OPERATION MANUAL

NAC HIGH SPEED VIDEO SYSTEM
HSV−4000

Model ST−592

First edition: Oct., 2003

nac
IMAGE TECHNOLOGY

nac Image Technology Incorporated

IMPORTANT NOTICES

SAFETY PRECAUTIONS

Read all the instructions and notices below before using the equipment.

Throughout this manual, some symbol marks are used together with comments to remind you of various safety precautions. When you encounter one of such symbol marks, be sure to read its comment before proceeding. Further, unexpected problems or troubles may occur under certain conditions. So it is recommended to always read and comprehend the manual (user's and operation manuals) of the equipment before using the equipment. If you encounter anything in the manual that you cannot understand, call your local distributor. The symbol marks will be presented in the following manner:

DANGER

This safety reminder is given to an item which is explicitly dangerous to life and property. If this item is done improperly, you will be seriously injured and in extreme cases, you will be put to death.

WARNING

This safety reminder is given to an item which is potentially dangerous to life and property. If this item is done improperly, you will be seriously injured and in extreme cases, you will be put to death.

CAUTION

This safety reminder is given to an item which is potentially dangerous to your body and devices. If this item is done improperly, you will be partially or not-seriously injured and devices will be damaged.

This symbol mark is given to an item which requires general notices for safety and protection of devices.

HANDLING PRECAUTIONS

Safety Alert symbol

This safety reminder is given to an item or operation which may cause a personal injury or damage when improperly done.

Read the comment carefully and perform the item or operation correctly.

Grounding Terminal symbol

This safety reminder is given to an item which requires grounding. If the grounding is omitted, you will get electric shocks from metallic parts. When you use a temporary adapter (for converting three prong grounding type to two prong type), its grounding means must be connected to a permanent ground. This grounding is effective to eliminate external noises on signal lines.

High Voltage Warning symbol

This safety reminder is given to an item which generates or uses a high voltage.

Guard Against Electric Shock

Do not open the cover. Do not touch electric parts with wet hand. Almost all circuits inside the machine work with low DC voltages. However, you may get electric shocks inside the machine in use.

NOTICES IN USING THE EQUIPMENT

Check input power Supply

Power supplied to the system is 100VAC to 120VAC or 220VAC to 240VAC, 47Hz to 63Hz when the AC adapter is used or 20VDC to 32VDC when a DC power supply or battery is used. Be sure to check the supply voltage, frequency, and polarities before connecting power to the system.
Do not over discharge batteries.

Ambient environment

- The operating temperature and relative humidity are 0°C to +40°C and 30%RH to 80%RH (no condensing).

- Do not store the machine outside the range of -10°C to +60°C and 20%RH to 80%RH (no condensing).

- Avoid dangerous environment.
  Do not use the machine in locations containing oil fume, soot, corrosive gas, strong magnetic field, or strong vibration.

- Keep the machine away from the direct sunlight, rain, and salty water.

- Do not use the machine in the presence of dirt, dusts, or sands, or in damp or wet locations.

- Do not place something near the ventilation slots to prevent the temperature from increasing.

Handling the camera

When you remove the lens or cap from the lens mount of the camera, you can look into the camera. Do not put your finger or anything inside the camera for protection of the inside of the camera. Handle the camera with care. Do not give any excessive force to it.

Handling the video cassette recorder (VCR)

The VCR is designed to stand vertically or sit horizontally (flat) on a desk, standing on their rubber feet.
When no unit is to be placed on the VCR, its built-in feet are available. Pull out the built-in feet and stand the VCR on them. The built-in feet are designed to support only one VCR. So, when putting one or more optional units (wave inserter units or synchronizer units) on the VCR, be sure to use the rubber feet. Do not use the built-in feet.

Caution: Never place any other unit than the optional units on the VCR.

The cassette door of the VCR opens when a video cassette tape is loaded or unloaded. Do not put your hand deeply into this opening. Do not put any metallic or magnetic material in it. Always keep the cassette door closed except when loading or unloading a video cassette tape. Be sure to unload the video cassette tape before turning off power to the VCR. You can load or unload the video cassette tape only while the VCR is powered on.

The air filter on the side of the VCR will be blocked with dust, and small particles. Replace the filter periodically for good ventilation.

Condensation

A condensation will occur on the inner and external surfaces of the VCR when it is moved from a cold place to a warm place. The condensed liquid on the surface of the magnetic head will damage the video tape. Do not use the VCR while the VCR is wet with condensed liquid.

When hot damp air touches a cool surface of an object, its water component condenses upon it. (For example, you can find this phenomenon by dews on the window glasses of your warm room in the winter time and dews on the outer surface of a glass containing cold water in the summer time.) This phenomenon is called condensation. The condensation will also occur on the VCR when it is moved from a cold place to a warm place.

VCR troubles caused by condensation and its prevention

Dews (if any) on the head drum of the VCR will adhere the tape to the surface of the head drum. If the VCR is operated in this status, excessive forces are given to the head drum and to the tape. In extreme cases, they will be broken. To prevent such troubles, the VCR has a dew detector which stops the operation of the VCR when detecting any dew in the VCR.

While a dew is detected, "DEW DETECTED" appears on the monitor screen and "DEW" appears on the counter of the operation unit to alert. However, note that the dew detector cannot detect immediately after condensation starts.

Occurrence of condensation and protecting the VCR from damages by condensation

Condensation will occur when:
- the cold room containing the VCR is warmed up by a heater,
- the VCR is moved from a cold place to a warm place, or
- the VCR is placed in a cool damp place.

In such a case, turn on power to the VCR and fully warm it up before loading the video cassette tape in the VCR.

Notices on moving or delivering the VCR

Be sure to remove the video cassette tape from the VCR before moving or delivering the VCR. If the VCR having the cassette is moved or delivered, the tape is untensioned and sagged, which may cause a tape or video head trouble.

Pack the VCR and the camera in their dedicated casings when moving or delivering them.

Notices on handling the strobe light system (optional)

Be sure to wear the safety glasses when turning on the strobe light system. Do not stare at the light source. The strobe light contains ultraviolet rays and is strong enough to hurt your eyes. (Even the reflected light may be harmful to your eyes.)

Furthermore, a small amount of ozone generates while the strobe light system is flashing. Ventilate the room well if the room is narrow or air-tight. Frequently turn off the strobe light system unless it is required.

Wait at least one minute after turning off power to the strobe light system before unplugging the connector of the strobe light system. Note that the strong strobe light may cause photo sensors to malfunction.

LIMITED WARRANTY

The HSV-4000 is warranted against defective material or workmanship for a period of one year from the date of delivery. For more information, see the attached Limited Warranty card.

APPLICABLE STANDARDS

Standards

FCC Statements (FCC Part 15, Class A)

This equipment complies with the requirements in Part 15 of FCC Rules for a Class A computing device. Operation of this equipment in a residential area may cause unacceptable interface to radio and TV reception requiring the operator to take whatever steps are necessary to correct the interference.

EMC Notice

Products with the CE Marking comply with the EMC Directive (89/336/EEC, 92/31/EEC) issued by the Commission of the European Community. Compliance with these directives implies conformity to the following European Norms :

EN55022	Class B-Radio Frequency Interference
EN55024	Electromagnetic Immunity

- Cable Connection

Connection to this device must be made with shielded cables with metallic RFI/EMI connector hood and put 25mm or more length of EMC ferrite core on the both ends of cable to maintain compliance with EMC Directive (89/336/EEC, 92/31/EEC). The cable should be shorter than 3 meters.

- Performance Degradation in the Immunity Test

NAC IMAGE TECHNOLOGY Inc. specifies that in the HSV-4000 system, the performance degradation implies only when a loss of sync in video image occurs due to external interfere.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received including interference that may cause undesired operation.

WARNING: This equipment has been tested and found to comply with the limits for Class "A" digital device, pursuant to part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE : This product was FCC verified under test conditions that included the use of shielded I/O cables and connectors between system components. To be in compliance with FCC regulations, the user must be use shielded cables and connectors and install them properly.

Contents

(Memo page)

CHAPTER 1   GENERAL

HOW TO USE THIS MANUAL

1) To test-run the HSV (recording and playback), first complete the system connection (see Chapter 2), then see the procedures on the next page (see "Outline of general operations").

2) For outline of the HSV system, see Chapter 1, "GENERAL."

3) For functions of the components (switches, indicators, connectors, buttons, etc.) of the panels, see Chapter 2, "COMPONENTS AND FUNCTIONS."

4) For menu operations and HSV-specific functions, see Chapter 3, "MENU SETTINGS."

5) For recording operations and HSV-specific functions, see Chapter 4, "RECORDING OPERATIONS".

6) For playback operations and HSV-specific functions, see Chapter 5, "PLAYBACK OPERATIONS".

7) For other functions of this system, see Chapter 6, "OTHER FUNCTIONS."

8) For maintenance of the HSV system, see Chapter 7, "DAILY MAINTENANCE."

9) For I/O interface of connectors, see Chapter 8, "INTERFACE."

10) For methods of controlling the HSV system by a computer, see Chapter 9, "CONTROLLING THE SYSTEM BY A PERSONAL COMPUTER."

11) For kinds of optional units and handling the parallel interface unit, see Chapter 10, "OPTIONAL UNITS."

For details of the other optional units such as the wave inserter and the synchronizer unit, see their operation manuals. For details of a monitor unit, see its operation manual.

OUTLINE OF GENERAL OPERATIONS

After the HSV system is installed and connected correctly, you can run the HSV system generally. Below is explained a procedure of operating the HSV system from the front panel of the VCR.

Note: Always warm up the HSV system at least 3 minutes before starting the HSV system under normal environmental conditions.

1. Turning on power
   Press the POWER switch on the lower right corner of the front panel of the VCR.

2. Loading the video cassette tape into the VCR
   (1) Press the PUSH OPEN button (on the upper part of the front panel of the VCR). The cassette door opens.
   (2) Set the video cassette tape in the cassette slot of the VCR with the arrow mark of the cassette faced forward.
   (3) Push the cassette forward. The VCR automatically takes in the cassette.
   (4) Close the cassette door.

Note: Always close the cassette door except when you load or unload the video cassette tape. Dust and lint are the greatest enemies to the video tape, video head and the mechanism.

3. Directing the camera and the lighting lamp to a target object.

4. Check the object image on the monitor screen or through the viewfinder.
   Aim and focus by the zoom ring, focusing ring, and the aperture ring to make the object image clear and bright.

5. Recording the image and then stop recording
   (1) Press the REC button. The REC indicator lights and about ten seconds later, the VCR starts recording.
   (2) To stop recording, press the STOP button.
   (3) Turn off the light.

6. Rewind the tape
   (1) Press the REW button.
   (2) To stop rewinding halfway, press the STOP button.

7. Playback the tape and stop playback   (Follow the steps below in that order.)
   (1) Press the PLAY button (normal playback).
   (2) To display a still picture(still playback), press the STILL/PAUSE button. The STILL indicator lights.
   (3) To display the succeeding or preceding picture(step playback), press the FWD STEP or REV STEP button.
   (4) To change the playback speed (search playback), keep on pressing the FWD STEP or REV STEP button.
   (5) To stop playback, press the STOP button.

8. Turn off the power
   (1) Press the EJECT button to remove the video cassette tape from the VCR. Close the cassette door after removal of the tape cassette. You cannot remove the tape cassette from the VCR while the VCR is not powered.
   (2) Then, turn off the power of VCR.

With this, the general operations of the VCR are complete.

SYSTEM OUTLINE

The HSV-4000 high-speed video system records 4000, 2000, 1000 or 500 pictures (in color or black and white) per second of a fast moving object, displays them on the monitor screen, and records them on a video tape simultaneously.

The recorded images can be replayed in various ways. The VCR output signals are NTSC color video signals (60 fields per second) which can be displayed on typical color monitor.

The HSV system consists of a high-resolution color camera using solid-state image sensors, a video cassette recorder (for recording and replaying of images), an operation unit for controlling the system, and an AC adapter.

Additionally, various optional units are available such as a strobe light system, a wave inserter, a synchronizer unit, and a parallel interface.

The system has been designed compact and portable and enables you to record high-speed motions of objects and to immediately replay the recorded images for monitoring and analysis with quite simple operations.

FEATURES OF THE SYSTEM

High-speed recording and immediate replaying
> The HSV system records 4000, 2000, 1000 or 500 color or black and white pictures per second and displays them on the monitor screen in various modes (e.g. search playback and jog playback in forward and backward directions).

Recording in a video cassette tape
> The HSV system can record up to 10 minutes on a single video cassette (ST-180). The S-VHS and VHS video cassette tapes which are widely used and not so expensive are available to the HSV system.
> In the video cassette recording method, image information is stored immediately when recording is completed. Therefore, you can start the succeeding shooting immediately.

Interchangeability of video cassette tape
> The recording method of the HSV-4000 system conforms to the VHS and S-VHS standard (NTSC). Therefore, the video cassette tape recorded by this system can be reproduced by any of the ordinary S-VHS and VHS (NTSC) video decks.

S-VHS ET recording
> The HSV-4000 has a capability of S-VHS ET recording.
> This function is to record the image on VHS cassette tape as similar image quality as S-VHS recording (i.e. more than 400 TV lines resolution).
> **Note: The recommended VHS cassette tape is so-called " HG" grade or better to meet the S-VHS ET recording.**

High-quality color camera
> The color camera using solid-state image sensors is very compact and light-weighted and produces sharp video images free from residual images. Further, the signals output from the color camera are all sent to the VCR in a digital form and consequently, the images will not be deteriorated by the cam-
> era cable

Electronic shutter

The electronic shutter built in the color camera has shutter speeds of 1/1000 second, 1/2000 second, 1/5000 second, 1/10000 second, 1/20000, 1/50000, 1/100000, and 1/200000 second.

When the electronic shutter is set to "OPEN," the equivalent shutter speed is 1/4000 second, 1/2000 second, 1/1000 or 1/500 second, which varies according to the recording speeds.

With the use of the optional strobe light system, very high shutter speeds 1/50,000 second or 1/100,000 second are available.

Image adjustment

You can monitor images of a target object through the viewfinder etc or on a general monitor screen and control the sensitivity of the camera, enhancement (of profiles), and knee (white saturation) before starting recording by the VCR. Furthermore, you can change noise reduction levels during replay of images.

Video output

The video signals output from the HSV system are NTSC color video signals can be connected to ordinary video equipment such as a color monitor, a video printer, a video deck, and a personal computer having a video input function. (The HSV system has a TBC function.)

There are two kinds of video outputs: video output with on-screen display and video output without on-screen display. Each video output has two output terminals (BNC and S). The system has a total of four output terminals.

This enables tape dubbing. And also you can create a tape which can be slow playback on a normal video deck without frame skipping.

Recording a scene code and a time code

A 3-digit scene code and time code (minutes, seconds, and milliseconds) are recorded on video tape during recording. These codes are used for identification of target objects, observation with time lapse, and automatic motion analysis.

Recording the date, time, shutter speed, and screen mode

During recording, the date (YY/MM/DD), the time (hours and minutes), and the shutter speed are recorded on the tape for identification of images recorded on the tape.

The current screen mode (the recording speed and the screen size) are also recorded on the tape, which will be used for automatic change of screen modes in reproduction of images.

Cue signal recording

You can record a cue signal on the tape any time during recording or edit playback. The tape being rewound or fast-fed can automatically stop near a cue signal. So you can search a desired picture easily and quickly during tape running. The cue signal conforms to the VISS (VHS Index Search System) standards.

Various playback modes

There are various playback modes: Normal playback mode for reproducing the recorded images at the speed of 0.06 times the recording speed, Still playback, Search/Jog playback whose direction (forward or backward) can be selected by a single dial on the operation unit, and single picture feeding.

Although ordinary video decks can reproduce still images for a predetermined time period only, the VCR of the HSV system can reproduce still images endlessly because it uses memory for still reproduction (which can protect the tape).

Repeat recording function

The HSV system has a repeat recording function which enables repetitive recording of an event which does not occur so often.

Self-diagnostic function

The HSV system has a self-diagnostic function which displays alarm and warning messages on the monitor screen to alert, prevent and correct misuse, and troubleshoot.

Operation unit

The HSV system has a compact operation unit. You can perform all recording and replaying operations of the system on it. The operation unit also has a time counter.

The operation unit is connected to the VCR and to the color camera.

Moreover, it can be used as infrared remote control to VCR.

RS-232 serial interface

This interface connects the HSV system to a personal computer or to a terminal for control. In addition to the operation panel and operation unit controls this interface enables additional controls such as, searching by lap time, scene code, and time code, displaying a cursor on an image screen, and getting the detailed system status.

Discrete interface

The HSV system has control I/O ports for contact signals. The functions to be controlled through these ports are almost the same as those on the operation panel of the VCR.

Power supply

The AC adapter of this HSV system has a wide input voltage range (100 to 120VAC or 220VAC to 240 VAC).

Similarly, the DC power input of this system has a wide range (20 VDC to 32 VDC). The power control of this system has a battery over-discharge preventing function. So Ni-Cd and lead-acid batteries of 20V, 24V, and 28V are available to the system.

Compact and portable

This HSV-4000 system is lighter in weight by one fifth than the previous high-speed video system (HSV-1000) and the whole system can be packed in one attached casing.

Various optional units

Various optional units are available to the HSV system. They are a strobe light system, a wave inserter, a parallel interface unit, a synchronizer unit, and. They are very useful for analysis of fast motions.

SYSTEM CONFIGURATION

Below are listed the components of the standard HSV-4000 system.

(1)	Color camera	1
(2)	Camera cable (5m)	1
(3)	Zoom lens	1
(4)	Video cassette recorder (VCR)	1
(5)	AC adapter	1
(6)	AC power cable	1
(7)	DC power cable	1
(8)	Operation unit	1
(9)	Batteries (UM-3 AA-size Alkaline)	2
(10)	Operation unit holder	1
(11)	Operation cable (3m)	1
(12)	AUX connector kit	1
(13)	S cable for video (3m)	1
(14)	Coaxial cable for video (3m)	1
(15)	Adapter (BNC-RCA pins)	1
(16)	Video cassette tape	1
(17)	Head cleaner	1
(18)	HSV-4000 operation manual	1
(19)	AC adapter operation manual	1
(20)	System case	1

SYSTEM SPECIFICATIONS

Recording format:	S-VHS or VHS video cassette system (NTSC, SP mode)
Recording speed:	4000 pictures per second (1/4- or full-size picture) 2000 pictures per second (vertically half or full-size picture) 1000 pictures per second (full-size picture) 500 pictures per second (full-size picture) Time deviation ±0.01% or less (without external synchronization)

Video signals

Camera output	(VCR input): Color Bayer pixel data (10 bits)
VCR output:	NTSC signal and its Y/C separation signal (60 fields per second)
Image pickup element:	Solid-state CMOS image sensor
Sensitivity:	31,000 lx (under conditions of F4, shutter OPEN, 1000 pictures per second, and gain of 0dB)
Electronic shutter:	OPEN, 1/1000 second, 1/2000 second, 1/5000 second, 1/10000 second, 1/20000 second, 1/50000 second, 1/100000 second and 1/200000 second
Lens mount:	C-mount
Video cassette tape:	S-VHS or VHS video cassette tape
Recording time:	10 minutes (on the ST-180 tape), 7 minutes (on the ST-120 tape)
Horizontal resolution:	340 lines or more (S-VHS, color, in the screen center) 240 lines or more (VHS, in the screen center)
Playback modes:	Normal, Still, Forward/Backward Step, Forward/Backward Jog, Forward/Backward Search (variable speed from slow to fast)
Messages on-screen:	Scene code, time, date and time, shutter speed, menu, mode, lap time, messages (alarm and warning)
Warm-up time:	3 minutes or longer (at 20°C)

Environmental temperature and relative humidity

Operating	:	0°C to +40°C, 30%RH to 80%RH
Storage	:	-10°C to +60°C, 20%RH to 80%RH

Input power supply:	100 VAC to 120VAC or 220VAC to 240 VAC, 47Hz to 63Hz (by the AC adapter) or 20 VDC to 32 VDC (by a DC power source)
Power consumption:	Approx. 205 watts (for the use of an AC adapter) or approx. 170 watts (for the use of a DC power source)

Weight

Color camera:	Approx. 1.6kg
Zoom lens:	Approx. 0.5kg
VCR:	Approx. 9.7kg
Operation unit:	Approx. 0.2kg
AC adapter:	Approx. 2.0kg
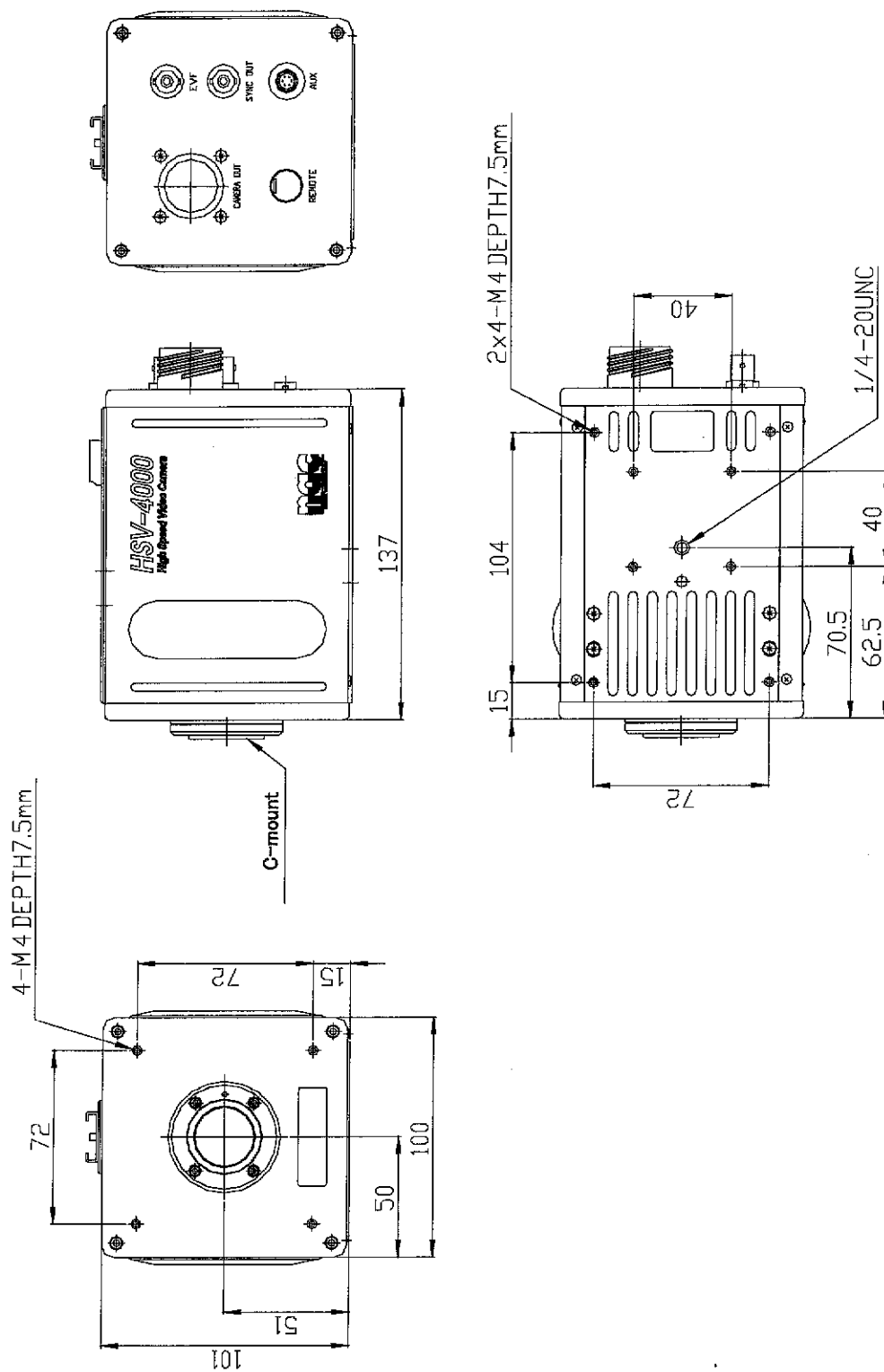
Figure 1-1   Color Camera   (unit: mm)

C16·8·4·2·1.5

30 20 15 12.5

15 2 3 5 10∞ m

108~112

4

M55P0.75

⌀57
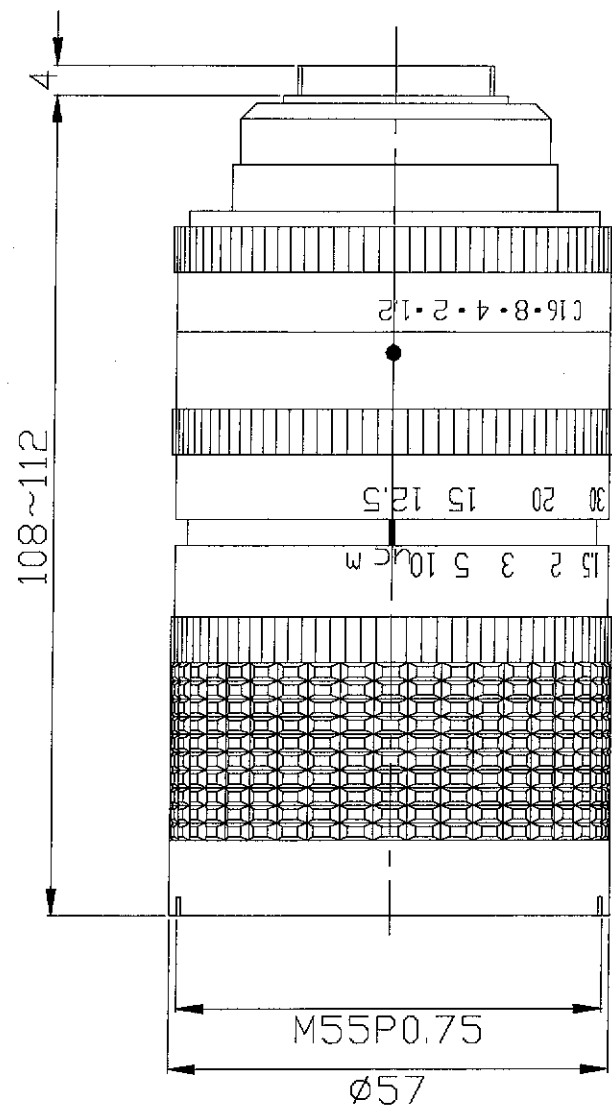
Figure 1-2   Zoom Lens   (unit: mm)
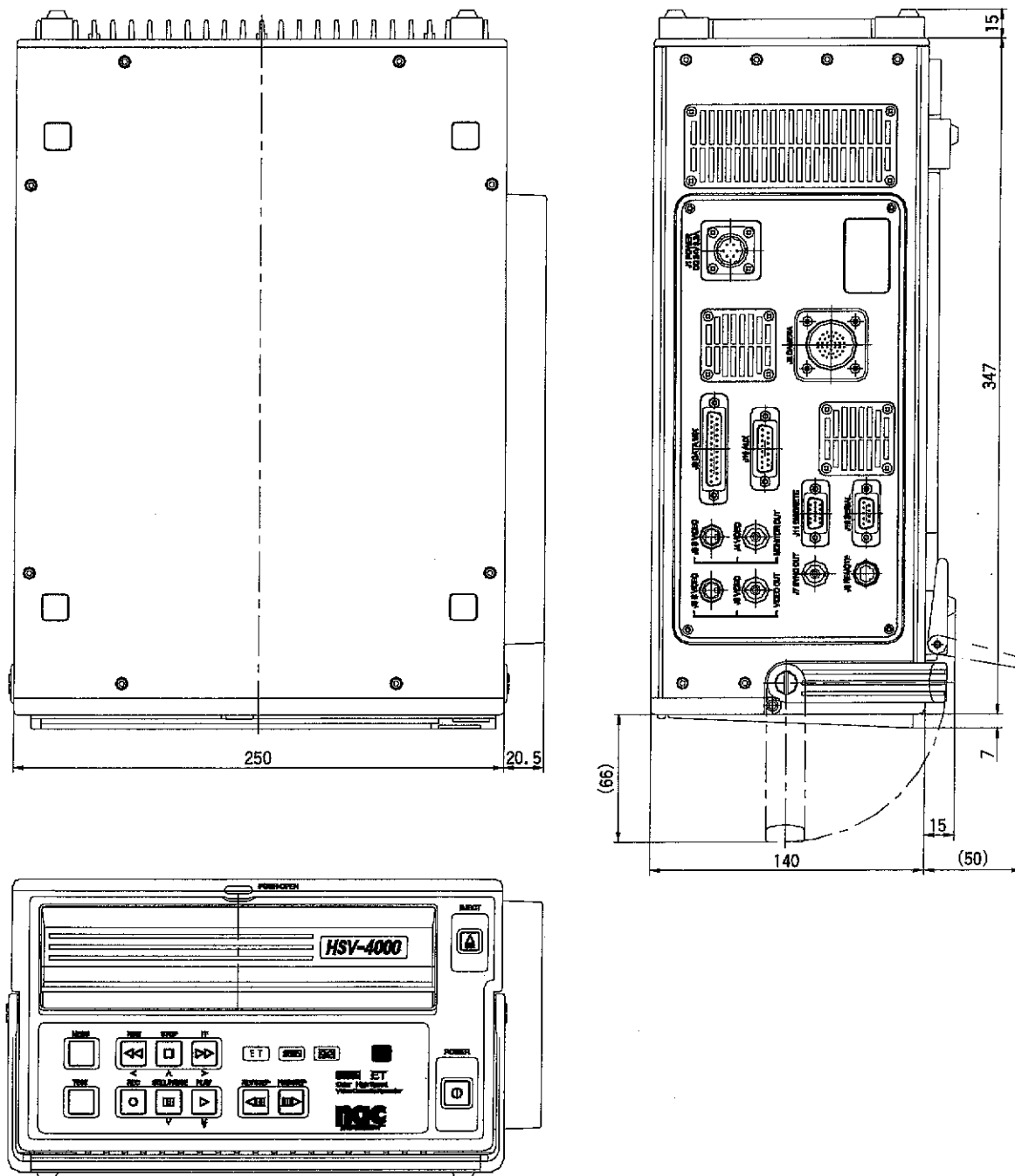
Figure 1-3   Video Cassette Recorder (VCR)   (unit: mm)

