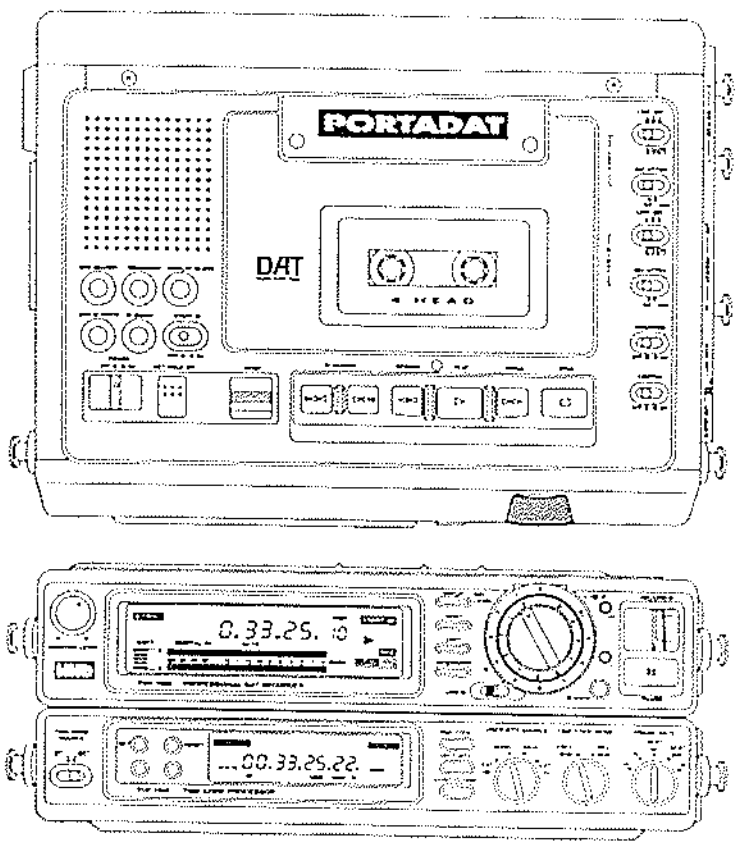
PORTADAT

PDR1000TC
Portable Timecode DAT Recorder

Operating Instructions
Bedienungsanleitung
Mode d'emploi
Manual de Instrucciones



DAT
Digital Audio Tape

WARNING

FOR USE IN THE UNITED KINGDOM

This appliance is supplied with a fitted three-pin mains plug. A 3 amp fuse is fitted in the plug.
Should the fuse need to be replaced, use a 3 amp fuse approved by ASTA or BSI to BS 1362. When replacing the fuse, you must ensure that any removable fuse covers are correctly refitted.
If you should lose the fuse cover, please contact HHB Communications Ltd..

DO NOT CUT OFF THE PLUG FROM THIS APPLIANCE. If the plug fitted is not suitable for the power points in your home, or the cable is too short to reach a power point, obtain an appropriate safety approved extension lead or adaptor. If in any doubt please consult a qualified electrician.

If the plug is cut off, remove the fuse and dispose of the plug immediately. THERE IS A DANGER OF SEVERE ELECTRICAL SHOCK. IF THE CUT OFF PLUG IS INSERTED INTO ANY 13 AMP SOCKET.

If a new plug is to be fitted please ensure it contains a 3 amp fuse, otherwise the circuit should be protected by a 3 amp fuse at the distribution board.

IMPORTANT

The wires in this mains lead are coloured in accordance with the following code:

Green-and-yellow:	Earth
Blue:	Neutral
Brown:	Live

As the colours of the wires in the mains lead of this apparatus may not correspond with the coloured markings identifying the terminals in your plug proceed as follows:

The wire which is coloured green-and-yellow must be connected to the terminal in the plug which is marked by the letter E or by the safety earth symbol ⏚ or coloured green or green-and-yellow.

The wire which is coloured blue must be connected to the terminal which is marked with the letter N or coloured black.

The wire which is coloured brown must be connected to the terminal which is marked with the letter L or coloured red.

WARNING

TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE.

Note:

This product is manufactured to comply with the radio interference requirements of EEC directive 82/499/EEC.

Hinweis:

Dieses Produkt erfüllt die Anforderungen der EEC-Richtlinien 82/499/EEC.

Remarque:

Ce produit est conçu pour être conforme aux normes CEE relatives aux interférences radio (directive 82/499/CEE).

Nota:

Este producto cumple los requisitos de radiointerferencias de la normativa de la CEE 82/499/CEE.

WARNING

Danger of explosion if lithium battery is incorrectly replaced. Replace only with same or equivalent type recommended by manufacturer. Discard used batteries according to the manufacturer's instructions.

VORSICHT

Bei falsch eingelegter Lithium-Knopfzelle besteht Berstgefahr. Die Knopfzelle gegen eine des gleichen Typs wie vom Hersteller empfohlen auswechseln. Verbrauchte Knopfzellen gemäß den Anweisungen des Herstellers entsorgen.

AVERTISSEMENT

Danger d'explosion si la pastille de lithium est mal placée. A remplacer uniquement par une pastille de même type ou de type équivalent recommandée par le fabricant. Jeter les pastilles usées conformément aux instructions de fabricant.

ADVERTENCIA

Puede haber peligro de explosión en caso de instalar incorrectamente la pila de litio. Utilice siempre una de las pilas recomendadas por el fabricante u otra de calidad equivalente. Deshágase de las pilas de acuerdo a las instrucciones del fabricante.

ADVARSEL!

Lithiumbatteri - Eksplosionsfare ved fejlagtig håndtering. Udskiftning må kun ske med batteri af samme fabrikat og type.
Lever det brugte batteri tilbage til laverandøren.

ADVARSEL

Lithiumbatteri - Eksplosjonsfare.
Ved utskifting benyttes kun batteri som anbefalt av apparatfabrikanten.
Brukt batteri returneres apparatleverandøren.

VARNING

Explosionsfara vid felaktigt batteribyte.
Använd samma batterityp eller en ekvivalent typ som rekommenderas av apparattillverkaren.
Kassera använt batteri enligt fabrikantens instruktion.

VAROITUS

Paristo voi räjähtää, jos se on virheellisesti asennettu.
Vaihda paristo ainoastaan laitevalmistajan suosittelemaan tyyppiin.
Hävitä käytetty paristo valmistajan ohjeiden mukaisesti.

Table of Contents

English

Principal Features

This manual provides all the information required to operate the PORTADAT Digital Audio Recorder. This tape recorder is intended for professional use, and this manual assumes that the reader has prior experience of using at least a conventional analog tape recorder.

High reliability four-motor drive

The unit uses four separate direct-drive motors to operate the drum, capstan, take-up spool and supply spool, providing very stable and reliable tape transport.

Four-head design for simultaneous playback and recording

The four head mechanism enables off tape confidence monitoring of the recording.

Phantom power supply

This provides a power supply for a microphone which operates on 48 V.

Long play function

This provides twice the normal recording time on a cassette, up to a maximum of four hours for a 120-minute tape with a small loss of sound quality.

Time stamp function

This records date and time on the tape, giving a permanent record of the time the recording was made.

Built-in speaker

The built-in speaker provides a simple playback monitoring function.

Analog inputs support 44.1 kHz sampling

The sampling frequency for analog inputs is selectable: not only 48 kHz and 32 kHz (LP mode) but also 44.1 kHz.

Wide range of inputs and outputs

The unit provides the following audio inputs and outputs:

- Balanced analog inputs
- AES/EBU format digital input and output
- SPDIF digital input and output.

High speed search operations

The identifier codes recorded on the tape make searching for a particular point on the tape extremely rapid.

Dual power supply for versatility

The rechargeable nickel-metal-hydride battery pack gives approximately one and a half hours of continuous operation. The unit also operates from an external 12 V DC power source, which can be supplied from the AC adaptor or an alternate 12 V source.

Robust design

The unit is designed to be used in tough applications: the front panel is designed to have minimum projections such as buttons, the body is diecast aluminium, and the rear is protected by tough rubber.

Lockable recording level

The REC LEVEL controls can be locked to prevent accidental adjustment.

Recording and playback of time codes

The unit has a built-in time code generator (TCG), and it is possible to record either time codes from the TCG or time codes input from an external source, and then to play back time codes recorded on the tape. It is also possible to play back with the time code locked to an external time code (time code chasing), and to output the time code from this unit.

Synchronized operation with other equipment

By using a digital audio signal, reference video signal or word sync signal for synchronization, this unit can be synchronized to other devices, so that in an editing system, for example, it can be used for accurate editing.

Notes on Operation

Handling the unit

Do not subject the unit to excessive force, as this may cause it to fail.

Do not leave the unit in the following locations

- In hot places such as in a car with the windows closed.
- In very humid, wet or dusty conditions.
- Where it is subject to strong vibration.
- In extreme cold.
- Do not place recorded cassettes, floppy disks or bank or other cards containing magnetically recorded information close to the speaker of this unit. Important information may be destroyed by the magnetic field.

Operation near a radio tuner or TV

Picture or sound interference may occur if the unit is too close to a radio tuner or TV. If this happens, move the unit further away.

Power supply

When using the supplied AC adaptor, plug it into a domestic wall outlet.

If not using the unit for a period of time

Remove the battery pack, and also do not leave a cassette loaded. If a cassette is left in the unit for a long time it is possible for the tape to stick to the drum.

Condensation

If the unit is brought from the cold to a warm place with high humidity, condensation may form on the head drum. This causes the tape to stick, and may damage the tape or mechanism. If there is a possibility of condensation, remove the cassette.

If the indication "dEw" appears in the display, the unit has detected condensation. If this occurs, remove the cassette, and leave the unit with the cassette compartment open for about two hours.

Care of the unit

• Heads

If the heads on the rotating drum become dirty the recording and playback sound quality will be impaired.

If this happens, clean the heads, using a commercially available DAT head-cleaning cassette.

• Casing and controls

Clean the unit using a soft cloth moistened with a little neutral detergent. Do not use any abrasive cleaners or volatile solvents such as thinners or alcohol.

Cassettes

Store DAT cassettes in their cases in an upright position. The cassette shells are designed to protect the tape from dust; do not attempt to force them open.

Lithium button cells

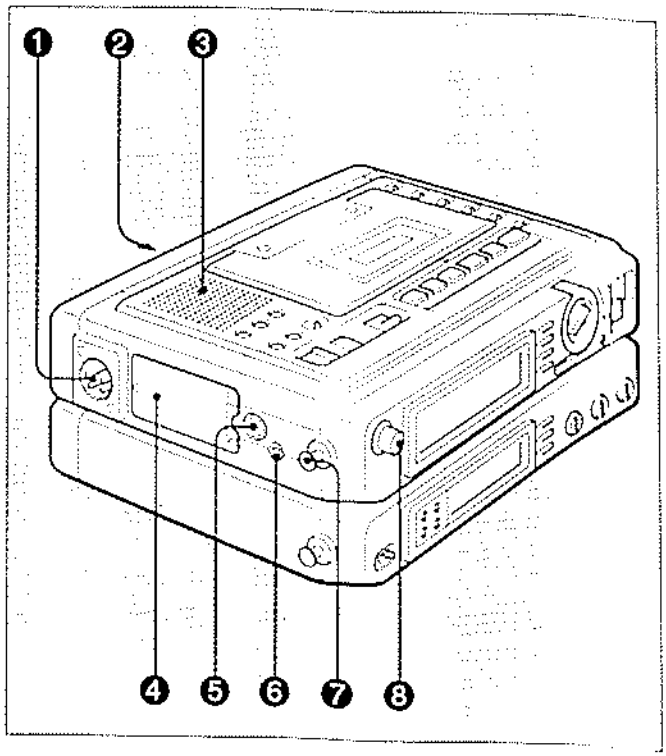
The backup battery contains lithium, which is extremely poisonous. Keep lithium cells out of the reach of children. If one is swallowed, get medical help immediately.

When using the unit with AC power:

Should there be a voltage drop caused by lightning or other incidents, it is possible for recording to be interrupted. To avoid such possible problems when using AC power, it is recommended always to have a rechargeable battery pack loaded at the same time.

Identification of Parts

DAT Unit



❶ **Power supply connector (12V DC INPUT)**
Connect the DC cord from the AC adaptor.

❷ **Battery pack compartment**
This is accessed from the rear panel.

❸ **Monitor speaker**

❹ **Back-up battery cover**

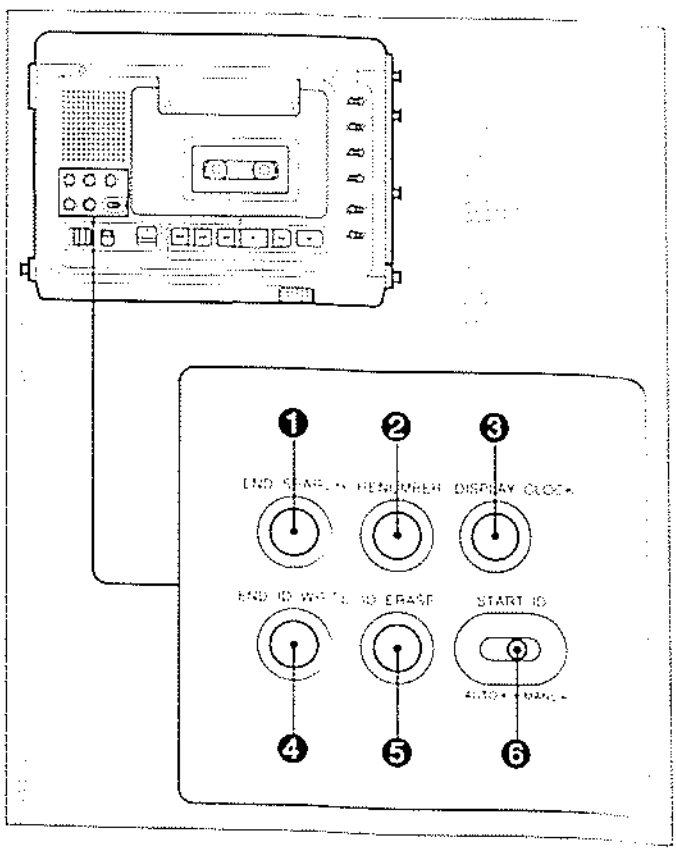
❺ **REMOTE connector**
Interface for remote control.

❻ **Headphone jack**
Connect headphones for audio monitoring.

❼ **Shoulder strap attachments**
Attach the supplied shoulder strap. (See the back cover of this manual.)

❽ **MONITOR LEVEL control**
Controls the volume of the monitor speaker or connected headphones. To adjust the volume, press the control lightly so that it pops out, then turn. When not in use, push the control back in, locking the adjustment. The monitor speaker is disabled whilst headphones are connected or when analog inputs are selected and the PORTADAT is in record mode.

■ Top panel controls - 1



❶ **END SEARCH button**
Locates the tape to an end-ID or the last recorded point.

❷ **RENUMBER button**
Renumbers all the program numbers.

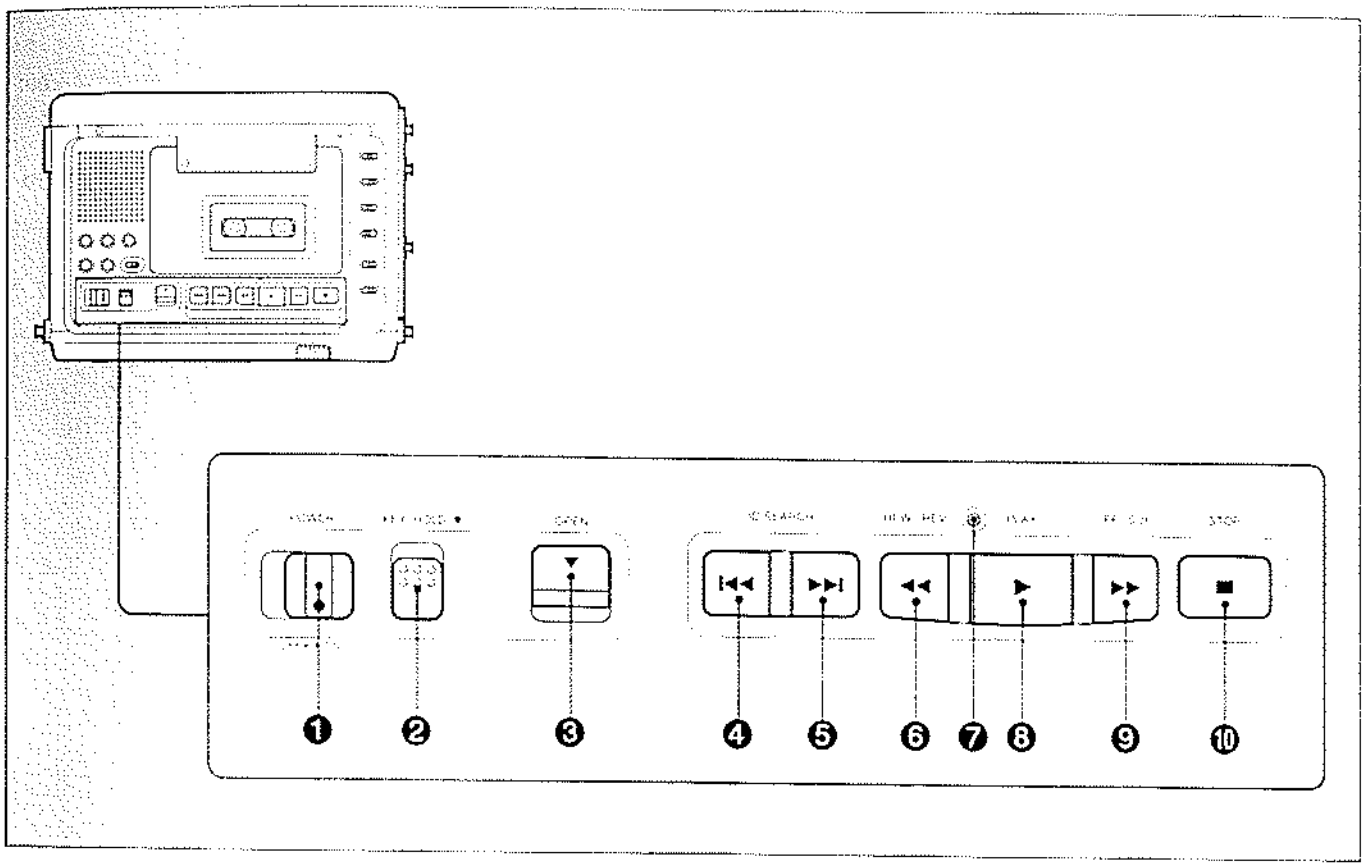
❸ **DISPLAY CLOCK button**
Shows the real-time clock and calendar on the display. Pressing this button cycles the display function through date, clock and day indications. During playback, pressing this button displays the time and date recorded on the tape. This button also activates the margin indicator in either record or playback modes.

❹ **END ID WRITE button**
Records an end-ID on the tape. When an end-ID is recorded on the tape, the tape transport does not move the tape past this point.

❺ **ID ERASE button**
Erases a start-ID or end-ID.

❻ **START ID switch**
Selects whether start-IDs are recorded on the tape automatically or manually.

■ Top panel controls - 2



❶ POWER switch
The unit powers on approximately six seconds after this switch is moved to the ON position.

❷ KEY HOLD † switch
When pushed in the direction shown by the arrow, this switch disables all of the tape operation buttons (STOP, FF/CUE, PLAY, REW/REV, RECORD, PAUSE, ID WRITE, END SEARCH, RENUMBER, END ID WRITE, ID ERASE, ▶▶I ID SEARCH, and I◀◀ ID SEARCH), and also the LOAD TC (JAM) and SET buttons on the time code processor unit.
It also disables control from a remote controller connected to the REMOTE connector.

❸ Cassette compartment catch
Pull in the direction of the arrow to open.

❹ I◀◀ ID SEARCH button
Skips back through the "programs" (tracks) on the tape by the number of times pressed. Pressing the button once moves to the beginning of the current "program" (track).

❺ ▶▶I ID SEARCH button
Skips forward through the "programs" (tracks) on the tape by the number of times pressed.

❻ ◀◀ REW/REV (rewind/review) button
Rewinds the tape. In play mode provides a reverse cueing function ("review" function), playing back the sound at high speed; if you hold down the button for 5 seconds continuously, the rewinding speed increases.

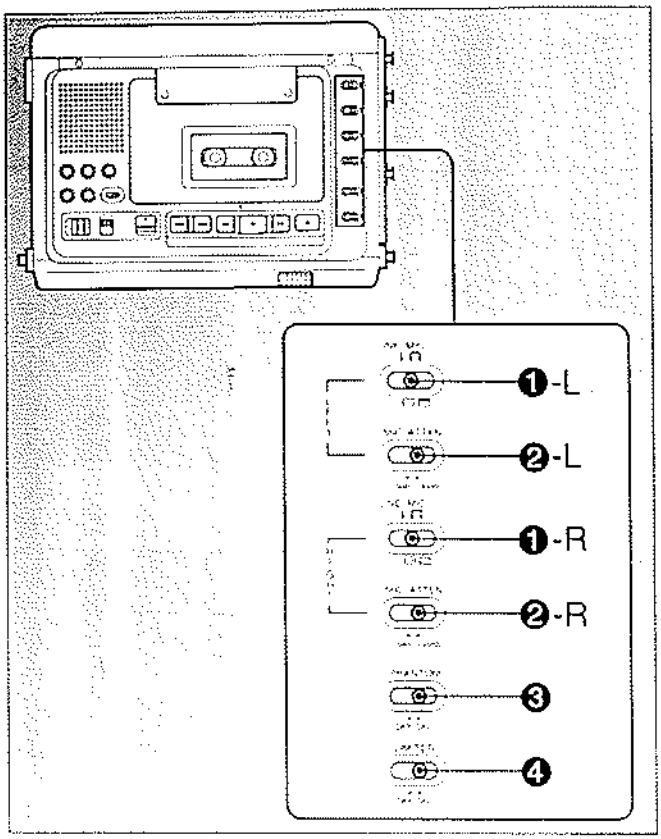
❼ Play indicator
Lights during playback and recording.

❽ ▶ PLAY button
Starts playback.

❾ ▶▶ FF/CUE (fast forward/cue) button
Fast forwards the tape. In play mode provides a forward cueing function, playing back the sound at high speed; if you hold down the button for 5 seconds continuously, the cue speed increases.

❿ ■ STOP button
Stops the tape transport.

■ Input controls



❶-L Left channel LINE/MIC selector

❶-R Right channel LINE/MIC selector
Select line input, or microphone input, either with a flat frequency response (the normal selection) or with a high pass filter to eliminate low frequency noise.

