

MOTU 896TM

User's Guide for Windows



MOTU

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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 896 COULD CAUSE AN ELECTRICAL SHOCK.

The MOTU 896 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 896 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

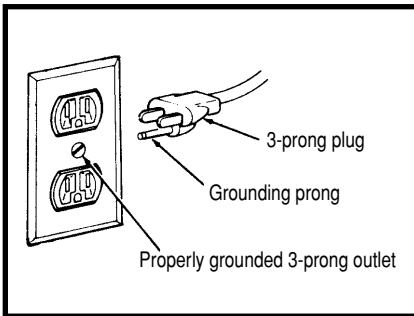
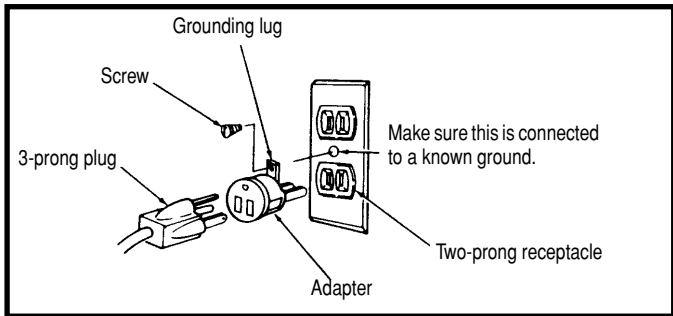


Figure B



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 896 plug.

IMPORTANT SAFEGUARDS

1. Read instructions - All the safety and operating instructions should be read before operating the MOTU 896.
2. Retain instructions - The safety instructions and owner's manual should be retained for future reference.
3. Heed Warnings - All warnings on the MOTU 896 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 896 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 896 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 896.
9. Lightning - For added protection for the MOTU 896 during a lightning storm, unplug it from the wall outlet. This will prevent damage to the MOTU 896 due to lightning and power line surges.
10. Servicing - Do not attempt to service this MOTU 896 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 896 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 896.
 - c. If the MOTU 896 has been exposed to rain or water.
 - d. If the MOTU 896 does not operate normally by following the operating instructions in the owner's manual.
 - e. If the MOTU 896 has been dropped or the cabinet has been damaged.
 - f. When the MOTU 896 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 896, 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.

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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 896 Front Panel

The light that is illuminated here tells you which bank (analog in, ADAT in, or ADAT out) you are monitoring with the programmable meter bank to the right.

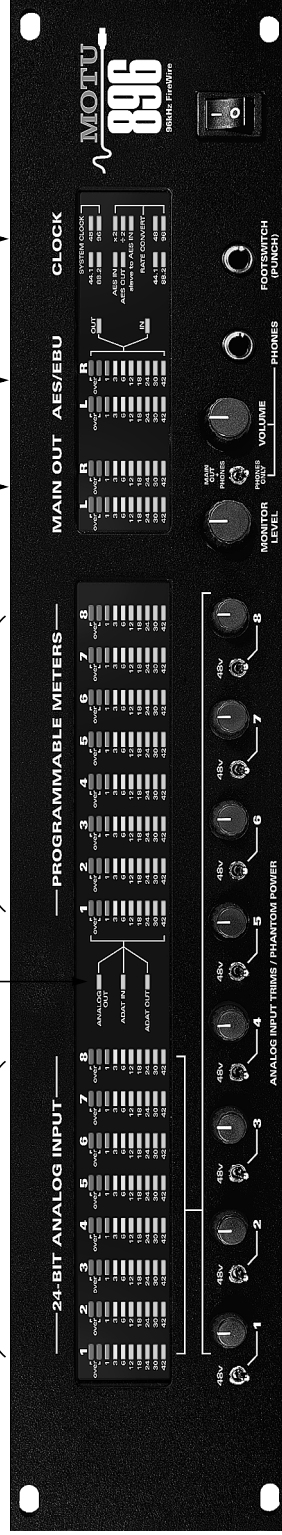
These 10-segment level meters are dedicated solely to the 896's eight analog inputs. The top red 'over' LED lights up when the signal reaches full scale—for even just one sample—and remains illuminated until you clear it in the software. The second 'over' LED below only lights up momentarily so that you can continue to adjust level even after clipping has just occurred.

This bank of level meters can be programmed to display one of three different banks: analog output, ADAT optical input, or ADAT optical output. Use the MOTU FireWire Audio Console to choose which bank you'd like to view with these meters. The LEDs to the left show which bank you are currently monitoring.

These meters can be programmed to display either AES/EBU input or output. Use the MOTU FireWire Audio Console to choose. The LEDs to the right indicate what you are currently monitoring.

These lights indicate the global sample rate at which the MOTU 896 is operating. Use the MOTU FireWire Audio 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 lights flash. For example, if you've set the MOTU 896 to slave to an external clock, such as ADAT, but there is no clock signal currently being detected, these lights will flash.

These meters display the level for the 896's main outs.



This toggle switch provides phantom power for a condenser mic plugged into this input. Up is on.

These eight trim knobs provide gain adjustment within a range of about 40dB for each analog input (when the 3-way switch on the rear panel is set to either MIC or LINE. If the 3-way switch is set to +4/FIXED, the corresponding front-panel trim pots is bypassed). Because each input also has a microphone preamp, you can plug just about anything into them: a microphone, a guitar, a synth — you name it.

For a microphone or unamplified instrument pickup, set the rear-panel 3-way switch to MIC, plug in your mic (XLR or quarter-inch plug) flip on 48V phantom power (if necessary) and use the trim knob as needed to adjust the level.

For -10dB (unbalanced) inputs (like synths) or +4 (balanced) signals, set the rear panel 3-way switch to LINE and use the trim knob to adjust the level. You can use either an XLR or quarter-inch plug. (Note: the complete trim range, from all the way down with the MIC setting to all the way up with the LINE setting is around 55dB total. The MIC setting provides a 40dB range (approximately -37dBu to +5dBu) and the LINE setting offers a 30dB range (approximately -16dBu to +15dBu) with some overlap between them.)

If you have +4 inputs for which you'd like to maintain unity gain (for levels up to +18dBu), set the rear-panel 3-way switch to +4/FIXED. You can use either an XLR or quarter-inch plug.

The MOTU 896 lets you monitor any analog or AES/EBU input (or input pair) via the main outs (and the headphone out). This knob controls the level of this monitored signal. This feature is called CueMix Plus™.

This is a standard quarter-inch stereo headphone jack. Its output matches the main outs on the rear panel.

The volume knob controls the headphone out and, if the toggle switch is up, the main outs, too. If the volume knob only affects the headphone out.

FireWire is a "plug-and-play" protocol. That means that you can turn off the MOTU 896 and turn it back on (or even unplug it) without restarting your computer. Keep in mind, however, that if you wish to change the MOTU 896's settings in the MOTU FireWire Audio Console, the MOTU 896 needs to be plugged in and switched on.

This foot pedal input is for Macintosh operation only.

Quick Reference: MOTU 896 Rear Panel

These two XLR jacks serve as the MOTU 896's main analog outputs. You can connect them to a set of powered studio monitors and then control the volume from the front panel "Volume" knob.

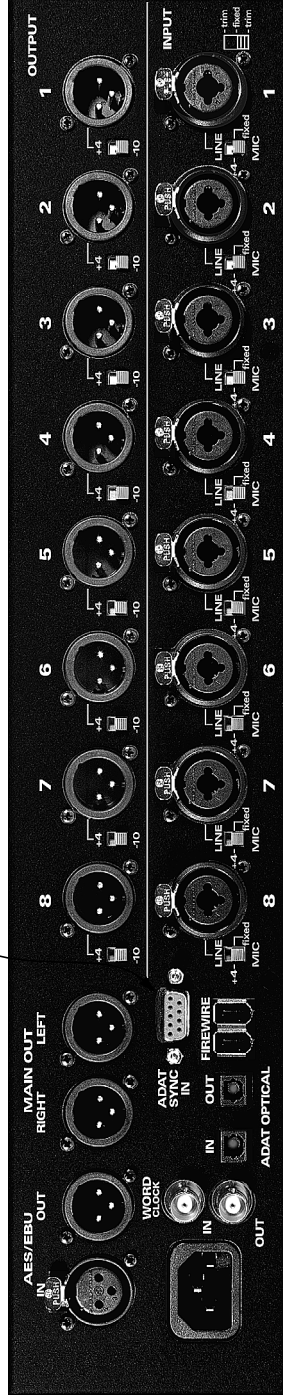
The signal that comes out of these outputs is a mix of analog outputs 1 and 2 and any live CueMix™ Plus input that you have chosen to monitor from a MOTU 896 input (or input pair). To hear disk tracks in your audio software on these main outs, assign the disk tracks (and master fader) to Analog Outs 1-2.

These AES/EBU connectors can handle any supported sample rate (44.1, 48, 88.2, or 96), and they are also equipped with a sample rate converter so you can input or output at a different rate than the 896. For details, see "Syncing AES/EBU devices" on page 28.

If you are using the MOTU 896 with an ADAT, use this standard ADAT SYNC INPUT to connect the MOTU 896 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).

The MOTU 896's eight analog outputs are XLR connectors with +4 / -10 switchable output (600 Ohm impedance). They are equipped with 24-bit, 128x oversampling enhanced multibit A/D converters capable of 44.1, 48, 88.2 and 96 kHz recording.

Analog outputs 1 and 2 are duplicated on the MOTU 896's main outputs (to the left), as well as the front panel stereo headphone jack. However, these outputs do not include any live CueMix™ Plus audio.



The 896 power supply is switchable between 115V and 240V operation. It should already be set to the proper voltage for your country, but you can check the setting and adjust it if necessary with the red switch just to the left of this power cord receptacle (on the side of the metal chassis).

These ADAT optical digital I/O connectors can be connected either to an ADAT or any ADAT-compatible "lightpipe" device (such as a digital mixer). ADAT optical supplies eight channels of 24-bit digital I/O at

Connect the MOTU 896 to the computer here using the standard 1394 FireWire cable provided with your MOTU 896.

These eight analog inputs are Neutrik™ combo connectors that accept either an XLR plug or a quarter-inch plug. They have 24-bit, 64x oversampling converters. Each input is equipped with a 3-way input level switch with these settings:

LINE: Use this setting for +4dB or -10dB inputs, such as synthesizers or consumer audio equipment. Adjust the input level as needed with the corresponding front panel Trim control and level meter for this input. This setting offers a trim range of around 30dB (approximately -16dBu to +15dBu).

+4 / FIXED: Use this setting for +4 balanced inputs for which you do not wish to modify the gain. This position disengages the front panel trim knob. This setting also provides slightly more attenuation than the LINE setting, allowing levels up to +18dBu.

Use the word clock input and output for digital transfers with devices that cannot slave to the clock supplied by their digital I/O connection with the 896.

Daisy-chain up to four 896's to a single FireWire bus. You can also connect a MOTU 828, Glyph M Project FireWire hard drive or other FireWire device. For details, see "Connecting multiple MOTU 896 interfaces" on page 33.

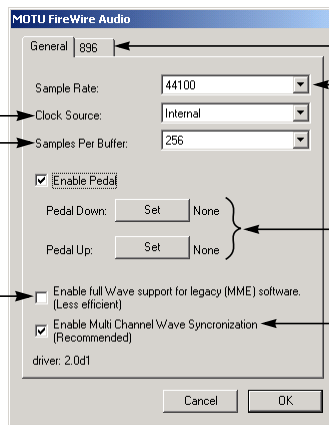
MIC: This setting feeds the input signal (XLR or quarter-inch) to the built-in preamp for additional gain. Use it for any microphone or unamplified instrument pickup. Engage phantom power for condenser mics with the front-panel 48V switch (up is on). Use the corresponding front-panel trim knob and level meter to adjust the input level as needed. This setting offers a trim range of around 40dB (approximately -37dBu to +5dBu).

Quick Reference: MOTU FireWire Audio Console

Determines the master clock source for your entire MOTU 896 system. If you're just using the analog ins and outs, set this to 'Internal'. The other settings are for digital transfers via AES/EBU or external synchronization via the ADAT SYNC in or Word Clock port. If you have multiple MOTU FireWire interfaces, you'll see all eligible clock sources from all available interfaces.

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 38.

Check this option if the audio software you are using with the MOTU 896 does not support Windows WDM drivers and instead only supports legacy MME (Wave) drivers. When checked, this option makes all of the MOTU 896 inputs and outputs available to legacy Wave-driver compatible audio software.