REMOTE OPERATION UNIT

12345678

MENU RESET MEMORY
EDIT ENTER CUE STOP
EJECT REC
REW STOP FF
SEARCH STILL PAUSE PLAY
REV STEP FWD STEP

STILL

CURSOR 田/囲 REF X/Y
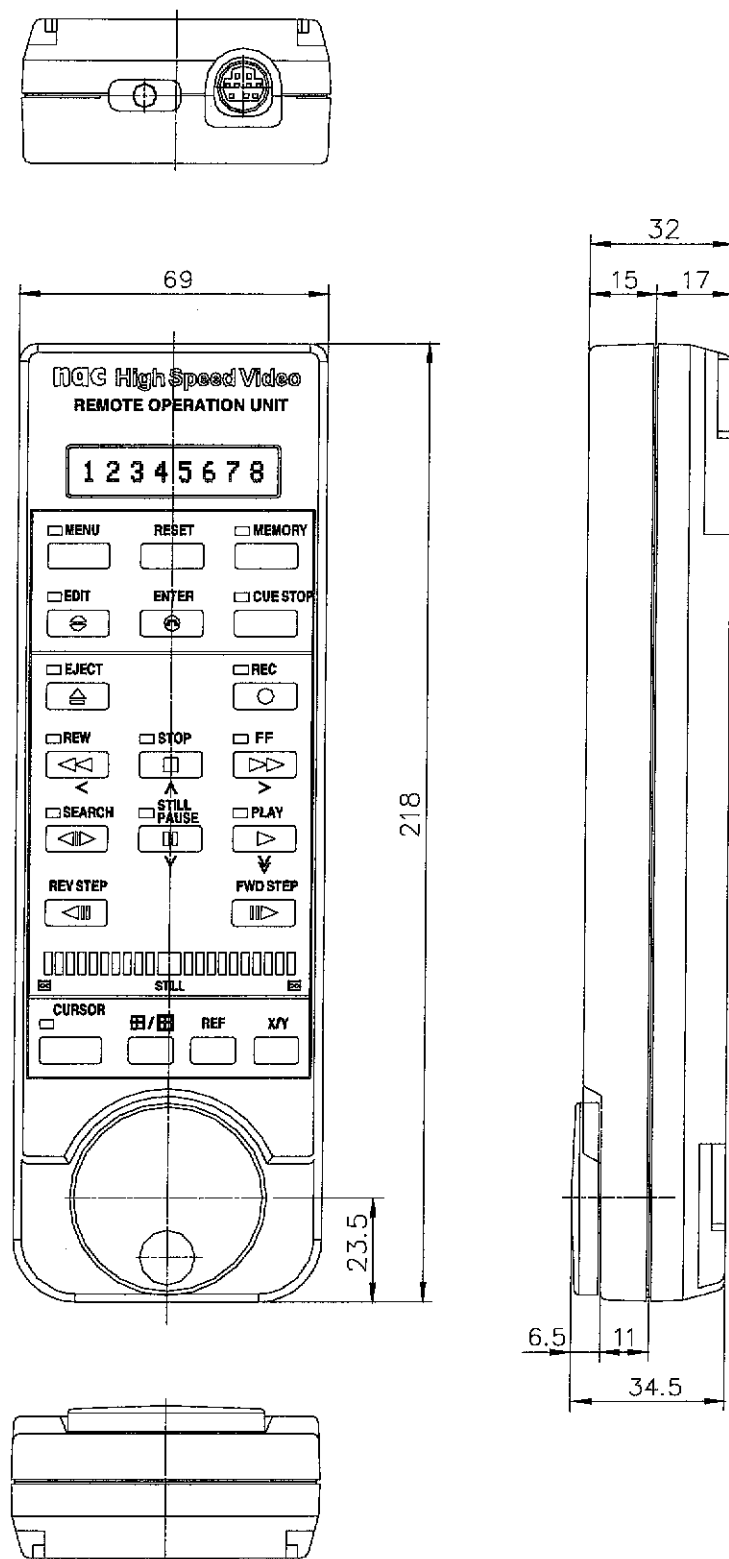
Figure 1-4   Operation Unit   (unit: mm)
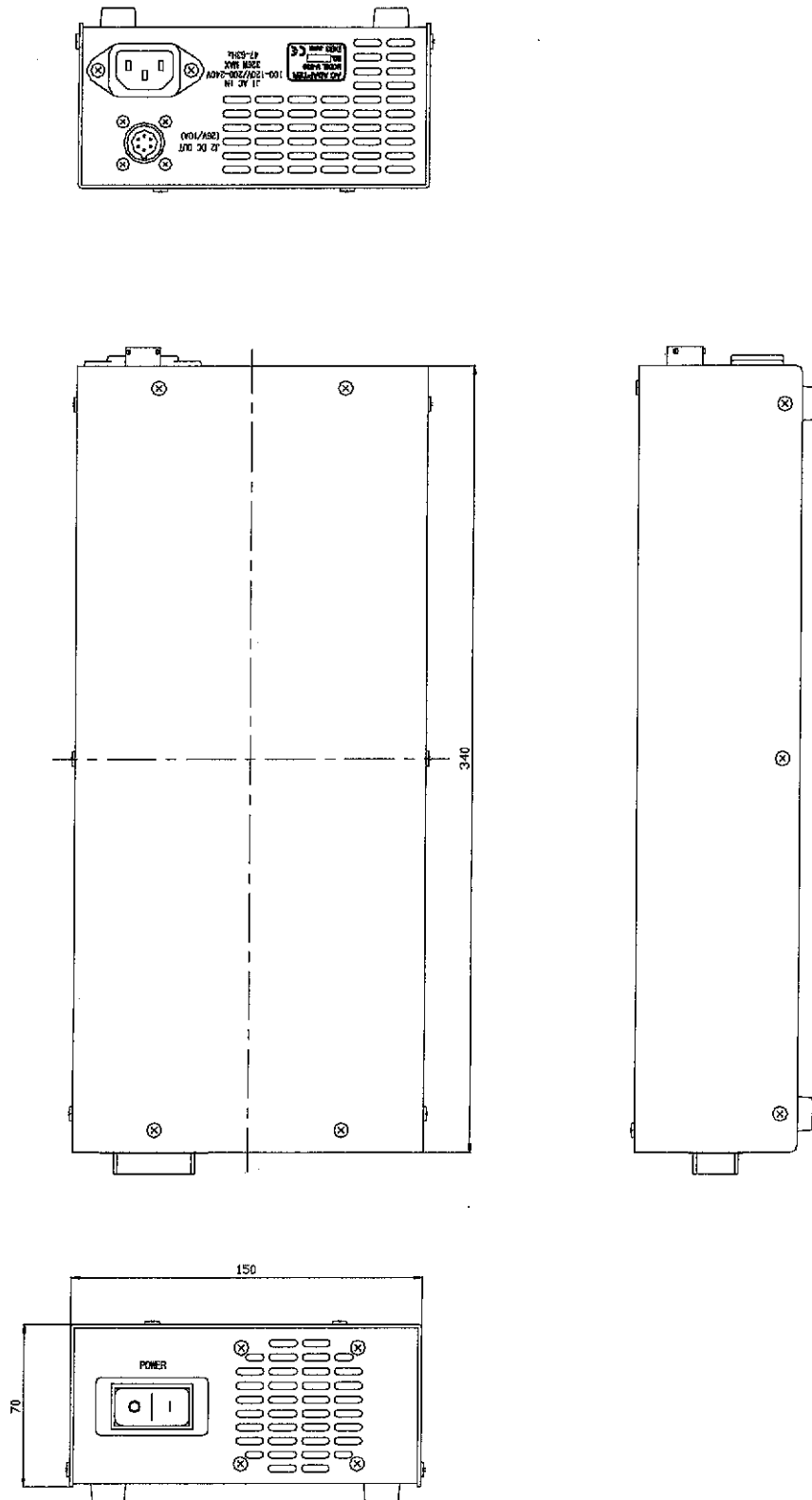
Figure 1-5   AC Adapter   (unit: mm)

VIDEO CASSETTE TAPE

The HSV-4000 system is designed for only video cassette with the S-VHS or VHS mark. The figures of "ST- or T-60," "ST- or T-120," etc. indicate the maximum recording time in minutes of the video cassette tape in the standard mode on the NTSC VHS video deck. The maximum recording time of these tapes on the high-speed VCR are about 0.06 times of the above maximum recording times.(For SE- or E-type cassette recording time is about 0.04 times)

Caution: Do not use the long recording time video tapes ST-210 and T-210 which are thinner than the above tapes.

Caution: Do not use the S-VHS-C and VHS-C tape cassettes.

Notices of handling a video cassette tape
For notices of handling a video cassette tape, see the instruction label of the cassette.

HEAD CLEANER

Note the following when using the head cleaning tape which is one of the accessories of the HSV-4000 system:
Run the head cleaning tape on the VCR at the normal playback (PLAY) speed.
Do not run the cleaning tape more than three times for one cleaning.
Be sure to check the image quality after running the cleaning tape once. When the image quality is satisfactory, the succeeding head cleaning is not required.
Never run the cleaning tape more than three times for one cleaning. For more information, see Chapter 7, "DAILY MAINTENANCE."

INTERCHANGEABILITY OF VIDEO CASSETTE TAPE

The video cassette tape recorded by the HSV-4000 can be reproduced by the HSV-500c3, HSV-500 system and the HSV-1000 system.
The video tape (cassette) recorded in the VHS mode of the HSV-4000 can be reproduced by the HSV-400 system.

Note: The XY coordinator V-78-J of the HSV-400 cannot read scene codes and time codes.

Set PB SCREEN = AUTO on the SCREEN MODE MENU page of HSV-4000 to reproduce a video cassette tape recorded by HSV-500c3 on the HSV-4000.

To reproduce a video cassette tape recorded by the HSV-400, HSV-500, HSV-1000, or ordinary video deck on the HSV-4000, set PB SCREEN = MANUAL on the SCREEN MODE MENU page and set the following as FRAME RATE:

Recording system	Recording speed	Menu setting
H S V — 4 0 0	2 0 0 pictures per sec.	1 0 0 0
	4 0 0 pictures per sec.	2 0 0 0 S
H S V — 5 0 0	2 5 0 pictures per sec.	1 0 0 0
	5 0 0 pictures per sec.	2 0 0 0 S
H S V — 1 0 0 0	5 0 0 pictures per sec.	1 0 0 0
	1 0 0 0 pictures per sec.	2 0 0 0 S
Other than HSV	— — —	1 0 0 0 or 5 0 0

Select a setting so that optimum images may be reproduced (as the setting varies according to the camera types and others).

RECORDING AND PLAYBACK SCREEN SIZES

To obtain identical recording and playback screen sizes, set "AUTO" for "PB SCREEN" on the menu.

Recording speeds and playback screen sizes
Images recorded at the speed of 2000 frames per second are reproduced about 90% or 45% in height on the monitor screen (which varies according to the menu setting).
Images recorded at the speed of 4000 frames per second are reproduced about 45% in height and about 50% in horizontally, or about 90% in height on the monitor screen (which varies according to the menu setting).

Figure 1-6   500, 1000

Figure 1-7   2000S

Figure 1-8   2000F

Figure 1-9   4000S

Figure 1-10   4000F

CHAPTER 2   COMPONENTS AND FUNCTIONS

System Components

Color Camera

Video Cassette Recorder (VCR)

VCR Operation Panel

VCR Connector Panel

Operation Unit

Operation Unit Holder

AC Adapter

Basic System Connection

SYSTEM COMPONENTS

This chapter explains components of the system and their functions.

Names of system components
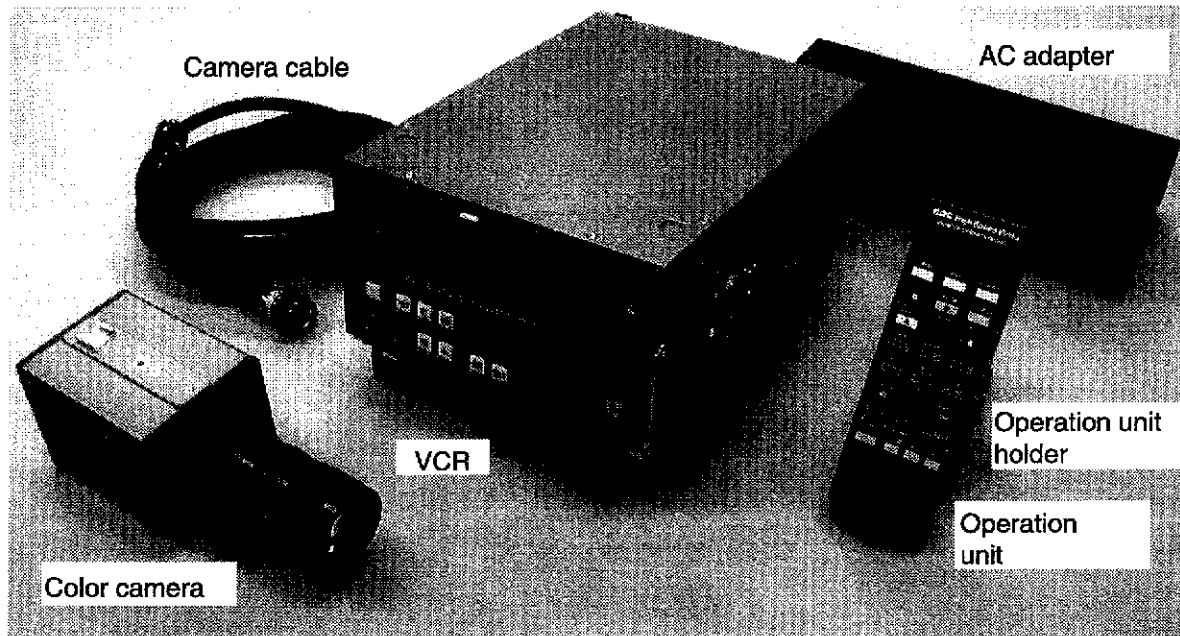
Figure 2-1   System Components
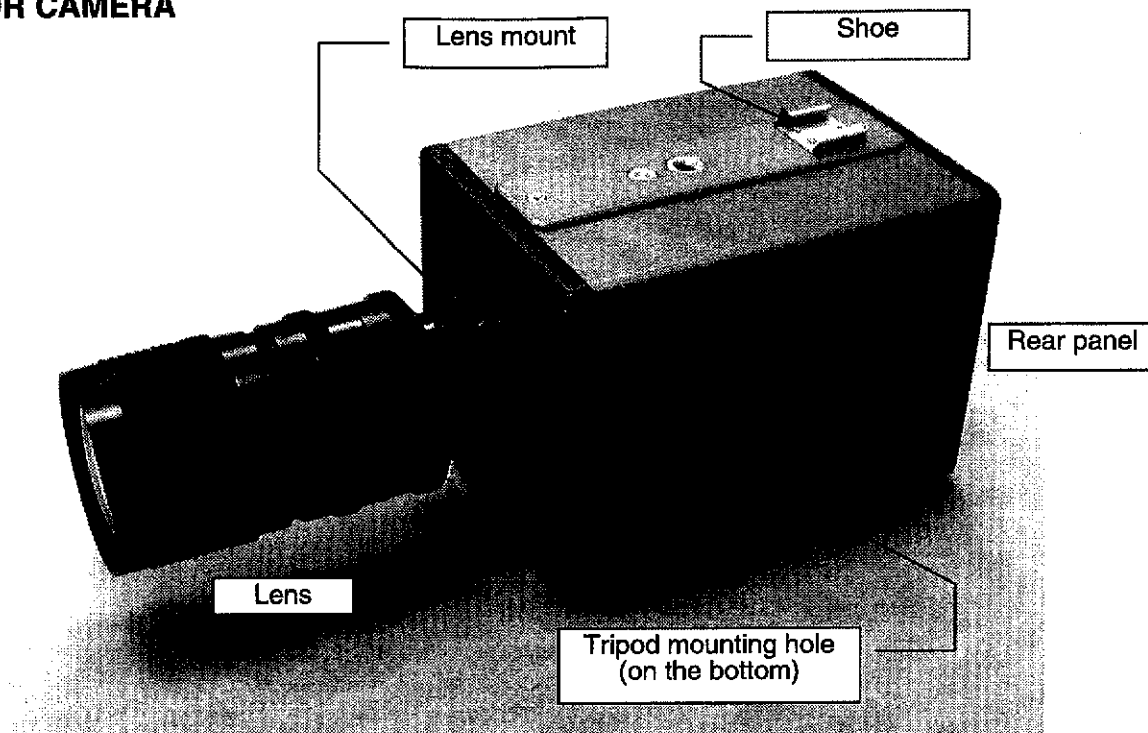
COLOR CAMERA

Figure 2-2   Color Camera

All settings of the color camera (e.g. shooting speed and shutter speed) except for manual lens adjustment (zooming, aperture control, and focusing) are made on the menu of the VCR.   Therefore, the camera has no operation panel on it.

Shoe   A viewfinder can be attached on this shoe.

Lens mount   The video lens is mounted on this mount.   Do not put anything into this opening (to protect the high-precision optical system inside the camera).

Lens   This lens assembly is of the C-mount type.

                Procedure to mount the lens assembly:
                • Turn right (clockwise) the lens assembly to mount.

Tripod mounting hole
                The camera has a tripod mounting screw hole (1/4-20 UNC screw) on each of the top and the bottom of the camera body.   Fit the screw of the camera plate of the tripod to this screw hole, fix the camera plate to the tripod firmly, then mount the camera.

REAR PANEL
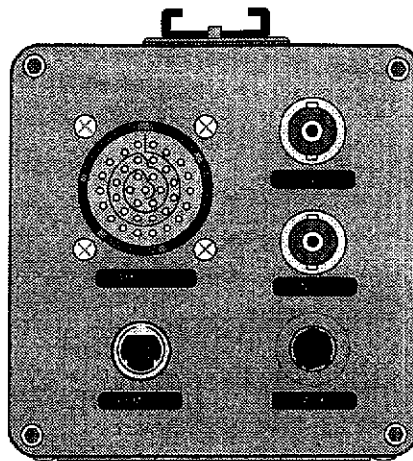
Figure 2-3   Rear Panel (Connector Panel) of the Color Camera

CAMERA OUT connector
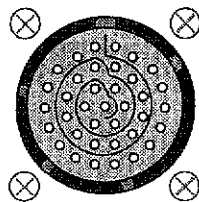
The camera cable from the J2 (CAMERA) connector on the VCR connector panel is connected to this connector. This connector receives a camera power and camera control signals from the VCR and outputs digital video signals to the VCR.

SYNC OUT connector
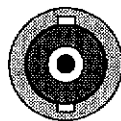
This connector outputs thr vertical sync signal. When the strobe light system is set up near the color camera, this connector is usefull. This connector is also used to output synchronization control signals to external equipment.

EVF connector

The EVF cable of the viewfinder etc is connected to this connector.

REMOTE connector

This connector is connected to the operation unit to control the HSV-4000 system.

Caution: Use the dedicated remote.

AUX connector
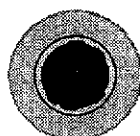
This connector has +12V DC power supply for the other equipment such as a viewfinder.

VIDEO CASSETTE RECORDER (VCR)

Cassette slot

PUSH-OPEN button

Slot Cover

Operation Panel

Hadle
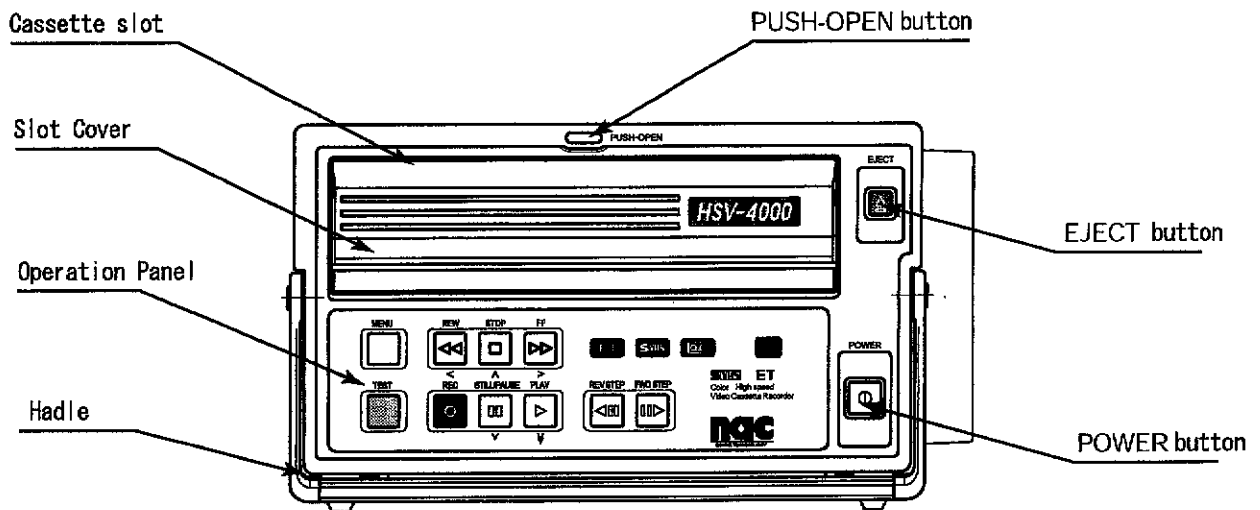
Figure 2-4 Front view of the VCR

EJECT button

POWER button

Filter (Inside)

Fan (Inside)

Filter (Inside)

Fan (Inside)

Filter (Inside)

Fan (Inside)

Connector panel
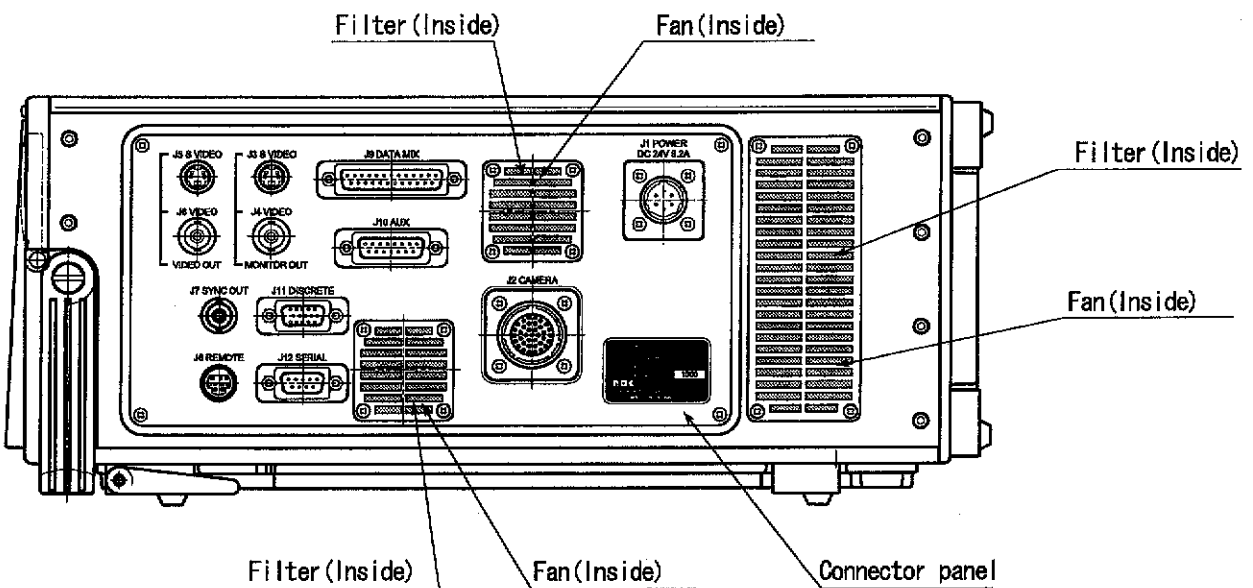
Figure 2-5 Right view of the VCR

FRONT PANEL

POWER button

This switch turns on and off power of the VCR. Each time this switch is pressed, power is turned on and off alternately. This button also works as a main power switch for the HSV-4000 system.

While the VCR is powered on (that is, while a DC voltage is supplied to the J1 (POWER) connector), the system control block of the VCR and the RS-232 interface block of the J12 (SERIAL) connector work independently of the on/off status of the POWER button.

EJECT button

This button is used to eject the tape cassette from the VCR. When you press this button, the cassette door of the cassette slot opens and the tape cassette comes out automatically.

PUSH-OPEN button
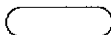
This button is used to open the cassette door of the VCR.

Cassette door

This door protects the inside of the VCR from dirt, dusts, and other contaminants and also prevents electromagnetic troubles. This cover must always be closed except when you load or unload the tape cassette.

Cassette slot

A tape cassette is loaded or unloaded through this slot.

VCR OPERATION PANEL
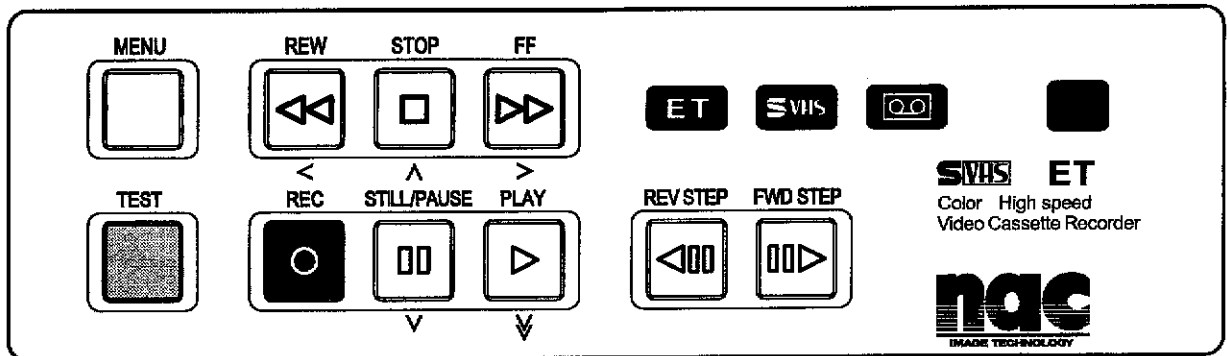
Figure 2-6   Operation Panel

MENU button

MENU

This button turns on and off the Menu Set mode.   When the Menu Set mode is turned on, the indicator of this button lights. In the Menu Set mode, only MENU related buttons (MENU, STOP, STILL/PAUSE, FF, REW, and PLAY) are available on the operation panel.

Note: To return to VCR operations, quit the Menu Set mode.

REW (Rewind) button

REW

This button is used to rewind the tape at a high speed.   When you press this button, rewinding starts and its indicator lights. During this fast rewinding, no play-back image is visible.   When this button is pressed in the PLAY mode, the tape is fast rewound with images displayed on-screen (Fast Backward Search mode).

When the beginning of the tape (BOT) reaches, the rewinding stops automatically, and the indicator of the REW button goes off.   To stop rewinding halfway, press the STOP button or use the Cue Stop function. When the REW button is pressed, the Cue Stop function is turned off forcibly. When the REW button is pressed again during rewinding or Fast Backward Search mode, the Cue Stop function is turned on.

