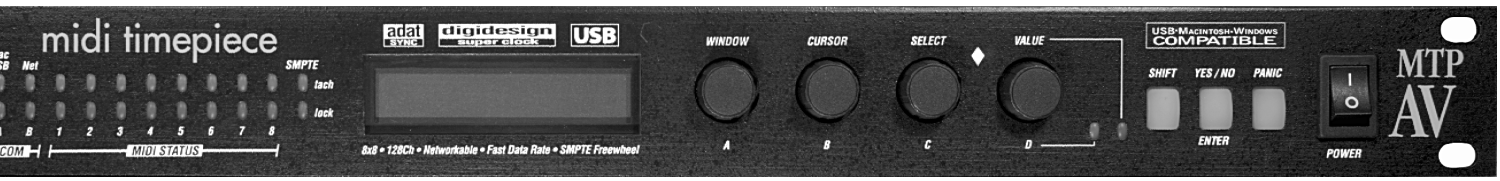
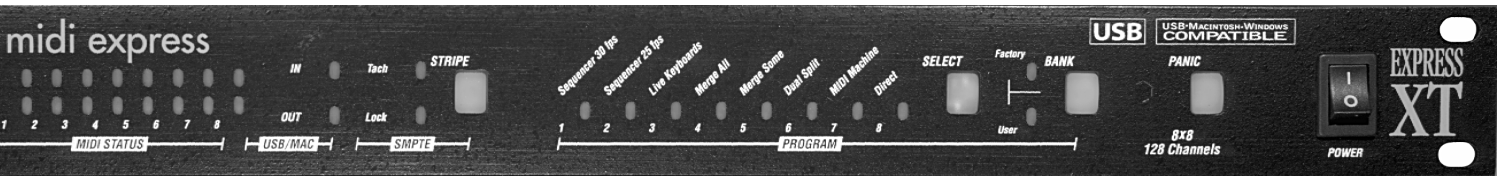
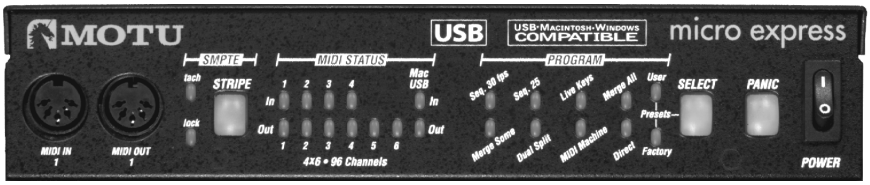
MOTU
Mark of the Unicorn, Inc.
1280 Massachusetts Avenue
Cambridge, MA 02138 • USA



MIDI Timepiece AV-USB



MIDI Express XT-USB



micro express-USB

Mac™ OS

MOTU
USB MIDI™

User's Guide for Macintosh

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MIDI Timepiece, MIDI Express, micro express, ClockWorks and Mark of the Unicorn are trademarks of Mark of the Unicorn, Inc.

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

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

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

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

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

CE

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User's Guide

For MOTU USB MIDI Interfaces

MIDI Timepiece AV-USB
MIDI Express XT-USB
micro express-USB

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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 USB MIDI interface COULD CAUSE AN ELECTRICAL SHOCK.

The MOTU USB MIDI interface is equipped with a three-conductor cord and grounding type plug which has a grounding prong, approved by Underwriters' Laboratories and the Canadian Standards Association. This plug requires a mating three-conductor grounded type outlet as shown in Figure A below.

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

Figure A

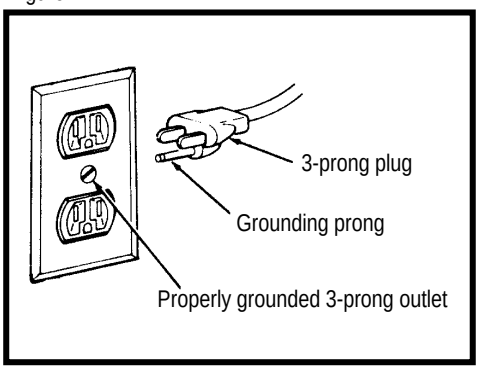
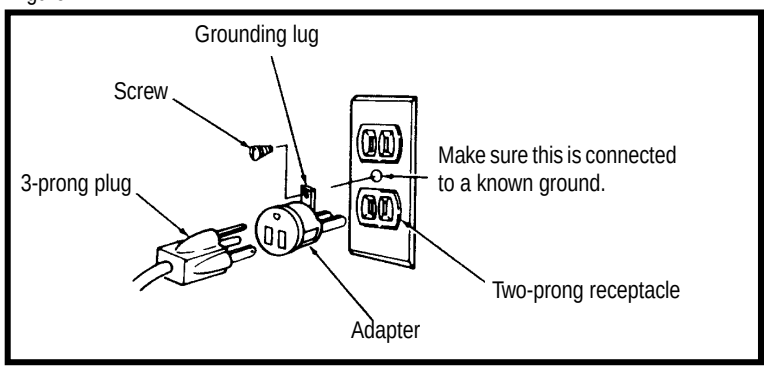


Figure B



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 USB MIDI interface plug.

IMPORTANT SAFEGUARDS

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

ENVIRONMENT

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

AVOID THE HAZARDS OF ELECTRICAL SHOCK AND FIRE

Do not handle the power cord with wet hands. Do not pull on the power cord when disconnecting it from an AC wall outlet. Grasp it by the plug.

INPUT

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

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

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Part I

For All Users

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All Users

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CHAPTER 1 Packing List and System Requirements

THANK YOU FOR CHOOSING MOTU

Thank you for purchasing a MOTU USB MIDI interface. Please read the important information in this chapter before using it.

PLEASE REGISTER TODAY

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

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

PACKING LIST

Your MOTU USB MIDI Interface is shipped with the items listed below. If any of these items are not present when you first open the box, please immediately contact your dealer or Mark of the Unicorn.

- MOTU USB MIDI Interface
- Power cord
- USB cable
- CD with software drivers
- Manual
- Product registration card

MIDI CABLES NOT INCLUDED

To connect each of your MIDI devices to your MOTU MIDI interface, you need MIDI cables, purchased separately. Talk to your music dealer to decide how many you need.

SYSTEM REQUIREMENTS

Your MOTU MIDI interface will run with any USB-equipped Macintosh running Mac OS 8.6 or later. If you are attempting to use your MOTU USB interface with an older Macintosh model equipped with a USB adaptor card, contact Mark of the Unicorn for compatibility.

MIDI SOFTWARE COMPATIBILITY

Your MOTU USB MIDI Interface will work with the following kinds of MIDI software:

- All Mark of the Unicorn software products
- All FreeMIDI-compatible software
- All OMS-compatible software

GETTING STARTED

Follow the directions in the next few chapters of this guide to successfully install and begin using your new MOTU USB MIDI interface.

FAMILIARITY WITH MACINTOSH®

This manual assumes that your are familiar with using a Macintosh computer. If you are not, you should review your Macintosh User's Guide before proceeding.

VISIT OUR WEB SITE FOR SOFTWARE UPDATES

Driver updates are posted on our web site as soon as they become available, so check our web site for the latest drivers: www.motu.com

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CHAPTER 2 Installing Your MOTU Interface

FOR ALL MOTU INTERFACE MODELS

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CONNECTING THE POWER CORD

Plug the power cord into your MOTU MIDI Interface and then plug the other end into a grounded power outlet. We recommend that you leave the interface switched off while making cable connections during installation.

CONNECTING A SERIAL PORT MACINTOSH

If you have an older Macintosh computer with serial (modem and printer) ports instead of USB ports, connect your MOTU MIDI interface to the computer with an AppleTalk cable purchased separately. Plug one end of the AppleTalk cable into the MOTU MIDI Interface *Mac* port and plug the other end into the modem port of the Macintosh. If you have multiple MOTU MIDI interfaces, see chapter 3, "Installing Multiple Interfaces" (page 19) for further information about how to connect them as a network.

CONNECTING A USB MACINTOSH

Using the USB cable included with your MOTU MIDI interface, put the Type A plug into a Type A USB jack on the computer, the USB computer keyboard, or any other USB device connected to the computer that has an available Type A USB jack. The USB cable allows the Mac to communicate with all MIDI devices connected to your MOTU MIDI interface.

If you have several MOTU interfaces, see chapter 3, "Installing Multiple Interfaces" (page 19).

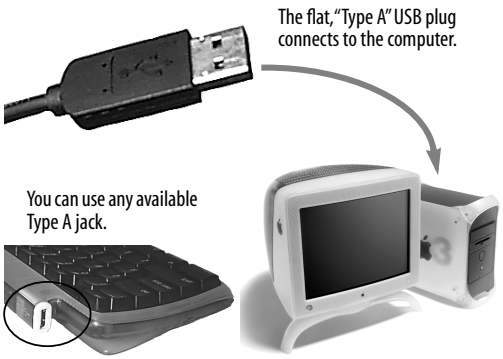

Figure 2-1: You can plug the Type A connector into a Type A jack directly on the computer itself, a USB keyboard connected to the computer, or any other USB device already connected to the computer that has an available Type A USB jack.

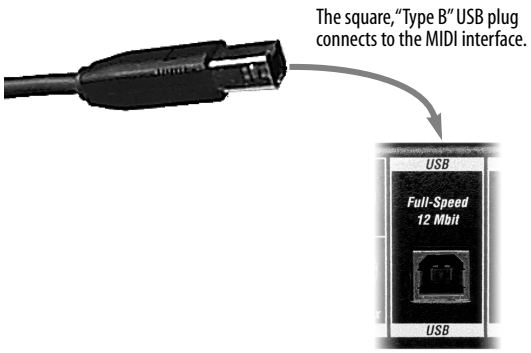

Figure 2-2: The square Type B plug goes into your MOTU interface.

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CONNECTING MIDI GEAR

Connect each MIDI device's MIDI IN jack to a MIDI OUT jack on your MOTU MIDI interface as shown by Connection A below. Conversely, connect the MIDI OUT jack on the MIDI device to one of the MIDI IN jacks on your MOTU MIDI interface as shown by Connection B.

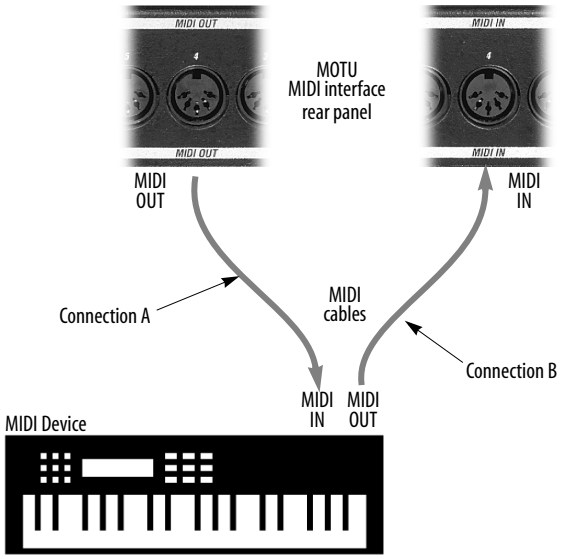

Figure 2-3: Connecting a MIDI device to your MOTU MIDI interface. If you are connecting a sound module or other device that does not need to transmit MIDI data, you only need to make connection A shown above. Conversely, if the device is a MIDI controller such as a drum pad or guitar controller, you only need to make Connection B.

One-way MIDI connections

MIDI devices that do not receive MIDI data, such as a dedicated keyboard controller, guitar controller, or drum pad, only need Connection B shown in Figure 2-3. Similarly, devices that never send data, such as a sound module, only need Connection A. However, if you plan to use editor/librarian software with the sound module, or if you need to get system exclusive bulk dumps from it, make both connections. In general, make both connections for any device that needs to both send and receive MIDI data.

☛ MOTU MIDI interfaces do not require that you use the same numbered MIDI IN and MIDI OUT for each device, but experience shows that your system will be easier to work with if you do.

Connecting additional gear with MIDI THRUs

If you use up all of the MIDI OUTs on your MOTU MIDI interface, and you still have more gear to connect, run a MIDI cable from the MIDI THRU of a device already connected to the interface to the MIDI IN on the additional device as shown below in Figure 2-4. The two devices then share the same MIDI OUT port on the MIDI interface. This means that they share the same set of 16 MIDI channels, so try to do this with devices that receive on only one MIDI channel (such as effects modules) so their receive channels don't conflict with one another.

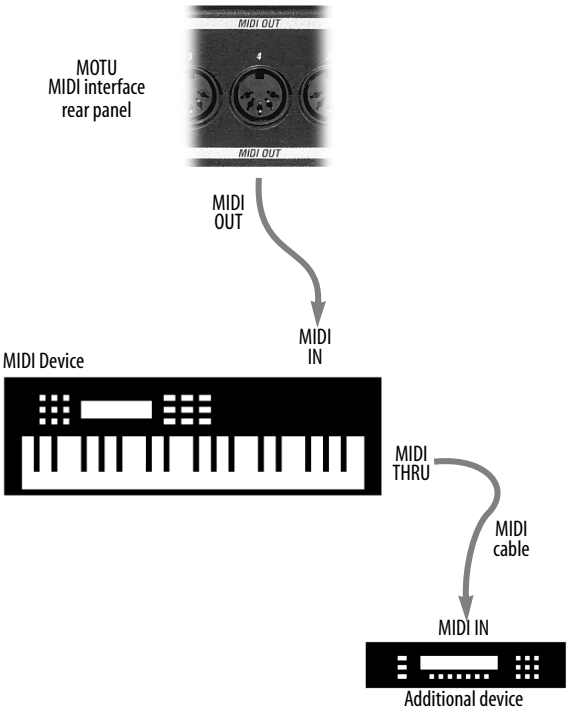

Figure 2-4: Connecting additional devices with MIDI THRU ports.

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MIDI CONNECTIONS WORKSHEET

Here's a suggestion. If you have more than a few pieces of gear connected to your MOTU MIDI interface, jot down which device is connected to each input and output in the worksheet below.

Later on, you'll enter this information into FreeMIDI, which makes your MIDI devices appear by name (rather than cable number) in the software.

MIDI IN	MIDI OUT
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8

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SMPTE TIME CODE SYNC CONNECTIONS

Your MOTU MIDI interface is both a SMPTE time code *converter* and *generator*. As a converter, it locks (slaves) to incoming longitudinal SMPTE time code (LTC) and converts it to MIDI Time Code (MTC) and reshaped LTC. As a generator, it produces both LTC and MTC time code, either running under its own internal clock or while slaved to external time code (or other time base).

When making the SMPTE time code connections described in the following sections, do not pass the signal through any type of signal processing equipment. Use shielded quarter-inch audio cables.

For a complete explanation of synchronization, see chapter 15, "Synchronization" (page 91) or chapter 22, "Synchronization with the AV" (page 139).

Connecting a SMPTE time code source

Connect any SMPTE time code *source*, such as the SMPTE timecode track on an analog multitrack tape deck, to the SMPTE IN port on your MOTU MIDI interface as shown in Figure 2-5. (For information about recording time code tracks, see "Striping SMPTE" on page 93.)

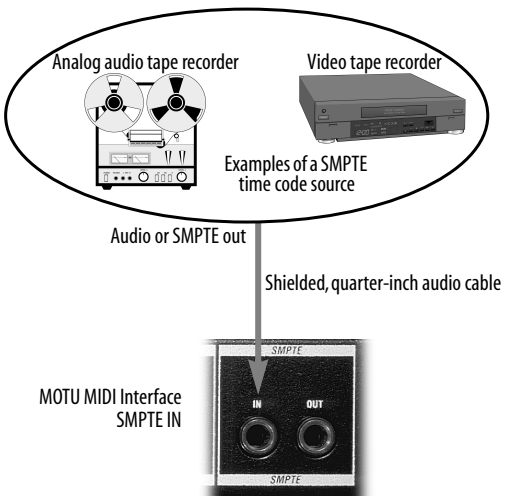

Figure 2-5: Connecting a SMPTE time code source.

Connecting a SMPTE time code destination

Connect the SMPTE OUT port of your MOTU MIDI interface to the SMPTE time code input of any *destination* device that accepts SMPTE time code as shown in Figure 2-6. For example, time code can be recorded on an outside track of a multitrack tape recorder so that everything can subsequently be synchronized to the multitrack. Other examples of a SMPTE time code destination are systems that have the ability to slave to SMPTE time code, such as stand-alone hard disk recording systems, digital audio workstations, or automated mixing consoles.

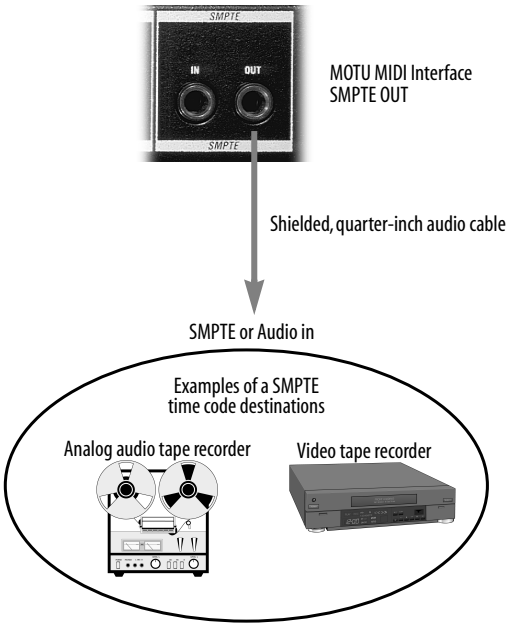

Figure 2-6: Connecting a SMPTE time code destination.

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CONNECTING A PEDAL OR FOOT SWITCH

If you would like to use a foot pedal or foot switch with your MOTU MIDI interface, connect it as shown below in Figure 2-7. For more information about how a pedal input can be used, see chapter 18, "Knobs and Pedals" (page 119).

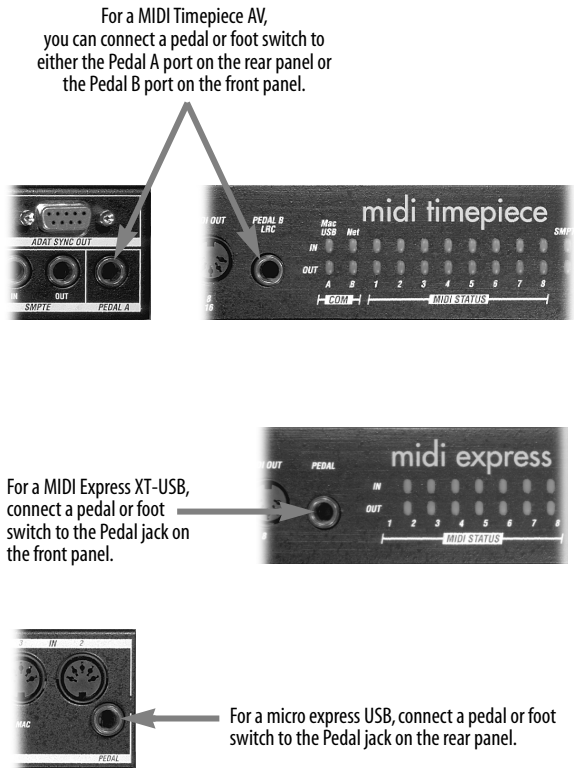

Figure 2-7: Connecting a foot switch or foot pedal.

CONNECTING AN AUDIO CLICK SOURCE

If you would like to convert an audio click to MIDI, connect the audio click source to the Pedal input as using a shielded, quarter-inch audio cable as shown below in Figure 2-8. For more information about converting an audio tempo source (such as a click, bass drum, tape deck signal, or other audio tempo source) to MIDI, see "Converting an audio click to MIDI" on page 88 or "Using an audio click as a tempo source" on page 123.

☛ On a MIDI Timepiece AV, only PEDAL A (on the rear panel) can be used for click-to-MIDI conversion.

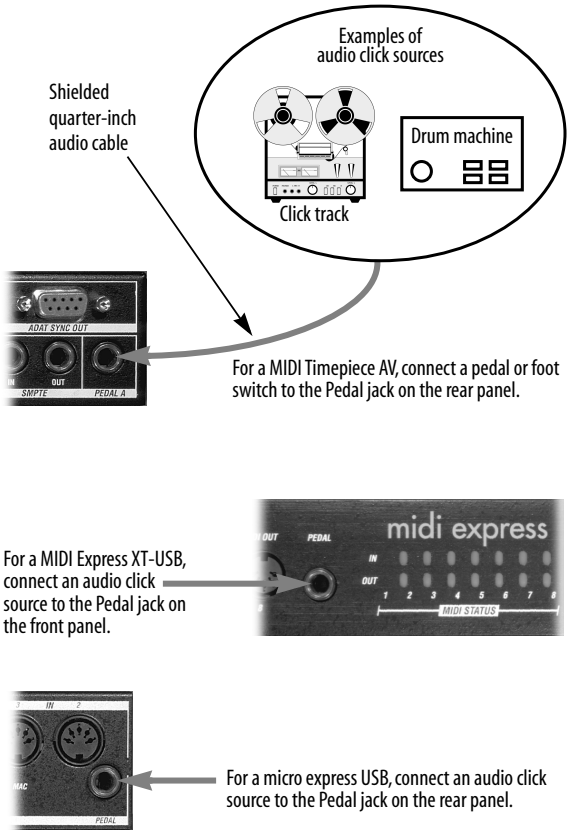

Figure 2-8: Connecting an audio click input. Only the Pedal A input on the rear panel of the MIDI Timepiece AV can be used as a click input.

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CONNECTING ADATS
(For the MIDI Timepiece AV only)

The MIDI Timepiece AV can serve as an ADAT sync master device, providing sample-accurate address and phase lock to one or more ADATs (or other ADAT sync-compatible devices). ADAT sync provides sample-accurate synchronizing and locating between the MTP AV and all devices on the ADAT sync chain.

Using the ADAT sync cable supplied with your ADAT, connect the ADAT SYNC OUT of the MIDI Timepiece AV to the SYNC IN port of the ADAT as shown below in Figure 2-9. Don't worry about setting the ADAT device ID: the MTP AV sets it automatically.

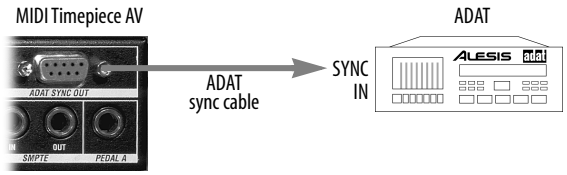

Figure 2-9: Connecting an Alesis ADAT.

If you have several ADATs, you can chain the rest of them to the one connected to the MIDI Timepiece AV as shown below in Figure 2-10.

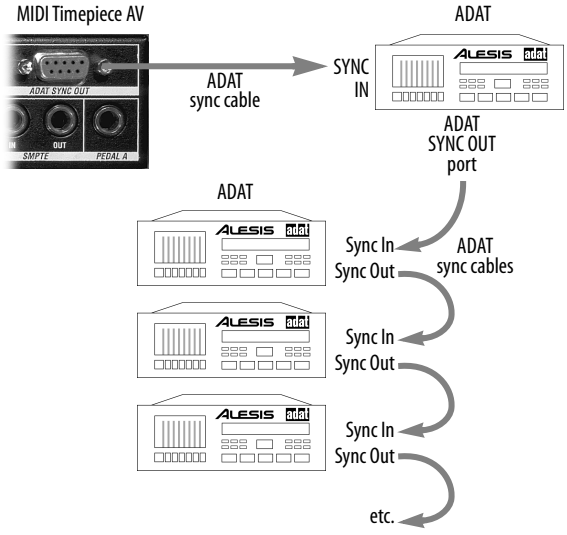

Figure 2-10: Connecting multiple ADATs.

CONNECTING VIDEO
(For the MIDI Timepiece AV only)

The MIDI Timepiece AV can synchronize to any incoming video signal, from a standard video tape recorder (VTR) to distributed house sync (blackburst). If your video source is a VTR of some kind, the video signal from the VTR will need to be distributed to both the MIDI Timepiece AV and your video monitor. This can be accomplished with the video thru jack found on some types of video monitors as shown in Figure 2-11.

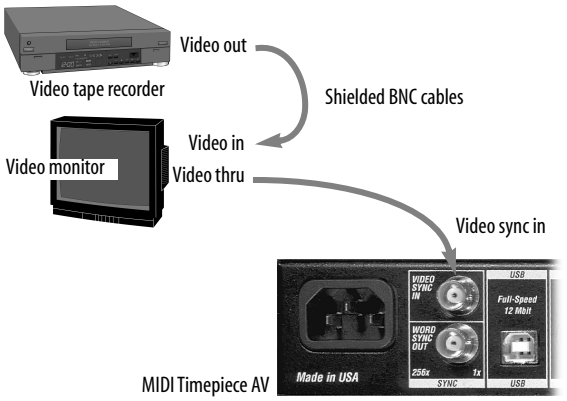

Figure 2-11: Connecting video via the video thru of a video monitor.

If your video monitor does not support video thru, use a video distribution amplifier to distribute the source video signal to both the Timepiece AV and the monitor as shown in Figure 2-12.

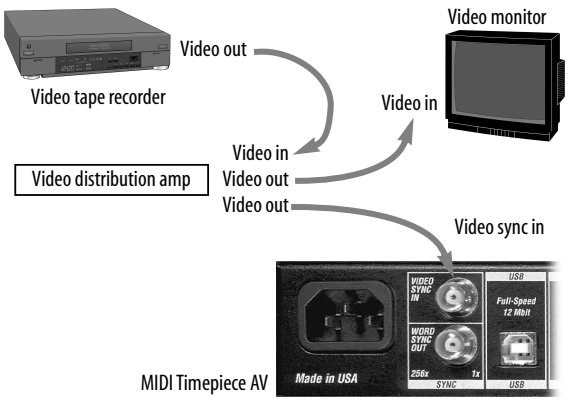

Figure 2-12: Connecting video via a video distribution amplifier.

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CONNECTING WORD CLOCK
(For the MIDI Timepiece AV only)

The MIDI Timepiece AV can serve as a word clock sync master device, providing sample-accurate phase lock for any standard word clock device. Word clock allows you to resolve hard disk recorders, digital tape decks, digital mixers and other digital audio devices to video, SMPTE time code, MIDI time code, or the MIDI Timepiece AV's internal audio clock.

In most situations, you'll want to slave your word clock device to the MIDI Timepiece AV with both the word clock and SMPTE time code connections shown below in Figure 2-13. In this scenario, the word clock device follows the MIDI Timepiece AV for transport control.

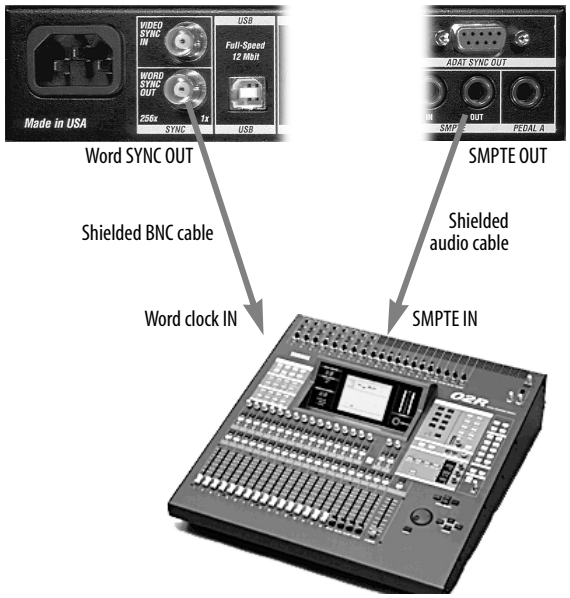

Figure 2-13: Connecting a word clock device.

In the above example, if you wanted to use the Yamaha 02R as the transport master, you would reverse the SMPTE time code connection, feeding SMPTE OUT of the mixer to SMPTE IN on the MIDI Timepiece AV.

CONNECTING PRO TOOLS "SUPERCLOCK"
(For the MIDI Timepiece AV only)

The MIDI Timepiece AV can serve as a Digidesign Pro Tools "superclock" (256x word clock) sync master device, providing sample-accurate phase lock for any Pro Tools system. Like word clock, super clock allows you to resolve Pro Tools to video, SMPTE time code, MIDI time code, or the MIDI Timepiece AV's internal audio clock.

To slave your Pro Tools hardware to the MTP AV, make the word sync connection shown below in Figure 2-13.



Figure 2-14: Connecting a word clock device.

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CONNECTING AN ALESIS LRC
(For the MIDI Timepiece AV only)

The Pedal B jack on the front panel of the MIDI Timepiece AV can serve as an input for the Alesis LRC™ remote controller, or any device that emulates the LRC, such as the Fostex Model 8312™ controller. Doing so gives you control of the MIDI Timepiece AV (and all devices slaving to it) from the LRC transport controls.

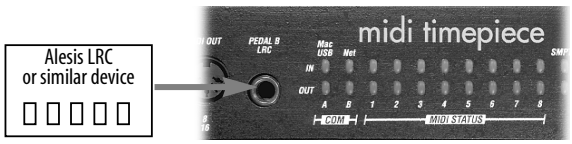

Figure 2-15: Connecting an Alesis LRC remote controller (or any LRC-compatible MMC controller) to a MIDI Timepiece AV.

USING 'FAST' SERIAL MODE
(For the MIDI Timepiece AV only)

☛ This section only applies to a MIDI Timepiece AV connected to the computer via its 'Mac' serial port. 'FAST' mode does not apply a MIDI Timepiece AV connected via USB.

☛ Only follow this section if you have Performer, Digital Performer or other MIDI software that supports the MIDI Timepiece AV's FAST mode, and you would like to use FAST mode. Otherwise, leave your MIDI Timepiece AV set to '1 MHz' mode (its factory default setting) and proceed to "What next?" on page 17.

When a serially connected MIDI Timepiece AV communicates with software on the computer in FAST mode, the MIDI Timepiece AV sends and receives data as fast as the Macintosh can. This rate can be between approximately 2 and 4 times faster than MIDI speed, depending on the model of the Macintosh. Since the Macintosh sets the limit in FAST mode, a fast Macintosh produces higher throughput. As a result, the MIDI Timepiece AV can sustain greater data throughput to and from all 8 MIDI input and output cables. Fast mode alleviates irregular timing problems that occur when too much data is being transmitted (a situation commonly referred to as *MIDI logjam*).

☛ Please note: one drawback of FAST mode is that it can cause system exclusive transfers to fail because of the extremely high data density in the message. If you will be using editor/librarian software, or if you will be doing system exclusive transfers with your sequencer, don't set the MIDI Timepiece AV to FAST mode; instead, skip this section, leave it set to 1 MHz, and set your software to 1 MHz as well.

☛ FAST mode can cause MIDI communication problems between the MIDI Timepiece AV and some Macintosh computers. If you experience problems, try setting the MIDI Timepiece AV to 1 MHz.

To set the MIDI Timepiece AV to FAST mode:

1 Turn on the MIDI Timepiece AV.

2 Turn the WINDOW knob clockwise two clicks to the right, or if necessary, turn it back and forth until you see what is shown in Figure 2-16.



Figure 2-16

3 Once you see Figure 2-16 in the display, turn the CURSOR knob clockwise one click.

Now you should see what is shown below in Figure 2-17, and the word "1 MHz" should be blinking to indicate that it can be changed with the VALUE knob.

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Figure 2-17

4 Turn the VALUE knob clockwise one click, or if necessary, turn it back and forth until you see the word FAST as shown below in Figure 2-18.



Figure 2-18

That's it! The MIDI Timepiece AV will remember this setting until you change it.

A Note about "xmit to Mac"

The MAC SPEED setting discussed in the previous section controls how fast the Macintosh sends data *to the MIDI Timepiece AV.* The "xmit to mac" indicator tells you just the opposite: how fast the MIDI Timepiece AV sends data back *to the Macintosh*. "1x" means "one times the speed of MIDI". "2x" means "two times the speed of MIDI" — or twice as fast as standard MIDI speed. These settings are hard-wired, and cannot be adjusted from the LCD front panel.

WHAT NEXT?

If you have several MOTU interfaces and need to connect them all to the same computer...

MOTU's latest line of USB interfaces can be mixed and matched as a network using a standard USB hub. If you have a MIDI Timepiece AV-USB, and you also have an earlier model MIDI Timepiece, you can connect it to your new MTP AV-USB as an "expander", doubling the number of MIDI inputs and outputs. For details about networking scenarios like these, turn to chapter 3, "Installing Multiple Interfaces" (page 19).

If you don't have multiple interfaces...

You're ready to install software. Turn to chapter 4, "Installing the MOTU USB Software" (page 23).

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CHAPTER 3 Installing Multiple Interfaces

OVERVIEW

The USB (*Universal Serial Bus*) specification allows you to connect multiple MOTU interfaces to a single Macintosh. You can mix and match any combination of MOTU USB interfaces to suit your needs.

The MIDI Timepiece AV has several unique networking features (not available with the Express XT or micro express). The MIDI Timepiece AV has a Network ("NET") serial port that allows you to connect a second MIDI Timepiece or a third-party serial MIDI device. The second of two networked MIDI Timepieces can be connected to a second Macintosh.

Connecting multiple USB interfaces **19**
Networking two MIDI Timepieces **20**
Installing a MIDI Timepiece network **20**
Networking a serial MIDI device **21**
Connecting a 2nd Macintosh **21**
Making network settings **21**
What next? **22**

CONNECTING MULTIPLE USB INTERFACES

The USB (*Universal Serial Bus*) specification allows many USB devices — theoretically up to 127 — to be connected to a single computer. However, many USB devices, including all MOTU USB interfaces, reserve USB bandwidth, so the theoretical and practical limits for MOTU interfaces are considerably fewer. In theory, the maximum number of MOTU USB interfaces you can connect to one Macintosh is just over 30 interfaces. Practically speaking, regardless of how slow or fast your USB-equipped Macintosh is, you should be able to connect upwards of 10 or more MOTU USB MIDI interfaces to the Mac and still enjoy just as much performance from each one as if it were the only one connected. Just don't try to run your USB scanner or digital camera while playing back and recording MIDI!

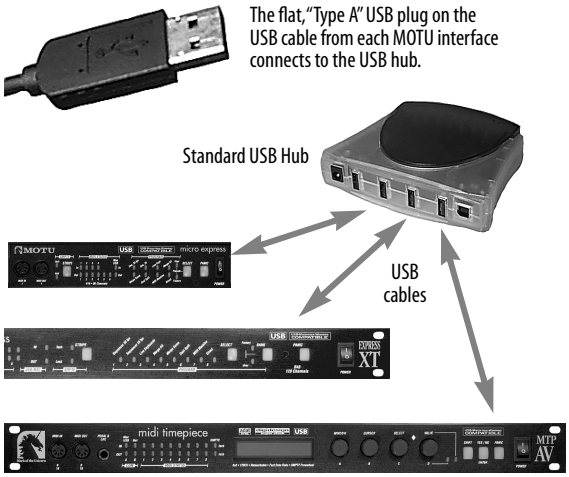

Figure 3-1: An inexpensive, standard USB hub, such as the machub4U™ shown above from Entrega, allows you to connect multiple MOTU USB MIDI interfaces. You can even mix and match different models of MOTU interfaces, using the combination that best suites your needs for synchronization, number of MIDI ports, etc.

For further details about USB, visit www.usb.org.

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To connect multiple MOTU interfaces to a macintosh, you'll need an inexpensive device called a *USB Hub* (purchased separately from your computer peripherals dealer). A USB Hub has multiple Type A ports on it, usually between 4 and 7 ports, to which you connect multiple USB MIDI interfaces as shown in Figure 3-1. Connect them to the hub in the standard fashion, as if you were connecting them directly to the computer. If needed, you can connect multiple hubs to each other to get enough USB ports for your multiple MOTU USB interfaces.

NETWORKING TWO MIDI TIMEPIECES
(For the MIDI Timepiece AV only)

The MIDI Timepiece AV-USB has a 'NET' serial port that allows you to connect a second MIDI Timepiece to it. The MIDI Timepiece AV-USB then operates as 'Box 1-8' (MIDI ports 1 through 8), while the second MIDI Timepiece operates as 'Box 9-16'. The two networked MIDI Timepieces then operate together as a single interface with 16 MIDI IN ports and 16 MIDI OUT ports. The two interfaces also operate as a seamless MIDI network, allowing to route MIDI data from any MIDI input to any combination of outputs on either interface. In the software, they appear as one device with 16 MIDI INs/OUTs.

You can network any model of MIDI Timepiece to a MIDI Timepiece AV-USB. Here is a complete list:

- MIDI Timepiece
- MIDI Timepiece II
- MIDI Timepiece AV
- MIDI Timepiece AV-USB

INSTALLING A MIDI TIMEPIECE NETWORK
(For the MIDI Timepiece AV only)

To network a second MIDI Timepiece to a MIDI Timepiece AV-USB:

1 Connect the MIDI Timepiece AV-USB to your computer via USB in the standard fashion, as described in the previous chapter (or to a USB hub as described in this chapter).

2 Connect the second MIDI Timepiece to the 'NET' serial port on the MTP AV-USB using a standard AppleTalk serial cable (included with your older model MIDI Timepiece or purchased separately) as shown below in Figure 3-2.

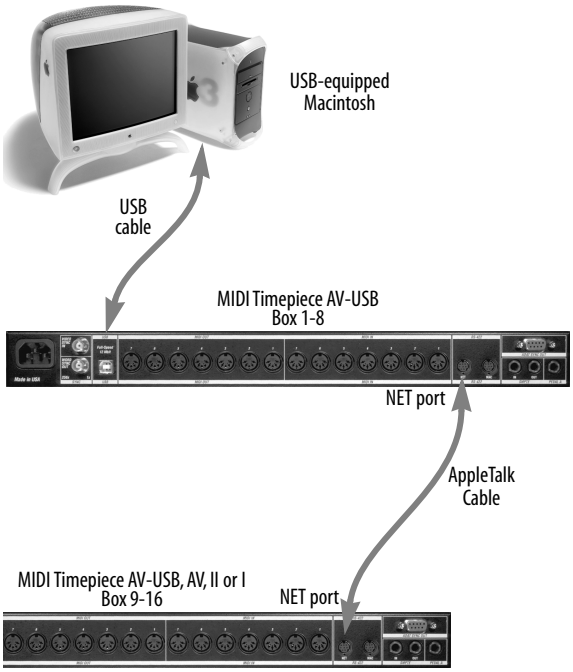

Figure 3-2: Networking a second MIDI Timepiece to a MIDI Timepiece AV-USB via their network serial ports. The second MIDI Timepiece can be an MTP AV, MTP I, MTP II or even another MTP AV-USB. The Mac serial port on Box 9-16 can be optionally connected to a serial port on a second Macintosh.

☛ Please note: never try to connect three MTP AV's directly to one another!

3 Proceed to "Making network settings" on page 21, to make important network settings.

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NETWORKING A SERIAL MIDI DEVICE
(For the MIDI Timepiece AV only)

If you have a third-party serial MIDI device instead of a second MIDI Timepiece, you can connect it to the NET serial port on your MIDI Timepiece as shown below.

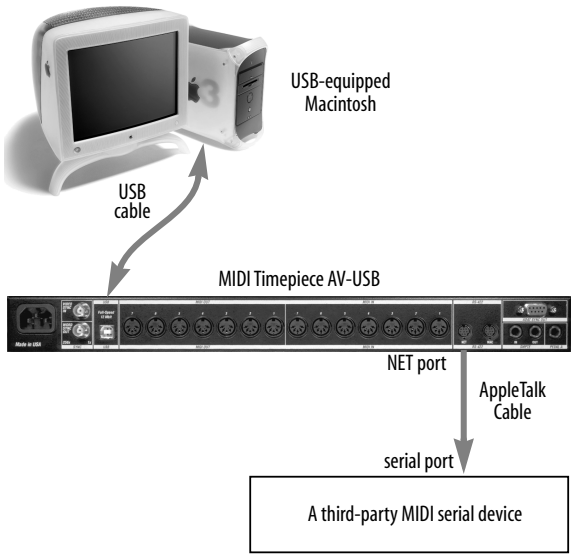

Figure 3-3: Connecting a MIDI serial device to the NET port.

You can do this with any MIDI device that is designed to connect to a Macintosh serial port, such as:

- a regular "1 MHz" 16-channel MIDI interface
- a MIDI keyboard or sound module that has a built-in serial port for direct connection to the Mac

When you connect devices like these to the NET port on the MIDI Timepiece AV, the NET port essentially serves as an additional pair of MIDI input/output jacks.

☛ Be sure to set the NET PORT setting in the LCD of the MIDI Timepiece AV to "MAC" instead of "MTP". For details, see "Making network settings" on page 21.

To route data to and from the Network port, see "Making network port connections" on page 49.

CONNECTING A 2ND MACINTOSH

When two MIDI Timepieces are networked together as shown in Figure 3-2 on page 20, the 2nd MIDI Timepiece (box 9-16) has a free Mac serial port, which can be connected to a second Macintosh. Both computers have access to any cable in the network. MIDI software can run on both computers at the same time, and both programs can send and receive MIDI data on the network at the same time. The second Macintosh in a network is optional.

To route data from one Mac to the other, see "Computer port routing in a two-MTP setup" on page 49.

MAKING NETWORK SETTINGS
(For the MIDI Timepiece AV only)

After you have networked two MTP's together, their network connections and box ID's must be set using the front panel controls.

Begin by following the procedure below on the MIDI Timepiece AV-USB that is connected to the computer (box 1-8). Then repeat the procedure with the second MIDI Timepiece (box 9-16):

1 Switch on the MTP AV that is connected directly to the computer (box 1-8).

When you switch on the MTP AV for the first time, you'll see the following in it's LCD:

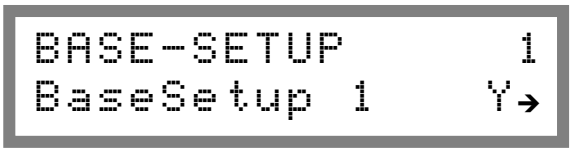

Figure 3-4

2 Turn the WINDOW knob clockwise two clicks to the right, or if necessary, turn it back and forth until you see what is shown in Figure 3-5.

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Figure 3-5

3 Once you see Figure 3-5 in the display, turn the CURSOR knob clockwise two clicks.

Now you should see what is shown below in Figure 3-6, and the phrase "1–8" should be blinking to indicate that it can be changed with the VALUE knob.



Figure 3-6

4 Choose the appropriate setting (1-8 or 9-16) by turning the VALUE knob.

If you are currently setting up the first MIDI Timepiece AV-USB in the network, choose 1-8. If you are setting up the second MIDI Timepiece, choose 9-16. Make sure that the box ID's on two networked MIDI Timepieces are never the same. One MIDI Timepiece should always be set to Box *1-8* and the other to Box *9-16*.

5 Once you have chosen the correct box ID above, turn the CURSOR knob clockwise one click.

Now the word "MAC" flashes to indicate that it can be edited with the VALUE knob.

6 Turn the VALUE KNOB to the setting that describes what is connected to the network port on this MIDI Timepiece.

If this is connected	Choose this
Nothing, a second computer, a third party MIDI interface, or a serial port device (such as a MIDI synth with a serial port connector)	MAC
A MIDI Timepiece I, II, AV, or AV-USB	MTP

You have completed the installation of a two-MTP network.

WHAT NEXT?

You're ready to install software. Turn to chapter 4, "Installing the MOTU USB Software" (page 23).

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CHAPTER 4 Installing the MOTU USB Software

OVERVIEW

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How the MOTU USB MIDI drivers work 29
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RUNNING THE MOTU USB INSTALLER

Your MOTU interface requires several software drivers. It also includes ClockWorks™, a setup program that gives you convenient access to your MOTU interface's numerous features. Install all of this software as follows:

1 Temporarily disable all system Extensions, including virus protection utilities, before you begin.

These utilities can interfere with installation. You can temporarily disable them by restarting the computer and holding down the shift key until you see the message "Extensions off", which appears right after "Welcome to Macintosh". They will turn back on the next time you restart the computer.

2 Insert the MOTU USB MIDI CD-ROM and run the installer. The installer is the icon called "Double-click to install". Just follow the directions that the installer gives you.

WHAT DOES THE INSTALLER DO?

The installer checks the computer to make sure it satisfies the minimum system requirements for your MOTU interface. If so, the installer creates a Folder on the hard disk containing a copy of ClockWorks, the control software for your MOTU interface. The installer also adds Mark of the Unicorn's FreeMIDI system extension to your Macintosh System Folder. ClockWorks requires FreeMIDI.

Even though the installer does everything for you, it may be useful for you to know what files are installed and where they go. The following table provides a summary of the primary components of the install. The information in this table is subject to change. Check the installer itself under the *Custom* install option for further information.

MOTU USB software item	What it is/does
ClockWorks™	An application that lets you to configure and program your MOTU interface.
MOTU USB Driver	A system extension that allows the Macintosh to talk to your MOTU interface.
MOTU FreeMIDI USB Driver	Goes in the FreeMIDI Folder inside your System Folder.
MOTU OMS USB Driver	Goes in the OMS Folder inside your System Folder.
FreeMIDI System Extension	This system extension is placed in your System Folder and serves as an integrated MIDI operating system for all FreeMIDI-compatible software. It is required by ClockWorks, even if you plan to use OMS instead of FreeMIDI.
FreeMIDI Folder	This folder is placed in your System Folder and contains files that are required by FreeMIDI.
FreeMIDI Applications Folder	This folder is placed on the top level of your hard disk. It contains several programs that help you configure FreeMIDI.

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FREEMIDI OR OMS?

FreeMIDI and OMS are industry standard MIDI System Extensions for Mac OS. They allow MIDI software to talk to your MOTU interface and the devices connected to it.

FreeMIDI is included in your MOTU USB interface software installation. OMS is available as a free web download at www.opcode.com.

Which one should you use? If you are not sure, the table below can help you decide:

If you use this	Choose this
MOTU software only	FreeMIDI only
Non-MOTU, OMS-compatible software only	OMS only
Both MOTU and OMS-compatible software, running separately	FreeMIDI and OMS separately
Both MOTU and OMS-compatible software, running together	OMS, with FreeMIDI using OMS

Regardless of what you decide, you'll need to configure FreeMIDI and/or OMS for your new MOTU USB MIDI interface. Refer to the section below that applies to you.

