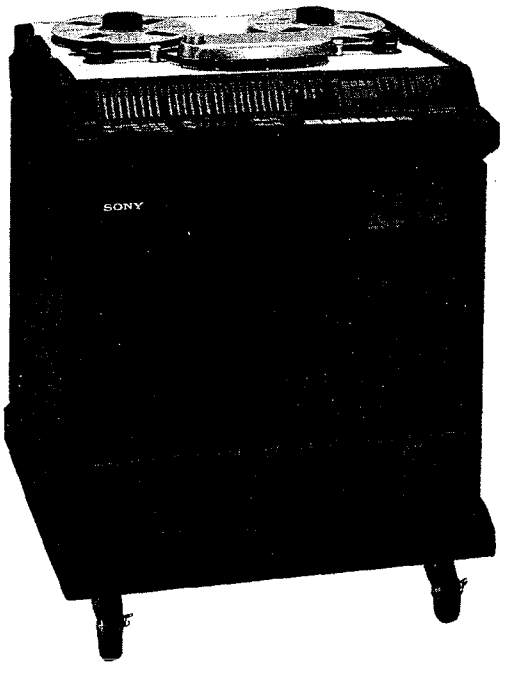
SONY

DIGITAL AUDIO RECORDER

PCM-3324S



DIGITAL

OPERATION MANUAL English

1st Edition (Revised 2)

Serial No. 10001 and Higher

For the customers in the USA

WARNING
This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

You are cautioned that any changes or modifications not expressly approved in this manual could void your authority to operate this equipment.

The shielded interface cable recommended in this manual must be used with this equipment in order to comply with the limits for a digital device pursuant to Subpart B of Part 15 of FCC Rules.



This symbol is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

WARNING: Using this unit at a voltage other than 120 V may require the use of a different line cord or attachment plug, or both.
To reduce the risk of fire or electric shock, refer servicing to qualified service personnel.

For customers in Canada
This apparatus complies with the Class A limits for radio noise emissions set out in Radio Interference Regulations.

Pour les utilisateurs au Canada
Cet appareil est conforme aux normes Classe A pour bruits radioélectriques, spécifiés dans le Règlement sur le brouillage radioélectrique.

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About This Manual

Purpose and intended audience

This manual describes the PCM-3324S Digital Audio Recorder. It is written for operators in production houses, recording studios, and broadcasting companies. It therefore assumes that readers have appropriate operating experience and background understanding of DASH format multi-channel digital audio recorders.

Organization of this manual

This manual comprises the following chapters.

Chapter 1 Overview
Describes the characteristics of this unit, and other related equipment.

Chapter 2 Preparations
Describes the preparatory operations for using the unit, including connections, powering on, loading tapes, initialization and backup procedures.

Chapter 3 Basic Operations
Describes the basic operations for normal use of the unit, including channel settings, using the timer, recording, playback, the locate function, and splice editing.

Chapter 4 Maintenance
Describes the warning and error codes and indications produced when an operating error occurs, together with appropriate measures to be taken.

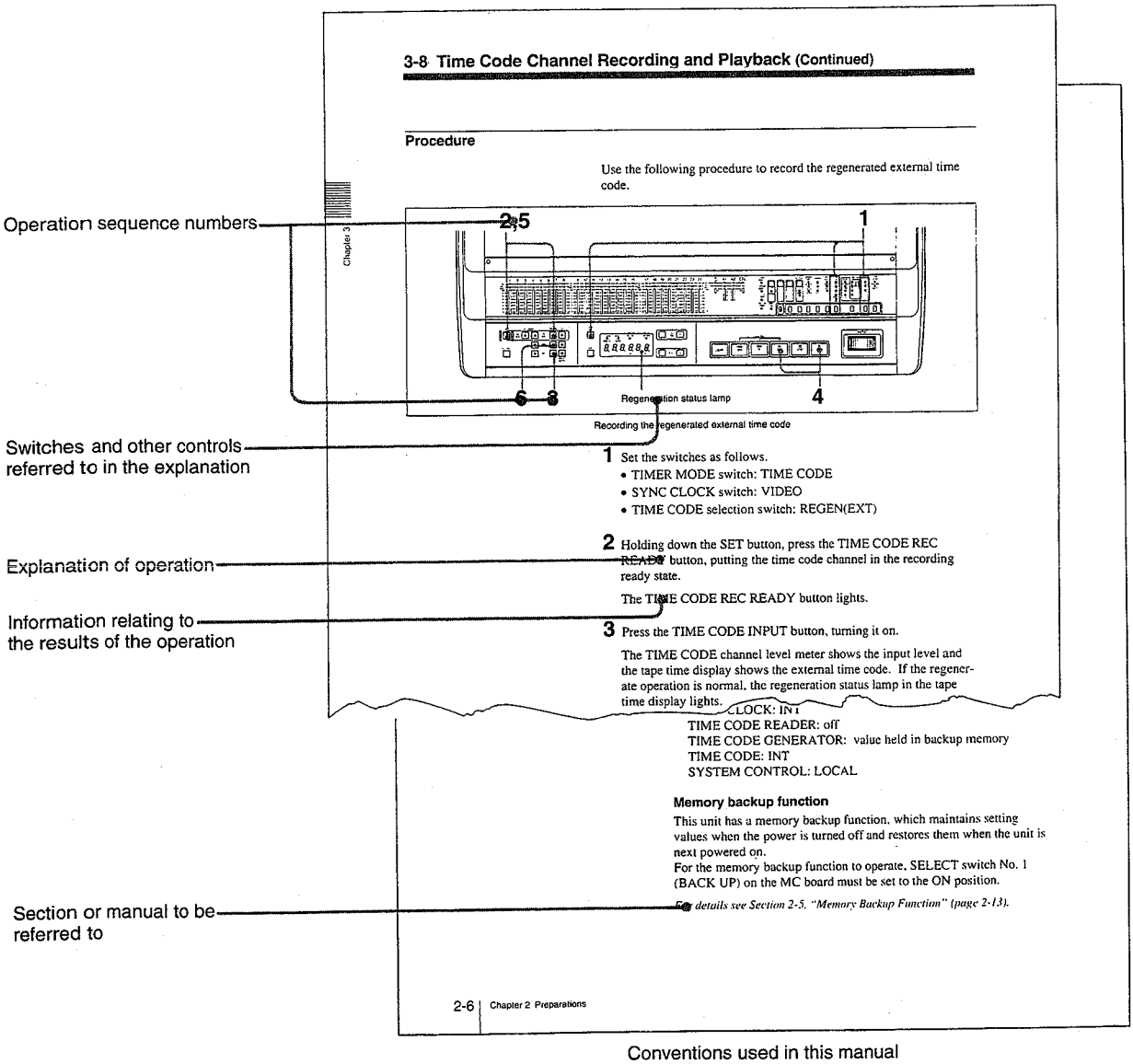
Appendixes
- **Error codes**
  A complete list of error and warning codes.
- **Location and function of parts**
  This lists the controls and lamps on the unit.
- **Specifications**
  Principal specifications of the unit.
- **Timing comparison chart**
  This illustrates the difference of signal input/output timing between this unit and the PCM-3348 Digital Audio Recorder.

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Conventions used

Operation descriptions and references

Numerals attached to buttons and switches in the diagrams indicate the corresponding steps in the process being described. Lamps whose status needs to be checked are also indicated. References in italics identify other places in this manual, and other documentation giving more information.



Conventions used in this manual

Related manuals

The following manuals are available (charged separately):

- SRIF-1 Protocol Manual (SRIF-1 version 1.1) 9-976-074-XX
- SRIF-3 Protocol Manual (SRIF-3 version 1.0) 9-976-076-XX
- APIB Protocol Manual 9-976-078-XX

Chapter 1
Overview

This chapter describes the characteristics of this unit, and other related equipment.

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1-2 Optional Accessories and Recommended Equipment 1-4

1-1 PCM-3324S Overview

The PCM-3324S is a 24-channel digital audio recorder, using 1/2-inch tape in DASH (Digital Audio Stationary Head) format.
In addition to a range of standard capabilities for a digital audio recorder, the PCM-3324S is compact and has a low power consumption, while providing a wide selection of options to meet a variety of operating requirements at minimum cost.
In combination with the RM-3324S Remote Control Unit (optional), the unit provides not only basic recording and playback functions, but also auto punch in/out, separate settings for each channel, memory for up to 100 cue points, variable speed playback, and time code chase functions. Combination with the RM-3324 Remote Control Unit (also optional) provides extra functions over and above those provided by the RM-3324S, including sound memory, digital copy, and electronic editing functions.
These functions allow this unit to be used as base component in a wide range of application systems.

1-2 Optional Accessories and Recommended Equipment

RM-3324S Remote Control Unit

The RM-3324S Remote Control Unit allows you to control recording and playback functions, and provides auto punch in/out functions, cue point memory for up to 100 cue points, variable speed playback (up to ±12.5%), and for synchronized operation with video equipment, time code chase functions (when the DABK-3328 is fitted) and CTL chase functions.

RM-3324 Remote Control Unit

The RM-3324 Remote Control Unit allows you to control recording and playback functions, and provides auto punch in/out functions, cue point memory for up to 100 cue points, variable speed playback (up to ±12.5%), and for synchronized operation with video equipment, time code chase functions (when the DABK-3328 is fitted). It also provides a memory function for channel settings, time shift editing using a sound memory function for up to 20 seconds of stereo signals (when the DABK-3329 is fitted), and digital inter-channel copy functions and electronic editing.

DABK-3321 Interface Board

The DABK-3321 is an interface board for controlling tape transport on the PCM-3324S Digital Audio Recorder. It is used principally by connection to an external time code synchronizer. It has an external speed control connector and an external phase control connector, to allow smooth control of the tape transport.

DABK-3322 Interface Board

The DABK-3322 is an interface board for connection to an RM-3324S Remote Control Unit. It also has a 9-pin remote connector for use with a video editing control system.
(The software for using the 9-pin remote control function is optional.)

DABK-3323 Interface Board

The DABK-3323 is an interface board for connection to an RM-3324 Remote Control Unit. In addition to the connector for the RM-3324 Remote Control Unit it has a SOUND MEMORY TRIGGER INPUT connector.

DABK-3324 Interface Board

The DABK-3324 is an interface board which allows you to control the channel REC READY/SAFE settings of the PCM-3324S Digital Audio Recorder from a mixing console equipped with a REC READY control function.

DABK-3325 Digital I/O Board

The DABK-3325 is an interface board which allows you to connect 24 channels of SDIF-2 (balanced) format digital audio input/output signals to the PCM-3324S.

DABK-3326 Digital I/O Board

The DABK-3326 is an interface board which allows you to connect 2 channels of SDIF-2 (unbalanced) format digital audio input/output signals to the PCM-3324S.

DABK-3327 Digital I/O Board

The DABK-3327 is an interface board which allows you to connect 2 channels of AES/EBU format digital audio input/output signals to the PCM-3324S.

DABK-3328 Time Code Reader Board

The DABK-3328 board allows time code regeneration of either an external time code or the playback time code, time code chasing using the connected remote control unit and time code sync playback, synchronizing the phase of a composite video signal and the phase of the playback time code.

DABK-3329 Sound Memory Board

The DABK-3329 board provides a sound memory function for storing up to 20 seconds of stereo audio signal and copying either to another channel or to another part of the same channel. This board can only be used in combination with the RM-3324 Remote Control Unit.

1-2 Optional Accessories and Recommended Equipment (Continued)

DMU-3024 Digital Meter Unit

This is a peak level meter, capable of displaying the levels of 24 channels of digital audio signals. It also has out of range indications, and peak hold and calibration functions. This meter unit allows remote monitoring of the status of the 24 channels.

DAH-24R Monitor Playback Head Kit

This provides a playback head for simultaneous playback while recording. It will be useful when using advance recording, for example during live recording.

Chapter 2
Preparations

This chapter describes the preparatory operations for using the unit, including connections, powering on, loading tapes, initialization and backup procedures.

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2-1 Basic Connections

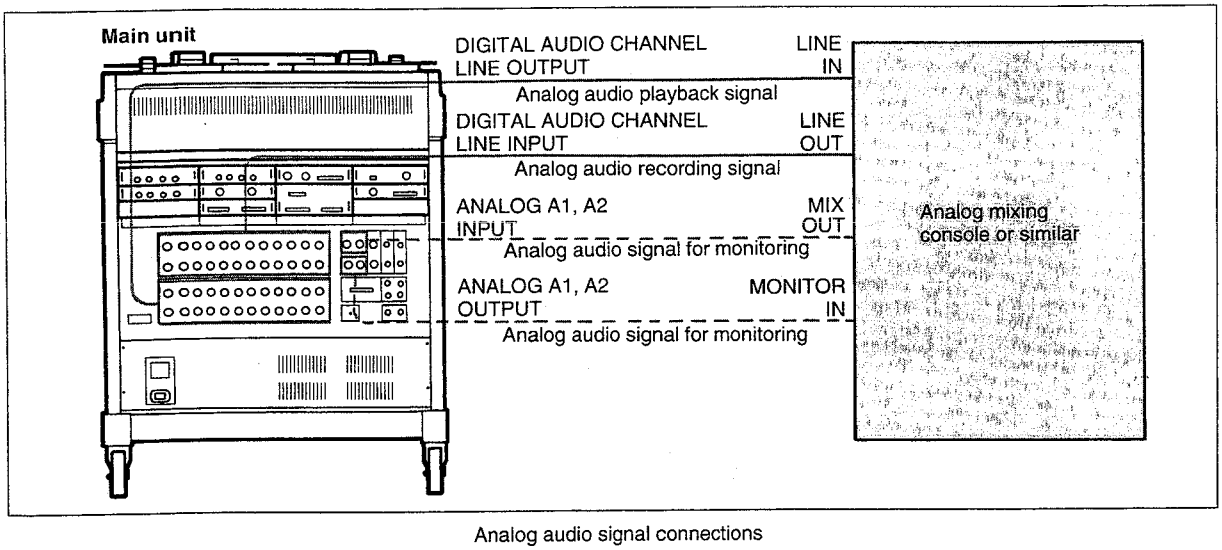
2-1-1 Notes on Installation and Connections

- Ensure that the ventilation openings in the rear panel are not obstructed.
- Ensure that all equipment is powered off before making any signal connections.
- Read the operation manual for each device before installing or operating it.

2-1-2 Connecting the Audio Signal

Connecting the analog audio signal

When using analog audio signals as input/output signals for digital audio channels 1 to 24, and using analog audio channels as cue monitor signals, make the connections as follows.



Analog audio signal connections

Adjusting the gain of the analog audio input/output signal for the DIGITAL AUDIO CHANNEL LINE connectors

- **Adjusting the gain of the input signal**
  The factory setting is such that for a reference analog audio signal input of +4 dBs (0 dBs = 0.775 V) the level meter has a full scale minus 20 dB indication.
  Adjust the gain using the fine and coarse INPUT LEVEL controls on ADA-1 to ADA-6 boards.
  The adjustment ranges with respect to the factory settings are as follows:
- **Fine control:** –2 dB to +2 dB
- **Coarse control:** –2 dB to +10 dB

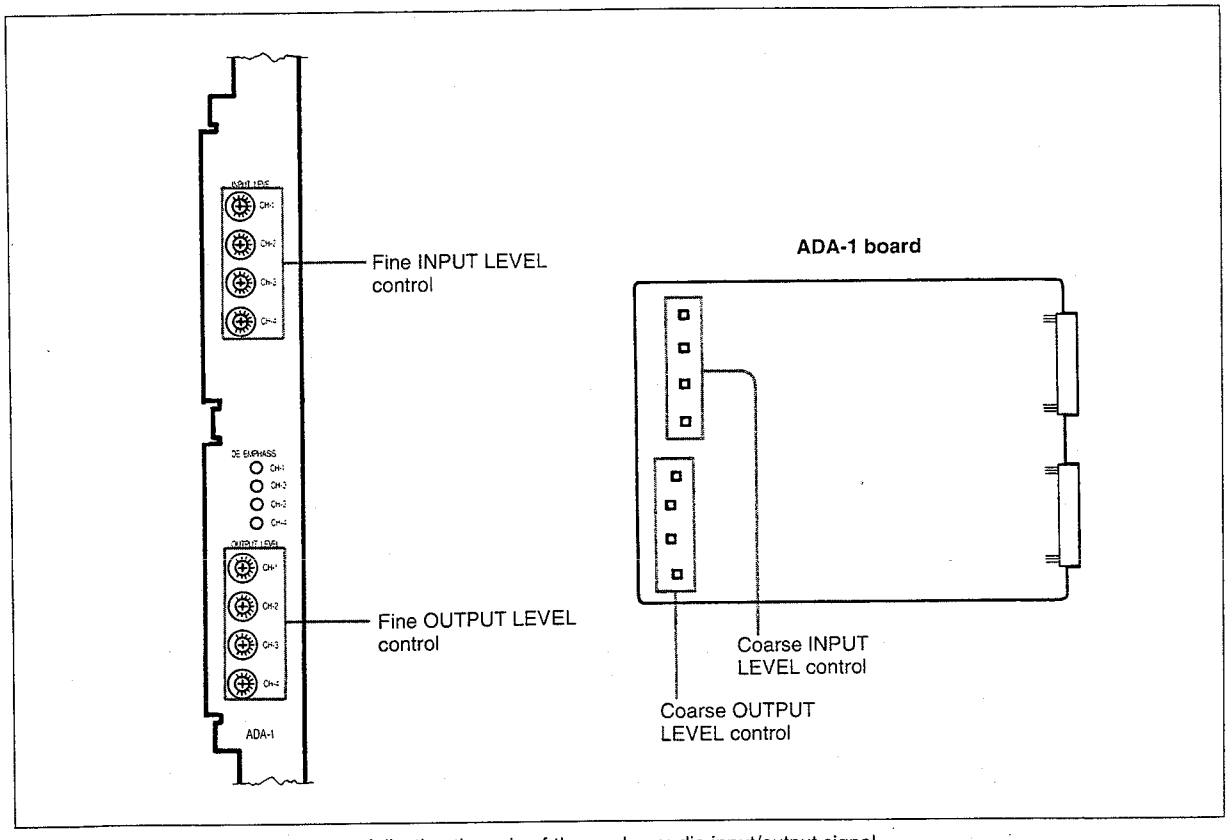
- **Adjusting the gain of the output signal**

The factory setting is such that a full scale minus 20 dB digital audio signal is output as a reference analog audio signal level of +4 dBs (0 dBs = 0.775 V).

Adjust the gain using the fine and coarse OUTPUT LEVEL controls on ADA-1 to ADA-6 boards.

The adjustment ranges with respect to the factory settings are as follows:

- **Fine control:** –2 dB to +2 dB
- **Coarse control:** –10 dB to +2 dB



Adjusting the gain of the analog audio input/output signal

Digital audio signal connections

When using digital audio signals as input/output signals for digital audio channels 1 to 24, at least one of the following boards (optional) is necessary.

- DABK-3325 Digital I/O Board (SDIF-2 format, 24 channels)
- DABK-3326 Digital I/O Board (SDIF-2 format, 2 channels)
- DABK-3327 Digital I/O Board (AES/EBU format, 2 channels)

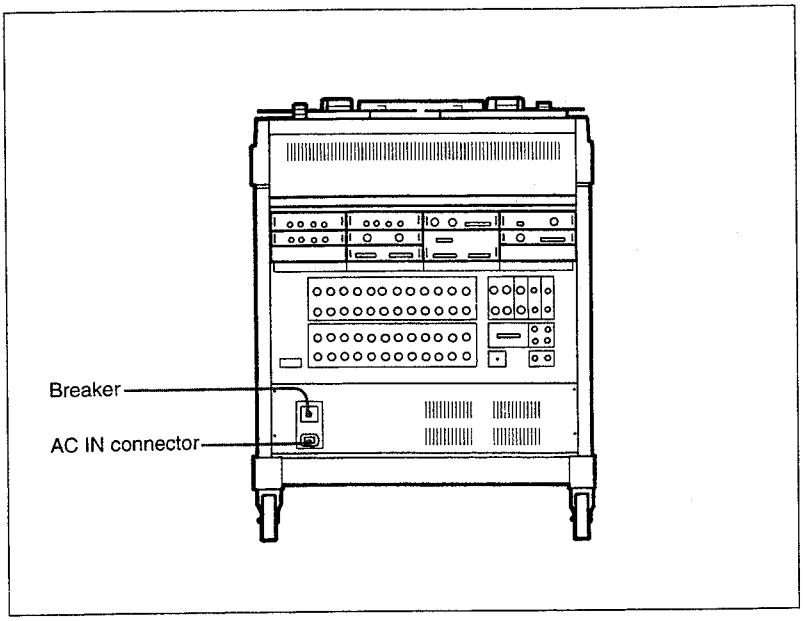
For details of the connection method, refer to the Operation and Maintenance Manuals supplied with these boards.

2-1-3 Connecting the Power Supply

Use the following procedure to connect the power supply.

Note

Always use the unit with an independent power outlet rated at at least 10 A where supply voltage is 100 V to 120 V, and 5 A where it is 220 V to 240 V.



Connecting the power supply

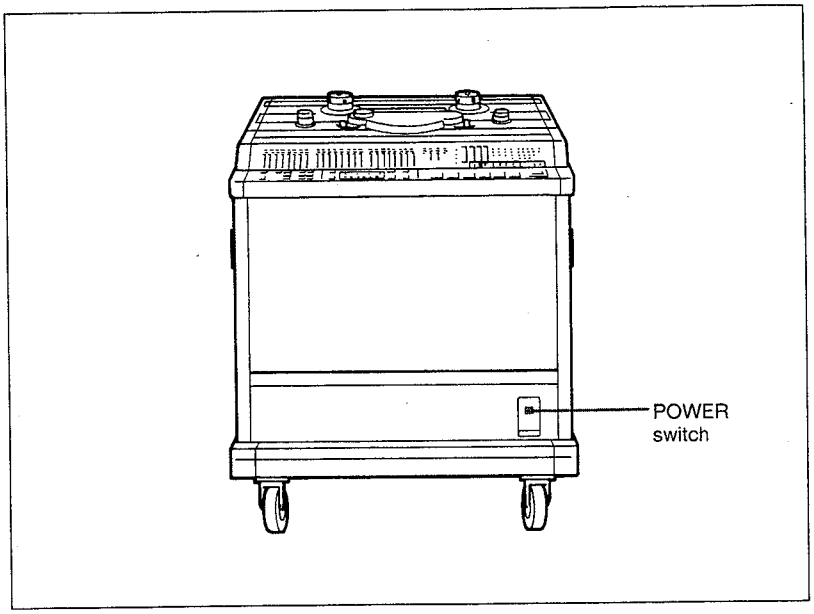
1 Check that the breaker is off.

2 Connect the power cord supplied to the AC IN connector.

3 Plug the power cord into the outlet.

4 Turn the breaker on.

2-2 Powering On



Powering on

Turn the POWER switch on.
When powered on, the lamp above the POWER switch lights, and the unit begins a self-diagnosis procedure. At this point the indication "StEP-1" appears in the tape time display. Between 10 and 20 seconds after powering on, the unit adopts the following state.

- STOP button: flashing
- ALL CHANNEL REPRO button: lighted
- System control panel
  REC MODE: INSERT
  SAMPLING FREQ: 44.1 kHz
  EMPHASIS: OFF
  INPUT SELECT: ANALOG
  SYNC CLOCK: INT
  TIME CODE READER: off
  TIME CODE GENERATOR: value held in backup memory
  TIME CODE: INT
  SYSTEM CONTROL: LOCAL

Memory backup function

This unit has a memory backup function, which maintains setting values when the power is turned off and restores them when the unit is next powered on.
For the memory backup function to operate, SELECT switch No. 1 (BACK UP) on the MC board must be set to the ON position.

For details see Section 2-5, "Memory Backup Function" (page 2-13).

2-3 Loading Tape

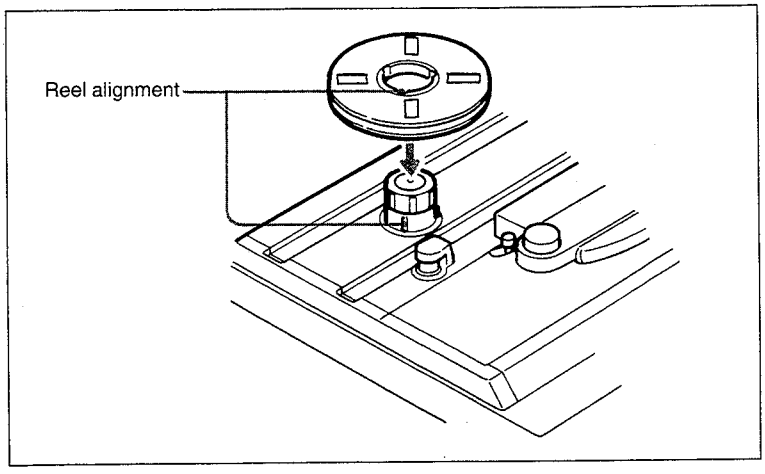
Tape reels to be used

Use 14-inch, 12.5-inch or 10-inch tape reels and empty reels.

Loading the tape

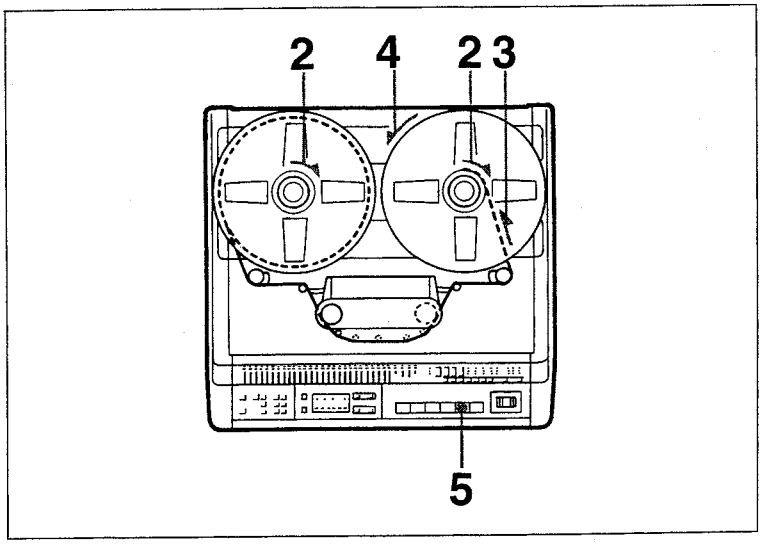
Use the following procedure to load the tape.

1 Aligning the reels so that the slot in the hub fits over the projection on the spindle, mount the tape reel and empty reel.



2 Turn the spindle knob clockwise until it stops, to fasten the reel.

3 Thread the tape as shown in the figure.



(Continued)

4 Turn the take-up reel to eliminate slack.

5 Press the STOP button of this unit.

This applies tension, and the tape is then in the loaded state. The STOP button changes from flashing to lighted.

Caution

If there is slack in the tape when it is loaded, this can cause damage to the tape or the tension arms.

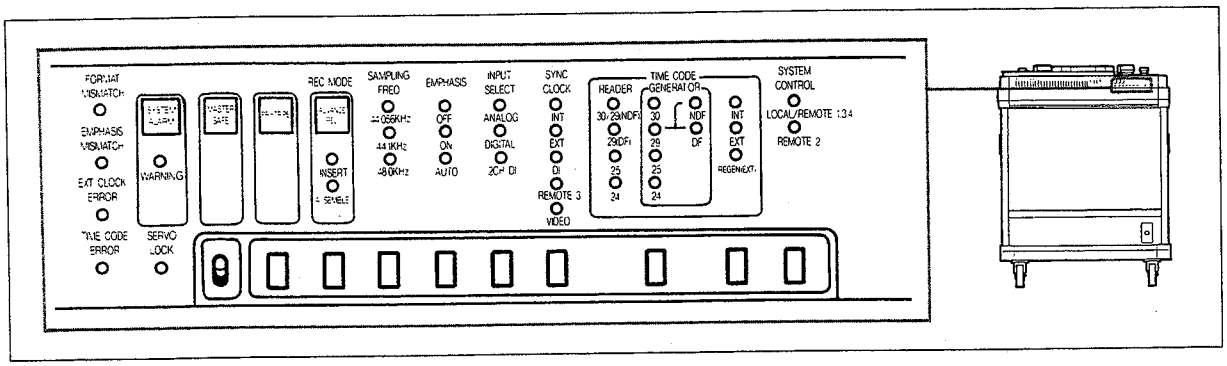
Rerecording the whole length of a previously used tape or using the tape reversed

In these cases it is essential to use advance recording, or to prestripe the tape before use.

2-4 Initial Settings

2-4-1 Setting the System Control Panel Switches

The upper right part of the control panel includes ten switches. When the MASTER SAFE switch is in the upper position, it is on, and the MASTER SAFE lamp lights. All of the other switches operate by changing the setting each time they are pressed. The corresponding lamp indicates the state of the setting.
Before starting operation, always check the settings of these switches.



System control panel

2-4-2 Selecting the Sampling Frequency

Sampling frequency for prestriping or advance recording

With the SAMPLING FREQ switch on the system control panel, select 44.056 kHz, 44.1 kHz, or 48.0 kHz. The selected frequency is recorded on the CTL track on the tape as the Fs ID code (sampling frequency identification code), and is also set as the AES/EBU digital I/O Fs ID code, and as the sampling frequency for internal operation in the PCM-3324S.

Setting the FS SHIFT switch on the CTK board to ON switches to Fs shift mode, and when the sampling frequency selected on the system control panel is 44.1 kHz or 48.0 kHz, the 44.1 kHz or 48.0 kHz lamp flashes. In this case, the sampling frequency used for internal operation of the PCM-3324S shifts down from the selected frequency by 0.1%. The Fs ID code, however, remains at the setting on the system control panel.

Sampling frequency other than for prestriping or advance recording

For insert recording, assemble recording, or playback, both the AES/EBU digital I/O Fs ID code and the sampling frequency used for internal operation are automatically set to the sampling frequency recorded on the CTL track.

2-4-3 Selecting the Input Signal

The relationship between input signals and input connectors is shown in the following table.

Input signals and input connectors

Input signal	Input connector
Analog audio signal	DIGITAL AUDIO CHANNEL LINE INPUT
Digital audio signal (24 channels)	SDIF-2 (BALANCE) INPUT (with DABK-3325 board)
Digital audio signal (2 channels AES/EBU format)	AES/EBU D-I (with DABK-3327 board)
Digital audio signal (2 channels SDIF-2 format)	SDIF-2 INPUT A/B (with DABK-3326 board)

Select the input signal with the INPUT SELECT switch on the system control panel.
The following table shows the relationship between the INPUT SELECT switch setting and the input signal.

