

Panasonic®

■ This product is eligible for the AVCCAM
3 Year Warranty Repair Program. For
details, see page 5 of Vol. 1.

Operating Instructions **Vol.2**

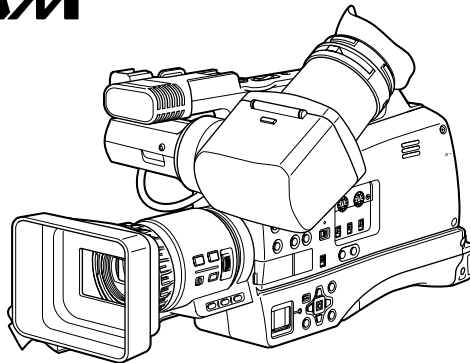
Memory Card Camera-Recorder

Model No. **AG-HMC80P**

Volume **2**

Note that Operation Instructions Vol.2 describes advanced operations of the Memory Card Camera-Recorder. For instructions on basic operations of the Memory Card Camera-Recorder, refer to Operating Instructions Vol.1 (printed documents) contained in the supplied CD-ROM.

AVCCAM



AVCHD™



HDMI™

HIGH DEFINITION MULTIMEDIA INTERFACE



Before operating this product, please read the instructions carefully and save this manual for future use.

Volume 1

Read this first!

IMPORTANT SAFETY INSTRUCTIONS

Operating precautions

Precaution for use

Outline

Accessories/Optional accessories/Description of parts

Preparation

Recharging the battery/Power sources/Adjusting the grip belt/Attaching the shoulder strap/
Detaching and attaching the lens hood/Fitting the eye cup/The remote control

Basic Operations

Turn on/off the camera/Tally lamp/Using the cursor button/Using the viewfinder/Setting the calendar/Basic shooting operations/Using the zoom function/Using the setup menus/Setup menu structure

Specifications

Volume 2

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Chapter 1: Operations in AVCHD mode

Shooting in manual mode

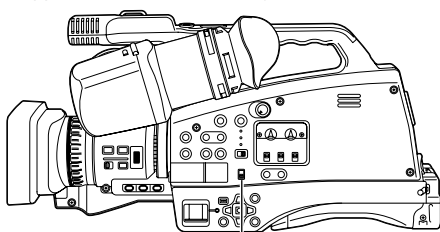
Set the shooting mode to AVCHD.

- Select AVCHD with the MODE switch, and then turn on the camera.

Set the unit to manual mode when manually adjusting the focus, shutter speed, iris, gain and white balance.

Switching to manual mode

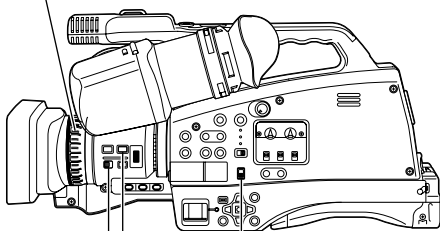
Move the AUTO/MANUAL switch to the MANUAL position to select the manual mode. (**A** will disappear from the viewfinder.)



AUTO/MANUAL switch

Manual focusing

Focus ring



AUTO/MANUAL switch
FOCUS button
RING selector switch

1 Use the AUTO/MANUAL switch to set to manual mode.

2 Use the FOCUS button to switch the focus mode.

- Pressing the FOCUS button switches to manual focus mode where "MF" appears on the screen. Pressing the FOCUS button again switches to auto focus mode where "AF" appears on the screen.
- Holding down the FOCUS button sets the focal length to infinity and causes "MF95" to appear on the screen.

When switching from auto mode to manual mode:

- Iris and focus are set to AUTO.
You can switch them to manual mode by pressing the IRIS dial and FOCUS button.
- Shutter speed
In CAMERA mode, the shutter speed of AUTO mode during SHUTTER ON is preserved. You can switch between ON/OFF with the SHUTTER button.
In PHOTO mode, the SHUTTER status is always ON. (You cannot switch to SHUTTER OFF with the SHUTTER button.)
Shutter speed can be changed by pressing the SPEED SEL +/- button.
- The shortest distance from a back-focusing lens differs depending on the zoom position.
- When using a macro range and AF or MF on the focus control information display appears in reverse black and white, zooming may cause the image to become unfocused.

3 The function allocated to the focus ring can be changed with the RING switch.

FOCUS:

Adjust the focus.

ZOOM/IRIS:

Adjust the zoom or iris (aperture) setting. You can change which functions are assigned from the menus. The factory default setting is ZOOM.

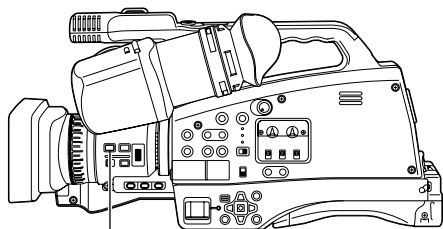
Temporarily switching to auto focus

You can also use auto focus mode while in manual mode by assigning the (PUSH)AF function to one of the USER buttons 1 to 3. Auto focus mode will be enabled for as long as the USER button is pressed, and the focal point will be automatically adjusted.

- Auto focus may not work properly if there is flickering. Select a shutter speed suited to the ambient light. (Page 15)
- If the auto focus mode is set with any format except 60i and 60P, controlling the focus will take slightly longer than in the normal focus mode.
- During macro shooting "AF" or "MF" will be displayed in a frame on the screen.

Using focus assist

Pressing the FOCUS ASSIST button enlarges the center of the viewfinder, or displays a bar at the bottom center of the screen. These displays make aligning the focus easier and are particularly useful in manual focus mode. The display that appears when the FOCUS ASSIST button is pressed can be configured with the FOCUS ASSIST SW item in the setting menu SW&DISP SETUP screen. (Page 107)



FOCUS ASSIST button

EXPANDED:

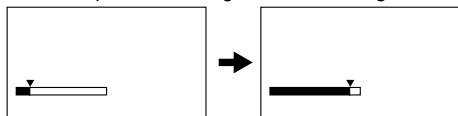
The central part of the screen will be enlarged by a factor of about 4 in the vertical direction and by a factor of about 6 in the horizontal direction.

A blue box will appear in the viewfinder screen during expanded display. Only the operation status display and counter will appear on the screen.

BAR:

A bar will appear at the bottom center of the viewfinder screen, indicating the level of focus alignment with its length.

The peak hold mark (▼) appears over the bar, and the bar expands to the right as focus is aligned.



Focus not aligned

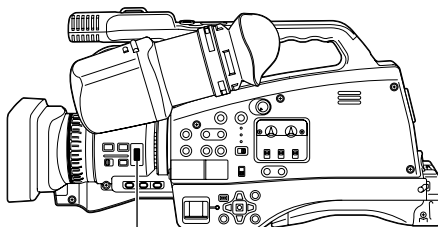
Bar expands to right as focus is aligned

BOTH:

Displays both the expanded display and focus bar.

- This function cannot be used while the digital zoom function is in use.
- Press the FOCUS ASSIST button again to return to the original screen.

Setting the aperture and gain



IRIS dial

- 1 Use the AUTO/MANUAL switch to set to manual mode. (Page 5)**
 - 2 Press the IRIS dial to switch the method of adjustment for the aperture of the lens.**
The method switches to AUTO IRIS or MANUAL IRIS with each press of the dial.
AUTO IRIS: Adjust the iris automatically.
MANUAL IRIS: Adjust the iris manually.
 - 3 Turn the IRIS dial to adjust the aperture of lens when in the manual iris mode.**
 - In the auto iris mode, the lens iris can be corrected using this dial.
 - Increase in brightness beyond the maximum aperture (OPEN) is performed via gain adjustment (CAMERA mode: 0 to 24 dB; PHOTO mode: 0 to 18 dB).
 - If further gain adjustment is necessary, assign HIGH GAIN to one of the USER buttons 1 to 3. The gain mode switches between normal and high with each press of the button. Gain can be set to up to 34 dB in high gain mode. In PHOTO mode, switching to high gain mode is disabled.
- Set the direction of the IRIS DIAL and aperture control in the setup menus, SW&DISP SETUP screen, IRIS DIAL.
 - The lens aperture can be adjusted in the focus ring by setting the RING switch to IRIS. The default setting for this item is ZOOM, so set the RING SW item to IRIS in the setting menu SW&DISP SETUP screen. The relationship between the direction of rotation and aperture control is based on the IRIS DIAL setting in the SW&DISP SETUP screen. However, as this will make it impossible to adjust the focus in the focus ring, please set the focus control method to AF (auto focus) with the FOCUS switch. Zoom control can also be assigned to the FOCUS ring. (Page 5)

- As you shrink the aperture to a near closed state, resolution will decrease due to light diffraction. You can prevent this by adjusting the shutter speed and increasing the aperture size.

Adjusting the white balance and black balance

When white balance adjustments are performed, black balance adjustments are performed at the same time.

White balance

In order to reproduce the white accurately, adjust the ratio between the three RGB primary colors. If the white balance is not adjusted properly, not only will the white be reproduced poorly but the color tones of the entire screen will also be downgraded. When you are shooting in manual mode, readjust the white balance whenever lighting conditions change.

You can store white balance adjustments to Ach and Bch of the Function Menu.

You can also use the preset values.

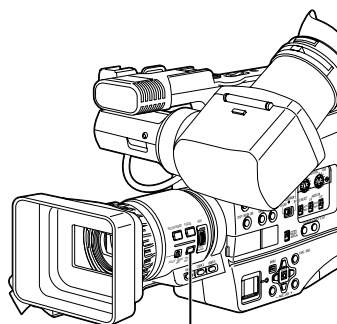
Use the settings to suit the shooting conditions.

Black balance

Adjust the ratio between the three RGB primary colors to reproduce black accurately. If the black balance is not adjusted properly, not only will black be reproduced poorly, but the color tones of the entire screen will also be downgraded.

Black balance adjustment is usually not necessary, but be sure to perform it in the following cases.

- When using the camera for the first time.
- When using the camera after extended periods of disuse.
- When using the camera after large changes in ambient temperature.
- After setting the shutter speed to standard or low speeds.
- After switching between progressive mode and standard (60i) mode.



WHITE BAL button

White balance and black balance adjustments

- 1 Use the AUTO/MANUAL switch to set to manual mode. (Page 5)**
- 2 Set the shutter speed. (Page 15)**
- 3 Place a white pattern in a location with the same lighting conditions and light source as the subject, then zoom in and fill the whole screen with white.**
Something white (a white cloth or wall) near the subject can be used instead.
 - Do not include bright spotlights in your shot.
- 4 Press the WHITE BAL button to display Ach or Bch.**
The mode changes in order from ATW→ATW LOCK→P3.2K→P5.6K→Ach or Bch→ATW with each press of the button.
- 5 Press the FUNC/EXEC button to display the Function Menu.**
- 6 Press the ENTER button and select Ach or Bch.**
The mode switches between Ach and Bch with each press of the ENTER button.

7 Press and hold the WHITE BAL button.

- Adjustment takes a few seconds.
(The following messages appear on the screen.)

Message during adjustment

AWB ABB
ACTIVE

Message after adjustment

AWB ABB OK

- An error message appears on the viewfinder screen when white balance adjustment is not possible.

Message when adjustment cannot be done

AWB NG

-
- White balance cannot be adjusted if the ATW (Auto Tracking White) function is working.
 - Black balance cannot be adjusted during recording.
 - White balance cannot be adjusted during auto mode. Only black balance can be adjusted.
 - White balance cannot be adjusted if the shutter speed is set to less than 1/24.
-

Using presets

Use this feature when you have no time to make white balance adjustments.

1 Use the AUTO/MANUAL switch to set to manual mode. (Page 5)

2 Press the WHITE BAL button.

The mode changes in order from ATW→ATW LOCK→P3.2K→P5.6K→Ach or Bch→ATW with each press of the button.

- Guide to the preset values
P3.2K (3200 K): halogen light
P5.6K (5600 K): outdoors

Auto Tracking White (ATW)

Using the ATW function enables the recording environment to be automatically analyzed and an optimum white balance to be constantly maintained during recording.

To use the ATW function, set the white balance to ATW mode by pressing the WHITE BAL button.

-
- Depending on the environment, there may be some error in the adjustment.
 - Use the procedure described on the previous page whenever you need more precise white balance.
-

Shooting in progressive mode

Selecting either 1080/30P or 1080/24P for the REC FORMAT option in the setting menu RECORD SETUP screen (Page 103) enables shooting in progressive mode.

In 720 mode, the camera always shoots in progressive mode.

30P mode (with 1080 mode):

Shoot 30 frames a second in the progressive mode.

For output and recording, the 30-frame-per-second signal is converted to 60-field-per-second interlace.

This mode gives you high quality images.



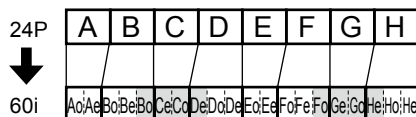
24P mode (with 1080, 720 mode):

Shoot 24 frames a second in the progressive mode.

(Only when the recording format is set to PH 1080/24P or PH 720/24P in AVCHD mode.)

Native recording is performed in 24P mode.

The external output signal is converted to a 2:3 format, 60 fps interlaced signal as follows.



Note the following when shooting in progressive mode.

- There may be a slight delay to the start of recording when you use the 24P mode because 4 frames are recorded at a time.

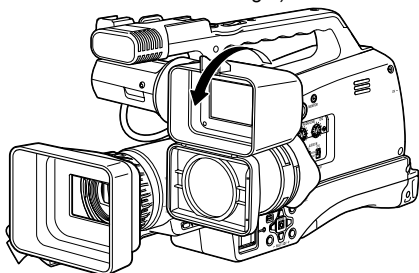
Shooting techniques for different targets

Self-portrait shooting

Self-portrait shooting is possible if the viewfinder is rotated 180° towards the lens.

You can make them appear better by reversing left and right. Go to the setup menus, SW&DISP SETUP screen, SELF SHOOT, and select MIRROR. Shooting in mirror mode has no effect on what you actually shoot and record.

The date display for time stamps will also appear reversed. (However, the dates are recorded in a non-reversed state on the image.)



- If you press and hold the DISP/MODE CHK button when self-portrait shooting, the mirror mode is temporarily disabled and the screen displays information such as the configuration status of all recording functions. Release the button to return to mirror mode.
- Mirror mode is also temporarily disabled when menus are displayed.

- Images played back by pressing the REC CHECK button cannot be inverted horizontally.
- Operation status displays during self-portrait recording
No display: Cannot record (no card, etc.)
 - : Recording in progress
 - : (Red) Transitioning to recording standby mode
 - (Green) Recording standby mode
 - ! : Warning display
- When ! is displayed, turn the viewfinder back in the direction of normal recording, and check what the message says.
- Holding down the DISP/MODE CHK button displays the screen display information.
- Images will be output normally to external devices. In addition, only operation status displays will appear on the screen.

Zebra pattern

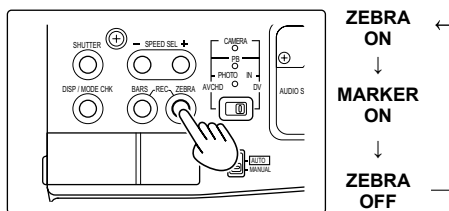
Pressing the ZEBRA button in CAMERA or PHOTO mode displays zebra patterns and markers on the viewfinder, allowing you to check the brightness of a subject.

Parts that may be whited out through over exposure are shown as a zebra pattern.

- Very bright
- Reflecting parts

You can remove most overexposed parts by adjusting the iris and shutter speed in the manual mode to remove the areas with zebra patterns.

The display changes as follows each time you press the ZEBRA button.



You can set brightness levels for the zebra patterns with the ZEBRA DETECT item in the setting menu SW&DISP SETUP screen. (Page 108)

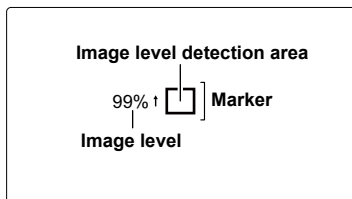
The zebra pattern cannot be displayed while the focus assist function (expanded display) is in use.

Low angle shooting

You can shoot using the handle START/STOP button on the handle during low angle shooting.

Marker

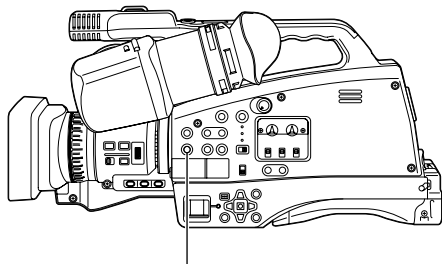
If you press the ZEBRA button while zebra patterns are displayed, a marker appears near the center of the display (if you have set the setup menu, SW&DISP SETUP, MARKER to ON). The brightness of the areas near the screen center can be checked as a percentage (0 % to 99 %). "99%↑" appears if the percentage is over 99.



The normal display reappears if you press the ZEBRA button again.

- The marker does not appear when the face detection function is set to ON.

Checking and displaying shooting status



DISP/MODE CHK button

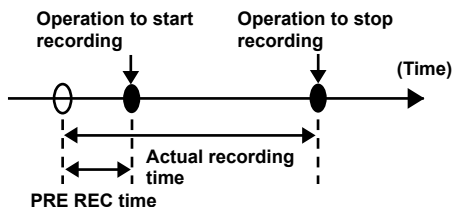
If you press and hold the DISP/MODE CHK button in recording standby mode or while recording, the configuration status of all recording functions, a list of USER button function assignments, focus ring function, and all other camera information will be displayed. Release the button to return to the normal display.

Pressing the DISP/MODE CHK button during recording or while recording is paused will remove all displays from the screen except for the operation status, counter, marker, and safety zone display. Press the button again to return to the normal display. (Page 99)

The display mode selected using the DISP/MODE CHK button is retained even if you turn off the camera by setting the POWER switch to OFF, or change the operating mode.

PRE REC

Record video and audio from three seconds before the time of the operation to begin recording.



- 1 Select ON for the PREREC MODE item in the setting menu RECORD SETUP screen, and then press the ENTER button.**

PRE REC is displayed on the screen.

- When the TCG item on the RECORD SETUP screen has been set to REC RUN in AVCHD mode, the setting will be automatically changed to FREE RUN.

- 2 Press the START/STOP button.**

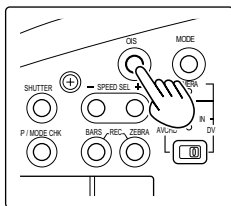
Video and audio from approximately 3 seconds previously will be recorded.

- Recording of the previous 3 seconds of video and audio may not be possible if recording is started immediately in the following cases.
 - Immediately after switching from another mode to CAMERA mode
 - Immediately after turning power on
 - Immediately after changing to PREREC MODE item
- The thumbnail for clips recorded using the PREREC function will display the image from when the START/STOP button was pressed.

Optical Image Stabilizer

Use the Optical Image Stabilizer (OIS) to reduce the effects of camera shake when shooting by hand.

Press the OIS button to turn the function on and off. The  appears on the viewfinder when this function is on. Turn the function off when using a tripod for more natural images.



- This function will not be as effective when the vibration is severe or when tracking a moving subject.

Adding effects to images

Press the USER button you have allocated to the BLACKFADE or WHITEFADE feature to add fading effects to your images. The button's function is forcibly canceled during playback or REC CHECK and also when thumbnails are displayed.

BLACKFADE:

Press and hold to fade out to black. Audio also fades out. Fade-in starts when the button is released.

WHITEFADE:

Press and hold to fade out to white. Audio also fades out. Fade-in starts when the button is released.

- This function does not work while INTERVAL REC is enabled.

Using the USER buttons

You can allocate one of 14 features to each of the three USER buttons.

Use these buttons to change shooting settings quickly or add effects to the images you are shooting.

The following features are allocated to the buttons at the time of shipping.

USER1: (PUSH)AF

USER2: BACKLIGHT

USER3: SHOT MARK

For details, see the setup menus, SW&DISP SETUP screen, USER1 to 3. (Page 107)

If you press a USER button to which one of the functions has been allocated and then turn off the power, the added effect to the image will not be retained.

Backlight compensation

Press the USER button you have allocated to the BACKLIGHT feature when shooting subjects lit from the back.

BACK LIGHT appears on the screen, and  appears at the bottom right of the screen.

Backlight compensation adjusts the iris so the subject doesn't come out dark.

Press the same USER button to turn the feature off. (If you perform backlight compensation in manual iris mode and it is disabled, the camera switches to auto iris control.)

Color bars

Press and hold the BARS button in CAMERA mode to output a color bar screen to a television or external monitor so you can adjust them. Press the button again to turn the feature off.

- While the color bar is displayed, a test tone of 1 kHz will be output from the PHONES (headphone) terminal, the Pin jack OUT terminal, or the HDMI terminal. There will be no speaker output.
- The color bar can be recorded by pressing the START/STOP button.
- The BARS button is disabled in PB mode and PHOTO mode.
- The color bar display is canceled when the power is turned off.

Wave form monitor function

During CAMERA mode, you can display a waveform for an image in the viewfinder screen by pressing the USER button to which the WFM function has been assigned.

Press the button again to return to the normal display.

- This function cannot be used while the focus assist function is enabled.
- Wave forms cannot be recorded.
- While wave forms are displayed, part of the recording screen will be hidden by the wave forms.

Shot mark function

The marks attached to the thumbnails of clips are called shot marks. On the thumbnail screen monitor you can select only those clips with a shot mark and display them or play them back. During recording, when you press the USER button to which the SHOT MARK function has been allocated, MARK ON appears in the LCD monitor or the viewfinder, and a shot mark is set for the thumbnail of the clip being recorded. If you press the button again, the shot mark is released. You can also set or release the shot marks by performing the thumbnail operations for clips. (Page 49)

However, note that you cannot set or release shot marks during playback.

- INVALID appears when you cannot set or release shot marks.

Interval recording

This function allows you to create short videos of scenes that move slowly over long periods of time through frame-by-frame recording at specified intervals. Single frames are recorded at the specified interval, with 24 frames equaling 1 second of video. You can specify the interval in CAMERA mode with the INTERVAL REC item in the setting menu RECORD SETUP screen.

- **1 SECOND/10 SECONDS/30 SECONDS/1 MINUTE/2 MINUTES:** Change the recording interval.
- **OFF:** Disable interval recording.
-  appears on the screen.
- Interval recording will be disabled when shooting is finished.
- Audio recording is disabled.
- The PRE-REC function is disabled, even if it is set.

Example	Recording interval	Shooting time	Video length
Sunsets	1 SECOND	30 min to 1 hour	1 min 15 sec to 2 min 30 sec
Butterfly emerging from cocoon	10 SECONDS	2 hr to 4 hr	30 sec to 1 min
Flowers blooming	30 SECONDS	1 hr to 3 hr	5 sec to 15 sec

- The maximum shooting time is 24 hours.
- When recording for long periods, use the AC adaptor to eliminate battery concerns.

- Do not remove the battery or disconnect the AC adaptor during interval recording. Doing so may damage recorded image data or result in data loss.
- You cannot change the recording mode while interval recording is enabled.
- Depending on lighting and shooting conditions, color and focus settings may not adjust automatically. In such cases, make adjustments manually.
- The digital zoom function, and BLACKFADE and WHITEFADE functions cannot be used while INTERVAL REC is enabled.
- Set the below values for REC FORMAT when setting INTERVAL REC. If the settings differ to the below, INTERVAL REC will be displayed in gray and disabled.
REC FORMAT: PH 1080/24P
- When playing back a recorded video, set the playback format to 1080/24P.
- Photo shooting is disabled.
- Even if you have not met 24 frames when you stop recording, a 1 second video will be created.

Time stamp function

The date and time of recording can be recorded to video images.

Select ON in the TIME STAMP item on the settings menu RECORD SETUP screen.

When the TIME STAMP function is ON,  will be displayed in front of the date and time display in the viewfinder. In addition, the month display will change from a numerical value to an English name display.

- The letter  display itself will not be recorded to the video.
- The size and position of the time and date characters recorded to the image will vary depending on the recording format.
- The size and position of the time stamp characters in external output displays may vary from the displays in the viewfinder and external input/output displays.
- The recorded time and date display will follow the settings made in the DATE/TIME item on the SW&DISP SETUP screen. If this item is set to OFF, the date and time will not be recorded as a time stamp.
- To avoid date and time displays overlapping when clips with time stamps recorded are played with this camera, please set the DATE/TIME item on the SW&DISP SETUP screen to OFF.

LAST CLIP function

The most recently recorded clip can be deleted at the touch of a button by allocating the LAST CLIP function to any of the USER 1 - 3 buttons.

Press the USER button allocated for the LAST CLIP function to display YES/NO on the screen.

Select YES to delete the most recently recorded clip.

- Select NO not to delete the clip.
- If the camera has been switched to PB mode or PHOTO mode, or the recording format has been changed since recording was completed, clips cannot be deleted even if the button is pressed. Clips also cannot be deleted if the power has been switched off and back on again.
- Clips cannot be deleted even if the button is pressed if the memory card has been removed and reinserted since recording was completed.

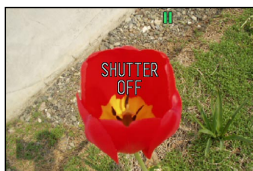
Adjusting the shutter speed

1 Set the AUTO/MANUAL switch to MANUAL to select manual mode. (Page 5)

2 Press the SHUTTER button.



- CAMERA mode
SHUTTER ON is enabled after switching to MANUAL mode from AUTO mode. The shutter speed switches between the standard (OFF) shutter speed and the shutter speed you have selected with the SPEED SEL $\pm$ button each time you press the button.



- PHOTO mode
You cannot switch between SHUTTER ON/OFF. It is always set to SHUTTER ON.
- The shutter speed appears at the left of the screen during SHUTTER ON.

3 Press the SPEED SEL $\pm$ button to adjust the shutter speed while in SHUTTER ON mode.

The shutter speed changes as per the following table.

- As the shutter speed increases, camera sensitivity decreases.
- With auto iris control, as the shutter speed increases, the aperture widens and the focal length decreases.
- Because the focal time increases at slower shutter speeds, we recommend using a tripod.

- With artificial lighting and especially fluorescent lights and mercury-vapor lamps, the luminance changes in synchronization with the power line frequency. When this frequency is 50 Hz, mutual interference will occur between the camera-recorder's vertical sync frequency (approx. 60 Hz) and the lighting frequency (50 Hz). This means that the white balance may change periodically.

Before shooting in areas with artificial lighting or adjusting the white balance, set the shutter speed as follows.

Progressive mode	Shutter speed	
	50 Hz	60 Hz
OFF (60i)	1/100	1/60 (OFF)
30P	1/50 (OFF)	1/60
24P	1/50 (OFF)	1/60

Adjusting the shutter speed (continued)

CAMERA mode:

With the 1080/60i or 720/60P formats	
OFF (1/60)	SYNCRO SCAN ↔ 1/2 ↔ 1/4 ↔ 1/8 ↔ 1/15 ↔ 1/30 ↔ 1/60 ↓ 1/2000 ↔ 1/1000 ↔ 1/500 ↔ 1/250 ↔ 1/120 ↔ 1/100
With the 1080/30P or 720/30P formats	
OFF (1/50)	SYNCRO SCAN ↔ 1/2 ↔ 1/4 ↔ 1/8 ↔ 1/15 ↔ 1/30 ↔ 1/50 ↓ 1/2000 ↔ 1/1000 ↔ 1/500 ↔ 1/250 ↔ 1/120 ↔ 1/60
With the 1080/24P or 720/24P formats	
OFF (1/50)	SYNCRO SCAN ↔ 1/2 ↔ 1/3 ↔ 1/6 ↔ 1/12 ↔ 1/24 ↔ 1/50 ↓ 1/2000 ↔ 1/1000 ↔ 1/500 ↔ 1/250 ↔ 1/120 ↔ 1/60

PHOTO mode:

Standard (1/60) * SHUTTER OFF is not available in PHOTO mode.	1/2 ↔ 1/4 ↔ 1/8 ↔ 1/15 ↔ 1/30 ↔ 1/60 ↔ 1/100 ↔ 1/120 ↔ 1/180 ↓ 1/2000 ↔ 1/1500 ↔ 1/1000 ↔ 1/750 ↔ 1/500 ↔ 1/350 ↔ 1/250
--	---

- Under fluorescent and other discharge tube lighting, horizontal bands may appear on the display. Adjusting the shutter speed in such cases may resolve the problem.
- When shooting subjects moving quickly across the screen, the image may be distorted. This is a result of the readout method of the pickup device (MOS sensor), and is not a malfunction.
- White, red, blue, and green spots may appear on the display when using slow shutter speeds. This is not a malfunction.

Synchro scan

Adjust the shutter speed to match the frequency of the television or computer monitor to minimize the horizontal noise that appears when shooting such subjects.

- If SYNC is displayed in grey, it cannot be used with the current recording format. This function will only operate for preset values for each recording format.

Valid setting values will appear to the right of the adjustment value.

1080/60i, 720/60P:

1/60.0 to 1/250.0 sec

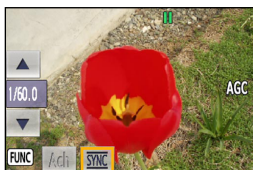
1080/30P, 720/30P:

1/30.0 to 1/250.0 sec

1080/24P, 720/24P:

1/24.0 to 1/250.0 sec

- 1 Set the AUTO/MANUAL switch to MANUAL to select manual mode. (Page 5)**
- 2 Press the FUNC/EXEC button to display the Function Menu.**
- 3 Select SYNC with the left or right button of the cursor button, and press the ENTER button.**
 - The shutter speed appears at the left of the screen.



