YAMAHA

DIGITAL MULTITRACK RECORDER

D24

Owner's Manual

Keep This Manual For Future Reference.

E

Laser Diode Properties
* Material : AlGaInP
* Wavelength : 675–695 nm
* Emission Duration : Continuous
* Laser Output Power : Less than 44.6 μW
   (Note) Laser output is measured at a
            distance of 20 cm from the object
            lens on the optical pick-up head.

```
CLASS 1 LASER PRODUCT
LUOKAN 1 LASERLAITE
KLASS 1 LASERAPPARAT
```
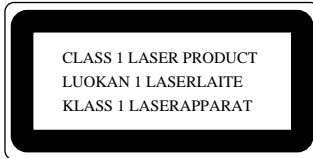
This unit is classified as a
Class 1 laser product.
This label is located on the
exterior.

Klassmärkning för Finland.

```
DANGER                                        APL
INVISIBLE  LASER  RADIATION  WHEN  OPEN.
AVOID  DIRECT  EXPOSURE  TO  BEAM.

DANGER
RADIATIONS  INVISIBLES  DU  LASER  EN  CAS  D' OUVERTURE.
EVITER  TOUTE  EXPOSITION  DIRECTE  AU  FAISCEAU.

VORSICHT
LASERSTRAHLUNG.  WENN  ABDECKUNG  GEÖFFNET
NICHT  DEM  STRAHL  AUSSETZEN.

ADVARSEL
USYNLIG  LASERSTRÅLING  VED  ÅBNING  NÅR
SIKKERHEDSAFBRYDERE  ER  UDE  AF  FUNKTION.
UNDGÅ  UDSAETTELSE  FOR  STRÅLING.
```

• These labels are
  located on the interior.
• Varningsanvisning för
  laserstrålning. Placerad
  i apparaten.

```
VARNING
OSYNLIG LASERSTRÅLNING NÄR
DENNA DEL ÄR ÖPPEND. STRÅLEN
ÄR FARLIG.
```
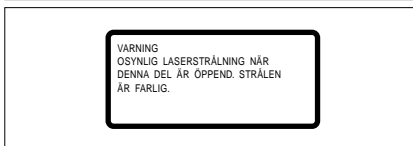
CAUTION
USE OF CONTROLS OR ADJUSTMENTS OR
PERFORMANCE OF PROCEDURES OTHER
THAN THOSE SPECIFIED HEREIN MAY RESULT
IN HAZARDOUS RADIATION EXPOSURE.

ADVARSEL
Usynlig laserstråling ved åbning. Undgå udsaettelse
for stråling.

VAROITUS
Laitteen käyttäminen muulla kuin tässä käyttöohjeesa
mainitulla tavalla saattaa altistaa käyttäjän
turvallisuusluokan 1 ylittävälle näkymättömälle
lasersäteilylle.

VARNING
Om apparaten används på annat sätt än i denna
bruksanvisning specificerats, kan användaren utsättas
för osynlig laserstrålning, som överskrider gränsen för
laserklass 1.

Important Information

Read the Following Before Operating the D24

Warnings

- Do not subject the D24 to extreme temperatures, humidity, direct sunlight, or dust, which could be a potential fire or electrical shock hazard.

- Connect the D24 power cord to an AC outlet of the type stated in this *Owner's Manual* or as indicated on the D24. Failure to do so is a fire and electrical shock hazard.

- Do not plug several devices into the same AC outlet. This may overload the AC outlet, and could be a fire or electrical shock hazard. It may also affect the performance of some devices.

- Do not place heavy objects on the power cord. A damaged power cord is a potential fire and electrical shock hazard.

- If the power cord is damaged (e.g., cut or a bare wire is exposed), ask your dealer for a replacement. Using the D24 with a damaged power cord is a fire and shock hazard.

- Hold the power cord plug when disconnecting from an AC outlet. Never pull the cord. A power cord damaged through pulling is a potential fire and electrical shock hazard.

- Do not place small metal objects on top of the D24. Metal objects falling inside the D24 is a fire and electrical shock hazard.

- Do not block the D24 ventilation slots. The D24 has ventilation slots at the side and a cooling fan at the rear to keep the internal components cool. Blocking the ventilation slots or obstructing the fan's airflow is a potential fire hazard.

- Do not attempt to modify the D24. This is a potential fire and electrical shock hazard.

- The D24 operating temperature is between 5°C and 35°C (41°F and 95°F).

Cautions

- Allow enough free space around the unit for normal ventilation. This should be: 10 cm behind and 20 cm above.
  These distances should also be adopted when rack-mounting the unit. For normal ventilation during use, remove the rear of the rack or open a ventilation hole.
  If the airflow is not adequate, the unit will heat up inside and may cause a fire.

- Turn off audio devices when connecting them to the D24, and use only the cables specified in the relevant owner's manuals.

- If you notice any abnormality—such as smoke, odor, or noise—turn off the D24 immediately. Remove the power cord from the AC outlet. Confirm that the abnormality is no longer present. Using the D24 in this condition is a potential fire and shock hazard. Consult your dealer for repair.

- If a foreign object or water gets inside the D24, turn it off immediately. Remove the power cord from the AC outlet. Using the D24 in this condition is a potential fire and electrical shock hazard. Consult your dealer for repair.

- If you plan not to use the D24 for a long period of time, remove the power cord from the AC outlet. Leaving the D24 connected is a potential fire hazard.

- Do not use benzene, thinner, cleaning detergent, or a chemical cloth to clean the D24. Use only a soft, dry cloth.

MO Disks

- Use only MO disks of the type specified in this manual.
- Store MO disks in a place free from extreme temperatures, humidity, dust, and dirt.
- Do not slide open the MO disk shutter, and never touch the actual disk.
- If an MO disk is stored in a cold place (e.g., overnight in a car), and then moved to a warmer environment, condensation may form on the disk. In this case, the disk should be left to acclimatize for about 30 minutes before use.

Interference

The D24 uses high-frequency digital circuits that may cause interference on radio and television equipment located nearby. If interference is a problem, relocate the affected equipment.

D24 Exclusion of Certain Responsibility

Manufacturer, importer, or dealer shall not be liable for any incidental damages including personal injury or any other damages caused by improper use or operation of the D24.

Package Contents

The D24 package should contain the following items. Contact your Yamaha dealer if you are missing an item.

- D24 Digital Multitrack Recorder
- This manual
- Power cord
- MO disk
- Disk eject tool

Trademarks

ADAT MultiChannel Optical Digital Interface is a trademark and ADAT and Alesis are registered trademarks of Alesis Corporation. Apple and Macintosh are registered trademarks of Apple Computer, Inc. Digidesign and OMF are registered trademarks and Sound Designer II is a trademark of Avid Technology, Inc. Tascam Digital Interface is a trademark and Tascam and Teac are registered trademarks of Teac Corporation. MS-DOS is a registered trademark and Windows is a trademark of Microsoft Corporation. Yamaha is a trademark of Yamaha Corporation. All other trademarks are the property of their respective holders and are hereby acknowledged.

Copyright

Contents

Welcome to the D24

1

In this chapter...

Welcome to the D24

Thank you for choosing the Yamaha D24 Digital Multitrack Recorder.

The D24 uses standard 3.5-inch removable MO (Magneto Optical) disks for digital audio recording and playback. By employing a removable media, backup downtime in between sessions is eliminated. When one session is complete, simply insert a new disk and begin recording right away. Random access capability provides instant access to up to 99 projects per disk, 99 locate memories per project, all without unproductive rewinding and fast forwarding. Audio data is not compressed, and superb sonic performance is achieved using 16-, 20-, or 24-bit recording resolutions and 44.1 kHz, 48 kHz, 88.2 kHz, or 96 kHz sampling rates, all of which can be set on a project-by-project basis.

Overwrite-type 640 MB MO disks offer 8-track simultaneous recording, with a 24-bit recording resolution and 44.1 kHz or 48 kHz sampling rates, and 4-track simultaneous recording at the higher sampling rates of 88.2 kHz or 96 kHz. A single 640 MB MO disk provides a total recording time of 120 track minutes, or 30 minutes for 4 tracks, 15 minutes for 8 tracks. In addition to the eight main tracks, each track features up to eight virtual tracks, for a grand total of 64 tracks. Auto punch in/out recording, with multiple take capability, allows you to choose the best from up to 99 takes. Both manual and auto punch in/out recording can be rehearsed with automatic playback and input monitor switching.

Video machine-like shuttle playback makes it easy to locate material, and the current position can be nudged in sub-frame steps while listening to a small section of the surrounding material. Tracks can be soloed for individual track monitoring. Other features include ±6% varispeed, A-B repeat playback, and fast forward or rewind at 8x or 16x normal playback speed.

In addition to the 99 locate memories, the A, B, Last Rec In, and Last Rec Out points offer additional ways locate specific positions quickly, repeatedly, and accurately. Other quick locate functions include Project Search, Return to Zero, and Roll Back. Location points can be specified with sub-frame accuracy.

Additional recording space can be made available, and projects backed up by connecting optional, external hard disk drives or removable media disk drives to the D24's SCSI port. The number of tracks available for simultaneous recording and playback can be expanded in multiples of eight by combining up to eight D24s. The total continuous recording time can be extended by using two D24s in Serial mode. The D24's 3U rack size makes it a drop-in alternative to modular digital multitrack recorders.

Optional mini YGDAI (Yamaha General Digital Audio Interface) cards offer a variety of analog and digital I/O configurations, with support for all the popular digital audio interconnect formats: AES/EBU, ADAT, and Tascam TDIF-1. S/PDIF Coaxial I/O allows digital stereo transfer between 2-channel digital audio equipment, CD players, DAT decks, and mastering equipment. A front panel phones jack provides convenient monitoring.

Once recorded, projects, tracks, and parts can be edited using non-destructive editing functions, such as 50% to 200% time compression and expansion, ideal for audio-fit-video applications, and pitch change without speed change. Project editing functions include Copy, Delete, Erase, Title, Protect, and Timecode Modify. Track editing functions include Copy, Move, Erase, Swap, and Slip. Part editing functions include Copy, Move, Erase, Insert Space, Insert Copy, and Delete, with single-step undo and redo. Edit points can be specified with sub-frame accuracy.

Tape recorder-like transport controls, and the Large vacuum fluorescent display, with large, easy to read counter, make operation a breeze. Visual level monitoring is provided by eight 16-segment track level meters. Selectable normal and fine scales make it easy to set precise levels when recording reference tones. Also, projects can be titled for easy identification.

The D24 can generate, or synchronize to either SMPTE/EBU or MTC (MIDI Time-code) timecode. Timecode synchronization is to 1/10-frame accuracy, and an offset can be set relative to an external timecode source.

Remote control is possible using MMC (MIDI Machine Control), or video editing equipment that supports 9-pin protocols.

Other features include Absolute (ABS) and Relative (REL) counter modes, disk duplication with two D24s, and the ability to mount D24 MO disks on personal computers.

See "D24 Features" on page 4 for a concise rundown of D24 features.

About this Manual

This *Owner's Manual* contains all the information you need in order to operate your D24 Digital Multitrack Recorder. Use the table of contents to familiarize yourself with the organization of this manual and locate topics, and use the index to locate specific information. A glossary of D24-related jargon is provided on page 201.

The following format is used throughout this *Owner's Manual* for display messages: "FORMAT DISK—ARE YOU SURE". The message before the dash appears on the 1st line of the display, and the message after the dash appears on the 2nd line.

Installing the D24

The D24 can be used freestanding on a stable surface, somewhere that complies with the important information at the beginning of this manual, or mounted in a rack.

When mounting the D24 in a rack, remove the D24's feet and leave adequate ventilation space around the D24 (at least 10 cm of free space behind). If the D24 is mounted in a portable rack case, keep the rear of the case open when using the D24, so as not to obstruct the flow of air from the cooling fan. Do not mount the D24 next to equipment that produces a lot of heat, such as a power amplifier.

D24 Features

Recording Media

- Standard 3.5-inch MO (Magneto Optical) disks.
- Convenient removable media for quick access to recorded material and sound libraries.
- No backup downtime, loading, or winding.
- Up to 99 projects per disk.

Sonic Performance

- 16/20/24-bit linear recording for superb sonic quality.
- 44.1/48/88.2/96 kHz sampling rates.
- Sampling rate and recording resolution can be set on a project-by-project basis.

Recording

- 8-track simultaneous recording on 640 MB Overwrite-type MO disks, with a 24-bit recording resolution and 44.1 kHz or 48 kHz sampling rate.
- 4-track simultaneous recording on 640 MB Overwrite-type MO disks, with a 24-bit recording resolution and 88.2 kHz or 96 kHz sampling rate.
- 120 track minutes (15 minutes for 8 tracks) using 640 MB MO disks (16-bit, 44.1 kHz).
- 8 virtual tracks per main track, for a total of 64 tracks.
- Auto punch in/out recording with multiple take capability—record and choose the best from up to 99 takes.
- Manual and auto punch in/out recording, with rehearsal.

Playback

- Video machine-like shuttle playback.
- Position nudge, with audio listen.
- Solo function for individual track monitoring.
- ±6% varispeed.
- A-B repeat playback.

Quick Locate

- Up to 99 locate points per project, plus A, B, Last Rec In, and Last Rec Out points.
- Project Search, Return to Zero, and Roll Back functions.
- Location points can be specified with sub-frame accuracy.
- Fast forward or rewind at 8x or 16x normal playback speed.

System Expansion

- SCSI port for connecting external disk drives (hard disks, removable media drives, etc).
- Tracks can be expanded by combining up to eight D24s, for a total of 64-tracks.
- Continuous recording time can be extended by using two D24s in Serial mode.
- 3U rack size for drop-in alternative to tape-based modular digital multitrack recorders.

Flexible I/O

- Optional mini YGDAI (Yamaha General Digital Audio Interface) cards offer a variety of analog and digital I/O configurations, with support for all the popular digital audio interconnect formats: AES/EBU, ADAT, and Tascam TDIF-1.
- S/PDIF Coaxial I/O.
- Phones.

Editing

- Project editing functions include Copy, Delete, Erase, Title, Protect, and Timecode Modify.
- Track editing functions include Copy, Move, Erase, Swap, and Slip.
- Part editing functions include Copy, Move, Erase, Insert Space, Insert Copy, and Delete.
- Edit Undo/Redo function.
- Edit points can be specified with sub-frame accuracy.
- 50% to 200% time compression and expansion, for audio-fit-video applications.
- Pitch Change function provides pitch change without speed change.

Easy Operation

- Tape recorder-like transport controls.
- Large vacuum fluorescent display, with large, easy to read counter.
- 16-segment track level meters, with selectable normal and fine scales.
- Projects can be titled for easy identification.

Synchronization

- SMPTE/EBU or MTC (MIDI Timecode) synchronization, with timecode offset.
- Timecode synchronization to 1/10-frame accuracy.
- Wordclock I/O for master/slave operation.

Remote Control

- MMC (MIDI Machine Control).
- 9-pin video editor protocols with video sync.
- Optional RC-D24 Remote Controller.

Others

- Absolute (ABS) and Relative (REL) counter modes.
- Project backup.
- Disk duplication with two D24s.
- Mount D24 MO disks on personal computers.

Choosing MO Disks

The D24's internal MO disk drive uses removable 3.5-inch MO (Magneto Optical) disks for recording and playback. Normal or Overwrite-type MO disks in a variety of sizes can be used, but only 640 MB Overwrite-type disks support 8-track simultaneous recording with a 24-bit recording resolution. The number of tracks available for simultaneous recording depends on the type of MO disk used, its capacity, the selected recording resolution, and sampling rate. See the following section for more information.

Both normal and Overwrite-type MO disks support 8-track simultaneous playback at sampling rates of 44.1 kHz and 48 kHz, and 4-track simultaneous playback at 88.2 kHz and 96 kHz.

Overwrite-type disks feature the Overwrite logo shown here.

Tracks Available for Simultaneous Recording

The following table lists the number of tracks available for simultaneous recording with a variety of normal and Overwrite-type MO disks at each recording resolution and sampling rate.

Disk Type		44.1, 48 kHz			88.2, 96 kHz		
		16-bit	**20-bit**	**24-bit**	**16-bit**	**20-bit**	**24-bit**
Overwrite	640 MB	8	8	8	4	4	4
	230 MB	8	6	6	4	3	3
Normal	640 MB	8	6	6	4	3	3
	230 MB	5	3	2	2	1	1

For performance reasons, it's recommended that you do not use 128 MB MO disks.

When tracks that have already been recorded are playing back, depending on the number and performance of those tracks (i.e., how heavily they've been edited), the number of tracks available for simultaneous recording is reduced. Use the Optimize function to arrange the recorded sound files for optimum performance. See "Recovering Disk Space" on page 172 for more information.

Recording Time

The total recording time depends on the disk capacity, recording resolution, and sampling rate. A 640 MB Overwrite-type MO disk, for example, offers a total recording time of 120 track minutes with a 16-bit recording resolution and 44.1 kHz sampling rate.

The following table lists the approximate recording times offered by a variety of MO disk capacities, with a 16-bit recording resolution and 44.1 kHz sampling rate.

Disk Capacity	Recording Time (16-bit, 44.1 kHz)			
	Track minutes (mono)	**2 tracks**	**4 tracks**	**8 tracks**
640 MB	120 min	60 min	30 min	15 min
230 MB	43 min	21 min	10 min	5 min

The following table lists the approximate recording times available using 640 MB MO disks at a variety of recording resolutions and sampling rates.

Bit	Sampling Rate	Track minutes (mono)	2 tracks	4 tracks	8 tracks
16	**44.1 kHz**	120 min	60 min	30 min	15 min
	48 kHz	111 min	55 min	27 min	13 min
	88.2 kHz	60 min	30 min	15 min	—
	96 kHz	55 min	27 min	13 min	—
20	**44.1 kHz**	96 min	48 min	24 min	12 min
	48 kHz	88 min	44 min	22 min	11 min
	88.2 kHz	48 min	24 min	12 min	—
	96 kHz	44 min	22 min	11 min	—
24	**44.1 kHz**	80 min	40 min	20 min	10 min
	48 kHz	74 min	37 min	18 min	9 min
	88.2 kHz	40 min	20 min	10 min	—
	96 kHz	37 min	18 min	9 min	—

Higher recording resolutions and sampling rates offer higher quality, but produce more data, which reduces the total available recording time. Use the Remain function to check the available recording time. See "Checking the Time Remaining" on page 38 for more information.

The number of tracks available for simultaneous recording can be expanded using multiple D24s. See "Multiple D24s" on page 144 for more information.

The D24's internal MO disk drive supports 230 MB, 540 MB, and 640 MB MO disks. See the Yamaha Professional Audio Web site at the address below for up-to-date news on MO disks.

<http://www.yamaha.co.jp/product/proaudio/homeenglish/>

Preformatted MO Disks

MO disks preformatted for use with PC or Macintosh computers can be used with the D24, but require formatting before use. See "Formatting MO Disks" on page 26 for more information.

Calculating the approximate Recording Time

You can calculate the approximate recording time for a given recording resolution, sampling rate, and disk capacity as follows. First multiple the recording resolution by the sampling rate to get the number of bits produced per second (e.g., $16 \times 44100 = 705,600$ bits per second). Then divide that by eight to get the number of bytes per second (e.g., $705,600 \div 8 = 88,200$ bytes per second). Multiply that by 60 to get the number of bytes required per minute (e.g., $88,200 \times 60 = 5,292,000$ bytes per minute, or 5.292 MB/min). Now you know the number of megabytes required to store one minute of audio data, simply divide the capacity of the disk by that number to get the approximate number of track minutes (e.g., $640,000,000 \div 5,292,000 = 120$ minutes). Finally, divide the number of track minutes by two, four, or eight to get the approximate recording time available for several tracks (e.g., $120 \div 8 = 15$ minutes for 8-track simultaneous recording).

Touring the D24

2

In this chapter...

Front Panel

The D24 front panel is explained in the following sections.

Display
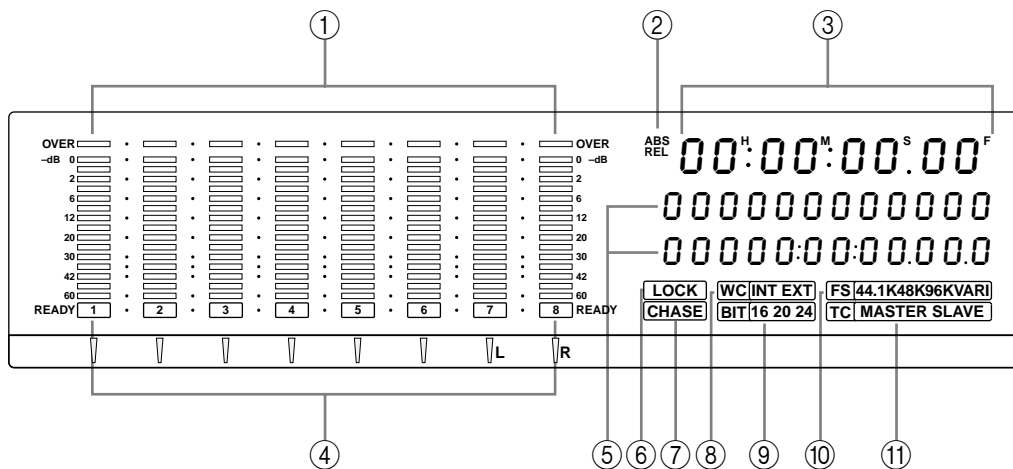
① **Level meters**

These 16-segment track meters, with Peak Hold function, show playback and input signal levels from –60 dB to 0 dB. In Fine mode, they display levels from –26 dB to 0 dB. The OVER indicator lights up when several consecutive audio samples exceed the digital saturation point. See "Metering" on page 39 for more information.

When the Shuttle, Nudge, Time Compression, or Pitch Change function is used, track meters 7 and 8 function as stereo meters, and meters 1 through 6 are turned off.

② **ABS/REL indicators**

These indicators show whether the counter is displaying absolute (ABS) time or relative (REL) time. See "Using Absolute & Relative Zero" on page 49 for more information.

③ **Counter**

The main counter shows the current position in hours, minutes, seconds, and frames, (00:00:00.00), and can display the absolute (ABS) time or relative (REL) time. See "Using Absolute & Relative Zero" on page 49 for more information.

The 2nd line of the message area displays time information in hours, minutes, seconds, frames, and sub-frames (00:00:00.00.0). Each sub-frame is one tenth of a frame, making 10 sub-frames per frame.

The 2nd line is also used to display the remaining recording time. See "Checking the Time Remaining" on page 38 for more information.
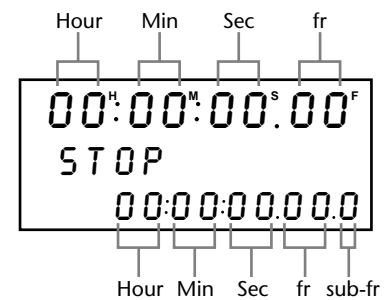
④ **READY indicators**

These indicators show which tracks are selected for recording. When a track is selected for recording, the corresponding READY indicator flashes. During recording or rehearsal, the corresponding indicator lights up continuously. See "Recording" on page 33 for more information.

⑤ **Message area**

The message area consists of two lines that can each display up to 12 characters, which typically show the status and operating mode of the D24, function and parameter names and values, project titles and numbers, locate memory numbers, editing information, time values, and so on.

⑥ **LOCK indicator**

This indicator shows whether or not the D24 is locked to the selected wordclock source. See "Selecting a Wordclock Source" on page 124 for more information.

⑦ **CHASE indicator**

This indicator shows whether or not the D24 is synchronized to the external timecode source. It flashes when the D24 is chasing, and lights up continuously when it's fully synchronized. See "Chasing External Timecode" on page 138 for more information.

⑧ **WC window**

This window shows the selected wordclock source: internal (INT) or external (EXT). See "Selecting a Wordclock Source" on page 124 for more information.

⑨ **BIT window**

This window shows the selected recording resolution: 16, 20, or 24. See "Setting the Recording Resolution" on page 32 for more information.

⑩ **FS window**

This window shows the selected sampling rate: 44.1 kHz, 48 kHz, 88.2 kHz, or 96 kHz. When 88.2 kHz is selected, both the 44.1 kHz and 96 kHz indicators light up. See "Selecting a Wordclock Source" on page 124 for more information.

The "VARI" indicator lights up when the Varispeed function is turned on. See "Using Varispeed" on page 55 for more information.

⑪ **TC window**

This window shows the selected timecode source: master or slave. When set to master, the D24 uses internal timecode, and when set to slave, an external timecode source. See "Selecting a Timecode Source" on page 135 for more information.

Transport Controls
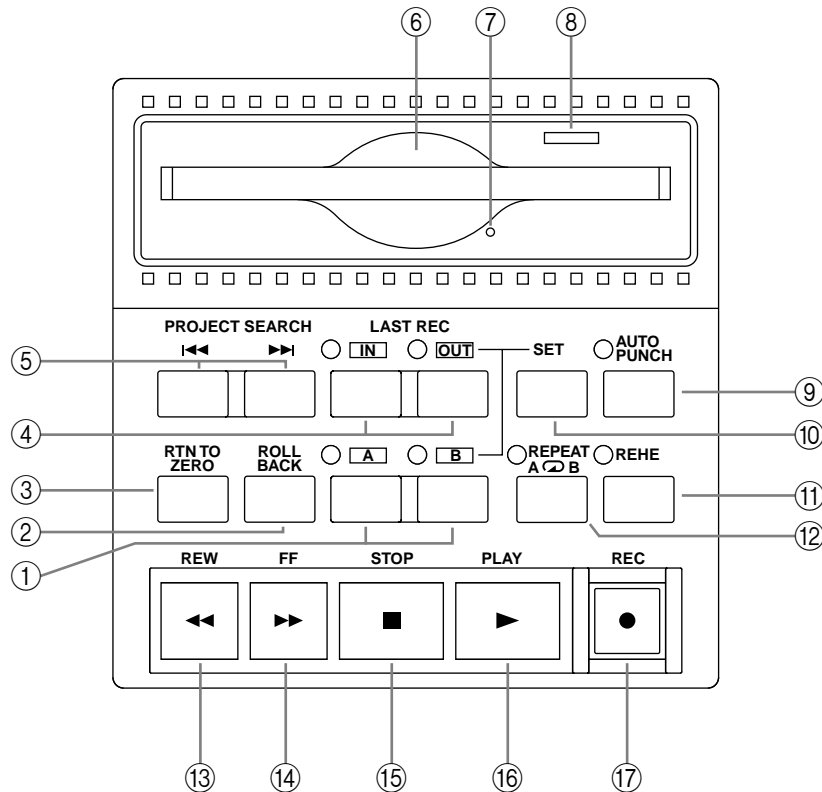
The "Transport Operation Table" on page 27 and the "Indicator Status Tables" on page 28 list how the transport buttons and indicators function in each transport mode.

① **A & B buttons & indicators**

These buttons are used to set and locate the A and B points. The A and B indicators light up when the respective A or B point is set. See "Using the A & B Points" on page 61 for more information.

② **ROLL BACK button**

This button is used to roll back from the current position in steps of between 1 and 30 seconds, the default being 5 seconds. See "Using Roll-back" on page 50 for more information.

③ **RTN TO ZERO button**

This button is used to locate the zero position. See "Returning to Zero" on page 60 for more information.

④ **LAST REC IN & OUT buttons & indicators**

These buttons are used to set and locate the LAST REC IN and LAST REC OUT points. The IN and OUT indicators light up when the respective IN or OUT point is set. See "Setting the LAST REC IN & OUT Points" on page 71 and "Locating the LAST REC IN & OUT Points" on page 62 for more information.

⑤ **PROJECT SEARCH buttons**

These buttons are used to search for projects. Pressing the [◄◄] button selects the top of the current project. Pressing the [►►] button selects the top of the next project. See "Searching for Projects" on page 58 for more information.

⑥ **MO disk drive slot**

MO disks are loaded into the internal MO drive through this slot. See "Inserting & Ejecting Disks" on page 25 for more information.

⑦ **Manual eject hole**

This hole is used when disks cannot be ejected in the normal way. See "Ejecting Troublesome Disks (emergency use)" on page 174 for more information.

⑧ **Eject button & activity indicator**

This button is used to eject MO disks, but also functions as a drive activity indicator, lighting up when the disk drive is busy. See "Inserting & Ejecting Disks" on page 25 for more information.

⑨ **AUTO PUNCH button & indicator**

This button selects the Auto-Punch In/Out function. The AUTO PUNCH indicator flashes when this function is on. See "Auto Punch In/Out Recording" on page 68 for more information.

⑩ **SET button**

This button is used in conjunction with the LAST REC [IN], LAST REC [OUT], [A], and [B] buttons to set the LAST REC IN, LAST REC OUT, A, and B points, respectively. See "Setting the LAST REC IN & OUT Points" on page 71 and "Setting the A & B Points" on page 61 for more information. It's also used in conjunction with the [RTN TO ZERO] button to set the relative zero position. See "Using Absolute & Relative Zero" on page 49 for more information.

The [SET] button is also used in conjunction with the [ENTER] button for the Auto Memory Store function, and in conjunction with the [LOCATE] button to set the Keypad Timecode Input mode. See "Storing Locate Points Automatically" on page 65 and "Locating Positions Directly" on page 63 respectively for more information.

⑪ **REHE button & indicator**

This button is used to engage Rehearsal Standby mode and, when pressed together with the [PLAY] button, punch in rehearsal. In Rehearsal mode, recording can be practiced, with automatic playback and input monitor switching at the punch in and out points, without actually recording anything to disk. The REHE button indicator flashes in Rehearsal Standby mode, and lights up continuously during rehearsal. See "Rehearsing" on page 36, "Manual Punch In/Out Rehearsal" on page 69, and "Auto Punch In/Out Rehearsal" on page 72 for more information.

⑫ **REPEAT button & indicator**

This button selects the A–B Repeat playback function. The REPEAT indicator lights up when this function is on. See "A–B Repeat Playback" on page 47 for more information.

⑬ **REW button**

This button is used to start rewind. Press it once for rewind at 8x normal play speed, the REW button indicator flashes. Press it again for rewind at 16x normal play speed, the REW button indicator lights up continuously. Pressing and holding the REW button during playback rewinds at 8x normal play speed.

⑭ **FF button**

This button is used to start fast forward. Press it once for fast forward at 8x normal play speed, the FF button indicator flashes. Press it again for fast forward at 16x normal play speed, the FF button indicator lights up continuously. Pressing and holding the FF button during playback fast forwards at 8x normal play speed.

⑮ **STOP button**

This button is used to stop playback, recording, rehearsal, rewind, and fast forward, and to cancel the Rehearse Standby mode. The STOP button indicator lights up when the D24 is stopped.

⑯ **PLAY button**

This button is used to start playback, punch out of recording or rehearsal, and in conjunction with the [REC] and [REHE] buttons, punch in for recording or rehearsal, respectively. The PLAY button indicator lights up during playback, recording, and rehearsal.

⑰ **REC button**

This button is used in conjunction with the [PLAY] button to start recording. The REC button indicator lights up while recording. See "Recording" on page 29 for more information.

Power Switch & Phones
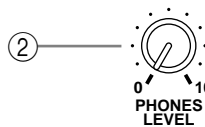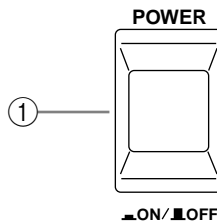
① **POWER switch**

This switch is used to turn on and off the D24. It's recessed to prevent accidental operation. See "Turning On & Off the D24" on page 24 for more information.

② **PHONES LEVEL control**

This control is used to adjust the volume level of the phones. See "Monitoring" on page 42 for more information.

③ **PHONES jack**

A pair of stereo headphones can be connected to this stereo phone jack for monitoring. See "Monitoring" on page 42 for more information.

The following illustration shows how the PHONES jack is wired.
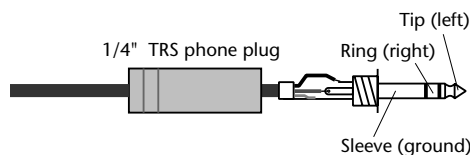
Jog/Data & Shuttle/Cursor Controls
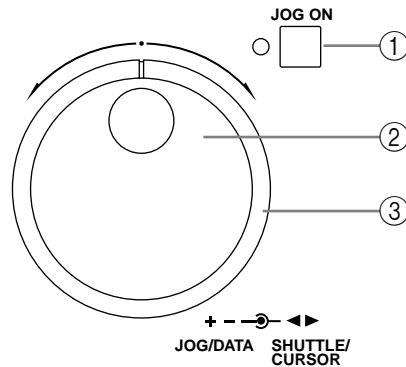
① **JOG ON button & indicator**

This button is used to turn on the Nudge and Shuttle functions. The JOG ON indicator lights up when these functions are on. See "Nudging the Current Position" on page 53 and "Shuttling" on page 52 for more information.

② **JOG/DATA dial**

This is a dual-function control, the operation of which depends on the [JOG ON] button. When [JOG ON] is off, the JOG/DATA dial is typically used for time and data entry and selecting parameters and functions on the display. Time values can be entered on the 2nd line of the display using the keypad, and then adjusted up or down in sub-frame steps using the JOG/DATA dial.

When [JOG ON] is on, the JOG/DATA dial is used to nudge the current position while auditioning a small section of recorded material. See "Nudging the Current Position" on page 53 for more information.

When the [VARI SPEED], [UTILITY], [SETUP], [V.TRACK SELECT], or [EDIT] button is pressed, the JOG/DATA dial is used to select functions and set parameter values.

③ **SHUTTLE/CURSOR ring**

This is a dual-function control, the operation of which depends on the [JOG ON] button. When [JOG ON] is off, the SHUTTLE/CURSOR ring is used to move the cursor on the display when selecting virtual tracks, titling projects, setting a timecode offset, or setting the absolute start time for a new project.

When [JOG ON] is on, the SHUTTLE/CURSOR ring is used to shuttle forwards or backwards at various speeds while auditioning the recorded material. See "Shuttling" on page 52 for more information.

Function Buttons
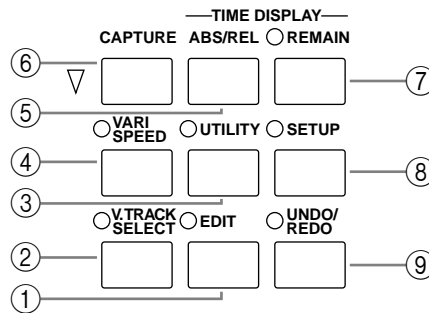
① **EDIT button & indicator**

This button is used to access the edit functions. The EDIT indicator lights up when this button is pressed. The D24 must be stopped to use the edit functions. See "Editing Projects" on page 77, "Editing Tracks" on page 85, and "Editing Parts" on page 95 for more information.

② **V. TRACK SELECT button & indicator**

This button is used to access the Virtual Track function. The V. TRACK SELECT indicator lights up when the Virtual Track function is on. See "Using Virtual Tracks" on page 51 for more information.

③ **UTILITY button & indicator**

This button is used to access the utility functions. The UTILITY indicator lights up when this button is pressed. The D24 must be stopped to use the utility functions.

④ **VARI SPEED button & indicator**

This button is used to access the Varispeed function. The VARI SPEED indicator lights up when the Varispeed function is on. The Varispeed function can be set while the D24 is stopped or during playback.See "Using Varispeed" on page 55 for more information.

⑤ **ABS/REL button**

This button is used to set the counter mode to either Absolute (ABS), the default setting, or Relative (REL). See "Using Absolute & Relative Zero" on page 49 for more information.

⑥ **CAPTURE button**

This button is used to capture time positions while the D24 is stopped or during rewind, fast forward, playback, recording, or rehearsal. Captured values appear on the 2nd line of the display and can then be located or stored. See "Storing Locate Points" on page 64 for more information.

⑦ **REMAIN button & indicator**

This button turns on the Remain function, which shows how much recording time is available. The REMAIN indicator lights up when the Remain function is on. See "Checking the Time Remaining" on page 38 for more information.

⑧ **SETUP button & indicator**

This button is used to access the setup functions. The SETUP indicator lights up when this button is pressed. The D24 must be stopped to use the setup functions.

⑨ **UNDO/REDO button & indicator**

This button is used to undo or redo the last recording or edit. See "Undoing a Recording or Edit" on page 35.

Peak, Monitor, Format & Chase Buttons

```
   ①         ②       ③        ④       ⑤
   │         │       │        │       │

  ○ PEAK   ○ AUTO  ○ ALL    ○ FORMAT ○ CHASE
    HOLD     INPUT   INPUT
  ┌────┐   ┌────┐  ┌────┐   ┌────┐   ┌────┐
  │    │   │    │  │    │   │    │   │    │
  └────┘   └────┘  └────┘   └────┘   └────┘
           MONITOR SELECT
```
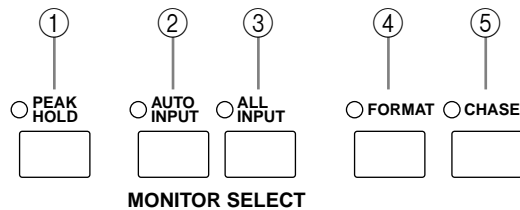
① **PEAK HOLD button & indicator**

This button is used to turn the Peak Hold function on and off. The Peak Hold indicator lights up when the Peak Hold function is on. See "Using Peak Hold" on page 41 for more information.

② **AUTO INPUT button & indicator**

This button selects the Auto Input function. The Auto Input function works best with punch in/out recording. The AUTO INPUT indicator lights up when the Auto Input function is on.

Normally, when a track is selected for recording, its input signal is monitored during recording. When the Auto Input function is on, however, track monitoring is automatically switches from playback to input signal at the punch-in point, and from input signal back to playback at the punch-out point. See "Monitoring" on page 42 for more information.

③ **ALL INPUT button & indicator**

This button selects the All Input function. When the All Input function is on, all track inputs are monitored regardless of the transport mode, [RECORD READY] buttons. The ALL INPUT indicator lights up when the All Input function is on. See "Monitoring" on page 42 for more information.

④ **FORMAT button & indicator**

This button selects the Format function. The FORMAT indicator lights up when the Format function is used. New MO disks and external disk drives must be formatted before they can be used for recording with the D24. See "Formatting MO Disks" on page 26 and "Formatting External Disk Drives" on page 158 for more information.

⑤ **CHASE button & indicator**

This button selects Chase mode, in which the D24 synchronizes to an external timecode source. The CHASE indicator lights up when the Chase function is on. See "Chasing External Timecode" on page 138 for more information.

Keypad
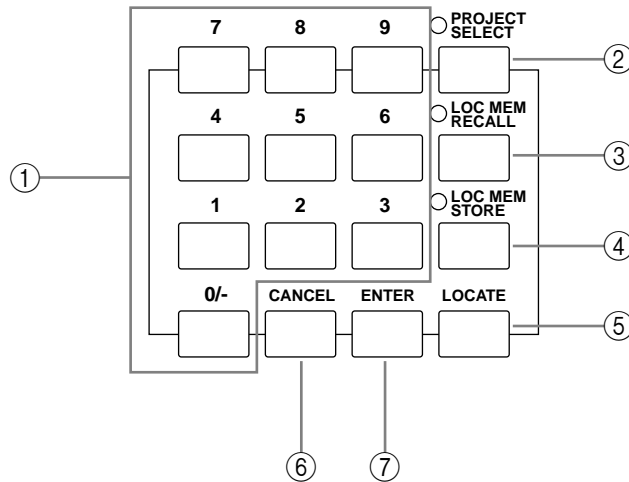
① **Keypad buttons**

The keypad is used with various functions to enter time values, parameter values, project numbers, locate memory numbers, and so on.

The [0/-] is used to enter the number "0" and to make values plus or minus.

② **PROJECT SELECT button & indicator**

This button is used to select projects by number. The PROJECT SELECT indicator lights up when the Project Select function is on. See "Selecting Projects Directly" on page 59 for more information.

③ **LOC MEM RECALL button & indicator**

This button is used to recall locate memories. The LOC MEM RECALL indicator lights up when the Locate Memory Recall function is on. See "Recalling Locate Points" on page 66 for more information.

④ **LOC MEM STORE button & indicator**

This button is used to store locate memories. The LOC MEM STORE indicator lights up when the Locate Memory Store function is on. See "Storing Locate Points" on page 64 for more information.

⑤ **LOCATE button**

This button is used to locate the position specified on the 2nd line of the display. See "Locating Positions Directly" on page 63 and "Recalling Locate Points" on page 66 for more information.

⑥ **CANCEL button**

This button is used to cancel functions and reset time values to zero on the 2nd line of the display.

⑦ **ENTER button**

This button is used to select, confirm, and execute functions.

Track Buttons
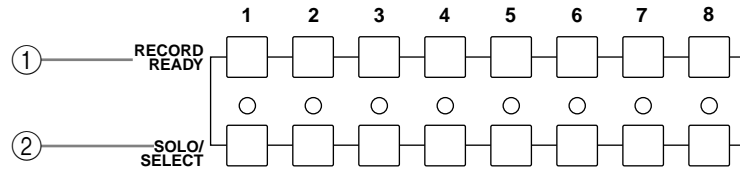
① **RECORD READY buttons 1–8**

These buttons are used to select tracks for recording. When a track is selected for recording, the corresponding READY indicator flashes. During recording or rehearsal, the corresponding indicator lights up continuously. See "Recording" on page 33 for more information.

② **SOLO/SELECT buttons & indicators 1–8**

These buttons are used to solo individual tracks. When a track is soloed, the corresponding SOLO/SELECT indicator lights up. See "Soloing Tracks" on page 48 for more information.

Rear Panel
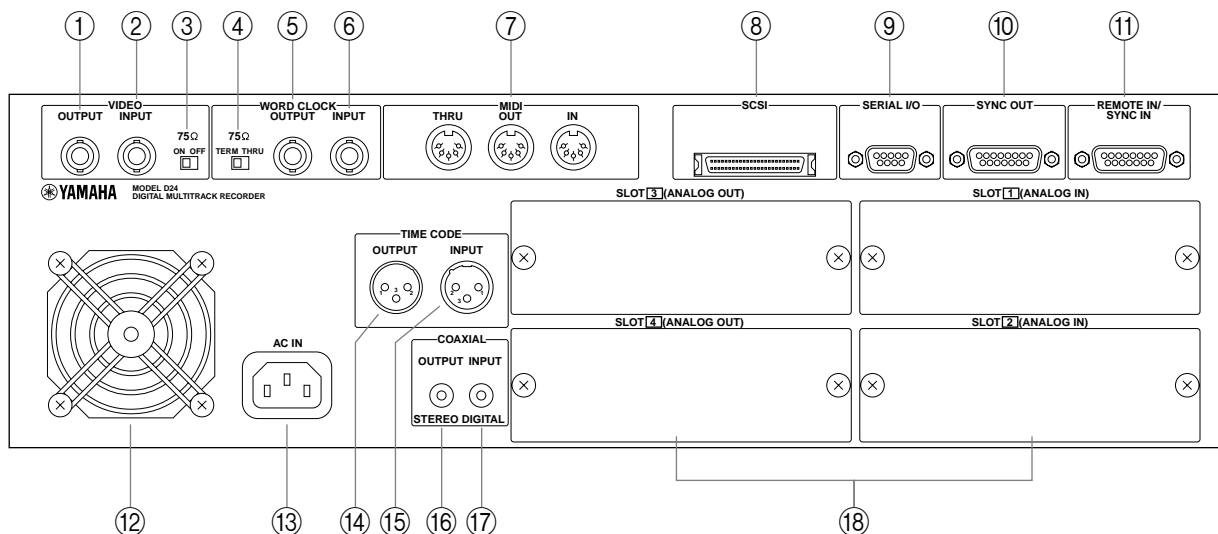
① **VIDEO OUTPUT connector**

This BNC connector transmits the video sync signal received at the VIDEO INPUT when the VIDEO 75Ω ON/OFF switch is set to OFF. See "Using Video Sync" on page 149 for more information.

② **VIDEO INPUT connector**

This BNC connector receives video sync signals (black burst or color bar). See "Using Video Sync" on page 149 for more information.

③ **VIDEO 75Ω ON/OFF switch**

This switch is used to terminate the video signal received at the VIDEO INPUT connector. When set to OFF, the video sync signal received at the VIDEO INPUT is transmitted by the VIDEO OUTPUT connector. When set to ON, nothing is transmitted by the VIDEO OUTPUT connector. See "Terminating BNC Video Sync Distribution" on page 150 for more information.

④ **WORD CLOCK 75Ω TERM/THRU switch**

This switch is used to terminate the wordclock signal received at the WORD CLOCK INPUT connector. See "Terminating BNC Wordclock Distribution" on page 131 for more information.

⑤ **WORD CLOCK OUTPUT connector**

This BNC connector transmits the wordclock signal received at the WORD CLOCK INPUT when the WORD CLOCK 75Ω TERM/THRU switch is set to THRU, or the internally generated wordclock signal when this switch is set to TERM. See "Wordclock Connections" on page 123 for more information.

⑥ **WORD CLOCK INPUT connector**

This BNC connector receives wordclock signals when the D24 is locked to an external wordclock source. See "Wordclock Connections" on page 123 for more information.

⑦ **MIDI IN, OUT & THRU ports**

These are standard MIDI IN, OUT, and THRU ports and are used to connect the D24 to other MIDI equipment for use with MTC (MIDI Timecode) and MMC (MIDI Machine Control). See "MIDI Ports" on page 178 for more information.

⑧ **SCSI port**
This 50-pin, half-pitch SCSI connector is used to connect external SCSI disk drives and removable media drives for additional recording space. The SCSI interface supports Narrow SCSI-2 (FAST-20). A personal computer equipped with SCSI can also be connected, which can then access files on the MO disk in the D24. See "SCSI & the D24" on page 154 for more information.

⑨ **SERIAL I/O port**
This 9-pin D-sub connector is used to connect the D24 to a video remote controller or video editor for control using 9-pin protocols. See "Connecting a Video Editor" on page 151 for more information.

⑩ **SYNC OUT port**
This 15-pin D-sub connector is used to connect multiple D24s in a synchronized system. In addition to various control signals, SYNC connections also carry wordclock and timecode signals. See "Expanding the Number of Tracks" on page 145 for more information.

⑪ **REMOTE IN/SYNC IN port**
This 15-pin D-sub connector is used to connect multiple D24s in a synchronized system. It can also be used to connect an optional remote controller. In addition to various control signals, SYNC connections also carry wordclock and timecode signals. See "Expanding the Number of Tracks" on page 145 for more information.

⑫ **Cooling fan**
The cooling fan keeps the internal components cool. See "Installing the D24" on page 3 for more information.

⑬ **AC IN connector**
This connector is used to connect the D24 to an AC outlet, using the supplied power cord. See "Connecting the Power Cord" on page 24 for more information.

⑭ **TIMECODE OUTPUT connector**
This male XLR-3-32 connector (balanced) transmits internally generated SMPTE/EBU timecode when the D24 is used as the timecode master, or the timecode received at TIMECODE INPUT when the D24 is used as a timecode slave. See "Timecode Connections" on page 134 for more information.

⑮ **TIMECODE INPUT connector**
This female XLR-3-31 connector (balanced) receives SMPTE/EBU timecode when the D24 is used as a timecode slave. See "Timecode Connections" on page 134 for more information.

⑯ **COAXIAL STEREO DIGITAL OUTPUT connector**
This phono jack transmits S/PDIF format, 2-channel digital audio. See "Using the Coaxial Digital Input & Output" on page 187 for more information.

⑰ **COAXIAL STEREO DIGITAL INPUT connector**
This phono jack receives S/PDIF format, 2-channel digital audio. See "Using the Coaxial Digital Input & Output" on page 187 for more information.

⑱ **SLOTs 1–4**
These four slots are for use with optional mini YGDAI cards, which offer various analog and digital I/O options. See "Digital Audio I/O" on page 181 for more information.

The Basics

3

In this chapter...

Connecting the Power Cord

> *Warning:* Turn off all equipment before making any power connections.

Connect the socket-end of the supplied power cord to the AC IN socket on the rear panel of the D24, and the plug-end to a suitable AC wall outlet, one that conforms to the power supply requirements stated on the D24 rear panel.

AC IN
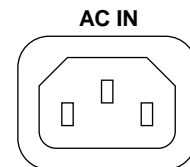
Turning On & Off the D24

To prevent loud clicks and thumps in your loudspeakers, turn on your audio equipment in the following order (reverse this order when turning off your equipment)—sound sources, D24, mixing console, monitor amplifier.

Before turning on the D24, turn on any external disk drives connected to the D24's SCSI port. Disk drives that are not turned on will not be recognized by the D24. Drives that you do not intend to use should be disconnected before turning on the D24. See "Using External Disk Drives" on page 154 for more information.

POWER

1   Press the [POWER] switch to turn on the D24.

After several seconds, "NO DISK" appears on the display and the D24 is ready for use.

ON/ OFF

2   Press the [POWER] switch again to turn off the D24.
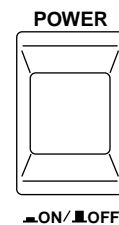
Write Protecting Disks

MO disks feature write-protect tabs similar to those found on floppy disks, allowing you to protect your recordings against accidental overwriting.

When the write-protect tab window is open, the disk is write protected and cannot be used for recording or editing. When the write-protect tab window is closed, the disk is unprotected and both recording and editing are possible.

Individual projects can be protected using the Project Edit Protect function. See "Protecting Projects" on page 82 for more information.

Inserting & Ejecting Disks

This section explains how to insert and eject MO disks.

1   Insert the MO disk into the disk drive with the shutter facing forward and the labeled side facing up, as shown below. Push it in until it clicks into place.
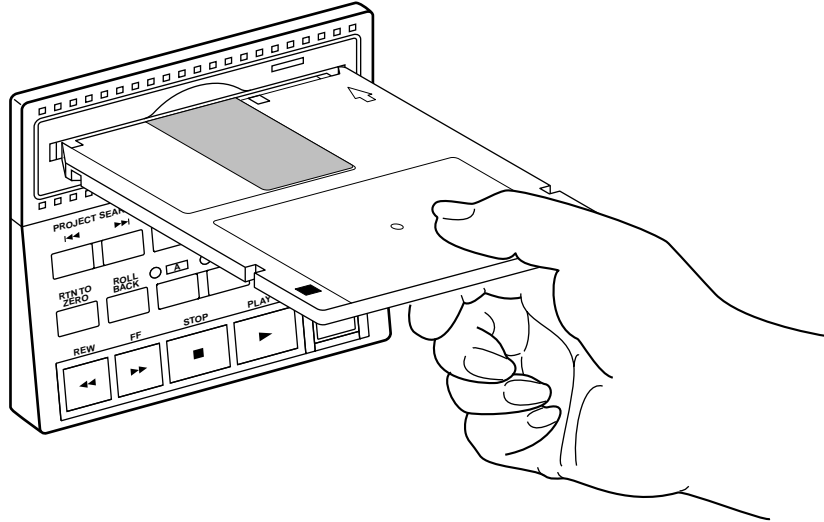
The disk should slide easily into the disk drive. If it doesn't, make sure that you've inserted it the right way around.

When a disk is inserted, "DISK LOADED" appears on the display.

If the disk has already been used for recording in the D24, the number and title of the first project appear on the display. If the disk has been formatted for use with the D24 but not yet used for recording, "01 NO TITLE" is displayed.

2   To eject a disk, press the eject button, as shown below.
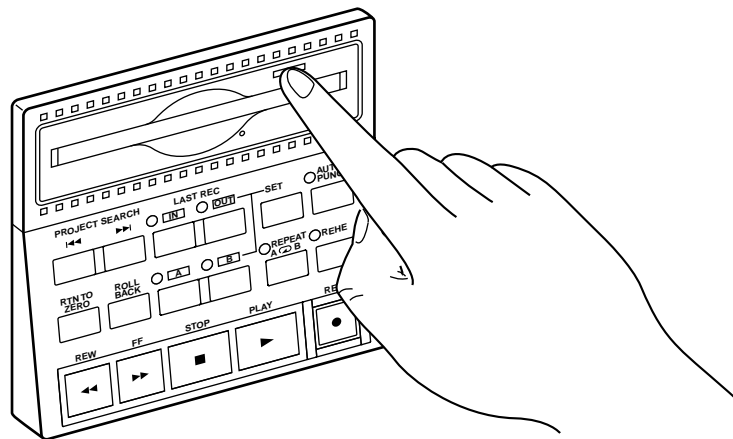
The eject button also functions as a drive activity indicator, lighting up when the disk drive is busy.

The eject button does not operate during recording and should not be pressed simultaneously with another button, as this may cause a malfunction.

Formatting MO Disks

New MO disks and MO disks that have been used to store other kinds of data must be formatted before they can be used in the D24. The formatting process prepares a disk for storing D24 data. Formatting erases all previously stored data, so if you're reusing a disk, make sure that it contains no important data before formatting.

Before formatting a disk, set the sampling rate as required. If the sampling rate is changed after formatting, project start times other than 00:00:00.00 may change. If the start time does change, use the TC Modify function to correct it. See "Modifying a Project's Start Time" on page 83 for more information.

1   Insert the disk into the D24 disk drive.

If the disk is new or has been formatted for use in a device other than the D24, the message "UNFORMATTED" appears on the display.

2   Press the [FORMAT] button.

The FORMAT indicator flashes and "FORMAT DISK—ARE YOU SURE" flashes on the display.

3   Press the [ENTER] button.

"PRESS—REC + PLAY" appears on the display.