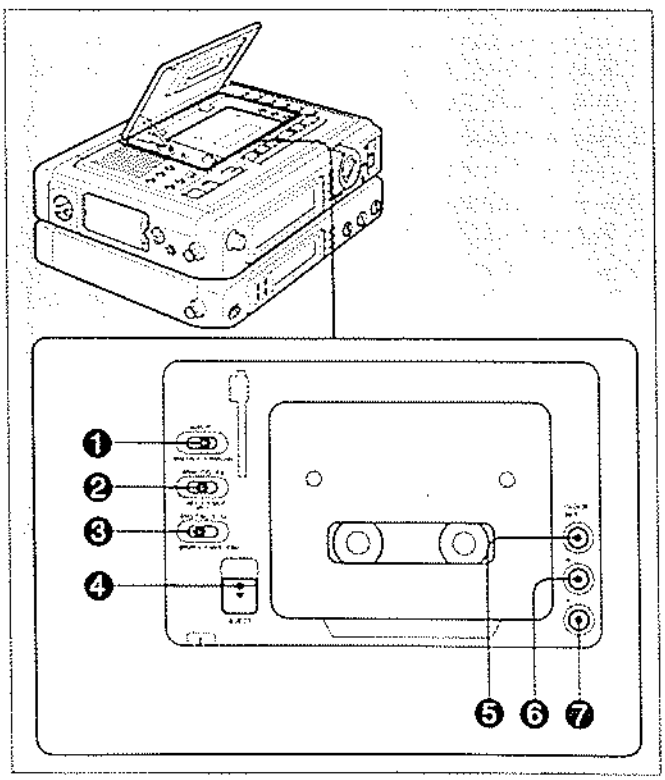
❷-L Left channel MIC ATTEN (microphone attenuation) switch

❷-R Right channel MIC ATTEN (microphone attenuation) switch
This switch gives 30 dB microphone attenuation to prevent input overload when high levels of signal are present.

❸ PHANTOM power supply switch
Set this switch to the ON position when using a microphone which requires a phantom power supply (48 V).

❹ LIMITER (limiter) switch
This switch restricts distortion from excess levels.

■ Cassette compartment controls



❶ INPUT selector
Selects analog or digital input

❷ ANALOG Fs selector
Selects the sampling frequency for analog input.

❸ DIGITAL I/O selector
Selects SPDIF or AES/EBU digital I/O.

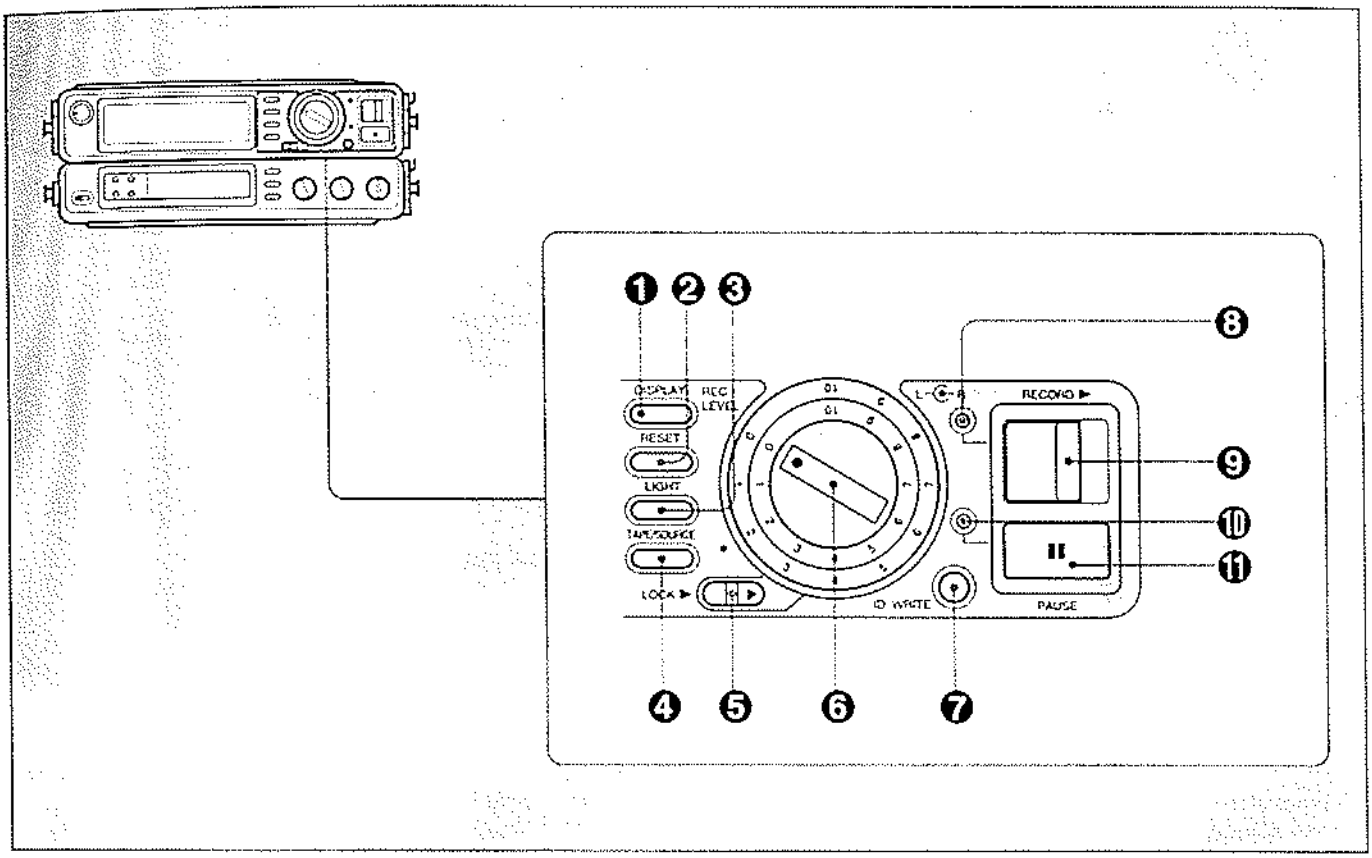
❹ EJECT button
This ejects the tape.

❺ CLOCK SET button

❻ Adjustment button (+)

❼ Adjustment button (–)
These buttons adjust the current time and date held in the unit.

■ Front panel controls



❶ DISPLAY button
Selects the type of time display to indicate the tape position.

❷ RESET button
Resets the tape position time counter to zero. Also resets the indication of the recording level margin (dB) when this is being displayed.

❸ LIGHT button
Switches the display backlighting on and off. This button is enabled about 6 seconds after the POWER switch is moved to the ON position.

❹ TAPE/SOURCE button
Selects tape or source monitoring mode as indicated on the display.

❺ LOCK button
Analog recording level lock. When slid to the right, this locks the outer control (for the left channel), preventing accidental movement.

❻ REC (recording) LEVEL controls
These adjust the left and right channel recording levels for analog input recording only.

❼ ID WRITE button
Writes a start-ID on the tape.

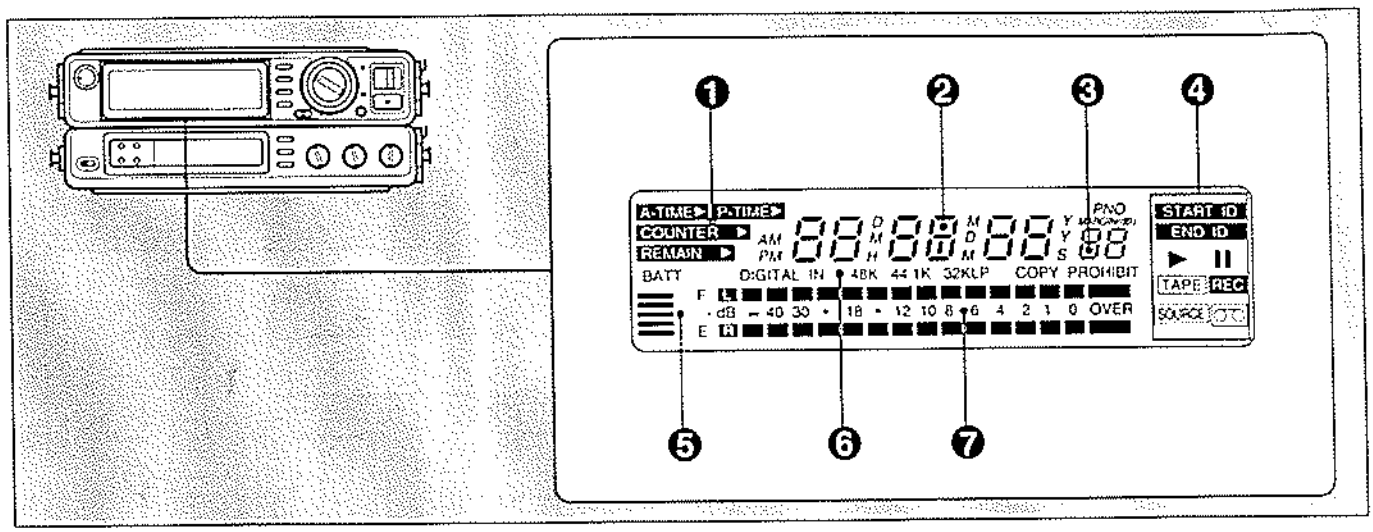
❽ Recording indicator
Lights when recording.

❾ RECORD button
Slide to the right to start recording.

❿ Pause indicator
Lights when the tape transport is paused.

⓫ ⏸ PAUSE button
Press to pause either playback or recording. If the tape transport is paused for more than 10 minutes, the unit enters the same state as when the STOP button is pressed to protect the tape.

■ Display



❶ Counter mode indications

A-TIME: Shows the absolute time from the beginning of the tape.

P-TIME: Shows the time from the beginning of the current program (track).

COUNTER: Shows the time in terms of a counter, which you can reset to zero at any point.

REMAIN: Shows the time remaining on the tape.

❷ Time display

When any of the indications above appears, this display shows a time counter value, in hours, minutes and seconds, corresponding to the tape position. It is also used to show the date, real time, day of the week, and various error and status indications.

Text indications

CAUtion	There is a malfunction. If this indication appears the unit may require servicing.
dEw	Condensation detected on the head drum.
End	The tape is positioned at the end of the recorded section.
Er	A start-ID or end-ID is being erased.
HOLd	An operation button was pressed while being disabled by the KEY HOLD switch.
LOAd	The tape is being wound round the drum.
rH	Rehearsal mode.
r n	Renumbering function in progress.
TAPE	An operation button was pressed with no tape loaded, or the cassette compartment open.
TOP	Tape is positioned at the beginning.
UnLd	The tape is being unwound from the drum.

❸ Numerical display

When the PNO indication appears, this shows the "program" (track) number. Pressing the DISPLAY CLOCK button displays the MARGIN (dB) indication, which indicates the margin above the highest input signal level; this value is held until reset by the RESET button.

❹ ID/Status indications

START ID: Flashes while recording or erasing a start-ID, and lights when the tape is positioned on a start-ID.

END ID: Flashes while recording or erasing an end-ID, and lights when an end-ID is detected during playback.

►: Lights while the unit is recording or playing back.

II: Lights while the unit is paused.

TAPE: Lights when the output signal is the signal recorded on the tape.

SOURCE: Lights when the output signal is a direct relay of the source input signal.

REC: Lights while the unit is recording.

⊡⊡: Lights when there is a tape loaded.

❺ BATT indication

This indicates the approximate charge state of the battery pack. See "Battery capacity indication" on page 16(E) for more details.

❻ Signal indications

These indicate the type of signal being played back or recorded on the tape.

DIGITAL IN: Digital input mode is selected.

48K: The sampling frequency is 48 kHz.

44.1K: The sampling frequency is 44.1 kHz.

32K: The sampling frequency is 32 kHz.

32KLP: Long play mode with sampling frequency of 32 kHz.

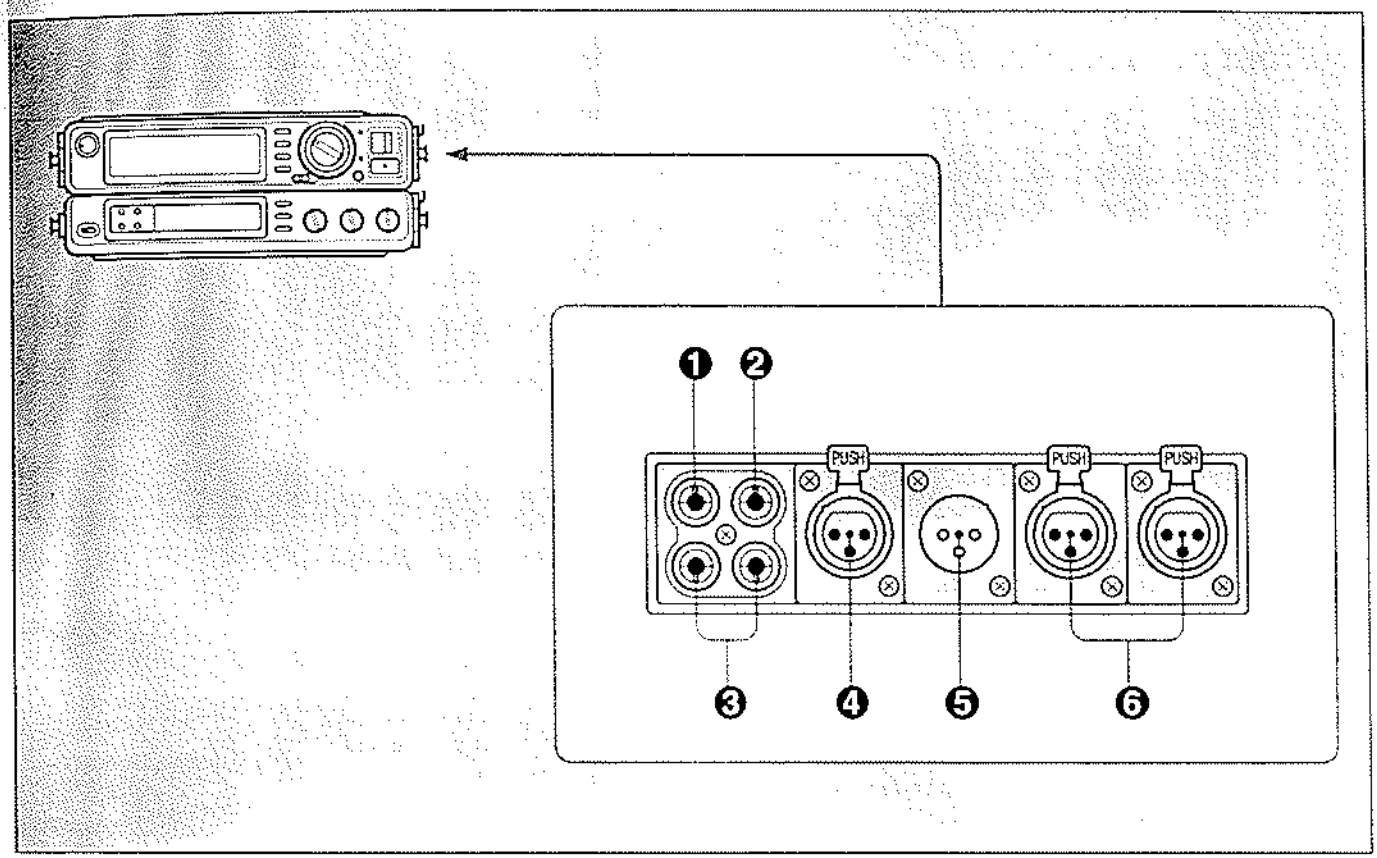
COPY PROHIBIT: Indicates that the recording input signal includes a copy prohibit code.

❼ Peak level meters

These show the peak levels of the signals currently being monitored.

"OVER" represents excessively high levels.

■ Input/output connectors



❶ SPDIF IN
Accepts a digital signal in the Sony-Philips digital interface format (SPDIF).

❷ SPDIF OUT
Outputs an SPDIF digital signal.

❸ LINE OUT L/R
Analog output signals. The connectors are color-coded: white for the left channel and red for the right channel.

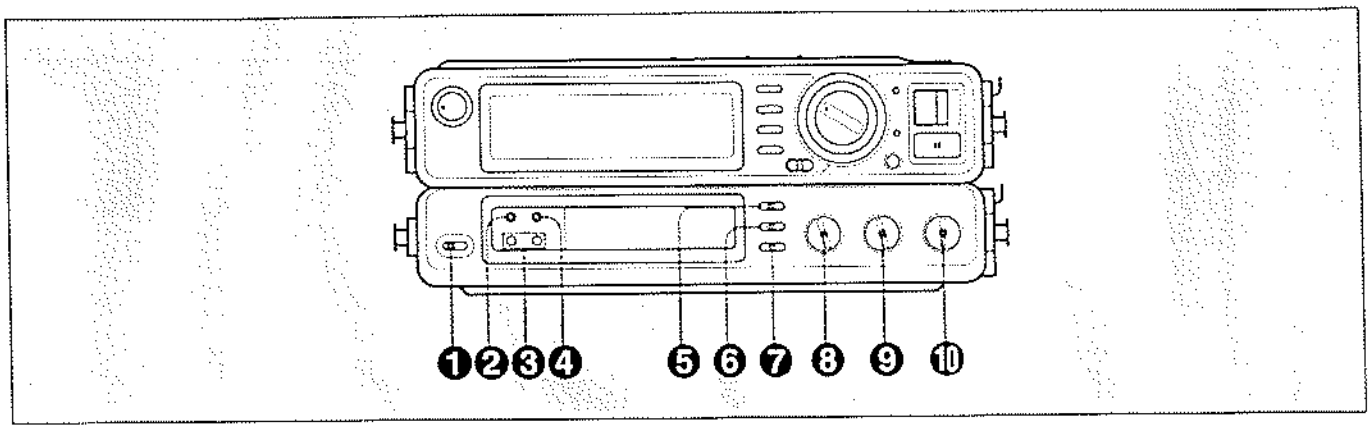
❹ AES/EBU IN
Accepts a digital signal in the AES/EBU format.

❺ AES/EBU OUT
Outputs a digital signal in the AES/EBU format.

❻ LINE/MIC L/R inputs
Analog input signals.

Time Code Processor Unit

■ Front panel controls



❶ TIME CODE SOURCE selector
Selects the source from which the time code is obtained.
INT: internal time code
EXT: external time code

❷ SET button
Used to set the time code or user bit value.

❸ +/– adjustment buttons
Adjust the value when setting the time code or user bits. Also, in combination with the TIME CODE button, select the time code output mode.

❹ RESET button
When setting the time code, this returns the value to its previous setting. When setting the user bits, this resets the value to zero.

❺ TIME CODE button
Selects which time code is to be displayed: the time code read from the tape or the time code selected with the TIME CODE SOURCE and TIME CODE MODE selectors. Also used to check or change the time code output mode. For details see pages 54(E) and 55(E).

❻ USER BITS button
Selects which user bits are to be displayed: the user bits read from the tape or the user bits selected with the USER BITS SOURCE selector.
For details see pages 54(E) and 55(E).

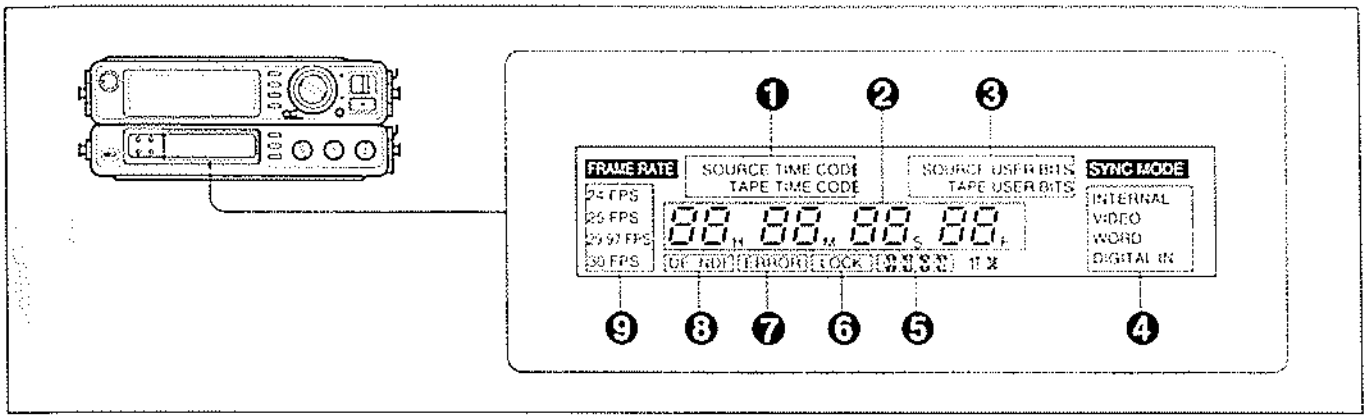
❼ LOAD TC (JAM) button
Synchronizes the internal time code generator with the external time code signal, i.e. performs a jam sync.

❽ USER BITS SOURCE selector
Selects the user bits recorded by this unit.
EXT UB: The user bits from the external time code signal
MANU: The eight-digit hexadecimal value entered manually.
DATE: The date from the unit's internal clock.
EXT TC: External time code.

❾ TIME CODE MODE selector
Selects the mode in which the internal time code generator operates, as follows.
FREE RUN: Time codes are counted constantly as long as the unit is powered on.
REC RUN: Time codes are counted only while recording.

❿ FRAME RATE selector
Selects the number of frames per second.
24: Film, 24 frames per second
25: PAL/SECAM, 25 frames per second
29.97 DF: NTSC color in drop-frame mode, 29.97 frames per second
29.97 NDF: NTSC color in non-drop-frame mode, 29.97 frames per second
30: NTSC monochrome in non-drop-frame mode, 30 frames per second

■ Display



❶ Time code indication

This shows whether a time code is currently displayed.

SOURCE TIME CODE: The time code selected by the TIME CODE SOURCE selector. If the TIME CODE SOURCE selector is set to EXT, and there is no external time code input, this indication flashes.

TAPE TIME CODE: The time code (Pro R-TIME) read from the tape. If no Pro R-TIME subcodes are recorded on the tape, the A-TIME values are displayed. If neither Pro R-TIME nor A-TIME subcodes are recorded, the "TAPE TIME CODE" indication flashes.

❷ Time code/user bits

This display shows the time code or user bits. It also shows the currently selected time code output mode.

❸ User bits indication

This shows whether a user bit value is currently displayed.

SOURCE USER BITS: The user bits included in the time code selected by the USER BITS SOURCE selector. This indication flashes in the following cases:

- The USER BITS SOURCE selector is set to EXT TC to select external time code or EXT UB to select user bits included in an external time code, but no external time code is input.
- The USER BITS SOURCE selector is set to DATE to select the date setting of the DAT unit, but no date is set on the DAT unit.