- 4 Adjust the shutter speed with the up or down button of the cursor button, and press the ENTER button.**
- 5 Press the FUNC/EXEC button and close the Function Menu.**

-
- To activate a synchro scan setting, press the SPEED SEL $\rightarrow$ / $\leftarrow$ button while set to SHUTTER ON mode, and switch to SYNCRO SCAN (Page 16).
 - You can change the progressive mode in the setup menu with REC FORMAT in the RECORD SETUP screen. (Page 103)
-

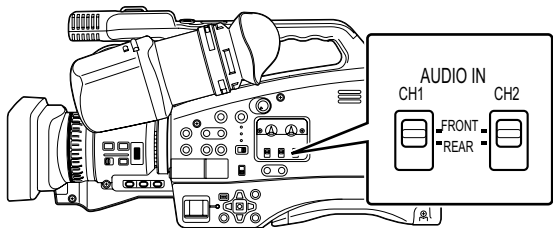
Selecting audio input

The camera will record two-channel audio. Select from the built-in microphone, an external microphone, or any microphones or audio devices connected to the XLR CH1/CH2 terminal to record audio on the respective channels.

Setting/State			Recording Channel	
AUDIO IN CH1 switch	AUDIO IN CH2 switch	External microphone	CH1	CH2
FRONT	FRONT	Not connected	Built-in microphone L-ch	Built-in microphone R-ch
FRONT	REAR	Not connected	Built-in microphone L-ch	XLR CH2
REAR	FRONT	Not connected	XLR CH1	Built-in microphone R-ch
FRONT	FRONT	Connected	External microphone L-ch	External microphone R-ch
FRONT	REAR	Connected	External microphone L-ch	XLR CH2
REAR	FRONT	Connected	XLR CH1	External microphone R-ch
REAR	REAR	—*	XLR CH1	XLR CH2

* With this setting, whether the external microphone is connected or not may not affect the recording channel.

Using the built-in microphone / external microphone (3.5 mm stereo mini jack)



■ Set the AUDIO IN CH1 switch to the FRONT position

When an external microphone is not connected to the EXT MIC terminal, the built-in microphone records audio for the built-in microphone left channel (L-ch). When an external microphone is connected to the EXT MIC terminal, the external microphone records audio for the external microphone left channel (L-ch).

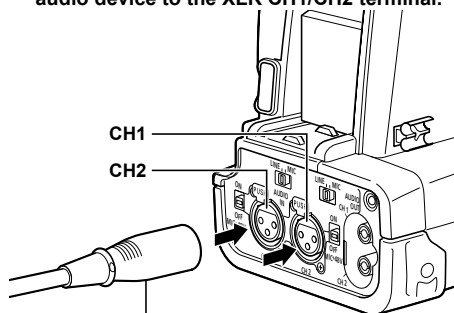
■ Set the AUDIO IN CH2 switch to the FRONT position

When an external microphone is not connected to the EXT MIC terminal, the built-in microphone records audio for the built-in microphone right channel (R-ch). When an external microphone is connected to the EXT MIC terminal, the external microphone records audio for the external microphone right channel (R-ch).

Using the external microphone or audio devices connected to the XLR input terminal

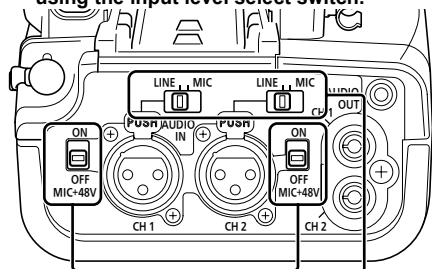
Adjust the input level for the internal or external microphone during shooting.

1 Connect the external microphone or an audio device to the XLR CH1/CH2 terminal.



An external microphone or an audio device

2 Switch the connected audio input signal using the input level select switch.



MIC + 48V ON/
OFF switch

Input level
select switch

LINE: Select when an audio device is connected. The input level is 0 dB.

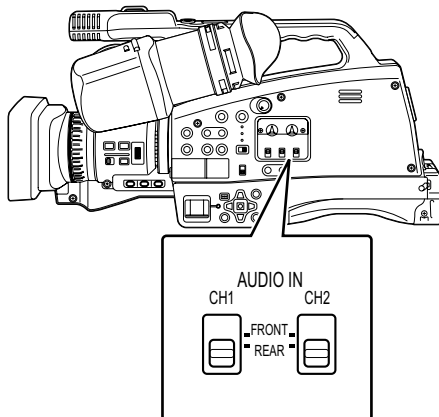
MIC: Select when an external microphone is connected. The input level is -50 dB/-60 dB. The setting can be changed for MIC GAIN1 or MIC GAIN2 in the setting menu RECORD SETUP screen. (Page 104)

3 Set the input level select switch to + 48 V to use a phantom microphone (a microphone that requires the + 48 V power supply).

- + 48 V power is supplied to the XLR input terminal.

- The battery will discharge faster when a phantom microphone is used.
- When connecting a device that does not support the + 48 V power supply, set the MIC + 48 V ON/OFF switch to OFF. Setting the switch to ON may cause the connected device to fail.

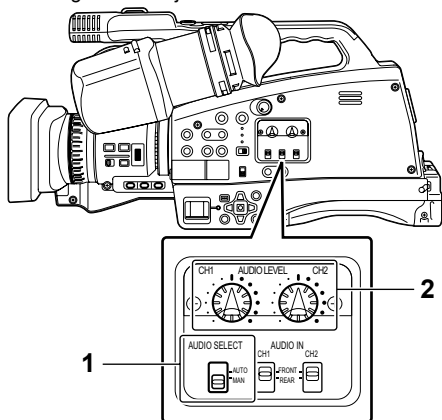
4 Set the AUDIO IN CH1/CH2 switch to REAR. Audio from the connected device is recorded.



Set the switch on the connected device to REAR.

Adjusting the audio recording level

The recording level of audio signals during recording can be adjusted.



- If the indicated audio level meter is red, and then the audio has reached an excessive level with reference to the standard input level. Adjust the recording level with the AUDIO LEVEL knob.

1 Set the AUDIO SELECT switch to MAN.

AUTO: With the ALC (Auto Level Control)

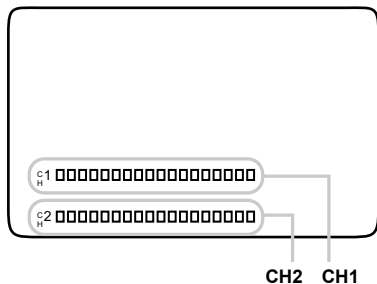
function, the recording level is automatically adjusted when the audio input is excessively loud. The AUDIO LEVEL knob is disabled.

MAN: The ALC (Auto Level Control) function is disabled. The audio recording level can be adjusted with the AUDIO LEVEL knob.

- If excessive inputs are expected, use the AUTO mode.

2 Adjust the audio recording level with the AUDIO LEVEL knob.

- Adjust the audio recording level with the AUDIO LEVEL knob according to the audio level meter on the bottom of the viewfinder.



Using scene files

You can store various scene file setting items for different shooting conditions within a scene file. Different scene files can be saved separately for AVCHD mode and DV mode.

By changing scene files, you can recall necessary settings.

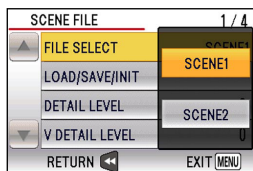
The following scene files are saved as the factory default settings.

Scene 1: Settings suited to standard shooting.

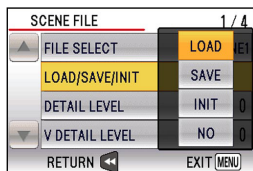
Scene 2: Settings suited to shooting images with modulated color hues and contrast.

Loading scene files

- 1 Set the **POWER** switch to **ON**.
(Page 30 of Vol.1)
 - The CAMERA lamp lights red.
- 2 Press the **MENU** button.
- 3 Select **SCENE1** or **SCENE2** for the **FILE SELECT** item in the setting menu **SCENE FILE** screen, and then press the **ENTER** button.



- 4 Select **LOAD** for the **LOAD/SAVE/INIT** item in the setting menu **SCENE FILE** screen, and then press the **ENTER** button.



- The settings stored on the scene file will be enabled.

- 5 Select **YES** and press the **ENTER** button when the confirmation message appears.
 - SCENE1 LOADED TURN POWER OFF" appears on the screen.

The SCENE1 setting is applied when you restart the camera.

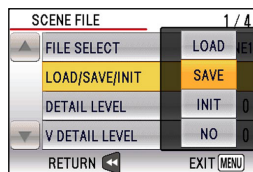
- Simply changing the scene file in **FILE SELECT** will not change the settings. Be sure to perform **LOAD** with **LOAD/SAVE/INIT**. As current setting values will be changed when you perform **LOAD**, be sure to save them if necessary.

Setting and saving scene files

You can set the items found in the setting menu **SCENE FILE** screen. (Page 101)

You can save changed settings as **SCENE1** or **SCENE2**.

- 1 Set the **POWER** switch to **ON**.
(Page 30 of Vol.1)
 - The CAMERA lamp lights red.
- 2 Press the **MENU** button.
- 3 Set the items found in the setting menu **SCENE FILE** screen.
- 4 Select **SCENE1** or **SCENE2** for the **FILE SELECT** item in the setting menu **SCENE FILE** screen, and then press the **ENTER** button.
- 5 Select **SAVE** for the **LOAD/SAVE/INIT** item in the setting menu **SCENE FILE** screen, and then press the **ENTER** button.

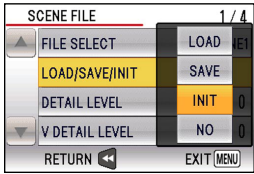


- 6 Select **YES** and press the **ENTER** button when the confirmation message appears.
 - The scene file selected in the **FILE SELECT** item will be overwritten. To cancel save, select **NO** and press the **ENTER** button.
 - You cannot restore scene files that have been overwritten.

Initializing scene files

You can return current setting values to their factory default settings.

- 1 Set the **POWER** switch to **ON**.
(Page 30 of Vol.1)
 - The **CAMERA** lamp lights red.
- 2 Press the **MENU** button.
- 3 Select **SCENE1** or **SCENE2** for the **FILE SELECT** item in the setting menu **SCENE FILE** screen, and then press the **ENTER** button.
- 4 Select **INIT** for the **LOAD/SAVE/INIT** item in the setting menu **SCENE FILE** screen, and then press the **ENTER** button.



- 5 Select **YES** and press the **ENTER** button when the confirmation message appears.
 - The scene file selected in the **FILE SELECT** item will be initialized.
 - “SCENE 1 (or SCENE2) LOADED TURN POWER OFF” appears on the screen. The default settings will be applied when you restart the camera.

Clip metadata

You can add the name of the videographer, shooting location, text memos and other information to the video data you have recorded on the SD Memory Card. This data is called the clip metadata.

Display clip metadata with the META DATA PROP item (Page 105) in the setting menu RECORD SETUP screen.

There are two kinds of clip metadata: the data that is recorded automatically during shooting, and the data in the metadata upload file created on the SD Memory Card which is loaded in the unit.

What the clip metadata consists of

You can set the items underlined below by loading the metadata upload file on the SD Memory Card. All other items are set automatically during shooting.

CLIP NAME:*1

This indicates the LOAD DATA (loaded data), COUNT (counter value), and REC DATA (recorded data).

ACCESS:

This indicates the CREATOR (name of the person recording) and LAST UPDATE PERSON (the person who last updated the data).

SHOOT:

This indicates the SHOOTER (name of the videographer) and the PLACE NAME (name of location).

SCENARIO:*2

This indicates the PROGRAM NAME, SCENE NO. and TAKE NO.

NEWS 1:

This indicates the REPORTER (name of the reporter) and PURPOSE (purpose of data collection).

NEWS 2:

This indicates the OBJECT (target of data collection).

MEMO1:

This indicates the PERSON (name of the person who recorded the text memo).

MEMO2:

This indicates the TEXT (contents of memo).

*1 If there is no information in the metadata upload file, consecutive five-digit numbers will be applied to the clips in the order that they were recorded, with the first clip to be recorded being given the number 0. The USER CLIP NAME recording method is selectable. Please refer to the page 24.

*2 When SCENARIO is to be input, you must input the PROGRAM NAME. You cannot input the SCENE NO. and TAKE NO. only.

- Only printable ASCII characters can be displayed by this unit.
- Due to the limitations imposed by this unit on the number of characters which can be displayed, not all the data can be displayed. (This does not mean that the data which is not displayed has been deleted.) Use an AVCCAM viewer or other program to check all the data.
- Metadata can be produced with AVCCAM Viewer. (Page 122)

Loading the metadata

You can perform any of the following operations. If necessary, make preparations prior to undertaking the operations.

Loading the metadata

- Insert the SD Memory Card on which the metadata is recorded into the unit.

Selecting whether to record the metadata on the SD Memory Card

Initializing the metadata inside the unit

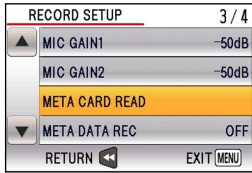
Displaying information on metadata inside the unit

- 1 Set the POWER switch to ON.**
(Page 30 of Vol.1)
 - The CAMERA lamp lights red.
- 2 Press the MENU button.**
Menu operation (Page 40 of Vol.1)
- 3 Select the setting menu RECORD SETUP, and press the ENTER button.**

(Continued on the next page)

Clip metadata (continued)

- 4 Press the up or down button of the cursor button to switch pages, select **META CARD READ**, and press the ENTER button.**



META CARD READ:

Read metadata set to the SD Memory Card with the camera.

- Up to 8 metadata files stored on the SD Memory Card (MTDT00 to MTD07) are displayed in a list. Files with no corresponding data are displayed in gray.



- When you select the file you want to read by pressing the ENTER button, a confirmation message appears. Select YES and press the ENTER button to read the metadata.

META DATA REC:

Select this to set whether to record the metadata to be loaded into the unit simultaneously on the SD Memory Card. Select ON and press the ENTER button to set metadata recording.

The **META** icon appears on the LCD monitor. The factory setting for this mode is OFF.

USER CLIP NAME:

The USER CLIP NAME recording method is selectable. For details, see "Selecting the USER CLIP NAME recording method".

META DATA PROP:

Select this to display metadata that has been loaded to the unit.

CLIP COUNTER RST:

Reset the COUNT value to 1.

Select YES and press the ENTER button to reset.

META INITIAL SET:

Select this to initialize the metadata which has been recorded in the unit.

Select YES and press the ENTER button to initialize.

- 5 Press the MENU button to release the menu mode.**

Selecting the USER CLIP NAME recording method

You can set the recording method for USER CLIP NAME by selecting the USER CLIP NAME item in the setting menu RECORD SETUP screen and then pressing the ENTER button. The TYPE1 and TYPE2 options are available for selection.

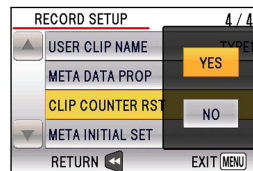
USER CLIP NAME to be recorded

	TYPE1	TYPE2
If clip metadata has been read in	Uploaded data	Uploaded data + COUNT value*
If no clip metadata has been read in or if the setting for recording clip metadata has been turned off	Sequential 5-digit number, in order of recording	Sequential 5-digit number, in order of recording

- * The COUNT value is indicated as a four-digit number. The COUNT value is incremented each time a new clip is captured if clip metadata has been read in and TYPE2 has been selected as the recording method.

The COUNT value can be reset using the following procedure.

Select YES for the CLIP COUNTER RST item in the setting menu RECORD SETUP screen, and then press the ENTER button to reset the COUNT value to 1.



Using the Counter

Counter display

You can display a counter that indicates how much time has elapsed during shooting or playback.

1 Press the COUNTER button.

Each time you press the button, the display changes as follows. (Page 92)

0 : 00. 00 (CAMERA mode only)

Counter value

CLIP 0 : 00 . 00 (CAMERA mode only)

Displayed when CLIP is selected in the REC COUNTER item on the settings menu SW&DISP SETUP screen.

Values are automatically reset when recording is started, and counter values are displayed for each individual clip.

TC 12 : 34 : 56 . 01

Time code value (Display time code frame digits in 25 frames.)

UB 12 34 56 78

User information

No display

Data is not displayed.

Resetting the counter

Press the RESET button while the counter is displayed.

Charging the built-in battery/Setting the time code

Recharging the built-in battery

The camera's internal battery saves the date and time.

When SET DATE AND TIME is displayed even when the date and time are set, it means that the charge of the internal battery is depleted. Do the following to recharge it.

Reset the date and time when fully recharged.

1 Connect the AC adaptor. (Page 26 of Vol.1)

- Leave the POWER switch at OFF.

2 Leave the camera-recorder like this for about 4 hours.

- The internal battery charges during this time.
- Check the time code and menu operations after recharging.

If the date and time are not memorized after recharging, the internal battery requires changing. Please consult the place of purchase.

Setting the time code

In the setup menus, RECORD SETUP screen, set the following time code related items.

(Pages 103, 104)

- TC MODE
- TCG
- TC PRESET

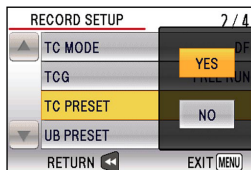
Specifying the time code

Set TC PRESET so you can record a value of your choice as the initial setting for the time code to be used at the start of recording.

1 Set the POWER switch to ON. (Page 30 of Vol.1)

2 Select the TC PRESET item in the setting menu RECORD SETUP screen, and then press the ENTER button.

- Menu operation (Page 40 of Vol.1)
- Operations may also be performed using buttons on the remote control that correspond to those on the camera. For details, see "Description of parts (Remote control)". (Page 23 of Vol.1)

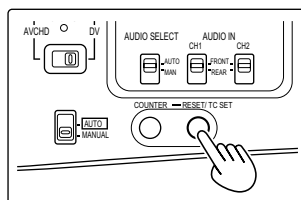


3 Select YES and press the ENTER button.

4 Using the cursor button, select the item you want to set with the left or right button, and set the numerical value with the up or down button.



You can reset the time code to zero by pressing RESET button.



Camera

5 Select ENTER and press the ENTER button when all items have been set.

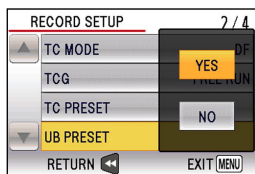
With this unit, the time code value is adjusted in accordance with the format and frame rate. For this reason, bear in mind that making a change in the format or frame rate may result in discontinuity from the last time code value of the previous recording.

Recording format	Time code adjustment
1080/24P	Adjustable in 4-frame increments
720/24P	

Setting user information

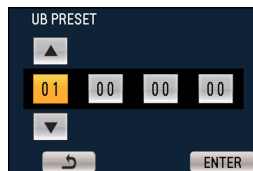
Setting user information allows you to store 8-digit information in the hexadecimal format. User information is automatically saved in the memory and retained after you turn off the power.

- 1 Set the **POWER** switch to **ON**.
(Page 30 of Vol.1)
- 2 Select the **UB PRESET** item in the setting menu **RECORD SETUP** screen, and then press the **ENTER** button.
 - Menu operation (Page 40 of Vol.1)
 - Operations may also be performed using buttons on the remote control that correspond to those on the camera. For details, see "Description of parts (Remote control)". (Page 23 of Vol.1)

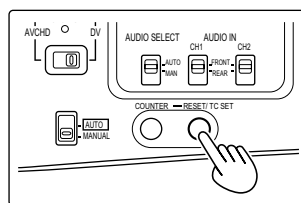


3 Select YES and press the ENTER button.

4 Using the cursor button, select the item you want to set with the left or right button, and set the numerical value with the up or down button.



You can reset the user information to nothing by pressing **RESET** button.



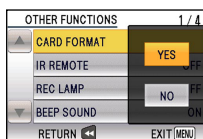
Camera

5 Select ENTER and press the ENTER button when all items have been set.

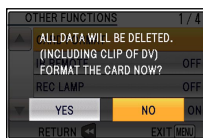
Operating SD Memory Cards

Formatting SD Memory Cards

- 1** Set the **POWER** switch to **ON**.
(Page 30 of Vol.1)
- 2** Press the **MENU** button.
- 3** Select **YES** for the **CARD FORMAT** item in the setting menu **OTHER FUNCTIONS** screen, and press the **ENTER** button.
 - Press the **MENU** button to close the menu display.
 - Press the left button of the cursor button to return to the previous screen.



- 4** Select **YES** on the confirmation screen, and press the **ENTER** button.
 - The SD Memory Card will be formatted.



- 5** Select **EXIT** and press the **ENTER** button.
 - When an SD Memory Card is formatted, all data (including clips recorded in DV mode) recorded on the card will be erased and will not be restorable.
Save all important data to your computer.

SD Memory Card recording times

Total available recording times (approx.) when using SD/SDHC Memory Cards manufactured by Panasonic.

SD Memory Card capacity	AVCHD mode			
	PH* ¹ (Highest quality mode* ² / 1920 × 1080 pixels or 1280 × 720 pixels)	HA* ¹ (High quality mode/ 1920 × 1080 pixels)	HG* ³ (Standard quality mode/ 1920 × 1080 pixels)	HE* ³ (Long duration mode/ 1440 × 1080 pixels)
512 MB	Approx. 2 min	Approx. 3 min	Approx. 4 min	Approx. 10 min
1 GB	Approx. 5 min	Approx. 7 min	Approx. 9 min	Approx. 21 min
2 GB	Approx. 10 min	Approx. 15 min	Approx. 20 min	Approx. 45 min
4 GB	Approx. 21 min	Approx. 30 min	Approx. 40 min	Approx. 90 min
6 GB	Approx. 33 min	Approx. 45 min	Approx. 60 min	Approx. 135 min
8 GB	Approx. 45 min	Approx. 60 min	Approx. 80 min	Approx. 180 min
12 GB	Approx. 65 min	Approx. 90 min	Approx. 120 min	Approx. 270 min
16 GB	Approx. 90 min	Approx. 120 min	Approx. 160 min	Approx. 360 min
32 GB	Approx. 180 min	Approx. 240 min	Approx. 320 min	Approx. 720 min

*¹ Use an SD memory class of SD speed class 4 or above when recording on PH mode or HA mode.

Recording cannot be completed on SD Memory Cards of lower speed classes.

*² This is the highest quality mode of this camera.

*³ We recommend using an SD memory card of SD speed class 2 or above when recording in HG mode or HE mode.

- This camera uses the VBR recording system. "VBR" stands for Variable Bit Rate, and it refers to a system in which the bit rate (volume of data per given time period) varies automatically depending on the subject which is being shot. This means that the recording times will be shorter when fast-moving subjects have been recorded.
- Times displayed include time needed for processing, etc. – actual available recording times will be slightly shorter.
- The camera is capable of continuous recording for a maximum of 12 hours.
- Repeatedly recording or deleting images over and over again may reduce the recording time on the SD Memory Card. In such cases, format the SD Memory Card using the camera. When a card is formatted, all of its recorded data will be erased, and it will not be subsequently possible to restore this data. Save any valuable data on your PC prior to formatting.

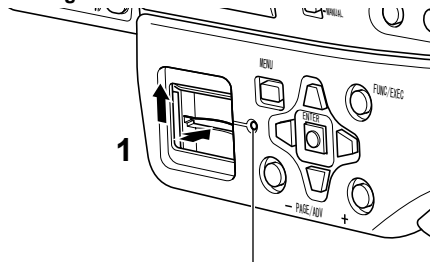
Dividing clips recorded onto SD Memory Cards

When the recorded memory of a single clip exceeds 4 GB when using a SDHC Memory Card of 8 GB or more with this camera, it will automatically be saved as a separate clip.

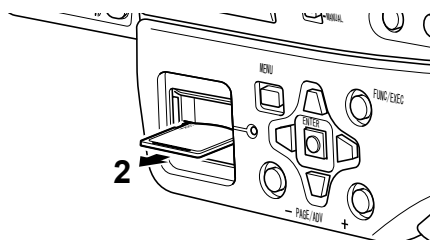
Saved data can be used as a single clip when operating the thumbnail function of this camera. Clips will be treated separately when operated on non-linear editing software or computers.

Removing SD Memory Card

- 1 Slide the card cover upwards to open.**
 - Make sure that the SD Memory Card ACCESS lamp is not flashing orange before opening the cover.
- 2 Press the center of the SD Memory Card so that it pops out slightly, and pull the card straight outwards.**



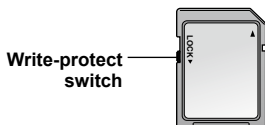
SD Memory Card access lamp



- Do not remove the SD Memory Card or switch off the power in the following circumstances. Doing so may damage your SD Memory Card.
 - 1) While the SD Memory Card ACCESS lamp is flashing orange after inserting an SD Memory Card.
 - 2) While the SD Memory Card ACCESS lamp is flashing during recording, recording finalization, and other operations.

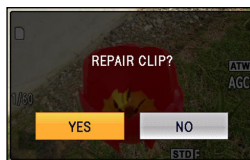
Protecting SD Memory Cards

Move the write-protect switch on the SD Memory Card to the "LOCK" position to prevent recorded contents being accidentally erased from the card.



Repairing SD Memory Cards

Never remove the SD Memory Card or disconnect the battery or DC cable while the SD Memory Card ACCESS lamp is flashing, as doing so may damage the SD Memory Card. In the event the SD Memory Card is removed while the SD Memory Card access lamp is flashing, or the battery or DC cable is disconnected during a recording or recording finalization process, a repair verification screen will appear the next time the power is turned on to allow errors to be repaired.



Select YES to begin repairing. When repairing is complete, "REPAIR FINISHED" will be displayed, and the camera will switch to the recording paused screen. Select NO to switch directly to the recording paused screen without repairing.

- Memory cards cannot be repaired with the camera if NO is selected, but can still be repaired by using the AVCCAM Restorer* contents repair software.
 - An SD Memory Card on which an error occurred can be repaired by using either the camera that was used for the shooting, or the AVCCAM Restorer contents repair software.
 - A repair confirmation message may be displayed after inserting an SD Memory Card which has no error, but repair will not be performed even when YES or NO is selected.
 - Repair may take up to 20 minutes or so depending on the places where the errors occurred on the card.
 - Use a battery with an adequate charge or the AC adaptor.
 - If the repair operation has failed, "SYSTEM ERROR TURN POWER OFF" will be displayed. In this case, please use the AVCCAM Restorer contents repair software.
 - Depending on the status of the data, it may not be possible to restore all data completely. In this case, it will no longer be possible to play back the clips that were recorded before the SD Memory Card was ejected or the power was turned off.
 - Clips with a total recording time of less than 10 seconds may not be able to be repaired.
 - Shot marks added during recording cannot be repaired.
 - * AVCCAM Restorer is included on the supplied CD-ROM. For details on how to install it, refer to install.txt. For details on how to use it, read the operating instructions (PDF file).
- The AVCCAM Viewer can also be downloaded from the following website.
<http://pro-av.panasonic.net/>

Shooting photos

1 Set the POWER switch to ON. (Page 30 of Vol.1)

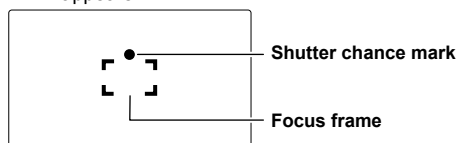
- The CAMERA lamp lights red.

2 Press and hold the MODE button.

- The PHOTO lamp lights red.

3 Press the REC CHECK/PHOTO SHOT button halfway.

- During auto focus, a shutter chance mark and focus frame appear and focus is aligned. During manual focus, only the focus frame appears.

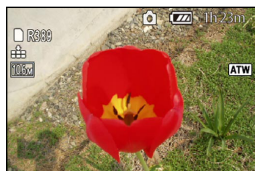


- Shutter chance mark
 - (Flashing white): Focusing in progress.
 - (Lit green): Focusing complete.
- No mark: Focusing incomplete.

4 Press the REC CHECK/PHOTO SHOT button fully.

- Audio recording is disabled.
- If you press the REC CHECK/PHOTO SHOT button fully without first pressing it halfway, it may take longer to record the photo.
- As the shutter speed decreases in dark conditions, we recommend using a tripod or flash.
- If the shutter speed is 1/30 sec or below, the screen will be dark while the START/STOP button is pressed halfway.
- It is always set to SHUTTER ON when in MANUAL mode. SHUTTER OFF will not be enabled even if you press the SHUTTER button.

■ Screen displays during photo shooting



- : Operation mode status
- : Remaining battery display
- : Quality
- : Recording pixels

R389 : Remaining media capacity (flashes red when "0" is reached)

ATW : AWB information display

- For details on other screen displays, see "Screen displays". (Page 91)

■ Shutter chance mark

- The shutter chance mark does not appear in manual focus mode.
- The shutter chance mark may not appear if the following occur.
 - High zoom ratio
 - Excessive camera shake
 - Moving subjects
 - Backlight
 - Nearby and far away objects coexist in the frame
 - Low lighting or dark conditions
 - Bright areas in the frame
 - Subjects consisting entirely of horizontal lines
 - Conditions with low contrast

■ Focus frame

If the focus does not align, perform the following.



Focus frame

The focus aligns on an object with high contrast (such as a fence) and the subject is blurred.



The focus will align if you reposition the center of focus. Shift the center of focus.

OR



Zoom in or move closer to the subject.