FreeMIDI 24
OMS 27
FreeMIDI and OMS separately 28
OMS, with FreeMIDI using OMS 28

FREEMIDI

For existing FreeMIDI users

If you're adding a new MOTU interface to a USB-equipped Mac that already has FreeMIDI installed, be sure to run the MOTU USB MIDI software installer as described at the beginning of this chapter to update FreeMIDI. Then simply run *FreeMIDI Setup*. Your new MOTU USB interface will automatically appear in your current FreeMIDI configuration. If it doesn't, make sure it's turned on and check cables.

For new FreeMIDI users

If you haven't previously installed and used FreeMIDI on your Macintosh, follow this simple procedure:

1 Make sure that your MOTU interface is connected and powered up.

2 Locate the *FreeMIDI Setup* program on you hard drive. During installation, it is placed in the FreeMIDI Applications folder on the top level of your hard drive.

3 Double-click the *FreeMIDI Setup* application icon to launch the program.

4 If this is the very first time you've run a FreeMIDI program on this computer, and you happen to have OMS installed in the computer, you'll see the dialog below.



5 Since this is the procedure for using FreeMIDI, click the *FreeMIDI* button.

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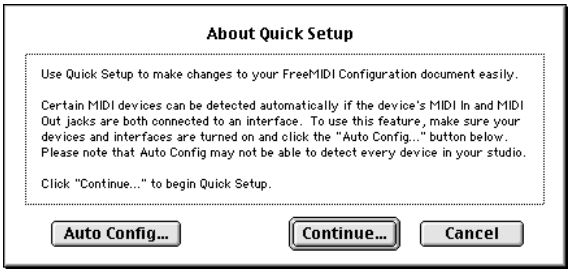
After the initial splash screen, the *Welcome to FreeMIDI* dialog box appears as shown below.



6 Click Continue. The *About Quick Setup* dialog appears.



7 Click Continue again and you'll see the *Quick Setup* window below. You should see your MOTU USB MIDI interface in the list on the right-hand side.

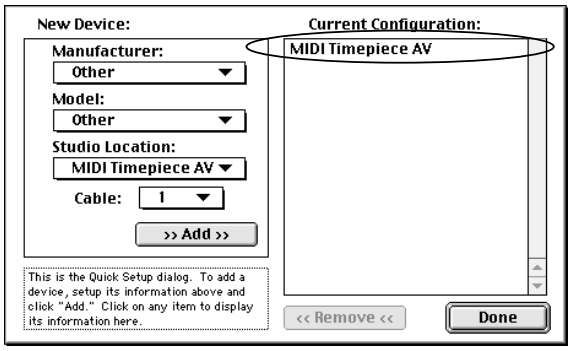


Figure 4-1: You should see your MOTU interface by name in the list on the right.

8 If you are in a hurry, you can just click *Done* and proceed to the next section, "Saving the FreeMIDI Configuration".

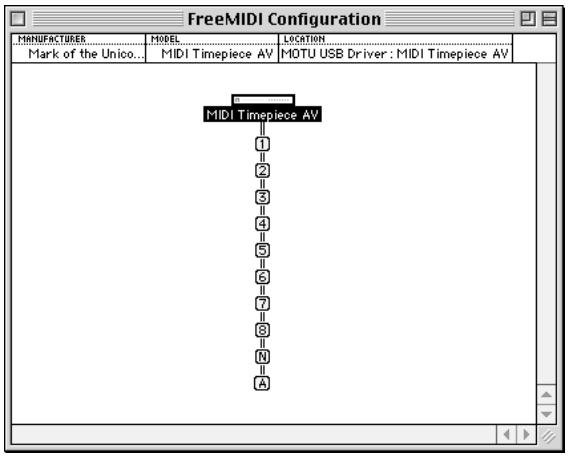


Figure 4-2: An example of a bare-bones FreeMIDI Configuration — with a MIDI Timepiece AV in this example. This is the minimum setup you need to run ClockWorks and other FreeMIDI software with your MOTU interface.

9 If, however, you would like your Mark of the Unicorn MIDI software programs to display the names of the MIDI devices connected to your MIDI interface, you can use the Quick Setup dialog in Figure 4-1 to identify them by their manufacturer and model names. If you can't find one of your devices by name in the pop-up menu lists, just use the "other" designation for now. You can rename the device in the next step. When you are finished with the Quick Setup window, click *Done*, and the FreeMIDI Configuration window appears.

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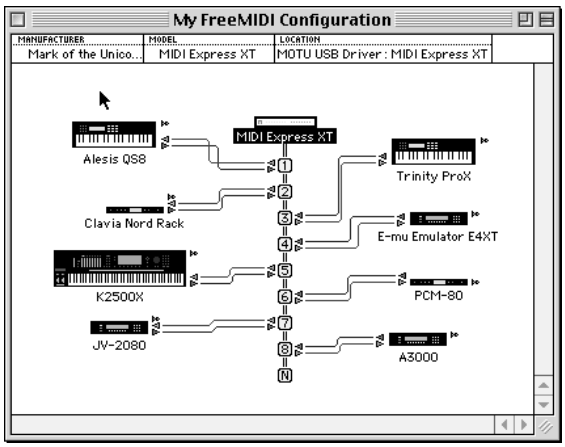

Figure 4-3: A FreeMIDI Configuration window with MIDI devices. Click a device name to change it. The devices here appear automatically in various ClockWorks windows. To add a device, use the Create Device or Quick Setup commands in the Configuration menu. To delete a device, click it and press the delete key.

If you indicated what devices are connected to your MOTU interface, your configuration will look something like Figure 4-3 after you position the MIDI device icons as desired.

Saving the FreeMIDI Configuration

Once you have a FreeMIDI configuration, you'll want to save it to disk so that you don't have to configure FreeMIDI for your studio again.

To save your configuration:

1 Choose Save from the File menu. Alternately, you can type command-S on your Mac keyboard.

A standard Macintosh File Save dialog box opens.

2 Use the suggested name "FreeMIDI Configuration" or enter another name for your configuration, if you like. Use the directory pop-up menu to navigate to a disk and folder in which you wish to save this configuration. Click *Save* or click *Cancel* to cancel the operation.

Quitting FreeMIDI Setup

Once you've saved your configuration file, you are now ready to use the ClockWorks. You do not need keep FreeMIDI Setup open. The only time you need to open FreeMIDI Setup is when you would like to make changes to your FreeMIDI studio configuration. You can re-open FreeMIDI Setup at any time.

Learning more about FreeMIDI

This chapter only covered FreeMIDI bare essentials to get your MOTU interface running. If you have Performer, Digital Performer, Mosaic, FreeStyle, or Unisyn, consult their manuals to learn more about the many other great FreeMIDI features that support these programs.

Completing your MOTU interface installation

To complete your MOTU interface installation, proceed now to "Where to go next" on page 30.

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OMS

The software installation for your MOTU USB MIDI interface (described at the beginning of this chapter) detects OMS if it is present in your system and places the MOTU USB OMS driver in the appropriate place. To activate your MOTU interface in OMS, follow this simple procedure:

1 Launch OMS Setup.

2 If this is the first time you've run OMS Setup, follow the directions it gives you to successfully create a studio setup.

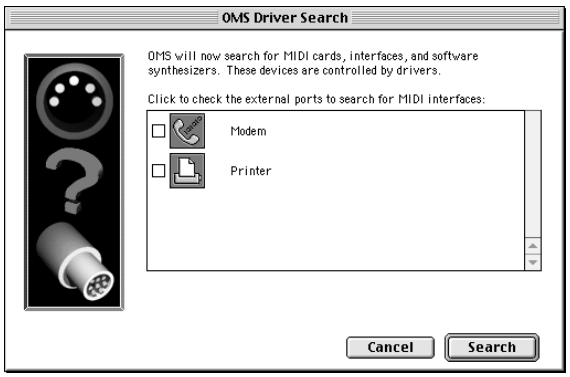
3 From the Studio menu, choose *MIDI cards & interfaces*.

You'll see the following alert.



4 Click Update Setup.

You'll see the following dialog.



5 Click *Search*.

☛ On a USB Macintosh, you don't need to check either of the serial port check boxes in this window because your MOTU USB interface is not connected to a serial port.

Your MOTU Interface will appear in your Studio Setup window, as demonstrated below.

☛ If your MOTU interface does not appear, check power and cables and try again.



Figure 4-4: A MOTU interface in the OMS studio setup window.

6 Save your OMS Setup.

7 Add devices to your OMS interface in OMS Setup.

Consult the on-line documentation included with OMS for further information about adding devices to your MOTU interface in the Studio Setup window and other related tasks.

Completing your MOTU interface installation

To complete your MOTU interface installation, proceed now to "Where to go next" on page 30.

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FREEMIDI AND OMS SEPARATELY

If you plan to use both FreeMIDI and OMS separately, set up OMS as you normally would (see OMS's included on-line documentation for assistance) and then follow this procedure for FreeMIDI:

1 Make sure that your MOTU interface is connected and powered up.

2 Locate the *FreeMIDI Setup* program on you hard drive. During installation, it is placed in the FreeMIDI Applications folder on the top level of your hard drive.

3 Double-click the *FreeMIDI Setup* application icon to launch the program.

4 If this is the very first time you've run a FreeMIDI program on this computer, you'll be asked if you want to use FreeMIDI or OMS as shown below.



5 Since this is the procedure for using FreeMIDI separately from OMS, click FreeMIDI.

6 Proceed to Step 6 on page 25 and continue from there to complete the FreeMIDI setup.

OMS, WITH FREEMIDI USING OMS

If you plan to use both FreeMIDI and OMS together, set up OMS as you normally would (see OMS's included on-line documentation for assistance) and then follow this procedure for FreeMIDI:

1 Make sure that your MOTU interface is connected and powered up.

2 Locate the *FreeMIDI Setup* program on you hard drive. During installation, it is placed in the FreeMIDI Applications folder on the top level of your hard drive.

3 Double-click the *FreeMIDI Setup* application icon to launch the program.

4 If this is the very first time you've run a FreeMIDI program on this computer, you'll be asked if you want to use FreeMIDI or OMS as shown below.



5 Since this is the procedure for OMS with FreeMIDI using OMS, click the *OMS* button.

6 Go to "OMS" on page 27 and follow the procedure for using OMS.

☛ If you don't see the dialog above when you run FreeMIDI Setup, refer to "Toggling FreeMIDI's use of OMS" on page 29.

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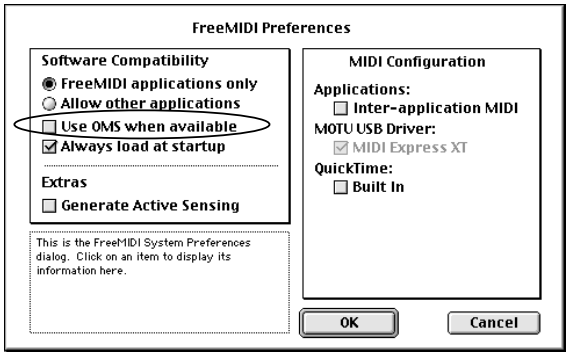
TOGGLING FREEMIDI'S USE OF OMS

If you have OMS, you can make FreeMIDI use it or stop using it as follows:

1 Launch FreeMIDI Setup.

2 Choose *FreeMIDI Preferences* from the File menu.

3 Check or uncheck the OMS option as shown below.



HOW THE MOTU USB MIDI DRIVERS WORK

You don't need to know this, but just in case you're wondering how your FreeMIDI and OMS compatible software actually "talks" to your MOTU USB interface, the diagram below illustrates how. The FreeMIDI and OMS drivers shown below belong in the FreeMIDI and OMS folders in the System Folder. (The installer puts them there.)

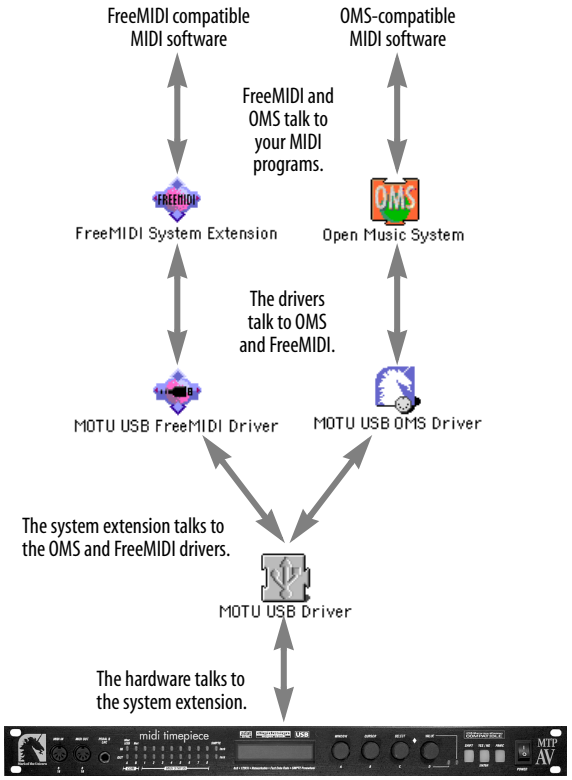


Figure 4-5: The USB drivers for your MOTU USB interface establish communication between the interface hardware and your FreeMIDI and OMS compatible MIDI software.

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WHERE TO GO NEXT

Where you go next depends, of course, on what you would like to do.

If you want to learn the front panel controls...

Turn to the chapter below that applies to you:

- For the MIDI Express XT or micro express, see chapter 13, "Working with Presets" (page 77).
- For the MIDI Timepiece AV, see chapter 17, "Using Front Panel LCD" (page 103).

If you want to start using MIDI software with your new MOTU interface...

All MOTU interfaces have factory default settings that allow your FreeMIDI or OMS compatible software to communicate with all MIDI devices connected to the interface. So from here, you can turn to your software documentation to get started. If you haven't created devices in your FreeMIDI (or OMS) setup as demonstrated in Figure 4-3 on page 26, do so now before you begin using your MIDI programs.

If you want to program your interface with ClockWorks...

ClockWorks is the software "front end" for the features in your MOTU interface. It allows you to configure and program the powerful MIDI routing and processing features in the interface. You can graphically make direct routings from inputs and outputs, stripe SMPTE time code, create and save interface *setups* (which consist of the entire internal configuration of the interface), set up the pedal inputs, or other tasks.See chapter 6, "ClockWorks" (page 37) for details.

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CHAPTER 5 Using Performer & Digital Performer

OVERVIEW

Performer and Digital Performer allow you to take full advantage of the powerful MIDI I/O, synchronization, and MIDI Machine control features of your MOTU MIDI interface/synchronizer.

For clarity, the name *Digital Performer* will be used in this chapter to refer to both Performer and Digital Performer, except where otherwise noted.

IMPORTANT NOTE!

☛ Digital Performer 2.6 (and higher) has been specially programmed to support the advanced features of USB, including "hot-swapping" (bringing devices off-line and on-line on the fly) and expanded systems consisting of multiple MOTU interfaces. If you are using an older version of Digital Performer or Performer, keep your MOTU USB interface turned on and connected at all times to avoid problems with your older MOTU software. Contact Mark of the Unicorn about upgrading.

FOR ALL MOTU INTERFACE MODELS

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Slaving Digital Performer to SMPTE 32
MIDI Machine Control (MMC).....32

FOR MIDI TIMEPIECE AV USERS

ADAT sync 34
Sample-accurate sync with a 2408.....34
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Slaving Pro Tools.....35
Using FAST mode 36

MIDI INPUT AND OUTPUT

Once you've configured FreeMIDI or OMS to use your MOTU MIDI interface/synchronizer, and you've created and saved a FreeMIDI or OMS studio setup that shows all MIDI devices that are connected to it as described in chapter 4, "Installing the MOTU USB Software" (page 23), those devices will appear in Digital Performer's MIDI input and output menus as shown below.

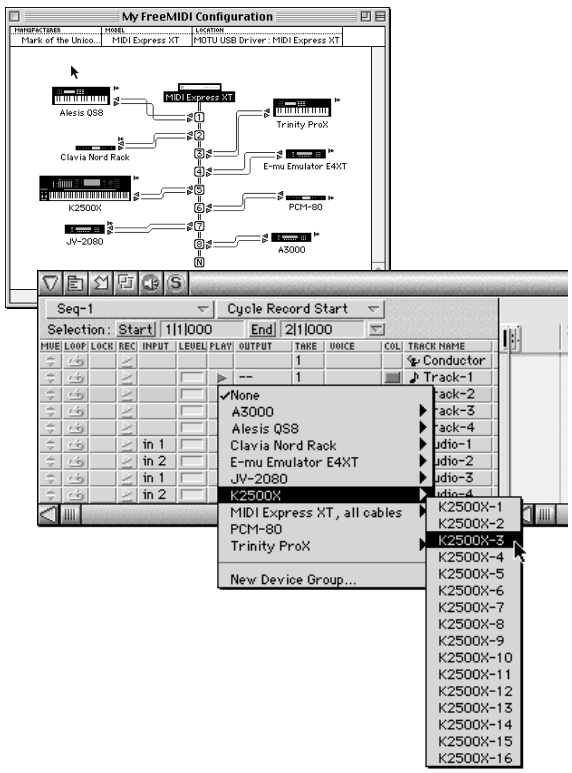

Figure 5-1: The devices in your FreeMIDI or OMS studio setup connected to your MOTU MIDI interface will automatically appear as MIDI sources and destinations in Digital Performer's MIDI I/O menus.

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SLAVING DIGITAL PERFORMER TO SMPTE

To slave Performer or Digital Performer to SMPTE time code (LTC) via your MOTU MIDI interface and synchronizer:

1 In Performer or Digital Performer, choose *Receive Sync* from the Basics menu.

2 Make sure the *Sync to port* menu is set to *Any Port*, or the name of the interface, or the serial port the interface is connected to, if any.

3 Set the *Type of Sync* to MTC. Choose the SMPTE frame format that matches the format you are converting with your MOTU interface.

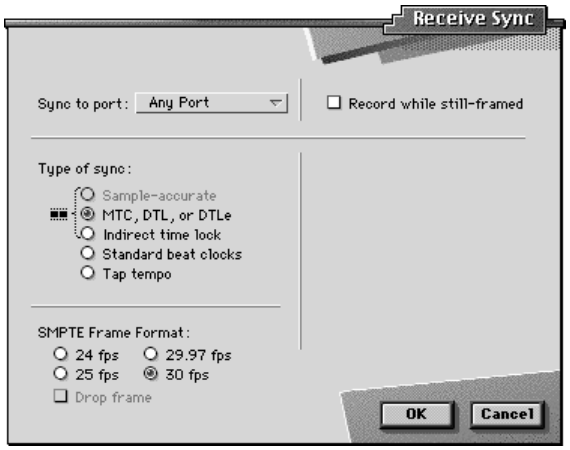

Figure 5-2: In Performer's receive sync dialog, choose MTC and choose the SMPTE frame format that matches the setting in your MOTU MIDI interface (which should also match the time code).

MIDI MACHINE CONTROL (MMC)

Performer (version 5.0 or higher) and Digital Performer (version 1.5 or higher) both have the ability to serve as a MIDI Machine Control transport master for any MMC device in your studio, allowing you to play, stop, and cue the device from Performer's transport controls.

Your MOTU MIDI interface/synchronizer has the ability to serve as a MMC transport slave to Digital Performer, while at the same time generating time code for other devices in your studio. In doing so, your MOTU interface/synchronizer becomes a central time code "hub" for all of the devices in your studio, allowing you play, stop, and cue them all directly from Digital Performer.

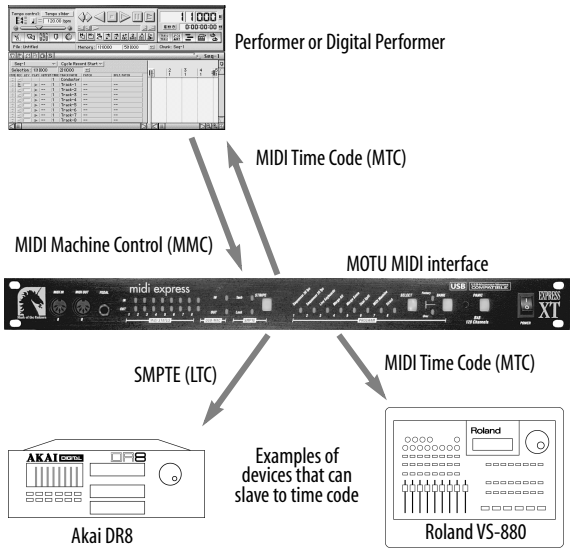

Figure 5-3: Your MOTU MIDI interface/synchronizer can serve as a time code "hub" while you control it from Digital Performer via MMC transport commands.

How you configure Performer or Digital Performer depends for MMC on what version you have. Refer to the section below that applies to you.

Performer 6.0/Digital Performer 2.0

Performer 6.0 (or later) and Digital Performer 2.0 (or later) automatically handle all of the MIDI Machine Control window setup chores for your MOTU MIDI interface/synchronizer when it is detected in your FreeMIDI or OMS setup.



Figure 5-4: Performer 6.0 and Digital Performer 2.0 (or later) automatically configure their MIDI Machine Control window when a MOTU MIDI interface/synchronizer is present in the current FreeMIDI configuration. They automatically detect the interface/synchronizer's MMC device ID.

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Performer 5.5/Digital Performer 1.71 or earlier

Performer 5.5 and Digital Performer 1.71 require a few simple additional setup procedures. First, you need to create an extra device in FreeMIDI as shown in Figure 5-5 below that has the MMC properties of your MOTU MIDI interface/synchronizer. The only requirements for this device are:

- It must have the "MIDI Machine" property assigned to it
- It must be connected bidirectionally to one of the ports on the MOTU interface (it doesn't matter which one)
- It must match the Device ID of the MOTU MIDI interface/synchronizer itself

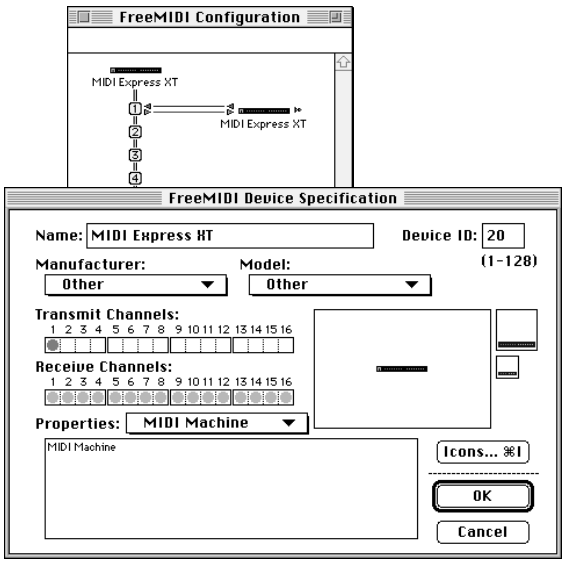

Figure 5-5: Important note: only use the setup shown here for Performer 5.5 or Digital Performer 1.71 (or earlier). Don't use it for later versions. For Performer 5.5 or Digital Performer 1.71 (or earlier), create a extra MOTU interface/synchronizer as shown here in FreeMIDI that has the same MMC properties as the MOTU MIDI interface/synchronizer. The name of the device doesn't matter. It must, however, be connected bidirectionally to one of the MOTU interface ports (it doesn't matter which one). It also must have the MIDI Machine property, and the Device ID must match the ID in the MOTU interface itself. The MOTU interface's factory default Device ID is 20.

In Performer or Digital Performer, make sure the that MIDI Machine Control is turned on (with the arrow button between the Mac and the tape deck) and that the MOTU MIDI interface/synchronizer device is Online.

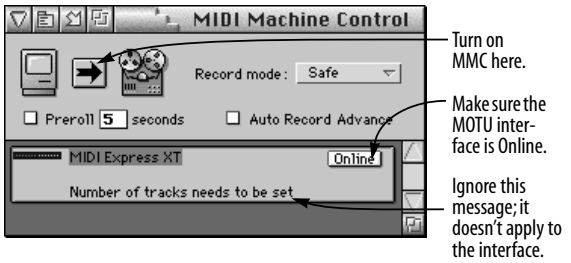

Figure 5-6: Setting up the MOTU MIDI interface/synchronizer in the MIDI Machine Control window of Performer 5.5 or Digital Performer 1.71 (or earlier). (If you have versions 6.0 or 2.0, respectively, or later, see Figure 5-4.) Make sure that MIDI Machine Control is turned on and that the MOTU interface/synchronizer device is Online. You don't need to assign any tracks to the MOTU MIDI interface/synchronizer device.

MMC control of record functions

For information about setting up remote control of the record functions of MMC devices connected to the MOTU interface/synchronizer, see your Performer or Digital Performer manual.

Enabling MMC in Digital Performer

Once you have made the preparations outlined in the previous sections, you are ready to enable MMC control between Performer and the MOTU MIDI interface/synchronizer. For complete details, see your Performer Reference Manual. For convenience, below is a brief summary. These directions apply to any version of Performer and Digital Performer discussed in this chapter:

1 Turn on the MMC control button as shown in Figure 5-4 (or Figure 5-6).

2 As shown in Figure 5-2, open Performer's Receive Sync dialog (Basics menu) and prepare Performer to slave to MIDI Time Code (MTC) at the desired frame rate (which needs to match the MOTU MIDI interface/synchronizer's frame rate).

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3 Set the SMPTE start time for the sequence (using the button in the main counter as usual).

Now, just cue Performer anywhere you like and press play. This sends a play command to the MOTU MIDI interface/synchronizer, which starts the MMC slave device and begins sending time code to Performer, syncing everything together. You can stop, play, and cue anywhere you like in Performer and your MMC slave device will chase, play and record accordingly.

Routing Time Code to Other Devices

Once you have successfully established MMC control of the MOTU interface/synchronizer as described in this chapter, you can route MIDI Time Code (MTC) from the MOTU MIDI interface/synchronizer to other devices in your studio to control them remotely from Performer via the interface, as shown in Figure 5-3 on page 32. For more information, see "The MTC In and MTC Out connections" on page 49.

ADAT SYNC
(For the MIDI Timepiece AV only)

Performer 5.5 (or later) and Digital Performer 2.0 (or later) automatically and continually scan the MIDI Timepiece AV for the presence of ADATs (any model) or other ADAT SYNC-compatible devices, such as the Fostex RD-8, connected to the MIDI Timepiece AV's ADAT Sync Out port. If Digital Performer detects one, a row of eight record-enable buttons automatically appears in the MIDI Timepiece AV panel in the MMC window, as shown below in Figure 5-7. These record buttons give you remote control of the record-enable functions of the ADAT. If Performer detects more than one ADAT, it will add another row of 8 buttons for each additional ADAT that it detects. Performer continually scans for ADATs, so if you disconnect one, Performer will adjust the buttons shown in the MMC window after a moment or so.

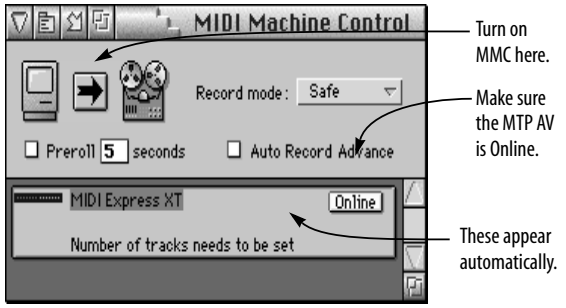

Figure 5-7: Performer 5.5 and Digital Performer 2.0 (or later) automatically and continuously scan the AV's ADAT Sync Out port for any connected ADATs (or ADAT-compatible recorders).

MMC control of ADAT record functions

In Performer 5.5 (or later) and Digital Performer 2.0 (or later), you can remotely control MMC features of ADATs in standard fashion as described in the MIDI Machine Control chapter of your Performer Reference Manual. For example, you can record-enable ADAT tracks in the MIDI Machine Control window and set auto punch points via the AutoRecord button in Digital Performer's main transport controls.

SAMPLE-ACCURATE SYNC WITH A 2408
(For the MIDI Timepiece AV only)

For details about setting up your 2408 hard disk recording system for sample-accurate synchronization between Digital Performer any ADATs connected to the 2408, see "Slaving a MOTU 2408 system" on page 145. Sample-accurate sync allows you to make digital transfers between Digital Performer and ADATs (or any ADAT-SYNC compatible devices connected to the MIDI Timepiece AV). In other words, you can transfer audio back and forth between Digital Performer and ADATs as many times as you like and they won't drift by even one sample.

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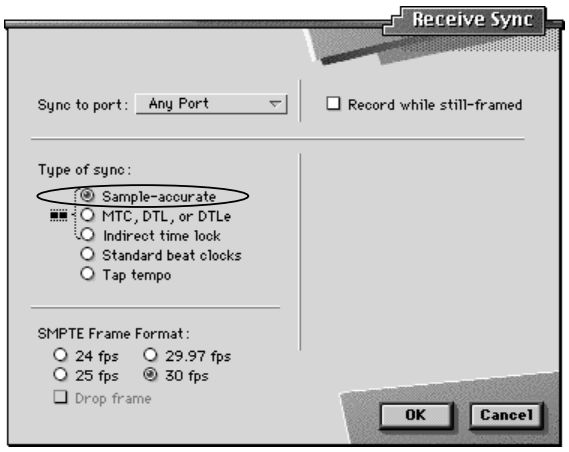

Figure 5-8: When you're working with ADATs and a 2408 hard disk recording system, use sample-accurate sync in Performer's receive sync dialog.

WORD CLOCK SYNC
(For the MIDI Timepiece AV only)

To synchronize Digital Performer with a word clock device connected to the MIDI Timepiece AV, make the connections shown in Figure 2-13 on page 15. In this scenario, Digital Performer slaves to MIDI Time Code (MTC) from the MIDI Timepiece AV. So follow the directions earlier in this chapter in "Slaving Digital Performer to SMPTE" on page 32.

If the word clock device slaved to the MIDI Timepiece AV also has the ability to slave to SMPTE time code, you can set up Digital Performer to be the transport master of the entire rig as explained in "MIDI Machine Control (MMC)" on page 32 and "Routing Time Code to Other Devices" on page 34.

SLAVING PRO TOOLS
(For the MIDI Timepiece AV only)

If you have Digidesign hardware that can slave to Digidesign's "superclock", such as Pro Tools III or Pro Tools|24, you can achieve the highest quality synchronization possible. In this scenario, Digital Performer slaves to MIDI Time Code, while your Digidesign hardware slaves via the "superclock" word clock connection between the MIDI Timepiece AV and the Digidesign hardware.

To slave Digital Performer and Pro Tools to the MIDI Timepiece AV:

1 Connect the "Word Sync out" of the MIDI Timepiece AV to the "Slave Clock input" of your Digidesign audio interface. as shown in Figure 2-14 on page 15.

2 In the front panel LCD of the MIDI Timepiece AV, use the WINDOW knob to go to the SMPTE/SYNC menu, and use the CURSOR and VALUE knobs to set the sample rate as desired (44.1K or 48K) and set the clock format to DIGI (instead of 1X).

3 Make the other settings in the SMPTE/SYNC menu as desired.

You can slave your rig to VIDEO, LTC, MTC, or the MIDI Timepiece AV's INTERNAL clock. If you are using INTERNAL, you'll also need to set up MMC control between your sequencer and the MTP AV as described in "Using computer software as an MMC controller" on page 156.

4 Slave Digital Performer to MTC as described in "Slaving Digital Performer to SMPTE" on page 32.

5 *Uncheck* the Sync Audio to Timecode command in the Basics menu.

This turns off Digital Performer's software synchronization, which is not necessary with the hardware sync provided by the MIDI Timepiece AV (which is far superior).

☛ When configuring DAE (in the Basics menu), do *not* change the *Sync mode* option to *Digital*, Leave it set to *Internal*! Your Digidesign hardware

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will automatically switch to Slave mode when you connect the BNC word clock cable to its "superclock" input.

USING FAST MODE
(For the MIDI Timepiece AV only)

☛ This section only applies to a MIDI Timepiece AV connected to the computer via its 'Mac' serial port. 'FAST' mode does not apply a MIDI Timepiece AV connected via USB.

If your MIDI Timepiece AV is connected to your Macintosh via the modem or printer serial port, you'll want to take advantage of FreeMIDI's support for the MIDI Timepiece AV fast data transfer rate. This provides better throughput from Performer or Digital Performer running on the Macintosh to all of the MIDI devices connected to the MIDI Timepiece AV. For details, see "Using 'FAST' serial mode" on page 16.

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CHAPTER 6 ClockWorks

OVERVIEW

This chapter introduces ClockWorks™, the console software for all MOTU MIDI interface/synchronizer hardware products. ClockWorks lets you configure and program your MOTU interface/synchronizer, taking full advantage of its many advanced features.

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OPENING CLOCKWORKS

After setting up FreeMIDI or OMS as described in chapter 4, "Installing the MOTU USB Software" (page 23), follow the procedure below to ensure that it has successfully established communication with your MOTU interface.

☛ You might want to double-check to make sure that your MOTU interface is switched on before you launch ClockWorks. This ensures smooth hand-shaking between ClockWorks and the interface.

1 Double-click the ClockWorks icon.

After you launch ClockWorks, the software and hardware perform a handshaking operation to establish communication. This may take a brief moment, and the lights on the front panel of your MOTU interface will flicker during this period. If the handshake is successful, ClockWorks will open, and its menu bar appears with the File, Edit, Windows, and Utilities menus. If this is the first time you've opened ClockWorks, you should also see the Device List window, as shown below in Figure 6-1. If not, you can open it by choosing it from the Windows menu.

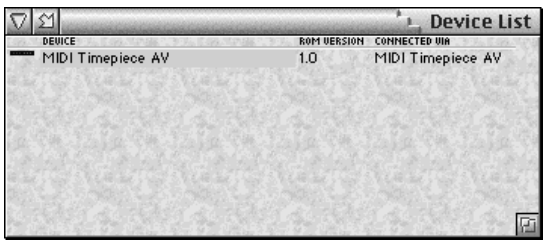

Figure 6-1: The Device List window shows what MOTU interface were detected by ClockWorks when it opens.

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IF YOUR MOTU INTERFACE DOESN'T APPEAR

If your MOTU interface doesn't show up in the Device List, check the following things:

■ Your MOTU interface is turned off. Power it up and choose *Verify Network* from the Utilities menu.

■ A MOTU interface is not connected to the Mac, or it is connected improperly. Make sure your cable connection(s) to the interface match Figure 2-1 and Figure 2-2 on page 9. Then click Try Again.

■ Open FreeMIDI Setup or OMS Setup and make sure that the interface is present in your current studio setup. If not, scan for it as explained in

2 If you make any adjustments to your hardware, choose *Verify Network* from the Utilities menu to make the ClockWorks scan the network again.

Alternately, you can press command-N. You can continue to make adjustments and verify the network until the Device List window matches your MOTU interface setup.

3 Once you have verified the presence of your MOTU interface/synchronizer, you are ready to begin using the other features in ClockWorks.

THE DEVICE LIST WINDOW

ClockWorks serves as the "control center" for your MOTU interface. The Device List window is one of the most important windows because it shows you the current state of communication with your MOTU interface.

If ClockWorks has detected and established normal communication with your interface, it appears by name as shown in Figure 6-1 on page 37.

If your MOTU interface is off-line (switched off or temporarily disconnected), its icon will become grayed out.

Working with several MOTU devices

ClockWorks serves as the control center for all MOTU interface and synchronizer products, including the Digital Timepiece synchronizer. If you have several MOTU devices, they will all appear in the Device List (once ClockWorks has established communication with them).

When you're working with several MOTU devices, ClockWorks needs to know which device you want to work with at the moment. You indicate this by opening the Device List from the Windows menu and clicking the name of the device you want to control. This make the windows and menus of ClockWorks apply to the currently selected device. If a menu item or other item does not apply to the device, it becomes grayed out.

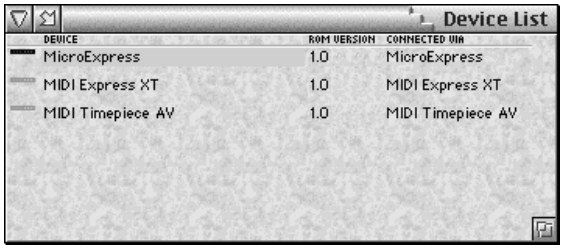

Figure 6-2: The Device List lets you control which device you are working with in ClockWorks when you have several pieces of Mark of the Unicorn gear. Click the name of device to select it. The settings of the currently selected device appear in all of ClockWork's windows.

CLOCKWORKS BASICS

In explaining how to use ClockWorks, this chapter assumes that you are already familiar with the standard Macintosh user interface conventions, such as how to select options using check boxes and radio buttons, how to type and edit text, and so forth.

Overall look and feel

The ClockWorks "look and feel" is modeled after Mark of the Unicorn's award-winning Performer sequencing program. Several aspects of this interface, including mini-menus, are explained later in this chapter. Even if you are familiar with

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Performer's conventions and appearance, we suggest that you skim this chapter to learn about features that are unique to ClockWorks.

The following sections cover several important, unique characteristics about ClockWorks.

Windows

Most of the features in ClockWorks are presented to you in windows opened from the Windows menu. The Utilities menu contains several additional commands which are described in chapter 12, "Utilities Menu" (page 73).

After you open a window, you can position it anywhere on the screen. It will remember this location. In several windows, the name of the current base setup or modifier is displayed in parentheses in the title bar of the window to clearly indicate which base setup the settings apply to.

Mini-menus

Most of the ClockWorks windows have mini-menus, which are located in the title bar of the window at the left-hand side next to the close triangle. A mini-menu acts just like a Macintosh main menu except that it provides commands that are specific to its own window.

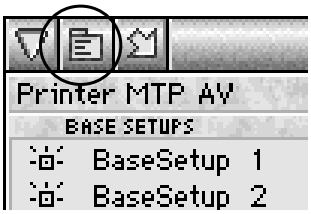

Figure 6-3: A mini-menu

Buttons

Every time you click a button in a ClockWorks window, ClockWorks sends a corresponding command to your MOTU interface/synchronizer. Therefore, the buttons in the window always reflect the state of the interface hardware.

Radio buttons

Although ClockWorks radio buttons look unique, they behave just like standard Macintosh radio buttons. Radio buttons work such that you can only select one of the given choices; if you click a new button, the previously chosen one will deselect.



Figure 6-4: ClockWorks radio buttons.

Check boxes

Check boxes are also a bit different. You can select any combination of them.



Figure 6-5: A ClockWorks check box.

Push buttons

ClockWorks push buttons look different from but function the same way as standard push buttons.



Check box grid

The Event Muting window displays an entire grid of check boxes, like this:

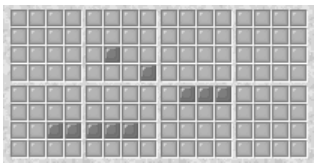

Figure 6-6: A check box grid.

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The grid consists of check boxes placed edge to edge in rows and columns. The rows and columns are arranged into groups of four for clarity. A check box in the grid represents a connection between its row and column numbers.

Check boxes in a grid function the same way as regular check boxes. In addition, we have added several shortcuts that you will find extremely useful when using the grids. To select several adjacent boxes, click and drag. To select an entire column, click the column number. Similarly, to select an entire row, click the row name.

To deselect an entire row or column, click the name or number again. The row will only deselect if all boxes in it are selected.

Text boxes

There are text boxes throughout ClockWorks for typing in things like MIDI channel numbers, etc. However, in addition to typing in the standard fashion, ClockWorks also lets you drag vertically to change the value. Just click on the current number in the box and drag vertically.

Using ClockWorks with multiple interfaces

ClockWorks provides many windows that control various aspects of a single MOTU interface.

When you have two or more MOTU interfaces connected to your Mac, you need to choose which one you are controlling with the software. There are two ways to choose:

- Click the MIDI Timepiece icon in the Device List window.

OR

- Choose the MIDI Timepiece name using the Box Select command in the Utilities menu.

For example, if you want to set up the Pedal A input of your MIDI Timepiece AV, you need to select that MIDI Timepiece in the Device List window before you go to the Pedals & Knobs window to make your settings. The currently selected device highlights.

Working with a MIDI Timepiece I or II

If you have a MIDI Timepiece I or II networked to your MIDI Timepiece AV, you can use ClockWorks to access virtually all of the original MIDI Timepiece's features. To do so, click the icon of the MIDI Timepiece AV in the Device List window and then use the features in ClockWorks's windows to do what you need to do.

☛ When an original MIDI Timepiece is selected in the Device List window, features that are not supported by it (such as freewheeling in the SMPTE Controls window) are greyed out to indicate that they are not available. To reactivate them click on a MIDI Timepiece AV or other interface that supports those features in the Device List window.

Understanding the interaction between the software and hardware

ClockWorks always reflects the current state of your MOTU interface/synchronizer. At least, it *should*. If, at any time, you suspect that the windows in the software don't accurately reflect what's going on in the hardware for some reason, choose *Verify Network* from the Utilities menu. Doing so reestablishes communication between the software and hardware, and the software gets updated to the current state of the hardware.

When communication is successfully established, changes you make in ClockWorks are immediately reflected in the hardware.

Likewise, when you select a preset (or MIDI Timepiece AV base setup) from the front panel, your MOTU interface updates the software on the computer, as long as the software is the currently

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active application. This is actually a handy way to run through all of your user presets (or MIDI Timepiece AV base setups and patches) to inspect each one's settings in the software. If ClockWorks is not the active application on the computer, a system exclusive message is sent to whatever application is currently active. If this application is recording incoming MIDI, these sysex messages get recorded as well.

☛ Other changes you make in the LCD of a MIDI Timepiece AV, such as changing a specific parameter, *are not reflected* in the ClockWorks. To update the software, choose Verify Network from the Utilities menu.

OBTAINING THE ROM VERSION

To obtain the ROM version of any MOTU interface/synchronizer connected to your computer, look in the Device List window. The ROM version is displayed to the right of each interface in the list.

On a MIDI Timepiece AV, the ROM version is also displayed in the LCD when the unit is first powered up.

MEMORY METER

The Memory meter window can be opened by choosing its name from the Windows menu or by pressing command-M.



Figure 6-7: The Memory meter.

This window displays the amount of the computer's random access memory (RAM) available to ClockWorks. Ideally, this window should display at least 100,000 bytes. Normally, it won't get much lower than this. If it does get lower, quit ClockWorks and increase the memory partition in the Get Info window. (Highlight the ClockWorks icon and choose Get Info from the File menu.) You may also want to do this if you create and use many modifiers.

WORKING WITH FILES

ClockWorks lets you save the entire contents of your MOTU interface's memory, including base setups, modifiers, and patches (which are explained in later chapters) as a file on disk. The file can later be opened and modified at any time. This allows you to store an unlimited number of MOTU interface setups.

ClockWorks handles file saving, opening, and closing in the normal Macintosh fashion. You can save a file, open it, make changes to it, save the changes, or save them as a different file under a different name with the Save As command.

☛ ClockWorks is unique, however, when you close a file. In most Macintosh programs, when you close a file, windows associated with the file close as well. In ClockWorks, none of the windows "belong" to a specific file, so any windows that are open will remain open after you close.

Creating a new file

To create a new file, just open ClockWorks. When you open ClockWorks, it loads the entire contents of the MOTU interface memory into the computer. It is stored in RAM until you save it as a file, which is explained in the next section.

Saving files

As you work with ClockWorks, the settings it is currently displaying are stored in you MOTU interface's memory. If you create an operating configuration that is either important to you or somewhat time-consuming to recreate, we strongly recommend that you also save it as a file on your computer's hard disk. This will allow you to easily restore it at a later time, if necessary, by simply opening it in ClockWorks.

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Here's the basic procedure to save a file:

1 Choose the Save command from the File menu.

2 If you are saving the file for the first time, a dialog box will appear prompting you for a name. Type in the name of your file and click Save.

After you save, any changes you make will not be saved with the file until you save again.

Saving a file under a different name

The Save As command is used to save a file under a different name or to a different disk:

1 Choose *Save As* from the File menu.

The Save As dialog box will appear.

2 Type in the new name for the file.

3 Click Save.

Your file is saved on the disk in its current state under the new name.

Reverting to a previously saved version

If you've made unwanted changes to a file, you can undo the changes you've made by returning to the last saved version. This operation is identical to closing the file without saving changes and opening it from the disk again.

1 Choose Revert to Saved from the File menu.

A dialog box asks you to confirm this choice.

2 Click on OK to confirm your choice.

Reverting to the last saved version of the file means that all changes you've made since you opened or last saved the file will be lost.

Reverting to a previously saved version is useful when experimenting with a file. You can quickly remove any changes by using this command. Make sure that you save the file in the state you want it before beginning to experiment.

Opening an existing file

To open an existing file:

1 Double-click on the file icon.

You can also click once on the file and choose Open from the File menu. This will start ClockWorks and bring up the selected file.

To open an existing file from within ClockWorks:

1 If a file is already open, close it by selecting Close from the File menu. You are given the option of saving changes in this file.

2 Select Open from the File menu.

A dialog box appears containing a list of files on the selected disk. To see the files on a disk in a different drive, click the Desktop button. To view files on another disk which is not currently in a drive, click on the Eject button and insert the other disk.

3 Click on the name of the file you wish to open.

4 Click on the Open button.

The file you selected will be opened. Double-clicking on the name of the file will also open the file.

Checking to see what file is currently open

To determine which file you currently have open in ClockWorks, if any, check the Close command in the File menu. If a file is open, the Close command will read Close 'Filename', where the name of the file is displayed in parentheses after the word *Close*.

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Closing a file

To close a file, choose Close 'filename' from the File menu, where *filename* is the name of the currently open file. If you have made changes in ClockWorks windows that are not yet saved, you will be asked if you want to save them before closing.

☛ All ClockWorks windows that are currently open will remain open after you close the current file. If you wish to make further changes to the file, you will need to reopen it first (with the Open command) in order to be able to save them.

Quitting ClockWorks

Quitting ClockWorks returns you to the Macintosh desktop.

- Choose *Quit* from the File menu.

A dialog box may appear asking you if you want to save changes made to the file. To save the changes, press Save. If you don't want to save changes, press Don't Save. To withdraw the Quit command and return to your ClockWorks file, press Cancel.

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CHAPTER 7 Device Settings & Routing

OVERVIEW

The Device Settings & Routing Window in ClockWorks provides an easy and powerful way for you to route MIDI data from any device connected to your MOTU interface to any other device connected to it. This window provides you with complete control over the flow of MIDI data through the interface (or a two-MTP network).