TAPE USER BITS: The user bits read from the tape. If no user bits are recorded on the tape, this indication flashes.

❹ Synchronization mode

Shows which of the possible four reference clock sources is being used.

INTERNAL: The signal from the internal clock.

VIDEO: An external video sync signal input to the VIDEO/WORD SYNC INPUT connector. If the frame rate of the sync signal is different from the setting on this unit, this indication flashes.

WORD: An external word sync signal input to the VIDEO/WORD SYNC INPUT connector. If the frequency of the word sync signal is different from the sampling frequency setting on this unit, this indication flashes.

DIGITAL IN: A digital audio signal input to the AES/EBU IN connector or SPDIF IN jack. If the sampling frequency of the digital audio signal is different from the sampling frequency setting on this unit, this indication flashes

❺ LOAD TC

When an external time code signal is present and the LOAD TC (JAM) button is pressed with the KEY HOLD switch on the DAT unit in the off, or down, position, this appears while the button is held down.

❻ LOCK

Flashes during a time code chase operation, and lights continuously for about four seconds when time code locking is achieved.

❼ ERROR

This appears or flashes during jam syncing, time code recording, or time code chase playback, if the system settings for these operations are erroneous.
For more details see page 63(E).

❽ DF/NDF

These indicate the frame counting mode.

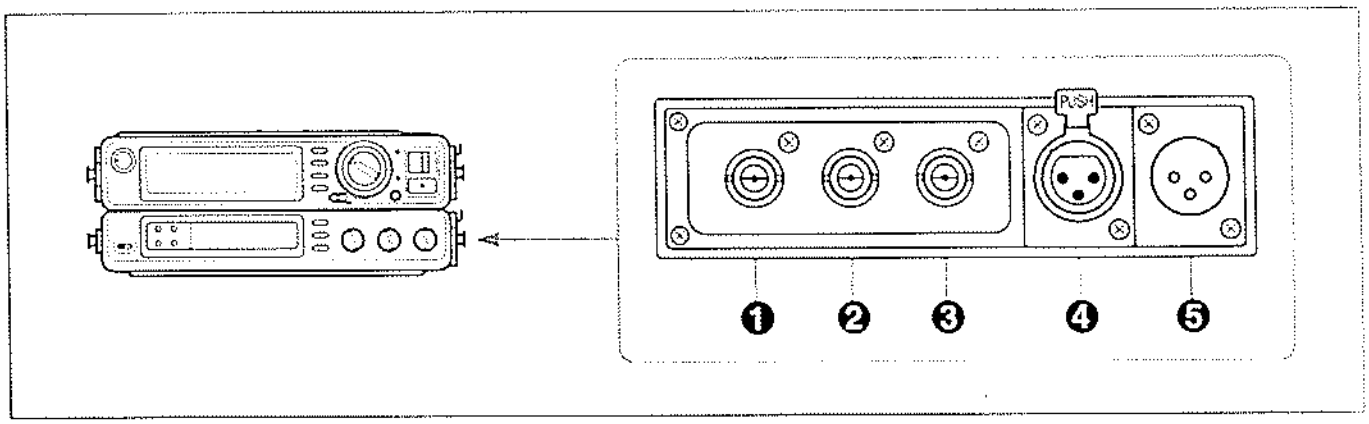
DF: drop-frame mode

NDF: non-drop-frame mode

❾ Frame rate indication

Shows the current frame rate as selected by the FRAME RATE selector. If the frame rate setting of this unit does not agree with an external time code, the indication for the setting of this unit and the "SOURCE TIME CODE" indication both flash

■ Input/output connectors



❶ VIDEO/WORD SYNC INPUT connector
Connector for inputting an external video or word sync signal.

- When inputting a video sync signal, make sure that the frame rate setting on this unit and the frame rate of the video sync signal are the same.
- When inputting a word sync signal for analog recording, set the sampling frequency on this unit to be the same as the frequency of the word sync signal. The word sync signal must be a square wave of frequency 44.1 kHz or 48 kHz.

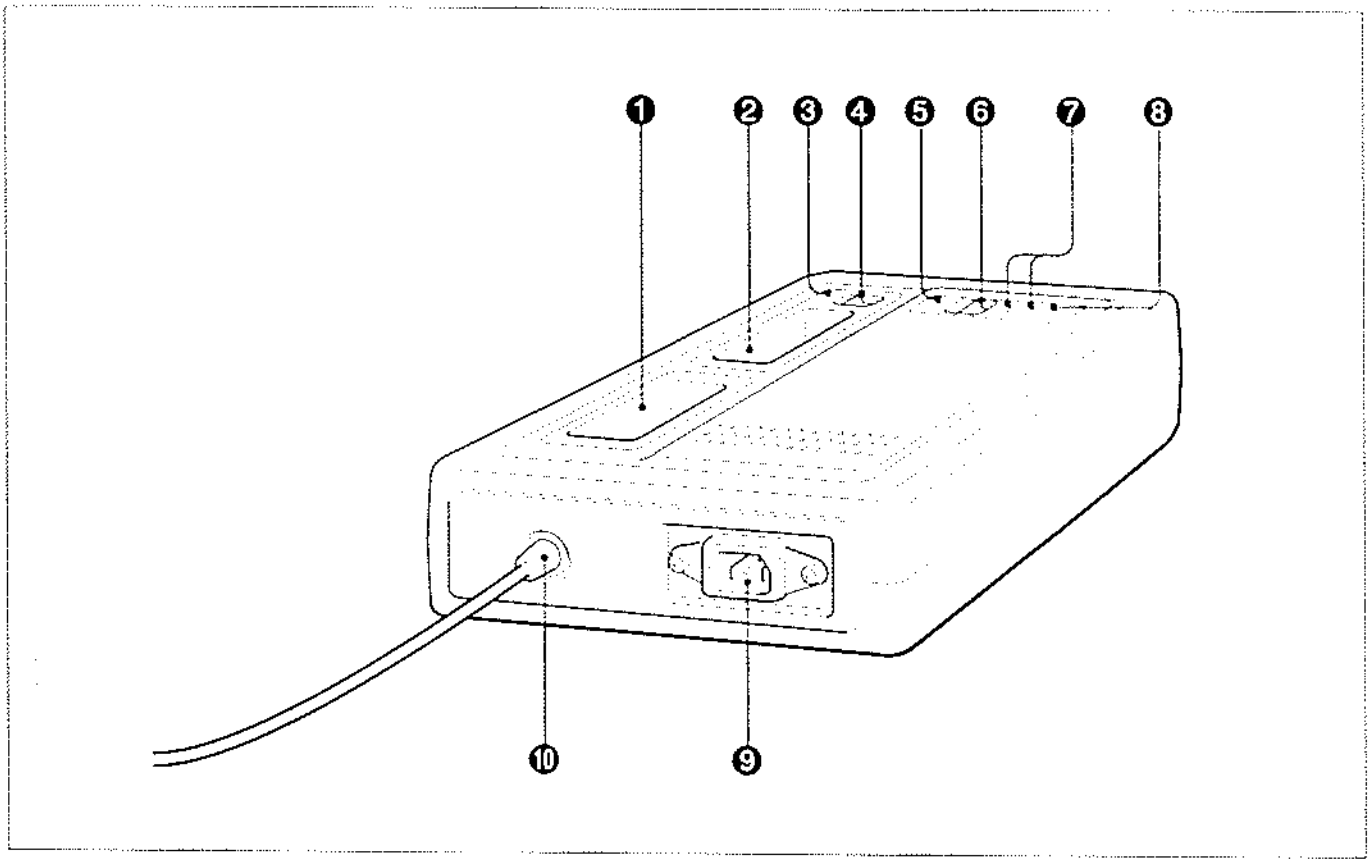
❷ VIDEO/WORD SYNC THROUGH connector
This connector outputs the signal input to the VIDEO/WORD SYNC INPUT connector. If there is no external device connected to this connector, always fit a 75-ohm terminator (not supplied).

❸ WORD SYNC OUTPUT connector
This connector outputs the reference clock signal being used internally.

❹ TIME CODE IN connector
Input an external time code signal.

❺ TIME CODE OUT connector
During playback or pause, this connector outputs the time code read from the tape, and at all other times outputs the time code selected by the TIME CODE SOURCE selector (internal or external time code).

AC Adaptor



❶ Battery slot A
Insert a battery pack to be charged.

❷ Battery slot B
Insert a battery pack to be charged. When the REFRESH switch ❹ is on, the battery pack in this slot is put through a deep discharge-recharge cycle to restore its capacity.

❸ REFRESH indicator
Lights when the battery pack in slot B is being refreshed.

❹ REFRESH switch
This refreshes the battery pack in slot B.

❺ DC OUT indicator
Lights when power is being supplied to the recorder.

❻ CHARGE/DC OUT selector
Switches the output of the AC adaptor.
CHARGE: Charges battery packs.
DC OUT: Provides power to recorder via attached DC cord.

❼ CHARGE indicators
Lights when a battery pack is being charged.

❽ POWER indicator
Lights when the AC supply is connected.

❾ AC supply connector
Connect the supplied power cord.

❿ DC cord
Connect to the 12V DC INPUT connector on the recorder.

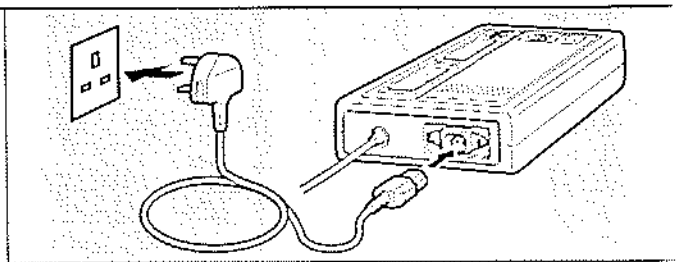
Power Supply

Using a Battery Pack

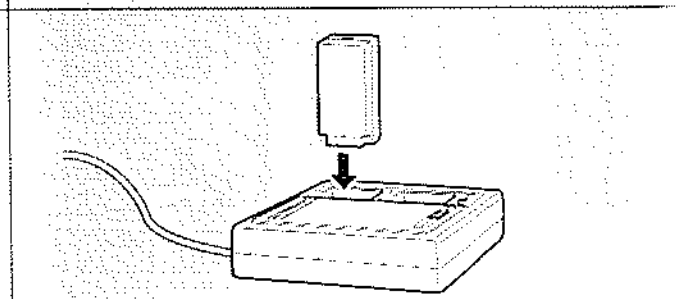
When using a battery pack for the first time, charge it until the CHARGE indicator goes out.
For the supplied battery pack you are recommended always to use the battery pack until completely exhausted before recharging. If you charge a partly used battery pack it may not be possible to obtain the full charge capacity.

■ Charging

1 **Connect the power cord of the AC adaptor.**

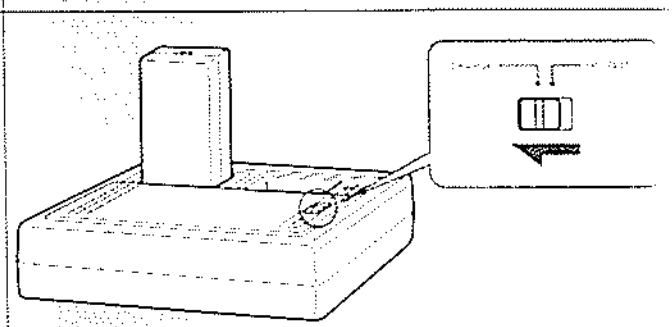


2 **Insert the battery pack to be charged.**
You can use either of the two slots, A or B.



3 **Switch the CHARGE/DC OUT selector to the CHARGE position.**
The CHARGE indicator lights, and charging begins. When charging is completed, the CHARGE indicator goes off.

Remove the battery pack promptly once charging is completed.



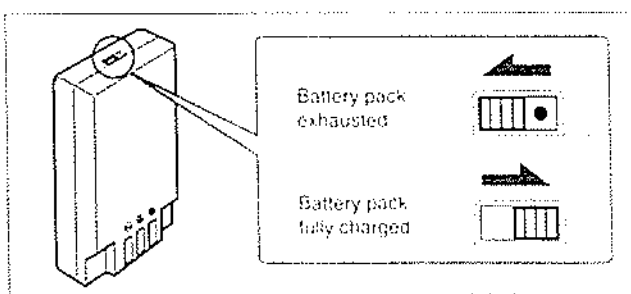
Using both slots
The battery pack in slot A is charged first. When the CHARGE indicator for slot B lights, the battery pack in slot A is fully charged.

Charging and operation times
Charging time: about two hours
Operation time: about one and a half hours (with the phantom power and backlighting turned off)

Charge cycles
The life of the battery pack is about 300 charge-discharge cycles.

Notes on charging
- Use only the supplied AC adaptor for charging
  Using any charger other than the supplied AC adaptor may result in malfunction.
- The AC adaptor and battery pack may become warm during the charging process. This is normal.
- Rechargeable batteries discharge over a period of time even when not in use. For this reason it is recommended that batteries are charged a short time before use.

Battery pack charging reminder
When the battery pack has been used, move the switch to the position where the red tab is showing, then switch it back after charging the battery pack.



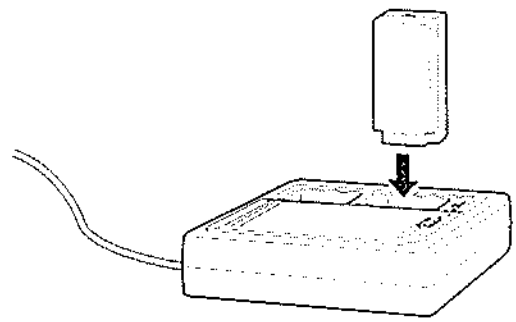
This switch acts as a reminder only; it has no internal effect

What is refreshing operation?
If a battery pack is recharged before the whole capacity has been used, the subsequent charge capacity may be reduced. The refreshing operation puts the battery pack through a deep discharge-recharge cycle to restore its capacity.

■ Refreshing a battery pack

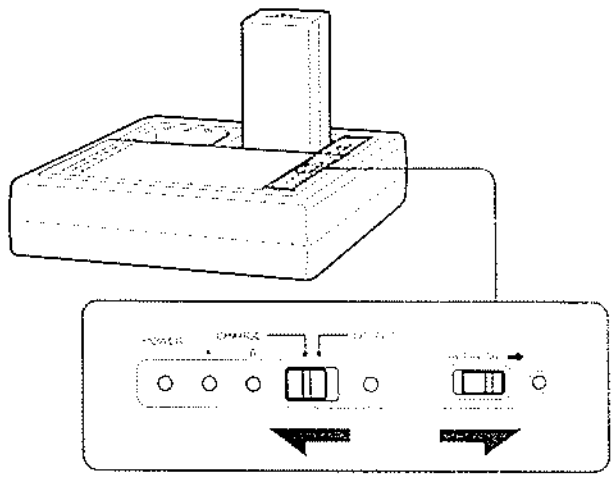
1 Insert the battery pack in battery slot B.

There is no refresh function for slot A



2 Switch the CHARGE/DC OUT selector to the CHARGE position and turn the REFRESH switch on.

The REFRESH indicator lights, and the AC adaptor begins to discharge the battery pack.
The discharging operation normally takes about six to eight hours for a fully-charged battery pack. Once the battery pack is fully discharged, the REFRESH indicator goes off, and the AC adaptor automatically starts to recharge the battery pack.

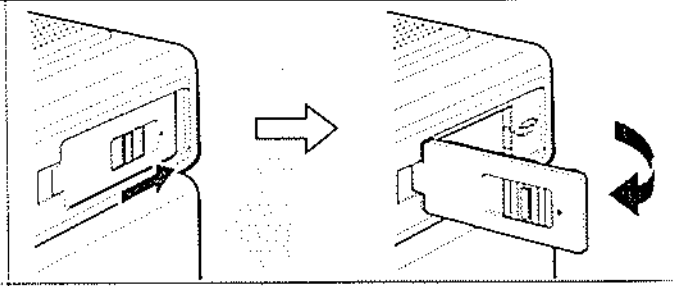


Charging during the refresh operation
While slot B is in use refreshing a battery pack, slot A can be used to charge other battery packs.

■ Loading a battery pack

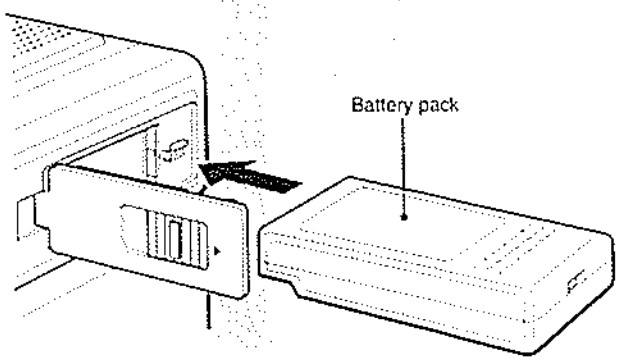
1 **Open the cover of the battery pack compartment.**

① Slide the cover to the right.
② Pull open.



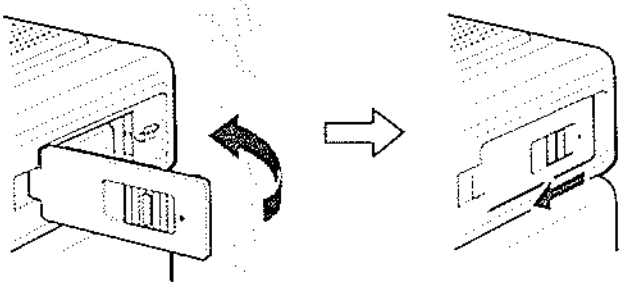
2 **Slide the battery pack into the compartment.**

Check that the battery pack is the correct way round.



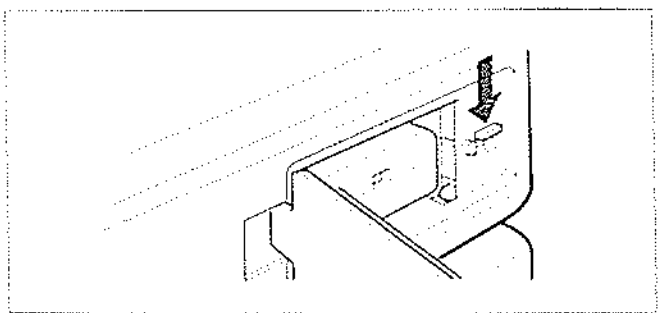
3 **Reclose the cover.**

① Push the cover closed.
② Slide to the left.



Removing the battery pack

To open the cover of the battery pack compartment, first slide down the release button to release the lock.



If the unit does not power on when you insert a battery pack

If the battery pack is removed with the POWER switch on, to protect the internal circuitry the power does not come on immediately when the next charged battery pack is inserted. In this case first turn the POWER switch off, then on again.

Battery capacity indication

The BATT indication in the display shows the approximate charge state of the battery pack.
When the charge has been used until only one segment of the BATT indication is showing, the indication flashes, and a warning beep is given by the speaker and headphones. When this happens, switch the power supply from the battery pack to the AC adaptor or replace the battery pack immediately.

Notes on battery packs

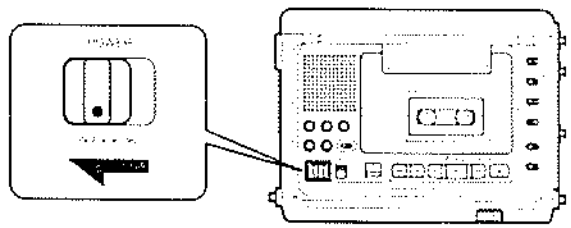
If battery packs are handled inappropriately, they may emit heat, catch fire or burst. Follow these guidelines carefully.

- Never short the terminals or throw used battery packs into a fire.
- Do not dismantle the battery pack, or subject it to heat.
- Do not charge or store battery packs in very cold or very hot conditions. The ambient temperature for use should be between 10°C and 40°C.

Using AC Power

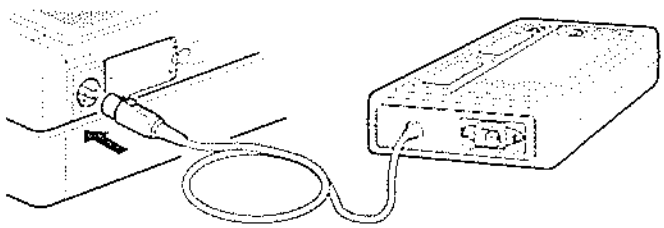
The AC adaptor is a universal voltage type, accepting any supply from 100 to 240 volts, and 50 or 60 Hz. It serves as both a power supply and as a charger for the battery packs.

1 Turn the POWER switch off.

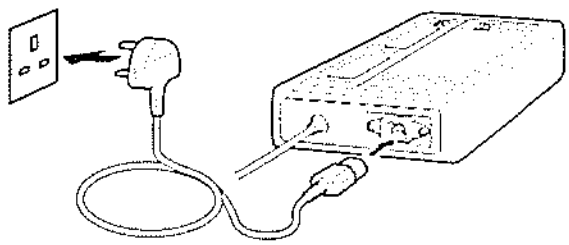


2 Connect the AC adaptor to the recorder.

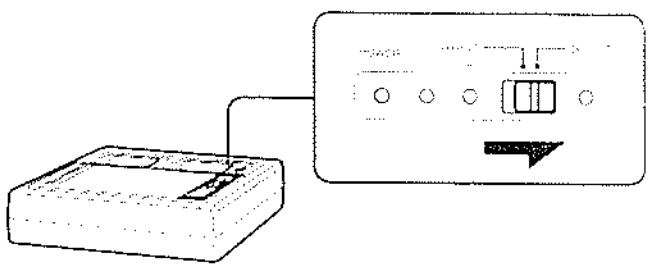
Connect the DC cord from the AC adaptor to the power supply connector (12V DC INPUT) on the recorder.



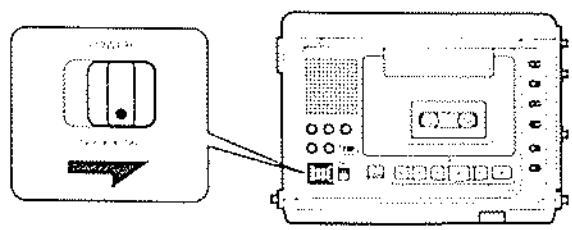
3 Connect the AC adaptor to a wall outlet using the power cord supplied.



