

# **MOTU 828™**

## **User's Guide for Windows**



**MOTU**

1280 Massachusetts Avenue  
Cambridge, MA 02138

Business voice: (617) 576-2760

Business fax: (617) 576-3609

Tech support phone: (617) 576-3066

Tech support fax: (617) 354-3068

Tech support email: [techsupport@motu.com](mailto:techsupport@motu.com)

Web site: [www.motu.com](http://www.motu.com)

# 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 MOTU 828 COULD CAUSE AN ELECTRICAL SHOCK.**

The MOTU 828 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 MOTU 828 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

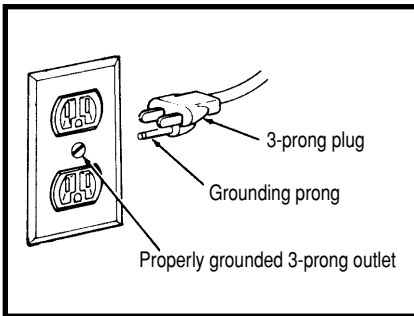
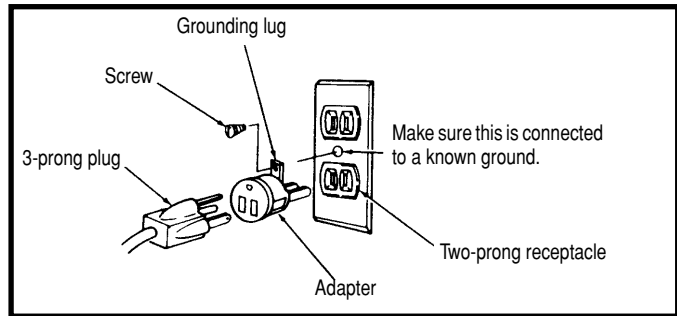


Figure B



**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 MOTU 828 plug.

## IMPORTANT SAFEGUARDS

1. Read instructions - All the safety and operating instructions should be read before operating the MOTU 828.
2. Retain instructions - The safety instructions and owner's manual should be retained for future reference.
3. Heed Warnings - All warnings on the MOTU 828 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 MOTU 828 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 MOTU 828 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 MOTU 828.
9. Lightning - For added protection for the MOTU 828 during a lightning storm, unplug it from the wall outlet. This will prevent damage to the MOTU 828 due to lightning and power line surges.
10. Servicing - Do not attempt to service this MOTU 828 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 MOTU 828 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 MOTU 828.
  - c. If the MOTU 828 has been exposed to rain or water.
  - d. If the MOTU 828 does not operate normally by following the operating instructions in the owner's manual.
  - e. If the MOTU 828 has been dropped or the cabinet has been damaged.
  - f. When the MOTU 828 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 MOTU 828, 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°F)

## 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

- 5 **Quick Reference: MOTU 828 Front Panel**
- 6 **Quick Reference: MOTU 828 Rear Panel**
- 7 **Quick Reference: MOTU 828 Console**
- 9 **About the MOTU 828**
- 13 **Packing List and  
Windows System Requirements**
- 15 **IMPORTANT! Run the MOTU 828 Software  
Installer First**
- 17 **Installing the MOTU 828 Hardware**
- 31 **MOTU 828 Console**
- 39 **ASIO-compatible Audio Software**
- 45 **Windows Multimedia-compatible Audio  
Software**
- 49 **Performance Tips & Troubleshooting**
- 53 **Index**

## About the Mark of the Unicorn License Agreement and Limited Warranty on Software

TO PERSONS WHO PURCHASE OR USE THIS PRODUCT: carefully read all the terms and conditions of the "click-wrap" license agreement presented to you when you install the software. Using the software or this documentation indicates your acceptance of the terms and conditions of that license agreement.

Mark of the Unicorn, Inc. ("MOTU") owns both this program and its documentation. Both the program and the documentation are protected under applicable copyright, trademark, and trade-secret laws. Your right to use the program and the documentation are limited to the terms and conditions described in the license agreement.

### Reminder of the terms of your license

This summary is not your license agreement, just a reminder of its terms. The actual license can be read and printed by running the installation program for the software. That license agreement is a contract, and clicking "Accept" binds you and MOTU to all its terms and conditions. In the event anything contained in this summary is incomplete or in conflict with the actual click-wrap license agreement, the terms of the click-wrap agreement prevail.

YOU MAY: (a) use the enclosed program on a single computer; (b) physically transfer the program from one computer to another provided that the program is used on only one computer at a time and that you remove any copies of the program from the computer from which the program is being transferred; (c) make copies of the program solely for backup purposes. You must reproduce and include the copyright notice on a label on any backup copy.

YOU MAY NOT: (a) distribute copies of the program or the documentation to others; (b) rent, lease or grant sublicenses or other rights to the program; (c) provide use of the program in a computer service business, network, time-sharing, multiple CPU or multiple user arrangement without the prior written consent of MOTU; (d) translate, adapt, reverse engineer, decompile, disassemble, or otherwise alter the program or related documentation without the prior written consent of MOTU.

MOTU warrants to the original licensee that the disk(s) on which the program is recorded be free from defects in materials and workmanship under normal use for a period of ninety (90) days from the date of purchase as evidenced by a copy of your receipt. If failure of the disk has resulted from accident, abuse or misapplication of the product, then MOTU shall have no responsibility to replace the disk(s) under this Limited Warranty.

THIS LIMITED WARRANTY AND RIGHT OF REPLACEMENT IS IN LIEU OF, AND YOU HEREBY WAIVE, ANY AND ALL OTHER WARRANTIES, BOTH EXPRESS AND IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE LIABILITY OF MOTU PURSUANT TO THIS LIMITED WARRANTY SHALL BE LIMITED TO THE REPLACEMENT OF THE DEFECTIVE DISK(S), AND IN NO EVENT SHALL MOTU OR ITS SUPPLIERS, LICENSORS, OR AFFILIATES BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LOSS OF USE, LOSS OF PROFITS, LOSS OF DATA OR DATA BEING RENDERED INACCURATE, OR LOSSES SUSTAINED BY THIRD PARTIES EVEN IF MOTU HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS WHICH MAY VARY FROM STATE TO STATE. SOME STATES DO NOT ALLOW THE LIMITATION OR EXCLUSION OF LIABILITY FOR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

### Update Policy

In order to be eligible to obtain updates of the program, you must complete and return the attached Mark of the Unicorn Purchaser Registration Card to MOTU.

### Copyright Notice

Copyright © 2001 by Mark of the Unicorn, Inc. All rights reserved. No part of this publication may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any human or computer language, in any form or by any means whatsoever, without express written permission of Mark of the Unicorn, Inc., 1280 Massachusetts Avenue, Cambridge, MA, 02138, U.S.A.

## Limited Warranty on Hardware

Mark of the Unicorn, Inc. and S&S Research ("MOTU/S&S") warrant this equipment against defects in materials and workmanship for a period of NINETY (90) DAYS from the date of original retail purchase. This warranty applies only to hardware products; MOTU software is licensed and warranted pursuant to separate written statements.

If you discover a defect, first write or call Mark of the Unicorn at (617) 576-2760 to obtain a Return Merchandise Authorization Number. No service will be performed on any product returned without prior authorization. MOTU will, at its option, repair or replace the product at no charge to you, provided you return it during the warranty period, with transportation charges prepaid, to Mark of the Unicorn, Inc., 1280 Massachusetts Avenue, MA 02138. You must use the product's original packing material for in shipment, and insure the shipment for the value of the product. Please include your name, address, telephone number, a description of the problem, and the original, dated bill of sale with the returned unit and print the Return Merchandise Authorization Number on the outside of the box below the shipping address.

This warranty does not apply if the equipment has been damaged by accident, abuse, misuse, or misapplication; has been modified without the written permission of MOTU, or if the product serial number has been removed or defaced.

ALL IMPLIED WARRANTIES, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED IN DURATION TO NINETY (90) DAYS FROM THE DATE OF THE ORIGINAL RETAIL PURCHASE OF THIS PRODUCT.

THE WARRANTY AND REMEDIES SET FORTH ABOVE ARE EXCLUSIVE AND IN LIEU OF ALL OTHERS, ORAL OR WRITTEN, EXPRESS OR IMPLIED. No MOTU/S&S dealer, agent, or employee is authorized to make any modification, extension, or addition to this warranty.

MOTU/S&S ARE NOT RESPONSIBLE FOR SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES RESULTING FROM ANY BREACH OF WARRANTY, OR UNDER ANY LEGAL THEORY, INCLUDING LOST PROFITS, DOWNTIME, GOODWILL, DAMAGE OR REPLACEMENT OF EQUIPMENT AND PROPERTY AND COST OF RECOVERING REPROGRAMMING, OR REPRODUCING ANY PROGRAM OR DATA STORED IN OR USED WITH MOTU/S&S PRODUCTS.

Some states do not allow the exclusion or limitation of implied warranties or liability for incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may have other rights which vary from state to state.

MOTU, AudioDesk, MOTU, Mark of the Unicorn and the unicorn silhouette logo are trademarks of Mark of the Unicorn, Inc.

This equipment has been type tested and found to comply with the limits for a class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television equipment reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by any combination of the following measures:

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

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

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

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



# Quick Reference: MOTU 828 Front Panel

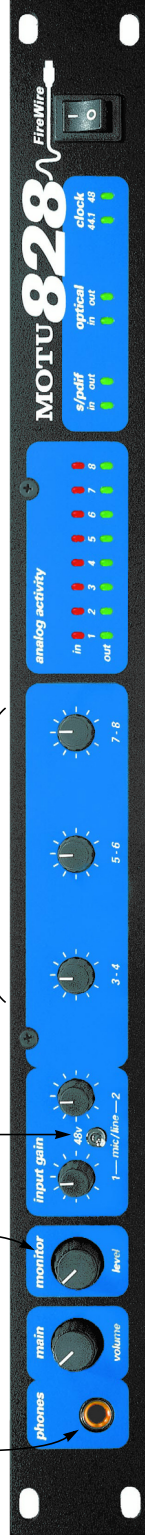
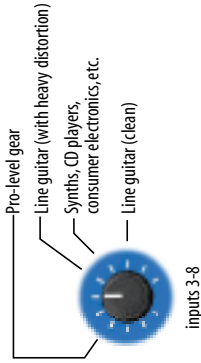
This is a standard quarter-inch stereo headphone jack. Its output matches the main outs on the rear panel. The volume knob controls both the headphone out and the main outs.

The MOTU 828 lets you monitor any analog input (or input pair) via the main outs (and the headphone out). This knob controls the level of this monitored signal.

This switch provides phantom power for microphones on inputs 1 and 2. Up is on.

These three input trim knobs provide up to 40dB of gain for inputs 3 through 8 (in pairs). These inputs don't have mic pre-amps, so they are best for line-level inputs such as synthesizers, drum machines, samplers, effects processors and other studio gear. If your input is hot (-4dB), start with the trim knob at about 10 or 11 o'clock. If you're dealing with a synth or consumer audio product, try 2 o'clock. Then calibrate the input using the level meters in your host audio software to make sure the level isn't clipping (clipping is bad and causes unwanted distortion).

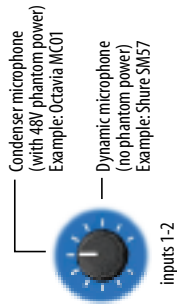
Approximate trim positions on inputs 3 through 8 for guitars and other studio gear. Start with these positions and then adjust according to the level meters in your audio software.



These two trim knobs provide up to 40dB of gain for inputs 1 and 2. Because inputs 1 and 2 also have microphone pre-amps, you can plug just about anything into them: a microphone, a guitar, an synth — your name it.

If you plug in a condenser microphone (with phantom power), start with the trim knob at about 12 o'clock. For a dynamic mic (no phantom), try 3 o'clock. Then calibrate the input using the level meters in your host audio software to make sure the level isn't clipping (clipping is bad and causes unwanted distortion).

Approximate trim positions on inputs 1 and 2 for a microphone. Start with these positions and then adjust according to the level meters in your audio software.



These lights indicate signal presence on the analog inputs and outputs. Their threshold is around -42 dB. They do not indicate clipping in any way; use your host audio software level meters to calibrate input and output levels.

These lights indicate the signal presence on the digital inputs and outputs. Their threshold is around -42 dB. They do not indicate clipping in any way; use your host audio software level meters to calibrate inputs and outputs.

FireWire is a "plug-and-play" protocol. That means that you can turn off the MOTU 828 and turn it back on without restarting your computer. Keep in mind, however, that if you wish to change the MOTU 828's settings in the MOTU 828 Console, the MOTU 828 needs to be plugged in and switched on.

These lights indicate the global sample rate at which the MOTU 828 is operating. Use the MOTU 828 Console to set the sample rate or to choose an external clock source from which the sample rate will be derived. When no sample clock is currently present, these two lights flash rapidly. For example, if you've set the MOTU 828 to slave to an external clock, such as ADAT, but there is no clock signal currently being detected, these lights will flash.

# Quick Reference: MOTU 828 Rear Panel

If you are using the MOTU 828 with an ADAT, use this standard ADAT SYNC INPUT to connect the MOTU 828 to the end of your ADAT sync chain. For example, if you have three ADATs, chain the ADATs in the usual fashion (SYNC OUT to SYNC IN, etc.), and then connect the last ADAT'S SYNC OUT to this SYNC IN. This connection allows you to make sample-accurate audio transfers between AudioDesk (or other sample-accurate software) and the ADATs. If you have a MOTU MIDI Timepiece AV or Digital Timepiece, make it the master of the ADAT SYNC chain so that you can control everything from AudioDesk (or your other MIDI Machine Control compatible software).

This foot pedal input is for Macintosh operation only.

The MOTU 828's eight analog outputs are gold-plated, balanced +4dB TRS (tip/ring/sleeve) quarter-inch connectors that can also accept an unbalanced plug. They are equipped with 24-bit, 128x oversampling converters.

These Neutrik™ jacks for inputs 1 and 2 accept either a mic (XLR) cable or a quarter-inch plug. Each is equipped with a mic preamp. 48V phantom power can be supplied via the front-panel switch. Since these inputs have mic preamps, they are ideal for microphones, guitars and other low-level sources.

These jacks provide stereo, 24-bit S/PDIF digital input and output.



These optical digital I/O connectors can be connected either to an ADAT-compatible "lightpipe" device (such as a digital mixer) or to a S/PDIF optical ("TOSlink") compatible device, such as an effects processor or DAT machine. Be sure to set the format in the MOTU 828 Console software. (see "Optical input/output" on page 34 for details.) ADAT optical supplies eight channels of 24-bit digital I/O, and TOSlink is stereo.

