

# **4pre<sup>™</sup>**

## **User Guide for Windows**

**MOTU**

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- Relocate or reorient the receiving antenna
- Increase the separation between the equipment and the receiver
- Plug the equipment into an outlet on a circuit different from that to which the receiver is connected

If necessary, you can consult a dealer or experienced radio/television technician for additional assistance.

PLEASE NOTE: only equipment certified to comply with Class B (computer input/output devices, terminals, printers, etc.) should be attached to this equipment, and it must have shielded interface cables in order to comply with the Class B FCC limits on RF emissions.

WARNING: changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.



# Contents

## *Part 1: Getting Started*

---

- 7 **Quick Reference: 4pre Front Panel**
- 8 **Quick Reference: 4pre Rear Panel**
- 9 **Quick Reference: MOTU Audio Console**
- 11 **About the 4pre**
- 15 **Packing List and System Requirements**
- 17 **Installing the 4pre Software**
- 19 **Installing the 4pre Hardware**

## *Part 2: Using the 4pre*

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- 31 **MOTU Audio Console**
- 35 **4pre Front Panel Operation**
- 39 **Configuring Host Audio Software**
- 45 **Reducing Monitoring Latency**
- 51 **CueMix FX**
- 75 **MOTU SMPTE Console**
- 79 **Troubleshooting**



*Part 1*

*Getting Started*



# Quick Reference: 4pre Front Panel



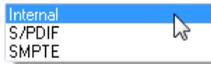
- These four Precision Digital Trim™ rotary encoders (7) to calibrate the input signal level. These knobs provide -60 dB and +22 dB of boost, respectively, for the mic (XLR) and instrument (TRS) input jacks. Adjustment can be made in approximately 1 dB increments. All four jacks have preamps, so you can plug in just about anything: a microphone, a guitar or even a synth. For -4 dB signals, push the knob (1) to engage the -20 dB pad. For the XLR mic input, push and hold the knob to toggle 48V phantom power.
- When in mix mode, use the knob to control the jack's input volume or pan (as indicated by the LEDs, 11) for the currently selected mix.
- When in trim mode, use the knob and input level meters (7) to calibrate the input signal level. These knobs provide -60 dB and +22 dB of boost, respectively, for the mic (XLR) and instrument (TRS) input jacks. Adjustment can be made in approximately 1 dB increments. All four jacks have preamps, so you can plug in just about anything: a microphone, a guitar or even a synth. For -4 dB signals, push the knob (1) to engage the -20 dB pad. For the XLR mic input, push and hold the knob to toggle 48V phantom power.
- When in mix mode, use the knob to control the jack's input volume or pan (as indicated by the LEDs, 11) for the currently selected mix.
- These four Precision Digital Trim™ rotary encoders provide triple-function control over the trim level, mix volume, and pan of the XLR/TRS combo jacks on the rear panel. Push the MIX knob (2) repeatedly to cycle among the four separate mixes and trim mode. The LEDs (11) indicate the current mix, or trim mode. When a mix is active, push and hold the MIX knob to toggle between volume and pan control, as indicated by the LEDs (11).
- This multi-function knob controls volume of the 4pre's four mix busses (11). Push the knob repeatedly to cycle among the four mix busses, as indicated by the LEDs (11). When a mix is active, push and hold the VOL knob to toggle the individual channel knobs (1, 2, 3, and 4) between volume and pan control, as indicated by the "pan" LED (11), where on is pan and off is volume.
- Turn the MAIN knob to control the main outs and the headphone jack below the knob, which mirrors the main outs.
- Turn the PHONES knob to control the headphone jack volume below it. When power is off, push the PHONES knob to power on the 4pre; push and hold to turn it off. When connected to the computer via FireWire, the 4pre is powered by its FireWire connection. When connected via USB, it must be powered with the included DC power adapter.
- These eight LEDs indicate whether the -20 dB pad or 48V phantom power is enabled or disabled for the corresponding mic input (1).
- The "line out" LEDs provide signal activity on line outputs 3 and 4.
- The four input meters provide five-segment metering for the mic inputs, ranging from -42 dB to -1 dB.
- The MAIN OUT meters provide ten-segment ladder LED metering for the stereo main outputs, ranging from -42 dB to 0 dB.
- These four input meters provide five-segment metering for the mic inputs, ranging from -42 dB to -1 dB.
- The MAIN OUT meters provide ten-segment ladder LED metering for the stereo main outputs, ranging from -42 dB to 0 dB.
- Indicates the current operational sample rate.
- The S/PDIF activity LEDs indicate signal presence for input and output.
- The Mix LEDs indicate what is being controlled by the mix/trim knobs (1 and 2). Push the MIX knob (2) repeatedly to cycle among the four separate mixes and trim mode. When a mix is active, the knobs control input levels for the current mix. Push and hold the MIX knob (2) to toggle between volume and pan control (pan LED off and on, respectively).
- When trim mode is selected, the knobs control input trim levels.
- This is a standard quarter-inch stereo headphone jack. From the factory, it operates as its own output pair. But it can be programmed to mirror any other output pair (digital or analog). See "Phones Assign" on page 34. Use the volume knob above to control its level.

# Quick Reference: 4pre Rear Panel



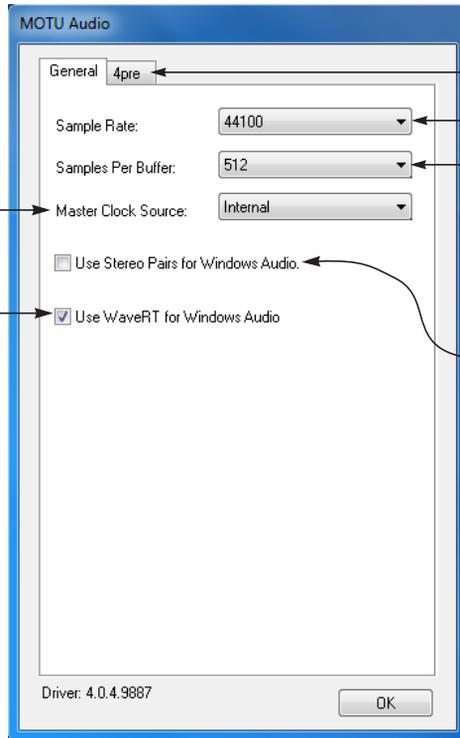
1. These jacks provide stereo, 24-bit, 5/PDIF digital input and output at any sample rate up to 96kHz.
2. These two balanced, quarter-inch jacks serve as the 4pre's main outputs. You can connect them to a set of powered studio monitors and then control the volume from the front-panel volume knob. To hear disk tracks in your audio software on these main outs, assign the disk tracks (and master fader) to these main outs (*Main Out 1-2*). You can also use the 4pre's on-board CueMix mixing to monitor live 4pre inputs here as well.
3. These XLR/TRS combo jacks accept either a mic cable or a cable with a quarter-inch plug. Use the front-panel mic 1-4 encoders to apply up to +60 dB or +22 dB of boost, respectively, for the mic (XLR) or TRS input. To toggle the -20 dB pad for the XLR (mic) input, push the corresponding front-panel mic encoder. To toggle 48V phantom power for the XLR (mic) input, push and hold the corresponding front-panel encoder. The TRS jacks for inputs 3-4 have higher impedance for DI guitar connections.
4. The 4pre's analog line outputs operate as separate outputs on balanced +4dB TRS (tip/ring/sleeve) quarter-inch connectors that can also accept an unbalanced plug. They are equipped with 24-bit, 128x oversampling converters.
5. Connect the 4pre to the computer here via either FireWire or USB2, using either the standard 1394 FireWire A or USB cable provided with your 4pre. There's not much difference, except that FireWire offers bus-powered operation (without the DC power supply). **Important note: it is best to turn off the 4pre when plugging in the FireWire cable, as this avoids the possibility of static discharge, which can harm the electrical components in the 4pre or your computer.**
6. This jack accepts any standard 9-18V DC power supply with either tip-positive or tip-negative polarity.

# Quick Reference: MOTU Audio Console



Determines the clock source for your 4pre. If you're just using the analog ins and outs, set this to *Internal*. The other settings are for digital transfers via S/PDIF or synchronization to time code or other audio devices.

Uncheck this option if the Windows audio software you are using with the 4pre does not support Windows WaveRT drivers and instead only supports WDM drivers.



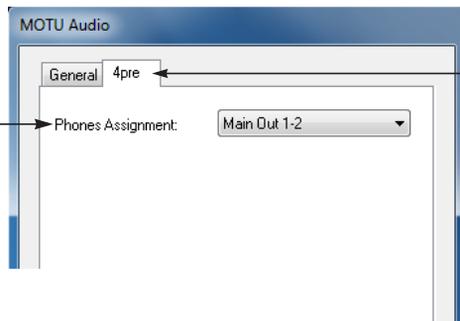
Click the tabs to access general MOTU interface settings or settings specific to the 4pre (or other connected interface).

Choose the global sample rate for the system here.

Choosing a smaller setting here reduces the delay you may hear when listening to live input that you are running through effects plug-ins in your software. But lower settings also increase the strain on your computer. For details, see "Samples Per Buffer" on page 33.

This option should always be left on (checked). There are only a few rare cases in which you would want to turn it off. For details, refer to the MOTU tech support database at [www.motu.com](http://www.motu.com).

This menu lets you choose what you will hear from the headphone jack. To mirror the main outs, choose *Main Out 1-2*. Or you can mirror any other output pair. To hear the phones as their own independent output, choose *Phones 1-2*.



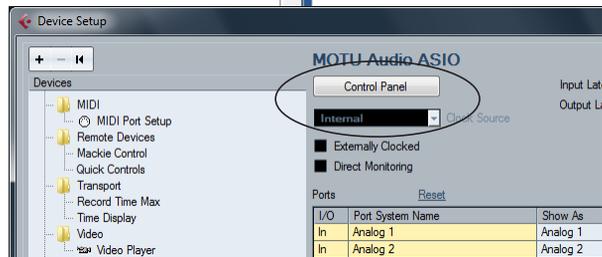
Click the 4pre tab to access this setting.

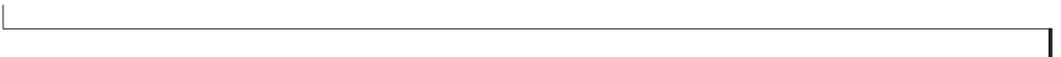
Device Setup in Cubase

## How to access these settings

There are several ways to access these settings:

- From the Windows Start menu, choose *Programs>MOTU>MOTU Audio Console*.
- From within Cubase, go to the Device Setup window, click the MOTU Audio ASIO list item and click the *Control Panel* button.
- From within other applications, refer to their documentation.





# CHAPTER 1 About the 4pre

Overview .....	11
The 4pre Rear Panel.....	11
The 4pre Front Panel.....	13
16-bit and 24-bit recording .....	13
CueMix mixing and effects.....	13
Host Audio Software.....	14

## OVERVIEW

The 4pre is a hybrid FireWire and USB2 audio interface for Mac and Windows that offers six independent inputs and eight independent outputs. Both analog and digital I/O are offered at sample rates up to 96 kHz. All inputs and outputs can be accessed simultaneously. The 4pre is housed in a sturdy, compact half-rack enclosure that connects directly to a computer via a standard FireWire or USB cable.

The 4pre offers the following main features:

- Universal computer connectivity via FireWire or high-speed USB 2.0
- Bus-powered operation (FireWire only)
- Two 24-bit analog quarter-inch (TRS) outputs
- Four combo XLR/TRS mic/guitar inputs with preamps, 48V phantom power, 20 dB pad, and Precision Digital Trim™ preamp gain adjustment
- Operation on all I/O at standard sample rates up to 96 kHz
- Digitally controlled analog trim for all analog inputs
- Coaxial S/PDIF digital I/O at sample rates up to 96 kHz
- SMPTE synchronization
- Headphone jack with independent output and volume control

- Extra headphone jack that mirrors the main outs
- Front panel volume control of the main outs
- Front-panel mixing of live inputs
- Front panel metering and status LEDs
- Stand-alone operation
- Mac and Windows drivers for multi-channel operation and across-the-board compatibility with any audio software on current Mac and Windows systems
- CueMix FX cross-platform mixing software with attractive graphic mixing and a convenient tabbed interface for quick access to all features in one window. CueMix also provides a full-screen real-time FFT display, spectrogram “waterfall” display, oscilloscope, X-Y plot, linear or polar phase analysis, and a tuner.

With a variety of I/O formats, mic preamps and no-latency mixing and processing of live input, the 4pre is a complete, portable “studio in a box” when used with a Mac or Windows computer.

## THE 4PRE REAR PANEL

The rear panel has the following connectors:

- Four combo XLR/TRS mic/instrument inputs
- Four balanced +4dB quarter-inch (TRS) analog outputs (with 24-bit 96 kHz converters)
- Coaxial S/PDIF in/out
- 1394 FireWire B connector
- High-speed USB 2.0 connector
- DC power jack

## 6 inputs and 8 outputs

All 4pre inputs and outputs can be used simultaneously, for a total of 6 inputs and 8 outputs:

Connection	Input	Output
Analog 24-bit 96 kHz on bal/unbal TRS	-	4
Mic preamps 24-bit 96 kHz on XLR/TRS combo	4	-
SPDIF 24-bit 96kHz digital	2	2
Stereo headphones with independent output	-	2
<b>Total</b>	<b>6</b>	<b>8</b>

All inputs and outputs are discrete and can be active simultaneously.

The headphone output can operate as an independent output pair, or it can mirror any other 4pre output pair, such as the line outs.

The second headphone output (labeled MAIN) always mirrors main outs.

### Mic/guitar inputs with preamps

The four mic/instrument inputs are equipped with preamps and “combo” XLR/TRS jacks, which accept XLR microphone inputs or quarter-inch guitar/line inputs, as indicated below each connector. Individual 48 volt phantom power and a 20 dB pad can be supplied independently to each mic input. The Precision Digital Trim™ knobs on the front panel for each mic/instrument input provide 60 dB of boost for the XLR mic input and 22 dB of boost for the TRS input in approximately 1 dB increments.

### Analog outputs

All four quarter-inch analog outputs are on balanced TRS +4dB jacks. All of these jacks can also accept unbalanced plugs.

### Precision Digital Trim™

All of the 4pre’s mic/guitar inputs are equipped with digitally controlled analog trims that allow adjustments in approximately 1 dB increments

using front-panel digital rotary encoders or the CueMix FX control software for Mac and Windows, with 60 dB of adjustment for the mic input and 22 dB for the TRS input. This allows you to fine-tune trim settings for guitars, synths, effects modules and a wide variety of analog inputs for optimum levels. Different trim configurations can then be saved as files on disk for instant recall.

### S/PDIF

The 4pre rear panel provides coaxial S/PDIF input and output.

### SMPTE time code synchronization

The 4pre can resolve directly to SMPTE time code via any analog input, without a separate synchronizer. It can also generate time code via any analog output. The 4pre provides a DSP-driven phase-lock engine with sophisticated filtering that provides fast lockup times and sub-frame accuracy.

The included MOTU SMPTE Console™ software provides a complete set of tools for generating and regenerating SMPTE time code, which allows you to slave other devices to the computer. Like CueMix FX, the synchronization features are cross-platform and compatible with any audio software that supports the ASIO 2 or 3 sample-accurate sync protocol.

### Hybrid FireWire/USB2 connectivity

FireWire has long been recognized as a reliable, high-performance connectivity standard for professional MOTU audio interfaces. Meanwhile, high-speed USB2 has also developed into a widely adopted standard for connecting peripheral devices to personal computers.

To fully support both formats, your 4pre Hybrid audio interface is equipped with both a 9-pin FireWire B (400 Mbit/sec) connector and a hi-speed USB2 (480 Mbit/sec) connector, and you can use either port to connect the 4pre to your

computer. This gives you maximum flexibility and compatibility with today's ever-expanding universe of Mac and Windows computers.

The 4pre has the ability to power itself from its FireWire connection to the computer, for convenient, mobile bus-powered operation.

### **Power supply**

If you do not want the 4pre to draw power from the computer, and AC power is available, you can power the 4pre from any standard 9-18V, 5 watt DC power supply with any polarity (tip positive or negative).

## **THE 4PRE FRONT PANEL**

### **Front-panel trim adjustment and mixing**

The six digital rotary encoders on the 4pre front panel provide hands-on trim adjustment and mixing of all four mic inputs. In fact, these controls provide control of up to four separate mixes. Use the volume and trim/mix knobs to control input volume for each mix; push the MIX knob to cycle among the four different mixes, plus trim mode, which lets you adjust input trim for each across all mixes.

### **48V phantom power and pad**

The four TRIM/MIX knobs let you toggle independent 48V phantom power and -20 dB pad settings for the four mic inputs. See “Mic/guitar inputs with preamps” on page 12.

### **Main volume control with dedicate headphone output**

The 4pre front panel provides two independent headphone jacks with independent volume knobs, one of which also controls the main outs on the rear panel. Alternately, this MAIN knob can be programmed to control any combination of outputs (analog and/or digital).

### **Status and metering LEDs**

The LED section provides visual indication of audio levels, audio activity status, and the current settings for all front-panel controls.

### **16-BIT AND 24-BIT RECORDING**

The 4pre system handles all data with a 24-bit signal path, regardless of the I/O format. You can record and play back 16-bit or 24-bit audio files at any supported sample rate via any of the 4pre's analog or digital inputs and outputs. 24-bit audio files can be recorded with any compatible host application that supports 24-bit recording.

### **CUEMIX MIXING AND EFFECTS**

All 4pre inputs and outputs can be routed to the on-board CueMix 8-bus (4 stereo) digital mixer driven by hardware-based DSP. The mixer allows you to mix all inputs to any output pair directly in the 4pre hardware, independent of the computer. The on-board mixer can be used when the 4pre is operating stand-alone (without a computer) as a complete portable mixer.

### **INCLUDED SOFTWARE**

The 4pre software installer provides the following including cross-platform software applications for Mac and Windows.

#### **MOTU Audio Console**

MOTU Audio Console provides access to basic hardware settings, such as sample rate, headphone output channel selection, and other settings.

#### **MOTU SMPTE Console**

MOTU SMPTE Console provides access to the 4pre system's SMPTE time code synchronization features, including locking to time code, generating time code, displaying a time code read-out, and so on.

**CueMix FX**

CueMix FX gives you complete control over the 4pre's CueMix FX on-board mixer, which provides no-latency monitoring, mixing of live inputs through your 4pre.

CueMix FX provides attractive graphic mixing, a convenient tabbed interface for quick access to all mixing features, digitally controlled trims and other settings in your MOTU audio interface.

CueMix FX provides many advanced features, such as an accurate instrument tuner and an extensive arsenal of audio analysis tools, including a real-time FFT, spectrogram “waterfall” display, oscilloscope, and phase analysis tools.

**HOST AUDIO SOFTWARE**

The 4pre system ships with standard Windows drivers that allow you to record, edit, play back and mix your 4pre projects using your favorite Windows audio software.

## CHAPTER 2 **Packing List and System Requirements**

### **PACKING LIST**

The 4pre ships with the items listed below. If any of these items are not present in your 4pre box when you first open it, please immediately contact your dealer or MOTU.

- One 4pre I/O rack unit
- One 9-pin to 9-pin IEEE 1394 “FireWire” cable
- One USB cable
- One set of removable rack mounting brackets
- One 4pre Mac/Windows manual
- One cross-platform CD-ROM
- Product registration card

### **WINDOWS SYSTEM REQUIREMENTS**

The 4pre system requires the following Windows system:

- A 1 GHz Pentium-based PC compatible or faster equipped with at least one USB2 or FireWire port
- 1 GB RAM; 2 GB or more recommended
- Windows 7 or Vista, 32- or 64-bit; Vista SP 2 or later required
- Available FireWire or high-speed USB 2.0 port
- A large hard drive (preferably at least 250 GB)

### **PLEASE REGISTER TODAY!**

Please register your 4pre today. There are two ways to register.

- Visit [www.motu.com/register](http://www.motu.com/register)

OR

- Fill out and mail the included product registration card

As a registered user, you will be eligible to receive technical support and announcements about product enhancements as soon as they become available. Only registered users receive these special update notices, so please register today!

Thank you for taking the time to register your new MOTU products!



# CHAPTER 3 Installing the 4pre Software

## OVERVIEW

- Installation..... 17
- MOTU Audio drivers ..... 18
- MOTU Audio Console..... 18
- CueMix FX ..... 18
- MOTU SMPTE Console ..... 18

## INSTALLATION

Before you connect the 4pre to your computer and power it on, run the 4pre software installer. This ensures that all the 4pre components are properly installed in your system.

☛ If you've already connected the 4pre to your computer and powered it on, Windows may issue an alert notifying you that the 4pre requires drivers, followed by another window asking you to locate the drivers. If this happens:

- 1 Cancel the driver search.

- 2 Power off and disconnect the 4pre.

- 3 Run the MOTU Audio Installer as instructed in the next section.

### Run the MOTU Audio installer

Install the 4pre software as follows:

- 1 Insert the MOTU Audio Installer disc; or, if you have downloaded the MOTU Audio installer, locate the folder containing the download.

- 2 Read the *Read Me* file for installation assistance and other important information.

- 3 Open the *Setup Audio* application.

- 4 Follow the directions that the installer gives you.

Drivers are installed, along with MOTU Audio Console, CueMix FX, and other components, summarized in the table below.

Software component	Purpose	For more information
MOTU audio drivers	Provides multi-channel audio input and output for MOTU FireWire and USB Audio devices with host audio software.	"MOTU Audio drivers" on page 18
MOTU Audio Console	Provides access to all of the settings in the 4pre and other MOTU interfaces. Required for 4pre operation.	chapter 5, "MOTU Audio Console" (page 31)
CueMix FX	Gives you complete control over the 4pre's CueMix FX on-board mixer, which provides no-latency monitoring, mixing and analysis of live inputs through your 4pre.	chapter 9, "CueMix FX" (page 51)
MOTU SMPTE Console	Provides access to the 4pre system's SMPTE time code sync features.	chapter 10, "MOTU SMPTE Console" (page 75)

## MOTU AUDIO DRIVERS

### ASIO

*ASIO* is an acronym for *Audio Streaming Input and Output*. The MOTU Audio ASIO driver provides multi-channel audio input and output for applications that support ASIO audio drivers, such as Ableton Live, Avid Pro Tools, Cakewalk SONAR, Cockos Reaper, Propellerhead Reason and Record, Steinberg Cubase and Nuendo, and others.

