SONY

3-758-840-21(2)

Digital Audio Tape Deck

Operating Instructions

DAT
Digital Audio Tape

SBM
Super Bit Mapping

DTC-60ES

WARNING

Operating Instructions

Before operating the unit, please read this manual thoroughly and retain it for future reference.

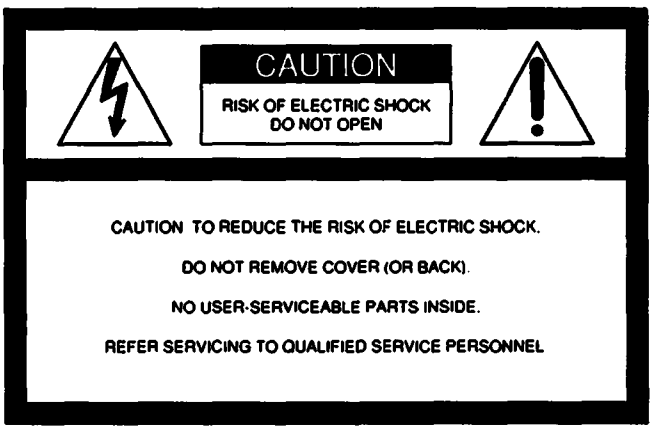
Owner's Record

The model and serial numbers are located on the rear of the unit. Record the serial number in the space provided below. Refer to them whenever you call upon your Sony dealer regarding this product.

Model No. DTC-60ES Serial No._____

WARNING

To prevent fire or shock hazard, do not expose the unit to rain or moisture.





This symbol is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.



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

The graphical symbol are on the rear enclosure.

INFORMATION

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures

— Reorient or relocate the receiving antenna
— Increase the separation between the equipment and receiver.
— Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
— Consult the dealer or an experienced radio/TV technician for help.

CAUTION

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

For the customers in Canada

CAUTION

TO PREVENT ELECTRIC SHOCK, DO NOT USE THIS POLARIZED AC PLUG WITH AN EXTENSION CORD, RECEPTACLE OR OTHER OUTLET UNLESS THE BLADES CAN BE FULLY INSERTED TO PREVENT BLADE EXPOSURE.

INFORMATION

This apparatus complies with the Class B limits for radio noise emissions set out in Radio Interference Regulations

IN NO EVENT SHALL SELLER BE LIABLE FOR ANY DIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY NATURE, OR LOSSES OR EXPENSES RESULTING FROM ANY DEFECTIVE PRODUCT OR THE USE OF ANY PRODUCT.

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Digital Audio Tape

DAT (Digital Audio Tape) is a new recording system which digitalizes the audio signal and records it on a DAT cassette tape.

DAT records the audio signal by converting the analog sound into a digital signal. This converting system is called the PCM (Pulse Code Modulation), and its accurate processing of the audio signal allows recording/playback with lower wow and flutter, wider dynamic range, lower distortion rate, and superb signal-to-noise ratio.

In addition, various control codes called sub codes can be written on the DAT cassette separately from the audio signal. They are written for a variety of convenient playback/tape editing operations, and except for the absolute time, can be rewritten after audio signal recording has been completed.

Precautions

Safety
- Operate the unit only on 120 V AC, 60 Hz.
- One blade of the plug is wider than the other for the purpose of safety and will fit into the power outlet only one way. If you are unable to insert the plug fully into the outlet, contact your dealer.
- Should any solid object or liquid fall into the cabinet, unplug the unit and have it checked by qualified personnel before operating it any further.
- Unplug the unit from the wall outlet if it is not to be used for an extended period of time. To disconnect the cord, pull it out by grasping the plug. Never pull the cord itself.

Operation
Before making program source connections, be sure to unplug the unit.

Installation
Do not install the unit in a location near heat sources such as radiators or air ducts, or in a place subject to direct sunlight, excessive dust, mechanical vibration or shock.

Moisture Condensation
If the unit is brought directly from a cold to a warm location, moisture may condense inside the unit. In this condition, the tape may adhere to the head drum and be damaged, or the unit may not operate correctly. Always remove the cassette when the unit will not be used.

If moisture is present...
- Function controls will not operate.
- All operations will stop.

When the CAUTION indicator lights and the unit will not operate
Leave the unit turned on for about an hour.

Detaching the side panels (on the model sold in Canda)
After removing the screws, secure the cabinet with the supplied lock screws (M4 × 6). Do not use the longer screws.
For safety, before doing this, be sure to disconnect the AC power cord from the AC outlet.

NOTE
When closing the cassette compartment, do not push the cassette lid forcibly by hand, but perform with the ▲OPEN/CLOSE button.

For the customers in the U.S.A.
For detailed safety precautions, see the "IMPORTANT SAFEGUARDS" leaflet.

If you have any question or problem concerning your unit, please consult your nearest Sony dealer

Features

Serial copy management system
This unit utilizes the serial copy management system that permits digital-to-digital recording for one generation. You can record CD sound or other digital formats through a digital-to-digital connection. (See page 42.)

Date Function automatically memorizes the recording date and time
The year, month, day, day of the week, hour, minute and second are automatically memorized in the subcode area during recording, so that during playback you can display this data to check when the tape was recorded. This function is especially convenient when recording live performances, etc.

Three sampling frequencies
Recording/playback can be done with three sampling frequencies (48 kHz, 44.1 kHz and 32 kHz).
48 kHz: For analog and digital input signals in a standard mode.
44.1 kHz: For compact disc, pre-recorded DAT tape and analog input signals.
32 kHz: For analog input signals in a long-play mode.

Long play mode
This unit can operate in long-play mode. Analog input signals can be recorded or played back for up to four consecutive hours when the DT-120 DAT cassette tape is used. The sampling frequency will be 32 kHz in the long-play mode.

Visible cassette loading
You can view the tape operation through the lid of the cassette compartment. Due to a revolutionary new transport mechanism, cassette loading time has been significantly reduced.

Excellent sound quality
1-bit A/D converter
For the A/D converter section which converts analog input signals to digital signals, the unit employs a 1-bit A/D converter which theoretically generates no zero-cross distortion for a clear, elegant sound quality.
Pulse D/A converter
Superior playback performance is achieved with a 1-bit D/A converter.

SBM (Super Bit Mapping)
Super Bit Mapping reduces noise at the frequency levels most discernible to the human ear, and re-integrates sound information subtracted during the A/D conversion process, greatly improving the dynamic audible range and sound quality of the recorded signal during analog recording.

44.1-kHz analog recording capability
By supporting the recording of analog sources at a sampling frequency of 44.1 kHz, the DTC-60ES allows you to record from DAT tape to a MiniDisc recorder through a digital-to-digital connection.

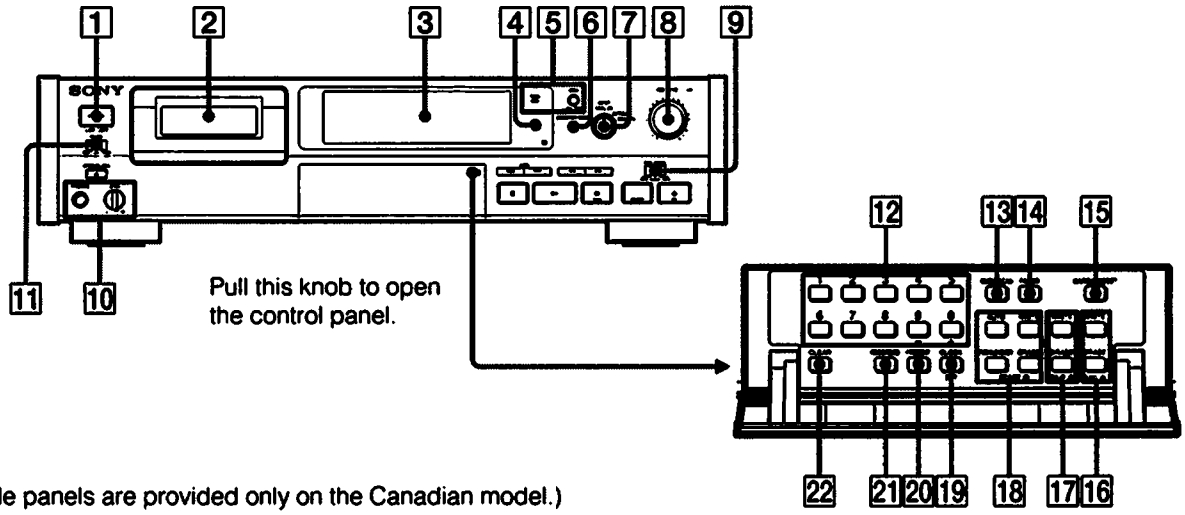
Rich variety of subcode information
This unit can record subcode information such as Start IDs, program numbers, Skip IDs, and absolute time data, enabling you to quickly locate tunes and display the playback time in the same manner as when playing compact discs.

