DiGiGrid IOS / IOS-XL

User Guide

Contents

INTRODUCTION 3
HARDWARE AND CONNECTIONS 4
GETTING STARTED 6
Connect the Hardware 6
One I/O 6
Add I/Os 7
Download and Install Software 8
Configure the System 9
Manual Device Configuration 10
Automatic Device Configuration 10
Device Firmware 11
IOS / IOS XL CONTROL PANEL 12
Controls Page 13
Clock Page 18
System Info Page and About Page 20
Presets 21
USING IOS/IOS-XL WITH A DAW 22
USING THE IOS/IOS-XL WITH MIDI 22
SPECIFICATIONS 23
RESETTING THE UNIT 26
INSTALLATION NOTES 26

Waves Inc
2800 Merchants Drive, Knoxville, TN 37912 USA
1-865-909-9200
www.waves.com

Introduction

DiGiGrid IOS and IOS-XL are SoundGrid interfaces with built-in DSP servers for DAWs and Waves SoundGrid applications. IOS and IOS-XL have the same I/O sections. Both models feature eight mic/line inputs with premium grade preamps, eight line outputs, two headphone outputs, and MIDI, S/PDIF, and AES inputs and outputs. They also feature a built-in network switch to connect more SoundGrid components to your system.

The IOS and IOS-XL's internal DSP server is used to offload plugin processing from the host CPU. This dramatically increases processing power and enables greater plugin counts—it also provides very low system latency. The IOS internal SoundGrid DSP server is powered by an Intel i3 processor, while the IOS-XL uses an Intel i7 Extreme processor.

A SoundGrid I/O device is part of a SoundGrid network. SoundGrid is the Waves high-speed networking protocol for moving audio, clock, and other information between a host system and I/O devices—and between I/O devices themselves. A SoundGrid host configures the network, assigning servers and I/O devices to mix, process, or record, depending on the host. SoundGrid I/Os link to the SoundGrid network with standard Ethernet cable.

SoundGrid is scalable. Connect one I/O device to a DAW and you have a high-quality sound card. Add more I/Os and your system becomes more flexible and powerful. Depending on the host application, a SoundGrid host can assign up to sixteen I/O devices. Complete SoundGrid systems can be networked together to share devices.

Hardware and Connections

IOS-XL is a 2U rack-mounted device. Aside from headphone jacks, all connections are from the rear panel.

IOS/IOS-XL Front Panel

Front panel LEDs indicate status regarding essential device functions for each channel.

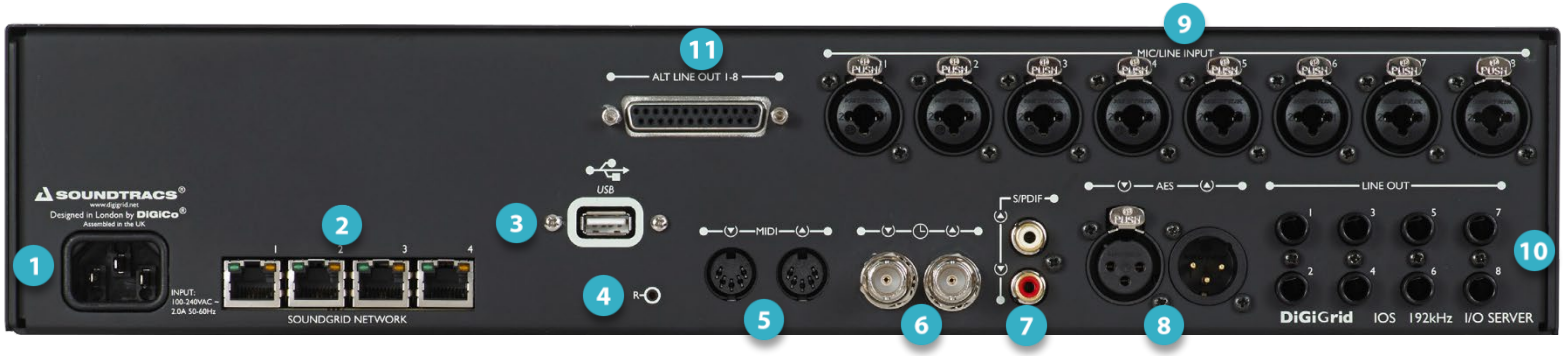
1. Input clipping Red = clipping (level can be set through the control panel)
2. Input signal present Green = signal present
3. 48V phantom power Orange = ON
4. Network status indicator

