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PART ONE:

Introduction to the Studio 3

Introduction—Chapter 1

Panel Descriptions—Chapter 2

1 Introduction

OVERVIEW OF THE STUDIO 3

Opcode's Studio 3 is a standard computer MIDI interface with assignable MIDI outputs, a built-in SMPTE timecode generator and a SMPTE-to-MIDI timecode converter.

MIDI features of the Studio 3 include:

- Two MIDI inputs
- Six MIDI outputs
- MIDI activity indicators
- MIDI/Serial Port thru switches
- Two assignable footswitch inputs and a foot controller input

Timecode functions of the Studio 3 include:

- SMPTE Time Code generation (four frame rates)
- SMPTE-to-MIDI Time Code conversion
- SMPTE-to-Direct Time Lock conversion
- Jam Syncing (rewrites fresh SMPTE when locked)
- Flywheeling (remains locked despite dropouts or other short SMPTE errors)
- Audio input to create a MIDI trigger

The Studio 3 allows you to synchronize sequenced MIDI data to tape. This means you can synchronize virtual MIDI tracks to recorded acoustic tracks or to video. Once you've recorded SMPTE timecode onto either audio or video tape, you can accurately lock MIDI playback to that tape using the Studio 3.

HOW TO READ THIS MANUAL

This manual does not attempt to teach fully the fundamentals of MIDI or SMPTE operation. A brief timecode overview is presented at the end of this chapter, but if you're new to either of these standards, you should purchase Opcode's "Book of MIDI" software, read magazines specializing in music technology, or purchase introductory MIDI and SMPTE books from your local bookstore or music dealer.

Also, you should be familiar with the basic operation of your computer. If you're not, please read its manual before using the Studio 3.

This manual discusses how to connect, set up and use the Studio 3—it describes Studio 3 operations at the time of its printing. However, updates and changes may occur. Always look for hardware and software change information on your master program disk.

This manual is divided into three parts:

Part 1: Introduction to the Studio 3—This part provides an overview of the Studio 3, discusses various timecode basics, and examines the Studio 3's front and rear panels.

Part 2: Using the Studio 3 with a Macintosh—This part discusses using the Studio 3 with a Macintosh computer. It includes chapters on hardware and software installation, configuring the Studio 3's various MIDI and timecode functions, and troubleshooting.

Part 3: Using the Studio 3 with other Computers—This part is written for programmers and discusses using the Studio 3 with computers other than the Macintosh. It details the commands needed to control the Studio 3.

THE STUDIO 3 PACKAGE

Your Studio 3 package contains the Studio 3, power cord, two serial cables, 4 rubber feet, OMS and Studio 3 software, an OMS manual, this Studio 3 manual and a registration card.

STUDIO 3 SYSTEM REQUIREMENTS

To use the Studio 3, you'll need:

- A computer (hard disk recommended)
- One or more MIDI devices.
- One or more MIDI cables to connect your MIDI device(s) to the Studio 3.

REGISTERING YOUR STUDIO 3

Be sure to send Opcode your registration card. If we don't receive it, you won't be eligible for free technical support and various other services and products.

***IMPORTANT**: Please write down your Studio 3 serial number here. The serial number can be found on the bottom of the Studio 3.*

S/N _____

Purchase Date _____

When we receive your registration card, you'll be entitled to free technical support and information about upgrades, updates, and new products. Also, you'll receive Opcode's periodic newsletter, which contains advanced tips, troubleshooting techniques and more.

Opcode technical support hours (Pacific Time) are:

- Monday through Thursday: 9:00 a.m. to 6:00 p.m.
- Saturday: 11:00 a.m. to 5:00 p.m.

Call (415) 856-3331 for technical support, but *please* try to find the answer in this manual first.

***NOTE:** Technical support hours are subject to change.*

TIMECODE BASICS

The operational portions of this manual assume you're familiar with SMPTE Time Code, MIDI Time Code, and Direct Time Lock. If you're not, you should read this section to develop a basic understanding of synchronization and the various timecode formats. Consult music technology magazines or introductory books if you need more information about any of these topics.

SMPTE Time Code

SMPTE Time Code is an international timecode standard created by the Society of Motion Picture & Television Engineers. It specifies a format for recording digital timing information onto magnetic tape; this timing information is divided into hours, minutes, seconds and frames. By using SMPTE Time Code (often referred to simply as "SMPTE"), you can synchronize the playback of separate audio decks, video decks and computers.

Using SMPTE requires two separate actions:

1. Generating the SMPTE Time Code and recording it onto tape (a process often referred to as "striping").
2. Reading the SMPTE Time Code off the tape and using it as a master timing source for synchronizing playback of other tape machines and computers.

There are two types of SMPTE Time Code: Longitudinal Time Code (LTC), and Vertical Interval Time Code (VITC). LTC is recorded on tape tracks that run linearly across the length of the tape. This format is recorded on audio tape or on the audio track of a video tape. VITC is recorded within the video portion of a video tape.

Since different video systems run at different speeds (or "frame rates"), the SMPTE format also specifies a number of different rates.

The Studio 3 will both generate and read SMPTE Time Code in the LTC format. If you have a tape striped with VITC, you'll need to use either a VITC-to-LTC converter or a VITC-to-MTC converted such as Opcode's Studio AV.

The Studio 3 supports four SMPTE frame rates. These rates are as follows:

- 24 Frames/second—Film frame rate.
- 25 Frames/second—EBU (European) television frame rate.
- 29.97 Drop Frame—NTSC (North American) color television frame rate. This format runs at 30 Frames/second, but has the first two frames dropped every minute, except at minutes 0, 10, 20, 30, 40 and 50.
- 30 Frames/second (Non-Drop)—Original NTSC black and white television standard. Often used in audio-only situations since there are no dropped frames and the SMPTE time is equal to real time.

MIDI Time Code and Direct Time Lock

MIDI computer software cannot read SMPTE Time Code directly off a tape, so the code must be converted into a format that the computer can understand. This format is called MIDI Time Code (MTC). The converter then sends MTC (which retains SMPTE's hour/minute/second/frame timing information) to the computer to control the playback of MIDI sequencers. You use MIDI Time Code to synchronize your computer sequence to a master SMPTE timing source.

Direct Time Lock (DTL) is an alternate MIDI synchronization format developed by Mark of the Unicorn for their Performer sequencer. DTL performs basically the same function as MTC; it converts SMPTE timecode into a format that can be read by a MIDI sequencer. DTL is not widely used since the standard SMPTE-to-MIDI synchronization format is MTC.

The Studio 3 will convert SMPTE timecode (recorded at one of the four supported frame rates) to either MIDI Time Code or Direct Time Lock.

2 Panel Descriptions

THE STUDIO 3 FRONT PANEL

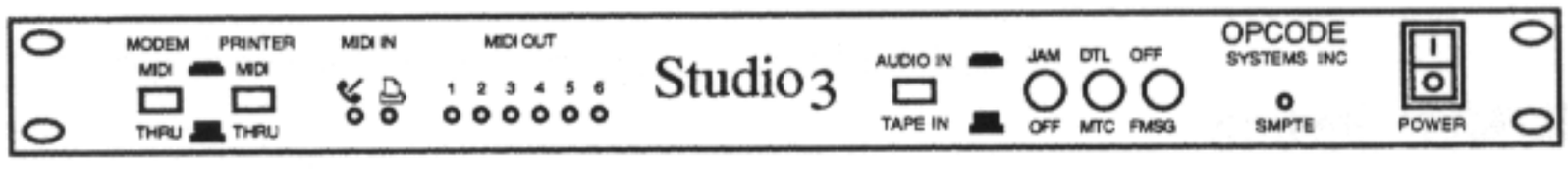


Figure 2-1: Studio 3 Front Panel

From left to right, the front panel switches and LED's are as follows:

Thru Switches

These switches provide convenient access to printers, modems or other peripherals.

When a Thru switch is in the MIDI position, the Studio 3 is in MIDI mode—allowing your computer to communicate with your various MIDI studio devices.

When a Thru switch is in the THRU position, serial data from the computer passes through the Studio 3. Data arriving at a serial input port is passed through to the corresponding serial thru port on the Studio 3's rear panel. The Studio 3 will continue to function as a MIDI thru box—MIDI data received at its MIDI input ports will pass through to its MIDI output ports. Set a Thru switch to the THRU position when your computer needs to communicate with an external peripheral (such as a printer or modem).

MIDI In LED's

These red Light Emitting Diodes (LED's) indicate MIDI data is arriving at one or both of the Studio 3 MIDI input ports. If the LED below the phone icon blinks, then there is MIDI data coming into the Studio 3's Modem MIDI port. If the LED below the printer icon blinks, then there is MIDI data coming into the Studio 3's Printer MIDI port.

MIDI Out LED's

This row of green Light Emitting Diodes (LED's) indicates MIDI data is leaving one or more of the Studio 3's six MIDI output ports. Each numbered LED corresponds to one of the numbered MIDI output ports on the Studio 3's rear panel.

Audio In/Tape In Switch

Set this switch to the TAPE IN position to synchronize MIDI playback to SMPTE timecode. In this position, the Studio 3 acts as a SMPTE-to-MTC converter.

Set the switch to the AUDIO IN position to synchronize MIDI playback to an audio click track. See Chapter 6 for a tutorial on using the AUDIO IN feature with Vision.

Jam/Off Switch

Set this switch to the JAM position to put the Studio 3 in Jam Sync (or "regeneration") mode. See Chapter 5 for information about regeneration of SMPTE timecode.

Set this switch to the OFF position to turn off Jam Sync.

DTL/MTC Switch

Set this switch to the MTC position if your software application synchronizes to MIDI Time Code.

Set this switch to the DTL position if your software application only synchronizes to Direct Time Lock.

Off/FMSG Switch

Set this switch to the FMSG position if you want the Studio 3 to send SMPTE full messages and user bits.

Set this switch to the OFF position of you do not want the Studio 3 to send full messages or user bits.

Full Messages and user bits are discussed in Chapter 5.

SMPTE/Power Indicator Light

This LED will blink when there is any SMPTE activity. When no timecode is received, the LED is lit as a power indicator.

Power Switch

When pushed in at the bottom ("0"), the power is OFF. When pushed in at the top ("1"), the power is ON. The SMPTE/Power LED should light when the switch is in the ON position if the power cord is connected to the Studio 3 and plugged in.

THE STUDIO 3 REAR PANEL

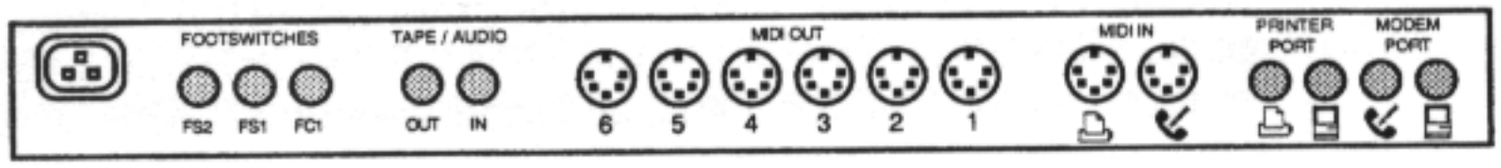


Figure 2-2: Studio 3 Rear Panel

From left to right, the rear panel connectors are as follows:

Power Connector

Plug the factory supplied 3-prong power cord into this socket.

Footswitch Connectors

Use these 1/4" phone jacks to connect two momentary footswitches and a continuous foot pedal. Footswitches and foot pedals are available through Opcode Systems or your local music dealer.

FC1

Use this input to connect an optional continuous control foot pedal (Opcode's foot controller uses a 100k logarithmic taper). The Studio 3 reads the position of the pedal and interprets a MIDI value between 0 and 127. Foot controllers are ideal MIDI controllers for such effects as panning, portamento or volume control. FC1 is assigned to MIDI controller number 15 and its MIDI transmit channel defaults to channel 15. You may change the MIDI transmit channel in the Studio 3 computer software.

FS1 and FS2

Use these two inputs to connect optional momentary (on/off) footswitches. The Studio 3 sends a value of 127 when the foot pedal is depressed and a value of zero (0) when the foot pedal is released. FS1 is MIDI controller number 78; FS2 is number 79. Their MIDI transmit channel defaults to Channel 15. You may change the MIDI transmit channel in the Studio 3 computer software.

You can use either a normally open or normally closed footswitch—the Studio 3 recognizes the type upon powering up. You must plug in the footswitches prior to turning on the Studio 3—this will enable the unit to recognize the footswitches' polarity. Do not step on any footswitches while turning on the Studio 3 so that the correct polarity can be determined.

Footswitches make ideal MIDIKeys in Opcode's Vision sequencer—one switch could be used as the MIDIShift.

Tape/Audio Connectors

These two connectors are used for SMPTE or audio synchronizing. They are unbalanced stereo connectors capable of accepting either 1/4" mono phone plugs or stereo tip/ring/sleeve connectors. Input impedance is 500 kΩ. Output impedance is less than 5 Ω.

Tape/Audio IN

If the front panel's AUDIO IN/TAPE IN switch is in the TAPE IN position, then this jack receives SMPTE timecode from a tape deck or other SMPTE source. The Studio 3 converts the SMPTE input into the MIDI format specified by the front panel's DTL/MTC switch. If the JAM/OFF switch is in JAM position, the Studio 3 regenerates the SMPTE signal and sends it out the TAPE OUT jack.

If the front panel's AUDIO IN/TAPE IN switch is in the TAPE IN position, then this jack receives an audio input that Vision or Studio Vision can use as a sync source. You can use any steady audio beat like a drum or bass as the timing source. This allows you to add synchronized virtual tracks to a tape that was recorded without using SMPTE timecode. See Chapter 6 for a tutorial on using the Audio IN feature with Vision and Studio Vision.

Tape/Audio OUT

This jack outputs SMPTE timecode generated (or regenerated) by the Studio 3. This jack is normally connected to the line input of a tape deck.

MIDI OUT Connectors

Connect these ports to the MIDI IN ports of your MIDI devices.

MIDI IN Connectors

Connect these ports to the MIDI OUT ports of any MIDI devices that are to send MIDI to either the computer or to other MIDI devices connected to the Studio 3's MIDI OUT ports.

Devices connected to the Printer MIDI IN port will communicate over the computer's Printer port and with MIDI devices connected to Studio 3 MIDI OUTs assigned to the Printer.

Devices connected to the Modem MIDI IN port will communicate over the computer's Modem port and with MIDI devices connected to Studio 3 MIDI OUTs assigned to the Modem.

Computer Ports and Thru Ports

Connect these ports to your computer and external peripherals as follows:

Printer Ports

Connect the port with the computer icon to either the computer's Printer port or Modem port using the supplied 8-pin mini-DIN cable.

***IMPORTANT**: You must use this port to communicate with your computer. The Studio 3 and your computer use this port to communicate MIDI port setup, SMPTE, foot controller and other information.*

Connect the port with the printer icon to a printer or other peripheral that would normally connect to the computer's Printer port.

Modem Ports

Connect the port with the computer icon to the computer's Modem port or Printer port using the supplied 8-pin mini-DIN cable.