4 Switch the CHARGE/DC OUT selector to the DC OUT position.



5 Turn the POWER switch on.



Power Supply

If the unit does not power up when you connect the AC adaptor

If the 12 V DC power supply is disconnected with the POWER switch on, to protect the internal circuitry the power does not come on immediately when the power is next connected. In this case first turn the POWER switch off, then on again.

Switching between charging and power supply functions

The CHARGE/DC OUT selector switches the output of the AC adaptor either to battery pack charging or to the DC output to the unit. It is not possible to use the two functions simultaneously.

If the 12 V DC power supply (either from the AC adaptor or from another source) is connected to the recorder while a charged battery pack is loaded, the recorder automatically switches to take power from the external supply. The recorder does not have a charging function.

Output short-circuit protection

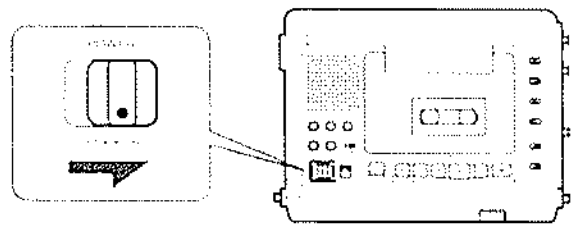
If the 12 V DC connection is short-circuited, a safety circuit operates, and the DC OUT indicator goes off. If this occurs, first disconnect the AC adaptor from the AC supply, then correct the cause of the fault. In any event, it is necessary to wait at least one minute before reconnecting the AC adaptor to the AC supply.

Note

Do not leave the AC adaptor plugged into the supply when not using the unit for a significant time.

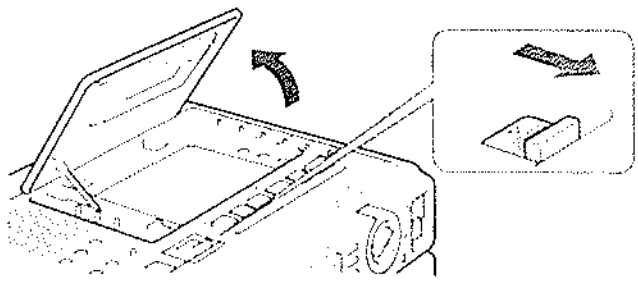
Inserting a Cassette

1 Turn the POWER switch on.



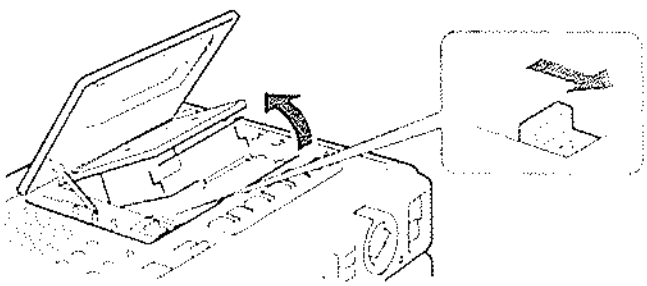
2 Slide the cassette compartment catch towards you.

This opens the cover of the cassette compartment



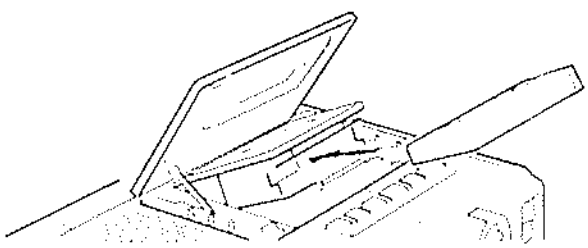
3 Slide the EJECT button towards you.

This raises the cassette holder.



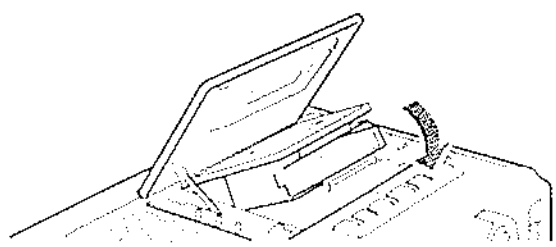
4 Insert the cassette.

Insert the cassette with the tape window visible on the upper side, and the record inhibit tab towards you, and slide it firmly in as far as it will go.



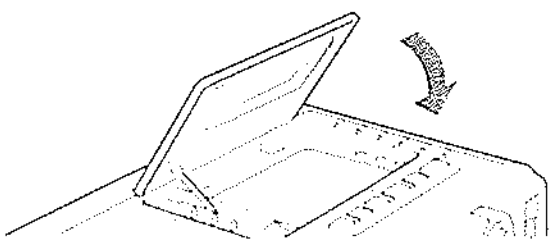
5 Push the cassette holder down.

At this point the tape is not wound round the drum



6 Close the cassette compartment cover.

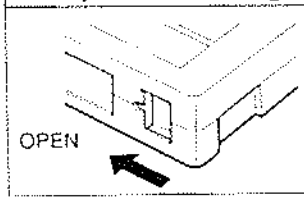
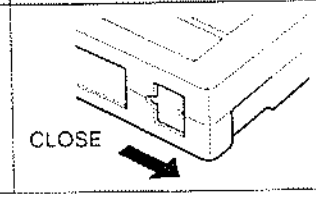
The indication "LOAd" appears in the display as the tape is wound round the drum



Inserting a Cassette

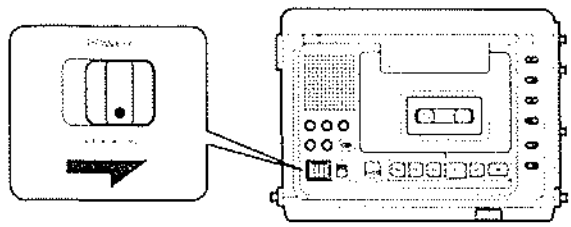
Protecting a cassette from re-recording

If you re-record on a DAT cassette, the previous recording is lost. To protect valuable recordings, open the record inhibit tab; the unit will now refuse to record on the tape.

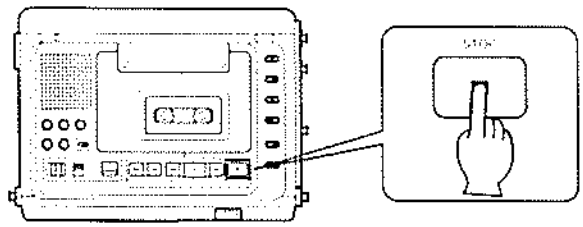
To prevent recording	To allow recording
	

Ejecting a Cassette

1 Turn the POWER switch on.

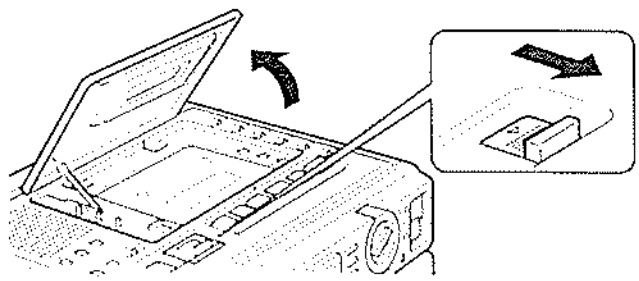


2 Press the STOP button if the tape transport is operating.



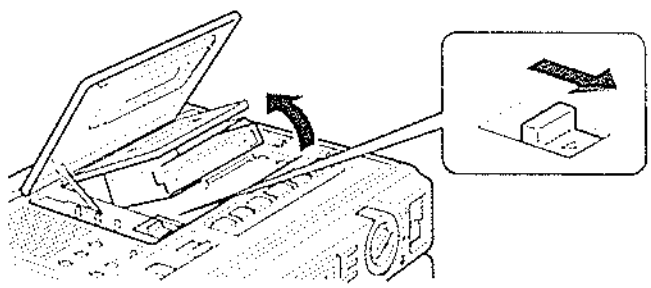
3 Slide the cassette compartment catch towards you.

This opens the cover of the cassette compartment. At the same time, the indication "UnLd" appears in the display while the tape is unwound from the drum.



4 Slide the EJECT button towards you.

This raises the cassette holder. Remove the cassette.



If you open the cassette compartment cover while the tape transport is operating

The tape transport continues to operate. If you forcibly move the EJECT button in this state, the tape or drum may be damaged. If you wish to eject the cassette, first press the STOP button and only after confirming that the tape has been unwound, move the EJECT button towards you.

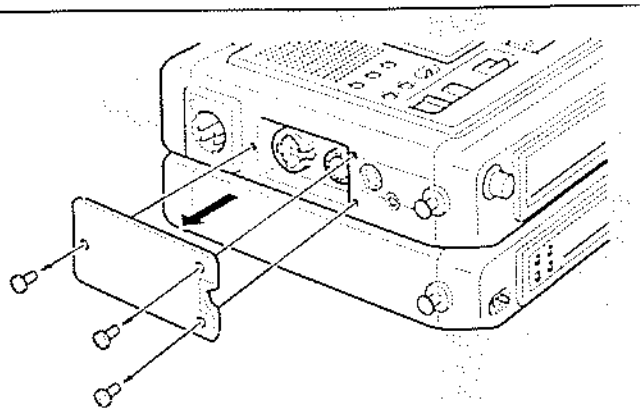
If you powered off the unit with a cassette loaded

The EJECT button does not operate because the tape is still wound around the drum. If you wish to eject the cassette, first power on the unit and move the OPEN button towards you. After confirming that the tape has been unwound, move the EJECT button towards you.

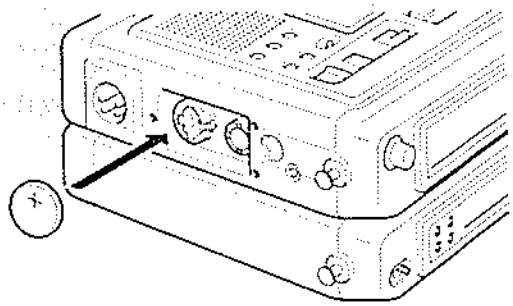
Preliminary Operations

Inserting the Back-Up Battery

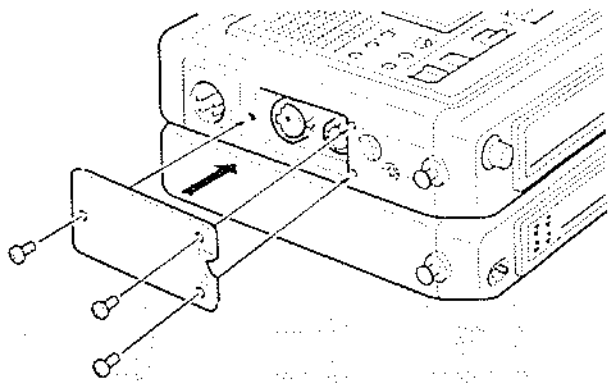
1 **Remove the back-up battery cover plate.**
Remove the retaining screws.



2 **Insert the lithium button cell (type CR2032).**
Take care that the polarity is correct.



3 **Replace the cover plate.**
Fasten the screws.

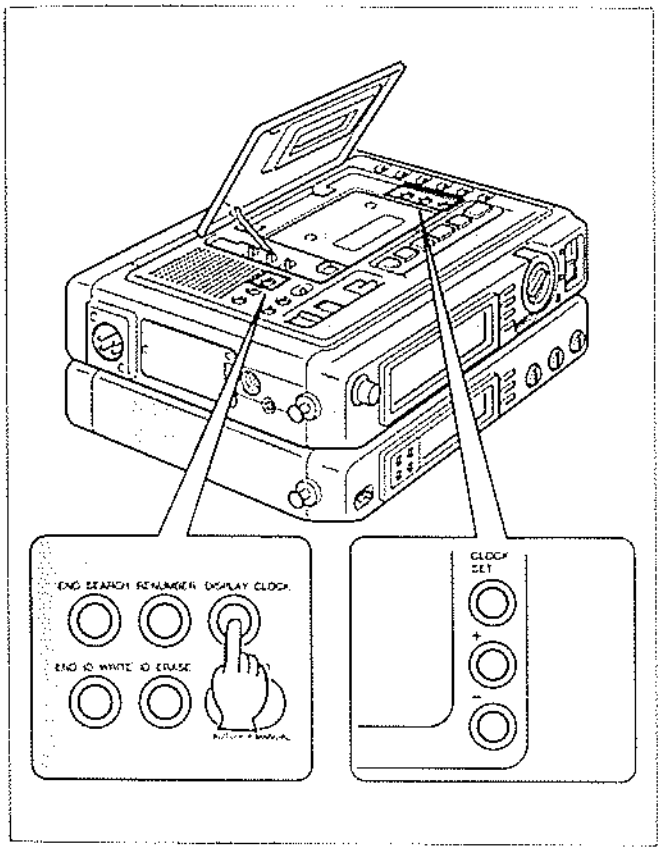


Back-up battery replacement

The back-up battery will maintain the clock and calendar settings for approximately one year.
If the back-up battery is removed, the clock stops. Therefore, replace the back-up battery either with the unit connected to the AC adaptor power supply or with a battery pack loaded.

Setting the Clock/Calendar

This unit has a built-in clock and calendar, which you can use to time-stamp recordings.

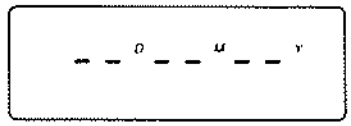


Note
The clock/calendar settings are also used in 24H CLOCK mode (see page 44(E)) and DATE mode (see page 49(E))operations of the time code processor unit.

■ Setting the date

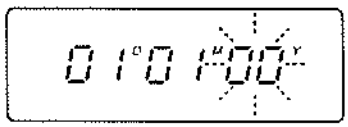
1 Press the DISPLAY CLOCK button to display the date.

(North American version will display the date in M/D/Y.)



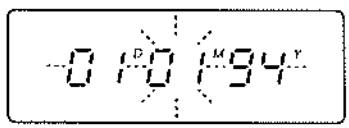
2 Press the CLOCK SET button.

The year flashes.



3 Set the year.

Use the + and – adjustment buttons to set the correct year, then press the CLOCK SET button again.
This confirms the setting of the year, and next the month flashes.

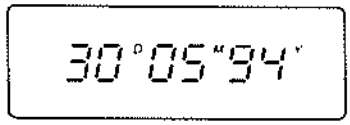


4 Set the month.

Use the + and – adjustment buttons to set the correct month, then press the CLOCK SET button again.
This confirms the setting of the month, and next the day flashes.

5 Set the day.

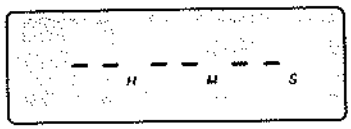
Use the + and – adjustment buttons to set the correct day, then press the CLOCK SET button again.
This completes the setting of the date.



If you make a mistake in setting the date, press the CLOCK SET button again, and repeat the process to correct the necessary figures.

■ Setting the time

1 Press the DISPLAY CLOCK button to display the time.



2 Press the CLOCK SET button.

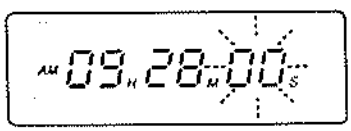
The hour flashes.

3 Set the hour.

Use the + and – adjustment buttons to set the correct hour, then press the CLOCK SET button again.
This confirms the setting of the hour, and next the minute flashes.

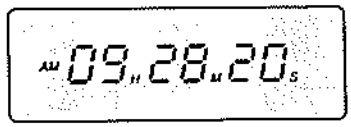
4 Set the minute.

Use the + and – adjustment buttons to set the correct minute, then press the CLOCK SET button again.
This confirms the setting of the minute, and next the second flashes.



5 Set the second.

Use the + and – adjustment buttons to set the correct second.
Pressing the CLOCK SET button starts the clock.



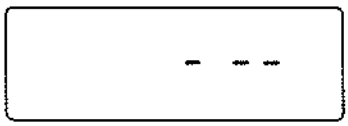
If you make a mistake in setting the time, press the CLOCK SET button again, and repeat the process to correct the necessary figures.

Note

Variations of temperature have a small effect on the time-keeping of the internal clock. For very accurate timing of recordings it is advisable to synchronize the clock about once a week.

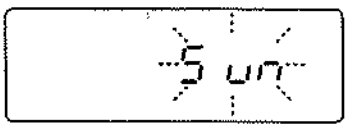
■ Setting the day-of-the-week

1 **Press the DISPLAY CLOCK button to display the day-of-the-week.**



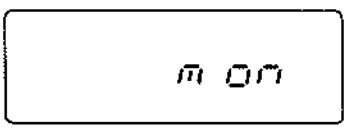
2 **Press the CLOCK SET button.**

The "Sun" (Sunday) indication flashes.



3 **Set the day-of-the-week.**

Use the + and – adjustment buttons to set the correct day-of-the-week, then press the CLOCK SET button again.
This confirms the setting of the day-of-the-week.



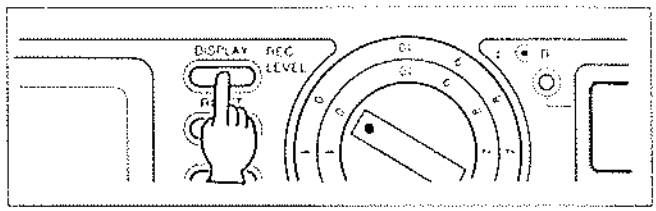
If you make a mistake in setting the day-of-the-week, press the CLOCK SET button again so that the day-of-the-week indication flashes.

Day-of-the-week indications

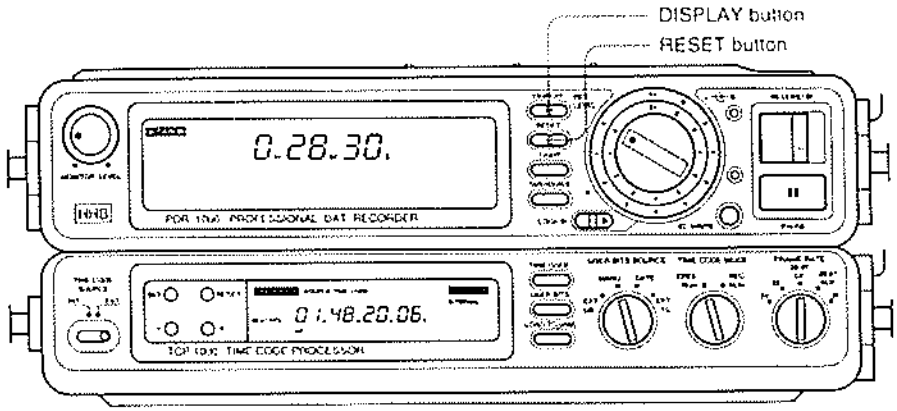
mon	Monday
tuE	Tuesday
wEd	Wednesday
thu	Thursday
Fri	Friday
SAt	Saturday
Sun	Sunday

Returning to the tape position indication

First close the cassette compartment cover, then press the DISPLAY button.



Selecting the Tape Position Display Mode



While the tape transport is operating, the time display shows the tape position.
If the tape has A-TIME subcodes recorded on it, pressing the DISPLAY button cycles through the following four possibilities.

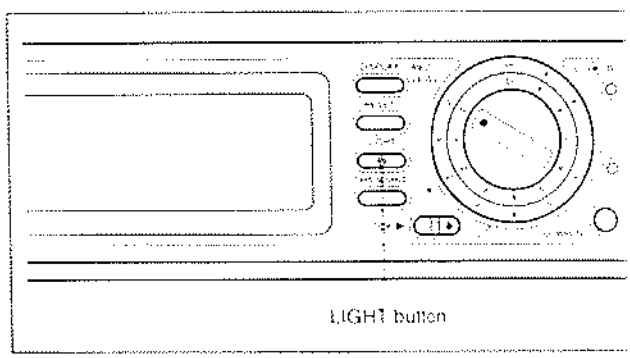
A-TIME("Absolute" time)	P-TIME("Program" time)*	COUNTER	REMAIN
Shows the time from the beginning of the tape.	Shows the time from the beginning of the current "program" (track).	Shows the time elapsed from the point at which you reset the counter by pressing the RESET button.	Shows the time remaining on the tape.

* If you fast forward or rewind the tape then start playback from the middle of a "program" (track), this indication appears as "– – –". The P-TIME indication reappears after the next start-ID is encountered.

If the tape has no A-TIME subcodes recorded on it
The counter value is displayed initially.

Tape position indications in long play mode
The A-TIME, COUNTER and REMAIN indications always show the corresponding values for standard mode. The real times in long play mode are therefore twice the indicated values.

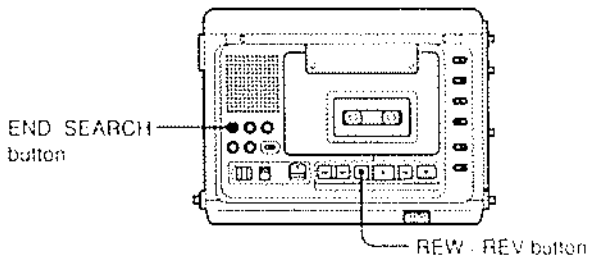
Display backlighting
Press the LIGHT button to toggle the backlighting for the display panel on and off.



Before Recording

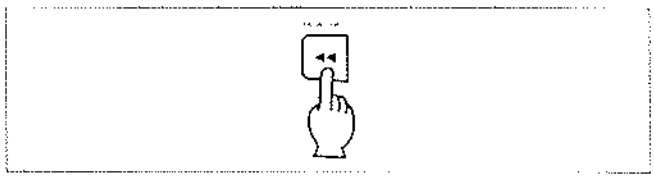
Recording A-TIME Subcodes

When you record on a tape with this unit, it automatically records the A-TIME subcodes on the tape, indicating the ("absolute") time from the beginning of the tape.
In order to record the A-TIME correctly, carry out the following operations, according to the tape being used.



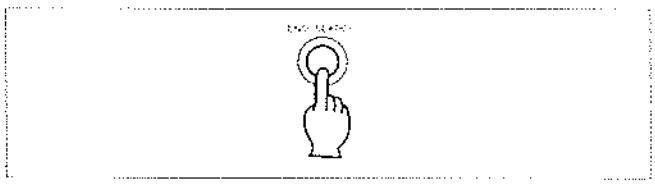
■ Recording on a new tape

Press the ◄◄ REW/REV button.
This rewinds the tape to the beginning, where it stops.
Always begin recording with the tape in this position.



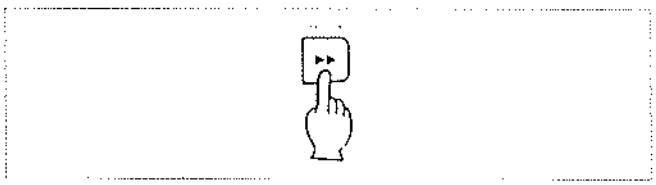
■ Adding a recording after the end of existing recording made with this unit

Press the END SEARCH button.
This rewinds the tape to the beginning, then winds it forward to the end of the recording, where it stops. If an end-ID is recorded on the tape, it stops at the end-ID.
Always begin recording with the tape in this position.