- The focus frame will not appear in the following case.
 - While face detection frames are displayed during auto face detection shooting mode.

Shooting photos (continued)

Setting the aspect ratio / recording pixels

You can select an aspect ratio based on the your intended print or playback method. In addition, the higher the recording pixel setting, the sharper your printed images will appear.

Set the aspect ratio with the ASPECT RATIO item in the setting menu PICTURE screen. (Page 105)

Set the recording pixels with the PICTURE SIZE item in the setting menu PICTURE screen. (Page 105)

■ Recording pixels

Aspect ratio	Recording pixels	
4:3	9M	3520×2640
	8M	3264×2448
	5M	2560×1920
	0.3M	640×480
3:2	10.6M	3984×2656
	7M	3264×2176
	4.5M	2592×1728
16:9	10M	4224×2376
	6M	3328×1872
	3.5M	2560×1440

- If you set the aspect ratio to 4:3 or 3:2, black bars will appear on the left and right edges of the screen.
- When you print photos recorded with this camera in 16:9 aspect ratio, the edges may be cut off. Be sure to check beforehand when printing at a store or with other printers.
- The recording pixel settings that are available vary depending on the selected aspect ratio.
- Recording may take longer with higher recording pixel settings.
- The maximum zoom ratio is x 12.

Setting the picture quality

You can select the quality for recorded pictures. Set the picture quality with the QUALITY item in the setting menu PICTURE screen. (Page 105)

■ : Record photos with high image quality.

■ : Prioritize quantity, and record photos with standard image quality.

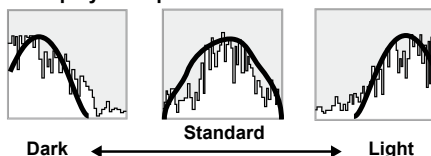
- When shooting with QUALITY set to **■**, photos may appear blurry depending on the subject.

Displaying the histogram

You can display a histogram on the screen.

To display the histogram, set the HISTOGRAM item to ON in the setting menu SW&DISP SETUP screen. The histogram displays a graph with the horizontal axis representing brightness, and the vertical axis representing number of pixels. You can determine the exposure distribution of an entire image by viewing the distribution in the graph.

■ Display example



Maximum number of photos

Aspect ratio		4:3							
Recording pixels		9M 3520×2640		8M 3264×2448		5M 2560×1920		0.3M 640×480	
Quality									
SD Memory Card capacity	8 MB	0	0	0	0	0	1	33	52
	16 MB	1	3	2	3	3	6	77	120
	32 MB	3	6	4	7	7	13	145	220
	64 MB	9	15	11	18	19	31	330	510
	128 MB	20	32	23	38	39	62	650	1010
	256 MB	44	70	51	81	84	135	1380	2150
	512 MB	89	140	105	165	170	270	2760	4300
	1 GB	180	290	210	330	340	540	5550	8660
	2 GB	370	590	430	680	700	1110	11320	17650
	4 GB	730	1150	850	1340	1390	2180	22250	34710
	6 GB	1110	1750	1300	2040	2110	3310	33850	52800
	8 GB	1490	2350	1740	2730	2820	4440	45310	70690
	12 GB	2250	3540	2620	4120	4260	6690	68370	106650
	16 GB	3010	4720	3500	5490	5680	8930	91200	142280
	32 GB	6030	9480	7010	11020	11400	17920	182990	285460

Aspect ratio		3:2					
Recording pixels		10.6M 3984×2656		7M 3264×2176		4.5M 2592×1728	
Quality							
SD Memory Card capacity	8 MB	0	0	0	0	0	2
	16 MB	0	2	1	4	4	7
	32 MB	3	5	5	6	8	14
	64 MB	8	13	13	21	21	34
	128 MB	17	28	26	42	43	68
	256 MB	38	61	58	92	93	145
	512 MB	78	125	115	185	185	300
	1 GB	160	250	240	380	380	600
	2 GB	330	510	490	770	770	1210
	4 GB	640	1010	960	1510	1520	2390
	6 GB	980	1540	1460	2290	2310	3640
	8 GB	1310	2060	1950	3070	3100	4870
	12 GB	1980	3110	2950	4630	4670	7340
	16 GB	2640	4150	3930	6180	6240	9800
	32 GB	5300	8320	7890	12400	12510	19660

Shooting photos (continued)

Aspect ratio		16:9					
Recording pixels		10M 4224×2376		6M 3328×1872		3.5M 2560×1440	
Quality							
SD Memory Card capacity	8 MB	0	0	0	1	1	3
	16 MB	0	2	2	4	5	9
	32 MB	3	5	6	10	10	17
	64 MB	8	14	15	24	26	41
	128 MB	18	30	30	49	52	83
	256 MB	41	65	66	105	115	180
	512 MB	83	130	135	210	230	360
	1 GB	170	270	270	430	460	720
	2 GB	340	540	560	870	940	1480
	4 GB	680	1070	1090	1720	1850	2900
	6 GB	1030	1620	1660	2610	2810	4420
	8 GB	1380	2170	2230	3500	3770	5910
	12 GB	2090	3280	3360	5280	5680	8920
	16 GB	2780	4370	4480	7050	7580	11910
	32 GB	5580	8780	9000	14140	15210	23890

- The maximum number of photos may vary if both  and  quality photos are recorded or depending on the subject.
- The maximum display for the remaining number of photos that can be recorded is 99999.
If the remaining number of photos that can be recorded is greater than 99999, the display will remain the same until the remaining number of photos is below 99999.

Clip and photo operations

Video data recorded in CAMERA mode is referred to as a clip, while still image data recorded in PHOTO mode is referred to as a photo. When you enter PB mode, thumbnail images of clips or photos appear on the viewfinder (The thumbnails may take longer to display with higher quantities of clips and photos.). You can perform the following operations using the thumbnail screen.

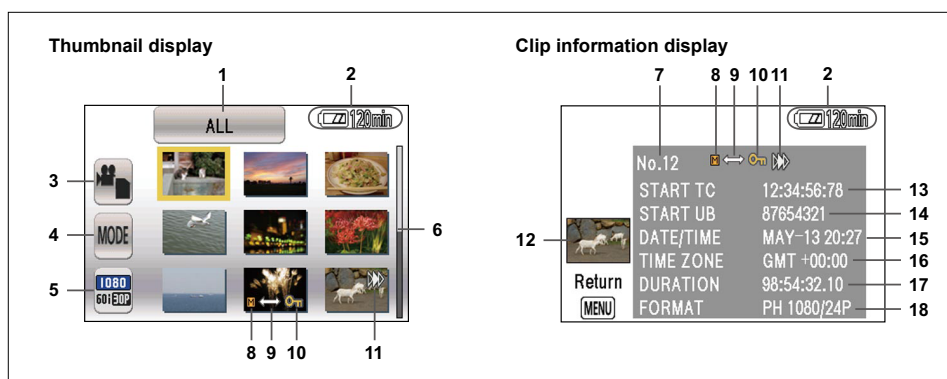
- Play and delete clips or photos
- Format SD Memory Card
- Add or delete shot mark

During clip playback

Clip thumbnails and the operating menu are displayed in the thumbnail screen.

9 thumbnails are displayed in a single screen. When more clips than that are recorded, use PAGE/ADV →/← button to advance to other pages.

In addition, you can press the DISP/MODE CHK button to display information about the clip currently selected with the yellow cursor.



- Thumbnail mode display**
Displays the selected thumbnail mode.
- Remaining battery display**
Displays the remaining battery capacity.
- Video/photo selection**
Selects whether to display the clip or photo thumbnail screen.
- Thumbnail mode selection**
Selects the thumbnail mode. (Page 38)
- Playback format selection**
Selects the playback format. (Page 41)
- Scrollbar**
Displayed when there is a large quantity of clips. Allows you to scroll the screen.
- Clip number**
Displays in the order recorded. Clips with invalid recording formats and other clips that cannot be played back will be displayed in a red frame. To play back clips displayed in red frames, change the playback format.
- Shot mark**
Indicates that a shot mark has been added. (Page 49)
- Interval recording mark**
Indicates clips that were recorded with interval recording. (Page 13)
- Clip protect mark**
Indicates protected clips. (Page 45)
- Resume playback mark**
Indicates clips that will resume playback from a previous point. (Page 49)
- Thumbnails**
A thumbnail of the clip.
- START TC**
Displays the time code value at start of recording.
- START UB**
Displays the user information value at start of recording.
- DATE/TIME**
Displays the date of recording and time at start of recording.
- TIME ZONE**
Displays the time zone.

(Continued on the next page)

17 DURATION

Displays the clip length.

18 FORMAT

Displays the recording format.

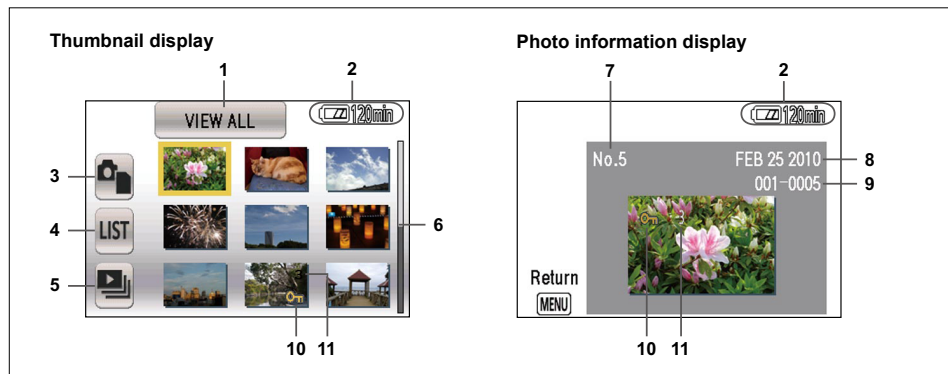
- If “” appears on a thumbnail, the clip cannot be played back.
-

During photo playback

Photo thumbnails and the operating menu are displayed in the thumbnail screen.

9 thumbnails are displayed in a single screen. When more photos than that are recorded, use PAGE/ADV -/+ button to advance to other pages.

In addition, you can press the DISP/MODE CHK button to display information about the clip currently selected with the yellow cursor.



1 Date selection display

Displays the selected date selection.

2 Remaining battery display

Displays the remaining battery capacity.

3 Video/photo selection

Selects whether to display the clip or photo thumbnail screen.

4 Date selection

Use to select photos to display by date.

5 Slideshow

Use to perform slideshow playback. (Page 42)

6 Scrollbar

Displayed when there is a large quantity of photos. Allows you to scroll the screen.

7 Photo number

Displays in the order recorded.

8 Date display

Displays the date of recording.

9 Photo folder/filename display

Displays the folder/filename for the photo.

10 Scene protect mark

Indicates protect photos. (Page 45)

11 DPOF settings mark

Indicates photos that include DPOF settings. (Page 46)

- If "P" appears on a thumbnail, the photo cannot be played back.

Thumbnail operations

Selecting the thumbnail display method

■ During clip playback

You can display the kind of clips you want to see as thumbnails.

You can also set more precisely how you want the thumbnails to appear on the screen.

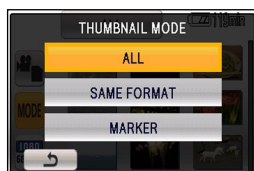
1 Press the FUNC/EXEC button.

The cursor moves to the icon display at the left.

Thumbnail mode selection



2 Select MODE and press the ENTER button.



MODE:

Select the clips to be displayed.

ALL:

Display all clips.

SAME FORMAT:

Display all clips of the same format as the current PB format.

MARKER:

Display all clips with shot marks.

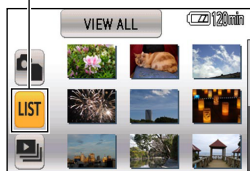
■ During photo playback

You can display thumbnails by the date on which the photos were recorded.

1 Press the FUNC/EXEC button.

The cursor moves to the icon display at the left.

Select date



2 Select the LIST, and press the ENTER button.



LIST:

VIEW ALL:

Display all photos.

Date:

Display photos recorded on the specified date.

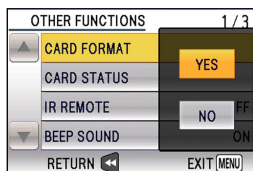
Format card and card information

SD Memory Cards can be formatted, and SD Memory Card information can be checked.

1 Press the MENU button.

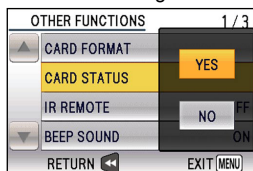
Menu operation (Page 40 of Vol.1)

2 Select the OTHER FUNCTIONS setting menu, and press the ENTER button.



CARD FORMAT:

- Insert card to be formatted into the camera.
- SD Memory Card will be formatted. When executed, all data will be deleted including contents recorded in DV mode. Select YES and press the ENTER button to proceed with formatting.

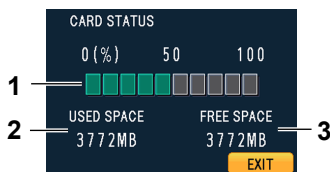


CARD STATUS:

Displays information on the SD Memory Card. Select YES and press the ENTER button to display.

3 Select EXIT and press the ENTER button to return to the thumbnail screen.

SD Memory Card information screen



1 Remaining capacity:

Displays the remaining SD Memory Card capacity.

2 USED SPACE:

Displays the amount of SD Memory Card capacity used.

3 FREE SPACE:

Displays the amount of SD Memory Card capacity free.

Playing back clips

- 1 Set the POWER switch to ON.**
(Page 30 of Vol.1)
 - The CAMERA lamp lights red.
- 2 Press the MODE button to switch to PB mode.**
 - The PB lamp lights green.
- 3 Press the FUNC/EXEC button.**
The cursor moves to the icon display at the left.
- 4 Select [Video/photo selection], and press the ENTER button.**
 - Video will be selected after you have switched from CAMERA mode to PB mode.

Video/photo selection



- 5 Press the FUNC/EXEC button.**
The cursor moves to the thumbnail.
- 6 Using the cursor button, select the clip you want to play back and press the ENTER button.**
The clip is played back.
 - When more than 9 clips are recorded, use PAGE/ADV -/+ button to advance to other pages.

Clip playback functions are operated by the cursor button.

Cursor button	Functions
Up	Play/pause
Down	Stop playback and return to thumbnail screen
Left	During playback : fast reverse (approx. 10 times the speed of normal playback) During pause: skip (rewind clips)
Right	During playback: Fast forward (approx. 10 times the speed of normal playback) During pause: skip (fast forward clips)

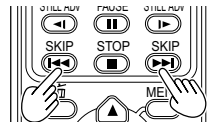
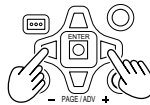
- Clips that are displayed in the thumbnail screen with a red frame cannot be played back due to the playback format being incorrect. Change the playback format.
For details, see "Set playback format". (Page 41)
- An SD Memory Card on which 901 or more clips are recorded becomes a dedicated playback card, and the clips cannot be deleted. After saving the data to a computer or other device using the dedicated AVCCAM Viewer, format the SD Memory Card before using it again.

Fast reverse/forward playback

Using the cursor button, press the right button during playback for fast forward playback, and the left button for fast reverse playback. Press the up button to return to normal playback.

Fast forward/reverse playback

- 1) Press the up button on the cursor button during playback (or the PAUSE button on the remote control) to pause playback.
- 2) Press the left or right button on the cursor button (or the ◀◀ or ▶▶ button on the remote control.).



- Press the down button on the cursor button (or the STOP button on the remote control) to return to the thumbnail display.

■ Frame-playback

You can also play back videos one frame at a time (frame-by-frame) or 15 frames at a time.

- 1) Press the up button on the cursor button during playback (or the PAUSE button on the remote control) to pause playback.
- 2) Press the PAGE/ADV +/- button (or the STILL ADV button on the remote control).
 - Hold down to continuously advance frame by frame until the button is released.
 - Press the STILL ADV button on the remote control during playback to continuously advance frame by frame. Press the PLAY button to cancel.



Video compatibility

- This camera supports the AVCHD format.
 - This camera can play back the following video signal types:
1920×1080/60i, 1920×1080/30P, 1920×1080/24P, 1440×1080/60i, 1280×720/60P, 1280×720/30P, or 1280×720/24P
 - Video recorded with other AVCHD-compatible devices may not play back properly on this camera. Similarly, video recorded with this camera may not play back properly on other devices.
-
- Audio is only included in normal playback.
 - Thumbnails that appear as ! cannot be played back.
-

Set playback format

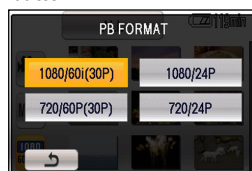
Set format for playback.

- 1 Press the **FUNC/EXEC** button.
The cursor moves to the operating menu.
- 2 Select **[Playback format selection]**, and press the **ENTER** button.



Playback format selection

- 3 Select the playback format and press the **ENTER** button.



- Available playback formats:
1080/60i (30P), 1080/24P, 720/60P (30P), 720/24P
- Under default settings, the setting for the REC FORMAT item in the setting menu RECORD SETUP screen will be applied.
- Clips that cannot be played back will be displayed with a red frame.

Even if the playback format is changed, the format set in the REC FORMAT item on the settings menu RECORD SETUP screen will be restored when the camera is switched to CAMERA mode.

Playing back photos

- 1 Set the POWER switch to ON.
(Page 30 of Vol.1)

- The CAMERA lamp lights red.

- 2 Press the MODE button to switch to PB mode.

- The PB lamp lights green.

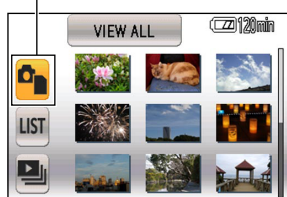
- 3 Press the FUNC/EXEC button.

The cursor moves to the icon display at the left.

- 4 Select [Video/photo selection], and press the ENTER button.

- It switches to photo playback.

Video/photo selection



- 5 Press the FUNC/EXEC button.

The cursor moves to the thumbnail.

- 6 Using the cursor button, select the photo you want to play back and press the ENTER button.

The photo is played back.

- When more than 9 photos are recorded, use PAGE/ADV +/- button to advance to other pages.

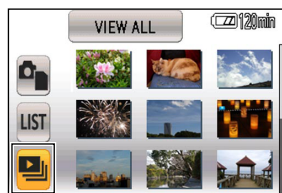
Photo playback functions are operated by the cursor button.

Cursor button	Functions
Up	Start/pause slideshow
Down	Stop playback and return to thumbnail screen
Left	Display previous photo (while pausing)
Right	Display next photo (while pausing)

■ Changing slideshow settings in PB mode

1) Press the FUNC/EXEC button.

- The cursor moves to the icon display at the left.



Slideshow

2) Select the slideshow icon, and press the ENTER button.

3) Select an interval duration, and press the ENTER button.

- SHORT: Approx. 1 second
- NORMAL: Approx. 5 seconds
- LONG: Approx. 15 seconds

4) Select a background music selection, and press the ENTER button.

- Use the MONITOR LEVEL knob to adjust the volume for music during slideshow playback or music check.
 - To check the music, select START.
 - To check another music selection, select it on the screen.
 - Select STOP to stop music playback.
- 5) Select ENTER and press the ENTER button.

-
- Thumbnails that appear as ! cannot be played back.
-

Photo compatibility

- This camera complies with DCF (Design rule for Camera File system) specifications established by JEITA (Japan Electronics and Information Technology Industries Association).
- This camera can play back JPEG-format photo files. (Playback is not guaranteed for all JPEG files.)
- Photos recorded/created with other devices may not play back properly on this camera. Similarly, photos recorded with this camera may not play back properly on other devices.

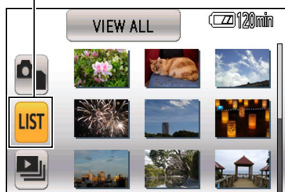
Playback by date

This function selects only photos shot on a specified date for playback.

- 1 Press the FUNC/EXEC button.**
The cursor moves to the operating menu.

- 2 Select [Select date] and press the ENTER button.**

Select date



- 3 Select the date on which the photos for playback were shot, and press the ENTER button.**



Thumbnails for only the photos shot on that date appear.

- 4 Select the photo with which to start playback, and press the ENTER button.**

- The display returns to full-screen playback when you turn off the camera or switch modes, and then switch to photo playback again.
- If the number of photos shot on the same date exceeds 999, the photos will be displayed separately.

Deleting clips/photos (videos and photos)

- Clips and photos that are deleted cannot be restored. Be sure to check carefully before deleting them.

Deleting multiple clips or photos simultaneously

- Press the MENU button while the clip or photo thumbnail screen is displayed.
- Select the DELETE item in the setting menu OPERATION screen, and press the ENTER button.
- Select ALL CLIPS and press the ENTER button.

CAMERA mode

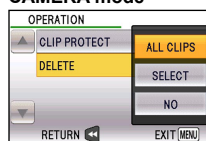
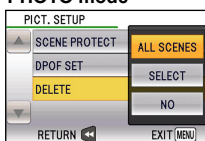


PHOTO mode



- When you select ALL CLIPS, all clips and photos stored on the SD Memory Card that were recorded in AVCHD mode will be deleted. Select YES when the confirmation message appears, and press the ENTER button.
 - Select CANCEL to cancel deletion procedures in progress, and press the ENTER button.
 - Clips and photos that are protected will not be deleted.
- Press the MENU button when deletion is finished.

Selecting clips or photos to delete

- Press the MENU button while the clip or photo thumbnail screen is displayed.
- Select the DELETE item in the setting menu OPERATION screen, and press the ENTER button.
- Select SELECT and press the ENTER button.

CAMERA mode

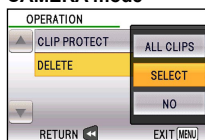
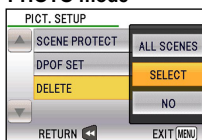


PHOTO mode



- Select the clips or photos to delete, and press the ENTER button.
 - ☐ appears for selected clips and photos. To cancel a selection, reselect the clip or photo and press the ENTER button.
 - You can select up to 99 clips or 99 photos.
 - Clips and photos that are protected will not be deleted.
- Press the FUNC/EXEC button.
 - Select YES when the confirmation message appears, and then press the ENTER button.
 - Select CANCEL to cancel deletion procedures in progress, and press the ENTER button.

- Press the MENU button when deletion is finished.

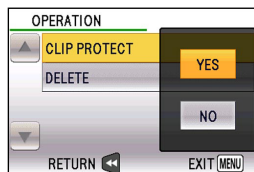
-
-
- Thumbnails that appear as ! cannot be deleted.
 - The deletion procedure may take longer when deleting large numbers of clips or photos.
 - Be sure that the battery is sufficiently charged or use the AC adaptor when deleting data.
 - When using this camera to delete clips or DCF-compliant photos shot with other devices, all related data may also be deleted.
 - When deleting photos that were shot with other devices and stored on an SD Memory Card, even files that cannot be played back on this camera (non-JPEG files) may be deleted.
 - When you select ALL CLIPS, all clips and photos stored on the SD Memory Card that were recorded in AVCHD mode will be deleted.
-
-

Setting protection (videos and photos)

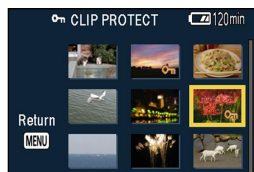
You can set protection for clips and photos to prevent accidental deletion. (**Even protected data will be deleted if you format the memory.**)

Protecting clips

- 1 Press the **MENU** button while the clip thumbnail screen is displayed.
- 2 Select **YES** for the **CLIP PROTECT** item in the setting menu **OPERATION** screen, and then press the **ENTER** button.



- 3 Select the clip to protect, and press the **ENTER** button.
 - **On** appears for selected clips. To release protection, reselect the clip and press the **ENTER** button.

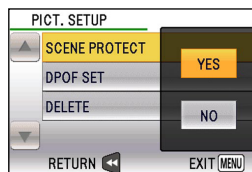


- 4 Press the **MENU** button when protection settings are finished.

-
- Executing a format of the memory will delete clips even if they are protected.
-

Protecting photos

- 1 Press the **MENU** button while the photo thumbnail screen is displayed.
- 2 Select **YES** for the **SCENE PROTECT** item in the setting menu **PICT. SETUP** screen, and then press the **ENTER** button.



- 3 Select the photo to protect, and press the **ENTER** button.
 - **On** appears for selected photos. To release protection, reselect the photo and press the **ENTER** button.



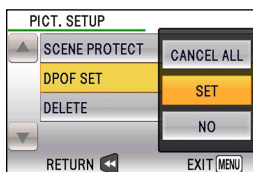
- 4 Press the **MENU** button when protection settings are finished.

-
- Executing a format of the memory will delete photos even if they are protected.
-

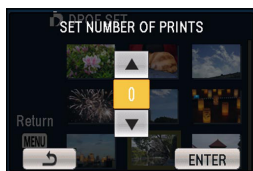
DPOF settings (photos)

Information (DPOF data) such as which photos to print and the number of copies to print can be written to the SD Memory Card.

- 1 Press the **MENU** button while the photo thumbnail screen is displayed.
- 2 Select **SET** for the **DPOF SET** item in the setting menu **PICT. SETUP** screen, and then press the **ENTER** button.



- 3 Select the photo and press the **ENTER** button.
- 4 Use the up or down button of the cursor button to set the number of copies to print.



- You can set the number to between 0 and 999 copies. (You can print the specified number of copies on DPOF-compatible printers.)
 - To cancel the setting, set the number to 0.
- 5 Select **ENTER** and press the **ENTER** button.
- Configure DPOF settings for other photos.
 - Press the **MENU** button when DPOF settings are finished.

■ Canceling all DPOF settings

Select **CANCEL ALL** for the **DPOF SET** item in the setting menu **PICT. SETUP** screen (Page 106), and then press the **ENTER** button.

- Select **YES** when the confirmation message appears, and then press the **ENTER** button.

■ What is DPOF?

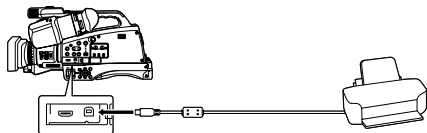
DPOF stands for Digital Print Order Format.

DPOF allows you to write print information onto the memory card for use on a DPOF-compatible system.

- You cannot specify date printing with DPOF settings.

Printing photos on a printer (PictBridge)

- A PictBridge-compatible printer is necessary. (Refer to the operating instructions for the printer.)



USB connection cable (optional)

- 1 Set the POWER switch to ON.**
(Page 30 of Vol.1)
- 2 Connect the camera to the printer.**
The USB function select screen appears.
 - Connect the camera to the printer directly, and do not use a USB hub.
 - Use the AC adaptor to eliminate battery concerns.
- 3 Select [PRINTER] and press the ENTER button.**

- 4 Select the photo to print, and press the ENTER button.**
- 5 Use the up or down button of the cursor button to set the number of copies to print.**
 - You can set up to 9 copies to print.
 - To cancel the setting, set the number to 0.
 - You can set up to 999 different photos to print.
- 6 Select ENTER and press the ENTER button.**
- 7 Press the FUNC/EXEC button.**
The cursor moves to the operating menu.

- 8 Select [Tool] and press the ENTER button.**



Tool

- 9 Select whether to print the date.**
 - This is only available for printers that support date printing.
- 10 Select the print size.**

STANDARD : Standard size set for the printer

4X5 INCH	: 102X127 mm (4X5 inch) size
5X7 INCH	: 127X178 mm (5X7 inch) size
4X6 INCH	: 102X152 mm (4X6 inch) size (postcard)
A4	: A4 size

 - You cannot select print sizes that are not supported by the printer.
- 11 Select the layout.**

STANDARD : Standard layout set for the printer

	: Prints without frames
	: Prints with frames

 - You cannot select layouts that are not supported by the printer.
- 12 Select ENTER and press the ENTER button.**

(Continued on the next page)

13 Select [Printer], and press the ENTER button.

Printer



- Select YES when the confirmation message appears, and then press the ENTER button.
- To cancel printing, select CANCEL and press the ENTER button. A confirmation message appears.

YES:

Clear print settings, and return to step 4.

NO:

Keep print settings, and return to step 4.

- PictBridge will close when you disconnect the USB connection cable (optional) after printing finishes.

-
- To prevent printing errors, do not do the following while printing is in progress.
 - Disconnect the USB connection cable
 - Open the card cover and remove the SD Memory Card
 - Change modes
 - Turn the power off
 - When you print photos recorded with this camera in 16:9 aspect ratio, the edges may be cut off.

If the printer supports functions such as trimming and printing without frames, try clearing these settings before printing. (Refer to the operating instructions for the printer.)

- When the camera is connected to a printer, DPOF printing is disabled.
-

Useful playback functions

Adding a SHOT MARK to a clip

Adding a SHOT MARK (M) will make it easier to find the clips you are looking for.

1 Using the cursor button, select the clip for which a SHOT MARK will be added.

- You can also set or release SHOT MARK settings while shooting a clip, from the thumbnail screen, or from the clip information screen.

2 Press the USER button to which the SHOT MARK function has been allocated. (Page 107)

To remove a SHOT MARK, repeat the above steps.

- It is not possible to add shot marks to clips recorded using a consumer camcorder model.

Repeat playback

Use this setting to repeatedly play back all available clips.

1 Press the MENU button.

- Menu operation (Page 40 of Vol.1)

2 Set the REPEAT PLAY item in the PLAY SETUP screen to ON.

3 Select EXIT and press the ENTER button to return to the thumbnail screen.

When the playback operation is performed, the playable clips are played back repeatedly.