   Blue: device recognized by the SoundGrid network

   Red: device not recognized by the SoundGrid network Yellow: Updating

   White: unit malfunction (e.g., firmware did not load properly, unit did not boot properly) Cycling through colors: this LED is also used to identify the unit from the control panel.
5. Power switch/indicator
6. Two ¼-inch TRS headphone jacks with individual volume control knobs; 8 ohms – 600 ohms; gain = OFF to +15 dB

IOS/IOS-XL Rear Panel



1. Mains input: 90–240 V AC 50/60 Hz
2. Built-in 1GB Ethernet switch, four ports
   The four-port Ethernet switch can connect IOS directly to a host computer and three other devices without an external Ethernet switch. For larger systems, a 1 GB SoundGrid-approved Ethernet switch is necessary. It is not important which of the Ethernet ports is used to connect to the SoundGrid network.
3. USB server service port
4. Recovery/reset button
5. MIDI in and out (can be linked to Waves applications and to DAWs)

Digital and clock connections: software selected

6. Clock in and out (BNC connectors for external Word Clock)
7. S/PDIF in and out (RCA connectors)
8. AES in and out (XLR connectors)

Analog connections

9. 8 mic/line inputs (combo XLR/TRS connectors)
10. 8 line out ¼ inch TRS connectors
11. Alt line out (DB25 8 channel balanced connector) See connection diagram in the specifications section.

Getting Started

Configure SoundGrid and assign your devices as follows, however large or small your system.

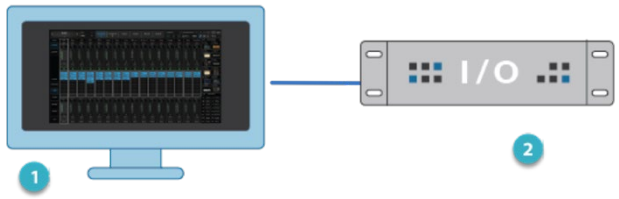
- (A) Connect the hardware
- (B) Install the software
- (C) Configure your system

(A) *Connect the Hardware*

Systems can range from small and simple, to huge and complex.

One I/O

In this example, one DiGiGrid IOS or IOS-XL is connected directly to the SoundGrid host computer using a Cat 5e Ethernet cable or better. This provides plugin processing and/or DAW playback/recording via the SoundGrid ASIO/Core Audio driver.



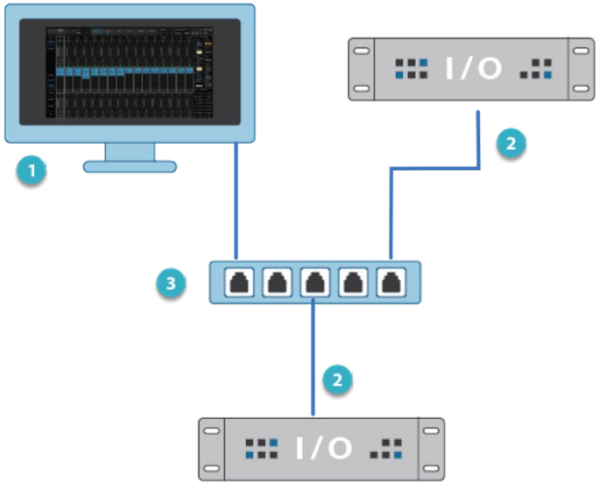
1. Host computer with SoundGrid application
2. SoundGrid I/O device

The host computer's LAN port that's connected to the SoundGrid network should be used for SoundGrid only. Do not share this port with the internet or other networks.