■ Quick End Search Function

Press the ►► FF/CUE button.
This winds the tape forward from its existing position to the end of the recording, where it stops. If an end-ID is recorded on the tape, it stops at the end-ID.
Always begin recording with the tape in this position.



■ Beginning a recording from an intermediate position of an existing recording made with this unit

It is possible to begin recording from any desired position on the tape.
Locate the required point, using the A-TIME indication or the playback sound to identify it.

Recording start position
If you begin recording from the beginning of a tape, the audio signals start from the 00'00"02" position.

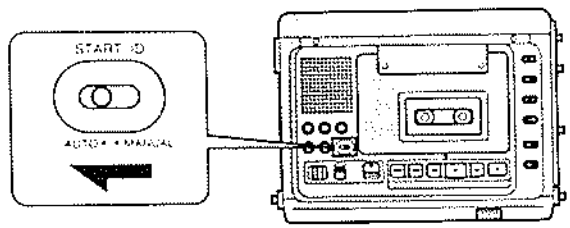
Blank Tape
When the unit reaches the end of recording (blank tape), it stops.
To move past blank tape, press the ►► FF/CUE button.
This function is useful when playing back discontinuous tapes.

Recording the current date and time
When this unit records, at the same time as recording the A-TIME it also records the current date and time.

Note
If different sampling frequencies exist on the same tape, a malfunction may result. Avoid recording different frequencies on the same tape.

Automatic Recording of Start-ID Subcodes

This unit can record start-ID subcodes, which mark the beginning of each "program" (track) of the recording.
When start-ID subcodes have been recorded, it is possible to search rapidly for the required "program" (track).
To record start-ID subcodes automatically, set the START ID selector to the AUTO position.



■ How are start-ID subcodes recorded?

Digital recording	**SPDIF signal**	The start-ID subcodes included in the input signal are recorded unchanged. Program number subcodes are not recorded.
	AES/EBU signal	The source signal does not include start-ID subcodes, and therefore no start-ID subcodes are recorded.
Analog recording		A start-ID subcode is recorded at the end of a period with a recording level close to zero which lasts for at least three seconds.

Notes on analog recording

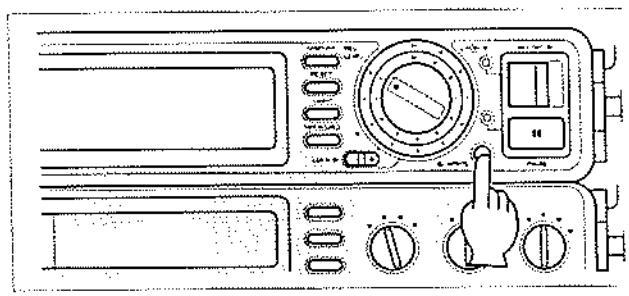
- During a recording of classical music, for example, where a pianissimo passage may last for at least three seconds, a start-ID subcode will be recorded at the next crescendo.
- During a live performance, if the transition between two numbers is obscured by clapping, for example, no start-ID subcode will be recorded.

Automatic recording of program numbers

- In analog recording, when recording start-ID subcodes automatically, program numbers are recorded at the same positions as the start-ID subcodes.
- When recording from an intermediate point on the tape, if the last program number is read before beginning the recording, program numbers will be recorded.

■ Recording start-ID subcodes manually

When the unit is placed into RECORD, it will automatically place a start-ID at that point on the tape.
During recording, press the ID WRITE button at the desired position.
When you record start-ID subcodes manually, no program numbers are recorded.



Recording a start-ID subcode during playback

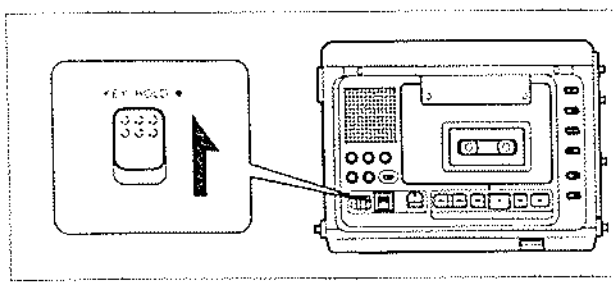
See page 36(E).

KEY HOLD Switch

You can use the KEY HOLD switch to prevent inadvertent button operations during important recording or playback. Moving the KEY HOLD switch in the direction indicated by the arrow disables the following buttons:

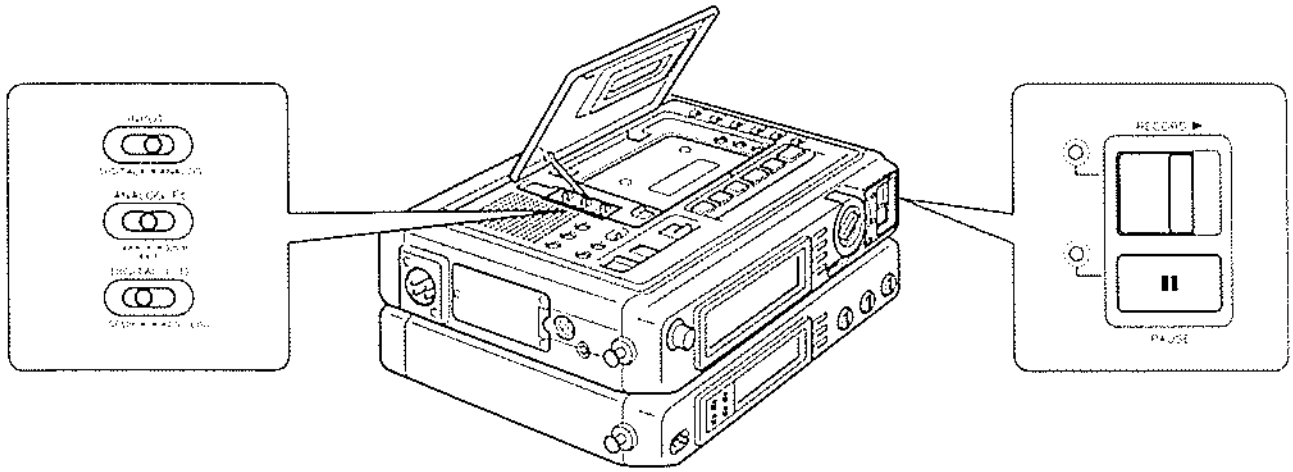
STOP, FF/CUE, PLAY, REW/REV, RECORD, PAUSE, ID WRITE, END SEARCH, RENUMBER, END ID WRITE, ID ERASE, and ID SEARCH (on the DAT unit), and also LOAD TC(JAM) and SET (on the time code processor unit).

The KEY HOLD switch also disables control from a remote controller connected to the REMOTE connector.



Recording

Digital Recording

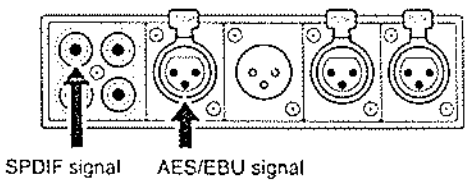


1 **Insert a cassette.**
Insert a cassette with the record inhibit tab visible.

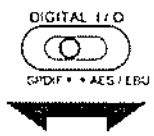
See page 19(E).

2 **Set the INPUT selector to the DIGITAL position.**

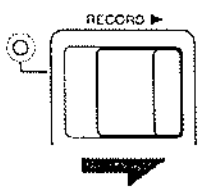
3 **Connect the input signal line.**
AES/EBU signal: XLR-3 connector
SPDIF signal: Phono (RCA) connector



4 **Set the DIGITAL I/O selector to the format of the input signal.**

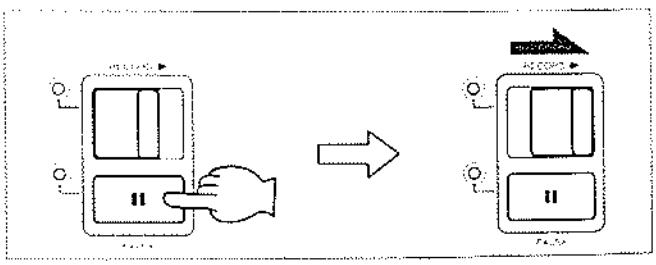


5 **Slide the RECORD button to the right.**
The recording indicator (red) lights and recording starts immediately.



Beginning recording from standby

In step 5 above, press the ❚❚ PAUSE button before moving the RECORD button. The pause indicator (orange) lights. After preparations for recording are complete, press the ❚❚ PAUSE button once more to begin recording.

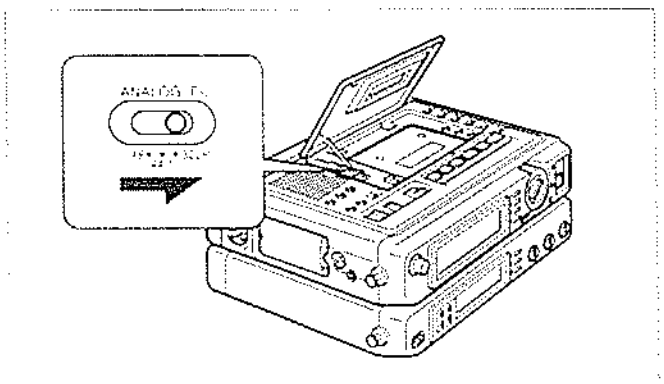


Recording

Stopping recording
Press the ■ STOP button.

Pausing recording
Press the ❚❚ PAUSE button
To restart recording, press the ❚❚ PAUSE button again more than 3 seconds after the unit entered "record - pause" mode. (In order to facilitate continuous A-Time recordings, the unit must pre-roll and re-synchronize to the previous recorded segment of tape, prior to continuing the recording.)

Recording in long play mode
Before beginning recording, set the ANALOG Fs switch to the 32LP position
It is possible to record in long play mode (one half of normal speed) when the sampling frequency of the input signal is 32 kHz.



Recording 32 kHz standard play
When the ANALOG Fs switch is set to 44.1 kHz or 48 kHz and 32 kHz digital signal is present, a 32 kHz standard play (16 bit) recording will be made.

Recording levels
When recording a digital input signal, there is no need for a recording level adjustment. The signals are recorded with exactly the same levels as the input signals.

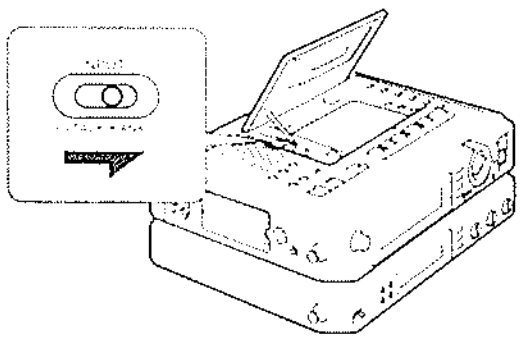
Analog Recording

1 Insert a cassette.

Insert a cassette with the record inhibit tab visible

See page 19(E).

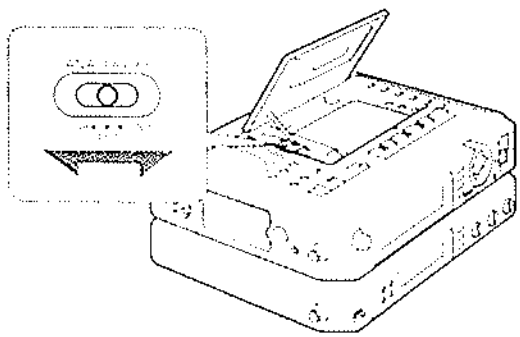
2 Set the INPUT selector to the ANALOG position.



3 Select the required sampling frequency.

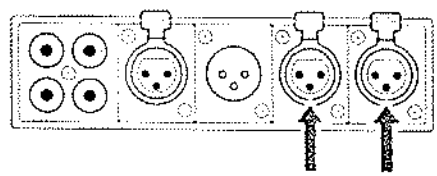
Selecting long play mode automatically sets the sampling frequency to 32 kHz

For details of setting the sampling frequency when inputting an external sync signal, see page 58(E)



4 Connect the mic or line input cables.

Connect the input signal lines to the LINE/MIC L/R connectors (balanced, XLR-3)



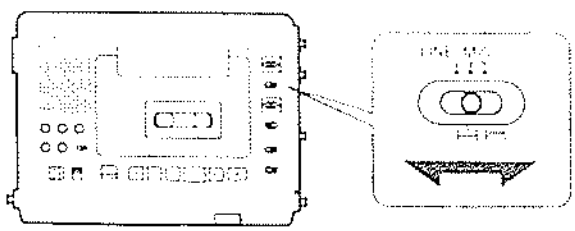
Source signals

5 Set the LINE/MIC selectors.

LINE: Line input

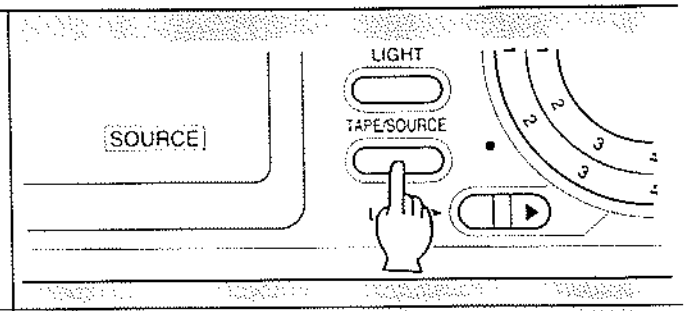
MIC: Microphone input

Select the position to insert the high pass filter



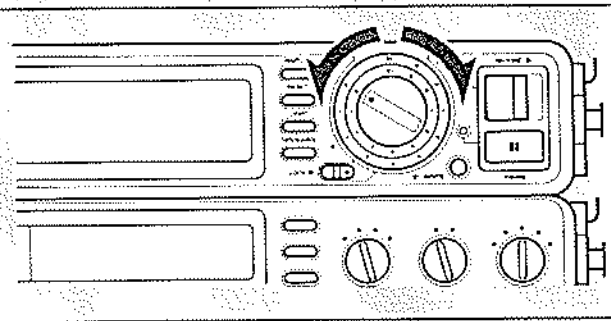
(Continued on the next page)

6 Press the TAPE/SOURCE button until the SOURCE indication appears.



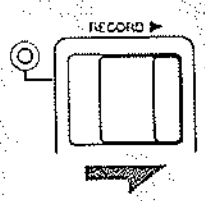
7 Adjust the recording levels.

Adjust the recording levels so that the peak level meters do not go beyond 0 dB at the highest level. If the recording level is above this level, the "OVER" indication lights, and distortion to the recorded sound may result.



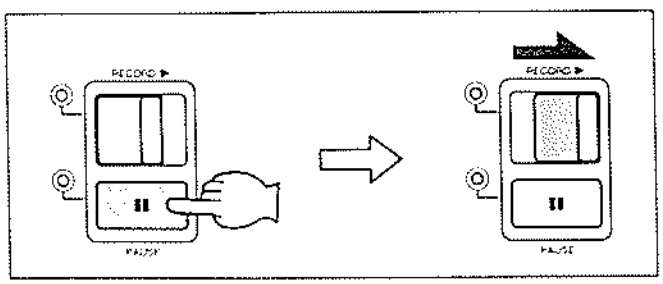
8 Slide the RECORD button to the right.

The recording indicator (red) lights and recording starts immediately.



Beginning recording from standby

In step 8 above, press the ❚❚PAUSE button before moving the RECORD button. The pause indicator (orange) lights. After preparations for recording are complete, press the ❚❚ PAUSE button once more to begin recording.



Stopping recording

Press the ■ STOP button.

Pausing recording

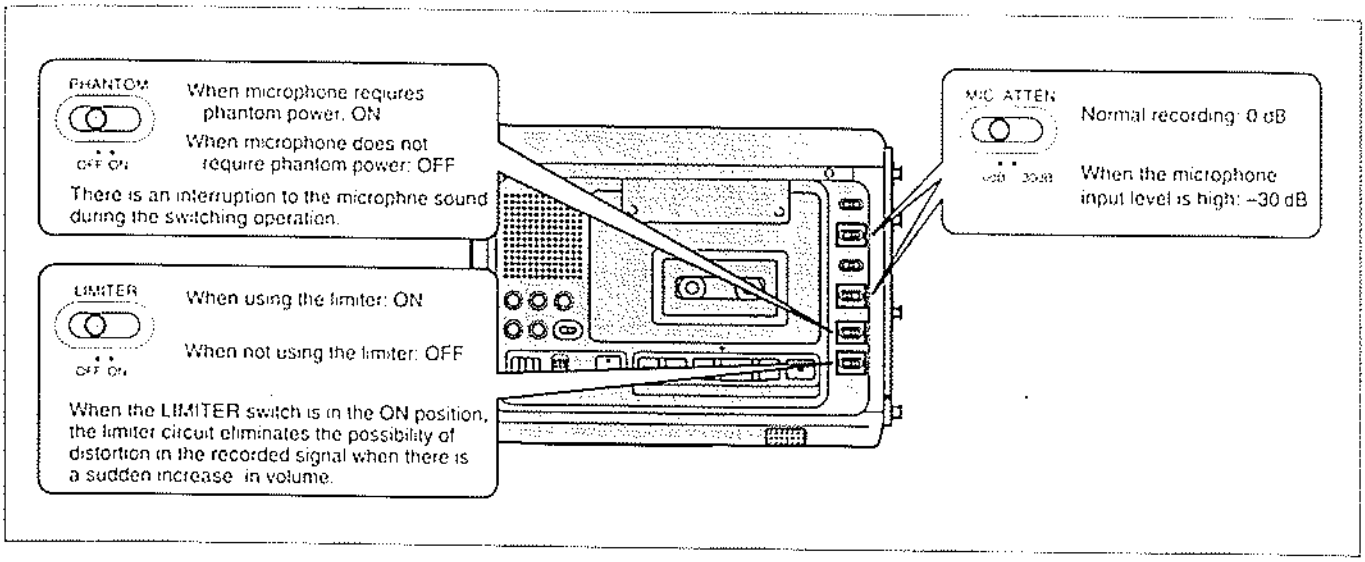
Press the ❚❚ PAUSE button.

To restart recording, press the ❚❚ PAUSE button again more than 3 seconds after the unit entered "record - pause" mode (In order to facilitate continuous A-Time recordings, the unit must pre-roll and re-synchronize to the previous recorded segment of tape, prior to continuing the recording.)

Using a microphone input and line input simultaneously

Connect one of the microphone input and line input to one c the channels, and the other to the other channel. Then set the LINE/MIC selector for each of the channels to the settin appropriate for the respective input signal.

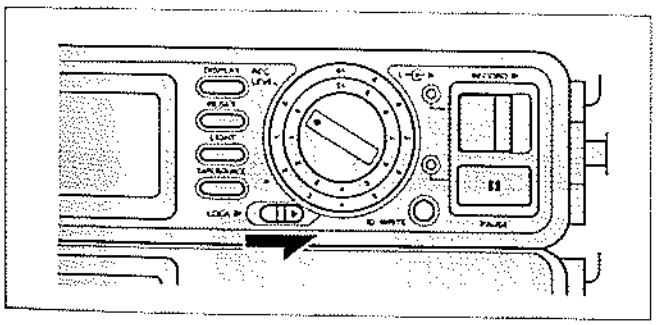
■ Extra settings for microphone recording only



■ Using the REC LEVEL controls

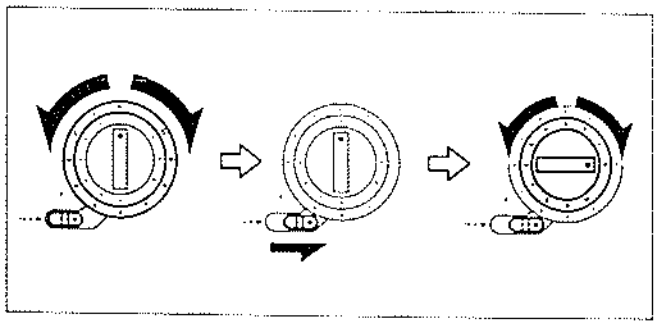
Locking the REC LEVEL controls

After adjusting the recording levels, move the LOCK button to the right, to prevent the REC LEVEL controls being moved inadvertently.



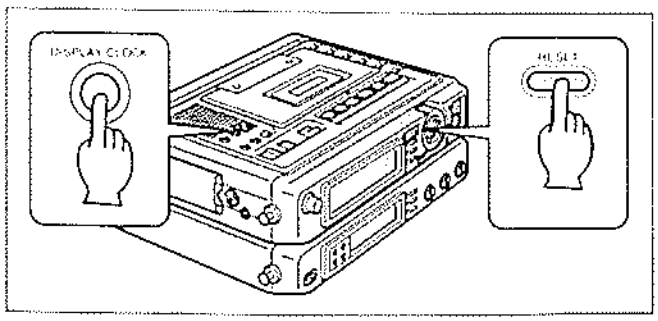
Adjusting the right and left channel recording levels independently

First adjust the left channel with the outer knob, then move the LOCK button to the right, and then adjust the right channel with the inner control.



■ Checking the recording level margin

The margin indicator displays the remaining available headroom in both recording and playback modes, and is a peak held reading which can be manually reset.
Press the DISPLAY CLOCK button so that the MARGIN (dB) indication appears.
Pressing the RESET button resets the level margin indication.



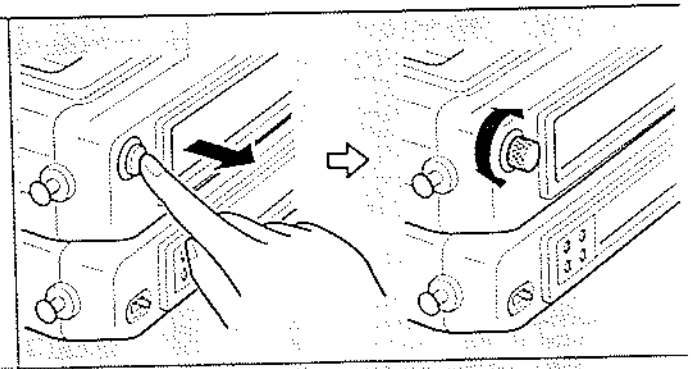
Additional Information

Monitoring During Recording

During recording you can monitor the signals either on the built-in loudspeaker or using headphones.

Adjusting the volume

Use the MONITOR LEVEL control to adjust the volume.