- Repeat playback will continue until playback is paused.
- When REPEAT PLAY is set to ON,  appears on the playback screen.
- To turn the repeat playback setting off, select OFF in step 2.

Resume playback (RESUME PLAY)

Use this setting to play back from where clip had previously been paused.

1 Press the MENU button.

- Menu operation (Page 40 of Vol.1)

2 Set the RESUME PLAY item in the PLAY SETUP screen to ON.

3 Select EXIT and press the ENTER button to return to the thumbnail screen.

4 Select a clip for playback.

If playback has previously been paused, the remainder of the clip will be played next time the clip is selected for playback.

- The resume playback indicator will be displayed on the clip thumbnail.
- To turn the resume playback setting off, select OFF in step 2.

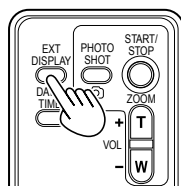
Viewing images on a television

You can view the images on a television if you connect the unit to a TV set using a separately sold video cable, HDMI cable or component cable.

1 Connect the camera-recorder to the TV set. (Page 52)

2 Start playback.

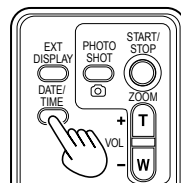
- To show the information that appears on the viewfinder on a television, press the EXT. DISPLAY button on the remote control. Press the EXT. DISPLAY button again to clear the display.



Checking the date and time

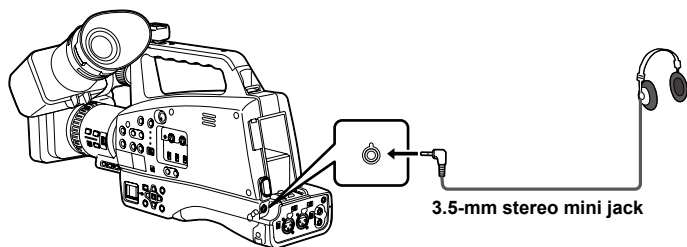
Press the DATE/TIME button on the remote control to show the date and time of shooting on the viewfinder. The display changes as follows each time you press the button.

Time
↓
Date
↓
Time and Date
↓
No display



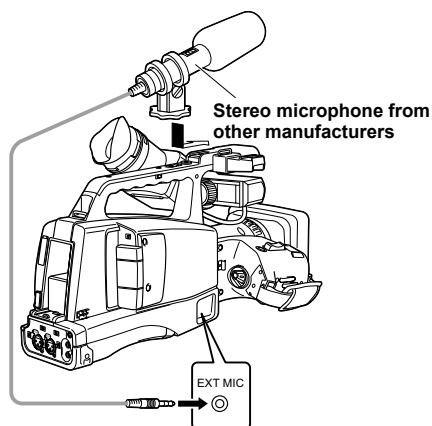
Connecting external units

Headphones

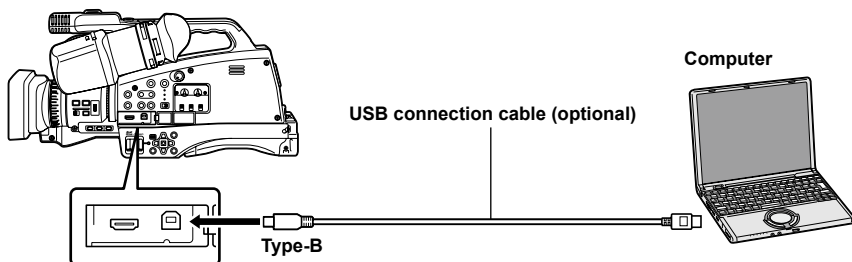


- Sound is no longer heard from the speaker when the headphones (optional) are connected.

External microphone (Stereo mini jack compatible)



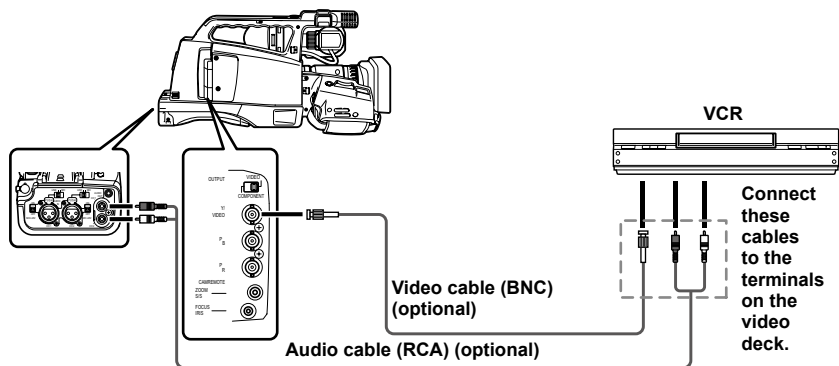
Computer (non-linear editing/file transfer)



- For details on the computer's conditions and other factors, see page 53.
- A USB cable is not supplied with this camera.
Use a commercially available USB 2.0 cable with noise reduction shielding.
- USB cables up to 5 m (approx. 16 ft.) in length are supported, but we recommend using a cable that is within 3 m (approx. 10 ft.) in length.

Video deck (Dubbing)

Video and audio output will be limited to that from the camera.

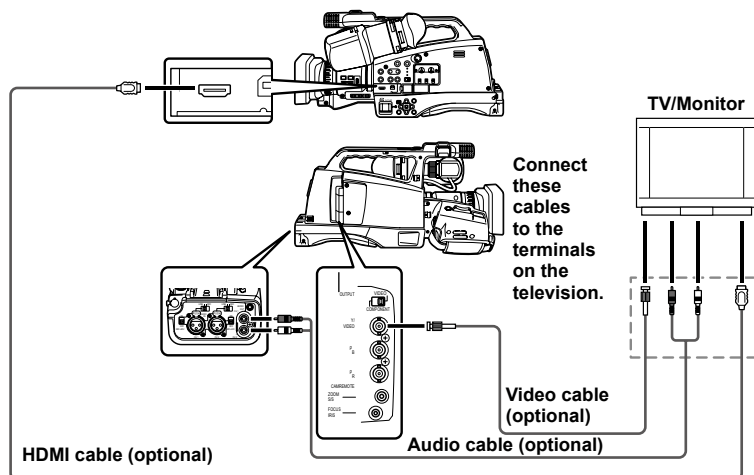


■ When outputting video and audio signals from the camera to an external device, connect to the input terminals of the external device.

- SD quality signals are output from the VIDEO OUT terminal.

TV/Monitor

Only the output signals from the camera are shown.



■ When outputting video and audio signals from the camera to an external device, connect to the input terminals of the external device.

- It is recommended that you use Panasonic's HDMI cable.
- HDMI output will take priority if both HDMI cable and VIDEO OUT cable are connected at the same time. Simultaneous output is not possible.
- This product is not compatible with VIERA Link.
- Since the component terminal only outputs pictures, an audio cable must be connected at the same time. (Connect the cable to the audio input terminal of the component terminal input. For details, refer to the operation manual for the TV.)
- The component terminal of the unit is the BNC type. To connect a pin-type cable, use a pin-BNC converter plug (optional).

■ Output by HDMI output, COMPONENT OUT, and VIDEO OUT

- When an HDMI cable is connected simultaneously with a COMPONENT cable or a VIDEO cable, HDMI output is prioritized.
- Simultaneous output from COMPONENT OUT and VIDEO OUT is not possible. Output is determined by the terminal selected by the OUTPUT switch.

Nonlinear editing

Non-linear editing of video data on SD Memory Cards can be performed by connecting the camera via the USB connection cable to a computer for editing. (As for connection, refer to page 51)
Use a sufficiently charged battery or the AC adaptor.

The following conditions are necessary for USB connection.

- PC with Windows 2000, Windows XP, Windows Vista or Windows 7; Macintosh with Intel CPU (Intel Mac)
- USB 2.0 (High Speed, Mass Storage Class) compatibility (not compatible with USB 1.1)
- Only connect to one computer at a time.
- Camera cannot be operated if a hub or other device is connected between the camera and computer.

1 Insert the SD Memory Card, and move the POWER switch to ON.

- Check that the MODE switch is set to AVCHD. The operation is not possible in DV mode.

2 Connect the camera to the computer with the USB connection cable.

Turn the computer's power on before connecting.



3 Select PC and press the ENTER button.

4 Perform non-linear editing on the computer.

The contents of the SD Memory Card will appear as a removable disk icon within My Computer or the desktop on the computer screen. (Page 122)

(Example) Windows



Removable disk (E:)

(Example) Macintosh



NO NAME

- When copying files from the camera to a computer, be careful to ensure that files are not accidentally overwritten.
- For more details, please refer to your computer editing software's operating instructions.
- When changing cards, always ensure that the access lamp is not flashing and that the card is not currently being accessed.
- You cannot operate the camera when it is connected to a computer.
- Always perform "safe hardware removal" when disconnecting the cable.
- The data on the SD Memory Card cannot be accessed when the SD Memory Card slot cover is open.

5 Turn the camera's power off.

- If the camera cannot be correctly recognized by the computer, this may be able to be remedied by one of the following methods.
- Turn the power of the camera and the computer off and back on again.
- Remove the SD Memory Card from the camera and reinsert it.
- Connect to a different USB terminal on the computer.

Chapter 2: Operations in DV mode

Shooting in manual mode

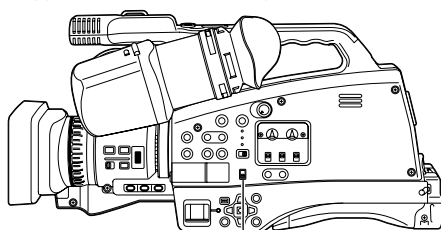
Set the shooting mode to DV.

- Select DV with the MODE switch, and then turn on the camera.

Set the unit to manual mode when manually adjusting the focus, shutter speed, iris, gain and white balance.

Switching to manual mode

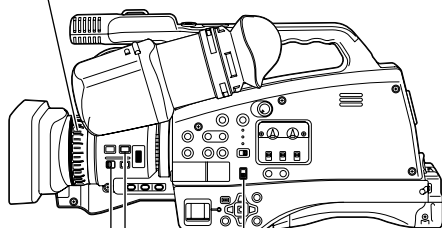
Move the AUTO/MANUAL switch to the MANUAL position to select the manual mode. ([A] will disappear from the viewfinder.)



AUTO/MANUAL switch

Manual focusing

Focus ring



AUTO/MANUAL switch

FOCUS button

RING selector switch

- 1 Use the AUTO/MANUAL switch to set to manual mode.**
- 2 Use the FOCUS button to switch the focus mode.**

Pressing the FOCUS button switches to manual focus mode where "MF" appears on the screen. Pressing the FOCUS button again switches to auto focus mode where "AF" appears on the screen.

 - Holding down the FOCUS button sets the focal length to infinity and causes "MF95" to appear on the screen.

When switching from auto mode to manual mode:

- Iris and focus are set to AUTO.

You can switch them to manual mode by pressing the IRIS dial and FOCUS button.
- Shutter speed

In CAMERA mode, the shutter speed of AUTO mode during SHUTTER ON is preserved. You can switch between ON/OFF with the SHUTTER button.
- The shortest distance from a back-focusing lens differs depending on the zoom position.
- When using a macro range and AF or MF on the focus control information display appears in reverse black and white, zooming may cause the image to become unfocused.

3 The function allocated to the focus ring can be changed with the RING switch.

FOCUS:

Adjust the focus.

ZOOM/IRIS:

Adjust the zoom or iris (aperture) setting.

You can change which functions are assigned from the menus.

The factory default setting is ZOOM.

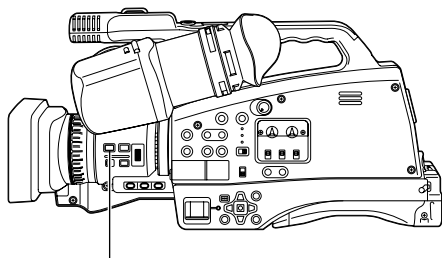
Temporarily switching to auto focus

You can also use auto focus mode while in manual mode by assigning the (PUSH)AF function to one of the USER buttons 1 to 3. Auto focus mode will be enabled for as long as the USER button is pressed, and the focal point will be automatically adjusted.

- Auto focus may not work properly if there is flickering. Select a shutter speed suited to the ambient light. (Page 65)
- If the auto focus mode is set with any format except 60i and 60P, controlling the focus will take slightly longer than in the normal focus mode.
- During macro shooting "AF" or "MF" will be displayed in a frame on the screen.

Using focus assist

Pressing the FOCUS ASSIST button enlarges the center of the viewfinder, or displays a bar at the bottom center of the screen. These displays make aligning the focus easier and are particularly useful in manual focus mode. The display that appears when the FOCUS ASSIST button is pressed can be configured with the FOCUS ASSIST SW item in the setting menu SW&DISP SETUP screen. (Page 107)



FOCUS ASSIST button

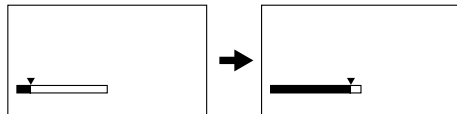
EXPANDED:

The central part of the screen will be enlarged by a factor of about 4 in the vertical direction and by a factor of about 6 in the horizontal direction. A blue box will appear in the viewfinder screen during expanded display. Only the operation status display and counter will appear on the screen.

BAR:

A bar will appear at the bottom center of the viewfinder screen, indicating the level of focus alignment with its length.

The peak hold mark (▼) appears over the bar, and the bar expands to the right as focus is aligned.



Focus not aligned

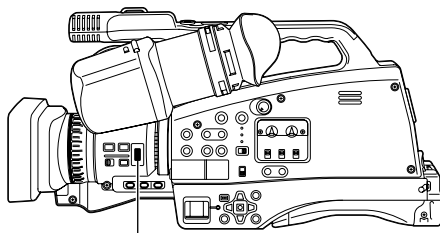
Bar expands to right as focus is aligned

BOTH:

Displays both the expanded display and focus bar.

- This function cannot be used while the digital zoom function is in use.
- Press the FOCUS ASSIST button again to return to the original screen.

Setting the aperture and gain



IRIS dial

- 1 Use the AUTO/MANUAL switch to set to manual mode. (Page 54)**
 - 2 Press the IRIS dial to switch the method of adjustment for the aperture of the lens.**
The method switches to AUTO IRIS or MANUAL IRIS with each press of the dial.
AUTO IRIS: Adjust the iris automatically.
MANUAL IRIS: Adjust the iris manually.
 - 3 Turn the IRIS dial to adjust the aperture of lens when in the manual iris mode.**
 - In the auto iris mode, the lens iris can be corrected using this dial.
 - Increase in brightness beyond the maximum aperture (OPEN) is performed via gain adjustment (CAMERA mode: 0 to 24 dB).
 - If further gain adjustment is necessary, assign HIGH GAIN to one of the USER buttons 1 to 3. The gain mode switches between normal and high with each press of the button.
Gain can be set to up to 34 dB in high gain mode.
- Set the direction of the IRIS DIAL and aperture control in the setup menus, SW&DISP SETUP screen, IRIS DIAL.
 - The lens aperture can be adjusted in the focus ring by setting the RING switch to IRIS. The default setting for this item is ZOOM, so set the RING SW item to IRIS in the setting menu SW&DISP SETUP screen. The relationship between the direction of rotation and aperture control is based on the IRIS DIAL setting in the SW&DISP SETUP screen. However, as this will make it impossible to adjust the focus in the focus ring, please set the focus control method to AF (auto focus) with the FOCUS switch. Zoom control can also be assigned to the FOCUS ring. (Page 54)

(Continued on the next page)

Shooting in manual mode (continued)

- As you shrink the aperture to a near closed state, resolution will decrease due to light diffraction. You can prevent this by adjusting the shutter speed and increasing the aperture size.

Adjusting the white balance and black balance

When white balance adjustments are performed, black balance adjustments are performed at the same time.

White balance

In order to reproduce the white accurately, adjust the ratio between the three RGB primary colors. If the white balance is not adjusted properly, not only will the white be reproduced poorly but the color tones of the entire screen will also be downgraded. When you are shooting in manual mode, readjust the white balance whenever lighting conditions change.

You can store white balance adjustments to Ach and Bch of the Function Menu.

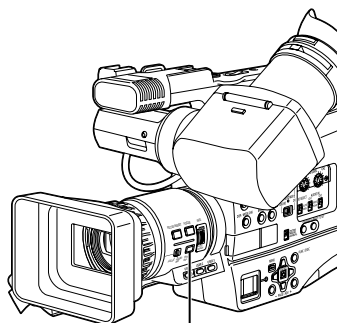
You can also use the preset values.

Use the settings to suit the shooting conditions.

Black balance

Adjust the ratio between the three RGB primary colors to reproduce black accurately. If the black balance is not adjusted properly, not only will black be reproduced poorly, but the color tones of the entire screen will also be downgraded. Black balance adjustment is usually not necessary, but be sure to perform it in the following cases.

- When using the camera for the first time.
- When using the camera after extended periods of disuse.
- When using the camera after large changes in ambient temperature.
- After setting the shutter speed to standard or low speeds.
- After switching between progressive mode and standard (60i) mode.



WHITE BAL button

White balance and black balance adjustments

- 1 Use the AUTO/MANUAL switch to set to manual mode. (Page 54)
- 2 Set the shutter speed. (Page 65)
- 3 Place a white pattern in a location with the same lighting conditions and light source as the subject, then zoom in and fill the whole screen with white.
Something white (a white cloth or wall) near the subject can be used instead.
 - Do not include bright spotlights in your shot.
- 4 Press the WHITE BAL button to display Ach or Bch.
The mode changes in order from ATW→ATW LOCK→P3.2K→P5.6K→Ach or Bch→ATW with each press of the button.
- 5 Press the FUNC/EXEC button to display the Function Menu.
- 6 Press the ENTER button and select Ach or Bch.
The mode switches between Ach and Bch with each press of the ENTER button.

7 Press and hold the WHITE BAL button.

- Adjustment takes a few seconds.
(The following messages appear on the screen.)

Message during adjustment

AWB ABB
ACTIVE

Message after adjustment

AWB ABB OK

- An error message appears on the viewfinder screen when white balance adjustment is not possible.

Message when adjustment cannot be done

AWB NG

-
- White balance cannot be adjusted if the ATW (Auto Tracking White) function is working.
 - Black balance cannot be adjusted during recording.
 - White balance cannot be adjusted during auto mode. Only black balance can be adjusted.
 - White balance cannot be adjusted if the shutter speed is set to less than 1/24.
-

Auto Tracking White (ATW)

Using the ATW function enables the recording environment to be automatically analyzed and an optimum white balance to be constantly maintained during recording.

To use the ATW function, set the white balance to ATW mode by pressing the WHITE BAL button.

-
- Depending on the environment, there may be some error in the adjustment.
 - Use the procedure described on the previous page whenever you need more precise white balance.
-

Using presets

Use this feature when you have no time to make white balance adjustments.

1 Use the AUTO/MANUAL switch to set to manual mode. (Page 54)**2 Press the WHITE BAL button.**

The mode changes in order from ATW→ATW LOCK→P3.2K→P5.6K→Ach or Bch→ATW with each press of the button.

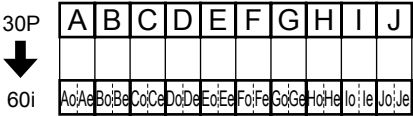
- Guide to the preset values
P3.2K (3200 K): halogen light
P5.6K (5600 K): outdoors

Shooting in progressive mode

Selecting 480/30P for the REC FORMAT option in the setting menu RECORD SETUP screen (Page 103) enables shooting in progressive mode.

30P mode (with 480 mode):

Shoot 30 frames a second in the progressive mode.
For output and recording, the 30-frame-per-second signal is converted to 60-field-per-second interlace.
This mode gives you high quality images.



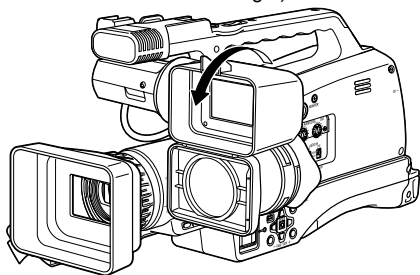
Shooting techniques for different targets

Self-portrait shooting

Self-portrait shooting is possible if the viewfinder is rotated 180° towards the lens.

You can make them appear better by reversing left and right. Go to the setup menus, SW&DISP SETUP screen, SELF SHOOT, and select MIRROR. Shooting in mirror mode has no effect on what you actually shoot and record.

The date display for time stamps will also appear reversed. (However, the dates are recorded in a non-reversed state on the image.)



- If you press and hold the DISP/MODE CHK button when self-portrait shooting, the mirror mode is temporarily disabled and the screen displays information such as the configuration status of all recording functions. Release the button to return to mirror mode.

- Images played back by pressing the REC CHECK button cannot be inverted horizontally.
- Operation status displays during self-portrait recording

No display: Cannot record (no card, etc.)

●: Recording in progress

□□: (Red) Transitioning to recording standby mode

(Green) Recording standby mode

! : Warning display

- When ! is displayed, turn the viewfinder back in the direction of normal recording, and check what the message says.
- Holding down the DISP/MODE CHK button displays the screen display information.
- Images will be output normally to external devices. In addition, only operation status displays will appear on the screen.

Zebra pattern

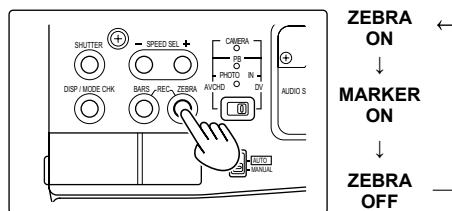
Pressing the ZEBRA button in CAMERA mode displays zebra patterns and markers on the viewfinder, allowing you to check the brightness of a subject.

Parts that may be whited out through over exposure are shown as a zebra pattern.

- Very bright
- Reflecting parts

You can remove most overexposed parts by adjusting the iris and shutter speed in the manual mode to remove the areas with zebra patterns.

The display changes as follows each time you press the ZEBRA button.



You can set brightness levels for the zebra patterns with the ZEBRA DETECT item in the setting menu SW&DISP SETUP screen. (Page 108)

The zebra pattern cannot be displayed while the focus assist function (expanded display) is in use.

Low angle shooting

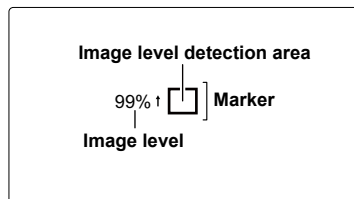
You can shoot using the handle START/STOP button on the handle during low angle shooting.

Marker

If you press the ZEBRA button while zebra patterns are displayed, a marker appears near the center of the display (if you have set the setup menu, SW&DISP SETUP, MARKER to ON).

The brightness of the areas near the screen center can be checked as a percentage (0 % to 99 %).

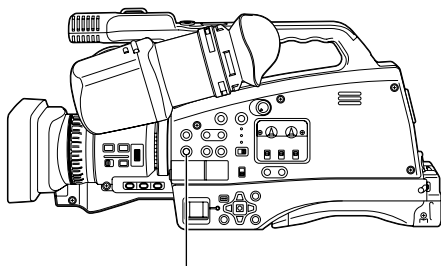
"99%↑" appears if the percentage is over 99.



The normal display reappears if you press the ZEBRA button again.

- The marker does not appear when the face detection function is set to ON.

Checking and displaying shooting status



DISP/MODE CHK button

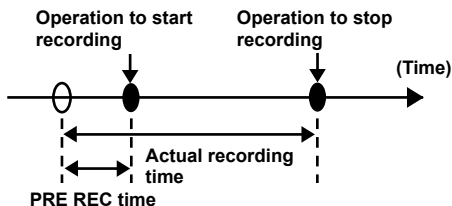
If you press and hold the DISP/MODE CHK button in recording standby mode or while recording, the configuration status of all recording functions, a list of USER button function assignments, focus ring function, and all other camera information will be displayed. Release the button to return to the normal display.

Pressing the DISP/MODE CHK button during recording or while recording is paused will remove all displays from the screen except for the operation status, counter, marker, and safety zone display. Press the button again to return to the normal display. (Page 99)

The display mode selected using the DISP/MODE CHK button is retained even if you turn off the camera by setting the POWER switch to OFF, or change the operating mode.

PRE REC

Record video and audio from three seconds before the time of the operation to begin recording.



- 1 Select ON for the PREREC MODE item in the setting menu RECORD SETUP screen, and then press the ENTER button.

PRE REC is displayed on the screen.

- 2 Press the START/STOP button.

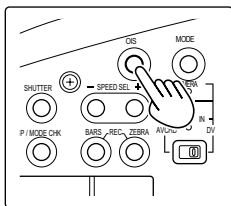
Video and audio from approximately 3 seconds previously will be recorded.

- Recording of the previous 3 seconds of video and audio may not be possible if recording is started immediately in the following cases.
 - Immediately after switching from another mode to CAMERA mode
 - Immediately after turning power on
 - Immediately after changing to PREREC MODE item
- The thumbnail for clips recorded using the PREREC function will display the image from when the START/STOP button was pressed.

Optical Image Stabilizer

Use the Optical Image Stabilizer (OIS) to reduce the effects of camera shake when shooting by hand.

Press the OIS button to turn the function on and off. The  appears on the viewfinder when this function is on. Turn the function off when using a tripod for more natural images.



- This function will not be as effective when the vibration is severe or when tracking a moving subject.

Adding effects to images

Press the USER button you have allocated to the BLACKFADE or WHITEFADE feature to add fading effects to your images. The button's function is forcibly canceled during playback or REC CHECK and also when thumbnails are displayed.

BLACKFADE:

Press and hold to fade out to black. Audio also fades out. Fade-in starts when the button is released.

WHITEFADE:

Press and hold to fade out to white. Audio also fades out. Fade-in starts when the button is released.

- This function does not work while INTERVAL REC is enabled.

Using the USER buttons

You can allocate one of 14 features to each of the three USER buttons.

Use these buttons to change shooting settings quickly or add effects to the images you are shooting.

The following features are allocated to the buttons at the time of shipping.

USER1: (PUSH)AF

USER2: BACKLIGHT

USER3: SHOT MARK

For details, see the setup menus, SW&DISP SETUP screen, USER1 to 3. (Page 107)

If you press a USER button to which one of the functions has been allocated and then turn off the power, the added effect to the image will not be retained.

Backlight compensation

Press the USER button you have allocated to the BACKLIGHT feature when shooting subjects lit from the back.

BACK LIGHT appears on the screen, and  appears at the bottom right of the screen.

Backlight compensation adjusts the iris so the subject doesn't come out dark.

Press the same USER button to turn the feature off. (If you perform backlight compensation in manual iris mode and it is disabled, the camera switches to auto iris control.)

Color bars

Press and hold the BARS button in CAMERA mode to output a color bar screen to a television or external monitor so you can adjust them. Press the button again to turn the feature off.

- While the color bar is displayed, a test tone of 1 kHz will be output from the PHONES (headphone) terminal, or the Pin jack OUT terminal. There will be no speaker output.
- The color bar can be recorded by pressing the START/STOP button.
- The BARS button is disabled in PB mode, and DV IN mode.
- The color bar display is canceled when the power is turned off.

Wave form monitor function

During CAMERA mode, you can display a waveform for an image in the viewfinder screen by pressing the USER button to which the WFM function has been assigned.

Press the button again to return to the normal display.

- This function cannot be used while the focus assist function is enabled.
- Wave forms cannot be recorded.
- While wave forms are displayed, part of the recording screen will be hidden by the wave forms.
- Wave forms cannot be displayed in DV IN mode.

Shot mark function

The marks attached to the thumbnails of clips are called shot marks. On the thumbnail screen monitor you can select only those clips with a shot mark and display them or play them back. During recording, when you press the USER button to which the SHOT MARK function has been allocated, MARK ON appears in the LCD monitor or the viewfinder, and a shot mark is set for the thumbnail of the clip being recorded. If you press the button again, the shot mark is released. You can also set or release the shot marks by performing the thumbnail operations for clips. (Page 85)

However, note that you cannot set or release shot marks during playback.

- INVALID appears when you cannot set or release shot marks.

Interval recording

This function allows you to create short videos of scenes that move slowly over long periods of time through frame-by-frame recording at specified intervals. Single frames are recorded at the specified interval, with 30 frames equaling 1 second of video.

You can specify the interval in CAMERA mode with the INTERVAL REC item in the setting menu RECORD SETUP screen.

- **1 SECOND/10 SECONDS/30 SECONDS/1 MINUTE/2 MINUTES:** Change the recording interval.
- **OFF:** Disable interval recording.
-  appears on the screen.
- Interval recording will be disabled when shooting is finished.
- Audio recording is disabled.
- The PRE-REC function is disabled, even if it is set.

Example	Recording interval	Shooting time	Video length
Sunsets	1 SECOND	30 min to 1 hour	1 min 15 sec to 2 min 30 sec
Butterfly emerging from cocoon	10 SECONDS	2 hr to 4 hr	30 sec to 1 min
Flowers blooming	30 SECONDS	1 hr to 3 hr	5 sec to 15 sec

- The maximum shooting time is 24 hours.
- When recording for long periods, use the AC adaptor to eliminate battery concerns.