For details about using the 4pre with ASIO, see chapter 7, “Configuring Host Audio Software” (page 39).

### WDM

*WDM* is an acronym for *Windows Driver Model*. The MOTU Audio WDM driver provides multi-channel audio input and output for applications that support WDM audio drivers.

For details about using the 4pre with WDM, see chapter 7, “Configuring Host Audio Software” (page 39).

### WaveRT

Uncheck this option if the Windows audio software you are using with your MOTU audio interface does not support Windows WaveRT drivers and instead only supports WDM drivers.

## MOTU AUDIO CONSOLE

MOTU Audio Console (available in the Start menu) gives you access to all of the settings in the 4pre, such as the clock source and sample rate. For complete details, see chapter 5, “MOTU Audio Console” (page 31).

### CUEMIX FX

CueMix FX (available in the Start menu) provides control over the 4pre’s no-latency CueMix FX on-board mixing, an instrument tuner, a full-featured oscilloscope, and other audio analysis tools. For details, see chapter 9, “CueMix FX” (page 51).

## MOTU SMPTE CONSOLE

MOTU SMPTE Console (available in the Start menu) software provides a complete set of tools to resolve the 4pre to SMPTE time code, and to generate time code for striping, regenerating or slaving other devices to the computer. For details, see chapter 10, “MOTU SMPTE Console” (page 75).

# CHAPTER 4 Installing the 4pre Hardware

## OVERVIEW

Here's an overview for installing the 4pre:

**Important note before you begin!** ..... 19

Take these precautions to prevent damage to your computer, the 4pre and other equipment.

**Connect the 4pre interface** ..... 20

Connect the 4pre to the computer.

**Connect audio inputs and outputs** ..... 22

Make analog and digital connections as desired.

**Connect and sync S/PDIF devices** ..... 23

Connect a DAT deck, effects processor or other device with digital I/O, but be sure to make the correct clock source settings.

**Power options** ..... 23

Choose from among several convenient options.

**A typical 4pre setup** ..... 25

An example setup for computer-based mixing/FX.

**Connect multiple MOTU interfaces** ..... 26

Connect additional 4pre or other audio interfaces.

## IMPORTANT NOTE BEFORE YOU BEGIN!

Before you begin installing the 4pre (or any bus-powered device), take these important precautionary measures to avoid damaging the sensitive electrical components in your computer, the 4pre or other devices being connected:

- Turn off the computer.
- Turn off the 4pre (push and hold the phones volume knob).
- Turn off the power of any other devices.
- Touch the metal casing of the 4pre to discharge any static electricity that you may be carrying just before the installation.

After you have made all of the necessary connections, as described in this chapter, turn on the devices in this sequence:

1. Turn on the computer.
2. Turn on the 4pre.
3. Turn on other devices connected to the 4pre.

## CONNECT THE 4PRE INTERFACE

Your 4pre audio interface is equipped with both a 9-pin FireWire B (400 Mbit/sec) connector and a hi-speed USB2 (480 Mbit/sec) connector, and you can use either port to connect the 4pre to your computer. This gives you maximum flexibility and compatibility with today's ever-expanding universe of Mac and Windows computers.

### Type B FireWire ports

The 4pre has a FireWire 9-pin Type B port, which provides the most reliable FireWire connection available. The port operates at 400 Mbit/s, and it can be connected to any available FireWire port on your computer: Type A (6-pin), Type A "mini" (4-pin), or Type B (9-pin). If your computer has FireWire Type B ports, use the included 9-pin-to-9-pin FireWire cable. If your computer has either standard Type A ports or miniature Type A ports, use the appropriate 9-pin-to-6-pin or 9-pin-to-4-pin FireWire cable (sold separately).

### Which should I use: FireWire or USB2?

If your computer does not have a FireWire port, then obviously you will need to connect the 4pre to one of its high-speed USB 2.0 ports.

If your computer has both FireWire and USB2, then it is your choice, and your decision may depend mostly on other peripherals you may also have, or bus power, as explained below.

### Bus-powered operation requires FireWire

There is only one significant difference between FireWire and USB2 operation: bus power. FireWire provides enough power on the FireWire bus that the 4pre can be powered solely by its FireWire connection to the computer. For complete information, see "Bus power requirements" on page 23.

If you use USB2, you must also use the DC power supply included with your 4pre, as USB2 does not supply enough power by itself.

### If you are connecting via FireWire

**1** Before you begin, make sure your computer and the 4pre are switched off.

**2** Plug one end of the 4pre FireWire cable (included) into the FireWire socket on the computer.

**3** Plug the other end of the FireWire cable into the 4pre I/O.

☛ Make absolutely sure to align the notched side of the FireWire plug properly with the notched side of the FireWire socket on the 4pre. If you attempt to force the plug into the socket the wrong way, you can damage the 4pre.

### High Speed USB 2.0 versus USB 1.1

There are primarily two types of USB host controllers widely available on current personal computers. USB 1.1 controllers support simple peripherals that don't require a high speed connection, such as a computer keyboard, a mouse, or a printer. USB 2.0 controllers support high speed devices such as the 4pre. Since the 4pre requires a high speed connection, it must be connected to a USB 2.0 host controller or hub.

For the most reliable connection, it is recommended that you connect the 4pre directly to one of your computer's USB 2.0-compatible ports. However, since USB 2.0 hubs are compatible with both types of devices, the 4pre can be connected to a USB 2.0 hub along with USB 1.1 devices if necessary. The 4pre will not operate properly if it is connected to a USB 1.1 hub.

Follow these instructions to determine whether your computer supports USB 1.1 or USB 2.0:

**1** Open the Windows Control Panel, and choose Hardware and Sound.

**2** In the Devices and Printers section, click Device Manager.

- 3 In Device Manager, open the Universal Serial Bus Controllers section.
- 4 Look in the list of USB devices. An Enhanced USB Host Controller Interface (EHCI) represents a USB 2.0 controller. An Open USB Host Controller Interface (OHCI) or Universal USB Host Controller Interface (UHCI) represents a USB 1.1 controller.

**If you are connecting via high-speed USB 2.0**

- 1 Before you begin, make sure your computer and the 4pre are switched off.
- 2 Plug the flat “type A” plug of the 4pre USB cable (included) into a USB2-equipped socket on the computer as shown below in Figure 4-1.
- 3 Plug the squared “type B” plug of the USB cable into the 4pre I/O as shown below in Figure 4-1.



Figure 4-1: Connecting the 4pre to the computer via USB.

**Switching Between FireWire and USB**

Most of the time, the 4pre can detect whether a FireWire or a USB cable is connected to it, and it will automatically switch to FireWire operation or USB operation accordingly. Some FireWire or USB ports that do not provide bus power can not be automatically detected by the 4pre, and you may need to switch the device to FireWire mode or USB mode manually:

To switch to	Press and hold this knob while turning on the 4pre
FireWire	INPUT 3 knob
USB	INPUT 4 knob

When the 4pre switches to FireWire operation, it displays *F* on the front panel LEDs. When it switches to USB operation, it displays *U* on the front panel LEDs.

## CONNECT AUDIO INPUTS AND OUTPUTS

Here are a few things to keep in mind as you are making audio connections to other devices.

### Mic/instrument inputs

Connect a microphone, guitar, keyboard or other analog input to the XLR/TRS combo jack with either a standard mic cable or a balanced cable with a quarter-inch plug. The quarter-inch jacks on inputs 3-4 provide higher impedance suitable for DI guitar input.

🔊 Do not connect a +4 (line level) XLR cable to the mic inputs (because of the preamps).

### Phantom power

If you are connecting a condenser microphone or other device that requires phantom power, enable phantom power as follows:

- 1 Push the TRIM/MIX knob repeatedly until the green *trim* LED is illuminated on the front panel.
- 2 Push and hold the corresponding TRIM/MIX knob for a few seconds to toggle phantom power. The red 48V LED will turn on or off accordingly.

### Trim

The XLR mic input and the TRS instrument input are equipped with 60 dB and 22 dB of trim control, respectively. Use the digital trim encoders on the front panel to adjust the input level for each input as follows:

- 1 Push the MIX knob repeatedly until the green *trim* LED is illuminated on the front panel.
- 2 Turn the TRIM/MIX knob to adjust the trim.

The ten-segment MAIN OUT meters provide visual feedback as you turn the knob. The 4pre's input trims are digitally controlled, so they allow you to make fine-tuned adjustments in

approximately 1 dB increments. You can also adjust trim in the MOTU CueMix FX software. See “Input trim” on page 53.

### 20 dB pad

Each XLR mic input is equipped with a -20 dB pad. To toggle the pad for a mic input:

- 1 Push the MIX knob repeatedly until the green *trim* LED is illuminated on the front panel.
- 2 Push the TRIM/MIX knob to toggle the pad. The amber pad LED will turn on or off accordingly.

### Combo jack summary

Use these general guidelines for the 48V phantom power, pad and trim settings on the two combo input jacks:

Input	48V	Pad	Trim
Condenser mic	On	As needed	As needed
Dynamic mic	Off	As needed	As needed
Guitar	Off	As needed	As needed

### Main outs

In a standard studio configuration, the main outs are intended for a pair of studio monitors, but they can also be used as regular outputs for any purpose. Their reference level is +4dB. Use the front panel MAIN knob to adjust the Main out volume.

### Outputs 3-4

The quarter-inch analog outputs (3-4) are balanced (TRS) connectors that can also accept an unbalanced plug. The quarter-inch outputs are calibrated to produce a +4 dBu line level output signal.

### S/PDIF

If you make a S/PDIF digital audio connection to another device, be sure to review the digital audio clocking issues, as explained in “Connect and sync S/PDIF devices” on page 23.

The 4pre on-board mixer also supplies 12dB of digital trim adjustment for the S/PDIF input pair, which can be adjusted from CueMix FX (“Input trim” on page 53).

## CONNECT AND SYNC S/PDIF DEVICES

DAT decks and other devices with S/PDIF digital I/O will sync to the 4pre via the S/PDIF connection itself. Just connect it to the 4pre via the S/PDIF connectors. When the device records a digital audio signal (from the 4pre), it will simply synchronize to the clock provided by the digital audio input from the 4pre.

When recording digital audio into your host audio software via the 4pre’s S/PDIF input, you can either resolve the external device to the 4pre, as described above, or you can resolve the 4pre to its S/PDIF input.

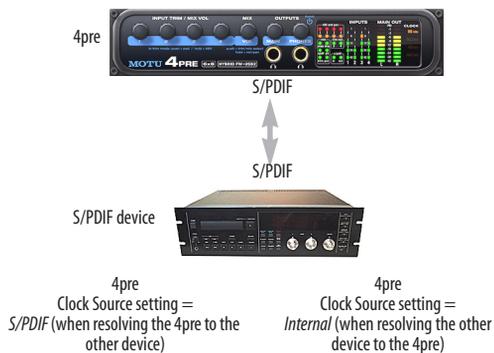


Figure 4-2: The setup for synchronizing a S/PDIF device with the 4pre. Sync is achieved via the digital I/O connection itself. In this case, you have to choose S/PDIF as the 4pre’s clock source when resolving it to the other device.

## POWER OPTIONS

The 4pre can draw power from two possible sources:

1. the computer via FireWire, or
2. a DC power supply.

If you use USB to connect to your computer, you must also use the DC power supply included with your 4pre.

## Bus power requirements

The 4pre draws all the power it needs from the FireWire bus connection to the computer. However, the FireWire connection to the computer must meet all of the requirements discussed below.

### 9-pin and 6-pin FireWire connectors

The 4pre can only draw power over the FireWire bus from a 9-pin to 9-pin cable, or a 6-pin to 9-pin cable. It cannot draw power from a FireWire cable with a 4-pin connector, as shown below:

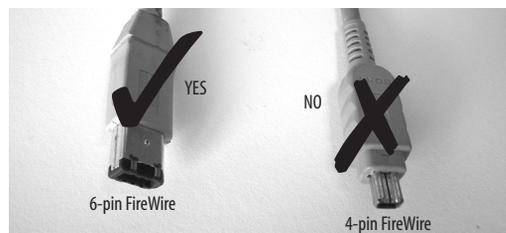


Figure 4-3: 4-pin FireWire connectors cannot be used for bus power.

### When operating under bus power, daisy-chaining is not recommended

The 4pre can be daisy-chained with other FireWire devices from a single FireWire connection to the computer. However, if the 4pre is operating under bus power, this is not recommended. If you need to daisy chain the 4pre with other devices on the same FireWire bus, power the 4pre with the included power adapter. The other devices on the chain should also have their own power supply. In general, bus-powered FireWire devices should not be daisy-chained.

### FireWire adapter products must be powered

If you are using a FireWire adapter (a third-party product that supplies one or more FireWire ports to your computer), it must have direct access to a power supply:

■ **PCI FireWire cards** — If you plan to connect the 4pre to a PCI card and run the 4pre under bus power, the PCI card must have a direct connection to the power supply harness inside your computer. This is the same power supply harness to which you connect internal hard drives, CD/DVD drives, etc.

■ **PCMCIA or ExpressCard slot adapters** — If you plan to connect the 4pre to a PC card FireWire adapter (inserted in the PC card slot in your laptop), it must provide a 6-pin or 9-pin connection and it must also have its own power supply. Most commonly, these types of products have a DC power adapter. As you can see, however, this situation does not allow for remote battery operation, as the PC card adapter requires AC.

### Examples of bus-powered operation

Here are a few typical examples of bus-powered 4pre operation:

#### Bus power from a desktop computer

Your desktop computer is running off of its usual AC power connection, and the 4pre draws power from the FireWire cable connected to the computer. There are no limits to running time.

#### Bus power from an AC-powered laptop

This scenario is identical to the desktop situation described above: the laptop is powered by AC, the 4pre is powered via the FireWire bus and there are no limits to running time.

#### Bus power from a battery-powered laptop

The laptop is being powered by its own battery, and the 4pre is being powered by its FireWire connection to the computer. So the laptop battery is supplying power to both the laptop and the 4pre. This is the most compact and portable operating scenario. Running time is determined by the capacity of the laptop battery. For extended recording sessions, bring extra, fully charged laptop batteries.

### DC power supply

If you do not want the 4pre to draw power from the computer, and AC power is available, you can power the 4pre from any standard 9-18 volt, 5 watt DC power supply with any polarity (tip positive or negative), and amperage as shown below.

Voltage	Amperage
9 volts	1.33 amps
12 volts	1 amp
18 volts	0.66 amps

### Turning off the 4pre

To turn on the 4pre, push the PHONES volume knob. To turn it off, push *and hold* the PHONES volume knob. When the 4pre is turned off, it is really in a sort of “sleep” mode, where it still draws just enough power to detect the power switch (a digital encoder) when the 4pre is turned back on. But the amount of power that the 4pre draws when it is turned off is so small that it has very little practical impact. If you are running a laptop under battery power, and you are in a situation where you are not using the 4pre and you need every last bit of laptop battery power, unplug the 4pre entirely from the computer.

## A TYPICAL 4PRE SETUP

Here is a typical 4pre studio setup. In this example, no external mixer is needed. All mixing and processing can be done in the computer with audio

software, or you can use the 4pre's CueMix™ no-latency mixer. You can control the 4pre's four separate mixes from the front panel or from the included CueMix FX software.



Figure 4-4: A typical 4pre studio setup.

## CONNECT MULTIPLE MOTU INTERFACES

You can daisy-chain up to three MOTU FireWire interfaces on a single FireWire bus, with the restrictions described in the following sections. Most computers have only one built-in FireWire bus (even if it supplies multiple FireWire sockets).

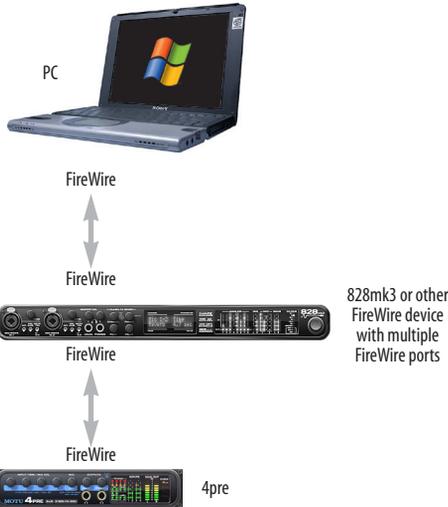


Figure 4-5: Connecting multiple MOTU FireWire audio interfaces.

### Multiple interfaces cannot be bus-powered

Do not run the 4pre under bus power when connecting it with other devices to the same FireWire bus. See “Power options” and “Bus power requirements” on page 23.

### Multiple interfaces in MOTU Audio Console

MOTU Audio Console displays the settings for one interface at a time. To view the settings for an interface, click its tab as shown below in Figure 4-6.

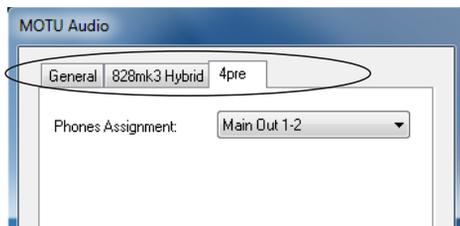


Figure 4-6: To view the settings for an interface, click its tab.

## Synchronizing multiple interfaces

When multiple MOTU interfaces are connected, choose a *Master Clock Source* from the menu in the General tab (Figure 4-7). You can choose any available sync source from any connected interface (as shown in Figure 4-7), giving you a great deal of flexibility in choosing a clock source.

A separate *Clock* menu is provided for any interfaces not chosen as the master clock source, as demonstrated with the 828mk3 Hybrid in Figure 4-7. You can either resolve the interface to the *Master Clock Source* or to one of its own digital inputs or other sync sources. The latter scenario is useful for externally resolving the interface with the the interface chosen as the Master Clock Source.

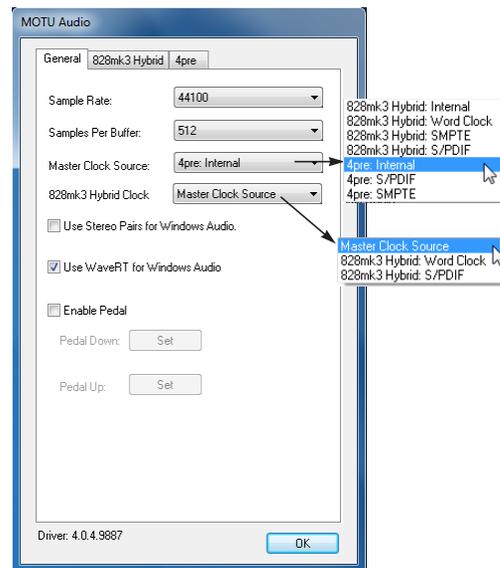


Figure 4-7: Choosing clock sources with multiple interfaces.

### Connecting other MOTU FireWire interfaces

You can mix and match multiple 4pre interfaces with other MOTU FireWire interfaces using a standard FireWire hub. You can daisy-chain 828mkIIs, 828mk3s, 896HDs, 896mk3's, Travelers, and Traveler-mk3s, which all have two FireWire ports convenient for daisy-chaining. Up to four interfaces can be combined on one FireWire bus.

**Adding additional interfaces with a second FireWire bus**

Third-party FireWire bus expansion products in the form of a cardbus (“PC card”) adaptor, ExpressCard adaptor or PCI card allow you to add

a second FireWire bus to your computer. It may be possible to add additional MOTU FireWire interfaces connected to such a third-party product, depending on the performance of the product and the performance of your host computer.



*Part 2*

*Using the 4pre*



## CHAPTER 5 MOTU Audio Console

### OVERVIEW

MOTU Audio Console gives you access to basic 4pre hardware settings, such as sample rate, clock source and more.

Accessing the 4pre settings.....	31
'General' tab Settings .....	32
Sample Rate .....	32
Master Clock Source .....	32
Samples Per Buffer.....	33
Use stereo pairs for Windows audio.....	34
Use WaveRT for Windows audio .....	34
Enable Pedal.....	34
'4pre' tab settings.....	34
Phones Assign .....	34

### ACCESSING THE 4PRE SETTINGS

There are several ways to access 4pre settings:

- Open MOTU Audio Console from the Windows Start menu > Programs > MOTU.
- From within your host audio software's audio driver preferences. For example, in Cubase or Nuendo, open the Device Setup window, click *VST Audio System* and choose *MOTU Audio ASIO* from the *ASIO Driver* menu. Then click the *MOTU Audio ASIO* item in the list and click the *Control Panel* button.

☛ Most applications provide access only to basic settings such as sample rate and clock source. For access to all settings, open MOTU Audio Console using one of the techniques above.

#### General tab settings

The General tab (Figure 5-1) provides settings that apply to all connected MOTU FireWire and USB audio interfaces.

#### 4pre tab settings

The 4pre tab (Figure 5-1) provides settings that apply to a specific 4pre interface. If you have several 4pre interfaces connected (or other MOTU interfaces), you'll see a separate tab for each one.

## 'GENERAL' TAB SETTINGS

### Sample Rate

Choose the desired *Sample Rate* for recording and playback. The 4pre can operate at 44.1 (the standard rate for compact disc audio), 48, 88.2, or 96 kHz. If you have a S/PDIF device connected to the 4pre, make sure that it matches the 4pre's sample rate.

☞ Mismatched sample rates cause distortion and crackling. If you hear this sort of thing, check the sample rate settings in your hardware and here in MOTU Audio Console.

### Master Clock Source

The *Master Clock Source* determines the digital audio clock that the 4pre will use as its time base. The following sections briefly discuss each clock source setting.