INPUT SELECT switch settings

INPUT SELECT switch setting	Selected input signal
ANALOG	Analog audio signals for all channels
DIGITAL	Digital audio signals for all channels (with DABK-3325 board)
2CH DI	Digital audio signals in AES/EBU format (when DABK-3327 board is fitted) or SDIF-2 format (when DABK-3326 board is fitted) for channels selected by the RM-3324S or RM-3324 Remote Control Unit; for other channels, digital audio signals in SDIF-2 (balanced) format (when DABK-3325 board is fitted)

Warning

The input signals to all digital audio channels must be selected together either as analog or digital. It is not possible to make different settings for individual channels.

2-4-4 Selecting the Emphasis

Emphasis using analog audio signal input

When inputting analog audio signals to the digital audio channels, you can use the EMPHASIS switch on the system control panel to enable or disable a preemphasis circuit (50 µs/15 µs CD type). Recording is carried out according to the ON/OFF setting of the EMPHASIS switch, and the emphasis information is written on the tape together with the digital audio signal.
The following table shows the relationship between the EMPHASIS switch setting and the preemphasis circuit.

EMPHASIS switch setting and preemphasis circuit

EMPHASIS switch setting	Preemphasis circuit
OFF	Emphasis off for all channels
ON	Emphasis on for all channels
AUTO	Emphasis switched on or off for all channels automatically, according to setting information recorded on the playback tape

Note

The emphasis on/off setting must be the same for all digital audio channels. It is not possible to make different settings for individual channels.

Emphasis using digital audio signal input

Regardless of the EMPHASIS switch setting, the input signal is recorded using the emphasis information which it contains.

2-4-5 Selecting the Clock Signal

You can use the SYNC CLOCK switch on the system control panel to select the synchronizing signal to be used.
The following table shows the relationship between the SYNC CLOCK switch setting and the synchronizing signal.

SYNC CLOCK switch setting and synchronizing signal

SYNC CLOCK switch setting	Synchronizing signal
INT	Internal master clock signal
EXT	Synchronizing signal input to the WORD SYNC INPUT connector on the rear panel
DI	Synchronizing signal input to the AES/EBU D-I connector on the rear panel (when DABK-3327 board is fitted)
REMOTE 3	Synchronizing signal input via the RM-3324 Remote Control Unit (when DABK-3323 board is fitted)
VIDEO	Composite video signal input to the REFERENCE VIDEO INPUT connector on the rear panel

When the SYNC CLOCK switch is not set to the INT position and no external synchronizing signal is input

The PCM-3324S synchronizes with the internal master clock. In this case, the INT lamp lights, and the SYNC CLOCK lamp which indicates the SYNC CLOCK switch setting flashes. At the same time the EXT CLOCK ERROR lamp lights.

2-5 Memory Backup Function

2-5-1 Items Held in Backup Memory

The PCM-3324S has a memory backup function.
When the memory backup function is activated, even when the unit is powered off, the following settings are retained for up to three days.

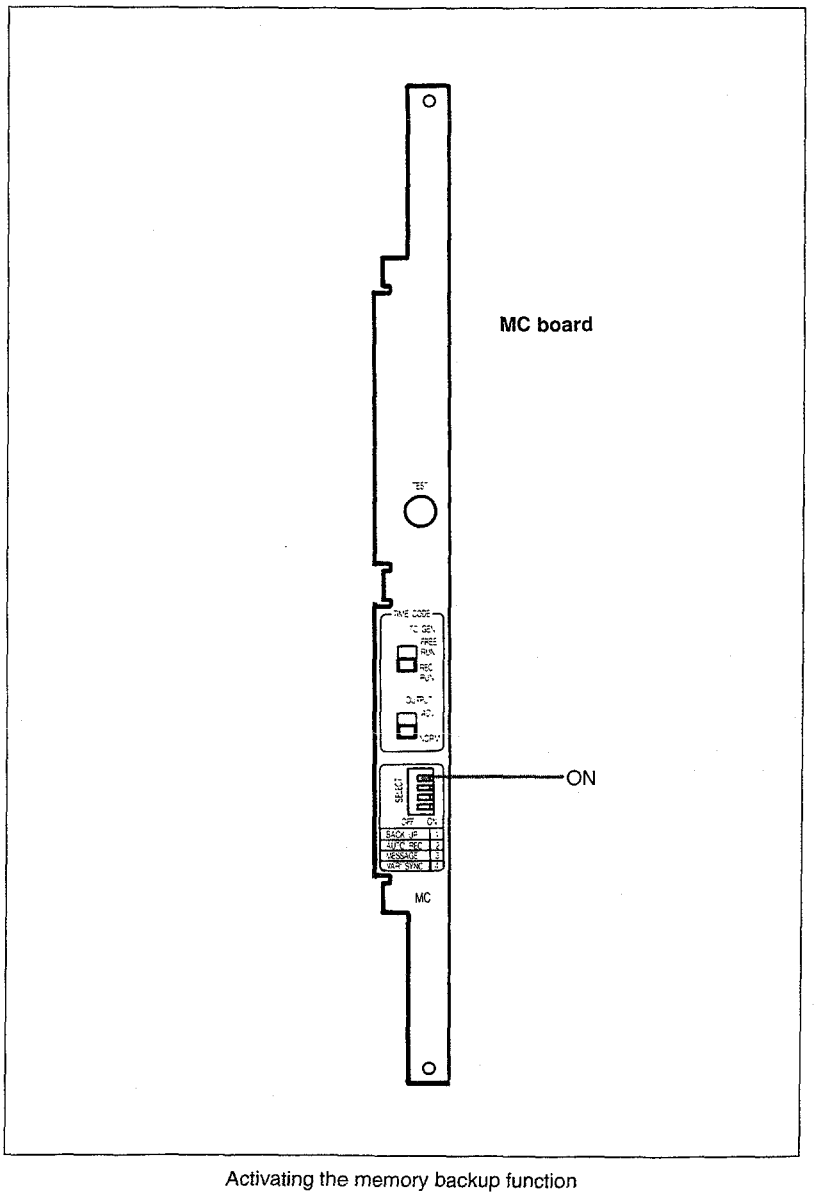
- Channel status
- AUTO INPUT button setting (ON/OFF)
- Timer display mode
- Sampling frequency setting
- Emphasis setting
- INPUT SELECT switch setting
- SYNC CLOCK switch setting

The following information is not retained.

- Cue points A and B
- Recording mode
- REC MUTE button setting (ON/OFF)

2-5-2 Activating the Memory Backup Function

To activate the memory backup function, set SELECT switch No. 1 (BACK UP) on the MC board to the ON position.



Activating the memory backup function

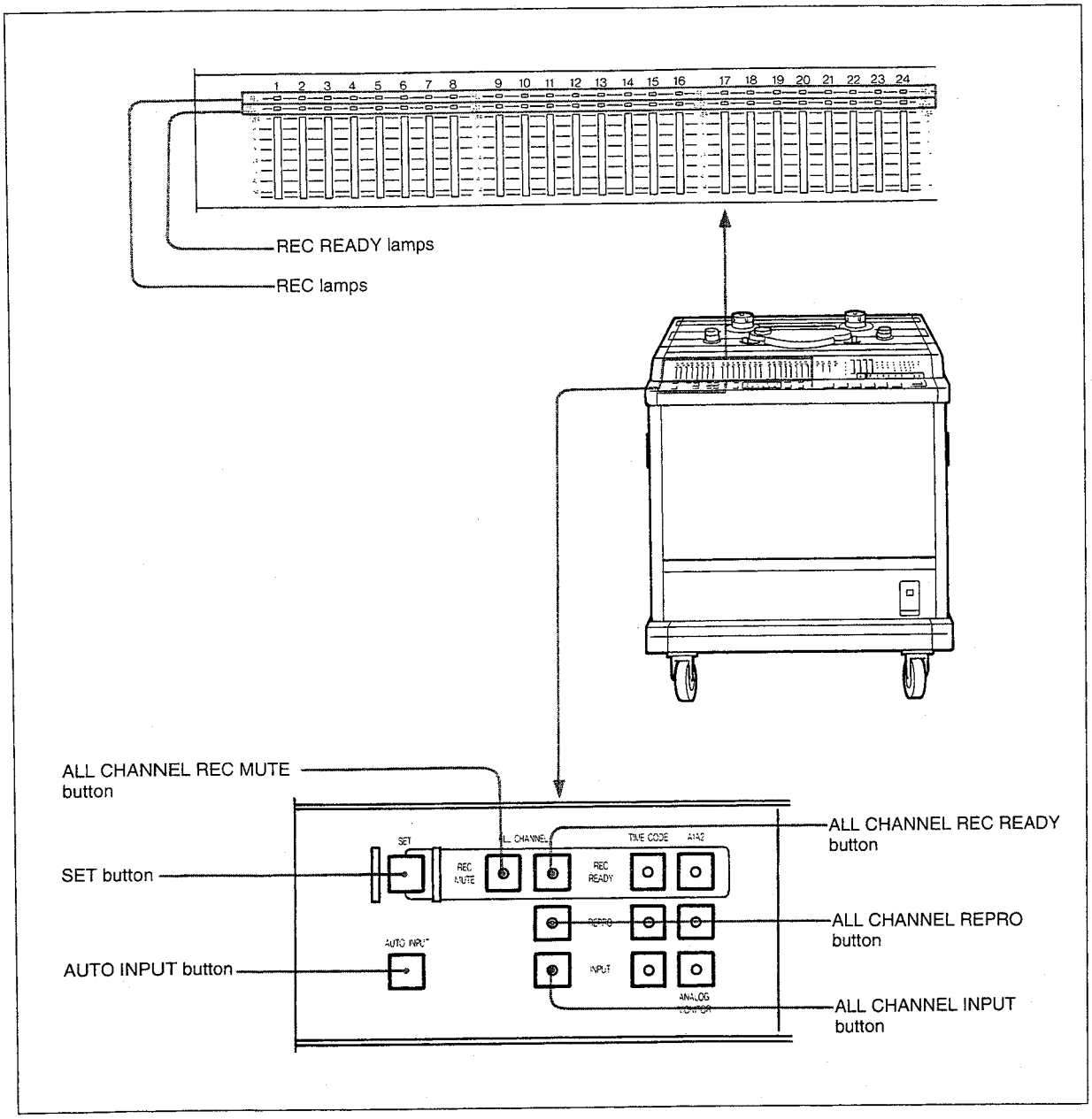
Chapter 3
Basic Operations

This chapter describes the basic operations for normal use of the unit, including channel settings, using the timer, recording, playback, the locate function, and splice editing.

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3-1 Channel Settings

Buttons and lamps used



Buttons and lamps used for channel settings

Channel settings

- **Selecting REC READY (allows recording) or SAFE (prevents recording)**
  Holding the SET button down, press the ALL CHANNEL REC READY button.
- **Setting REPRO (playback signal monitor state)**
  Press the ALL CHANNEL REPRO button.
- **Setting INPUT (input signal monitor state)**
  Press the ALL CHANNEL INPUT button.

The following table shows the relationship between the lamps and the operating state.

Lamps and operating state

Lamp/button	State	Operating state
REC	Lit	Recording for each channel
REC READY	Lit	Recording possible for each channel
ALL CHANNEL REC READY	High tally	Recording possible for all digital audio channels
	Low tally	Recording possible for some channels
	Off	Recording not possible (SAFE) for all digital audio channels
ALL CHANNEL REPRO	High tally	Playback signal monitor state for all digital audio channels
	Low tally	Playback signal monitor state for some channels
ALL CHANNEL INPUT	High tally	Input signal monitor state for all digital audio channels
	Low tally	Input signal monitor state for some channels

When the ALL CHANNEL REC READY, REPRO, and INPUT buttons are lit in low tally

When the RM-3324 or RM-3324S Remote Control Unit has been used to make different settings for individual channels, the corresponding button lights in low tally to indicate this fact.
When both ALL CHANNEL REPRO and ALL CHANNEL INPUT buttons are off, this indicates that the monitor output is muted.

Switching the monitor output automatically depending on the tape transport state

Press the AUTO INPUT button, turning it on, and the monitor output will switch automatically depending on the tape transport state as shown in the following table.

Monitor output signal and tape transport state

			Tape transport state				
			REC	REH	PLAY	FF/REW	STOP
Channel setting	Digital audio channel	REC READY	Input signal a)	Input signal a)	Playback signal	Input signal	Input signal
		SAFE	Playback signal	Playback signal	Playback signal	Playback signal	Playback signal
	Analog audio channel (AUTO REC: off)	REC READY	Input signal a)	Playback signal	Playback signal	Input signal	Input signal
		SAFE	Playback signal	Playback signal	Playback signal	Playback signal	Playback signal
	Analog audio channel (AUTO REC: on)		Input signal	Input signal	Input signal	Input signal	Playback signal

Operating examples when the AUTO INPUT button is on (insert/assemble recording mode)

Operations		Monitor output
Tape transport operation	REC READY operation	
STOP	Off	Playback signal
	On	Input signal
PLAY		Playback signal
REC		Input signal a)
PLAY		Playback signal
LOCATE		Input signal
	Off	Playback signal
PLAY		
REC		
	On	Input signal a)
	Off	Playback signal
PLAY		
STOP		

a) In advance recording mode in these cases the playback signal is output. In insert recording mode and assemble recording mode, if the monitor is set to REPRO for channels being recorded, both REPRO and INPUT buttons on the remote control unit light, but the monitor output is the input signal.

Setting all digital audio channels to the muting signal recording state

Press the ALL CHANNEL REC MUTE button turning it on.

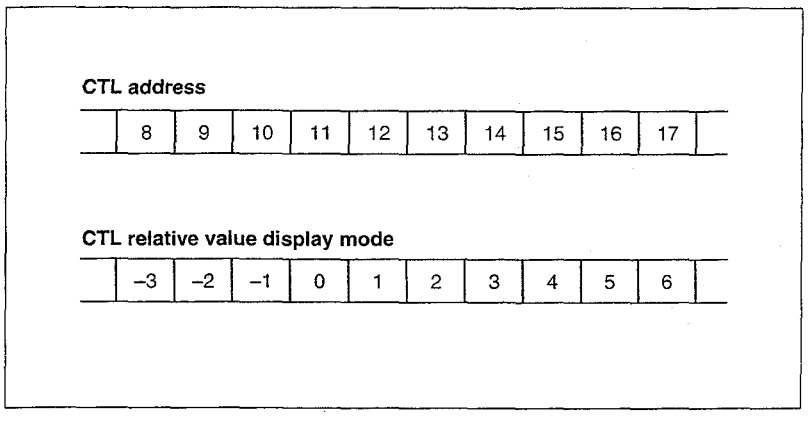
To release the muting signal recording state, press the ALL CHANNEL REC MUTE button again, turning it off.

3-2 Using the Timer

3-2-1 Timer Display Modes

The timer display has three modes for showing the tape time.

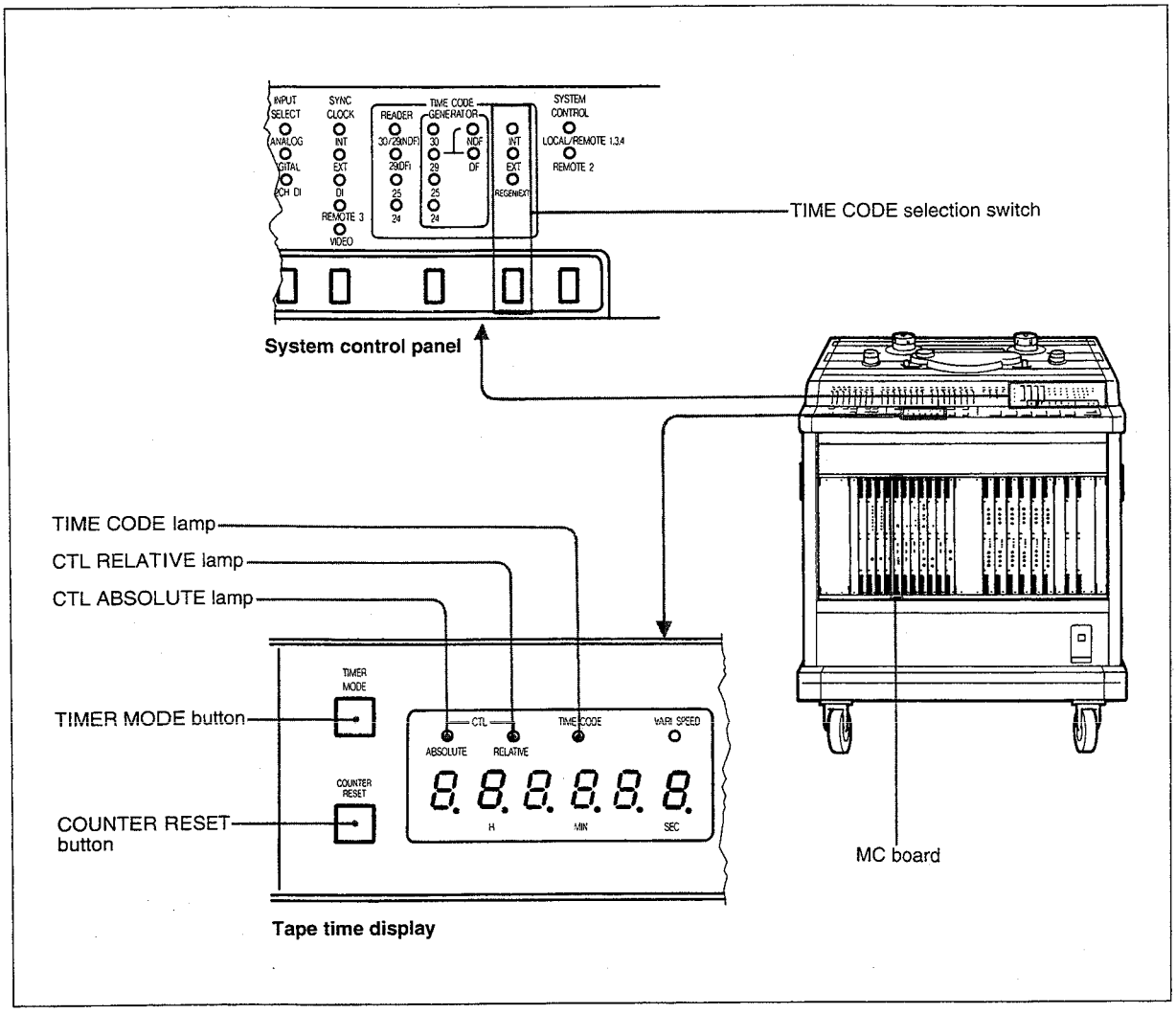
- **CTL absolute value display mode**
  This displays the CTL address exactly as recorded on the tape.
- **Time code absolute value display mode**
  This displays the time code directly, as produced by the internal time code generator, or the external time code or time code recorded on the tape.
- **CTL relative value display mode**
  This shows the tape running time from "0:00:00" at the CTL address set as the reference point. Values before the reference point are indicated as negative.



CTL relative value display mode

3-2-2 Setting the Timer Display Mode

Use the following procedure to set the timer display mode.



Buttons and lamps used for setting the timer display mode

Selecting CTL absolute mode

Press the TIMER MODE button so that the CTL ABSOLUTE lamp is lit.

When recording the CTL signal, for advance recording or assemble recording, for example, select this mode.

Selecting CTL relative mode

Use the following procedure to select CTL relative mode.

1 Press the TIMER MODE button so that the CTL RELATIVE lamp is lit.

2 Run the tape, and stop at the point to be used as the reference point.

3 Press the COUNTER RESET button.

The tape time display will change to "0:00:00".

With this setting, the tape time display now shows the tape travel from the reference point.

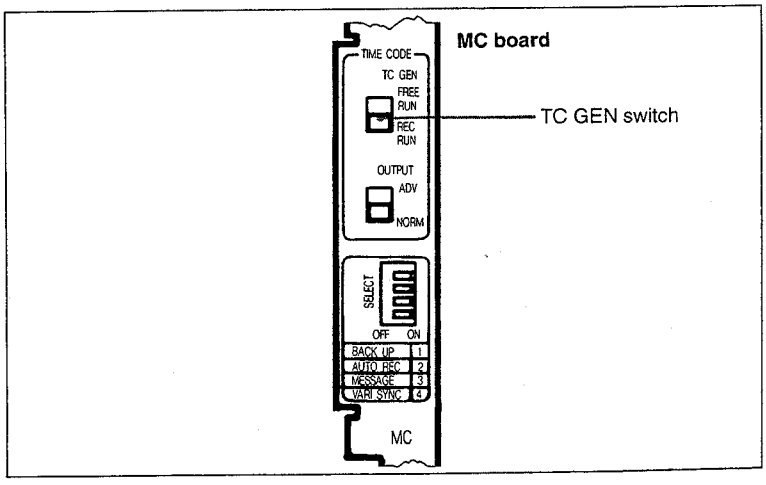
Setting the time code absolute value display mode

Use the following procedure to select the time code absolute value display mode.

1 Press the TIMER MODE button so that the TIME CODE lamp is lit.

2 With the TIME CODE selection switch on the system control panel, select any of INT, EXT, or REGEN(EXT) (when the DABK-3328 is fitted).

3 If you selected INT in the previous step **2**, use the TC GEN switch on the MC board to set the time code run mode to FREE RUN or REC RUN.



3-3 Recording Modes

The PCM-3324S has four recording modes.

- **Prestriping mode**
  Prestriping means recording CTL and time code tracks over the whole length of the tape before recording. This is necessary in order to use insert recording on a new tape.
- **Advance recording mode**
  In this mode the CTL signal and digital audio signals are recorded simultaneously; this is used principally for live recording. Fitting the DAH-24R Monitor Playback Head Kit (optional) allows simultaneous recording and playback.
- **Assemble recording mode**
  The audio signal and CTL signal are recorded together in sequence as the recording is made.
- **Insert recording mode**
  This mode uses a prestriped tape, already containing a CTL signal. The audio signal only is recorded on the digital audio tracks.

  The insert recording mode is normally used in a system with an RM-3324 or RM-3324S Remote Control Unit. For details refer to the Operation Manual for the RM-3324 or RM-3324S.

Normally, first use the prestriping mode to record the CTL and time code, then switch to insert recording mode to record the digital audio signals.

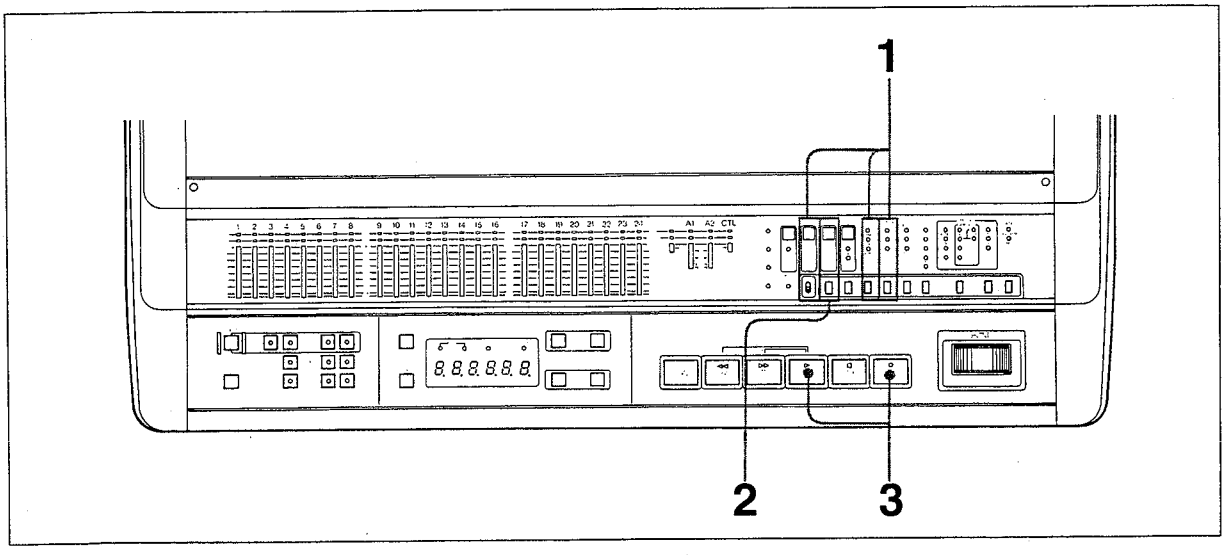
3-4 Prestriping

3-4-1 What Is Prestriping?

Prestriping means recording the CTL signal over the whole length of the tape before recording. This is necessary before using insert recording on a new tape. At the same time as recording the CTL signal, prestriping also writes the time code from the internal time code generator.

3-4-2 Prestriping Operation

Use the following procedure to carry out prestriping.



Prestriping operation

1 Set the switches as follows.
- MASTER SAFE switch: OFF
- SAMPLING FREQ switch: sampling frequency being used
- EMPHASIS switch: ON or OFF

2 Set the PRESTRIPE switch on the system control panel to ON.

The PRESTRIPE lamp flashes, and the REC MODE ADVANCE REC lamp lights.

3 Holding down the REC button, press the PLAY button.

The PRESTRIPE lamp and the REC lamps for all channels light, and prestriping is carried out at four times normal speed.

Prestriping erases any previously recorded signals on the analog audio channels A1 and A2. It also first erases the CTL channel and time code channel, then records the new values. Any recorded information on digital audio channels 1 to 24 is also lost.

The start points for the CTL and time code values written by prestriping are as follows.

CTL: 10 seconds before $00_{H}00_{MIN}00_{SEC}$
Time code: $00_{H}59_{MIN}50_{SEC}$

Selecting different start points for the CTL and time code values

Use the following procedure.

1 Set the PRESTRIPE switch to ON.

2 Use the TIMER MODE button to select the CTL absolute value, CTL relative value or time code for the timer display mode.

3 On the RM-3324 or RM-3324S Remote Control Unit, enter the desired time using the numeric keypad, then press the " ↑ " button.

This transfers the input time to the tape time display.

3-5 Advance Recording

3-5-1 What Is Advance Recording?

Regardless of any existing signals recorded on the tape, the CTL signal, time code signal and digital audio signals are recorded simultaneously.
This mode is used for live recording.
Fitting the DAH-24R Monitor Playback Head Kit (optional) provides a simultaneous monitor output for the recorded signal (simultaneous recording and playback).

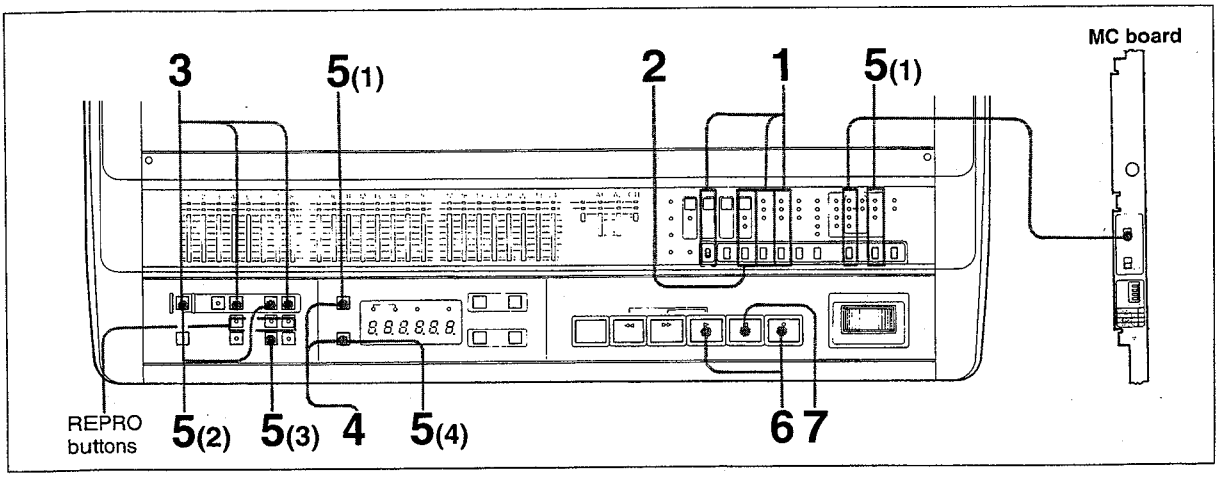
Note

Normally, simultaneous recording and playback is only possible during advance recording. However, setting the fourth jumper from the top on the MC board to the left enables simultaneous recording and playback for recording on a prestriped tape.

For details see "MC board" (page A-16) in the appendixes.

3-5-2 Basic Advance Recording

Use the following procedure to carry out advance recording.



Advance recording operation

Using the internal time code generator

1 Set the switches as follows.
- MASTER SAFE switch: OFF
- SAMPLING FREQ switch: sampling frequency being used
- EMPHASIS switch: ON or OFF

2 Set the REC MODE switch on the system control panel to ADVANCE REC.

3 Holding down the SET button, press the ALL CHANNEL REC READY button, to put all digital audio channels in the recording ready state.

If recording on analog audio channels A1 and A2, holding down the SET button, press the A1 A2 REC READY button, to put channels A1 and A2 in the recording ready state.

The ALL CHANNEL REC READY button (and the A1 A2 REC READY button) lights.

4 With the TIMER MODE switch, select CTL ABSOLUTE, and press the COUNTER RESET button to set the tape time display to "$00_H00_{MIN}00_{SEC}$".

The tape timer display switches momentarily to "$00_H00_{MIN}00_{SEC}$", then returns to its previous value.

5 **(1)** Set the switches as follows.

- TIMER MODE switch: TIME CODE
- TIME CODE selection switch: INT
- TIME CODE format selection switch: desired format
- TC GEN switch on the MC board: REC RUN

(2) Holding down the SET button, press the TIME CODE REC READY button, to set the time code channel to the recording ready state.

The TIME CODE REC READY button lights.

(3) Press the TIME CODE INPUT button, turning it on.

(4) Press the COUNTER RESET button to reset the internal time code generator to "$00_H00_{MIN}00_{SEC}$".

6 Holding down the REC button, press the PLAY button.

The REC lamps for all channels light, and recording starts. The signal level for each channel is displayed on the respective level meter.

7 When the recording is finished, continue recording for approximately 30 seconds, then press the STOP button to stop recording.