- Do not remove the battery or disconnect the AC adaptor during interval recording. Doing so may damage recorded image data or result in data loss.
- You cannot change the recording mode while interval recording is enabled.
- Depending on lighting and shooting conditions, color and focus settings may not adjust automatically. In such cases, make adjustments manually.
- The digital zoom function, and BLACKFADE and WHITEFADE functions cannot be used while INTERVAL REC is enabled.
- Set the below values for REC FORMAT when setting INTERVAL REC. If the settings differ to the below, INTERVAL REC will be displayed in gray and disabled.
REC FORMAT: 480/60i

Time stamp function

The date and time of recording can be recorded to video images.

Select ON in the TIME STAMP item on the settings menu RECORD SETUP screen.

When the TIME STAMP function is ON,  will be displayed in front of the date and time display in the viewfinder. In addition, the month display will change from a numerical value to an English name display.

- The letter  display itself will not be recorded to the video.
- The size and position of the time and date characters recorded to the image will vary depending on the recording format.
- The size and position of the time stamp characters in external output displays may vary from the displays in the viewfinder and external input/output displays.
- The recorded time and date display will follow the settings made in the DATE/TIME item on the SW&DISP SETUP screen. If this item is set to OFF, the date and time will not be recorded as a time stamp.
- To avoid date and time displays overlapping when clips with time stamps recorded are played with this camera, please set the DATE/TIME item on the SW&DISP SETUP screen to OFF.

LAST CLIP function

The most recently recorded clip can be deleted at the touch of a button by allocating the LAST CLIP function to any of the USER 1 - 3 buttons.

Press the USER button allocated for the LAST CLIP function to display YES/NO on the screen. Select YES to delete the most recently recorded clip.

- Select NO not to delete the clip.
- If the camera has been switched to PB mode or DV IN mode, or the recording format has been changed since recording was completed, clips cannot be deleted even if the button is pressed. Clips also cannot be deleted if the power has been switched off and back on again.
- Clips cannot be deleted even if the button is pressed if the memory card has been removed and reinserted since recording was completed.

Changing the size of images

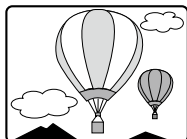
When recording in DV mode, you can change the size (aspect ratio) of recorded images. It can be set with the ASPECT CONV item in the setting menu RECORD SETUP screen (Page 103).

- Menu operations (Page 40 of Vol.1)
- The illustrations depict displays on monitors with 4:3 aspect ratios during external output.

SIDE CROP:

Records in standard 4:3 ratio.

Crops the left and right edges of the screen. Images recorded in an aspect ratio of 4:3 will appear in the viewfinder, with black bars displayed on the left and right edges of the screen.



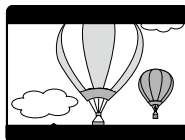
- The left and right black bars that appear on the OSD of the viewfinder while SIDE CROP is enabled do not appear in external output displays.

LETTER BOX:

Records with a 16:9 angle of view.

Black bars are displayed at the top and bottom edges of the screen.

Images recorded in an aspect ratio of 16:9 will appear in the viewfinder, with "LT.BOX" displayed.



SQUEEZE:

Records by squeezing images horizontally from the left and right.

The aspect ratio will be set to 16:9 when playing back recorded images on a wide-screen TV.

Images recorded in an aspect ratio of 16:9 will appear in the viewfinder.



Recording backup images

Images recorded with this video can be automatically backed up to external devices (Page 88) connected to the DV terminal. Set external device controls with the DV CONTROL and DV CMD SEL items in the setting menu OTHER FUNCTIONS screen.

Note the following when recording backup images.

- Since menu item settings are saved even after power is switched OFF, images may overwrite media on connected devices if this camera is used while the backup recording setting is enabled.
 - If an additional AG-HMC80 unit is used as an external device for recording backup images, set the DV CONTROL item (Page 110) in the external device to OFF and use in DV IN mode.
 - Backup image recording may not work properly when 2 or more external devices are connected.
 - Make sure the length of the DV (1394) cable used for connections does not exceed 4.5 m.
 - Make sure the DV (1394) signal can be recorded with external devices when recording backup images.
 - When recording backup images set to CHAIN for the DV CONTROL item (Page 110) in the setting menu OTHER FUNCTIONS screen, backup images will automatically be recorded by backup devices set to record standby mode when the camera's media has nearly run out during shooting.
 - When conducting REC CHECK, note that those images will also be recorded.
 - The backup recording function does not work after interval recording.
-

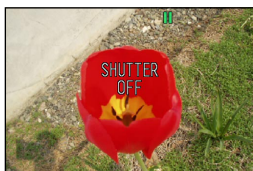
Adjusting the shutter speed

1 Set the AUTO/MANUAL switch to MANUAL to select manual mode. (Page 54)

2 Press the SHUTTER button.



- SHUTTER ON is enabled after switching to MANUAL mode from AUTO mode. The shutter speed switches between the standard (OFF) shutter speed and the shutter speed you have selected with the SPEED SEL $\pm$ button each time you press the button.



- The shutter speed appears at the left of the screen during SHUTTER ON.

3 Press the SPEED SEL $\pm$ button to adjust the shutter speed while in SHUTTER ON mode.

The shutter speed changes as per the following table.

- As the shutter speed increases, camera sensitivity decreases.
- With auto iris control, as the shutter speed increases, the aperture widens and the focal length decreases.
- Because the focal time increases at slower shutter speeds, we recommend using a tripod.

- With artificial lighting and especially fluorescent lights and mercury-vapor lamps, the luminance changes in synchronization with the power line frequency. When this frequency is 50 Hz, mutual interference will occur between the camera-recorder's vertical sync frequency (approx. 60 Hz) and the lighting frequency (50 Hz). This means that the white balance may change periodically.

Before shooting in areas with artificial lighting or adjusting the white balance, set the shutter speed as follows.

Progressive mode	Shutter speed	
	50 Hz	60 Hz
OFF (60i)	1/100	1/60 (OFF)
30P	1/50 (OFF)	1/60
24P	1/50 (OFF)	1/60

Adjusting the shutter speed (continued)

CAMERA mode:

With the 480/60i format	
OFF (1/60)	SYNCRO SCAN ↔ 1/2 ↔ 1/4 ↔ 1/8 ↔ 1/15 ↔ 1/30 ↔ 1/60 ↕ 1/2000 ↔ 1/1000 ↔ 1/500 ↔ 1/250 ↔ 1/120 ↔ 1/100 ↕
With the 480/30P format	
OFF (1/50)	SYNCRO SCAN ↔ 1/2 ↔ 1/4 ↔ 1/8 ↔ 1/15 ↔ 1/30 ↔ 1/50 ↕ 1/2000 ↔ 1/1000 ↔ 1/500 ↔ 1/250 ↔ 1/120 ↔ 1/60 ↕
With the 480/24P format	
OFF (1/50)	SYNCRO SCAN ↔ 1/2 ↔ 1/3 ↔ 1/6 ↔ 1/12 ↔ 1/24 ↔ 1/50 ↕ 1/2000 ↔ 1/1000 ↔ 1/500 ↔ 1/250 ↔ 1/120 ↔ 1/60 ↕

- Under fluorescent and other discharge tube lighting, horizontal bands may appear on the display. Adjusting the shutter speed in such cases may resolve the problem.
- When shooting subjects moving quickly across the screen, the image may be distorted. This is a result of the readout method of the pickup device (MOS sensor), and is not a malfunction.
- White, red, blue, and green spots may appear on the display when using slow shutter speeds. This is not a malfunction.

Synchro scan

Adjust the shutter speed to match the frequency of the television or computer monitor to minimize the horizontal noise that appears when shooting such subjects.

- If SYNC is displayed in grey, it cannot be used with the current recording format. This function will only operate for preset values for each recording format.

Valid setting values will appear to the right of the adjustment value.

480/60i:

1/60.0 to 1/250.0 sec

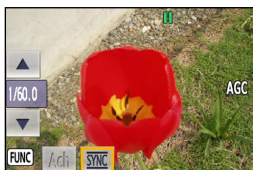
480/30P:

1/30.0 to 1/250.0 sec

480/24P:

1/24.0 to 1/250.0 sec

- 1 Set the AUTO/MANUAL switch to MANUAL to select manual mode. (Page 54)**
- 2 Press the FUNC/EXEC button to display the Function Menu.**
- 3 Select SYNC with the left or right button of the cursor button, and press the ENTER button.**
 - The shutter speed appears at the left of the screen.



- 4 Adjust the shutter speed with the up or down button of the cursor button, and press the ENTER button.**
- 5 Press the FUNC/EXEC button and close the Function Menu.**

-
- To activate a synchro scan setting, press the SPEED SEL $\rightarrow$ / $\leftarrow$ button while set to SHUTTER ON mode, and switch to SYNCRO SCAN (Page 66).
 - You can change the progressive mode in the setup menu with REC FORMAT in the RECORD SETUP screen. (Page 103)
-

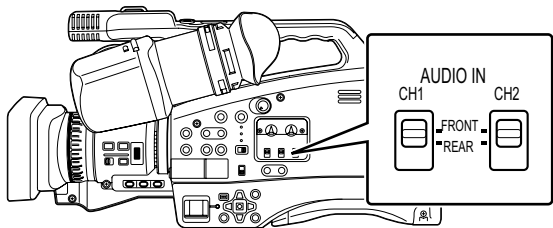
Selecting audio input

The camera will record two-channel audio. Select from the built-in microphone, an external microphone, or any microphones or audio devices connected to the XLR CH1/CH2 terminal to record audio on the respective channels.

Setting/State			Recording Channel	
AUDIO IN CH1 switch	AUDIO IN CH2 switch	External microphone	CH1	CH2
FRONT	FRONT	Not connected	Built-in microphone L-ch	Built-in microphone R-ch
FRONT	REAR	Not connected	Built-in microphone L-ch	XLR CH2
REAR	FRONT	Not connected	XLR CH1	Built-in microphone R-ch
FRONT	FRONT	Connected	External microphone L-ch	External microphone R-ch
FRONT	REAR	Connected	External microphone L-ch	XLR CH2
REAR	FRONT	Connected	XLR CH1	External microphone R-ch
REAR	REAR	—*	XLR CH1	XLR CH2

* With this setting, whether the external microphone is connected or not may not affect the recording channel.

Using the built-in microphone / external microphone (3.5 mm stereo mini jack)



■ Set the AUDIO IN CH1 switch to the FRONT position

When an external microphone is not connected to the EXT MIC terminal, the built-in microphone records audio for the built-in microphone left channel (L-ch). When an external microphone is connected to the EXT MIC terminal, the external microphone records audio for the external microphone left channel (L-ch).

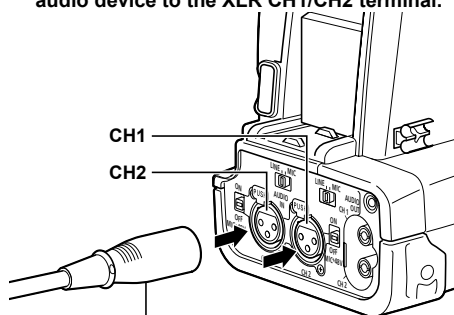
■ Set the AUDIO IN CH2 switch to the FRONT position

When an external microphone is not connected to the EXT MIC terminal, the built-in microphone records audio for the built-in microphone right channel (R-ch). When an external microphone is connected to the EXT MIC terminal, the external microphone records audio for the external microphone right channel (R-ch).

Using the external microphone or audio devices connected to the XLR input terminal

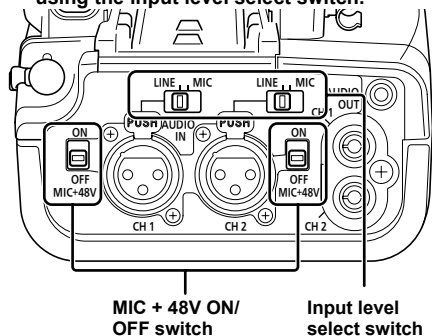
Adjust the input level for the internal or external microphone during shooting.

- 1 Connect the external microphone or an audio device to the XLR CH1/CH2 terminal.



An external microphone or an audio device

- 2 Switch the connected audio input signal using the input level select switch.

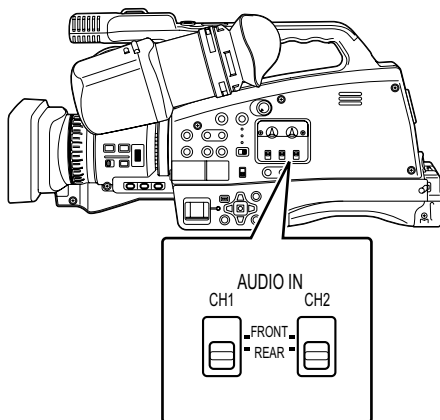


- LINE:** Select when an audio device is connected. The input level is 0 dB.
- MIC:** Select when an external microphone is connected. The input level is -50 dB/-60 dB. The setting can be changed for MIC GAIN1 or MIC GAIN2 in the setting menu RECORD SETUP screen. (Page 104)

- 3 Set the input level select switch to + 48 V to use a phantom microphone (a microphone that requires the + 48 V power supply).

- + 48 V power is supplied to the XLR input terminal.
- The battery will discharge faster when a phantom microphone is used.
- When connecting a device that does not support the + 48 V power supply, set the MIC + 48 V ON/OFF switch to OFF. Setting the switch to ON may cause the connected device to fail.

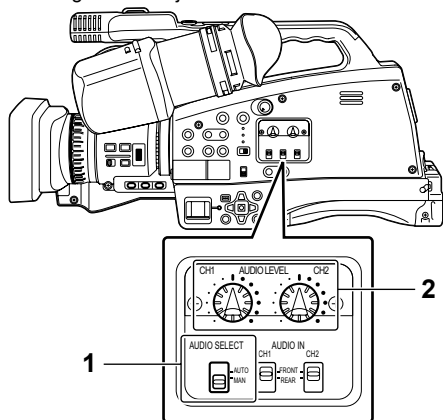
- 4 Set the AUDIO IN CH1/CH2 switch to REAR. Audio from the connected device is recorded.



Set the switch on the connected device to REAR.

Adjusting the audio recording level

The recording level of audio signals during recording can be adjusted.



- If the indicated audio level meter is red, and then the audio has reached an excessive level with reference to the standard input level. Adjust the recording level with the AUDIO LEVEL knob.

1 Set the AUDIO SELECT switch to MAN.

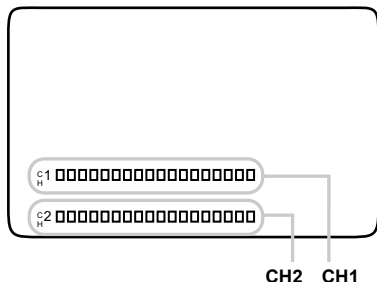
AUTO: With the ALC (Auto Level Control) function, the recording level is automatically adjusted when the audio input is excessively loud. The AUDIO LEVEL knob is disabled.

MAN: The ALC (Auto Level Control) function is disabled. The audio recording level can be adjusted with the AUDIO LEVEL knob.

- If excessive inputs are expected, use the AUTO mode.

2 Adjust the audio recording level with the AUDIO LEVEL knob.

- Adjust the audio recording level with the AUDIO LEVEL knob according to the audio level meter on the bottom of the viewfinder.



Using scene files

You can store various scene file setting items for different shooting conditions within a scene file. Different scene files can be saved separately for AVCHD mode and DV mode.

By changing scene files, you can recall necessary settings.

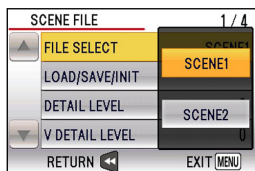
The following scene files are saved as the factory default settings.

Scene 1: Settings suited to standard shooting.

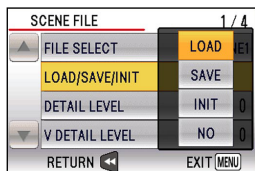
Scene 2: Settings suited to shooting images with modulated color hues and contrast.

Loading scene files

- 1** Set the **POWER** switch to **ON**.
(Page 30 of Vol.1)
 - The CAMERA lamp lights red.
- 2** Press the **MENU** button.
- 3** Select **SCENE1** or **SCENE2** for the **FILE SELECT** item in the setting menu **SCENE FILE** screen, and then press the **ENTER** button.



- 4** Select **LOAD** for the **LOAD/SAVE/INIT** item in the setting menu **SCENE FILE** screen, and then press the **ENTER** button.



- The settings stored on the scene file will be enabled.

- 5** Select **YES** and press the **ENTER** button when the confirmation message appears.
 - **SCENE1 LOADED TURN POWER OFF** appears on the screen.
 The **SCENE1** setting is applied when you restart the camera.

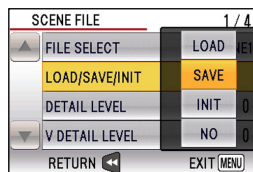
- Simply changing the scene file in **FILE SELECT** will not change the settings. Be sure to perform **LOAD** with **LOAD/SAVE/INIT**. As current setting values will be changed when you perform **LOAD**, be sure to save them if necessary.

Setting and saving scene files

You can set the items found in the setting menu **SCENE FILE** screen. (Page 101)

You can save changed settings as **SCENE1** or **SCENE2**.

- 1** Set the **POWER** switch to **ON**.
(Page 30 of Vol.1)
 - The CAMERA lamp lights red.
- 2** Press the **MENU** button.
- 3** Set the items found in the setting menu **SCENE FILE** screen.
- 4** Select **SCENE1** or **SCENE2** for the **FILE SELECT** item in the setting menu **SCENE FILE** screen, and then press the **ENTER** button.
- 5** Select **SAVE** for the **LOAD/SAVE/INIT** item in the setting menu **SCENE FILE** screen, and then press the **ENTER** button.

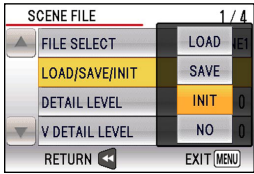


- 6** Select **YES** and press the **ENTER** button when the confirmation message appears.
 - The scene file selected in the **FILE SELECT** item will be overwritten. To cancel save, select **NO** and press the **ENTER** button.
 - You cannot restore scene files that have been overwritten.

Initializing scene files

You can return current setting values to their factory default settings.

- 1 Set the POWER switch to ON.
(Page 30 of Vol.1)
 - The CAMERA lamp lights red.
- 2 Press the MENU button.
- 3 Select SCENE1 or SCENE2 for the FILE SELECT item in the setting menu SCENE FILE screen, and then press the ENTER button.
- 4 Select INIT for the LOAD/SAVE/INIT item in the setting menu SCENE FILE screen, and then press the ENTER button.



- 5 Select YES and press the ENTER button when the confirmation message appears.
 - The scene file selected in the FILE SELECT item will be initialized.
 - "SCENE 1 (or SCENE2) LOADED TURN POWER OFF" appears on the screen. The default settings will be applied when you restart the camera.

Using the Counter

Counter display

You can display a counter that indicates how much time has elapsed during shooting or playback.

1 Press the COUNTER button.

Each time you press the button, the display changes as follows. (Page 92)

0 : 00. 00 (CAMERA mode only)

Counter value

CLIP 0 : 00 . 00 (CAMERA mode only)

Displayed when CLIP is selected in the REC COUNTER item on the settings menu SW&DISP SETUP screen.

Values are automatically reset when recording is started, and counter values are displayed for each individual clip.

TC 12 : 34 : 56 . 01

Time code value (When set to 24P mode, display time code frame digits in 30 frames.)

UB 12 34 56 78

User information

No display

Data is not displayed.

Resetting the counter

Press the RESET button while the counter is displayed.

1394 TC preset mode

You can synchronize initial TC values when shooting with multiple cameras (the following describes the synchronization source as MASTER and the synchronized end as the SLAVE).

1 Connect 2 devices with the IEEE1394 cable and set the power to ON.

2 Set the MASTER to CAMERA mode, and then set it so that video signals are output from the DV terminal.

- Match the recording formats of the 2 connected cameras, and set the TCG item (Page 104) in the setting menu RECORD SETUP to FREE RUN.

The below operation are performed entirely by the SLAVE.

3 Press and hold the MODE button to switch to DV IN mode.

4 Select OFF for the 1394 TC REGEN item (Page 103) in the RECORD SETUP screen, and then press the ENTER button.

5 Select ON for the DV IN PRESET item (Page 104) in the RECORD SETUP screen, and then press the ENTER button.

- "DVTC" is displayed on the screen.

6 Press the RESET/TC SET button.

- "TC SET OK" is displayed on the screen.
- The TCG value is reset to match the TCG value input from the DV terminal.

7 Press and hold the MODE button to switch to CAMERA mode.

Charging the built-in battery/Setting the time code

Recharging the built-in battery

The camera's internal battery saves the date and time.

When SET DATE AND TIME is displayed even when the date and time are set, it means that the charge of the internal battery is depleted. Do the following to recharge it.

Reset the date and time when fully recharged.

1 Connect the AC adaptor. (Page 26 of Vol.1)

- Leave the POWER switch at OFF.

2 Leave the camera-recorder like this for about 4 hours.

- The internal battery charges during this time.
- Check the time code and menu operations after recharging.

If the date and time are not memorized after recharging, the internal battery requires changing. Please consult the place of purchase.

Setting the time code

In the setup menus, RECORD SETUP screen, set the following time code related items.

(Pages 103, 104)

- TC MODE
- TCG
- TC PRESET

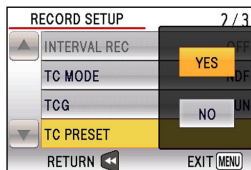
Specifying the time code

Set TC PRESET so you can record a value of your choice as the initial setting for the time code to be used at the start of recording.

1 Set the POWER switch to ON. (Page 30 of Vol.1)

2 Select the TC PRESET item in the setting menu RECORD SETUP screen, and then press the ENTER button.

- Menu operation (Page 40 of Vol.1)
- Operations may also be performed using buttons on the remote control that correspond to those on the camera. For details, see "Description of parts (Remote control)". (Page 23 of Vol.1)

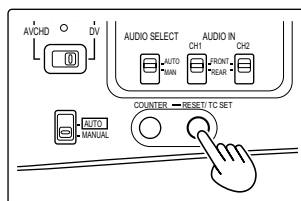


3 Select YES and press the ENTER button.

4 Using the cursor button, select the item you want to set with the left or right button, and set the numerical value with the up or down button.



You can reset the time code to zero by pressing RESET button.



Camera

5 Select ENTER and press the ENTER button when all items have been set.

With this unit, the time code value is adjusted in accordance with the format and frame rate. For this reason, bear in mind that making a change in the format or frame rate may result in discontinuity from the last time code value of the previous recording.

Aspect Recording format ratio	Time code adjustment
480P/24P	Adjustable in 5-frame increments

Setting user information

Setting user information allows you to store 8-digit information in the hexadecimal format.

You can select from USER, DATE, TIME, or TCG (time code generator) for the UB MODE item in the setting menu RECORD SETUP screen.

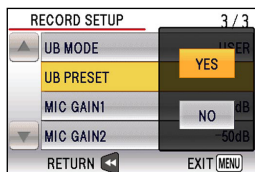
User information is automatically saved in the memory and retained after you turn off the power.

1 Set the POWER switch to ON. (Page 30 of Vol.1)

2 Select USER for the UB MODE item in the setting menu RECORD SETUP screen, and press the ENTER button.

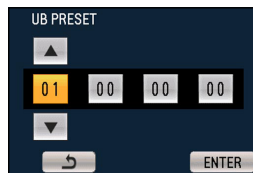
3 Select the UB PRESET item in the setting menu RECORD SETUP screen, and then press the ENTER button.

- Menu operation (Page 40 of Vol.1)
- Operations may also be performed using buttons on the remote control that correspond to those on the camera. For details, see "Description of parts (Remote control)". (Page 23 of Vol.1)

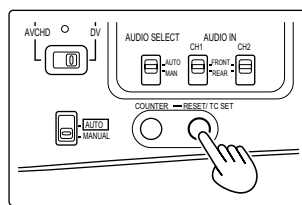


4 Select YES and press the ENTER button.

5 Using the cursor button, select the item you want to set with the left or right button, and set the numerical value with the up or down button.



You can reset the user information to nothing by pressing RESET button.



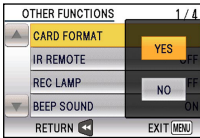
Camera

6 Select ENTER and press the ENTER button when all items have been set.

Operating SD Memory Cards

Formatting SD Memory Cards

- 1** Set the **POWER** switch to **ON**.
(Page 30 of Vol.1)
- 2** Press the **MENU** button.
- 3** Select **YES** for the **CARD FORMAT** item in the setting menu **OTHER FUNCTIONS** screen, and press the **ENTER** button.
 - Press the **MENU** button to close the menu display.
 - Press the left button of the cursor button to return to the previous screen.



- 4** Select **YES** on the confirmation screen, and press the **ENTER** button.
 - The SD Memory Card will be formatted.



- 5** Select **EXIT** and press the **ENTER** button.
 - When an SD Memory Card is formatted, all data (including clips recorded in AVCHD mode) recorded on the card will be erased and will not be restorable.
Save all important data to your computer.

SD Memory Card recording times

Total available recording times (approx.) when using SD/SDHC Memory Cards manufactured by Panasonic.

SD Memory card Capacity	DV mode
512 MB	Approx. 2 min
1 GB	Approx. 4 min
2 GB	Approx. 8 min
4 GB	Approx. 16 min
8 GB	Approx. 32 min
16 GB	Approx. 64 min
32 GB	Approx. 128 min

- Times displayed include time needed for processing, etc. – actual available recording times will be slightly shorter.
- Repeatedly recording or deleting images over and over again may reduce the recording time on the SD Memory Card. In such cases, format the SD Memory Card using the camera. When a card is formatted, all of its recorded data will be erased, and it will not be subsequently possible to restore this data. Save any valuable data on your PC prior to formatting.

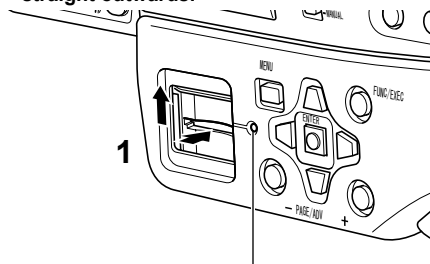
Dividing clips recorded onto SD Memory Cards

When the recorded memory of a single clip exceeds 4 GB when using a SDHC Memory Card of 8 GB or more with this camera, it will automatically be saved as a separate clip.

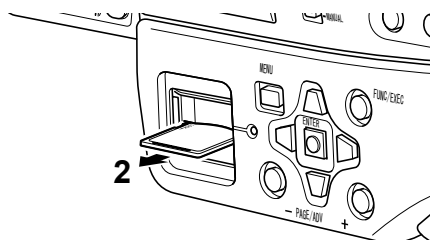
Saved data can be used as a single clip when operating the thumbnail function of this camera. Clips will be treated separately when operated on non-linear editing software or computers.

Removing SD Memory Card

- 1 Slide the card cover upwards to open.**
 - Make sure that the SD Memory Card ACCESS lamp is not flashing orange before opening the cover.
- 2 Press the center of the SD Memory Card so that it pops out slightly, and pull the card straight outwards.**



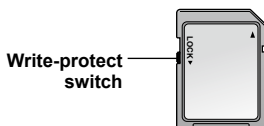
SD Memory Card access lamp



- Do not remove the SD Memory Card or switch off the power in the following circumstances. Doing so may damage your SD Memory Card.
 - 1) While the SD Memory Card ACCESS lamp is flashing orange after inserting an SD Memory Card.
 - 2) While the SD Memory Card ACCESS lamp is flashing during recording, recording finalization, and other operations.

Protecting SD Memory Cards

Move the write-protect switch on the SD Memory Card to the "LOCK" position to prevent recorded contents being accidentally erased from the card.



Repairing SD Memory Cards

Never remove the SD Memory Card or disconnect the battery or DC cable while the SD Memory Card ACCESS lamp is flashing, as doing so may damage the SD Memory Card. In the event the SD Memory Card is removed while the SD Memory Card access lamp is flashing, or the battery or DC cable is disconnected during a recording or recording finalization process, a yellow incomplete clip indicator will appear for the recorded clips in the thumbnail screen.

Refer to "Repairing Clips" (Page 82) for more details.

Clip operations

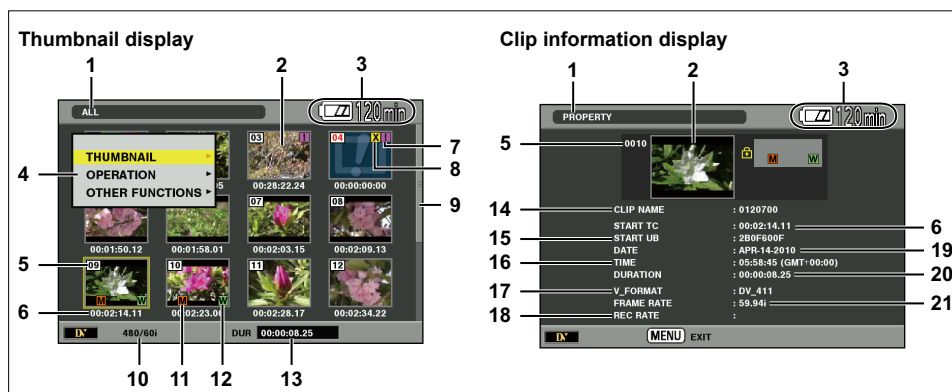
Video data recorded in CAMERA mode is referred to as a clip. When you enter PB mode, thumbnail images of clips appear on the viewfinder. (The thumbnails may take longer to display with higher quantities of clips.)

You can perform the following operations when using the thumbnail screen in DV mode.

