

Operating Instructions

Panasonic **VHS**
Professional/Industrial Video

**PRO
LINE**

AG-**1970P**



Hi-Fi
Video Cassette Recorder

Before attempting to connect, operate or adjust this product, please read these instructions completely.

Dear Customer

We would like to thank you for purchasing this Panasonic Video Cassette Recorder.

We would particularly advise that you carefully study the Operating Instructions before attempting to operate the unit and that you note the listed precautions.

FCC NOTE: This device complies with Part 15 of the FCC Rules. To assure continued compliance follow the attached installation instructions and do not make any unauthorized modifications.

FCC's limits are designed to provide reasonable protection against harmful interference when operated in a residential environment.

If this device does cause interference to radio or television reception, which can be determined by turning the device off and on, use this device in another location and/or utilize an electrical outlet different from that used by the receiver. If necessary, consult the dealer or an experienced radio/TV technician for help.



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WARNING:
TO REDUCE THE RISK OF FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS EQUIPMENT TO RAIN OR MOISTURE.

CAUTION:

- TO REDUCE THE RISK OF FIRE OR SHOCK HAZARD AND ANNOYING INTERFERENCE, USE THE RECOMMENDED ACCESSORIES ONLY.



This symbol warns the user that uninsulated voltage within the unit may have sufficient magnitude to cause electric shock. Therefore, it is dangerous to make any kind of contact with any inside part of this unit.



This symbol alerts the user that important literature concerning the operation and maintenance of this unit has been included. Therefore, it should be read carefully in order to avoid any problems.

Note to CATV system installer:

This reminder is provided to call the CATV system installer's attention to Article 820-40 of the NEC that provides guidelines for proper grounding and, in particular, specifies that the cable ground shall be connected to the grounding system of the building; as close to the point of cable entry as possible.

ACCESSORIES

- 1 pc. Infrared Remote Controller
- 1 pc. Coaxial Cable
- 1 pc. Stereo Type Phone Cable
- 1 pc. AC Power Cord
- 1 pc. S-Video Cable
- 2 pcs. "AA" size Batteries

Precautions

Please read these precautions before you operate this VCR.

Cassette Compartment Door

When first unpacking the VCR, the cassette compartment door may be open partially. This is due to a safety device designed to protect the VCR from vibration during shipment; it is not a malfunction. After the AC Power Cord is connected to an AC outlet, the door returns to its original position.

Avoid Sudden Temperature Changes

If the VCR is suddenly moved from a cold to a warm place, moisture may form on the tape and inside the VCR. In such a case the Dew Indicator "D" will flash on and off and the VCR will not operate.

Humidity and Dust

Avoid places with high humidity or a lot of dust. These can damage internal parts.

Avoid Covering Ventilation Holes

The ventilation holes prevent abnormal increased temperature in the VCR. Do not block or cover these holes. Especially avoid covering the holes with soft materials such as cloth or paper.

Keep away from High Temperature

Keep the VCR away from extreme direct heat such as direct sunlight, radiators, or in closed automobiles.

Keep Magnets away

Never bring a magnet or magnetized object near the VCR because it will adversely affect the performance of the VCR.

No Fingers or Other Objects Inside

Touching internal parts of the VCR is dangerous, and may cause serious VCR damage. Do not attempt to disassemble the VCR. There are no user-serviceable parts inside.

Keep Away from Water

Keep the VCR away from flower vases, tubs, sinks, etc. CAUTION: If liquids are spilled into the VCR, serious damage may occur. If you spill any liquid into the VCR, immediately disconnect the AC Power Cord and consult qualified service personnel.

Lightning

To avoid damage by lightning, disconnect the antenna plug from the VCR.

Keep VCR Clean

Wipe the VCR with a clean, dry cloth. Never use cleaning fluid, or other chemicals. Do not use compressed air to remove dust.

Stacking

Place the VCR in a horizontal position and do not place anything heavy on it.

Video Head Clogging

The video heads place picture signals on the tape during recording, and read picture signals from the tape during playback. Therefore they are of critical importance for the picture quality. To ensure that they can always provide optimum picture quality, this VCR is equipped with an Auto Head Cleaning Function that removes tape particles and dust from the video heads. However, if the VCR is used over extremely long periods of time, these heads may still become dirty and clogged. In such a case, the signals can no longer be recorded correctly, and the playback picture will be distorted accordingly. This is the case, for example, if during playback sound is reproduced normally, but no picture is seen, or the picture is greatly distorted. When such symptoms occur consult your dealer for further advice.

If Dew Condensation Forms in the VCR

Condensation may form in the VCR if:

- The VCR is in a room where the heater has just been turned on.
- The VCR is in a room with steam or high humidity.
- The VCR is brought from cold surroundings into a well-heated room.
- The VCR is suddenly brought from cool surroundings, such as an air-conditioned room or car, to a hot and humid place.

When dew forms in the VCR:

The Dew Indicator "D" on the VCR Display will flash on and off all the function buttons are made non-operational to protect the tape and the video heads. When the Dew Indicator flashes, wait until this indicator disappears.

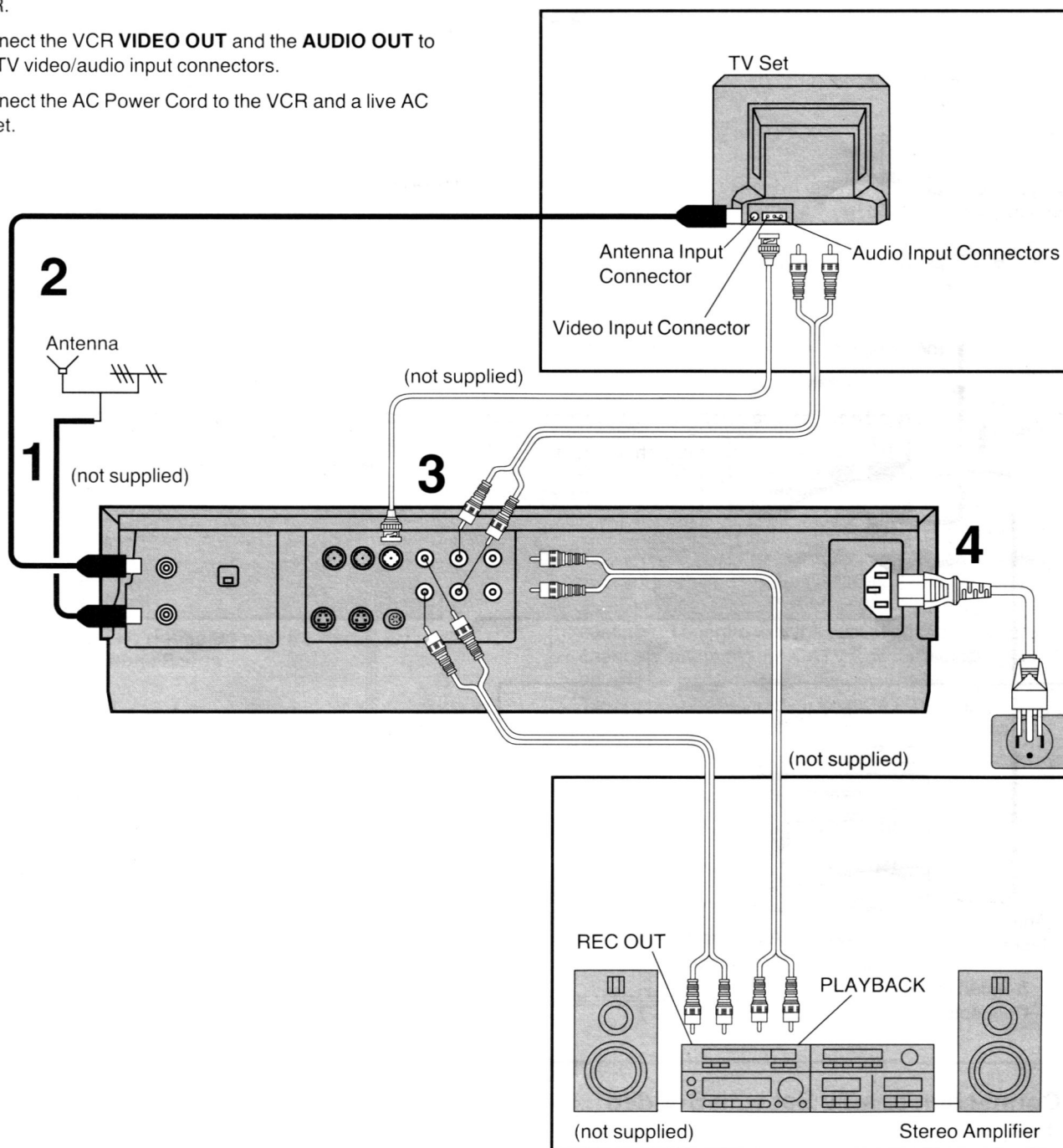
- If dew condensation forms inside the VCR while the power is off, it will turn on automatically and the Dew Indicator will flash on and off. As soon as the dew condensation has been dissolved, the VCR will turn itself off again.

The following connections are required to operate the VCR for recording and playback through a TV set.

Procedure of connection to TV without S-Video Input

- 1 Unplug VHF/UHF antenna plug from the TV antenna input connector and plug it into the VCR **VHF/UHF IN**.
- 2 Connect the VCR **VHF/UHF OUT** to the TV antenna input connector with the Coaxial Cable supplied with the VCR.
- 3 Connect the VCR **VIDEO OUT** and the **AUDIO OUT** to the TV video/audio input connectors.
- 4 Connect the AC Power Cord to the VCR and a live AC outlet.

• Connection to a TV Set without an S-Video Input



• Connection to a Stereo Amplifier

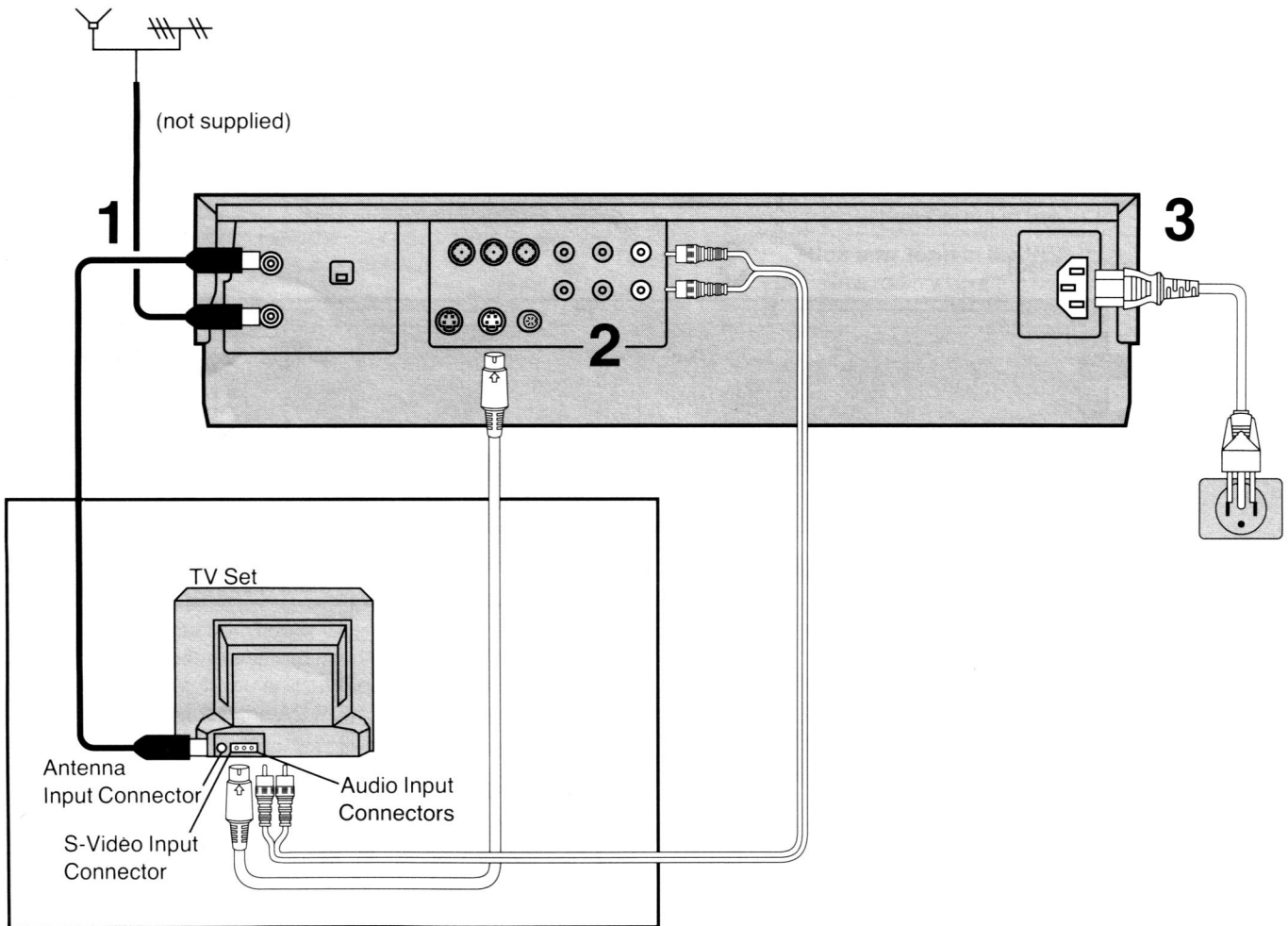
Procedure of connection to TV having S-Video Input

- 1 Execute steps 1 and 2 on page 5.
- 2 Connect the VCR **S-VIDEO OUT** and the **AUDIO OUT** to the TV S-Video and audio input connectors.
- 3 Connect the AC Power Cord to VCR and live AC outlet.

The S-VHS format used in this VCR enables you to obtain high resolution and high picture quality when high performance S-VHS video cassette tapes are used.

The conventional VCR video connectors output and input signals which are composed of the luminance signal (Y) and color signal (C) which are then recorded on the video tape. The new S (Separate)-Video Connector allows separate transmission of signals in order to obtain clearer pictures.

The connection with the S-Video Cable can also be used for playback of a tape that was recorded in the conventional VHS system. The "S" in the "S-Video Connector" stands for "SEPARATED Y/C", not for "S-VHS".



• Connection to a TV Set with S-Video Jack

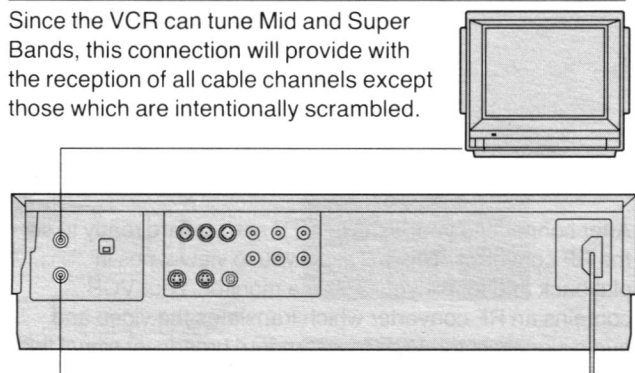
Cable Connection

Cable-VCR-TV (For CATV/PAY Channels Recording/Playback)

The VCR has an extended range, and can tune the Low-Band, Mid-Band, Super-Band, Hyper-Band, Ultra-Band and Special cable channels. (Channels A-W, AA-FFF, A-5-A-1, 66-94, 5A). Also, the VCR can tune to any of the 56 UHF channels (14-69). Refer to **Storing TV Channels on your VCR** on page 10.