Digital fade-in/fade-out
Professional sounding fade-in/fade-out of either digital or analog signals can be accomplished by use of the FADER button.

Post edit recording of sub codes
You can record or rewrite the following sub codes after the audio signal recording has been completed.
Start ID: Signifies the beginning of a selection.
Program number: Gives a number to the selection.
Skip ID: Signifies the beginning of a portion to be skipped.
End ID: Signifies the end position of recording/playback.
Since sub codes are written on the tape separately from audio signals, the audio signals are not affected.

Location and Function of Controls

Front Panel/Remote Commander



(Side panels are provided only on the Canadian model.)

1 POWER switch
Turns the power on and off.

2 Cassette compartment
Insert a cassette with the window side up and the safety tab facing you.

3 Display window

4 Remote sensor
Receives the signal from the remote commander.

5 SBM (Super Bit Mapping) switch and indicator
Set to ON for Super Bit Mapping during analog recording through the LINE IN jacks in STANDARD recording mode (REC MODE selector).
SBM indicator lights when the SBM function is on (applicable during analog recording only).

6 COUNTER MODE button
Selects the display of the absolute time, elapsed time of the current selection, remaining time to the end of whole tape or linear counter (tape running time). Each time you press the button, the display changes sequentially.

7 INPUT selector
Set according to the signal to be recorded.
ANALOG: For recording from the equipment connected to the LINE IN jacks.
OPTICAL: For recording from the equipment connected to the DIGITAL IN (OPTICAL) jack.
COAXIAL: For recording from the equipment connected to the DIGITAL IN (COAXIAL) jack.

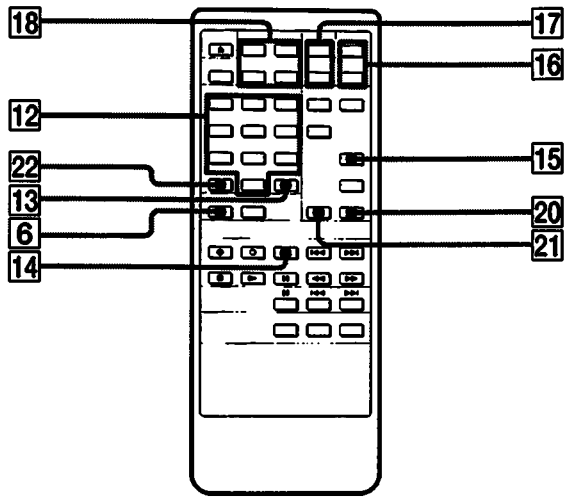
8 REC LEVEL (recording level) controls
Adjust the recording levels and balance for the analog input signals.
The outer knob controls the L (left) channel level and the inner knob the R (right) channel level. The knobs can be adjusted together. To adjust each channel independently, turn the knob while holding the other knob.
When recording digital signals, it is not necessary to adjust the recording levels.

9 REC MODE selector
Normally set to the STANDARD position
When this selector is set to the LONG position, you can record analog input signals or digital signals with 32 kHz in the long-play mode.

10 PHONES-LEVEL jack and control
Insert the headphones plug to this jack and turn the control to adjust the headphones volume level

11 TIMER switch
Normally set to the OFF position When recording or playing back at the desired time using a commercially available audio timer, set to the REC position or the PLAY position respectively.

12 Numeric buttons (0 - 9)
Designate the desired program number to be played back before starting playback Designate the desired number in the record-pause mode, the program number is written consecutively from the designated number.



13 MUSIC SCAN button
Press to listen to the beginning of each selection successively.

14 FADER button
Press to fade in or fade out during recording or playback.

15 MARGIN RESET button
Press to reset the margin of peak level.

16 END ID buttons
WRITE: Press to write the ID signifying the end of playback or recording.
ERASE: Press to erase the end ID.

17 SKIP ID buttons
WRITE: Press at the beginning of the portion you may wish to skip later. A skip ID will be written from the point where you pressed this button.
ERASE: Press to erase the nearest skip ID which is before the current position.

18 START ID buttons
AUTO: Press to turn on and off the AUTO indicator. When the AUTO indicator is lit, the start ID will automatically be written during recording. When the AUTO indicator is not lit, press the START ID WRITE button at the point where you want to write a start ID.
WRITE: Press to write the start ID at the desired point during recording or playback.
ERASE: Press to erase a start ID. When a start ID and a program number are written on the tape, both codes are simultaneously erased by pressing this button.
RENUMBER: Press to renumber all programs on the tape. When only the start IDs are written, pressing this button will insert the proper program numbers beginning with "1". The tape will rewind and start from the beginning to accomplish this function.

19 CLOCK SET button
Press to adjust the time of the clock built in this unit. In this mode, the 0 button and the 9 button function as the + and – buttons respectively.

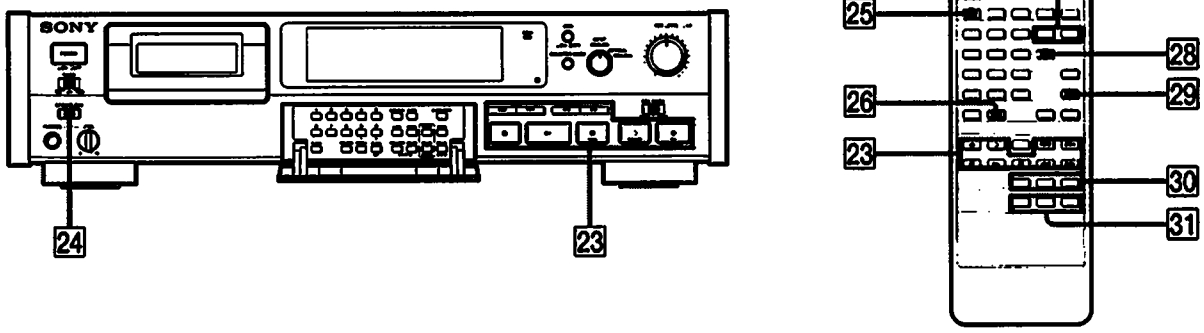
20 PRESENT button
Press to display the current time.
Each time the RECORDED or PRESENT button is pressed, day, month and year display, the day of the week display or hour, minute and second display is switched sequencially.

21 RECORDED button
Press to display the recording day of the tape being played.

22 CLEAR button
Press to cancel the program number which has been mistakenly entered.

Location and Function of Controls

Front Panel/Remote Commander



23 Tape operating buttons

■ (stop): Press to stop recording or playback.

► (play): Press to play back the tape.

II PAUSE (pause): Press to stop for a moment during recording or playback. To restart recording or playback, press this button again or press the ► button.

If the unit is left in the pause mode for about 10 minutes, it will automatically be released and the deck will enter the stop mode. To restart recording or playback from the stop mode, press the ● REC or ► button respectively.

O REC MUTE (record muting): Inserts a sound-muted portion (space).

● REC (recording): Press to enter the record-pause mode. After pressing this button, press the II PAUSE or ► button.

I◄◄ / ►►I (AMS): Press to locate the beginning of the selection during the playback.

◄◄ / ►► (rewind/review, fast-forward/cue): In the stop mode, press to rewind/fast-forward the tape. During playback, press to rewind or fast-forward the tape while listening to the sound.

24 ≙ OPEN/CLOSE button

Press to open or close the cassette compartment.

25 DISPLAY MODE button

Changes the display mode. (Refer to page 10.)

26 RESET

Resets the linear counter to "0M 00s".

27 RMS play buttons

ENTER: To program the selections in a desired order, press this button after pressing the numeric buttons.

CHECK: Press to check the programmed contents

28 REPEAT 1/ALL button

Press to play a desired portion repeatedly. Each time you press the button, the indicatior changes as follows REPEAT 1 → REPEAT ALL → off

29 SKIP PLAY button

Press to activate the skip ID code function. The portion of the tape previously marked will be skipped

30 CD operation buttons

Operative only for the Sony CD player equipped with a Remote Commander.

II (pause): Press this button twice to start playback. Press this button once in the playback mode, the deck enters the pause mode.

I◄◄ / ►►I (AMS): Press to locate the desired selection on the Compact Disc during playback or in the stop mode.

