MOTU 24*i*™

User's Guide for Windows

SAFETY PRECAUTIONS AND ELECTRICAL REQUIREMENTS

WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRICAL SHOCK, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR OTHER MOISTURE.

CAUTION: TO REDUCE THE RISK OF ELECTRICAL SHOCK, DO NOT REMOVE COVER. NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

WARNING: DO NOT PERMIT FINGERS TO TOUCH THE TERMINALS OF PLUGS WHEN INSTALLING OR REMOVING THE PLUG TO OR FROM THE OUTLET.

WARNING: IF NOT PROPERLY GROUNDED THE 24i audio interface COULD CAUSE AN ELECTRICAL SHOCK.
The 24i audio interface is equipped with a three-conductor cord and grounding type plug which has a grounding prong, approved by Underwriters' Laboratories and the Canadian Standards Association. This plug requires a mating three-conductor grounded type outlet as shown in Figure A below.

If the outlet you are planning to use for the 24i audio interface is of the two prong type, DO NOT REMOVE OR ALTER THE GROUNDING PRONG IN ANY MANNER. Use an adapter as shown below and always connect the grounding lug to a known ground. It is recommended that you have a qualified electrician replace the TWO prong outlet with a properly grounded THREE prong outlet. An adapter as illustrated below in Figure B is available for connecting plugs to two-prong receptacles.
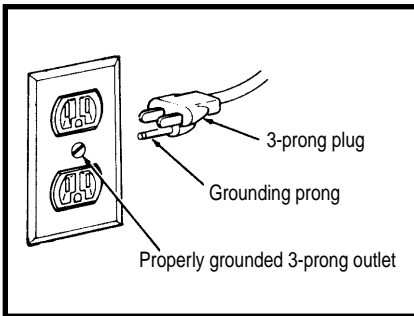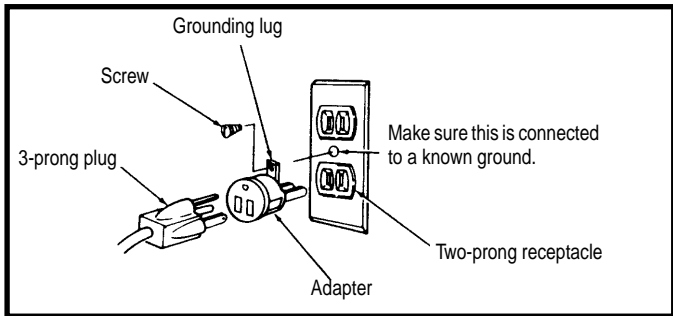
Figure A

3-prong plug

Grounding prong

Properly grounded 3-prong outlet

Figure B

Grounding lug

Screw

3-prong plug

Make sure this is connected to a known ground.

Two-prong receptacle

Adapter

WARNING: THE GREEN GROUNDING LUG EXTENDING FROM THE ADAPTER MUST BE CONNECTED TO A PERMANENT GROUND SUCH AS TO A PROPERLY GROUNDED OUTLET BOX. NOT ALL OUTLET BOXES ARE PROPERLY GROUNDED.
If you are not sure that your outlet box is properly grounded, have it checked by a qualified electrician. NOTE: The adapter illustrated is for use only if you already have a properly grounded two-prong receptacle. Adapter is not allowed in Canada by the Canadian Electrical Code. Use only three wire extension cords which have three-prong grounding type plugs and three-prong receptacles which will accept the 24i audio interface plug.

IMPORTANT SAFEGUARDS
1. Read instructions - All the safety and operating instructions should be read before operating the 24i audio interface.
2. Retain instructions - The safety instructions and owner's manual should be retained for future reference.
3. Heed Warnings - All warnings on the 24i audio interface and in the owner's manual should be adhered to.
4. Follow Instructions - All operating and use instructions should be followed.
5. Cleaning - Unplug the 24i audio interface from the computer before cleaning and use a damp cloth. Do not use liquid or aerosol cleaners.
6. Overloading - Do not overload wall outlets and extension cords as this can result in a risk of fire or electrical shock.
7. Power Sources - This 24i audio interface should be operated only from the type of power source indicated on the marking label. If you are not sure of the type of power supply to your location, consult your local power company.
8. Power-Cord Protection - Power-supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them. Pay particular attention to cords and plugs, convenience receptacles, and the point where they exit from the 24i audio interface.
9. Lightning - For added protection for the 24i audio interface during a lightning storm, unplug it from the wall outlet. This will prevent damage to the 24i audio interface due to lightning and power line surges.
10. Servicing - Do not attempt to service this 24i audio interface yourself as opening or removing covers will expose you to dangerous voltage and other hazards. Refer all servicing to qualified service personnel.
11. Damage Requiring Service - Unplug the 24i audio interface from the computer and refer servicing to qualified service personnel under the following conditions.
    a. When the power supply cord or plug is damaged.
    b. If liquid has been spilled or objects have fallen into the 24i audio interface.
    c. If the 24i audio interface has been exposed to rain or water.
    d. If the 24i audio interface does not operate normally by following the operating instructions in the owner's manual.
    e. If the 24i audio interface has been dropped or the cabinet has been damaged.
    f. When the 24i audio interface exhibits a distinct change in performance, this indicates a need for service.
12. Replacement Parts - When replacement parts are required, be sure the service technician has used replacement parts specified by the manufacturer or have the same characteristics as the original part. Unauthorized substitutions may result in fire, electric shock or other hazards.
13. Safety Check - Upon completion of any service or repairs to this 24i audio interface, ask the service technician to perform safety checks to determine that the product is in safe operating conditions.

ENVIRONMENT
Operating Temperature: 10°C to 40°C (50°F to 104°)

AVOID THE HAZARDS OF ELECTRICAL SHOCK AND FIRE
Do not handle the power cord with wet hands. Do not pull on the power cord when disconnecting it from an AC wall outlet. Grasp it by the plug.

INPUT
Line Voltage: 100 - 120 volts AC, RMS (US and Japan) or 220 - 250 volts AC, RMS (Europe). Frequency: 47 - 63 Hz single phase. Power: 7 watts maximum.

CAUTION: DANGER OF EXPLOSION IF BATTERY IS REPLACED. REPLACE ONLY WITH THE SAME OR EQUIVALENT TYPE RECOMMENDED BY MANUFACTURER. DISPOSE OF USED BATTERY ACCORDING TO MANUFACTURER'S INSTRUCTIONS.

Contents

Quick Reference: 24i I/O Front Panel

This knob controls the volume of the headphone output only.

Output metering for the Main Outs.
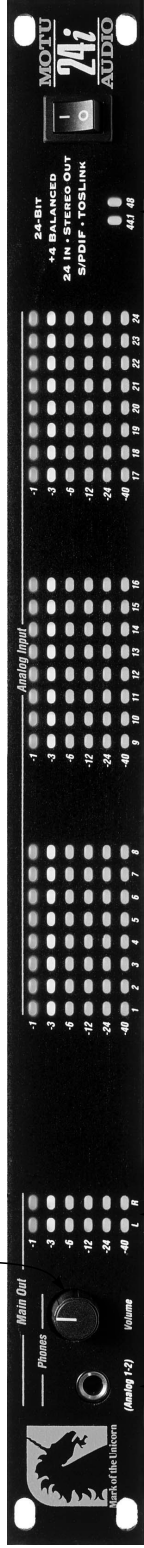
This is a standard quarter-inch stereo headphone jack. Its output matches the 24i's main outputs, but the volume knob to the right controls the headphone output only.

Metering for the 24 analog inputs.

Indicates the current sample rate. If both of these lights flash simultaneously, it means that you have chosen (via software) an external clock source (such as word clock), but the 24i is not successfully receiving it. Check the 24i's clock setting in the 324 Console window, or check your external clock source and its cable connections to the 24i.

Quick Reference: 24i I/O Rear Panel

These two balanced, +4dB TRS jacks serve as the 24i's main outputs. To hear material from them, assign any tracks you want to hear to the 24i main outs 1-2.

These are stereo S/PDIF outputs that mirror the 24i's main analog outputs (to the right). The left-hand connector supplies optical "TOSLink" S/PDIF output, and the right-hand connector supplies RCA "coax" S/PDIF output.

The 24i's twenty four analog inputs are gold-plated, balanced, +4dB TRS connectors. They have 24-bit, 128x oversampling A/D converters.

Connect the 24i to the PCI-324 card here using the AudioWire cable provided with your 24i system.

Use the word clock input and output to resolve the 24i to other devices or synchronization sources.

Main Out R L

S/PDIF TOSLink Out

+4 Balanced TRS
ANALOG IN

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

AUDIO WIRE

WORD IN OUT

Made in USA

Quick Reference: PCI-324 Audio Card

Connect additional 24i I/Os here — or mix and match the 24i with other MOTU interfaces like the 2408, 1224 or 308. You can connect up to three I/Os to a PCI-324 card for a total of 72 active inputs and 54 outputs (with one 24i and two 2408's).

Connect the PCI-324 card to the 24i I/O here using the Audio Wire cable included with your 24i system. If you use your own 1394 cable, it should not be longer than 15 feet.

If you have a MOTU Digital Timepiece, connect one of its 'Control Track' outputs here using a standard RS422 DIN-8 cable. This allows you to synchronize your 24i system to the Digital Timepiece for resolving the 24i to external time code (or other external clocks).

If you are using the 24i with one or more ADATs, use this standard ADAT SYNC INPUT to connect the PCI-324 card to the end of your ADAT sync chain. Doing so allows you to resolve the 24i system with the ADATs so that audio transferred between them stays in sync. However, if you regularly need to do transfers between your computer and ADATs, get a 2408 I/O, which allows you to transfer the audio digitally.

Quick Reference: 24i Expansion I/O

EXPANSION I/O OR CORE SYSTEM?

Read this chapter if you have purchased the 24i audio interface as an an Expansion I/O for a core 24i, 2408 or 1224 system. If you've purchased a core system, skip to the next chapter.

PACKING LIST FOR THE EXPANSION I/O

The MOTU Audio 24i Expansion I/O ships with:

- One 24i I/O rack unit

- One 15-foot "AudioWire" cable

- One CD-ROM with drivers and Setup Wizard

- Power cord

- One 24i Windows/Mac manual and reg card

INSTALLING THE 24I EXPANSION I/O

To connect your 24i Expansion I/O to a 24i, 2408 or 1224 core system, use one of the two available Audio Wire sockets on your core system's PCI-324 card as shown below in Figure 1.

Audio Wire jack #3 → ← A 2nd Expansion I/O can go here.

Audio Wire jack #2 → ← 24i Expansion I/O goes here.

Audio Wire jack #1 → ← Core system I/O should be attached here (the jack closest to the circular DIN-8 'Control Track' connector).
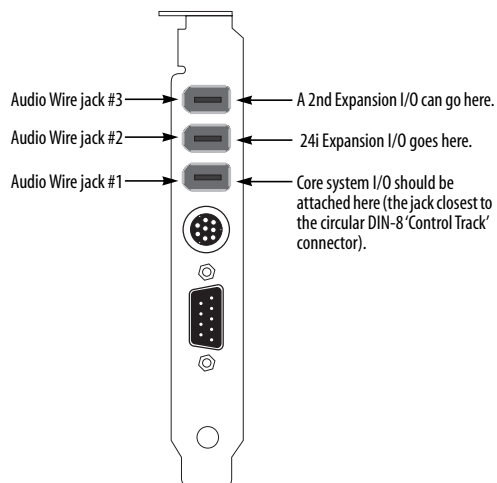
Figure 1: You can connect up to three 24i I/Os to a PCI-324 card.