Use these tabs to access general settings and settings that are specific to the MOTU 896 interface. If you have multiple MOTU FireWire audio interfaces connected, each gets its own tab.

Choose the global sample rate for the system here.

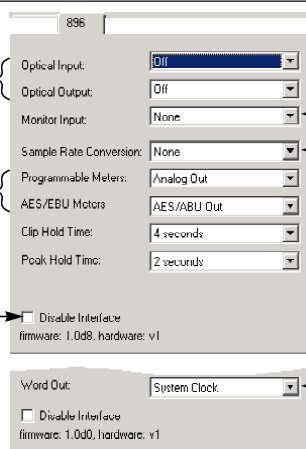
If you have a foot switch connected to the MOTU 896, these settings let you map the foot switch to any computer keyboard key for both the up and down position.

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

Choose the desired optical format you'd like to use for the optical input and output. For the 896, the choices are 'ADAT' or 'OFF'. Turning them off frees up FireWire bandwidth for other devices.

Lets you choose what to monitor with the 896's programmable front panel meters.

Use the 'Disable' check box to take the interface off-line without shutting off its power. Doing so frees up FireWire bandwidth.



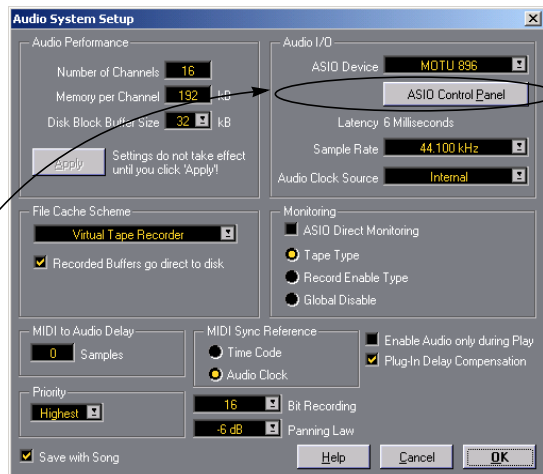
This is the MOTU 896's no-latency CueMix™ Plus monitoring feature. The inputs you choose here will be mixed with the main outs and can be controlled with the 'Monitor Level' knob on the front panel.

This menu provides several options for the MOTU 896's AES/EBU sample rate conversion. For further details see, "Syncing AES/EBU devices" on page 28.

The Clip Hold Time controls how long the top-most red LED remains illuminated after clipping. The Peak Hold Time controls how long the highest illuminated LED remains lit before going dark.

If you are running a MOTU 896 interface at a high sample rate (96 or 88.2), this option appears at the bottom of the interface settings. It lets you choose a word clock output rate that either matches the global sample rate (e.g. 96 kHz) or halves the global rate (e.g. 48 kHz instead of 96 kHz).

Audio System Setup in Cubase VST



How to access these settings

The MOTU FireWire Audio Console gives you complete control over the settings in your MOTU 896 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 FireWire Audio 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.

CHAPTER 1 **About the MOTU 896**

OVERVIEW

The MOTU 896 is a computer-based hard disk recording system for Mac OS and Windows that offers 18 simultaneous inputs and outputs. The MOTU 896 consists of a standard 19-inch, double-space, rack-mountable I/O unit that connects directly to a computer via a standard IEEE 1394 FireWire™ cable. The MOTU 896 offers the following:

- Operation at 44.1, 48, 88.2 or 96 kHz
- Eight 24-bit analog outputs individually switchable between +4 and -10dB operation
- Eight 24-bit analog inputs equipped with Neutrik “combo” jacks and independent 3-way level switch for MIC, LINE or +4/FIXED inputs
- Eight-channel ADAT optical digital I/O
- AES/EBU with sample rate conversion
- Two extra analog main outs
- Eight mic preamps (one on each input)
- Independent 48V phantom power for each input
- Independent front-panel trim for each input
- Sample-accurate ADAT sync input
- Word clock input and output
- Two FireWire jacks for chaining multiple units
- Foot switch input for hands-free punch-in/out
- Front-panel Headphone jack
- Main volume knob (for headphone + main outs)
- CueMix™ Plus no-latency monitoring
- 10-segment LED level meters for each input
- 10-segment programmable LEDs for analog output, ADAT input or ADAT output
- 10-segment programmable LEDs for AES/EBU input or output
- Switchable power supply (110V or 220V)

With a variety of I/O formats, mic preamps, no-latency monitoring of live input and synchronization capabilities, the MOTU 896 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 Me/2K/XP. Also included is an ASIO driver for multi-channel operation with any Windows audio software that supports ASIO drivers.

THE MOTU 896 I/O REAR PANEL

The MOTU 896 rear panel has the following connectors:

- Eight 24-bit XLR analog outputs, each equipped with an independent 2-way output level switch (+4 or -10dB)
- Eight 24-bit Neutrik “combo” (XLR + balanced quarter-inch) analog inputs, each equipped with an independent 3-way level switch (MIC, LINE, +4/FIXED), mic preamp, front-panel 48V phantom power switch, and front-panel trim knob
- One set of ADAT optical ‘light pipe’ connectors (8 channels of ADAT optical input and output)
- AES/EBU input and output
- Two XLR main analog outputs with volume knob (on the front panel)
- One 9-pin ADAT SYNC IN connector

- BNC word clock input and output
- Two 1394 FireWire jacks

18 simultaneous inputs and outputs

All MOTU 896 inputs and outputs can be used simultaneously, for a total of 18 inputs and outputs (8 analog + 8 ADAT optical + 2 AES/EBU).

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. Each output can be individually switched between either +4 or -10dB operation. Each input can be individually set to one of three input levels: MIC (feeds the mic preamp and includes front-panel trim and switchable 48V phantom power), LINE (for -10dB inputs with front-panel trim) and +4/FIXED (for +4 “hot” inputs for which no gain adjustment in the 896 is desired).

Mic preamps

All eight analog inputs are equipped with a mic preamp on a Neutrik™ combo-style connector that accepts either an XLR or quarter-inch plug. Defeatable 48V phantom power is supplied by a front panel switch. In addition, each input has its own trim knob, which provides a trim range of approximately 40dB.

Main Outs

For main stereo output, analog outputs 1 and 2 are duplicated as a stereo pair of XLR jacks. If an input (or input pair) is being monitored via the MOTU 896'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.

ADAT optical

The MOTU 896 optical jacks support eight channels of 24-bit ADAT optical digital audio input and output at either 44.1 or 48 kHz.

AES/EBU with sample rate conversion

The MOTU 896 rear panel provides standard AES/EBU digital inputs and outputs that support digital I/O at 44.1, 48, 88.2 and 96 kHz. In addition, input or output can be sample-rate converted to any of these sample rates in situations that call for a different rate than the 896's global sample rate.

ADAT sync: sample-accurate synchronization

The MOTU 896'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.

Word clock

The MOTU 896 provides standard word clock that can slave to any supported sample rate. In addition, word clock can resolve to and generate “high” and “low” sample rates. For example, if the MOTU 896 global sample rate is set to 96 kHz, the word clock input can resolve to a “low” rate of 48 kHz. Similarly, when the MOTU 896 is operating at 96 kHz, the MOTU 896 FireWire Audio Control Panel lets you choose a word clock output rate of 48 kHz (“System clock ÷ 2”).

Punch in/out

The quarter-inch Punch in/out jack accepts a standard foot switch. When you push the foot switch, the MOTU 896 triggers a programmable keystroke on the computer keyboard. For example, with MOTU's Digital Performer audio sequencer software, the foot switch triggers the 3 key on the

numeric keypad, which toggles recording in Digital Performer. Therefore, pressing the foot switch is the same as pressing the 3 key. The MOTU FireWire Audio Control Panel software lets you program any keystroke you wish.

1394 FireWire

The two 1394 FireWire jacks accept a standard IEEE 1394 FireWire cable to connect the MOTU 896 to a FireWire-equipped Macintosh or Windows computer. Both jacks can be used together to connect up to four 896's (or other MOTU FireWire audio interfaces) to a single FireWire chain.

THE MOTU 896 FRONT PANEL

Headphone output and main volume control

The MOTU 896 front panel includes a quarter-inch stereo headphone output jack and volume knob. The headphone output matches the main stereo outs. An accompanying switch allows you to control the volume of the phones only (down) or both the phones and the main outs (up).

CueMix™ Plus no-latency monitoring

The MOTU 896 provides CueMix™ Plus no-latency monitoring from any input (or input pair). The CueMix monitored signal, mixed with outputs 1-2, appears on the main outs and headphone jack. An independent volume knob is provided for the monitored signal.

Input trim knobs and phantom power switch

The front-panel input trim knobs provide independent trim for the eight analog inputs. The phantom power switch for each input provides 48V phantom power. Up is on; down is off.

Metering

The front panel of the MOTU 896 displays two eight-channel banks of 10-segment ladder LEDs. The left-hand bank always shows the eight analog inputs. The right-hand bank shows one of three different banks, which you can specify in the

MOTU FireWire Audio Console software: Analog out, ADAT input, or ADAT output. A status LED to the left shows which bank you are currently viewing.

The 896 front panel also displays stereo meters for the main analog outs and AES/EBU. The AES/EBU meters can display either input or output as specified in the MOTU FireWire Audio Console software. A status LED to the right shows whether you are viewing input or output.

16-BIT AND 24-BIT RECORDING

The MOTU 896 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 44.1, 48, 88.2 or 96 KHz via any of the MOTU 896's analog or digital inputs and outputs (except optical, which only supports 44.1 or 48). 24-bit audio files can be recorded with any compatible host application that supports 24-bit recording.

HOST AUDIO SOFTWARE

The MOTU 896 system ships with a standard WDM Windows driver that allows you to record, edit, play back and mix your MOTU 896 projects using your favorite Windows audio software.

The MOTU 896 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 896, 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 896 ships with the items listed below. If any of these items are not present in your MOTU 896 box when you first open it, please immediately contact your dealer or MOTU.

- One MOTU 896 I/O rack unit
- One 1394 “FireWire” cable
- Power cord
- One MOTU 896 Mac/Windows manual
- One AudioDesk Manual
- One cross-platform CD-ROM
- Product registration card

WINDOWS SYSTEM REQUIREMENTS

The MOTU 896 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 Me, 2000 or XP
- A large hard drive (preferably at least 9 Gb)

PLEASE REGISTER TODAY!

Please send in the registration card included with your MOTU 896 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!

CHAPTER 3 **IMPORTANT! Run the MOTU 896 Software Installer First**

OVERVIEW

The MOTU 896 ships with the following software and drivers for Windows 2000/Me/XP:

Software component	Purpose
MOTU FireWire Audio Console	Provides access to all of the settings in the MOTU 896 hardware.
ASIO MOTU FireWire Audio driver	Allows Cubase VST or other ASIO-compliant software to do multi-channel input and output with the MOTU 896. Only required if you are using Cubase VST or another ASIO-dependent program.
MOTU 896 WDM Driver	Allows any WDM-driver compatible audio software to do multichannel input and output with the MOTU 896.

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INSTALL THE MOTU 896 SOFTWARE FIRST!

Before you connect the MOTU 896 audio interface to your computer and turn it on, insert the MOTU 896 software CD and run the MOTU 896 Software Installer. This ensures that all the MOTU 896 components are properly installed in your system.

If Windows asks you to locate the drivers

If you've already connected the MOTU 896 to your computer and switched it on, Windows probably issued an alert notifying you that the MOTU 896 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 896.
- 3 Restart the computer.
- 4 Run the MOTU 896 Software Installer as instructed in the next section.

INSTALLING THE MOTU 896 SOFTWARE

To install the MOTU 896 software, insert the MOTU Audio CD-ROM and follow the directions it gives you on your computer screen.

MOTU FIREWIRE AUDIO CONSOLE

The MOTU FireWire Audio 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 FireWire Audio Console gives you access to all of the settings in the MOTU 896, such as the clock source and sample rate. For complete details, see chapter 5, "MOTU FireWire Audio Console" (page 35).