In this configuration, all plugin processing is carried out on the host computer. The speed and power of the host defines overall latency.

Add I/Os

Adding I/O devices not only increases the number of I/O channels, but lets you have separate devices for stage and FOH, or live room and control room. Both the IOS and IOS-XL feature a four-port Ethernet switch to connect with SoundGrid devices. When more than four device connections are needed, use a "star" network configuration with a 1GB Ethernet switch. Only use switches tested and approved by Waves.



1. Host computer
2. I/O devices
3. 1GB Ethernet switch

See this support article for a list of supported switches.

You can connect and assign up to 16 SoundGrid I/O devices to the network, depending on the SoundGrid host application. All SoundGrid I/O devices, hosts, and servers are connected through the Ethernet switch. You can also add more computers to enable audio streaming among hosts.

B Download and Install Software

Installing a New SoundGrid Host System

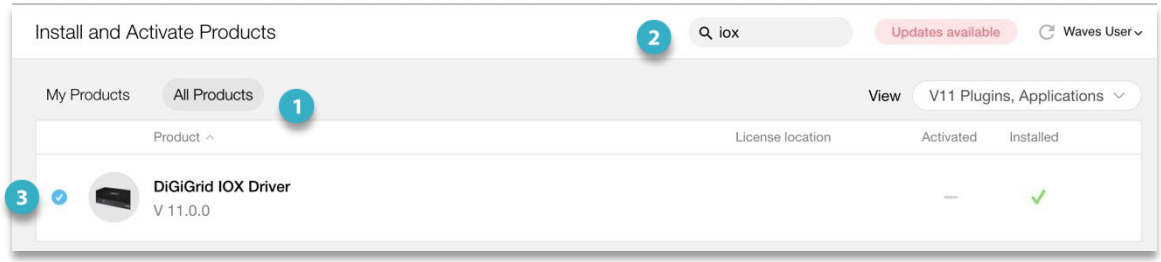
Installing the Waves SoundGrid host application will also install applicable device drivers and ASIO/Core Audio drivers. Your devices will appear in the Inventory of your host system. If a device is not visible in the Inventory, you may need to install a specific driver from **Waves Central**—please see below. First, however, check the device's connections and power.

Adding an I/O Device to an Existing SoundGrid Host System

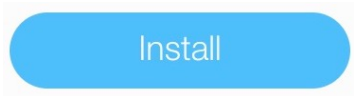
If you are already using a Waves SoundGrid host application and your device does not appear in the Network Devices list, use Waves Central to update the host application, which also updates the device drivers—or install just the missing device driver from Waves Central.[1]

Waves Central

All Waves software is downloaded and installed via the Waves Central application. To install a specific device driver, launch Waves Central and follow these steps:



1. Choose **All Products**
2. Search for the driver by name
3. Choose the driver and click **Install**



If you are new to Waves products, begin by downloading the Waves Central installer from the Waves Download Page. See the Waves Central User Guide for instructions on how to install drivers, plugins, and applications.

Licenses

You do not need a license to use this device. However, many hosts or specific host configurations do require a license. Refer to your host's product page for details.