Connect the other end of the Audio Wire cable to the Audio Wire socket on the 24i interface as shown below in Figure 2.
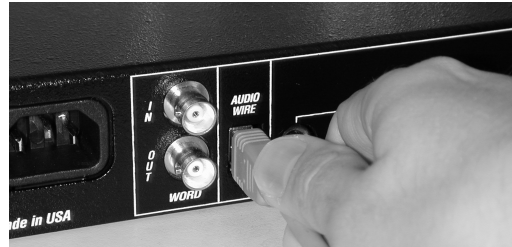
Figure 2: Attaching the Audio Wire cable to the 24i Expansion I/O.

IMPORTANT NOTE

Always power on your 24i Expansion I/O when operating your core system. In fact, you should turn on all audio interfaces connected to the PCI-324 card.

UPDATING SOFTWARE

Your Expansion I/O includes a CD-ROM with updated software that is necessary to run your Expansion I/O with your core system. Be sure to run the installer on the Expansion I/O disc to ensure that the software in your system will support your Expansion I/O.

COMPLETING THE INSTALLATION

To complete the installation, open 324 Console to confirm that the PCI-324 card and its updated software drivers see the newly installed Expansion I/O and to configure your multi-interface system. For details, turn to chapter 10, "Expanding Your 24i System" (page 43).

SYNCHRONIZATION AND CLOCK SOURCE

For details about synchronizing a multiple-I/O system, see "Synchronizing multiple 24i's" on page 44.
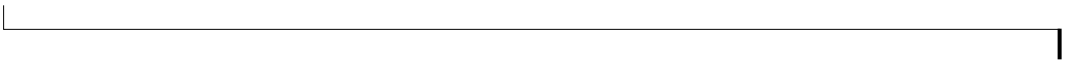
Quick Reference: MOTU 324 Console Window

If you have two or three 24is (or other interfaces) connected to the PCI-324 card in your computer, use this menu to choose which one you are controlling with the settings in the middle portion of this window.

The 'Clock Source' menu determines the master clock source for your entire 24i system. This is an important setting when you are resolving the 24i to external clock sources.

How to open this window

The MOTU 324 Console Window gives you complete control over the settings in your 24i hard disk recording system. There are several ways to access the 324 Console window. But the window is the same, regardless of how you access it.

- From Windows, run MOTU 324 console (the stand-alone applet for the 24i)

PCI-324 Console.exe

This section of the window has general settings that are related to the PCI-324 card, not the 24i I/O(s) connected to it.

This section of the window shows the three available I/O formats provided by the 24i.

- From within Cubase VST™, go to the Audio menu and choose *System*. In the System window, click the *ASIO Control Panel* button.

These buttons let you save and reload the interface settings (in the middle portion of the window).

Refresh checks to make sure that the computer knows about all connected 24i's.

Displays the ROM version of the 24i.

The stand-alone Console window, above, is the same as the "ASIO Control Panel" dialog found in Cubase VST.

Check 'Enable Routing' to expand the window as shown. This view lets you enable individual inputs and outputs and route inputs to outputs directly within the system (without a host audio program).

This menu identifies the analog inputs and main outputs provided by the 24i. It cannot be changed when viewing 24i I/O settings in this window. (Several menus appear here when viewing 2408, 1224 or 308 I/O settings in this window.)

The 'Enable Input' check boxes refer to input to the computer. If checked, the inputs will be available in the input menus of Cubase VST or other host audio applications that support the 24i.

The 'Output Source' menus determine what you'll hear from the 24i's outputs. When it says 'From Computer', then the output pair will appear as outputs in Cubase VST or other host audio applications that support the 24i. And any tracks assigned to that pair of outputs will be heard from them.

Notice that you can choose one of the 24i's own inputs as a source for a 24i output, allowing you to directly route audio from the 24i inputs to its own outputs. This can also be done with additional 24is and 2408s connected to the PCI-324 card.

Choosing a smaller setting here reduces the latency you may hear when recording live inputs. But lower settings also increase the strain on your computer. For details, see "'Samples per buffer'" on page 32.

The 'Mono Routing' button displays each input and output individually, rather than in stereo pairs as shown here. For details, see "Mono routing" on page 35.
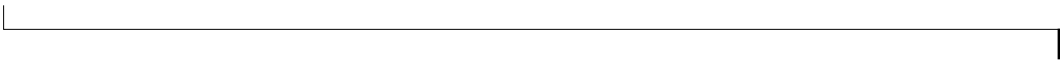
About the 24i

OVERVIEW

The 24i is a computer-based, 24-bit hard disk recording system for Mac OS and Windows 95/98 that offers 24 simultaneous inputs and a pair of main outputs. The system consists of a PCI card connected to a standard 19-inch, single-space, rack-mountable I/O unit. The external I/O unit offers the following:

■ 24 gold-plated, balanced +4dB TRS analog inputs with 24-bit A/D converters

■ 2 gold-plated, balanced +4dB TRS analog outputs with 24-bit D/A converters

■ One RCA "coax" S/PDIF stereo output (24-bit)

■ One optical "TOSLink" S/PDIF stereo output (24-bit)

■ A quarter-inch, stereo headphone output with volume knob (on the front panel)

The 24i supplies exceptionally high-quality audio on its 24 analog inputs and main outputs, which provide a dynamic range of 111 dB.

Up to three 24i I/O units can be connected to the system's single PCI card for a maximum of 72 inputs and 18 output connections. Or you can connect up to two additional 2408 I/Os for up to 48 channels of digital I/O in ADAT optical and/or Tascam T/DIF formats.

The system includes AudioDesk™, full-featured audio workstation software for Mac OS that supports both 16-bit and 24-bit recording.

For Windows, a Wave driver is included for compatibility with audio applications that support standard multi-channel Windows Wave drivers.

Also included are ASIO drivers on both Macintosh and Windows for multi-channel operation with Steinberg Cubase VST for Macintosh and Windows, and other audio programs that support ASIO drivers.

The 24i system can record and play back at either 44.1 or 48kHz sampling rates.

THE 24i I/O REAR PANEL

24 inputs and stereo outputs

The 24i I/O is a single-space, rack mountable chassis with gold-plated analog audio connectors on its rear panel and level meters on the front. The rear panel has 24 gold-plated, balanced +4dB TRS analog inputs with 24-bit A/D converters. Stereo main outs are supplied in three different formats:

■ 2 gold-plated, balanced +4dB TRS analog outputs with 24-bit D/A converters

■ One RCA "coax" S/PDIF stereo output (24-bit)

■ One optical "TOSLink" S/PDIF stereo output (24-bit)

All inputs and outputs can be accessed simultaneously.

24-bit audio

The analog inputs and outputs are equipped with 24-bit, 128x oversampling A/D and D/A converters. Internally, the 24i has a 24-bit data path to and from the computer so that all audio data is carried to/from the computer in 24 bits.

Converters

All analog-to-digital and digital-to-analog converters on the 24i are extremely high-quality, latest-generation converters. The converters on the 24i's 24 inputs, as well as the main outputs, provide a signal-to-noise ratio of 111dB.

Word clock in and out

BNC Word clock connectors (in and out) are provided for synchronization with standard word clock devices.

THE 24i I/O FRONT PANEL

Level Meters

The front panel of the 24i I/O displays 24 level meters for the 24 analog inputs, arranged in three banks of 8 channels. For each channel, there is a six-segment meter that measures from -40 dB to 0 dB.

The left half of the front panel provides similar stereo metering for the main outs (in all three formats).

Two LEDs on the far right of the front panel indicate the current sample rate (44.1 or 48 kHz).

Headphone output

The 24i front panel includes a quarter-inch stereo headphone output jack and volume knob. The headphone output matches the main stereo outs, while the volume knob controls the volume of the headphone output only.

THE PCI-324 CARD

The 24i system ships with a single PCI audio card called the PCI-324. The card features a custom processor, three 1394-type 'Audio Wire' connectors, an ADAT SYNC IN connector, and a Digital Timepiece 'Control Track' sync connector (DIN-8 socket).

Expansion

The Audio Wire connectors allow up to three 24i I/O units to be connected at one time, providing you with 72 inputs and 18 output connections. The 24i system uses standard 1394 components, but it employs a proprietary communication protocol between the card and the external I/O to handle the extremely low latencies required by the system. The heart of the PCI-324 card is a custom-programmed VLSI chip capable of simultaneously processing 72 inputs and outputs (144 channels total) at either 44.1 or 48 KHz. The custom chip handles all of the system's I/O processing, freeing up the host computer's processing bandwidth for real-time DSP effects and hard disk I/O. The custom processor also allows the system to act as a massive, 72 by 72 patch bay, allowing you to route any input to any output (or combination of outputs).

Expansion with the MOTU 2408 interface

Mark of the Unicorn's popular 2408 digital interface can be connected to the PCI-324 card in a core 24i system, providing 24 additional channels of input and output in many formats: ADAT optical, Tascam TDIF, S/PDIF and RCA analog. Up to two 2408s can be connected to a core 24i system for a total of 72 inputs and 66 outputs.

Sample-accurate synchronization

The PCI-324 card's standard 9-pin ADAT SYNC IN connector allows the 24i to be continuously resolved with ADAT tape decks — or any other digital audio synchronizer that supports ADAT SYNC. If a MOTU 2408 I/O is connected to the PCI-324 card, this connection provides sample-accurate synchronization with all Alesis ADAT tape decks connected to the 24i/2408 system. For example, if you digitally transfer a single track of material from the ADAT via the 2408's light pipe connection into AudioDesk or Digital Performer (which both support sample-accurate sync), and then transfer the track back to the ADAT, it will be recorded exactly at its original location.

☞ Sample-accurate sync is currently only available on the Macintosh.

Digital Timepiece Control Track sync
The PCI-324 card's RS-422 Control Track connector allows the 24i to be continuously resolved with MOTU's Digital Timepiece universal A/V synchronizer. If a MOTU 2408 I/O is connected to the PCI-324 card, this connection provides the sample-accurate synchronization with the Digital Timepiece. For example, if you have a Tascam DA-38/88/98, you can use a Digital Timepiece to synchronize your 24i/2408 system with Tascam tape decks to perform sample-accurate transfers in the same manner as just described for ADATs. Control Track is a proprietary, sample-accurate digital audio synchronization protocol developed by Mark of the Unicorn.

☞ Control track sync is currently only available on the Macintosh.

16-BIT AND 24-BIT RECORDING
The 24i's on-board A/D and D/A converters are 24-bit converters, and the 24i system handles the data internally with a 24-bit signal path. Using AudioDesk™, the 24i's Macintosh workstation software (included), you can record 16-bit or 24-bit audio files at either 44.1 or 48 KHz. On Windows, 24-bit audio files can be recorded with any compatible host application that supports 24-bit recording.

AUDIODESK
AudioDesk is a full-featured audio workstation software package for Mac OS included with the 24i system. AudioDesk provides multi-channel waveform editing, automated virtual mixing, graphic editing of ramp automation, real-time effects plug-ins with 32-bit floating point processing, crossfades, support for many third-party audio plug-ins (in the MOTU Audio System and Adobe Premiere formats), background

processing of file-based operations, sample-accurate editing and placement of audio, sample-accurate synchronization with ADATs and Tascam tape decks and more.

DIGITAL PERFORMER
The 24i system is fully integrated with MOTU's award-winning Digital Performer audio sequencer software package.

OTHER AUDIO SOFTWARE
The 24i system ships with a standard multi-channel Windows Wave (.WAV) driver that allows you to record, edit, play back and mix your 24i projects using your favorite Wave-compatible Windows software.

The 24i system also ships with a standard Mac OS Sound Manager driver for stereo I/O with any audio application that supports Sound Manager.

The 24i also includes an ASIO driver for multi-channel compatibility with Steinberg Cubase VST and other programs that support ASIO drivers.