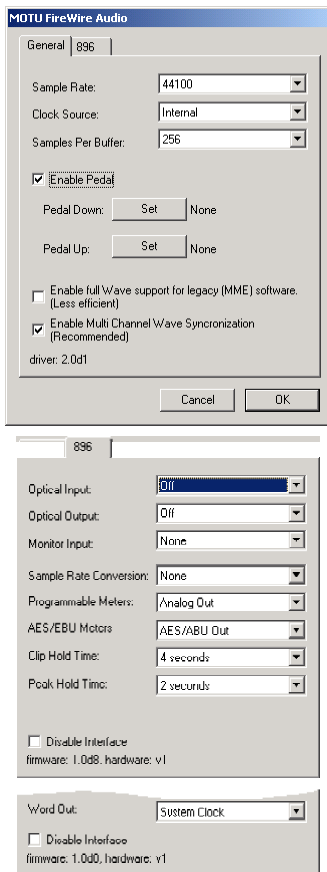


Figure 3-1: The MOTU FireWire Audio Console gives you access to all of the settings in the MOTU 896 hardware.

ASIO MOTU FIREWIRE AUDIO DRIVER

ASIO stands for *Audio Streaming Input and Output*. The ASIO MOTU FireWire Audio driver allows MOTU 896 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 FireWire Audio 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 896).

The ASIO MOTU FireWire Audio driver is installed by the MOTU 896 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 896, see chapter 6, "ASIO-compatible Audio Software" (page 43).

THE MOTU FIREWIRE AUDIO WDM DRIVER

The MOTU FireWire Audio WDM driver provides standard multi-channel input and output for audio applications running under Windows 2000, Windows Me or Windows XP. See chapter 7, "Windows Multimedia-compatible Audio Software" (page 49) for details.

The MOTU 896 installer CD installs the MOTU FireWire Audio WDM driver into Windows for you.

CHAPTER 4 Installing the MOTU 896 Hardware

OVERVIEW

Here's an overview for installing the MOTU 896:

Connect the MOTU 896 interface17

Connect the MOTU 896 audio interface to the computer with the supplied FireWire cable.

Connect inputs and outputs18

Make optical and analog connections as desired.

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An example setup for a mixer-based studio.

Making sync connections21

If you need to resolve the MOTU 896 with other devices in your studio, make the necessary synchronization connections.

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CONNECT THE MOTU 896 INTERFACE

1 Plug one end of the MOTU 896 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 896 I/O as shown below in Figure 4-1.

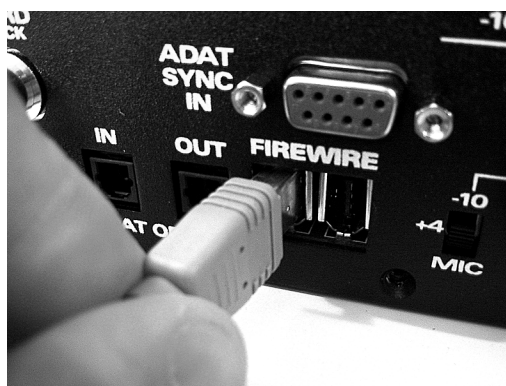


Figure 4-1: Connecting the MOTU 896 to the computer.

CONNECT INPUTS AND OUTPUTS

The MOTU 896 audio interface has the following input and output connectors:

- 8 XLR analog outputs
- 8 Neutrik™ XLR/quarter-inch analog inputs
- 2 XLR main outs
- AES/EBU input/output
- ADAT optical input/output

Analog inputs

The MOTU 896 analog inputs are Neutrik combo connectors that accept either a male XLR plug or a quarter-inch plug. You can use either type of plug, regardless of whether its a mic, synth, or whatever. Set the 3-way input level switch as follows:

For a microphone or unamplified instrument pickup, set the rear-panel 3-way switch to MIC, plug in your mic (XLR or quarter-inch plug) flip on 48V phantom power (if necessary) and use the trim knob as needed to adjust the level.

For -10dB (unbalanced) inputs (like synths) or +4 (balanced) signals that may need to be boosted, set the rear panel 3-way switch to LINE and use the trim knob to adjust the level. You can use either an XLR or quarter-inch plug. (Note: the complete trim range, from all the way down with the MIC setting to all the way up with the LINE setting is around 55dB total. The MIC setting provides a 40dB range and the LINE setting offers a 30dB range with some overlap between them.)

If you have +4 inputs for which you'd like to maintain unity gain, set the 3-way switch to +4/FIXED. Use either an XLR or quarter-inch plug.

Analog outputs

Connect an XLR cable and set the desired output level with the 2-way level switch (+4 or -10dB).

ADAT optical

Use standard ADAT optical cables. Reminder: optical goes OUT to IN and IN to OUT, like MIDI.

AES/EBU

Connect standard AES/EBU input and output. High sample rates (88.2 & 96 kHz) are supported.

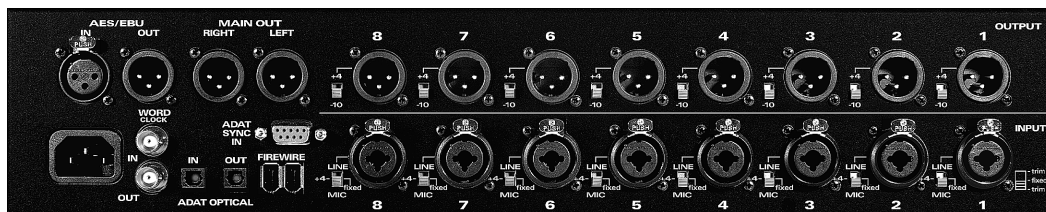
Main outs

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 can be controlled by the main volume knob on the front panel (when the switch is up). In a typical studio, the main outs are intended for a pair of monitors. However, if you are using the MOTU 896 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 896 can be used without a mixer, 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 896 with a mixer" on page 20.

Figure 4-2: the MOTU 896 rear panel.



A TYPICAL STUDIO SETUP (NO MIXER)

Here is a typical MOTU 896 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 896's CueMix™ Plus no-

latency monitoring to listen to what you are recording via the main outs. The MOTU FireWire Audio 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.

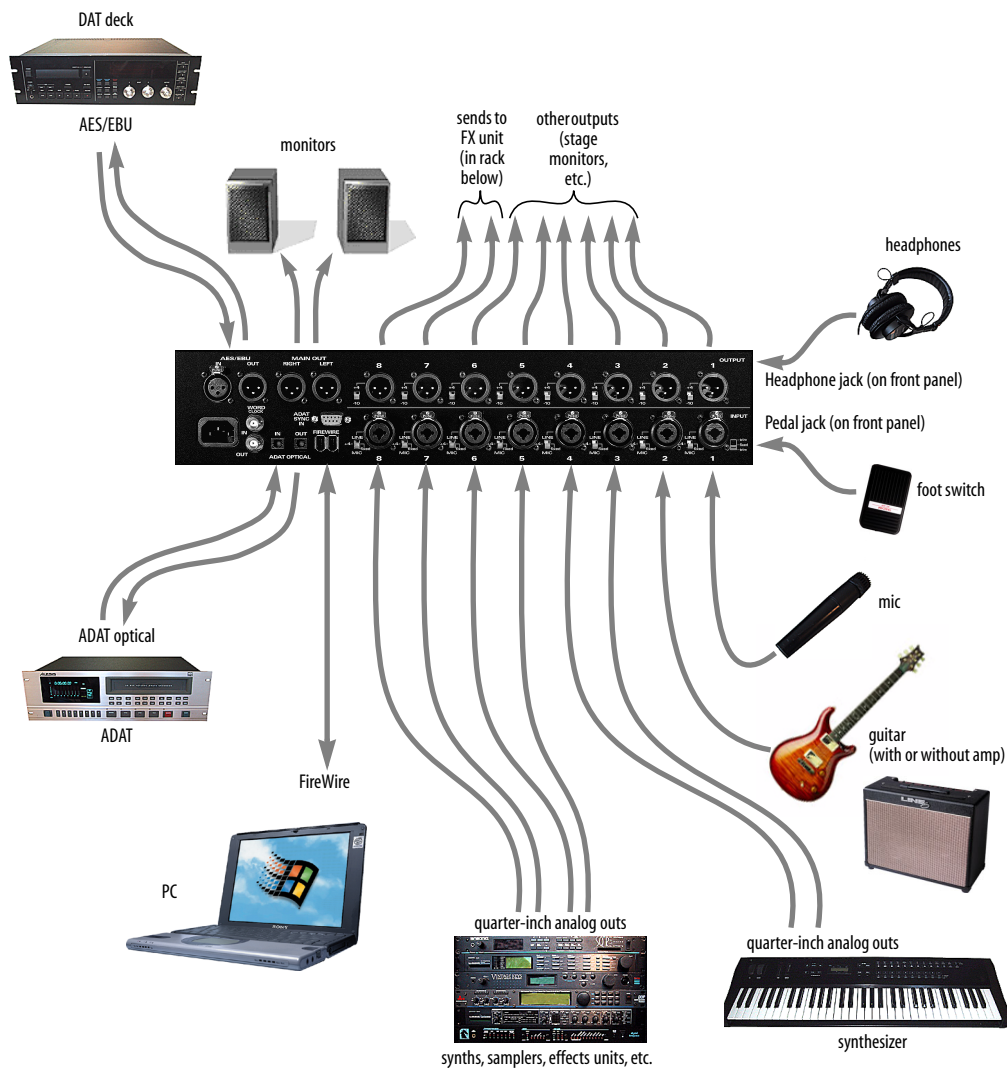


Figure 4-3: A typical MOTU 896 studio setup.

USING THE MOTU 896 WITH A MIXER

While there are many ways to use the MOTU 896 with an external mixer, typically the MOTU 896 serves as a multi-channel “pipeline” between the mixer and the computer. If your mixer is analog, connect the analog section of the MOTU 896 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. Add more 896’s for

additional banks of eight-channel I/O. The MOTU 896’s available analog and AES/EBU 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 896 with an external mixer, use the mixer for mixing. Trying to mix large multitrack projects in two places can become very cumbersome very quickly.

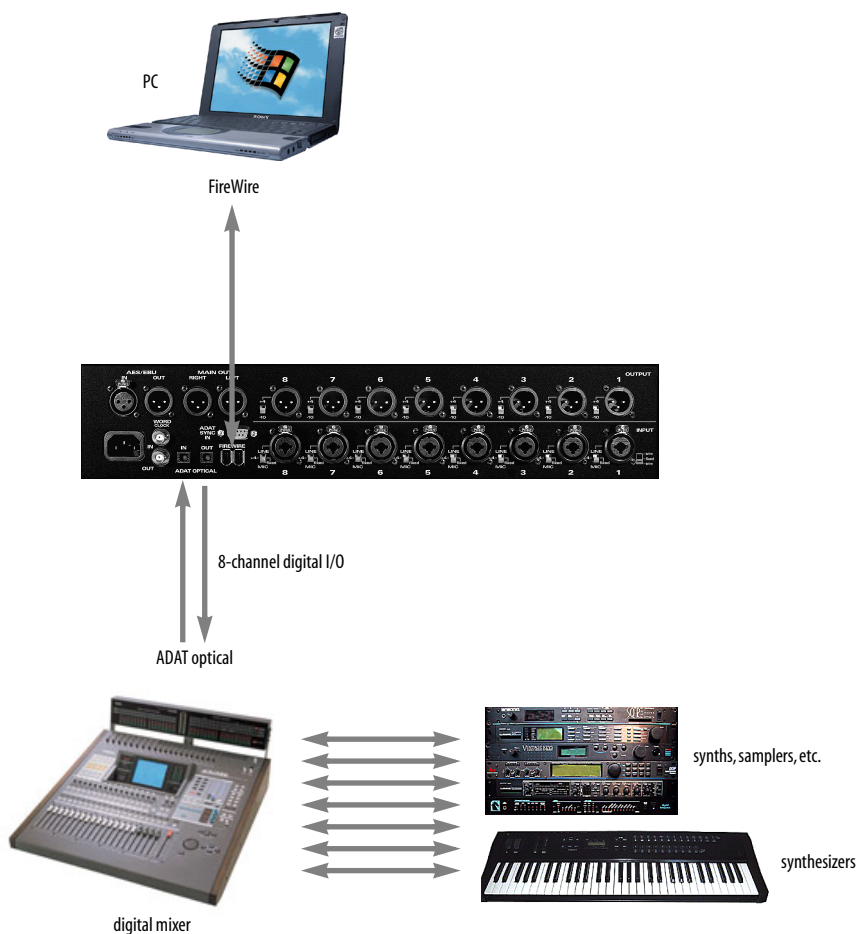


Figure 4-4: Using the MOTU 896 with a digital mixer.

MAKING SYNC CONNECTIONS

If you connect devices digitally to the MOTU 896, or if you need to synchronize the MOTU 896 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 896?