One special note: you can choose independent formats for the optical IN and OUT. For example, you could choose ADAT for the optical IN (for, say, eight channels of input from your digital mixer) and S/PDIF for the optical OUT (for, say, your DAT machine).

Connect the MOTU 828 to the computer here using the standard 1394 FireWire cable provided with your MOTU 828.

These six analog inputs are gold-plated, balanced TRS (tip/ring/sleeve) quarter-inch connectors that can also accept an unbalanced plug. The front panel trim allows you to adjust them for either +4dB or -10dB input signals. They have 24-bit, 64x oversampling converters. These inputs (3 through 8) do not have microphone preamps, so they are best used for synthesizers, drum machines, effects processors, and other instruments. However, because the trim knobs on the front panel give you 40 dB of input gain adjustment, you can probably get a way with plugging in a guitar (depending on the guitar).

Analog outputs 1 and 2 are duplicated on the MOTU 828's main outputs (to the right), as well as the front panel stereo headphone jack. However, these outputs do not include any live CueMix™ Plus audio.

These two balanced, quarter-inch jacks serve as the MOTU 828's main outputs. You can connect them to a set of powered studio monitors and then control the volume from the front panel "Main" volume knob.

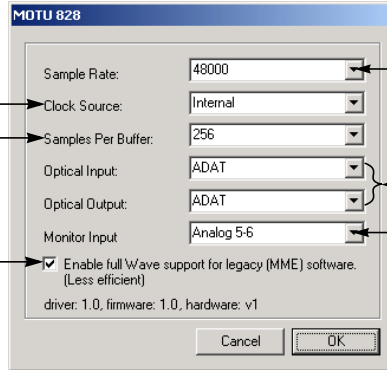
The signal that comes out of these outputs is a mix of analog outputs 1 and 2 and any live CueMix™ Plus input that you have chosen to monitor from a MOTU 828 input (or input pair). To hear disk tracks in your audio software on these main outs, assign the disk tracks (and master fader) to Analog Outs 1-2.

# Quick Reference: MOTU 828 Console

Determines the master clock source for your entire MOTU 828 system. If you're just using the analog ins and outs, set this to 'Internal'. The other settings are for digital transfers via S/PDIF or external synchronization via the ADAT SYNC in port.

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

Check this option if the audio software you are using with the MOTU 828 does not support Windows WDM drivers and instead only supports legacy MME (Wave) drivers. When checked, this option makes all of the MOTU 828 inputs and outputs available to legacy Wave-driver compatible audio software.



Choose the global sample rate for the system here.

Choose the desired optical format you'd like to use for the optical input and output. Note that they don't have to be the same.

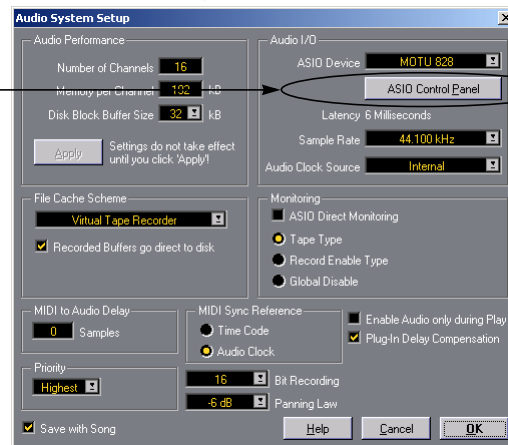
This is the MOTU 828's no-latency CueMix™ Plus monitoring feature. The inputs you choose here will be mixed with the main outs and can be controlled with the 'monitor' volume knob on the front panel.

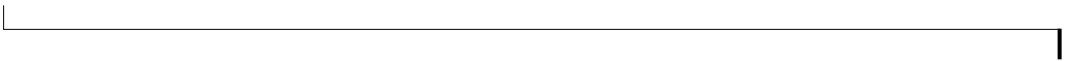
## How to access these settings

The MOTU 828 Console gives you complete control over the settings in your MOTU 828 hard disk recording system. There are several ways to access these settings. But the settings are the same, regardless of how you access them.

- From the Windows Start menu, choose Programs>MOTU>MOTU 828 Console.
- From within Cubase™, go to the Audio System Setup window and click on the ASIO Control Panel button.
- From within other applications, refer to their documentation.

Audio System Setup in Cubase VST







## CHAPTER 1 **About the MOTU 828**

### OVERVIEW

The MOTU 828 is a computer-based hard disk recording system for Mac OS and Windows that offers 18 simultaneous inputs and outputs. The MOTU 828 consists of a standard 19-inch, single-space, rack-mountable I/O unit that connects directly to a computer via a standard IEEE 1394 FireWire™ cable. The MOTU 828 offers the following:

- Eight 24-bit analog inputs and outputs
- Eight-channel ADAT optical digital I/O
- S/PDIF (optical and RCA)
- Two extra analog main outs
- Two mic preamps on inputs 1 and 2
- 48V phantom power for both mic inputs
- ADAT sync in
- Headphone jack
- Main volume knob (for headphone + main outs)
- CueMix™ Plus no-latency monitoring
- Individual front-panel input trim knobs

With a variety of I/O formats, mic preamps, no-latency monitoring of live input and synchronization capabilities, the MOTU 828 is a complete, portable “studio in a box” when used with a Macintosh or Windows computer. A WDM driver is included for audio applications running under Windows 2000, Windows Me or Windows 98/Second Edition. Also included is an ASIO driver for multi-channel operation with any Windows audio software that supports ASIO drivers.

### THE MOTU 828 I/O REAR PANEL

The MOTU 828 rear panel has the following connectors:

- Eight gold-plated, balanced +4dB quarter-inch (TRS) analog outputs (with 24-bit converters)
- Six gold-plated, balanced +4 dB quarter-inch (TRS) analog inputs (with 24-bit converters)
- Two additional analog mic/line inputs on Neutrik combo (XLR/quarter-inch) connectors equipped with mic pre-amps
- One set of ADAT optical ‘light pipe’ connectors (8 channels of ADAT optical I/O), individually switchable to optical S/PDIF (‘TOSLink’)
- RCA S/PDIF in/out
- Two balanced +4 quarter-inch TRS main outputs with volume knob (on the front panel)
- One 9-pin ADAT SYNC IN connector
- One 1394 FireWire jack

### 18 simultaneous inputs and outputs

All MOTU 828 inputs and outputs can be used simultaneously, for a total of 18 inputs and outputs (8 analog + 8 ADAT optical + 2 RCA S/PDIF).

### Analog

The analog inputs are equipped with 24-bit, 64x oversampling A/D converters. The analog outputs have 24-bit 128x oversampling D/A converters. All audio is carried to the computer in a 24-bit data stream. The eight analog outputs are on balanced TRS +4dB quarter-inch jacks, as are the six quarter-inch input jacks below them. All of these jacks can also accept unbalanced plugs.

All analog inputs can be gain-adjusted with the trim knobs on the front panel. The range of these knobs is approximately 40 dB.

### **Mic inputs**

Analog inputs 1 and 2 are each equipped with a mic preamp on a Neutrik™ combo-style connector that accepts either a mic (XLR) cable or a cable with a quarter-inch plug. Defeatable 48V phantom power is supplied by a front panel switch.

### **Main Outs**

For main stereo output, analog outputs 1 and 2 are duplicated as a stereo pair of balanced, +4dB quarter-inch TRS jacks. If an input (or input pair) is being monitored via the MOTU 828's CueMix™ Plus monitoring feature, the monitored signal is summed with the main outs. You can control the volume of the main outs with the front panel volume knob. You can independently control the CueMix Plus monitored signal with the Monitor level knob on the front panel.

### **Optical**

The MOTU 828 optical jacks support two digital audio formats: ADAT and S/PDIF. The ADAT optical format provides eight channels of 24-bit digital audio at either 44.1 or 48 kHz. The optical S/PDIF format (often referred to as *TOSLink*), supplies stereo S/PDIF input or output.

### **S/PDIF**

The MOTU 828 rear panel provides S/PDIF input and output in two different formats: RCA “coax” and optical “TOSLink”. The RCA jacks are dedicated to the S/PDIF format. The TOSLink jacks can be used either for the TOSLink format or for ADAT optical. In addition, the optical input and output jacks can operate independently. For example, the optical input can be set to TOSLink while the optical output is set to ADAT.

### **ADAT sync: sample-accurate synchronization**

The MOTU 828's standard 9-pin ADAT SYNC IN connector provides sample-accurate synchronization with all Alesis ADAT tape decks connected to the system—or any device that supports the ADAT sync format. For example, if you digitally transfer a single track of material from an ADAT via light pipe into audio workstation software on the computer, and then transfer the track back to the ADAT, it will be recorded exactly at its original location, down to the sample.

### **1394 FireWire**

The 1394 FireWire jack accepts a standard IEEE 1394 FireWire cable to connect the MOTU 828 to a FireWire-equipped Macintosh or Windows computer.

## **THE MOTU 828 FRONT PANEL**

### **Headphone output and main volume control**

The MOTU 828 front panel includes a quarter-inch stereo headphone output jack and volume knob. The headphone output matches the main stereo outs, and the volume knob controls both the headphones and the main outs.

### **CueMix™ Plus no-latency monitoring**

The MOTU 828 provides CueMix™ Plus no-latency monitoring from any analog input (or input pair). The CueMix monitored signal is mixed with outputs 1-2 (which are duplicated on the main outs). An independent volume knob is provided for the monitored signal.

### **Input trim knobs and phantom power switch**

The *Input Gain* section provides 40 dB of trim for the eight analog inputs. Inputs 1 and 2 have independent trim knobs, while inputs 3 through 8 have one knob per input pair (3-4, 5-6, and 7-8). The phantom power switch provides 48V phantom power to the two mic inputs. Up is on; down is off.

### **Activity lights**

The front panel of the MOTU 828 displays several banks of activity LEDs. The *Analog Activity*, *S/PDIF* and *Optical* lights display the presence of signal on the input or output. The threshold for these lights is approximately -42 dB. The *Clock* lights indicate the global sample rate (as chosen in the MOTU 828 Console software).

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

The MOTU 828 system handles all data with a 24-bit signal path, regardless of the I/O format. You can record and play back 16-bit or 24-bit audio files at either 44.1 or 48 KHz via any of the MOTU 828's analog or digital inputs and outputs. 24-bit audio files can be recorded with any compatible host application that supports 24-bit recording.

### **HOST AUDIO SOFTWARE**

The MOTU 828 system ships with a standard WDM Windows driver that allows you to record, edit, play back and mix your MOTU 828 projects using your favorite Windows audio software.

The MOTU 828 also includes a Windows ASIO driver for multi-channel compatibility with any audio application that supports ASIO drivers.

### **A COMPUTER-BASED SYSTEM**

Regardless of what software you use with the MOTU 828, 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. 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 2 **Packing List and Windows System Requirements**

### **PACKING LIST**

The MOTU 828 ships with the items listed below. If any of these items are not present in your MOTU 828 box when you first open it, please immediately contact your dealer or MOTU.

- One MOTU 828 I/O rack unit
- One 1394 “FireWire” cable
- Power cord
- One MOTU 828 Mac/Windows manual
- One AudioDesk Manual
- One cross-platform CD-ROM
- Product registration card

### **WINDOWS SYSTEM REQUIREMENTS**

The MOTU 828 system requires the following Windows system:

- A 300 MHz Pentium-based PC compatible or faster equipped with at least one FireWire port
- A Pentium III/300 or faster is recommended
- At least 32 Mb (megabytes) of RAM (64 Mb or more is recommended)
- Windows 2000, Windows Me or Windows 98/Second Edition
- A large hard drive (preferably at least 9 Gb)

### **PLEASE REGISTER TODAY!**

Please send in the registration card included with your MOTU 828 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 MOTU products!



# IMPORTANT! Run the MOTU 828 Software Installer First

## OVERVIEW

The MOTU 828 ships with the following software and drivers for Windows 2000:

Software component	Purpose
MOTU 828 Console	Provides access to all of the settings in the MOTU 828 hardware.
ASIO MOTU 828 Driver	Allows Cubase VST or other ASIO-compliant software to do multi-channel input and output with the MOTU 828. Only required if you are using Cubase VST or another ASIO-dependent program.
MOTU 828 WDM Driver	Allows any WDM-driver compatible audio software to do multichannel input and output with the MOTU 828.

Install the MOTU 828 software first! .....15

Installing the MOTU 828 software .....15

MOTU 828 Console .....16

ASIO MOTU 828 Driver .....16

The MOTU 828 WDM driver .....16

## INSTALL THE MOTU 828 SOFTWARE FIRST!

Before you connect the MOTU 828 audio interface to your computer and turn it on, insert the MOTU 828 software CD and run the MOTU 828 Software Installer. This ensures that all the MOTU 828 components are properly installed in your system.

### If Windows asks you to locate the drivers

If you've already connected the MOTU 828 to your computer and switched it on, Windows probably issued an alert notifying you that the MOTU 828 requires drivers, followed by another window asking you to locate the drivers on disk. If this happens:

- 1 Cancel the driver search.
- 2 Switch off the MOTU 828.
- 3 Restart the computer.
- 4 Run the MOTU 828 Software Installer as instructed in the next section.

## INSTALLING THE MOTU 828 SOFTWARE

To install the MOTU 828 software, insert the MOTU Audio CD-ROM and follow the directions it gives you on your computer screen.

## MOTU 828 CONSOLE

The MOTU 828 Console application is placed by the 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 828 Console gives you access to all of the settings in the MOTU 828, such as the clock source and sample rate. For complete details, see chapter 5, "MOTU 828 Console" (page 31).

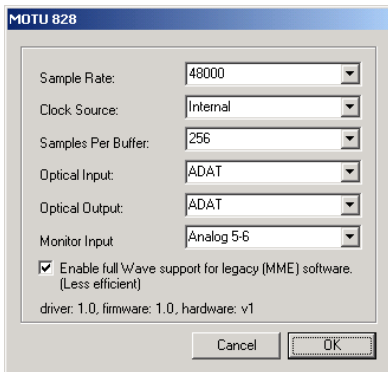


Figure 3-1: The MOTU 828 Console gives you access to all of the settings in the MOTU 828 hardware.

## ASIO MOTU 828 DRIVER

*ASIO* stands for *Audio Streaming Input and Output*. The ASIO MOTU 828 driver allows MOTU 828 to provide multi-channel input and output for Steinberg's Cubase VST software, or any other audio application that supports ASIO drivers.

The ASIO MOTU 828 driver is only required if you are using Cubase VST (or another audio program that relies on the ASIO driver to support multi-channel I/O with the MOTU 828).

The ASIO MOTU 828 driver is installed by the MOTU 828 Software Installer and properly registered with Windows, so you don't need to be concerned about its installation or location.

For details about using Cubase VST with the MOTU 828, see chapter 6, "ASIO-compatible Audio Software" (page 39).