A COMPUTER-BASED SYSTEM
Regardless of what software you use with the 24i, the host computer determines the number of tracks the software can record and play simultaneously, as well as the amount of real-time effects processing you can apply to your mix. A faster computer with more RAM and faster hard drives will allow more simultaneous tracks and real-time effects than a slower computer with less RAM and slower hard drives. A 200+ MHz Power Macintosh or Pentium II PC should allow your software to play 16-24 simultaneous tracks of audio (although your results may vary depending on your software and hardware). Today's fastest computers can typically play as many as 32 tracks or more. Standard third-party SCSI acceleration products can also help you achieve higher track counts.

CHAPTER 4   Core System Packing List and PC System Requirements

PACKING LIST FOR THE 24I CORE SYSTEM

If you have purchased a 24i Expander, see "Packing list for the Expansion I/O" on page 9.

The MOTU Audio 24i core system ships with the items listed below. If any of these items are not present in your 24i box when you first open it, please immediately contact your dealer or Mark of the Unicorn.

■ One 24i I/O rack unit

■ One PCI-324 PCI audio card

■ One 15-foot "AudioWire" cable

■ Power cord

■ One 24i Windows/Mac manual

■ One AudioDesk Manual with software registaration card

■ One cross-platform CD-ROM

■ Product registration card for your 24i hardware

PC SYSTEM REQUIREMENTS

The 24i system requires the following Windows-based computer:

■ A 200 MHz Pentium CPU or faster

■ A Pentium II processor or faster is recommended

■ At least 32 Mb (megabytes) of RAM (64 Mb is recommended)

■ One available PCI slot

■ Windows 95 or Windows 98

■ A large hard drive (preferably at least 4 Gb)

PLEASE REGISTER TODAY!

Please send in the registration card included with your 24i system. As a registered user, you will be eligible to receive on-line technical support email and announcements about product enhancements as soon as they become available. Only registered users receive these special update notices, so please, complete and mail this registration card!

Thank you for taking the time to register your new Mark of the Unicorn product!

Installing the 24i Windows Software

OVERVIEW

The 24i ships with the following software for Windows 95/98:

Software component	Purpose
MOTU 324 Console	Provides access to all of the settings in the PCI-324 and 24i hardware. Required for 24i operation.
ASIO MOTU PCI-324 Driver	Allows Cubase VST or other ASIO-compliant software to do multi-channel input and output with the 24i. Only required if you are using Cubase VST or another ASIO-dependent program.
PCI-324 Wave Driver	Allows any Wave-driver compatible audio software to do input and output with the 24i hardware. Provides multi-channel support for applications that support standard multi-channel Wave drivers.
Setup Wizard	Asks you questions about the gear you'll connect to the 24i, and then helps you set everything up, including the software
PCI-324 Cue Mix Console	Gives you complete control over the 324 driver's Cue Mix feature, which provides low-latency patch thru of live inputs through your 24i system.

INSTALL THE 24I SOFTWARE FIRST!

Due to an issue with the way that Windows 95/98 handles new hardware drivers, you will have an easier time installing the 24i software if you do so *before installing the PCI-324 card itself*.

If you've already installed the card, you might want to temporarily remove it to install the software, and then put it back in after installing the 24i software.

If you haven't installed the PCI-324 card yet, proceed with the installation.

INSTALLING THE 24I SOFTWARE

To install the 24i software, insert the 24i CD-ROM and follow the directions it gives you on your computer screen.

MOTU 324 CONSOLE

The MOTU 324 Console application is placed by the 24i software installer in the folder you specify during the installation process. If you aren't sure where it is on your hard drive, use the Find command in the Windows Start menu.

The MOTU 324 Console gives you access to all of the basic settings in your PCI-324 and 24i hardware, such as synchronization settings, routing to and from the computer, and patchbay routing within the 24i I/O itself (if any).

For complete details, see chapter 7, "MOTU 324 Console Window" (page 29).
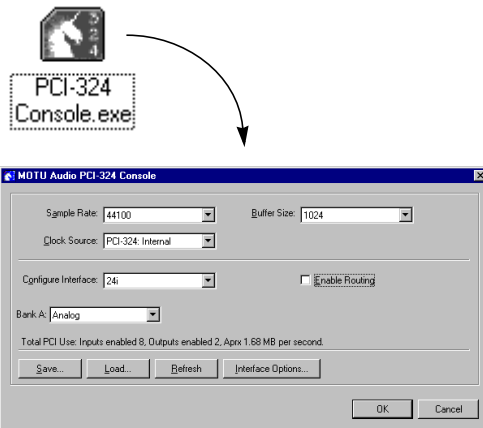
Figure 5-1: The MOTU 324 Console application gives you access to all of the settings in the PCI-324 and 24i hardware.

THE PCI-324 WAVE DRIVER

The PCI-324 Wave driver provides standard multi-channel input and output for any Windows audio program that support multi-channel wave drivers. See chapter 9, "Using the PCI-324 Wave Driver" (page 41) for details.

The 24i installer CD-ROM installs the PCI-324 Wave driver into Windows for you.

ASIO MOTU 324 DRIVER

ASIO stands for *Audio Streaming Input* and *Output*. The ASIO MOTU 324 driver allows the PCI-324 audio card to do multi-channel input and output with Steinberg's Cubase VST software, or any other audio application that supports ASIO drivers.

The ASIO MOTU 324 driver is only required if you are using Cubase VST (or another audio program that depends on the ASIO driver to do multi-channel I/O with the 24i system).

The 24i software installer correctly installs the ASIO driver, so all you have to do is run the installer to use it.

For details about using Cubase VST with the 24i, see chapter 8, "Using the 24i with Cubase VST" (page 37).

PCI-324 CUE MIX CONSOLE

This program, when launched, provides a mixing console that gives you control over the the PCI-324 driver's low latency Cue Mix features. For details, see "Even lower latency with Cue Mix" on page 48.

24I SETUP WIZARD

Check out the Setup Wizard. It helps you figure out how to connect your gear to the 24i, and it even configures the PCI-324 driver for you based on your setup.

Installing the 24i Hardware

OVERVIEW

Here's the basic procedure for installing the 24i:

Install the PCI-324 audio card **22**

Insert the PCI-324 card into any available PCI slot inside your PC computer.

Connect the 24i interface **23**

Connect the 24i audio interface to the PCI-324 card via the Audio Wire cable (use the Audio Wire port closest to the DIN-8 Control Track socket on the PCI-324).

Connect inputs and main outputs **24**

Make all desired line-level +4 dB analog connections. Connect the analog and/or S/PDIF main outputs.

Connect word clock **25**

Connect the 24i's word clock input or output as necessary to either resolve the 24i to an external source or to resolve it to a connected AES/EBU device.

Using Control Track or ADAT Sync **27**

Either of these sync connections to the 24i's PCI-324 card can be used instead of word clock to resolve the 24i to a MOTU Digital Timepiece A/V synchronizer or any ADAT synchronizer.

INSTALL THE 24I SOFTWARE FIRST!

Due to an issue with the way that Windows 95/98 handles new hardware drivers, you will have an easier time installing the 24i software if you do so *before installing the PCI-324 card itself*.

If you've already installed the card, you might want to temporarily remove it to install the software, and then put it back in after installing the 24i software. If you haven't installed the PCI-324 card yet, go now to chapter 5, "Installing the 24i Windows Software" (page 19).

TRY THE 24i SETUP WIZARD

The 24i software CD-ROM includes an easy-to-use Setup Wizard. This interactive software tutorial will help you figure out the best way to connect all your gear to the 24i. This chapter covers important general concepts regarding connections and synchronization, but the 24i Setup Wizard asks you specific questions about your gear and then makes specific recommendations for you based on your answers. To use the Wizard, just run the 24i software installer on the 24i CD-ROM, and then look for it on your hard drive when the installation is done.

INSTALL THE PCI-324 AUDIO CARD

1 Switch off and unplug your computer.

☛ Failure to do so may result in serious shock or injury.

2 Open your computer.

3 Find an available PCI slot. Note: some PCs share resources between their AGP video slot and the closest PCI slot. Avoid this slot, if possible.

4 Remove the slot cover, if necessary.

5 Before removing the PCI-324 card from it's anti-static bag, touch the power supply inside your computer to discharge any static electricity that may have built up on you.

6 Remove the PCI-324 card from its anti-static bag.

7 Gently but firmly insert the card into any available PCI slot.

8 Secure the bulkhead of the PCI-324 card to the computer chassis with the bolt from the slot cover.

☛ We strongly recommend securing the PCI-324 card in this manner. Doing so allows you to ensure secure connections to the card later on in the installation.

9 Place the cover back on your computer.

10 Reconnect the power cord to the computer before proceeding.

Step 2
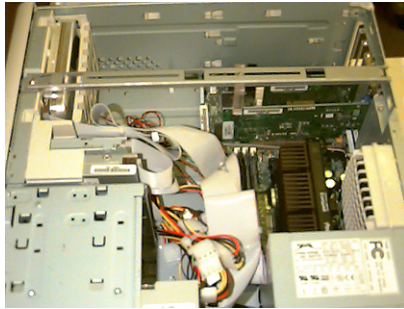
Step 5
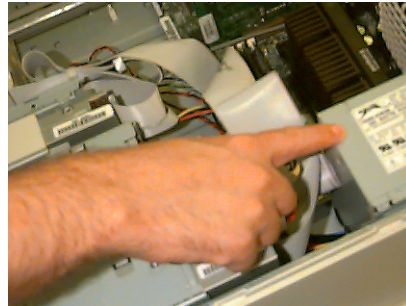
Step 7
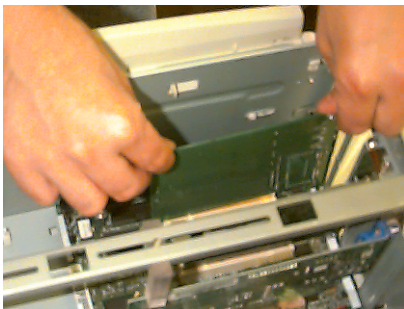
Figure 6-1: Installing the PCI-324 card.

Step 8

CONNECT THE 24I INTERFACE

1 Plug one end of the 24i system firewire cable (included) into the firewire socket next to the DIN-8 Control Track socket on the PCI-324 card as shown below in Figure 6-2.

2 Plug the other end of the firewire cable into the 24i I/O as shown below in Figure 6-2.

☞ Important note: if you are connecting multiple interfaces to a single PCI-324 card, be sure to turn them all on when you're using the system, even if you don't plan to use a particular interface. This ensures trouble-free operation.

Step 1
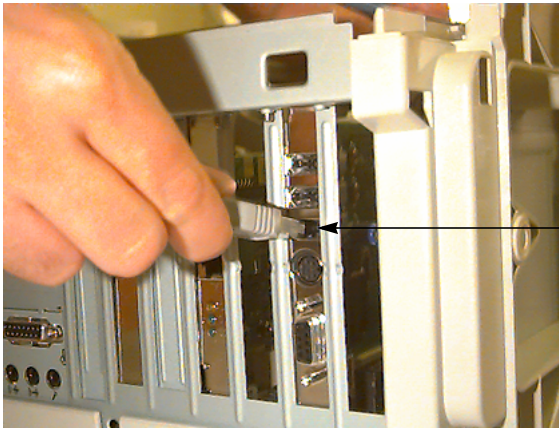
Connect the Audio Wire to the socket closest to the circular DIN-8 (Control Track) socket.

Step 2

Figure 6-2: Connecting the 24i I/O to the PCI-324 audio card.

CONNECT INPUTS AND MAIN OUTPUTS

Make connections to the 24i inputs and outputs as desired. Here are a few things to keep in mind when doing so.

Connect them all, if you like

All of the 24i's inputs and outputs can be active simultaneously.

Avoid adaptors

If you don't have the right cable, you'll avoid headaches later on — and ensure the best possible audio quality — by taking the time to obtain the correct cable.

+4 dB analog inputs/outputs

The 24i's analog connectors are calibrated at +4 dB, so if you are plugging in a microphone, you'll need a mic preamp of some kind (or a connection to a mixer with a mic pre).