4   Press the [REC] and [PLAY] buttons simultaneously to format the disk, or the [CANCEL] button to cancel the Format function.

While the disk is being formatted, "FORMATTING" appears on the display.

When formatting is complete, "FINISHED" appears on the display, the FORMAT indicator goes out, and "01 NEW PROJ" appears on the display.

5   If you want to set the absolute start time of project 01 to a time other than "00:00:00.00," set it now. See "Recording" on page 33 for more information. Otherwise, press the [ENTER] button.

The absolute start time for subsequent projects can be specified as and when they are recorded.

The MO disk is now ready for use.

Transport Operation Table

The following table shows the function of each control in each transport mode.

X = no change or invalid

Button	Transport Mode								
	Stop	**Play**	**Rew**	**FF**	**Record**	**Rehearse Standby**	**Rehearse**	**Nudge/ Shuttle**	**A–B Repeat**
[REW]	Rew (8x)	Rew (8x) while pressing	Rew (16x)	Stop FF & rew	Stop rec & rew	Rew	Stop rehearsal & rew	Cancel & rew	Cancel & rew[1]
[FF]	FF (8x)	FF (8x) while pressing	Stop rew & FF	FF (16x)	Stop rec & FF	FF	Stop rehearsal & FF	Cancel & FF	Cancel & FF[1]
[STOP]	X	Stop play	Stop rew	Stop FF	Punch out & stop	Cancel & stop	Punch out & stop	Cancel & stop	Stop play
[PLAY]	Play	X	Stop rew & play	Stop FF & play	Punch out & play	Rehearsal punch in	Punch out & play	Cancel & play	X
[REC]	X	REC+PLAY to start recording	X	X	X	X	X	X	X
[REHE]	Rehearse standby	Rehearsal punch in	X	X	X	Cancel	X	X	Cancel & rehearsal punch in
Eject	Eject	X	X	X	X	Cancel & eject	X	X	X

1. Release button for normal playback.

Indicator Status Tables

The following tables show the status and meaning of the front-panel indicators.

Transport Indicators

● On   ✹ Flashing   - Off

Indicator	Transport Mode							
	Stop	**Play**	**Rew/FF**	**Record**	**Rehearse Standby**	**Rehearse**	**Nudge/ Shuttle**	**A–B Repeat**
REW 8x	-	-	✹	-	-	-	-	-
REW 16x	-	-	●	-	-	-	-	-
FF 8x	-	-	✹	-	-	-	-	-
FF 16x	-	-	●	-	-	-	-	-
STOP	●	-	-	-	-	-	-	-
PLAY	-	●	-	●	-	●	●	●
REC	-	-	-	●	-	-	-	-
REHE	-	-	-	-	✹	●	-	-
READY (REC READY=OFF)	-	-	-	-	-	-	-	-
READY (REC READY=ON)	✹	✹	✹	●	✹	●	✹	✹
Eject[1]	-	✹	-	✹	-	✹	✹	✹

1. Indicates drive activity. Lights up continuously when a disk is being loaded or ejected.

Other Indicators

● On   - Off

Indicator	Status	Condition
LAST REC IN	-	LAST REC IN point has not been set
	●	LAST REC IN point has been set
LAST REC OUT	-	LAST REC OUT point has not been set
	●	LAST REC OUT point has been set
A	-	A point has not been set
	●	A point has been set
B	-	B point has not been set
	●	B point has been set
UNDO/REDO	-	Last record or edit operation has not been undone
	●	Last record or edit operation has been undone
SOLO/SELECT	-	Track not soloed
	●	Track soloed

Other front-panel indicators typically indicate whether a function is on or off.

Recording

4

In this chapter...

About Projects

D24 recordings are organized as projects, with a typical project consisting of many sound files and a settings file. Up to 99 projects can be recorded on a single MO or external disk drive. The following settings are stored with each project: recording resolution (BIT), sampling rate (FS), timecode frame rate, absolute start time, project title, virtual track assignments, relative zero position, up to 99 locate points, and the LAST REC IN, OUT, A, and B locate points, as shown in the following illustration. The wordclock source (WC) and timecode source (TC) settings are not stored with each project.

WC: INT ────────▶	Internal or external wordclock source (INT, EXT)
TC: MASTER ──────▶	Timecode master or slave (MASTER, SLAVE)
BIT: 16 ─────────▶	Recording resolution (16, 20, 24)
FS: 44.1 kHz ─────▶	Sampling rate (44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz)
Frame rate: 30 ───▶	Timecode frame rate (24, 25, 30D, 30)
Start: 00:00:00.00 ──▶	Absolute start time of project
Title: POP SONG ──▶	Project title
Virtual track assignments ──▶	1-1, 2-3, 3-4, 4-4, etc
Rel: 00:00:00.00 ───▶	Relative zero position
LOC MEM ────────▶	Locate points 1–99
LAST REC IN, OUT, A, B ──▶	IN, OUT, A, & B points

Highlighted settings are stored with each project

The following illustration shows four example projects and their associated settings.

00:00:00.00	00:10:00.00	01:00:00.00	23:30:00.00
01 PROJECT	**02 PROJECT**	**03 PROJECT**	**04 PROJECT**
WC: INT	WC: INT	WC: EXT	WC: EXT
TC: MASTER	TC: MASTER	TC: SLAVE	TC: SLAVE
BIT: 16	BIT: 24	BIT: 16	BIT: 20
FS: 44.1 kHz	FS: 96 kHz	FS: 44.1 kHz	FS: 48 kHz
Frame rate: 30	Frame rate: 24	Frame rate: 30D	Frame rate: 30D
Start: 00:00:00.00	Start: 00:10:00.00	Start: 01:00:00.00	Start: 23:30:00.00
Title: POP SONG	Title: DVD X	Title: TVCM	Title: NEWS
V.TRK assign: 1-1...	V.TRK assign: 1-1...	V.TRK assign: 1-1...	V.TRK assign: 1-1...
Rel: 00:00:00.00	Rel: 00:00:00.00	Rel: 00:00:00.00	Rel: 00:00:00.00
LOC MEM: 1–99	LOC MEM: 1–99	LOC MEM: 1–99	LOC MEM: 1–99
IN: 00:01:05.12	IN: 00:11:05.12	IN: 01:01:05.12	IN: 23:31:05.12
OUT: 00:01:30.29	OUT: 00:11:30.23	OUT: 01:01:30.29	OUT: 23:13:30.29
A: 00:00:20.00	A: 00:10:20.00	A: 01:00:20.00	A: 23:31:20.00
B: 00:00:45.00	B: 00:10:45.00	B: 01:00:45.00	B: 23:31:45.00

The recording resolution and sampling rate are set when a new project is created, and once something has been recorded in a project, cannot be changed. Although a project can be played with a timecode frame rate different to that used when it was originally recorded, stored locate memories will be out of sync with the recorded material, so in addition to the recording resolution and sampling rate, it's best to set the timecode frame rate as required before recording each new project.

When an already recorded project is selected, the D24 automatically sets the recording resolution and timecode frame rate, using the settings stored with that particular project. If the project's sampling rate is different to the current setting, the project's sampling rate flashes in the FS window and you must use the Wordclock function ("Selecting a Wordclock Source" on page 124) to set the sampling rate of the D24 to match that of the project, otherwise, playback will be distorted.

Projects recorded using an external wordclock source can also be played, edited, or recorded using an internal wordclock source, and vice versa. A project originally recorded with an external wordclock source running at 44.1 kHz, for example, can also be used with an internal wordclock of 44.1 kHz.

Projects recorded using an external timecode source can be played, edited, or recorded using an internal timecode source even at a different frame rate, and vice versa. A project originally recorded with an external timecode source running at 30 fps, for example, can also be used with an internal timecode source of 25 fps.

When recording a new project, the counter initially displays 00:00:00.00. If this value is not changed, it's used as the absolute start time for the new project. You can, however, specify a different start time.

New projects are numbered using the next available project number. If the highest numbered project on disk is 06, for example, the next new project will be 07. Projects can be titled for easy identification. See "Titling Projects" on page 81 for more information.

D24 disks contain sound files and project settings files.
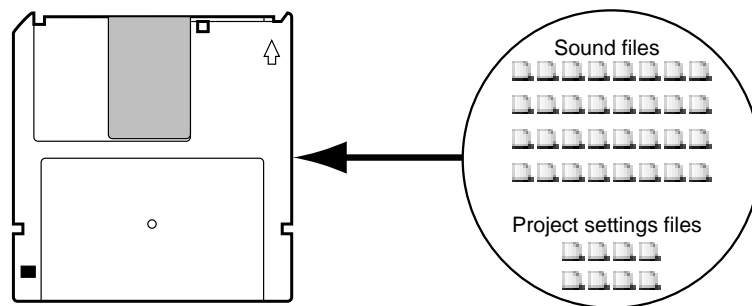
Preparing to Record

This section explains how to prepare for recording.

1   Select a wordclock source.

See "Selecting a Wordclock Source" on page 124 for more information. Although the wordclock source can be changed after recording, the sampling rate cannot be changed once something is recorded in a project.

2   If you're using a brand-new disk, format it.

See "Formatting MO Disks" on page 26 or "Formatting External Disk Drives" on page 158 for more information.

3   Select a timecode source.

See "Selecting a Timecode Source" on page 135 for more information. The timecode source can be changed after recording.

4   Set the timecode frame rate.

See "Setting the Timecode Frame Rate" on page 136 for more information.

5   Set the recording resolution.

See "Setting the Recording Resolution" on page 32 for more information. The recording resolution cannot be changed once something is recorded in a project.

6   Proceed to "Recording" on page 33.

Setting the Recording Resolution

The recording resolution can be set to one of three bit rates: 16, 20, or 24. Once something has been recorded in a project, the recording resolution cannot be changed, so it's important that you set the correct resolution when creating a new project.

1   Press the [SETUP] button.

The SETUP indicator lights up.

2   Use the JOG/DATA dial to select "REC BIT," and then press the [ENTER] button.

The currently selected recording resolution appears on the display.

3   Use the JOG/DATA dial to select a recording resolution.

The recording resolution can be set to 16, 20, or 24. The default setting is 24.

4   Press the [ENTER] button to activate your selection, or the [CANCEL] button to cancel the Rec Bit function.

The selected resolution appears in the BIT window on the display, as shown here.

`BIT|16      |`

`BIT|    20  |`

5   Press the [SETUP] button again to leave setup.

`BIT|      24|`

The SETUP indicator goes out.

The following table lists the theoretical dynamic range available with each resolution.

Recording Resolution	Theoretical Dynamic Range
16	96 dB
20	120 dB
24	144 dB

Higher recording resolutions offer improved sonic performance by increasing the dynamic range, but require more disk space. A 640 MB Overwrite-type MO disk, for example, can store approximately 120 track minutes of 16-bit, 44.1 kHz digital audio, compared with 80 track minutes of 24-bit, 44.1 kHz digital audio.

The recording resolution you choose will ultimately depend on your application and recording system. There's no point selecting a 20- or 24-bit recording resolution on the D24 if your digital mixing console's A/D converters are only 16-bit. If you intend to deliver your project to a third party, another studio, for example, consult them and agree on a recording resolution before you start recording on the D24.

In general, 16-bit is the standard for music CDs and MiniDiscs, while 20- and 24-bit are used for professional recording and mastering applications, although you don't have to select the same resolution as that of the final distribution media. In fact, recording, mixing, and mastering at a higher resolution will most likely yield a better result. In a 16-bit system, for example, it's necessary to keep recording levels high to make best use of the 96 dB dynamic range and maximize signal-to-noise performance, which restricts headroom and constrains level setting. In a 24-bit system, levels can be set lower due to the larger 144 dB dynamic range, providing additional headroom, while maintaining signal-to-noise performance.

Low-resolution digital audio signals can easily be transferred to higher-resolution systems, however, the reverse is not true. A 20-bit digital signal recorded on a 16-bit recorder without digital dither will be truncated, resulting in distortion. See "Digital I/O & Wordlength" on page 189 for more information.

Recording

Before recording a new project, you must first set the wordclock source, timecode source, timecode frame rate, and recording resolution. See "Preparing to Record" on page 31 for more information.

The following illustration shows the procedure for recording.
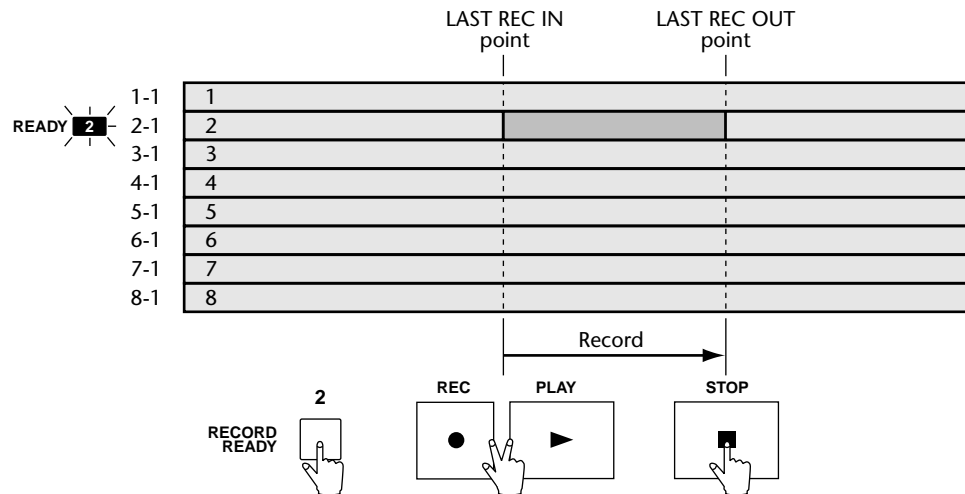
1   Press the [▶▶|] PROJECT SEARCH button repeatedly until "nn NEW PROJ" appears on the display ("nn" being the number of the new project). If the disk has just been formatted, this will already be displayed, so you can ignore this step.

The 2nd line of the display shows "00:00:00.00," which is the absolute start time for the new project.

2   If you want to change the absolute start time, use the keypad or JOG/DATA dial to enter a time.

Use the SHUTTLE/CURSOR ring to move the cursor. Press the [CANCEL] button to return to the previous value.

3   Press the [ENTER] button.

The absolute start time appears on the main counter.

4   Use the [RECORD READY] buttons to select tracks for recording.

The corresponding READY indicators flash.

5   Set the recording levels in conjunction with the D24 track meters.

See "Metering" on page 39 for more information. Recording levels are typically set using the group, or bus output faders on the mixing console.

6   Select a monitoring mode.

See "Monitoring" on page 42 for more information.

7   Press the [REC] and [PLAY] buttons simultaneously to start recording.

Recording starts, "nn RECORDING" appears on the display ("nn" being the project number), and the REC and PLAY button indicators and READY indicators light up continuously. The LAST REC IN point is set automatically and its indicator lights up.

If the [PLAY] button is pressed while recording, the D24 punches out of recording and continues with normal playback, in which case the REC button indicator goes out, the READY indicators flash, and the LAST REC OUT point is set.

8 Press the [STOP] button to stop recording.

The REC and PLAY button indicators go out and the READY indicators flash. The LAST REC OUT point is set automatically and its indicator lights up.

To audition what you've just recorded, press the LAST REC [IN] button to locate the point at which recording started, and then press the [PLAY] button to start playback.

Recording can be undone using the Undo Function. See "Undoing a Recording or Edit" on page 35 for more information.

Projects can be titled using the Project Edit Title function. See "Titling Projects" on page 81 for more information. When an untitled project is selected, "NO TITLE" appears on the display.

Conserving Disk Space

Like all digital audio recorders, the D24 uses up disk space regardless of what's being recorded, so recorded silence uses as much disk space as recorded music. A two minute section of continuous music, for example, will use the same amount of disk space as a two minute section of silence. Obviously, it's wasteful to leave the D24 recording silence longer than necessary.

Disk space can be conserved by recording only when there's something that actually needs recording. When recording material with long silent sections, for example, you could save disk space by punching out of recording during those sections.

The disk space occupied by the recorded silences can be retrieved for additional recording by first deleting the silent sections, using the Part Erase function, see "Erasing Parts" on page 104, and then optimizing the disk, using the Optimize function, which deletes unused sound files from disk, thereby freeing up space for additional recording, see "Recovering Disk Space" on page 172.

Undoing a Recording or Edit

The Undo function can be used to undo the last recording or edit. After recording or performing an edit, the UNDO/REDO indicator lights up, indicating that the Undo function can be used.

1 Press the [UNDO/REDO] button.

The last recording or edit is undone and the UNDO/REDO indicator goes out. When the last recording is undone, the previous recording (i.e., the recording that was overwritten), if any, is restored.

2 Press the [UNDO/REDO] button again to redo the last recording or edit.

The UNDO/REDO indicator lights up.

As well as undoing unneeded recordings or edits, the Undo function provides a convenient way to compare the previous and last recording, or edit.

Rehearsing

In Rehearsal mode, recording can be practiced, with automatic playback and input monitor switching at the punch in and out points, without actually recording anything to disk.

The following illustration shows the procedure for rehearsal.
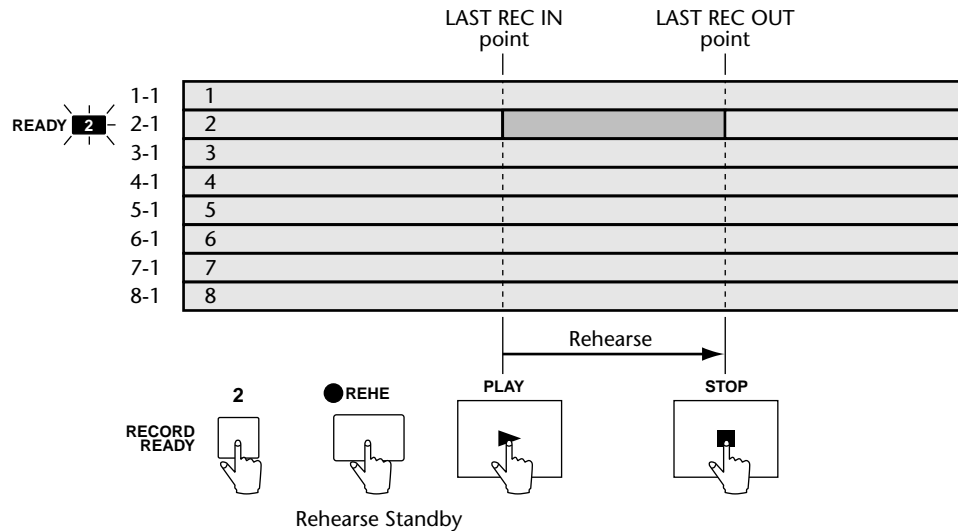
1   Set wordclock source, timecode source, timecode frame rate, and recording resolution. See "Preparing to Record" on page 31 for more information.

2   Use the [RECORD READY] buttons to select tracks for recording.

The corresponding READY indicators flash.

3   Set the recording levels in conjunction with the D24 track meters.

See "Metering" on page 39 for more information. Recording levels are typically set using the group, or bus output faders on the mixing console.

4   Select a monitoring mode.

See "Monitoring" on page 42 for more information.

5   Press the [REHE] button.

The REHE button indicator flashes, indicating Rehearse Standby mode.

To cancel Rehearse Standby mode, press the [STOP] button.

6   Press the [PLAY] button to start rehearsal.

Rehearsal starts and the PLAY button indicator and READY indicators light up continuously. The LAST REC IN point is set automatically and its indicator lights up.

Rehearsal can also be started by pressing the [PLAY] and [REHE] buttons simultaneously.

If the [PLAY] button is pressed during rehearsal, the D24 punches out of rehearsal, continues with normal playback, and sets the LAST REC OUT point.

7   Press the [STOP] button to stop rehearsal.

The REHE and PLAY button indicators go out and the READY indicators flash. The LAST REC OUT point is set automatically and its indicator lights up.

Extending the Top of a Project

Since it's not possible to record before the absolute 00:00:00.00 position of a recorded project, if you need to record something new at the top of a project, for example, you need to extend the intro of a song, you must use the Track Slip function to slip forward the tracks already recorded, and then record the new material. See "Slipping Tracks" on page 93 for more information.

In the following example, a project's absolute start time is 00:00:00.00. Using the Track Slip function, the four recorded tracks are slipped forward eight seconds, so that new material can be recorded at the top of the project.
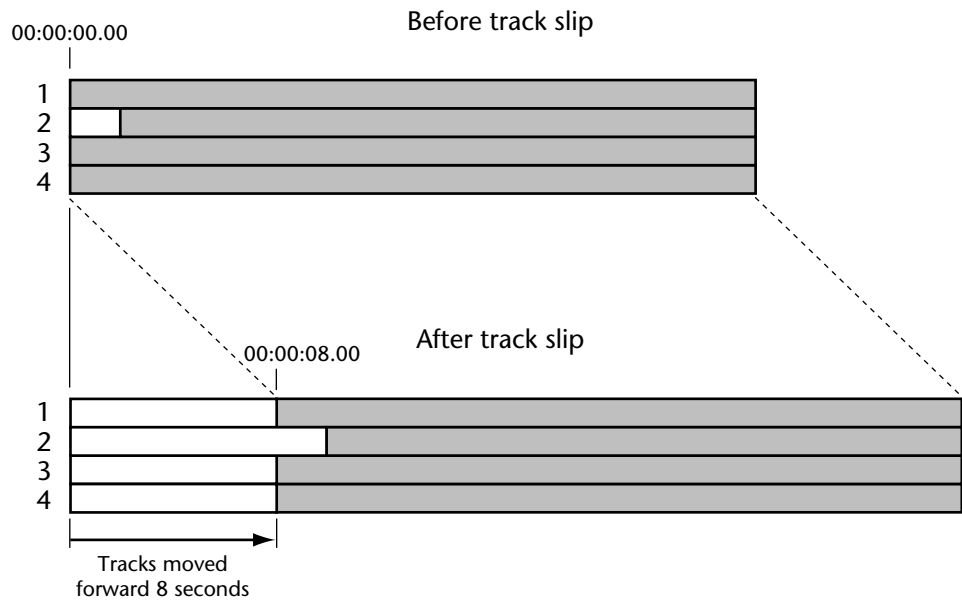
Checking the Time Remaining

The Remain function displays how much time is available for additional recording.

1 Press the [REMAIN] button.

The amount of time left for additional recording is displayed on the 2nd line of the display, as shown below.

```
00:00:00.00
R- 00.60.40.00.0
```
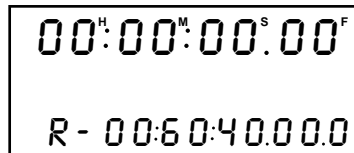
The Remain function displays the recording time available relative to the number of tracks selected for recording. For example, you can check the simultaneous recording time available for four tracks by pressing four [RECORD READY] buttons, and then pressing the [REMAIN] button. In the following example, tracks 1 through 4 are selected for recording and the Remain function displays the recording time available for four tracks.

```
00:00:00.00
R- 00:15:10.00.0
```

READY 1 2 3 4 5 6 7 8
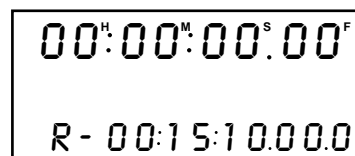
When tracks, or parts are erased or deleted, although they can no longer be accessed, the actual audio data remains on disk as unused sound files, taking up disk space, and reducing the time available for additional recording. After repeated recording and editing, there may be a lot of unused sound files on the disk. To delete these unused sound files and recover the disk space for further recording or editing, use the Optimize function. See "Recovering Disk Space" on page 172 for more information.

Metering

Playback and input signal levels are displayed on the eight 16-segment track meters, with Peak Hold, and Normal and Fine metering modes.

The 0 dB indicators light up when audio samples reach the maximum digital level. The OVER indicators light up when several consecutive samples exceed the digital saturation point. When setting recording levels, it's okay for signals to light the 0 dB indicator. If the OVER indicator lights up, however, you should back off the input level, as shown below.
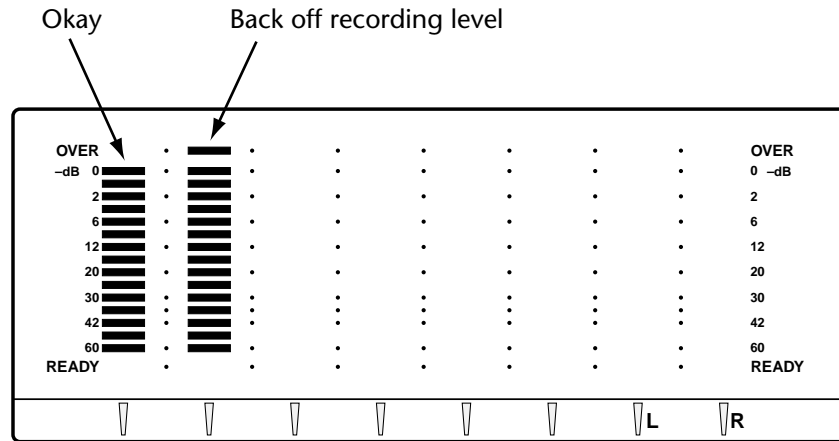
When the Shuttle, Nudge, Time Compression, or Pitch Change function is used, track meters 7 and 8 function as stereo meters, and meters 1 through 6 are turned off.

Using Normal & Fine Metering

Track meters function in one of two modes: Normal or Fine. In Normal mode, the meter range is from –60 dB to 0 dB. In Fine mode, it's from –26 dB to 0 dB.
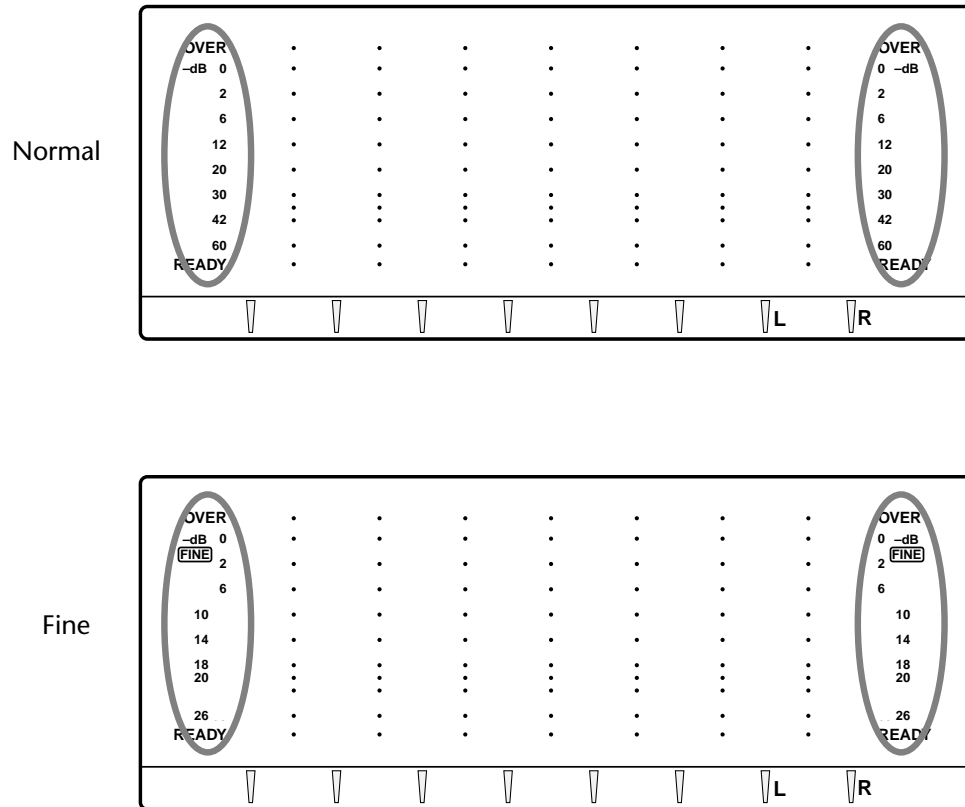
Fine mode is useful for accurate level setting when recording reference tones at –10, –14, –18, or –20 dB, but can also be used for precise metering with normal recording.

The normal and fine meter modes are set using the Level Meter function.

1 Press the [UTILITY] button.

The UTILITY indicator lights up.

2 Use the JOG/DATA dial to select "LEVEL METER," and then press the [ENTER] button.

The currently selected meter mode appears on the display.

3 Use the JOG/DATA dial to select either "NORMAL" or "FINE."

4 Press the [ENTER] button to activate your selection, or the [CANCEL] button to cancel the Level Meter function.

5 Press the [UTILITY] button again to leave utility.

The UTILITY indicator goes out.

Using Peak Hold

By keeping the highest lit segment of each meter illuminated, the Peak Hold function provides a convenient way to check for signal peaks.

Peak Hold can be set so that the highest lit segment of each meter remains lit for 800 ms (MOMENTARY) or continuosuly (PERMANENT). See "Setting the Peak Hold Mode" on page 170 for more information.

1   Press the [PEAK HOLD] button to turn on the Peak Hold function.

The PEAK HOLD indicator lights up.

2   Press the [PEAK HOLD] button again to turn off the Peak Hold function.

The PEAK HOLD indicator goes out.

To reset the Peak Hold function, turn it off and then on again.
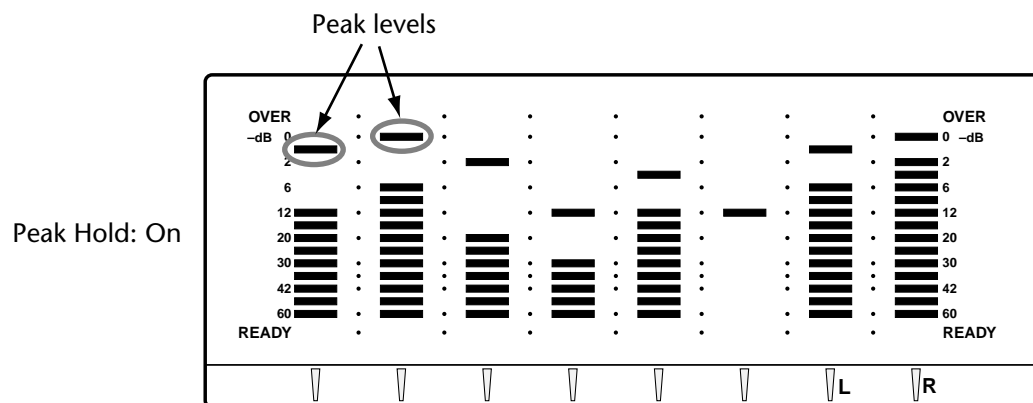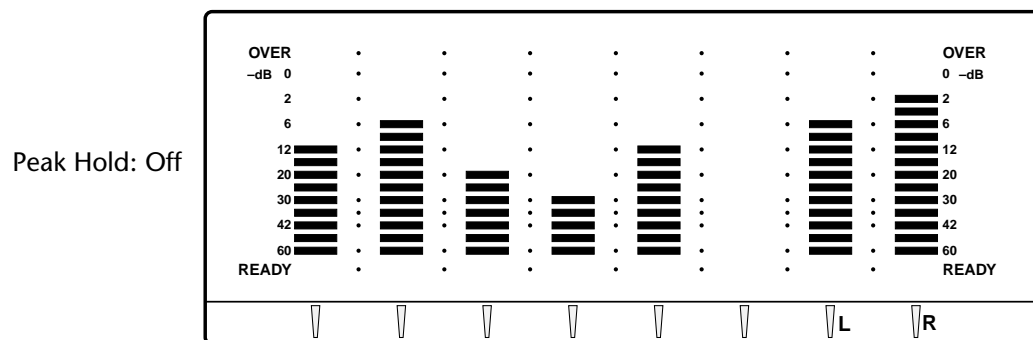
Monitoring

In a typical D24 multitrack recording system, monitoring is performed at the mixing console via the tape returns, which are connected to the D24's track outputs via mini YGDAI cards ("About mini YGDAI Cards" on page 182). The signal source for each track output, either playback or input signal, depends on that track's [RECORD READY] button setting, the transport mode (e.g., stop, playback, or record), and the [AUTO INPUT] and [ALL INPUT] MONITOR SELECT buttons, as shown in the following illustrations.

The disk and plug symbols used in the following illustrations are explained below.

Track output source: ⊘ Playback   ⟋ Input signal

In the following illustration, the [AUTO INPUT] and [ALL INPUT] buttons are both turned off. Tracks not selected for recording don't output anything during stop, fast forward, or rewind, but output playback signals during playback, recording, or rehearsal. Tracks selected for recording output the track input signal regardless of the transport mode.
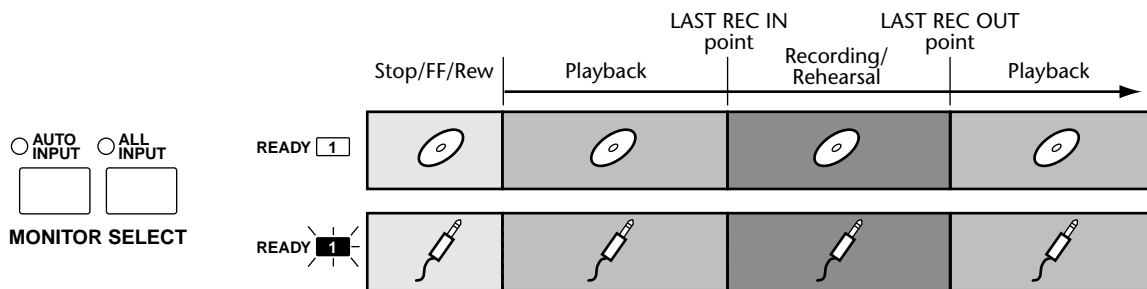
In the following illustration, the [AUTO INPUT] button is turned on, the default setting. Tracks not selected for recording function as before. Tracks selected for recording, however, output playback signals during playback, but switch to track input signals during recording or rehearsal. This setting is convenient for punch in/out recording.
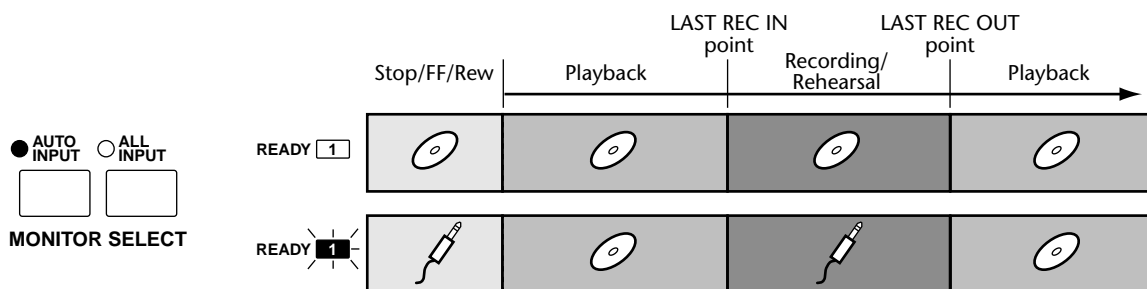
In the following illustration, the [ALL INPUT] button, which has priority over all other settings, is turned on and the track outputs output the track input signals regardless of the transport mode and [RECORD READY] button. All Input is useful when you want to monitor track inputs regardless of any other settings.
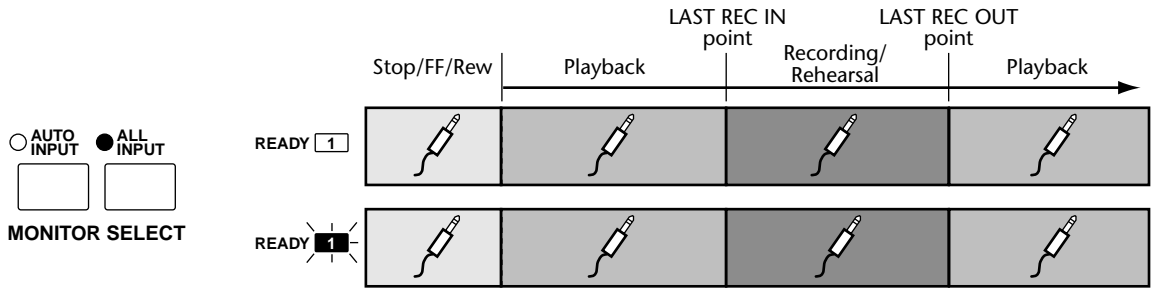
General Operation

5

In this chapter...

Using Playback

The Playback function is used to play back recorded material.

1   While the D24 is stopped, press the [PLAY] button.

Playback starts and the PLAY button indicator lights up.

2   Press the [STOP] button to stop playback.

Playback stops and the PLAY button indicator goes out.

If the [REW] or [FF] button is pressed and held during playback, the D24 rewinds (8x) or fast forwards (8x) respectively and returns to normal playback when the button is released. You can go directly to play from either rewind or fast forward simply by pressing the [PLAY] button.

> *Note:*   In Rehearse Standby mode, and during recording and rehearsal, the [PLAY] button is used to punch in and out of recording. See "Transport Operation Table" on page 27 for more information.

Using Fast Forward & Rewind

The Fast Forward and Rewind functions are used to fast forward and rewind at either 8x or 16x normal play speed.

1   Press the [FF] button to fast forward, or the [REW] button to rewind.

The respective button flashes and fast forward or rewind runs at 8x normal play speed.

2   Press the [FF] or [REW] button again for fast forward or rewind at 16x normal play speed.

The respective button lights up continuously and fast forward or rewind runs at 16x normal play speed.

3   Press the [STOP] button to stop fast forward or rewind.

If the [PLAY] button is pressed during fast forward or rewind, the D24 stops, and then starts playback.

Pressing and holding the [FF] or [REW] button during playback fast forwards or rewinds respectively at 8x normal play speed. Releasing the [FF] or [REW] button resumes normal playback.

A–B Repeat Playback

A–B Repeat playback can be used to repeatedly play a specific part of a project, with playback cycling between the specified A and B points, as shown below.
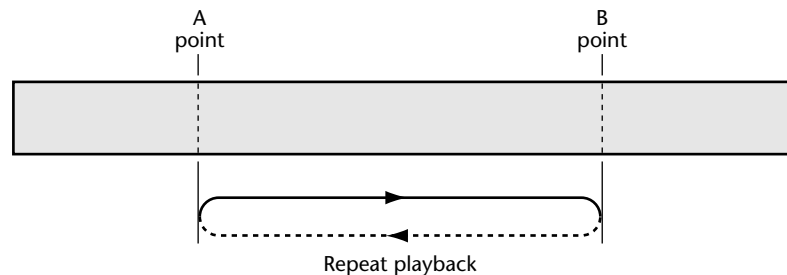
To use the A–B Repeat function, you must first set the A and B points, which can be set while the D24 is stopped or during rewind, fast forward, playback, recording, or rehearsal, but cannot be changed during A–B repeat playback.

1   While holding down the [SET] button, press the [A] button to set the A point, and then the [B] button to set the B point.
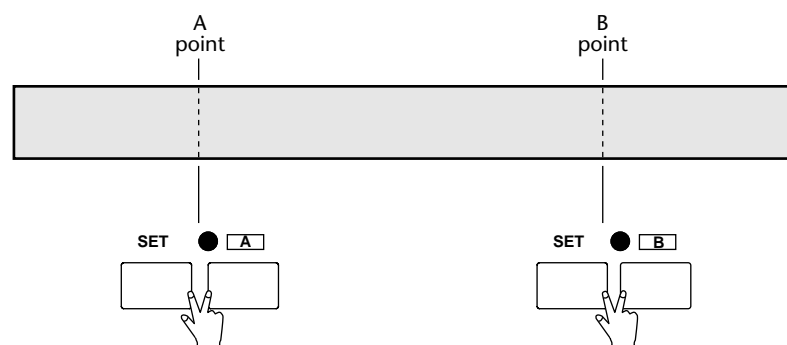
When a point is set, the corresponding indicator (A or B) lights up and the stored position appears on the 2nd line of the display. See "Using the A & B Points" on page 61 for more information about setting the A and B points.

2   Press the [REPEAT] button.

The REPEAT indicator lights up.

3   Press the [PLAY] button to start repeat playback.

Playback cycles between the A and B points.

Repeat playback can also be started by pressing the [REPEAT] button during playback.

If the [REPEAT] button is pressed during repeat playback, the D24 cancels repeat playback and continues with normal playback.

4   Press the [STOP] button to stop playback.

5   Press the [REPEAT] button to cancel A–B Repeat.

The REPEAT indicator goes out.

A–B Repeat playback plays from the lowest point to the highest, so if the B point occurs before the A point, playback cycles from B to A.

The A and B points for each project are saved to disk automatically.

Soloing Tracks

Tracks can be monitored individually using the Solo function.

1   To solo a track, press its [SOLO/SELECT] button.

The signal from the soloed track is fed to the outputs selected using the Solo Out function, and the corresponding SOLO/SELECT indicator lights up.

Several tracks can be soloed at the same time, with odd numbered tracks mixed to the left channel, and even numbered tracks mixed to the right channel.

2   Press the [SOLO/SELECT] button again to unsolo the track.

The corresponding SOLO/SELECT indicator goes out.

Selecting the Solo Outputs

Solo can be used with all outputs (i.e., PHONES jack, COAXIAL DIGITAL STEREO OUTPUT, and the tracks outputs), or just the PHONES jack. This setting is made using the Solo Out function.

1   Press the [UTILITY] button.

The UTILITY indicator lights up.

2   Use the JOG/DATA dial to select "SOLO OUT," and then press the [ENTER] button.

The current Solo Out setting appears on the display.

3   Use the JOG/DATA dial to select either "ALL OUTPUTS" or "PHONES."

The default setting is PHONES.

4   Press the [ENTER] button to activate your selection, or the [CANCEL] button to cancel the Solo Out function.

5   Press the [UTILITY] button again to leave utility.

The UTILITY indicator goes out.

When Solo Out is set to PHONES, the Solo signal is output only to the PHONES jack, with odd numbered tracks mixed to the left channel, and even numbered tracks mixed to the right channel. The COAXIAL DIGITAL STEREO OUTPUT and track outputs are not affected by the Solo function.

When Solo Out is set to ALL OUTPUTS, the Solo signal is output to the PHONES jack and COAXIAL DIGITAL OUTPUT, with odd numbered tracks mixed to the left channel, and even numbered tracks mixed to the right channel. In addition, the track outputs of soloed tracks output their respective track signals, and other track outputs are muted. When track 1 is soloed, for example, track output 1 outputs the track 1 signal, while track outputs 2 through 8 are muted.

Using Absolute & Relative Zero

The zero point can be the absolute zero position of a project, or a specified point relative to it. In Absolute mode (ABS), 00:00:00.00 is typically the top of the project. In Relative mode (REL), you can set the zero point to any position within the project. Before being set, the relative zero position is the same as the absolute zero position.

1   To set the Relative zero position, while holding the [SET] button, press the [RTN TO ZERO] button.

The relative zero position is set at the point at where the [SET] button and [RTN TO ZERO] buttons are pressed.

In the following example, the relative zero position has been set at the absolute position of 00:02:00.00.

ABS   00:00:00.00   00:01:00.00   00:02:00.00   00:03:00.00

REL   23:58:00.00   23:59:00.00   00:00:00.00   00:01:00.00

SET   RTN TO ZERO
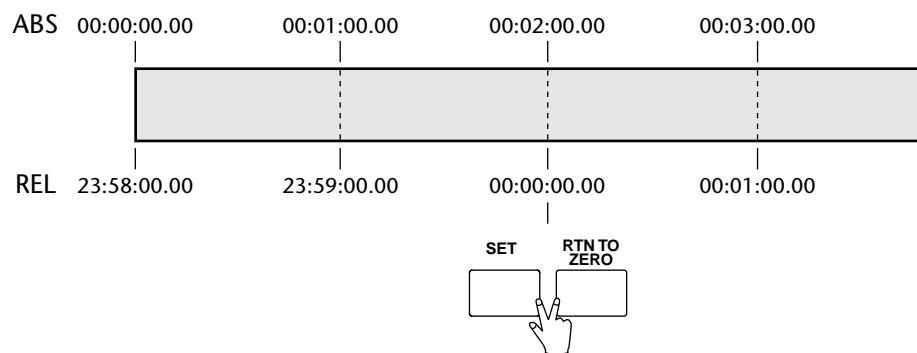
2   To select Relative counter mode, press the [ABS/REL] button.

The ABS indicator goes out and the REL indicator lights up.

3   To select Absolute counter mode, press the [ABS/REL] button again.

The REL indicator goes out and the ABS indicator lights up.

4   To locate the zero position in either Absolute or Relative mode, press the [RTN TO ZERO] button.

If the current project doesn't have a zero position, the Return to Zero function locates the top of the project.

Using Roll-back

The Roll Back function rolls back from the current position in steps of between 1 and 30 seconds, the default being 5 seconds.

1   Press the [ROLL BACK] button to roll back by the specified amount.

If the [ROLL BACK] button is pressed during playback, the D24 rolls back by the specified amount, and then continues playing.
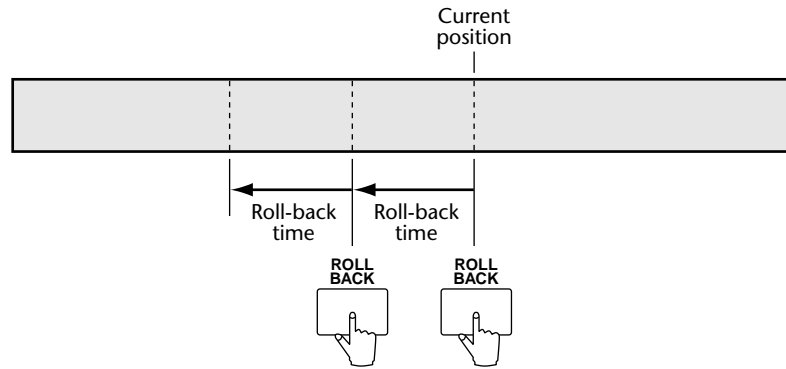
Setting the Roll-back Time

The roll-back time is set using the Roll Back function.

1   Press the [UTILITY] button.

The UTILITY indicator lights up.

2   Use the JOG/DATA dial to select "ROLL BACK," and then press the [ENTER] button.

The currently set roll-back time appears on the display.

3   Use the JOG/DATA dial to set the roll-back time from 1 to 30 seconds.

4   Press the [ENTER] button to activate your selection, or the [CANCEL] button to cancel the Roll Back time setting.

5   Press the [UTILITY] button again to leave utility.

The UTILITY indicator goes out.

Using Virtual Tracks

Each main track has access to eight virtual tracks, making 64 tracks in all. Virtual tracks are assigned to their respective main track using the Virtual Track function. Main and virtual track combinations are identified using the notation 1-1, 1-2, 2-1, etc., (main-virtual). For example, "2-3" indicates that virtual track 3 is assigned to main track 2, as shown in the following illustration.
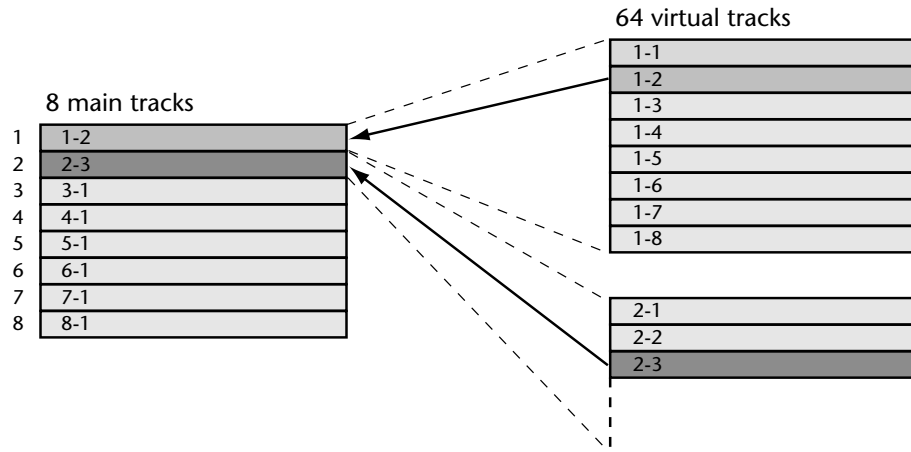
1   While the D24 is stopped, press the [V. TRACK SELECT] button.

The V. TRACK SELECT indicator lights up and the display shown below appears.
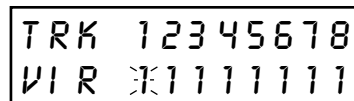
The 1st line of the display shows the main track numbers from 1 through 8. The 2nd line shows the virtual tracks assigned to those main tracks. Initially, each main track is assigned its respective virtual track 1.

2   Use the SHUTTLE/CURSOR ring to select a main track.

The number of the virtual track assigned to the selected main track flashes on the 2nd line of the display.

3   Use the JOG/DATA dial to assign a virtual track to the selected main track.

4   Press the [ENTER] button to apply your virtual track settings.

The V. TRACK SELECT indicator goes out and "FINISHED" appears on the display for a few seconds.

In the following example, virtual track 5 is assigned to main track 3.

Selected main track

Assigned virtual track
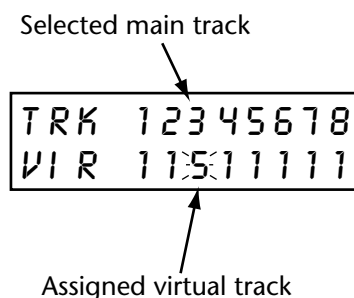
Shuttling

The Shuttle function can be used to shuttle forwards or backwards at various speeds while listening to the recorded material.

1   Press the [JOG ON] button.

The JOG ON and [STOP] button indicators light up.

2   Turn the SHUTTLE/CURSOR ring clockwise to shuttle forwards, or counter-clockwise to shuttle backwards. The further you turn the ring, the faster the shuttling.

"SHTL" appears on the 1st line of the display.

The center position of the SHUTTLE/CURSOR ring is stop. The following shuttle speeds are available. The plus or minus sign in front of each value indicates forward or backward motion, respectively, and 1/1 is normal playback speed.

Forward: +1\16, +1\8, +1\4, +1\2, +1, +2, +4
Backward: –1\16, –1\8, –1\4, –1\2, –1, –2, –4
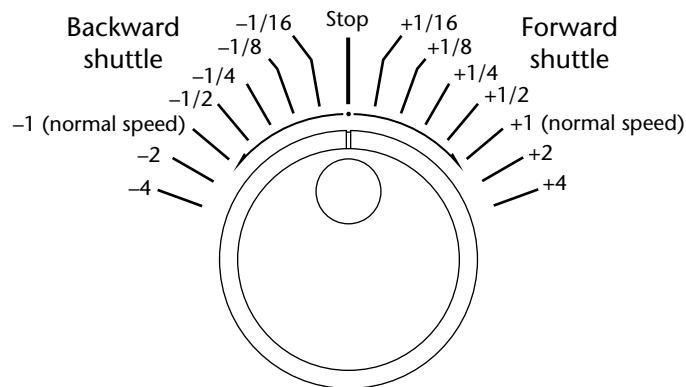
3   Press the [JOG ON] button again, or any transport button to cancel the Shuttle function.

The JOG ON and [PLAY] button indicators go off and the [STOP] button indicator lights up.

The Shuttle function requires a lot of processing power, so for monitoring purposes only, all tracks are mixed to tracks 7 and 8, with odd-numbered tracks appearing on the output and meter of track 7, and even-numbered tracks appearing on the output and meter of track 8. This mix can also be monitored via the PHONES, or if the Coaxial I/O is assigned to tracks 7 and 8 (see "Assigning the Coaxial Input & Output" on page 188), the COAXIAL STEREO DIGITAL OUTPUT. Track outputs 1 through 6 do not output anything when these functions are used. In addition, up to 4 tracks can be monitored simultaneously at the x2 speed, and up to 2 tracks at the x4 speed.

Nudging the Current Position

The Nudge function can be used to nudge the current position backwards or forwards in sub-frame steps while auditioning a small section of the recorded material after the current position. This is useful for locating precise positions when editing parts, storing locate memories, or setting the LAST REC IN and OUT points for auto punch in/out recording. The length of the section to be auditioned can be set from 25 ms to 100 ms using the Nudge Time function, the default setting is 50 ms.

1　Press the [JOG ON] button.

The JOG ON and [STOP] button indicators light up.

Playback cycles from the current position for the specified number of milliseconds, as shown below.

Current position

Backward nudge ◄------┼------► Forward nudge

Nudge time
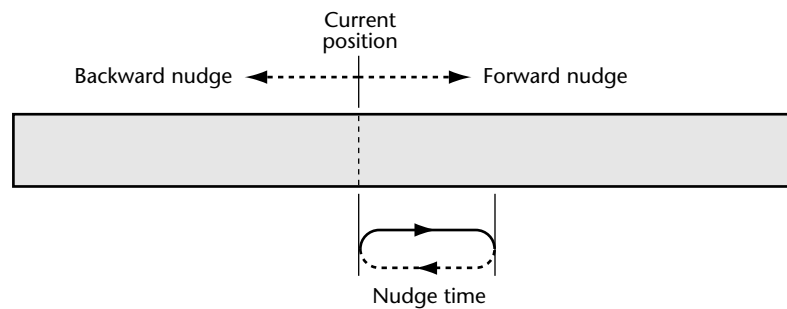
2　Turn the JOG/DATA dial clockwise to nudge forwards, or counterclockwise to nudge backwards.

"NUDGE" appears on the 1st line of the display, and the position, including sub-frame digits, appears on the 2nd line.