BASIC Hook-Up

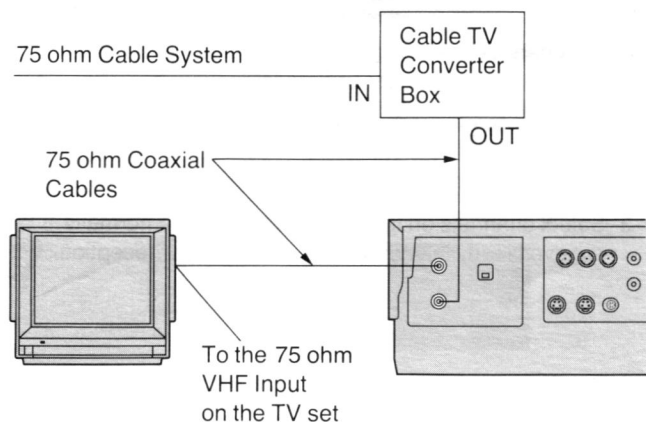
Since the VCR can tune Mid and Super Bands, this connection will provide with the reception of all cable channels except those which are intentionally scrambled.



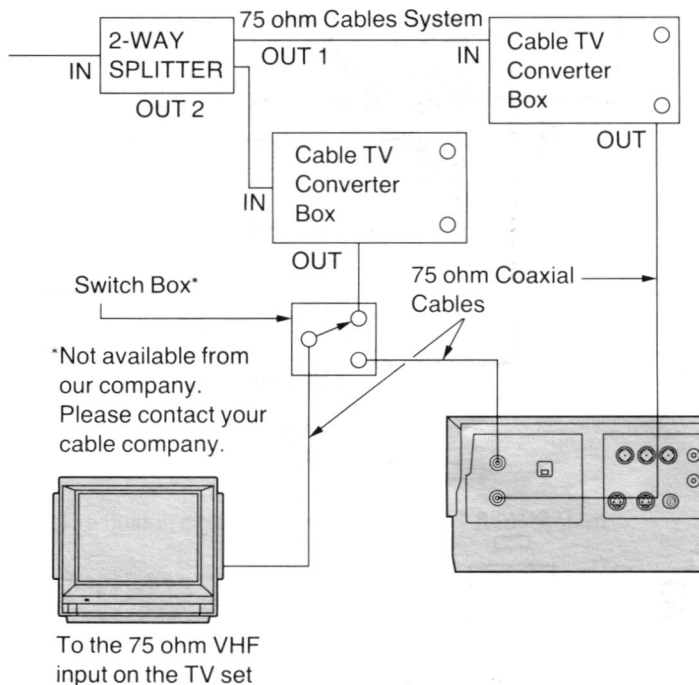
75 ohm coaxial cable
Channels 2-13 and 5A, A-5-A-1, A-W, AA-FFF, 66-94

However, if you subscribe to a special channel which is scrambled—you will probably have a descrambler box for proper reception. The VCR by itself cannot properly receive a scrambled program since it does not contain a descrambler. In order for the VCR to properly receive a scrambled program, your existing descrambler must be used. There are two commonly used methods of connection in this case.

Typical Cable System Hook Ups with Cable Converter/Descrambler Boxes



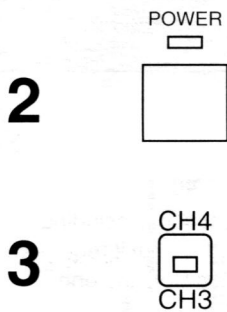
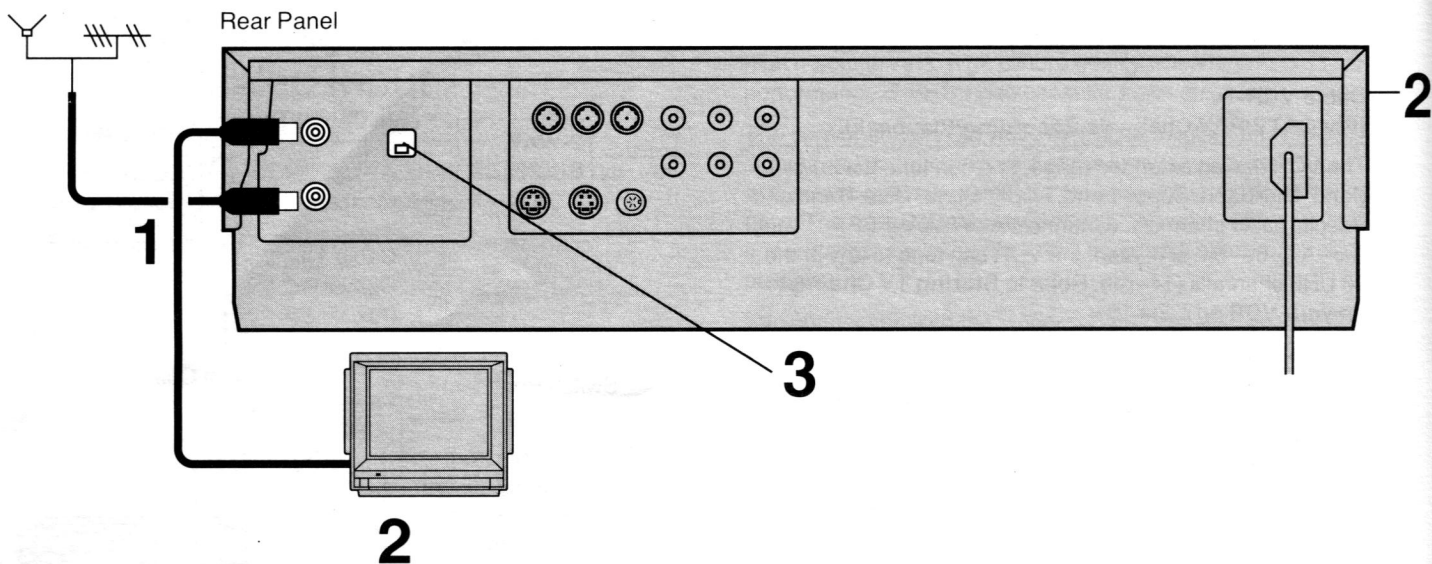
The above cable hook-up allows VCR-TV functions except for viewing one channel while recording another.



The above cable hook-up allows VCR functions, including viewing one channel while recording another, but it requires two cable TV Converter Boxes, one Switch Box and one 2-Way Splitter.

Since the VCR has an extended range of tuning, tuning-programming of non-scrambled Mid-Band and Super-Band TV programs is possible. When a cable converter or descrambler box is connected to the VCR, all timer-controlled recording functions will continue to operate with the exception of changing channels automatically. CATV Channel selection will have to be performed with the cable converter. Timer-controlled recording from CATV Channels is therefore limited to one channel at any given time.

Tuning the TV into your VCR



After connecting your VCR to a TV set, you are ready to set the RF converter. This will allow you to view tapes in playback and to use your TV as a monitor. Your VCR contains an RF converter which translates the video and audio signals in the VCR to a standard broadcast signal that your TV can receive.

The RF converter can transmit this signal on channel 3 or 4. To prevent any interference it is advisable that you select the channel that is not normally broadcast in your area.

Tuning procedure

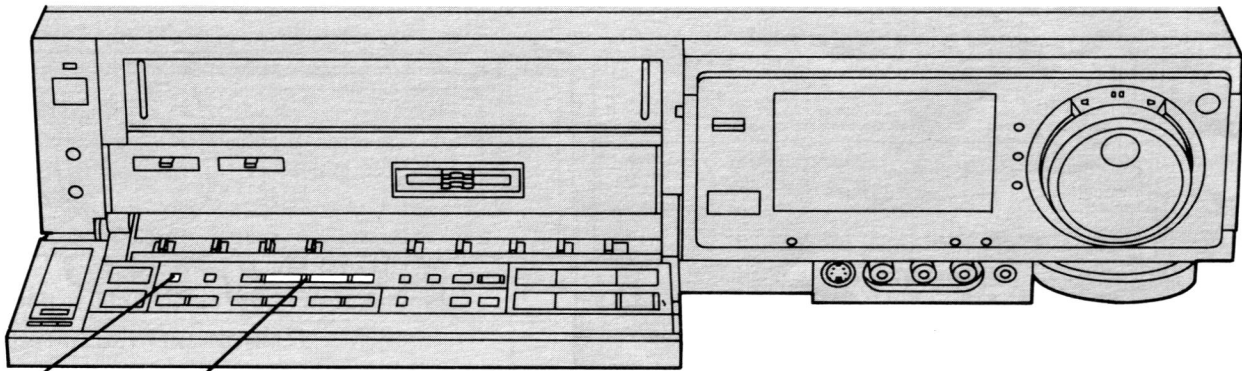
- 1 Refer to pages 5 and 6 confirm that the VCR and TV have been connected correctly.
- 2 Turn on the VCR and TV.
- 3 Set RF Converter Channel Selector (on the rear panel) to "CH3" or "CH4"; whichever is not normally broadcast or the least viewed. This is to select a channel for video playback.

Channel Reception Check






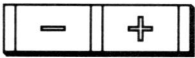
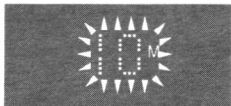


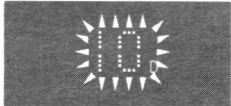

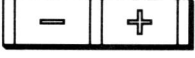
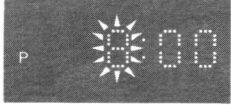




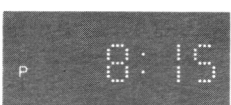
- 1 Set channel 3 or 4 on your TV (selected in step 3) in order to check a proper broadcast reception.
- 2 Press **VCR/TV** (on the front panel) to "VCR" to select the "VCR" operation mode.
 - The "VCR" indicator appears on the VCR Display.
- 3 Select channels on the VCR that you would normally receive clearly in your area to check proper reception.

Setting the Clock of the VCR

Tuning the TV into your VCR
Setting the Clock of the VCR



1, 7 2~6

1	 CLOCK		
2	 TRACKING/ V-LOCK		
3	 TRACKING/ V-LOCK		
4	 TRACKING/ V-LOCK		
5	 TRACKING/ V-LOCK		
6	 TRACKING/ V-LOCK		
7	 CLOCK		

The built-in digital clock employs the 12-hour system.

Preparation

Turn the VCR on.

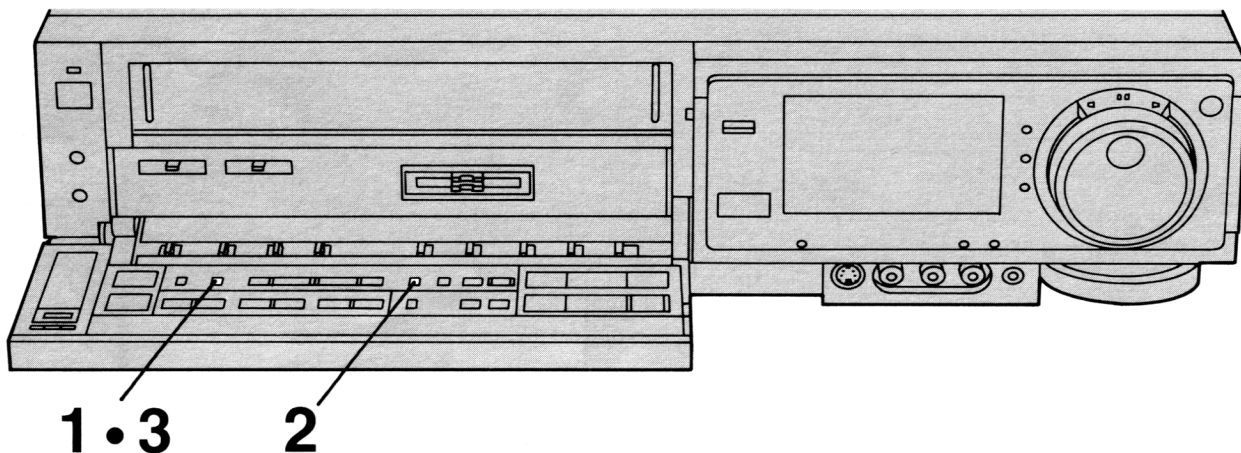
Setting procedure

- 1 Press **CLOCK** to start Clock Setting.
- 2 Press **TRACKING/V-LOCK** "+" or "-" to set the YEAR, then press **NEXT**.
- 3 Press **TRACKING/V-LOCK** "+" or "-" to set the MONTH, then press **NEXT**.
- 4 Press **TRACKING/V-LOCK** "+" or "-" to set the DAY, then press **NEXT**.
- 5 Press **TRACKING/V-LOCK** "+" or "-" to set the HOUR, then press **NEXT**.
- 6 Press **TRACKING/V-LOCK** "+" or "-" to set the MINUTE.
- 7 Press **CLOCK** to finish the setting.

Note:

In case of a power failure, the back-up system retains the present time memory for about 60 minutes.

Storing TV Channels on your VCR



1

PRESET/FINE/
NORMAL

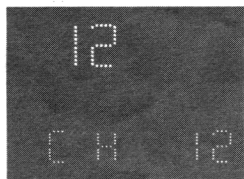


2

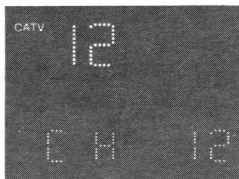
ANT
SELECT



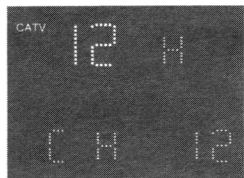
TV mode



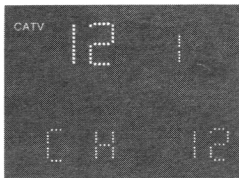
CATV NORMAL mode



CATV HRC mode



CATV IRC mode



3

PRESET/FINE/
NORMAL



Introduction

The VCR is fitted with its own tuner (just like a normal TV set) and can be preset to receive up to 155 TV broadcast stations.

Preparations

- Turn the TV on.
- Select Channel 3 or 4 on the TV for video playback.
- Set the **VCR/TV** to "VCR".

Direct Tuning

Your VCR is preset at factory. This means that all channels can be received at the program positions shown in the chart on the next page. This is achieved by selecting the desired Tuning mode.

- Blanking unwanted channels so that they will be skipped during the channel selection will allow you to find your desired channel quickly. Refer to the next page how to blank program positions.

Selecting the Tuning Mode

This VCR can select from among 4 tuning modes: TV, CATV, CATV H, CATV I.

- 1 Press **PRESET/FINE/NORMAL**.
- 2 The tuning mode can be changed by pressing **ANT SELECT**.
- 3 Press **PRESET/FINE/NORMAL** twice to select the VCR normal operation mode.