24-bit audio

All of the connectors on the 24i support 24-bit audio, so you can connect 24-bit devices to it.

S/PDIF connections

For best performance with RCA S/PDIF connections, be sure to use standard 75 Ohm coax cables (not audio cables with RCA connectors). The TOSLink optical S/PDIF output takes any standard TOSLink optical cable. Be sure the S/PDIF device you connect to the 24i is set up to synchronize to its S/PDIF input.

Mixing live inputs with the 24i

With all of the mixing and processing that is possible in today's crop of other powerful audio software, it is possible to treat the 24i system as a complete, stand-alone recorder and mixer. You can plug in synthesizers, microphones (with a preamp), and any other analog sources, and then mix and process them all within your computer.

If you intend to take this approach, with no external mixing in your setup, you need to be aware of an important issue: patch-thru latency when monitoring live inputs. With a host computer-based system like the 24i, there is an inherent amount of delay in a live input signal being routed through the system and monitored live through the system's outputs. For example, if you have a rhythm section already recorded, and you play a live guitar on top of it, the live guitar will sound a fraction of a second late compared to the pre-recorded mix. The guitar would get recorded with the correct timing, but the live monitoring would sound late.

Fortunately, the 24i has buffer settings you can adjust to minimize this latency — or make it completely inaudible. But these adjustments come at a cost: the processing power of your computer. Lower latency means more of a load on your computer's CPU. On a fast computer, this is less of an issue. You can record and mix a fairly large, multi-track project, even with your 24i system adjusted for low latency. But on slower computers, you may not have the computing power to do everything you want to do while patching through a live input. Our advice is: if you plan to patch live inputs into your 24i system, get the fastest computer you can.

For more information, see chapter 11, "Reducing Latency" (page 47).

Figure 6-3: The 24i gives you 24 inputs and stereo main outputs in three formats: 24-bit analog, optical S/PDIF and RCA S/PDIF.

CONNECT WORD CLOCK

The 24i supports both a word clock IN and OUT .

Do you need word clock?

If you will be using only the 24i's analog inputs and outputs, and you have no plans to synchronize your 24i system to SMPTE time code, you don't need word clock. Open the 324 Console Window and set the *Clock Source* setting to *24i: Internal* as shown below in Figure 6-4. For details, see chapter 7, "MOTU 324 Console Window" (page 29).
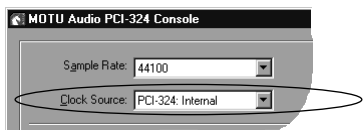
Figure 6-4: You can run the 24i under its own internal clock when it has no digital audio connections and you are not synchronizing the 24i system to SMPTE time code.

Situations that require word clock sync

If either of the following situations are true, you'll need to use the 24i's word clock sync features:

■ You need to synchronize the 24i with other digital audio devices so that their digital audio clocks are *phase-locked*.

■ You need to synchronize the 24i system to SMPTE time code, such as from a video deck or an analog multi-track tape recorder.

Choose a digital audio clock master

In either of the above cases, you need to choose an audio clock master. In the simplest case, you have two devices and one is the word clock master and the other is the slave as shown below in Figure 6-5 and Figure 6-6.
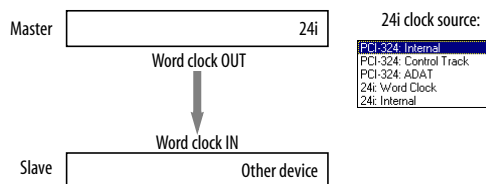
Figure 6-5: Slaving another digital audio device to the 24i. For the 24i's clock source, choose any source besides '24i: Word clock'.
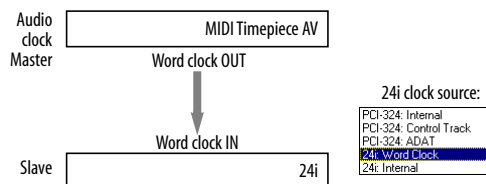
Figure 6-6: To slave the 24i to SMPTE time code, use a dedicated synchronizer such as a MOTU MIDI Timepiece AV or Digital Timepiece. For the 24i's clock source, choose '24i: Word clock'. You could also use ADAT SYNC from the MTP AV connected to the ADAT SYNC IN port on the 24i's PCI-324 card.

Don't chain word clock

If you have three or more digital audio devices that you need to synchronize, avoid chaining their word clock connections (OUT to IN, OUT to IN, etc.), as this causes problems. Instead, use a dedicated synchronizer like the Digital Timepiece or a word clock distribution device of some kind.

Advanced setups

If you have several devices, including the 24i, that must be synchronized with each other, slave them all to a single clock master, such as a MOTU Digital Timepiece.
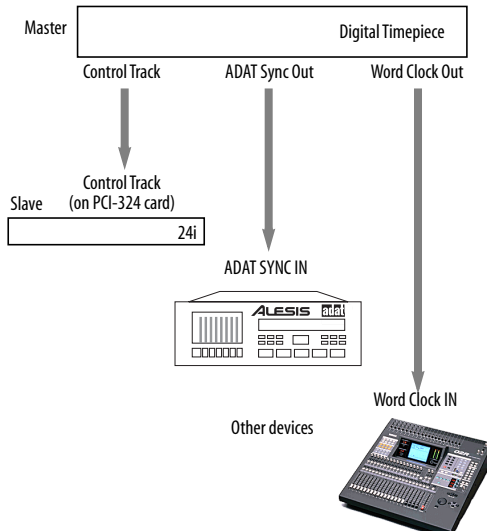
Figure 6-7: To synchronize sevearal devices with the 24i, use a dedicated synchronizer like a MOTU Digital Timepiece. Notice that you can use Control Track for the 24i to free up the other sync formats (ADAT Sync and Word Clock) for other devices.

The 24i offers several audio sync formats

Remember, you have several ways to slave a 24i to a synchronizer like the Digital Timepiece. You can use word clock (connected to the 24i itself), ADAT SYNC (connected to the PCI-324 card) or Digital Timepiece Control Track (connected to the PCI-324 card). These latter two connections free up the Digital Timepiece's word clock output for another device that only supports word clock.

USING CONTROL TRACK OR ADAT SYNC

The 24i system's PCI-324 card offers two sync connectors: ADAT Sync In and Control Track (for the Digital Timepiece). Either of these sync formats can be used instead of word clock to resolve the 24i to external sources and maintain phase lock with other digital audio devices, as discussed in the previous sections.

Digital Timepiece Control Track

To use Control Track, use the (standard) circular DIN-8 cable that ships with the Digital Timepiece to connect one of its Control Track ports to the Control Track jack on the 24i system's PCI-324 card as shown in Figure 6-7.

ADAT Sync

To use ADAT Sync, use a standard ADAT sync cable to connect SYNC OUT from another device (an ADAT or ADAT-compatible synchronizer) to the SYNC IN port on the PCI-324 card. If you have a several devices in an ADAT sync chain, place the PCI-324 card at the end of the chain (as it has no ADAT SYNC OUT port).
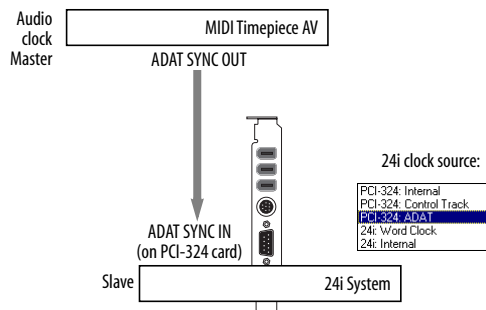
Figure 6-8: Using ADAT SYNC to resolve the 24i to an ADAT synchronizer such as the MIDI Timepiece AV.
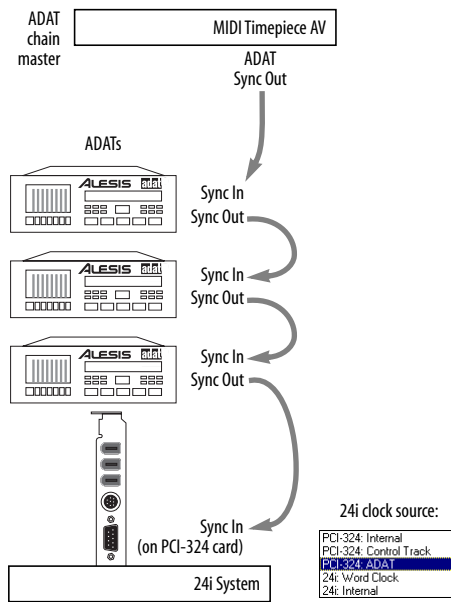
Figure 6-9: The 24i system can also be placed at the end of an ADAT sync chain.

MOTU 324 Console Window

OVERVIEW

The MOTU 324 Console Window gives you complete control over the settings in your 24i hard disk recording system.

ACCESSING THE 324 CONSOLE WINDOW

There are several ways to access the 324 Console window:

■ From Windows 95/98, run MOTU 324 Console (the stand-alone applet for the 24i)

■ From within Cubase VST, go to the Audio menu, choose *System* and then click the *ASIO Control Panel* button.
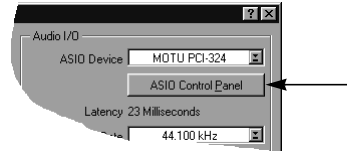
It doesn't matter which way you access the window. The settings are the same either way.

QUICK REFERENCE

If you have two or three 24is (or other interfaces) connected to the PCI-324 card in your computer, use this menu to choose which one you are controlling with the settings in the middle portion of this window.

The 'Clock Source' menu determines the master clock source for your entire 24i system. This is an important setting when you are resolving the 24i to external clock sources.

This section of the window has general settings that are related to the PCI-324 card, not the 24i I/O(s) connected to it.

This section of the window shows the three available I/O formats provided by the 24i.

MOTU Audio PCI-324 Console

Sample Rate: 44100
Buffer Size: 1024
Clock Source: PCI-324: Internal
Configure Interface: 24i
☐ Enable Routing
Bank A: Analog
Total PCI Use: Inputs enabled 8, Outputs enabled 2, Aprx 1.68 MB per second.
Save... | Load... | Refresh | Interface Options...
OK | Cancel

These buttons let you save and reload the interface settings (in the middle portion of the window).

Refresh checks to make sure that the computer knows about all connected 24i's.

Displays the ROM version of the 24i.

How to open this window

The MOTU 324 Console Window gives you complete control over the settings in your 24i hard disk recording system. There are several ways to access the 324 Console window. But the window is the same, regardless of how you access it.

- From Windows, run MOTU 324 console (the stand-alone applet for the 24i)

PCI-324
Console.exe

- From within Cubase VST™, go to the Audio menu and choose *System*. In the System window, click the *ASIO Control Panel* button.

Audio I/O
ASIO Device: MOTU PCI-324
ASIO Control Panel
Latency 23 Milliseconds
44.100 kHz

The stand-alone Console window, above, is the same as the "ASIO Control Panel" dialog found in Cubase VST.

Choosing a smaller setting here reduces the latency you may hear when recording live inputs. But lower settings also increase the strain on your computer. For details, see "'Samples per buffer'" on page 32.

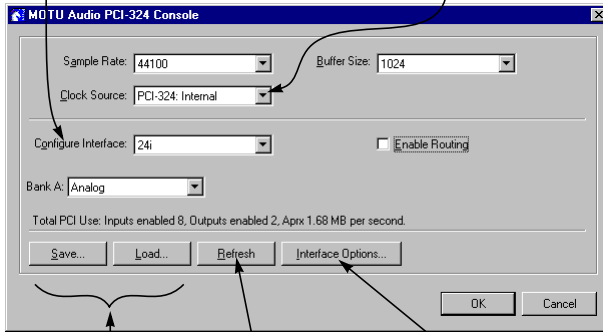This menu identifies the analog inputs and main outputs provided by the 24i. It cannot be changed when viewing 24i I/O settings in this window. (Several menus appear here when viewing 2408, 1224 or 308 I/O settings in this window.)