For simultaneous playback while recording

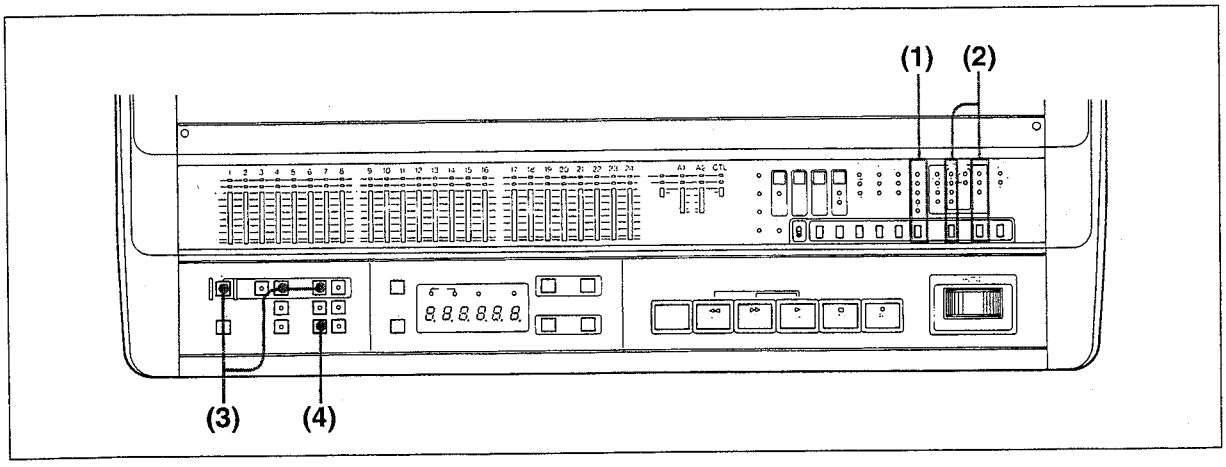
Press the ALL CHANNEL, TIME CODE, A1 or A2 REPRO buttons. The buttons pressed light, and you can simultaneously monitor the playback of the signal being recorded.

Note

Simultaneous playback and recording is not possible unless you have installed the DAH-24R Monitor Playback Head Kit (optional).

Using an external time code

In place of step **5** of the procedure "Using the internal time code generator" (page 3-13) use the following procedure.



Using an external time code

(1) Use the SYNC CLOCK switch on the system control panel to set the synchronizing signal to VIDEO, to synchronize the PCM-3324S to an external composite video signal.

(2) Set the switches as follows.

- TIME CODE selection switch: REGEN(EXT) (when DABK-3328 board is fitted) or EXT
- TIME CODE format selection switch: format of the external time code

(3) Holding down the SET button, press the TIME CODE REC READY button, to set the time code channel to the recording ready state.

The TIME CODE REC READY button lights.

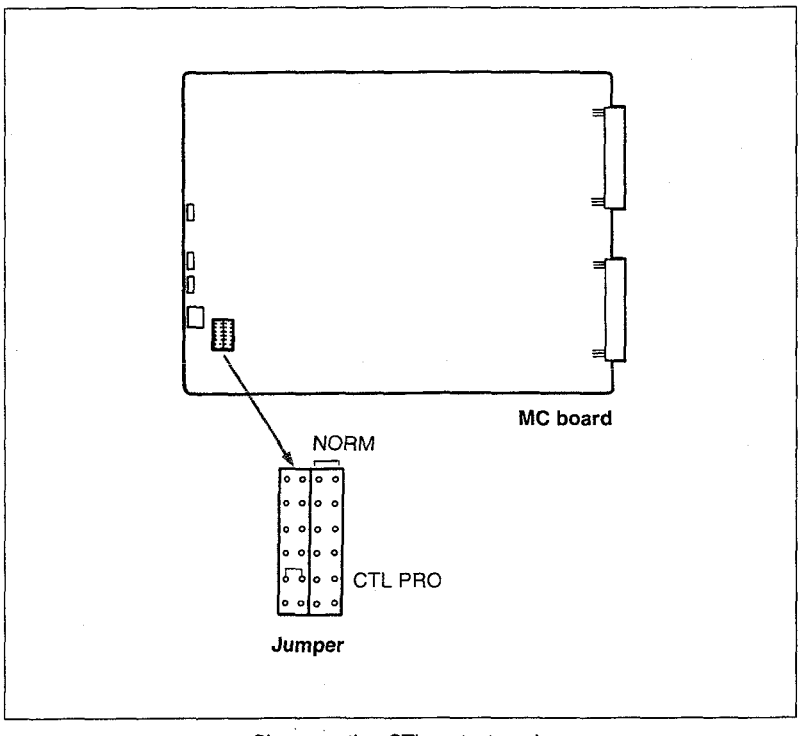
(4) Press the TIME CODE INPUT button, to confirm time code input.

If the recording starts from a CTL address other than "$00_H00_{MIN}00_{SEC}$" using advance recording

At the beginning of recording, if you press the PLAY button before the REC button, the CTL address continues from the value recorded on the tape.

CTL protect mode

If you record the CTL signal on a tape which already contains a digital audio signal recording, that digital audio signal will no longer be able to be played back. To prevent an operational error from losing recorded information in this way, in the advance recording mode recording is not possible unless all digital audio channels are in the recording ready state. This is termed "CTL protect mode".
If this restriction is inconvenient for operating requirements, you can circumvent it, by switching the CTL PRO jumper on the MC board to the left.

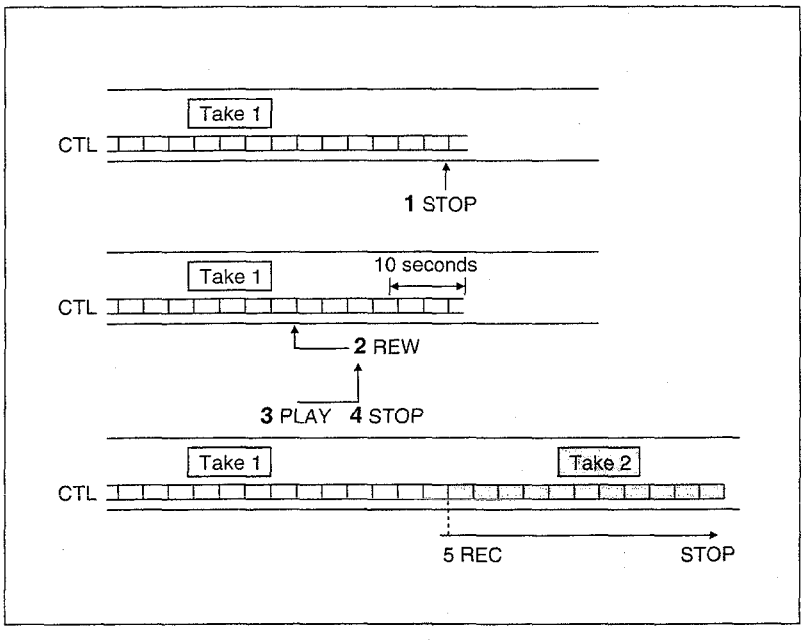


Circumventing CTL protect mode

3-5-3 Playing Back while Recording Consecutive Takes

Function

In advance recording mode, if you stop recording temporarily, then continue with the next take on the portion of the tape which does not already have the CTL signal written on it, it is possible to arrange that the CTL addresses appear to continue successively.
Simultaneous playback and recording is also possible (when the DAH-24R is fitted).



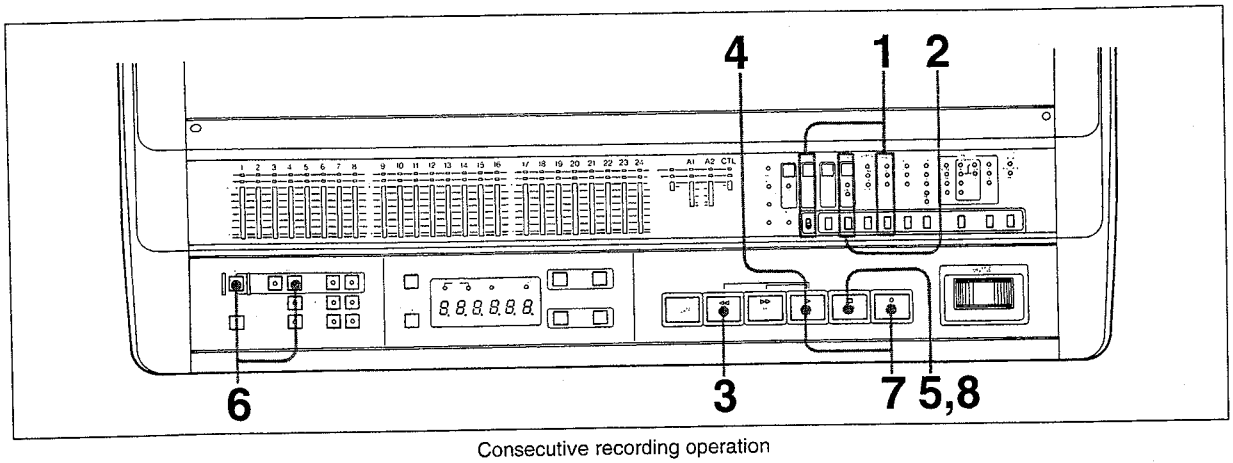
Consecutive recording in advance recording mode

Note

When the CTL address is recorded using this method, you can still use the locate function, but since the actual CTL signals are not continuous, it is not possible to dub a new section of recording to straddle the discontinuity.
If it is necessary to dub in this way, use assemble recording. In this case, however, simultaneous monitoring of the playback signal is not possible.

Procedure

Use the following procedure to carry out consecutive recording in advance recording mode.



Consecutive recording operation

1 Set the switches as follows.
- MASTER SAFE switch: OFF
- EMPHASIS switch: ON or OFF

2 Set the REC MODE switch on the system control panel to ADVANCE REC.

3 Press the REW button to rewind the tape to the previously recorded take.

4 Press the PLAY button, and replay the previous take.

The CTL signal is now being read from the tape.

5 Approximately 10 seconds before the end point of the recording, press the STOP button and stop the tape.

6 Holding down the SET button, press the ALL CHANNEL REC READY button, putting all digital audio channels in the recording ready state.

The ALL CHANNEL REC READY button lights.

7 Holding down the REC button, press the PLAY button.

The REC lamps for all digital audio channels light, and recording starts. The signal level for each channel is displayed on the respective level meter.

8 When the recording is finished, continue recording for approximately 30 seconds, then press the STOP button to stop recording.

3-6 Assemble Recording

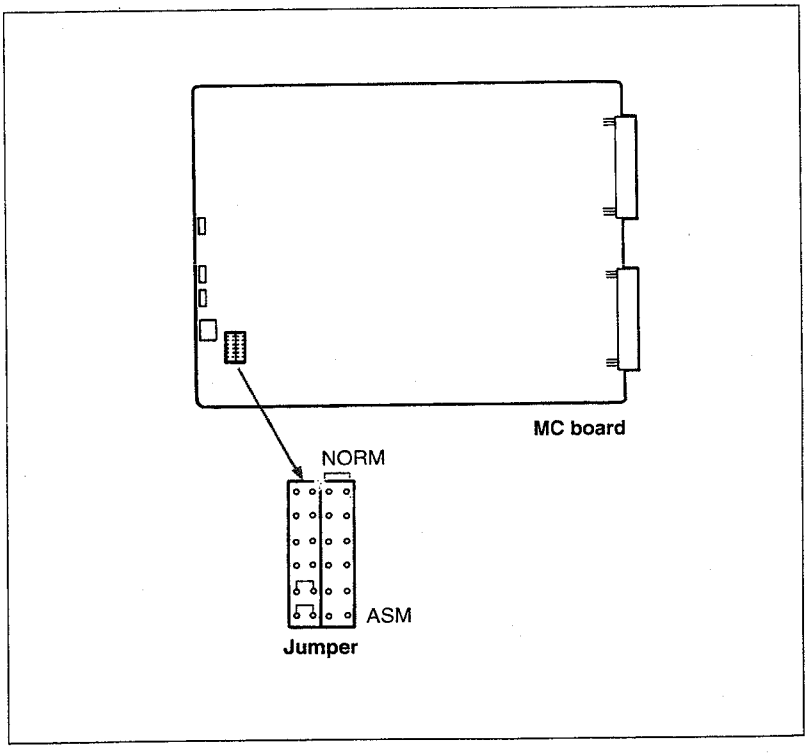
3-6-1 What Is Assemble Recording?

In assemble recording, as in advance recording, the digital audio signals and CTL signals are recorded simultaneously, but unlike advance recording, the CTL addresses can be recorded consecutively on the tape.
In order to be able to dub a new recording over two previously recorded sections (insert recording), it is necessary to use assemble recording.

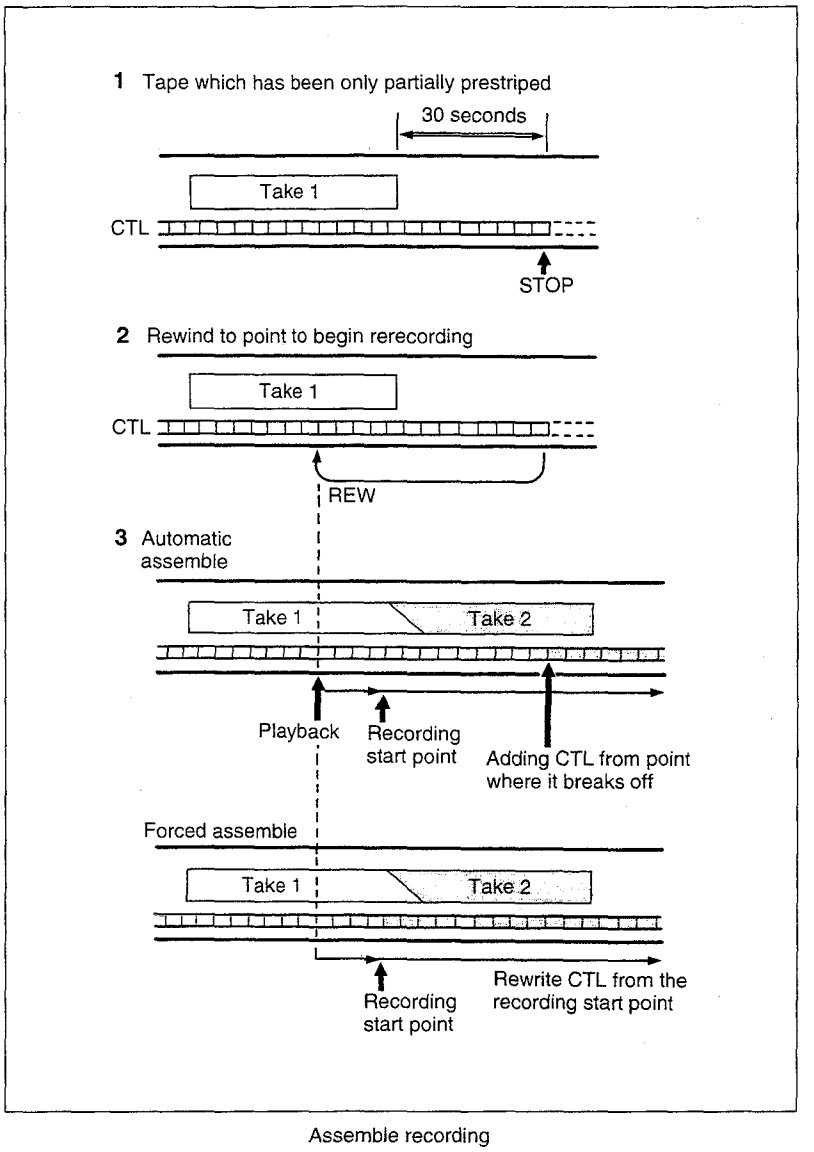
In assemble recording there are two ways of adding the CTL signal, as follows:

- **Automatic assemble recording:** the CTL signal continues from where it was broken off.
- **Forced assemble recording:** the CTL signal is overwritten from the beginning of the recording.

The unit is factory set to the automatic assemble recording mode.
To select forced assemble recording, switch the ASM jumper on the MC board to the left.



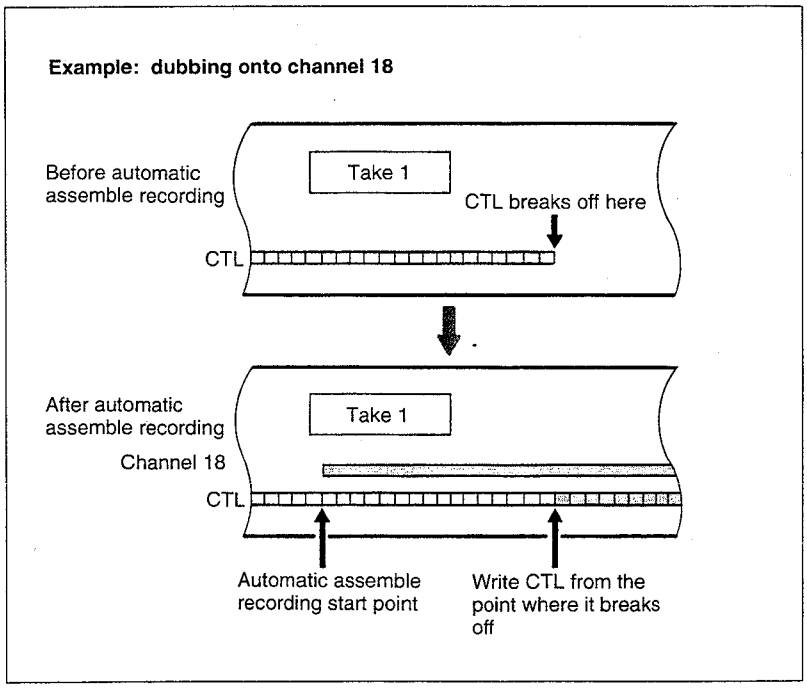
Selecting forced assemble recording



Assemble recording

Automatic assemble recording

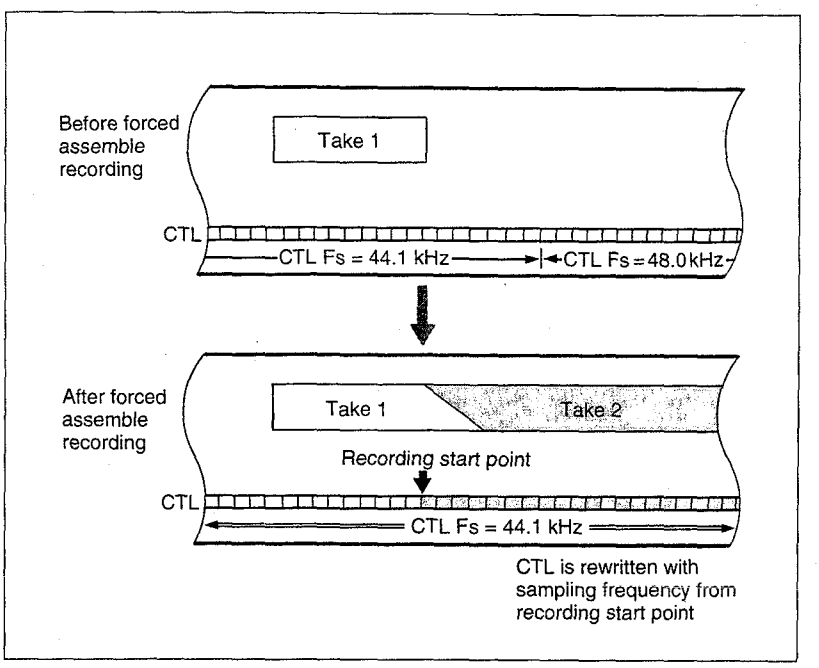
In automatic assemble recording the CTL signal is added from where it was broken off.
For example, to dub one channel onto a tape which has been only partially prestriped, use the RM-3324 or RM-3324S Remote Control Unit to set that channel only into the recording ready state, and carry out an automatic assemble recording.
Since the CTL signal and audio signals can be recorded in a single pass, this method saves operation time when compared with insert recording where the complete CTL signal is recorded before the digital audio signals.



Automatic assemble recording

Forced assemble recording

In forced assemble recording, CTL is rewritten from the recording start point.
The CTL track is written following the sampling frequency at the recording start point. Therefore, even if the sampling frequency of the CTL being recorded changes, there is no need for prestriping. In this case, however, all digital audio channels must be in the recording ready state.



Forced assemble recording

3-6-2 Assemble Recording Operation

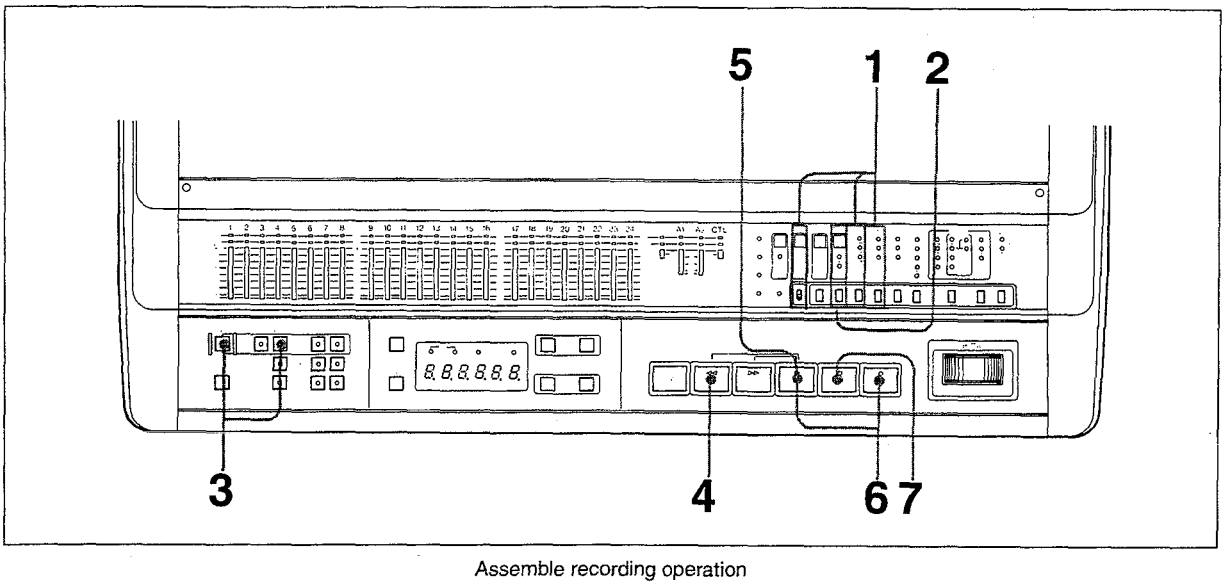
Preparations

Set the ASM jumper on the MC board to automatic assemble or forced assemble, as required.

For the position of the ASM jumper, see page 3-18.

Procedure

Use the following procedure to carry out assemble recording.



Assemble recording operation

1 Set the switches as follows.
- MASTER SAFE switch: OFF
- SAMPLING FREQ switch: sampling frequency being used
- EMPHASIS switch: ON or OFF

2 Set the REC MODE switch on the system control panel to ASSEMBLE.

3 Holding down the SET button, press the ALL CHANNEL REC READY button, to put all digital audio channels in the recording ready state.

The ALL CHANNEL REC READY button lights.

4 Press the REW button to rewind the tape to the previously recorded sound.

5 Press the PLAY button, and replay the previous sound.

The CTL signal is now being read from the previous take.

6 Holding down the REC button, press the PLAY button.

The REC button and the REC lamps for all digital audio channels light, and recording starts.
The signal level for each channel is displayed on the respective level meter.

7 When the recording is finished, continue recording for approximately 30 seconds, then press the STOP button to stop recording.

Notes on automatic assemble recording

Always start automatic assemble recording from a point on the tape where the CTL is recorded.
In automatic assemble recording, the unit checks that CTL is recorded when the REC button is pressed. If there is no CTL recorded, the SYSTEM ALARM lamp lights, and the tape time display shows the error code "E.04-14". It is not possible to continue the operation.

Using a previously recorded tape
In assemble recording, the playback head reads the CTL signal from the tape while the recording head is writing new CTL values to the tape. When using a previously recorded tape, the existing CTL values appear on the tape time display, and therefore these displayed values may not necessarily be the same as the values being recorded.

Using CTL protect mode in forced assemble recording
During forced assemble recording, as in advance recording mode, the CTL protect mode is selected by default, and recording is not possible unless all digital audio channels are in the recording ready state.
If this restriction is inconvenient for operating requirements, you can circumvent it, by switching the CTL PRO jumper on the MC board to the left.

For details of the CTL PRO jumper position, see page 3-15.

3-7 Analog Audio Channel Recording and Playback

3-7-1 Signals Recorded on the Analog Audio Channels

Analog audio channels A1 and A2 record the signals input to the ANALOG A1/A2 INPUT connectors on the rear panel.
You can use these recorded signals for cuing during editing.

Note

To increase the signal-to-noise ratio, the analog audio channels use a compander. Therefore, in order to record a pulse signal, it must meet the following conditions.

- Pulse width (attack time plus margin): 5 ms minimum
- Pulse cycle time (release time): 13.5 ms maximum

Automatic recording of analog audio channels

The PCM-3324S has an automatic recording mode for the analog audio channels. In this mode, if you begin playback with the analog audio channels set to the recording ready state, the signals input to the ANALOG A1/A2 INPUT connectors are automatically recorded on the analog audio channels.
Select the automatic recording mode using SELECT switch No. 2 (AUTO REC) on the MC board. When automatic recording mode is selected, the SYSTEM WARNING lamp lights, and the tape time display shows the warning code "InF 01".
ON: automatic recording mode selected
OFF: automatic recording mode disabled (factory setting)

For details of the SELECT switch position, see "MC board" (page A-16).

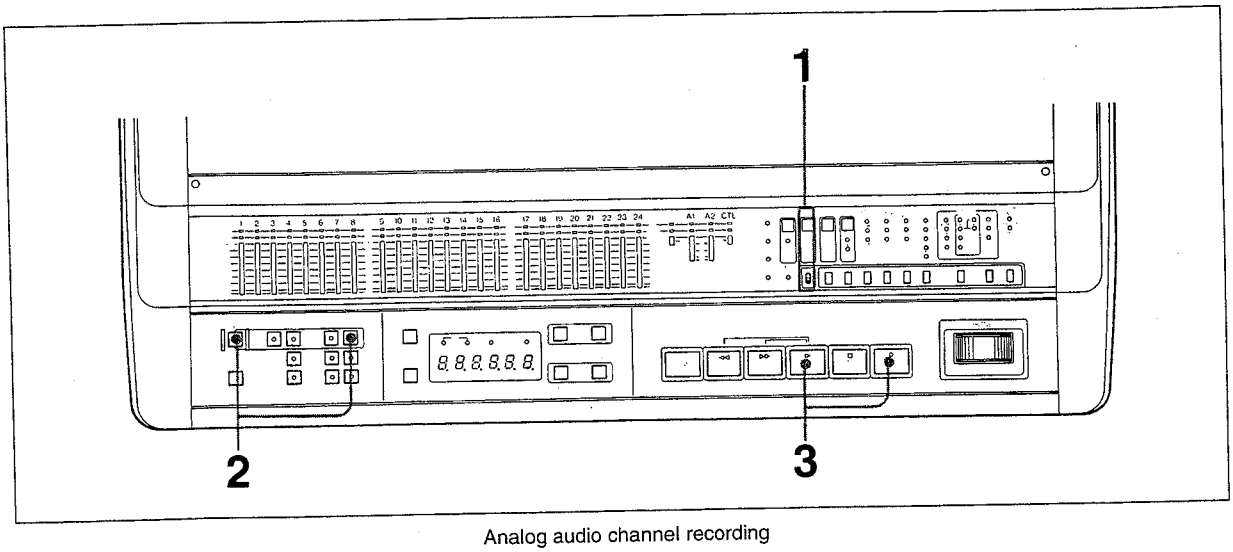
3-7-2 Analog Audio Channel Recording

Preparations

It is not possible to make a direct rerecording on analog audio channels recorded on the PCM-3324A/3324. First record muting signals on the analog audio channels on the PCM-3324A/3324, or prestripe the tape again before recording.

Procedure

Use the following procedure to record on the analog audio channels.



Analog audio channel recording

1 Set the MASTER SAFE switch to the OFF position.

2 Holding down the SET button, press the A1 A2 REC READY button, to put channels A1 and A2 in the recording ready state.

The A1 A2 REC READY button lights.

3 Holding down the REC button, press the PLAY button. (If using automatic recording mode, press only the PLAY button.)

The REC lamps for channels A1 and A2 light, and recording starts.

3-7-3 Analog Audio Channel Playback

Monitoring during insert or assemble recording

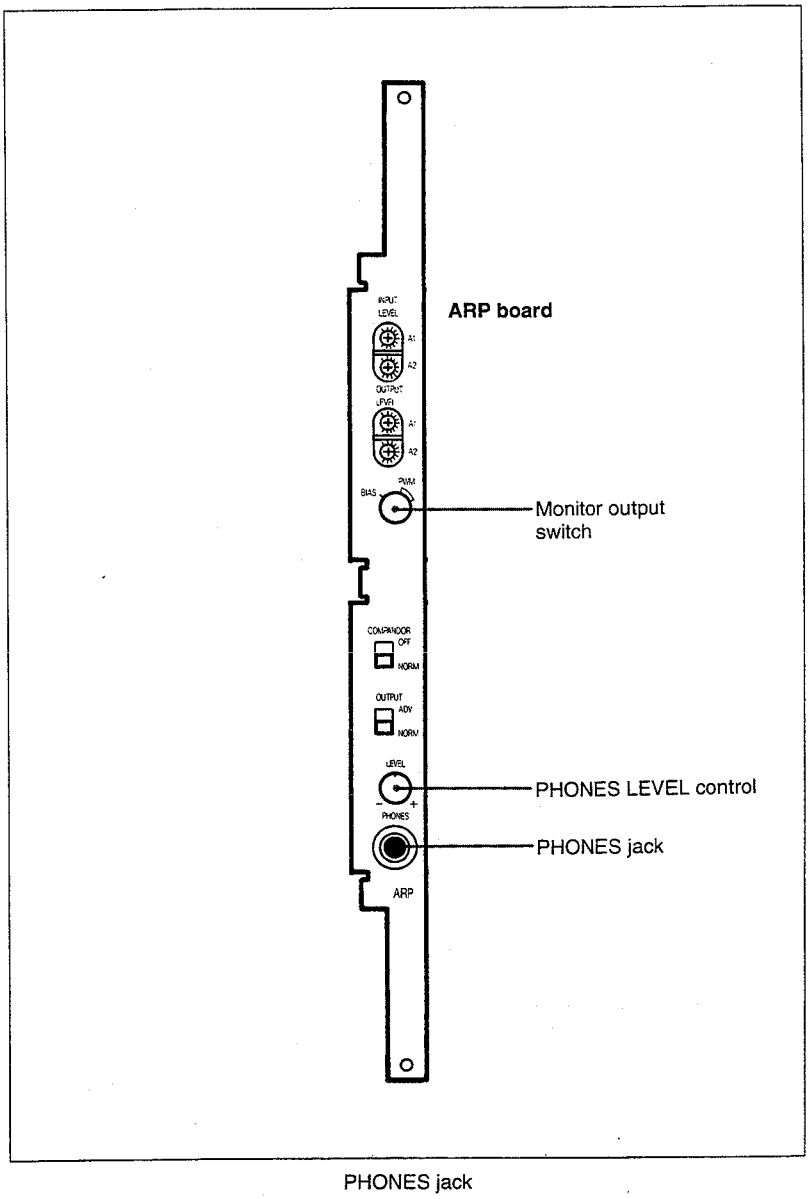
During recording the input signal is monitored.