---

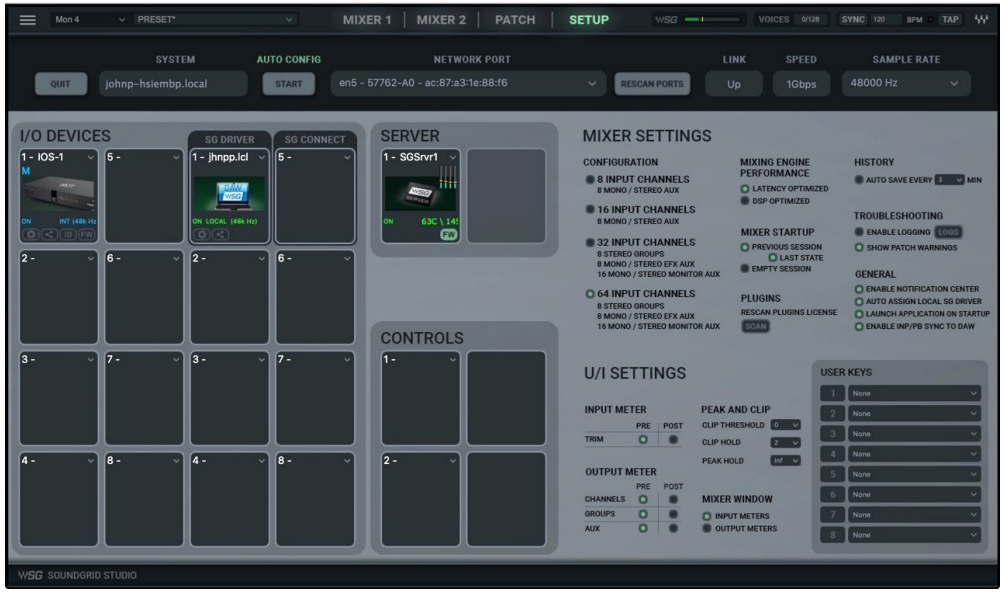
[1] The SoundGrid QRec host is installed with any I/O.

C Configure the System

A SoundGrid network is configured and devices are assigned in a host's **Setup** window. At the heart of this window are racks where devices are assigned. Any compatible device that's part of the host's SoundGrid network will be available for assignment. This collection of devices is called the **Inventory**. Setup is similar with all hosts: identify the host's LAN port, select a device slot, and use the drop-down menu to choose an available device.

Please consult the user guide of your host application for specific instructions.

SoundGrid QRec

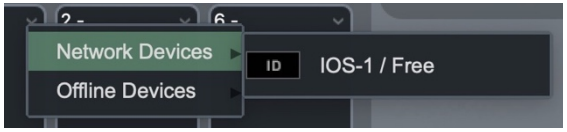


SoundGrid Studio Setup Window

All SoundGrid devices are configured in a similar manner. Throughout this section, we show DiGiGrid IOS as an example.

Manual Device Configuration

SoundGrid QRec



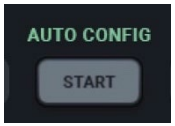
SoundGrid Studio

You can assign, remove, and manage a device manually. Click on the **plus** or **arrow** symbol in a device slot to open the **Device Menu**, then select a device.

Any device not already used will be available for assignment. If no other devices are assigned, the current device will become your clock master. Drivers and servers are assigned in the same manner.

See the user guide of your host system for specific instructions on device assignment and I/O channel patching.

Automatic Device Configuration



Certain SoundGrid hosts—including SoundGrid Studio, eMotion LV1 or SuperRack SoundGrid—offer an **Auto-Config** tool. Once your devices are connected and powered up, click **Auto Config** to start the configuration.

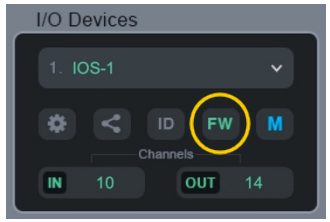
Auto-config chooses the correct LAN port on the host computer and scans the SoundGrid network for devices. It then patches the devices to the host. We recommend that you let Auto-Config take care of things, at least when you are getting started. If later you add, remove, or swap a device, Auto-Config will reconfigure your inventory and re-patch.

Note that SoundGrid Studio assigns the SoundGrid driver automatically. SuperRack SoundGrid and eMotion LV1 require that the SoundGrid ASIO/Core Audio driver is assigned manually.