The 'Enable Input' check boxes refer to input to the computer. If checked, the inputs will be available in the input menus of Cubase VST or other host audio applications that support the 24i.

The 'Output Source' menus determine what you'll hear from the 24i's outputs. When it says 'From Computer', then the output pair will appear as outputs in Cubase VST or other host audio applications that support the 24i. And any tracks assigned to that pair of outputs will be heard from them.

Notice that you can choose one of the24i's own inputs as a source for a 24i output, allowing you to directly route audio from the 24i inputs to its own outputs. This can also be done with additional 24is and 2408s connected to the PCI-324 card.

Check 'Enable Routing' to expand the window as shown. This view lets you enable individual inputs and outputs and route inputs to outputs directly within the system (without a host audio program).

MOTU Audio PCI-324 Console

Sample Rate: 44100
Buffer Size: 1024
Clock Source: PCI-324: Internal
Configure Interface: 24i
☑ Enable Routing
☐ Mono Routing
Bank A: Analog

Enable Input	Output Source	Enable Input	Output Source	Enable Input	Output Source
1-2 ☑	From Computer	9-10 ☑		17-18 ☑	
3-4 ☑	From Computer / None / Analog 1-2	11-12 ☑		19-20 ☑	
5-6 ☑	Analog 3-4 / Analog 5-6	13-14 ☑		21-22 ☑	
7-8 ☑	Analog 7-8 / Analog 9-10	15-16 ☑		23-24 ☑	

Analog 11-12 / Analog 13-14 / Analog 15-16 / Analog 17-18 / Analog 19-20 / Analog 21-22 / Analog 23-24

Total PC... puts enabled 2, Aprx 1.68 MB per second.
Refresh | Interface Options...
OK | Cancel
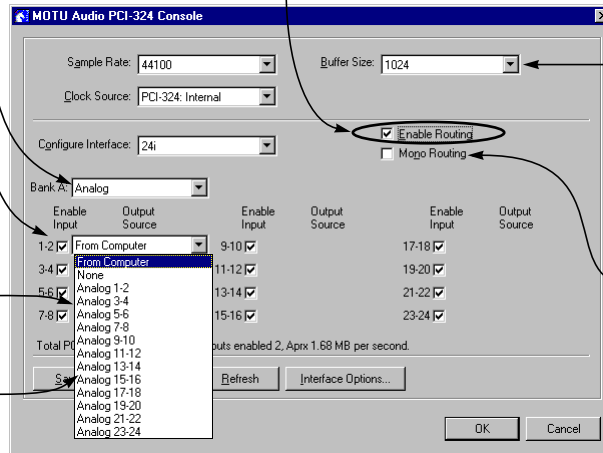
The 'Mono Routing' button displays each input and output individually, rather than in stereo pairs as shown here. For details, see "Mono routing" on page 35.

PCI-324 SETTINGS

The top of the MOTU 324 Console window, as shown in Figure 7-1, has several settings for the PCI-324 card itself. These are settings that are not dependent on the I/Os connected to the card. Instead, they impact the function of the system as a whole.

Figure 7-1: The PCI-324 settings at the top of the window are global settings that apply to the system as a whole, regardless of the I/Os connected to it.

Sample rate

Choose the desired *sample rate* for recording and playback. The 24i system can operate at either 44.1 KHz (the standard rate for compact disc audio) or 48 KHz. The entire 24i system will run at this sample rate. If you have a S/PDIF device connected di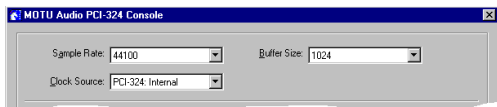gitally to the 24i, make sure its sample rate matches the 24i's sample rate. If you have a Digital Timepiece, MIDI Timepiece AV or other digital audio synchronizer, make sure it matches as well.

Also check your host audio software sample rate setting, if it has one that is independent of the 24i's driver setting.

☞ 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 the 324 Console window.

Clock Source
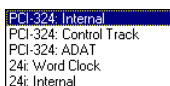
The *clock source* determines the digital audio clock that the 24i system will use as its time base.

PCI-324: Internal

Use the *PCI-324: Internal* setting when you want the 24i system 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. For example, you might simply be playing the hard disk tracks and mixing them to the main outputs of the 24i. In this case, no other digital audio clocks are involved.

Another example is transferring a mix to DAT. You can operate the 24i system on its internal clock, and then slave the DAT deck to the 24i, either via the S/PDIF connection (usually DAT decks slave to their S/PDIF input when you choose it as the input source) or via the 24i's word clock output (if your DAT deck has a word clock input).

For all practical purposes, the *PCI-324: Internal* setting produces the same results as the *24i: Internal* setting explained on page 32.

PCI-324: Control Track

Control Track is the Digital Timepiece's proprietary digital audio synchronization format. It allows the entire 24i system to slave to a MOTU Digital Timepiece's audio clock.

Use this setting (or the ADAT setting discussed below) when you have a Digital Timepiece as the synchronization hub for your 24i studio.

PCI-324: ADAT

ADAT refers to the Alesis ADAT digital audio synchronization format. It allows the entire 24i system to slave to the ADAT sync chain connected to your PCI-324 audio card (via the 9-pin connector on the card).

Use this setting when you are using the 24i system with one or more ADATs. Make sure the PCI-324 card is connected to the end of the ADAT sync chain.

You could also use this setting if you have a MIDI Timepiece AV, which also supports ADAT SYNC.

If you have a Digital Timepiece, you can also use ADAT sync instead of Control Track. There is no difference in features or performance.

24i: Word Clock
This setting refers to the Word Clock In BNC connector on the 24i I/O itself. This setting allows the entire 24i system (including other 24i I/Os connect to the PCI-324 card) to slave to an external word clock source, such as the word clock output from a digital mixer or a DA-88 with an SY-88 sync card.

24i: Internal
This setting produces the highest possible audio performance (best signal to noise ratio, etc.) from the 24i system. Use the *24i: Internal* setting when you want the 24i system 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. For example, you might simply be playing the hard disk tracks and mixing them to the main outputs of the 24i. In this case, no other digital audio clocks are involved.

For all practical purposes, the *24i: Internal* setting produces the same results as the *PCI-324: Internal* setting explained on page 31.

'Samples per buffer'
The *'Samples Per Buffer'* setting lets you reduce the delay you hear when patching live audio through the 24i system and your audio software. For

example, you might have MIDI instruments, samplers, microphones, guitars (or other live instruments), a digital mixer or other live audio source connected directly to 24i analog or digital inputs. And if so, you will probably want to monitor those live inputs at the same time as you are listening to tracks already recorded in your audio software. However, when doing so, you'll very likely hear a delay between the live inputs and the tracks already recorded.

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

The *'Samples Per Buffer'* setting determines the size of the buffers used by the PCI-324 Driver to transfer audio to and from the 24i hardware. This setting has a large impact on the following things:

- The load on your computer's CPU

- The patch thru latency

- How responsive the transport controls are in your audio 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 patched through your system. If you reduce the buffer 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. But don't set the buffer size too low, or it may cause distortion in your audio.

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 buffer size will make your software respond faster; raising the buffer size will make it a little bit slower, but barely enough to notice.

Reducing latency with the '*Samples Per Buffer*' setting has another benefit: it lets you route live inputs through the effects processing and mix automation of your audio software.

The Cue Mix console (explained in the next section), can help you choose an optimum buffer size.

Even lower latency — without software effects processing

If your computer is not fast enough to handle lower buffer sizes, or if you would like to reduce the latency even more, you can use the 24i's *Cue Mix* patch through feature. Cue Mix reduces latency to one quarter of its normal, non-Cue Mix value. In addition, the Cue Mix Console application has a message area that helps you find the optimum buffer setting for your computer. But because Cue Mix patch thru happens at such a low level in the software driver, it does not allow you to monitor the audio material through the real-time software effects in your host audio application. For details, see chapter 11, "Reducing Latency" (page 47).

24i INTERFACE SETTINGS
The middle portion of the 324 Console Window displays settings for the 24i I/O interface connected to your PCI-324 card.

Working with multiple 24i I/Os
If you have two or three 24i I/Os (or MOTU 2408 I/Os) connected to your PCI-324 card, the 324 Console displays settings for one I/O at a time. To view the settings for a particular I/O, choose it from the *Configure interface* menu as shown below in Figure 7-2.
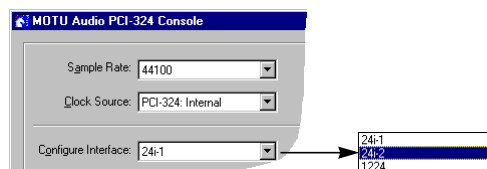
Figure 7-2: Choosing a 24i I/O when there are two or three interfaces connected to your PCI-324 card. In this example, the expanded system includes a 1224 audio interface.

Bank menu
When you are viewing the settings of a 24i I/O in the window, the bank menu confirms the presence of the 24i analog inputs and cannot be changed. If, however, you view a MOTU 2408 I/O (by choosing it from the "Configure Interface" menu), you would then be able to choose the desired audio format for each of the three 2408 banks. Refer to your 2408 manual for details.

THE ENABLE ROUTING CHECK BOX
The Enable Routing check box, when checked, expands the window to display each individual input and output pair. You can then disable individual inputs, if desired, as well as make basic audio routing from inputs to outputs directly with the 24i system (without the use of host audio software).

Figure 7-3: Check the 'Enable Routing' check box (circled above) to expand the window. You can then disable individual inputs, and make basic routing from 24i inputs to outputs without the use of host audio software.
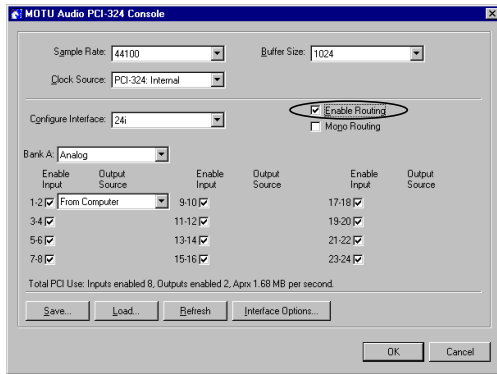
Enable Inputs

Check the *Enable Inputs* check box next to a pair of channels to send their input to the computer. Once the box is checked, the inputs will appear in the input source menus in your host audio application.

Output Source

The *Output Source* menus let you choose what you will hear on each pair of outputs.

If you choose *None*, you'll hear silence.

If you choose *From Computer*, the output pair will appear in the output menus of any 24i-compatible host audio application. Then, any tracks (or other audio sources) that you assign to the output pair will be heard from the corresponding 24i outputs.

All of the other sources in the menu represent inputs provided by the 24i system itself. If you have two or three 24i I/Os connected to your PCI-324 card, all of their inputs will appear in this menu as well, since the PCI324 card lets you route any input pair to any output pair across the three interfaces. The same is true for the inputs of any other I/Os (2408, 1224, 308, etc.) that are connected to the PCI-324 card.

Total PCI use

Enabled inputs and outputs take up a small portion of your computer's processing power. And while the amount is quite small for individual I/O pairs, an expanded 24i system lets you enable up to 72 inputs and 18 outputs at a time (a total of 90 connections). On large systems like this, you can conserve your computer's processing power by only enabling inputs and outputs when you are actually using them. Otherwise, leave inputs unchecked, and set outputs to *None*. On a core 24i system, however, you can leave them enabled without much risk of performance issues arising.

The *Total PCI use* status display tells you the approximate PCI bandwidth being used by the PCI-324 card for the currently enabled inputs and outputs. This display is mostly intended for multiple-24i systems, as the window only shows one 24i I/O at a time. A higher number will alert you that there are a significant number of inputs and outputs enabled, perhaps including the ones you are not currently viewing.