## THE MOTU 828 WDM DRIVER

The MOTU 828 WDM driver provides standard multi-channel input and output for audio applications running under Windows 2000, Windows Me or Windows 98/Second Edition. See chapter 7, "Windows Multimedia-compatible Audio Software" (page 45) for details.

The MOTU 828 installer CD installs the MOTU 828 WDM driver into Windows for you.



# CHAPTER 4 Installing the MOTU 828 Hardware

## OVERVIEW

Here's an overview for installing the MOTU 828:

Connect the MOTU 828 interface . . . . .17

Connect the MOTU 828 audio interface to the computer with the supplied FireWire cable.

Connect inputs and outputs . . . . .18

Make optical and analog connections as desired.

A typical studio setup (no mixer) . . . . .19

An example setup for computer-based mixing/FX.

Using the MOTU 828 with a mixer . . . . .20

An example setup for a mixer-based studio.

Making sync connections . . . . .21

If you need to resolve the MOTU 828 with other devices in your studio, make the necessary synchronization connections.

Do you need a synchronizer? . . . . .22

Sample-accurate sync . . . . .23

Sample-accurate sync with ADATs . . . . .24

ADAT sync with no synchronizer . . . . .25

Sync to SMPTE, word clock, video . . . . .26

Syncing optical devices . . . . .27

Syncing S/PDIF devices . . . . .28

Syncing large systems . . . . .29

## CONNECT THE MOTU 828 INTERFACE

**1** Plug one end of the MOTU 828 FireWire cable (included) into the FireWire socket on the computer as shown below in Figure 4-1.

**2** Plug the other end of the FireWire cable into the MOTU 828 I/O as shown below in Figure 4-1.

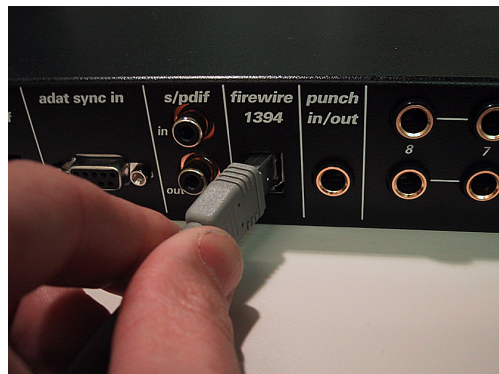
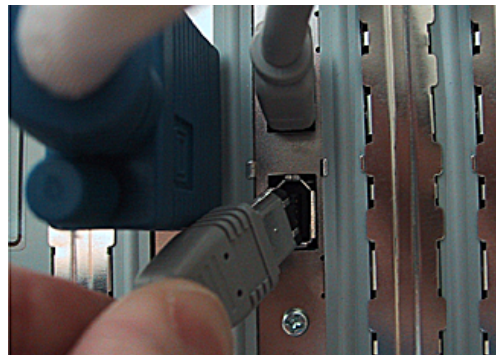


Figure 4-1: Connecting the MOTU 828 to the computer.

## CONNECT INPUTS AND OUTPUTS

The MOTU 828 audio interface has the following input and output connectors:

- 8 balanced, +4 dB quarter-inch analog outputs
- 6 balanced +4 dB quarter-inch analog inputs
- 2 Neutrik™ XLR/quarter-inch analog inputs
- 2 balanced, +4 dB quarter-inch TRS main outs
- 1 pair of RCA S/PDIF in and out
- 1 pair of optical in/out switchable between ADAT (“Lightpipe”) or optical S/PDIF (TOSLink)

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

### Mic/line inputs

The mic/line inputs (1 and 2) have mic preamps, so connect your microphone(s) to inputs 1 and/or 2. If your microphone requires phantom power, move the 48V phantom power switch on the front panel to the up (enabled) position. Use the trim knobs on the front panel to adjust the input level as needed for each input.

### Quarter-inch analog

The quarter-inch analog inputs (3-8) and outputs (1-8) are balanced TRS connectors that can also accept an unbalanced plug. Use the trim knobs on the front panel to adjust the input level as needed for each input (or input pair).

### Optical

Reminder: optical goes OUT to IN and IN to OUT, like MIDI.

The optical connectors can be connected to either an ADAT “lightpipe” device or an optical S/PDIF “TOSLink” device. Just make the connections as needed and then you’ll set the format later on in the MOTU 828 Console. The input is independent from the output; for example, you could connect ADAT optical input from your digital mixer and connect optical output to the TOSLink input on your DAT deck.

### Main outs

The main outputs, as well as the headphone output on the front panel, match the output from Analog outputs 1-2. In addition, any live inputs that are being monitored via CueMix™ Plus are summed to the signal on the main outs. The main out volume is controlled by the main volume knob on the front panel. In a standard studio configuration, the main outs are intended for a pair of studio monitors. However, if you are using the MOTU 828 in other ways, such as in a live performance situation, you could use the main outs for stage monitors while outputs 1 and 2 are used for the PA.

### Using an external mixer

The MOTU 828 can be used without a mixing board, as shown on the opposite page in Figure 4-3. In this setup, all mixing and effects processing occurs in the audio software running on the computer.

If you’d like to use external mixing, see “Using the MOTU 828 with a mixer” on page 20.



Figure 4-2: the MOTU 828 rear panel.

### A TYPICAL STUDIO SETUP (NO MIXER)

Here is a typical MOTU 828 studio setup. This rig can be operated without an external mixer. All mixing and processing can be done in the computer with audio software. During recording, you can use the MOTU 828's CueMix™ Plus no-

latency monitoring to listen to what you are recording via the main outs. The MOTU 828 Console software lets you choose the input (or input pair) that you wish to monitor. Guitar can be processed with plug-ins on the computer, or with an amp.

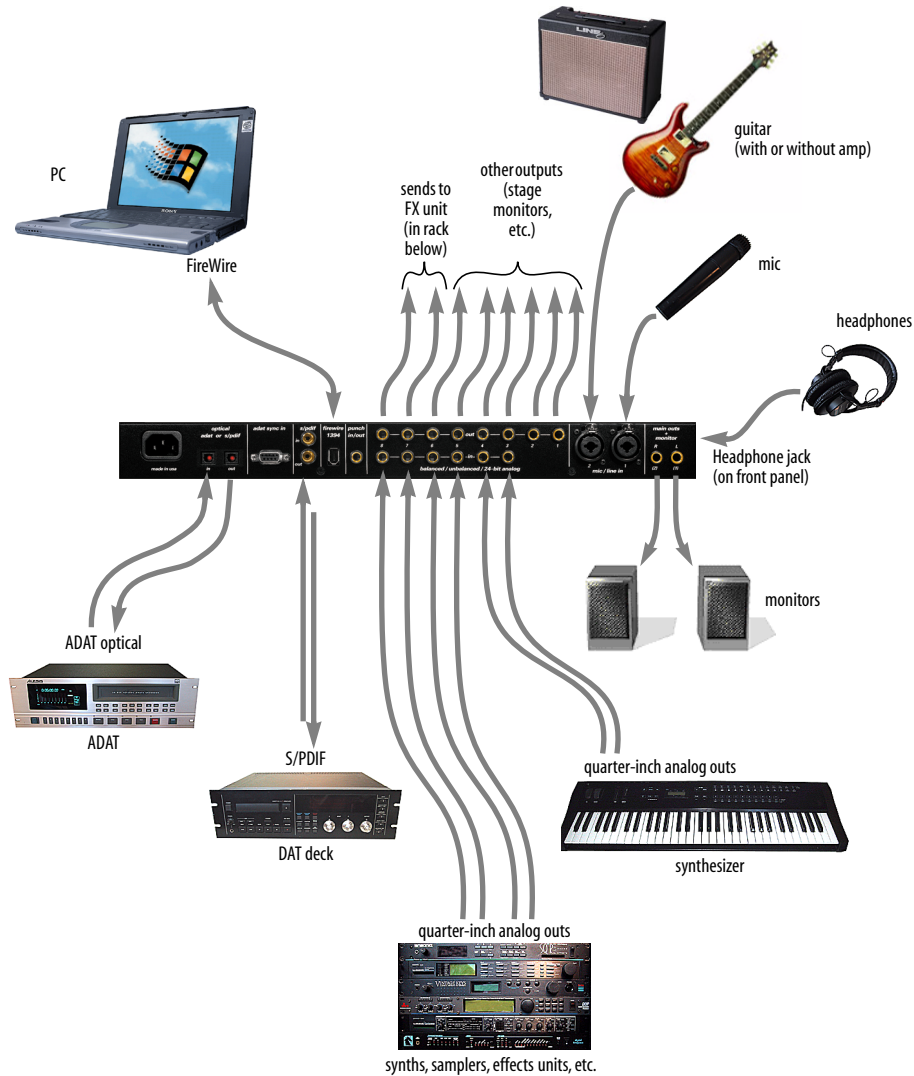


Figure 4-3: A typical MOTU 828 studio setup.

## USING THE MOTU 828 WITH A MIXER

While there are many ways to use the MOTU 828 with an external mixer, typically the MOTU 828 serves as a multi-channel “pipeline” between the mixer and the computer. If your mixer is analog, connect the analog section of the MOTU 828 to your mixer. If your mixer is digital, and it has ADAT optical I/O, you can connect them optically as shown below in Figure 4-4. The MOTU 828’s

available analog and S/PDIF inputs and outputs can serve as an extension to the mixer I/O, but then you will probably find yourself mixing in two places: the mixer and the computer. A word of advice: if you would like to use the MOTU 828 with an external mixer, use the mixer for mixing. Trying to mix large multitrack projects in two places can become very cumbersome very quickly.

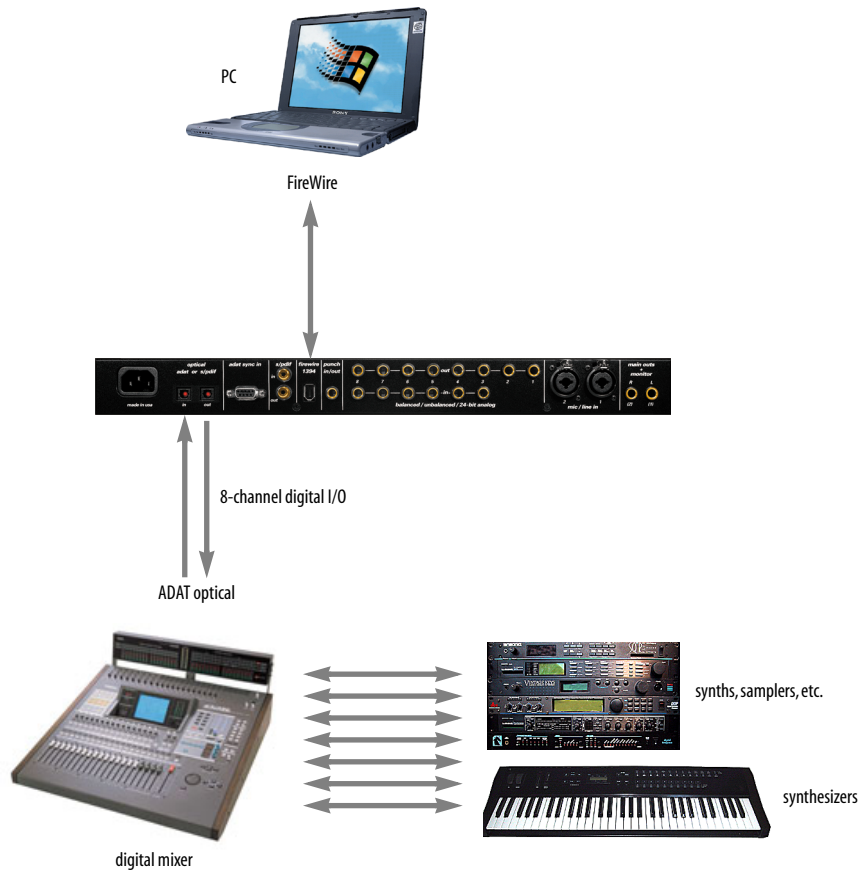


Figure 4-4: Using the MOTU 828 with a digital mixer.

## MAKING SYNC CONNECTIONS

If you connect devices digitally to the MOTU 828, or if you need to synchronize the MOTU 828 with an outside time reference such as SMPTE time code, you must pay careful attention to the synchronization connections and clock source issues discussed in the next few sections.

### Do you need to synchronize the MOTU 828?

If you will be using only the MOTU 828's analog inputs and outputs (and none of its digital I/O), and you have no plans to synchronize your MOTU 828 system to SMPTE time code, you don't need to make any sync connections. You can skip this section and proceed to chapter 5, "MOTU 828 Console" (page 31) where you'll open the MOTU 828 Console and set the *Clock Source* setting to *Internal* as shown below in Figure 4-5. For details, see chapter 5, "MOTU 828 Console" (page 31).

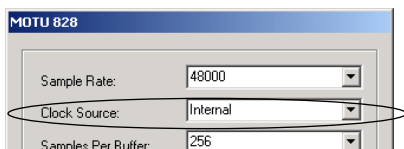


Figure 4-5: You can run the MOTU 828 under its own internal clock when it has no digital audio connections and you are not synchronizing the MOTU 828 system to an external time reference such as SMPTE time code.

### Situations that require synchronization

There are three general cases in which you will need to synchronize the MOTU 828 with other devices:

- Synchronizing the MOTU 828 with other digital audio devices so that their digital audio clocks are *phase-locked* (as shown in Figure 4-6)
- Slaving the MOTU 828 system to SMPTE time code, such as from a video deck or an analog multi-track tape recorder
- Both of the above

## Synchronization is critical for clean digital I/O

Synchronization is critical in any audio system, but it is especially important when you are transferring audio between digital audio devices. Your success in using the MOTU 828's digital I/O features depends almost entirely on proper synchronization. The following sections guide you through several recommended scenarios.

### Be sure to choose a digital audio clock master

When you transfer digital audio between two devices, their audio clocks must be in phase with one another — or *phase-locked*. Otherwise, you'll hear clicks, pops, and distortion in the audio — or perhaps no audio at all.

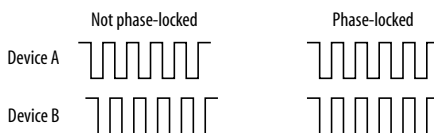


Figure 4-6: When transferring audio, two devices must have phase-locked audio clocks to prevent clicks, pops or other artifacts.

There are two ways to achieve phase lock: slave one device to the other, or slave both devices to a third master clock. If you have three or more digital audio devices, you need to slave them all to a single master audio clock.