- Play, restore and delete clips
- Format SD Memory Cards
- Add or delete shot marks

- To display information on a clip, move the yellow cursor to the clip and press the DISP/MODE CHK button.
- To use the standard setting menu (PLAY SETUP etc.), press and hold down the MENU button (approx. 3 seconds).

During clip playback



1 Thumbnail mode display

Displays the selected thumbnail mode.

2 Thumbnail

A thumbnail of the clip.

3 Remaining battery display

Displays the remaining battery capacity.

4 Thumbnail menu display

Displays the thumbnail menu.

5 Clip number

Displays in the order recorded. Clip numbers will be displayed in red for clips with invalid recording formats or other clips that cannot be played back.

6 START TC

Displays the time code value at start of recording.

7 Incomplete clip indicator

When the recorded memory of a single clip exceeds 4 GB (approx. 16 minutes of recording time), the clip will be divided automatically and saved as separate related clips. If the battery runs out while shooting, for example, and the final clip could not be saved properly as a related clip, this indicator will be displayed for that clip.

You can restore the full sequence of related clips by restoring the final clip with this unit. (Page 82)

8 Faulty clip indicator

Displayed for clips that were unable to record properly due to causes such as the power being turned off while recording. It may be possible to repair clips displayed with a yellow faulty clip indicator. (Page 82) Clips displayed with a red faulty clip indicator cannot be repaired so should be deleted. Format SD Memory cards if they cannot be deleted.

(Continued on the next page)

9 Scrollbar

Displayed when there is a large quantity of clips. Allows you to scroll the screen.

10 FORMAT

Displays the recording format.

11 Shot mark

Indicates that a shot mark has been added.

(Page 85)

12 Wide indicator

Displayed for clips recorded in a 16:9 angle of view.

13 Recording time

Displays the clip length.

14 CLIP NAME

Displays the clip name.

15 START UB

Displays the user information value at start of recording.

16 TIME

Displays the time and time zone of the recording.

17 V_FORMAT

Displays the clip recording format.

18 REC RATE

Displays the recording frame rate.

This is blank for clips recorded with this camera.

19 DATE

Displays the date of the recording.

20 DURATION

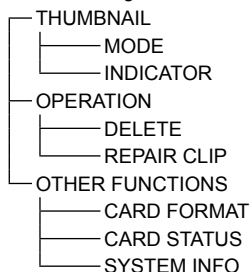
Displays the clip length.

21 FRAME RATE

Displays the playback frame rate.

Thumbnail operations

Thumbnail operations in DV mode are composed of the following.



Operating the thumbnail menu

1 Press the MENU button in the thumbnail screen.

The thumbnail menu is displayed.

- To display the standard setting menu, press and hold down the MENU button (approx. 3 seconds).

2 Using the up or down button of the cursor button, select a menu item.

3 Press the right button of the cursor button or the ENTER button.

Repeat this operation to display additional items.

- Press the left button of the cursor button to return to the previous item.
- Press the MENU button to close the thumbnail menu.

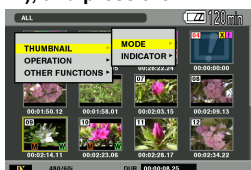
Selecting the thumbnail display method

You can change the thumbnail display method.

1 Press the MENU button in the thumbnail screen.

The thumbnail menu is displayed.

2 Select the thumbnail menu THUMBNAİL item (Page 114), and press the ENTER button.



3 Select the item you want to set, and press the ENTER button.

MODE:

ALL:

Displays all the clips.

MARKER:

Displays only clips for which a shot mark has been added.

INDICATOR:

ON:

Displays markers (shot marks, etc.) on the thumbnails.

OFF:

Markers (shot marks, etc.) are not displayed on the thumbnails.

Deleting clips

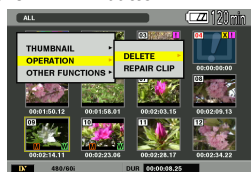
- Clips that are deleted cannot be restored. Be sure to check carefully before deleting them.

■ Deleting all clips

1 Press the MENU button in the thumbnail screen.

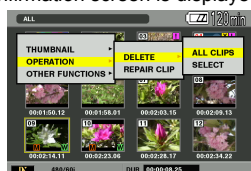
The thumbnail menu is displayed.

2 Select the DELETE item (Page 114) for the thumbnail menu OPERATION, and then press the ENTER button.



3 Select ALL CLIPS and press the ENTER button.

The confirmation screen is displayed.



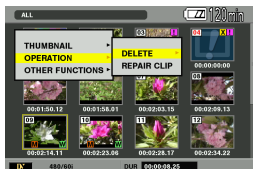
4 Select YES and press the ENTER button.

The clip is deleted.

Thumbnail operations (continued)

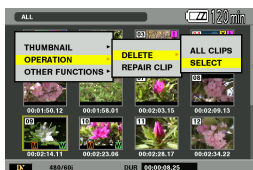
■ Deleting selected clips

- 1 Press the **MENU** button in the thumbnail screen.
The thumbnail menu is displayed.
- 2 Select the **DELETE** item (Page 114) in the setting menu **OPERATION**, and then press the **ENTER** button.



- 3 Select **SELECT** and press the **ENTER** button.

The thumbnail menu closes.



- 4 Select the clip to delete, and press the **ENTER** button.

The clip will be displayed with a red frame.
To cancel a selection, press the **ENTER** button again.

- 5 Press the **FUNC/EXEC** button.
The confirmation message is displayed.
- 6 Select **YES** and press the **ENTER** button.
The clip is deleted.

Repairing clips

Repairs clips displayed with a yellow faulty clip indicator.

Clips displayed with a red faulty clip indicator cannot be repaired.

- 1 Press the **MENU** button while the thumbnail screen is displayed.
The thumbnail menu is displayed.
- 2 Select the **REPAIR CLIP** item (Page 114) in the thumbnail menu **OPERATION**, and press the **ENTER** button.

- 3 Select the clip to repair, and press the **ENTER** button.

You can select multiple clips.

- 4 Press the **FUNC/EXEC** button.

- 5 Select **YES** and press the **ENTER** button when the confirmation message appears.

The clip repair function is executed.

- If a shot mark has been set, this setting will be cancelled.

- When transferring clip data files to a computer, for example, be sure to repair the clips with the camera beforehand.

If you transfer incomplete clips to a computer before they are repaired, and copy them onto the SD Memory Card again, you will not be able to repair the clips.

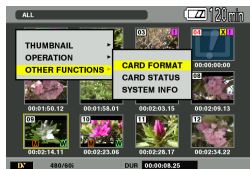
Formatting SD Memory Cards

- All data recorded in **AVCHD** mode and **DV** mode will be deleted. Data deleted when formatting cannot be restored. Be sure to check carefully before proceeding with this operation.

Formats SD Memory Cards.

When executed, all data will be deleted.

- 1 Press the **MENU** button in the thumbnail screen.
The thumbnail menu is displayed.
- 2 Select the **CARD FORMAT** item (Page 114) in the thumbnail menu **OTHER FUNCTIONS**, and press the **ENTER** button.



The confirmation message is displayed.

- 3 Select **YES** and press the **ENTER** button.
The SD Memory Card will be formatted.

 - When in **CAMERA** mode, format from the **CARD FORMAT** item in the setting menu **OTHER FUNCTIONS** screen.

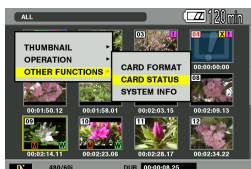
Displaying card and system information

You can confirm information relating to SD Memory Cards and systems.

1 Press the MENU button in the thumbnail screen.

The thumbnail menu is displayed.

2 Select the thumbnail menu OTHER FUNCTIONS item (Page 114), and press the ENTER button.



3 Select the item you want to display, and press the ENTER button.

CARD STATUS:

Displays information relating to the SD Memory Card.



SYSTEM INFO:

Displays information relating to the system version of this camera.

Playing back clips

- 1 Set the camera's POWER switch to ON.**
(Page 30 of Vol.1)
 - The CAMERA lamp lights red.
- 2 Press the MODE button and switch to PB mode.**
 - The PB lamp lights green.
- 3 Using the cursor button, select the clip you want to play back and press the ENTER button.**
 The clip is played back.

Clip playback functions are operated by the cursor button.

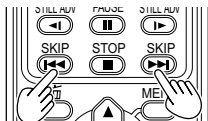
Cursor button	Functions
Up	Play/pause
Down	Stop playback and return to thumbnail screen
Left	During playback : fast reverse (approx. 12 times the speed of normal playback) During pause: skip (rewind clips)
Right	During playback: fast forward (approx. 12 times the speed of normal playback) During pause: skip (fast forward clips)

■ Fast forward/reverse playback

Using the cursor button, press the right button during playback for fast forward playback and the left button for fast reverse playback. Press the up button to return to normal playback.

■ Skip playback

- 1) Press the up button on the cursor button during playback (or the PAUSE button on the remote control) to pause playback.
- 2) Press the left or right button on the cursor button (or the ◀◀ or ▶▶ button on the remote control.).



■ Slow motion playback

You can also play back videos one frame at a time (frame-by-frame).

- 1) Press the up button on the cursor button during playback (or the PAUSE button on the remote control) to pause playback.
 - 2) Press the PAGE/ADV -/+ button (or the STILL ADV button on the remote control).
- Slow playback will continue for as long as you press and hold down the button.
 - Press the STILL ADV button on the remote control during playback to continuously advance frame by frame. Press the PLAY button to cancel.



- Press the down button of the cursor button (or the remote control STOP button) to return to the thumbnail display.

Useful playback functions

Adding a SHOT MARK to a clip

Adding a SHOT MARK (M) will make it easier to find the clips you are looking for.

1 Using the cursor button, select the clip for which a SHOT MARK will be added.

- You can also set or release SHOT MARK settings while shooting a clip, from the thumbnail screen, or from the clip information screen.

2 Press the USER button to which the SHOT MARK function has been allocated. (Page 107)

To remove a SHOT MARK, repeat the above steps.

- It is not possible to add shot marks to clips recorded using a consumer camcorder model.

Repeat playback

Use this setting to repeatedly play back all available clips.

1 Press and hold the MENU button.

- Menu operation (Page 40 of Vol.1)

2 Set the REPEAT PLAY item in the PLAY SETUP screen to ON.

3 Select EXIT and press the ENTER button to return to the thumbnail screen.

When the playback operation is performed, the playable clips are played back repeatedly.

- Repeat playback will continue until playback is paused.
- When REPEAT PLAY is set to ON,  appears on the playback screen.
- To turn the repeat playback setting off, select OFF in step 2.

Resume playback (RESUME PLAY)

Use this setting to play back from where clip had previously been paused.

1 Press and hold the MENU button.

- Menu operation (Page 40 of Vol.1)

2 Set the RESUME PLAY item in the PLAY SETUP screen to ON.

3 Select EXIT and press the ENTER button to return to the thumbnail screen.

4 Select a clip for playback.

If playback has previously been paused, the remainder of the clip will be played next time the clip is selected for playback.

- To turn the resume playback setting off, select OFF in step 2.

- If the cursor was moved in the thumbnail screen after the clip was paused, you will not be able to resume playback. Playback will begin from the start of the clip selected with the cursor.

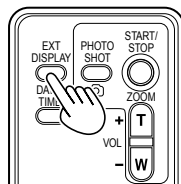
Viewing images on a television

You can view the images on a television if you connect the unit to a TV set using a separately sold video cable or component cable.

1 Connect the camera-recorder to the TV set. (Page 89)

2 Start playback.

- To show the information that appears on the viewfinder on a television, press the EXT. DISPLAY button on the remote control. Press the EXT. DISPLAY button again to clear the display.

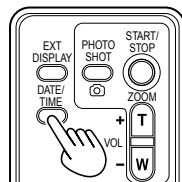


- The left and right black bars that appear on the OSD of the viewfinder while SIDE CROP is enabled do not appear in external output displays.

Checking the date and time

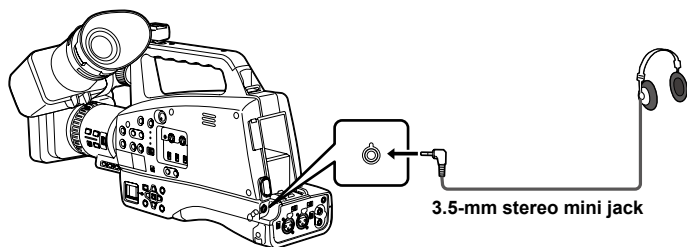
Press the DATE/TIME button on the remote control to show the date and time of shooting on the viewfinder. The display changes as follows each time you press the button.

Time
↓
Date
↓
Time and Date
↓
No display



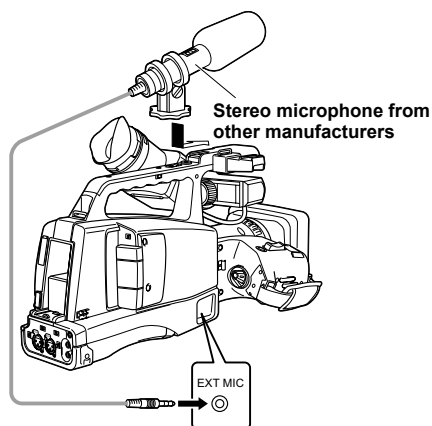
Connecting external units

Headphones



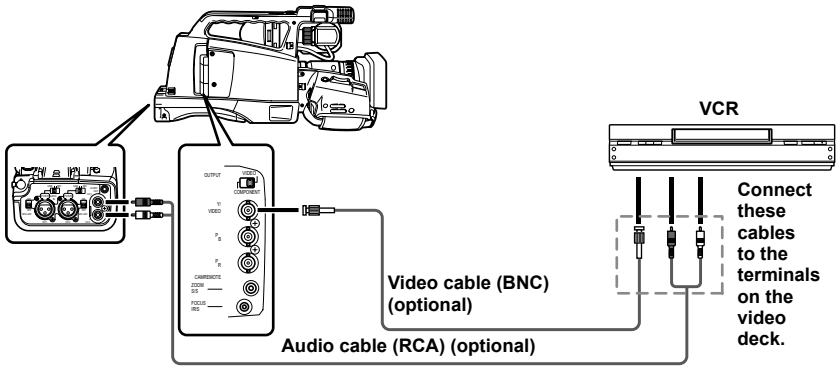
- Sound is no longer heard from the speaker when the headphones (optional) are connected.

External microphone (Stereo mini jack compatible)



Video deck (Dubbing)

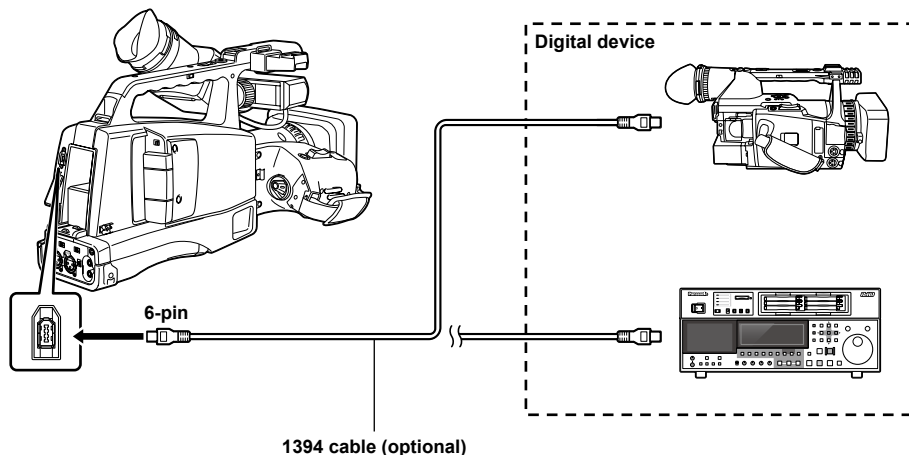
Video and audio output will be limited to that from the camera.



■ When outputting video and audio signals from the camera to an external device, connect to the input terminals of the external device.

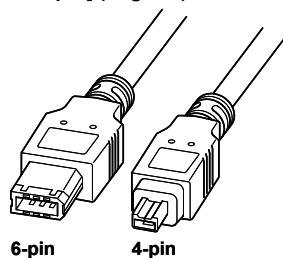
- SD quality signals are output from the VIDEO OUT terminal.

Digital video (Dubbing)



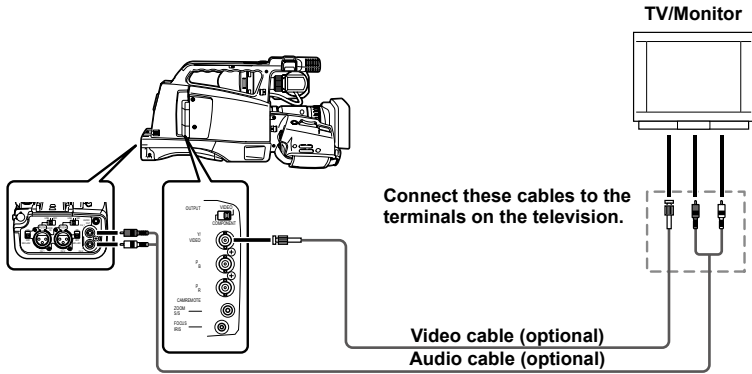
■ When connecting a digital video device with a DV terminal, you can digitally transfer video and audio signals and time codes. For more details, refer to [Digital input/output] (Page 90).

- Be sure to connect or remove the 1394 cable after switching off the power of the device to be connected.
- When connecting the cable to an external terminal with a 6-pin DV terminal, carefully confirm the configuration of the 1394 cable before connecting it. If connected in reverse, this may damage internal components and cause camera failure.
- When connecting to devices with a 4-pin DV terminal, connect this camera's terminal (6-pin) in advance.
- Avoid adding heavy external loads when connecting the 1394 cable to the DV terminal because this may damage the DV terminal.



TV/Monitor

Only the output signals from the camera are shown.



■ When outputting video and audio signals from the camera to an external device, connect to the input terminals of the external device.

- Since the component terminal only outputs pictures, an audio cable must be connected at the same time. (Connect the cable to the audio input terminal of the component terminal input. For details, refer to the operation manual for the TV.)
- The component terminal of the unit is the BNC type. To connect a pin-type cable, use a pin-BNC converter plug (optional).

■ Output by **COMPONENT OUT**, and **VIDEO OUT**

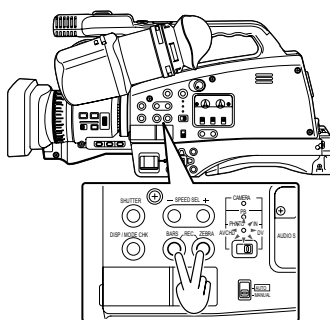
- Simultaneous output from COMPONENT OUT and VIDEO OUT is not possible. Output is determined by the terminal selected by the OUTPUT switch.

Dubbing

Digital input/output

When connecting this camera with a 1394 cable to a digital video device with a 1394 terminal, you can dub high quality images two-way with digital signals.

- 1 Connect the digital video device to this camera.**
- 2 Select DV mode with the MODE switch.**
- 3 Set the POWER switch to ON. (Page 30 of Vol.1)**
- 4 Press and hold the MODE button to switch to DV IN mode.**
 - Set so that the connected device can playback or record.
 - When digital dubbing is conducted with a second camera-recorder, recording is not possible unless the output and input digital signals use the same format.
- 5 Play back the images with the playback device.**
- 6 Start recording the images with the recording device.**
 - If this camera is the recording device, simultaneously press the 2 REC buttons (BARS and ZEBRA buttons).



- 7 Finish recording with the recording device.**
 - If this camera is the recording device, press the down button on the cursor button.
- 8 Finish playback with the playback device.**
 - If this camera is the playback device, press the down button on the cursor button.

-
- With the menu of the recording device, setting the 1394 TC REGEN and 1394 UB REGEN items to ON and dubbing enables you to copy the user information and time code of the playback device. (Pages 103, 104)

Then start recording after confirming that the recording device is receiving video signals from the playback device. Date and time information from the external device is recorded and displayed. It may not be possible to correctly copy time codes or user information if recording is started when signals are not being received by the recording device.

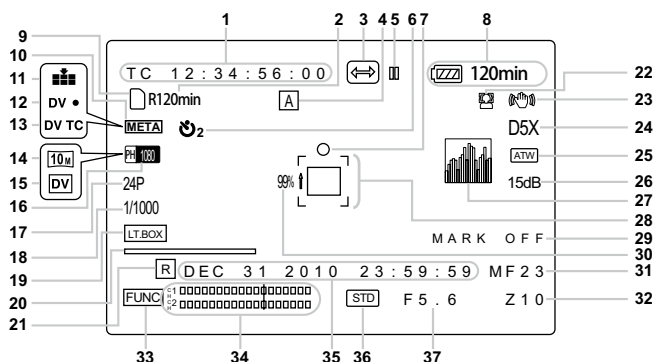
- When recording signals from external devices, record after confirming that the video signal has been input.
 - When recording signals from external devices, do not disturb output from the external device or remove the cable. It may not recognize the device when recording again.
 - When recording signals from external devices, do not change the format of the signal output by the external device.
-

Chapter 3: Screen displays and setting menus

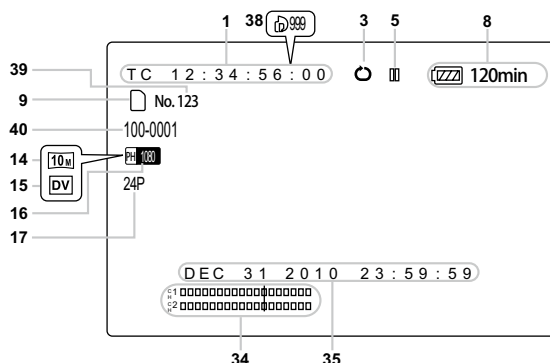
Screen displays

Regular displays

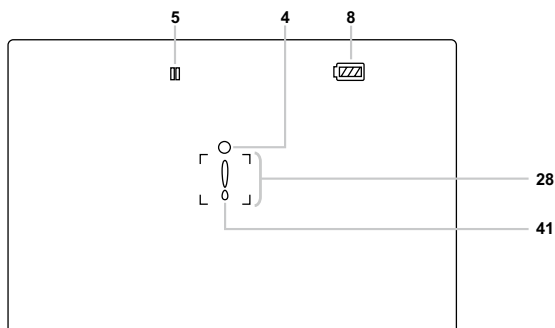
CAMERA mode/PHOTO mode/DV IN mode



PB mode



During self-portrait recording



For details on **42** information display, **43** mode check information display, and **44** safety zone, see page 95.

(Continued on the next page)

Screen displays (continued)

1 Time code display*1

Each time you press the COUNTER button, the display switches over to the following data (or no indication).

COUNTER:

Counter value

CLIP:

Counter value for each recorded clip

Displayed when the REC COUNTER item in the setting menu SW&DISP SETUP screen is set to CLIP.

TC:

Time code value.

When the time code value could not be read correctly from the SD Memory Card, [TC*] is displayed.

UB:

User information

When user information could not be read correctly from the SD Memory Card, [UB*] is displayed.

2 Media capacity display

CAMERA mode:

Displays the remaining recording time for the frame rate set with the REC FORMAT item in the setting menu RECORD SETUP screen.

PHOTO mode:

Displays the number of photos that can be recorded under the current quality setting for the QUALITY item in the setting menu PICTURE screen.

3 Recording function display

: Displayed when PREREC MODE is set to ON. (Pages 11, 60)

: Displayed when INTERVAL REC is enabled. (Pages 13, 62)

: Displayed when REPEAT PLAY is set to ON. (Pages 49, 85)

4 AUTO/MANUAL switch operation display

This display appears when AUTO/MANUAL switch is switched to AUTO.

: Auto shooting

: Auto face detection shooting

5 Operation status display

- : Recording
- : (Red) Transitioning to recording standby mode
- : (Green) Recording standby mode
- : Playback or REC CHECK in progress
- : (White) Playback paused
-  (): Frame-by-frame playback (Frame-by-frame reverse playback)
-  (): Fast forward/fast playback (Rewind/fast reverse playback)
-  (): Last clip/first clip (During pause (AVCHD mode only))

Self-portrait recording display

No display: Cannot record (no card, etc.)

- : Recording in progress, transitioning to recording standby mode
- : (Green) Recording standby mode
- : Warning display

6 Self-timer display

Displayed when the SELF TIMER item in the setting menu PICTURE screen is set.

7 Shutter chance display (Page 31)

*1 Will not be output to external devices.

8 Remaining battery capacity display

When using Panasonic-manufactured batteries compatible with this product, the remaining battery capacity is displayed ("min" indicates minutes).

Time remaining will be displayed after a brief pause.

- The battery display will change



as battery capacity decreases. will be displayed in red when less than 3 minutes are remaining, and will flash when the battery is empty.

- Remaining battery capacity may not be displayed correctly when using in high or low temperatures, or when the battery has not been used for a long period of time. To ensure that remaining battery capacity is displayed correctly, use the battery completely from a fully-charged state, and charge the battery again. (Remaining battery capacity may still not be displayed correctly if the battery has been used for long periods in high or low temperatures, or if the battery has been recharged a large number of times.)
- The remaining battery capacity display is a guideline and may change according to usage conditions.
- The remaining battery capacity display will momentarily disappear when switching between modes, when conducting REC CHECK operations or when changing the LCD brightness since the capacity is recalculated at these times.
- Not displayed when using AC adaptor.

9 Media information display

Displays basic information about inserted SD Memory Card.

: (Flashing)

(White) Playback possible

(Green) Recognizing card

: (Red) Card not inserted

10 Metadata mark

Displayed when the META DATA REC item in the setting menu RECORD SETUP screen is set to ON. (Page 104)

11 Quality display

Displays the image quality during PHOTO mode.

12 DV control device status display (DV mode only)

Displays status of devices connected to the DV terminal.

DV : Recording

DV : (Green) Recording standby

DV : Device cannot be controlled

DV: Device is not connected

DV ---: Device cannot record and go on recording standby

13 DV IN PRESET display (DV mode only)

Displayed when set to 1394 TC preset mode. (Page 73)

14 Recording pixel display

Displays the recording pixels during PHOTO mode.

15 DV mode display (DV MODE only)

Displayed when DV mode is selected with the MODE switch.

16 Recording format display (Page 103)

17 Frame rate display

Displays recording frame rate.
Not displayed when set to 60i.

18 Shutter speed display

The shutter speed is displayed here.

19 Recording aspect display (DV mode only) (Page 103)

20 Focus bar display*1

Displayed when the FOCUS ASSIST SW item in the setting menu SW&DISP SETUP screen is set to BAR.

21 Time stamp display (Page 103)

22 Face detection frame display

Displayed when the FACE FRAMING item in the setting menu SW&DISP SETUP screen is set to PRIMARY or ALL, and FACE DETECT ON is enabled.

23 Optical Image Stabilizer display

Displayed when Optical Image Stabilizer is ON.

24 Digital zoom ratio display

Displays digital zoom ratio.

D 2X: 2 x zoom

D 5X: 5 x zoom

D 10X: 10 x zoom

*1 Will not be output to external devices.

25 AWB information display

Displays the information of white balance.

ATW: When ATW is set
 LOCK: When ATW is locked
 P3.2K/P5.6K: In the case of preset
 Ach/Bch: In the case of A/B

26 Gain display

Displays the gain value of the image amplifier configured. (During the auto mode, AGC is displayed.)

Displayed when the LENS STATUS item in the setting menu SW&DISP SETUP screen is set to ON.

27 Histogram display

Displayed in PHOTO mode when the HISTOGRAM item in the setting menu SW&DISP SETUP screen is set to ON.

28 Focus frame display (Page 31)

29 Shot mark recording display

(SHOT MARK)

Displayed when you press a USER button to which the SHOT MARK function has been assigned.

INVALID will be displayed if an index or shot mark cannot be attached.

30 Marker luminance display*¹

When markers are displayed, the brightness level around the center of the screen is indicated as 0 % to 99 %. "99%↑" appears if the percentage is over 99.

Marker display:

During shooting, pressing the ZEBRA button once or twice will display the marker.

31 Focus control information display*²

Displays the focus control information with 99 - 00. In the auto focus mode, AF appears. In the manual focus mode, MF appears. When the focus control is set to a macro range, the black and white of AF or MF are displayed in reverse.

95 (Focusing distance: infinity)

:

00 (Focusing distance: approx. 5 cm)

Depending on the zoom position, the macro range may not be enabled.

Also, depending on the zoom position, the lower limit value of macro range may be different. Displayed when the LENS STATUS item in the setting menu SW&DISP SETUP screen is set to ON.

- When using a macro range for the focus control, zooming may cause the image to become unfocused.

32 Zoom position display*²

The zoom position is displayed with Z00 (maximum wide-angle) - Z99 (maximum zoom). Displayed when the LENS STATUS item in the setting menu SW&DISP SETUP screen is set to ON.

33 Function menu display (Page 41 of Vol.1)

34 Audio level meter display*²

35 Date and time display

Month:

JAN (January), FEB (February),
 MAR (March), APR (April), MAY (May),
 JUN (June), JUL (July), AUG (August),
 SEP (September), OCT (October),
 NOV (November), DEC (December)

Day of the month

Year:

2010 - 2036

Hours

Minutes

Seconds

mmm dd yyyy hh:mm:ss

- When the time stamp function is ON, the month display is switched from numbers to words.

*¹ Will not be displayed when the face detection function is set to ON in the auto mode, unless FACE FRAMING is set to OFF.