### Internal

Use the *Internal* setting when you want the 4pre to operate under its own digital audio clock. For example, you may be in a situation where all you are doing is playing tracks off hard disk in your digital audio software on the computer. In a situation like this, you most often don't need to reference an external clock of any kind.

Another example is transferring a mix to DAT. You can operate the 4pre system on its internal clock, and then slave the DAT deck to the 4pre via the S/PDIF connection (usually DAT decks slave to their S/PDIF input when you choose the S/PDIF input as their record source).

If you would like help determining if this is the proper clock setting for your situation, see "Connect and sync S/PDIF devices" on page 23.

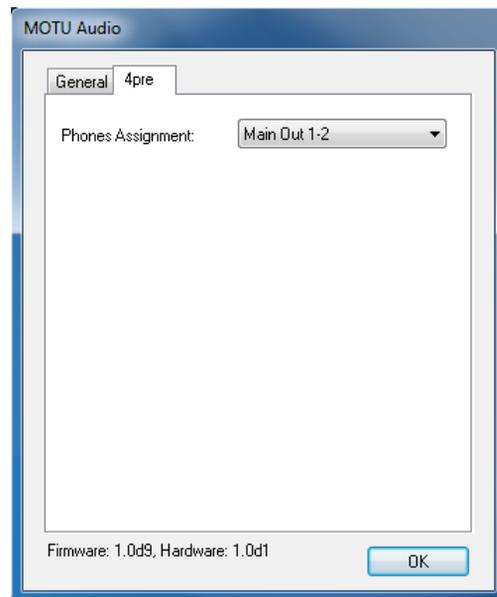
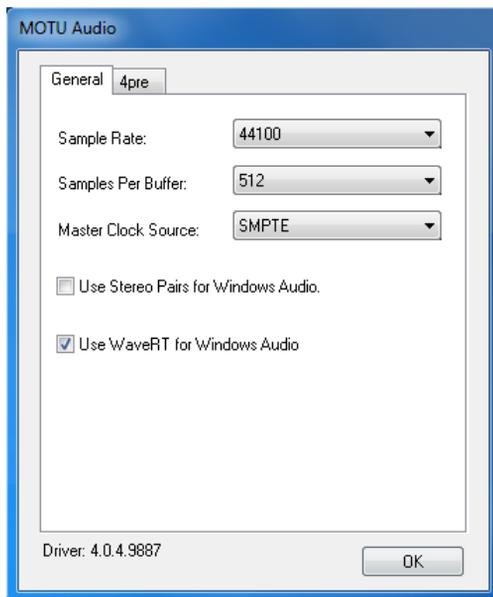


Figure 5-1: MOTU Audio Console gives you access to all of the settings in the 4pre hardware.

## S/PDIF

The *S/PDIF* clock source setting refers to the *S/PDIF* coaxial input jack on the 4pre. This setting allows the 4pre to slave to another *S/PDIF* device.

Use this setting whenever you are recording input from a DAT deck or other *S/PDIF* device into the 4pre. It is not necessary in the opposite direction (when you are transferring from the 4pre to the DAT machine).

For further details about this setting, see “Connect and sync *S/PDIF* devices” on page 23.

## SMPTE

Choose this setting to resolve the 4pre directly to SMPTE time code (LTC) being received via one of the 4pre’s audio inputs. For details, see chapter 10, “MOTU SMPTE Console” (page 75).

## Samples Per Buffer

The *Samples Per Buffer* setting lets you reduce the delay you hear when patching live audio through your audio software. For example, you might have a live microphone input that you would like to run through a reverb plug-in that you are running in your host audio software. When doing so, you may hear or feel some “sponginess” (delay) between the source and the processed signal. If so, don’t worry. This effect only affects what you hear: it is not present in what is actually recorded.

You can use *Samples Per Buffer* setting to reduce this monitoring delay—and even make it completely inaudible.

☛ If you don’t need to process an incoming live signal with software plug-ins, you can monitor the signal with no delay at all using CueMix FX, which routes the signal directly to your speakers via hardware. For details, see chapter 9, “CueMix FX” (page 51).

Adjusting the *Samples Per Buffer* setting impacts the following things:

- The strain on your computer’s CPU
- The delay you hear when routing a live signal through your host audio software plug-ins
- How responsive the transport controls are in your software

This setting presents you with a trade-off between the processing power of your computer and the delay of live audio as it is being processed by plug-ins. If you reduce the *Samples Per Buffer*, you reduce patch thru latency, but significantly increase the overall processing load on your computer, leaving less CPU bandwidth for things like real-time effects processing. On the other hand, if you increase the *Samples Per Buffer*, you reduce the load on your computer, freeing up bandwidth for effects, mixing and other real-time operations. But don’t set the *Samples Per Buffer* too low, or it may cause distortion in your audio.

If you don’t process live inputs with software plug-ins, leave this setting at its default value of 1024 samples. If you do, try settings of 256 samples or less, if your computer seems to be able to handle them. If your host audio software has a processor meter, check it. If it starts getting maxed out, or if the computer seems sluggish, raise the *Samples Per Buffer* until performance returns to normal.

If you are at a point in your recording project where you are not currently working with live, patched-thru material (e.g. you’re not recording vocals), or if you have a way of externally monitoring input, choose a higher *Samples Per Buffer* setting. Depending on your computer’s CPU speed, you might find that settings in the middle work best.

The *Samples Per Buffer* setting also impacts how quickly your audio software will respond when you begin playback, although not by amounts that are very noticeable. Lowering the *Samples Per Buffer*

will make your software respond faster; raising the *Samples Per Buffer* will make it a little bit slower, but barely enough to notice.

#### **Monitoring live inputs without plug-in effects**

As mentioned earlier, CueMix FX allows you to monitor dry, unprocessed live inputs with no delay at all. For complete details, see chapter 8, “Reducing Monitoring Latency” (page 45).

#### **Use stereo pairs for Windows audio**

Some legacy Windows audio applications require audio channels to be grouped in stereo pairs. If you are using old Windows audio software, and you are having issues accessing 4pre channels from within the software, make sure to enable the *Use Stereo Pairs for Windows Audio* option.

#### **Use WaveRT for Windows audio**

If your host software supports WaveRT, enable this option. Consult your host application documentation for details.

#### **Enable Pedal**

This setting applies to other MOTU audio interfaces, but it does not apply to the 4pre.

### **‘4PRE’ TAB SETTINGS**

#### **Phones Assign**

The *Phones Assign* setting lets you choose what you will hear from the headphone jack. Choose *Main Out 1-2* if you’d like the headphone output to match the main outs. Choose *Phones 1-2* if you would like the headphones to serve as their own independent output, which you can access as an independent output destination in your host audio software and as an output destination for the four on-board CueMix FX mix busses.

# CHAPTER 6 4pre Front Panel Operation

## OVERVIEW

The 4pre offers front-panel mixing via six rotary encoders and a bank of status LEDs.

- Push-button rotary encoders ..... 35
- Power switch ..... 35
- Phones ..... 35
- Main out volume ..... 35
- Mixing with the front panel controls ..... 36
- Visual feedback when adjusting mix controls ..... 38
- Metering and activity LEDs ..... 38
- Restoring factory defaults ..... 38

## PUSH-BUTTON ROTARY ENCODERS

All of the knobs on the 4pre front panel are push-button digital rotary encoders. In many cases, you can either push the knob, hold it in, or turn it to make a setting.

## POWER SWITCH

Push the PHONES knob to power on the 4pre. Push in and hold the knob to turn it off.

## MAIN OUT VOLUME

Use the MAIN knob to control the volume of the main outputs (1-2) on the back panel. This knob also controls the volume of the headphone jack below it, which always mirrors the main outs.

As you turn the MAIN knob to adjust volume, the MAIN OUT ladder LEDs (Figure 6-1) provide visual feedback.

## PHONES

Use the PHONES knob (Figure 6-1) to control the volume of the independent headphone jack below it. As you turn the knob, the MAIN OUT ladder LEDs provide visual feedback.

From the factory, the PHONES jack mirrors the main outs, just like the MAIN phone jack, but the PHONES jack can be programmed to mirror any other output pair (digital or analog). See “Phones Assign” on page 34.



Figure 6-1: The 4pre front panel.

## MIXING WITH THE FRONT PANEL CONTROLS

The 4pre can operate as a mixer, and you can use the knobs on the front panel to control the mix. The mixer combines the signals of all inputs and sends the mixed signal to an output pair, such as the main outs. You can control the relative volume of the inputs, as well as the overall volume of the mix signal on output.

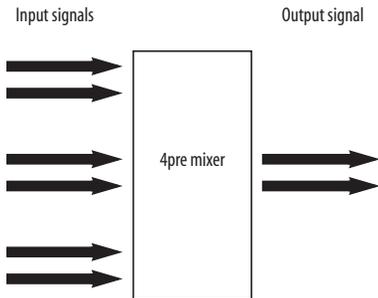


Figure 6-2: The 4pre mixer takes all the input signals and combines them to an output. You control the volume of each input separately to produce a good mix.

### Four separate mixes

The 4pre provides a separate mix for each of its four output pairs, as follows:

Mix	Front panel LED	Physical output
Mix 1	<i>main</i>	Main Out 1-2
Mix 2	<i>line</i>	Analog 1-2
Mix 3	<i>spdif</i>	S/PDIF 1-2
Mix 4	<i>ph</i>	Phones 1-2

This means that for each 4pre output pair, the volume of each input can be completely different than it is for other output pairs. This allows you to create different mixes and send them to separate destinations. For example, you could send one mix to a PA system, and send a separate, different mix to stage monitors. Yet a third mix could be created for the headphones, and a fourth mix could be sent to the digital outputs to a recording device of some kind (or to an effects processor).

### Choosing a mix to control

The 4pre front panel controls only one mix at a time. To choose which mix you are controlling, push the *MIX/VOL* knob (Figure 6-1) repeatedly. The *current mix* LEDs (Figure 6-3) indicate the currently selected mix: *main*, *line*, *spdif*, or *ph* (phones). The factory default setting is *trim* (explained later), so make sure one of these four mix LEDs is illuminated before making mix level adjustments.



Figure 6-3: The Mix LEDs indicate which mix you are controlling with the front panel.

### Controlling the volume of inputs

Use the *Input controls* (Figure 6-1) to control the volume of the 4pre’s four analog inputs. Push to mute or unmute the input.

☞ If you need to also mix the digital S/PDIF input alongside the four analog inputs, use the included CueMix FX software to control the S/DIF input levels. See chapter 9, “CueMix FX” (page 51).

### Controlling the volume of the mix

Use the *Mix volume* knob (Figure 6-1) to control the overall output volume of the mix. Mix level is independent of the output level for the main outs (or other physical output jack to which the mix is assigned).

## Controlling pan

If a mix is selected and the *pan* LED is dark, as shown in (Figure 6-3), this indicates that the front-panel knobs are currently controlling each input's mix volume. If you wish to control the left-right panning of the input, push *and hold* the MIX/VOL knob. Doing so causes the *pan* LED (Figure 6-3) to illuminate. You can now use the knobs to pan each mono input left or right. Like volume, the pan setting for the input can be different for each of the four mixes. Push the knob to toggle between pan-center or pan-left/right.

Use the following gestures for controlling pan for any inputs that are configured as a stereo pair by the CueMix FX software (see the next section):

Do this	To do this
Turn	To adjust balance or width
Push and hold	To toggle between balance and width
In balance mode, push	To set balance to center
In width mode, push	To toggle between 100% (full stereo) and 0% (full mono)

To go back to controlling volume, push and hold the MIX/VOL knob again. The *pan* LED once again becomes dark.

## Stereo pairs

From the factory, the four mic/instrument inputs are configured as individual mono inputs, each with its own knob. However, the CueMix FX software gives you the option of controlling them as stereo pairs. (See “Mono/stereo pairing” on page 53.) If you do so, the two front panel knobs that correspond to the pair will each affect both channels in identical fashion.

For example, if mic inputs 1-2 are configured as a stereo pair, you could use either the INPUT 1 knob or the INPUT 2 knob to control the volume of the

pair. Panning can also be controlled using either knob, as explained in the previous section for stereo pairs.

The S/PDIF input is, by default, grouped as a stereo pair. In addition, there is no knob on the front panel for S/PDIF volume control. Use the included CueMix FX software to control the S/DIF input level, panning, and mono/stereo grouping. See chapter 9, “CueMix FX” (page 51).

Trim, pad, and phantom power controls are always independent, regardless of stereo pairing.

## Adjusting input trim

When you push the *Mix Volume* knob (Figure 6-3) repeatedly to cycle among the four different mixes, there is a fifth choice: the *trim* LED (Figure 6-3). When it is illuminated, the input volume knobs (Figure 6-1) control the trim level for each input. The trim level adjustment occurs before the signal enters the 4pre mixer, so it applies to all mixes. Trim is useful for adjusting the overall level of the input. For example, if you plug in a mic, and the signal is so strong (loud) that it distorts the input, use trim to reduce the volume until it no longer overdrives the input.

## Toggling pad and 48V phantom power

When adjusting trim (the trim LED is illuminated), you can toggle the -20 dB pad and 48-volt phantom power for each mic input as follows:

- Push the knob to toggle the -20 dB pad
- Push *and hold* the knob to toggle 48V power

When enabled, the corresponding 48V or *pad* LED (Figure 6-3) will illuminate.

## Using the 4pre as a monitor mixer while recording tracks on the computer

You can use the 4pre front-panel mixer while connected to a computer. This allows you to create monitor mixes that are independent of what's going

on in the computer. Using the 4pre as a monitor mixer in this fashion is a good way to avoid latency (delay) issues that can arise when using audio software on a computer. See chapter 8, “Reducing Monitoring Latency” (page 45) for more information about dealing with latency.

#### **Using the 4pre as a stand-alone mixer**

When the 4pre is not connected to a computer, it can operate as a stand-alone mixer, and you can use the front panel to control your mix.

#### **VISUAL FEEDBACK WHEN ADJUSTING MIX CONTROLS**

When you turn a knob to adjust volume or pan, the ten-segment MAIN OUT ladder LEDs provide visual feedback as you turn the knob.

#### **METERING AND ACTIVITY LEDS**

The *Line Out* LEDs (Figure 6-3) indicate output activity on the quarter-inch Line Out 3-4 jacks.

The *SPDIF* LEDs (Figure 6-3) indicate input and output activity on the digital audio jacks.

The MAIN OUT meters (Figure 6-1) provide ten-segment metering for the Main Outs.

The INPUTS meters provide five-segment metering for the mic/instrument combo jacks.

#### **RESTORING FACTORY DEFAULTS**

To restore factory default settings hold down the MIX and PHONES knobs simultaneously for three (3) seconds.

# CHAPTER 7    **Configuring Host Audio Software**

## OVERVIEW

The 4pre provides multi-channel audio input and output for ASIO- and WDM-compatible audio applications, including Ableton Live, Avid Pro Tools, Cockos Reaper, Propellerhead Reason and Record, Steinberg Cubase and Nuendo, Cakewalk SONAR, and others.

Additionally, sample-accurate synchronization is possible with applications that support ASIO 2 or 3's sample-accurate positioning protocol.

Preparation .....	39
Run MOTU Audio Console .....	39
Choosing the MOTU Audio driver .....	40
Reducing latency .....	43
Working with 4pre inputs and outputs .....	43
Processing live inputs with host plug-ins .....	44
Working with CueMix FX mixing .....	44
Synchronization .....	44

## PREPARATION

To make sure that everything is ready for your host audio software, install your host audio software first (if you haven't already done so), and then see these chapters before proceeding:

- chapter 3, "Installing the 4pre Software" (page 17)
- chapter 4, "Installing the 4pre Hardware" (page 19).

## RUN MOTU AUDIO CONSOLE

Before you run your host audio software, launch MOTU Audio Console to configure your 4pre hardware.

MOTU Audio Console provides settings to configure your audio interface and enable the desired inputs and outputs. Only enabled inputs

and outputs will be available to your software, so this is an important step. For complete details see chapter 5, "MOTU Audio Console" (page 31).

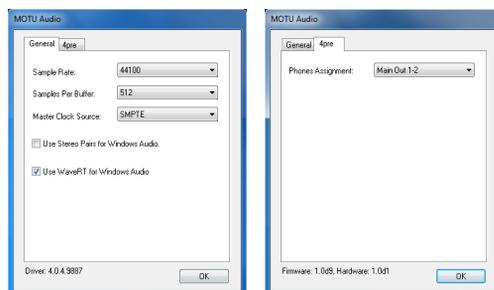


Figure 7-1: MOTU Audio Console.

For complete details about the 4pre settings, see chapter 5, "MOTU Audio Console" (page 31). The following sections provide a brief explanation of each 4pre setting.

### Sample rate

Choose the desired overall sample rate for the 4pre system and your host audio software. Newly recorded audio will have this sample rate.

### Master Clock Source

This setting is very important because it determines which audio clock the 4pre will follow.

If you do not have any digital audio connections to your 4pre (you are using the analog inputs and outputs only), and you will not be slaving your host software to external SMPTE time code, choose *Internal*.

If you have a S/PDIF digital audio device connected to the 4pre, see "Connect and sync S/PDIF devices" on page 23.

If you are slaving the 4pre and your host software to SMPTE time code, follow the directions in “Syncing to SMPTE time code” on page 78.

☛ In order to use the 4pre’s direct SMPTE sync (and sample-accurate sync) feature, the host audio software must support the ASIO 2 or 3 sample-accurate positioning protocol. Cubase and Nuendo support this protocol; for other software, check with its documentation.

### Samples Per Buffer

The *Samples Per Buffer* setting can be used to reduce the delay — or *monitoring latency* — that you hear when live audio is patched through your 4pre hardware and host audio software. For example, you might have MIDI instruments, samplers, microphones, and so on connected to the analog inputs of the 4pre. If so, you will often be mixing their live input with audio material recorded in your audio software. See chapter 8, “Reducing Monitoring Latency” (page 45) for complete details.

### Phones Assign

This 4pre setting lets you choose what you’ll hear from the PHONES jack. For example, if you choose *Main Out 1-2*, the headphones will duplicate the main outs. Or you can choose any other output pair. If you choose *Phones 1-2*, this setting makes the headphone jack serve as its own independent output pair. As a result, you’ll see *Phones 1-2* as an additional audio destination in your host’s audio output menus. When operating at high sample rates, the phones must mirror one of the other output pairs.

☛ The headphone jack labeled MAIN is hard-wired to mirror the main outs; it cannot be reassigned to another output pair.

## CHOOSING THE MOTU AUDIO DRIVER

Once you’ve made the preparations described so far in this chapter, you’re ready to run your audio software and enable the MOTU Audio driver.

Check the audio system or audio hardware configuration window in your software. There will be a menu there that lets you choose among various drivers that may be in your system. Choose the desired MOTU Audio driver from this menu. Several driver options are available. For a summary, see “MOTU Audio drivers” on page 18.

### Pro Tools

In Avid Pro Tools, go to the Setup menu and choose *Playback Engine* as shown in Figure 7-2. Choose the *MOTU Audio ASIO* from the Current Engine menu. For information about the *H/W Buffer Size* setting, see “Adjusting the audio I/O buffer” on page 47.

☛ Pro Tools 9 or later is required for operation with the 4pre.

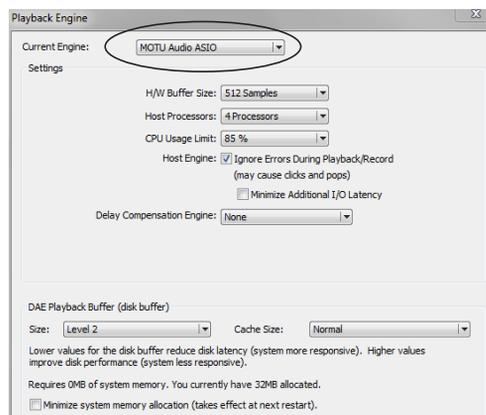


Figure 7-2: Enabling the MOTU Audio ASIO driver in Pro Tools

## Cubase and Nuendo

In Cubase or Nuendo, go to the *Device Setup* window. Click the *VST Audio System* item in the *Devices* list and choose *MOTU Audio ASIO* from the *ASIO Driver* menu as shown below in Figure 7-3. Activate the inputs and outputs within Cubase or Nuendo as usual.

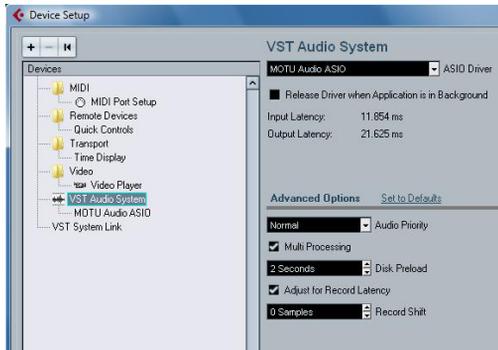


Figure 7-3: Enabling the MOTU Audio ASIO driver in Cubase

## Live

In Ableton Live, access the preferences window and click the *Audio* tab. Choose *ASIO* from the *Driver Type* menu. Choose the *MOTU Audio ASIO* from the *Input Audio Device* and *Output Audio Device* menus as shown below in Figure 7-4. To enable or disable input or output channels, click the *Input Config* or *Output Config* buttons.

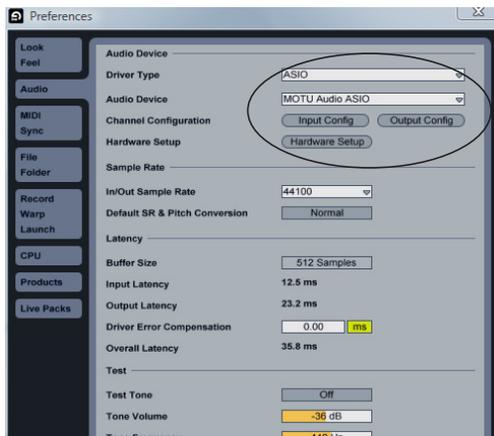


Figure 7-4: Enabling the MOTU Audio ASIO driver in Live

## Reason and Record

In Propellerhead Reason or Record, go to the Preferences window, choose *Audio* preferences from the menu and choose *MOTU Audio ASIO* from the *Audio Card Driver* menu as shown below in Figure 7-5.