When this button is pressed in the Menu Set mode, the preceding set value is called back.

STOP button

STOP

This button is used to stop the current tape movement or to reset an alarm.

When this button is pressed in the Menu Set mode, the preceding menu item is called back.

FF (Fast Forward) button

FF

This button is used to feed the tape forward at a high speed. When you press this button, fast-forwarding starts and its indicator lights.   During this fast forwarding, no play-back image is visible.   When this button is pressed in the PLAY mode, the tape is fast forwarded with images displayed on-screen (Fast Forward Search mode).

When the end of the tape (EOT) reaches, the fast forwarding stops automatically, and the indicator of the FF button goes off. To stop fast forwarding halfway, press the STOP button or use the Cue Stop function.

When the FF button is pressed, the Cue Stop function is turned off forcibly. When the FF button is pressed again during fast forward or Fast Forward Search mode, The Cue Stop function is turned on.

When this button is pressed in the Menu mode, the next set value is called back.

TEST button

TEST

This pushbutton switch is used to cause the VCR to test its recording and playback functions. After setting a video cassette tape in the VCR, keep on pressing the TEST button more than one second . The VCR automatically records the internal color bar signal for two seconds, reproduces this recorded signal, and displays a message indicating the test result on the screen.

Caution: Do not use a video tape whose recorded data should be archived.

REC button

REC

This button is used to start recording. When this button is pressed, the VCR starts recording. The indicator of this button is on during recording. Press the STOP button to stop recording. You can record a cue signal on the tape by pressing the REC button any time when recording.

STILL/PAUSE button

STILL/PAUSE

V

This button is used to reproduce a still image or pause recording. When you press the STILL/PAUSE button in the PLAY mode, its indicator lights and the running playback images stop. The image on-screen is stationary. (Still playback) The indicator of this button lights also in search playback.

When you press the STILL/PAUSE button in the RECORD mode, its indicator lights and the VCR pauses recording. When you press the STILL/PAUSE button again, the VCR restarts recording.

When this button is pressed in the Menu mode, the next menu item is called.

PLAY button

PLAY

This button is used for normal playback of video images. When you press this button, the VCR runs the video tape forward at a preset speed for reproduction of images. To stop normal playback, press the STOP button.

When this button is pressed in the Menu mode, the next menu page is called.

REV STEP button

REV STEP

This button is used to call back previous still picture on the screen in the still playback. Each time you press this button, next still picture in reverse direction is called back and displayed.

When you keep on pressing this button more than one second, the VCR enters the Backward Search playback. The longer you keep on pressing this button, the faster becomes the backward searching. (This is equivalent to turning left the dial on the operation unit.)

FWD STEP button

FWD STEP

This button is used to call next still picture on the screen in the still playback. Each time you press this button, next still picture in forward direction is called and displayed.

When you keep on pressing this button more than one second, the VCR enters the Forward Search playback. The longer you keep on pressing this button, the faster becomes the forward searching. (This is equivalent to turning right the dial on the operation unit.)

S-VHS indicator

This indicator lights while the VCR is in the S-VHS mode. (This indicator also lights when a video cassette tape is not in the VCR).

Cassette indicator

This indicator lights while a video cassette tape is in the VCR.

S-VHS ET indicator

This indicator lights while S-VHS ET mode is selected.

ET

VCR CONNECTOR PANEL (SIDE PANEL)
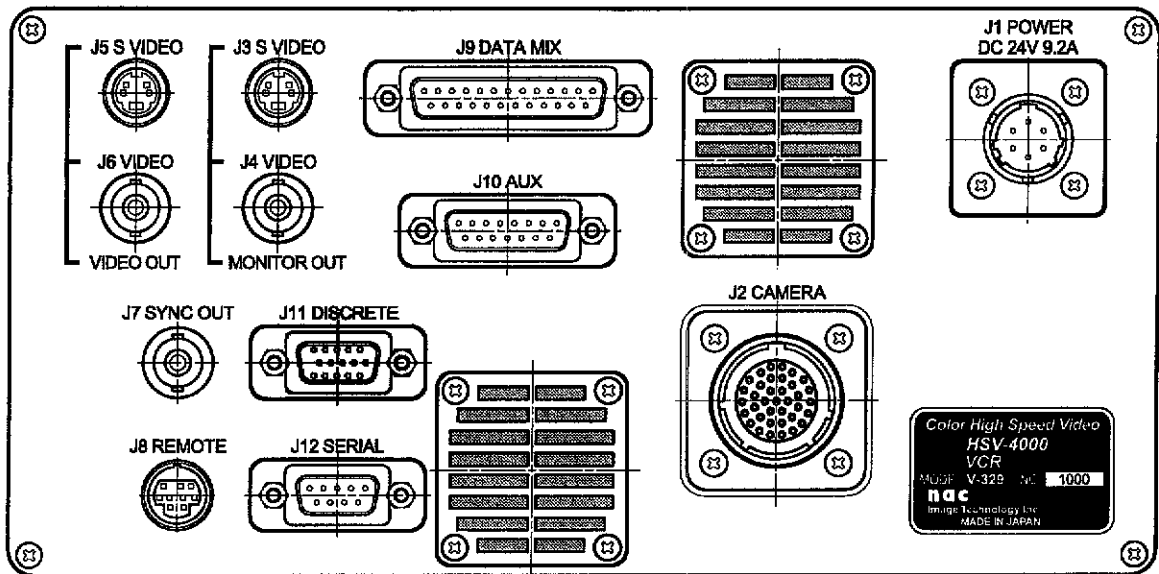
Figure 2-7   Connector Panel

J1 (POWER) connector
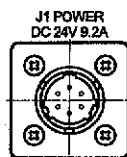
This connector inputs power for the VCR. Be sure the DC power voltage is 20C to 32VDC.

J2 (CAMERA) connector
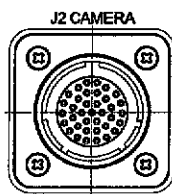
This connector is connected to the color camera with the camera cable.

J3 (S VIDEO) connector (MONITOR OUT side)

This connector outputs a Y/C separation video signal to a video monitor having a Y/C separation video signal input. This connector is connected to the video monitor with the video cable. The on-screen display is added to this output.

J4 (VIDEO) connector (MONITOR OUT side)

This connector outputs a VBS video signal to a video monitor having a VBS video signal input. This connector is connected to the video monitor with the coaxial cable. The on-screen display is added to this output.

J5 (S VIDEO) connector (VIDEO OUT side)

This connector outputs a Y/C separation video signal to a video monitor having a Y/C separation video signal input. This connector is connected to the video monitor with the video cable. The on-screen display is not added to this output.

J6 (VIDEO) connector (VIDEO OUT side)

This connector outputs a VBS video signal to a video monitor having a VBS video signal input. This connector is connected to the video monitor with the coaxial cable. The on-screen display is not added to this output.

J7 (SYNC OUT) connector

This connector outputs thr vertical sync signal. When the strobe light system is set up near the color camera, this connector is usefull. This connector is also used to output synchronization control signals to external equipment.

J8 (REMOTE) connector

This connector is connected to the operation unit.
Use the Parallel Interface cable to connect the optional parallel interface unit to this connector.

J9 (DATA MIX) connector

When the HSV-4000 system uses a wave inserter (optional), this connector is connected to the wave inserter with the Data Mix cable.

J10 (AUX) connector

This connector is connected to the optional synchronizer unit with the AUX cable. This connector is also used to externally control the display of scene codes and time values.

J11 (DISCRETE) connector

This connector is connected to a contact signal and a TTL signal to control the VCR.

J12 (SERIAL) connector

This RS-232 serial interface connector is connected to a personal computer or a terminal to let it control the HSV-4000 system.

Air filter

The VCR has three air filters on right side of the VCR.

OPERATION UNIT

The operation unit enables you to remotely perform almost all VCR operations (excluding turning on/off power of the VCR and loading a tape cassette). With the operation unit holder (provided as standard), the operation unit can be fixed to the tripod or a table.
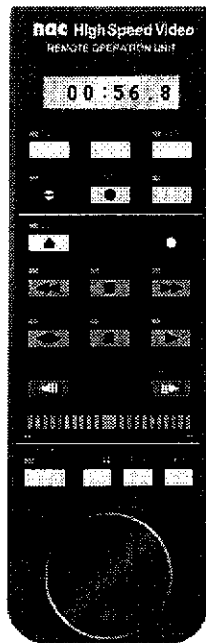
Figure 2-8   Operation Unit

COUNTER display

This 7-segment light-emitting-diode (LED) display unit shows a lap time or a menu number.   This display unit also displays the tape status or part of the VCR operation.

Note: The indicators do not light while wireless operation.

-59:59.9 to 59:59.9:	Shows a lap time count.
00-00 to 99-99:	Shows a menu number.
START/XXXX:	Indicates that the tape is at beginning.
END /XXXX:	Indicates that the tape is at end.
DEW:	Indicates that a condensation is detected in the VCR. "DEW" disappears when the condensation disappears. Wait until "DEW" disappears.
ALARM:	Appears when a VCR trouble occurs. Press STOP button to reset the alarm. If this message remains after restart VCR or change cassette, the VCR may be broken. Call your local distributor.

MENU button

MENU

Each time this button is pressed, the normal mode and the Menu set (MENU) mode is set alternately. When the MENU mode is set, the indicator above this button lights.

Note: Be sure to exit the Menu mode before performing a VCR operation.

RESET button

RESET

This button is used to reset the lap time counter to 0.

MEMORY button

MEMORY

Each time this button is pressed, the memory function is enabled (ON) and disabled (OFF) alternately. When the memory function is enabled (ON), the indicator of this button lights. The memory function automatically stops the running of the tape when the count on the counter reaches 0 in a FF or REW operation.

EDIT button

EDIT

This button is used to start edit playback. When this button is pressed, its indicator lights and edit playback starts. In the edit playback mode, you can record cue signals anywhere on the tape while monitoring images (by pressing the ENTER button). This edit playback erases the old cue signals recorded on the tape.
The tape speed for the edit playback is the same as that for the normal playback.
To stop edit playback, press the STOP button.

ENTER button

ENTER

This button is used to record a cue signal on the tape. This button is available during recording or edit playback. Each time the ENTER button is pressed, a cue signal is recorded on the tape.

CUE STOP button

CUE STOP

Each time this button is pressed, the Cue Stop function is enabled (ON) and disabled (OFF) alternately. When the Cue Stop function is enabled (ON), the indicator over this button lights. The Cue Stop function automatically stops the fast forward, rewinding or fast search movement of the tape at a cue signal.

EJECT button

EJECT

This button is used to eject a tape cassette from the VCR. When this button is pressed, the indicator over this button lights (regardless of whether a tape cassette is in the VCR) and the tape cassette (if any) is ejected. The EJECT button is locked during recording or playback.

REC buttons

REC

This button is used to start recording. The REC indicator is on while recording is in progress.
To stop recording, press the STOP button.

REW (Rewind) button

▨ REW

◀◀

<

This button is used to rewind the tape. When this button is pressed, the indicator over the button lights and rewinding starts. No reproduced image appears on screen while rewinding is in progress. To stop rewinding halfway, press the STOP button or use the Cue Stop function or the Memory function.

When the REW button is pressed in the PLAY operation, the tape is rewound fast with images on the screen. (Backward Fast Search playback). Rewinding stops and the REW indicator goes off when the beginning of the tape reaches. To stop rewinding halfway, press the STOP button or use the Cue Stop function.

You can skip cue signals by pressing the REW button with the Cue Stop function enabled (ON) during rewind or backward fast search playback. You can skip the cue signals (up to eight cue signals) as many as the number of times by which the REW button is pressed.

When the REW button is pressed more than 1 second and then released, the Fast Search mode is set and the image at which the REW button is released is stationary.

In the Menu mode, this button is used to call a preceding setting item.

STOP button

▨ STOP

■

∧

This button is used to stop the current tape movement in progress. This button is also used to reset an alarm or the Battery Monitor function.

In the Menu mode, this button is used to call a preceding menu item.

FF (Fast Forward) button

▨ FF

▶▶

>

This button is used to forward the tape at a high speed. When this button is pressed, fast forwarding starts and the indicator over this button lights. No reproduced image is visible on the screen during fast forwarding. To stop fast forwarding halfway, press the STOP button or use the Cue Stop function or the Memory function.

When the FF button is pressed in the PLAY operation, the tape is forwarded fast with images on the screen. (Forward Fast Search playback). Fast forwarding stops and the FF indicator goes off when the end of the tape reaches. To stop fast forwarding halfway, press the STOP button or use the Cue Stop function.

You can skip cue signals by pressing the FF button with the Cue Stop function enabled (ON) during fast forward or forward fast search playback. You can skip the cue signals (up to eight cue signals) as many as the number of times by which the FF button is pressed.

When the FF button is pressed more than 1 second and then released, the Fast Search mode is set and the image at which the FF button is released is stationary.

In the Menu mode, this button is used to call a next setting item.

SEARCH button

SEARCH

This button enables search playback. When this button is pressed, the SEARCH indicator and the STILL LED (in the center of the speed indicator) lights. (The image on-screen is stationary when the SEARCH button is pressed.) Turn right or left the speed control dial. search playback starts.

In search playback, you can get ten searching speeds by turning the dial. The tape runs forward when you turn right the dial or backward when you turn left the dial. The speed of reproduction is indicated by the number of LEDs which are on in the speed indicator.

STILL/PAUSE button

STILL PAUSE

V

This button is used to reproduce a still image or pause recording. When you press this button in the normal (PLAY) or search playback, the current moving image becomes stationary. The indicator over this button lights and the STILL LED (in the center of the speed indicator) flashes.

When this button is pressed in recording, the STILL/PAUSE indicator lights and recording pauses.
When this button is pressed again, the preceding operation (PLAY or RECORD) restarts.
In the Menu mode, this button is used to call a next menu item.

Note: **When the STILL/PAUSE button is pressed in the search playback to make images stationary, then pressed again to return to the search playback, the images still remain stationary and the reproduction at the previous tape speed is not performed. This button is not effective while the tape is not running (or while the STOP indicator is on). Namely, still playback is not performed.**

PLAY button

PLAY

V

This button is used for normal playback of video tape. When this button is pressed, the indicator over this button lights and the VCR runs the tape forward at a fixed speed. To stop normal playback, press the STOP button.

In the Menu mode, this button is used to call the next menu page.

REV STEP (Reverse Step) button

REV STEP

This button is used to call one preceding still picture in the still playback. Each time you press this button, the older pictures are called in sequence.

FWD STEP (Forward Step) button

FWD STEP

This button is used to call one next still picture in the still playback. Each time you press this button, the succeeding pictures are called in sequence.

CURSOR button

CURSOR

This button enables XY cursor function. Each time this button is pressed, the cursor function is enabled (ON) and disabled (OFF) alternately. When the cursor function is enabled (ON), the indicator over this button lights.

CURSOR INDICATOR button

This button enables to change the XY cursor indicators black or white alternately, when the cursor function is ON.

CURSOR REFERENCE button

REF

This button enables to switch the cursor's coordinate value to absolute coordinate mode or relative coordinate mode. In case of relative coordinate mode, the origin of coordinate is set when the button is pressed.

CURSOR X/Y button

X/Y

This button is to select X-axis cursor or Y-axis cursor.

Speed indicator

STILL

This indicator shows the search playback speed of the tape. The indicators to the right of the STILL LED (in the center of the indicator) turn on to show the tape speed in the forward direction and the indicators to the left of the STILL LED turn on to show the tape speed in the backward direction. The number of indicators which are on varies to indicate the current tape speed. The STILL LED is on during search-reproduction and flashes during Play Still or Search Still operation which enables jog playback.

For tape of 4000 frames per second, the indicators respectively represent tape speeds of 4, 8, 15, 30, 60, 120, 240, 480, 1200, and 4000 pictures per second (from the STILL LED to the leftmost or rightmost LED). For tape of 2000 frames per second, the indicators respectively represent halves of the above tape speeds. Similarly, for tape of 1000 frames per second, the indicators respectively represent one fourth of the above tape speeds. For tape of 500 frames per second, the indicators respectively represent one eighth.

Control dial
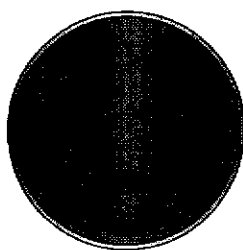
This dial is used to change the running direction and speed of tape in search or jog playback. Turn right the dial to run the tape forward (FWD) or left the dial to run the tape backward (REV).

In search direction, the turning position of the dial indicates the running speed of the tape in search playback. Even when you release the dial, the tape keeps on running at the speed corresponding to the dial position. The tape speed in search playback is indicated by the speed indicator. In jog playback, the further you turn the dial, the faster the tape runs. When you stop turning the dial, the running image stops on the screen.

When the CURSOR function is ON, this dial is used to move the cursors.

BATTERY replacing

In case of wireless operation, the batteries in the operation unit are consumed. Replace the batteries when the wireless operations do not work (as shown in Figure 2-9).

Remove the two screws on the bottom cover to take up the two batteries. Be sure that the polarity are correct, and install new batteries.

Batteries: UM-3 AA-size Alkaline

Screws   Battery Cover   Polarity
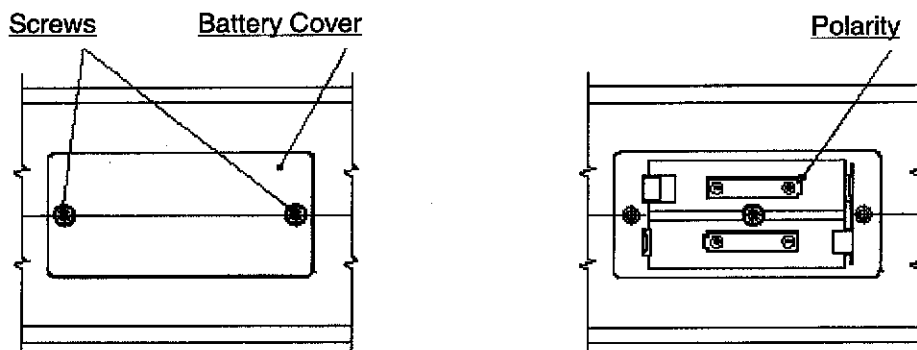
Figure 2-9

OPERATION UNIT HOLDER

The operation unit holder is used to fix the operation unit to the tripod or table.

Figure 2-10

Use of the operation unit holder:

Let the holder grip the stable rigid part of the tripod or table and make sure that the holder is securely fastened.

Loosen the lock screw under the bracket, orient the bracket so that you can easily access the operation unit on the bracket, then tighten the lock screw.

Place the operation unit on the bracket and slide it downward until the bracket is caught by the groove of the operation unit.

To detach the operation unit from the bracket, slide up the operation unit. It comes off easily.

AC ADAPTER

In addition to this manual, read attached AC Adaptor's operation manual (800016).

J1 AC input connector

Plug one end of the AC power cable to this connector and the other end of the cable to the power outlet. Make sure that the AC input voltage and the frequency are in the specified ranges.

J2 DC output connector

Plug this connector to the J1 (POWER) connector (receptacle) of the VCR.

Power switch

Push "|" to turn on, push "O" to turn off.

Fan and ventilation slits

These are provided to cool the AC adapter. The fan rotates during the power is on.
Do not block the ventilation slits.

Caution: This AC adapter is dedicated for this system only. Do not use the AC adapter for the other purpose.

BASIC SYSTEM CONNECTION

Connect the components of the HSV-4000 system as shown below before connecting the AC power supply to the system.


```
                              DC Power Cbale  ┌──────────────┐
                          J1                  │  AC Adapter  │──[plug]
                POWER     ┤                    └──────────────┘   AC Power Cable

                          J2        Camera Cable        ┌─────────┬──────┐
                CAMERA    ┤                         ─────│ Camera  │ Lens │◄
                                                         └─────────┴──────┘
                          J3        Video Cable
                S VIDEO   ┤
                          J4
                VIDEO     ┤                              Monitor
                          J5                       ┌──────────────┐
                S VIDEO   ┤                         │              │
                          J6                        │              │
                VIDEO     ┤                         └──────────────┘──[plug]
          VCR
                          J7
                SYNC OUT  ┤
                          J8
                REMOTE    ┤          Operation Cable   ┌────────────────┐
                                                        │ Operation Unit │
                          J9                            └────────────────┘
                DATA MIX  ┤
                          J10
                AUX       ┤
                          J11
                DISCRETE  ┤
                          J12
                SERIAL    ┤
```
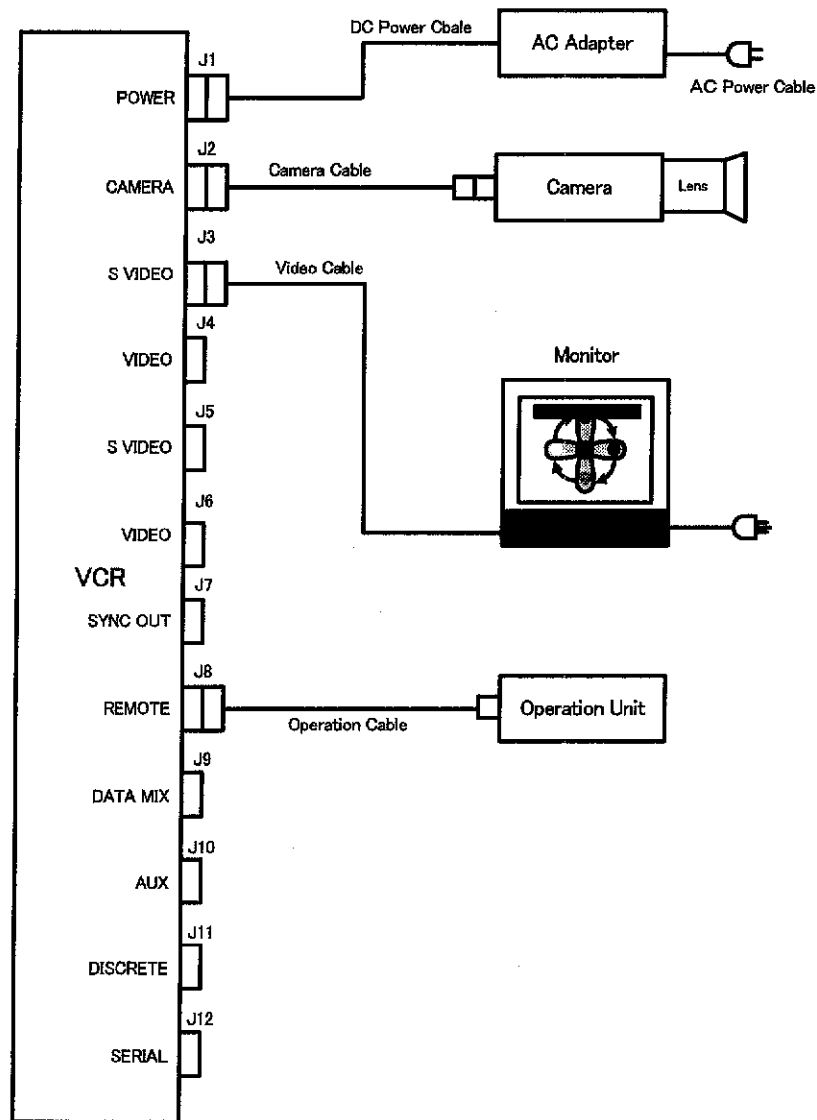
Figure 2-11   Basic System Connection

⚠ **Caution: Fix the color camera on the tripod before starting the above connection so that it may not fall by an unexpected tension.**

⚠ **Caution: Before connecting or disconnecting cables, be sure to turn off the power switch and disconnect power supplies (AC adapter or battery).**

CHAPTER 3   MENU SETTING

Starting and Ending Menu Setting

Buttons for Menu Operation

Menu Page Configuration

List of Menu Items

STARTING AND ENDING MENU SETTING

All settings of this HSV-4000 system are made through menus.
The contents of menu settings are stored by C-MOS memory IC and will not be cleared when the VCR is powered off.

Press the MENU button on the operation panel of the VCR or the MENU button of the operation unit. The Menu Set mode is turned on and a menu is displayed on the screen of a monitor connected to the VCR (by J3 and J4 (MONITOR OUT) connectors).

To exit the Menu Set mode, press the MENU button once more. You can start and end a menu setting any time while the system is powered on.

Note: **Menu setting data will not be output through the J5 and J6 (VIDEO OUT) connectors.**

BUTTONS FOR MENU OPERATION

In the Menu Set mode, tape operation buttons are used for menu setting. (The buttons on the operation panel of the VCR are functionally the same as those on the operation unit.) Each button has its operation name over it and its menu control symbol under it.

Operation name	Menu control symbol	Function
P L A Y	$\Downarrow$	Change menu pages.
S T O P	$\wedge$	Call a preceding menu item.
S T I L L／P A U S E	$\vee$	Call a next menu item.
F F	$>$	Call the next setting data.
R E W	$<$	Call the preceding setting data.

Changing menu pages

The VCR has eight menu pages. These menu pages are arranged in a loop and displayed in sequence each time the PLAY button is pressed.

Selecting a menu item in a menu page

Use the STOP button or the STILL/PAUSE button to select a menu item in a selected page. A ">" mark is placed before a selected menu item.

When you press the STOP button while the ">" mark is placed before the top item on the page, the preceding page is called and displayed and the ">" mark is placed before the bottom item on the new page.

When you press the STILL/PAUSE button while the ">" mark is placed before the bottom item on the page, the next page is called and displayed and the ">" mark is placed before the top item on the new page. You can see that the menu items are arranged in a loop.

Changing setting values

Use the FF button or the REW button to change the value of the selected menu item. Values (data) of each menu item are also arranged in a loop. Each time you press the FF button, the succeeding value is called and displayed. Similarly, each time you press the REW button, the preceding value is called and displayed.

Menu display on the operation unit

In the Menu mode, the counter field of the operation unit shows a menu item number and a set value. You can perform menu settings, using this counter field. (This is helpful when the monitor screen and the viewfinder is not near at hand.) A menu item number and a value are respectively given by the leading two digits and the trailing two digits on the counter field.

PAGE CONFIGURATION

The VCR has a total of eight menu pages as shown below. The name of a selected menu page is given on the first line on the screen.

(1) SCREEN MODE MENU page (Menu No.01 to Menu No.06)
This page is used to set a recording speed (picture rate), a picture size and a message to be displayed on-screen.

(2) CAMERA MENU page (Menu No.07 to Menu No.13)
This page is used to set camera-related conditions.

(3) CHARACTER MENU page (Menu No.14 to Menu No.29)
This page is used to set characters recorded on tape.

(4) RECORD MENU page (Menu No.30 to Menu No.34)
This page is used to set recording-related conditions.

(5) PLAYBACK MENU page (Menu No.35 to Menu No.38)
This page is used to set playback-related conditions.

(6) FREEZE MENU (Menu No.39 to Menu No.40)
This page is used to set freeze images.

(7) SERVICE SW MENU page (Menu No.41 to Menu No.46)
This page is used to set the other items.

(8) SYSTEM INFORMATION page
This page shows system-related information and has no setting item.

LIST OF MENU ITEMS

Each menu item (parameter) is assigned a 2-digit number for identification which is enclosed in parentheses in the description below. A 4-digit number including a menu item number (parameter number) and a set number (parameter value) is displayed in the counter field of the operation unit.

SCREEN MODE MENU page

(01) FRAME RATE (Frame rate, Recording speed, or Playback screen mode)

Set:		Set No. :	Default: 1000
	500	00	
	1000	01	
	2000S	02	
	2000F	03	
	4000S	04	
	4000F	05	

Explanation : This parameter specifies recording speed and picture size.
- 500: 500 pictures /second, full size (100%)
- 1000: 1000 pictures /second, full size (100%)
- 2000S: 2000 pictures /second, half size (approx. 45%)
- 2000F: 2000 pictures /second, full size (approx. 90%)
- 4000S: 4000 pictures /second, quarter size (approx. 45% vertically, approx. 50% horizontally)
- 4000F: 4000 pictures /second, full size (approx. 90%)

Specify this parameter when the parameter (02) PB SCREEN is "00" (Manual) in the playback mode.

(02) PB SCREEN (Playback screen)

Set:		Set No. :	Default : Auto
	Manual	00	
	Auto	01	
	Shrink	02	

Explanation : This parameter specifies the change of playback screen modes.

AUTO: Automatically changes the picture rate and the screen size according to the information recorded on the tape (digital data in vertical blanking). This function is valid for tapes recorded by this HSV-4000 system or HSV-500c3 system.

When a tape recorded by the other system is used or information recorded on the tape cannot be read, or when this parameter is set to "00" (Manual), specify the parameter (01) FRAME RATE.