While the theoretical maximum PCI bandwidth is 132 MB per second, there are no hard and fast rules for how much bandwidth is actually available on any given computer. Many factors come in to play, including the efficiency of the bridge chip that controls the PCI bus and the number of other PCI devices on the bus competing for bandwidth. Practically speaking, most of today's personal computers seem to have approximately 30-50 Mb per second of PCI bandwidth for the PCI-324 and other PCI cards in the computer.

The Cue Mix console ("324 Cue Mix Console" on page 49) provides information about your PCI bus usage for diagnostic purposes. Use it to manage your PCI resources and help with troubleshooting.

MONO ROUTING

When the *Mono Routing* check box is checked, the 324 Console window displays input and output channels independently, instead of in pairs, as shown below in Figure 7-4:
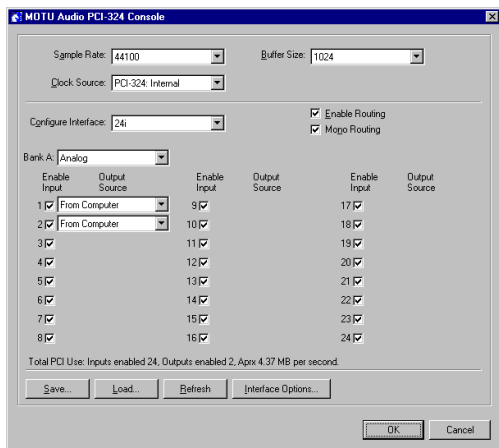

Figure 7-4: Mono routing.

Patchbay routing *within* the PCI-324 can be done in mono, whereas computer routing (to and from the computer) can only be done in channel pairs. Therefore, the input check boxes can only be checked and unchecked in pairs. When you click on one input check box, its corresponding check box will respond as well.

Similarly, if you choose *From Computer* from an Output Source menu, the menu for its paired output will also be set to *From Computer.*

However, when you choose a 24i input (e.g. *Analog 3*) from an *Output Source* menu, only that menu will change to your new setting.

Mono routing does not affect the manner in which the inputs and outputs appear in input/output menus in your host audio application.

INTERFACE OPTIONS

The *Interface options* button opens a dialog that tells you the version number of the 24i I/O currently being viewed in the 324 Console window.

SAVING AND RECALLING ROUTINGS

If you have two or three I/Os connected to the PCI-324 card, there are a lot of inputs and outputs to configure in the middle portion of the 324 Console window (one entire "page" for each!). For your convenience, the *Save* button lets you save the current routing configuration (including the routing for the 2nd and 3rd I/Os, if you have any) so you can recall the configuration later on with an easy click of the *Load* button. Save the file in the standard fashion. Note that only the settings in the middle portion of the window (i.e. the input and output routings) are saved. The PCI-324 settings are not included as part of the configuration, as they are usually system-wide settings that you won't change very often.

THE REFRESH BUTTON

The *Refresh* button makes the 324 Console window query the 24i hardware to make sure that the settings in the window accurately reflect the settings in the hardware. Under normal operations, this should never be necessary. Even if you switch off the 24i hardware, the 324 software driver is specially programmed to re-establish contact with the hardware. Even so, if you suspect that the hardware might be in a different state than what you see in the window, click Refresh.

CHOOSING A CONFIG BEFORE OPENING A FILE

The settings in the 324 Console window are not saved with the files you create and save with host audio applications. To save time, you can save the current 324 Console Window settings as a file on disk (as explained earlier), along with your host audio program files. If you work on the project later

on, you can quickly load the configuration file, without having to remember how the 324 Console window was configured.

Some host audio applications remember the 324 Console Window's input and output settings at the time you last saved a project file. This means that even if the 324 Console Window doesn't currently have the exact same settings, the program displays the inputs and outputs that were in effect when the file was last saved.

Some host applications, however, lose their input and output settings if they are not available at the time you open the file. You can save yourself the time of reassigning them by saving a 324 configuration along with the file. For details, see "Saving and recalling routings" on page 35.

CHAPTER 8   Using the 24i with Cubase VST

OVERVIEW

The 24i includes an ASIO driver that provides multi-channel I/O with Steinberg's Cubase VST digital audio sequencer. The 24i requires Cubase VST for Windows Version 3.553 or higher.

PREPARATION

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

■ chapter 6, "Installing the 24i Hardware" (page 21).

■ chapter 5, "Installing the 24i Windows Software" (page 19)

CHOOSING THE PCI-324 DRIVER IN VST

Once you've made the preparations described so far in this chapter, you're ready to run VST.

To activate the 24i's PCI-324 driver in VST:

1 Choose *System* from the Audio menu.

2 Choose *MOTU PCI-324* from the ASIO device menu.

3 Make the other settings in the dialog as need for your system and synchronization scenario.
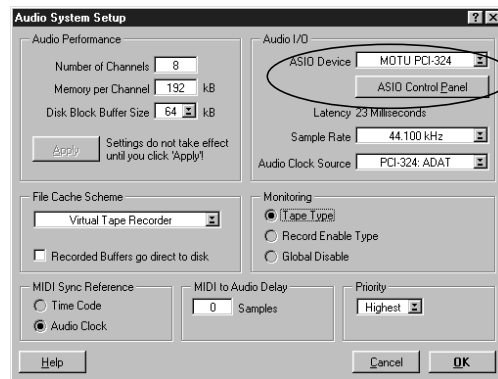

Figure 8-1: Activating the 24i driver in VST.

SAMPLE RATE AND CLOCK SOURCE

Aftering clicking the ASIO Control Panel button in the System dialog as shown in Figure 8-1, you'll see the MOTU 324 Console window shown below in Figure 8-2. Choose the desired sample rate and clcok source. For complete details regarding the MOTU 324 Console, see chapter 7, "MOTU 324 Console Window" (page 29).
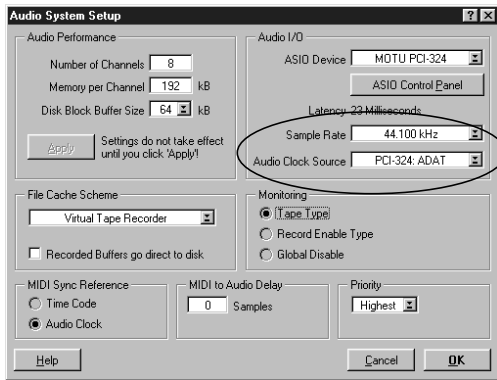

Figure 8-2: Setting the sample rate and clock source in the PCI-324 Console window.

☞ Some versions of VST lose their input and bussing assignments when you modify ASIO driver settings. To avoid this, you can save a 324 setup on disk with your VST file. Then, the next time you open the VST file, you can load the 324 configuration first so that no settings are lost. For details, see "Saving and recalling routings" on page 35.

NUMBER OF CHANNELS

Be sure to choose enough channels in the System dialog (as shown above in Figure 8-1) to cover the 24i's 24 separate inputs and main stereo outputs.

REDUCING MONITORING LATENCY

The Latency setting in the System dialog cannot be adjusted, but it can be adjusted in the MOTU 324 Console, where it is called *Samples Per Buffer*. For complete information about reducing latency with this setting, see "'Samples per buffer'" on page 32.

AUDIO CLOCK SOURCE

This setting is the same as the Clock Source setting in the MOTU 324 Console window. It determines which audio clock the 24i system will slave to. Choose the setting that is most appropriate for your synchronization scenario. For complete details, see "Clock Source" on page 31.

THE 'RECORDED BUFFERS' SETTING

The *Recorded Buffers go direct to disk* option can cause poor disk performance on some computers, severely limiting the number of tracks you'll be able to record and play back. If you experience poor disk performance, try unchecking this option.

OTHER SYSTEM DIALOG SETTINGS

Consult your VST documentation for details about the rest of the settings in this dialog.

ACTIVATING 24I INPUTS

Once you've chosen the MOTU PCI-324 driver in the Audio System dialog, choose *Audio Inputs* from the Audio menu to see the 24i inputs. To activate them, click the *Active* light next to each input.

☞ If some of the 24i's inputs do not appear in the Audio Inputs window, check in the MOTU 324 Console, as shown in Figure 7-3 on page 34, and make sure that their input check boxes are checked.
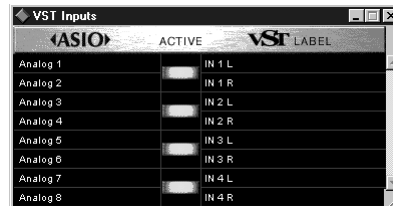

Figure 8-3: Activating 24i inputs in Cubase VST.

ASSIGNING INPUTS TO CHANNELS

Once you've activated the 24i inputs as shown in the previous section, you can then assign them to VST audio channels in the Monitor window in the usual fashion: by control-clicking on the input button at the top of each channel strip as shown below in Figure 8-4.

Figure 8-4: Assigning a 24i input to a VST audio channel: control-click the input button at the top of the channel strip.

ASSIGNING OUTPUTS TO BUSSES

As shown earlier in Figure 7-3 on page 34, any outputs that you set to *From Computer* in the MOTU 324 Console will be available in VST. These outputs appear in the Master window as output assignments for the master fader and busses.

Figure 8-5: Use the output buttons at the bottom of each channel strip, including the master fader, to assign 24i outputs to busses. You can then assign channels in the Monitor window to each bus as desired.

CHANGING 24i SETTINGS

To change the 24i settings at any time, go to the System command in the Audio menu and then click the ASIO Control Panel button.

SYNCHRONIZATION

Cubase VST can run under its own transport control or slave to SMPTE time code.

Running VST under its own transport control

If you do not need to synchronize VST with time code or another recording device, such as a tape deck, just leave its SMPTE time code synchronization features disabled.

However, even though VST is not slaving to SMPTE time code, you still need to be concerned with the synchronization of the 24i's digital audio clock with other devices connected to it digitally (if any). For example, if you have a DAT machine connected to the 24i via S/PDIF, you need to make sure that their audio clocks are phase-locked. If you don't have any digital audio devices connected to the 24i, digital audio phase-lock does not apply to you.

Slaving VST and the 24i to SMPTE time code

If you need to slave VST and the 24i system to SMPTE time code, follow the instructions in your VST manual for slaving VST to MIDI Time Code (MTC). To ensure that your audio tracks don't drift out of sync with your MIDI tracks — or time code, use a hardware synchronizer like the MIDI Timepiece AV or Digital Timepiece to slave the 24i hardware to the SMPTE (or MIDI Time) Code as well. A digital audio synchronizer is required for drift-free SMPTE/MIDI time code sync. Make sure the *Clock Source* setting in the MOTU 324 Console window has the appropriate setting for locking the 24i system to the synchronizer.

24-BIT OPERATION

Your 24i hardware supports Cubase VST's 24-bit recording capabilities. Simply enable 24-bit operation in VST as instructed in your VST manual. The 24i system always supplies VST with a 24-bit data stream, and when you enable 24-bit operation in VST, it simply uses all 24-bits supplied by the 24i hardware.

MONITORING SYSTEM PERFORMANCE

Keep the Audio Performance window open (from the Audio menu) to keep tabs on the load on your CPU and disk buffers. If the meters get too high, you can reduce the load by reducing the number VST plug-ins you are working with.

Figure 8-6: Keep the Audio Performance window open to keep tabs on your computer's processing power and hard disk performance.

CHAPTER 9   Using the PCI-324 Wave Driver

OVERVIEW
The PCI-324 Wave driver provides standard multi-channel input and output for any Windows audio program that support multi-channel wave drivers.

INSTALLING THE PCI-324 WAVE DRIVER
The 24i installer CD-ROM installs the PCI-324 Wave driver into Windows for you. That's pretty much all the preparation you need. See chapter 5, "Installing the 24i Windows Software" (page 19).