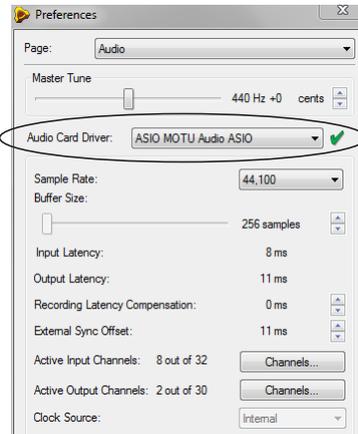


Figure 7-5: Enabling the MOTU Audio ASIO driver in Reason

## Reaper

In Cockos Reaper, access the Preferences and click *Devices* under the *Audio* preferences. Choose *ASIO* for the audio system and choose *MOTU Audio ASIO* from the *ASIO driver* menu as shown below in Figure 7-6.

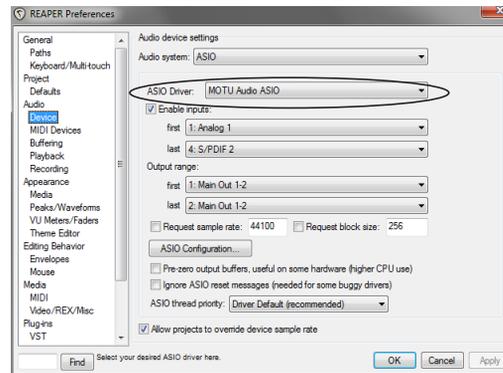


Figure 7-6: Enabling the MOTU Audio ASIO driver in Reaper

## SONAR

In Cakewalk SONAR, you can use the MOTU ASIO driver or the MOTU WDM driver. Note that when using ASIO, only one audio interface may be selected for use in SONAR.

### Using the MOTU ASIO driver

- 1 Go to SONAR's Preferences.
- 2 In the Audio preferences section, choose *Playback and Recording*.
- 3 Choose ASIO as the Driver Mode, as shown below.

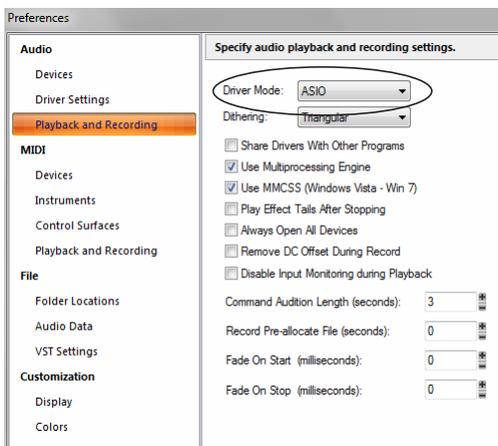


Figure 7-7: Enabling the MOTU Audio ASIO driver in SONAR.

- 4 Next, in the Audio preferences section, choose *Devices*.
- 5 Check the 4pre inputs and outputs that you wish to use and uncheck the ones you don't, as shown in Figure 7-8 on page 42.

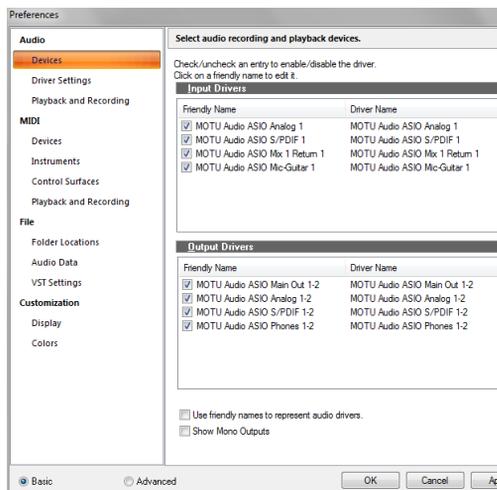


Figure 7-8: Enabling inputs and outputs in SONAR.

### Using the MOTU WDM driver

- 1 Go to SONAR's Preferences.
- 2 In the Audio preferences section, choose *Playback and Recording*.
- 3 Choose WDM/KS as the Driver Mode, as shown below.

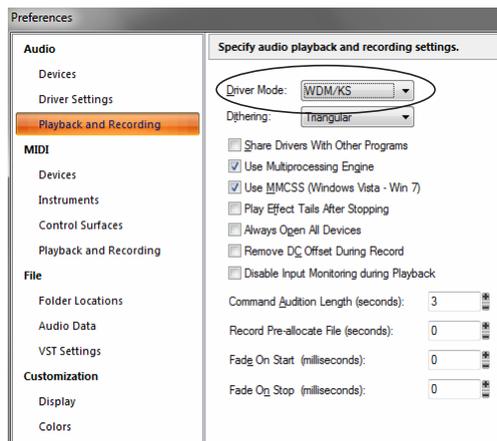


Figure 7-9: Enabling the MOTU WDM driver in SONAR.

- 4 Next, in the Audio preferences section, choose *Devices*.

5 Check the 4pre inputs and outputs that you wish to use and uncheck the ones you don't, as shown in Figure 7-7 on page 42.

### Other audio settings in SONAR

There are a few other settings in SONAR that impact 4pre operation:

1 In the Audio preferences section, choose *Driver Settings*.

2 Choose an 4pre input and output for recording and playback timing as shown below in Figure 7-10. It doesn't matter which input or output you choose.

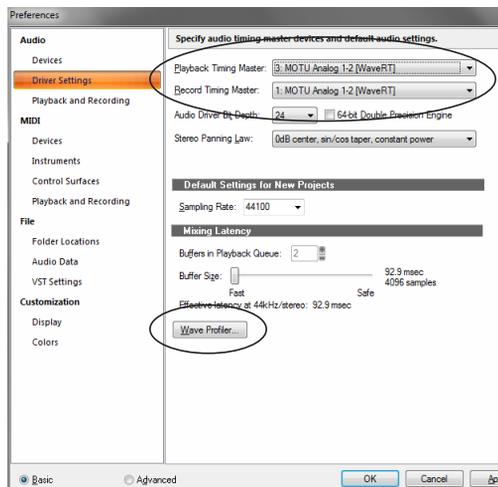


Figure 7-10: Make sure you have chosen a 4pre input and output for the playback and recording timing master settings.

3 Additionally, if you are using the MOTU WDM driver, click the *Wave Profiler* button and run the Wave Profiler. This process chooses the optimum settings for the 4pre hardware.

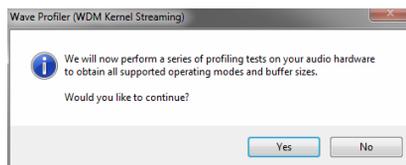


Figure 7-11: Running the Wave Profiler in Cakewalk's SONAR.

### Sound Forge

In Sony Sound Forge, go to the Preferences window, click the *Audio* tab, and then choose *MOTU Audio* from the *Audio device type* menu.

### Other audio software

For other audio applications, the procedure is similar to that shown above. Consult your owner's manual for further information.

### REDUCING LATENCY

On Windows, audio I/O buffer size is handled by the audio driver rather than the host audio application.

In the MOTU Audio Console, *Samples Per Buffer* provides an adjustable audio buffer setting that lets you control the amount of delay you'll hear when monitoring live inputs through your host audio software or processing them with software plug-ins.

For information, see the "Adjusting the audio I/O buffer" section of chapter 8, "Reducing Monitoring Latency" (page 45).

### WORKING WITH 4PRE INPUTS AND OUTPUTS

Once you've enabled the 4pre's driver, 4pre audio inputs and outputs will appear in your host software wherever audio inputs and outputs are listed.

Remember that the headphone output can be configured in MOTU Audio Console to mirror other outputs besides the main outs. See "Phones Assign" on page 34.

### Number of channels

If your host audio software requires that you specify the number of audio voices or channels you will be using, be sure to choose enough channels to cover the 8 inputs and 8 outputs provided by your 4pre.

### Mix1 1-2 return bus

In your host audio software audio input menus, you'll see an 4pre input called *Mix1 Return 1-2*. This is a stereo feed from the 4pre that matches its main outs (Mix 1). This can be used, for example, to record a final stereo mix for reference and archiving purposes.

 Warning: the Mix1 Return 1-2 return inputs can cause feedback loops! DO NOT assign this input to a track assigned to the 4pre main outs.

For Mix1 Return 1-2, you can choose whether or not to include audio being sent to the main outs from the computer. See “Mix1 Return Includes Computer Output” on page 56.

### The “Phones 1-2” output

Host audio tracks assigned to the *Phones 1-2* output pair will be heard on the headphone jack only. If the Phones are set to mirror another output (such as the main outs), the mirrored audio stream is mixed with the phones audio output. For further explanation, see “Phones Assign” on page 34.

### Audio Input and output names

The 4pre audio driver supplies text string labels for its inputs and outputs to clearly identify each one, but some applications do not display these labels.

The following tables show how you can identify each input and output in a host that does not display port names:

Input	Number of Channels	List position	Comment
Mic	4	1-4	-
SPDIF	2	5-6	-
Mix1 return	2	7-8	See “Mix1 1-2 return bus” on page 44.

Outputs are listed in this order:

Output	Channels	List position
Main	2	1-2
Line	2	3-4
SPDIF	2	5-6
Phones	2	7-8

### PROCESSING LIVE INPUTS WITH HOST PLUG-INS

If you patch a live input (such as a MIDI synthesizer) through a plug-in effect in your host software, you might hear a slight delay. There are several ways to reduce this delay. For details, see chapter 8, “Reducing Monitoring Latency” (page 45).

### WORKING WITH CUEMIX FX MIXING

The 4pre provides its own hardware-based mixing, which you can operate hand-in-hand with your host's mixing environment. For example, the 4pre can serve as a monitor mixer routing channels to musicians, or it can serve as an integrated extension of your host's mixing environment. If you program a 4pre mixing configuration that goes hand in hand with your host project, be sure to use the file save features in CueMix FX to save the 4pre settings as a file in your host project folder for instant recall of all settings. See chapter 9, “CueMix FX” (page 51) for complete details.

### SYNCHRONIZATION

If your host audio software supports ASIO 2 or 3's sample-accurate positioning protocol, then it can resolve to the 4pre's built-in time code synchronization feature. To resolve your 4pre directly to SMPTE time code with no additional synchronization devices, use the setup shown in “Syncing to SMPTE time code” on page 78.

## CHAPTER 8 Reducing Monitoring Latency

### OVERVIEW

*Monitoring latency* is that slight delay you hear when you run an input signal through your host audio software. For example, you might hear it when you drive a live mic input signal through an amp modeling plug-in running in your audio sequencer.

This delay is caused by the amount of time it takes for audio to make the entire round trip through your computer, from when it first enters an 4pre input, passes through the 4pre hardware into the computer, through your host audio software, and then back out to an 4pre output.

If you don't need to process a live input with plug-ins, the easiest way to avoid monitoring latency is to use the 4pre's CueMix digital mixer to patch the input directly to your monitor outs via the 4pre audio hardware. For details, see "CueMix hardware monitoring" on page 48.

If you *do* need to process a live input with plug-ins, or if you are playing virtual instruments live through your 4pre audio hardware, you can significantly reduce latency — and even make it completely inaudible, regardless of what host audio application software you use. This chapter explains how.

It is important to note that monitoring delay has no effect on when audio data is recorded to disk or played back from disk. Actual recording and playback is extremely precise.

Monitoring live input.....	46
Adjusting the audio I/O buffer .....	47
Lower latency versus higher CPU overhead .....	48
Transport responsiveness .....	48
Effects processing and automated mixing .....	48
CueMix hardware monitoring.....	48
Three methods for controlling CueMix .....	48
Controlling CueMix from the front panel.....	48
Using the CueMix FX application.....	49
Controlling CueMix from your audio software .....	49

## MONITORING LIVE INPUT

There are two ways to monitor live audio input with an 4pre: 1) through the computer or 2) via the 4pre's CueMix hardware mixer. Figure 8-1 below shows method 1, which allows you to add effects processing such as reverb and guitar amp effects via plug-ins in your audio software. See the next section, “Adjusting the audio I/O buffer” for details about how to reduce — and possibly eliminate — the audible monitoring delay that the computer introduces.

Figure 8-2 shows how to use CueMix hardware-based monitoring, which lets you hear what you are recording with no monitoring delay and no

computer-based effects processing. Instead, input is routed directly to an output. See “CueMix hardware monitoring” later in this chapter for details on how to use CueMix with your audio software, or with the included CueMix FX software.

If the material you are recording is suitable, there is a third way to monitor live input: use both methods (Figure 8-1 and Figure 8-2) at the same time. For example, you could route guitar to both the computer (for an amp model effect) and mix that processed signal on the main outs with dry guitar from CueMix.

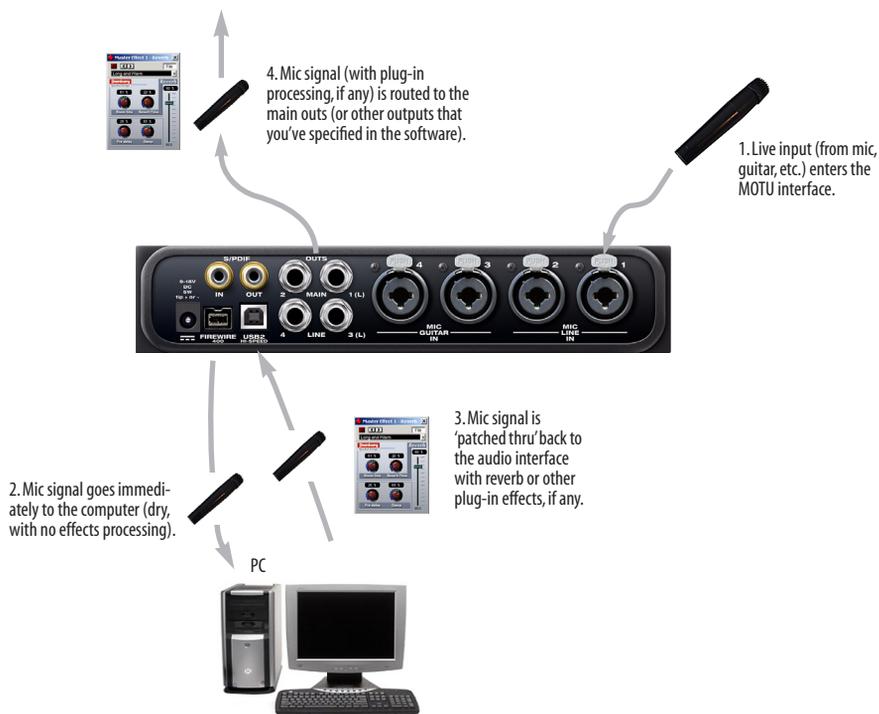


Figure 8-1: There are two ways to monitor live audio inputs with an 4pre: 1) through the computer or 2) via CueMix hardware monitoring. This diagram shows method 1 (through the computer). When using this method, use your host software's buffer setting to reduce the slight delay you hear when monitoring the live input, but don't lower it too much, or your computer might get sluggish.

## ADJUSTING THE AUDIO I/O BUFFER

A *buffer* is a small amount of computer memory used to hold data. For audio interfaces like the 4pre, buffers are used for the process of transferring audio data in and out of the computer. The size of the buffers determines how much delay you hear when monitoring live inputs through your audio software: larger buffers produce more delay; smaller buffers produce less.

Buffer size adjustment is made in MOTU Audio Console, as shown in Figure 8-3 via the *Samples Per Buffer* setting.

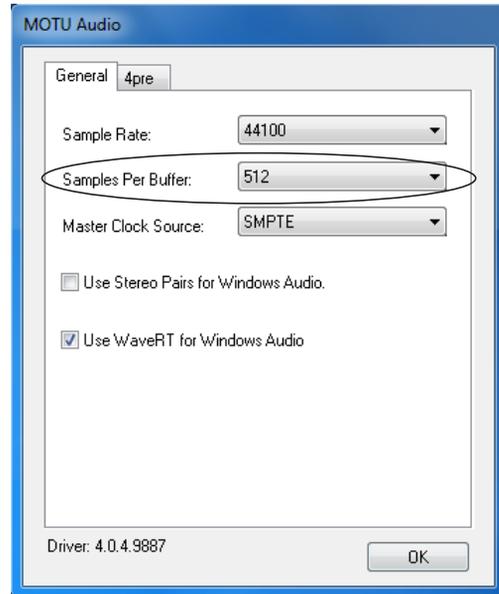


Figure 8-3: Lowering the 'Samples Per Buffer' setting in MOTU Audio Console reduces patch thru latency. But doing so increases the processing load on your computer, so keep an eye on the Performance Monitor in your host audio software.

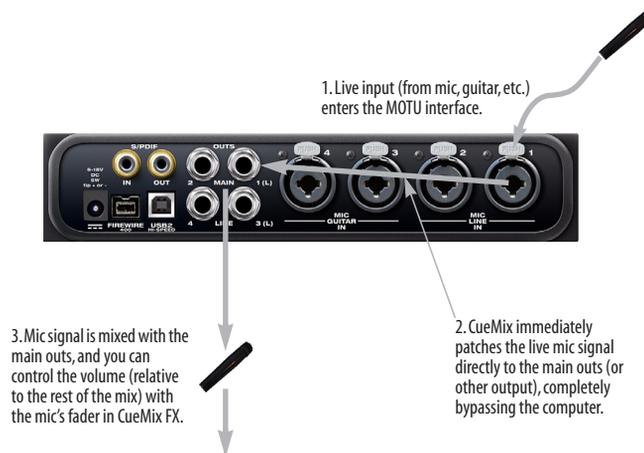


Figure 8-2: This diagram shows the signal flow when using CueMix no-latency monitoring. Notice that this method does not process the live input with plug-ins in your audio software.

### Lower latency versus higher CPU overhead

The buffer setting has a large impact on the following things:

- Patch thru latency
- The load on your computer's CPU
- Possible distortion at the smallest settings
- How responsive the transport controls are in your audio software

The buffer setting presents you with a trade-off between the processing power of your computer and the delay of live audio as it is being patched through your software. If you reduce the size, you reduce patch thru latency, but significantly increase the overall processing load on your computer, leaving less CPU bandwidth for things like real-time effects processing. On the other hand, if you increase the buffer size, you reduce the load on your computer, freeing up bandwidth for effects, mixing and other real-time operations.

If you are at a point in your recording project where you are not currently working with live, patched-thru material (e.g. you're not recording vocals), or if you have a way of externally processing inputs, choose a higher buffer size. Depending on your computer's CPU speed, you might find that settings in the middle work best (256 to 1024).

### Transport responsiveness

Buffer size also impacts how quickly your audio software will respond when you begin playback, although not by amounts that are very noticeable. Lowering the buffer size will make your software respond faster; raising the buffer size will make it a little bit slower, but barely enough to notice.

### Effects processing and automated mixing

Reducing latency with the buffer size setting has another benefit: it lets you route live inputs through the real-time effects processing and mix automation of your audio software.

### CUEMIX HARDWARE MONITORING

The 4pre has a more direct method of patching audio through the system: *CueMix*. CueMix is a digital mixer in the 4pre hardware itself. CueMix has two important benefits:

- First, it completely eliminates the patch thru delay (reducing it to a small number of samples — the same amount as any digital mixer).
- Secondly, CueMix FX imposes no strain on the computer.

The trade-off, however, is that CueMix FX bypasses your host audio software. Instead, live audio inputs are patched directly through to outputs in the 4pre itself and are mixed with disk tracks playing back from your audio software. This means that you cannot apply plug-ins, mix automation, or other real-time effects that your audio software provides. But for inputs that don't need these types of features, CueMix is the way to go.

On the other hand, if you really need to use the mixing and processing provided by your audio software, you should not use CueMix. Instead, reduce latency with the buffer setting (as explained earlier in this chapter).

### THREE METHODS FOR CONTROLLING CUEMIX

There are three ways to control CueMix:

- With the knobs on the 4pre front panel
- With the 4pre CueMix FX software
- From within your host audio software (if it supports direct hardware monitoring)

You can even use these methods simultaneously.

### Controlling CueMix from the front panel

The knobs on the 4pre front panel give you direct control over CueMix. For complete details, see “Mixing with the front panel controls” on page 36.

## Using the CueMix FX application

If your host audio software does not support direct hardware monitoring, you run the 4pre's CueMix FX application side-by-side with your host software and manage your monitor mix in CueMix FX. For complete details, see chapter 9, "CueMix FX" (page 51).

## Controlling CueMix from your audio software

Some ASIO-compatible audio applications, such as Cubase and Nuendo, allow you to control CueMix monitoring from within the application (without the need to use the separate CueMix FX software). In most cases, this support consists of patching an 4pre input directly to an output when you record-arm a track. Exactly how this is handled depends on the application.

CueMix routings that are made via host applications are made "under the hood", which means that you won't see them in CueMix FX. However, CueMix connections made inside your host audio software dovetail with any other mixes you've set up in CueMix FX. For example, if your host application routes audio to an output pair that is already being used in CueMix FX, both audio streams will simply be merged to the output.

## Controlling CueMix from within Cubase or Nuendo

To turn on CueMix in Cubase or Nuendo, enable the Direct Monitoring check box in the Device Setup window.

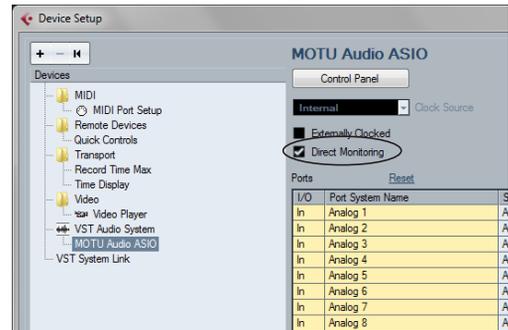


Figure 8-4: Activating the Direct Monitoring option in Cubase or Nuendo.