If you will be using only the MOTU 896's analog inputs and outputs (and none of its digital I/O), and you have no plans to synchronize your MOTU 896 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 FireWire Audio Console" (page 35) where you'll open the MOTU FireWire Audio Console and set the *Clock Source* setting to *Internal* as shown below in Figure 4-5. For details, see chapter 5, "MOTU FireWire Audio Console" (page 35).

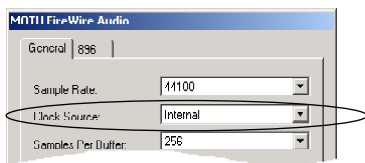


Figure 4-5: You can run the MOTU 896 under its own internal clock when it has no digital audio connections and you are not synchronizing the MOTU 896 system to an external time reference such as SMPTE time code.

Situations that require synchronization

There are three general cases in which you will need to synchronize the MOTU 896 with other devices:

- Synchronizing the MOTU 896 with other digital audio devices so that their digital audio clocks are *phase-locked* (as shown in Figure 4-6)
- Slaving the MOTU 896 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 896'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.

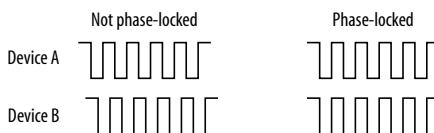


Figure 4-6: When transferring audio, two devices must have phase-locked audio clocks to prevent clicks, pops or other artifacts.

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.

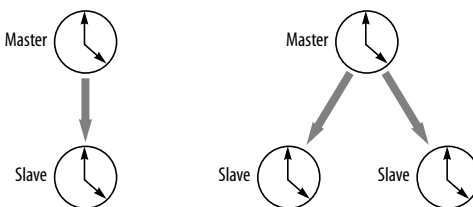


Figure 4-7: To keep the MOTU 896 phase-locked with other digital audio devices connected to it, choose a clock master.

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 896.

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 896 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 896 system.

You don't need a synchronizer if...

As explained earlier, the MOTU 896'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 896's clock (via ADAT lightpipe or AES/EBU), 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 896, 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 896 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 896 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 896 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 896, 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 896 (and your audio software) to SMPTE time code, this requires a dedicated synchronizer, which continuously resolves the MOTU 896 to SMPTE time code, while simultaneously resolving your audio software to MIDI Time Code. When the MOTU 896 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 896 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 896 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 896 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 896 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 896 is continuously resolved, audio playback will never drift with respect to time code.

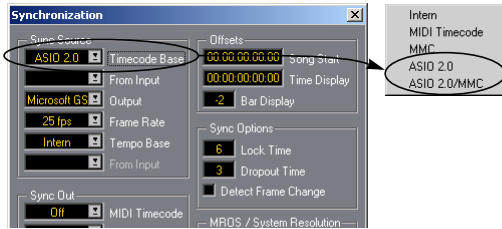


Figure 4-9: Cubase VST 5 and other ASIO 2.0-compatible programs support sample-accurate transfers with ADATs.

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 896 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 896 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 896 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 896, 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).

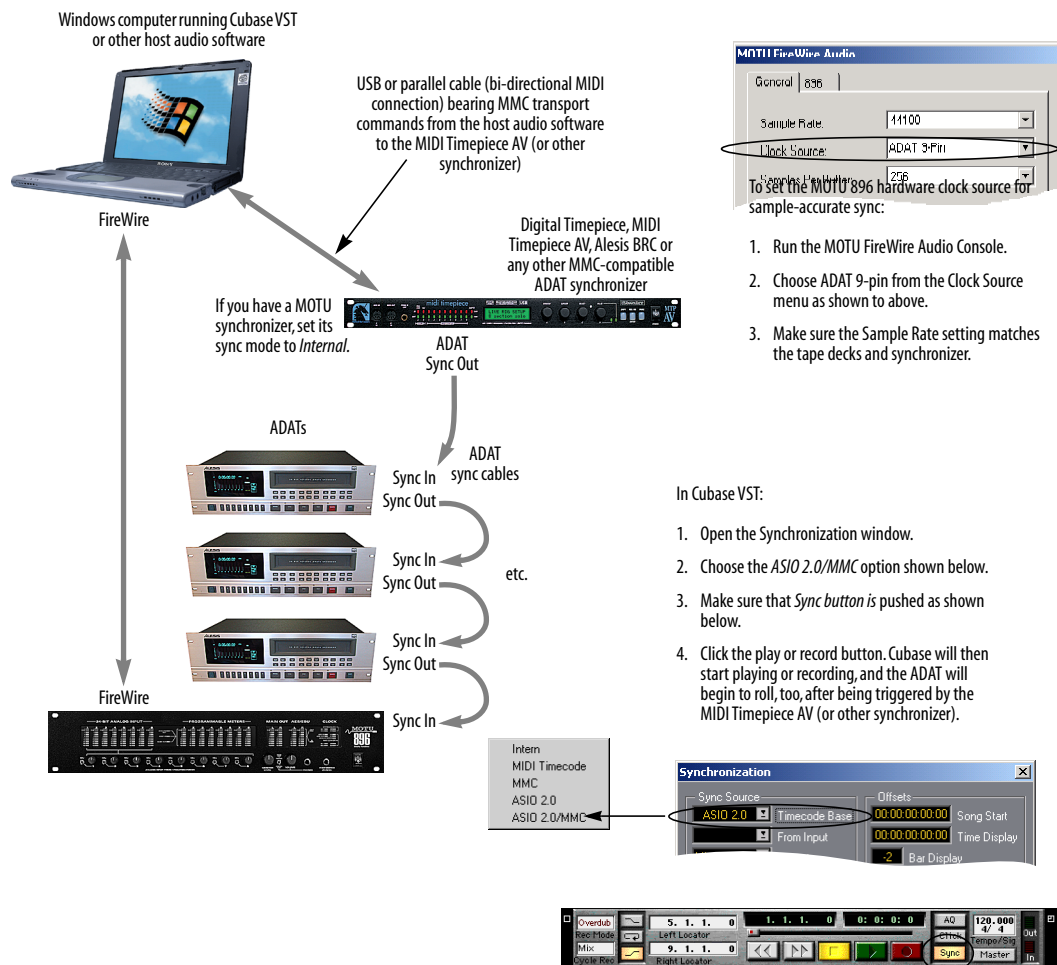


Figure 4-10: Connections for sample-accurate sync between one or more ADATs and the MOTU 896.

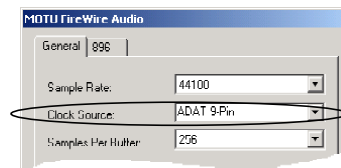
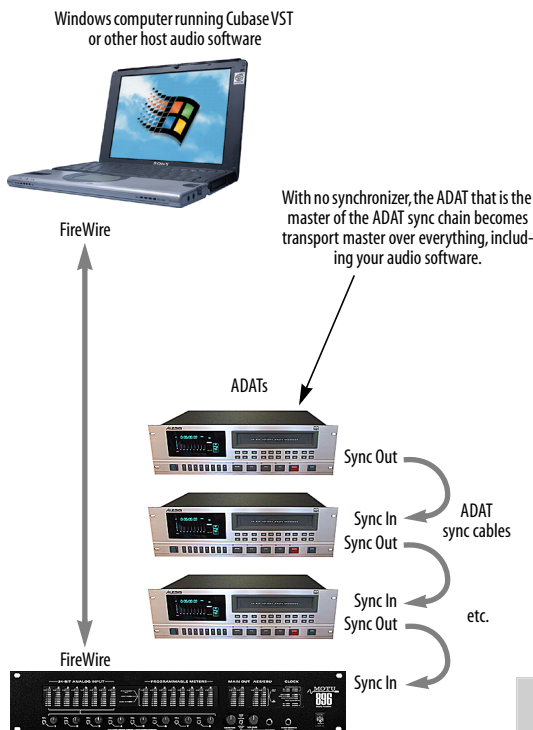
ADAT SYNC WITH NO SYNCHRONIZER

Even if you don't have an ADAT synchronizer, you can achieve sample-accurate sync between ADATs, the MOTU 896, and any sample-accurate software. Just connect the MOTU 896 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 896, 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 896 hardware clock source for sample-accurate sync:

4. Run the MOTU FireWire Audio 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.

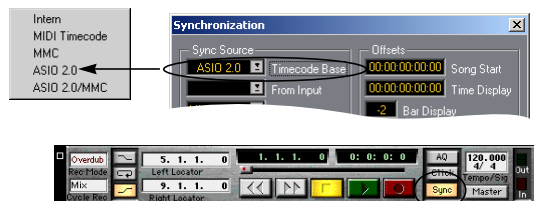


Figure 4-10: Sample-accurate sync without an ADAT synchronizer.

SYNC TO SMPTE, WORD CLOCK, VIDEO

To synchronize (continuously resolve) the MOTU 896 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 word clock. The synchronizer resolves continuously to the chosen time base, and the MOTU 896 slaves to the synchronizer via word clock. 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 ± 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)

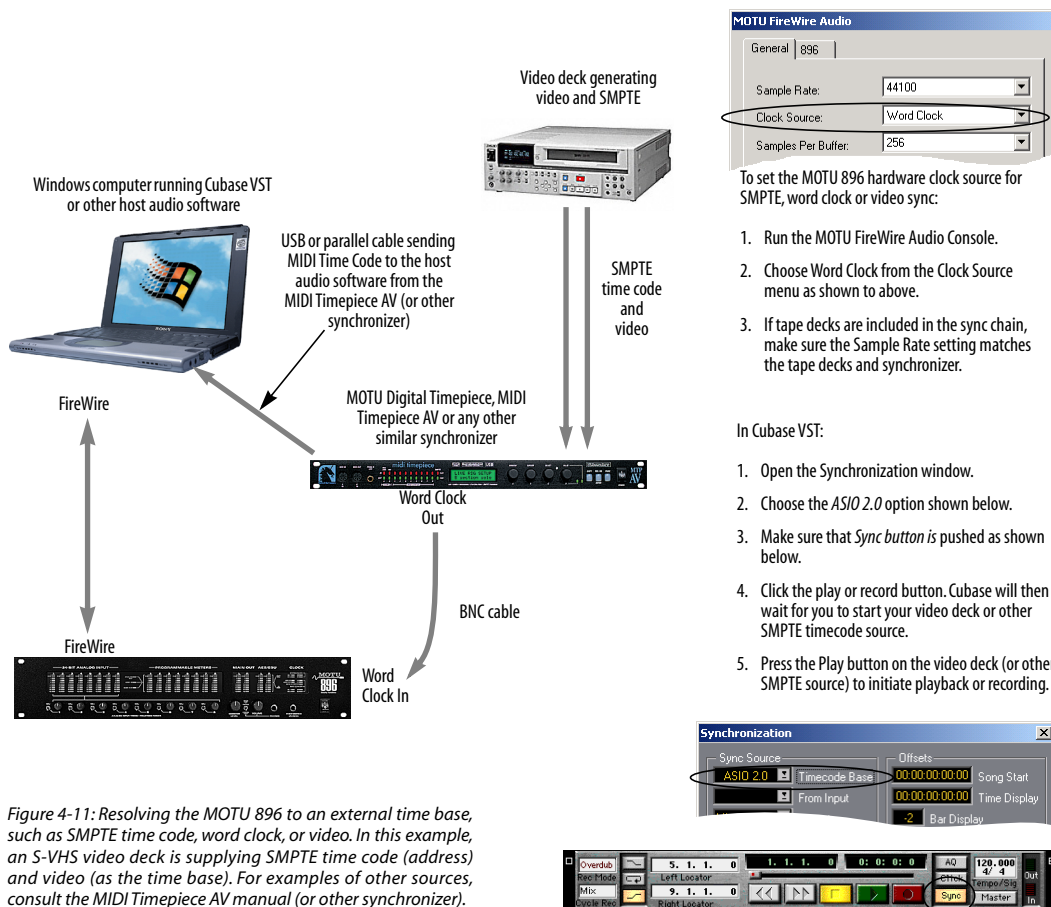


Figure 4-11: Resolving the MOTU 896 to an external time base, such as SMPTE time code, word clock, or video. In this example, an S-VHS video deck is supplying SMPTE time code (address) and video (as the time base). For examples of other sources, consult the MIDI Timepiece AV manual (or other synchronizer).