Device Firmware

An I/O that is using outdated or incompatible firmware will not work properly in a SoundGrid network until its firmware is updated. The color of the **FW** button in a device slot indicates the current firmware status.

SoundGrid Studio



SoundGrid QRec

Grey	Compatible firmware
Blue	Compatible firmware, but a newer version exists
Red	Firmware not compatible and must be updated in order to use

If a device requires updated firmware, click on the FW button to start a hardware scan. Do not disconnect the device or turn off the computer before **Done** appears. Once the update is ready, turn the device off and on to reset.

Identify a Device on the SoundGrid Network

SoundGrid Studio

SoundGrid QRec

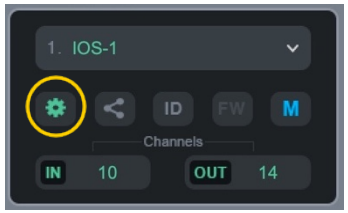
Click on the **ID** button to activate a hard-to-miss LED on the front panel of the corresponding hardware device. You can also activate the front panel from the top bar of the device's control panel.

IOS / IOS XL Control Panel

There are two ways to open the device control panel:

From the Device Rack

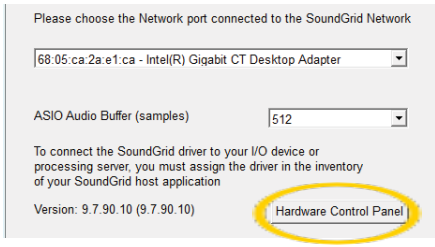
SoundGrid Studio



SoundGrid QRec

Click the **Gear** button on a device in the rack slot.

From the Driver Control Panel



Open the driver control panel and then click the Hardware Control Panel button. The driver control panel is located here in the host computer:

PC: C:\Program Files (x86)\Waves\SoundGrid\Driver Control Panel

Mac: System HD/Applications/Waves/SoundGrid

Control Panel Pages

The **Clock** and **Controls** pages are used to set up and manage the unit. The **About** and **System Info** pages provide information about the unit, such as MAC address, SOE master, firmware version, and more.

Controls Page

This is where you configure the inputs and outputs of the IOS/IOS-XL.

Mic preamps, line inputs and outputs, digital I/O, level control and metering.

The Controls page is divided into three sections:

1. Top Bar
2. Analog section
3. Digital section
4. Focus section: input and output levels and 48V phantom power for selected I/O channel are controlled here.

Top Bar

The Top Bar of the Controls page includes an illustration of the IOS/IOS-XL rear panel. When an input or output is selected in the main section of the page, the corresponding connector is highlighted.

Analog Section

There are eight mic preamps and line inputs and eight line outputs. Each preamp channel is represented by a button that turns the channel on or off. Each channel has a meter and a clip indicator. Select a channel and it will appear in the **Focus** section, where preamp parameters are controlled.

Use the Focus section on the left side to adjust preamp levels and turn the 48V phantom on and off. The long meters range from -80 dBFS to 0 dBFS.

Mic/Line knob gain range: 0 dB to +52.5 dB in 7.5 dB steps

Line knob gain range: 0 dB to +52.5 dB in 7.5-dB steps

Fine knob digital gain range: 0 dB to +7 dB in 0.5 dB steps

A clip indicator holds for two seconds or for as long as clipping persists. Peak hold stays lit until you reset it by clicking on the indicator.

An orange light on a channel button indicates that phantom power for that channel is active. This status is also shown in the Focus section.

Remote Preamp Control

You can control input preamp functions directly from the channel strip of SoundGrid applications, including eMotion LV1, SoundGrid Studio and SuperRack SoundGrid.

Control	Function
48V Phantom	On or Off
Preamp Gain Input	Controls analog gain in an assigned I/O device that includes a controllable preamp.
Input Polarity	Mono channels have one polarity reverse button. Stereo channels have two. Buttons are latching and are colored green when polarity is reversed.
Digital Input Trim	Controls input level from digital sources. Separate controls for L/R when input is stereo.