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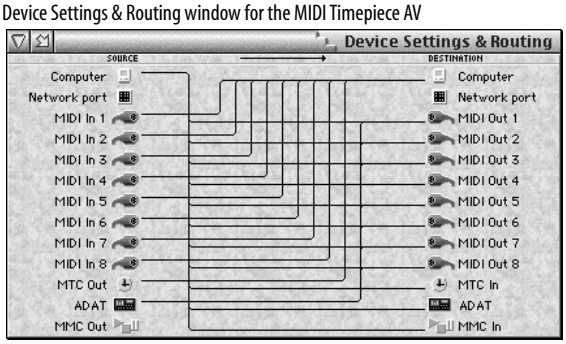
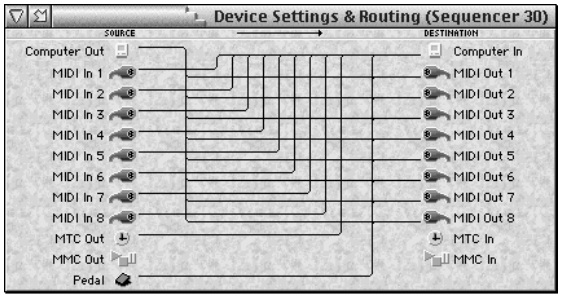
DEVICE SETTINGS & ROUTING WINDOW

If you created a bare-bones FreeMIDI or OMS setup as shown in Figure 4-2 on page 25 or Figure 4-4 on page 27, you'll see the generic names (Cable 1, Cable 2, etc.) shown below in Figure 7-1.

Device Settings & Routing window for the MIDI Timepiece AV



Device Settings & Routing window for the MIDI Express XT



Device Settings & Routing window for the micro express

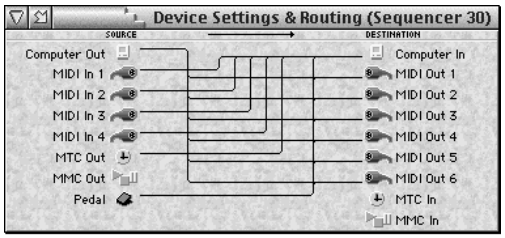


Figure 7-1: The Device Settings & Routing window provides graphic access to all of your MOTU interface's MIDI routing, merging and splitting capabilities. If you have two MIDI Timepieces networked together, you'll see 16 cables instead of 8.

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NAMING DEVICES WITH FREEMIDI OR OMS

If you configured your FreeMIDI or OMS setup to accurately reflect the names of the devices connected to your interface, you'll see device names as shown below in Figure 7-2. These device names are also displayed in other windows throughout ClockWorks, including the Channel Mapping, Event Muting, Knobs & Pedals, Patch List, MIDI Cannon, and Setups & Modifiers windows.

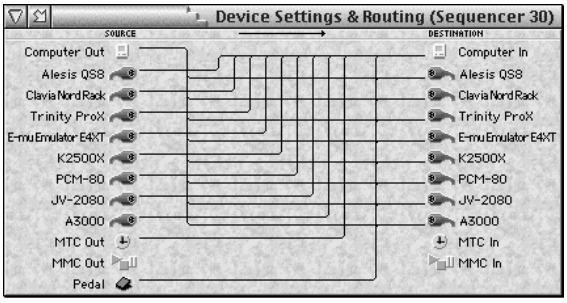

Figure 7-2: FreeMIDI or OMS provides names for the MIDI device connected to each input and output. Choose Edit FreeMIDI Configuration from the Utilities menu to open FreeMIDI Setup or OMS Setup and create device names. If you have multiple devices connected to a MIDI port, the console displays the term 'multipledevices'.

Use FreeMIDI Setup or OMS Setup to add, remove, or change device names. To launch FreeMIDI Setup or OMS Setup from within ClockWorks, choose *Edit FreeMIDI Configuration* from the Utilities menu in ClockWorks. Then refer to the information below.

To do this	Do this
Add a device	FreeMIDI Use the *Create Device* or *Quick Setup* commands in the Configuration menu. OMS Use the *New Device* command in the Studio menu.
Delete a device	Click it to select it and press the delete key.
Rename a device	Click its name to edit the text.

MAKING A CONNECTION

To connect any MIDI device to another in the network:

1 Click the source cable icon on the left and drag to the destination cable icon on the right as shown below in Figure 7-3.

In the example below, the Alesis QS8 keyboard controller is being connected to the Roland JV-2080 sound module.

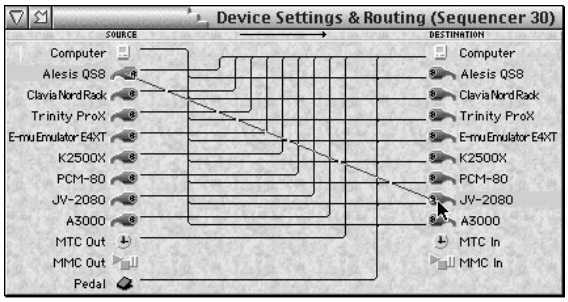

Figure 7-3: Routing MIDI data from one piece of gear to another.

2 When you release the mouse, the connection appears in the window as shown in Figure 7-4, along with an activated pop-up box on top of the connection with the word *all* in it.

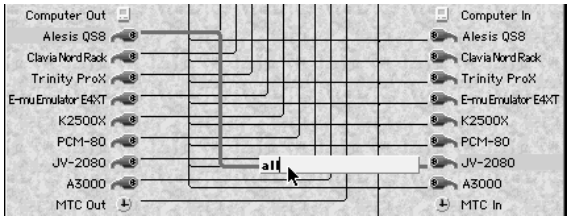

Figure 7-4: Setting the MIDI channels when making a connection.

The "all" box means that all channels on the QS8 are currently routed to all channels on the JV-2080. If you want to connect specific MIDI channels, see "Specifying channels in a connection" on page 48. (Note: the original MIDI Timepiece I does not support routing by channels in this manner. Therefore, if you connect the input of an original MTP to an MIDI Timepiece AV output, there will be no channel box.)

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3 Press return to confirm the cable connection.

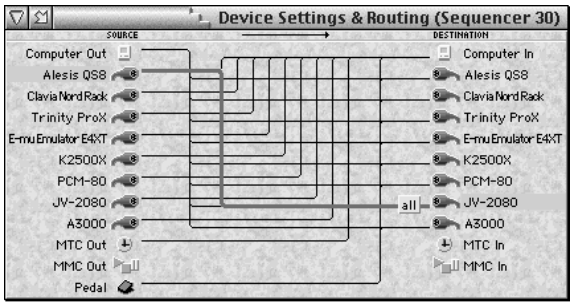


Figure 7-5: A completed cable connection.

CONNECTING ONE INPUT TO MULTIPLE OUTPUTS

To connect an input to more than one output, make each connection separately as described in the previous section. As a shortcut, shift-drag from the input cable on the left over to the first output, and then drag directly to each additional output on the right. As you "touch" each output, it highlights and a connection is made.

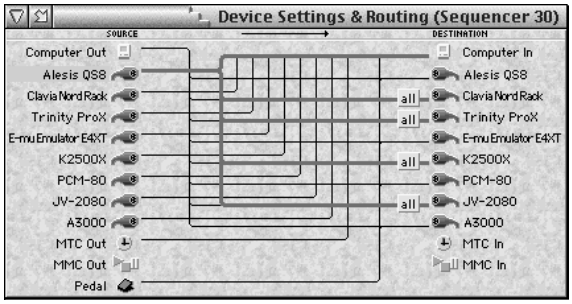


Figure 7-6: Connecting one input to several outputs.

SELECTING A CONNECTION

To select a connection, click the connection's input cable icon on the left or any one of its output cable icons on the right.

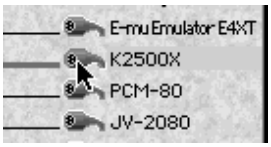


Figure 7-7: Selecting a connection.

DESELECTING ALL CONNECTIONS

To deselect all connections, click anywhere in the middle of the window between the two columns of cables.

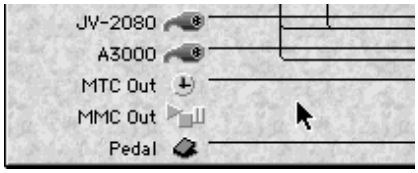


Figure 7-8: Click anywhere on the background to deselect all connections. A deselected connection appears as a thin line.

BREAKING A CONNECTION

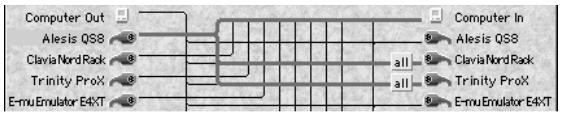
To break a connection:

1 Select the connection by clicking its cable icon.

2 Press the delete key, or choose Clear from the Edit menu.

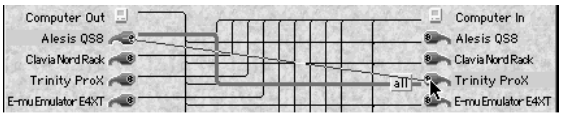
BREAKING ONE OF SEVERAL CONNECTIONS

Often, a device will be connected to several other devices, like this:



And you'll want to only remove one of the connections. To do so:

1 Redraw the connection you want to break.



2 Press the return key to get past the channel pop-up.

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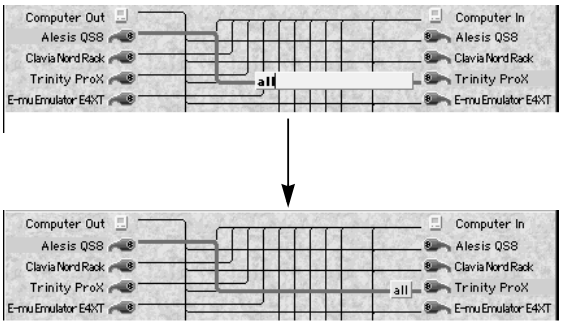
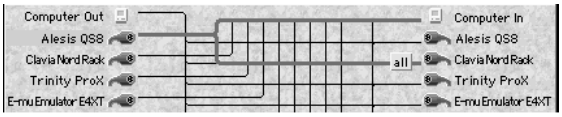


3 Press the delete key to remove the highlighted connection. If you click on the device again, the connection will be gone:



SPECIFYING CHANNELS IN A CONNECTION

Your MOTU interface lets you specify channels when you make a connection from one piece of gear to another.

For example, you can specify that channel 2 on the input is to be connected to channel 2 on the output. The input and output channel will always be the same in a connection. (To change channels on input or output, you can use the Channel Map window.)

Multiple connections from the same device can have different channel assignments. For example, you could make a connection from your controller to channel 1 on one synth, and then make a second connection to channel 5 on another synth.

To specify the channel to be routed:

1 Click the MIDI cable icon of either the input device or output device.

2 Click the text box on the connection.

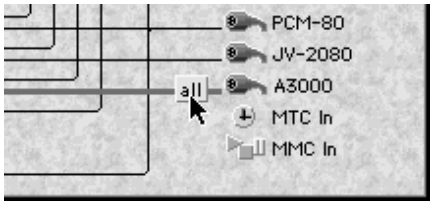
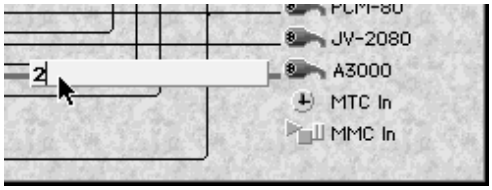


Figure 7-9: Specifying a single MIDI channel in a Device Settings & Routing connection. To do so, click the input device and then pop-edit the box shown.

3 Type in the desired MIDI channel in the text box and press return to confirm your choice.



If you want, you can type in several channels as shown below. This is useful if you are using a keyboard split on your controller and you want to send the splits to different channels of the same synth. In Figure 7-10, the QS8 keyboard is split into three parts, transmitting on channels 1, 2, and 3, which are being connected to channels 1, 2, and 3 on the Emulator E4xt, as well as a few other synths. In each connection, channel 1 is being mapped to channel 1, channel 2 is being mapped to channel 2, etc. If you want all channels to be connected, type "a" for "all" (connect all channels).

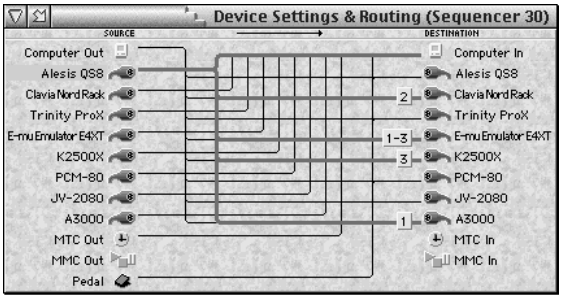


Figure 7-10: Specifying multiple channels when making connections.

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☛ Note: channel remapping cannot be done in this window. For example, you cannot route channel 3 on the QS8 to channel 5 on the E4. To accomplish this, see chapter 8, "Channel Map" (page 55).

MAKING COMPUTER CONNECTIONS

When your MOTU interface ships from the factory, it is set up so that anything connected to the interface can talk to the computer, and the computer can talk to anything connected to the interface. These connections are represented by the lines connected to the Computer icons in the Device Settings & Routing window.

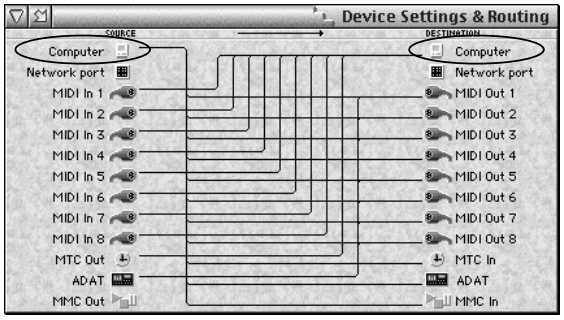

Figure 7-11: Editing computer connections. To route MIDI data to the computer, use the computer icon on the right. To route MIDI data from the computer, use the computer icon on the left.

Edit these connections in the same manner as described earlier in this chapter.

MAKING NETWORK PORT CONNECTIONS (For the MIDI Timepiece AV only)

As described in "Networking a serial MIDI device" on page 21, you can connect a regular 16-channel MIDI interface or other serial device (such as a keyboard or sound module with a Mac serial port on it) to the Network port of the MIDI Timepiece AV. If you have done so, you can make routings to and from the network port device with the Device Settings & Routing window.

The Device Settings & Routing window displays the NET port for the MIDI Timepiece AV as shown below.

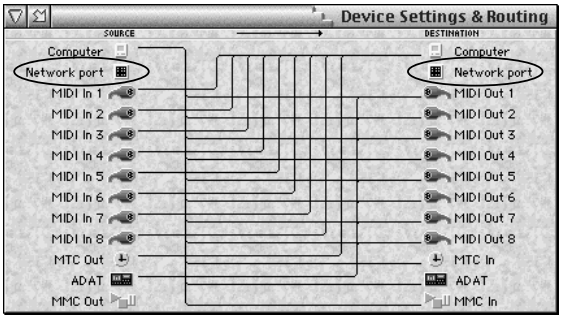

Figure 7-12: Make NET port connections on a MIDI Timepiece AV with the Network ports circled above using the techniques already described in this chapter. To route MIDI data to the NET port, use the Network port on the right. To route MIDI data from the NET port, use the Network port icon on the left.

COMPUTER PORT ROUTING IN A TWO-MTP SETUP

If you have a second MIDI Timepiece connected to the network port, the network port icon changes to a second computer icon, since it refers to the Mac port on the second MIDI Timepiece (box 9-16).

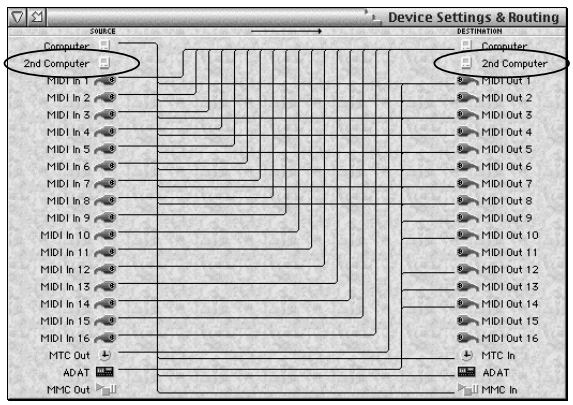

Figure 7-13: The Mac serial port on box 9-16 in a two-MTP network.

THE MTC IN AND MTC OUT CONNECTIONS

The MTC In and MTC Out connectors represent MIDI Time Code (MTC) routing to and from the interface itself. If you would like to send MIDI Time Code from your MOTU interface to devices connected to its MIDI Out ports, create a connection from the MTC Out port to the desired devices, as shown in Figure 7-14.

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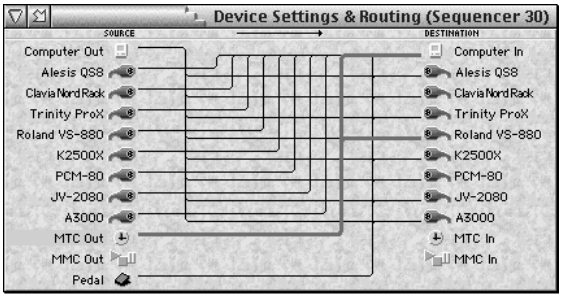

Figure 7-14: To send MIDI Time Code (MTC) generated by the MIDI Timepiece AV to other devices in your network, make a connection from the MTC Out port (on the left) to the desired devices on the right as shown here. In this example, the MOTU interface (an Express XT in this example) is programmed to send MTC to the Roland VS-880 hard disk recorder (and the computer, too, of course).

Routing MTC to your MOTU interface

If you would like to slave your MOTU interface to MIDI Time Code generated by another device, make a connection from the device (on the left) to the MTC In port (on the right). If you have a MIDI Timepiece AV, you'll also need to set the MASTER SYNC mode to MTC or MTC/VIDEO. (Please note that MTC mode is not recommended because other forms of SMPTE provide a more stable time base. For details, see "Advice about choosing a time base master" on page 140.)

Routing MTC to the computer port

From the factory, your MOTU interface is programmed to send MTC to the computer port, as shown below in Figure 7-15. This connection is required by any MIDI software that needs to slave to MTC generated by the interface.

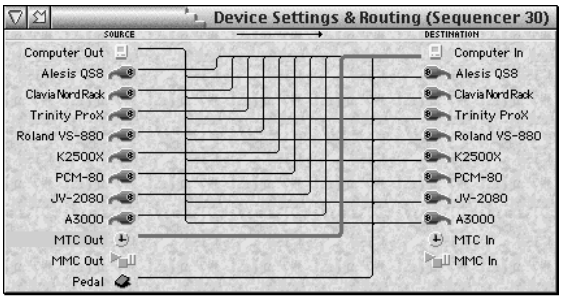

Figure 7-15: From the factory, your MOTU interface is programmed to send MIDI Time Code to the computer as shown here by the selected connection. This connection is necessary for slaving software to MTC generated by the interface.

Routing MTC to an MTP AV Net port (AV only)

If you have a MIDI Timepiece AV, you can route MIDI Time Code to a device connected to the Network port as shown below (but not if the network port is connected to a second MIDI Timepiece).

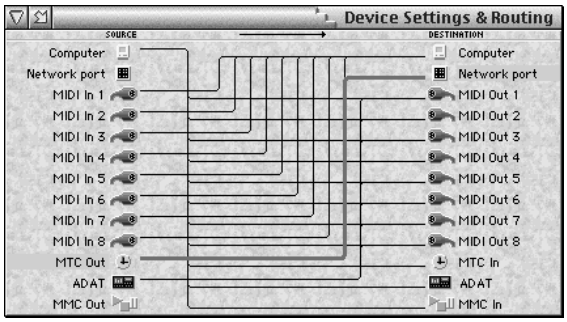

Figure 7-16: Sending MIDI Time Code to a device connected to the network port. (Note: see Figure 7-17 if a second MIDI Timepiece is connected to the network port.)

Routing MTC to a 2nd MTP AV Mac port (AV only)

If you have a second MIDI Timepiece (box 9-16) with a computer connected to it, you can route time code to it from box 1-8 as shown below in Figure 7-17.

It is not necessary to route MIDI Time Code to ADATs connected to the MIDI Timepiece AV's ADAT Sync Out port. The MIDI Timepiece AV synchronizes ADATs using a proprietary sync protocol that is "hard-wired"; it is therefore not represented graphically in the Device Settings & Routing window. The ADAT ports have no impact on the AV's synchronization control over ADATs.

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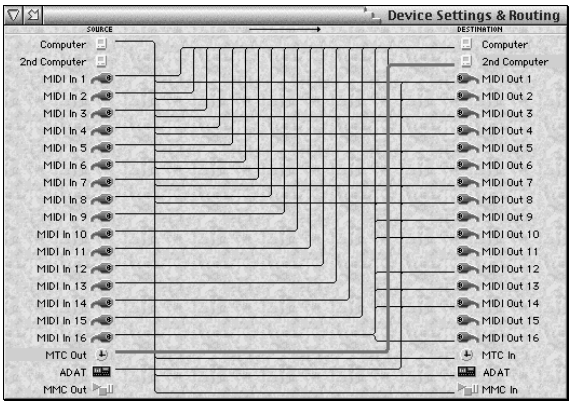

Figure 7-17: Routing MTC to a second computer connected to a second MIDI Timepiece.

THE ADAT PORTS
(For the MIDI Timepiece AV only)

The ADAT ports in the Device Settings & Routing window allow other devices in your studio—or computer software, such as a "soft BRC" console—to communicate with ADATs connected to the MIDI Timepiece AV's MIDI Sync Out port. If you have software that needs to communicate back and forth with the ADATs for purposes other than standard MMC transport control (which is handled by the MIDI Timepiece AV), all you need are the factory default connections to the ADAT ports shown below.

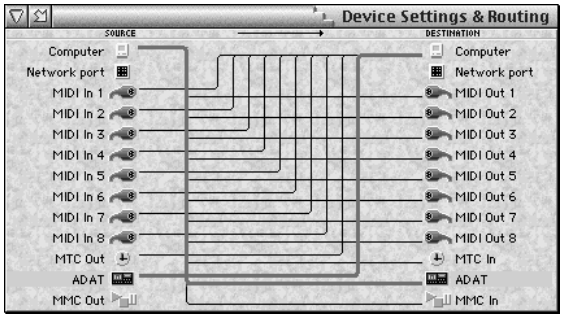

Figure 7-18: These factory default connections between the ADAT ports and the computer allow software, such as a "soft BRC" console, to communicate with ADATs connected to the AV's ADAT Sync Out port. These connections are not required, however, for MMC transport control of the ADATs, which is handled by the MIDI Timepiece AV.

Synchronization and transport control between the MIDI Timepiece AV itself and ADATs connected to its ADAT Sync Out port is "hard-wired" and is therefore not represented graphically in the Device Settings & Routing window. The ADAT ports have no impact on the AV's control over ADATs.

ADAT PORT SETTINGS
(For the MIDI Timepiece AV only)

If you click on either ADAT icon in the Device Settings & Routings window, the ADAT port settings dialog appears:

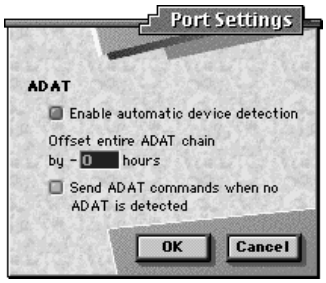

Figure 7-19: ADAT port settings.

These settings help you manage how the MIDI Timepiece AV interacts with your ADAT device.

Enable automatic device detection

When this option is checked (the default setting), the MIDI Timepiece AV continuously polls its ADAT port for the presence of an ADAT. If you plug one in and turn it on, the AV will detect it and perform its routine handshake with the ADAT (or any ADAT device on the ADAT sync chain).

Some ADAT-sync compatible devices do not respond well to this sort of continuous polling. If your ADAT device or ADAT sync chain is not behaving normally, try unchecking this box.

Offset entire ADAT chain by _hours

When ADATs run under ABS time, the time span on an ADAT tape is from zero to 45 minutes. Sometimes, however, the MIDI Timepiece AV needs to be working at a timecode offset that starts in another hour besides zero. For example, many SMPTE time code cues start at 1 hour and go from there. If you are working with a similar situation,

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you can simply type in a 1-hour negative offset here in the Port settings dialog. Then, when the MIDI Timepiece AV goes to 1 hour, 13 minutes, for example, the ADATs connected to your AV will go to 13 minutes.

Here's another example. If the time code you are working with is in the 10-hour range (10:00:00:00), you would type in a 10-hour negative offset.

☛ This ADAT chain offset affects the time readout of each individual ADAT in the Sync/MMC window. For example, if the ADAT chain offset is -1 hour, the individual ADAT offset (in the ADAT's panel) will be 1:00:00:00.

Send ADAT commands when no ADAT is detected

When this option is checked, the MIDI Timepiece AV will send sync commands to its ADAT SYNC OUT port, regardless of whether an ADAT device has been detected or not.

When this option is unchecked, the MIDI Timepiece AV only sends sync commands to the ADAT port when an ADAT device is detected. If no ADAT device is detected, it sends nothing.

Check this option when you have connected the MIDI Timepiece AV ADAT SYNC OUT port directly to a MOTU PCI-324 card SYNC IN port, with no ADATs in between.

THE MMC OUT AND MMC IN PORTS

The MMC Out and MMC In ports provide routing of MIDI Machine Control (MMC) transport commands to and from your MOTU interface itself. For example, if you would like to send MMC transport commands generated by (or redistributed by) your MOTU interface itself to another device, create a connection from the MMC Out port to the desired device as shown below in Figure 7-20. Usually, you will only have one such connection at a time, as only one device would be triggered as the Time Code source. Note also that this connection is not necessary, however, if you intend to send MMC transport commands directly from computer software (or a MMC hardware device) to a MMC device.

MMC In and MMC Out port connections only involve MMC transport commands; they do not route MMC record functions, such as record-enable or auto punch-in/out. To route MMC record functions, make connections between the Device Settings & Routing Window's MIDI ports and computer icon as needed.

If you have a MIDI Timepiece AV, it is not necessary to connect the MMC Out port to either ADAT port; MIDI Timepiece AV control over ADATs connected to its ADAT Sync Out port is "hard-wired" and therefore not represented graphically in the Device Settings & Routing window.

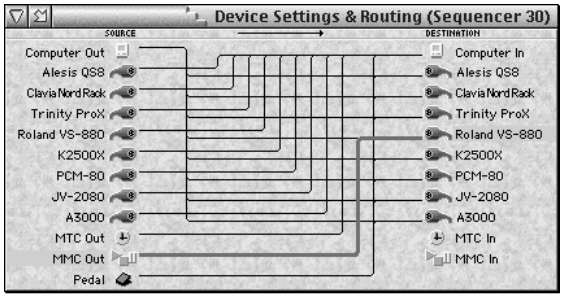

Figure 7-20: When you want to trigger another MMC device with your MOTU MIDI interface, or if you want the interface to redistribute MMC transport commands from your sequencer or an Alesis LRC, connect the MMC Out port to any device you wish to control. Note that these MMC connections involve MMC transport commands only. For MMC record functions (play-enable, punch-in, etc.), use the regular MIDI ports and computer connections.

Routing MMC from the Mac to the interface

The MMC In port in the Device Settings & Routing window represents MIDI Machine Control input to your MOTU interface itself. In other words, the interface "listens" to MMC transport commands from any devices (or computer software) connected to this port.

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For MMC transport control of the interface from the computer, make the connection shown below in Figure 7-21.

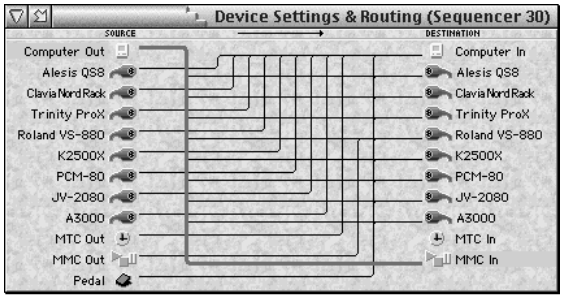

Figure 7-21: The selected connection shown above is required when you want to control your MOTU interface — and any devices slaving to it — from your sequencer or other MMC software on the computer.

Direct MMC versus redistributed MMC

When the connection shown in Figure 7-21 is made, your MOTU interface "swallows" all MMC transport commands sent by MMC software running on the computer, regardless of the MMC device the messages are intended for (as determined by the MMC device ID embedded in the messages). If you want to control a MMC device from your computer, you have two choices:

1. bypass the interface's MMC features,

2. or send the MMC transport commands to the MOTU interface instead and have it redistribute them to the other MMC device(s)

If you would like to bypass the interface and control a MMC device directly from your computer software (choice #1 above), remove the highlighted connection shown in Figure 7-21.

If you plan to use choice #2 above, make the connection shown in Figure 7-21, and also make connection shown in Figure 7-20 (which routes your MOTU interface's MMC Out port to the other MMC device).

Connecting an MMC controller

If you would like to control your MOTU interface from a MMC controller connected to one of its MIDI inputs, connect the device's input cable to the MMC In port as demonstrated below.

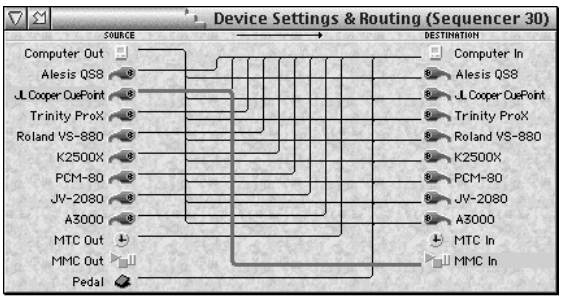

Figure 7-22: To control your MOTU interface from a MMC controller such as JLCooper's CuePoint, connect it to the MMC In port.

☛ An Alesis LRC controller does not require any routing in the Device Settings & Routing window because of its special connection to the LRC Input on the MIDI Timepiece AV's front panel. For details, see "Using an Alesis LRC" on page 158.

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CHAPTER 8 Channel Map

The Channel Map window controls the channelizing of MIDI data on all MIDI IN and MIDI OUT cables. With complete flexibility, this window can switch data from its current MIDI channel to any other channel immediately when the data either enters or exits your MOTU interface.

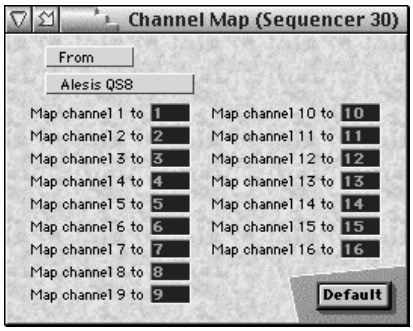

Figure 8-1: Use the pop-up menus to choose the MIDI device input or output you would like to remap. Then change the MIDI channel numbers as desired. Click the Default button to restore all mappings to their default state (channel 1 to channel 1, 2 to 2, etc.)

BASICS

A simple way to think of channel mapping is this: imagine that each MIDI IN or MIDI OUT port connected to your MOTU interface has a filter just inside the socket. MIDI data enters the filter on one channel and as it passes through the filter, it gets switched to a different channel.

On a MIDI IN port, data enters on a given channel. But before it goes anywhere else, either to the Macintosh or to a MIDI OUT cable, the Channel Map window can switch the data to a different MIDI channel.

On a MIDI OUT cable, data exits the interface. But before it does, the Channel Map window can switch the data to a different channel.

USING CHANNEL MAPPING

Channel Mapping like this is useful in many different situations. For example, you may have a MIDI keyboard that only transmits data on MIDI channel 1. If you want to transmit its data on a different channel, you can map channel 1 on the keyboard's MIDI IN cable to any other MIDI channel. To the rest of the network, it will then appear as if the keyboard is transmitting on the new, destination channel.

MUTING AND REMAPPING

For information about when muting occurs before channel mapping and vice versa, see "Muting and remapping" on page 58.

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CHAPTER 9 Muting

OVERVIEW

The Event Muting window is a sophisticated MIDI data filter that controls what types of data will be sent and received by each MIDI OUT and MIDI IN cable. You can filter out any type of MIDI data on any channel on any cable. In addition, each MIDI channel can have its own unique muting setup. The Event Muting window shows the muting status for each type of data on all MIDI channels and all cables at once, giving you immediate feedback on the state of your interface.

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Muting a data type on all channels 58
Muting on all channels, all cables. 58
Unmuting data 58
Muting MIDI beat clocks 58
Muting and remapping 58

BASICS

A simple way to think of data muting is this: imagine that each MIDI IN or MIDI OUT cable on your MOTU interface has a filter just inside the socket. A MIDI data stream enters the filter and then continues on past the filter with certain types of data removed. The filter has simply "swallowed" the data types that are being muted.

On a MIDI IN cable, data is muted before it enters the interface. On a MIDI OUT cable, data gets muted just before it gets transmitted out of the interface.

☛ When data is muted on a MIDI IN port, the light on the front panel still blinks when the data is received on the port. Don't be concerned. The light blinks to let you know that the interface is indeed receiving the data on that port. However, the data does get muted. (On output, however, since muted data doesn't actually get sent, the light does *not* blink.)

Whenever you would like to mute data, begin with the following procedure:

1 If you have more than one MOTU interface, select the box you want to mute in the Device List window in ClockWorks. See "The Device List window" on page 38 for details.

2 From the Windows menu, open the Event Muting window.

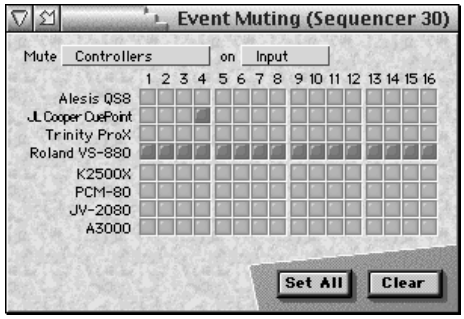

Figure 9-1: The pop-up menus at the top of the window let you choose the type of data to be muted and whether you are muting MIDI inputs or outputs. Click the desired check box(es) in the grid; each check box represents a MIDI channel (by column) for a device (by row). When the check box is checked, the data is muted.

3 Select the type of data to be muted from the *Mute* pop-up menu.

4 Choose *Input* or *Output* from the pop-up menu.

Doing so makes the check box grid control muting for either MIDI IN ports or MIDI OUT ports.

Now you are ready to click check boxes in the grid to mute data.

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MUTING DATA ON A SINGLE CHANNEL

To mute data on a single MIDI channel for a device, click the appropriate check box in the grid. Its channel number is labeled by column across the top of the grid; its device is labeled by row along the left side of the grid.

MUTING A DATA TYPE ON ALL CHANNELS

To mute a data type on all 16 channels for a device, click the device name at the left edge of the check box grid. Doing so will select all check boxes in the row, selecting all channels for muting.

MUTING ON ALL CHANNELS, ALL CABLES

To mute a data type on all channels and all devices, click the Input button and click Set All. This sets the grid to all MIDI IN cables and select all the check boxes in the grid. Similarly, click the Output button and click Set All again. This sets the grid to all MIDI OUT cables and selects all the check boxes.

UNMUTING DATA

To unmute data on a single channel, deselect its check box. To unmute data on all channels and cables, click Clear.

MUTING MIDI BEAT CLOCKS

When MIDI beat clocks are transmitted to your MOTU interface (via a MIDI device or the Macintosh) they are echoed to all cables. If you do not want MIDI beat clocks sent to all your MIDI devices, mute Real-time data on the output cables for those devices.

MUTING AND REMAPPING

On the MIDI IN ports, muting occurs before channel remapping. On the MIDI OUT ports, channel remapping occurs before muting, as shown in Figure 9-2.

For example, let's say that on one of the MIDI ports, you are muting channels 1-8, and you are also remapping all channels (1-16) to channel 16.

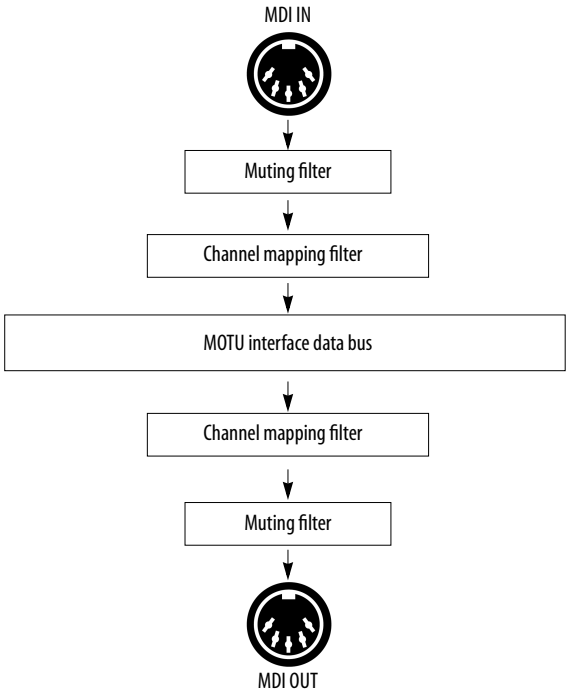

Figure 9-2: How muting and remapping interact with each other.

If you did this on a MIDI IN port, channels 1-8 would get muted, and the data on channels 9-16 would get mapped to channel 16. If you did this on a MIDI OUT port, all data on all channels would be sent out on channel 16, since all channels are mapped to channel 16 before the muting occurs on channels 1-8.

Here's another example: Let's say you are mapping all channels to channel 1, and you are muting channels 1-8.

On input, only channels 9-16 will get rechannelized to channel 1, because channels 1-8 get muted first. On output, no data would be sent because all channels are mapped to channel one first, and then channel 1 is muted.

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CHAPTER 10 Sync and MIDI Machine Control

OVERVIEW

The Sync/MMC window in ClockWorks gives you control over your MOTU interface's sync and MMC transport control features. This chapter provides a brief overview of this window. For more information, see chapter 15, "Synchronization" (page 91) or chapter 22, "Synchronization with the AV" (page 139).

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SMPTE Readout 59
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The Record settings 60
VTR Recording options 61
FreeMIDI Sync 61
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TRANSPORT CONTROLS

The transport controls are just like standard tape deck transports. From left to right, they are: rewind, stop, play, pause and record. These buttons control the time code generated by your MOTU interface when it is in *Internal* mode.

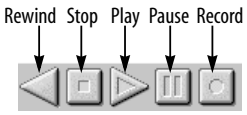

Figure 10-2: ClockWorks transport controls.

SMPTE READOUT

The SMPTE Readout provides a running update of the time code being generated or converted by your MOTU interface. This running update is made possible by MIDI Time Code (MTC) generated by your MOTU interface and routed to the Macintosh. If the SMPTE Readout is not responding, make sure the Device Settings & Routing window has the connection shown in Figure 7-14 on page 50.

The SMPTE readout shows your MOTU interface's current frame location in hours: minutes: seconds/frames. You can also type in any frame location you wish into the SMPTE Readout to cue your MOTU interface to a specific frame location.



Figure 10-1: The Sync/MMC window

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When your MOTU interface is set to slave to an external time code source, you can click the offset button as shown below in Figure 10-3 to type in a global SMPTE offset for your MOTU interface.



Figure 10-3: Click the button as shown to type in a global SMPTE offset for your MOTU interface.

LOCATE BUTTONS

You can set the eight locate buttons to any SMPTE frame location you wish and then cue your MOTU interface (and all connected devices) as desired by clicking the appropriate Locate button.



Figure 10-4: The Locate buttons.

The *Set Locate* controls provide two ways to program a locate button as shown in Figure 10-5.

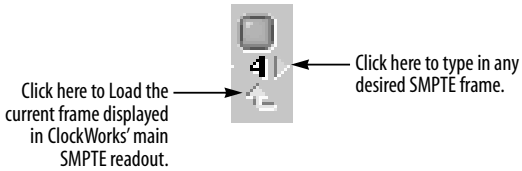

Figure 10-5: The Set Locate controls. Click the lower arrow to load the SMPTE frame currently displayed in the SMPTE Readout. You can even do so on the fly. Click the upper arrow to type in the desired SMPTE frame.

Click the upper arrow to type in the desired SMPTE frame. Use the tab key to move from field to field as shown in Figure 10-6 and press return to confirm the SMPTE location you type in.



Figure 10-6: Typing in a SMPTE frame for a locate button.

Locate points are saved with ClockWorks files.

TIME BASE AND FRAME RATE SETTINGS

The Time Base and SMPTE Frame rate settings let you choose the overall time base and SMPTE frame rate for your MOTU interface. These settings are the same as the SMPTE and TIME BASE settings on the front panel LCD of a MIDI Timepiece AV. For a complete explanation of Time Base modes and SMPTE frame rates, see chapter 22, "Synchronization with the AV" (page 139).

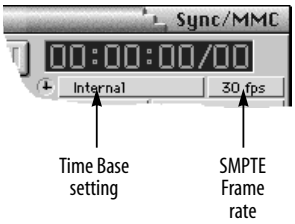

Figure 10-7: The Time Base and SMPTE frame rate settings.

THE RECORD SETTINGS

The recording settings let you control exactly when recording will occur in MMC devices being controlled by your MOTU interface.

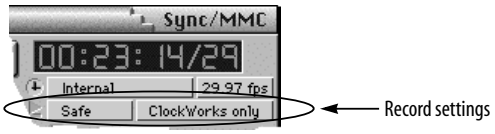

Figure 10-8: The record settings.

The left-hand record menu has three choices: *safe*, *rehearse*, and *record*.

Safe

No recording can occur in any MMC device.

Rehearse

This mode causes MMC devices to act as if they are recording, punching in, punching out, etc. but no recording actually occurs.

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☛ Make sure that your MMC device supports rehearse mode before attempting to use this record feature. If it doesn't, rehearse mode may actually record. Consult the manual for your MMC device for details.

Record

This mode allows recording on the currently record-enabled track(s) for any MMC device. To actually record, press the record button in ClockWorks' transport controls (Figure 10-2 on page 59).

ClockWorks only / Any application

The right-hand menu has two choices: *ClockWorks only* and *Any application*. When ClockWorks only is chosen, recording will only occur when ClockWorks is the active application. This mode is useful for preventing accidental recording when you switch to your sequencer (or other MMC-compatible software) on the Macintosh.

When *Any application* is chosen, ClockWorks still controls whether or not recording will occur, but you can initiate recording from other FreeMIDI compatible programs, such as Performer or Digital Performer, that you may have running at the same time as ClockWorks. First, make sure that FreeMIDI Sync is enabled. Then press the record button in ClockWorks to allow recording. When you switch to another FreeMIDI application, such as Performer, ClockWorks' record button will remain on. If you then hit play in the other program (e.g. Performer), recording will happen. If you want to control record functions entirely in Performer, turn off FreeMIDI Sync so that ClockWorks doesn't interfere with Performer.

VTR RECORDING OPTIONS

The *VTR recording* options determine how the Sony 9-pin compatible video tape recorder (VTR) will respond when it is put into record. This feature is only available in the MOTU Digital Timepiece synchronizer. It is grayed out when you are using a MOTU MIDI interface.

FREEMIDI SYNC

When the *FreeMIDI Sync* option is checked, ClockWorks' transport buttons will control the transport functions (play, stop, rewind, and locate) of other FreeMIDI applications running in the background.

☛ *FreeMIDI Sync should be turned off whenever any FreeMIDI application is slaving to MIDI Time Code.* For example, when you are using Performer or Digital Performer, you are most likely slaving them to MTC from your MOTU interface. In this case, be sure to turn off FreeMIDI Sync.

EXTRA SETTINGS

The *Extra Settings* button shown below in Figure 10-9 opens an additional pane in the Sync/MMC window.

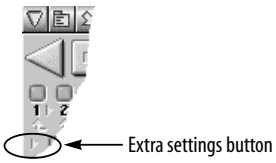

Figure 10-9: Click the Extra Settings button shown here to display more synchronization settings.

Some options in the Extra Settings pane may grey out depending on which MOTU interface you have and which time base mode you select. Only options that apply to the currently selected time base mode remain active. You can see how this works by opening the pane and successively choosing different time base modes from the time base pop-up menu (as shown in Figure 10-7 on page 60). As you change modes, you'll see options grey out and become active.

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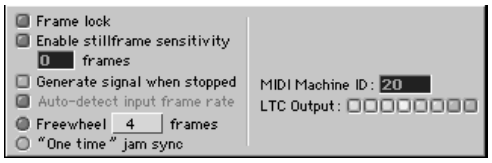

Figure 10-10: The Extra Settings pane for the MIDI Express XT and micro express.

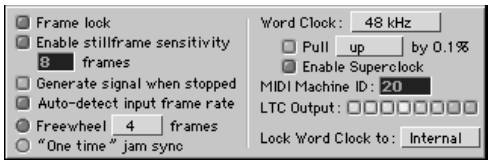

Figure 10-11: The Extra Settings pane for the MIDI Timepiece AV.

The following sections provide a brief explanation for all of the options in the Extra Settings pane.

LTC AND MTC SETTINGS

Several settings in the Sync/MMC window apply to the MTC, LTC or LTC QuikLock modes. These options pertain to when your MOTU interface is converting time code (MTC or LTC) from an external source.

Frame lock

The *Frame lock* check box is only available when your MOTU interface is locking to external SMPTE time code (in any form — MTC, LTC or VITC). It is not available when your MOTU interface is the time code address master (any time base mode that includes the word *Internal* in its name).

To understand the Frame lock option, you first need to know that your MOTU interface continuously monitors incoming time code to detect any possible discontinuity in the frame times as they advance. If your MOTU interface detects more than five frames in a row that are not continuous with respect to previous frames received, then it does one of two things, depending on whether the Frame lock option is turned on (checked) or off (unchecked).

If the Frame lock option is turned *on* (checked), and your MOTU interface detects more than five frames in a row that are not continuous with respect to previous frames received, then it will stop converting altogether.

If the Frame lock option is turned *off* (unchecked), and your MOTU interface detects more than five frames in a row that are not continuous with respect to previous frames received, then it begins to perform a kind of "pseudo jam sync". In this mode, it continues to convert an uninterrupted stream of continuous time code, while at the same time clocking off of the incoming time code. Even though the frames it is generating no longer match the frames it is reading, it will continue to remain in sync with the incoming time code.

In other words, when the Frame lock option is *off*, your MOTU interface ignores discontinuous jumps in incoming time code by continuing to clock itself off of the incoming time code without stopping (or pausing). In doing so, it continues to convert a continuous, uninterrupted stream of frame times based on the time code to which it first locked.

