TASCAM

TEAC Professional Division

MMP-16

Modular Multitrack Player

MMP-16 Version 4.0
OWNER'S MANUAL

TASCAM MMP-16 Owner's Manual

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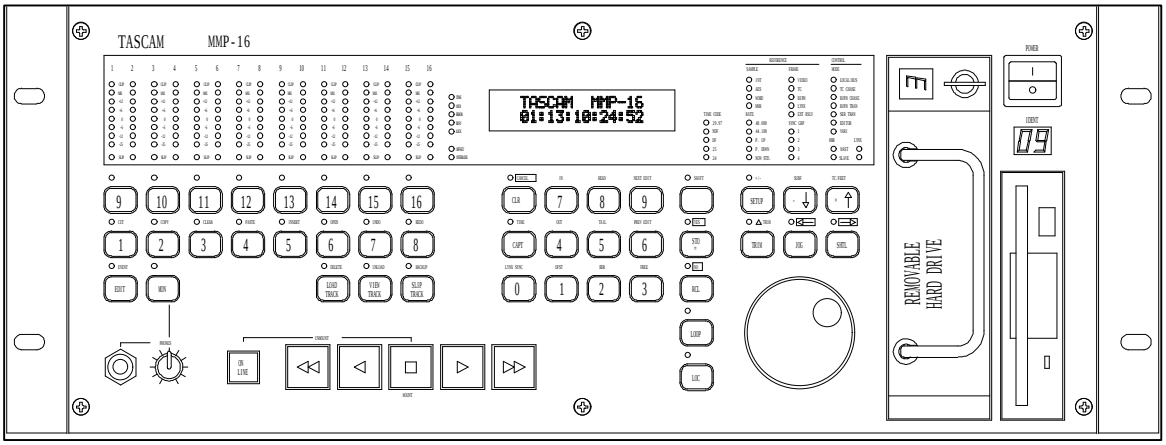
Chapter 1 General Information

This chapter presents the main features and capabilities of the MMP-16 hardware and a functional overview of its Panel/Display states. MMP-16 product specifications are also included.

MMP-16 Introduction



MMP-16 Front View

The MMP-16 is a non-linear digital replacement for the analog or digital tape machines found in recording studios and broadcast facilities, and for magnetic film dubbers found in film and video post-production facilities. The MMP-16 can play back sixteen tracks of material from one or more SCSI hard drives or other removable media. Each MMP-16 can play back from multiple SCSI disk drives of various types. Playback can be in exact or track-slipped synchronization to industry-standard film, video, and audio devices, whether they are mechanical tape-based or hard drive-based.

Audio files played back on the MMP-16 may consist of selectable linear 16-bit or linear 24-bit words at sample rates of 48.0 kHz or 44.1 kHz, modifiable to a pull-up or pull-down rate, including conversion between PAL, film, and video, making fourteen total discrete sample playback rates. The analog output section uses balanced +4 dBu analog connections on a DB-25 connector that are pin-compatible with the TASCAM DA-88 and may use the same cables. The two digital audio output connections are labeled DO-16 (output channels 1-8) and AO-16 (output channels 9-16) and conform to the AES/EBU standard for direct digital recording and playback. Digital audio output is provided on two 25-pin DB-25 connectors which can use a standard TASCAM DA-88 cable (the analog cable – ***not TDIF***) to provide four stereo AES outputs per connector. See the Pin out drawing given in Appendix D for detailed information. The unit can be synchronized to the digital sample clock reference coming in on digital input channels 7&8 of the AO-16 board (pin 7 is REF IN +, pin 20 is REF IN -, and pin 8 is REF IN GND).

The MMP-16 will directly play back material created on many different digital audio workstation systems. A format compatibility chart is given in the Functional Specifications section of this chapter. The disk drive or drives containing edited Project (EDL and audio) files may be simply “unplugged” from the workstation and then “hot-plugged” into the MMP-16, using the standard internal Kingston hard drive carrier, or otherwise connected to the MMP-16’s external SCSI port. Optionally, files on a RAID may be accessed via the external SCSI port as well. Once the drive(s) are mounted by the MMP-16, tracks from one or more projects may be loaded as required for the mix session. Sound files of the same or different audio file formats may be played back on the same unit simultaneously from one or more drives.

When the MMP-16 is turned on for the first time, the system default operating parameters are loaded, and the machine boots into the Normal state (see the Functional Overview section in this chapter). There are ten user settings files that may be stored to and recalled from the internal hard drive so that the MMP-16 setup parameters can be instantly reconfigured between mix sessions. The MMP-16’s operating parameters can be manually changed at any time via Setup menu selections. Password protection may be used to prevent some parameters from being changed inadvertently.

Hardware Overview

The MMP-16 comes standard with one removable Kingston drive carrier. The Kingston carrier can hold a standard SCSI drive for playback of audio tracks. An internal IDE hard drive holds the operating system, the MMP-16 software, and the parameter settings files. Additional external SCSI drives can be connected and accessed by the MMP-16. This allows loading tracks simultaneously from more than one disk. A list of approved media drives is given in Appendix B.

The MMP-16 is based on a standard Intel Pentium™ processor-based PC motherboard, with integral PCI and ISA bus slots running under an industry-standard operating system. The MMP-16 processing and interface boards plug directly into this PC motherboard. There is a Lithium battery # CR2032 for the CMOS circuit on the motherboard. **Caution: Battery May Explode if Mistreated. Do Not Recharge, Disassemble, or Dispose of in Fire.** The MOC (digital-to-analog Output Converter) boards are in their own shielded cage, connected to the AO-16 (Analog Output) card via ribbon cables. Very high quality 20-bit converters on all analog outputs assure excellent audio fidelity. The MMP-16 uses 24-bit internal digital resolution for all digital audio processing. The MMP-16 plays back audio stored in standard linear 16-bit or 24-bit sound files.

Internal Boards for Units with Serial Numbers up to 01344

The PRX (DSP) card performs the audio processing for the MMP-16. A standard Symbios SCSI-2 controller card also plugs into the PCI bus. The Sync card, the UI/B (User Interface/Biphase) card, the AO-16 (Analog Output) card, and the DO-16 (AES/EBU Digital Output) card are all plugged into the ISA bus. The Biphase Operations Board (BOB) occupies a slot on the back panel to provide connections for the system’s four Biphase inputs and one Biphase throghpu. It is attached to the UI/B card via a ribbon cable and is not plugged into a slot.

Internal Boards for Units with Serial Numbers of 01345 and above

Units with serial numbers of 01609 and above have a different set of internal processing boards. Functionally, these units are identical to previous units. The change was made to facilitate a more streamlined manufacturing process. Instead of separate boards for DSP processing, sync, remote control, etc., these functions have been combined into a single board designated as the M2 board. Connectors on the side of the M2 board have ribbon cables attached which break out to brackets and connectors serving the same functions as the previous array of boards and connectors.

Front Panel

The MMP-16 front panel contains 44 soft-touch keys with most of the common dubber and audio playback functions available through one or two keystrokes. There are also five large illuminated motion control buttons (Play, Stop, FF, Rew, Reverse Play) for track playback and "play head" locating, and an Online button for setting the MMP-16 offline (as a local machine) or online (as a synchronized slave or a master machine). When the MMP-16 is set as a slave, it can chase SMPTE time code (LTC), biphase (film tach), a TimeLine Lynx™ module, or another MMP-16 or MMR-8.

A 40-character (two line by 20-character) LCD (Liquid Crystal Display) serves as the MMP-16 status and control text window. The top line typically shows the machine status and current time code or feet/frames location, while the bottom line shows various time code registers (In, Out, memory, slip. etc.) and accepts input from the front panel. The entire display may also alert the operator to any machine or user error conditions. Text can be scrolled horizontally or vertically, using the Wheel or arrow keys, for entering Panel/Display state and setup information, or for finding and loading projects and tracks.

There are dedicated front panel LED peak meters that always display monitor level information for the track outputs during playback. Each meter contains seven green, yellow and red LEDs plus a CLIP/Hold LED for easy at-a-glance level monitoring. An additional 70 status LEDs instantly identify current synchronization modes, bus control modes, sample and frame reference settings, and transport status.

Rear Panel

The MMP-16 rear panel contains all the audio and synchronization connections. To minimize connector footprint, female DB-25 connectors are used for the audio connections. The sixteen analog audio outputs are divided between two female DB-25 connectors, each providing eight channels of audio. Each analog connector mounts on a separate card within the chassis, and is labeled to show which channels (1-8 or 9-16) are present. The connectors are pin-compatible with the TASCAM DA-88 analog audio connector.

The digital output card allows direct digital audio transfers out of the MMP-16. Because it uses standard AES/EBU digital signal conventions, there are four stereo digital audio outputs with odd-even track pairs per connector. Tracks 1+2 are on the first AES/EBU connection, tracks 3+4 on the second AES/EBU connection, and so on. Note that these connectors carry AES/EBU digital signals using the standard DA-88 analog audio cable and are NOT pin-compatible with the TASCAM DA-88 TDIF digital audio format connector cable.

Built-in biphase control allows the MMP-16 to automatically lock to and chase biphase devices without having to use an external biphase to SMPTE LTC adapter. Up to four biphase input signals can be simultaneously connected to the MMP-16. The active biphase input is linked to the active Sync Group assignment and is determined by menu selection (Setup Menu 100). A biphase throughput connector passes through the selected incoming biphase signal. A biphase throughput connector passes through the selected incoming biphase signal. Software Setup Menu 300 bank parameters (frame rate, pulses per frame, input type) allow various biphase devices to be used with the MMR-8. **The biphase connector is not intended for public telecommunications network connection.**

Video post-production work can be done with any industry-standard playback device. The MMP-16 supports SMPTE/EBU Linear Time Code, Word Clock, Video sync, MIDI Time Code, MIDI Machine Control input, and Sony 9-pin serial in and out (P2- protocol).

Accessory Products

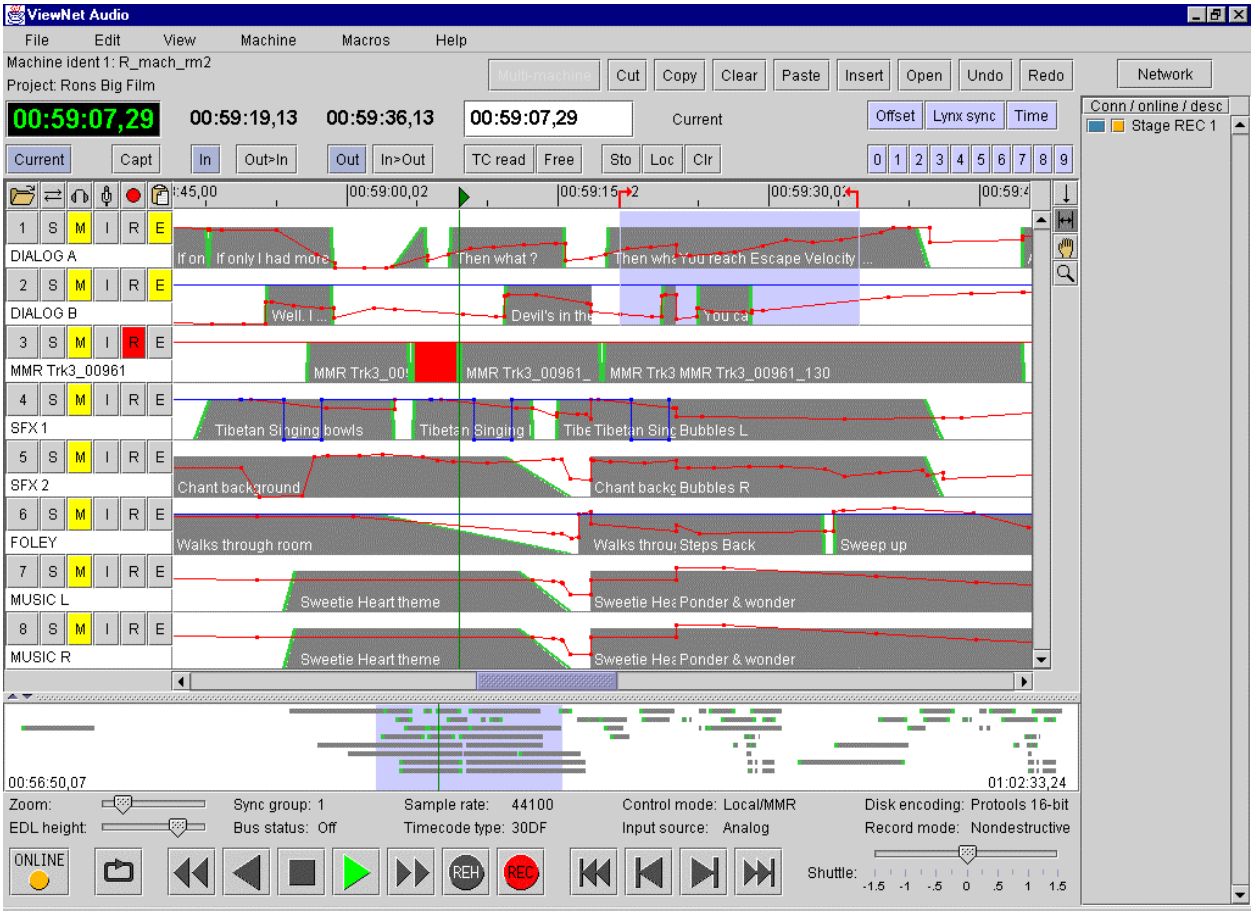
The TASCAM MM-RC is a dedicated remote control unit designed specially for use with the MMR-8 recorder and the MMP-16 player. It connects directly to the UI/B board on the MMR/MMP back panel and allows control of any combination of up to 100 MMR-8 or MMP-16 units.

The TASCAM MMU-16 is a multi-segment digital meter unit which can display sixteen channels of audio level information. Two connectors on the back of the MMU-16 allow it to be connected to one or two MMR-8 units, or an MMP-16 sixteen channel player. The MMU-16 can also be connected to the MM-RC for displaying detailed level information for the MMR-8 or MMP-16 unit being accessed by the MM-RC. The MMU-16 comes with standard rack ears for mounting in a standard 19” equipment rack and also with mounting brackets for attaching the unit to an MM-RC.

The TimeLine Lynx Keyboard Control Unit (KCU) can function directly as a remote controller for up to six MMP-16s without the use of dedicated Lynx-2 modules, since the MMP-16 contains the functional equivalent of an integrated Lynx-2 synchronizer. Optionally, Lynx-2 modules can also be connected to the Lynx port of the MMP so that other transports connected to the Lynx bus may also be controlled from a Lynx KCU connected to the MMP-16. TimeLine offers a special software version for the Lynx KCU (KCU 900 software) which includes special MMP support for some editing and event slip commands. Other remote controllers can also be used for controlling the transport functions of the MMP-16 through the Parallel Transport connector or via Sony P2 protocol through the 9-pin serial Editor port.

ViewNet Audio™

The ViewNet Audio option is a graphical interface network for the MM Series modular multitrack machines which provides a Fast Ethernet (100 Mbps) connection for the MM unit and the special ViewNet Audio software application running on a computer attached to the network.



ViewNet Audio Project View Screen

ViewNet Audio is designed to allow system administration and control of setup parameters for all machines from any computer on the network. Since ViewNet was written using the Java programming environment, the software application can be run from computers running the Windows (95, 98, or NT), Macintosh, or UNIX (Linux) operating systems. Administration and Server software is included with the system to allow for setting levels of security in multi-room facilities. This helps to prevent operators from accidentally controlling machines in other areas of the facility for which they do not have access permission.

ViewNet provides a graphical editing environment for making changes to sound events at the mix. Multi-machine edits and macros are also supported. Real time scrolling of sound events with clip names provides a visual cue sheet for mixers. Complete access to all system setup parameters and the ability to broadcast parameters to multiple sets of machines makes it easy for machine room operators to set up jobs for different clients in different rooms. ViewNet is available from authorized TASCAM MM series dealers and distributors.

Functional Overview

The MMP-16 operates in any of eight different Panel/Display states (simply referred to as “states” for convenience). These states are distinguished by the nature of the information displayed in the LCD window and by which keys are functionally available while in that state. These MMP-16 Panel/Display states are described here.

Normal state is the default Panel/Display state on power-up. In this state, the LCD shows the current system play time in the top of the display, and shows the active register (last requested register or function time) in the bottom of the display. All keys are active while in this state, and will respond by performing an action, accessing a register, or changing to the state written on the key. Shifted key functions are also available by first pressing the SHIFT key, then pressing the key which corresponds to the desired shifted function. Once the SHIFT key is selected, pressing the appropriate key to activate the desired shifted function completes the SHIFT operation. The SHIFT state can be cancelled by pressing SHIFT again, or by pressing CLR, to return the system to normal key selection.

Pressing the SETUP key activates the **Setup** state. This state gives access to the system setup menus, where most of the operating parameters of the MMP-16 can be altered. Some parameters are changeable only under certain operating conditions (while stopped, etc.), although all are viewable at any time in the Setup state. Once in the Setup state, you may return to the Normal state by pressing the SETUP key again, or by pressing CLR.

There are three types of Panel/Display states that deal with MMP-16 track operations. These are **Load Track**, **View Track**, and **Slip Track**. Pressing the LOAD TRACK, TRACK, or SLIP keys puts the MMP-16 into one of these Track states. The SEL keys for each MMP track are used in conjunction with these keys to identify the specific track to be loaded, viewed, or slipped.

There are also two keys to the left of the Track state keys labeled EDIT and MON. These keys do not change the state of the MMP display, but are used to determine what status is being indicated for each MMP track by the track selection LEDs when the SEL keys are pressed while in the Normal state of operation. One of these keys is always active as the current Track Mode. Since these keys function along with the Track state keys to identify the function being specified by the SEL keys, the entire group of five keys (EDIT, MON, LOAD TRACK, TRACK, and SLIP) are also referred to as the Track Mode keys.

The Track states supersede the Normal state since they change the display and make certain keys unavailable until the Track state is exited or cleared. To exit a Track state and return the MMP-16 to the Normal state, it is necessary to either complete the selected track operation (by pressing STO to load a Project, for example), or press the selected Track state key again, or press the CLR key to cancel the operation. After exiting a Track state, the system will return to the Normal state and the last selected Track Mode (EDIT, MON).

Pressing the LOAD TRACK key activates the **Load Track** state. This state allows for loading WaveFrame projects, OMF Compositions, or Pro Tools Session files from any mounted disk volume. This state also allows loading of individual tracks from a Project, Composition, or Session (hence the name of this key and state), and moving of tracks from one MMP channel to another. The shifted function of LOAD TRACK allows for deleting WaveFrame Projects or Tracks. The MMP-16 software does not currently allow OMF Compositions and Pro Tools Session Files to be deleted.

The MMP **Backup** state is accessed via the Load Track state by pressing SHIFT+SLIP after choosing (scrolling to) the desired Project while in the LOAD TRACK state. This state is similar to the Setup state in that it has menu choices which are accessed by using the Up/Down arrow keys or the Wheel. The key choices available in the Backup state are the same as those in the Setup state, hence it exists at the same level of the hierarchy of panel/display states as the Setup state.

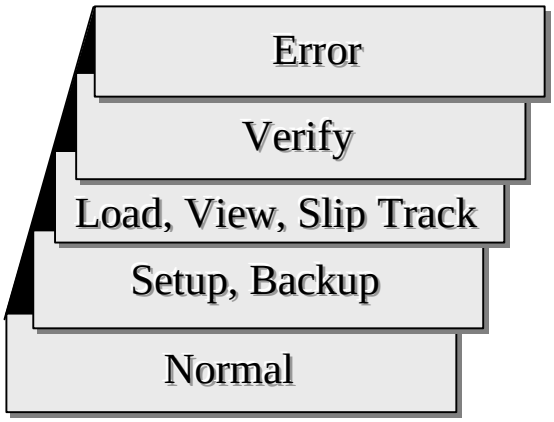
Pressing the TRACK key activates the **View Track** state. This state allows for viewing the names of loaded tracks, and unloading of tracks (the shifted function of the TRACK key) from the loaded track list.

Pressing the SLIP key activates the **Slip Track** state. This state allows for slipping one or more of the already loaded tracks in time.

Verify state supersedes the Normal and Track states. The two most common Verify state functions are confirmation (a Yes/No answer is required from the user) and password entry (a password must be entered to complete the action request). Both of these requests override most other actions or do not allow access to the Normal, Setup, or Track states until they are cleared or a valid response is entered. Verify state, when cleared, usually drops the MMP-16 back into the previously active state.

Error state is the final level in the hierarchy of Panel/Display states. In this state, the ERROR status light flashes and the user is asked to clear a condition by pressing the CLR key, or if that is impossible (as in the case of a fatal error), to note the error information and possibly take some extraordinary action (such as re-starting the MMP-16). Until the Error state is cleared, or a valid response is entered, access to the Normal, Setup, or Track states is not allowed. The Error state, when cleared, may drop to another state, or to any appropriate condition—depending on the type and severity of the error.

These states are hierarchical in the sense that some require a response or they require a state to be cleared before certain keys or other states can be accessed. The Normal state is at the base of the hierarchy because it is the default on startup and can always be accessed from any other state or by pressing the CLR key as many times as is necessary to clear any other state. The transport keys can be accessed directly from any state, so the MMP can always playback, regardless of what other functions or states are being accessed. The following diagram illustrates the hierarchical relationship between the various states, based on the number of choices available from each state.



MMP-16 Panel/Display State Hierarchy

STATE	LCD WINDOW DISPLAY	COMMENT
NORMAL	Shows current play head time on top and selected time register on bottom of display.	Default at startup. Allows direct access to SETUP and TRACK states, all keys functional.
SETUP	Shows setup menus and parameter choices for each menu item.	Press SETUP to enter state, press TRIM to view parameters.
LOAD TRACK	Shows disk directory list of projects, compositions, sessions, and their tracks. Shows other levels for WaveFrame projects. Backup state can be accessed only while viewing name of project while in this state.	Press LOAD TRACK once to see Project level, again to see successive levels (tracks). Press SHIFT+SLIP while in LOAD TRACK to enter Backup state.
VIEW TRACK	Shows the name of each loaded track. Use wheel, arrows, or press appropriate SEL key to choose which track to view.	Press TRACK to enter state, SHIFT+TRACK to unload track.
SLIP TRACK	Shows Current Play position on top, Slip register value for each track below, allows for slipping tracks in time. All SEL keys have a SLIP register, so numbers can be stored, recalled, or cleared directly.	Press SLIP to enter state, use wheel or arrows to change value, or enter TC value on keypad & press STO then SEL to enter number directly.
VERIFY	Asks for a response (usually requires pressing Yes or No) to clear state and return to previous state.	Disallows most key entry or switching to other states until response is made.
ERROR	Shows Error message, usually requires pressing CLR to clear and return to previous state.	Disallows most key entry or switching to other states until condition is cleared.
BACKUP	Menu with three choices: Begin Backup to: (device#), Tape Mode Convert to: (device#), and OMF Export to: (device#). Only currently mounted devices will appear as choices.	Accessed only via LOAD TRACK state. Use Up/Down arrows or wheel to choose Backup style, press STO to begin backup process.

MMP-16 Panel/Display State Chart

System Specifications

Analog Output Level:+4 dBu balanced, +24 dBu clip, nominal levels trim pot adjustable
Headroom:20 dB above nominal level
Analog Output Impedance:10k, balanced / <75 ohms, balanced
Output Adjustment Range:+10 dBu - +25 dBu, clipping / +18 dBu - +25 dBu, clipping
THD+N:<.004 % @ 1 kHz, @ clip level -0.5 dB

Dynamic range:>104 dB (10 Hz - 22 kHz, with A-weighted filter)
S/N ratio:>108 dB (10 Hz - 22 kHz, with A-weighted filter)
Crosstalk:<-85 dB (between any channels, 20 Hz - 20 kHz)
Frequency Response:20 Hz - 20 kHz ±0.1 dB

Digital Conversion / Quantization:20-bit DAC conversion
Sample length, Playback:16-bit, linear or 24-bit, linear
Sample Length, Internal: 24 bit
Timing Reference sources:Internal, Internal Varispeed, Follow time code in, Follow biphase signal input (any one of four inputs), Video (either NTSC or PAL), AES/EBU digital clock input (optional), Word clock input, MMR bus, Lynx bus

Internal Sample Rates in Hz: 42294 (44x23/25), 42336 (44x24/25), 44056 (44100-), 44100, 44144 (44100+), 45938 (44x25/24), 45983 (44x25/23), 46034 (48x23/25), 46080 (48x24/25), 47952 (48000-), 48000, 48048, (48000+),50000 (48x25/24)50050 (48x25/23)

External Sample rates:32 kHz - 51 kHz (via external sync input)
Time Code Type & Rate:30 Non drop frame (NDF) @ 30 frames per second
30 Drop frame (DF) @ 30 frames per second
PAL @ 25 frames per second (PAL default setting)
Film @ 24 frames per second
NTSC @ 29.97 frames per second NDF (NTSC default setting)
29.97 Drop frame(DF) @ 29.97 frames per second

Display Modes:SMPTE/EBU time code, with or without subframes
Feet & Frames, with or without subframes

Time Code Memories:ten (numbered 0 - 9)

Time Code Registers:IN (punch in point)
OUT (punch out point)
HEAD (jump to beginning of project)
TAIL (jump to end of project)
NEXT EDIT (jump to next track edit)
PREVIOUS EDIT (jump to last track edit)
TIME (for establishing 0 film feet and frames referenced to time code)
LYNX SYNC (Lynx bus offset time calculation)
OFFSET (Offset time for Lynx bus and time code chase)
READER (time code from LTC or Serial inputs)
FREE (available record time on current disk)

Electrical Ratings:


115 VAC @ 2A, 50-60Hz 230 W Max

-OR-


230 VAC @ 1A, 50-60Hz 230 W Max

Nominal temperature should be 41 to 95 degrees Fahrenheit (5 to 35 degrees Centigrade).
Relative humidity should be 30 to 90% (non-condensing)
Analog input/output is 12.28 VRMS Max

Weight is approximately 37 Pounds (16.78 Kilograms) with a hard disk loaded.

Chapter 2 Installation

This chapter covers the physical installation of the TASCAM MMP-16 as either a stand-alone recording/playback system or as part of a larger, multiple unit digital dubber system. Descriptions are given of the various connectors on the MMP back panel. Both general installation procedures and specific application installations are covered.

MMP-16 Materials Kit Box

Before connecting the MMP-16 hardware to your audio system and to your video or film playback devices, verify that you have all the equipment required to complete the task. The following equipment is included in the MMP Materials Kit Box:

Rack Ears Kit — For rack mount installation, the two rack ears may be attached to the front sides of the MMP-16 chassis using the six 8-32 x 3/8" Phillips head screws included in the MMP-16 materials kit. The MMP-16 can be used without the rack ears for desktop applications.

MMR Bus Sync Cable — A three-foot sync cable for synchronizing the operation of multiple MMP-16's together via the rear panel MMR bus connectors.

RS422 Cable — A 9-pin RS-422 (232) cable for attaching the COM port to a terminal for running field diagnostics. Also may be used for 9-pin serial connections.

Kingston Removable SCSI Drive Carrier Instructions — One Kingston removable drive carrier is included with the system. This carrier allows drives to be hot-swapped while the system is powered on. It is necessary to install a SCSI drive from the list of approved drives into the Kingston carrier before you can playback audio using the carrier with the MMP-16. The instruction manual for installing drives in the Kingston carrier is in the MMP-16 materials kit.

AC Power Cord — A six-foot (1.83 Meter) IEC AC Mains cord set is included with the MMR-8. The mains connector for 115 VAC systems is USA standard. A six-foot (1.83 Meter) AC Mains cord set for use in Europe, proper for the country of use will be supplied by your TASCAM dealer. Attach the AC connector in accordance with local requirements.

Toolkit — As a convenience, a small tool kit consisting of a "tweaker" and a small screwdriver is included in the zip-locked plastic bag in the materials kit. The "tweaker" may be used for making any necessary adjustments to the analog trim pots on the analog audio output board.

General Guidelines

Mounting Rack Ears

The MMP-16 is a self-contained sixteen channel digital playback device designed to be mounted in a standard 19” (48.26 cm) IEC equipment rack in either the mix studio or a dedicated machine room in a professional audio recording facility. As such, each MMP-16 is housed in a steel chassis 19-inches (48.26 cm) wide by 17 ¼ inches (43.81 cm) deep by 7-inches (17.78 cm) tall. Each MMR-8 requires 5U (7-inches or 17.78 cm) of rack space.

Integral rack ears are provided with the chassis. If the unit is not rack-mounted, the rack ears do not need to be installed onto the MMP-16 chassis. For rack mounting, install one rack ear to the front of each side of the MMP-16 (three Phillips screws per side are supplied for fastening the rack ears to the chassis).

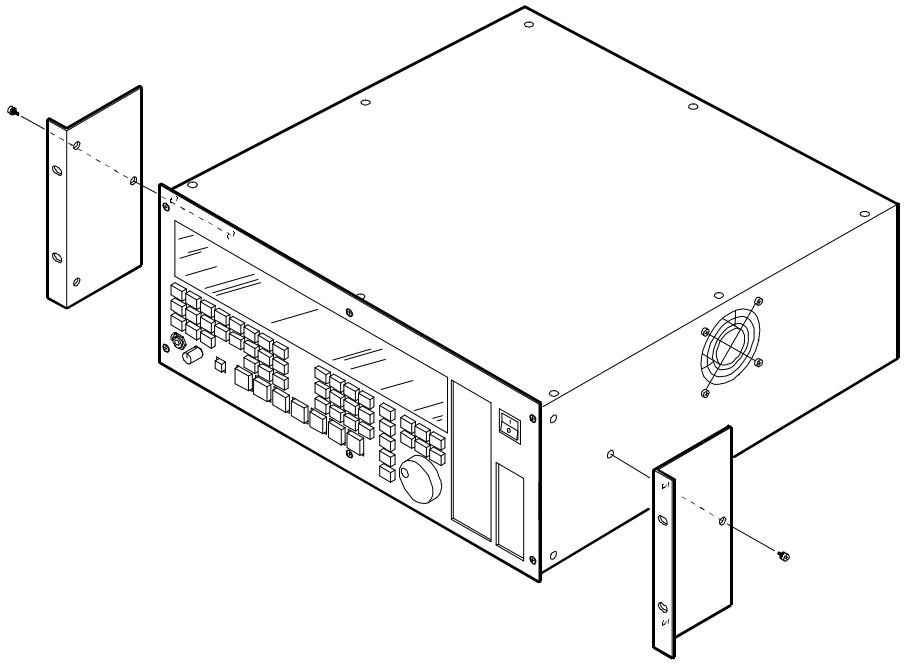
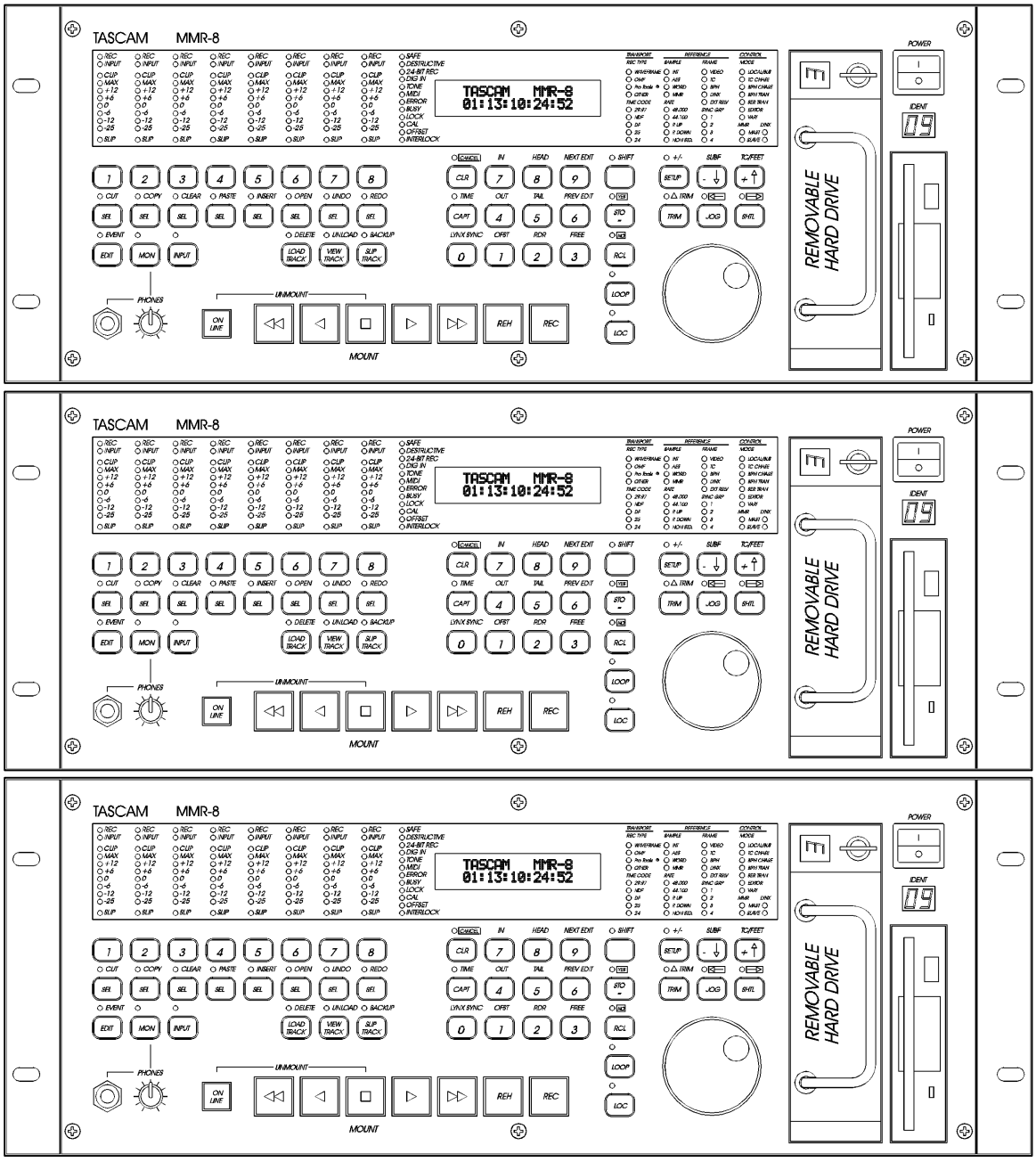


Figure 2-1. Rack Ear Installation

Installing Multiple MMP Units

Multiple units can be mounted one on top of the other when forced air rack ventilation is provided. A one-inch clearance is required on both sides of the MMP-16. In facilities with raised computer room-style flooring, a ventilation opening in the floor is recommended. In no case should the internal rack temperature ever exceed 110 degrees Fahrenheit (43 degrees Centigrade) during normal operation (as measured at the rear of any of the MMP-16s in the system).



Multiple MMR-8 Rack Installation

AC Mains and Grounding (Earthing) Considerations

Each MMP-16 requires one AC mains connection. A standard six-foot (1.83 Meter) power cord set is included with each MMP-16 wired for the USA standard. A six-foot (1.83 Meter) AC Mains cord set for use in Europe, proper for the country of use will be supplied by your TASCAM dealer. The AC mains outlet must be capable of delivering 230 watts (2 amps) for each MMP-16 in the system. The main power supply has a 115/230 VAC switch on the back of the unit. This switch should be set to match the facility power level.

An unswitched female IEC convenience outlet is located on the rear panel of each MMP-16. In normal use there is no connection to this outlet, although other electronics equipment using IEC plugs, and drawing less than 120 watts total, can be connected to this outlet using the appropriate male-to-female IEC power cord (like those used with computer monitors).

A facility-wide UPS system is recommended for protecting the MMP-16, and all your audio equipment, from power line spikes, surges, brownouts, and line failure. If a facility-wide UPS is not available, each MMP-16 should be connected to a home computer-type surge/spike protection system (of 250 watts minimum) which is then plugged into an isolated ground AC outlet.

Caution: Grounding (Earthing)

Do not defeat the AC cord U-ground as this will present a potentially dangerous operator hazard. Using an isolated ground outlet ensures the proper chassis grounding to the mains "power company" ground. Using only isolated ground outlets throughout a facility will prevent audio ground loops caused by AC outlets with different ground potentials. A Ground Stud is provided on the back panel for chassis grounding of the MMP-16.

Audio Cables

Analog Output All analog output on the MMP-16 is done through a pair of 25-pin D-sub connectors which are pin-compatible with the TASCAM DA-88 connector. TASCAM DA-88 DB-25 to XLR cables, with either male (output) or female (input) XLR connectors, are available from your authorized TASCAM dealer.

Digital Output DA-88 analog output cables should be used as digital out cables (***NOT TDIF cables***). This arrangement provides four stereo AES/EBU digital outputs on each DA-88 cable, for a total of 16 channels of digital audio output.