SYNCING OPTICAL DEVICES

The word *optical* is our short-hand way of referring to any device that connects to the MOTU 896 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 896 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 896. There are three ways to do this:

- Slave the optical device to the MOTU 896
- Slave the MOTU 896 to the optical device
- Slave both the optical device and the MOTU 896 to a third master clock (such as a Digital Timepiece or MIDI Timepiece AV synchronizer)

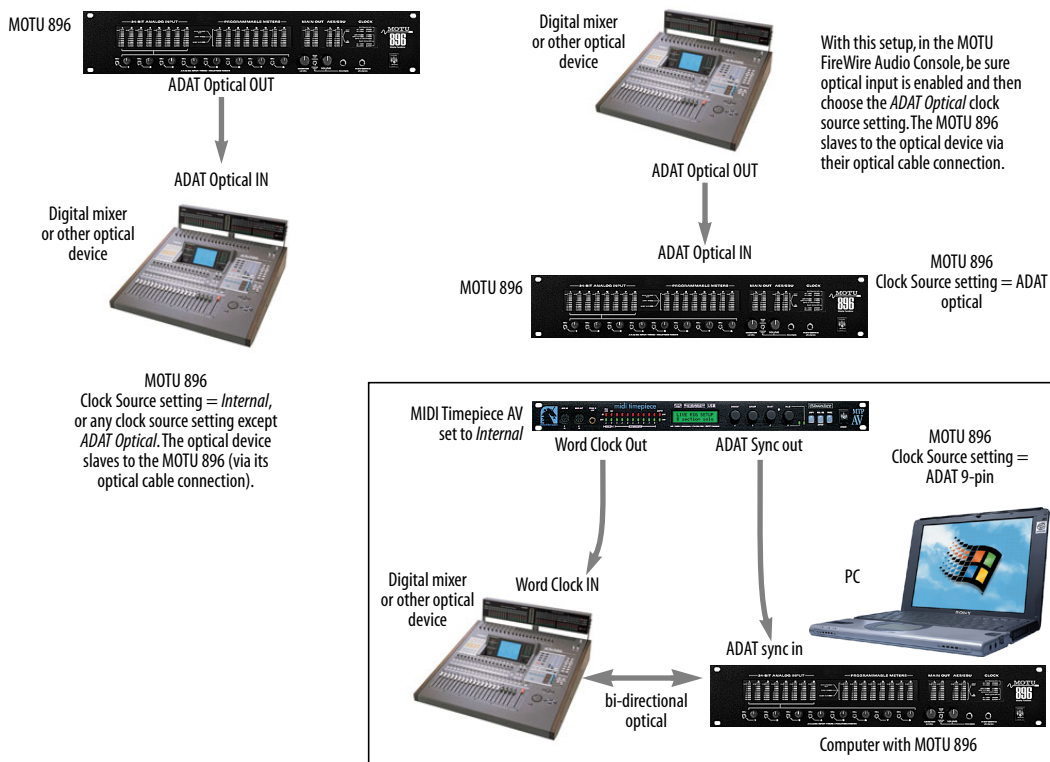


Figure 4-12: Three setups for synchronizing an optical device with the MOTU 896. You can slave the optical device to the MOTU 896 or vice versa with their optical connections. For more elaborate setups, you can slave both to a digital audio synchronizer like the Digital Timepiece. Don't use any of these setups for an ADAT or other optical device that records. Instead, see "Sample-accurate sync with ADATs" on page 24.

SYNCING AES/EBU DEVICES

If you would like to transfer stereo audio digitally between the 896 and another device that has AES/EBU I/O, connect it to the 896's AES/EBU jacks with balanced, AES/EBU grade audio cables.

AES/EBU clock and sample rate conversion

The 896 AES/EBU section is equipped with a real-time sample rate converter that can be used for either input or output. This feature provides a great deal of flexibility in making digital transfers. For example, you can:

- Transfer digital audio into the 896 at a sample rate that is completely different than the 896 system clock rate.

- Transfer digital audio into the 896 without the need for any external synchronization arrangements.

- Transfer digital audio out of the 896 at double or half the 896 system clock rate.

Rate conversion does not add any appreciable noise to the audio signal (under -120 dB).

Digital audio phase lock

Without sample rate conversion, when you transfer digital audio between two devices, their audio clocks must be in phase with one another — or *phase-locked* — as demonstrated below in Figure 4-14. Otherwise, you'll hear clicks, pops, and distortion in the audio, or perhaps no audio at all.

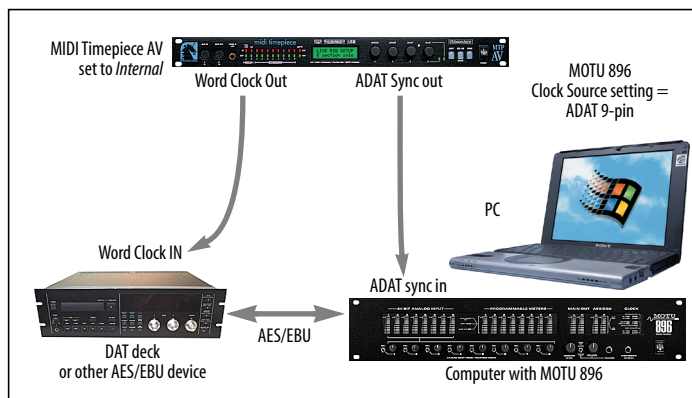
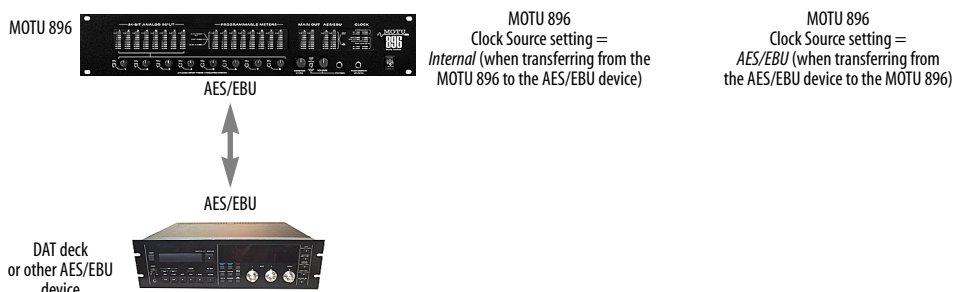


Figure 4-13: Two setups for synchronizing an AES/EBU device with the MOTU 896. In the top diagram, sync is achieved via the AES/EBU connection itself. In this case, you have to choose AES/EBU as the MOTU 896's clock source when recording from the AES/EBU device. If you don't want to have to worry about switching the Clock Source setting depending on the direction of the AES/EBU transfer, you can slave the AES/EBU device to word clock from the MOTU 896 or vice versa (not shown). The Word Clock connection maintains sync, regardless of the direction of the transfer.

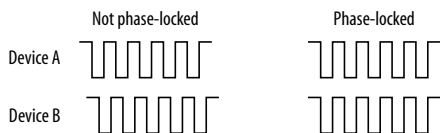


Figure 4-14: When transferring audio without sample rate conversion, two devices must have phase-locked audio clocks to prevent clicks, pops or other artifacts.

Without sample rate conversion, 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.

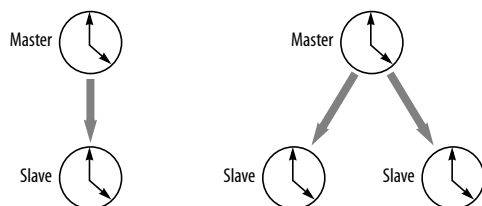


Figure 4-15: Without sample rate conversion, you need to choose a clock master to which all other devices slave. Each slaved device remains continuously resolved to the master, meaning that there will be no drift over time.

Audio phase lock as shown above in Figure 4-15 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.

Another benefit of direct master/slave clocking (without sample rate conversion) is that each slaved device remains continuously resolved to the master, which means that there will be no gradual drift over time. This form of synchronization is best for audio that needs to remain resolved to film, video, etc.

Sample rate conversion

With sample rate conversion (SRC), an extra level of master/slave clocking is added to the equation, as demonstrated below in Figure 4-16, which shows the clocking going on when you transfer digital audio from the 896 (AES/EBU OUT) to a

DAT deck (AES/EBU IN) using SRC. Notice that with SRC, the DAT deck is not slaved to the 896's system clock. Instead, their clocks are running completely independently of one another. But also notice that the DAT deck must still slave to the sample-rate-converted output from the 896 for a clean digital audio transfer (unless it has its own rate converter on its AES/EBU input).

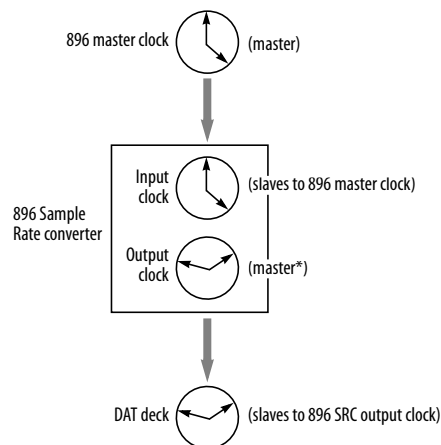


Figure 4-16: Clock relationships when sending audio from the 896 to a DAT deck using sample rate conversion. The DAT deck needs to be slaving to its AES/EBU input. *Note: the 896 AES/EBU output can actually be clocked from a number of different sources. In this example, it is resolved to the 896 system clock. For details about other possible clock sources, see "Clocking scenarios for AES/EBU output" on page 30.

System clock, AES clock & rate convert settings

When you are setting up AES/EBU input and output with the 896, pay careful attention to the following settings in the MOTU FireWire Audio Console (see the quick reference overview on page 7):

- Clock source
- Sample rate conversion

These options are mentioned briefly in the following sections. For further details, see "Clock Source" on page 36 and "Sample Rate Conversion" on page 39.

Clocking scenarios for AES/EBU input

There are three possible clocking scenarios for the 896 AES/EBU input:

- 1. Simple transfer (slave the 896 system clock to the AES/EBU input signal — no sample rate conversion).
- 2. Sample rate convert the AES/EBU input.
- 3. Use word clock to resolve the 896 system clock and the other AES/EBU device with each other.

These three AES/EBU input scenarios are summarized below.

	Scenario 1	Scenario 2	Scenario 3
Description	Simple transfer	Rate convert	Use word clock
896 clock source setting	AES/EBU	Any setting except AES/EBU	Word Clock
Sample rate conversion setting	None	AES In	None
Required 896 cable connections	AES/EBU In	AES In	AES/EBU In and Word Clock In
Are the devices continuously resolved?	Yes	No	Yes
Is the signal being sample rate converted?	No	Yes	No
Example application	Simple digital transfer into the 896 from DAT deck or digital mixer.	Transfer from digital mixer running at a different sample rate.	Both the 896 and other AES/EBU device are slaved to 'house' word clock.

Some example scenarios are demonstrated below.

Simple AES/EBU input transfer (no rate convert)

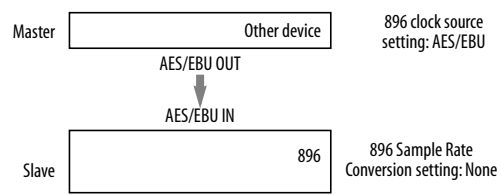


Figure 4-17: Slaving the 896 to an AES/EBU device. For the 896's clock source, choose 'AES/EBU'.

AES/EBU input with rate conversion

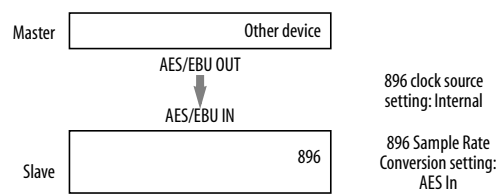


Figure 4-18: Rate-converting AES/EBU input.

AES/EBU input with word clock

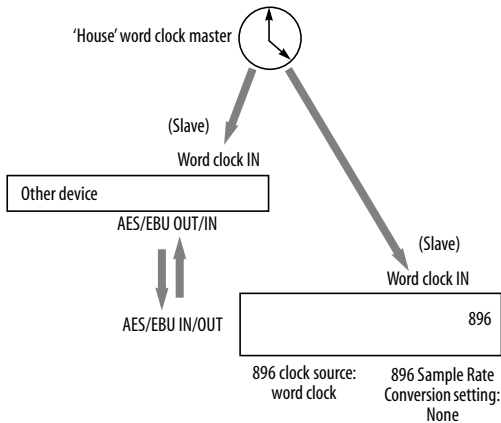


Figure 4-19: In this scenario, the 896 and other AES/EBU device are both resolved to one another via a third master word clock source.