The current position is nudged forwards or backwards in sub-frame steps.

Backward nudge

Forward nudge
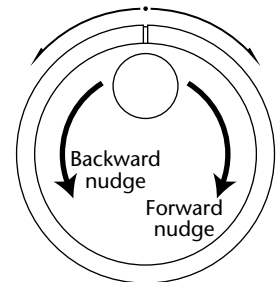
3　Press the [JOG ON] button again, or any transport button to cancel the Nudge function.

The JOG ON and [PLAY] button indicators go off and the [STOP] button indicator lights up.

The Nudge function requires a lot of processing power, so for monitoring purposes only, all tracks are mixed to tracks 7 and 8, with odd-numbered tracks appearing on the output and meter of track 7, and even-numbered tracks appearing on the output and meter of track 8. This mix can also be monitored via the PHONES, or if the Coaxial I/O is assigned to tracks 7 and 8 (see "Assigning the Coaxial Input & Output" on page 188), the COAXIAL STEREO DIGITAL OUTPUT. Track outputs 1 through 6 do not output anything when these functions are used.

Setting the Nudge Time

The length of the section to be auditioned is set using the Nudge Time function.

1 Press the [UTILITY] button.

The UTILITY indicator lights up.

2 Use the JOG/DATA dial to select "NUDGE TIME," and then press the [ENTER] button.

The currently set nudge time appears on the display.

3 Use the JOG/DATA dial to set the nudge time to 20, 50, or 100 ms.

The default setting is 100 ms.

4 Press the [ENTER] button to activate your selection, or the [CANCEL] button to cancel the Nudge Time function.

5 Press the [UTILITY] button again to leave utility.

The UTILITY indicator goes out.

Using Varispeed

The Varispeed function can be used to adjust the playback, recording, and rehearsal speed in 0.05% steps from –6.00% to +6.00% (approximately ±100 cents, or ±1 semi-tone). Increasing the speed has the effect of raising the pitch, while decreasing it lowers the pitch. Varispeed can be set while the D24 is stopped or during playback, recording, or rehearsal.

1 Press the [VARI SPEED] button.
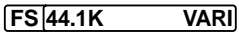
The VARI SPEED indicator lights up and the following display appears.

```
VARI SPEED
         +0.00
```

2 Use the JOG/DATA dial to set the varispeed.

When Varispeed is set to something other than "+0.00," "VARI" appears in the FS window on the display, as shown here.

`FS 44.1K          VARI`

Playback, recording, and rehearsal will now run at the specified speed.

Varispeed can also be set using the keypad. To enter a value of –2.90%, for example, press [0/-], [2], [9], [0/-] and then press the [ENTER] button to activate the setting.

3 Press the [VARI SPEED] button again to turn off the Varispeed function.

The Varispeed setting is stored when the Varispeed function is turned off.

You can toggle between varispeed and normal speed by pressing the [VARI SPEED] button.

In addition to playback speed, varispeed also affects the sampling rate and wordclock frequency. If the varispeed is set to –1%, for example, the sampling rate and wordclock frequency decrease by 1%. So with the wordclock source set to internal 44.1 kHz, the resultant sampling rate would be 43.659 kHz. Anything recorded at this rate will be sampled at 43.659 kHz, not 44.1 kHz. Equipment that is wordclock synchronized to the D24 will also be affected, although in most cases this shouldn't be an issue. Some equipment, however, may have trouble synchronizing to the D24's wordclock at certain varispeed settings.

When the D24 is used as a wordclock slave, the Varispeed function cannot be used because the D24's sampling rate is locked to the external source.

In a multiple D24 system, slave D24s follow the Varispeed setting made on the master D24. See "Multiple D24s" on page 144 for more information.

Quick Locate

6

In this chapter...

Searching for Projects

Projects can be selected using the PROJECT SEARCH buttons.

1 Press the [◄◄] PROJECT SEARCH button to locate the top of the current project. Press the button again to locate the top of the previous project.

Current
position

| 01 PROJECT | 02 PROJECT | 03 PROJECT | 04 PROJECT |

◄◄

2 Press the [►►] PROJECT SEARCH button to locate the top of the next project.

Current
position
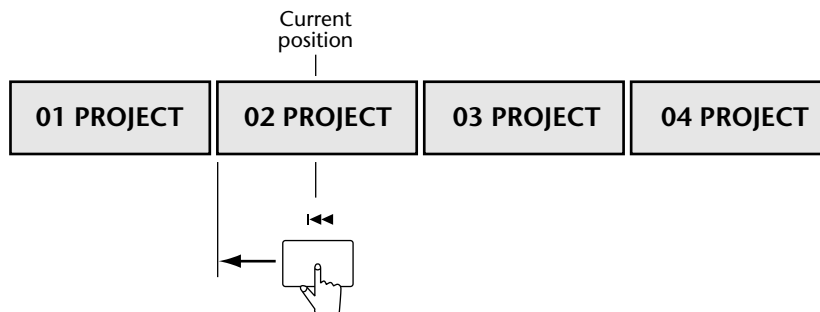
| 01 PROJECT | 02 PROJECT | 03 PROJECT | 04 PROJECT |

►►
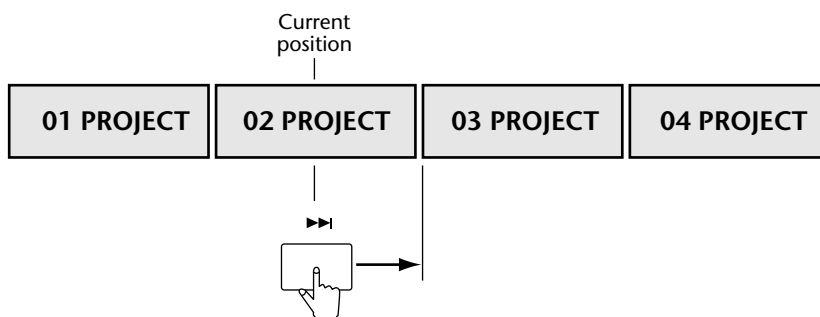
If the [►►] PROJECT SEARCH button is pressed while the last recorded project is selected, "nn NEW PROJ" appears on the display. See "Recording" on page 33 for more information.

Project Search Confirmation

The Project Search Confirmation function is used to prevent accidental project selection with the PROJECT SEARCH buttons. When set to ON, the message "ARE YOU SURE" appears when a different project is selected by using the PROJECT SEARCH buttons, and you must press the [ENTER] button to confirm your selection.

Project search confirmation is turned on or off using the P SERCH CNFM function.

1 Press the [UTILITY] button.

The UTILITY indicator lights up.

2 Use the JOG/DATA dial to select "P SERCH CNFM," and then press the [ENTER] button.

The current setting appears on the display.

3 Use the JOG/DATA dial to select either "OFF" or "ON."

The default setting is OFF.

4 Press the [ENTER] button to activate your selection, or the [CANCEL] button to cancel the P SERCH CNFM function.

5 Press the [UTILITY] button again to leave utility.

The UTILITY indicator goes out.

Selecting Projects Directly

A project can be selected directly by entering its number using the keypad or JOG/DATA dial.

1   Press the [PROJECT SELECT] button.

The PROJECT SELECT indicator lights up.

2   Use the keypad or JOG/DATA dial to enter the number of the project.

The number and title of the project appear on the display.

3   Press the [ENTER] button to locate the top of the specified project.

The PROJECT SELECT indicator goes out.

In the following example, project number 4 is selected.
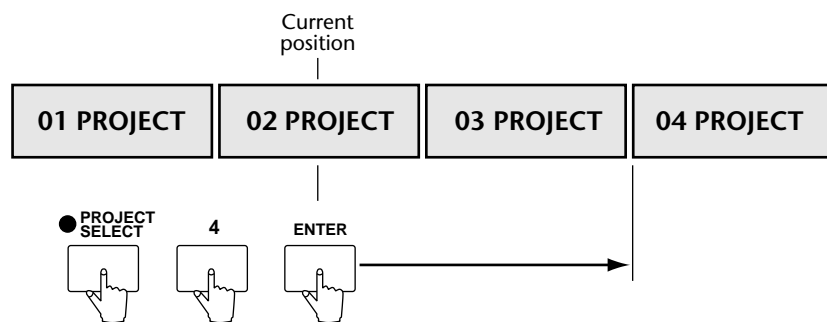
Returning to Zero

The Return to Zero function can be used to locate the zero position. In Absolute (ABS) mode, Return to Zero locates the absolute zero position. In Relative (REL) mode, it locates the relative zero position. See "Using Absolute & Relative Zero" on page 49 for more information about the Absolute and Relative modes.

1 Press the [RTN TO ZERO] button to locate the zero position.

When the [RTN TO ZERO] button is pressed during playback, the zero position is located, and then playback continues.

In the following example, Absolute (ABS) mode is used, so the absolute zero position is located when the [RTN TO ZERO] button is pressed.

ABS 00:00:00.00   00:01:00.00   00:02:00.00   00:03:00.00
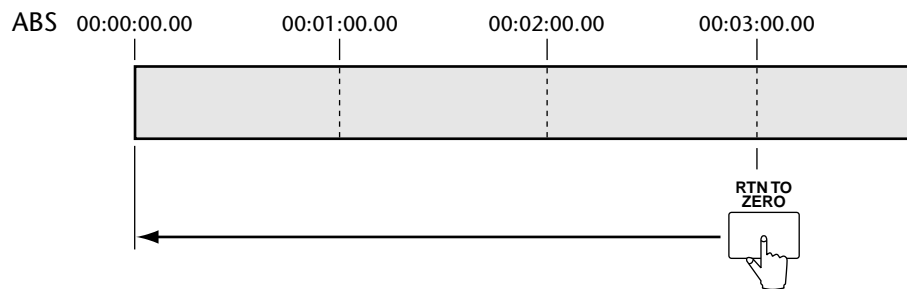
RTN TO ZERO

In the following example, Relative (REL) mode is used, so the relative zero position is located when the [RTN TO ZERO] button is pressed.

(ABS 00:00:00.00)
REL 23:58:00.00   23:59:00.00   00:00:00.00   00:01:00.00
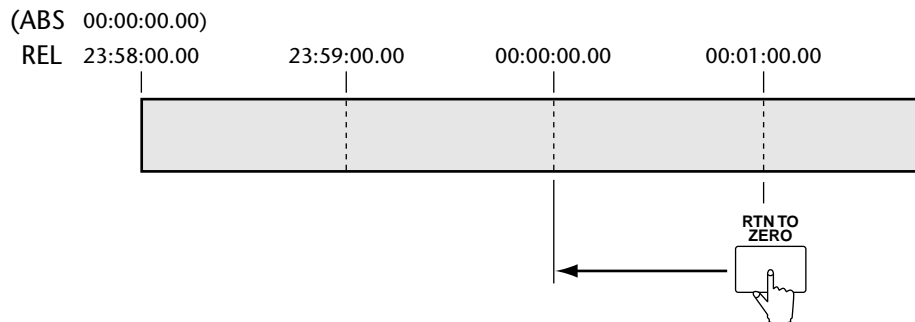
RTN TO ZERO

If the current project doesn't have a zero position, for example, the project starts at the absolute time of 01:00:00.00, the Return to Zero function locates the top of the project.

Using the A & B Points

The A and B points can be used for quick locate or A–B Repeat playback. See page 47 for more information on A–B repeat playback.

Setting the A & B Points

The A and B points can be set while the D24 is stopped or during rewind, fast forward, playback, recording, or rehearsal.

1 While holding down the [SET] button, press the [A] button to set the A point, or the [B] button to set the B point.
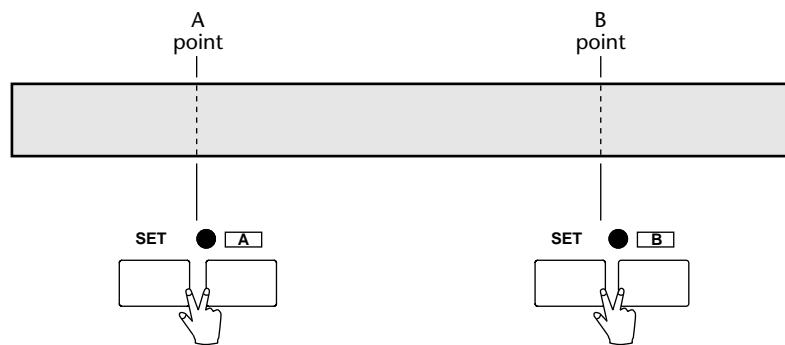
When a point is set, the corresponding indicator (A or B) lights up and the stored position appears on the 2nd line of the display.

A and B points are set with sub-frame accuracy.

To set the A or B point to a specific position, first locate that position, see "Locating Positions Directly" on page 63, and then store as explained above.

To set the A or B point to one of the 99 locate memories, first recall the locate memory, see "Recalling Locate Points" on page 66, and then store as explained above.

The A and B points for each project are saved to disk automatically.

Locating the A & B Points

1 Press the [A] or [B] button to locate the A or B point respectively.
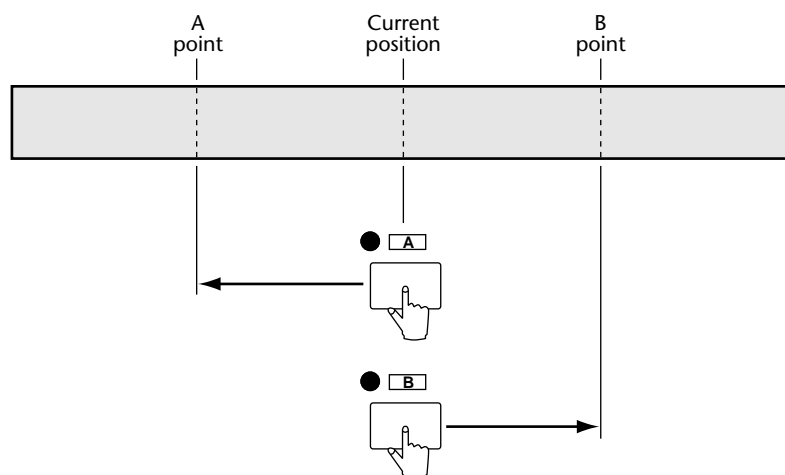
When the [A] or [B] button is pressed during playback, the stored point is located, and then playback continues.

Locating the LAST REC IN & OUT Points

The LAST REC IN and OUT points are typically used to mark the punch-in and punch-out points for recording and rehearsal, but can also be used as general locate points.

1   While holding down the [SET] button, press the [IN] button to set the IN point, or the [OUT] button to set the OUT point.

When a point is set, the corresponding indicator (IN or OUT) lights up. See "Setting the LAST REC IN & OUT Points" on page 71 for more information about setting the LAST REC IN and OUT points.

2   Press the LAST REC [IN] or LAST REC [OUT] button to locate the IN or OUT point respectively.
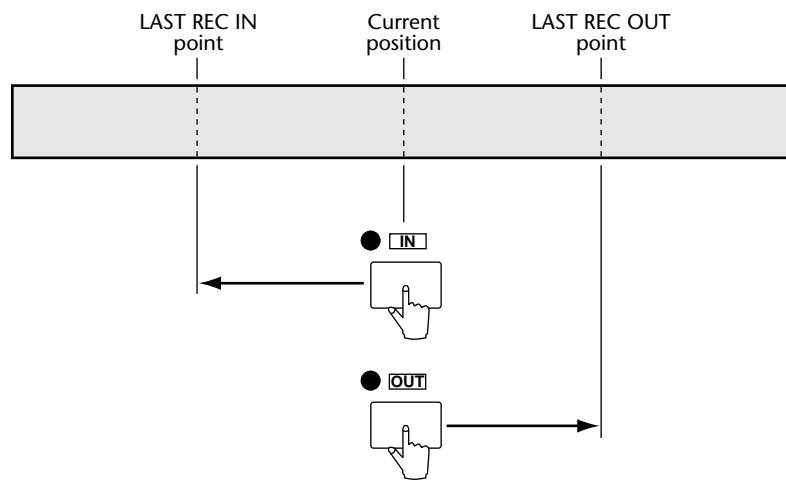
When the LAST REC [IN] or [OUT] button is pressed during playback, the stored point is located, and then playback continues.

Locating Positions Directly

Positions can be located directly by entering time values.

1 Use the keypad to enter the position that you want to locate, starting with hours, minutes, and seconds.

To enter the position 3 minutes and 27 seconds (00:03:27), for example, press [3], [2], and [7].

The entered value appears on the 2nd line of the display, as shown below.

```
00ᴴ:00ᴹ:00ˢ.00ᶠ
01  NO  TITLE
        00:03:27
```
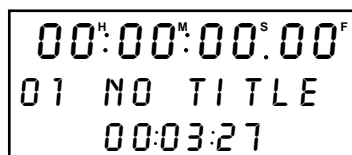
Press the [CANCEL] button to reset the entered value back to the captured value.

The JOG/DATA dial can be used to finely adjust the entered value.

You can specify the value with sub-frame accuracy by switching the Keypad Timecode Input mode to hours, minutes, seconds, frames, and sub-frames. To do this, while holding down the [SET] button, press the [LOCATE] button. Repeat this procedure to switch the Keypad Timecode Input mode back to hours, minutes, and seconds.

2 Press the [ENTER] button to fix the entered value.

Alternatively, press the [LOCATE] button to locate the specified position straightaway.

3 Press the [LOCATE] button to locate the specified position.

The specified position is located.

In the following example, the position 00:03:00 is located.
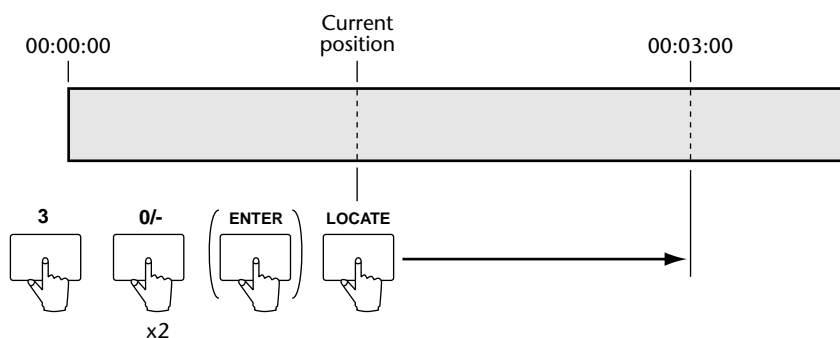
Storing Locate Points

Up to 99 locate points can be stored with each project using the Locate Memory Store function. Locate points can be stored while the D24 is stopped or during rewind, fast forward, playback, recording, or rehearsal.

1   Display the position that you want to store on the 2nd line of the display.

You can do this by capturing the current position by pressing the [CAPTURE] button, entering a value by using the keypad or JOG/DATA dial, or recalling the LAST REC IN, OUT, A, or B point by pressing the corresponding button.

2   Press the [LOC MEM STORE] button.

The LOC MEM STORE indicator lights up, "STORE MEM nn" (the flashing "nn" being the memory number), and the value already stored in the locate memory appear on the display. If no value has been stored in the memory, "--:--:--.--.-" is displayed.

3   Use the keypad or JOG/DATA dial to select a locate memory from 1 to 99.

To select locate memory 15, for example, press [1] and then [5].

To cancel your selection and select another locate memory, press the [CANCEL] button, and then reenter the locate memory number.

4   Press the [ENTER] button to store the locate point.

The stored locate point appears on the 2nd line of the display.

5   Press the [LOC MEM STORE] button to leave the Locate Memory Store function.

The LOC MEM STORE indicator goes out.

Locate points are stored with sub-frame accuracy. They are saved to disk automatically, and loaded from disk automatically when a project is selected.

In the following example, the position 00:01:00.00.0 is captured and stored to locate memory 5.
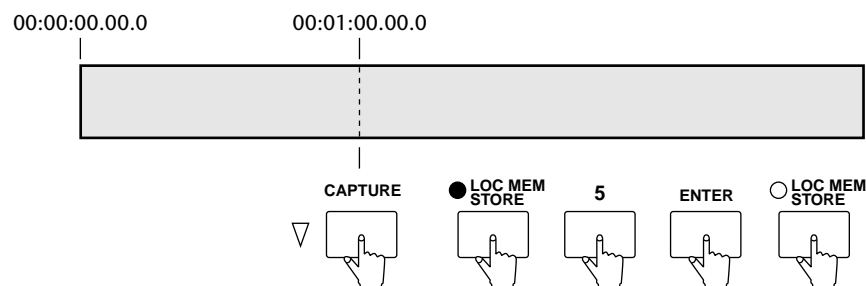
Storing Locate Points Automatically

Locate points can easily be stored on-the-fly by using the Auto Memory Store function, which automatically selects the next locate memory as each locate point is stored.

1   Press the [LOC MEM STORE] button.

The LOC MEM STORE indicator lights up, "STORE MEM nn" (the flashing "nn" being the memory number), and the value already stored in the locate memory appear on the display. If no value has been stored in the memory, "--:--:--.--.-" is displayed.

2   Use the JOG/DATA dial or keypad to select a locate memory from 1 to 99.

3   While holding down the [SET] button, press the [ENTER] button.

The current position is stored to the selected locate memory and the next locate memory is selected automatically.

4   Repeat step 3 to store further locate points.

Locate points can be stored while the D24 is stopped or during rewind, fast forward, playback, recording, or rehearsal.

5   Press the [LOC MEM STORE] button to leave the Locate Memory Store function.

The LOC MEM STORE indicator goes out.

In the following example, the positions 00:01:00.00.0, 00:02:00.00.0, and 00:03:00.00.0 are stored to locate memories 01, 02, and 03 respectively during playback.
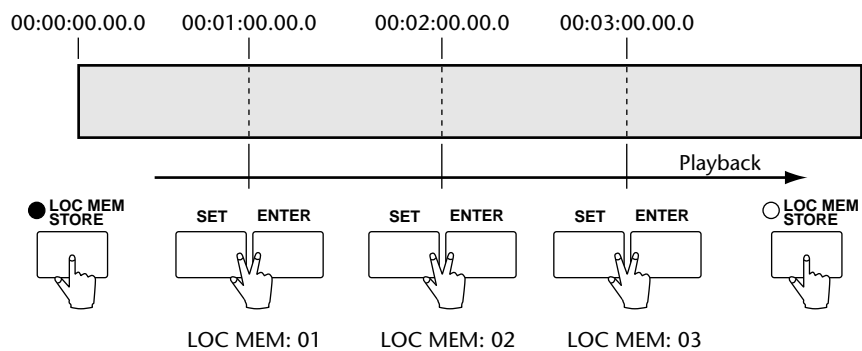
Recalling Locate Points

Stored locate points can be recalled using the Locate Memory Recall function.

1 Press the [LOC MEM RECALL] button.

The LOC MEM RECALL indicator lights up, "RECALL MEM nn" (the flashing "nn" being the memory number), and the value stored in the locate memory appear on the display. If no value has been stored in the memory, "--:--:--.--.-" is displayed.

2 Use the keypad or JOG/DATA dial to select a locate memory from 1 to 99.

To enter number 37, for example, press [3] and then [7].

To cancel your selection and select another locate memory, press the [CANCEL] button, and then reenter the locate memory number.

3 Press the [ENTER] button to fix the selected memory number.

The memory number "nn" stops flashing.

```
00ᴴ:00ᴹ:00ˢ.00ᶠ
RECALL MEM01
      00:03:27.00.0
```
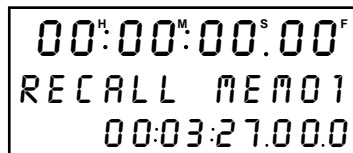
Alternatively, press the [LOCATE] button to locate the selected point straightaway.

4 Press the [LOCATE] button to locate the recalled position.

The specified position is located and the position appears on the main counter, as shown below.

```
00ᴴ:03ᴹ:27ˢ.00ᶠ
RECALL MEM01
      00:03:27.00.0
```
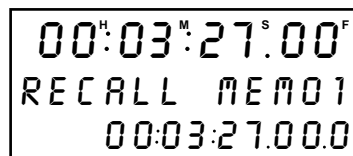
5 Press the [LOC MEM RECALL] button to leave the Locate Memory Recall function.

The LOC MEM RECALL indicator goes out.

Locate points are recalled with sub-frame accuracy.

In the following example, locate memory number 5 is recalled and located.

Punch In/Out Recording

7
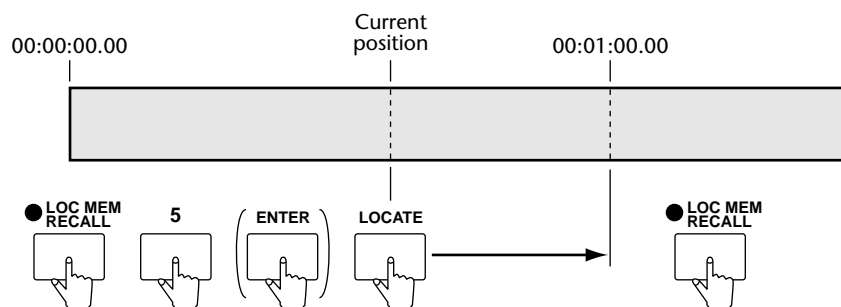
In this chapter...

About Punch In/Out Recording

The D24 provides both manual and automated punch in/out recording, both of which can be rehearsed before actually recording anything to disk. The number of tracks available for simultaneous punch-in recording is the same as that for regular recording. See "Tracks Available for Simultaneous Recording" on page 6 for more information.

Manual Punch In/Out Recording

Manual punch in/out recording allows you to manually punch in and out of recording on the tracks selected for recording while monitoring previously recorded tracks.

Auto Punch In/Out Recording

Auto punch in/out recording is used to automatically punch in and out of recording on the tracks selected for recording while monitoring the previously recorded tracks. The punch-in point is referred to as the LAST REC IN point, while the punch-out point is referred to as the LAST REC OUT point. These points are set automatically when you manually punch in and out of recording or rehearsal, and can also be set manually. See "Setting the LAST REC IN & OUT Points" on page 71 for more information.

Auto Punch allows you to record up to 99 takes. You can listen to the recorded takes using the Audition Take function, and pick the take that you want to keep using the Fix Take function.

Punch In/Out Fade In/Out

When dissimilar sounds are digitally spliced together, the discontinuity and sudden level change sometimes produces an audible click. To smooth the transition when using punch in/out recording, a small fade in/out is applied at the punch-in and out points. See "Setting the Fade In/Out Time" on page 170 for more information.

Monitoring

How you choose to monitor tracks for punch-in/out recording will depend on your application. The Auto Input monitoring function, which provides automatic playback and input monitor switching at the LAST REC IN and OUT points, is convenient for this type of recording. See "Monitoring" on page 42 for more information.

At the punch-out point, the outputs of tracks selected for recording are muted for an instant as the monitor circuits switch from input to playback. The length of the mute depends on the number of tracks selected for recording and the type of MO disk being used, although it's typically less than one second. Since this affects only the monitoring circuitry, audio data recorded to disk is not affected and punch outs are seamless.

Manual Punch In/Out Rehearsal

The Rehearse function allows you to practice manual punch in/out recording without actually recording anything to disk. With the Auto Input monitoring function turned on, playback and input monitor switching is performed automatically at the LAST REC IN and OUT points. See "Monitoring" on page 42 for more information.

The following illustration shows the procedure for manual punch-in/out rehearsal.
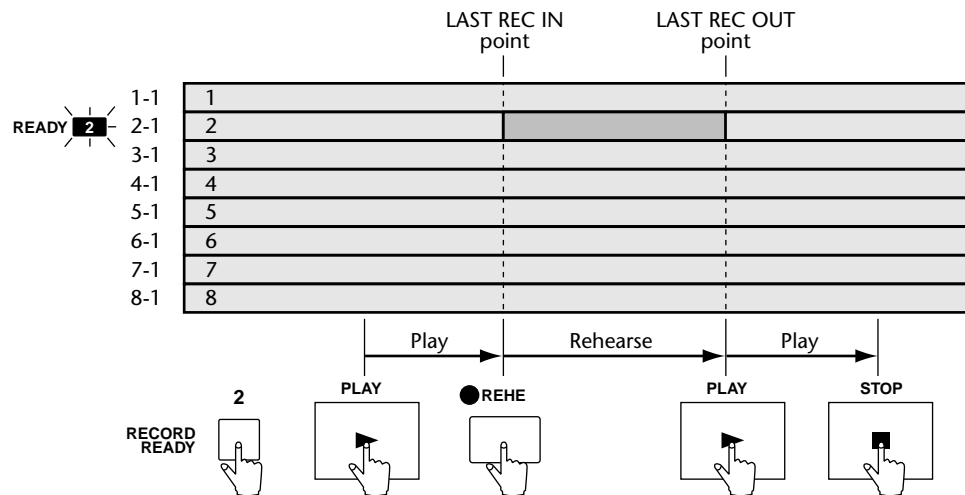
1   Use the [RECORD READY] buttons to select tracks for recording.

The corresponding READY indicators flash.

2   Press the [PLAY] button to start playback.

Playback starts and the PLAY button indicator lights up.

3   Press the [REHE] button to punch in.

Rehearsal starts, "REHEARSAL" appears on the display, and the REHE button indicator and READY indicators light up continuously. The LAST REC IN point is set automatically and its indicator lights up.

4   Press the [PLAY] button to punch out.

The D24 stops rehearsal and continues with normal playback. The LAST REC OUT point is set automatically and its indicator lights up.

The REHE button indicator goes out and the READY indicators flash.

5   Press the [STOP] button to stop playback.

The PLAY button indicator goes out.

Manual Punch In/Out Recording

This section explains how to perform manual punch in/out recording for real. With the Auto Input monitoring function turned on, playback and input monitor switching is performed automatically at the LAST REC IN and OUT points. See "Monitoring" on page 42 for more information.

The following illustration shows the procedure for manual punch-in/out recording.
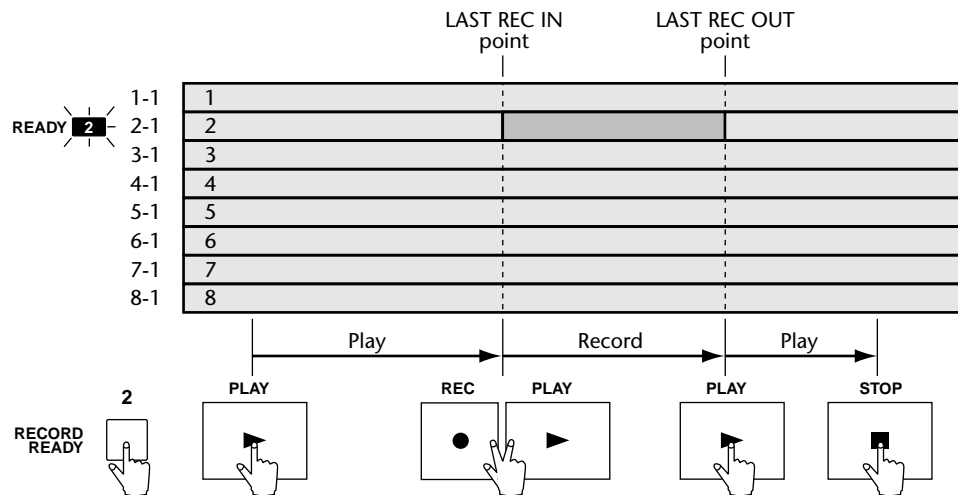
1 Use the [RECORD READY] buttons to select tracks for recording.

The corresponding READY indicators flash.

2 Press the [PLAY] button to start playback.

Playback starts and the PLAY button indicator lights up.

3 Press the [REC] and [PLAY] buttons simultaneously to punch in.

Recording starts, "RECORDING" appears on the display, and the REC button indicator and READY indicators light up continuously. The LAST REC IN point is set automatically and its indicator lights up.

4 Press the [PLAY] button to punch out.

The D24 stops recording and continues with normal playback.

The REC button indicator goes out and the READY indicators flash. The LAST REC OUT point is set automatically and its indicator lights up.

The transport buttons are inactive for about one second following a punch out, due to internal processing by the D24.

5 Press the [STOP] button to stop playback.

The PLAY button indicator goes out.

To play back what you've just recorded, press the LAST REC [IN] button to locate the point at which recording started, and then press the [PLAY] button to start playback.

Setting the LAST REC IN & OUT Points

The LAST REC IN and OUT points are set automatically when you manually punch in and out of recording or rehearsal. They can also be set using the [SET] and LAST REC [IN] and [OUT] buttons while the D24 is stopped or during rewind, fast forward, play-back, recording, or rehearsal. When the LAST REC IN or OUT point is set, the corresponding indicator (IN or OUT) lights up.

1   While holding down the [SET] button, press the [IN] button to set the IN point, or the [OUT] button to set the OUT point.
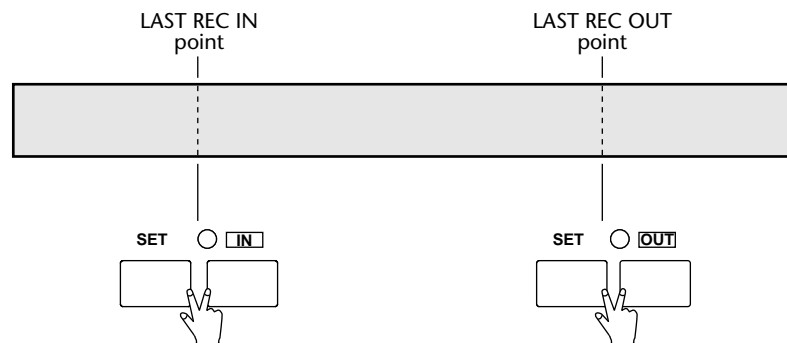
The LAST REC IN and OUT points are set with sub-frame accuracy.

The LAST REC IN and OUT points can be located using the LAST REC [IN] and [OUT] buttons respectively. See "Locating the LAST REC IN & OUT Points" on page 62 for more information.

To set the LAST REC IN or OUT point to an A or B point, first locate the A or B point, see "Using the A & B Points" on page 61, and then set as explained above.

To set the LAST REC IN or OUT point to one of the 99 locate memories, first recall the locate memory, see "Recalling Locate Points" on page 66, and then set as explained above.

The LAST REC IN and OUT points for each project are saved to disk automatically.

Auto Punch In/Out Rehearsal

The Rehearse function allows you to practice auto punch-in/out recording without actually recording anything to disk. With the Auto Input monitoring function turned on, playback and input monitor switching is performed automatically at the LAST REC IN and OUT points. See "Monitoring" on page 42 for more information.

The following illustration shows the procedure for auto punch-in/out rehearsal.
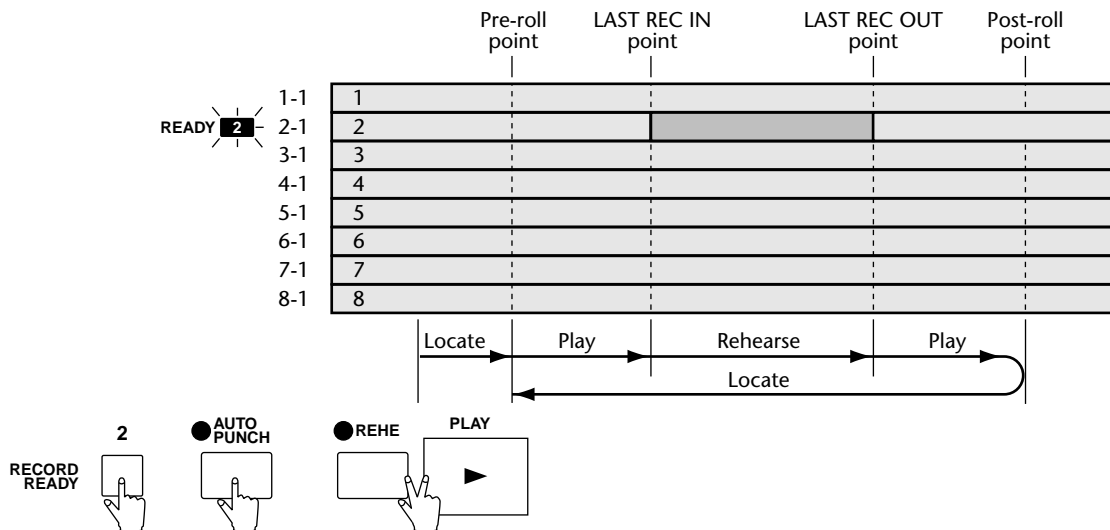
1   Set the LAST REC IN and OUT points. See "Setting the LAST REC IN & OUT Points" on page 71 for more information.

2   Use the [RECORD READY] buttons to select tracks for recording.

The corresponding READY indicators flash.

3   Press the [AUTO PUNCH] button.

The AUTO PUNCH indicator flashes and "AUTO PUNCH—REC TAKE 1" appears on the display.

4   Press the [REHE] and [PLAY] buttons simultaneously.

The PLAY button indicator lights up, the REHE indicator flashes, and "REC TAKE 1" disappears from the display. The Pre-roll point is located, and then playback starts. The Pre-roll time is set using the Pre Roll function. "Setting the Pre-roll Time" on page 76

5   Rehearsal punch in is performed automatically at the LAST REC IN point.

The REHE and READY indicators light up continuously.

6   Rehearsal punch out is performed automatically at the LAST REC OUT point.

The REHE indicator goes out and the READY indicators flash.

Playback continues up to the Post-roll point at which playback stops, the PLAY button indicator goes out, the Pre-roll point is located, and the D24 waits.

7   Press the [AUTO PUNCH] button to leave Auto Punch In/Out.

The AUTO PUNCH indicator goes out.

Auto Punch In/Out Recording

This section explains how to perform auto punch in/out recording for real. With the Auto Input monitoring function turned on, playback and input monitor switching is performed automatically at the LAST REC IN and OUT points. See "Monitoring" on page 42 for more information.

The following illustration shows the procedure for auto punch-in/out recording.
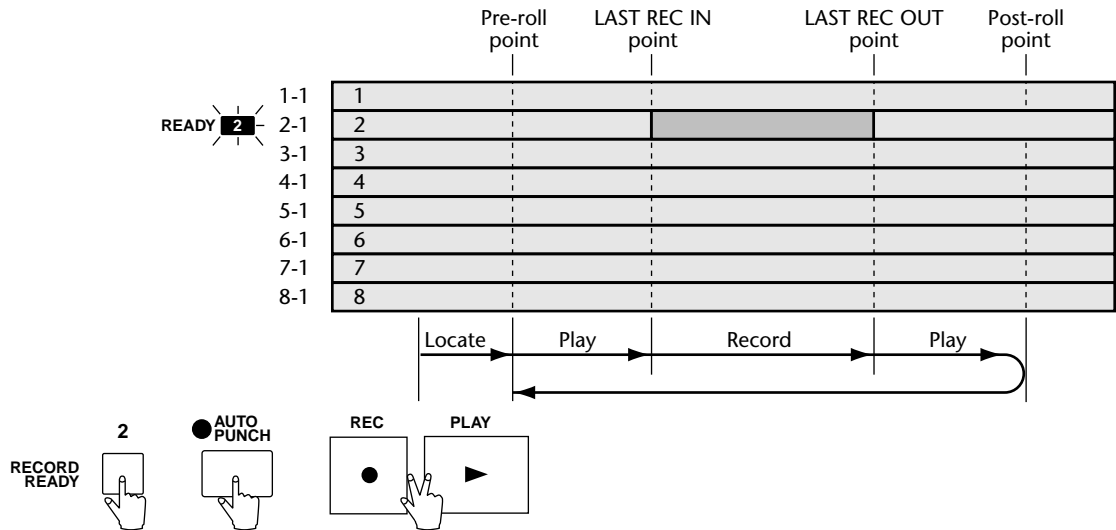
1 Set the LAST REC IN and OUT points. See "Setting the LAST REC IN & OUT Points" on page 71 for more information.

2 Use the [RECORD READY] buttons to select tracks for recording.

The corresponding READY indicators flash.

3 Press the [AUTO PUNCH] button.

The AUTO PUNCH indicator flashes and the following display appears.

```
AUTO PUNCH
REC TAKE1
```

4 Press the [REC] and [PLAY] buttons simultaneously.

The PLAY button indicator lights up and the REC indicator flashes. The Pre-roll point is located, and then playback starts. The Pre-roll time is set using the Pre Roll function. See "Setting the Pre-roll Time" on page 76 for more information.

5 Record punch in is performed automatically at the LAST REC IN point.

The READY and REC button indicators light up continuously.

6 Record punch out is performed automatically at the LAST REC OUT point.

The REC button indicator goes out and the READY indicators flash

Playback continues up to the Post-roll point at which playback stops, the PLAY button indicator goes out, the Pre-roll point is located, and the D24 waits. The display shows "AUTO PUNCH—REC TAKE 2".

7   Use the Audition Take function to listen to the take that you've just recorded (see bellow), record additional takes by repeating step 4 (or simply pressing the [ENTER] button), or leave the Auto Punch In/Out function by pressing the [AUTO PUNCH] button.

So long as the LAST REC IN and OUT points are not set to new positions, you can continue recording additional takes in the same place on the same track or on other tracks, and continue using the Audition and Fix functions. If the LAST REC IN or OUT point is set to a new position, however, you will not be able to audition or fix the previously recorded takes, in fact, they will become unused sound files that can no longer accessed. The disk space occupied by these unused sound files can be retrieved for additional recording using the Optimize function. See "Recovering Disk Space" on page 172 for more information.

As each additional take is recorded, the take number increments automatically. When several takes have been recorded, you must select the one you want to keep using the Fix Take function. See "Fixing Takes" on page 75 for more information. When only one take has been recorded, it's not necessary to use the Fix function, as the take is fixed automatically when you leave the Auto Punch In/Out function.

If all 99 takes are recorded, the D24 waits at the Pre-roll point and "NO MORE TAKE" appears on the display, indicating that no more takes can be recorded. In this case, use the Audition Take and Fix Take functions to select the take that you want to keep.

Auditioning Takes

The Audition Take function is used to audition recorded takes.

In the following example, take 4 is auditioned.
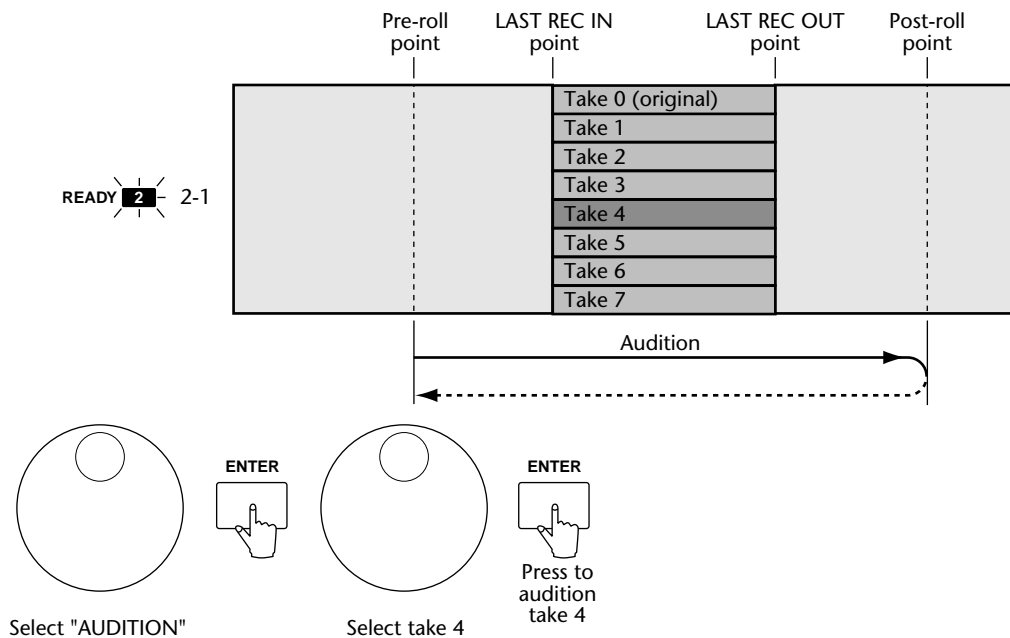
8   Use the JOG/DATA dial to select "AUDITION," and then press the [ENTER] button.

"AUDITION—TAKE nn" appears on the display ("nn" being the number of the take to be auditioned).

Take 0 is the original material and can be auditioned even before any takes are recorded.

9   Use the JOG/DATA dial to select the take that you want to audition, and then press the [ENTER] button.

The D24 plays the selected take along with the seven other main tracks from the Pre-roll point through to the Post-roll point. Then it locates the Pre-roll point and waits.

Press the [ENTER] button again to audition the selected take again.

10   Use the JOG/DATA dial and [ENTER] button to select and audition other takes.

11   To leave the Audition function, press the [CANCEL] button.

"AUDITION" appears on the display.

12   Use the JOG/DATA dial to select "REC TAKE nn" for additional take recording, or "FIX TAKE" to fix a take, and then press the [ENTER] button to activate your selection.

Fixing Takes

The Fix Take function is used to select the take you want to keep.

When only one take has been recorded, it's not necessary to use the Fix function, as the take is fixed automatically when you leave the Auto Punch In/Out function.

In the following example, eight takes have been recorded and take 4 is fixed.
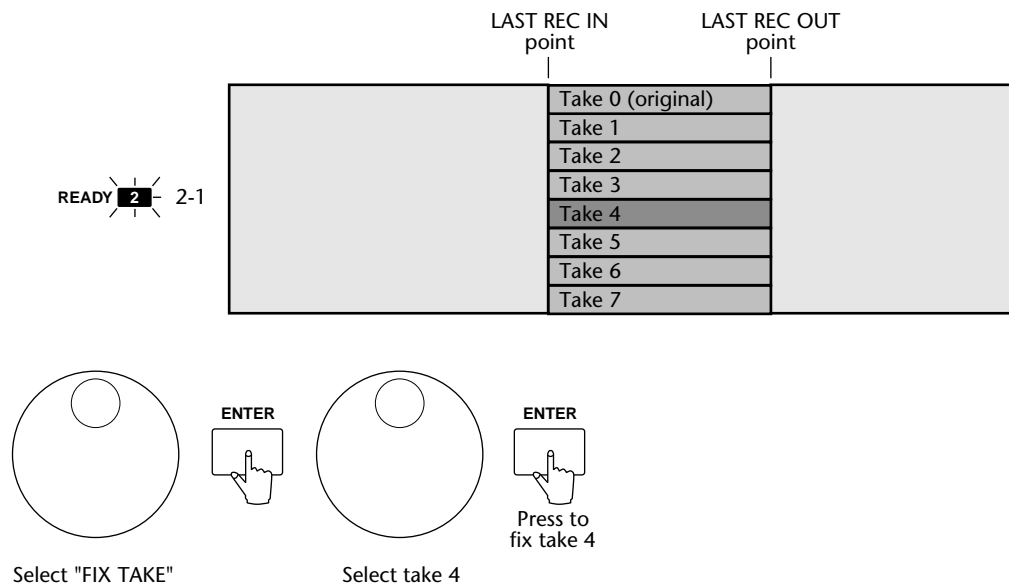
13   Use the JOG/DATA dial to select "FIX TAKE," and then press the [ENTER] button.

"FIX TAKE—TAKE nn" appears on the display ("nn" being the number of the take).

14   Use the JOG/DATA dial to select the take that you want to fix, and then press the [ENTER] button.

"TAKE nn—ARE YOU SURE" appears on the display.

15   Press the [ENTER] button to fix the take, or the [CANCEL] button to select another take.

If you press the [ENTER] button, "FIXED" appears on the display for a few seconds, the selected take is fixed, the Auto Punch In/Out function is cancelled, and the AUTO PUNCH indicator goes out.

If you press the [CANCEL] button, repeat step 14 to select another take.

Setting the Pre-roll Time

The pre-roll time can be set from 1 to 30 seconds, the default being 5 seconds.
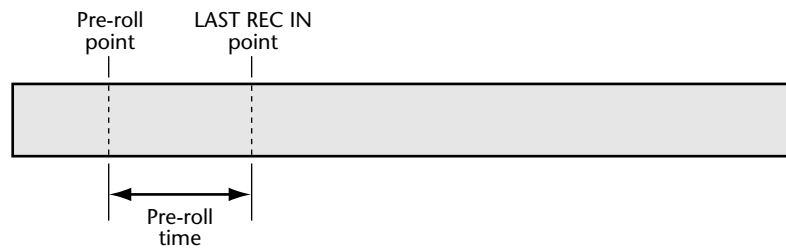
1 Press the [UTILITY] button.

The UTILITY indicator lights up.

2 Use the JOG/DATA dial to select "PRE ROLL," and then press the [ENTER] button.

The currently set pre-roll time appears on the display.

3 Use the JOG/DATA dial to set the pre-roll time from 1 to 30 seconds.

4 Press the [ENTER] button to activate your selection, or the [CANCEL] button to cancel the Pre Roll function.

5 Press the [UTILITY] button again to leave utility.

The UTILITY indicator goes out.

Setting the Post-roll Time

The post-roll time can be set from 1 to 30 seconds, the default being 5 seconds.
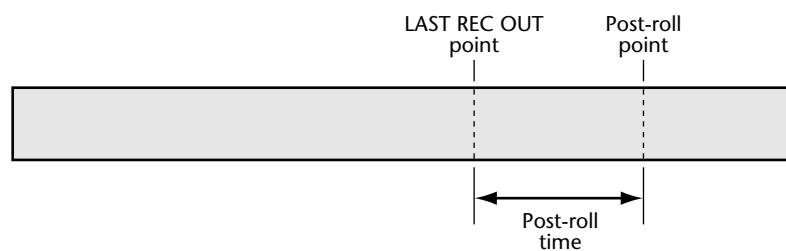
1 Press the [UTILITY] button.

The UTILITY indicator lights up.

2 Use the JOG/DATA dial to select "POST ROLL," and then press the [ENTER] button.

The currently set post-roll time appears on the display.

3 Use the JOG/DATA dial to set the post-roll time from 1 to 30 seconds.

4 Press the [ENTER] button to activate your selection, or the [CANCEL] button to cancel the Post Roll function.

5 Press the [UTILITY] button again to leave utility.

The UTILITY indicator goes out.

Editing Projects

8

In this chapter...

Copying Projects

The Project Copy function is used to copy projects.

1 Press the [EDIT] button.

The EDIT indicator lights up.

2 Use the JOG/DATA dial to select "PROJECT EDIT," and then press the [ENTER] button.

3 Use the JOG/DATA dial to select "COPY," and then press the [ENTER] button.

"FROM PROJ nn—project title" appears on the display ("nn" and "project title" being the number and title of the project to be copied).

4 Use the JOG/DATA dial to select the project that you want to copy, and then press the [ENTER] button.

"TO NEWPROJ nn—ARE YOU SURE" appears on the display ("nn" being the next available project number, which is the automatically assigned to the new project).

5 Press the [ENTER] button to copy the selected project, or the [CANCEL] button to cancel.

The selected project is copied.

When the copy operation is complete, "FINISHED" appears on the display.

To copy another project, press the [ENTER] button to return to step 4.

6 Press the [EDIT] button to leave edit.

The EDIT indicator goes out.

In the following example, project 2 is copied with new project number 4.
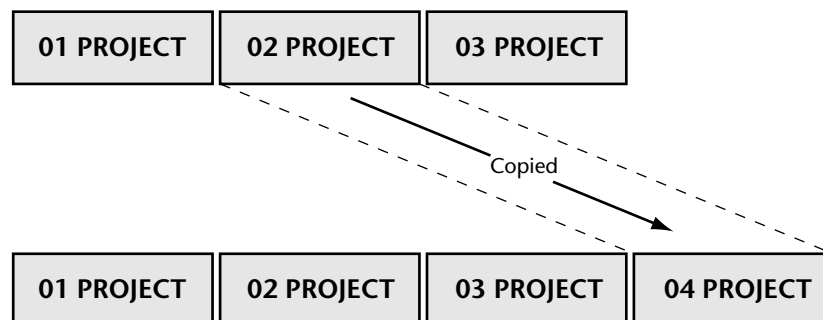
Erasing Projects

The Project Erase function is used to erase the contents of a project. The project number is kept.

1 Press the [EDIT] button.

The EDIT indicator lights up.

2 Use the JOG/DATA dial to select "PROJECT EDIT," and then press the [ENTER] button.

3 Use the JOG/DATA dial to select "ERASE," and then press the [ENTER] button.

"PROJECT nn—project title" appears on the display ("nn" and "project title" being the number and title of the project whose contents are to be erased).

4 Use the JOG/DATA dial to select the project whose contents you want to erase, and then press the [ENTER] button.

"ERASE PROJ nn—ARE YOU SURE" appears on the display.

5 Press the [ENTER] button to erase the contents of the selected project, or the [CANCEL] button to cancel.

The contents of the selected project are erased.

When the erase operation is complete, "FINISHED" appears on the display.

To erase another project, press the [ENTER] button to return to step 4.

6 Press the [EDIT] button to leave edit.

The EDIT indicator goes out.

In the following example, the contents of project 2 are erased.

01 PROJECT	02 PROJECT	03 PROJECT	04 PROJECT

Contents erased

01 PROJECT	02 PROJECT	03 PROJECT	04 PROJECT
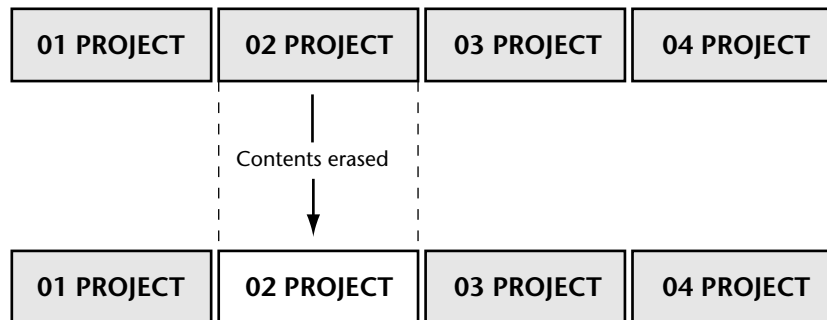
When a project's contents are erased, the time available for additional recording is increased.