MMP-16 Back Panel for Serial Numbers up to 01344

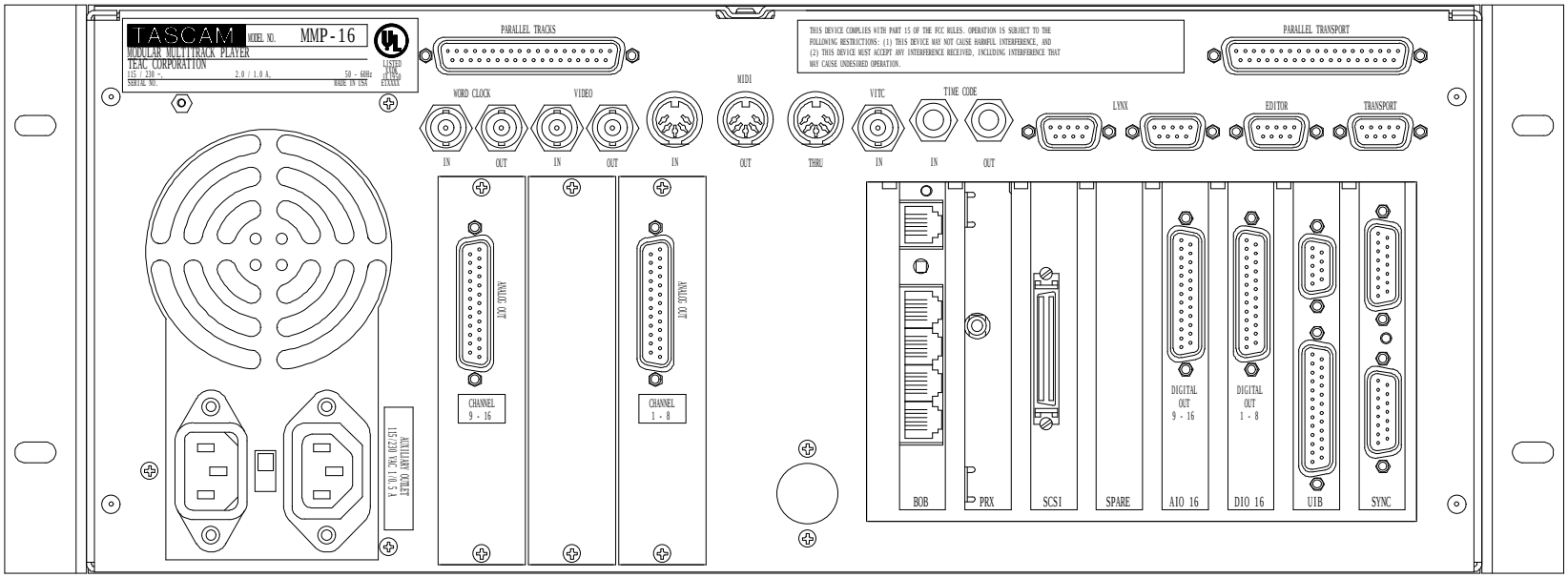


Figure 2-3. MMP-16 Back Panel

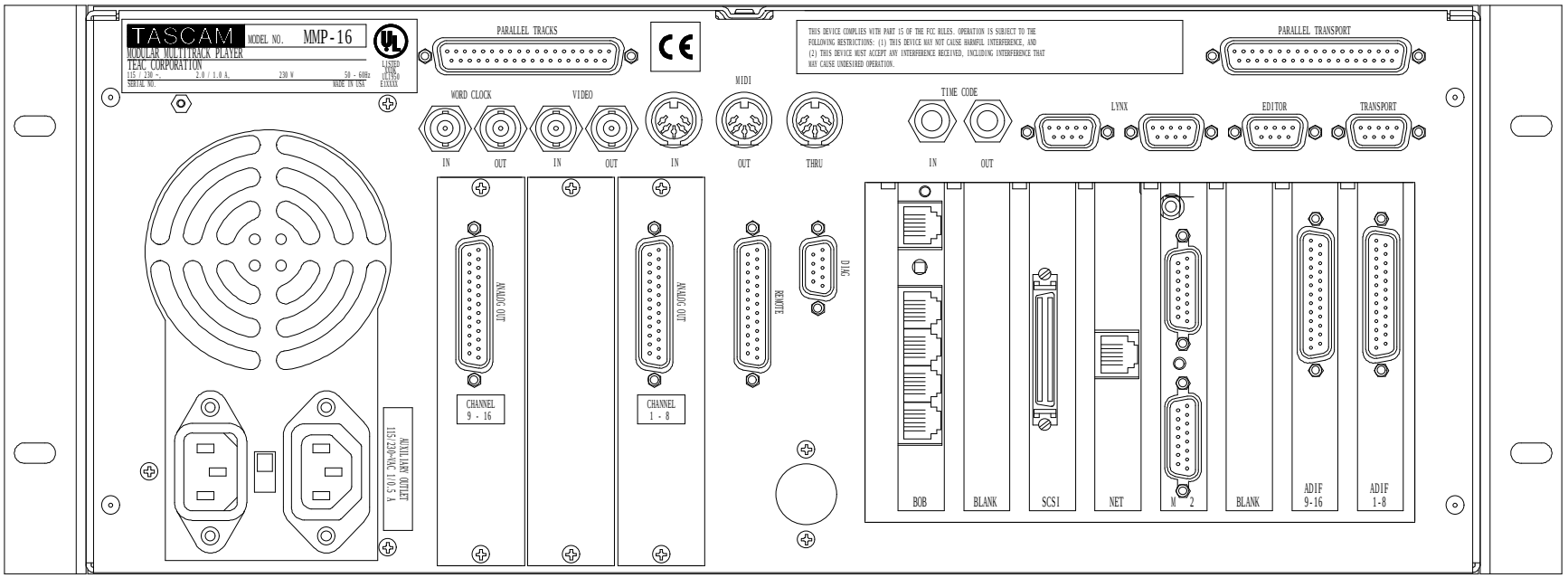
MMP-16 Back Panel Connections

The MMP-16 back panel has connectors for analog and digital audio output, as well as various types of synchronization and control signals. The following MMP back panel connections are described in this chapter, and the pin outs for many of these connectors are given in Appendix D: Cable Information.

- Analog audio out (x2)
- Digital audio I/O
  - Biphase in (BOB)
  - Biphase out (BOB)

  } Not intended for public telecommunication network connection
- Mono mix audio out (PRX)
- SCSI
- Remote control (UI/B)
- MMR bus (Sync)
- Word clock in
- Word clock out
- Video in
- Video out
- Midi in
- Midi out
- Midi thru
- Time code in
- Time code out
- Lynx (2 connections)
- Editor (Sony 9-pin)
- Transport (Sony 9-pin)
- Parallel Tracks
- Parallel Transport

MMP-16 Back Panel for Serial Numbers 01345 and above



MMP-16 Back Panel Connections for Serial # 01345 and above

MMP units with serial numbers starting at 01345 and higher have a different arrangement for back panel connectors than previous units. The arrangement of connectors for serial numbers 10345 and above are shown in the drawing above and are listed here.

- Analog audio out 1-8
- Analog audio out 9-16
- AES Digital audio Out (labeled ADIF 1-8 and ADIF 9-16)
  - Biphase In (BOB)
  - Biphase Thru (BOB)

  } Not intended for public telecommunication network
- Mono mix audio out (M2)
- SCSI
- Remote control
- MMR bus (M2)
- Word clock in
- Word clock out
- Video sync in
- Video sync out
- Midi in
- Midi out
- Midi thru
- Time code in
- Time code out
- Diagnostic port
- Lynx (2 connections)
- Editor (Sony 9-pin in)
- Transport (Sony 9-pin out)
- Parallel Tracks
- Parallel Transport
- Network (for OPTIONAL 100Mbit Ethernet card)

Audio Connections

All audio outputs (both analog and digital) of the MMP-16 use DB-25 connectors. The pin configuration used on the DB-25 analog audio connectors is identical to that used for TASCAM DTRS format digital tape machines such as the DA-88. Two female DB-25 connectors are used for the analog connections, one for channel 1-8 and the other for channels 9-16, as labeled on the MMP back panel. Each of the digital outputs uses a female DB-25 connector to carry eight channels of AES/EBU digital output signals (two sets of four stereo pairs). These are labeled as digital outputs 1-8 and 9-16.

Analog Output Connections

All analog outputs use balanced signals designed to mate with standard 600-ohm devices using +4 dBu levels. Analog audio processing is done on two separate 20-bit Digital to Analog converter cards mounted within the MMP-16. These converters are mounted in a special shielded cage within the MMP and are attached via ribbon cable to a card (labeled AO) plugged into one of the system ISA bus slots on the PC motherboard. These D/A boards have their own power supply separate from the main PC power supply. Max load is 12.28 VRMS.

Digital Output Connections

Two female DB-25 connectors are used to provide four stereo digital outputs each, for a total of sixteen channels of digital audio output. Two TASCAM DA-88 analog I/O cables should be used as digital output cables. Even though the MMP-16 has no audio inputs, the digital input 1&2 pair on the first digital input cable is the default reference input for the AES/EBU clock reference. This can be changed to use digital input 3, 5, or 7 from one of the other three digital input pairs using Setup Menu 600 (Dig In Ref Track).

NOTE: The digital clock signals coming from any external device connected to the AES/EBU inputs will force the MMP-16's internal clock to try to lock to it when digital input is selected (Setup Menu 500). This can cause playback problems if the clock source is not accurate. If this occurs set that track to use the sample rate converter in Setup Menu 500 (Input Source).

Monitoring Connections

For monitoring at the MMP-16 there is a mono headphone jack on the front panel (compatible with stereo headphones of either low or high impedance). For studio Cue or remote monitoring there is a rear panel line level mono mini phone jack. It is an unbalanced output designed to be connected to external amplification.

The front panel headphone monitor jack is controlled by the LEVEL control located next to the jack on the front panel. Press the MON key and select the desired tracks using the Track Select keys to choose which of the MMP-16 tracks will be summed to appear at the headphone jack output. The rear panel jack is a pre-LEVEL control, so it is a fixed line level output (-10 dBu), and it always presents a summed output of the audio channels selected using the MON function on the front panel.

Timecode and Video Reference Signals

To accurately synchronize the MMP-16 to film or video, or with other audio playback equipment, some method of providing a stable timing reference must be used. Because the MMP-16 is very flexible, there are numerous methods one could use to connect film and video equipment. The best method depends upon the chosen method of sync, the other equipment that is being controlled, and whether the MMP-16 will be the master or a slave to the other equipment. This section covers the various reference signals available on the MMP-16 system and their applications.

Video In/Out

Most video post houses have a common house sync signal to lock all the audio and video equipment in the facility to a standard video reference signal. This insures that all devices receiving the house sync signal will lock together to the edge of the video frame. The house sync signal can be black burst, composite sync, or color bars in NTSC or PAL format. The house sync video reference signal should be connected to the VIDEO IN connector on the back of the MMP-16. To loop the connection through the MMP, connect the MMP VIDEO OUT to the next device that will use the house sync signal. If there is not a loop through connection then the VIDEO OUT may need to be terminated, depending upon the facility signal design. To set the MMP frame reference to use this video input, choose setup menu 001, Frame Reference, and set the value of this parameter to be Video Reference.

SMPTE/EBU Time Code In/Out

The MMP has two stereo phone jack connections using ¼" Tip/Ring/Sleeve connectors (with the tip being + and the ring being - on a balanced signal) for synchronizing the operation of the MMP to other devices using SMPTE/EBU Longitudinal Time Code (LTC). To synchronize the MMP to an external device which outputs SMPTE/EBU LTC, connect the time code audio output of the master device to the MMP TIME CODE IN jack. The MMP-16 can also generate a stable SMPTE/EBU time code output (equivalent to a time code track signal) that can be used to synchronize external equipment or to stripe time code onto tape. The TIME CODE OUT jack will always output SMPTE/EBU LTC when the MMP is playing.

Biphase Connections

Biphase is a control signal typically generated by a film projector and is traditionally used to interlock the operation of the film with sprocketed magnetic tape machines. The Biphase Operations Board (BOB) on the back panel of the MMP has four biphase input connections and one biphase throughput connection for synchronizing the operation of the MMP-16 to film transports. Use Setup Menu 100, Sync Group, to select which of the four Biphase inputs (Sync Groups) will control the system. The biphase connections use 6-pin modular RJ-12 connectors (like those used on commercial phone systems) and twisted multi-pair cabling (Category 5 Ethernet). Up to 100 feet of cable can be typically run from a biphase device to the MMP-16 or vice versa. The pinout diagram for these connectors is given in Appendix D: Cable Information.

Unlike time code, Biphase gives only speed and direction and does not contain an absolute address. To set the MMP to lock to biphase, use Setup Menu 000, Control Mode. The various biphase parameters such as frame rate, pulse rate, acceleration, etc. are set in the 300 series Setup Menus. **Not intended for public telecommunications network connection.**

Digital Audio Sample Reference Connections

In combination with a frame reference for video and film, there may also be a sample reference for the audio. The sample reference can be taken from the digital input 1&2 on the Digital output cable, the frame reference, the Word Clock input (if there is an active signal on that input), or the system's internal clock source. These connections are described here in more detail.

Word Clock

Word Clock is a digital reference signal used by many digital editors and digital tape machines. This permits two digital audio devices to synchronize their sample clocks to facilitate digital audio transfers between machines, and to insure that they are running at precisely the same sample frequency. The signal is transmitted on an unbalanced coaxial cable that terminates into a BNC connector at the MMP-16 end. The MMP-16 has both a digital WORD CLOCK IN and a digital WORD CLOCK OUT connection using BNC connectors.

When an external tape machine is to control the sample rate of the MMP-16, connect the Word Clock output from that machine to the WORD CLOCK IN on the MMP-16. When the MMP-16 is to control the sample rate of an external machine connect the WORD CLOCK OUT from the MMP-16 to the Word Clock In on the controlled machine. The maximum practical cable distance is up to 100 feet. Use setup menu 002 to select the sample reference for the MMP-16 system. Normally this is a 48 kHz TTL-compatible (5 volt) signal.

AES/EBU Sample Rate

To lock the digital sample clock to an AES digital audio source, the audio sample reference for the MMP-16 can be taken from the digital audio input 1&2 pair on the connector used for the AES digital output. Use setup menu 002 to select the sample reference for the MMP-16 system.

MIDI Connections

The MMP-16 has MIDI (Music Instrument Digital Interface) In, Out, and Thru connectors. These are used for sending MIDI Time Code and for controlling the transport via MIDI Machine Control.

The MMP MIDI OUT connector carries a MTC signal generated by the MMP-16 whenever the unit is in Play. To slave MIDI devices that can follow MTC (MIDI Time Code) to the MMP-16, connect the MMP MIDI OUT connector to MIDI In port of the external device. The MIDI out signal (and the MIDI Through signal, if it is set as a second MIDI output) will contain any MMP-16 responses to the MMC input commands in addition to MTC generated by the MMP-16 from the time code reference source.

The MIDI IN port on the MMP can receive MIDI Machine Control messages for operating the MMP's basic transport control functions. The MIDI THRU jack on the MMP will pass through any MIDI signals appearing at the MMP MIDI IN port.

External Controllers & Bus Connections

In most installations the MMP-16 will be rack mounted in a machine room and thus will either be remote controlled through slaving to another time code-based machine (typically a VTR) or to a biphase machine (typically a film transport). Any controller that has a Lynx port can also directly control, or be controlled by, the MMP-16 (the TimeLine Lynx Keyboard Control Unit and the TimeLine Lynx-2 module are two examples). There is also a fully featured remote, the TASCAM MM-RC, which is specifically designed to control multiple MMR and MMP units.

Lynx Bus / KCU Connection

The TimeLine Lynx Keyboard Control Unit (KCU) can be used with the MMP-16. Multiple units may be daisy-chained using either of the two LYNX connectors as input. The other LYNX connector could be tied to another MMP-16, or to a Lynx module for controlling other tape machine transports. The Lynx KCU can control a total of up to six machines.

MMR Sync Bus Connections

The real power of the MMR-8/MMP-16 system comes into play when multiple MMP-16s are tied together using the MMR Bus to create larger "virtual" audio playback machines. The MMR bus supports up to 100 MMP-16s, all tied together to create up to an 800-track playback system that could be controlled by a single MMP-16, MM-RC Remote, Lynx KCU, or other machine remote controller.

The MMR Bus connects each MMP-16 using a 15-pin connector located on the SYNC card connector on the MMP back panel. Two DB-15 connectors are provided on the back of each MMP-16 so that multiple machines can be daisy-chained together. The system is auto terminating. To add MMP-16 units to the system, connect a cable from the last unit in the chain to the new unit.

The MMP Bus is made active on each machine by choosing the MMP Master or Slave setting in Setup Menu 110, MMP Bus Request. All of the MMP-16s that are tied together can then be software divided (Setup Menu 100) into four Sync Groups, each featuring fully independent control within their group. All of the MMR/MMP machines that are connected, Online, and set to the same sync group can then be controlled together. The MMR Bus thus turns three MMP-16s into a single 48-track playback machine, six MMP-16s into a 96-track machine, and so on up to 100 MMP-16s functioning as a single 1600-track playback machine. Any MMP-16 tied onto the MMR bus can also be individually taken off-line and controlled locally at any time. MMR and MMP Units can be added or dropped from Sync Groups using the Online key on the front panel.

Serial Transport Connection

The TRANSPORT connection uses the industry-standard RS-422 Sony 9-pin P2 protocol (Ampex VPR-3 is also supported) for controlling external serial transports such as audio or videotape machines. It is intended for transport control of a single external device. This port will send out the appropriate transport commands when the transport functions of the MMP are engaged through the front panel or via the MM-RC Remote controller. Use Setup Menu 000 (Control Mode) to set the MMP to control external devices via the Serial Transport connection. A video reference source is recommended for this type of operation.

Serial Editor Connection

The EDITOR connection uses the industry-standard RS-422 Sony 9-pin P2 protocol. The Editor connection allows for controlling the MMP-16's transport functions from a standard Video editor controller or other external device. Use Setup Menu 000 (Control Mode) to set the MMP for control via the Editor connection. A video reference source is required for this type of operation.

Parallel Transport

The PARALLEL TRANSPORT connector allows use of remote control devices that operate by sending messages via parallel signals for the motion control keys. There are +12 volts available to drive switch lamps in conjunction with the tally outputs that are available for each key. The pinout diagram for the Parallel transport connector is given in Appendix D: Cable Information.

Parallel Tracks

Since there are no audio inputs on the MMP-16, the PARALLEL TRACKS connector has no function in the current software release. The Parallel tracks connector may be used in future releases of the MMP-16.

Connecting External SCSI Media

The MMP-16 SCSI interface card is pre-set to SCSI ID 7. The internal Kingston drive receiver in the MMP-16 is set to SCSI ID 0. Each device added in the SCSI chain must have a unique SCSI ID number or else the MMP-16 will not boot properly.

External SCSI connections should be made using the shortest possible length of double-shielded SCSI-2 cables with 110 ohms impedance. Only the last drive in the chain is terminated. All other drives must have their terminating resistors removed or have termination jumpers set to off (including those drives placed in the MMP-16 internal drive slot). SCSI cables are readily available from most computer stores. For the most reliable operation, the total length of all SCSI cabling must not exceed 15 to 20 feet.

All drives must be pre-formatted using a single partition. Drives with capacities of up to 9 GB have been tested and found suitable for use with the MMP-16. The MMP-16 system plays all audio from separate uncompressed 16-bit or 24-bit linear files. Approximately 5 MB (Megabytes) of disk space is required for each minute of audio recorded per track. Thus a 4 GB drive can hold about 12 track hours of 16-bit audio, while a 2 GB drive will hold about 6 track hours.

SCSI Cables

There is a considerable difference in quality and performance of cables used to connect SCSI devices. It is imperative that users pay close attention to this issue.

Cable Quality

High quality SCSI cables are essential for proper MMR/MMP system performance. Low quality cables, which are often thin, may cause data transmission errors, file corruption, and system malfunctions. This is often due to improper and insufficient grounding, incorrect pin wiring, and unwired pins. The following SCSI cable manufacturers are highly recommended as a source for MMR/MMP SCSI cables:

Paralan Corporation -
www.paralan.com
4655 Ruffner St., San Diego, CA 92111
Tel. (619) 560-7266 || Fax 619-560-8929
email: scsi@paralan.com

Black Box Corporation -
www.blackbox.com
1000 Park Drive Lawrence, PA 15055-1018
Tel: 724-746-5500 || Fax: 724-746-0746
email info@blackbox.com

Cable Length and Device Support

The MMR/MMP SCSI host card supports from one to eight SCSI devices. However when one to four SCSI devices are connected, total cable length should not exceed three meters. When five to eight SCSI devices are connected, total cable length should not exceed 1.5 meters. Note that total cable length includes the internal cabling in carriers or drive bays. Thus if a 4-bay drive enclosure contains ribbon cable internally that measures one meter in length, the external cable must not exceed 2 meters. Improper cable length often causes an MMR system to freeze while mounting volumes. (Note: Paralan can provide custom-length SCSI cables).

Cabling Wide and Narrow Devices in a System

NARROW SCSI uses 8-bit data transfers. It generally uses a 50-pin connector.

WIDE SCSI uses 16-bit data transfers. It generally uses a 68-pin connector. Wide SCSI may also refer to 32-bit SCSI data transfers but 32-bit wide SCSI is not as common.

Narrow drives should always be placed at the end of a SCSI chain. This is due to the fact that when a Wide to Narrow connection is made, 8 bits are not passed through, so the Wide drive (and all subsequent SCSI devices in the chain) receives only 8 bits of data instead of 16. If a Narrow drive is connected after a Wide drive, the Wide drive still receives all 16 bits of data.

SCSI Termination

A terminator provides electrical circuitry at the end of a SCSI chain to prevent the reflection of electrical signals when they reach the end of the chain. The SCSI bus requires termination only at the ends of the SCSI chain, not in the middle. There are several types of SCSI Termination: Passive, Active, Active Negation, Force Perfect Termination, and Low Voltage Differential.

The MMR/MMP should only use Active terminators. This is because active terminators involve a voltage regulator to reduce fluctuation effects in termination power to insignificance. This results in more stable SCSI signals, less signal reflection and fewer data errors. Active negation terminators are most optimized for Fast- and Ultra-SCSI speeds. Active negation termination is currently not under testing and thus is not supported by TASCAM.

Kingston Frame Configuration

When configuring a Kingston receiving frame the settings in Figure 1 must be used.
Note: All but one setting are factory defaults. Jumpers should be installed on W3, W1 and pins 1&2 of J6 (Figure 1). Jumper W2 determines termination. In the “A” position (default) termination resistors are disabled (This is the recommended configuration for most external applications). In certain conditions it may be desirable to terminate at the frame, for example, if an internal bay is being installed in the MMR/MMP. If this is the case jumper W2 should be set in the “B” position

On-Board Termination (W2): Position 'A' is installed at the factory and will disable termination. Moving the jumper to Position 'B' will enable on-board termination.

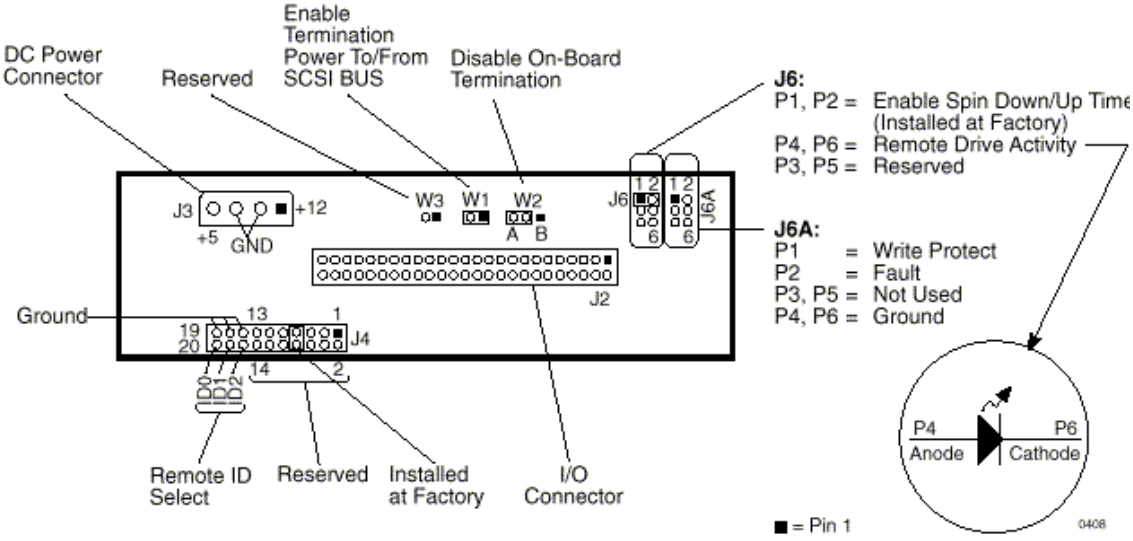


Figure 1

Wide SCSI Cards and Kingston Frames

The MMR/MMP are normally shipped with a narrow Symbios SCSI card. The MMR/MMP units also support the Symbios SYM8751SP Wide SCSI card. To install a wide SCSI card, use a grounding strap and follow the installation instructions below:

Removing the Narrow Host Adapter (Symbios SYM 8600SP)

1) Disconnect the 26-pin ribbon cable from J2 on the MMR Biphase Operations Board, and fold out of the way.
2) Disconnect the 50-pin ribbon cable from J2 on the Symbios SYM8600SP SCSI host adapter.
3) Remove the Phillips head screw that secures the host adapter to the chassis.
4) Carefully remove the host adapter.

Installing the Wide Host Adapter (Symbios SYM8751SP)

1) Prior to inserting the wide host adapter into the PCI slot, connect the 50-pin ribbon cable to J4 on the SYM8751SP. This connector is located on the side of the card, which makes it very difficult to install if the card is already in the PCI slot.
2) Insert the wide host adapter into the same PCI slot that previously contained the narrow adapter.
3) Secure the wide host adapter to the chassis with the Phillips head screw.
4) Reconnect the 26-pin ribbon cable to J2 on the MMR Biphase Operations Board.

Wide Kingston Drive Frames

The Kingston SCSI drive frame in the MMR is normally configured for narrow SCSI. TASCAM can also provide MMR/MMP units configured with wide Kingston frames and carriers, and can perform a service upgrade to remove the existing narrow Kinston frame and carrier and replace it with a wide Kingston frame and carrier. Contact your TASCAM representative for pricing and availability on these wide units. Note that a narrow drive carrier will not fit into a wide frame, and vice versa.

It is possible to mount a narrow SCSI drive in a wide Kingston carrier (or vice versa) by means of an adapter inside the carrier. One source for these adapters and other SCSI cable peripherals can be found at:

CS Electronics
17500 Gillette Ave.
Irvine, California 92614
Tel (949) 475-9100 Fax (949) 475-9119
http://www.scsi-cables.com/Index.htm

CS Model # ADP-9051 is for HD68-pin male to 50-pin male (mounts a wide drive in a narrow carrier)

CS Model # ADP-9056 is for HD68-pin female to 50-pin female (mounts a narrow drive in a wide carrier).

Approved SCSI Drives

The following disk drives have been approved for use with the MMR-8 as of July 19, 1999:

Drive Manufacturer	Drive Model	Firmware Version
Seagate	ST118273LW	6246
Seagate	ST19101W	0014
Seagate	ST318203LW	0001
Seagate	ST318275LW	0001
Seagate	ST32272N	0876
Seagate	ST34371N	0484
Seagate	ST34573N	5958
Seagate	ST34573W	5764
Seagate	ST39102LW	0005
Seagate	ST39173N	5764
Seagate	ST39173W	5764
Seagate	ST39173LW	6264
Nikon*	DD53-SIP Beluga AV	Unknown
IBM	DCHS09F	2222

Manufacturers frequently release new drive models and obsolete other drive models. The most current list of approved drives can be found on the TASCAM web site at http://www.tascam.com .

* Users should be aware these drives do not perform as well as hard drives. Test results with the NIKON Beluga drive with 1K/sector media show 8 tracks of record and playback in 16- or 24-bit TapeMode is generally reliable. Non-destructive mode performance is less reliable, especially with heavy edit density.

DVD RAM Support

The MMR/MMP will support SCSI backup and export to DVD RAM disks as of software version 3.1. Testing so far indicates that these drives are several times slower than Magneto-Optical disks for recording and transfers. Playback of a limited number of tracks is possible from a DVD RAM disk, but maximum performance seen to date is 6 channels of 16-bit material in TapeMode.

LIMDOW Optical Drives

For backing up files, and for ease of moving smaller projects around, we recommend using a "LIM/DOW" (Light Intensity Modulation / Direct Over Write) type optical disk. The LIM/DOW technology achieves better performance than is available on older types of Magneto-Optical media, which must execute an erase pass before they can write new data to the disk. The Nikon Beluga AV MO (Magneto-Optical) disk drive has been tested and rated to perform well when used with the MMP-16. A chart of currently tested and certified disk drive media is given in Appendix B, MMR Approved Drives List. The results from performance tests of the NIKON Beluga AV MO drive with 1K per sector media are also given there. It is possible to use other removable media such as the IOMEGA Jaz drive and the SyQuest Syjet, but these do not provide the same level of performance for recording as a hard drive and they are more fragile than optical drive media. Use these devices at your own risk, as they are not supported as primary record or playback devices DAT, Exabyte and other streaming tape device cannot currently be used with the MMP-16 system.

Remote Controllers for the TASCAM MMP-16

TASCAM MM-RC The TASCAM MM-RC is a dedicated remote control unit designed specially for use with the MMP-16 and the MMP-16 sixteen channel player unit. It connects to a special remote connector on the UI/B card on the back of the MMR and MMP units. This remote allows complete control of all attached functions of the MMR and MMP units, including all setup menus. It also allows for machine grouping as well as system wide control of all attached units. A total of up to 100 units (any combination of MMR and MMP) can be controlled from the MM-RC.

Lynx KCU The TimeLine Lynx Keyboard Control Unit (KCU) is a tabletop controller which is typically used in conjunction with Lynx 2 synchronizer modules. It provides a time code display, motion control functions (including a jog/shuttle Wheel), track selections, and audio editing functions for most professional video and audio transports. The KCU can remotely control the operation of a total of up to six transports including MMP-16s. When used with the KCU 900 software, the Lynx KCU unit allows control of the following MMP-16/MMR-8 functions:

- Transport Control
- Track Record Arm/Select (Record arm only for MMR-8)
- Slip Track/Region
- Undo/Redo
- Goto Prev/Next Edit
- Goto Head/Tail
- Clear/Paste

The Lynx KCU may be directly connected to either of the two integrated Lynx ports on the MMP back panel. The second Lynx connector provides a loop thru connection to an external Lynx module for control of other devices from the KCU.

The TimeLine Lynx KCU is available from:

TimeLine Vista, Inc.
1755 La Costa Meadows Drive, Suite B
San Marcos, CA 92069
Tel: (760) 761-4440 Fax: (760) 761-4449

Keyboard Operation (with MM-RC option)

The optional MM-RC (Remote Control unit) has a keyboard connector located on the rear panel which accepts a standard PC-AT style keyboard. The purpose of the keyboard is to facilitate selecting menu items while in the Setup Mode and to make it easier to name Projects and Tracks. There is no way to connect a keyboard directly to the MMR or MMP – this must be done using the MM-RC.

Note: *The internal software of the MM-RC will be automatically updated when an MMR-8 or MMP-16 is booted while attached to the MM-RC. Be sure the power switch of the MM-RC is on while the MMR/MMP unit is started so the unit can sense the presence of the MM-RC remote.*

Using the PC Keyboard

Use the keyboard to perform the following data entry tasks on the MMR or MMP:

- Enter Project and Track names directly by using the standard alphanumeric keys.
- Enter Tape Mode Start time, Pre-Roll and Post-Roll directly using the number keys.
- Access Menu Banks directly by using the Number keys.
- Use the Up and Down arrow keys on the keyboard to scroll through the Setup Menus.
- Use the Up and Down arrow keys to scroll through menu parameters. Once the desired menu is reached, press F1 to toggle the Trim key function.
- Pressing Enter on the keyboard has the same effect as pressing STO on the MMR or MMP front panel and will store the parameter selection displayed in the LCD.

Not all keys on the PC keyboard are active. Use the following keys:

F1 – Press F1 to enter Setup. Once Setup Mode has been entered, F1 will toggle the TRIM key on the MMP front panel.

Escape (Cancel) key – This key is equivalent to the Cancel (CLR) key on the MMP front panel. Press Esc to leave the Setup Mode and return to the Normal Display State.

Arrow keys - These serve the same function as the Arrow keys on the MMP front panel.

Enter key - Equivalent to STO on the MMP front panel. When a menu or parameter setting has been changed pressing Enter stores the new parameter.

Shift key - Acts like a standard keyboard Shift key, but will only work in conjunction with Letter keys and the Minus key.

Letter keys – May be used shifted or unshifted. Note that most punctuation keys are not supported.

Minus key - Shifted for Underscore, or unshifted for Minus/Hyphen.

Caps Lock - Works like a standard keyboard Caps Lock key.

Num Lock - When Num Lock is active (Num Lock is lit on the keyboard) use of the numeric Keypad is enabled. The Number keys and the Enter key are active in this mode, and they function exactly like they do on the keyboard. When Num Lock is not active (the Num Lock light is not lit), the numeric keypad serves only as up (8), down (2), left (4), and right (6) arrows.

Powering Up the System

The MMP-16 comes from the factory with the operating system and MMP-16 software pre-loaded onto the internal hard drive. At POWER ON, the front panel LCD should display the following message:

```
TASCAM MMP-16
© TimeLine 1996 - 99
```

If this message is not seen, the front panel is not operating correctly, and you should contact TASCAM technical support for assistance. As the system software is loaded, the LCD will go blank, then after a few seconds will display the message “Mounting Volumes”. Any SCSI drive that will be used by the system must be attached to the SCSI bus and powered on at startup in order to be available for mounting. After all volumes have been mounted, the display will be initialized with a fill character (all character positions will be filled), and will pause as the power-up settings are restored. Various LEDs may turn on and off during this process. The entire sequence of events may take up to 30 seconds. When it is complete, the front panel display should show something like:

```
01:00:00,00.00
01:00:00,00.00
```

This indicates the system is now ready to go to work. Any other indication is an error condition. Should an error occur, note the message, if any (if it is a long message, scroll using the left/right arrow keys), and contact TASCAM technical support.

Verifying MMP-16 Installation

Once the MMP-16 is properly mounted in a rack or has been positioned on or in the studio furniture, follow these steps to complete, or to verify, the proper installation of your MMP-16 system:

1. Connect the MMP-16’s 25-pin female D-sub analog output connector to the mixing console’s tape returns or to those line-level inputs normally used for tape playback. Refer to Appendix D: Cable Information for the connection pin outs for the analog output connectors.

2. Install the removable drive into the front panel of the MMP-16 (if it is not already installed). Slide the drive into the front panel opening and press on the drive to fully seat it in the holder. Turn the key to lock the unit into place and to connect the drive power. The LED indicating the drive SCSI address will flash until the drive has finished spinning up and is ready for operation.

3. If external SCSI hard drives will be incorporated into the system, connect a SCSI-2 cable from the MMP-16 rear panel SCSI-2 port to one of the SCSI ports on an external SCSI drive housing.

   SCSI NOTES: Each device connected to the SCSI bus must have a unique SCSI ID number. Configure the MMP-16’s removable hard drive (installed in the Kingston carrier) to use SCSI ID 0. The internal SCSI interface board uses SCSI ID 7. Thus, no other drive in the system can use these SCSI ID numbers. Also, only the last drive in the SCSI chain can be terminated. All other drives must NOT be terminated. If two drives are set for the same SCSI ID number, or if any drive other than the last one in the chain is terminated, it will prevent the MMP-16 from properly functioning. See *Connecting External SCSI Media* (in this chapter) for additional information.

4. Connect the MMP-16 to the applicable timing reference source and to the appropriate remote control interface

a. To connect the MMP-16 to a film transport, connect the biphase sync output from the projector to one of the four biphase inputs. The four biphase inputs are numbered 1 - 4 from top to bottom. Any, or all, of the inputs can be connected. Use Setup Menu 100, Sync Group, to select which of the four Biphase inputs (Sync Groups) will control the system.

b. To connect the MMP-16 as a slave to a video machine, first connect a source of Video Frame synchronization to the MMP-16's VIDEO IN (either the Video Reference out from a video deck, or a Video black burst signal). This is normally a loop-through connection so the MMP-16'sVIDEO OUT jack should be terminated if it is not connected to another machine. Next connect the Time Code signal from the video to the MMP-16, using the SMPTE/EBU TIME CODE IN (LTC) connector. Use the RS422 Sony 9-Pin Editor port to control the MMP-16 via Sony protocol. To connect the MMP-16 as a master for a video deck, connect the TRANSPORT connector to the video deck's Sony P2 protocol-compatible remote control connector.

c. To connect the MMP-16 to other audio devices, connect the TIME CODE IN/OUT connectors. If the other devices do not read or transmit SMPTE/EBU time code, but they do read MTC (MIDI time code), then connect the MIDI IN/OUT/THRU as required.

To connect multiple MMP-16 Players together, daisy chain them using the MMR Bus (the 15-pin SYNC connectors). A 3-foot MMR bus cable is provided with each MMP-16 for this application. Since each connector parallels the other, connection order is not critical. The MMR Bus is self-terminating.

e. If remote control capabilities are desired, then connect a TASCAM MM-RC remote control unit to the 25 pin D-sub connector on the UI/B board on the back panel of the MMP-16. Some functions of the MMP-16 can also be controlled via the TimeLine Lynx Keyboard Control Unit (KCU) by connecting the KCU to either LYNX connection (they operate in parallel, so either one may be used) on the MMP-16 back panel. If necessary the other LYNX connection can be daisy-chained to other equipment (MMP-16, a Lynx-2 controller, etc.).

Software Updates

Software updates are available on the TASCAM Web site at http://www.tascam.com, and may be downloaded onto one or more floppy disks. To install the software update, insert the floppy disk (or Disk 1, if multiple disks are received) into the front panel floppy drive while the unit is operating normally. Access Menu 995 (Load Software) and press STO. The system will ask "Are you sure?" Confirm the floppy is properly inserted and press STO again to confirm. If multiple disks are supplied, the operator will be prompted via the display to remove Disk 1 and place Disk 2 into the drive. After the software update is installed, the system will display a message that the update is complete, and will display a checksum number (written on the floppy update disk for reference) to verify that the installation has been successful. Remove the floppy disk and recycle the power to operate the unit with the new software installed. All system floppy disks should be kept in a secure location in case they are needed in the future.

Factory Default Settings

The MMP-16 is shipped from the factory using a pre-defined set of operating parameters. The factory default settings can be changed in the field at any time through a system of Setup menus that control the MMP-16 operating parameters. The new value settings will be automatically saved and used at system start-up as the normal operating parameters of the MMP-16. The system can be reset to use the factory defaults at any time by accessing menu 901 (“Recall Settings”), and selecting the “Default” value. The system will then be returned to the factory default settings and is ready to use.