Connect the port with the telephone icon to a modem or other peripheral that would normally connect to the computer's Modem port.

ABOUT THE INTERFACE CABLES

The Studio 3 comes with standard 8-pin mini-DIN cables. If you are using cables other than the ones supplied with the Studio 3, please ensure that they are 8-pin mini-DIN.

You should use only high quality shielded MIDI and audio cables when operating your Studio 3 or any other professional audio equipment.

PART TWO:

Using the Studio 3 with a Macintosh

Hardware Installation—Chapter 3

Software Installation—Chapter 4

Studio 3 Menu—Chapter 5

Practical Applications—Chapter 6

Troubleshooting—Chapter 7

3 Hardware Installation

To use the Studio 3 with a Macintosh you must have a Macintosh Plus or better with at least one megabyte of RAM and System 6.0.4 or higher.

INSTALLATION INSTRUCTIONS

The Studio 3 mounts in a standard 19" equipment rack as shown in the following illustration.

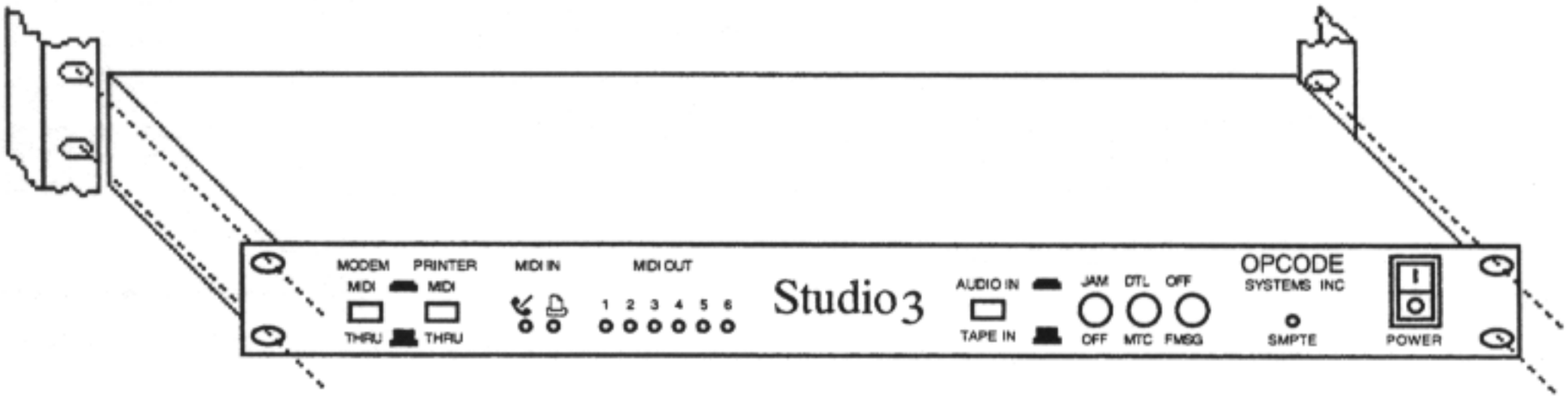


Figure 3-1: Rack Installation

If you do not wish to rack mount the Studio 3, you may sit it on a steady surface. Attach the four rubber feet (provided in this package) to the bottom of the unit to prevent it from sliding.

POWER CONNECTION

Make sure the Studio 3's power switch is in the off position, then connect the female end of the supplied power cord to the recessed power connector on the back of the Studio 3. Plug the cord into a standard 120VAC, 60Hz electrical outlet.

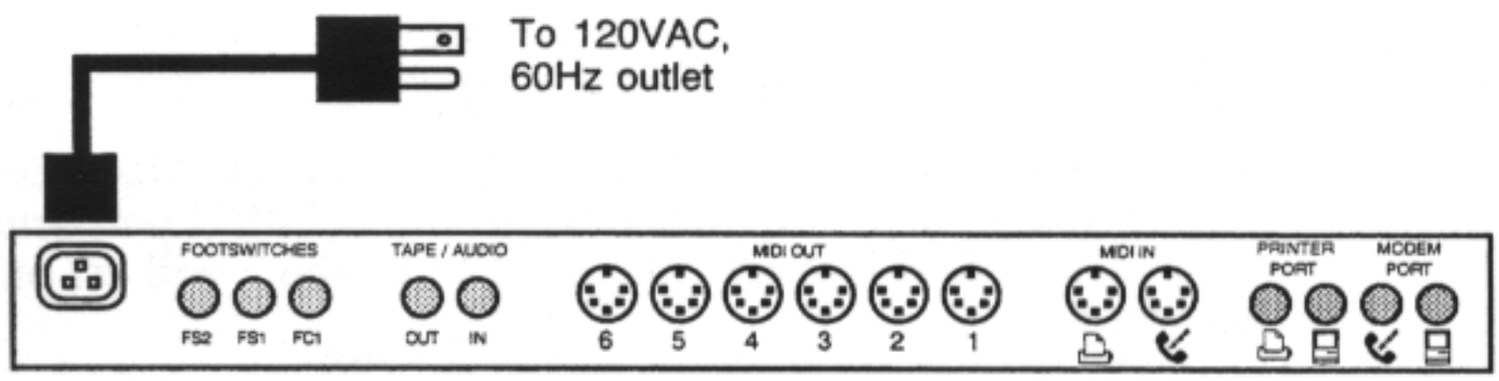


Figure 3-2: Power Cord Connection

MACINTOSH CONNECTIONS

Connect the Macintosh and Studio 3 by connecting their serial ports with the supplied 8-pin mini-DIN cables as discussed in the following sections.

Single Port Connection

Figure 3-3 illustrates the recommended single port Macintosh connection.

The Studio 3 serial Printer port is the only port connected to the microprocessor inside the Studio 3. You must, therefore, use the Studio 3 Printer port to communicate timecode and MIDI port setups, footswitch channel, and ROM version numbers. For this reason, Opcode recommends that if you connect only one Studio 3 port to a Macintosh, connect the Studio 3 Printer port. You may connect the Studio 3's Printer port to either the Macintosh Modem or Printer ports.

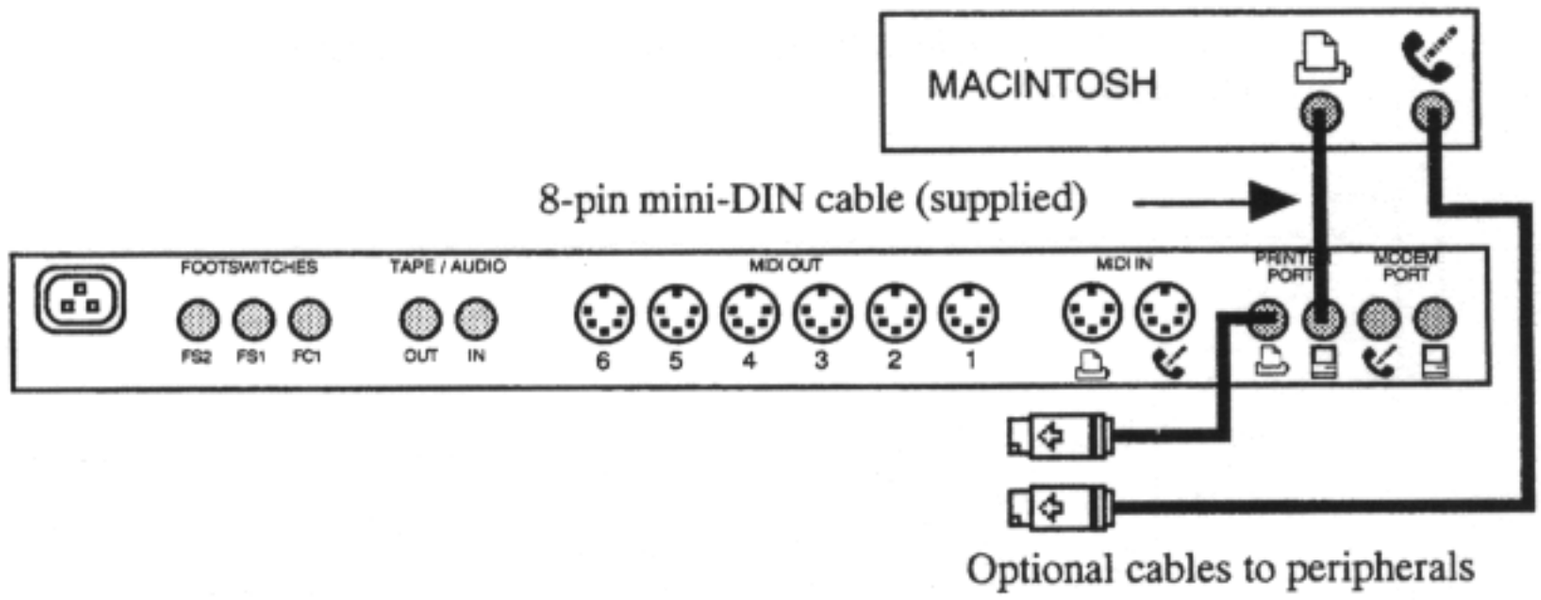


Figure 3-3: Single (Printer) Port Connection

Studio 3 Printer Port -> Macintosh Printer Port

This is the recommended single-port connection as shown in Figure 3-3.

Studio 3 Printer Port -> Macintosh Modem Port

You can connect the Studio 3 Printer port to the Macintosh Modem port if your Macintosh Printer Port must be used at all times by some other application (for example, you have an AppleTalk file server like AppleShare or TOPS).

Studio 3 Modem Port -> Macintosh Modem Port

If you connect only the Studio 3 Modem port to the Macintosh Modem port, you will not be able to perform timecode operations, MIDI port setup, footswitch channel selection, or ROM version checks. The Studio 3 will act only as a standard MIDI interface.

Studio 3 Modem Port -> Macintosh Printer Port

If you connect only the Studio 3 Modem port to the Macintosh Printer port, you will not be able to perform timecode operations, MIDI port setup, footswitch channel selection, or ROM version checks. The Studio 3 will act only as a standard MIDI interface.

Dual Port Connection

Figure 3-4 illustrates a dual port connection. Connect both Macintosh serial ports to the Studio 3 and attach any external peripherals to the Studio 3 THRU jacks. You can switch between the Studio 3 and the external peripherals by using the corresponding THRU switch on the front panel.

Use a dual port connection to balance the MIDI data load between Macintosh serial ports. Since timecode travels only over the Studio 3 printer port (and is fairly dense), connect devices that play dense MIDI data (flurries of notes, pitch bend and continuous controls) to Studio 3 modem port outputs. Use the Configure Outputs dialog (see Chapter 5) to assign Studio 3 output ports. Use the OMS Studio Setup document to reflect your connections (see your OMS manual).

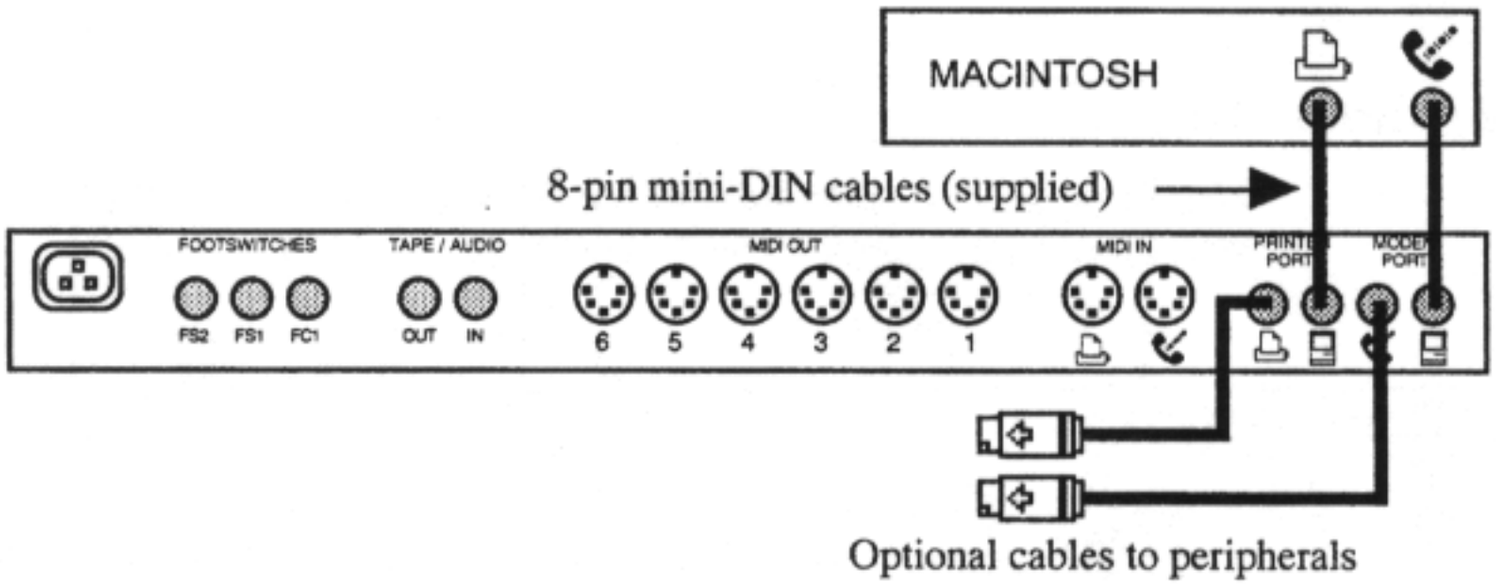


Figure 3-4: Dual Port Connection

TAPE/AUDIO CONNECTIONS

Figure 3-5 illustrates typical audio and tape connections. You can use the Studio 3 either as a tape sync device or as a tempo control device.

