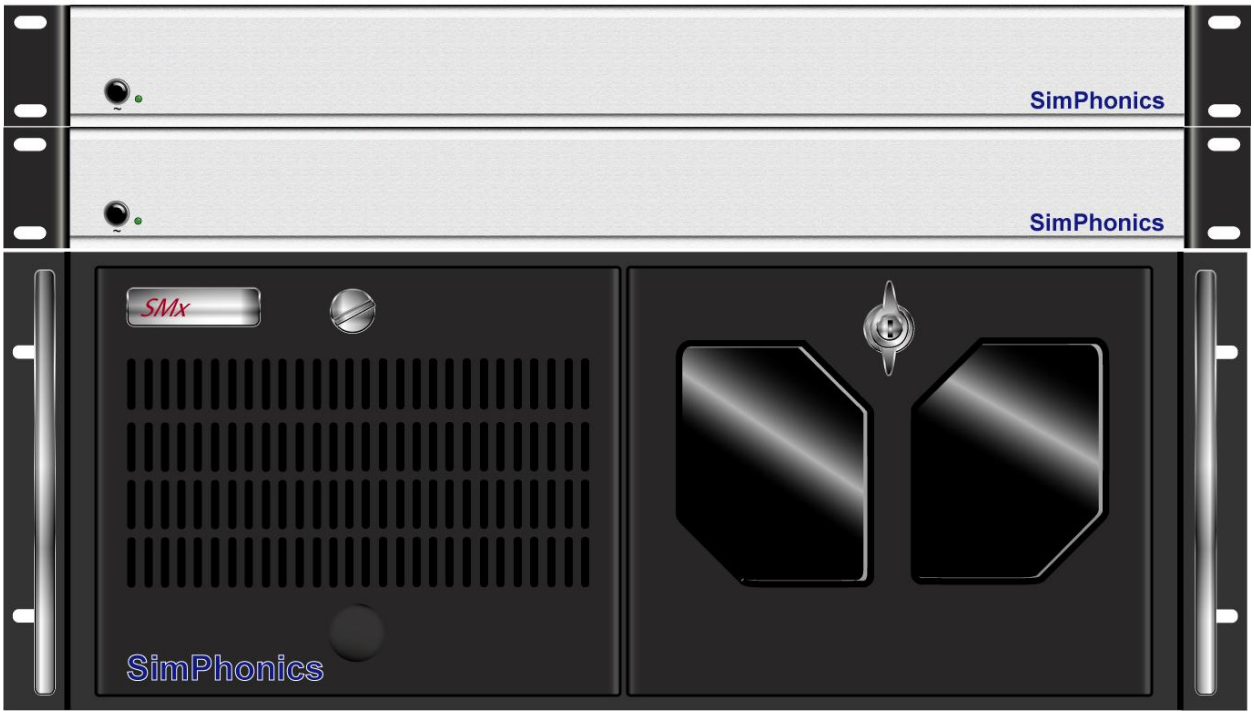
SMx Audio System
User's Manual



SimPhonics, Inc.
3226 North Falkenburg Road
Tampa, Florida 33619
Voice (877) 205-4901
CAGE: 0L4C8
Email: info@simphonics.com

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1 Preface

1.1 Trademarks and Copyrights

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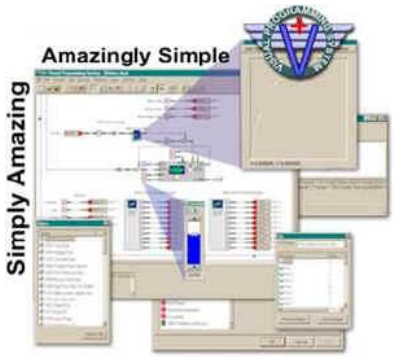
1.2 Before Reading this Document



The reader should be familiar with the V+ Visual Programming System, in particular the use of I/O devices and ports. The V+ Programming System User Manual is available from at this URL and is the software engine for the SMx system and is the only means of controlling the SMx behavior. The SMx audio system is designed for use in advanced applications requiring basic knowledge of digital audio sampling theory, real-time systems, and a good understanding of modern desktop PC architecture. There are additional V+ I/O devices that may be attached to the SMx system to extend the capabilities. To review these devices, click here.

1.3 Revision History

Ensure that you have the latest release of this document before relying on this information.

Version	Revision Description	Date
0.1	Pre-release.	8 October 1998
1.0	Initial Release.	29 January 2002
1.1	Added information regarding front SMx panel phone jack and volume control and updated system block diagram, pages 9 & 11.	15 April 2002
1.2	Changed to the new SMx mixer architecture. Version 2.0 Build 104 of the SMx Audio System Driver.	26 July 2002
1.3	Updated minimum requirements for system computer.	01 August 2002
1.4	Added "Amplitude Modulation - Single Side Band Radios in V+" section.	11 September 2002
1.5	Added SMx drawings and "tested cable lengths" data. Added section "Connecting SMx Cards to SMx Master Boxes."	09 April 2003
1.6	Updated "cable limitations" section. Added section "Extending SMx Master-to-Slave Connections."	25 April 2003
1.7	Changed fiber optic cables on drawing – "Connecting SMx Cards to Master Boxes."	08 May 2003
1.8	Updated document to reference VComm.	19 May 2003
1.9	Removed "BAL" from rear of SMXB0B-10 channel labels; updated DIP Switch Settings section.	23 July 2003
1.10	Updated SMx PCI card picture.	01 August 2003
1.11	Added virtual channel user interface.	21 August 2003
1.12	Updated recommended mating connector part numbers to "mono" ¼" connectors. Added "single-ended" description to SMx input and output channels	29 August 2003
1.13	Added "Operating and Storage Conditions" section.	28 September 2003
1.14	Corrected Error in WO and WI figures.	16 October 2003
1.15	Removed references to multimedia headsets.	15 March 2004
1.16	Replaced references to Cool Edit with Adobe Audition.	11 May 2004
1.17	Updated power, temperature & humidity specifications.	February 18, 2005
1.18	Formatting updates.	November 17, 2005
1.19	Added CE certification to Breakout Box power supply description.	December 13, 2005
1.20	Updated environmental and electrical characteristics.	June 2, 2006
1.21	Corrected electrical characteristics. Updated dimension shown for 4U high chassis, page 15; did not re-release version.	June 8, 2006 September 27, 2006
1.22	Added a section describing diskless boot.	October 25, 2006
1.23	Added specifications for SNR and Crosstalk.	December 1, 2006
1.24	Clarified cross talk specification.	June 14, 2007
1.25	Updated Graphics and Mother Board Specifications.	June 27, 2007

Version	Revision Description	Date
1.26	Moved the section describing diskless operation to the Hardware chapter.	July 26, 2007
1.27	Added warning for power disconnect of the breakout box.	August 10, 2007
1.28	Discussed the new SMx devices.	April 13, 2008
1.29	Added a section with instructions for updating the driver.	August 14, 2008
1.30	Moved the WaveOut Meters to just after the Windows Audio Mixer.	October 1, 2008
1.31	Updated Table 5 to read Analog Inputs (8 Single Ended TS).	February 23, 2009
1.32	Changed Table 3's Humidity Operating Condition to have a lower limit of 20% (Non-condensing).	April 29, 2009
1.33	Updated the status device to report to the V+ Run Time System message window.	October 12, 2009
1.34	Updated to show proper status port results when the system is in simulated hardware mode. (No DSPs or BOBs)	2010-11-22
1.35	Updated to correct problem in **echosmx.sys** driver. Added the Object 2023 detailed information along with an example.	2011-02-05
1.36	Updated the scaling of the input meters.	2011-03-01
1.37	Updated the Troubleshooting section. Corrected formatting errors, did not re-release.	2011-09-08
1.38	Added Object 2103 W I/O Select to A I/O (SWJ)	2012-08-04
1.39	Updated installation requirements for Build 503 and greater needing Windows 7 32-bit versions only.	2013-06-13
1.40	Added registry section. (SWJ)	2013-06-25
1.41	Updated minimum equipment performance standard and power specs (DCH)	2014-08-27
1.42	Added SMx system product volatility section (letter of volatility); changed all references of SMx serial cable to SMx LVDS cable; added SMx LVDS plenum cable to table 8; removed PCMCIA devices from table 6. (DCH)	2019-03-28
1.43	Removed max load current ratings of power supplies and listed nominal current ratings for SMx. Max load current ratings on power supplies are available in OEM user manuals. (DCH)	2020-01-31

1.4 Terms and Acronyms

AI	Analog Input
AIn	Analog Input
AO	Analog Output
AOut	Analog Output
BIOS	Basic Input / Output System
CPU	Central Processing Unit
dB	Decibel
dBA	Decibel A-Weighted – Acoustical measurement of SPL
dBu	Decibel Voltage relative to 0.750 volts regardless of impedance (unloaded)
DIS	Distributed Interactive Simulation
DLL	Direct Linking Library
DOS	Disk Operating System
DSP	Digital Signal Processor
ESD	Electrostatic Discharge
HLA	High Level Architecture
Hz	Hertz – Cycles per Second
IC	Integrated Chips
KHz	Kilo Hertz – Thousands of Cycles per Second
KΩ	Kilo Ohms – units of measure for resistance or impedance
I/O	Input / Output
ISA	Industry Standard Architecture
NIC	Network Interface Card
PXE	Preboot Execution Environment
RMS	Root-Mean-Square
SNR	Signal to Noise Ratio
SPL	Sound Pressure Level
THD+n	Total Harmonic Distortion plus Noise
TS	Tip/Sleeve
Z	Impedance
VOX	Voice Operated Relay
WFM	Wired-For-Management
WI	Wave In
WIn	Wave In
WO	Wave Out
WOut	Wave Out

1.5 References

For more information, click on the hyperlinks below see the respective user manuals for the system or subsystem you are interested in.

V+ User Manual

VComm User Manual

VComm Terrain Server User Manual

V+ On-line Object Help

V+ Remote Control Specification

Complete list of SimPhonics documentation

2 Introducing SMx

The SMx system is a culmination of over fifteen years of real-time audio system development. From the early days of custom hardware and software, SimPhonics has evolved a system that finally meets expectations of high performance, complete flexibility, and low cost. Most importantly, it does this while maintaining an open architecture that embraces modern industry standards. Open architectures mean extensibility, and the SMx was designed from the ground up as a platform for growth into areas that are not yet defined.

SMx delivers up to 64 physical channels of input and output of 24-bit 44.1Khz digital audio per PC. Each channel is capable of connecting to a wide variety of electrical signal levels; from standard line audio levels to phantom powered microphones, to low impedance headphones. Internal audio streams can be routed to any destination from any source in any combination. In fact SMx introduces some completely new concepts in digital audio systems that will be discussed later in this document.

Even without the use of V+, the SMx system is well suited to multi-track digital recording and playback systems often found in recording studios.

One of the disadvantages of such a modular and flexible system is that it requires a good understanding of its architecture in order to be fully utilized. The primary goal of this document is to educate the user in more than just the technical workings of this system. Since this system will be used to fulfill an application specific need, applications examples are presented and explored.

This document describes the installation, operation and trouble-shooting of the SMx system. More importantly, it also contains “How-To” information to help the user construct V+ designs for controlling the SMx and generating sound for simulation, simulating communications systems, generating tones, and connecting the SMx to the DOD DIS/HLA voice communication networks (VComm).

2.1 What is an SMx System?

The SMx Audio System is a visually programmable, multi-channel audio system primarily used in real-time simulation and training equipment. The needs of such systems are somewhat unique. Many features of the SMx system are designed specifically to suite the needs of flight simulation, such as low latency mixing of all channels, and special add-on interfaces that can connect to various types of computer systems and support hardware.

2.2 Complete Audio and I/O System Solution

SMx is more than an audio system. In fact, SMx has been used as a complete I/O system. Thanks to the various I/O devices such as our National Instruments I/O device, V+ can take advantage of existing PC I/O hardware on the market. Also, since SMx uses existing software standards, any network interface card with a Windows driver can be used directly. Want to use Gigabit Ethernet? Fiber? FDDI? No problem. The Host and the DIS/HLA network can be connected via any of these. Other custom devices are available such as VMIC's Reflective Memory, SCRAMNet, Camber/Bit-3 VME-to-PC, and PROFIBUS just to name a few.

2.3 SMx Terminology

Before we get started, lets agree on some terminology. Commercial audio systems generally use audiophile terminology. However, the SMx system sticks to the engineering definitions.

Analog Input (AI or AIn) – An AI signal is an actual physical audio input connection. These are present on breakout boxes as inputs and are labeled channel 1 through 64.

Analog Output (AO or AOut) – An AO signal is an actual physical audio output connection. These are present on breakout boxes as outputs and are labeled channel 1 through 64.

Breakout Box – A Breakout Box provides the external interface for Analog Inputs and Outputs. Each Breakout Box contains 8 AIs and 8 AOs which are physically situated on the back panel using industry standard ¼" phone jacks.

Wave Output (WO or WOut) – A WO is a digital stream of output audio samples flowing from the PC system. The term WAVE OUT is taken from the Windows file extension for sound files (.WAV). Windows XP ships with a number of wave files in the c:\WINDOWS\MEADIA directory, and can be played directly by the system. When Windows plays a sound, it is usually a wave file. The WO channels in the SMx are often referred to as "virtual channels" since these are not actually connected directly to physical outputs.

Wave Input (WI or WIn) – A WI is a digital stream of input audio samples flowing into the PC system from a physical input. This is usually considered recording audio. The SMx uses WI to send digital audio to the PC system. SMx WI streams can be recorded in the same way any other sound can be recorded using windows. However, the SMx system can also send these streams to the voice network, or a number of other destinations. The WI channels in the SMx are often referred to as "virtual channels" since these are not actually connected directly to physical inputs.

3 System Architecture

Figure 1 shows a simplified overall view of the system. A CPU powers the system and runs the visual programming software, V+, which controls all aspects of the system. Audio signals are connected to the system via ¼" phone plugs on the breakout boxes. Each breakout box features eight inputs and eight outputs, and one (1) system chassis can support up to eight breakout boxes for a total of 64 inputs and 64 outputs. The flexibility of the SMX system allows any configuration from one (1) to eight (8) external boxes resulting in 8 to 64 channels.

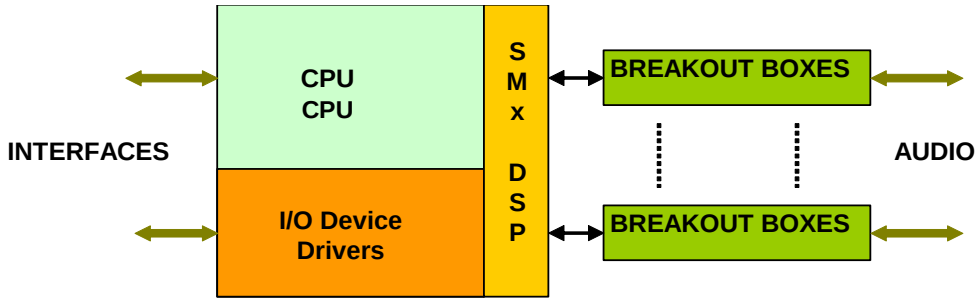


Figure 1, SMx System Architecture

The interfaces shown in the figure above refer to a variety of connections that can be one or more Ethernet connections, and or I/O devices that have their own interfaces specific to their type. For example, a typical system may have a DIS/HLA Ethernet connection and a Host Ethernet interface. For now, let's focus on the audio architecture.

3.1 Overall System Block Diagram

Figure 2 illustrates an overall system block diagram for a standard 32 Channel system. The delivered components are shown in separate colors. The computer chassis connects to a Host computer via Ethernet, which commands the system via real-time data. This data controls a V+ design, which generates sounds via the SMx system and output rack. This diagram represents our standard 32 Channel configuration, PN: SMx-32-Enn-RM4i7.

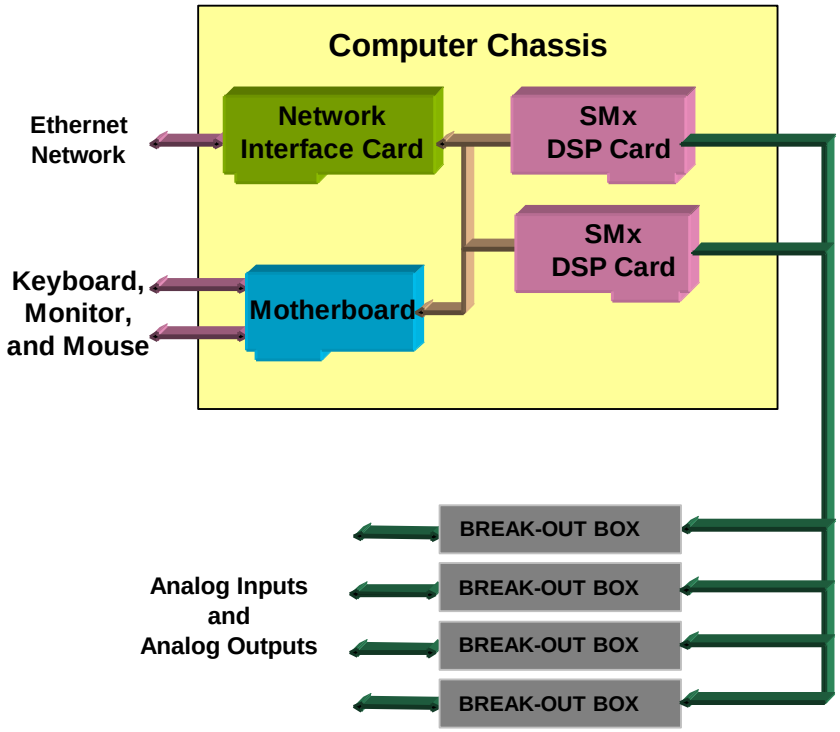


Figure 2, Overall System Block Diagram

3.2 SMx Audio System

Figure 3 is a top level flow diagram of the AIs to WIs, and WOs to AOs. This is the heart of the SMx audio system. Analog inputs and outputs flow to and from the Super Mixer, which is also connected to the Wave inputs and Wave outputs of the Windows operating system. Our SMx architecture is conceptually the same as an ordinary sound card for Windows, except that there are many more channels of audio. The Super Mixer is controlled in V+ via the "SMx Audio System" I/O driver.

The Super Mixer is a kernel level driver embedded within the Windows operating system. It directly controls the SMx DSP cards which are connected to the breakout boxes. It can route audio streams in almost any fashion. In order to understand SMx, it is essential to understand the Super Mixer operation. Each line in the diagram can actually be 64 discrete channels. Note that breakout boxes are not shown for clarity.

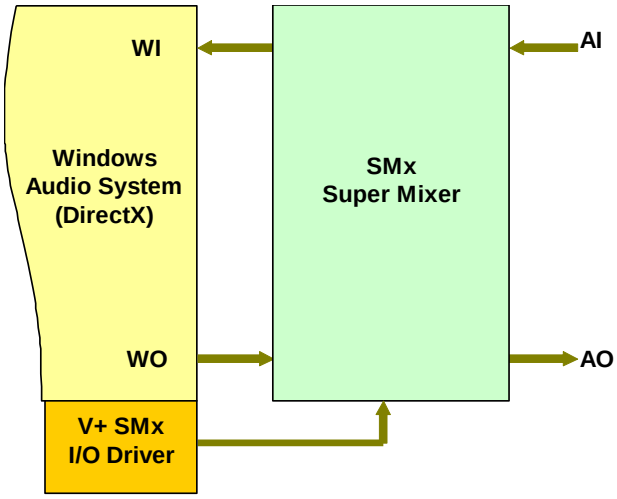


Figure 3, SMx Audio System

3.3 SMx Super Mixer

The Super Mixer is the key to the flexibility of SMx. This is what enables SMx to be used in applications where normal sound cards cannot. Let's take a look at how this works. There are four basic audio signal paths in the Super Mixer (refer to Figure 4):

1. **Analog In to Analog Out –** Input signals applied to the AIs are routed through the input gain block, monitored at the AIn metering interface, mixed to AOs by the Analog In to Analog Out mixer, routed through the output gain block, monitored at the AOut metering interface and sent to the AOs.
2. **Analog In to Wave In –** Input signals applied to the AIs are routed through the input gain block, monitored at the AIn metering interface, mixed to WIs by the Analog In to Wave In mixer, and sent to the WIs of the Windows audio system.
3. **Wave Out to Wave In –** WO signals coming from the Windows audio system are mixed to WIs in the Wave Out to Wave In mixer, and sent to the WIs of the Windows audio system.
4. **Wave Out to Analog Out –** WO signals coming from the Windows audio system are mixed to AOs in the Wave Out to Analog Out mixer, monitored at the WOut metering interface, routed through the output gain block, monitored at the AOut metering interface and sent to the AOs.

This mixer is a 64-channel system. That is, all of the lines connecting these mixer components are 64 channels of audio. Even if your system has less than 64 channels of physical audio, all 64 signals are mixed. The user can adjust the number of WO and WI channels that are present in any SMx system. Keep in mind however, more channels means more processing power needed to perform the Super Mixer calculations. Modern processors have no problem with a full 64 channel super mixer requiring less than 8 percent of the overall CPU.

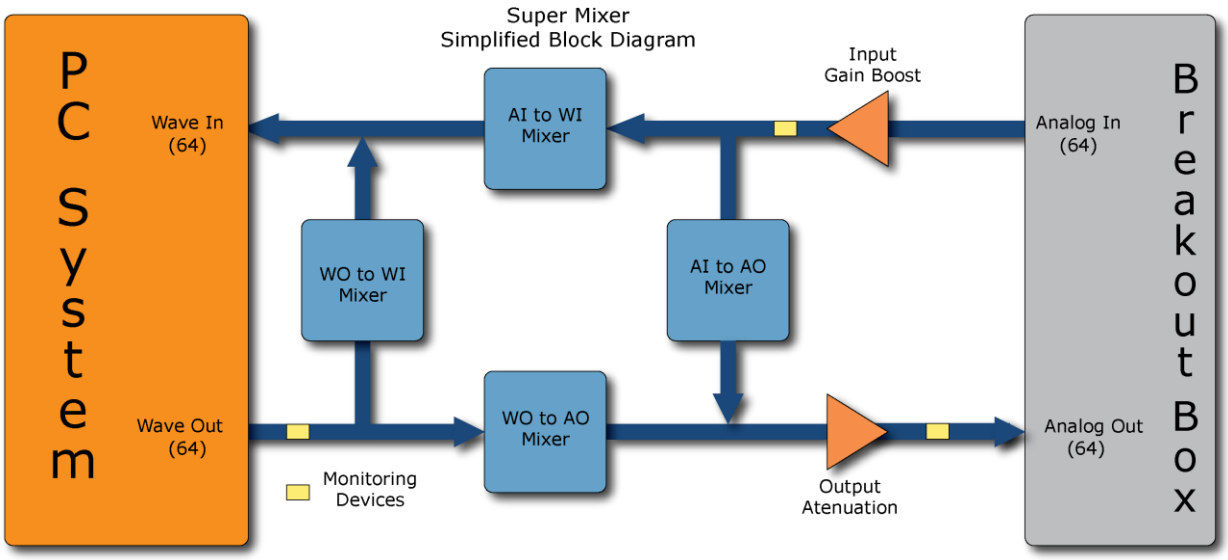


Figure 4, SMx Super Mixer

Each of the components shown in the figure above are represented in V+ as an I/O device. Each of these I/O devices is explained further in sections below.

3.4 Individual Mixers

A mixer is a device used to mix audio signals from inputs to outputs. In order to remain flexible, the mixer must be able to mix any input to any output independently without affecting any other inputs or outputs. This is accomplished via a XY matrix of gain controls.

To further understand the generic mixer model, refer to Figure 5 below. The diagram shows a matrix of lines, 64 horizontal and 64 vertical, with a circle at the intersection of each horizontal and vertical line. For the sake of this discussion, let each horizontal line represent an input to the mixer and each vertical line represent an output. The circles at the intersections, then, would represent the gain values that are used to control the signal flow from input to output.

The output signal is then computed as the summation of all input signals multiplied by the respective gain values for that output. Each gain value (as represented by the circles in the diagram) in the mixer has a corresponding port in V+ that can be given a value from 0.0 to 1.0.

There are four mixers in the SMx Super Mixer (see the tan boxes in Figure 4). The mixer shown in the figure below is the Analog In to Analog Out Mixer. The mixers and the V+ I/O devices that control them are discussed later.