Turn on Frame lock when you want your MOTU interface's frame times to match incoming frame times, and you want it to stop converting altogether if there are jumps in incoming time code.

Turning off Frame lock can be a life saver if you find yourself in a situation where you have time code on tape (or other source) but the frame locations jump around to different times (because of overlapping SMPTE striping, edits, or whatever). By turning off Frame lock, you can sync continuously to this type of time code without glitching or stopping. If the SMPTE on your tape jumps around as described, you are likely to experience brief drop-outs at the points where it jumps. If so, just increase your MOTU interface's freewheeling to cruise past them.

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Enable still-frame sensitivity

This option lets you control how many frames in a row your MOTU interface needs to receive to consider incoming SMPTE as being parked on a single frame. While lowering this value makes your MOTU interface more responsive when you pause your video deck, it is also more likely to misinterpret ordinary transport shuttling. So make this value as low as you can, but raise it if you start getting improper frame locations when shuttling your deck.

Generate signal when stopped

This option applies to situations in which your MOTU interface is converting time code and the source time code continues even when it is parked on a frame. The most common case is when your MOTU interface is locked to VITC, and the video deck is paused. In this situation, the *Generate signal when stopped* option, when checked, makes your MOTU interface continues to output time code (LTC, MTC and VITC), even while the video is parked on a single frame in pause mode. It will continue to do so as long as the video head is engaged and VITC lines can be scanned.

Auto-detect input frame rate (MTP AV only)

This option is only available for the MIDI Timepiece AV. When this option is checked, your MOTU interface will automatically detect the frame rate of incoming SMPTE time code (VITC, LTC or MTC). In most situations, this is desirable because it ensures that your MOTU interface is properly interpreting and synchronizing to the time code. If, however, you find yourself in a situation where you would like to set the frame rate manually, uncheck this option and set the frame rate using either ClockWorks (in the MMC/Sync window) or your MOTU interface front-panel controls.

Freewheel _ frames

This option lets you set the number of frames your MOTU interface will freewheel over when it encounters a time code drop-out. For a complete explanation of freewheeling, see your MOTU interface *User's Guide*.

"One time" jam sync

Choosing this option is like choosing "infinite freewheel". When you choose this option, your MOTU interface begins generating time code on its own indefinitely as soon as it stops receiving incoming time code. And it will continue to do so until you stop it with the STRIPE button on the front panel. You can also stop it by changing the master sync mode or by enabling the Freewheel option in ClockWorks.

WORD CLOCK SETTINGS (MTP AV ONLY)

This option is only available for the MIDI Timepiece AV. The word clock settings set the digital audio word clock rate for your MOTU interface. There are six possible word clock rates: normal, pull-up, and pull-down for both 44.1kHz and 48kHz. These settings correspond to the settings in the front-panel LCD of the MIDI Timepiece AV. These settings are grayed out if your MOTU interface is in a time base mode where it should determine the word clock rate on its own, such as when it is slaving to an external word clock as a time base.



Figure 10-12: ClockWorks' word clock settings.

Enable Superclock (MTP AV only)

This option is only available for the MIDI Timepiece AV. The *Enable Superclock* option changes the MIDI Timepiece AV word clock output to Digidesign 256x "superclock" instead of standard 1x word clock. Use superclock with Pro Tools systems.

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Lock Word Clock to (MTP AV only)

This option is only available for the MIDI Timepiece AV. The *Lock Word Clock to* option has two choices: *internal* or *video*. Use the video option when you would like the MIDI Timepiece AV to derive its time base from a video signal present on its VIDEO IN connector. This is equivalent to choosing one of the three VIDEO timebase modes in the MIDI Timepiece AV's front panel LCD.

MMC ID

The MMC ID option lets you change the MMC (MIDI Machine Control) device ID of your MOTU interface. The factory default ID of your MOTU interface is 20. The only situation in which you really need to change it is if you are connecting two MOTU interfaces together. Otherwise, just leave it set to one, and make sure that your MMC transport master controller device or computer software knows that your MOTU interface's ID is 20.

If you change your MOTU interface device ID for some reason, make sure that it does not match the ID of another device connected to it.

If you are experienced with using MMC, you may be thinking, "But don't I have to at least assign Device IDs for my ADATs connected to my MIDI Timepiece AV?" The answer is no: you don't have to worry about this because the AV sets the device IDs of all ADATs connected to it automatically. For more information, see "Setting MMC device ID's" on page 154.

LTC OUTPUT LEVEL

This row of buttons allows you to adjust the overall gain of the SMPTE time code from your MOTU interface LTC output jack. Click towards the left to reduce the level; click towards the right to increase it. This level control affects LTC output in all sync modes, including LTC, MTC, etc.

ADAT LIST
(For the MIDI Timepiece AV only)

The ADAT list shows a list of all of ADATs (or other ADAT-sync compatible devices) connected to the ADAT port on a MIDI Timepiece AV. The MIDI Timepiece AV automatically detects any ADAT-type devices connected to it and continuously reports that information to ClockWorks, which displays the ADATs in the list. The MIDI Timepiece AV continuously polls for devices, so the list will update within a few seconds whenever a change occurs. For example, if your ADAT is currently switched off, and you then turn it on, it will appear in ClockWorks' ADAT list after a few seconds — after the MIDI Timepiece AV powers up and detects the ADAT during the next regular polling cycle.

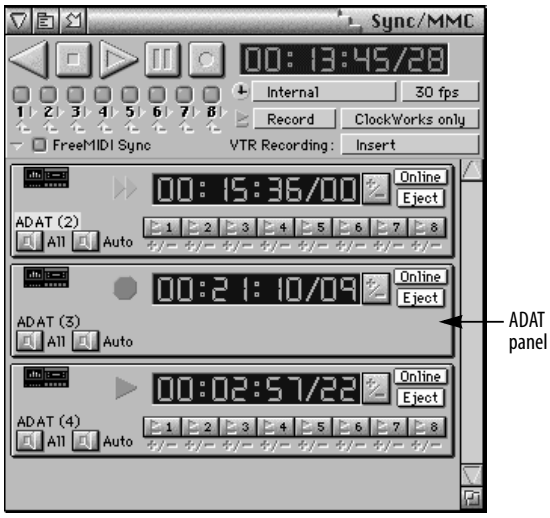

Figure 10-13: ADATs connected to a MIDI Timepiece AV.

ADAT device panels

Each ADAT is displayed in the list as a panel, which provides status information about the ADAT, such as the current state of its transports, its current SMPTE location, and whether or not it currently has a tape in it. The panel also provides settings for the ADAT as shown in Figure 10-14, such as a unique SMPTE offset (each ADAT can have its own offset) and even individual track offsets.

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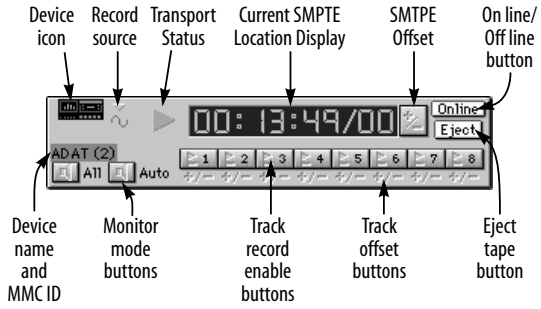

Figure 10-14: Here is an example of an ADAT panel. It presents status information and settings for the ADAT.

Device icon

The device icon merely serves as a graphical identification for the ADAT. It is for display purposes only.

Record source

This drop down menu lets you choose between the digital or analog inputs on the ADAT.



Figure 10-15: To choose the record source (either the analog or digital inputs on the ADAT), choose the desired source from the pop-up menu as shown.

Current SMPTE location display

The current SMPE location display shows the current transport location of the ADAT. Except in unusual circumstances, this number will exactly match the number displayed on the front panel of the ADAT, even if you have programmed a SMPTE offset for the ADAT in ClockWorks.

☛ Some ADATs, such as the ADAT XT, display hundredths of a second instead of frames in their front panel. But the SMPTE display in ClockWorks will always show hours: minutes: seconds: and frames, since ClockWorks derives its SMPTE display from MIDI Time Code, which only provides information in frames (not hundredths of a second).

Transport status

The transport status area of the ADAT panel as shown in Figure 10-14 shows you the current status of the transports of the ADAT. The chart below explains each possible transport status icon.

Transport icon	Name	What it means
	Stop	The ADAT is stopped, and the tape head is disengaged.
	Play	The ADAT is playing.
	Fast forward	The ADAT is cuing forward.
	Rewind	The ADAT is rewinding.
	Pause	The ADAT is paused and the tape head is still engaged.
	Eject	The tape in the ADAT is ejected.
	Variable play	You probably won't see this icon.
	Search	This icon is blue, while the fast forward icon is green.
	Shuttle	You probably won't see this icon.
	Step	You probably won't see this icon.
	Step completed	You probably won't see this icon.
	Unrecognized command	This means that ClockWorks did not recognize the command sent from the ADAT. Rare.
		Means that the last operation was not completed successfully. You'll probably never see this.

SMPTE Offset

The SMPTE Offset button as shown in Figure 10-14 lets you program a SMPTE offset for the ADAT. This means that each ADAT can have its own separate offset. To program the offset, click the offset button and then type in the desired offset amount. Use the tab key to move from field to field and press return to confirm your choice. You can also change numbers by dragging up or down on them. Notice also that you can offset by sub-frames, as shown below in Figure 10-16.

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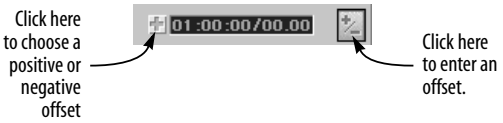

Figure 10-16: Each ADAT can have its own individual SMPTE offset. Notice that the offset includes sub-frames in hundredths of a frame.

On Line / Off Line

When the ADAT is *on line*, it will respond to the MIDI Timepiece AV's transport control. When the ADAT is *off line*, it will not respond to the MIDI Timepiece AV.

Monitor mode buttons

These buttons let you set the monitor mode of the ADAT. *All* monitors all track input. *Auto* monitors record-enabled tracks only. *Auto* mode overrides *All*.

Track record-enable buttons

The track record-enable buttons allow you to arm tracks on the ADAT for recording. When you click the button, it will flash green if ClockWorks is currently set to *Rehearse* or *Safe* modes, or it will flash red if ClockWorks is set to *Record* mode. The button will turn solid when recording actually begins.

When you then press the record button in ClockWorks (or your MMC-compatible sequencer or other software — with ClockWorks' record mode set to *Any application*), the ADAT will begin recording on the track(s) you've armed.

Track offset buttons

ADATs have the ability to offset individual tracks by a number of samples. The *Track offset* buttons below each record button as shown in Figure 10-17 allow you to set each track offset from within ClockWorks. You can either type in a number of samples or simply drag vertically on the number to change it. The range of samples for ADATs is 0 to 8191.



Figure 10-17: To enter a track offset, click the track offset button as shown and then enter the desired number of samples by typing or by dragging vertically on the number.

ADATs provide this feature in samples as apposed to frames. Below is a conversion chart to help you work in frames.

SMPTE unit	Samples at 44.1kHz	Samples at 48kHz
1 frame @ 30 fps	1470	1600
1 frame @ 29.97 fps	1470*	1600*
1 frame @ 25 fps	1764	1920
1 frame @ 24 fps	1837	2000
1/4 frame @ 30 fps	367	400
1/4 frame @29.97 fps	367*	400*
1/4 frame @ 25 fps	441	480
1/4 frame @ 24 fps	459	500

* This value is based on a pull-down rate.

ADAT PREFERENCES

(For the MIDI Timepiece AV only)

The Sync/MMC window has a mini-menu (as shown in Figure 10-1 on page 59) in its title bar. The menu has a command called *Set Machine Preferences*. To set the preferences for a ADAT:

1 Click anywhere on the panel of the ADAT you wish to set preferences for.

2 Choose *Set Machine Preferences* from the Sync/MMC window mini-menu.

The Machine Preferences window opens.

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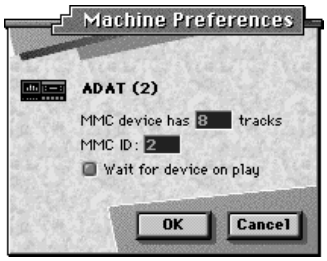

Figure 10-18: To set machine preferences, click the panel of the ADAT you want to set preferences for and choose the Set Machine Preferences command from the mini-menu in the title bar of the window.

MMC device settings

The window shows the icon, name and MMC device ID of the selected ADAT. It lets you change the number of tracks for the ADAT, as well as the MMC device ID.The MIDI Timepiece AV automatically assigns device IDs to ADATs chained off its ADAT Sync out port. Under routine circumstances, each ADAT will automatically be set to its own unique ID (this is a requirement of MMC and ADAT sync) and you won't have to fuss with this setting. If you do need to adjust it for some reason, make sure the number you type in is not being used by any other device on the ADAT chain.

Deferred play

The *Wait for device on play* option, when checked, causes the MIDI Timepiece AV to wait for the ADAT to cue to the current playback location before it begins generating or converting time code.

When the *Wait for device on play* option is unchecked, the MIDI Timepiece AV may, depending on the situation, begin generating or converting time code while the ADAT is still cueing to catch up to the current playback location. The device will begin playing as soon as it catches up.

Turning this option on for all ADATs will ensure that they all begin playing at the same time. But the trade-off is that you will have to wait for all of them to cue before playback begins. Here are some other reasons why you might want to turn this option off for a device:

- The device is particularly slow.
- You just don't want to have to constantly wait for a particular device to catch up.
- You have several random-access systems that can cue instantly, along with one device that has a tape transport, and you don't want to wait for the one tape transport device.

SONY 9-PIN CALIBRATION

The Sync/MMC window mini-menu (shown in Figure 10-1 on page 59) has an item called *Sony 9-PIN calibration*. This feature is only available in the MOTU Digital Timepiece synchronizer. It is grayed out when you are using a MOTU MIDI interface.

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CHAPTER 11 SMPTE Reader

OVERVIEW

As a smaller, more compact version of the upper portion of the Sync/MMC window, the SMPTE Reader window provides a running update of the time code being generated or converted by your MOTU interface. Status information is continuously fed to the SMPTE Reader from your MOTU interface via MIDI Time Code. It also provides valuable status information about your MOTU interface itself.

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Time base status 70
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Timebase measure 71
Actual Frame Rate 71
Video Out Phase Lock 71
Output phase lock 71
Input frame phase lock 72
Input quarter frame phase lock 72
External time code detect 72
Word clock stable 72

THE SMPTE READER WINDOW

The SMPTE Reader provides a running update of the time code being generated or converted by your MOTU interface. This running update is made possible by MIDI Time Code (MTC) generated by your MOTU interface and routed to the Macintosh. If the SMPTE Reader is not responding, make sure the Device Settings & Routing window has the connection shown in Figure 7-14 on page 50.

The SMPTE Reader shows your MOTU interface's current frame location in hours: minutes: seconds/ frames.



Figure 11-1: The SMPTE Reader provides a running update of your MOTU interface while it is generating or converting time code.

If you click the triangle in the lower left-hand corner of the window, an additional status display appears at the bottom of the window. This area shows what state your MOTU interface is in at any given time.

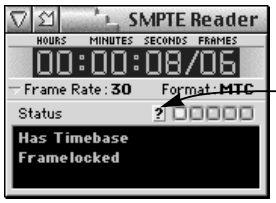

Figure 11-2: The triangle along the left-hand side of the window opens and closes the status display at the bottom of the window.

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SMPTE READER STATUS DISPLAY

The SMPTE reader status display can be opened by clicking the triangle in the lower left-hand corner of the SMPTE Reader, as shown in Figure 11-2.

The status area provides detailed information about what state your MOTU interface is in as a synchronizer. The following sections provide a brief explanation of each term.

The sync status area of the SMPTE Reader can also be opened as a separate window by clicking the question mark icon shown in Figure 11-2.

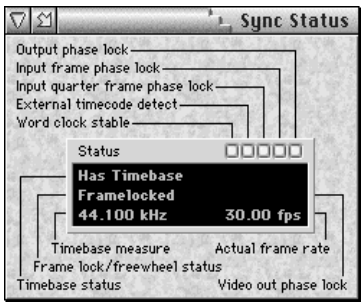

Figure 11-3: To open the Sync Status window, click the question mark icon shown in Figure 11-2.

TIME BASE STATUS

The time base status readout tells you whether or not your MOTU interface is currently locked to a time base. The terms you will see here are:

- Needs Timebase
- Has Timebase
- Getting Timebase

Needs Timebase

This status indicator means that your MOTU interface is waiting to receive incoming signal from an external time base source from which it will derive a time base. When it successfully achieves lockup, it then displays *Has Timebase*.

Has Timebase

This status indicator means that your MOTU interface has established a stable time base. You'll see this indicator when one of the following is true:

- your MOTU interface is in Internal mode
- your MOTU interface is set to receive external sync (MTC, LTC, word clock, etc.) and it has successfully achieved lockup with the external sync source.

Getting Time base

This status indicator is displayed briefly while your MOTU interface is in the process of establishing lock-up to an external time base. It is an intermediate state and you'll only see it briefly.

FRAME LOCK/FREEWHEEL STATUS

This line in the status display tells you if your MOTU interface is frame-locked or if it is currently freewheeling. The terms you will see here are:

- Frame-locked
- Jam

Frame-locked

This status indicator means that your MOTU interface is successfully locked to an external time base and that it is also successfully generating or converting SMPTE time code.

Jam (MIDI Timepiece AV only)

This status indicator means that the MIDI Timepiece AV has been successfully locked to external SMPTE time code in one of its video modes, but that it has also detected that the SMPTE time code has drifted out of frame-lock with video for more than five frames in a row or the time code has dropped out completely.

The primary reason for the *Jam* indicator is to alert you to SMPTE time code on a video tape that is not *frame-locked* — that is, the time code drifts in relation to the actual video frames.

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Here is a great way to put this feature to good use and to ensure trouble-free video sessions: if you get a video tape that has time code already on it, and you have no way of verifying how the time code was recorded, you should slave the MIDI Timepiece AV to it (in LTC/VIDEO mode) from start to finish once before you begin working with it. If you do not get the *Jam* indicator at any time, you know that the SMPTE time code is frame-locked and does not drift in reference to video frames. If you do get the JAM status indicator, you are alerted that the SMPTE time code is not frame-locked, and you can take appropriate action with the MIDI Timepiece AV to fix the tape. By connecting the video signal from your VCR to the video-in jack on the MIDI Timepiece AV, connecting the SMPTE-out jack to one of the audio tracks on your video deck, and selecting INTERNAL/VIDEO as the sync mode, you can re-stripe the tape with frame-lock accuracy.

If it doesn't really matter to you that the time code is not frame-locked, you can simply lock the MIDI Timepiece AV to the SMPTE time code in LTC mode (instead of LTC/VIDEO), which will provide consistent, reliable sync.

TIMEBASE MEASURE
(For the MIDI Timepiece AV only)

This status indicator shows the actual sample rate being generated by the MIDI Timepiece AV based on the current external time base. This display shows the number of samples being generated per second. It allows you to measure how accurate external time base sources are (such as video or LTC). It is also affected by the sample rate settings in the MIDI Timepiece AV, so it can help you chase down discrepancies with pull-up and pull-down sample rates.

ACTUAL FRAME RATE
(For the MIDI Timepiece AV only)

This status indicator shows how far off the current SMPTE frame rate output of the MIDI Timepiece AV is from the current frame rate setting (as shown by the LEDs on the front panel of the MIDI Timepiece AV). This is an easy way to check the accuracy of external timebases. It also helps avoid pull up/down problems that can inadvertently arise.

You can also use this to differentiate between 30 fps and 29.97 fps (non-drop) coming from an external source. Normally the MIDI Timepiece AV will automatically switch to the frame rate that it detects, but it is not possible to differentiate, for example, between 29.97 non-drop coming from an accurate time base and 30 fps coming from a timebase that is running slightly slow. If you know whether your sync source is generating 29.97 or 30 fps, you should set the MIDI Timepiece AV frame rate appropriately. If you are not sure which frame rate is correct, the time base adjust display can give you an idea. For example, if the MIDI Timepiece AV is set to 30 fps and the actual frame rate display shows 29.97, it is likely that the actual received frame rate is 29.97 fps.

VIDEO OUT PHASE LOCK
(For the MIDI Timepiece AV only)

When this status indicator is illuminated, it means that the video out signal of the MIDI Timepiece AV is in sync with the correct time base.

OUTPUT PHASE LOCK

When this status indicator is illuminated, it means that time code generated by your MOTU interface (MTC and LTC) is in sync with the current time base.

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INPUT FRAME PHASE LOCK

When this status indicator is illuminated, it means that your MOTU interface has successfully achieved lockup with incoming LTC/MTC full frame messages.

INPUT QUARTER FRAME PHASE LOCK

When this status indicator is illuminated, it means that your MOTU interface has successfully achieved lockup with incoming LTC/MTC quarter frame messages.

EXTERNAL TIME CODE DETECT

When this status indicator is illuminated, it means that your MOTU interface has successfully detected external time code (MTC, LTC).

WORD CLOCK STABLE

When this status indicator is illuminated, it means that your MOTU interface has successfully achieved a stable time base rate from its internal time base or by determining the external time base rate.

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CHAPTER 12 Utilities Menu

INTERFACE SETTINGS

Use the *Interface Settings* command in the Utilities menu to open the Interface Settings dialog box. This dialog box is the same dialog box that appears in other FreeMIDI applications and will control FreeMIDI's access to the serial ports of your Macintosh for all FreeMIDI applications. This dialog box allows you to enable and disable the two serial ports for MIDI.

EDIT FREEMIDI CONFIGURATION

The *Edit FreeMIDI Configuration* command in the Utilities menu launches the FreeMIDI Setup application (or switch to FreeMIDI Setup if it is already open) and display the current FreeMIDI Configuration. There is a Return command in FreeMIDI Setup (command-R) that will switch back to ClockWorks, if you entered FreeMIDI Setup using the *Edit FreeMIDI Configuration* command.

If you are running OMS, this command launches the OMS Setup application.

SELECT

If you have other Mark of the Unicorn hardware connected to your Macintosh, such as multiple MIDI interfaces or a Digital Timepiece, this command lets you choose which piece of gear you want to be editing in the windows and menus of ClockWorks. This feature is similar to highlighting a device in the Device List window.

VERIFY NETWORK

Causes ClockWorks to poll for Mark of the Unicorn MIDI interfaces and Digital Timepieces to detect what units are connected and obtain their basic hardware configuration.

REESTABLISH COMMUNICATION

This command makes ClockWorks perform a handshake with the MOTU interface currently being controlled with ClockWorks — without polling it for all of its current settings. As a result, this command is faster than the *Verify Network* command. Reestablish Communication is grayed out unless ClockWorks has detected that one of your pieces of MOTU hardware has gone off line.

SEND DATA TO

This command sends all of the current settings in ClockWorks to your MOTU interface (or the currently selected Mark of the Unicorn hardware in the Device List window.) This command is useful if your MOTU hardware has been turned off or disconnected while you were working with ClockWorks. This command updates the internal state of the hardware so that it matches what you have done in the software on the computer.

SET MTP 1 DEFAULT

This command is grayed out unless an original MOTU MIDI Timepiece is currently on-line and selected in the Device List window. If so, it restores the MIDI Timepiece to its factory default state.

AUTOTECH™ ASSISTANT

When AutoTech™ assistant is turned on (checked), ClockWorks will monitor the settings in all Mark of the Unicorn MIDI interfaces connected to your Mac to detect and resolve conflicting settings. AutoTech will detect problems such as conflicting MMC device IDs, other conflicting MMC settings and sysex muting settings that will interfere with the interface's ability to communicate with other MIDI devices and hardware. We strongly

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recommend that you keep this feature turned on, especially if you are using a Digital Timepiece or multiple MOTU interfaces.

ALL NOTES OFF

The *All Notes Off* command causes FreeMIDI to send out All Notes Off messages to all devices. In addition, it sends out a MIDI note off command for every note on every channel. As you can imagine, this is a lot of data, and it will take FreeMIDI a moment to transmit all of it! Just watch the front-panel LED's, and when they finish flickering, then the operation is done.

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Part II

For XT & Micro Users

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CHAPTER 13 Working with Presets

OVERVIEW

This chapter describes your MOTU Express interface's eight factory presets and explains how to:

- Select a factory preset or one of eight user presets from the front panel
- Create your own user presets
- Use the Presets window in ClockWorks
- Select presets using patch changes from any MIDI source (such as a keyboard controller or sequencer)

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Selecting a preset on an Express XT 77
Selecting a preset on a micro express 77
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User Presets 80
The Presets window in ClockWorks 80
Switching presets using a patch change 81
Modifying a preset 82

FACTORY VERSUS USER PRESETS

Your Express interface provides eight factory presets and eight more user presets. Factory presets are "hard-wired" and cannot be permanently changed. If a factory preset is the current preset, changes you make to your Express interface's settings will not be remembered unless you save them to one of its eight user presets.

The eight user presets can be configured any way you wish, and they can be stored in the interface hardware itself for later recall.

SELECTING A PRESET ON AN EXPRESS XT

To select a preset from the front panel:

1 If you have a MIDI Express XT, press the BANK button as needed to choose either the factory preset bank or user preset bank. The Factory Preset or User Preset LED will become lit.

2 Repeatedly press the SELECT button until the LED below the program you want lights up.

As you repeatedly press the button, the LED cycles through the eight programs.

SELECTING A PRESET ON A MICRO EXPRESS

To select a preset from the front panel:

1 Repeatedly press the SELECT button until the LED for the program you want lights up.

2 The SELECT button cycles through both the factory and user presets, as indicated by the red *User* LED and the green *Factory* LED.

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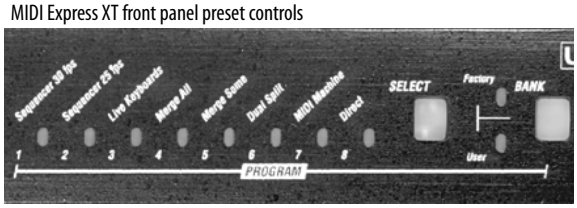
FACTORY PRESETS

The eight factory presets provide you with optimum cable routing, SMPTE, and other settings for various common situations in which you will use your Express interface. The eight factory preset settings are listed on the front panel as shown below:

MIDI Express XT front panel preset controls



micro express front panel preset controls

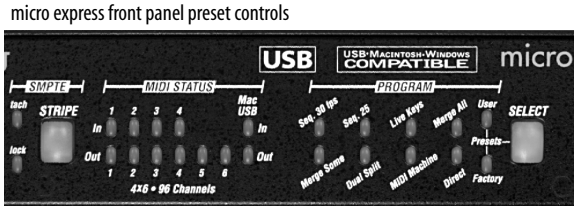


Figure 13-1: The eight factory presets on the front panel of the Express XT and micro express.

Each factory preset is described in the following sections, including situations in which you would find it useful.

Sequencer 30 fps

This preset is designed for MIDI software, especially sequencing software, that supports multi-cable interfaces such as your Express interface. Use this preset if you have Performer, Vision, Cubase, Logic, or any other MIDI software that supports multi-cable interfaces.

This preset connects all inputs and outputs to the computer. In addition, it sets the SMPTE sync settings for lockup and striping at 30 frames per second (fps).

Sequencer 25 fps

This preset is identical to the Sequencer 30 fps above except that the frame rate is set to 25 frames per second (fps) for converting and striping at 25 fps.

Live Keyboards

Use this preset when you want to route any controller connected to a MIDI IN to all MIDI outputs. This preset is ideal for quickly routing a controller to a sound module and for using a MIDI controller without a computer. If you have connected both the MIDI IN and MIDI OUT of your keyboard controller to your Express interface, it is best to match the input/output MIDI port numbers on your MOTU interface. For example, if the controller is connected to MIDI IN port 3, connect it to MIDI OUT port 3 as well. If you do so, this preset prevents troublesome MIDI feedback loops, which happen when the controller sends data back to itself via your Express interface. This preset avoids this problem by not sending data to the port that has the same number. For example, MIDI IN port 3 routes data to all MIDI OUT ports *except* MIDI OUT number 3.

Merge All

With this preset, any device connected to a MIDI IN will send data to all devices connected to your Express interface outputs, including the computer. This preset is ideal for troubleshooting because it routes everything to everywhere; any incoming data will be sent to all outputs. For example, if you are not getting sound from a sound module when you play notes on your controller, you can eliminate MIDI routing as the cause of the problem by temporarily using this preset. You can rest assured that your Express interface is routing the data to the module correctly, and you can then focus your efforts on other possible causes, such as bad MIDI cables, volume settings, etc.

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Use this troubleshooting technique if you cannot successfully record data into your sequencer on the computer.

Merge Some

The Merge Some preset is similar to the Merge All preset, except that it divides the inputs into two groups: inputs 1-4 (1-2 on the micro express) are routed to the computer only, while inputs 5-8 (3-4 on the micro express) are routed directly to all outputs (but not the computer).

Dual Split

The Dual Split preset is similar to the Live Keyboards preset, except that it splits the interface into two sets of inputs and outputs.

For the micro express, input 1 is routed to outputs 1-3. Input 3 is routed to outputs 4-6.

For the Express XT, input 1 is routed to outputs 1-4. Input 5 is routed to outputs 5-8.

MIDI Machine/for the Express XT

This preset provides MIDI data, time code, and MIDI Machine Control settings for using MIDI Machine Control between devices without a computer.

Inputs 1-4 are reserved for non-MMC devices being routed to outputs 1-5, as well as the computer.

Input 5 is also routed to the computer but not to any of the MIDI outputs.

MIDI outputs 6, 7 and 8 are reserved for MIDI Machine devices, as these ports are programmed to receive MIDI Time Code and MMC transport commands from the MIDI Express XT.

MIDI inputs 6, 7 and 8 are intended for MMC controller devices, and they are each programmed slightly differently to accommodate three different scenarios. Input 6 routes MIDI data only to outputs 6, 7 and 8. Input 7 routes MMC to the MIDI Express XT only. Input 8 does a combination of inputs 6 and 7.

MIDI Machine/for the micro express

This preset provides MIDI data, time code, and MIDI Machine Control settings for using MIDI Machine Control between devices without a computer.

Inputs 1-2 are reserved for non-MMC devices being routed to outputs 1-4, as well as the computer.

Input 3 is also routed to the computer but not to any of the MIDI outputs.

MIDI outputs 5 and 6 are reserved for MIDI Machine devices, as these ports are programmed to receive MIDI Time Code and MMC transport commands from the micro express.

MIDI inputs 3 and 4 are intended for MMC controller devices, and they are each programmed slightly differently to accommodate several different scenarios. Input 3 routes MMC to the micro express only. Input 4 routes MIDI data only to output 6.

Direct

This preset causes your Express interface to function like a simple 1 IN/8 OUT or 1 IN/ 6 OUT MIDI interface, respectively. All of the extra routing, merging, muting, rechannelizing, and running status features are disabled. Your Express interface applies no processing whatsoever to MIDI data as it is sent to and from the computer. This mode is referred to as *Direct Connect mode* through this manual.

Input 1 connects to the computer, and the computer connects to all 8 (or 6) outputs. But none of the inputs are connected directly to the outputs.

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This preset can be used effectively to solve problems with non-standard MIDI data transfers. For example, some samplers transmit sample dumps in a way that won't work when your Express interface's MIDI processing features are enabled. This mode disables the processing features, which solves the problem. If you experience trouble with sysex, try this preset.

☛ ClockWorks cannot communicate with your Express interface when it is in Direct mode. To restore communications, use the front panel controls to choose another preset.

USER PRESETS

Your Express interface provides eight user presets, which you can configure any way you wish. From the factory, these eight user presets match the eight Factory presets described earlier in this chapter. To change one of the eight user presets, use ClockWorks as described in the next few sections to modify and save the user preset in your Express interface itself. Optionally, you can also save it on your computer hard disk.

THE PRESETS WINDOW IN CLOCKWORKS

The Presets window in ClockWorks (as shown in Figure 13-2) gives you an overview of information about all the presets. It lets you:

- View an itemized description of each preset
- Change the names of the eight user presets
- Assign a MIDI patch change number to each preset so that it can be called up from a sequencer, controller, or foot switch
- Make modifications to the preset settings

Selecting a preset

One of the presets is always highlighted as shown in Figure 13-2, and the currently highlighted preset always matches the currently selected preset on the front panel of your Express interface.

To switch to a different preset, choose it from your Express interface front panel or click the preset name in the Presets window.

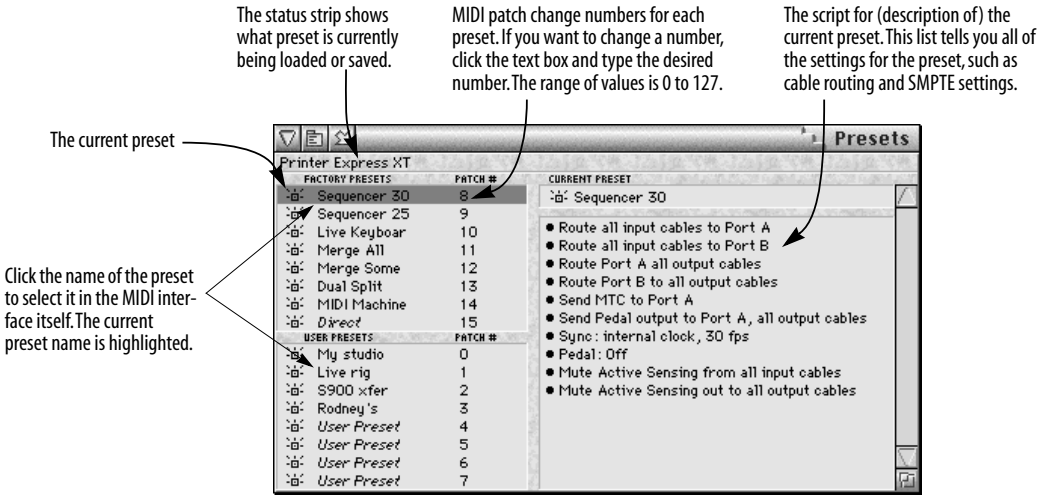

Figure 13-2: The Presets window.

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Viewing the preset script

The *preset script* is an itemized list of settings for the currently selected preset. The script is shown in the right-hand portion of the window with the name of the current preset shown at the top, as shown in Figure 13-2 on page 80.) The script is a comprehensive list of all of the interface settings for the preset.

To add or change an item in the list, go to the appropriate window in the ClockWorks windows menu and make the change. The change will be automatically saved when you quit ClockWorks or switch to a different preset. (See "Modifying a preset" on page 82 for a complete explanation of how to modify a preset.)

Renaming user presets

The factory preset names (the first eight presets in the list) cannot be changed since they should always match the names of the front panel of your Express interface. Any user preset name, however, can be changed.

To change the name of a user preset:

1 Double-click the name to pop-edit it.

A pop-up box appears in which you can edit the text.

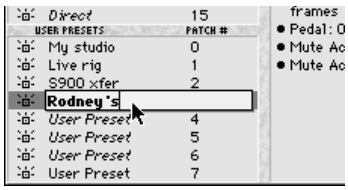

Figure 13-3: Naming a user preset. Factory preset names can't be changed.

2 Type the desired name.

3 Press return to confirm the new name or press command-period to cancel.

SWITCHING PRESETS USING A PATCH CHANGE

Each preset has a MIDI patch change number assigned to it; the patch change number is displayed in a text box to the right of the preset in the Presets window as shown in Figure 13-2 on page 80. You can call up a preset using a MIDI controller or sequencer by sending a MIDI patch change event to your Express interface with the corresponding patch number value. For example, if you wanted to call up the *Live Keyboards* factory preset shown in Figure 13-2, you would send a MIDI patch change event with a value of 10.

If you want to change the patch change number for a preset, click the text box and type in the new number.

To get your Express interface to respond to the preset patch changes, you need to indicate where the patch change will be sent from. We'll call this the *preset trigger source*: the MIDI channel your Express interface will "listen to" for preset patch changes.

To specify the preset trigger source:

1 Choose Set preset trigger source from the Preset menu.

2 When the Set Trigger Source dialog box appears, indicate the MIDI or serial port you would like to send the patch changes from.

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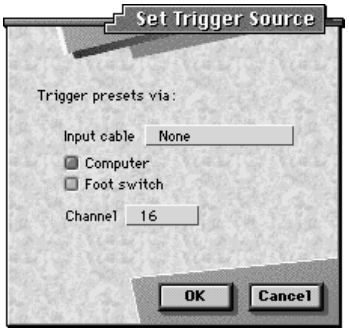

Figure 13-4: The Set Trigger Source dialog lets you indicate the source of patch change messages that will call up your Express interface presets.

If you are going to use a MIDI controller, choose it from the input cable device pop-up menu. If you are going to change Express interface presets from computer software, check the computer box. The foot switch option lets you switch presets using patch change events sent by a foot switch. For information, see "Switching presets with the pedal" on page 88. Be sure to indicate the MIDI channel you will be transmitting the patch change on, too.

Sending patch changes from the Mac

As you can see by the serial port options in the Set Trigger Source dialog box, your Express interface can receive patch changes from software running on the Macintosh. You should be careful, however, when choosing to do so because you can inadvertently switch the current preset. For example, you might have a patch change event in a sequencer track that you intended to call up a patch on a sound module. But if the patch number is the same as your Express interface preset, your Express interface will respond to it as well.

To avoid this problem, you can use system exclusive data instead of patch change events to make Express interface preset changes from the computer. Your Express interface has a "preset selection" system exclusive message, which you can program into your sequencer instead of a patch change.

Your Express interface preset select message is as follows:

```
F0 00 00 33 08 22 00 00 xx F7
```

The "xx" byte specifies the preset number. Use the value shown in the table below. For example, to select the Live Keyboards preset, plug in "0B" in the message to get:

```
F0 00 00 33 08 22 00 00 0B F7
```

When you send this message to your Express interface, it will switch to the Live Keyboards preset.

Preset	Hex number ("xx")
Sequencer 30 fps	09
Sequencer 25 fps	0A
Live Keyboards	0B
Merge All	0C
Merge Some	0D
Dual Split	0E
MIDI Machine	0F
Direct	10
User Preset 1	01
User Preset 2	02
User Preset 3	03
User Preset 4	04
User Preset 5	05
User Preset 6	06
User Preset 7	07
User Preset 8	08

MODIFYING A PRESET

You can change any settings of the currently selected preset in any window in ClockWorks. For example, you could add or delete a connection in the Device Settings & Routing window, change a setting in the SMPTE Controls window, or mute something in the Event Muting window.

If a user preset is selected at the time you make the modification, the change is automatically saved with the preset. (Saving occurs when you switch to a different preset or when you quit ClockWorks.)

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If a factory preset is selected when you make the modification, the change remains in effect until you switch to a different preset. Since the modification can't be saved with the factory preset (factory presets can't be modified), ClockWorks presents you with a window asking you if you would like to save the current state of the interface as one of the eight user presets:



Figure 13-5: Saving the current state of your Express interface to one of the eight user presets.

Select one of the eight user presets from the pop-up menu, type in a new name for it if you like, and click OK. The modified factory preset gets saved as a user preset.

You can invoke the *Save Preset* dialog shown above at any time by choosing Save Preset from the Presets menu.

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CHAPTER 14 Working with a Foot Pedal

OVERVIEW

This chapter explains how you can use a foot pedal with your Express interface to:

- Generate MIDI data, such as notes, controllers, patch changes, pitch bend, and system exclusive data using a foot switch
- Use the foot switch to step through a series of MIDI data events (or groups of events)
- Use the foot switch to change the current Express interface preset or step through a series of presets
- Convert an audio tempo source (such as a click track) into MIDI data to slave MIDI hardware or software to the audio tempo source

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Converting an audio click to MIDI 88

PEDAL WINDOW BASICS

The pedal input is controlled by the Pedal window, which can be opened from the Windows menu. This window lets you indicate the type of input you are using (click input or foot switch). It also lets you choose what type of data will be generated.

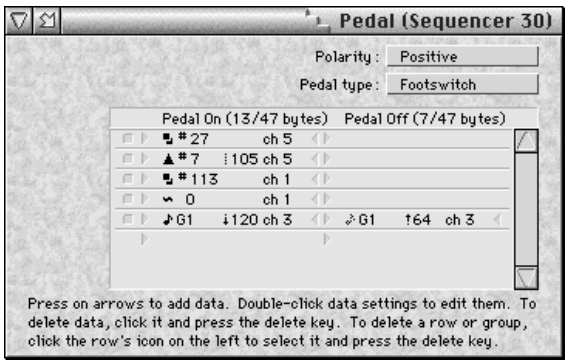

Figure 14-1: The Pedal window.

Saving pedal settings as part of a user preset

As with other ClockWorks windows, the settings you make in this window affect the current preset in your Express interface, and they will remain in effect until you change them or switch to a different preset. In addition, you can save these settings as part of one of the eight user presets. Each one of the eight user presets can have its own, unique pedal & click settings. For example, you could set up user preset 1 to handle a foot switch, while preset 8 could be set up for click-to-MIDI conversion.

To save pedal and click settings with a user preset:

1 Select the preset.

2 Make the settings you wish in the Pedal window.

The settings will be automatically saved when you quit ClockWorks or switch to a different preset.

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Using a foot switch

You can use any standard momentary foot switch with your Express interface. Note, however, that your Express interface does not support "expression" foot pedals, which generate a continuous stream of data.

☛ There are several types of momentary foot switches. Some are "on" when they are pressed; others are on when they are released. For simplicity, in this manual we refer to the type where "on" is *pressed*.

A momentary foot switch triggers one MIDI event (or set of events) at a time, either when you press down on it or when you release it. With your Express interface, you can even program the foot switch to step through a series of MIDI events. For example, you might set up a series of MIDI patch changes that call up different sounds on your synths and then use the foot switch to step through them during a live performance, calling up the next sound each time you press the foot switch. Consecutive events don't have to be the same type of event. For example, you could send a patch change event to call up a sound, followed by a controller #7 with a value of zero to mute an instrument.

The foot switch can even send more than one MIDI event at a time. For example, you could press the foot switch at the beginning of a new song during a live performance to have it select a sound (patch change event), set the correct volume (volume controller), and zero out pitch bend to begin at the correct pitch (pitch bend event of zero).

The foot switch can also trigger a *panic* hit, sending note-offs to all output cables.

Pedal setup overview

Here is an overview of how to set up your Express interface to use a foot switch:

1 Be sure the foot switch is connected to your Express interface as shown in Figure 2-7 on page 13.

2 Open the Pedal window by choosing it from the Windows menu.

3 Choose *Foot Switch* from the Pedal type menu.

4 Set up the data to be sent using the controls in the bottom portion of the window. This is covered in detail in the next section, "Setting up the foot switch output data".

5 In the Device Settings & Routing window, make connections from the foot pedal icon to the desired MIDI out port icons and computer icons.

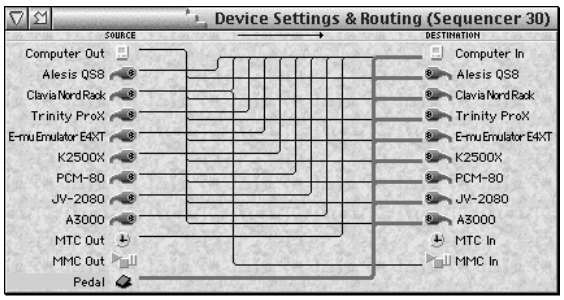

Figure 14-2: Routing pedal data.

MIDI data that you generate with the foot switch can be sent to any device connected to your Express interface, including the computer (serial port A) and serial port B.

6 When you have finished setting up the data, you are ready to use the foot switch.

See "Sending data with the foot switch" on page 87.

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Setting up the foot switch output data

If you choose "Foot Switch" from the "Pedal type" pop-up menu, the window displays the data for the foot switch as shown in Figure 14-1 on page 85.

The data sequence list lets you build a series of MIDI data events. Here is a summary of what you can do:

To do this	Do this
To add a MIDI event that you want sent when you press the pedal down (on)	Press on the arrow on the left-hand side of the Pedal On column.
To add a MIDI event that you want sent when you release the pedal (off)	Press on the arrow on the left-hand side of the Pedal Off column.
To add another MIDI event to either column	Press on the arrow on the left-hand side at the bottom of the list.
To edit the settings of an event	Double-click the setting you wish to change.
To add a new event that will be grouped with the event above it	Press on a arrow anywhere in the group where the event should be inserted. The event is inserted where the arrow points.
To delete an event	Click the event to select it and press the delete key.
To delete an entire row or group	Click the square icon to the left of the row to select it and press the delete key.
To add a "panic" hit	Press on a triangle and choose the *PANIC* item.

Sending "pedal off" data

So far, we've only discussed sending "pedal on" data. That is, data which is sent when you press *down* on the foot switch. Your Express interface can also send "pedal off" data when you *release* the foot switch. In fact, you can program the list of data for both pedal on and pedal off data. Each time you press down, you send a pedal on event, and when you release you send a pedal off event. Keep in mind, however, that this could be a little awkward because––depending on what you are doing––you may be required to hold your foot down for a while before sending the next event.

To program pedal off data, add it to the Pedal Off column as discussed in the previous section, "Setting up the foot switch output data". The Pedal Off list can have up to 47 bytes of pedal off data, just like the pedal on data, giving you a total of 94 bytes worth of foot switch data.

Grouping data

You can set up the list so that the pedal sends several MIDI events all at once. After you create the first event, press on the arrow to its right to add a second event to the group. You can continue to add more events to the group by clicking the right-hand arrow of any event in the group. The new event you insert will always be inserted just below the arrow you press on.

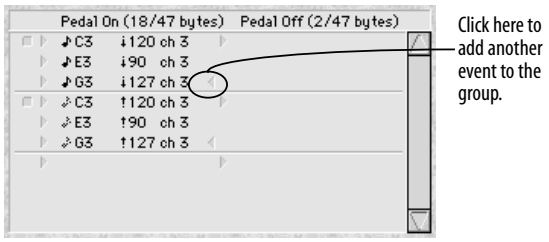

Figure 14-3: An example of grouping data events. In this example, the Pedal On group, a C major triad (notes C-E-G), is sent when the pedal is pressed a first time. When the pedal is pressed again, Note-Off events are sent to silence the chord. (Note-off events are denoted by a grayed out note icon.) The status bar above the list indicates 18 bytes worth of pedal on data.