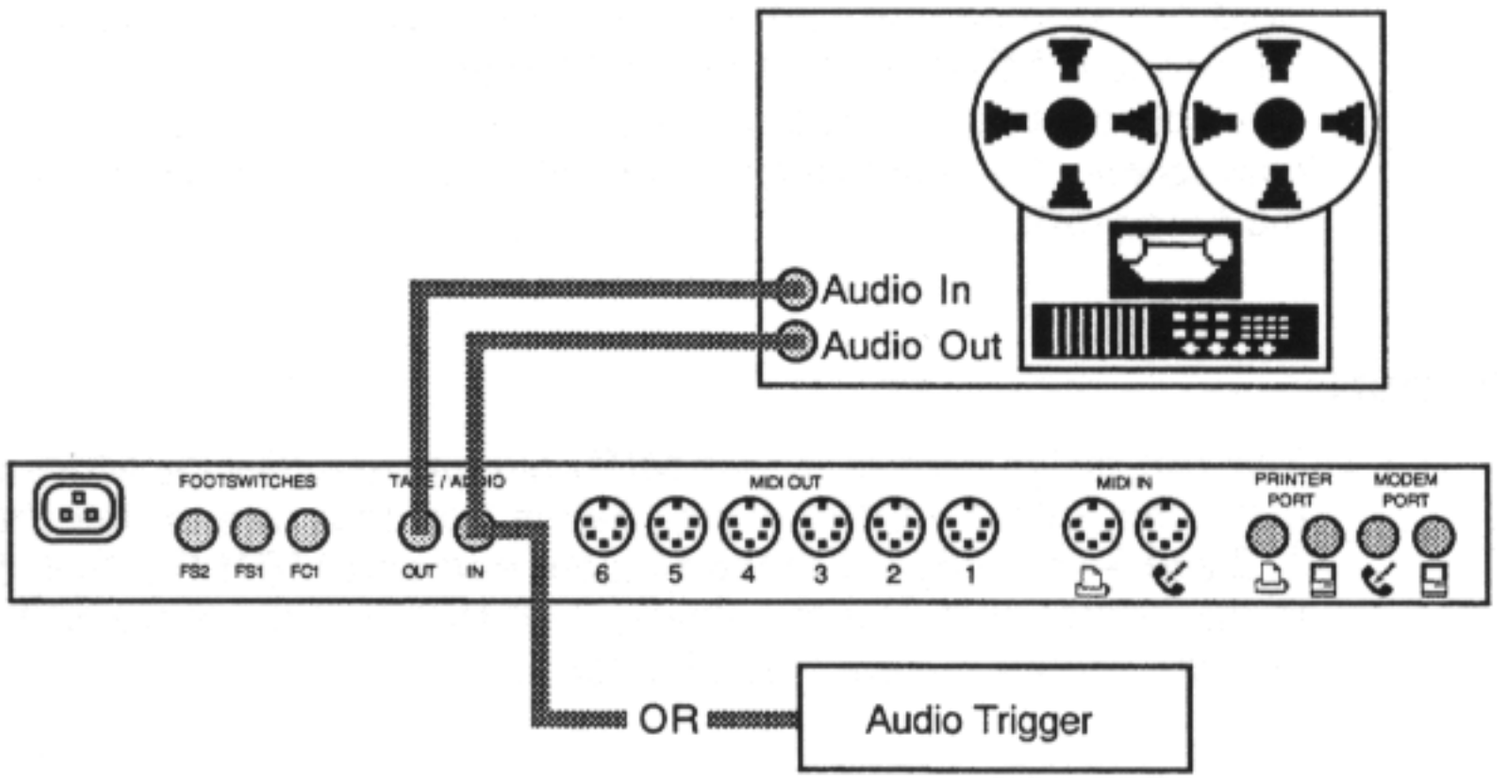


Figure 3-5: Audio and Tape Connections

Tape/Audio Input

Use high-quality shielded audio cables to connect the TAPE/AUDIO IN jack to either a SMPTE timecode source (such as a video or audio tape output) or to an audio trigger signal.

If you connect a SMPTE timecode source, set the front panel's AUDIO IN/TAPE IN switch to the TAPE IN position.

If you connect an audio click track, set the AUDIO IN/TAPE IN switch to the AUDIO IN position (see Chapter 6 for information about using the Audio In feature).

Avoid placing any other components (such as a mixer) in the SMPTE signal path. If you must have a mixer in the path, be certain not to use any equalization.

Tape/Audio Output

Use high-quality shielded audio cables to connect the TAPE/AUDIO OUT jack to the line input of a video or audio tape deck.

MIDI CONNECTIONS

The MIDI connectors on the back of the Studio 3 are grouped as two MIDI INs and six MIDI OUTs. The following sections discuss these MIDI ports in detail.

MIDI Inputs

The Studio 3 has two independent MIDI inputs—one for the Modem port and one for the Printer port. The Studio 3 is capable of handling two separate and simultaneous data streams. MIDI data arriving at the Printer MIDI IN port merges with timecode and foot controller information that's generated by the Studio 3. All this data passes over the Printer serial cable from the Studio 3 to the Macintosh. MIDI data arriving at the Modem MIDI IN port passes over the Modem serial cable from the Studio 3 to the Macintosh. If you don't have a serial cable between the Studio 3 Modem port and the Macintosh, you cannot send MIDI data received on the Modem MIDI IN port to the Macintosh. Similarly, if you don't have a serial cable connecting the Studio 3 Printer port and the Macintosh, you cannot send MIDI data received on the Printer MIDI IN port (or timecode and foot controller data) to the Macintosh.

MIDI Outputs

You can assign each of the six MIDI outputs to *either* the Modem port or Printer port using the Studio 3 OMS driver. When you first turn on the Studio 3, MIDI OUTs 1, 2 and 3 are assigned to the Modem Port and MIDI OUTs 4, 5 and 6 are assigned to the Printer port. Use the Studio 3 OMS driver to set the MIDI OUT assignments the way you want them (see Chapter 5).

Typical Connections

Figure 3-6 illustrates a typical 2-port computer connection and some common MIDI connections.

The master controller synthesizer's MIDI output connects to the Studio 3 Modem MIDI IN. Studio 3 Modem MIDI OUTs (1-3 by default) connect to various MIDI device MIDI inputs. The drum machine's MIDI output connects to the Studio 3 Printer MIDI IN so that its MIDI clock signal can be used as a potential timing source. Studio 3 Printer MIDI OUTs (4-6 by default) connect to various MIDI device inputs.

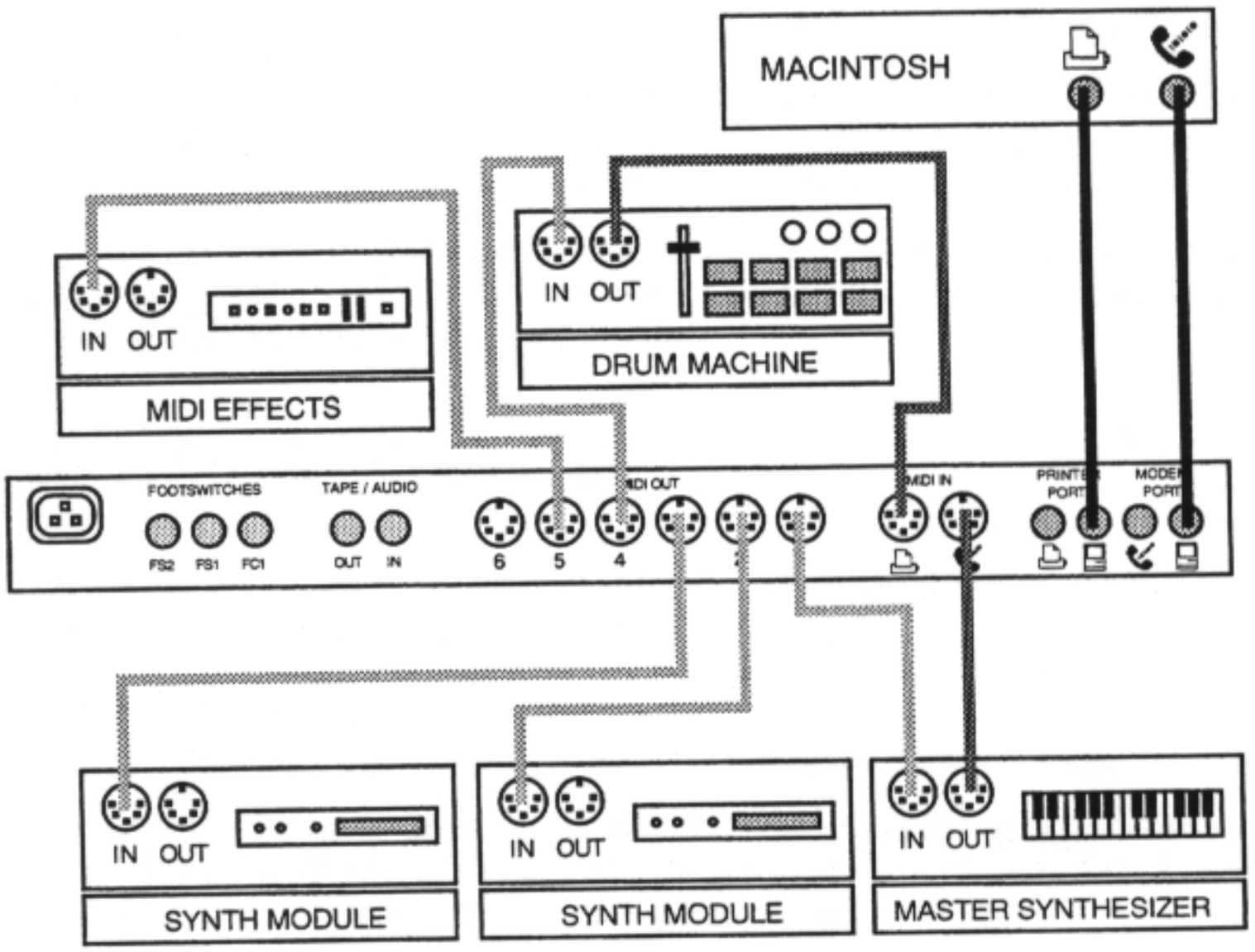


Figure 3-6: MIDI Connections

4 Software Installation and Setup

You should be familiar with basic Macintosh operations. If you're not, please read the Macintosh manual. In particular, you should be familiar with clicking, double-clicking, dragging, choosing, selecting, scrolling, windows and pop-up menus.

The Studio 3 uses the Opcode MIDI System (OMS) and the Studio 3 OMS driver to configure its MIDI ports, timecode, footswitch channel and other functions. If you're familiar with OMS, you can read this manual straight through.

NOTE: *If you have never used OMS, read the OMS manual now. Pay particular attention to the OMS manual's discussions of installation and creating a custom OMS Studio Setup document.*

INSTALLING OMS AND THE STUDIO 3 SOFTWARE

The Studio 3 uses OMS and the Studio 3 OMS driver software to configure MIDI ports, timecode, footswitch channel and other functions.

- Insert the OMS installation disk.
- Open the Read Me folder and read the installation instructions.
- Use the Installer to install all OMS files, the OMS Setup application and the Studio 3 OMS driver. The Installer will also update any OMS files and drivers that might already be on your hard disk.

NOTE: *If you experience a crash when running the OMS Installer, remove any virus-checking INITs from your System folder, restart your Macintosh and run the Installer again.*

What's Installed

The Installer places all the necessary OMS and Studio 3 files onto your hard disk automatically. After running the Installer and restarting your Macintosh, you can begin to use OMS and your Studio 3.

See the OMS manual to learn about the various OMS files and where they're installed.

If you had been using OMS prior to installing the Studio 3, your previous Studio Setup documents will be read by the new OMS Setup application.

CAUTION: *Do not relocate or rename any files or folders that the Installer places in the System Folder. You may delete unnecessary files, but some files are essential for OMS operation. See the Software Definitions section of your OMS manual for more information.*

Although the Studio 3 works with non-OMS applications, all programming and setup of the Studio 3 is handled by OMS. If you have never worked with OMS, please read the OMS manual before continuing with the Studio 3 manual.

LAUNCHING THE OMS SETUP APPLICATION

By now you should have connected the Studio 3 to your Macintosh and installed the OMS software. The next step is to launch the OMS Setup application.

- Turn on your Studio 3.
- Double-click the OMS Setup icon.



Figure 4-1: OMS Setup Icon

If you have never used OMS, or if you haven't defined a current Studio Setup document, you will need to open and create a new Studio Setup document. Your OMS manual describes this procedure in detail, but highlights are included in the next section, "Creating a New Custom Studio Setup Document".

If you are already an OMS user and have defined a current Studio Setup document, you will need to update your setup to work with the Studio 3. This is described in "Updating an Old Studio Setup Document", later in this chapter.

Creating a New Custom Studio Setup Document

If you do not have a current OMS Studio Setup document, you will be asked to create one when you double-click the OMS Setup application.

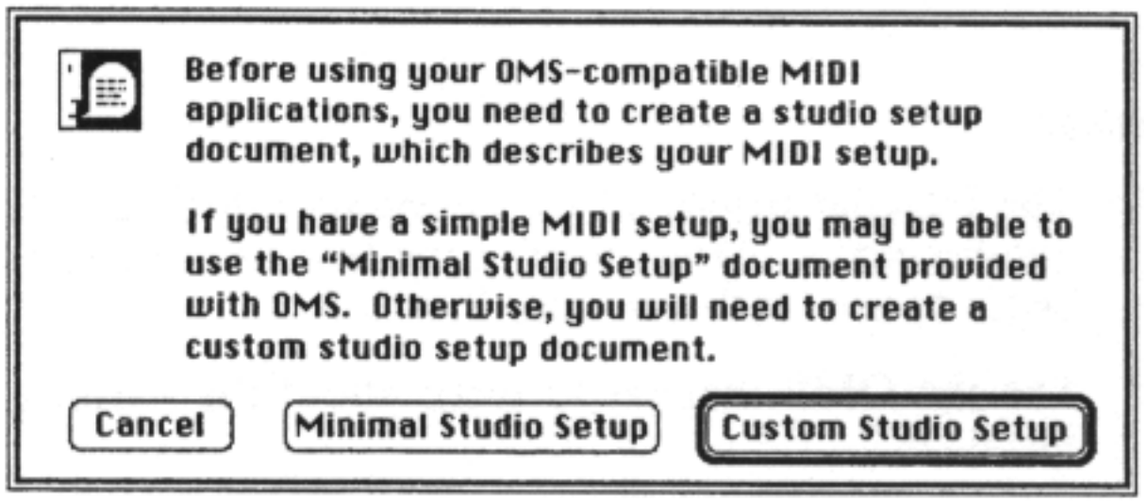


Figure 4-2: Configure OMS Dialog Box

- Click the **Custom Studio Setup** button or hit the return key.

A dialog box appears. There is a check box for each Macintosh serial port. You should check only those ports that are connected to the Studio 3 or any other MIDI interface you wish to appear in your Studio Setup document.

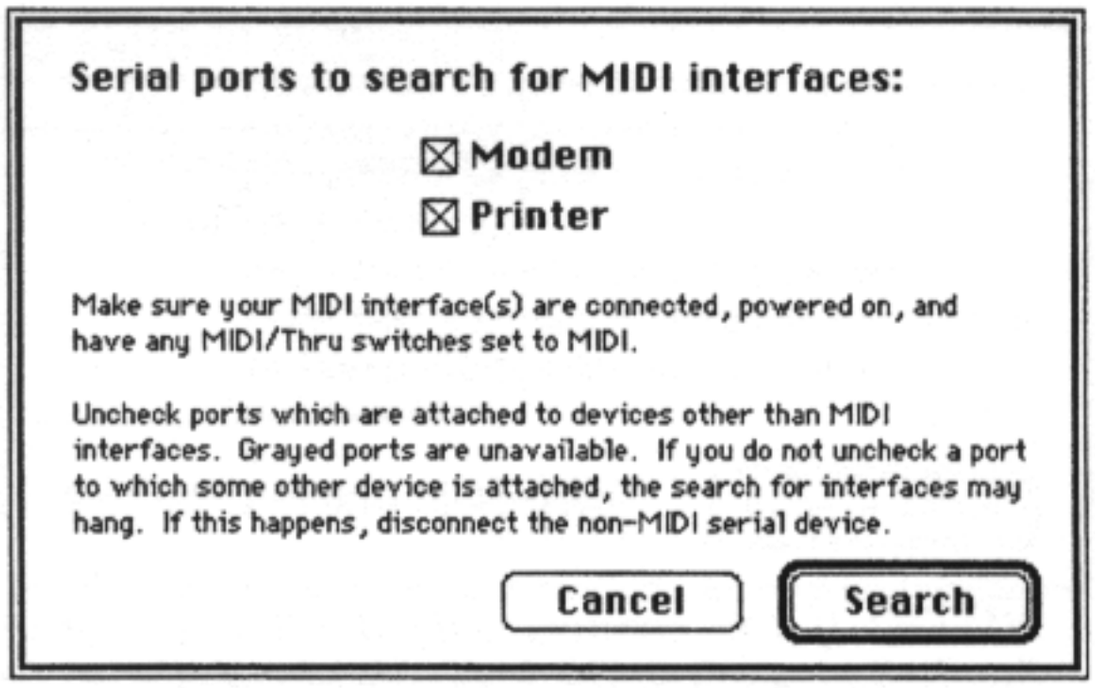


Figure 4-3: Interfaces Dialog Box

- Click the **Search** button or hit the return key.