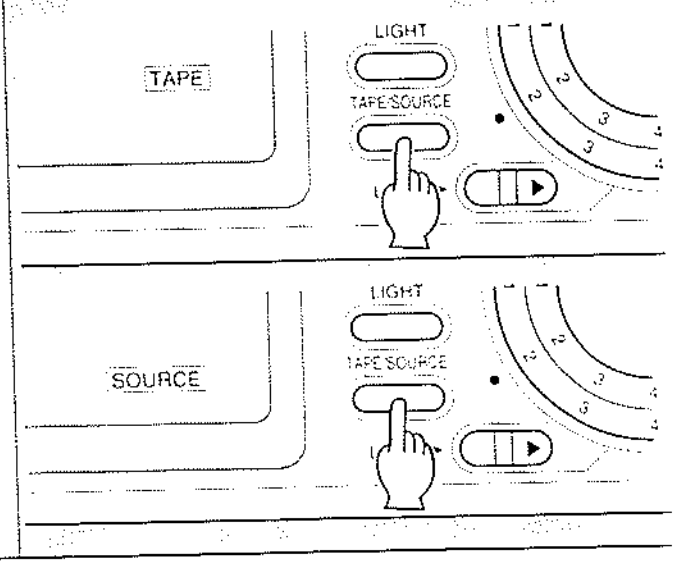


Simultaneous recording and playback

The four-head design of this unit includes read-after-write heads. These play back the signals recorded on the tape immediately, allowing you to confirm that the recording is correct.
To monitor the recorded sound, press the TAPE/SOURCE button so that the TAPE indication appears.

Monitoring the source signal

To monitor the source signal, press the TAPE/SOURCE button so that the SOURCE indication appears.



■ Operation mode and monitoring mode

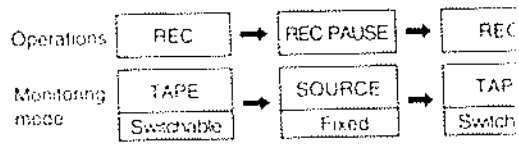
Whether the monitor signal is fixed, or whether the TAPE/SOURCE button operates depends on the operating state of the unit as shown in the following table.

Operating state		Monitoring mode
STOP		TAPE ⟷ SOURCE
PLAY		TAPE (fixed)*
PLAY PAUSE		TAPE (fixed)
FF/REW Search	Digital input	TAPE (fixed)
	Analog input	TAPE ⟷ SOURCE
REC		TAPE ⟷ SOURCE
REC PAUSE		SOURCE (fixed)
Recording or erasing subcodes		TAPE (fixed)

* In the case of an analog input only, the unit switches to source monitoring mode while you hold the TAPE/SOURCE button down.

- When there is no cassette loaded, the unit is always in tape monitoring mode.
- When moving from a state in which the monitoring mode fixed to a state in which the TAPE/SOURCE button operates, the unit returns to the original monitoring mod

Example:



Recording Subcodes

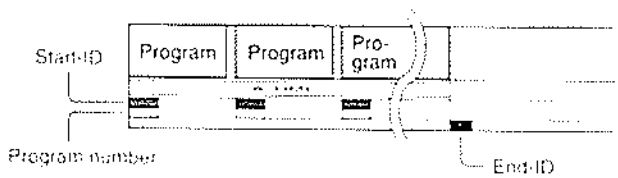
What Are Subcodes?

In the DAT format, in addition to the audio information itself, you can record various identifying codes on the tape to aid location of required sections of the recording, or "programs" (tracks). "Subcode" may be considered to be a contraction of "subsidiary data code".
Recording or erasing subcodes has no effect on the audio data recorded on the tape.

■ Subcodes which the DAT unit can record

Subcode identifier	Meaning	Where recorded	Method of recording
A-TIME	Elapsed time from the beginning of the tape ("Absolute time").	Throughout the length of the tape.	Automatic recording (page 27(E))
Start-ID	This marks the beginning of a "program" (track).	At beginning of "program" (track). (9 seconds)*	Automatic recording (page 28(E)) or manual recording (pages 28(E) and 36(E))
Program number	The number of the "program" (track) from the beginning of the tape.	At beginning of "program" (track) (9 seconds)*	Automatic recording (page 28(E)) or renumbering (page 39(E))
End-ID	This marks the current end of the recorded part of the tape.	Any position.	Manual recording (page 38(E))
Date and time	Year, month, day; hour, minute, second; day-of-the-week.	Throughout the length of the tape.	Automatic recording (page 27(E)) after clock/calender setting (pages 23(E) to 25(E))

*18 seconds in long play mode



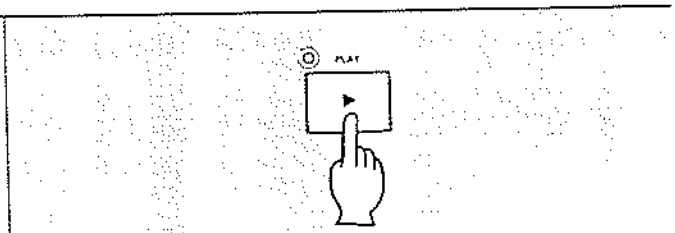
■ Subcodes which the time code processor unit can record

Subcode identifier	Meaning	Where recorded	Method of recording
Pro R-Time	Internal (IEC) time codes in FREE RUN, REC RUN or 24H CLOCK modes, or external (IEC) time codes.	Throughout the length of the tape.	Automatic recording (page 47(E))
Pro Binary	Manually set user bit value, date, external time code, or user bits included in external time code.	Throughout the length of the tape.	Automatic recording (page 49(E))

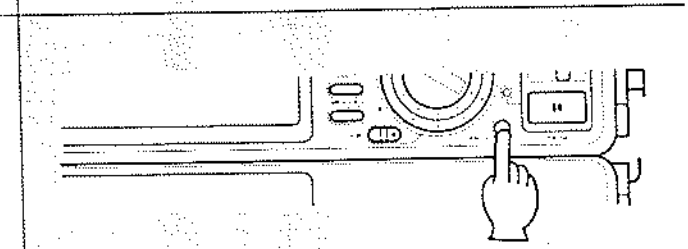
Recording Start-ID Subcodes During Playback (Rehearsal Function)

You can use the following method to record a start-ID subcode at a precise position.
For details of the procedures for recording start-ID subcodes during recording, see page 28(E).

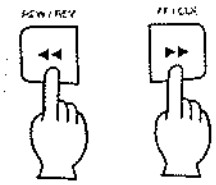
1 **Press the ► PLAY button.**
Play the tape back to the required position.



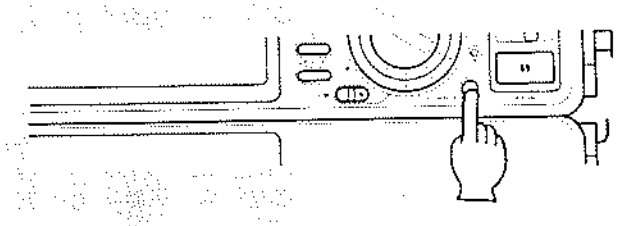
2 **At the required position, press the ID WRITE button.**
The indication "rH" appears, and the unit switches to rehearsal mode. This repeatedly plays a segment of approximately three seconds of tape, starting from the point where you pressed the ID WRITE button.



3 **Make any required fine adjustments to the position.**
Pressing the ◄◄ REW/REV or ►► FF/CUE button moves the start point of the rehearsal segment back or forward by 0.3 seconds



4 **At the required position, press the ID WRITE button.**
This records a start-ID subcode at the beginning of the rehearsal segment. There is no audio output while the subcode is being recorded.



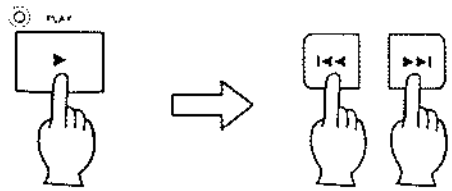
Notes on recording a start-ID subcode

- It is not possible to enter the rehearsal mode in a segment of tape which already includes a start-ID subcode. Erase the existing start-ID subcode before entering rehearsal mode to record another one.
- To ensure that skip operations function correctly, there must be an interval of at least 18 seconds between one START-ID and the next.
- When you record a start-ID subcode manually, this does not insert a program number.

■ Erasing a start-ID subcode

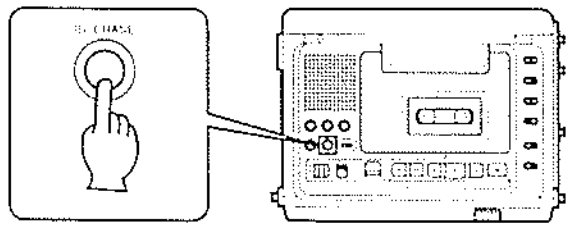
1 **Position the tape at any point in the program which starts with the start-ID subcode to be erased.**

Use the skip functions to position the tape at the beginning of the "program" (track) marked by the start-ID subcode.



2 **Press the ID ERASE button.**

The indication 'Er' appears, and the unit searches back through the tape, then erases the first start-ID subcode it encounters. There is no audio output while the subcode is being erased.



Pressing the ID ERASE button while the tape is stopped

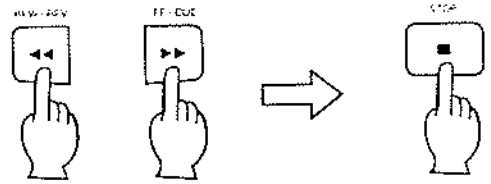
This has the same effect as pressing the ID ERASE button during playback.

What about program numbers?

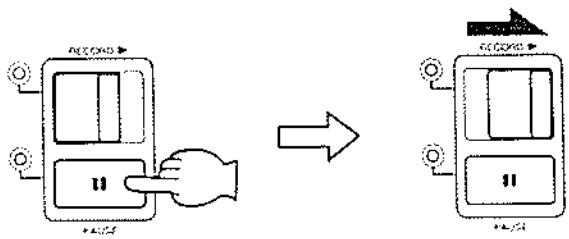
If there is a program number recorded at the same position as the start-ID subcode, erasing the start-ID subcode also erases the program number.

Recording an End-ID

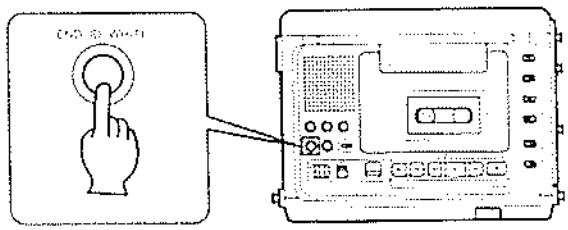
1 **Position the tape at the appropriate point, and press the STOP button.**
The tape stops.



2 **Press the ❚❚ PAUSE button and slide the RECORD button to the right.**
This puts the unit in the recording paused mode



3 **Press the END ID WRITE button.**
This records an end-ID.



End-ID subcodes and the tape transport

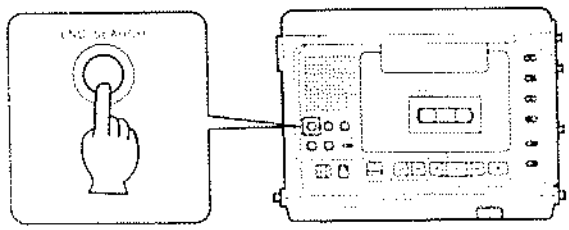
When an end-ID is recorded on the tape, the tape transport will not advance the tape beyond this point.
To advance the tape beyond an end-ID, erase the end-ID

Interval between an end-ID and the end of the recorded portion of the tape

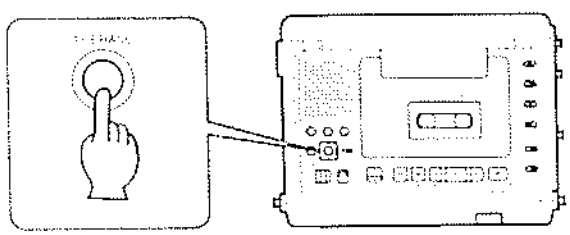
If the end-ID marker is positioned too close to the end of the recording, the recorded portion may be truncated when a continuation is recorded. Always leave an interval of at least 2 seconds between the end of the recording and the END-ID marker.

■ Erasing an end-ID

1 **Press the END-SEARCH button**
This rewinds the tape to the beginning, then winds the tape forward until it encounters an end-ID, then stops
For the quick END SEARCH function, press the ►► FF/CUE button. This winds the tape forward from its existing position to the first end-ID, where it stops



2 **Press the ID ERASE button.**
This erases the end-ID.



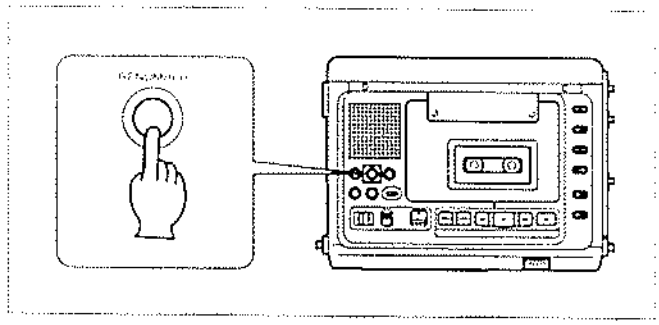
Recording Program Numbers (Renumber Function)

As a result of a digital copy or when you have manually recorded start-ID subcodes during an analog recording, no program numbers are recorded. If you have inserted or erased start-ID subcodes, the program numbers are no longer in sequence. In cases such as these, record program numbers at all of the start-ID positions on the tape (renumbering).

Press the RENUMBER button during playback or while the tape is stopped.

The "r n" indication appears, and the tape rewinds to the beginning, then winds forward at high speed to the first start-ID subcode.

While the unit is recording a program number (9 seconds) the tape transport moves at normal speed, and you can monitor the sound. The tape transport moves from one start-ID to the next at high speed.



In long play mode, while recording the program numbers the playback sound is at twice the normal speed.

There is no audio output during renumbering.

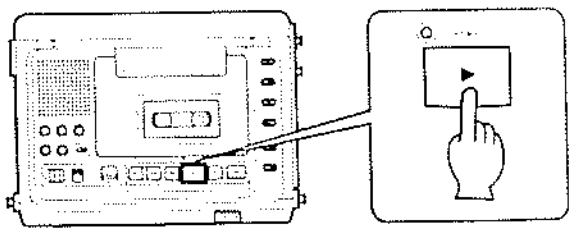
Playback

1 **Insert a cassette.**

See page 19(E).

2 **Press the ▶ PLAY button.**

The PLAY indicator (green) lights and playback begins



Stopping playback

Press the ■ STOP button

Pausing playback

Press the ❚❚ PAUSE button

Pressing the ❚❚ PAUSE button once more resumes playback

Rewinding or fast forwarding the tape

With the tape transport stopped, press the ▶▶ FF/CUE button or ◀◀ REW/REV button

To stop the tape transport, press the ■ STOP button.

Carrying out cue/review functions

During playback, press the ▶▶ FF/CUE button or ◀◀ REW/REV button. If you hold down the button for more than five seconds, the playback speed increases still further. If you then release your finger from the button, the playback speed returns to the normal speed.

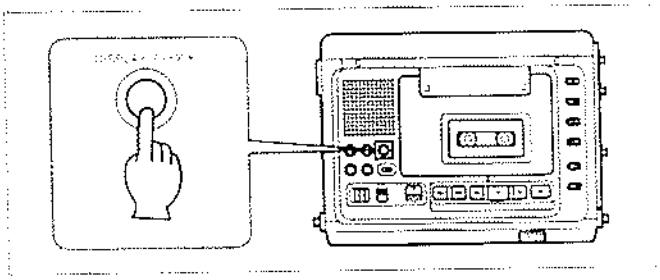
Seeing the subcodes recorded on the tape

During playback, you can check the subcodes recorded on the tape.

For details of subcodes, see page 35(E).

- Date and time set in the DAT unit

During playback, press the DISPLAY CLOCK button.



For details of the method of checking the subcodes recorded by the time code processor unit (time codes, date and time, etc.) see page 49(E).

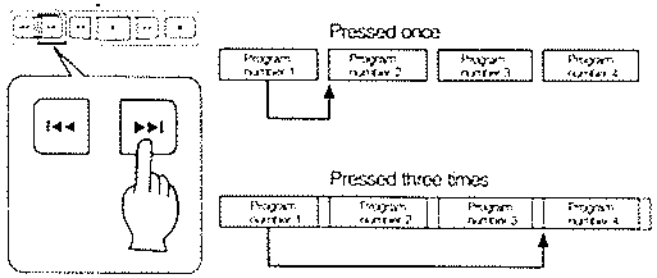
Playback synchronized with an external sync signal

See page 58(E).

Cueing to the Beginning of a "Program" (Track) (Skip Functions)

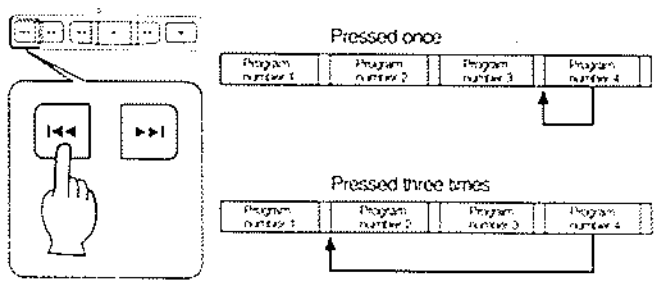
Skipping forward

During playback, if you press the ▶▶▌ ID SEARCH button, the tape transport skips the same number of "programs" (tracks) as the number of times that you pressed the button. If you press the button once, it skips to the beginning of the next "program" (track).



Skipping back

During playback, if you press the ▌◀◀ ID SEARCH button, the tape transport skips the same number of "programs" (tracks) as the number of times that you pressed the button. If you press the button once, it skips to the beginning of the current "program" (track).



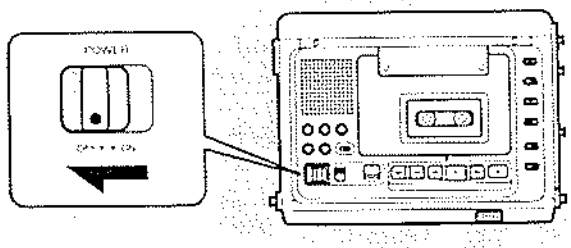
Skipping from the play paused state

" you press the ▌▌ PAUSE button to pause playback, then press the ▶▶▌ ID SEARCH button or ▌◀◀ ID SEARCH button, the ..pe transport moves to the beginning of the required "program" (track), but playback remains paused.

If you wish to skip further in this state, press the required ID SEARCH button once more than the normally required number of times.

Connecting Audio Equipment

1 Turn the POWER switch off.



2 Connect the audio equipment.

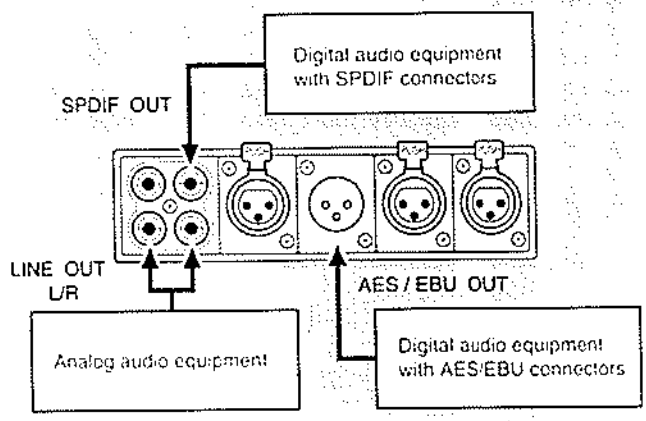
AES/EBU OUT: Audio equipment with AES/EBU input connectors

SPDIF OUT: Audio equipment with SPDIF input connectors

LINE OUT: Analog audio equipment

Red: Right channel

White: Left channel

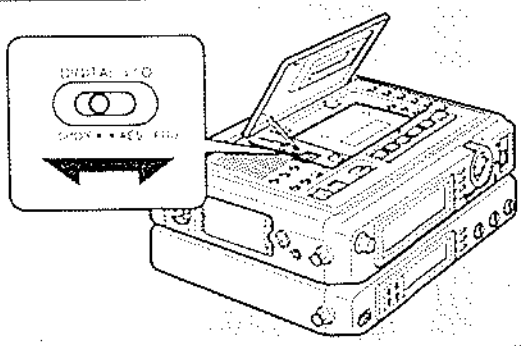


3 Set the DIGITAL I/O switch according to the type of audio equipment.

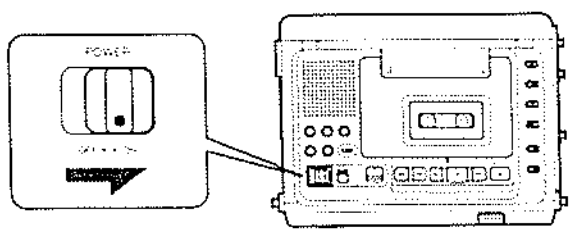
AES/EBU: When connected to AES/EBU OUT

SPDIF: When connected to SPDIF OUT

If you have only connected equipment to LINE OUT, either setting is satisfactory.



4 Turn the POWER switch on.



ote

You can use both digital and analog outputs simultaneously, but it is not possible to use the AES/EBU and SPDIF outputs simultaneously.

Volume setting

You are recommended to set the volume to the minimum level before beginning playback.

The extremely high signal-to-noise ratio of DAT compared with an analog cassette means that before playback starts there is almost no audible noise level. If you attempt to use the noise level as a guide, as is possible with an analog cassette, the volume level may be high enough to damage the speakers. Be especially careful when using headphones, as it is possible to damage your ears.

Time Code Operations

The time codes referred to in this section are IEC time codes, used for synchronization of both video and audio signals, to allow accurate editing.
This unit provides the following time code functions.

- Recording the internal time code or an external time code on the tape
- Time code chase playback
- Time code output

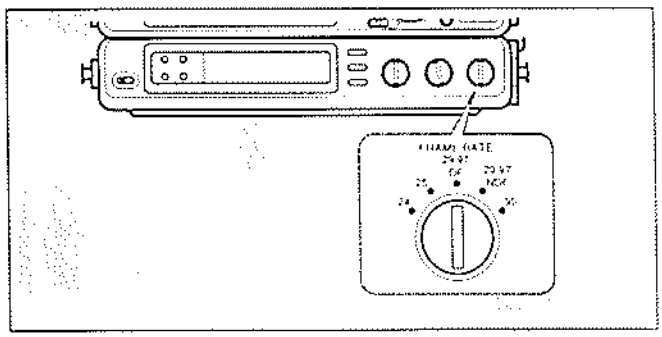
Note

When the sampling frequency is set to 32 kHz, it is not possible to record or play back time codes.

Selecting the Frame Rate

The frame rate selection determines the number of frames per second of the synchronizing signal or external time code used by this unit.
Use the FRAME RATE selector to select one of the following.