Shrink mode is selectable only when the Frame Rate is set 2000F. This is used in case of the information recorded by HSV-500c3 at 500F mode cannot be read by this HSV-4000 system.

(03) TC DISPLAY (Time code display)

Set:	OFF	Set No. : 00	Default : OFF
	ON	01	

Explanation : This parameter enables (ON) or disables (OFF) the function of displaying a scene code and a time code on-screen.

(04) DATE DISPLAY

Set:	OFF	Set No. : 00	Default : OFF
	ON	01	

Explanation : This parameter enables (ON) or disables (OFF) the function of displaying the date and the time on-screen.

(05) MODE DISPLAY

Set:	OFF	Set No. : 00	Default : OFF
	ON	01	

Explanation : This parameter enables (ON) or disables (OFF) the function of displaying the VCR mode and the lap time count on-screen.

(06) RATE DISPLAY

Set:	OFF	Set No. : 00	Default : OFF
	ON	01	

Explanation : This parameter enables (ON) or disables (OFF) the function of displaying the recording speed and the shutter speed on-screen.

Note: **The above on-screen functions mix a message with a video signal output to the monitor to superimpose the message on the image on-screen. This message is not recorded on the tape.**

CAMERA MENU page

(07) SHUTTER

Set:	OPEN	Set No. : 00	Default : OPEN
	1/1000	01	
	1/2000	02	
	1/5000	03	
	1/10000	04	
	1/20000	05	
	1/50000	06	
	1/100000	07	
	1/200000	08	

Explanation : This parameter specifies the shutter speed of the electronic shutter of the color camera. "OPEN" can be 1/4000, 1/2000, or 1/1000 second according to a recording speed.
The shutter speed below frame rate cannot be set up.
1/100000 is available when the frame rate is set 1000 pictures /second or higher rate. 1/200000 is available only when the frame rate is set 4000 pictures /second.

(08) GAIN

Set:	0dB	Set No. : 00	Default : 0dB
	3dB	01	
	6dB	02	

Explanation : This parameter adjusts the sensitivity of the color camera. Usually, this parameter is "00" (0dB). When the illumination is not enough, set "01" (3dB) or "02" (6dB) to increase the sensitivity. In this case, however, noises increase on screen.

(09) WHITE BALANCE

Set:	AUTO	Set No. : 00	Default : AUTO
	HOLD	01	
	3200	02	
	5000	03	
	9000	04	

Explanation : This parameter adjusts the white balance of the color camera.
Usually, this parameter is "00" (AUTO). When this parameter is set to "01" (HOLD) while a white object (e.g. white paper sheet) is shot in the AUTO mode white balance mode, the current white balance is set. When the color temperature of lighting is 3200K, 5000K, or 9000K, select "02" (3200), "03" (5000), or "04" (9000) respectively.

(10) ENHANCE

Set: OFF   Set No. : 00   Default : LOW
                LOW   01
                HIGH   02

Explanation : This parameter sets the degree of enhancement of profiles in a picture taken by the color camera. "00"(OFF) gives no enhancement. "01"(LOW) gives low enhancement and "02"(HIGH) gives high enhancement.

(11) GAMMA

Set: OFF   Set No. : 00   Default : NORMAL
                NORMAL   01

Explanation : This parameter sets a gamma (the degree of contrast) in a picture taken by the color camera. "01"(NORMAL) is a standard gamma of the normal video camera. "00"(OFF) (about 1 gamma) makes the dark part darker.

(12) KNEE

Set: OFF   Set No. : 00   Default : NORMAL
                NORMAL   01

Explanation : The knee function enlarges an intensity range by compressing white levels greater than a preset intensity. "01"(NORMAL) enlarges the intensity range. "00"(OFF) does not enlarge the intensity range. The white level greater than a preset intensity is saturated.

(13) CAMERA SELECT

Set: 1   Set No. : 01   Default : 1

Explanation : This parameter is not available for this system.

CHARACTER MENU page

(14) CHARACTER

Set: OFF   Set No. : 00   Default : ON
            ON   01

Explanation : This parameter enables (ON) or disables (OFF) superimposition of characters on camera images. "00"(OFF) does not superimpose characters on camera images. "01"(ON) superimposes characters on camera images and records the characters on tape.
This setting does not affect recording of digital data in the vertical blanking.
When this parameter is set to "OFF" for the recording speed of 500 or 1000 pictures per second, the effective screen area increases. (For the frame rate of 2000 and 4000 pictures per second does not affect the effective screen area.)

(15) TIME COUNT

Set: AUTO   Set No. : 00   Default : AUTO
            STOP   01
            RUN   02

Explanation : This parameter controls the operation of the time code counter.
(00)"AUTO" starts counting immediately when recording starts and resets the count to 0 when recording stops or pauses. (01)"STOP" always resets the counter to 0. (02)"RUN" keeps the time code counter counting. The count value (digital data) is recorded also in the vertical blanking.

(16) VCR NO.

Set: OFF   Set No. : 00   Default : OFF
            1 to 9   01 to 09

Explanation : This parameter specifies the number of a VCR. Specify "00" (OFF) when only one VCR is used. When the HSV-4000 system has two or more VCRs to be controlled by a single personal computer (via synchronizer unit), a unique number (unit address) is assigned to each VCR. Up to nine VCRs can be assigned VCR numbers.

(17) Scene code (100's place)

(18) Scene code (10's place)

(19) Scene code (1's place)

Set: 0 to 9   Set No. : 00 to 09   No default value is provided.

Explanation : These parameters are used to set a new scene code. When the VCR NO. parameter is "00" (OFF), a scene code can be a 3-digit figure. When the VCR NO. parameter is not "00" (OFF), a scene code can be a 2-digit figure. The scene code is recorded in a digital data form also in the vertical blanking.
The scene code is automatically incremented by one when the time code counter is reset to 0 or counts one hour.

(20) RTC TIME (Real-time clock time) 10's place of hours

(21) RTC TIME (Real-time clock time) 1's place of hours

(22) RTC TIME (Real-time clock time) 10's place of minutes

(23) RTC TIME (Real-time clock time) 1's place of minutes

Set: 0 to 9   Set No. : 00 to 09   A Japan standard time (JST) is factory-set.

Explanation : These parameters are used to set the time of a built-in real-time clock. The time is stored in the digital data format also in the vertical blanking.

(24) RTC DATE (Real-time clock date) 10's place of year

(25) RTC DATE (Real-time clock date) 1's place of year

(26) RTC DATE (Real-time clock date) 10's place of month

(27) RTC DATE (Real-time clock date) 1's place of month

(28) RTC DATE (Real-time clock date) 10's place of day

(29) RTC DATE (Real-time clock date) 1's place of day

Set: 0 to 9   Set No. : 00 to 09   A Japan standard time (JST) is factory-set.

Explanation : These parameters are used to set the date of a built-in real-time clock. The date is stored in the digital data format also in the vertical blanking.

RECORD MENU page

(30) S-VHS/VHS

Set: AUTO   Set No. : 00   Default : AUTO
            VHS   01

Explanation : This parameter specifies a mode in case of recording on S-VHS tape. In the "00"(AUTO) mode, the VCR records in the S-VHS mode, in the "01"(VHS) mode, records in the VHS mode.
In case of recording on VHS tape, the recording mode depends on "34"(S-VHS ET) set up.
In the playback operation, the setting of this parameter is ignored because the S-VHS or VHS mode is automatically selected in the playback operation.

(31) REPEAT REC

Set: OFF   Set No. : 00   Default : OFF
            ON   01

Explanation : This parameter enables (ON) or disables (OFF) repetitive recording.
ON: When the end of tape (EOT) comes in the REC operation, the tape is rewound to the beginning of tape (BOT) and recording starts from the beginning of the tape. This function is effective when a rare phenomenon is to be recorded.

(32) START CUE

Set: OFF   Set No. : 00   Default : OFF
            ON   01

Explanation : This parameter specifies whether a cue signal is automatically recorded on the tape when recording starts. This setting is effective in the REC operation only. The cue signal conforms to the VISS (VHS Index Search System) standard.
OFF: Does not record a cue signal on tape at the start of recording.
ON: Automatically record a cue signal on tape at the start of recording.

(33) COLOR MODE

Set: OFF   Set No. : 00   Default : COLOR
            COLOR   01

Explanation : This parameter specifies color or monochromatic recording. This parameter setting is effective only for recording.

(34) S-VHS ET

Set: OFF   Set No. : 00   Default : OFF
            ON   01

Explanation : ON: The VCR records in S-VHS ET mode on VHS tape.
See "SYSTEM FUTURES" in CHAPTER 1 regarding to S-VHS ET.

PLAYBACK MENU page

(35) NR (Noise Reduction)

Set: OFF   Set No. : 00   Default : LOW
           LOW   01
           HIGH   02

Explanation : This parameter specifies the degree of reduction of playback noises.
              OFF : Does not perform noise reduction.   ("OFF" is recommended
                     for dubbing.
              LOW : Performs low noise reduction.
              HIGH : Performs high noise reduction.   ("HIGH" is recommended for
                     noisy tapes.)

(36) PB SERVO (Playback Servo)

Set: FREE RUN   Set No. : 00   Default : FREE RUN
           INTERNAL   01

Explanation : This parameter changes reference signals for the playback servo
              motor.
              Usually, set "00" (FREE RUN).   In the FREE RUN mode, you can get
              video signals satisfying the requirements of broadcasting video
              equipment.

              To create a tape whose image frames can be reproduced clearly and
              no missing frame on an ordinary video tape deck, set "01"
              (INTERNAL).   In the INTERNAL mode, the video signal may not be
              connected to the broadcasting video equipment under a certain
              reproduction speed condition.   (See Chapter 5 for influence of this
              parameter on dubbing.)

              In reproduction of a tape recorded at a frame rate of 500 frames per
              second, it may happen that the pictures may pitch up and down by
              one horizontal scanning line when pictures change.   This
              phenomenon will disappear when "01" (Internal) is set.

(37) AUTO TRACKING

Set: OFF   Set No. : 00   Default : ON
           ON   01

Explanation : This parameter specifies automatic or manual playback tracking
              adjustment.
              This parameter is usually "01" (ON) as the VCR performs automatic
              tracking adjustment so as to make the reproduced signals optimum.
              If the optimum images cannot be reproduced by the automatic
              tracking adjustment (e.g. because of poor compatibility of video tape),
              set "00" (OFF).   Adjust the tracking by the next (38)TRACKING ADJ
              parameter.

(38) TRACKING ADJ

Set: Graphically displayed Set No. : 00 to 15 No default value
is provided.

Explanation : This parameter is used to adjust the tracking. When the Auto
Tracking parameter is "01" (ON), only menu item and parameter value
are displayed.

Meaning (display): AUTO Value (display): 08

The tracking can be displayed when the Auto Tracking parameter is
"00" (OFF). Adjust the tracking by pressing the FF or REW button.
When the Auto Tracking parameter is changed from "01" (ON) to "00"
(OFF), the tracking is reset to the preset position.

FREEZE MENU page

(39) FREEZE

Set: OFF   Set No. : 00   Default : OFF
              ON   01

Explanation : An image at the moment this menu is changed from OFF to ON, the
still image is memorized. In order to see the memorized image,
maintain this menu to ON, and set the next menu "FREEZE
DISPLAY" to ON or MIX.
When this menu is switched to OFF, or when playback is stopped,
memorized image is erased.

(40) FREEZE DISPLAY

Set: OFF   Set No. : 00   .   Default : OFF
              MIX   01
              ON   02

Explanation : This menu specifies the displaying freeze image.
ON: displays only memorized still image.
MIX: the still image and playing back images are mixed, and
displayed at the same time.
OFF: displays only playing back images.

SERVICE SW MENU page

(41) BUZZER

Set: OFF   Set No. : 00   Default : ON
             ON   01

Explanation : This parameter enables or disables the buzzer. In case "01" (ON) is set, the buzzer beeps when a button on the operation panel or on the operation unit is pressed or when a cue signal is detected.

(42) EE2

Set: OFF   Set No. : 00   Default : ON
             ON   01

Explanation : This parameter is usually "01" (ON). In the EE mode, the output brightness signal for monitor is created from signals of two image pictures. Therefore, in the EE mode, a picture containing a moving object consists of two overlapped images. If this overlapping is not wanted, set "00" (OFF) to this parameter. The signal for one image frame is directly output to the monitor. The image is clear free from overlapping. In this case, the horizontal resolution is half of that in the normal mode.

(43) EVF VIDEO (Electric Viewfinder Video)

Set: COLOR   Set No. : 00   Default : COLOR
             BW   01

Explanation : This parameter specifies which images are displayed on the viewfinder connected to the color camera, colored or monochromatic.

(44) INPUT

Set: CAMERA   Set No. : 00   Default : CAMERA
             COLOR BAR   01

Explanation : This parameter specifies which signals the VCR inputs, video signals from the color camera or color bar signals created by the VCR. Usually this parameter is set to "00" (CAMERA).

Note: **If the color camera is not connected to the VCR even when this parameter is "00" (CAMERA), the input changes the color bar signal automatically.**

(45) BATT MONITOR (Battery Monitor)

Set:		Set No. :		Default : OFF
	OFF		00	
	N24		01	
	L24		02	
	N28		03	
	L28		04	

Explanation : This parameter specifies the type of a battery monitor which is to prevent over-discharging of the battery for protection. When detecting the voltage of the battery falling under a preset level, this function outputs a warning message and then turns off power.

Caution: When using a battery as a power supply to the system, be sure to set its type and supply voltage. Otherwise, the battery will not be monitored correctly and may cause battery trouble.

OFF: No battery is used. Be sure to set "00" (OFF) when using the AC adapter (accessory) or DC power supply.
N24 : 24V nickel-cadmium battery
L24 : 24V lead-acid battery
N28 : 28V nickel-cadmium battery
L28 : 28V lead-acid battery

Note: **If the Battery Monitor function is turned on when the AC adapter is in use, the function beeps the buzzer to alert a voltage reduction, outputs a message on-screen, and turns off power about 10 seconds later. You can turn off this function by pressing the STOP button within this time period.**

(46) NTSC/PAL

Set:		Set No. :		Default : NTSC
	NTSC		00	
	PAL		01	

Explanation : This parameter is usually "00" (NTSC). When "01" (PAL) is set, the VCR outputs converted PAL video signals. The frames of PAL video signals is about 85% as big as those of NTSC color signals.

SYSTEM INFORMATION page

Set: None   Set No. : 00   (No default value is provided)

Explanation : This menu page shows system information. Its menu item number
              and value are respectively 00.

POWERED: The total time period during which the main power supply of the
              VCR has been on.
V HEAD: The total time period during which the video head has been used.
              In this system, the video head rotates faster in the REC operation
              than the PLAY operation.   Therefore, the time counting in REC is
              about 5 times faster than counting in PLAY.   The time counting in
              PLAY is normal.
              The typical service life of the video head is about 200 hours in only
              REC use, and is about 1,000 hours in only PLAY use. These times
              given by "V HEAD" are equivalent to 1,000H.
SERVICE NO.: Serial service number
ROM No.:   Serial service number

Caution: Menu settings and date/time information are all stored in a memory
         built-in clock IC (backed up by a battery).
         If the battery is expired, the information will be lost. The service life of
         the battery is about 10 years when connected to power. If the battery is
         expired, a "BACK UP CELL IS DEPLETED" message appears on the
         System Information page.

(memo page)

CHAPTER 4   RECORDING OPERATIONS

Main Recording Sequence

Set up in recording location

Turning on power

Menu Setting

Checking image of object

Loading a Video Cassette Tape

Recording and Stopping

Rewinding and Fast Forwarding

Power off

MAIN RECORDING SEQUENCE

- ## Preparing tools

   Prepare the system and the equipment according to the type of object and method of recording.

   Lighting equipment:
   > Determine shooting by an electronic shutter or strobe light according to the ambient brightness and the brightness of an object to be shot.
   > When using an electronic shutter, calculate and determine the shutter speed according to the motion of the object.

   Tripod or support:
   > These units are used to fix the color camera and/or the strobe light system.

   Lens unit or particular optical system:
   > Determine distance of shooting and scales of enlargement.

- ## Setting up for shooting

   Position the camera and the lighting apparatus and aim them to a target object.
   Connect the camera, the lighting apparatus, the VCR, and the other units with cables, then supply power.

- ## Menu setting

   Set a frame rate, a shutter speed, color or black-and-white mode, and a white balance.

- ## Adjusting a camera image

   Adjust the aperture and focusing of the lens and select a filter.

- ## Start recording

   Put a video cassette tape in the VCR.
   > (Make sure the tape remain is enough.)
   Mark the recording start point.
   > (Reset the LAP counter or turn on the Start Cue function.)
   Press the REC button.
   > The VCR starts recording.

- ## Stop recording

   Press the STOP button.
   > Rewind the tape to the position where recording started using memory or a cue signal.

SETUP IN RECORDING LOCATION

Place the tripod on a proper shooting position which is solid and rigid. Before placing the color camera or a lighting apparatus (strobe light) on it, level the camera platform of the tripod and firmly tighten the moving parts of the tripod (e.g. pan lock, elevator lock, and head lock). Especially, lock the platform lock and elevator lock more a little stronger.

• Handling the tripod

Caution: **It is very important to securely stand the tripod and to make it support the camera and the strobe light head firmly. If any of the moving parts of the tripod moves involuntarily, the camera and the strobe light head will fall and be damaged. Before mounting the camera and the strobe light head on the tripod, be sure to tighten the moving parts firmly. To move the camera and the strobe light head, loosen the locks little by little holding the camera or strobe light head.**

Level the camera platform and lock the tilt pan.
Tighten the elevator lock firmly.
Tighten the center post lock firmly.

• Mounting the camera on the camera platform of the tripod

The color camera has a mounting hole (1/4-20 UNC 8mm depth) on its bottom. Fit the mounting screw of the camera platform of the tripod to one of the mounting hole of the camera, and tighten it firmly.

• Preparing a lighting apparatus (if necessary)

Dispose the electric bulbs for illumination, using proper lamp stands.

• Mounting the strobe light head (for strobe light recording)

Mount a strobe light head on the tripod.

Then, face the camera and the electric bulb or strobe light bulb to the target object.

• Connecting units with cables

It is recommended to dispose the units within the reach of cables before connecting them with cables. Do not try to move the connected units so far. A yanked cable may fall the tripod and may damage the camera and the strobe light head.

A basic system connection is illustrated in Figure 4.1. The system connection varies according to the types and numbers of standard and optional units in the system. For connections of optional units such as the wave inserter and the synchronizer unit, see their operation manuals.

TURNING ON POWER

• Turning on the VCR

Press the POWER switch (on the lower right corner of the front panel of the VCR). The POWER indicator lights.

⚠️ **Caution:** For at least 3 minutes after the VCR is powered on, the video cassette tape must not be loaded in the VCR. During this time period (that is, a warm up time), the Condensation Detecting circuit works (which will vary according to the environment). A longer warm-up time should be taken in rainy seasons, in summertime, and in wintertime.

• Turning on the monitor

The monitor screen becomes bright and shows an image.
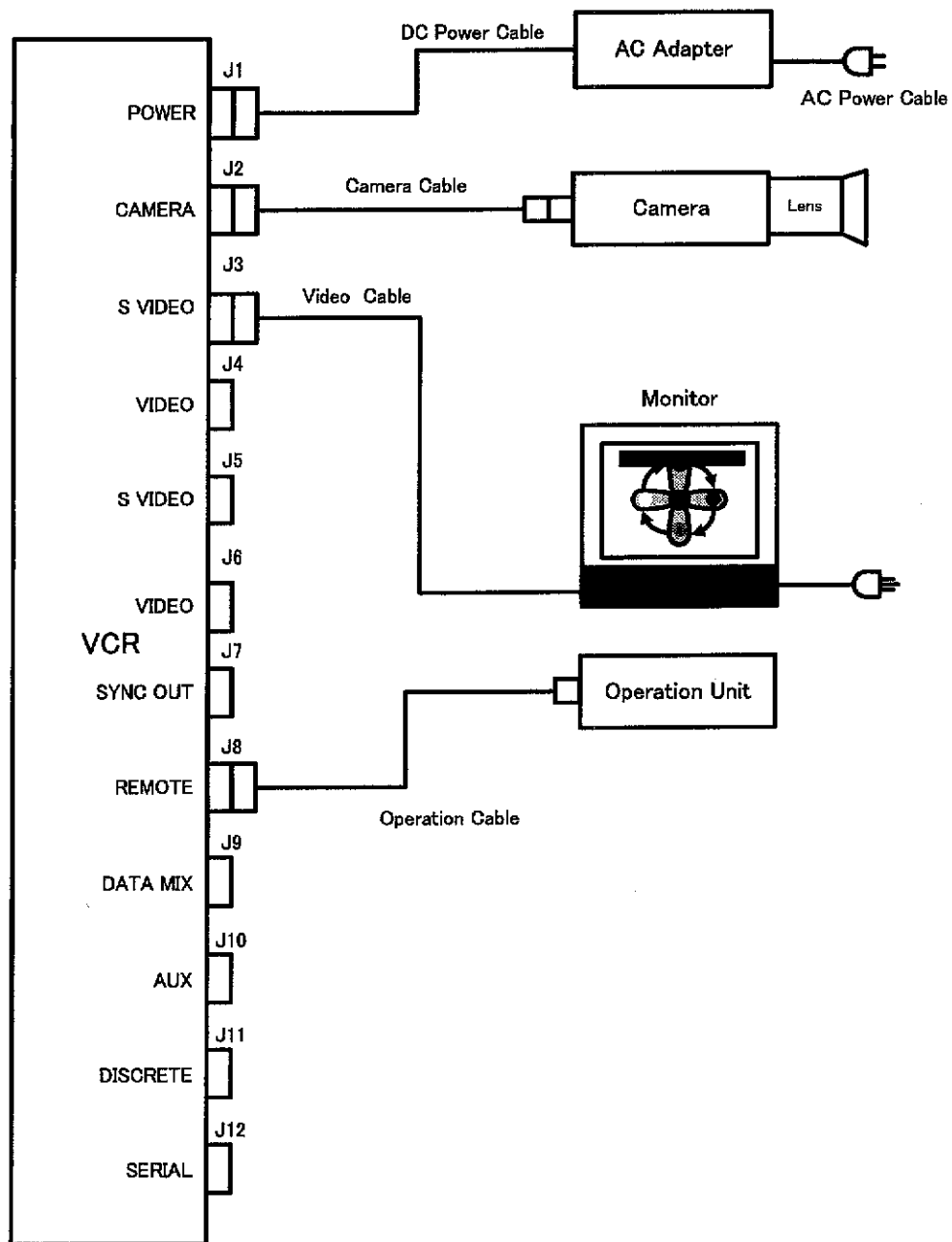
Figure 4-1   Basic System Connection

MENU SETTING

For detailed menu setting procedures, see Chapter 3. This section describes menu item numbers (parameter numbers) and outlines of their functions only.

(01) Frame Rate (Frame rate or Recording speed)

This parameter specifies the frame rate and the screen size.

(07) Shutter

This parameter specifies a shutter speed.

(08) Gain

This parameter specifies a camera gain.

(09) White Balance

This parameter specifies a white balance.

(10) Enhance

This parameter specifies a degree of enhancement of profiles in a picture taken by the color camera.

(11) Gamma

This parameter specifies a gamma (the degree of contrast) in a picture taken by the color camera.

(12) Knee

This parameter specifies a knee (an intensity range by compressing white levels greater than a preset intensity).

(14) Character

Specify "OFF" to widen the effective image area on-screen. Specify "ON", if this parameter is used to check a scene code and a time code in an image played back on other VCR than HSV-4000 VCR.

(15) Time Count

Specify "AUTO" which starts time counting immediately when recording starts.

(17) Scene code (100's place)

(18) Scene code (10's place)

(19) Scene code (1's place)

These parameters are used to set a new scene code.

(30) S-VHS/VHS

This parameter specifies a recording S-VHS or VHS mode for the use of a S-VHS cassette tape.

(34) S-VHS ET

This parameter specifies a recording S-VHS ET or VHS mode for the use of a VHS cassette tape. See "SYSTEM FUTURES" in CHAPTER 1 regarding to S-VHS ET.

(31) REPEAT REC

This parameter enables (ON) or disables (OFF) repetitive recording.
Specify "OFF" to perform normal recording or "ON" to enable repetitive recording.

(32) Start Cue

Specify "ON" to record a cue signal at the beginning of each recording.

(33) Color Mode

This parameter specifies color or monochromatic recording. Specify "B/W" (black and white) mode when color images recorded on VHS tape are pale or when images can be monochromatic.

(44) INPUT

Specify "CAMERA" to record camera images.

CHECKING IMAGE OF OBJECT

Turn on the power switch of the lamp or the ON/AUTO switch of the strobe light head (when using a strobe light).
Run the electronic shutter when shooting using the electronic shutter.

Face the lamp or the strobe light to the target object and adjust the lens aperture so as to get optimum video images on the monitor screen.

Adjusting the camera sensitivity (by (08) GAIN)
Adjust the sensitivity of the camera. Usually set 0dB ("00 for GAIN). If the illumination is insufficient, set 3dB ("01") or 6dB ("02") to increase the sensitivity. (As the sensitivity increases, the screen noises also increases.)

• Color balance

Color balancing is to adjust the camera to compensate for the lighting conditions.
Color balancing is adjusted by (09) WHITE BALANCE. Improper color balancing makes poor color reproduction.

In normal lighting conditions, the (09) WHITE BALANCE parameter can be AUTO ("00") and no additional color balancing is required. In special lighting and object conditions, white balancing is required.

White balancing is required each time the lighting condition changes. When the color temperature of the lighting is known, set the color temperature 3200K ("02"), 5000K ("03") or 9000K ("04"). If good white balancing cannot be obtained still, adjust white balance manually. This setting status is stored in memory of the color camera. Accordingly, no additional white balancing is required as far as you use the same lighting.

Procedures to adjust the color balance
White-balancing (manual adjustment)
Open the lens aperture to get the bright image.

Illuminate a white paper with a lighting which you want to use for taking images, shoot the illuminated paper with the color camera, and make sure that the whole monitor screen is white evenly. (Particularly, the white should be well balanced in every place on the screen.)

Turn the focus ring to fully out of focus. (The whole screen should be white evenly.)

Set "AUTO" ("00") for the (09) WHITE BALANCE parameter, wait at least 2 seconds, then set "HOLD" ("01") for the WHITE BALANCE parameter.

Too bright or dark illumination is not good for balancing. Also try to change the aperture of the lens.

NOTE: **In the following cases, additional color balancing may be required.**
1) When the sensitivity of the camera is changed (by the camera GAIN)
2) When the kind of illumination is changed
3) When the frame rate is changed

LOADING A VIDEO CASSETTE TAPE

Press the PUSH-OPEN button of the VCR.
   The cassette door opens.

Load a video cassette into the VCR.
   Put the video cassette tape into the cassette slot of the VCR with the arrow
   mark oriented forward and with the tape window faced up.   Push the back of
   the cassette a little.   The cassette is automatically taken into the VCR.

   **NOTE: You cannot record anything on a video cassette whose erasure
   prevention tab is removed.**

Close the cassette door.

⚠ **Caution: After the video cassette is taken into the VCR normally, push
   the cassette door to close.**

Test recording:
   Before actual recording, it is recommended to test-record something, play it
   back, and make sure it has been recorded successfully.

Self-test function:
   The VCR of the system is equipped with a Self Test function which
   automatically checks the recording and playback functions of the VCR.   To
   start the self-test, keep on pressing the TEST button on the operation panel of
   the VCR for more than 1 second.   To cancel the self-test, press the STOP
   button.   Always execute the self-test when video cassettes are changed.   If
   the self-test fails, its reason is displayed on the screen.

RECORDING AND STOPPING

You can start or stop recording by pressing the REC or STOP button on the operation panel of the VCR or on the operation unit connected to the VCR or the color camera. Below are explained how recording is started or stopped by the buttons on the operation unit. The difference between the operation panel and the operation unit is enclosed in brackets.

Press the REC button on the operation unit. The REC indicator lights and recording starts.

If the REC indicator remains off, an error message (indicating why the recording cannot start) is displayed on the monitor screen. On the operation unit, the reason of the failure is indicated by an indicator as shown below.

> The EJECT indicator is on. (No video cassette is in the VCR.)
> > [On the operation panel of the VCR, the cassette indicator is off.]

> The STOP indicator is on. (The playback-only video cassette is in the VCR.)
> > You cannot record anything on a video cassette whose erasure prevention tab is removed.

> Condensation in the VCR
> > "DEW" is on the COUNTER display. Keep on warming up the VCR and wait until a value is displayed on the COUNTER display.
> > [All indicators on the operation panel of the VCR are off.]