The Macintosh searches the checked serial ports for MIDI interfaces. It also looks for any NuBus cards that have an OMS driver installed. If OMS Setup finds a Studio 3 Printer port connected to one of the Macintosh serial ports, and if there are interfaces on both Macintosh serial ports, you'll see the dialog box shown in Figure 4-4.

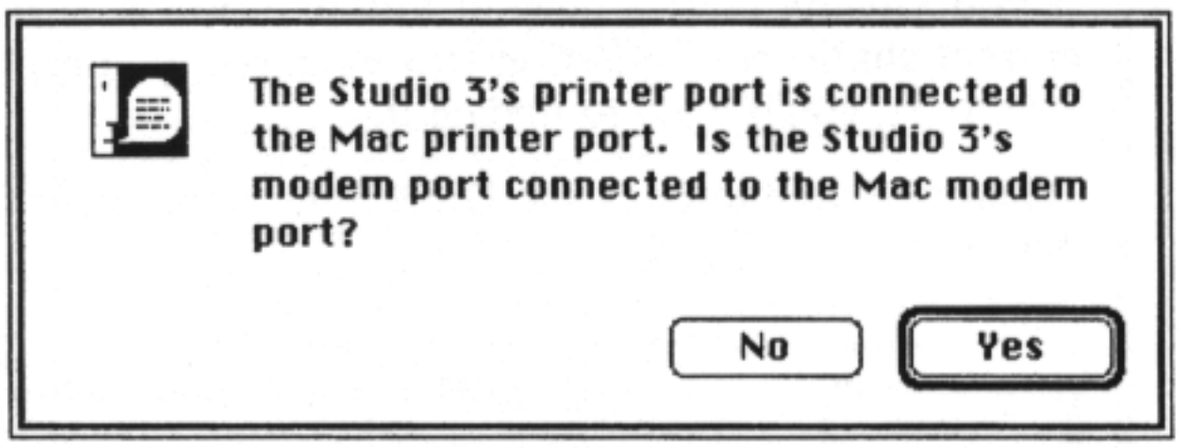


Figure 4-4: Studio 3 Modem Port Query Dialog Box

***NOTE**: If you connected the Studio 3's Printer port to the Macintosh Modem port, the dialog box shown in Figure 4-4 reflects that connection and asks if the Studio 3's Modem port is connected to the Macintosh Printer port.*

- Click the appropriate answer button.

When the Macintosh finds all interfaces and cards, it creates a new untitled Studio Setup document. In this instance, the Studio Setup document contains an icon for each Macintosh serial port that's connected to a Studio 3.

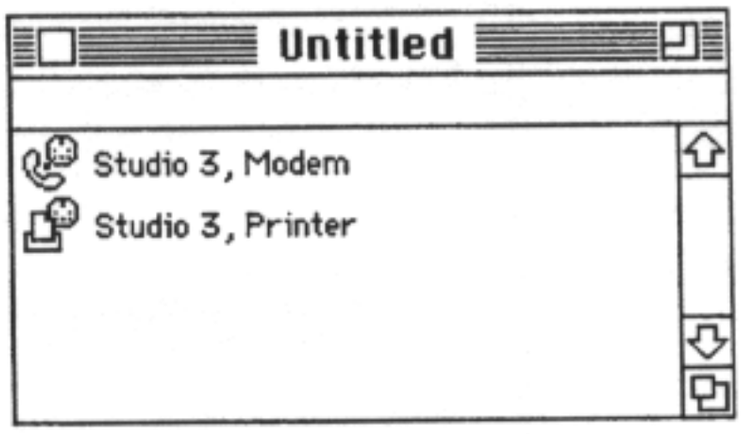


Figure 4-5: Untitled Studio Setup Document

***NOTE**: If you connect only the Studio 3 Modem port to the Macintosh, the Studio 3 appears in the Studio Setup document as a standard interface—you must connect the Studio 3 Printer port to one of the Macintosh serial ports to use the Studio 3 OMS driver.*

Read your OMS manual to learn how to configure and use a Studio Setup document.

***IMPORTANT**: The Studio 3 OMS driver will not recognize a Studio 3 if it is either sending or receiving timecode. Do not stripe tape or send timecode to the Studio 3 when OMS searches for interfaces.*

Updating an Old Studio Setup Document

If you already have a current Studio Setup document, but it doesn't reflect your current studio configuration (for example, you replaced your old interface with a Studio 3), you'll need to update it.

When you double-click the OMS Setup icon, your current Studio Setup document opens.

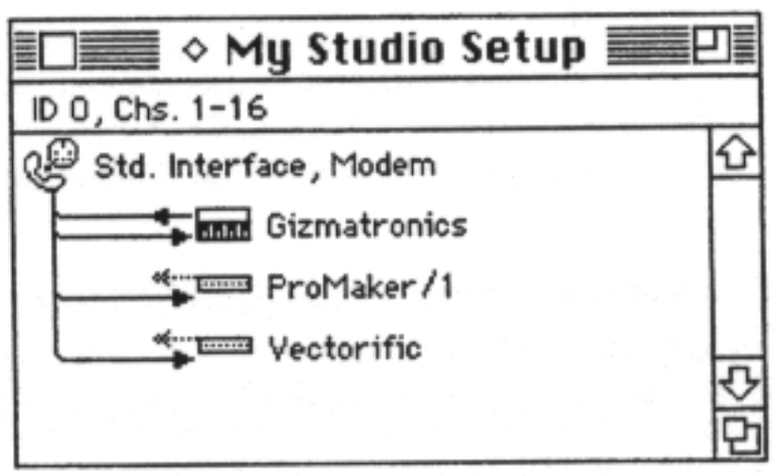


Figure 4-6: Standard Interface Studio Setup Document

- Choose the **Interfaces** command in the **Studio** menu to open the Update Setup dialog box.

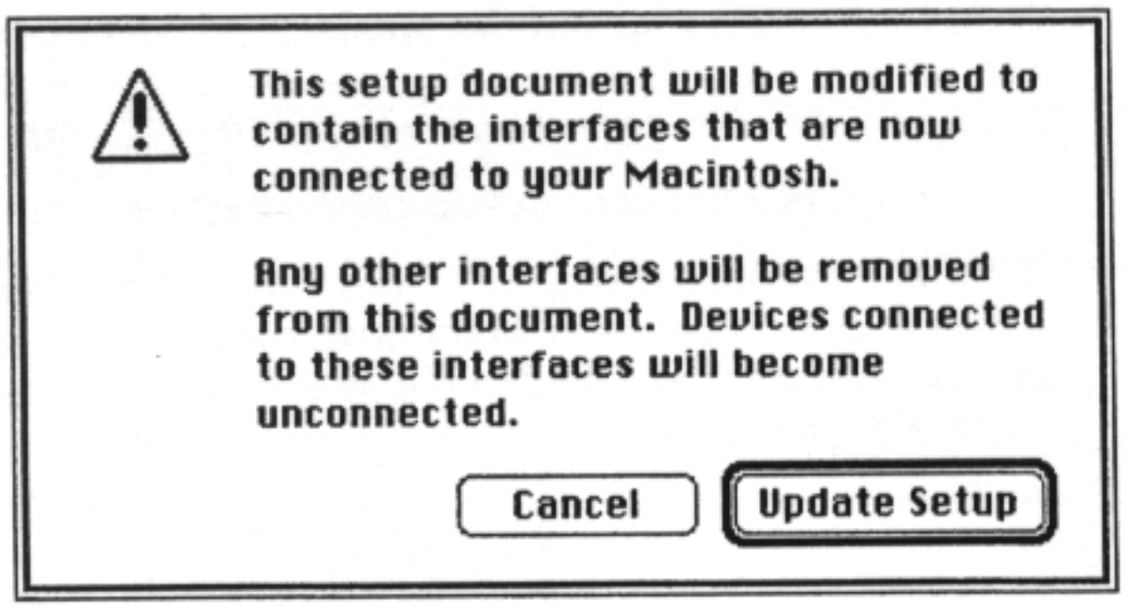


Figure 4-7: Update Setup Dialog Box

- Click the **Update Setup** button.

A dialog box appears. There is a check box for each Macintosh serial port. You should check only those ports that are connected to the Studio 3 or any other MIDI interface you wish to appear in your Studio Setup document.

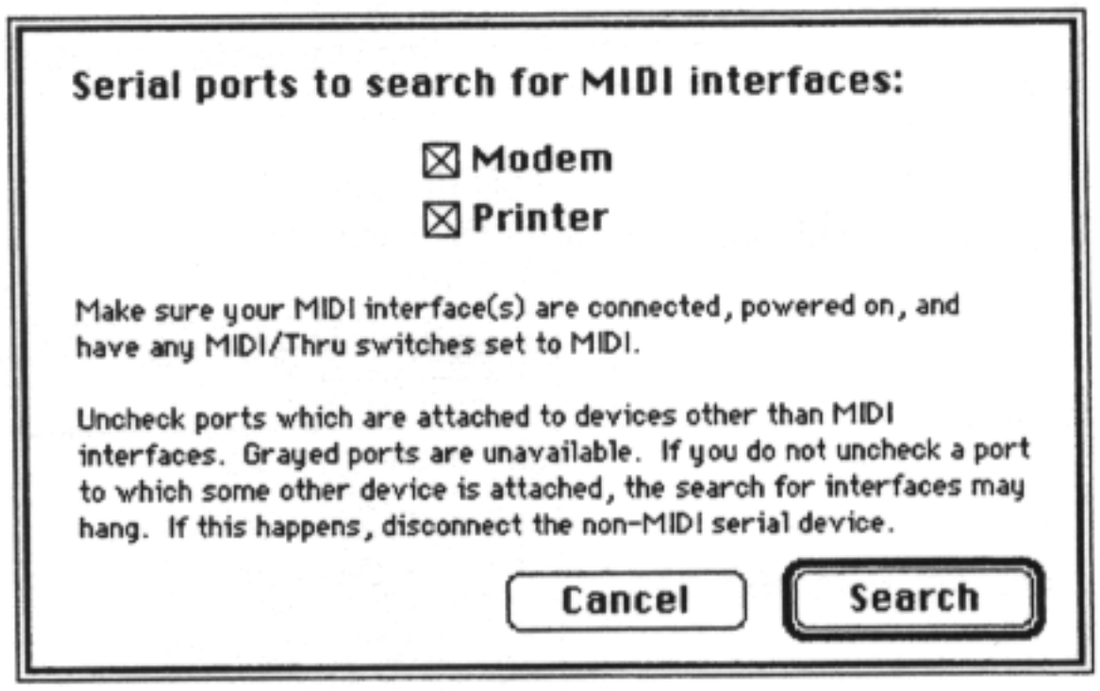


Figure 4-8: Interfaces Dialog Box

- Click the **Search** button.

When you update interfaces, the Macintosh locates the Studio 3's Printer port automatically. If OMS Setup finds a Studio 3 Printer port connected to one of the Macintosh serial ports, and if there are interfaces on both Macintosh serial ports, you'll see the dialog box shown in Figure 4-9.

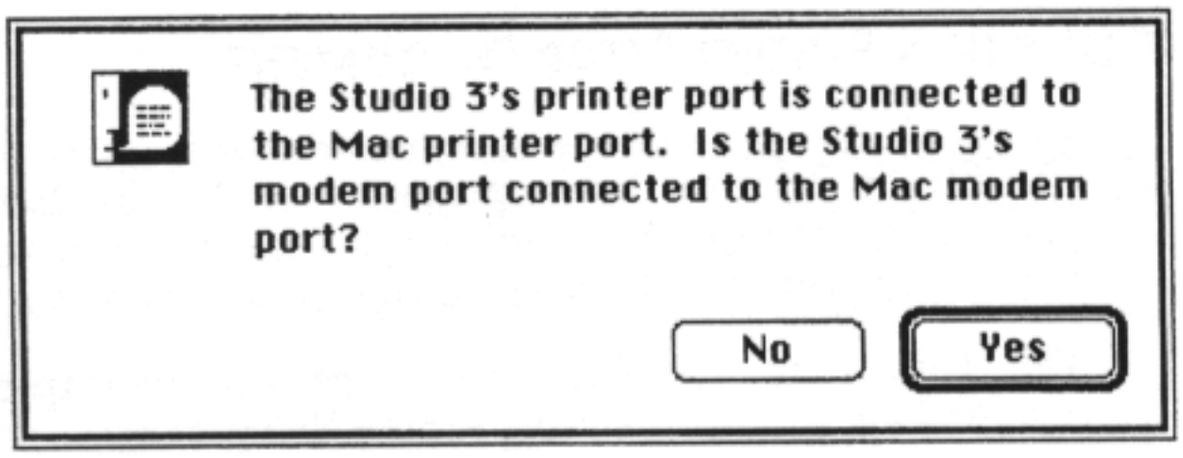


Figure 4-9: Studio 3 Modem Port Query Dialog Box

***NOTE**: If you connected the Studio 3's Printer port to the Macintosh Modem port, the dialog box shown in Figure 4-9 reflects that connection and asks if the Studio 3's Modem port is connected to the Macintosh Printer port.*

- Click the appropriate answer button.

Your old interface disappears from your Studio Setup document and is replaced with a Studio 3 icon for each Macintosh serial port that's connected to a Studio 3. Any devices that were attached to old interfaces appear unconnected in the updated Studio Setup document.