This allows you to control preamps “on the fly,” without leaving your monitor mixer. Refer to your host application’s user guide for details.

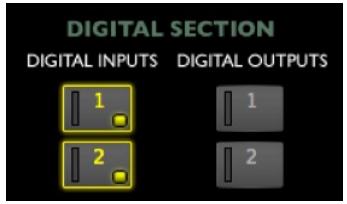
Analog Output Controls

In addition to meters and clip and peak indicators—which are identical to those in the input controls—there is a Headroom switch that provides a -10 dB pad

Presence of the -10 dB pad on an analog output is indicated by a LED.

Digital Section

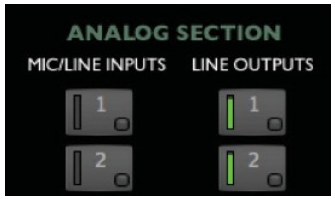
Digital inputs and outputs are selected in pairs. Two buttons in the Focus section are used to switch digital input and clock between AES/EBU and S/PDIF. This choice is reflected in the Top Bar illustration.



Use the SRC button to enable input sample rate conversion. When SRC is selected, IOS/IOS-XL will convert incoming digital stream to the sample rate of the clock that the device is locked to. Sample rate conversion is indicated by a yellow light on the channel button.

Clip Indication and Small Meters

Clip Indication Threshold sets the level where clipping is shown on the meter in the Focus section. The threshold can be set to 0 dB, -1 dB, -2 dB, or -3 dB. This setting is global: it affects level indication for all channels—input and output.



Each channel button—analog or digital, input or output—has a small level meter that indicates when signal is present and provides a rough idea of level. A red light on the channel button indicates clipping.

Headphones output levels are indicated in the same manner.

Clock Page

Use the Clock page to set the clock source and sample rate for the device and to assess clock status.

1 **SOURCE** sets the requested clock source.

Internal	The device itself provides the SEO clock.
External WC	Clock is provided by an external device via the Word Clock Input connector.
Sync over Ethernet	The device receives clock from the SoundGrid network.
Digital	IOS/IOS-XL clocks to incoming digital stream

2 SAMPLE RATE sets the sample rate when Clock Source is set to Internal. Range: 44.1 / 48 / 88.2 / 96 kHz.

If the device is the network (SOE) clock master, as determined in the Device Racks of the SoundGrid host, then this setting determines the sample rate of the SoundGrid network.

If Clock Source is set to an external clock source, you cannot change the sample rate from the host. The Sample Rate menu is grayed out and inoperative.

3 CLOCK STATUS INDICATORS

Three windows on the right side of the Clock control panel help you to quickly assess the network status of the device.

Status	Reports the presence or absence of sync between the IOS/IOS-XL and the SoundGrid network.
Current Clock Source	Displays the current sync method. This may differ from the choice made in the Source menu.
SOE	Indicates whether this IOS/IOS-XL is the master or a slave in the SoundGrid network. This mirrors the status information in the SoundGrid Studio Device Rack.

When the device is a slave in the SoundGrid network, you will likely sync it to the SoundGrid network clock (via SOE).

Even when the device is an SOE slave, you can lock it to an external clock source. For example, if another SoundGrid I/O device is the SOE master and is locked to a word clock device, you may choose to receive clock from the same external device over word clock from the master device rather than via network SOE.

In the event that the selected clock source fails, IOS/IOS-XL has a series of clock fallback layers, in this order: WC, Digital, SOE, Internal. If the device is clocked to external source and that clock source fails, it will seek an alternate source of clock, in this priority: word clock, Digital 1, Digital 2, and then SOE. If this fails, the device will fall back to Internal.