31 CD SYNCHRO (CD synchronized recording) buttons

(The playback of the Sony CD player equipped with a Remote Commander and the recording of the DAT deck can be performed simultaneously.)

STANDBY: Press to set the unit in the record-standby mode.

START: Press to start recording of the DAT deck and then playback of the CD player.

STOP: Press to stop the DAT deck recording and the CD player playback.

Remote Commander Operation

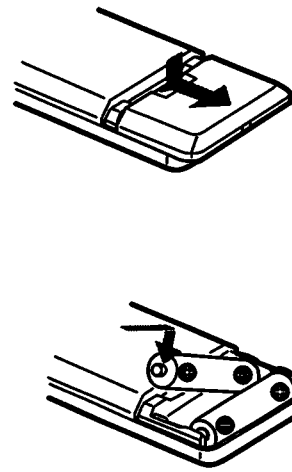
Each button on the remote commander functions in the same way as those having the same name on the front panel.
However, the following operations cannot be performed using the remote commander. Use the front panel controls instead.

- Turning the power on and off
- Selecting digital(optical/coaxial)/analog input source
- Setting the clock
- Adjusting the recording level and balance
- Adjusting the headphones level
- Setting the timer recording/playback
- Selecting the record mode (standard or long)
- Turning the SBM function on and off

The following operations can be performed only with the remote commander.

- Activating CD synchronized recording using a Sony CD player and controlling the CD player
- Locating a selection on the Compact Disc or changing the CD player to pause mode (possible only when a Sony CD player is used)
- Repeat play
- Skip play
- RMS* play
  * RMS: Random Music Sensor
- Resetting the linear counter to "0M 00s"

Installing Batteries



Insert two size AA (R6) batteries with correct polarity, and close the lid.

Notes on remote control

- Do not expose the remote sensor on the deck to strong light such as direct sunlight, lighting apparatus, etc.
- Do not place any obstructions between the Remote Commander and the remote sensor, or else operations will not be performed correctly.
- The controllable range is limited. Point the Remote Commander directly at the remote sensor on the deck.
- When remote control operation distance becomes shorter, the batteries are weak. Replace both batteries with new ones.

To avoid battery leakage

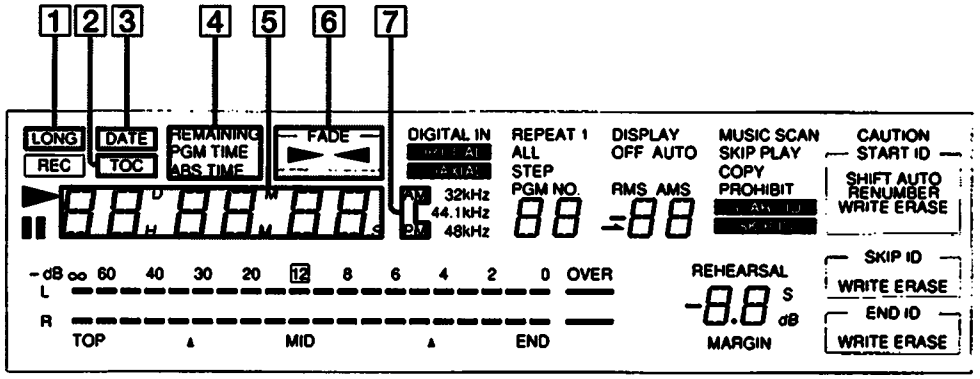
When the commander will not be used for a long period of time, remove the batteries to avoid damage caused by battery leakage and corrosion.

Battery life

About half a year of normal operation can be expected when using the Sony SUM-3 (NS) batteries.

Location and Function of Controls

Display Window



To turn off the display window
When the power is turned on, the display window also is turned on. During recording or playback, all display or some parts of the display can be turned off as follows:
When operating with the front panel controls
While pressing the COUNTER MODE button, press the 0 button.
When operating with the remote commander
Press the DISPLAY MODE button.
Each time you press the above buttons, the indicators change as follows:

Normal indicators ←
↓
Peak level meters and margin indicators go off.
(The DISPLAY OFF indicator lights.)
↓
All the indicators go off during recording or playback*.
(The DISPLAY OFF AUTO indicator lights momentarily just before the indicators go off.)

* When pressing the COUNTER MODE or DISPLAY MODE button except during recording or playback, the DISPLAY OFF AUTO indicator lights. In this case, all the indicators go off immediately after recording or playback starts.

To change the brightness of the display window
While pressing the COUNTER MODE button on the front panel or the COUNTER MODE button on the remote commander, press one of the numeric buttons 1, 2 and 3. The greater number pressed, the darker the display window becomes.

1 LONG play mode indicator
Lights when recording or playback is being performed in the long play mode

2 TOC (Table Of Contents) indicator
When a pre-recorded DAT cassette is played back, this indicator will light

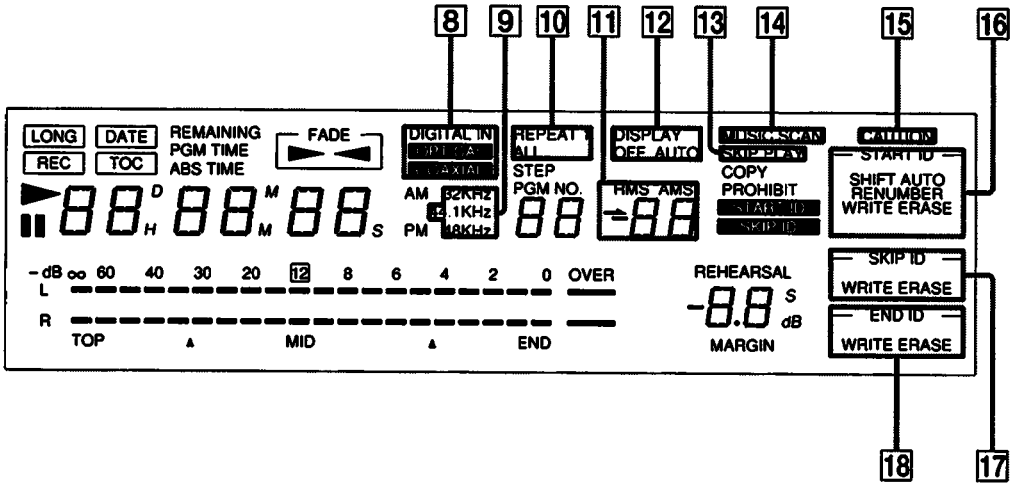
3 DATE indicator
Lights when the RECORDED button is pressed to display the recording day of the tape being played
Flashes when the PRESENT button is pressed to display the current time

4 REMAINING (remaining time): Lights when the counter shows the remaining time of the tape
PGM TIME (program time): Lights when the counter shows the elapsed time of the current selection
ABS TIME (absolute time) indicator: Lights when the counter shows the elapsed time from the beginning of the tape.

5 Time indicator
Indicates the tape running time, absolute time, elapsed time of the current selection, remaining time or recording day. Each time the COUNTER MODE button is pressed, the display is changed

6 Fade in/out indicator
FADE : Flashes when recording or playback fades in
FADE : Flashes when recording of playback fades out

7 AM/PM indicators
Show AM or PM of the time



8 INPUT selector indicators
The DIGITAL IN OPTICAL or COAXIAL indicator lights according to the position of the INPUT selector. No indicator lights when the INPUT selector is set to the ANALOG position.

9 SAMPLING FREQ. (Sampling frequency) indicator
48kHz: For recording/playback of analog input signals (standard mode).
44.1kHz: For recording/playback of CD, a pre-recorded DAT cassette or analog input signals.
32kHz: For recording/playback of analog input signals (long-play mode).

10 REPEAT indicators
REPEAT 1: Lights when a desired selection is played back repeatedly.
REPEAT ALL: Lights when all the selections are played back repeatedly.

11 AMS (Automatic Music Sensor)/RMS (Random Music Sensor) indicators
Show the number of selections to be skipped ahead or behind in the AMS operation. When designating a selection directly by the numeric button and the ► button, the display shows the program number of the target selection while the selection is being searched for. When programming the desired selections in the RMS operation (page 39), the display shows the program number of the selection to be programmed.

12 DISPLAY OFF/AUTO indicators
The DISPLAY OFF indicator lights when peak level meters and margin indicators are turned off. The DISPLAY OFF AUTO indicator lights momentarily before all the indicators are turned off.

13 SKIP PLAY indicator
When this indicator is lit during playback, the portion marked by the skip ID is skipped and playback continues from the next start ID.