Fine Tuning Procedure

- 1 Press **PRESET/FINE/NORMAL** twice.
- 2 Press **TRACKING/V-LOCK** "+" or "-" to correct tuning.
 - "A" indicator does not appear.
 - To return the tuning to its former state, press **ANT SELECT**.
- 3 Press **PRESET/FINE/NORMAL**.

Blanking of unoccupied program positions

- 1 Press **PRESET/FINE/NORMAL**.
- 2 Press ∇ or \wedge (channel button) to select the program position that is not to be occupied with a TV station.
- 3 Press **ADD/DELETE**. ("—" appears on the Program Position Display.)
 - Repeat steps 2 and 3 for all program positions which are not occupied by a TV station. Afterwards, these program positions can no longer be called up.
 - To cancel the blanked program position, select the corresponding program position on VCR and then press **ADD/DELETE**.
- 4 Press **PRESET/FINE/NORMAL** twice.

CHANNEL CHART

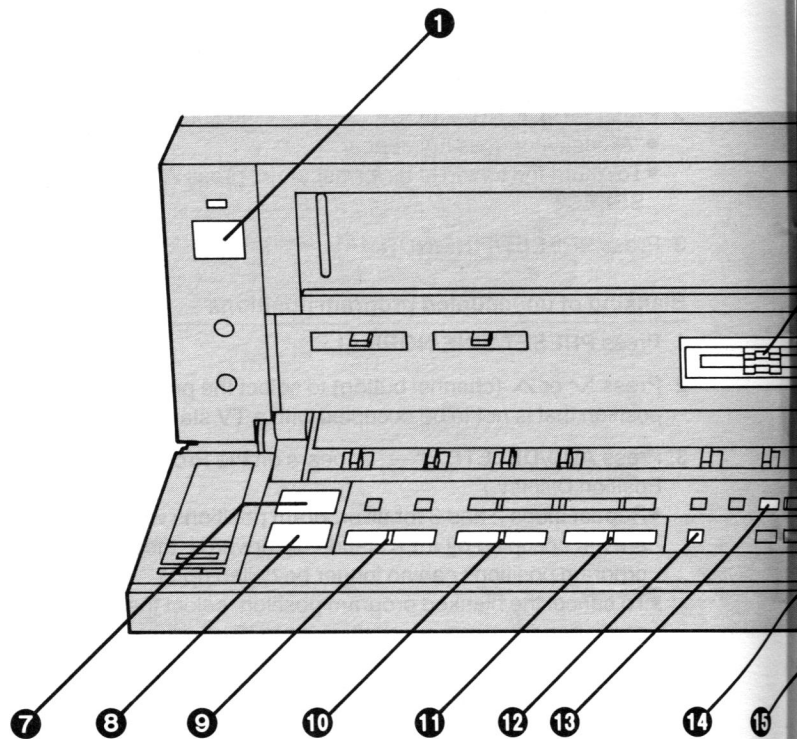
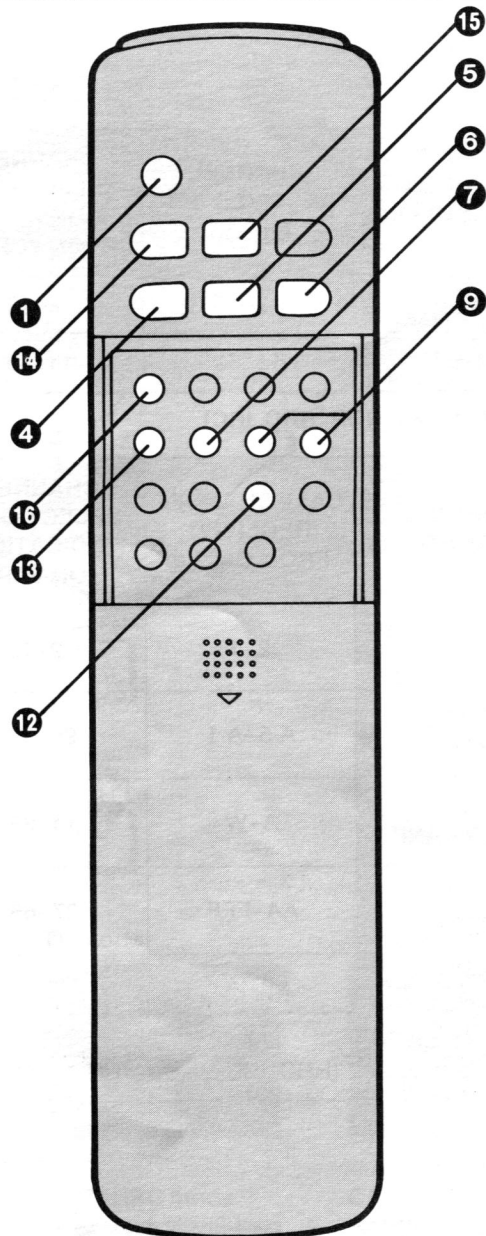
• **TV mode**

CHANNEL DESIGNATIONS	CHANNEL RECEIVED OFF THE AIR	CHANNEL SELECTION & INDICATION ON VCR
VHF	2-13	2-13
UHF	14-69	14-69

• **CATV modes (NOR, HRC, IRC)**

CHANNEL DESIGNATIONS	CATV CHANNEL RECEIVED FROM CABLE	CHANNEL SELECTION & INDICATION ON VCR
BROADCAST VHF	2-13	2-13
CATV LOW BAND	A-5-A-1	95-99
CATV MID/SUPER BANDS	A-W	14-36
CATV HYPER BAND	AA-FFF	37-65
ULTRA BAND	66-94	66-94
SPECIAL CATV CHANNEL	5A (HRC, IRC only)	1 (HRC, IRC only)

Controls, Indicators and Connectors

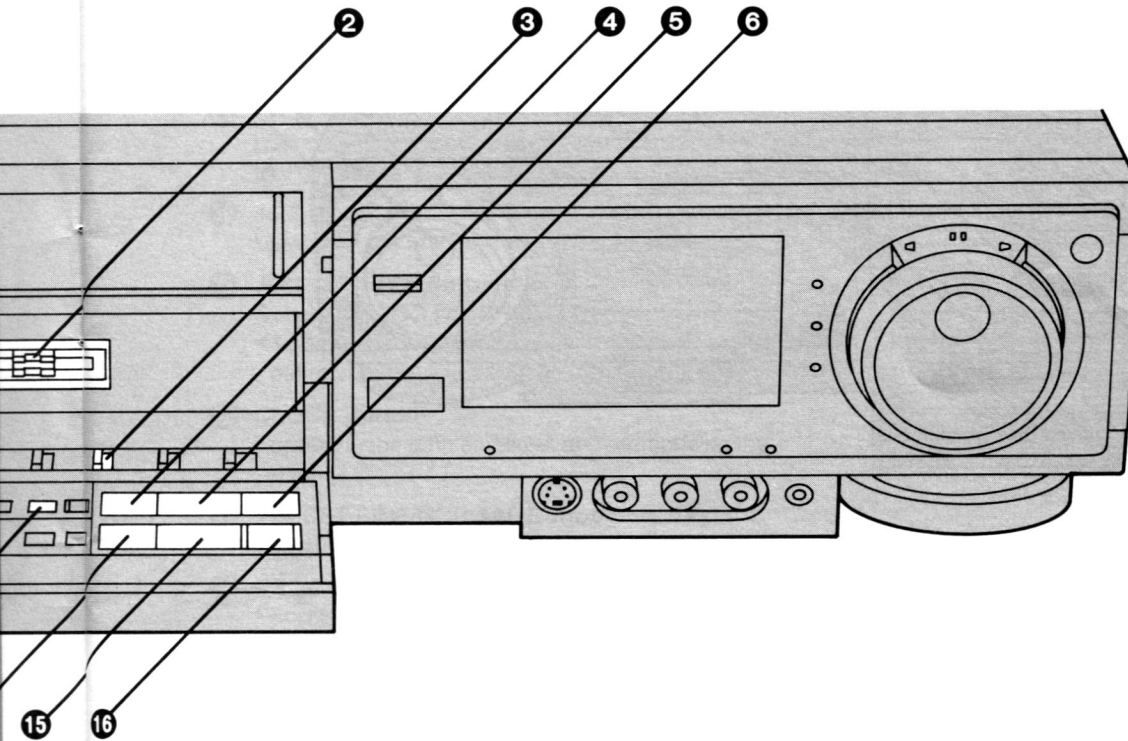


Basic Controls

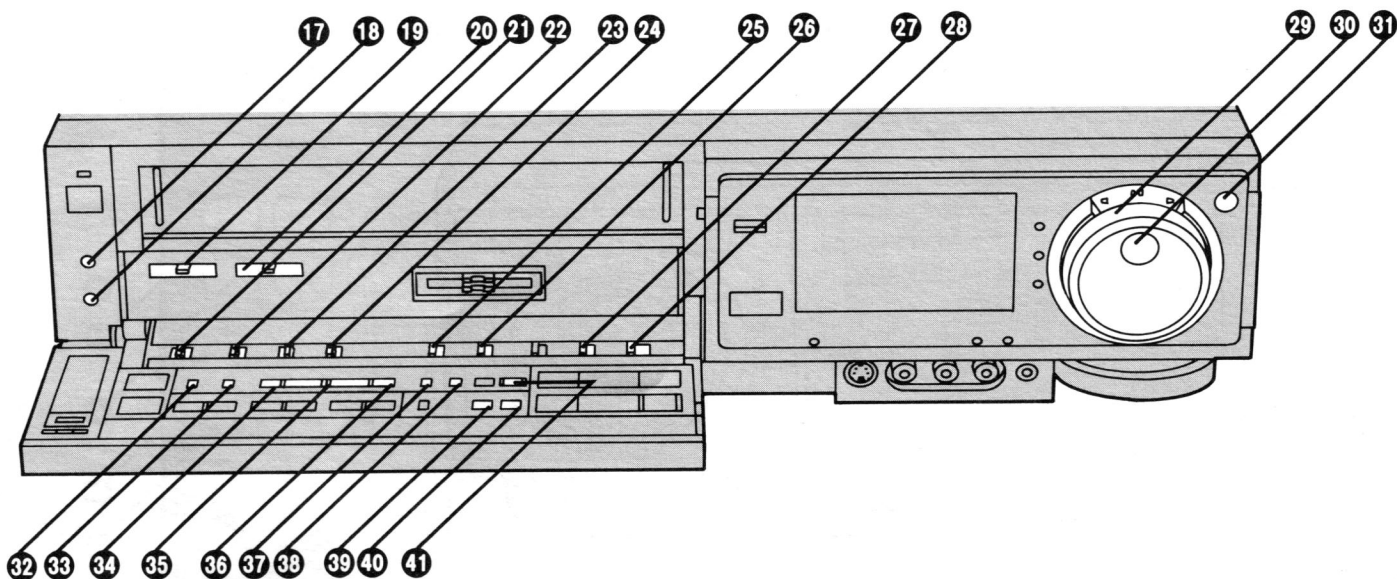
- 1 POWER Button with Indicator**
Turns the VCR on and off.
 - **Auto power on**
Inserting a video cassette automatically turns the VCR on.
- 2 Hi-Fi REC LEVEL Control**
Adjusts the Hi-Fi recording level so that the peak reaches about +4 dB on the Audio Level Meter.
- 3 S-VHS Selector**
Selects the correct tape recording mode.
 - ON: S-VHS cassettes are recorded in the S-VHS System.
 - The S-VHS indicator is lit.
 - OFF: S-VHS cassettes are recorded in the VHS system.
 - The S-VHS indicator is not lit.

- VHS cassettes are recorded automatically in the VHS system irrespective of the switch position.
- For playback, it is not necessary to operate this switch.
- S-VHS recording cannot be played back on a conventional VHS VCR.

- 4 REW Button**
Used to rewind the tape rapidly. “<<” appears on the VCR Display.
When this button is held pressed during Normal playback or Rewind operation, the picture is played back at higher speed in reverse direction. (Review Playback)
If you tap this button during Normal Playback, Review Playback remains activated. Press PLAY to resume Normal Playback.
- 5 PLAY Button**
Starts normal playback. “▶” is lit on the VCR Display.
- 6 FF Button**
Used to advance the tape rapidly. “▶▶” appears on the VCR Display.
When this button is held pressed during Normal playback or Fast Forward operation, the picture is played back at higher speed in forward direction. (Cue Playback)
If you tap this button during Normal Playback, Cue Playback remains activated. Press PLAY to resume Normal Playback.



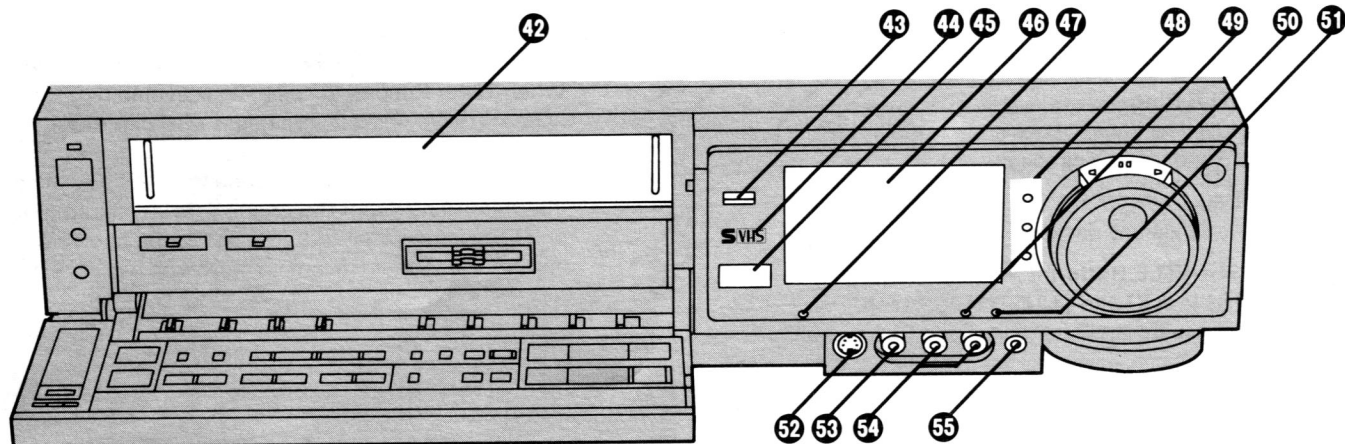
- 7 VCR/TV Button**
Selects "VCR" or "TV" operation mode.
- 8 EJECT Button**
Eject the cassette.
 - If this button is pressed to eject a cassette loaded in the VCR when the power is turned off, the VCR is turned on for automatic ejection and, afterwards, turned off.
- 9 Channel ∇ and \wedge Buttons**
Selects the program positions (channels), the VCR can memorize TV stations in 99 program positions.
- 10 OTR ON + and - Buttons**
Used to set the OTR (One-touch Timer Recording) starting time.
- 11 OTR OFF + and - Buttons**
Used to set the OTR ending time.
- 12 AUDIO OUT Button**
Selects the audio track. Each time you press this button, the audio track changes as follows:
Hi-Fi stereo (L and R) \rightarrow Hi-Fi mono left (L) \rightarrow Hi-Fi mono right (R) \rightarrow Normal (Hi-Fi off) \rightarrow Hi-Fi Stereo...
- 13 RECORDING SP/SLP Button**
Selects the recording tape speed.
"SP" for normal tape speed gives the best picture quality.
"SLP" for one-third tape speed gives the longest (3 times) normal recording time.
 - The VCR selects the correct tape speed during playback.
- 14 PAUSE/STILL Button**
Used to interrupt recording temporarily (Recording Pause).
Pressing this button again resumes recording.
Used to view a still picture during playback "□□" appears on the VCR Display. Pressing this button again resumes playback.
 - The VCR automatically switches to the Stop mode to protect the tape and the video heads if Recording Pause or Still Playback continues for more than 5 minutes.
- 15 STOP Button**
Stops Recording or Playback.
- 16 REC Button**
Starts Recording. ("▷ REC" appears on the VCR Display.)