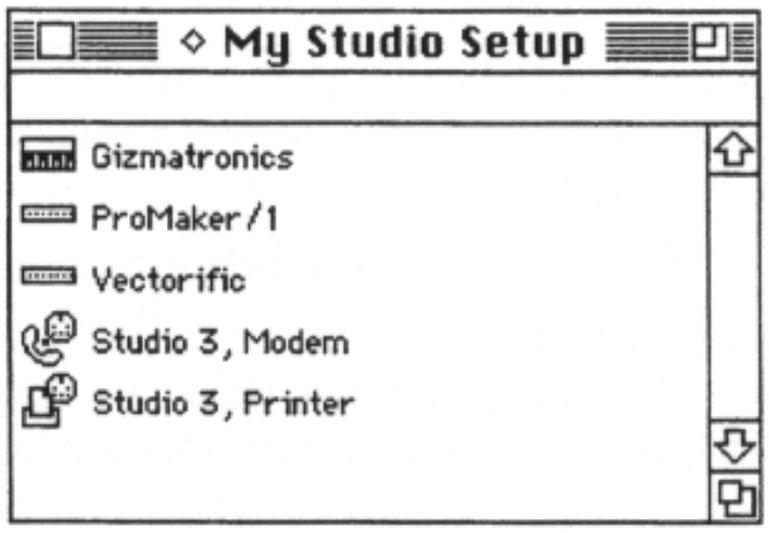


Figure 4-10: Unconnected Studio Setup Document

- Connect the MIDI device icons to Studio 3 icons using techniques discussed in the OMS manual.

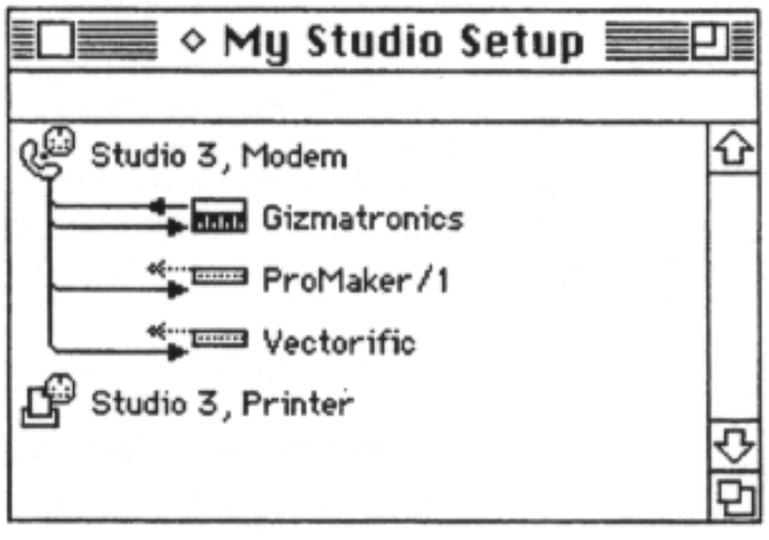


Figure 4-11: Updated Studio Setup Document

- Save your Studio Setup document.

STUDIO 3 ICONS IN A STUDIO SETUP DOCUMENT

The Studio 3 icons that appear in your Studio Setup document depend on how you've connected the Studio 3 to the Macintosh. There is an icon for each Macintosh port that OMS Setup finds connected to a Studio 3.

The following sections show specific examples of Macintosh<->Studio 3 connections and the resulting Studio Setup icons.

Single Port Connection Icons

If you use only one serial cable to connect your Macintosh to a Studio 3, then your Studio Setup document will contain an interface icon for the Macintosh port that's connected to the Studio 3. Figure 4-12 illustrates all possible single cable Macintosh-to-Studio 3 connections and the Studio Setup icons that result.

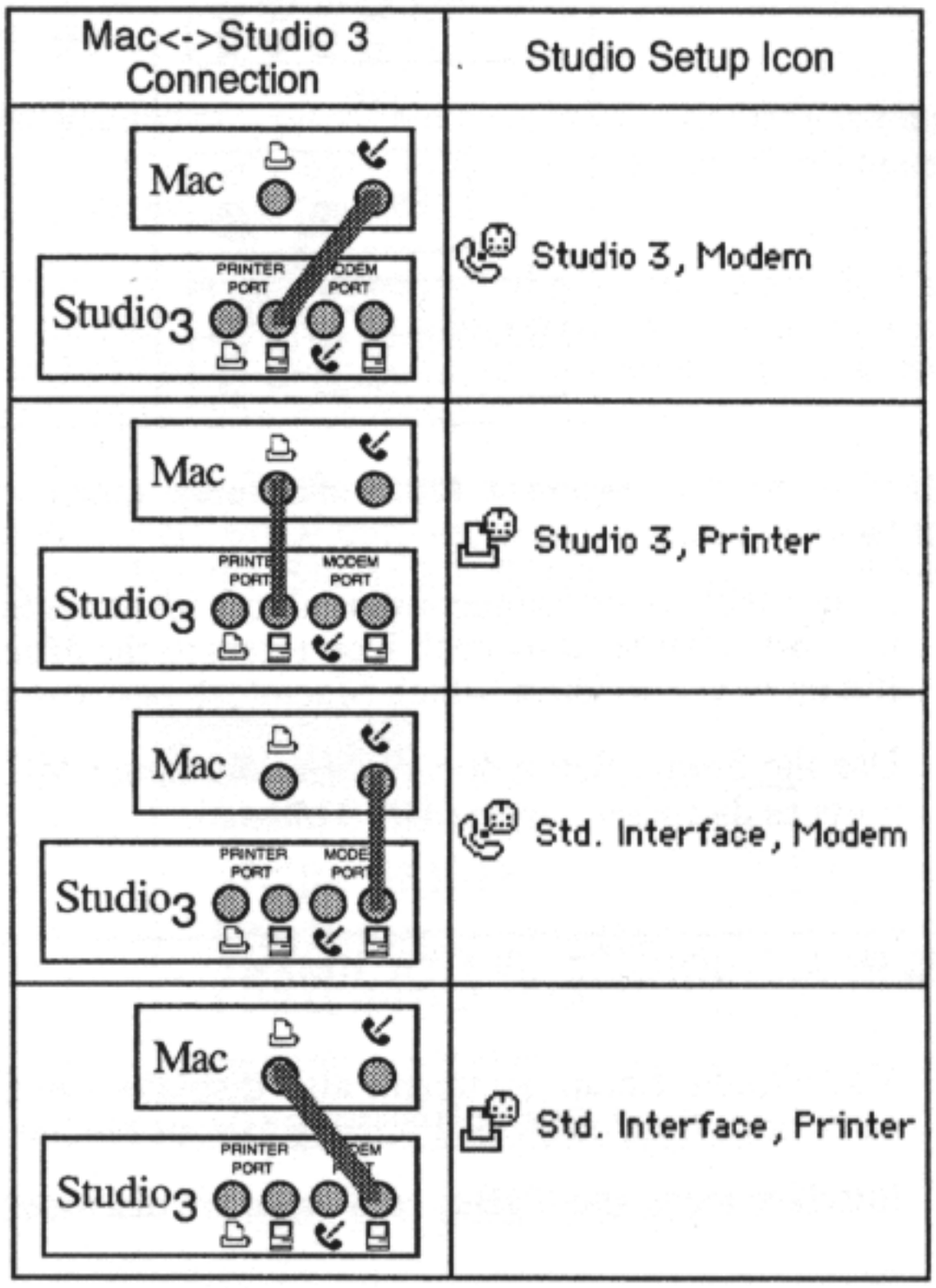


Figure 4-12: Studio Setup Icons—One Serial Cable

Notice that when you connect only the Studio 3's Modem port to the Macintosh (the two bottom connections), OMS Setup does not recognize the interface as a Studio 3. This is because the Studio 3's microprocessor is wired to its Printer port (see "Macintosh Connections" in Chapter 3).

Dual Port Connections

If you use two serial cables to connect your Macintosh to the Studio 3, then your Studio Setup document will contain two Studio 3 icons—one for each Macintosh port that OMS Setup finds connected to the Studio 3. Figure 4-13 illustrates the possible dual cable Macintosh-to-Studio 3 connections and the Studio Setup icons that result.

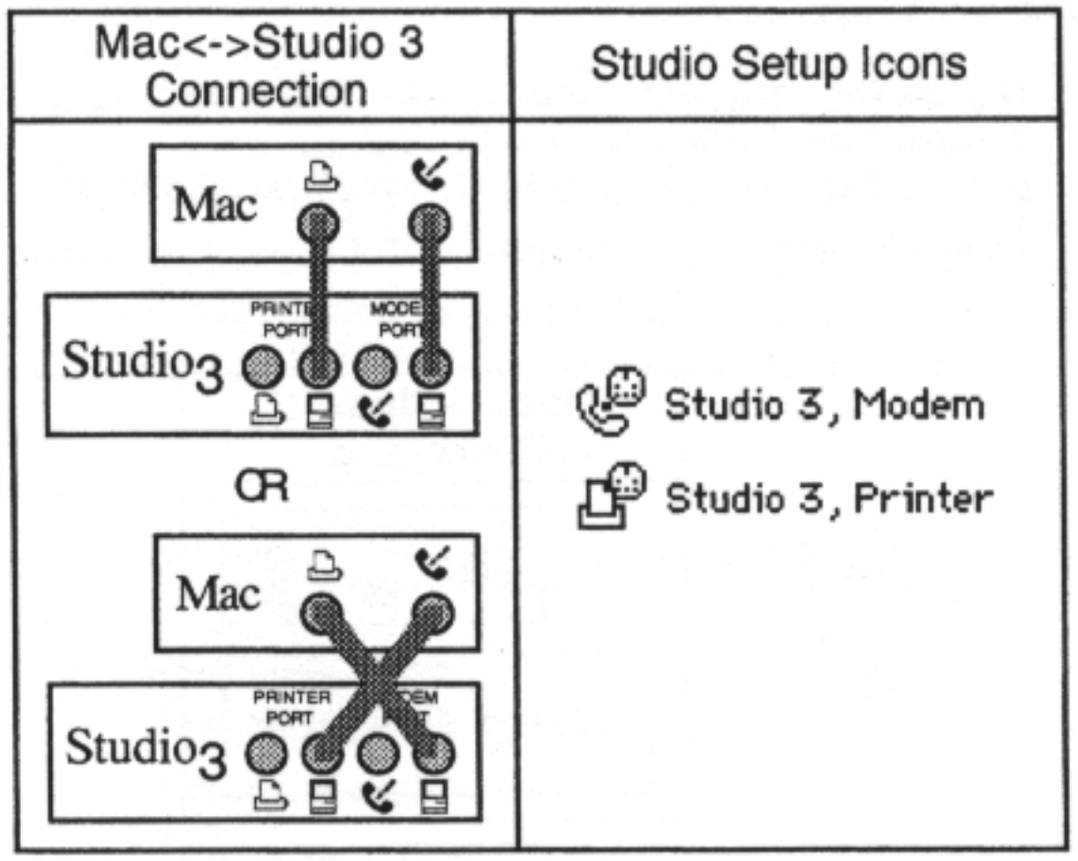


Figure 4-13: Studio Setup Icons—Two Serial Cables

Notice that either connection produces identical Studio Setup icons. This is because the port referenced by each icon refers to the *Macintosh* port, not the Studio 3 port. It's up to you to know which Macintosh port you connected to which Studio 3 port.

Use the Studio Setup document to distribute MIDI data between Macintosh serial ports as discussed in your OMS manual.

OTHER ICONS IN A STUDIO SETUP DOCUMENT

Your Studio Setup document also displays icons for any other interfaces, NuBus cards or devices connected directly to your Macintosh.

Interface icons and NuBus card icons are discussed in your OMS manual.

5 Studio 3 Menu

Before beginning this chapter, you should have read your OMS manual and created a current Studio Setup document. If you have not read your OMS manual or created a Studio Setup document, do so at this time.

You must connect one of the Macintosh serial ports to the Studio 3's Printer port to use the Studio 3 menu. Also, the Studio 3 ignores incoming system exclusive messages when in JAM mode, so you must turn off JAM mode before opening a window or dialog from the Studio 3 menu.

Use the Studio 3 menu in OMS Setup to: read and write SMPTE timecode, configure the Studio 3's six MIDI outputs, assign a MIDI channel to the Studio 3's footswitches and display the Studio 3's ROM version and front panel switch positions.

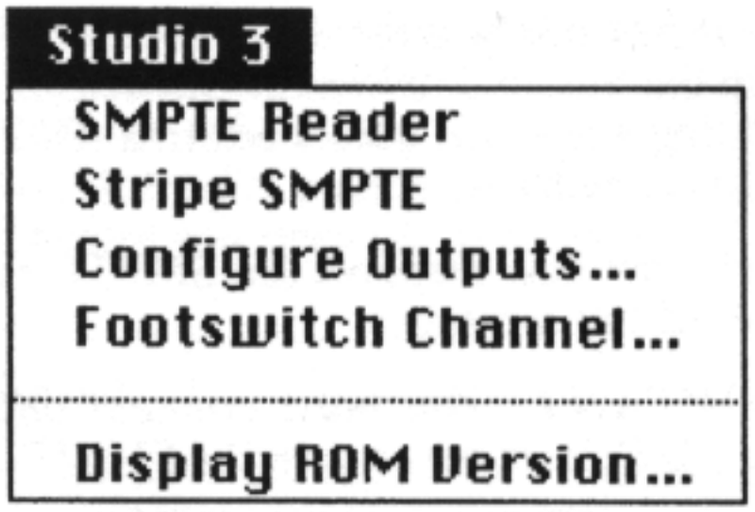


Figure 5-1: Studio 3 Menu

A Studio 3 menu appears in the OMS Setup application whenever a Studio 3 driver is installed and the current Studio Setup document contains a Studio 3. Studio 3 menu commands are described in the following sections.

SMPTE READER WINDOW



Figure 5-2: SMPTE Reader Window

This window displays the SMPTE timecode signal received at the TAPE/AUDIO IN jack on the Studio 3 unless the Studio 3 is striping tape; then it displays the SMPTE time being striped. It uses the format (MTC or DTL) specified by the front panel's DTL/MTC switch.

The window also displays the SMPTE rate and format, user bits (if any) and the number of full messages.

***IMPORTANT**: You must connect one of the Macintosh serial ports to the Studio 3's Printer port to use the SMPTE Reader window.*

If you use MIDI Time Code (MTC), every time the Studio 3 achieves sync, it sends a "Full Message". During a normal syncing situation, you will get only one full message (when the Studio 3 initially locks to tape). If the tape is of poor quality or the SMPTE signal is not strong enough, additional full messages are sent. Each full message increments the counter and provides a good way to check the quality of your tape or incoming SMPTE signal. The SMPTE Reader window doesn't display Full Messages when you use DTL.