Clocking scenarios for AES/EBU output

The 896 AES/EBU output can also employ sample rate conversion. The output options, shown below in Figure 4-20, are briefly summarized in the following sections. For further details, see "Sample Rate Conversion" on page 39.

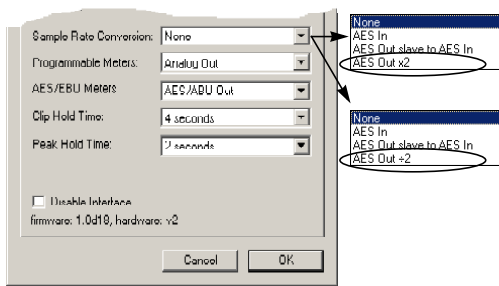


Figure 4-20: The Sample Rate Conversion option in the MOTU FireWire Audio Console gives you access the AES/EBU output clock options. The last option is either “x2” or “÷2” depending on the system sample rate.

None

To make the AES/EBU output sample rate match the System sample rate, choose *None*. No sample rate conversion occurs when this setting is chosen.

AES Out slave to AES in

To make the AES/EBU output sample rate match the sample rate currently being received by the 896’s AES/EBU input, choose *AES Input*. This setting requires a connection to the 896’s AES/EBU input from a device that is transmitting an AES/EBU clock signal.

☞ Be careful when both the 896’s AES/EBU input and output are connected to the same external device: this option is likely to create a clock loop.

☞ When you are using the AES/EBU input as a clock source for sample rate conversion on the AES/EBU output, you cannot use the AES/EBU input for audio input.

AES Out x 2 / AES Out ÷ 2

Choose one of these sample rates when the desired AES/EBU output rate needs to be twice the 896 system clock rate (when the system clock is at either 44.1 or 48 kHz) or half the system clock rate (when the system clock is at 88.2 or 96 kHz). For further details about this option, see “Sample Rate Conversion” on page 39.

SYNCING TO WORD CLOCK

The 896 Word Clock input and output connectors allow you to synchronize the 896 with other devices via standard word clock connections.

Do you need word clock?

If you will be using only the 896’s analog inputs and outputs, and you have no plans to synchronize your 896 system to SMPTE time code, you don’t need word clock.

Situations that require word clock sync

If either of the following situations are true, you’ll need to use the 896’s word clock sync features:

- You need to resolve the 896 with other digital audio devices so that they share a common timebase.
- You need to synchronize the 896 system to SMPTE time code, such as from a video deck or an analog multi-track tape recorder, as explained earlier in “Sync to SMPTE, word clock, video” on page 26.

Choose a digital audio clock master

In either of the above cases, you need to choose an audio clock master (as explained in Figure 4-15 on page 29). In the simplest case, you have two devices and one is the word clock master and the other is the slave as shown below in Figure 4-21 and Figure 4-22.

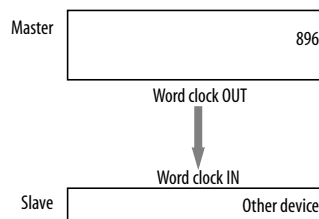


Figure 4-21: Slaving another digital audio device to the 896. For the 896’s clock source, choose any source.

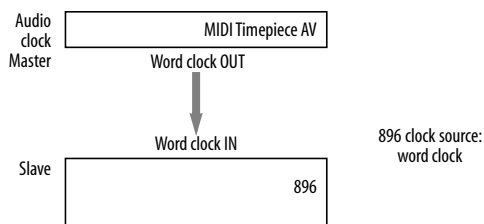


Figure 4-22: To slave the 896 to SMPTE time code, use a dedicated synchronizer such as a MOTU MIDI Timepiece AV or Digital Timepiece. For the 896's clock source, choose 'Word clock'. You could also use ADAT SYNC from the MTP AV connected to the ADAT SYNC IN port on the 896.

Don't chain word clock

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

Slaving to 2x and 1/2x word clock

The 896 has the ability to slave to a word clock signal running at half the 896's current system clock. For example, the 896 could be running at 96 kHz while slaving to a 48 kHz word clock signal from a MOTU Digital Timepiece. Conversely, the 896 could run at 48 kHz and slave to 96 kHz word clock.

Remember, the word clock signal must be one of the following:

- The same as the 896 system clock

- Half the 896 system clock
- Twice the 896 system clock

For example, if the 896 is running at 96 kHz, it cannot slave to word clock running at 44.1 kHz.

The 896 offers several audio sync formats

Remember, you have several ways to slave an 896 to a synchronizer like the Digital Timepiece. You can use word clock (connected to the 896 itself), ADAT SYNC (connected to the PCI-324 card) or Digital Timepiece Control Track (connected to the PCI-324 card). These latter two connections free up the Digital Timepiece's word clock output for another device that only supports word clock.

SYNCING LARGE SYSTEMS

If you are connecting the MOTU 896 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™ II video-to-word clock converter. Products like this offer multiple word clock outputs and an extremely low-jitter clock.

CONNECTING MULTIPLE MOTU 896 INTERFACES

You can daisy-chain up to four MOTU 896 interfaces on a single FireWire bus, with the restrictions described in the following sections. Most computers have only one built-in FireWire bus (even if it supplies multiple FireWire sockets). Connect them as follows:

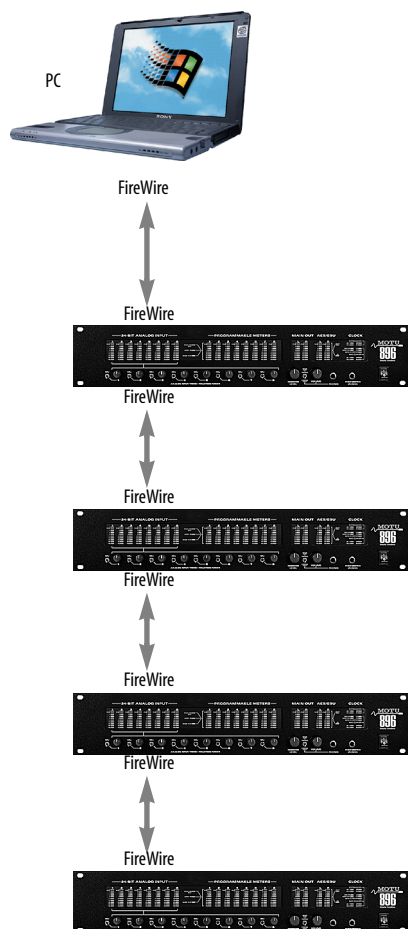


Figure 4-23: Connecting multiple 896's to a computer.

Multiple 896s in the MOTU FireWire Audio Console

The MOTU FireWire Audio Console displays the settings for one 1296 I/O at a time. To choose which I/O you are looking at, click the appropriate tabs shown below in Figure 4-24.

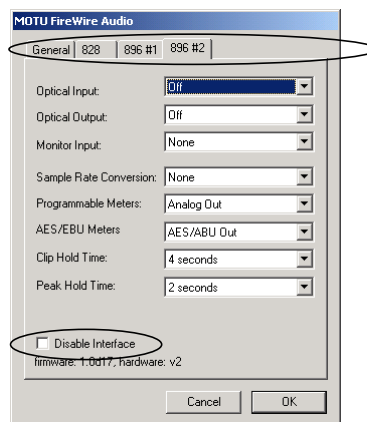


Figure 4-24: Choosing which 896 you are working with in the MOTU FireWire Audio Console.

Synchronizing multiple 896s

The entire 896 system gets its clock from whatever you choose from the *Clock Source* menu in the MOTU FireWire Audio Console. When you connect multiple 896 I/Os or other MOTU FireWire interfaces, all of their respective sync sources are displayed in the menu as shown below in Figure 4-25.

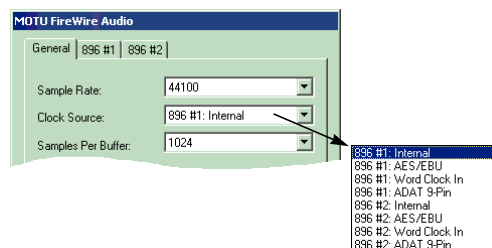


Figure 4-25: The entire 896 system gets its clock from a single master sync source on any connected 896 (or other MOTU FireWire interface). After you choose a source from this menu, the entire system, including all connected 896s, synchronizes to it.

Word clock connections are not necessary

Each 896 in the system gets its clock from the Audio Wire cable connection (unless it is the master clock itself). There is no need to make word clock connections between multiple 896 I/Os.

Connecting a MOTU 828

You can add a MOTU 828 to the end of a MOTU 896 FireWire daisy chain (because the 828 has only one FireWire port), or you can mix and match multiple 896's and 828's using a standard FireWire hub. Up to four interfaces can be combined on one FireWire bus.

Operating multiple 896 interfaces at high sample rates

Four MOTU 896 interfaces (or mixed and matched 896 and 828 interfaces) can operate at 44.1 kHz or 48 kHz on a single FireWire bus. When operating 896 interfaces at a high sample rate (88.2 or 96 kHz), ADAT optical becomes disabled (because it does not support these sample rates). As a result, the 896 carries 10 channels of audio (8 analog and 2 AES/EBU). At a sample rate of 88.2 kHz allows you to run up to three 896s (with 10 channels each). At 96 kHz, you can operate no more than two 896s on a single FireWire bus.

Adding additional interfaces with a second FireWire bus

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

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

Managing the IDs of multiple interfaces

As shown in Figure 4-24 on page 33, multiple MOTU 896 interfaces are identified by number (#1, #2, #3, etc.) Interfaces are ID'd (given a number) by the order in which they are first powered up after being connected. This information is stored in the MOTU FireWire Audio preferences file. Once ID'd, they retain the same number regardless of the order in which they are powered up. You can disable an interface at any time with the *Disable interface* option shown in Figure 4-24 on page 33. Doing so frees up the FireWire bandwidth required by the interface without turning it off. Switching off an interface accomplishes the same thing. To get the MOTU FireWire Audio Console to forget about an interface entirely, you'll see a *Forget* button in the MOTU FireWire Audio Console. Just click the *Forget* button and the MOTU FireWire Audio Console will no longer consider the interface to be present but off line (turned off).

CHAPTER 5 MOTU FireWire Audio Console

OVERVIEW

The MOTU FireWire Audio Console provides access to all MOTU 896 settings.

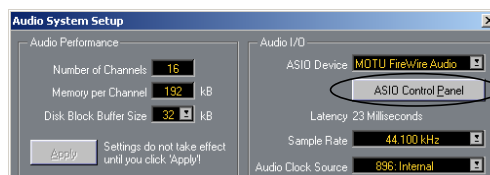
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ACCESSING THE MOTU 896 SETTINGS

There are several ways to access the MOTU FireWire Audio Console settings:

- From the Windows Start menu, choose *Programs>MOTU>MOTU FireWire Audio 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 44.



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

It doesn't matter which way you access the MOTU

MOTU 896 SETTINGS

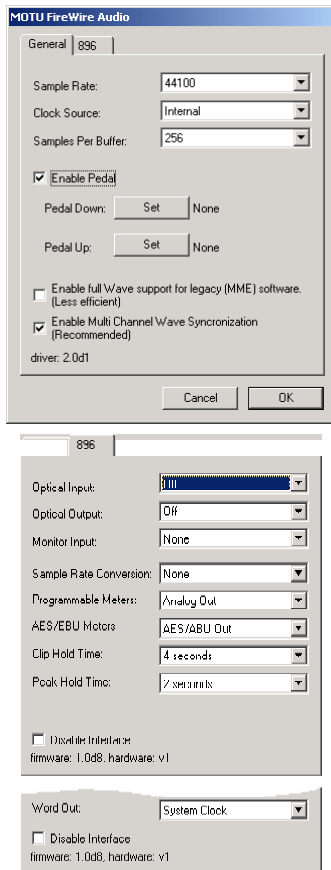


Figure 5-1: The MOTU FireWire Audio Console gives you access to all of the settings in the MOTU 896 hardware.

General tab settings

The General tab provides settings that apply globally to all connected MOTU 896 interfaces (and other MOTU FireWire audio interfaces).

896 tab settings

The 896 tab provides settings that apply to a specific 896 interface. If you have several 896's (or other MOTU FireWire audio interfaces) connected, you'll see a separate tab for each one.