CHOOSING 24I INPUTS AND OUTPUTS
Use the MOTU 324 Console application to choose which 24i inputs and outputs you would like to use with your Wave-compatible audio software. You also use the MOTU 324 Console to make other important 24i settings, such the audio format you would like to use on each bank, the 24i's clock source, and others.
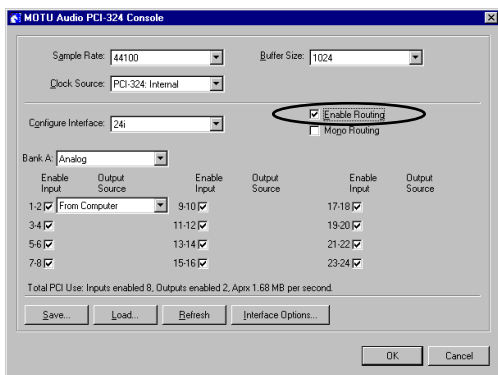

Figure 9-1: Check the 'Enable Routing' check box to expand the middle portion of the window. Then check the box next to any input pair you would like to use in your audio program. For outputs that you want to use in your audio software, choose 'From Computer' from their Output Source menu. Only activate the ones you really need, though, to conserve CPU and PCI bandwidth.

REDUCING DELAY WHEN MONITORING LIVE INPUTS
If you have live audio inputs connected to the 24i, such as MIDI synthesizers, samplers, microphones or other live instruments, you might hear a slight delay when their audio is being patched through your 24i hardware and your audio software. You can reduce this delay at the expense of increased processing for your computer. For details, see "'Samples per buffer'" on page 32 and chapter 11, "Reducing Latency" (page 47).

USING CAKEWALK PRO AUDIO WITH THE 24I
Cakewalk Pro Audio Version 6 or higher is recommended. If you successfully install the Wave driver as discussed in chapter 5, "Installing the 24i Windows Software" (page 19), and then run the MOTU 324 Console to choose your 24i inputs and outputs as just described above, the 24i's inputs will appear in CakeWalk. In Version 7, choose *Audio Options* from the Tools menu, and then click the *Drivers* tab. The 24i's inputs and outputs appear in the Audio Options window under the Drivers tab. If you highlight them, they appear in the track input and port menus for each track.

CAKEWALK PRO AUDIO SETTINGS
Only a few of CakeWalk Audio's audio settings require specific settings for the 24i.

Playback/Record Timing Master
In the Audio Options window, under the General tab, be sure to choose a 24i output and input for playback and recording timing. It doesn't matter which input or output you choose.

Consult your CakeWalk documentation for the other settings in the General tab of the Audio Options window.

CakeWalk Pro Audio advanced settings
In the Advanced settings tab of the Audio Options window, you will experience more accurate timing with the 24i if you turn on the *Use Wave Out Position for Timing* option.

OTHER WAVE-COMPATIBLE SOFTWARE
The 24i can be used with any Wave-compatible audio software. Use the MOTU 324 Console application to enable inputs and outputs as described earlier in this chapter in "Choosing 24i inputs and outputs" on page 41. Then consult the documentation for your wave-compatible audio software in regards to using it with a multi-channel Wave driver.

A NOTE TO SOUND FORGE USERS
If the *Smooth Scroll* option under the Options menu is turned on, you may experience clicks and pops or other anomolies in audio playback. This gets worse as you zoom in more to the waveform while playing. For the best quality playback, turn this option off.

CHAPTER 10   Expanding Your 24i System

OVERVIEW

Up to three 24i I/Os can be connected to a single PCI-324 card for a total of 72 inputs and 18 output connections.

The PCI-324 card ties all three 24i's together, allowing them to act as a massive, 72 by 18 matrix for mixing, merging, splitting and routing to/from all connected inputs and outputs.

24i I/Os are sold separately as expanders for a core 24i system. See your Mark of the Unicorn dealer for details.

You can also add MOTU 2408, 1224 and 308 expansion interfaces to a core 24i system.

CONNECTING ADDITIONAL 24i's

Connect additional 24i's to the two available Audio Wire jacks on your core system's PCI-324 card as shown below in Figure 10-1.
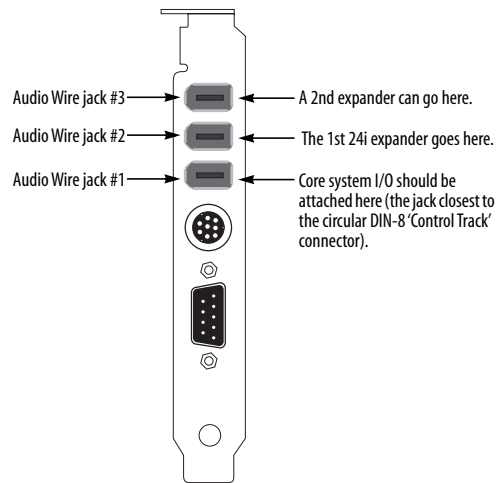

Figure 10-1: You can connect up to three 24i I/Os to a single PCI-324 card.

☛ Important note: when connecting multiple interfaces to a single PCI-324 card, be sure to turn them all on when you're using the system, even if you don't plan to use a particular interface. This ensures trouble-free operation.

MULTIPLE 24i's IN THE 324 CONSOLE WINDOW

The MOTU 324 Console window displays the settings for one 24i I/O at a time. To choose which I/O you are looking at, choose it from the *Configure Interface* menu as shown below in Figure 10-2.
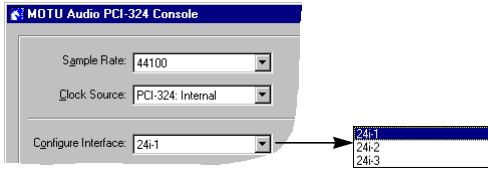
Figure 10-2: Choosing which 24i you are working with in the MOTU 324 Console window. In this example, the expanded system includes three 24i audio interfaces.

Audio routing

Audio routing in the MOTU 324 Console window works the same for multiple 24i's as it does for a single 24i, except that the inputs for two or three I/Os appear in the *Output Source* menus, as demonstrated below in Figure 10-3 with additional 1224 and 2408 interfaces.
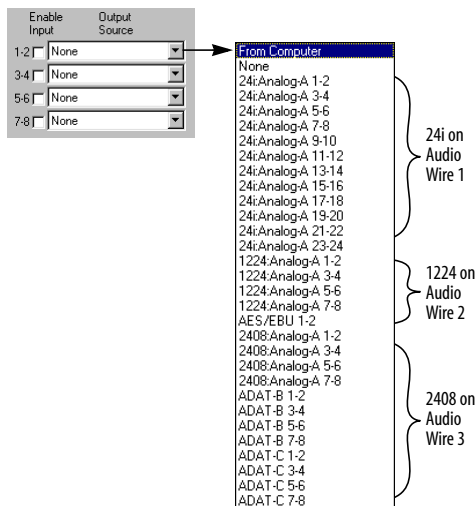

Figure 10-3: The menus in 324 Console show the inputs of all connected 24i's (and other connected interfaces). You can use these menus to route any input to any out.put. In this example, a 24i interface is connected to Audio Wire 1, a 1224 interface is connected to Audio Wire 2, and a 2408 interface is connected to Audio Wire 3.

In the MOTU 324 Console window menus, each input is identified by the 24i it belongs to (the I/Os are numbered 1, 2 and 3), the audio format for the bank, the bank identifier (labeled A, B or C), and finally by its input pair.

Patchbay routing among 24i I/Os

To route any input directly to any output, choose the desired input from the appropriate *Output Source* menu, as usual. In Figure 10-4 below, the AES/EBU inputs on a 1224 interface are being routed to the main outputs on the 24i. For a further explanation about using these menus, see "Output Source" on page 34.
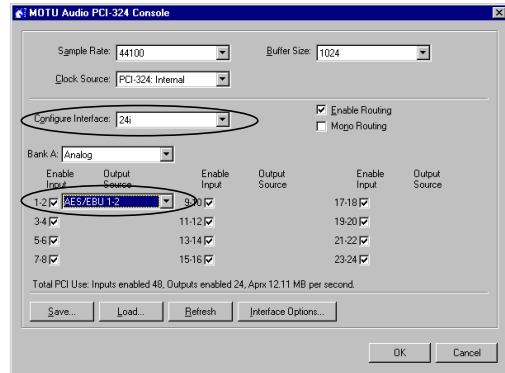

Figure 10-4: The menus in 324 Console show the inputs and outputs of all connected 24i's. You can use these menus to route any input to any output. In this example, the AES/EBU inputs of a connected 1224 (circled) are being routed to the main outputs of the 24i.

SYNCHRONIZING MULTIPLE 24i'S

The entire 24i system gets its clock from whatever you choose from the *Clock Source* menu in the MOTU 324 Console window. When you connect multiple 24i I/Os to the PCI-324 card, all of their respective sync sources are displayed in the menu as shown below in Figure 10-5.
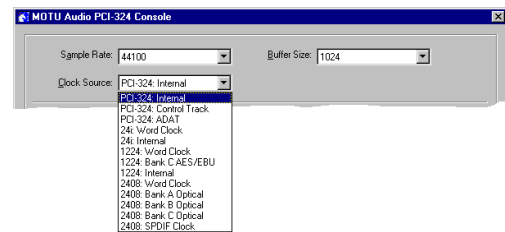

Figure 10-5: The entire 24i system can get its clock from the PCI-324 card itself or any sync source on any connected 24i (or other interface). After you choose a source from this menu, the entire system, including all connected 24i's, synchronizes to it.

Word clock connections are not necessary

Each 24i in the system gets its clock from the Audio Wire cable connection to the PCI-324 card (unless its the master clock itself). There is no need to make word clock connections between multiple 24i I/Os.

Connecting MOTU 2408 I/Os

You can connect up to two MOTU 2408 I/Os to a core 24i system. Each 2408 I/O adds 24 channels of input and output, 58 input connections and 62 output connections.

Just add them to the two addition Audio Wire connectors on the PCI-324 card as shown earlier in Figure 10-1 on page 43. Then configure them in the 324 Console Window as usual by choosing them from the *Configure Interface* menu as shown in Figure 10-2 on page 44. Your PCI-324 card seamlessly integrates them with the 24i, creating a completely flexible patch bay, where you can mix, merge split, and otherwise route data between any of the three I/Os.
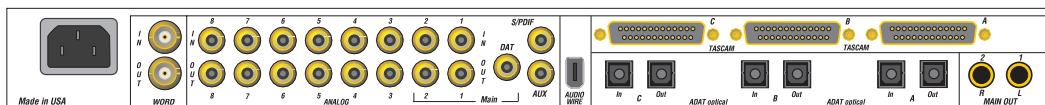

Figure 10-6: You can connect up to three ADATs, three DA-88s, eight analog and two S/PDIF devices to a 2408 I/O. Two 2408 I/Os can be added to a core 24i system.

CHAPTER 11 Reducing Latency

OVERVIEW

Latency is the amount of time it takes for audio to be patched through your 24i system, from when it first enters a 24i input, passes through the 24i hardware into the computer, through your host audio software, and then back out a 24i output.

The delay is small but audible (from just a few milliseconds to several dozen milliseconds, depending on the 24i driver settings). Latency is most noticeable when you patch live audio through the 24i system and your audio software. For example, you might have MIDI instruments, samplers, microphones, a guitar, a digital mixer or other live audio sources connected directly to 24i analog inputs. And if so, you will probably want to monitor those live inputs through your audio software, possibly even with some real-time effects processing (such as reverb) applied to the live input. You may also want to listen to the live input along with existing tracks that you've already recorded on your hard drive. However, when doing so, you'll hear a delay between the live inputs and the tracks already recorded. The live input will sound just a little bit late.

Your 24i software offers several different ways to reduce latency — and even make it completely inaudible. You can take these measures regardless of what host audio application software you use.

