SONY

4K Memory Player

Operating Instructions

Before operating the unit, please read this manual thoroughly
and retain it for future reference.
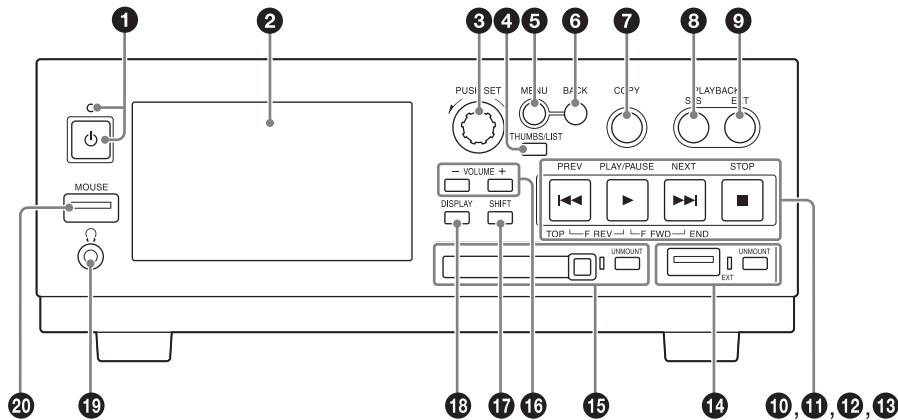
PMW-PZ1

SXS XAVC HDMI

Table of Contents

Parts Identification

For details on each function and how to use them, see the pages in the parentheses.

Front

❶ Power button and indicator *(page 7)*

❷ LCD display (960×540 pixels)
List screen *(page 8)*
Thumbnail screen *(page 8)*
File playback screen *(page 9)*
Copy screen *(page 13)*
Menu screen *(page 14)*

> **Note**
>
> A screensaver will activate and the screen will darken if the unit is not operated for a specified period (about 4 hours). The screen will return to normal brightness when you resume operation or connect a mouse.

❸ PUSH SET dial
Use this to select files and menu items. General operation consists of turning the dial left or right and pressing it to confirm selections.

❹ THUMBS/LIST button
Switch between displaying the list screen or thumbnail screen in the display.

❺ MENU button
Switch between displaying the menu screen or list/thumbnail screen in the display.

❻ BACK button
Return to the previous screen in the display. When pressed in the list screen or thumbnail screen, this returns to the previous (higher) level.

❼ COPY button *(page 13)*
Switch to the copy screen in the display. When pressed in the copy screen, this displays the list screen or thumbnail screen.

❽ PLAYBACK SxS button
Access the SxS memory card, and display the file list.

❾ PLAYBACK EXT button
Access the external storage device, and display the file list.

❿ PREV button / ⓫ PLAY/PAUSE button /
⓬ NEXT button / ⓭ STOP button
List/thumbnail screen operations *(page 8)*
File playback operations *(page 9)*

⓮ EXT (external storage) connector (USB3.0) and UNMOUNT button and indicator *(page 6)*

⓯ SxS memory card slot and UNMOUNT button and indicator *(page 6)*

⓰ VOLUME (–/+) buttons
Adjust the volume for the audio output from the front panel headphones jack.

⓱ SHIFT button
Use this to perform various operations during file playback *(page 9)*.

⓲ DISPLAY button
Superimpose text information (file names, playback status, etc.) on the LCD display during file playback.
By configuring menu settings, you can also superimpose text information on the displays of monitors or projectors connected to the rear panel connectors (3G/HD SDI MONITOR OUT, 4K/HD OUT) *(page 15)*.
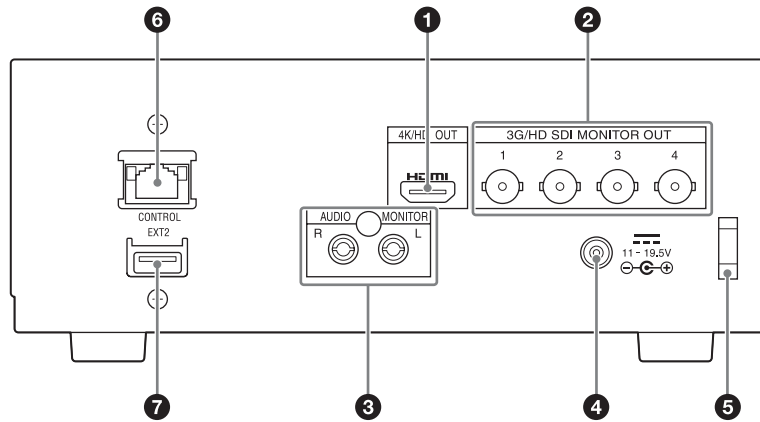
⓳ Headphones jack (stereo mini jack)
Use this to monitor audio during +1 speed playback. Audio is muted during all other playback situations.