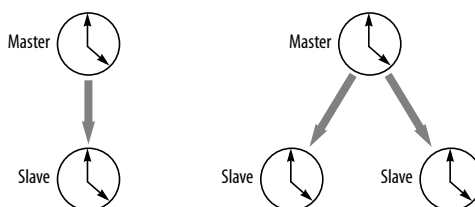


Figure 4-7: To keep the MOTU 828 phase-locked with other digital audio devices connected to it, choose a clock master.

Also remember that audio phase lock can be achieved independently of time code (location). For example, one device can be the time code master while another is the audio clock master. But only one device can be the audio clock master. If you set things up with this rule in mind, you'll have trouble-free audio transfers with the MOTU 828.

## DO YOU NEED A SYNCHRONIZER?

Whether or not you'll need a synchronizer depends on your gear and what you will be doing with your MOTU 828 system. The following pages give you specific information about common sync scenarios. At least one of them will likely apply to you. Here are some general considerations to help you figure out if you need (or want) a synchronizer for you MOTU 828 system.

### You don't need a synchronizer if...

As explained earlier, the MOTU 828's digital audio clock must be phase-locked (synchronized) with other connected digital audio devices to achieve clean digital transfers between them. Can this be accomplished without an additional digital audio synchronizer? It depends on the nature of the other devices, and what you want to do with them. You don't need a synchronizer if the device has a way of locking itself directly to the MOTU 828's clock (via ADAT lightpipe or S/PDIF), AND if the device carries no sense of location in time. A digital mixer is a good example: it can slave to its ADAT lightpipe connection from the MOTU 828, and it has no sense of time; it just passes audio through for mixing.

An ADAT, on the other hand, does have a sense of location in time, either via SMPTE time code or via its own sample address time format (ABS). If you want to fly tracks back and forth between your computer and ADAT tapes while maintaining the audio's position in time, the ADAT SYNC port on the MOTU 828 lets you do so without a separate synchronizer — and with sample-accurate precision (if you're using an ASIO 2.0-compatible program that supports sample-accurate sync). Just connect the MOTU 828 directly to the ADAT as discussed in “ADAT sync with no synchronizer” on page 25. But if you also want transport control over the entire rig (including the ADAT) from your audio software, you'll need a MIDI Machine Control-compatible synchronizer such as MOTU's

MIDI Timepiece AV, as discussed in “Sample-accurate sync” on page 23. If you are simply using the ADAT as a backup medium where you transfer eight tracks at a time and don't care about their exact location, no synchronizer is required. You can simply slave the ADAT to the optical output from the MOTU 828 as explained in “Syncing optical devices” on page 27.

### Transport control from your computer

If you have ADATs or other digital recording devices connected to the MOTU 828, your audio software — if it supports MIDI Machine Control (MMC) — allows you to control the transports of everything from your computer. Most advanced audio programs support MMC. To do this, you'll also need an MMC-compatible ADAT synchronizer such as a MOTU MIDI Timepiece AV or Digital Timepiece. Synchronizers like these allow you to play, stop, rewind and locate all of your tape decks using the transport controls in the audio software. If your audio software supports ASIO 2, you can do so with sample-accurate precision. The following pages show you how to achieve MMC control, where possible.

### Continuous sync to SMPTE / MTC

If you need to synchronize the MOTU 828 (and your audio software) to SMPTE time code, this requires a dedicated synchronizer, which continuously resolves the MOTU 828 to SMPTE time code, while simultaneously resolving your audio software to MIDI Time Code. When the MOTU 828 is continuously resolved, audio playback will never drift with respect to the time code. Again, the MOTU MIDI Timepiece AV and Digital Timepiece are affordable examples of this type of synchronizer. The following pages illustrate how to set up this type of synchronization with various kinds of gear. Regardless of the specific equipment you have, you can follow the basic connections shown.

## SAMPLE-ACCURATE SYNC

Your MOTU 828 system provides you with the most advanced, accurate synchronization possible with Alesis ADATs (Type I and II) or any device that supports ADAT sync. Figure 4-8 below shows a few best-case scenarios for syncing the MOTU 828 with ADATs (in ABS time). Below is a brief explanation of the benefits you achieve with these setups.

### Sample accurate locating

With *sample accurate locating*, when you transfer audio between AudioDesk (or any other sample-accurate host software such as Digital Performer) and ADATs, the audio will not drift in time — even by as little as one sample. This is the tightest possible synchronization between digital audio devices. The timing in your audio will not be affected in any way by the process of transferring it between the MOTU 828 and your ADATs. Sample-accurate locating is only possible with software that supports this feature, such as AudioDesk, Digital Performer, Cubase VST or other ASIO 2 compatible audio software.

## Transport control from your computer

If you have a MIDI Timepiece AV, Digital Timepiece or any ADAT synchronizer that also supports MIDI Machine Control (MMC), you can play, stop, rewind and locate all of your ADATs using the transport controls in the audio software running on your computer. This includes cueing features like markers, position bars, playback wipers, time rulers, etc.

### Continuous sync to SMPTE / MTC

This means that the MOTU 828 can be continuously resolved to SMPTE time code (or MIDI Time Code) via a dedicated synchronizer, such as the MIDI Timepiece AV. When the MOTU 828 is continuously resolved, audio playback will never drift with respect to time code.

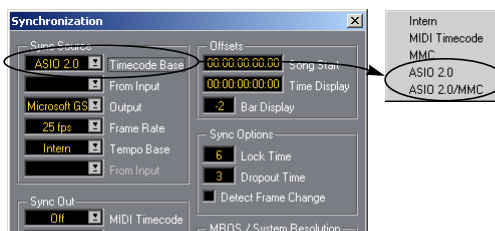


Figure 4-9: Cubase VST 5 and other ASIO 2.0-compatible programs support sample-accurate transfers with ADATs.

Tape recorder/ Sync format	Software	Synchronizer	Sample accurate locating	Transport control from computer	Continuous sync to SMPTE / MTC
ADAT	Cubase VST or other ASIO 2.0-compatible app	MIDI Timepiece AV or Digital Timepiece	Yes	Yes	Yes
ADAT	Cubase VST or other ASIO 2.0-compatible app	BRC (or any MMC capa- ble ADAT synchronizer)	Yes	Yes	Yes
ADAT	Cubase VST or other ASIO 2.0-compatible app	None	Yes	No	No

Figure 4-8: These recommended combinations of hardware and software offer the tightest sync possible between the MOTU 828 and digital audio tape decks in the form of sample-accurate locating between the software and the tape decks. Sample accurate locating is possible with ADATs even without a MIDI Timepiece AV or Digital Timepiece, although you give up transport control from the computer without them.

## SAMPLE-ACCURATE SYNC WITH ADATs

The MOTU 828 can achieve sample-accurate sync with Cubase VST or any ASIO 2.0-compatible audio software that also supports sample-accurate sync. Connect the MOTU 828 to the end of the ADAT chain and make the software settings shown below in Figure 4-10. If you will be using the ADAT for its analog inputs and outputs only (you won't be using any tapes in the ADAT), treat it as an 'optical' device. See "Syncing optical devices" on page 27.

### What this setup provides

- ✓ Sample-accurate locating between all ADATs, the MOTU 828, and Cubase VST or other ASIO 2-compatible software that supports sample-accurate sync.
  - ✓ Transport control of everything from the computer.
- OR
- ✓ Continuous sync to SMPTE time code and other sync sources (the other source is the transport master in this case).

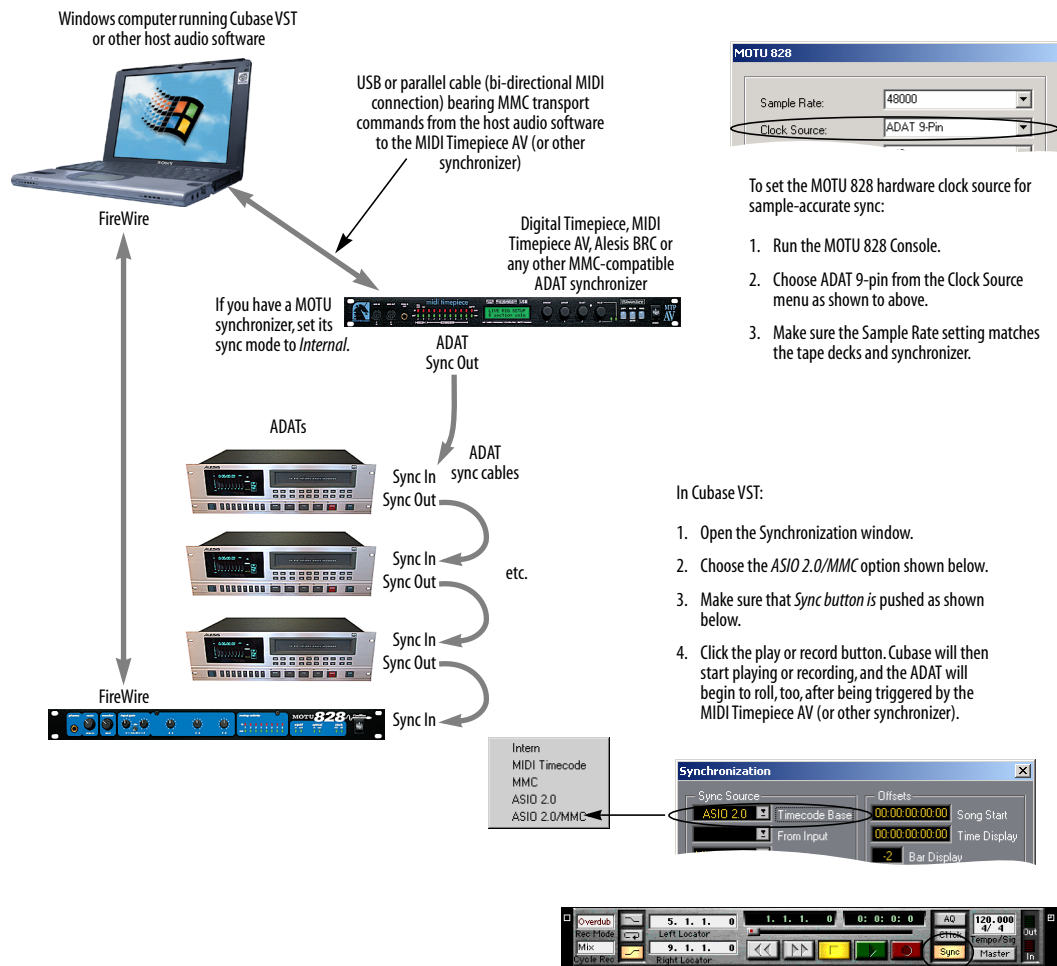


Figure 4-10: Connections for sample-accurate sync between one or more ADATs and the MOTU 828.



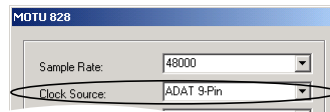
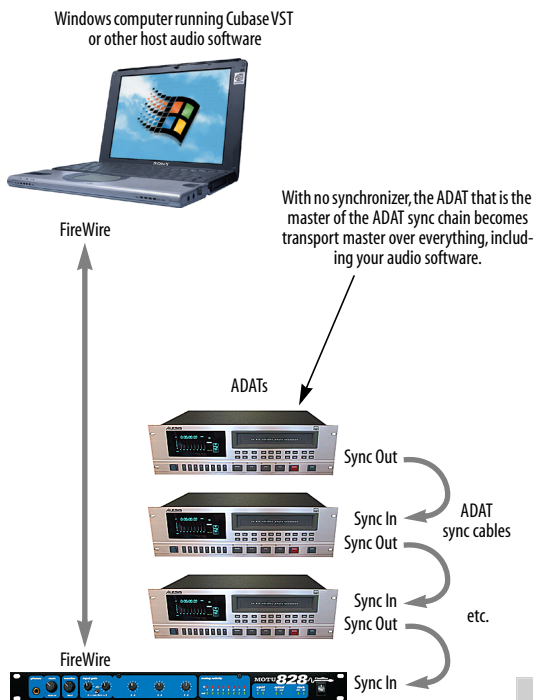
## ADAT SYNC WITH NO SYNCHRONIZER

Even if you don't have an ADAT synchronizer, you can achieve sample-accurate sync between ADATs, the MOTU 828, and any sample-accurate software. Just connect the MOTU 828 to the end of the ADAT sync chain as shown below. But without the synchronizer, you don't get transport control from your computer, nor can you slave the system to external SMPTE time code. Instead, you have to play, stop, rewind and cue the system from the transports on your ADAT (or via an Alesis LRC). If you will be using the ADAT for its analog inputs

and outputs only (you won't be using any tapes in the ADAT), treat it as an 'optical' device. See "Syncing optical devices" on page 27.

### What this setup provides

- ✓ Sample-accurate locating between all ADATs, the MOTU 828, and Cubase VST or other ASIO 2-compatible software that supports sample-accurate sync.
- ✗ No transport control of everything from the computer
- ✗ No continuous sync to SMPTE time code and other sources



To set the MOTU 828 hardware clock source for sample-accurate sync:

4. Run the MOTU 828 Console.
5. Choose ADAT 9-pin from the Clock Source menu as shown to above.
6. Make sure the Sample Rate setting matches the tape decks and synchronizer.

In Cubase VST:

4. Open the Synchronization window.
5. Choose the *ASIO 2.0* option shown below.
6. Make sure that *Sync* button is pushed as shown below.
7. Click the play or record button. Cubase will then wait for you to start your ADAT.
8. Press the Play button on the front panel of your ADAT to initiate playback or recording.

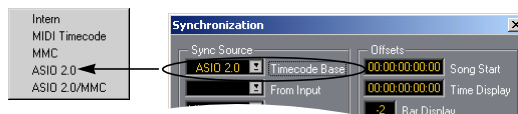


Figure 4-10: Sample-accurate sync without an ADAT synchronizer.