Additional Controls

- 17 MIC Jack**
For connecting a microphone. If a microphone is connected, other audio inputs are automatically switched off.
- 18 PHONES Jack**
For connecting stereo headphones.
- 19 PHONES LEVEL Control**
Adjusts the volume of connected stereo headphones.
- 20 PICTURE Control**
Adjusts the picture sharpness during playback.
- 21 NOISE FILTER/EDIT Selector**
OFF: For normal VCR operation.
EDIT: For dubbing. (PICTURE Control is not operative.)
NOISE FILTER ON:
For playback of tapes whose picture quality is inferior, for example, from repeated dubbing.
• This position has no effect on the playback of S-VHS recordings.
- 22 TBC Switch (Time Base Corrector)**
When playing back a tape which is loose or damaged, or when the tape movement is unstable during recording or playback, the playback picture may shake from side to side and be distorted. You can improve the picture quality by setting TBC Switch to "ON". Normally, this switch must be set to "OFF".
• During playback of some pre-recorded tapes, the playback picture may shake vertically. If this occurs, set TBC Switch to "OFF".
• The TBC function works only during normal playback.
- 23 SEARCH SOUND Selector**
OFF: The sound is played back only during normal playback.
ON: The sound can also be heard during Cue playback and Review playback.
• No sound may be heard during playback of SLP recordings if VCR and TV have been connected each other with only coaxial cable.
- 24 Hi-Fi/NORMAL MIX Switch**
Audio signal is recorded on both the Hi-Fi and normal audio tracks.
OFF: Normal position for Hi-Fi audio playback.
ON: Both audio tracks are played back simultaneously. (For playback of tapes edited by Insert Editing or Audio Dubbing.)
- 25 INPUT SELECT Switch**
Used to select the corresponding connectors if you wish to perform recording through the external input connectors.
Select the program position "A1" or "A2" on Channel Display with **INPUT SELECT** on the Remote Controller.
S-VIDEO: For recording through the S-VIDEO IN and AUDIO IN.
For playback through the S-VIDEO OUT and AUDIO OUT.
LINE: For recording through the VIDEO IN and AUDIO IN.
- 26 TAPE SELECT Switch**
Set according to the cassette tape length in order to obtain correct indication of the remaining tape time.
-T120: For cassettes T30, T60, T90, T120
T140-T180: For cassettes T140, T160 and T180.
- 27 MONO Switch**
OFF: For normal recording.
ON: For recording normal sound during a stereo or Audio II broadcast. Select this position if the stereo sound is distorted due to poor reception.
- 29, 30, 31**

- 28 MTS Switch**
For selecting the audio track to be recorded.
- 29 SHUTTLE Ring**
Used to adjust the playback speed step by step in both forward and reverse directions.
- 30 JOG Dial**
Used to locate any desired frame precisely.
- 31 JOG/SHUTTLE Button**
Switches to JOG and SHUTTLE operation.
• To resume Normal playback, press **PLAY** or this button again.
- 32 CLOCK Button**
For setting the date and time, and memorizing the setting.
- 33 PRESET/FINE/NORMAL Button**
For storing TV stations on the VCR.
- 34 PROG/CHECK Button**
For selecting the program number (up to 8) for timer recording and checking the timer programming.
- 35 TRACKING/V-LOCK + and – Buttons**
• Used to input data for clock setting and timer programming.
• For manual tracking adjustment:
Used to make a manual tracking adjustment to minimize color and noise bar distortions which cannot be eliminated by the automatic digital tracking control. After the manual adjustment, simultaneously press TRACKING/V-LOCK “+” and “–” Buttons to return to automatic digital tracking control.
If tapes recorded on another VCR are played back, manual tracking adjustment may be required to reproduce optimum Hi-Fi sound and picture quality.
• For slow tracking adjustment:
Used to minimize the noise bar distortions during Still, Still Advance or Slow playback. Put VCR in Slow playback to make this adjustment.
• For vertical locking adjustment:
Used to minimize vertical jitter during Still playback.
- 36 NEXT Button**
Used to memorize input data and to change to the next display segment. Each time you press this button, the flashing indication on Date Display changes in the order YEAR, MONTH, DAY, HOUR, MINUTE.
- 37 ANT SELECT Button**
Used to select the tuning mode.
- 38 ADD/DELETE Button**
Used to blank unoccupied program positions.
- 39 AUDIO DUB Button**
Used to make Audio Dubbing. (The Audio Dubbing Indicator is lit.)
- 40 INSERT Button**
Used for Insert Editing. (The Insert Editing Indicator is lit.)
- 41 TIMER REC Button**
Used to enter VCR Timer Recording; standby mode. When Timer Recording has been activated (“□” appears on the VCR Display), the VCR cannot be operated manually.
Press this button again to operate the VCR. Pressing this button if no Timer Recording data is programmed or no cassette is inserted, “□” flashes on and off to indicate that Timer Recording cannot be performed.



42 Cassette Compartment

43 PUSH-OPEN

Open the control panel.

44 S-VHS Indicator

45 Infrared Remote Control Receiver Window
Receives signals from the Remote Controller.

46 Multi-Function Display

10 OTR Mode Indicator

11 Position Indicator

12 Date Display

13 Write Indicator

14 Remaining Tape Time Indicator

15 Audio Track Indicators

16 Tape Speed Indicator

17 Tape Counter Mode Indicator

18 Clock/Tape Counter Display

47 TBC Indicator

48 Reception Indicators of Stereo, Audio II and Mono
Indicates the sound system of a broadcast.

49 Audio Dubbing Indicator

50 JOG/SHUTTLE Indicator
Lights up if JOG/SHUTTLE Button is pressed.

51 Insert Editing Indicator

52 S-VIDEO IN Connector (AV2)

For connecting the S-video cable of a video camera or another VCR equipped with an S-VIDEO OUT connector.

53 VIDEO IN Connector (AV2)

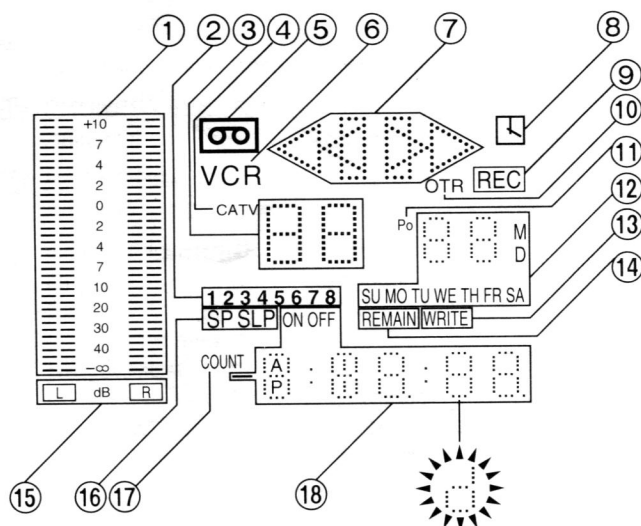
For connecting the video cable of a video camera or another VCR.

54 AUDIO IN Connectors (AV2)

For connecting the audio cable(s) of a video camera, a Hi-Fi stereo system or another VCR.

55 SYNC. EDIT Connector

For connecting to a Movie Camera or another VCR equipped with a Synchro Edit Function.



When dew forms:
Dew Indicator

1 Audio Level Meter

2 Timer Program Number

3 Channel Display

4 Cable TV Indicator

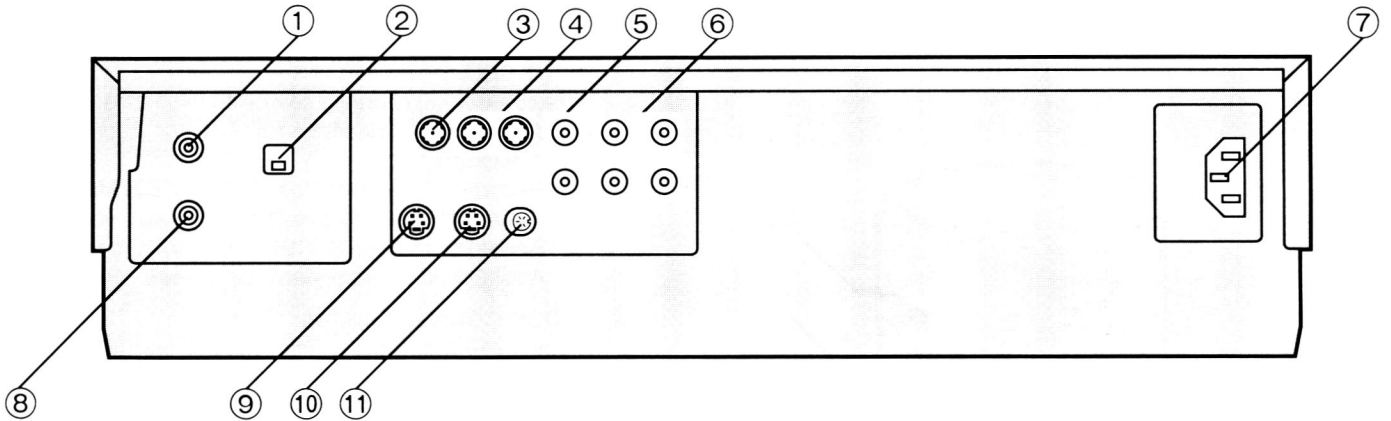
5 Cassette-in Indicator

6 VCR Mode Indicator

7 Tape Running Indicator

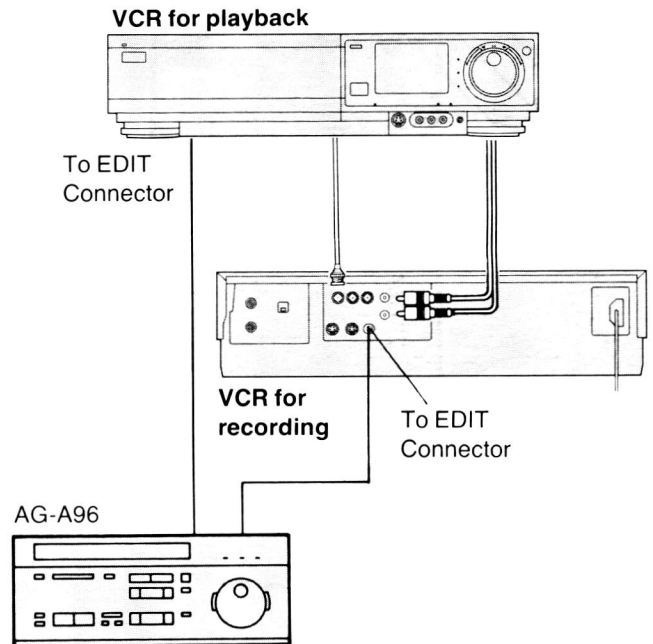
8 Timer Recording Indicator

9 Recording Indicator



- ① **VHF/UHF OUT Connector**
For connecting to a TV antenna connector.
- ② **CH3/CH4 Switch**
Used to select the RF Converter Channel (CH3 or CH4).
- ③ **VIDEO IN Connector (AV1)**
For connecting to another VCR or to a signal source equipped with a video output connector.
- ④ **VIDEO OUT Connector**
For connecting to another VCR or to a TV equipped with a video input connector.
- ⑤ **AUDIO IN Connector (AV1)**
For connecting the audio cables of a stereo audio system.
- ⑥ **AUDIO OUT Connectors**
For connecting the audio cables to a stereo audio system or to a TV equipped with audio input connectors.
- ⑦ **AC IN~**
- ⑧ **VHF/UHF IN Connector**
For connecting an external antenna.
- ⑨ **S-VIDEO IN Connector (AV1)**
For connecting to another VCR or to a signal source equipped with an S-Video output connector.
- ⑩ **S-VIDEO OUT Connector**
For connecting to another VCR or to a TV equipped with an S-Video input connector.
- ⑪ **EDIT Connector**
By connecting the optional Editing Controller AG-A96 to this connector, editing functions can be performed more quickly and efficiently between two VCRs or between a VCR and a camera recorder.

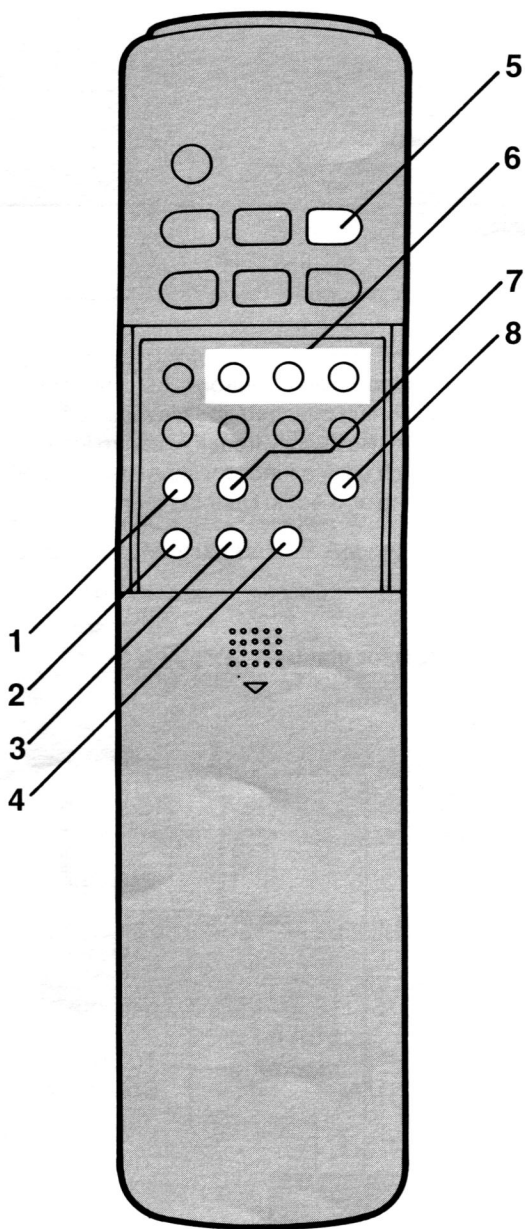
The use of the Editing Controller AG-A96 (optional) gives you control over both the playback and the recording VCRs directly from this controller, to let you perform such editing functions as Assemble Editing, Insert Editing and Audio Dubbing more quickly and efficiently.