Switching the monitor output automatically depending on the tape transport state

Press the AUTO INPUT button, turning it on.
The monitor output is then automatically switched according to the table on page 3-5.

Monitoring with headphones

You can monitor the sound on the analog audio channels using headphones.
Connect headphones of at least 8 Ω impedance to the PHONES jack on the ARP board panel. Adjust the volume with the PHONES LEVEL control.



PHONES jack

Playing back analog audio channels recorded on the PCM-3324A/3324

Set the monitor output switch on the ARP board to the BIAS position.

3-8 Time Code Channel Recording and Playback

3-8-1 Time Code Overview

SMPTE/EBU time code channel

This channel is recorded in-line with the digital audio channels during dubbing (insert recording), assemble recording, and advance recording. You can therefore playback the time code recorded on this channel and use it as the time code reference for a synchronizer or mixing console.

Built-in time code generator

- The SMPTE/EBU time code generator/reader is built in, so an external time code generator is not required.
- Select the time code format from the following options:
  – 30 NDF: 30 frames/s, non-drop frame (NTSC)
  – 29 NDF: 29.97 frames/s, non-drop frame (NTSC)
  – 29 DF: 29.97 frames/s, drop frame (NTSC)
  – 25: 25 frames/s (PAL)
  – 24: 24 frames/s (film)
- If you have installed the DABK-3328 Time Code Reader Board (optional), it is possible to generate a time code locked to an external time code read by the time code reader or the playback time code (regeneration).
- If you have installed the DABK-3328 Time Code Reader Board (optional), when using the PCM-3324S synchronized to an external composite video signal, it is possible to synchronize the sync phase of the composite video signal and the sync phase of the playback time code (time code sync playback).
  This is convenient when using the PCM-3324S as the master unit together with a video system.
- The tape time is displayed according to the time code. However, the following restrictions apply when the DABK-3328 Time Code Reader Board is not installed.
  – Playback time code: displayed only during playback
  – External time code: only displayed accurately when the tape transport is operating at normal speed (during variable speed operation the display of an external time code cannot be guaranteed).
  If you fit the DABK-3328 board, you can also carry out locate operations using the time code.

Time code output during fast forward and rewind

While the PCM-3324S is carrying out a fast tape transport operation (fast forward, rewind or locate), a tape shifter mechanism moves the tape away from the heads to protect them. If you have installed the DABK-3328 Time Code Reader Board (optional), even with the tape away from the heads, the internal interpolation function still operates, and the TIME CODE OUTPUT connector outputs a continuous time code.

Reading the time code during fast forward and rewind

If you set the HEAD jumper on the MC board to the left, the time code is read even during fast forward and rewind.

For details, see "MC board" (page A-17).

Time code recording methods

The PCM-3324S provides three methods of recording the time code:

- **External time code through recording**
  In this method the external time code input to the TIME CODE INPUT connector on the rear panel is recorded directly.
- **External time code regenerated recording**
  In this method the external time code input to the TIME CODE INPUT connector on the rear panel is regenerated by the internal time code generator, then recorded.
  To use this method requires the DABK-3328 Time Code Reader Board (optional).
- **Internal time code recording**
  This method records the time code generated by the internal time code generator.

Time code playback methods

The PCM-3324S provides three methods of time code playback:

- **Time code through playback**
  In this method the time code recorded on the time code channel is played back unaltered.
- **Time code regenerated playback**
  In this method the time code recorded on the time code channel is regenerated then played back.
  To use this method requires the DABK-3328 Time Code Reader Board (optional).
- **Time code sync playback**
  When using the PCM-3324S synchronized to an external composite video signal, the time code is output with its phase synchronized to the sync phase of the composite video signal.
  Time code sync playback requires the following conditions to be met:
  - There must be a time code recorded on the tape which is synchronized to the composite video signal.
  - The DABK-3328 Time Code Reader Board (optional) must be installed.

External synchronization with a composite video signal

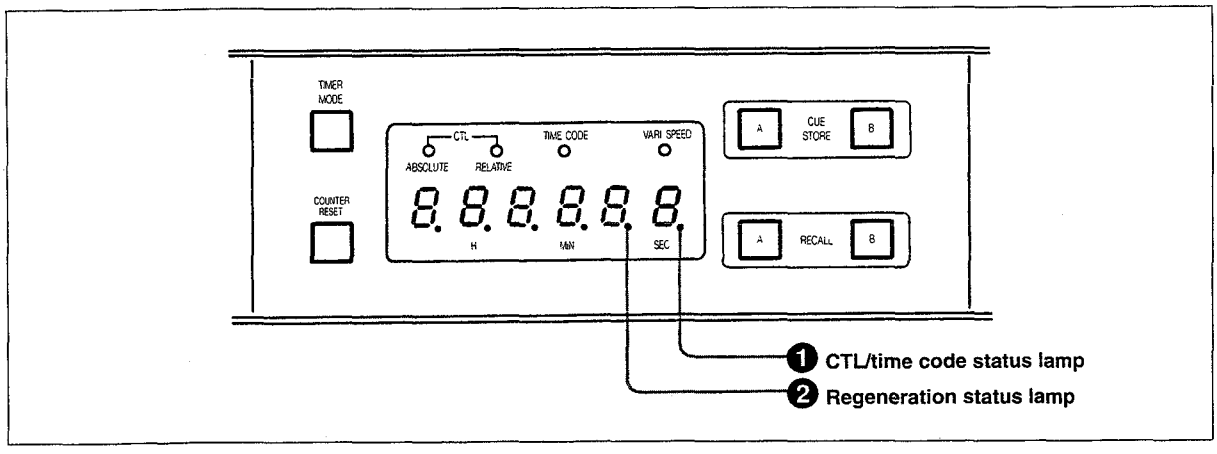
If the PCM-3324S is synchronized with an external composite video signal, regardless of whether it was synchronized with the composite video signal during prestriping, using the internal time code generator, a time code signal synchronized with the CTL signal can be recorded at any time.

Playback and recording of a time code channel recorded on the PCM-3324A/3324

- The time code can be played back directly.
- When recording by advance recording, rerecording is immediately possible.
- When recording by assemble recording or insert recording, rerecording is not immediately possible. Muting signal must first be recorded on the PCM-3324A/3324.

3-8-2 Switches and Lamps Used for Time Code Recording and Playback

Tape time display



Tape time display

❶ CTL/time code status lamp

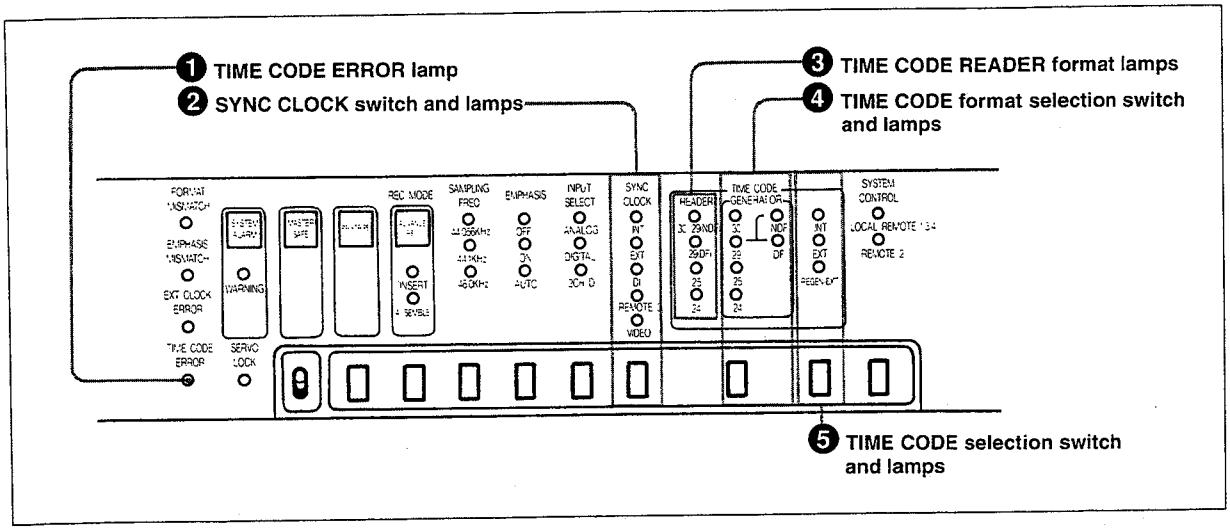
This lights when the following signals are displayed. It goes off if a signal error occurs.

- Playback CTL
- Playback time code
- External time code

❷ Regeneration status lamp
This lights when the built-in time code generator is regenerating the following signals, which are displayed. It goes off if a regeneration error occurs. This lamp is only effective when the optional DABK-3328 board is fitted.

- Playback time code
- External time code

System control panel



System control panel

❶ TIME CODE ERROR lamp
This lights when one of the following formats does not match.

- Playback time code format
- Format selected by the TIME CODE format selection switch ❹
- External time code format

❷ SYNC CLOCK switch and lamps
Select the reference signal for the PCM-3324S from among the following:

INT: internal master clock
EXT: signal input to the WORD SYNC INPUT connector on the rear panel
DI: signal input to the AES/EBU D-I connector (when the DABK-3327 board is fitted)
REMOTE 3: synchronizing signal supplied via the RM-3324 (when DABK-3323 board is fitted)
VIDEO: video signal input to the REFERENCE VIDEO INPUT connector on the rear panel

❸ TIME CODE READER format lamps

These indicate the following formats:

- When the monitor output is the playback signal: playback time code format
- When the monitor output is the input signal, and the TIME CODE selection switch ❺ is set to EXT: external time code format

Note

When using functions related to time code, make sure that one of the TIME CODE READER format lamps is lit.
One of these lamps lights when the time code format on the tape is read while the tape is played back.

❹ TIME CODE format selection switch and lamps

Select the format for the built-in time code generator from among the following:

- **30 NDF:** 30 frames/s, non-drop frame (NTSC)
- **29 NDF:** 29.97 frames/s, non-drop frame (NTSC)
- **29 DF:** 29.97 frames/s, drop frame (NTSC)
- **25:** 25 frames/s (PAL)
- **24:** 24 frames/s (film)

The lamps show the following formats:

- When the TIME CODE selection switch ❺ is set to INT or EXT: format of the built-in time code generator
- When the TIME CODE selection switch ❺ is set to REGEN(EXT): format of the external time code

When regenerating the external time code, it is not possible to change the format.

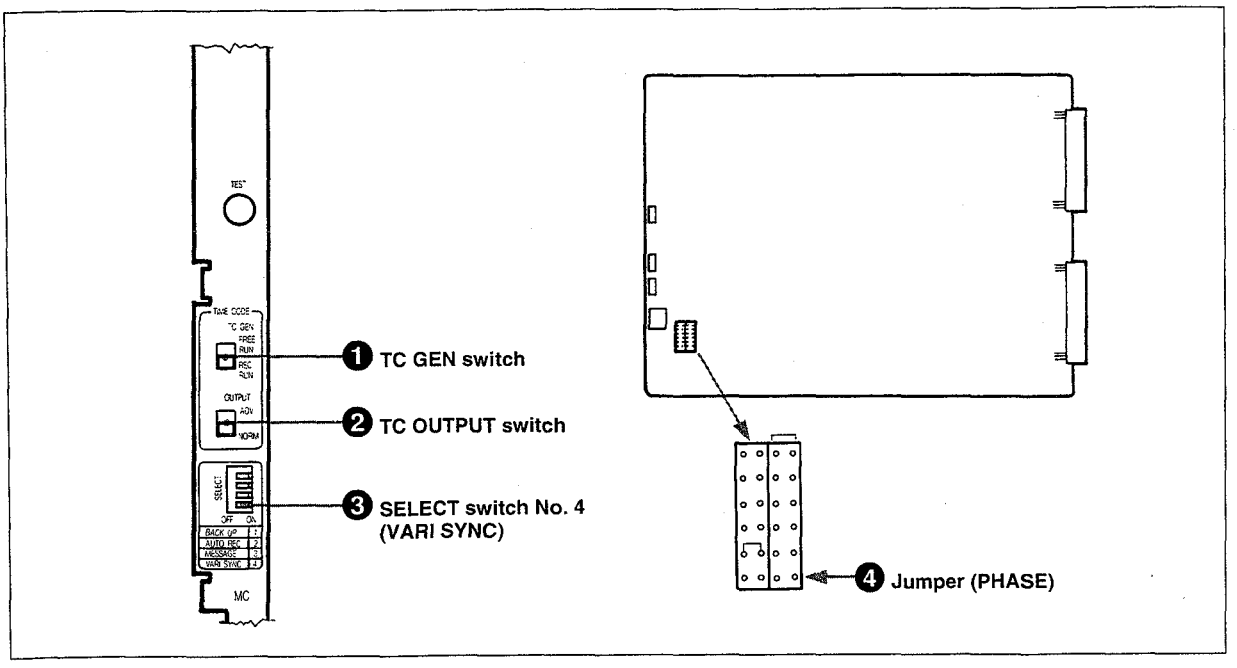
❺ TIME CODE selection switch and lamps

Select the time code to be recorded on the time code channel from among the following:

- **INT:** internal time code
- **EXT:** external time code
- **REGEN(EXT):** time code regenerated by the built-in time code generator locked to the external time code (when the DABK-3328 board is fitted)

The lamps show the setting of the TIME CODE selection switch.

MC board



MC board

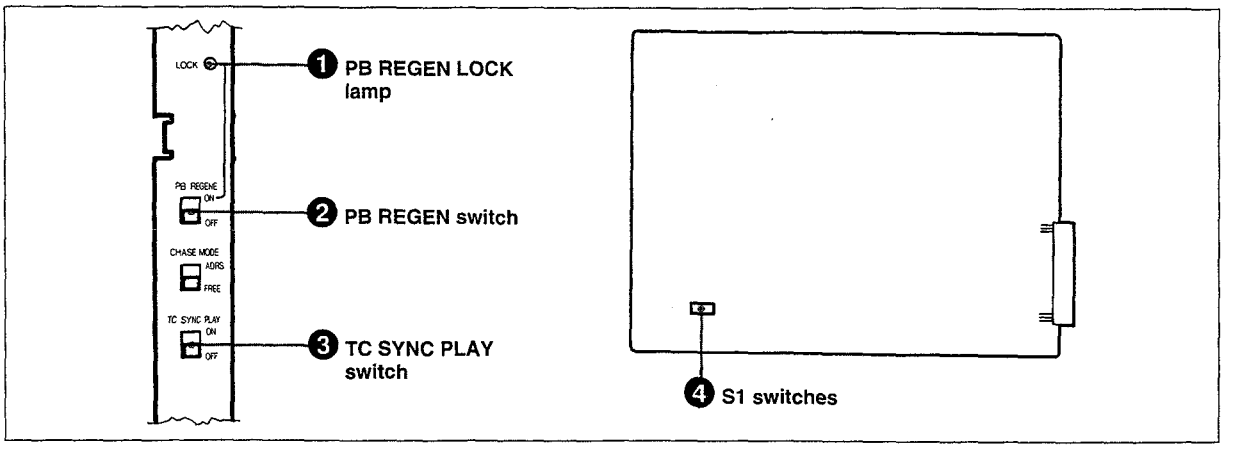
❶TC GEN (time code generator) switch
Select the advancement mode for the time code.
REC RUN: the time code only advances while the PCM-3324S is actually recording.
FREE RUN: as long as the PCM-3324S is powered on, the time code advances irrespective of whether or not it is recording.

❷TC (time code) OUTPUT switch
Select the time code output timing.
NORM: the time code is output at the in-line point.
ADV: the time code is output ahead of the in-line point.

❸SELECT switch No. 4 (VARI SYNC)
This selects whether the vari sync function is on or off during time code sync playback (when the DABK-3328 board is fitted).
When this switch is off, the sector sync function is enabled.

❹Jumper (PHASE)
This enables or disables the phase correction function of the built-in time code generator.
Right: on
Left: off

DABK-3328 Time Code Reader (TCR) Board (optional)



TCR (DABK-3328) board

❶PB REGEN (playback time code regeneration) LOCK lamp
This lights when a playback time code is input, and is being correctly regenerated. If the playback time code ceases to be input, this lamp goes off even if the regeneration continues.

❷PB REGEN (playback time code regeneration) switch
Select whether or not to regenerate the playback time code.
ON: regenerate the playback time code, and output it from the TIME CODE OUTPUT connector.
OFF: output the playback time code unaltered from the TIME CODE OUTPUT connector.

❸TC (time code) SYNC PLAY switch
This enables or disables time code sync playback. When using time code sync playback, use SELECT switch No. 4 (VARI SYNC) on the MC board to set the vari sync function on or off.

❹S1 switches
No. 1: switches on or off the time code interpolation function during fast forward and rewind.
No. 2: When the playback time code is in NTSC format, this selects the frame frequency for the time code interpolation output during fast forward and rewind.
ON: 30 Hz.
OFF:29.97 Hz (NDF/DF).
This swich has no effect except for NTSC format.
No. 3: selects whether the output from the TIME CODE OUTPUT connector should be only the regenerated playback time code.
ON: output the regenerated playback time code only if the PB REGEN switch ❷ is on, and the PB REGEN LOCK lamp ❶ is lit. Under all other conditions, there is no output.
OFF: regardless of the setting of the PB REGEN switch ❷,

output the selected time code. (normal setting) When this swich is off, swiching from the playback time code to the regenerated output causes an instantaneous bit error.

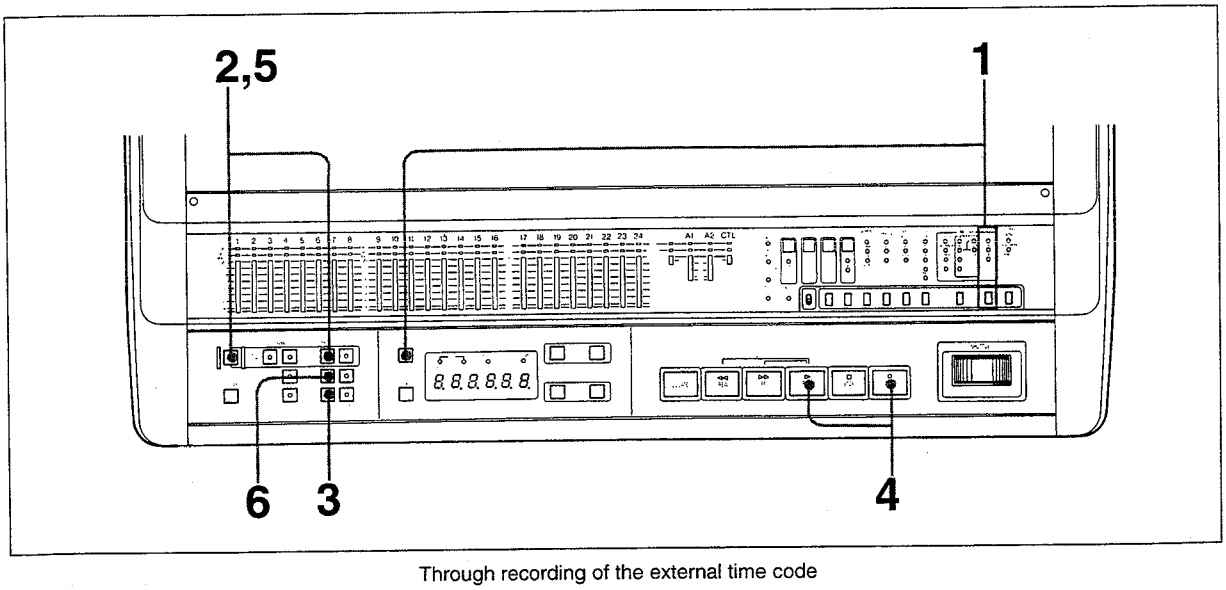
3-8-3 Through Recording of the External Time Code

Function

This function records the external time code input to the TIME CODE INPUT connector unaltered on the time code channel.

Procedure

Use the following procedure to record the external time code unaltered.



Through recording of the external time code

1 Set the switches as follows.
- TIMER MODE switch: TIME CODE
- TIME CODE selection switch: EXT

2 Holding down the SET button, press the TIME CODE REC READY button to put the time code channel in the recording ready state.

The TIME CODE REC READY button lights.

3 Press the TIME CODE INPUT button, turning it on.

The TIME CODE channel level meter shows the input level and the tape time display shows the external time code.

4 Holding down the REC button, press the PLAY button.

The TIME CODE REC lamp lights, and recording begins.

5 When the recording is completed, holding down the SET button, press the TIME CODE REC READY button, which will then go off.

6 Press the TIME CODE REPRO button, to set the monitor output to the playback signal.

3-8-4 Recording the Regenerated External Time Code

Function

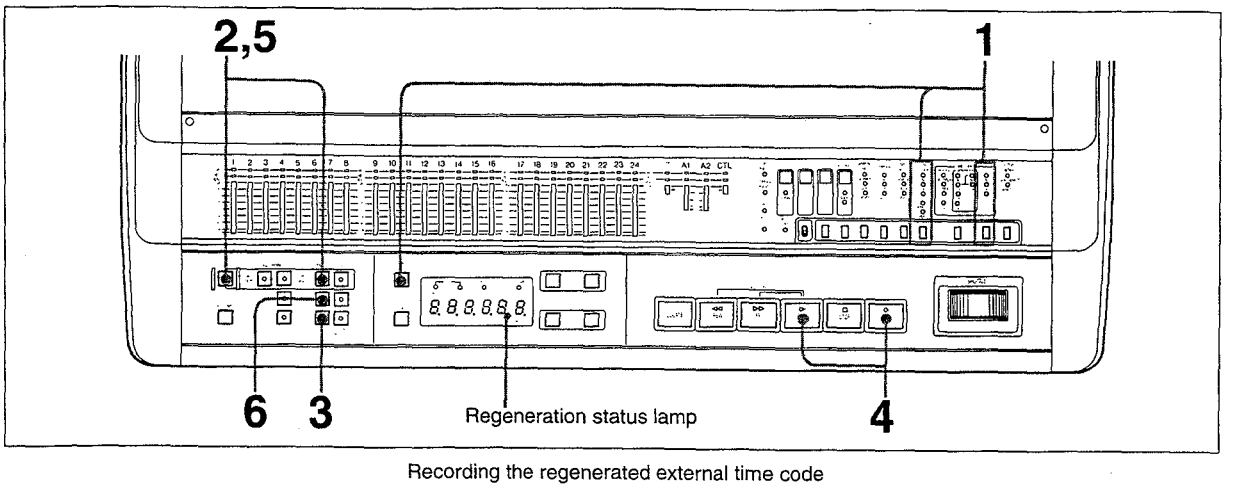
This function records the regenerated external time code which has been input to the TIME CODE INPUT connector on the rear panel.

Notes

- This function requires the DABK-3328 Time Code Reader Board.
- If the tape speed is other than normal speed, this function defaults to through recording.

Procedure

Use the following procedure to record the regenerated external time code.



Recording the regenerated external time code

1 Set the switches as follows.
- TIMER MODE switch: TIME CODE
- SYNC CLOCK switch: VIDEO
- TIME CODE selection switch: REGEN(EXT)

2 Holding down the SET button, press the TIME CODE REC READY button, putting the time code channel in the recording ready state.

The TIME CODE REC READY button lights.

3 Press the TIME CODE INPUT button, turning it on.

The TIME CODE channel level meter shows the input level and the tape time display shows the external time code. If the regenerate operation is normal, the regeneration status lamp in the tape time display lights.

4 Holding down the REC button, press the PLAY button.

The TIME CODE REC lamp lights, and recording begins.

5 When the recording is completed, holding down the SET button, press the TIME CODE REC READY button, which will then go off.

6 Press the TIME CODE REPRO button, to set the monitor output to the playback signal.

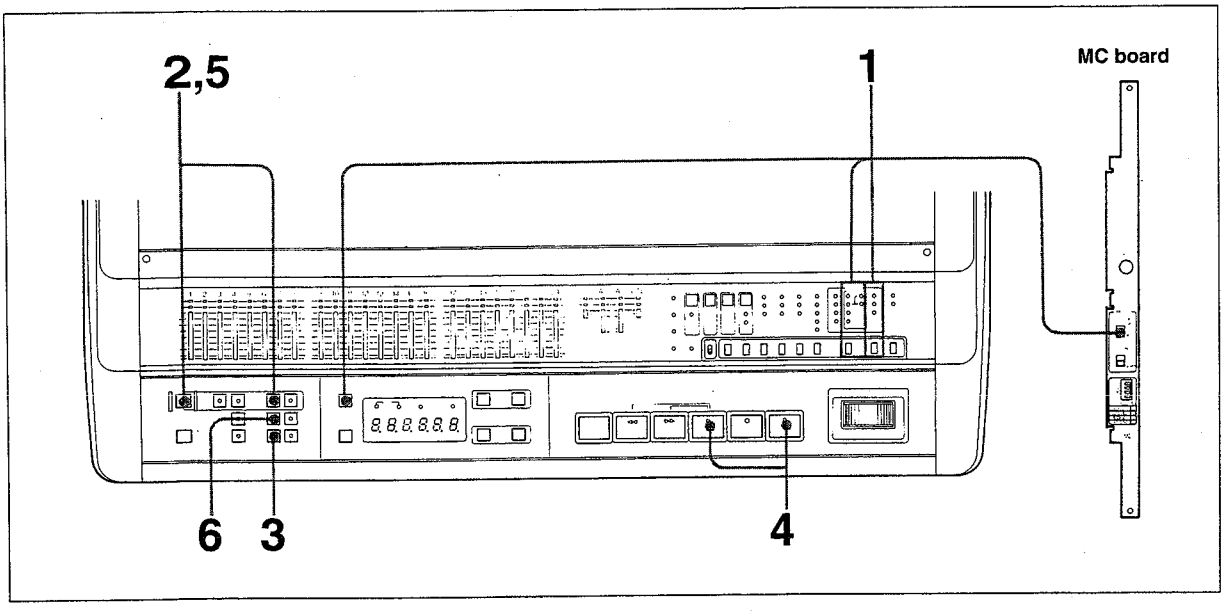
3-8-5 Recording the Internal Time Code

Function

This function records the time code produced by the built-in time code generator. Select the advancement mode for the time code: REC RUN mode, in which the time code only advances while the PCM-3324S is actually recording, or FREE RUN mode, in which the time code advances as long as the PCM-3324S is powered on.

Procedure

Use the following procedure to record the internal time code.



Recording the internal time code

1 Set the switches as follows.
- TIMER MODE switch: TIME CODE
- TIME CODE format selection switch: format being used
- TIME CODE selection switch: INT
- TC GEN switch (MC board panel): REC RUN or FREE RUN

2 Holding down the SET button, press the TIME CODE REC READY button to put the time code channel in the recording ready state.

The TIME CODE REC READY button lights.

(Continued)

3 Press the TIME CODE INPUT button, turning it on.

The TIME CODE channel level meter shows the input level and the tape time display shows the output of the built-in time code generator.

4 Holding down the REC button, press the PLAY button.

The TIME CODE REC lamp lights, and recording begins.

5 When the recording is completed, holding down the SET button, press the TIME CODE REC READY button, which will then go off.

6 Press the TIME CODE REPRO button, to set the monitor output to the playback signal.

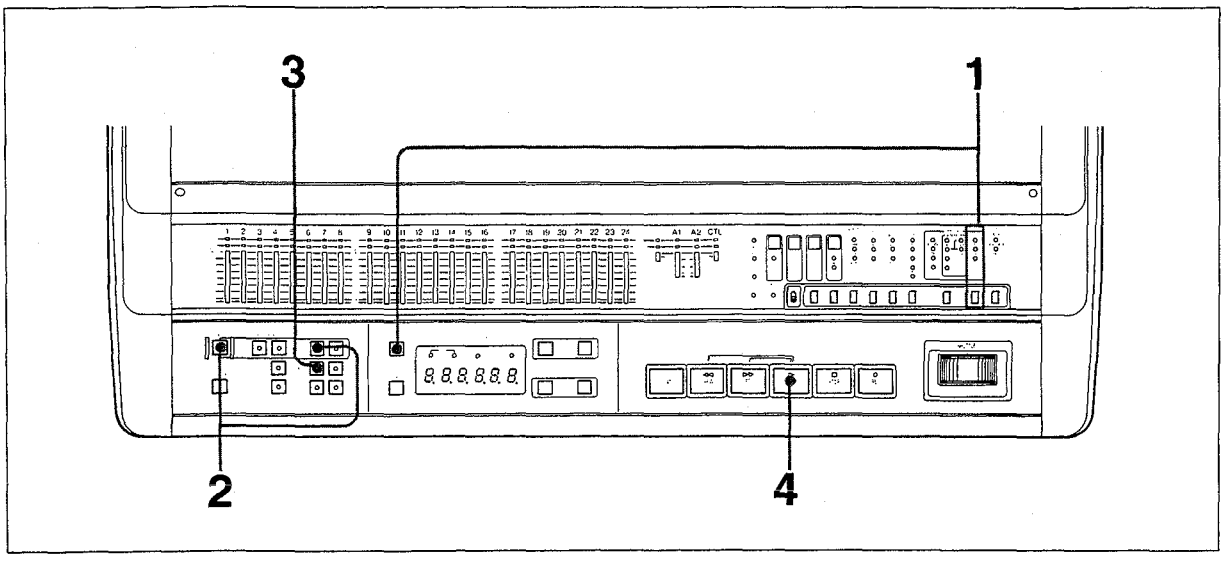
3-8-6 Time Code Through Playback

Function

This function plays back unaltered the time code recorded on the tape.

Procedure

Use the following procedure for through playback of the time code.



Time code through playback

1 Set the switches as follows.
- TIMER MODE switch: TIME CODE
- TIME CODE selection switch: INT

2 If the TIME CODE REC READY button is lit, holding down the SET button, press the TIME CODE REC READY button, turning it off.

3 Press the TIME CODE REPRO button turning it on.

4 Press the PLAY button, to start playback.

As the playback time code is read, the TIME CODE READER lamp for the playback time code format lights.

Note

If you press the STOP button while playing back a time code of low quality, the time code display may momentarily give a spurious indication. This is normal and does not indicate any problem.