For details on storage device transmission speed, see page 7.

⓴ MOUSE connector (USB2.0)
Connect a USB mouse *(page 10)*.

Rear

❶ 4K/HD OUT connector (HDMI 19-pin)
Output video and audio being played back on the unit to a 4K monitor or other HDMI device. When not playing back a file, a screen identical to that of the unit's LCD display will be output.

For details on storage device transmission speed, see page 7.

❷ 3G/HD SDI MONITOR OUT connectors 1 to 4 (BNC type)
Output video and audio played back on the unit to a 4K monitor or other SDI device.
3G-SDI and HD SDI signals are supported.
When not playing back a file, a screen identical to that of the unit's LCD display will be output.

For details on storage device transmission speed, see page 7.

❸ AUDIO MONITOR connector (phono jack)
Output the audio being played back on the unit.

For details on storage device transmission speed, see page 7.

❹ DC power input connector (EIAJ compliant)
Connect to an AC power supply via the supplied AC adapter or the AC-DN10 (not supplied) *(page 7)*.

Note

When disconnecting the AC adapter, be sure to press the power button to turn off the unit *(page 7)* and wait for the indicator to light red beforehand.

❺ Cable clamp
Use to secure the cable connected to the DC power input connector.

❻ CONTROL connector
Use to connect to a network *(page 17)*.

❼ EXT2 connector
Use to connect external storage to the rear panel *(page 7)*.
Can be used in the same way as the EXT connector on the front panel of the unit.

Connection Examples

Connection to a 4K Monitor

For details on the monitor, refer to the operating instructions for the monitor.

HDMI connection

PMW-PZ1 (rear)

4K/HD OUT

HDMI cable

HDMI input

Professional Video Monitor
PVM-X300

SDI connection

PMW-PZ1 (rear)

3G/HD SDI MONITOR OUT

BNC cable

SDI input

Professional Video Monitor
PVM-X300
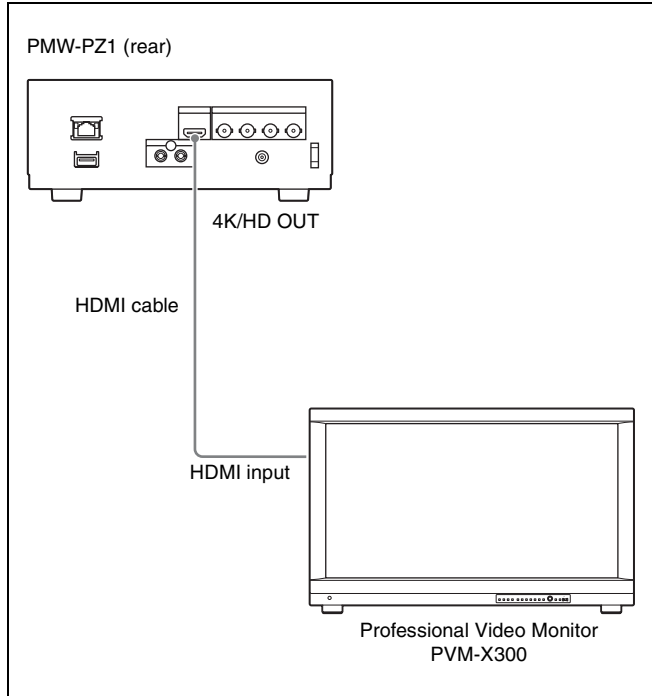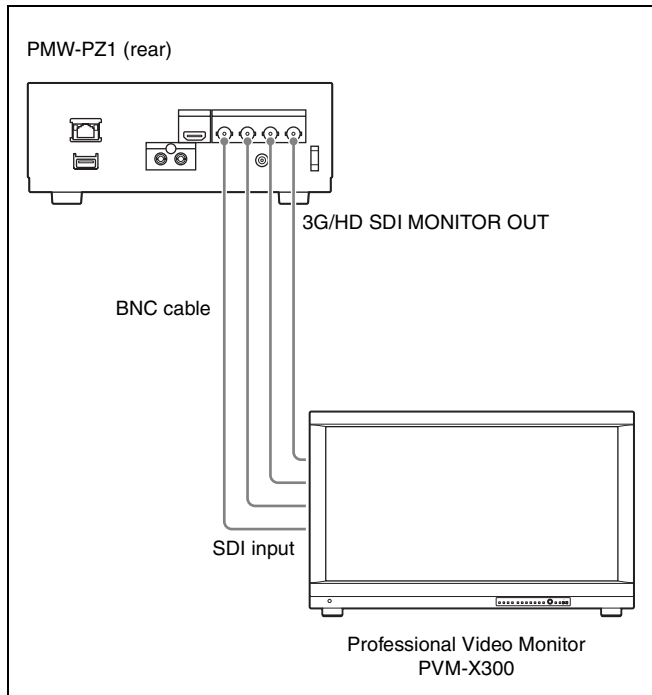
Connection to a 4K Projector

For details on the projector, refer to the operating instructions for the projector.