As you can see, there a lot of V+ ports needed to control this mixer. In fact there are 64 X 64, or 4,096 ports per mixer, and there are four of them! If this mixer was exposed as a hardware mixer to Windows XP and there were controls for each gain cell, there would be over 16,384 controls present on the mixer console.

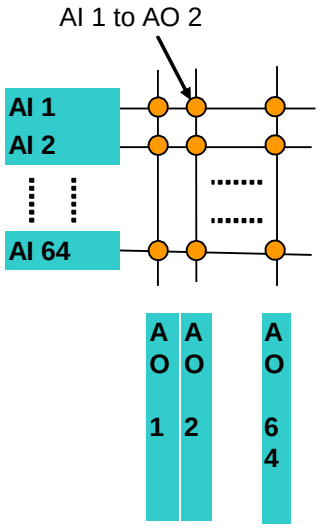
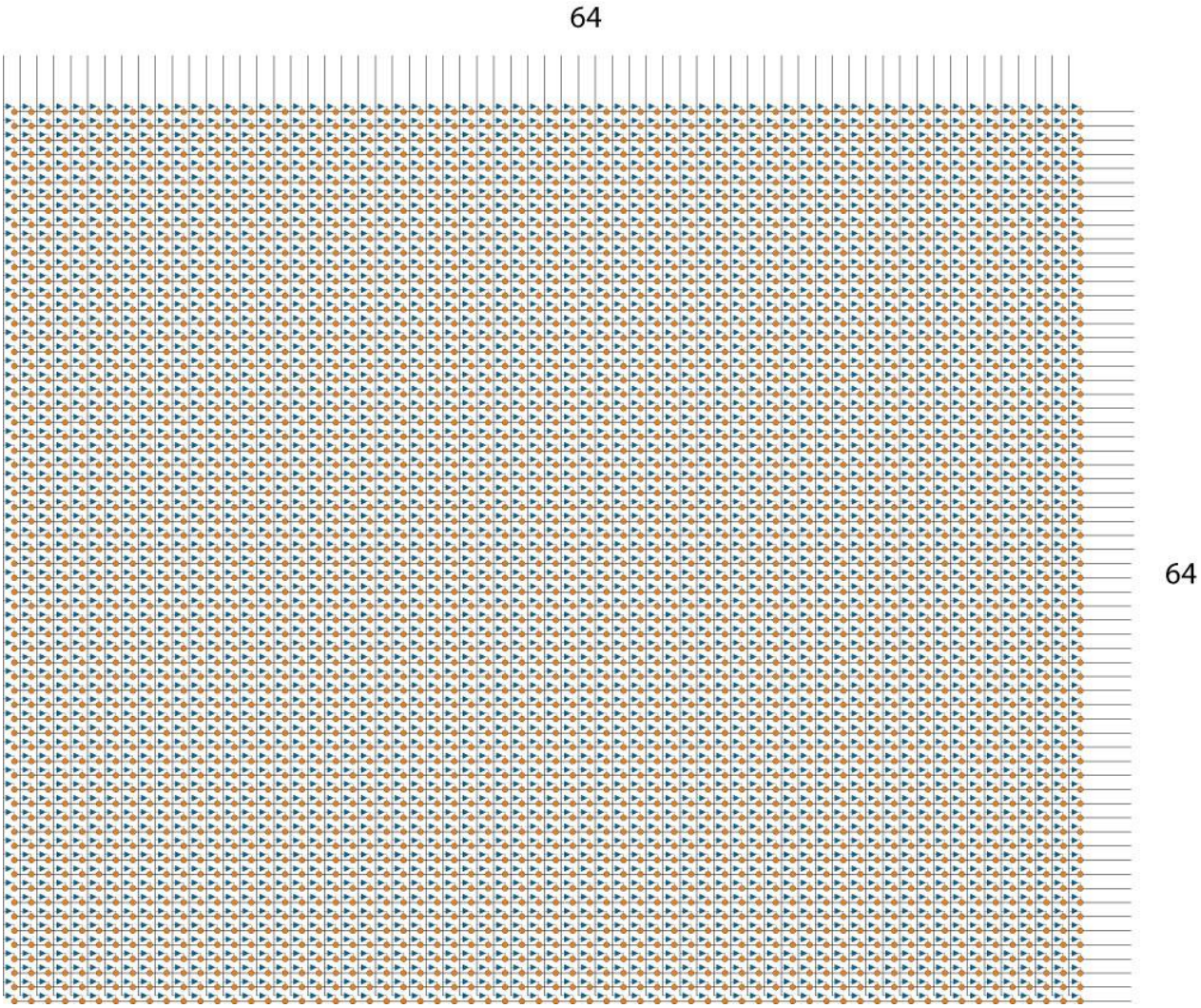


Figure 5, SMx Mixer Matrix

3.5 Individual Mixer Module

There are four mixer modules in the SMx super mixer and each one contains 4,096 gain controls that are exposed as a port in V+. The entire SMx super mixer contains 4 X 4,096 or 16,384, + (5) more gain block and meter sections of 64 ports each, resulting in 16,704 V+ ports under CPU control. There is no other mixer like this on planet earth.

Figure 6, Single SMx Mixer Module Showing all 4,096 Gain Controls



4 Hardware

4.1 Specifications

Physical

All components shown in the Table 1 are standard 19" EIA rack-mountable units.

Table 1. SMx Physical Specifications

SMx Component	Dimensions (Inches)	Weight (Pounds)
2U System Chassis	3.465H x 19W x 25.6D	31
4U System Chassis	7.00H x 19W x 20.5D	40
SMx Breakout Box	1.5H X 19W X 6D	3

Power Requirements

All components shown in Table 2 are designed to operate from US or European power systems. All SMx power supplies are CE certified. Please reference OEM power supply user manual for additional specifications.

Table 2. SMx Power Requirements

SMx Component	Nominal Current	Voltage
2U System Chassis	.49A 120VAC	90-264VAC (Auto Switching), 47-63Hz
4U System Chassis	.46A 120VAC	100-240VAC (Auto Switching), 47-63Hz
SMx Breakout Box	.175A 120VAC	90-264VAC (Auto Switching), 47-63Hz

Operating and Storage

Table 3 lists the operating and storage conditions for the SMx Audio System. Note: These specifications are for the SMx system without a keyboard, monitor and mouse.

Table 3. Operating and Storage Conditions

Category	Operating	Storage
Temperature	0°C to 40°C	-20°C to 60°C
Altitude	0 to 10,000 Feet	0 to 40,000 Feet
Humidity	20% to 90% (Non-condensing)	5% to 95% (Non-condensing)

4.2 Electrical Characteristics

The voltages in Table 4 represent full-scale 24 bit conversions with 0dB boost and maximum gains of 1.0 on the Super Mixer controls. Boost values are in +6dB increments, up to +60dB.

Table 4. Electrical Characteristics

Item	Volts
Input	13.1 V Peak, 9.26 Vrms
Output	13.1 V Peak, 9.26 Vrms

4.3 Audio Performance

Audio performance specifications are provided in Table 5.

Table 5. Audio Performance Specifications

Item	Specification
Analog Inputs (8 Single-Ended ¼" TS)	
Frequency Response	10 Hz – 22 kHz, ±0.25dBA
Dynamic Range	110 dBA (24 bit)
THD+n	<0.001%, 20 Hz–22 kHz, A-weighted
Nominal Input Level	+4 dBu
Maximum Input Level	+22 dBu
Input Impedance	10 KΩ
Analog Outputs (8 Single-Ended ¼" TS)	
Frequency Response	10 Hz – 22 kHz, ±0.25dBA
Dynamic Range	116 db
THD+n	<0.002%, 20 Hz–22 kHz, A-weighted
Nominal Output Level	+4 dBu
Maximum Output Level	+22 dBu
Crosstalk	> 81dB of rejection across a frequency range of 20 Hz to 20 KHz with a -10 dBv input sine wave signal.

4.4 Transport Delay

The SMx was designed to minimize transport delays between input and output audio through the use of a Super Mixer. The delay from analog input to analog output using the Analog Input to Analog Output Mixer device is less than 6 milliseconds. More detail on the Super Mixer is provided below.

4.5 Reliability and Maintainability

SimPhonics has calculated and produced a Reliability and Maintainability (R&M) documentation for the SMX system. Our document contains information about the SMx Mean Time Between Failures (MTBF) and Mean Time To Repair (MTTR). This information is used to predict how long repairs and maintenance tasks will take in the event of a system failure.

For more information, go to our website to download the SMx Reliability and Maintainability Predictions document.

4.6 CPU Chassis

The computer system for SMx can be ordered as a laptop, desktop, or rack-mounted unit. Most applications will use a rack-mounted unit. Table 6 shows the relationship between the various types of physical CPU's and the number of breakout boxes that may be used.

SimPhonics also provides a PCMCIA card for the SMx system in order to use a laptop as a CPU for the SMx system. Up to two of these cards can be used, providing up to 32 channels. It is unlikely that a laptop would be used to drive 32 audio channels in a given application; however a laptop could be used as a development system for SMx applications.

Table 6, Chassis Options

Chassis Configuration	Maximum SMx DSP Cards	Maximum Physical Channels Per Chassis	Maximum SMx Breakout Boxes
Mid-Tower Desktop	4	64	8
2U Rack Mount	2	32	4
4U Rack Mount	4	64	8

Any typical SMx SOUND/COMM system utilizes a 4U high 19-inch rack-mountable chassis, with an ATX style power supply. Depending on the user's application, SimPhonics can deliver 2U or 4U rack-mount style chassis; 4U or 6U passive backplane chassis, desktop, or laptop units. (The SMx system, when integrated and designed for Sound, COMM, Voice, and I/O, for example, fits into a single 4U high chassis).

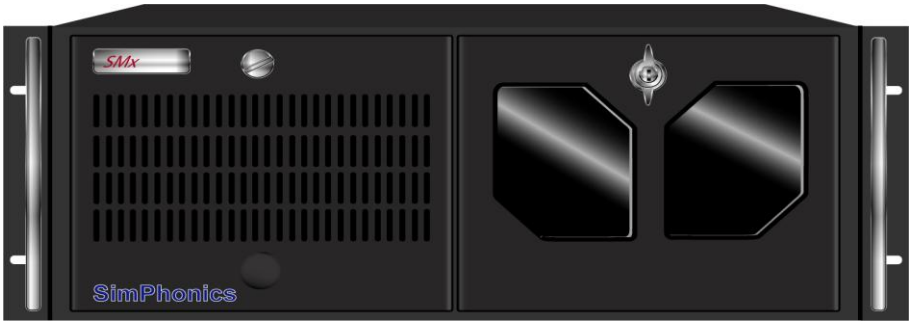


Figure 7, Typical SMx PC Chassis

4.7 Motherboard and Processor

SimPhonics uses all of the latest technology Intel based processors and motherboards in our SMx computer systems. The current delivered i7 motherboard has two 240-pin DDR3 DIMM sockets supporting up to 16GB of RAM and are equipped with a minimum of five (5) PCI slots. All normal I/O ports such as video, Ethernet, PS/2 and USB ports are integrated to the motherboard's I/O backpane. Table 7 below summarizes the minimum processing capability of the current SimPhonics SMx computer configuration.

Additional quad-port Ethernet cards and Data Acquisition (DAQ) cards can be configured into the system upon request. SimPhonics has numerous I/O device drivers available including NI DAQ devices so that interoperates with V+ seamlessly.

Table 7. SMx System Minimum Performance Characteristics

Component	Specifications
Processor	Intel® Core™ i7-3770 3.4GHz LGA1155 22nm (4 cores/8 threads)
RAM	4GB DDR3 PC3-12800 1600Mhz Cas Latency 11
Number of PCI Slots	5 or More
Hard Drive	500GB SATA III 6Gbps 7200rpm
Optical Drive	CD/DVD-RW SATA
Video	Intel® HD Graphics 4000 (built into the processor)
Ethernet	2 Gigabit Ethernet Ports

SimPhonics uses only genuine Intel processors in systems since some software utilizes the latest DirectX instructions for real-time high performance audio applications. Also, the Intel processor features several high accuracy-timing registers that may not be available on other processors.

4.8 Diskless Operation

SMx computer provided by SimPhonics support diskless boot operation via an Ethernet connection. The motherboard BIOS supports the Intel Preboot Execution Environment (PXE). The Network Interface Card (NIC) chipset, whether onboard or installed in a PCI or PCIe slot, are Wired-For-Management (WFM) qualified. Since there are numerous products which support diskless operation, the exact nature of the diskless implementation is application specific.

4.9 SMX Breakout box

Figure 8 and Figure 9 below depict the front and rear views respectively of a SMx Breakout Box, part number SMXBOB-10. Every Breakout Box is identical and can be configured to be either a Master or a Slave. The LINE INPUTS and LINE OUTPUTS labels are separate parts and can be replaced to denote the correct channel numbers.

Figure 8, SMXB0B-10 Front View

Figure 9, SMXB0B-10 Rear View

4.10 Cable Limitations

Table 8 outlines physical length limitations for system hardware cabling.

Table 8 Cable Limitations

From	To	Part No.	Description	Max Length
System Chassis	AC Outlet	Vendor Supplied	Power Cord	6 feet
System Chassis	Breakout Box (Master)	SM4038-XX	SMx LVDS Cable	100 feet
System Chassis	Breakout Box (Master)	SM4038-XXP & SM4038-XXXP	SMx LVDS Plenum Rated Cable	130 feet
Breakout Box	AC Outlet	Vendor Supplied	Power Cord	6 feet
Breakout Box (Master)	Breakout Box (Slave)	SM4F01-XX	SMx Plastic Fiber Optic Cable	50 feet
Breakout Box (Master)	Breakout Box (Master)	SM4039-XX	SMx Sync Cable	100 feet

4.11 SMx System Volatility

The following will describe volatile, non-volatile, and storage media on the SMx audio system. Customers can use this document to comply with security requirements and equipment handling procedures and may use this portion of the document as the letter of volatility. For additional information, please contact SimPhonics, Inc. at 877.205.4901 or email technical support at support@simphonics.com.

Product Information
Manufacturer: SimPhonics, Inc.

Product Family: SMx

Product Part Numbers:

RM2
RM2Q
RM2i7
RM2i10
RM2i10-SHB
RM4
RM4Q
RM4i7
RM4i10
RM4i10-SHB
SMXPCI-10
SMXB0B-10
SMx-PCI10-RM2i7
SMXVIP-8D-Enn-RM2
SMXVIP-8DMH-Enn-RM2
SMXVIP-8D-2GEnn-RM4Q
SMXVIP-8D-Enn-DC1
SMXVIP-DMH-2GEnn-RM4Q
SMXVIP-8DMH-Enn-DC1
SMXRC-08-2GE-RM4i7
SMXRC-08-2GEnn-RM4Q
SMXRC-08-Enn-DC1
SMx-08-G4E-RM2
SMx-08-G4E-RM2-CKPT
SMx-08-G4E-RM2-IOS
SMx-08-G4E-RM2-BDS
SMx-08-G4E-RM2-DCKPT
SMx-08-G4E-RM2-DIOS
SMx-08-G4E-RM2i7-CKPT
SMx-08-G4E-RM2i7-IOS
SMx-08-G4E-RM2i7-BDS
SMx-08-G4E-RM2i7-DCKPT
SMx-08-G4E-RM2i7-DIOS
SMx-08-PCI10-RM2
SMx-08-2GEnn-RM2Q
SMx-08-2GEnn-RM4Q
SMx-08-2GE-RM2i7
SMx-08-2GE-RM2i10
SMx-08-2GE-RM2i10-SHB
SMx-08-2GE-RM4i7
SMx-08-2GE-RM4i10
SMx-08-2GE-RM4i10-SHB
SMx-16-2GEnn-RM2Q
SMx-16-2GE-RM2i7
SMx-16-2GE-RM2i10
SMx-16-2GE-RM2i10-SHB
SMx-16-ENN-RM4
SMx-16-2GEnn-RM4
SMx-16-2GEnn-RM4Q
SMx-16-2GE-RM4i7
SMx-16-2GE-RM4i10
SMx-16-2GE-RM4i10-SHB
SMx-24-2GE-RM4i10-SHB
SMx-24-2GE-RM4i10
SMx-24-2GE-RM4i7
SMx-24-2GEnn-RM4Q
SMx-32-2GE-RM2i7
SMx-32-2GE-RM4i10-SHB
SMx-32-2GE-RM4i10
SMx-32-2GE-RM4i7
SMx-32-2GEnn-RM4Q
SMx-40-2GE-RM4i10-SHB
SMx-40-2GE-RM4i10
SMx-40-2GEnn-RM4Q
SMx-48-2GE-RM4i10-SHB
SMx-48-2GE-RM4i10
SMx-48-2GEnn-RM4Q
SMx-56-2GE-RM4i10-SHB
SMx-56-2GE-RM4i10
SMx-56-2GEnn-RM4Q
SMx-64-2GE-RM4i10-SHB
SMx-64-2GE-RM4i10
SMx-64-2GEnn-RM4Q

4.11.1 Volatile Memory

These products contain volatile memory, which is erased when power is removed.

4.11.1.1 Item 1

Type: FPGA

User Modifiable: No

Function: These ICs provide functionality for the DSP (PN: SMXPCI-10) and breakout boxes (PN:SMXB0B-10) and each will contain QTY 1 FPGA. These devices are re-programmed each time the board is powered up. These device's programming data are contained in a PROM which can only be programmed at the manufacturing factory.

Process for Clearing: Power down

4.11.1.2 Item 2

Type: RAM (SDRAM) Size: 4GB

User Modifiable: Yes

Function: This device is used in the SMx audio computer and provides fast storage/buffering of data for the Windows Operating System (OS) and all software applications.

Process for Clearing: Power down

4.11.2 Non-Volatile Memory

This product contains non-volatile memory, which is retained when power is removed.

4.11.2.1 Item 1

Type: Hard Drive Size: 500GB or larger

User Modifiable: Yes

Function: The hard drive contains the operating system, software applications and all stored user data as well as a recovery partition to restore the operating system.

Process for Clearing: Low-Level format and delete partitions, destruction of hard drive or removal of hard drive prior to shipment is recommended for security.
Note: Hard drive sizes may change without notice depending upon availability.

4.11.2.2 Item 2

Type: Motherboard Basic Input Output System (BIOS)

Modifiable: Extremely limited

Function: The BIOS is a typical computer BIOS used to boot the SMx audio computer's motherboard. It is pre-programmed at the OEM factory. It contains initial boot-up instructions for the CPU. While this is normally user accessible, the type of data stored is extremely limited (such as boot-up device order and date/time settings.) A BIOS password can also be stored to limit the BIOS setup and access to authorized personnel only. A lithium button battery (CR2032) provides backup power if the unit is unplugged from power.

Process for Clearing: Clear CMOS per OEM instructions in motherboard user manual which is provided as part of the SMx audio system's documentation package or removing the battery will reset the BIOS with AC power source disconnected.

4.11.3 Media

This product does not contain media storage devices such as: floppy drive, tape drives, or memory cards. While external USB mass storage devices could be attached by users, they are not supplied. Any software CD/DVDs in delivery with the SMx audio system are burned with track at once (TAO) closed and disc at once (DAO) closed methods so that no additional data may be burned onto these disks.

4.12 Recommended Mating Connectors

The following Switchcraft ¼" mono mating connectors are recommended when connecting to SMx single-ended input and output audio channels:

Switchcraft ¼" Phone Plug (black), PN: 250

Switchcraft ¼" Phone Plug (red), PN: 255

We further recommend that any Buyer interface cables use Red handled connectors for all Inputs, and Black handled connectors for all Outputs. (Colored heat shrink can also be used for Input/output identification purposes.)

Note that these Switchcraft brand connector handles are cylindrical in nature providing a consistent outside diameter (OD) from top to bottom (see Figure 10). This allows multiple connectors to be plugged into the SMx without interference. Many other manufacturers or brands of ¼" mono plugs have conical handles where the OD gets larger as it gets closer to the connector. This "larger" diameter handle causes interference when plugged in side by side on an SMx breakout box and therefore CANNOT be used. The maximum diameter of a Switchcraft plug is ½" as show below. This is the maximum diameter for a connector to plug into a SMx breakout box.

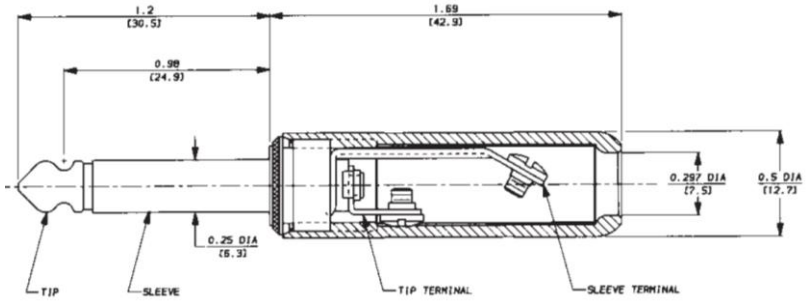


Figure 10, Switchcraft Plug Physical Dimensions

Another reason these Switchcraft parts are recommended is the head of the plug has more of a tip and is smooth. Many are flat on top, flat on the sides, and/or have sharp edges – they do not plug in or mate as efficiently.

4.13 SMX PCI DSP Card

The SMx audio interface is used for the input and output of analog sounds and voice, such as intercom, aircraft/avionics tones, and radio communications in Simulator Subsystems. Contrary to standard PC audio cards, which provide one set of stereo inputs and outputs (2 input, 2 output channels), the PCI based SMx DSP card, shown in Figure 11, is capable of processing up to 16 analog audio inputs and 16 analog audio outputs. The composite audio input and output signals are sent to and from the audio card via a LVDS cable to the 19" rack-mounted breakout boxes, where the signals are combined and separated. Located on the rear of the boxes are the necessary ¼" mono input and output connections which connect directly to the analog equipment (microphones, headphones, amplifiers, etc).

The SMx DSP card is a simple 32-bit PCI card. Up to four of these cards may be used in an SMx system for up to 64 channels of audio. Each card is responsible for 16 channels. The cards are synchronized via an external BNC cable on the external boxes. This sync cable is connected from the first card's breakout box master to the next card's external breakout box master, to the next card's breakout box master, etc. More details on the synchronization connections are provided below.

Figure 11, SMx DSP Card

The order of channels is dictated by the order that the cards are plugged into the PCI bus. On most motherboards, PCI slot 0 is located next to the graphics slot, or closer to the CPU. The cards do not have to be located in adjacent slots however. There are no jumpers on the DSP card as this is a fully plug and play compliant card.

4.14 Simulated Hardware

If the SMx Audio System I/O device for V+ is loaded with no SMx DSP present on the machine, the I/O device will sense this situation, and simulate the hardware. This is important, since V+ can be used to create and or edit SMx V+ designs even though the SMx hardware is not present.

4.15 Sound Cards

You can use additional sound cards with the SMx. However, Windows XP limits the number of stereo (two channel) sound cards that can be used to 32, which is 64 channels. If a 64 channel SMx system is installed, no additional sound cards can be used. The additional sound card may in fact cause the 64 channel SMx system not to work at all.

If you are using additional sound cards, make sure you set the "sample rate conversion quality" to its highest setting (see below).

Note: *When less than a 64 channel SMx system is installed, ensure that you use a sound card with a WDM driver.*

4.15.1 Setting the Sample Rate Conversion Quality

If an additional sound card is used with SMx, it is mandatory to set the "sample rate conversion quality" to the highest setting. To set the sample rate conversion quality, do the following:

1. Click **Start**, select **Settings**, select **Control Panel**.
2. Double-click the **Sounds and Audio Devices** icon.
3. Select the **Audio** tab.
4. If the **Advanced** button(s) are not highlighted, click OK. Close the control panel, restart the computer and skip the remaining steps. Otherwise, in the **Sound playback** section, click the **Advanced** button.
5. Select the **Performance** tab.
6. Make sure the **Hardware acceleration** slider is set to **Full**.
7. Make sure the **Sample rate conversion quality** slider is set to **Best**.
8. Click **OK**.
9. Click **OK**.
10. Close the **Control Panel**.
11. Restart the computer.

4.15.2 Controlling the Sound Cards

Most sound cards for the PC expose a set of controls to Windows that allow Windows to manipulate their mixer. This is called the Windows Audio Mixer, and is controlled via the Volume Control panel. For example, a Creative sound Blaster PCI card exposes a Volume Control panel that looks like Figure 12 below. Note the name of the device in the bottom left corner.