3-8-7 Regenerated Time Code Playback

Function

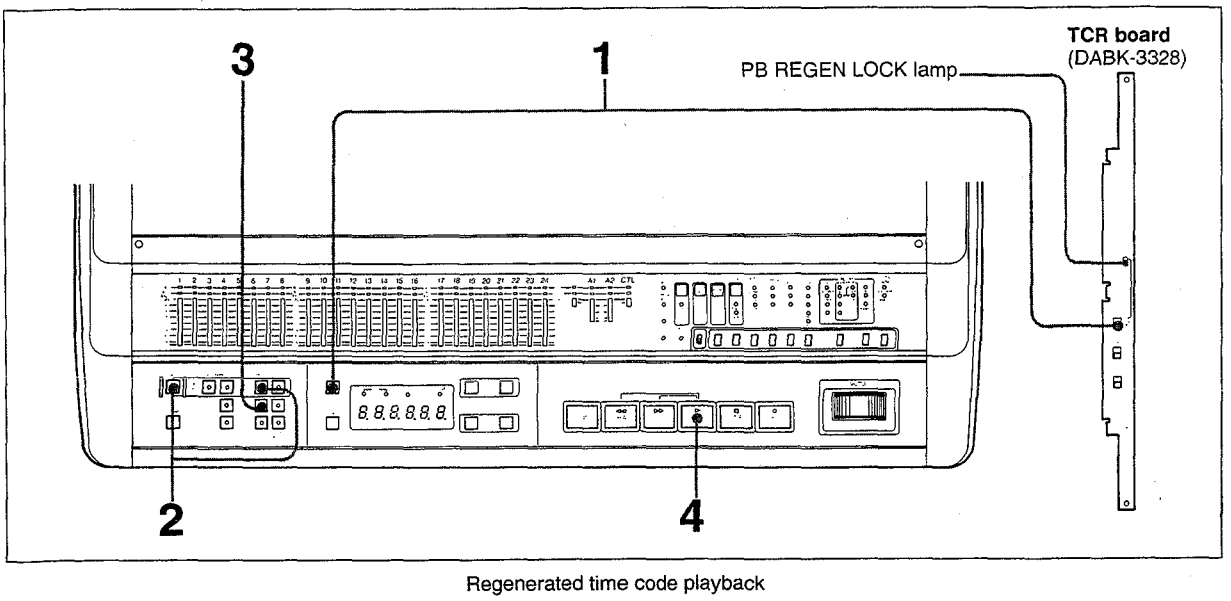
This function plays back a regenerated version of the time code recorded on the tape.

Note

This function requires the DABK-3328 Time Code Reader Board.

Procedure

Use the following procedure to play back the regenerated time code.



Regenerated time code playback

1 Set the switches as follows.
- TIMER MODE switch: TIME CODE
- PB REGEN switch (TCR board): on

2 If the TIME CODE REC READY button is lit, holding down the SET button, press the TIME CODE REC READY button, turning it off.

3 Press the TIME CODE REPRO button turning it on.

4 Press the PLAY button, to start playback.

As the playback time code is regenerated, the PB REGEN LOCK lamp on the TCR board (DABK-3328) lights.

3-8-8 Time Code Sync Playback

Function

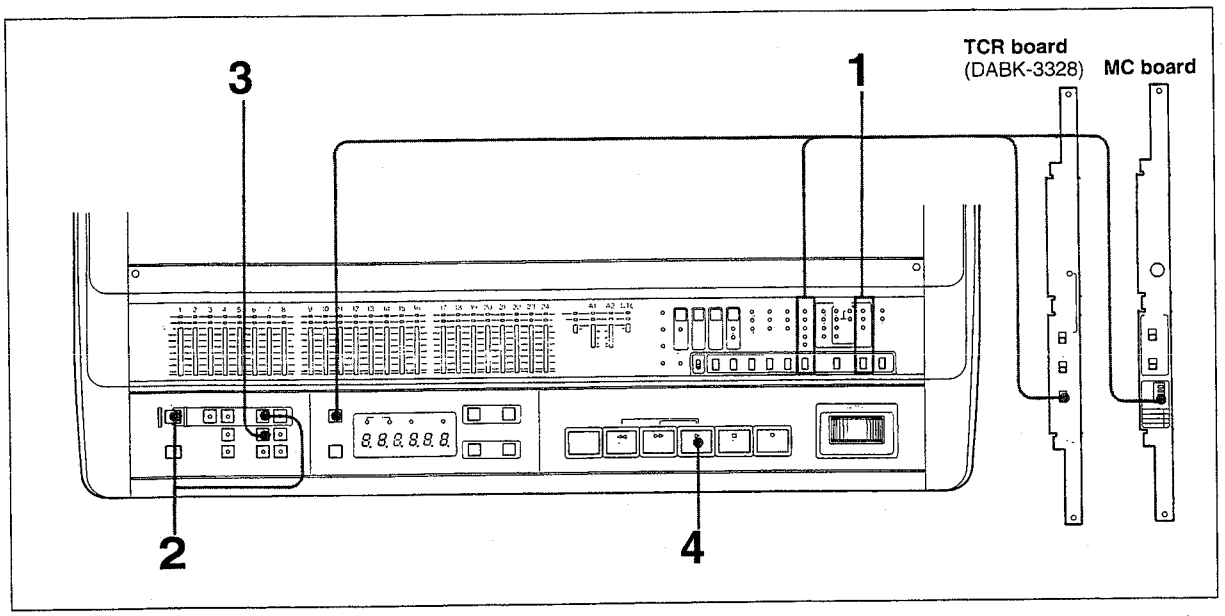
This function provides playback with the playback time code phase in sync with an external composite video signal.

Note

This function requires the DABK-3328 Time Code Reader Board.

Procedure

Use the following procedure for time code sync playback.



Time code sync playback

1 Set the switches as follows.
- TIMER MODE switch: TIME CODE
- SYNC CLOCK switch: VIDEO
- TIME CODE selection switch: INT
- TC SYNC PLAY switch (TCR board): ON
- VARI SYNC switch (MC board): ON or OFF

2 If the TIME CODE REC READY button is lit, holding down the SET button, press the TIME CODE REC READY button, turning it off.

3 Press the TIME CODE REPRO button turning it on.

(Continued)

4 Press the PLAY button, to start playback.

While the phase synchronization with composite video signal is being carried out, the PLAY button starts flashing. If the VARI SYNC switch is off, you will not be able to hear the playback sound at this point.

Once phase synchronization is achieved, the PLAY button changes from flashing to continuously lit, and you will then be able to hear the playback sound.

In order to output the sound during the phase synchronization process, set the VARI SYNC switch to the ON position. Note, however, that if you do this, word clock synchronization on any other connected equipment will be lost.

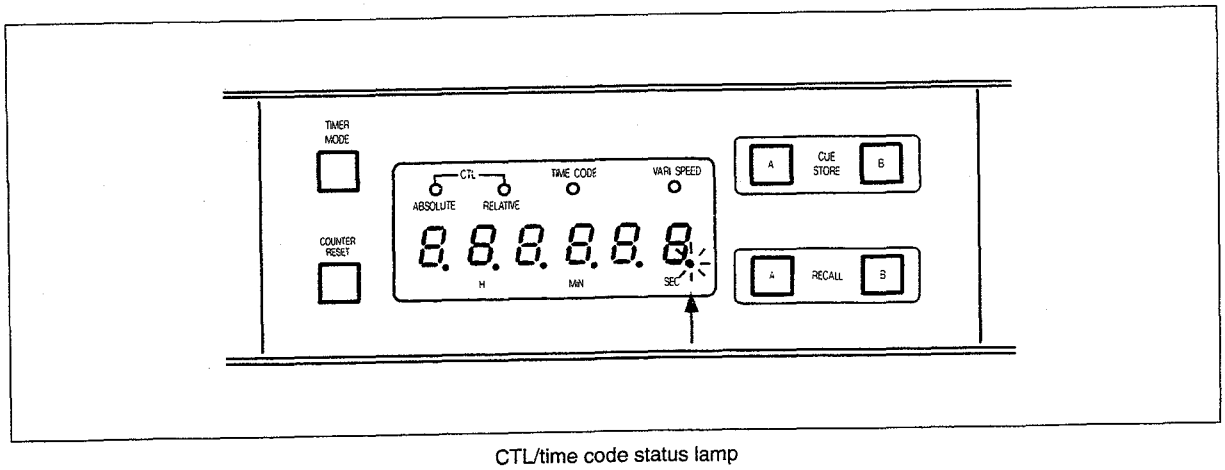
3-8-9 Tape Time Display

This section describes the information displayed on the tape time display while the time code channel is being recorded or played back.

Indication during normal recording and playback

Channel setting	Display
INPUT	Internal time code or external time code
REPRO	Playback time code

If there is no error in the external time code or playback time code, the CTL/time code status lamp lights.

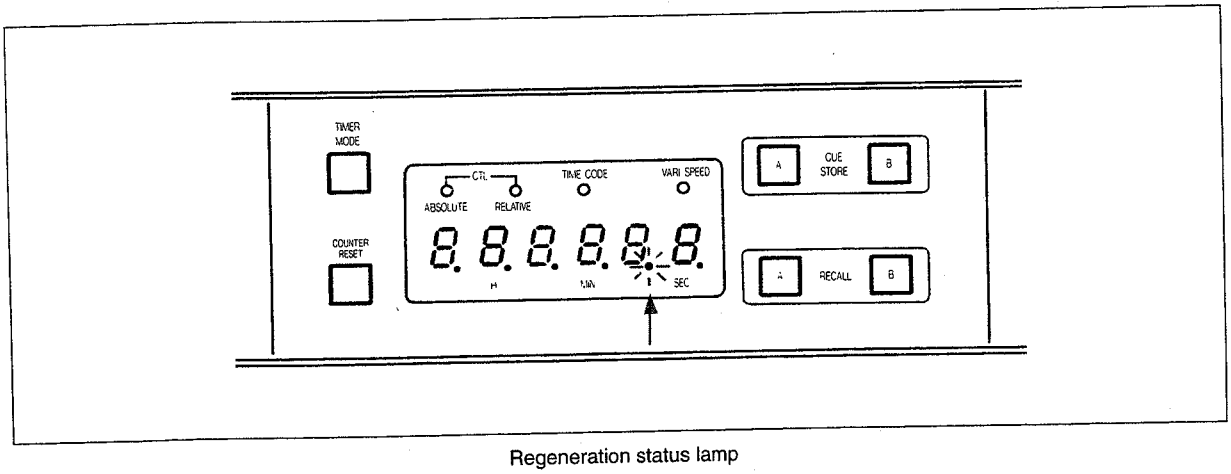


CTL/time code status lamp

Indication during external time code regeneration and playback time code regeneration

Channel setting	Display
INPUT	Internal time code locked to the external time code
REPRO	Internal time code locked to the playback time code

If there is no error in the external time code or playback time code, the regeneration status lamp lights (when the DABK-3328 board is fitted).



Regeneration status lamp

If the regeneration status lamp goes off or starts to flash

When the external time code or playback time code is being regenerated, if at any time it becomes no longer possible to regenerate the time code correctly, the regeneration status lamp, which was on, will go off or start flashing. In this case the status of the time code depends on which LED of the level meter for the time code channel is lit.

TIME CODE level meter	Time code status
Orange LED is lit.	The input of the external time code or playback time code has stopped. Regeneration is carried out normally.
Green LED is lit.	There are dropout or jump problems in the external time code or playback time code.

3-8-10 Reference Table of Switch Settings for Time Code Recording and Playback

Switch settings for time code recording

			External time code		Internal time code recording
			Through recording	Regenerated recording [a]	
Settings	Monitor mode		REC READY INPUT	REC READY INPUT	REC READY INPUT
	TIMER MODE button		TIME CODE	TIME CODE	TIME CODE
	SYNC CLOCK switch		—	(VIDEO) [b]	(VIDEO) [b]
	TIME CODE format selection switch		—	—	Format being used
	TIME CODE selection switch		EXT	REGEN (EXT)	INT
	MC board	TC GEN switch	—	—	REC RUN or FREE RUN
Displays	Tape time display		External time code	Time code from the built-in time code generator	Time code from the built-in time code generator
	Meter display		External time code	Time code from the built-in time code generator	Time code from the built-in time code generator

— : Setting not relevant
a) Possible only when the DABK-3328 Time Code Reader Board (optional) is installed.
b) Set to VIDEO to synchronize to an external composite video signal.

Switch settings for time code playback

			Time code through playback	Regenerated time code playback	Time code sync playback
Settings	Monitor mode		SAFE REPRO	SAFE REPRO	SAFE REPRO
	TIMER MODE button		TIME CODE	TIME CODE	TIME CODE
	SYNC CLOCK switch		—	—	VIDEO
	MC board	VARI SYNC switch	—	—	ON or OFF
	DABK-3328 (TCR) board	PB REGEN switch	OFF	ON	OFF / (ON) [a]
		PB REGEN LOCK lamp	Off	On	Off / (On) [a]
		TC SYNC PLAY switch	OFF	OFF	ON
Displays	Tape time display		Playback time code	Time code from the built-in time code generator	Playback time code
	Meter display		Playback time code	Playback time code	Playback time code

— : Setting not relevant
a) When the time code recorded on the tape is synchronized to an external composite video signal, switching the PB REGEN switch on during time code sync playback allows you to perform the playback with a regenerated time code synchronized to the composite video signal.

3-9 Locate Operation

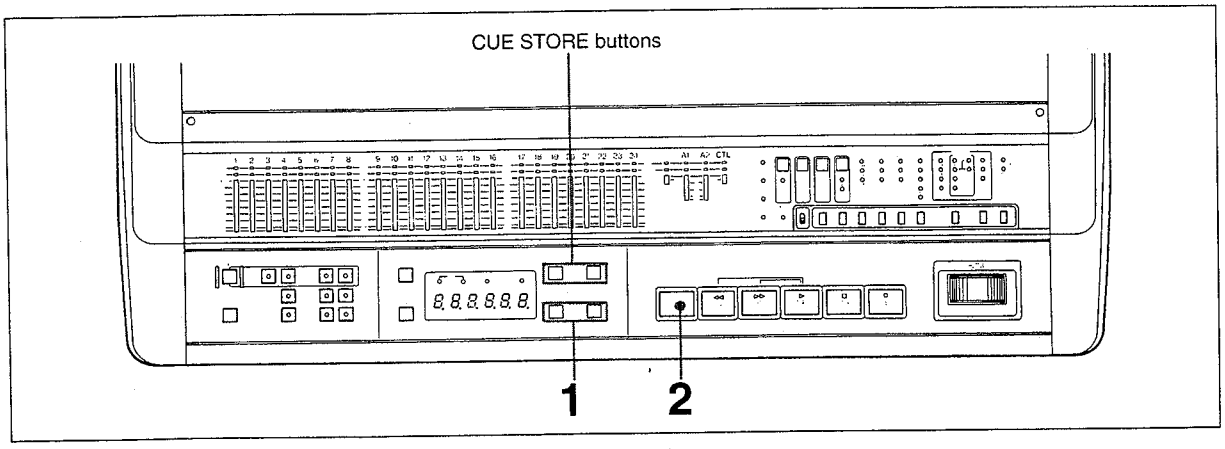
Cue point memory

Function

The PCM-3324S has two cue point memories (A and B) which can hold tape time data. You can store the time from the tape time display in a cue point memory, then use it to locate the corresponding position on the tape.

Procedure

Use the following procedure to carry out a locate operation.



Locate operation

Storing a cue point

Listening to the playback sound, at the required point press either of the A and B CUE STORE buttons.
While you press the CUE STORE button, the tape time point to be stored appears on the tape time display, and is stored in the corresponding A or B cue point memory.

Recalling a cue point, and locating the tape at it

1 Press either of the A and B RECALL buttons.

While you press the RECALL button, the stored tape time point appears on the tape time display.

2 Press the LOCATE button.

The unit rewinds or fast forwards the tape to the position corresponding to the recalled tape time point, then stops.

Automatically playing back from the located point

Use either of the following methods.

- Press the LOCATE button, then while the locate operation is being carried out press the PLAY button.
- Press the PLAY button while holding down the LOCATE button.

Whichever method you use, playback starts automatically when the locate operation is completed.

3-10 Splice Editing

You will need the following:
- CY-24A tape splicer
- AM-9 audio marker
- Scotch 620-1/2 splicing tape

Splice editing procedure

Find the edit point, monitoring the cue monitor signal recorded on the analog audio channel.

Before carrying out the following procedure, select the analog audio channel automatic recording mode.

For details of how to select the automatic recording mode, see "Automatic recording of analog audio channels" (page 3-24).

1 Connect the output of a digital audio channel which makes the edit point easy to locate to one of the analog audio channels A1 or A2.

2 Put the analog audio channels A1 and A2 in the recording ready state.

3 Run the tape to a point just before the edit point, and stop.

4 Set the monitor output to REPRO, and press the PLAY button to play back the digital audio channel.

This records the playback signal from the digital audio channel on the analog audio channel.

5 Rewind the tape to a point just before the edit point, and press the STOP button.

6 Rotate the search knob, and monitoring the playback signal from the analog audio channel, find the edit point, and stop the tape at the edit point.

7 Mark the back coated side of the tape at the position corresponding to the edit point.

For details of the splicing method, refer to the manual for the CY-24A.

Chapter 4
Maintenance

This chapter describes the warning and error codes and indications produced when an operating error occurs, together with appropriate measures to be taken.

4-1 Periodic Maintenance 4-3
4-2 Warning Lamps 4-3
4-2-1 Location of Warning Lamps 4-3
4-2-2 If the FORMAT MISMATCH Lamp Lights Repeatedly 4-4
4-2-3 If the EMPHASIS MISMATCH Lamp Lights Repeatedly 4-4
4-2-4 If the EXT CLOCK ERROR Lamp Lights Repeatedly 4-5
4-2-5 If the SYSTEM WARNING Lamp Lights 4-7
4-2-6 If the SYSTEM ALARM Lamp Lights 4-7
4-3 Error Code Display 4-8

4-1 Periodic Maintenance

Carry out the first inspection when the tape transport operating time reaches 500 hours. Thereafter, make an inspection every 1,500 hours.

For details of the inspection procedure, refer to Chapter 4 of the PCM-3324S Maintenance Manual.

Checking the tape transport operating time

Holding down the SET button in the channel status setting section on the PCM-3324S, press the RECALL A button in the timer control panel.
The tape transport operating time appears in units of hours in the tape time display.

Caution

It is important to carry out regular checks at the prescribed intervals. If this is not done, tape interchangeability may be impaired.

If the condition lamps on the SPU-1 to SPU-3 boards light frequently, or if you detect abnormalities in the audio signal characteristics, refer to the PCM-3324S Maintenance Manual.

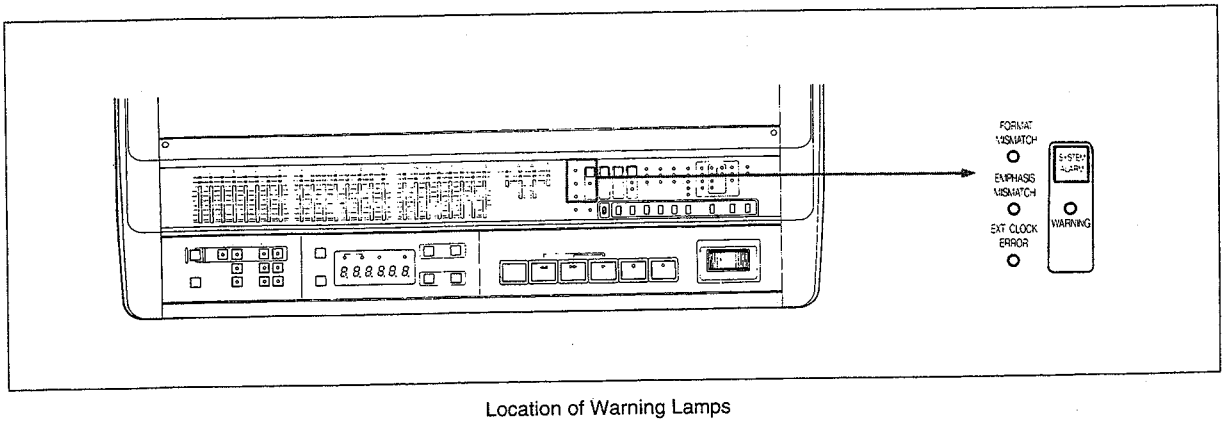
For the daily maintenance and inspection procedures, refer to the PCM-3324S Maintenance Manual.

4-2 Warning Lamps

4-2-1 Location of Warning Lamps

The various warning lamps light to indicate setting errors or operational errors detected.

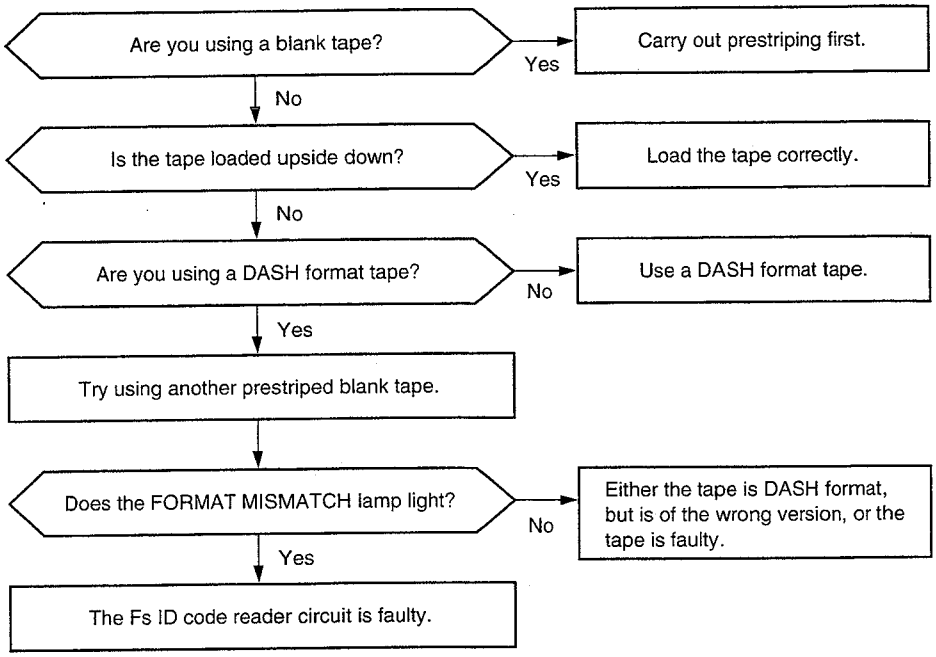
For details of the TIME CODE ERROR lamp, see Section 3-8-2, "Switches and Lamps Used for Time Code Recording and Playback" (page 3-31).



Location of Warning Lamps

4-2-2 If the FORMAT MISMATCH Lamp Lights Repeatedly

If the FORMAT MISMATCH lamp lights, carry out the following diagnostic procedure.

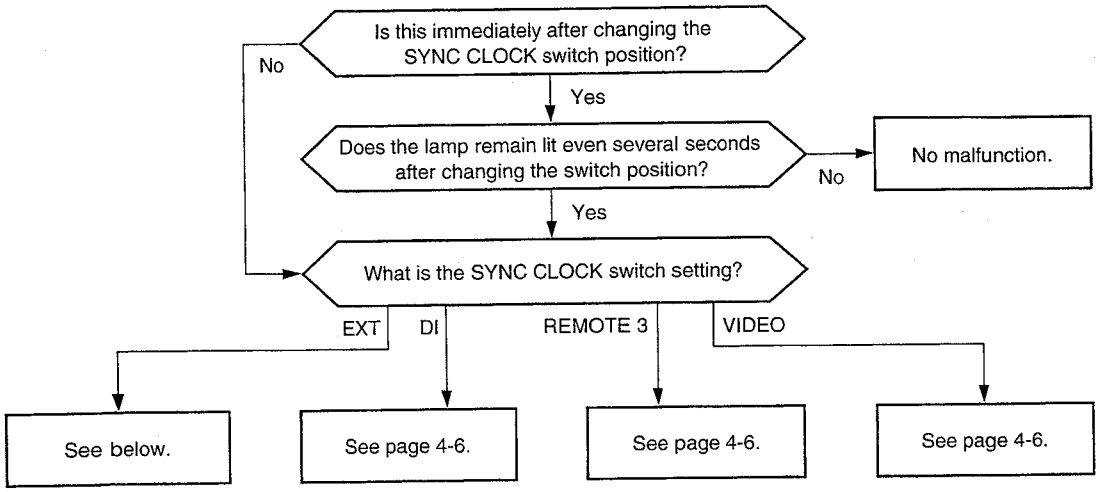


4-2-3 If the EMPHASIS MISMATCH Lamp Lights Repeatedly

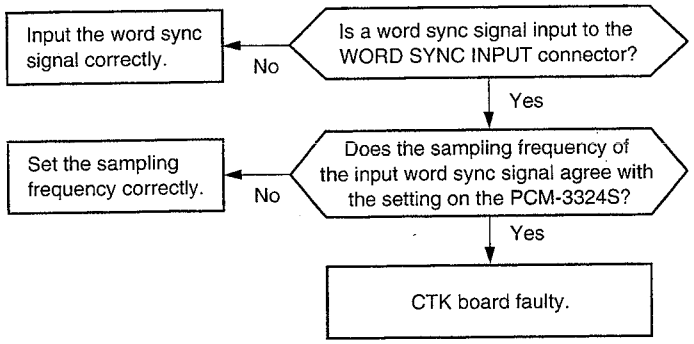
If the emphasis information recorded on a channel which is in the recording ready state is different from the EMPHASIS switch setting, the EMPHASIS MISMATCH lamp lights. During recording, the emphasis information follows the EMPHASIS switch setting, and therefore care is needed when recording repeatedly on a tape being used for playback. If you continue recording while the EMPHASIS MISMATCH lamp is lit, the recording will be carried out with different emphasis settings from those recorded on the tape.

4-2-4 If the EXT CLOCK ERROR Lamp Lights Repeatedly

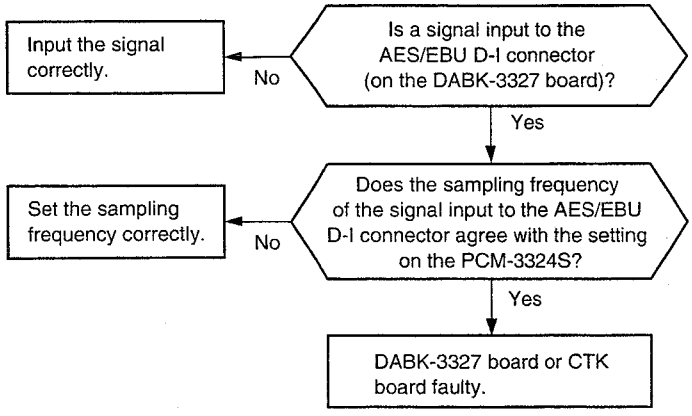
If the EXT CLOCK ERROR lamp lights, carry out the following diagnostic procedure.



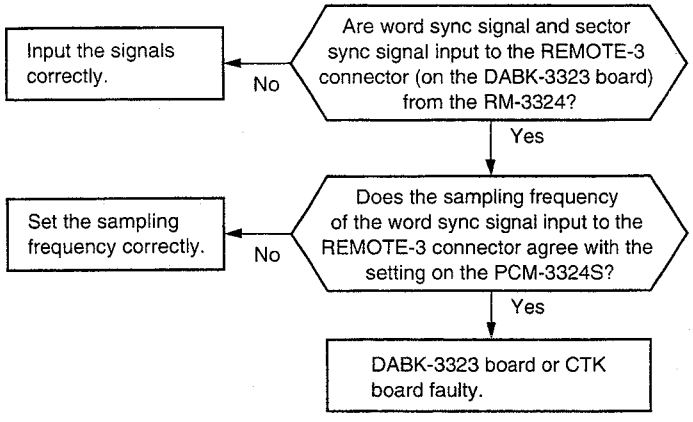
Checks when the SYNC CLOCK switch is set to EXT



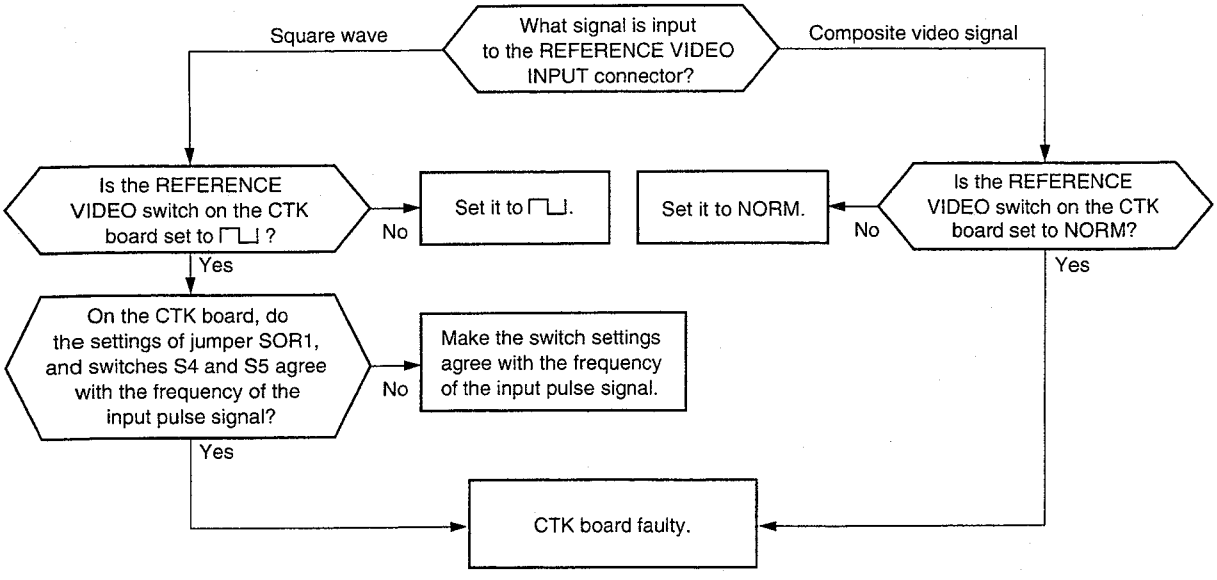
Checks when the SYNC CLOCK switch is set to DI



Checks when the SYNC CLOCK switch is set to REMOTE 3



Checks when the SYNC CLOCK switch is set to VIDEO



4-2-5 If the SYSTEM WARNING Lamp Lights

If you make particular settings, this lamp may light. If it does light, check that the settings are correct. It is, however, possible to continue operation while this lamp is on. If SELECT switch No. 3 on the MC board is set to ON, while this lamp is lit, the tape time display also shows a warning code.