## Other ASIO 2/3-compatible host software

If your ASIO-compatible host audio software supports ASIO's direct monitoring feature, consult your software documentation to learn how to enable this feature. Once enabled, it should work similarly as described for Cubase (as explained in the previous section).

## Using CueMix with WDM- or Wave-compatible software

Run CueMix FX (chapter 9, "CueMix FX" (page 51)) and use it to route live inputs directly to outputs, control their volume and panning, etc. If necessary, you can save your CueMix FX setup with your project file.



## CHAPTER 9 CueMix FX

### OVERVIEW

CueMix FX is a cross-platform software application that provides graphic, on-screen control for the 4pre's mixing features. Essentially, it gives you on-screen control of the 4pre's front panel mixing controls.

CueMix FX also provides many advanced audio analysis tools, including a tuner and oscilloscope.

CueMix FX can be used independently of host audio software, or together with it. CueMix dovetails with the direct monitoring features of your host audio software, allowing you to seamlessly mix in both environments.

Advantages over host-based mixing and processing	51
CueMix FX installation	51
CueMix FX basic operation	51
Working with a mix	53
Shortcuts	54
Info display	54
Talkback and listenback	54
Scope channel selection	56
File menu	56
Edit menu	56
Devices menu	57
FFT Analysis / spectrogram	57
Oscilloscope	59
X-Y Plot	65
Phase Analysis	68
Tuner	72
Configurations menu	72
Talkback menu	73
Phones menu	73
Control Surfaces menu	73

### ADVANTAGES OVER HOST-BASED MIXING AND PROCESSING

CueMix FX provides several advantages over mixing and processing in your host audio software:

- CueMix has no buffer latency. Thanks to the 4pre's DSP chip, CueMix provides the same throughput performance as a digital mixer.
- CueMix routing can be maintained independently of individual software applications or projects.
- CueMix routing can operate without the computer, allowing the 4pre to operate as a portable, stand-alone mixer.

### CUEMIX FX INSTALLATION

*CueMix FX* is installed as a standard application by the 4pre setup software.

### CUEMIX FX BASIC OPERATION

The CueMix FX application is simple to operate, once you know these basic concepts.

#### A separate mix for each output pair

As explained in "Mixing with the front panel controls" on page 36, the 4pre provides a separate mix for each of its four output pairs, as follows:

Mix name	Physical output
Mix 1	Main Out 1-2
Mix 2	Analog 1-2
Mix 3	S/PDIF 1-2
Mix 4	Phones 1-2

### Many inputs to one output pair

It might be useful to think of each mix as some number of inputs all mixed down to a stereo output pair. CueMix FX lets you choose which inputs to include in the mix, and it lets you specify the level and pan for each input being fed into the mix.

### Viewing one mix at a time

CueMix FX displays one mix at a time. To select which mix you are viewing, choose it from the mix menu (Figure 9-1). Click the mix name to change it. The mix output pair appears above the mix master fader (Figure 9-1).

### Each mix is independent

Each mix has its own settings. Settings for one mix will not affect another. For example, if an input is used for one mix, it will still be available for other mixes. In addition, inputs can have a different volume, pan, mute and solo setting for each mix.

### Widening the CueMix FX window

To view more input faders at once, drag the grow box (Figure 9-1) to the right.

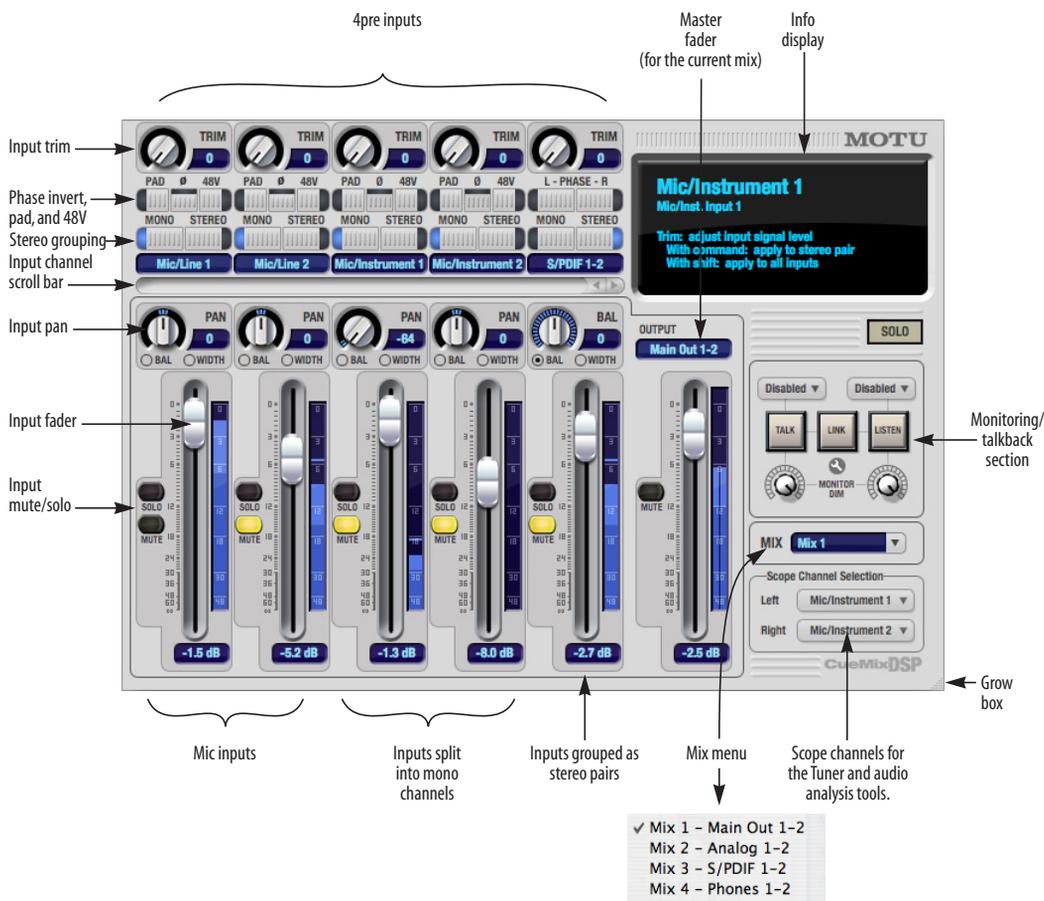


Figure 9-1: CueMix FX is a virtual mixer that gives you control over the 4pre's on-board mixing features.

## WORKING WITH A MIX

Each mix has the following components:

- A stereo output with master fader
- Name
- Master mute (to enable/disable the entire mix)
- Any number of mono or stereo inputs
- Pan, volume, mute and solo for each input

### Viewing a mix

To view a mix, choose it from the *Mix* menu (Figure 9-1). The menu shows all mixes by name, followed by the audio interface's output pair that it corresponds to.

### Naming a mix

Click the mix name to edit its text.

### Master fader

The master fader (Figure 9-1) controls the overall level of the mix (its volume on its stereo output). Use the individual input faders to the left to control individual input levels.

### Mix mute

The mix mute button (Figure 9-1) disables (silences) the mix.

### Mix level meter

The mix level meter, which is post-fader, shows you the output for the mix's output.

### Input channels

The *Inputs* section (Figure 9-1) gives you access to individual 4pre inputs (or input pairs). Unmute the input and bring up its fader to hear the input on the current mix's output. Mute, solo, and pan are also provided for each input channel.

### Input trim

All 4pre inputs, both analog and digital, offer continuously variable input trim. In all cases, trim level can be controlled digitally in approximately 1

dB increments. This includes the digitally controlled analog trims on the four analog inputs. Here is a summary of input trim ranges for each type of 4pre input:

Input	Trim cut	Trim boost	Trim Range
XLR mic	0 dB	+60 dB	60 dB
TRS analog	0 dB	+22 dB	22 dB
S/PDIF	0 dB	+12 dB	12 dB

Once you adjust the trim levels, you can save them as a file on disk for future instant recall. See “Saving and loading hardware presets” on page 56 and “Configurations menu” on page 72.

### Pad and phantom

The Pad and phantom settings are the same 20 dB pad and 48V phantom power settings that you can also control from the 4pre front panel encoders. There are separate settings for each mic input.

### Invert phase

The *Phase* button (Figure 9-1) inverts the phase of the input signal. For stereo pairs, you can invert the phase for the left and right channels independently. For the mic/instrument/line channels, click the phase button ( $\emptyset$ ) repeatedly to cycle among two states for mono channels (on or off) and four states for stereo grouped channels (no inversion, left only, both, or right only).

### Mono/stereo pairing

Click the *Mono* button (Figure 9-1) if you would like an input to be treated as a mono channel. If you would like to work with it as one channel of a linked stereo pair, click the *Stereo* button. Inputs are grouped in odd/even pairs (Mic/instrument 1-2, Mic/Line 1-2, etc.) Stereo pairs appear as a single channel strip in the CueMix FX mixer.

### Input pan

The pan knob (Figure 9-1) for each input pans the input across the mix's stereo outputs. If the input itself is grouped as a stereo pair, two forms of panning control are provided:

### Balance

*Balance* works like the balance knob on some radios: turn it left and the right channel dims, turn it right and left channel dims. But the left channel always stays left and the right channel stays right.

### Width

*Width* spreads the left and right channels across the stereo image, depending on the knob position. Maximum value (turning the pan knob all the way up) maintains the original stereo image: the left channel goes entirely left and right goes entirely right, without attenuation. The minimum value (turning the knob all the way down) creates a mono effect: equal amounts of left and right are combined and sent to both outputs. In between, the left out is a mixture of the left input and some of the right input (and vice-versa) with the effect of narrowing the field.

### Input fader

Use the input fader (Figure 9-1) to adjust the level for the input in the mix. Note that an input can have different level, pan, mute and solo settings for each mix. Input channel level meters are post-fader.

## SHORTCUTS

Use these general modifier keys as shortcuts:

Shortcut	Result
Shift key	Applies your action to all inputs or all outputs in the mix.
Control key	Applies your action to the stereo input pair, even when it is currently configured as mono.
Alt key	Applies your action to all busses.
Shift-Alt	Applies your action to all inputs and mixes.
Double-click	Returns the control to its default value (pan center, unity gain, etc.)

## INFO DISPLAY

The info display shows fly-over help for items in the CueMix FX window.

## TALKBACK AND LISTENBACK

CueMix FX provides *Talkback* and *Listenback* buttons. Talkback allows an engineer in the control room to temporarily dim all audio and talk to musicians in the live room. Conversely, Listenback allows musicians to talk to the control room.

### Hardware setup

Figure 9-2 below shows a typical hardware setup for Talkback and Listenback. For Talkback, set up a dedicated mic in your control room and connect it to a mic input on your 4pre. For Listenback, set up a dedicated listenback mic in the live room for the musicians and connect it to another mic input. For talkback output, set up a headphone distribution amp or set of speakers in the live room, and connect it to a pair of outputs. For example, you might connect a headphone distribution amp to analog outputs 3-4 on your 4pre, as demonstrated below in Figure 9-2.

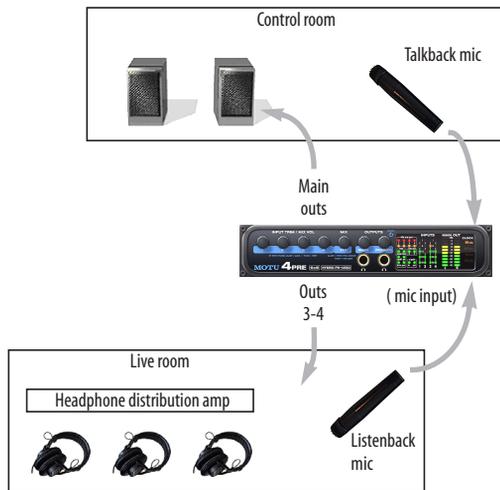


Figure 9-2: Typical hardware setup for Talkback and Listenback.

### Talkback / Listenback mic input

Choose the audio input to which your Talkback and/or Listenback mic is connected, as shown below:

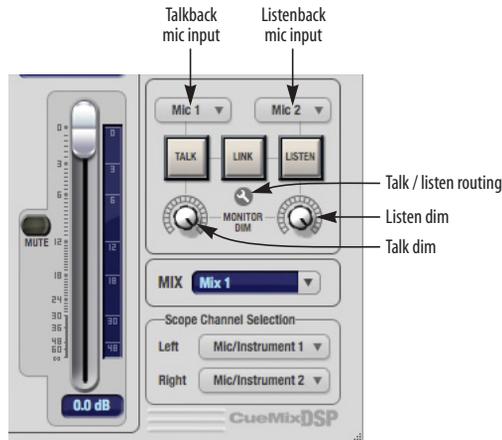


Figure 9-3: Specifying the talkback and listenback mic inputs. Use the input fader for the chosen input to control the mic volume.

### Talkback / Listenback monitor dim

Use the knobs next to the Talk and Listen buttons (Figure 9-3) to determine the amount of attenuation you would like to apply to all other audio signals (besides the talkback/listenback signal) when Talkback and/or Listenback is

engaged. To completely silence all other CueMix audio, turn them all the way down. Attenuation only occurs when talkback or listenback is engaged. Audio playing back from disk (your host software) is not affected.

### Talk / Listen signal routing

Click the *Talk/Listen routing* button (Figure 9-3) to open the routing dialog (Figure 9-4). Check the boxes next to the outputs on which you'd like to hear the Talkback mic and/or Listenback mic. For example, as demonstrated in the diagram in Figure 9-2, to hear the Talkback mic on the headphones in the live room, check the *Analog 1-2* check box in the *Talk* column as demonstrated in Figure 9-4. To hear the Listenback mic on the main monitors in the control room, check the *Main Out 1-2* check box in the *Listen* column.

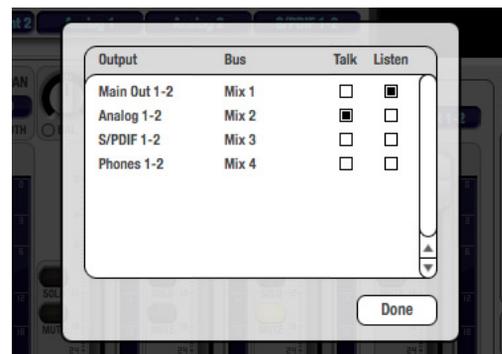


Figure 9-4: Routing the Talkback and Listenback mics to outputs.

### Engaging/disengaging Talkback and Listenback

To engage Talkback or Listenback, press on the Talk or Listen buttons (Figure 9-3) and then release to disengage. Alt-click to make the buttons “sticky” (stay engaged until you click them again — so you don’t have to hold down the mouse). Or use the Talkback menu items.

If you would like to engage both Talkback and Listenback at the same time, enable the *Link* button (Figure 9-3).

## Controlling Talkback and Listenback volume

To control the volume of the Talkback and/or Listenback mics, adjust their input fader in CueMix FX. This fader controls the volume of the input, regardless of which bus mix is being displayed in the CueMix FX window. In other words, once an input has been designated as a Talkback or Listenback input, its fader becomes global for all CueMix buses.

## SCOPE CHANNEL SELECTION

The *Scope channel selection* menus (Figure 9-1 on page 52) let you choose what input channels will be fed to the CueMix FX audio analysis (scoping) features. See “Devices menu” on page 57.

## FILE MENU

### Saving and loading hardware presets

The 4pre can store up to 16 presets in its on-board memory. A preset includes all CueMix FX settings for all for mix busses, but it excludes global settings like clock source and sample rate.

The Load Hardware Preset and Save Hardware Preset commands in the CueMix FX file menu let you name, save and load presets in the 4pre.

### Peak/hold time

In CueMix FX, a peak indicator is a line (representing a virtual LED) displayed in a level meter that indicates the maximum signal level registered by the meter. The *Peak/hold time* setting (File menu) determines how long this indicator remains visible before it disappears (or begins to drop). To disable peak/hold indicators altogether, choose Off from this sub-menu.

### Mix1 Return Includes Computer Output

When checked (enabled), the *Mix1 return includes computer Output* File menu item causes audio being sent to the main outs (Mix 1) from host software on the computer to be included in the Mix1 1-2 return bus. This feature can be used to apply the audio analysis tools, such as the FFT

display and oscilloscope, to computer audio output. See “Scoping host software audio output” on page 57.

 **Warning!** When this option is enabled, it can cause feedback loops! In your host software, make sure that the stereo return bus is not routed back to the main outs!

For more information on the Mix 1 Return feature, see “Mix1 1-2 return bus” on page 44.

### Hardware follows console stereo settings

This File menu item applies to other MOTU interfaces products and has no effect on the 4pre.

## EDIT MENU

### Undo/Redo

CueMix FX supports multiple undo/redo. This allows you to step backwards and forwards through your actions in the software.

### Copying & pasting (duplicating) entire mixes

To copy and paste the settings from one mix to another:

- 1 Select the source mix (Figure 9-1) and choose Copy from the Edit menu (or press control-C).
- 2 Choose the destination mix and choose Paste from the Edit menu (or press control-V).

### Clear Peaks

Choose *Clear Peaks* from the Edit menu to clear all peak indicators in all CueMix FX meters.

## DEVICES MENU

If you are working with more than one MOTU audio interface product, this menu displays all interfaces that are currently on line. Choose any device from the menu to edit its settings using the CueMix FX software.

Below each device are five signal analysis tools: FFT Analysis, Oscilloscope, X-Y Plot, Phase Analysis, and the Tuner. Choose one to open its window. For details on these features, see the following sections.

FFT Analysis / spectrogram .....	57
Oscilloscope .....	59
X-Y Plot .....	65
Phase Analysis .....	68
Tuner .....	72

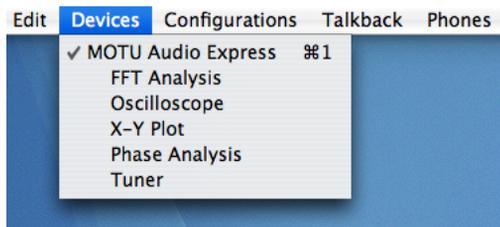


Figure 9-6: Opening the FFT, oscilloscope, X-Y Plot, Phase Analysis, and Tuner windows.

## Scope channels

The *Scope channel selection* menus (Figure 9-1 on page 52) let you choose what input channels will be fed to the CueMix FX audio analysis (scoping) features described in the following sections.

## Scoping the main outs

If you wish to scope audio output, send it to the 4pre main outs (Mix 1) and choose one or both of the Mix1 returns from the Scope Channel Selection menus.

## Scoping host software audio output

If you want to scope audio output from your host software, send your host's output to the main outs (Mix 1), enable the *Mix1 Return Includes Computer Output* option (File menu), and choose one or both of the Mix1 returns from the Scope Channel Selection menus.

## FFT ANALYSIS / SPECTROGRAM

Choose *FFT Analysis* from the Devices menu (Figure 9-6) to open a new window that displays a real-time Fast Fourier Transform (FFT) frequency measurement curve, as shown in Figure 9-5. Each MOTU audio interface has its own FFT/spectrogram window.

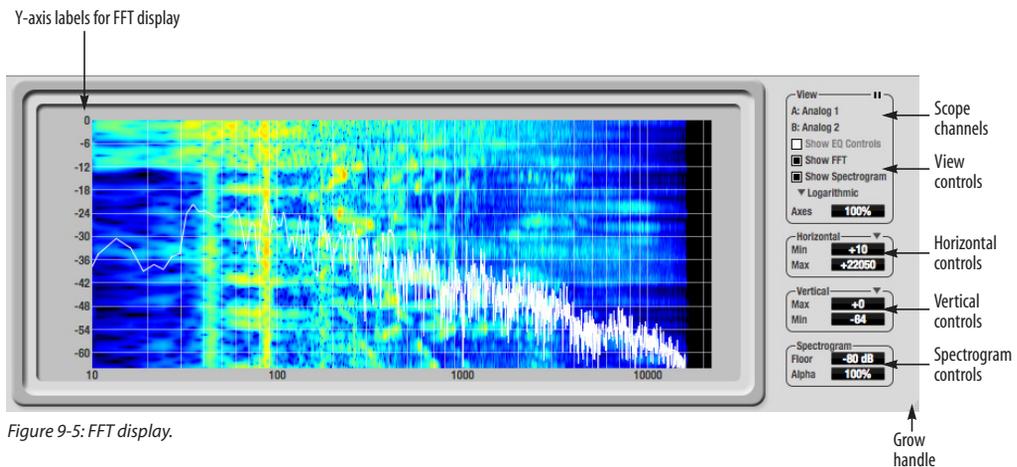


Figure 9-5: FFT display.

## Choosing a channel to display

The FFT window follows the currently chosen *Scope channels* (Figure 9-1 on page 52).

## View controls

You can show and hide the FFT display and spectrogram as desired using the *View controls* (Figure 9-7).

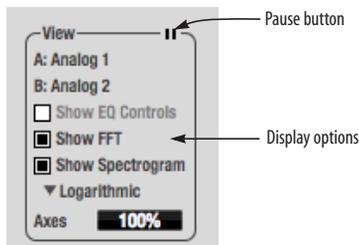


Figure 9-7: View controls

The *Show EQ controls* item is for other MOTU audio interfaces and is grayed out for the 4pre.

## Spectrogram

Click the *Show Spectrogram* option (Figure 9-7) to superimpose a real-time spectrogram “waterfall” display in the background of the FFT display, as demonstrated in Figure 9-5.

The spectrogram scrolls from top to bottom, where the top edge of the display represents what you are hearing “now”. Color represents amplitude along the left/right frequency spectrum. The amplitude color scale runs from black (silence) to red (full scale) as follows:



Figure 9-8: Spectrogram color-to-amplitude spectrum.

Also see “Spectrogram controls” on page 59.

## Logarithmic or Linear X-Axis Scale

The x-axis defaults to a logarithmic scale, but can be changed to a linear scale if desired. In the *View controls* (Figure 9-7), click *Logarithmic* to access the x-axis scale options menu. With a linear scale

selected, frequency is constant, but the width of each octave along the x-axis is different. With a logarithmic scale selected, octaves are displayed with a constant width, but frequency is displayed logarithmically within each octave.