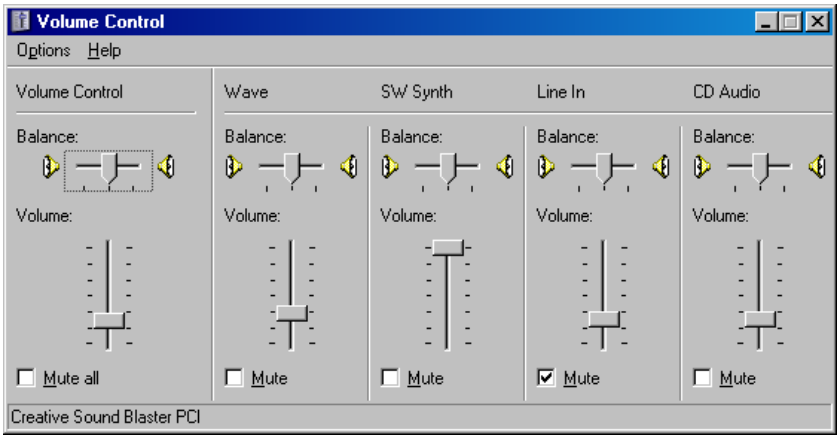


Figure 12, Creative Sound Blaster PCI Card Control Panel

The SMx Super Mixer does not reveal its controls to the Windows Audio Mixer environment. However, Windows automatically exposes some of these controls. Figure 13 shows the controls which are displayed for the playback section of each SMx device. The controls for Line out, SW Synth, and CD Player have no effect. However, the Wave control does. Always leave this control at its maximum position (default) as shown. Decreasing this gain will decrease the amplitude of the Wave Out signals before these signals are introduced into the super mixer.

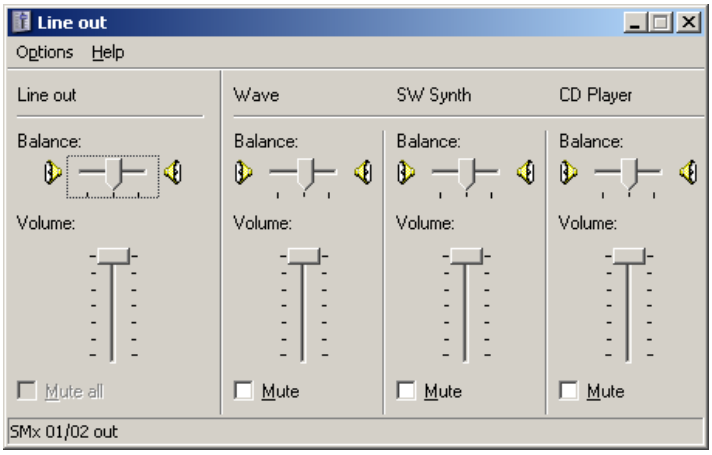


Figure 13, SMx Playback Controls Exposed by Windows

If you are using another sound card along with the SMx system, V+ provides a way to manipulate these controls within a V+ application. This is accomplished using the "Windows Audio Mixer I/O Device" which is a topic discussed in the V+ Programming System User Manual.

4.16 Power-up and down Sequence

AC power should be applied to each of the SMx components simultaneously or within a few seconds of each other.

4.16.1 Powering Up the System

When powering on the SMx system:

1. Turn the SMx breakout box(s) power on first. Power should be applied to all the breakout boxes within a few seconds of each other.
2. Apply power to the computer chassis.

Note: *The SMx system does not work properly if it is not powered up in the correct sequence! If you mistakenly power up the computer before the breakout boxes, simply reboot the computer (with the breakout boxes turned on). If at any time the LVDS cable connections are disconnected with the SMx system chassis powered on, the entire SMx system must be powered off and on.*

4.16.2 Powering Down the System

When powering off the SMx system:

1. Shut down the SMx system CPU first, using the shutdown feature of the operating system.
2. Remove power to the external SMx chassis.

Note: *If power is removed from one of the breakout boxes while the SMx CPU system is running, the SMx CPU system will have to be rebooted.*

5 SMx System Interconnect Cables

All of the SMx interconnection cables are supplied with the system, and consist of the PCI card to breakout box, fiber optic interconnect, and BNC sync cables along with the power cords for the breakout boxes. If any of the interconnect cables are not connected properly the system will not function correctly.

The SMx internal PCI DSP card connects to the breakout boxes via a LVDS cable with DB9 connectors.

The sync cable synchronizes the sampling clocks among the PCI DSP cards installed in your system. SMx will not work without this sync cable, and the driver software will remind you of this if you attempt to run the system without it. The sync cable connects to the sync output of the first master box to the input sync of the next master box, etc.

Toslink fiber optic cables connect a master breakout box to a slave breakout box (Refer to section 5.1 to set master and slave settings). Two cables are used: master output to slave input, and slave output to master input.

5.1 SMx Breakout Box DIP Switch Settings

The switch settings shown below are the DIP switches located on the rear of the SMx breakout box(s). These switches are used to select Phantom Power, and are also used to select Master/Slave box position within the system design.

5.1.1 Master/Slave DIP Switch

Each PCI DSP card connects to the master breakout box, which in turn connects to an additional breakout slave box if more than eight channels are used. Therefore each PCI card can connect up to two boxes, the master and the slave. Each breakout box is assigned a master or a slave by setting a DIP switch on the back of the unit (see Figure 14). When switch 9 is moved to the "down" position, the box is in MASTER mode. When switch number 9 is moved to the "up" position, the box is in the SLAVE mode.

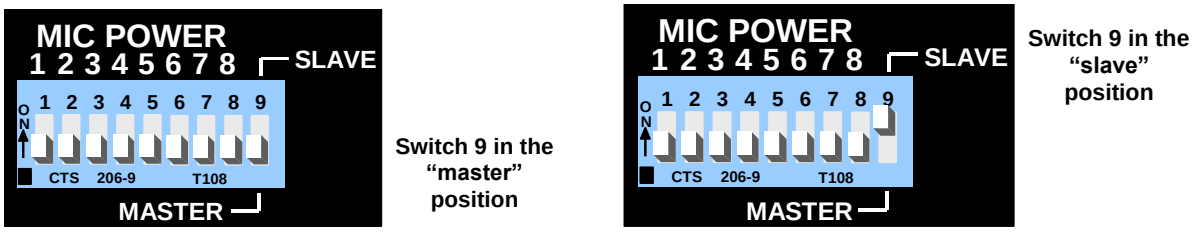


Figure 14, Breakout Box Master/Slave Dip Switch

5.1.2 Phantom Power Switches

The SMx system is capable of connecting to phantom power type microphones, or phantom powered mic preamps. Each channel features a phantom power option set by a DIP switch on the rear of each chassis. Most general aviation style headset microphones utilize phantom power and will not work without it. If the switch is in the ON position, a +15Vdc signal is applied back down the input. The current is limited by a 130ohm resistor used for dropping the voltage; ideally to 7.5Vdc and the AC signal rides on the DC level.

The SMx uses a 130ohm pull-up resistor to +15VDC. For those applications using phantom power check to ensure that this is compatible with your microphone preamplifier.

IMPORTANT!

Do not turn on the phantom power unless you are sure that a microphone pre-amp is connected to the corresponding input connector. Otherwise, the phantom power can cause damage to electronic equipment that is connected to the input. To select Phantom Power (MIC POWER ON), DIP switches 1-8 should be positioned in the "up" or top of the slot position (for the corresponding input channel(s) on your box). Figure 15 portrays phantom power switches 1 and 2 turned on with switches 3 through 8 turned off.

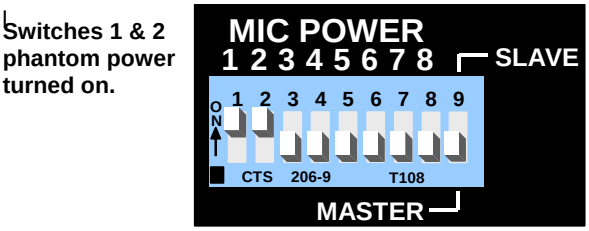
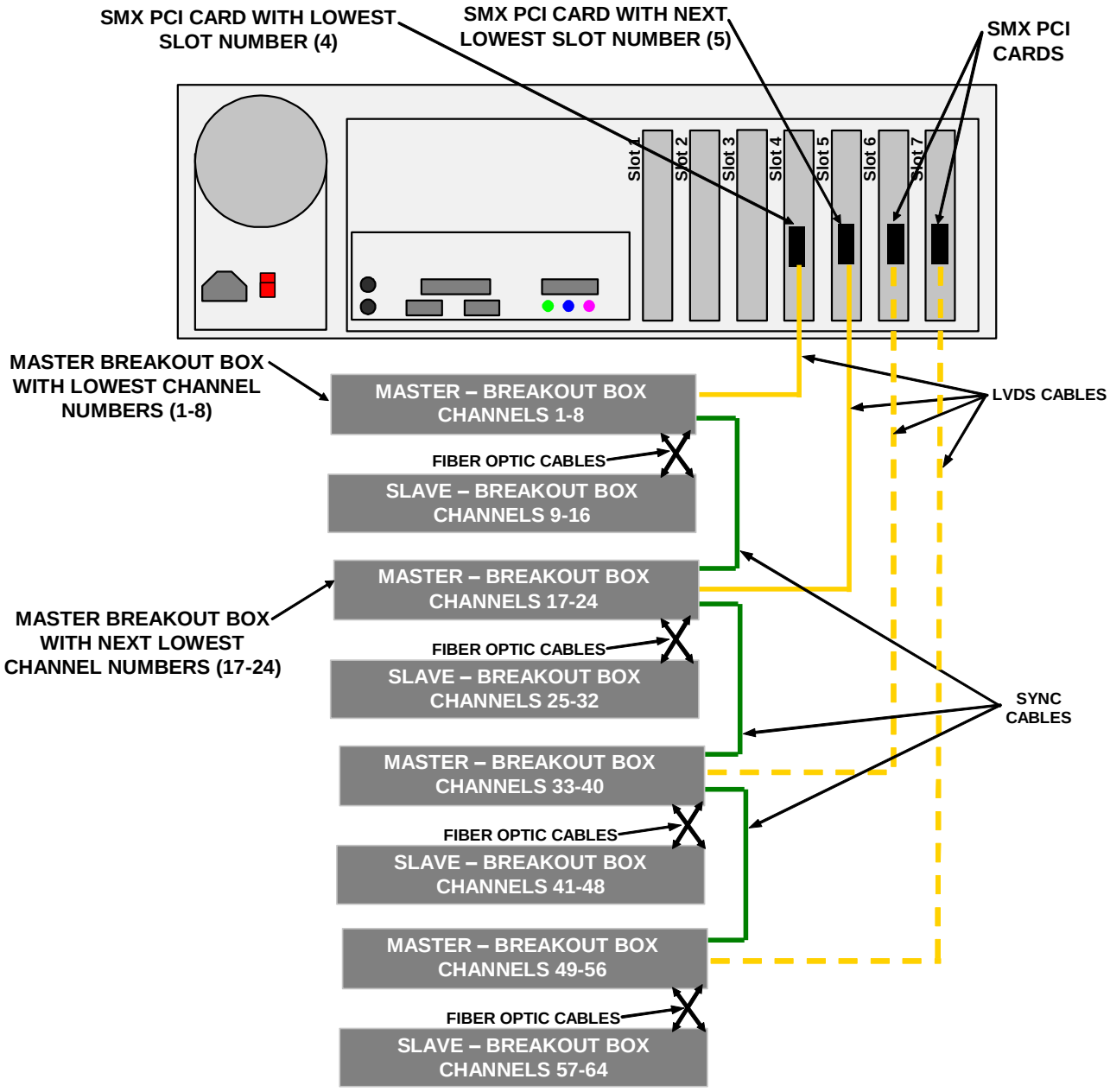


Figure 15, Breakout Box Phantom Power Switches

Note: *If the SMx box is for any group of channels, other than 1-8, the lowest MIC POWER number will always correspond with the lowest channel number; the next lowest MIC Power switch with correspond with the next lowest channel number, etc.*

5.2 Connecting SMx Cards to SMx Master Boxes

Using LVDS Cables, connect SMx cards with lower PCI slot numbers to SMx master boxes with lower channel numbers (see Figure 16). Lower slot numbers are closer to the left side of the chassis facing the rear of the chassis.



Note: The SMx PCI card with the lowest slot number (4) is connected to the Master – Breakout Box with the lowest channel numbers (1-8). The SMx PCI card with the next lowest slot number (5) is connected to the Master – Breakout box with the next lowest channel numbers (17-24). etc.

Figure 16, Connecting SMx Cards to Master Boxes

5.3 8 Channel System

Figure 17 depicts an 8 channel SMx system connection diagram. Table 9 provides the list of parts for this configuration.

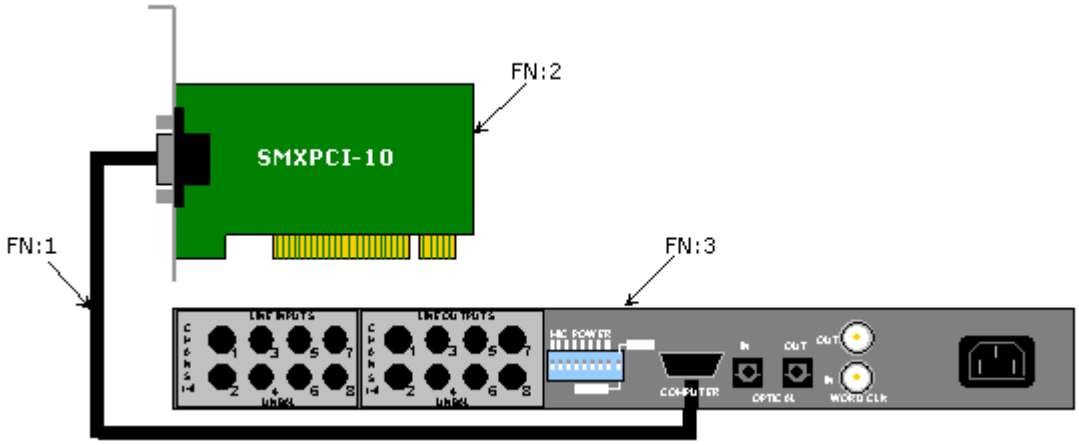


Figure 17, 8 Channel SMx System Connection Diagram

Table 9, 8 Channel SMx System Parts List			
Qty	**FN**	**Part No.**	**Description**
1	1	SM4038- xx	SMx LVDS Cable
1	2	SMXPCI-10	SMx PCI DSP Card
1	3	SMXB0B-10	SMx Breakout Box

5.4 16 Channel System

Figure 18 depicts an 16 channel SMx system connection diagram. Table 10 provides the list of parts for this configuration.

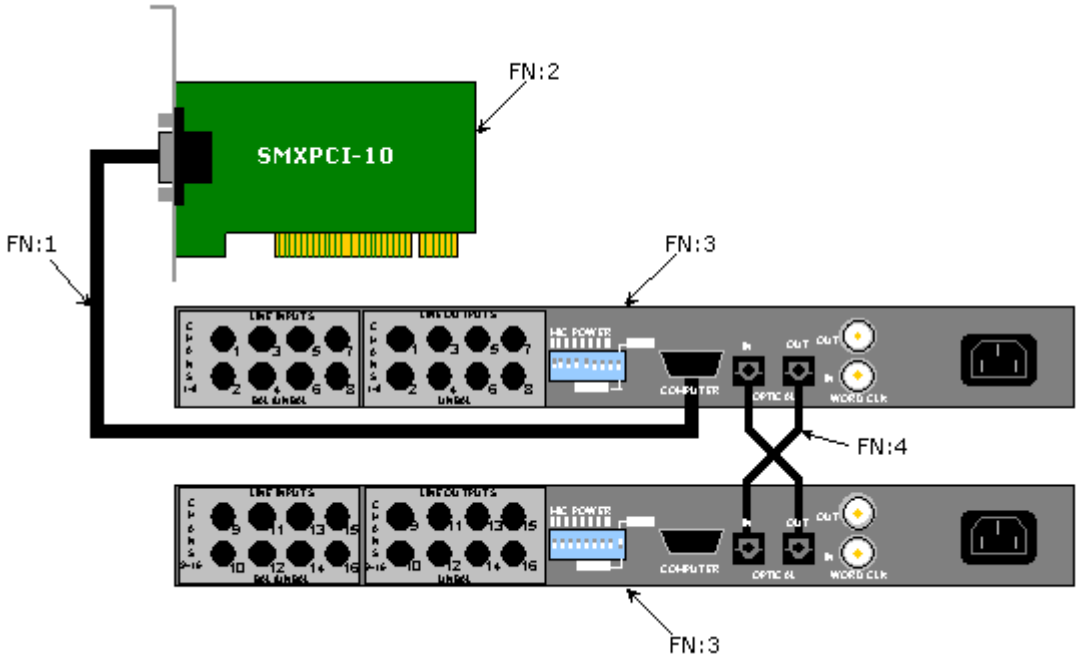


Figure 18, 16 Channel SMx System Connection Diagram

Table 10. 16 Channel SMx System Parts List

Qty	FN	Part No.	Description
1	1	SM4038-xx	SMx LVDS Cable
1	2	SMXPCI-10	SMx PCI DSP Card
2	3	SMXB0B-10	SMx Breakout Box
2	4	SM4F01-xx	SMx Plastic Fiber Optic Cable

5.5 24 Channel System

Figure 19 depicts an 24 channel SMx system connection diagram. Table 11 provides the list of parts for this configuration.

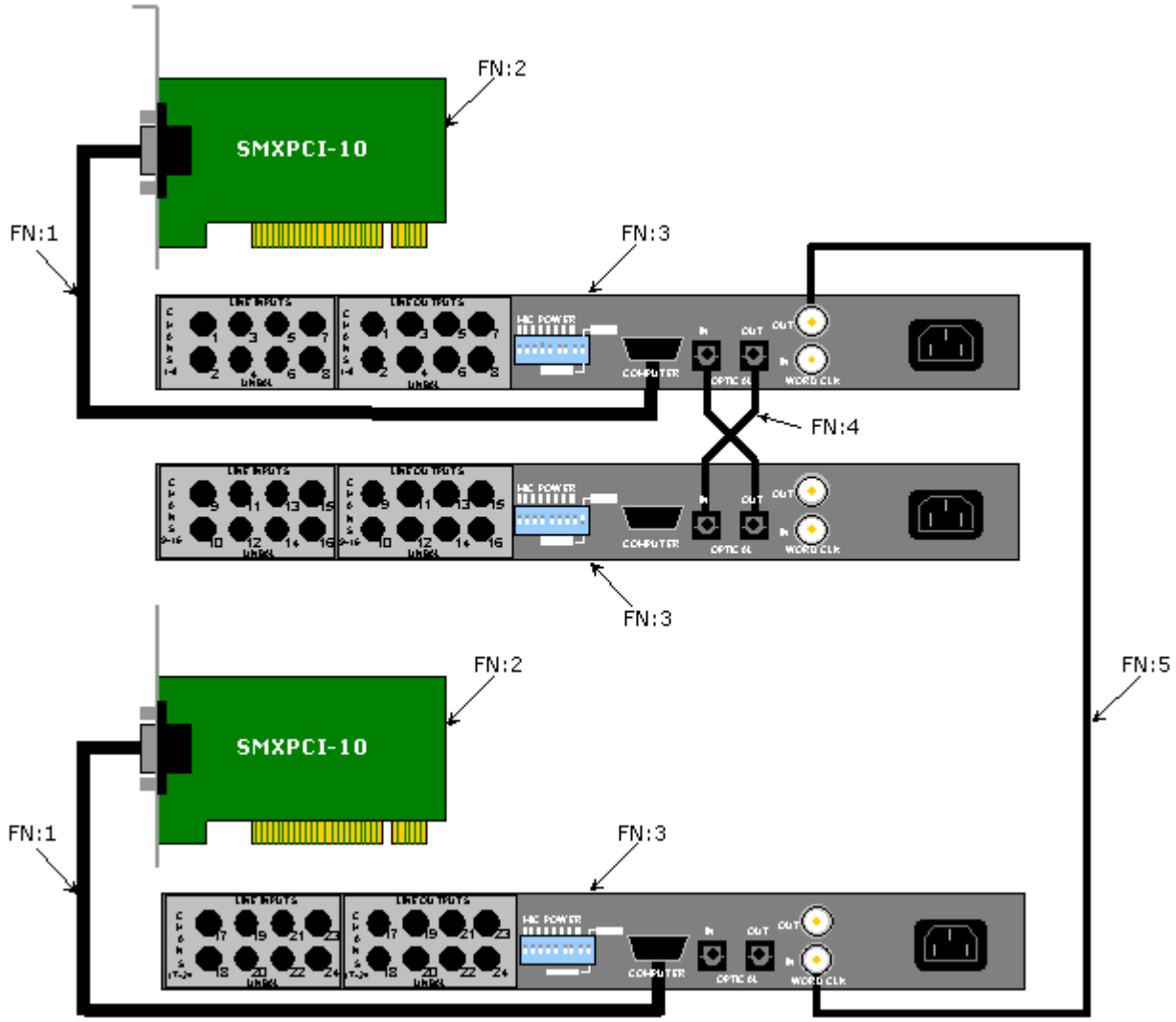


Figure 19, 24 Channel SMx System Connection Diagram

Table 11. 24 Channel SMx System Parts List

Qty	FN	Part No.	Description
2	1	SM4038-xx	SMx LVDS Cable
2	2	SMXPCI-10	SMx PCI DSP Card
3	3	SMXB0B-10	SMx Breakout Box
2	4	SM4F01-xx	SMx Plastic Fiber Optic Cable
1	5	SM4039-xx	SMx Sync Cable

5.6 32 Channel System

Figure 20 depicts an 32 channel SMx system connection diagram. Table 12 provides the list of parts for this configuration.

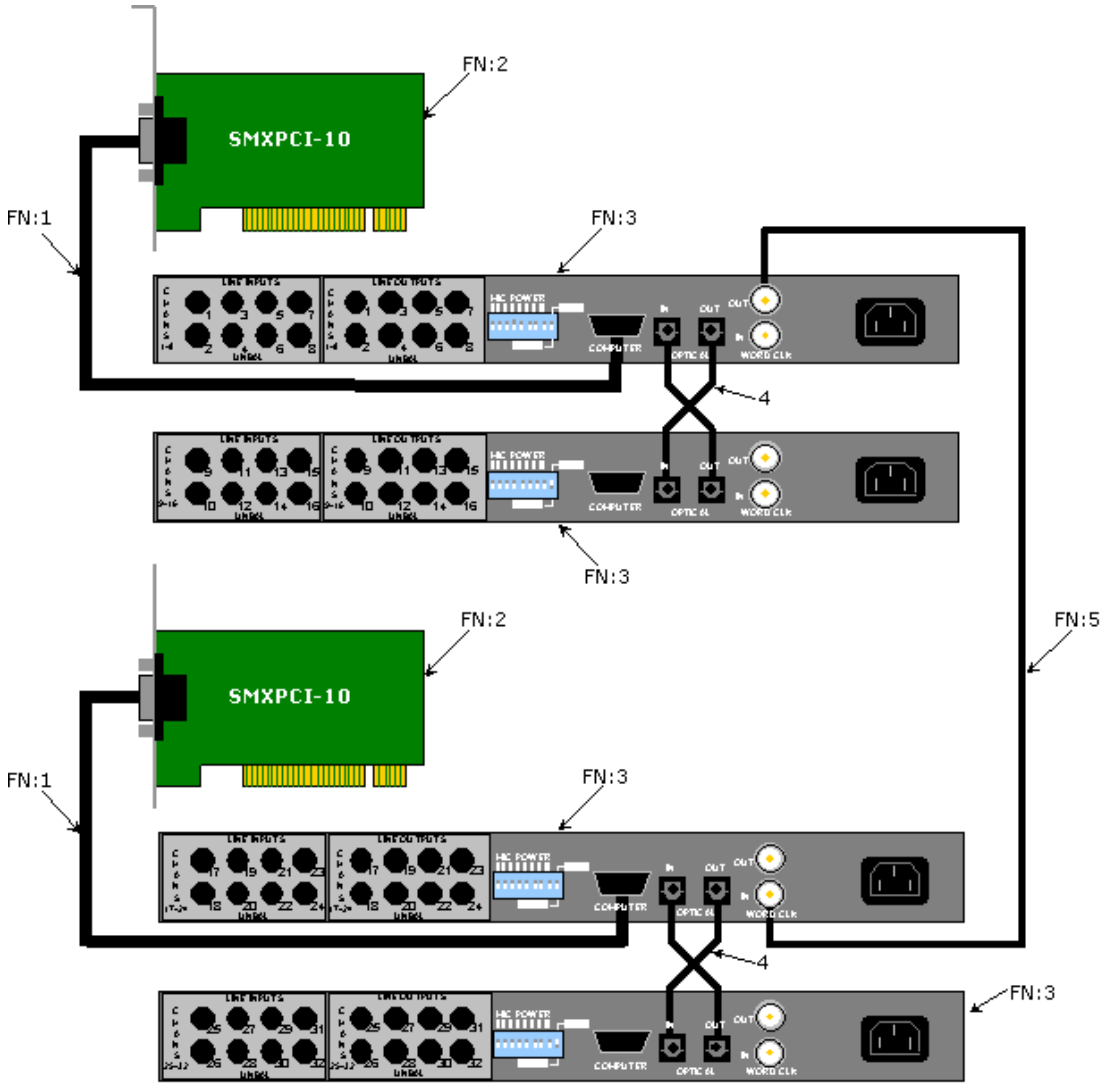


Figure 20, 32 Channel SMx System Connection Diagram

Table 12. 32 Channel SMx System Parts List

Qty	FN	Part No.	Description
2	1	SM4038-xx	SMx LVDS Cable
2	2	SMXPCI-10	SMx PCI DSP Card
4	3	SMXB0B-10	SMx Breakout Box
4	4	SM4F01-xx	SMx Plastic Fiber Optic Cable
1	5	SM4039-xx	SMx Sync Cable

5.7 40 Channel System

Figure 21 depicts an 40 channel SMx system connection diagram. Table 13 provides the list of parts for this configuration.