24: Film, 24 frames/sec
25: PAL/SECAM, 25 frames/sec
29.97 DF: NTSC color in drop-frame mode, 29.97 frames/sec
29.97 NDF: NTSC color in non-drop-frame mode, 29.97 frames/sec
30: NTSC monochrome in non-drop-frame mode, 30 frames/sec



Internal Time Code Generator Operating Modes

The TIME CODE MODE selector selects the mode in which the internal time code generator operates, as follows.

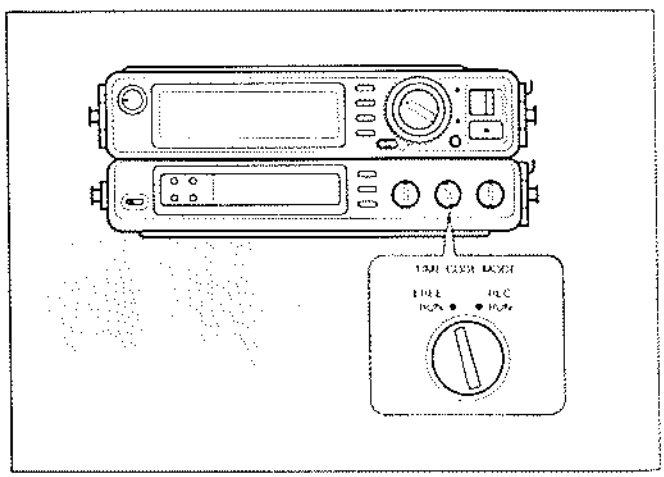
FREE RUN: Time codes are counted constantly as long as the unit is powered on.
REC RUN: Time codes are counted only while recording.

Note

When the unit is first powered on, the time code is reset to zero.

FREE RUN standby mode

When the POWER switch is turned off with the unit in FREE RUN mode, provided that there is either a battery pack loaded or the unit is being supplied with power from the AC adaptor, the time code generator keeps operating to maintain the free running value for 24 hours.
Once 24 hours has elapsed, the standby mode terminates, and the value is reset to $00_h00_m00_s00_f$ and the counting stops.



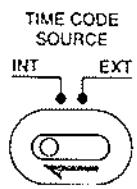
Setting the Time Code

Use the following procedure to set the initial time code value.

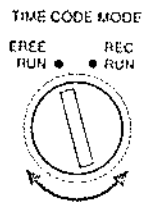
Notes

- Time code setting operation is only possible when the unit is in stop mode; it is not possible while recording, or while recording is paused.
- When the sampling frequency is set to 32 kHz (displayed as "32K" or "32KLP", either continuously or flashing) it is not possible to display a time code value. Select either the 44.1 kHz or 48 kHz mode.
  When a digital signal with a 32 kHz sampling frequency is input, the unit remains in the 32 kHz mode even when the signal is disconnected. To switch from the 32 kHz mode, either input a digital signal with a 44.1 kHz or 48 kHz sampling frequency, or power the unit off and on again.

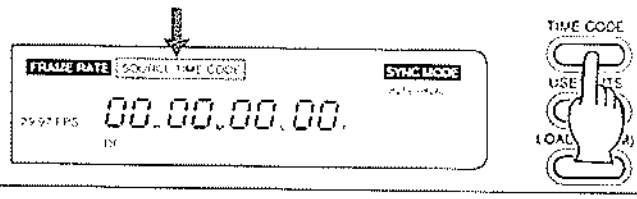
1 **Set the TIME CODE SOURCE selector to INT.**



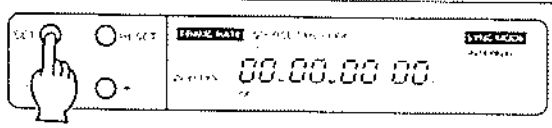
2 **Set the TIME CODE MODE selector to FREE RUN or REC RUN.**



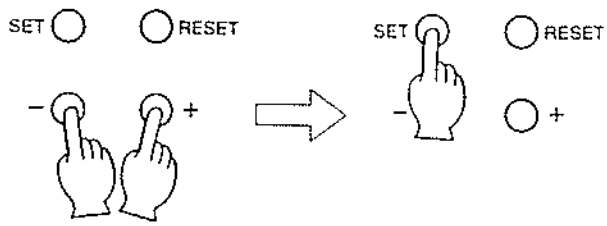
3 **Press the TIME CODE button until the "SOURCE TIME CODE" indication appears.**



4 **Press the SET button.**
The hour value (H) flashes.



5 **Press the + or – adjustment button to change the hour value, and press the SET button.**
The flashing value changes to the minutes. Use the same procedure to set the minutes (M), seconds (S) and frames (F) in turn.
Pressing the SET button after setting the frames exits from setting mode.
The behavior after setting is completed depends on the setting of the TIME CODE MODE selector, as follows.
FREE RUN: The time code starts counting immediately from the new value.
REC RUN: The time code does not start to count until recording stars.



Returning to the previous setting

During the setting operation, press the RESET button.

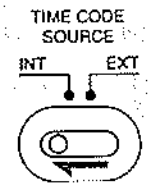
If you make a mistake in the setting

Repeat the procedure from step 4.

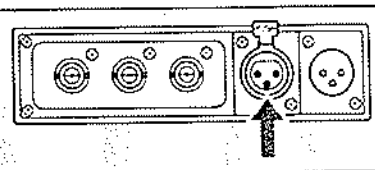
Jam Syncing (Copying an External Time Code Value into the Time Code Generator)

It is possible to set the initial value of the internal time code to be the same as an externally supplied time code.

1 **Set the TIME CODE SOURCE selector to INT.**



2 **Connect an external time code signal.**



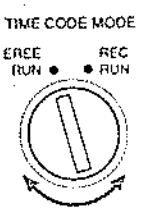
3 **Set the frame rate to be the same as that of the external time code signal.**

If the rates are different, the jam sync operation will not be successful.

4 **Set the TIME CODE MODE selector to FREE RUN or REC RUN.**

Note

When the selector is set to REC RUN, start the recording before going to step 5.

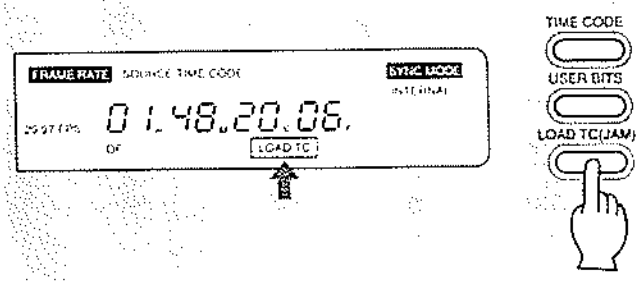


5 **Press the LOAD TC (JAM) button.**

The "LOAD TC" indication appears, and the value is copied from the external time code signal to the time code generator. In other words, the value of the external time code at the time you press the LOAD TC (JAM) button is taken as the initial value for the internal time code.

Note

The LOAD TC (JAM) button will not operate if the KEY HOLD switch is pushed forward. Check that the KEY HOLD switch is in the released position before using the LOAD TC (JAM) button.



Frame synchronization of the internal time code generator

When you press the LOAD TC (JAM) button in step 5 above, the internal time code generator is frame synchronized in the mode selected in step 4 (FREE RUN or REC RUN) as follows.

In FREE RUN mode:

- When a reference video signal is input, synchronize to the frame phase of the video signal.
- When no reference video signal is input, synchronize to the frame phase of the external time code signal.

In REC RUN mode:

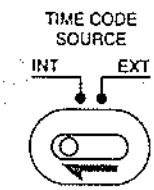
Regardless of whether or not a reference video signal is input, synchronize to the frame phase of the external time code signal.

Recording Time Codes

Recording with this unit automatically records time codes on the tape.

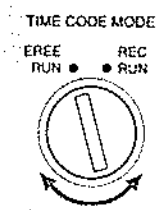
■ Recording the internal time code

1 Set the TIME CODE SOURCE selector to INT.



2 Select the time code generator operating mode with the TIME CODE MODE selector.

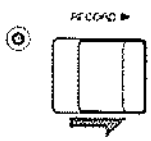
For details see the section "Internal Time Code Generator Operating Modes" (page 44(E)).



3 Set the frame rate and time code selection.

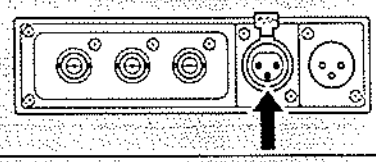
(See pages 44(E) and 45(E).)

4 Begin recording.

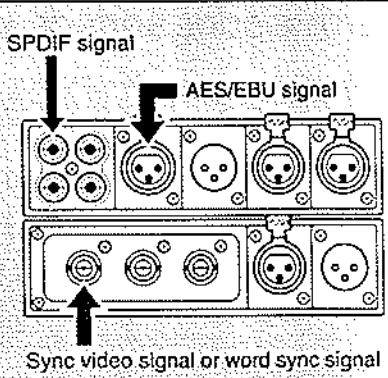


■ Recording an external time code

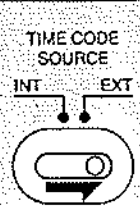
1 **Connect the external time code signal.**
Note that only video longitudinal time code (LTC) can be used. It is not possible to use VITC.



2 **Connect an external sync signal, if neccesary.**
An external sync signal is required for operation synchronized with other equipment.
For details of external sync signals, see pages 57(E) to 59(E).

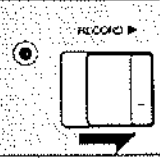


3 **Set the TIME CODE SOURCE selector to EXT.**



4 **Set the frame rate to be the same as that of the external time code signal.**
If the rates are different, the time code will not be recorded correctly.

5 **Begin recording.**

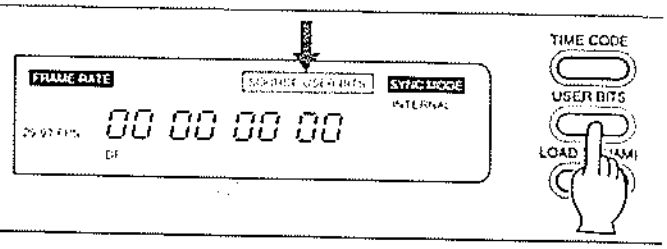


Recording User Bits

User bits are 8-digit hexadecimal values recorded on the tape, which can be used to identify the date of a recording or for other identifying information.
Recording with this unit automatically records user bits on the tape.

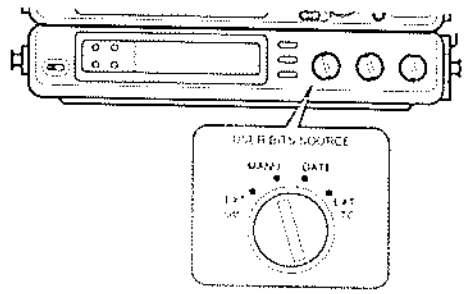
■ Selecting the user bit value to be recorded

1 **Press the USER BITS button until the "SOURCE USER BITS" indication appears.**



2 **Set the USER BITS SOURCE selector to the user bit value to be recorded.**

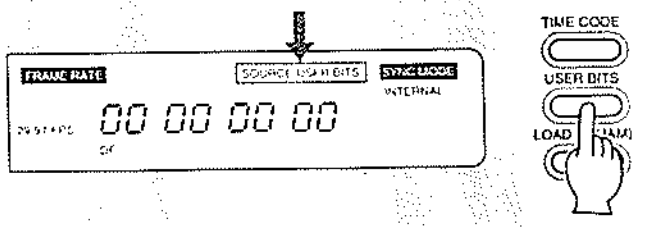
EXT UB: The user bits included in an external time code signal. If no external time code signal is input, the "SOURCE USER BITS" indication flashes.
MANU: The eight-digit hexadecimal value entered manually.
DATE: The date from the unit's internal clock. If the date is not set, the "SOURCE USER BITS" indication flashes.
EXT TC: External time code. If no external time code signal is input, the "SOURCE USER BITS" indication flashes.
Recording automatically records the selected user bits on the tape.



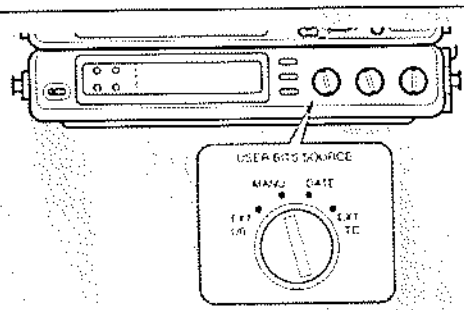
■ Setting the user bits manually

Note
It is not possible to make user bits settings while recording, or while recording is paused.

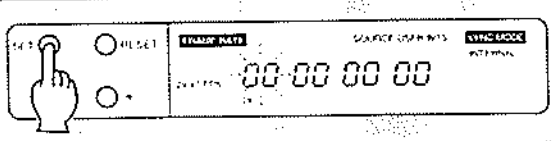
1 **Press the USER BITS button until the "SOURCE USER BITS" indication appears.**



2 **Set the USER BITS SOURCE selector to MANU.**

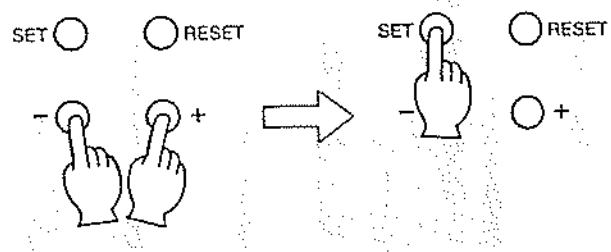


3 **Press the SET button.**
The first two digits flash.



4 **Press the + or – adjustment button to change the first two digits, and press the SET button.**
Each pair of digits can be set to hexadecimal values 00 to FF. Pressing the SET button switches the flashing to the next two digits. Use the same procedure to adjust the other three pairs of digits.

Pressing the SET button after setting the last two digits completes the setting procedure.



To set the user bit value to 00:00:00:00
Hold down the SET button, and press the RESET button.

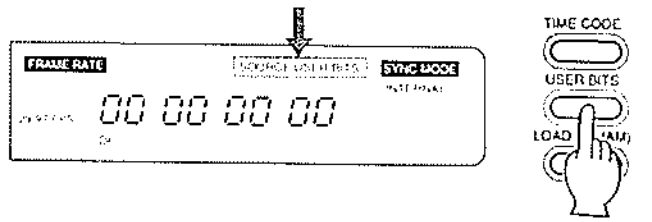
If you make a mistake in the setting
Repeat the procedure from step 3.

Note
The rightmost two digits of the manually set value are also used when the USER BITS SOURCE selector is set to DATE.

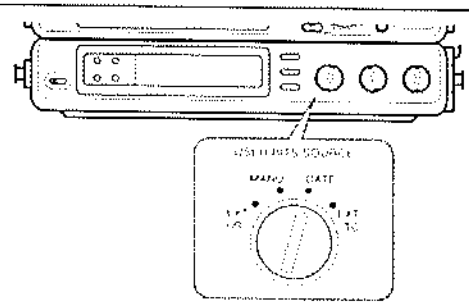
■ Using the date for the user bits

When using the date from the unit's internal clock for the user bits, the last two hexadecimal digits are supplied by from the manually set value (see previous page). When the DATE setting is selected it is possible to set these two digits, but this setting is also reflected in the value used with the MANU setting.

1 **Press the USER BITS button until the "SOURCE USER BITS" indication appears.**

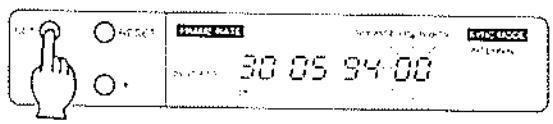


2 **Set the USER BITS SOURCE selector to DATE.**



3 **Press the SET button.**

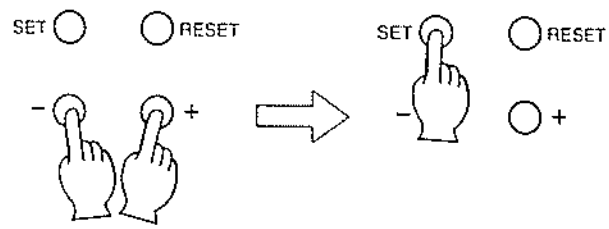
The internal date setting appears, and the last two digits flash.



4 **Press the + or – adjustment button to change the last two digits, and press the SET button.**

The two digits can be set to hexadecimal value 00 to FF.

Pressing the SET button completes the setting procedure.

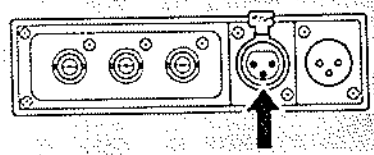


Carrying Out Time Code Chase Playback

The time code chase function allows playback with the time code (Pro R-TIME) on the tape locked to an external time code. Once the locking achieved, chase mode is released and normal playback begins.

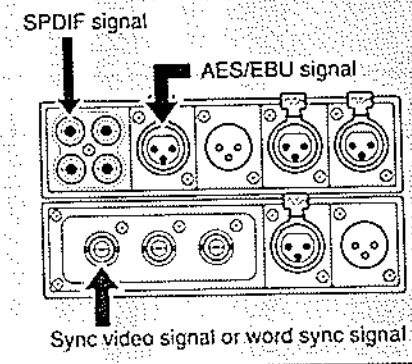
1 Connect the external time code signal.

Note that only video longitudinal time code (LTC) can be used. It is not possible to use VITC.

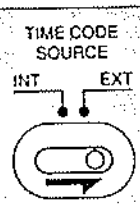


2 Connect an external sync signal, if necessary.

An external sync signal is required for operation synchronized with other equipment.
For details of external sync signals, see pages 57(E) to 59(E).



3 Set the TIME CODE SOURCE selector to EXT.



4 Set the frame rate to be the same as that of the external time code signal.

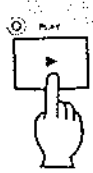
If the rates are different, time code chasing will not be performed properly.

5 Press the PLAY button.

The unit enters into playback mode.

Note

If the tape is positioned at the end, or at the end of the recorded portion, first rewind for several seconds, then press the PLAY button.



6 Check that playback has started, then hold down the PLAY button for at least one second.

The time code chase operation starts, and the tape is rewound or fast-forwarded until the time code on the tape matches the external time code. During the chase operation, the "LOCK" indication flashes. When the time code is locked, the "LOCK" indication lights continuously for about four seconds, then playback at normal speed resumes.

.he time code matching is lost

If the external time code input is interrupted, or the external time code values are not continuous, will be lost. To regain the matching press the PLAY button once more.

If Pro R-TIME subcodes are not recorded on the tape

It is not possible to carry out time code chase playback.
To check whether or not Pro R-TIME subcodes are recorded on the tape, press the TIME CODE button once or twice to select the tape time code display mode. For more details, see the section "Displaying and Outputting Time Code and User Bits" on the next page

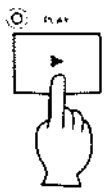
■ Reducing the time to achieve time code lock

Using the following procedure to carry out time code chase playback allows faster locking to the external time code.
The example is of time code chase playback with a video deck.

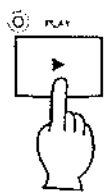
1 **Carry out steps 1 to 4 of the procedure on page 52(E).**

2 **Stop the advance of the external time code.**
Pause playback on the video deck just before the point at which you wish to lock.

3 **Press the PLAY button.**
The unit enters into playback mode



4 **Check that playback has started, then hold down the PLAY button for at least one second.**
The time code chase operation starts, and the tape is rewound or fast-forwarded until the time code on the tape matches the external time code, then playback is paused.



5 **Restart the external time code.**
Resume playback on the video deck.

This locks the time code on the tape to the external time code, and playback begins.

Displaying and Outputting Time Code and User Bits

By selecting the appropriate display and output modes on the time code processor unit, it is possible to obtain appropriate display and output of time code and user bit values.

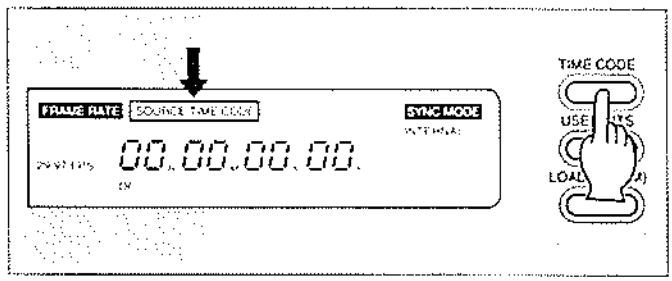
■ Selecting the display mode

To select the mode for displaying time code or user bit values, press the TIME CODE button or USER BITS button to select the appropriate display mode.

Selecting the source time code display mode

Press the TIME CODE button once or twice to display the "SOURCE TIME CODE" indication.

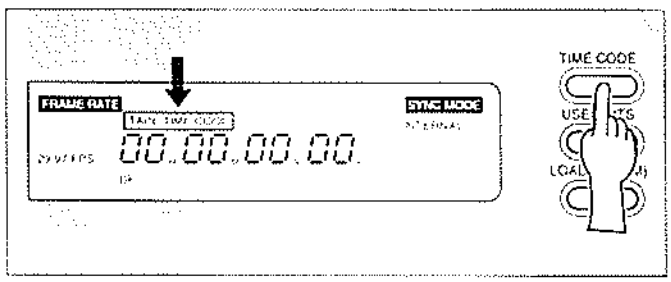
If the "SOURCE TIME CODE" indication is flashing
There is a setting or connection error. Use the table on page 62(E) to determine the problem.



Selecting the tape time code display mode

Press the TIME CODE button once or twice to display the "TAPE TIME CODE" indication.

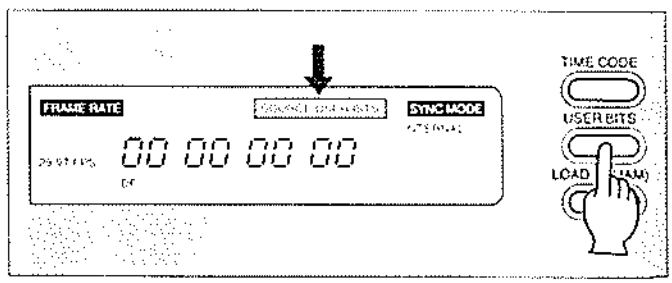
If the "TAPE TIME CODE" indication is flashing
There is a setting or connection error. Use the table on page 62(E) to determine the problem.



Selecting the source user bits display mode

Press the USER BITS button once or twice to display the "SOURCE USER BITS" indication.