Carefully read the operating instructions for the AG-A96.

Caution:
When using the AG-A96, switch the AG-A96 to the standard speed mode. Do this by pressing the EDIT STOP button and PLAYER button simultaneously.

Infrared Remote Controller



1 INPUT SELECT Button

Selects external recording source connected to video/audio input connectors. "A1" or "A2" appears on the VCR Display.

A1: Recording through S-VIDEO IN or VIDEO IN and AUDIO IN Connectors on Rear Panel.

A2: Recording through S-VIDEO IN or VIDEO IN and AUDIO IN Connectors on Front Panel.

2 CLOCK/COUNTER Button

Changes the indication on the VCR Display from CLOCK time to COUNTER (tape running time) and vice versa. If the character-forming segments for seconds are circulating on COUNTER Display, this indicates that there is nothing recorded on the tape being moved.

3 TAPE REMAIN Button

Changes the indication of the VCR Display from tape running time (COUNTER) to remaining tape time, or vice versa. "REMAIN" appears on the VCR Display during remaining tape time display mode.

4 RESET Button

Resets the Tape Counter (tape running time) to "0:00.00".

- The Tape Counter is automatically reset to "0:00.00" when a cassette is inserted.

5 STILL ADV Button

For Still Picture Advance playback. Each time you press this button during Still playback, the still picture is advanced by one field.

6 SLOW Buttons

For Slow Motion playback. Press SLOW Button during normal playback. The slow-motion speed can be varied with "+" or "-" Buttons.

7 MEMORY PLAY Button

If you press this button in Stop mode, the tape winds forward or backward and normal playback starts at the tape counter position "0:00.00".

8 MONITOR Button

Keep this button depressed during playback to watch TV broadcast.

Power source for the Remote Controller

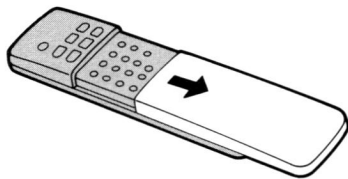
Infrared Remote Controller is powered by 2 ANSI "AA" size batteries. Replace the batteries with new ones about every year. However, battery life depends on the frequency of use or the selected operation mode.

Precautions for battery replacement

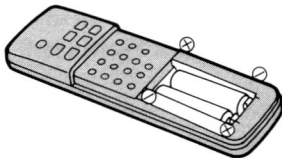
- Load new batteries with their polarities (+ and -) aligned correctly.
- Do not mix new and old batteries and never use an alkaline battery with a manganese battery.
- Do not apply heat to the batteries, or an internal short-circuit may occur.
- Remove batteries and store them in a cool and dry place when Remote Controller is not in use for long periods of time.
- Remove spent batteries immediately and dispose of them.

Loading the batteries

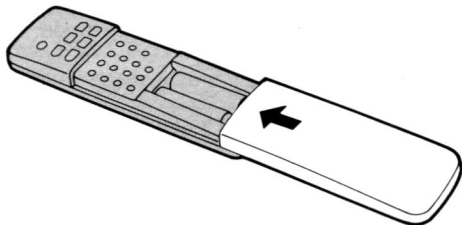
- 1 Remove Battery Compartment Lid.



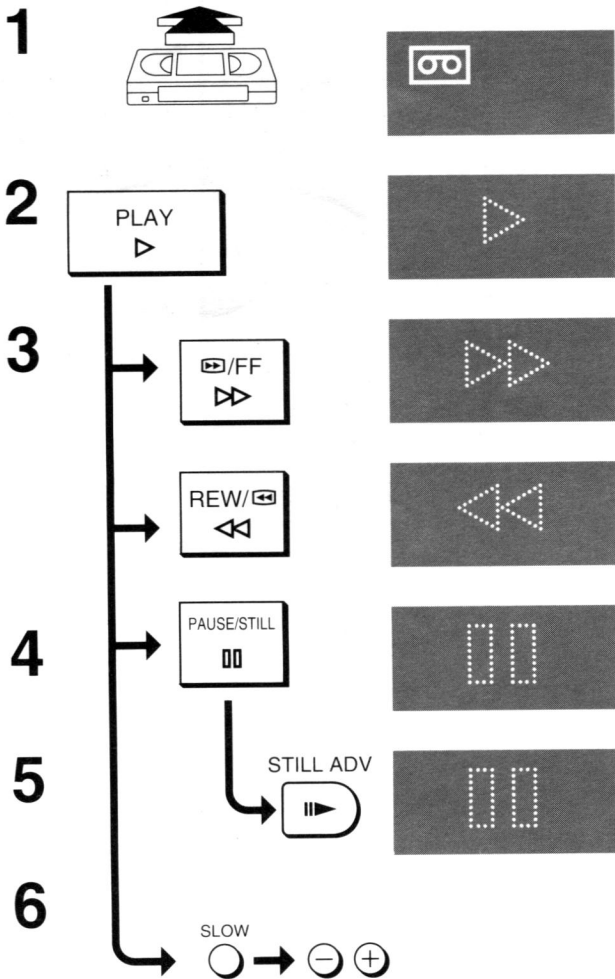
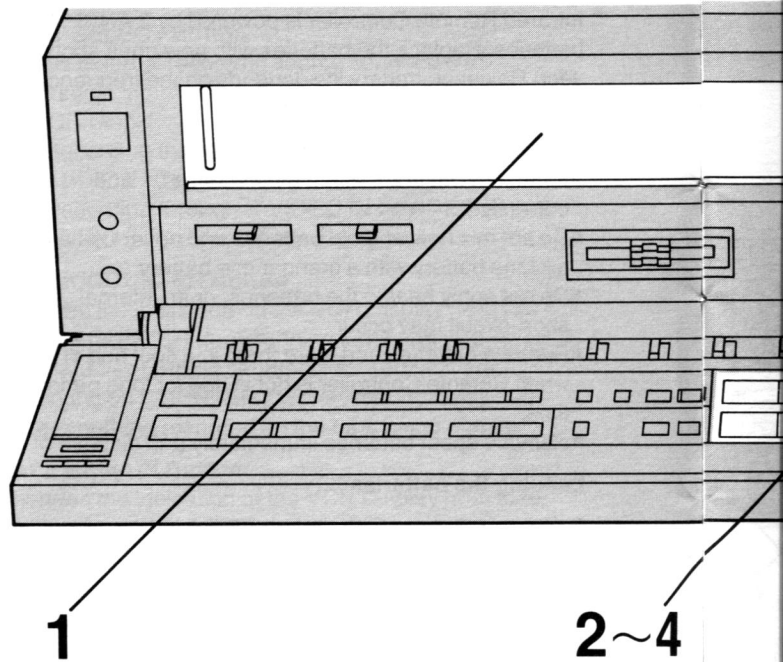
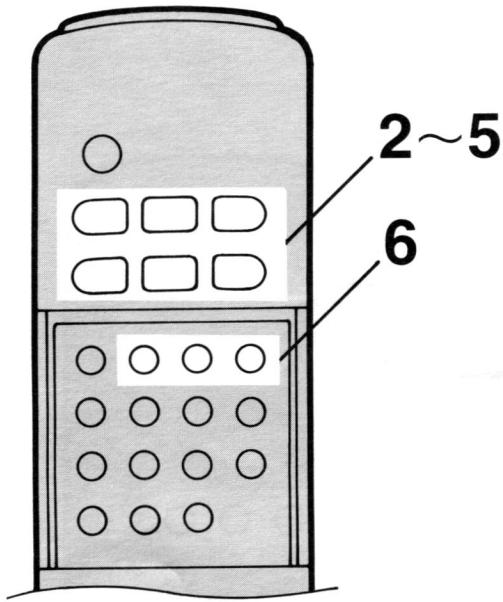
- 2 Insert the batteries, aligning their polarities as indicated inside Battery Compartment.



- 3 Replace the lid.



Playback



Introduction

The following playback can be performed with the Remote Controller or with the appropriate operation buttons on the VCR.

- Normal playback
- Cue/Review playback
- Still playback
- Still Advance playback*
- Slow playback*
- Shuttle operation to change the playback speed in small steps between Still and Cue/Review playback.
- Jog operation to locate the desired picture exactly.

*Operative only with the Remote Controller.

The playback picture appears promptly on the TV from the Stop mode because the VCR head cylinder remains rotating for about 20 minutes even in the Stop mode.

Preparation

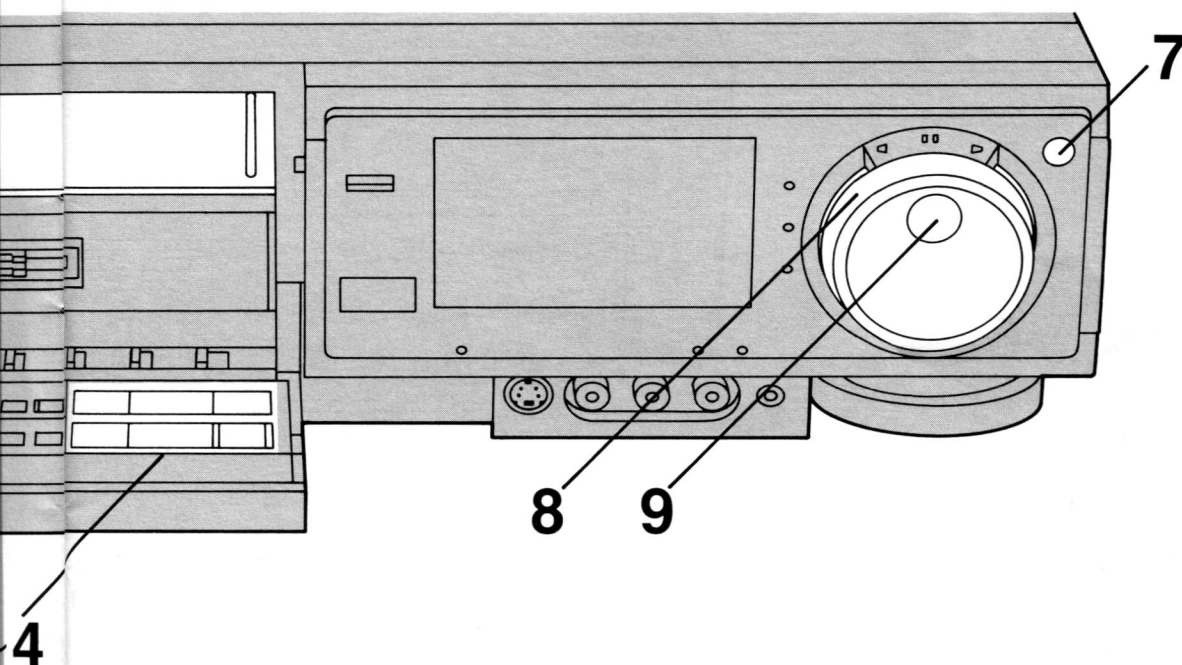
Turn the TV on and select channel 3 or 4 for video playback on the TV.

Playback procedure

- 1 Insert a recorded cassette.
 - If a cassette has been inside the VCR, press **POWER** to turn VCR on.

Normal playback

- 2 Press **PLAY** to start Normal playback.



Cue/Review playback

- 3 Keep **FF** or **REW** pressed to perform Cue or Review playback at a higher speed in forward or backward direction.
- This is convenient to search for a specific scene during Normal playback.
- If you tap **FF** or **REW**, Cue or Review playback remains activated. Press **PLAY** to resume normal playback.

Still playback

- 4 Press **PAUSE/STILL** to view the still picture during Normal playback.
- Press **PLAY** or **PAUSE/STILL** to resume normal playback.

Still Advance playback

- 5 Press **STILL ADV** on Remote Controller during Still playback to advance the still picture by one frame.

Slow playback

- 6 Press **SLOW** on the Remote Controller to view the slow-motion picture. The tape speed of Slow playback can be adjusted with “+” or “-”.
- Press **PLAY** to resume normal playback.

Jog/Shuttle playback

- 7 Press **JOG/SHUTTLE**. Still playback starts.
- 8 Rotate **Shuttle Ring** to select the desired playback speed in forward and backward directions.
- 9 Rotate **Jog Dial** to locate the desired picture precisely.

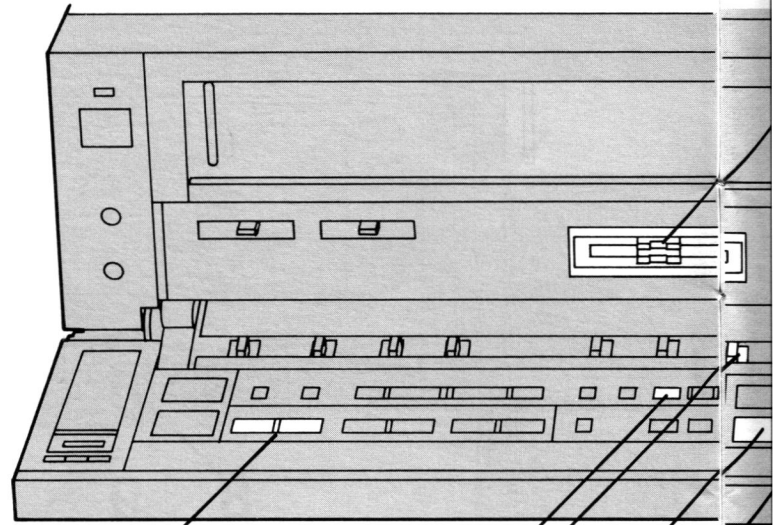
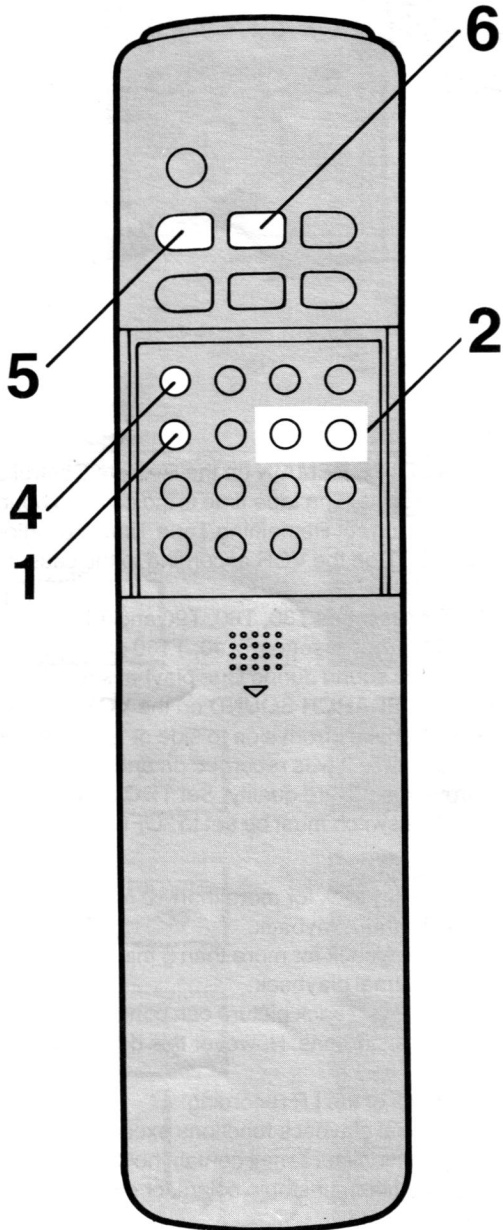
Options







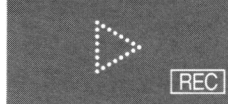



- If you press **TAPE REMAIN** on the Remote Controller, the approximate remaining tape time is indicated in hours and minutes. For correct Remaining Tape Time indication, set **TAPE SELECT** on the VCR according to the cassette type:
 - T120: For cassettes T30, T60, T90 and T120
 - T140–T180: For cassettes T140, T160 and T180
- To listen to the sound during Cue playback and Review playback, set **SEARCH SOUND** on the VCR to “ON”.
- If the picture shakes from side to side or is distorted during playback because it was recorded on another VCR, you can improve the picture quality. Set **TBC** on VCR to “ON”. Normally, this switch must be set to “OFF”.