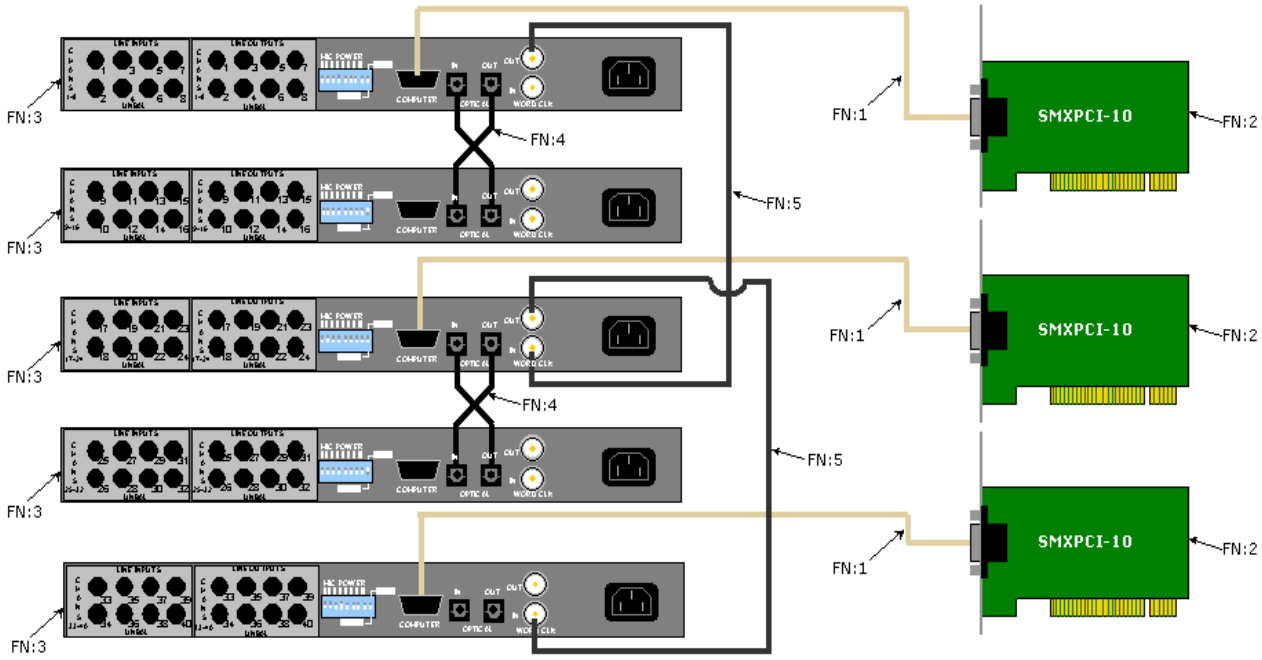


Figure 21, 40 Channel SMx System Connection Diagram

Table 13. 40 Channel SMx System Parts List

Qty	FN	Part No.	Description
3	1	SM4038-xx	SMx LVDS Cable
3	2	SMXPCI-10	SMx PCI DSP Card
5	3	SMXB0B-10	SMx Breakout Box
4	4	SM4F01-xx	SMx Plastic Fiber Optic Cable
2	5	SM4039-xx	SMx Sync Cable

5.8 48 Channel System

Figure 22 depicts an 48 channel SMx system connection diagram. Table 14 provides the list of parts for this configuration.

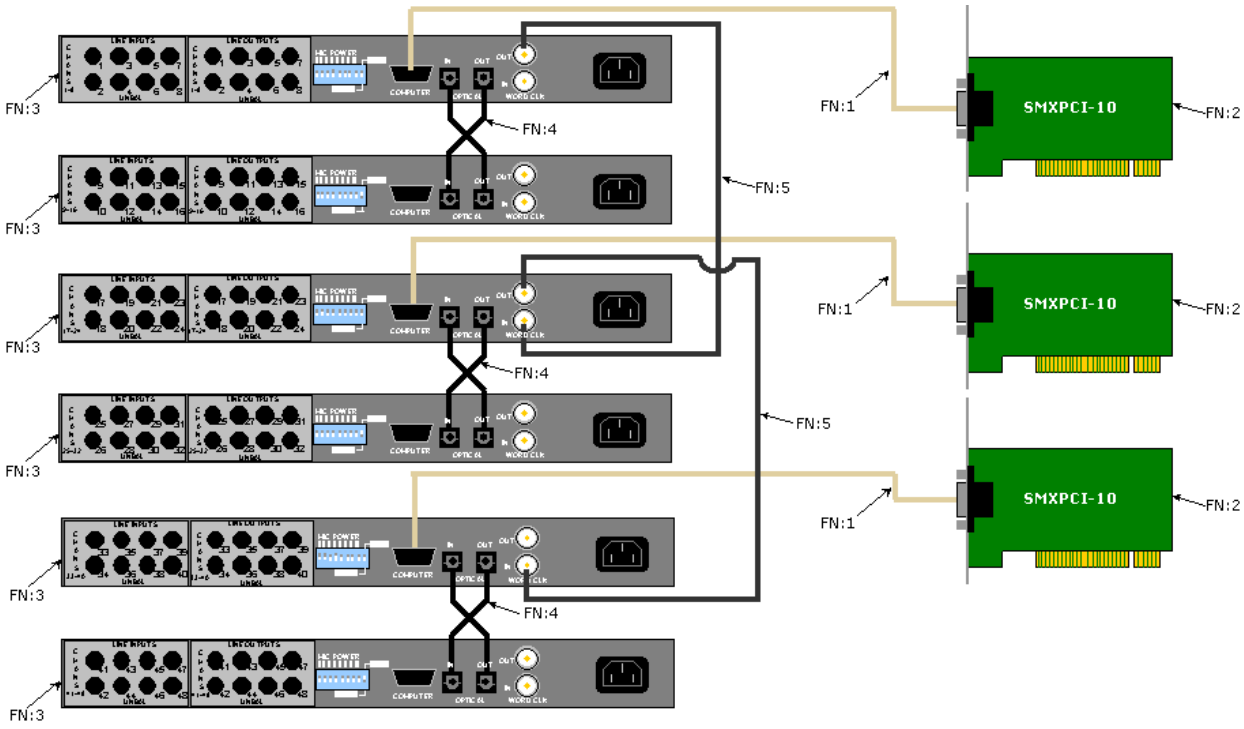


Figure 22, 48 Channel SMx System Connection Diagram

Table 14. 48 Channel SMx System Parts List

Qty	FN	Part No.	Description
3	1	SM4038-xx	SMx LVDS Cable
3	2	SMXPCI-10	SMx PCI DSP Card
6	3	SMXB0B-10	SMx Breakout Box
6	4	SM4F01-xx	SMx Plastic Fiber Optic Cable
2	5	SM4039-xx	SMx Sync Cable

5.9 56 Channel System

Figure 23 depicts an 56 channel SMx system connection diagram. Table 15 provides the list of parts for this configuration.

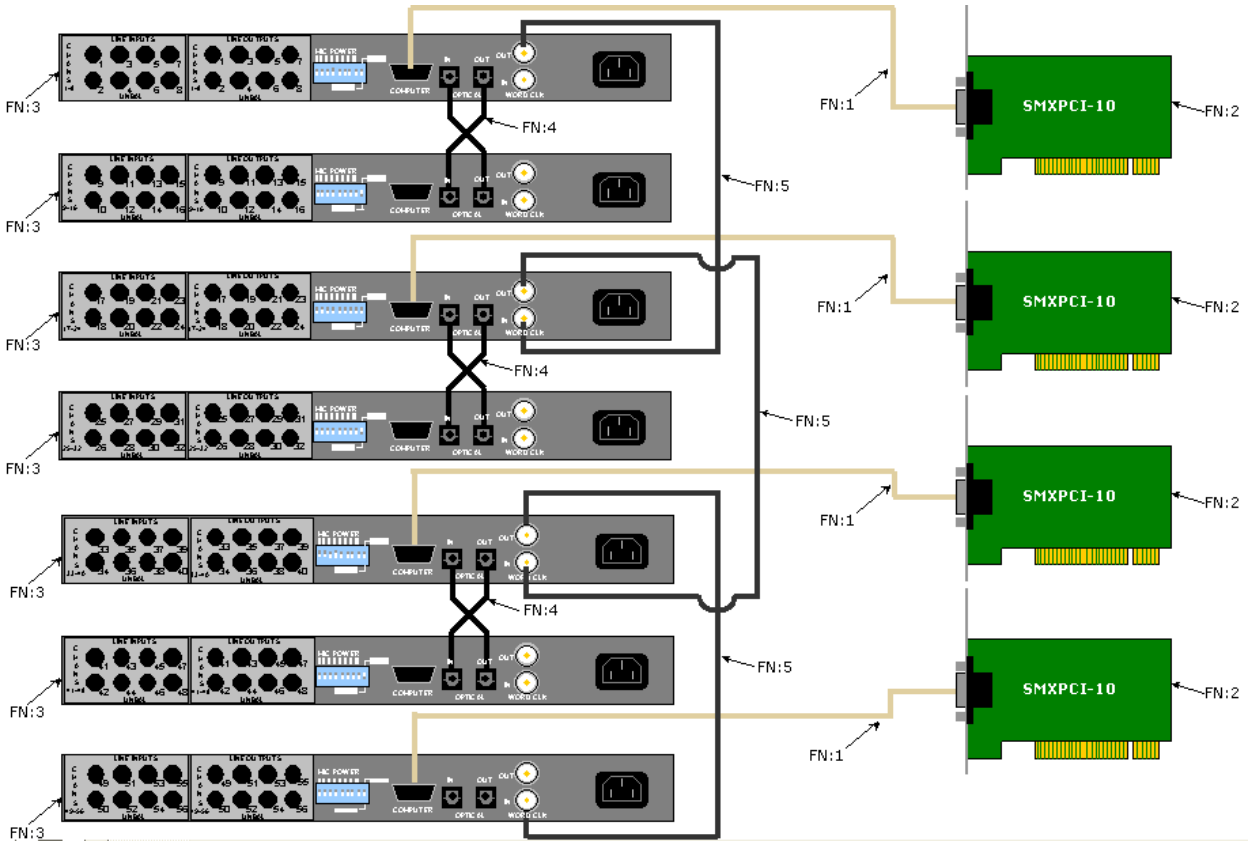


Figure 23, 56 Channel SMx System Connection Diagram

Table 15, 56 Channel SMx System Parts List

Qty	FN	Part No.	Description
4	1	SM4038-xx	SMx LVDS Cable
4	2	SMXPCI-10	SMx PCI DSP Card
7	3	SMXB0B-10	SMx Breakout Box
6	4	SM4F01-xx	SMx Plastic Fiber Optic Cable
3	5	SM4039-xx	SMx Sync Cable

5.10 64 Channel System

Figure 24 depicts an 64 channel SMx system connection diagram. Table 16 provides the list of parts for this configuration.

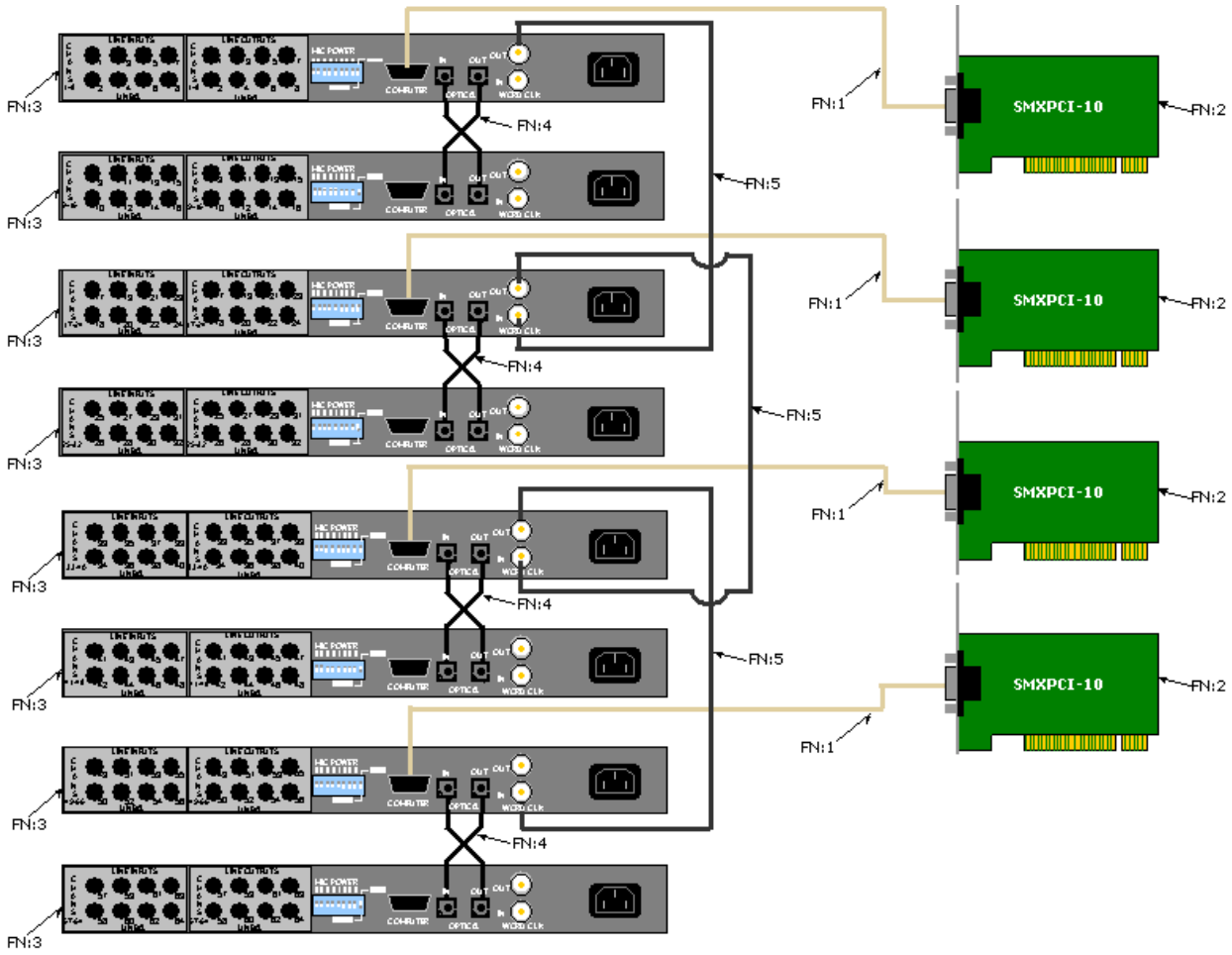


Figure 24, 64 Channel SMx System Connection Diagram

Table 16. 64 Channel SMx System Parts List

Qty	FN	Part No.	Description
4	1	SM4038-xx	SMx LVDS Cable
4	2	SMXPCI-10	SMx PCI DSP Card
8	3	SMXB0B-10	SMx Breakout Box
8	4	SM4F01-xx	SMx Plastic Fiber Optic Cable
3	5	SM4039-xx	SMx Sync Cable

6 Software Installation

The following sections describe the SMx software and how to install it on an SMx system.

6.1 Minimum Software Requirements

Most SMx systems are ordered from the factory with software pre-installed. This section is for those customers installing the software. From June 2013, SimPhonics moved the SMx from Windows XP to Windows 7, 32-bit only. All future releases of the SMx Audio System will be on Windows 7 or later releases.

- Windows 7 32-bit Professional with Service Pack 1 or greater
- V+ version 9.0.503.0 or greater
- SMx Audio System Software Build 503 or later

Additional software may be installed for specific configurations. For a list of V+ I/O devices that may be available, see www.simphonics.com.

6.2 Installing V+

Perform the following steps to install V+ Run-time System:

1. Insert the V+ Run-time System disk into the drive.
2. The installation program will begin automatically.
   (Note: If the installation does not begin automatically, select **Start » Run** and enter d:\setup. Click **OK**.)
3. Click **Next**.
4. Select "I accept the terms in the license agreement".
5. Click **Next**.
6. Click **Next**.
7. Click **Install**.
8. Click **Finish**.
9. Remove the disk from the drive when installation is complete.

6.3 Installing the SMx Audio System Software

Perform the following steps to install SMx Audio System Software:

1. Insert the SMX Audio System Software disk into the drive.
2. The installation program will begin automatically.
   (Note: If the installation does not begin automatically, select **Start » Run** and enter d:\setup. Click **OK**.)
3. Click **Finish** when installation is complete.
4. Right-click the **My Computer** icon on the desktop.
5. Click **Properties**.
6. Click the **Hardware** tab.
7. Click **Device Manager**.
8. Right-click the first **Multimedia Controller** listed under **Other Devices**.
9. Click **Uninstall**.
10. Click **OK**.
11. Repeat this step for all remaining Multimedia Controller devices.
    (Be careful not to uninstall any other type of devices).
12. Click **Action**.
13. Select **Scan for hardware changes**.
14. Click **Next**.
15. Follow the default instructions of the installation dialog boxes.
16. After installation is complete, close all open windows.
17. Remove the disk from the drive.

6.4 Updating the SMx Audio System Software

Perform the following steps for a installing new version of SMx Driver for V+ onto a computer which already has the SMx Driver installed:

1. Note the Number of Virtual Channels and the Super Mixer Sample Rate settings for your application before you install the new SMx driver. These values will be used after installing the new SMx driver.
2. Remove the V+ application by selecting **Start » Settings » Control Panel** followed by double-clicking **Add or Remove Programs**.
3. Select **SMx Audio System** and click **Remove**.
4. Click **Yes** to remove the SMx driver from your computer.
5. Click **Finish**.
6. If your new version of the SMx driver is on CD, insert it into your CD drive. The installation should automatically start. If it doesn't, click **Start » Run** and type `D:\setup.exe` followed by clicking **OK**.
7. If your new version of SMx Driver is simply the `setup.exe` file, double-click the file.
8. Click **Finish**.
9. Ensure that your breakout boxes are powered on.
10. Reboot the computer.
11. After the computer has finished rebooting, Start the V+ Run Time System and click **Configure**.
12. Double-click the **SMx Audio System** driver to enable it
13. Click the **Configure** button.
14. Set the Number of Virtual Channels and Super Mixer Sample Rate to the settings you noted in Step 1 above.
15. Click OK.
16. Click Yes.
17. Click OK.
18. Click OK.
19. Close the V+ Run Time System window and reboot the computer.

6.5 Configuring SMx within V+

There are two user configurable items in the SMx software. The first is the number of virtual channels. Virtual channels are the WI and WO channels that are connected to the Super Mixer. The default number of virtual channels is set to 16 for both WO and WI channels regardless of the number of physical channels in the SMx system. The second configurable item is the Super Mixer Sample Rate. Two choices are available: 22050 and 44100. It is advisable to keep the 44 KHz sampling rate as this provides better quality sound when playing wave files. However, if run-time performance is below acceptable limits for your program, try setting the sample rate to 22 KHz.

Note: *If you have a voice only application, such as for communications and/or networked radios, setting the sample rate to 22 KHz has little or no effect on the quality due to the limited frequency range of voice.*

While in the V+ Run Time System window, select the Configure menu and the Platform Configure window shown in Figure 25 will appear.

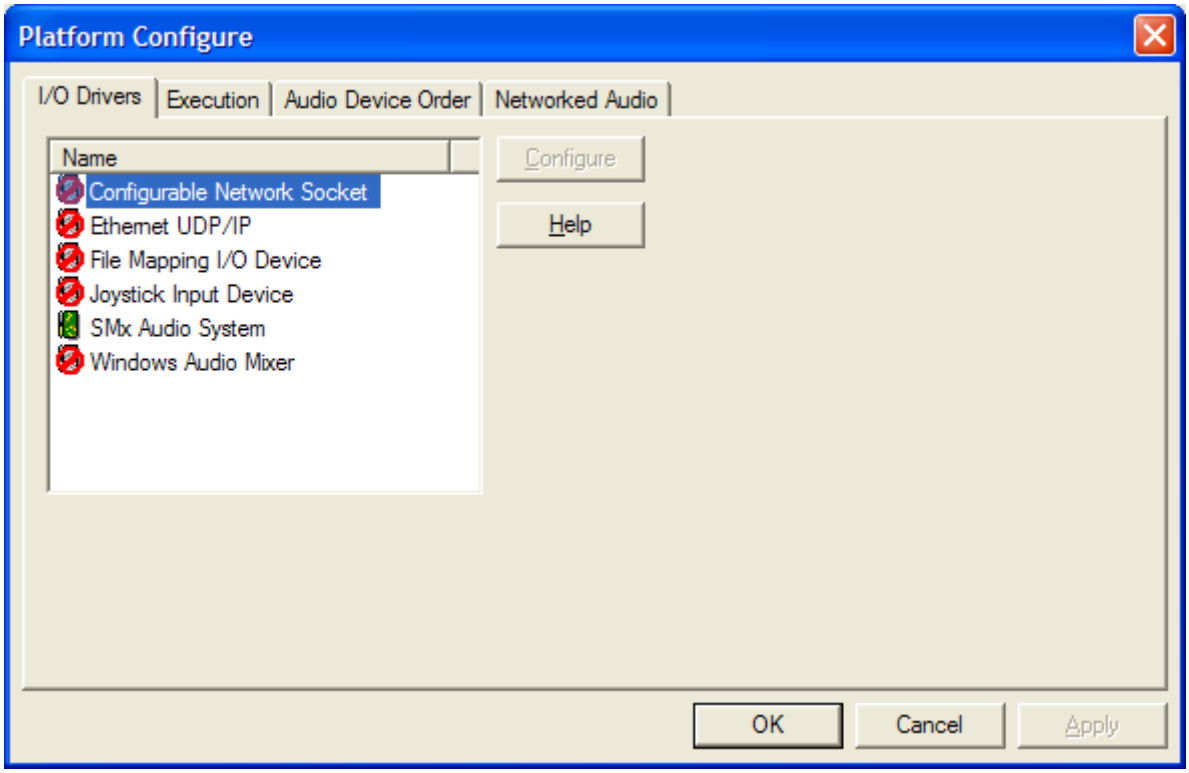


Figure 25, V+ Platform Configure Window

Double-click the SMx Audio System I/O driver (which will turn the icon to the left of it green), followed by clicking the Configure button. The SMx Configuration window shown in Figure 26 will appear.