Sending data with the foot switch

Once you have made the preparations described in the previous section, you are ready to use the foot switch. Just press it and release it. With each press, it will send out a group of MIDI events. When you press it again, it sends out the next event or group in the list. When you reach the last event or group, your Express interface returns to the beginning to step through the list again.

If you have programmed "pedal off" events, it will send a MIDI event or group each time you release the foot switch as well, alternating between the *Pedal On* and *Pedal Off* data lists. Using both pedal on and pedal off events is an effective way to step

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through a series of events quickly. Rather than having to press down for each event, which involves two motions (up and down), you can use just one motion––a quick press or release.

SWITCHING PRESETS WITH THE PEDAL

The foot switch can be used to change to a different preset. For example, you might set up the eight user presets for various controller routings for a live show and then use the foot switch to step through the presets at various points during your live performance.

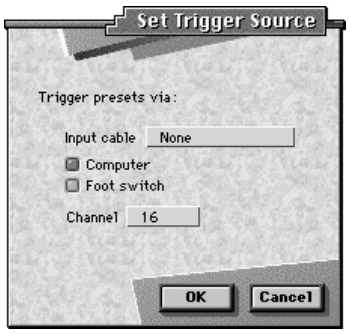
Another benefit of this feature is that it when you switch to a different preset, the new preset can have a completely different list of foot switch data events. You could then step through them and at the end of the list switch to yet another preset with yet another list of events to step through. This is a great way to break the 94-bytes-per-preset limit on foot switch MIDI data. Each preset can have 94 bytes (47 pedal on bytes plus 47 pedal off bytes), and you can step through eight presets, which gives you a total of 752 consecutive bytes you can step through with a foot switch.

To switch presets with a foot switch:

1 Open the Presets window.

2 Choose Set Trigger Source from the Presets window mini-menu.

The Set Trigger Source dialog box appears.



3 Check the Foot switch option, choose a MIDI channel, and click OK.

4 Back in the Presets window, make note of the patch number for the preset you want to select with the foot switch.

5 Go to the Pedal window and add a Pedal On or Pedal Off MIDI patch change event with a patch change number that matches the preset you want. Also make sure the MIDI channel number matches.

See "Setting up the foot switch output data" on page 87 for details.

When you reach the patch change event in the list, you'll switch to the new preset.

☛ Make sure your preset patch change is the last event in the foot switch data list for the preset you are currently programming because when you switch to the new preset, the foot switch data list will change to the new preset's list.

CONVERTING AN AUDIO CLICK TO MIDI

Your Express interface can convert an audio click into any MIDI event. For example, the audio click can be played back from a tape deck or generated live by a drummer. This feature can be used for many purposes. Below are a few ideas:

- Recording the click's tempo map into a sequencer
- Slaving a sequencer to a click track
- Triggering drum samples

This feature can be used with Mark of the Unicorn's Performer program to slave a sequence to prerecorded music on tape while referenced to SMPTE time code. For more information, please refer to the Performer User's Manual.

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To convert an audio click into MIDI:

1 Be sure that the audio click source is connected to the PEDAL phone jack on your Express interface as shown in Figure 2-7 on page 13.

2 Open the Pedal window from the Windows menu in ClockWorks.

3 Under Pedal Type, select Click-to-MIDI.

The click-to-MIDI options appear.

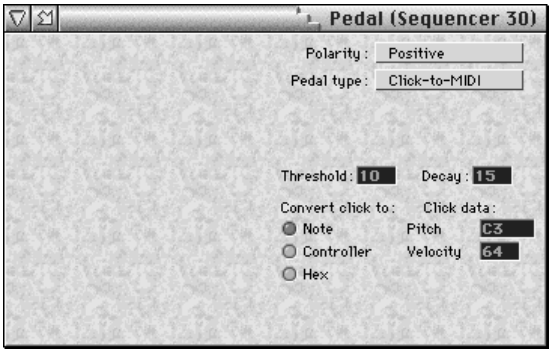

Figure 14-4: The click-to-MIDI options.

4 Adjust the Threshold and Decay options as needed as you experiment with the response.

The decay and threshold settings are meant to prevent doubled attacks. The decay is the amount of time your Express interface will wait before it begins scanning for another click. The decay can be set from 1 to 15. Set the decay as high (long) as possible to prevent false attacks, but low (short) enough so that it won't miss the next true click. Fast tempos require a low decay; you can afford to use a higher decay for slow tempos.

5 Under "Convert click to:", choose the data type you wish to generate from the click.

You have three categories here: *Note*, *Controller*, and *Hex*. The hex option lets you enter any MIDI event in its raw, hexadecimal form as shown below, with a status byte followed by data byte 1 and data byte 2.

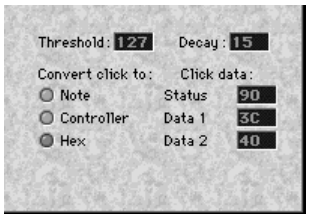

Figure 14-5: Entering click-to-MIDI data in hexadecimal.

6 Make the desired output assignment for the MIDI click data using the pedal icon in the Device Settings & Routing window as demonstrated in Figure 14-2 on page 86.

7 Check to make sure that your Express interface is successfully reading the click.

Observe the green MIDI OUT LED's on the front panel to see if they flash in sync with the click. If they miss a beat, or if they seem to flicker or stutter with a doubled attack, try adjusting the input level of the click; also try adjusting the decay.

Click input hints

If your Express interface reads the audio click erratically, such as generating doubled attacks, try adjusting the decay value. If you still have trouble, try attenuating the audio signal. The pedal input is purposefully sensitive so that it can detect a low-amplitude signal. Also try adjusting the Threshold and Decay settings in the Pedal window.

If you are creating the click that your Express interface will convert, set the audio level fairly high (at around 0 dB). Also, record a short, transient click sound with no reverb or other effects. A short and precise click sound will produce the best, most reliable results.

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CHAPTER 15 Synchronization

OVERVIEW

This chapter explains how to use your MOTU Express interface to synchronize computer software and other devices to an audio tape recorder (ATR), video tape recorder (VTR), or other time code sources using SMPTE time code. It also explains how to generate SMPTE (a process commonly referred to as *striping*).

This chapter also explains how to:

- Slave your Express interface and other devices to MIDI Time Code
- Measure incoming time code to see how fast or slow it is
- Solve various SMPTE synchronization problems

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MTC Mode 96

IF YOU ARE NEW TO SMPTE SYNC

If you are not familiar with the process of synchronizing with SMPTE time code, see Appendix B, "SMPTE Synchronization Basics" page (169)before reading this chapter. It provides a definition of SMPTE time code and an explanation of how it is used for synchronizing MIDI devices to audio and video equipment.

ACCESSING SMPTE SETTINGS

You can access the sync settings in your MOTU interface via ClockWorks in the Sync/MMC window. See chapter 10, "Sync and MIDI Machine Control" (page 59), for details about the settings in this window.

SYNCING YOUR EXPRESS INTERFACE TO SMPTE

Your Express interface ships from the factory ready to lock the computer to SMPTE time code via the MIDI Time Code (MTC) routing shown in Figure 7-14 on page 50. When this MTC routing is present, your Express interface will send MIDI Time Code to the computer as soon as it locks up. Any software running on the computer can then slave to the time code. (Make sure the software is set up to lock to MIDI time code.)

When your Express interface locks to the time code, the green "LOCK" LED on the front panel glows steadily and the red "TACH" LED blinks regularly. In addition, the green computer OUT LED glows steadily, indicating that MIDI time code (MTC) is being sent to the computer.

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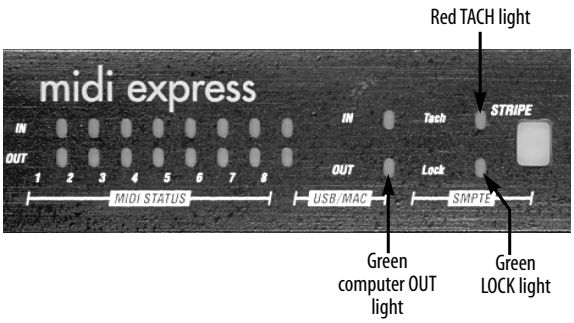

Figure 15-1: Converting time code. When your Express interface converts incoming time code, the red TACH light blinks, the green LOCK light glows steadily, and the green computer OUT light glows steadily as well. For the micro express, the lights on the front panel are arranged slightly differently than what is show here on the XT, but they perform in an identical fashion.

If the LOCK and TACH lights do not behave as described, your Express interface is not successfully locking to the SMPTE time code. This could be a problem with the audio connections between the tape deck and your Express interface. It could also be that the SMPTE level is not high enough. See Appendix C, "Troubleshooting and Customer Support" page (173).

If the LOCK and TACH lights look OK, but the green computer OUT LED is not glowing, this means that your Express interface settings have been altered somehow such that it is not sending MIDI time code to the computer. To correct the settings, see Figure 7-15 on page 50.

Getting a running update of SMPTE

You can get a running update of SMPTE in the ClockWorks SMPTE Reader and Sync/MMC windows. For details, see chapter 10, "Sync and MIDI Machine Control" (page 59).

SMPTE Offset

When reading time code, there may be times when you need to offset your Express interface a certain amount from the time code you are feeding it. See Figure 10-3 on page 60 for details.

Routing MIDI Time Code to other devices

At times, you may need to route MIDI Time Code to a device connected to one of your Express interface's MIDI OUTs. Similarly, you may have the need to route MTC to serial port B on your Express interface. For example, serial port B might be connected to a Macintosh, which you need to slave to time code. To make time code routings such as these, see "The MTC In and MTC Out connections" on page 49.

Freewheeling to avoid time code dropouts

When your Express interface encounters a drop-out —a series of missing or unreadable frames—in the SMPTE time code, it "freewheels" past them, pretending that they were not missing by briefly generating its own code to make up for the missing frames. The default freewheel value is 4 frames. This means that your Express interface will continue to generate time code for four more frames after it stops receiving time code. If it does not receive any more time code after four frames, it will stop converting.

The factory default base setups have the freewheeling feature set to 4 frames for fastest response when you stop the tape deck. The Freewheel amount can be adjusted up to 32 frames. This allows your Express interface to maintain lockup even over lengthy SMPTE drop outs.

If you encounter a time code drop out that causes your Express interface to stop converting for a moment, try increasing the freewheel amount in the Sync/MMC window. Try adding just a few frames at a time when adjusting the amount. (For details on the "one time jam sync" option, see "Regenerating fresh time code ('jam syncing')" on page 95.)

your Express interface freewheels at the frame rate it is reading at the time it begins freewheeling — except for 29.97 drop and non-drop. If you intend

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on reading 29.97 SMPTE, be sure to manually set the SMPTE format to 29.97 so that freewheeling will occur at the proper rate.

When you increase the freewheel amount, you also increase the amount of time that your Express interface keeps converting when you stop tape. To make your Express interface as responsive as possible, only raise the freewheel amount as high as necessary to overcome the drop-out(s) you are encountering.

Synchronizing to discontinuous time code

your Express interface has the ability to stay in sync with discontinuous time code — that is, time code that has no gaps in it but does have jumps in its frame locations. For details about how to do this, see "Frame lock" on page 62.

Slaving Performer to your Express interface

To slave Performer to your Express interface:

1 In Performer, select the appropriate options in the Receive Sync dialog box in the Basics menu.

Specify the port to which your Express interface is connected by clicking either the modem or printer port button. Also, choose MTC as the "Type of sync."

2 Set the frame rate and click OK.

3 Set the sequence starting frame.

Click the button in the main counter and enter the starting time. This should be a SMPTE time that is within the range of the SMPTE striped on the tape to which it will be slaving.

4 Check Slave to External Sync in the Basics menu.

This puts Performer into slave mode, waiting for sync information from an external device.

5 Click on the Play or Record button in the Controls window.

The Play button will begin flashing (or turn grey on a black and white monitor), meaning that Performer is waiting for sync information to start.

6 To start Performer, start the external device.

When Performer is locked and playing, the Play button will turn blue (or solid black on a black and white monitor). Once locked, Performer will follow, start, stop and rewind under control of the master.

7 To terminate the lock up with the master, click on the Stop button.

Clicking on the Stop button will stop Performer and remove it from the master's control. This can be done at any time. To return to normal operation, turn off Slave to External Sync by selecting it again from the Basics menu.

With your Express interface, it is not necessary to click Play in Performer before you roll tape. You can click the Play button in Performer even with the tape rolling and Performer will jump right into sync within a second or so.

STRIPING SMPTE

Along with its other capabilities, your Express interface is a SMPTE time code generator. It generates an audio form of SMPTE time code called Longitudinal Time Code (LTC).

Use the procedure below to generate new code from scratch:

1 Make the audio cable connections shown in Figure 2-6 on page 12.

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We recommend that you do not pass the time code output from your Express interface through a mixer or any form of signal processor. If you must go through a mixer, be sure equalization is flat.

2 Open the Sync/MMC window in the MTP/Express Console software.

3 Set the master sync mode in the Sync/MMC window to *Internal*.

4 If you are recording time code on a tape deck, and your tape deck has dbx noise reduction, be sure to defeat the noise reduction on the track you are recording time code.

5 Enter a SMPTE start time in the Sync/MMC window.

6 Choose the necessary frame rate.

7 Adjust the SMPTE output volume.

The goal when striping SMPTE is to get the VU meter on the tape deck to read approximately –3. You can adjust your Express interface's SMPTE volume output level by using the SMPTE VOLUME OUT setting in the SMPTE/SYNC menu in the front panel LCD. Or you can use the *Output Level* meter in the Sync/MMC window (visible when the master mode is set to *Internal*). If you want to test the level, set the Master sync mode to *Internal* and use the Start and Stop buttons to make your Express interface emit time code, and then meter it with your mixer.

8 Roll tape.

9 Click Start.

Striping will begin at the frame shown in the Start Time box. The SMPTE Reader will begin to roll. While striping, you can close the Sync/MMC window, and you can even switch to another application or Quit your Express interface software.

10 To stop striping, click Stop.

You can stop striping at any time.

Of course, if you want to stripe a tape and meanwhile get on with other work, you can quit ClockWorks. Striping will proceed in the background.

Striping SMPTE on a multitrack tape deck

The goal when striping SMPTE time code is to generate an error-free signal strong enough for reliable lockup, but not so strong that the SMPTE bleeds through to adjacent tracks.

There are several ways to handle this. One way is to leave an empty track on your multi-track tape deck as a buffer between the SMPTE and other tracks. With a buffer track, SMPTE can be recorded at very strong ("hot") levels (above 0 VU) without risk of bleedthrough.

If your tape deck has no tracks to spare, a good level at which to record is around –3 VU. That is, the VU meter for the SMPTE track on your tape deck should read –3 when you stripe the SMPTE. This records SMPTE that is hot enough for reliable lockup and weak enough so that it will not bleed into adjacent tracks. -3 VU is only a rule of thumb, though, so don't hesitate to use other levels if they work better for you.

LTC MODE

In LTC mode, your Express interface locks to incoming SMPTE time code received on its SMPTE IN jack. But LTC mode differs from LTC QuikLock mode in several significant ways. In LTC mode, your Express interface:

- Emits regenerated LTC on its SMPTE OUT jack

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- Analyzes incoming time code and responds in several useful ways, depending on what happens to the incoming time code

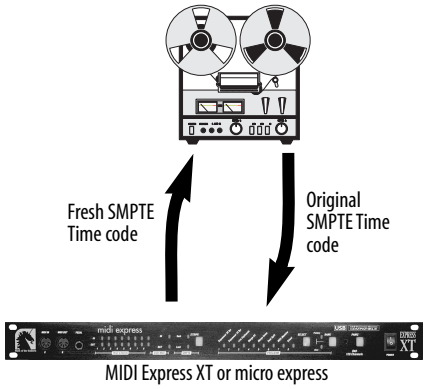
- Measures incoming time code with an extremely accurate internal clock to see how fast or slow it is running and displays the results in the SMPTE Reader window in ClockWorks

Because LTC mode employs a sophisticated phase-lock synchronization engine in your Express interface, the amount of time it takes to establish lockup to incoming time code is considerably longer than LTC QuikLock mode. On the other hand, LTC mode offers the additional capabilities mentioned above. These features, and how you can use them, are discussed in the next few sections.

Regenerating fresh time code ('jam syncing')

SMPTE is a problem when you are copying tapes: it degrades rapidly every time you try to copy it from one tape to another. Often, the SMPTE signal deteriorates so much that it will not be recognizable by any SMPTE-to-MIDI converter, including your Express interface, and you will no longer be able to lock to it.

The solution to this problem is to use your Express interface to regenerate fresh SMPTE time code that matches the original time code while you are copying the tape. Some people refer to this process as *jam syncing*. When your Express interface receives a SMPTE signal on its SMPTE IN cable, it always regenerates a fresh signal that exactly matches the incoming signal and sends it out the SMPTE OUT cable (except for drop-outs, which it eliminates with freewheeling).



To regenerate SMPTE:

1 Connect the original SMPTE track to the SMPTE IN on your Express interface, and connect the SMPTE OUT from your Express interface to the destination SMPTE track (which could even be on a different tape deck).

2 Set the freewheel option in the Sync/MMC window to a high enough number of frames to cover any drop outs that may exist in the current time code.

Try setting it to between 2 and 8 frames, unless there is an obviously large dropout. If so, set it more than 8 frames. This ensures that drop-outs in the old code are not reproduced in the fresh code.

3 Roll tape and set the SMPTE volume levels.

When your Express interface is reading the old time code, it generates fresh time code via its SMPTE OUT jack only when it is in LTC mode; it won't regenerate LTC in *LTC QuikLock* mode.

4 When the levels are set, roll tape and convert as normal.

your Express interface automatically creates fresh SMPTE time code that matches the original time code and its relation to the other tracks on the tape.

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In addition, your Express interface freewheels over drop-outs in the old time code so that the new, clean code has none.

Lengthening a SMPTE track

If the time code on your SMPTE track ends too early and you need to add more code, you can use the "One time" jam sync option. To do so, feed the original track into your Express interface and record the fresh code onto a new track. Be sure to start from the beginning so that you regenerate the entire length of the original track. When your Express interface reaches the end of the original SMPTE track, it will begin striping on its own. To stop striping, click the Stop button or wait until your Express interface reaches the stop time.

And remember, your Express interface must be in *LTC* mode to do this, not *LTC QuikLock*.

Regeneration and time code bits

Except for when it is in *LTC QuikLock* mode, your Express interface always regenerates fresh time code from its SMPTE out jack. Time code user bits embedded in incoming LTC on its SMPTE input are not preserved.

Measuring incoming time code

In LTC mode, your Express interface measures incoming time code with an extremely accurate internal clock to see how fast or slow it is running and displays the results in the SMPTE Reader window in ClockWorks. For details, see "SMPTE Reader status display" on page 70.

MTC MODE

Choose this synchronization mode when you want your Express interface to slave to MIDI Time Code (MTC) being sent from a device connected to one of its inputs. This mode offers the least amount of time base stability, so it is recommend that you try to set things up so that you can use one of the other modes.

When your Express interface operates in MTC mode, it locks to any MTC coming from your computer. In doing so, however, it also "swallows" the MTC coming from the computer. If you attempt to transmit MTC from Performer, Digital Performer, Pro Tools, or other software to a specific MIDI device in your studio, it won't reach the MIDI device because it will get read and "swallowed" by your Express interface. Since computer-generated MTC is not as stable as other forms of time code, you are better off doing just the opposite: send MTC from your Express interface to the computer, and if necessary, control your Express interface from your computer software via MIDI Machine Control as demonstrated in Figure 5-3 on page 32.

If you absolutely must transmit MTC from your computer for some reason, See "Routing MTC to your MOTU interface" on page 50 for important information about routing MTC to your Express interface. If you need to send MTC to other devices as well, you can route it to them as demonstrated in Figure 7-14 on page 50.

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CHAPTER 16 MIDI Machine Control

OVERVIEW

Your Express interface can serve as a MIDI Machine Control (MMC) transport control "hub" for all MMC-compatible devices, allowing you to manipulate the transport controls of everything from one master set of controls: either an MMC hardware controller device such as JL Cooper's CuePoint or from MMC-compatible MIDI software on the computer.

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Setting up other MMC devices.....98
Setting up your computer software.....98
Setting up a hardware MMC controller 99
computer software as an MMC controller 99
Digital Performer as an MMC controller.....99
MMC remote control of record functions 99
Using a 3rd-party device as a master 99
MMC routing example.....100

HOW MMC WORKS

An MMC controller (which has transport and cueing controls) sends transport commands (play, stop, cue, etc.) to an MMC device that is serving as a time code source. When the MMC device responds to the transport commands, it generates time code to which all other devices (and software) chase and lock. The other devices do not need to be MMC devices, as they sync in the usual fashion via time code (LTC or MTC).

A recommended setup for MMC

The best scenario for MMC is to set the Master sync mode of your Express interface to *Internal*. Your Express interface serves as the time code source, and your computer software (or hardware MMC controller) serves as your MMC transport control master. The MMC controller sends play, stop, start and locate commands to your Express interface, and all other devices (including the computer software) chase and lock to time code being generated by your Express interface.

In this scenario, your Express interface serves as a time code "hub" for all other devices as pictured in Figure 5-3 on page 32.

Other MMC scenarios

In the recommended scenario described in the previous section, your Express interface receives MMC transport commands and serves as the time code master for everything else.

Alternately, you could choose another MMC device, such as a hard disk recorder, to receive transport commands and serve as the time code master. For example, the device would receive transport commands from your computer software and generate SMPTE time code (LTC). In

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this case, you would set your Express interface master sync mode to *LTC QuikLock* and feed the LTC into your Express interface, which would then drive all other devices.

There is no advantage to doing MMC this way; in fact, it will probably not provide as stable a time base as your Express interface does in the recommended scenario described in the previous section. You should only really use this setup if you have a MMC device that does not have the ability to be a time code slave and therefore must be the master.

MMC and video

If you are working with video, and you want MMC control of your rig from your computer software (or MMC-compatible controller) via your Express interface, your video deck needs to have the ability to either:

- Synchronize to external SMPTE time code

OR

- Support MMC

Without either of these capabilities in your video deck, your Express interface has no way to control the video deck transports. You'll instead have to use your video deck as the transport and time code master.

If your video deck supports the SONY 9-PIN protocol, consider purchasing Mark of the Unicorn's *Digital Timepiece*, which lets you control your video deck from a computer (or other MMC controller).

SETTING MMC DEVICE ID'S

Each MMC device requires a unique MMC device ID, including your Express interface itself. The factory default ID of your Express interface is 20. If needed, you can change it as shown in Figure 10-10 on page 62.

SETTING UP OTHER MMC DEVICES

If you have an MMC-compatible device, you can slave it to your Express interface. But first, you need to make your Express interface send MTC (or LTC for some devices). To send MTC, use the Device Settings & Routings window in ClockWorks to make connections from the MTC Out port in the left-hand column to the desired destinations in the right-hand column as demonstrated in Figure 7-14 on page 50.

For most MMC devices that support being an MMC slave, routing time code (either MTC as just discussed or LTC) to them is all you need to do. For some devices, you may also need to get your Express interface to send MMC transport commands to the device. Once again, you do this in the Device Settings & Routing window: connect the MMC Out port in the left-hand column to the destinations in the right-hand column as demonstrated in Figure 7-20 on page 52. Then you are ready to control your MMC device — via your Express interface — from the computer (or a hardware MMC controller).

SETTING UP YOUR COMPUTER SOFTWARE

Regardless of what you decide to use as your MMC transport control master (an MMC controller device or computer software), you need to set up the software so that it will slave to MIDI Time Code (MTC) generated by your Express interface. This will ensure that your software chases and locks with all other MMC devices. Check to make your software is set up to the proper frame rate, and that it is in "external sync" or "slave" mode, waiting for MTC.

Also see "computer software as an MMC controller" on page 99.

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SETTING UP A HARDWARE MMC CONTROLLER

To use any MMC transport controller, such as the JL Cooper CuePoint™:

1 Connect the MIDI OUT and IN jacks on the MMC controller to your Express interface.

2 Using ClockWorks, route MTC to the MIDI OUT port that the MMC controller is connected to as shown in Figure 7-14 on page 50 so that it can receive MIDI Time Code from your Express interface.

3 In the MMC controller device, identify the MMC device ID for your Express interface.

From the factory, the default MMC device ID for your Express interface is 20. If you need to, you can change it as described in "Setting MMC device ID's" on page 98.

From the standpoint of achieving MMC transport control over your Express interface, the above preparations are all you need. There may, of course, be other preparations necessary in the controller itself.

COMPUTER SOFTWARE AS AN MMC CONTROLLER

Most likely, you'll want to make your computer software be the MMC transport control master, so you can control all MMC devices from your computer.

This can be accomplished with an MMC-compatible sequencer, MMC applet, or any other software that transmits MMC transport control commands.

Generally speaking, once you've successfully established overall MIDI communication between your software and your Express interface, all you have to do is tell your MMC software what the MMC Device ID is of your Express interface. From the factory, the default MMC device ID for your Express interface is 20. If you need to, you can change it as described in "Setting MMC device ID's" on page 98.

As long as MMC routing from the computer to your Express interface exists (as shown in Figure 7-21 on page 53), and its master sync mode is set to *Internal*, your Express interface will respond to MMC commands coming from the computer specifying its device ID. It will start, stop, and locate to any SMPTE location you designate from your software.

DIGITAL PERFORMER AS AN MMC CONTROLLER

Performer and Digital Performer have features to make using MMC with your Express interface even easier. For details about this, see "MIDI Machine Control (MMC)" on page 32.

MMC REMOTE CONTROL OF RECORD FUNCTIONS

To record-enable tracks of MMC devices connected to your Express interface, make sure your MIDI software sends MMC record-enable commands using the MMC device ID's configured for the device. This is straightforward, one-way MIDI communication between your MMC software and the MMC device. Your Express interface MMC features do not come into play here.

USING A 3RD-PARTY DEVICE AS A MASTER

We recommend trying to set up MMC as described in "A recommended setup for MMC" on page 97. However, you may have an MMC device, such as an MMC-equipped reel-to-reel tape deck, that does not have the ability to be a time code slave and therefore needs to be the time code master. In this case, you need to set up your Express interface so that it knows that this device will be the master instead of the computer.

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If the device transmits LTC, you can simply connect it to your Express interface's SMPTE input and set your Express interface's master sync mode to LTC QuikLock.

If the device only transmits MIDI Time Code (MTC), use the Device Settings & Routing connection shown below in Figure 16-1 and set your Express interface's master sync mode to MTC.

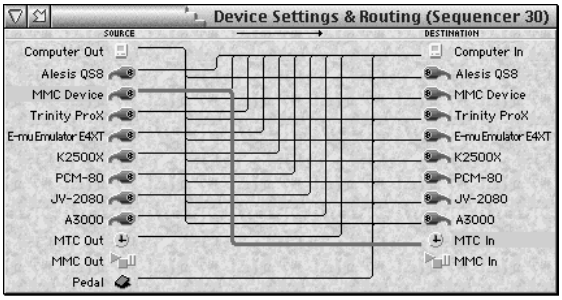

Figure 16-1: If you have an MMC device that can only transmit time code (and cannot be a time code slave), then you can make it the time code master by routing MTC to your Express interface (MTC In) as shown here. It is better to use LTC, though, or better yet: your Express interface as the time code master. Both are a more stable time base than MTC.

MMC ROUTING EXAMPLE

Below is a typical MMC routing example. The devices involved are:

- Performer (or any other MMC sequencer running on the computer)
- JLCooper CuePoint MMC controller
- Akai DR8 hard disk recorder
- Roland VS-880 hard disk recorder

Your Express interface master sync mode is set to INTERNAL. It is being shuttled by either the CuePoint or Performer. Figure 16-2 and Figure 16-3 show the computer, MTC, and MMC connections needed to control everything from either Performer or the CuePoint. This setup allows you to use either one interchangeably as your transport master controls, without having to change any settings when switching between them.

Performer is slaving to MTC from your Express interface, while at the same time issuing MMC transport commands to your Express interface.

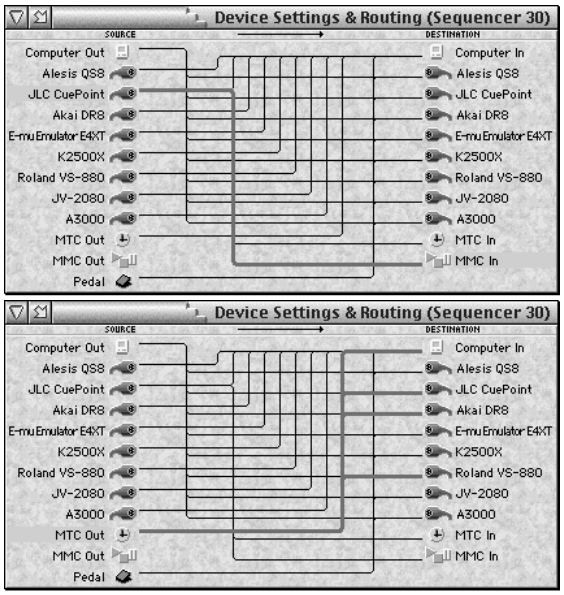

Figure 16-2: A typical routing configuration for MMC. Here, the CuePoint is being routed to an Express interface's MMC In port so that it will respond to MMC transport commands from the CuePoint. In turn, the interface, which is in INTERNAL sync mode, is redistributing MTC to the Akai DR8 and Roland VS-880 hard disk recorders.

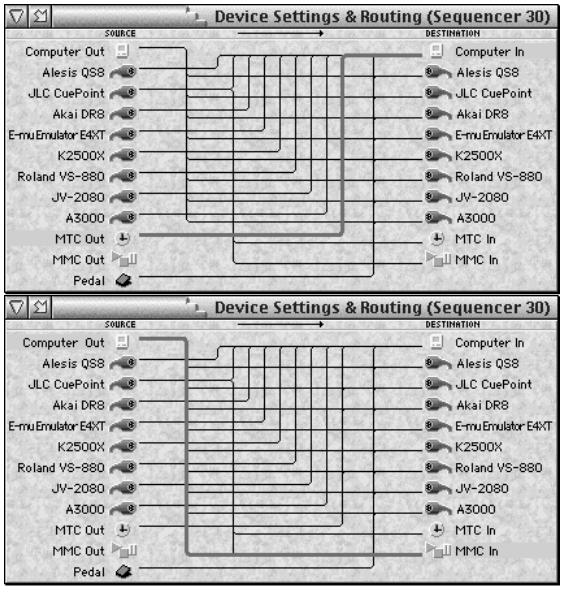

Figure 16-3: In the highlighted connections shown here, MIDI Time Code is being routed to the computer so that Performer can slave to it. MMC is being routed from Performer to the interface (MMC In).

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Part III

For MTP AV Users

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CHAPTER 17 Using the Front Panel LCD

OVERVIEW

This chapter explains how to program the MIDI Timepiece AV from the front panel. It also explains what the PANIC button does, and how to restore the factory default settings in the MIDI Timepiece AV.

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Working with base setups 107
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MIDI Channel Map. 117
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USING THE LCD DISPLAY

The MIDI Timepiece AV front panel liquid crystal display (LCD) is a 2 by 16 character, back-lit display.

With the LCD and four front panel knobs and the Enter button, you can control just about every capability in the MIDI Timepiece AV. (If you're curious, see "A few things the LCD can't do..." on page 118.)

☛ Please note: changes that you make to the MIDI Timepiece AV in the LCD do not automatically get reflected in ClockWorks. If you have made changes using the LCD, and you want the software to reflect those changes, choose *Verify Network* from the Utilities menu in ClockWorks.

Understanding the LCD window structure

The LCD provides 11 windows that are organized around its primary features. These windows are displayed across the top of Figure 17-1 on page 104. Several windows have sub-windows with additional parameters, which are shown below each main window.

☛ Note: if you have an original MIDI Timepiece connected to the network port of the MIDI Timepiece AV, an additional, 12th window is added in the LCD between the BASE SETUP and the PATCH SELECT windows.

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MIDI Timepiece AV LCD Window Structure

(continued on opposite page) ——►

BASE SETUP	IMPORT/EXPORT MTP 1 (only appears with networked MTP 1)	PATCH SELECT	GLOBAL HARDWARE SETUP	MIDI DATA DUMP	SYNC
MODIFIER		USE BASE SETUP	MAC SPEED		MASTER SYNC
		USE MODIFIER (1 THRU 4)	BOX ID & NET PORT		WORD CLOCK OUT
		TRIGGER	MMC DEVICE ID for MTP AV and ADAT		SMPTE VOLUME OUT
		PATCH NAME/ SAVE	RUNNING STATUS		SMPTE FORMAT
			DIRECT CONNECT MODE		SMPTE DESTINATION
			RESET ALL DATA		offset/stripe
					JAM SMPTE FRAMES

Figure 17-1: The MIDI Timepiece AV window structure. The twelve main windows are displayed across the top in the double-ruled boxes. Use the WINDOW knob to scroll horizontally through the top row of main windows. Use the CURSOR knob to scroll vertically through the sub-windows listed below each main window.

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(continued from opposite page)

PEDALS	KNOBS	MIDI ROUTING	MUTE MIDI DATA	MIDI CHANNEL MAP	BASE SETUP NAME
PEDAL TYPE	KNOB START/ STEP SIZE	ROUTING BY CABLE	MUTING PARAMETERS	INPUT CHANNEL REMAP	
POLARITY or THRESHOLD/ DECAY	RANGE	ROUTING BY CHANNEL		OUTPUT CHAN-NEL REMAP	
RANGE or CLICK TO MIDI OUTPUT	DATA ASSIGN-MENT & OUTPUT ASSIGNMENT				
OUTPUT ASSIGNMENT					

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Getting familiar with the LCD conventions

Here are several conventions that will help you navigate through the LCD display:

- Left and right arrows indicate that there is another screenful of data to the left or right that relates to the current window.



Figure 17-1: The left and right arrows indicate other windows to the left or right, which you can scroll to with the CURSOR knob.

- "Y/N" means to press the YES/NO button to confirm or execute something you have just done in the LCD.

- "<E>" means to press the ENTER button to confirm or carry out something you have just done in the LCD.

- "N" or "Y" means to press the YES/NO button to toggle something from N to Y or Y to N. "Y" means "on" or "enabled" and "N" means "off" or "disabled".

- When choosing a base setup, modifier, or patch, "N" means that the base setup or modifier has not been called up. (Press the YES/NO button to recall it.) "Y" means that the modifier, base setup or patch has been called up. In this case, disable the modifier, base setup, or patch by enabling a different one.

- When selecting cables in the LCD, the cable range can either be 1-8 or 1-16 if you have two MIDI Timepieces. "MAC" or "M" stands for the Macintosh (computer port), "NET" or "N" stands for the network port, and "mac" or "m" stands for the computer port on a MIDI Timepiece that you have networked to the one with which you are working.

- If you find yourself in a window that asks you to save settings that you have made, and you do not want to save the changes, turn the WINDOW knob to exit the window and cancel the operation.

Using the knobs to control the LCD

Here is how the four knobs control the LCD:

- Use the WINDOW knob to select a main window. The LCD has eleven main windows that correspond to the MIDI Timepiece AV's primary capabilities.

- Use the CURSOR knob to select variables within each window. A variable is a numeric or text item that flashes when it is selected. When selected, you can change it with the VALUE knob.

- Use the VALUE knob to change the currently flashing numeric or text item in the LCD.

- Sometimes the LCD has *two* flashing variables. In this case, one of them is underlined. Use the SELECT knob to change a flashing, underlined variable.

When the LCD and software conflict

If you've been using Clock Works on the computer to edit the MIDI Timepiece AV, the LCD may not be able to accurately reflect the changes you have made from the software because the software can do things that the LCD cannot. For example, you can program a knob to send system exclusive data from the software, but this is not possible from the LCD. If there is any doubt, check the software since it can accurately reflect everything about the MIDI Timepiece AV.

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WORKING WITH BASE SETUPS

For a complete definition of base setups, see "What is a "base setup"?" on page 128 before reading this section.

Think of a base setup as a picture of all the MIDI Timepiece AV's current internal settings saved all at once. This includes its cable routing connections, muting and rechannelizing settings, SMPTE convert settings––everything.

The MIDI Timepiece AV has eight internal base setups; each can store its own unique settings. One of the eight base setups is always active, and it's name and number are displayed in the BASE SETUP window. Any changes you make in any of the LCD windows are remembered until you switch to a different base setup. At any time, you can add changes you've made to the current base setup. Or, you can save the current base setup, along with the changes, as a different base setup that replaces one of the eight. (See "Making changes to a base setup" on page 107.)

Selecting the current base setup

The BASE SETUP window lets you call up one of the MIDI Timepiece AV's eight internal base setups.



To select a base setup:

1 Use the WINDOW knob to go to the BASE SETUP window.

2 Turn the VALUE knob until you see the name and number of the desired base setup.

3 Once you have selected the desired base setup, press the YES/NO button to recall it.

Notice that only one base setup can be called up at a time.

Making changes to a base setup

To make changes to a base setup:

1 Select the base setup as described in the previous section.

2 Make any changes you like to the base setup by using any other windows in the LCD.

You can select modifiers, change cable routings, or anything you want.

3 Use the WINDOW knob to go to the BASE SETUP NAME window.

It's the window farthest clockwise.

4 If desired, use the VALUE and CURSOR knobs to edit the base setup name.

5 Press the ENTER button.

You'll now see the following window.



6 Make sure that the original base setup appears in the LCD.

If not, use the VALUE knob to select it. This is because you are going to replace the original base setup. (Although, if you want, you can preserve the original by writing over a different base setup.)

7 When you have selected the base setup you want to replace, press the YES/NO button.

The new base setup replaces the old one.

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Changing the name of a base setup

Use the same procedure as "Making changes to a base setup" on page 107 to rename a base setup.

Working with modifiers

For a complete definition of a modifier, see "What is a modifier?" on page 128.

A modifier is any command, or set of commands, that you can program the MIDI Timepiece AV to do. For example, a modifier could be the command to "connect input cable 3 to output cable 5".

Modifiers cannot be created or edited in the LCD. They can, however, be called up in the LCD.

Calling up a modifier

The MODIFIER window lets you call up a modifier that you have created with ClockWorks.

To select a modifier:

1 Use the WINDOW knob to get to the BASE SETUP window.

2 Use the CURSOR knob to got to the MODIFIER window.



3 Turn the VALUE knob until you see the name and number of the desired modifier.

4 Once you have selected the desired modifier, press the YES/NO button to recall it.

You can recall as many modifiers at a time as you want.

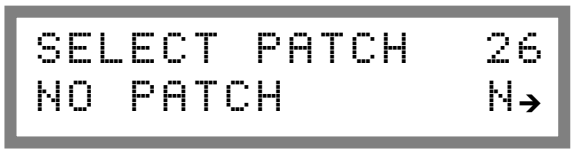
Building a patch

For a definition of a patch, see "What is a patch?" on page 133.

A patch is built using the base setups and modifiers that are stored in the MIDI Timepiece AV's memory.

To build a patch from the LCD:

1 Use the WINDOW knob to go to the SELECT PATCH window.



2 Turn the CURSOR knob one click to the right to the USE BASE SETUP window.



3 Use the VALUE knob to select one of the eight base setups or NONE (no base setup).

4 Turn the CURSOR knob one click to the right to the USE MODIFIER window.



5 Use the VALUE knob to select a desired modifier or to select NONE.

You can assign up to four modifiers to the patch. To assign a second, third and fourth modifier, use the SELECT knob and VALUE knob for each one.

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6 Turn the CURSOR knob one click to the right to the TRIGGER window.

The trigger is the MIDI patch change event that will call up the patch. You define what patch change, as well as what cable and channel it will come from in the network. This window provides three parameters, which can be selected with the CURSOR knob: the MIDI channel (CH), the patch change number (PC), and the source cable (IN).



7 Use the CURSOR and VALUE knob to set the trigger parameters as desired.

8 Turn the CURSOR knob one more click to the right.

The PATCH NAME/SAVE window appears. Use the CURSOR and VALUE knobs to adjust the name as desired.

9 Press the ENTER button to save the patch settings and name.

Selecting a patch

To select a patch:

1 Use the WINDOW button to go to the SELECT PATCH window.

2 Use the value knob to select the desired patch.

3 Press the YES/NO button to call up the patch.

MAKING THE GLOBAL HARDWARE SETTINGS

Go to the GLOBAL HARDWARE window using the WINDOW knob. Make the global hardware settings with the CURSOR and VALUE knobs as follows:

Mac Speed

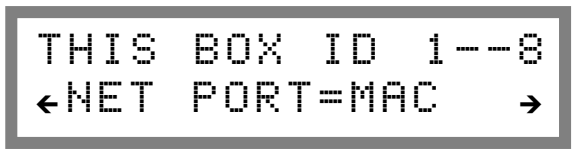
☛ This setting applies to the "Mac" serial port on the MIDI Timepiece AV. If you're using the USB port to connect the interface to your computer, this setting has no effect on the performance of your interface.

Your choices here are 1 MHz or FAST. Choose the speed that matches the MIDI software you are running on the Macintosh. For a complete explanation, see "Using 'FAST' serial mode" on page 16.



Network Connection and Box ID

NET PORT is used to describe what is connected to the network port. Choices for BOX ID are 1-8 or 9-16. See "Making network settings" on page 21 for detailed information about these settings.



MMC Device ID

Use the VALUE knob to switch between two MMC device settings: MTP AV and ADAT. For each one, use the CURSOR and VALUE knobs to set the MMC device ID's for each. Make sure the ID's are different.

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Running Status

By default, the MIDI Timepiece AV uses running status on its output cables as prescribed by the MIDI specification. Running status is a method of data transmission that uses less data, thereby conserving effort on the part of the MIDI Timepiece AV and the receiving device.



Defeating running status solves problems with devices that do not support it. Running Status is about 25% more efficient than non-running status, so don't defeat it unless you have to. If you are not sure whether a MIDI device uses running status, and you encounter strange problems such as stuck notes, try disabling running status on the output cable to the device.

Use the VALUE knob to select the cable and the YES/NO button to disable (or enable) running status.

Direct Connect

Direct connect is a special mode that allows non-standard MIDI data transmission between a MIDI device and the Macintosh. In this mode, all cable merging is disabled. You may need to use Direct Connect mode with hardware that does not conform to standard practices. For example, some samplers require Direct Connect mode in order to perform sample dump transfers to and from the Mac. If you have difficulty with sysex transfers, try Direct Connect mode.



☛ Note: the MIDI device must be connected to a MIDI IN and a MIDI OUT with the same number.

Use the VALUE knob to select the cable that the device is connected to.

☛ Important note: when the MIDI Timepiece AV is in Direct Connect mode, it cannot receive or send data from any other ports except the direct connect ports.

Direct Connect mode can only be turned on and off with the front panel LCD.

Reset All Data

This window resets the MIDI Timepiece AV to its factory default settings.

☛ BEWARE! When you reset all data, you lose everything in memory, including all modifiers and any modifications you have made to the base setups.



PERFORMING A MIDI DATA DUMP

The DATA DUMP window (selected with the WINDOW knob) causes the MIDI Timepiece AV to transmit several system exclusive messages to the computer and to output cable 1. These messages contain a description of the current state of the MIDI Timepiece AV at the time of the bulk dump (not including modifiers and base setups other than the current base setup).

To initiate the bulk dump, press ENTER.

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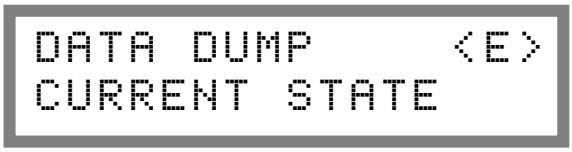


Receiving a MIDI data dump

To get the MIDI Timepiece AV to receive a MIDI data dump, transmit the data dump from software running on the Mac, or transmit it from a sequencer or other device connected to MIDI IN number 8. (To transmit a bulk dump from ClockWorks, use the Send Data To command in the Utilities menu.) The MIDI Timepiece AV is ready to receive the dump at all times; no special preparation is needed. The data dumps must be received from either the computer port, the network port, or MIDI IN cable 8.

USING THE SMPTE CONTROLS

Use the WINDOW knob to go to the SYNC window. Make the SMPTE settings with the CURSOR and VALUE knobs as follows:

SYNC

This window is for display only. It shows a running update of the current SMPTE location (in hours, minutes, and seconds) while the MIDI Timepiece AV is striping SMPTE or locking to external SMPTE time code. It also indicates whether the MIDI Timepiece AV is synchronizing from its own internal time base (Internal) or locking to incoming SMPTE time code (LTC or MTC).

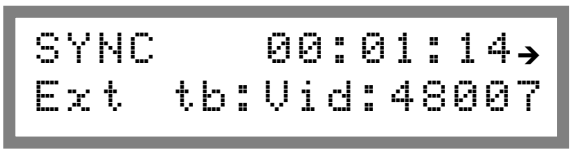


External Time Base Status Display

The SYNC window gives you a time base status display to the right of the "tb:". *Vid* means video. LTC or MTC indicate SMPTE or MIDI Time Code. Following the time base indicator is the status display. If it says "No TB", this means that it is waiting to receive a valid time base, as determined by its MASTER SYNC setting. If MASTER SYNC is set to LTC or MTC, you'll see the "No TB" message while the MIDI Timepiece AV waits to receive incoming time code, which it will use as the time base. If MASTER SYNC is set to one of the three VIDEO modes, you'll see the "No TB" message if the MIDI Timepiece AV is not properly receiving video input, which it uses as the time base in these modes.



Once the MIDI Timepiece AV locks on to a stable time base, it displays "TB OK" for a moment and then displays the sample rate it is generating based on the current time base.



When the MIDI Timepiece AV both locks to a stable time base and begins converting, it displays the digital audio sample rate it is generating, based on the current time base (either external or internal).This display can be very helpful for determining if the SMPTE frame rate settings are correct and if the external time base is both stable and accurate.

You may also see the "JAM" indicator. For a complete explanation, see "Jam (MIDI Timepiece AV only)" on page 70.