*² Will not be output to external devices.

36 Auto iris control display**STD:** Standard auto-iris control: Auto iris control for spotlight: Auto iris control for backlight compensation**37 Iris display**

Displays F value.

38 DPOF display (Page 46)**39 Clip number display (Page 35)****40 Photo folder/filename display (Page 37)****41 Warning display**

Displayed when a warning message appears during self-portrait recording.

42 Information display

Following information is displayed depending on the situation.

- Performance of the auto white balance or the auto black balance
- Warning
- The AWB error message (AWB NG) is displayed.

43 Mode check information display

Displayed when the DISP/MODE CHK button is held down.

44 Safety zone*1

The range of the zone is indicated by the SAFETY ZONE item (Page 108) on the SW&DISP SETUP screen.

4:3 This indicates the position which is cropped to 4:3.**90%** This indicates the range (90 %) in which signals can be displayed by an ordinary home use TV set.

Will not be displayed in the viewfinder when the FOCUS ASSIST SW item on the setting menu SW&DISP SETUP screen is set to EXPANDED, or when the face detection frames are displayed.

*1 Will not be displayed when the face detection function is set to ON in the auto mode, unless FACE FRAMING is set to OFF.

Main warning displays

The main warning displays appearing on the viewfinder are listed below. If a warning display is not listed, check carefully the message displayed.

■ Number

1394 INPUT ERROR

OTHER FORMAT

The format of the signal input to the DV terminal while in DV IN mode differs from the unit's settings.

Check the format of the signal input to the DV terminal.

■ A

ALL DATA WILL BE DELETED. (INCLUDING CLIP OF AVCHD) FORMAT THE CARD NOW?

Do you wish to format the SD Memory Card now? Yes/No

ALL DATA WILL BE DELETED. (INCLUDING CLIP OF DV) FORMAT THE CARD NOW?

Do you wish to format the SD Memory Card now? Yes/No

AVCHD/DV SW CHANGED TURN POWER OFF

Switch the power off and back on again.

■ C

CANNOT BE USED DUE TO INCOMPATIBLE DATA.

No use is possible because the standard for the data is different. If the SD Memory Card was used on another device, reformat the card with this unit.

CANNOT DELETE WITH THIS BUTTON

Clip cannot be deleted.

CANNOT DELETE.

Clip cannot be deleted.

CANNOT PLAY WITH THIS BUTTON

No playback is possible.

CANNOT PLAY.

No playback is possible.

CANNOT RECORD DV MODE INTO THIS CARD.

Use an SD/SDHC Memory Card in Speed Class 6 or higher.

CANNOT RECORD PH MODE AND HA MODE INTO THIS CARD.

This card cannot be recorded to in PH mode or HA mode. Use an SD/SDHC Memory Card in Speed Class 4 or higher.

CANNOT SET PRE-REC, CARD CAPACITY TOO LOW.

PRE-REC cannot be set as the remaining card capacity is low.

CARD DOOR IS OPEN

Close the card door.

CARD ERROR. PLEASE REFORMAT.

Formatting has failed. The card needs to be reformatted.

CARD FULL.

The card is full.

CARD LOCKED.

Unlock the card.

CHECK CARD.

Please check the card.

If you use an SD Memory Card that has been used with other devices or personal computers, for the first time with this unit, CHECK CARD may be displayed and the unit cannot operate. In this case, perform the following:

- ① Remove the SD Memory Card from the unit and reinsert it. (Page 30)
The CHECK CARD display may disappear if the unit detects the card.
- ② If CHECK CARD remains displayed even if you remove and insert the card several times, check the contents of the card and delete all its data, using a personal computer.
- ③ Format the card with this unit. (Page 28)

If the data in the card is unreadable or cannot be deleted with a personal computer, the card may be damaged. Use another SD Memory Card.

**CONTROL DATA ERROR
HAS BEEN DETECTED.**

An error has been detected in the control information.

■ D**DISCONNECT USB CABLE.**

The camera cannot be operated while connected via USB cable.

DISCONNECT USB CABLE.

When switching from one mode to another, disconnect the USB connection cable.

■ I**INCOMPATIBLE CARD.
PLEASE CHECK CARD.**

Recording may not be successful with this card. Please check the card.

■ N**NO CARD**

No card is inserted.

NOW ACCESSING.**PLEASE DO NOT REMOVE
CARD.**

Card is currently being accessed. Please do not remove the card.

■ R**REC STOPPED.
NOW WRITING.**

Video recording has been stopped. Data is now being written to the card.

REPAIR CLIP?

Do you wish to repair clips now?

■ S**SET DATE AND TIME**

Set the date and time.

■ T**THE CLIP ARE PROTECTED.
PLEASE REMOVE THE PROTECTION.**

The clip is protected. Please cancel the protection.

**THE RECORDING IS STOPPED
(OVER THE LIMITATION)**

Recording will stop. (Continuous recording for 12 hours)

**THIS BATTERY CANNOT
BE USED.**

This battery cannot be used.

**THIS CARD CANNOT
RECORD IN VIDEO MODE.**

The card cannot be used for video recording.

**THUMBNAIL DATA ERROR
IS DETECTED.**

An error has been detected in the thumbnail information.

■ U**UNABLE TO FORMAT.**

The card cannot be formatted.

Error displays

The following messages are displayed when an error has occurred in the camera or the SD Memory Card. If the problem is not solved by switching the power off and back on again, either change the card in accordance with the instructions displayed, or consult the place of purchase.

■ C

CHECK CARD SYSTEM ERROR TURN POWER OFF

Displayed when a card-related error has occurred in the system. Switch the power off and back on again.

For details on how to resolve the problem, see the CHECK CARD warning display.

■ E

ERROR OCCURRED. RECORDING IS STOPPED.

Displayed when an error has occurred during recording. Start the recording again. If the message appears again, please consult the place of purchase.

- Please switch the power off if the message continues to appear.
- Please try inserting a different card if the message appears again after restarting recording.

■ P

POWER TURNED OFF DUE TO FAN STOPPING.

Displayed when an error has occurred with the fan. The power then turns off.

Wait a few minutes, and then try turning the power on again.

■ S

SYSTEM ERROR TURN POWER OFF

Displayed when an error has occurred in the system. Switch the power off and back on again.

- If this error is displayed when accessing the SD Memory Card, such as when deleting a clip, the SD Memory Card may be damaged. Please replace it with a new SD Memory Card.
- If this error is displayed when repairing the SD Memory Card, please use the AVCCAM Restorer content repair software (Page 30).

Setting the DISPLAY items

Display the following items on the viewfinder and by pressing the DISP/MODE CHK button or by configuring OTHER DISPLAY of the SW&DISP SETUP screen of the setup menus. (Page 109)

✓ : Displayed

x : Not displayed

— : Displayed depending on other settings

Displays	CAMERA mode	DV IN Mode	PHOTO mode	MODE CHK (Hold down DISP/MODE CHK button)	DISPLAY	OTHER DISPLAY settings	
						ON	OFF
1 Time code display	✓	✓	x	✓	—*1	—*1	—*1
2 Media capacity display	✓	✓	✓	✓	✓	—*2	—*2
3 Recording function display	✓	x	✓	✓	—	✓	✓
4 AUTO/MANUAL switch operation display	✓	x	✓	✓	✓	✓	x
5 Operation status display	✓	✓	✓	✓	—	—	—
6 Self-timer display	x	x	✓	—*2	—	✓	✓
7 Shutter chance display	x	x	✓	—	—	✓	✓
8 Remaining battery capacity display	✓	✓	✓	✓	✓	—*2	—*2
9 Media information display	✓	✓	✓	✓	✓	—*2	—*2
10 Metadata mark	✓	x	x	✓	✓	✓	x
11 Quality display	x	x	✓	✓	✓	✓	x
12 DV control device status display	✓	x	x	—*2	—*2	—*2	—*2
13 DV IN PRESET display	x	✓	x	—*2	—*2	—*2	—*2
14 Recording pixel display	x	x	✓	✓	✓	✓	x
15 DV mode display	✓	x	x	x	✓	x	x
16 Recording format display	✓	✓	x	✓	✓	✓	x
17 Frame rate display	✓	x	x	✓	✓	✓	x
18 Shutter speed display	✓	x	✓	✓	✓	—*3	—*3
19 Recording aspect display	✓	✓	x	—*2	—*2	—*2	—*2
20 Focus bar display	✓	x	✓	—*1	—*1	—*1	—*1
21 Time stamp display	✓	x	x	—*2	—*2	—*2	—*2
22 Face detection frame display	✓	x	✓	✓	✓	—*2	—*2
23 Optical Image Stabilizer display	✓	x	✓	✓	✓	—*3	—*3
24 Digital zoom ratio display	✓	x	x	✓	✓	✓	x
25 AWB information display	✓	x	✓	✓	✓	✓	x
26 Gain display	✓	x	✓	✓	✓	—*3	—*3
27 Histogram display	x	x	✓	—*2	—*2	—*2	—*2
28 Focus frame display	x	x	✓	—	—	✓	✓
29 Shot mark recording display	✓	✓	x	—*1	—*1	—*1	—*1

*1 Toggle display with the buttons.

*2 Toggle display with menu item settings other than those listed above.

*3 Displayed when the LENS STATUS item in the setting menu SW&DISP SETUP screen is set to ON.

Screen displays (continued)

30 Marker luminance display	✓	x	✓	x	__*1	__*1	__*1
31 Focus control information display	✓	x	✓	✓	✓	__*3	__*3
32 Zoom position display	✓	x	✓	✓	✓	__*3	__*3
33 Function menu display	✓	x	✓	x	x	x	x
34 Audio level meter display	✓	✓	x	✓	✓	__*2	__*2
35 Date and time display	✓	✓	✓	✓	✓	__*2	__*2
36 Auto iris control display	✓	x	✓	✓	✓	__*3	__*3
37 Iris display	✓	x	✓	✓	✓	__*3	__*3
38 DPOF display	x	x	✓	—	—	✓	✓
39 Clip number display	✓	x	✓	✓	✓	__*2	__*2
40 Photo folder/filename display	x	x	✓	✓	✓	__*2	__*2
41 Warning display	✓	✓	✓	__*4	__*4	__*4	__*4
42 Information display	✓	✓	✓	__*4	__*4	__*4	__*4
43 Mode check information display	✓	✓	✓	✓	—	—	—

*1 Toggle display with the buttons.

*2 Toggle display with menu item settings other than those listed above.

*3 Displayed when the LENS STATUS item in the setting menu SW&DISP SETUP screen is set to ON.

*4 Displayed during warnings.

The item in ✓ in the MODE CHECK space appears when you press and hold the DISP/MODE CHK button.

The item in ✓ in the DISPLAY space disappears when you press the DISP/MODE CHK button.

Setup menu list

SCENE FILE screen

Item	Display mode	Description of settings
FILE SELECT	CAMERA	Selects the scene file. Scene files can be saved individually in AVCHD mode and DV mode. SCENE1 SCENE2
LOAD/SAVE/INIT	CAMERA	Loads, saves, or initializes the scene file selected with FILE SELECT. LOAD: Loads the scene file settings set on this camera. SAVE: Saves changed scene file settings. INIT: Returns current setting values to factory default settings. NO: Returns to the last screen.
DETAIL LEVEL	CAMERA	Adjusts the level of the image outline correction (in the horizontal and vertical directions). - 7...0...+ 7
V DETAIL LEVEL	CAMERA	Adjusts the level of outline correction in the vertical direction. - 7...0...+ 7
DETAIL CORING	CAMERA	Adjusts the level of noise reduction of the detail signal. - 7...0...+ 7 Set to - for a clearer image. Noise increases slightly. Set to + to reduce noise.
CHROMA LEVEL	CAMERA	Adjusts the chroma level. - 7...0...+ 7
CHROMA PHASE	CAMERA	Makes fine adjustments to the chroma phase. - 7...0...+ 7
COLOR TEMP	CAMERA	Makes fine adjustments to the color temperature. - 7...0...+ 7 • Enabled when presets, Ach, or Bch are configured for white balance in manual mode.
MASTER PED	CAMERA	Adjusts the master pedestal (black level of the image) as the basis for images. - 15...0...+ 15
A.IRIS LEVEL	CAMERA	Sets the desired AUTO IRIS level. - 10...0...+ 10
DRS	CAMERA	Selects the DRS (dynamic range stretcher) function. It enables the dynamic range to be expanded by compressing the level of the video signals in the high-brightness areas where overexposure results during normal shooting. OFF, 1, 2, 3 • The higher the number of the setting, the higher the compression level of the high-brightness areas.
GAMMA	CAMERA	Selects the gamma curves. HD NORM: This gamma setting is suitable for HD shooting. Initial AVCHD mode settings. LOW: Makes a mellow image using the gamma curve which has a gentle incline in low-brightness curve. The contrast sharpens. SD NORM: This is the normal video setting, carried over from the DVX100 series. Initial DV mode settings. HIGH: Expands the tone of dark parts and makes a brighter image using the gamma curve which has a sharp incline in low-brightness curve. The contrast softens. B.PRESS: Makes the contrast shaper than LOW. CINE-LIKE D: Uses a gamma designed to create cinema-like images. CINE-LIKE V: Uses a gamma designed to create cinema-like images with emphasized contrast. • When you select CINE-LIKE gamma, we recommend setting the lens aperture lower than normal image level (approximately 1/2) for optimal results.

___ indicates the factory setting.

Setup menu list (continued)

SCENE FILE screen (continued)

Item	Display mode	Description of settings
KNEE	CAMERA	To avoid overexposure, select the compression level (knee point) of the high intensity video signals received through the pickup device. AUTO: Sets the level automatically according to the received signals. LOW: Low setting (Compression starts at approx. 80 %.) MID: Medium setting (Compression starts at approx. 90 %.) HIGH: High Setting (Compression starts at approx. 100 %.) • Not available when a DRS value is set, or when GAMMA is set to CINE-LIKE.
MATRIX	CAMERA	Selects the MATRIX table suitable for the desired color expression during shooting. NORM1: Suitable for shooting in the open air or under a halogen lamp. NORM2: Suitable for brighter colors than the NORM1 mode. FLUO: Suitable for shooting under fluorescent light indoors. CINE-LIKE: Suitable for cinema-like image.
SKIN TONE DTL	CAMERA	Switches skin tone details on or off. Select ON to reduce the skin tone details and soften the skin tone. ON OFF

CAMERA SETUP screen

Item	Display mode	Description of settings
I.EXPOSURE	PHOTO	Enables brightness compensation for shooting dark, hard-to-see areas. ON OFF • Can only be selected in manual mode. • Fixes AUTO mode to ON.
DETAIL LEVEL	PHOTO	Adjusts the level of the image outline correction (in the horizontal and vertical directions). - 7...0...+ 7
CHROMA LEVEL	PHOTO	Adjusts the chroma level. - 7...0...+ 7
A.IRIS LEVEL	PHOTO	Sets the desired AUTO IRIS level. - 10...0...+ 10
SKIN TONE DTL	PHOTO	Switches skin tone details on or off. Select ON to reduce the skin tone details and soften the skin tone. ON OFF

___ indicates the factory setting.

RECORD SETUP screen

Item	Display mode	Description of settings
REC FORMAT (AVCHD mode only)	CAMERA	Selects the recording format. PH 1080/60i PH 1080/30P PH 1080/24P PH 720/60P PH 720/30P PH 720/24P HA 1080/60i HG 1080/60i HE 1080/60i - PH 1080/24P and PH 720/24P represent native recording. - You cannot change the format during interval recording.
REC FORMAT (DV mode only)	CAMERA	Selects recording format 480/60i 480/30P 480/24P
ASPECT CONV (DV mode only)	CAMERA	Selects the clip's aspect ratio. SIDE CROP: Records in 4:3 ratio. Crops the left and right edges. LETTER BOX: Records in 16:9 ratio. Adds black bars to the top and bottom edges. SQUEEZE: Squeezes images horizontally from the left and right.
PREREC MODE	CAMERA	Sets PRE RECORDING to ON or OFF. (Pages 11, 60) ON OFF - TCG is set to FREE RUN (AVCHD mode only). - Cannot be set during INTERVAL REC.
TIME STAMP	CAMERA	Specifies whether date and time information is superimposed over recorded images. ON: Superimposes date and time information on the image. OFF: Does not superimpose date and time information on the image.
INTERVAL REC	CAMERA	Enables frame-by-frame recording at specified intervals to create short videos of scenes with slow movement over long periods of time. Single frames are recorded at the specified interval, with 24 frames equaling 1 second of video in AVCHD mode and 30 frames per second in DV mode. OFF, 1 SECOND, 10 SECONDS, 30 SECONDS, 1 MINUTE, 2 MINUTES Set the below values for REC FORMAT when setting INTERVAL REC. If the settings differ to the below, INTERVAL REC will be displayed in gray and disabled. AVCHD mode REC FORMAT: PH 1080/24P DV mode REC FORMAT: 480/60i
1394 TC REGEN	DV IN	Sets the time code for recording. ON: Records the time code of the device connected to the DV terminal. OFF: Records the time code set with this camera. When set to ON, TC MODE and TCG cannot be changed.
TC MODE	CAMERA DV IN	Selects the correction mode of the internal time code generator when the time code of the internal time code generator is recorded. DF: Uses the drop frame mode. NDF: Uses the non-drop frame mode. TC MODE is automatically set to NDF when you set recording frame rate of recording format to 24P (AVCHD only).

___ indicates the factory setting.

Setup menu list (continued)

RECORD SETUP screen (continued)

Item	Display mode	Description of settings
TCG	CAMERA DV IN	Sets the mode in which you advance the internal time code generator. FREE RUN: The time code is advanced regardless of the operation mode. A slight time error may occur when switching to PB mode if the frame rate is set to 24P. REC RUN: The time code is advanced only when recording.
TC PRESET	CAMERA DV IN	Sets the initial time code. YES NO • Set the frame value to 0 or a multiple of 4 when you set recording frame rate of recording format to 24P. If any other value is set, the recorded time code will mis-match.
1394 UB REGEN	DV IN	Sets user information for recording. ON: Records user information of the device connected to the DV terminal. OFF: Records user information set with this camera. • When set to ON, UB MODE cannot be changed.
UB MODE (DV mode only)	CAMERA DV IN	Sets recording details as user information. USER: Records user information. TIME: Records the time. DATE: Records the date. TCG: Records the value of the time code generator. FRM.RATE: Records frame-conversion frame rate information.
UB PRESET	CAMERA DV IN	Sets the user information. YES NO
DV IN PRESET	DV IN	Set to ON to synchronize initial TC values when shooting with multiple cameras. ON OFF • Does not work when 1394 TC REGEN is set to ON.
MIC GAIN1	CAMERA	Sets the input level for external microphones in AUDIO IN CH1. -50dB -60dB
MIC GAIN2	CAMERA	Sets the input level for external microphones in AUDIO IN CH2. -50dB -60dB
META CARD READ (AVCHD mode only)	CAMERA	Loads the metadata recorded on the SD Memory Card into the unit. Up to 8 metadata files stored on the SD Memory Card (MTDT00 to MTD07) are displayed in a list. Files with no corresponding data are displayed in gray. • Displayed in gray when metadata is not stored on the SD Memory Card.
META DATA REC (AVCHD mode only)	CAMERA	Sets whether to record the metadata to be loaded into the unit simultaneously on a SD Memory Card. ON: Records simultaneously. OFF: Does not record simultaneously.
USER CLIP NAME (AVCHD mode only)	CAMERA	Selects the method of CLIP NAME recording. TYPE1: User clip name is the same as the CLIP NAME if there is no uploaded metadata or data. TYPE2: User clip name is the same as the CLIP NAME if no combination of data and COUNT value is uploaded, or if there is no uploaded data.

___ indicates the factory setting.

RECORD SETUP screen (continued)

Item	Display mode	Description of settings
META DATA PROP (AVCHD mode only)	CAMERA	Displays the metadata which has been recorded in the unit. CLIP NAME ACCESS SHOOT SCENARIO NEWS1 NEWS2 MEMO1 MEMO2
CLIP COUNTER RST (AVCHD mode only)	CAMERA	Resets the COUNT value to 1. YES NO
META INITIAL SET (AVCHD mode only)	CAMERA	Returns metadata stored on the camera to factory default conditions. All metadata settings, including ON/OFF settings for META DATA REC, are cleared. YES NO

PICTURE screen (AVCHD mode only)

Item	Display mode	Description of settings
PICTURE SIZE	PHOTO	Sets the recording pixels during photo shooting. 4:3 image aspect ratio: 9M 3520×2640 8M 3264×2448 5M 2560×1920 0.3M 640×480 3:2 image aspect ratio: 10.6M 3984×2656 7M 3264×2176 4.5M 2592×1728 16:9 image aspect ratio: 10M 4224×2376 6M 3328×1872 3.5M 2560×1440
QUALITY	PHOTO	Sets the image quality during photo shooting. High High image quality Low Standard image quality
ASPECT RATIO	PHOTO	Sets the aspect ratio. 4:3 3:2 16:9
SELF TIMER	PHOTO	Sets the self timer. OFF, 10 SECONDS, 2 SECONDS
SHTR SOUND	PHOTO	Selects whether to enable the shutter sound. ON OFF

_____ indicates the factory setting.

Setup menu list (continued)

PLAY SETUP screen

Item	Display mode	Description of settings
REPEAT PLAY	DV IN PB	When set to ON, supported clips are played repeatedly. ON OFF
RESUME PLAY	DV IN PB	When set to ON, playback resumes from the video position at which clip playback stopped. ON OFF

OPERATION screen (AVCHD mode only)

Item	Display mode	Description of settings
CLIP PROTECT	PB	Protects clips to prevent accidental deletion. YES: Enables clip protection or cancels protection. NO • Executing a format of the memory card will delete all clips even if they are protected.
DELETE	PB	Deletes clips. ALL CLIPS: Deletes all clips. SELECT: Deletes only the selected clips. Press the FUNC/EXEC button to execute. NO • Clips for which CLIP PROTECT is specified are not deleted.

PICT. SETUP screen (AVCHD mode only)

Item	Display mode	Description of settings
SCENE PROTECT	PB	Protects photos to prevent accidental deletion. YES: Enables photo protection or cancels protection. NO • Executing a format of the memory will delete photos even if they are protected.
DPOF SET	PB	Allows you to write data related to the print quantity of a photo onto the SD Memory Card. CANCEL ALL: Cancels all quantity settings. SET: Sets the print quantity. NO
DELETE	PB	Deletes photos. ALL SCENES: Deletes all photos. SELECT: Deletes only the selected photos. Press the FUNC/EXEC button to execute. NO • Photos for which SCENE PROTECT is specified are not deleted.

___ indicates the factory setting.

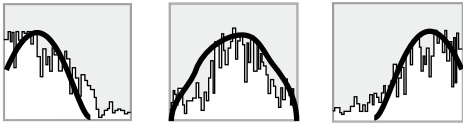
SW&DISP SETUP screen

Item	Display mode	Description of settings
HANDLE ZOOM	CAMERA PHOTO	Sets the speed allocated to the handle zoom switch. L/OFF/H: 1 - (low-speed); 2 - (speed adjustment OFF); 3 - (high-speed) L/M/H: 1 - (low-speed); 2 - (medium-speed); 3 - (high-speed) L/OFF/M: 1 - (low-speed); 2 - (speed adjustment OFF); 3 - (medium-speed)
IRIS DIAL	CAMERA PHOTO	Sets the rotation direction and the aperture control of the IRIS dial. (In MANUAL IRIS mode) DOWN OPEN: The iris opens when the IRIS dial is turned downward. UP OPEN: The iris opens when the IRIS dial is turned upward.
USER1 SW	CAMERA PHOTO DV IN PB	Selects the function assigned to the USER1 button. INH: No function assigned. (PUSH)AF: Switches to auto focus mode when the button is held during manual focus mode. BACKLIGHT: Auto iris control for the backlight compensation. (Pages 12, 61) SPOTLIGHT: Switches auto iris control for the spotlight on or off. BLACKFADE: Blackfade (Pages 12, 61) WHITEFADE: Whitefade (Pages 12, 61) ATW: Switches the ATW function on or off. ATW LOCK: Fixes the white balance value when the button is pressed during ATW. Press again to perform ATW. HIGH GAIN: The gain mode switches between normal and high with each press of the button. Gain can be set to up to 34 dB in high gain mode. This does not work in PHOTO mode. (Pages 6, 55) D.ZOOM: Changes the ratio of the DIGITAL ZOOM function. Each press of the button changes the ratio in the following order: OFF (x1) → x2 → x5 → x10 → OFF (x1). (Page 39 of Vol.1) EVF DTL: Emphasizes outlines of images in the viewfinder for easier focusing when the button is pressed. SHOT MARK: Shot mark recording (Pages 49, 85) LAST CLIP: Deletes the last recorded clip. (Pages 14, 63) WFM: Displays a waveform (only on the viewfinder during CAMERA mode).
USER2 SW	CAMERA PHOTO DV IN PB	Assigns a function to the USER2 button. The setting contents are the same as USER1 SW. BACKLIGHT
USER3 SW	CAMERA PHOTO DV IN PB	Assigns a function to the USER3 button. The setting contents are the same as USER1 SW. SHOT MARK
INDICATOR (AVCHD mode only)	PB	Selects whether to display the thumbnail indicator. ON: Displayed OFF: Not displayed
FOCUS ASSIST SW	CAMERA PHOTO	Assigns a function to the FOCUS ASSIST button. EXPANDED: Displays the center of the screen in expanded view. BAR: A bar extends to the right as focus is aligned. BOTH: Enables both expanded view and focus bar display.
RING SW	CAMERA PHOTO	Assigns a function to the RING switch. ZOOM: Switch between FOCUS and ZOOM. IRIS: Switch between FOCUS and IRIS.

_____ indicates the factory setting.

Setup menu list (continued)

SW&DISP SETUP screen (continued)

Item	Display mode	Description of settings
AUTO SW	CAMERA PHOTO	Sets the face detection function during auto mode to ON or OFF. AB ON : Enables face detection. AB OFF : Disables face detection.
SMOOTH ZOOM STOP	CAMERA PHOTO	Selects the method in which zoom operations are stopped. ON : Smooth stop. OFF : Precise stop.
CAM GAIN LIMIT	CAMERA PHOTO	Sets the maximum value for camera gain. CAMERA mode 24 dB : Camera gain can be set to up to 24 dB. 12 dB : Camera gain can be set to up to 12 dB. PHOTO mode 18 dB : Camera gain can be set to up to 18 dB. 12 dB : Camera gain can be set to up to 12 dB.
FACE FRAMING	CAMERA PHOTO	Sets the detection frame displays when AB is selected in auto mode. OFF : Not displayed. PRIMARY : Displays only the primary frame. ALL : Displays all face detection frames.
ZEBRA DETECT	CAMERA PHOTO	Selects the brightness level of the left-leaning zebra patterns on the screen. 105%, 100%, 95%, 90%, 85%, 80%, 75%, 70%, 65%, 60%, 55%, 50%
MARKER	CAMERA PHOTO	Select ON to display the marker. ON OFF To display the marker, press the ZEBRA button.
GUIDE LINES	PHOTO	Displays guide lines for confirming level shooting. OFF ,  ,  ,  • Guide lines are not recorded on images. • Guide lines do not appear when the face detection function is set to ON.
HISTOGRAM	PHOTO	Displays a graph with the horizontal axis representing brightness, and the vertical axis representing number of pixels. You can determine the exposure distribution of an entire image by viewing the distribution in the graph. ON OFF ■ Display example  Dark ← Standard → Light • Adjust the brightness by adjusting the aperture.
SAFETY ZONE	CAMERA	Sets SAFETY ZONE. OFF, 90%, 4:3
REC COUNTER	CAMERA DV IN	Selects counter operation during recording. TOTAL : The count continues to increase until the RESET button is pressed to reset it. CLIP : Resets the counter at start of recording and counts the time of each recording session. • Not displayed in PB mode.