Deleting Projects

The Project Delete function is used to delete a project.

1 Press the [EDIT] button.

The EDIT indicator lights up.

2 Use the JOG/DATA dial to select "PROJECT EDIT," and then press the [ENTER] button.

3 Use the JOG/DATA dial to select "DELETE," and then press the [ENTER] button.

"PROJECT nn—project title" appears on the display ("nn" and "project title" being the number and title of the project to be deleted).

4 Use the JOG/DATA dial to select the project that you want to delete, and then press the [ENTER] button.

"DEL PROJ nn—ARE YOU SURE" appears on the display.

5 Press the [ENTER] button to delete the selected project, or the [CANCEL] button to cancel.

The selected project is deleted.

When the delete operation is complete, "FINISHED" appears on the display.

To delete another project, press the [ENTER] button to return to step 4.

6 Press the [EDIT] button to leave edit.

The EDIT indicator goes out.

In the following example, project 2 is deleted.

01 PROJECT	02 PROJECT	03 PROJECT	04 PROJECT

Deleted

01 PROJECT		03 PROJECT	04 PROJECT
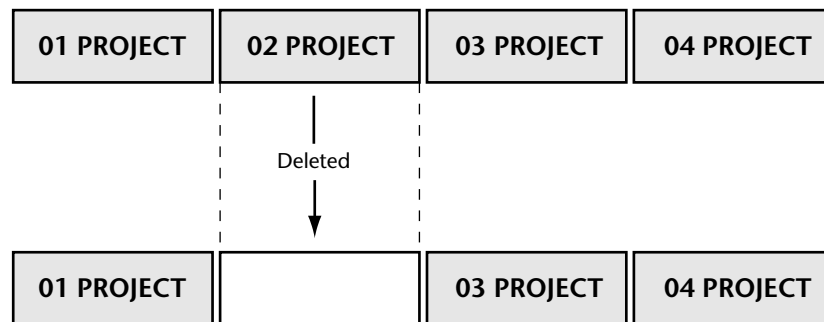
When a project's contents are deleted, the time available for additional recording is increased.

Titling Projects

Projects can be titled for easy identification, and titles can be up to 12 characters long. When a titled project is selected, the first nine characters of its title appear on the display.

1 Select the project that you want to title.

2 Press the [EDIT] button.

The EDIT indicator lights up.

3 Use the JOG/DATA dial to select "PROJECT EDIT," and then press the [ENTER] button.

4 Use the JOG/DATA dial to select "TITLE," and then press the [ENTER] button.

"PROJECT nn—project title" appears on the display ("nn" and "project title" being the number and title of the project to be titled).

5 Use the JOG/DATA dial to select characters, and the SHUTTLE/CURSOR ring to move the cursor to the left or right.

The following characters are available:

```
⌴ABCDEFGHIJKLM
NOPQRSTUVWXYZ⌴
0123456789⌴
⌐⌐[](){}=*+-/
```

(⌴ = space)

6 Press the [ENTER] button.

"PROJ TITLE—ARE YOU SURE" appears on the display.

7 Press the [ENTER] button to set the title.

8 Press the [EDIT] button to leave edit.

The EDIT indicator goes out.

Protecting Projects

The Project Protect function can be used to protect projects against accidental editing. When a project is protected, it cannot be edited using the Project, Track, or Part edit functions, although it can still be copied.

1   Select the project that you want to protect.

2   Press the [EDIT] button.

The EDIT indicator lights up.

3   Use the JOG/DATA dial to select "PROJECT EDIT," and then press the [ENTER] button.

4   Use the JOG/DATA dial to select "PROTECT," and then press the [ENTER] button.

"PROTECT—PROTECT OFF" appears on the display.

5   Use the JOG/DATA dial to select either "OFF" or "ON."

The default setting is OFF.

6   Press the [ENTER] button.

"PROJ PROT—ARE YOU SURE" appears on the display.

7   Press the [ENTER] button to confirm your selection, or the [CANCEL] button to cancel.

When OFF is selected, "UNPROTECTED" appears on the display, and when ON is selected, "PROTECTED" appears.

8   Press the [EDIT] button to leave edit.

The EDIT indicator goes out.

Modifying a Project's Start Time

The TC Modify function is used to modify a project's start time, which is initially set when a project is first recorded. See "Recording" on page 33 for more information.

1   Select the project whose start time you want to modify.

2   Press the [EDIT] button.

The EDIT indicator lights up.

3   Use the JOG/DATA dial to select "PROJECT EDIT," and then press the [ENTER] button.

4   Use the JOG/DATA dial to select "TC MODIFY," and then press the [ENTER] button.

"PROJ TC MOD—00:00:00.00.0" appears on the display.

5   Use the JOG/DATA dial or keypad to enter a new start time.

The default setting is 00:00:00.00.0.

The current position can be captured by pressing the [CAPTURE] button and adjusted in sub-frame steps using the JOG/DATA dial.

6   Press the [ENTER] button.

"PROJ TC MOD—ARE YOU SURE" appears on the display.

7   Press the [ENTER] button to fix the entered start time.

8   Press the [ENTER] button to modify the start time of the selected project, or the [CANCEL] button to cancel.

The start time of the selected project is modified.

When the timecode modify operation is complete, "FINISHED" appears on the display.

9   Press the [EDIT] button to leave edit.

The EDIT indicator goes out.

In the following example, the project's start time is modified from 00:00:00.00 to 00:10:00.00.

Editing Tracks

9

In this chapter...

Copying Tracks

The Track Copy function is used to copy tracks. Existing material on the destination track is overwritten by the Copy function. The source track is unaffected.

1 Press the [EDIT] button.

The EDIT indicator lights up.

2 Use the JOG/DATA dial to select "TRACK EDIT," and then press the [ENTER] button.

3 Use the JOG/DATA dial to select "COPY," and then press the [ENTER] button.

"EDIT COPY—FROM TR nn" appears on the display ("nn" being the number of the track to be copied).

4 Use the JOG/DATA dial to select the source track.

You can select individual tracks, track pairs, or all tracks: 1–8, 1/2–7/8, or ALL. To copy a virtual track, assign it to a main track first, and then copy the main track.

5 Press the [ENTER] button.

"COPY TR nn—TO TR nn" appears on the display ("TO TR nn" being the destination track).

6 Use the JOG/DATA dial to select the destination track.

When FROM is an individual track, TO can be a main track or one of the source's virtual tracks. When FROM is a pair of tracks, TO can be a pair of main tracks or a pair of the source's virtual tracks. When FROM is set to ALL, all tracks can be copied to their corresponding virtual tracks. The following table lists the FROM and TO options, with several examples ("TR" stands for "main track," and "V. TR" for "virtual track").

Source & Destination		Examples		
From	**To**	**From**	**To**	**Result**
TR 1–8	TR 1–8, source's V. TR 1–8	TR 1	TR 2	TR 1 copied to TR 2
		TR 1	V. TR 3	TR 1 copied to V. TR 1-3
TR pair 1/2–7/8	TR pair 1/2–7/8, source pair's V. TR 1–8	TR 1/2	TR 3/4	TR 1/2 copied to TR 3/4
		TR 1/2	V. TR 3	TR 1/2 copied to V. TR 1-3/2-3
ALL	Source V. TR 1–8	ALL	V. TR 1	TR 1 copied to V. TR 1-1 TR 2 copied to V. TR 2-1 TR 3 copied to V. TR 3-1 etc.
		ALL	V. TR 3	TR 1 copied to V. TR 1-3 TR 2 copied to V. TR 2-3 TR 3 copied to V. TR 3-3 etc.

7 Press the [ENTER] button.

"TRACK COPY—ARE YOU SURE" appears on the display. If the destination track contains material, "OVER WRITE" appears instead.

8 Press the [ENTER] button to copy the selected tracks, or the [CANCEL] button to cancel.

The selected track is copied. When the copy operation is complete, "FINISHED" appears on the display and the UNDO/REDO indicator lights up, indicating that it can be undone. See "Undoing a Recording or Edit" on page 35 for more information.

To copy another track, press the [ENTER] button to return to step 4.

9 Press the [EDIT] button to leave edit.

The EDIT indicator goes out.

The following five examples show how tracks can be copied using a variety of FROM and TO combinations.

Track Copy
From: 1
To: 2

Main tracks → Main tracks

Track 1 copied to track 2

Track Copy
From: 1
To: V_TR 3

Main tracks → Virtual tracks

Track 1 copied to virtual track 1-3

Track Copy
From: 1/2
To: 3/4

Main tracks → Main tracks

Tracks 1 and 2 copied to tracks 3 and 4

Track Copy
From: 1/2
To: V_TR 3

Main tracks → Virtual tracks

Tracks 1 and 2 copied to virtual tracks 1-3 and 2-3

Track Copy
From: ALL
To: V_TR 1

Main tracks → Virtual tracks

Tracks 1 through 8 copied to virtual tracks 1-1, 2-1, 3-1, etc.

Moving Tracks

The Track Move function is used to move tracks. Existing material on the destination track is overwritten by the Move function. The source track is left empty.

1 Press the [EDIT] button.

The EDIT indicator lights up.

2 Use the JOG/DATA dial to select "TRACK EDIT," and then press the [ENTER] button.

3 Use the JOG/DATA dial to select "MOVE," and then press the [ENTER] button.

"EDIT MOVE—FROM TR nn" appears on the display ("nn" being the number of the track to be moved).

4 Use the JOG/DATA dial to select the source track.

You can select individual tracks, track pairs, or all tracks: 1–8, 1/2–7/8, or ALL. To move a virtual track, assign it to a main track first, and then move the main track.

5 Press the [ENTER] button.

"MOVE TR nn—TO TR nn" appears on the display ("TO TR nn" being the destination track).

6 Use the JOG/DATA dial to select the destination track.

When FROM is an individual track, TO can be a main track or one of the source's virtual tracks. When FROM is a pair of tracks, TO can be a pair of main tracks or a pair of the source's virtual tracks. When FROM is set to ALL, all tracks can be moved to their corresponding virtual tracks. The following table lists the FROM and TO options, with several examples ("TR" stands for "main track," and "V. TR" for "virtual track").

Source & Destination		Examples		
From	**To**	**From**	**To**	**Result**
TR 1–8	TR 1–8, source's V. TR 1–8	TR 1	TR 2	TR 1 moved to TR 2
		TR 1	V. TR 3	TR 1 moved to V. TR 1-3
TR pair 1/2–7/8	TR pair 1/2–7/8, source pair's V. TR 1–8	TR 1/2	TR 3/4	TR 1/2 moved to TR 3/4
		TR 1/2	V. TR 3	TR 1/2 moved to V. TR 1-3/2-3
ALL	Source V. TR 1–8	ALL	V. TR 1	TR 1 moved to V. TR 1-1 TR 2 moved to V. TR 2-1 TR 3 moved to V. TR 3-1 etc.
		ALL	V. TR 3	TR 1 moved to V. TR 1-3 TR 2 moved to V. TR 2-3 TR 3 moved to V. TR 3-3 etc.

7 Press the [ENTER] button.

"TRACK MOVE—ARE YOU SURE" appears on the display. If the destination track contains material, "OVER WRITE" appears instead.

8 Press the [ENTER] button to move the selected tracks, or the [CANCEL] button to cancel.
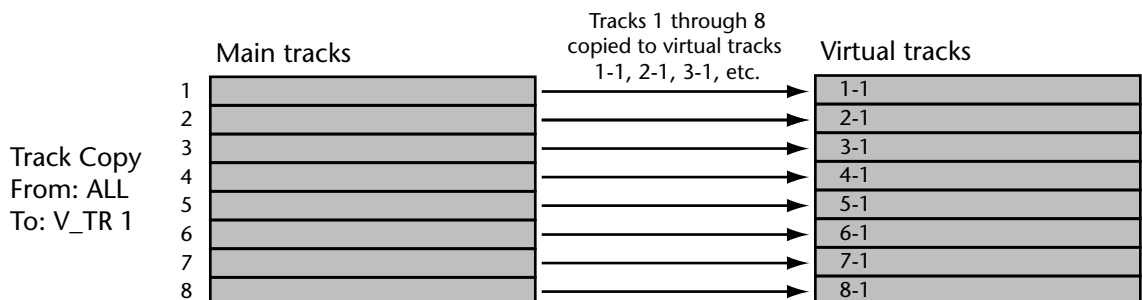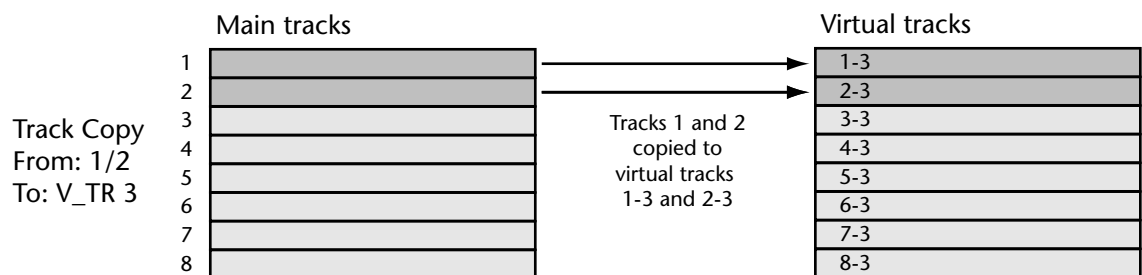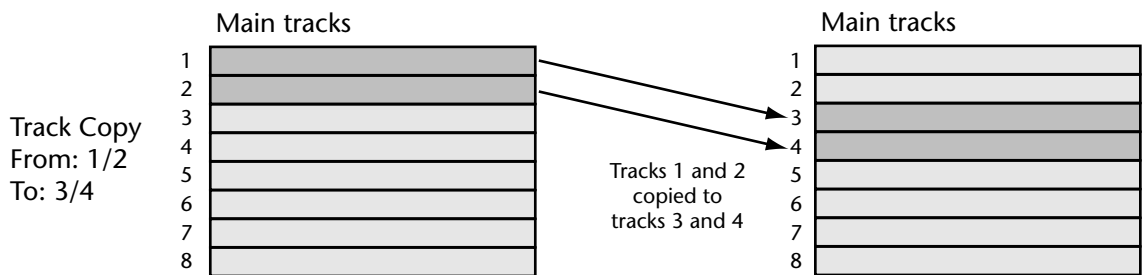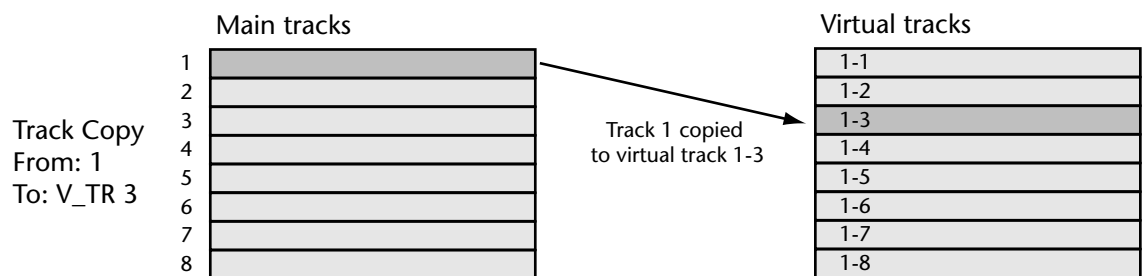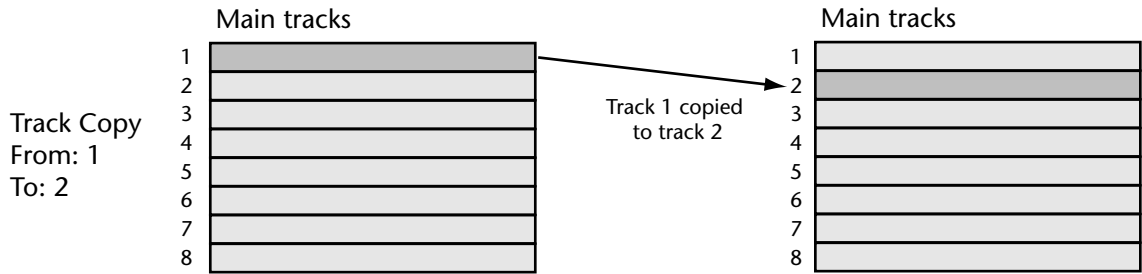
The selected track is moved. When the move operation is complete, "FINISHED" appears on the display and the UNDO/REDO indicator lights up, indicating that it can be undone. See "Undoing a Recording or Edit" on page 35 for more information.

To move another track, press the [ENTER] button to return to step 4.

9 Press the [EDIT] button to leave edit.

The EDIT indicator goes out.

The following five examples show how tracks can be moved using a variety of FROM and TO combinations.

Main tracks · Main tracks

Track Move
From: 1
To: 2

Track 1 moved
to track 2

Main tracks · Virtual tracks

Track Move
From: 1
To: V_TR 3

Track 1 moved
to virtual track 1-3

Main tracks · Main tracks

Track Move
From: 1/2
To: 3/4

Tracks 1 and 2
moved to
tracks 3 and 4

Main tracks · Virtual tracks

Track Move
From: 1/2
To: V_TR 3

Tracks 1 and 2
moved to
virtual tracks
1-3 and 2-3

Tracks 1 through 8
moved to virtual tracks
1-1, 2-1, 3-1, etc.

Main tracks · Virtual tracks

Track Move
From: ALL
To: V_TR 1

Erasing Tracks

The Track Erase function is used to erase the contents of a track.

1 Press the [EDIT] button.

The EDIT indicator lights up.

2 Use the JOG/DATA dial to select "TRACK EDIT," and then press the [ENTER] button.

3 Use the JOG/DATA dial to select "ERASE," and then press the [ENTER] button.

"EDIT ERASE—TR nn" appears on the display ("nn" being the number of the track to be erased).

4 Use the JOG/DATA dial to select the track you want to erase.

You can select individual tracks, track pairs, or all tracks: 1–8, 1/2–7/8, or ALL. To erase a virtual track, assign it to a main track first, and then erase the main track.

5 Press the [ENTER] button.

"TRACK ERASE—ARE YOU SURE" appears on the display.

6 Press the [ENTER] button to erase the selected track, or the [CANCEL] button to cancel.

The selected track is erased.

When the erase operation is complete, "FINISHED" appears on the display and the UNDO/REDO indicator lights up, indicating that it can be undone. See "Undoing a Recording or Edit" on page 35 for more information.

To erase another track, press the [ENTER] button to return to step 4.

7 Press the [EDIT] button to leave edit.

The EDIT indicator goes out.

In the following example, track 2 is erased.
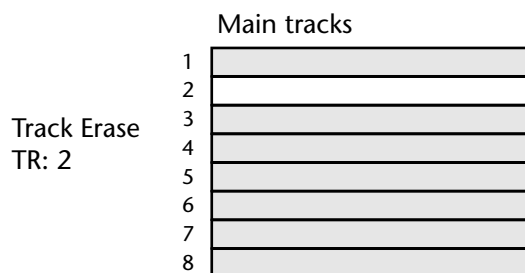
When a track is erased, although they can no longer be accessed, its sound files remain on disk as unused files, taking up disk space, and reducing the time remaining for additional recording. To delete these unused files and recover the disk space, use the Optimize function. See "Recovering Disk Space" on page 172 for more information.

Swapping Tracks

The Track Swap function is used to swap tracks. The material on the source track is swapped with that on the destination track.

1 Press the [EDIT] button.

The EDIT indicator lights up.

2 Use the JOG/DATA dial to select "TRACK EDIT," and then press the [ENTER] button.

3 Use the JOG/DATA dial to select "SWAP," and then press the [ENTER] button.

"EDIT SWAP—FROM TR nn" appears on the display ("FROM TR nn" being the source track).

4 Use the JOG/DATA dial to select the source track.

You can select individual tracks, track pairs, or all tracks: 1–8, 1/2–7/8, or ALL. To swap a virtual track, assign it to a main track first, and then swap the main track.

5 Press the [ENTER] button.

"SWAP TR nn—TO TR nn" appears on the display ("TO TR nn" being the destination track).

6 Use the JOG/DATA dial to select the destination track.

When FROM is an individual track, TO can be a main track or one of the source's virtual tracks. When FROM is a pair of tracks, TO can be a pair of main tracks or a pair of the source's virtual tracks. When FROM is set to ALL, all tracks can be swapped with their corresponding virtual tracks. The following table lists the FROM and TO options, with several examples ("TR" stands for "main track," and "V. TR" for "virtual track").

Source & Destination		Examples		
From	**To**	**From**	**To**	**Result**
TR 1–8	TR 1–8, source's V. TR 1–8	TR 1	TR 2	TR 1 swapped with TR 2
		TR 1	V. TR 3	TR 1 swapped with V. TR 1-3
TR pair 1/2–7/8	TR pair 1/2–7/8, source pair's V. TR 1–8	TR 1/2	TR 3/4	TR 1/2 swapped with TR 3/4
		TR 1/2	V. TR 3	TR 1/2 swapped with V. TR 1-3/2-3
ALL	Source V. TR 1–8	ALL	V. TR 1	TR 1 swapped with V. TR 1-1 TR 2 swapped with V. TR 2-1 TR 3 swapped with V. TR 3-1 etc.
		ALL	V. TR 3	TR 1 swapped with V. TR 1-3 TR 2 swapped with V. TR 2-3 TR 3 swapped with V. TR 3-3 etc.

7 Press the [ENTER] button.

"TRACK SWAP—ARE YOU SURE" appears on the display.

8 Press the [ENTER] button to swap the selected tracks, or the [CANCEL] button to cancel.
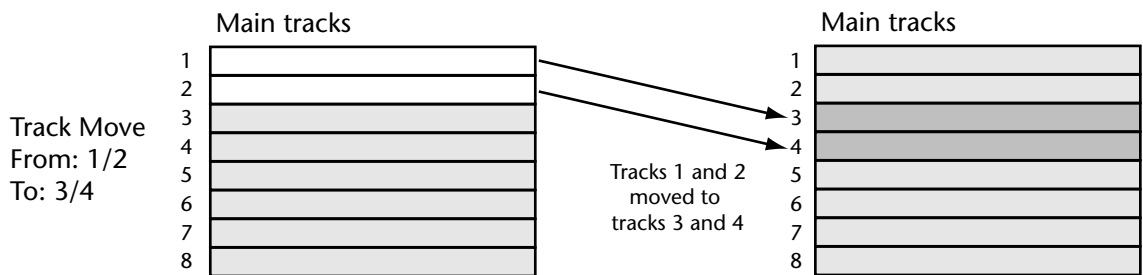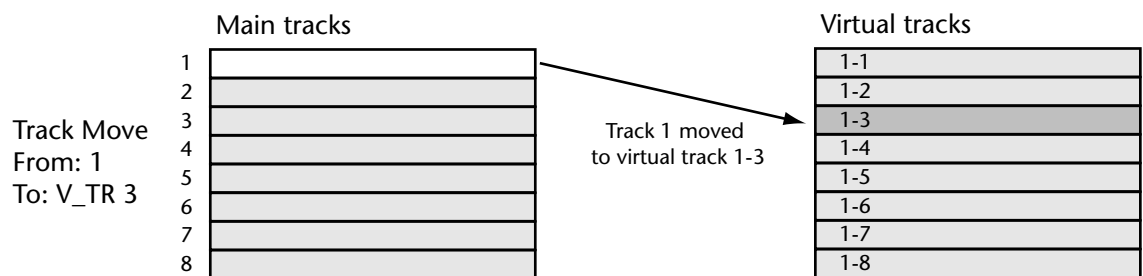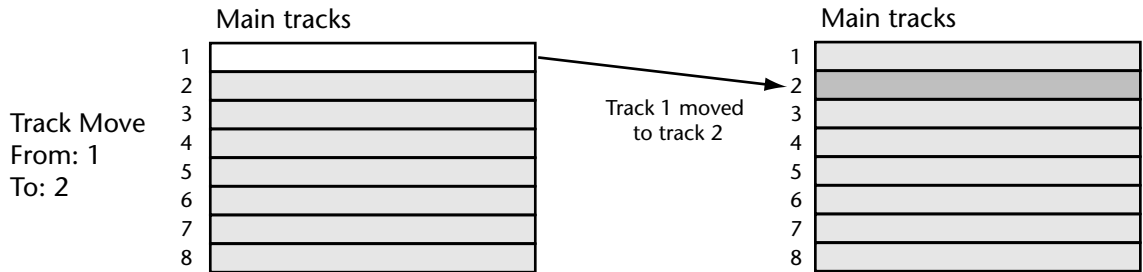
The selected tracks are swapped. When the swap operation is complete, "FINISHED" appears on the display and the UNDO/REDO indicator lights up, indicating that it can be undone. See "Undoing a Recording or Edit" on page 35 for more information.

To swap other tracks, press the [ENTER] button to return to step 4.

**9** Press the [EDIT] button to leave edit.

The EDIT indicator goes out.

The following five examples show how tracks can be swapped using a variety of FROM and TO combinations.

Main tracks   Main tracks

Track Swap
From: 1
To: 2

Track 1 swapped with track 2

Main tracks   Virtual tracks

Track Swap
From: 1
To: V_TR 3

Track 1 swapped with virtual track 1-3

Main tracks   Main tracks

Track Swap
From: 1/2
To: 3/4

Tracks 1 and 2 swapped with tracks 3 and 4

Main tracks   Virtual tracks

Track Swap
From: 1/2
To: V_TR 3

Tracks 1 and 2 swapped with virtual tracks 1-3 and 2-3

Tracks 1 through 8 swapped with virtual tracks 1-1, 2-1, 3-1, etc.

Main tracks   Virtual tracks

Track Swap
From: ALL
To: V_TR 1

Slipping Tracks

The Track Slip function is used to modify a track's start time.

The following points, which can be adjusted in sub-frame steps, can be selected when specifying a new start time: LAST REC IN, LAST REC OUT, A, B, or a locate memory from 1 through 99. Note that you must set the point that you intend to use before entering the Track Slip function. See the Quick Locate Chapter on page 57 for more information about setting these points.

For projects whose start time is "00:00:00.00," the specified point becomes the track's new start time. For projects whose start time is not "00:00:00.00," the track's new start time will be its current start time plus the value of the specified point.

1 Press the [EDIT] button.

The EDIT indicator lights up.

2 Use the JOG/DATA dial to select "TRACK EDIT," and then press the [ENTER] button.

3 Use the JOG/DATA dial to select "SLIP," and then press the [ENTER] button.

"EDIT SLIP—TR nn" appears on the display ("nn" being the number of the track to be slipped).

4 Use the JOG/DATA dial to select the track you want to slip.

You can select individual tracks, track pairs, or all tracks: 1–8, 1/2–7/8, or ALL. To slip a virtual track, assign it to a main track first, and then slip the main track.

5 Press the [ENTER] button.

"EDIT SLIP—TO MARK" appears on the display.

6 Use the JOG/DATA dial to select one of the following points:

MARK IN—LAST REC IN point

MARK OUT—LAST REC OUT point

MARK A—A point

MARK B—B point

LOC MEM 01–99—a locate memory from 1 through 99

7 Press the [ENTER] button.

"EDIT SLIP—TO 00:00:00.00.0" appears on the display ("00:00:00.00.0" being the position of the selected point).

8 Use the JOG/DATA dial or keypad to adjust the position, and then press the [ENTER] button.

"TRACK SLIP—ARE YOU SURE" appears on the display.

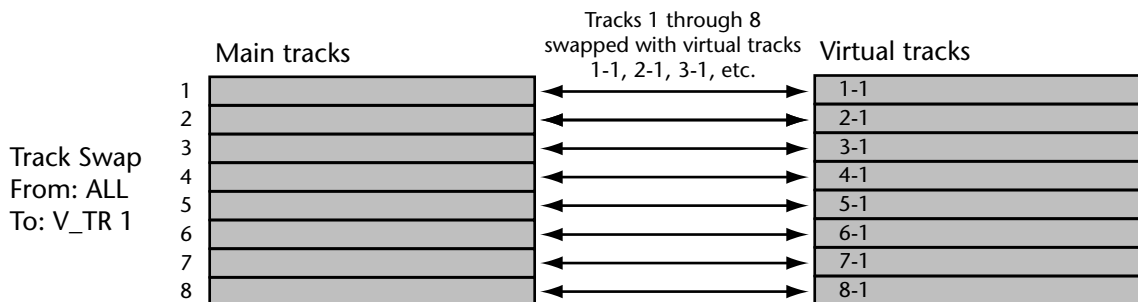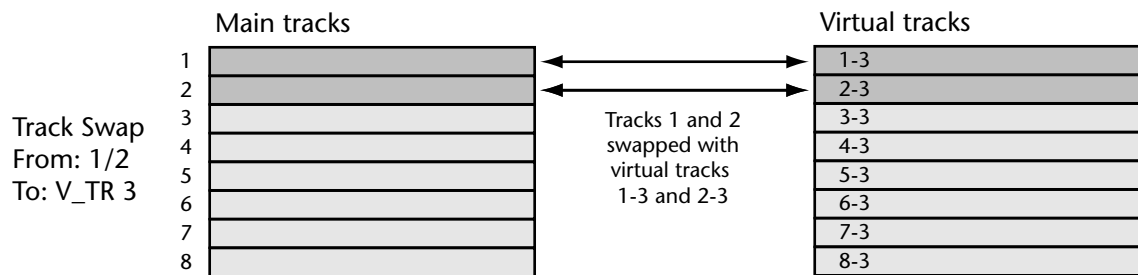**9** Press the [ENTER] button to slip the selected track, or the [CANCEL] button to cancel.
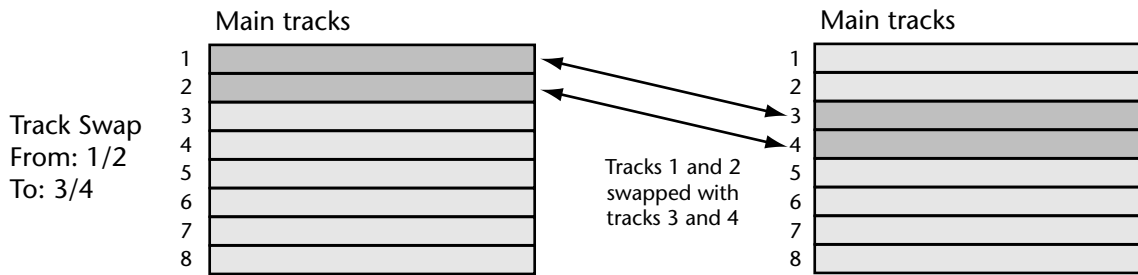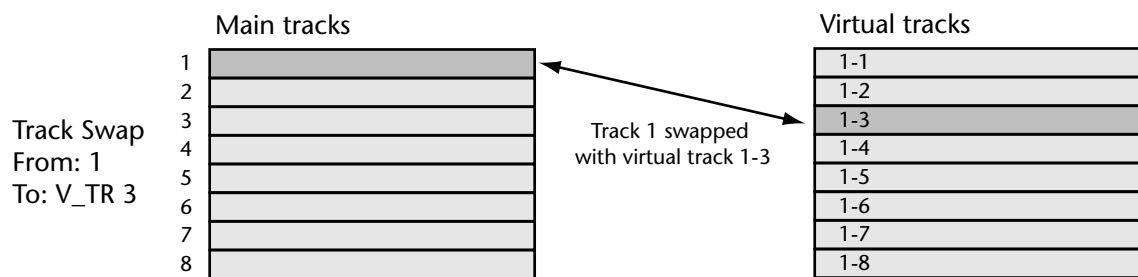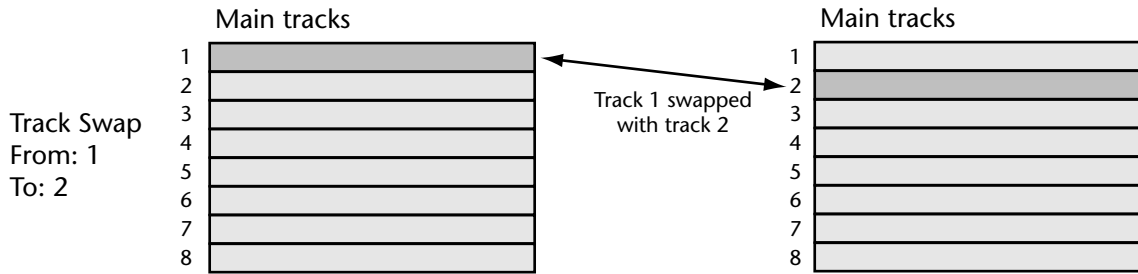
The selected track is slipped.

When the slip operation is complete, "FINISHED" appears on the display and the UNDO/REDO indicator lights up, indicating that it can be undone. See "Undoing a Recording or Edit" on page 35 for more information.

To slip another track, press the [ENTER] button to return to step 4.

10 Press the [EDIT] button to leave edit.

The EDIT indicator goes out.

In the following example, track 2 is slipped to a new start time.

Project start time
00:00:00.00

Track slipped to
00:00:30.00

Track Slip
TR: 2

1
2
3
4
5
6
7
8
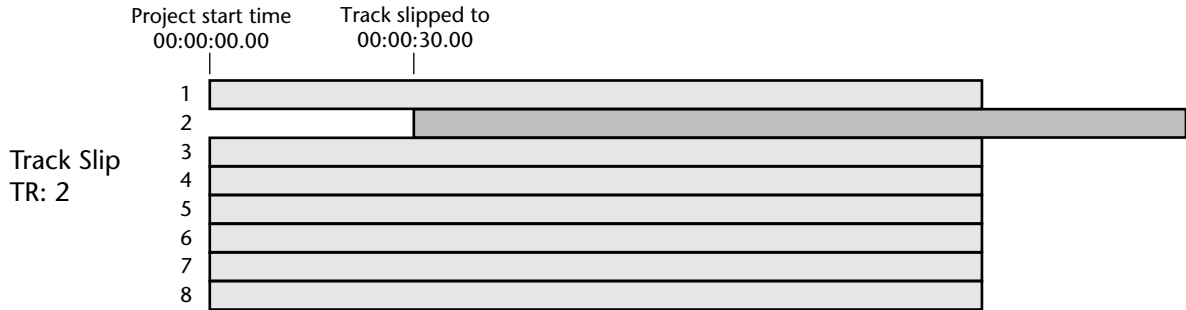
Editing Parts

10

In this chapter...

Copying Parts

The Part Copy function is used to copy part of a track. Existing material on the destination track is overwritten by the Copy function. The source track is unaffected.

The following points, which can be adjusted in sub-frame steps, can be selected when specifying edit points: LAST REC IN, LAST REC OUT, A, B, or a locate memory from 1 through 99. Note that you must set these points before entering the Part Copy function. See the Quick Locate Chapter on page 57 for more information about setting these points.

1 Press the [EDIT] button.

The EDIT indicator lights up.

2 Use the JOG/DATA dial to select "PART EDIT," and then press the [ENTER] button.

3 Use the JOG/DATA dial to select "COPY," and then press the [ENTER] button.

"PART COPY—FROM TR nn" appears on the display ("nn" being the number of the track from which the part is to be copied).

4 Use the JOG/DATA dial to select the source track.

You can select individual tracks, track pairs, or all tracks: 1–8, 1/2–7/8, or ALL. To copy part of a virtual track, assign it to a main track first, and then copy.

5 Press the [ENTER] button.

"COPY TR nn—ST MARK IN" appears on the display ("nn" being the number of the selected track and "ST" being the start point of the part to be copied).

6 Use the JOG/DATA dial to select one of the following points: MARK IN, MARK OUT, MARK A, MARK B, or a locate memory from 1 through 99.

7 Press the [ENTER] button.

"COPY TR nn—ST 00:00:00.00.0" appears on the display ("00:00:00.00.0" being the position of the selected point).

8 Use the JOG/DATA dial or keypad to adjust the start position, and then press the [ENTER] button.

"COPY TR nn—ED MARK IN" appears on the display ("ED" being the end point of the part to be copied).

9 Use the JOG/DATA dial to select one of the following points: MARK IN, MARK OUT, MARK A, MARK B, or a locate memory from 1 through 99.

10 Press the [ENTER] button.

If the duration of the specified part is less than 15 milliseconds, the minimum size, the message "TOO SHORT" appears.

"COPY TR nn—ED 00:00:00.00.0" appears on the display ("00:00:00.00.0" being the position of the selected point).

11 Use the JOG/DATA dial or keypad to adjust the end position, and then press the [ENTER] button.

"COPY TR nn—TO TR nn" appears on the display ("TO TR nn" being the destination track).

12 Use the JOG/DATA dial to select the destination track.

When FROM is an individual track, TO can be a main track or one of the source's virtual tracks. When FROM is a pair of tracks, TO can be a pair of main tracks or a pair of the source's virtual tracks. When FROM is set to ALL, parts from all tracks can be copied to their corresponding virtual tracks. The following table lists the FROM and TO options, with several examples ("TR" stands for "main track," and "V. TR" for "virtual track").

Source & Destination		Examples		
From	To	From	To	Result
TR 1–8	TR 1–8, source's V. TR 1–8	TR 1	TR 2	Part of TR 1 copied to TR 2
		TR 1	V. TR 3	Part of TR 1 copied to V. TR 1-3
TR pair 1/2–7/8	TR pair 1/2–7/8, source pair's V. TR 1–8	TR 1/2	TR 3/4	Parts from TR 1/2 copied to TR 3/4
		TR 1/2	V. TR 3	Parts from TR 1/2 copied to V. TR 1-3/2-3
ALL	Source V. TR 1–8	ALL	V. TR 1	Part of TR 1 copied to V. TR 1-1 Part of TR 2 copied to V. TR 2-1 Part of TR 3 copied to V. TR 3-1 etc.
		ALL	V. TR 3	Part of TR 1 copied to V. TR 1-3 Part of TR 2 copied to V. TR 2-3 Part of TR 3 copied to V. TR 3-3 etc.

13 Press the [ENTER] button.

"COPY TR nn—TO MARK IN" appears on the display ("TO" being the position on the destination track at which the part is to be copied).

14 Use the JOG/DATA dial to select one of the following points: MARK IN, MARK OUT, MARK A, MARK B, or a locate memory from 1 through 99.

15 Press the [ENTER] button.

"COPY TR nn—TO 00:00:00.00.0" appears on the display ("00:00:00.00.0" being the position of the selected point).

16 Use the JOG/DATA dial or keypad to adjust the destination position, and then press the [ENTER] button.

"EDIT COPY—TIMES 01" appears on the display ("TIMES 01" being the number of times the part is to be repeated on the destination track).

17 Use the JOG/DATA dial to set the number of times the part is to be repeated.

The part can be repeated from 1 to 99 times. Parts are repeated consecutively, creating a seamless section of material on the destination track.

18 Press the [ENTER] button.

"EDIT COPY—ARE YOU SURE" appears on the display. If the destination track contains material, "OVER WRITE" appears instead.

19 Press the [ENTER] button to copy the selected part, or the [CANCEL] button to cancel.

The specified part is copied.

When the copy operation is complete, "FINISHED" appears on the display and the UNDO/REDO indicator lights up, indicating that it can be undone. See "Undoing a Recording or Edit" on page 35 for more information.

To copy another part, press the [ENTER] button to return to step 4.

20 Press the [EDIT] button to leave edit.

The EDIT indicator goes out.

In the following example, the part of track 2 between the ST and ED points is copied to to track 3 at the TO point and repeated twice.
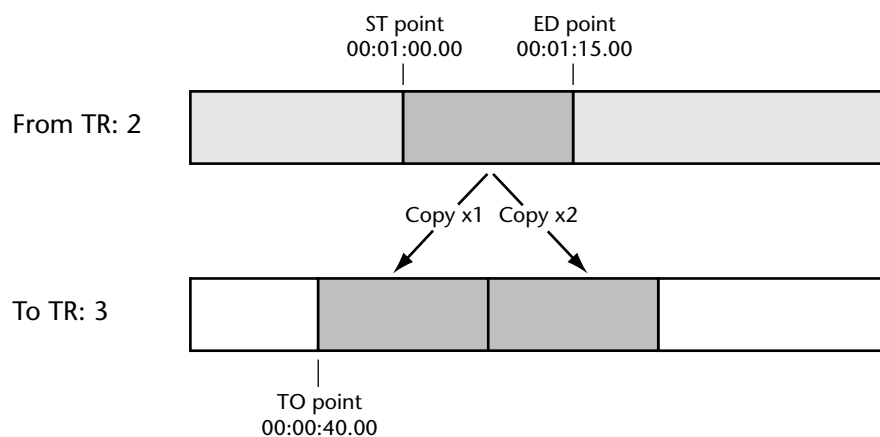
Moving Parts

The Part Move function is used to move part of a track. Existing material on the destination track is overwritten by the Move function. The part on the source track is left empty.

The following points, which can be adjusted in sub-frame steps, can be selected when specifying edit points: LAST REC IN, LAST REC OUT, A, B, or a locate memory from 1 through 99. Note that you must set these points before entering the Part Move function. See the Quick Locate Chapter on page 57 for more information about setting these points.

1 Press the [EDIT] button.

The EDIT indicator lights up.

2 Use the JOG/DATA dial to select "PART EDIT," and then press the [ENTER] button.

3 Use the JOG/DATA dial to select "MOVE," and then press the [ENTER] button.

"PART MOVE—FROM TR nn" appears on the display ("nn" being the number of the track from which the part is to be moved).

4 Use the JOG/DATA dial to select the source track.

You can select individual tracks, track pairs, or all tracks: 1–8, 1/2–7/8, or ALL. To move part of a virtual track, assign it to a main track first, and then move.

5 Press the [ENTER] button.

"MOVE TR nn—ST MARK IN" appears on the display ("nn" being the number of the selected track and "ST" being the start point of the part to be moved).

6 Use the JOG/DATA dial to select one of the following points: MARK IN, MARK OUT, MARK A, MARK B, or a locate memory from 1 through 99.

7 Press the [ENTER] button.

"MOVE TR nn—ST 00:00:00.00.0" appears on the display ("00:00:00.00.0" being the position of the selected point).

8 Use the JOG/DATA dial or keypad to adjust the start position, and then press the [ENTER] button.

"MOVE TR nn—ED MARK IN" appears on the display ("ED" being the end point of the part to be moved).

9 Use the JOG/DATA dial to select one of the following points: MARK IN, MARK OUT, MARK A, MARK B, or a locate memory from 1 through 99.

10 Press the [ENTER] button.

If the duration of the specified part is less than 15 milliseconds, the minimum size, the message "TOO SHORT" appears.

"MOVE TR nn—ED 00:00:00.00.0" appears on the display ("00:00:00.00.0" being the position of the selected point).

11 Use the JOG/DATA dial or keypad to adjust the end position, and then press the [ENTER] button.

"MOVE TR nn—TO TR nn" appears on the display ("TO TR nn" being the destination track).

12   **Use the JOG/DATA dial to select the destination track.**

When FROM is an individual track, TO can be a main track or one of the source's virtual tracks. When FROM is a pair of tracks, TO can be a pair of main tracks or a pair of the source's virtual tracks. When FROM is set to ALL, parts from all tracks can be moved to their corresponding virtual tracks. The following table lists the FROM and TO options, with several examples ("TR" stands for "main track," and "V. TR" for "virtual track").

Source & Destination		Examples		
From	**To**	**From**	**To**	**Result**
TR 1–8	TR 1–8, source's V. TR 1–8	TR 1	TR 2	Part of TR 1 moved to TR 2
		TR 1	V. TR 3	Part of TR 1 moved to V. TR 1-3
TR pair 1/2–7/8	TR pair 1/2–7/8, source pair's V. TR 1–8	TR 1/2	TR 3/4	Parts from TR 1/2 moved to TR 3/4
		TR 1/2	V. TR 3	Parts from TR 1/2 moved to V. TR 1-3/2-3
ALL	Source V. TR 1–8	ALL	V. TR 1	Part of TR 1 moved to V. TR 1-1 Part of TR 2 moved to V. TR 2-1 Part of TR 3 moved to V. TR 3-1 etc.
		ALL	V. TR 3	Part of TR 1 moved to V. TR 1-3 Part of TR 2 moved to V. TR 2-3 Part of TR 3 moved to V. TR 3-3 etc.

13   **Press the [ENTER] button.**

"MOVE TR nn—TO MARK IN" appears on the display ("TO" being the position on the destination track at which the part is to be moved).

14   **Use the JOG/DATA dial to select one of the following points: MARK IN, MARK OUT, MARK A, MARK B, or a locate memory from 1 through 99.**

15   **Press the [ENTER] button.**

"MOVE TR nn—TO 00:00:00.00.0" appears on the display ("00:00:00.00.0" being the position of the selected point).

16   **Use the JOG/DATA dial or keypad to adjust the destination position, and then press the [ENTER] button.**

"EDIT MOVE—TIMES 01" appears on the display ("TIMES 01" being the number of times the moved part is to be repeated on the destination track).

17   **Use the JOG/DATA dial to set the number of times the moved part is to be repeated.**

The moved part can be repeated from 1 to 99 times. Parts are repeated consecutively, creating a seamless section of material on the destination track.

18   **Press the [ENTER] button.**

"EDIT MOVE—ARE YOU SURE" appears on the display. If the destination track contains material, "OVER WRITE" appears instead.

19 Press the [ENTER] button to move your selection, or the [CANCEL] button to cancel.

The specified part is moved.

When the move operation is complete, "FINISHED" appears on the display and the UNDO/REDO indicator lights up, indicating that it can be undone. See "Undoing a Recording or Edit" on page 35 for more information.

To move another part, press the [ENTER] button to return to step 4.

20 Press the [EDIT] button to leave edit.

The EDIT indicator goes out.

In the following example, the part of track 2 between the ST and ED points is moved to to track 3 at the TO point and repeated twice.
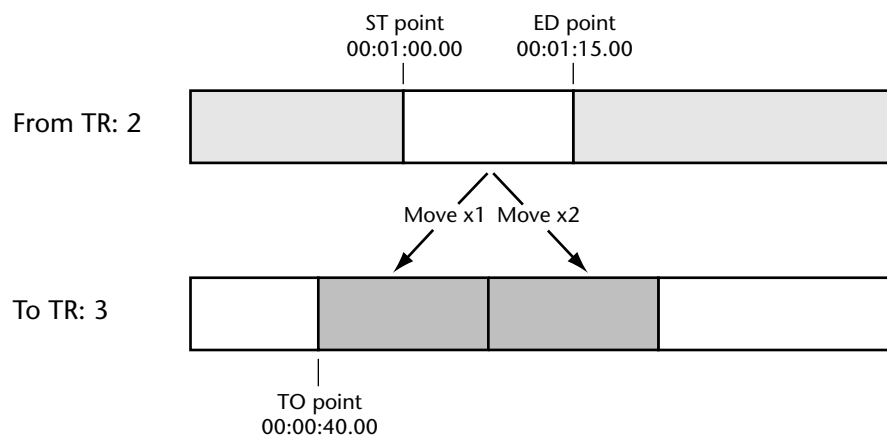
Deleting Parts

The Part Delete function is used to delete part of a track. Subsequent material on the track is moved forward.

The following points, which can be adjusted in sub-frame steps, can be selected when specifying edit points: LAST REC IN, LAST REC OUT, A, B, or a locate memory from 1 through 99. Note that you must set these points before entering the Part Delete function. See the Quick Locate Chapter on page 57 for more information about setting these points.

1 Press the [EDIT] button.

The EDIT indicator lights up.

2 Use the JOG/DATA dial to select "PART EDIT," and then press the [ENTER] button.

3 Use the JOG/DATA dial to select "DELETE," and then press the [ENTER] button.

"PART DELETE—TR nn" appears on the display ("nn" being the number of the track from which the part is to be deleted).

4 Use the JOG/DATA dial to select the track.

You can select individual tracks, track pairs, or all tracks: 1–8, 1/2–7/8, or ALL. To delete part of a virtual track, assign it to a main track first, and then delete.

5 Press the [ENTER] button.

"DEL TR nn—ST MARK IN" appears on the display ("nn" being the number of the selected track and "ST" being the start point of the part to be deleted).

6 Use the JOG/DATA dial to select one of the following points: MARK IN, MARK OUT, MARK A, MARK B, or a locate memory from 1 through 99.

7 Press the [ENTER] button.

"DEL TR nn—ST 00:00:00.00.0" appears on the display ("00:00:00.00.0" being the position of the selected point).

8 Use the JOG/DATA dial or keypad to adjust the start position, and then press the [ENTER] button.

"DEL TR nn—ED MARK IN" appears on the display ("ED" being the end point of the part to be deleted).

9 Use the JOG/DATA dial to select one of the following points: MARK IN, MARK OUT, MARK A, MARK B, or a locate memory from 1 through 99.

10 Press the [ENTER] button.

If the duration of the specified part is less than 15 milliseconds, the minimum size, the message "TOO SHORT" appears.

"DEL TR nn—ED 00:00:00.00.0" appears on the display ("00:00:00.00.0" being the position of the selected point).

11 Use the JOG/DATA dial or keypad to adjust the end position, and then press the [ENTER] button.

"EDIT DELETE—ARE YOU SURE" appears on the display.

12 Press the [ENTER] button to delete the specified part, or the [CANCEL] button to cancel.

The part is deleted and subsequent material is moved forward.

When the delete operation is complete, "FINISHED" appears on the display and the UNDO/REDO indicator lights up, indicating that it can be undone. See "Undoing a Recording or Edit" on page 35 for more information.

To delete another part, press the [ENTER] button to return to step 4.

13 Press the [EDIT] button to leave edit.

The EDIT indicator goes out.

In the following example, the part between the ST and ED points on track 2 is deleted and subsequent material is moved forward.
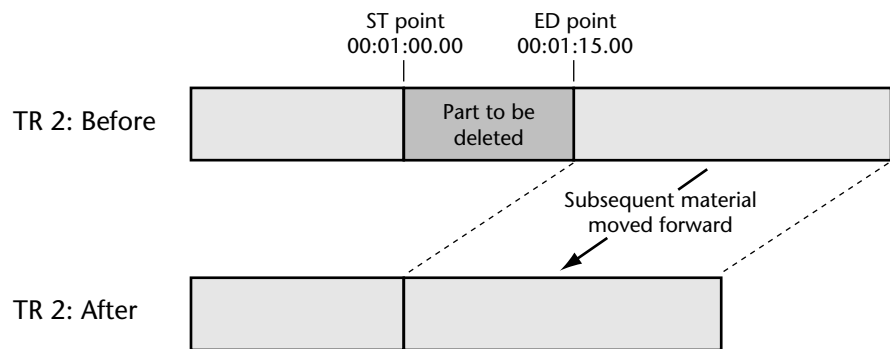
When a part is deleted, although it can no longer be accessed, its sound files remain on disk as unused files, taking up disk space, and reducing the time remaining for additional recording. To delete these unused files and recover the disk space, use the Optimize function. See "Recovering Disk Space" on page 172 for more information.

Erasing Parts

The Part Erase function is used to erase part of a track. The erased part is left empty.

The following points, which can be adjusted in sub-frame steps, can be selected when specifying edit points: LAST REC IN, LAST REC OUT, A, B, or a locate memory from 1 through 99. Note that you must set these points before entering the Part Erase function. See the Quick Locate Chapter on page 57 for more information about setting these points.

1   Press the [EDIT] button.

The EDIT indicator lights up.

2   Use the JOG/DATA dial to select "PART EDIT," and then press the [ENTER] button.

3   Use the JOG/DATA dial to select "ERASE," and then press the [ENTER] button.

"PART ERASE—TR nn" appears on the display ("nn" being the number of the track from which the part is to be erased).

4   Use the JOG/DATA dial to select the track.

You can select individual tracks, track pairs, or all tracks: 1–8, 1/2–7/8, or ALL. To erase part of a virtual track, assign it to a main track first, and then erase.

5   Press the [ENTER] button.

"ERS TR nn—ST MARK IN" appears on the display ("nn" being the number of the selected track and "ST" being the start point of the part to be erased).

6   Use the JOG/DATA dial to select one of the following points: MARK IN, MARK OUT, MARK A, MARK B, or a locate memory from 1 through 99.

7   Press the [ENTER] button.

"ERS TR nn—ST 00:00:00.00.0" appears on the display ("00:00:00.00.0" being the position of the selected point).

8   Use the JOG/DATA dial or keypad to adjust the start position, and then press the [ENTER] button.

"ERS TR nn—ED MARK IN" appears on the display ("ED" being the end point of the part to be erased).

9   Use the JOG/DATA dial to select one of the following points: MARK IN, MARK OUT, MARK A, MARK B, or a locate memory from 1 through 99.

10 Press the [ENTER] button.

If the duration of the specified part is less than 15 milliseconds, the minimum size, the message "TOO SHORT" appears.

"ERS TR nn—ED 00:00:00.00.0" appears on the display ("00:00:00.00.0" being the position of the selected point).

11 Use the JOG/DATA dial or keypad to adjust the end position, and then press the [ENTER] button.

"EDIT ERASE—ARE YOU SURE" appears on the display.