14 MUSIC SCAN indicator
Lights after the MUSIC SCAN button is pressed to listen to the beginning of each selection successively.

15 CAUTION indicator
Lights when moisture condensation occurs. If this happens, the deck stops functioning automatically. (See page 4.)

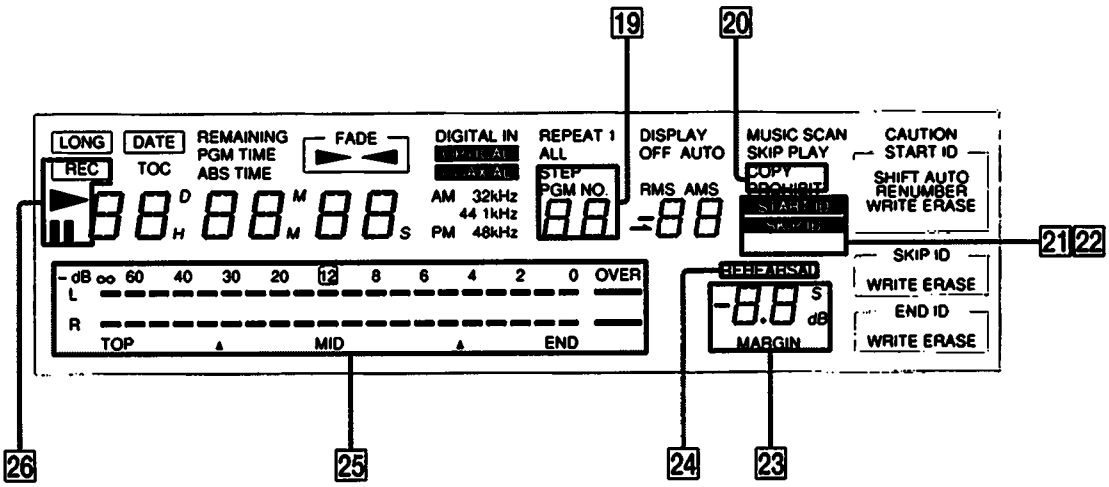
16 START ID mode indicators
AUTO: Lights when the AUTO button is pressed to write the start ID automatically.
RENUMBER: Lights when the RENUMBER button is pressed to renumber the program numbers.
WRITE: Lights when writing the start ID manually.
ERASE: Lights when erasing the start ID.
AUTO RENUMBER: Lights when renumbering program numbers automatically.
SHIFT RENUMBER: Lights when shifting the start ID and program number position.

17 SKIP ID mode indicator
WRITE: Lights when writing the skip ID.
ERASE: Lights when erasing the skip ID.

18 END ID mode indicator
WRITE: Lights when writing the end ID.
ERASE: Lights when erasing the end ID.

Location and Function of Controls

Display Window



19 STEP/PGM NO. indicator
Shows the program number of the selection being played. When programming the desired selection with the RMS operation (page 39), the display shows the step number of the programmed selection.

20 COPY PROHIBIT indicator
Lights when recording the digital signal with the copy prohibit code. In this case, record with the LINE IN jacks.

21 START ID indicator
Flashes when writing (for 9 or 18 seconds) or erasing a start ID code, and lights when the start ID is detected during playback.

22 SKIP ID indicator
Lights when writing (for 1 or 2 seconds) or erasing a skip ID code or when the skip ID is detected during playback.

23 MARGIN indicator
Shows how much margin there is between the peak level of input audio signal and 0 dB.

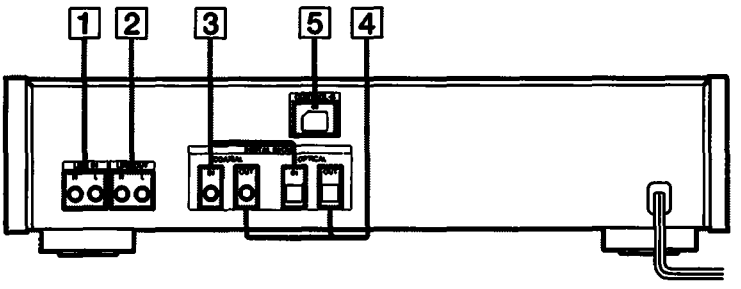
24 REHEARSAL indicator
Lights while the rehearsal function is activated (page 29).

25 Peak level meters/Frequencies map
Indicate the signal levels during playback and recording. There are separate meters for each left and right channel. These meters have a peak hold function which indicates the peak level momentarily
When pressing the 4 button while keeping the COUNTER MODE button pressed, the sampling frequencies with which the tape was recorded is displayed (page 35).

26 Tape operation indicators
REC : Lights during recording or in the record-pause mode.
► : Lights during recording or playback. It also lights in the record-pause mode or in the play-pause mode.
❚❚ : Lights in the record-pause mode or in the play-pause mode.

Connections

Rear Panel Jacks



1 LINE IN (line input) jacks (phono jack)
Connect to the recording outputs of an amplifier. Signals supplied by the amplifier can be recorded using the sampling frequency of 48 kHz or 44.1 kHz in the standard play mode or 32 kHz in the long play mode.

2 LINE OUT (line output) jacks (phono jack)
Connect to the DAT or tape inputs of an amplifier. The playback signal of this deck will be output.

3 COAXIAL/OPTICAL DIGITAL IN (digital input) jacks (coaxial phono jack/optical jack)
Connect to the digital outputs of an amplifier with a digital output jack or another digital source such as a CD player for digital-to-digital recording.

4 COAXIAL/OPTICAL DIGITAL OUT (digital output) jack (coaxial phono jack/optical jack)
Connect to the digital inputs of an amplifier having a built-in D/A converter or another DAT deck, for playback of a DAT cassette or digital-to-digital recording.

5 CONTROL-S IN jack
Connect to the CONTROL-S output of a Sony amplifier or receiver for remote control.

Notes on connection
- Use the connecting cords specified in the illustrations.
- Turn off the power for all equipments before making connections.
- Be sure to insert the plugs firmly into the jacks. Loose connections may cause hum and noise. When unplugging, grasp the plug and not the cord.

Notes on the optical cable
- Do not bend the cord. When the cord is not used, curl it with a diameter of more than 15 cm (5 $^{7}/_{8}$ inches).
- Do not use it under high temperatures.
- When the optical cable is not connected, cover the OPTICAL IN/OUT jacks with the supplied caps.

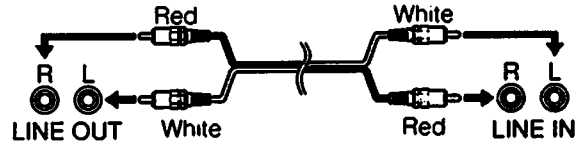
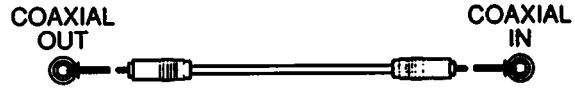
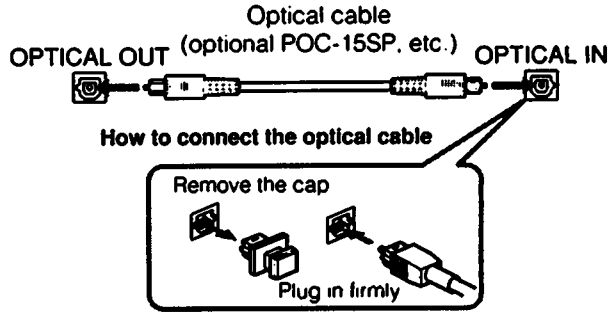
Note on sound signals
When connecting an optical cable to the DIGITAL IN/ DIGITAL OUT jacks, sound signals (L/R) are transmitted together through the cable.

Note on the CONTROL-S IN jack
To remote control this unit through a receiver or amplifier, connect the input of this unit to the CONTROL-S output of a Sony receiver or amplifier, with a CONTROL-S cable. When this connection is used, only remote control commands sent through the receiver or amplifier will be executed. The remote sensor of this unit will not function.