## Axes display

The *Axes control* (Figure 9-7) sets the opacity of the grid displayed in the graph, from 100% (fully visible) down to 0% (fully hidden).

## Pausing the display

The *Pause button* in the upper right corner of the *View* section (Figure 9-7) allows you to freeze the display at any time. To resume, click the button again.

## Horizontal controls (frequency axis)

The *Horizontal controls* (Figure 9-7) configure the value range of the x-axis (frequency). Click and drag the values up or down to set them, or double-click to return to the default value.

There are two modes for the controls: *Zoom/Offset* and *Min/Max*. To change the mode, use the *Horizontal control menu* (Figure 9-9).

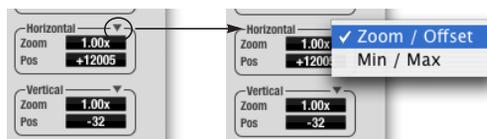


Figure 9-9: Horizontal control menu

In *Zoom/Offset* mode, *Zoom* sets the display zoom from 1x to 100x, where the number represents the zoom factor relative to the entire frequency range. For example, when the horizontal zoom value is 1x, the entire frequency range from 10 to 24000 Hertz is displayed; when the horizontal zoom value is 2x, one half of the entire frequency range is displayed. *Pos* determines which frequency is displayed at the center of the graph.

In *Min/Max* mode, *Min* and *Max* set the lowest and highest displayed frequencies (in Hertz).

### Vertical controls (amplitude axis)

The *Vertical* controls (Figure 9-7) operate similarly to the *Horizontal* controls, except that they configure the *y*-axis (amplitude).

In *Zoom/Offset* mode, *Zoom* sets the display zoom from 1x to 100x, and *Pos* sets the center amplitude of the graph.

In *Min/Max* mode, *Min* and *Max* set the smallest and largest displayed amplitude.

### Spectrogram controls

The *Floor* control (Figure 9-5) sets the amplitude threshold for the spectrogram display, from -144 dB up to 1 dB.

The *Alpha* control (Figure 9-5) sets the opacity of the spectrogram information displayed in the graph, from 100% (fully visible) down to 0% (fully hidden).

## OSCILLOSCOPE

The Oscilloscope (Figure 9-10) graphs the amplitude of an audio signal over time.

Amplitude is displayed on the *y*-axis and time is displayed on the *x*-axis. A thick white vertical line marks where time equals zero; a thick white horizontal line marks where amplitude equals zero (Figure 9-10, below).

Level meters are displayed to the right of the graph. One or two meters are shown, depending on the current view mode (see “View controls”).

### Opening the oscilloscope

Each MOTU audio interface has its own oscilloscope. To open an oscilloscope, choose the *Oscilloscope* item from the *Devices* menu under the desired interface (Figure 9-6).

### Choosing a channel to display

The oscilloscope follows the currently chosen *Scope channels* (Figure 9-1 on page 52).

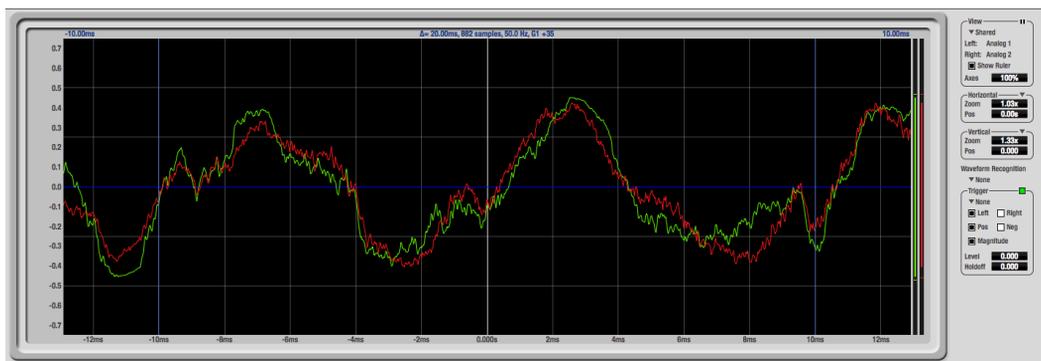


Figure 9-10: Oscilloscope

## View controls

The View controls (Figure 9-11) provide several options for the oscilloscope display.

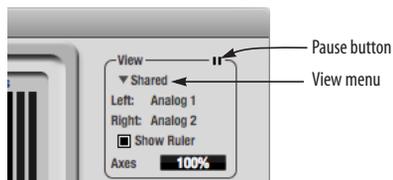


Figure 9-11: View controls

## View menu

The View menu (Figure 9-11) lets you choose how you wish to display the audio channel(s) being displayed.

View menu setting	What it displays
Left	Left channel only
Right	Right channel only
Split screen	Left channel on top; right channel on the bottom
Shared	Left and right on top of each other; left is green, right is red
Add	Left and right channels' amplitudes are added together
Subtract L-R	The right channel's amplitude is subtracted from the left channel's amplitude

## Display options

The *Axes* control (Figure 9-11) sets the opacity of the grid displayed in the graph, from 100% (fully visible) down to 0% (fully hidden). The *Show Ruler* option toggles the measurement items (see “Measurement information” on page 62).

## Pausing the display

The Pause button in the upper right corner of the View section (Figure 9-11) allows you to freeze the display at any time. To resume, click the button again. The level meters will remain active while the display is paused.

## Horizontal controls (time axis)

The *Horizontal* controls (Figure 9-12) configure the value range of the x-axis (time). Click and drag the values up or down to set them, or double-click to return to the default value.

There are two modes for the controls: *Zoom/Offset* and *Min/Max*. To change the mode, use the Horizontal control menu (Figure 9-12).

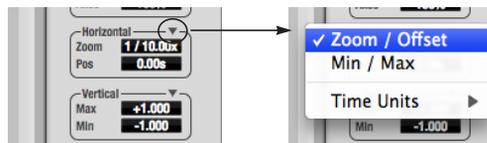


Figure 9-12: Horizontal control menu

In *Zoom/Offset* mode, *Zoom* sets the display zoom from 1/1000x to 10x, where the number represents the number of pixels per sample. For example, when the horizontal zoom value is 10x, 10 samples are displayed in 100 pixels; when the horizontal zoom value is 1/10x, 100 samples are displayed in 10 pixels. *Offset* moves the line marking time equals zero left or right.

In *Min/Max* mode, *Min* and *Max* set the earliest and most recent displayed time.

## Time Units

The *Time Units* sub-menu (Figure 9-12) provides the option to view the X axis in Seconds or Samples.

## Vertical controls (amplitude axis)

The *Vertical* controls (Figure 9-12) operate similarly to the Horizontal controls, except that they configure the y-axis (amplitude).

In *Zoom/Offset* mode, *Zoom* sets the display zoom from 1/2 to 200x, and *Offset* moves the line marking amplitude equals zero line up or down.

In *Min/Max* mode, *Min* and *Max* set the smallest and largest displayed amplitude.

## Waveform Recognition

The Waveform Recognition option searches through new audio data looking for a waveform which most resembles that which was previously displayed. The region where this takes place is a small window around the line marking time equals zero, denoted by the extra vertical graph lines surrounding it. There are two kinds of waveform recognition available: Type I and Type II.

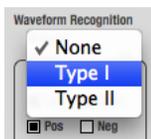


Figure 9-13: Waveform Recognition menu

Type I recognition provides the most stable display of the waveform. It is the most resistant to change. Louder transients, such as those produced by a snare drum, are not displayed inside of the waveform window. Type I is best for observing the shape of a signal produced by a synthesizer or observing the tone of a guitar through a chain of pedals.

Type II recognition is less resistant to change. It will include loud transients within the waveform recognition window. Type II is better for observing percussive music where the beat itself is to be centered within the waveform window.

## Trigger

When the *Trigger* (Figure 9-14) is not enabled (the Trigger menu is set to *None*), the graph updates based on time: after every  $n$  samples of the monitored audio signal, the most recent samples are displayed. When the Trigger is enabled (set to any mode other than *None*), the graph updates in response to specific conditions in the signal. The Trigger section defines that criteria and how the graph will display the events that match.

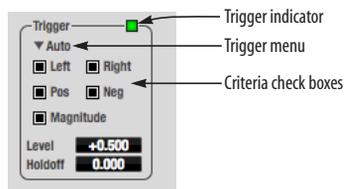


Figure 9-14: Trigger settings

## Criteria

The criteria check boxes (Figure 9-14) determine the conditions that the trigger is looking for and where it will look for them.

The *Left* check box causes the condition to be looked for in the left channel of the signal; likewise, the *Right* check box looks for the condition in the right channel. One or both of these can be enabled simultaneously. If neither is enabled, the criteria will not be found because the trigger is not looking at any audio signal.

The *Pos* and *Neg* check boxes determine the slope of the event. When the *Pos* check box is enabled, the trigger will look for an event where amplitude is increasing; likewise, enabling the *Neg* check box tells the trigger to look for an event where amplitude is decreasing. One or both of these can be enabled simultaneously. If neither is enabled, the criteria will not be found because the trigger is not looking for any particular kind of event.

The *Level* setting defines the amplitude threshold that the trigger is looking for. The Level is indicated on the graph by a blue horizontal line (or two blue horizontal lines, if *Magnitude* is enabled). Events which cross this threshold using the enabled slope(s) in the enabled channel(s) will activate the trigger. The response of the trigger is set by the Trigger mode (see “Trigger modes”, below).

Enabling the *Magnitude* check box tells the trigger to look for both positive and negative Level values, regardless of whether the Level value is positive or negative. For example, if Level is set to +0.500 and

*Magnitude* is enabled, the trigger will look for both +0.500 and -0.500. You will see a second blue line appear in the display when *Magnitude* is enabled to denote the second value.

### Holdoff

*Holdoff* defines a time interval during which the oscilloscope does not trigger. The most recent trace will be displayed during that period. When the period is over, the trigger is “re-armed”, i.e. it will begin looking for the criteria again.

Click and drag this value up or down to set it, or double-click to return to the default value.

### Trigger modes

The Trigger menu (Figure 9-14 on page 61) provides four modes:

Trigger mode	What it does
None	The Trigger is not active; this is the default mode. The incoming audio signal will be displayed continuously as audio is received.
Auto	The display is always updating, but when the condition is met, the trigger event will be displayed centered around the line marking time equals zero.
Normal	The display updates only when the condition is met; the last trace will be displayed until the next matching event is found.
Single Sweep	Similar to Normal mode, but the last trace will be displayed until you manually arm the trigger by clicking the Trigger indicator (Figure 9-14 on page 61) or by pressing the spacebar.

### Trigger indicator

The Trigger indicator (Figure 9-14 on page 61) displays the state of the trigger, and also provides a way to manually interact with it. The Trigger indicator always displays one of three colors:

Color	Status
Green	When the current Trigger criteria has been met (including when the Trigger mode is <i>None</i> ).
Yellow	When the Trigger is armed, but has not yet found an event which matches its criteria. Yellow can also indicate that the graph has been manually paused using the Pause button in the View section (see “Pausing the display” on page 60).
Red	When the Trigger is being held off, either because the Trigger mode is set to Single Sweep or the Holdoff time is not set to zero.

You can also click on the Trigger indicator to force certain actions, depending on the Trigger mode. In Auto and Normal modes, clicking on the Trigger indicator causes the display to run freely; you may click & hold to force this to occur for as long as you’d like. In Single Sweep mode, clicking on the Trigger indicator re-arms the trigger. When the Trigger mode is *None*, clicking on the Trigger indicator has no effect.

### Measurement information

You can view detailed information about a particular time range by using the measurement bars.

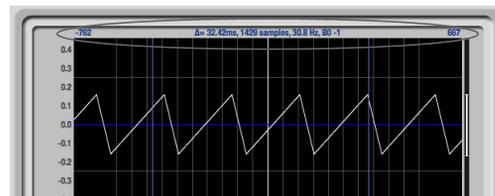


Figure 9-15: Measurement information

To adjust the left and right edges of the measurement area, click and drag the blue bars in the graph, or click and drag the blue numbers in the upper left or right corners. To reset them to the default value, double-click the numbers.

Information about the measured area is displayed at the center of the top ruler: the duration (in seconds and samples), the approximate frequency, and the scientific note name. If the measured area is long enough, the approximate beats per minute (bpm) is displayed.

### Ideas for using the Oscilloscope

The Oscilloscope can be used in many useful ways during the routine operation of your recording studio. Here are just a few examples.

#### Analyzing and comparing harmonic content

The oscilloscope lets you “see” the nature of the harmonic profile in any audio material. You can also view two signals side by side (in stereo mode) to compare their profiles and, if necessary, make adjustments to the source of each signal and view your changes in real time.

### Viewing transients such as drum hits

If you loop a snare hit or other similar transient audio clip and feed it through the oscilloscope, you can more or less “freeze” the transient waveform in the oscilloscope frame. This can be useful, for example, for viewing the results of real-time compression that you are applying with an effects plug-in, as demonstrated in Figure 9-16. In this example, a snare hit is being compressed by Digital Performer’s Dynamics plug-in. As you make adjustments to the compression plug-in’s settings, you can see the transient waveform change the next time the Oscilloscope triggers. For compression, this can be particularly useful for balancing the effect of the attack on the transient, relative to the decay portion of the waveform. Conversely, you can see the effect of the threshold setting directly on the decay portion, relative to the attack. In effect, you can see as well as hear the results of your compression adjustments.

To view a transient waveform in the Oscilloscope display, turn off Waveform Recognition and use the *Normal* Trigger mode. Adjust the level high enough to encompass the vertical amplitude of most of the transient. If the transient pulse sweeps across the

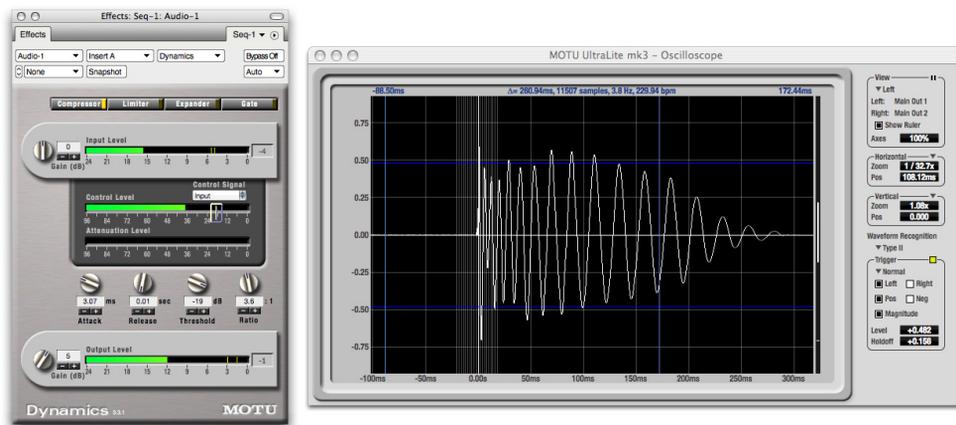


Figure 9-16: Viewing transients in the Oscilloscope

screen, try raising the Holdoff level. Once the transient is settled in the display and fairly stable, you may need to adjust the horizontal position to center it in the display. These settings are depicted in the example in Figure 9-16.

You can also pause the display at any time and adjust the horizontal bounds to locate a transient.

### Clip detection

You can use the Oscilloscope to detect clipping in a digital audio signal. To do so, enable all criteria (Figure 9-14 on page 61), choose *Single Sweep* from the trigger menu (Figure 9-14), set the level to 0.999 and click the trigger indicator (Figure 9-14) to arm it (yellow). As soon as the signal clips, the trigger indicator will turn red, and the display will show the offending clip at the line marking time equals zero.

### Viewing timing pulses

If you have two audio signals with recognizable, timed pulses in them, and you wish to compare their timing with respect to each other, you can use Split Screen or Shared view to visually compare the timing of the two signals. You can zoom in to the sample level for sample accurate viewing.

### Building synthesizer patches

If you are building a synth patch on a synthesizer (or forming similar highly periodic audio material), you can run the audio signal through the Oscilloscope as you adjust its sound to check in real time for undesirable (and possibly inaudible) characteristics, which are easily seen in the Oscilloscope display. A good example is DC offset. If a signal develops DC offset, the apparent vertical center of its overall waveform will drift above or below the line marking amplitude equals zero. Try setting Waveform Recognition to *Type I* and setting Trigger to *None*.

Another example is waveform polarity. If you are combining several raw waveforms, polarity is a critical, yet not always obvious, factor in determining the resulting sound. You can use the Oscilloscope to easily view and compare polarities to see if they are inverted from one another or not. The *Add* and *Subtract L - R* View menu settings are particularly useful here.

You can also use the Oscilloscope to help you apply waveform modulation and keep it “in bounds”. For example, you could easily see if pulse width modulation is collapsing in on itself to choke the sound, an effect that is readily seen in the Oscilloscope display but not necessarily easy to determine by ear when using multiple modulation sources.

Guitarists can also visually observe the effects of their pedals and processing, while playing. With the Trigger mode set to *None* and Waveform Recognition set to *Type I*, the waveform will be tracks automatically.

When applying filters and filter resonance, the visual effect on the waveform can be invaluable in reinforcing what you are hearing as you make adjustments.

**Monitoring control voltage output from Volta**  
MOTU’s Volta instrument plug-in for Mac OS X turns your audio interface into a control voltage interface, giving you precise digital control from your favorite audio workstation software of any hardware device with a control voltage (CV) input. The CV signals output from Volta can be monitored in the Oscilloscope, giving you visual feedback on LFOs, envelopes, ramps, step sequencers, and more.

For more information on Volta, see [www.motu.com](http://www.motu.com).

## X-Y PLOT

The *X-Y Plot* window (Figure 9-17) graphs the amplitude of a stereo audio signal on a two-dimensional grid.

For each unit of time (i.e. each sample), the amplitude of the left channel is displayed on the x-axis and the amplitude of the right channel is displayed on the y-axis. A thick white vertical line marks where left channel amplitude equals zero; a thick white horizontal line marks where right channel amplitude equals zero (Figure 9-17, below). There are also thick white diagonal lines for  $y = x$  and  $y = -x$ .

### Metering

Level meters are displayed above and to the right of the graph for the left (green) and right (red) channels, respectively. An additional *Correlation meter* (blue) is displayed on the right. This meter displays the correlation between the two channels.

The higher the meter, the higher the correlation between the two channels. Below are a few examples:

Situation	Meter level	X-Y Plot graph	Mathematical relationship
Perfect correlation	+1	Diagonal line going from lower left to upper right:	$y = x$
Zero correlation	0	No discernible pattern	None
Perfectly out of phase	-1	Diagonal line going from upper left to lower right:	$y = -x$

### Opening the X-Y Plot

Each MOTU audio interface has its own X-Y Plot window. Choose the *X-Y Plot* item from the Devices menu under the desired interface (Figure 9-6 on page 57).

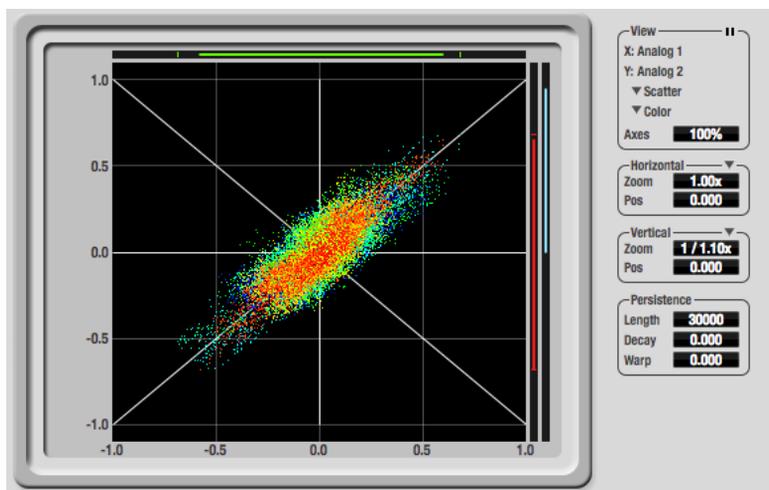


Figure 9-17: X-Y Plot

## Choosing a channel to display

The X-Y Plot follows the currently chosen *Scope channels* (Figure 9-1 on page 52).

## View controls

The View controls (Figure 9-18) provide several options for the X-Y Plot display.

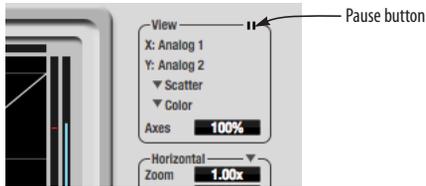


Figure 9-18: View controls

## Pausing the display

The Pause button in the upper right corner of the View section (Figure 9-18) allows you to freeze the display at any time. To resume, click the button again. The level meters will remain active while the display is paused.

## Line/Scatter

Choose either *Line* or *Scatter* from the menu in the View section (Figure 9-18) to plot each point (sample) as either a single pixel or as a continuous line that connects each plot point to the next, as shown below in Figure 9-19.

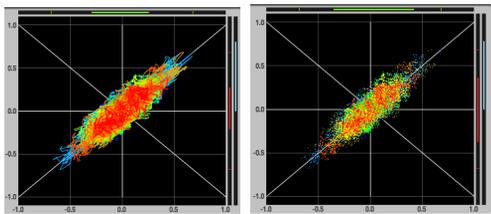


Figure 9-19: The same X-Y Plot displayed in Line versus Scatter mode.

Line mode is significantly more CPU intensive than Scatter. You can reduce Line mode CPU overhead on the X-Y Plot by reducing the Length parameter (described below).

## Color/Grayscale

In *Color* mode (Figure 9-18) the most recently displayed audio data is shown in red, which fades to yellow, green and then finally blue, before disappearing. In Grayscale mode, data is first shown in white and then fades to gray. To adjust the scale of this color/brightness change, see “Decay” on page 67.