12 Press the [ENTER] button to erase the specified part, or the [CANCEL] button to cancel.
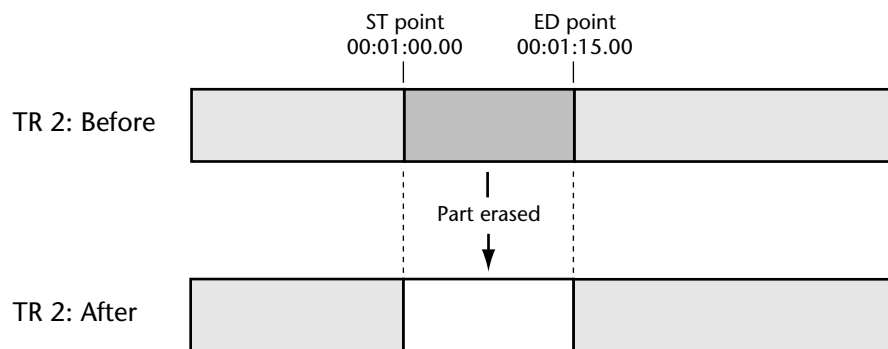
The part is erased.

When the erase operation is complete, "FINISHED" appears on the display and the UNDO/REDO indicator lights up, indicating that it can be undone. See "Undoing a Recording or Edit" on page 35 for more information.

To erase another part, press the [ENTER] button to return to step 4.

13 Press the [EDIT] button to leave edit.

The EDIT indicator goes out.

In the following example, the part between the ST and ED points on track 2 is erased.

When a part is erased, although it can no longer be accessed, its sound files remain on disk as unused files, taking up disk space, and reducing the time remaining for additional recording. To delete these unused files and recover the disk space, use the Optimize function. See "Recovering Disk Space" on page 172 for more information.

Inserting Parts

The Part Insert Space function is used to insert an empty part into a track. Existing material on the track is moved backward.

The following points, which can be adjusted in sub-frame steps, can be selected when specifying edit points: LAST REC IN, LAST REC OUT, A, B, or a locate memory from 1 through 99. Note that you must set these points before entering the Part Insert Space function. See the Quick Locate Chapter on page 57 for more information about setting these points.

1 Press the [EDIT] button.

The EDIT indicator lights up.

2 Use the JOG/DATA dial to select "PART EDIT," and then press the [ENTER] button.

3 Use the JOG/DATA dial to select "INSERT SPACE," and then press the [ENTER] button.

"PART INSR S—FROM TR nn" appears on the display ("nn" being the number of the track into which the empty part is to be inserted).

4 Use the JOG/DATA dial to select the track.

You can select individual tracks, track pairs, or all tracks: 1–8, 1/2–7/8, or ALL. To insert an empty part into a virtual track, assign it to a main track first, and then insert.

5 Press the [ENTER] button.

"INSR TR nn—ST MARK IN" appears on the display ("nn" being the number of the selected track and "ST" being the start point of the part to be inserted).

6 Use the JOG/DATA dial to select one of the following points: MARK IN, MARK OUT, MARK A, MARK B, or a locate memory from 1 through 99.

7 Press the [ENTER] button.

"INSR TR nn—ST 00:00:00.00.0" appears on the display ("00:00:00.00.0" being the position of the selected point).

8 Use the JOG/DATA dial or keypad to adjust the start position, and then press the [ENTER] button.

"INSR TR nn—ED MARK IN" appears on the display ("ED" being the end point of the part to be inserted).

9 Use the JOG/DATA dial to select one of the following points: MARK IN, MARK OUT, MARK A, MARK B, or a locate memory from 1 through 99.

10 Press the [ENTER] button.

If the duration of the specified part is less than 15 milliseconds, the minimum size, the message "TOO SHORT" appears.

"INSR TR nn—ED 00:00:00.00.0" appears on the display ("00:00:00.00.0" being the position of the selected point).

11 Use the JOG/DATA dial or keypad to adjust the end position, and then press the [ENTER] button.

"EDIT INSR S—ARE YOU SURE" appears on the display.

12 Press the [ENTER] button to insert the specified part, or the [CANCEL] button to cancel.

An empty part is inserted into the specified track and existing material is moved backward.

When the insert space operation is complete, "FINISHED" appears on the display and the UNDO/REDO indicator lights up, indicating that it can be undone. See "Undoing a Recording or Edit" on page 35 for more information.

To insert a part into another track, press the [ENTER] button to return to step 4.

13 Press the [EDIT] button to leave edit.

The EDIT indicator goes out.

In the following example, an empty part is inserted into track 2 between the ST and ED points and the existing material is moved backward.
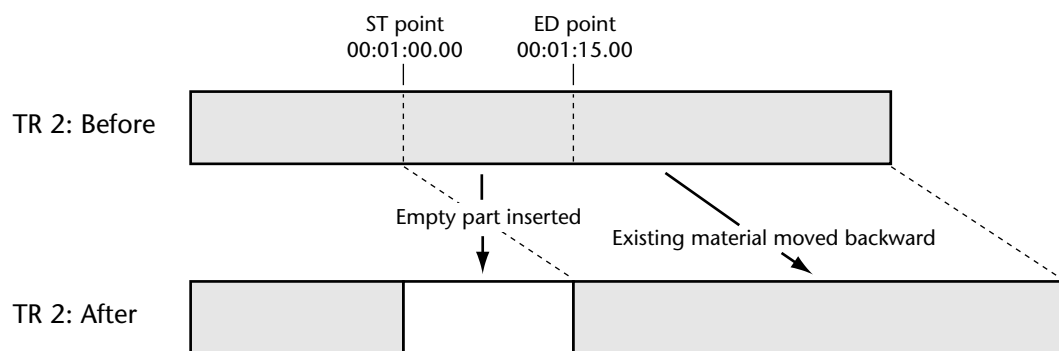
Insert Copying Parts

The Part Insert Copy function is used to insert a copied part into a track. Existing material on the track is moved backward.

The following points, which can be adjusted in sub-frame steps, can be selected when specifying edit points: LAST REC IN, LAST REC OUT, A, B, or a locate memory from 1 through 99. Note that you must set these points before entering the Part Insert Copy function. See the Quick Locate Chapter on page 57 for more information about setting these points.

1   Press the [EDIT] button.

The EDIT indicator lights up.

2   Use the JOG/DATA dial to select "PART EDIT," and then press the [ENTER] button.

3   Use the JOG/DATA dial to select "INSERT COPY," and then press the [ENTER] button.

"PART INSR C—FROM TR nn" appears on the display ("nn" being the number of the track from which the part is to be copied).

4   Use the JOG/DATA dial to select the source track.

You can select individual tracks, track pairs, or all tracks: 1–8, 1/2–7/8, or ALL. To copy part of a virtual track, assign it to a main track first, and then copy.

5   Press the [ENTER] button.

"INSR TR nn—ST MARK IN" appears on the display ("nn" being the number of the selected track and "ST" being the start point of the part to be copied).

6   Use the JOG/DATA dial to select one of the following points: MARK IN, MARK OUT, MARK A, MARK B, or a locate memory from 1 through 99.

7   Press the [ENTER] button.

"INSR TR nn—ST 00:00:00.00.0" appears on the display ("00:00:00.00.0" being the position of the selected point).

8   Use the JOG/DATA dial or keypad to adjust the start position, and then press the [ENTER] button.

"INSR TR nn—ED MARK IN" appears on the display ("ED" being the end point of the part to be copied).

9   Use the JOG/DATA dial to select one of the following points: MARK IN, MARK OUT, MARK A, MARK B, or a locate memory from 1 through 99.

10   Press the [ENTER] button.

If the duration of the specified part is less than 15 milliseconds, the minimum size, the message "TOO SHORT" appears.

"INSR TR nn—ED 00:00:00.00.0" appears on the display ("00:00:00.00.0" being the position of the selected point).

11   Use the JOG/DATA dial or keypad to adjust the end position, and then press the [ENTER] button.

"INSR TR nn—TO TR nn" appears on the display ("TO TR nn" being the destination track).

12 Use the JOG/DATA dial to select the destination track.

When FROM is an individual track, TO can be a main track or one of the source's virtual tracks. When FROM is a pair of tracks, TO can be a pair of main tracks or a pair of the source's virtual tracks. When FROM is set to ALL, parts from all tracks can be copied and inserted into their corresponding virtual tracks. The following table lists the FROM and TO options, with several examples ("TR" stands for "main track," and "V. TR" for "virtual track").

Source & Destination		Examples		
From	To	From	To	Result
TR 1–8	TR 1–8, source's V. TR 1–8	TR 1	TR 2	Part of TR 1 copied to TR 2
		TR 1	V. TR 3	Part of TR 1 copied to V. TR 1-3
TR pair 1/2–7/8	TR pair 1/2–7/8, source pair's V. TR 1–8	TR 1/2	TR 3/4	Parts from TR 1/2 copied to TR 3/4
		TR 1/2	V. TR 3	Parts from TR 1/2 copied to V. TR 1-3/2-3
ALL	Source V. TR 1–8	ALL	V. TR 1	Part of TR 1 copied to V. TR 1-1 Part of TR 2 copied to V. TR 2-1 Part of TR 3 copied to V. TR 3-1 etc.
		ALL	V. TR 3	Part of TR 1 copied to V. TR 1-3 Part of TR 2 copied to V. TR 2-3 Part of TR 3 copied to V. TR 3-3 etc.

13 Press the [ENTER] button.

"INSR TR nn—TO MARK IN" appears on the display ("TO" being the position on the destination track at which the copied part is to be inserted).

14 Use the JOG/DATA dial to select one of the following points: MARK IN, MARK OUT, MARK A, MARK B, or a locate memory from 1 through 99.

15 Press the [ENTER] button.

"INSR TR nn—TO 00:00:00.00.0" appears on the display ("00:00:00.00.0" being the position of the selected point).

16 Use the JOG/DATA dial or keypad to adjust the destination position, and then press the [ENTER] button.

"EDIT INSR C—TIMES 01" appears on the display ("TIMES 01" being the number of times the copied part is to be inserted on the destination track).

17 Use the JOG/DATA dial to set the number of times the part is to be repeated.

The part can be repeated from 1 to 99 times. Parts are repeated consecutively, creating a seamless section of material on the destination track.

18 Press the [ENTER] button.

"EDIT INSR C—ARE YOU SURE" appears on the display. If the destination contains material that will be overwritten when the existing material on the track is moved backward, "OVER WRITE" appears on the display.

19 Press the [ENTER] button to insert the copied part, or the [CANCEL] button to cancel.

The specified part is copied and inserted into the destination track. Existing material on the track is moved backward.

When the copy and insert operation is complete, "FINISHED" appears on the display and the UNDO/REDO indicator lights up, indicating that it can be undone. See "Undoing a Recording or Edit" on page 35 for more information.

To insert a copied part into another track, press the [ENTER] button to return to step 4.

20 Press the [EDIT] button to leave edit.

The EDIT indicator goes out.

In the following example, the part of track 2 between the ST and ED points is copied and inserted into track 3 at the TO point and repeated twice. Existing material on the track is moved backward.
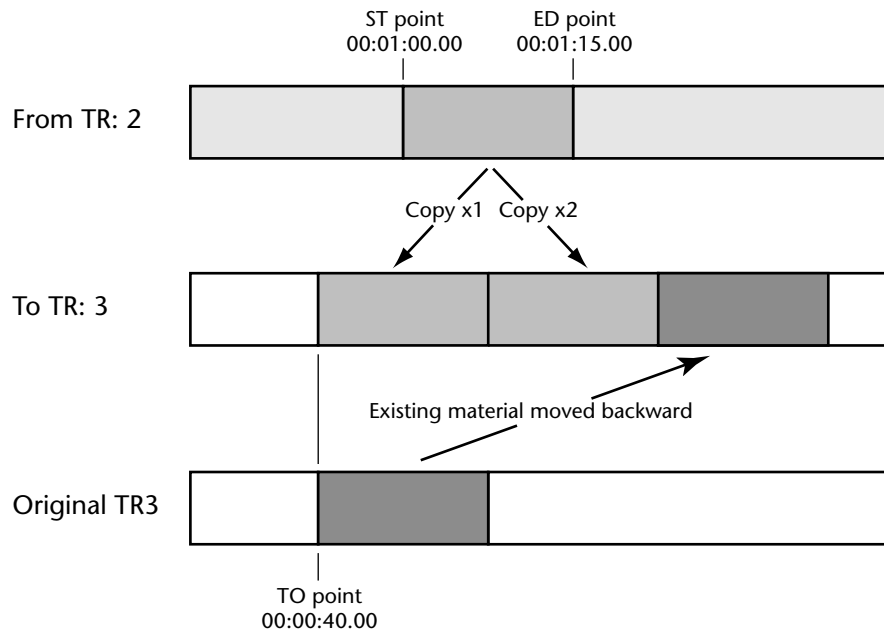
Time Compression

The Time Compression function is used to stretch or squeeze recorded material without affecting its pitch. For example, a 34-second section of material could be squeezed to fit a 30-second video scene.

Individual tracks or a pair of tracks can be processed simultaneously. To process all eight tracks, Time Compression must be run four times, selecting a different pair of tracks each time. The selected material is stretched or squeezed and the result is recorded to the specified virtual track, from which it can be copied or moved to its destination track. The source material is not overwritten.

The following points, which can be adjusted in sub-frame steps, can be selected when specifying the edit points: LAST REC IN, LAST REC OUT, A, B, or a locate memory from 1 through 99. Note that you must set these points before entering the Time Compression function. See the Quick Locate Chapter on page 57 for more information about setting these points.

1 Press the [EDIT] button.

The EDIT indicator lights up.

2 Use the JOG/DATA dial to select "TIME COMP," and then press the [ENTER] button.

"TYPE—GENERAL" appears on the display ("GENERAL" being the selected processing algorithm).

3 Use the JOG/DATA dial to select a suitable algorithm.

The following algorithms are available:

GENERAL—suitable for use with a variety of material.

VOCAL—optimized for use with vocals.

RHYTHM—optimized for use with rhythm material, such as drums and percussion.

4 Press the [ENTER] button.

"RATIO—RATIO 100.00" appears on the display ("100.00" being the time compression ratio expressed as a percentage).

You can calculate the required ratio by dividing the desired length by the current length and multiplying by 100. For example, to squeeze a 34-second part to 30 seconds, a ratio of 88.23% is required (e.g., $30 \div 34 \times 100 = 88.23$).

5 Use the JOG/DATA dial or keypad to set the time compression ratio from 50% to 200% (150% for the RHYTHM algorithm) in 0.01 steps, and then press the [ENTER] button.

"MODE—TEST PLAY" appears on the display.

6 Use the JOG/DATA dial to select a mode: "TEST PLAY" or "REC."
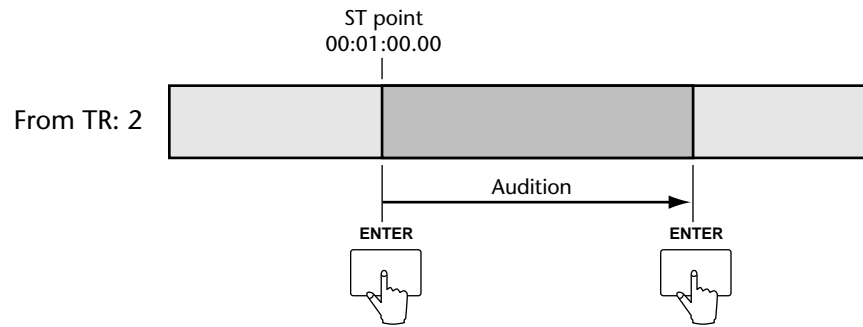
Test Play mode allows you to audition the selected track with the specified time compression ratio, while Rec mode is used to perform the actual time compression and record the result to a virtual track.

When auditioning a track with the VOCAL or RHYTHM algorithm and a compression ratio of less than 90% or higher than 110%, the audition sound quality is impaired slightly. The audio quality for recording is not affected.

Test Play Mode

7 Having selected "TEST PLAY," press the [ENTER] button.

"TIME COMP—FROM TR nn" appears on the display ("nn" being the source track containing the material to be processed).

8 Use the JOG/DATA dial to select the source track.

You can select individual tracks or track pairs: 1–8 or 1/2–7/8. To process a virtual track, assign it to a main track first, and then process the main track.

9 Press the [ENTER] button.

"TIME COMP—ST MARK IN" appears on the display ("ST" being the start point of the part to be processed).

10 Use the JOG/DATA dial to select one of the following points:

MARK IN—LAST REC IN point

MARK OUT—LAST REC OUT point

MARK A—A point

MARK B—B point

LOC MEM 01–99—a locate memory from 1 through 99

11 Press the [ENTER] button.

"TIME COMP—ST 00:00:00.00.0" appears on the display ("00:00:00.00.0" being the position of the selected point).

12 Use the JOG/DATA dial or keypad to adjust the start position, and then press the [ENTER] button.

"PLAY OK—ENTER TO PLY" appears on the display.

13 Press the [ENTER] button to audition the source track.

"TCMP PLAY—ENTER TO STP" appears on the display and playback begins at the specified start point and continues to the end of the project.

Auditioning the Time Compression function requires a lot of processing power, so for monitoring purposes only, the source tracks are mixed to tracks 7 and 8, with odd-numbered tracks appearing on the output and meter of track 7, and even-numbered tracks appearing on the output and meter of track 8. This mix can also be monitored via the PHONES, or if the Coaxial I/O is assigned to tracks 7 and 8 (see "Assigning the Coaxial Input & Output" on page 188), the COAXIAL STEREO DIGITAL OUTPUT. Track outputs 1 through 6 do not output anything when these functions are used.

14 Press the [ENTER] button to stop playback.

Use the [ENTER] button to audition the source track again.

15 Press the [CANCEL] button several times to return to the mode selection display.

"MODE—TEST PLAY" appears on the display, and from here you can select either "TEST PLAY" or "REC."

The following illustration shows the procedure for auditioning.

Rec Mode

16 Having selected "REC," press the [ENTER] button.

"TIME COMP—FROM TR nn" appears on the display ("nn" being the source track containing the material to be processed).

17 Use the JOG/DATA dial to select the source track.

You can select individual tracks or track pairs: 1–8 or 1/2–7/8. To compress a virtual track, assign it to a main track first, and then compress the main track.

18 Press the [ENTER] button.

"TIME COMP—ST MARK IN" appears on the display ("ST" being the start point of the part to be processed).

19 Use the JOG/DATA dial to select one of the following points: MARK IN, MARK OUT, MARK A, MARK B, or a locate memory from 1 through 99.

20 Press the [ENTER] button.

"TIME COMP—ST 00:00:00.00.0" appears on the display ("00:00:00.00.0" being the position of the selected point).

21 Use the JOG/DATA dial or keypad to adjust the start position, and then press the [ENTER] button.

"TIME COMP—ED MARK IN" appears on the display ("ED" being the end point of the part to be processed).

22 Use the JOG/DATA dial to select one of the following points: MARK IN, MARK OUT, MARK A, MARK B, or a locate memory from 1 through 99.

23 Press the [ENTER] button.

"TIME COMP—ED 00:00:00.00.0" appears on the display ("00:00:00.00.0" being the position of the selected point).

24 Use the JOG/DATA dial or keypad to adjust the end position, and then press the [ENTER] button.

If the duration of the specified part is less than 15 milliseconds, the minimum size, the message "TOO SHORT" appears.

"TIME COMP—TO V_TR nn" appears on the display ("nn" being the virtual track to which the processed material will be recorded).

25 Use the JOG/DATA dial to select the destination virtual track.

When FROM is an individual track, TO can be one of the source's virtual tracks. When FROM is a pair of tracks, TO can be a pair of the source's virtual tracks. The following table lists the FROM and TO options, with several examples ("TR" stands for "main track," and "V. TR" for "virtual track").

Source & Destination		Examples		
From	**To**	**From**	**To**	**Result**
TR 1–8	Source's V. TR 1–8	TR 1	V. TR 3	Processed part of TR 1 recorded to V. TR 1-3
TR pair 1/2–7/8	Source pair's V. TR 1–8	TR 1/2	V. TR 3	Processed parts of TR 1/2 recorded to V. TR 1-3/2-3

All the existing data in the destination virtual track is deleted when the data is squeezed.

26 Press the [ENTER] button.

"TIME COMP—TO MARK IN" appears on the display ("TO" being the position on the virtual track at which the processed part is to be recorded).

27 Use the JOG/DATA dial to select one of the following points: MARK IN, MARK OUT, MARK A, MARK B, or a locate memory from 1 through 99.

28 Press the [ENTER] button.

"TIME COMP—TO 00:00:00.00.0" appears on the display ("00:00:00.00.0" being the position of the selected point).

29 Use the JOG/DATA dial or keypad to adjust the destination position, and then press the [ENTER] button.

"REC OK—ARE YOU SURE" appears on the display.

30 Press the [ENTER] button to process the track, or the [CANCEL] button to cancel.

If you press the [ENTER] button, the selected track is processed and the result is recorded to the specified virtual track.

Use the Virtual Track function to assign the virtual track to a main track (page 51), and the Track or Part editing functions to copy or move the main track.

When the operation is complete, "FINISHED" appears on the display and the UNDO/REDO indicator lights up, indicating that it can be undone. See "Undoing a Recording or Edit" on page 35 for more information.
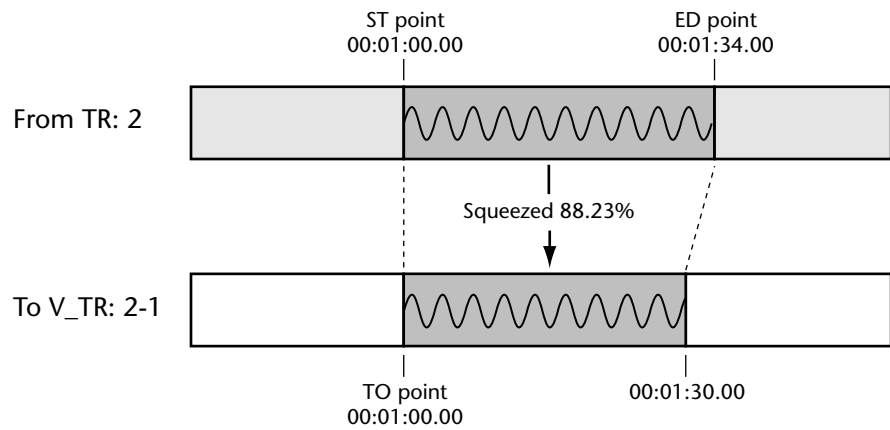
To stretch or squeeze another part, press the [ENTER] button to return to step 3.

31 Press the [EDIT] button to leave edit.

The EDIT indicator goes out.

In the following example, the 34-second part of track 2 between the ST and ED points is squeezed by 88.23% and recorded to virtual track 2-1 at the TO point with its new

length of 30 seconds, starting at the TO point.

When a part is stretched or squeezed, any stored locate points will be out of sync with the recorded material.

Pitch Change

The Pitch Change function is used to raise or lower the pitch of recorded material without affecting its length. For example, a 15-second section of material could be pitched by +100 cents and the length would remain the same. The pitch can be changed by up to ±1,200 cents (±12 semitones, or ±1 octave).

Individual tracks or a pair of tracks can be processed simultaneously. To process all eight tracks, Pitch Change must be run four times, selecting a different pair of tracks each time. The pitch of the selected material is raised or lowered and the result is recorded to the specified virtual track, from which it can be copied or moved to its destination track. The source material is not overwritten.

The following points, which can be adjusted in sub-frame steps, can be selected when specifying the edit points: LAST REC IN, LAST REC OUT, A, B, or a locate memory from 1 through 99. Note that you must set these points before entering the Pitch Change function. See the Quick Locate Chapter on page 57 for more information about setting these points.

1   Press the [EDIT] button.

The EDIT indicator lights up.

2   Use the JOG/DATA dial to select "PITCH CHANGE," and then press the [ENTER] button.

"MODE—RATIO" appears on the display ("RATIO" being the units selected for specifying the amount of pitch change).

3   Use the JOG/DATA dial to select either "RATIO" or "CENT."

RATIO—pitch can be specified from 50% to 200%.

CENT—pitch can be specified from –1,200 cents to +1,200 cents.

4   Press the [ENTER] button.

If RATIO was selected, "MODE—RATIO 100.00" appears on the display. If CENT was selected, "MODE—CENT 0000" appears.

5   Use the JOG/DATA dial or keypad to set the amount of pitch change, and then press the [ENTER] button.

"MODE—TEST PLAY" appears on the display.

6   Use the JOG/DATA dial to select a mode: "TEST PLAY" or "REC."

Test Play mode allows you to audition the selected track with the specified pitch change, while Rec mode is used to perform the actual pitch change and record the result to a virtual track.
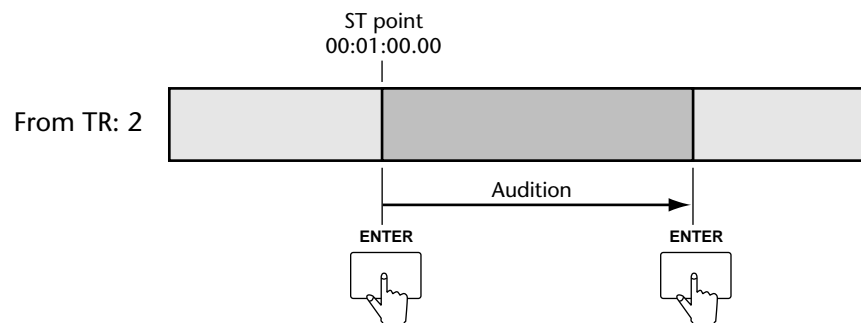
Test Play Mode

7   Having selected "TEST PLAY," press the [ENTER] button.

"PITCH CHANGE—FROM TR nn" appears on the display ("nn" being the source track containing the material to be pitched).

8   Use the JOG/DATA dial to select the source track.

You can select individual tracks or track pairs: 1–8 or 1/2–7/8. To pitch a virtual track, assign it to a main track first, and then pitch the main track.

9 Press the [ENTER] button.

"PITCH CHANGE—ST MARK IN" appears on the display ("ST" being the start point of the part to be pitched).

10 Use the JOG/DATA dial to select one of the following points:

MARK IN—LAST REC IN point

MARK OUT—LAST REC OUT point

MARK A—A point

MARK B—B point

LOC MEM 01–99—a locate memory from 1 through 99

11 Press the [ENTER] button.

"PITCH CHANGE—ST 00:00:00.00.0" appears on the display ("00:00:00.00.0" being the position of the selected point).

12 Use the JOG/DATA dial or keypad to adjust the start position, and then press the [ENTER] button.

"PLAY OK—ENTER TO PLY" appears on the display.

13 Press the [ENTER] button to audition the source track.

"PCHG PLAY—ENTER TO STP" appears on the display and playback begins at the specified start point and continues to the end of the project.

Auditioning the Pitch Change function requires a lot of processing power, so for monitoring purposes only, the source tracks are mixed to tracks 7 and 8, with odd-numbered tracks appearing on the output and meter of track 7, and even-numbered tracks appearing on the output and meter of track 8. This mix can also be monitored via the PHONES, or if the Coaxial I/O is assigned to tracks 7 and 8 (see "Assigning the Coaxial Input & Output" on page 188), the COAXIAL STEREO DIGITAL OUTPUT. Track outputs 1 through 6 do not output anything when these functions are used.

14 Press the [ENTER] button to stop playback.

Use the [ENTER] button to audition the source track again.

15 Press the [CANCEL] button several times to return to the mode selection display.

"MODE—TEST PLAY" appears on the display, and from here you can select either "TEST PLAY" or "REC."

The following illustration shows the procedure for auditioning.

Rec Mode

16 Having selected "REC," press the [ENTER] button.

"PITCH CHANGE—FROM TR nn" appears on the display ("nn" being the source track containing the material to be pitched).

17 Use the JOG/DATA dial to select the source track.

You can select individual tracks or track pairs: 1–8 or 1/2–7/8. To pitch a virtual track, assign it to a main track first, and then pitch the main track.

18 Press the [ENTER] button.

"PITCH CHANGE—ST MARK IN" appears on the display ("ST" being the start point of the part to be pitched).

19 Use the JOG/DATA dial to select one of the following points: MARK IN, MARK OUT, MARK A, MARK B, or a locate memory from 1 through 99.

20 Press the [ENTER] button.

"PITCH CHANGE—ST 00:00:00.00.0" appears on the display ("00:00:00.00.0" being the position of the selected point).

21 Use the JOG/DATA dial or keypad to adjust the start position, and then press the [ENTER] button.

"PITCH CHANGE—ED MARK IN" appears on the display ("ED" being the end point of the part to be pitched).

22 Use the JOG/DATA dial to select one of the following points: MARK IN, MARK OUT, MARK A, MARK B, or a locate memory from 1 through 99.

23 Press the [ENTER] button.

"PITCH CHANGE—ED 00:00:00.00.0" appears on the display ("00:00:00.00.0" being the position of the selected point).

24 Use the JOG/DATA dial or keypad to adjust the end position, and then press the [ENTER] button.

If the duration of the specified part is less than 15 milliseconds, the minimum size, the message "TOO SHORT" appears.

"PITCH CHANGE—TO V_TR nn" appears on the display ("nn" being the virtual track to which the pitched material will be recorded).

25 Use the JOG/DATA dial to select the destination virtual track.

When FROM is an individual track, TO can be one of the source's virtual tracks. When FROM is a pair of tracks, TO can be a pair of the source's virtual tracks. The following table lists the FROM and TO options, with several examples ("TR" stands for "main track," and "V. TR" for "virtual track").

From	To	Examples		
		From	To	Result
TR 1–8	Source's V. TR 1–8	TR 1	V. TR 3	Pitched part of TR 1 recorded to V. TR 1-3
TR pair 1/2–7/8	Source pair's V. TR 1–8	TR 1/2	V. TR 3	Pitched parts of TR 1/2 recorded to V. TR 1-3/2-3

All the existing data in the destination virtual track is deleted when the data is pitched.

26 Press the [ENTER] button.

"PITCH CHANGE—TO MARK IN" appears on the display ("TO" being the position on the virtual track at which the pitched part is to be recorded).

27 Use the JOG/DATA dial to select one of the following points: MARK IN, MARK OUT, MARK A, MARK B, or a locate memory from 1 through 99.

28 Press the [ENTER] button.

"PITCH CHANGE—TO 00:00:00.00.0" appears on the display ("00:00:00.00.0" being the position of the selected point).

29 Use the JOG/DATA dial or keypad to adjust the destination position, and then press the [ENTER] button.

"REC OK—ARE YOU SURE" appears on the display.

30 Press the [ENTER] button to process the track, or the [CANCEL] button to cancel.

If you press the [ENTER] button, the selected material is pitched and the result is recorded to the specified virtual track.

Use the Virtual Track function to assign the virtual track to a main track (page 51), and the Track or Part editing functions to copy or move the main track.

When the pitch change operation is complete, "FINISHED" appears on the display and the UNDO/REDO indicator lights up, indicating that it can be undone. See "Undoing a Recording or Edit" on page 35 for more information.

To pitch another part, press the [ENTER] button to return to step 3.

31 Press the [EDIT] button to leave edit.

The EDIT indicator goes out.

In the following example, the part of track 2 between the ST and ED points is pitched by +100 cents and recorded to virtual track 2-1 at the TO point.
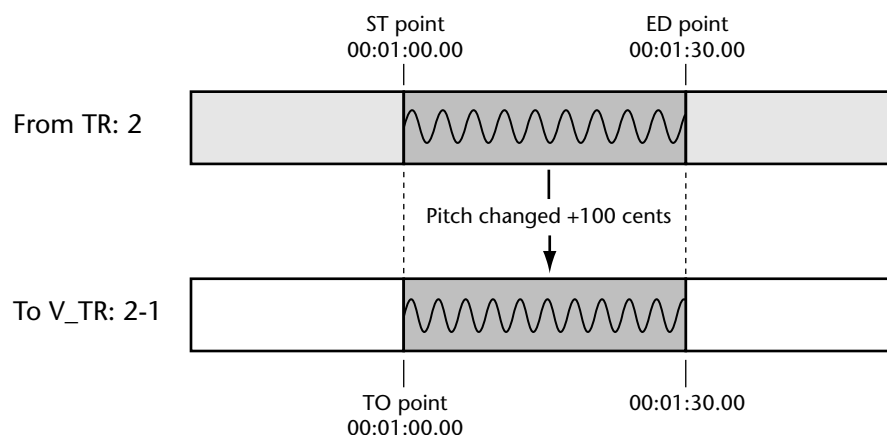
When a part is pitched, any stored locate points will be out of sync with the recorded material.

Wordclocks

11

In this chapter...

Wordclocks & the D24

Unlike analog audio equipment, digital audio equipment must be synchronized when digital audio signals are transferred from one device to another, otherwise, the signal may not be read correctly and audible noise, glitches, or clicks may occur. Synchronization is achieved using what's called a *wordclock*, which is a clock signal for synchronizing all the digital audio signals in a system. Note that wordclocks are not the same as SMPTE/EBU timecode or MIDI timecode, which are typically used to synchronize tape machines, MIDI sequencers, and so on. Wordclock synchronization refers to the synchronization of the digital audio processing circuits inside each digital audio device, so that signals can be transmitted and received correctly.

In a typical digital audio system, one device operates as the wordclock master, while the other devices operate as wordclock slaves, synchronizing to the wordclock master. If you're connecting to the D24 using only analog inputs and outputs, no special wordclock settings are required, and the D24 can be set to use its own internally generated wordclock. Add a digital mixer or DAT recorder, however, and you must decide which device to use as the wordclock master and which devices to use as slaves. Normally, the D24 should be used as the wordclock master. For certain applications, however, such as recording a digital source via the COAXIAL STEREO DIGITAL INPUT, the D24 must be configured as a wordclock slave.

Wordclock signals can be distributed via dedicated cables, typically BNC cables, or derived from digital audio connections, which are synchronous and transmit a clock signal regardless of whether any digital audio signals are present. The D24 can receive an external wordclock signal via its BNC WORDCLOCK INPUT or derive an external wordclock signal from the SLOT 1, SLOT 2, or COAXIAL STEREO DIGITAL INPUT audio connection. In a multiple-unit system, wordclock signals can be distributed via SYNC IN/OUT connections by setting the timecode source on each slave to REMOTE IN. See "Selecting a Wordclock Source" on page 124 for more information.

The following block diagram shows three different methods of wordclock distribution. The first via dedicated BNC wordclock cable, the second via S/PDIF coaxial cable, and the third via AES/EBU, ADAT, or Tascam TDIF-1 multichannel YGDAI connection.
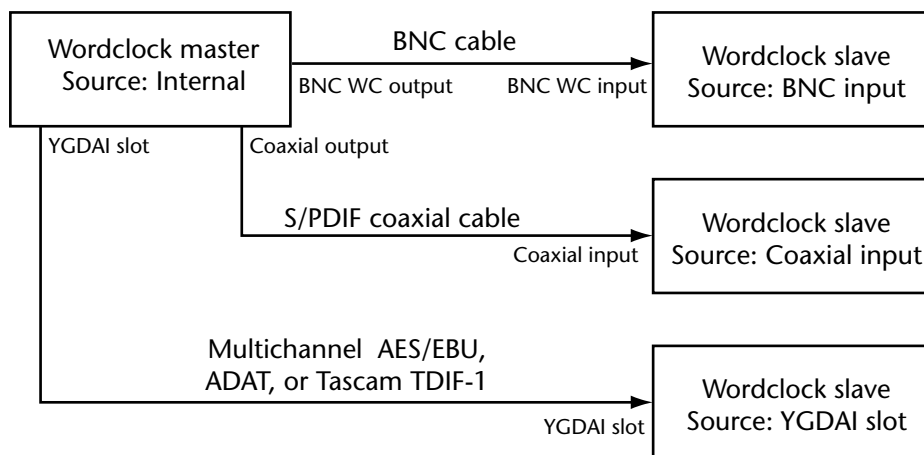
The D24 can be used as the wordclock master for an entire system, or slaved to an external wordclock source of between 41.454 kHz and 50.88 kHz (44.1 kHz –6% to 48 kHz +6%). With sampling rates of 44.1 kHz and 88.2 kHz, the frequency of the wordclock signal and digital output signals is 44.1 kHz, and with sampling rates of 48 kHz and 96 kHz, it's 48 kHz. When using the higher sampling rates of 88.2 kHz and 96 kHz, the D24 uses what's known as *Dual AES/EBU* mode, in which the wordclock frequency is

exactly half that of the sampling rate, and each AES/EBU format digital I/O signal is split in two, requiring two transmission channels. See "Dual AES/EBU Mode" on page 123 for more information.

In a system where all devices share a common wordclock, it's important that all devices be turned on even if they're not being used. Turn on the wordclock master device first, and then the slave devices. When shutting down the system, turn off the slaves first, and then the master. Before recording, make sure that the wordclock slave devices are correctly locked to the master device. Most devices have front panel indicators, similar to the LOCK indicator on the D24, to show when they are wordclock synchronized. Refer to the relevant owner's manuals for more information.

When the wordclock source or recording resolution is changed, or a project with a different sampling rate or recording resolution is selected, lower the volume of your monitoring system just in case your digital mixer, or another device locked to the D24's wordclock, becomes unlocked and produces unpleasant noises.

Wordclock Connections

When the wordclock source is set to WC IN or WC IN DUAL, the D24 locks to the wordclock signal received at the WORD CLOCK INPUT connector.

The WORD CLOCK OUTPUT connector transmits the wordclock signal received at the WORD CLOCK INPUT when the WORD CLOCK 75Ω TERM/THRU switch is set to THRU, or the internally generated wordclock signal when it's set to TERM.

The WORD CLOCK 75Ω TERM/THRU switch is used to terminate the wordclock signal connected to the WORD CLOCK INPUT connector. See "Terminating BNC Wordclock Distribution" on page 131 for hookup examples.
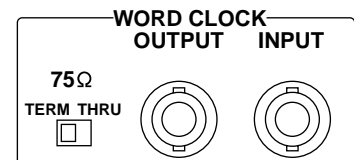
An external wordclock can also be sourced from SLOT 1, SLOT 2, REMOTE IN, or COAXIAL IN.

Dual AES/EBU Mode

When using the higher sampling rates of 88.2 kHz and 96 kHz, the number of tracks is reduced from eight to four and the available tracks are 1, 3, 5, and 7. Project, track, and part editing functions are not available in this mode. For digital I/O, the D24 uses what's known as Dual AES/EBU mode, in which the wordclock frequency is exactly half that of the sampling rate, and each AES/EBU format digital I/O signal is split in two, requiring two transmission channels. Normally, two AES/EBU format signals, for example, left and right channels of a stereo signal, can be transmitted by a single balanced connection. In Dual AES/EBU mode, however, only one AES/EBU format signal can be transmitted per connection. See "Using Dual AES/EBU Mode" on page 186 for more information. Analog I/O is not possible when a Dual mode wordclock source is selected.

Selecting a Wordclock Source

The wordclock source is selected using the Wordclock function. The source setting also determines the sampling rate, which is set when a new project is created. Once something has been recorded in a project, the sampling rate cannot be changed, so it's important that you set the correct rate when creating a new project. See "About Projects" on page 30 for more information.

1 Press the [SETUP] button.

The SETUP indicator lights up.

2 Use the JOG/DATA dial to select "WORD CLOCK," and then press the [ENTER] button.

The currently selected wordclock source appears on the display.

3 Use the JOG/DATA dial to select a wordclock source.

The following wordclock sources can be selected:

Source	Description
INT 44.1K	Internal 44.1 kHz wordclock
INT 48K	Internal 48 kHz wordclock (default setting).
WC IN	External wordclock via the BNC WORDCLOCK INPUT (41.454 kHz–50.88 kHz).
SLOT 1	External wordclock via SLOT 1 (41.454 kHz–50.88 kHz).
SLOT 2	External wordclock via SLOT 2 (41.454 kHz–50.88 kHz).
COAXIAL IN	External wordclock via the COAXIAL STEREO DIGITAL INPUT (41.454 kHz–50.88 kHz).
INT88.2KDUAL	Internal 44.1 kHz wordclock, 88.2 kHz sampling rate, and Dual AES/EBU mode.
INT96K DUAL	Internal 48 kHz wordclock, 96 kHz sampling rate, and Dual AES/EBU mode.
WC IN DUAL	External wordclock via the BNC WORDCLOCK INPUT (41.454 kHz–50.88 kHz) and Dual AES/EBU mode. The sampling rate is double the wordclock frequency.
SLOT 1 DUAL	External wordclock via SLOT 1 (41.454 kHz–50.88 kHz) and Dual AES/EBU mode. The sampling rate is double the wordclock frequency.
SLOT 2 DUAL	External wordclock via SLOT 2 (41.454 kHz–50.88 kHz) and Dual AES/EBU mode. The sampling rate is double the wordclock frequency.

For all non-DUAL sources, the sampling rate is the same as the wordclock frequency.

4 Press the [ENTER] button to activate your selection, or the [CANCEL] button to cancel the Word Clock function.

The D24 checks the selected source to see if an acceptable wordclock signal is available. If such a signal exists, the D24 locks to it and the LOCK indicator appears on the display, as shown here.

`LOCK`

When an internal wordclock is selected, "INT" appears in the WC window on the display, and when an external source is selected, "EXT" appears, as shown here.

`WC INT`
`WC    EXT`

The sampling rate appears in the FS window, as shown here.

`FS    96K`
`FS    48K`
`FS 44.1K`

When the sampling rate is 88.2 kHz, the 44.1K and 96K indicators both appear, as shown here.

`FS` `44.1K     96K`

If an acceptable wordclock signal is not found, the D24 will not operate and the LOCK and FS indicators do not appear. In this situation, you must either select another wordclock source, or correct the selected external wordclock source. This condition also occurs when the external wordclock is disconnected or the device supplying it is turned off.

5   Press the [SETUP] button again to leave setup.

The SETUP indicator goes out.

When the timecode source is set to REMOTE IN, the wordclock source is also set to REMOTE IN (the EXT indicator in the WC window lights up) and the D24 is automatically configured as a wordclock slave. When the timecode source is set to a different source, the wordclock source reverts to its previous setting. See "Selecting a Timecode Source" on page 135 for more information.

Higher sampling rates offer improved sonic performance, but require more disk space. A 640 MB Overwrite-type MO disk, for example, can store approximately 120 track minutes of 16-bit, 44.1 kHz digital audio, compared with 55 track minutes of 16-bit, 96 kHz digital audio.

The sampling rate you choose will ultimately depend on your application and recording system. In general, 44.1 kHz is used for music CDs and MiniDiscs, 48 kHz for some professional recording applications, and 88.2 kHz and 96 kHz for professional recording, mastering, and DVD (Digital Versatile Disk) applications. Since all devices in a digital audio system must be synchronized to a common wordclock, the sampling rate will be the same for each device. So if the D24 is wordclock master and is running at 48 kHz, when you mix down to DAT, for example, via a digital connection from the mixing console, the DAT recording will also be at 48 kHz.

If you intend to burn your own CDs, for example, it's best to use 44.1 kHz, the standard for music CDs. If you intend to deliver your project to a third party, a mastering studio, for example, consult them and agree on a sampling rate before you start recording on the D24. Although it's possible to convert between sampling rates, using third-party sample rate converters, choosing the correct sampling rate in the first place is the best way to avoid this additional process.

When the Varispeed function is used, the sampling rate also changes. See "Using Varispeed" on page 55 for more information.

Wordclock System Examples

The following system examples show several wordclock configurations. Timecode connections are not shown.

Basic Recording System

In the following two examples, a single D24 is used in conjunction with a digital mixing console and DAT deck. In the first example, digital audio is transferred between the D24 and digital mixing console, and from the digital mixing console to the DAT deck, providing multitrack recording, mixing, and mixdown recording to DAT. The D24 is the wordclock master and the digital mixing console and DAT deck are wordclock slaves.
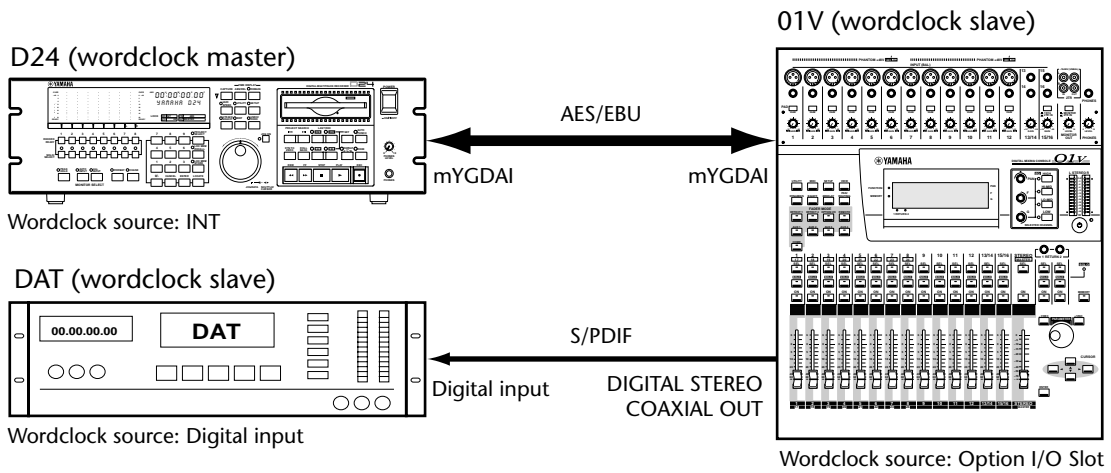
In the second example below, digital audio from the DAT deck is transferred to the D24 via the digital mixing console. This requires a different wordclock configuration, and the DAT deck is the wordclock master and the D24 and digital mixing console are wordclock slaves.
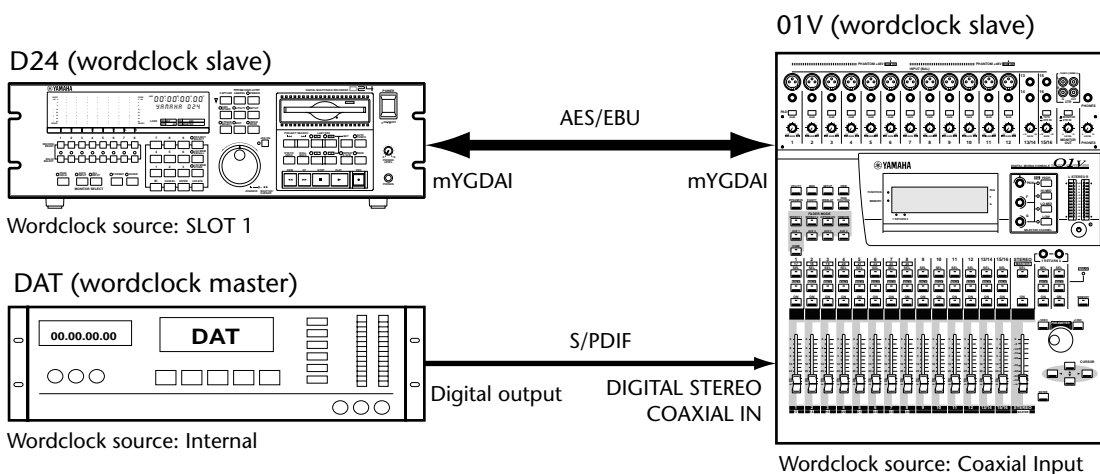
Two D24s

In this example, two D24s are used with a digital mixing console. D24-A is wordclock master, and D24-B and the digital mixing console are wordclock slaves. Since the time-code source on D24-B is set to REMOTE IN, the wordclock signal is transmitted from D24-A to D24-B via the 15-pin sync cable. Alternatively, it could be transmitted via the BNC wordclock connectors and a BNC cable.


D24-A (wordclock master)

SYNC OUT

Wordclock source: INT

Sync cable

D24-B (wordclock slave)

REMOTE IN/
SYNC IN

TC: REMOTE IN

mYGDAI
(SLOT 1)

AES/EBU

YGDAI
(SLOT 1)

mYGDAI
(SLOT 1)

AES/EBU

YGDAI
(SLOT 2)

02R (wordclock slave)

Wordclock source: SLOT 1
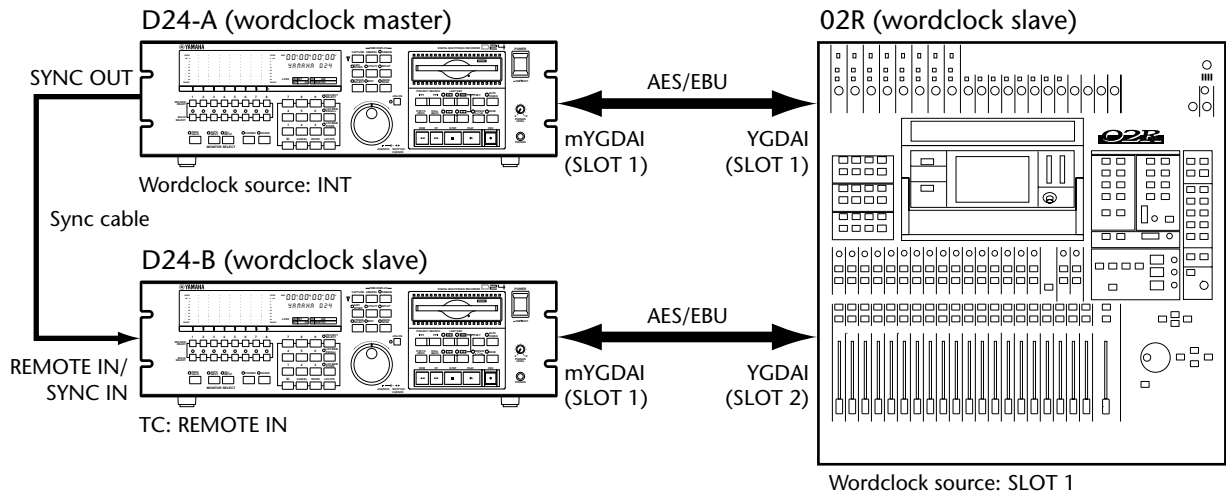
Two D24s & Two MDMs

In the following example, two D24s are used in conjunction with two MDM (Modular Digital Multitrack) recorders and a digital mixing console. D24-A is the wordclock master, and D24-B, the MDMs, and the digital mixing console are wordclock slaves. Since the timecode source on D24-B is set to REMOTE IN, the wordclock signal is transmitted from D24-A to D24-B via the 15-pin sync cable.
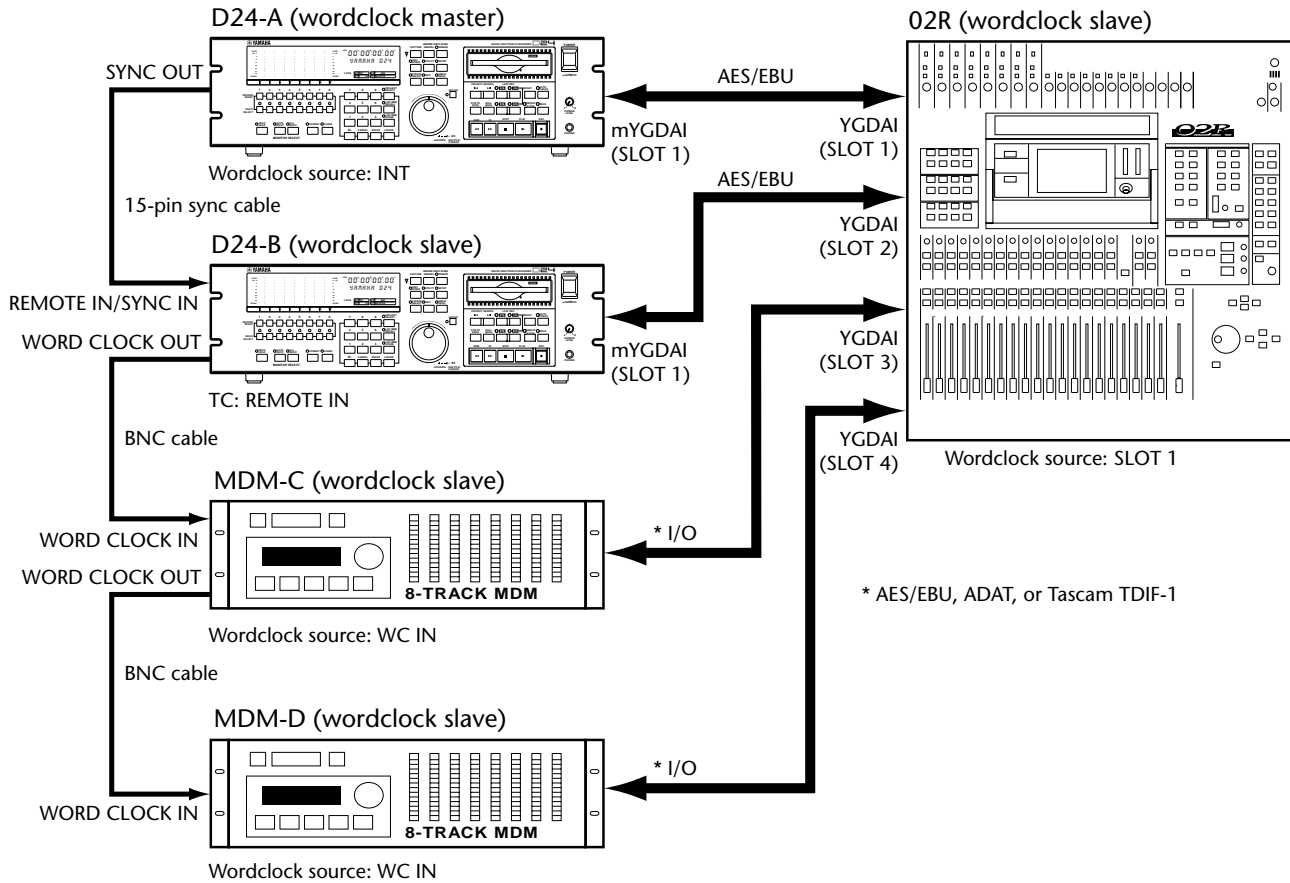
Digital Audio Transfer

In the following example, tracks from an MDM are transferred digitally to the D24. The MDM is wordclock master, and the D24 is wordclock slave.