Chapter 3 MMP-16 Keys and Status Displays

MMP-16 Keys & Definitions

Throughout this manual several abbreviations and written shortcuts are used to define user operations and machine functions. The following summarizes how these abbreviations and text shortcuts relate to the operational description:

Keys Refers to the colored front panel keys on the MMP-16. The gray keys are used to enter time code numbers (on the numeric keys) and to perform various other common functions. The shift key is the only yellow key. Key use in the text is indicated through capitalizing the key legends (e.g., LOAD TRACK indicates the Load Track key is to be pressed).

Shift Key This key, the only yellow key on the front panel, functions like the shift key on a computer keyboard. Located at the top-right corner of the numeric keypad area, shift works in combination with selected gray keys, enabling their shifted functions. The shifted function for each applicable gray key is written above the key on the front panel metal. Press and release the shift key before pressing any other key, to "latch" the shift key until the desired key is pressed. This will light the shift LED above the SHIFT key. Pressing another key while the shift LED is on will cause that key to execute its shifted function. Once the shifted function has been activated, the shift LED will go off and the system will return to the normal non-shifted state. If multiple shifted keystrokes are required, you may also press and hold SHIFT (the shift LED above the key will stay on) while pressing one or more gray keys in succession.

In the text "SHIFT+X" indicates the Shift key is used in combination with one of the gray keys (X) that has a shifted function. Thus, SHIFT+TRIM means "press and release (or press and hold) the SHIFT key and then press the TRIM key." In this case, the MMP-16 will enter Dynamic Trim mode since the shifted function for the TRIM key is "Dynamic Trim" (which is indicated above the key). To cancel shift, when the shift LED indicator is on, press SHIFT again, or press CLR.

Text Above Keys Indicates the "shifted function" for that key. Pressing SHIFT+ key, as detailed above, accesses the shifted function.

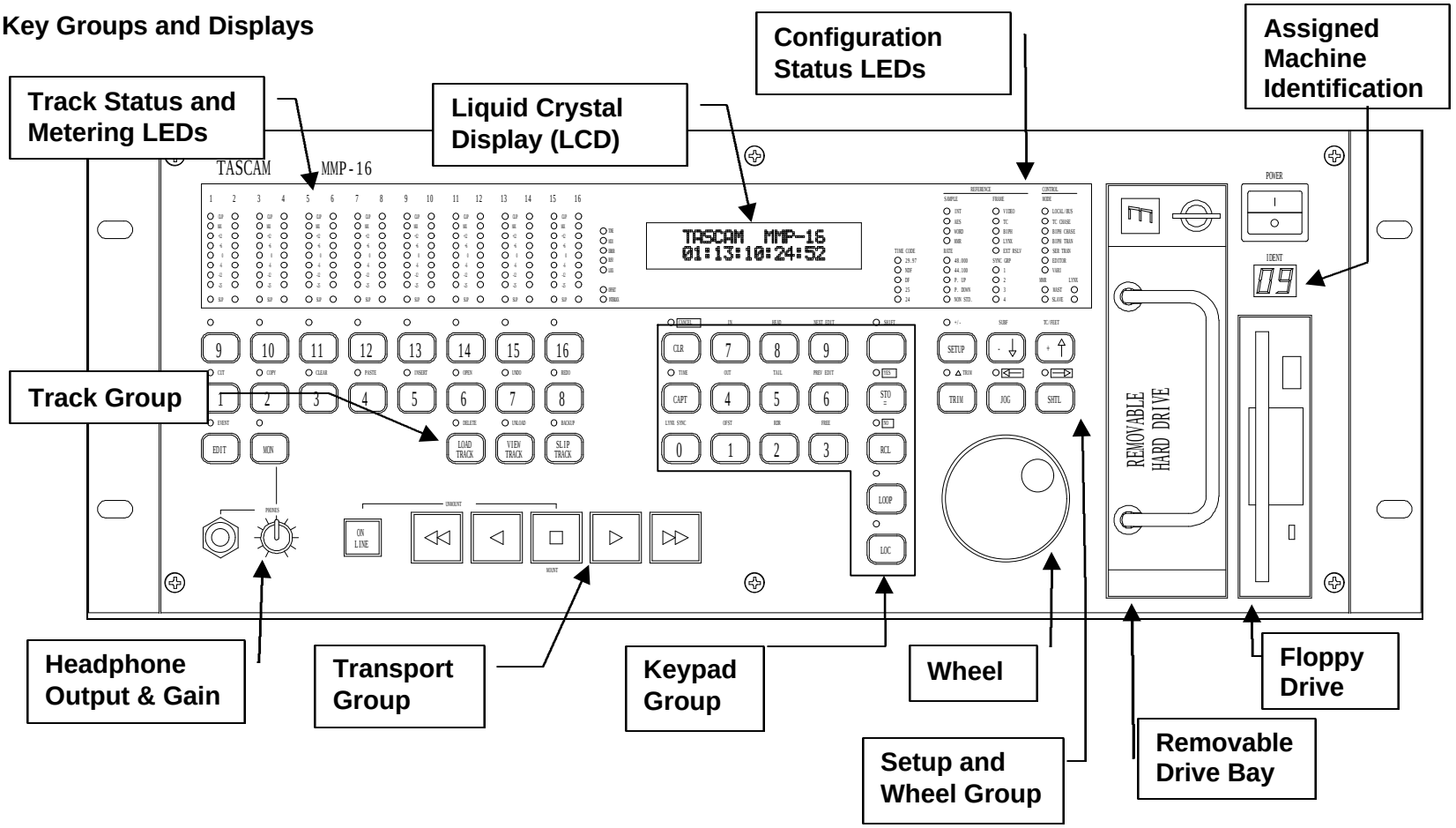
Reversed Text Above Keys Indicates the "alternate" function for the JOG and SHTL keys, and for the STO, RCL and CLR keys. The alternate functions are used in Setup, Track, Verify, and Error modes, and while trimming values. In Normal mode, the key functions are normal (i.e., pressing JOG turns the Wheel into a Jog Wheel). In Setup or Track modes, pressing JOG indicates a left-arrow function as a cursor or window movement tool.

Mode This term is used to refer to the active Control mode selected by Setup menu 000 and to refer to the Track Select Mode which governs the behavior of the SEL keys. It may also be used to refer to various operational modes such as Loop, Trim, or Shift which change the meaning of other keys or controls as long as the mode is active.

LCD Text To indicate the front panel LCD text, curly brackets are used to enclose the text. (e.g., `{X. 01:00:00,00}`) A mono-spaced Courier font duplicates the spacing and alphanumeric characters shown in the LCD. In the Normal state, the top line of the LCD typically shows the current "play head" time code, while the bottom line shows the entry (or other active) register time code. In Setup, Track, Verify, or Error states, the two LCD lines will change to show various text messages as indicated in the Functional Overview section of Chapter 2.

MMP-16 Front Panel

Key Groups and Displays



Front Panel Indicators, Switches, and Displays

Collectively, all the front panel keys and the Wheel are called *switches* and the LEDs, six motion control lamps, and the Liquid Crystal Display (LCD) are called *indicators*. The MMP-16 is manually controlled through front-panel switches, while system status is shown via the indicators. The front panel switches are divided into five groups: the *track* group, the *keypad* group, the *setup & wheel* group, the *wheel* itself, and the *transport* (or motion control) group. The functions for each switch in each group and how their selection affects the indicators are discussed in this section. The MM-RC remote control unit provides most of the same functions as the MMP front panel. Note that the CLR (clear or cancel) key will almost always terminate an operation, and is a good first key to try to cancel an operation.

LED Indicators

Most operating parameters and key functions are indicated through LEDs, as are the output signal levels.

Configuration Settings

To the right of the LCD are 34 LEDs used to indicate the Control mode, the frame and sample reference sources, the time code format, the sample rate being used, the active sync group, and the state of the MMP-16 buses (master or slave on the MMR or Lynx buses).

Active Mode/Key Indicators

Above most soft-touch keys there are LEDs to indicate the key status. In some cases they indicate that the shifted function is active. In other cases they indicate a key status. For example, the LOC (locate) key's LED will be on while the MMP-16 is locating, turning off to indicate the transport has completed locating (the time code in the top and bottom lines of the display should then be equal).

The LEDs above the SEL keys indicate which tracks are selected according to which track function key is also active. The track function key (EDIT, MON, LOAD TRACK, TRACK or SLIP) that is active will also have its LED turned on. For example, pressing MON will turn on the MON LED, as well as the SEL LEDs for all the tracks that are currently being monitored in the headphones. Pressing any SEL key will then toggle the track between monitor on (when the LED is lit) and monitor off (no SEL LED for that track). If another track mode key is pressed the SEL LEDs will now indicate that mode's selected tracks.

Track Status and Metering

Immediately above the track select buttons associated with tracks 9-16 in the MMP-16 are 9 LEDs per track (for a total of 144 LEDs). These indicate audio signal levels (meter LEDs) & track slip status for each track.

Meter LEDs

Each track has its own column of signal level LEDs that read the MMP-16 analog output signal off disk. Each meter column contains eight LEDs. Functioning much like a tape machine's peak meters, their meters have a fixed rise time of <30 ms and a default decay time of <0.5 seconds.

The bottom level LED (-25) is a green presence indicator. Any time there is signal on the track there will be an indication. The next three LEDs indicate signal levels of -12, -6 and 0 VU. The next two LEDs are yellow and indicate +6 and +12 VU. The final two LEDs are red to indicate the audio peaks are at MAX (3 dB below clipping) and CLIP, which means the signal has most likely exceeded the input capability of the digital converter and may be distorted. The CLIP indicator acts as a peak-hold indicator during playback. It is only reset when the MMP-16 is stopped and put into PLAY again.

A de-facto film/video industry standard for digital device monitoring is that 0 VU should be set to indicate a signal level of -20 dBFS (decibels below full scale, i.e. 20 dB below the digital clipping level). The MMP-16 default setup follows this recommendation with the MAX LED indicator set to turn on with a signal 17 dB above the nominal 0 VU indication (just before all bits would be set true in the ADC). The CLIP indication is typically adjusted for a 3 dB hotter signal (20 dB above 0 VU). These settings can be adjusted in 1dB increments using Setup mode menu 520 (Meter Reference Level) for any dB reference level from -15 dBFS to -24 dBFS.

See *Chapter 8, Maintenance and Service* for instructions on calibrating the outputs using the meters.

Machine Status LEDs

To the left of the LCD are 7 LEDs used to indicate the status of various MMP machine states (interlock, busy, lock, etc.). These are described here:

- The TONE LED is lit when menu 530 (Reference Tone) is set to On. Pressing play when this LED is lit will cause all channels to output a 1kHz reference tone at 0 VU.
- The MIDI LED is used to indicate a valid MIDI input signal (MMC) is being received.
- The ERROR LED indicates an error state has occurred and must be cleared before normal operation can resume.
- The BUSY LED indicates the system is occupied with a task, and the transport keys are not available until the system finishes the current task and the Busy LED goes out.
- The LOCK LED indicates the system is locked to the incoming machine synchronization source (usually time code, biphase, or the MMR Bus).
- The OFFSET LED indicates there is an offset (value other than 0) in the offset register (local MMP offset) or when there is an MMR bus offset and the unit is a slave on the MMR bus.
- The INTERLOCK LED lights when the system is in Biphase Chase Control Mode.

Liquid Crystal Display (LCD)

The LCD or “display” consists of two lines of twenty characters that show various operator messages (time code, user prompts, error messages and information, track data, and setup menu information) depending upon the active panel/display state. Both lines of the LCD can also show various system messages according to the operating state. Typically the top line will indicate the current time code position in the Normal state, the Setup menu number and item in the Setup state, and the Track information or action instruction in the Track states. In the Verify or Error states, additional text may be displayed in the bottom line of the display, depending upon the message or error generated.

In cases where the message exceeds the width of the LCD window, the left/right arrow keys can be used to horizontally scroll the message. The window follows the arrow key movement (right-arrow moves the window to the right and left-arrow moves the window to the left), thus scrolling the text across the LCD in the opposite direction. The appearance of the LCD in each of the MMP panel/display states is described in detail here.

Normal State Display

In the Normal state, the top line shows the current transport status and the current position of the “play head” in either SMPTE/EBU time code or in feet & frames. The bottom line of the display shows the time code entry register or most recently accessed time code register. The display format selected is kept as part of the user settings file. The following illustrates the Normal state display of just the top line for time code and for feet & frames:

01234567890123456789	the 20 LCD character positions
cd HH:MM:SS:FF.xx	(Top Line Display for time code)
cd TTTTT FF.xx	(Top Line Display for feet & frames)

“cd” is a one or two character display code for the current state of the MMP-16 transport:

□ Indicates the transport is stopped

> Indicates the system is in play mode but unlocked

>L Indicates the system is locked and in play

< Indicates the system is in reverse play

>> Indicates the system is in fast forward

<< Indicates the system is in rewind

In Shuttle or Jog the display will show <<, <, > or >> according to the movement of the Wheel. The Time Code and Feet & Frames characters shown in the Normal state display are:

HH - the hour display (01 - 23)

MM - the minutes display (00 - 59)

SS - the seconds display (00 - 59)

FF -the frame number (00-29)

xx - the subframe number (00 - 99)*

TTTTT is the film footage count (00000 - 99999)

* Subframes is an optional display characteristic.

In the Normal state, the bottom line of the display shows time code (or feet & frames) that has been entered manually, captured, or recalled from one of the memory or special-purpose registers. There is a label in front of the time code (or feet & frames) to indicate what register is being displayed. The “Label” identifies the memory or register that is currently being displayed through these abbreviations: SYNC, OFST, RDR, TIME, FREE, HEAD, TAIL, IN, OUT, NEXT, PREV, and MEM n (where n = 0 - 9). If a time code is manually entered, or if CLR was pressed, there will be no listing in the “Label” area of the display, indicating the timecode Entry register is displayed.

01234567890123456789	LCD character positions (left to right)
Label HH:MM:SS:FF.xx	(Bottom Line Display for time code)
Label TTTTT FF.xx	(Bottom Line Display for feet & frames)

Setup State Display

In the Setup state, the display is used to show a list of menus for setting various system parameters. Pressing the SETUP key enters this state. The top line shows the 3-digit menu number and the name of the menu. The bottom line shows the list of parameters. To scroll through the list of menus, use the Up/Down arrow keys or the wheel. You may also jump directly to “banks” of menus by pressing any of the numeric keys on the keypad. To scroll through the list of parameters for a selected menu, press TRIM, then use the Up/Down arrow keys or the Wheel. Note that the currently selected parameter will always be preceded by a * character. Many parameters have system default values which can be accessed by pressing TRIM, followed by press SHIFT + CLR.

01234567890123456789	20 position LCD character positions
NNN Ttttttttttttttt	Top: (NNN indicates the menu number, t indicates the menu name)
***Ttttttttttttttttttt**	Bottom: (* indicates the currently selected parameter, t indicates the parameter name)

To exit the Setup state and return to the Normal state, press SETUP, or press CLR, or press the EDIT, MON, or INPUT Track Mode keys. To jump directly to one of the Track states from the Setup state, press VIEW TRACK, TRACK, or SLIP. Note that attempting to set the MMP to an invalid condition may result in an Error state, and that attempting to choose some menu parameters will put the system in the Verify state for confirmation of the choice before it is finalized.

View Track State Display

In the View Track state, the display is used to show the name of the selected track. To enter this state, press the TRACK key. Press the appropriate SEL key to display the desired track. The wheel and the Up/Down arrow keys can be used to move to the next or previous track selection.

01234567890123456789	LCD character positions (left to right)
Track Contents: **T nnnnnnnnnnnnnnnnn**	Top: (Operator message) Bottom: (T indicates the assigned track, nnn is the track name in the EDL) and will read *Blank* if the track isn’t assigned.

To exit the View Track state and return to the Normal state, press TRACK, or press CLR.

Slip Track State Display

In the Slip Track state, the display will show the current time position in the top line of the display (the same as in the Normal state), while the bottom line of the display is used to show the contents of the slip register for the selected track. If more than one track is selected, all of their registers are active, but only the last selected track indexes slip register will be shown.

01234567890123456789	LCD character positions (left to right)
Label HH:MM:SS:FF.xx **SlipX HH:MM:SS:FF.xx**	Top: (Operator message) same as Normal state Bottom: (X is the number of the currently selected track index, Time code display is the slip register for the selected track index)

To increment or decrement the slip register amount for the selected track index, use the Up/Down arrow keys or the Wheel. To clear a slip register, set the slip amount to zero (0), or hold the clear key while also pressing the appropriate track SEL key. To directly enter a slip time into a slip register, use the keypad while in the Normal state to enter the desired slip time amount, then press STO followed by pressing the appropriate track SEL key.

Load Track State Display

In the Load Track state, the display is used to show the directory of all Edit Decision Lists or EDLs (Projects, Sessions, and Compositions) on all mounted drives. Use the wheel or the Up/Down arrow keys to scroll through the list of projects. Press STO to automatically load the first sixteen tracks of the Project into the sixteen MMP track indexes.

01234567890123456789	LCD character positions (left to right)
Project: **nnnnnnnnnnnnnnnnn**	Top: (Operator message) Bottom: (nnn is the project name, use wheel or Up/Down arrows to scroll

Pressing the Load Track key again shows the next level of the EDL hierarchy for the chosen project (usually the Track name) and allows for scrolling through the list of tracks in the Project, and loading any track into the selected track index.

01234567890123456789	LCD character positions (left to right)
Load into Track X: ☐ **nnnnnnnnnnnnnnnnn**	Top: (X is the currently SELected track index) Bottom (☐ indicates an unloaded track, and nnn is the track name)

If a track from the list of available tracks has already been loaded into an MMP track index, the display will ask if you wish to move that track into the currently selected Track index. If accepted, this action will remove the track from its previous Track index location, thus leaving it blank.

01234567890123456789	LCD character positions (left to right)
Move Track X Y	Top: (X is the Track index into which the listed track is already loaded, Y is the currently SELected track index)
X **nnnnnnnnnnnnnnnnn**	Bottom: (X is the Track index into which the listed track is loaded, and nnn is the track name)

To move a loaded track from its current Track index position into the selected Track index or to load a currently unloaded track into the selected Track index, scroll through the list of available tracks until the desired track is located. The display will indicate your choice of both the selected track to be moved or loaded, and the destination Track index. Press the STO key to complete the operation and load the track.

Backup State Display

The Backup state is accessed via the Load Track state by choosing (scrolling to) the desired Project and then pressing SHIFT + SLIP. There are six menu choices that can be displayed: Backup, Rename, TapeMode Convert, WaveFrame Export, OMF Export, and ProTools Export. Use the Up/Down arrow keys or the Wheel to toggle between the Backup types. Only currently mounted disk volumes will be shown as choices for the target of the backup operation. Press CLR to cancel the Backup state and return to the Normal state.

Backup:

01234567890123456789	LCD character positions (left to right)
Begin Backup to: ***Disk X**	Top: (Menu Item) Bottom: (Drive SCSI ID #)

Rename:

01234567890123456789	LCD character positions (left to right)
Rename project as: ***Project Name**	Top: (Menu Item) Bottom:(shows project name)

TapeMode Convert:

01234567890123456789	LCD character positions (left to right)
TapeMode Convert to: ***Disk X**	Top: (Menu Item) Bottom: (Drive SCSI ID #)

WaveFrame Export:

01234567890123456789	20 position LCD character positions
WaveFrame Export to: *** Disk 0**	Top: (Menu Item) Bottom: (Drive SCSI ID #)

OMF Export:

01234567890123456789	20 position LCD character positions
OMF Export to: *** Disk 0**	Top: (Menu Item) Bottom: (Drive SCSI ID #)

Pro Tools Export:

.

01234567890123456789	20 position LCD character positions
ProTools Export to: *** Disk 0**	Top: (Menu Item) Bottom: (Drive SCSI ID #)

After choosing an Export option, the display will prompt for a new name for the exported file:

01234567890123456789	20 position LCD character positi
Pro Tools Export As: ***MMR Project Name**	Top: (menu name) Bottom:(Enter new file name)

For more detail on the Backup, Rename, TapeMode Convert, and Export functions, see ***Chapter 6, File Format Support.***

Verify State Display

In the Verify state, the display is used for operator interface messages which usually request a Yes/No answer or require a number to be entered (such as a password) before normal operation can be resumed.

01234567890123456789	LCD character positions (left to right)
Function Message **Are you sure (Y/N)?**	Top: (Operator message) Bottom: Verification request – press STO for Yes, press RCL for No, use keypad to enter number, or press CLR to Cancel and return to previous state

Error State Display

The Error state will cause the ERROR LED to flash red and show a message in the display indicating an action can not be implemented or gives some other instruction. This state may also present various information messages indicating system status, disk mount status, an event has timed out, or that some type of operation (such as disk formatting) is requiring the system to wait until the operation is finished.

01234567890123456789	20 position LCD character positions
Error: nnnn **Ttttttttttttttttttt**	Top: (nnnn indicates the error message number) Bottom: (t indicates a possible text message)

It is necessary to clear the Error state to return the front panel keys to normal operation. Most error messages can be cleared from the display by pressing the CLR key.

Front Panel Key Groups

The MMP-16 front panel keys and controls are divided into five functional groups, the Transport Group, the Setup & Wheel Group, the Wheel itself, the Track Group, and the Keypad Group.

Transport Group

These keys consist of the On Line, Rewind (<<), Reverse Play (<), Stop (□), Play (>), and Fast Forward (>>), keys. These transport functions are analogous to those found on tape dubbers. The keys are located on the bottom central portion of the front panel, and are larger and backlit to be seen clearly at a distance.

ONLINE This key selects whether the MMP-16 is controlled from an outside sync source or external device (the key is lit), or isolated and working as a stand-alone device (the key is unlit). When pressed in combination with the Stop key (ONLINE+STOP), all currently mounted disk volumes are unmounted in preparation for removal from the MMP-16.

The system will keep track of position on the Biphase input even while offline. To set a new sync interlock point at the current position relative to the Biphase source, simple press ONLINE. To put the unit back ONLINE at the previously established sync point (the interlock location that existed prior to when the unit was taken offline), press SHIFT + ONLINE.

<< (REWIND) The Rewind key causes the current time code position to roll in reverse at approximately 18 times play speed. Rewind cancels any loop operation. There is no shifted function for this key.

< (REVERSE PLAY) The Reverse Play key causes the MMP-16 to play audio backwards at play speed. Except for the direction, other operating parameters such as speed and output level will follow those of Play. If there is a loop function pending, Reverse Play enters Loop play operation and causes the MMP to perform an alternating forward-backward loop. There is no shifted function for this key.

□ (STOP) (MOUNT) The Stop key halts the operation of the transport under all conditions and removes any loop pending mode. It is usually lit in the stopped condition, and not lit under other conditions (with the exception of Jog and Shuttle modes). Used in combination with the On Line key, the Stop key causes all currently mounted disk volumes to be unmounted. There is no shifted function for this key. The alternate function of the Stop key is to MOUNT all available disk drive(s) after a dismount operation has been performed.

> (PLAY) The Play key causes the MMP-16 to play audio in the forward direction at play speed, advancing the time code counter. If there is a loop pending, Play enters the playback loop operation and will play the loop according to the parameter settings in menu 210 (Loop Mode). There is no shifted function for this key.

>> (FAST FORWARD) The Fast Forward key causes the current time code position to roll forward at approximately 18 times play speed. Fast Forward cancels any loop pending operation. There is no shifted function for this key.

Setup and Wheel Group

This group of keys contains the SETUP and arrow keys, and the TRIM, JOG, and SHTL (shuttle) keys. These keys are located on the right section of the front panel, directly over the wheel and below the right end of the LED display panel. The Setup and Wheel Group keys are used to navigate through the various choices in the Setup menus and to control the operation of the Wheel. These keys also have shifted functions indicated in the text above the keys. To access, first press the SHIFT key, then the key itself.

SETUP This key places the MMP-16 into the Setup state, where MMP operating parameters can be changed as required using the Setup menus. To exit Setup mode, press SETUP again or press CLR.

SHIFT+SETUP (+/-) The shifted function of the SETUP key is the +/- (plus/minus) key. This is used during time code entry to change the sign (+/-) of the time code value being entered. Most often used to enter a negative offset amount.

DOWN ARROW This key performs whatever the mode requires, and often duplicates the function of the Wheel in scrolling “downward” through track or menu options, or decrementing numeric values.

SHIFT+DOWN ARROW (SUBF) Toggles the display of subframes in the LCD for both time code and feet and frames. Also controls whether subframes may be entered or trimmed using the Up/Down arrow keys or Wheel..

UP ARROW This key often duplicates the function of the Wheel in scrolling “upward” through track or menu options, or incrementing numeric values.

SHIFT+UP ARROW (TC/FEET) Toggles the LCD transport position and register display between time code or 35mm film feet/frames format.

TRIM Activates a mode in which Wheel rotation and Up/Down arrow keys change the time code value in the currently active register. This allows fine control over incremental and decremental changes in a particular time code value. When TRIM is pressed, the MMP-16 goes into a Trim mode, indicated by the lit LED over the Trim key. At this point, the active register is being “trimmed”, with the left/right arrow keys (JOG/SHTL) selecting the digit, and the Wheel or Up/Down arrow keys incrementing or decrementing that digit. If no register is recalled beforehand, the trim operation is performed only on the entry register’s time code. When trim mode is exited by pressing the TRIM key, the trimmed value is then kept in the register, and the value for that register is sent to the transport.

SHIFT+TRIM (Δ TRIM) The shifted version of this key performs what is called a “dynamic” trim, indicated by use of the Delta (Δ) character for the shifted key designation. The only difference between this and the normal trim is that dynamic trim sends the trimmed value continuously to the transport whenever the value changes.

At any time during either type of trim operation, CLR may be pressed to cancel the trim operation, returning the value of the register being trimmed to its previous value. Pressing TRIM during the trim operation completes the trimming and automatically stores the trimmed value in the appropriate memory or register.

JOG Pressing JOG stops the transport and allows the Wheel to "scrub" over the current location at a speed relative to the motion of the wheel. The minimum Jog speed is Play/8 (3 octaves down), and maximum is 1.5 times nominal speed. Jog is typically used to play audio at slow speed to locate to a particular spot in pre-recorded material in order to identify an edit or punch point. Sound is produced in the Jog mode only as long as the wheel moves.

Pressing the JOG key again or pressing the STOP key halts the Jog action and takes the system out of the Jog mode. Although Jog has no shifted function, the alternate function of this key is the left-arrow, which is active in several different modes, and which typically scrolls the window to view parts of the display that may extend beyond the window. This key also moves the cursor left for selection of a digit within a time code that may need trimming, or for selecting a character value to alter in a Setup menu.

SHTL (SHUTTLE) Pressing the Shuttle key stops the transport and allows the Wheel to initiate sustained audio playback from the current location at continuously variable speeds. Shuttle is typically used to assist in locating a particular spot in pre-recorded material, and is useful for "fast-forwarding" through material while listening. The minimum Shuttle speed is a very slow crawl (Play/1000) and maximum is 1.5 times nominal speed. The Shuttle speed is governed by the distance traveled by the Wheel, with ½ turn equal to half speed, a full turn for nominal speed, and 1 ½ turns for 1.5 times nominal speed. Pressing the Shuttle key again or pressing the Stop key halts the Shuttle action.

Although there is no shifted function of the Shuttle key, the alternate function of this key is the right-arrow, which is active in several different modes, and which typically scrolls the window to view parts of the display that may extend beyond the window. This key also moves the cursor to the right for selection of a digit within a time code that may need trimming, or for selecting a character value to alter in a Setup menu. The lit transport lamps indicate the current relative speed range for Jog and Shuttle according to the following conventions:

- ☐ Indicates the transport is stopped
- ☐ + > Indicates the transport is playing forward slower than nominal speed
- > Indicates the transport is playing forward at nominal speed
- > + >> Indicates the transport is playing forward faster than nominal speed
- ☐ + < Indicates the system is in reverse play at slower than nominal speed
- < Indicates the system is in reverse play at nominal speed
- ☐ + << Indicates the system is in reverse play at faster than nominal speed

Wheel

The wheel is its own group, and has several different functions during MMP-16 operation. In the Normal state, it controls jog and shuttle of the system transport in conjunction with the JOG and SHTL keys. In conjunction with the TRIM key it can be used to manually trim time code registers. In the Setup state, the Wheel normally scrolls through the menu items, but when TRIM is active, it scrolls through the parameter values. In the Track states, it scrolls through the Project or track names for loading and viewing. There is no shifted function for the Wheel.

Track Group

These keys are located at the left central portion of the front panel under the track meters. Although the SEL keys are active all the time, they affect tracks according to which Track Select Mode (EDIT, MON, LOAD TRACK, TRACK, SLIP) is active. The active mode is indicated by the amber LED above the keys, while the active track(s) for that mode are indicated by the amber LEDs above the SEL keys.

SEL (TRACK SELECT)

The sixteen gray SEL keys are located just below their associated meter display LEDs. These keys are normally used to select and deselect their associated tracks, although they do have track independent shifted functions as well (as indicated by the labels above each SEL key: Cut, Copy, Clear, etc.).

When EDIT or MON is active (as one will always be while in the Normal state), the SEL keys choose which tracks are edited (when EDIT is active), or monitored at the headphone jack (when MON is active). The chosen tracks for each function are indicated through the amber LEDs above each SEL key. The chosen tracks are "remembered" by the MMP-16. Thus as EDIT or MON is pressed, the amber SEL indicators change to reflect the selected tracks for each function.

When loading individual tracks in the Load Track state (after pressing LOAD TRACK twice), the Track Select keys allow the selection of the "target" track—the MMP track index to which a stored track file will be loaded or moved. Only one track at a time may be selected in this mode. When viewing tracks in the Track state (TRACK key is active), only one track can be viewed at a time as indicated by the amber LED above the SEL key (the Wheel and arrow keys are active in this mode, scrolling and selecting one track at a time).

When slipping tracks in the Track Slip state (SLIP is active), multiple tracks may be selected as "targets" for a slip operation. However, only the last selected track is displayed on the bottom line of the LCD. A slip value may be entered manually into the entry register, or recalled from one of the memories or registers. It is then stored into the selected track by pressing STO followed by the appropriate SEL key. Slipped tracks (NOT tracks *selected* for slipping) are identified by an LED on the bottom row of the meter panel, regardless of the operating mode of the MMP-16. Press CLR+SEL to clear the slip register for any track and return it to an un-slipped status.

SHIFT+SEL (various EDIT commands)

When shifted (SHIFT+SEL), the Track Select keys perform various edit operations on those tracks previously selected while the EDIT key was active. Editing is controlled by the In point and Out point times from the In and Out registers. Note that the In and Out registers can be automatically set to the start and end times of any event by placing the play head within the event and pressing SHIFT+EDIT.

SHIFT+EDIT (EVENT) Loads the start and end of the event currently under the play head on the selected track(s) into the In point and Out point registers (also called “event capture”).

MON Pressing this key while in the Normal state allows the SEL keys to select which track(s) will be monitored through the front panel headphone monitor output. This does not affect the rear panel Studio Monitor jack, which always presents a mono mix of all tracks.

SHIFT+MON (Slip In/Out) Pressing SHIFT + MON puts the MMP into a Slip In/Out mode that allows for slipping (or nudging) all material between the In and Out register locations on selected tracks. When Slip In/Out is active, none of the status LEDs for the Track Mode Select keys is lit on the MMP front panel. This is to distinguish this mode from all other Track Select Modes, wherein at least one Track Select Mode status LED is always lit. Upon pressing SHIFT + MON, the bottom line of the display will show Slip and a time code entry field. Use the Wheel or the Up/Down arrow keys to enter the amount by which the defined region (between In and Out) on the selected tracks is to be slipped. This operation does not affect sync on material which is not located between the In and Out register locations. Slip In/Out will overwrite any existing material on the selected tracks that is at the new destination location to which the material has been moved.

To complete the Slip In/Out operation, press SHIFT +MON again. The bottom line of the display will show Slip In/Out to indicate that the slip operation has been performed. To exit the Slip In/Out operation without executing the slip, press CLR.

LOAD TRACK Pressing this key puts the MMP-16 into the Load Track state, and is the first step to loading pre-recorded material for playback or for deleting recorded material. Information on the pre-recorded material available on the drive is presented in hierarchical levels on the LCD display, according to the EDL format of the material itself.

For WaveFrame™ or StudioFrame™ volumes, this means the material will be listed in a Project / Episode / Reel / Dub / Track hierarchy, with Episode being an optional element. For Pro Tools™ volumes, the material will be listed in Session / Track hierarchy, and for OMF™ volumes, the material will be presented in a Composition / Track hierarchy.

As with the Setup menu system, the Wheel and arrow keys are used to navigate through the available selections at a given level. Unlike the Setup menu system, however, descending through the hierarchy of track information is accomplished by repeatedly pressing LOAD TRACK. Pressing LOAD TRACK while at the bottom or “track” level exits the Load Track state and returns the MMP-16 to the Normal state.

When LOAD TRACK is first pressed, the LCD will show a list of all WaveFrame Projects, Pro Tools Sessions, or OMF Compositions on all mounted volumes. The wheel or arrow keys are used to scroll through the various choices (if multiple choices are available) and to display the name of each of the available files. To view the next lower level of the EDL hierarchy (Episode, Reel, Act, Dub or Track), for the currently displayed Project, Session, or Composition, press LOAD TRACK again. Repeat this procedure to reach the lowest level available for the particular EDL file type. Pro Tools Session files and OMF Compositions will exhibit only two levels – the main EDL (Session or Composition) and Track.

Once the desired Project or track is located and displayed, press the Store (STO) key to load the Project (up to sixteen tracks) or individual track into the MMP Track index locations. The target Track index is designated by activating the SEL key associated with the Track index (the LED above the SEL will be lit when the Track index is chosen as a target). If a track listed in the display has already been loaded into a track index, the display message will read “Move” rather than “Load”. This allows you to move an already loaded track into a different track index. Which operation is performed depends upon whether the source track file is already loaded; if it is, then a track move is performed. If the source track file is not already loaded, a track load is performed and the track file is loaded or “stored” into the target track. If track information is stored into a track location that is already occupied by a previously loaded track, the previously loaded track is automatically “unloaded.” In Load Track mode, the bottom line of the LCD shows the names of “unloaded” tracks preceded by a small box (the STOP character) in the first character of the display. Loaded tracks are preceded by their track number (indicating the track into which the sound file has been loaded).

The last target track (which defaults to Track 1 at the start of a session) is remembered for the duration of the session. A store operation (either load or move) automatically advances the target track by one, circularly advancing back to track one after track sixteen. The target track may be selected manually by pressing the appropriate SEL key before STO is pressed. The Load Track key is also used to identify Projects or Tracks for Backup. Choose (scroll to) the name of the desired Project or Track, then press SHIFT + SLIP to enter the Backup state.

SHIFT + LOAD TRACK (DELETE)

Pressing SHIFT + LOAD TRACK deletes the currently displayed project or track file. The deletion simply removes the EDL information, not the associated sound file(s), so little disk drive space is reclaimed by this operation. However, sound files not associated with the EDL (track) information are made available for deletion by the Disk Cleanup operation accessed via Setup menu 720. This is the typical method by which space on a given drive volume is reclaimed (the other method is by using Destructive Record on a TASCAM MMR-8 Recorder to record over existing material).

TRACK

Pressing this key places the MMP into the View Track state to allow inspection of the currently loaded tracks. The Wheel, the Select keys, or the Up/Down arrow keys may be used to select and view a track index. If nothing is loaded in a selected Track index, the word “*Blank*” is displayed for that track. Pressing this key again while viewing tracks or pressing the CLR key exits the View Track state and returns the MMP-16 to the Normal state.

SHIFT+TRACK (UNLOAD)

The shifted function of the TRACK key allows “unloading” of a loaded track, and will return the track to the “blank” state, as well as returning the loaded track back to the pool of unloaded tracks, which can then be viewed using LOAD TRACK.

Note that tracks may be loaded or unloaded even while the MMP is playing. This is a very convenient feature of the MMP and allows for auditioning alternate tracks during playback or loading tracks from different projects.

SLIP

Pressing this key allows the re-positioning of selected tracks relative to the timeline and other tracks. The LCD will show the number of the last selected track, although all selected tracks (as indicated by the LEDs above the SEL keys) will be “slipped” as a group. Once the tracks to be slipped have been selected, the wheel or arrow keys are used to trim the slip value. The slip register for each track will be adjusted by the relative amount entered during the slip operation. In other words, if a track is already slipped by 10 frames and it is then made part of a group of tracks which are slipped by two more frames, that track’s slip register will then show a value of 12 frames. The MMP-16 will “remember” the slipped tracks (as indicated by the SLIP LEDs below the meters) and the slip value for a given session, so any slip value must be explicitly removed in order to clear the slip register for that track. To clear the Slip register, either use the Wheel or Up/Down arrow keys to set the Slip value to 0, or press CLR + SEL for the desired track. Note that the value in the slip register is volatile, and will not be retained when the track index is unloaded or replaced by a different track. To slip a track permanently within the EDL, perform an Edit operation (Clear and Paste the contents of the entire track), or use the Slip In/Out function described under SHIFT + MON.

SHIFT + SLIP (BACKUP)

Pressing SHIFT+SLIP places the MMP into the Backup state so that a backup copy of the currently displayed project or track can be made to any mounted drive volume. The Backup state presents three menu items that allow for choosing either normal, Tape Mode, or OMF Export style backup. Use the Wheel or Up/Down arrow keys to switch between these three menus after entering the Backup state.

Normal backup will copy the project or track file including all edit information and associated audio clips to the target drive. The Tape Mode backup will rewrite (copy) the project or track files as continuous media files with no audio edits, and all fades fully rendered. Tape Mode backup will copy only media actually used in the project or track, and provides a way to consolidate the data and “flatten” the file for more efficient playback and disk usage. The word _TAPE will be appended to the end of the file name of the newly created tape mode backup file so that it can be distinguished from the original file name. This is especially important if the backup is made to the same disk as the original file. The OMF Export option will write out all media files and the EDL to any Macintosh formatted disk. The audio files will be converted to Sound Designer II format, and the EDL will be written as an OMF composition referencing the Sound Designer II media. When not in the Load Track state, pressing SHIFT + SLIP will display the current status (progress) of the Backup function.