Sample Rate

Choose the desired *Sample Rate* for recording and playback. The MOTU 896 can operate at 44.1 KHz (the standard rate for compact disc audio), 48 KHz, 88.2 kHz or 96 kHz.

⚠ 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 FireWire Audio Console.

Clock Source

The *Clock Source* determines the digital audio clock that the MOTU 896 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 896 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 896 system on its internal clock, and then slave the DAT deck to the MOTU 896 via the AES/EBU connection (usually DAT decks slave to their AES/EBU input when you choose the AES/EBU 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 896 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 896 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 896 with one or more ADATs. Make sure the MOTU 896 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.

You could also use ADAT sync to continuously resolve the MOTU 896 to SMPTE time code, video, and word clock via a synchronizer like the MOTU MIDI Timepiece AV. Word clock can accomplish the same thing.

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 896’s optical input, when it is connected to an ADAT optical device. This setting can be used to slave the MOTU 896 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 896 or an external synchronizer such as the Digital Timepiece. In this case, the *ADAT Optical* clock source setting lets you slave the MOTU 896 to the device itself via its digital input to the MOTU 896.

If the *ADAT Optical* setting does not appear in the menu, it means that the MOTU 896’s optical input is currently turned off. If so, choose the *ADAT* format from the Optical input menu (Figure 5-1 on page 36).

This setting is also useful if you just need to make a simple, click-free digital transfer between the MOTU 896 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.

AES/EBU

The *AES/EBU* clock source setting refers to the AES/EBU input connector on the MOTU 896. This setting allows the MOTU 896 to slave to another AES/EBU device.

Use this setting whenever you are recording input from a DAT deck or other AES/EBU device into the MOTU 896. It is not necessary in the opposite direction (when you are transferring from the MOTU 896 to the DAT machine).

For further details about this setting, see “Syncing AES/EBU devices” on page 28.

Word Clock In

Choose this setting to slave the MOTU 896 to an external word clock source. For details, see “Syncing to word clock” on page 31.

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 896.

The *Samples Per Buffer* setting lets you control the size of these buffers in the MOTU FireWire Audio 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 896 and your audio software. (See “Monitoring live input” on page 41 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).

At a sample rate of 44.1 kHz, 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 896’s CueMix™ Plus no-latency monitoring feature completely eliminates monitoring latency. For further information, see “Monitoring live input” on page 41.

Enable Pedal

Check the Enable Pedal option if a foot switch is connected to the MOTU 896 and you would like to trigger recording punch in/out (or other software functions) with it. Use the Set buttons to determine what keystroke is trigger by the pedal-up and pedal-down positions. You can assign the pedal to any two keystrokes you wish. (You are not restricted to punch in/out.)

Enable full 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 896 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 896 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.

Enable multichannel wave synchronization

This option should be left on. There are only a few rare cases in which you would want to turn it off. For details, consult the on-line tech support database at www.motu.com.

Optical input/output

The *Optical input* and *Optical output* settings let you choose between ADAT ('lightpipe') or OFF. Turning it off frees up FireWire bandwidth. In other words, it opens up resources on the FireWire bus for other devices connected via FireWire.

Monitor input — CueMix™ Plus

The *Monitor input* settings enables the MOTU 896 CueMix™ Plus feature (Figure 5-4 on page 41), which lets you route an analog or AES/EBU input or input pair directly to the MOTU 896 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 Level* knob on the MOTU 896

front panel. For information about other ways to handle input monitoring, see "Monitoring live input" on page 41.

Sample Rate Conversion

This option lets you control AES/EBU sample rate conversion. Each option is explained below.

None

No sample rate conversion occurs. Both the AES/EBU input and output match the sample rate of the 896's system clock.

AES In

The AES/EBU input locks to the sample rate of the input signal (whatever it happens to be) and converts it to the 896 system clock rate. The Rate Conversion LEDs on the 896 front panel indicate the incoming sample rate and that rate conversion is occurring.

AES Out slave to AES in

To make the AES/EBU output sample rate match the sample rate currently being received by the 896's AES/EBU input, choose *AES Input*. This setting requires a connection to the 896's AES/EBU input from a device that is transmitting an AES/EBU clock signal.

☛ Be careful when both the 896's AES/EBU input and output are connected to the same external device: this option is likely to create a clock loop.

☛ When you are using the AES/EBU input as a clock source for sample rate conversion on the AES/EBU output, you cannot use the AES/EBU input for audio input.

AES Out x 2 / AES Out ÷ 2

Choose one of these sample rates when the desired AES/EBU output rate needs to be twice the 896 system clock rate (when the system clock is at either 44.1 or 48 kHz) or half the system clock rate (when the system clock is at 88.2 or 96 kHz). Either way, the AES/EBU output remains resolved to the

896 system clock. For further details about this option, see “Syncing AES/EBU devices” on page 28.

Programmable Meters

This option lets you choose which bank you wish to monitor with the eight programmable meters on the MOTU 896 front panel. Your choices are: Analog Out, ADAT In or ADAT Out.

AES/EBU Meters

This option lets you choose to monitor either AES/EBU input or output with the programmable AES/EBU meters on the MOTU 896 front panel.

Clip Hold Time

The *Clip Hold Time* option controls how long the top red LED remains illuminated after clipping occurs (see Figure 5-2 below).

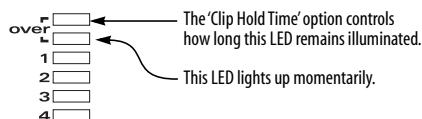


Figure 5-2: The Clip Hold Time option.

Peak Hold Time

The 896 front-panel level meters support standard peak/hold metering, where the LED for the highest level recently measured on the channel remains illuminated for a brief period of time while the rest of the LEDs below it remain fully dynamic. The *Peak Hold Time* controls how long the peak-hold LED remain illuminated before going dark again.

Disable Interface option

Check this option to temporarily take an interface off line. Doing so frees up FireWire bandwidth for other devices without turning off the disabled 896.

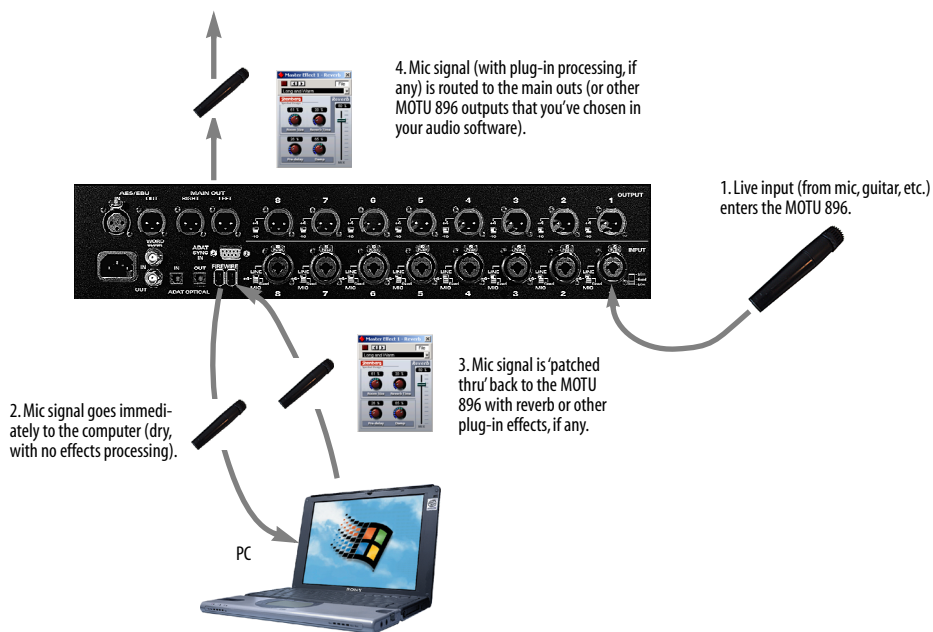


Figure 5-3: There are two ways to monitor live audio inputs with the MOTU 896: 1) through the computer or 2) via CueMix™ Plus hardware monitoring. This diagram shows method 1 (through the computer). When using this method, use the MOTU 896's 'Samples Per Buffer' setting to reduce the slight delay you hear when monitoring the live input, but don't lower it too much, or your computer will act sluggish.

Word Out

If you are running a MOTU 896 interface at a high sample rate (96 or 88.2), this option appears at the bottom of the interface settings. It lets you choose a word clock output rate that either matches the global sample rate (e.g. 96 kHz) or halves the global rate (e.g. 48 kHz instead of 96 kHz).

MONITORING LIVE INPUT

There are two ways to monitor live audio input with the MOTU 896: 1) through the computer or 2) via CueMix™ Plus hardware monitoring. Figure 5-3 on page 40 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 38 for details about how to reduce — and possibly eliminate — the audible monitoring delay that the computer introduces.

Figure 5-4 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 39.

If the material you are recording is suitable, there is a third way to monitor live input: use both methods (Figure 5-3 and Figure 5-4) 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.

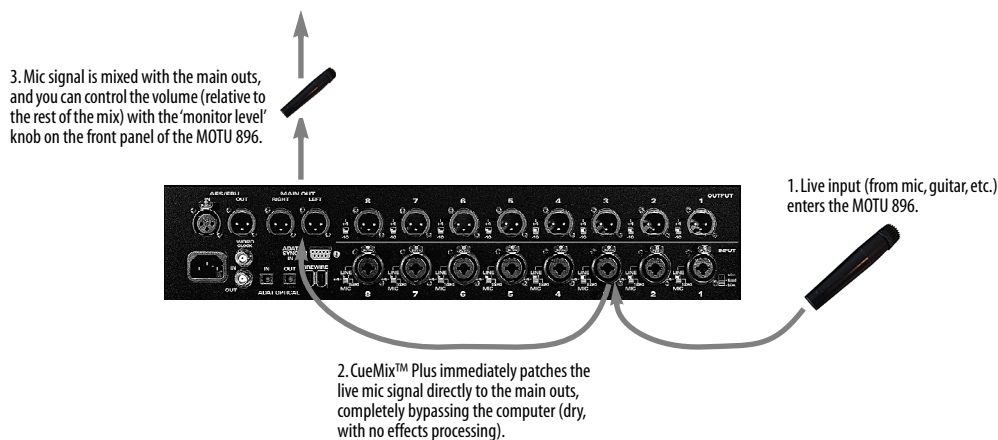


Figure 5-4: This diagram shows the signal flow when using CueMix™ Plus no-latency monitoring. Notice that this method does not allow you to process the live input with plug-ins in your audio software while it is being monitored. You can, however, add effects later — after recording the live input as 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 896 includes an ASIO driver that provides multi-channel I/O with any ASIO-compatible audio software.

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WHAT IS ASIO?

ASIO is an acronym for *Audio Streaming Input and Output*. The ASIO MOTU FireWire Audio driver allows the MOTU 896 to provide multi-channel audio input and output for any audio application that supports ASIO drivers.

Sample-accurate sync

The MOTU FireWire Audio ASIO driver supports sample-accurate sync (via the MOTU 896'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 FIREWIRE AUDIO CONSOLE

Before you run your audio software, launch the MOTU FireWire Audio Console to configure your MOTU 896 hardware. The MOTU FireWire Audio 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 FireWire Audio Console” (page 35).

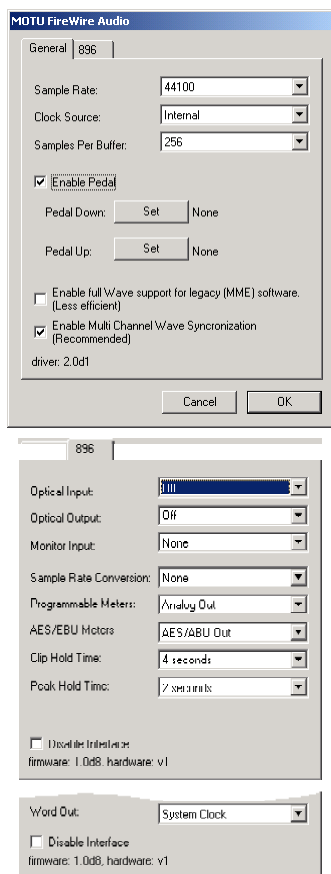


Figure 6-1: The MOTU FireWire Console gives you access to all of the settings in the MOTU 896 hardware, including the clock source, optical I/O enable/disable and CueMix™ Plus monitor input(s).

ENABLE THE MOTU FIREWIRE AUDIO 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 FireWire Audio driver. Check the audio system or audio hardware configuration window in your software. There will be a menu there that lets you choose among various ASIO drivers that may be in your system. Choose the MOTU 896 from this menu.