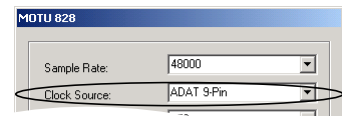
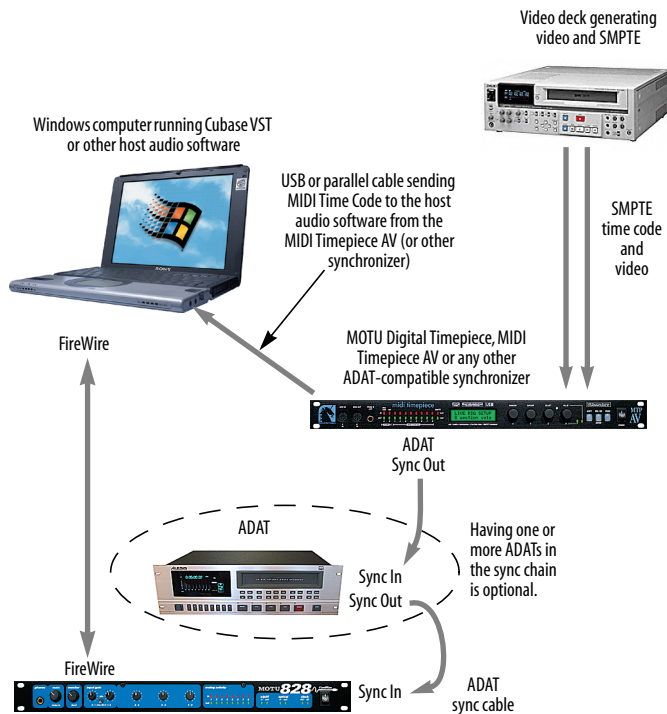
## SYNC TO SMPTE, WORD CLOCK, VIDEO

To synchronize (continuously resolve) the MOTU 828 with SMPTE time code, word clock, video or blackburst, you will need a MOTU Digital Timepiece, MIDI Timepiece AV or any other universal synchronizer equipped with ADAT sync. The synchronizer resolves continuously to the chosen time base, and the MOTU 828 slaves to the synchronizer via ADAT Sync. In addition, the audio software running on the computer slaves to MIDI Time Code generated by the synchronizer. How accurate will transfers be between your audio software and other audio devices? As good as the resolution of MIDI time code, which — at 30 fps — provides quarter frame resolution of 120th of a

second (367 samples at 44.1 KHz). But if you are running your synchronizer under its own internal clock (triggering it via MMC from your software), you will probably get even tighter timing than that — perhaps as good as  $\pm 50$  samples.

### What this setup provides

- ✗ No sample-accurate locating
- ✓ Timing accuracy that is at least as good as MIDI time code (quarter-frame)— and maybe even tighter
- ✗ No transport control of from the computer
- ✓ Continuous sync to SMPTE time code and other sync sources (the other source is the transport master in this case)



To set the MOTU 828 hardware clock source for SMPTE, word clock or video sync:

1. Run the MOTU 828 Console.
2. Choose ADAT 9-pin from the Clock Source menu as shown to above.
3. If tape decks are included in the sync chain, make sure the Sample Rate setting matches the tape decks and synchronizer.

In Cubase VST:

1. Open the Synchronization window.
2. Choose the *ASIO 2.0* option shown below.
3. Make sure that *Sync* button is pushed as shown below.
4. Click the play or record button. Cubase will then wait for you to start your video deck or other SMPTE timecode source.
5. Press the Play button on the video deck (or other SMPTE source) to initiate playback or recording.

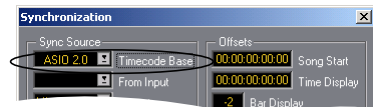


Figure 4-11: Resolving the MOTU 828 to an external time base, such as SMPTE time code, word clock, or video. In this example, an S-VHS video deck is supplying SMPTE time code (address) and video (as the time base). For examples of other sources, consult the MIDI Timepiece AV manual (or other synchronizer).

## SYNCING OPTICAL DEVICES

The word *optical* is our short-hand way of referring to any device that connects to the MOTU 828 via an optical cable. But we make a further distinction: an optical device is also one that doesn't care about sample location. An example is a digital mixer. Since a digital mixer is not a recording device, it has no sense of sample location like an ADAT does. An ADAT can cue to a specific sample number (e.g. sample number 43,478, 103) — as can any device that supports ADAT sync, but most digital mixers simply mix and process audio digitally, with no sense of a specific sample location. There are many other devices that fall into this category, including digital effects processors, synthesizers, A/D converters, and many more.

For ADATs or other devices that support ADAT sync, synchronize them with the MOTU 828 as described in the previous sections of this chapter.

For *optical* devices, such as digital mixers, all you have to do is make sure that their digital audio clock is phase-locked (in sync with) the MOTU 828. There are three ways to do this:

- Slave the optical device to the MOTU 828
- Slave the MOTU 828 to the optical device
- Slave both the optical device and the MOTU 828 to a third master clock (such as a Digital Timepiece or MIDI Timepiece AV synchronizer)

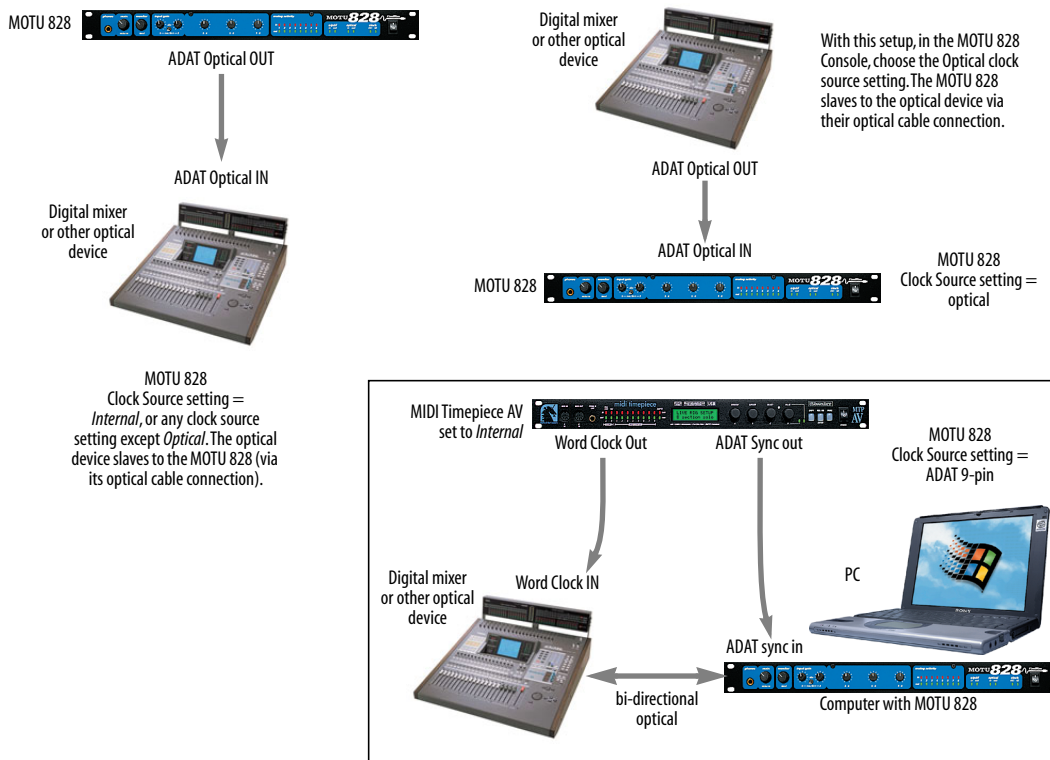


Figure 4-12: Three setups for synchronizing an optical device with the MOTU 828. You can slave the optical device to the MOTU 828 or vice versa with their optical connections. For more elaborate setups, you can slave both to a digital audio synchronizer like the Digital Timepiece. Don't use any of these setups for an ADAT or other optical device that records. Instead, see "Sample-accurate sync with ADATs" on page 24.

## SYNCING S/PDIF DEVICES

DAT decks and other S/PDIF devices will sync to the MOTU 828 in one of two ways:

- Via the S/PDIF connection itself
- Via word clock

### S/PDIF devices with no word clock

If your DAT deck or other S/PDIF device has no word clock sync connectors, just connect it to the MOTU 828 via the S/PDIF connectors. When the device records S/PDIF audio (from the MOTU 828), it will simply synchronize to the clock provided by the audio input.

On the other hand, when you transfer audio from the S/PDIF device into the MOTU 828, you'll have to slave the MOTU 828 to its S/PDIF input. If you have other digital audio devices connected to the MOTU 828, and they are not slaved directly to the MOTU 828 itself, you may hear clicks and pops resulting from their unsynchronized audio clock. If so, just turn them off during the transfer.

### S/PDIF devices with word clock

If your S/PDIF device has a Word Clock input, slave both the S/PDIF device and the MOTU 828 to a MOTU MIDI Timepiece AV (or other synchronizer). You can then freely transfer audio between the MOTU 828 and the S/PDIF device.

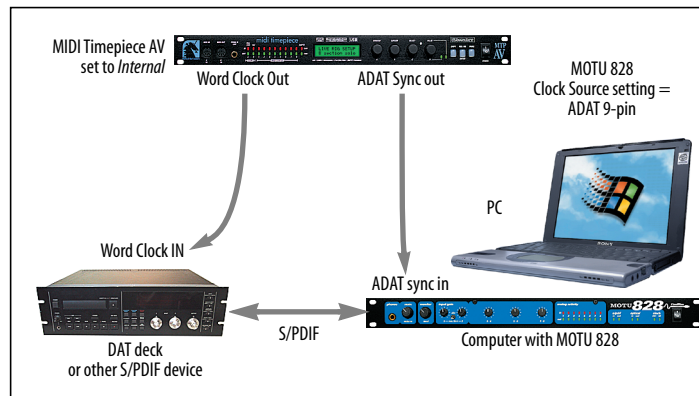
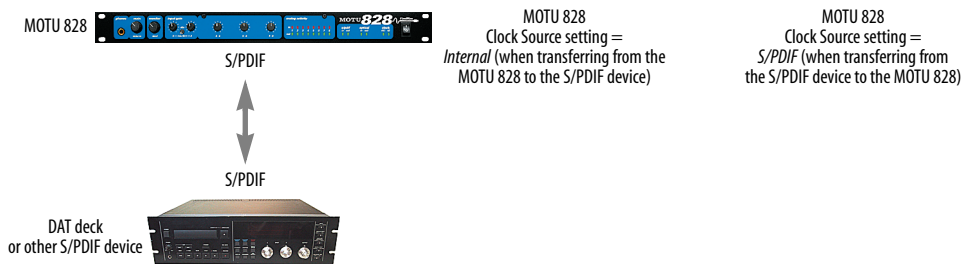


Figure 4-13: Two setups for synchronizing an S/PDIF device with the MOTU 828. In the top diagram, sync is achieved via the S/PDIF connection itself. In this case, you have to choose S/PDIF as the MOTU 828's clock source when recording from the S/PDIF device. If you don't want to have to worry about switching the Clock Source setting depending on the direction of the S/PDIF transfer, you can slave the S/PDIF device to word clock from the MOTU 828 or vice versa (not shown). The Word Clock connection maintains sync, regardless of the direction of the transfer.

## **SYNCING LARGE SYSTEMS**

If you are connecting the MOTU 828 to a lot of other digital audio gear, get a Digital Timepiece. It can synchronize a wide variety of devices, and it offers sample accurate synchronization for devices that support it, such as ADATs. You will also be able to control everything from the transport controls of your audio software. If you have even more devices than a single Digital Timepiece can support, consider a word clock distribution device, such as the Aardvark Aard Sync™ video-to-word clock converter. Products like this offer multiple word clock outputs and an extremely low-jitter clock.



# CHAPTER 5 MOTU 828 Console

## OVERVIEW

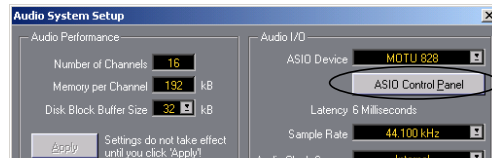
The MOTU 828 Console provides access to all MOTU 828 settings.

- Accessing the MOTU 828 settings .....31
- MOTU 828 Settings .....31
- Sample Rate .....31
- Clock Source .....32
- Samples Per Buffer .....33
- Optical input/output .....34
- Monitor input — CueMix™ Plus .....34
- Wave support for legacy (MME) software .....35
- Monitoring live input .....36

## ACCESSING THE MOTU 828 SETTINGS

There are several ways to access the MOTU 828 Console settings:

- From the Windows Start menu, choose *Programs>MOTU>MOTU 828 Console*
- From within Cubase (Version 5 or higher), click the *ASIO Control Panel* button in the System Setup dialog as shown in Figure 6-2 on page 40.



- From within other ASIO-compatible programs, refer to their documentation.

## MOTU 828 SETTINGS

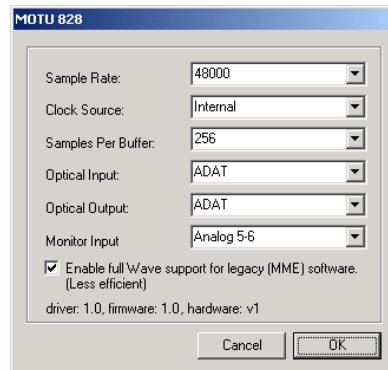


Figure 5-1: The MOTU 828 Console gives you access to all of the settings in the MOTU 828 hardware.

### Sample Rate

Choose the desired *Sample Rate* for recording and playback. The MOTU 828 can operate at either 44.1 KHz (the standard rate for compact disc audio) or 48 KHz. Make absolutely sure that all of

the devices connected digitally to the MOTU 828 match the MOTU 828's sample rate. Also make sure that your Digital Timepiece, MIDI Timepiece AV or other digital audio synchronizer matches it as well.

☞ 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 MOTU 828 Console.

### **Clock Source**

The *Clock Source* determines the digital audio clock that the MOTU 828 will use as its time base. For a complete explanation of synchronization issues, see “Making sync connections” on page 21. The following sections briefly discuss each clock source setting.

#### **Internal**

Use the *Internal* setting when you want the MOTU 828 to operate under its own digital audio clock. For example, you may be in a situation where all you are doing is playing tracks off hard disk in your digital audio software on the computer. In a situation like this, you most often don't need to reference an external clock of any kind.

Another example is transferring a mix to DAT. You can operate the MOTU 828 system on its internal clock, and then slave the DAT deck to the MOTU 828 via the S/PDIF connection (usually DAT decks slave to their S/DIF input when you choose the S/PDIF input as their record source).

If you would like help determining if this is the proper clock setting for your situation, see “Do you need a synchronizer?” on page 22.

With ADAT devices, however, you usually want an external digital audio synchronizer, such as the MIDI Timepiece AV or Digital Timepiece, to be the

digital clock master. In this case, you would set the MOTU 828 clock source setting to *ADAT 9-pin*, as described below.

#### **ADAT 9-pin**

The *ADAT 9-pin* clock source setting refers to the ADAT digital audio synchronization format. It allows the MOTU 828 to slave to an ADAT — or ADAT sync chain — via its ADAT sync 9-pin connector. ADAT sync also carries precise, sample location information, which allows Cubase VST or other sample-accurate ASIO 2.0-compatible audio software to transfer audio to and from ADATs without drifting by as much as one sample.

Use this setting when you are using the MOTU 828 with one or more ADATs. Make sure the MOTU 828 is connected to the end of the ADAT sync chain.

You should also use this setting if you have a MIDI Timepiece AV, which allows you to drive your entire system from the transport controls of your audio software.

ADAT sync also allows you to continuously resolve the MOTU 828 to SMPTE time code, video, and word clock via a synchronizer like the MOTU MIDI Timepiece AV.