Keypad Group

These keys are located in the central portion of the front panel, directly under the LCD. In addition to the numeric keys 0-9 (which are mainly used to enter and otherwise manipulate time code), keys performing various other operations are also located here:

- (CLR) the clear time code key
- (CAPT) time code capture key
- SHIFT key
- (STO) store key
- (RCL) recall key
- (LOOP) looping key
- (LOC) locate transport key

NUMERIC KEYS (0-9)

In the Normal state, these keys are used to enter a time code value into the hold register (the bottom line of the LCD). The numeric keys are also used to access ten time code memory registers and in combination with the SHIFT, RCL, STO, LOOP and LOC keys to store or recall time code to and from the various special time code registers. In the Setup state, these keys directly select menu banks, and are used to enter passwords, date, time, and other numeric entry. The Error and Track states may also use these keys to enter a password or other numeric value.

Time code values are entered into the entry register, beginning with the right-hand digit which moves left as additional digits are entered. Use CLR to reset the entry register to zero {00:00:00,00}. As an example of the entry register's use; to enter a time code of 00:34:00,15 (thirty-four minutes and 15 frames); press CLR one or two times (to set the entry register to zero), then the 3 (three) key, 4 (four) key, 0 (zero) key, 0 (zero) key, 1 (one) key, and 5 (five) key. The time code is displayed as the numbers are keyed into the hold register.

To store the entry register time code into one of the ten memory registers, press STO followed by one of the numeric keys. This stores the entry register time code into the selected memory register (0 - 9). The stored time code can later be recalled by pressing RCL then the appropriate numeric key. The entry register time can also be stored to the special-purpose registers that are not display-only (Lynx Sync, Offset, Time, Out, In), replacing the previous register contents. In this case the shift key is added to the store command key sequence (STO then SHIFT+ the appropriate numeric key).

SHIFT+ NUMERIC KEY

The shifted function for each numeric key recalls the special-purpose register contents listed above each numeric key, and for certain registers (the registers associated with keys 0, 4, 5, 6, 7, 8, or 9) performs an immediate transport locate to the register time code value. If STO is pressed before SHIFT+ one of the numeric keys is pressed, then the active register contents (bottom line of the display) are stored in the target register location (providing, of course, that the target register is a writeable and not a read-only register).

LYNX SYNC (SHIFT+0)

This register holds the MMP-16 sync point time which is used in conjunction with the master sync point on the Lynx bus to calculate the MMP-16 offset. Storing a value to this register automatically calculates this offset.

OFFSET (SHIFT+1)
This display-only register represents the time difference between the MMP-16's time code and the time code being chased. When locked to the Lynx bus, this equals the time difference between the MMP-16's time code and the Lynx master time code. In either case, the offset is equal to the MMP-16 time minus the time code being chased.

READER (SHIFT+2)
This display-only register shows the current time code being chased by the MMP-16. If time code chase mode is active, whatever time code is being read is displayed here. If the MMP-16 is a slave on the Lynx bus, it holds the current time coming from the Lynx bus master machine.

FREE (SHIFT+3)
This display-only register shows the amount of recording time available on the system default disk volume (the volume or drive available for recording). Note that this value is always displayed in "time code" format, even if the display format currently is feet/frames, because it is essentially an elapsed time value, not a time code. This display will show the time in "Track minutes" for a single track. ***Note: If more than 24 hours of single track recording is available, the display will show only the time over 24 hours. This is not a software bug, but is a result of the fact that free time is expressed in terms of time code values and there are only 24 hours possible for a time code style display. This happens most often with 9 gigabyte drives where the disk capacity at 16 bit 44.1kHz is more than 28 hours.***

OUT POINT (SHIFT+4)
This register holds the "Out Point" time. It is used as the end point of a play loop and as the end time for a track marked for editing.

TAIL (SHIFT+5)
This read-only register shows the end time of the last edit on the currently loaded tracks. Tracks selected while in the EDIT track select mode govern the operation of this function. If no tracks are selected in the EDIT track select mode, the MMP will scan across all loaded tracks to find the last edit location. To select a single track or a group of tracks for location of the last edit point location, press only the desired track SEL keys while in the EDIT track select mode, then select SHIFT + 5. The location of the last edit point on the selected tracks will be shown.

PREVIOUS EDIT (SHIFT+6)
This register represents the location of the first splice point (or start of the sound event) located just previous to the current location. Each time PREV EDIT is selected the register value moves "back" one event in time in the edit list, showing the start point of the earlier of event.

Pressing SHIFT+PREV EDIT not only finds and displays this point, but also performs an automatic locate function, moving the transport to that point. This is in contrast to RCL+SHIFT+PREV EDIT, which will simply find and display the appropriate time point in the entry register without performing a locate function (also see the Recall key).

IN POINT (SHIFT+7)
This register holds the In Point time code. It is used as the start point of a play loop as well as the beginning time for edit operations on any track selected for editing in the Edit track select mode.

HEAD (SHIFT+8)

This read-only register shows the start time of the first edit on the currently loaded tracks. Tracks selected while in the EDIT track select mode govern the operation of this function. If no tracks are selected in the EDIT track select mode, the MMP will scan across all loaded tracks to find the first edit location. To select a single track or a group of tracks for location of the first edit point location, press only the desired track SEL keys while in the EDIT track select mode, then select SHIFT + 8. The location of the first edit point on the selected tracks will be shown.

NEXT EDIT (SHIFT+9)

This register shows the location of the first splice point (or start of sound event) located just after the current location. Each time NEXT EDIT is selected the register value moves "forward" one event in the edit list, always coming to rest at the next splice point or start of event. Pressing SHIFT+NEXT EDIT not only finds and displays this point, but also performs an automatic locate function, moving the transport to that point. RCL+SHIFT+NEXT EDIT simply finds and displays the next edit time code in the hold register (also see the Recall key).

CLR

This key performs both a clear and a cancel function, operating in almost all modes and situations. CLR has no shifted function.

In the Setup and Verify states, the CLR key takes on its alternate function, "cancel." In Setup, pressing CLR generally returns a changed value back to the previously stored value, or exits altogether. It is also used to re-enter a password, to cancel a password entry, and as an alternative method of providing a "no" response to an operator query. In the Error state, pressing CLR will clear the error message and return the MMP-16 to the previous operating state. During track slip or register trim, pressing the key returns the registers to their previous values (before the slip or trim operation changed them). During time code entry in the Normal state, CLR returns the entry register time code to a zero value. For most other operations, CLR will return the MMP-16 to the Normal state.

CAPT

The capture key places the time code value from the top line of the display into the entry register in the bottom line of the display. After capturing the time code value the CAPT LED will flash until a target register key is pressed to place the captured time code value into that register. Note that pressing CAPT automatically readies the system to store the value into the target register, as if the STO key had already been pressed. This action can be done at any time during normal operation of the MMP-16 (including playback). To complete the capture operation, either press a target register key or press CLR to cancel.

SHIFT + CAPT (TIME)

This register holds the Time code location that is set to be equal to 0 feet and frames. This is used in film post production work to set a "local 0" for interlocking film to a time code source. To set the offset between the time code display and the feet and frames display, use the keypad to enter the time code that will be equivalent to 0 feet and frames into the entry register. Next, press LOC to locate the MMP transport to that time and press CLR to clear the entry register. Finally, press STO + SHIFT + CAPT to enter the number listed in the top of the display into the TIME register. There will now be an offset between the time code display and the feet and frames display when toggling between these two display styles. To clear the time register, locate to 00:00:00:00 and store that to the Time register.

SHIFT The yellow SHIFT key functions like a locking keyboard shift key. When active, it modifies those keys that have a shift function assigned to them (identified by the function name written above the gray keys). Pressing and releasing the yellow Shift key causes the shift LED to turn on, indicating SHIFT is active. Pressing a gray key with a shift function will then perform the shifted function and turn off the yellow Shift LED. To cancel Shift without pressing a function key, press SHIFT again or press CLR (the shift LED will then turn off).

If multiple shifted keys are to be entered in a sequence, press and hold SHIFT (the shift LED will light) while pressing the various gray keys in sequence. When you lift your finger off SHIFT, the Shift function will be canceled (and the shift LED will turn off).

Use of the shift key is indicated in the text by SHIFT+X, where X indicates one of the gray keys. For example, pressing SHIFT+EDIT captures the in and out points of the current edit event, while pressing SHIFT+LOOP only cancels Shift (since LOOP has no shift function). All the various shifted functions are described in the appropriate key definitions. They are also listed in the *Key Command Summary* in Appendix A.

STO (STORE) The Store key is an important key, performing the functions of an enter or confirmation key for various operations, as well as being a selection key for an actual store operation. Pressing STO + SEL will enter the current hold register time code as a Slip amount for the selected track. In the Setup and Track states, its alternate function is to answer “yes” to a Verify or Error state operator query.

In the Normal state, the store key is used to save the hold register value into another register. To store a time code value into a register, press the STO key followed by a numeric key (to save the value to a memory register) or by the shift key and a numeric key (to save the value to a special-purpose register). In the Setup state, pressing STO selects the parameter value displayed in the LCD or undertakes an action, according to the type of menu displayed. In the Verify state, the Store key serves both to complete a password entry and to confirm a potentially destructive action. When loading projects or tracks (in the Load Track state), the Store key initiates the action of loading tracks into the MMP Track index locations. The LED above the Store key will flash when the key is pressed to begin a store operation, and will flash more quickly when pressing this key is a possible YES response to a verify request or menu parameter selection. There is no shifted function for this key.

RCL (RECALL) This key is used to recall one of the time code registers, and to make it the “active” register. Pressing RCL+ a numeric key recalls one of the 10 system memory registers. Special-purpose register contents may also be accessed in this way through using RCL+SHIFT+ a numeric key. After a recall operation, the recalled value is displayed in the bottom line of the LCD. It is preceded with a four-character mnemonic indicating the register that was recalled. The Recall key is also used to provide a NO or negative response to a query when confirmation of a potentially destructive action is required. The LED above the Recall key will flash when the key is pressed to begin a recall operation, and will flash more quickly when pressing this key is a possible NO response to a verify request or menu parameter selection. There is no shifted function for this key.

LOOP Pressing the Loop key prepares the MMP transport for performance of one of several possible types of loop sequences relative to the In and Out time code registers. To start looping after LOOP is pressed and the In and Out times are set, press the appropriate transport key (<, >). To cancel Loop mode press LOOP again before pressing a transport key.

The start point of the loop is always the In register (minus any pre-roll time set) and the end point is the Out register (plus any post-roll time set). If the value of the Out register is less than (i.e., before) the value of the In point register, then the loop will not play and an error message "Loop points inverted" will be displayed, since the In point value must always be considered the "start" point. The loop cannot play across the "midnight crossing" at the 24 hour mark. This includes pre-roll or post-roll amounts. There must be at least one frame between the 00:00:00:00 time code location and the In minus pre-roll or Out plus post-roll times. There is no shifted function for this key.

There are three selectable Loop Play modes (Setup menu 210): Play Once and Stop, Play Once and Cue, and Play Repeatedly. For Play Once and Stop, when play (>) is pressed after LOOP, the MMP-16 will loop from the In register time (minus any pre-roll amount) to the Out register time (plus any post-roll amount), and then stop. For Play Once and Cue, when play (>) is pressed after LOOP, the MMP-16 will loop from the In register time (minus any pre-roll amount) to the Out register time (plus any post-roll amount), then cue to the In point minus pre-roll time. If Play Repeatedly is selected, the MMP-16 will play from the In time (minus any pre-roll amount) to the Out time (plus any post-roll amount), and repeat this same play sequence until STOP or LOOP is pressed again. The MMP does not execute a seamless repeat, so there will be a small gap in time between the end of the loop and beginning of the next iteration of the loop.

There are three selectable Loop Record modes (Setup menu 211): Record Once Only, Repeat Record, and Repeat w/Unload. Record Once Only will record only on the first pass of the loop, and then switch to playback only for subsequent loops. Repeat Record will initiate a recording between the In and Out points for every loop. Repeat w/Unload will make a recording on each pass and then unload the track just created by the record pass before the next loop begins. This allows for rapidly making many recordings in succession and keeping them all as separate sequentially numbered track files in the project.

Note: This menu and Menus 202: Record Key and Menu 203: Rehearse Key exist in the MMP-16 to provide these settings for any MM-RC which may be attached to the MMP-16 as part of a larger system containing an MMR-8. The MM-RC derives its settings for the Record, Rehearse, and Loop Record functions from the unit to which it is attached (via the UI/B board), thus these menus are necessary even though they do not have a function on the MMP-16 itself.

To perform a forward-backward loop, press Loop and then Reverse Play (<). The MMP-16 will play forward from the start time (minus any pre-roll amount) to the end time (plus any post-roll amount) and then play in the reverse direction from the end time (plus any post-roll amount) to the start time (minus any pre-roll amount). The MMP will then continually repeat the process (according to the Loop Play menu setting). Press STOP or LOOP to cancel Looping.

LOC (LOCATE) This key causes the transport to locate to the active register (bottom line of the display) time code. The time code may be from a recalled register, a captured value or a value entered through the numeric keypad. An implicit (or automatic) locate to certain registers is done when a SHIFT+ numeric key is pressed. A locate operation always stops the transport if it is not stopped. There is no shifted function for this key.

Chapter 4 MMP-16 Operation

Loading and Mounting Drives

The MMP-16 will scan the SCSI bus when the system is powered up and will mount all available drives. Be sure that all drive bays holding removable drives contain fully-seated and engaged SCSI disk drives throughout the power-up process. Removable storage devices (such as the Nikon Beluga™ AV LIMDOW optical drive) must be attached to the system SCSI bus when the system powers up. Removable storage devices do not require that removable media disks be present at power up, as long as the device itself is present and turned on. Once the power up process is complete, drives in the removable Kingston carriers may be "spun down" and removed from the MMP-16 following the unmount procedure, and later re-inserted and re-mounted using the mount procedure.

After this point, it is not necessary to turn off power to the MMP-16 if the internal removable hard drive needs to be changed. "Hot swapping" is possible because the Kingston Drive Carrier features an integral lock/unlock key which removes power from the drive when in the unlock position. Before removing the internal drive, **always unmount the drives first** (press STOP+ONLINE), before turning the drive key to remove power. ***DATA MAY BE LOST IF DRIVES ARE NOT UNMOUNTED BEFORE REMOVING.***

HARD DRIVE NOTE:
To prevent drive damage when moving hard drives, always allow plenty of time for the drive heads to lock, and for the drive to spin down and stop, before removing the drive.

Once a new drive has been installed (simply press it into place, it only goes into the slot in one direction), move the key from the unlock position to the lock position. The drive will automatically spin up to speed. After allowing a few seconds for the drive to reach locked speed and release the heads, press the STOP key. The MMP-16 will attempt to mount the drive. The "Mounting Volumes" message will be displayed on the LCD as the mount attempt begins. The MMP-16 will try for up to 30 seconds to find the first drive to mount. This is to allow time for the disk drive to spin up completely. After a successful re-mount (i.e., not a power-up mount), the LCD will display the message "n Volumes Mounted", where n is the number of volumes mounted. If you receive the message "No Volumes Mounted", press the STOP key again. If the "No Volumes Mounted" message persists, re-seat, format, or replace the drive(s) as necessary until the mount succeeds. If the mount operation is attempted after all drives are already mounted, the message "No New Drives Mounted" will be shown.

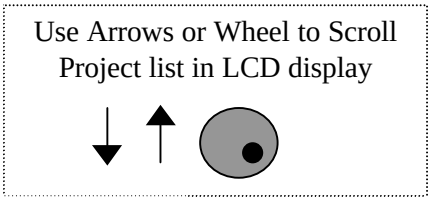
If an unformatted drive is installed, or if the drive is not compatible with the system (i.e., is unreadable by the MMP-16), then the MMP-16 will not be able to mount the volume. To initialize a volume, access menu item 710 (Disk Initialize), and press the STO (store) key. The LCD will display the message {Initialize Disk? }. If it's a new hard drive, or you wish to fully erase and re-initialize a used drive, press STO (store) to continue. The message {Are you sure (y/n)?} then appears. If you wish to continue, press the STO (store) key again. If the drive is known to have information on it, and you wish to keep the information, answer no by pressing the RCL (Recall) key. Drives are initialized in WaveFrame format.

Once the drive has been initialized, it can be used on the MMP-16 or on a WaveFrame/StudioFrame system for recording and playback. A low-level format may be accomplished in a similar fashion, using menu item 711 (Disk Low Format). Note that it will take quite some time to low-level format a disk, with the amount of time dependent upon the size of the hard drive (e.g., for a 2 GB drive figure at least 30 minutes). A low-level format is rarely needed, and should have been done by the drive manufacturer.

Loading a Project

Press LOAD TRACK to show list of Projects, Sessions, or Compositions from all mounted drives. The list is shown in alphanumeric order.

Example: To load 2B Project



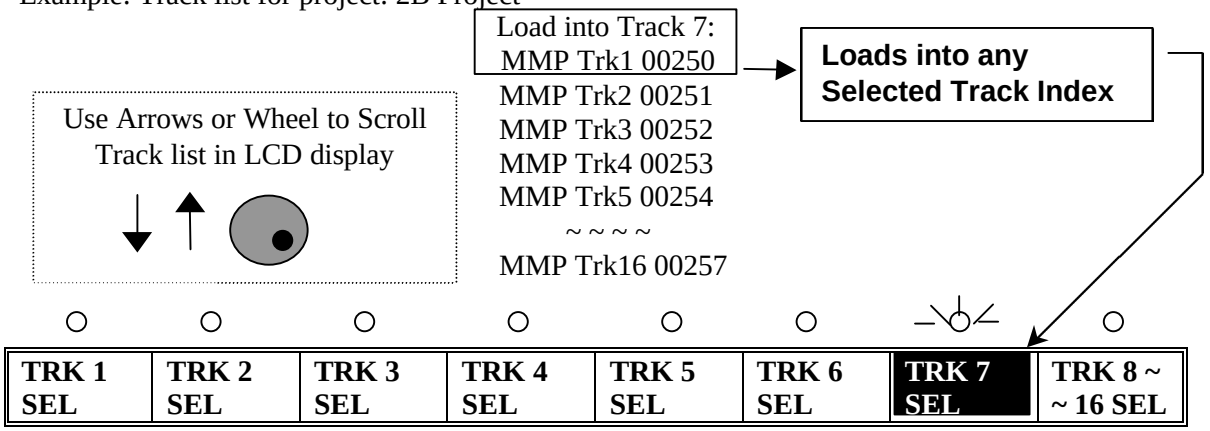
Project	From Disk:
2B Project	1 (MMP/WaveFrame)
A Project	1 (MMP/WaveFrame)
Dialogue Export 1.omf	2 (Macintosh)
Mix Stems 1	1 (MMP/WaveFrame)
Pro Tools Session RWF	2 (Macintosh)
Pro Tools Session SW	2 (Macintosh)
WaveFrame MAT	1 (MMP/WaveFrame)

Press STO [YES] to load the first sixteen tracks from the desired Project into MMP Track Index 1 – 16

Loading Individual Tracks

After pressing LOAD TRACK (as above), choose (scroll to) the Project, Session, or Composition containing the tracks you wish to load. Press LOAD TRACK again to show the list of tracks in the Project, Session, or Composition (if Project is WaveFrame, it may also show Episode, Act, Reel, or Dub).

Example: Track list for project: 2B Project



- Press the appropriate SEL key to choose the desired Track index into which the track will be loaded.
- Press STO [YES] to load the displayed track from the list into the currently selected Track index.
- Use the arrows or wheel to scroll to a different track from the list of available tracks in the project.
- To facilitate loading tracks in succession, the MMP will automatically increment the selected Track index and advance the display to the next track in the list of available tracks after a track is loaded.

After pressing the LOAD TRACK key twice, the first Track name will be displayed in the bottom line of the LCD preceded by a small box (the STOP character) in the first character of the display to indicate the track has not been loaded yet (it is “unloaded”). To load tracks individually in succession starting with Track 1, first press the Track 1 SEL key. The LED on Track 1 will be lit to indicate that when STO is pressed the displayed track will load onto track 1. After track 1 is loaded, the next track name in the list will automatically display, and the LED on track 2 will turn on to indicate pressing STO will store that track onto track 2. Any target track may be selected manually by pressing the appropriate SEL key before STO is pressed. Typically, a hard drive will contain sixteen or more tracks for one project, and thus tracks can be loaded in rapid sequence by simply pressing STO sixteen times in a row. After a track is loaded, the track index number into which the sound file has been loaded will precede the track name.

Once a track is loaded into a track index, it is removed from the “pool” of tracks available for direct loading, but it may be moved from its current track index position to another track index position. If a track from the project is already loaded into a track index, then choosing (scrolling to) that track name in the list of tracks will cause the MMP to ask if you want to Move that track to the currently selected Track index. If a track is moved from its current track index position to a new track index by this method, the previous Track index will then be empty and will show *Blank* when viewed using the TRACK key (View Track state). If you do not wish to move a currently loaded track into an empty Track Index, use the arrows or Wheel to scroll through the list of available tracks to find currently unloaded tracks which may then be loaded into the empty track index. If track information is stored into a track location that is already occupied by a previously loaded track, the previously loaded track is automatically “unloaded.” Press TRACK again (or press CLR) to exit the Track state and return the MMP-16 to the Normal state.

Viewing Tracks

To view which tracks are currently loaded, press TRACK, which puts the MMP-16 into the View Tracks state. Use the Wheel, the arrow keys, or the Select keys to select which track index to view. If nothing is loaded for a given track, the word “*Blank*” is displayed for that track in the LCD.

Unloading Tracks

To “unload” a loaded track and return the track to the “blank” state, while returning the loaded track back to the pool of unloaded tracks, put the MMP-16 into “view tracks” mode by pressing the TRACK key. Select the track you wish to unload, and press SHIFT+TRACK. The displayed track will be “unloaded”, and the word “*Blank*” will appear in the display.

Deleting Tracks from the Disk

To delete a displayed track, enter the Load Tracks state by pressing the LOAD TRACK key, and descending through the project/file hierarchy as detailed above. Select the track you wish to delete, and press SHIFT+LOAD TRACK. Deletion simply removes the track edit information (the “EDL”), not the associated sound files, so very little disk drive space is reclaimed by this operation. However, sound files not associated with any track edit information may be deleted from the disk by using the Disk Cleanup function (found in Setup Menu 720). This is the typical method by which space on a given disk drive volume is reclaimed. When Tape Mode is used on an MMR-8 recorder, existing material will automatically be recorded over (deleted) when a new recording is made where material already exists.

Using the Backup Functions

The MMR-8 and MMP-16 are capable of Backing up files, Converting Projects or Sessions created in Non-Destructive Record Mode into TapeMode Projects or Sessions, Renaming some projects, and Exporting some formats as other formats. To Backup, Convert, Rename, or Export a file using the MMR-8 or MMP-16, first press the Load Track key and scroll (using the up/down arrow keys or wheel) to the name of the Project. Next, press the Shift key followed by the Track Slip key. The shifted function of the Slip key is labeled Backup. Pressing Shift+Slip brings up a series of menus that allow setting the parameters for file Backup, Convert, Rename, or Export. Choose a process by scrolling to the appropriate menu and then press the Trim key to select the SCSI ID number of the drive to which the file is to be backed up, converted, or exported. Press the STO (YES) key to initiate the process. The system will ask if you are sure. Press STO (YES) again to initiate the process, or CLR (CANCEL) to cancel and return to the previous menu.

Backup

Both the MMR-8 and MMP-16 can make a backup copy of any WaveFrame Project, OMF Composition, or Pro Tools Session, either to the same disk as the original file or to an external disk volume. This provides a convenient way to make a safety or archive copy of a project, including the EDL (Project, Composition, or Session) and the audio files. The Backup process will copy the EDL and audio data to the drive specified. If any of the audio files already exist on the target disk, they will not be copied again. The backup menu is accessed by pressing the Load Track key to find the file to be backed up, then pressing Shift + Slip to access the Backup menu:

01234567890123456789	20 position LCD character positions
Begin Backup to: *** Disk 0**	Top: (Menu Item) Bottom: (Drive SCSI ID #)

Press the Trim key to select the SCSI ID number of the drive to which the file is to be Backed Up. Press the STO (YES) key to initiate the Backup process. The menu will ask if you are sure. Press STO (YES) again to initiate the Backup process, or CLR (CANCEL) to cancel the process and return to the previous menu.

The MMR/MMP Backup process will back up all Pro Tools data created on the MMR/MMP but will not copy Pro Tools fade files or preserve Session data such as TDM bus data. If it is necessary to back up Pro Tools files which have this type of data, it is best to use the Pro Tools system to perform the backup. This will be changed in a future MMR software release so that such data is retained during the Backup. **Note that Backups must be made to a disk of the same type (WaveFrame to WaveFrame or Macintosh to Macintosh).**

Rename

The MMR-8 and MMP-16 software can rename any Project or Session file that currently exists on a disk in the WaveFrame, Pro Tools or OMF/SDII formats. Rename of other formats such as Sonic Solutions, Fairlight, Akai and DEVA formats is not supported because the MMR and MMP do not write these file types. To rename a file, access the file by pressing LOAD TRACK and scrolling to the name of the Project to be renamed. While the name of the Project to be renamed is showing in the LCD, press SHIFT+SLIP (backup) and scroll to the Rename menu item:

01234567890123456789	20 position LCD character positi
Rename project as: ***Project Name**	Top: (menu name) Bottom:(shows project name)

Use the Up/Down arrow keys or wheel to choose alphanumeric characters and the Left/Right arrow keys to move to the next or previous character. When the new name has been entered, press STO to complete the process and write the new file name to the disk.

When Rename is used, the old file name will be overwritten and will no longer exist. To save a copy of a Project under a new name while still retaining the original file with the original name, use the Export menu to Export the file to the same disk, using the Export As function described elsewhere in this document to create a copy of the file with a different name. The original file will still exist under the original name.

TapeMode Convert

The TapeMode Convert process will copy the audio data to the drive specified and will “flatten” the EDL so that each track consists of a single audio file. If the same TapeMode audio files already exist on the target disk, they will not be copied again. The word _TAPE will be appended to the end of the file name of the newly created tape mode backup file so that it can be distinguished from the original file name. This is especially important if the backup is made to the same disk as the original file. The Convert to TapeMode menu is accessed by pressing the Load Track key to find the file to be backed up, then pressing Shift + Slip to access the Backup menus and then pressing the up/down arrow keys or wheel until the TapeMode Convert menu appears:

01234567890123456789	20 position LCD character positions
TapeMode Convert to: *** Disk 0**	Top: (Menu Item) Bottom: (Drive SCSI ID #)

Press the Trim key to select the SCSI ID number of the drive to which the file is to be TapeMode Converted. Press the STO (YES) key to initiate the Backup process. The menu will ask if you are sure. Press STO (YES) again to initiate the TapeMode Convert process, or CLR (CANCEL) to cancel the process and return to the previous menu.

Export

The Export feature of the MMR-8 and MMP-16 allows files in one format to be exported as files of a different format. There are three Export menus available, which allow exporting the chosen file as a WaveFrame Project, OMF Composition with Sound Designer II audio media, or as a Pro Tools Session. The Export menu is accessed by pressing the Load Track key to find the file to be exported, pressing Shift + Slip to access the Backup menus, and then pressing the up/down arrow keys or wheel until the appropriate Export menu appears.

Press the Trim key to select the SCSI ID number of the drive to which the file is to be Exported. Press the STO (YES) key to initiate the Export process. The menu will ask if you are sure. Press STO (YES) again to initiate the Export process, or CLR (CANCEL) to cancel the process and return to the previous menu.

WaveFrame Export

Use this menu to Export an OMF Composition with Sound Designer II media to a WaveFrame formatted disk as a WaveFrame Project with WaveFrame audio media. Pro Tools Sessions may not be exported as a WaveFrame Project.

01234567890123456789	20 position LCD character positions
WaveFrame Export to: *** Disk 0**	Top: (Menu Item) Bottom: (Drive SCSI ID #)

OMF Export

Use this menu to Export a WaveFrame Project (with WaveFrame audio media), or a Pro Tools Session file (with Sound Designer II audio media) to a Macintosh formatted disk as an OMF Composition referencing Sound Designer II audio media files.

01234567890123456789	20 position LCD character positions
OMF Export to: *** Disk 0**	Top: (Menu Item) Bottom: (Drive SCSI ID #)

To perform the OMF export operation, first select the project that you wish to convert by pressing LOAD TRACK on the MMP front panel. Then use the Wheel to scroll through the names of available projects and select the desired project.

To access OMF Export press SHIFT + SLIP (this accesses the BACKUP function) and use the Wheel to scroll through the Backup menus until "OMF Export to:" is displayed. Press TRIM and select the disk to which you would like to export (shown by SCSI ID number) and then press STO. You will be prompted by the message "Are you sure (y/n)?" to confirm that you wish to perform an OMF export. Press YES to execute the export or press NO to cancel the export. The target disk must be Macintosh-formatted in order to perform the OMF export function. If it is not, the message "Vol does not support format" will be displayed. The newly created OMF project will have the same name as the project from which it originated, but it will be identifiable by the extension "**.**omf" which is automatically added to the file name of the exported file. The WaveFrame project, from which the OMF project was created, will remain unaffected.

To Import the OMF Export File into Pro Tools

The OMF export files created by the MMP can be imported into the Pro Tools Session format by using the Digidesign OMF Tool software to convert the OMF Composition (EDL file) into the Pro Tools Session EDL format. Sound file data is not re-written for this import step. To get the Digidesign OMF Tool, contact your authorized Digidesign representative, or go to the following FTP site to download the Digidesign OMF Tool:

ftp://ftp.digidesign.com/pub/support/digi/mac/PTs/

Once at this site, download the file OMFTool203.sea.hqx onto a Macintosh computer and un-stuff the file. Once you have completed installation of the software, use it to translate the OMF Composition files generated by the MMP into Pro Tools Session files. Then open the Session files directly in Pro Tools.

Crossfades in OMF

Occasionally a WaveFrame project will have an asymmetrical crossfade that must be adjusted in order to perform an OMF Export, since asymmetrical crossfades in OMF files are not supported. This is very rare, but when this situation does arise the message "OK to conform xfades?" will be displayed. Answering YES will conform the crossfades (make them symmetrical) and the OMF export will be performed. If NO is selected the message "EDL not exportable, try TapeMode convert first" will be displayed. Once the project is converted to TapeMode it is possible to perform an OMF Export without conforming the crossfades. This is because all crossfades are rendered into a single media file per track after using the Tape Mode Convert backup function.

Tape Mode Export to OMF

The WaveFrame format allows “holes” to exist in a sound file, a capability that preserves disk space when working in the MMR/MMP Tape Mode. The Macintosh file system does not allow this, so Tape Mode projects exported to the Mac take more space because the “holes” in the file are written as digital silence and take up disk space. However, when projects that were created in Tape Mode in the WaveFrame format are exported as OMF Compositions and Sound Designer media files, each event in the track will be exported as a separate sound file rather than allocating continuous space for the entire track. This saves drive space when going to the Macintosh file system.

Note that this affects only the export of Tape Mode projects to OMF. Using the Tape Mode Convert capability (in the Backup menu) will cause the new files to be “flattened out” so that the track is written as one continuous piece of audio media. Because of this change, the OMF export composition will be seen by the MMR/MMP as a Non-destructive Record mode project, not a Tape Mode project.

Pro Tools Export

Use this menu to Export a WaveFrame Project, or an OMF Composition with Sound Designer II media to a Macintosh-formatted disk as a Pro Tools Session file with Sound Designer II audio media.

01234567890123456789	20 position LCD character positions
ProTools Export to: *** Disk 0**	Top: (Menu Item) Bottom: (Drive SCSI ID #)

Pro Tools files may be Backed up to a Macintosh disk, Converted to Pro Tools Tape Mode Sessions, or may be exported to a Macintosh disk as an OMF Composition referencing Sound Designer II audio files. Export directly from Pro Tools Session format to the WaveFrame file format is not supported, although you may export a Pro Tools Session as an OMF file and then export the OMF file to the WaveFrame format. As explained elsewhere in this document, you may also Export OMF or WaveFrame files as ProTools Sessions. Exporting a Pro Tools Session as an OMF file to the same disk is a very fast operation since it will only rewrite the Session EDL as an OMF Composition, but will not rewrite the audio files.

Export As

The Export menus allow for changing the name of a file when it is exported. After pressing STO to initiate an Export, the Menu changes to allow entering a new name. It is also possible to use Export As to make a copy of the Project (EDL) under a different name to the same disk as the original file. Audio files will only be copied if they do not already exist in the proper format on the target SCSI device.

01234567890123456789	20 position LCD character positi
Pro Tools Export As: *MMR Project Name	Top: (menu name) Bottom:(Enter new file name)

The MMR/MMP software only allows writing to WaveFrame or Macintosh HFS disk volumes. If an attempt is made to Backup, Export, or Convert to a disk that is not in one of these formats, an error message is shown:

01234567890123456789	20 position LCD character positi
File Vol does not support format	Top: (menu name) Bottom:(Error message – scroll to read entire message on LCD)

Dynamic Backup Status Display

Clear the display and press SHIFT + SLIP (Backup) to interrogate the current status of the backup process. The current status (percent complete) for the Backup, Tape Mode Convert, and OMF Export functions in the Backup Menu is dynamically updated and will display progress all the way to completion as it goes.

Using Registers

There are 21 time code registers (10 memory registers and 11 special-purpose registers) that hold time code values for immediate or future use. Some of the special-purpose registers are automatically filled when tracks are loaded (e.g., HEAD, TAIL), others are updated according to the current play or stop time code reading (e.g., PREV, NEXT), while others (notably memory registers 0 - 9) are entered either manually or through using CAPT, STO, or RCL functions. The register currently displayed on the lower line of the LCD is called the *active* register. By default, the active register is the entry register, which is the register used to capture manual time code input from the keypad.

Accessing registers is done using a two-keystroke command sequence which consists of the function (store, recall, capture) and the numeric or shifted numeric key associated with the desired register (i.e., 0 - 9). Before pressing the second key, operations can be canceled by pressing the same function key again or by pressing CLR, but are typically ended by completing the full key sequence.

Recalling Registers

To recall the time code previously stored into a memory register, press RCL (the RCL LED will flash) and then press the desired key (0 - 9). The RCL LED will turn off and the time code from that register will be displayed in the bottom line of the display, with a prefixed heading indicating which register is the currently displayed (active) register. All special-purpose registers may be recalled similarly, first by pressing RCL, then SHIFT+the desired numeric key. Special-purpose registers have their names written on the front panel directly above the numeric key with which they are associated. Note that if RCL is not pressed first, then pressing SHIFT+ one of these special-purpose register keys — LYNX SYNC, IN, OUT, HEAD, TAIL, NEXT EDIT, or PREV EDIT — will cause the transport to automatically locate to the register contents. This is a short cut for RCL + SHIFT+ register key + LOC.

Capturing the Current Time Code

During any transport state (stop, play), the current time code shown on the top line of the LCD display can be captured into the entry register by pressing the CAPT key. The captured time code can be stored to one of the ten memory registers for later recall, or to one of the five “writeable” special-purpose registers (IN, OUT, OFST, LYNX SYNC, TIME). The capture key places the time code value from the top line of the display into the active time code register in the bottom line of the display. After capturing the time code value the CAPT LED will flash until a target register key is pressed to place the captured time code value into that register. Note that pressing CAPT automatically readies the system to store the value into the target register, as if the STO key had already been pressed. To complete the capture operation, either press a target register key or press CLR to cancel.

Trimming Time Code Values

Any time a writeable register is shown in the bottom line of the display (usually by being recalled), it can be trimmed as required. There are two types of trimming: *static* and *dynamic*. Dynamic trim is desirable only in certain special situations, and differs from static trim in that the register values are sent to the transport immediately as they are changed. In static trim, register values are sent to the transport at the point where trim mode is exited. Note that Trim mode cancels Jog or Shuttle modes, if active, since Trim, Jog, and Shuttle are mutually exclusive.

To trim the time code in the active register, press TRIM (for static trim) or SHIFT+TRIM (for dynamic trim). The TRIM LED will flash slowly (static trim) or flash quickly (dynamic trim) to indicate trim mode is active. Rotate the Wheel clockwise or press the up-arrow key to increment the time code numbers, or rotate the wheel counterclockwise or press the down-arrow key to decrement the time code numbers.

When the desired value is reached, press TRIM again to exit trim mode. This saves the value as trimmed, while continuing to display the register last trimmed. If you don't want to save the trimmed value, exit trim mode by pressing CLR. This cancels Trim mode and restores the register to its pre-trimmed value.