Notes:

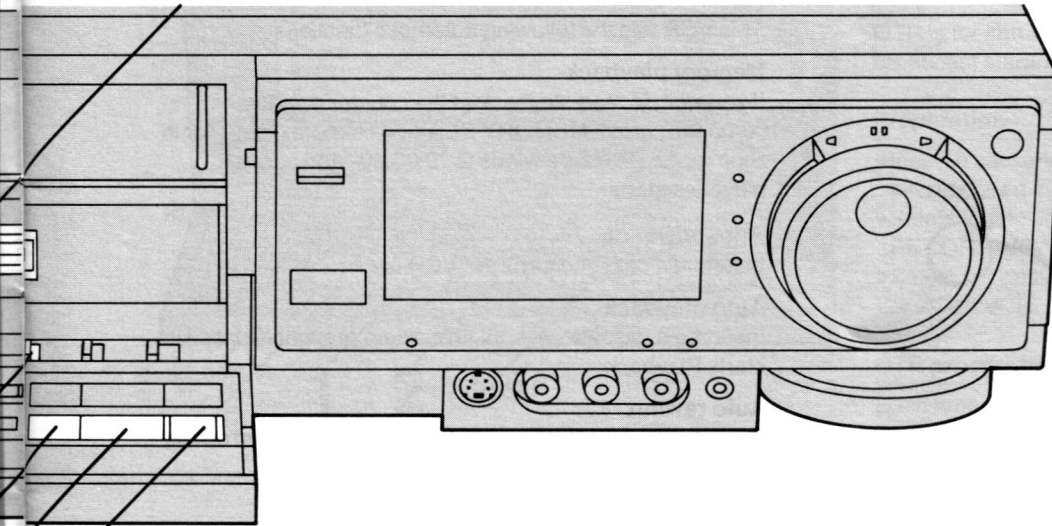
- Cue/Review playback for more than 10 minutes switches the VCR to normal playback.
- Still or Slow playback for more than 5 minutes switches the VCR to normal playback.
- Cue or Review playback picture can contain horizontal noise bars or distortions. However this does not indicate a malfunction.
- In the playback of the LP recording:
 1. In the special playback functions except normal playback, the picture may contain horizontal noise bars, distortions, unstable colors, or can be in black-and-white.
 2. A tape recorded on another VCR may need Tracking Control adjustment; picture may still be inferior owing to format limitations.

On-the-spot Recording



- | | | |
|---|---|---|
| 1 | RECORDING
SP/SLP
 |  |
| 2 |  |  |
| 3 | S-VHS
ON..OFF
 | |
| 4 |  |  |
| 5 | PAUSE/STILL
 |  |
| 6 |  | |

Hi-Fi REC LEVEL



Introduction

You can record a TV broadcast without turning on the TV by using the Infrared Remote Controller or by using the appropriate buttons on the VCR. You can also watch a TV broadcast on the TV while recording another TV broadcast.

Preparations

- Insert a cassette with an erasure prevention tab. (If a cassette has been inside VCR, press **POWER** to turn VCR on.)
- Press **VCR/TV** to display "VCR" on the VCR Display.

Recording procedure

- 1 Select the desired tape speed "SP" or "SLP" with **RECORDING SP/SLP**.
- 2 Select the desired channel to be recorded by pressing \checkmark or \wedge on the VCR.
 - If you wish to confirm proper reception, turn TV on and select channel 3 or 4 (for video playback channel) on TV.
- 3 Set **S-VHS** to "ON" or "OFF".
 - ON: S-VHS tape is recorded in S-VHS format; VHS tape in VHS format.
 - OFF: for VHS format on S-VHS tape
- 4 Press **REC** to start Recording.
 - When a video cassette without an erasure prevention tab is inserted, "00" blinks and an alarm sounds indicating that recording is not possible.
- 5 To interrupt recording temporarily, press **PAUSE/STILL**. Press this button again to continue recording.
 - A recording pause for more than 5 minutes switches the VCR to Stop mode to protect the tape and the video heads.
- 6 Press **STOP** to stop recording.

Watching any other TV broadcast while recording

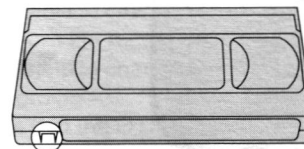
- 1 Set **VCR/TV** to "TV" during recording.
- 2 Select the desired channel on TV.

Hi-Fi Audio Recording Level Adjustment

Normally set **Hi-Fi REC LEVEL** in the middle "5" position (click stop). Recommended peaks in audio level are +4 dB. When using the VCR as a Hi-Fi Audio Recorder or when producing your own tapes, it may be desirable to adjust **Hi-Fi REC LEVEL** to some other position.

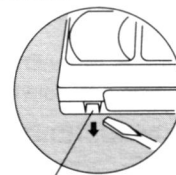
- Sound on normal track is adjusted automatically.

Erasure Prevention Tab

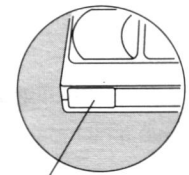


To prevent accidental erasure

To record again

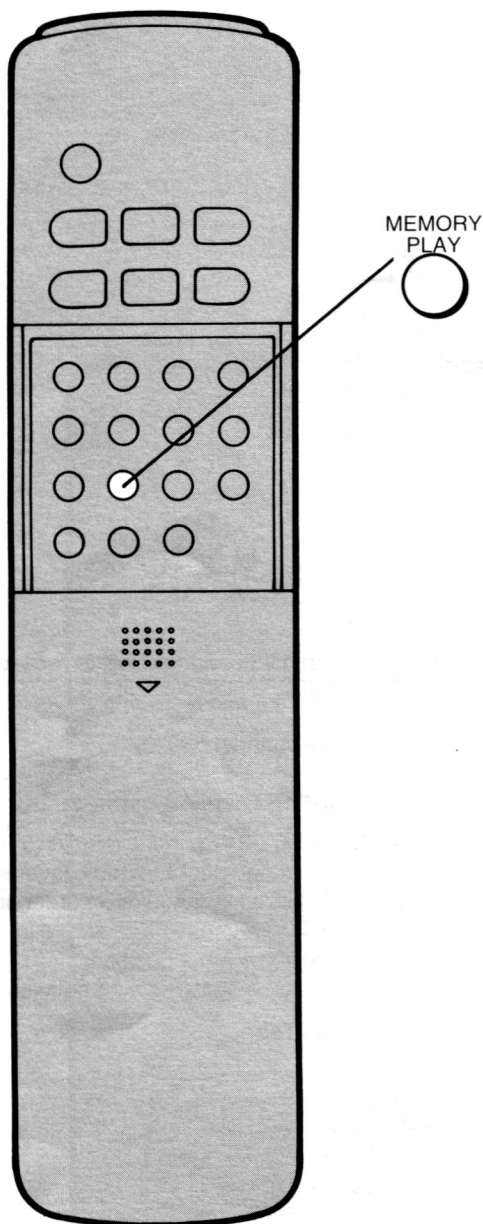


Break off the tab with a screwdriver.



Cover the hole with adhesive tape.

Automatic Features



Introduction

This VCR has the following automatic functions:

Memory playback

If you wish to start playback at the counter position "0:00.00", press **MEMORY PLAY** on Remote Controller in Stop mode. The tape winds to "0:00.00" and normal playback starts.

Auto power on

Inserting a cassette turns the VCR on.

Auto playback

Inserting a cassette without an erasure prevention tab starts Playback.

Auto rewind

Fully rewind the tape when the tape reaches its end during Playback and Recording (except OTR and Timer Recording).

Auto power off eject

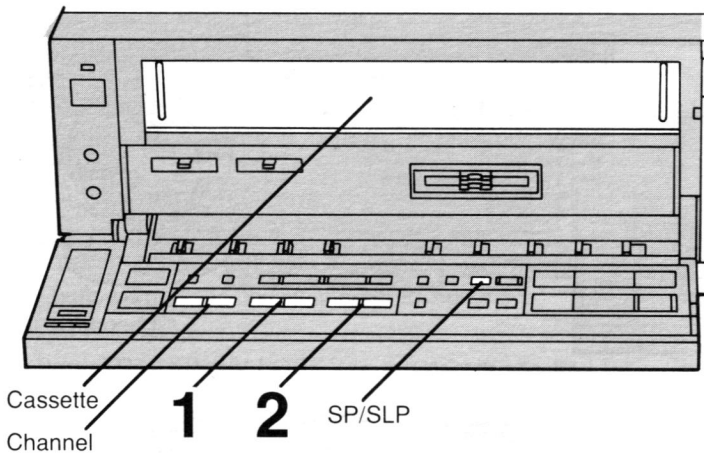
Ejects a cassette when the VCR is OFF by pressing **EJECT** only (the VCR turns OFF after ejecting the cassette).

Auto head cleaning

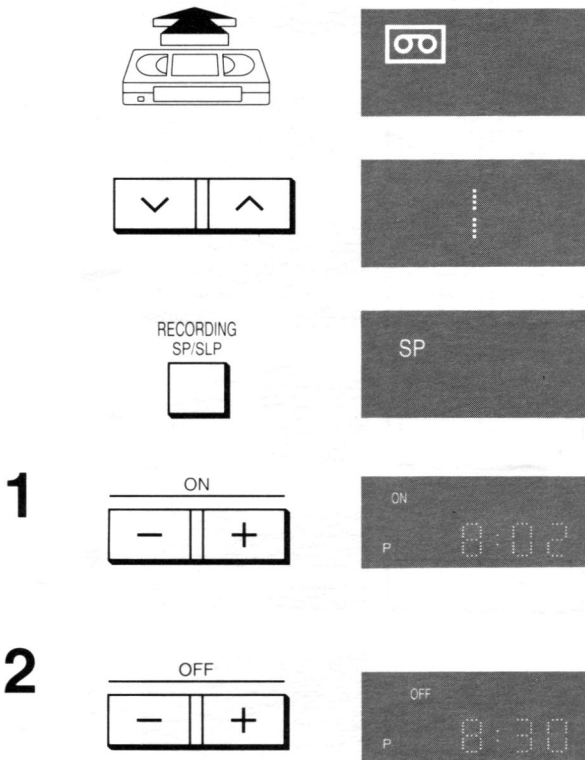
Removes tape particles and dust from the video heads so that the heads always provide optimum picture quality. While this function is working, some mechanical noise can be heard from the VCR; this does not indicate a malfunction.

One-Touch Timer Recording (OTR)

Automatic Features
One-Touch Timer Recording (OTR)



For example:
OTR recording of TV Station 1 from 8:02 pm to 8:30 pm.



Introduction

OTR is for immediately setting the VCR to record a TV broadcast starting within the next 24 hours.

Preparation

- Insert a cassette with an erasure prevention tab. (If it has already been inserted, press **POWER** to turn VCR on.)
- Select the desired tape speed "SP" or "SLP" with **RECORDING SP/SLP**.
- Select the desired channel to be recorded by pressing ∇ or \blacktriangle on VCR.

OTR procedure

Each time you tap **OTR ON** +/- **OTR OFF** +/- Button, the time indication changes in 1-minute increments. Keeping it depressed changes the time indication in 10-minute increments.

- 1 Set OTR starting time by pressing **ON** + or -. **If you want to start OTR recording immediately, disregard this step.**
 - When a cassette without an erasure prevention tab is inserted, "OTR" blinks and an alarm sounds indicating that recording is not possible.
- 2 Set OTR ending time by pressing **OFF** + or -.
 - If the OTR starting time is set, **OFF** + or - Button must be pressed within 8 seconds to select the OTR ending time, otherwise the starting time will be canceled.

After 4 seconds, the display will automatically change back to the starting time indication.

The VCR will automatically switch off, when the OTR is completed. To turn the VCR on, press **POWER**.

Notes:

- To interrupt an OTR, press **POWER**.
- It is possible to change the OTR starting time or ending time before the recording starts.
- It is possible to change the OTR ending time even during the recording.
- Be sure that the OTR function does not overlap with a programmed timer recording. An OTR always takes precedence over an timer recording.

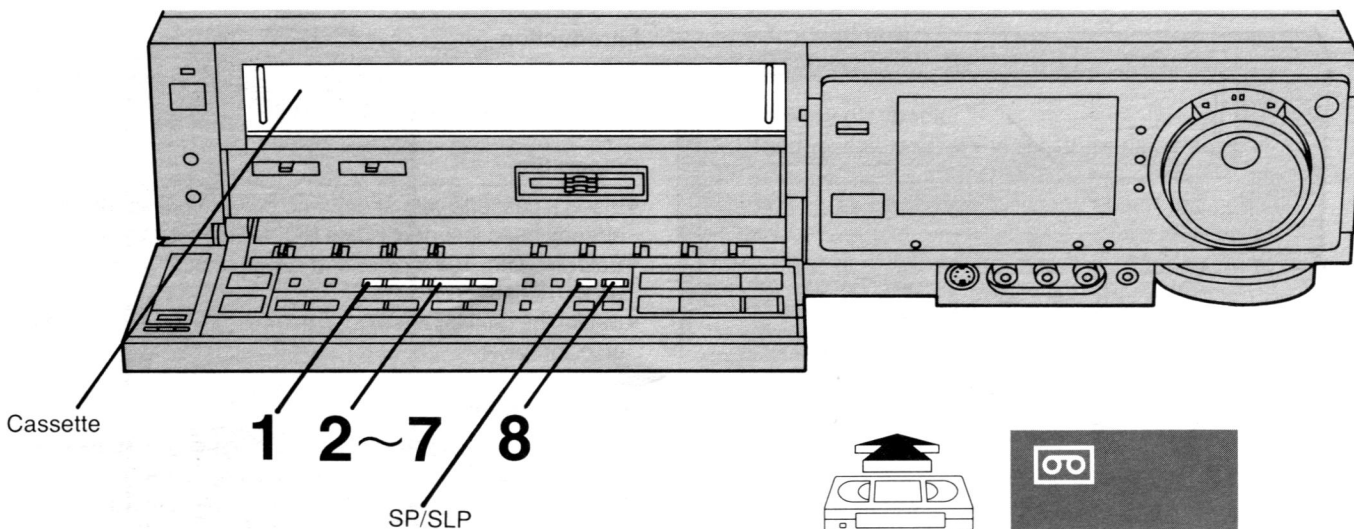
To confirm the OTR ending time before the recording starts

Press **PROG/CHECK** once.