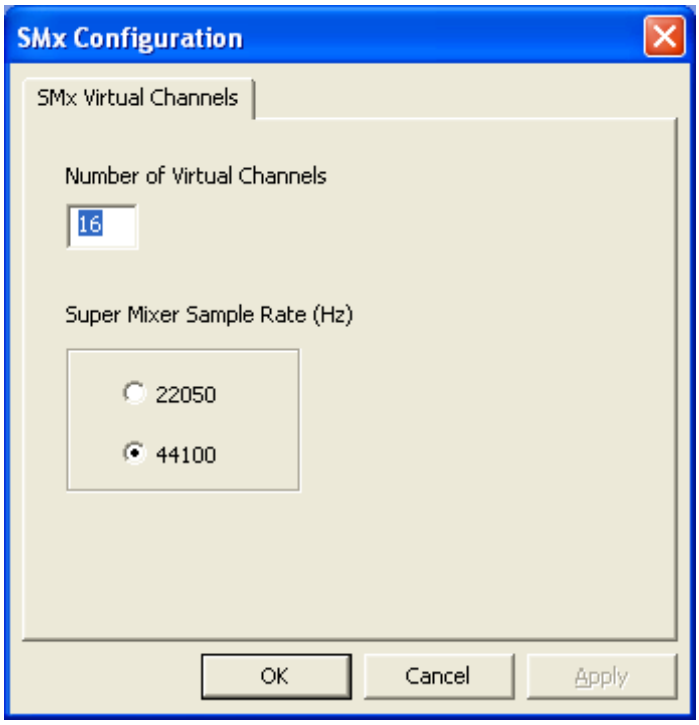


Figure 26, SMx Configuration Window

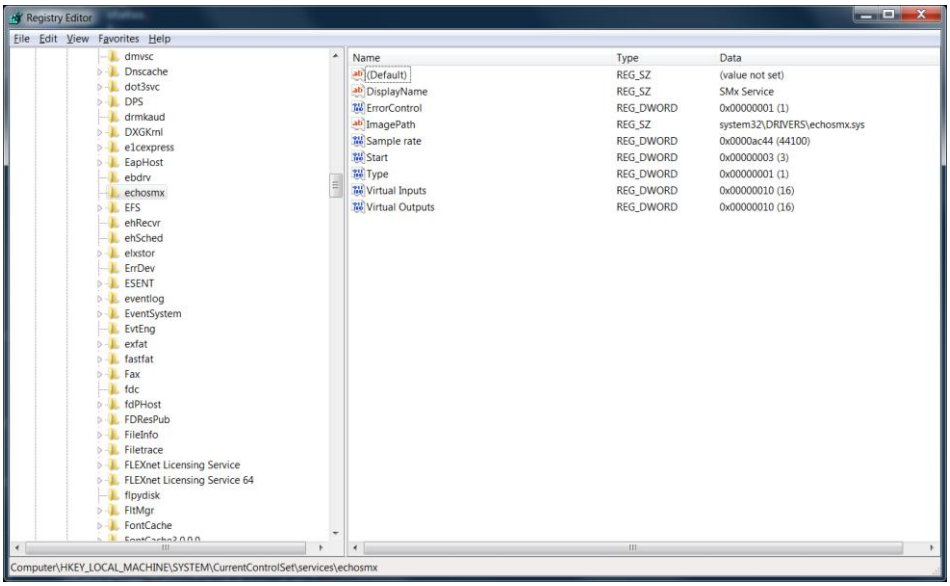
Enter the desired number of virtual channels in the dialog box. This must be an even number since there are two channels per device. Valid numbers are even integers from 2 to 64. Once the number is entered, you will be prompted to confirm the change. Click Yes. You will then be notified that these channels will not appear until the machine is rebooted.

Note: *This number of channels and sample rate will remain the same until the changed again via this interface. These values are stored in the system registry. If either of these parameters is modified, the system must be rebooted for the change(s) to take effect.*

7 Registry Settings

A variety of run-time information can be setup for the SMx system in the system registry. The base registry location is at:

/HKEY_LOCAL_MACHINE/SYSTEM/CurrentControlSet/services/echosmx



Do not change the other registry data.

Changing Registry Settings

When editing the registry use extreme caution since you can easily render your computer useless by changing the wrong data. To access the registry, click **Start » Run** which will open the Run dialog box as shown in Figure 27. Enter the command **`regedit`** and click **OK**. This will start the Registry Editor.

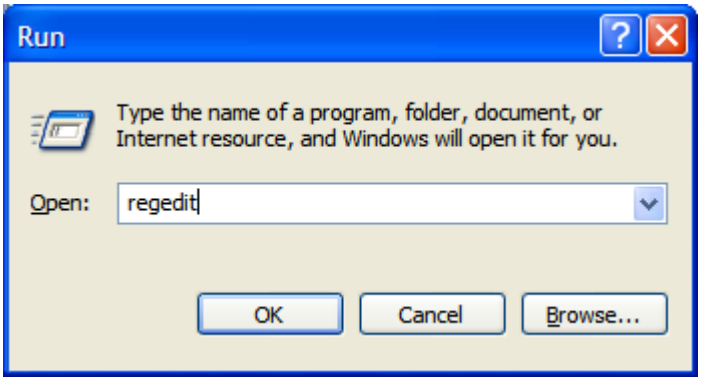


Figure 27, Run Dialog Box

When editing registry values navigate to the base registry key shown earlier. Be sure to enter the new key name before adding a new value (entry) if it does not already exist. Also make sure to use the correct data type. Note that the key and entry name must match exactly. The following sections identify and describe the VComm keys and their associated entries (values).

Key name: **`/HKEY_LOCAL_MACHINE/SYSTEM/CurrentControlSet/echosmx`**

These values have miscellaneous purposes as explained in Table 17.

Table 17, MISC Registry Key

Entry	Type	Description
Virtual Inputs	DWORD	This value is the number of virtual channels for Inputs that will be shown in the user interface. This value is installed and set to 16 (0x10) by default.
Virtual Outputs	DWORD	This value is the number of virtual channels for Outputs that will be shown in the user interface. This value is installed and set to 16 (0x10) by default.
Sample rate	DWORD	This is the sample rate use by the SMx and displayed in the user interface. This value is installed and set to 0x0000ac44 (44100) by default.

8 Using V+ with SMx

SMx is completely user programmable right down to multiplies and OR gates without having to write a single line of text-based code! You are not constrained with a fixed model or factory feature, and you have complete visibility and control into the operation of the system. The user can connect individual data from one I/O device to another with a click of a mouse.

One of the advantages of using V+ is the self-documenting paradigm that is inherent within a visual programming system. The design executes directly without the need for compiling. The bottom line is – flexibility and freedom; freedom to create new applications without the worry of model charges, royalties, and ridiculous charges for simple changes. Remember, all of SimPhonics' software is available free of charge for evaluation at www.simphonics.com.

8.1 Application Examples

The SMx system is shipped with sample V+ designs on the CPU hard drive. These are copies of those available at www.simphonics.com/library/VPLusSamples. New design examples will be added as SimPhonics evolves newer applications and tutorials.

All example files are located on the SMx hard drive in the following folder:

C:\Program Files\VPLus\VPLus Samples\…

Sample wave-files are located on the SMx hard drive in the following folder:

C:\Program Files\VPLus\VPLus Samples\Wavefiles

8.2 The SMx Super Mixer

8.3 SMx I/O Devices for the SMx Audio System

The SMx I/O devices are installed when the "SMx Audio System Software" CD is installed. Once this software is installed, the driver can be activated from the run-time system. There are 10 I/O devices available in V+ for controlling the SMx Super Mixer. These devices are shown in Figure 28, and are described in greater detail below. Each device is used to control a component of the Super Mixer and is composed of a list of ports. Each port is assigned a specific function within the I/O device.

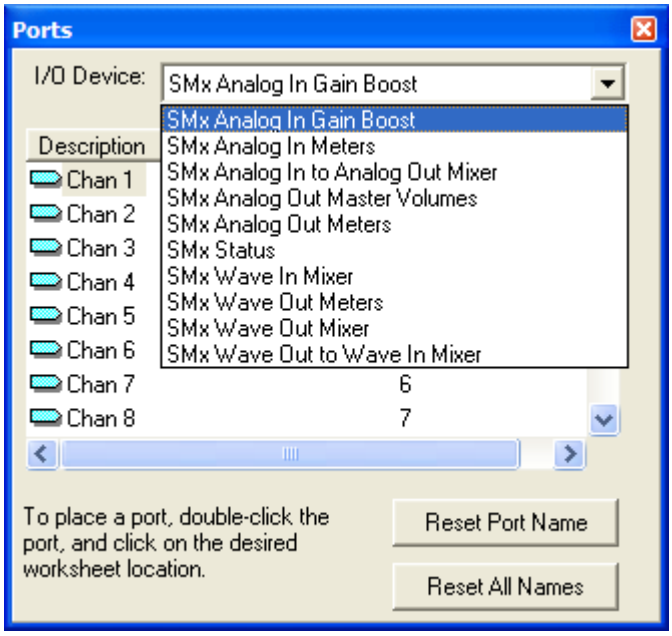


Figure 28, SMx I/O Devices

The SMx defaults to an off condition, so that when V+ is not running and a Super Mixer component is not enabled, the SMx audio system will not pass any audio in any direction. Also, when V+ is started or stopped, all of the ports for each Super Mixer I/O device are set to zero. This ensures that any previous settings are reset to zero.

8.3.1 SMx Analog In Gain Boost Device

This device is used to boost the gain of the input signal (see Figure 29). Each analog input has a gain boost port in V+ that can be used to boost the gain by as much as +60 dB in increments of 6 dB. A value of 0.0 represents unity gain. If the port for a given channel is not used on a worksheet, the gain boost in set to 0 for that channel.

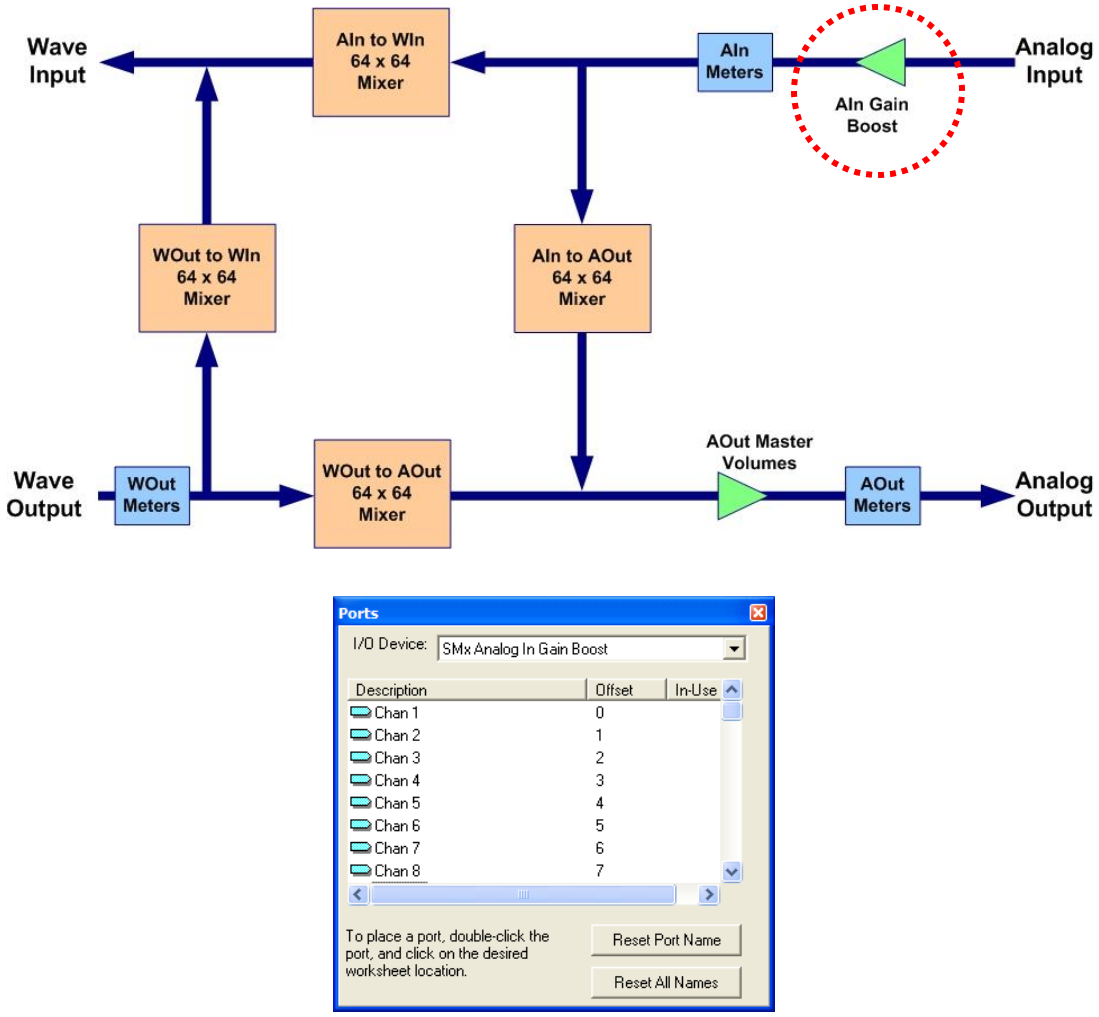


Figure 29, SMx Analog in Gain Boost Device

For example, assume that the input signal is a sine wave of 2.5Vrms. Using a gain boost of +6 will increase the level of the signal to +5Vrms before the signal is applied to the system. Ports for this device are named "Chan 1" through "Chan 64". The SMx has an exceptional dynamic range due to its 24 bit resolution. However, the dynamic range of the input signal is reduced when boosting gain. A signal is boosted digitally so that each 6 dB increase in gain results in a loss of 1 bit of range. Therefore, a +60 dB increase results in a loss of 10 bits. The analog-to-digital conversion is 24 bits in length, so a 60 dB boost still results in a 14-bit signal, which is only 2 bits less than CD quality. If you want at least CD quality of 16 bits, keep the boost less than or equal to 48 dB.

8.3.2 SMx Analog In Meters Device

This device is used to monitor the input signal level of each channel (see Figure 30). There are 64 ports in this device, each of which is associated with one of the 64 input channels. The monitor is placed after the gain boost. The monitor port value represents the true RMS voltage level of the input signal multiplied times 2000, averaged over a ten-millisecond interval. Therefore a true sine wave input of 1 volt at 1,000 Hertz will produce a reading of 2000+/- .1 %.

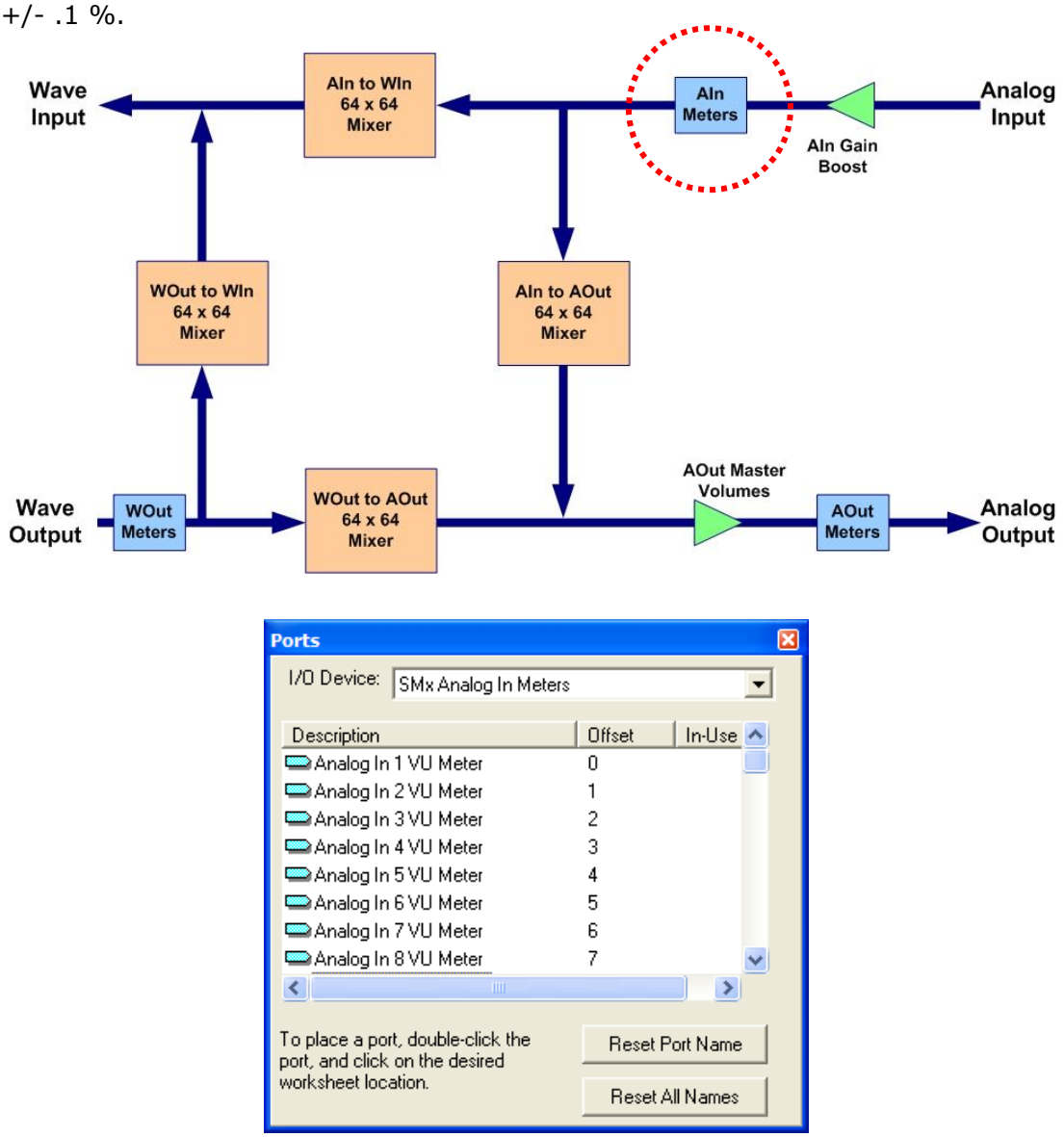


Figure 30, SMx Analog in Meters Device

Ports for this device are named "Analog In 1 VU Meter" through "Analog In 64 VU Meter". This device is typically used to construct VOX designs. Monitoring the meter value and determining when a valid signal is present on the input accomplishes this. See the application section for more information.

8.3.3 SMx Analog In to Analog Out Mixer Device

This device can mix any analog input to any analog output in any combination (see Figure 31). The mixer is a 64 input X 64 output mixer consisting of 4,096 V+ ports. Most applications only use a small portion of these ports. A maximum value of 1.0 represents unity gain and a minimum value 0.0 represents off. Unused ports are automatically set to a gain value to 0. Each input signal that is mixed to an output is summed together at that output. Therefore, input signals accumulate in amplitude. Gain controls are linear 16 bit values which represent voltage attenuation.

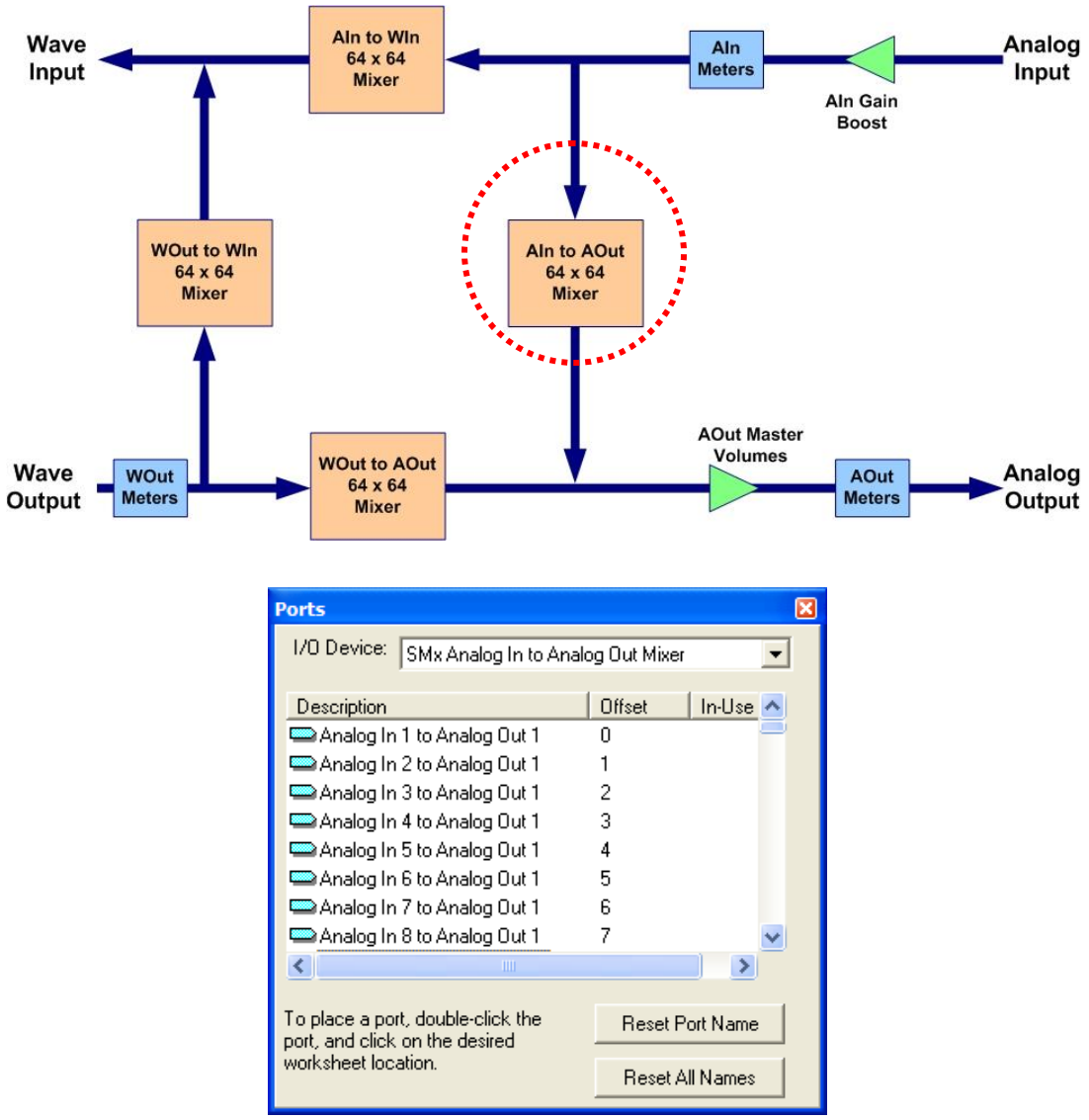


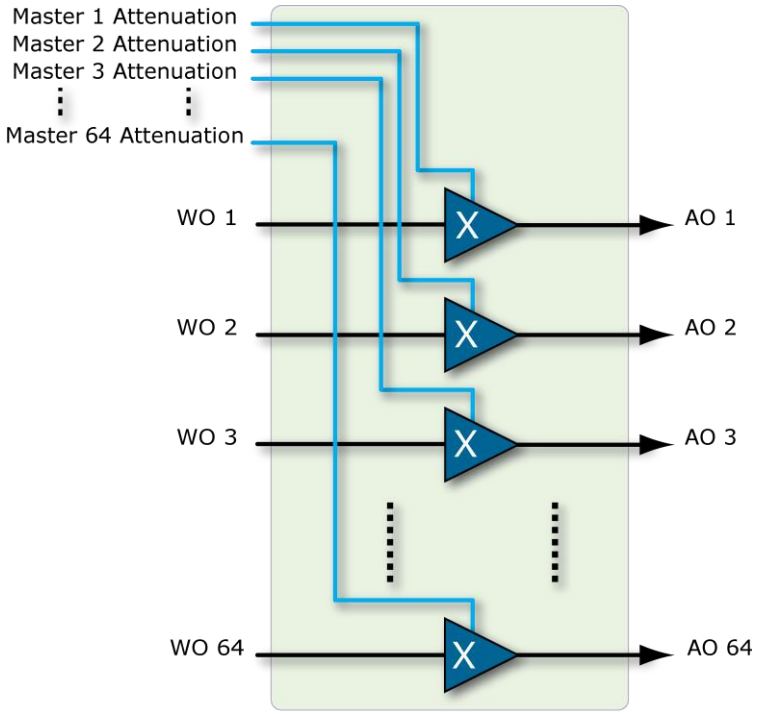
Figure 31, SMx Analog In to Analog Out Mixer Device

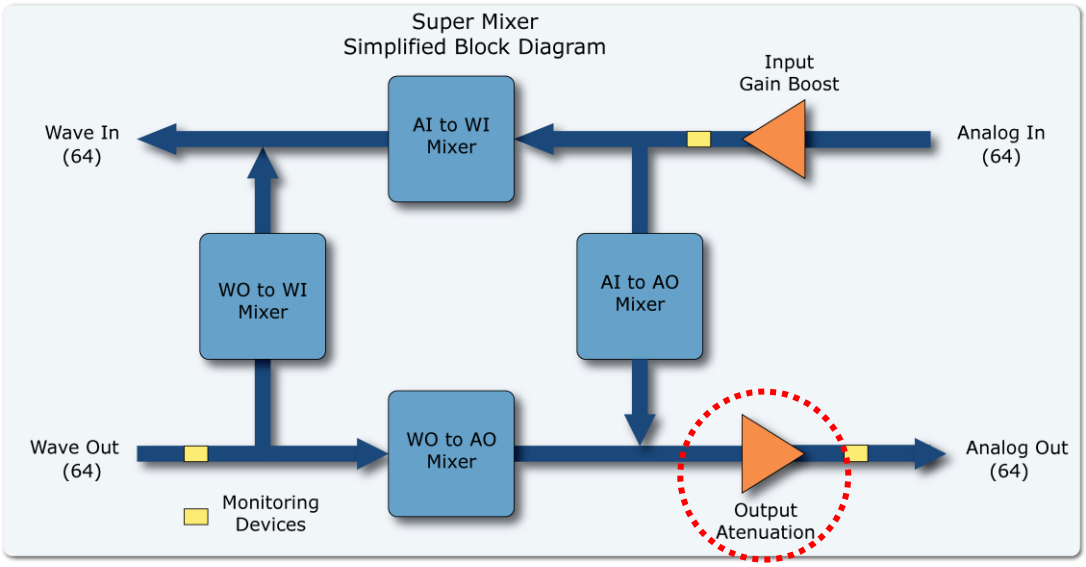
Ports are named "Analog In 1 to Analog Out 1" through "Analog In 64 to Analog Out 64". For example, to mix input channel 1 to output channel 5, set port "Analog In 1 to Analog Out 5" to some value greater than 0.0 and less than or equal to 1.0.