Using the Entry Register

In the Normal state, the bottom line of the LCD typically displays the entry register. This register is used for manual time code entry from the keypad. It can be used to update memory registers and the writeable special-purpose registers. Once time code is displayed in the entry register, the MMP-16 can be immediately located to that time by pressing the LOC key. The following methods may be used to enter time code into the entry register while in the Normal state):

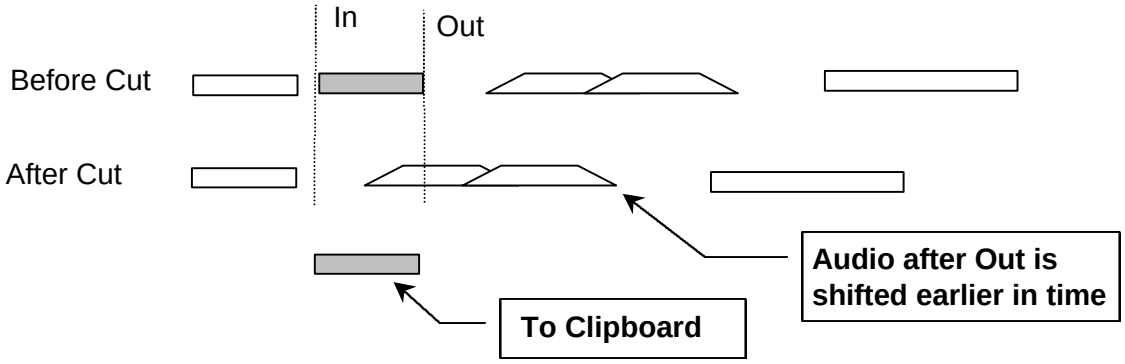
Direct time code entry	Use the numeric keys to type in the time code. The keyed time code will replace any existing time code in the display. Use this method if the time code position is known. Pressing CLR will reset any existing time code in the register to zero, making it easier to enter new time code numbers.
Capture the time code	Press CAPT during play or while stopped. This copies the "play head" time code shown in the top line, at the moment the CAPT key is pressed, to the entry register on the bottom line.
Recall, Trim, and Store a Register	Recall and trim one of the ten memory registers (using RCL+0 - 9), or one of the special-purpose registers (using RCL+SHIFT+0 - 9), and press the STO key. The register time code value is then copied to the entry register.

The time code value in the entry register can be trimmed, as required, by using the Wheel or Up/Down arrow keys to increment or decrement the time code before any other action is taken on the time code.

Editing

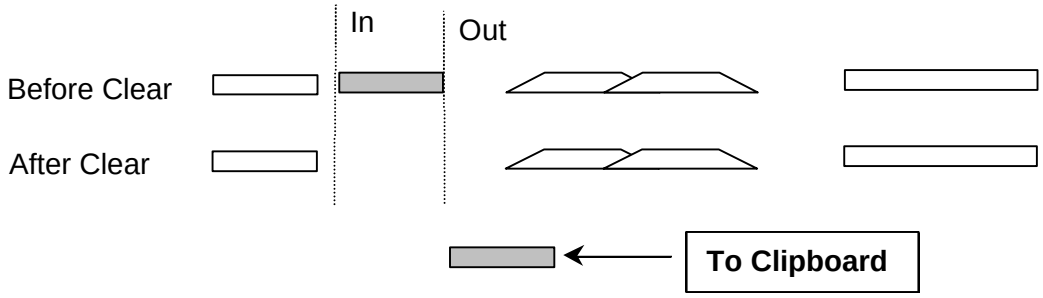
The Edit commands activated by the shifted SEL keys perform the indicated edit operation only on those tracks selected while the EDIT key is active. The shifted functions for the SEL keys are *cut* (SHIFT+SEL 1), *copy* (SHIFT+SEL 2), *clear* (SHIFT+SEL 3), *paste* (SHIFT+SEL 4), *insert* (SHIFT+SEL 5), *open* (SHIFT+SEL 6), *undo* (SHIFT+SEL 7) and *redo* (SHIFT+SEL 8). Following are illustrated summaries of these edit operations:

Cut *Cut* removes the audio from the selected track(s) between the In point and the Out point and places it into the clipboard, while pulling up (slipping earlier in time) all subsequent events by an amount equal to the length of the cut track segment.



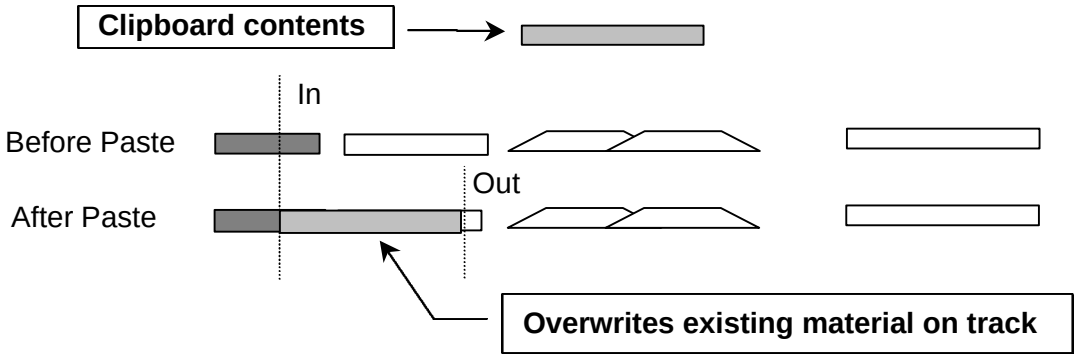
Copy *Copy* places a copy of the material that is between the In and Out points on the selected track(s) into the clipboard without altering the audio events on the track(s).

Clear *Clear* removes the events on the selected track between the In and Out points, replacing the audio with silence. It does not affect the position of any other audio material on the track.



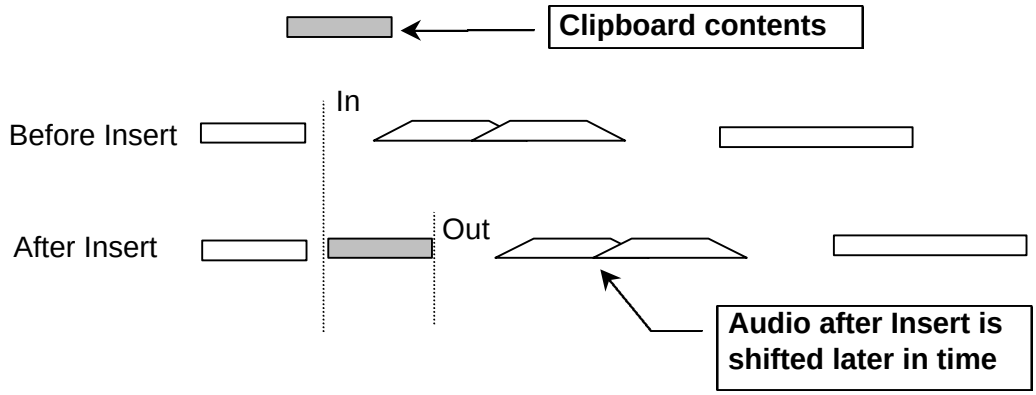
Paste

Paste places the contents of the clipboard into the selected track(s) at the position of the In register and overwrites any existing material on the selected track(s) starting at the In point time and extending for the duration of the clipboard contents. It does not alter the placement of any other material on the track(s).



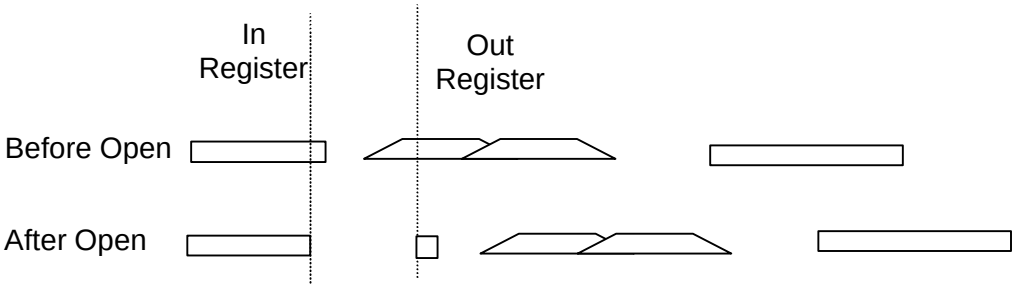
Insert

Insert places the contents of the clipboard into the selected track(s) at the In point time, while moving all subsequent events “down stream” (later in time) by the length of the inserted event(s).



Open

Open places a segment of silence into the selected track(s) equal to the time between the In point register and the Out point register. It functions like an Insert, slipping all subsequent material on the selected tracks downstream in time. Another way to say it is that all material on the selected tracks from the In point onward is moved (or rippled) so that it now begins at the time code location in the Out register. If the In point is within an audio segment on the track, the segment is split at the In point, with material before the In point remaining in place and material after the In point shifted to the position defined in the Out register.



Undo

Undo un-does the last edit operation. There are 100 levels of undo available, accessed by selecting SHIFT and then pressing SEL7 one or more times (while the SHIFT key is active).

Redo

Redo re-does the last undo edit operation. There are 100 levels of redo possible, accessed by selecting SHIFT and then pressing SEL 8 one or more times while the SHIFT key is active.

Undo and Redo put the time code registers and Selected tracks to the state they were in before the edit (undo) or after the edit (Redo).

EDIT

Pressing this key (while in the Normal state) allows the SEL keys to select which track(s) will be later edited (using the SHIFT+SEL edit functions described above). The suggested sequence of keystrokes to follow for editing is:

Press the EDIT key to enter the Edit Track Mode, then the SEL key for the track(s) to be edited.

Set the In and Out points to define the range of material to be affected on the selected track(s).

Press SHIFT + SEL for the desired edit function (Cut, Clear, Copy).

Set the In point to the time code location where the material on the clipboard is to be placed.

While the EDIT key is still enabled (amber LED is on), press the SEL key for the track(s) where the material on the clipboard is to be placed.

Press SHIFT + SEL for the desired edit function (Paste, Insert)

This completes the Edit operation. Note that Open operates differently in that it does not place material from the Clipboard into a track, but instead references the length of time between the In and Out registers and moves the downstream material by that amount.

If material from a single track is placed on the clipboard, but multiple destination tracks are selected, only the first selected track (counting upwards from 1 to 8) will be used as the target for the Paste or Insert.

If multiple tracks are placed on the clipboard, then multiple destination tracks can be selected. Selecting the same number of target tracks as used for the clipboard operation insures the material will be placed on only those tracks. If a different number of target tracks are selected, the Paste or Insert will place the clipboard material consecutively on the selected tracks, starting with the first selected track, up to the limit of the number of tracks selected. For example:

If material is Copied from Track 1, then tracks 3, 4, 6, and 8 are Selected for the target, the Paste operation will only put material on track 3.

If material is Copied from tracks 2, 4, and 6, then tracks 1 through 8 are all selected, the Paste operation will place material on tracks 1, 2, and 3. If only three tracks are selected for the Paste (for example, tracks 3, 5, and 7) then the material will go on those tracks in order.

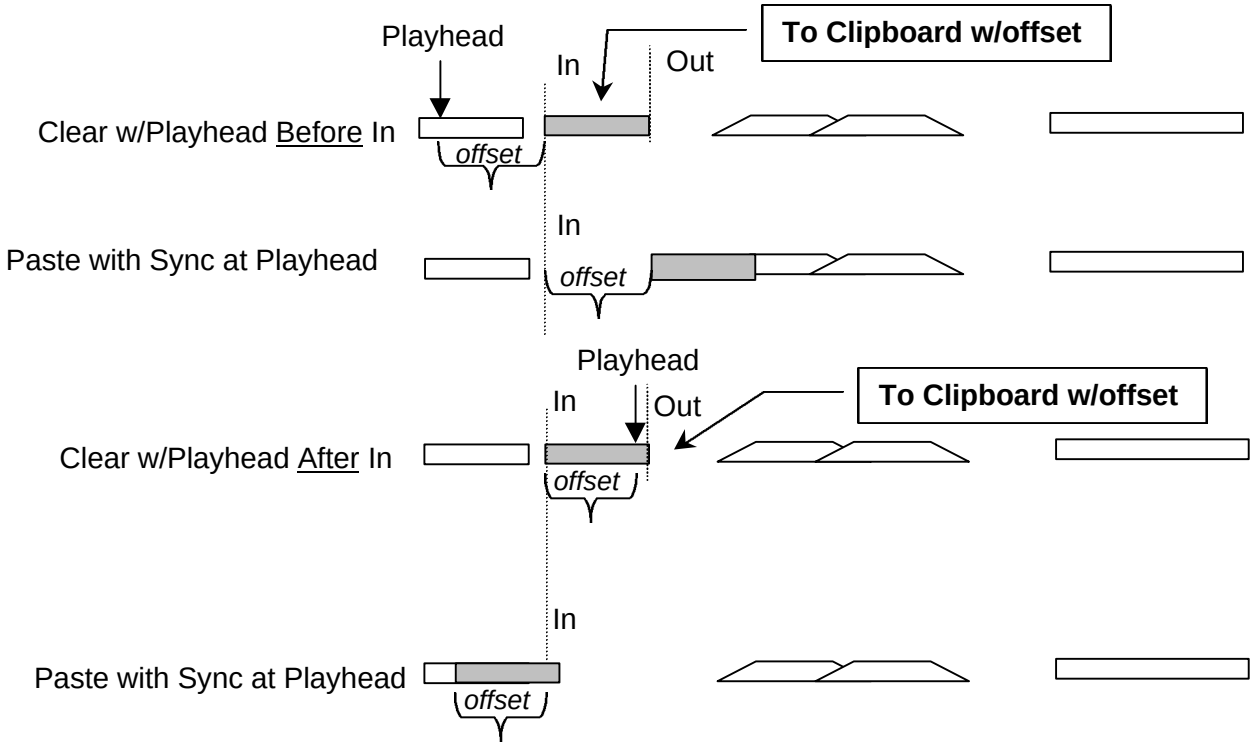
Edit Sync Mode

The setting chosen in Setup Menu 221 - **Edit Sync Mode** – determines which point in the audio material to be pasted or inserted from the clipboard will be used as the sync reference point for the edit. This is a very important consideration, since the end result of the edit operation may be very different depending on the current setting of this menu parameter when the edit is performed.

The two parameters for this menu are Sync at In Point and Sync at Playhead.

When Sync at In Point is chosen as the Edit Sync Mode, the beginning of the region placed in the clipboard (by executing a Copy, Clear, or Cut operation) will be placed at the current In register time code setting when a Paste or Insert operation is performed. This is the mode illustrated in the graphic representations of the Edit functions shown on the previous pages of this manual.

When Sync at Playhead is chosen as the Edit Sync Mode, the location of the playhead relative to the In register is remembered as an offset when the material is placed on the clipboard (by executing a Copy, Clear, or Cut operation). That offset point (rather than the beginning of the region defined in the clipboard) will be placed at the current In register time code when a Paste or Insert operation is performed. The region defined in the clipboard will be placed at the appropriate location relative to the offset amount defined when the Cut, Copy, or Clear operation was performed. The Playhead offset can be before or after the In point of the material placed on the Clipboard. Here are two examples:



This function is most often used to synchronize a point within an audio segment (for example the point of the Doppler shift in a car drive by) to a specific time code point (the place where the car appears closest in the shot).

Local & Studio Monitoring

A front panel headphone jack allows the MMP-16 operator to locally monitor one or more tracks, right at the front panel, without affecting the output signals. The rear panel mini-jack output on the PRX card is designed for studio monitoring using a customer-supplied studio monitor amplifier and speaker. The mini-jack level is not controlled by the front panel volume control, and the audio output of the mini-jack always presents a mono sum mix of all tracks according to the track monitor selection chosen on the front panel. Headphone and studio monitoring both follow the Input Monitor selection, so if a track is being monitored and it is switched to Input Monitor, the audio change will be heard in the headphones and studio.

Headphone Volume (LEVEL)

The headphone monitoring volume is set by the LEVEL control next to the headphone jack.

Headphone Jack (PHONES)

Even though the Headphone jack is a standard pro-size stereo headphone jack (phone-type), all track monitoring is done in mono. Either low (8 ohms) or high impedance (600 ohms) headphones can be used.

HEADPHONE NOTE:

To prevent hearing damage, always turn the Headphone Level full off before putting on the headphones and leave the Level at a low volume until at least one track has been selected for monitoring.

The Lynx Bus

The Lynx bus allows control of the MMP via a TimeLine Lynx Keyboard Control Unit (KCU). Connect the KCU to one of the Lynx bus connectors on the back of the MMP. It is not necessary to have a Lynx 2 module as part of the system, since the MMP behaves as a Lynx synchronizer itself when connected to a KCU. Other Lynx modules may then be connected through the other Lynx bus connector and the entire system (up to a limit of six devices) controlled from the KCU.

To setup the MMP to be controlled from a Lynx KCU, set menu 120 (Lynx Bus) to Slave/KCU and use menu 121 (Lynx Address) to set a valid Lynx address (one not used by any other Lynx device controlled form the KCU). Although normal transport and track arm functions may be controlled from a standard KCU, there is a special version of the Lynx KCU software (version 900) which provides increased support for special MMP functions.

The KCU 900 software provides the following features for controlling the MMP-16 and MMR-8:

- Transport Control
- Track Record Arm/Select (MMR-8 only)
- Slip Track/Region
- Undo/Redo
- Goto Prev/Next Edit
- Goto Head/Tail
- Clear/Paste

Note that No support is provided by the KCU 900 software for the Lynx System Supervisor Unit (SSU)

Transport Control

The Lynx KCU will recognize the MMP-16 unit and will control all of the normal transport functions of the unit. Note that the KCU does not support reverse play of multiple MMP units. When using the Roll Back key for reverse play, it is first necessary to solo a machine.

Track Record Arm/Select (MMR-8 Only)

To arm a track for record or to select a track for an edit or goto operation, press the Track key on the KCU and then press the appropriate number key on the calculator keypad to select or arm the desired track. The Slip operation, as well as goto Prev/Next edit, goto Head/Tail, and Clear/Paste will operate only on tracks that have been selected in this manner. If one of these operations is attempted, but a track is not selected, the KCU display will prompt you to select a track first.

Head/Tail

Hold CLR while pressing the Head or Tail key to set the current time to the beginning or end of the material on the selected track(s). You may then play from that point, or store the value in the desired timecode register (press STO then the appropriate key on the Calculator).

Slip Track/Region

The K900 KCU software has a Slip key in the place of the key previously labeled END PT in the Special Functions section of the KCU. Pressing this key puts the KCU in a “Trim” mode to allow slipping the selected material forward or backward in time. The selection is defined as all material located between the In and Out timecode registers on tracks that have been armed/selected as described above (see Track Record Arm/Select). Upon pressing Slip, the – and + keys will highlight and the Wheel will be in Trim mode. Use the Wheel or keys to enter a trim value to indicate how far the selected region will be slipped. To end the operation and complete the Slip, press either the Trim key or the Slip key. Note that slipping material within a track will automatically overwrite any previous material on the selected track(s) at the new location.

To slip an entire track, use the goto Head/Tail commands (Hold CLR while pressing the Head or Tail key) to set the current time and then store the value in the appropriate register (press STO then the In or Out key on the Calculator) before executing the Slip command. To slip a single edit in an EDL, use the PREV and NEXT keys in a similar fashion to locate the beginning and end of the Edit on the desired track and store the time value for the beginning and end of the edit region in the In and Out registers before executing the Slip command.

Prev/Next

Hold CLR while pressing the PREV and NEXT keys to set the current time to the beginning or end of an edited region on the desired track. You may then play from that point, or store the value in the desired timecode register (press STO then the appropriate key on the Calculator).

Undo/Redo

Hold CLR while pressing the Undo or Redo key to undo or redo the previous edit operation. The MMP-16 supports ten levels of Undo and Redo. The MMP display will indicate which level of Undo or Redo is affected by the operation, up to the maximum or ten.

Clear/Paste

Hold CLR while pressing the Clear or Paste keys to perform these edit operations on the selected material. Clear will remove audio from the selected tracks between the In and Out times, replacing it with silence and will place the material into the MMP clipboard memory. Paste will place the material from the Clipboard memory at the time set in the In timecode register on the selected track.

The MMR Bus

The operation of multiple MMP-16s may be synchronized by using the supplied 15-pin sync cable to connect the MMP units together via the MMR bus sync connection (the two 15-pin connectors on the SYNC card). Since this bus is self-terminating, simply daisy chain all the MMP-16s together in any order. The MMR bus supports four independent Sync Groups, so any machine on the MMR bus can be assigned to any of the four groups at any time without changing the physical connections. Also, since the MMR bus carries system-wide frame and sample references, no other connections are required between the various MMP-16s to provide sample accurate synchronization lock between them.

Each MMR/MMP Sync Group on the MMR bus must have a Master MMR or MMP unit, with the rest of the units in the Sync Group acting as Slaves to the Master unit. It is only necessary for the Master unit to receive incoming synchronization signals from external sources (digital clock, video sync, SMPTE/EBU, biphase, etc.) since the remaining units on the associated MMR bus Sync Group will slave only to the Master unit. This allows up 100 units to work synchronously and sample accurately together as one large machine without having to feed duplicate sync reference signals independently to each unit.

Once the units to be linked using the MMR bus have been physically connected via the MMR bus connection, their transports can be operated together as one large system. There are several Setup menus which are used to govern how each unit behaves within the system. These are described here.

Menu 110 (MMR Bus Request) allows each MMR/MMP to request to be Master, Slave, or off the MMR bus altogether. Only one MMR/MMP per sync group can act as master. If multiple units are set to request master status through this menu, the MMR Bus system will automatically choose the unit with the lowest serial number among those making the request to be set as the master for the sync group. The appropriate MAST or SLAVE LED will light on the front panel to show the unit's status on the MMR bus.

Menu 111 (Ident Request) allows each unit to request an individual identity on the MMR bus. If no other unit is requesting the same ID, the system will set the unit ID to the requested number and that number will be displayed in the Ident window on the front panel of the MMP. If another unit has requested the same ID, the system will resolve the conflict and automatically assign each unit a unique ID on the bus. If an ID other than that requested is assigned due to a conflict, this field will not change, and the machine will continue to request this ID whenever it is powered up or added to an MMR bus chain.

Menu 112 (Ident Assigned) is an information display only (data cannot be entered) that shows the currently assigned identity for this unit on the MMR bus. This number may be different than the ID requested if there is a conflict on the MMR bus and the system has assigned the unit a different ID.

To synchronize a slave unit to the master unit on the bus once the above settings are confirmed, place the slave unit online (press the ONLINE key on the transport).

Chapter 5 MMP-16 Setup Menus

The Setup State & the Setup Menus

Setup menus allows individual MMP-16 parameters to be changed, and if desired, saved to one of the ten User settings files. Parameters can also be changed within the current session without saving them to a specific User settings file. Changes made in this way are automatically stored in a system init file and will still be remembered even if the MMP-16 is powered down and restarted.

To enter the Setup state, press SETUP. To exit the Setup state and return to the Normal state, press the SETUP key again, or press CLR. While in the Setup state, a display of various Setup menus and their parameters takes the place of the time code display shown in the LCD in the Normal state.

When the Setup state is activated for the first time after power-up, Setup menu 000 (the Control Mode selection menu) is displayed in the LCD. The Setup menus are divided into ten banks, grouped according to their common functions (see Table 4-1). Scroll through the various Setup menus by rotating the Wheel or using the Up/Down arrow keys. Clockwise (CW) rotation or up-arrow incrementally scrolls upward through the menus, while counterclockwise (CCW) rotation or down-arrow scrolls downward through the menus. The scrolling wraps around at the end of the list (thus menu 990, the highest menu in the 900 bank, is displayed when the wheel is rotated CCW from menu 000, and vice versa). Jump directly to any menu bank by pressing a numeric key while in Setup. For example, pressing 3 will jump the display to menu 300 (Biphase Frame Rate), which is the first menu in the 300 bank.

BANK #	BANK DESCRIPTION
000	Basic Setup (Control Mode, frame/sample reference, etc.)
100	Bus Control (sync group, MMR/Lynx bus, interlock)
200	Transport Control (Record modes, Loop modes, pre/post roll, etc.)
300	Biphase (pulse rate, motion limits, start/end limits)
400	Remote Control (parallel remote)
500	Audio parameters (input source, calibration, reference level & tone)
600	Digital I/O (format, delays, sample rate conversion & reference tracks)
700	Disk (formatting, cleanup, archive)
800	Tracks & Projects (project name, track prefix)
900	System (store/recall settings, date & time, LED brightness, serial #)

The Ten Setup Menu Banks

The JOG and SHTL (Shuttle) keys above the Wheel take on their alternate reversed text-labeled functions (left and right arrows) when pressed during Setup. Note that these are not shifted functions, but alternate functions that occur in the Setup or Track states. These keys typically affect window scrolling, but in some cases move a cursor to different points in displayed information.

When trimming is active (press TRIM), rotating the Wheel or pressing the Up/Down arrow keys scrolls through the available selections for the current menu. These selections also usually "wrap around." If the menu requires a single numeric value, the wheel or arrow keys will increment or decrement the numeric value, but it will not "wrap around" once the top or bottom of the range is reached. For character and time code items, the left/right arrow keys usually control the position of the cursor (and therefore which character or digit is changed), rather than horizontally scrolling the window.

Setup Operation

There are various types of Setup menu items, each with its own particular behavior. Many scroll through a set of multiple-choice selections; others simply display information that cannot be altered, such as a version or serial number. The top line of the LCD in Setup lists the menu number and name, while the bottom line shows the current menu item value. Here's a typical example:

`0123456789012345678 9`	LCD character positions (left to right)
`000 Control Mode` **`  *Biphase Chase`**	(Setup Menu Item number and name) (The current parameter choice)

The asterisk (*) directly before the item value indicates that the displayed value is the currently selected value.

To scroll through the parameters in a menu of this type, press the TRIM key (the LED above TRIM will turn on) and then rotate the Wheel or press the up/down arrow keys. Each choice will be sequentially displayed. Once the desired parameter is shown in the display, press STO (the Store key). This activates that choice, placing an asterisk in the display, and exiting trim mode. At this point, rotating the Wheel or pressing the arrow keys will again scroll through the menus. To stop scrolling through the parameter list without saving any changes, press TRIM again. To exit Setup and return to the Normal state, press SETUP or CLR. Exiting Setup does not save a value, but exits without changing the current menu item's value. Exceptions to this are the few menu items that update dynamically as they are changed, such as LED brightness (menu 920).

The next pages provide a chart of all of the MMP-16 menus and the parameter choices for each menu item. Following the chart, some of the menus and the parameter choices they present are discussed in more detail.

Setup Menu Chart

This chart lists all of the Setup Menus and their parameters. Note that * indicates the default selection.

MENU #	MENU NAME	PARAMETERS
000	Control Mode	Local/MMR* Time Code Chase Biphase Chase Serial Transport Editor Varispeed
001	Frame Reference	Automatic* Video
002	Sample Reference	Automatic* AES/EBU Input Ext Wordclock
003	Time Code Type	24/24 25/25 29.97/DF 29.97/NDF 30/DF 30/NDF*
004	Sample Rate	42294 (44x23/25) 42336 (44x24/25) 44056 (44100-) 44100 44144 (44100+) 45938 (44x25/24) 45983 (44x25/23) 46034 (48x23/25) 46080 (48x24/25) 47952 (48000-) 48000* 48048 (48000+) 50000 (48x25/24) 50050 (48x25/23)
006	Varispeed Rate	100% * (range 88.5% to 104.3%)
100	Sync Group	1* 2 3 4

MENU #	MENU NAME	PARAMETERS
110	MMR Bus Request	Master Off* Slave
111	Ident Request	Auto Assign* 01 (Range 01-100)
112	Ident Assigned	01* (Range 01–100 read-only display)
120	Lynx Bus	Off* Slave/KCU Master
121	Lynx Address	1* Range: 0 through 127
122	Lynx V500 Mode	Off* On
210	Loop Mode	Play Repeatedly* Play once and Cue Play once and Stop
211	Loop Record	Repeat Record* Record Once Only Repeat w/Unload
212	Pre-Roll	00:00:05:00*
213	Post-roll	00:00:02:00*
220	Next/Prev Mode	Event* Cue
221	Edit Sync Mode	Sync at In Point* Sync at Playhead
250	Slip Commit	All Tracks* Track 1 [lists all tracks through Track 8 on MMR, 16 on MMP] Track *N*
300	Biph Frame Rate	24 fps* 25 fps 30 fps
301	Biph Pulse Rate	2 ppf 4 ppf 10 ppf* 20 ppf 25 ppf 50 ppf 100 ppf
302	Biphase Input	Biphase* Tach + Dir Tach + Inverse Dir

MENU #	MENU NAME	PARAMETERS
400	Editor Device	TASCAM MMR-8* Sony PCM-7030 Sony BVU-950
404	Editor Chase	Disabled * Timecode Biphase
420	MIDI Device Id	74* (Range 1 to 127)
510	Crossfade	10 ms* Range: 0 through 100
520	Meter Ref Level	-20 dBFS* Range: -15 through -24 dBFS
522	Clip LED on Play	Off* On
530	Reference Tone	Off* 1kHz
550	Remote Meter Source	MMR Bus* Local
610	Digital Out Delay	Internal* Number of Samples (Range:1 through 255 Samples)
710	Disk Initialize	Press STO
711	Disk Low Format	Press STO
720	Disk Cleanup	Press STO
790	Drives Mounted	[shows list in format: 0,1,2,3,4,5,6]
800	Project Name	MMR Project*
810	Track Prefix	MMR Trk*
900	Store Settings	User 1 [through] User 10
901	Recall Settings	Default User 1 [through] User 10 Previous
910	Set MM:DD:YY	Date: __:__:__
911	Set HH:MM:SS	Time: __:__:__
912	Change Password	Press STO
920	LED Brightness	8* Range: 0 through 15

MENU #	MENU NAME	PARAMETERS
940	Machine Name	Unnamed machine*
950	IP Address	000.000.000.000
951	IP Netmask	255.255.255.255
952	IP Gateway	000.000.000.000
980	Serial Number	Read – only display
990	Software Version	Read – only display
995	Load Software	Press STO key

000 Basic Setup

This menu bank has settings for the most fundamental settings governing how the MM series machine responds to external clocks and control. The items in this bank are:

- Control Mode
- Frame Reference
- Sample Reference
- Timecode Type
- Sample Rate
- Varispeed Rate

000 Control Mode

The MMP-16 will always operate in one of six Control modes. The default Control mode, which is how the MMP-16 starts up when the unit is first installed, is called the Local/Bus Control Mode.

To change the Control mode, select Setup menu 000 (press SETUP to display the Setup menus). Whenever the MMP-16 is powered up, the first menu displayed will always be menu 000 (“Control Mode”). Afterwards, the menu displayed when entering Setup mode is the last menu displayed. Once Setup menu 000 (“Control Mode”) is displayed, press TRIM to change the Wheel and the Up/Down arrow keys to scroll through the seven menu choices under Setup menu 000. Once the desired operating mode is displayed, press STO (the Store key) to select that choice. This immediately switches the various parameters to the new control mode, typically causing several LEDs to change status according to the new parameters. To exit Setup mode, press SETUP or the CLR (Clear) key.

Following is a more detailed description of the six control modes that are supported by the MMP-16:

Local/Bus

In local mode (offline) the MMP-16 functions like other stand-alone digital playback devices. No external sync signals are required. The front panel transport keys offer direct control over system audio playback. When placed into bus (online) mode, the MMP-16 can function as either a master or a slave to other MMR bus or Lynx bus devices, as set through Setup menu 110 (MMR Bus) and menu 120 (LYNX bus).

Time Code Chase

In Time Code Chase, the MMP-16 will slave to the time code coming from the time code input on the rear panel when it is placed Online. In this mode the time code input must have valid time code in order for the MMP-16 to chase, lock, and synchronize itself to the incoming time code. Pressing any of the transport keys will take the MMP-16 off-line and allow local control at any time. Placing the MMP-16 back online will cause it to lock to and chase the selected time code once again.

Biphase Chase

In Biphase Chase, the MMP-16 chases, interlocks, and synchronizes to a biphase or tach/dir. signal on one of the four Biphase Inputs (the active input is determined by the Sync Group number set in menu 100). The system locks and plays audio at speeds from 0 to 1.5 times play speed in both forward and reverse directions. The MMP-16 can then serve as a master for other devices on the MMR or Lynx buses.

Serial Transport

This mode allows the MMP-16 to control an external audio or video transport connected to the 9-pin serial Transport connector. Video and audio decks using the P2 protocol can be controlled (including models from Accom, Alesis, Ampex, Fostex, JVC, Otari, Panasonic, Sony, and TASCAM). When in Serial Tran mode, the MM series unit will output transport commands to external serial devices through the 9-pin serial Transport output using Sony P-2 protocol. The unit will then lock to the external serial device via linear timecode coming from the device through the MM unit's timecode input (not through serial timecode).

Editor

Using the Editor connector (and Sony P2 protocol) a video editor or other non-Lynx synchronizer can control the MMP-16 transport functions when the MMP-16 Control Mode is set to Editor. When in Editor mode, the MM series unit will respond to transport and track arming commands coming in to the 9-pin serial Editor port. This setting is typically used with traditional video edit controllers.

Varispeed

Varispeed mode allows for setting playback speed within a range of 87.5% to 112.5% of nominal play speed. This range varies according to the sample rate selected. Varispeed varies the playback frequency as well as the digital sample clock on the digital output.

Serial Editor Port Details

There are a number of important details to note about the Serial Editor port as noted below.

Record Ready Tallies

Record ready tallies issued over the 9-pin serial Editor port now include tracks armed at the MMR-8 front panel or MM-RC, and not just those tracks armed by serial command. This allows an external Serial device to know when a track has been armed for recording, regardless of the source of the track arm command.

Sony P2 Chase and Offset Commands

Sony P-2 protocol Chase and Offset commands are accepted by the MMR/MMP. Setup Menu 404 allows for setting the chase source to either Timecode, Biphase, or Disabled.

Serial Editor Port Active When Not ONLINE

The MMR/MMP unit will follow transport, track arm, and record commands given on the 9-pin serial Editor port even when the unit is not ONLINE.

Automatic ONLINE

The MMR/MMP unit will automatically be placed in the ONLINE state when placed in Chase via the serial 9-pin Editor port.

Local Machine Response to Serial Record Commands

Serial record arm and punch in/out commands are honored locally on each machine, regardless of whether it is acting as an MMR Bus slave or master machine. These commands are not propagated across the

MMR Bus to other machines, and serve only to activate the machine to which the Serial control device is directly connected.

Program Speed Play

The MMR/MMP responds in a very controlled way to Sony Program Speed Play commands. The status response during Program Speed Play indicates Play mode, with the VAR bit set in byte 2 of the Sony Status array.

Editor Mode Operation Without Video Reference

The Editor Control Mode (set via Setup Menu 000) will not force the Frame Reference (Setup Menu 001) to Video, and will allow operation of the MMR/MMP without a valid video sync reference source attached to the MMR/MMP. It is highly recommended to have such a source when operating in this mode, and to set the Frame Reference Setup Menu to Video, but the system does not require it and will allow operation even if no such source is detected. If the controlling device is synchronizing the MMR/MMP via the serial Editor port, it is essential to provide a video reference to insure correct operation and synchronization.

Hybrid Protocol on Serial Editor Port

The MMR/MMP internal communication protocol (TimeLine's Hybrid Protocol) can be accessed via the serial 9-pin Editor control port. This is most useful for companies which want to exercise remote control (from some other device) of MMR/MMP features not supported via any of the other standard remote interfaces. Requests for Hybrid Protocol information and documentation should be directed to the Marketing Director at TimeLine Vista, Inc. at (760)761-4440, or via email request to: TimeLine@digaudio.com.

001 Frame Reference

These settings determine the source of the MM unit's video frame reference signal.

Automatic

Sets the unit to automatically use an internal video reference if no external reference is available. This is the default value.

Video

When set to Video, the MM unit will reference the video signal coming into the Video In port on the back of the machine.

002 Sample Reference

These settings determine the source of the MM series unit's digital sample clock reference signal.

Automatic

Sets the unit to automatically use an internal word clock reference if no external reference is available. This is the default value.

AES/EBU Input

When set to AES/EBU Input, the MM machine will reference the digital sample clock of the AES/EBU signal coming in on the machine's Digital In port.

Ext Wordclock

When set to external word clock Input, the MM machine will reference the digital sample clock of the external word clock signal coming in on the machine's external word clock BNC connector.

003 Timecode Type

The following timecode types are provided as choices in this setting:

- 30ND (default)
- 30DF
- 25/25
- 24/24
- 29ND
- 29DF

004 Sample Rate

The following digital sample rates are provided as choices in this setting:

- 42294 (44x23/25)
- 42336 (44x24/25)
- 44056 (44100-)
- 44100
- 44144 (44100+)
- 45938 (44x25/24)
- 45983 (44x25/23)
- 46034 (48x23/25)
- 46080 (48x24/25)
- 47952 (4800-)
- 48000 (default)
- 48048 (4800+)
- 50000 (48x25/24)
- 50050 (48x25/23)

006 Varispeed Rate

This setting allows for setting a varispeed playback rate. This function allows playback of audio over a range of speeds from 88.5% to 112.5% of nominal play speed. This range varies according to the sample rate selected. Varispeed varies the playback frequency as well as the digital sample clock on the digital output. The precise speed can be set from ViewNet in increments of .01% over the entire range.

This function works by changing the sampling rate of the unit and this is reflected in the sample rate of the digital audio output stream from the MMR/MMP, which will vary according to the speed set in this menu. This is different from the jog/shuttle mode because that mode produces a constant sample rate output while scrubbing audio off speed. Note that the Varispeed Mode is mutually exclusive with Timecode Chase or Biphase Chase and thus the unit cannot be synchronized to an external source while in this mode.

The default value is 100%.

100 Bus Control

100 Sync Group

Sets the MMR Bus sync group assignment for the MM series unit. Default is 1.

110 MMR Bus Request

Sets the status request for the MM series unit on the MMR Bus.

Off	The MM unit will not be active on the MMR Bus (default).
Slave	The MM unit will request to be a Slave on the MMR Bus.
Master	The MM Unit will request to be the Master on the MMR Bus.

111 Ident Request

Sets the unit ID (Ident) request for the MM series unit on a particular MMR Bus sync group. This value can be any number between 00 and 99, or can be set to Auto. When Auto request is on, the system will assign ID numbers based on when units become active on the bus and their unique serial numbers. The recommended practice is to assign units to unique individual ID numbers and to avoid using the Auto setting. If a conflict arises, the system will automatically resolve it and will not allow duplicate ID numbers. Default is auto assign.

112 Ident Assigned

This setting shows the Ident assigned for the MM series unit on the MMR Bus. Since there can be no duplicate ID numbers on the MMR Bus Sync Group, it is possible that some units will be assigned a status other than that requested.

120 Lynx Bus

Sets the MM series unit's status on the TimeLine Lynx bus.