If pressed twice, the present time is displayed again.

Press **PROG/CHECK** to confirm the present time during recording.

Timer Recording



Introduction

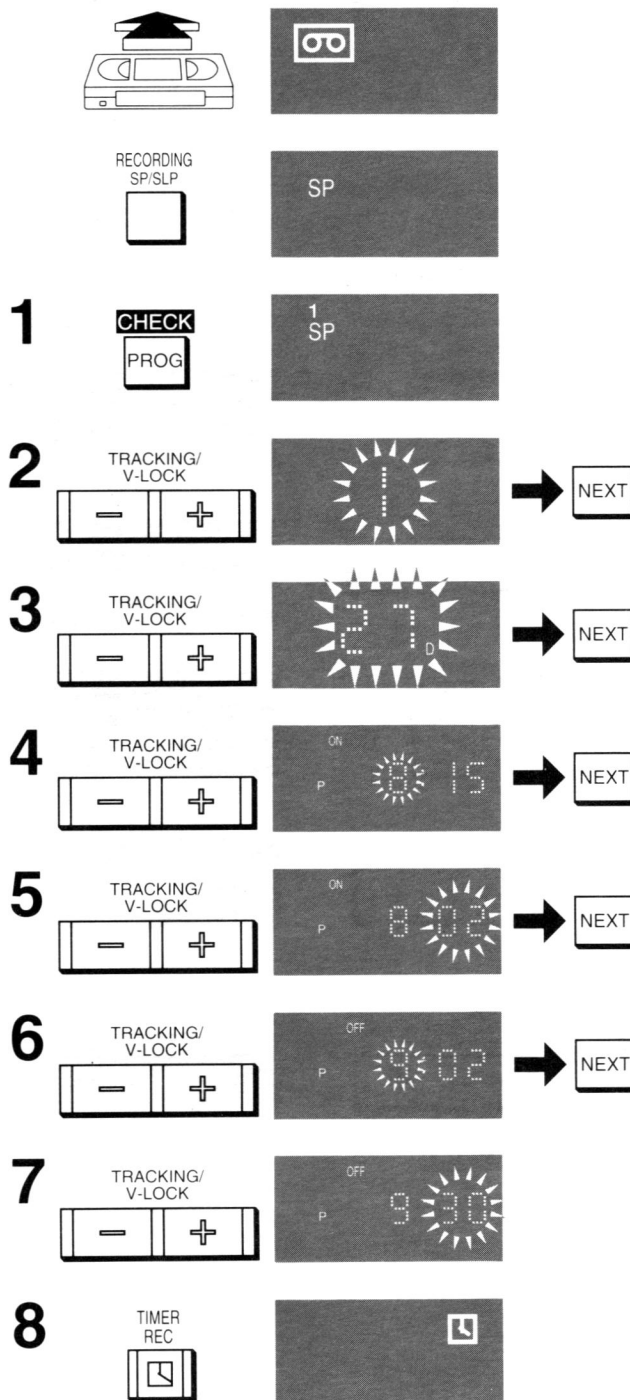
You can program the VCR so that it automatically records up to 8 TV broadcasts with the period of one month. You can also program Timer Recording of daily and weekly broadcasts at the same time.

For daily recording, there are three categories to choose from.

- (1) from Monday to Friday,
- (2) from Monday to Saturday,
- (3) from Sunday to Saturday

For Example:

Timer programming for a TV program to be broadcast on Wednesday, October 27, from 8:02 pm to 9:30 pm, on program position (channel) 1, on timer program number 1. (Present date=October 10, 1999)



Preparations

- Insert a cassette with an erasure prevention tab. (If it has already been inserted, press **POWER** to turn VCR the on.)
- Select the desired tape speed "SP" or "SLP" with **RECORDING SP/SLP**.

Timer Recording procedure

- 1 Press **PROG/CHECK** to start programming.
 - Timer program number "1" appears. (Each time this button is pressed, the timer program number is changed.)
- 2 Press **TRACKING/V-LOCK** +/- to select the desired TV station and then **NEXT** to memorize input data and change to the next display segment.
- 3 Press **TRACKING/V-LOCK** +/- to set the starting date of timer recording and then **NEXT**.
 - For daily recording, press **TRACKING/V-LOCK** - until the desired daily recording type.
 - For weekly recording, press **TRACKING/V-LOCK** - until the desired indication for the day of the week appears.
- 4 Press **TRACKING/V-LOCK** +/- to set the start time (hour), then **NEXT**.
- 5 Press **TRACKING/V-LOCK** +/- to set the start time (minute), then **NEXT**.
- 6 Press **TRACKING/V-LOCK** +/- to set the end time (hour), then **NEXT**.
- 7 Press **TRACKING/V-LOCK** +/- to set the end time (minute). No need to press **NEXT**.
 - Repeat steps 1 to 7 to program several timer recordings successively.
- 8 Press **TIMER REC** to activate Timer Recording.
 - "☐" appears on the VCR Display and the VCR cannot be operated manually.
 - If you want to operate the VCR, press **TIMER REC** to switch off "☐". To reactive the timer press this button again.

Confirming timer programming

Press **PROG/CHECK** to select the timer program number to be checked. The channel, date, starting and ending time are displayed for about 12 seconds.

Canceling timer programming

- 1 Press **TIMER REC** to deactivate Timer Recording. (Be sure that "☐" disappears.)
- 2 Press **PROG/CHECK** to select the timer program number to be canceled.
- 3 Press **TRACKING/V-LOCK** +/- simultaneously for more than 3 seconds.

Note:

If a timer recording is interrupted or canceled, the programmed recording data is memorized until 4:00 am two days later. However, if another timer recording or OTR is activated or performed at 4:00 am two days later, the recording data will be maintained until 4 am on the following day.

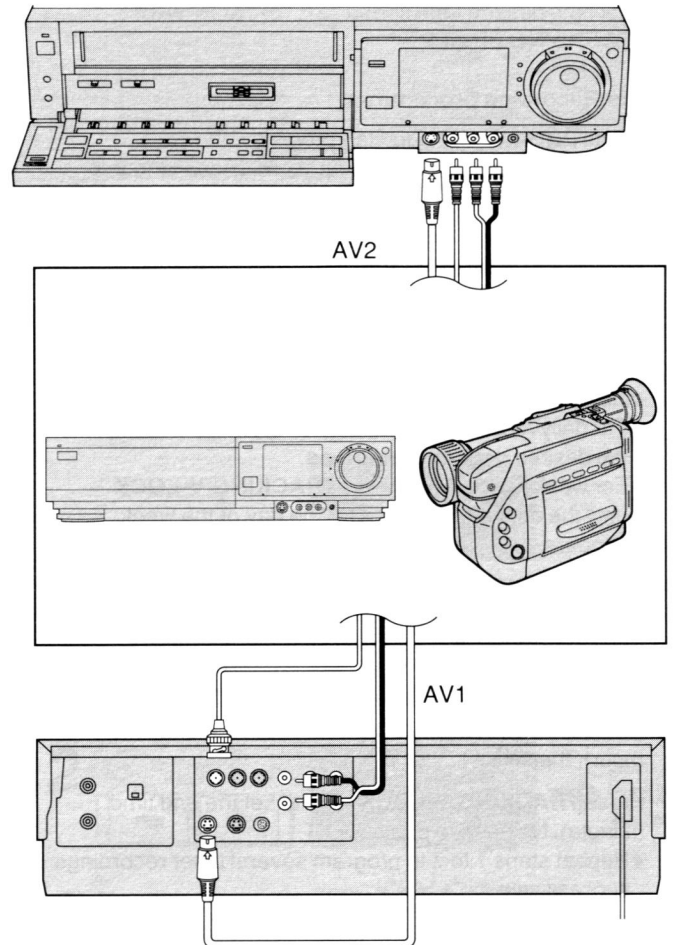
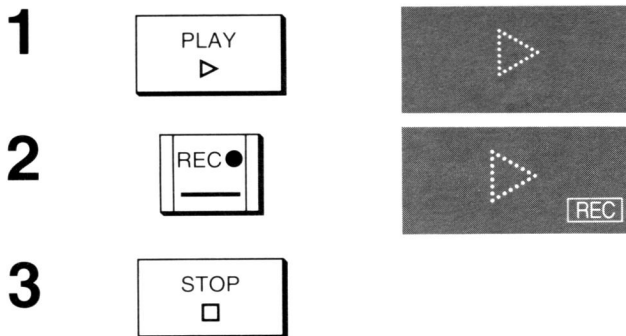
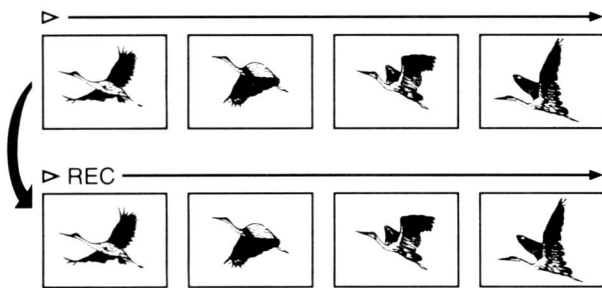
Editing

Copy Editing

This function is used to make duplicates.

Preparations

- Connect a Movie Camera or another VCR to this VCR as shown in the diagram.
- Set **NOISE FILTER/EDIT** to "EDIT".
- Insert a recorded cassette in the connected Movie Camera or another VCR, used as Player, and a blank cassette in this VCR, used as Recorder.
- Press **INPUT SELECT** on Remote Controller to select the program position (channel) "A1" or "A2".
A1: Recording through S-VIDEO IN or VIDEO IN and AUDIO IN Connectors (AV1) on the rear panel.
A2: Recording through S-VIDEO IN or VIDEO IN and AUDIO IN Connectors (AV2) on the front panel.
- Set **INPUT SELECT** on VCR to select the corresponding connectors.
S-VIDEO: S-VIDEO IN and AUDIO IN Connectors
LINE: VIDEO IN and AUDIO IN Connectors



Operations

- 1 Play back the recorded tape on the Player VCR.
- 2 Press **REC** on the Recording VCR.
- 3 Press **STOP** to stop copying.

Note:

Be sure to set **NOISE FILTER/EDIT** to "OFF" after copying is finished for normal use.

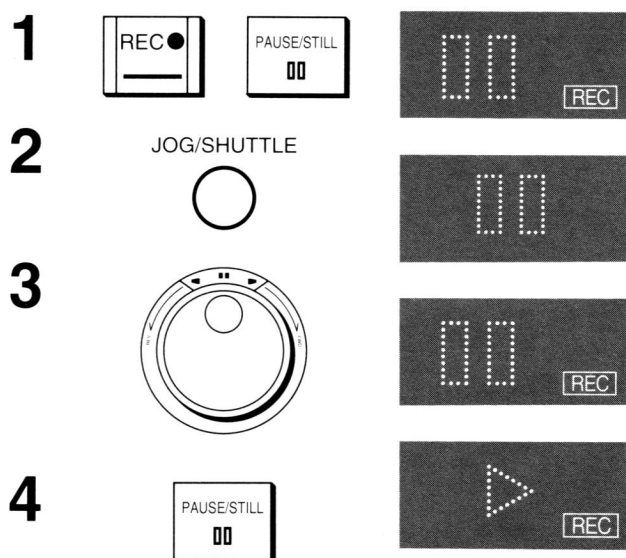
Assembly Editing

This function is used to make an edited tape from several other video recordings.

A new scene can be joined to the end of an existing recording without interference or distortion.

Preparations

- Insert a recorded cassette with an erasure prevention tab.
- Select the corresponding input connectors.
(Refer to "Preparations" on page 28.)
- Set **NOISE FILTER/EDIT** to "EDIT".



Operations

- 1 Press **REC** and then **PAUSE/STILL** to put the VCR in Recording Pause.
- 2 Press **JOG/SHUTTLE**.
- 3 Search for the end part of a scene by using the **JOG Dial**.
 - 2 seconds later, the VCR is set to Recording Pause again.
- 4 Start Recording to join a new scene by pressing **PAUSE/STILL**.

Synchronized Editing

It is possible to synchronize the playback start and stop of the compatible Panasonic Ind. movie.

Preparations

- Connect a Movie Camera to the VCR with Synchro Connection Cord (optional).
- Insert a recorded cassette with an erasure prevention tab.
- Select the corresponding input connectors.
(Refer to "Preparations" on page 28.)
- Set **NOISE FILTER/EDIT** to "EDIT".

Operations

- 1 Press **REC** and then **PAUSE/STILL** to put the VCR in Recording Pause.
- 2 Put the Movie Camera into Still playback at the point where you want to start editing.
- 3 Press **PAUSE/STILL** on the VCR so that Movie Camera starts playback.
 - Dubbing starts.

Synchronized Editing between two VCRs

When editing from another VCR equipped with Synchro Edit connector, synchronized start and stop of both VCRs can be activated from this VCR.

The operation is the same as described for synchronized editing from a Movie Camera.

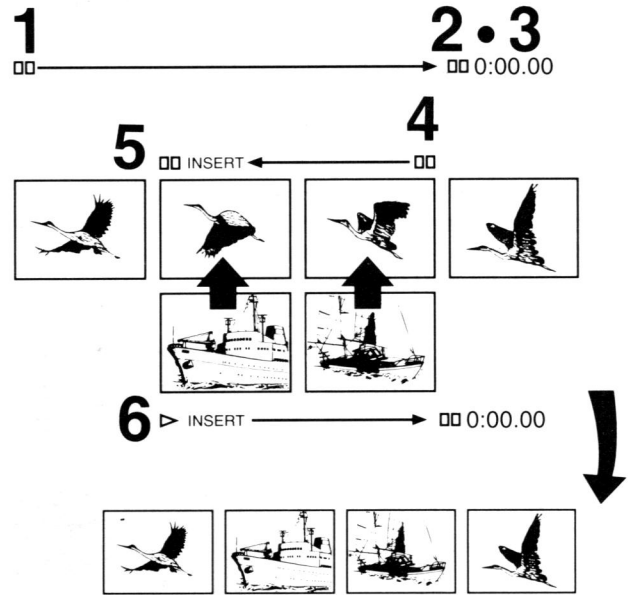
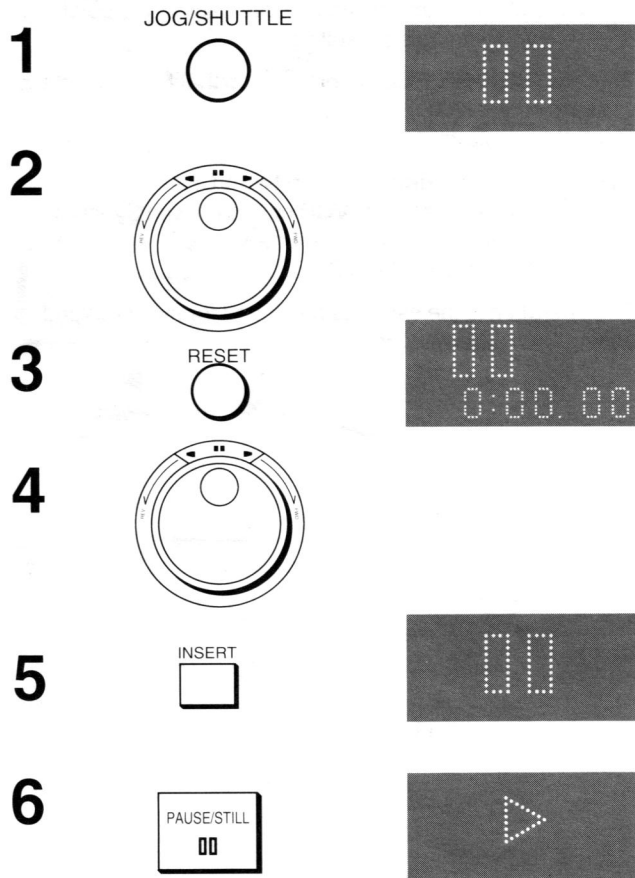
Insert Editing

This function allows you to smoothly insert new scenes between selected Editing "In" and "Out" points on an existing recording.