For further details, see “Sample-accurate sync with ADATs” on page 24, “ADAT sync with no synchronizer” on page 25 and “Sync to SMPTE, word clock, video” on page 26.

#### **ADAT optical**

The *ADAT optical* clock source setting refers to the clock provided by the MOTU 828's optical input, when it is connected to an ADAT optical device. This setting can be used to slave the MOTU 828 directly to the optical input connection. Most of the time, you can set up a better operating scenario that uses one of the other synchronization options. However, there may be occasions when you have an



ADAT optical compatible device that has no way of synchronizing digitally to the MOTU 828 or an external synchronizer such as the Digital Timepiece. In this case, the *ADAT Optical* clock source setting lets you slave the MOTU 828 to the device itself via its digital input to the MOTU 828.

If the *ADAT Optical* setting does not appear in the menu, it means that the MOTU 828's optical input is currently either turned off or set to the *TOSLink* format. In either case, choose the *ADAT optical* format from the Optical input menu (Figure 5-1 on page 31).

This setting is also useful if you just need to make a simple, click-free digital transfer between the MOTU 828 and another device — where a time code reference and shared transport control are not needed — without having to set up an elaborate synchronization scenario.

For further details about this setting, see “Syncing optical devices” on page 27.

### **TOSLink**

The *TOSLink* clock source setting refers to the clock provided an optical S/PDIF device connected to the MOTU 828's optical input. This setting can be used to slave the MOTU 828 directly to the optical input connection. Most of the time, you can set up a better operating scenario that uses one of the other synchronization options. However, there may be occasions when you have an *TOSLink*-compatible device that has no way of synchronizing digitally to the MOTU 828 or an external synchronizer such as the Digital Timepiece. In this case, the *TOSLink* clock source setting lets you slave the MOTU 828 to the other device via the MOTU 828's optical input.

If the *TOSLink* setting does not appear in the menu, it means that the MOTU 828's optical input is currently either turned off or set to the *ADAT*

*optical* format. In either case, choose the *TOSLink* format from the Optical input menu (Figure 5-1 on page 31).

This setting is also useful if you just need to make a simple, click-free digital transfer between the MOTU 828 and another device — where a time code reference and shared transport control are not needed — without having to set up an elaborate synchronization scenario.

For further details about this setting, see “Syncing optical devices” on page 27.

### **S/PDIF**

The *S/PDIF* clock source setting refers to the *S/PDIF* RCA input connector on the MOTU 828. This setting allows the MOTU 828 to slave to another *S/PDIF* device.

Use this setting whenever you are recording input from a DAT deck or other *S/PDIF* device into the MOTU 828. It is not necessary in the opposite direction (when you are transferring from the MOTU 828 to the DAT machine).

If the *S/PDIF* setting does not appear in the menu, it means that the MOTU 828's optical input is currently set to *TOSLink*. To make it appear again, either disable the Optical input or switch it to the *ADAT* optical format (Figure 5-1 on page 31).

For further details about this setting, see “Syncing *S/PDIF* devices” on page 28.

### **Samples Per Buffer**

A *sample buffer* is a small part of computer memory that briefly holds digital audio samples as they are passed between the computer and the MOTU 828.

The *Samples Per Buffer* setting lets you control the size of these buffers in the MOTU 828 driver. A higher setting reduces the processing load on your computer; a lower setting reduces *monitoring latency*, which is the slight delay you hear when

patching live audio through the MOTU 828 and your audio software. (See “Monitoring live input” on page 36 for further explanation.) For example, you might want to listen to the vocals you are recording with a little bit of reverb on them from a plug-in in your audio software. The signal that gets recorded to disk is ‘dry’, but the signal in your headphones is ‘wet’. Since the vocal material recorded to disk is dry, you then have the flexibility to apply real-time reverb to the track after recording and change it at any time (since the reverb is not ‘printed’ in the track). You can even automate changes to plug-in effects over time (if your software supports plug-in automation).

A *Samples Per Buffer* setting of 512 produces a round-trip delay (monitoring latency) of approximately 23 milliseconds (ms). A setting of 256 produces monitoring latency of around 12-13 ms, and the delay starts to become inaudible.

**Monitoring latency has no effect on recording**  
It is important to note that *monitoring latency only applies to the live signal as it is being monitored*. It has no effect whatsoever on the timing accuracy of the material being recorded to hard disk. The system is precisely calibrated to record and play back hard disk audio perfectly on time.

**Choosing the right ‘Samples per buffer’ setting**  
If you would like to process live inputs with plug-in effects in your software (such as putting a reverb plug-in on a vocal mic input or a guitar amp simulation plug-in on your guitar signal), make the *Samples Per Buffer* setting as low as possible. How low you can go depends on how fast your computer is and how much plug-in processing (and other processor-intensive tasks) you are using in your recording project. Try settings below 512 and if your computer begins to act sluggish, try raising them again to the next highest buffer setting until the computer feels responsive. If your computer doesn’t allow you to go low enough, try cueMix™

Plus monitoring (“Monitor input — CueMix™ Plus” below) and then apply plug-in processing to the disk track after it has been recorded.

### **Changing the ‘Samples Per Buffer’ setting**

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), switch to a higher *Samples Per Buffer* setting. Depending on your computer’s CPU speed, you might find that settings in the middle work best and that your computer is much more responsive.

### **CueMix™ Plus monitoring**

The MOTU 828’s CueMix™ Plus no-latency monitoring feature completely eliminates monitoring latency. For further information, see “Monitoring live input” on page 36.

### **Optical input/output**

The *Optical input* and *Optical output* settings let you choose between ADAT optical (‘lightpipe’) and S/PDIF optical (‘TOSLink’) as the format for the MOTU 828’s optical input and output. Choose the format that matches the device connected. If you are not using the optical connections, it is recommended that you turn them off (as provided in the menus) to reduce bandwidth and processing overhead. Note that you can operate the input and output independently. For example, you could use the ADAT optical format on the input (with a digital mixer, for example) and optical S/PDIF on the output (with a DAT deck, for example).

### **Monitor input — CueMix™ Plus**

The *Monitor input* settings enables the MOTU 828 CueMix™ Plus feature (Figure 5-3 on page 37), which lets you route a single analog input or input pair directly to the MOTU 828 main outs, where it is mixed with the signal on the main outs. Routing occurs with virtually no monitoring latency (audible delay), and the signal is passed through dry (with no signal processing of any kind). In addition, the CueMix Plus signal volume can be

controlled (relative to the main mix volume) with the *Monitor* knob on the MOTU 828 front panel. For information about other ways to handle input monitoring, see “Monitoring live input” on page 36.

### **Wave support for legacy (MME) software**

Windows only exposes the first two channels of a multi-channel WDM audio stream to applications which use the legacy (MME) multimedia interface. The *Enable full Wave support for legacy (MME) software (less efficient)* option forces the MOTU 828 multimedia driver to expose all channels as stereo pairs, providing full MME support.

If your host audio software does *not* directly support WDM audio and instead only supports legacy MME drivers, use this option to access multiple MOTU 828 input and output channels.

If your host audio software *does* directly support WDM audio, leave this option unchecked for optimal performance.

This option is only available when the multimedia driver has been installed, and it defaults to being not checked.

## MONITORING LIVE INPUT

There are two ways to monitor live audio input with the MOTU 828: 1) through the computer or 2) via CueMix™ Plus hardware monitoring. Figure 5-2 below shows method 1, which allows you to add effects processing such as reverb and guitar amp effects via plug-ins in your audio software. See “Samples Per Buffer” on page 33 for details about how to reduce — and possibly eliminate — the audible monitoring delay that the computer introduces.

Figure 5-3 shows how to use CueMix™ Plus hardware-based monitoring, which lets you hear what you are recording with no monitoring delay and no computer-based effects processing. (You can add effects later, after you’ve recorded the live input as a disk track.) To learn more, see “Monitor input — CueMix™ Plus” on page 34.

If the material you are recording is suitable, there is a third way to monitor live input: use both methods (Figure 5-2 and Figure 5-3) at the same time. For example, you could route vocals to both the computer (for a bit of reverb) and mix that processed signal on the main outs with dry vocals from CueMix Plus.

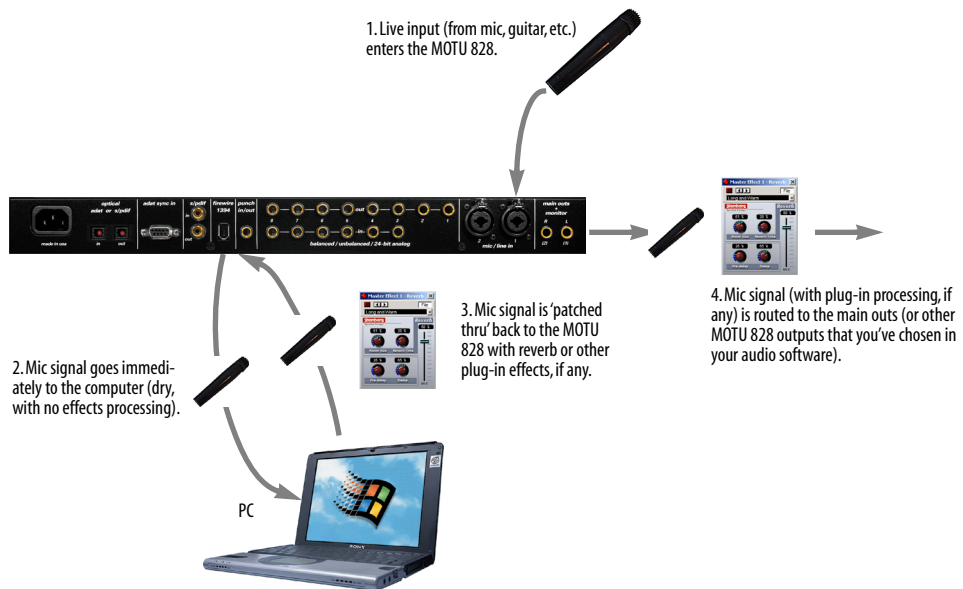


Figure 5-2: There are two ways to monitor live audio inputs with the MOTU 828: 1) through the computer or 2) via CueMix™ Plus hardware monitoring. This diagram shows method 1 (through the computer). When using this method, use the MOTU 828's 'Samples Per Buffer' setting to reduce the slight delay you hear when monitoring the live input, but don't lower it too much, or your computer will act sluggish.

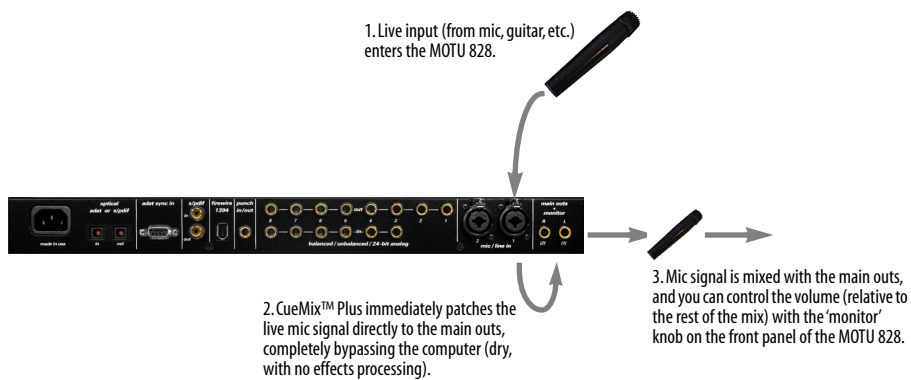


Figure 5-3: This diagram shows the signal flow when using CueMix™ Plus no-latency monitoring. Notice that this method does not allow you to process the live input with plug-ins in your audio software while it is being monitored. You can, however, add effects later — after recording the live input as a disk track. CueMix™ Plus lets you hear what you are recording with no delay and no computer-based effects.



## CHAPTER 6 **ASIO-compatible Audio Software**

### OVERVIEW

The MOTU 828 includes an ASIO driver that provides multi-channel I/O with any ASIO-compatible audio software.

What is ASIO? .....	39
Check the MOTU 828 Console.....	39
Enable the MOTU 828 ASIO driver.....	40
Number of audio channels .....	40
Working with MOTU 828 inputs and outputs ..	41
Trimming the analog inputs .....	41
Changing MOTU 828 settings .....	41
Reducing delay when monitoring live inputs ..	41
Audio clock source .....	41
Synchronization .....	42
MIDI Machine Control (MMC).....	43
24-bit operation.....	43

### WHAT IS ASIO?

*ASIO* is an acronym for *Audio Streaming Input and Output*. The ASIO MOTU 828 driver allows the MOTU 828 to provide multi-channel audio input and output for any audio application that supports ASIO drivers.

#### Sample-accurate sync

The MOTU 828 ASIO driver supports sample-accurate sync (via the MOTU 828's ADAT sync feature) for applications that support it.

#### Attention: Cubase VST users

Cubase VST Version 5 is used for the examples in this chapter. However, there is no significant difference between the Version 5 examples shown and what you see in Version 4. The basic procedures are the same.

#### Attention: Other software users

Cubase VST is used for the examples in this chapter. However, the basic procedures are the same and can be easily applied to any ASIO-compatible software. Just follow the general descriptions at the beginning of each main section in this chapter. Consult your software documentation for details about each topic, if necessary.

#### If your audio software doesn't support ASIO

If your host audio software does not support ASIO, but instead supports WDM (or legacy Wave) audio drivers, refer to the next chapter.

### CHECK THE MOTU 828 CONSOLE

Before you run your audio software, launch the MOTU 828 Console to configure your MOTU 828 hardware. The MOTU 828 Console lets you choose

the audio clock source, and it lets you enable the optical input and output, if needed. For details, see chapter 5, “MOTU 828 Console” (page 31).

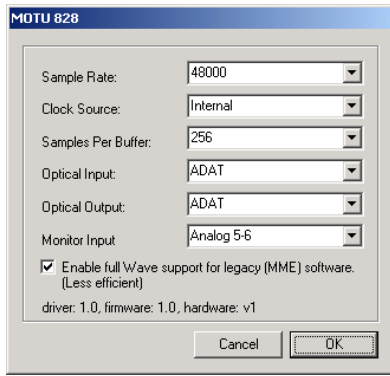


Figure 6-1: The MOTU 828 Console gives you access to all of the settings in the MOTU 828 hardware, including the clock source, optical I/O enable/disable and CueMix™ Plus monitor input(s).

## ENABLE THE MOTU 828 ASIO DRIVER

Once you’ve made the preparations described so far in this chapter, you’re ready to run your audio software and enable the MOTU 828 driver. Check the audio system or audio hardware configuration window in your software. There will be a menu there that lets you choose among various ASIO drivers that may be in your system. Choose the MOTU 828 from this menu.