Off	The MM unit will not be active on the Lynx Bus (default).
Slave	The MM unit will request to be a Slave on the Lynx Bus.
Master	The MM Unit will request to be the Master on the Lynx Bus.

121 Lynx Bus Address

Sets the Lynx bus address for the selected MM series machine. The default is 1.

122 Lynx Bus V500 Mode

Sets the MM series machine to work with TimeLine Lynx V500 software. The default value is off.

200 Transport

210 Loop Mode

Sets the behavior of the MM series machine when the Loop function is active. The choices for the setting are:

Play Repeatedly	Loops until the transport is stopped (default).
Play Once and Cue	Plays once from pre-roll before In to post-roll after Out then cues to pre-roll before In point and stops.
Play Once and Stop	Plays once from pre-roll before In to post-roll after Out then stops at end of post-roll.

211 Loop Record

Sets the behavior of the MM series machine during Loop Record operation. Choices are:

Repeat Record	Loop Record until the transport is stopped (default).
Record Once Only	Records once from In to Out then cues to pre-roll before In point and stops.
Repeat w/Unload	Record from In to Out then unloads track and records new track. Loop record continues, creating a new track with every loop until stopped.

212 Pre-roll

Sets the amount of time before the In point (called the pre-roll amount) used for loop play and record functions. The default value is 00:00:05:00.

213 Post-roll

Sets the amount of time after the Out point (called the post-roll amount) used for loop play and record functions. The default value is 00:00:02:00.

220 Next / Previous Mode

Sets which type of edit is used to determine the location of the next and previous edit points when working with WaveFrame projects only. These edit points are used in the Go to Next or Go to Previous edit commands in the transport control section of the ViewNet interface. The default value is Event.

Event	Moves the playhead to the next or previous WaveFrame Event. See the WaveFrame documentation for information on events.
Cue	Moves the playhead to the next or previous WaveFrame Cue. See the WaveFrame documentation for information on cues.

221 Edit Sync Mode

This setting affects where a clip will be pasted during an edit operation.

In point	Sets the paste to place the beginning of the region stored in the clipboard at the In point. (default value)
Playhead	Sets the paste to place the contents of the clipboard to the selected edit tracks in the same position relative to the Playhead as those contents occupied when the material was placed on the clipboard.

250 Slip Commit

The Track Slip function on the MMR/MMP works by changing the value of a track offset register. This slip offset is volatile and will be cleared when a new Project or track is loaded. When a track slip is committed using this setting, the amount of the slip for the selected track(s) is incorporated into an edit operation which changes the track EDL to reflect the new timecode location for all audio events on the track. This change is automatically saved to disk for WaveFrame and Pro Tools projects (not for other formats since they cannot be saved to disk) and the EDL is immediately updated.

The Slip Commit menu allows for committing all tracks which have a slip offset, or of choosing only a specific track. The default value is to commit all track slips.

300 Biphase

These settings are used to control the behavior of the system while in Biphase Chase control mode.

300 Biphase Frame Rate

Sets the frame rate used when the system is in Biphase Chase mode. Frame Rate choices are:

24 Frames per second (default value)
25 Frames per second
30 Frames per second

301 Biphase Pulse Rate

Sets the frame rate used when the system is in Biphase Chase mode. Frame Rate choices are:

2 Pulses per frame (ppf)
4 ppf
10 ppf (default value)
20 ppf
25 ppf
50 ppf
100 ppf

302 Biphase Input

Sets the type of Biphase input signal required for operation in Biphase mode. Choices are:

Biphase Input (default value)
Tach and Direction
Tach and Inverse Direction

400 Remote

These settings are used to control the behavior of the system while being remotely controlled by other devices or controllers.

400 Editor Device

Sets the Sony 9-pin control personality while in the Edit control mode.

TASCAM MMR-8

This is the default setting. The TASCAM MMR-8 is the only setting which allows arming of all eight digital tracks on the MMR. This is the default setting.

Sony PCM-7030

Emulates operation of a two-channel DAT machine. Only tracks one and two can be armed for recording via the 9-pin port. All tracks can be armed locally or via the TASCAM MM-RC Remote Control Unit.

Sony BVU-950

Emulates operation of this ¾" video deck. Only tracks one and two can be armed for recording via the 9-pin port. All tracks can be armed locally or via the TASCAM MM-RC Remote Control Unit.

404 Editor Chase

This allows for setting the only P-2 protocol chase source to either Timecode, Biphase, or Disabled. This governs how the MM series unit responds to Sony 9-pin Chase and Offset commands. The default setting is disabled.

420 MIDI Device ID

The sets the MM series unit's MIDI device ID for use with MIDI machine control devices. The MMR/MMP responds to MIDI Machine Control (MMC) messages received on the unit's MIDI In port. To set the MMC address, go to Setup Menu 420, press Trim and set the appropriate MIDI Device ID number for as required by the device transmitting the MMC messages to which the MMR/MMP will respond. The range of available MIDI device ID's is 1 to 127, with the system default being 74.

500 Audio

These settings are used to control the behavior of the system audio functions.

510 Crossfade

This sets the crossfade amount used at punch in/out and edit points. The range is 0 to 100 ms in 1 ms intervals. The default value is 10 ms.

520 Meter Reference Level

This sets the meter reference level in decibels for the front panel meters of the MM series unit. The default value is –20dB.

522 Clip LED on Play

This setting determines whether or not the Clip LED on the MM-RC Remote Control Unit will illuminate when clipping is detected on a playback track. The default value is off.

530 Reference Tone

This activates the internal 1kHz reference tone in the MM series unit. To hear the tone, the unit must be in play. The default value is off.

550 Remote Meter Source

This sets the source of the signals sent to an MMU-16 meter bridge. The default setting is MMR Bus.

MMR Bus	Signals are sent over the MMR bus and should go through an MM-RC remote before being passed on to the MMU-16.
Local	Signals are sent directly from the UIB port (remote control port) to an MMU-16 unit.

600 Digital I/O

610 Digital Output Delay

This sets an amount by which digital output signals will be delayed. The range for this setting is 1 to 255 samples in 1 sample increments. The default value is internal (no delay).

700 Disk

710 Disk Initialize

Initializes the disk as a WaveFrame drive.

711 Disk Low Format

Performs a low level format on the drive. The drive must be initialized for recording after low format.

720 Disk Cleanup

The Disk Cleanup function looks at all available project files (EDLs) on the SCSI volume defined in the Target ID field and compares these to the audio files found on the disk. All unreferenced media files are then deleted (cleaned up) to regain disk space. This is a direct command, not a setting. This function is often used in conjunction with the Delete command found in the File Utilities window. After a project or track is deleted, Cleanup can be used to delete the media that was referenced by the deleted EDL. A warning prompt is shown if anything exists in the clipboard or undo list when a Disk Cleanup is performed. This warning insures users will be aware that the clipboard will be emptied by the Disk Cleanup process.

01234567890123456789	20 position LCD character positions
721 Disk Cleanup **OK to Clear Undo List?**	Top: (Menu Item) Bottom: (Warning Prompt)

To clear the clipboard and perform the Disk Cleanup, press STO. To cancel the Disk Cleanup operation, press RCL (No). The LCD will then show the following message.

01234567890123456789	20 position LCD character positions
721 Disk Cleanup **No Files Deleted**	Top: (Menu Item) Bottom: (Message)

790 Drives Mounted

This is an information display which shows the SCSI volume IDs of all mounted drives.

800 Tracks/Project

800 Project Name

This field is used to set the name for a new project. Once a new project name is applied, the existing project will be unmounted and a new blank project with the project name indicated here will be created as soon as some audio is recorded into one track of the project. The default name is MMR Project.

Another way to start a new project is to choose New project from the file menu. Using the New project function also enters the project name into this field.

810 Track Prefix

This field is used to set the track prefix used for any newly created tracks. The default name is MMR Trk.

900 System

900 Store Settings

This menu allows for storing and recalling the current settings as a user settings file in the MMR-8 or MMP-16. When using ViewNet to control the MM series machine, ViewNet settings files provide a better way to create, save, and recall users settings. To save a customized setting, select Setup Menu 900 (press SETUP, then the 9 key). Press the TRIM key, and rotate the Wheel or use the arrow keys to select the User settings file number (1 - 10) desired. Press STO. This saves all of the current Setup parameters to disk in the target User settings file. These settings are retained by the MMP-16, independently of even the usual automatic-save, automatic-restore sequence, and may be recalled when desired.

901 Recall Settings

This menu allows for recalling any of the 10 user settings saved in the MM series machine. To recall a previously stored User setting, select Setup Menu 901 (press SETUP, the 9 key, and rotate the Wheel CW or use the arrow keys to locate menu 901, “Recall Settings”). Select the desired User settings file from the list (press TRIM to change the Wheel and arrow key function to scroll through the Menu selections). It is not possible to name the User settings files, nor is it possible to back them up to floppy disk or to restore them to hard disk. It is possible to create and save named settings files using the ViewNet Audio graphical interface. Note that Setup Menu 901 also allows the operator to select the last User setting that was used (“Previous” option) as well as reset the MMP-16 to the factory defaults (“Default” option). Most Control modes require that certain synchronization signals appear on one or more MMP-16 sync inputs. If these signals are not present, the MMP-16 will fail to respond correctly. The following configuration information is divided into the three main application areas of the MMP-16 (video, film, and audio-only). Typical signal connections and Setup Menu selections are covered.

910 Set MM:DD:YY [Date]

This sets the date used by the system. Whenever a recording is made, the current date and time are used to “time stamp” the recorded files.

911 Set HH:MM:SS [Time]

This sets the time used by the system. Whenever a recording is made, the current date and time are used to “time stamp” the recorded files.

912 Change Password

Use this Menu to change the system password which protects user settings.

920 LED Brightness

The menu allows for setting the brightness of the LEDs on the front panel. The range is 0 – 18.

940 Machine Name

This field sets the name of the MM series machine. This information is stored as part of the system init file on the hard disk of the MM machine. This name can also be set using the Machine Information window available in the Machine menu. The machine name is shown in the Network and Project View screens of ViewNet Audio.

950 IP Address

The IP (Internet Protocol) address for each machine must be entered manually at the front panel of the MM series machine before that machine can be seen by the network and appear as a machine to the ViewNet Audio software application. To set the IP address, press Setup on the front panel of the MMR, and use the wheel or arrows to move to Setup menu 950.

Setting the IP Address

Enter the value for each of the four segments by using the wheel, up/down arrows, or by entering the number on the keypad. To move to the previous or next segment (byte) of the address, press the left or right arrow keys to move the cursor to that segment of the address. Use a leading 0 for two digit numbers.

Format of IP Addresses

The format of an IP address is 32 bits, divided into four bytes separated by periods. Each byte has eight bits, so the maximum decimal numerical value of each of the four segments of the address is 255 (which, starting at 0 gives a total of 256 or 2^8 values). IP addresses thus theoretically run from 000.000.000.000 to 255.255.255.255.

IP addressing is based on the concept of hosts and networks. A host is any device on the network that is capable of receiving and transmitting IP data packets such as a personal computer, MM series machine (which is also a computer), or a router. The hosts are connected by one or more networks. The IP address of any host consists of its network address plus its own host address on the network.

951 IP Net Mask

Use this field to enter the IP Net mask. Set this value to 255.255.255.000 unless your network administrator advises that you should use a different setting.

952 IP Gateway

Use this field to enter the IP Gateway if the ViewNet network is part of a larger network which uses a Gateway. If there is no Gateway in use, there is no need to enter any data in this menu.

Important Rules for IP Addresses

It is important to make sure all host devices on the network have the same network IP addresses but have unique host addresses within the network. Put simply, the first three bytes of the IP address should be the same for all host machines on that network, and **the final byte should set to a number which is unique for each device on the network**.

This rule is very important and bears repeating in another way – **no two host devices on the same network should have identical IP addresses**. If the address of two host devices on the network are identical, it may cause serious problems for the network, including causing the whole network to stop working properly until the duplicate address problem is remedied.

If the MM series machine is to be used in a facility where IP addresses are managed by a network administrator, that person should assign and log the IP addresses for each MM series machine and ViewNet computer according to the address scheme for the facility. IP addresses for MM series machines can always be changed by using MMR/MMP Setup menu 950.

980 Serial Number

This sets the time used by the system. Whenever a recording is made, the current date and time are used to “time stamp” the recorded files.

990 Software Version

This sets the time used by the system. Whenever a recording is made, the current date and time are used to “time stamp” the recorded files.

995 Load Software

This sets the time used by the system. Whenever a recording is made, the current date and time are used to “time stamp” the recorded files.

Show Project Format

The file format of any project available for loading on the MMR/MMP is indicated by a two letter code in brackets at the end of the project name.

01234567890123456789	20 position LCD character positions
File **Rons Project [PT]**	Top: (File Item) Bottom: (Indicates Pro Tools project)

The codes used for currently supported file types are:

[PT]	Pro Tools
[WF]	WaveFrame
[AK]	Akai
[DV]	DEVA (Broadcast Wave)
[OM]	OMF/SDII
[SS]	Sonic Solutions
[FL]	Fairlight

Show Track Format, Drive ID

Once a track has been loaded, pressing VIEW TRACK will show the name of the selected track followed by brackets around a number which indicates the drive ID and format type of the track.

01234567890123456789	20 position LCD character positions
Track Contents: **1 MMR Trk1_00837 [0,PT]**	Top: (Track contents) Bottom: (Indicates drive ID and Format for track)

Formatting Macintosh Disks

The MMR-8 and MMP-16 cannot format disk drives as Macintosh HFS volumes, so a drive must first be formatted as a Macintosh HFS volume using a Macintosh computer before the drive can be used with the MMR-8 or MMP-16. If a non-Macintosh formatted drive is mounted, the MMR/MMP will not allow Pro Tools or OMF as a choice for recording, backup, or file export to that disk. Users are advised to follow the recommendations of Digidesign for formatting disk drives for use with the Pro Tools system and with the MMR-8 and MMP-16.

Delete and Disk Cleanup for Macintosh Volumes

The Project Delete function (accessed by using SHIFT + LOAD TRACK) and the Disk Cleanup function (Setup Menu 720) work for Macintosh HFS disks. The Delete command will Delete the selected Session or OMF file from a Macintosh volume. The Disk Cleanup command will delete all Sound Designer II files that are not being referenced by a Pro Tools Session or an OMF Composition. This command will also delete all linear fade files created by a ProTools Session. Users should make sure there are no other SDII files that they wish to keep (such as raw SDII sound libraries not referenced by an EDL) on a Macintosh disk before using this command. **Warning**: this command cannot be undone.

Macintosh File System Errors

Various types of file errors and inconsistencies can sometimes accumulate on a Macintosh drive. Although the MMR-8 and MMP-16 can read and write data on Macintosh HFS volumes, it is of critical importance that any Macintosh disk used be free of file and format errors. When the MMR/MMP unit scans the SCSI bus for available drives and sees a Macintosh volume, it will look for file errors on the disk. If errors are found, the volume may not load at all. In some cases, the volume may load but only a few files will show up in the drive directory. If a disk is found to have file system errors, the MMR-8 will not allow recording, backup, or export to that disk and track arming will be disallowed.

Fortunately, commercially available disk repair utilities such as Norton Disk Doctor can locate, and in many cases (although not all) can repair the disk and rectify the errors. If a Macintosh disk connected to an MMR-8 or MMP-16 has problems such as:

disk volume will not mount
files appear to be missing
the MMR-8 will not go into record

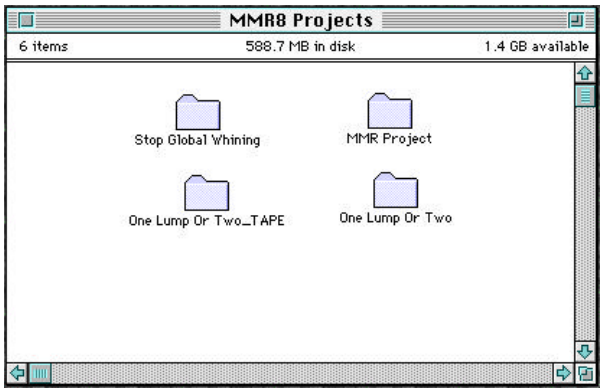
then connect the disk to a Macintosh computer and use a Macintosh disk repair utility to locate and repair any errors. If the errors cannot be fixed by the disk repair program, then the drive will need to be re-formatted on a Macintosh computer before it can be used on the MMR/MMP. A list of possible Mac file system errors and their error codes is given at the end of this document.

Macintosh Files Created by the MMR

Whenever a Macintosh disk is mounted on an MMP-16, a series of file folders are created so that the system is ready to hold recordings, backup files, or edits made by the MMR-8 or MMP-16. These folders and files are created according to the hierarchy explained here. A folder called MMR8 Projects is automatically created at the root level of the disk drive mounted on the MMR-8 or MMP-16.

The other files and folders created are stored within this folder. Any Pro Tools Sessions recorded on the MMR-8 (and their attendant sub-folders and audio files) will be automatically placed in this folder by the system.

Inside the MMR8 Projects folder, another folder is created with the name of the Project (as defined in setup menu 800 when the recording was first made). In the case of a Macintosh disk which is simply mounted on an MMR or MMP, a default Project folder called MMR Project is created. A new folder labeled with the name of the Project will be created for each new Session recorded on the MMR-8. Here is an example of several Project folders nested inside the MMR8 Projects folder:



Each of these folders contains the Pro Tools Session file and Audio File and Fade File folders for that Session, as explained on the following page. Note that Sessions created on the Pro Tools system may be placed elsewhere within the disk filing system. Sessions created on the MMR-8 will always be placed here. Inside the Session folders, the system automatically creates two new folders labeled Audio Files and Fade Files. If a Pro Tools Session has been recorded, there will also be a Pro Tools Session file. The contents of a typical project file folder created when a Session is recorded to an MMR-8 would look like this:

All sound designer II files recorded for this Session will be placed in the folder labeled Audio Files. The Fade Files folder is automatically created so that Pro Tools has a place to store any fade files the system may create. The MMR does not create Pro Tools fade files, but will play them back. The MMR does generate the proper fade file descriptor so that Pro Tools can later generate appropriate fade files. When opening a Session on Pro Tools that was created on the MMR, Pro Tools will alert the user that fades are missing. The user can then choose Skip All from the Pro Tools dialogue and Pro Tools will generate the missing fade files. The MMR-8 and MMP-16 will also perform default fades in real time according to the default fade settings in setup menu 510. If any fade files are missing from a Session created using Pro Tools, the MMR and MMP will simply play a real-time linear crossfade of the appropriate length in place of the missing fade file.

Support for Pro Tools® Session Files

The MMR-8 and MMP-16 support playback of version 3.2 as well as version 4.0 and higher of Digidesign's Pro Tools Session file format.

Pro Tools Features Supported

The MMR-8 and MMP-16 will recognize and play back Pro Tools Session files (and all Sound Designer II audio files referenced by the Session file) created as version 3.2 or 4.x Sessions on a 16-bit or 24-bit Pro Tools system. The name of all recognized Session files on all mounted volumes will appear in the list of projects shown in the LCD display after the Load Track key is pressed. If fade files are present, the MMR/MMP will play them. If fade files are missing, the unit will play back a linear fade of the correct duration in real time. Any playback mutes or volume automation that is part of the Session will be followed by the MMR/MMP, and the audio material programmed to mute will not play back. If audio mutes or volume automation have been applied in error, the material must be un-muted using the Pro Tools system before it will play back on the MMR/MMP.

Pro Tools Features Not Supported

The TASCAM MMR-8 and MMP-16 are designed to be able to play back edited audio files and fades from Pro Tools Session files and other workstation file types, but they do not have all of the complex DSP and routing/mixing capabilities of a full-fledged digital audio workstation. There are therefore some capabilities of such systems that do not translate when files are played back on the MMR/MMP. For post production sound editing, this need not pose a problem if these limitations are understood and material is prepared with the capability of the MMR/MMP in mind. This section details some features of the Pro Tools system and Session file format which are not directly supported on the MMR/MMP.

Dynamic Voice Allocation

The Pro Tools system has special features for assigning dynamic voice allocation utilizing virtual tracks and track priority. The MMR-8 and MMP-16 software does not recognize or respond to these parameters in a Session file.

TDM Plug-Ins

One of the most impressive features of the Pro tools system is the number and variety of third-party DSP plug-in effects available for the system. These effects rely on special DSP hardware in the Pro Tools system to perform various digital audio processes in real time. These real-time effects are not supported by the MMR/MMP since there is no equivalent processing power or software. Another class of Pro Tools effects called AudioSuite plug-ins work by actually applying the effect and changing the audio data on the disk. In this case, the files will play back just as they have been processed, since the processing has been made part of the file.

Voice Output Assignments

Since Pro Tools has extensive mixing capabilities, it also allows tracks to be freely assigned to various outputs for playback. The MMR/MMP units are designed to assign Pro Tools tracks directly to audio output channels on the MMR/MMP unit on a one-to-one basis and do not follow the output mapping of Pro Tools session. When editing material on Pro Tools for eventual playback on an MMR/MMP, it is best to place the material on the track where it should play on the MMR/MMP. Track assignments can be changed locally on the MMR/MMP and any track can be assigned to play out of any MMR/MMP channel output, but the default assignment when loading a Session will be to the tracks as numbered in the Pro Tools Session, not the voice assignment patching.

Restrictions When Using the Pro Tools Session Format

Both the TASCAM MMR-8/MMP-16 and Digidesign Pro Tools have features for which there is no equivalent function in the other system. This leads to certain restrictions the user should be aware of when moving material between these two systems.

Pull Up / Pull Down

ProTools only supports a Pull Up from 30fps and a Pull Down from 29.97fps. The MMR/MMP supports these and other frame rates. If something other than the standard frame rates or the above mentioned pull-up / pull-downs are set in a recording made on the MMR-8, the ProTools Session file created will not save that property in the Session file since that format has no way to store this data.

Frame and Sample Rates in Tape Mode

When creating TapeMode ProTools projects, be sure to pick a supported frame rate/sample rate combination (see above) before recording. Once the TapeMode Session file has been created, altering the frame rate will cause the Session to be regarded as a regular Non-Destructive Session and not a TapeMode Session. This is due to the fact that the Session format does not store sample based start times, but frame based start times. TapeMode very much depends on the Project or Session start time, which cannot be altered if TapeMode capability is to be retained.

Limitations on Number of Tracks

ProTools 4.2 supports a maximum of 43 tracks per Session. This track number limitation affects how many times tracks may be unloaded on the MMR-8/MMP-16. Once the maximum number of tracks has been reached the unit will no longer be able to unload tracks for that Session. Note that this will also affect the Loop Mode (menu 211) when the Repeat w/Unload option is chosen. Once the unload limit is reached, the transport will stop with an error message indicating that the maximum number of tracks has been reached. The same restriction will prevent exporting WaveFrame Projects or OMF Compositions to ProTools if the maximum number of channels is exceeded. A future software revision of the MMR/MMP will use the alternate tracks feature of ProTools to permit unlimited unloading of tracks and eliminate this restriction.

Session Start Time Restrictions

When recording additional audio on existing projects created originally with ProTools, audio punch-in before the start time defined in the project is not allowed. Pro Tools has the same restriction. If it is necessary to punch in on a track before the Session start time, use the Pro Tools system to re-set the session start time as appropriate. The MMR-8 has no provision to set the start time, except for tape mode. Non-TapeMode ProTools sessions generated on the MMR-8 always use a start time of 0 and hence will have no punch in restriction. A TapeMode project has its own TapeMode start time for all formats, set in menu 230.

Using TapeMode with ProTools Sessions

The MMR-8 has two record modes, Non-Destructive and TapeMode. Non-Destructive Record Mode works the same way as Pro Tools in that each recording makes a new audio file on the disk and does not over-write any existing material. In TapeMode, each track is considered to be a single continuous audio file and successive recordings will destructively over-write any existing audio on the same track when a punch-in is made. This is a useful way to record on the MMR-8 because it makes the most efficient use of disk space when recording mix tracks that will have a lot of record punch-in and out passes over the same part of the track. It is also more efficient in operation and will make the MMR-8 much less susceptible to "media too slow" errors when punching in and out across many tracks simultaneously, particularly when recording 24-bit files.
Although Pro Tools has a destructive record mode, it does not work the same way as the MMR TapeMode, so some of the rules for using TapeMode on the MMR-8 do not have an equivalent on the Pro Tools system. It is important to understand some of the consequences of using TapeMode when recording in the Pro Tools Session file format, since there are differences between the way TapeMode recording works with WaveFrame files and how it works with Pro Tools Sessions.

If the Record Mode (menu 200) is set to TapeMode when recording a Pro Tools Session, the MMR will automatically allocate all disk drive space between the TapeMode Start Time (menu 230) and the time where audio is recorded in each track. For example, in a TapeMode Session with a TapeMode Start time of 01:00:00:00, if audio is recorded beginning at one hour, then only the audio actually recorded will take up space on the disk. If the TapeMode start time is set to one hour and the current time location of the MMR-8 is set to two hours and recording begins, the system will automatically allocate one track-hour of disk space for each track in record. It is possible to verify that this is so by checking the Free Time on the disk (press Shift + 3). This behavior is different from the way WaveFrame TapeMode projects work. The WaveFrame file system allows continuous files to have "holes" in them but still be considered a single file. The Macintosh Hierarchical File System has no way to do this, so a recording made after the start time of a TapeMode Session will cause the system to automatically see all disk space between the TapeMode start time and the last bit of audio recorded on a particular track as being allocated to that audio file. This means that it is very important to set an appropriate start time when using TapeMode to make sure disk space is not wasted or used unnecessarily. For example, successive reels of a film will quite often carry a time code hour number that is the same as the reel number. If this method is being used and reel 3 is being recorded (mixed) to an MMR-8, be sure the time code for the TapeMode start time is set to 03:00:00:00 and not to 01:00:00:00, or the disk may show that it is full immediately as soon as recording is started at the beginning of the reel (at the 03:00:00:00 time code) since all space between one hour and three hours is allocated for the recording on all armed tracks. If this happens in error, you must take the disk to a Macintosh computer and delete the audio files to regain use of the allocated disk space. A future version of the MMR-8 will allow these files to be deleted by the MMR-8 using the Disk Cleanup function, but this does not yet work for Macintosh disks in version 2.0.

Another distinction between the file system of Macintosh disks versus WaveFrame disks is that Mac disks make different data block sizes on different volumes, depending on the capacity of the disk, whereas the WaveFrame file system has a fixed data block size. One effect of this is that when a backup is made of a Pro Tools TapeMode Session, the Session created will only be a TapeMode Session if made to a disk which is formatted with exactly the same data block size, otherwise it will be backed up as a Non-Destructive Record Mode project.

Pro Tools Volume and Mute Automation

The MMR-8 and MMP-16 support Digidesign Pro Tools volume (gain) and mute automation data on playback.

Volume Automation

The MMP-16 software supports playback of volume automation inserted in the Digidesign Pro Tools system. Pro Tools volume automation allows an audio track to have a volume overlay which determines the audio gain at user-specified break points on the track. The slope defined by the line between breakpoints will translate as a change in audio level over time as the track is played. There is no capability to perform direct editing of volume automation data or recording of volume automation data on the MM series unit.

Volume automation data will always be played if present in the track. MM series units will always faithfully play the track in the same way as if the track were being played on a Pro Tools system. If tracks which contain volume automation data are edited using the edit capabilities of the MM series unit, the automation data will always be included in the edit operation. Volume automation can only be disabled using a Pro Tools system.

Mute Automation

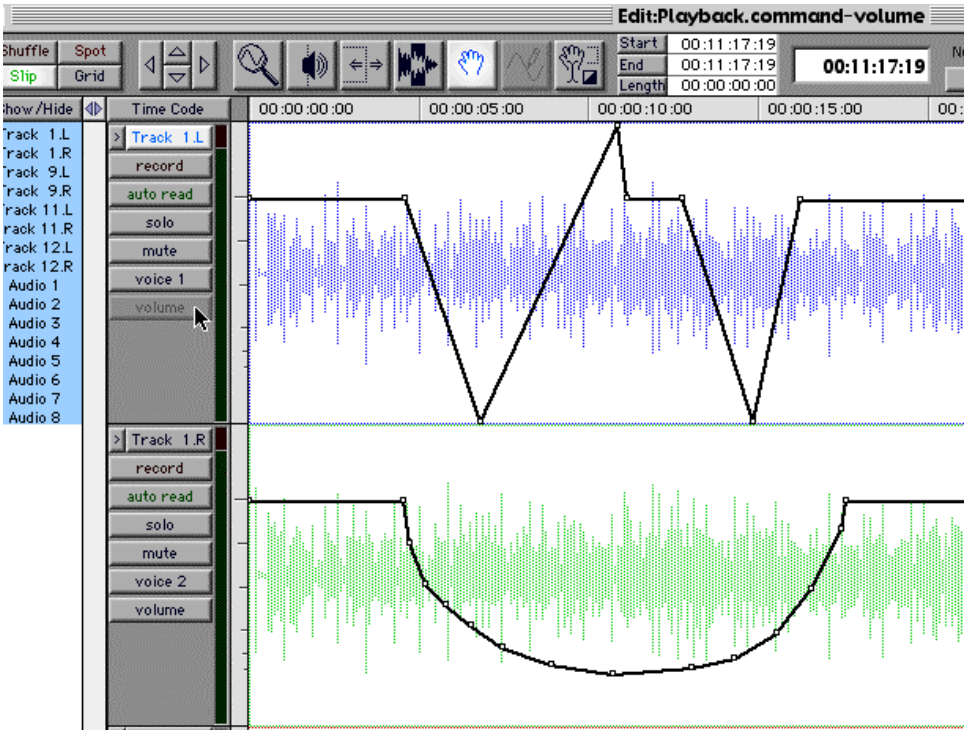
The MMP-16 software supports playback of mute automation data inserted using the Digidesign Pro Tools system. Pro Tools Mute Automation allows an audio track to have a volume overlay which determines segments of the audio track where audio gain will be muted (attenuated) between user-specified break points on the track. There is no capability to perform direct editing of mute automation data or recording of mute automation data on the MM series unit.

Mute automation data will always be played if present in the track. The MM series unit will always faithfully play the track in the same way as if the track were being played on a Pro Tools system. If tracks which contain mute automation data are edited using the edit capabilities of the MM series unit, the mute automation data will always be included in the edit operation. Mute automation can only be disabled using a Pro Tools system.

Disabling Pro Tools Volume Automation

Volume (gain) automation can only be disabled using a Pro Tools system – it cannot be disabled directly on the MM series unit. To disable ProTools volume Automation:

- Go to the Edit Window in Pro Tools
- Press the "command" key (the one with the apple on it) and click on the volume automation selector.
- This will cause the volume selector to gray out as in Track 1.L below.
- Gray out each audio track volume automation selector on which you desire to have volume automation disabled.
- Press save. The volume automation is disabled.



In the example above: Track1.L will not play back any volume automation moves on the MMR/MMP while Track 1.R will.

Audio File Time Stamp Support

A time code “stamp” is saved as an attribute of all recorded files. This time code stamp represents the time code location of the MMR unit when the recording was made. This data is now recorded as part of the audio file data. This information will be retained when files are Backed Up, Converted, or Exported to a different format. Many Digital Audio Workstations can use this information to place audio at its recorded time code location for editing.

AIFF File Support

Pro Tools and OMF EDLs may reference standard AIFF (Audio Interleaved File Format) files for playback or file utility (export) operations. To be recognized, these audio files must end in one of the following suffixes: .aiff, .AIFF, .aif, or .AIF. No mixed case suffixes may be used (e.g. Aiff). Both AIFF files and Sound Designer II (SDII) files can be recognized and played in the same EDL, even in the same track. Note that the MM series machines will only read or play back AIFF files, and will not export or record to the AIFF format. If a Pro Tools track containing AIFF files is loaded, any new recording made to that track on the MMR-8 will be made in the SD II format.

To properly play back on the MM series unit, the file which has the .aiff suffix must actually be a real AIFF audio file. On the Pro Tools system, a Macintosh system file identifier is used by the software to understand the true identity of a file. Thus, if a Sound Designer II file is erroneously named xxxx.aiff, the Pro Tools application will understand that it is actually an SDII file and will play it back correctly. This is a service provided by the Macintosh operating system. This is not the case for an MM series machine. If a file which is not an actual AIFF audio file is named xxxx.aiff, the MM unit will try to play it as a true AIFF audio file. The result will be “garbage” audio because of the difference between the actual file type (e.g. SD II) and the .aiff file that the MM series machine is attempting to play. File names are in important in this regard, particularly the suffix after a period. Do not rename files without regard to this fact.

OMF Files

The TASCAM MM Series machines can playback and export OMF composition (EDL) files which reference external Sound Designer II or AIFF audio files. As of MM software Version 4.0, only sample accurate OMF files conforming to version 1.0 of the OMF specification can be played or exported. To be recognized by the MM series machines as a valid OMF file, it is required that the OMF composition follow the naming convention xxx.omf, where xxx is any file name, and the suffix .omf is all lower case. Files which do not have the .omf suffix will not be recognized as valid OMF files and will not be displayed in the list of available files for loading or file utility operations. Frame accurate exports such as those created by the Avid Media Composer are not directly supported. For more information on working with OMF files and moving files between OMF compliant applications and the TASCAM MM series machines, see the technical support page on the TimeLine web site at http://www.timelinevista.com.

Zaxcom DEVA Broadcast Wave File Support

TASCAM MM Series units support playback of Projects and audio files created on the Zaxcom DEVA hard disk recorder. This is a field recorder which records digital audio to an internal hard drive and can immediately mirror recordings to an external SCSI device such as an Iomega Jaz disk. The MMR/MMP can read DEVA files which have been recorded as mono sound files in the Broadcast Wave format to an external SCSI drive formatted as a DOS volume. Only DEVA files recorded in precisely this way can be read by the MMR/MMP. Polyphonic sound files (stereo or more tracks interleaved) can not be read, nor can Sound Designer II files recorded to a DOS disk. Projects and Track Names of files recorded on a DEVA unit will show the designation [DV] at the end of the name when it is displayed in the MMR/MMP LCD window. Support is also provided for Export of DEVA files to the WaveFrame, Pro Tools, and OMF/SDII formats.

DEVA Files Naming Conventions

Audio files created by the Zaxcom DEVA hard disk field recorder can be played on the TASCAM MM Series machines. These must be in the EBU standard Broadcast Wave format on a DOS-FAT16 formatted disk in a directory labeled /ZFILES. The name of the DEVA track files must conform to the naming conventions used by the DEVA recorder. The format is six characters, followed by either a dash or underscore, followed by a track number (which must be 1, 2, 3, or 4), followed by the .BWF suffix. For example: take17_1.BWF or take17-1.BWF. Previous to Version 4.0, only the underscore character was recognized but the Version 4.0 software adds support for names using a dash as well.

Akai DD-8 Support

The MMP-16 provides support for the Akai DD-8 digital dubber and other Akai products which use the identical disk file systems and audio formats. These include the Akai DR-8, DR-16, and DD-1500. Support is limited to playback of Akai files and export of Akai files to WaveFrame, Pro Tools, and OMF/SDII formats. Support does not include recording in the Akai format on the MMR-8. To identify files in the Akai format, the MMR/MMP will show [AK] at the end of any Akai Project or Track name when these names are displayed in the LCD.

Playback

Playback of Projects created on the Akai DD-8 digital disk recorder is now supported on the MMR-8 and MMP-16. This includes audio and projects created on the original DD-8 format as well as the newer DD-Plus format using either 16-bit or 24-bit audio files. All files recorded on an Akai DD-8 will play on the MMR/MMP, with the following exceptions:

1) The Akai DD-8 20-bit recording mode is not supported on the MMR/MMP.
2) The MMR/MMP do not support playback of audio files recorded at 96kHz sample rate.

Export

Akai DD-8 format projects can be exported to WaveFrame, Pro Tools, and OMF/SDII formats on the MMR-8 and MMP-16. To Export an Akai file to one of these other formats, first press LOAD TRACK and scroll through the display until it shows the name of the desired Akai file (the end of the file name will show [AK] when an Akai file is recognized). Then press SHIFT+SLIP (Backup) to show the Backup Menus. Scroll through the menus and choose either WaveFrame Export, Pro Tools Export, or OMF Export and use the normal export procedure. The Project file (EDL) and audio files will be copied to the designated SCSI target device in the format specified. Files can not be exported from any other format into the Akai format because the MMR/MMP do not currently support writing the Akai format.

Editing File Formats not Written by The MM Series

Akai DD-8, Sonic Solutions, Failright, and DEVA files can be edited on the MMR/MMP, but all edits are held in RAM memory only and not written back to the disk. This is because the MMR-8 and MMP-16 do not write these formats. Edits in these formats will not be retained in the Project EDL.

Sonic Solutions File Support

Software for the MMR-8 and MMP-16 provides support for files created on the Sonic Studio workstation from Sonic Solutions. The Sonic Studio digital audio workstation uses a proprietary disk file system, a specially modified version of the AIFF audio format, and a proprietary EDL format. Sonic Solutions is in the process of moving toward using the newest version of Apple's Hierarchical File System instead of their proprietary Media Optimized File System (MOFS). For this reason, TASCAM supports Sonic audio media files and EDLs only after they have been copied to a Macintosh HFS formatted disk volume, and will not recognize a Sonic MOFS volume directly. The MMR/MMP system will only read Sonic files copied to a Macintosh HFS volume, and does not write Sonic audio or EDL files.

Using Sonic Lightspeed

The preferred method for copying Sonic files to a Macintosh HFS volume is by using Sonic's Lightspeed program. Lightspeed enables Sonic MOFS volumes to be mounted on the Mac SCSI bus and accessed on the Macintosh desktop. While on the Mac SCSI bus, the Sonic Studio system cannot record to this MOFS drive. Lightspeed in this case is only used as a means to transfer files from the MOFS volume to the Mac volume. The Lightspeed Toolkit program and a Macintosh system extension called Sonic Lightspeed are available from Sonic Solutions.