D24 (wordclock slave)   MDM (wordclock master)

Digital audio transfer

mYGDAI   Digital output
(SLOT 1)

Wordclock source: SLOT 1   Wordclock source: Internal
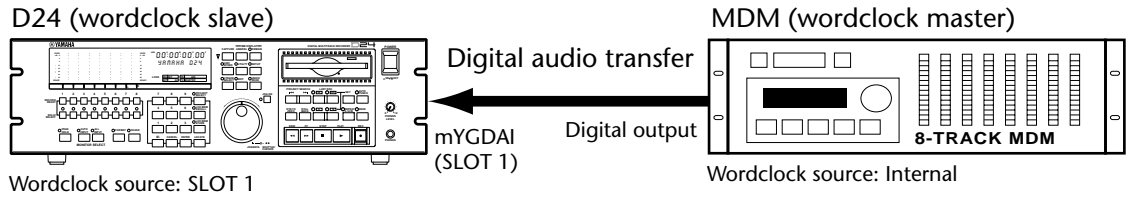
In the next example, two tracks from the D24 are transferred digitally to a DAT deck via coaxial S/PDIF. The D24 is wordclock master, and the DAT deck is wordclock slave.

D24 (wordclock master)   DAT (wordclock slave)

S/PDIF

COAXIAL   Digital In
OUTPUT

Wordclock source: INT   Wordclock source: External
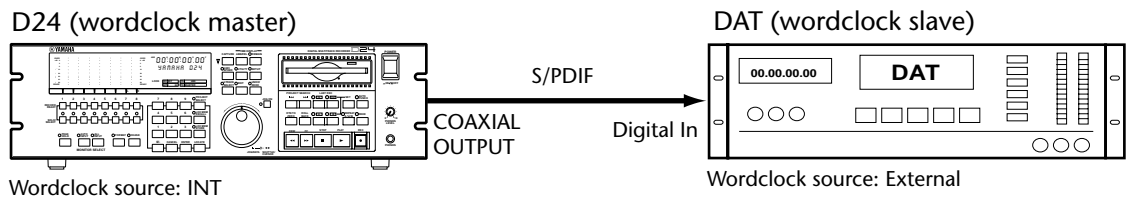
In the following example, two tracks from the a DAT deck are transferred digitally to the D24 via coaxial S/PDIF. The DAT deck is wordclock master, and the D24 is wordclock slave.

D24 (wordclock slave)   DAT (wordclock master)

S/PDIF

COAXIAL   Digital Out
INTPUT

Wordclock source: COAXIAL IN   Wordclock source: Internal
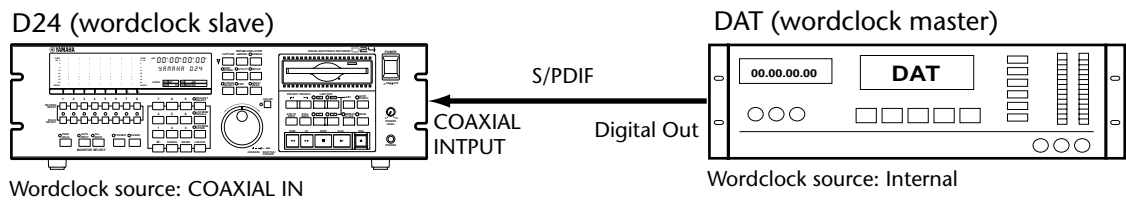
In the next example, tracks from two D24s are transferred to a personal computer, running audio editing software, via an ADAT I/O card. D24-A is wordclock master, while D24-B and personal computer are wordclock slaves. Since the timecode source on D24-B is set to REMOTE IN, the wordclock signal is transmitted from D24-A to D24-B via the 15-pin sync cable. Alternatively, it could be transmitted via the BNC wordclock connectors and a BNC cable.

D24-A (wordclock master)

Personal computer with ADAT I/O card & audio editing software

SYNC OUT

Wordclock source: INT

mYGDAI (SLOT 1)

ADAT

Sync cable

D24-B (wordclock slave)

ADAT

mYGDAI (SLOT 1)

REMOTE IN/ SYNC IN

TC: REMOTE IN

Wordclock source: ADAT input

ADAT I/O card
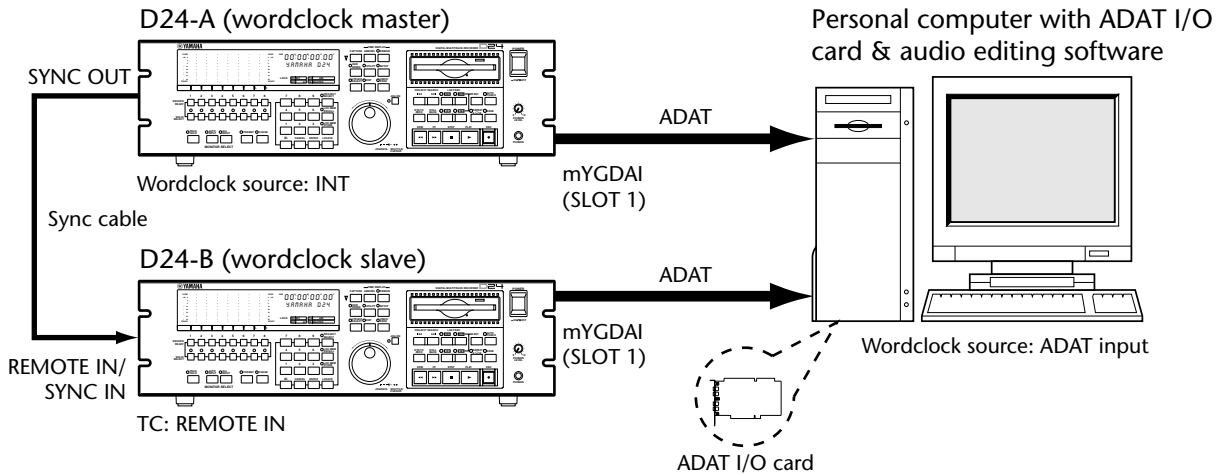
In this final example, tracks from the personal computer are transferred to a pair of D24s. The personal computer is wordclock master, while the D24s are wordclock slaves. The wordclock source on D24-A is set to SLOT 1. Since the timecode source on D24-B is set to REMOTE IN, the wordclock signal is transmitted from D24-A to D24-B via the 15-pin sync cable. Alternatively, it could be transmitted via the BNC wordclock connectors and a BNC cable.

D24-A (wordclock slave)

Personal computer with ADAT I/O card & audio editing software

SYNC OUT

Wordclock source: SLOT 1

mYGDAI (SLOT 1)

ADAT

Sync cable

D24-B (wordclock slave)

ADAT

mYGDAI (SLOT 1)

REMOTE IN/ SYNC IN

TC: REMOTE IN

Wordclock source: Internal

ADAT I/O card
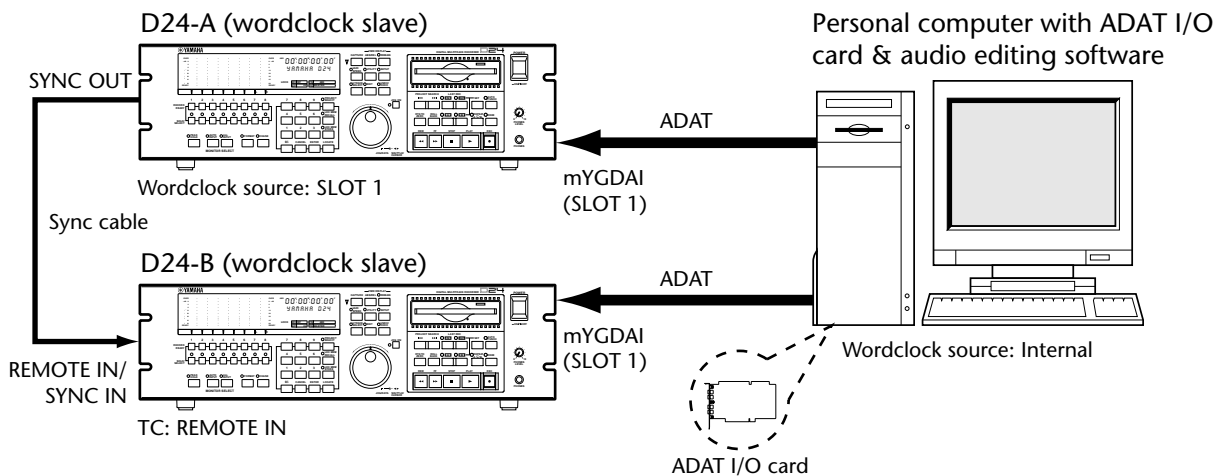
Terminating BNC Wordclock Distribution

When a wordclock signal is distributed via BNC cables, it must be terminated correctly. Termination is typically applied at the last device, although it depends on the distribution method being used. The D24's WORD CLOCK 75Ω TERM/THRU switch allows the D24 to be connected in a variety of ways. The following examples show three ways in which a wordclock signal can be distributed and how termination should be applied.

Wordclock Distribution Box

In this example, a dedicated wordclock distribution box is used to supply a wordclock signal to each device individually. Termination is applied at each device.
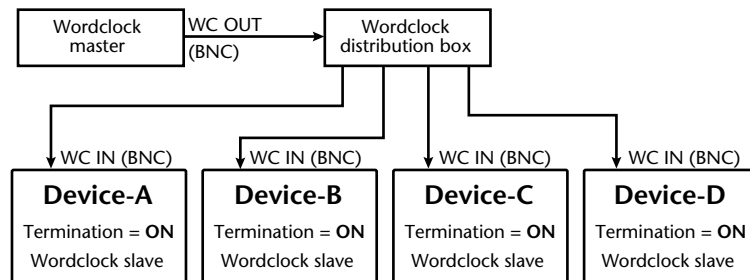
Bus Distribution

In this example, the wordclock signal is distributed via a common bus. Termination is applied at the last device only.
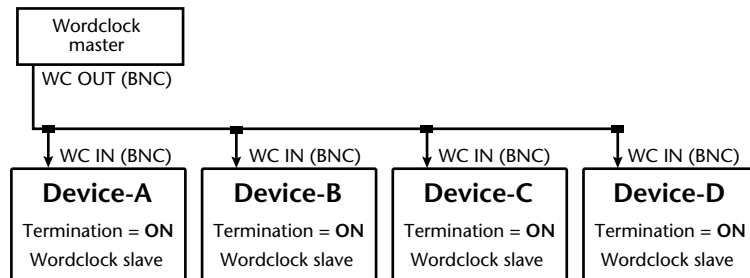
Daisy Chain Distribution

In this example, the wordclock signal is distributed in a daisy-chain fashion, with each device feeding the wordclock signal on to the next device. Termination is applied at the last device only. This method of distribution is not recommended for larger systems.
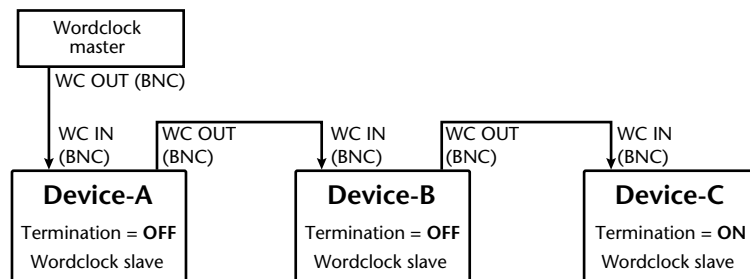
Timecode

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In this chapter...

Timecode & the D24

The D24 supports longitudinal timecode (LTC) and the four common SMPTE/EBU frame rates of 24, 25, 30D (drop-frame), and 30 fps. It can generate its own timecode, or synchronize to an external timecode source via one the following inputs: TIME CODE IN or REMOTE IN. In addition, it can synchronize to an external MTC signal received via the MIDI IN port, and can transmit MTC from the MIDI OUT port even when it's synchronized to an external SMPTE/EBU timecode source. An offset relative to an external timecode source can be set in sub-frame steps. Each sub-frame is one tenth of a frame, making 10 sub-frames per frame. Timecode is transmitted during playback, recording, or rehearsal.

Timecode Connections

When the timecode source is set to TIME CODE IN, the D24 synchronizes to the SMPTE/EBU timecode signal received at the TIMECODE INPUT.

The TIMECODE OUTPUT connector transmits internally generated SMPTE/EBU timecode when the D24 is used as the timecode master, or the timecode received at TIMECODE INPUT when it's used as a timecode slave.
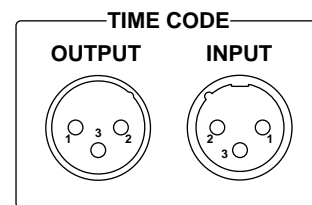
An external timecode can also be sourced from the REMOTE IN connector.

Selecting a Timecode Source

The timecode source is selected using the TC Select function. Settings other than MASTER are used when the D24 is synchronized to external timecode. In addition to selecting the source, you must also set the frame rate. See "Setting the Timecode Frame Rate" on page 136 for more information. The TC Select setting is not stored with each project. See "About Projects" on page 30 for more information.

1   Press the [SETUP] button.

The SETUP indicator lights up.

2   Use the JOG/DATA dial to select "TC SELECT," and then press the [ENTER] button.

The currently selected timecode source appears on the display.

3   Use the JOG/DATA dial to select a timecode source.

The following timecode sources can be selected:

Source	Description
MASTER	Internal SMPTE/EBU timecode (default setting).
TIME CODE IN	External SMPTE/EBU timecode via the TIME CODE IN. Used when synchronizing the D24 to external timecode.
MIDI IN	External MTC timecode via the MIDI IN port. Used when synchronizing the D24 to external timecode.
REMOTE IN	External SMPTE/EBU timecode via the REMOTE IN/SYNC IN. Used when synchronizing slave D24s to the timecode from the master D24 in a multiple unit system.
SERIAL IN	External SMPTE/EBU timecode via the TIME CODE IN and command information via the SERIAL I/O port. Used when synchronizing the D24 to external timecode and controlling via command information received at the SERIAL I/O port.
TC IN+VIDEO	External SMPTE/EBU timecode via the TIME CODE IN and video sync via the VIDEO INPUT. Used when synchronizing the D24 to external timecode and video sync.

4   Press the [ENTER] button to activate your selection, or the [CANCEL] button to cancel the TC Select function.

When the timecode source is set to MASTER, "MASTER" appears in the TC window on the display, and when it's set to TIME CODE IN, MIDI IN, REMOTE IN, or SERIAL IN, "SLAVE" appears, as shown here.
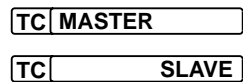
TC| MASTER |

TC| SLAVE |

5   Press the [SETUP] button again to leave setup.

The SETUP indicator goes out.

When the timecode source is set to REMOTE IN, the wordclock source is also set to REMOTE IN (the EXT indicator in the WC window lights up) and the D24 is automatically configured as a wordclock slave. When the timecode source is set to a different source, the wordclock source reverts to its previous setting.

Setting the Timecode Frame Rate

The timecode frame rate, which is stored with each project, can be set to one of four frame rates: 24, 25, 30D (drop-frame), or 30 fps. When the D24 is synchronized to external timecode, you must set the frame rate so that it matches that of the external timecode.

1 Press the [SETUP] button.

The SETUP indicator lights up.

2 Use the JOG/DATA dial to select "FRAME RATE," and then press the [ENTER] button.

The currently selected frame rate appears on the display.

3 Use the JOG/DATA dial to select a frame rate.

The following frame rates can be selected:

Source	Description
24 FRAME	24 fps
25 FRAME	25 fps
30D FRAME	30 fps drop-frame
30 FRAME	30 fps (default setting)

4 Press the [ENTER] button to activate your selection, or the [CANCEL] button to cancel the Frame Rate function.

5 Press the [SETUP] button again to leave setup.

The SETUP indicator goes out.

The frame rate you choose will ultimately depend on your application and recording system. In general, 24 fps is used for film work, 25 fps is used with European monochrome and color PAL/SECAM television systems, 30D fps is used with U.S. and Japanese NTSC color television systems, and 30 fps is used with U.S. monochrome television systems. For audio-only applications, it's common to use the frame rate standard of the country in which you are working—25 fps in Europe, 30 fps in the U.S. and Japan.

If you intend to deliver your project to a third party, another studio, for example, consult them and agree on a timecode frame rate before you start recording on the D24.

Setting a Timecode Offset

A timecode offset relative to the external timecode source can be set using the TC Offset function. Plus values retard the D24, minus ones advance it. With an offset of +00:05:00.00.0 (+ 5 minutes), for example, an external timecode value of 01:00:00.00.0 (1 hour) will correspond to 01:05:00.00.0 (1 hour and 5 minutes) on the D24.

1 Press the [SETUP] button.

The SETUP indicator lights up.

2 Use the JOG/DATA dial to select "TC OFFSET," and then press the [ENTER] button.

The currently set offset, if any, appears on the display.

3 Use the JOG/DATA dial to specify an offset.

An offset can also be entered using the keypad. Use the [CANCEL] button to revert to the previous value, and the [0/-] button to toggle between plus and minus values.

The timecode offset can be set from –23:59:59.29.9 to +23:59:59.29.9 (23 hours, 59 minutes, 59 seconds, 29 frames, and 9 sub-frames). The default setting is 00:00:00.00.0.

To use the current time as the offset value, press the [CAPTURE] button to copy it to the 2nd line of the display.

4 Press the [ENTER] button to activate your selection, or the [CANCEL] button to cancel the TC Offset function.

5 Press the [SETUP] button again to leave setup.

The SETUP indicator goes out.

The following illustration shows how minus and plus offsets of one minute retard and advance a project relative to an external timecode source. The project's absolute start time is 00:00:00.00 and the timecode frame rate is 30 fps.
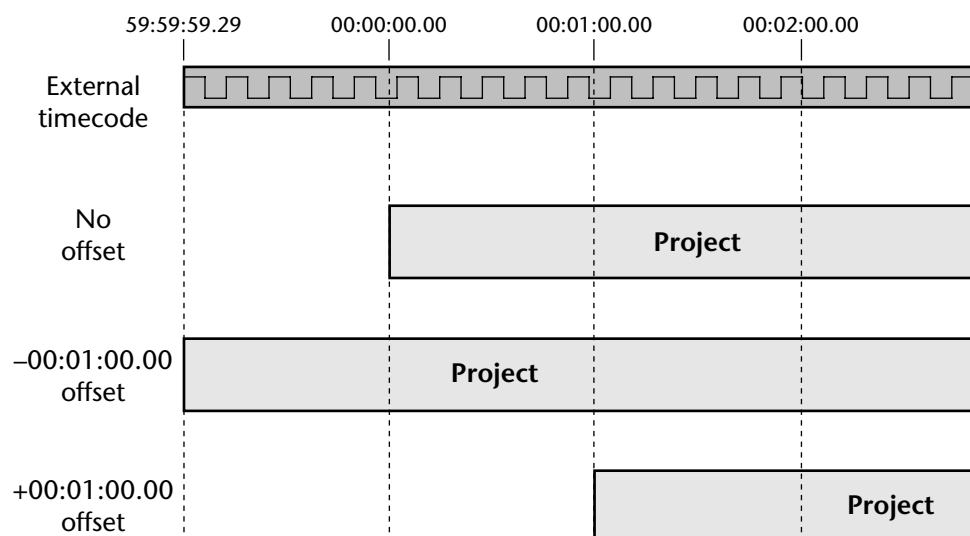
Chasing External Timecode

The Timecode Chase function is used to synchronize D24s in a multiple-unit system, or to synchronize a single D24 to an external timecode source. The D24 can chase SMPTE/EBU timecode received via the TIMECODE INPUT or MTC received via the MIDI IN. When the Chase function is turned on, the D24 automatically chases and synchronizes to the selected external timecode source.

1 Set the timecode source to either TIMECODE IN, MIDI IN, or TC IN+VIDEO. See "Selecting a Timecode Source" on page 135 for more information.

When TC IN+VIDEO is selected, first the D24 chases and synchronizes to the external timecode, and once chase lock has been achieved, it synchronizes to the incoming video sync signal.

**2** Press the [SETUP] button.

The SETUP indicator lights up.

3 Use the JOG/DATA dial to select "CHASE MODE," and then press the [ENTER] button.

The currently set Chase Mode appears on the display.

4 Use the JOG/DATA dial to select a Chase mode.

Mode	Description
ALL CHASE	Continuously check the timecode and chase and synchronize as necessary.
FREE CHASE	Chase and synchronize to the external timecode and run freely once chase lock has been achieved.
RE CHASE1	Chase and synchronize to the external timecode and run freely once chase lock has been achieved, but relock if the timecode deviates by more than 1 second.
RE CHASE2	Chase and synchronize to the external timecode but run freely once chase lock has been achieved, but relock if the timecode deviates by more than 2 seconds.

5 Press the [ENTER] button to activate your selection, or the [CANCEL] button to cancel the Chase mode function.

6 Press the [SETUP] button again to leave setup.

The SETUP indicator goes out.

7 Press the [CHASE] button.

The CHASE indicator lights up, as shown here.   CHASE

The D24 will now chase and synchronize to the selected external timecode source.

When the incoming timecode reaches normal playback speed, the D24 automatically starts playback, and when the incoming timecode stops, the D24 stops.

8 Press the [CHASE] button again to turn off the Chase function.

The CHASE indicator goes out.

Playback can also be stopped by pressing the [CHASE] button.

See "Multiple D24s" on page 144 for details about using multiple D24s, and see "Connecting a Video Editor" on page 151 for details about using the SERIAL I/O port.

Setting the Chase Speed

When the D24 is synchronized to external timecode in Chase mode, devices that are locked to the D24's wordclock, such as digital mixers, may become unlocked and produces unpleasant noises. In this case, you should reduce the D24's Chase Speed. At slower Chase Speeds, however, the D24 takes longer to chase and synchronize to external timecode.

1   Press the [UTILITY] button.

The UTILITY indicator lights up.

2   Use the JOG/DATA dial to select "CHASE SPEED," and then press the [ENTER] button.

The current Chase Speed setting appears on the display.

3   Use the JOG/DATA dial to set the Chase Speed from 01–10.

01 is the slowest speed and 10 is the fastest. The default setting is 08.

4   Press the [ENTER] button to activate your selection, or the [CANCEL] button to cancel the Chase Speed function.

5   Press the [UTILITY] button again to leave utility.

The UTILITY indicator goes out.

Transmitting MTC

The D24 can transmit MTC from the MIDI OUT port at the specified frame rate regardless of the selected timecode source, which means that the D24 can transmit MTC even when it's synchronized to an external SMPTE/EBU timecode source.

The D24 transmits MTC during rewind, fast forward, playback, recording, or rehearsal.

MTC transmission can be turned on or off using the MTC Transmit function.

1   Press the [UTILITY] button.

The UTILITY indicator lights up.

2   Use the JOG/DATA dial to select "MTC TRANSMIT," and then press the [ENTER] button.

The current MTC Transmit setting appears on the display.

3   Use the JOG/DATA dial to select either "OFF" or "ON."

The default setting is OFF.

4   Press the [ENTER] button to activate your selection, or the [CANCEL] button to cancel the MTC Transmit function.

5   Press the [UTILITY] button again to leave utility.

The UTILITY indicator goes out.

Timecode Hookup Examples

The following system examples show several timecode configurations.

MTC with MIDI Sequencer

In the following example, the D24 is the timecode master and the personal computer running MIDI sequencing software is the timecode slave. Since the D24 does not support MMC when it's configured as a timecode slave, it must be the timecode master (see "Timecode & the D24" on page 134).
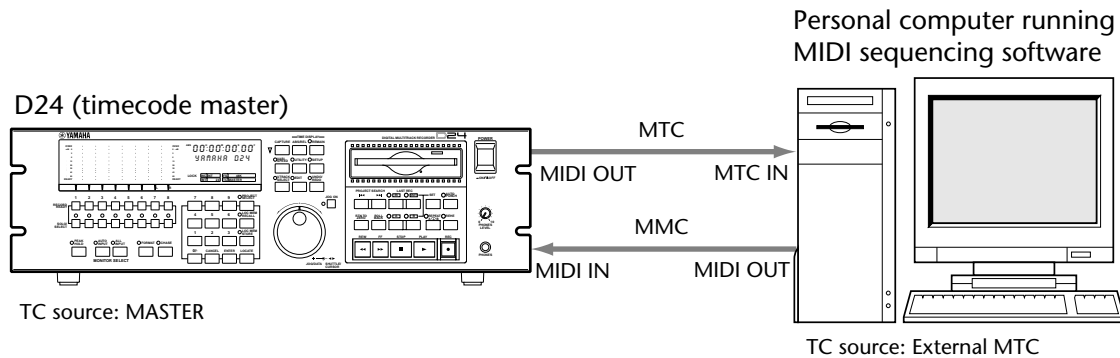
SMPTE/EBU & Two D24s

In this example, two D24s are used with a digital mixing console. D24-A is the timecode master, and the D24-B and digital mixing console are timecode slaves. The digital mixing console uses the external timecode for automix synchronization. The timecode signal is transmitted from D24-A to D24-B via the 15-pin sync cable, and to the digital mixing console via the SMPTE/EBU cable. Alternatively, timecode could be transmitted to the digital mixing console as MTC.
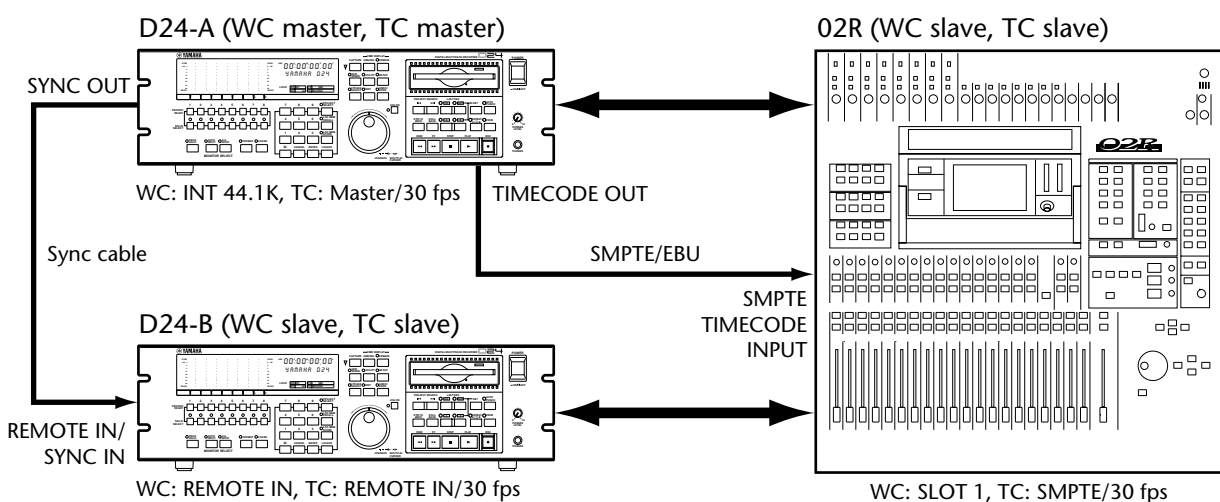
SMPTE/EBU Chase

In the following example, a VTR is the timecode master and the D24 and digital mixing console are timecode slaves. The timecode source on the D24 is set to TIMECODE IN (SMPTE/EBU). The D24's Timecode Chase function is turned on, so it automatically chases and synchronizes to the VTR's timecode. With ALL CHASE mode, the D24 is configured as the wordclock master in order to use the Varispeed function.

VTR (TC master)

02R (WC slave, TC slave)

SMPTE/EBU

Timecode
output

D24 (WC master, TC slave)

TIMECODE
INPUT

WC: INT 44.1K
TC: TIMECODE IN
Frame rate:30 fps
Chase: On
Chase mode: ALL CHASE

TIMECODE OUTPUT

SMPTE/EBU

SMPTE TIMECODE INPUT

WC: SLOT 1, TC: SMPTE/30 fps
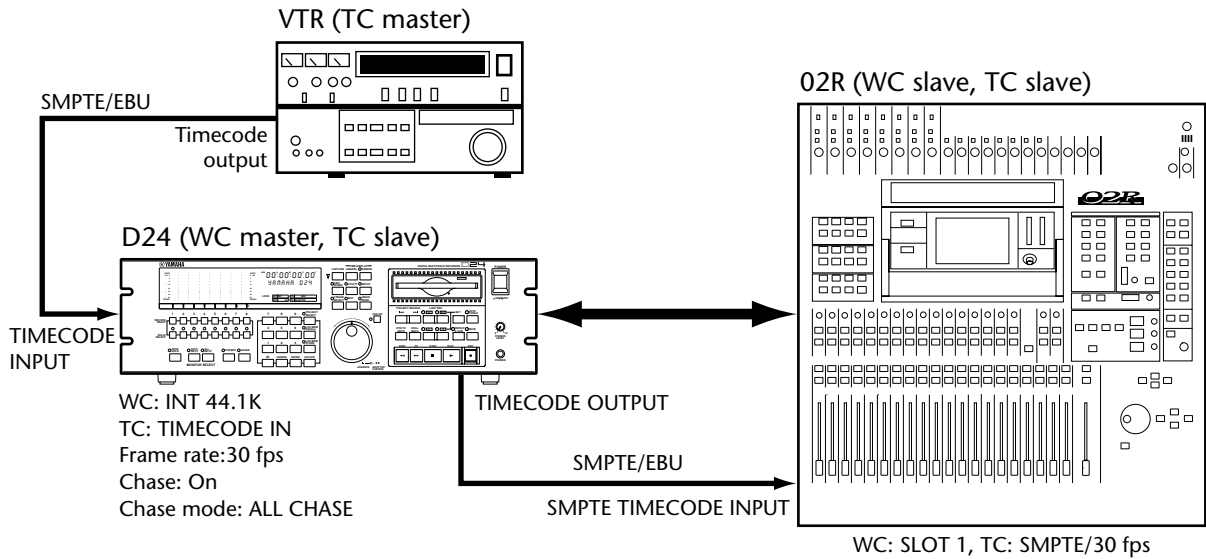
MTC Chase

In the following example, a recorder with MTC output is the timecode master and the D24 and digital mixing console are timecode slaves. The timecode source on the D24 is set to MIDI IN (MTC). The D24's Timecode Chase function is turned on, so it automatically chases and synchronizes to the recorder's timecode.

Recorder with MTC output

02R (WC slave, TC slave)

MTC

MTC output

D24 (WC master, TC slave)

MIDI IN

WC: INT 44.1K
TC: MIDI IN
Frame rate:30 fps
Chase: On
Chase mode: ALL CHASE

TIMECODE OUTPUT

SMPTE/EBU

SMPTE TIMECODE INPUT

WC: SLOT 1, TC: SMPTE/30 fps
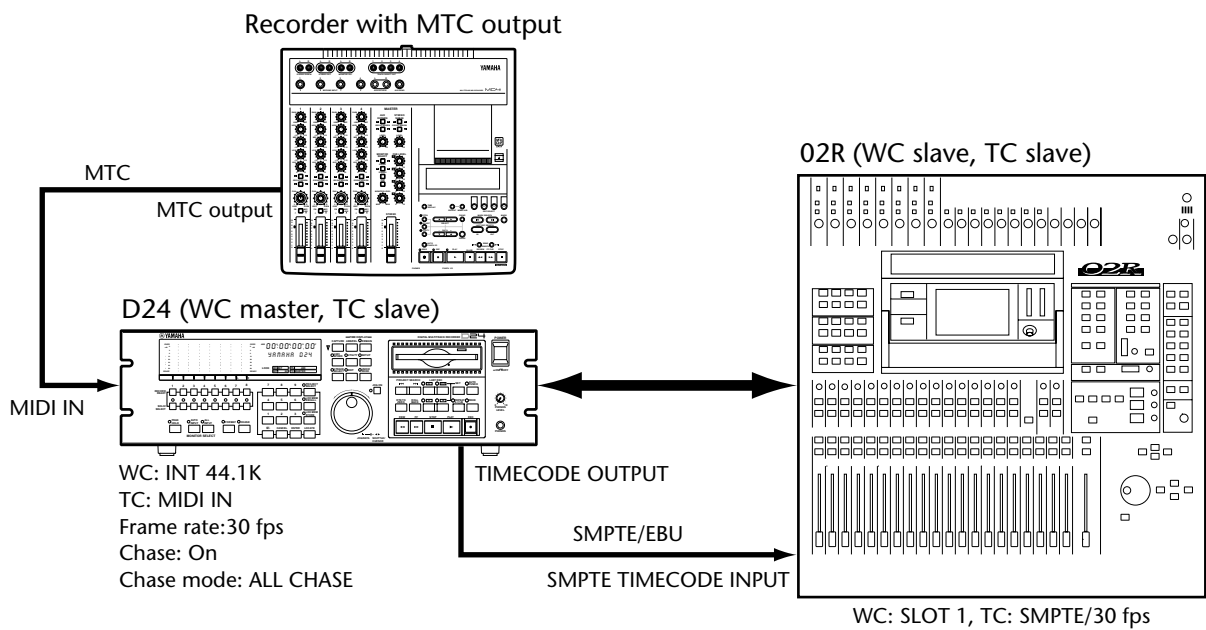
Multiple D24s & Video Sync

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In this chapter...

Multiple D24s

Several D24s can be used to expand the number of tracks available for simultaneous recording and playback, or to extend the total continuous recording time. The number of tracks can be expanded in multiples of eight by combining up to eight D24s. See "Expanding the Number of Tracks" on page 145 for more information. The continuous recording time can extended by using two D24s and the Serial Point function. See "Extending the Recording Time" on page 147 for more information.

Multiple D24s are connected together using 15-pin sync cables and the SYNC OUT and REMOTE IN/SYNC IN connectors. In addition to transport and function commands, sync connections also transmit wordclock and timecode.
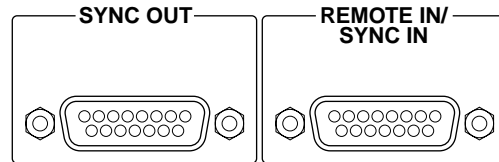
The SYNC OUT connector on the D24 operating as the wordclock and timecode master is connected to the REMOTE IN/SYNC IN connector on the second D24, which in turn connects to the REMOTE IN/SYNC IN connector on the third D24, and so on, as shown. Each D24 must be assigned an exclusive Remote ID number, with the master D24 being assigned ID 1 and slaves being assigned IDs 2 through 8, as shown. See "Setting the Remote ID" on page 171 for more information. All connected D24s must be turned on, otherwise, normal playback is not possible.

D24-A (master)

WC: INT, TC: MASTER/30 fps
Chase: Off
Remote ID: 1

SYNC OUT

15-pin sync cable

D24-B (slave) REMOTE IN/SYNC IN

TC: REMOTE IN/30 fps
Chase: On
Remote ID: 2

SYNC OUT

15-pin sync cable

D24-C (slave) REMOTE IN/SYNC IN

TC: REMOTE IN/30 fps
Chase: On
Remote ID: 3

SYNC OUT

15-pin sync cable

D24-D (slave) REMOTE IN/SYNC IN

TC: REMOTE IN/30 fps
Chase: On
Remote ID: 4

SYNC OUT

Next D24
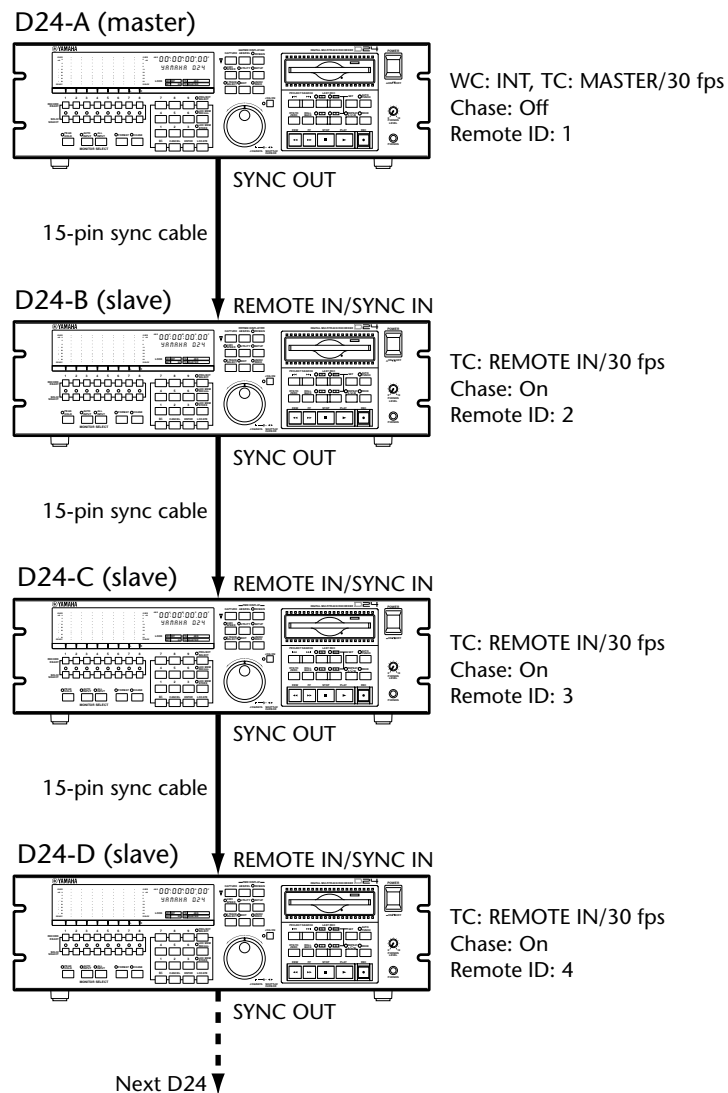
Expanding the Number of Tracks

The number of tracks available for simultaneous recording and playback can be expanded in multiples of eight by combining up to eight D24s.

In the following example, four D24s are used in conjunction with a digital mixing console, for a 32-track recording system. D24-A is the wordclock and timecode master, while the other D24s and the digital mixing console are wordclock and timecode slaves. Wordclock and timecode signals are distributed among the D24s via 15-pin sync cables. The Chase function is turned on on the slave D24s, which automatically chase and synchronize to the master's timecode. The digital mixing console's automix function is synchronized to the timecode coming from D24-A, for fully automated mixing.

D24-A (WC master, TC master)

02R (WC slave, TC slave)

SYNC OUT

WC: INT 44.1K, TC: Master/30 fps
Chase: Off, Remote ID: 1

TIMECODE OUT

SMPTE/EBU

15-pin sync cable

SMPTE
TIMECODE
INPUT

D24-B (WC slave, TC slave)

REMOTE IN/
SYNC IN

SYNC OUT

TC: REMOTE IN/30 fps
Chase: On, Remote ID: 2

WC: SLOT 1, TC: SMPTE/30 fps

15-pin sync cable

D24-C (WC slave, TC slave)

REMOTE IN/
SYNC IN

SYNC OUT

TC: REMOTE IN/30 fps
Chase: On, Remote ID: 3

D24-A: Tracks 1–8
D24-B: Tracks 9–16
D24-C: Tracks 17–24
D24-D: Tracks 25–32

15-pin sync cable

D24-D (WC slave, TC slave)

REMOTE IN/
SYNC IN

TC: REMOTE IN/30 fps
Chase: On, Remote ID: 4

Slave D24 Setup

1 Set the timecode source on each slave to REMOTE IN.

See "Selecting a Timecode Source" on page 135 for more information.

When the timecode source is set to REMOTE IN, the wordclock source is also set to REMOTE IN (the EXT indicator in the WC window lights up) and the D24 is automatically configured as a wordclock slave. When the timecode source is set to a different source, the wordclock source reverts to its previous setting.

2 Assign each slave D24 an exclusive Remote ID.

See "Setting the Remote ID" on page 171 for more information.

3 Set the timecode frame rate on each slave to match that of the master D24.

See "Setting the Timecode Frame Rate" on page 136 for more information.

4 Turn on the Chase function on each slave.

See "Chasing External Timecode" on page 138 for more information on the Chase function.

Slave & Master Operation

• Transport functions initiated on the master D24 are echoed by each slave. When playback is initiated on the master D24, for example, the slave D24s also start playback and chase and synchronize to the master's timecode.

• While the Chase function is on, the slave's transport functions are not available. To play an individual slave, turn off its Chase function.

• Tracks are selected for recording using the [RECORD READY] buttons on each D24.

• Recording and rehearsal should be initiated on the master D24.

• When recording is initiated on the master D24, the slave D24s also start recording, so make sure that only tracks you actually want to record are selected.

• Functions that are not echoed by the slaves must be set individually on each D24.

• When an optional remote controller is used, it should be connected to the REMOTE IN/SYNC IN port on the master D24.

Functions initiated on the master D24 that are echoed by the slave D24s include:

Transport functions—Rewind, Fast Forward, Stop, Play, Record, and Rehearsal.

Locate functions—Return to Zero and set and locate of the LAST REC IN, LAST REC OUT, A and B points.

Other functions—Repeat, Roll Back, Varispeed, Project Search, and Auto Punch.

Functions initiated on the master D24 that are NOT echoed by the slave D24s include: Project Select, Locate Memory Store, Locate Memory Recall, Locate, Capture, Nudge, Shuttle, Virtual Track, Solo, Peak Hold, Record Ready, Auto Input, All Input, Format, Chase on/off, Remain, ABS/REL, Undo/Redo, edit functions, utility functions, and setup functions. These functions must be set on each slave D24 individually before turning on the Chase function.

Extending the Recording Time

The total continuous recording time can be extended by using two D24s and the Serial Point function. The master D24 records the first half of the material, and the slave D24, which kicks in at the specified serial point, records the second half of the material.

In the following example, two D24s are used in conjunction with a digital mixing console for extended recording. The Slot Output Select function is set on the digital mixing console so that both D24s receive the same bus signals. D24-A track outputs feed tape returns 1–8, while those of D24-B feed tape returns 9–16.

D24-A is the wordclock and timecode master, while D24-B and the digital mixing console are wordclock and timecode slaves. Wordclock and timecode signals are transmitted from D24-A to D24-B via the 15-pin sync cable.
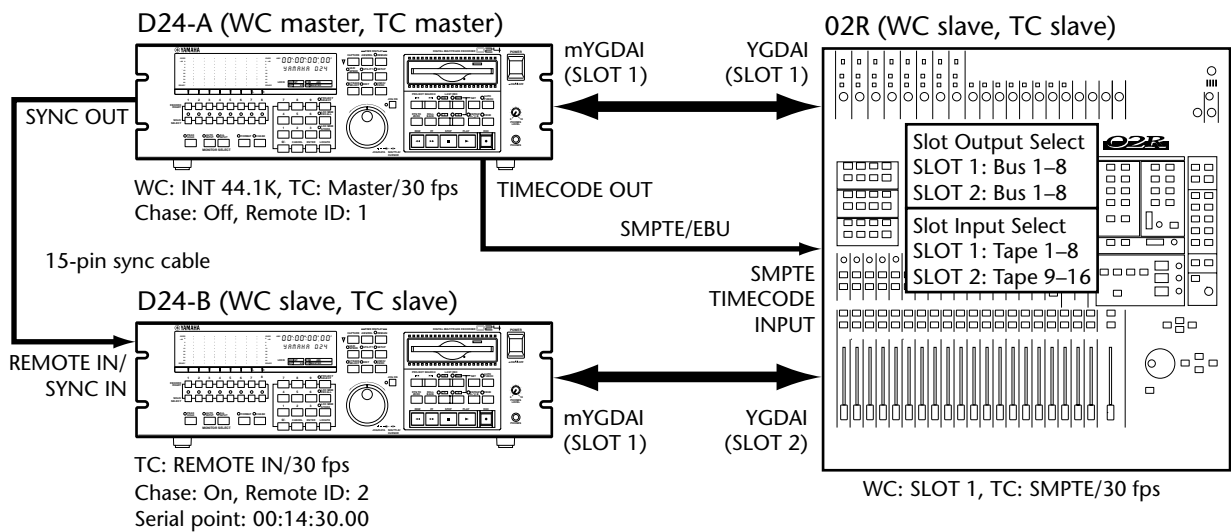
A single 640 MB Overwrite-type MO disk offers 15 minutes of 8-track, 16-bit, 44.1 kHz recording, so two D24s offer a combined 8-track recording time of 30 minutes. The serial point time is set to zero (00:00:00.00) on D24-A, and 14 minutes, 30 seconds (00:14:30.00) on D24-B, as shown below. The Chase function is turned on on D24-B, which automatically chases and synchronizes to the master's timecode at the specified serial point.
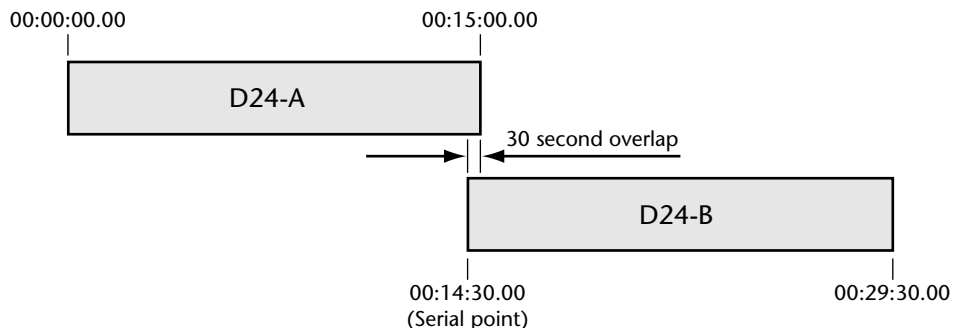
When recording or playback is started on D24-A, the D24 -B waits until the specified serial point, at which it chases and synchronizes to D24-A's timecode and then starts recording or playback. D24-A continues for another 30 seconds and then stops. This 30 second overlap can be used to crossfade between the slave and master D24s during playback.

The digital mixing console's automix function is synchronized to the timecode coming from the master D24, and an automated crossfade between D24-A and D24-B (i.e., tape returns 1–8 and tape returns 9–16) is set to occur in the 30 second overlap. This means that track 1, for example, is processed by tape return 1 for the first half of the material and tape return 9 for the second half, so channel settings will need to be identical on all corresponding tape returns.

Setup

1   Set the timecode source on the slave D24 should be set to REMOTE IN.

See "Selecting a Timecode Source" on page 135 for more information.

When the timecode source is set to REMOTE IN, the wordclock source is also set to REMOTE IN (the EXT indicator in the WC window lights up) and the D24 is automatically configured as a wordclock slave. When the timecode source is set to a different source, the wordclock source reverts to its previous setting.

2   Assign the slave D24 an exclusive Remote ID.

See "Setting the Remote ID" on page 171 for more information.

3   Set the timecode frame rate on the slave D24 to match that of the master D24.

See "Setting the Timecode Frame Rate" on page 136 for more information.

4   Set the serial point on the slave D24.

See "Setting the Serial Point" on page 149 for more information.

5   Turn on the Chase function on the slave D24.

See "Chasing External Timecode" on page 138 for more information on the Chase function.

The same input signals must be fed to both the master and slave D24.

Operation

1   Recording or playback is started in the normal way on the master D24.

The slave D24 waits until the specified serial point and its PLAY indicator flashes.

2   At the serial point, the slave D24 chases and synchronizes to the master D24's timecode and then starts recording or playback

The slave D24's PLAY indicator lights up continuously.

3   The master D24 continues for another 30 seconds and then stops.

This 30 second overlap can be used to crossfade between the slave and master D24s during playback, a task that can be automated using the automix functions of a digital mixing console.

4   The slave D24 can be stopped either by pressing its [STOP] or [CHASE] button, and stops automatically when its disk is full.

The slave D24's CHASE indicator goes out.

Setting the Serial Point

The Serial Point function determines the position at which the slave D24 starts recording or playback, when two D24s are used to extend the continuous recording time. The serial point can be entered using the keypad, and finely adjusted using the JOG/DATA dial.

1 Press the [SETUP] button.

The SETUP indicator lights up.

2 Use the JOG/DATA dial to select "SERIAL CHASE," and then press the [ENTER] button.

"SERIAL CHASE—OFF" appears on the display.

3 Use the JOG/DATA dial to select "ON," and then press the [ENTER] button.

4 Use the keypad to enter the serial point position, starting with hours, minutes, seconds, frames, and sub-frames.

To enter the position 14 minutes and 30 seconds (00:14:30.00.0), for example, press [1], [4], [3], [0/-], [0/-], [0/-], and then [0/-].

The entered value appears on the 2nd line of the display, as shown below.

```
00ᴴ:00ᴹ:00ˢ.00ᶠ
SERIAL  POINT
      00:1 4:3 0.0.0.0
```
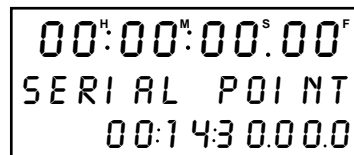
Press the [CANCEL] button to revert to the previous value.

5 Use the JOG/DATA dial to finely adjust the entered value.

6 Press the [ENTER] button to activate your selection, or the [CANCEL] button to cancel the Serial Point function.

7 Press the [SETUP] button again to leave setup.

The SETUP indicator goes out.

Using Video Sync

The VIDEO INPUT connector receives video sync signals (black burst or color bar), which the D24 uses as a timecode reference when the timecode source is set to TC IN+VIDEO. See "Selecting a Timecode Source" on page 135 for more information.

The VIDEO OUTPUT connector transmits the video signal received at the VIDEO INPUT when the VIDEO 75Ω ON/OFF switch is set to OFF.

The VIDEO 75Ω ON/OFF switch is used to terminate the video signal received at the VIDEO INPUT connector. When set to OFF, the video sync signal received at the VIDEO INPUT is transmitted by the VIDEO OUTPUT connector. When set to ON, nothing is transmitted by the VIDEO OUTPUT connector. See "Terminating BNC Video Sync Distribution" on page 150 for hookup examples.
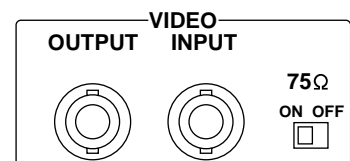
Terminating BNC Video Sync Distribution

When a video sync signal is distributed via BNC cables, it must be terminated correctly. Normally, termination is applied at the last device connected, although it depends on the distribution method being used. The D24's VIDEO 75Ω ON/OFF switch allows the D24 to be connected in a variety of ways. The following examples show three ways in which a video sync signal can be distributed and how termination should be applied.

Video Sync Distribution Box

In this example, a dedicated video sync distribution box is used to supply a video sync signal to each device individually. Termination is applied on each device.
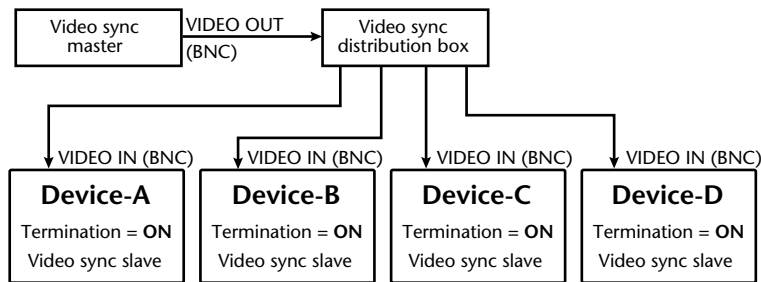
Bus Distribution

In this example, the video sync signal is distributed via a common bus. Termination is applied at the last device only.
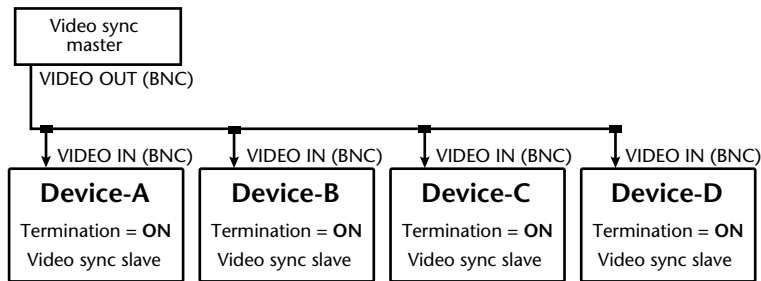
Daisy Chain Distribution

In this example, the video sync signal is distributed in a daisy-chain fashion, with each device feeding the video sync signal on to the next device. Termination is applied at the last device only. This method of distribution is not recommended for larger systems.
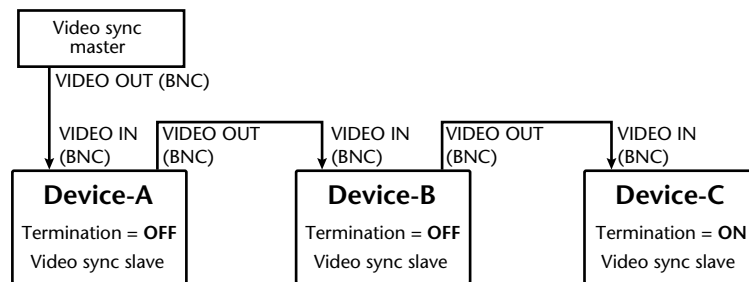
Connecting a Video Editor

In a video editing environment, the D24 can be controlled by connecting a video remote controller or video editor, which supports 9-pin protocols, to the SERIAL I/O port. With the timecode source set to SERIAL, the D24 responds to commands from the video remote controller. For sync play operation, the VTR's timecode should be fed to the D24 and the Chase function should be turned on.
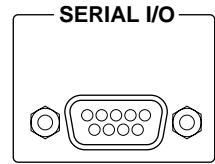
Video Hookup Example

In the following example, the D24 provides multitrack recording and playback in a video editing system. The D24 and VTRs are controlled by the video editor using 9-pin protocols. Note that not all video editors are supported. The D24's timecode source is set to SERIAL and timecode is received from the Record VTR via the TIMECODE INPUT. If the video editor has timecode outputs, the D24's timecode can be sourced from the video editor instead of the Record VTR.