### Enabling the MOTU 828 ASIO driver in Cubase

To activate the MOTU 828 ASIO driver in Cubase:

- 1 Choose *System* from the Audio menu.
- 2 Choose *MOTU 828* from the ASIO device menu.
- 3 Make the other settings in the dialog as need for your system and synchronization scenario.

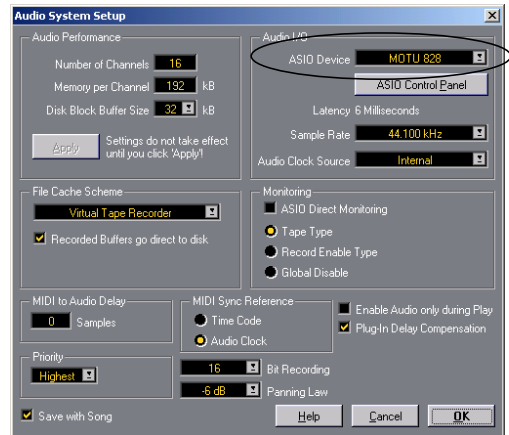


Figure 6-2: Activating the MOTU 828 driver in Cubase. The Audio Clock Source setting shown here is for the MOTU 828. You can also choose the clock source in the MOTU 828 Console.

## NUMBER OF AUDIO CHANNELS

Be sure to configure your audio software so that it has enough audio channels (or voices) to cover the 18 channels of input and output provided by the MOTU 828:

- 8 channels for analog I/O
- 2 channels for RCA S/PDIF
- Zero, 2 or 8 channels for optical, depending on whether you have optical turned off, or set to S/PDIF or ADAT optical

For example, if you are using analog only, you only need 8 channels. If you are using analog and RCA S/PDIF, you need 10 channels.

As another example, if you are using analog, RCA S/PDIF and ADAT optical, you need 18 channels (the maximum number of simultaneous channels provided by the MOTU 828).

In Cubase, set the number of channels in the System dialog (as shown above in Figure 6-2).



## WORKING WITH MOTU 828 INPUTS AND OUTPUTS

Once you've enabled the MOTU 828 ASIO driver in your host audio software, MOTU 828 audio inputs and outputs will appear in your software's input/output menus, and you can set them up and use them as any standard audio input and output. If you don't see the optical inputs and/or outputs, check the MOTU 828 Console to make sure they are turned on and set to the format you require. If you don't plan to use the optical input or output, turn it off to conserve computer bandwidth.

### MOTU 828 inputs/outputs in Cubase

Once you've chosen the MOTU 828 driver in the Audio System dialog, choose *Audio Inputs* from the Audio menu to see the MOTU 828 inputs. To activate them, click the *Active* light next to each input. Once you've activated the MOTU 828 inputs, you can then assign them to Cubase audio channels in the Monitor window in the usual fashion. MOTU 828 outputs appear in the Master window as output assignments for the master fader and busses.



Figure 6-3: Use the output buttons at the bottom of each channel strip to assign MOTU 828 outputs to busses. You can then assign channels in the Monitor window to each bus as desired.

### TRIMMING THE ANALOG INPUTS

The MOTU 828 analog inputs provide trim knobs on the front panel. Each knob provides 40dB of input gain. Use the level meters in your audio

software to calibrate these inputs before recording. As you feed signal to the MOTU 828 analog input, adjust the input's corresponding trim knob on the front panel of the MOTU 828 until peaks in your software's level meter are as high as possible without clipping (hitting zero dB).

### CHANGING MOTU 828 SETTINGS

You can change the MOTU 828 settings at any time by accessing the MOTU 828 Console. (See "Accessing the MOTU 828 settings" on page 31.)

### REDUCING DELAY WHEN MONITORING LIVE INPUTS

If you have live audio inputs connected to the MOTU 828, such as MIDI synthesizers, samplers, microphones or other live instruments, you might hear a slight delay when their audio is being monitored through your MOTU 828 hardware and your host audio program. (In Cubase, this delay is displayed under *Latency* in the Audio System dialog shown in Figure 6-2.) There are several ways to reduce — and eliminate — this audible monitoring delay. For details, see "Monitoring live input" on page 36.

### AUDIO CLOCK SOURCE

If you have devices connected to the MOTU 828 digital inputs (optical or RCA S/PDIF), or if you need to synchronize MOTU 828 digital audio and your host audio software to an external sync source, be sure the MOTU 828 clock source is set properly. For complete information, see "Making sync connections" on page 21 and "Clock Source" on page 32.

## SYNCHRONIZATION

If your audio software has the ability to slave to SMPTE time code or perform sample-accurate digital audio transfers with Alesis ADATs, then it can take advantage of the synchronization features in the MOTU 828.

As you read through the following sections to decide what form of synchronization you might need with other devices in your studio, be sure to consult “Making sync connections” on page 21 for the proper hardware connections. Use the synchronization diagrams to be clear about how you will be synchronizing your audio software and the MOTU 828 to the other components of your system.

### Synchronizing digital audio connections

If you have devices connected to the MOTU 828 digital inputs (optical or RCA S/PDIF), you need to be concerned with the synchronization of the MOTU 828’s digital audio clock with other devices connected to it digitally (if any). For example, if you have a digital mixer connected to the MOTU 828 via an ADAT optical lightpipe cable, you need to make sure that their audio clocks are phase-locked. For details, see “Syncing optical devices” on page 27 and “Making sync connections” on page 21. If you don’t have any digital audio devices connected to the MOTU 828, digital audio phase-lock does not apply to you.

### Slaving to SMPTE time code

If you need to slave your audio software and the MOTU 828 system to SMPTE time code, follow the instructions in your software’s manual for slaving it to MIDI Time Code (MTC). To ensure that your audio tracks don’t drift out of sync with your MIDI tracks or the time code, use a hardware synchronizer like the MOTU MIDI Timepiece AV or Digital Timepiece to slave the MOTU 828 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 828 Console is set to *ADAT 9-pin*. For examples of how to set this up, see “Sync to SMPTE, word clock, video” on page 26.

### Sample-accurate sync to ADAT

If your audio software supports sample-accurate synchronization, the MOTU 828 provides sample-accurate digital transfers between the computer and ADATs, or any other device that supports standard ADAT sample address (*ADAT Sync*).

A sample-accurate digital transfer is one in which the original location of the audio is preserved in the transfer, down to the sample.

For details on how to connect your hardware for sample-accurate sync, see “Sample-accurate sync” on page 23. For software setup, consult your audio software documentation.

### Sample-accurate sync with Cubase

For sample-accurate sync in Cubase, set up Cubase as follows:

- 1 In Cubase’s Audio System Setup window (Audio menu), choose an *Audio Clock Source* setting of *ADAT 9-pin*.
- 2 In Cubase’s *Synchronization* window, set the Sync Source Time Base to *ASIO 2.0* as shown below:

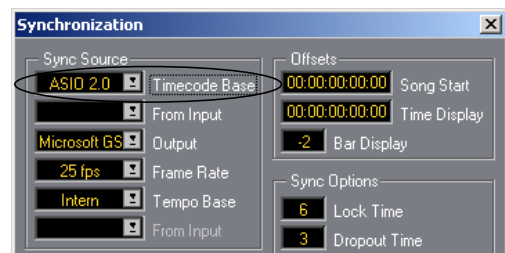


Figure 6-4: Setting up sample-accurate sync via ASIO 2.

- 3 Enable SYNC in the Controls window.



Figure 6-5: Enabling the SYNC button.

**4** Begin playback from the sample-accurate sync source (ADAT, etc.) Transport control is handled by the sample-accurate sync source.

### The ASIO 2.0 MMC setting in Cubase

The *Timecode Base* menu shown above in Figure 6-4 includes a setting called *ASIO 2.0 MMC*, which provides sample-accurate transport control of the MOTU MIDI Timepiece AV (or other MMC-compatible synchronizer) from the transport buttons in Cubase itself.

## MIDI MACHINE CONTROL (MMC)

If your audio software supports MIDI Machine Control (MMC), and you have ADATs and a MMC-compatible ADAT synchronizer like the MIDI Timepiece AV, you can control everything from the transport controls and cueing features in your audio software (like the playback wiper, etc.) See “Sample-accurate sync to ADAT” on page 42 for details on how to set this up.

## 24-BIT OPERATION

Your MOTU 828 hardware fully supports 24-bit recording in any audio software that supports it. Simply enable 24-bit operation as instructed by the software. The MOTU 828 system always supplies the software with a 24-bit data stream, and when you enable 24-bit operation, it simply uses all 24-bits supplied by the MOTU 828 hardware.



# Windows Multimedia-compatible Audio Software

**OVERVIEW**

The MOTU 828 WDM driver provides standard multi-channel input and output for audio software running under Windows 2000, Windows Me or Windows 98/Second Edition.

- WDM and Wave driver compatibility . . . . . 45
- Installing the MOTU 828 WDM driver . . . . . 45
- Enabling Wave (MME) compatibility . . . . . 45
- Making settings in the MOTU 828 Console . . . 45
- Enabling the MOTU 828 WDM driver . . . . . 46
- Working with MOTU 828 inputs and outputs .47
- Trimming the analog inputs . . . . . 47
- Changing MOTU 828 settings . . . . . 47
- Reducing delay when monitoring live inputs . .47
- Audio clock source . . . . . 47
- Synchronization . . . . . 47
- 24-bit operation. . . . . 48

**WDM AND WAVE DRIVER COMPATIBILITY**

WDM is an acronym for *Windows Driver Model*. The MOTU 828 WDM driver allows the MOTU 828 to provide multi-channel audio input and output for any audio application that supports WDM audio drivers.

**Attention: Cakewalk users**

Cakewalk SONAR is used for the WDM driver setup examples in this chapter.

**Attention: other software users**

Cakewalk’s SONAR software is used for the WDM driver setup examples in this chapter. However, the basic procedures are the same and can be easily applied to any WDM-compatible software. Just follow the general descriptions at the beginning of

each main section in this chapter. Consult your software documentation for details about each topic, if necessary.

**INSTALLING THE MOTU 828 WDM DRIVER**

The MOTU 828 installer CD-ROM installs the MOTU 828 WDM driver into Windows for you. That’s pretty much all the preparation you need. See chapter 3, “IMPORTANT! Run the MOTU 828 Software Installer First” (page 15).

**ENABLING WAVE (MME) COMPATIBILITY**

If your host audio software does not yet support Windows 2000 WDM drivers, you need to enable Wave driver compatibility in the MOTU 828 WDM driver so that all of the MOTU 828’s inputs and outputs show up in your software. For details, see “Wave support for legacy (MME) software” on page 35.

☛ If your host audio software *does* support WDM audio drivers, *don’t* enable Wave driver compatibility.

**MAKING SETTINGS IN THE MOTU 828 CONSOLE**

Before you run your audio software, launch the MOTU 828 Console to configure your MOTU 828 hardware. The MOTU 828 Console lets you choose the audio clock source, and it lets you enable the optical input and output, if needed. For details, see chapter 5, “MOTU 828 Console” (page 31).

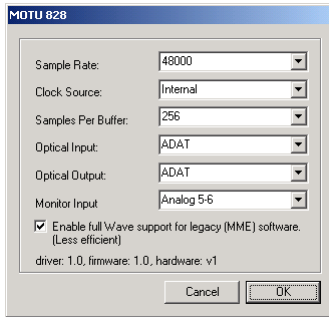


Figure 7-1: The MOTU 828 Console gives you access to all of the settings in the MOTU 828 hardware, including the clock source, optical I/O enable/disable and CueMix™ Plus monitor input(s).

## ENABLING THE MOTU 828 WDM DRIVER

Once you've made the preparations described so far in this chapter, you're ready to run your audio software and enable the MOTU 828 WDM driver. Check the audio system or audio hardware configuration window in your software.

### Enabling the MOTU 828 WDM driver in SONAR

To activate the MOTU 828 WDM driver in SONAR:

- 1 Choose *Audio Options* from the Options menu.
- 2 Click the *Drivers* tab.
- 3 Highlight the MOTU 828 inputs and outputs that you wish to use and unhighlight the ones you don't as shown in Figure 7-2.

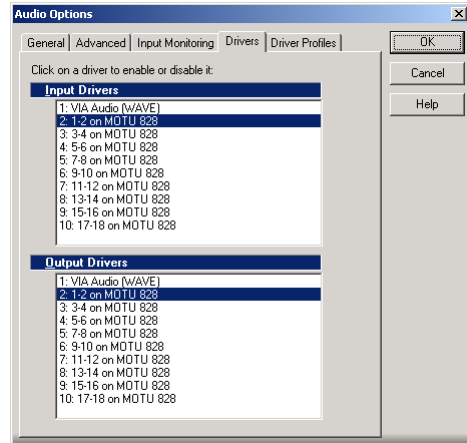


Figure 7-2: Activating the MOTU 828 driver in SONAR by highlighting inputs and outputs.

### Other audio settings in SONAR

There are a few other settings in SONAR that impact MOTU 828 operation:

- 1 In the Audio Options window, click the *General* tab.
- 2 Choose a MOTU 828 input and output for recording and playback timing as shown below in Figure 7-3. It doesn't matter which input or output you choose.

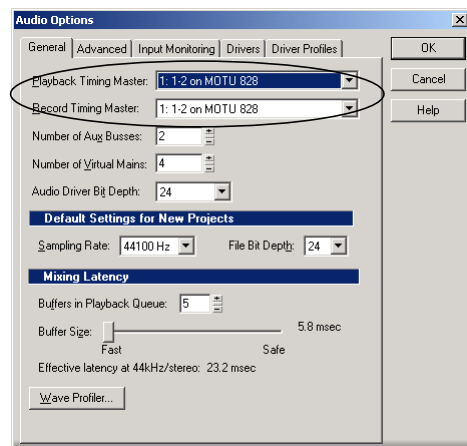


Figure 7-3: Make sure you have chosen a MOTU 828 input and output for the playback and recording timing master settings.

3 In the Audio Options window, click the *Driver Profiles* tab and set the *Stream > 16 bit data as* option to *4 bytes left-justified* as shown below in Figure 7-4.

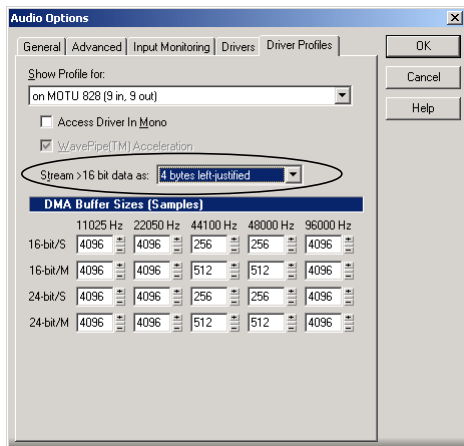


Figure 7-4: Setting the streaming option in Cakewalk's SONAR.