PMW-PZ1 (rear)

4K/HD OUT

HDMI cable

HDMI input

Audio amp +
speakers

HDMI input

HDMI cable

VPL-VW1100ES
Video Projector

Preparation

Playable Formats

The unit supports the following file systems and formats.

File systems
- SxS memory cards, XQD memory cards[1]: exFAT, SxS UDF, FAT32
- External storage devices: exFAT, NTFS

1) When using a QDA-EX1 XQD ExpressCard adapter.

> **Note**
>
> Be sure to insert the XQD Express Card adapter in the proper orientation. Inserting it in an improper orientation may damage the card slot.

Video formats

See *"Playback Formats" (page 23)*.
Do not place video files in non-playable formats in folders for playback.

Audio formats

This unit supports PCM format audio playback only. AAC and other formats are muted.
The type of audio codec for each file is displayed on the list screen.

SxS Memory Cards

Use the following Sony SxS memory cards. Operation is not guaranteed for other memory cards.
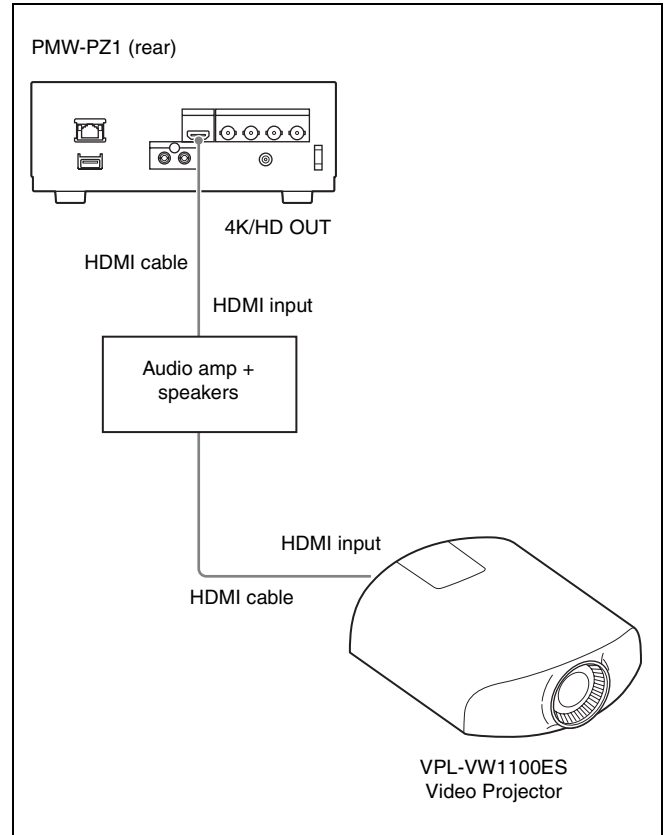- SxS PRO+
  SBP-256D/E, SBP-128B/C/D/E, SBP-64B/C/D/E
- SxS PRO
  SBP-64A, SBP-32 (HD)
- SxS-1
  SBS-128G1B, SBS-64G1A/B, SBS-32G1A/B (HD)

These cards comply with the ExpressCard standard.
You can also use XQD cards by using an adapter (not supplied).

For details and precautions on using SxS memory cards, refer to the operating instructions for the SxS memory card.

Inserting/ejecting SxS memory cards

Inserting SxS memory cards
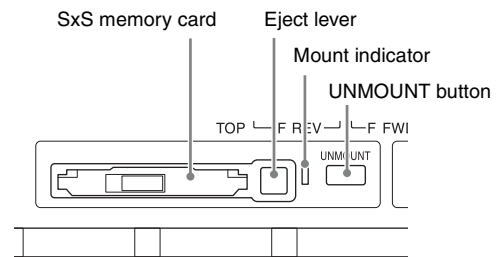
Be sure to insert SxS memory cards in the proper orientation and direction. When an SxS memory card is inserted and the unit recognizes it properly, the mount indicator lights.

Ejecting SxS memory cards

1 **Press the UNMOUNT button to the right of the SxS memory card slot.**
The mount indicator blinks while the unmount procedure is processing.

2 **Verify that the mount indicator has turned off, and then press the SxS memory card slot's eject lever to eject the card.**

> **Notes**
>
> - Be sure to insert or eject SxS memory cards only after the unit has finished starting up.
> - If you eject an SxS card while the mount indicator is lit, the data on the card may be damaged. Do not eject the card while it is being accessed (e.g., when copying is in progress).
> - Formatting or error recovery for SxS memory cards cannot be performed on the unit.
> - Do not move the unit while the eject lever is extended out.