Warning codes and meanings

Warning code	Meaning	Notes
InF 01	The analog audio channel automatic recording mode is selected. (SELECT switch No. 2 on the MC board set to ON)	See "Automatic recording of analog audio channels" (page 3-24).
InF 02	CTL protect mode is not selected. (CTL PRO jumper on the MC board set to the left)	Normally, select CTL protect mode. See "CTL protect mode" (page 3-15).
InF 03	Fs shift mode is selected. (FS SHIFT switch on the CTK board set to ON)	See "Sampling frequency for prestriping or advance recording" (page 2-9).
InF 04	An external word clock error has occurred.	See Section 4-2-4, "If the EXT CLOCK ERROR Lamp Lights Repeatedly" (page 4-5).
InF 05	Forced assemble recording mode is selected. (ASM jumper on the MC board set to the left)	See Section 3-6-1, "What Is Assemble Recording?" (page 3-18).
InF 06	The heads are set to be in contact with the tape during fast forward and rewind. (HEAD jumper on the MC board set to the left)	See "MC board" (page A-17).
InF 07	EDIT test mode is selected. (Test switches on the ED board set to TEST)	See "ED board" (page A-22).
InF 08	The setting (PWM or BIAS) of the playback signal monitor output switch on the ARP board does not agree with the playback signal.	See "ARP board" (page A-21).

4-2-6 If the SYSTEM ALARM Lamp Lights

This lamp lights if there is a fault in the system.
If this lamp lights, the unit is not usable. Note the error code shown in the tape time display, power off the unit, and refer to your Sony servicing representative.

A list of error codes with their meanings appears in the Appendixes.

4-3 Error Code Display

When the unit is powered on, it carries out a self-diagnosis check. If this discovers a fault, or if a fault arises during operation, the tape time display shows an error code. If this occurs, note the error code, power off the unit, and refer to your Sony servicing representative.

A list of error codes with their meanings appears in the Appendixes.

Appendixes

Error codes **A-3**
Location and Function of Parts **A-6**
Main Unit A-6
Tape transport A-6
Lamps and meters A-7
Warning lamps A-8
System control panel A-9
Channel status settings A-10
Timer control panel A-11
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Internal Boards A-15
SPU-1 to SPU-3 boards A-15
MC board A-16
CTK board A-18
ARP board A-20
ED board A-22
MT board A-23
ADA-1 to ADA-6 boards A-24
Specifications **A-25**
Timing Comparison Chart **A-33**

Error Codes

When a code marked by an asterisk appears, the SYSTEM ALARM lamp simultaneously lights.
While it is powered on, the unit checks continuously the conditions associated with the errors marked by asterisks.
Other error codes are only produced by the initial self-diagnosis procedure immediately after powering on.

Error code	Meaning
E.01-01*	Power supply fault.
E.01-02*	+12 V supply has failed.
E.01-03*	–12 V supply has failed.
E.02-02	D BUS error.
E.02-03	A BUS error.
E.02-04	RAM check error.
E.02-05	ROM check error.
E.02-06	AUPC71059 interrupt controller write/read check error.
E.02-07	AUPC71059 interrupt controller write/read check error.
E.02-08	ATMP82C79 keyboard/display controller write/read check error.
E.02-09	WAIT control circuit error.
E.02-10	TCG EXT ROUTE error.
E.02-11	TCG PB ROUTE error.
E.02-12	PB DELAY or REC DELAY error.
E.02-13	EEPROM read/write check error.
E.03-02	TCR LOOP TEST or PB FORMAT error.
E.03-03	TCR LOOP TEST or EXT FORMAT error.
E.03-04	TCR LOOP TEST or PB STATUS error.
E.03-05	TCR LOOP TEST or EXT STATUS error.
E.03-06	PB REGEN TEST error.
E.04-01	CTK board not installed.
E.04-02	INTERNAL WORD cycle check error.
E.04-03	INTERNAL SECTOR cycle check error.
E.04-04	REC counter or ISA or ESA data check error. (normal speed)
E.04-05	DECODE DELAY check error.
E.04-06	ENCODE DELAY check error.
E.04-07	DEC RANGE check error. (normal speed)
E.04-08	SPEED check error. (normal speed)
E.04-09	ISA or ESA data check error. (4× speed)
E.04-10	DEC RANGE check error. (4× speed)
E.04-11	SPEED check error. (4× speed)
E.04-12	TIMER ROLLER check error.
E.04-13	CTL LOCK MODE read error.
E.04-14*	CTL is not recorded on the tape, and therefore automatic assemble recording is not possible.
E.05-01	ARP board not installed.
E.05-02	ARP self-diagnosis error. (A1)
E.05-03	ARP self-diagnosis error. (A2)

(Continued)

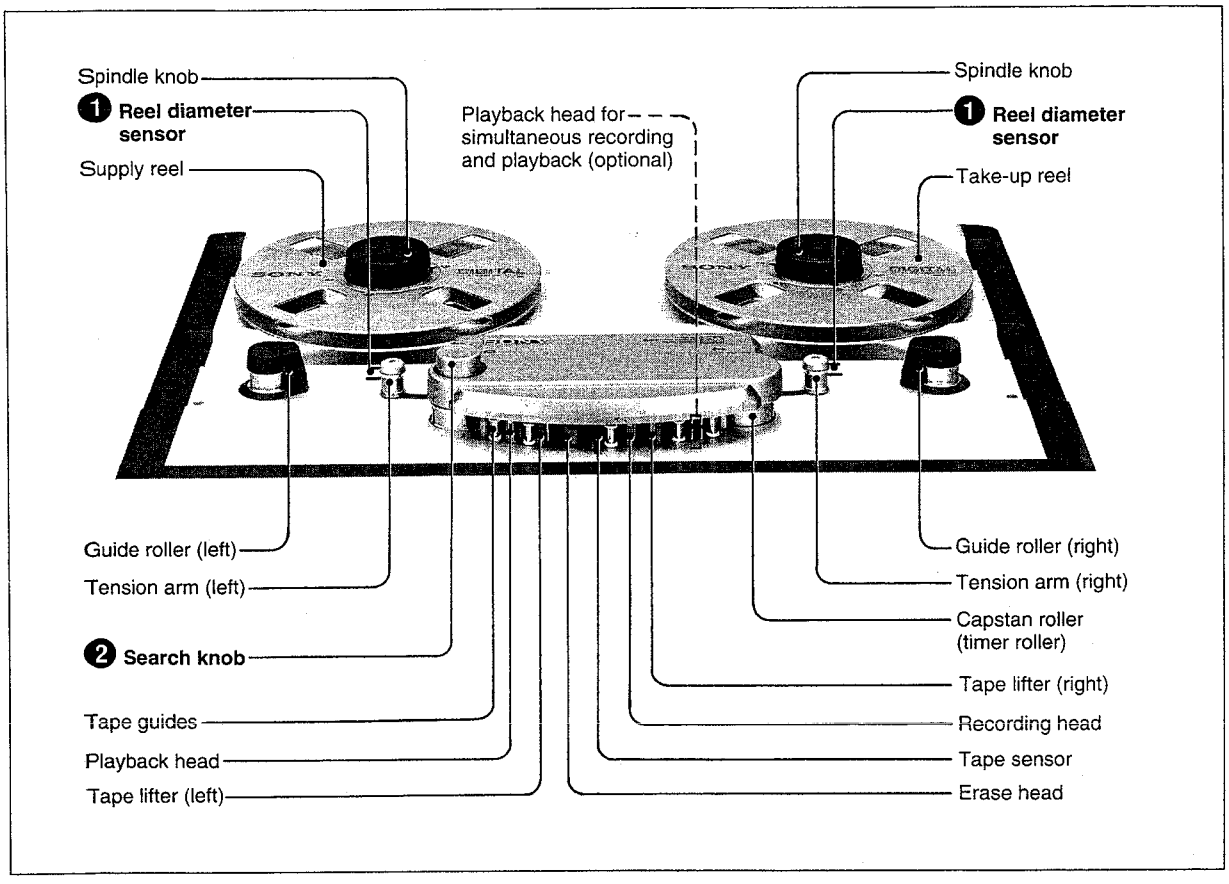
Error code	Meaning
E.05-04	ARP PB LEVEL parameter error.
E.06-02	Sound memory self-diagnosis loop test error.
E.06-03*	Communications error between sound memory and MC.
E.07-01	EDIT board not installed.
E.07-02	EDIT RAM test error.
E.07-03	EDIT LOOP test error.
E.07-04	PB MUTE test error.
E.07-05	REC MUTE test error.
E.07-06	DIGITAL COPY test error.
E.07-07	X'FADE TIME test error.
E.07-08	EMPHASIS flag test error.
E.07-09	Signal processing loop error.
E.07-10	Signal processing EMPHASIS flag error.
E.07-11	MONITOR MUTE error.
E.07-12*	REC STOP READY timeout error.
E.07-13*	LIMIT TOP WAIT timeout error.
E.07-14	REC ON MONITOR error
E.07-16	Self-diagnosis not possible with ED board test switch on.
E.08-02*	SERVO power supply error.
E.08-03	Tension regulation error.
E.08-04	Reel error.
E.08-05	Capstan error.
E.08-06	SHIFTER/SHUTTLE error.
E.08-07	Tension error.
E.08-08	Tape speed error.
E.08-09*	Reel diameter fault.
E.08-10*	Drive voltage fault.
E.08-11*	Communications error with capstan.
E.08-12*	Communications error with MC.
E.08-13	Loading error.
E.08-14	Unload complete timeout error.
E.08-15	Servo parameter error.
E.09-02	DET STATUS error.
E.09-03	REC STATUS error.
E.09-04*	DET-MC communications error.
E.09-05	AD GAIN (SYNC HEAD) error. (including coefficient errors in EEPROM)
E.09-06	C1 (SYNC HEAD) error. (including coefficient errors in EEPROM)
E.09-07	C3 (SYNC HEAD) error. (including coefficient errors in EEPROM)
E.09-08	AD GAIN (MONITOR PB HEAD) error. (including coefficient errors in EEPROM)
E.09-09	C1 (MONITOR PB HEAD) error. (including coefficient errors in EEPROM)

Error code	Meaning
E.09-10	C3 (MONITOR PB HEAD) error. (including coefficient errors in EEPROM)
E.09-11	REC coefficient error. (including coefficient errors in EEPROM)
E.09-12	ERASE coefficient error. (including coefficient errors in EEPROM)
E.09-15*	DET error.
E.09-16*	NACK return from DET in MC-DET communications.
E.10-02	RM2 self-diagnosis error.
E.10-03*	RM2-MC communications error.
E.11-02	Communications RAM write/read check error from RM3 self-diagnosis.
E.11-03	CRC generation circuit error from RM3 self-diagnosis.
E.12-02	IF1 self-diagnosis error.
E.13-02	IF4 self-diagnosis error.
E.14-02	DIO (MULTI) LOOP error from self-diagnosis.
E.14-03	DIO (MULTI) EMPHASIS flag error from self-diagnosis.
E.14-04	2-CH DIO EMPHASIS flag error from self-diagnosis.
E.14-05	SDIF-2 2CH-DIO LOOP error from self-diagnosis.
E.14-06	AES/EBU 2CH-DIO LOOP error from self-diagnosis.

Location and Function of Parts

Main Unit

Tape transport

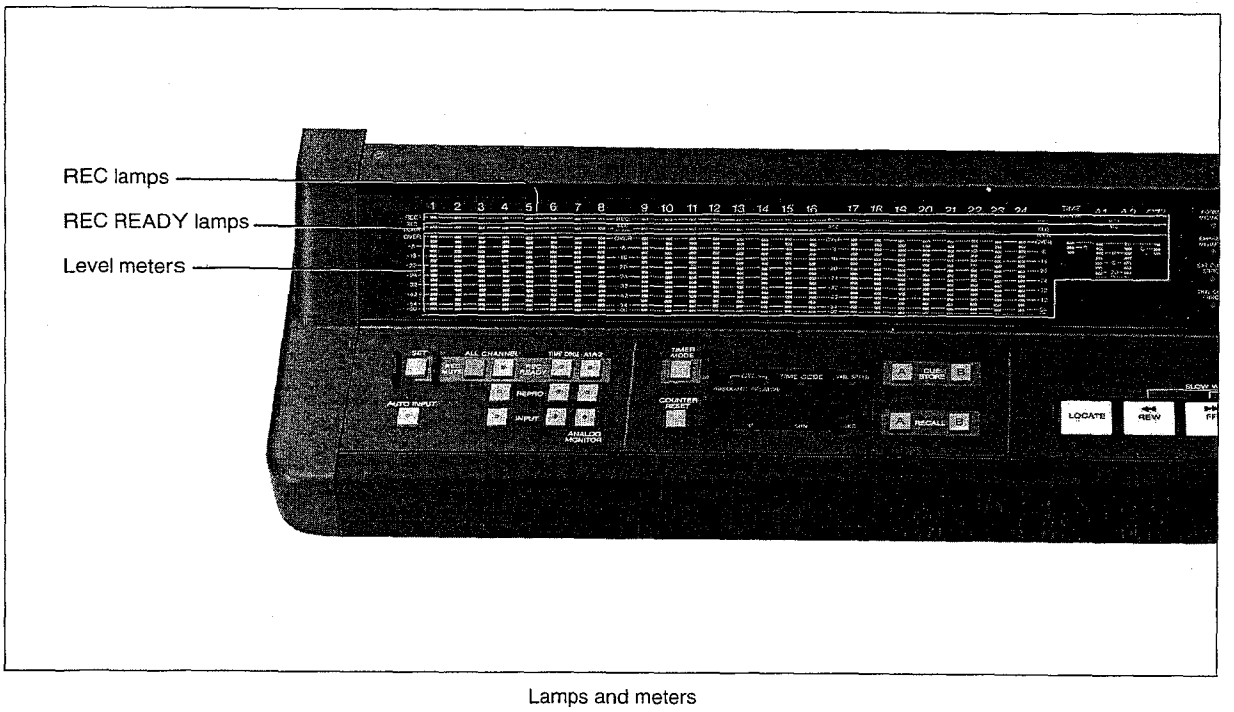


Tape transport

❶ Reel diameter sensors
These detect 12.5-inch and 14-inch reels.

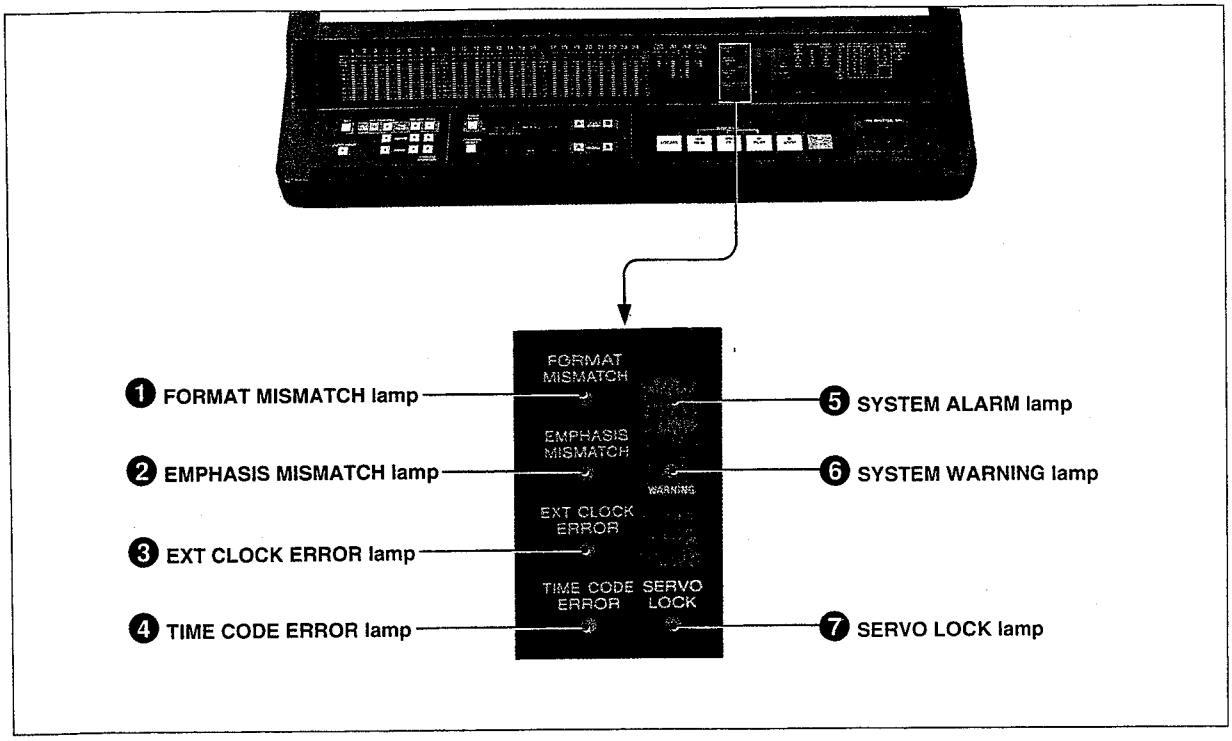
❷ Search knob
When the tape is stationary, use the search knob to find the edit point.

Lamps and meters



Lamps and meters

Warning lamps



Warning lamps

❶FORMAT MISMATCH lamp

For details of the function of this lamp, see Section 4-2-2, "If the FORMAT MISMATCH Lamp Lights Repeatedly" (page 4-4).

❷EMPHASIS MISMATCH lamp

For details of the function of this lamp, see Section 4-2-3, "If the EMPHASIS MISMATCH Lamp Lights Repeatedly" (page 4-4).

❸EXT (external) CLOCK ERROR lamp

For details of the function of this lamp, see Section 4-2-4, "If the EXT CLOCK ERROR Lamp Lights Repeatedly" (page 4-5).

❹TIME CODE ERROR lamp

For details of the function of this lamp, see Section 3-8-2, "Switches and Lamps Used for Time Code Recording and Playback" (page 3-30).

❺SYSTEM ALARM lamp

For details of the function of this lamp, see Section 4-2-6, "If the SYSTEM ALARM Lamp Lights" (page 4-7).

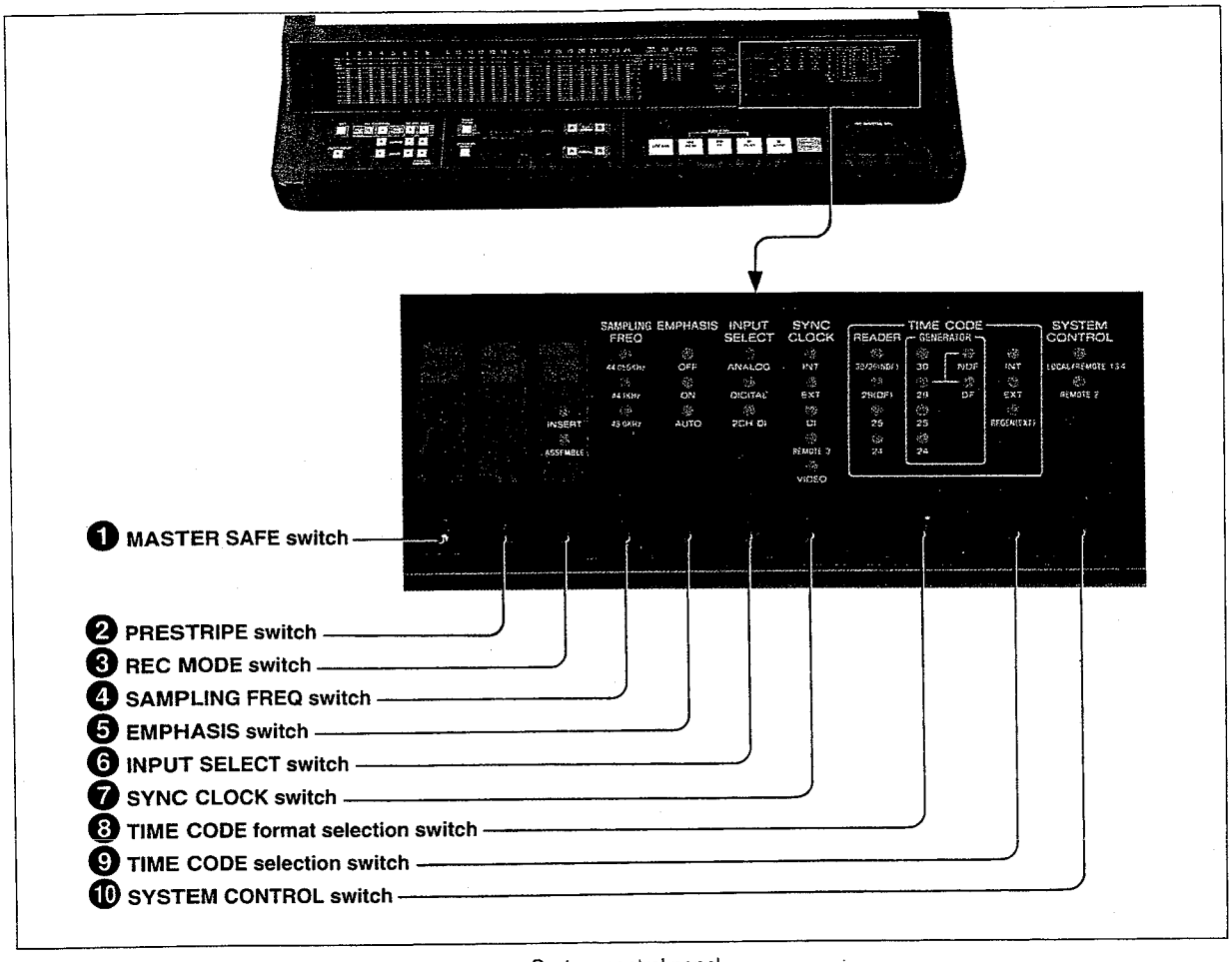
❻SYSTEM WARNING lamp

For details of the function of this lamp, see Section 4-2-5, "If the SYSTEM WARNING Lamp Lights" (page 4-7).

❼SERVO LOCK lamp

This lamp lights when the servo is locked.

System control panel



System control panel

❶MASTER SAFE switch
When this switch is in the ON position, recording is inhibited on all channels.

❷PRESTRIPE switch
Set this switch to the ON position to carry out prestriping.

For details see Section 3-4, "Prestriping" (page 3-10).

❸REC (record) MODE switch
Select the recording mode from the following settings:
ADVANCE REC: advance recording mode
INSERT: insert recording mode
ASSEMBLE: assemble recording mode

❹SAMPLING FREQ (frequency) switch
Select the sampling frequency.

For details see Section 2-4-2, "Selecting the Sampling Frequency" (page 2-9).

❺EMPHASIS switch
For details see Section 2-4-4, "Selecting the Emphasis" (page 2-11).

❻INPUT SELECT switch
For details see Section 2-4-3, "Selecting the Input Signal" (page 2-10).

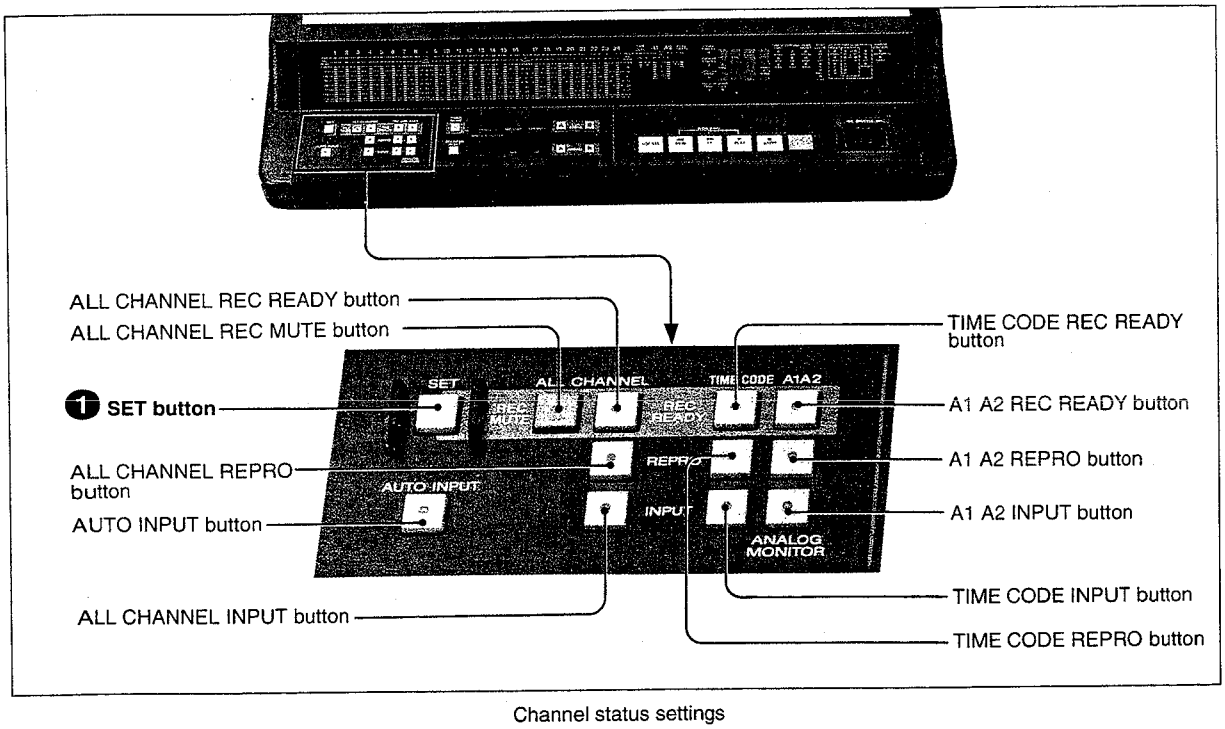
❼SYNC CLOCK switch
❽TIME CODE format selection switch
❾TIME CODE selection switch
For details of the operation of these switches see Section 3-8-2, "Switches and Lamps Used for Time Code Recording and Playback" (page 3-30).

⑩SYSTEM CONTROL switch
This selects the device used to control the PCM-3324S.

LOCAL/REMOTE 1, 3, 4: PCM-3324S.
(When DABK-3321 board is fitted) time code synchronizer connected to the EXT PHASE CONTROL INPUT connector, EXT SPEED CONTROL INPUT connector, or REMOTE-1 connector.
(When DABK-3323 board is fitted) RM-3324 Remote Control Unit connected to the REMOTE-3 connector.
(When DABK-3322 board is fitted) RM-3324S Remote Control Unit connected to the RM-3324S connector.
(When DABK-3324 board is fitted) mixing console connected to the AUX connector, REC RDY CONTROL 1 or 2 connector.
(When DABK-3322 board is fitted) video editing control system connected to the REMOTE-2 connector.

REMOTE 2: (When DABK-3322 board is fitted) video editing control system connected to the REMOTE-2 connector.

Channel status settings



Channel status settings

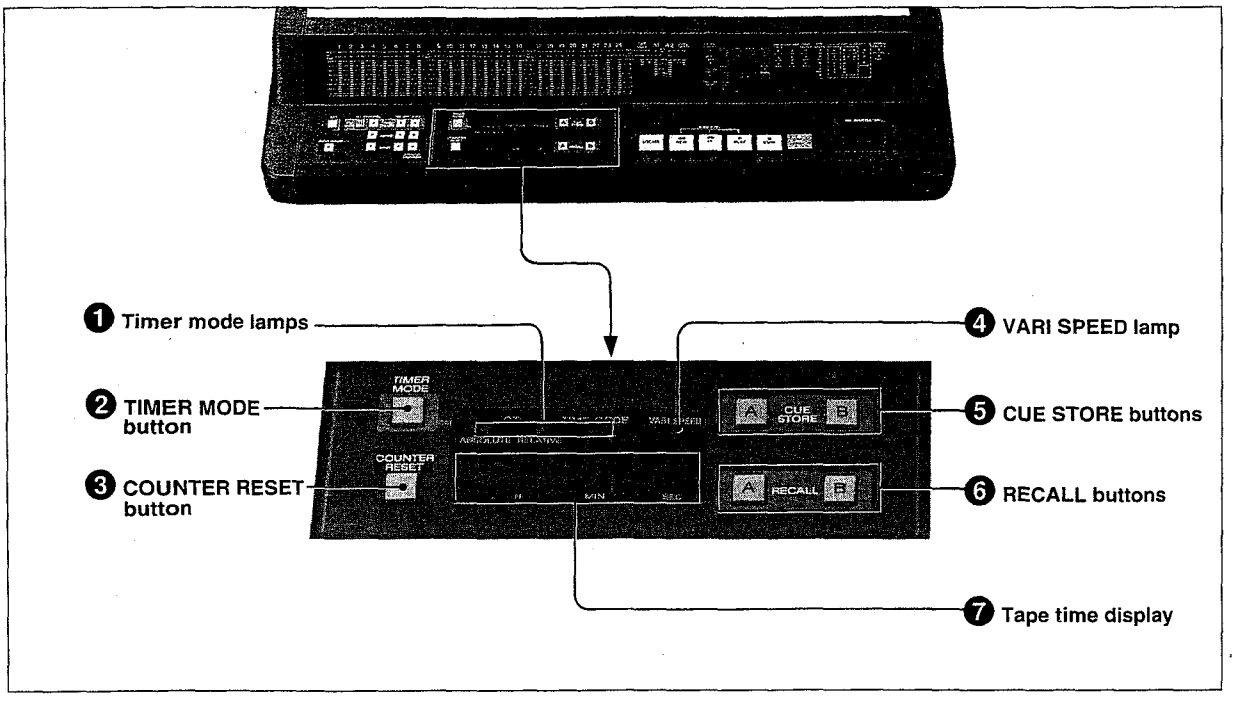
❶SET button
To put all digital audio channels, two analog audio channels, or time code channel in the recording ready state, hold down this button and press the ALL CHANNEL REC READY button, A1 A2 REC READY button, or TIME CODE REC READY button.

For details of the operation of the other buttons, see the following sections:

Section 3-1, "Channel Settings" (page 3-3).
Section 3-5, "Advance Recording" (page 3-12).
Section 3-6-2, "Assemble Recording Operation" (page 3-22).

For analog audio channel (A1 A2) buttons see Section 3-7-2, "Analog Audio Channel Recording" (page 3-25).
For time code related buttons see Section 3-8, "Time Code Channel Recording and Playback" (page 3-27).
For the ALL CHANNEL REC MUTE button see "Setting all digital audio channels to the muting signal recording state" (page 3-5).
For the AUTO INPUT button see "Switching the monitor output automatically depending on the tape transport state" (page 3-5).