> "End" is displayed on the COUNTER display of the operation unit.
> > (The end of tape has come. Rewind the tape or load a new video cassette into the VCR.)
> > [All indicators on the operation panel of the VCR are off.]

Recording: Start recording

Press the REC buttons.

> The REC indicator lights and time counting on the COUNTER display advances (about 15 seconds later).

Recording: Standby in the REC mode

Press the REC buttons, then press the STILL/PAUSE button.

> The REC indicator and the STILL/PAUSE indicator light. It takes about 10 seconds before recording starts after the REC button is pressed. Press the STILL/PAUSE button in this time period.

Press the STILL/PAUSE button again to start recording.

> Time counting on the monitor screen and the value on the COUNTER display of the operation unit advance during recording.

PAUSE AND RESTART

Press the STILL/PAUSE button.

When recording is paused, the video tape stops running in contact with the head drum. To restart recording, just press the STILL/PAUSE button once more.

NOTE: **You can pause recording as long as you want, but the VCR feeds the tape forward a little every 30 seconds for protection of the tape. Therefore, as this pause time becomes longer, the unrecorded part on the tape becomes more.**

STOP RECORDING

Press the STOP button.

When recording stops, values and codes on the VCR are treated as follows:
Time code: Reset to zero.
Scene code: Incremented by one.
Value on the COUNTER display: Keeps the current value.

Turning off the strobe light or illuminating bulb

Be sure to turn off the strobe light or illuminating bulb after stopping recording.

Scene code and time code:

When recording is discontinued by the STOP or STILL/PAUSE button, the scene code is automatically incremented by one and the time code is reset to zero.

REWINDING AND FAST-FORWARDING

Use the REW button and the FF button respectively. These buttons are used to search a target frame or unrecorded position of the tape rapidly. To position the frame, use the memory function of the counter or a cue signal as no reproduced picture is visible on the screen during rewinding or fast-forwarding. (For procedures to search pictures rapidly with pictures displayed on the screen ("Fast Picture Search"), see Chapter 5.)

Picture searching using the memory function:

Press the MEMORY button at a frame which you want to search later. The MEMORY indicator lights.) [The memory function is not available to the operation panel of the VCR.]

Picture searching using the Cue Stop function:

Press the CUE STOP button at a frame which you want to search later. In rewinding or fast-forwarding, the tape stops at the cue signal automatically.

When the tape reaches a cue signal position, the buzzer beeps (when the BUZZER function is ON).

You can also use the counter function to search an unrecorded portion on a tape because counting stops over unrecorded portions on the tape.

• Rewinding (REW button)

Press the REW button.

The indicator of the REW button lights. The tape is rapidly rewound (in the direction opposite to that associated with the play mode). When the tape is rewound to the beginning, the VCR automatically stops rewinding, turns off the REW indicator, and turns on the STOP indicator. When the tape is rewound to its beginning, the COUNTER displays "Start." When the tape stops at a cue signal position or memory-set position, "Start" is not displayed on the COUNTER display. In the either case, the tape stop reason is displayed on the monitor screen.

• Fast forwarding (FF button)

Press the FF button.

The indicator of the FF button lights. The tape is rapidly forwarded (in the direction associated with the play mode). When the tape is forwarded to the end of the tape, the VCR automatically stops forwarding, turns off the FF indicator, and turns on the STOP indicator. When the tape reaches to the end of the tape, the COUNTER displays "End." When the tape stops at a cue signal position or memory-set position, "End" is not displayed on the COUNTER display. In the either case, the tape stop reason is displayed on the monitor screen.

• Stopping halfway (STOP button)

Press the STOP button to stop the tape running.

• Changing operations

You can play back the tape immediately after stopping recording.

Press the PLAY or SEARCH button while the tape is rewound or fast-forwarded. The tape is played back. You can press any desired button without pressing the STOP button.

• Others

You can rapidly search a desired picture by using the Memory function or cue signals. For more information, see Chapter 6.

POWER OFF

Before shutting off power to the VCR after recording, press the EJECT button, unload the video cassette from the VCR, and close the cassette door. Then, turn off the POWER switch of the VCR.

Close the aperture of the lens of the color camera and mount the cap on the lens unit.

(memo page)

CHAPTER 5   PLAYBACK OPERATIONS

Preparation for Playback

Automatic Detection of Recording Status

Playback Operations

Eliminating Noises in Reproduced Images

Adjusting Reproduced Images

Dubbing

Capturing Reproduced Images to PC

Caution:

When part or whole of a video tape is played back repeatedly, the magnetic recording layer of the tape is gradually scraped away and consequently the images on the tape will be blurred. Therefore, it is recommended to make a copy of the tape (which is termed "dubbing") and use the copied tape for frequent reproduction. (Keep the master tape.)

PREPARATION FOR PLAYBACK

Connect a monitor to the VCR and turn on power to them. Press the PUSH-OPEN button. The cassette door opens. Load a video cassette into the VCR and start reproduction of the tape by pressing buttons on the operation panel of the VCR or on the operation unit.

In addition to normal operation buttons of the operation panel of the VCR, the operation unit has a tape speed control, a tape speed indicator, a lap counter display, a counter reset button, an EDIT button, and a SEARCH button for easy operation.

Below are explained operations on the operation unit. The difference between the operation panel of the VCR and the operation unit is enclosed in brackets.

AUTOMATIC DETECTION OF RECORDING STATUS

The VCR automatically detects and identifies the S-VHS or VHS format of a loaded tape and plays it back according to the format.
When the loaded tape is of the S-VHS format, the S-VHS indicator on the operation panel lights.

When reproducing a video tape which was recorded by the HSV-4000 system, the VCR automatically determines the recording speed and the screen size (when the (02) PB SCREEN parameter is "AUTO").
This automatic detecting function is not available for video tapes which were recorded by non-HSV-4000 system. Set the parameter in reference to Chapter 1.

NOTE: **In case a tape recorded at the frame rate of 500 frames per second, it sometimes happens that the whole screen drifts up and down by a horizontal scanning line when screens change.**
To eliminate this phenomenon, set the (36) PB SERVO parameter on the PLAYBACK MENU page to INTERNAL ("01").

NOTE: **When the (36) PB SERVO parameter on the PLAYBACK MENU page is set to INTERNAL, the output of a video tape at a certain playback speed cannot be connected to a broadcasting video equipment. To always connect such an output to the broadcasting video equipment, set the (36) PB SERVO parameter on the PLAYBACK MENU page to FREE RUN ("00").**

PLAYBACK OPERATIONS

NORMAL PLAYBACK (PLAY button)

Press the PLAY button.

The VCR lights the PLAY indicator and starts to playback pictures recorded on the tape. This mode is used to review tape through slowly or to search for scenes to be looked at carefully.

STILL PLAYBACK (STILL/PAUSE button)

For still playback of pictures, press the STILL/PAUSE button when a normal playback or a search playback is in progress.

The PLAY indicator or the SEARCH indicator and the STILL/PAUSE indicator light on. On the operation unit, the STILL indicator in the SPEED indicator field lights.

In this mode, the step playback and the jog playback are enabled. [Only the step playback is enabled on the operation panel of the VCR.]

By pressing the STILL/PAUSE button once again, a normal playback is restarted, or a still picture is displayed in a search playback.

STEP PLAYBACK (FWD STEP or REV STEP button)

To display a preceding or next still picture, press the REV STEP or FWD STEP button while a still playback or a search playback is in progress.

Each time you press the REV STEP button (or FWD STEP button), the former (or later) picture is displayed.

The step playback is enabled while only the STILL indicator in the speed indicator field is on or flashing.

- Forward step playback .... Press the FWD STEP button.
  Each time you press the FWD STEP button, the later picture is displayed.

- Backward step playback .... Press the REV STEP button.
  Each time you press the REV STEP button, the former picture is displayed.

SEARCH PLAYBACK (SEARCH button and DIAL)

In the search playback mode, you can see the recorded pictures at various reproduction speeds.

The playback direction and speed changes in accordance with the dial turning direction and angle. If you release your hand from the dial, playback continues at the speed of the dial position at that time.

At maximum speed, the tape is played back approximately same speed as it is recorded.

(1) **Press the SEARCH button.**

The SEARCH indicator and the STILL indicator in the speed indicator light (to indicate the SEARCH mode).   A still picture is displayed on the screen.

(2) **Turn the dial.**

Turn the dial clockwise (to run the tape forward) or counterclockwise (to run the tape backward).

As you turn the dial further, the tape speed becomes faster and more indicators in the speed indicator turns on to indicate the tape speed.

Each side of the STILL indicator has ten bar indicators which are arranged in the order of 4 (next to the STILL indicator), 8, 15, 30, 60, 120, 240, 480, 1200, and 4000 (end) pictures per second. (The tape recorded at 4000 pictures per second.)

The tape recorded at 2000 pictures per second is reproduced at half of the above speed and the tape recorded at 1000 pictures per second is reproduced at one fourth of the above speed.   And the tape recorded at 500 pictures per second is reproduced at one eighth of the above speed.

When you press the FWD STEP button or the REV STEP button while only the STILL indicator in the speed indicator is on, the step playback is enabled.

[Although the operation panel of the VCR does not have the SEARCH button and the DIAL, you can get the search playback mode and select the search playback speed and direction by pressing the FWD STEP or REV STEP button for more than1 second.]

When the (05) MODE DISPLAY parameter of the SCREEN MODE MENU page is set "ON", the playback tape speed (1 to 10) and direction (FWD or REV) are displayed on the screen.   "1" to "10" of the tape speed are corresponded to the bar indicator position of the speed indicator of operation unit.

JOG PLAYBACK (Turn the DIAL while the STILL indicator is flashing.)

The jog reproduction enables rapid search of a series of motions. The direction and speed of the jog playback can be set by the DIAL. You can make the jog playback faster by turning the DIAL quickly or slower by turning the DIAL slowly.

The jog playback is enabled while a still playback is in progress.

The still playback is in progress while the PLAY indicator or the SEARCH indicator and the STILL/PAUSE indicator are on and the STILL indicator in the SPEED indicator is flashing.

The speed of the picture reproduction is in proportion to that you turn the DIAL.

Turn the control clockwise to perform a forward jog playback or counterclockwise to perform a backward jog playback.

When you stop turning the DIAL, the pictures stop jogging and the picture on the screen is still.

[You can not perform a jog playback on the operation panel of the VCR.]

EDIT PLAYBACK(EDIT button)

To set the edit playback mode, press the EDIT button in the STOP status.
The edit playback is almost the same as the normal playback (PLAY) but you can record cue signals during the edit playback.

Caution: In this edit playback, the old cue signals on the tape are all deleted and only new cue signals are recorded on the tape. The edit playback function is not available to a write-protected video cassette (whose safety lug is removed).

• Recording cue signals

To record a cue signal on the tape, press the ENTER button at a desired tape position in edit playback.

• Pause and restart (STILL/PAUSE button)

To pause the edit playback, press the STILL/PAUSE button.   The picture on the screen is still.

To restart the edit playback, press the STILL/PAUSE button once more.

To go to the other mode, first stop the edit playback. (Press STOP button)

[The edit playback function is not available to the operation panel of the VCR.]

FAST SEARCH PLAYBACK (Fast forwarding or rewinding with pictures displayed on screen)

To set the fast search playback mode, press the FF or REW button while the normal or search playback is in progress.

NOTE: **Unlike the search playback, the fast search playback is performed at a fixed speed but stopped at cue signals.**

To stop the fast search playback at cue signal, press the CUE STOP button. (The CUE STOP indicator lights.)

(1) Press the PLAY or SEARCH button.
(2) Press the FF or REW button. With this, the fast search playback starts.

In the fast search playback:

- When detecting a cue signal while the CUE STOP indicator is on, the VCR stops the fast search playback and displays a still picture together with a "STOP AT CUE SIGNAL" message on the screen. This message disappears when another operation is made.

- When the FF or REW button is pressed (which was pressed for the fast search reproduction), the Cue Signal Skip function is enabled. This function skips the cue signals (up to 8 cue signals) as many as the number of times you pressed the button.

[When the fast search playback mode is set on the operation panel of the VCR, the cue stop function is automatically turned off (OFF). To turn on the cue stop function, press the FF or REW button (which you pressed to set the Fast Search playback mode) once more. The cue signal skip function is not available.]

- To return to the normal playback, press the PLAY button.

Changing from fast search playback to still playback

Keep on pressing the FF or REW button for more than1 second, find target pictures, and release the button. The obtained picture is still.

[The operation panel of the VCR does not have this function.]

STOPPING PLAYBACK (STOP button)

In any playback mode, press the STOP button.   Reproduction stops and pictures from the tape disappear from the screen. An image from the color camera or from the built-in color bar is displayed.

POWER OFF (POWER button)

Before shutting off power to the VCR, be sure to press the EJECT button, unload the video cassette from the VCR, close the cassette door, then press the POWER buttons.

Be sure to close the cassette door of the VCR.

ELIMINATING NOISES IN REPRODUCED IMAGES

Usually, noises in the reproduced images are eliminated by the automatic tracking function. In some cases (when the recording ambient temperature is greatly different from the playback ambient temperature, or when the recording VCR is not identical to the playback VCR), some noises (unwanted drifting horizontal line noises or flickering screen) may appear. These noises can be eliminated by setting the (38) TRACKING ADJ parameter.

NOTE: **This part describes the playback speed assuming that the tape was recorded at a frame rate of 4000 pictures per second. Therefore, the playback speed for a tape recorded at 2000 frames per second is a half of the above reproduction speed and that for a tape recorded at 1000 frames per second is one fourth of the above reproduction speed. And playback speed for a tape recorded at 500 frames per second is one eighth of the above reproduction speed.**

NOTE: **Noises will not be eliminated for fast playback of 4000 frames per second.**

(1) Press the MENU button. The Menu mode is set.

(2) Select (37) AUTO TRACKING of the PLAYBACK MENU page by operating the cursor control buttons (PLAY, STILL/PAUSE, and STOP).

(3) Change the value of the (37) AUTO TRACKING parameter from AUTO to MANUAL by pressing the FF button. In this status, the tracking is preset.

(4) Press the STILL/PAUSE button and select (38) TRACKING ADJ.

(5) Press the FF or REW button and adjust to eliminate screen noises while monitoring the reproduced picture on the screen.

(6) When the tracking adjustment is completed, press the MENU button to exit the menu mode and return to the normal mode, and continue playback.

NOTE: **When the (37) AUTO TRACKING parameter is reset to "AUTO," the manually set tracking information is lost.**

ADJUSTMENT OF REPRODUCED PICTURES

• Monitor

Adjust the monitor controls (usually CONTRAST and BRIGHTNESS) to get optimum pictures according to the monitor operation manual.

• VCR

You can set a noise reduction level on the VCR. Call the (35) NR parameter of the PLAYBACK MENU page and select a noise reduction level.

OFF: Does not perform a noise reduction. The VCR directly displays pictures from the tape on the monitor screen. In this mode, noises are not reduced and details of the pictures are not damaged. It is recommended to use this setting for tape dubbing.

LOW: Enables a light noise reduction. In this mode, noises are reduced to some extent and details of the pictures are not damaged so much. It is recommended to usually use this setting.

HIGH: Enables a hard noise reduction. In this mode, noises are reduced greatly but details of the pictures are damaged.
This mode is effective for reproduction of noisy tapes.

NOTE: The effect of a new noise reduction setting will not come soon in still playback.   The new noise reduction is effective after picture frames are changed.

DUBBING

Dubbing is to make a copy of a recorded tape. When part or whole of a video tape is played back repeatedly, the magnetic recording layer of the tape is gradually scraped away and consequently the images on the tape will be blurred. Therefore, it is recommended to make a copy of the tape (which is termed "dubbing") and use the copied tape for frequent reproduction. (Keep the master tape.)

You can also make a copy of the HSV-4000 tape for an ordinary video deck.

NOTE: No cue signal is copied in dubbing.

Reference:

The copied video images are a little inferior to the master video images.   To copy video images as clear as those on the master tape, the NR parameter should be set to OFF.

For tape dubbing, connect the HSV VCR to the video deck.

Tools and apparatus required for dubbing:

HSV-4000 VCR

S-VHS or VHS video deck (NTSC system) (should be equipped with a Framing Record function to make a copy of a tape recorded at 500 pictures per second)

Video cable

S-VHS or VHS video cassette tape

NOTE: Set OUTPUT VIDEO of the VCR to "NTSC" for dubbing.

• Dubbing a tape for frequent playback (Making a complete tape copy)

Procedure:

1) Connect the J5 (S VIDEO) connector on the connector panel of the HSV VCR to the S VIDEO IN terminal of the video deck with a video cable (or the J6 (VIDEO) connector to the VIDEO IN terminal of the video deck).
2) Turn on power to the HSV VCR and to the video deck.
3) Load the master video cassette into the HSV VCR.
4) Set the HSV VCR screen mode as reproduction of 1000 pictures per second.   (*1)
5) Run and stop the master tape at the starting point of the tape which you want copy.
6) Load a video cassette (onto which the content of the master tape will be copied) into the video deck and set the SP mode.
7) Run the video deck in the REC mode and run the HSV VCR in the normal playback (PLAY) mode.
8) When dubbing is completed, stop the HSV VCR and the video deck, and unload the master tape and the copied tape.

Reference:

The above dubbing can be performed by two ordinary video decks (other than the HSV-4000 VCR).   The dubbing procedure of these video decks are the same as above.   The video deck for reproduction should be preferentially equipped with the TBC function.

*1 Setting reproduction of 1000 pictures per second

Always set reproduction of 1000 pictures per second on the HSV VCR and play in the normal playback regardless of the settings (frame rate and screen size) of the master tape. First call the (01) FRAME RATE parameter on the SCREEN MODE menu and set "01" (1000 frames per second) for the parameter. Then Call the (02) PB SCREEN parameter and set "00" (Manual). With this, reproduction of 1000 pictures per second is set.

DUBBING A TAPE FOR AN ORDINARY VIDEO DECK

An ordinary video deck is usually equipped with a frame by frame tape advance and reproduce the same TV field instead of original TV frame for step by step playback. (A TV frame is made by 2 TV fields.) This function is effective to make the reproduced pictures stable. But, HSV 's 1 picture is a TV field form(1000pps), therefore when the video tape recorded by the HSV-4000 VCR (or its complete copy) is reproduced step by step on an ordinary video deck, every other pictures are displayed on the screen.(1 picture skip) Further, when a video tape recorded at 4000 or 2000 pictures per second is reproduced, four pictures are horizontally and vertically, two pictures are vertically displayed on the screen. If the tape has been recorded with the (14) CHARACTER parameter set to OFF (to make the effective image area wider), characters (time codes and scene codes) recorded on the tape will not be displayed.

The above problems in reproduction on the ordinary video deck can be removed by dubbing tapes in the procedures shown below.

In the procedures, unit connections and operations are almost the same as those described in "Dubbing a tape for frequent reproduction" but reproduction settings of the HSV VCR are somewhat different.

- Dubbing of a tape recorded at 4000 pictures per second
  1) Set (02) PB SCREEN to "01" (Auto).
  2) Set (36) PB SERVO to "01" (Internal).
  3) Play the tape at 30 pictures per second (forward) and record it by the ordinary video deck.
     (This reproduction speed is indicated by the **four** bar indicators in the right side of the STILL indicator on the operation unit and by "**FWD 4**" on the screen.)

- Dubbing of a tape recorded at 2000 pictures per second
  1) Set (02) PB SCREEN to "01" (Auto).
  2) Set (36) PB SERVO to "01" (Internal).
  3) Play the tape at 30 pictures per second (forward) and record it by the ordinary video deck.
     (This reproduction speed is indicated by the **five** bar indicators in the right side of the STILL indicator on the operation unit and by "**FWD 5**" on the screen.)

- Dubbing of a tape recorded at 1000 pictures per second
  1) Set (02) PB SCREEN to "01" (Auto).
  2) Set (36) PB SERVO to "01" (Internal).
  3) Play the tape at 30 pictures per second (forward) and record it by the ordinary video deck.
     (This reproduction speed is indicated by the **six** bar indicators in the right side of the STILL indicator on the operation unit and by "**FWD 6**" on the screen.)

- Dubbing of a tape recorded at 500 pictures per second
     This kind of tape can be dubbed in the normal dubbing procedure. See "Dubbing a tape for frequent reproduction."

NOTE: **When the master or copied tape recorded at 500 pictures per second is frame-by-frame reproduced by ordinary video deck, the number of vertical scanning lines is reduced by half.**

Dubbing tape contents together with recording information

When a tape recorded with (14) CHARACTER set "00" (OFF) is reproduced, scene codes, time codes, and dates will not be displayed on the screen. To display these information, set "01" (ON) to (03) TC DISPLAY and to (04) DATE DISPLAY on the SCREEN MODE menu page.

However in this case, use the MONITOR OUT connectors instead of the VIDEO OUT connector as a dubbing output. The on-screen messages will not be output to the VIDEO OUT connector.

> **NOTE:** Only the tape prepared according to "Dubbing a tape for frequent reproduction" should be used on the HSV-4000 VCR for analysis. A tape prepared according to "DUBBING FOR REPRODUCTION ON AN ORDINARY VIDEO DECK" is not available to the HSV-4000 VCR.

CAPTURING REPRODUCED IMAGES TO PC

The reproduced video signal from this HSV-4000 can be captured into a personal computer as same manner as handling a general analog video signal. There are kinds of file formats made on PC like DV-AVI, MPEG-1, MPEG-2 and so on, and also those formats may be restricted by the used equipment or software. Therefore, it would be important to select the PC and the software according to your purpose.

Prepare a computer whose environment has an analog video input (S video input or composite input) as follows.

1) In case of using the personal computer equipped with the video capture card which has the analog video input.
In this case, connect the output video signal from HSV-4000 VCR to the capture card. The file formats are DV-AVI, MPEG-1, MPEG-2 and so on.

2) In case of using the personal computer equipped with IEEE1394 connector and the consumer DV converter from analog video signal.
Connect the output video signal from HSV-4000 VCR to the DV converter's analog input, and connect the output signal from the converter to PC.
The file format is usually DV-AVI.

3) In case of using the personal computer equipped with USB connector and the consumer video capture card for USB.
Connect the output video signal from HSV-4000 VCR to the capture card's analog input, and connect the output signal from the card to PC by USB cable.
The file format is usually MPEG-1 or MPEG-2.

NOTE: **Read the manuals attached with the each equipment and software for detailed operation.**

The personal computer usually captures the images frame by frame. Therefore, the images must be captured by the method as same as written in clause "DUBBING A TAPE FOR AN ORDINARY VIDEO DECK" of this manual in case of playing back the captured images on PC picture by picture (field by field).

NOTE: **In the clause "DUBBING A TAPE FOR AN ORDINARY VIDEO DECK", the menu set of (36) "PB SERVO" is (01) "INTERNAL", however there is a possibility that the reproduced images from HSV VCR cannot be captured into the PC correctly.**

nac's HSV controlling software (SP-839) is available. This software can control the HSV-4000 and capture the images from the HSV by one PC at the same time.

CHAPTER 6   OTHER FUNCTIONS

To increase the efficiency of recording and analyzing very quick motions of objects and to facilitate video operations, the VCR of the HSV-4000 system has unique functions as shown below. This chapter describes how such functions are used in actual picture shooting (recording) and picture analysis (reproduction).

Character Display Bar .... Used to identify video pictures.

Memory Function and Counter .... Used to quickly find a point at which recording started.

Cue Signal .... Used to rapidly find a target video picture.

Repetitive Recording .... Used to record a phenomenon which may not occur not so often.

On-screen Message .... Used to display the operating status of the VCR.

Alarms and Troubleshooting .... Used for troubleshooting and repairing.

Self-test .... ·Used to test the VCR itself.

XY Cursor Function .... Simple Measurement

CHARACTER DISPLAY BAR (Used to identify video pictures.)

A character display bar appears on the top of the screen together with a video picture. This bar is recorded together with each video picture on the tape for identification of the picture.

The contents of the character display bar are mainly set by parameters on the CHARACTER MENU page.

Date data   Scene code

97.04.01 12:00 001 00:00:000

Time data   Time count
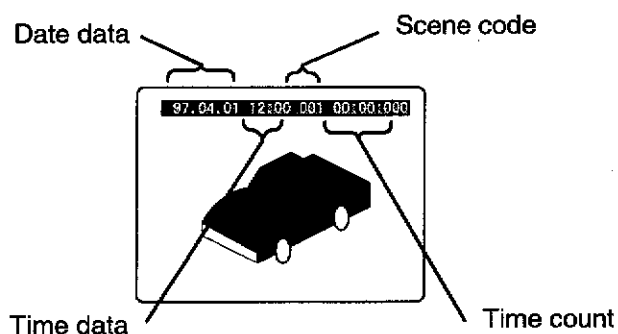
Figure 6-1   Character Display Bar

Date data

This data indicates the current system date (real-time clock date) in the YY.MM.DD format (YY for year, MM for month, and DD for day).

Time data

This data indicates the current system time (real-time clock time) in the HH:MM format (HH for hours in the 24-hour system and MM for minutes).

Scene code

The scene code is a 3-digit serial number given to each scene. It is "001" initially (when the VCR is powered on) and is automatically incremented by one each time recording is stopped (by the STOP button), paused (by the STILL/PAUSE button), or each time the lap time reaches 1 hour.

You can set a desired scene code to a scene on the tape by the (17) (18) and (19) SCENE CODE parameters.

When the HSV-4000 system has two or more VCRs to be controlled, the 100's place of the scene code indicates the unit address of each VCR. Therefore, only two digit places of each scene code are available. In this case, a colon ":" is placed between the 100's place and the 10's place of the scene code on the character display bar.

Time count

The time count indicates the lap time of recording and is reset to 0 when the VCR is powered on or when recording stops or pauses. Immediately when recording starts, time counting starts and the time count is incremented by one for every 0.25 milliseconds (for a recording speed of 4000 pictures per second), 0.5 milliseconds (for a recording speed of 2000 pictures per second), 1 millisecond (for a recording speed of 1000 pictures per second), or 2 millisecond (for a recording speed of 500 pictures per second).

The time count is useful in analyzing the motion change with a lapse of time and the motion speed.

```
0 0 : 0 0 : 0 0 0 2 . 5 ■
 |      ↓      milliseconds
 ↓      second
minute
```

The minimum time count indication is 0.5 milliseconds.
In case of a recording speed of 4000, the time counts every 0.25 milliseconds, so that the "■" symbol is added after the time count indication. The followings are examples at 4000 recording.

Actual time		Time count indication
0 0 0 . 0 0 ms	→	0 0 : 0 0 : 0 0 0 . 0
0 0 0 . 2 5 ms	→	0 0 : 0 0 : 0 0 0 . 0 ■
0 0 0 . 5 0 ms	→	0 0 : 0 0 : 0 0 0 . 5
0 0 0 . 7 5 ms	→	0 0 : 0 0 : 0 0 0 . 5 ■
0 0 1 . 0 0 ms	→	0 0 : 0 0 : 0 0 1 . 0

For a recording of 2000 pictures per second, 1000 pictures per second and 500 pictures per second, the time count indicates the actual time.

Starting and stopping of time counting are set by the (15) TIME COUNT parameter. Time counting can also be controlled externally through the AUX connector. For more information, see Chapter 8.

The error of time counting is $\pm 10^{-4}$ (= 0.01%) or less when the system is not synchronize with an external unit. It depends upon the time accuracy of an external unit when the system is synchronized with the external unit.

Digital code signal

The content (date data, time data, scene code, and time count) of the character display bar on the monitor screen is encoded into digital data and recorded together with each picture on the tape (during the vertical blanking portion). It is possible to read this code signal and display it on the screen (see (03) to (06) parameters). Further, it can be read through the RS-232 serial port for analysis. For more information see Chapter 9. The digital code signal also contains information on recording screen settings.

Deleting the character display bar from the screen

Set "00" (OFF) to the (14) CHARACTER parameter to delete the character display bar from the screen. Without the character bar, the effective picture area on the screen becomes wider for recording at 500 pictures per second or 1000 pictures per second. However, for recording at 2000 pictures per second and 4000 pictures per second, the character display bar is recorded outside the effective picture area. Therefore, the effective picture area remains unchanged regardless of whether the character display bar is present.

Deleting both the character display bar and the digital code signals

To delete both the character display bar and the digital code signals, connect between pin 10 and pin 11of the J10 AUX connector.   To display them again, disconnect pin 11 from pin 10.

Caution: When these materials are deleted by the above jumper connection, only video signals are recorded on the tape.   Therefore, when this tape is played back, the Automatic Screen Mode Detecting function is disabled and no recording information (date data, time data, scene code, time count, and picture rate) is displayed on-screen.   Further, it cannot be read through the RS-232 serial port.