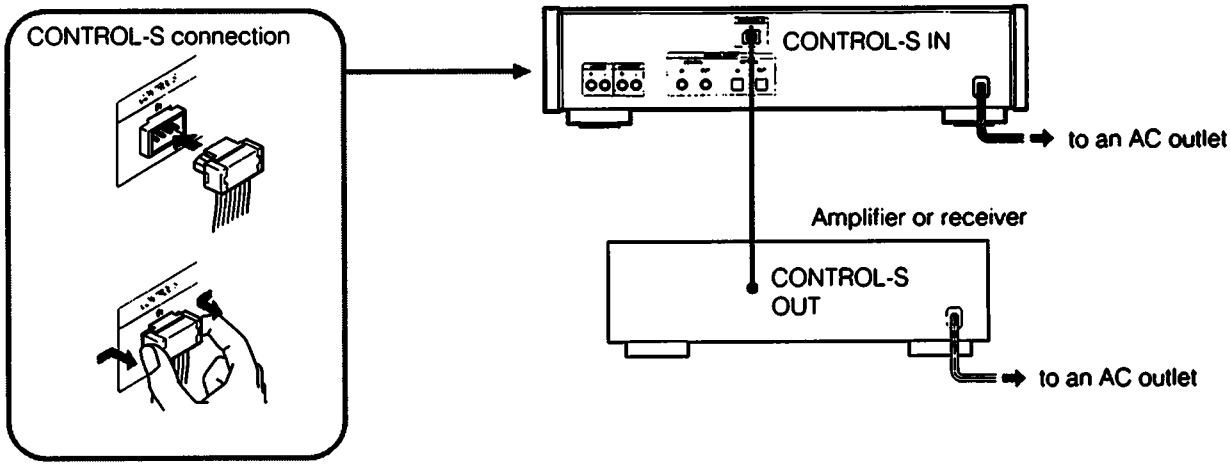
Connections

Connecting Cords

There are following three types of connecting jacks at the rear of the deck. Each type of jack requires a different type of connecting cord.

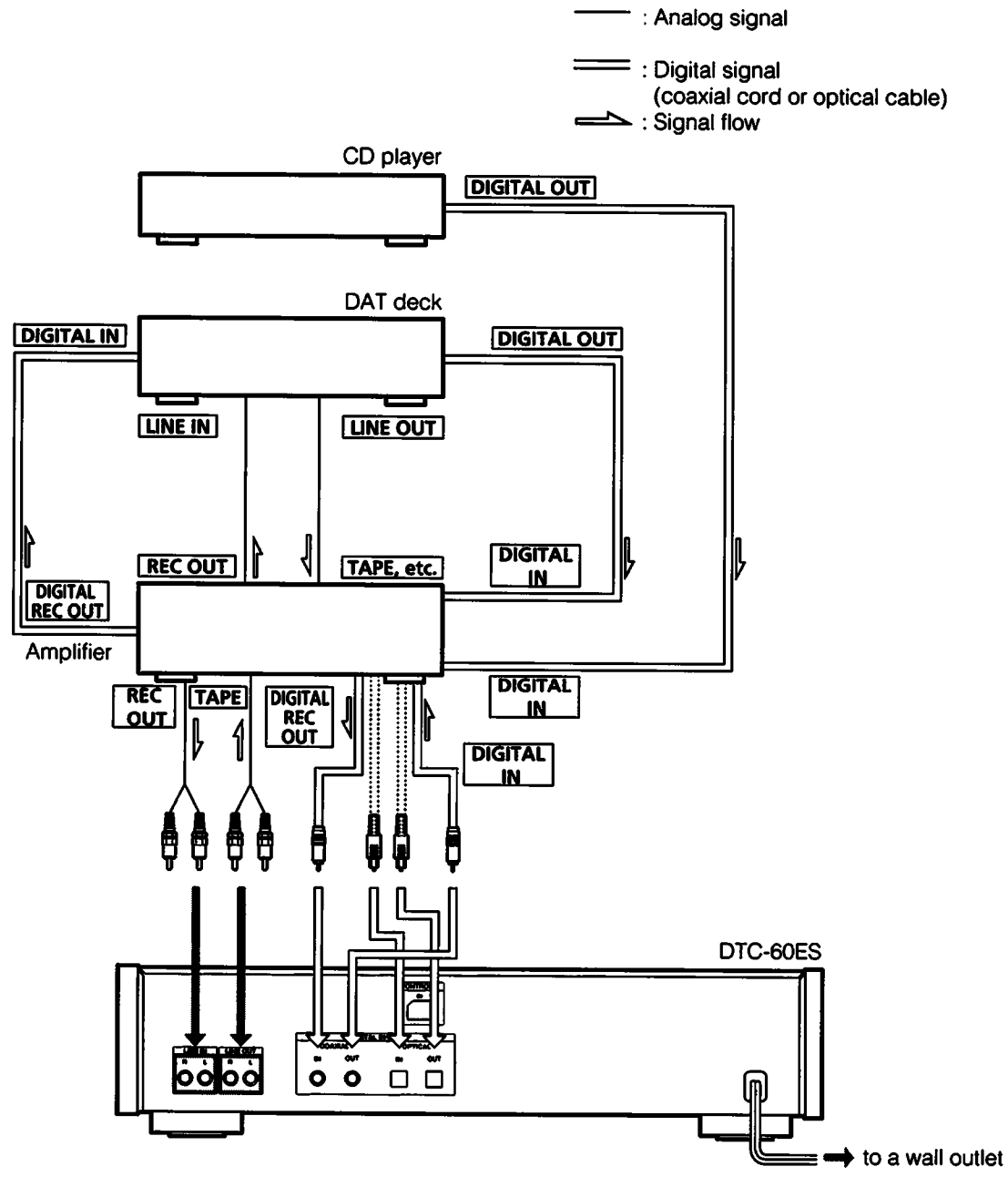
Jack	Required cord
LINE IN/OUT (analog input/output) jacks	Audio signal connecting cord (supplied, or optional RK-C510HG etc) 
COAXIAL IN/OUT (digital input/output) jacks	Coaxial digital connecting cord (optional VMC-10HG, etc) 
OPTICAL IN/OUT (optical transmission digital input/output) jacks	Optical cable (optional POC-15SP, etc.) 

Connecting the Remote Control System



Connection Examples

If your amplifier is equipped with digital signal jacks

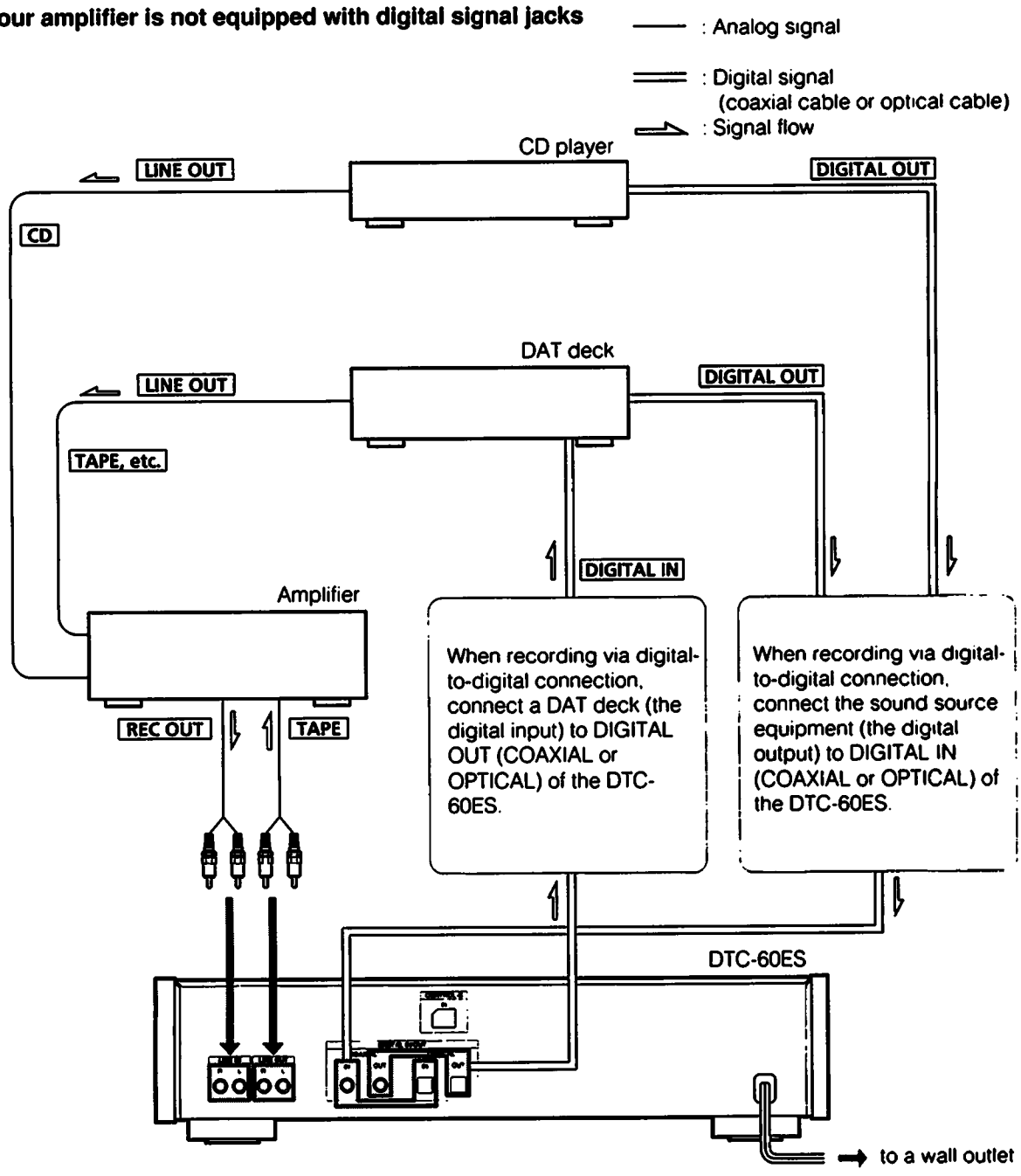


Note
If "COPY PROHIBIT" appears in the display window, recording via digital-to-digital connection cannot be performed.
In this case, connect the sound source equipment using LINE IN and OUT jacks.