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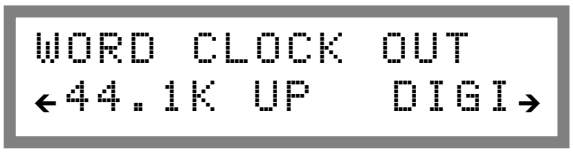
Master Sync

Use the VALUE knob to choose the appropriate time base and address sources. See "Choosing a master SYNC mode" on page 140 for an explanation of these settings.



Word Clock Out

Use the CURSOR and VALUE knobs to choose the sample rate and sample clock format (DIGI for Digidesign superclock or 1X for standard word clock). The sample rate can be either 44.1K or 48K, and there are three variations of each frame rate: normal, pull-up (UP), and pull-down (DN). The pull-up and pull-down sample rates can be used in the standard fashion when working with audio that will be transferred between video (at 29.97 frames per second) and film (24 fps) — or other frame rates.



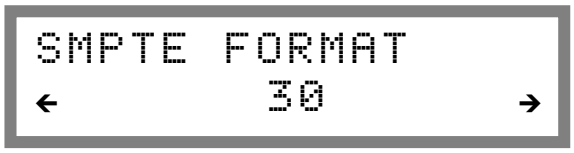
SMPTE Volume Out

This setting lets you adjust the volume of the SMPTE output from the MIDI Timepiece AV.



SMPTE Format

Use the VALUE knob to choose the desired frame rate for striping — or any time the MIDI Timepiece AV serves as the SMPTE time code master. If you are working with video, be sure to choose 29.97 (either drop or non-drop as needed or desired) instead of 30.



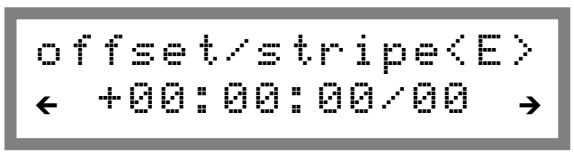
SMPTE Destination

This window determines where the MIDI Timepiece AV sends MIDI Time Code when it is converting or generating time code. By default, it sends time code to the computer only. To send time code to another cable, use the SELECT knob to choose the cable and use the VALUE knob to enable time code (Y) or disable it (N).



Offset/Stripe

Use the CURSOR AND VALUE knobs to set the start frame for striping. Press the ENTER button to start striping. Press it again to stop striping. The start time is expressed in hours, minutes, seconds, and frames.



Jam SMPTE Frames

Use the VALUE knob to increase or decrease the number of frames the MIDI Timepiece AV will "jam sync" or "freewheel" for in order to bypass drop outs in the time code. Choices are 0, 1, 2, 4, 8, 16, and 32 frames or "I". Choose "I" for "infinite" jam sync, which causes the MIDI Timepiece AV to begin striping on its own when it encounters a drop

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out. To stop striping in this case, use the CURSOR knob to go back to the STRIPE START window and press ENTER.



Getting a running update of SMPTE in the LCD

While the MIDI Timepiece AV is either converting or generating SMPTE time code, use the WINDOW knob to go to the SYNC window. The SYNC window provides a running update (hours:minutes:seconds) of the time code.

PROGRAMMING THE PEDAL INPUTS

Use the WINDOW knob to go to the PEDALS window.

Pedals display

The first pedal window provides a running update of pedal values, which shows you the current value of the pedal as you press it. Turn the CURSOR knob to the right to make the pedal settings described in the following sections.

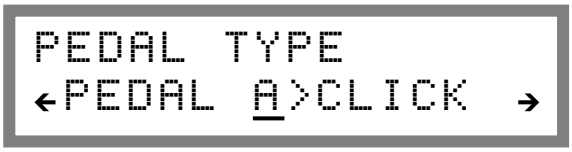


Pedal Type

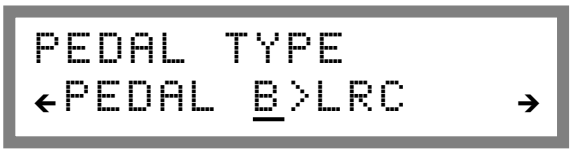
Use the SELECT knob to choose between pedal A and pedal B. Use the VALUE knob to choose a type of pedal. You have five choices:

- Roland expression
- KORG expression
- Click-to-MIDI (pedal A only)
- Momentary (for a foot switch)
- LRC (available for Pedal B only)
- Off

If you are not sure whether your pedal is a KORG type or Roland type, choose one and then see "Verifying that the pedal is working" on page 115.

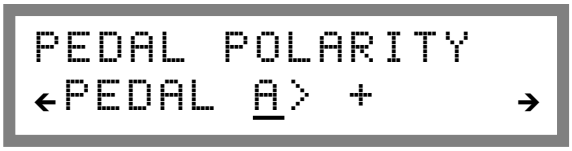


For the Alesis LRC, use the SELECT knob to choose PEDAL B and use the VALUE knob to choose LRC.



Pedal Polarity

Use the SELECT knob to choose between pedal A and pedal B. Use the VALUE knob to choose between positive (+) and negative (-) polarity. Negative polarity reverses the direction of the pedal, so that if it normally goes up when you press down, negative polarity will make it go down (and vice versa). If you aren't sure which to choose, use positive and then check it by going to "Verifying that the pedal is working" on page 115.



Pedal Range

Use the SELECT knob to choose between pedal A and pedal B. Use the CURSOR knob to select the low and high end of the range. Use the VALUE knob to set the numbers. This is the minimum and maximum value that the pedal will generate.

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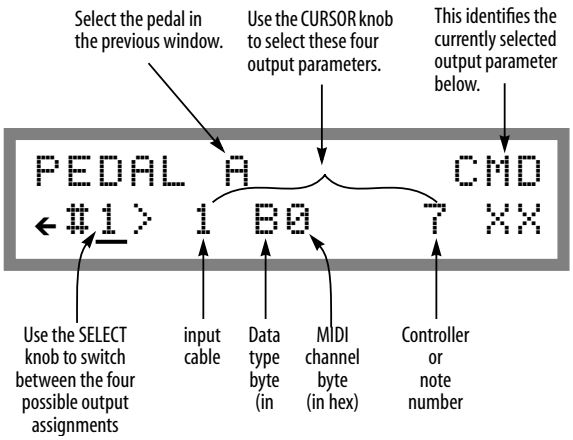
PEDAL OUTPUT ASSIGNMENT

To select the pedal, use the CURSOR knob to go back to the previous window and use the SELECT knob to select the pedal. In this window, use the SELECT knob to choose among four possible output assignments. Use the CURSOR knob to switch between the four output assignment parameters (input cable, data byte, channel byte, and controller/note number).



☛ Note: pedal output cannot be assigned directly to an output cable. Instead, it must be assigned to an input cable with which it gets merged. See "Making a pedal or knob output assignment" on page 121.

For the data type byte, enter one of the following values:

To generate this	Enter this as the data type byte
Note	9
Polyphonic pressure	A
Controller	B
Program change	C
Mono pressure	D
Pitch bend	E

For the MIDI channel byte, enter the appropriate value below:

Channel	Hex value
1	0
2	1
3	2
4	3
5	4
6	5
7	6
8	7
9	8
10	9
11	A
12	B
13	C
14	D
15	E
16	F

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Verifying that the pedal is working

To verify that the pedal you have programmed is working properly, use the WINDOW knob to go to the PEDALS window. Press the pedal and watch the display. You should get a running update in the LCD as the pedal moves. If not, try choosing a different pedal type.

Programming Pedal A to convert an audio click

To program Pedal A to convert an audio click:

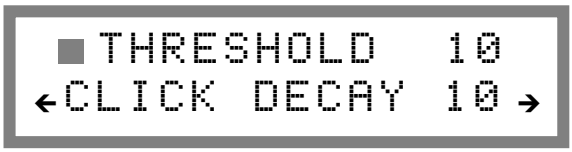
1 Use the WINDOW knob to go to the PEDALS window.

2 Use the CURSOR knob to go to PEDAL TYPE.

3 Use the SELECT knob to choose Pedal A.

4 Use the VALUE knob to choose CLICK.

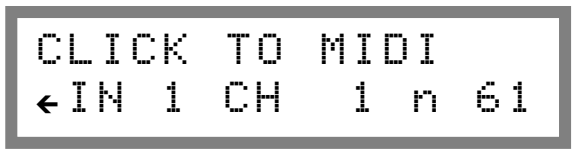
5 Turn the CURSOR knob one click to the right to go to the THRESHOLD/DECAY window.



6 Use the CURSOR and VALUE knobs to set the Threshold and Decay.

The threshold can be set anywhere on a scale from 0 to 70. The audio click must be loud enough to reach the threshold. A soft click will require a low threshold. Try to set the threshold as high as possible, however, to avoid false triggering from noise. Decay is meant to prevent doubled attacks. The decay can be set from 1 to 31. Low values make the decay longer; high values make it shorter. Try to set the decay as long (low) as possible, but if you are working with a faster tempo, don't make it too long or you will miss beats. The decay also determines the duration of the MIDI note generated by the MIDI Timepiece AV. A low decay produces a long duration; a high decay produces a short duration. You may need to experiment to adjust these values. See "Checking the Click-to-MIDI settings" on page 115.

7 Turn the CURSOR knob one click to the right to go to the CLICK TO MIDI output assignment window.



8 Use the CURSOR and VALUE knobs to set the output channel, MIDI note number, and input cable assignment.

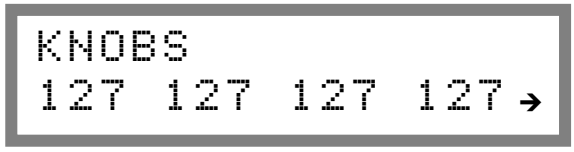
☛ Note: the click-to-MIDI output assignment cannot be assigned directly to an output cable. Instead, it must be assigned to an input cable with which it gets merged. See "Making a pedal or knob output assignment" on page 121.

Checking the Click-to-MIDI settings

Use the WINDOW knob to go to the PEDALS window. Play the audio click. Watch the display. You should see the bar indicator flash for every click. You can also observe the green MIDI OUT LED's on the front panel to see if they flash in sync with the click as well. If they miss a beat, or if they seem to flicker or stutter with a doubled attack, try adjusting the threshold and decay.

PROGRAMMING KNOBS TO SEND DATA

Use the WINDOW knob to go to the KNOB window.



Make the KNOB settings with the SELECT, CURSOR and VALUE knobs as follows:

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1 Turn the CURSOR knob one click to the right to go to the KNOB START/STEP SIZE window.



2 Use the SELECT and VALUE knobs to set the start value and step size for each knob.

The start value is the value that the knob gets set to when you first call up the base setup or modifier that stores the knob settings. The step size determines the value change of the controller or patch change messages every time you turn the knob one click. Normally, the value will change by one. You could, however, get a more dramatic change with less turning of the knob by making this value five, for example. Then the knob will generate values of 0, 5, 10, 15, 20, 25, etc. on each click as you turn it.

3 Turn the CURSOR knob one click to the right to go to the KNOB RANGE window.



4 Use the SELECT, CURSOR and VALUE knobs to set the range for each knob.

These values determine the lowest and highest value that the knob can generate.

5 Turn the CURSOR knob one click to the right to go to the KNOB output assignment window.



The knob output assignment window works in the same fashion as the pedal output assignment window described in the section "PEDAL OUTPUT ASSIGNMENT" on page 114. Please refer to that section for details.

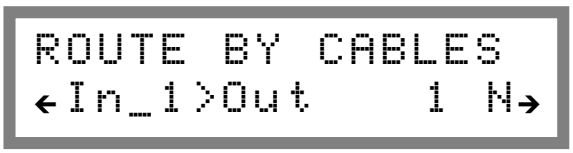
☛ Note: similarly to pedals, knob output cannot be assigned directly to an output cable. Instead, it must be assigned to an input cable with which it gets merged. See "Making a pedal or knob output assignment" on page 121.

MIDI ROUTING

Use the WINDOW knob to go to the MIDI ROUTING window. Use the CURSOR, SELECT, and VALUE knobs to make cable routings as follows:

Route by cables

Use the SELECT knob to choose an input cable. Use the VALUE knob to select an output to which to route the input. Once you have made your input to output cable choices, press YES/NO to make (or break) the connection. (For cable designations, see "Getting familiar with the LCD conventions" on page 106.)



Route by channel

Use the SELECT knob to choose an input cable. Use the CURSOR and VALUE knobs to select the input cable and channel that you want to route to an output cable. (The input and output channel are the same.) Once you have made your input to output cable choices, press YES/NO to make (or break) the connection. (For cable designations, see "Getting familiar with the LCD conventions" on page 106.)

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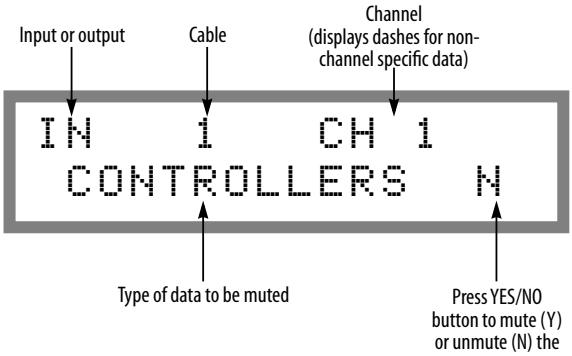
MUTING MIDI DATA

Use the WINDOW knob to go to the MUTE MIDI DATA window. Make the muting settings with the CURSOR and VALUE knobs as follows:



MIDI CHANNEL MAP

Use the WINDOW knob to go to the MIDI CHANNEL MAP window. Make the mapping settings with the CURSOR and VALUE knobs as follows:

Input Channel Remap

Use the SELECT knob to choose an input cable. Use the CURSOR and VALUE knobs to select the source and destination channels. (For cable designations, see "Getting familiar with the LCD conventions" on page 106.)



Output Channel Remap

Use the SELECT knob to choose an output cable. Use the CURSOR and VALUE knobs to select the source and destination channels. (For cable designations, see "Getting familiar with the LCD conventions" on page 106.)



USING THE PANIC BUTTON

The MIDI Timepiece AV has a Panic button on the front panel.

If the Panic is pressed once, it sends out a MIDI All Notes Off message to each cable.

If the Panic button is pressed twice (somewhat like a double-click of a computer mouse), it not only sends out All Notes Off messages, it also sends out a MIDI note off command for every note on every channel. As you can imagine, this is a lot of data, and it takes the MIDI Timepiece AV a moment to transmit all of it!

If you hold down the Panic button while switching on the MIDI Timepiece AV, the unit is restored to its factory default settings.

RESTORING FACTORY DEFAULT SETTINGS

The "factory default" settings are the settings that the MIDI Timepiece AV has when it ships from the factory. At times, you might need to start from a "clean slate", so to speak, and restore the factory default settings. To restore the factory default settings, hold down the Panic button while powering up the unit. Or you can reset it from the front panel LCD as follows:

1 Use the WINDOW knob to go to the GLOBAL HARDWARE SETUP window.

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2 Turn the CURSOR knob all the way clockwise.

The RESET ALL DATA window appears.

3 Press the ENTER button.

☛ BEWARE! You'll lose everything in the MIDI Timepiece AV memory, including modifiers and patches that you have created and saved, and changes you have made to any of the eight base setups.

CALIBRATING THE CLICK INPUT

The click input (Pedal A) is calibrated before the unit leaves the factory. However, this calibration can be lost in some circumstances.

To recalibrate the click input:

1 Insert the audio source into the Pedal A.

2 Configure Pedal A for click to MIDI conversion as described in "Programming Pedal A to convert an audio click" on page 115.

3 Go to the THRESHOLD window using the CURSOR knob.

4 With silence on the audio click input (no click being played), press ENTER in the THRESHOLD window.

This recalibrates the click input. In doing so, the threshold bottoms out at approximately 2 or 3 in a range from 0 to 70.

A FEW THINGS THE LCD CAN'T DO...

There are a handful of things that cannot be programmed from the front panel. You cannot:

- Program a knob to send system exclusive data (You can program it to send controller data, however.)
- Create or edit modifiers
- MIDI cannon

These tasks can be accomplished with ClockWorks.

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CHAPTER 18 Knobs and Pedals

OVERVIEW

This chapter explains how you can use the four knobs on the front panel of the MIDI Timepiece AV and the two pedal inputs (A & B) to:

- Generate MIDI data, such as notes, controllers, patch changes, pitch bend, and system exclusive
- Route the data from the knob or pedal to any MIDI Timepiece destination
- Convert an audio tempo source such as an audio click into MIDI data in order to slave MIDI hardware or software to the audio tempo source

This chapter explains how to do these things with ClockWorks. To learn how to program the knobs and pedal from the front panel LCD, see chapter 17, "Using Front Panel LCD".

☛ If an original MIDI Timepiece is currently selected in the Device List window, this window cannot be opened and it becomes grayed out in the Windows menu.

Choosing a pedal or knob to program 119
Setting up a knob 120
Setting up a pedal 120
Making a pedal or knob output assignment . .121
Sending knob data 122
Sending pedal data 122
Saving knob settings as part of a base setup . .122
Saving the knob settings as a modifier 122
Using an audio click as a tempo source 123
Click input hints 124
Sending sysex data with a knob or pedal 124
Custom Pedal Curves 124

CHOOSING A PEDAL OR KNOB TO PROGRAM

The first thing you need to do is select which knob or pedal you are going to program.

1 Open up ClockWorks.

2 If you have more than one MIDI Timepiece, open the Device List window from the Windows menu and click the box you want to program.

For more information, see "The Device List window" on page 38.

3 Choose Knobs & Pedals from the Windows menu.

4 Click the knob or pedal that you want to set up.

A box appears around the knob or pedal to indicate that it is selected. Settings for it appear to the right.

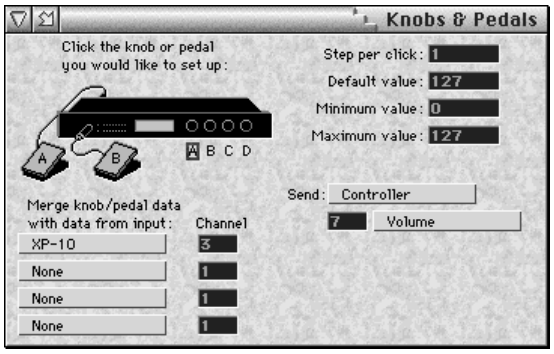

Figure 18-1: The Knobs & Pedals window lets you program the MIDI Timepiece AV's front-panel knobs and its two pedal inputs.

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SETTING UP A KNOB

Note: before you set up a knob, you should decide whether you want to save the knob settings as a modifier which can be remembered by the MIDI Timepiece AV and recalled either with the software, the front panel LCD, or a MIDI patch change. If you would like to save the knob setting as a modifier, go to the Setups & Modifiers window and add a new modifier before you begin the procedure below. See "Creating a new modifier" on page 131 for more information on adding a new modifier.

1 Set the *steps per click* option.

This option determines the value change of the controller, sysex, or patch change messages that are sent every time you turn the knob one click. Normally, the value will change by one. You could, however, get a more dramatic change with each click of the knob by making this value five, for example. Then the knob will generate values of 0, 5, 10, 15, 20, 25, etc. on each click.

2 Set the default value.

The value must be between zero and 127. When you first call up the setup or modifier with this knob setting, the knobs will be set to this initial value.

3 Enter a minimum and maximum value.

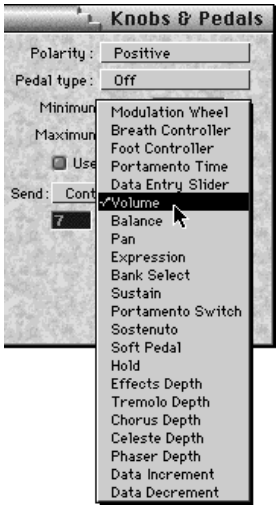
These values determine the lowest and highest value that the knob can generate.

4 Select the type of data you wish to enter in the Send pop-up menu.

A knob or pedal can generate MIDI notes, pitch bend, controller data, sysex data, patch changes, and channel and polyphonic aftertouch.

5 If you choose to send a controller, select the type of controller you wish to generate.

You can either type in the controller number or choose it by name from the pop-up menu.



6 If you chose system exclusive, see "Sending sysex data with a knob or pedal" on page 124.

7 Proceed to "Making a pedal or knob output assignment" on page 121.

SETTING UP A PEDAL

This section explains how to program the pedal inputs on the MIDI Timepiece AV.

Before you set up a pedal, you should decide whether you want to save the pedal settings as a modifier which can be remembered by the MIDI Timepiece AV and recalled either from the Setups & Modifiers window, from the front panel LCD, or from a MIDI patch change. If you would like to save the pedal setting as a modifier, go to the Setups & Modifiers window and add a new modifier before you begin the procedure below. See "Creating a new modifier" on page 131 for information on adding a new modifier.

1 Set the pedal polarity to positive or negative.

Negative polarity reverses the direction of the pedal, so that if it normally goes up when you press down, negative polarity will make it go down (and

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vice versa). If you aren't sure which to choose, use positive and then check it by going to "Verifying that the pedal is working" on page 115.

2 Describe the type of pedal or input that is connected.

You have five choices shown below in Figure 18-2. Roland and KORG expression pedals are continuous control pedals, where the MIDI Timepiece AV reads the position of the pedal and maps it to a MIDI value between zero and 127. The foot switch setting should be used for momentary foot pedals. If you choose the click-to-MIDI option (which is only available on the Pedal A input on the rear panel), skip the rest of the steps in this section and see "Using an audio click as a tempo source" on page 123. For Pedal B, you may also choose Alesis LRC for the pedal type.



Figure 18-2: Setting the pedal type.

3 Enter a minimum and maximum value.

These values determine the lowest and highest value that the pedal can generate (range 0-127). If you are working with a foot switch pedal, these are the two values that the pedal will generate.

4 Check the *Use custom curve table* option, if desired.

For more information about this option, see "Custom Pedal Curves" on page 124.

5 Select the type of data you wish to enter in the Send pop-up menu.

A knob or pedal can generate MIDI notes, pitch bend, controllers, patch changes, or sysex data.

6 If you chose controller, select the type of controller you wish to generate.

You can either type in the controller number or choose it by name from the pop-up menu.

7 If you chose system exclusive, see "Sending sysex data with a knob or pedal" on page 124.

8 Proceed to "Making a pedal or knob output assignment" on page 121.

MAKING A PEDAL OR KNOB OUTPUT ASSIGNMENT

The output from a pedal or knob cannot be assigned directly to an output cable or serial port. Instead, the knob or pedal data is assigned to an input cable, and from there it is routed to whatever outputs to which the input cable is routed.

For example, let's say that we want a knob to generate MIDI volume (controller number 7) and then send it to three synths in our MIDI studio (a Proteus, Roland D-110, and an S1000). Here is how to do so:

1 Assign the knob to one of the MIDI Timepiece AV's MIDI inputs by choosing the input from the pop-up menu provided.

If you are using a MIDI controller, assign the pedal or knob to the controller's input. Then the knob or pedal data will be routed to the same outputs as the controller. If you have an input cable that isn't connected to anything else, you could use it instead. In the example below, the Kurzweil K2500 input is chosen.

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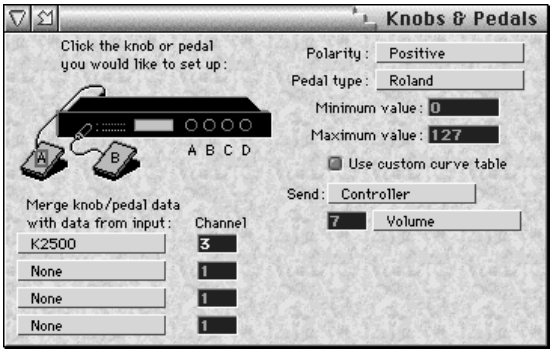
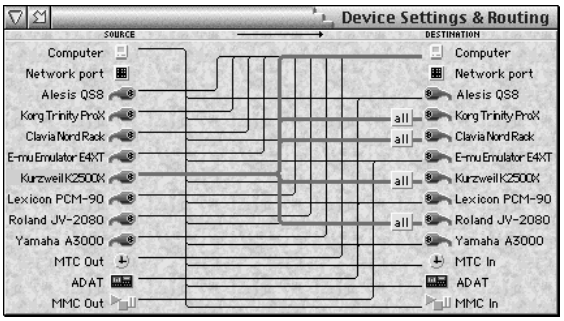


2 Open the Device Settings & Routing window and route the input to the outputs to which you would like the knob data to go.

In this example, the knob is being routed to the Korg Trinity, Clavia Nord Lead, Kurzweil K2500x, and the Roland JV-2080 via the K2500 input.



3 Once you have completed the knob or pedal settings with the above output assignment, be sure to save the settings as a modifier or as part of the current basic setup.

For more information, see "Adding commands to a setup or modifier" on page 130.

SENDING KNOB DATA

Once you have programmed one or more knobs, you can make them generate the data you have programmed as follows:

1 Press the SHIFT button on the front panel of the MIDI Timepiece AV so that the green LED is lit.

When the red LED is lit, the knobs control the MIDI Timepiece AV LCD display. When the green LED is lit, the knobs switch into their data transmission mode and send MIDI data instead.

2 Turn the knobs to send the data.

Notice that the four knob values are displayed in the LCD on the front panel.



Figure 18-3

3 To switch the knobs back so that they again control the LCD display, press the SHIFT button such that the red LED is lit.

You can freely switch back and forth.

SENDING PEDAL DATA

Once you have made the pedal data assignment and output assignment as described in the previous sections in this chapter, no other preparation is necessary. Just move the pedal.

SAVING KNOB SETTINGS AS PART OF A BASE SETUP

For information about how to save knob and pedal settings as part of one of the eight MIDI Timepiece AV base setups, see "Adding commands to a setup or modifier" on page 130.

SAVING THE KNOB SETTINGS AS A MODIFIER

You can save one or more knob or pedal settings together as a modifier. Doing so allows you to recall the settings instantly with the Setups & Modifiers window, the Patch List window, the front panel LCD, or a MIDI patch change without changing the rest of the settings in the MIDI Timepiece AV. For information, see "Adding commands to a setup or modifier" on page 130.

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USING AN AUDIO CLICK AS A TEMPO SOURCE

The MIDI Timepiece AV can convert an audio click into any MIDI event. The audio click can be played back from a tape deck or generated live by a drummer. This feature can be used for many purposes. Below are a few ideas:

- Recording the click's tempo map into a sequencer
- Slaving a sequencer to a click track
- Triggering drum samples

This feature can be used in conjunction with Mark of the Unicorn's Performer program to slave a sequence to prerecorded music on tape while referenced to SMPTE time code. For more information, please refer to the Performer (Version 3.5 or higher) User's Manual.

To convert an audio click into MIDI:

1 Be sure that the audio click source is connected to the PEDAL A phone jack on the rear panel of the MIDI Timepiece AV.

2 Open the Knobs & Pedals window in ClockWorks.

3 Click Pedal A.

4 Under Pedal Type, select Click-to-MIDI.

The Click-to-MIDI options appear in the right-hand side of the window.

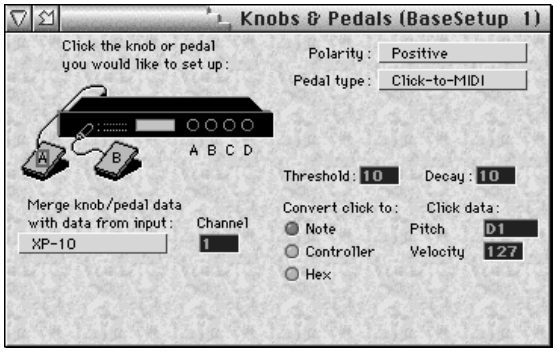

Figure 18-4: Click-to-MIDI Assignments.

5 Set the Threshold and Decay.

The threshold can be set anywhere on a scale from 0 to 70. The audio click must be loud enough to reach the threshold. A soft click will require a low threshold. Try to set the threshold as high as possible, however, to avoid false triggering from noise. Decay is meant to prevent doubled attacks. The decay can be set from 1 to 31. Low values make the decay longer; high values make it shorter. Try to set the decay as long (low) as possible, but if you are working with a faster tempo, don't make it too long or you will miss beats. The decay also determines the duration of the MIDI note generated by the MIDI Timepiece AV. A low decay produces a long duration; a high decay produces a short duration. You may need to experiment to adjust these values. See "Checking the Click-to-MIDI settings" on page 115.

6 Choose the data type you wish, and set the data for the event.

7 Make the desired output assignment for the MIDI click data.

For more information, see "Making a pedal or knob output assignment" on page 121.

8 Check to make sure that the MIDI Timepiece AV is successfully reading the click.

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See “Checking the Click-to-MIDI settings” on page 115.

CLICK INPUT HINTS

If the MIDI Timepiece AV reads the audio click erratically, such as generating doubled attacks, try adjusting the threshold and decay values. If you still have trouble, try attenuating the audio signal from the click source or through a mixer. The PEDAL A input is purposefully sensitive so that it can detect a low-amplitude signal.

If you are generating the click that the MIDI Timepiece AV will convert, set the audio level fairly high (at around 0 dB). Also, record a short, transient click sound with no reverb or other effects. A short and precise click sound will produce the most reliable results.

SENDING SYSEX DATA WITH A KNOB OR PEDAL

A knob or pedal can transmit a sysex message up to 27 bytes long. You define a variable byte within the message. As you press the pedal or turn the knob, the knob generates a continuous stream of sysex messages; each message is exactly the same except for the value of the variable byte. It changes in correspondence with the current position of the pedal or knob on a scale between zero and 127.

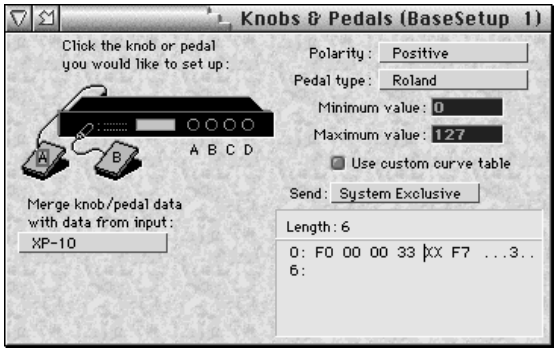
This feature is ideal for creating smooth, real-time changes to parameters on synthesizers and other MIDI devices.

The reason for the 27-byte limit is that a message larger than 27 bytes cannot be transmitted efficiently enough to be generated in real time.

To program the sysex message:

1 Set up the knob or pedal as described in “Setting up a knob” on page 120 or “Setting up a pedal” on page 120.

Once you have selected system exclusive as the type of data, you’ll see the sysex data entry window.



2 Click inside the sysex data entry box and type in the bytes necessary.

The message can be up to 27 bytes long, including the F0 and F7 at the beginning and end of the message.

3 For the variable byte, type “xx”.

4 Set the output assignment as described in “Making a pedal or knob output assignment” on page 121.

CUSTOM PEDAL CURVES

Custom pedal curves can now be created and saved within Modifiers to allow the MTP AV’s Pedal inputs to react in a non-linear manner to control voltage foot pedals. When Pedal A or B input is assigned to be controlled by a KORG or Roland Expression-type foot pedal, you can make a custom pedal curve for that pedal in the Pedal Curves window. The Knobs & Pedals window contains a new check box to toggle whether a pedal input uses the current custom pedal curve.

To make a custom pedal curve:

1 Select or create a Modifier in which you wish to store the pedal curve.

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To save a pedal curve, it must be part of a Modifier. Pedal curves cannot be saved as part of Base Setup.

2 Choose Pedal Curve from the Windows menu.

The Pedal Curve window appears.

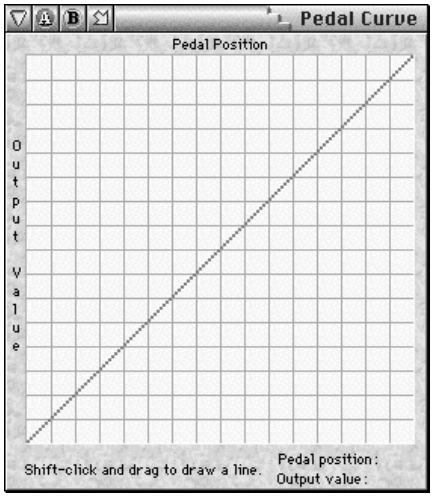


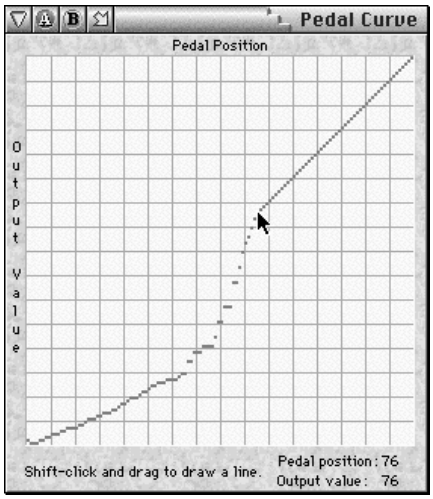
Figure 18-5: Pedal Curve Window.

3 Choose the pedal, A or B, for which you wish to create a custom pedal curve, by clicking A or B in the Pedal Curve window title bar.

The current pedal curve for the selected pedal displays.

4 Use the mouse to draw a new curve.

Shift-drag to draw a straight line. If you shift-drag past the upper right-hand corner, the line will snap to a perfect diagonal (default) position.



5 Save the Modifier and "Pedal Curve Message" appears in the script for that Modifier in the Setups & modifiers window.

The custom pedal curve is saved as part of the modifier.

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CHAPTER 19 Setups and Modifiers

OVERVIEW

This chapter explains how to manage multiple internal settings in the MIDI Timepiece AV. It explains how to create and save multiple configurations as *setups* and *modifiers*, which provide you with a tremendous degree of control and flexibility over the MIDI Timepiece AV.

You can then recall configurations as setups and modifiers from the front panel LCD. See "Selecting the current base setup" on page 107 and "Calling up a modifier" on page 108.

Or you can recall them with MIDI patch changes from a MIDI controller as described in "Recalling patches via a MIDI patch change" on page 135.

You do not need to know the information in this chapter for basic operations of the MIDI Timepiece AV. Instead, you can "set it and forget it" if doing so suits your needs. Read this chapter if you are interested in creating and saving different settings within the MIDI Timepiece AV that can be easily recalled.

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WHAT IS A "BASE SETUP"?

Think of a setup as a basic configuration of all the MIDI Timepiece AV's current internal settings. This includes its cable routing connections, muting and rechannelizing settings, SMPTE convert settings––everything. It even includes all of the settings for an original MIDI Time Piece or MIDI Timepiece II connected to the network port.

The MIDI Timepiece AV can store eight different setups in its internal, battery-backed memory. They are remembered by the MIDI Timepiece AV for the life of the internal battery. Each setup can be entirely different from the others. The eight setups can be edited and saved from the front panel LCD or from ClockWorks.

One of the eight base setups is always active. Whenever you make a change to one of the MIDI Timepiece AV's settings, the change is added to the current setup. To see which setup is the current one, turn the WINDOW knob all the way to the left; the setup name appears in the LCD.

Most of the time, you will probably have one basic studio setup. In addition, you may have perhaps one, two, or three other base setups for various situations (a basic live gig setup, for example). The MIDI Timepiece AV provides you with eight such base setups. If you need more, don't worry. That's where modifiers (defined in the next section) come in. The sections that follow describe how you can tailor a base setup to your needs.

Once a setup has been named and saved, it can be recalled instantly in one of the following ways:

- with the knobs on the front panel
- with the Setups & Modifiers window or Patch List window in ClockWorks
- with a MIDI patch change sent to the MIDI Timepiece AV from a controller or other device connected to the network

WHAT IS A MODIFIER?

A modifier is any set of commands that you can issue to the MIDI Time Piece. It could be just one command, such as "Connect MIDI IN cable 5 to MIDI OUT cable 3" or "Map K2000 input ch. 4 to ch. 6".

A modifier, however, can be more than just one command. It could, for example, consist of several commands saved together. For example, you could create a modifier that connects a keyboard controller to two sound modules, connects a drum pad controller to a sampler, and mutes real time data on input cable 3, all at once.

As another example, a modifier can be a set of commands that sets up one of the front panel knobs to send MIDI volume controllers to all MIDI outputs.

The MIDI Timepiece AV can store up to 127 modifiers (depending on how large each one is) in its internal, battery-backed memory. Like setups, modifiers are remembered by the MIDI Timepiece AV for the life of the internal battery. Modifiers can be created, edited, and saved from ClockWorks. Unlike base setups, no modifiers exist in the MTP AV until you create them.

Modifiers can be recalled instantly, in the same manner as setups, with the front panel LCD, the Setups & Modifiers window, the Patch List window, or with a MIDI patch change event sent to the MIDI Timepiece AV from any device (or software) connected to the network.

COMPARING THE MTP AV TO A SYNTH

You may find it helpful to understand Setups and Modifiers in terms of a synth: a base setup is like a patch, which consists of a whole set of parameters that make up a sound. A modifier is like one parameter within that patch. With modifiers, you

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can tweak an individual parameter (modifier) without affecting any of the other current parameters of the patch (base setup).

This kind of flexibility is what makes the MTP AV so powerful. Rather than provide you with only 128 patches (whole setups), the MTP AV has so many settings that you will often want to change an individual setting without affecting the others. If the only way you could change one parameter would be to change them all, a lot of memory inside the MTP AV would be wasted because you would have to make many base setups that are almost identical. In addition, if you then make changes to the current setup that are not saved, calling up another patch would erase them. Imagine having to reset an entire patch on a synth just to be able to tweak an LFO––not very useful, to say the least.

With base setups and modifiers, you have the ability to create an almost infinite number of possible configurations with a conservative (and affordable) amount of memory. You also have a great deal of flexibility in controlling the MIDI Timepiece AV settings.

USING THE SETUPS & MODIFIERS WINDOW

The Setups & Modifiers window is where you configure your eight base setups and where you create modifiers.

☛ If an original MIDI Time Piece is currently selected in the Device List window, this window cannot be opened and it becomes greyed out in the Windows menu.

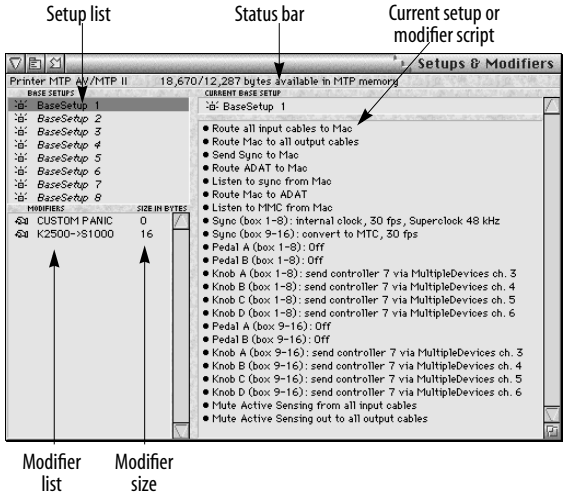

Figure 19-1: The Setups & Modifiers List window. This window is where you configure the eight base setups and create modifiers.

CREATING A SETUP

Since the MIDI Timepiece AV ships with eight base setups already built in, you don't actually create one from scratch. Instead, you modify one of the existing eight setups. See the following sections for how to do so.

NAMING A SETUP OR MODIFIER

To name a setup or modifier:

1 Double-click or option-click the name to pop-edit it.

2 Type the desired name.

Names can be up to twelve characters in length.

3 Press return.

RECALLING SETUPS AND MODIFIERS

To call up a setup or modifier, click its icon in the setup or modifier list in the left-hand side of the window.

When you click a modifier or setup icon, its command script appears in the scrolling list on the right, and it gets called up inside the MIDI Timepiece AV.

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Only one base setup can be current at a time. But as many modifiers as you like can be recalled on top of the current setup.

When you recall a modifier, any commands that it contains override the current setup. Everything else about the current setup remains the same.

When you recall a setup, it completely replaces the current setup and clears away any current modifiers.

USING THE SCRIPT

The current setup or modifier *script* (as shown in on page 129) is a scrolling list of commands that make up that setup or modifier. Each command is a description of a specific setting in the MIDI Timepiece AV. The modifier or setup name appears at the top of the list.

The script allows you to see everything that's going on in the MIDI Timepiece AV at the moment. If you make a change (by doing something in one of the other windows), the change will appear at the bottom of the script.

The script is an itemization of every command that makes up the setup or modifier.

Italicized items in the script are commands that have been made but have not yet been saved as part of the current setup. See the next section for how to do so.

ADDING COMMANDS TO A SETUP OR MODIFIER

To add a command to the setup or modifier script:

1 Be sure that the modifier or setup you want to edit is currently being displayed in the script list.

The modifier or setup name appears at the top of the list. If it isn't, click its icon in the setup or modifier list.

2 Open the necessary window in the windows menu and execute the command you wish to make.

For example, if you want to add a cable connection such as "Route Kurzweil K2000 to Proteus sound module", choose Device Settings & Routings from the Windows menu and make the connection. (For information about cable routing, see chapter 7, "Device Settings & Routing" (page 45).)

3 Repeat step 2 as necessary to add as many commands as you need.

As you add each new command, it appears at the bottom of the script list. If you are adding the commands to a setup, notice that when it is first added, it is italicized. (It won't be italicized if you are adding it to a modifier.)

4 When you have finished adding commands, choose "Save to base setup" or "Save to modifier" in the mini-menu.

This adds the commands to the setup or modifier.

REMOVING A COMMAND FROM A MODIFIER

To remove a command from the modifier script, click it to select it and press the delete key. Alternately, you can choose Clear from the Edit menu.

REMOVING A COMMAND FROM A BASE SETUP

To remove a command from a setup:

1 Call up the base setup.

2 Go to the appropriate window and "undo" the command.

For example, if you want get rid of a mute setting, go to the Muting window and uncheck the appropriate check box. To clear a cable routing, delete the connection in the Device Settings &

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Routings window. To change a SMPTE setting, go to the SMPTE Controls window and change the setting. Basically, in this step you will uncheck a check box, delete a connection, or change a setting, depending on what you want to do.

3 Save the change by choosing Save to Base Setup from the mini-menu.

A dialog appears to give you the choice of saving to a different base setup. Since you are changing the current one, and it is already selected in the pop-up menu, just click OK. When you do, the command is removed from the setup.

CREATING A NEW MODIFIER

There are two ways to create a modifier: one way is to create a new one from scratch and then add commands to it. The other way is to make the command changes first and then save them as a modifier. See "Saving new script commands as a modifier" on page 131.

To create a new modifier from scratch:

1 Choose Add Modifier from the mini-menu.

A dialog appears in which you can type a name for the modifier and choose a patch to include it in, if desired.

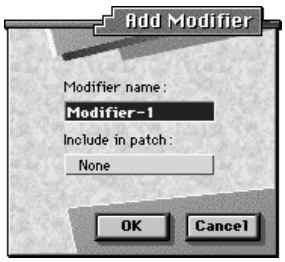

Figure 19-2: Adding a modifier.

2 Name the modifier, choose a patch if desired, and click OK.

3 A new modifier appears in the modifier list (in the lower left corner of the window).

4 Add commands to the new modifier as necessary.

See "Adding commands to a setup or modifier" on page 130.

ADDING NEW SCRIPT COMMANDS TO A SETUP

Any time you add a script command, it is automatically saved to the current setup. Saving occurs when you switch to a different setup or when you quit ClockWorks.

If you want, you can save them manually by choosing the "Save to setup" mini-menu command.

If you don't want to add new commands to the script, save them as a modifier (see the next section).

SAVING NEW SCRIPT COMMANDS AS A MODIFIER

As you work, you may add additional commands to the current setup script and then decide that you don't want them to be part of the setup. Instead, you want to save them separately as a modifier, which can be recalled on its own (with its own patch change, for example).

To save additional commands in the script as a modifier:

1 Choose "Save to modifier" from the mini-menu.

A dialog appears.

2 Choose an existing modifier, or click New Modifier and enter a name for it.

3 Click OK.

If you created a new modifier, it appears at the bottom of the list.

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SAVING AS ANOTHER MODIFIER

The procedure for this is the same as described above in "Saving new script commands as a modifier".

MERGING MODIFIERS INTO A SETUP

To merge modifiers into a setup:

1 Select the setup.

2 Select the desired modifiers.

3 Choose Save to setup from the mini-menu.

CLEARING ALL CURRENT MODIFIERS

To clear away modifiers from the current script, reselect the current setup (or select a different one). Doing so replaces all existing modifiers with the newly selected setup.

DELETING A MODIFIER

To delete a modifier from the MIDI Timepiece AV memory:

1 Click the modifier to select it.

2 Choose "Delete modifier" from the mini-menu.

THE CUSTOM PANIC MODIFIER

The Custom Panic modifier automatically appears in the Modifiers list. This is always modifier 127 in the MIDI Timepiece AV. It gets activated when you do a single hit on the Panic button on the front panel. Selecting it in the Setups & Modifiers window is the same as pressing the Panic button on the front panel once. (See "Using the Panic button" on page 117.

If you want, you can add additional commands to this button, just like any modifier. In essence, this allows you to program the panic button. To do so, see "Adding commands to a setup or modifier" on page 130.

HINTS FOR USING SETUPS AND MODIFIERS

Setups and modifiers provide you with efficiency and flexibility in managing the MIDI Timepiece AV's internal configuration within the confines of its internal RAM.

Think of a setup as a base of operations for any given situation. Modifiers can then be recalled and removed as needed to make changes to the base setup.

For example, let's say that you use the MIDI Timepiece AV in live performance, and you use its routing capabilities to create connections from your controller synth to other synths in your live rig. Let's also say that you have different routings for each song in your set.

In this situation, you should create a basic live performance setup that meets basic requirements that don't change during the performance, such as data muting and SMPTE settings.

Then, create one modifier for each change to the MIDI Timepiece AV that you need to make during the performance. For example, you could create different cable routing modifiers which set up the MIDI Timepiece AV the way you need for each song. You can then call up that modifier with a MIDI patch change from your controller (see chapter 20, "Patches" (page 133)), and the MIDI Timepiece AV is instantly ready to go with the correct routing.

You can create modifiers for just about anything the MIDI Timepiece AV can do, including pedal input and knob settings, cable connections, data muting, and channel remapping.

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CHAPTER 20 Patches

OVERVIEW

This chapter explains how to define a patch in the MIDI Timepiece AV and recall the patch via ClockWorks, a sequencer, a MIDI device, or the front panel LCD.