For sync play on the video editor, the D24 responds to transport commands received from the video editor and automatically chases and synchronizes to the Record VTR's timecode when the Chase function is turned on.
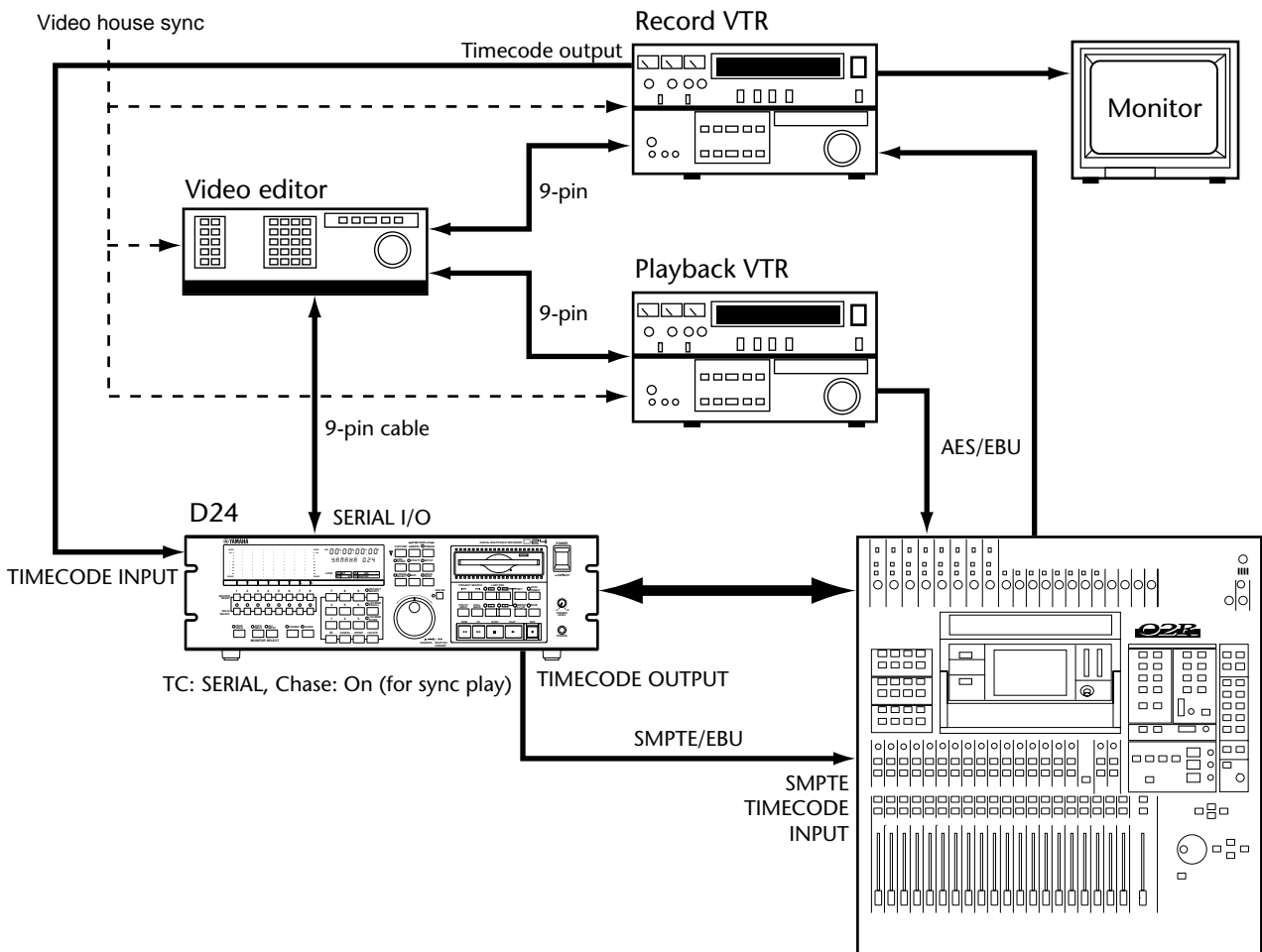
SCSI & External Disk Drives

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In this chapter...

SCSI & the D24

Additional recording space can be made available by connecting optional, external SCSI hard disk drives or removable media drives to the D24's SCSI port. The SCSI interface supports Narrow SCSI-2 (FAST-20). The D24's filing system supports up to 8.4 GB of disk space per disk drive. Larger capacity disk drives can be used, but only the first 8.4 GB can be accessed by the D24. A list of disk drives certified for use with the D24 is provided on page 155.

The D24 works with one disk drive at a time, internal MO or external drive, and does not record across drives. The maximum recording time therefore is dependant on the capacity of the selected work disk. With five SCSI IDs available, up to five external disk drives can be connected to the D24 at the same time.

Using External Disk Drives

When using external disk drives, keep the following points in mind:

- Turn off the D24 and the external disk drives before making any connections.

- For reliable operation, use only good-quality SCSI cables.

- Assign an exclusive SCSI ID to each disk drive. See "Assigning SCSI IDs" on page 156 for more information.

- Terminate the SCSI bus correctly. See "Terminating the SCSI Bus" on page 157 for more information.

- All connected disk drives must be turned on in order to use the D24.

- The D24 checks the SCSI bus for connected devices when it's turned on. SCSI devices that are not turned on will not be recognized and may affect performance, so make sure that all connected drives are turned on before the D24. External disk drives that you do not intend to use should be disconnected before turning on the D24.

- Never turn off or disconnect an external disk drive while the D24 is on.

- The work disk is selected using the Drive Select function. See "Selecting the Work Disk" on page 161 for more information.

- New disk drives and drives that have been used to store other kinds of data must be formatted before they can be used with the D24. See "Formatting External Disk Drives" on page 158 for more information.

- The recording time available on an external disk drive can be checked using the Remain function. The disk drive must be selected as the work disk first. See "Checking the Time Remaining" on page 38 for more information.

- Drive space occupied by unused sound files can be retrieved for additional recording using the Optimize function. See "Recovering Disk Space" on page 172 for more information.

- When using large external disk drives, we recommend that you backup up your important projects to the internal MO disk drive using the Backup function. See "Copying Projects Between Disk Drives" on page 164 for more information.

- If a SCSI error message appears on the display, see "Error Messages" on page 194 for more information.

Certified Disk Drives

The following disk drives have been performance tested by Yamaha and are certified for use with the D24. Other disk drives may work just as well, although performance cannot be guaranteed. The D24's SCSI interface supports Narrow SCSI-2 (FAST-20).

Drive Type	Manufacturer	Model	Capacity
Hard disk drive	IBM	DDRS-34560U	4.5 GB
	Quantum	XP34300	4.3 GB
	Seagate	ST32430N	2.4 GB
		ST34573N	4.5 GB
		ST39140N	9.1 GB
	Western Digital	WDE4550-003	4.3 GB
Removable media drive	Iomega	Jaz	1 GB

See the Yamaha Professional Audio Web site at the address below for an up-to-date list of certified disk drives.

<http://www.yamaha.co.jp/product/proaudio/homeenglish/>

Available Recording Time

The available recording time depends on the capacity of the selected work disk and the selected recording resolution and sampling rate. A 1 GB hard disk drive, for example, offers 188 track minutes of 16-bit, 44.1 kHz recording.

The following table lists the approximate 16-bit, 44.1 kHz recording time offered by a variety of disk capacities. To calculate the approximate recording time for other disk capacities, see "Calculating the approximate Recording Time" on page 7, or simply multiply the time available for a 1 GB disk by the disk capacity. A 6 GB disk, for example, can store approximately 1,128 track minutes, or 30 hours of 16-bit, 44.1 kHz digital audio (e.g., $188 \times 6 = 1,128$).

Disk Capacity	Recording Time (16-bit, 44.1 kHz)			
	Track minutes (mono)	2 tracks	4 tracks	8 tracks
1 GB	188 min	94 min	47 min	23 min
2 GB	377 min	188 min	94 min	47 min
4.5 GB	850 min	425 min	212 min	106 min
6.5 GB	1,228 min	614 min	307 min	153 min
9.1 GB[1]	1,587 min	793 min	396 min	198 min

1. The D24's filing system supports up to 8.4 GB of disk space per disk drive. Larger capacity disk drives can be used, but only the first 8.4 GB can be accessed by the D24.

Connecting Disk Drives

The D24's SCSI port is a 50-pin, half-pitch SCSI connector, which accepts 50-pin, half-pitch, pin-type SCSI plugs.

For reliable operation, use only good-quality SCSI cables.

The total length of the SCSI bus must not exceed six meters (20 feet). Note that this is the total length of the bus from the D24 to the last device, not the length of the cables between individual devices.

In the following example, an external SCSI disk drive is connected to the D24.
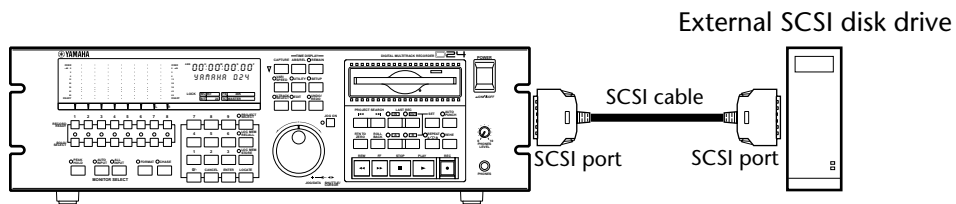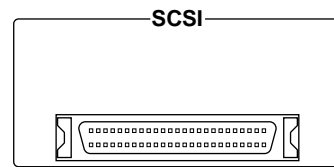
SCSI ID settings
D24 internal: 6
D24 MO drive: 2
External hard disk: 1

Assigning SCSI IDs

Each device on the SCSI bus must be assigned an exclusive identity number called a SCSI ID. There are eight SCSI IDs in all, however, 7 is reserved for use by personal computers, 6 is used internally by the D24, and 2 is the default setting of the internal MO disk drive. This leaves SCSI IDs 0, 1, 3, 4, and 5 available for use with external disk drives.

The following table lists SCSI ID availability.

O = Available   X = Unavailable

SCSI ID	Availability	Description
7	X	Typically used by the computer's SCSI driver.
6	X	D24 internal ID.
5	O	
4	O	Available for use with external disk drives.
3	O	
2	X	D24 internal MO drive (default setting).
1	O	Available for use with external disk drives.
0	O	

If two or more devices on the SCSI bus are assigned the same SCSI ID, the system will not function properly and may hang. If the D24 displays a SCSI ID error message, turn off all connected devices, and recheck the SCSI ID settings.

For information on setting the SCSI ID on your external SCSI disk drives, refer to the relevant owner's manuals.

Terminating the SCSI Bus

Both ends of the SCSI bus must be terminated for correct operation. The D24 takes care of termination at its end, so all you have to do is make sure that termination is applied on the last device on the bus. Some SCSI disk drives feature automatic termination, which automatically terminates the bus as necessary, while others feature termination switches, which you must set manually. Some drives require you to plug a SCSI terminator into the unused SCSI port. For information on setting SCSI termination on your external disk drives, refer to the relevant owner's manuals.

In the following example, two external SCSI disk drives are connected to the D24's SCSI port. Disk drive A is set to SCSI ID 0, disk drive B, to SCSI ID 1. Since it's located at the end of the SCSI bus, termination is applied on disk drive B.

SCSI disk drives

Disk drive A   Disk drive B

SCSI cable   SCSI cable

SCSI port   SCSI port   SCSI port   SCSI port

SCSI bus termination
is applied on this drive

SCSI ID settings
D24 internal: 6
D24 MO drive: 2
External disk drive A: 0
External disk drive B: 1
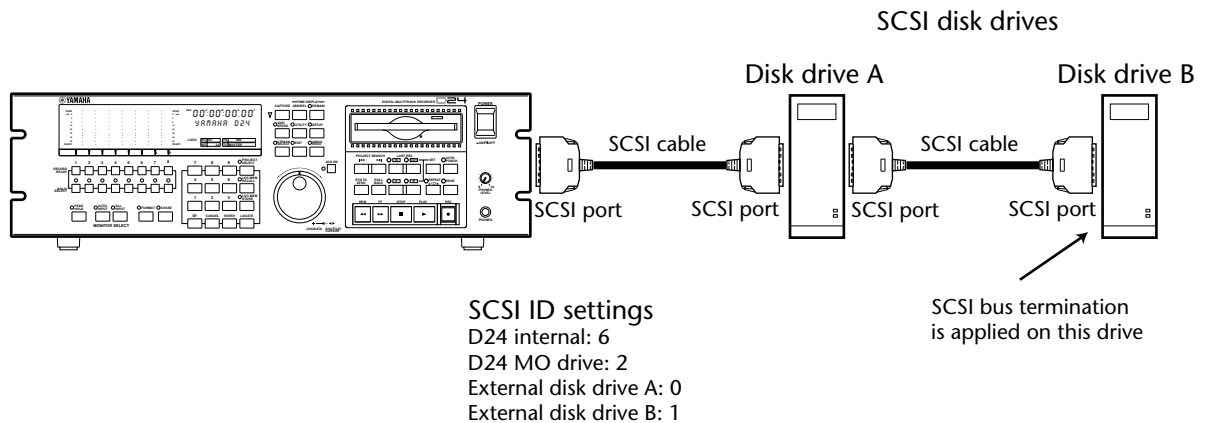
Formatting External Disk Drives

New disk drives and drives that have been used to store other kinds of data must be formatted before they can be used with the D24. The formatting process prepares a disk for storing D24 data. Formatting erases all previously stored data, so if you're reusing a disk, make sure that it contains no important data before formatting.

The method of formatting depends on the type of external disk drive and whether or not you want to mount the disk using a personal computer. Three procedures are provided as follows.

Formatting Hard Disks for Maximum Capacity

This section explains how to format an external hard disk drive in order to use the maximum capacity supported by the D24, which is 8.4 GB. The drive must be formatted using both the Physical Format and front panel [FORMAT] functions. Disk drives formatted this way cannot be mounted by a personal computer.

1   Connect the external hard disk drive to the D24.

2   Select the external hard disk drive using the Drive Select function. See "Selecting the Work Disk" on page 161.

3   Press the [UTILITY] button.

   The UTILITY indicator lights up.

4   Use the JOG/DATA dial to select "PHYS FORMAT," and then press the [ENTER] button.

   The FORMAT indicator flashes and "ARE YOU SURE" flashes on the display.

5   Press the [ENTER] button to format the disk.

   The physical formatting process starts and "FORMATTING" appears on the display.

   When the physical formatting process is complete, "FINISHED" appears on the display and the FORMAT indicator goes out.

6   Press the [FORMAT] button.

   The FORMAT indicator flashes and "FORMAT DISK—ARE YOU SURE" flashes on the display.

7   Press the [ENTER] button.

   "PRESS—REC + PLAY" appears on the display.

8   Press the [REC] and [PLAY] buttons simultaneously to format the disk, or the [CANCEL] button to cancel the Format function.

   The logical formatting process starts and "FORMATTING" appears on the display.

   When formatting is complete, "FINISHED" appears on the display, the FORMAT indicator goes out, and "01 NEW PROJ" appears on the display.

9   If you want to set the absolute start time of project 01 to a time other than "00:00:00.00," set it now. See "Recording" on page 33 for more information. Otherwise, press the [ENTER] button.

   The absolute start time for subsequent projects can be specified as and when they are recorded.

   The hard disk is now ready for use.

Formatting Hard Disks for Computer Mounting

This section explains how to format an external hard disk drive so that it can be mounted by a personal computer. Since the disk drive must first be formatted as a DOS FAT16 volume on a personal computer, the maximum size of the volume is 2 GB, so even if you're using a 4.5 GB hard disk, you'll only be able to use 2 GB for recording on the D24.

1 Connect the external hard disk drive to a personal computer and format it as a DOS FAT16 volume using the MS-DOS "Fdisk" command.

The D24 does not support FAT32 volumes, so be sure to format as FAT16.

2 Connect the external hard disk drive to the D24.

3 Select the external hard disk drive using the Drive Select function. See "Selecting the Work Disk" on page 161.

4 Press the [FORMAT] button.

The FORMAT indicator flashes and "FORMAT DISK—ARE YOU SURE" flashes on the display.

5 Press the [ENTER] button.

"PRESS—REC + PLAY" appears on the display.

6 Press the [REC] and [PLAY] buttons simultaneously to format the disk, or the [CANCEL] button to cancel the Format function.

The logical formatting process starts and "FORMATTING" appears on the display.

When formatting is complete, "FINISHED" appears on the display, the FORMAT indicator goes out, and "01 NEW PROJ" appears on the display.

7 If you want to set the absolute start time of project 01 to a time other than "00:00:00.00," set it now. See "Recording" on page 33 for more information. Otherwise, press the [ENTER] button.

The absolute start time for subsequent projects can be specified as and when they are recorded.

The hard disk is now ready for use.

Formatting External MO Disks

This section explains how to format MO disks in an external MO disk drive. The procedure for formatting MO disks in the internal MO disk drive is provided on page 26.

1 Connect the external MO disk drive to the D24.

2 Select the external MO disk drive using the Drive Select function. See "Selecting the Work Disk" on page 161.

3 Press the [FORMAT] button.

The FORMAT indicator flashes and "FORMAT DISK—ARE YOU SURE" flashes on the display.

4 Press the [ENTER] button.

"PRESS—REC + PLAY" appears on the display.

5 Press the [REC] and [PLAY] buttons simultaneously to format the disk, or the [CANCEL] button to cancel the Format function.

The logical formatting process starts and "FORMATTING" appears on the display.

When formatting is complete, "FINISHED" appears on the display, the FORMAT indicator goes out, and "01 NEW PROJ" appears on the display.

6 If you want to set the absolute start time of project 01 to a time other than "00:00:00.00," set it now. See "Recording" on page 33 for more information. Otherwise, press the [ENTER] button.

The absolute start time for subsequent projects can be specified as and when they are recorded.

The MO disk is now ready for use.

Selecting the Work Disk

The Drive Select function is used to select the internal MO disk drive or an external disk drive as the work disk.

1 Press the [UTILITY] button.

The UTILITY indicator lights up.

2 Use the JOG/DATA dial to select "DRIVE SELECT," and then press the [ENTER] button.

The current Drive Select setting appears on the display.

3 Use the JOG/DATA dial to select one of the following:

INT MO—internal MO disk drive (i.e., SCSI ID 2).

EXT SCSI-0—external disk drive set to SCSI ID 0.

EXT SCSI-1—external disk drive set to SCSI ID 1.

EXT SCSI-3—external disk drive set to SCSI ID 3.

EXT SCSI-4—external disk drive set to SCSI ID 4.

EXT SCSI-5—external disk drive set to SCSI ID 5.

The default setting is INT MO.

4 Press the [ENTER] button to activate your selection, or the [CANCEL] button to cancel the Drive Select function.

The D24 mounts the specified disk drive.

5 Press the [UTILITY] button again to leave utility.

The UTILITY indicator goes out.

When the D24 is turned on, the disk drive with the highest SCSI ID is automatically selected as the work disk. So an external disk drive set to ID 3, 4, or 5 is automatically selected as the work disk instead of the internal MO disk drive, whose default ID is 2. If the external disk drive set to ID 0 or 1, the internal MO disk drive is selected, because its ID is higher.

When you use an external disk drive, make sure that it's turned on before the D24, otherwise, it won't be recognized.

Duplicating MO Disks

MO disks can be duplicated using two D24s and the Duplicate function. In addition to duplicating disks, this is a convenient way to back up MO disks. The source and destination MO disks must be of the same capacity: 230 MB, 540 MB, or 640 MB. You cannot, for example, duplicate a 230 MB disk to a 640 MB disk. The type of disk, however, is not important, so you can duplicate an Overwrite-type MO disk to a normal MO disk and vice versa.

Individual projects can be copied between an external disk drive and the internal MO drive using the Backup function. See "Copying Projects Between Disk Drives" on page 164 for more information.

Setting the SCSI ID of the Internal MO Drive

In order to use the Duplicate function, the internal MO drive of the destination D24 (D24-B) must be set to a higher SCSI ID than the MO drive of the source D24 (D24-A). Since the default SCSI ID for the internal MO drive is 2, you could set the D24-B to SCSI ID 3, 4, or 5, or alternatively set D24-A to SCSI ID 0 or 1 (SCSI IDs 6 and 7 are reserved for other purposes). See "Setting the SCSI ID of the Internal MO Drive" on page 193 for more information.

Hookup

To hookup the D24s you'll need a 50-pin, half-pitch SCSI cable (pin type). Data is transferred from D24-A to D24-B via the SCSI cable. The MO disk in D24-A is duplicated to the MO disk in D24-B. The internal MO drive of D24-B is set to SCSI ID 3.

D24-A

SCSI port

The MO disk in D24-A is duplicated on D24-B

SCSI cable

D24-B   SCSI port

SCSI ID settings
D24-A MO drive: 2
D24-B MO drive: 3
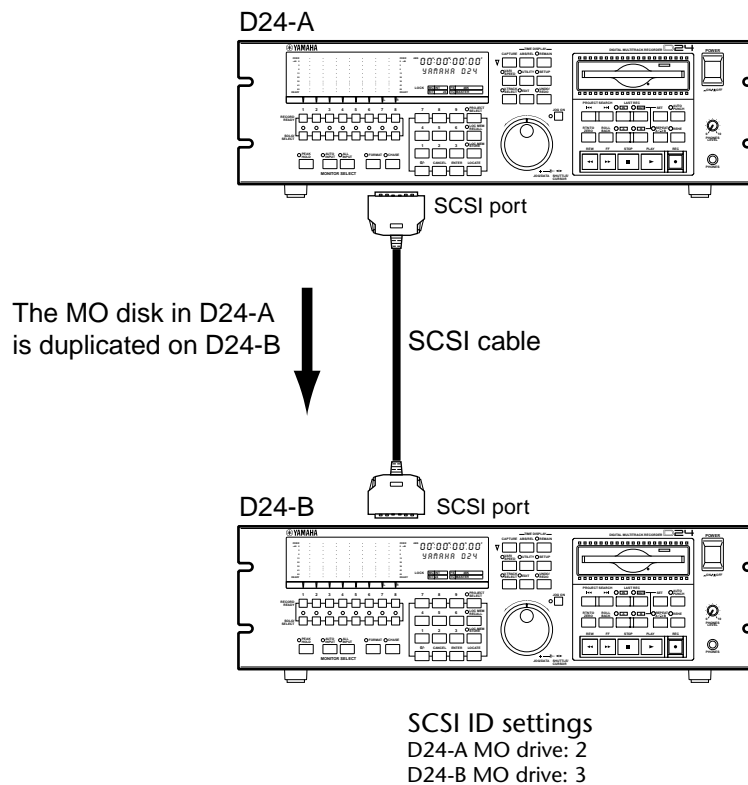
Duplication Procedure

The source and destination MO disks must be the same capacity, and the destination disk must be formatted beforehand. See "Formatting MO Disks" on page 26 for more information.

1 Turn off both D24s.

2 Turn on D24-B.

3 Insert the destination MO disk into D24-B.

4 Press the D24-B [UTILITY] button.

The UTILITY indicator lights up.

5 Use the D24-B JOG/DATA dial to select "DUPLICATE," and then press the [ENTER] button.

6 Use the D24-B JOG/DATA dial to select "SLAVE," and then press the [ENTER] button.

7 Turn on D24-A.

8 Insert the MO disk to be duplicated into D24-A.

9 Press the D24-A [UTILITY] button.

The UTILITY indicator lights up.

10 Use the D24-A JOG/DATA dial to select "DUPLICATE," and then press the [ENTER] button.

11 Use the D24-A JOG/DATA dial to select "MASTER," and then press the [ENTER] button.

"ARE YOU SURE" flashes on the display.

12 Press the D24-A [ENTER] button again to confirm your selection, or the [CANCEL] button to cancel the Duplicate function.

The duplication process starts and "DUPLICATING" appears on the display.

When the duplication process is complete, "FINISHED" appears on the display.

To duplicate the disk again, insert a new disk into D24-B and repeat step 12.

13 Press the [UTILITY] buttons on both D24s to leave utility.

The UTILITY indicators go out.

> *Note: When you have finished using the Duplication function and want to use the D24s for normal operation, disconnect the SCSI cable between them, otherwise, they may malfunction.*

Copying Projects Between Disk Drives

Individual projects can be copied between disk drives using the Backup function.

1 Turn off the D24 and external disk drives.

2 Connect the external disk drive to the D24 using a SCSI cable.

See "Connecting Disk Drives" on page 156 for more information.

3 Turn on the external disk drive and then the D24.

See "Turning On & Off the D24" on page 24 for more information.

4 Select the disk drive that contains the project that you want to copy as the work disk.

See "Selecting the Work Disk" on page 161 for more information.

5 Press the [UTILITY] button.

The UTILITY indicator lights up.

6 Use the JOG/DATA dial to select "BACK UP," and then press the [ENTER] button.

"FROM PROJ nn—project title" appears on the display ("nn" and "project title" being the number and title of the project to be copied).

7 Use the JOG/DATA dial to select the project that you want to copy, and then press the [ENTER] button.

"TO INT MO" appears on the display.

8 Use the JOG/DATA dial to select the destination disk, and then press the [ENTER] button to mount it.

If you are copying to an external disk drive, "TO EXT m nn—ARE YOU SURE" appears on the display ("m" being the SCSI ID of the external disk drive and "nn" being the project number that will be assigned to the copy).

If you are copying to the internal MO disk drive, "TO INT MO nn—ARE YOU SURE" appears on the display ("nn" being the project number that will be assigned to the copy).

If the destination disk contains a project with the same number as the project to be copied, the copy is automatically assigned the next available project number.

9 Press the [ENTER] button to start the copying process.

The copying process starts and "COPYING" appears on the display.

When the copying process is complete, "FINISHED" appears on the display. Press the [ENTER] or [CANCEL] button to return to step 7 to copy another project.

To copy a project from a different disk drive, select that disk drive as the work disk and then copy. See "Selecting the Work Disk" on page 161 for more information.

10 Press the [UTILITY] button to leave utility.

The UTILITY indicator goes out.

The Backup function checks the amount of available space on the destination disk before copying. If there isn't enough space, the message "DISK FULL" appears.

If an error occurs (e.g., a disk is removed or the power is turned off) while using the Backup function, the message "DRIVE ERROR" appears on the display.

Mounting D24 Disks on a Personal Computer

The D24 uses the DOS FAT16 filing system to manage files on disk. This means that an MO disk formatted by the D24 can be mounted on the desktop of a PC running a Windows operating system, or a Macintosh computer that can mount DOS formatted disks. Obviously, the MO disk drive that you use with your computer must support the disk type and capacity. You cannot, for example, mount a 640 MB Overwrite-type MO disk in a normal 640 MB MO disk drive.

External hard disk drives can also be mounted by a personal computer, although this only applies to disks that were initially formatted as DOS FAT16 volumes using a personal computer. See "Formatting External Disk Drives" on page 158 for more information.

D24 sound files and some of the project settings files appear on the desktop just like any other file. Since the D24 sound files use a proprietary Yamaha format, they cannot be played using common audio playback software.

When a D24 disk is mounted by your computer, do not use any disk utilities on the disk, such as defragmenting software. Doing so may damage the disk or stored data.

The following example shows how a D24 MO disk can be mounted by a personal computer with a compatible MO disk drive.

Personal computer

3.5" MO disk drive

D24 MO disk
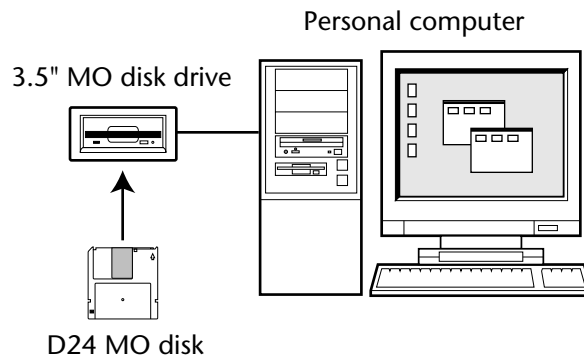
The following example shows how a SCSI disk drive used for recording on the D24 can be mounted by a personal computer with a SCSI interface.

Personal computer

SCSI disk drive
formatted by the D24

SCSI cable

SCSI port   SCSI port

SCSI ID: 4

SCSI bus termination
is applied on this drive
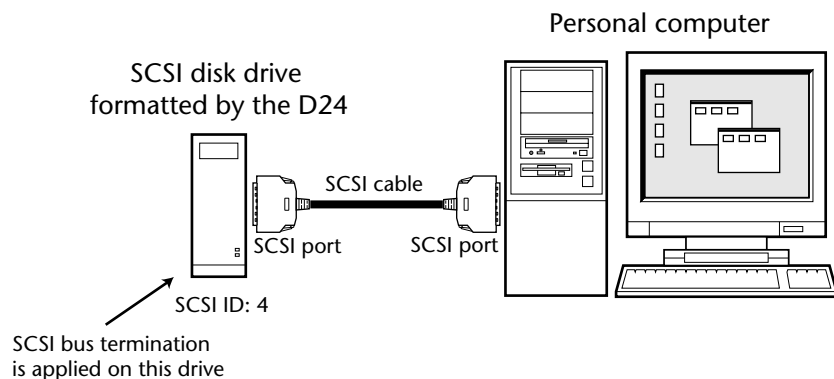
Connecting the D24 to a Personal Computer

The D24 can be connected to a personal computer via SCSI. The personal computer can then mount the internal MO disk drive and any connected external MO disk drives. Since the D24 uses the DOS FAT16 filing system to manage files on disk, MO disks formatted on the D24 can be mounted by PC computers running a Windows operating system, or Macintosh computers that can mount DOS formatted disks. The D24's internal MO disk drive appear on the computer's desktop much like any other drive.

External hard disk drives can also be mounted by a personal computer, although this only applies to disks that were initially formatted as DOS FAT16 volumes using a personal computer. See "Formatting External Disk Drives" on page 158 for more information.

When the D24 is connected to a personal computer, the SCSI connection between the D24 and internal MO disk drive must be disconnected temporarily. See "Accessing the Internal MO Disk Drive" on page 168 for more information.

D24 sound files and some of the project settings files appear on the computer's desktop much like any other file. Since the D24 sound files use a proprietary Yamaha format, you cannot play them using common audio playback software.

> *Note: Do not attempt to access the D24 MO disk drive or any connected external disk drives while the D24 is in use. Doing so may seriously affect performance.*

When a D24 disk is mounted by your computer, do not use any disk utilities on the disk, such as defragmenting software. Doing so may damage the disk or stored data.

To connect the D24 to a personal computer, the computer must have a SCSI-1 or SCSI-2 interface. Since each device on the SCSI bus must be assigned an exclusive ID, you need to be extra careful that the SCSI IDs used by the D24 and any external disk drives do not conflict with those used by the computer and any connected peripherals.

PC computers typically use ATA-type internal hard disk drives, which don't require SCSI IDs, reducing the risk of an ID conflict. Macintosh computers with built-in SCSI, on the other hand, typically use SCSI ID 0 for their internal SCSI hard disk drive and SCSI ID 3 for their internal SCSI CD-ROM drive.

Use the following SCSI ID table as a guide when connecting the D24 to a personal computer. See also "Assigning SCSI IDs" on page 156 and "Setting the SCSI ID of the Internal MO Drive" on page 193.

SCSI ID	Notes
7	Typically used by the computer's SCSI driver.
6	D24 internal ID.
5	Typically available.
4	Typically available.
3	Macintosh computers with built-in SCSI typically use this ID for their internal SCSI CD-ROM drive.
2	D24 internal MO drive (default setting).
1	Typically available.
0	Macintosh computers with built-in SCSI typically use this ID for their internal SCSI hard disk.

To connect the D24 to a personal computer, you'll need a good-quality SCSI cable. The end that connects to the D24 must be fitted with a 50-pin, half-pitch SCSI connector (pin type). The SCSI connector on the other end must match the SCSI port on your computer. See the owner's manuals supplied with your computer for more information.

PC Hookup

In the following example, the D24 is connected to a SCSI adapter installed in a PC computer. Since the PC's internal hard disk drive is an ATA type drive, only SCSI ID 7 is used on the PC side, and the D24's internal MO disk drive is set to SCSI ID 2, the default setting.
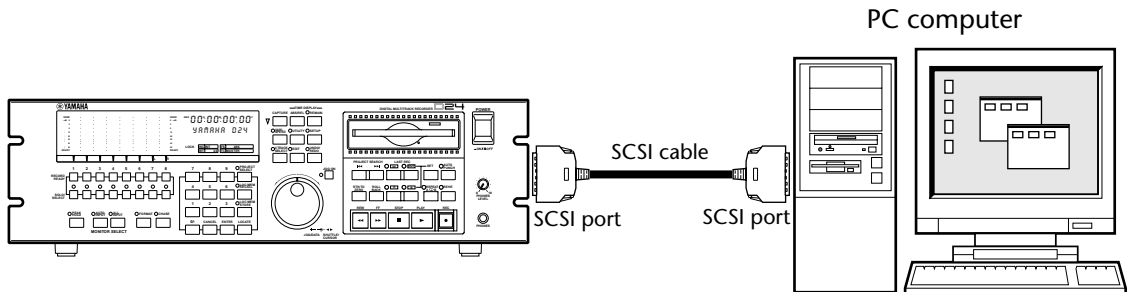
SCSI ID settings
D24 internal: 6
D24 MO drive: 2
Computer internal: 7

Macintosh Hookup

In the following example, the D24 is connected to the SCSI port on a Macintosh computer.
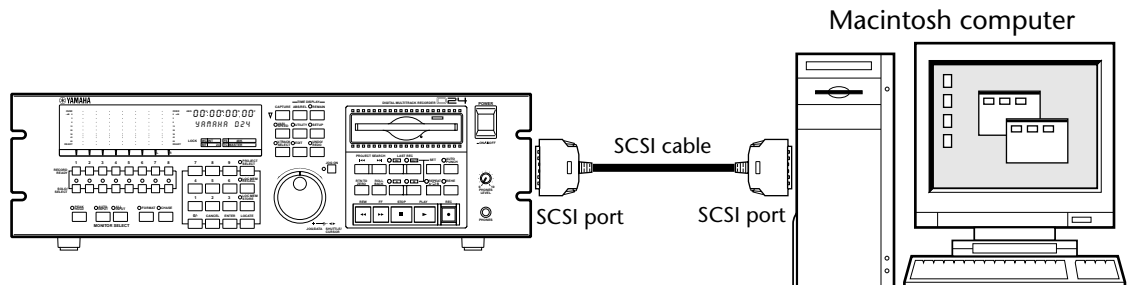
SCSI ID settings
D24 internal: 6
D24 MO drive: 2
Computer internal: 7
Computer CD-ROM: 3
Computer hard disk drive: 0

For Macintosh computers, in order to mount 640 MB MO disks that do not use 512 bytes/sector, third-party disk mounting software is necessary, such as "DOS Mounter 98" by Software Architects, Inc. <http://www.softarch.com/>.

Accessing the Internal MO Disk Drive

When the D24 is connected to a personal computer, the PC Mode function is used to temporarily disconnect the SCSI bus between the D24 and internal MO disk drive while the drive is being accessed.

1 Press the [UTILITY] button.

The UTILITY indicator lights up.

2 Use the JOG/DATA dial to select "PC MODE," and then press the [ENTER] button.

The SCSI connection between the D24 and internal MO disk drive is temporarily disconnected and all D24 functions are inactive.

The D24's internal MO disk drive can now be accessed from the connected personal computer.

3 Press the [UTILITY] button when you've finished accessing the internal MO disk drive.

The UTILITY indicator goes out.

The SCSI connection between the D24 and internal MO disk drive is restored and the D24 functions as normal.

If the D24 is turned off while the SCSI connection between the D24 and internal MO disk drive is temporarily disconnected, the SCSI connection is restored automatically, and the D24 functions as normal the next time it is turned on.

Other Functions

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In this chapter...

Setting the Peak Hold Mode

Peak Hold can be set so that the highest lit segment of each meter remains lit for 800 ms (MOMENTARY) or continuously (PERMANENT). See "Using Peak Hold" on page 41 for information on using the Peak Hold function.

1 Press the [SETUP] button.

The SETUP indicator lights up.

2 Use the JOG/DATA dial to select "PEAK HOLD," and then press the [ENTER] button.

The current setting appears on the display.

3 Use the JOG/DATA dial to select "MOMENTARY" or "PERMANENT."

The default setting is PERMANENT.

4 Press the [ENTER] button to activate your selection, or the [CANCEL] button to cancel the Peak Hold function.

5 Press the [SETUP] button again to leave setup.

The SETUP indicator goes out.

Setting the Fade In/Out Time

When dissimilar sounds are digitally spliced together, the discontinuity and sudden level change sometimes produces an audible click. To smooth the transition between new and existing material at the punch-in and out points, and the part editing edit points, a small fade in/out is applied, the length of which can be set to 2, 5, 10, 25, 50, or 100 ms, the default being 2 ms.

1 Press the [UTILITY] button.

The UTILITY indicator lights up.

2 Use the JOG/DATA dial to select "FADE I/O," and then press the [ENTER] button.

The currently set fade in/out time appears on the display.

3 Use the JOG/DATA dial to select a fade in/out time: 2, 5, 10, 25, 50, or 100 ms.

The default setting is 2 ms.

4 Press the [ENTER] button to activate your selection, or the [CANCEL] button to cancel the Fade I/O function.

5 Press the [UTILITY] button again to leave utility.

The UTILITY indicator goes out.

The Fade I/O setting can be changed at anytime and is applied to punch-in and out points, and the part editing edit points during playback, not recording.

Setting the Display Brightness

The brightness of the display can be adjusted using the VFD (Vacuum Florescent Display) Dimmer function.

1   Press the [SETUP] button.

The SETUP indicator lights up.

2   Use the JOG/DATA dial to select "VFD DIMMER," and then press the [ENTER] button.

The currently set brightness value appears on the display.

3   Use the JOG/DATA dial to select a value from 1 through 5.

The default setting is 5.

4   Press the [ENTER] button to activate your selection, or the [CANCEL] button to cancel the VFD Dimmer function.

5   Press the [SETUP] button again to leave setup.

The SETUP indicator goes out.

Setting the Remote ID

When multiple D24s are synchronized together, each D24 must be assigned an exclusive Remote ID number from 1 through 8.

1   Press the [SETUP] button.

The SETUP indicator lights up.

2   Use the JOG/DATA dial to select "REMOTE ID," and then press the [ENTER] button.

The currently set Remote ID number appears on the display.

3   Use the JOG/DATA dial to select a Remote ID number from 1 through 8.

4   Press the [ENTER] button to activate your selection, or the [CANCEL] button to cancel the Remote ID function.

5   Press the [SETUP] button again to leave setup.

The SETUP indicator goes out.

The D24 can be controlled remotely using an optional remote controller. See your Yamaha dealer for more information about optional remote controllers. The remote controller connects to the REMOTE IN/SYNC IN port on the master D24, and in a multiple D24 system, controls all D24s. By assigning each D24 an exclusive Remote ID number from 1 through 8, however, D24s can be controlled individually.

See the owner's manual supplied with your remote controller for more information.

Recovering Disk Space

When tracks and parts are erased or deleted, although they can no longer be accessed, the actual sound files remain on disk as unused files, occupying disk space, and reducing the time available for additional recording. Likewise, takes recorded using auto punch in/out recording remain on disk even after a single take has been fixed. The reason being that if the sound files were deleted from disk each time an edit function was used, over time files would be fragmented, and new sound files would not be stored to disk in consecutive sectors, which could affect disk drive performance.

Disk space occupied by unused sound files can be retrieved for additional recording using the Optimize function, which deletes all unused files from the disk and optimizes the remaining files for optimum performance.

Since the Optimize function deletes all unused sound files, the Undo function cannot be used to undo the last recording or edit once the Optimize function has been run. Unused sound files deleted by the Optimize function cannot be recovered. Other sound files are not affected.

You can check how much disk space (i.e., recording time) is recovered using the Remain function to check the available recording time before and after running the Optimize function. See "Checking the Time Remaining" on page 38 for more information.

The Optimize function operates on the currently selected work disk. See "Selecting the Work Disk" on page 161 and for more information about selecting disk drives.

1   Press the [UTILITY] button.

The UTILITY indicator lights up.

2   Use the JOG/DATA dial to select "OPTIMIZE," and then press the [ENTER] button.

"ARE YOU SURE" flashes on the display.

3   Press the [ENTER] button again to confirm your selection, or the [CANCEL] button to cancel the Optimize function.

The Optimize process starts and "OPTIMIZING" appears on the display.

When the Optimize process is complete, "FINISHED" appears on the display.

4   Press the [UTILITY] button again to leave utility.

The UTILITY indicator goes out.

Physical Formatting for MO Disks

The Format function accessed via the front panel [FORMAT] button is all that is required to prepare new MO disks and MO disks that have been used to store other kinds of data for use with the D24. This is a logical, or high-level format, which simply readies the disk for storing D24 data, and takes only a few seconds.

In addition to the logical format function, a physical format function for use with external disk drives and damaged MO disks is also available. An MO disk may become damaged when, for example, the D24 is turned off while recording. If the D24 displays a Drive or Media error, which cannot be remedied by cleaning the MO disk (see "Error Messages" on page 194), the Physical Format function can be used to reinitialize the disk. As with the logical formatting function, physical formatting permanently erases all data on the disk. A physical format, also known as a low-level format, rewrites all the sector addresses on the disk, and can take several minutes.

1   Insert the damaged MO disk into the D24 disk drive.

To perform a physical format on an MO disk inserted in an external MO disk drive, use the Drive Select function to select the disk drive. See "Selecting the Work Disk" on page 161.

2   Press the [UTILITY] button.

The UTILITY indicator lights up.

3   Use the JOG/DATA dial to select "PHYS FORMAT," and then press the [ENTER] button.

The FORMAT indicator flashes and "ARE YOU SURE" flashes on the display.

4   Press the [ENTER] button again to confirm your selection, or the [CANCEL] button to cancel the Physical Format function.

The physical formatting process starts and "FORMATTING" appears on the display.

When the physical formatting process is complete, "FINISHED" appears on the display and the FORMAT indicator goes out.

The MO disk is now ready for use.

If the D24 displays a media error message even after running the Physical Format function, the MO disk may be damaged beyond repair.

MO disks formatted using the Physical Format function do not need to be formatted using the front panel [FORMAT] function.

Ejecting Troublesome Disks (emergency use)

If the D24 is turned off inadvertently, or the disk loading mechanism fails, you may not be able to eject a disk in the normal way. In this case, the disk can be ejected using the supplied disk eject tool. Note that this technique should only be used as a last resort, as frequent use may lead to malfunction.

1 Turn off the D24.

2 Insert the disk eject tool into the manual eject hole, as shown below, and push gently to eject the disk.
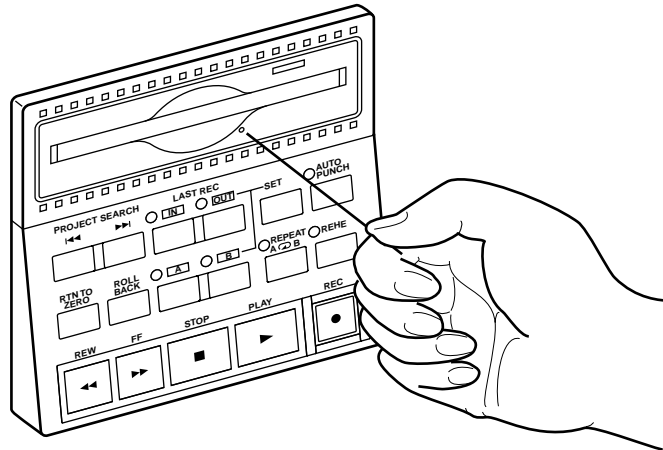
3 The disk ejects.

If the disk cannot be ejected, see your Yamaha dealer.

Initializing the D24

You can reset the D24 to its initial settings as follows.

1 Turn off the D24.

2 While holding down the [RTN TO ZERO] button, turn on the D24.

The D24 is initialized and "INITIALIZED" appears on the display.

Checking the Version Number

You can check the version number of the D24 system software as follows.

1 Turn off the D24.

2 While holding down the [UTILITY] button, turn on the D24.

The version number appears on the display.

Updating the System Software

See the Yamaha Professional Audio Web site at the address below for information on system updates.

<http://www.yamaha.co.jp/product/proaudio/homeenglish/>

MIDI

16

In this chapter...

MIDI & the D24

The D24 supports the following MIDI messages:

* MMC (MIDI Machine Control) for remote control with, for example, a MIDI sequencer—See "Using MMC (MIDI Machine Control)" on page 178.

* MTC (MIDI Timecode) for synchronization with MTC-compatible equipment—See "Timecode & the D24" on page 134.

MIDI Ports

The MIDI ports are used to connect the D24 to other MIDI equipment for use with MTC and MMC.
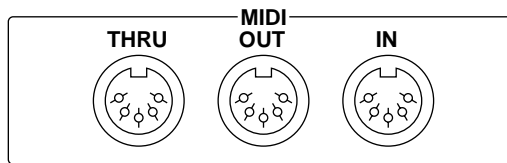
The MIDI IN port receives MIDI messages, the MIDI OUT port transmits them, and the MIDI THRU port retransmits all MIDI messages received by the MIDI IN port.

Using MMC (MIDI Machine Control)

MMC allows you to control the D24 remotely using a MIDI sequencer or other device that can transmit MMC commands, so when, for example, you start playback on your MIDI sequencer, the D24 starts playing as well. Since the D24 does not support MMC when it's configured as an MTC or SMPTE/EBU timecode slave, it must be the time-code master (see "Timecode & the D24" on page 134). Among the D24 functions that can be controlled via MMC are Stop, Play, Fast Forward, Rewind, and Record. See the table page 179 for a list of supported commands. The D24 does not transmit MMC commands.

Turning On MMC Reception

MMC command reception can be turned on or off using the MMC Receive function.

1 Press the [UTILITY] button.

The UTILITY indicator lights up.

2 Use the JOG/DATA dial to select "MMC RECEIVE," and then press the [ENTER] button.

The current MMC Receive setting appears on the display.

3 Use the JOG/DATA dial to select either "OFF" or "ON."

The default setting is OFF.

4 Press the [ENTER] button to activate your selection, or the [CANCEL] button to cancel the MMC Receive function.

5 Press the [UTILITY] button again to leave utility.

The UTILITY indicator goes out.

Supported MMC Commands

The D24 supports the following MMC commands.

Command	MMC #	Description
Stop	01	The D24 stops recording, rehearsal, playback, rewind, or fast forward.
Play	02	The D24 starts playback. This command is ignored during recording or rehearsal.
Play	03	The D24 locates to the specified timecode address, and then starts playback. This command is ignored during recording or rehearsal.
Fast Forward	04	The D24 fast forwards. If this command is received during recording or rehearsal, the D24 stops recording or rehearsal and fast forwards.
Rewind	05	The D24 rewinds. If this command is received during recording or rehearsal, the D24 stops recording or rehearsal and rewinds.
Record Strobe	06	If the D24 is stopped, it starts recording. If it's playing, it punches in.
Record Exit	07	The D24 stops recording.
MMC Reset	0D	The D24 resets its MMC functions to their initial values.
Eject	OA	Ejects the disk.
Write	40	The D24 writes the data to the specified information field.
Locate	44	The D24 locates to the timecode address stored in the specified information field.
REC Mode	Information field 4C	Toggles the D24 between Rehearsal and Record.
Track Record Ready	Information field 4F	Selects tracks for recording.

Setting the MMC Device Number

When MMC is used with several MIDI devices, each must be assigned an exclusive identity number, so that only the intended device responds to the transmitted commands.

1 Press the [UTILITY] button.

The UTILITY indicator lights up.

2 Use the JOG/DATA dial to select "MMC DEVICE," and then press the [ENTER] button.

The current MMC Device setting appears on the display.

3 Use the JOG/DATA dial to select a device number from 1 through 127.

The default setting is 1.

4 Press the [ENTER] button to activate your selection, or the [CANCEL] button to cancel the MMC Device function.

5 Press the [UTILITY] button again to leave utility.

The UTILITY indicator goes out.

MMC Hookup Examples

In the following example, the D24 receives MMC commands from the personal computer running MIDI sequencing software. The sequencer is synchronized to the D24 using MTC. The D24 is set to MMC device number 1 and the sequencing software is set to transmit MMC commands to MMC device number 1. The D24's timecode source is set to MASTER. When playback is started on the MIDI sequencer, the D24 also starts playing, and when the MIDI sequencer is stopped, the D24 stops too.

Since the D24 does not support MMC when it's configured as a timecode slave, it must be the timecode master (see "Timecode & the D24" on page 134).
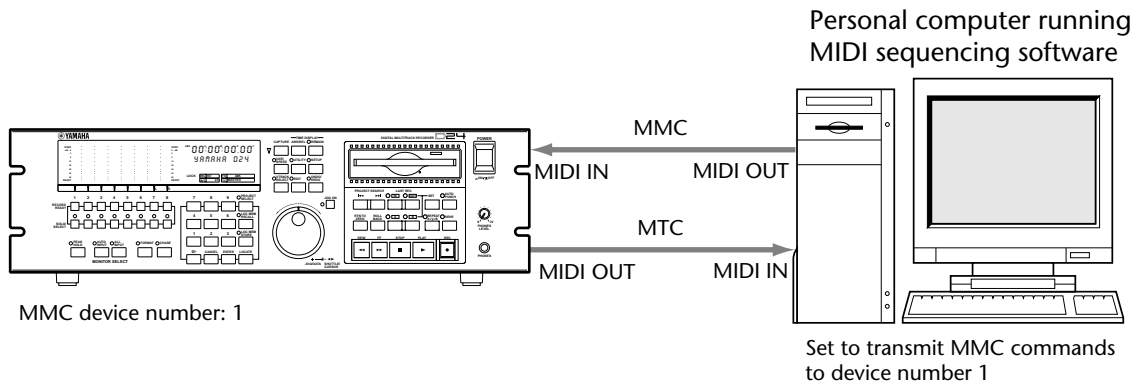
In the following example, the D24 receives MMC commands from the 01V Digital Mixing Console, which in addition to basic transport commands, can transmit up to six user-definable locate points.
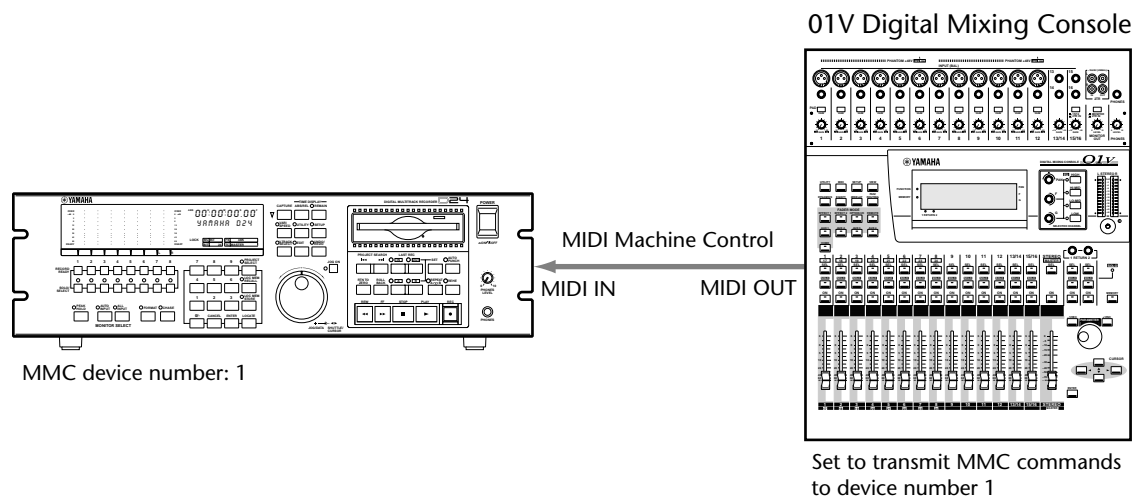
Digital Audio I/O

17

In this chapter...