Connections

Connection Examples

If your amplifier is not equipped with digital signal jacks



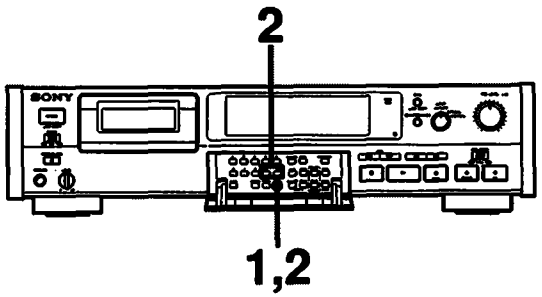
When connecting a microphone
Connecting a stereo microphone amplifier (the analog output) to LINE IN of the DTC-60ES.

Note
If "COPY PROHIBIT" appears in the display window, recording via digital-to-digital connection cannot be performed.
In this case, connect the sound source equipment using LINE IN and OUT jacks.

Clock Setting

This unit uses a built-in clock to keep track of the current date and time. Once you set the date and time, this information will be recorded on the tape along with the audio signal during recording, allowing you to check the recording date of the tape during playback at a later time.

Setting the Date and Time



1 **With the unit stopped, press the CLOCK SET button.**
The year display begins to flash.

2 **Press 9 (–) or 0 (+) to decrease or increase the displayed item, then press the CLOCK SET button.**
The next item begins to flash.

3 **Repeat step 2 until all items have been set.**
For greater accuracy, set the seconds display to zero, then press the CLOCK SET button in synchronization with a timecast (from the telephone or other time source).

To confirm the date or time
Press the PRESENT button to display the date, the day of the week or time. When pressing the PRESENT button once, the date is displayed, when pressing twice, the day of the week is displayed and when pressing three times, the time is displayed. To return to the original counter display, press the COUNTER MODE button.

Time display
The time is displayed in 12-hour format.
Midnight and noon are displayed as follows:
Midnight: 12:00 AM
Noon: 12:00 PM

Built-in clock
This unit's built-in clock operates using a quartz oscillator, and time variations caused by changes in temperature, etc., may accumulate. For precise recording of hour, minute, and second data by the built-in date function, it is recommended that you set the clock once a week.

Precautions when setting the clock
- Set the clock while the tape is stopped.
- Although this unit's clock automatically adjusts for leap years and long and short months, do not enter a date which does not exist.

The day of the week is displayed as follows:

Sunday	SU
Monday	MO
Tuesday	TU
Wednesday	WE
Thursday	TH
Friday	FR
Saturday	SA

Note
This unit uses a back-up battery to keep the clock running when the power is turned off. The life of the battery under normal use is approximately seven years. When the battery starts to run down, the clock will stop operating normally. When this occurs, have the battery replaced at your dealer or nearest Sony Service Center (a battery replacement fee is required).

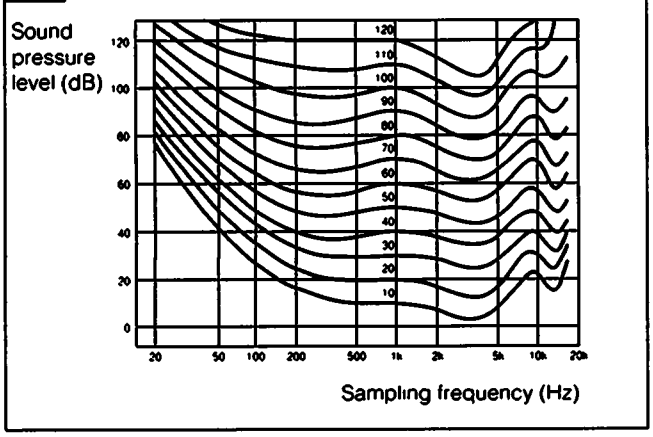
SBM (Super Bit Mapping) Function

During analog recording, the SBM function lowers noise within the frequency band to which to the human ear is most receptive to noise, thereby, sharply expanding the auditory dynamic range of the recorded signal.
To activate the function, turn on the SBM switch when recording an analog source through the analog (LINE IN) connectors except when long-play mode (32 kHz) is selected.

High-precision pulse A/D converter
The DAT deck uses a pulse A/D converter and decimation filter to convert an analog signal into a quantized 24-bit digital signal. DAT, like CDs, uses 16-bit quantization, and thus the 8-bit difference results in more precise quantization, more signal information and less quantizing noise than16-bit quantization. During conversion of the 24-bit data to a 16-bit DAT recording signal, the SBM function boosts sound quality by reintegrating into the 16-bit signal 4 bits of signal information that would normally be lost.

Applying the principle of human hearing
The SBM function applies the principle of human hearing in the reintegration of signal information. The auditory range of the human ear is generally considered to be 20 Hz to 20 kHz; hearing sensitivity, however, shows greater sensitivity to the range between 3 kHz and 4 kHz, and lower sensitivity to frequencies above and below this range (see Fig. A). This principle applies also to quantizing noise as well. By reducing quantizing noise in this particular range, signals can be recorded to produce more expansive sound than is possible by a uniform reduction of noise over the entire audible range.

A



Noise-shaping filter
The SBM function uses a noise-shaping filter (see Fig B) with a frequency response similar to that of the human ear to reduce quantizing noise within the most sensitive frequency range, and to feed back the quantizing error (that is normally lost) back to the input signal, re-integrating the low-end bit information with the high-end bit information (see Fig. B).

B

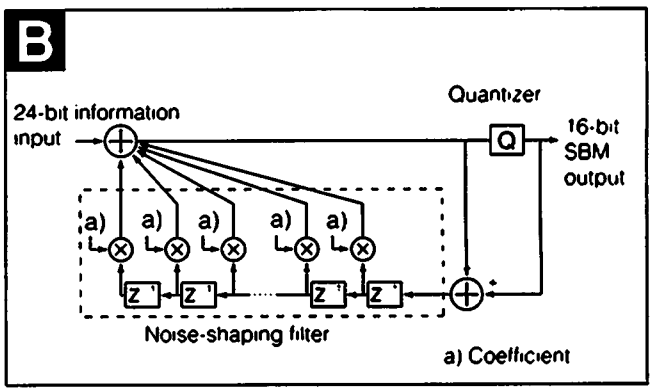
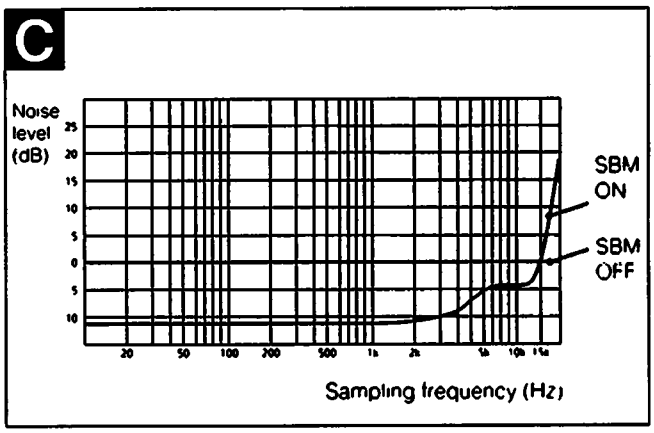