To copy Sonic files from the MOFS volume to the Mac HFS volume using Lightspeed, unmount the Sonic MOFS volume from the Sonic SCSI chain and mount it on the Mac SCSI chain. If the Lightspeed application and system extension are properly installed, the MOFS drive should mount automatically on the Macintosh. If it does not mount automatically run the Lightspeed Toolkit program, select the drive to be mounted and click on "Mount".

Drag the root folder of the MOFS drive onto the root folder of the Mac formatted drive. Since the Sonic EDL is dependent on the full path name to a file, do not copy a sub folder or file from the MOFS volume. Do not choose a target folder on the Mac drive - drop the file onto the drive itself (root folder). Once the file is on the Macintosh HFS volume, it can be recognized directly by the MMR-8 or MMP-16 unit.

Sonic SSP, USP, and HD System Support

Over the years, Sonic has shipped several different audio processor cards (SSP, USP, and HD) for their Sonic Studio system. The MMR/MMP only support 16-bit files from Sonic SSP-based systems. Both 16- and 24-bit files are supported for Sonic USP- and HD-based systems.

Sonic Fade Files

The Sonic Studio system can play various types of complex fades in real time. The MMR/MMP will play any non-rendered fades as linear fades of the length specified by the EDL, but these units cannot reproduce complex fade types unless they are rendered in advance by the Sonic system. The MMR/MMP will always play a linear fade for all non-rendered fades.

Format Chart

The following chart shows the Matrix of formats supported and the various Backup, Export, and TapeMode Conversion operations available as of Version 4.1 of the MMR-8 and MMP-16 software.

File Compatibility Chart *TO* *FROM*	Wave Frame	WaveFrame TapeMode	OMF/SDII	Pro Tools	ProTools TapeMode
WaveFrame	Backup	Convert to TapeMode	Export	Export	Convert to TapeMode
WaveFrame TapeMode	Backup	Backup	Export	Export	Convert to TapeMode
OMF/SDII	Export	Convert to TapeMode	Backup	Export	Convert to TapeMode
Pro Tools	*See Note*	*See Note*	Export	Backup	Convert to TapeMode
Pro Tools TapeMode	*See Note*	*See Note*	Export	Backup	Backup *
Akai DD8	Export	Convert to TapeMode	Export	Export	Convert to TapeMode
DEVA (DOS disk)	Export	Convert to TapeMode	Export	Export	Convert to TapeMode
Sonic Solutions (Mac HFS)	Export	Convert to TapeMode	Export	Export	Convert to TapeMode
Fairlight MFX 3	Export	Convert to TapeMode	Export	Export	Convert to TapeMode

Table of Backup, TapeMode Conversion, and Export Paths

Note: Any file format that can be played on the MMR/MMP can also be written (exported) to any written format supported by the MMR. Written formats are WaveFrame, Pro Tools, and OMF/SDII. The sole exception is that Digidesign Pro Tools files may be written as OMF files, but not as WaveFrame files (shown as *Not Permitted* in the chart above). To convert Pro Tools to WaveFrame, first export Pro Tools to OMF on the same disk, then use that OMF file for export to WaveFrame (one extra step).

** This is true only if the Mac HFS disk being copied to is formatted identically (same block size), otherwise Backup to a Mac volume with a different block size will yield a non-destructive project. In this case, use Convert to Tape Mode to insure the project remains a TapeMode project after being copied to the new disk.*

Fairlight MFX3 support is provided in MMR Version 4.1 and higher. Support is for files exported in ML format only, not DL format from the MFX3.

Chapter 7 MMP-16 System Applications

This chapter offers more detailed information for using the MMP-16 with film and video applications. Setup Menu parameter selections, technical background information, and block diagram connections are also covered.

Film Post Production

A standard method of synchronizing a film transport with external audio devices (like the MMP-16) is to use the pulse-interlock signal, or as it is more commonly known today--the biphase control signal, as a method of generating time code from the film's movement to drive the various audio devices.

The biphase control signal consists of two 5 volt or 12-volt pulses (called phase A and phase B) that are generated from the sprocket drive motor on the film transport. The phase relationship between the two pulses indicates the transport direction (when phase A leads phase B by 90° the film is moving forward), while the pulse frequency indicates the relative film speed (the nominal pulse rate indicates play speed, with higher rates indicating wind speed and slower rates indicating crawl speed).

It is only through knowing exactly how many pulses are generated per frame, and then keeping track of the total number of pulses that have been received (while subtracting pulses for when the film is moving in reverse), that the MMP-16 can constantly translate the biphase signal into the correct feet & frames or SMPTE/EBU time code numbers for the film frames. Since there are several "standard" biphase pulse rates used by the various film transport manufacturers, there is no one nominal frequency of the biphase signal for normal film play speed (pulse frequencies of 48 Hz up to 2400 Hz are used per frame). For the MMP-16 to interpret and lock onto a biphase signal, and to generate the correct time code numbers, it must be given the correct Setup parameters for the type of transport that it is following (Setup Menu 301). Table 5.1 lists the biphase pulse rates the MMP-16 can lock to and some examples of the equipment for each rate.

Biphase Pulse Rate	Biphase Play Frequency	Transport Type	Acceleration / fast wind speed	Notes
2 ppf	48 Hz	DIN standard	32 / 15x	Also used by Westrex
4 ppf	96 Hz	Westrex	8 / 5x	Alternate DIN standard
10 ppf	240 Hz	MTE	8 / 5x	
20 ppf	480 Hz	RCA	8 / 5x	
25 ppf	600 Hz	RCA	8 / 5x	
50 ppf	1200 Hz	RCA	8 / 5x	Biphase only
100 ppf	2400 Hz	MTM	8 / 5x	Biphase only

ppf = pulse per frame

Table 5.1 Biphase Pulse Rate Settings

On older film transports that use a tach and a direction signal, the phase A connection comes from the direction signal and the phase B connection comes from the tachometer output. Setup Menu 302 allows the default setting (which is biphase) to be changed to tach+direction. If the transport controls seem to be “backwards” (i.e. Play runs the film in reverse), select the tach+inverse direction choice from Setup Menu 302.

Both menus 301 and 302 are used to set the MMP-16 as a slave to the biphase device (where the MMP-16 will be generating time code or feet & frame numbers off the biphase signal from the film transport). Using the MMP-16 in this way requires that the Biphase Chase operating mode be selected and that the MMP-16 be placed online (the online button is lit up).

Biphase Setup Menus

Once the biphase operating mode is selected, the 300 bank Setup Menus (Table 5.2) can be used to verify and set the parameters for the specific film transport being used with the MMP-16. For most applications, the acceleration (Menu 320) and fast wind speed (Menu 321) defaults can be used since they correspond to the pulse rate selection (Menu 301). Thus, if they must be changed, they must be changed after the pulse rate has been set, otherwise they will be changed back to the default setting for the new pulse rate.

300 Menu Item	Selection	Choices
300 Biphase Frame Rate	film frame rate	24, 25, 30 fps
301 Biphase Pulse Rate	pulses per frame	2, 4, 10, 20, 25, 50, 100 ppf
302 Biphase I/O	biphase or tach+direction	Biphase, Tach+Direction, Tach+Inverse Direction

Biphase Setup Menus

Menu 300 is used to set the Biphase Frame Rate. In most applications in the USA the film frame rate will be set to 24 fps (the default setting). For some European applications this may need to be set for 25 fps, and for specialized film for video applications there is also the 30 fps rate available.

Menu 301is used to set the Biphase Pulse Rate. The number of pulses per frame is determined by the model of film transport or dubber that is being used with the MMP-16. See Table 5.1 for a list of transport types and the pulses per frame they use. If the model that will be connected to the MMP-16 is not listed consult the film transport manual for the specification. It is normally listed under the specifications as the ppf for nominal play speed. If this setting is incorrect then all time code and feet & frame calculations made by the MMP-16 will be off since they are derived from the pulse rate.

Menu 302 is used to choose the Biphase I/O setting. In the majority of applications biphase control will be used so Menu 302 is normally left at the default setting of biphase.

MMP-16 Film Connections

Although the MMP-16 can only be controlled by one film transport bus at a time, there are four film transport connections (biphase input) on the UI/B card on the rear panel. These connections allow a single MMP-16 to be switched between up to four projection/mix down rooms when it is placed into a main machine room. The biphase input that the MMP-16 follows is set using the Sync Group menu 100. The four inputs are grouped together in the lower part of the UI/B card and are numbered 1 - 4 (top to bottom) to match Sync Groups 1 - 4 (selected through menu 100).

All biphase connectors use standard 6-pin modular telephone plugs (RJ12, the same type used on 3-line telephone systems) so that up to 1,000 feet of standard 6-wire phone wiring can be run to the various film transports. A terminal strip (or a 6-wire surface mount jack) can be used to adapt the film transport connector wiring to the MMP-16 wiring. These connections are normally done for post production final mixing sessions. **Not intended for public telecommunications network connection.**

As in all uses of the MMP-16, the Lynx and/or MMR buses can be used by the MMP-16 to control any number of additional audio and video equipment even though that MMP-16 is being controlled by the film transport.

Video Post Production

In video post production the MMP-16 is typically slaved to a video tape recorder. In this use the VTR's time code output is the time code reference for the MMP-16. If the VTR is connected to a house sync signal, then the MMP-16 should also be connected to house sync (through the Video In connector) and should use that signal as the frame reference. In lieu of house sync, the VTR's video output would connect to the MMP-16's Video In for the frame reference source. The MMP-16, although time code slaved to the VTR, typically also functions as a master for any other audio devices on the Lynx and/or MMR buses.

The Lynx Bus

The Lynx Bus is an asynchronous communications bus that transmits a frame clock as well as time code and motion commands between the MMP-16 and other devices using an RS-422 serial communications bus operating at 38.4 KBaud. Up to 1,000 feet of cabling can be used in the bus system with each device connecting via 9-pin D-sub connectors. All that is required to build-up a Lynx bus is to daisy-chain each Lynx bus device to the next one in line along with a separate house sync connection. Each Lynx-2 box has two Lynx bus loop-through connections just like each MMP-16. A Lynx-2 interface is necessary to connect each remote controllable audio or video device to the Lynx bus. A Lynx Keyboard Control Unit KCU can also be connected directly to the Lynx bus to allow independent and grouped remote control of up to six Lynx bus connected machines. For more information, see *Chapter 5 MMP-16 Setup Menus*.

Chapter 8 Maintenance & Service

The MMP-16 requires little maintenance other than ensuring adequate airflow through the interior of the unit. Do not use alcohol or other common studio chemical cleaners on the front panel keys.
The rear panel maintenance is to vacuum and/or brush off the fan opening area of the power supply if a build-up of dust occurs.

MMP Output Level Calibrations

Use the following procedure to calibrate the MMP-16 Output Converter board (MOC). It is assumed that an electronics technician who has experience operating audio measurement equipment is performing the calibration.

The following equipment is required to perform calibration adjustments:

1. A Low distortion, accurate balanced input/output audio analyzer/generator (Audio Precision System 2 or equivalent). A digital multi-meter with AC rms volts measurement capability, in conjunction with a function generator with a sine wave output as a signal source may also be used. However, the AP equipment will provide more accurate measurements, and the settings/displays will be in the proper units
2. Plastic Potentiometer Adjustment screwdriver/tweaker.
3. Output cables compatible with the MMP-16 analog Audio Out connectors (equivalent to TASCAM DA-88 analog audio cables).

The MMP-16 has a built-in 1 kHz oscillator to check that the output levels are calibrated. To check the output levels, select Setup Menu 530 and select the 1 kHz setting. Press STO to turn on the internal oscillator and then press the Play key on the front panel. Measure the output levels and verify that they match the calibration settings (+4 dBu nominal=1.228Vrms, measured at XLR pin 2(+) and 3(-) pins). If calibration is required continue to the MOC Calibration Procedure.

MOC Calibration Procedure

Follow this step-by-step procedure to calibrate the MMP-16 Output Converters (MOC).

1. Turn off power and remove the top cover of the MMP.
2. Connect the audio analyzer input to the Output connector at the rear of the MMP.
3. Turn on the MMP. Wait for the software to load.
4. Generate the MOC calibration tone, a 1 kHz, -20 dBFS (of the digital bus) sine wave. To do this, Press SETUP, and go to menu 530 by turning the Wheel. Press TRIM then turn the Wheel to select the 1 kHz tone. Press STO to enable generation of the tone. Press the PLAY (>) switch to start tone generation.
5. Set up the audio analyzer input to measure the output level on Output channel 1. Standard Calibration level is digital full scale = +24 dBu. Pot adjustment range is digital full scale = +17 dBu to +25 dBu.(If there are special level requirements, those levels must be substituted for the levels in the following steps.)

6. Locate the MOC card cage. Note on its cover that the Output board is identified, as well the pot associated with each channel.

7. Using a plastic tweaker (supplied with the MMP-16), adjust the Output Ch1 pot to +4 dBu, +/-0.025 dB (=-20 dBFS.)

8. Move the audio analyzer input to the next MMP output channel. Repeat step 7. Continue until all 16 channels are calibrated.

End of the analog output level calibration procedure.

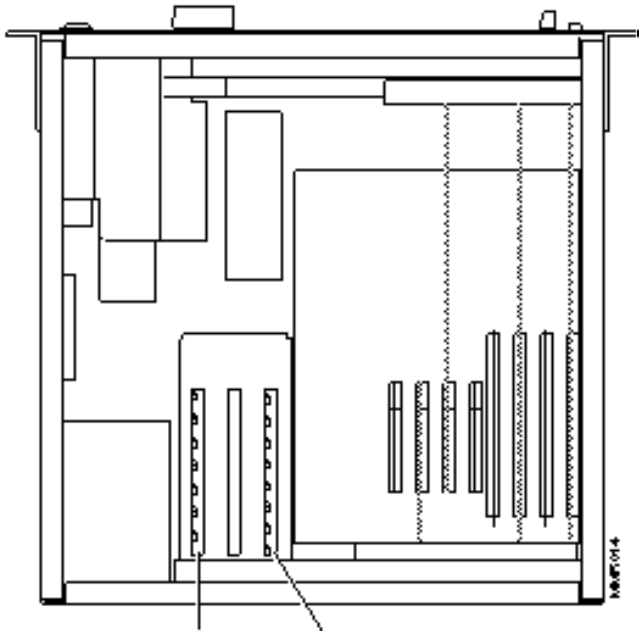


Figure 6-1: Analog Converter cards location within the MMP-16 chassis (top view).

Adding External Drives to the System

Up to five additional SCSI drives can be added to each MMP-16. The drives must be assigned unique SCSI ID numbers. Two SCSI ID numbers (7 and 0) are already taken by the MMP-16 SCSI controller card and the removable drive in the internal Kingston carrier of the MMP-16. The external drives should be added to the system while the MMP-16 is powered down (off).

Formatting Disks

The MMP-16 uses the WaveFrame disk format for recording, so disks from that system are compatible with the MMP-16, and disks can be formatted on the MMP-16 for use with the WaveFrame. There are two formatting options: Disk Initialize (menu 710), which is the typical formatting option; and Disk Low Format (menu 711), which would be used on a brand new (unformatted at the factory) disk, a (software) damaged disk, or a disk that has been formatted for use on a non-Intel based system using an incompatible formatter.

When a new disk is added to the system, and you wish to initialize it, place the disk into the default system disk location. Go to Setup menu 710, and press STO to select Disk Format. A warning message will show in the display, asking if you wish to format the disk. Press STO to answer yes (or RCL to answer no, returning you to Setup Menu 710). A further message will appear, asking if you are sure. Again, use STO for yes, RCL for no. If a password has been set, then the Enter Password: message will be displayed and you will have to enter the password to continue with the format.

On disks that have been (software) damaged, or incompatibly formatted, repeat the above operation using menu 711 instead. Keep in mind that a low-level format can take from 20 minutes to an hour, during which time the MMP-16 cannot be used for normal operation.

Using Removable Media

The MMP-16 currently supports two types of removable media: SCSI hard drives, and SCSI MOs (Magneto Optical) drives. The only type of SCSI hard drives that should be used are those specifically recommended by TASCAM, or drives and media that have been specified for use with high-demand applications such as audio/video systems. These disks typically have faster access times (12 ms or faster average seek time is required), larger storage capacities (2.4 GB or larger), and thermal compensation that is only active when the drive is not being accessed. A list of approved removable media drives is given in Appendix B of this manual. Contact TASCAM for the most current list of recommended SCSI hard drives for the MMP-16. This list is also available on the TASCAM Web site at www.TASCAM.com.

For archiving and for transferring 4-track reels between the WaveFrame editor and the MMP-16, the Tahiti 3 or similar optical drive may be used. The MMP-16 can format, backup to, or play back up to four tracks off of 620 MB, 1.3 GB, or 2.6 GB MO media. The latest generation of LIM/DOW optical drives (such as the Nikon Beluga A/V drive) offer the best removable optical disk performance.

Chapter 9 Technical Support

For technical support on the MMP-16 product line contact:

TASCAM
7733 Telegraph Road
Montebello, CA 90640
Tel (213) 726-0303 Ext 617
Fax (213) 727-7632
E-mail: tascamsupport@teac.com

Technical assistance is only available to registered owners of MMP-16 products. Be sure to write down your serial number before installation for future reference, as you will need it, along with the software version you are currently running, when contacting technical support. You can write your serial number here:

MMP-16 serial #: _____

Information on software updates, technical support, and TASCAM products is also available via the TASCAM World Wide Web site at:

http://www.tascam.com

MMP-16 System Software

The MMP-16 operates using an industry-standard operating system and program files that run on a Pentium microprocessor chip. The system software comes pre-installed onto the internal hard drive in the MMP-16. When the MMP-16 is turned on, all necessary software is loaded automatically. The version of software that is currently running can be displayed using Setup menu 990, which displays the current revision level of the software.

Software updates are supplied on one or more floppy disks. To install the software update, insert the floppy disk (or Disk 1, if multiple disks are received) into the front panel floppy drive while the unit is operating normally. Access Menu 995 (Load Software) and press STO. The system will ask “Are you sure?” Confirm the floppy is properly inserted and press STO again to confirm. If multiple disks are supplied, the operator will be prompted via the display to remove Disk 1 and place Disk 2 into the drive. After the software update is installed, the system will display a message that the update is complete, and will display a checksum number (written on the floppy update disk for reference) to verify that the installation has been successful. Remove the floppy disk and recycle the power to operate the unit with the new software installed. All system floppy disks should be kept in a secure location in case they may be needed in the future.

Appendix A: Control Panel Command Summary

Transport Group

ONLINE	Toggles between offline and online. When lit, indicates unit is online.
ONLINE+□ (Stop)	Unmounts all drives so they can be removed from the MMP-16.
<< (Rewind)	Moves all tracks in reverse at a high rate of speed with no audio playback.
< (Play Backwards)	Plays audio backwards at the normal play speed.
□ (Stop)	Stops audio playback; re-mounts drives after an unmount operation.
> (Play)	Plays the audio at the normal play speed.
>> (Fast Forward)	Moves all tracks forward at a high rate of speed with no audio playback.

Setup and Wheel Group

SETUP	Enters Setup Mode.
SHIFT+SETUP	Changes the algebraic sense of time code entry (+/-).
DOWN ARROW	Performs decrement action, according to mode.
SHIFT+DOWN ARROW	Displays/hides subframes
UP ARROW	Performs the increment action, according to mode.
SHIFT+UP ARROW	Switches display of time code position between time code and feet/frames format
TRIM	Trims the time code value in the display's bottom line.
SHIFT+TRIM	Dynamically trims the time code value in the display's bottom line.
JOG	Wheel rotation plays the audio either forwards (CW) or backwards (CCW) up to play speed.
SHTL	Wheel rotation shuttles the audio from stop to play forwards (CW) or stop to play reverse (CCW).

Keypad keys

CLR	Clears the time code in the bottom line of the display; cancels most operations
7	Enter digit, or selects 700 menus (in Setup)
SHIFT+7	Locate to “In point”
STO+7	Stores time code in bottom line of display into Memory register 7.
RCL+7	Recalls the time code in Memory register 7.
8	Enter digit, or selects 800 menus (in Setup)
SHIFT+8	Locate to “Head of tape” – follows SEL key selection in EDIT mode
STO+8	Stores time code in bottom line of display into Memory register 8.
RCL+8	Recalls the time code in Memory register 8.
9	Enter digit, or selects 900 menus (in Setup)
SHIFT+9	Locate to “Next Edit” point
STO+9	Stores time code in bottom line of display into Memory register 9.
RCL+9	Recalls the time code in Memory register 9.
SHIFT	Modifies function of most keys
CAPT	Captures the current time code and places it in the bottom line (active register).
SHIFT+ CAPT	Time (Feet & Frames local zero) register
4	Enter digit, or selects 400 menus (in Setup)
SHIFT+4	Locate to “Out point”
STO+4	Stores time code in bottom line of display into Memory register 4.
RCL+4	Recalls the time code in Memory register 4.
5	Enter digit, or selects 500 menus (in Setup)
SHIFT+5	Locate to “Tail of tape” - follows SEL key selection in EDIT mode
STO+5	Stores time code in bottom line of display into Memory register 5.
RCL+5	Recalls the time code in Memory register 5.

6 Enter digit, or selects 600 menus (in Setup)

SHIFT+6 Locate to Previous Edit point

STO+6 Stores time code in bottom line of display into Memory register 6.

RCL+6 Recall Previous Edit time into the bottom line of display.

STO Used with the number keys to store the bottom line time code into another register; loads tracks in Track mode, selects in Setup mode, affirmative response in other modes

0 Enter digit, or selects 000 menus (in Setup)

SHIFT+0 Lynx sync register

STO+0 Stores time code in bottom line of display into Memory register 0.

RCL+0 Recalls the time code in Memory register 0.

1 Enter digit, or selects 100 menus (in Setup)

SHIFT+1 Offset register (shows machine MMR Bus offset when slave on MMR bus)

STO+1 Stores time code in bottom line of display into Memory register 1.

RCL+1 Recalls the time code in Memory register 1.

2 Enter digit, or selects 200 menus (in Setup)

SHIFT+2 Time Code Reader register

STO+2 Stores time code in bottom line of display into Memory register 2.

RCL+2 Recalls the time code in Memory register 2.

3 Enter digit, or selects 300 menus (in Setup).

SHIFT+3 Free time register

STO+3 Stores time code in bottom line of display into Memory register 3.

RCL+3 Recalls the time code in Memory register 3.

RCL Used to recall a memory register (used with number keys); provide negative response to query

LOOP When active, loops the transport from the In time to the Out time until Stop is pressed.

LOC Locates the transport to the time code location in the active register.

Track Select Keys

EDIT+SEL (1 – 16)	Select Edit Mode for Tracks 1 - 16
MON+SEL (1 - 16)	Select Headphone Monitor, Tracks 1 - 16
LOAD TRACK	Enter Load Track mode
TRACK	Enter View Track mode
SLIP	Enter Slip Tracks mode
SHIFT+SEL (1)	Cut
SHIFT+SEL (2)	Copy
SHIFT+SEL (3)	Clear
SHIFT+SEL (4)	Paste
SHIFT+SEL (5)	Insert
SHIFT+SEL (6)	Open
SHIFT+SEL (7)	Undo
SHIFT+SEL (8)	Redo
SHIFT+EDIT	Sets in and Out times to beginning and end of event under play head on track currently selected for editing
SHIFT+MON	Enters Slip In/Out mode
SHIFT+LOAD TRACK	Delete
SHIFT+TRACK	Unload
SHIFT+SLIP	Backup

Appendix B: TASCAM MMP-16 Drive Compatibility Chart

Approved SCSI Drives

The following disk drives have been approved for use with the MMR-8 as of July 19, 1999:

Drive Manufacturer	Drive Model	Firmware Version
Seagate	ST118273LW	6246
Seagate	ST19101W	0014
Seagate	ST318203LW	0001
Seagate	ST318275LW	0001
Seagate	ST32272N	0876
Seagate	ST34371N	0484
Seagate	ST34573N	5958
Seagate	ST34573W	5764
Seagate	ST39102LW	0005
Seagate	ST39173N	5764
Seagate	ST39173W	5764
Seagate	ST39173LW	6264
Nikon*	DD53-SIP Beluga AV	Unknown
IBM	DCHS09F	2222

Manufacturers frequently release new drive models and obsolete other drive models. The most current list of approved drives can be found on the TASCAM web site at http://www.tascam.com .

*** Users should be aware these drives do not perform as well as hard drives. Test results with the NIKON Beluga drive with 1K/sector media show 8 tracks of record and playback in 16- or 24-bit TapeMode is generally reliable. Non-destructive mode performance is less reliable, especially with heavy edit density.**

TASCAM MMP-16 Approved Drives

The TASCAM Web site at http://www.tascam.com has the latest information on approved drives for use with the MMP-16.
Use this page of the Owner's Manual to note new drives that have been added to the approved drives list.

MANUFACTURER	*MODEL*	*MODEL NO.*	*FIRMWARE*	*DATE*	*COMMENTS*

Appendix C: WaveFrame Compatibility

This section contains information on using the MMP-16 in the film post production environment that heretofore has relied on a WaveFrame/StudioFrame system for playback on the mix stage.
There are a number of considerations necessary to ensure compatibility between the MMP-16 and existing WaveFrame/StudioFrame projects. WaveFrame/StudioFrame systems require at least one fixed drive on the 'A' SCSI bus. On many StudioFrame systems, all drives are configured as "fixed" (i.e., non-removable). However, fixed drives in the StudioFrame system do not hold edit information, only the track audio. To store the edit information with the audio on the same drive requires that the drive be set up as a "removable" drive. The MMP-16, therefore, will work only with drives that have been configured by the workstation as "removable", since it relies on edit information being present on those drives. In addition, WaveFrame/StudioFrame systems place a maximum of four playable tracks of audio (per project/reel/dub) on each disk volume.

The optimal configuration for a WaveFrame/StudioFrame system that is intended for use with the MMP-16 is as follows: The workstation would have the one required fixed drive on the 'A' SCSI bus, with enough additional drives for holding all tracks. The additional drives would all be configured as "removable" drives. Tracks 1-4 would be recorded onto drive 1A (the first removable drive), tracks 5-8 would be recorded onto drive 1B (the second removable drive), and so on for any further groups of four. Although this is the best MMR/MMP-compatible configuration, earlier projects may have been created under other StudioFrame configurations using fixed drives. In these cases, a conversion procedure is necessary in order to use the MMP-16 with the pre-recorded disk volumes. The following outline describes the procedure for turning "fixed" StudioFrame drives into removable drives that can then be moved to the MMP-16, with both track edits and audio information intact.

As an example, suppose we wished to make two drives "removable" that were attached as fixed drives to the 'A' SCSI bus on the workstation. To make the fixed drives removable, you must first edit your Autoexec.bat file to include this line somewhere in the file (for example, as the last line):
SET NFREMOVEID=4

(To edit your Autoexec.bat file select File, Run and type SYSEDIT in the dialog box. Click on the Autoexec.bat window and type in the new command (SET NFREMOVEID=4) on a new line. Select File, Quit. Select Save to save the changes you made to the Autoexec.bat file.) Changing the Autoexec.bat file requires rebooting for the change to take effect. You could also exit Windows, type the 'set' command above on the command line, and re-start Windows, if you do not wish to reboot. You would, however, have to do this every time the system was restarted.

To the WaveFrame/StudioFrame, this will signal that all SCSI drive addresses equal to or higher than four (4) are to be considered "removable" drives (lower numbers than 4 may be used, but be careful not to over-step any other lower addresses in use on the bus). Before re-starting your system, you must physically change the SCSI addresses of the two drives to SCSI id's 4 and 5, or 5 and 6. The SCSI id's must not be duplicated by any other drive on the SCSI bus.

StudioFrame Configuration Example A: 8-8-8 (8 track layout, tracks are in stereo pairs, on two fixed drives). Sound was recorded to the F1 drive group.

Edit your Autoexec.bat file and (perhaps) change the SCSI address of your drives as described above. Restart the system, launch StudioFrame, and mount the now-removable drives. Disregard the "missing edits" message at startup (fixed disks do not have the edits stored on them, whereas removable drives do). Go into the Track Rack. Move all left channel tracks to the '1B' drive and move all right channel tracks to the '1A' drive. Rebuild the database on both drives.

StudioFrame Configuration Example B: 8-8-8 (8 track layout, tracks are in stereo pairs, two fixed drives). Sound was recorded as Tracks 1-4 to FA, Tracks 5-8 to FB.

Edit your Autoexec.bat file and change the SCSI address of your drives as described above. Launch StudioFrame and mount the now-removable drives. Disregard the “missing edits” message at start up (fixed disks do not have the edits stored on them, whereas removable drives do).

Go into the Track Rack. Move tracks 1-4 to the ‘1A’ drive and move tracks 5-8 to the ‘1B’ drive. Rebuild the database on both drives.

In each of the above examples, you will now have two removable drives with four tracks of audio (along with their edits) on each drive. If you have an external drive housing to hold a second drive, the two drives, with four tracks each, can be used on a single MMP-16. If not, the MMP-16 can handle playing all eight tracks from one drive. To do this on the WaveFrame/StudioFrame, you must copy the tracks from either drive to the other drive using the Track Rack. This procedure will, as you know, require some time to copy all the actual sound files.

If you moved all eight tracks to one drive and then need to bring the tracks back into StudioFrame from the MMP-16, you must mount the drives, go into the Track Rack, and swap the tracks onto the editor, making sure that you assign only four tracks per drive. Note: these swapped tracks will now be mono, and will need to have their pans re-set (if they contained that information). If the audio was recorded in mono and had a pan value set, the pan value will be lost as well.

Note: For more detailed information on using the MMP-16 with the WaveFrame system, contact WaveFrame Company support in the United States at:

Advanced Systems Group (Oakland, CA)
(510) 654-8300

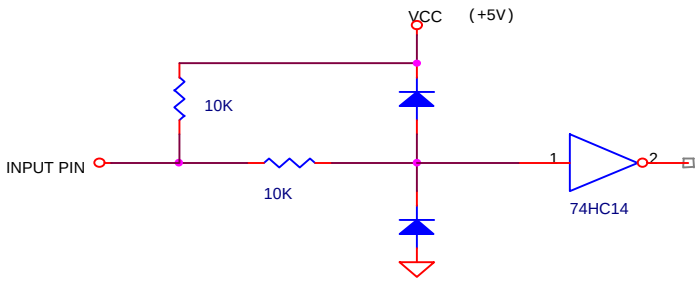
Digital Difference (Burbank, CA)
(818) 846-0589

Appendix D: MMP-16 Cable Information

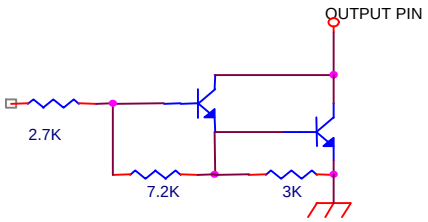
Parallel Tracks and Parallel Transport Connector Pinout

Connectors are 37-pin D male. I/O on connectors share same logical ground. Electrical characteristics are:

TYPICAL INPUT



TYPICAL OUTPUT



DARLINGTON OUTPUT STAGE OF ULN2803A

MAX RATINGS: 50V @ 500MA

Tracks		Tracks		Transport	
Switch	**Tally**	**Switch**	**Tally**	**Switch**	**Tally**
				1. Record ON	
				2. Record OFF	
				Locked	28.
1. Trk 1 Input	21.	9. Trk 1 Rec	29.	9. Online	29.
2. Trk 2 Input	22.	10. Trk 2 Rec	30.	10. Rewind	30.
3. Trk 3 Input	23.	11. Trk 3 Rec	31.	11. Rev Play	31.
4. Trk 4 Input	24.	12. Trk 4 Rec	32.	12. Stop	32.
5. Trk 5 Input	25.	13. Trk 5 Rec	33.	13. Play	33.
6. Trk 6 Input	26.	14. Trk 6 Rec	34.	14. FFwd	34.
7. Trk 7 Input	27.	15. Trk 7 Rec	35.	15. Record	35.
8. Trk 8 Input	28.	16. Trk 8 Rec	36.	16. Preview *	36.

Pins Common to Both Connectors

19. +12VDC 20. GRD 37. GRD

**When preview is grounded, all record functions will invoke rehearse.*

MIDI IN/THRU/OUT Connector pinout

PIN #	Signal Description (IN, OUT, & THRU)
1	n/c
2	n/c
3	n/c
4	Signal +
5	Signal -

NOTES:

1. DIN-5 connector - shield tied to case.
2. Signals are MIDI specification compliant.

LYNX (Remote Controller) Connector pinout

PIN #	MSTR Signal	SLAVE Signal	Pin #	MSTR Signal	SLAVE Signal
1	Frame ground	Frame ground	6	Frame ground	Frame ground
2	Receive -	Transmit -	7	Receive +	Transmit +
3	Transmit +	Receive +	8	Transmit -	Receive -
4	Frame ground	Frame ground	9	Frame ground	Frame ground
5	Frame clock	Frame clock			

NOTES:

1. 9-pin D-subminiature female connector (DB-9).
2. Signals are RS422 Compatible Frame clock is open collector driver.
3. The two connectors allow parallel connection of the Lynx Bus. Each pin is paralleled internally between the two connectors. The signal description indicates master / slave signals.

EDITOR Connector pinout

PIN #	MSTR Signal	SLAVE Signal	Pin #	MSTR Signal	SLAVE Signal
1	Frame ground	Frame ground	6	Frame ground	Frame ground
2	Receive -	Transmit -	7	Receive +	Transmit +
3	Transmit +	Receive +	8	Transmit -	Receive -
4	Frame ground	Frame ground	9	Frame ground	Frame ground
5	Spare Fr Ck	Spare Fr Ck			

NOTES:

1. 9-pin D-subminiature female connector (DB-9).
2. Signals are RS422 Compatible. Frame Clock spare should not be used.

3. The two connectors allow parallel connection of the Lynx Bus. Each pin is paralleled internally between the two connectors. The signal description indicates master / slave signals.

TRANSPORT (Sony 9-pin) Connector pinout

PIN #	MSTR Signal	SLAVE Signal	Pin #	MSTR Signal	SLAVE Signal
1	Frame ground	Frame ground	6	Frame ground	Frame ground
2	Receive -	Transmit -	7	Receive +	Transmit +
3	Transmit +	Receive +	8	Transmit -	Receive -
4	Frame ground	Frame ground	9	Frame ground	Frame ground
5	Spare Fr Ck	Spare Fr Ck			

NOTES:

1. 9-pin D-subminiature female connector (DB-9).
2. Signals are RS422 Compatible Frame Clock spare should not be used.
3. The two connectors allow parallel connection of the Lynx Bus. Each pin is paralleled internally between the two connectors. The signal description indicates master / slave signals.
4. Signal Descriptions are MMR Output / Transport (Input). Signals are of Protocol-2 (P-2) standard, which is also known as Sony 9-pin

ANALOG OUTPUT Connectors pinouts

There are two DB-25 style analog output connectors, one for tracks 1-8, the other for tracks 9-16 as labelled on the back of the MMP-16 unit. They each follow the pattern indicated here:

PIN #	Signal Description	PIN #	Signal Description
1	Channel 8 + signal	14	Channel 8 - signal
2	Channel 8 ground	15	Channel 7 + signal
3	Channel 7 - signal	16	Channel 7 ground
4	Channel 6 + signal	17	Channel 6 - signal
5	Channel 6 ground	18	Channel 5 + signal
6	Channel 5 - signal	19	Channel 5 ground
7	Channel 4 + signal	20	Channel 4 - signal
8	Channel 4 ground	21	Channel 3 + signal
9	Channel 3 - signal	22	Channel 3 ground
10	Channel 2 + signal	23	Channel 2 -signal
11	Channel 2 ground	24	Channel 1 + signal
12	Channel 1 - signal	25	Channel 1 ground
13	No connection		

NOTES:

1. 25-pin D-subminiature female connector (DB-25). The pinouts follow the TASCAM DA-88 configuration. Each input is differential with the (+) inputs being the non-inverting input and the (-) being the inverting input.
2. Input impedance is 10k ohm.
3. Output impedance is 75 ohm.
4. Max load 12.28 VRMS

BIPH (Biphase) Connectors pinout

PIN #	Signal Description
1	Ground
2	Phase-A
3	Phase-B
4	Phase-B
5	Phase-A
6	Ground

NOTES:

1. RJ12 compatible Modular Plug, 6 Position, 6 Conductor.: Flat Wire - Stranded. Round Wire - Stranded. DataComm Warehouse (http://kerry.warehouse.com/) can supply these parts, however, many other sources are also available.
2. The four Biphase Inputs are selected one-at-a-time by the Sync Group setting.
3. Not intended for public telecommunication network.

DO (AES/EBU Digital Audio Out 1-8) Connector pinout

PIN #	Signal Description	PIN #	Signal Description
1	Digital Output 4 (ch 7&8) + signal	14	Digital Output 4 (ch 7&8) - signal
2	Digital Output 4 (ch 7&8) ground	15	Digital Output 3 (ch 5&6) + signal
3	Digital Output 3 (ch 5&6) - signal	16	Digital Output 3 (ch 5&6) ground
4	Digital Output 2 (ch 3&4) + signal	17	Digital Output 2 (ch 3&4) - signal
5	Digital Output 2 (ch 3&4) ground	18	Digital Output 1 (ch 1&2) + signal
6	Digital Output 1 (ch 1&2) - signal	19	Digital Output 1 (ch 1&2) ground
7	Digital Input 4 (ch 7&8) + signal	20	Digital Input 4 (ch 7&8) - signal
8	Digital Input 4 (ch 7&8) ground	21	Digital Input 3 (ch 5&6) + signal
9	Digital Input 3 (ch 5&6) - signal	22	Digital Input 3 (ch 5&6) ground
10	Digital Input 2 (ch 3&4) + signal	23	Digital Input 2 (ch 3&4) - signal
11	Digital Input 2 (ch 3&4) ground	24	Digital Input 1 (ch 1&2) + signal
12	Digital Input 1 (ch 1&2) - signal	25	Digital Input 1 (ch 1&2) ground
13	No connection		

NOTES: 25-pin D-subminiature female connector (DB-25).