MEMORY FUNCTION AND COUNTER

Usually, the COUNTER display of the operation unit shows how long the tape has been recorded in the MM:SS format (MM for minutes and SS for seconds). But when the Memory function is used, you can automatically stop rewinding and fast forwarding at a target picture.

When the VCR is powered on, the COUNTER display shows "00:00.0"

When the RESET button is pressed on the operation unit, the content of the COUNTER display is reset to 0.

Automatic REW or FF stop by the memory function (MEMORY ON)

In the MEMORY ON status (while the MEMORY indicator is on), rewinding or fast-forwarding automatically stops when the time count on the COUNTER display reaches "00:00.0" However, the tape passes by the target stop point a little before it stops because the tape is running rapidly. The difference between the target point and the stop point set by the memory function becomes greater as this automatic stopping is repeated.

Procedure:

1. Run the tape in the REC or PLAY mode and press the RESET button at a point at which you want to stop later. The time count on the COUNTER display is reset to 0.

2. Press the MEMORY button and make sure the MEMORY indicator turns on. Keep on running the tape in the REC or PLAY mode.

3. Rewind (or fast-forward) the tape. The tape automatically stops when the time count of the COUNTER display reaches "00:00.0" A "MEMORY STOP" message is displayed on the monitor screen.

CUE SIGNALS

A cue signal is recorded on a non-video track of the tape and gives no influence on pictures. A cue signal is recorded on a desired point and causes the tape in fast-search reproduction, fast-forwarding, or rewinding to automatically stop there. So it is very useful to rapidly search a target picture.

Cue signals can be recorded on the tape while the tape is running in the REC mode or EDIT playback mode. Each time you press the ENTER button on the operation unit, a cue signal is recorded on the running tape. You can place cue signals anywhere on the tape but too many cue signals will make searching difficult. It is recommended to provide a time period of at least 5 seconds between two consecutive cue signals.

You can also use the REC button on the operation panel of the VCR to place cue signals. However, this cue signal recording is valid only when the tape is running in the REC mode.

NOTE: **You cannot record any cue signal on a reproduction-only video cassette because the tape can be neither recorded nor edit- reproduced.**

Recording a cue signal (at the start of recording)

A cue signal is automatically recorded each time recording starts when the (32) START CUE parameter is set to "01" (ON) in advance.

Recording a cue signal (during recording)

A cue signal is recorded each time you press the CUE ENTER button on the operation unit while recording is in progress. You can also use the REC button on the operation panel of the VCR

Recording a cue signal (in edit playback)

The tape speed in the edit playback (EDIT) mode is the same as that in the normal playback but in the EDIT mode, you can record cue signals on the tape while monitoring video pictures. By this cue signal recording, old cue signals recorded on the tape are erased.

Procedure:

1. Press the EDIT button. The VCR runs the tape like in the PLAY mode.

2. Press the CUE ENTER button at a point at which you want to stop later.

A "RECORDING CUE SIGNAL" message appears on-screen while a cue signal is being recorded.

Automatic tape stop by a cue signal (CUE STOP ON)

When the CUE STOP button on the operation unit is pressed and its indicator is on, a cue signal recorded on the tape causes the tape to stop near the cue signal in fast-search reproduction, fast-forwarding, or rewinding. A "STOP AT CUE SIGNAL" message appears on-screen when the tape stops at a cue signal.

On the operation panel of the VCR, you can turn off the CUE STOP function by pressing the FF/REW button once or turn on the CUE STOP function by double-pressing the FF/REW button.

Skipping cue signals

You can skip a desired number of cue signals in fast-search playback, fast-forwarding, or rewinding while the CUE STOP function is on. Press the REW or FF button as many times as you want (up to 8 cue signals). The tape stops at the last cue signal that you specified. [This function is not available to the operation panel of the VCR.]

While the cue signals are skipped, the remaining number of cue signals to be skipped is indicated by an on-screen message (e.g. "CUE STOP 3"). The number to be displayed on-screen is 1 to 9.

Ignoring cue signals (CUE STOP OFF)

When the CUE STOP indicator on the operation unit is off, cue signals recorded on the tape are all ignored and the tape will not stop at cue signals. However, when the (41) BUZZER parameter is "01" (ON), the buzzer beeps each time a cue signal is detected.

ERASING CUE SIGNALS

To erase cue signals from the tape, use the edit playback (EDIT) mode.

Procedure:

1. Run the tape, find a cue signal which you want to erase, rewind the tape a little, run the tape in the EDIT mode.

2. Wait about 3 seconds after the tape passes by the cue signal, then press the STOP button.

REPETITIVE RECORDING (Automatic tape rewinding for re-recording)

This function automatically rewinds the tape to the beginning of the tape when finding the end of the tape and records again from the beginning of the tape.

To enable this function, set the (31) REPEAT REC parameter of the RECORD MENU page to "01" (ON). Then run the tape in the REC mode. The REPEAT REC function can be turned on and off also while recording is in progress.

While the REPEAT REC function is on, an on-screen message (one of messages given below) appears on-screen to indicate that the repetitive recording is in progress. This message is displayed independently of the MODE DISPLAY setting.

REPEAT REC: Now recording with REPEAT REC ON

REPEAT REC PAUSE: Now pausing with REPEAT REC ON

REPEAT REW: Found the end of tape and now rewinding the tape

To end the repetitive recording, press the STOP button. The on-screen message disappears.

As long as the (31) REPEAT REC parameter of the RECORD MENU page is "01" (ON), the succeeding recordings are all carried out in the REPEAT REC ON mode. To quit the repetitive recording, set the (31) REPEAT REC parameter of the RECORD MENU page to "00" (OFF).

ON-SCREEN MESSAGES

Messages in English which appears on-screen are "on-screen messages." Their locations on the screen are determined as shown below. This section describes when and where the messages are displayed.

Message on the upper left corner of the screen

Message on the upper right corner of the screen

Message in the center of the screen

Message on the lower left corner of the screen

Message on the lower right corner of the screen
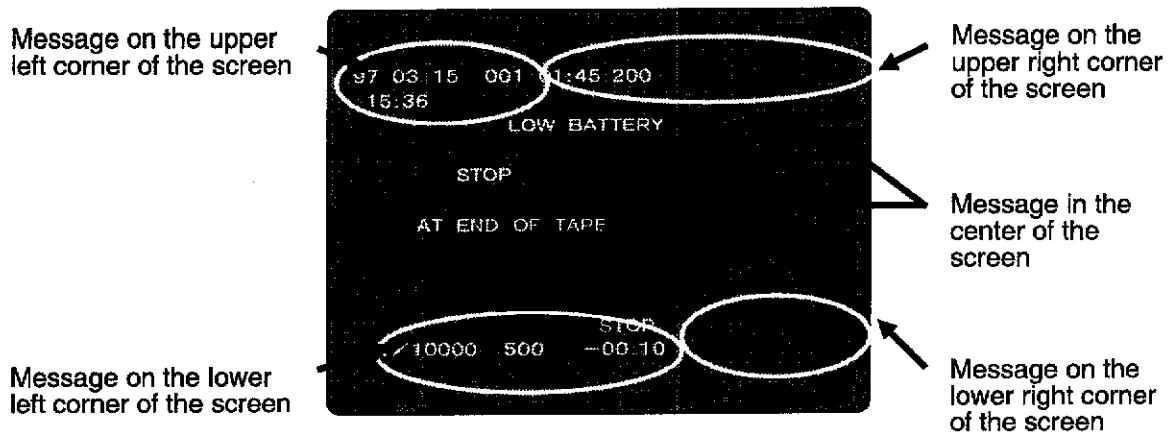
Figure 6-2   On-screen Messages

Message on the upper left corner of the screen

This message is displayed on two lines: System date over system time. In a mode except for the reproduction mode, the current system date and time are displayed. During reproduction, information obtained from a digital code signal in the vertical blanking (that is, a recording setting) is displayed here. If the digital code signal cannot be read correctly in tape reproduction, only hyphens "-" are displayed here. This message can be turned on or off by the (04) DATE DISPLAY parameter of the SCREEN MODE menu page.

Message on the upper right corner of the screen

This message is displayed on one line: 3-digit scene code and time code (minutes:seconds:milliseconds) in that order. In a mode except for the reproduction mode, the current scene code and time code are displayed. During reproduction, information obtained from a digital code signal in the vertical blanking (that is, a recording setting) is displayed here. If the digital code signal cannot be read correctly in tape reproduction, only hyphens "-" are displayed here. This message can be turned on or off by the (03) TC DISPLAY parameter of the SCREEN MODE menu page.

Message on the lower left corner of the screen

This message is displayed on one line: shutter speed and picture rate in that order. In a mode except for the reproduction mode, the current shutter speed and picture rate are displayed. During reproduction, information obtained from a digital code signal in the vertical blanking (that is, a recording setting) is displayed here. If the digital code signal cannot be read correctly in tape reproduction, only hyphens "-" are displayed here as a shutter speed and a picture rate. This message can be turned on or off by the (06) RATE DISPLAY parameter of the SCREEN MODE menu page.

Message on the lower right corner of the screen

This message is displayed on two or three lines: lap time counter data (bottom), mode (middle), and cue-stop message (displayed only when a specified cue signal is searched).

This message can be turned on or off by the (05) MODE DISPLAY parameter of the SCREEN MODE menu page. Some messages are displayed even when the MODE DISPLAY parameter is set to OFF.

- Lap time counter data (on the bottom line)

  00:00   Minutes: Seconds (-59:59 to 59:59)

- Mode data (on the middle line)

  [When the (05) MODE DISPLAY parameter is "01" (ON)]

Message	Description
NO CASSETTE	No video cassette in the VCR
STOP	Stop
FF	Fast Forward
REW	Rewind
PLAY	Normal playback
STILL	Still playback
FWD n	Forward search playback at a speed of "n" (representing the n-th bar indicator (counted from the central STILL indicator) in the speed indicator field of the operation unit) "n" is an integer ranging from 1 to 10.
REV n	Backward search playback at a speed of "n" (representing the n-th bar indicator (counted from the central STILL indicator) in the speed indicator field of the operation unit) "n" is an integer ranging from 1 to 10.
FWD SEARCH	Forward fast search
REV SEARCH	Backward fast search
REC	Recording
REC PAUSE	Pause of recording
EDIT	Edit playback
EDIT PAUSE	Pause of edit playback
REPEAT REC	Repeat recording (automatic return to the beginning of tape to continue recording)
REPEAT REC PAUSE	Pause of repeat recording
REPEAT REW	Rewinding to the beginning of tape to continue recording

  [When the (05) MODE DISPLAY parameter is "00" (OFF)]

Message	Description
Flashing square mark	Unstable head drum revolution
REPEAT REC	Repeat recording
REPEAT REC PAUSE	Pause of repeat recording
REPEAT REW	Rewinding to the beginning of tape to continue recording

  NOTE: When the (05) MODE DISPLAY parameter is "01" (ON), the mode data on the screen flashes until the revolution of the head drum becomes stable and the head drum becomes ready to record or reproduce.

- Cue Stop message (on the top line)

  CUE STOP n   This message indicates the last cue signal at which the tape stops. "n" is an integer ranging from 1 to 10.

Message in the center of the screen

This message is displayed to alert you to something.   There are two kinds of messages to be displayed in the center of the screen. Operating status message and alarm message.   You cannot turn on or off this messages by a menu parameter.

- Operating status messages:

Below are listed the operating status messages.

Message	Display timing	Timing of disappearance
PERFORMING SELF-TEST	When the self-test is in progress	When the self test is completed
RECORDING CUE SIGNAL	When a cue signal is recorded in the execution of recording or edit-reproduction	When recording of a cue signal is completed
STOP AT BEGINNING OF TAPE	When the tape stops at the beginning of tape	by the next operation
STOP AT END OF TAPE	When the tape stops at the end of tape	by the next operation
STOP AT CUE SIGNAL	When the tape stops at a cue signal	by the next operation
MEMORY STOP	When the tape stops by the Memory function	by the next operation
BEGINNING OF TAPE	When a try is made to rewind the tape over the beginning of tape	by the next operation
END OF TAPE	When a try is made to forward the tape over the end of tape	by the next operation
NO CASSETTE	When a try is made to move a tape although no video tape is in the VCR	by the next operation
REC TAB REMOVED	When a try is made to perform edit-reproduction or recording on a write-protected video cassette (whose safety lug is removed)	by the next operation
DEW DETECTED	When condensation is detected	When condensation is removed
SELF-TEST PASSED	When the self-test is completed successfully	by the next operation
SELF-TEST FAIL	When an error is detected in the execution of the self-test This message is always accompanied with a reason of the failure.	by the next operation

Reason messages are as follows:	Possible cause
ABNORMAL RF LEVEL	Abnormal video modulation signal level
COLOR NOT DETECTED	No color signal is detected.
CTL NOT DETECTED	No control signal is detected.

LOW BATTERY	Reduction of battery voltage	Replace the battery.
LOW BATTERY <GOING TO AUTO SHUT OFF> PRESS STOP BUTTON TO CANCEL BATT MONITOR	The power control is automatically shut off due to the reduction of a battery voltage. Then the power supply is turned on again.	Replace the battery or press the STOP button(to cancel the battery monitor function).

- Alarm messages:

"ALARM" tells you that a trouble has caused the VCR to abnormally stop the selected operation and an alarm message indicates the cause of the trouble.   This is very helpful in troubleshooting and repairing. Below are listed alarm messages, their display timing, and actions to remove the trouble.

ALARMS AND TROUBLESHOOTING

When detecting an alarm, first stop the current operation, perform the same operation once more, and check whether the alarm occurs again.   If the same alarm message appears frequently, call the local NAC distributor.

Alarm number

An alarm number is assigned to each alarm and it is displayed before the alarm message in the format shown below.   This alarm number is the same as a 2-digit number of "ALARM XX" on the COUNTER display of the operation unit.

Alarm messages, display timing, and troubleshooting

No.	Message	Display timing	Troubleshooting
8~9	DD MECHANISM STOPED DIRECTION FWD/REW	When the DD mechanism stopped at either direction of FWD or BWD	Turn off power, wait a moment, turn on power again.
10	SUPPLY REEL STOPPED	When the supply reel stops	Turn off power, wait a moment, turn on power again, or replace the cassette.
11	TAKE-UP REEL STOPPED	When the take-up reel stops	Turn off power, wait a moment, turn on power again, or replace the cassette.
12	EXCESSIVE SUPPLY TENSION	When the tape supply tension is excessive	Turn off power, wait a moment, turn on power again, or replace the cassette.
13	INSUFFICIENT SUPPLY TENSION	When the tape supply tension is insufficient	Turn off power, wait a moment, turn on power again, or replace the cassette.
14	CANNOT PERFORM LOADING	When the video cassette cannot loaded into the VCR	Turn off power, wait a moment, turn on power again, or replace the cassette.
15	CANNOT PERFORM EJECTION	When the video cassette cannot ejected from the VCR	Turn off power, wait a moment, turn on power again.
16 to 31	FUNCTION MECHANISM STOPPED POSITION :X DIRECTION :FWD/REV	When the function mechanism stops Position: Number Direction: Forward/backward	Turn off power, wait a moment, turn on power again.
32	CAPSTAN SERVO UNLOCKED	When a capstan servo is not locked.	Turn off power, wait a moment, turn on power again..
33	DRUM SERVO UNLOCKED	When the drum servo motor is not locked	Turn off power, wait a moment, turn on power again..
34	CAPSTAN STOPPED	When the capstan stops	Turn off power, wait a moment, turn on power again.
35	DRUM STOPPED	When the drum stops	Turn off power, wait a moment, turn on power again.

SELF-TEST

This function tests the recording and reproducing functions of the VCR.
Test procedure:
1) Load a test video cassette into the VCR. (The safety lug of the VCR must not be removed.)
2) Press the TEST button on the operation panel more than 1 second.

The self-test function of the VCR automatically records the test color bar signals on the tape, reproduces them, and displays the result of the test on the monitor screen.
When the "SELF-TEST PASSED" message appears on the screen, the self-test function is completed.

Displayed message at the failure of the self-test	Troubleshooting
ABNORMAL RF LEVEL	Head cleaning.
COLOR NOT DETECTED	Head cleaning.
CTL NOT DETECTED	Reload the video cassette.

XY Cursor function

The operation unit of this HSV-4000 has the XY cursor function. It has a capability of showing the XY cursors and XY coordinate values on the monitor by using four buttons and a dial on the operation unit.

Coordinate:

The value of X and Y coordinates are shown as pixel values.

It's not depended on the frame rate. The values are from 0 to 767 on X-axis and from 0 to 483 on Y-axis for the monitor screen. Upper left on the monitor screen is the (0, 0) position.

The shape of one pixel on the monitor is rectangle, and the ratio between X and Y is 1 to 1.16. Therefore, the ratio between the coordinate values on the monitor and the actual distance is different.

(116 pixels of X coordinate equals to 100 pixels of Y coordinate as their distance.)

Turning ON and OFF the cursors:

Each time the CURSOR button is pressed, the cursor function is enabled (ON) and disabled (OFF) alternately, when it's ON, the cross hair is indicated on the monitor as the XY cursor.

Moving the cursor:

Rotate the dial on the operation unit to move the cursors. To switch from the X to Y cursor or from Y to X cursor, press X / Y button.

The solid line of the cursors shows selected cursor.

Relative position indication:

When REF button is pressed, the function is changed to the relative position indicating function. The position when the REF button was pressed becomes the reference position shown in "■" mark.

When the cursor function is the relative position indication, move back the X and Y cursors to the reference position again and press REF button to switch to the absolute position indication. The other method to switch back to the absolute position indication is pressing REF button twice at any position.

Changing the indication of cursor:

"⊞/▦ " button is to change the cursor's color indication. Each time this button is pressed, the indication is changed from black to white or white to black.

CHAPTER 7   DAILY MAINTENANCE

CLEANING OF THE OUTER CASING

Wipe clean the outer casing of the VCR with a soft lint-free cloth. Clean spots, stains and dirt (if any) with a soft cloth dampened with thin detergent water.

Caution: **Never use any organic solvent such as thinner and benzol to clean the outer casing of the VCR. Brush or vacuum away dust and lint on the switches and the connectors.**

Caution: **Do not apply any compressed air to any part.**

CLEANING THE VENTILATION SLITS

The VCR has a ventilation slits on each lateral side of the body. Vacuum or brush clean each slits and wipe clean their surfaces with a soft cloth.

REPLACING THE AIR FILTERS

Each ventilation slits (filter plate) has an air filter behind it.
Replace the air filters periodically. The time period to replace the filters is dependent upon the operating environment. Periodically check how much the air filters are blocked.

Replacing procedure:
1) Disconnect all cables from the VCR.
2) Remove the four mounting screws of the filter plate and take it off.
3) Replace the blocked air filter by a new one.
4) Reverse the above steps for re-assembly.

CLEANING THE VIDEO HEAD

Clean the video head and the tape pass components with a dedicated head cleaning tape (in cassette) or equivalent when noises start to appear on the reproduced pictures.

⚠️ **Caution: Never clean the video head in the REC mode. (The video head may be damaged.) Always follow the cleaning instructions.**

Run the cleaning tape for ten seconds in the PLAY mode (up to three times).

Cleaning procedure:

(1) Load the head cleaning tape into the VCR and close the cassette door.

(2) Press the PLAY button of the VCR. Cleaning starts.

(3) Wait 10 seconds and press the STOP button.

(4) Press the EJECT button and take out the cleaning tape. (Do not rewind or fast-forward the cleaning tape except in case of the end of tape condition.)

(5) Playback a noiseless video tape and make sure the reproduced pictures are perfect free from noises.

If noises are still found in the reproduced pictures, repeat the above steps (1) to (5).
Up to three head cleanings are allowed at a time.
If noises still remain, call the local NAC distributor.

REPLACING THE VIDEO HEAD

The typical service life of the video head is about 200 hours in only REC use, and is about 1,000 hours in only PLAY use. The video head must be replaced when noises cannot be removed by head cleaning or when the integrated service time ("V HEAD" on the SYSTEM INFORMATION page) of the video head is 1000H (hours) or more (The indicated time is converted to normal PLAY BACK time.). If the reproduced pictures are clear free from noises, the video head need not be replaced

NOTE: **In this system, the video head rotates faster in the REC operation than the PLAY operation. Therefore, the time counting indicated by V HEAD item in REC is about 5 times faster than counting in PLAY.**
For replacement of the video head, call the local NAC distributor.

Preparation for replacement of the video head

(1) Clean the video head with the head cleaning tape (see the above head cleaning procedure (1) to (4)).

(2) Play a noiseless recorded video tape.

(3) Record camera image or color bar on a new video tape and play it back.

When unwanted noises are recognized in the above steps (2) and (3), check or replace of the video head will be needed.

PERIODIC CHECKS AND MAINTENANCE

Periodic checks and maintenance are required to keep the initial performance of the VCR.

The VCR in the normal and standard use, every 250 hours check and maintenance is recommended.

The periodic check and maintenance works contain tape passage cleaning, periodic part replacement, lubrication, and operational checks.

The typical service life (frequency of replacement) of each part is as follows:

Part name	Frequency of replacement
Upper drum	1000 hours
Brush	1000 hours
Pinch roller	1000 hours or 2 years
Air filter	1000 hours
Capstan motor	------- (*)
Supply and Take-up reel motor	------- (*)
Function motor	------- (*)
Front loading motor	------- (*)

* : Necessity of replacement would be judged at the periodic checks and maintenance.

These above hours are basically equivalent to the value given by "V HEAD" of the SYSTEM INFORMATION page. The frequency of replacement of the pinch roller is a time given by "V HEAD" of the SYSTEM INFORMATION page or a time period from the date of purchase of the VCR or replacement of the pinch roller.
The indicated time "V HEAD" is converted to normal PLAY BACK time.

NOTE: **In this system, the video head rotates faster in the REC operation than the PLAY operation. Therefore, the time counting indicated by V HEAD item in REC is about 5 times faster than counting in PLAY.**
For periodic checks and maintenance, call the local distributor.

CHAPTER 8   INTERFACE

VCR Connector Interface

Camera Connector Interface

VCR CONNECTOR INTERFACE

J1 POWER

J1 POWER
DC 24V 9.2A
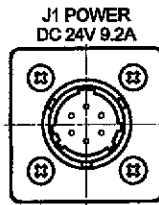
Part number   AFD50-10-6PN-1A
Mating Connector   AFD57-10-6SN-059

Figure 8-1   J1 (POWER) Connector

Pin No.	Signal name	Description
A	NC	not connected
B	24V	D.C. voltage input (20V to 32V) (supplied to both the VCR and the color camera)
C	24V	D.C. voltage input (20V to 32V) (supplied to both the VCR and the color camera)
D	FG	Frame ground
E	24V RTN	Power return
F	24V RTN	Power return

This power input connector inputs power (20 VDC to 32 VDC) from an AC adapter or a battery.

Caution: An over voltage, a reverse voltage, or an AC voltage will damage the VCR system if supplied. Always check the polarity and the DC voltage range.

J2 CAMERA
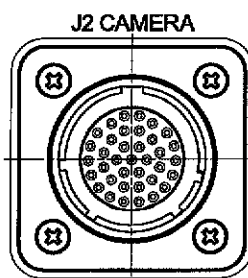
J2 CAMERA

Part number   ACT90MD35SN-12126
Mating Cable   Attached or optional camera cable

Figure 8-2   J2 (CAMERA) Connector

Pin No.	Signal name	Description
1	DATA1+	Video data1+
2	DATA1-	Video data1-
3	DATA3+	Video data3+
4	DATA3-	Video data3-
5	DATA5+	Video data5+
6	DATA5-	Video data5-
7	DATA6+	Video data6+
8	DATA6-	Video data6-
9	DATA8+	Video data8+
10	DATA8-	Video data8-
11	CAM TX+	VTR command and camera status input+

J2 CAMERA (Continued)

Pin No.	Signal name	Description
13	CAM RX+	VTR status and camera command output+
14	CAM RX-	VTR status and camera command output-
15	VRESET+	V Reset+ to color camera
16	VRESET-	V Reset- to color camera
17	HD+	HD+ from color camera
18	FG	Frame ground
19	DATA2+	Video data2+
20	DATA2-	Video data2-
21	DATA4+	Video data4+
22	DATA4-	Video data4-
23	DATA7+	Video data7+
24	DATA7-	Video data7-
25	NC1+	Not used (connected GND in VCR)
26	NC1-	Not used (connected GND in VCR)
27	NC2+	Not used (connected GND in VCR)
28	NC2-	Not used (connected GND in VCR)
29	NC3+	Not used (connected GND in VCR)
30	HD-	HD- from color camera
31	CAM24V RTN	Power return
32	CAM24V	24V power output
33	CAM24V	24V power output
34	CAM24V RTN	Power return
35	EVF	Video output for viewfinder
36	NC3-	Not used (connected GND in VCR)
37	EVF RTN	Video return for viewfinder

The cable of the color camera is connected to this connector. The cable must be an attached or optional camera cable.
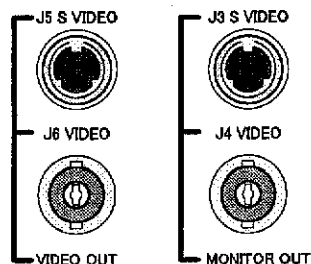
Figure 8-3   J3/J5 (S-VIDEO) Connector and J4/J6 (VIDEO) Connector

J3 S VIDEO

	Part number	TCS7648-01-201
	Mating Cable	S cable

Pin No.	Signal name	Description
1	GND	YS return
2	GND	C return
3	YS	YS output
4	C	C output
E	SHIELD	Cable shield

YC separation S-video output with on-screen data

J4 VIDEO

	Part number	BNC284-BR
	Mating Cable	BNC cable (75 Ω)

Pin No.	Signal name	Description
C	VBS	VBS output
S	GND	VBS return

Composite video output with on-screen data

J5 S VIDEO

	Part number	TCS7648-01-201
	Mating Cable	S cable

Pin No.	Signal name	Description
1	GND	YS return
2	GND	C return
3	YS	YS output
4	C	C output
E	SHIELD	Cable shield

YC separation S-video output without on-screen data

J6 VIDEO

	Part number	BNC284-BR
	Mating Cable	BNC cable (75 Ω)

Pin No.	Signal name	Description
C	VBS	VBS output
S	GND	VBS return

Composite video output without on-screen data

J7 SYNC OUT
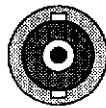
	Part number	BNC284-BR
	Mating Cable	BNC cable (75 Ω)

Figure 8-4   J7 (SYNC OUT) Connector

Pin No.	Signal name	Description
C	SYNC	SYNC output, negative polarity, TTL 75 Ω
S	GND	SYNC return

This connector outputs a vertical SYNC signal as following frequency.

Frame rate	Frequency
500 pictures per/ second	500Hz
1000 pictures per/ second	1KHz
2000 pictures per/ second	2KHz
4000 pictures per/ second	4KHz

J8 REMOTE

	Part number	TCS7963-01-201
	Mating Cable	Attached or optional operation cable

Figure 8-5   J8 (REMOTE) Connector

Pin No.	Signal name	Description	
1	— — —	NC	
2	— — —	NC	
3	/SERA	VCR status output-	RS-422
4	GND	GND	
5	VCC	12V power output	
6	/SERB	VCR command input-	RS-422
7	SERA	VCR status output+	RS-422
8	— — —	NC	
9	SERB	VCR command input+	RS-422
E	SHIELD	Cable shield	

This connector is for remote control of the VCR and connected to the attached operation unit or the optional parallel interface.

J9 DATA MIX
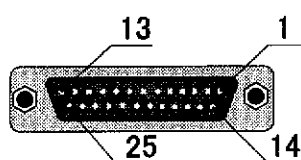
Part number	DB-25SF-T-N
Mating Connector	DB-25PF-N

Figure 8-6   J9 (DATA MIX) Connector

Pin No.	Signal name	Description
1	GND	0V
2	GND	0V
3	GND	0V
4	GND	0V
5	GND	0V
6	GND	0V
7	GND	0V
8	GND	0V
9	GND	0V
10	GND	0V
11	SCR2	Recording speed output_2
12	SCR1	Recording speed output_1
13	SCR0	Recording speed output_0
14	EXTMIX_A	ChA white input, $75\,\Omega$, positive polarity
15	EXTWIN_A	ChA black input, $75\,\Omega$, positive polarity
16	EXTMIX_B	ChB white input, $75\,\Omega$, positive polarity
17	EXTWIN_B	ChB black input, $75\,\Omega$, positive polarity
18	EXTMIX_C	ChC white input, $75\,\Omega$, positive polarity
19	EXTWIN_C	ChC black input, $75\,\Omega$, positive polarity
20	EXTMIX_D	ChD white input, $75\,\Omega$, positive polarity
21	EXTWIN_D	ChD black input, $75\,\Omega$, positive polarity
22	EXTMIX_E	ChE white input, $75\,\Omega$, positive polarity
23	EXTWIN_E	ChE black input, $75\,\Omega$, positive polarity
24	SYNC	Composite sync, $75\,\Omega$, negative polarity
25	GND	0V

A recording character input equipment such as an optional wave inserter is connected to this connector.