## WORKING WITH MOTU 828 INPUTS AND OUTPUTS

Once you've enabled the MOTU 828 WDM driver in your host audio software, MOTU 828 audio inputs and outputs will appear in your software's input/output menus, and you can set them up and use them as any standard audio input and output. If you don't see the optical inputs and/or outputs, check the MOTU 828 Console to make sure they are turned on and set to the format you need. If you don't plan to use the optical input or output, turn it off to conserve computer bandwidth.

## TRIMMING THE ANALOG INPUTS

The MOTU 828 analog inputs provide trim knobs on the front panel. Each knob provides 40dB of input gain. Use the level meters in your audio software to calibrate these inputs before recording. As you feed signal to the MOTU 828 analog input, adjust the input's corresponding trim knob on the front panel of the MOTU 828 until peaks in your software's level meter are as high as possible without clipping (hitting zero dB).

## CHANGING MOTU 828 SETTINGS

You can change the MOTU 828 settings at any time by accessing the MOTU 828 Console. (See "Accessing the MOTU 828 settings" on page 31.)

## REDUCING DELAY WHEN MONITORING LIVE INPUTS

If you have live audio inputs connected to the MOTU 828, such as MIDI synthesizers, samplers, microphones or other live instruments, you might hear a slight delay when their audio is being monitored through your MOTU 828 hardware and your host audio program. There are several ways to reduce — and eliminate — this audible monitoring delay. For details, see "Monitoring live input" on page 36.

## AUDIO CLOCK SOURCE

If you have devices connected to the MOTU 828 digital inputs (optical or RCA S/PDIF), or if you need to synchronize MOTU 828 digital audio and your host audio software to an external sync source, be sure the MOTU 828 clock source is set properly. For complete information, see "Making sync connections" on page 21 and "Clock Source" on page 32.

## SYNCHRONIZATION

If your audio software has the ability to slave to SMPTE time code, then it can take advantage of the synchronization features in the MOTU 828.

As you read through the following sections to decide what form of synchronization you might need with other devices in your studio, be sure to consult "Making sync connections" on page 21 for the proper hardware connections. Use the synchronization diagrams to be clear about how you will be synchronizing your audio software and the MOTU 828 to the other components of your system.

### **Synchronizing digital audio connections**

If you have devices connected to the MOTU 828 digital inputs (optical or RCA S/PDIF), you need to be concerned with the synchronization of the MOTU 828's digital audio clock with other devices connected to it digitally (if any). For example, if you have a digital mixer connected to the MOTU 828 via an ADAT optical light pipe cable, you need to make sure that their audio clocks are phase-locked. For details, see "Syncing optical devices" on page 27 and "Making sync connections" on page 21. If you don't have any digital audio devices connected to the MOTU 828, digital audio phase-lock does not apply to you.

### **Slaving to SMPTE time code**

If you need to slave your audio software and the MOTU 828 system to SMPTE time code, follow the instructions in your software's manual for slaving it to MIDI Time Code (MTC). To ensure that your

audio tracks don't drift out of sync with your MIDI tracks or the time code, use a hardware synchronizer like the MOTU MIDI Timepiece AV or Digital Timepiece to slave the MOTU 828 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 828 Console is set to *ADAT 9-pin*. For examples of how to set this up, see "Sync to SMPTE, word clock, video" on page 26.

### **24-BIT OPERATION**

Your MOTU 828 hardware fully supports 24-bit recording in any audio software that supports it. Simply enable 24-bit operation as instructed by the software. The MOTU 828 system always supplies the software with a 24-bit data stream, and when you enable 24-bit operation, it simply uses all 24-bits supplied by the MOTU 828 hardware.



## CHAPTER 8 Performance Tips & Troubleshooting

### *CD player will not play through the MOTU 828*

Playback from an audio CD on the PC requires a physical connection between the CD player and your sound card. The MOTU 828 does not have an internal CD connection.

### *Why does the start sound not play through the MOTU 828?*

The MOTU 828 will only playback audio at a sampling rate of 44.1 kHz, or 48 kHz

### *The computer freezes when it starts up*

If the computer is unable to boot up, it may be a conflict with the WDM Driver. As soon as the computer boots up, Windows will try and initialize the WDM Driver. If this fails, your computer will hang. To determine if the WDM Driver is the problem, boot up in Safe Mode or remove the MOTU Audio software with the Add/Remove Programs Control Panel then restart. Reinstall the MOTU 828 software and choose only to install the MOTU 828 ASIO driver, not the WDM Driver. Restart again.

### *'New hardware detected' window*

If you connect your MOTU 828 before running the MOTU 828 Software Installer CD, Windows will prompt you that new hardware has been detected. Cancel this, and run the MOTU 828 Software Installer, rather than allowing Windows to locate the drivers.

### *Audio in Cakewalk or SONAR speeds up or slows down*

This could be caused by having incorrect SMPTE/MTC Sync settings when you record audio into Cakewalk. These settings are located at the bottom of the Advanced Tab in the Audio Options dialog box, accessed from Cakewalk's Tools menu. Make

sure that you have the SMPTE/MTC Sync set to "Trigger and Freewheel" before recording audio while slaved to external time code.

### *MOTU 828 inputs and outputs are not available in Cakewalk or SONAR*

Make sure that the inputs and/or outputs that you want to use are enabled in Cakewalk or SONAR.

### *MOTU 882 inputs and outputs are not available in Cubase*

Make sure that the inputs and outputs are enabled in Cubase.

### *Sound Forge and 'Smooth Scroll'*

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

### *ADATs - converting 48kHz tracks to 44.1kHz*

If the audio on your ADAT tape was recorded at 48kHz, then you must transfer that audio into your host software at 48kHz. If you plan to digitally mix this data and burn an audio CD, you must convert your audio to 44.1kHz with your host software. Once you sample rate convert your audio to 44.1kHz, you will have to set the sample rate in the console back to 44100 so you can play the file. You always want your digital clocks and sample rates to match when dealing with any kind of digital audio transfer or synchronizing.

### *No input from an ADAT*

If you are having trouble recording on your ADAT from the MOTU 828, check the Digital input setting. After power cycling, tape decks often come

up configured to record from their analog inputs. You won't be able to record from the MOTU 828 to a tape deck until it is switched to digital input.

#### *Alesis blackface (classic) ADAT optical sync*

If you are using a Classic (black-faced) ADAT as a sync master in your MOTU 828 setup, and you want to record sample accurately into it, you must configure it to use its internal clock, instead of slaving to the optical input. To do this, hold down the SET LOCATE button and press the DIGITAL IN button. This will toggle the ADAT between external sync (shown as "diG") and internal sync ("int"). Note that the ADAT will return to the "diG" setting each time it is powered off.

#### *Alesis ADAT track offset*

If you find that sample accurate transfers from an ADAT are displaced by a small amount, try to reset the ADAT to its factory default state. This is accomplished by powering on the ADAT while holding down the RECORD and PLAY keys simultaneously. The ADAT lx uses a 'soft' power key so lx users will have to unplug and plug the ADAT lx while holding down the RECORD and PLAY keys.

#### *Clicks and pops under word clock sync*

Many problems result from incorrect word clocking. It is essential that all digital devices in the system be word locked. Consult chapter 4, "Installing the MOTU 828 Hardware" (page 17) for detailed information on how to word clock your gear. Whenever there is any weird noise or distortion, suspect incorrect word lock.

#### *Clicks and pops under ADAT Sync*

Sometimes, the ADAT sync cable seems to be plugged into the MOTU 828, and partially works - but it isn't really all the way in. This can cause clicks when slaved to ADAT 9-pin. Make sure the cable is seated firmly.

#### *Clicks and pops due to hard drive problems*

If you have checked your clock settings sync cable connections and you are still getting clicks and pops in your audio, you may have a drive related problem. Set the MOTU 828 Clock Source to Internal and try recording just using the analog inputs and outputs of the MOTU 828. If you encounter the same artifacts you may want try using another drive in your computer. Clicks and pops can also occur when the drive is severely fragmented, the disk drivers are outdated, or if you are using a SCSI accelerator that is not optimally configured for working with audio.

#### *Connecting or powering gear during operation*

It is not recommended that you connect/disconnect, or power on/off devices connected to the MOTU 828 while recording or playing back audio. Doing so may cause a brief glitch in the audio.

#### *Monitoring - How to monitor inputs?*

Please refer to the documentation for the audio application that you are using. If your application does not support input monitoring, you will need to use the MOTU 828's hardware-based CueMix Plus monitoring feature. Please see "Monitor input — CueMix™ Plus" on page 34.

#### *No optical inputs or outputs are available in host audio application*

Check to make sure you have the desired optical inputs and/or outputs enabled in the MOTU 828 Console.

#### *Controlling monitoring latency*

See "Monitoring live input" on page 36.

### **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 MOTU 828 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 MOTU 828 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 MOTU 828 system, you may contact our technical support department in one of the following ways:

- Tech support hotline: (617) 576-3066 (Monday through Friday, 9 am to 6 pm EST)

- Tech support 24-hour fax line: (617) 354-3068
- 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 MOTU 828 system. This is printed on a sticker placed on the bottom of the MOTU 828 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 MOTU 828 WDM Driver, MOTU 828 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.



02R mixer 27  
 connecting 20  
 1394 connector 6, 10, 17  
 2408  
 software installation 15  
 24-bit  
 3rd party software 43, 48  
 analog recording 9  
 optical 6, 10  
 recording 11

**A**  
 Aardvark Aard Sync 29  
 Activity LEDs 5, 11  
 ADAT 9-pin 10, 32  
 ADAT lightpipe 27  
 ADAT optical 6, 10  
 clock source setting 32  
 connecting 18  
 syncing with 32  
 ADAT Sync 10  
 connector 6  
 sample-accurate 23, 24, 25  
 sync setting 32  
 Analog activity lights 5, 11  
 Analog inputs/outputs 6  
 converters 9  
 making connections to 18  
 trimming in 3rd party software 41, 47  
 ASIO 11, 15, 16, 39  
 ASIO 2.0 MMC option 43  
 ASIO 2.0 option 42  
 ASIO Control Panel button 7, 31  
 Audio  
 bit resolution 31  
 AudioDesk  
 MOTU 828 settings 7  
 sync settings 24, 25, 26

**B**  
 Balanced analog 18  
 Bias Peak 11, 39

**C**  
 CakeWalk 11, 39  
 Clock LEDs 5, 11  
 Clock source 7, 21, 32  
 Coax 10  
 Condenser mic input 5  
 Control Panel (MOTU 828) 31  
 Control Strip module (828) 31  
 Converters 6, 9  
 Cubase 11, 39  
 828 inputs/outputs 41  
 enabling the 828 ASIO driver 40, 46  
 CueMix Plus 10, 34  
 choosing inputs 7  
 output jacks 6, 18  
 volume control 5  
 Customer service contact info 50

Customer support 50

**D**  
 DAT  
 connecting 19  
 Digital mixer  
 connecting 20  
 Digital Performer  
 MOTU 828 settings 7  
 sync settings 24, 25, 26  
 Digital Timepiece 24  
 Disk  
 getting a replacement 51

**F**  
 FireWire 10  
 connecting 17  
 connector 6

**G**  
 Guitar  
 connecting 19  
 Guitar (levels) 5

**H**  
 Headphone jack 5, 10  
 Headphones  
 connecting 19

**I**  
 Input gain 5, 10  
 Inputs  
 analog 6  
 optical 6  
 S/PDIF (RCA) 6

Installation  
 hardware 17  
 software 15  
 Internal (sync setting) 32

**L**  
 Latency 10, 33, 34  
 CueMix Plus 7  
 w/3rd party software 41, 47  
 Lightpipe 27  
 Logic Audio 11, 39

**M**  
 Main outs 10  
 choosing CueMix monitor inputs 7  
 jacks 6  
 making connections to 18  
 volume 5  
 Main volume 5  
 Mic inputs  
 connecting 19  
 phantom power 5  
 Mic preamps 6, 10  
 Mic/line inputs 6, 18  
 MIDI Machine Control 22, 23, 43  
 MIDI Time Code sync 22, 23  
 MIDI Timepiece AV 24

Mixing  
 using an external mixer 18  
 MMC 22, 23, 43  
 Monitor input 7, 34  
 Monitor level 5  
 Monitoring 10, 33, 34, 36  
 thru main outs 18  
 w/3rd party software 41, 47  
 MOTU  
 Digital Timepiece 24  
 MIDI Timepiece AV 24  
 MOTU 324 Console 16  
 MOTU 828  
 ASIO driver 16  
 installing 17  
 rear panel overview 9  
 summary of features 9  
 MOTU 828 Control Panel 7, 31  
 MOTU 828 Control Strip module 7, 31  
 MOTU Audio System  
 bit resolution 31  
 MTC sync 22, 23

**N**  
 Neutrik jacks 6

**O**  
 Optical  
 choosing format (ADAT or TOSlink) 34  
 choosing format (ADAT/TOSlink) 7  
 connectors 6, 18  
 LEDs 5, 11  
 overview 10  
 sync 27  
 Outputs  
 analog 6  
 optical 6  
 S/PDIF (TOSLink) 6

**P**  
 Packing list 13  
 PCI-324  
 Wave driver 16, 45  
 Peak 11, 39  
 Phantom power 5, 10, 18  
 Phase-lock 21  
 Phones 5

**R**  
 Registration 13

**S**  
 S/PDIF 10  
 clock source setting 33  
 lights 5, 11  
 optical 6, 10  
 RCA 6  
 sync 28  
 Sample rate 7, 31  
 Sample-accurate sync 10, 23, 24, 25, 42  
 Samplers  
 connecting 19

- Samples per buffer 7, 33
- SMPTE sync 21, 22, 23, 26
- Software installation 15
- Sound control panel
  - rate (bit resolution) 31
- Sound Manager 11, 39
  - bit resolution 31
- Studio setup (example) 19
- Sync
  - sample-accurate 23, 24, 25
- Synchronization 21
  - 3rd party software 42, 47
- Synths
  - connecting 19
- System requirements

- minimum 13
- recommended computer 11, 13

## **T**

- Tech support contact info 51
- Technical support 51
- Timecode Base menu 43
- TOSLink 6, 10
  - clock source setting 33
  - connecting 18
- Trim (input) 5, 10
- TRS connectors 18

## **U**

- Unbalanced analog 18

## **V**

- Video sync 21, 26
- Volume
  - headphone 10
- VST 11, 39

## **W**

- Wave driver 16, 45
- Word clock 21, 26, 28

## **Y**

- Yamaha 02R
  - connecting 20
- Yamaha 02R mixer 27