8.3.4 SMx Analog Out Master Volume Device

This device is used to set the attenuation of the output levels of each output channel (see Figure 33). Therefore, there are 64 ports in this device, one for each output channel. A maximum value of 1.0 represents unity gain and a minimum value 0.0 represents off. Unused ports are automatically set to 0. Port controls are linear 16 bit values which represent voltage attenuation.

Figure 32, SMx 64 Master Attenuators (Volumes)





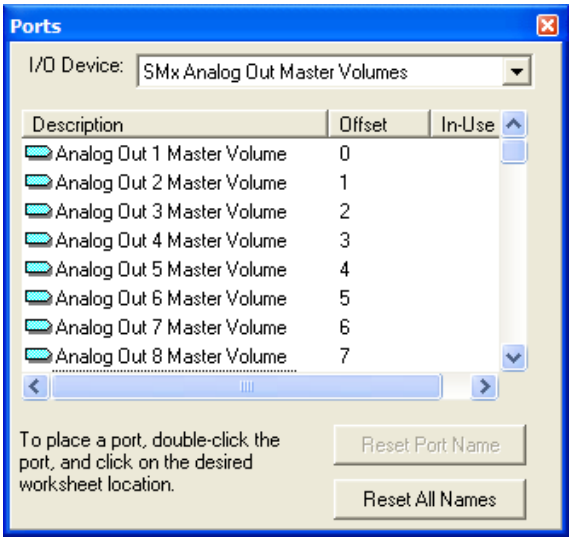


Figure 33, SMx Analog Out Master Volume Device

Ports are named “Analog Out 1 Master Volume” through “Analog Out 64 Master Volume”. Unless these ports are set to some value greater than 0.0, no signal will be present on the output, since this attenuation is just before the output is applied to the output connector.

8.3.5 SMx Analog Out Meters Device

This device is used to monitor the output signal level of each channel (see Figure 34). There are 64 ports in this device, each of which is associated with one of the 64 output channels. The monitor is placed after the master volumes so that the effects of the master volume can be observed. The monitor port value represents the peak voltage level of the output signal, averaged over a ten-millisecond interval. The scaling on this device is such that the value represents the output RMS voltage on the output channel.

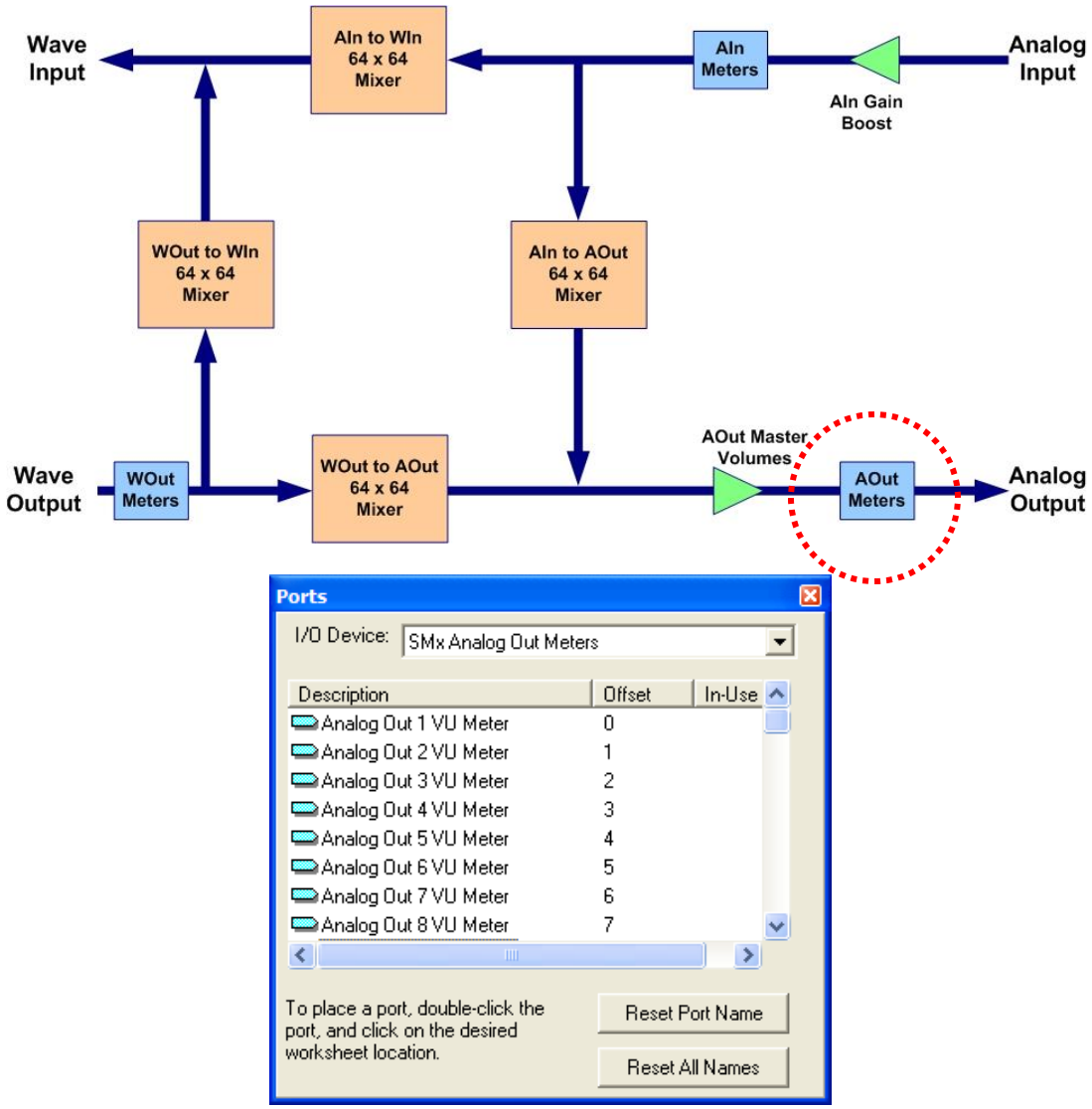


Figure 34, SMx Analog Out Meters Device

Ports for this device are named "Analog Out 1 VU Meter" through "Analog Out 64 VU Meter". Monitoring the meter value and determining when a valid signal is present on the output can be used to turn on an LED indicating activity on an output.

8.3.6 SMx Wave In Mixer Device

This device controls the attenuation of signals flowing from the SMx analog input to the PC Wave Input (see Figure 35). There are up to 64 channels of input from the PC system that can be applied to the input of the mixer. The mixer can mix any input SMx channel to any one of the outputs of this mixer, which is then applied to the Wave In system of the PC. A maximum value of 1.0 represents unity gain and a minimum value 0.0 represents off. Unused ports are automatically set to 0. Port controls are linear 16 bit values which represent voltage attenuation.

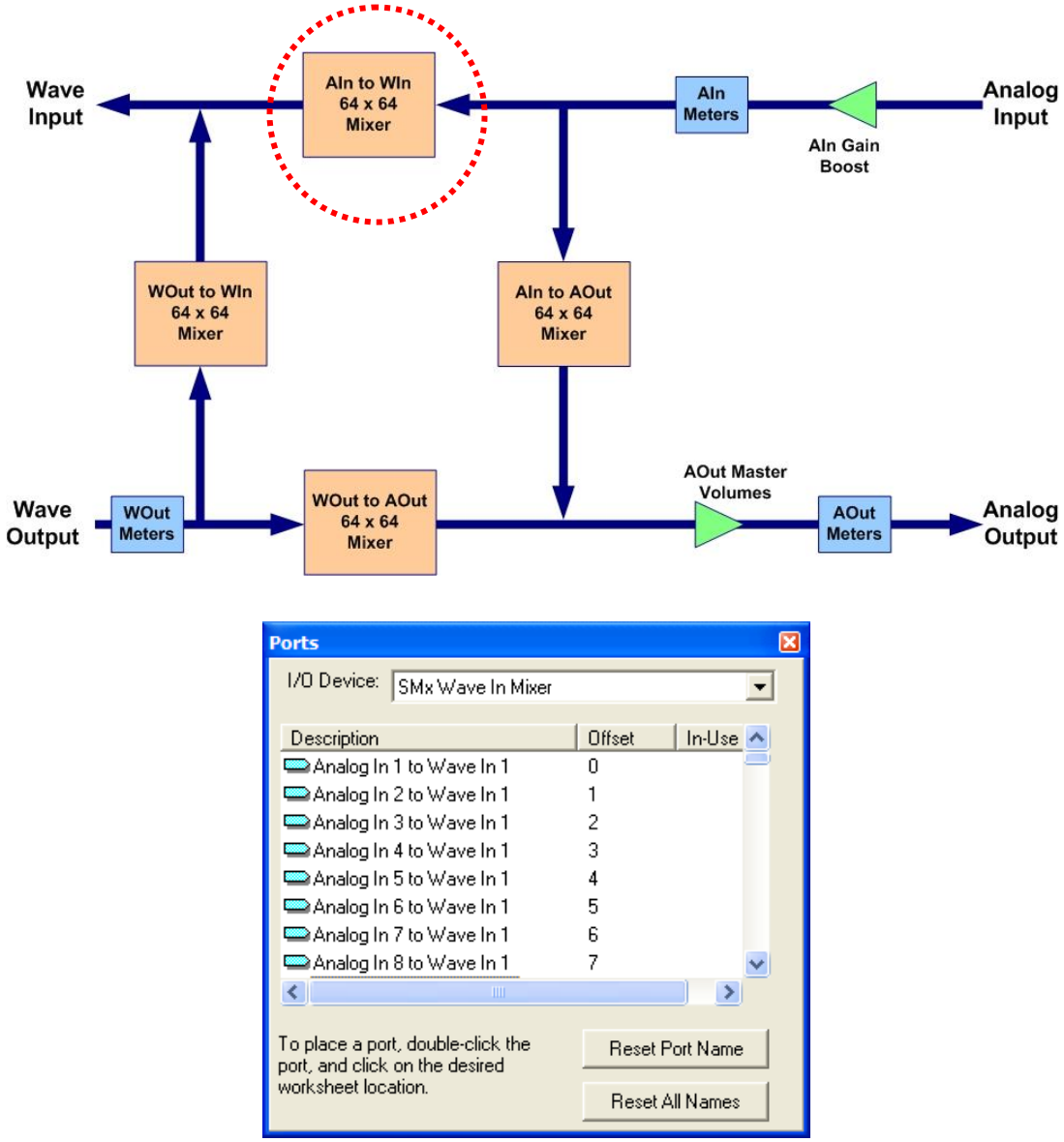


Figure 35, SMx Wave In Mixer Device

Ports are named "Analog In 1 to Wave In 1" through "Analog In 64 to Wave In 64". Before any AI signal can be sent to a WI stream, such as for recording or networked audio (radios), the respective AI to WO port must be utilized.

8.3.7 SMx Wave Out Meters Device

This device is used to monitor the output signal level of each Wave Out channel (see Figure 36). There are 64 ports in this device, each of which is associated with one of the 64 Wave Out channels. The monitor is placed immediately following the Wave Ouputs of the Windwos Audio Mixer. The monitor port value represents the peak voltage level of the output signal, averaged over a ten-millisecond interval. The scaling on this device is such that the value represents the output RMS voltage on the output channel.

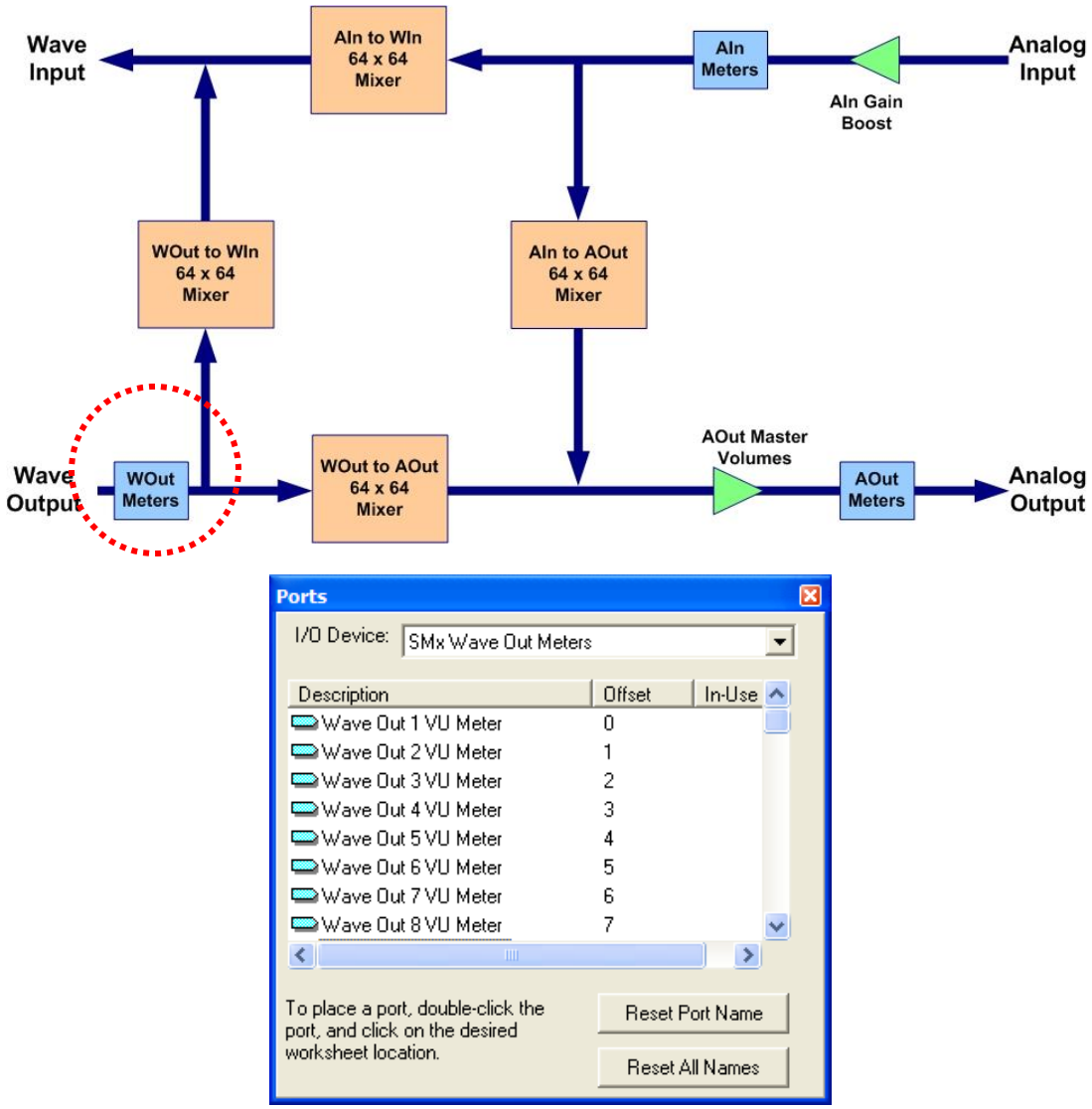


Figure 36, SMx Wave Out Meters Device

Ports for this device are named "Wave Out 1 VU Meter" through "Wave Out 64 VU Meter". Monitoring the meter value and determining when a valid signal is present on the output can be used to turn on an LED indicating activity on a Wave Output.

8.3.8 SMx Wave out Mixer Device

This device controls the attenuation of signals flowing from the PC Wave output to the SMx system (see Figure 37). There are up to 64 channels of wave output available for allocation within the SMx. The mixer can mix any of these wave output channels to any one of the analog outputs of this mixer. A maximum value of 1.0 represents unity gain and a minimum value 0.0 represents off. Unused ports are automatically set to 0. Port controls are linear 16 bit values which represent voltage attenuation.

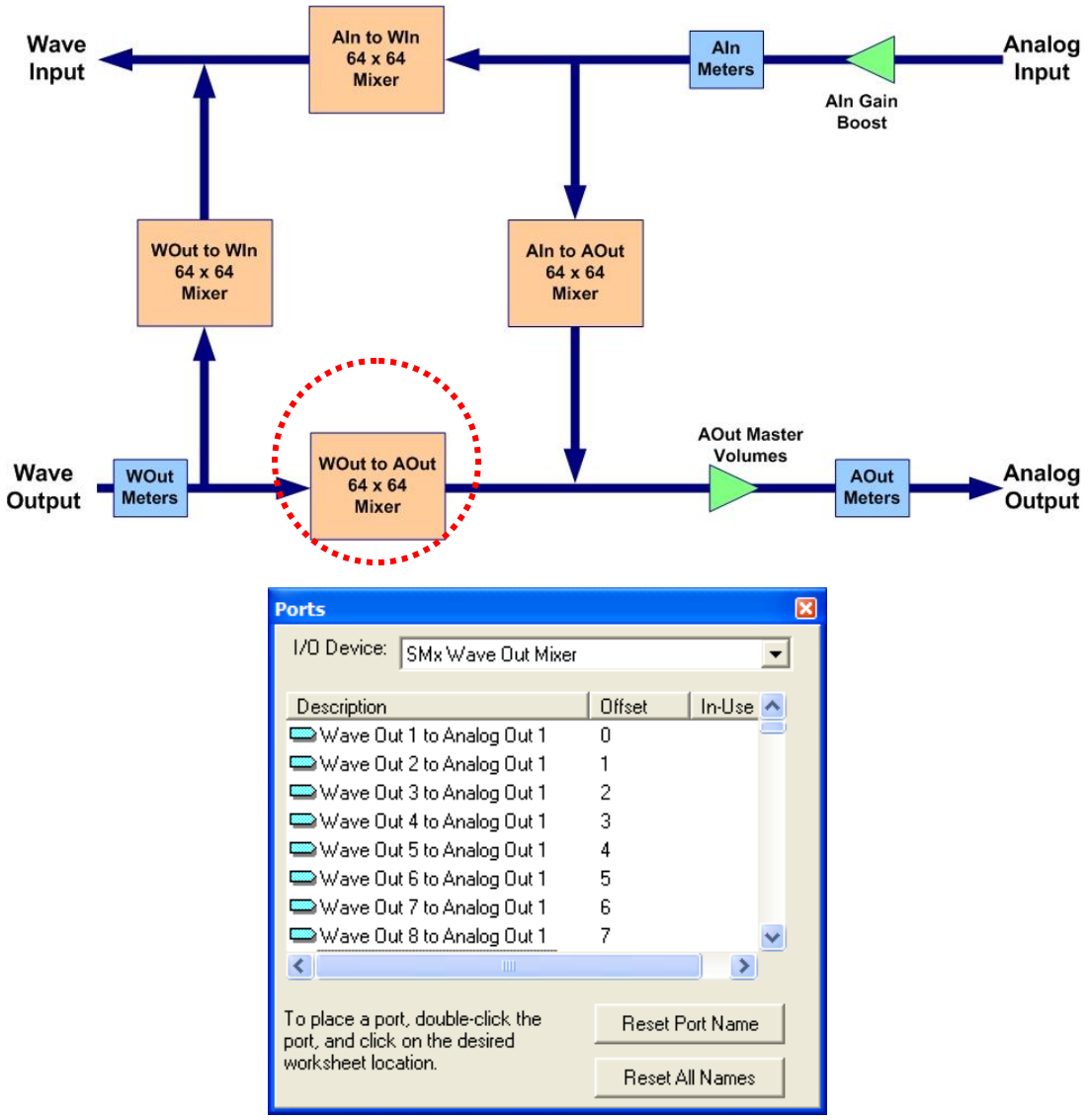


Figure 37, SMx Wave Out Mixer Device

Ports are named "Wave Out 1 to Analog Out 1" through "Wave Out 64 to Analog Out 64". Before any WO signal can be sent to an AO, at least two ports must be utilized. One for the AO's master gain, and one for the specific WO to AO channel.

8.3.9 SMx Wave Out to Wave in Mixer Device

This device controls the attenuation of signals flowing from the PC Wave output to the SMx system (see Figure 38). There are up to 64 channels of wave output available for allocation within the SMx. The mixer can mix any of these wave output channels to any one of the analog outputs of this mixer. A maximum value of 1.0 represents unity gain and a minimum value 0.0 represents off. Unused ports are automatically set to 0. Port controls are linear 16 bit values which represent voltage attenuation.

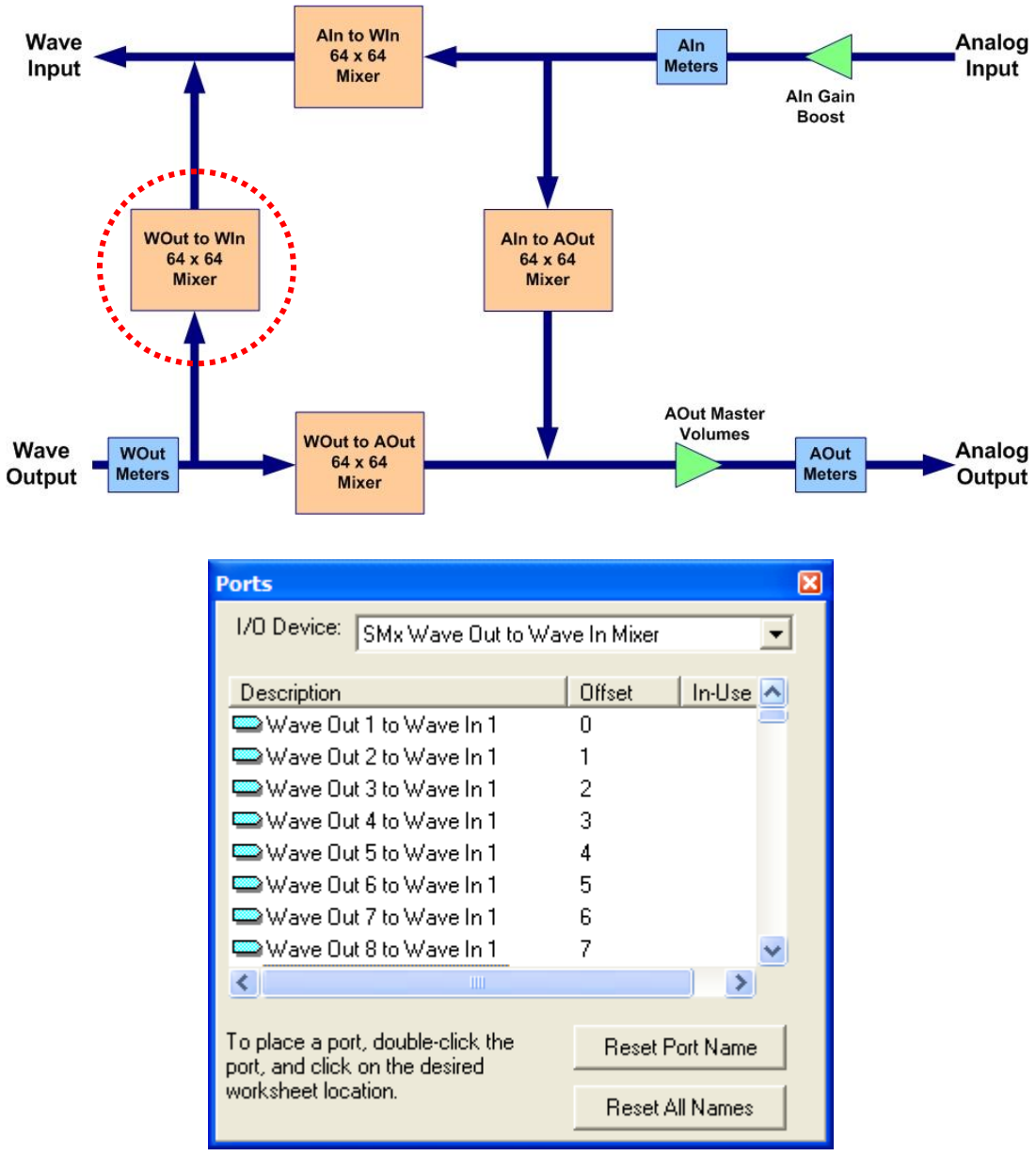


Figure 38, SMx Wave Out to Wave In Mixer Device

Ports are named "Wave Out 1 to Wave In 1" through "Wave Out 64 to Wave In 64". This mixer can be used to send the audio stream of a wave file player to a VComm radio, which will result in this stream being sent over the network.