When both EXTMIX (A to E) and EXTWIN (A to E) are high, EXTMIX is used in preference to EXTWIN. (The white signal is used preferentially.)

When these signals are input, these signals are always recorded independently of the setting status of pin 10 (DISPLAY) of the J10 (AUX) connector.

The following chart shows the logical levels of pin 11 to pin 13 corresponding to recording speed.

SCR2 (pin11)	SCR1 (pin12)	SCR1 (pin13)	Recording speed
H	H	H	1000 pps
H	H	L	NA
H	L	H	NA
H	L	L	2000 pps (half in vertically)
L	H	H	500 pps
L	H	L	2000 pps (full screen)
L	L	H	4000 pps (half in horizontally and vertically)
L	L	L	4000 pps (full screen)

pps: pictures per second

The EXTMIX_A and EXTWIN_A character signals must be in synchronism with the SYNC signal.   In addition, the signals of EXTMIX_B / EXTWIN_B~EXT_E / EXTWIN_E must have phase difference to EXTMIX_A and EXTWIN_A as shown below.

Signals	Phase difference
EXTMIX_B / EXTWIN_B:	337.5H
EXTMIX_C / EXTWIN_C:	112.5H
EXTMIX_D / EXTWIN_D:	450.0H
EXTMIX_E / EXTWIN_E:	225.0H
	(1H = 19.0476usec)

The character signals must be input on identical NTSC signal lines (e. g. line 14 and line 276 at 500 and 1000 pictures per second, line 145 and line 407 at 2000 and 4000 pictures per second) to prevent pictures from drifting up and down by framing.   Further, at 500 pictures per second, two fields in one frame must have identical characters so that characters may not be overlapped illegally.

When the VCR system is made synchronous to external signals via the J10 (AUX) connector, it is possible to generate character signals from external signals.

J10 AUX
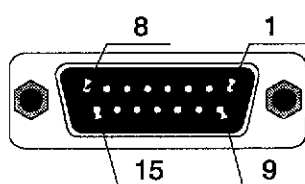
Part number | DA-15SF-T-N
Mating Connector | Attached AUX connector kit (DA-15PF-N)

Figure 8-7   J11 (AUX) Connector

Pin No.	Signal name	Description	
1	SERB	VCR command input+	RS-422
2	/SERB	VCR command input-	RS-422
3	SERA	VCR status output+	RS-422
4	/SERA	VCR status output-	RS-422
5	/TIMEON	Low to force the time counter to count	
6	/TIMEOFF	Low to force the time counter to reset to 0	
7	/HDOUT	Recording master HD output, negative polarity, 75 Ω	
8	/VDOUT	Recording master VD output, negative polarity, 75 Ω	
9	GND	GND	
10	DISPLAY	Low to disable superimposition of characters on pictures	
11	GND	Ground (for DISPLAY)	
12	/HDIN	External HD input, negative polarity, 75 Ω TTL level	
13	/VDIN	External VD input, negative polarity, 75 Ω TTL level	
14	GND	GND	
15	GND	GND	
E	SHIELD	Cable shield	

A time counter or a time counter control unit such as an optional synchronizing unit is connected to this connector with the attached AUX connector kit. The synchronizing I/O pins of this connector are used to make the VCR in synchronism with external signals or vice versa.

Pins 1 to 4 are VCR command/status signals which are the same as those of the J8 (REMOTE) connector.

/TIMEON (pin 5) and /TIMEOFF (pin 6) are pulled up to 5V with a resistor of 10 KΩ. Usually these inputs are controlled by contact signals but can be control led also by TTL levels. In the description below, "H" means "open" or "high level" (2.0V or higher) and "L" means "grounded" or "low level" (0.8V or less). These pins (/TIMEON and /TIMEOFF) control the operation of the counter for the recording character generator according to their logical levels, as shown below.

/TIMEON	/TIMEOFF	Counter operation
H	H	Counts according to a menu setting.
H	L	Stops counting when reset to 0.
L	H	Always counts.
L	L	Always counts.

/HDOUT (pin 7) outputs a horizontal drive SYNC signal of 260KHz and /VDOUT (pin 8) outputs a vertical drive SYNC signal of 100Hz. These pins output constant SYNC signals independently of the frame rate. Each output is about 5Vpp when not terminated or about 2.5Vpp when terminated with 75Ω.

The DISPLAY input (pin 10) enables or disables both recording of characters generated in the VCR and recording of digital data signals during vertical blanking.

Each input of this connector is pulled up to 5V with 10KΩ. Usually each input controls the VCR by a contact signal but TTL levels are also used to control the VCR. In the description below, "H" means "open" or "high level" (2.0V or higher) and "L" means "grounded" or "low level" (0.8V or less). The input becomes ON at the high level or OFF at the low level. These settings will not have any influence upon external character inputs through the J9 (D ATA MIX) connector.

/HDIN (pin 12) and /VDIN (pin 13) inputs external SYNC signals. When a signal of 260KHz is input to pin 12 (/HDIN) and a signal of 100Hz is input to pin 13 (/VDIN) at the same time, the VCR system runs in synchronism with these signals. The signal format should be 1000/59.94 times the NTSC frequency. The signal is triggered by a drive signal (not a SYNC signal). The signal level is a TTL level (when terminated by 75Ω). With this input, the time accuracy of the VCR is dependent upon that of the SYNC signal input.

J11 DISCRETE
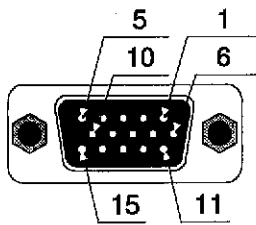
Part number	D02-M15-STF-21L9
Mating Connector	D02-M15PG-N-F0

Figure 8-8   J10 (DISCRETE) Connector

Pin No.	Signal name	Description
1	GND	0V
2	/CMDA	Command A input
3	/CMDB	Command B input
4	/CMDC	Command C input
5	/CMDD	Command D input
6	/STSA	Status A output
7	/STSB	Status B output
8	/STSC	Status C output
9	/STSD	Status D output
10	/CUE ENT	Cue signal input
11	— — —	NC
12	5V	5V power output
13	GND	0V
14	/STSSEL	Status selection input
15	/POWER	Power on/off input
E	SHIELD	Cable shield

This connector controls the VCR discretely and enables you to perform the same operations as those of the operation panel of the VCR.   Each input of this connector is pulled up to 5V with 10KΩ. Usually each input controls the VCR by a contact signal but TTL levels are also used to control the VCR.

In the description below, "H" means "open" or "high level" (2.0V or higher) and "L" means "grounded" or "low level" (0.8V or less).

Each output of this connector is an open collector output.   In the description, "H" means "open" and "L" means "Grounding" (0V).

/CUE ENT (pin 10) is a cue signal input.   When this input is made "low" in the REC or EDIT mode, a cue signal is recorded on the tape.

/POWER (pin 15) is a power on/off input.   Power is turned on and off alternately each time this input is made "low."

/STSSEL (pin 14) is a status selection input.   When this input is made "low," status outputs /STSA to /STSD are individually output.   When this input is made "high," status outputs /STSA to /STSD are output in combination.

The other pins (excluding POWER and GND) are command input pins and status output pins.   Their functions are described below.

Command inputs (/CMDA to /CMDD)

These inputs are made "low" singly or in combination to input a command. The input of 100ms or longer is valid. NOP indicates "no operation."

D C B A	Command-related buttons on the operation panel

D	C	B	A	
H	H	H	H	NOP
H	H	H	L	STOP
H	H	L	H	REC
H	L	H	H	PLAY
L	H	H	H	REW

Note: The above four commands are respectively made valid by a single pin. These commands are termed "Simple commands."

D	C	B	A	
H	H	L	L	NOP
H	L	H	L	STILL/PAUSE
H	L	L	H	MENU
H	L	L	L	NOP
L	H	H	L	NOP
L	H	L	H	NOP
L	H	L	L	FF
L	L	H	H	FWD STEP
L	L	H	L	REV STEP
L	L	L	H	NOP
L	L	L	L	TEST

Status outputs (/STSA to /STSD)

These outputs are used singly or in combination to indicate a status.

Simple status

When /STSSEL (pin 14) is made "low" (grounded), the status output signals /STSA to /STSD are singly used to indicate a status (simple status). The simple states are as follows:

/STSA   Grounded in an alarm status or open in a non-alarm status
/STSB   Grounded in the PLAY status or open in a non-PLAY status
/STSC   Grounded in the REC status or open in a non-REC status
/STSD   Grounded in the alarm, PLAY or REC status or open in the other status

Non-simple status

When /STSSEL (pin 14) is made "high" (open), the status output signals /STSA to /STSD are used in combination to indicate a status (non-simple status). The non-simple states are as follows:

D	C	B	A	Status	Description	Related indicators on the operation panel
H	H	H	H	ALARM	Alarm	None
H	H	H	L	DEW	Condensation	None
H	H	L	H	EOT	End of tape	None
H	H	L	L	EJECT	No cassette	CASSETTE
H	L	H	H	STOP	Stop	STOP
H	L	H	L	FF	Fast forward	FF
H	L	L	H	REW	Rewind	REW
H	L	L	L	FAIL	Test failed	None
L	H	H	H	FSRCH	Forward fast search reproduction	FF and PLAY
L	H	H	L	RSRCH	Backward fast search reproduction	REW and PLAY
L	H	L	H	STILL	Still or search reproduction	STILL and PLAY
L	H	L	L	PLAY	Normal reproduction	PLAY
L	L	H	H	GO	Test passed	STOP
L	L	H	L	MENU	Menu mode	MENU
L	L	L	H	PAUSE	Pause of recording	STILL and REC
L	L	L	L	REC	Recording	REC

J12 SERIAL
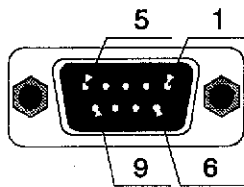
Part number

Mating Cable

DE-9SF-T-N

9-pin RS-232 serial cable
(Extension cable for a DOS/V
computer)

Figure 8-9 J12 (SERIAL) Connector

Pin No.	Signal name	Description
1	DCD	Not used (open)
2	RXD	Serial reception (PC → VCR)
3	TXD	Serial transmission (VCR → PC)
4	DTR	Connected to DSR (pin 6)
5	GND	0V
6	DSR	Connected to DTR (pin 4)
7	RTS	Connected to CTS (pin 8)
8	CTS	Connected to RTS (pin 7)
9	RI	Not used (open)
E	SHIELD	Cable shield

A personal computer or a terminal equipment is connected to this connector with an
RS-232 cable.   For details, see Chapter 9.

CAMERA CONNECTOR INTERFACE

CAMERA OUT connector

Part number   ACT90MD35PN-12122

Mating Cable   Attached or optional camera cable

This connector (plug) is functionally the same as the J2 (CAMERA) connector (socket) of the VCR.

SYNC OUT connector

Part number   BNC284-BR

Mating Connector   BNC cable (75 Ω)

This connector is functionally the same as the J7 (SYNC OUT) connector of the VCR.

EVF connector
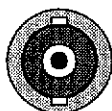
Part number   BNC284-BR

Mating Connector   BNC cable (75 Ω)

Figure 8-10   EVF Connector

Pin No.	Signal name	Description
C	VIDEO OUT	composite video output
S	VIDEO GND	Video Ground

This connector sends video signal to video equipment like a viewfinder.

REMOTE connector

Part number   TCS7963-01-201

Cable   Attached operation cable

The operation unit is connected to this CONTROL connector to control the system. This connector is functionally the same as the J8 (REMOTE) connector of the VCR.

AUX connector
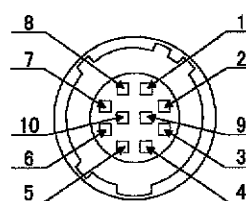
| Part number | HR10A-10R-10SB |
| Mating Connector | HR10A-10P-10P |

Figure 8-11   AUX Connector

Pin No.	Signal name	Description
1	NC1+	not used
2	NC1-	not used
3	NC2+	not used
4	NC2-	not used
5	NC3+	not used
6	NC3-	not used
7	12V	DC12V power (0.2A)
8	GND	Ground
9	open	
10	open	

This connector is an auxiliary connector and is not usually used.
Pin 7 outputs DC12V power.   And its current limitation is 0.2 amperes.

(memo page)

CHAPTER 9   CONTROLLING BY A PERSONAL COMPUTER

Outline of Controlling System by a Personal Computer

Connecting VCR to a Personal Computer

RS-232 Communication with a Personal Computer

Commands and States

List of Commands

List of Status

OUTLINE OF CONTROLLING SYSTEM BY A PERSONAL COMPUTER

The J12 (SERIAL) connector of the VCR is connected to a personal computer to let the computer to control the system. The VCR can send its operating status and results to the computer through this connector.

Features:

- The personal computer can control the system in the Terminal mode or by programs.
- The personal computer can read the operating status of the system.
- The personal computer can read detailed information which cannot be displayed on any of the monitor screen, the operation panel, and the operation unit.
- The automatic search function can feed the tape rapidly to a target point by using a personal computer.
- The personal computer can read scene codes and time data from the tape.
- The VCR has a function to display a cursor on a monitor screen by using a personal computer.
- The personal computer can recognize the maximum of nine HSV-4000 systems by the VCR number.

CONNECTING VCR TO A PERSONAL COMPUTER

Connect the J12 (SERIAL) connector of the VCR to the RS-232 serial connector of the personal computer (PC) with the RS-232 cable.

If the personal computer is IBM-PC/AT compatible computer, the D-SUB 9-pin straight expansion cable which is widely on the market is available. If the VCR is connected to the other computer, a conversion adapter or cable is required for connection.

Example of VCR - PC connection

IBM-PC/AT compatible PC (9-pin connector)			VCR (V-329) (9-pin connector)
DCD	1	1	DCD
RXD	2 ——————————— 2		RXD (to the PC)
TXD	3 ——————————— 3		TXD (from the PC)
DTR	4 ——————————— 4		DTR (connected to pin 6)
GND	5 ——————————— 5		GND
DSR	6 ——————————— 6		DSR (connected to pin 4)
RTS	7 ——————————— 7		RTS (connected to pin 8)
CTS	8 ——————————— 8		CTS (connected to pin 7)
RI	9	9	RI
FG	———————————		FG

Pins 1 and 9 are not used, but a cable whose pins 1 and 9 are connected are also available.

Caution: Be sure to turn off power to the VCR and to the PC before connecting them. (Disconnect the power cable from the J1 (POWER) connector of the VCR.)
After connecting the connectors, be sure to lock them with their lock screws.

RS-232 COMMUNICATION WITH A PERSONAL COMPUTER

For successful communication between the PC (RS-232 interface) and the VCR (SERIAL connector), the interfacing conditions must be set on the PC. This setting is dependent upon PC types. Typical interfacing conditions are given below for reference.

VCR serial connector specifications

Bit rate:	9600 bits per second
Communication method:	Start-stop (asynchronous) communication method, full duplex
Data format:	8 data bits, 1 start bit, 1 stop bit, no parity
Flow control	none
Connector:	D-SUB 9-pin (socket)
Mode:	DCE
Storage capacity of receive buffer:	128 bytes

COMMANDS/STATUS

A command is data sent from the PC to the VCR to control the operation of the VCR and a status is data sent from the VCR to the PC to indicate the operating status of the VCR.

Commands and status are ASCII character code strings.

Every command (excluding commands sent to two or more VCRs and cameras) starts with a slash "/" and ends with a CR code or LF code, or both.

Every status starts with a semicolon ";" and ends with CR and LF codes.

Parameters (if any) in a command or status are separated by a comma ",".

Commands can be entered with uppercase letters, lowercase letters or both.

The returned status are all given with uppercase characters.

Every command sent to the maximum of three VCRs and cameras starts with a sharp mark "#".
(Up to nine VCRs and up to nine cameras connected to VCR can be controlled by a single PC.)   This command is formatted as follows:

[VCR-number][camera-number] / [command-strings][end-code] where a VCR number and a camera number are respectively a 1-digit integer (1 to 9).

When the VCR number (the camera number) of a command is 0, the command is given to all VCRs (or cameras) in the HSV-4000 system.

The VCR number is a value set for the (16) VCR NO. parameter of the CHARACTER MENU page.   When the HSV-4000 has two or more VCRs connected to a single PC (by means of the synchronizer unit, etc.), a unique VCR number must be assigned to each VCR.

Example of command

/PLAY[CR][LF]:	This command sets a VCR in the REC mode.
#20/Q,3,1[CR][LF]:	This command sets the sensitivities of camera connected to the second VCR to 0dB.

Example of status

;S,37,1[CR][LF]:	This status indicates that the screen mode is 1000 pictures per second.
;A[CR][LF]:	This status indicates that the command was correctly received by the VCR.

LIST OF COMMANDS

All command listed below are without end codes (CR and LF) for legibility. For actual use of the commands, they must be ended with the end code(s). Generic parameter values "m," "n," and "k" in commands must be replaced by actual values.

Basic VCR commands

Command	Operation	Function
/POW,1	Power ON	Turn on power.
/POW,0	Power OFF	Turn off power. (Low power standby)
/EJECT	Eject	Eject the video cassette.
/STOP	Stop	Stop the video tape and reset the alarm.
/FF	Fast Forward	Feed the tape rapidly or perform fast-search playback in the playback mode.
/REW	Rewind	Rewind the tape rapidly or perform fast-search playback in the playback mode.
/REC	Record	Record video images (pictures) on the tape.
/PLAY	Play	Playback the tape.
/STILL	Pause	Enable or disable pausing in reproduction, recording, or edit reproduction.
/SP,n	Search Play	Search-playback the tape. ("n" is an integer ranging from -10 to 10.) (*1)
/FSTEP	Forward Step	Feed one picture forward.
/RSTEP	Backward Step	Feed one picture backward.
/NSTEP,n	Step n Screens	Feed n pictures. ("n" is an integer ranging from -128 to 127.)
/TEST	Test	Start the self-test.
/EDIT	Cue Edit	Set the Cue Signal Edition mode.

*1   "n" is corresponding to the furthest illuminated bar indicator in the STILL indicator field of the operation unit. "0" is the STILL indicator.   A plus integer indicates a forward search and a negative integer indicates a backward search.

- The basic VCR commands change the basic operating status (mode) of the VCR.
- The change of operating modes is limited by the current operating mode.
- The basic VCR commands are almost the same as operations made by the operation panel or the operation unit.

Auxiliary VCR commands

Command	Operation	Function
/MENU	Menu	Change between the MENU mode and the NORMAL mode.
/RESET	Counter Reset	Reset the lap counter to zero.
/ENTER	Cue Record	Record a cue signal on the tape.
/CUE	Cue Stop On/Off	Turn on or off automatic cue signal stop.
/NCUE,0	Cue Stop Off	Turn off automatic cue signal stop.
/NCUE,n	n-th Cue	Automatically stop the tape at n-th cue signal. (n = 1 to 9)
/MEM	Memory On/Off	Turn on or off automatic tape stop at lap count = 0
/MM,1	Memory On	Turn on automatic tape stop at lap count = 0.
/MM,0	Memory Off	Turn off automatic tape stop at lap count = 0.
/ASCN,n	Scene Code	Set a scene code. (n = 000 to 999)
/ATIM,n,m	RTC Time	Set an RTC time. (n = 00 to 59 hours, m = 00 to 59 minutes)
/ADAT,n,m,k	RTC Date	Set an RTC date. (n = 00 to 99 (year), m = 1 to 12 (month), k = 1 to 31 (day))

- The auxiliary VCR commands are used to change VCR settings but have no direct influence upon basic VCR operations.

- The auxiliary VCR command will not be limited by the current operating mode except that the "/ENTER" command is available only during recording and during cue editing in which cue signals can be recorded.

- The auxiliary VCR commands are almost the same as operations made by the operation panel or the operation unit.

SEARCH COMMANDS

Command	Operation	Function
/LLAP,n	Search by Lap Counter	Feed the tape to a point specified by the lap count n. "n" is a 6-digit hexadecimal value in the range of E488C4 to 1B773C (-1799996 to 1799996 in decimal). The units are in 1/4 frames.
/LSCN,n	Scene Code Still ON	Enables automatic still search by a scene code "n" (000 to 999).
/LTCN,n	Time Code Still On	Enables automatic still search by a time code "n" (00.00.000 to 59,59,999).
/LCAN	Search/Auto Still Cancel	Cancels search and automatic still search by /LLAP, /LSCN, and /LTCN commands.

- The /LLAP command performs a search playback in the PLAY status or automatic search by the FF or REW button in the STOP status.

- The /LSCN and /LTCN commands are valid only in the PLAY status. The preset values in the VCR are changed by these commands but automatic search will not be performed. /FF or /REW command shall be added after the /LSCN or /LTCN to specify the tape feed direction and start searching.

- The /EJECT, /STOP, /REC, /EDIT, or /TEST command entered after the /LSCN or /LTCN command will cancel the Auto Stop setting. Auto Stop setting are also canceled /STILL command entered in the non-Still Playback status or when the VCR is powered on.

- To cancel searching, cancel the automatic stop by the /LCAN command.

- The /LCAN command simply cancels Auto Stop setting and causes the tape to keep on running. To stop the tape, a stop command such as /STOP or /STILL is required.

- When searching is completed, the Automatic Stop setting is cancelled.

CURSOR COMMANDS

Command	Operation	Function
/XYP,n,m	Cursor position	Move the cursor to a specified point (Horizontal line n, Vertical m). n=0 to 767 m=0 to 483 A point (0,0) indicates the upper left corner of the screen.
/XYS,0	Cursor OFF	Does not display the cursor.
/XYS,1	White cursor	Displays a white cursor.
/XYS,2	Black cursor	Displays a black cursor.

- The use of the above cursor commands is not limited by the current operation mode.

EXPANSION COMMANDS

Command	Operation	Function
/Q,n,m	Memory Switch Write	Set a value "m" to a memory switch "n." (n <70)
/K,n	Memory Switch Read	Read the content (status) of the specified memory switch "n." (n < 70)
/K,k	Expansion Status Read	Read the expansion status "k." (k≧70)

- Memory switches are listed below.

LIST OF MEMORY SWITCHES
(Each memory can be written and read unless otherwise specified.)

Command	Operation	Function
1	Reserved	
/Q,2,0	Shutter	Set the electronic shutter of the camera to OPEN for continuous exposure.
/Q,2,1	Shutter	Set the electronic shutter of the camera to 1/1000 second.
/Q,2,2	Shutter	Set the electronic shutter of the camera to 1/2000 second.
/Q,2,3	Shutter	Set the electronic shutter of the camera to 1/5000 second.
/Q,2,4	Shutter	Set the electronic shutter of the camera to 1/10000 second.
/Q,2,5	Shutter	Set the electronic shutter of the camera to 1/20000 second
/Q,2,6	Shutter	Set the electronic shutter of the camera to 1/50000 second
/Q,2,7	Shutter	Set the electronic shutter of the camera to 1/100000 second
/Q,2,8	Shutter	Set the electronic shutter of the camera to 1/200000 second
/Q,3,0	Sensitivity	Set the sensitivity of the camera to 0dB.
/Q,3,1	Sensitivity	Set the sensitivity of the camera to +3dB.
/Q,3,2	Sensitivity	Set the sensitivity of the camera to +6dB.
/Q,4,0	White Balance	Automatically adjust the white balance of the camera.
/Q,4,1	White Balance	Holds the current white balance of the camera.
/Q,4,2	White Balance	Set the camera white balance to 3200K.
/Q,4,3	White Balance	Set the camera white balance to 5000K.
/Q,4,4	White Balance	Set the camera white balance to 9000K.
5	Reserved	
/Q,6,0	Enhancement	Disable camera profile enhancement.
/Q,6,1	Enhancement	Enhance camera profiles at low level.
/Q,6,2	Enhancement	Enhance camera profiles at high level.
/Q,7,0	Gamma	Set Camera Gamma to OFF.
/Q,7,1	Gamma	Set Camera Gamma to NORMAL.
8	Reserved	
/Q,9,0	Knee	Set Camera Knee to OFF.
/Q,9,1	Knee	Set Camera Knee to NORMAL.
/Q,11,0	S-VHS	Record by S-VHS format on the S-VHS video cassette.
/Q,11,1	S-VHS	Record by VHS format on the S-VHS video cassette.
/Q,12,0	Repeat	Disable repeat recording.
/Q,12,1	Repeat	Enable repeat recording.
/Q,13,0	Start Cue	Disable automatic recording of a cue signal at the start of recording.
/Q,13,1	Start Cue	Enable automatic recording of a cue signal at the start of recording.
/Q,14,0	Color Recording	Set monochromatic recording mode.
/Q,14,1	Color Recording	Set color recording mode.
/Q,15,0	OSD RATE	Display frame rate and shutter speed on-screen message.
/Q,15,1	OSD RATE	Do not display frame rate and shutter speed on-screen message.
/Q,16,0	Noise Reduction	Disable playback noise reduction.
/Q,16,1	Noise Reduction	Perform low playback noise reduction.
/Q,16,2	Noise Reduction	Perform high playback noise reduction.
/Q,17,0	Auto Screen	Turn off the automatic playback screen mode switch for manual setting.
/Q,17,1	Auto Screen	Turn on the automatic playback screen mode switch.
/Q,17,2	Auto Screen	Set screen mode of playing back the full screen image recorded at 500 pictures per seconds by HSV-500c3.
/Q,18,0	Playback Servo	Turn off the normal VCR tape creation mode. The servo motor runs freely.
/Q,18,1	Playback Servo	Turn on the normal VCR tape creation mode. The servo motor is locked to the internal memory circuit.
/Q,19,0	Auto Tracking	Turns on playback manual tracking.
/Q,19,1	Auto Tracking	Turns on playback auto tracking.
/Q,20,n	Tracking	Set a playback manual tracking value. (n = 0 to 159, The default is 80.)
/Q,21,0	VCR Number	Reset a VCR number (100's place of a scene code).
/Q,21,n	VCR Number	Set a VCR number (100's place of a scene code). n = 1 to 9
22~24	Reserved	

(Continued)

Command	Operation	Function
/Q,25,0	Time Counter	Automatic counting (during recording)
/Q,25,1	Time Counter	Reset the time counter to 0.
/Q,25,2	Time Counter	Keep the time counter counting (Always counting).
26~35	Reserved	
/Q,36,0	Recording Character	Turn on recording characters.
/Q,36,1	Recording Character	Turn off recording characters.
/Q,37,n	Screen Mode	Set a recording screen. Set a playback screen manually (also when automatic setting fails) n:0,1,2,3,4,5=500,1000,2000S,2000F,4000S,4000F
/Q,38,0	OSD Scene/Time	Do not display on-screen scene code and a time code.
/Q,38,1	OSD Scene/Time	Display on-screen scene code and time code.
/Q,39,0	OSD RTC	Do not display on-screen RTC data.
/Q,39,1	OSD RTC	Display on-screen RTC data.
/Q,40,0	OSD Mode	Do not display on-screen mode data.
/Q,40,1	OSD Mode	Display on-screen mode data.
/Q,41,n	Power Supply Type	Set a power supply type (N for nickel-cadmium cell and L for lead-acid cell) n: 0 (other than battery), 1 (N24), 2 (L24), 3 (N28), 4 (L28)
/Q,42,1	Buzzer	Buzzer ON
/Q,42,0	Buzzer	Buzzer OFF
/Q,43,0	EE Screen	1-frame EE screen (Horizontal resolution: 1/2)
/Q,43,1	EE Screen	2-frame EE screen (Generation of overlapped image)
/Q,44,0	Viewfinder	Viewfinder video color
/Q,44,1	Viewfinder	Viewfinder video monochromatic
/Q,45,1	Input Switch	Input video or built-in color chart
/Q,45,0	Input Switch	Input video or camera
/Q,46,0	Output Video system	NTSC output video
/Q,46,1	Output Video system	PAL output video
47~52	Reserved	
/Q,53,0	S-VHS ET OFF	Record by VHS format on the VHS video cassette.
/Q,53,1	S-VHS ET ON	Record by S-VHS ET format on the VHS video cassette.
54~57	Reserved	
/Q,58,0	Freeze	Turn on the freeze image
/Q,58,1	Freeze	Turn off the freeze image
/Q,59,0	Freeze Display	Set the freeze display to OFF
/Q,59,1	Freeze Display	Set the freeze display to MIX
/Q,59,2	Freeze Display	Set the freeze display to ON
/Q,60,0	Lap 0 Detected	Output the status (D2) at lap count 0.
/Q,60,1	Lap 0 Detected	Do not output the status (D2) at lap count 0.
/Q,61,0	No Recording Detected	Output the status (D3) in the non-recording tape portion.
/Q,61,1	No Recording Detected	Do not output the status (D3) in the non-recording tape portion.
/Q,62,0	Received Status	Output the status (A,B,N) received in response to a command.
/Q,62,1	Received Status	Do not output the status (A,B,N) received in response to a command.
/Q,63,0	End Status	Output the status (D0,D1) at the end of execution of a command.
/Q,63,1	End Status	Do not output the status (D0,D1) at the end of execution of a command.
/Q,64,0	EOT/BOT Status	Output the status (D4) at the EOT or BOT.
/Q,64,1	EOT/BOT Status	Do not output the status (D4) at the EOT or BOT.
65~69	Reserved	

COMMANDS TO READ EXPANSION STATUS

Command	Operation	Function
/K,71	Camera Status	Read camera status (preset information).
/K,72	VCR Status 1	Read VCR status 1.
/K,73	VCR Status 2	Read VCR status 2.
/K,74	Time Code 1	Read the time code on the tape for a scene code and a time count.
/K,75	Time Code 2	Read the time code on the tape for a calendar and shutter data
/K,76	Lap Counter	Read a lap count value.
/K,77	RTC	Read the RTC date and time. (RTC: Rea-ltime clock built in the VCR)
/K,78	VCR TYPE	Read the type of the VCR.
79~99	Reserved	

LIST OF STATUS

All status listed below are without end codes (CR and LF) for legibility. In actual use of the status, they are followed by the end codes. Generic parameter values "m" and "n" in state data are replaced by actual values or characters.