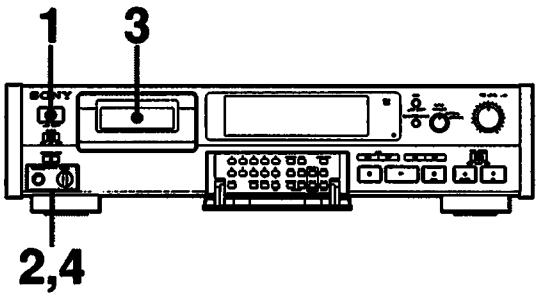
Fig. C shows the improvement in the quantizing noise level when the SBM switch is on. Given a noise level of 0 dB when the SBM switch is off, the improvement in noise level for sampling frequencies lower than 3 kHz exceeds 10 dB when the SBM is activated

C



The SBM function operates only during recording The improved sound produced by the SBM function, however, can be enjoyed during playback, regardless of the SBM switch position or the DAT deck being used

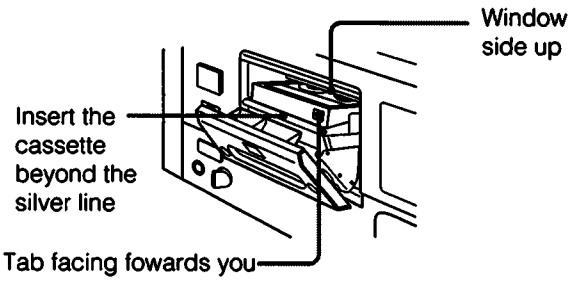
Cassette Loading



1 **Turn on the power.**

2 **Press ⏏ OPEN/CLOSE.**
The OPEN indicator appears on the display.

3 **Insert the cassette.**



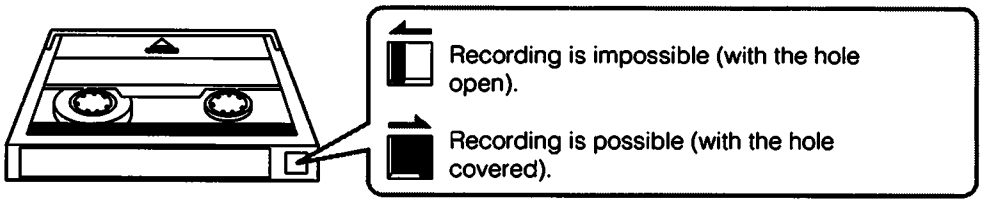
4 **Press ⏏ OPEN/CLOSE.**
The CLOSE indicator appears on the display.

To remove the cassette
Press ⏏ OPEN/CLOSE.

Digital audio tape characteristics
This deck uses only digital audio tape made especially for DAT and which has the following characteristics:
Unlike a conventional analog audio cassette tape, **digital audio tape uses only one side.**

- The digital audio tape case is designed to keep out dust. Do not open the case to expose the tape.
- The hole at the back of the tape is the detector slot. Do not cover this slot.
- Do not use thin-tape cassettes (with a playing time of over 120 minutes) since this may cause the unit to display inaccurate time information, or result in tape damage caused by abnormal operation.

To prevent accidental erasure
When a recording is made, any previously recorded signal will be erased automatically. To prevent accidental erasure, set the safety tab to the position shown in the illustration. With the hole open, rewriting sub codes cannot be performed.



Notes

- When you turn on the power, the ▮▮ indicator flashes for a moment in the display window. During this period, no buttons other than the ⏏ OPEN/CLOSE and ► buttons are operative. Wait until blinking stops and the ▮▮ indicator goes off.
- When inserting the cassette, do not push the cassette compartment closed. Be sure to use the ⏏ OPEN/CLOSE button.

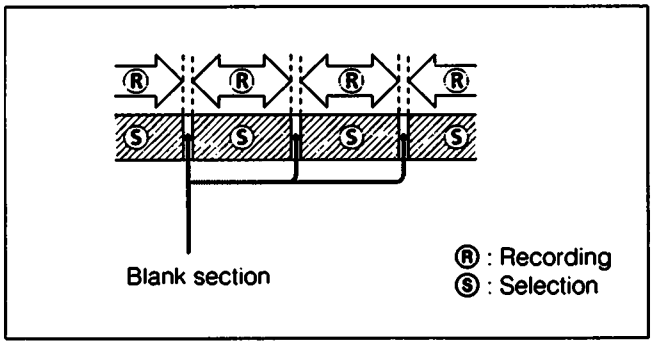
On the sampling frequency
When a cassette is inserted and a source program is played back, the sampling frequency (48 kHz, 44.1 kHz or 32 kHz) of the source program appears in the display window.

Before Recording

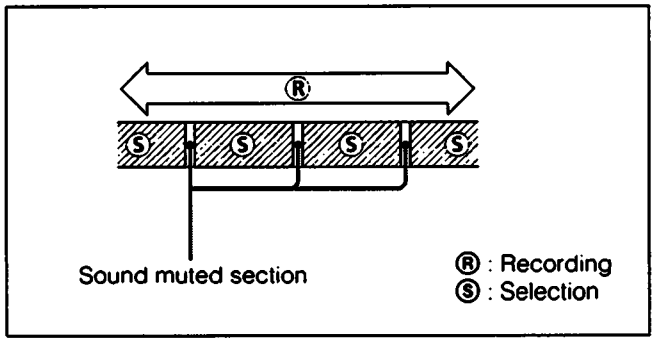
Blank Section and Sound Muted Portion

With conventional analog audio tapes, the tape portion on which no recording ever has been made and the portion on which a recording has been made but the sound is muted are treated the same, since no sound can be heard from these portions.
However, with DAT cassette, you should know that the two kinds of "no sound" portions must definitely be distinguished one from the other.

Blank section
Means the portion on which no recording ever has been applied.



Sound muted portion
Means the portion on which a recording has been applied but that no audible sound is recorded.



Important
When recording, be certain that no blank section is left on the tape. If blank sections remain on the tape, search operations using the AMS buttons, for example, may take quite a long time or the absolute time is not written correctly.

Difference between the blank section and sound-muted portion
When you record, a track format is constructed on the recorded area, even if the sound is muted during recording. On the blank section, since no recording is applied, there is no track format.

Absolute Time Codes

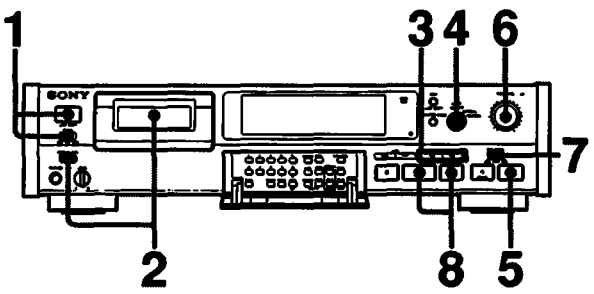
The absolute time indicates the position of the tape, giving the time elapsed from the beginning. The absolute time codes correctly written on the tape can be used in various convenient ways during playback.

Recording absolute time codes
When you record, the absolute time codes are also written automatically from the beginning of the tape
Once the absolute time codes are recorded, it cannot be re-written. With the absolute time, you can check the elapsed time from the beginning of the tape or designate the position of the tape to be played back precisely
Note, however, that the absolute time codes are not written if you start recording from the middle of blank section No blank sections should be left on the tape when recording

Tips for recording:
- To insert silence between selections, use the record muting function (page 24). Do not advance the tape with the ▶▶ or ▶ button.
- To start recording from the middle of the tape, use the end search function (page 24) to locate the beginning of the blank section. This will avoid leaving a blank section

If absolute time codes cannot be written
If the continuity of the time codes is broken by a blank section, absolute time codes will not be recorded during later recording operations.
In this case, start recording from the beginning of the tape, or from the end of the previously recorded material (located with the end search function described on page 24)

Recording



1 **Make sure that the TIMER switch is set to the OFF position, and turn on the power.**

2 **Insert a cassette and press the ≙ OPEN/CLOSE button to load the cassette. (See page 19.)**

3 **Locate the position at which you want to start recording.**

- To start recording from the beginning of the tape, press the ◀◀ button. (Pressing the ◀◀ button again at the beginning of the tape will cause the "TOC" indicator to appear.)

Note on recording from the beginning of the tape
Create a 4-second sound-muted section at the beginning of the tape with the record muting function. (See page 24.) If you do not, the beginning part of the first selection may be skipped during later playbeck.

- To start from the middle of the tape, locate the point immediately before the blank section with the end search function. (See page 24.)