8.3.10 SMx Status Device

The SMx Audio System I/O Device for V+ device version 4.3.0.124 (Build 124) and later versions include a new input device, "SMx Status" device (see Figure 39). This new device has a number of input ports that report real-time properties of the system. This information is useful for diagnostics that can be reported back to a host computer, to a user of the system via a GUI, or whatever the V+ designer chooses.

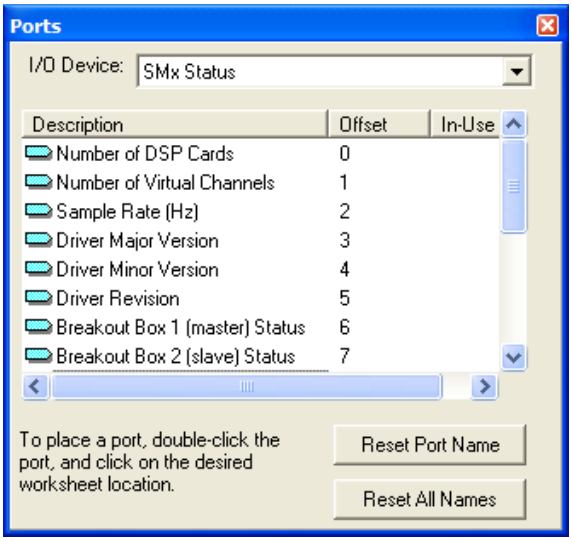


Figure 39, SMx Status Device

8.3.11 Simulated Hardware Mode

If the SMx hardware is not present in the computer when the status device is run, the status ports will report back the values shown in Figure 40, SMx Simulated Hardware Mode Status Ports. Not all ports produce results that are expected in this mode.

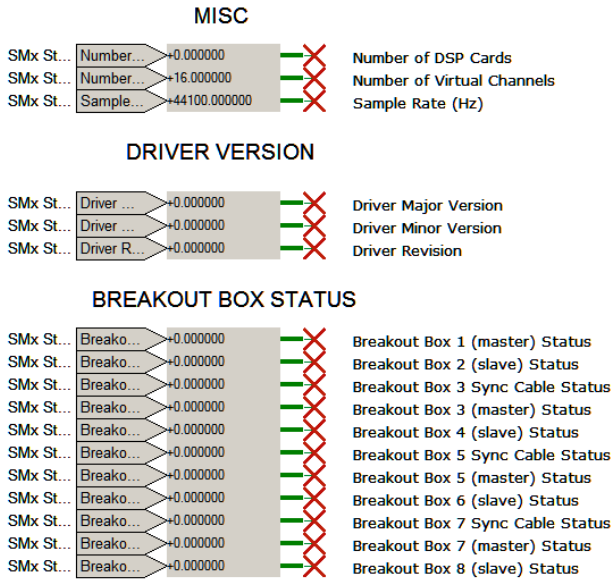


Figure 40, SMx Simulated Hardware Mode Status Ports

If an error is detected during pre-execute of the "SMx Audio System" I/O Device then V+ will not start. Pre-execution errors are displayed in the V+ Run Time message window. Errors encountered during execution are reported via ports and in the V+ Run Time message window. The SMx Status Device contains the following input ports shown in the order that they appear in the port list:

1. **Number of DSP Cards –** The number of DSP cards is reported on this input port. Valid values are 0, 1, 2, 3, and 4. Zero indicates that either breakout boxes are turned off, or that the system is operating in Software Emulation Mode.
2. **Number of Virtual Channels –** This input port will reflect the number of virtual channels currently configured. The user can change this value in the configuration dialog of the V+ Run Time System. The number of channels is the same for input and output. Valid values are even numbers from 2 through 64. If this value is ever zero, this indicates that the driver was not installed properly since the installation software for the SMx Audio System sets this value in the registry to a default of 16. The user may change this value from that point on.
3. **Sample Rate –** This input port is the sample rate of the SMx system in samples per second. The default is 44,100.
4. **Driver Major Version –** This is the major version number of the hardware driver (echosmx.sys). The format of the version numbers of this driver are **a.b.c**, where **a** is the major version number, **b** is the minor version, and **c** is the revision number.
5. **Driver Minor Version –** This is the minor version number of the hardware driver (echosmx.sys).
6. **Driver Revision –** This is the revision number of the hardware driver (echosmx.sys).
7. **Breakout Box 1 (master) Status –** This port indicates the status of the first breakout box (which is a master). A status of 1 indicates that the breakout box is powered on and connected to the first DSP card. A status of 0 indicates that the breakout box is either powered off, its LVDS cable is disconnected, the breakout box has failed, or that the first DSP card has failed.
8. **Breakout Box 2 (slave) Status –** This port indicates the status of the second breakout box (which is a slave). A status of 1 indicates that the breakout box is powered on and connected to its master breakout box. A status of 0 indicates that the breakout box is either powered off, one of its fiber optic cables is disconnected, the breakout box has failed, or that the breakout box 1 has failed.
9. **Breakout Box 3 Sync Cable Status –** This port indicates the status of the sync cable connecting breakout box 1 to breakout box 3. A status of 1 indicates that the cable is properly connected between the breakout boxes. A status of 0 indicates that it is not.
10. **Breakout Box 3 (master) Status –** This port indicates the status of the third breakout box (which is a master). A status of 1 indicates that the breakout box is powered on and connected to the second DSP card. A status of 0 indicates that the breakout box is either powered off, its LVDS cable is disconnected, the breakout box has failed, or that the second DSP card has failed.
11. **Breakout Box 4 (slave) Status –** This port indicates the status of the fourth breakout box (which is a slave). A status of 1 indicates that the breakout box is powered on and connected to its master breakout box. A status of 0 indicates that the breakout box is either powered off, one of its fiber optic cables is disconnected, the breakout box has failed, or that the breakout box 3 has failed.
12. **Breakout Box 5 Sync Cable Status –** This port indicates the status of the sync cable connecting breakout box 3 to breakout box 5. A status of 1 indicates that the

cable is properly connected between the breakout boxes. A status of 0 indicates that it is not.

13. **Breakout Box 5 (master) Status –** This port indicates the status of the fifth breakout box (which is a master). A status of 1 indicates that the breakout box is powered on and connected to the third DSP card. A status of 0 indicates that the breakout box is either powered off, its LVDS cable is disconnected, the breakout box has failed, or that the third DSP card has failed.
14. **Breakout Box 6 (slave) Status –** This port indicates the status of the sixth breakout box (which is a slave). A status of 1 indicates that the breakout box is powered on and connected to its master breakout box. A status of 0 indicates that the breakout box is either powered off, one of its fiber optic cables is disconnected, the breakout box has failed, or that the breakout box 5 has failed.
15. **Breakout Box 7 Sync Cable Status –** This port indicates the status of the sync cable connecting breakout box 5 to breakout box 7. A status of 1 indicates that the cable is properly connected between the breakout boxes. A status of 0 indicates that it is not.
16. **Breakout Box 7 (master) Status –** This port indicates the status of the seventh breakout box (which is a master). A status of 1 indicates that the breakout box is powered on and connected to the fourth DSP card. A status of 0 indicates that the breakout box is either powered off, its LVDS cable is disconnected, the breakout box has failed, or that the fourth DSP card has failed.
17. **Breakout Box 8 (slave) Status –** This port indicates the status of the fourth breakout box (which is a slave). A status of 1 indicates that the breakout box is powered on and connected to its master breakout box. A status of 0 indicates that the breakout box is either powered off, one of its fiber optic cables is disconnected, the breakout box has failed, or that the breakout box 7 has failed.

8.4 "2103 SMx W I/O Select to A I/O" Object

The Super Mixer is so complex and contains so many ports, that a new object was necessary to simplify V+ worksheet applications where an A I/O pair (Headset/Microphone for example) had to select a WI and WO pair (Simulated Radio for example) that could be one of any of the 64 pairs. For example, if an operator using a headset/microphone had a user interface that could select any one of the 64 WI/WO for a simulated radio, then all of the ports for the AI 1 to WI 1 through WI 64 would have to be placed on a worksheet along with the same concept for the Headset as WO 1 through WO 64 to AO 1. This would require all of the ports in the mixer! A new object had to be developed that could simplify this condition.

8.4.1 "2103 SMx W I/O Select to A I/O"

8.5 "2023 SMx Local ICS" Object

The SMx system is often used to simulate a voice communications system where a number of analog headsets are connected directly to the breakout boxes. The super mixer was designed to provide a simple yet extremely powerful computer controlled mixing system that can be used to create complex voice communications systems. The user can place the super mixer ports on the V+ worksheet and control the mixer to accomplish almost any communications system imaginable. Object 2023, SMx Local ICS is a powerful object to simplify the process of designing voice communications functionality It is the result of a number of customer requests and is a long time coming. If you have a large centralized communications system using the SMx that also includes more than one ICS channel, this object is for you. In fact, building a V+ design to handle multiple ICS channels any other way is difficult. If multiple users are connected to a single SMx system in addition to the normal DIS/HLA networked radios and a number of ICS channels, the V+ design can get out of control. It can be done of course, but it is also unnecessary now.

8.5.1 Local ICS Only

The object is useful on a SMx audio system between local users since this object manipulates the SMx super mixer. The new object simplifies SMx local ICS designs by taking control of specific AI to AO mixer ports on the SMx super mixer. Only the minimum ports necessary to implement the ICS design are controlled, leaving the others for your use in V+. It is such an innocent looking object, but it is very powerful when used together with other 2023 objects.

This object uses the super mixer AI to AO ports and may overwrite ports that you may have in your project. The use of this object assumes that the designer is not using AI to AO ports for any other form of local intercommunications simulation.

8.5.2 Networked ICS versus Local ICS

It is important to understand the differences between local ICS, and networked ICS. Networked ICS refers to audio that is transferred over a network to another audio system. Local ICS channels are those that are local to a single SMx audio system computer.

8.5.3 Object 2023

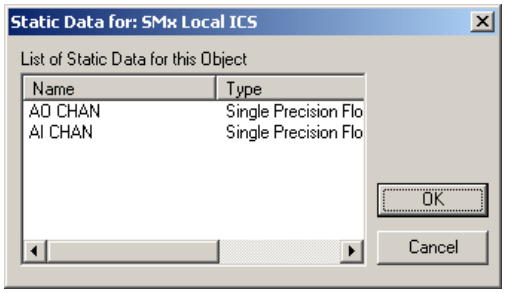
Object 2023 has four input pins and two static data elements described below.

PIN	DESCRIPTION
ICS#	INTERCOM SYSTEM NUMBER This pin identifies the desired ICS channel, and only positive integer numbers are allowed. Other values will result in post execute errors.

VOL	VOLUME This is the volume pin, and accepts floating-point values of attenuation from 0 to 1.0, with 1.0 equal to no attenuation.
RX	RECEIVE ENABLE Enables reception for this channel. You can use this to set for receive only.
TX	TRANSMIT ENABLE Enables transmission on this channel. If TX enable is set TRUE, then internally RX enable is set to TRUE for as long as TX is TRUE. After TX goes back to FALSE, RX will go back to whatever value is at the RX pin.

8.5.4 STATIC DATA

The object contains two static data elements for setting the input and output channel that for the intercom. Each element sets the physical analog output and analog input connection for the headset or other device that this object is assigned to.

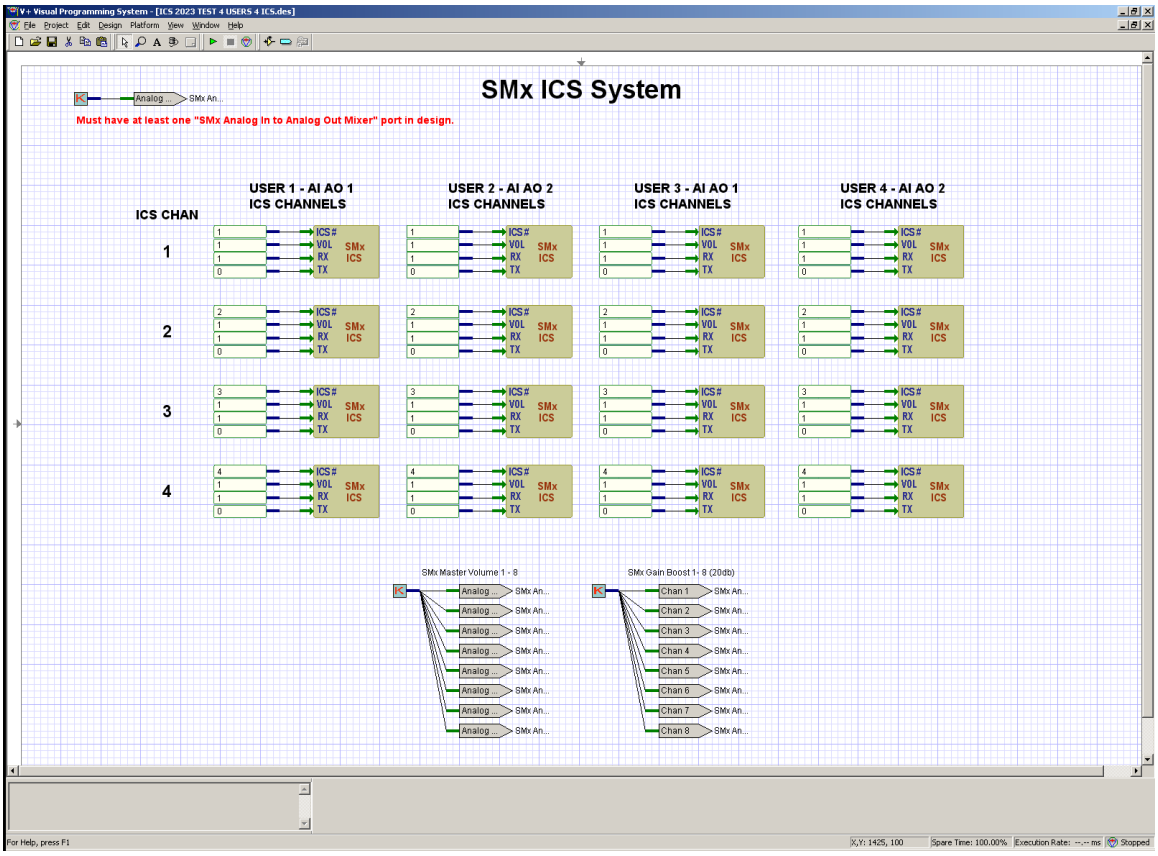


STATIC DATA	DESCRIPTION
AI CHAN	ANALOG INPUT CHANNEL This is the physical analog input channel to which your user's input is attached. You can change this value only when the system is not executing. Changing the value during execution will have no effect and this value will retain its previous value.
AO CHAN	ANALOG OUTPUT CHANNEL This is the physical analog output channel to which your user's input is attached. You can change this value only when the system is not executing. Changing the value during execution will have no effect and this value will retain its previous value.

There are some caveats that must be considered when using this object. First and foremost, ***you must have at least one "SMx Analog In to Analog Out Mixer" device port present in the project***. The SMx device will not execute the "SMx Analog In to Analog Out Mixer" if at least one port is not in the project. Note the sample screen shot below.

8.5.5 SIDETONE

You must enable your own sidetone via ports in V+, since this object does not compute the sidetone for you. To setup sidetone, set the AI to AO port for your input and output channel.



8.5.6 BE CAREFUL WHEN SETTING UP THE AI AND AO CHANNELS

Multiple ICS objects for the same AI and AO pair can be used to setup multiple ICS channels for that user (AI and AO pair). However, an error will be generated if another ICS object uses only one of the same AI or AO channels. In other words, another object must use the same AI and AO or both AI and AO channel must be different numbers.

8.5.7 DO NOT USE MORE THAN ONE ICS WITH THE SAME PARAMETERS

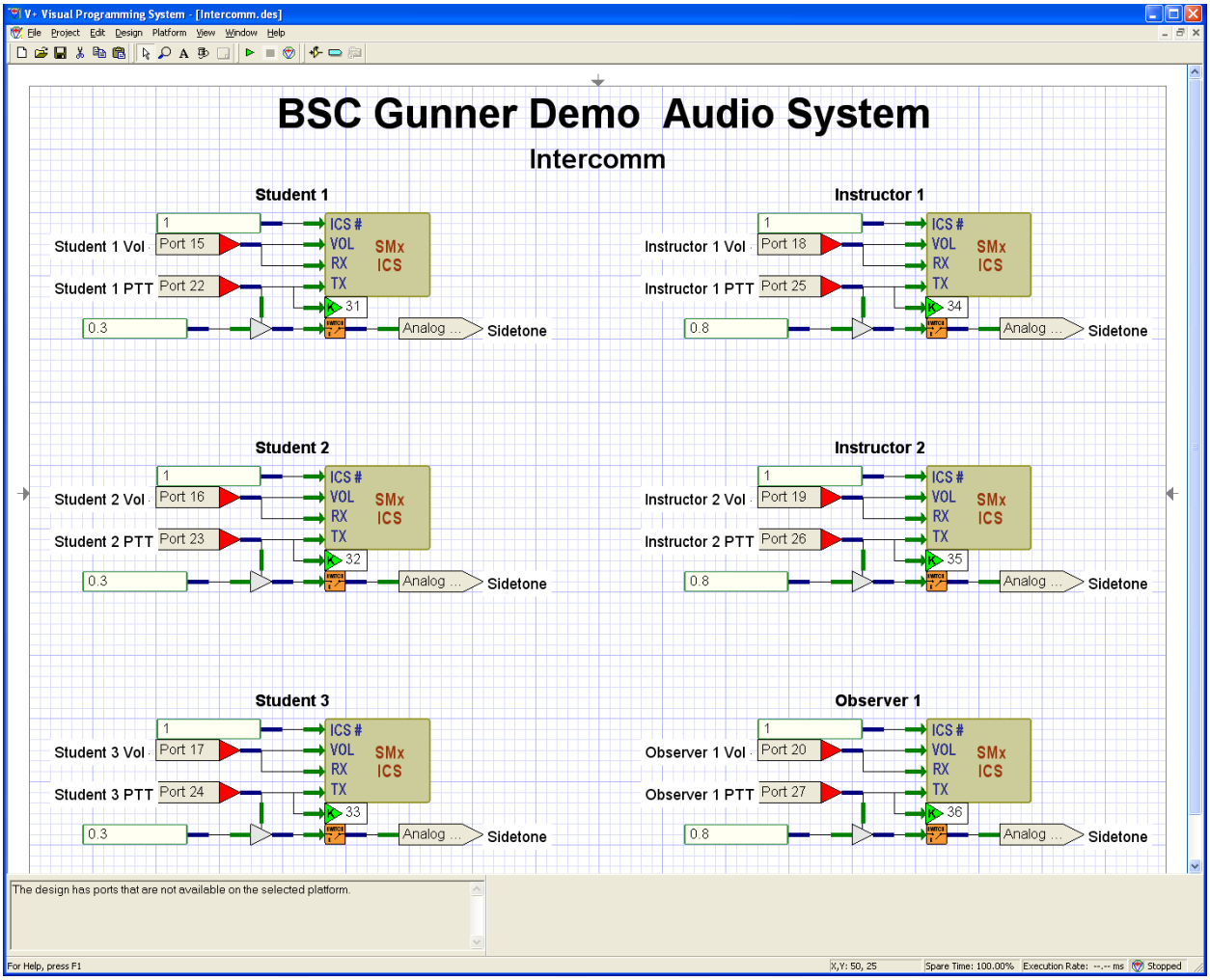
Ensure you do not user more than one ICS object with the same AO, AI and ICS channel at the same time in a design. This will result in only one of the objects with the same parameters working properly. In most cases the controlling mechanism or GUI that is being used to control the system will not allow a single user to have more than one ICS with the same channel.

8.5.8 SAMPLE WORKSHEET

You can download the sample worksheet above from:
http://www.simphonics.com/library/VPLusSamples/SMx/LOCAL%20ICS/

8.5.9 PRACTICAL APPLICATION

The screenshot below shows a simple one channel intercom system for six stations. In this case, there are three Students, two Instructors, and an Observer. Since this application did not require more than one ICS channel, all ICS# pins were set to 1. Note the AI to AO port under each ICS object to enable sidetone for a given station. Remember that the ICS object does not provide sidetone. There are other functions on this worksheet that are application specific.



8.6 Super Mixer V+ Examples

The C:\Program Files\VPLus\VPLus Samples\Tutorials\SMx folder contains a design worksheet called Super Mixer Examples.des which is shown in the following examples.

8.6.1 Controlling the Super Mixer's Master Gains

Figure 41 highlights the AI Gain port for channel 1. It is set to a 18 dB gain boost, which is pretty common for a headset microphone. Figure 42 highlights the AO Master Volume port for channel 1. It is set to 0.75 which represents 75% of the maximum volume.