Enabling the MOTU FireWire Audio ASIO driver in Cubase

To activate the MOTU FireWire Audio ASIO driver in Cubase:

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

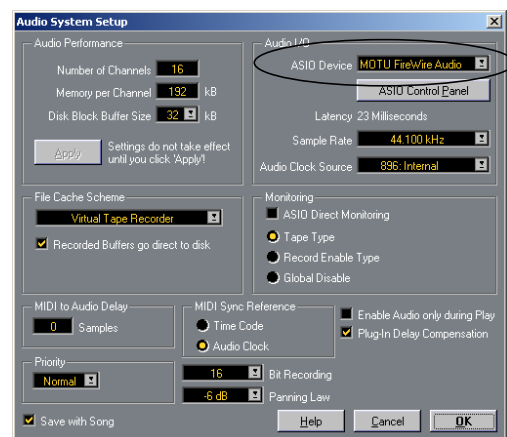


Figure 6-2: Activating the MOTU FireWire Audio ASIO driver in Cubase. The Audio Clock Source setting shown here is for the MOTU 896. You can also choose the clock source in the MOTU FireWire Audio Console.

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 896:

- 8 channels for analog I/O
- 2 channels for AES/EBU
- Zero or 8 channels for optical, depending on whether you have optical turned off or on

For example, if you are using analog only, you only need 8 channels. If you are using analog and AES/EBU, you need 10 channels.

As another example, if you are using analog, AES/EBU and ADAT optical, you need 18 channels (the maximum number of simultaneous channels provided by the MOTU 896).

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

WORKING WITH MOTU 896 INPUTS AND OUTPUTS

Once you've enabled the MOTU FireWire Audio ASIO driver in your host audio software, MOTU 896 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 FireWire Audio 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 896 inputs/outputs in Cubase

Once you've chosen the MOTU FireWire Audio ASIO driver in the Audio System dialog, choose *Audio Inputs* from the Audio menu to see the MOTU 896 inputs. To activate them, click the *Active* light next to each input. Once you've activated the MOTU 896 inputs, you can then assign them to Cubase audio channels in the Monitor window in the usual fashion. MOTU 896 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 896 outputs to busses. You can then assign channels in the Monitor window to each bus as desired.

TRIMMING THE ANALOG INPUTS

The MOTU 896 analog inputs provide trim knobs on the front panel. Use the level meters on the 896's front panel to calibrate these inputs before recording. As you feed signal to the MOTU 896 analog input, adjust the input's corresponding trim knob on the front panel until peaks are as high as possible without clipping (hitting zero dB).

USING A FOOT SWITCH

Use a foot switch connected to the MOTU 896 to trigger recording punch-in and punch-out, or any other feature in your host audio software that is assigned to a computer keystroke.

CHANGING MOTU 896 SETTINGS

You can change the MOTU 896 settings at any time by accessing the MOTU FireWire Audio Console. (See "Accessing the MOTU 896 settings" on page 35.)

REDUCING DELAY WHEN MONITORING LIVE INPUTS

If you have live audio inputs connected to the MOTU 896, 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 896 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 41.

AUDIO CLOCK SOURCE

If you have devices connected to the MOTU 896 digital inputs (optical or AES/EBU), or if you need to synchronize MOTU 896 digital audio and your host audio software to an external sync source, be sure the MOTU 896 clock source is set properly. For complete information, see “Making sync connections” on page 21 and “Clock Source” on page 36.

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 896.

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 896 to the other components of your system.

Synchronizing digital audio connections

If you have devices connected to the MOTU 896 digital inputs (optical or AES/EBU), you need to be concerned with the synchronization of the MOTU 896’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 896 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 896, 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 896 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 896 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 FireWire Audio Console is set to *Word Clock In*. 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 896 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:

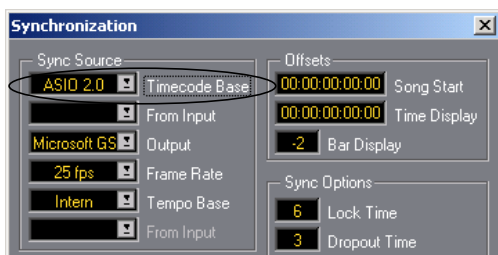


Figure 6-4: Setting up sample-accurate sync via ASIO 2.

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 46 for details on how to set this up.

24-BIT OPERATION

Your MOTU 896 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 896 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 896 hardware.

Windows Multimedia-compatible Audio Software

OVERVIEW

The MOTU FireWire Audio WDM driver provides standard multi-channel input and output for audio software running under Windows 2000, Windows Me or Windows XP.

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WDM AND WAVE DRIVER COMPATIBILITY

WDM is an acronym for *Windows Driver Model*. The MOTU FireWire Audio WDM driver allows the MOTU 896 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 FIREWIRE AUDIO WDM DRIVER

The MOTU 896 installer CD-ROM installs the MOTU FireWire Audio WDM driver into Windows for you. That's pretty much all the preparation you need. See chapter 3, "IMPORTANT! Run the MOTU 896 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 FireWire Audio WDM driver so that all of the MOTU 896's inputs and outputs show up in your software. For details, see "Enable full Wave support for legacy (MME) software" on page 38.

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

MAKING SETTINGS IN THE MOTU FIREWIRE AUDIO CONSOLE

Before you run your audio software, launch the MOTU FireWire Audio Console to configure your MOTU 896 hardware. The MOTU FireWire Audio 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 FireWire Audio Console" (page 35).

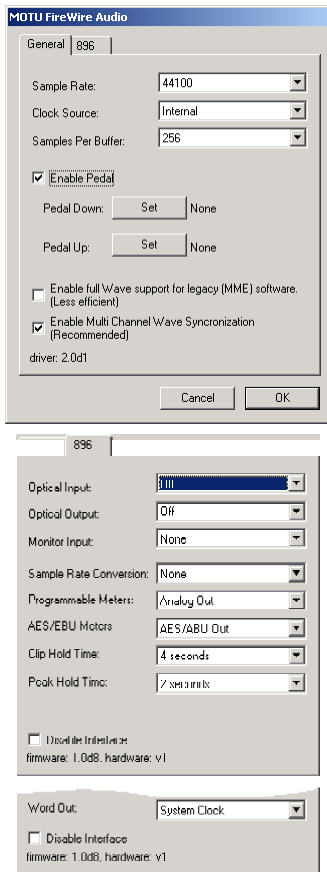


Figure 7-1: The MOTU FireWire Audio Console gives you access to all of the settings in the MOTU 896 hardware, including the clock source, optical I/O enable/disable and CueMix™ Plus monitor input(s).

ENABLING THE MOTU FIREWIRE AUDIO 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 FireWire Audio WDM driver. Check the audio system or audio hardware configuration window in your software.

Enabling the MOTU FireWire Audio WDM driver in SONAR

To activate the MOTU FireWire Audio WDM driver in SONAR:

- 1 Choose *Audio Options* from the Options menu.

- 2 Click the *Drivers* tab.

- 3 Highlight the MOTU 896 inputs and outputs that you wish to use and unhighlight the ones you don't as shown in Figure 7-2.

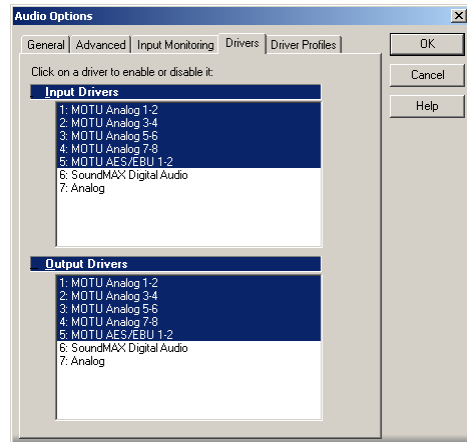


Figure 7-2: Activating the MOTU FireWire Audio driver in SONAR by highlighting inputs and outputs.

Other audio settings in SONAR

There are a few other settings in SONAR that impact MOTU 896 operation:

- 1 In the Audio Options window, click the *General* tab.
- 2 Choose a MOTU 896 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.

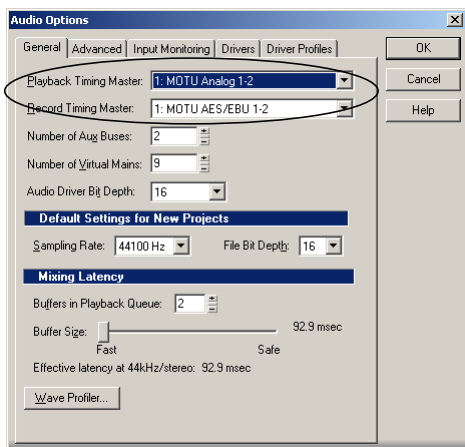


Figure 7-3: Make sure you have chosen a MOTU 896 input and output for the playback and recording timing master settings.

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.

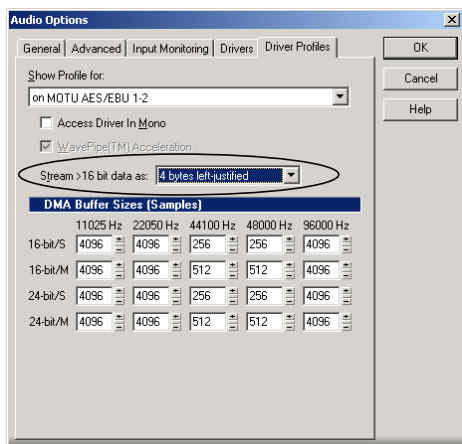


Figure 7-4: Setting the streaming option in Cakewalk's SONAR.

WORKING WITH MOTU 896 INPUTS AND OUTPUTS

Once you've enabled the MOTU FireWire Audio WDM driver in your host audio software, MOTU 896 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 FireWire Audio Console to make sure they are turned on. 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 896 analog inputs provide trim knobs on the front panel. Use the level meters on the front panel of the 896 to calibrate these inputs before recording. As you feed signal to the MOTU 896 analog input, adjust the input's corresponding trim knob on the front panel of the MOTU 896 until peaks are as high as possible without clipping (hitting zero dB).

CHANGING MOTU 896 SETTINGS

You can change the MOTU 896 settings at any time by accessing the MOTU FireWire Audio Console. (See "Accessing the MOTU 896 settings" on page 35.)

REDUCING DELAY WHEN MONITORING LIVE INPUTS

If you have live audio inputs connected to the MOTU 896, 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 896 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 41.

AUDIO CLOCK SOURCE

If you have devices connected to the MOTU 896 digital inputs (optical or AES/EBU), or if you need to synchronize MOTU 896 digital audio and your host audio software to an external sync source, be sure the MOTU 896 clock source is set properly. For complete information, see "Making sync connections" on page 21 and "Clock Source" on page 36.

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 896.

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 896 to the other components of your system.

Synchronizing digital audio connections

If you have devices connected to the MOTU 896 digital inputs (optical or AES/EBU), you need to be concerned with the synchronization of the MOTU 896’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 896 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 896, 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 896 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 896 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 FireWire Audio Console is set to *Word Clock In*. For examples of how to set this up, see “Sync to SMPTE, word clock, video” on page 26.

24-BIT OPERATION

Your MOTU 896 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 896 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 896 hardware.

CHAPTER 8 Performance Tips & Troubleshooting

CD player will not play through the MOTU 896

Playback from an audio CD on the PC requires a physical connection between the CD player and your sound card. The MOTU 896 does not have an internal CD connection.

Why does the start sound not play through the MOTU 896?

The MOTU 896 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 896 software and choose only to install the MOTU FireWire Audio ASIO driver, not the WDM Driver. Restart again.

'New hardware detected' window

If you connect your MOTU 896 before running the MOTU 896 Software Installer CD, Windows will prompt you that new hardware has been detected. Cancel this, and run the MOTU 896 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 896 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 896, 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 896 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 896 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 , "Making sync connections" (page 21) 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 896, 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 896 Clock Source to Internal and try recording just using the analog inputs and outputs of the MOTU 896. 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 896 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 896's hardware-based CueMix Plus monitoring feature. Please see "Monitor input — CueMix™ Plus" on page 39.

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 FireWire Audio Console.

Controlling monitoring latency

See "Monitoring live input" on page 41.

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 896 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 896 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 896 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 896 system. This is printed on a sticker placed on the bottom of the MOTU 896 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 FireWire Audio WDM Driver, MOTU FireWire Audio 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.

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