## Axes

The *Axes* control (Figure 9-18) sets the opacity of the grid displayed in the graph, from 100% (fully visible) down to 0% (fully hidden).

## Horizontal and vertical controls

The *Horizontal* and *Vertical* controls (Figure 9-20) configure the value range of the x-axis (left channel amplitude), and y-axis (right channel amplitude), respectively. Click and drag the values up or down to set them, or double-click to return to the default value.

There are two modes for the controls: *Zoom/Offset* and *Min/Max*. To change the mode, use the menu shown in Figure 9-20.

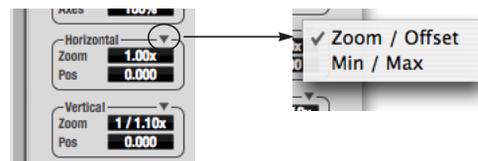


Figure 9-20: Setting the Horizontal or Vertical control modes.

In *Zoom/Offset* mode, *Zoom* scales the axis. *Pos* moves the lines marking  $x = 0$  left and right, or  $y = 0$  up and down.

In *Min/Max* mode, *Min* and *Max* let you scale the grid by moving the  $-1.0$  and  $+1.0$  points along the axis. *Min/Max* mode lets you control the graph boundaries directly.

## Persistence

The *Persistence* controls (Figure 9-21) affect the appearance of data from when it is first displayed until it disappears from the grid.

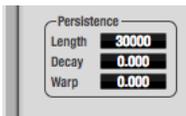


Figure 9-21: The Persistence controls.

## Length

*Length* (Figure 9-21) sets the number of recent samples to show on the plot. For example, when Length is set to 10,000, the 10,000 most recent samples are shown.

## Decay

The brightness (in Grayscale mode) or hue (in Color mode) of each sample on the plot is determined by a linear scale, with the most recent sample displayed at the maximum value and the oldest sample displayed at the minimum value.

*Decay* (Figure 9-21 on page 67) determines the brightness or hue of the minimum value. When Decay is zero, the oldest sample is black. When Decay is +1.000, the oldest sample is fully opaque (in Grayscale mode) or red (in Color mode).

## Warp

*Warp* (Figure 9-21) determines the position of data points after they are first drawn. When warp is zero, data points remain in the same position.

When warp is positive, they contract towards the origin (center of the grid). When warp is negative, they expand away from the origin. The further the warp value is from zero, the greater the effect.

## Using the X-Y Plot

The X-Y Plot helps you “see” the width of the stereo field of a mix. It also helps you determine if a mix has issues with polarity, as follows:

Activity on the X-Y Plot	What it indicates
Signal activity occurs mostly along the $x = y$ axis (lower left to upper right) and the Correlation meter reading is high	Left and right channels are predominantly in polarity (the stereo field is relatively narrow)
Signal activity occurs mostly along the $y = -x$ axis (upper left to lower right) and the Correlation meter reading is low (near -1)	Left and right channels are predominantly out of polarity (not in phase)
Signal activity occurs in a seemingly random fashion throughout the grid	No phase relationship exists (i.e. it is probably a wide stereo field)

If a stereo signal is out of phase, it is not mono compatible because it can cancel itself out, either partially or nearly completely, when collapsed to mono.

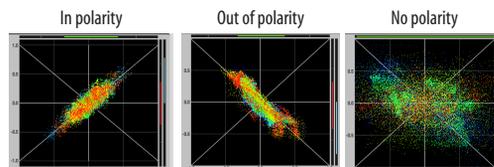


Figure 9-22: Checking polarity in a stereo signal with the X-Y Plot.

## PHASE ANALYSIS

The *Phase Analysis* window (Figure 9-23 on page 68) graphs frequency versus phase difference versus amplitude of a stereo signal on either rectangular or polar coordinates.

In rectangular coordinates, the vertical axis represents frequency, and the horizontal axis represents the phase of the left channel minus the phase of the right channel (measured in radians).

In polar coordinates, the radius represents frequency and the angle (theta) from the +y vertical axis represents the phase difference of left channel minus the right channel.

### Correlation Meter

The blue *Correlation Meter* to the right of the display shows the correlation between the two channels. The higher the meter, the higher the correlation between the two channels.

### Opening the Phase Analysis

Each MOTU audio interface has its own Phase Analysis window. Choose the *Phase Analysis* item from the Devices menu under the desired interface (Figure 9-6 on page 57).

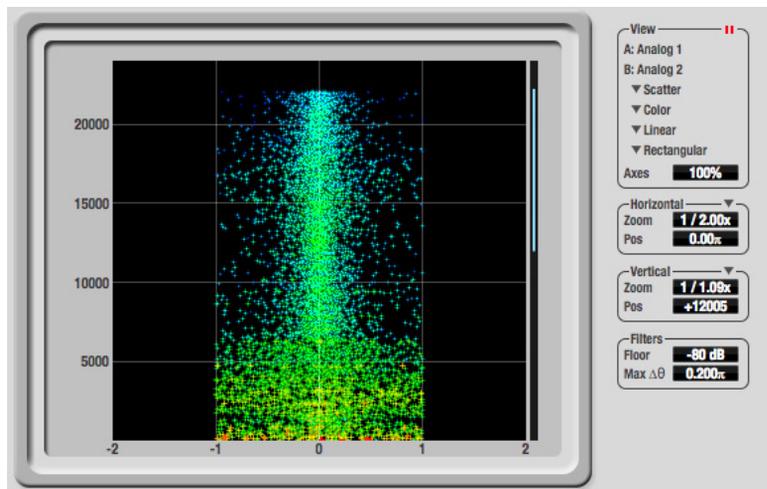


Figure 9-23: Phase Analysis

## Choosing a channel to display

The Phase Analysis window follows the currently chosen *Scope channels* (Figure 9-1 on page 52).

### View controls

The View controls (Figure 9-24) provide several options for the Phase Analysis display.

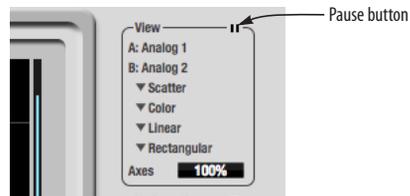


Figure 9-24: View controls

### Pausing the display

The Pause button in the upper right corner of the View section (Figure 9-24) allows you to freeze the display at any time. To resume, click the button again. The correlation meter will remain active while the display is paused.

### A/B (stereo audio channels)

The *View* section (Figure 9-24) displays the pair of input or output audio channels you are viewing. See “Choosing a channel to display” above.

### Line/Scatter

Choose either *Line* or *Scatter* from the menu in the View section (Figure 9-24) to plot each data point as either a single pixel or as a continuous line that connects each frequency data point to the next, as shown below in Figure 9-19.

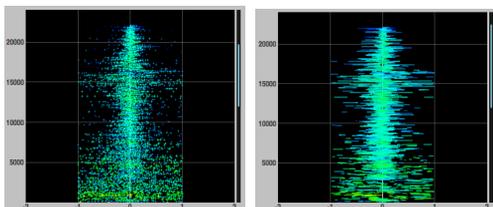


Figure 9-25: The same Phase Analysis displayed in Line versus Scatter mode.

☛ Line mode is significantly more CPU intensive than Scatter. You can reduce Line mode CPU overhead for the Phase Analysis display by increasing the Floor filter and reducing the Max Delta Theta filters (see “Filters” on page 70).

### Color/Grayscale

In *Color* mode (Figure 9-24) signal amplitude is indicated by color as follows: red is loud and blue is soft. In grayscale mode, white is loud and gray is soft.

### Linear/Logarithmic

Choose either *Linear* or *Logarithmic* from the menu in the View section (Figure 9-24) to change the scale of the frequency axis. In rectangular coordinates, the vertical axis represents frequency, and in polar coordinates, the radius from the center is frequency. With a linear scale, frequencies are spaced evenly; in a logarithmic scale, each octave is spaced evenly (frequencies are scaled logarithmically within each octave).

Linear is better for viewing high frequencies; logarithmic is better for viewing low frequencies.

### Rectangular/Polar

Choose either *Rectangular* or *Polar* from the menu in the View section (Figure 9-24) to control how audio is plotted on the Phase Analysis grid.

*Rectangular* plots the audio on an X-Y grid, with frequency along the vertical axis and phase difference on the horizontal axis. *Polar* plots the data on a polar grid with zero Hertz at its center. The length of the radius (distance from the center) represents frequency, and the angle (theta) measured from the +y (vertical) axis represents the phase difference in degrees.

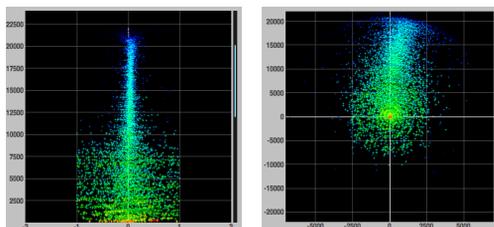


Figure 9-26: Rectangular versus Polar display (with a linear plot).

Above, Figure 9-26 shows Rectangular versus Polar display with a Linear plot. Below, Figure 9-27 shows the same displays (and the same data) with a Logarithmic plot:

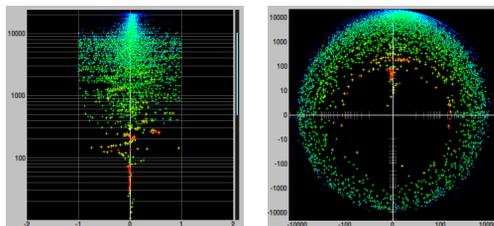


Figure 9-27: Rectangular versus Polar display with a logarithmic plot.

### Axes

The *Axes* control (Figure 9-24) sets the opacity of the grid displayed in the graph, from 100% (fully visible) down to 0% (fully hidden).

## Horizontal and vertical controls

The *Horizontal* and *Vertical* controls (Figure 9-28) let you scale each axis of the grid and offset its zero point. Click and drag the values up or down to set them, or double-click to return to the default value.

There are two modes for the controls: *Zoom/Offset* and *Min/Max*. To change the mode, use the menu shown in Figure 9-28.

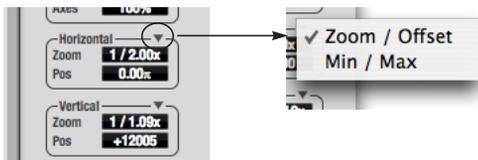


Figure 9-28: Setting the Horizontal or Vertical control modes.

In *Zoom/Offset* mode, *Zoom* scales the axis. *Pos* moves the zero line.

In *Min/Max* mode, *Min* and *Max* let you scale the grid by moving the end points along the axis. *Min/Max* mode lets you set the boundaries of the graph directly.

## Filters

The *Filters* section (Figure 9-29) lets you control the density of the Phase Analysis display.

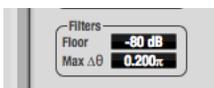


Figure 9-29: Filters

## Floor

*Floor* (Figure 9-29) determines the amplitude threshold for the display. When the amplitude of both channels drops below this threshold, the signal is not shown.

## Max delta theta

*Max delta theta* (Figure 9-29) only affects Line view (see “Line/Scatter” on page 69) and sets the maximum difference in frequency between plot points in the line plot. For two adjacent

frequencies, if the distance (phase difference) between the two frequencies is greater than the Max delta theta, then the line is not drawn.

## Using the Phase Analysis

In the polar display (top row of Figure 9-30 on page 71), stereo material that is predominantly phase-aligned (correlated) appears along the vertical axis, as demonstrated in the first column (*Perfectly in phase*) in Figure 9-30. If the vertical line tilts left or right, this indicates general differences in phase; the more the tilt (delta theta), the more the phase difference. If the vertical line points downwards in the polar display, this indicates that the stereo image is predominantly out of polarity, as demonstrated by the fourth column (*Inverted*) in Figure 9-30. Delays appear as spirals in the polar display.

The rectangular display (bottom row of Figure 9-30) also shows a predominantly phase-aligned stereo image along the vertical axis, and tilt (or left-right offset) from the center vertical axis represents differences in phase. If a signal is predominantly out of polarity, it appears along the  $\theta = -1.0$  or  $\theta = +1.0$  lines in the rectangular display, as demonstrated in the fourth column (*Inverted*) in Figure 9-30 on page 71.

## Using Phase Analysis for multiple mic placement

The polar display can be very useful when recording drums or another instrument with multiple microphones. The slight delays caused by the differences in distance to the source can often create a comb filtering (delay) effect between two mic signals, due to phase cancellation. These comb filter effects appear as spirals in the polar display. If you arrange the mics so that the null points (where the spiral pattern meets the negative y axis) are

outside the critical frequency range of the instrument being recorded, you can avoid phase problems among the mic signals.

### Tuning PA systems

The Phase Analysis window can also be used to troubleshoot and tune PAs and sound reinforcement systems by placing microphones in strategic locations, comparing the two signals in the Phase Analysis grid and looking for phase issues at various locations.

### Summing to mono

The Phase Analysis window is ideal for checking stereo audio that needs to be summed to mono. The Phase Analysis lets you see what frequencies will be canceled out when summed.

In the rectangular view, any lines in the signal that touch the +1.0 or -1.0 vertical lines in the grid will be canceled out at the frequency where they touch, when the signal is summed to mono.

In the polar view, any signal that falls on the negative y axis (below zero) in polar view will be canceled out when the signal is summed to mono.

### Checking for phase issues in stereo tracks

You can use the Phase Analysis window to check the overall polarity of a stereo mix. Figure 9-31 is an example of a full stereo mix that has phase issues, as indicated by the majority of the signal's energy, which is predominantly skewed to the left side of the rectangular view (left) and spread along the -y axis in the polar view (right).

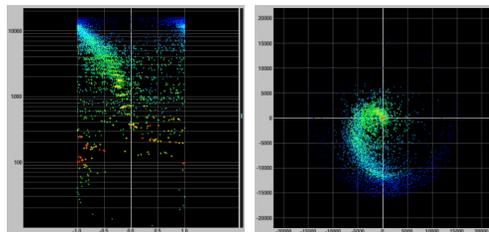


Figure 9-31: A stereo mix with phase issues.

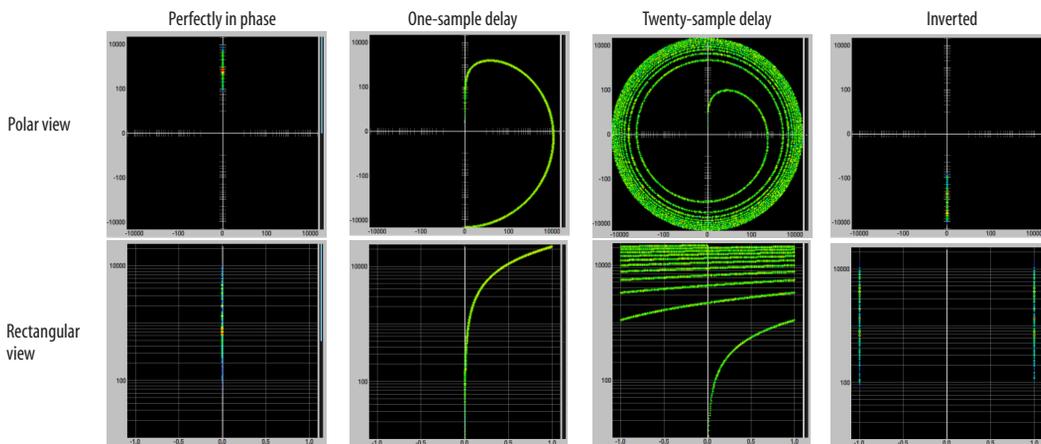
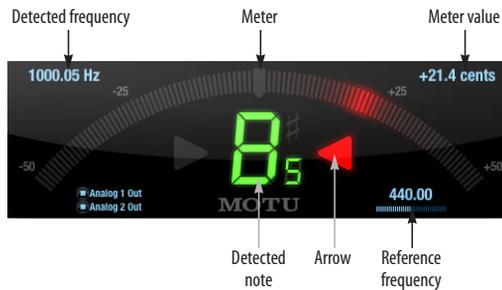


Figure 9-30: Two identical audio streams in the Phase Analysis.

## TUNER



The *Tuner* window is an accurate and easy to use tuner.

### Opening the Tuner

Each MOTU audio interface has its own Tuner window. Choose the *Tuner* item from the Devices menu under the desired interface (Figure 9-6 on page 57).

### Choosing a channel to tune

The Tuner follows the currently chosen *Scope channels* (Figure 9-1 on page 52).

In the Tuner window, the displayed channel pair is shown in the lower left corner. Each channel has a checkbox to enable or disable its input to the tuner.

### Tuner controls

**Detected frequency:** fundamental frequency of the incoming signal, in Hertz (Hz).

**Detected note:** note name and octave that correspond to the detected fundamental frequency.

**Meter:** representation of the pitch difference between the detected note and the detected fundamental frequency. The horizontal position of the illuminated segments indicates how far the detected frequency is from the detected note. The number of illuminated segments indicates uncertainty or inharmonicity in the signal; a greater number of illuminated segments represents

greater uncertainty. The color of the segments changes gradually from green (in tune) to yellow, orange, and red (progressively further out of tune).

**Meter value:** difference between the detected note and the detected frequency, in cents.

**Arrows:** the direction in which the detected frequency needs to move to match the frequency of the detected note. The color of the arrows changes progressively in the same manner as the meter segments. When the detected fundamental frequency matches the detected note within three cents, both arrows will be illuminated.

**Reference frequency:** sets the frequency reference for the pitch A4, between 400 and 480 Hz. The default frequency is 440 Hz. The reference frequency can be adjusted by dragging on the bar below the number, or by clicking the number and typing a value. To reset the tuner to the default frequency, double-click the slider, or click the number, press the Delete key, and press Enter.

### Tuning stereo signals

When tuning a stereo signal, the tuner analyzes the sum of the two channels. If the channels are not phase coherent, the tuner may not be able to measure the frequency of the signal. To tune only one channel of the channel pair, disable one of the channels as described in “Choosing a channel to tune”.

## CONFIGURATIONS MENU

A configuration is just like a hardware preset (a “snapshot” of all settings in CueMix FX and therefore the 4pre hardware itself), except that it can be created and managed using the CueMix FX software on your computer, completely independently of the 4pre hardware. The commands in the Configurations menu let you create, save, load, import, export and otherwise manage as many configurations as you wish.

Here is a summary of Configurations menu operations:

<b>Configurations Menu item</b>	<b>What it does</b>
Create New	Lets you name and save a new configuration, which appears at the bottom of the Configurations menu.
Save	Overwrites the current configuration (checked in the list at the bottom of the menu) with the current settings in CueMix FX.
Save To	Same as Save above, except that it lets you first choose the configuration you wish to save to (instead of the current one).
Delete	Lets you choose a configuration to permanently remove from the menu.
Import	Loads all configurations from a configuration file on disk.
Export	Saves all current configurations as a file on disk.
Configuration list	Choose any configuration to load it. The current (last loaded or saved) configuration has a check mark next to it.

### Modifying a configuration

The name of the current configuration is displayed in the CueMix FX window title bar. If you make any changes to the settings in CueMix FX, an asterisk appears in front of the name to remind you that the current state of CueMix FX doesn't match the saved configuration. If you wish to update the saved configuration with the new changes, use the Save command. To save the current state of CueMix FX to another configuration, use Save To. To save as a new, separate configuration, use Create New.

### Saving a CueMix FX configuration as a hardware preset

To save a CueMix FX configuration as a hardware preset:

- 1 Choose the configuration from the Configurations menu to make it the current active configuration.
- 2 Choose *File menu* > *Save Hardware Preset*.

- 3 Type in a name, choose a preset slot and click OK.

### Saving a hardware preset as a CueMix FX configuration

To save a hardware preset as a CueMix FX configuration:

- 1 Choose *File menu* > *Load Hardware Preset* to make it the current active preset.
- 2 Choose *Configuration menu* > *Create New* (or *Save To*) to save it as a configuration.

### TALKBACK MENU

Choose the commands in the Talkback menu to engage or disengage Talkback or Listenback. See "Talkback and listenback" on page 54.

### PHONES MENU

The Phones menu allows you to choose what you will hear on the headphone output, just like the Phones setting in MOTU Audio Console. However, this menu provides one extra option that is exclusive to CueMix FX: *Follow Active Mix*. This menu item, when checked, causes the headphone output to mirror the output of the current mix being viewed in CueMix FX. For example, if you are currently viewing mix bus 3, the headphones will mirror the mix bus 3 output (whatever it is assigned to).

### CONTROL SURFACES MENU

CueMix FX can be controlled from an automated control surface such as the Mackie Control™. Use the commands in the *Control Surfaces* menu to enable and configure this feature.

### Application follows control surface

When checked, the *Application follows control surface* menu command makes the CueMix FX window scroll to the channel you are currently adjusting with the control surface, if the channel is not visible when you begin adjusting it. The same is true for the bus tabs: if you adjust a control in a bus

that is not currently being displayed, CueMix FX will jump to the appropriate tab to display the control you are adjusting.

### Share surfaces with other applications

When the *Share surfaces with other applications* menu command is checked, CueMix FX releases the control surface when you switch to another application. This allows you to control your other software with the control surface. Here's a simple way to understand this mode: the control surface will always control the front-most application. Just bring the desired application to the front (make it the active application), and your control surface will control it. When you'd like to make changes to CueMix FX from the control surface, just bring CueMix FX to the front (make it the active application).

When this menu item is unchecked, your control surface will affect CueMix FX all the time, even when CueMix FX is not the front-most application. In addition, you will not be able to control other host audio software with the control surface at any time (because CueMix FX retains control over it at all times). This mode is useful when you do not need to use the control surface with any other software.

### CueMix Control Surfaces

CueMix FX includes support for the following control surface products:

- Mackie Control™
- Mackie HUI™
- Mackie Baby HUI™

Use the sub-menu commands in the *CueMix Control Surfaces* menu item to turn on and configure control surface support, as described briefly below.

### Enabled

Check this menu item to turn on control surface operation of CueMix FX. Uncheck it to turn off control surface support.

### Configure...

Choose this menu item to configure your control surface product. Launch the on-line help for specific, detailed instructions on configuring CueMix FX for operation with your control surface product.