4 **Set the INPUT selector to ANALOG, OPTICAL or COAXIAL depending upon your sound source.**

5 **Press the ● REC button.**
REC, ► and ❚❚ indicators light on the display, and the deck enters the record-pause mode. The sampling frequency to be applied for recording appears.
If the digital copy prohibit signal is written on the codes of the sound source, the COPY PROHIBIT indicator appears in the display window and signifies that you cannot record that source with the digital-to-digital connection. In this case, use the analog-to-analog connection.

6 **When recording the analog input signal, adjust the recording level and balance with the REC LEVEL controls respectively. (See page 23.)**
No recording level adjustment is required when recording the digital input signal.

7 **Set the REC MODE selector.**
When recording in standard mode, set REC MODE to STANDARD 48 kHz or STANDARD 44.1 kHz.
When recording in long-play mode, set REC MODE to LONG.

8 **Press the ❚❚ PAUSE or ► (play) button.**
The ❚❚ indicator goes off, and recording starts.

To write start ID automatically during recording
Make sure that the AUTO indicator is lit.
If not, press the START ID AUTO button. (See page 28.)

To designate the program number
Press the desired numeric button. (See page 30.)
When recording from the beginning of the tape, the program number will be assigned automatically from 1.

To insert sound muted portion at the beginning of the tape
Do not advance the tape with the ▶▶ or ► button. This will leave a blank section at the beginning. Be sure to proceed with the record muting function. (See page 24.)

To stop recording
Press the ■ button.
To stop recording for a moment
Press the ❚❚ PAUSE button.
When you press the FADER or ○ REC MUTE button, the deck will also enter the record-pause mode.
To release pause and restart recording
Press the ❚❚ PAUSE or ► button.
To remove the cassette
Press the ≙ OPEN/CLOSE button.

If recording cannot be made
Check the following:

- The safety tab of the cassette is not set to the record-possible position. (See page 19.)
- No cassette is loaded.
- The INPUT selector is set to the incorrect position.
- Tape is fully rewound to the end.
- The output level of the playback equipment is too low.
- The digital copy prohibit signal is written in the codes of the sound source you want to record. (The COPY PROHIBIT indicator appears in the display window.)
- The REC LEVEL controls are set to the 0 position. (Only when recording the analog input signal.)

Recording

Note on the INPUT selector and the REC MODE selector
Do not change the position of these selectors after recording starts. If you do, the wrong "PGM TIME" information may appear in the display window.

Note on the SBM switche
To obtain uniform characteristics in the recorded sound, do not change the setting of the SBM switch after recording starts.

If the cassette is ejected after it has been loaded
Check to see if the cassette is inserted correctly. (See page 19.)

When the tape is recorded to the end (Auto rewind function)
The tape is rewound to the beginning and stops automatically.
The auto rewind function is not applied when the TIMER switch is set to the REC position.

Accuracy of the electronic linear time counter
The linear time counter provided with this unit is not a clock. The time indicated by the counter may differ slightly from the actual recording/playback time.

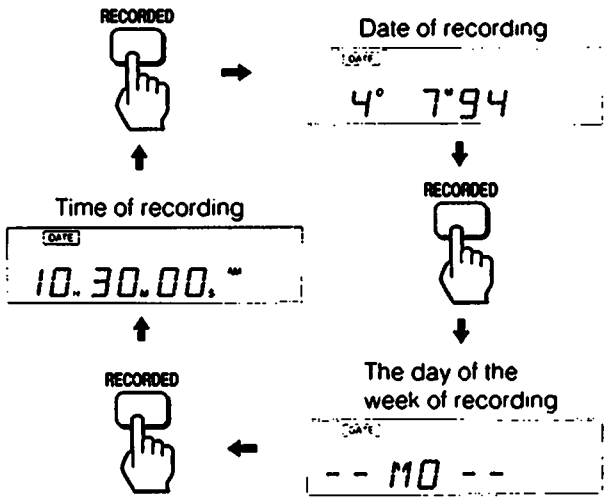
To Store the Recording Date and Time

Once the built-in clock is set, the day, the day of the week and time of recording will automatically be recorded on the tape along with the audio signal. When playing the tape back later, you can display this information to check when the tape was recorded.
To check the day, the day of the week and time being recorded, press the PRESENT button to display the current date and time.

Note
If you use another DAT deck to record subcodes (using the renumbering function, etc.) on a tape initially recorded on this unit, the recording date and time data may be erased from those sections of the tape.

To Check the Recording Date and Time

During playback you can check the recording day, the day of the week and time which was recorded on the tape at the same time the audio signal was recorded (No display will appear if the recording date and time are not recorded on the tape.)
To display the recorded date and time, press the RECORDED button. Each press of the button changes the display according to the following sequence.



To check the current date and time
Press the PRESENT button. The day, the day of the week and time are displayed in the same way as with the RECORDED button.

Recording level adjustment (for analog input signals only)

The peak level meters have a peak hold function which indicates the peak level of the analog input signal momentarily. The MARGIN indicator shows how much margin there is between the peak level of the input audio signal and 0 dB. Whenever a signal having a higher level than the displayed one is input, the new level replaces the lower one on the MARGIN indicator.

Turn the REC LEVEL controls so that the "OVER" segments do not light, even at the highest level.

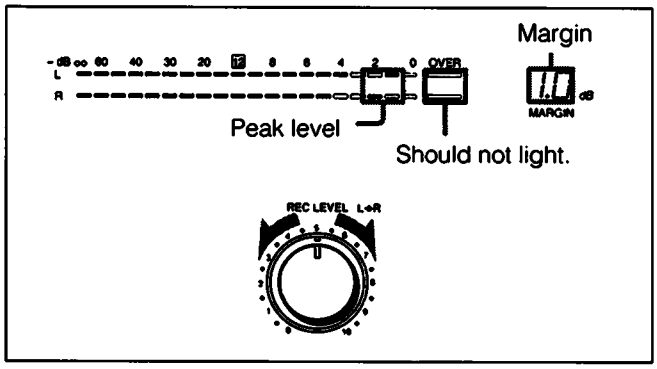
To reset the margin

Press MARGIN RESET. The margin will become "- -".

If the level exceeds 0 dB

The "OVER" segments light in red, and "0.0 dB" flashes.

If "OVER" lights steadily, lower the recording level so that the peak level meter lights between –12 dB (12) and 0 dB to avoid sound distortion.



If you keep adjusting the recording level with the unit in the record-pause mode

If the unit is left in the record-pause mode for more than 10 minutes, the record-pause mode will be released automatically, and the unit will enter the stop mode.

The levels of the input audio signals appear even in the stop mode, and you can continue to adjust the recording level. (The "AD-DA" indicator appears on the display.)

In the above case, press the ● REC button again to set the unit to record-pause mode.

If the unit is left in the record-pause mode for more than 10 minutes during digital recording

The record-pause mode will be released automatically, and the unit will enter the stop mode. (The "-DA" indicator appears on the display.) In this case, press the ● REC to set the unit to record-pause mode.

If the cable is disconnected or the program source is intermitted, the digital input signal will be interrupted during digital recording

The OPTICAL or COAXIAL indicator flashes and the unit will enter record-pause mode (for about 10 minutes). If the digital signal is input again in this period, the unit will enter recording mode automatically.

Recording Mode

The following table show the recording mode for various input signals and REC MODE selector settings.

Input signal	REC MODE selector position	Recording mode
Analog input signal	STANDARD (48 kHz)	Standard play (48 kHz)
	STANDARD (44.1 kHz)	Standard play (44.1 kHz)
	LONG	Long play (32 kHz)
Digital input signal (32 kHz)	STANDARD (48 kHz)	Standard play (32 kHz)
	STANDARD (44.1 kHz)	
	LONG	Long play (32 kHz)
Digital input signal (44.1 kHz)	STANDARD (48 kHz)	Standard play (44.1 kHz)
	STANDARD (44.1 kHz)	
	LONG	
Digital input signal (48 kHz)	STANDARD (48 kHz)	Standard play (48 kHz)
	STANDARD (44.1 kHz)	
	LONG	

( ): sampling frequency

Note

Digital input signals with a sampling frequency of 44.1 kHz or 48 kHz are recorded only in standard mode and at their original sampling frequencies, regardless of the REC MODE selector setting.

The longest recording period at each mode

Mode / Cassette	The longest recording period	
	standard	long
DT-120	2 h	4 h
DT-90	1 h 30m	3 h
DT-60	1 h	2 h

(h: hour, m: minute)

The timer counter in the long-play mode

Tape running time, absolute time and total remaining of the tape appears, based on those in the standard mode. To obtain the actual time, double each value.