_____ indicates the factory setting.

SW&DISP SETUP screen (continued)

Item	Display mode	Description of settings
VIDEO OUT OSD	CAMERA PHOTO DV IN PB	Select ON to output the information displayed on the screen together with the signals from the VIDEO OUT jack. ON OFF • Even when set to ON, the time code display, audio level meter display, focus information display, and zoom position display are not displayed.
DATE/TIME	CAMERA PHOTO DV IN PB	Sets whether to display the date and time on the screen and whether to output from the VIDEO OUT jack. OFF: The date and time are not displayed. TIME: The time is displayed. DATE: The date is displayed. TIME & DATE: The date and time are displayed.
DATE FORMAT	CAMERA PHOTO DV IN PB	Selects the display format for dates. Y/M/D: Year/month/day M/D/Y: Month/day/year D/M/Y: Day/month/year
LEVEL METER	CAMERA DV IN PB	Select ON to display the audio level meter. ON OFF
LENS STATUS	CAMERA PHOTO	Sets lens-related displays to ON or OFF (Optical Image Stabilizer, shutter, aperture, zoom, auto iris, and focus displays). ON OFF
CARD & BATTERY	CAMERA PHOTO DV IN PB	Select ON to display the remaining SD Memory Card recording capacity and remaining battery charge. ON OFF
OTHER DISPLAY	CAMERA PHOTO DV IN PB	Switches between information displayed on the viewfinder. (Page 99) ON OFF
EVF BACKLIGHT	CAMERA PHOTO DV IN PB	Adjusts the backlight of the viewfinder. The brightness increases as the setting value increases. [+2]*, [+1]*, [0]*, [-1]*
EVF SET	CAMERA PHOTO DV IN PB	Adjusts the display level of the images on the viewfinder. (Page 34 of Vol.1) COLOR BRIGHTNESS CONTRAST
SELF SHOOT	CAMERA PHOTO	Selects the viewfinder mirror mode for self-portrait shooting. Selecting MIRROR displays the left and right side of the viewfinder monitor image inverted during self-portrait shooting. (Pages 10, 59) NORMAL MIRROR
EVF COLOR	CAMERA PHOTO DV IN PB	Switches viewfinder images to color or black and white. ON: Color OFF: Black and white

___ indicates the factory setting.

Setup menu list (continued)

OTHER FUNCTIONS screen

Item	Display mode	Description of settings
CARD FORMAT	CAMERA PHOTO DV IN PB*¹	Formats the SD Memory Card. YES: Formats the card. NO • Formatting a card will delete all data recorded in AVCHD mode and DV mode.
CARD STATUS (AVCHD mode only)	PB	Displays the SD Memory Card status. YES: Displays the card status. NO
IR REMOTE	CAMERA PHOTO DV IN PB	Sets the operations of the supplied remote control unit. ON: Accepts commands from the remote control. OFF: Operations are not accepted from remote control.
DV CONTROL (DV mode only)	CAMERA	Selects the control method by this camera when a digital device is connected to the DV terminal and backup images are recorded. OFF: Not controlling any external device. EXT: Controls external devices with the START/STOP button. BOTH: Simultaneously records with this camera and an external device. CHAIN: The external device starts recording automatically when this camera's recording memory has nearly run out.
DV CMD SEL (DV mode only)	CAMERA	Sets the recording operation of the external device when the START/STOP button is pressed. REC_P: Switches between record and pause. STOP: Switches between record and stop.
REC LAMP	CAMERA PHOTO	Sets lighting of the tally lamp. FRONT: Lights the front side tally lamp. REAR: Lights the rear side tally lamp. BOTH: Lights both tally lamps. OFF: Tally lamp lighting is turned off.
BEEP SOUND	CAMERA PHOTO DV IN PB	Turns the beep sound ON or OFF. ON OFF If the SD Memory Card becomes FULL while ON is selected, the beep sound is output. When the beep is sounded, the audio signals from the output connector are muted before the beep sound is output.
CLOCK SET	CAMERA PHOTO DV IN PB	Sets the camera-recorder's calendar. YES NO

*¹ AVCHD mode only

_____ indicates the factory setting.

OTHER FUNCTIONS screen (continued)

Item	Display mode	Description of settings																																																																																																												
TIME ZONE	CAMERA PHOTO DV IN PB	Adds to or deducts from GMT the time value of -12:00 to +13:00 in 30-minute steps. (Refer to the table below.) +00:00 <table><tr><th>Time difference</th><th>Area</th><th>Time difference</th><th>Area</th></tr><tr><td>+ 00:00</td><td>Greenwich</td><td>- 00:30</td><td></td></tr><tr><td>- 01:00</td><td>Azores Islands</td><td>- 01:30</td><td></td></tr><tr><td>- 02:00</td><td>Mid-Atlantic</td><td>- 02:30</td><td></td></tr><tr><td>- 03:00</td><td>Buenos Aires</td><td>- 03:30</td><td>Newfoundland Island</td></tr><tr><td>- 04:00</td><td>Halifax</td><td>- 04:30</td><td></td></tr><tr><td>- 05:00</td><td>New York</td><td>- 05:30</td><td></td></tr><tr><td>- 06:00</td><td>Chicago</td><td>- 06:30</td><td></td></tr><tr><td>- 07:00</td><td>Denver</td><td>- 07:30</td><td></td></tr><tr><td>- 08:00</td><td>Los Angeles</td><td>- 08:30</td><td></td></tr><tr><td>- 09:00</td><td>Alaska</td><td>- 09:30</td><td>Marquesas Islands</td></tr><tr><td>- 10:00</td><td>Hawaii</td><td>- 10:30</td><td></td></tr><tr><td>- 11:00</td><td>Midway Island</td><td>- 11:30</td><td></td></tr><tr><td>- 12:00</td><td>Kwajalein</td><td>+ 12:30</td><td></td></tr><tr><td>+ 13:00</td><td></td><td>+ 11:30</td><td>Norfolk Island</td></tr><tr><td>+ 12:00</td><td>New Zealand</td><td>+ 10:30</td><td>Lord Howe Island</td></tr><tr><td>+ 11:00</td><td>Solomon Islands</td><td>+ 09:30</td><td>Darwin</td></tr><tr><td>+ 10:00</td><td>Guam</td><td>+ 08:30</td><td></td></tr><tr><td>+ 09:00</td><td>Tokyo</td><td>+ 07:30</td><td></td></tr><tr><td>+ 08:00</td><td>Beijing</td><td>+ 06:30</td><td>Yangon</td></tr><tr><td>+ 07:00</td><td>Bangkok</td><td>+ 05:30</td><td>Mumbai</td></tr><tr><td>+ 06:00</td><td>Dacca</td><td>+ 04:30</td><td>Kabul</td></tr><tr><td>+ 05:00</td><td>Islamabad</td><td>+ 03:30</td><td>Tehran</td></tr><tr><td>+ 04:00</td><td>Abu Dhabi</td><td>+ 02:30</td><td></td></tr><tr><td>+ 03:00</td><td>Moscow</td><td>+ 01:30</td><td></td></tr><tr><td>+ 02:00</td><td>Eastern Europe</td><td>+ 00:30</td><td></td></tr><tr><td>+ 01:00</td><td>Central Europe</td><td></td><td></td></tr></table>	Time difference	Area	Time difference	Area	+ 00:00	Greenwich	- 00:30		- 01:00	Azores Islands	- 01:30		- 02:00	Mid-Atlantic	- 02:30		- 03:00	Buenos Aires	- 03:30	Newfoundland Island	- 04:00	Halifax	- 04:30		- 05:00	New York	- 05:30		- 06:00	Chicago	- 06:30		- 07:00	Denver	- 07:30		- 08:00	Los Angeles	- 08:30		- 09:00	Alaska	- 09:30	Marquesas Islands	- 10:00	Hawaii	- 10:30		- 11:00	Midway Island	- 11:30		- 12:00	Kwajalein	+ 12:30		+ 13:00		+ 11:30	Norfolk Island	+ 12:00	New Zealand	+ 10:30	Lord Howe Island	+ 11:00	Solomon Islands	+ 09:30	Darwin	+ 10:00	Guam	+ 08:30		+ 09:00	Tokyo	+ 07:30		+ 08:00	Beijing	+ 06:30	Yangon	+ 07:00	Bangkok	+ 05:30	Mumbai	+ 06:00	Dacca	+ 04:30	Kabul	+ 05:00	Islamabad	+ 03:30	Tehran	+ 04:00	Abu Dhabi	+ 02:30		+ 03:00	Moscow	+ 01:30		+ 02:00	Eastern Europe	+ 00:30		+ 01:00	Central Europe		
Time difference	Area	Time difference	Area																																																																																																											
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POWER SAVE	CAMERA PHOTO DV IN	Selects the power-saving mode when the camera is not operated for about five minutes in the recording standby mode (when an SD Memory Card has been inserted while using the battery). ON: The camera-recorder's power is set to OFF. OFF: The camera-recorder's power is not set to OFF. • Even when this setting is ON, the power will not turn OFF when an SD Memory Card is not inserted, when the camera is in PB mode, or when the AC adaptor is connected. • Designated operations include button and ring operations, cursor button operations, and remote control operations (when IR REMOTE is set to ON).																																																																																																												
HDMI OUT SEL (AVCHD mode only)	CAMERA PHOTO PB	Sets the output video format of the HDMI OUT terminal. AUTO: Automatically determines the output resolution based on information of connected monitors. 1080i/720P: Fix the output at the recorded resolution. (Output in 1080 interlaced or 720 progressive mode) 480P: Output in 480 progressive mode. • Simultaneous output from HDMI OUT, COMPONENT OUT, and VIDEO OUT is not possible. The order of priority is HDMI > COMPONENT > VIDEO.																																																																																																												

— indicates the factory setting.

OTHER FUNCTIONS screen (continued)

Item	Display mode	Description of settings
CMPNT OUT SEL (AVCHD mode only)	CAMERA PHOTO PB	Selects the type of component terminal. AUTO: Monitor with D4 terminal (720P/1080i output) 1080i: Monitor with D3 terminal (1080i output) 480i: Monitor with D1 terminal (480i output) - Cross-conversion is only performed when content recorded at 720P is output at 1080i. Cross-conversion does not take place in other cases. - DV mode is only output at 480i.
DOWNCON MODE (AVCHD mode only)	CAMERA PB*1	Switches down-conversion output mode. SIDE CROP: Crops the left and right edges. Images may extend beyond the boundaries of the screen and be partially unable to be seen when outputting from the VIDEO OUT terminal, or when outputting from the COMPONENT OUT terminal when the COMPNT OUT SEL item is set to 480i. LETTER BOX: Adds black bars to the top and bottom edges. SQUEEZE: Squeezes images horizontally from the left and right.
TV ASPECT	CAMERA*2 PHOTO DV IN PB*3	Sets the aspect ratio of the TV that will be connected. 16:9 4:3
VIDEO SETUP	CAMERA DV IN PB*1	Sets the setup level of video signals. 0%: VIDEO OUT terminal output and recording setup levels will both be set to 0%. 7.5% A: VIDEO OUT terminal output setup level will be set to 7.5 %, while recording setup level will be set to 0 %.
AUDIO OUT	CAMERA DV IN PB*1	Sets the audio signals output from the Pin jack OUT terminal. CH1/CH2: CH1 terminal = CH1 signals, CH2 terminal = CH2 signals CH1: CH1 terminal = CH1 signals, CH2 terminal = CH1 signals CH2: CH1 terminal = CH2 signals, CH2 terminal = CH2 signals When an SD Memory Card containing 5.1 channel content, recorded on other equipment, is played back on the camera, it is down-mixed to 2 channels when output through the Pin jack OUT or PHONES (headphone) terminal.
MENU INIT	CAMERA PHOTO DV IN	Returns menu settings to factory default settings. YES NO Returns all items except User information, CLOCK SET, TIME ZONE, and OPERATION TIME to factory default settings.
SYSTEM INFO	PB*4	Displays the version of the system in this camera. YES NO
LANGUAGE	CAMERA PHOTO DV IN PB	Selects the language for menu displays. English Español Français
OPERATION TIME	CAMERA PHOTO DV IN PB	Displays the power-on time (a 5-digit figure).

*1 Only during clip playback _____ indicates the factory setting.

*2 Only during DV mode

*3 Enabled during both PHOTO and DV mode

*4 Only during AVCHD mode

OPTION MENU screen (DV mode only)

Item	Display mode	Description of settings
1394 STATUS	CAMERA DV IN	Displays the 1394 status display sub-screen. FORMAT: Input/output signal format RATE: Input/output signal-transfer rate 60/50: Input/output signal system CH: Input/output channel value SPEED: Input/output signal-transfer speed STATUS: Input/output signal status VIDEO: Input/output video signal status AUDIO: Input/output audio signal status
1394 CONFIG	CAMERA DV IN	Adjusts 1394 signals. DFLT 1 to 255

___ indicates the factory setting.

List of thumbnail menus (DV mode only)

THUMBNAIL menu

Item	Display mode	Description of settings
MODE	PB	Sets clips to display in the thumbnail screen. ALL: Displays all clips. MARKER: Only displays clips with shot marks.
INDICATOR	PB	Sets display of information on top of thumbnails. ON: Displays information on top of the thumbnail. OFF: Information is not displayed on top of the thumbnail

OPERATION menu

Item	Display mode	Description of settings
DELETE	PB	Deletes clips. ALL CLIPS: Deletes all clips. SELECT: Deletes selected clips. Press the FUNC/EXEC button to execute.
REPAIR CLIP	PB	Repairs clips displaying the faulty clip indicator.

OTHER FUNCTIONS menu

Item	Display mode	Description of settings
CARD FORMAT	PB	CARD FORMAT YES: Formats cards. NO
CARD STATUS	PB	Displays the status of SD Memory Cards.
SYSTEM INFO	PB	Displays the system version of this camera's DV mode.

___ indicates the factory setting.

Chapter 4: Reference

Before calling for service

Power supply

There's no power.	Make sure the battery and AC adaptor are connected properly. Check the connections again.	Page 26 of Vol.1
Power shuts off for no apparent reason.	To prevent the battery from running down needlessly, the camera-recorder automatically turns off when the camera-recorder has been left in the recording pause mode for more than 5 minutes. Check the settings in the OTHER FUNCTIONS screen, POWER SAVE.	Page 111
Power goes off as soon as it is turned on.	The battery may have run out. If the remaining battery charge display is blinking or  appears, the battery has run out. Either recharge the battery or replace the discharged battery with a fully charged one.	Page 25 of Vol.1

Battery

The battery runs down quickly.	- Make sure the battery is fully charged. Keep charging until the AC adaptor's CHARGE lamp goes out. - Are you using the battery in a cold place? The battery is affected by the ambient temperature. Its operating time is reduced in low-temperatures. - The battery may have reached the end of its service life. The battery will become unchargeable. The battery has a certain service life which varies depending on how the battery is used. If the battery operates only for a short period even when it is charged adequately, it has reached the end of its service life.	Page 24 of Vol.1
The battery cannot be charged.	The battery cannot be charged if the DC cable is connected. Disconnect it.	Page 24 of Vol.1
The remaining battery capacity is not displayed correctly.	The remaining battery capacity display is merely a guideline. To ensure that remaining battery capacity is displayed correctly, use the battery completely from a fully-charged state, and charge the battery again. (Remaining battery capacity may still not be displayed correctly if the battery has been used for long periods in high or low temperatures, or if the battery has been recharged a large number of times.)	—

Shooting

Cannot start shooting.	Make sure the POWER switch is ON.	Page 30 of Vol.1
Cannot focus automatically.	- Make sure the camera is in manual focus mode. You can focus automatically when the auto focus mode is selected. - You may be shooting a scene where it is difficult to bring the subject into focus in the auto focus mode. If this is the case, focus in the manual focus mode. It may be hard to bring the subject into focus when - both close and distant objects are to be shot - shooting through a dirty window - shooting in a dark place - there are sparkling or shiny objects around the subject - the subject is moving fast - shooting a scene with minimal contrast	Pages 5, 54
Images do not focus when zooming.	When using a macro range for the focus control, the zoom is set to the wide end or the telephoto end, and even if the image is focused, zooming may cause the image to become unfocused. For details about the macro display, see page 94.	—

Recording

Cannot record even through the SD Memory Card is inserted correctly.	- Is the write-protect switch on the SD Memory Card in the "LOCK" position? The card cannot be recorded to if the switch is in the "LOCK" position. - Is the remaining memory available on the SD Memory Card extremely low? Please save contents onto different media and delete unneeded data from the card, or use a new card instead. - Has the SD Memory Card been correctly formatted? Alternatively, is the card of a format that is incompatible with this camera? Reformat the card with the camera. 8 MB – 16 MB SD Memory Cards cannot be used for video recording. - Are you using a class of SD Memory Card that supports the selected recording mode? Make sure that the SD Memory Card is of a class that supports the recording mode.	Pages 30, 78 Pages 28, 76 Page 12 of Vol.1 Page 12 of Vol.1
Recording stops by itself.	Is your SD Memory Card compatible with use for video recording? Always use an SD Memory Card compatible with use for video recording.	Page 12 of Vol.1

Editing

Cannot read the data on the SD Memory Card.	Make sure the SD Memory Card is formatted correctly. If it is not, format the card in the unit.	Pages 28, 76
Cannot perform nonlinear editing.	Check the specifications of your computer and connecting cable.	Page 51
Cannot dub onto an external device.	Make sure the external device is connected correctly.	Pages 51, 87

Displays

Something is wrong with the time code display.	The time code display may not register a regular count if a clip is played in the reverse slow mode. This is normal.	—
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Playback

Cannot play even when I press the play button.	- Make sure the PB lamp is on. Switch to PB mode by pressing the MODE button. - Is the playback format correct? Make sure the playback format on the camera matches the recording format for the clip.	Pages 40, 84 Pages 41, 81
Mosaic-like noise appears when I cue or review a clip.	This noise is inherent to digital video technology. This is normal.	—
Images do not appear on the television even though I have connected the camera-recorder properly.	- Make sure the input selector on your television is set to video input. Read the television's instructions carefully and select the correct video input connector for the camera-recorder. - Is the MODE switch set to DV mode? HDMI output is not supported in DV mode. Switch to AVCHD mode. - Does the OUTPUT switch setting match the terminal to which the cable is connected? Set the switch to COMPONENT when a component cable is connected, and set the switch to VIDEO when a video cable is connected. - Are multiple cables connected? When multiple cables are connected, the output priority is as follows: HDMI OUT > COMPONENT OUT > VIDEO OUT.	— Page 17 of Vol.1 Pages 52, 89 Pages 52, 89

Playback

Cannot hear any sound from the camera-recorder's speaker.	You may have turned down the camera-recorder's volume control too far. Adjust the sound volume with the MONITOR LEVEL knob.	Page 21 of Vol.1
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PC connection

Computer does not recognize camera when USB connection cable is connected.	- Check that the camera is in AVCHD mode. - If your computer has multiple USB terminals, please try connecting the camera to a different USB terminal. - Switch the camera's power off and back on again, and reconnect the USB connection cable.	Page 51
An error message appears on the computer when the USB connection cable is disconnected.	To disconnect the USB connection cable safely, double-click the icon in the task tray, and follow the instructions on the screen.	—

Other

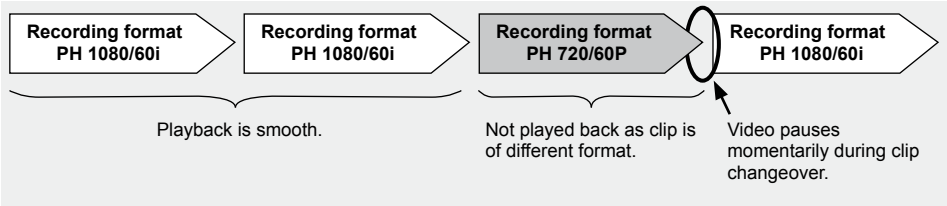
The remote control does not work.	- The battery in the remote control may have run out. If the remote control fails to work even if it is operated close to the remote control sensor of the camera-recorder, it means that the battery has run out. Replace it with new one. - Check that the IR REMOTE item in the setting menu OTHER FUNCTIONS screen is not set to OFF.	Page 29 of Vol.1
There is a rattling sound when the camera-recorder is tilted back and forth.	This is the sound of the lens moving. This is not a fault. No sound should be heard when the camera's power is switched on.	—
A clicking sound is heard when the power is turned on or when the PB mode is switched to the CAM mode.	This initialization operation is performed when the camera starts up. It occurs due to the construction of the camera and is not indicative of any trouble.	—
The SD Memory Card screen appears strange.	The data on the card could be corrupted. Data can be corrupted by static electricity and electromagnetic waves. Please always save important data to a computer or other storage media.	—
The SD Memory Card cannot be used even after formatting.	There could be a fault with the camera or with the SD Memory Card. Please consult the place of purchase. Always use only SD Memory Cards of 512 MB - 32 GB with this camera.	—
The camera does not recognize the SD Memory Card even though it is inserted correctly.	Was the inserted SD Memory Card originally formatted with a computer? Always use this camera to format SD Memory Cards. Please be aware that, when an SD Memory Card is formatted, all data recorded on the card will be erased and will not be restorable.	Pages 28, 76
The SD Memory Card is not recognized when inserted into other devices.	Please check that the device is compatible with the capacity or type (SD Memory Card/SDHC Memory Card) of the SD Memory Card that you are using. For details, please consult the device's own operating instructions.	Page 14 of Vol.1

Before calling for service (continued)

The changeover between clips may not always be smooth when playing back multiple clips in succession. Video may momentarily pause when playing back multiple clips in succession in circumstances such as those detailed below.

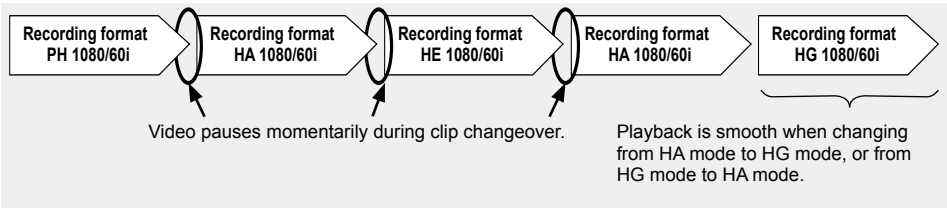
Mixture of different recording formats

Recording mode = PH mode
Playback format = 1080/60i, 1080/30P

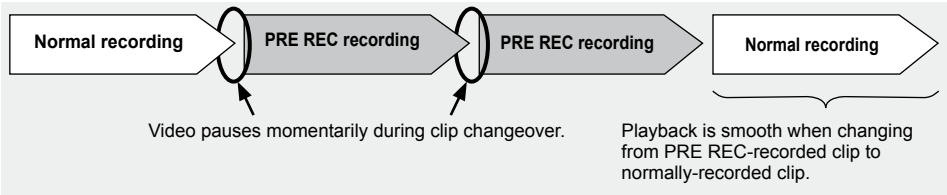


Mixture of different recording modes

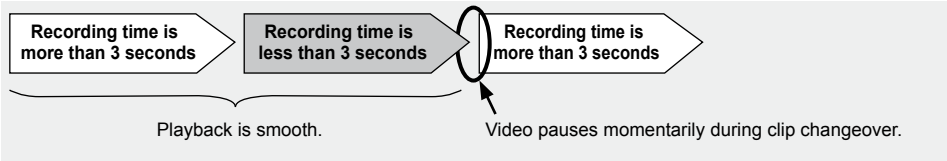
Recording format = 1080/60i
Playback format = 1080/60i, 1080/30P



Some clips have been recorded using PRE REC function



Some clips have a recording time of less than 3 seconds



Updating the firmware

For the latest information on firmware updates, visit the support page at the following Web site.

<http://pro-av.panasonic.net/>

Cleaning

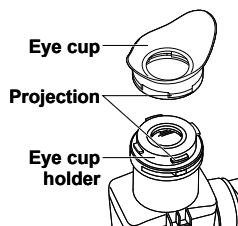
When cleaning, do not use benzene or thinner.

- Using benzene or paint thinners may deform the camera-recorder and/or cause the surface finish to peel off.
- Before proceeding with maintenance, remove the battery or disconnect the AC cable from the power outlet.
- Use a soft, clean cloth to wipe the camera-recorder. To remove stubborn dirt, wipe the camera-recorder with a cloth moistened with kitchen detergent that has been diluted with water and then use a dry cloth to take up the remaining moisture.

Cleaning the eye piece

■ When the outer lens becomes dirty

After removing the surface dust with a soft brush or blower brush, wipe the lens with a commercially-available lens cleaner (and lens cleaning paper).



■ When dust becomes attached to the inner filter, the inside of the eye piece or the LCD monitor within the viewfinder.

Remove the eye piece and remove the dust.

Remove the surface dust with a soft brush or blower brush.



- Do not use solvents such as thinner to remove dust or dirt.

Storage Precautions

Before storing the camera-recorder, remove both the SD Memory Card and battery.

Store all of these items in a place with low humidity and relatively constant temperature.

[Recommended temperature range: 15 °C to 25 °C (59 °F to 77 °F)]

[Recommended relative humidity: 40 % to 60 %]

Camera-recorder

- Wrap the camera-recorder in a soft cloth to keep the dust off.

Battery

- The battery life is shortened in places with extreme temperatures.
- Storing the battery in a location with oily vapors or high dust concentrations may corrode the terminals or cause other damage, leading to malfunction.

- **Keep metal objects (such as necklaces and hairpins) away from the terminals.**

Short-circuiting may occur across the terminals, causing the battery to heat up, and you may seriously burn yourself if you touch the battery in this state.

SD Memory Cards

- After ejecting an SD Memory Card from the unit, be absolutely sure to stow it in its own case.
- Do not leave SD Memory Cards in areas where corrosive gases, etc. are present.
- Do not leave the cards inside vehicles, in places exposed to direct sunlight or in other places where the temperature is high.
- Do not leave the cards where the humidity level is high or where there are high concentrations of dust.

Software information

1. This product includes GNU General Public License (GPL) and GNU Lesser General Public License (LGPL) software. Customers are granted permission to acquire, modify, and redistribute the source code of these software

Details on the GPL/LGPL can be found on the supplied CD-ROM under the LDOC folder (original English text only). For details on acquiring the source code, visit the following website.

<http://panasonic.biz/sav/>

Do not contact Panasonic with questions regarding the content of the acquired source code.

2. This product includes MIT-License software.

Details on the MIT License can be found on the supplied CD-ROM under the LDOC folder (original English text only).

Recording format

Recording mode			Frame rate		
			60	30P	24P
A V C H D	PH	1080/60i	1080/60i	1080/30P (over 60i)	1080/24P (Native recording)
		720/60P	720/60P	720/30P (over 60P)	720/24P (Native recording)
	HA	1080/60i	1080/60i	—	—
	HG	1080/60i	1080/60i	—	—
	HE	1080/60i	1080/60i	—	—
DV		480/60i	480/60i	480/30P (over 60i)	480/24P (over 60i)

How to handle data recorded on SD Memory Card

AVCHD Mode:

Data recorded in AVCHD format offers excellent compatibility with computers due to the file type, but since this format includes not only video and audio data, but also a variety of important information, the folder structure will consist of file associations as illustrated in the diagram on the right. If even part of this information is modified or deleted, the data may no longer be recognized as AVCHD data, or the memory card may no longer be able to be used with AVCHD devices.

To prevent the loss of any part of the information when transferring data on the SD Memory Card to a computer or when copying data stored on a computer back onto the SD Memory Card, be sure to use the dedicated AVCCAM Viewer.

The AVCCAM Viewer can be downloaded from the following website.

Both a Windows version and a Mac version are available.

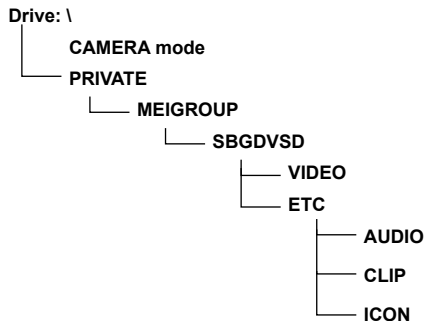
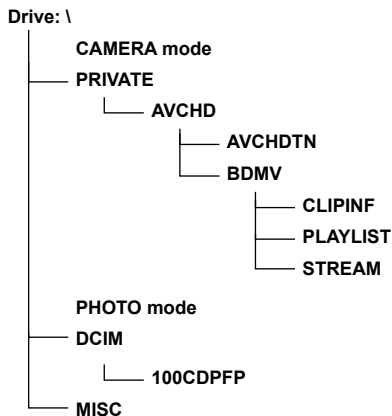
(Compatible OS: Windows XP/Windows Vista/Windows7/Mac OS X 10.6 (Snow Leopard), 10.5 (Leopard), 10.4 (Tiger))

<http://pro-av.panasonic.net/>

- AVCHD format video data files ([00000.MTS] etc.) are saved in the [BDMV] folder.
- Video thumbnails are saved in the [AVCHDNTN] folder.
- JPEG format photos ([IMGA0001.JPG] etc.) are saved in the [100CDPFP] folder. Up to 999 files can be saved in each folder.
- Photo data can be opened with picture software that supports JPEG pictures.
- The DPOF setting files are recorded in the [MISC] folder.

DV mode:

- DV format video and audio data files ([00000.AVI] etc.) are saved in the [VIDEO] folder.
- Video thumbnails are saved in the [ICON] folder.
- PCM data needed to play back audio on this camera are recorded in the [AUDIO] folder.



■ Concerning the handling of the camera's metadata

A special manufacturer area in the control file area under the AVCHD standard is employed for the metadata which is supported by this camera.

If files are deleted or copied, if clip protection is added or removed or if other such editing operations have been performed using editing software or a camera recorder which does not support this camera's metadata, the special area for the metadata will be erased, and the shot marks added by the camera as well as the PH mode information and other information will be lost. Therefore, before proceeding with these kinds of editing operations, check whether the camera's metadata is supported.

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Information on Disposal in other Countries outside the European Union



This symbol is only valid in the European Union.

If you wish to discard this product, please contact your local authorities or dealer and ask for the correct method of disposal.

Panasonic Solutions Company

3 Panasonic Way, Secaucus, NJ 07094 Tel: 877-803-8492
www.panasonic.com/broadcast e-mail: MediaProServices.PSC@us.panasonic.com

Panasonic Canada Inc.

5770 Ambler Drive, Mississauga, Ontario L4W 2T3 Tel: 905-624-5010

Panasonic de México S.A. De C.V.

Casa Matriz: Moras No.313 Col. Tlacoquemecatl Del Valle Del Benito Juárez México, D.F., C.P.03200
Tel: 55-5488-1000 Fax: 55-5575-6783

Panasonic Latin America, S.A.

P.O.Box 0816-03164 Panama, Republic of Panama Tel: +507-229-2955 Fax: 507-229-5352

Panasonic do Brasil Ltda.

Rua Cubatão, 320-6º andar-Paraíso CEP 04013-001- São Paulo -SP Tel: 11-3889-4000 Fax: 11-3889-4004