***DTL NOTE:** There are a couple points you need to consider when using Direct Time Lock (DTL):*

- *DTL and MIDI Beat Clock use identical messages . Consequently, any MIDI Beat Clock messages received by the Studio 3 merge with DTL messages generated by the Studio 3, making both messages unreadable. Therefore, when you sync your sequencer to DTL, you must not allow any devices to send MIDI Beat Clock messages to the Macintosh. Either stop the device from sending MIDI Beat Clock, disable input from the device to the Macintosh or use MIDI Time Code.*
- *DTL does not support MIDI Time Code user bits, so the user bits displayed when reading DTL do not reflect the true user bits on tape. If you need to read user bits, use MTC.*

STRIPE SMPTE WINDOW

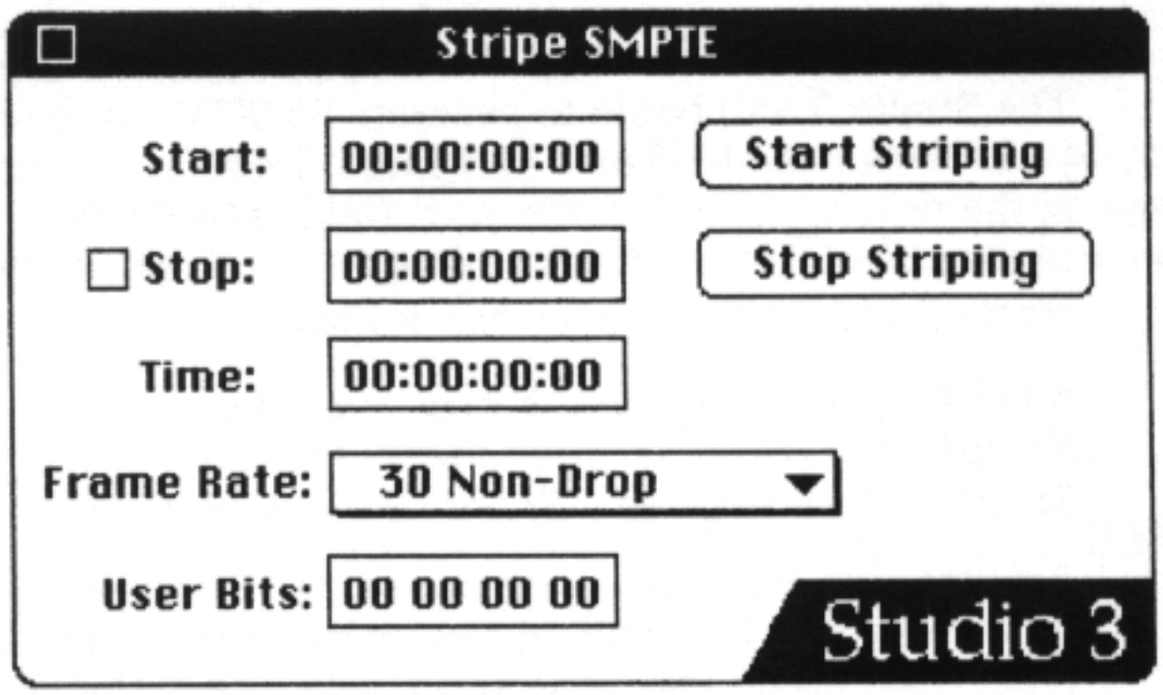


Figure 5-3: Stripe SMPTE Window

Choose **Stripe SMPTE** from the **Studio 3** menu to open the window shown in Figure 5-3. The following sections discuss the mechanics of this window.

***IMPORTANT NOTE**: You must connect one of the Macintosh serial ports to the Studio 3's Printer port to use the Stripe SMPTE window. Also, since the Studio 3 ignores incoming sysex when in JAM mode, you will not be able to use the Stripe SMPTE window with the JAM/OFF switch in JAM position. You must set the JAM/OFF switch to OFF before you open the Stripe SMPTE window.*

Setting and Using Start and Stop Times

The **Start** field contains the SMPTE start time. Reading from left to right, the numbers represent hours, minutes, seconds and frames.

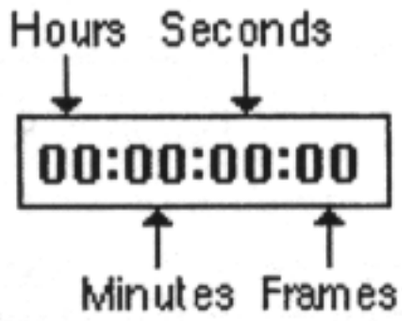


Figure 5-4: SMPTE Start Field

The Studio 3 can stop generating time code automatically. This is especially useful for unattended striping sessions. You can enter a stop time value in the **Stop** field. The check box to the left of the **Stop** field turns on the automatic stop feature. If the box is checked *and* a value is entered into the **Stop** field, the Studio 3 will automatically stop sending SMPTE timecode when that value is reached. If the box is not checked, the Studio 3 will ignore the Stop value, and continue striping until the **Stop Striping** button is clicked.



Figure 5-5: SMPTE Stop Field

The Studio 3 will begin to generate SMPTE timecode from its TAPE/AUDIO OUT jack as soon as the **Start Striping** button is clicked. The SMPTE value will begin at the time specified in the Start field. The Studio 3 will cease to generate SMPTE timecode when the **Stop Striping** button is clicked (or when the Stop field value is reached and the Stop check box is checked).

NOTE: *The Stop check box must be checked BEFORE clicking the* ***Start Striping*** *button. If you check the Stop check box AFTER clicking* ***Start Striping****, then striping will not stop automatically.*

Assume, for example, that you wanted to stripe a tape with exactly 33 minutes of time code, and you wanted this stripe to begin at 1 hour SMPTE time. You would type 01:00:00:00 into your **Start** field, check the Stop check box, enter 01:33:00:00 into your **Stop** field, roll tape and press the **Start Striping** button.

Setting and Using SMPTE Frame Rates

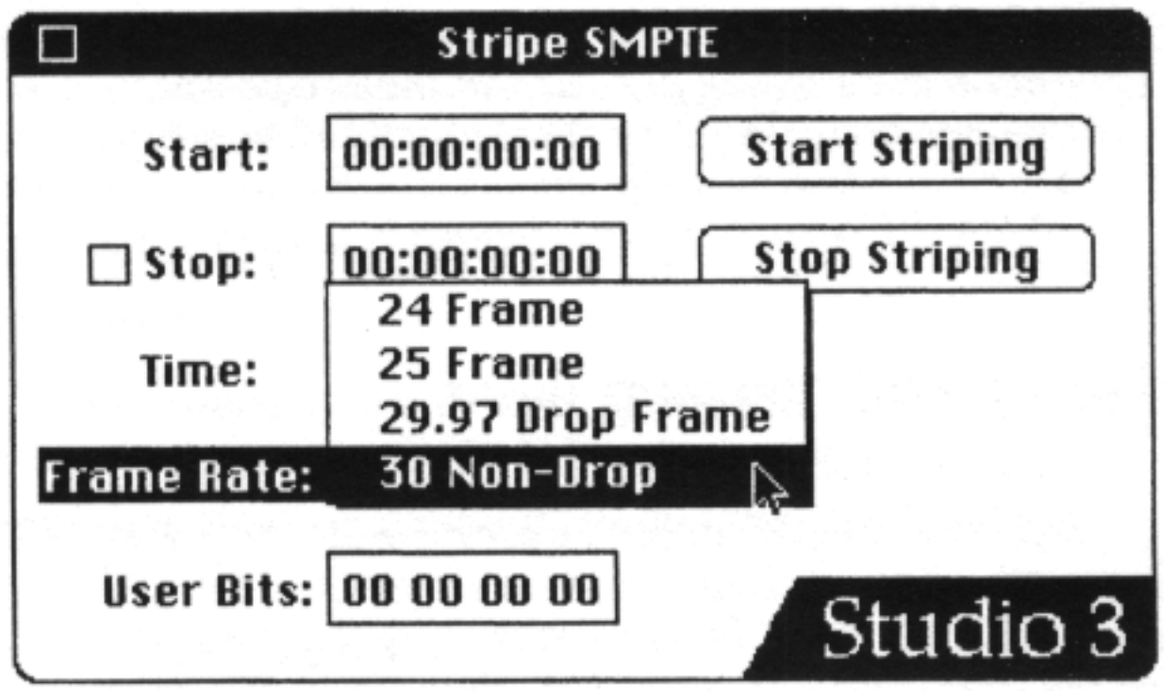


Figure 5-6: Setting SMPTE Frame Rate

You can choose one of four SMPTE frame rates from the **Frame Rate** pop-up menu. When you click the **Start Striping** button, the chosen rate is generated within the Studio 3 and sent to the TAPE/AUDIO OUT jack. The following is a brief description of the various SMPTE frame rates.

- 24 Frame: Film frame rate.
- 25 Frame: EBU (European) television frame rate.
- 29.97 Drop Frame: NTSC color television frame rate.
- 30 Non-Drop: Original NTSC black and white television standard. Often used in audio-only situations since there are no dropped frames and the SMPTE time is equal to real time.

User Bits

This field allows you to enter user bits as defined by the SMPTE standard. User bits are striped onto tape along with the SMPTE time and are often used to mark and identify various sections of a tape. User Bits are hexadecimal, so legal values are the numbers 0-9, and the letters A-F.

***DTL NOTE**: You can stripe timecode that includes user bits regardless of the MIDI synchronization format you specify. However, if you're reading timecode using DTL, user bits will not be displayed in the SMPTE Reader window—you must use MTC.*

Related SMPTE Functions

The following functions, though not accessed through the Stripe SMPTE window, are vital to the SMPTE striping and synchronizing process.

Setting SMPTE Recording Levels

Use the following guidelines to set optimum SMPTE recording levels for various conditions.

- If your tape machine operates at -10 dB, adjust the SMPTE recording level to about -3 dB.
- If you are using a -10 dB machine with LED metering, adjust the SMPTE recording level to between -1 and -2 dB.
- If your tape machine operates at +4 dB, adjust the SMPTE recording level to about -7dB.
- If your audio recorder uses dbx noise reduction and you can't defeat it, adjust the SMPTE recording level to between -1 and 0 dB.
- If you have a mixer in the SMPTE signal path (and you shouldn't), make sure that the equalization is either switched out or flat. Any filtering of the SMPTE signal will render it invalid.

Using Jam Sync

The Studio 3 has a Jam Sync mode. In this mode, it generates a fresh SMPTE signal from the SMPTE OUT jack in sync with the signal received at the SMPTE IN jack. You should always use Jam Sync mode to regenerate a SMPTE track when you copy tapes; a copied SMPTE track may degrade enough to make it unusable.

To put the Studio 3 into Jam Sync mode, set the front panel's JAM/OFF switch to JAM position. To turn off Jam Sync, set the JAM/OFF switch to OFF.

If you want to copy a multitrack tape and its SMPTE track, connect the Studio 3 between the two tape recorders and set the JAM/OFF switch to JAM. The Studio 3 will generate a fresh copy of SMPTE from the original tape's signal regardless of any dropouts in the original copy.

If you do not need to regenerate SMPTE (such as when you're using the Studio 3 to sync a sequencing application to tape), you should turn off Jam Sync. This frees the Studio 3's microprocessor to handle other MIDI and timing tasks.

CONFIGURE OUTPUTS DIALOG

Choose **Configure Outputs** from the **Studio 3** menu to open the Configure Outputs dialog box. Use this dialog box to assign each of the six MIDI OUTs to either the Studio 3's Printer or Modem port. Simply click the "Modem" or "Printer" radio button for each of the Studio 3's six MIDI outputs and click **OK**.

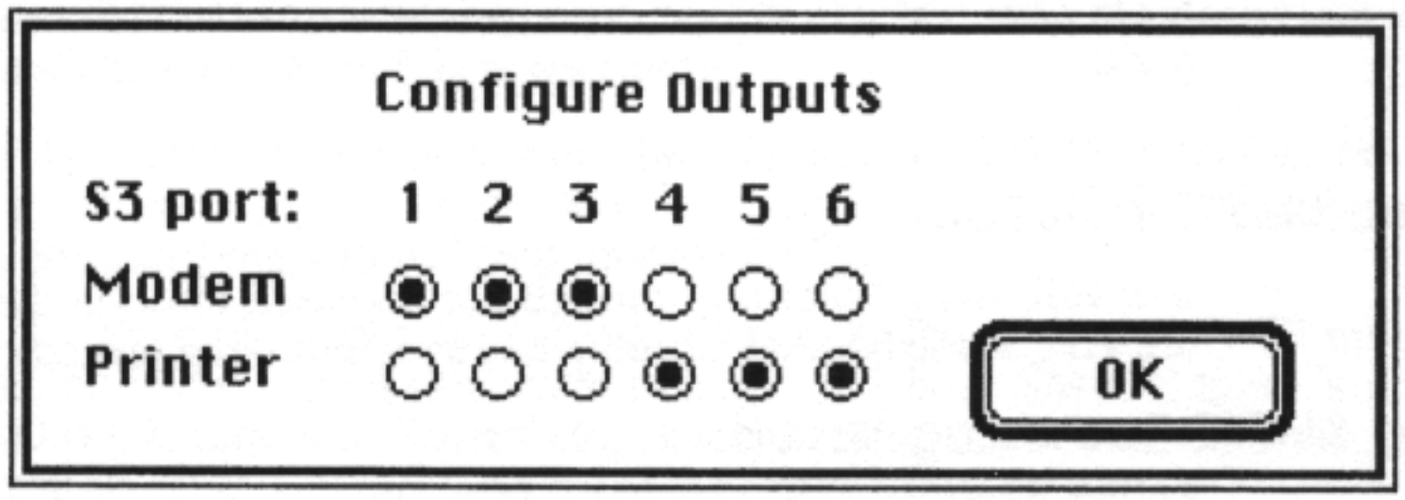


Figure 5-8: Configure Outputs Dialog

The MIDI output configuration is remembered by the Macintosh, so if the Studio 3 is on when you start your Macintosh, its MIDI outputs configure automatically to the conditions last set in the Configure Outputs dialog box.

If, for example, both Studio 3 MIDI/THRU switches are in the THRU position, the outputs assigned to the Modem port transmit MIDI received at the Studio 3's Modem MIDI input port, and the outputs assigned to the Printer port transmit information received at the Studio 3's Printer MIDI input port.

As another example, if both Studio 3 MIDI/THRU switches are in the MIDI position, the outputs assigned to the Modem port transmit information received from the Macintosh port connected to the Studio 3 Modem serial port. Outputs assigned to the Printer port transmit information received from the Macintosh port connected to the Studio 3 Printer serial port.

***IMPORTANT NOTE**: It's up to you to keep track of which Macintosh serial port you connect to which Studio 3 serial port, but to use the Configure Outputs dialog, you must connect one of the Macintosh serial ports to the Studio 3's Printer port.*

FOOTSWITCH CHANNEL DIALOG

Choose **Footswitch Channel** from the **Studio 3** menu to change the MIDI transmit channel of the Studio 3's foot controller and two footswitches.