Timer control panel



Timer control panel

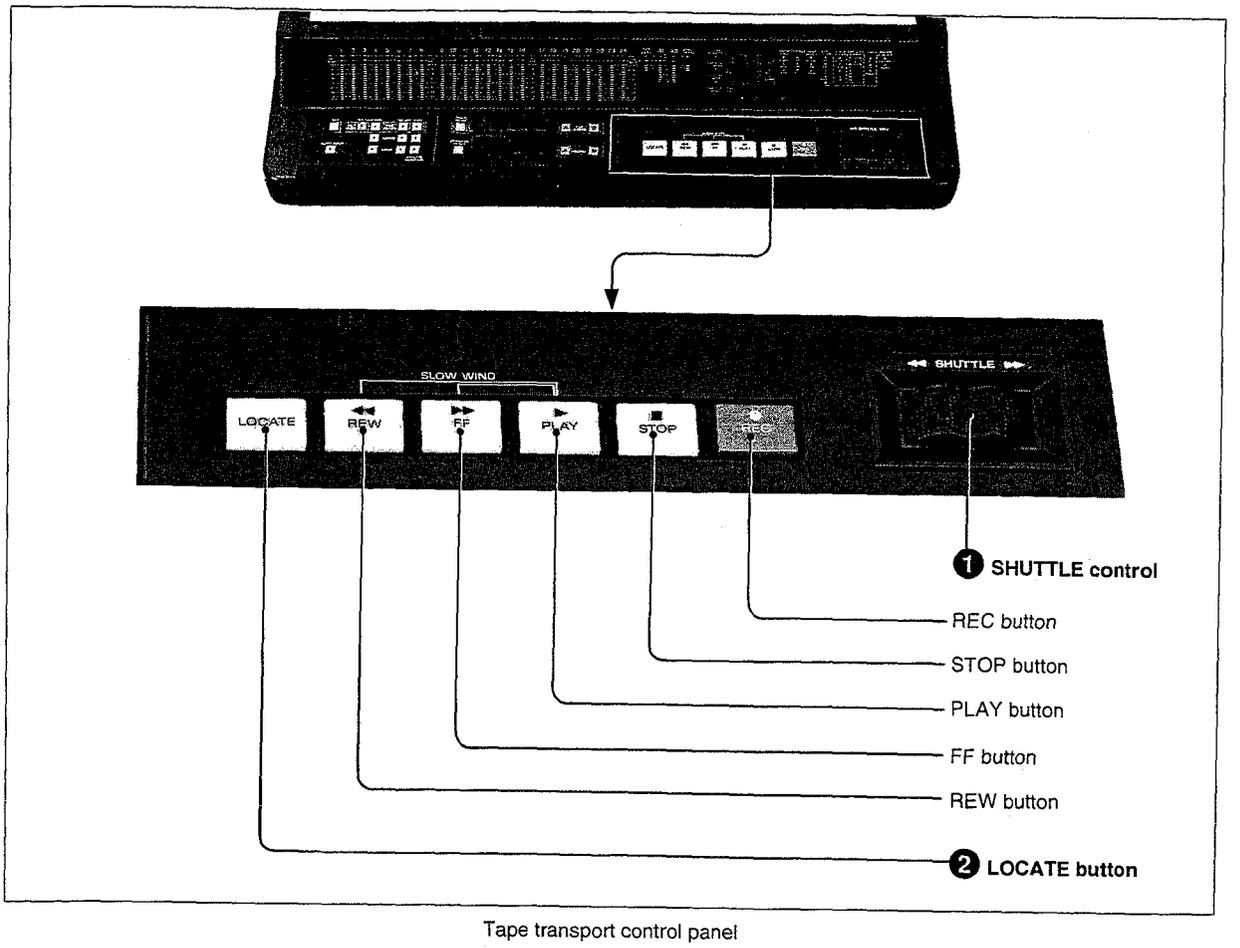
❶Timer mode lamps
❷TIMER MODE button
❸COUNTER RESET button
For details of the operation of these controls see Section 3-2-2, "Setting the Timer Display Mode" (page 3-7).

❹VARI (variable) SPEED lamp
This indicates the status of variable speed playback.
Flashing: the playback speed is being changed to the target variable speed.
Lit: the playback speed has reached the target variable speed.
Off: normal speed playback.

❺CUE STORE buttons
❻RECALL buttons
For details of the operation of these controls see Section 3-9, "Locate Operation" (page 3-45).

❼Tape time display
This shows the tape running time, current position, and stored cue points; it is also used for displaying error codes.

Tape transport control panel



Tape transport control panel

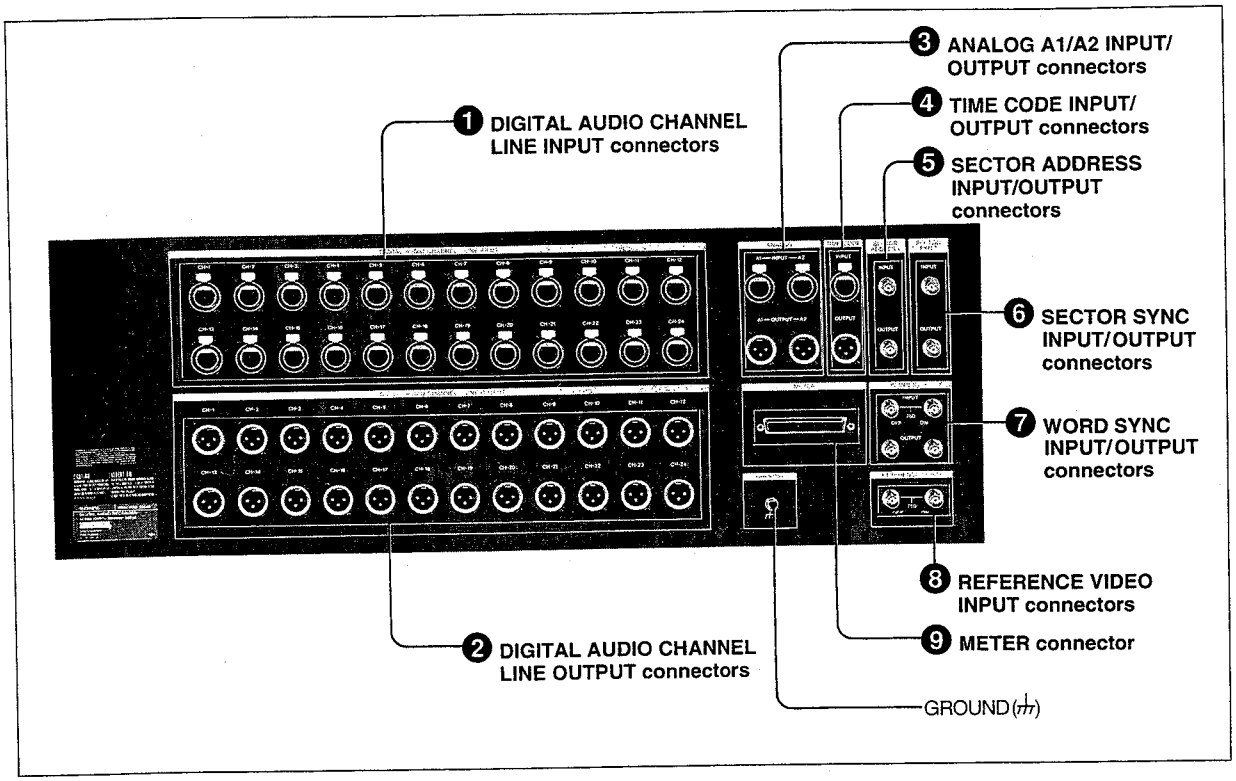
❶SHUTTLE control

When the tape is stationary, turning this control to the right (or left) transports the tape forward (or reverse) at a speed proportional to the angle through which the control is turned. The speed can be varied from $^1/_{10}$ to 5 times normal speed.

❷LOCATE button

For details see Section 3-9, "Locate Operations" (page 3-45).

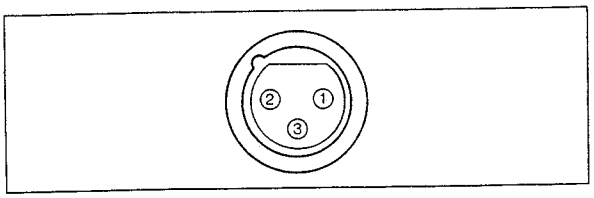
Rear panel connectors



Rear panel connectors

❶ DIGITAL AUDIO CHANNEL LINE INPUT connectors (XLR-3-31)

Connect analog audio signals. The analog audio signals are converted to digital audio signals, then input to digital audio channels 1 to 24. The relationship between pin numbers and signals is shown in the following figure.



DIGITAL AUDIO CHANNEL LINE INPUT connector pin assignments

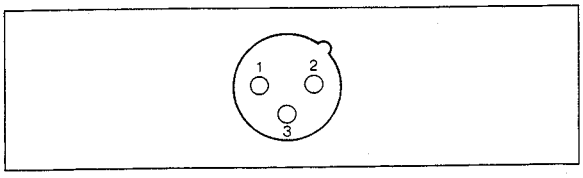
Pin number	Signal name
1	GND
2	COLD
3	HOT

Note

If you want to change the pin assignments so that HOT is connected to pin 2 and COLD to pin 3, pull out the wires from the CN601 connector on the CN529 board and connect them to the CN600 connector on the same board.

❷ DIGITAL AUDIO CHANNEL LINE OUTPUT connectors (XLR-3-32)

These connectors output the playback signals from digital audio channels 1 to 24, converted to analog audio signals. The relationship between pin numbers and signals is shown in the following figure.



DIGITAL AUDIO CHANNEL LINE OUTPUT connector pin assignments

(Continued)

Pin number	Signal name
1	GND
2	COLD
3	HOT

Note

If you want to change the pin assignments so that HOT is connected to pin 2 and COLD to pin 3, pull out the wires from the CN611 connector on the CN681 board and connect them to the CN610 connector on the same board.

❸ ANALOG A1/A2 INPUT connectors (XLR-3-31) and OUTPUT connectors (XLR-3-32)

These are the input/output connectors for analog audio signals on analog audio channels A1 and A2. The relationship between pin numbers and signals is the same as for the DIGITAL AUDIO CHANNEL LINE INPUT connectors ❶ and OUTPUT connectors ❷.

❹ TIME CODE INPUT connectors (XLR-3-31) and OUTPUT connectors (XLR-3-32)

These are the input/output connectors for time code signals. The relationship between pin numbers and signals is the same as for the DIGITAL AUDIO CHANNEL LINE INPUT connectors ❶ and OUTPUT connectors ❷.

❺ SECTOR ADDRESS INPUT/OUTPUT connectors (BNC type)

❻ SECTOR SYNC INPUT/OUTPUT connectors (BNC type)

❼ WORD SYNC INPUT/OUTPUT connectors (BNC type)

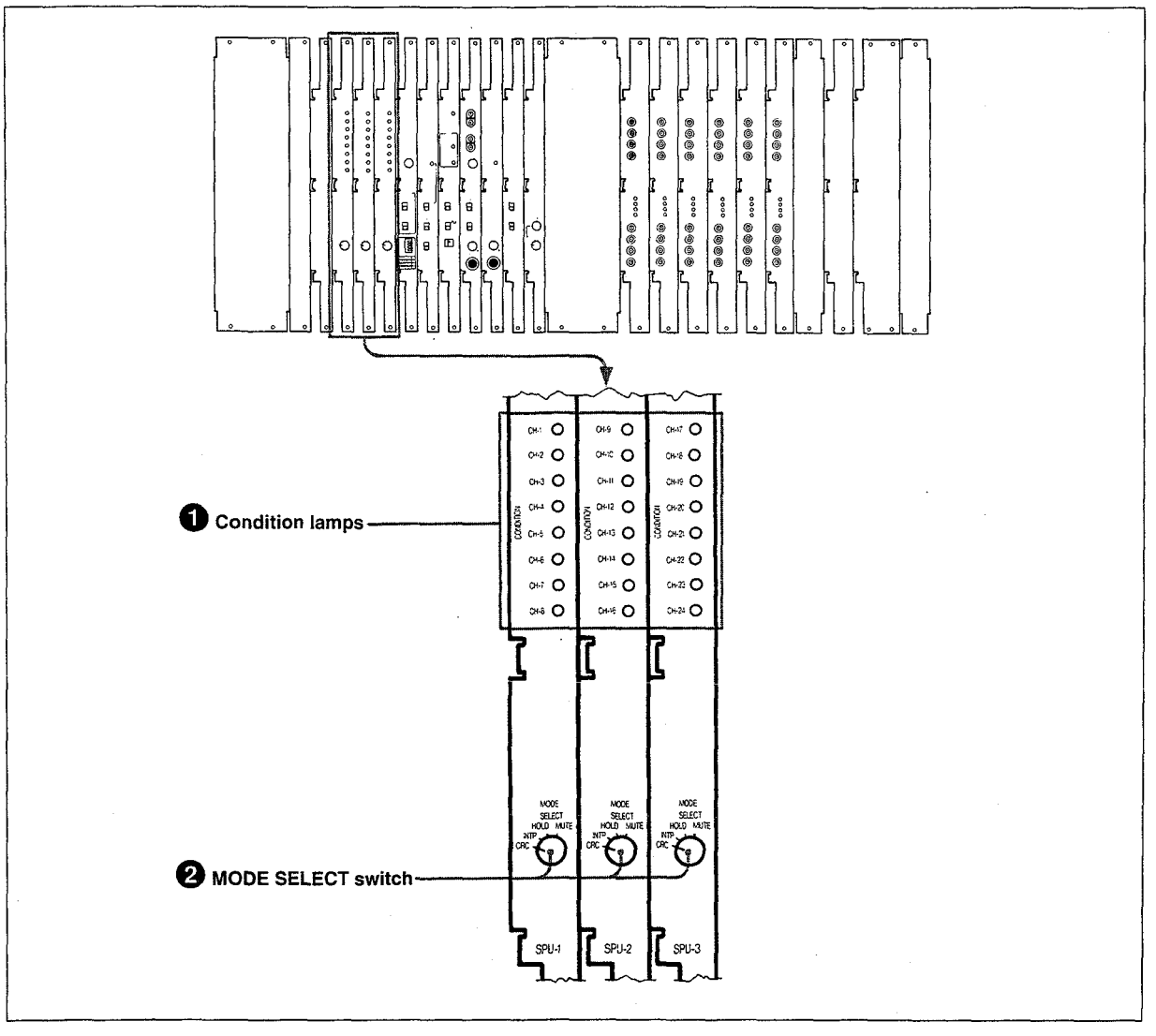
❽ REFERENCE VIDEO INPUT connectors (BNC type)

For details of the operation of these connectors refer to the Operation Manual for the RM-3324 or RM-3324S Remote Control Unit, the section entitled "Connectors used for connecting synchronizing signals" (RM-3324: page 8-12; RM-3324S: page 5-12).

❾ METER connector (D-SUB 37-pin)

Connect the optional DMU-3024 digital meter unit.

SPU-1 to SPU-3 boards



SPU-1 to SUP-3 boards

❶ Condition lamps

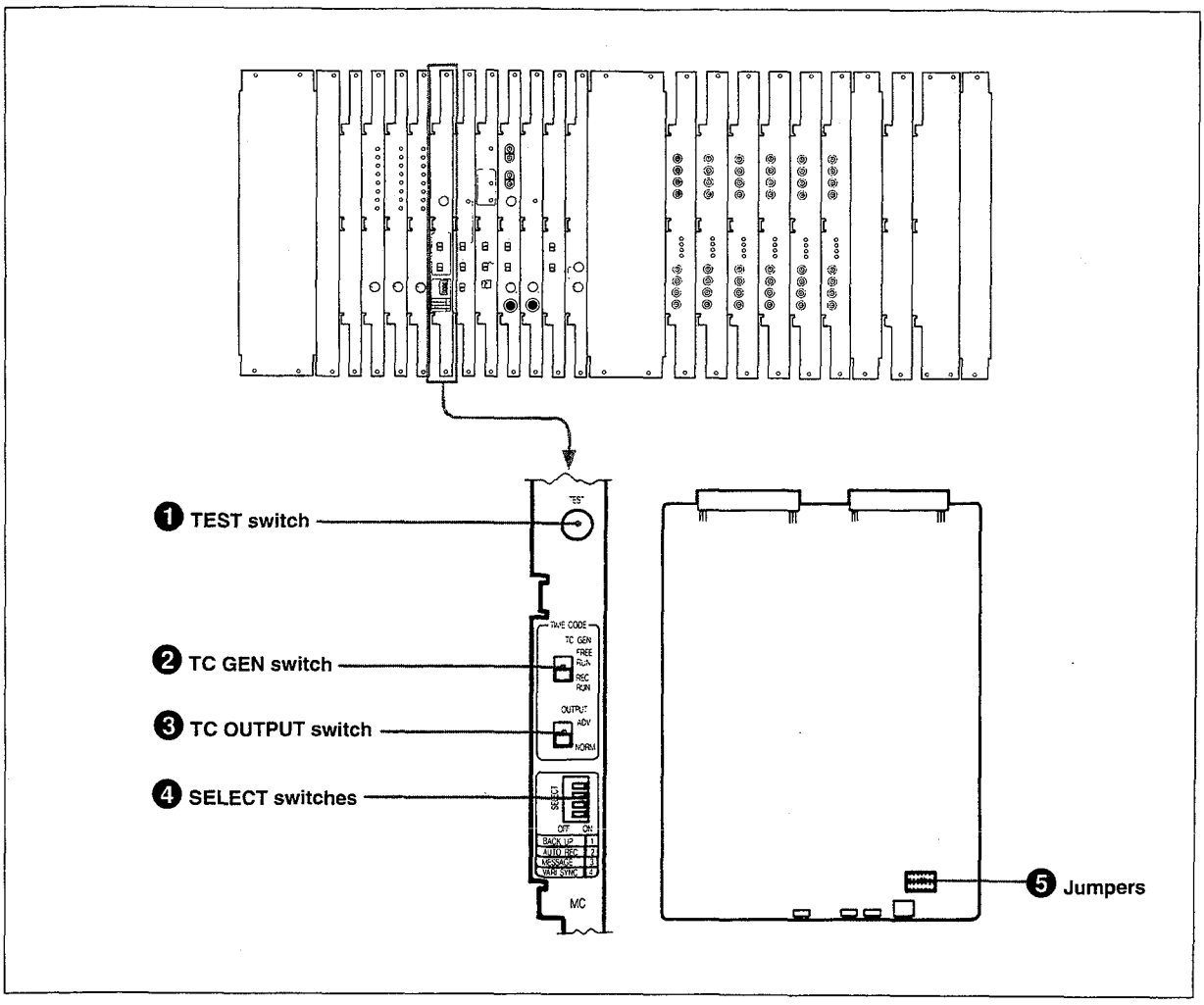
These lamps light if an error occurs on the corresponding digital audio channel. Use the MODE SELECT switch ❷ to determine which errors should be reported.

❷ MODE SELECT switch

This switch determines which errors the condition lamp reports, as follows:

CRC: when a CRC error is detected.
INTP: when error correction is not possible, and the average of surrounding correctly played back words has been used for interpolation.
HOLD: when error correction is not possible, and the output has been held at the last correctly played back word.
MUTE: when neither of the above error concealment is possible, and the output has been muted.

MC board



MC board

❶ TEST switch
This is for maintenance purposes only. Do not touch it.

❷ TC GEN (time code generator) switch
❸ TC (time code) OUTPUT switch
For details of the operation of these switches see "MC board" (page 3-32).

❹ SELECT switches
No. 1 (BACK UP): switches the PCM-3324S memory backup function on and off.

For details see Section 2-5, "Memory Backup Function" (page 2-13).

No. 2 (AUTO REC): switches the automatic recording mode for the analog audio channels on and off.

For details see "Automatic recording of analog audio channels" (page 3-24).

No. 3 (MESSAGE): determines whether the tape time display does (ON) or does not (OFF) display warning codes when the SYSTEM WARNING lamp is lit.

No. 4 (VARI SYNC): switches the vari sync function on and off.

For details see Section 3-8-8, "Time Code Sync Playback" (page 3-41).

❺ Jumpers

The jumpers control the following settings.

PHASE: switches the internal time code generator phase correction function on and off.
Left: OFF
Right: ON (normal setting)

HEAD: determines whether the tape is in contact with the heads and the time code is read during fast forward and rewind.
To use this function requires the DABK-3328 Time Code Reader Board (optional).
Left: tape in contact.
Right: tape not in contact. (normal setting)
Setting the jumper to the left enables cuing up using the time code even when the time codes are not recorded sequentially on the tape.

Caution

Frequent use of this function shortens the life of heads greatly.

The fourth jumper from the top: switches on and off the simultaneous playback function for recording on a prestriped tape.
To use this function requires DAH-24R Monitor Playback Head Kit (optional).
Left: ON
Right: OFF

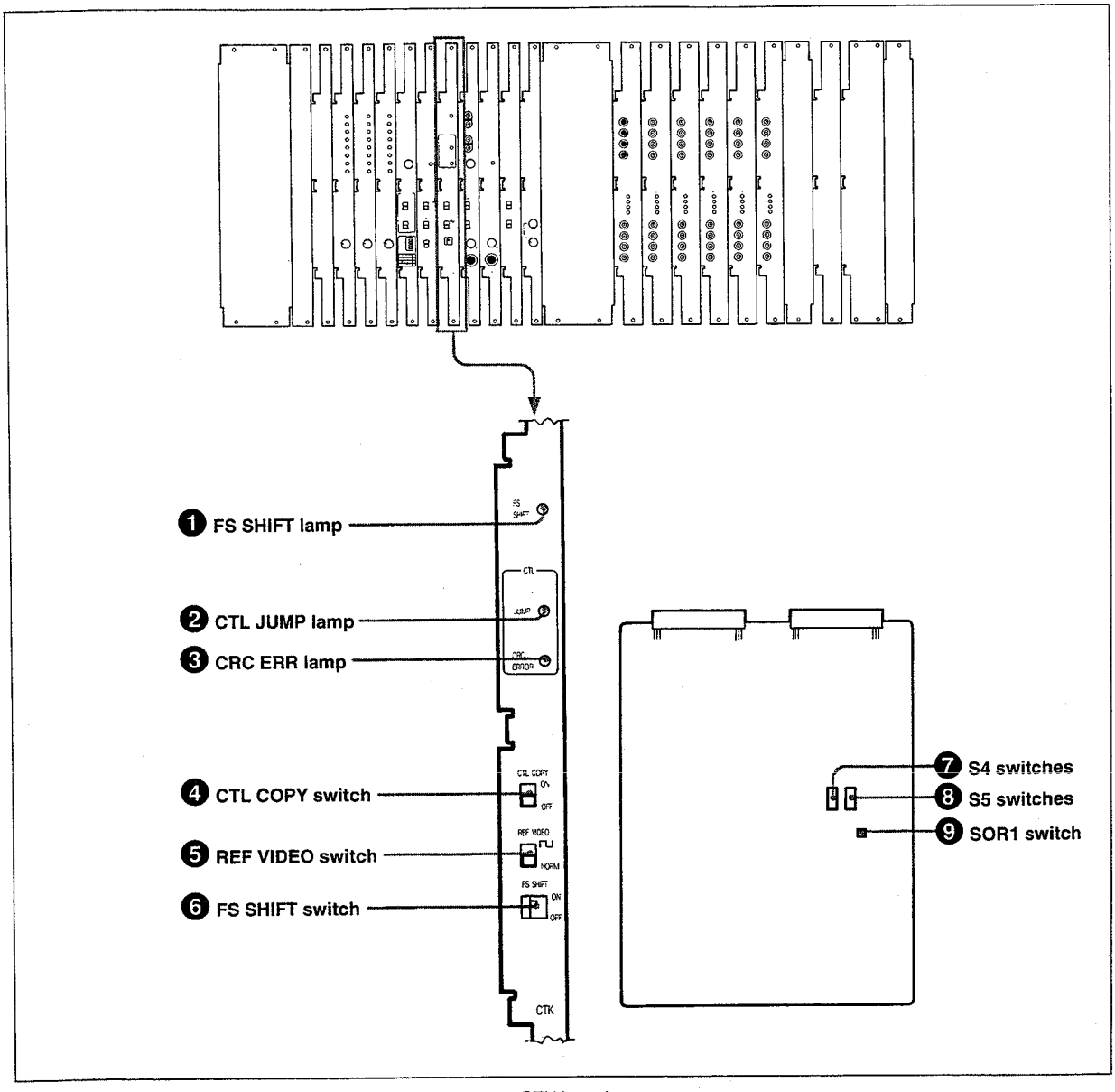
CTL PRO: switches the CTL protection function on and off.
Left: OFF
Right: ON (normal setting)

For details see "CTL protect mode" (page 3-15).

ASM: determines the CTL recording mode during assemble recording.
Left: forced assemble recording
Right: automatic assemble recording

For details see Section 3-6-1, "What Is Assemble Recording?" (page 3-18).

CTK board



CTK board

❶ FS (sampling frequency) SHIFT lamp
This lights when the FS SHIFT switch ❻ is on.

❷ CTL JUMP lamp
This lights whenever there is a discontinuity in the CTL addresses.

❸ CRC ERR (cyclic redundancy check error) lamp
This lights when there is a CRC error in the CTL played back.

❹ CTL COPY switch
Determines whether or not to copy CTL data together with the digital audio signals when making a backup copy.
ON: copy the CTL data.
OFF: do not copy the CTL data. (factory setting)

❺ REF (reference) VIDEO switch
Selects the signal to be input to the REFERENCE VIDEO INPUT connector on the rear panel.
NORM: NTSC or PAL composite video signal
⊓⊔ : square wave (30 Hz, 29.97 Hz, 25 Hz, 24 Hz)

❻ FS SHIFT switch
Shifts the sampling frequency.

For details see "Sampling frequency for prestriping or advance recording" (page 2-9).

❼ S4 switches (Numbers 1 to 8 from left to right)
❽ S5 switches (Numbers 1 to 8 from left to right)
❾ SOR1 switch
When a square wave is input to the REFERENCE VIDEO INPUT connector, these three switches determine the frequency division ratio required to produce the reference frequency of 30 Hz, 29.97 Hz, 25Hz, or 24 Hz.

The relationship between the SOR1 jumper position and the frequency division factor is as follows:
Left (1/1): the input signal is used unaltered as the synchronizing signal.
Center (1/2 to 1/7): set the ratio from 1/2 to 1/7 using S5 switches No. 1 to No. 3.
Right (1/8 to 1/999): set the ratio from 1/8 to 1/999 using S5 switches No. 5 to No. 8 and S4 switches No. 1 to No. 8.

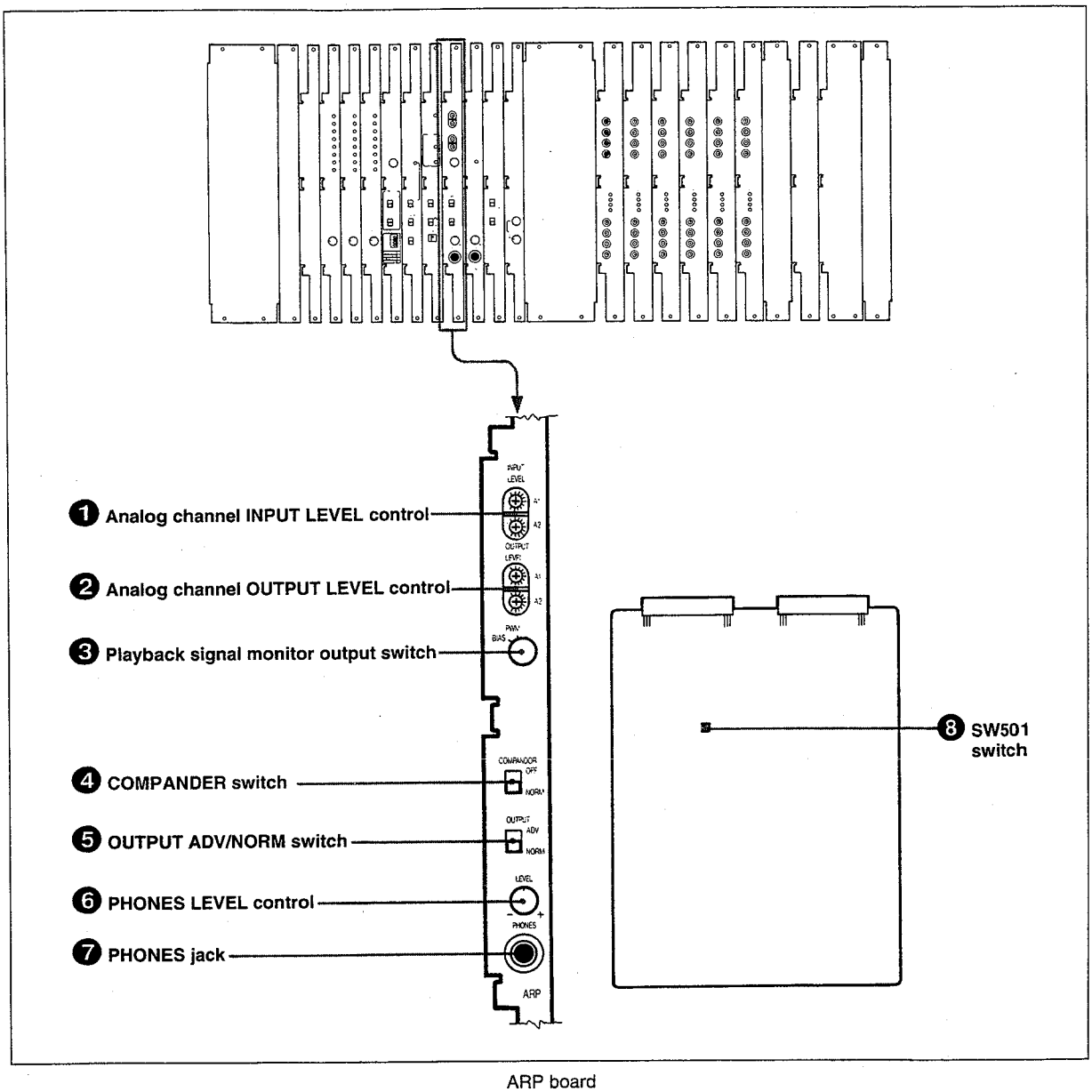
Setting the ratio from 1/2 to 1/7 (SOR1 jumper in center position)
The frequency is divided by the number represented in binary by S5 switches No. 1 to No. 3.
No. 1: 1
No. 2: 2
No. 3: 4
A switch in the ON position represents a 1 and OFF represents 0. Thus if all three switches are in the ON position, the frequency division factor is 1/7.

Example:
If the signal supplied is 60 Hz, for a 30 Hz synchronizing signal, set switch No. 2 only to ON, the others to OFF, thus dividing by 2.