AO (AES/EBU Digital Audio Out 9-16) Connector pinout

PIN #	Signal Description	PIN #	Signal Description
1	Digital Output 8 (ch 15&16) + signal	14	Digital Output 8 (ch 15&16) - signal
2	Digital Output 8 (ch 15&16) ground	15	Digital Output 7 (ch 13&14) + signal
3	Digital Output 7 (ch 13&14) - signal	16	Digital Output 7 (ch 13&14) ground
4	Digital Output 6 (ch 11&12) + signal	17	Digital Output 6 (ch 11&12) - signal
5	Digital Output 6 (ch 11&12) ground	18	Digital Output 5 (ch 9&10) + signal
6	Digital Output 5 (ch 9&10) - signal	19	Digital Output 5 (ch 9&10) ground
7	Digital Input 8 (ch 15&16) + signal	20	Digital Input 8 (ch 15&16) - signal
8	Digital Input 8 (ch 15&16) ground	21	Digital Input 7 (ch 13&14) + signal
9	Digital Input 7 (ch 13&14) - signal	22	Digital Input 7 (ch 13&14) ground
10	Digital Input 6 (ch 11&12) + signal	23	Digital Input 6 (ch 11&12) - signal
11	Digital Input 6 (ch 11&12) ground	24	Digital Input 5 (ch 9&10) + signal
12	Digital Input 5 (ch 9&10) - signal	25	Digital Input 5 (ch 9&10) ground
13	No connection		

NOTES: 25-pin D-subminiature female connector (DB-25).

SYNC (MMR-Bus) Connector pinout

PIN #	Signal Description	PIN #	Signal Description
1	CAN_BUS+	9	CAN_BUS-
2	CCLK_BUS0+	10	CCLK_BUS0-
3	CCLK_BUS1+	11	CCLK_BUS1-
4	CCLK_BUS2+	12	CCLK_BUS2-
5	CCLK_BUS3+	13	CCLK_BUS3-
6	+12 TERM PWR	14	Frame ground
7	CAN LEFT TERM	15	CAN RIGHT TERM
8	N/C		

NOTES:

1. 15-pin D-subminiature female connector (DB-15). The two connectors are paralleled in the MMP-16 and either can be used as an input or output.
2. TASCAM supplies a 3 foot interface cable, 70447. The differential signals should be routed on twisted pairs of wires.

TIMECODE IN Connector

PIN #	Signal Description
TIP	Time Code Reader +
Ring	Time Code Reader -
Sleeve	Ground

NOTES:

1. 1/4” TRS Phonejack
2. 10K Ohm input impedance. Differential input.

TIMECODE OUT Connector

PIN #	Signal Description
TIP	Time Code Reader +
Ring	Time Code Reader -
Sleeve	Ground

NOTES:

1. 1/4” TRS Phonejack
2. Differential op-amp output circuit.

WORD CLOCK IN Connector

NOTES:

1. BNC, 75 Ohm Terminated. TTL logic levels.

WORD CLOCK OUT Connector

NOTES:

1. BNC, 75 Ohm Drive Capability. TTL logic levels.

VIDEO IN/OUT Connector

NOTES:

1. BNC, Video is connected in parallel between connectors.
2. 1K Ohm input impedance. Supports Composite, Color Bars, Black Burst. Should be 75 ohm terminated if at end of cable.

SERIAL CONNECTORS

NOTES:

1. These connectors are for factory diagnostics only.
2. 9-pin D-subminiature female connector (DB-9), connected to COM1 on the motherboard.
3. 25-pin D-subminiature female Connector (DB-25), connected to COM2 on the motherboard.

SCSI Connector

NOTES:

1. SCSI-2 Compliant.

PRX Connector

NOTES:

1. 3.5 mm Stereo Phonejack.
2. Same audio signal as on Headphone Monitor, but audio on tip (left channel) only.

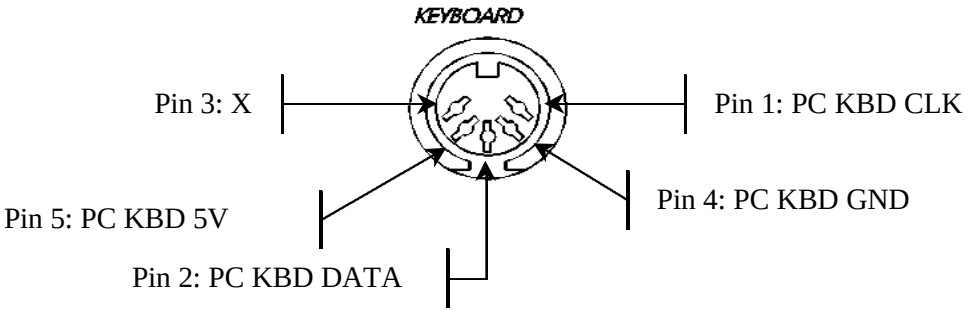
Keyboard Operation (with optional MM-RC)

The optional MM-RC (Remote Control unit) has a keyboard connector located on the rear panel which accepts a standard PC-AT style keyboard. The purpose of the keyboard is to facilitate selecting menu items while in the Setup Mode and to make it easier to name Projects and Tracks. There is no way to connect a keyboard directly to the MMR or MMP – this must be done using the MM-RC.

Note: *The internal software of the MM-RC will be automatically updated as necessary when an MMR-8 or MMP-16 is booted while attached to the MM-RC. Be sure the power switch of the MM-RC is on while the MMR/MMP unit is started so the unit can sense the presence of the remote.*

The MM-RC Keyboard Connector

The MM-RC keyboard connector provides a means to attach a standard PC-AT style keyboard. Here are the pin out signals for this connector as seen facing the back of the MM-RC:



You may attach the PC Keyboard to the MM-RC before or after switching on the MM-RC power.

Appendix E: MMP-16 Glossary

Abbreviations and Terms	Definitions
24 frames	The standard film frame rate per second.
25 frames	The standard PAL and SECAM video frame rate per second.
29.97 frames	The standard NTSC video frame rate for color broadcasting per second.
30 frames	The standard audio-only and black and white video frame rate per second.
AES/EBU	Audio Engineering Society/European Broadcasting Union. The two main organizations that set the standards for audio production. Digital audio connections are often referred to as AES/EBU since these organizations standardized the digital audio interconnection methods.
Autolocator	An analog tape function to position the transport to previously marked locations that is emulated in the MMP-16 using the LOC key and a register or memory location to instantly locate the “play head.”
Biphase	The two-pulse sync signal generated by a film transport that the MMP-16 uses to generate time code or feet & frames timing.
Bus	Any signal that is daisy chained between multiple devices. In the case of the MMP-16, there are two main buses: the MMR bus and the Lynx Bus.
Calibrate	Adjusting a signal to match a reference or standard. The MMP-16’s inputs can be calibrated so that a +4 dBu signal will correctly drive the MMP-16, and the outputs can be calibrated for a +4 dBu output from the MMP-16. In these cases the calibration references are the level meters.
Capture	During play or stop saves the current time code into the bottom line of the LCD display for subsequent saving to a memory or position register.
Chase	The process whereby one device controls another device to synchronize their playback. Chase implies there is both a synchronization signal as well as a device control signal.
Clear	A function to remove audio between the In and Out times on one or more tracks of audio.
Clip	Indicates the maximum signal level has been exceeded going into the analog-digital converter. Typically this will cause severe distortion (popping, snapping, crackling sounds) in the output signal.
Control Mode	The mode (menu 000) which sets how the MMP-16 is being controlled.

Abbreviations and Terms	Definitions
Control Track	The VTR speed control signal recorded onto the tape. It typically also has time code recorded in it.
DF	Drop Frame. A type of time code that compensates for color video tape (which runs at 29.97 frames per second) having 108 less frames per hour than black and white video (which uses 30 frames per second). Since most video productions are in color, 108 frames must be “dropped” each hour from the audio in order to keep audio and video in sync. 29.97 DF is the normal time code used in the majority of video applications.
Dubber	An audio transport that uses film sprockets as its timing device.
Edit	The process of modifying the tracks in a project using the EDIT key and one of the edit functions (cut, copy, paste, clear, insert, open).
Error	An LCD display that indicates a problem with the MMP-16 or with the last operator key entry.
Frame	Each image on a film strip is a frame. In video, a frame consists of two interlaced fields. In film there are 24 frames per second (fps). In video there are 25 fps in the PAL and SECAM systems (European broadcasting) and 29.97 fps in the NTSC system (USA and Japan). Older black and white video and audio-only applications use 30 fps.
Frame Reference	The timing signal for each frame of video.
Groups	There are four Sync Groups in the MMP-16. This allows multiple MMP-16s to be shared between up to four film transports or video systems.
HH:MM:SS:FF	SMPTE/EBU time code stated as Hours:Minutes:Seconds:Frames.
Head	The start of a project.
Input Monitor	Applies the MMP-16 track Input to the Output in lieu of the audio from the hard drive. Typically used to check Input levels before recording.
Interlock	Refers to synchronizing film transports, audio dubbers and audio transports via the biphase bus.
Jam Sync	When discontinuous time code is found on a tape, jam sync will ignore the gaps to create continuous time code on another tape.
Jog	Also called scrub, this function uses the Wheel to manually control the speed of forward and reverse play.
KCU	Keyboard Control Unit. TimeLine’s external machine controller. Provides remote control for up to six machines (MMP-16s or tape machines).
LCD	Liquid Crystal Display. The twenty character by two line display used on the

Abbreviations and Terms	Definitions
	MMP-16 to display time code, Setup Menus, or machine status.
LED	Light Emitting Diode. Front panel indicators used to identify machine or key status.
Local	When the MMP-16 is Off-line it is said to be in local mode.
Locate	Jumps the MMP-16 (and any controlled machines) to a new time code location using the LOC key and one of the registers or memories.
Loop	Plays the project between the In and Out time code points according to the Loop Mode setting selected in Setup Menu 110.
LTC	Longitudinal Time Code. Time code that is recorded on audio tape or using one of the audio tracks or the control track on videotape.
Lynx	TimeLine's machine controller interface bus that is compatible with the MMP-16, Lynx-2 Interface, the KCU, and Micro Lynx controllers.
Lynx Master	The Lynx device that is the master for the Lynx bus. If one or more MMP-16s are tied to the Lynx bus only one can be the master on the Lynx bus.
Lynx Sync	The Lynx bus frame clock.
Machine	Any audio, video or film playback device.
Machine Control	Remote control commands for positional control and operational control of a device. In the case of the MMP-16, machine control commands can come from the MIDI input, the Lynx or MMR buses, the Editor input or the parallel remote input.
Master	The device that is in positional control of one or more slave devices.
MIDI	Musical Instrument Digital Interface. A serial data connection originally used to communicate key and voice parameters between music synthesizers. The MMP-16 will respond to MMC (MIDI Machine Commands) but will ignore any other signals transmitted on the MIDI bus.
MMR Bus	An asynchronous bus that ties multiple MMP-16s together to relay motion control commands and timing references from the master machine to the slave machines. The MMR bus supports up to four Sync Groups with their own timing references and motion control commands.
MMR Master	The MMP-16 that is in control of a particular Sync Group on the MMR bus.
Mixdown	The process of bringing together the multiple tracks of dialogue, FX, Foley, and music to create a finished soundtrack for a film or video production.

Abbreviations and Terms	Definitions
Monitor	The process of selecting one or more tracks to listen to in the headphones or rear panel studio monitor output.
Motion Controls	The “transport” keys on the MMP-16.
MTC	MIDI Time Code. Time code that is transmitted as part of a MIDI signal. Because there is not enough room for the complete time code to be sent at once, MTC counts in two frame increments.
Multitrack	A tape or solid state device that can record and/or playback more than one track of audio at a time.
NDF	Non-Drop Frame. A type of time code that uses full frames for timing. It is used in audio-only applications and with black and white video.
NTSC	National TV Standards Committee. The television and video format used in the USA and Japan. The basic frame rate is 30 fps for monochrome and 29.97 fps for color transmissions and recording.
Offset	The amount of difference between the program time code and an event. Tracks and entire machines can be offset. Offsets are sometimes added to correct for incorrect time code numbers on a tape or to compensate for timing delays between machines.
Operating State	There are eight operating states of the MMP-16, Normal, Setup, Load Track, View Track, Slip Track, Backup,Verify, and Error. These are distinguished by the nature of the information displayed in the LCD window and by the keys that are available while in each state.
PAL	Phase Alternating Line. The main European broadcasting standard that uses a 25 fps rate.
Phase Lock	The process where a machine is locked to reference signal (or to another machine’s reference signal) so that its reference signal can be matched in phase by controlling the speed of the machine compared to the other machine or to a speed reference signal.
RAM	Random Access Memory. To convert audio from analog into digital, or vice versa, a RAM buffer is required to allow the continuous analog audio to be converted into “chunks” of digital data and the chunks of data from the hard drive to be converted back into continuous analog audio.
Rate	How many ticks per second of some clock or other counter. There are various rates used in the MMP-16 include fps (frames per second), ppf (pulse per frame, biphase), word clock (samples per second)
Reference	The master clock. The MMP-16 uses two reference signals: a sample reference for the audio and a frame reference to keep the audio timed correctly to the video or film frame.

Abbreviations and Terms	Definitions
Register	A memory that holds a time code position or other number. There are 11 dedicated registers (to hold such numbers as the Head, Tail, In and Out points, etc.) plus 10 memory registers (0 -9) in the MMP-16.
Reshape	The process of regenerating incoming time code so that the time code output is clean and free of noise or other signal distortions.
Resolving	The process of regulating the playback speed of a machine through phase locking a recorded signal on the tape to a fixed reference signal.
Safe	No recording can take place since all record enables are locked out.
Sample Reference	The reference for the digital audio sample clock in the MMP-16. It can come from a digital input, from the word clock input, or from the frame reference.
SCSI	Small Computer System Interface. The bus that connects external removable drives to the MMP-16.
Setup Menus	The method through which operating parameters are changed and set in the MMP-16. To bring up the Setup Menus on the LCD display press the Setup key.
Shuttle	Manual control over the machine transport from stop to play to fast forward and from stop to reverse play to rewind through using the Wheel.
Slip	The process of adding slight timing offsets to individual tracks.
SMPTE	Society of Motion Picture & Television Engineers. The organization that developed and approved the video time code that is often referred to as SMPTE or SMPTE/EBU code.
Sync Group	Each MMP-16 can be placed into one of four Sync Groups, or groups of machines that can be controlled together. The Sync Group also selects the biphase input that is being used.
Sync Word	Part of the SMPTE/EBU time code, the sync word indicates the end of the time code word. It can also be used to determine the direction the transport is moving as well as for phase locking.
TC	Time Code. The 80 bit biphase-encoded code that marks the time on a video or audio tape in hours:minutes:seconds:frames:subframes. It also identifies the type of code being used (DF or NDF). It can be recorded longitudinally along the edge of a tape or recorded within the vertical interval on a video tape. Time code can also be encoded onto film, although in most applications the time code will be generated from the film transport biphase signal.

TC Generator Time Code Generator. A device to create the 80 bit time code signal for recording onto a video or audio tape. The MMP-16 contains a built-in generator which is always sending out TC when the MMP-16 is playing.

TC Reader Time Code Reader. The circuit in the MMP-16 that reads incoming time code from the time code inputs. Typically used to slave the MMP-16 to another time code generator's output.

Tail The end of the track's audio.

Track Can refer to one of the audio channels in the MMP-16, but typically it refers to the edited audio for one track of audio on the reel.

Track Select The process of selecting which tracks an action affects through using the SEL key for that track.

Transport A generic reference to any audio, video, or film device that mechanically "moves tape" or electronically plays audio or video.

Trim The process of adjusting the time code using the Wheel.

Unmount The process of releasing the removable hard drive from the MMP-16 so that it can be removed.

User Settings When any MMP-16 Setup parameters have been changed, the new settings can be saved in a User Settings File (menu 900). Ten User Settings are available.

Video Sync Also known as house sync, it is generated by an extremely stable video source and consists of black burst, sync bars, or composite video. It's used as a timing reference to synchronize video devices throughout a video facility.

Virtual Tracks Audio tracks that are "stacked" on top of one another so that alternate takes can be kept at hand. Only the track on top will actually play back.

VITC Vertical Interval Time Code. SMPTE/EBU time code that is recorded within the video signal on a VTR. VITC can be read during fast searches and even when the video machine is paused since the rotating VTR heads are always reading the video portion of the tape. VITC is not supported in the MM Series.

VSO Variable Speed Oscillator. Indicates that the audio is not being played back at a "standard" playback speed, but is rather playing back at an off-speed for an effect or to compensate for incorrect timing between devices.

Word Clock The digital audio clocking signal (44.1 or 48 kHz most commonly used) used to synchronize audio devices.

Wheel The rotary encoder on the MMP-16 front panel that can be used to trim, jog, and shuttle audio, in addition to being used to scroll through the Setup Menus and menu choices.

Appendix F: Disk Time Chart

Disk Time Chart

TASCAM MMR-8 and MMP-16 System

MMR-8 Available Rec. Time	48 kHz - 8 Channels						48 kHz - 1 Channel					
Sampling Rate (kHz)	48	48	48	48	48	48	48	48	48	48	48	48
Word Length (bits)	16	16	16	24	24	24	16	16	16	24	24	24
Hard Drive Capacity (GB)	2	4	9	2	4	9	2	4	9	2	4	9
Number of Channels	8	8	8	8	8	8	1	1	1	1	1	1
Record Time (mins.)	43	87	195	29	58	130	347	694	1562	231	462	1041
Record Time (hours:mins)	:43	1:27	3:15	:29	:58	2:10	5:47	11:34	26:02	3:51	7:42	17:21

MMR-8 Available Rec. Time	44.1 kHz - 8 Channels						44.1 kHz -1 Channel					
Sampling Rate (kHz)	44.1	44.1	44.1	44.1	44.1	44.1	44.1	44.1	44.1	44.1	44.1	44.1
Word Length (bits)	16	16	16	24	24	24	16	16	16	24	24	24
Hard Drive Capacity (GB)	2	4	9	2	4	9	2	4	9	2	4	9
Number of Channels	8	8	8	8	8	8	1	1	1	1	1	1
Record Time (mins.)	47	94	213	31	63	142	377	755	1700	251	503	1133
Record Time (hours:mins)	:47	1:34	3:33	:31	1:03	2:22	6:17	12:35	28:20	4:11	8:23	18:53

MMR-8 Available Rec. Time	48 kHz - 2 Channels						48 kHz – 4 Channel					
Sampling Rate (kHz)	48	48	48	48	48	48	48	48	48	48	48	48
Word Length (bits)	16	16	16	24	24	24	16	16	16	24	24	24
Hard Drive Capacity (GB)	2	4	9	2	4	9	2	4	9	2	4	9
Number of Channels	2	2	2	2	2	2	4	4	4	4	4	4
Record Time (mins.)	174	347	781	116	231	521	87	174	391	58	116	260
Record Time (hours:mins)	2:54	5:47	13:01	1:56	3:51	8:41	1:27	2:54	6:31	:58	1:56	4:20

MMR-8 Available Rec. Time	44.1 kHz - 2 Channels						44.1 kHz -4 Channel					
Sampling Rate (kHz)	44.1	44.1	44.1	44.1	44.1	44.1	44.1	44.1	44.1	44.1	44.1	44.1
Word Length (bits)	16	16	16	24	24	24	16	16	16	24	24	24
Hard Drive Capacity (GB)	2	4	9	2	4	9	2	4	9	2	4	9
Number of Channels	2	2	2	2	2	2	4	4	4	4	4	4
Record Time (mins.)	189	378	850	126	252	567	94	189	425	63	126	283
Record Time (hours:mins)	3:09	6:18	14:10	2:06	4:12	9:27	1:34	3:09	7:05	1:03	2:06	4:43

MMR-8 Available Rec. Time	44.1 kHz - 16 Channels						48 kHz -16 Channel					
Sampling Rate (kHz)	44.1	44.1	44.1	44.1	44.1	44.1	48	48	48	48	48	48
Word Length (bits)	16	16	16	24	24	24	16	16	16	24	24	24
Hard Drive Capacity (GB)	2	4	9	2	4	9	2	4	9	2	4	9
Number of Channels	16	16	16	16	16	16	16	16	16	16	16	16
Record Time (mins.)	24	47	106	16	31	71	22	43	98	14	29	65
Record Time (hours:mins)	:24	:47	1:46	:16	:31	1:11	:22	:43	1:38	:14	:29	1:05

Note: There is a single file limit of one Gigabyte (about 3 tracks hours) for WaveFrame files
This means no individual contiguous sound file can be longer. This restriction applies only to WaveFrame files. The MMR Reserves 10% of total formatted disk space as a reserve - up to a maximum of 250 MB. This reserve disk space is not figured into the above calculations - actual record time may vary slightly.

Appendix G: Macintosh File System Error Messages

There are a number of possible file system errors that can occur when attempting to load a Macintosh formatted disk drive. In this case, the top part of the display will be the standard display for the particular mode or state of the MMR/MMP when the error occurred. Some of these messages are longer than the 20 character width of the LCD screen. In this case, to read the rest of the error message, press the right arrow key to scroll the message. Here is a list of error messages that can be displayed by the MMR-8 or MMP-16 and the cause of the error. If any of these error messages occur, check the drive on a Macintosh computer by using a disk repair utility such as Norton Disk Doctor.

01234567890123456789	20 position LCD character positions
Standard State Display **Mac Disk at ID *N* has Errors, set to Read-Only. Repair on your Mac first please**	Top: (Mode Display) Bottom: (Error Message) Cause: MMR detects file system errors on Mac SCSI target ID *N* while mounting

01234567890123456789	20 position LCD character positions
Standard State Display **MacOpen (exists) failure**	Top: (Mode Display) Bottom: (Error Message) Cause: Error opening existing project file. Record or playback.

01234567890123456789	20 position LCD character positions
Standard State Display **MacOpen (create) failure**	Top: (Mode Display) Bottom: (Error Message) Cause: Error creating new project file.

01234567890123456789	20 position LCD character positions
Standard State Display **MacCommit Err: *N***	Top: (Mode Display) Bottom: (Error Message where *N* is Mac error code) Cause: Error while recording data. Record did not complete. Possible file system errors.

01234567890123456789	20 position LCD character positions
Standard State Display **MacRead Err: *N***	Top: (Mode Display) Bottom: (Error Message where *N* is Mac error code) `Cause: SCSI Read Error on drive N`

01234567890123456789	20 position LCD character positions
Standard State Display **MAC project creation failure**	Top: (Mode Display) Bottom: (Error Message) Cause: Could not create project folders for current project.

01234567890123456789	20 position LCD character positions
Standard State Display **MAC audio folder creation failure**	Top: (Mode Display) Bottom: (Error Message) Cause: Could not create audio folder for current project.

01234567890123456789	20 position LCD character positions
Standard State Display **MAC folder creation failure**	Top: (Mode Display) Bottom: (Error Message) Cause: Could not create Fade Files folder for current project.

Macintosh File System Error Codes

The following error codes are used to indicate the various types of Apple Macintosh file system errors. This list is given here to provide information which may be useful in resolving a Macintosh file system error using standard Macintosh file repair utilities. The MMR-8 and MMP-16 do not format Macintosh disks and cannot repair Macintosh file system errors. Please contact the vendor or manufacturer of the disk drive exhibiting the problem for technical assistance with drive problems.

Volinfo errors

Error Name	Error #	Comment
READVIFAILED	-1	Failed to read volume info block
WRITEVIFAILED	-2	Failed to write volume info block
READVIOUTOFMEM	-3	
WRITEVIOUTOFMEM	-4	
NOTHFSDISK	-5	

Readwrite errors

Error Name	Error #	Comment
READSECTFAILED	-10	Couldn't read *any* sectors
WRITESECTFAILED	-11	Couldn't write *any* sectors
INITREADWRITEFAILED	-12	Couldn't init read/write pkg.
INVALIDSTATEREC	-13	Trying to read/write a mountrecord which has not had initreadwrite sucessfully run on it.
CLOSEREADWRITEFAILED	-14	Could not shutdown read/write
WRITESECTUNBUFFAILED	-15	could not perform unbuffered write or sync mount record

Volume Bitmap errors

Error Name	Error #	Comment
READVBMCANTREAD	-30	Can't read volume bit map
READVBMOUTOFMEM	-31	ran out of mem reading vol bmap
WRITEVBMCANTWRITE	-32	can't write volume bit map
CHKVBMAPBADVIBINFO	-33	Volume bitmap is inconsistent
FREECSBADRANGE	-34	Trying to contiguously allocate a bad range
ALLOCSOUTOFMEM	-35	Contiguous allocation ran out of memory
The following result from allocation failing and not being able to rollback the changes that have already been done		
ALLOCSCANTDEALLOC1	-36	Deallocation failed at stage 1
ALLOCSCANTDEALLOC2	-37	Deallocation failed at stage 2
ALLOCSCANTDEALLOC3	-38	Deallocation failed at stage 3
ALLOCSOUTOFBOUNDS	-39	Internal error happened – the allocator returned more space than asked for

Mac ReadWrite Errors

Error Name	Error #	Comment
MACREADEXTNOTFOUND	-80	Could not find an extent
GENEDLISTOUTOFMEM	-81	Generate Extent List ran out of memory
GENEDLISTINTERNALERR	-82	Gen extent list had internal err
GENEDLISTBLOCKNOTFOUND	-83	Gen extent list could not a logical block of the file
MACREADOUTOFMEM	-84	read ran out of memory
CANTREADALLOCBLOCK	-85	readsects failed to read a block
MACREADOUTOFBOUNDS	-86	Internal problem - macread discovered that it read more blocks than were requested
MACREADNOTENOUGHEDS	-87	there weren't enough extents on the edlist to complete the read
MACWRITECANTGROWFILE	-88	macwrite couldn't expand the file
MACWRITEOUTOFMEM	-89	macwrite ran out of memory
MACWRITECANTREAD	-90	macwrite couldn't read a block
MACWRITECANTWRITE	-91	macwrite couldn't write a block
FILEISNOTWRITABLE	-92	you're trying to write a file that was not opened writeable
FILEISNOTREADABLE	-93	you're trying to read a file that was not opened readable
BADWHENCE	-94	macseek was passed a bad whence
MACWRITEOUTOFBOUNDS	-95	
CANTWRITEALLOCBLOCK	-96	

BTREE ERRORS

Error Name	Error #	Comment
BT_MANYEXTENTS	-100	Btree has more than 3 extents
BT_NODENOTFOUND	-101	Looking for an inexistent node
BT_BADCATALOGTYPE	-102	
BT_UNIMPLEMENTED	-103	
BT_BADKEY	-104	
BT_FOUNDLESS	-105	The Btree is empty
BT_NOTFOUND	-106	The key was not found
BT_BADTREE	-107	A data structure error
BT_BIGTREE	-108	Don't want to extend the tree
BT_BADRECORD	-109	
BT_BUG1	-110	
BT_NOTALLOC	-111	
BT_BADNODE	-112	
BT_BUG2	-113	
BT_TOOHIGH	-114	The Btree is higher than BT_MAX_DEPTH
BT_WRITE_NODE_FAILED	-115	
BT_BADHEADER	-116	
BT_CHECK	-200	CheckBTree

200 --> 300 reserved for BT_CHECK

Catalog Support Errors

Error Name	Error #	Comment
OPENROOTNOSUCHFILE	-450	Opening the root failed–there is a serious problem with the FS

PCROUTOFMEMORY	-451	The path resolver ran out of memory
PCRBADPATHELEMENT	-452	path has a bad element in it
PCRNOSUCHPATHELEMENT	-453	path has a nonexisting element
PCRGOTFILENOTDIR	-454	path resolver encountered a file when it was expecting a dir
PCRCWDNOTDIR	-455	relative path search with a non directory current working dir was attempted
PCRUNEXPECTEDTYPE	-456	path resolver encountered a thread record
CLOSEFAILED	-470	Unable to close file
MACDIROUTOFMEM	-473	mdirentries ran out of memory
MACDIRTRYDECLOWESTFN	-474	Internal error in m/macdirentries
MACCREATEFILEOUTOFMEM	-475	create file ran out of mem
MACCREATEFILECANTDEALLOC	-476	create file failed and then rollback failed
MACCREATEFILENOSPACE	-477	no available space to create file
MACCREATEFOLDOUTOFMEM	-478	create folder ran out of mem
MACCREATEFOLDCANTDEALLOC	-479	create folder failed and then
NOSUCHFOLDER	-480	function could not find folder
MACDELFILEFAILED	-490	macdel couldn't delete a file
MACDELNOSUCHFOLDER	-491	macdelfolder on nonexistent fold
MACDELNOTAFOLDER	-492	macdelfolder on nonfolder
MACDELBADFOLDER	-493	Folder without thread record
MACDELCANTDELTHREADREC	-494	Couldn't delete thread record
MACDELCANTDELFOLDER	-495	Couldn't delete folder
MACDELNOSUCHFILE	-496	macdelfile on nonexisting file
MACDELNOTAFILE	-497	macdelfile on non-file
MACDELNOTHREADREC	-498	macdelfolder couldn't find thread thread record
CANTCREATEINNONDIR	-499	try to create a file in someplace that is not a folder

Error Name	Error #	Comment
BADFILEORFOLDERNAME	-500	Illegal file or folder name
MACDELFOLDERNOTEMPTY	-501	try to del nonempty folder
NAMETOOLONG	-502	bad name - too long
MOVENOTFOLDER	-503	movefolder on nonfolder
MOVENOTHDREC	-504	movefolder couldn't find thread record
MOVECANTMODIFYTHDREC	-505	movefolder couldn't modify thread record
MOVECANTDELFOLDREC	-506	movefolder couldn't del old folder record
MOVECANTPUTNEWFOLDREC	-507	movefolder couldn't put new folder record
MOVECANTDELFILEREC	-509	movefile couldn't del file rec
MOVECANTPUTNEWFILEREC	-510	movefile couldn't put new file rec
MOVENOTFILE	-511	movefile on non file
MOVEWOULDOVERWRITE	-512	move would overwrite something
MOVENOTFILEORFOLDER	-513	move on nonfile/nonfolder
TOOMANYOPENFILES	-514	open failed because catrectable is full
MOVEPARENTINTOCHILD	-515	Try to move parent folder into child folder failed
MOVEINTERNALERROR	-516	Move encountered internal error
MOVEFAILDURINGFAIL	-517	Move failed, then failed during rollback – bad
CANTFINDTHDREC	-518	Couldn't find a thread record
MGROWDOESNTTRUNC	-519	Trying to truncate using mgrowfile
MGROWNOTENOUGHSPACE	-520	mgrowfile could not find enough space to grow to desired size
MGROWCANTFINDLASTER	-521	mgrow could not find last extent record of the file
MGROWCANTWRITELASTER	-522	mgrow couldn't write the last extent record of a file

MGROWGREWTOWRONGSIZE	-523	mgrowfile internal error file grew to incorrect size
FILEISGONE	-524	This means that you are trying to read, write, or close an open file which someone deleted/moved out from under you.
CANTUPDATEDIR	-525	Could not update directory times and valence
BADPATH	-526	was given a bad path
CANONLYOPENFILES	-527	Try to macopen a non-file
TRUNCTONONZEROSIZE	-528	Tried to truncate to nonzero size
CANONLYTRUNCFILES	-529	Tried to truncate a nonfile
CANTOVERWRITEDIR	-530	Tried to overwrite a folder
CREATEFOLDWOULDOVERWRITE	-531	Creating the folder would overwrite an existing item
MACREADCANTREAD	-550	macreadblocks failed in mread
FILEISNOTOPEN	-551	Tried to close nonopen file
INVALIDMFILE	-552	The MFILE you passed is garbage
CANTSETNONFILEFINDERINFO	-553	We only do files right now...
CANTGETNONFILEFINDERINFO	-554	We only do files right now...
CANNOTCREATEFILE	-555	Only create files with absolute path
FILEISINUSE	-556	Cannot delete open files

Partition Errors

Error Name	Error #	Comment
PARTOUTOFMEM	-600	Ran out of memory
PARTCANTREADSECTZERO	-601	Couldn't read the device map
UNRECOGNIZEDTYPE	-603	Doesn't have valid device map
PARTCANTREADPARTMAPSECT	-604	Couldn't read partition map
BADPARTITION	-605	Asked to mount a non MAC HFS partition

Error Name	Error #	Comment
NOTMACHFSPART	-606	It looked like a MAC HFS part, but after reading vib, we don't think so
ALLOCSBITMAPFULL	-607	No more room left on disk
FOLDERNAMETOOLONG	-608	safeguard in create/delete folder routines
INVALIDOFFSET	-609	offset not madgetsector too big.
NOTSECTORALLIGNED	-610	offset to macgetsector not sector aligned
SECTOR_SIZE_MISMATCH	-611	Sector size gotten from device does not match sector size in partition table

Appendix H: MMR/MMP MIDI Machine Control Protocol

All numerical values are hexadecimal, unless otherwise noted. For descriptions of the following commands and responses, please refer to the MIDI Machine Control 1.0 specification, subtitled MIDI 1.0 Recommended Practice RP-13, January 1992.

MMC Commands:	Comments
01 STOP	
02 PLAY	
03 DEFERRED PLAY	
04 FAST FORWARD	
05 REWIND	
06 RECORD STROBE	(RECORDER ONLY)
07 RECORD EXIT	(RECORDER ONLY)
09 PAUSE	
0B CHASE	(requires time code input)
0D MMC RESET	
40 WRITE	
41 MASKED WRITE	(RECORDER ONLY)
42 READ	
44 LOCATE	
45 VARIABLE PLAY	(defaults to shuttle)
46 SEARCH	(defaults to shuttle)
47 SHUTTLE	
4C MOVE	
52 GROUP	
54 DEFERRED VARIABLE PLAY	

Note: In all velocity commands and information fields, the MMR-8 and MMP-16 support multiples of play speed from +/- 20 with 1/1024 fractional resolution.

MMC Information Fields

Hex	Field	Read / Read Write
01	SELECTED TIME CODE	r
02	SELECTED MASTER CODE	r
03	REQUESTED OFFSET	RW
04	ACTUAL OFFSET	r
05	LOCK DEVIATION	r
08	GP0/LOCATE POINT	RW
09	GP1	RW
0A	GP2	RW
0B	GP3	RW
0C	GP4	RW
0D	GP5	RW
0E	GP6	RW
0F	GP7	RW
21	short SELECTED TIME CODE	r
22	Short SELECTED MASTER CODE	r
23	Short REQUESTED OFFSET	r

24	short ACTUAL OFFSET	r
25	short LOCK DEVIATION	r
26	short GENERATOR TIME CODE	r
28	Short GP0/LOCATE POINT	r
29	Short GP1	r
2A	Short GP2	r
2B	Short GP3	r
2C	Short GP4	r
2D	Short GP5	r
2E	Short GP6	r
2F	Short GP7	r
45	TIME STANDARD	RW
48	MOTION CONTROL TALLY	r
49	VELOCITY TALLY	r
4C	RECORD MODE	RW (RECORDER ONLY)
4D	RECORD STATUS	r (RECORDER ONLY)
4E	TRACK RECORD STATUS	r (RECORDER ONLY)
4F	TRACK RECORD READY	RW (RECORDER ONLY)
50	GLOBAL MONITOR	RW (RECORDER ONLY)
51	RECORD MONITOR	RW (RECORDER ONLY)
53	TRACK INPUT MONITOR	RW (RECORDER ONLY)
58	CONTROL DISABLE	RW
5A	CHASE MODE	r

RW - indicates read / write r - indicates read only

MMR-8 MMC Signature

2E,	count = n
01, 00, 00, 00,	vi vf va vb
14,	<count_1>
7E, 5D, 00, 00, 00,	c0 c1 c2 c3 c4
00, 00, 00, 00, 00,	c5 c6 c7 c8 c9
71, 31, 50, 00, 00,	c10 c11 c12 c13 c14
00, 00, 00, 00, 00,	c15 c16 c17 c18 c19
14,	<count_2>
7E, 7E, 03, 00, 00,	r0 r1 r2 r3 r4
7E, 7E, 03, 00, 00,	r5 r6 r7 r8 r9
25, 66, 0F, 28, 04,	r10 r11 r12 r13 r14
00, 00, 00, 00, 00,	r15 r16 r17 r18 r19

MMP-16 MMC Signature

2E,	count = n
01, 00, 00, 00,	vi vf va vb
14,	<count_1>
7E, 5D, 00, 00, 00,	c0 c1 c2 c3 c4
00, 00, 00, 00, 00,	c5 c6 c7 c8 c9
71, 31, 50, 00, 00,	c10 c11 c12 c13 c14
00, 00, 00, 00, 00,	c15 c16 c17 c18 c19
14,	<count_2>
7E, 7E, 03, 00, 00,	r0 r1 r2 r3 r4
7E, 7E, 03, 00, 00,	r5 r6 r7 r8 r9
25, 66, 0F, 28, 04,	r10 r11 r12 r13 r14
00, 00, 00, 00, 00,	r15 r16 r17 r18 r19

MIDI Inquiry Message

General Response: F0 7E <channel> 06 02 mm ff ff dd dd ss ss ss ss F7

The MMR-8 and MMP-16 engineering development is done by TimeLine Vista, Inc. The MIDI inquiry response codes are therefore those of TimeLine and not TASCAM.

The MMR-8 responds to a MIDI Inquiry message as follows:

mm	TimeLine manufacturer system exclusive ID	00 00 49
ff ff	Device Family Code	04 00 (LSB First)
dd dd	Device Family Member Code	00 00 (LSB First)
ss ss ss ss	Software Revision Level	00 00 xx xx (e.g. 03 00)

The MMP-16 responds to a MIDI Inquiry message as follows:

mm	TimeLine manufacturer system exclusive ID	00 00 49
ff ff	Device Family Code	04 00 (LSB First)
dd dd	Device Family Member Code	01 00 (LSB First)
ss ss ss ss	Software Revision Level	00 00 xx xx (e.g. 03 00)

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