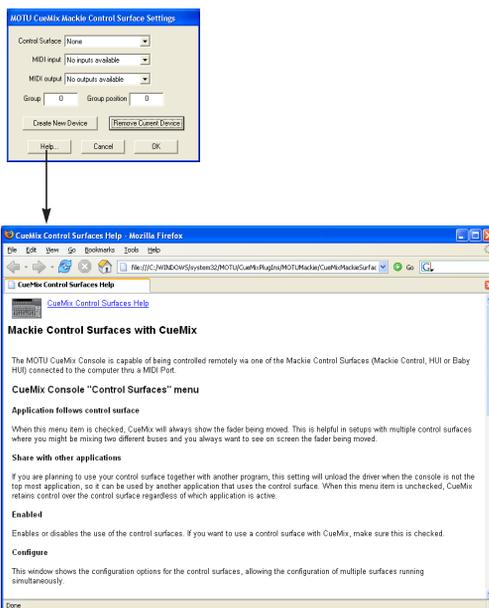


Figure 9-32: Refer to the extensive on-line help for details about configuring CueMix FX for operation with your control surface product.

# CHAPTER 10 MOTU SMPTE Console

## OVERVIEW

The 4pre can resolve directly to SMPTE time code via any analog input, without a separate synchronizer. The 4pre can also generate time code via any analog output. The 4pre provides a DSP-driven phase-lock engine with sophisticated filtering that provides fast lockup times and sub-frame accuracy. Direct time code synchronization is supported by Cubase, Nuendo and other audio sequencer software that supports the ASIO 2 or 3 sample-accurate sync protocol.

<b>MOTU SMPTE Console</b> .....	<b>75</b>
<b>Clock/Address</b> .....	<b>75</b>
<b>Frame Rate</b> .....	<b>75</b>
<b>Reader section</b> .....	<b>76</b>
<b>Generator section</b> .....	<b>77</b>
<b>Resolving Cubase or Nuendo to time code</b> .....	<b>77</b>
<b>Syncing to SMPTE time code</b> .....	<b>78</b>

## MOTU SMPTE CONSOLE

The included MOTU SMPTE Console™ software provides a complete set of tools to generate SMPTE for striping, regenerating or slaving other devices to the computer.

## CLOCK/ADDRESS

The *Clock/Address* menu (Figure 10-1) provides the same global *Master Clock Source* setting as in MOTU Audio Console (“Master Clock Source” on page 32), but it includes additional information: each setting shows both the clock and the address (time code or sample location), separated by a forward slash (/). To resolve the 4pre to SMPTE time code, choose the *SMPTE / SMPTE* setting in the *Clock/Address* menu. This means that the system will use SMPTE as the clock (time base) and SMPTE as the address.

## FRAME RATE

This setting should be made to match the SMPTE time code frame rate of the time code that the system will be receiving. The 4pre can auto-detect

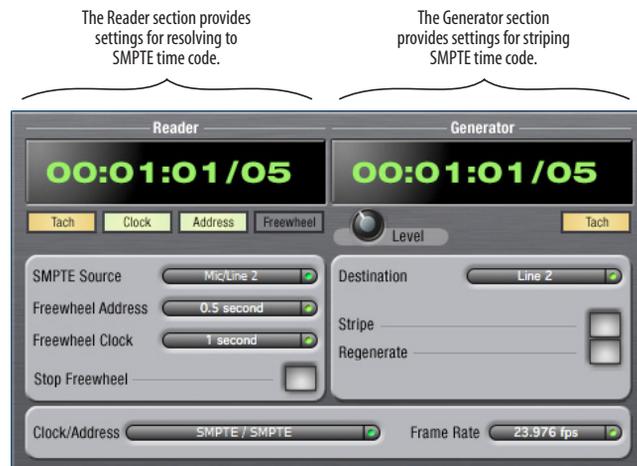


Figure 10-1: SMPTE Setup gives you access to your 4pre's on-board SMPTE time code synchronization features.

and switch to the incoming frame rate, except that it cannot distinguish between 30 fps and 29.97 fps time code, or 23.976 and 24 fps time code. So if you are working with either of these rates, make sure you choose the correct rate from this menu.

## READER SECTION

The Reader section (on the left-hand side of the window in Figure 10-1) provides settings for synchronizing the 4pre to SMPTE time code.

### Status lights

The four status lights (Tach, Clock, Address and Freewheel) give you feedback as follows.

#### Tach

The Tach light blinks once per second when the 4pre has successfully achieved lockup to SMPTE time code and SMPTE frame locations are being read.

#### Clock

The Clock light glows continuously when the 4pre has successfully achieved lockup to an external time base, such as SMPTE time code or the S/PDIF input.

#### Address

The Address light glows continuously when the 4pre has successfully achieved lockup to SMPTE time code.

#### Freewheel

The Freewheel light illuminates when the 4pre is freewheeling address (time code), clock or both. For details about Freewheeling, see “Freewheel Address” and “Freewheel clock” below.

#### SMPTE source

Choose the analog input that is connected to the time code source. This is the input that the 4pre “listens” to for time code.

### Freewheel Address

Freewheeling occurs when there is a glitch or drop-out in the incoming time code for some reason. The 4pre can freewheel past the drop-out and then resume lockup again as soon as it receives readable time code. Choose the amount of time you would like the 4pre to freewheel before it gives up and stops altogether.

The 4pre cannot freewheel address without clock. Therefore, the *Freewheel Address* setting will always be lower than or equal to the *Freewheel Clock* setting, and both menus will update as needed, depending on what you choose.

Keep in mind that freewheeling causes the system to keep going for as long as the duration you choose from this menu, even when you stop time code intentionally. Therefore, if you are starting and stopping time code frequently (such as from the transports of a video deck), shorter freewheel times are better. On the other hand, if you are doing a one-pass transfer from tape that has bad time code, longer freewheel times will help you get past the problems in the time code.

#### The ‘Infinite’ freewheel setting

The *Infinite* freewheel setting in the *Freewheel Address* menu causes the 4pre to freewheel indefinitely, until it receives readable time code again. To make it stop, click the *Stop Freewheeling* button.

### Freewheel clock

Freewheeling occurs when there is glitch or drop-out in the incoming SMPTE time code for some reason. The 4pre can freewheel past the drop-out and then resume lockup again as soon as it receives a stable, readable clock signal.

The 4pre cannot freewheel address without clock. Therefore, the *Freewheel Address* setting will always be lower than or equal to the *Freewheel Clock* setting, and both menus will update as needed, depending on what you choose.

### The ‘Infinite’ freewheel setting

The *Infinite* freewheel setting in the *Freewheel Clock* menu causes the 4pre to freewheel indefinitely, until it receives readable time code again. To make it stop, click the *Stop Freewheeling* button.

### Stop Freewheeling

The Stop Freewheeling button stops the system if it is currently freewheeling.

## GENERATOR SECTION

The Generator section (on the right-hand side of the window in Figure 10-1) provides settings for generating SMPTE time code.

### Level

Turn the level knob to adjust the volume of the SMPTE time code being generated by the 4pre. The level knob disappears when the Destination is set to *None*.

### Tach light

The Tach light blinks once per second when the 4pre is generating SMPTE time code.

### Destination

In the *Destination* menu, choose either *SMPTE* (to generate time code) or *None* (to turn it off).

### Stripe

Click this button to start or stop time code. To set the start time, click directly on the SMPTE time code display in the Generator section and type in the desired start time. Or drag vertically on the numbers.

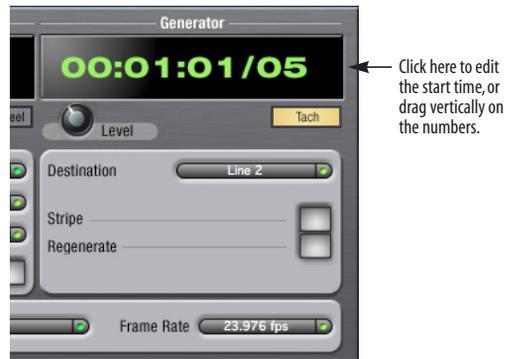


Figure 10-2: Setting the time code start time.

### Regenerate

This option, when enabled, causes the generator to generate time code whenever the 4pre is receiving SMPTE time code.

## RESOLVING CUBASE OR NUENDO TO TIME CODE

To resolve your 4pre and Cubase or Nuendo directly to SMPTE time code with no additional synchronization devices, use the setup shown in “Syncing to SMPTE time code” on page 78. Make sure the *Master Clock Source* setting in the MOTU Audio Console window is set to *SMPTE*. Also, make sure that you’ve connected an LTC input signal to a 4pre analog input, and that you’ve specified that input in the *SMPTE Source* menu in SMPTE Console.

## SYNCING TO SMPTE TIME CODE

The 4pre system can resolve directly to SMPTE time code. It can also generate time code, under its own clock or while slaving to time code. Therefore, the 4pre can act both as an audio interface and as a SMPTE time code synchronizer to which you can slave other devices. You can use the 4pre to slave your audio software to SMPTE as well, via sample-accurate sync (if your host software supports it).

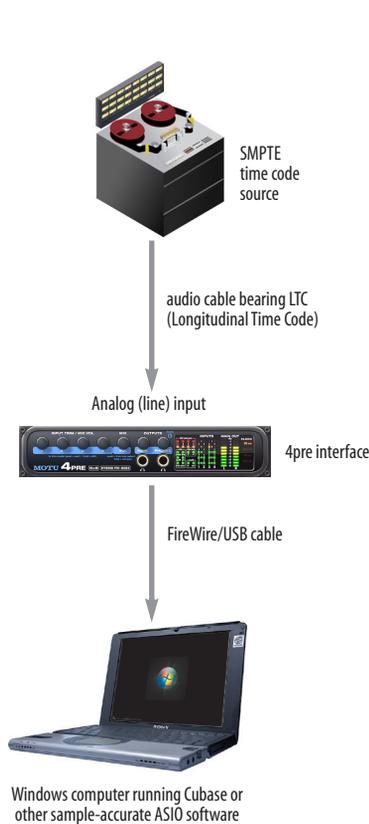


Figure 10-3: Connections for synchronizing the 4pre directly to SMPTE time code.

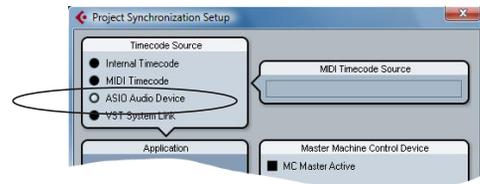
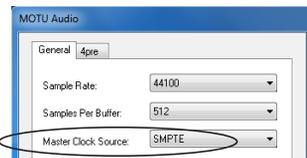
### Use this setup if you have:

- ✓ A SMPTE time code source, such as a multitrack tape deck.
- ✓ An 4pre by itself, OR with another slaved device (such as a digital mixer).
- ✓ Host software that supports sample-accurate sync.

### This setup provides:

- ✓ Continuous sync to SMPTE time code.
- ✓ Sub-frame timing accuracy.
- ✓ Transport control from the SMPTE time code source.

Choose *SMPTE* as the clock source in MOTU Audio Setup. This setting can also be made in the MOTU SMPTE Console (shown below).



In Cubase, go to the Synchronization window and choose *ASIO Audio Device* as the Timecode Base.



Launch the MOTU SMPTE Console and specify the *SMPTE Source*, which is the interface receiving the SMPTE time code. Also, confirm that the *Clock Source/Address* is *SMPTE/SMPTE*.

## CHAPTER 11 Troubleshooting

*Things seems like they are working fine, but the 4pre then just drops off line, and the computer can't see it anymore.*

This is a common symptom when the problem is that the 4pre is not getting enough power when it is being powered over the Firewire bus. Check the power source for the 4pre. Make sure that the power connection meets the requirements outlined in “Power options” on page 23.

*Slaving directly to time code in AudioDesk or Digital Performer*

To slave Digital Performer or AudioDesk directly to time code, be sure to go to the Receive Sync dialog in Digital Performer or AudioDesk and switch from “MTC” to “Sample-accurate.”

*4pre inputs and outputs are not visible in Cubase*

You probably need to enable them in Cubase.

*Can't authenticate AudioDesk*

When installing software off the CD-ROM, the OK button does not become active until you have entered in your name and a valid keycode. Your name must contain at least 3 characters, and you must enter the keycode exactly as it appears in your AudioDesk manual (on the inside of the back cover). If you continue to have difficulties, try repairing Mac OS X disk permissions using *Disk Utility*.

*Clicks and pops due to hard drive problems*

If you have checked your clock settings and you are still getting clicks and pops in your audio, you may have a drive related problem. Set your Clock Source to *Internal* and try recording just using the analog inputs and outputs of the 4pre. If you encounter the same artifacts you may want try using another drive in your computer. Clicks and pops can also occur when the drive is severely fragmented or the disk drivers are outdated.

*Connecting or powering gear during operation*

It is not recommended that you connect/disconnect, or power on/off devices connected to the 4pre while recording or playing back audio. Doing so may cause a brief glitch in the audio.

*How do I monitor inputs?*

Please refer to the documentation for the audio application that you are using. If your application does not support input monitoring, you will need to use the 4pre's hardware-based CueMix monitoring feature. Please see “Mixing with the front panel controls” on page 36.

*Controlling monitoring latency*

See chapter 8, “Reducing Monitoring Latency” (page 45).

### CUSTOMER SUPPORT

We are happy to provide customer support to our registered users. If you haven't already done so, please take a moment to register on line at [motu.com](http://motu.com), or fill out and mail the registration card included with your 4pre. Doing so entitles you to technical support and notices about new products and software updates.

### REPLACING DISCS

If your 4pre software installer disc becomes damaged and fails to provide you with fresh, working copies of the software, our Customer Support Department will be glad to replace it. You can request a replacement disc by calling our business office at (617) 576-2760 and asking for the customer service department. In the meantime, you can download the latest drivers from [www.motu.com](http://www.motu.com).

## TECHNICAL SUPPORT

If you are unable, with your dealer's help, to solve problems you encounter with the 4pre system, you may contact our technical support department in one of the following ways:

- Tech support hotline: (617) 576-3066 (Monday through Friday, 9 am to 6 pm EST)
- Tech support 24-hour fax line: (617) 354-3068
- Online support: [www.motu.com/support](http://www.motu.com/support)

Please provide the following information to help us solve your problem as quickly as possible:

- The serial number of the 4pre system. This is printed on a sticker placed on the bottom of the 4pre unit. You must be able to supply this number to receive technical support.

- A brief explanation of the problem, including the exact sequence of actions which cause it, and the contents of any error messages which appear on the screen.

- The pages in the manual which refer to the parts of the 4pre or AudioDesk with which you are having trouble.

- The version of your computer's operating system.

We're not able to solve every problem immediately, but a quick call to us may yield a suggestion for a problem which you might otherwise spend hours trying to track down.

If you have features or ideas you would like to see implemented, we'd like to hear from you. Please write to the 4pre Development Team, MOTU Inc., 1280 Massachusetts Avenue, Cambridge, MA 02138.

1394 connector 8, 12, 20, 21  
24-bit

recording 13

4-pin FireWire 23

4pre

connecting multiple interfaces 26

expansion 26

installing 19

power switch 35

rear panel overview 11

SMPTE setting 33

summary of features 11  
tab 31

6-pin FireWire 23

828

connecting to 4pre 26

896mk3

connecting to 4pre 26

## A

Ableton Live 39, 41

Analog inputs/outputs 8

making connections to 22  
trim 53

Application follows control surface 73

ASIO 14, 18

SONAR 42

Audio

sample rate 32

Audio Setup software 17, 31

Avid Pro Tools 40

## B

Balance 54

Balanced analog 22

Buffer Size 33, 47

Bus

fader 53

Bus power 23

examples 24

requirements 23

## C

Cakewalk SONAR 42

Clear Peaks 56

Clock Source 32

Clock source 9

SMPTE setting 33

Cockos Reaper 41

Combo jacks 8

Condenser mic input 7, 22

Configurations menu 72

Configure interface 26

Connecting multiple 4pres 26

Control Surfaces menu 73

Copy/Paste 56

Cubase 14, 31, 39

clock source 39

enabling the 4pre ASIO driver 42

Mac OS X 41

phones 40

sample rate 39

troubleshooting 79

CueMix FX 48, 51-74

Application follows control surface  
73

Configurations menu 72

control surfaces 74

Control Surfaces menu 73

CueMix control surfaces 74

Devices menu 57

Edit menu 56

File menu 56

installation 51

Listenback explained 54

listenback settings 55

Mixer 35

Phones menu 73

Share surfaces with other applica-  
tions 74

stand-alone operation 51

Talkback menu 73

talkback settings 54, 55

Customer support 79

## D

Daisy-chaining 23, 26

DAT

connecting 23, 25

DC power supply 24

Delay (latency) 45

Devices menu 57

Disc

replacing 79

Drivers

ASIO 18

installing USB drivers 17

Legacy MME (Wave) 9, 18

Dynamic mic 22

## E

Enable Pedal 34

Expansion 26

## F

Factory defaults 38

Feedback loops 44

FFT Analysis 57

File menu

Clear Peaks 56

Copy/Paste 56

Hardware Follows CueMix Stereo  
Settings 56

Load Hardware Preset 56

Mix1 return includes computer out-  
put 56, 57

Peak/Hold Time 56

Save Hardware Preset 56

undo/redo 56

FireWire 12

6-pin vs. 4-pin 23

additional busses 27

connecting 20, 21

connector 8

PC card adapters 24

PCI cards 24

Follow Active Mix 73

Freewheel

address 76

clock 76

infinite 76, 77

Front panel 35

## G

GarageBand

clock source 39

phones 40

sample rate 39

General tab 31

GSIF driver 14

Guitar

connecting 22, 25

## H

Hardware Follows CueMix Stereo Settings  
56

Hardware reset 38

Headphone jack 7, 13

Headphone output 13

Headphones

connecting 25

controlling output 9, 34

HUI 14

## I

Infinite freewheel 76, 77

Inputs

analog 8

pan 54

S/PDIF 8

trim 53

Installation

hardware 19

Installer CD

replacing 79

Internal (sync setting) 32

Invert phase 53

## L

Laptop operation 24

Latency 33, 40, 45, 47, 48, 51

Level meter

bus 53

Listenback

explained 54

Live 41

Load Hardware Preset 56

Logic Pro/Express

clock source 39

phones 40

sample rate 39

## M

Mac OS X 39

input and output names 44

Mackie Control 74

Main outs

jacks 8

volume control 7

Main volume 7, 13

- Master Clock Source 32
- Master fader
  - mix busses 53
- Mic/guitar inputs
  - trim 53
- Mic/instrument inputs 8, 22
  - connecting 25
  - overview 12
  - phantom power 7
- Mix 1 Return 1-2 44
- Mix bus
  - level meter 53
  - mute 53
- Mix1 return includes computer output 56, 57
- MME driver 9, 18
- Monitoring 46
- Mono button 53
- MOTU
  - ASIO driver 18
- MOTU Audio Console 31
- MOTU Audio Setup 9, 17, 31
- MOTU SMPTE Setup 75
- Multiple interfaces 26

## N

- Nuendo 14, 31, 39
  - clock source 39
  - Mac OS X 41
  - phones 40
  - sample rate 39

## O

- Optimization 48
- OS X audio software
  - clock source 39
  - phones 40
  - sample rate 39

- Outputs
  - analog 8

## P

- Packing list 15
- Pad 22
- Paste 56
- Patch thru
  - latency 33, 48
- PCI
  - FireWire adapters 27
- PCMCIA adapters 27
- Peak/Hold Time 56
- Performance 48
- Phantom power 13, 22
- Phase 53
- Phones 7, 9, 35

- menu 73
- Phones 1-2 output 44
- Phones Assign 34
  - 3rd party software 40
- Polarity 24
- Power supply 24
  - jack 8
- Power switch 24, 35
- Precision Digital Trim 12
- Pro Tools 39, 40
- Propellerhead Reason 41
- Propellerhead Record 41

## R

- Reaper 39, 41
- Reason 39, 41
- Record 39, 41
- Regenerate 77
- Registration 15
- Return Assign 44

## S

- S/PDIF 8, 12
  - clock source setting 33
  - connection 22
  - sync 23
  - trim 53
- Sample rate 9, 32
- Samplers
  - connecting 25
- Samples Per Buffer 9, 33, 47
- Samples per buffer 40
- Save Hardware Preset 56
- Scope channel selection 56, 57
- Scope channels 58, 59, 66, 68, 72
- Share surfaces with other applications 74
- Show EQ controls 58
- Show Spectrogram 58
- SMPTE
  - overview 75
  - Setup application 75
  - source setting 76
  - sync 75
- SMPTE sync 78
- SONAR 14, 39, 42
- Sony
  - Sound Forge 43
- Sound Forge 43
- Soundtrack Pro
  - clock source 39
  - phones 40
  - sample rate 39
- Stand-alone operation 35, 38, 51
- Stereo button 53
- Stop Freewheeling 76

- Stripe button 77
- Studio setup (example) 25
- Synchronization
  - multiple interfaces 26
- Synths
  - connecting 25
- System requirements
  - minimum 15
  - recommended computer 15

## T

- TACH
  - light (SMPTE Setup Console) 76
- Talkback
  - explained 54
  - menu 55, 73
  - settings 55
- Technical support 80
- Time code sync 75, 78
- Tip positive/negative 24
- Traveler
  - connecting to 4pre 26
- Trim 22, 53
- Troubleshooting
  - feedback loop 44
- TRS connectors 22
- TRS/XLR jacks 8
- Tuner 72

## U

- Unbalanced analog 22
- Undo/Redo 56
- USB
  - installing drivers 17
- USB2 12
- Use Stereo Pairs for Windows Audio option 34
- Use WaveRT for Windows audio 34

## V

- Video sync 75
- Volume
  - headphone 13
  - knob 13

## W

- Wave driver 9, 18
- WDM 18
- Width 54
- Windows Driver Model (see WDM)

## X

- XLR/TRS jacks 8