You may find it easier to understand this chapter if you read chapter 19, "Setups and Modifiers" (page 127) before reading this chapter.

What is a patch? 133
Creating a patch in the Patch List window 133
Recalling patches from the patch list window .135
Recalling patches via a MIDI patch change . . .135
Making the cable and channel assignment to all patches at once 135

WHAT IS A PATCH?

A patch in the MIDI Timepiece AV can consist of one of the following:

- A single base setup
- A single modifier
- A base setup accompanied by one to four modifiers
- A group of two, three, or four modifiers

The MIDI Timepiece AV can store up to 127 patches.

Each patch is assigned to a MIDI patch change number between zero and 127. You can then recall the patch by sending a MIDI patch change event to the MIDI Timepiece AV via any MIDI device or software that can send MIDI patch change events. In addition, each patch can be assigned its own receive cable and channel, so that you can call up patches from several different controllers.

CREATING A PATCH IN THE PATCH LIST WINDOW

The Patch List window lets you build patches from the base setups and modifiers that you have created in the Setups & Modifiers window.

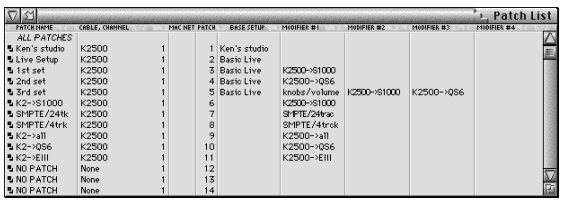

Figure 20-1: The Patch List window.

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☛ If an original MIDI Time Piece is currently selected in the Device List window, this window cannot be opened and it becomes grayed out in the Windows menu.

To build a patch:

1 Name the patch.

To do so, option-click or double-click the patch name in the left-most column to pop-edit it. Type in the desired name, and press return, or press the down or up arrow key to pop-edit the next or previous name.

2 Choose a device (or cable) and channel for the patch by selecting them from the cable and channel pop-up menus as shown in Figure 20-2. If you would like to be able to receive the patch change from any channel, select the *All* option in the list.

Click in the cable column next to the name of the patch to open the pop-up menu. This is the cable and channel that the MIDI Timepiece AV will monitor for the patch change event that calls up the patch. If you want to receive the patch change from any cable, choose the All option in the list.

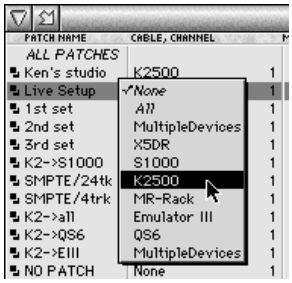


Figure 20-2: Choosing the MIDI controller from which you will be sending patch changes to the MIDI Timepiece AV.

3 If you want to receive the patch change from the computer or network port, click in the Mac/Net column next to the patch to make a check mark appear in the column.

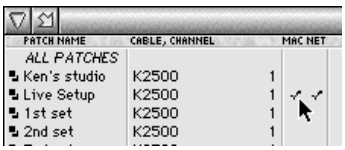
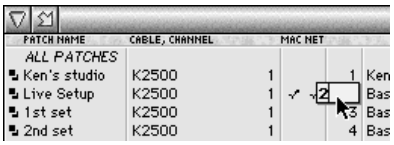


Figure 20-3: Enabling patch selection from the Mac and Net ports.

4 In the Patch column, type in a patch number.

You can enter any patch number between zero and 127.



5 If desired, choose a base setup from the base setup pop-up menu as shown below in Figure 20-4.

Remember, a patch does not require a base setup. See "What is a patch?" on page 133.

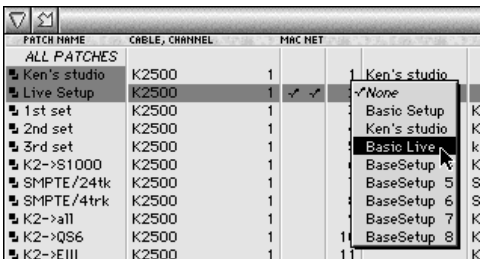


Figure 20-4: Assigning a base setup to a patch. Note: a patch does not require a base setup.

6 If desired, choose one or more modifiers from the four modifier pop-up menus.

A patch can have up to four modifiers, and each modifier can have any number of commands in it.

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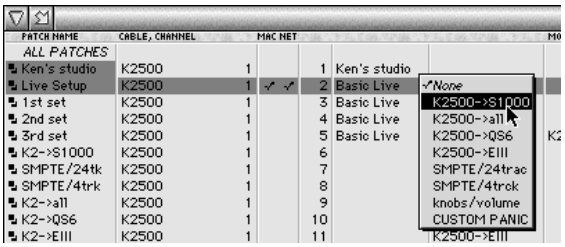


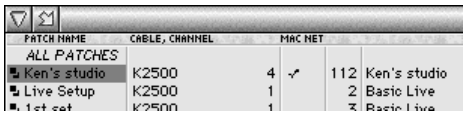
Figure 20-5: Assigning modifiers to a patch. A patch can have up to four modifiers assigned to it.

RECALLING PATCHES FROM THE PATCH LIST WINDOW

To recall a patch from the patch list window, click the patch icon to the left of the name.

RECALLING PATCHES VIA A MIDI PATCH CHANGE

To recall a patch via a MIDI patch change, send the appropriate MIDI patch change event from the appropriate cable and channel. For example, to recall the Basic setup patch highlighted below, you would need to send the MIDI Timepiece AV patch change number 112 transmitted from channel 4 on the Kurzweil K2500 (or from the Mac).



You can assign more than one patch to the same patch number; however, if two or more patches have the same patch number, and they also have the same receive cable and channel, only one of them will be recalled when the patch is sent. If you want to achieve their combined effect, combine them into one modifier.

Only use the same patch number when you will be receiving that patch from different inputs.

MAKING THE CABLE AND CHANNEL ASSIGNMENT TO ALL PATCHES AT ONCE

To assign all patches to the same cable and channel, choose the desired cable and channel from the pop-up menus next to the ALL PATCHES item at the top of the list.

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CHAPTER 21 MIDI Cannon

OVERVIEW

The MIDI Cannon allows you to store a group of MIDI events in a Modifier to be sent to any or all MIDI devices on an MTP network when the Modifier becomes current. There are two ways to make a Modifier current, by selecting it in the Setups & Modifiers window and by selecting an MTP AV patch with a patch change command.

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BASICS

Open the MIDI Cannon window by selecting its command from the Windows menu.

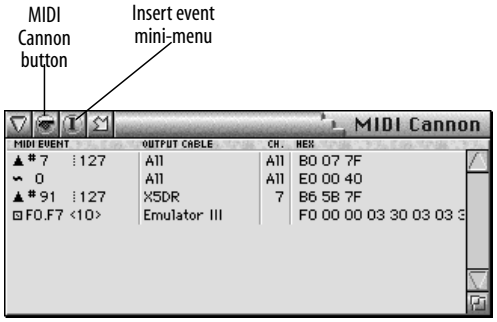

Figure 21-1: MIDI Cannon Window.

This window allows you to add, edit, and delete MIDI events in a specific MIDI Cannon message. It also allows you to test the current MIDI Cannon message.

CREATING MIDI CANNON MESSAGES

To create a MIDI Cannon message:

1 Select or create a Modifier in which you wish to store the MIDI Cannon message.

2 Select MIDI Cannon from the Windows menu.

The MIDI Cannon window appears.

3 Select a MIDI event from the Insert mini-menu

You can select any type of MIDI data that is in the mini-menu.

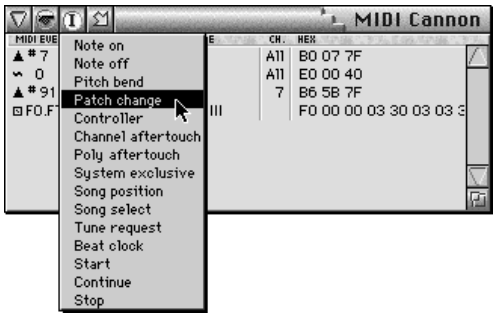

Figure 21-2: Insert mini-menu.

4 Edit the values of the newly inserted event.

For instance, if you inserted a patch change event, you will need to enter the patch change number you want, or if you entered a controller event, you will need to enter the controller number and the value you want. Each event type has a different set of fields for entering the desired values.

5 Assign a Cable and Channel (CH) for the event by using the Cable and Channel pop-up menus.

6 Add more MIDI events by repeating steps 3-5 until all the MIDI events that you want in this message are displayed in the MIDI Cannon window.

You can add as many events as you like up to the maximum size for the Modifier.

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☛ The maximum size for a Modifier is determined by the amount of free RAM in the MTP AV's memory.

7 Test the MIDI Cannon message by clicking the MIDI Cannon button.

All of the MIDI events in the list are transmitted to the assigned cables and channels.

8 If the MIDI Cannon message is correct, save the Modifier and "MIDI Cannon message" appears in the script for that Modifier in the Setups & modifiers window.

EDITING MIDI CANNON MESSAGES

You can edit MIDI Cannon messages that you have already created in two ways.

- Remove the MIDI Cannon message from the Modifier and then create a new MIDI Cannon message for that Modifier.
- Change the MIDI events in a MIDI Cannon message.

To remove a MIDI Cannon message from a modifier:

1 Make the Modifier that contains the MIDI Cannon message you wish to edit current by selecting it in the Setups & Modifiers window.

2 Select the MIDI Cannon message line in the script for the Modifier and type delete or backspace on your Mac keyboard.

The MIDI Cannon message is removed and you can then open the MIDI Cannon window to insert a new MIDI Cannon message as described above in "Creating MIDI Cannon Messages" on page 137 in this chapter.

To change the events in a MIDI Cannon message:

1 Make the Modifier that contains the MIDI Cannon message you wish to edit current by selecting it in the Setups & Modifiers window.

2 Open the MIDI Cannon window.

The MIDI Cannon message appears as a list of MIDI events.

3 Select MIDI events in the list and type delete or backspace on your Mac keyboard to remove them.

Alternately, you can use the Clear command in the Edit menu to remove MIDI events from the list.

4 Double-click events and type to change their values.

A double-clicked event pops-up for editing as illustrated below.

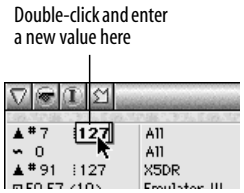

Figure 21-3: Editing a MIDI event.

5 Use the Cable and Channel pop-up menus to change the MIDI destination for an event.

6 Test the MIDI Cannon message by clicking the MIDI Cannon button.

All of the MIDI events in the list are transmitted to the assigned cables and channels.

7 If the MIDI Cannon message is correct, save the Modifier and "MIDI Cannon message" appears in the script for that Modifier in the Setups & modifiers window.

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CHAPTER 22 Synchronization with the AV

OVERVIEW

This chapter provides a complete explanation of the synchronization features in your MIDI Timepiece AV.

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Slaving a MOTU 2408 system.....145
Slaving a computer to the MTP AV 146
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A SYNC HUB FOR YOUR STUDIO

Think of the MIDI Timepiece AV as the synchronization hub for your recording studio. It provides stable, centralized synchronization services for ADATs, video, word clock devices, the 2408 and other MOTU hard disk recording systems, Digidesign systems like Pro Tools, your computer, and any devices that can lock to SMPTE time code (LTC) or MIDI Time code (MTC).

Using the MIDI Timepiece AV is simple: once you choose a synchronization master, the MIDI Timepiece AV generates all other sync formats.

THREE COMPONENTS OF SYNCHRONIZATION

The MIDI Timepiece AV handles all three components of synchronization:

- Time base
- Address
- Transport control

The MIDI Timepiece AV generates a *time base* — a stable, accurate measurement of the passage of time from which various forms of digital and analog synchronization data are generated to keep all connected devices in sync with one another as tightly as possible.

In addition, the MIDI Timepiece AV provides central *address* — the current cue position or playback location for all devices. When you tell all of your devices to cue to one hour (01:00:00:00) for example, all devices will know exactly where to go.

The MIDI Timepiece AV is a MIDI Machine Control (MMC) device, and, as such, it can respond to MMC transport messages (play, stop,

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rewind, and cue). In turn, it can redistribute MMC transport messages to ADATs connected to its ADAT Sync Out port, as well as other MMC devices connected to its MIDI outputs. For example, you can control your rack of ADATs and other MIDI Machine Control compatible devices with the transport controls of a MIDI sequencer running on your computer. Or you can run everything from an Alesis Little Remote Control (LRC).

CHOOSING A MASTER SYNC MODE

In any synchronization scenario, there is a master, and there are slaves. With the MIDI Timepiece AV, you can, in most situations, choose which device will be the master. And you can even choose different, independent master sources for transport control, time base, and address.

For example, you could choose house sync (video blackburst) as the time base master, choose the MIDI Timepiece AV itself as the address (SMTPE time code) master, and manipulate the transport controls of everything (ADATs, Pro Tools, any MMC device, and your sequencer) from your computer.

Advice about choosing a time base master

In general, you should try to set things up in your studio so that the master time base is either the MIDI Timepiece AV itself or video house sync. Both are especially designed to provide an extremely accurate, stable time base—more stable than SMPTE time code (LTC and, especially, MTC). When you set things up in this fashion, SMPTE time code (either LTC or MTC) is used just as an address source, while timing stability is handled entirely by the MIDI Timepiece AV.

Finding the MIDI Timepiece AV sync controls

The MIDI Timepiece AV synchronization controls are in the SYNC menu in its front panel LCD. You can get to this menu by turning the WINDOW knob on the front panel. Then use the CURSOR knob to proceed through the menu. The first setting, MASTER SYNC, is explained in the next section. You can find corresponding settings in the ClockWorks software, as described in chapter 10, "Sync and MIDI Machine Control" (page 59).

SUMMARY OF SYNCHRONIZATION MODES

In total, the MIDI Timepiece AV offers seven synchronization modes for its MASTER SYNC setting. Each mode provides a different combination of sources for a time base master and an address (SMPTE time code) master. The seven modes are as follows:

Master Sync mode	Address source	Time base
LTC QuikLock	SMPTE (LTC)	SMPTE (LTC)
INTERNAL	MTP AV	MTP AV
MTC	MIDI Time Code	MIDI Time Code
LTC	SMPTE (LTC)	SMPTE (LTC)
INTERN/VIDEO	MTP AV	Video
MTC/VIDEO	MIDI Time Code	Video
LTC/VIDEO	SMPTE (LTC)	Video

Below is a brief explanation of each mode.

LTC QuikLock

When the MIDI Timepiece AV locks to SMPTE time code (LTC), it employs a digital audio phase-lock loop to accurately synchronize ADATs and other digital audio devices connected to its Word Sync Out port. The MIDI Timepiece AV's lock-up time (approximately 4-5 seconds) is quite favorable compared to other similar digital audio synchronization devices. As of this writing, we know of no other *digital audio* synchronizer that can lock to LTC as quickly as a MIDI Timepiece AV.

LTC QuikLock, on the other hand, is specifically meant to be used in situations where you are not synchronizing any digital audio or gen-locking to video. In QuikLock mode, the MIDI Timepiece AV temporarily disables its digital audio phase-lock

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loop, allowing the AV to serve as a SMPTE-to-MIDI converter only. With the digital audio features "switched-off," lock-up time (the time it takes the MIDI Timepiece AV to lock up to incoming time code when it is first received) is reduced to less than one second.

Basically, QuikLock mode is a way of achieving faster lock-up time in situations where you do not need the MIDI Timepiece AV's digital audio synchronization features. If you aren't syncing ADATs, Pro Tools or any other word clock device, you can use QuikLock. If you *are* syncing ADATs or any other digital audio device connected to the MIDI Timepiece AV's Word Sync Out port, then you need to use one of the other six synchronization modes.

As its name implies, LTC QuikLock mode is meant for synchronizing to time code (LTC) received on its SMPTE input. A typical example is when you are slaving the MIDI Timepiece AV to a multi-track tape deck (with SMPTE time code striped on one of its tracks) as shown in Figure 2-5 on page 12.

Internal

Choose this setting when you want the MIDI Timepiece AV to be the time base master and SMPTE address master. This mode is highly recommended for stable sync. This mode is also recommended when you want to use MIDI Machine Control from your computer sequencer or from an Alesis LRC connected to the front panel of the MIDI Timepiece AV.

MTC

Choose this setting when you want the MIDI Timepiece AV to slave to MIDI Time Code being sent from a device connected to one of its inputs. This mode offers the least amount of time base stability, so we recommend that you try to set things up so that you can use one of the other modes.

When the MIDI Timepiece AV MASTER SYNC mode is set to MTC, it locks to any MTC coming from your computer. In doing so, however, it also "swallows" the MTC coming from the computer. If you attempt to transmit MTC from Performer, Digital Performer, Pro Tools, or other software to a specific MIDI device in your studio, it won't reach the MIDI device because it will get read and "swallowed" by the MIDI Timepiece AV. What you need to do, in this case, is have the MIDI Timepiece AV send MTC to the desired MIDI device. Just use the SMPTE DESTINATION window (located in the SMPTE/sync menu) to choose which output cable(s) you want to send MTC to. Or use the ClockWorks software to route MTC as needed.

LTC

Choose this setting when you want the MIDI Timepiece AV to slave to incoming SMPTE time code via the rear-panel LTC input. An example is an analog multi-track tape recorder with SMPTE time code striped on a track. The MIDI Timepiece AV will automatically detect the frame rate, with the exception that it cannot distinguish between 29.97 and 30. Therefore, to ensure that the audio components in your system will be driven at the proper sample rate, be sure to set the MIDI Timepiece AV to the proper frame rate when using either 29.97 (drop or non-drop) or 30.

Intern/Video

Choose this setting when you want the MIDI Timepiece AV to genlock to house sync video input (as a time base reference only), but wish the MIDI Timepiece AV itself to be the SMPTE time code (LTC and MTC) master address source. This mode is highly recommended for stable sync. Also use this mode when you would like to stripe frame-locked LTC onto video. When using this mode, be sure to set the MIDI Timepiece AV's frame rate to 29.97 (either drop or non-drop, as necessary or desired), instead of 30. Doing so

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ensures that the sample rate being generated by the MIDI Timepiece AV is exactly as it is set in the front-panel LCD.

MTC/Video

Choose this setting when you want the MIDI Timepiece AV to genlock to house sync video input (as a time base reference only) but make it use MTC input for the master address source. Be sure to set the MIDI Timepiece AV's frame rate to 29.97 (either drop or non-drop, as necessary or desired), instead of 30. Doing so ensures that the sample rate being generated by the MIDI Timepiece AV is exactly as it is set in the front-panel LCD.

LTC/Video

Choose this setting when you want the MIDI Timepiece AV to genlock to house sync video input (as a time base reference only) but make it look for LTC input (from the audio SMPTE input on the rear panel) for the master address source. Be sure to set the MIDI Timepiece AV's frame rate to 29.97 (either drop or non-drop, as necessary or desired), instead of 30. Doing so ensures that the sample rate being generated by the MIDI Timepiece AV is exactly as it is set in the front-panel LCD.

COMMON SYNCHRONIZATION SCENARIOS

Here are some common synchronization scenarios and the correct setting for each:

Typical scenario	MTP AV Master Sync setting
You have Digidesign hardware such as Pro Tools, or any word clock device, and ADATs and you want to sync them with each other (and the computer) as accurately as possible. (And you aren't doing video.)	INTERNAL — this makes the MIDI Timepiece AV the master timing source. In this case, you slave your sequencer (or digital audio software) to MTC generated by the MIDI Timepiece AV.
You want to slave everything (Pro Tools or other word clock device, ADATs, and the computer) to video with SMPTE time code (LTC) also coming from video.	LTC/VIDEO
You want the best sync possible, you want to control the transports of everything via MMC from your computer software or an LRC, and you aren't doing video.	INTERNAL — this makes the MIDI Timepiece AV the master timing source and the MMC master. You send it MMC commands from your sequencer, and it drives Pro Tools (via superclock and software address/transport control) and ADATs (via MMC and ADAT sync).
You want to stripe SMPTE time code (LTC) onto a video tape while resolved to video.	INTERN/VIDEO — this makes the MIDI Timepiece AV generate LTC that is frame-locked to video (i.e. LTC won't drift out of sync with video frames).
You don't have ADATs or any other digital audio devices and you want to slave the MIDI Timepiece AV to a multitrack	LTC QuikLock — this gives the MIDI Timepiece AV faster response when locked to LTC received on its SMPTE Input

LOCKING TO VIDEO

The following sections discuss several important points to be aware of when working with video.

Double-check the frame rate

When you are working with video, be sure to set the MIDI Timepiece AV's frame rate to 29.97 (drop or non-drop as needed). This ensures that the digital audio sample rate displayed in the MIDI Timepiece AV's front panel LCD is the rate that the box is actually generating. If the MIDI Timepiece AV's frame rate is set to 30 when you are slaving to video (via either LTC only or video genlock), then the MIDI Timepiece AV pulls down the digital audio down sample rate shown in the LCD

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to compensate for the fact that it is being forced to operate at 29.97 (due to video gen-lock). You can keep things simple and straightforward by making sure you have the frame rate set to 29.97 (either drop or non-drop) when you are using video. If you do, the sample rate you see is the sample rate you'll get.

Here is a chart summarizing the MIDI Timepiece AV's actual word clock output when locked to LTC or VIDEO as a time base. The examples in this chart are given at 48000 Hz, but the results in the last column for when pull down occurs are the same for 44100 Hz (for which the pull down rate is 44,056 Hz):

MTP AV Master sync setting	Word clock setting	SMPTE format setting	Actual incoming time base	Actual word clock output
LTC	48K	30	30 fps	48000
LTC	48K	30	29.97 fps	47952 (pull down)
LTC	48K	29.97 nd	29.97 fps	48000
LTC	48K up	30	29.97 fps	48000
LTC	48K dn	29.97 nd	29.97 fps	47952 (pull down)
Video (NTSC)	48K	30*	Video (29.97)	48000
Video (NTSC)	48K	29.97 nd	Video (29.97)	48000
Video (NTSC)	48K dn	30*	Video (29.97)	47952 (pull down)
Video (NTSC)	48K dn	29.97 nd	Video (29.97)	47952 (pull down)

* The MIDI Timepiece AV internally operates at 29.97 non-drop (nd) when its MASTER SYNC setting is set to one of its three video modes and, at the same time, the LCD frame rate is currently set to 30.

Video lock-up time

At the moment the MTP AV first receives video signal, it immediately gen-locks and then takes several seconds to "settle in" while it adjusts its phase-lock loop to the new video signal. During this brief period, there is a possibility — depending on your digital audio hardware and the nature of any audio you may be playing back — that you might hear a slight wavering in the audio for a few seconds. To avoid this, give yourself 5 or 10 seconds of preroll in any situation where video is starting up for the first time.

The above-mentioned brief period of phase-lock adjustment does not occur when you are feeding blackburst (house sync) to the MTP AV because the video signal is continuous. (It never stops and starts.) In this case, the MTP AV remains continuously phase-locked to video, and then simply engages as soon as LTC is received — with no subsequent period of adjustment. This scenario will provide the best results.

Getting faster lock-up when slaving to a VTR

If you are not using blackburst and are instead slaving directly to a video deck (VTR), you can shorten — and practically eliminate — the above-mentioned period of phase-lock adjustment by doing the following:

1 Use the MTP AV to stripe LTC onto your video tape while gen-locked to video. (Make sure that the MTP AV's MASTER SYNC mode is set to INTERN/VIDEO.)

This ensures that the LTC will be frame-locked (i.e. LTC won't drift out of sync with video frames.) The MTP AV is ideal for striping frame-locked LTC. (See "Striping frame-locked LTC onto video" on page 149 for details about this.)

2 When you are done striping and are ready to lock to the video, set the MTP AV's MASTER SYNC mode to LTC and lock to LTC only (without video genlock).

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This will provide stable, frame-accurate synchronization, along with rapid phase lock. If you aren't using ADATs or any other digital audio devices, you can even use QuikLock mode to make lock-up even more responsive.

Recording digital audio while locked to video

When you record digital audio with video as the time base, the MIDI Timepiece AV SMPTE format should be set to 29.97 (either drop-frame or non-drop). This ensures that the audio you record will be recorded at the exact sample rate you have chosen in the MIDI Timepiece AV LCD.

SLAVING ADATS

The MIDI Timepiece AV is programmed out of the box to automatically establish synchronization with an ADAT or chain of ADATs connected to its ADAT Sync Out port. The MIDI Timepiece AV will automatically set the first ADAT it sees to Device ID 1 and all subsequent chained ADATs to device IDs 2, 3, and so on. For more information, see "Setting MMC device ID's" on page 98.

Running ADATs at 44.1 kHz

To run an ADAT or ADAT XT at 44.1 kHz instead of 48kHz, just set the desired sample rate on the front panel of the MIDI Timepiece AV. Please note, however, that when you choose 44.1 kHz, there will be no indication on the ADAT front panel that it is running at 44.1 kHz. Furthermore, the SMTPE display on the ADAT front panel will not match the SMPTE display in the MIDI Timepiece AV front-panel LCD (or the rest of your MIDI Timepiece AV-based system). This discrepancy, however, is only a display issue: when you actually play music, the music on the ADAT will be in perfect time with the MIDI Timepiece AV (and everything else being synchronized by the MIDI Timepiece AV). Please contact Alesis for information about the availability of a ROM update that addresses this issue. Please note that this display discrepancy does not occur when the ADAT or ADAT XT is running at 48K.

Configuring the settings for each ADAT

Use the Sync/MMC window in ClockWorks to adjust the settings for each ADAT in the sync chain connected to the MIDI Timepiece AV. These settings include:

- Manual adjustment of the AV's automatically assigned device ID for each ADAT
- Individual machine offsets
- Deferred play

For complete details, see "ADAT List" on page 64 and "ADAT preferences" on page 66.

ADAT sync chain polling and offsets

ClockWorks offers several useful options for ADAT sync, including the ability to program a global time code offset for the entire ADAT chain when you're working with time code outside of the ADAT's zero to 45-minute time range. Additional options allow you to defeat the MIDI Timepiece AV's automatic polling of the ADAT port, and you can even make the AV send ADAT sync commands even if no ADAT is detected. For details, see "ADAT port settings" on page 51.

Working with ADATs and the 2408

MOTU's 2408 audio interface for Macintosh and PC provides a fiber-optic, 24-channel digital super-highway between your ADATs and your 2408-compatible audio software. The 2408 system includes both word clock and ADAT SYNC ports for clean, phased locked — and even sample-accurate — digital audio transfers from ADATs to the computer. For details, see the next section.

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SLAVING A MOTU 2408 SYSTEM

The MIDI Timepiece AV provides complete synchronization services for a MOTU 2408 (or related) hard disk recording system. The AV can continuously resolve the 2408 to video, SMPTE time code or its own internal clock. This allows you to slave the 2408 system to video, multi-track tape decks, other hard disk recorders and any other SMPTE time code source. If you have ADATs, the AV provides ADAT sync to the 2408 and the ADATs, allowing you to make sample-accurate transfers between your ADATs and Digital Performer or AudioDesk.

ADAT Sync versus Word Clock

There are two ways to slave a MOTU 2408 system to the MIDI Timepiece AV:

- via ADAT Sync
- via Word Clock

While there are several possible scenarios, we recommend ADAT sync if you have an ADAT and word clock otherwise.

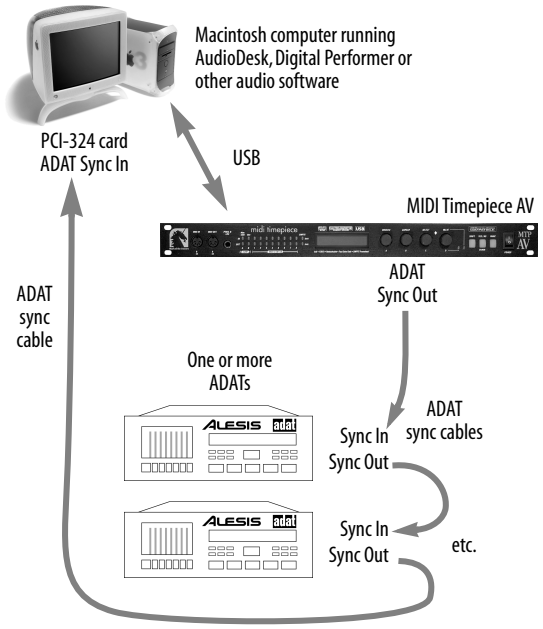

Figure 22-1: Slaving ADATs and a 2408 system to the MIDI Timepiece AV via ADAT Sync.

Slaving the 2408 to the AV with ADAT Sync

Use this scenario if you have one or more ADATs. Add the 2408 to the very end of the ADAT sync chain via the ADAT SYN IN port on the 2408 system's PCI-324 card as shown in Figure 22-1. Below is a table summarizing the various hardware and software settings for this setup:

System Component	Setting for the ADAT sync scenario
MTP AV sync mode	You can use any sync mode except LTC/QuikLock. The 2408 system will resolve to the MTP AV, even when the AV itself is resolving to SMPTE, video, etc. If you want to drive the whole rig from your MMC-compatible software, set the AV to Internal mode. This lets you do transport control from your software.
2408 system	In the PCI-324 Console window, set the Clock Source menu to 'PCI-324: ADAT'. Also make sure the sample-rate setting matches the ADATs and the MTP AV.
Digital Performer or AudioDesk	Make sure that the 'Slave to External Sync' command is checked in the Basics menu. In the Receive Sync dialog, choose the 'Sample-accurate via PCI-324" sync option. This setting resolves Digital Performer to the ADAT sync chain and even gives you sample-accurate transfers with ADATs. Alternately, if you are slaving the rig to video or external SMPTE time code (via the AV), and the time code is outside of the ADAT's normal zero to 45-minute time range, set the appropriate hour offset in ClockWorks as described in "Offset entire ADAT chain by _hours" on page 51.
Other MIDI/audio software	Slave it in the normal fashion to MIDI Time Code from the MIDI Timepiece AV.

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Slaving the 2408 to the AV with Word Clock

Use this scenario if when you don't have any ADATs. Connect the MIDI Timepiece AV's Word Clock Out to the 2408 audio interface's Word Clock In port as shown below in

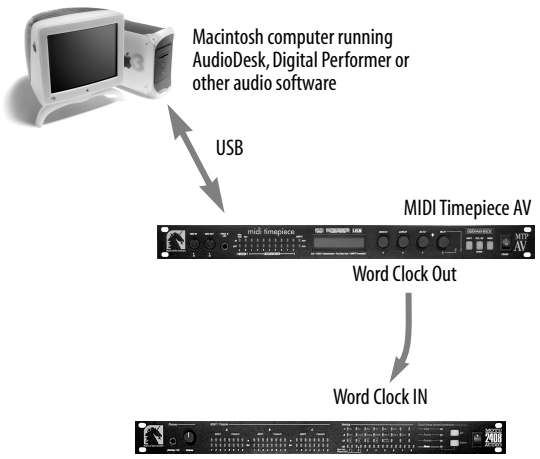

Figure 22-2: Slaving a 2408 system to the MIDI Timepiece AV via Word Clock.

The settings for this setup are as follows:

System Component	Setting for the ADAT sync scenario
MTP AV sync mode	You can use any sync mode except LTC/ QuikLock. The 2408 system will resolve to the MTP AV, even when the AV itself is resolving to SMPTE, video, etc. If you want to drive the whole rig from your MMC-compatible software, set the AV to Internal mode. This lets you do transport control from your software.
2408 system	In the PCI-324 Console window, set the Clock Source menu to '2408: Word'. Also make sure the sample-rate setting matches the ADATs and the MTP AV.
Digital Performer or AudioDesk	Make sure that the 'Slave to External Sync' command is checked in the Basics menu. In the Receive Sync dialog, choose the 'MIDI Time Code" sync option. This setting resolves Digital Performer to MIDI Timepiece AV.
Other MIDI/audio software	Slave it in the normal fashion to MIDI Time Code from the MIDI Timepiece AV.

SLAVING A COMPUTER TO THE MTP AV

The MIDI Timepiece AV ships from the factory ready to lock the computer to SMPTE time code via the MIDI Time Code (MTC) routing shown in Figure 7-15 on page 50. When this MTC routing is present, the MIDI Timepiece AV will send MIDI Time Code to the computer as soon as it locks up. Any software running on the computer can then slave to the time code. (Make sure the software is set up to lock to MIDI time code.)

When the MTP AV locks to the time code, the green "LOCK" LED on the front panel glows steadily and the red "TACH" LED blinks regularly. In addition, the green computer OUT LED glows steadily, indicating that MIDI time code (MTC) is being sent to the computer.

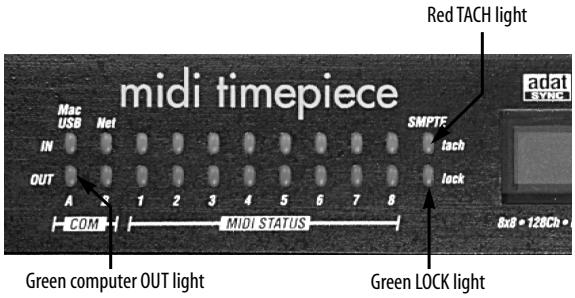

Figure 22-3: Converting time code. When the MTP AV converts incoming time code, the red TACH light blinks, the green LOCK light glows steadily, and the green computer OUT light glows steadily as well.

If the LOCK and TACH lights do no behave as described, the MTP AV is not successfully locking to the SMPTE time code. This could be a problem with the audio connections between the tape deck and the MTP AV. It could also be that the SMPTE level is not high enough. See Appendix C, "Troubleshooting and Customer Support" page (173).

If the LOCK and TACH lights look OK, but the green computer OUT LED is not glowing, this means that the MIDI Timepiece AV settings have been altered somehow such that it is not sending

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MIDI time code to the computer. To correct the settings, see "Getting a running update of SMPTE" on page 147.

Routing MIDI Time Code

At times, you may need to route MIDI Time Code to a device connected to one of the MTP AV's MIDI OUTs. Similarly, you may have the need to route MTC to the network port on the MIDI Timepiece AV. For example, the network port might be connected to a Macintosh, which you need to slave to time code. To make time code routings such as these, see "The MTC In and MTC Out connections" on page 49.

SMPTE Offset

When reading time code, there may be times when you need to offset the MIDI Timepiece AV a certain amount from the time code you are feeding it. See "Offset/Stripe" on page 112 for details about how to set the offset from the MIDI Timepiece AV front panel or "SMPTE Readout" on page 59 for doing so from ClockWorks.

Freewheeling to avoid time code dropouts

When the MIDI Timepiece AV encounters a drop-out —a series of missing or unreadable frames—in the SMPTE time code, it "freewheels" past them, pretending that they were not missing by briefly generating its own code to make up for the missing frames. The default freewheel value is 4 frames. This means that the MIDI Timepiece AV will continue to generate time code for four more frames after it stops receiving time code. If it does not receive any more time code after four frames, it will stop converting.

The factory default base setups have the freewheeling feature set to 4 frames for fastest response when you stop the tape deck. The Freewheel amount can be adjusted up to 32 frames. This allows the MIDI Timepiece AV to maintain lockup even over lengthy SMPTE drop outs.

If you encounter a time code drop out that causes the MIDI Timepiece AV to stop converting for a moment, try increasing the freewheel amount in the Sync/MMC window pop-up menu as shown in Figure 10-11 on page 62. Try adding just a few frames at a time when adjusting the amount. (For details on the "one time jam sync" option, see "Regenerating fresh time code ('jam syncing')" on page 149.)

The MIDI Timepiece AV freewheels at the frame rate it is reading at the time it begins freewheeling — except for 29.97 drop and non-drop. If you intend on reading 29.97 SMPTE, be sure to manually set the SMPTE format to 29.97 so that freewheeling will occur at the proper rate.

When you increase the freewheel amount, you also increase the amount of time that the MIDI Timepiece AV keeps converting when you stop tape. To make the MIDI Timepiece AV as responsive as possible, only raise the freewheel amount as high as necessary to overcome the drop-out(s) you are encountering.

Getting a running update of SMPTE

You can get a running update of SMPTE on the front panel of the MIDI Timepiece AV by using the WINDOW knob to dial up the SMPTE/SYNC menu. The first window of the menu displays SMPTE.

You can also get a running update of SMPTE in the ClockWorks SMPTE Reader and Sync/MMC windows. For details, see chapter 10, "Sync and MIDI Machine Control" (page 59).

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STRIPING SMPTE

The MIDI Timepiece AV can stripe SMPTE time code (LTC) — even while it is resolved to video. You can stripe LTC onto video without the time code drifting out of sync with the video frames.

You can use the SMPTE Controls window in the MIDI Timepiece AV software or the MIDI Timepiece AV front panel LCD to generate SMPTE. This section covers how to do so with the software. See "Using the SMPTE controls" on page 111 to learn about how to stripe SMPTE via the LCD display.

Note that the MIDI Timepiece AV always generates fresh time code while reading existing time code. You can use this capability to:

- Regenerate fresh time code that is based on existing time code, and eliminate drop-outs in the original code
- Lengthen existing time code tracks

For information about regenerating time code, see "Regenerating fresh time code ('jam syncing')" on page 149 and "Lengthening a SMPTE track" on page 150.

A general procedure for striping SMPTE

Use the procedure below to generate new code from scratch:

1 Make the audio cable connections shown in Figure 2-6 on page 12.

We recommend that you do not pass the time code output from the MIDI Timepiece AV through a mixer or any form of signal processor. If you must go through a mixer, be sure equalization is flat.

2 If you are recording to video, set the MIDI Timepiece AV MASTER SYNC mode to INTERN/VIDEO. This causes the MIDI Timepiece AV to generate fresh time code while resolved to video. If not, set it to INTERNAL.

3 If you are recording time code on a tape deck, and your tape deck has dbx noise reduction, be sure to defeat the noise reduction on the track you are recording time code.

4 Open the SMPTE Controls window in the MIDI Timepiece AV software.

5 Enter a start time.

To edit the start time, click inside the box and type a number. To move to the next field, press Tab. Each field allows valid numbers only, e.g. you cannot type "72" in the minutes field. A standard audio industry practice is to start at 01:00:00:00 (one hour) to avoid crossing the 24-hour count during preroll.

6 Choose the necessary frame rate.

7 Adjust the SMPTE output volume.

The goal when striping SMPTE is to get the VU meter on the tape deck to read approximately –3. You can adjust the MIDI Timepiece AV's SMPTE volume output level by using the SMPTE VOLUME OUT setting in the SMPTE/SYNC menu in the front panel LCD. Or you can use the *Output Level* meter in the Sync/MMC window (visible when the master mode is set to *Internal*). If you want to test the level, set the Master sync mode to *Internal* and use the Start and Stop buttons to make the MIDI Timepiece emit time code, and then meter it with your mixer.

8 Roll tape.

9 Click Stripe.

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Striping will begin at the frame shown in the Start Time box. The SMPTE Reader will begin to roll. While striping, you can close the SMPTE Controls window, and you can even switch to another application or Quit the MIDI Timepiece AV software.

10 To stop striping, click Stop.

You can stop striping at any time.

Of course, if you want to stripe a tape and meanwhile get on with other work, you can quit the MIDI Timepiece AV software. Striping will proceed in the background.

Striping frame-locked LTC onto video

The MIDI Timepiece AV can stripe LTC onto video while syncing to the video, ensuring that the LTC is frame-locked (i.e. LTC won't drift out of sync with the video frames).

When you do this, you are recording SMPTE time code onto one of the two audio tracks on the video tape. If you have a VTR that doesn't allow you to dub audio separately from video, you'll have to dub video at the same time. But while you are dubbing audio (the new time code) with video, you also have to send the same video signal to the VIDEO IN port of the MIDI Timepiece AV so that it can gen-lock to it. Therefore, to do all of this, you need a video deck that can record audio independently of video. If your video deck doesn't support this, you need:

- two video decks, and
- the ability to somehow split the video signal coming out of one of them (such as a dual video output, a separate video splitter, or video distribution amp)

Let's say that Video Deck 1 is the master, and Video Deck 2 is the destination. You dub video from Deck 1 to Deck 2, while at the same time feeding the video signal coming from Deck 1 to the MIDI Timepiece AV, which is set to INTERN/VIDEO sync mode. This makes the MIDI Timepiece AV gen-lock to video (so that it is in sync with Deck 1 and Deck 2) and generate SMPTE time code, which you feed into one of the audio tracks on Deck 2. The result is a video tape in Deck 2 with the original video plus frame-locked SMPTE time code that came from the MIDI Timepiece AV.

☛ Important note: our tests have shown that you will probably not get usable results if you attempt to feed video from Deck 2 to the MIDI Timepiece AV. You really need a bona fide video splitter to split the signal from Deck 1 to both Deck 2 and the MIDI Timepiece AV.

Striping SMPTE on a multitrack tape deck

The goal when striping SMPTE time code is to generate an error-free signal strong enough for reliable lockup, but not so strong that the SMPTE bleeds through to adjacent tracks.

There are several ways to handle this. One way is to leave an empty track on your multi-track tape deck as a buffer between the SMPTE and other tracks. With a buffer track, SMPTE can be recorded at very strong ("hot") levels (above 0 VU) without risk of bleedthrough.

If your tape deck has no tracks to spare, a good level at which to record is around –3 VU. That is, the VU meter for the SMPTE track on your tape deck should read –3 when you stripe the SMPTE. This records SMPTE that is hot enough for reliable lockup and weak enough so that it will not bleed into adjacent tracks. -3 VU is only a rule of thumb, though, so don't hesitate to use other levels if they work better for you.

Regenerating fresh time code ('jam syncing')

SMPTE is a problem when you are copying tapes: it degrades rapidly every time you try to copy it from one tape to another. Often, the SMPTE signal

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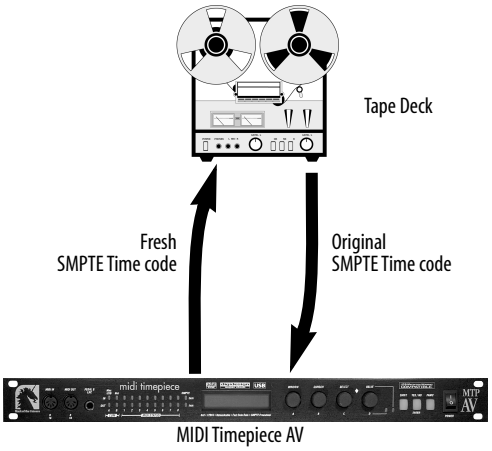
deteriorates so much that it will not be recognizable by any SMPTE-to-MIDI converter, including the MIDI Timepiece AV, and you will no longer be able to lock to it.

The solution to this problem is to use the MIDI Timepiece AV to regenerate fresh SMPTE time code that matches the original time code while you are copying the tape. Some people refer to this process as *jam syncing*. When the MIDI Timepiece AV receives a SMPTE signal on its SMPTE IN cable, it always regenerates a fresh signal that exactly matches the incoming signal and sends it out the SMPTE OUT cable (except for drop-outs, which it eliminates with freewheeling).



To regenerate SMPTE:

1 Connect the original SMPTE track to the SMPTE IN on the MIDI Timepiece AV, and connect the SMPTE OUT from the MIDI Timepiece AV to the destination SMPTE track (which could even be on a different tape deck).

2 Set the freewheel option in the SMPTE Controls window to a high enough number of frames to cover any drop outs that may exist in the current time code.

Try setting it to between 2 and 8 frames, unless there is an obviously large dropout. If so, set it more than 8 frames. This ensures that drop-outs in the old code are not reproduced in the fresh code.

3 Roll tape and set the SMPTE volume levels.

When the MTP AV is reading the old time code, it generates fresh time code via its SMPTE OUT jack only when it is in LTC mode; it won't regenerate LTC in *LTC QuikLock* mode.

4 When the levels are set, roll tape and convert as normal.

The MIDI Timepiece AV automatically creates fresh SMPTE time code that matches the original time code and its relation to the other tracks on the tape. In addition, the MIDI Timepiece AV freewheels over drop-outs in the old time code so that the new, clean code has none.

Lengthening a SMPTE track

If the time code on your SMPTE track ends too early and you need to add more code, you can use the "One time" jam sync option. To do so, feed the original track into the MIDI Timepiece AV and record the fresh code onto a new track. Be sure to start from the beginning so that you regenerate the entire length of the original track. When the MIDI Timepiece AV reaches the end of the original SMPTE track, it will begin striping on its own. To stop striping, click the Stop button or wait until the MTP AV reaches the stop time.

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Synchronizing to discontinuous time code

The MIDI Timepiece AV has the ability to stay in sync with discontinuous time code — that is, time code that has no gaps in it but does have jumps in its frame locations. For details about how to do this, see "Frame lock" on page 62.

Regeneration and time code bits

Except for when it is in *LTC QuikLock* mode, the MIDI Timepiece AV always regenerates fresh time code from its SMPTE out jack. Time code user bits embedded in incoming LTC on its SMPTE input are not preserved.

Slaving Performer to the MIDI Timepiece AV

To slave Performer to the MIDI Timepiece AV, you must have Performer Version 3.4 or higher. To slave Performer to the MIDI Timepiece AV:

1 In Performer, select the appropriate options in the Receive Sync dialog box in the Basics menu.

Specify the port to which the MIDI Timepiece AV is connected by clicking either the modem or printer port button. Also, choose MTC as the "Type of sync."

2 Set the frame rate and click OK.

3 Set the sequence starting frame.

Click the button in the main counter and enter the starting time. This should be a SMPTE time that is within the range of the SMPTE striped on the tape to which it will be slaving.

4 Check Slave to External Sync in the Basics menu.

This puts Performer into slave mode, waiting for sync information from an external device.

5 Click on the Play or Record button in the Controls window.

The Play button will flash (or turn grey on a black and white monitor), meaning that Performer is waiting for sync information to start.

6 To start Performer, start the external device.

When Performer is locked and playing, the Play button will turn blue (or solid black on a black and white monitor). Once locked, Performer will follow, start, stop and rewind under control of the master.

7 To terminate the lock up with the master, click on the Stop button.

Clicking on the Stop button will stop Performer and remove it from the master's control. This can be done at any time. To return to normal operation, turn off Slave to External Sync by reselecting it from the Basics menu.

With the MIDI Timepiece AV, it is not necessary to click Play in Performer before you roll tape. You can click the Play button in Performer even with the tape rolling and Performer will jump right into sync within a second or so.