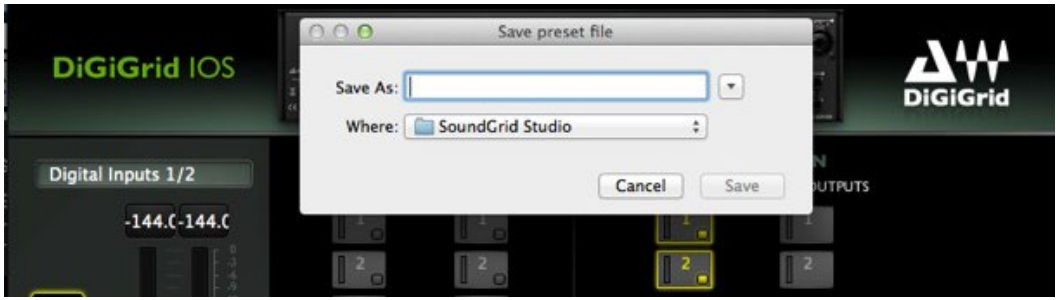
System Info Page and About Page

The **About** page contains a description of the device. The **System Info** page contains technical details about the device, including MAC address, Firmware version, and Module version. This information is useful for troubleshooting. Please have this information handy if you contact Waves technical support concerning the device.

Presets

The Top Bar is used to load and save device presets and to identify device hardware.

A saved preset includes all Clock and Control panels parameters. Save IOS/IOS-XL presets to use on future sessions or copy them to another computer to duplicate a configuration.



Click the **Identify** button to indicate which IOS/IOS-XL hardware device belongs to this Control Panel. Clicking the button causes the Network LED on the front panel of the IOS/IOS-XL to flash in a rather psychedelic manner.

Using IOS/IOS-XL with a DAW

Setting up SoundGrid devices with a DAW involves these steps:

Patch the I/O device and the SoundGrid ASIO/Core Audio driver

When using a DAW on a SoundGrid network, the SoundGrid ASIO/Core Audio driver serves as a bridge between the I/O device and the DAW. It enables the I/O to communicate with the DAW and it provides patches. Patching an I/O to the SoundGrid ASIO/Core Audio driver differs slightly among hosts. When you use a host's Auto-Config tool, the host input channels are patched automatically in an order based on rack. The order of the devices in the Device Rack determines the default patching order. Please refer to your SoundGrid host's user guide for details.

Configure the DAW for SoundGrid

1. Set the DAW playback engine to "Waves SoundGrid." The SoundGrid driver channels will now appear in the DAW I/O preferences and in the Input/Output selector in each DAW channel.
2. Route the DAW inputs and outputs to SoundGrid.

Using the IOS/IOS-XL with MIDI

An external MIDI controller can be connected to an IOS or IOS-XL. The software installer includes two MIDI drivers. One driver controls the device's MIDI ports; the other is for StudioRack (this is explained in greater detail in the StudioRack manual).

To activate MIDI ports, open the SoundGrid host Application. Go to I/O Rack and locate the IOS/IOS-XL that you want to assign. From the drop-down menu, choose "Assign to SoundGrid MIDI Driver." In the DAW, select the port for MIDI in and out: "Waves SoundGrid Device I/O."

Specifications

General

- 2U rack-mounted (standard 19 inch rack-mount wide, 2U high, 380 mm deep, excluding connectors)
- Supported sample rates: 44.1 kHz, 48 kHz, 88.2 kHz and 96 kHz (176.4 kHz and 192 kHz will be supported in the future)
- 8 channel mic/line inputs (on XLR/TRS combo)
- 8 channel line outputs (on TRS or 25-pin D-con)
- 2 headphone outputs with analog level knobs; range: Off to +15 dB
- 2 channel AES/EBU or S/PDIF (switchable), SRC optional.
- Word Clock I/O
- MIDI I/O
- Internal Ethernet switch with 4 SoundGrid ports (RJ45s)
- USB port (emergency port to boot server support function)
- Reset switch
- Settings for different broadcast level formats via jumpers on all analog I/Os
- Internal SoundGrid DSP server (IOS: Intel® i3 / IOS-XL: Intel® i7 Extreme)