About mini YGDAI Cards

For analog and digital audio inputs and outputs, the D24 uses optional mini YGDAI (Yamaha General Digital Audio Interface) cards, which offer several analog I/O options and digital I/O support for all the popular digital audio interconnect formats: AES/EBU, ADAT, and Tascam TDIF-1.

The same mini YGDAI cards are also used by the Yamaha 01V Digital Mixing Console. Note that the single and double slot YGDAI cards used by the 02R and 03D are not interchangeable with the mini YGDAI cards used by the D24 and 01V Digital Mixing Console.

The following mini YGDAI cards are currently available. See the Yamaha Professional Audio Web site at the address below for up-to-date news on mini YGDAI cards.

<http://www.yamaha.co.jp/product/proaudio/homeenglish/>

MY8-AD—8 Analog Inputs
The MY8-AD card provides eight balanced analog inputs via phone jack connectors, with 20-bit 128-times oversampling A/D converters. One card is required to access the D24's eight inputs.

MY4-AD—4 Analog Inputs (available spring '99)
The MY4-AD card provides four balanced analog inputs via female XLR connectors, with 24-bit 128-times oversampling A/D converters. Two cards are required to access the D24's eight inputs.

MY4-DA—4 Analog Outputs
The MY4-DA card provides four balanced analog outputs via male XLR connectors, with 20-bit 128-times oversampling D/A converters. Two cards are required to access the D24's eight outputs.

MY8-AT—ADAT
The MY8-AT card provides ADAT format digital I/O via two MultiChannel Optical Digital Interface connectors, and supports 16-, 20-, and 24-bit wordlengths. One card is required to access the D24's eight inputs and outputs.

MY8-AE—AES/EBU
The MY8-AE card provides AES/EBU format digital I/O via a 25-pin D-sub connector, and supports 16-, 20-, and 24-bit wordlengths. One card is required to access the D24's eight inputs and outputs. The MY8-AE can also be used for digital I/O in Dual AES/EBU mode. See "Using Dual AES/EBU Mode" on page 186 for more information.

MY8-TD—Tascam TDIF-1
The MY8-TD card provides Tascam TDIF-1 format digital I/O via a 25-pin D-sub connector, and supports 16-, 20-, and 24-bit wordlengths. One card is required to access the D24's eight inputs and outputs. A BNC connector is provided for wordclock output.

MY8-TD cards feature a device selector switch that should be set to match the device being connected. EXT: 88 for use with a Tascam DA-88. INT: 38 for use with a Tascam DA-38 or other device.

Card Specifications

The following table lists the specifications of the various mini YGDAI cards.

Card	Format	In	Out	A/D	D/A	Wordlength	Connectors
MY8-AD	Analog input	8	—	20-bit, 128 times	—	—	Phone jack (balanced) x8
MY4-AD	Analog input	4	—	24-bit, 128 times	—	—	XLR-3-31 type (balanced) x4
MY4-DA	Analog output	—	4	—	20-bit, 128 times	—	XLR-3-32 type (balanced) x4
MY8-AT	ADAT I/O	8	8	—	—	16, 20, 24	Optical x2
MY8-AE	AES/EBU I/O	8	8	—	—	16, 20, 24	25-pin D-sub (cable not included)
MY8-TD	Tascam TDIF-1 I/O	8	8	—	—	16, 20, 24	25-pin D-sub, BNC wordclock output

Choosing Digital I/O Cards

To connect the D24 to other digital audio equipment, you must determine which digital interconnect format (AES/EBU, ADAT, or Tascam TDIF-1) the other equipment supports, and then install the corresponding mini YGDAI card in the D24.

The following table lists which cards to use when connecting the D24 to the Yamaha 02R, 03D, and 01V digital mixing consoles.

Mixing Console	Tape Sends	Tape Returns	Max. Number of Cards	Format	Card for Mixer	Card for D24
Yamaha 02R	16	16 (plus 16 mic/line inputs)	4 single, 2 double	ADAT	CD8-AT	MY8-AT
				Tascam TDIF-1	CD8-TDII	MY8-TD
				AES/EBU	CD8-AE or CD8-AE-S	MY8-AE
Yamaha 03D	8	8	1	ADAT	CD8-AT	MY8-AT
				Tascam TDIF-1	CD8-TDII	MY8-TD
				AES/EBU	CD8-AE or CD8-AE-S	MY8-AE
Yamaha 01V	8	8	1	ADAT[1]	MY8-AT	MY8-AT
				Tascam TDIF-1[1]	MY8-TD	MY8-TD
				AES/EBU	MY8-AE	MY8-AE

1. 24-bit I/O not supported when installed in the 01V Digital Mixing Console, only 16- and 20-bit.

To connect the D24 to a Yamaha 02R or 03D Digital Mixing Console, you need to install a mini YGDAI card in the D24, and the corresponding YGDAI card in the 02R or 03D. Any of the interconnect formats, AES/EBU, ADAT, or Tascam TDIF-1, can be used and all support up to 24-bit. To connect the D24 to a Yamaha 01V Digital Mixing Console, you need to install mini YGDAI cards of the same interconnect format in both the D24 and 01V. For 24-bit operation, use AES/EBU cards.

When ADAT cards are used with certain devices, synchronization can easily be broken, so it is recommend that you source wordclock signals from other format cards.

When using the MY8-TD Tascam TDIF-1 format card in a D24 or 01V, or the CD8-TDII Tascam TDIF-1 format card in a 02R or 03D, set the card's device switch to INT: 38.

See your Yamaha dealer for more information.

Choosing D24 Slots

The D24 has four slots for installing mini YGDAI cards. Slots 1 and 2 are intended for use with analog input cards or digital I/O cards. Since slot 1 or 2 can be selected as the wordclock source, it's best to use these slots when installing digital I/O cards. Slots 3 and 4 are intended for use with analog output cards.

Use the following table as a guide when choosing slots. Also listed are input assignments for the analog cards and AES/EBU card when using Dual AES/EBU mode. See page 186 for more information on Dual AES/EBU mode.

Card	Recommended Slot			
	1	2	3	4
MY8-AD (8 analog inputs)	Inputs 1–8	—	—	—
	Dual mode: Inputs 1–4			
MY4-AD (4 analog inputs)	Inputs 1–4	Inputs 5–8	—	—
	Dual mode: Inputs 1–4	—		
MY4-DA (4 analog outputs)	—	—	Outputs 1–4	Outputs 5–8
			Dual mode: Outputs 1–4	—
MY8-AT (ADAT)	Inputs 1–8 Outputs 1–8	—	—	—
MY8-TD (Tascam)	Inputs 1–8 Outputs 1–8	—	—	—
MY8-AE (AES/EBU)	Inputs 1–8 Outputs 1–8	—	—	—
	Dual mode: Inputs 1–4 Outputs 1–4			

Selecting Slot Inputs

With the configurations listed in the previous table, the D24 will automatically chose which slot(s) to use for the track inputs. When two digital I/O cards, two analog input cards, or a combination of digital I/O and analog input cards are installed in slots 1 and 2, you must select which slot will feed the track inputs, using the Input Select function.

1   Press the [SETUP] button.

The SETUP indicator lights up.

2   Use the JOG/DATA dial to select "INPUT SELECT," and then press the [ENTER] button.

The currently selected slot appears on the display.

3   Use the JOG/DATA dial to select either "SLOT 1" or "SLOT 2."

4   Press the [ENTER] button to activate your selection, or the [CANCEL] button to cancel the Input Select function.

5   Press the [SETUP] button again to leave setup.

The SETUP indicator goes out.

Installing Cards

This section explains how to install mini YGDAI cards in the D24.

1 Turn off the D24.

2 Undo the two fixing screws and remove the slot cover, as shown below.
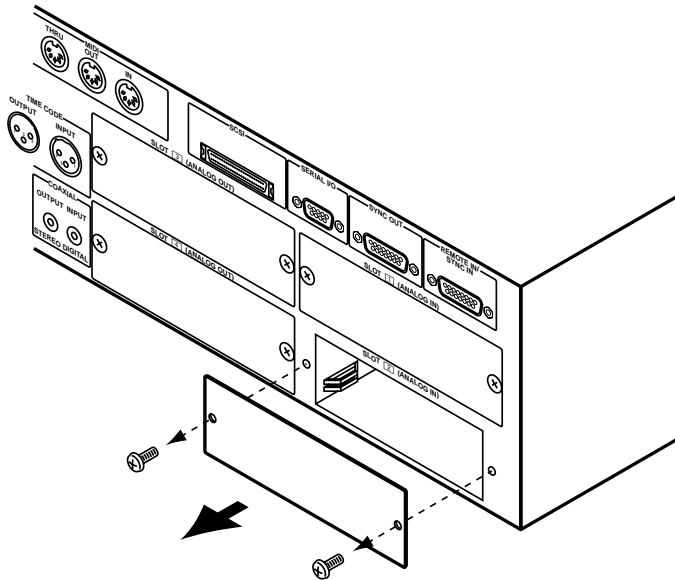
Keep the cover and fixing screws in a safe place for future use.

3 Insert the card between the guides and slide it all the way into the slot, as shown below. You may have to push firmly to plug the card into the internal D24 connector.
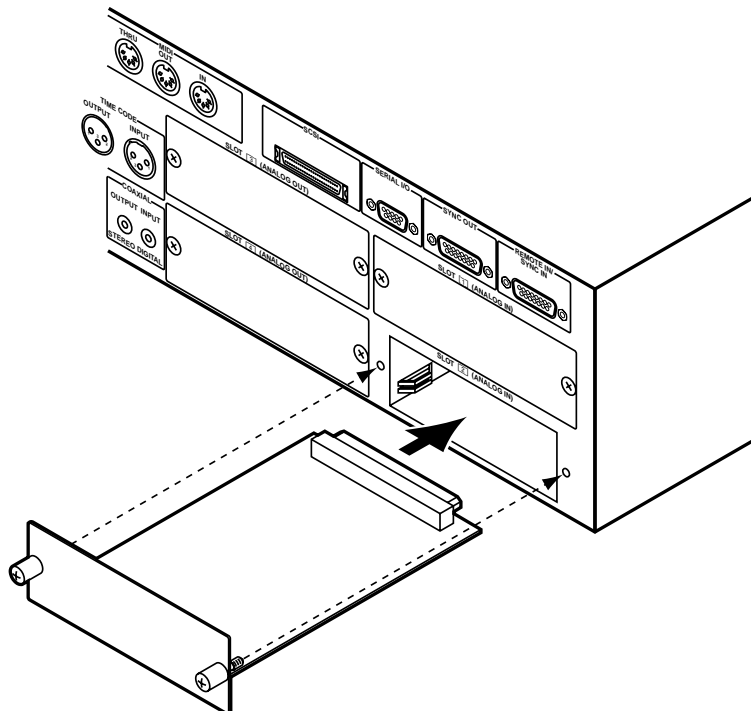
4 Secure the card using the attached thumbscrews. Do not leave the thumb-screws loose, as the card will not be grounded correctly.

Using Dual AES/EBU Mode

When using the higher sampling rates of 88.2 kHz and 96 kHz, the number of tracks is reduced from eight to four and the available tracks are 1, 3, 5, and 7. Project, track, and part editing functions are not available in this mode. For digital I/O, the D24 uses what's known as Dual AES/EBU mode, in which the wordclock frequency is exactly half that of the sampling rate. With a sampling rate of 96 kHz, for example, the wordclock frequency is 48 kHz. Digital I/O in Dual AES/EBU mode is only available with AES/EBU mini YGDAI cards.

In Dual AES/EBU mode, each AES/EBU format digital I/O signal is split in two, requiring two transmission channels. Normally, two AES/EBU format signals, left and right, for example, are transmitted by a single balanced connection. In Dual AS/EBU mode, however, only one AES/EBU format signal can be transmitted per connection.

The following table shows which tracks and AES/EBU inputs and outputs are used in Dual AES/EBU mode.

D24 Track	AES/EBU Inputs	AES/EBU Outputs
1	1/2	1/2
3	3/4	3/4
5	5/6	5/6
7	7/8	7/8

The adjacent illustration shows how external equipment, in this case a 2-channel AD/DA converter that supports Dual AES/EBU, can be connected to the D24 for Dual AES/EBU operation. A custom breakout cable is used to connect the D24 and converter. Each XLR connection handles a single AES/EBU signal, so 2-track recording and playback is possible. The sampling rate is 96 kHz and the wordclock frequency is 48 kHz.
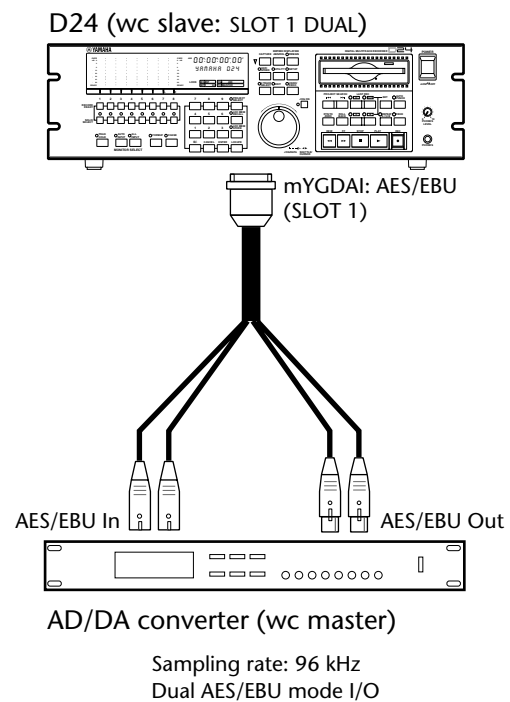
Shown below is an AES/EBU breakout cable similar to the one used in this system.
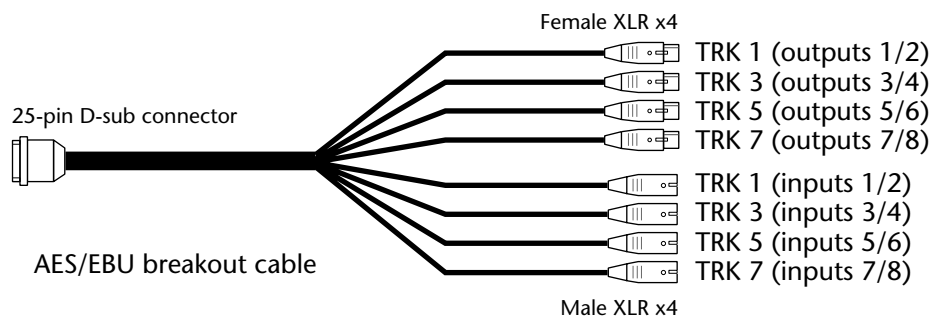
Using the Coaxial Digital Input & Output

The COAXIAL INPUT and OUTPUT phono jacks offer S/PDIF format, 2-channel digital input and output. They can be assigned to individual track pairs, all tracks, or turned off, using the Coaxial I/O function. See "Assigning the Coaxial Input & Output" on page 188 for more information.

```
┌─COAXIAL─┐
│ OUTPUT  INPUT │
│  ◎   ◎  │
│ STEREO DIGITAL │
└─────────┘
```

The COAXIAL INPUT supports 16-, 20-, and 24-bit wordlengths. If the wordlength of the signal being input is higher than that selected for recording, the extra bits are discarded, resulting in distortion. See "Digital I/O & Wordlength" on page 189 for more information.

When recording via the COAXIAL INPUT, the D24 and the source device must be locked to the same wordclock. This can be achieved by configuring the D24 as a wordclock slave, in which case the D24 derives its wordclock from the COAXIAL INPUT, or by locking the D24 and the source device to a common wordclock source. See "Wordclock System Examples" on page 126 for more information.

The COAXIAL OUTPUT supports 16-, 20-, and 24-bit wordlengths, and the wordlength of the signal being output will be the same as the recording resolution of the selected project.

When a Dual AES/EBU mode wordclock source is selected, the COAXIAL INPUT and OUTPUT do not function. See "Using Dual AES/EBU Mode" on page 186 for more information on Dual AES/EBU mode wordclocks.
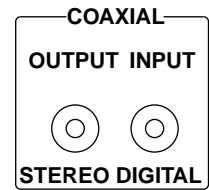
Assigning the Coaxial Input & Output

The COAXIAL INPUT and OUTPUT can be assigned to track pairs, all tracks, or turned off, using the Coaxial I/O function.

The COAXIAL INPUT assignment has priority over the slot inputs. When, for example, the COAXIAL INPUT is assigned to tracks 1 and 2, signals arriving at slot inputs 1 and 2 are ignored.

1   Press the [SETUP] button.

The SETUP indicator lights up.

2   Use the JOG/DATA dial to select "COAXIAL I/O," and then press the [ENTER] button.

The current COAXIAL I/O setting appears on the display.

3   Use the JOG/DATA dial to select an assignment.

The following assignments are available, the default setting is OFF:

TRK 1/2—The COAXIAL INPUT and OUTPUT are assigned to tracks 1 and 2.

TRK 3/4—The COAXIAL INPUT and OUTPUT are assigned to tracks 3 and 4.

TRK 5/6—The COAXIAL INPUT and OUTPUT are assigned to tracks 5 and 6.

TRK 7/8—The COAXIAL INPUT and OUTPUT are assigned to tracks 7 and 8.

ALL —The COAXIAL INPUT and OUTPUT are assigned to all tracks, with odd-numbered tracks being assigned to the left-channel, and even-numbered tracks being assigned to the right-channel. To prevent the possibility of signal clipping when four output signals are mixed, each signal is attenuated by 12 dB (this attenuation does not affect the slot outputs).

OFF—The COAXIAL INPUT and OUTPUT are off.

4   Press the [ENTER] button to confirm your selection, or the [CANCEL] button to cancel the Coaxial I/O function.

5   Press the [SETUP] button again to leave setup.

Emphasis & the D24

The D24 has no functions for adding or removing emphasis information. When a digital audio signal containing emphasis information (15 μs/50 μs) is input, the D24 automatically detects it and records both the audio and emphasis information. During playback, the digital audio is output with the same emphasis information.

SCMS & the D24

The D24 does not recognize SCMS (Serial Copy Management System) information. When a digital audio signal containing SCMS information is input, the SCMS information is ignored and only the audio is recorded.

Digital I/O & Wordlength

When a high-resolution digital audio signal is transferred to a lower-resolution system, care must be taken to ensure that the digital audio samples are truncated correctly. When a 24-bit signal is transferred directly to a 16-bit DAT recorder, for example, low-level detail is lost when the eight least-significant bits (LSB) of each audio sample are discarded, resulting in distortion and a grainy sound. The greater the truncation, the greater the distortion.

To optimize the truncation process, a technique known as digital dither is applied before feeding the signal to the lower-resolution system. Digital dither works by comparing the output of a special pseudorandom number sequence generator with the lowest data bit of the shortened audio sample and the unwanted bits. The lowest bit is then rounded up or down prior to D/A conversion.

Digital dither endows the digital signal with a noise signal (hiss) close to the minimum theoretical limit, which is around –96 dB for a 16-bit signal, although this is considered to be less offensive than the distortion caused by truncating without dither. To minimize the noise, some digital audio processors use noise-shaping techniques to shift it into areas of the audio spectrum where the ear is less sensitive. Unless you have a specific reason for not using it, digital dither should be used when transferring high-resolution signals to lower-resolution systems.

In the following system, a 24-bit recording resolution is used for multitrack recording on the D24, and a 16-bit resolution for stereo recording on the DAT. The digital dither function on the digital mixing console is set accordingly.
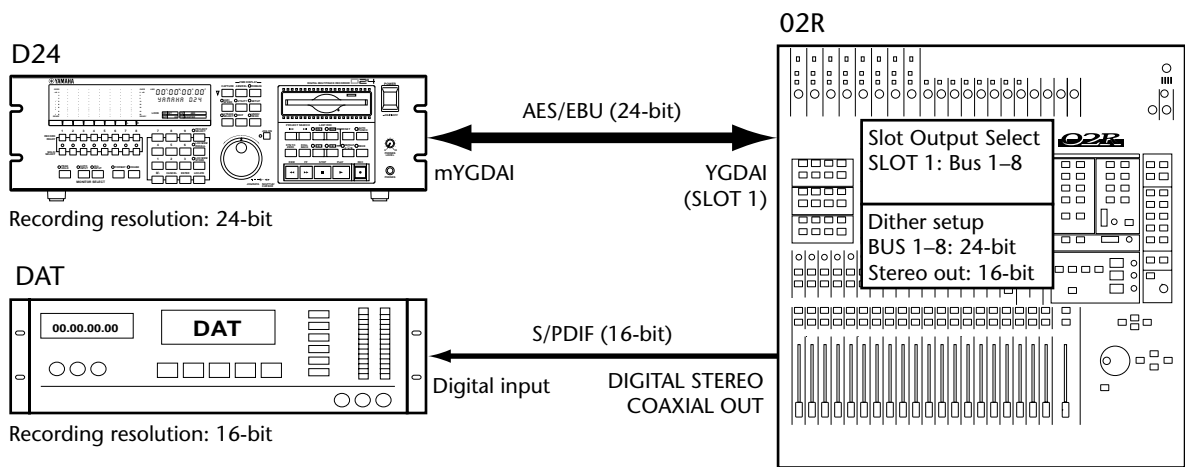
Care must be taken when transferring high-resolution digital audio directly from the D24's COAXIAL OUTPUT to a low-resolution device. In the following example, the 20-bit digital audio from the D24 will be truncated by the 16-bit DAT deck, resulting in distortion and graininess.
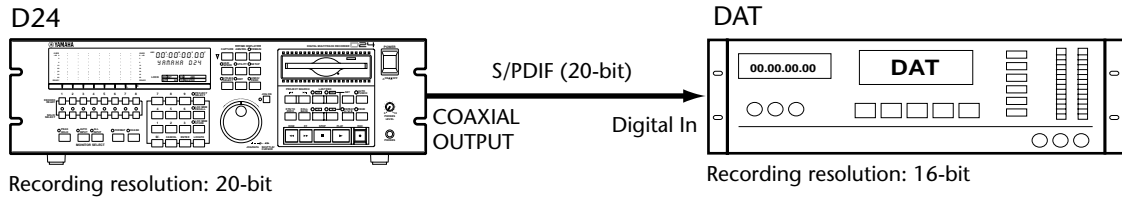
The 4 least-significant bits of each sample are discarded by the DAT, resulting in distortion.

If the device receiving the high-resolution signal does not feature digital dither, an external digital audio processor with digital dither function can be used to truncate the signal, as shown below.

Digital audio processor with digital dither function
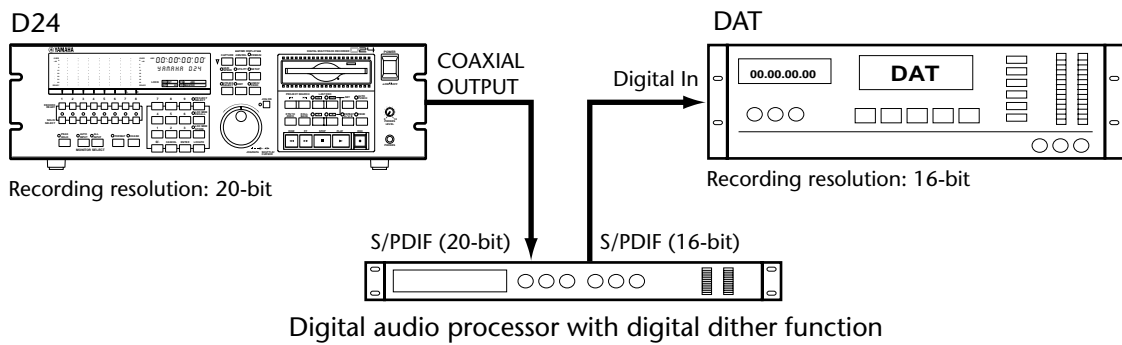
Troubleshooting

Symptom	Advice
Cannot turn on the D24.	Make sure that the power cord is connected to a suitable AC wall outlet. See "Connecting the Power Cord" on page 24 for more information.
	Make sure that the D24 POWER switch is set to the ON position. See "Turning On & Off the D24" on page 24 for more information.
	If you still cannot turn on the D24, contact your Yamaha dealer.
Cannot access the UTILITY, SETUP, V. TRACK SELECT, or EDIT functions.	These functions cannot be accessed during playback, fast forward, rewind, recording, or rehearsal. Stop the D24 in order to access these functions.
Cannot record signals connected to the slot inputs.	The COAXIAL INPUT assignment has priority over the slot inputs, so make sure that the COAXIAL INPUT is not assigned to the tracks that you are trying to record. See "Assigning the Coaxial Input & Output" on page 188 for more information.
The number of tracks available for simultaneous recording is less than expected.	When tracks that have already been recorded are playing back, depending on the number and performance of those tracks (i.e., how heavily they've been edited), the number of tracks available for simultaneous recording may be reduced. Use the Optimize function to arrange the sound files already recorded for optimum performance. See "Recovering Disk Space" on page 172 for more information.
Cannot set the recording resolution.	Once something has been recorded in a project, the recording resolution cannot be changed. See "Setting the Recording Resolution" on page 32 for more information.
Cannot record or edit.	Make sure that the disk's write-protect tabs are not set to protect. See "Write Protecting Disks" on page 24 for more information.
	Check if the project is protected. See "Protecting Projects" on page 82 for more information.
	Project, track, and part editing functions are not available with the higher sampling rates of 88.2 kHz and 96 kHz.
Cannot use the Auto Punch function.	The LAST REC IN and OUT points must be set to use the Auto Punch function. See "Auto Punch In/Out Recording" on page 73 for more information.
Cannot meter or listen to recorded tracks.	If the All Input function is on, input signals are metered and monitored regardless of any other setting. See "Monitoring" on page 42 for more information.
Recordings playback at the wrong pitch.	Check the Varispeed setting and adjust as necessary. See "Using Varispeed" on page 55 for more information.
The Time Remain function indicates that less time is available than expected.	When tracks and parts are erased or deleted, the sound files remain on disk as unused files, occupying disk space, and reducing the time available for additional recording. Use the Optimize function to delete the unused sound files and recover the disk space. See "Recovering Disk Space" on page 172 for more information.
Return to Zero doesn't locate the top of a project.	Perhaps zero has been set to a different position using Relative mode. See "Returning to Zero" on page 60 for more information.
Copied or moved a track or part but cannot play the result.	If the destination track was a virtual track, you must assign the virtual track to a main track in order to hear the result. See "Using Virtual Tracks" on page 51 for more information.

Symptom	Advice
Processed a part using the Time Compression or Pitch Change function, but cannot play the result.	Since the output of the Time Compression and Pitch Change function is recorded to the specified virtual track, you must assign the virtual track to a main track in order to play the result. See "Using Virtual Tracks" on page 51 for more information.
The D24 doesn't respond to MMC commands.	The D24 does not support MMC when it's configured as an MTC or SMPTE/EBU timecode slave. See "MMC Hookup Examples" on page 180 for more information.
	Make sure the D24 is set to the correct MMC device number. See "Setting the MMC Device Number" on page 179 for more information.
Cannot mount an external SCSI disk drive.	External disk drives must be turned on before the D24, otherwise they won't be recognized. See "Using External Disk Drives" on page 154 for more information.
Digitally transferred D24 tracks sound distorted on another recorder.	When a high-resolution digital audio signal is transferred to a lower-resolution system, care must be taken to ensure that the digital audio samples are truncated correctly. See "Digital I/O & Wordlength" on page 189 for more information.
The WORD CLOCK OUTPUT doesn't transmit the internal wordclock signal.	The WORD CLOCK OUTPUT transmits the internal wordclock signal only when the WORD CLOCK 75Ω TERM/THRU switch is set to TERM. See "Wordclock Connections" on page 123 for more information.
The WORD CLOCK OUTPUT doesn't transmit the video signal received at the WORD CLOCK INPUT.	The WORD CLOCK OUTPUT transmits the wordclock signal received at the WORD CLOCK INPUT only when the WORD CLOCK 75Ω TERM/THRU switch is set to THRU. See "Wordclock Connections" on page 123 for more information.
The timecode source is set to SERIAL IN, but the D24 does not respond to the timecode.	When the timecode source is set to SERIAL IN, only command information is received via the SERIAL I/O port. A timecode connection from the timecode source to the D24's TIMECODE INPUT is also required. See "Selecting a Timecode Source" on page 135 for more information.
The D24 doesn't lock to the selected wordclock source.	When the timecode source is set to REMOTE IN, the wordclock source is also set to REMOTE IN and the source selected using the Wordclock function is ignored. When the timecode source is set to a different source, the wordclock source reverts to its previous setting. See "Selecting a Wordclock Source" on page 124 for more information.
The display is difficult to read.	Try adjusting the brightness. See "Setting the Display Brightness" on page 171 for more information.
Cannot eject a disk.	See "Ejecting Troublesome Disks (emergency use)" on page 174 for more information.

Appendix

Setting the SCSI ID of the Internal MO Drive

Setting the SCSI ID of the internal MO disk drive involves removing the D24's top cover and setting the DIP switch located on the MO drive's circuit board.

This procedure should be carried out by a qualified engineer. If in doubt, contact your Yamaha dealer.

1 Remove the top-cover fixing screws (11), as shown here.

2 Remove the top cover.
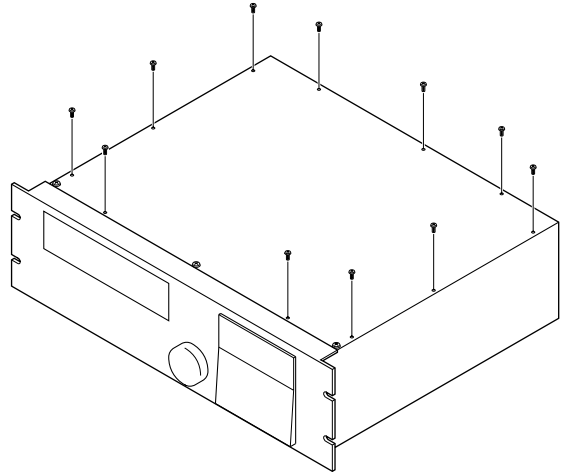
3 Using a small flat-bladed screw-driver, or something similar, set DIP switches 1 through 3, as listed below, to achieve the required SCSI ID.
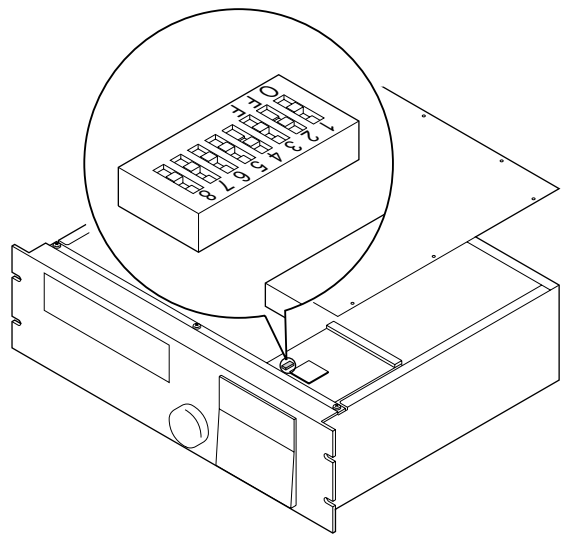
SCSI ID	DIP switch number		
	1	**2**	**3**
5	ON	OFF	ON
4	ON	OFF	OFF
3	OFF	ON	ON
2 (default)	OFF	ON	OFF
1	OFF	OFF	ON
0	OFF	OFF	OFF

SCSI IDs 6 and 7 are not listed, since they are reserved for other purposes.

Error Messages

If the D24 displays an error message, follow the instructions below.

Message	Meaning	Remedy
Sync no comm	The slave machine is not connected properly.	Check the connections to the slave machine.
TC not read	The timecode source cannot be read properly.	Check the timecode settings.
WC not read	The wordclock source cannot be read properly.	Check the wordclock settings.
FILE ERROR	The MO disk data is not correct.	Follow the instructions on the display. If "TURN OFF" is displayed, turn the D24 off and then on again.
DEV CONT ERR	SCSI communication error. External device connection.	Follow the instructions on the display.
SCSI BREAK n	SCSI communication error. Command break.	Follow the instructions on the display.
FIFO UO ERR n	SCSI communication error. FIFO under/over.	Follow the instructions on the display.
INVALID COM n	SCSI communication error. Invalid command.	Follow the instructions on the display.
PARITY ERR n	SCSI communication error. Parity error.	Follow the instructions on the display.
SCSI OUT n	SCSI communication error. Time out.	Follow the instructions on the display.
SCSI ERR nn	SCSI error. SCSI error other than those listed above.	Follow the instructions on the display.
MEDIA ERR nn	Error due to media.	Try the following: 1) Clean the media or disk drive head. 2) Physically reformat the disk. See "Physical Formatting for MO Disks" on page 173. If the error persists, change the media.
DRIVE ERR nn	Error due to media or drive.	Reload the disk. If the error persists, change the media. If that doesn't fix it, the drive may be broken, in which case you should see your Yamaha dealer.
REC ERROR	An incorrectly recorded track has been detected and its contents may be distorted. This message may appear after recording on a disk containing heavily edited tracks and is due to the D24's disk drive not been able to keep up with the excessive workload.	Press the [UNDO] button to undo the last recording, reduce the number of tracks selected for simultaneous recording, and try recording again. Temporarily assigning unused virtual tracks to main tracks is another way to reduce the D24's workload.
TOO SHORT	The interval between the points is too short.	For part editing, the minimum interval between the start and end points is 15 ms. For punch in/out recording, the minimum interval is 15 ms. Increase the interval as necessary.
DISK FULL	There is no space available for storing sound files.	Retrieve some disk space by using the Optimize function. See "Recovering Disk Space" on page 172 for more information. Delete or erase an unwanted project.

Message	Meaning	Remedy
FS DIFFER	Recording is not possible because the sampling rate of the selected project is not the same as the current D24 setting.	Set the sampling rate on the D24 to match that of the project. See "Selecting a Wordclock Source" on page 124 for more information.
RECCH NOTSEL	No tracks are selected for recording.	Select a track for recording. See "Recording" on page 33 for more information.
MO PROTECT	The disk is write protected.	Turn off the write protection. See "Write Protecting Disks" on page 24 for more information.
PROJ PROTECT	The project is write protected.	Turn off the write protection. See "Protecting Projects" on page 82 for more information.
DATA FULL	There is no space available for storing project management files.	Retrieve some disk space by using the Optimize function. See "Recovering Disk Space" on page 172 for more information.
		Delete or erase an unwanted project.

Specifications

Recording medium		3.5" MO disk (ISO/ECMA) (Overwrite and normal type)
Sound file format		Yamaha proprietary format
Tracks	Main tracks	8
	Virtual tracks	64 (8 per main track)
	Simultaneous recording	8 tracks (44.1, 48 kHz), 4 tracks (88.2, 96 kHz)
	Simultaneous playback	8
Sampling rate		44.1, 48 , 88.2 (Dual AES/EBU), 96 kHz (Dual AES/EBU)
Recording resolution		16, 20, 24-bit
Maximum recording time (44.1 kHz, 16-bit, 640 MB MO disks)		15 mins x8 tracks 30 mins x4 tracks 60 mins x2 tracks 120 mins x1 track
Shuttle playback		1/16 to 4x normal playback speed
Pitch control		±6%
Repeat playback		A–B Repeat
Punch in/out		Auto, Manual, Rehearsal
Auto Punch multi-take recording		Up to 99 takes
Locate	Project Select/Search	
	Locate point set/search	LAST REC IN, LAST REC OUT, A, B
	Locate memory store/recall	99
	Return to zero	
	Roll back	
Editing		Undo/Redo, Copy, Insert Copy, Move, Erase, Delete, Time Comp/Expand, Pitch Change, Optimize
Time Compression/Expansion		50%–200%
Pitch Change		50%–200% (±1,200 cents or ±1 octave)
Display	Type	VFD (Vacuum Fluorescent Display)
	Characters	12-character lines x2
	Main counter	Hours, minutes, seconds, frames
	Counter mode	ABS (Absolute), REL (Relative)
	Track level meters	16 segment with OVER indicator x8

Synchronization	Parallel unit chase (up to 8 units)
	Serial unit chase (2 units)
	External SMPTE/EBU timecode chase (24, 25, 30D, 30 fps)
	External MTC chase
	External MMC control
	9-pin protocol control

Other functions	Solo Select	
	Monitor Select	Auto Input/All input
	Peak Hold	On/Off

Power requirements	U.S.A. & Canada 120 V AC, 60 Hz Europe 230 V AC, 50 Hz
Power consumption	100 W
Dimensions (W × H × D)	480 × 144 × 383.9 mm (18.9 x 5.7 x 15.1 inches)
Weight	13 kg (28.7 lbs)
Free-air operating temperature range	5° C to 35° C (41° F to 95° F)
Relative humidity	10%–95%
Accessories	Power cord, MO disk, disk eject tool
Options	Digital interface card (MY8, MY4 series) RC-D24 Remote Controller

Analog Output

Connection	For Use With Nominal	Output Level	Connector
PHONES[1]	40 Ω phones	60 mW	Stereo phone jack (unbalanced)[2]

1. 20-bit 8-times oversampling D/A converter
2. PHONES stereo phone jack is unbalanced (tip = left, ring = right, sleeve = ground).

Digital Audio Input

Connection	Format	Wordlength	Level	Connector
COAXIAL STEREO DIGITAL INPUT	IEC-60958	16, 20, 24 bit	0.5 V pp (75 Ω)	Phono

Digital Audio Output

Connection	Format	Wordlength	Level	Connector
COAXIAL STEREO DIGITAL OUTPUT	IEC-60958[1] Consumer Use	16, 20, 24 bit	0.5 V pp (75 Ω)	Phono

1. Channel status
   Type: 2 audio channels
   Category code: 2 channel PCM encoder/decoder
   Copy prohibit: No
   Emphasis: No
   Sampling rate: depends on internal configuration

Control I/O

Connection	Format	Level	Connector
VIDEO INPUT	Composite (black burst or color bar)	—	BNC
VIDEO OUTPUT	Composite (black burst or color bar)	—	BNC
WORD CLOCK INPUT	—	TTL	BNC
WORD CLOCK OUTPUT	—	TTL	BNC
MIDI IN	MIDI	—	5-pin DIN
MIDI OUT	MIDI	—	5-pin DIN
MIDI THRU	MIDI	—	5-pin DIN
SCSI	Narrow SCSI-2 (FAST-20)	—	Half pitch 50-pin
SERIAL I/O	9-pin protocol	RS-422	9-pin D-sub
SYNC OUT	—	RS-422	15-pin D-sub
REMOTE IN/SYNC IN	—	RS-422	15-pin D-sub
TIMECODE INPUT	SMPTE/EBU	—	XLR-3-31 type (balanced)
TIMECODE OUTPUT	SMPTE/EBU	—	XLR-3-32 type (balanced)

Connector Pin Assignments

REMOTE IN/SYNC IN Port

Pin	Signal	Pin	Signal
1	LINK TC	9	LINK FS
2	LINK DT	10	485BUS B
3	CONNECT ASS	11	N.C.
4	485BUS A	12	N.C.
5	N.C.	13	N.C.
6	GND	14	+12 V
7	+12 V	15	GND
8	GND		

SYNC OUT Port

Pin	Signal	Pin	Signal
1	LINK TC	9	LINK FS
2	LINK DT	10	485BUS B
3	LINK MF	11	N.C.
4	485BUS A	12	N.C.
5	N.C.	13	N.C.
6	CONNECT SIG	14	N.C.
7	N.C.	15	GND
8	GND		

SERIAL I/O Port

Pin	Signal	Pin	Signal
1	F-GND	6	GND
2	TXD-A	7	TXD-B
3	RXD-B	8	RXD-A
4	GND	9	F-GND
5	N.C.		

D24 Dimensions

11.8

355.1

D: 383.9

4.1

12.9

W: 480

Units: mm

132

H: 144

12
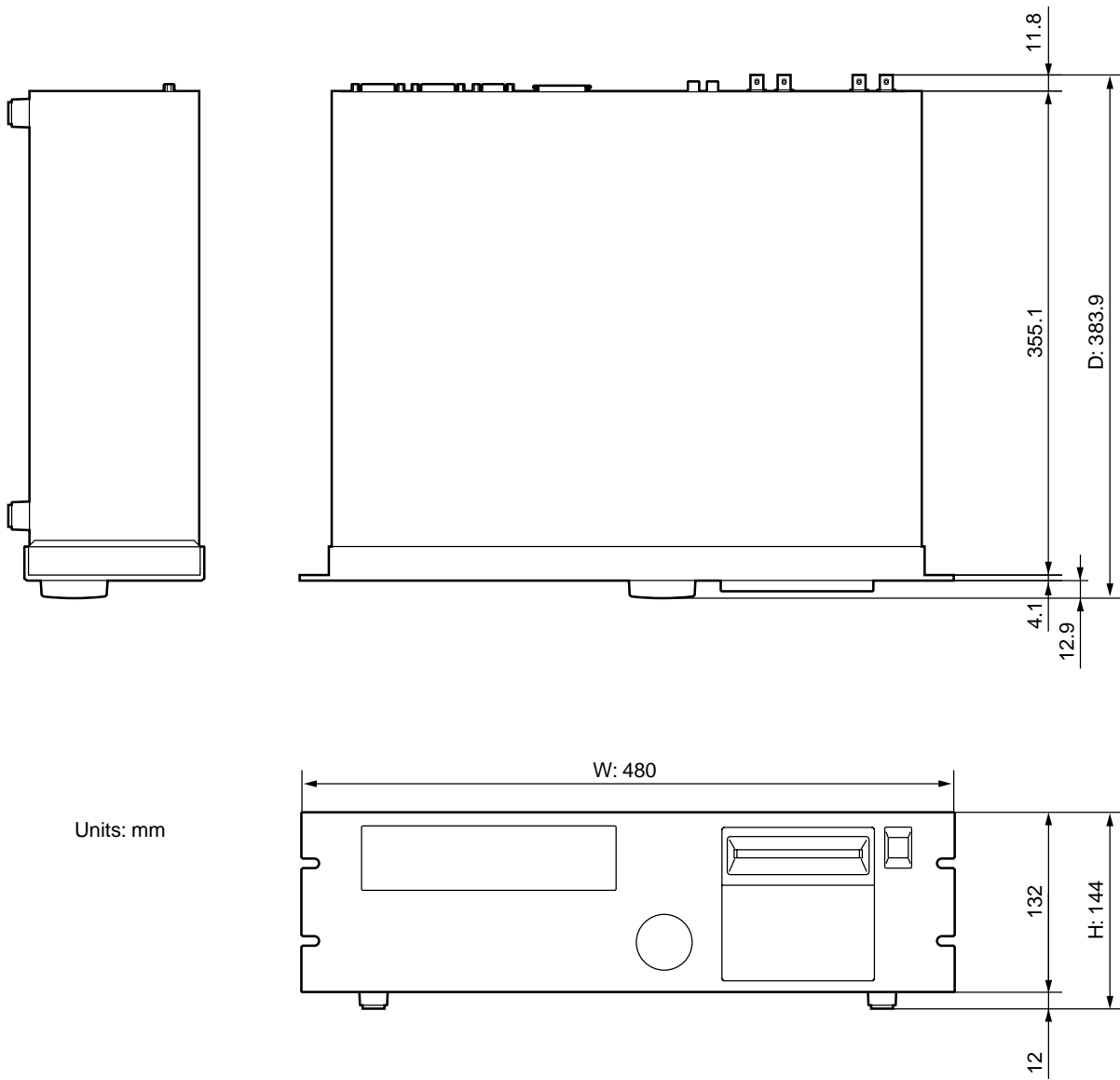
Specifications and external appearance subject to change without notice.

For European Model

Purchaser/User Information specified in EN55103-1 and EN55103-2.

Inrush Current: 16A

Conformed Environment: E1, E2, E3 and E4

Glossary

A/D converter—An electronic device for converting signals from analog to digital. *Contrast with* D/A converter.

ABS—An abbreviation for Absolute. *Contrast with* REL.

ADAT interconnect format—The digital audio interconnect format typically found on ADAT-compatible digital audio equipment. Eight channels of digital audio are carried per fiber-optic connection, using Toslink connectors.

AES/EBU interconnect format—The digital audio interconnect format, established by the AES (Audio Engineering Society) and EBU (European Broadcasting Union), for transferring digital audio data between professional digital audio equipment. Two channels of digital audio (left/odd and right/even) are carried per balanced line.

Aliasing—A type of signal distortion that occurs during A/D conversion if the sampling rate is less than twice that of the highest audio frequency. To prevent aliasing, A/D converters employ anti-aliasing filters to remove audio frequencies higher than half the sampling rate. *See also* Nyquist Sampling Theorem.

Anti-aliasing—In digital audio, a technique used to prevent aliasing in the form of an anti-aliasing filter before A/D conversion. This filter removes audio frequencies that are higher than half the sampling frequency (e.g., for a 32 kHz sampling rate, audio frequencies above 16 kHz are filtered).

Clipping—The distortion that occurs when an audio signal exceeds a circuit's maximum signal level handling capability.

caused by inputting too large a signal to an audio circuit.

D/A converter—An electronic device for converting signals from digital to analog. *Contrast with* A/D converter.

Digital dither—A technique used to optimize audio sample truncation, when high-resolution digital audio is transferred to a lower-resolution system. Digital dither works by comparing the output of a special pseudorandom number sequence generator with the lowest data bit of the shortened audio sample and the unwanted bits. The lowest bit is then rounded up or down prior to D/A conversion.

Drop frame—The technique of dropping video frames to compensate the accumulative error between 29.97 fps timecode and real time.

Dual AES/EBU mode—An AES/EBU interconnect mode used with the higher sampling rates of 88.2 kHz and 96 kHz, in which the wordclock frequency is exactly half that of the sampling rate and each signal is split in two and carried by two channels.

DSP (Digital Signal Processor)—A chip designed specifically for processing large amounts of data at high speed and in real time, ideal for digital audio processing.

Dynamic range—The difference between the loudest and quietest signal levels in a system. In an audio device, usually the difference between the maximum output level and the residual noise floor. In a digital system, the available dynamic range is determined by the data resolution, about 6 dB per digital bit. Hence, a 16-bit system theoretically provides a 96 dB dynamic range.

FF—Abbreviation for fast forward.

Formatting—The process that prepares a disk for data storage.

fps—Abbreviation for frames per second.

FS—Abbreviation for sampling frequency or rate.

Initial settings—The settings used when a device is first turned on after leaving the factory. Also known as the default, or factory settings.

Line-Level Signal—A high-level signal in the range from –20 dB to +20 dB. Most audio equipment outputs signals at line level. *Contrast with* Low-Level Signal.

Logical formatting—Also known as "high-level formatting," disk formatting that simply initializes a disk's filing system. *Contrast with* physical formatting.

Low-Level Signal—A signal in the range from –100 dB to –20 dB. Microphone and electric guitar signals are in this range. *Contrast with* Line-Level Signal.

LSB (Least Significant Bit)—The least significant bit of a binary number. *Contrast with* MSB.

LTC (Longitudinal Timecode)—Timecode, commonly used in audio applications, that is recorded throughout the length of the program material, with each 80-bit timecode word or frame contains sync and time information.

MDM—Abbreviation for modular digital multitrack.

MIDI (Musical Instrument Digital Interface)—The standard digital interface for remotely controlling electronic musical systems and audio equipment.

MIDI timecode—*See* MTC.

mini YGDAI (Yamaha General Digital Audio Interface)—The second-generation YGDAI interface system used on the 01V Digital Mixing Console and D24.

MMC (MIDI Machine Control)— The set of MIDI commands for controlling tape recorders, video machines, and other studio equipment. Typical MMC commands include Stop, Play, Rewind, and Pause.

MO (Magneto Optical)—To store data, MO disk technology uses a laser to heat the storage media to the Curie point, at which the magnetic polarity can be changed by applying a magnetic field. Reading is performed optically, with reflection variations due to magnetic polarization being converted into electrical signals.

MSB (Most Significant Bit)—Thinnest significant bit of a binary number. *Contrast with* LSB.

MTC (MIDI Timecode)—An addition to the MIDI Standard that allows the transmission of timing information over MIDI. MTC contains clock and position information.

Nominal level—*See* Operating Level.

Nyquist theorem—The Nyquist theorem states that the sampling rate of a digital audio system must be at least twice that of the highest audio frequency, otherwise waveform distortion know as aliasing will occur. *See also* Aliasing.

Operating level—This is the signal level at which a piece of audio equipment is designed to operate. The two most common operating levels are –10 dBV (316 mV), which is used by semiprofessional equipment, and +4 dBu (1.23 V), which is used by professional equipment.

Oversampling—A technique used to reduce noise due to quantization errors in which audio is sampled at a rate much higher than the nominal sampling rate.

Overwrite-type MO disks—MO disks come in two flavors: Normal and Overwrite. With normal disks, writing is a two-step process requiring two disk revolutions: one to erase and one to write. With Overwrite-type disks, the erase step is not necessary, so data can be written in a single revolution, offering write speeds 1.5-times faster than those of normal disks.

PCM (Pulse Code Modulation)—In the second stage of A/D conversion, the pulses derived using PAM are converted into binary numbers.

Physical formatting—Also known as "low-level formatting," disk formatting that, in addition to initializing the disk's filing system, divides tracks into sectors. *Contrast with* logical formatting.

REL—An abbreviation for Relative. *Contrast with* ABS.

Rew—An abbreviation for rewind.

RTZ—An abbreviation for Return To Zero. A recorder function providing a quick way to locate the zero position.

S/PDIF interconnect format—The digital audio interconnect format, developed by Sony and Philips, for transferring digital audio between consumer-type digital audio equipment, such as CD players, consumer DAT decks, and MiniDisc decks. Two channels of digital audio (left & right) are carried in an unbalanced connection, usually a phono or optical connector.

Sampling rate — The number of times per second an analog audio signal is sampled (i.e., measured) during A/D conversion.

SCMS (Serial Copy Management System)—Pronounced "scums," a protection system intended to prevent illegal copying of music. SCMS allows one-time serial copying of copy-protected material. If the source is not copy protected, it's possible to make any number of digital-to-digital copies of the material. If the source is copy protected, however, it's possible to make a first-generation copy, but further copies cannot be made from the first-generation copy. SCMS is only effective when copying via digital connections. Recordings made via analog connections are not affected.

SCSI (Small Computer Systems Interface)—Pronounced "scuzzy." A parallel interface for connecting computers and peripherals, such as hard disk drives, removable disk drives, and scanners. Up to eight devices (including the host computer) can be connected to a single SCSI bus.

SCSI ID—An exclusive identity number assigned to each device on the SCSI bus.

SCSI terminator—A resistive device, installed at both ends of the SCSI bus, to eliminate transmission errors.

Signal-to-noise ratio (S/N)—In an audio system, the difference between the operating signal level and the residual noise floor, expressed as a decibel ratio, and commonly used to measure a system's noise performance.

SMPTE/EBU timecode—SMPTE/EBU timecode is the timecode format approved for television by the SMPTE (Society of Motion Pictures and Television Engineers) in the United States and the EBU (European Broadcast Union) in Europe.

Tascam TDIF-1 interconnect format—The Tascam Digital InterFace audio interconnect format typically found on Tascam TDIF-1-compatible digital audio equipment. TDIF-1 is a bidirectional, 8-channel format, which uses 25-pin D-sub connectors.

TC—An abbreviation for timecode.

THD (Total Harmonic Distortion)—The amount of distortion introduced by an audio system relative to the audio signal, expressed as a percentage. Compared to third-harmonic distortion, which is the measure of a single harmonic, total harmonic distortion is the sum of distortions produced at all harmonics.

TR—An abbreviation for track.

Unity gain—A gain of one.

VFD—An abbreviation for vacuum fluorescent display.

Video sync—The black burst or color bar component of a composite video signal used as a timecode reference with video editing equipment.

WC—An abbreviation for wordclock.

Wordclock—A clock signal used to synchronize the data processing circuits of all devices in a digital audio system.

YGDAI (Yamaha General Digital Audio Interface)—The digital audio interface system that offers a range of analog and digital input and output options for Yamaha digital audio equipment.

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YAMAHA [Digital Multitrack Recorder]　　　　　　　　　　　**Date:**

Model: D24　　　　　　**MIDI Implementation Chart**　　**Version: 1.0**

Function...		Transmitted	Recognized	Remarks
Basic	Default	X	X	
Channel	Changed	X	X	
Mode	Default	X	X	
	Messages	X	X	
	Altered	**************	X	
Note		X	X	
Number	True Voice	**************	X	
Velocity	Note On	X	X	
	Note Off	X	X	
After	Keys	X	X	
Touch	Ch's	X	X	
Pitch bend		X	X	
Control Change		X	X	
Prog		X	X	
Change	:True#	**************	X	
System Exclusive		X	O	*1
System	:Song Pos	X	X	
Common	:Song Sel	X	X	
	:Tune	X	X	
System	:Clock	X	X	
Real Time	:Commands	X	X	
Aux Messages	:Local ON/OFF	X	X	
	:All Notes OFF	X	X	
	:Active Sense	X	X	
	:Reset	X	X	
Notes		MTC quarter frame messages are received in MTC Sync slave mode MTC quarter frame messages are transmitted in MTC Sync master mode. *1: MMC		

Mode 1: OMNI ON, POLY　　　　Mode 2: OMNI ON, MONO　　　　O: Yes
Mode 3: OMNI OFF, POLY　　　　Mode 4: OMNI OFF, MONO　　　　X: No