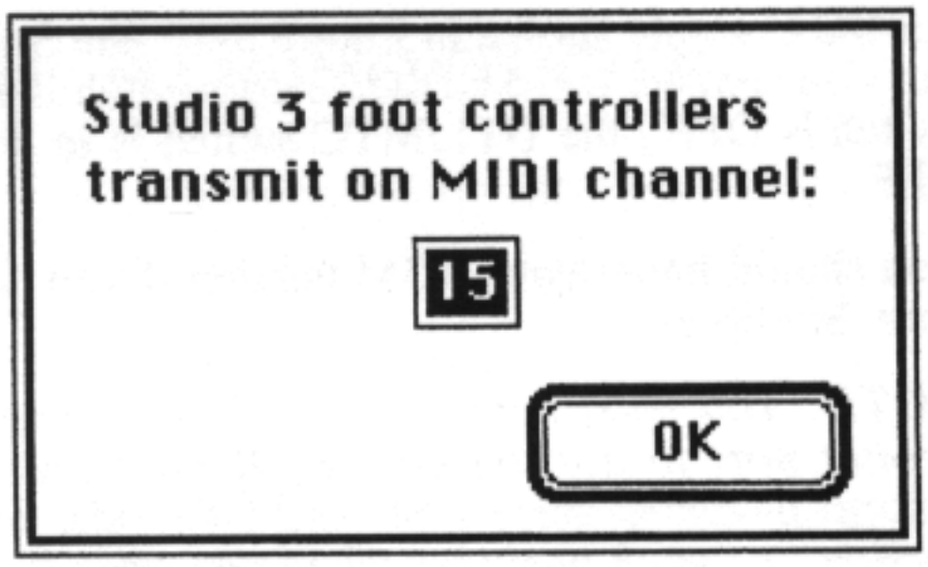


Figure 5-9: Footswitch Channel Dialog

Use the MIDI Channel text field to set the transmit channel. This value determines the transmit channel for both footswitches and the foot controller.

If the Studio 3 is on when you start your Macintosh, then it will set the foot controller transmit channel to the most recent value determined by this dialog box.

***NOTE**: You must connect one of the Macintosh serial ports to the Studio 3's Printer port to use the Footswitch Channel dialog.*

DISPLAY ROM VERSION DIALOG

Choose **Display ROM Version** from the **Studio 3** menu to display your Studio 3's ROM version and also to display front panel switch positions.

***IMPORTANT**: The Studio 3 cannot check the ROM while it is either striping a tape or syncing to timecode.*

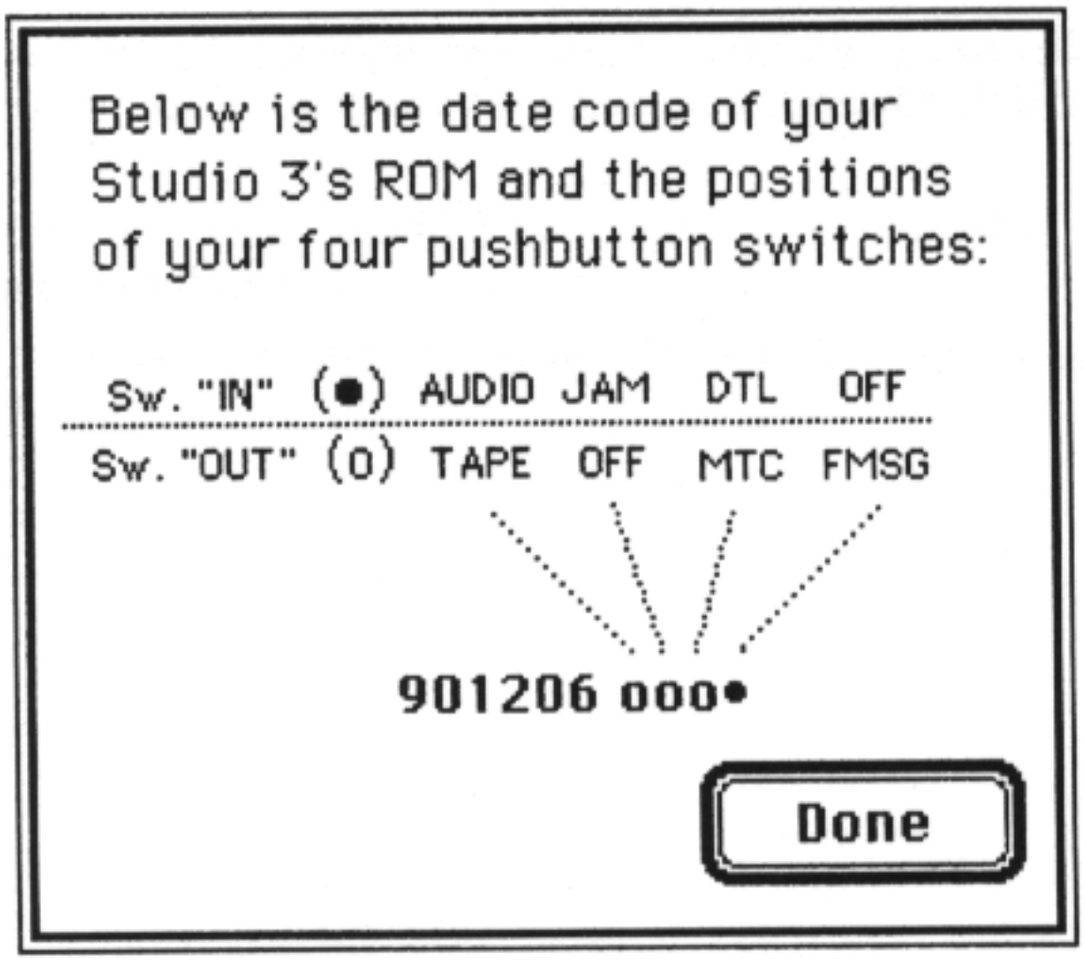


Figure 5-10: Display ROM Version Dialog

For the example shown in Figure 5-10, the Studio 3 ROM version is 901206. You can also see that the AUDIO/TAPE switch is in the TAPE position, the JAM/OFF switch is OFF , the DTL/MTC switch is in MTC position, and full messages are OFF.

You should know your ROM version if you call Opcode Technical Support about your Studio 3.

***NOTE**: You must connect one of the Macintosh serial ports to the Studio 3's Printer port to use the Display ROM Version dialog. Also, since the Studio 3 ignores incoming sysex when in JAM mode, you will not be able to view the ROM version or switch positions when you open the Display ROM Version dialog with the JAM/OFF switch in JAM position. You must set the JAM/OFF switch to OFF before you open the Display ROM Version dialog.*

6 Practical Applications

This chapter provides some useful Studio 3 tutorials including:

- Striping SMPTE
- Syncing to SMPTE
- Using the Audio In feature

SMPTE Tutorial

Follow through this tutorial to learn how to stripe a tape with SMPTE timecode and sync to it.

Striping a Tape

Unless you already have tapes with SMPTE on them, you will need to put SMPTE timecode onto a blank tape. This process is usually called "striping" a tape with SMPTE.

To stripe a new tape with SMPTE timecode, familiarize yourself with the Stripe SMPTE window as well as the operation of your tape recorder. A typical striping operation might go something like this:

- Use a new roll of recording tape and turn off any noise reduction on your tape recorder. Do not use any equalization or alter the SMPTE signal in any way.
- Make sure that your Studio 3 is connected as discussed in "Chapter 3: Hardware Installation".
- Choose **Stripe SMPTE** from the **Studio 3** menu to open the Stripe SMPTE window.

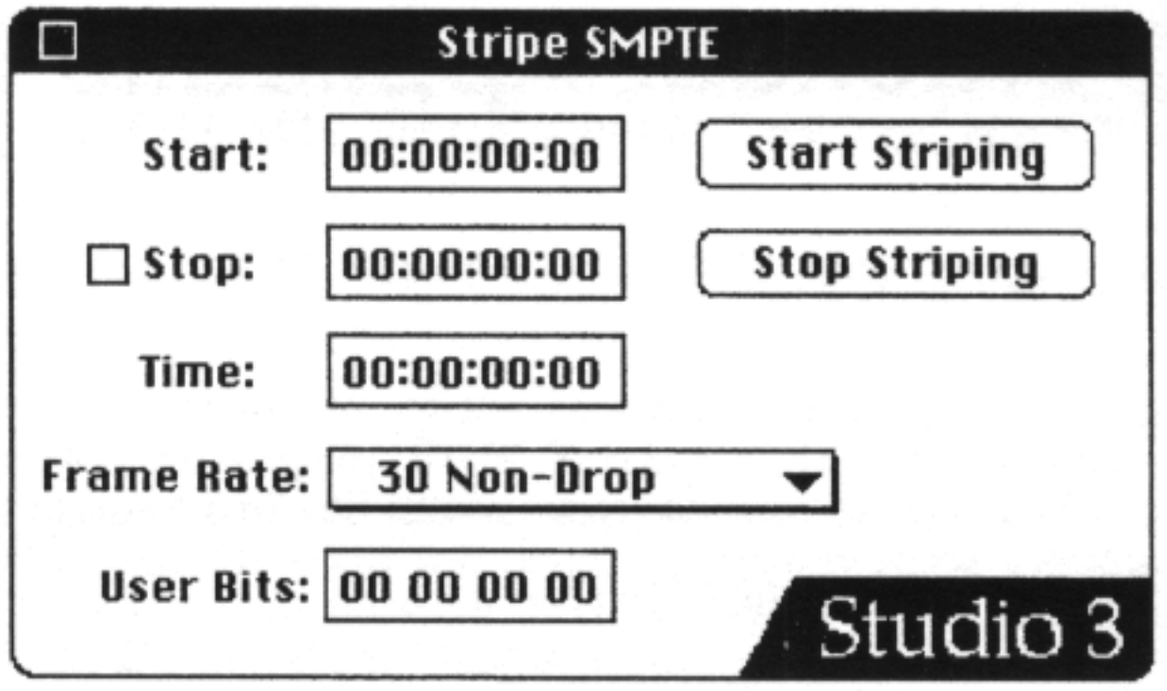


Figure 6-1: Stripe SMPTE Window

- Enter the SMPTE frame rate using the **Frame Rate** pop-up menu. Enter a Start time. If you wish the striping to stop automatically, enter a Stop time and check the **Stop** check box. If desired, enter the user bits.
- Choose a MIDI sync format (MTC or DTL) with the front panel DTL/MTC switch.
- Put your tape recorder into Record mode, but paused.
- Click the **Start Striping** button in the Stripe SMPTE window and the Studio 3 SMPTE/Power LED will begin to flash. You should see the SMPTE signal level on your recorder's input meters. Verify that the proper amount of SMPTE signal is going onto tape.
- Adjust, if necessary, the input level on your tape machine.
- When you are satisfied with the levels, click the **Stop Striping** button in the Stripe SMPTE window.
- Choose **SMPTE Reader** from the **Studio 3** menu so that you can monitor the SMPTE time.
- Turn off the Pause on your audio recorder to begin recording. When tape is rolling, click the **Start Striping** button in the Stripe SMPTE window.
- SMPTE timecode will stop generating when it reaches the time specified in the **Stop** field if the **Stop** check box is checked.
- If the **Stop** check box is unchecked, you can click **Stop Striping** when you reach the end of the tape.
- When you are finished striping, the Studio 3 SMPTE/Power LED will cease to flash. Click the close box to close the Stripe SMPTE window.

Syncing to Tape

Once you have a tape with SMPTE striped on it, you can use the Studio 3 to synchronize the Macintosh to the tape.

- Connect the SMPTE track output of your multitrack tape recorder to the Studio 3 TAPE/AUDIO IN jack (as discussed in the "SMPTE Connections" section of Chapter 3).

- Connect the computer as discussed in the "Computer Connections" section of Chapter 3.
- Choose, with the front panel DTL/MTC switch, the MIDI Format that will be sent to the Macintosh (MTC or DTL).
- Turn Jam Sync off with the front panel's JAM/OFF switch.
- Put your tape machine into play mode.
- Verify that the SMPTE/Power LED is flashing. When the Studio 3 detects valid SMPTE code at its input, the SMPTE/Power LED flashes and MIDI Time Code (or DTL, if selected) is sent to the computer.
- View the SMPTE timecode by choosing **SMPTE Reader** from the **Studio 3** menu.

The Studio 3 performs an operation known as "flywheeling". If your multitrack tape has timecode dropouts, the Studio 3 will continue to send timecode to the Macintosh as if the signal were still present at the input. If the Studio 3 loses sync there could be one of a number of problems. See "Studio 3 loses sync" in Chapter 7 for more information.

SMPTE, Vision and the Studio 3

The following discusses using the Studio 3 with Vision. The information is also applicable to working with Studio Vision.

Vision uses MIDI Time Code for synchronization, so...

- Choose **Stripe SMPTE** from the **Studio 3** menu and put the front panel's DTL/MTC switch in MTC position.
- Turn off Jam Sync by putting the front panel's JAM/OFF switch in OFF position.
- Choose **Receive Sync Mode** from Vision's **Options** menu and choose **MIDI Time Code** from the pop-up menu.
- Choose **Receive Sync Device** from Vision's **Options** pop-up menu and choose the Studio 3.
- Select the desired playback sequence, its **Sync** and its **Offset**.
- Click **Play** in Vision's Control window. The Status display will read "**Waiting for Sync**".
- Hit **Play** on your tape recorder and Vision will start playing back in sync with the tape.

Use a similar procedure for recording tracks into Vision while synchronized to tape. For more information concerning Vision's various sync modes, see your Vision manual.

AUDIO IN TUTORIAL

This tutorial discusses creating a tempo track in Vision or Studio Vision (versions 1.1 or later) using the Studio 3's Audio In feature.

Suppose you've recorded a live band on two tracks of a 4-track tape and you'd like to supplement the recording with some sequenced virtual tracks. Follow this step-be-step procedure for using the Studio 3 Audio In feature with Vision.

- Make certain you have two blank tape tracks. You'll need one for an audio click track and one for SMPTE time code.
- Record a click track onto a blank tape track.

A rim shot or similarly percussive sound works well. You'll want to include a one or two bar count-off before the song begins. The best way to do this is to turn the tape backward (so when you play the tape, you hear the music backwards), and record the click track this way. When the end of the song is reached, record an additional two bars. When the tape is played in the forward direction, you'll have two bars of clicks before the music begins. The click level should be between -2dB and +2dB.

- Record a SMPTE stripe on the remaining track, making sure it begins a few seconds before the click track you just recorded.
- Set the Studio 3's AUDIO IN/TAPE IN switch to the AUDIO IN position.
- Record enable the TEMPO track of an empty sequence. Click on the tempo number itself, so it is selected.
- Set the record mode to "Wait for Note".
- Set the sync mode to "Internal".
- Play the beginning of the song. Use the Macintosh's "single quote" (') tap tempo key to tap along with the song to establish a rough tempo. This will preset the sequence to about the right tempo.
- Enable MIDIKeys in Vision's **Setups** menu.
- Enable the Studio 3 in Vision's **Enable Input Device** dialog box.
- Open the MIDIKeys window and choose "Add Line" from it's Mogrify menu. Click the left side of the new line, and play a rim shot or similarly percussive sound into the Studio 3's Audio In jack. The Studio 3 will respond with a note (C#-1 or C#-2 on Channel 15 of the Printer Port, depending on the Middle C setting in the preferences menu selection).
- Click the right side of the new line, and type the single quote key ('). Your MIDIKey is now set up as shown below.