Analog Inputs Specifications

- Input Impedance:

  Mic: 2.5 kiloohm / Line: 8 kiloohm
- Gain Range:

  Mic: 0 dB to +52.5 dB in 7.5-dB steps / Line: 0 dB to +52.5 dB in 7.5-dB steps
- Maximum Input Level:

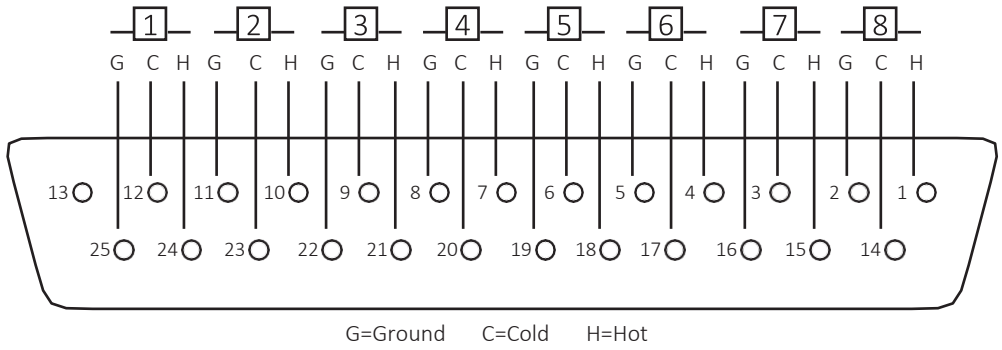
  Mic: +26 dBu / Line: +36 dBu
- Mic Equivalent Input Noise: > -126 dB (150 Ohm source, gain +60 dB)
- Harmonic Distortion: Typically < 0.01% @ unity gain, 10-dB input @ 1 kHz
- Frequency Response: +/-0.5 dB (20 Hz to 20 kHz)
- Channel Separation: Better than 90 dB (40 Hz to 15 kHz)

Analog Outputs specifications

- Maximum Output Level: +22 dBu
- Residual Output Noise: <90 dB (20 Hz to 20 kHz)
- Frequency Response: +/-0.5 dB (20 Hz to 20 kHz)
- Output Impedance: 50 Ohms
- Channel Separation: Better than 90 dB (40 Hz to 15 kHz)
- Harmonic Distortion: Typically < 0.01% @ +10-dB Output @ 1 kHz

IOS / IOS-XL Analog Connectors

DB25 8-channel balanced connector AES59-2012



XLR connectors

Positive (+)	Pin 2
Negative (-)	Pin 3
Signal Ground	Pin 1
Chassis Ground	Case

¼” TRS connectors

Positive (+)	Tip
Negative (-)	Ring
Signal Ground	Sleeve

Resetting the Unit

If an unsuccessful firmware update results in the device no longer being recognized by the host.
Follow these steps to reset the unit:

1. Turn off the unit.
2. Press and hold the Reset button.
3. Restart the unit while holding the button.
4. Release the Reset button once the device has fully booted.

The unit is now in “force update” mode, and a new firmware update can be performed.

Installation Notes

The IOS / IOS-XL unit must be earthed to the mains earth (ground) and installed according to the safety instructions included with the unit. The unit is powered from an IEC inlet on the rear. This must be connected to an earthed mains outlet using a cable that complies with local approvals and regulations.

Approvals cover use in ambient air temperature of up to 35°C. Operation in higher temperatures should be avoided. A 1U space should be left above and below the unit to prevent heat transfer from adjacent equipment, if this generates heat above 35°C.

At least 75 mm (3 inches) should be allowed to the sides of the unit to allow ventilation. At least 75 mm (3 inches) of free air should be left at both the front and the rear side of the rack to allow heat dissipation. Under no circumstances should the fan (where fitted) or ventilation outlets be blocked or restricted.