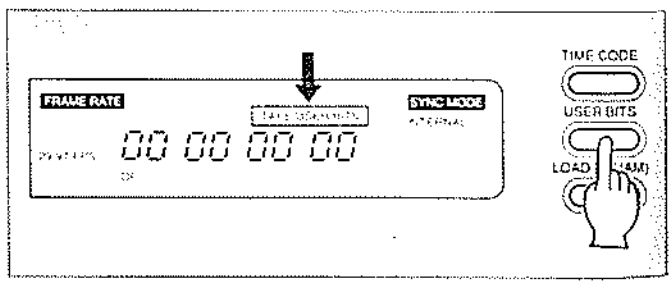
If the "SOURCE USER BITS" indication is flashing
There is a setting or connection error. Use the table on page 62(E) to determine the problem.



Selecting the tape user bits display mode

Press the USER BITS button once or twice to display the "TAPE USER BITS" indication.

If the "TAPE USER BITS" indication is flashing
There is a setting or connection error. Use the table on page 62(E) to determine the problem.



Selecting the output mode

To select the output mode for time code or user bit values, use the following procedure to select the appropriate output mode.

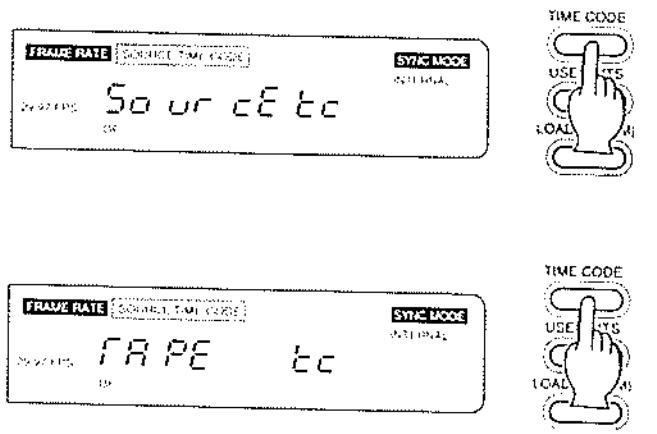
1 **Hold down the TIME CODE button for at least one second.**

The currently selected mode appears in the time code/user bits display as follows:

"So ur cE tc": Source time code output mode. The source time code and user bits are output.

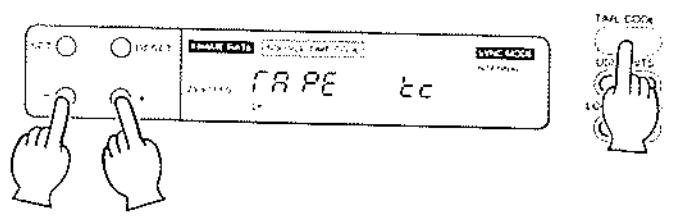
"TA PE tc": Tape time code output mode. The tape time code and user bits are output.

To change the selection, proceed to step 2.



2 **Still holding down the TIME CODE button, press the + button or – button.**

Pressing the + button or – button toggles the setting



■ Source time code and source user bits displayed/output

Source time code

When the source time code display/output mode is selected, the time code selected by the TIME CODE SOURCE selector and TIME CODE MODE button is displayed/output

TIME CODE SOURCE selector setting	Source time code displayed/output
INT	Internal time code selected by the TIME CODE MODE selector • FREE RUN • REC RUN
EXT	External time code

Source user bits

When the source user bits display/output mode is selected, the user bits selected by the USER BITS SOURCE selector are displayed/output.

- EXT UB
- MANU
- DATE
- EXT TC

■ Tape time code and tape user bits displayed/output

Tape time code

When the tape time code display/output mode is selected, the time code displayed/output depends on what time information is recorded on the tape, as shown in the following table.

Time information	Time code mode indication	Codes displayed (display format)	Codes output (output format)
Pro R-TIME A-TIME P-TIME	"TAPE TIME CODE" continuously	Pro R-TIME ($XX_HXX_MXX_SXX_F$)	Pro R-TIME (XXXXXXXX)
A-TIME P-TIME	"TAPE TIME CODE" continuously	A-TIME ($X_HXX_MXX_SXX_F$)*	A-TIME (XXXXXXXX)*
P-TIME	"TAPE TIME CODE" flashing	All zeros ($00_H00_M00_S00_F$)	All zeros (00000000)

* The first zero of the A-TIME display is suppressed, and only seven digits are displayed. The output value, however, is eight digits as for Pro R-TIME.

Tape user bits

When the tape user bits display/output mode is selected, the user bits read from the tape are displayed/output in the following formats.

Display: XX XX XX XX
Output: XXXXXXXX

When there are no user bits recorded, the "TAPE USER BITS" indication flashes, and the value is displayed/output as all-zero.

Display: 00 00 00 00
Output: 00000000

■ Notes on frame rate selection

Frame rate settings used

When the unit is put into one of the following modes relating to time code, set the FRAME RATE selector to select the frame rate to be used.

- Internal time code recording/display/output mode
- Tape time code display/output mode

If the setting of the FRAME RATE selector and the frame rate of an external time code do not agree

The frame rate indication selected by the FRAME RATE selector flashes. In this case, adjust the FRAME RATE selector so that the indication does not flash.

To check the frame rate of the time code recorded on the tape

With the "SOURCE TIME CODE" indication showing (press the TIME CODE button if the "TAPE TIME CODE" indication is displayed), hold down the TIME CODE button for at least one second.

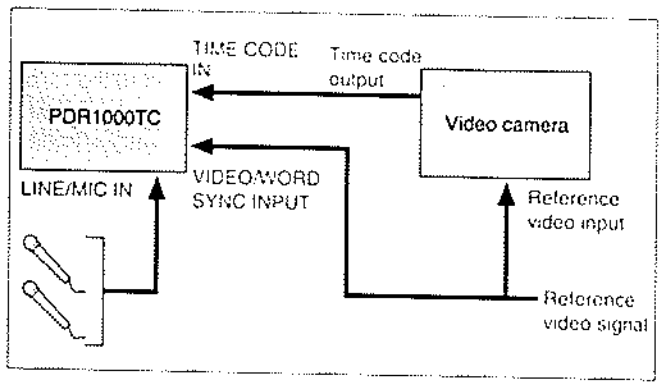
This displays the current selection of the time code/user bits output mode ("So ur cE tc" or "TA PE tc"), and also flashes the frame rate of the tape time code.

Example System Configurations Using Time Codes

■ Synchronized recording with a video camera

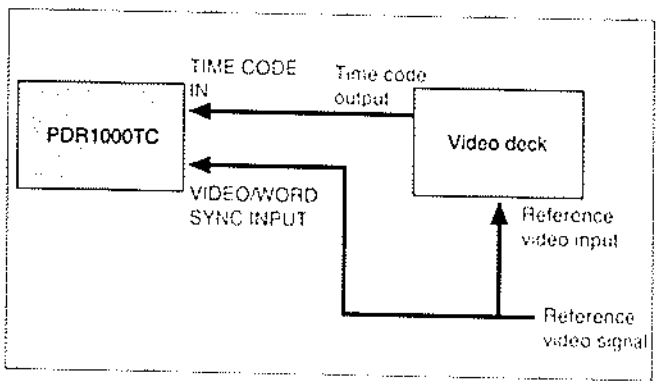
This system records a sound track on this unit with the same time codes recorded simultaneously on the video camera.

Switch settings
INPUT switch: ANALOG
LINE/MIC selector: MIC
TIME CODE SOURCE selector: EXT
FRAME RATE selector: frame rate of reference video signal



■ Time code chase system with a video deck

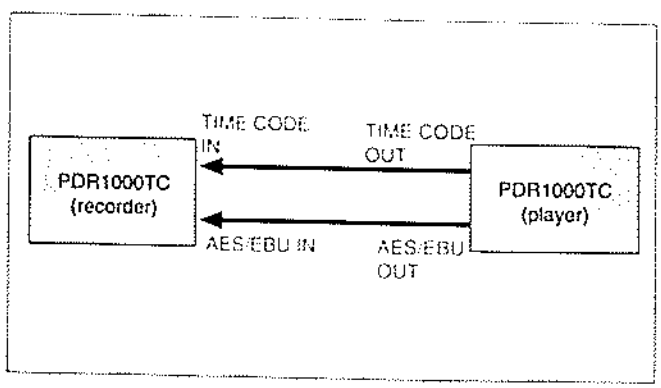
Switch settings
TIME CODE SOURCE selector: EXT
FRAME RATE selector: frame rate of reference video signal



■ Digital dubbing system

Switch settings
Player and recorder DIGITAL I/O selector: AES/EBU
Recorder TIME CODE SOURCE selector: EXT
Recorder FRAME RATE selector: frame rate of time code recorded on player
Recorder USER BITS SOURCE selector: EXT UB

Note
Set the player to tape time code output mode. (Follow the procedure in the section "Selecting the output mode" on page 55(E) to display the "TA PE tc" indication.



Synchronized Operation

By inputting an external synchronizing signal, this unit can be synchronized with other equipment for high-accuracy editing.

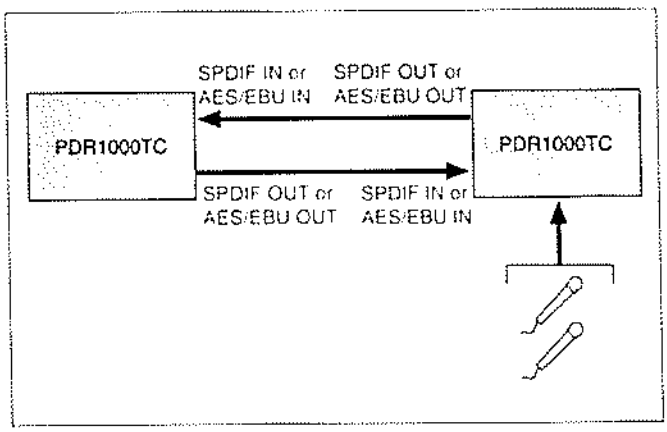
Note
Synchronized operation is impossible with a sampling frequency of 32 kHz.

■ External synchronizing signals used by this unit

External synchronizing signals can be connected to the following connectors.
If two or more external synchronizing signals are connected simultaneously, the synchronizing signal is selected in the priority shown. Only when no external synchronizing signal is connected, internal synchronization is used.

Signal	Signal standard	Input connector	Priority
Digital audio input signal	AES/EBU format	AES/EBU IN	1
	SPDIF format	SPDIF IN	
Video sync signal	Composite video signal	VIDEO/WORD SYNC INPUT	2
Word sync signal	44.1 kHz or 48 kHz square wave		
Field sync signal	48/50/59.94/60 Hz square wave		

Note
It is not possible to operate two PDR1000TC units in synchronization by the following configuration.



Switch settings for synchronized operation

Set the sampling frequency to 44.1 kHz or 48 kHz.
For synchronized operation, set the switches as follows. If the switch settings are not correct the unit will not synchronize correctly to the external equipment.

For analog recording

Synchronizing signal	ANALOG Fs selector	DIGITAL I/O selector	FRAME RATE selector
Video sync signal	44.1 or 48	—	Frame rate of video sync signal
Word sync signal	Frequency of word sync signal	—	—
AES/EBU format signal	Sampling frequency of AES/EBU format signal	AES/EBU	—
SPDIF format signal	Sampling frequency of SPDIF format signal	SPDIF	—

For playback

Use tapes recorded at a sampling frequency of 44.1 kHz or 48 kHz.

Synchronizing signal	ANALOG Fs selector	DIGITAL I/O selector	FRAME RATE selector
Video sync signal	—	—	Frame rate of video sync signal
Word sync signal[1]	—	—	—
AES/EBU format signal[2]	—	AES/EBU	—
SPDIF format signal[2]	—	SPDIF	—

1) If the sampling frequency of the playback signal is not the same as the frequency of the synchronizing signal, there will be no synchronization.
2) If the sampling frequency of the playback signal is not the same as the sampling frequency of the synchronizing signal, there will be no synchronization.

For digital recording

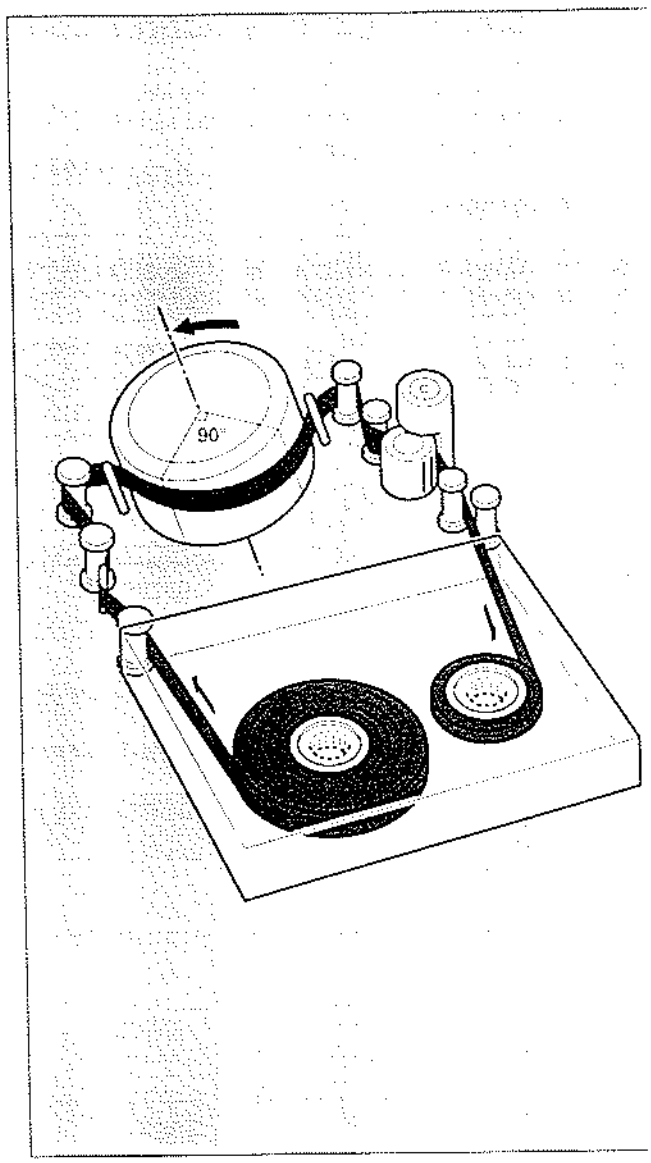
Synchronizing signal	ANALOG Fs selector	DIGITAL I/O selector	FRAME RATE selector
AES/EBU format signal	—	AES/EBU	—
SPDIF format signal	—	SPDIF	—

During digital recording, it is not possible to synchronize to a video sync signal or word sync signal.

About DAT

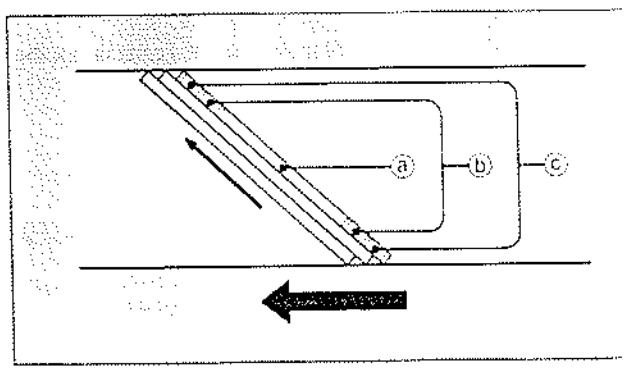
DAT stands for "Digital Audio Tape", a format which represents a breakthrough in audio recording technology. A signal is recorded magnetically on the tape, as in a conventional tape recorder, but instead of the signal directly representing the waveform of the sound signal (i.e. an analog coding), it is coded as a sequence of digital values. In other words, the variations in pressure which make up a sound are written ultimately as a sequence of binary 1s and 0s. This means that very slight fluctuations in the signal, which would cause deterioration of an analog coded signal, can be ignored, since the reading heads only have to decide whether the value is zero or one; the reproduction quality can thus be made almost perfect. This technique of representing a signal in binary codes is also referred to as pulse code modulation (PCM).

Basically, however, when sound information is represented digitally, it becomes bulkier. To a certain extent, advances in tape and recording head technology allow the information to be packed more densely, but there is still a space problem to be overcome; DAT achieves this by using the same helical scan technique which has made domestic video recording possible. Instead of the tracks lying straight along the tape, they are laid obliquely. The recording and playback heads are mounted on a spinning drum, and the tape is wrapped at a skew round the drum, as shown in the simplified illustration on the right. As the drum rotates, one head scans along a diagonal track on the tape, then as the next head begins to scan, the tape has moved forward so that it reads the next track.



When the cassette compartment is open, you can see the skewed drum right at the back of the unit. In practice, therefore, to load a cassette requires an intricate mechanism first to open the cassette shell, then wind the tape out and wrap it round the drum. The delay of a few seconds in loading or unloading a tape is due to the operation of this mechanism; the interlock on the cassette EJECT button is there to prevent chaos if a cassette were allowed to be ejected while the tape was still wrapped round the drum.

The figure (right) shows schematically the layout of tracks on the tape, as seen from the recording head drum. As the tape moves to the left, the heads on the drum scan up each diagonal track in turn. Each track has a central section ⓐ containing the audio information, surrounded by two sections for automatic tracking ⓑ. The ends of each track contain the subcode information ⓒ; whereas the audio information in each track is obviously different, the subcode information is duplicated over a section of the tape, so that it can still be read reliably while the tape is being fast-forwarded or rewound.



Error indication		Situation/accompanying phenomenon	Cause
User bits indications	"SOURCE USER BITS" flashes, and "00 00 00 00" is displayed.	"EXT TC" mode or "EXT UB" mode is selected.	No external time code is detected. In this case the user bits will automatically be "00 00 00 00".
		"DATE" mode is selected.	Date is not set on the DAT unit. In this case the user bits will automatically be "00 00 00 00".
	"TAPE USER BITS" flashes, and "00 00 00 00" is displayed.	Tape user bits display mode is selected.	No user bits are recorded on the tape.
"ERROR"	"ERROR" flashes.	External time code recording mode is selected.	No external time code is detected. In this case the internal time code will automatically be recorded in "REC RUN" mode.
			The system frame rate is not the same as the frame rate of the external time code signal.
		The tape pauses during time code chase playback.	No external time code is detected.
			The system frame rate is not the same as the frame rate of the external time code signal.
	"ERROR" appears and stays in the display.	The LOAD TC(JAM) button is pressed.	The system frame rate is not the same as the frame rate of the external time code signal.

Specifications

■ DAT unit

Basic system

Recording system	Rotating head DAT
Drum diameter	30 mm
Tape drive	Four-motor mechanism
Tape speed	8.15 mm/s (12.225 mm/s playback only) 4.075 mm/s (long play mode)
Sampling frequency and quantization levels	48 kHz 16-bit linear 44.1 kHz 16-bit linear 32 kHz 16-bit linear (standard play mode) (available for playback and digital recording only) 32 kHz 12-bit nonlinear (long play mode)
Number of channels	2
Error correction method	Double Reed-Solomon coding

Audio system

Frequency response	20 Hz to 22,000 Hz ±3 dB (fs: 48 kHz)
Signal-to-noise ratio	90 dB (line input)
Dynamic range	90 dB (line input)
Total distortion	0.015% (line input, with 22 kHz LPF)
Wow & flutter	Below measurable limit

Inputs and outputs (0 dBs =1 Vrms)

Digital inputs	SPDIF IN (RCA pin jack x 1) nominal 0.5 V p-p, input impedance 75 Ω AES/EBU IN (XLR-3-31 x 1) Based on IEC958 (AES/EBU) standard
Digital outputs	SPDIF OUT (RCA pin jack x 1) nominal 0.5 V p-p, output impedance 75 Ω AES/EBU OUT (XLR-3-32 x 1) Based on IEC958 (AES/EBU) standard
Analog input (Rated recording level: −12 dB) (XLR-3-31 x 2)	MIC: −66 dBs (0.5 mV), input impedance: at least 10 kΩ LINE: −2 dBs (800 mV), input impedance 47 kΩ
Analog output	LINE OUT L/R (RCA pin jacks x 2) Maximum output level: 2 Vrms Load impedance: at least 10 kΩ Headphone output (6.3 mm stereo phono jack x 1) Maximum 12.5 mW + 12.5 mW, EIAJ/32 Ω

Other functions

Clock/calendar function	Date, day-of-week and time (built-in clock)
Phantom power supply	48 V, 7 mA
Limiter	Operating level: Approximately −3 dB
Monitor speaker	50 mW
Microphone high-pass filter	Approx. 100 Hz, 6 dB/octave

■ Time code processor unit

External synchronization

Video synchronization	Composite video (NTSC/PAL/SECAM) ±0.1%
Field synchronization	Square wave, 48/50/59.94/60 Hz ±0.1%
Word synchronization	Square wave, 44.1/48 kHz 0.1%
DIO sync	SPDIF, AES/EBU format signal, 44.1/48 kHz ±0.5%

Time codes

Format	IEC 461 (SMPTE/EBU)
Frame rate	24, 25, 29.97 (non-drop-frame mode), 29.97 (drop-frame mode), 30
Compatible sampling frequency	44.1/48 kHz

Inputs/outputs

Time code input	TIME CODE IN (XLR-3-31 x 1) 0.25 to 5 V p-p, input impedance 8 kΩ (nominal), balanced
Time code output	TIME CODE OUT (XLR-3-32 x 1) 2.2 V p-p, input impedance 600 Ω, balanced
Video/word sync input	VIDEO/WORD SYNC INPUT (BNCx1) Video sync signal: 1 V p-p/75 Ω Word sync signal: TTL, input impedance 75 Ω
Word sync output	WORD SYNC OUTPUT (BNC x1) Square wave, 44.1/48 kHz, TTL levels, impedance 75 Ω
Video/word sync loop-through output	VIDEO WORD SYNC THROUGH (BNC x1) Loop-through output of input word sync signal

■ Power supply and miscellaneous

Power supply	6 V DC (using supplied MHB-220 battery pack) 100 to 240 V AC, 50/60 Hz (using supplied AC adaptor) External 12 V DC power supply
Power consumption	12 W (with AC adaptor or 12 V DC external power supply connected) 9 W (with battery pack loaded)
Operating time	Using supplied MHB-220 battery pack Operating time 1.5 hours (after 2 hours charging) (EIAJ, playback/recording with the phantom power and backlighting turned off)
External dimensions	240 (W) x 95 (H) x 177 (D) mm (excluding carrying case)
Weight	2280 g (without battery pack) 2600 g (with battery pack)

■ Supplied accessories

- Battery pack (MHB-220) (1)
- AC adaptor (RB-110) (1)
- Carrying case (1)
- Lithium battery (CR2032) (1)

■ Optional accessories

MHB-220 battery pack

Specifications and external appearance are liable to change without notice.