'SAMPLES PER BUFFER'

As shown below in Figure 11-1 below, the *'Samples per Buffer'* setting determines the size of the buffers used by the MOTU Audio System to transfer audio to and from the 24i hardware. This setting can be used to reduce latency.
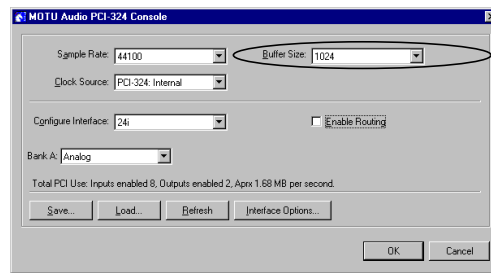
Figure 11-1: Lowering the 'Samples Per Buffer' setting in the MOTU 324 Console Window reduces patch thru latency. But doing so increases the processing load on your computer, so keep an eye on the Performance Monitor window in AudioDesk (or similar feature in your host audio software). If you hear distortion in your audio at lower Samples Per Buffer settings, open Cue Mix Console; its message center can help you find the best buffer size for your system.

For details on how to access the MOTU 324 Console window show above in Figure 11-1, see "Accessing the 324 console window" on page 29.

The 'Samples Per 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 AudioDesk, Digital Performer or other audio software

Lower latency versus higher CPU overhead

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 patched through your system. If you reduce the buffer 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 monitoring input, choose a higher buffer size. Depending on your computer's CPU speed, you might find that settings in the middle work best (256 to 2048).

Transport responsiveness

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 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 'Samples Per Buffer' setting has another benefit: it lets you route live inputs through the real-time effects processing and mix automation of your audio software.

EVEN LOWER LATENCY WITH CUE MIX

The 24i software driver has a more direct method of patching audio through your 24i system. This method is called *Cue Mix*. When enabled, Cue Mix activates a very low-level patch-thru in the 324 driver. Cue Mix has two important benefits: first, it drastically reduces the patch thru delay (latency) — to less than a quarter of the latency when it is not

enabled. Secondly, it does so with very little extra strain on the computer. The trade-off, however, is that this setting does not allow you to patch the live audio through your host audio software. Instead, live audio inputs are patched directly through to outputs by the 324 driver and are mixed with tracks playing back from your audio software by the driver. This means that you cannot apply any of the real-time effects processing, mix automation, or other real-time effects that your audio software provides. But if you are simply tracking and don't need these types of features as you record, definitely use this feature. On the other hand, if you really need to use the mixing and processing provided by your audio software, you should not use Cue Mix and try to reduce latency with the *'Samples Per Buffer'* setting instead (explained earlier).

Turning on Cue Mix

There are several ways to turn on Cue Mix, depending on what type of host application you are using with the 24i system.

Wave driver compatible software

If you host audio application has live monitoring (patch thru), disable it. Then, run the 324 Cue Mix Console (described later in this chapter) to turn on Cue Mix and control the output assignments, volume and panning of the inputs being monitored through Cue Mix.

Cubase VST (or other ASIO-compatible apps)

Remember, you can reduce the patch thru latency in Cubase VST by lowering the *'Samples Per Buffer'* setting as described earlier in this chapter. Doing so allows you to lower the latency and still apply VST plug-ins to the live input. However, you can reduce the latency further — but with no real-time VST effects — by enabling Cue Mix. To enable Cue Mix for VST:

1 From the Audio menu, choose *System*.

2 In the Monitoring section, choose *Global Disable*. This is because the 324 driver is going to provide monitoring instead of VST.

3 Run the 324 Cue Mix Console (described later in this chapter) to turn on Cue Mix and control the output assignments, volume and panning of the inputs being monitored through Cue Mix.

324 CUE MIX CONSOLE

If you are using Cue Mix with any application other than AudioDesk or Digital Performer, or you are using AudioDesk or Digital Performer without the *Auto Cue Mix Update* option, the 324 Cue Mix Console lets you control the output assignment, volume level, and pan setting for each Cue Mix input.

The *324 Cue Mix Console* is installed with the rest of your 24i software on the top level of your startup hard drive.

The Cue Mix Console provides the following controls.

Master On/Off button

The master On/Off button turns Cue Mix on or off. But remember, it is a global setting. If you turn it on in the Cue Mix Console, it can get turned off by AudioDesk or Digital Performer, depending on their settings. See "Turning on Cue Mix" on page 48.

Cue Mix Output Assignments

These four menus let you choose up to four output pairs as Cue Mix outputs. The outputs that appear in these menus are the Output Source menus in the 324 Console window that have been given the *From Computer* designation.

Master Cue Mix volume

This fader, on the right-hand side of the mixer, controls the overall Cue Mix level. Use the individual input faders to the left to control individual Cue Mix input levels.
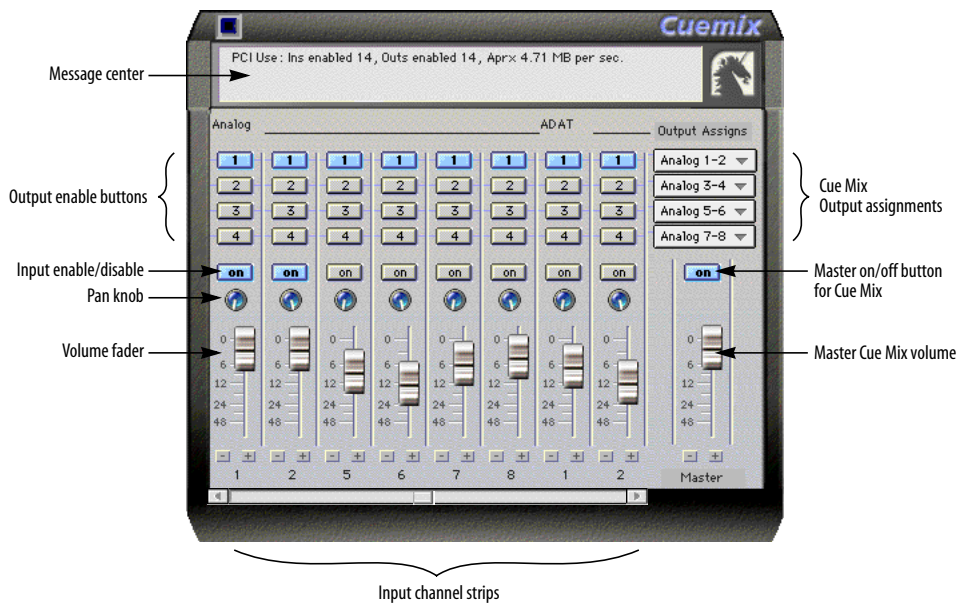

Figure 11-2: The PCI-324 Cue Mix Console. This virtual mixer gives you control over the PCI-324 driver's low-latency patch thru features.

Input channel strips

Each input that is enabled (checked) in the 324 Console window appears as a channel strip in the 324 Cue Mix Console. Each input has the following controls:

Output enable buttons

Click the output(s), 1 through 4, that you would like to monitor the input on. These buttons let you send the input to as many as four different output pairs on the 24i, if you want. Most of the time, you'll probably want to simply monitor all inputs on a single output pair, so you'll use only one of these buttons at a time.

Individual input enable/disable button

This button lets you enable or disable the individual input.

Pan knob

This pans the Cue Mix input across its corresponding output pair.

Volume fader

Each input has a Cue Mix fader to control its volume.

All of the control listed above are overridden by AudioDesk and Digital Performer if the *Auto Cue Mix Update* option is checked in the 324 Console window.

Message Center

The message center displays useful information, such as recommendations for the buffer size. It also reports errors that it detects in the operation of your system, and makes recommendations on how to address the problem. The messages displayed here do not only have to do with Cue Mix; they can also apply to the overall operation of the PCI-324 card and the 24i system. Use it as a handy monitor of your system's performance.

CHAPTER 12 Performance Tips & Troubleshooting

PERFORMANCE TIPS

Remove DOS mode drivers, if possible

DOS boxes are the enemy. Each DOS box or DOS mode driver that you have loaded drastically increases the time it takes for the 324 driver to pass audio to your programs. This means that your buffers will need to be larger, and your latencies will be longer. Look at your config.sys file and make sure there are not any lines that start off "device=". These load DOS mode drivers when Windows starts, and will greatly decrease the performance of your 24i system. In general these lines can be removed from the config.sys file without causing problems. Also, for the same reason, don't have DOS boxes or DOS programs running while you are using the 324 card.

Try to give the 324 its own IRQ

Right-click on *My Computer*, select Properties from the popup menu, click on the Device Manager tab of the dialog that opens, then double click on the *Computer* icon at the top of the list. This will show you a list of all the devices in your system and what IRQs they are using. Scroll the list until you see *MOTU PCI-324.* Check the IRQ setting to the left of the icon. If there are other devices such as a video card that are assigned to the same IRQ, you should try moving your 324 to a different slot. (Note: entries that say "IRQ Holder for PCI Steering" do not indicate conflicting devices. You can ignore these entries.) Although the 324 can share interrupts, it will perform better if it is given its own IRQ.

If you have trouble booting windows 95...

The 324 Wave driver sometimes may cause Windows Explorer not to launch if it is chosen as the Preferred device in the Audio tab of the

Multimedia control panel. This problem only shows up in some versions of Windows when certain other drivers are installed. When this happens, Windows will almost complete the boot process, but the desktop will remain blank. Icons and the task-bar will not show up. If this happens to you, double-click on the desktop to get the Task manager, select *Run Application* from the System menu at the top left of the window, type *Explorer* in the dialog that pops up and hit enter. This will allow Windows to finish booting. There are several ways to keep this from happening again:

1. Don't select any of the 24i's output channels as your Preferred Device in the multimedia control panel. Choose *None* or the output of some other sound card instead.

2. Upgrade to Windows 98. Microsoft seems to have corrected this problem in the newer version of the operating system.

3. Try disabling other drivers in the system, or upgrading your drivers. For example, we have found this problem to crop up when older versions of some sound cards were installed.

TROUBLESHOOTING

Most problems result from incorrect word clocking. All digital devices in the system must be word locked. There are numerous ways to achieve this. Whenever there is any weird noise or distortion, suspect incorrect word lock, and revisit chapter , "Connect word clock" (page 25).

ADATs can take a while to sync to the Digital Timepiece. For instance, when recording out to the ADATs, they can appear to chase and lock, but the record button is still flashing. Recorded data on the

tape won't be sample accurate until the record light stops flashing. Be sure to give ADATs enough time to lock.

Sometimes, the ADAT sync cable seems to be plugged into the card, and partially works - but it isn't really all the way in because it binds against the side of the bulkhead slot. This can cause clicks when slaved to 324 ADAT. Make sure it is really seated firmly. Connect the ADAT sync before screwing the card down - this will ensure that it is aligned properly.

If you experience poor recording and playback performance in Cubase VST, try turning off the *Recorded Buffers go direct to disk* option in the System dialog (Audio menu).

If you hear click and pops in your audio, try increasing the *Buffer Size* in the MOTU 324 Console window.

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 complete the registration card included with your 24i system. When we receive your card, you'll be placed on our mailing list for free software updates and information about new products.

REPLACING DISKS

If your 24i software CD-ROM becomes damaged and fails to provide you with fresh, working copies of the program, 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.

TECHNICAL SUPPORT

If you are unable, with your dealer's help, to solve problems you encounter with the 24i system, you may contact our technical support department in one of the following ways:

■ Tech support 24-hour fax line: (617) 354-3068

■ Tech support email: techsupport@motu.com

■ Web site: www.motu.com

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

■ The serial number of the 24i system. This is printed on a sticker placed on the bottom of the 24i rack unit. You must be able to supply this number to receive technical support.

■ Software version numbers for the audio software you are using, the PCI-324 Wave Driver, PCI-324 ASIO driver, etc.

■ 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.