Insert Editing cannot be executed on blank tape segments. In such a case, it is necessary to use Assembly Editing first.

Preparations

- Connect a Movie Camera or another VCR to this VCR as shown in the diagram on page 28.
- Insert a recorded cassette with an erasure prevention tab.
- Select the corresponding input connectors.
(Refer to "Preparations" on page 28.)
- Set **NOISE FILTER/EDIT** to "EDIT".



Operations

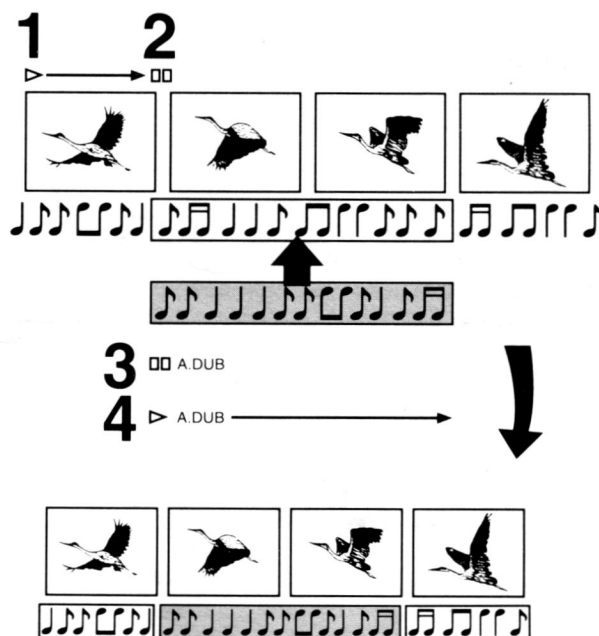
- 1 Press **JOG/SHUTTLE**.
- 2 Search for Editing Out (ending) point with **SHUTTLE Ring** and **JOG Dial**. Put the VCR into Still playback.
- 3 Press **RESET** to reset the Tape Counter to "0:00.00".
- 4 Search for Editing In (starting) point with **SHUTTLE Ring** and **JOG Dial**. Put the VCR into Still playback.
- 5 Press **INSERT**. (INSERT Indicator is lit.)
 - If you want to replace the original sound-track on the normal audio track with a new sound-track, press **AUDIO DUB**. (AUDIO DUB Indicator is lit.)
- 6 Press **PAUSE/STILL** to start Insert Editing.
 - Insert Editing stops when the tape reaches editing out point (counter position "0:00.00"). The VCR switches to Still playback.

Audio Dubbing

This function is used to add background music, narration, etc. on an already recorded tape.

Preparations

- Insert a recorded cassette with an erasure prevention tab.
- Select the corresponding input connectors.
(Refer to "Preparations" on page 28.)



Operations

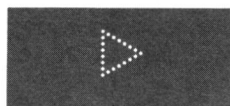
- 1 Press **PLAY** and search for the starting point where you wish to record the new sound-track.
- 2 Press **PAUSE/STILL** at the starting point of Audio Dubbing.
- 3 Press **AUDIO DUB**. (AUDIO DUB Indicator is lit.)
- 4 Press **PAUSE/STILL** to start Audio Dubbing.
- 5 Stop Audio Dubbing by pressing **STOP**.

Note:

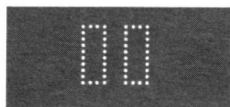
A new sound is dubbed onto the normal audio track of the tape, and the original sound is erased. However, the original sound is maintained on the Hi-Fi audio tracks. This means that Audio Dubbing is made monaurally.

- Press **AUDIO OUT** to select the normal audio track to listen to the sound recorded with Audio Dubbing.
- Select the Hi-Fi audio tracks to listen to the original sound.
- Set **Hi-Fi/NORMAL MIX** to "ON" to listen to both the original sound and the sound-track added by Audio Dubbing.

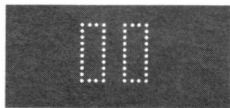
1



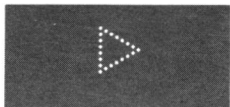
2



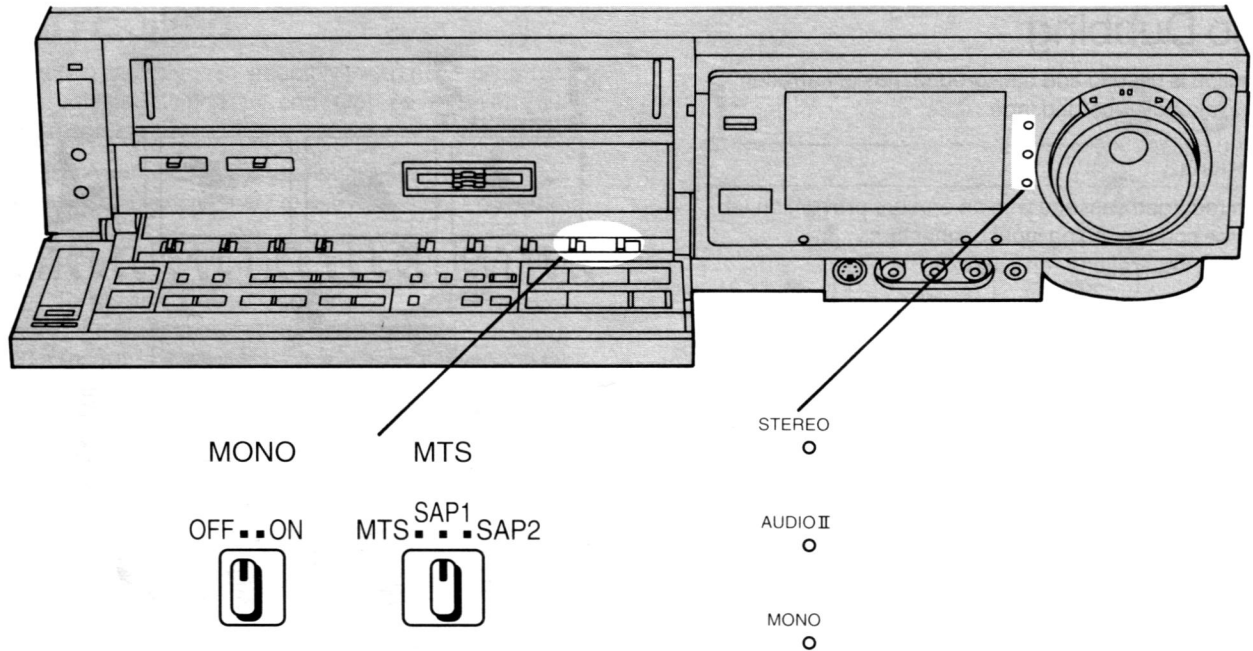
3



4



Audio Channel Selection



When a stereo and/or Audio II broadcast is received, "STEREO" and/or "AUDIO II" are lit to inform you of the type of broadcast.

The table below shows the TV broadcast type, MTS switch settings, and audio recording patterns.

Be sure that **MONO** Switch is set to "OFF" before setting **MTS** Switch and follow the operation procedure described on page 23 to record on the Hi-Fi audio tracks.

MONO Switch


If the sound of a stereo or Audio II broadcast is impaired by noise due to weak reception, set **MONO** Switch to "ON". ("MONO" indicator is lit.) The TV broadcast is recorded monaurally for easier listening. To resume stereophonic recording, set **MONO** to "OFF".

TV Broadcast	MTS switch	Audio Track		
		Normal (Mono)	Hi-Fi	
			Left	Right
Mono	All position	Mono	Mono	Mono
Stereo	All position	L+R (Mixed)	Left	Right
Mono and Audio II (SAP)	MTS	Mono	Mono	Mono
	SAP1	Mono	Mono	Audio II
	SAP2	Audio II		
Stereo and Audio II (SAP)	MTS	L+R (Mixed)	Left	Right
	SAP1	L+R (Mixed)	L+R (Mixed)	Audio II
	SAP2	Audio II		

Before Requesting Service

Audio Channel Selection
Before Requesting Service

Before requesting service, check the following points once again.

No Correct VCR Operation			
SYMPTOM	CAUSE	REMEDY	CHECKED
No Indications on the VCR Display.	AC Power Cord is not connected to live AC outlet.	Connect the AC Power Cord to the VCR and a live AC outlet.	
VCR Display is on but VCR does not function.	Timer Recording is activated. (Timer Recording Indicator  is lit.)	Press TIMER REC to deactivated Timer Recording mode.	
	Safety devices are operating.	Turn off POWER, disconnect AC Power Cord from AC outlet, About 1 minute later, reconnect AC Power Cord to AC outlet and turn on POWER.	
VCR stops operating and turns itself off a few seconds later.	Tape is jammed in VCR.	Do not try to remove jammed tape as this may damage it. Consult your dealer.	

Incorrect Playback Performance

SYMPTOM	CAUSE	REMEDY	CHECKED
Picture is noisy or in black-and-white. Horizontal bars run down.	Auto digital Tracking has no effect.	Make manual tracking adjustment to minimize noise bar distortions which cannot be eliminated by Auto Digital Tracking Control. See page 15.	
	TV is not tuned to VCR video playback channel.	Tune TV to proper video playback channel (CH3 or CH4). See page 8.	
	Poor reception when TV broadcast recording was performed.	Check antenna connection of VCR. See page 5.	
		Select program position (channel) on VCR used for Recording or Timer Recording. If it is poorly received, re-tune it. See page 11.	
	Video heads are clogged or abraded. Tape is damaged or worn.	See "Video Head Clogging" on page 4 and consult your dealer.	
VCR rewinds the tape during Playback.	Tape end detector works during Playback due to damaged tape.	Replace cassette.	

Incorrect Recording Performance			
SYMPTOM	CAUSE	REMEDY	CHECKED
Alarm sound and "Ⓜ" blinks.	Erasure prevention tab on cassette is removed.	Insert another cassette with tab or cover tab hole with adhesive tape if cassette's original recording is no longer required.	
Recording results are noisy or no picture.	Antenna or antenna lead wire is defective.	Reconnect antenna to VCR to check proper reception. Replace if necessary.	
	VCR is not correctly tuned.	Re-tune VCR. See page 8.	
	"A1" or "A2" is selected with INPUT SELECT on Remote Controller.	Select TV broadcast channel to be recorded.	
OTR or Timer Recording cannot be performed.	Clock blinks 12:00.	Set clock to present time. See page 9.	
	Clock or calendar is incorrect.	Set to present date and time. See page 9.	
	Wrong recording start or stop time setting.	Program timer recording. To learn correct programming, try a short timer recording a few minutes ahead of the present time. See page 26.	
	VCR is not set for Timer Recording.	Press TIMER REC Button after programming Timer Recording.	
Recording through S-VIDEO IN or VIDEO IN and AUDIO IN is not possible.	INPUT SELECT is not set correctly.	Select "A1" or "A2" with INPUT SELECT on Remote Controller and set INPUT SELECT on VCR to S-VIDEO or LINE.	
	External AV connections are incorrect.	Make correct connection. See page 5.	

Incorrect Remote Controller Operation

SYMPTOM	CAUSE	REMEDY	CHECKED
No function.	Remote control signal does not reach VCR.	Be sure that there is no obstacle between Remote Controller and Infrared Remote Control Receiver Window. Point Remote Controller at VCR.	
	Distance is too far.	Use Remote Controller within 7 m from the front of VCR.	
	Batteries are exhausted.	Replace AA type batteries available from your dealer. See page 19.	
	Batteries are not loaded with their polarities (+ and -) aligned correctly.	Insert batteries correctly. See page 19.	

Specifications

Before Requesting Service
Specifications

AG-1970P

Information for Your Safety

Power Source:	120 V AC, 50–60 Hz
Power Consumption:	Approx. 42 watts

Video Recording System: 2 rotary heads, helical scanning system
Video Heads: 4 heads
Tape Speed: SP; 33.3 mm/sec.
 SLP; 11.1 mm/sec.
Tape Format: S-VHS/VHS tape
Record/Playback Time: SP; 160 min. with NV-T160
 SLP; 480 min. with NV-T160
FF/REW Time: Approx. 2½ min. with NV-T120

VIDEO

Television System: EIA; Standard (525 lines, 60 fields) NTSC color signal
Modulation System: Luminance; FM azimuth recording
 Color signal; converted subcarrier phase shift recording

Input Level: VIDEO IN
 Front (PHONO); 1.0 Vp-p, 75 ohm
 Rear (BNC); 1.0 Vp-p, 75 ohm
 S-VIDEO IN (4P DIN); Y: 1.0 Vp-p, 75 ohm
 C: 0.286 Vp-p, 75 ohm

Output Level: VIDEO OUT (BNC); 1.0 Vp-p, 75 ohm
 S-VIDEO OUT (4P DIN); Y: 1.0 Vp-p, 75 ohm
 C: 0.286 Vp-p, 75 ohm
 RF Modulated; VHF channel US 3 or 4, 75 ohm, terminated

AUDIO

Input Level: AUDIO IN (PHONO); more than –10 dBV, more than 47 kohm
 MIC IN (M3×1); –70 dBV

Output Level: AUDIO OUT (PHONO); –8 dBV, less than 1 kohm
 HEADPHONES; –30 dBV, 8 ohm

Audio Track: 1 track (Normal), 2 channels (Hi-Fi sound)

Video Horizontal Resolution: Color; more than 230 lines (VHS/SP)
 more than 400 lines (S-VHS)

Signal-to-Noise Ratio: Video; more than 43 dB (VHS/SP)
 more than 44 dB (S-VHS)

Dynamic Range: Audio; more than 90 dB (Hi-Fi audio track)

Audio Frequency Response: 20 Hz–20 kHz (Hi-Fi audio track)

Wow and Flutter: 0.005% Wrms/Hi-Fi

Operating Temperature: 5°C–40°C

Operating Humidity: 35%–80%

Weight: 17³/₁₆ lbs. (7.8 kg)

Dimensions: 16¹⁵/₁₆" (W) × 4⁵/₁₆" (H) × 15⁷/₈" (D) mm
 [430 (W) × 109 (H) × 403 (D) mm]

Weight and dimensions shown are approximate.
 Specifications are subject to change without notice.

Panasonic

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