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CHAPTER 23 MIDI Machine Control with the AV

OVERVIEW

The MIDI Timepiece AV can serve as a MIDI Machine Control (MMC) transport control "hub" for ADATs and all other connected devices, allowing you to manipulate the transport controls of everything from one master set of controls: either an Alesis LRC (or LRC-compatible device) connected to the front panel of the MIDI Timepiece AV, or from MMC-compatible MIDI software on the computer.

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HOW MMC WORKS

MIDI Machine Control involves all three components of synchronization:

- time base
- address
- transport control

An MMC controller (which has transport and cueing controls) sends transport commands (play, stop, cue, etc.) to an MMC device that is serving as a time code (address) source. When the MMC device responds to the transport commands, it generates time code (address) information to which all other devices chase and lock. The other devices do not need to be MMC devices, as they sync in the usual fashion via time code (LTC or MTC).

The MMC device (address source) may also serve as the time base master, but in a MIDI Timepiece AV-based studio, it doesn't necessarily have to. For example, video house sync could provide the time base, while the MIDI Timepiece AV provides address (time code).

A recommended setup for MMC

The best scenario for MMC is to set the MASTER SYNC setting in the MIDI Timepiece AV to INTERNAL or INTERN/VIDEO. In either case, the MIDI Timepiece AV serves as the address master, and your computer software (or Alesis LRC-compatible hardware connected to the MTP AV front panel) serves as your MMC transport control master. The MMC controller sends play, stop, start and cueing commands to the MIDI Timepiece AV, and all other devices (including the computer software) chase and lock

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to time code being generated by the MIDI Timepiece AV. In this scenario, time base is provided either by the MIDI Timepiece AV or by incoming video sync.

Other MMC scenarios

In the recommended scenario described in the previous section, the MIDI Timepiece AV receives MMC transport commands and serves as the time code (address) master for everything else.

Alternately, you could choose another MMC device to receive transport commands and serve as the time code master. For example, the device would receive transport commands from your computer software and generate SMPTE time code (LTC). In this case, you would set the MIDI Timepiece AV MASTER SYNC setting to LTC and feed the LTC into the MIDI Timepiece AV, which would then drive all other devices.

There is no advantage to doing MMC this way; in fact, it will probably not provide as stable a time base as the MIDI Timepiece AV does in the recommended scenario described in the previous section. You should only really use this setup if you have a MMC device that does not have the ability to be a time code slave and therefore must be the master.

MMC and video

If you are working with video, and you want MMC control of your rig from your computer software (or LRC-compatible controller) via the MIDI Timepiece AV, your video deck needs to have the ability to either:

- Synchronize to external SMPTE time code (while locked to house sync)

OR

- Support MMC

Without either of these capabilities in your video deck, the MIDI Timepiece AV has no way to control the video deck transports. You'll instead have to use your video deck as the transport and address master.

If your video deck supports the SONY 9-PIN protocol, consider purchasing Mark of the Unicorn's Digital Timepiece, which lets you to control your video deck from a computer (or other MMC controller).

SETTING MMC DEVICE ID'S

Each MMC device requires a unique MMC device ID, including the MIDI Timepiece AV itself. For convenience, the MIDI Timepiece AV automatically sets the device ID's of all ADATs chained from its ADAT sync port. This means that you don't have to do anything in regard to setting the device ID's of your ADATs. The factory default ID of the MIDI Timepiece AV is 20, and the default ID of the first ADAT connected to the MIDI Timepiece AV is 1. Other chained ADATs are automatically set to ID's 2, 3, and so on. You can change these defaults if you'd like.

To change the MMC device ID in the MIDI Timepiece AV using the front panel LCD:

1 Use the WINDOW knob to go to GLOBAL HARDWARE SETUP.

2 Turn the CURSOR knob clockwise until you see the MMC device ID window as shown below.



3 Use the CURSOR and VALUE knobs to give the MTP AV and the first ADAT unique MMC device ID's.

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Connecting ADAT(s) to the MIDI Timepiece AV

Once you've connected a chain of ADATs to the MIDI Timepiece AV, they do not require any further preparation. The MIDI Timepiece AV takes care of setting their MMC device ID's and establishing communication with them.

Setting up other MMC devices

If you have an MMC-compatible device (other than an ADAT), you can slave it to the MIDI Timepiece AV. But first, you need to make the MIDI Timepiece AV send MTC (or LTC for some devices). To send MTC, use the SMPTE DESTINATION window in the front panel LCD (it's in the SMPTE/sync menu). Or you can do so in ClockWorks in the Device Settings & Routing window by making connections from the MTC Out port in the left-hand column to the desired destinations in the right-hand column as demonstrated in Figure 7-14 on page 50.

For most MMC devices that support being an MMC slave, routing time code (either MTC as just discussed or LTC) to them is all you need to do. For some devices, you may also need to get the MIDI Timepiece AV to send MMC transport commands to the device. Once again, you do this in the Device Settings & Routing window: connect the MMC Out port in the left-hand column to the destinations in the right-hand column as demonstrated in Figure 7-20 on page 52. Then you are ready to control your MMC device — via the MIDI Timepiece AV — from the computer (or an Alesis LRC).

Setting up your computer software

Regardless of what you decide to use as your MMC transport control master (an LRC or computer software), you need to set up the software so that it will slave to MIDI Time Code (MTC) generated by the MIDI Timepiece AV. This will ensure that your software chases and locks with all other MMC devices. Check to make your software is set up to the proper frame rate, and that it is in "external sync" or "slave" mode, waiting for MTC.

Also see "Using computer software as an MMC controller" on page 156.

Using an Alesis LRC-compatible controller

You can control the MIDI Timepiece AV and other MMC devices connected to it from and Alesis LRC (Little Remote Control). For complete details, see "Using an Alesis LRC" on page 158.

Setting up any other MMC transport controller

To use any MMC transport controller, such as the JL Cooper CuePoint™:

1 Connect the MIDI OUT and IN jacks on the MMC controller to the MIDI Timepiece AV.

2 Using ClockWorks or the front panel controls, route MTC to the MIDI OUT port that the MMC controller is connected to so that it can receive MIDI Time Code from the MIDI Timepiece AV.

How you do this in ClockWorks is demonstrated in Figure 23-2 on page 157.

3 Using ClockWorks or the front panel controls, route the MMC Controller to the ADAT port of the MIDI Timepiece AV (labeled "adt" in the MIDI ROUTING window of the front-panel LCD) so that the MMC controller can send MMC record functions to ADATs.

4 In the MMC controller device, identify what the MMC device ID is for the MIDI Timepiece AV.

From the factory, the default MMC device ID for the MIDI Timepiece AV is 20. If you need to, you can change it as described in "Setting MMC device ID's" on page 154.

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From the standpoint of achieving MMC transport control over the MIDI Timepiece AV, the above preparations are all you need. There may, of course, be other preparations necessary in the controller itself.

Using computer software as an MMC controller

Most likely, you'll want to make your computer software be the MMC transport control master, so you can control all MMC devices from your computer.

This can be accomplished with an MMC-compatible sequencer, MMC applet, or any other software that transmits MMC transport control commands.

Generally speaking, once you've successfully established overall MIDI communication between your software and the MIDI Timepiece AV, all you have to do is tell your MMC software what the MMC Device ID is of the MIDI Timepiece AV.

From the factory, the default MMC device ID for the MIDI Timepiece AV is 20. If you need to, you can change it as described in "Setting MMC device ID's" on page 154.

As long as MMC routing from the computer to the MIDI Timepiece AV exists (as shown in Figure 23-3 on page 158), the MIDI Timepiece AV will respond to MMC commands coming from the computer specifying its device ID. If it is in INTERNAL sync mode, it will start, stop, and locate to any SMPTE location you designate from your software. You can also control it from an LRC connected to the front-panel LRC input. Just make sure you follow the procedure in "Using an Alesis LRC-compatible controller" on page 155 beforehand.

Setting up Performer or Digital Performer as an MMC controller

Performer and Digital Performer have features to make using MMC with the MIDI Timepiece AV even easier. For details about this, see "MIDI Machine Control (MMC)" on page 32.

MMC remote control of record functions

To record-enable tracks of MMC devices connected to the MIDI Timepiece AV MIDI output ports, make sure your MIDI software sends MMC record-enable commands using the MMC device ID's configured for the device. This is straight-forward, one-way MIDI communication between your MMC software and the MMC device. The MIDI Timepiece AV MMC features do not come into play here.

For MMC remote control of the record functions on ADATs, things are a little trickier.

If you are using Performer or Digital Performer, see "MIDI Machine Control (MMC)" on page 32 for important details about setting up MMC control of ADAT record functions.

In OMS 2.0 or earlier, it is not possible to achieve MMC remote control of the record functions of ADATs connected to the MIDI Timepiece AV. To work around this limitation, you can use FreeMIDI and the FreeMIDI OMS emulator.

Using a third-party MMC device as a master

We recommend trying to set up MMC as described in "A recommended setup for MMC" on page 153. However, you may have an MMC device that does not have the ability to be a time code slave and therefore needs to be the time code master. In this case, you need to set up the MIDI Timepiece AV so that it knows that this device will be the master instead of the computer.

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If the device transmits LTC, you can simply connect it to the MIDI Timepiece AV's SMPTE input and set the MIDI Timepiece AV's master sync mode to LTC (or LTC QuikLock).

If the device only transmits MIDI Time Code (MTC), use the Device Settings & Routing connection shown below in Figure 23-1 and set the MIDI Timepiece AV's master sync mode to MTC.

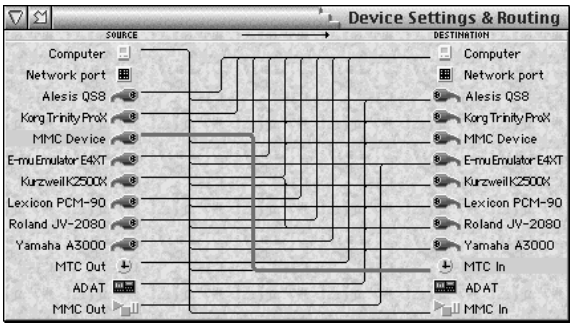

Figure 23-1: If you have an MMC device that can only transmit time code (and cannot be a time code slave), then you can make it the time code master by routing MTC to the MIDI Timepiece AV (MTC In) as shown here. It is better to use LTC, though, or better yet: the MIDI Timepiece AV as the time code master. Both are a more stable time base than MTC.

MMC routing example

Below is a typical MMC routing example. The devices involved are:

- Performer (or any other MMC sequencer running on the computer)
- JLCooper CuePoint MMC controller
- Akai DR8 hard disk recorder
- Roland VS-880 hard disk recorder

The MIDI Timepiece AV master sync mode is set to INTERNAL. It is being shuttled by either the CuePoint or Performer.

Figure 23-2 and Figure 23-3 show the computer, MTC, and MMC connections needed to control everything from either Performer or the CuePoint. This setup allows you to use either one inter-changeably as your transport master controls, without having to change any settings when switching between them.

Performer is slaving to MTC from the MIDI TimePiece AV, while at the same time issuing MMC transport commands to the MIDI Timepiece AV.

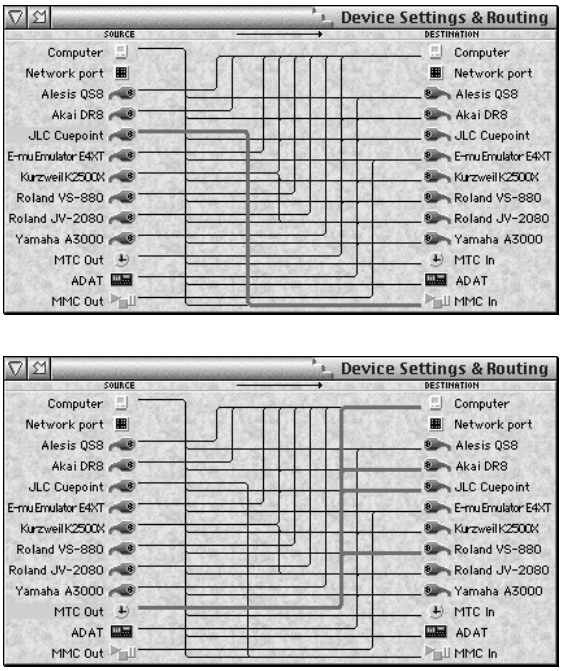

Figure 23-2: A typical routing configuration for MIDI Machine control. Here, the CuePoint is being routed to the MIDI Timepiece AV's MMC In port so that the AV will respond to MMC transport commands from the CuePoint. In turn, the AV, which is in INTERNAL sync mode, is distributing MTC to the Akai DR8 and Roland VS-880 hard disk recorders.

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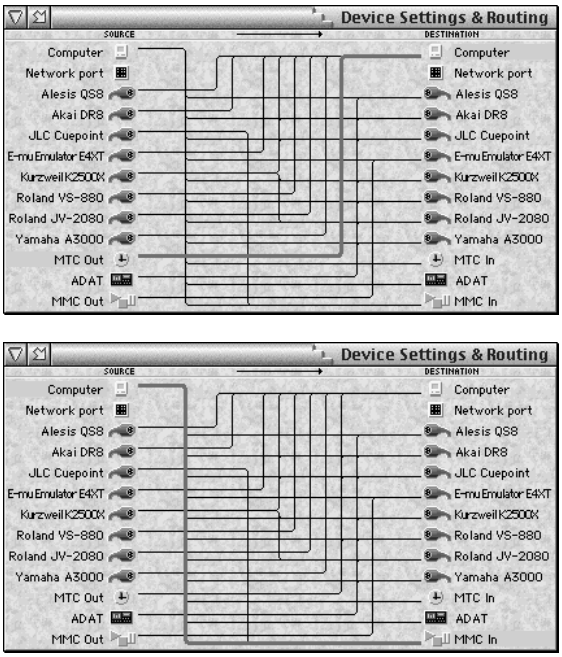


Figure 23-3: In the highlighted connections shown here, MIDI Time Code is being routed to the computer so that Performer can slave to it. MMC is being routed from Performer (on the computer) to the MIDI Timepiece AV (MMC In).

USING AN ALESIS LRC

The MIDI Timepiece AV pedal B jack on the front panel doubles as a connector for an Alesis LRC (Little Remote Control). An LRC can be used as a transport controller for the MIDI Timepiece AV or other MMC devices connected to its MIDI ports.

To use an Alesis LRC or compatible controller with the MIDI Timepiece AV:

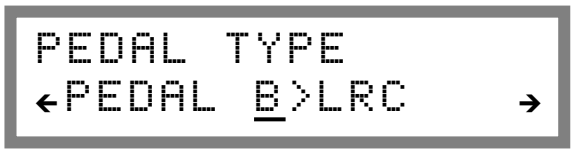
1 Plug the LRC into the front panel LRC jack.

2 On the MIDI Timepiece AV front panel, use the WINDOW knob to go to the PEDALS menu.



3 Turn the CURSOR knob one click clockwise to the PEDAL TYPE window.

4 Use the SELECT knob to choose PEDAL B and use the VALUE knob to choose LRC.



Transport control and shuttling with the LRC

All basic transport buttons (PLAY, STOP, REW, etc.) should function as labeled on the LRC. The Fast Forward and Rewind buttons shuttle forwards and backwards in ten-second intervals.

Other button mappings

There are a number of third-party LRC-compatible products on the market. Depending on your particular LRC model, some of the supplemental buttons on the LRC may not be supported, or they made function differently than a standard LRC.

With a genuine Alesis LRC connected to an MIDI Timepiece AV, the LRC buttons function as follows:

Button	MTP AV Function	Associated MMC Field
SET LOCATE	Set Locate	None
LOCATE 0	Locate 0	GP0
LOCATE 1	Locate 1	GP1
LOCATE 2	Locate 2	GP2
AUTO 2 > 1	Locate 3	GP3
AUTO PLAY	Locate 4	GP4
AUTO INPUT MONITOR	None	None
ALL INPUT MONITOR	None	None

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With an Alesis LRC for the ADAT XT, the LRC buttons function as follows:

Button	MTP AV Function	Associated MMC Field
SET LOCATE	Set Locate	None
LOCATE 2	Locate 0	GP0
AUTO LOOP	Locate 1	GP1
LOCATE 1	Locate 2	GP2
LOCATE 4	Locate 3	GP3
LOCATE 3	Locate 4	GP4
AUTO RECORD	None	None
REHEARSE	None	None

With a Fostex LRC connected, the LRC buttons function as follows:

Button	MTP AV Function	Associated MMC Field
AUTO REC	Set Locate	None
MARK IN	Locate 0	GP0
MARK OUT	Locate 1	GP1
A-RTN	Locate 2	GP2
LOC	Locate 3	GP3
A-PLAY	Locate 4	GP4
AUTO INPUT MONITOR	None	None
ALL INPUT MONITOR	None	None

If you have an LRC unit other than an Alesis or Fostex model and are unsure about its operation with your MIDI Timepiece AV, please contact Mark of the Unicorn technical support.

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CHAPTER 24 Synchronizing Pro Tools

OVERVIEW

The MIDI Timepiece AV serves as a digital audio synchronizer for all current Digidesign hard disk recording systems, including:

- Pro Tools™
- Pro Tools Project™
- Pro Tools III™
- Pro Tools|24
- Pro Tools|24 MIX
- Pro Tools|24 MIXplus
- Session 8™ (for Macintosh or Windows)

MIDI Timepiece AV lets you slave your Digidesign hardware to SMPTE time code or video via Digidesign's proprietary "Slave Clock" input. This is hardware-based digital audio synchronization, the best kind of synchronization that is possible with your Digidesign system.

Synchronization is possible with *any* software that supports your Digidesign hardware, such as Digidesign's Pro Tools software or Mark of the Unicorn's Digital Performer sequencer with digital audio recording.

SLAVING YOUR DIGIDESIGN HARDWARE

To slave your Digidesign hardware to SMPTE or video via the MIDI Timepiece AV:

1 Connect the "Word Sync out" of the MIDI Timepiece AV to the "Slave Clock input" of your Digidesign audio interface as shown in Figure 2-14 on page 15.

2 In the front panel LCD of the MIDI Timepiece AV, use the WINDOW knob to go to the SMPTE/SYNC menu, and use the CURSOR and VALUE knobs to set the sample rate as desired (44.1K or 48K) and set the clock format to DIGI (instead of 1X).

3 Make the other settings in the SMPTE/SYNC menu as desired.

You can slave your rig to VIDEO, LTC, MTC, or the MIDI Timepiece AV's INTERNAL clock. If you are using INTERNAL, you'll also need to set up MMC control between your sequencer and the MTP AV as described in "computer software as an MMC controller" on page 99.

4 In Pro Tools, Digital Performer, or other software that supports your Digidesign hardware, go to the hardware configuration window and make sure that you leave the "Sync Mode" setting to INTERNAL (not DIGITAL).

In Digital Performer, this setting can be found in the *Configure Hardware* command in the Basics menu.

☛ Do not use the DIGITAL setting. The DIGITAL setting is only for slaving your Digidesign hardware to S/PDIF or AES/EBU digital inputs. It does not refer to the Slave Clock input. The Digidesign hardware automatically detects when its slave clock input has a connection and will put itself into SLAVE mode as indicated on its front panel.

5 If your Digital Audio software has software synchronization, turn it off.

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In Digital Performer 1.71, you do this by unchecking the "Sync Audio To Time Code" command in the Basics menu. Software synchronization is not necessary because your Digidesign hardware will be driven by the MIDI Timepiece AV.

6 Set up your software so that it will slave to MTC.

In Digital Performer 1.71, set the Receive Sync command (Basics menu) to MTC and check the "Slave to External Sync" command (also in the Basics menu).

That's it! Now you should be able to roll tape and everything will go.

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Part IV

Appendices

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APPENDIX A Glossary

Address Track: A third audio track, used for time code, located on the edge of the video signal on a 3/4" VTR. Because of its proximity to the video signal, the address track cannot be recorded by itself; it must be recorded simultaneously with the video signal.

ATR: *Audio Tape Recorder.* A device that can record an audio signal on audio tape.

Base setup: One of eight MIDI Timepiece AV internal basic configurations. Each base setup stores all of the MIDI Timepiece AV internal settings as one configuration. Each base setup can be configured differently from the others.

Burn-in Window: A numeric display of time code superimposed over the video picture to aid in the post-production editing process.

Cable routing: An internal connection from one of the MIDI Timepiece AV's MIDI IN ports to one or more of its MIDI OUT ports.

Control Track: A video tape track located at the edge of the video tape containing a series of pulses that serve as a reference tracking the tape speed. This track is recorded with the video signal.

CRT: *Cathode Ray Tube*. The glass screen in TV's, computers, etc. upon which video images are projected.

Crosstalk: Interference on a track from the signal of an adjacent track on a multitrack tape recorder.

Default: An initial value or configuration.

Drop Frame: A SMPTE time code format used to compensate for an accumulating timing error in color video. Drop Frame skips two frames at the beginning of each minute (except every 10th minute) as it counts color video frames. The result is that the SMPTE time code values match the actual elapsed time, since color video runs slower (29.97 frames per second) than black and white video (30 frames per second). Drop-frame is required only with color video programs in which the SMPTE time code numbers must precisely match the actual elapsed time.

Drop-out: A brief period of missing information in a continuous signal, such as a video signal or SMPTE time code signal. Drop-outs are usually caused by small, physical imperfections in the surface of the tape on which the signal is recorded.

Flywheeling: Another name for *Freewheeling*. See *Freewheeling* below.

Freewheeling: A process in which a synchronizer, such as the MIDI Timepiece AV, continues to generate time code even when it encounters drop-outs in a time code source. Converters may briefly lose synchronization during a drop-out and, in turn, momentarily stop converting time code. The MIDI Timepiece AV can freewheel up to 32 frames, making it insusceptible to drop-outs.

FSK: *Frequency Shift Key.* An audio time code consisting of a series of pulses which increment the counter of an FSK reading device.

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FreeMIDI: A Macintosh system extension developed by Mark of the Unicorn for Mark of the Unicorn MIDI software products. FreeMIDI provides centralized, comprehensive MIDI system management.

Genlock: A process in which a video generator (graphics, picture, or VITC) is locked in phase with an external source.

Guard Track: An empty track adjacent to the LTC track on a multitrack tape recorder. A guard track prevents crosstalk from another track, which can interfere with the time code and cause synchronization problems.

Hard Record: A mode on a VTR that erases and records all tracks simultaneously.

Horizontal Blanking: A short period of time in the video display process in a CRT when the electron beam is shut off to retrace to the next horizontal scan line (similar to a carriage return on a typewriter).

House Sync: A process in which all video equipment in a studio is connected to and genlocks to a single video sync generator.

Input cable: One of the eight (or sixteen) MIDI IN jacks in a MIDI Time Piece network.

Insert Record: A mode on a VTR that records on the video tracks without recording on the audio tracks, or vice versa.

Jam Sync: The process of creating fresh, error-free time code or extending existing time code on tape by locking a time code generator to existing code.

LCD: *Liquid Crystal Display*. The alpha-numeric display on the front panel of the MIDI Timepiece AV.

LTC: *Longitudinal Time Code*. The Society of Motion Picture and Television Engineers (SMPTE) time code format, expressed in audio form as an 80-bit binary audio signal, that describes the location of each frame on film, video, or audio tape in hours, minutes, seconds, and frames. LTC's video counterpart is VITC (*Vertical Interval Time Code*), which is the same time code format in the form of a video signal. In audio production, LTC is often referred to as *SMPTE* or *SMPTE time code* since VITC is seldom used.

MIDI: *Musical Instrument Digital Interface*. An information protocol developed in the early 1980's by synthesizer and electronic instrument manufacturers to allow devices to communicate musical performance data to one another.

MIDI Manager: A multi-tasking software environment provided by Apple Computer, Inc. for the Macintosh which allows several MIDI programs to simultaneously communicate with each other and the Macintosh serial ports.

Modifier: A command, or set of commands, that changes one or more of the MIDI Timepiece AV's internal settings.

MTC: *MIDI Time Code*. A form of time code, digitized within the MIDI format, that expresses time in hours, minutes, seconds, and frames, just like SMPTE time code (LTC and VITC).

Network: Two MIDI Time Pieces connected via their NETWORK serial ports with a mini-DIN 8 cable.

Non-drop Frame: A SMPTE time code format that does not drop any frames. Its counterpart, Drop Frame, skips over the first two frames of every minute (except every 10th minute). Non-drop is the least confusing format and should be used unless Drop Frame is required. Drop-frame is

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required only with color video programs in which the SMPTE time code numbers must precisely match the actual elapsed time.

NTSC: *National Television Systems Committee Format*. A system of coding color information for broadcasting television formulated by the NTSC. NTSC uses 30 frames per second for black and white and 29.97 frames per second for color.

Output cable: One of the eight (or sixteen) MIDI OUT jacks in a MIDI Time Piece network.

PAL/SECAM: *Phase Alternate Line.* A system of coding color information that is similar to (but incompatible with) NTSC format. PAL/SECAM uses 25 frames per second.

Patch: In the MIDI Timepiece AV, a patch can be a base setup, a modifier, a combination of a base setup with up to four modifiers, or several (up to four) modifiers by themselves. A patch has a MIDI program change assignment, which can be called up by sending a MIDI program change to the MIDI Timepiece AV.

Script: An itemized description of the commands that make up a base setup or modifier. The script is displayed in the Setups & Modifiers window when the setup or modifier is selected.

Sequencer: A computer or software running on a computer that is capable of recording and playing back MIDI data.

SMPTE: *Society of Motion Picture and Television Engineers*. The acronym *SMPTE* is often used in audio production as a shorthand expression for *SMPTE Time Code*.

SMPTE Time Code: A series of binary impulses that express the location of each frame on film, video, or audio tape in hours, minutes, seconds, and frames. SMPTE has two forms: 1) an 80-bit audio signal, called *Longitudinal Time Code* (LTC), or 2) a video signal recorded in the vertical blanking segment of video frames, called *Vertical Interval Time Code* (VITC). In either form, SMPTE Time Code has four different formats for counting frames per second (fps): 24 fps, 25 fps, 30 fps, and Drop Frame. 24 is used mostly with film; 25 is a European format for film; 30 is the US standard for audio and video; Drop Frame is required only with color video programs in which the SMPTE time code numbers must precisely match the actual elapsed time.

SMPTE-to-MIDI Converter: A device that reads SMPTE time code from audio or video tape and converts it to MTC or DTL to synchronize MIDI devices to tape.

Striping: The process of recording SMPTE time code.

Switcher/Special Effect Generator: A machine that takes multiple video input signals and routes them to a variety of destinations to add special effects such as dissolves.

Synchronizer: A device that reads time code from audio or video tape and is used to synchronize the timing of two or more devices.

Time Code Generator: A device that is capable of producing LTC, VITC, or both.

Time Code Window: A display of SMPTE time code numbers on a video screen.

Universal Serial Bus: An industry standard for connecting peripheral devices to computers.

USB: See *Universal Serial Bus*.

User Bits: 32 unassigned bits in the 80-bit SMPTE time code word that have been set aside by the Standards Committee of SMPTE for users to place

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their own information in the time code, such as the shooting date, take identification, reel number, and so on.

Vertical Blanking: The area on video tape between video frames, which can be seen as the "black bar" above or below the picture when the vertical hold is adjusted. This area is where VITC can be recorded.

Video Field: One half (1/60th of a second) of a complete video scanning cycle (one video frame), which consists of 525 video scan lines. One video field consists of the odd-numbered scan lines; the other consists of the even-numbered scan lines.

Video Frame: One complete video scanning cycle, which consists of two video fields.

VITC: *Vertical Interval Time Code*. The Society of Motion Picture and Television Engineers (SMPTE) time code format, expressed in video form as binary video signal recorded in the vertical blanking segment between frames, that describes the location of each video tape frame in hours, minutes, seconds, and frames. VITC's audio counterpart is LTC (*Longitudinal Time Code*), which is the same time code format expressed in the form of a binary audio signal.

VTR: *Video Tape Recorder.* A device that can record a video signal onto video tape.

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APPENDIX B SMPTE Synchronization Basics

OVERVIEW

This chapter explains what SMPTE synchronization is, how it works, and how to synchronize using the MIDI Timepiece AV.

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WHAT IS SYNCHRONIZATION?

Synchronization is the occurrence of two or more events at exactly the same point in time. In regard to SMPTE and MIDI, it is the process of making MIDI devices, such as a MIDI sequencer, precisely follow an audio tape as it plays back. When the tape plays, the sequencer plays right along with it. When the tape fast forwards to a new location and begins to play, the sequencer will jump ahead to precisely the same location and begin playing, too. Synchronization allows you to freely move about in a piece of music without ever losing the "lockup" between the tape and the sequencer.

Without synchronization, devices with independent time bases, no matter how precisely they keep time, will inevitably drift apart from one another over time.

WHAT IS SMPTE?

The word *SMPTE* is an acronym for the Society of Motion Picture and Television Engineers. In the mid 1970's, the society established a timing standard, called *SMPTE time code,* that is now an international standard. SMPTE time code, commonly referred to as just "SMPTE", was developed for film and video work but has proven to be very useful in normal audio work as well. It is an absolute time code, expressing hours, minutes, seconds and divisions of a second in digital form.

Because of its accuracy and wide-spread acceptance, SMPTE is the most powerful of the time code formats that are used in audio production.

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TWO FORMS OF SMPTE: LTC VERSUS VITC

SMPTE time code consists of a series of binary impulses that are recorded onto each frame on film or video tape, or continuously on audio tape. These binary impulses count each frame, expressing its location in hours, minutes, seconds, and frames.

SMPTE has two forms:

1. an audio signal, called *Longitudinal Time Code* (LTC), or

2. a video signal recorded in the vertical blanking segment of video frames, called *Vertical Interval Time Code* (VITC)

WHAT IS LTC?

Longitudinal Time Code (LTC) is the audio form of SMPTE Time Code. LTC consists of an audio signal that oscillates between two frequencies (approximately 2 and 4 kHz) to form an 80-bit word of 1's and 0's for each frame on the tape. The 80 bits in each SMPTE frame describe, in binary form (1's and 0's), the location of that frame in hours, minutes, seconds, and frames.

WHAT IS VITC?

Vertical Interval Time Code (VITC, pronounced "Vit-see") is SMPTE time code that is encoded in the video signal in the vertical blanking segment at the top edge of each frame. A video signal consists of 525 scan lines, which the rotating heads of a VTR scan as the tape rolls past them. The first couple dozen of the scan lines at the edge of each frame are blank; they do not contain any part of the video picture. VITC is recorded on several of these blank scan lines.

You can actually see VITC in the vertical blanking segment portion of a video picture by adjusting the vertical hold on a video screen. The 90-bit binary VITC signal appears as a series of white dots in the black strip between the top and bottom of the picture.

VITC is part of the video signal; it does not have its own "track" on the video tape. It is therefore not possible to stripe VITC by itself onto video tape. VITC can only be recorded at the same time as the video picture.

THE BENEFITS OF VITC OVER LTC

Of the two forms of SMPTE time code, LTC has become much more widely used as a synchronization standard in the audio production industry because VITC synchronizers in the past have been extremely expensive. So, the term *SMPTE* or *SMPTE time code* has become a common expression for *LTC* in recording studios, post-production houses, MIDI hardware and software manuals, and so on.

Recently, Mark of the Unicorn introduced the Digital Timepiece, an affordable VITC synchronizer and video character generator. It is both an LTC *and* VITC synchronizer, so the distinction between LTC and VITC becomes important. So, if you are used to saying "SMPTE", ask yourself "What type of SMPTE? LTC or VITC?" This will help prevent confusion as you work with the Digital Timepiece.

The primary advantage that VITC has over LTC is that synchronization can be achieved at very slow tape speeds––even when shuttling the video tape backwards or forwards one frame at a time. VITC allows for this because it is part of the video signal, which is continuously scanned by the VTR's rotating heads even when the tape is stopped. LTC cannot be read at slow tape speeds because it is an audio signal in one of the audio tracks, which can only be read when the tape is moving at a constant speed.

Another benefit of VITC is that it does not eat up any audio tracks.

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SHOULD I USE LTC OR VITC?

Since VITC only works with video, you must use LTC for synchronizing a multi-track tape deck. But don't fret: LTC is affordable and more than adequate for tape synchronization.

If you compose music for film or video, you too can use LTC. We strongly recommend, however, that you consider VITC because of the benefits noted above. Contact Mark of the Unicorn for more information about the Digital Timepiece.

FRAME RATES

In either form (LTC or VITC), SMPTE time code has several basic formats for counting frames per second (fps): 24, 25, 29.97 non-drop, 29.97 drop-frame, and 30. 24 is the standard frame rate for film in the US; 25 is the European format for film; 30 is the US standard for audio; and 29.97 drop and non-drop are used for video. Drop frame, explained in detail in the next section, allows SMPTE time code numbers to precisely match the actual elapsed time.

WHAT IS DROP FRAME?

Drop Frame SMPTE time code counts frames at a rate of 29.97 frames per second but skips two frame numbers at the beginning of each minute, except every 10th minute. When the time code display reaches HH:MM:59:29 (59 seconds and 29 frames at the end of each minute), the frame count skips 00 and 01 and jumps ahead to HH:MM:00:02. This jump does not happen at minutes 00, 10, 20, 30, 40, and 50.

Thus, frame numbers such as 11:14:00:00 and 11:14:00:01 do not exist in Drop Frame: the display will show a frame at 11:13:59:29 and the next frame at 11:14:00:02. However, frame numbers at each tenth minute will not be skipped, such as from 11:19:59:29 to 11:20:00:00, followed by 11:20:00:01 and 11:20:00:02, etc.

Keep in mind that only numbers are skipped, not actual frames of the picture. In other words, every picture frame gets a frame number and the *numbers* skip every once in a while.

WHY DOES DROP FRAME EXIST?

Video was first introduced in black and white and it ran at exactly 30 frames per second. Years later, color video was developed. The Drop Frame format was developed to compensate for an accumulating timing error in color video, which runs slightly slower than black and white video. Color video frames actually run at a rate of 29.97 frames per second, which is slightly slower than exactly 30 frames per second. Over a period of time, this difference causes the time code that is counting the frames to fall behind actual elapsed time.

For example, let's say our video program is 60 minutes long. When shown in black and white video at exactly 30 frames per second, it will be precisely 60 minutes long. In addition, the time code that counts the frames will show 01:00:00:00 (exactly one hour's worth of frames) on the final frame. So far, so good.

Now, if we play a color version of the same program, it actually *runs slower* at 29.97 frames per second so that the *actual elapsed time* is 60 minutes and 3.6 seconds! Here's where the discrepancy arises: the time code that counts the frames shows that one hour's worth of frames has gone by, which is 01:00:00:00 on the final frame. But this does not match the *actual elapsed time*, which is 01:00:03:18! In broadcast situations, where edits are calculated down to fractions of a second, 3.6 seconds is a long, long time––too large a degree of inaccuracy.

Drop Frame time code fixes this problem by skipping ahead every once in a while as it counts color video frames to catch up with actual elapsed

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time. The result is that over the period of several minutes, the time code matches the actual elapsed time.

It is important to note that since frames are dropped only once every minute, Drop Frame time code does not *always* reflect the *exact* actual elapsed time: it may be up to a 10th of a second faster or slower than actual elapsed time, depending on how recently the last frame number was dropped.

SHOULD I USE DROP FRAME?

Use Drop Frame time code only when it is absolutely necessary. Drop Frame is required only with color video projects in which the SMPTE time code numbers must precisely match the actual elapsed time, such as when preparing a television broadcast. Otherwise, we suggest that you use 30 Non-drop time code because of the slight inaccuracy mentioned above, as well as the confusion that drop frame can cause.

HOW DOES SMPTE SYNCHRONIZATION WORK?

The syncing process is straightforward. It involves one device following another. As you play back a tape with SMPTE time code on it, the SMPTE feeds into a hardware device called a *SMPTE-to-MIDI converter*. The converter translates the SMPTE audio signal into MIDI Time Code and sends the MIDI Time Code to a MIDI device such as a sequencer. The MIDI device receives the time code and adjusts its playback position to match the time code. All of this happens very quickly, around 30 times per second, which is fast enough so that the MIDI device follows the tape smoothly.

Certain phrases are often used to describe synchronization. The tape deck to which the MIDI device is synchronized is called the synchronization *master*; the MIDI device, which follows, is called the *slave*. The MIDI device is *slaved to the master*. The converter, which reads the time code on tape, is *locked to tape*, or when using SMPTE time code, *locked to SMPTE*.

HOW DOES A MOTU SYNCHRONIZER WORK?

All MOTU MIDI interface/synchronizers function as a SMPTE-to-MIDI converter. When they receive SMPTE time code, they convert that signal into MIDI Time Code, which is then sent to MIDI devices connected to the network. These devices, in turn, slave to the MIDI Time Code.

WHAT IS MIDI TIME CODE?

MIDI Time Code is time code in the form of MIDI data that matches the format of SMPTE time code: time is expressed in hours, minutes, seconds, and frames. A MOTU interface/synchronizer can send MIDI Time Code over MIDI to a sequencer, which follows the MIDI Time Code.

LOCKING A MOTU INTERFACE TO SMPTE

In order to sync your MIDI device to tape, you must first successfully lock your MOTU interface/synchronizer to the SMPTE on the tape. To do so, you need to:

1. Stripe a tape with SMPTE

2. Connect the MOTU interface/synchronizer to the tape deck

3. Prepare the MOTU interface/synchronizer to convert SMPTE

4. Roll the tape to see if successful SMPTE lockup has been achieved

These steps are discussed in chapter 15, "Synchronization" (page 91). Once lockup has been achieved, you can stop the tape, set up your MIDI hardware or software, and then slave it to your MOTU interface/synchronizer.

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APPENDIX C Troubleshooting and Customer Support

COMMON PROBLEMS AND SOLUTIONS

My MOTU USB interface just won't show up in FreeMIDI or OMS, no matter what I do.

If it's not an obvious problem like cables or power, do a fresh install of FreeMIDI and, if you're using it, OMS. Then run the software installer for your MOTU interface again. This places drivers for your MOTU interface into the FreeMIDI and OMS folders inside the System Folder. To be sure, look in the FreeMIDI or the OMS Folder (again, it's located in the System Folder) and make sure that the *MOTU USB FreeMIDI Driver* is present in the FreeMIDI Folder and the *MOTU USB OMS Driver* is present in the OMS Folder. If FreeMIDI and OMS are happily installed, and these drivers are where they're supposed to be, it should be plug-and-play: plug in your MOTU interface (via USB) and it should just appear in FreeMIDI. In the case of OMS, after you plug in your MOTU interface (via USB), you'll have to scan for the interface with the *MIDI Cards & Interfaces* command in the Studio menu to get it to show up in your OMS studio setup.

ClockWorks keeps displaying a message saying that communication with my MOTU interface has been disrupted, even though the interface is connected.

If the problem is not simply that your MOTU interface is switched off or has a loose cable, it may be that communication between ClockWorks and your MOTU interface has been disrupted somehow. If you have a drum machine or sequencer connected to it, be sure that it is not sending MIDI sync to the MTP AV. If so, turn off the drum machine while launching the ClockWorks and then mute real time data on its input cable. To reestablish the connection between ClockWorks and the MTP AV, switch off all MIDI Time Pieces in the network, quit the Console, let the boxes sit for a moment, and then turn them back on again. You may want to try turning them back on again just one at a time. Turn on Box 1-8, and try opening the Console and/or clicking a serial port button in the Serial Ports window. Always return to the simplest possible scenario if you just can't seem to get to the bottom of the problem. Starting from the ground up usually either corrects the problem or gives you valuable insight into how to solve it.

The LEDs on the front panel of my MIDI Timepiece AV blink erratically as soon as I turn it on and the box doesn't operate properly.

This is a symptom that MIDI software running on the Macintosh is set to a different communications speed than a MIDI Timepiece AV that is connected one of your Mac's serial ports (the modem or printer port). To get things back to normal, switch the box off and set the MIDI software interface settings correctly and then power the MTP AV on again. To prevent this from happening again, be sure that the MIDI Time Piece mode Mac speed matches the software (1 MHz or Fast 1X). This type of "light show" can also be caused by INITs and other Macintosh software that sends miscellaneous data out the Macintosh serial ports when the Macintosh boots up. In general, it is a good idea to leave the MIDI Timepiece AV turned off until after the Macintosh has booted up. If the blinking is regular but faint, its just harmless active sensing from the synth.

My MOTU interface will not sync to SMPTE.

Make sure that the SMPTE IN cable is firmly seated and connected to the appropriate output on the tape deck. Observe the LTC LOCK light. Is it flickering quickly and steadily? If so, the MOTU interface is locked to tape and the syncing problem

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is probably related to MIDI. If not, check the level of the SMPTE: it should be approximately –3 VU; then, try boosting or attenuating the SMPTE signal from the tape. You may even want to try recording some fresh SMPTE and locking to it.

The SMPTE Reader window just sits there when my MOTU interface is syncing to SMPTE, even when its LTC LOCK LED shows that it seems to be locked up just fine.

This most likely means that MTC (MIDI Time Code) is not being routed to the Macintosh. Check the Device Settings and Routings window in ClockWorks to make sure there is a connection between the MTC port in the left-hand column and the computer port in the right-hand column. Also note that the SMPTE display in the SMPTE Reader and Sync/MMC windows will only display incommoding SMPTE when the ClockWorks is the active application. To make the ClockWorks the active application, click on of its windows (such as the SMPTE Reader window).

My MIDI software won't sync to tape via my MOTU interface.

Make sure that the interface is slaved to SMPTE first by opening the Sync/MMC or SMPTE Reader window in ClockWorks to see if you get a running update of time code while tape is running. As long as the SMPTE display shows that the interface is successfully locking to the SMPTE and generating MIDI Time Code, MIDI software should also be able to lock to the MIDI Time Code.

My Performer program won't sync to tape and my MOTU interface, no matter what I do.

Are you using Performer Version 3.4 or higher? If not, then you need to update because older versions of Performer don't support MTC. Contact Mark of the Unicorn for information about updating. If you are using Version 3.4 or higher, make sure that MTC is chosen in the Receive Sync dialog box. If the interface is connected to a serial port, make sure the correct port (modem or printer) is chosen. In the MIDI Monitor window, MTC lights up the "CO" indicator. Make sure that Performer is seeing the MTC.

When I play notes from my MIDI controller, the notes sound funny/chopped off/phased/etc. OR I run out of voices sooner than I should on my sound sources.

This means that you are probably routing data to the sound source twice by accident, either via the Auto Patch Thru feature in Performer or other MIDI software, or via a route you were not aware of in the Device Settings & Routing or Channel Mapping windows in ClockWorks. To solve the problem, try to identify from where the extra routing is coming. For example, switching off the Macintosh will tell you if it's the culprit or not. The Device Settings & Routing window is also a good place to hunt for a problem.

My JLCooper FaderMaster (or other MIDI device) behaves strangely when I send it MIDI data from my MOTU interface.

You might need to defeat running status on the output cable to the device. See "Running Status" on page 110.

My ADAT (or ADAT compatible device) connected to the ADAT sync out port on my MIDI Timepiece AV behaves erratically.

The MIDI Timepiece AV continuously polls its ADAT port for the presence of an ADAT. If you plug one in and turn it on, the AV will detect it and perform its routine handshake with the ADAT (or any ADAT device on the ADAT sync chain).

Some ADAT-sync compatible devices do not respond well to this sort of continuous polling. If your ADAT device or ADAT sync chain is not behaving normally, try disabling this automatic polling. For details on how to do this, see "ADAT port settings" on page 51.

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TROUBLESHOOTING

Troubleshooting is always simplest and most effective when the exact problem can be specified clearly and concisely. If you are surprised by an error message or by seemingly erratic behavior in the console or network, take a moment to jot down the relevant details: exactly what the error message said (including any error ID numbers), what actions were done on-screen just before the problem occurred, what kind of file you were working with, how you recovered from the problem, and any unusual conditions during the occurrence of the problem. This may not enable you to solve the problem at once, but will greatly aid in isolating the problem should it reoccur.

If the problem you are encountering seems inconsistent, try to determine what the necessary pattern of actions is that will cause it to occur. Genuine bugs in application software like the ClockWorks are almost always consistent in their manifestation: the same set of actions under the same conditions invariably brings about the same results. Determining the exact cause of a bug often requires experiments which replicate the problem situation with one factor changed: starting the program from a different disk drive, restarting the Macintosh with a reduced set of extensions, restarting your MOTU interface, etc.

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 in the front of the manual and send it in to us. When we receive your card, you'll be placed on our mailing list for free software updates and other information.

REPLACING DISKS

If your ClockWorks disk becomes damaged or lost, our Customer Support Department will be glad to replace it. Or you can download the latest ClockWorks installer from www.motu.com.

TECHNICAL SUPPORT

Registered users who are unable, with their dealer's help, to solve problems they encounter with the their MOTU interface may contact our technical support department in one of the following ways:

- Tech support phone (9 am to 6 pm EST): (617) 576-3066
- Tech support fax: (617) 354-3068
- Tech support email: techsupport@motu.com
- On-line tech support database: www.motu.com

If you decide to call, please have your MOTU interface manual at hand, and be prepared to provide the following information to help us solve your problem as quickly as possible:

- The serial number of your MOTU interface. This is printed on a sticker placed on the bottom of the unit. You must be able to supply this number to receive technical support.
- The version of ClockWorks you are working with. This is displayed in the About ClockWorks command in the Apple menu.
- 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. It is often very helpful to have brief written notes to which to refer.
- The pages in the manual which refer to the parts of the MOTU interface or ClockWorks with which you are having trouble.
- The version of the system software you are using to run the Macintosh. This can be found by choosing About this Macintosh from the Apple menu.

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

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Our technical support telephone line is dedicated to helping registered users solve their problems quickly. In the past, many people have also taken the time to write to us with their comments, criticism and suggestions for improved versions of our products. We thank them; many of those ideas have been addressed in our development efforts. If you have features or ideas you would like to see implemented, we'd like to hear from you. Please write to the MIDI Interface Development Team, Mark of the Unicorn Inc., 1280 Massachusetts Avenue, Cambridge, MA 02138.

Although we do not announce release dates and features of new products or versions of our software in advance, we will notify all registered users immediately by mail as soon as new releases become available. If you move from the address indicated on your registration card, please send us a note with your change of address so that we can keep you informed of future upgrades and releases.

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