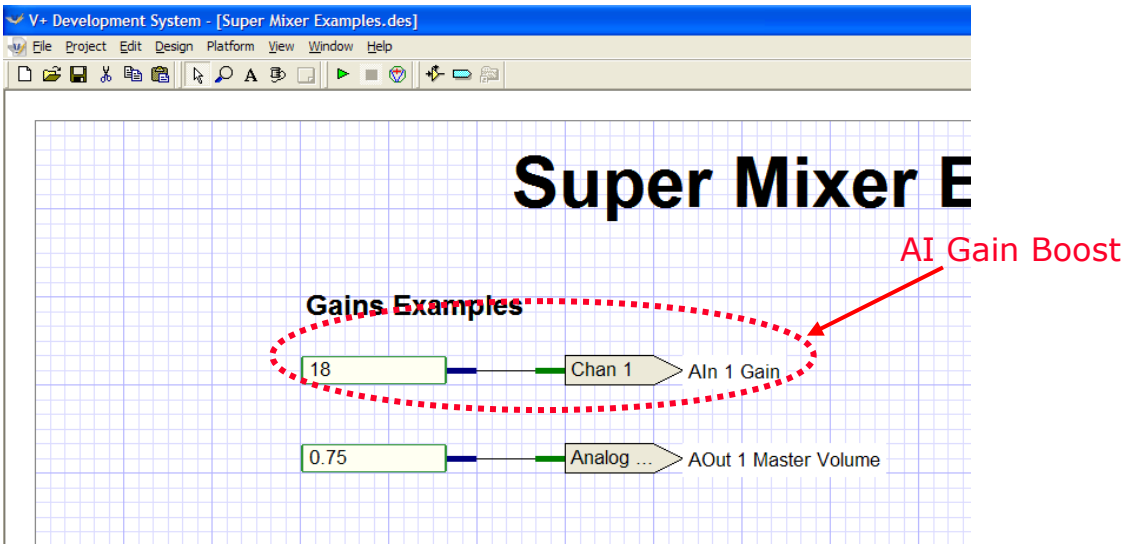


Figure 41, AI Gain Boost Example

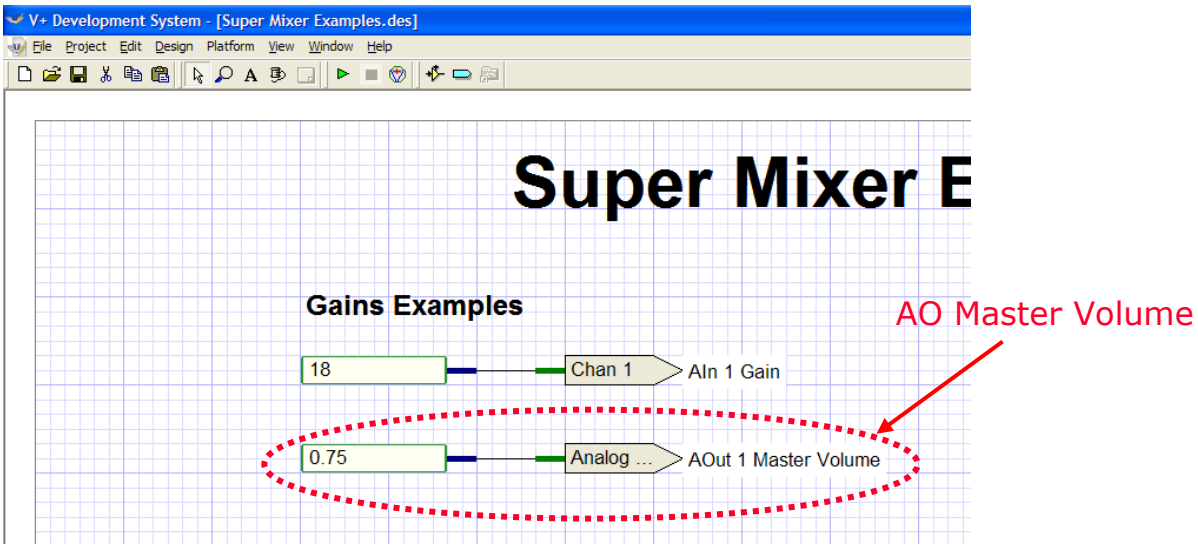


Figure 42, AO Master Volume Example

8.6.2 Monitoring the Super Mixer's Meters

Figure 43 highlights the VU Meter port for Analog In channel 1.

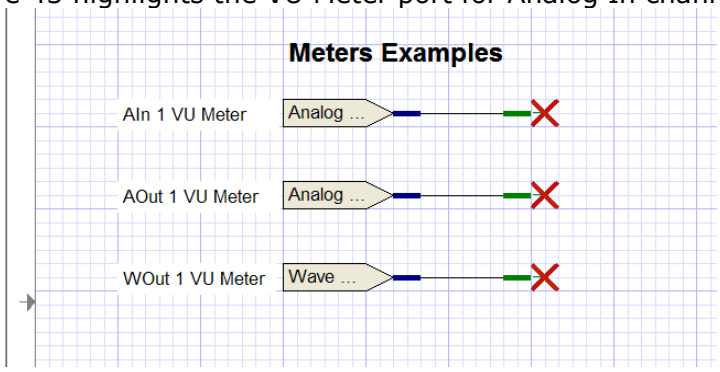


Figure 44 highlights the VU Meter Analog Out channel 1.

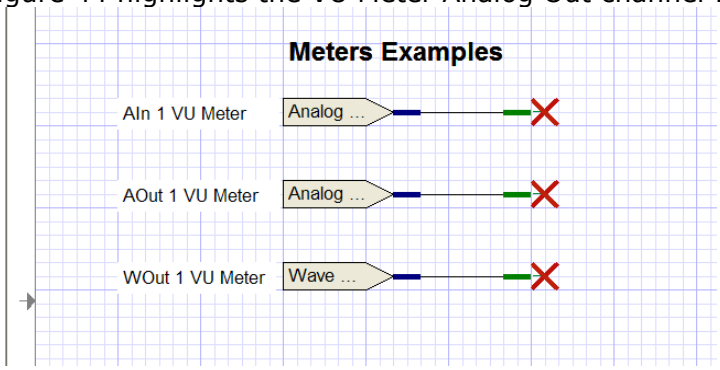


Figure 45 highlights the VU Meter port for Wave Out channel 1.

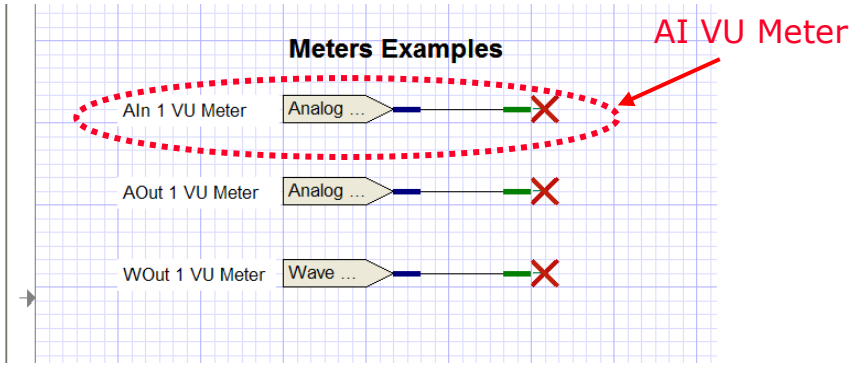


Figure 43, AI VU Meter Example

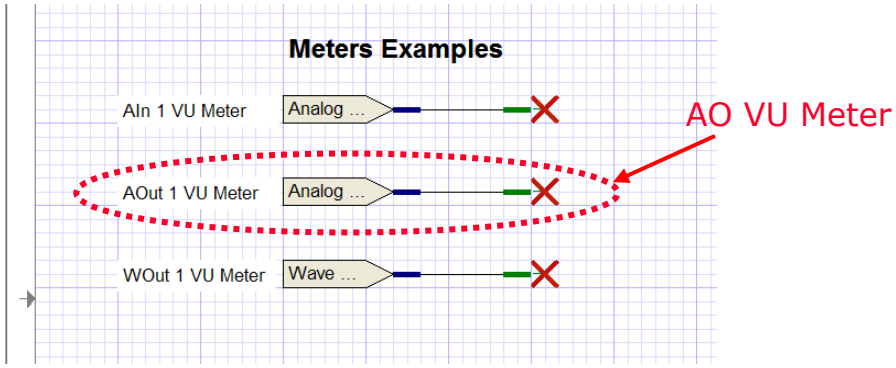


Figure 44, AO VU Meter Example

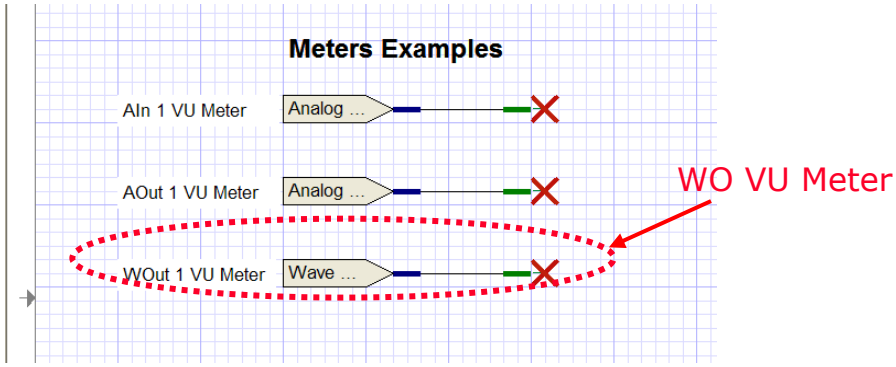


Figure 45, WO VU Meter Example

8.6.3 Controlling the Super Mixer's AI to AO Mixer

In order to pass an AI signal to an AO connector, you select the Analog In to Analog Out Mixer device within V+. Then you select the port which represents the AI to AO connection you wish to make. Figure 46 highlights an example of an AI to AO port. In this example, a value of 0.5 is passed to the AI 1 to AO 1 port. Let's say that in a communications simulation, AI 1 and AO 1 are assigned to the pilot microphone and headphones respectively. Feeding the pilot's microphone signal to the pilot's headphones would be done to produce a sidetone, as is heard in an aircraft when the pilot engages the Push-To-Talk (PTT) button.

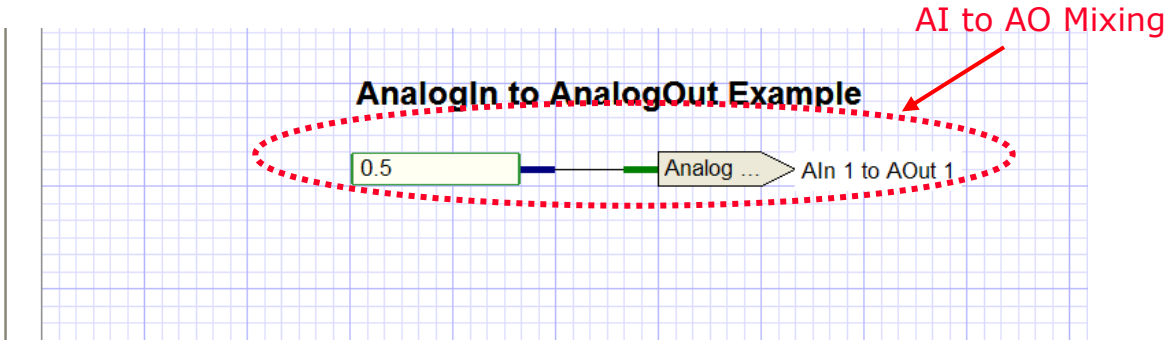


Figure 46, Analog In to Analog Out Mixer Example

8.6.4 Controlling the Super Mixer's WO to AO Mixer

In order to pass a WO signal to an AO connector, you select the Wave Out Mixer device within V+. Then you select the port which represents the WO to AO connection you wish to make. Figure 47 highlights an example of an WO to AO port. In this example, a value of 0.9 is passed to the WO 1 to AO 1 port. Also shown in this example is a looped wave player with a volume setting of 0.7, a frequency setting of 1, and the enable turned on. The static data for the wave player is shown as a comment below it. The Channel 1 allocation indication means that it is going to play on WO 1. Remember that this is only 1 wave player, and that it is mixed only to AO channel 1. Any combination of WOs and AOs could be used. In fact this one WO signal could be mixed to all AO output connectors by placing more ports on the worksheet.

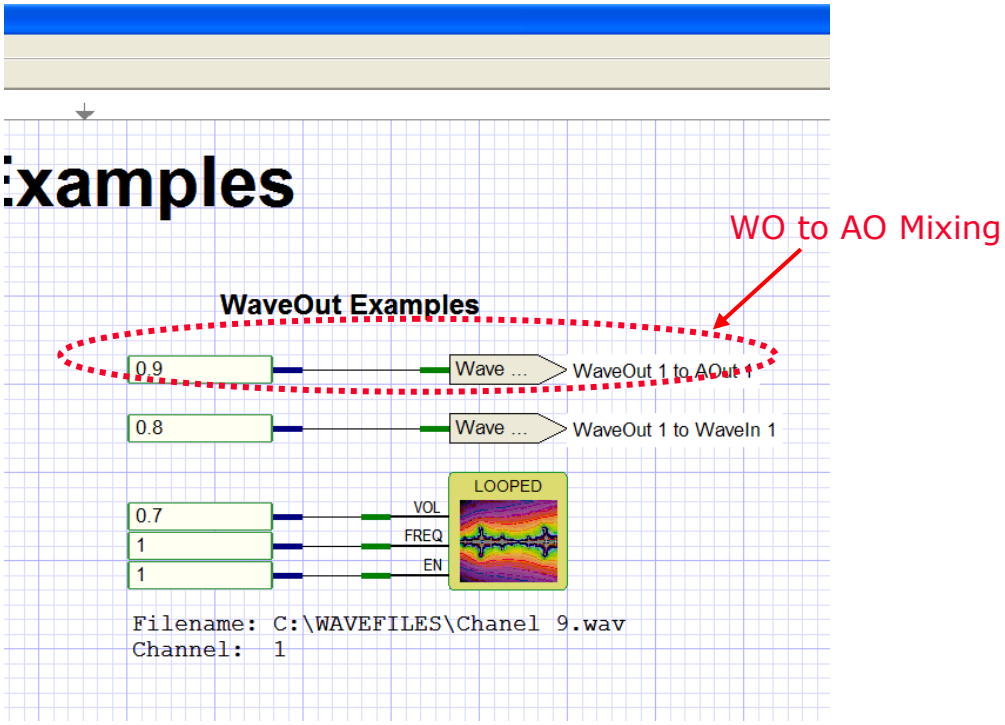


Figure 47, Wave Out to Analog Out Mixer Example

8.6.5 Controlling the Super Mixer's WO to WI Mixer

In order to pass a WO signal to an WI channel, you select the Wave Out to Wave In Mixer device within V+. Then you select the port which represents the WO to WI connection you wish to make. Figure 48 highlights an example of an WO to AO port. In this example, a value of 0.8 is passed to the WO 1 to WI 1 port. Also shown in this example is a looped wave player with a volume setting of 0.7, a frequency setting of 1, and the enable turned on. The static data for the wave player is shown as a comment below it. The Channel 1 allocation indication means that it is going to play on WO 1. Remember that this is only 1 wave player, and that it is mixed only to WI channel 1. Any combination of WOs and WIs could be used. In fact this one WO signal could be mixed to all WI channels by placing more ports on the worksheet.

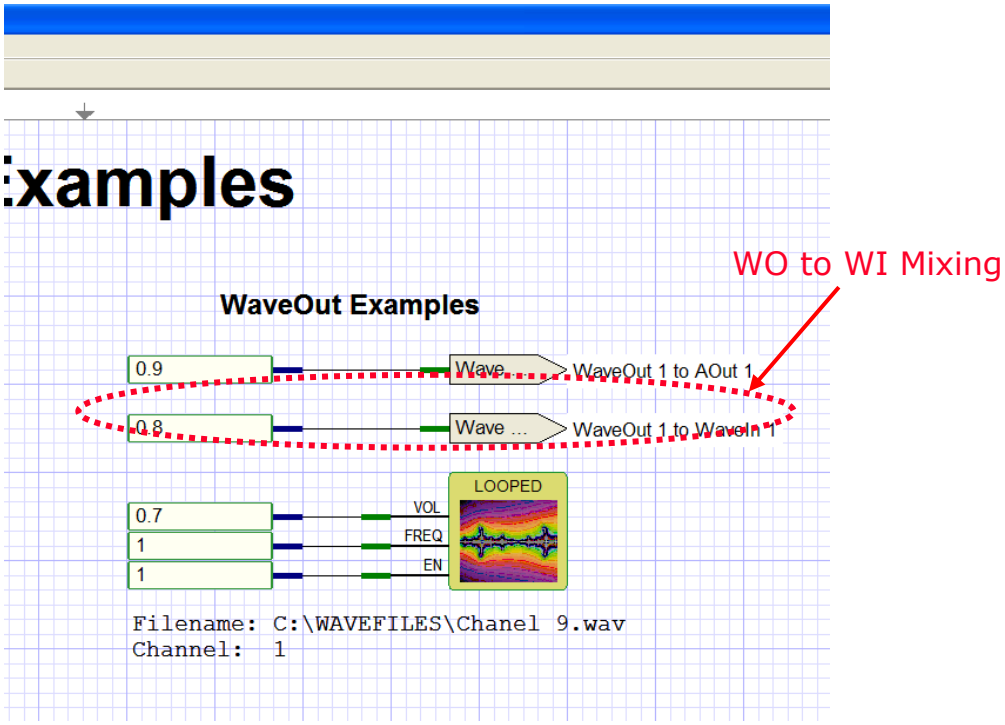


Figure 48, Wave Out to Wave In Mixer Example

8.6.6 Controlling the Super Mixer's AI to WI Mixer

In order to pass an AI signal to a WI channel, you select the Wave In Mixer device within V+. Then you select the port which represents the AI to WI connection you wish to make. Figure 49 highlights an example of an AI to WI port. In this example, a value of 0.75 is passed to the AI 1 to WI 1 port. Also shown in this example is a recorder with the STOP, PAUSE, RECORD pin set to 2 (record) and the FILE ID pin set to 1. The static data for the recorder is shown as a comment below it. The Channel 1 allocation indication means that it is going to record to WI 1. Remember that this is only 1 recorder, and that it is mixed only to WI channel 1. Any combination of AIs and WIs could be used. In fact this one AI signal could be mixed to all WI channels by placing more ports on the worksheet.

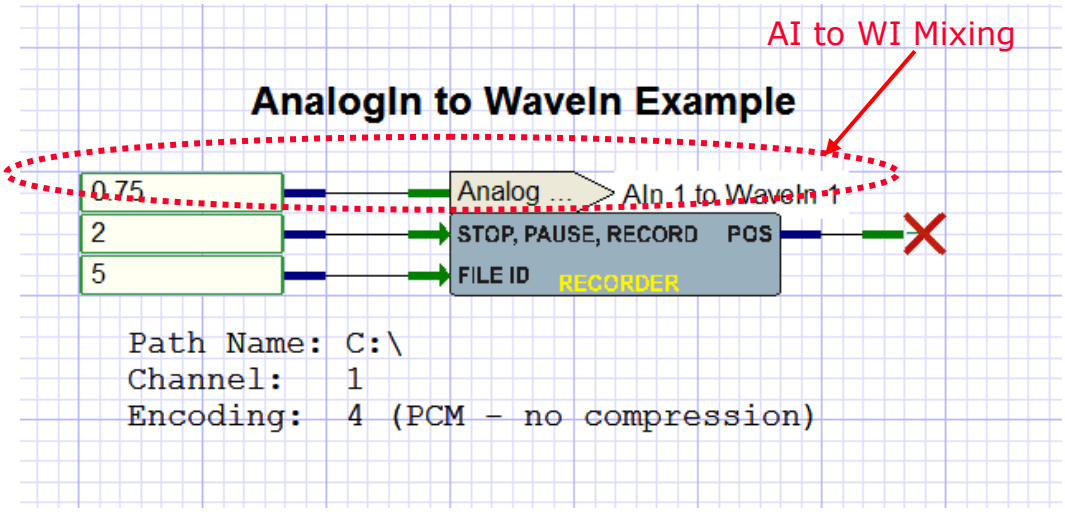


Figure 49, Analog In to Wave In Mixer Example

8.7 Run-Time Messages

The V+ Run Time System window has a scrollable message list which provides the user with useful information. Pay attention to this message list for error messages if your system stops or isn't working. A typical output of the message windows would look something as shown in Figure 47.

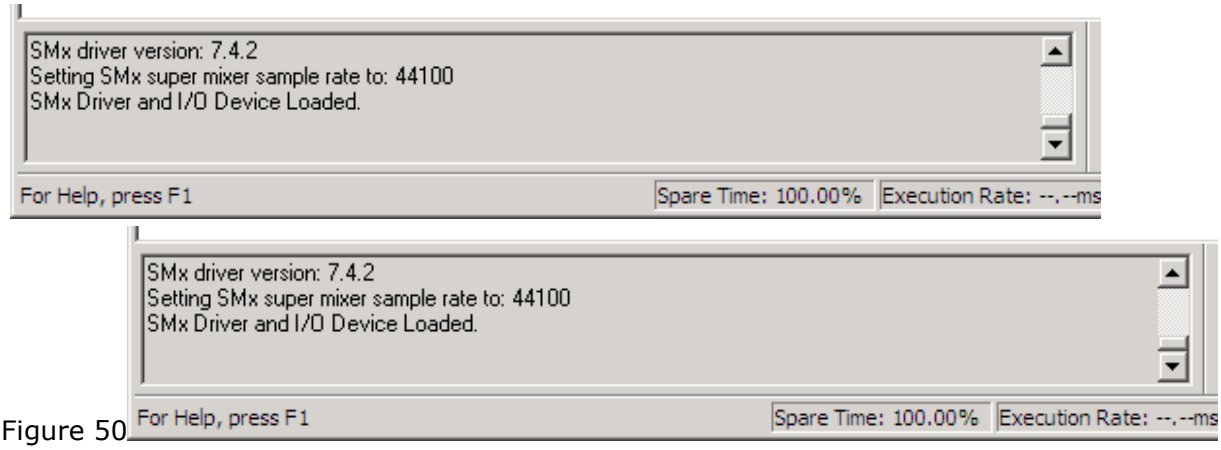


Figure 50

Figure 50, Run Time System Message Window

9 Troubleshooting

This section helps resolve "system" problems without incurring return costs and down time. Retrieve the delivered documentation packages provided with your unit, and refer to your Hardware and Software Configuration Documents. Verify all BIOS settings exactly match your delivered documentation. Verify all hardware switch settings and jumpers match your documentation. If the above are verified; reload* (or ColdBoot) the system software by following the procedure provided in your manuals. This will completely rebuild your system to original Factory settings.

9.1 Common Problems with Power

One of the most common problems faced by users of the SMx system is that the breakout box, BOB, is sometimes powered from a separate source than the chassis. The power to the breakout box cannot be turned off and back on while the SMx is running, or the system will lose synchronization, and very strange things will happen. Sometimes the situation will recover, sometimes not, and usually not.

If the power to the BOB is ever turned off while the system is running, the SMx must be rebooted.

***Warning:** Cold Booting/Reloading systems removes all changes made by the Buyer; please backup any modifications you wish to save.*

9.2 System Power Supply

If the green power LED is blinking on the front panel of a breakout box, this indicates that there is a fault in the breakout box power supply. Note that the main power plug of the breakout box is the only way to completely remove power from the breakout box.

9.3 Safety

The following safety precautions must be observed at all times for proper use of the system. Make sure all electrical cords are disconnected from the SMx system before removing, handling, or replacing any components,

Make sure to open all system computer chassis PRIOR to applying power. This is to ensure that no damage occurred during shipment. Verify all cards are well seated in their slots, and all power and drive connections are good.

9.4 Handling Your System

The SMx system components are sensitive to electrostatic discharge (ESD). Make sure you are properly grounded when handling an SMx system or its internal components.

SimPhonics is not responsible for any defect or damage caused by improper installation, modification, misuse, neglect, inadequate maintenance, and accidents, or for any product that has been repaired or altered by anyone other than SimPhonics. SimPhonics, Inc. also shall have no responsibility for any damage, which may occur during shipment of returned equipment for repair. The warranty will be invalid if any alterations are made to the circuitry or the hardware components, or if 3rd party software programs have been installed onto the unit. Damage due to static discharges or application of excessive voltages will void the warranty.

9.5 Warranty & RMA Information

SimPhonics products are warranted against defects in materials and workmanship for up to one year. System warranties are effective from the date of system ATP. Single product purchases are warranted from the date of shipment. SimPhonics, Inc. will repair or replace, at its option, any product found to be defective during the warranty period. See our website for additional information on the SMx Warranty. SimPhonics makes every effort to provide you with the highest quality products available. If you encounter a problem and need to return your equipment, you will need to obtain an RMA number. This is done by completing an RMA form. Before filling out an RMA form you should have the following information available:

- Serial number of part in question
- Part number of part in question
- The name of a contact at your company
- A description of the problem with the equipment
- Date of delivery

9.5.1 Requesting an RMA Number

To request an RMA number, complete the online RMA form found on our website. For more information about RMAs visit our website:

http://www.simphonics.com/supp/rma/instructions.htm

9.6 Contact Information

SimPhonics is committed to providing quality round-the-clock customer support. Below is a list of contact information should you need to speak to someone in our office. Additionally, our website is available 24 hours a day, seven days a week and, contains a comprehensive list of support services including technical documents, online manuals, tutorials, help systems, and much more. Visit our website's support link for more information.

Contact Information		
Corporate Office: SimPhonics, Inc. 3226 N. Falkenburg Road Tampa, FL 33619	Shipping & Receiving: SimPhonics, Inc. 3226 N. Falkenburg Road Tampa, FL 33619	Telephone: Toll Free: (877) 205-4901 Local: (813) 623-9917
Sales: sales@simphonics.com	General Information: info@simphonics.com	Business Hours: Monday-Friday 9:00 a.m. - 6:00 p.m. (Except on major holidays)
Technical Support: support@simphonics.com	Accounting: accounting@simphonics.com	