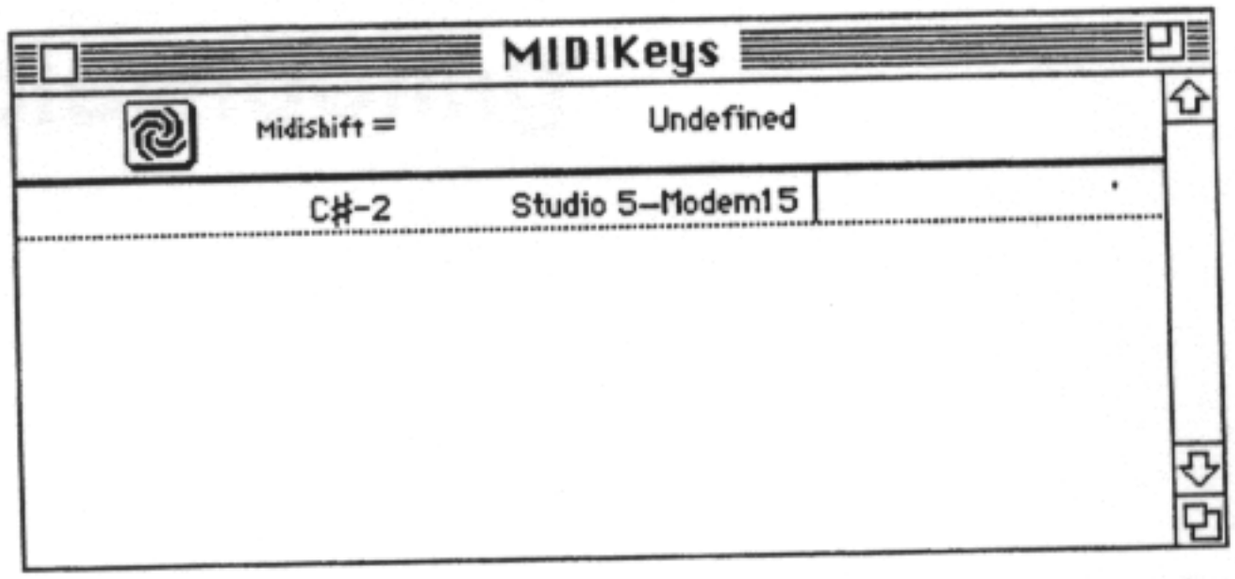


Figure 6-2: Setting a MIDIKey

- Verify that the tempo track is still record-enabled.
- Start the tape and listen to the count off.
- Play a MIDI note on the down beat of the first bar of your song. This will initiate recording of the tempo track. The actual note will not be recorded.
- Let the song play through until the end.
- Stop recording in Vision. Then stop the tape.

In the List Editing window of the tempo track you will see one tempo change event for every beat. This is the tempo Vision has extracted from the click. It is, however, one beat later than it should be: each event is at the time it was recorded (indicating the tempo of the past beat), but needs to be moved to the beginning of the beat (so the beat will play at the right tempo). To correct this, you will have to shift all the tempos one beat earlier.

- Set the start time in the upper left corner of the tempo track's List Editing window to 1 1 0, and the end time to one beat later.
- Choose **Delete Time** from the Mogrify menu. If there was an event at 1 1 0, it will be deleted. Now the tempo track should correctly describe the tempos of the click signal on the tape.
- Find the SMPTE time of the down beat of bar one and set the Start Time (offset).

If you don't know the SMPTE time of the down beat, then set the sync mode to **Time Code**, and turn off the Studio 3's Audio In feature by setting the front panel switch to TAPE IN. Play the tape and watch the SMPTE numbers on Vision's counter display. Set the sequence's Offset to a SMPTE number five to ten seconds before the approximate down beat of bar one. Then, select an empty track, rewind the tape, click on Record, and start the tape. Listen to the count off and record a note on the down beat of the first bar. Open the List window for that track, and look at the absolute SMPTE time of the note you recorded. Use this time as the actual Offset for the sequence.

You may have to adjust the 80ths of a frame of the Offset to make it exact—especially if there is no specified offset from the previous recording session.

Once you have a SMPTE Offset and the tempo "map" in the tempo track of a sequence, you can record and play Vision's MIDI tracks in sync with the music on tape. You can copy the tempo track and Offset to other sequences if you wish to record several MIDI versions for that tape recording.

7 Troubleshooting

COMMUNICATION PROBLEMS

Macintosh and Studio 3 don't communicate

Set the JAM/OFF switch to the OFF position, then choose **Display ROM Version** from the **Studio 3** menu. If the ROM version is displayed, the Studio 3 and Macintosh are communicating. Do not try to communicate with the Studio 3 when the Studio 3 is in JAM mode.

If the JAM/OFF switch is in the OFF position and you still can't read the ROM Version, make sure you have connected a serial cable between the Studio 3's printer port and one of the Macintosh serial ports. You must use the Studio 3's Printer port to communicate with the Studio 3.

PERIPHERAL PROBLEMS

Unresponsive modems, initialized printers, etc.

If the problem peripheral is connected directly to the Macintosh's serial port, you should choose **OMS MIDI Setup** from the **Edit** menu, uncheck that port's check box, and click **OK**.

If the problem peripheral is connected to the Studio 3, make sure the front panel THRU switch is set to the THRU position.

SYNC PROBLEMS

Studio 3 will not stripe tape

Make sure the power cord is firmly inserted into its connector, the power switch is on, and that the SMPTE/Power indicator light is lit.

Check all cables between your computer and the Studio 3, and between the Studio 3 and your tape deck.

Check the input level to your tape deck. Set levels as discussed in "Setting SMPTE Recording Levels" in Chapter 5.

Make sure that the Studio 3 Printer port is connected to the Macintosh.

Studio 3 loses sync

Make sure that the heads on your tape deck are clean and that your are using a quality tape in good condition. Old or worn tape contains dropouts that may cause the Studio 3 to lose sync.

If you are syncing to tape, and your sequencer keeps starting and stopping erratically, you are probably losing sync. One possibility is that your SMPTE source is not good. This can be because you have a bad tape or possibly a bad connection from your tape machine to the Studio 3 TAPE IN jack. This is easy to verify; if the Studio 3 SMPTE indicator light does not start blinking regularly when you try to sync, then the Studio 3 is not getting a correct signal. Check your cables and make sure that the recorded SMPTE level is sufficient (see Chapter 5 for a guide to SMPTE recording levels). If the tape was recorded with too high a SMPTE level, then it will have to be re-striped. If SMPTE was recorded at too low a level, you will need to boost the signal using a preamp or mixer between your tape deck and the Studio 3 TAPE IN.

If the Studio 3 SMPTE indicator light blinks regularly, then a bad SMPTE signal is not the problem. You may have too much data going from the Studio 3 into the Mac. Some instruments output constant active sensing or MIDI clock messages. MIDI clock messages especially can be a problem, because they are sent more often than active sensing. Or, you could have a device sending MIDI Time Code. You don't need this if you're trying to sync your sequencer to the Studio 3's MIDI Time Code. In general, if you tell a real time application (such as a sequencer) to play, and then send it too much data, it will start to lose some of the data. If it loses timecode data, it will lose sync.

See if any MIDI devices attached to the Studio 3 are transmitting data to the Studio 3 (make sure none of them are playing). Look at the red Studio 3 MIDI In LED's. If any are lit or flashing, you know the device on that input is constantly sending some kind of data. You can verify if this is the cause of sync loss by turning off the device, or disconnecting the MIDI In cables (from the instrument into the Studio 3). If the sync problem goes away, you have a few choices:

- If you can stop the device from sending this data in the first place, do so. Unfortunately, most devices will not let you do this. Typically, the devices that send MIDI clocks have built in sequencers; some of them only send MIDI clocks when their sequencer is actually playing. Others send MIDI clock messages when they are in their "sequencer" mode, and active sensing (which is far less intrusive) when they are not. If you cannot stop the device from sending MIDI clocks, you can set its sequencer to the slowest possible tempo—this results in a slower MIDI clock transmission rate. You can see the tempo change on the Studio 3's MIDI In LED for that device; it will blink slowly at slow tempos, and very rapidly at fast tempos.
- If you're using only one serial cable between the Macintosh and the Studio 3, try using two. Assign timecode to the Studio 3 Printer port and all other MIDI data to the Studio 3 Modem port.

Studio 3 will not sync to tape

Make sure the power cord is firmly inserted into its connector, the power switch is on, and that the SMPTE/Power indicator light is lit.

Check all the cables between your computer and the Studio 3, and between the Studio 3 and your tape deck.

Make sure that the Studio 3 Printer port is connected to the Macintosh.

Verify that the SMPTE/Power indicator light blinks when it is receiving timecode from the tape deck. If not, you may have a bad cable or connection between the Studio 3 and your tape deck. Also, your SMPTE level may be recorded too low. If so, you may need to use a preamp or mixer to boost the SMPTE level before sending it to the Studio 3. See Chapter 5 for proper SMPTE record levels.

Choose **SMPTE Reader** from the **Studio 3** menu, then start the tape. If it displays timecode correctly, the problem is with your application setup, not the Studio 3.

Audio In Function doesn't work

Make sure the power cord is firmly inserted into its connector, the power switch is on, and that the SMPTE/Power indicator light is lit.

Check the Studio 3 ROM version. You should have version 890620 or later. If you have an earlier version, contact Opcode to order a ROM upgrade.

Check that the AUDIO IN/TAPE IN button is in the AUDIO IN position.

Make sure that the Studio 3 Printer port is connected to the Macintosh.

Check your software manuals to verify that they can interpret this function.

MIDI Problems

MIDI Thru doesn't work

Check that the applicable MIDI/THRU switch is in the MIDI position.

Check that the MIDI cables are secure and connected to the MIDI devices properly.

Make sure that you have configured the MIDI outputs properly.

Make sure that the instrument with the MIDI IN connected is set to receive on the proper MIDI channel.

No Printer port MIDI input

If you are syncing to tape in JAM mode, MIDI IN on the Printer Port is shut off.

Timing errors with Printer port MIDI input

If you are syncing to tape and using the foot controllers and sending dense MIDI data into the Studio 3's Printer MIDI port, you may experience slight timing problems. To fix the problem, connect the Studio 3 modem port to the Macintosh and route incoming MIDI data to that port instead of the Printer port.

MISCELLANEOUS PROBLEMS

Macintosh crashes when running the Installer

If you experience a crash when running the Installer and are using the Virex INIT for virus protection, open the Control Panel and select Virex's panel. From the pop-up menu, select **File Diagnosing Options**. Deselect **Diagnose Files when Opened** and **Check for HyperCard Virus**. Run the Installer again, and the Macintosh should not crash. If problems persist, completely remove any Virus checking INITs from your System folder (Extensions folder for System 7), restart your Macintosh, and run the Installer again.

8 Technical Details for Programmers

If Opcode doesn't provide Studio 3 control software for your computer, you can use the information in this chapter to design your own software to control the Studio 3.

SYNCING TO TAPE

When the Studio 3 locks onto a SMPTE signal, it sends a MIDI Time Code Full Message, followed by a MIDI Time Code User Bits message, followed by MIDI Time Code Quarter Frame messages. If it receives backwards SMPTE, the quarter-frame messages are sent backwards, as in the MIDI Time Code specification. If it detects a freeze-frame condition, it sends the time of the first of each pair of frames, which may be an odd number. It always starts on an even frame, except in freeze-frame mode. If the tape signal is so bad that it loses sync, it will re-transmit the Full Message and User Bits messages when it regains sync. If the FMSG switch is OFF, the Full Message and User Bits messages are never sent. If the DTL/MTC switch is in DTL position, the direct lock messages as described in the Performer manual are sent.

GENERATING SMPTE

To make the Studio 3 generate SMPTE, you must send it the following commands:

```
F0 00 00 16 13 20 F7

F0 7F 7F 01 01 hh mm ss ff F7

F0 7F 7F 01 02 u1 u2 u3 u4 u5 u6 u7 u8 u9 F7

F0 00 00 16 13 04 F7
```

The first message stops any tape sync process the Studio 3 may be involved with, and prevents it from starting to sync to tape while awaiting a "generate" command.

The second message is a MIDI Time Code Full Message, and it indicates the first SMPTE time to be generated. The "hours" byte (hh) contains the desired SMPTE format encoded in the two highest of the seven lowest bits, according to the MIDI Time Code specification.

The third (optional) message is a MIDI Time Code User Bits message, which contains the User Bits for the generated SMPTE signal. If this message is not used, the User Bits most recently received by the Studio 3 are used instead.

The fourth message starts the actual generation process.

To stop generation, simply send the command:

```
F0 00 00 16 13 00 F7
```

CONFIGURING OUTPUT PORTS

To configure the MIDI output ports send the command:

```
F0 00 00 16 12 00 PP F7
```

"PP" is a byte whose value is between 0 and 3F. Bits 0 through 5 correspond to MIDI output ports 1 through 6, respectively. A 0 bit assigns the corresponding MIDI output port to the Printer port and a 1 assigns the corresponding output port to the Modem port. For example, PP=$30 assigns MIDI outputs 1-4 to the Printer port and MIDI outputs 5 and 6 to the Modem port.

CONFIGURING FOOT CONTROLLERS

To set the foot controller (FC1, FS1, FS2) transmit MIDI channel send the command:

```
F0 00 00 16 12 01 0T F7
```

where T is a hex digit that specifies the MIDI channel.

MIDI IMPLEMENTATION

All messages described here are received and transmitted on the Studio 3's Printer port only. Numbers in MIDI messages are hexadecimal.

Transmitted Messages

When locked to SMPTE (in MIDI Time Code mode):

```
F0 7F 7F 01 01 hr mn sc fr F7
```

MIDI Time Code Full Message

```
F0 7F 7F 01 02 0a 0b 0c 0d 0e 0f 0g 0h 0i F7
```

MIDI Time Code User Bits Message

```
F1 xx
```

MIDI Time Code Quarter-Frame Message

When locked to SMPTE (in Direct Time Lock mode—note that this is a non-standard use of MIDI):

```
F0 28 15 hr mn sc fr F7          DTL

F8
```

The following messages are transmitted on the "foot controller transmit channel". This channel defaults to 15 ($E) on power-up, but can be changed by a system-exclusive command (see below).

`BE 0F nn`	Foot Controller (nn=0-127)
`BE 4E nn`	Footswitch 1 (nn=0 or 127)
`BE 4F nn`	Footswitch 2 (nn=0 or 127)
`9E 01 64 01 00`	Audio In

Received Messages

`F0 7F 7F 01 01 hr mn sc fr F7`

MIDI Time Code Full Message

`F0 7F 7F 01 02 0a 0b 0c 0d 0e 0f 0g 0h 0i F7`

MIDI Time Code User Bits Message

`F0 00 00 16 13 20 F7`	Stop syncing, prepare to stripe
`F0 00 00 16 13 04 F7`	Start striping
`F0 00 00 16 13 00 F7`	Stop striping
`F0 00 00 16 12 00 pp F7`	Configure output ports:

pp: 00abcdef - a is port 1, f is port 6

1-Modem, 0=Printer

`F0 00 00 16 12 01 0c F7`	Foot controller transmit channel (c=0...F)

To start striping, send the following messages in sequence:

Stop Sync

MTC Full Message

MTC User Bits Message

Start Sync

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