Setting the ratio from 1/8 to 1/999 (SOR1 jumper in right position)
The switches represent the denominator of the division factor, in BCD notation as follows:
S5 switches No. 5 to No. 8: units (No. 5 = 1, No. 6 = 2, No. 7 = 4, No. 8 = 8)
S4 switches No. 1 to No. 4: tens (No. 1 = 1, No. 2 = 2, No. 3 = 4, No. 4 = 8)
S4 switches No.5 to No.8: hundreds (No. 5 = 1, No. 6 = 2, No. 7 = 4, No. 8 = 8)

Example:
To convert an input 9.6 kHz square wave to a 30 Hz synchronizing signal requires dividing by 320. In this case, set the S4 and S5 switches as follows:
S5 switches No. 5 to No. 8: all OFF (units value 0)
S4 switches No. 1 to No. 4: No. 2 (2) only ON (tens value 2)
S4 switches No. 5 to No. 8: No. 5 (1) and No. 6 (2) only ON (hundreds value 3)

ARP board



ARP board

1 Analog channel INPUT LEVEL control
This adjusts the input signal level to the analog audio channels A1 and A2.
Adjustment range: –2 dB to +10 dB

2 Analog channel OUTPUT LEVEL control
This adjusts the output signal level from the analog audio channels A1 and A2.
Adjustment range: –10 dB to +2 dB

3 Playback signal monitor output switch
For playback signal monitoring, this switch determines the analog audio output signal and the signal output to the headphones.
PWM: Plays back a signal PWM recorded to the analog audio tracks. Use this setting when playing back a tape recorded on this unit (the PCM-3324S).
BIAS: Plays back a signal bias recorded to the analog audio tracks. Use this setting when playing back a tape recorded on the PCM-3324A/3324.

❹ COMPANDER switch

Switches on and off the compander function — compressing while recording the analog audio signal and expanding during playback.

ON: enables the compander function. Use this setting when recording and playing back audio signals.

OFF: disables the compander function. Use this setting when recording and playing back signals other than audio signals.

❺ OUTPUT ADV/NORM (advance/normal) switch

When outputting an analog audio channel playback signal, this switch determines whether or not to provide a delay.

ADV: output signal with no delay.

NORM: output with a delay equal to the delay on the digital audio tracks. (normal setting)

❻ PHONES LEVEL (headphones volume) control

Adjusts the volume of the headphones for monitoring the analog audio channels A1 and A2.

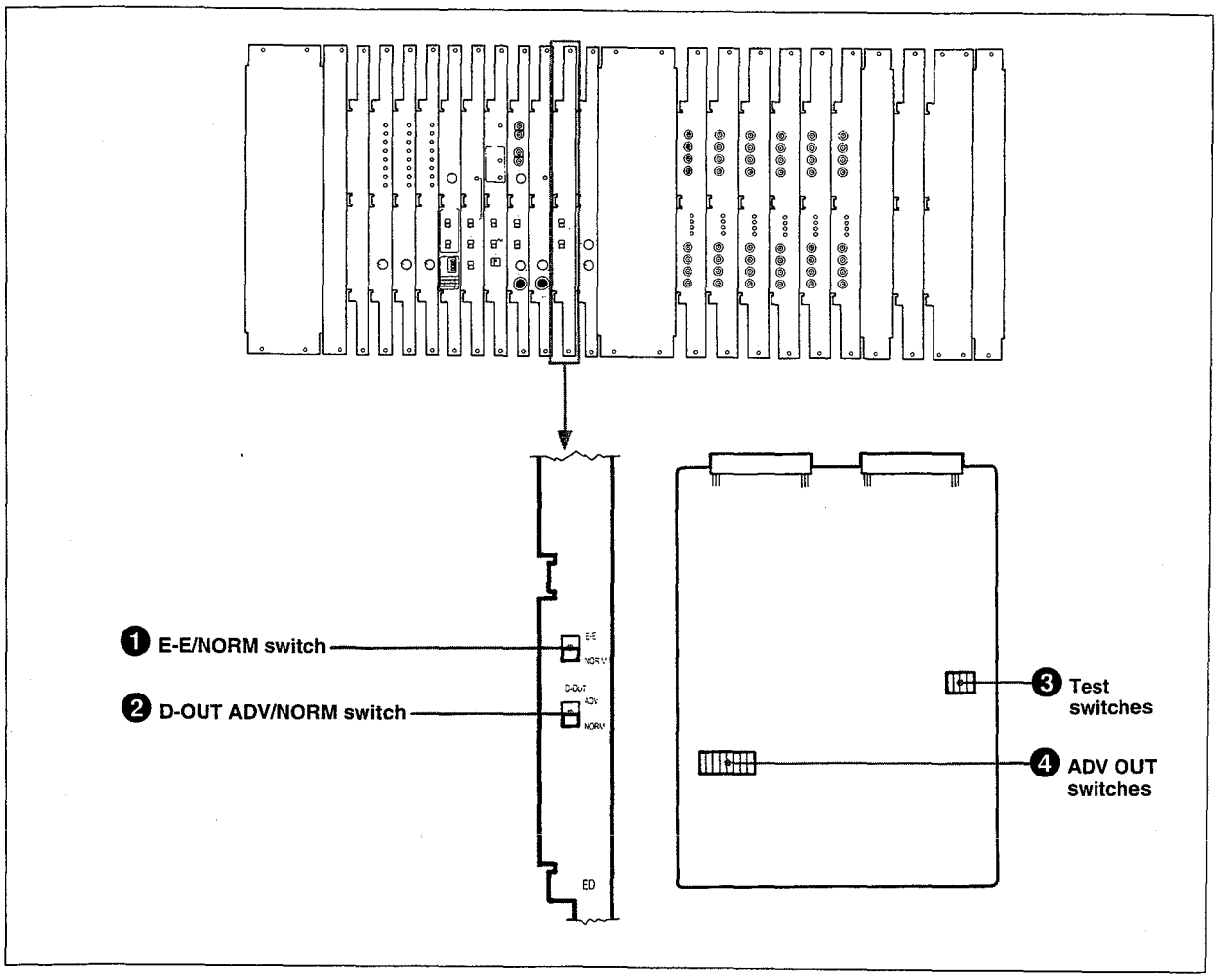
❼ PHONES (headphones) jack

Connect the headphones for monitoring the analog audio channels A1 and A2.

❽ SW501 switch

This switch is for factory adjustment only. Do not change the setting (NORM).

ED board



ED board

❶ E-E/NORM (electric-to-electric/normal) switch

This switch controls the signal flow when carrying out a circuit check.

NORM: *normal operating mode.*

E-E: circuit check mode. In this mode, the output of the encoder is input directly to the decoder, without passing through the head or tape.

❷ D-OUT ADV/NORM (digital audio signal advance/normal output) switch

❹ ADV OUT (advance output) switches

These switches determine the advance output of the digital audio signal.

D-OUT ADV/NORM switch ❷ selects between advance output (ADV) and normal output (NORM).

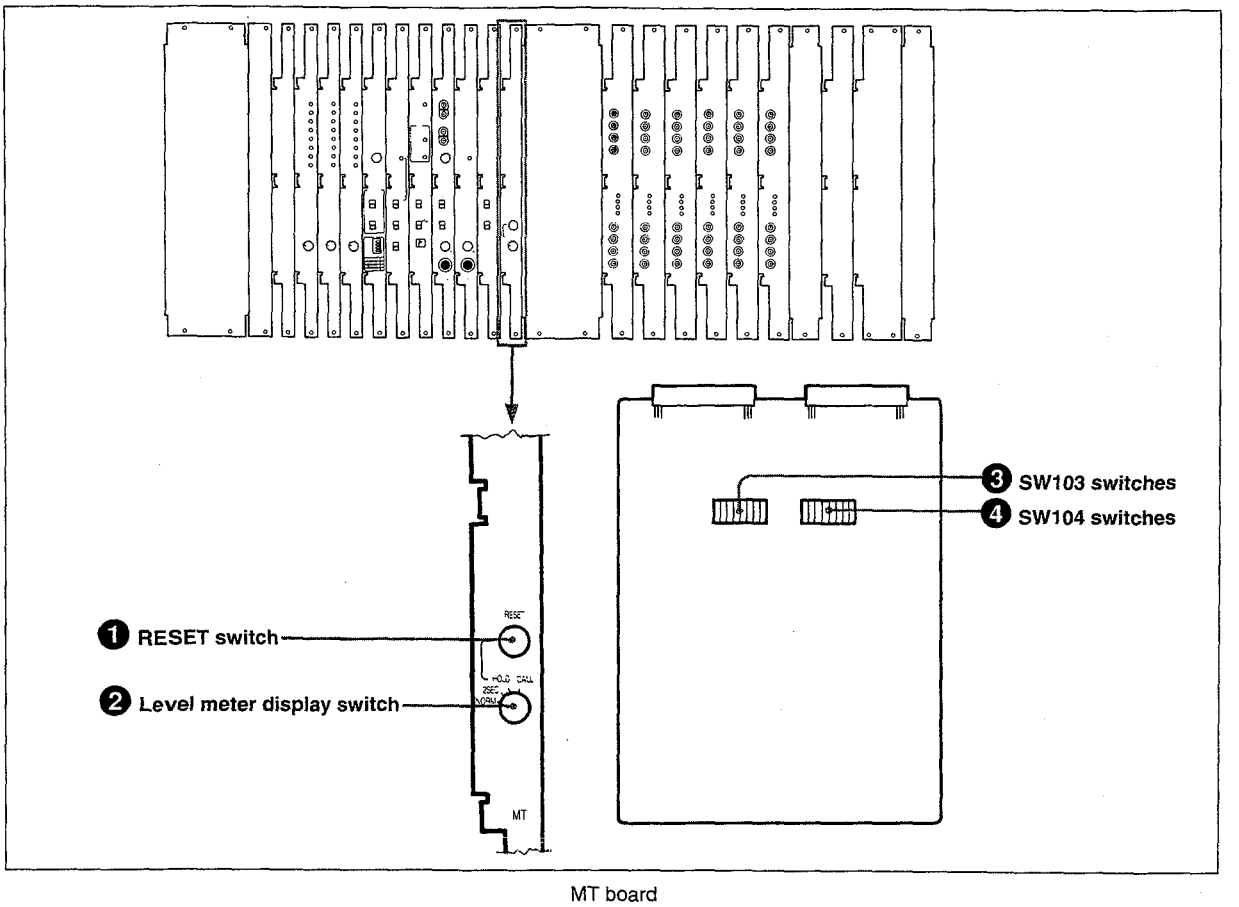
Normally all eight individual bit switches of the ADV OUT switches ❹ should be in the left position. This provides a 255 word value, representing the maximum advance.

The switches represent a binary eight-bit value, where the left position indicates a 1. This value indicates the advance in words.

❸ Test switches

These are for factory test purposes only. Do not change the settings.

MT board



MT board

❶ RESET switch

When the level meter display switch ❷ is set to HOLD, pressing this switch resets the held peak value.

❷ Level meter display switch

This selects how the digital audio channel level meter display operates as follows.

NORM: operates as a peak program meter.

2SEC: operates as a peak program meter, but also holds the peak value for approximately 2 seconds.

HOLD: operates as a peak program meter, but also holds the peak value until the RESET switch ❶ is pressed.

CAL: setting for calibrating the A/D converter gain.

❸ SW103 switches

These switches determine the number of consecutive words for which the level of a digital audio track has to be out of range before the OVER lamp of the level meter lights. The value which can be set ranges from 1 to 8, and DIP switches No. 1 to No. 8 correspond to one to eight words. Thus to set a limit of four words, move switch No. 4 only to the right position.

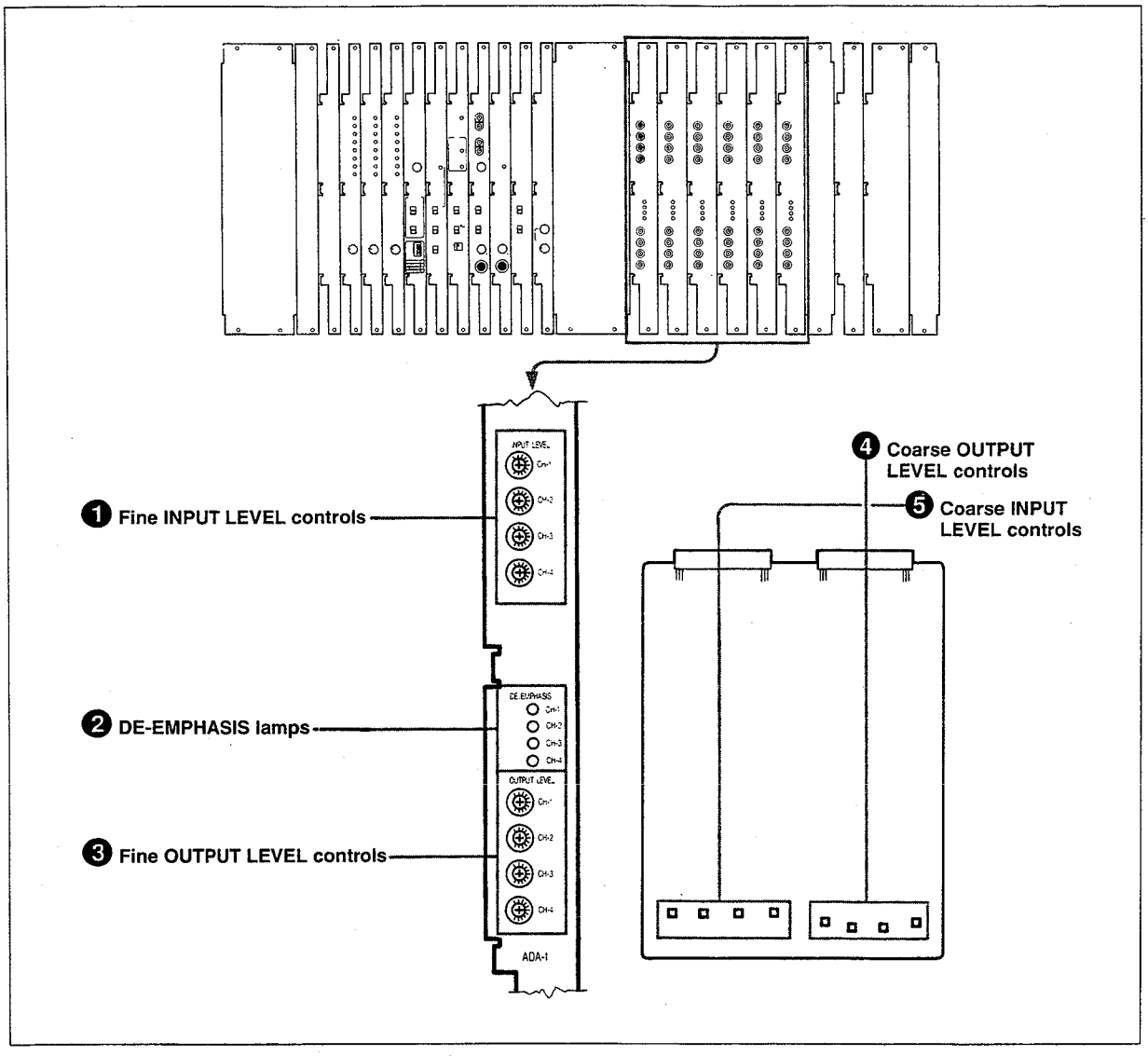
❹ SW104 switches

Switch No. 5 determines the mode for A/D converter gain calibration (when the level meter display switch ❷ is in the CAL position).

Left: each segment represents 0.2 dB centered on –20 dB.

Right (FLASH): when the input level reaches at least 0.2 dB of a segment of the meter, that segment flashes.

ADA-1 to ADA-6 boards



ADA-1 to ADA-6 board

1 Fine INPUT LEVEL controls
5 Coarse INPUT LEVEL controls
These adjust the input levels of the analog signal for each digital audio channel.

For details see "Adjusting the gain of the input signal" (page 2-3).

2 DE-EMPHASIS lamps
These lamps light when de-emphasis is being carried out on the corresponding digital audio channel. De-emphasis is automatically switched on and off depending on the emphasis information in the digital audio signal input to this board.

3 Fine OUTPUT LEVEL controls
4 Coarse OUTPUT LEVEL controls
These adjust the output levels of the analog signal for each digital audio channel.

For details see "Adjusting the gain of the output signal" (page 2-4).

Specifications

General

Dimensions	762 × 943 × 711 mm (30 × 37 1/4 × 28 inches) (w/h/d)(excluding projections)
Mass	About 120 kg (264 lb 9 oz)
Power requirements	100 to 240 V AC, 50/60 Hz
Power consumption	850 VA, 800 W (peak value)
Operating temperature	10°C to 35°C (50°F to 95°F) (to guarantee performance specification) 5°C to 40°C (41°F to 104°F) (to guarantee operation)
Operating humidity	30% to 70% (to guarantee performance specification) 20% to 90% (to guarantee operation)
Storage temperature	–20°C to +55°C (–4°F to +131°F)
Storage humidity	20% to 75%

Format

Recording format	DASH-F (Digital Audio Stationary Head — Fast Version)
Channel coding method	HDM-1
Number of digital audio channels	24
Quantization	16-bit linear
Error correction	Cross interleave
Recording time	(Using a 14-inch reel) 60 minutes (Fs = 48.0 kHz) 65 minutes (Fs = 44.1 kHz or 44.056 kHz)
Tape speed	76.2 cm/s (Fs = 48.0 kHz) 70.01 cm/s (Fs = 44.1 kHz) 69.94 cm/s (Fs = 44.056 kHz)
Tape speed variation range	±12.5%
Tape used	1/2-inch reel
Reels used	10-inch, 12.5-inch, 14-inch
Heads	Recording ×1 Playback ×1 Erase ×1
Recording tracks	Digital audio tracks 1 to 24 Analog audio tracks A1 and A2 Time code and CTL, 1 track each

Digital audio channel characteristics

Frequency response	20 Hz to 21.7 kHz $^{+0.5}_{-1.0}$ dB
Dynamic range	90 dB minimum at full scale (1 kHz, emphasis on)
Total harmonic distortion	0.07% maximum (20 Hz to 20 kHz, reference level)
Cross talk between channels	–80 dB minimum (20 Hz to 20 kHz)
Emphasis time constant	50 µs/15 µs (CD type)
Level displays	16 segment LED, peak level
Sampling frequency	44.056 kHz, 44.1 kHz, 48.0 kHz ±12.5% When recording: switchable During playback: switched automatically
Signal processing system delay time	Playback delay time: 252 blocks (63 ms at Fs = 48 kHz) Recording delay time: 236 blocks (59 ms at Fs = 48 kHz)

Analog audio channel characteristics

Frequency response	50 Hz to 10 kHz $^{+2}_{-6}$ dB
Signal-to-noise ratio	60 dB minimum (1 kHz, reference level input)
Total harmonic distortion	3% maximum (1 kHz, reference level input)
Level displays	8 segment LED, peak level
Carrier frequency	2 × sampling frequency
Emphasis time constant	150 µs/50 µs

Servo system characteristics

Capstan	
Lock-in time	0.5 seconds maximum, starting
Tape transport	
Tape speed	76.2 cm/s (Fs = 48 kHz) 70.01 cm/s (Fs = 44.1 kHz) 69.94 cm/s (Fs = 44.056 kHz)
Wow and flutter	0.15% maximum (RMS WTD)
Prestriping speed	304.8 cm/s (Fs=48 kHz) 280.04 cm/s (Fs=44.1 kHz) 279.76 cm/s (Fs=44.056 kHz)
Maximum fast forward/rewind speed	16 m/s
Slow wind speed	1.52 m/s
Shuttle variable speed range	0.076 m/s to 3.8 m/s (forward and reverse)
External phase control sensitivity	5% of playback speed/V (when DABK- 3321 is fitted)
External speed control sensitivity	160 cm/s/V (when DABK-3321 is fitted)
Reels	
Maximum rotation rate	1400 r/min (1400 rpm)
Winding time	4 minutes 20 seconds (14-inch reel) 2 minutes 25 seconds (10.5-inch reel)
Timer roller tolerance	±3.6 seconds (14-inch reel)
Locator	
Locate accuracy	Using timer roller ±3.6 s (running a D-1/2-2920 from beginning to end) Using CTL address 0 to +32 ms (Fs = 48 kHz)

Other characteristics

Editing resolution
1 sector
1.09 ms (Fs = 44.056 kHz)
1.088 ms (Fs = 44.1 kHz)
1.00 ms (Fs = 48 kHz)

Maximum cable lengths
Digital I/O
SDIF-2 (balanced): 75 m (246 feet) maximum (when DABK-3325 is fitted)
SDIF-2 (unbalanced): 30 m (98 feet) maximum (when DABK-3326 is fitted)
AES/EBU: 100 m (328 feet) maximum (when DABK-3327 is fitted)
REMOTE 2: 75 m (246 feet) maximum (when DABK-3322 is fitted)
REMOTE 3: 120 m (394 feet) maximum (when DABK-3323 is fitted)
WORD SYNC: 30 m (98 feet) maximum
SECTOR SYNC: 30 m (98 feet) maximum
SECTOR ADDRESS: 30 m (98 feet) maximum
METER: 100 m (328 feet) maximum

Input/output connectors

Input connectors

Connector	Number of channels	Rated input	Maximum input	Gain	Impedance	Connector type
DIGITAL AUDIO CHANNEL LINE INPUT	24	+4 dBs	+24 dBs	+10 dB to –2 dB variable	10 kΩ minimum, balanced	XLR-3-31
ANALOG A1, A2 INPUT	2	+4 dBs	+19 dBs	+10 dB to –2 dB variable	10 kΩ minimum, balanced	XLR-3-31

Connector	Levels	Impedance	Frequency	Connector type
WORD SYNC INPUT	3 V minimum	75 Ω, unbalanced 75 Ω on/off switchable	38.549 kHz to 56 kHz	BNC type (2), loop-through output
SECTOR SYNC INPUT	TTL levels	75 Ω, unbalanced	1 kHz ±50 ppm	BNC type (1)
REFERENCE VIDEO INPUT	0.3 V p-p (burst signal); 4 V p-p (composite sync signal)	75 Ω, unbalanced 75 Ω on/off switchable	30 Hz/29.97 Hz/25 Hz/24 Hz ±50 ppm	BNC type (2), loop-through output
SECTOR ADDRESS INPUT	TTL levels	75 Ω, unbalanced	—	BNC type (1)
TIME CODE	0.5 to 10 V p-p	10 kΩ minimum, balanced	—	XLR-3-31 (1)
EXT PHASE CONTROL[a)]	±10 V	10 kΩ minimum, balanced	—	XLR-3-31 (1)
EXT SPEED CONTROL[a)]	±10 V	10 kΩ minimum, balanced	—	XLR-3-31 (1)

a) When DABK-3321 board is fitted

Output connectors

Connector	Number of channels	Rated output	Maximum output	Gain	Impedance	Connector type
DIGITAL AUDIO CHANNEL LINE OUTPUT	24	+4 dBs, load impedance at least 600Ω	+24 dBs, load impedance at least 600Ω	+2 dB to –10 dB variable	60 Ω maximum, balanced	XLR-3-32
ANALOG A1, A2 OUTPUT	2	+4 dBs, load impedance at least 600Ω	+19 dBs, (at 1 kHz), load impedance at least 600Ω	+2 dB to –10 dB variable	60 Ω maximum, balanced	XLR-3-32

Connector	Levels	Impedance	Connector type
WORD SYNC OUTPUT	TTL output equivalent	75Ω, unbalanced	BNC type (2)
SECTOR SYNC OUTPUT	TTL output equivalent	75Ω, unbalanced	BNC type (1)
SECTOR ADDRESS OUTPUT	TTL output equivalent	75Ω, unbalanced	BNC type (1)
TIME CODE	2.4 V p-p ±0.1V	100Ω maximum, balanced	XLR-3-32 (1)

Digital inputs and outputs

Digital inputs

Connector	Connector type	Number of channels	Electrical characteristics	Format	Impedance	Transfer rate
SDIF-2 (BALANCE) INPUT [a]	D-SUB 50-pin (male)	24	RS-422A	SDIF-2 (balanced)	RS-422A, balanced	1.536 Mbits/s (Fs = 48.0 kHz)
AES/EBU D-I [b]	XLR-3-31 (1)	2	RS-422A	AES/EBU	RS-422A, balanced	3.072 Mbits/s (Fs = 48.0 kHz)
SDIF-2 INPUT A/B [c]	BNC type (2)	2	TTL	SDIF-2 (unbalanced)	75Ω, unbalnaced	1.536 Mbits/s (Fs = 48.0 kHz)

a) When DABK-3325 board is fitted
b) When DABK-3327 board is fitted
c) When DABK-3326 board is fitted

Digital outputs

Connector	Connector type	Number of channels	Electrical characteristics	Format	Impedance	Transfer rate
SDIF-2 (BALANCE) OUTPUT [a]	D-SUB 50-pin (female)	24	RS-422A	SDIF-2 (balanced)	RS-422A, balanced	1.536 Mbits/s (Fs = 48.0 kHz)
AES/EBU D-O [b]	XLR-3-32 (1)	2	RS-422A	AES/EBU	RS-422A, balanced	3.072 Mbits/s (Fs = 48.0 kHz)
SDIF-2 OUTPUT A/B [c]	BNC type (2)	2	TTL	SDIF-2 (unbalanced)	75Ω, unbalnaced	1.536 Mbits/s (Fs = 48.0 kHz)

a) When DABK-3325 board is fitted
b) When DABK-3327 board is fitted
c) When DABK-3326 board is fitted

Remote connectors

Remote control signal inputs and outputs

Connector	Format	Electrical characteristics	Connector type
REMOTE-1 [a]	SRIF-1	—	D-SUB 37-pin (female) (1)
REMOTE-2 [b]	Sony 9-pin remote format	RS-422A	D-SUB 9-pin (female) (1)
RM-3324S [b]	—	RS-422A	D-SUB 8-pin (1)
REMOTE-3 [c]	SRIF-3	RS-422A	D-SUB 50-pin (female) (1)
AUX [d]	SRIF-4	—	D-SUB 25-pin (male) (1)
REC RDY CONTROL [d]	SRIF-4	—	D-SUB 50-pin (male) (2)

a) When DABK-3321 is fitted
b) When DABK-3322 is fitted
c) When DABK-3323 is fitted
d) When DABK-3324 is fitted

Accessories supplied

Power Cord (for main unit) (1)
RH-10DA Empty Reel (10-inch) (1)
Operation Manual (1)
Maintenance Manual (1)
Quick Reference (1)

Optional accessories

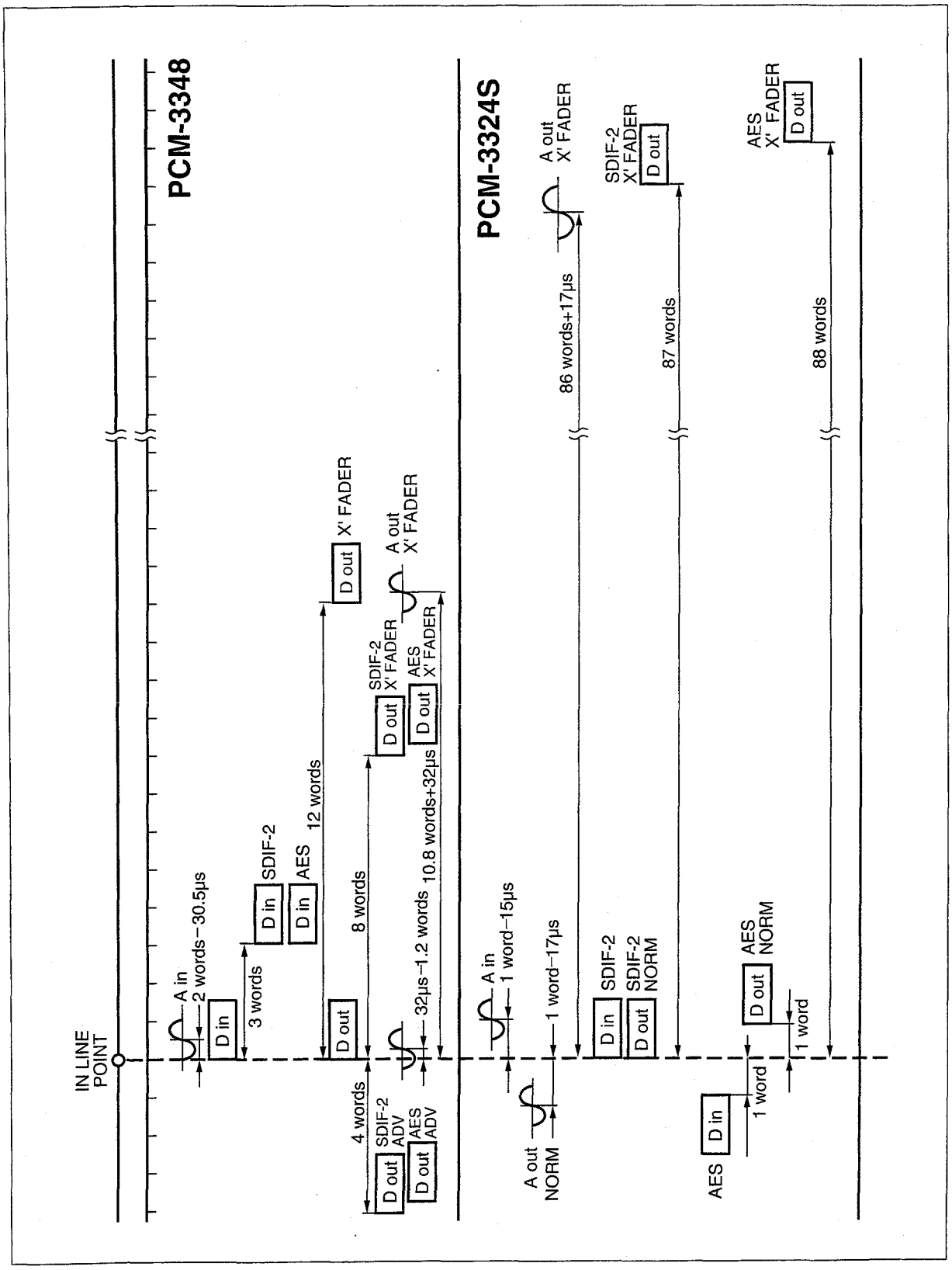
DABK-3321 Interface Board
DABK-3322 Interface Board
DABK-3323 Interface Board
DABK-3324 Interface Board
DABK-3325 Digital I/O Board
DABK-3326 Digital I/O Board
DABK-3327 Digital I/O Board
DABK-3328 Time Code Reader Board
DABK-3329 Sound Memory Board
DAH-24R Monitor Playback Head Kit
D-1/2-1460 Digital Audio Tape (10-inch)
D-1/2-2920 Digital Audio Tape (14-inch)
RH-14DA Empty Reel (14-inch)
CY-24A Tape Splicer
AM-9 Audio Marker
Scotch 620-1/2 Splicing Tape (manufactured by 3M)

Recommended equipment

RM-3324 Remote Control Unit
RM-3324S Remote Control Unit
DMU-3024 Digital Meter Unit

Design and specifications are subject to change without notice.

Timing Comparison Chart



Timing comparison chart

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