Basic status

Status	Meaning	Explanation
;A	Command Received	The VCR received a valid command and started to execute it.
;B	Command Received	The VCR received a valid command but discarded it because the VCR could not execute it.
;N	Command Received	The VCR received a command but discarded it because it is not valid.
;D0	Command Ended	The execution of a VCR basic command was completed and the VCR was in the steady status.
;D1	Search Completed	The execution of a search command was completed.
;D2	Lap 0 Detected	"Lap count = 0" specified by the "Q,60,0" command was detected.
;D3	Non-Signal Field Detected	A non-signal field specified by the "Q,61,0" command was detected.
;D4	EOT/BOT Detected	The EOT or BOT specified by the "Q,64,0" command was detected.
;S,m,n	Status Returned	Status returned in response to an expansion command

- The VCR returns status ";A," ";B," or ";N," in response to almost all commands. However, when a command having "0" as a VCR number (e.g. "#00/PLAY") is entered to control all VCRs in the system or when the "/Q,62,1" command is entered to prevent the VCR from returning a status, the VCR does not return a status to the PC.
- The ";A" status indicates that the entered valid command is executed correctly.
- The ";B" status indicates that the VCR received a valid command but discarded it because the VCR could not execute it. There are two main reasons for this status.
  1) A case the PC sends a command which is not available in the current operating status of the VCR (e.g. input of the "/EJECT" command when recording is in progress) To remove this status, the current operating mode of the VCR must be changed.
  2) A case the VCR is not ready to execute the command
     For example, this status is returned when a "/FSTEP" command is sent to the VCR which has just started to step frames by a former "/FSTEP" command. In this case, wait until the former command is completed, then enter another "/FSTEP" command.
- The ";N" status indicates that the command sent from the PC to the VCR is invalid (e.g. missing "/" mark, illegal character, illegal parameter value, etc.).
- The ";D0" status is returned when the VCR finished executing a basic command and is ready.
     Example: "/PLAY" → ";A" → ";D0"
- The ";D1" status is returned when the VCR stopped the tape at a target point by the "/LLAP,n" command (Search command).
- Do not send a command, to two or more VCRs, which may cause them to return status simultaneously. The PC may neither read such simultaneous status nor identify their senders.
- The "D0,D1" status will not be returned when the Q,63,1" command is sent to suppress returning of the Command Ended status.
- A set value is returned as the status of a memory switch. Memory switch status are one-to-one related to commands. See the List of Commands.
     Example: When the "/K,2" command is sent to the VCR after the "/Q,2,1" command, the VCR returns ";S,2,1" as the status.
- Expansion states are explained below.
     Example: The VCR returns ";S,71,5802" as a status in response to the "/K,71" command.

DETAILS OF EXPANSION STATUS

Status	Meaning	Explanation
;S,71,n	Camera Status	Indicates preset information of a camera.

- "n" is a 4-digit hexadecimal value and each digit takes a value ranging from 0 to 9 and A to F. Each digit has four bits to represent a hexadecimal value. Therefore a total of 16 bits are used to represent the preset camera information. The lowest four bits of each digit are disposed in the "0000 0000 0000 0000" form and these sixteen bits are divided as shown below to indicate camera information. (The leftmost bit is bit 15 and the rightmost bit is bit 0.)

Bit	Information name	Explanation (See List of Memory Switches.)
b15	Not Used	(Always 0)
b14	Knee	Same as the setting of the "/Q,9,n" command
b13	Not used	(Any)
b12	Gamma	Same as the setting of the "/Q,7,n" command
b11, b10	Enhancement	Same as the setting of the "/Q,6,n" command
b9	Not used	(Any)
b8~b6	White Balance	Same as the setting of the "/Q,4,n" command
b5、b4	Gain	Same as the setting of the "/Q,3,n" command
b3~b0	Shutter	Same as the setting of the "/Q,2,n" command

Example: ;S,71,5802 → 0101 1000 0000 0010 → 0 1 0 1 10 0 000 00 0010 → 0,1,0,1,2,0,0,0,2→ Knee NORMAL、Gamma NORMAL、Enhancement HIGH、White Balance AUTO、Gain 0dB、Shutter 1/2000

Status	Meaning	Explanation
;S,72,n	VCR Status 1	VCR status 1 (target and current status) read

- "n" is an 8-digit value indicating the target and current VCR status which is the same as that displayed on the operation panel and on the operation unit.
The eight digits are separated in the order of 2 digits, 2 digits and 4 digits.
A set of the leading two digits is called an M1 field; A set of the middle two digits is called an M2 field; and a set of the trailing four digits is called an L1 field.
- Each digit has a hexadecimal value (0 to 9 and A to F).
- The field M1 represents a status (target and current VCR status) to be returned in response to a VCR basic command.
- The field M2 represents an auxiliary status of the VCR (in binary) or the current alarm number (in hexadecimal).
- The field L1 represents the current lap counter value (in hexadecimal) obtained by converting a 16-bit signed binary value of the lap count (in seconds) to a hexadecimal value.

CONTENTS OF M1 FIELD (in hexadecimal)

Value	Status	Value	Status	Value	Status
00	ALARM	10	SP,0	20	–
01	EJECT	11	SP,1	21	SP,–1
02	FF	12	SP,2	22	SP,–2
03	REW	13	SP,3	23	SP,–3
04	PLAY	14	SP,4	24	SP,–4
05	EDIT	15	SP,5	25	SP,–5
06	REC	16	SP,6	26	SP,–6
07	STOP	17	SP,7	27	SP,–7
08	–	18	SP,8	28	SP,–8
09	SEARCH STILL	19	SP,9	29	SP,–9
0A	STOP (BOT)	1A	SP,10	2A	SP,–10
0B	STOP (EOT)	1B	PLAY FWD SEARCH	2B	PLAY REV SEARCH
0C	PLAY STILL	1C	SP FWD SEARCH	2C	SP REV SEARCH
0D	EDIT PAUSE	1D	TEST REC	2D	–
0E	REC PAUSE	1E	TEST REV	2E	–
0F	–	1F	TEST PLAY	2F	–

Note: "-" and 30 to FF: Not used

CONTENTS OF M2 FIELD (1)

In case the content of the M1 field is not "00" (i.e. not ALARM)
(The value in the M2 field is converted into a binary value and its bit pattern represents the auxiliary status of the VCR as shown below, assuming bit 0 is the LSB and bit 7 is the MSB.)

Bit	Name	Explanation
b0	STEPOK	0: Rejects the STEP command. 1: Accepts the STEP command.
b1	LAP	0: Menu number in the L1 field 1: Lap count in the L1 field
b2	MEM	0: Disables stopping at lap count = 0.
		1: Enables stopping at lap count = 0.
b3	CUE	0: Disables stopping at a cue signal. 1: Enables stopping at a cue signal.
b4	500	0: 500 or 1000 pictures per second 1: 2000 or 4000 pictures per second
b5	0	Always 0
b6	1	Always 1
b7	0	Always 0

CONTENTS OF M2 FIELD (2)

In case the content of the M1 field is "00" (i.e. ALARM)
(The value in the M2 field is represented in hexadecimal.)

Value	Alarm description	Value	Alarm description
01	TEST ALARM RF	19	FUNCTION MECHANISM STOP (FN=1 REV)
02	TEST ALARM COLOR	1A	FUNCTION MECHANISM STOP (FN=2 REV)
03	TEST ALARM COLOR RF	1B	FUNCTION MECHANISM STOP (FN=3 REV)
04	TEST ALARM CTL	1C	FUNCTION MECHANISM STOP (FN=4 REV)
05	TEST ALARM CTL RF	1D	FUNCTION MECHANISM STOP (FN=5 REV)
06	TEST ALARM CTL COLOR	1E	FUNCTION MECHANISM STOP (FN=6 REV)
07	TEST ALARM CTL COLOR RF	1F	FUNCTION MECHANISM STOP (FN=7 REV)
08	DD MOTOR STOP (FWD)	20	CAPSTAN SERVO UNLOCK
09	DD MOTOR STOP (REV)	21	DRUM SERVO UNLOCK
0A	SUPPLY REEL STOP	22	CAPSTAN STOP
0B	TAKE-UP REEL STOP	23	DRUM STOP
0C	EXCESSIVE SUPPLY TENSION	24	-
0D	INSUFFICIENT SUPPLY TENSION	25	-
0E	CANNOT PERFORM LOADING	26	-
0F	CANNOT PERFORM EJECTION	27	-
10	FUNCTION MECHANISM STOP (FN=0 FWD)	28	-
11	FUNCTION MECHANISM STOP (FN=1 FWD)	29	-
12	FUNCTION MECHANISM STOP (FN=2 FWD)	2A	-
13	FUNCTION MECHANISM STOP (FN=3 FWD)	2B	-
14	FUNCTION MECHANISM STOP (FN=4 FWD)	2C	-
15	FUNCTION MECHANISM STOP (FN=5 FWD)	2D	-
16	FUNCTION MECHANISM STOP (FN=6 FWD)	2E	-
17	FUNCTION MECHANISM STOP (FN=7 FWD)	2F	DEW DETECTED
18	FUNCTION MECHANISM STOP (FN=0 REV)	30 ~ FF	-

Example 1): ;S,72, 00230173   →   M1=00H   ALARM
M2=23H   DRUM MOTOR STOP
L1= 0173H = 371 seconds = 6 minutes and 11 seconds

Example 2: ;S,72,044EFF92   →   M1=04H   PLAY
M2=4EH=01001110
→   →   2000 or 4000,CUE STOP ON,
MEMORY STOP ON,L1: LAP,STEP NOT OK
L1= FF92H = -110 seconds = -1 minute and 50 seconds

Status	Meaning	Explanation
;S,73,n	VCR Status 2	VCR status 2 (current VCR status) read

- "n" is an 5-digit value indicating the current VCR status. These digits are separated into individual digits. The deck status, the playback speed, the tape recording speed, the current information bit, and the power supply status are assigned to these five digits in that order. These status are all represented by a single digit (4 bits).

DECK STATUS

Value	Current deck status
0H	Unknown status (Alarm status)
1H	No cassette
2H	Stop
3H	Fast Forward
4H	Rewind
5H	Record
6H	Record Pause
7H	Playback
8H	Transient status

Note: Values 9 to F in hexadecimal are not used.

PLAYBACK SPEED STATUS

Value	Current playback speed of the deck ( ): Playback in the 1000 frame-per-second mode
0H	Not a playback mode
1H	Backward search REV 10(1000 pictures per second)
2H	Backward search REV 9 (300 pictures per second)
3H	Backward search REV 8 (120 pictures per second)
4H	Backward search REV 7 (60 pictures per second)
5H	Backward search REV 6 (30 pictures per second)
6H	Backward search REV 5 (15 pictures per second)
7H	Forward/backward search REV4 to REV1, FWD1 to FWD4, and STILL
8H	Forward search FWD 5 (15 pictures per second)
9H	Forward search FWD 6 (30 pictures per second)
AH	Forward search FWD 7 (60 pictures per second) or normal playback
BH	Forward search FWD 8 (120 pictures per second)
CH	Forward search FWD 9 (300 pictures per second)
DH	Forward search FWD 10(1000 pictures per second)

Note: Values E and F in hexadecimal are not used.

RECORDING SPEED STATUS (Recording speed (time code data) detected during tape reproduction)

Value	Tape recording speed
0H	1000 pictures per second
1H	Unknown recording status (tape recorded by the HSV of an earlier version or non-HSV video deck)
2H	2000 pictures per second (Half)
3H	500 pictures per second (Full)
4H	500 pictures per second (playing back tape of the full screen image recorded at 500 pictures per seconds by HSV-500c3)
5H	2000 pictures per second (Full)
6H	4000 pictures per second (Quarter)
7H	4000 pictures per second (Full)

Note: Values 8 to F in hexadecimal are not used.

CURRENT INFORMATION BITS

Bit	Name	Description
b0	REC	0: Not recording on the tape 1: Recording on the tape
b1	EE	0: Outputting pictures from the tape 1: Outputting pictures from camera (or color bar)
b2	NOCTL	0: CTL detected 1: No CTL detected (non-recording portion)
b3	LSTL	0: Not protecting the tape 1: Protecting the tape during long-term still playback

POWER SUPPLY STATUS

Value	Power supply status
0H	Power off (low power standby)
1H	Turning on power
2H	Turning off power
3H	Power on
4H	Power-on, but in the STOP mode because of under voltage

Note: Values 5 to F in hexadecimal are not used.

Example: ;S,73,7A003 ->

Deck status=7:	Playback
Playback speed=A:	FWD 7 or Normal playback (PLAY)
Tape recording speed=0:	1000 pictures per second
Current information bit=0000:	(b3 -> b0) LSTL=0, NOCTL=0, EE=0,REC=0
Power supply status=3:	Power on

Status	Meaning	Explanation
;S,74,n	Time code 1	Cause the time code reader to read a scene code and a time count.

- "n" is a 11-digit value indicating a time code and a scene code of a picture currently displayed on the monitor screen. The built-in time code reader reads these values from digital information recorded outside the effective picture area on the tape.
- The 11-digit value consists of a 3-digit scene code, a 2-digit time code (minutes), a 2-digit time code (second), a 3-digit time code (milliseconds), and a 1 expansion digit. This value does not have any delimiter to separate these data values from each other.
- Each digits has a value in the range of 0 to 9.
- When this information cannot be read from the tape while the tape is being played back, the error detection function of the VCR corrects the error using a time interval obtained from the preceding data.
- When data cannot be read, the corresponding digits are question marks.

The values to be displayed are as follows:

Scene code	000 to 999
Time code (minutes)	00 to 59
Time code (seconds)	00 to 59
Time code (milliseconds)	000 to 999
Expansion	0, 1, 2, 3
	One of the codes from 0 to 3 is added to milliseconds data corresponding to recording speed as shown below.

Recording speed	Expansion code 0	1	2	3
500	+0	-	-	-
1000	+0	-	-	-
2000S	+0	+0.5ms	-	-
2000F	+0	+0.5ms	-	-
4000S	+0	+0.25ms	+0.5ms	+0.75ms
4000F	+0	+0.25ms	+0.5ms	+0.75ms

Example) ;S,74,00501365120   ->

Scene code	005
Time code (minutes)	01
Time code (seconds)	36
Time code (milliseconds)	512
Expansion	0

Status	Meaning	Explanation
;S,75,n	Time code 2	Cause the time code reader to read calendar data and shutter data.

- "n" is a 11-digit value indicating calendar data and shutter data of a picture currently displayed on the monitor screen.
- The 11-digit value consists of 2-digit year data, 2-digit month data, 2-digit day data, 2-digit hours data, 2-digit minutes data, and 1-digit shutter and cue data. This value does not have any delimiter to separate these data values from each other.
- Each digits has a value in the range of 0 to 9 but only shutter data is represented in hexadecimal.
- When this information cannot be read from the tape while the tape is being played back, the error detection function of the VCR corrects the error using a time interval obtained from the preceding data.
- When data cannot be read, the corresponding digits are question marks.

The values to be displayed are as follows:

Year	00 to 99
Month	01 to 12
Day	01 to 31
Hours	00 to 23
Cue	0, 1 ("1" means the cue signal was recorded.)
Minutes	00 to 59
Shutter	0H to FH
	(The corresponding shutter speeds are as shown below)
Recording VCR model	0 to 7
	(The corresponding models are as shown below)

The values of shutter are shown below corresponding to the exposure time.

Value	Shutter speed
0	Open
1	1/500
2	1/1000
3	1/2000
4	1/5000
5	1/10000
6	1/20000
7	1/50000
8, 9, A, B, C, D	Not used
E	1/100000
F	1/200000

The values of recording VCR model are shown below.

Value	Recording VCR
1	HSV-4000 (V-329)
4	HSV-500c3 (V-321)
Other	Unknown

Status	Meaning	Explanation
;S,76,n	Lap counter	Lap count read

- "n" is the current value of the lap counter (6-digit hexadecimal value). The value is in the range of E488C4H to 0000000H to 1B773CH (-1799996 to 0 to 1799996). The counting accuracy is about ±1 second during FF or REW operation.
- The lap count can be converted into the number of frames by dividing it by 4. 1 frame is equivalent to 8ms. The lap count can be converted into the number of seconds by dividing it by 500.
- The remainder 0, 1, 2, or 3 obtained by dividing the lap count by 4 indicates the position of a picture in one frame. This value is effective for the STEP mode only (invalid in a long STILL mode).

Picture position
Dependent upon the screen mode in which the tape was recorded
(pps: pictures per second).

At 500 pps	Always 0	
At 1000 pps	0: First field	2: Second field
At 2000 or 4000 pps	0: Above the first field	1: Under the first field
	2: Above the second field	3: Under the second field

Example: ;S,76, 0D7558 →   0D7558(HEX)=882008

→   882008÷4 = 220502 frames

→   882008÷500 = 441.004 seconds

Status	Meaning	Explanation
;S,77,n	RTC	RTC date and time read

The RTC (real-time clock) is a built-in clock in the VCR. "n" is a 10-digit value containing the system date and time (2 digits for year, 2 digits for month, 2 digits for day, 2 digits for hours, and 2 digits for minutes).

Example: ;S,77,9704011215   1997, April, 01, 12 hours, 15 minutes

Status	Meaning	Explanation
;S,78,n	VCR TYPE	VCR type read

The VCR always returns ";S,78,V329."

(memo page)

CHAPTER 10   OPTIONAL UNITS

About Optional Units

Parallel Interface Unit

ABOUT OPTIONAL UNITS

For expansion of system performances, NAC provides the following optional units:

- ## Wave inserter (V-929)

    This unit superimposes two channels of external analog signals (as waveforms) on video images. Waveforms of a total of four channels can be superimposed by two wave inserters.

- ## Synchronizer (V-721)

    This unit synchronizes three HSV-4000 systems to record pictures. For synchronous connection of four or more HSV-4000 systems, call your local NAC distributor.

- ## Camera cables (H-6516-2 / 380230-1 / 380230-3)

    The standard camera cable is 5 meters long. The optional camera cables of 10, 25, and 50 meters long are available.

- ## BOOSTER BOX (V-840)

    This unit is to extend the camera cable (distance between VCR and CAMERA). One booster box can drive 100 meters distance with two 50m camera cables.
    In case of that a DC power supply (20V to 32V) is used for the booster box, the longer distance is available more than 100 meters.

- ## Tripod for the camera unit (4H0497)

    This is a machine-screw type tripod for a camera.

- ## Strobe light system (ST-444)

    This light system condenses two flash lights into a spot of about 10 cm in diameter. This unit is a high-luminance strobe light system which flashes about 1/100000 second and effective to shoot very quick motions. This strobe light system is dedicated to the HSV-1000 but also available to the HSV-4000. The optional casing (V-064) for the strobe light system is also available. To connect to the HSV-4000, a SYNC cable (481556) is necessary.

- ## Strobe drive cables (480901-1/2B)

    The standard strobe drive cable is 3 meters long. The optional cables of 25 and 50 meters long are available.

- ## Tripod for the strobe light head (4H0033)

    This is a tripod for the strobe light head.

- ## Parallel interface unit (V-813)

    This unit is used to externally control the VCR by contact or TTL signals. This unit always comes with a cable (1.5 meter long) and a connector kit.

- ## Operation cable (481407-2/3/4)

    The standard operation cable (as the accessory) is 3 meters long. The optional cables of 10, 25, and 50 meters long are available.

- **HSV control software (SP-839)**

    This software controls the HSV-4000 system through RS-232 interface. This software runs on a Windows personal computer having a display of 720 dots by 480 dots (as resolution).
    The RS-232 cable is required for connection.

- **Battery system (4H1092)**

    This system contains two Ni-MH batteries (120 watts per hour), a battery holder, a charger, and a power cable. The operating time of the battery used in the HSV-4000 standard system is about half hour (when used continuously recording). The operating time of the battery will be affected by the operating temperature and the frequency of usage.

- **Power cable (380224)**

    This cable is used to connect a general 24VDC battery or AC adapter (XLR with a 4-pin connector) to the VCR.

- **Power cable (380225)**

    This cable is used to connect the VCR to an DC power supply.
    The ends of the cable are discrete wires.

PARALLEL INTERFACE UNIT

The parallel interface unit (V-813) enables the VCR to be controlled by external signals. The available operations of this unit are the same as those of the operation unit. For details, see Chapter 2.

Connect the J1 connector of the parallel interface unit is connected to the REMOTE connector of the connector panel of the VCR or to the CONTROL connector of the camera with the P I/F cable.

You must prepare cables for connecting the J2 connector of this unit to an external control unit. The parallel interface unit contains a kit of plugs for the connection of the J2 connector.

OPERATION

To cause the VCR to perform a wanted operation, connect a signal line (indicated by a pin number of the J2 connector) corresponding to the operation to pin 37 (GND) for 40ms or longer using the attached connector kit.
You can recognize that the VCR has started the operation by a status signal sent from the other signal line.

Typical VCR operation examples are explained below. For the other operations, see Table 10-1.

Notes on connections:
1) All signals are active low (negative logic).
2) All input signals are used to remotely control the system.
   - Connected to the TTL level or connect to GND. Inputs are pulled up to 5V by 4.7 KΩ
   - Minimum pulse width: 40ms
3) All output signals indicate the status of the VCR.
   - Open collector output
   - Maximum applied voltage: 30V
   - Maximum input current: 50mA

Examples:

Start recording
This operation is valid only when the VCR is in STOP mode.
Connect pin 33 (/REC CMD) to pin 37 (GND).
The VCR starts recording and the status of pin 6 (/REC STATUS) changes from "open" to "GND" level.

Stop recording
Connect pin 12 (/STOP CMD) to pin 37 (GND). The VCR stops recording.

Pausing and restarting recording
Connect pin 34 (/STL CMD) to pin 37 (GND).
The VCR pauses recording.
Connect pin 34 (/STL CMD) to pin 37 (GND) once more.
The VCR restarts recording.

Table 10-1   Pin Description of the J2 Connector

Pin No.	Symbol	Description [equivalent portion of the operation unit]
1	/CUE STATUS	Output signal indicating that the Cue Stop function is enabled (ON) [CUE STOP indicator]
2	/EJECT STATUS	Output signal indicating that the cassette has been ejected or no cassette is in the VCR [EJECT indicator]
3	/MENU STATUS	Output signal indicating that the MENU mode is set [MENU indicator]
4	/FFWD STATUS	Output signal indicating that the VCR is fast-forwarding the tape [FF indicator]
5	/PLAY STATUS	Output signal indicating that the VCR is reproducing the tape [PLAY indicator]
6	/REC STATUS	Output signal indicating that the VCR is recording [REC indicator]
7	/STL STATUS	Output signal indicating that the VCR performs a still reproduction or pauses recording [STILL indicator]
8	/START STATUS	Output signal indicating that the beginning of the tape is detected ["Start" on the COUNTER display]
9	/EJECT CMD	Input signal to cause the VCR to eject a video cassette [EJECT button]
10	/MEM CMD	Input signal to cause the VCR to turn on or off the Memory function [MEMORY button]
11	/CUE IN	Input signal to cause the VCR to record a cue signal on the tape [ENTER button]
12	/STOP CMD	Input signal to cause the VCR to stop the current operation [STOP button]
13	/REW CMD	Input signal to cause the VCR to rewind the tape [REW button]
14	/V PLAY CMD	Input signal to cause the VCR to search or jog-play back [SEARCH button]
15	/A DUB CMD	Input signal to cause the VCR to edit-play back [EDIT button]
16	/F STEP CMD	Input signal to cause the VCR to perform forward-step reproduction [FWD STEP button]
17	/D1	Input signal required for search or jog reproduction [DIAL]
18	NC	Not used
19	GND	Signal ground
20	/MEM STATUS	Output signal indicating that the Memory function is enabled (ON) [MEMORY indicator]
21	/LAP STATUS	Output signal indicating that the VCR is in a normal operation and the counter is counting a lap time [LAP indicator]
22	/STOP STATUS	Output signal indicating that the VCR has stopped [STOP indicator]
23	/REW STATUS	Output signal indicating that the VCR is rewinding the tape [REW indicator]

Table 10-1   (Continued)

Pin No.	Symbol	Description [equivalent portion of the operation unit]
24	/V PLAY STATUS	Output signal indicating that the search playback or the jog playback is in progress [SEARCH indicator]
25	/A DUB STSTUS	Output signal indicating that the edit playback is in progress [EDIT indicator]
26	/STEP OK	Output signal indicating that the VCR is ready to start step reproduction [No corresponding function available to the operation unit]
27	/END STATUS	Output signal indicating that the end of the tape is detected ["End" on the COUNTER display]
28	/LAP CMD	Input signal to change between the NORMAL mode and the MENU mode of the VCR [LAP/MENU button]
29	/CRST	Input signal to reset the counter to 0 [RESET button]
30	/CUE ON	Input signal to turn on or off the Cue Stop function [CUE STOP button]
31	/FFWD CMD	Input signal to cause the VCR to fast forward [FF button]
32	/PLAY CMD	Input signal to cause the VCR to play the tape (normal playback) [PLAY button]
33	/REC CMD	Input signal to cause the VCR to record [REC button]
34	/STL CMD	Input signal to cause the VCR to perform a still playback or to pause recording [STILL/PAUSE button]
35	/R STEP CMD	Input signal to cause the VCR to perform a reverse step reproduction [REV STEP button]
36	/D2	Input signal required for search or jog reproduction [DIAL]
37	GND	Signal ground

Note: How to use /D1 and /D2 signals
These signals can be used for step movement or speed control in the search and still playback like the DIAL on the operation unit.   In the waveforms below, you can step-play back or change speeds at portions indicated by upward arrows.
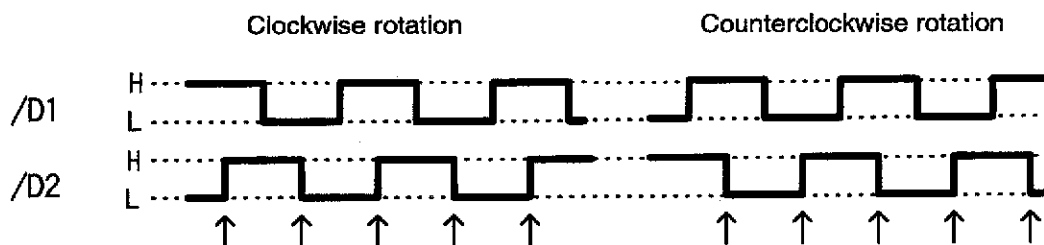
Note: How to use the /STEP OK signal
You can use the /F STEP CMD and /R STEP CMD signals to feed pictures (step playback) in the still search playback or still playback.   When the /STEP OK signal is "low," the VCR can feed pictures one by one.   When the /STEP OK signal is "high," the step signal is ignored as the VCR is carrying out a step operation.   Wait until the signal goes low.