XQD Memory Cards

You can use the unit to play back files stored on the following XQD memory cards by using a QDA-EX1 XQD ExpressCard adapter (not supplied).
- XQD G/XQD S (EB Stream)
- XQD N

For details on recording formats and recommended media, see "Recommended Media (XQD Memory Cards)" (page 22).

> **Note**
>
> Be sure to insert the XQD Express Card adapter in the proper orientation. Inserting it in an improper orientation may damage the card slot.

External Storage Devices

Files and folders cannot be accessed normally if the names of folders/files contain 2-byte characters (for example, Chinese/Japanese characters) or special symbols.

File playback

You can connect a USB drive, SSD/HDD, or other external storage device, and play back files stored on the device. (Transmission speed depends on the external storage, and may fluctuate irregularly.)

Notes

- If the mount indicator does not light even when a device is connected, try reconnecting the device.
- If an external storage device was previously connected to and operated on the unit and you want to connect the device to other equipment, be sure to verify the file system of the equipment beforehand.

Copying files

You can copy files from the SxS memory card to an external storage device.

Note

Normal accessing cannot be performed in the following cases.
- When multiple external storage devices are connected
- When multiple partitions exist on the external storage device

Safely removing external storage devices

Press the UNMOUNT button to the right of the EXT connector, verify that the mount indicator has turned off, and then remove the external storage device.

Notes

- If you eject an external storage device while the mount indicator is lit, the data on the device may be damaged. Do not eject the device while it is being accessed (e.g., when copying is in progress).
- Formatting or error recovery for external storage devices cannot be performed on the unit.
- If the transmission speed of the external storage device is slow, playback may not be smooth. The transfer speed of storage may vary.
- External storage devices that are bus-powered and have a current consumption 900 mA may not operate properly.

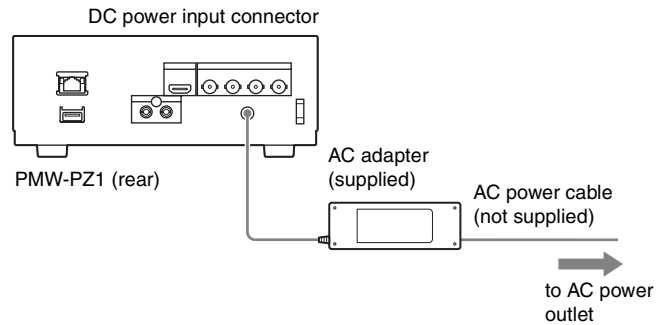### Connecting external storage on rear panel

The EXT2 connector on the rear panel can be used in the same way as the EXT connector on the front panel.
- The indicator is lit while the connector is in use.
- To disconnect external storage, press the UNMOUNT button on the front panel.
- The EXT connector and EXT2 connector cannot be used at the same time.

Power Supply

Connecting the power supply

Using the supplied AC adapter

DC power input connector

PMW-PZ1 (rear)

AC adapter (supplied)

AC power cable (not supplied)

to AC power outlet

Using the AC-DN10 (not supplied)

DC power input connector

PMW-PZ1 (rear)

AC-DN10 (not supplied)

to AC power outlet

XLR 4-pin DC power adapter cable (not supplied)
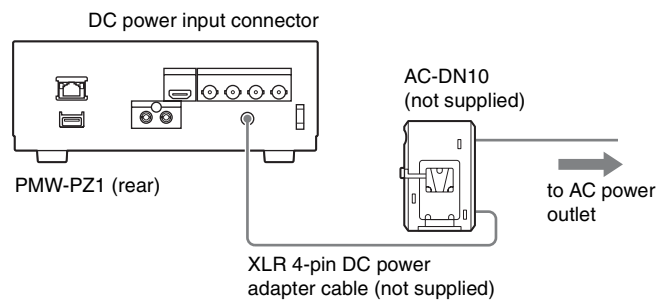
Turning the unit on

Press the power button while the power button indicator is lit red.
The indicator lights green, and the unit starts up. (The startup procedure takes about 2 minutes.)
When startup is complete, the list screen *(page 8)* or thumbnail screen *(page 8)* appears.

Turning the unit off

1 **Pause file playback, and press the UNMOUNT button on the front panel of the unit.**

2 **Press and hold the power button for at least 1 second, and release it when the power indicator starts blinking green.**
When the unit turns off, the power indicator lights red.

Note

A forced shutdown occurs when you press and hold the power button for approx. 5 seconds. As this may negatively affect the unit's internal SSD, do not perform this unless necessary.

Using the Unit for the First Time

When using the unit for the first time, configure the following menu items *(page 16)*.
- TIME ZONE
- LOCAL DATE
- LOCAL TIME

Playing Back Files

Displaying the List Screen and Thumbnail Screen

THUMBS/LIST button

Press the THUMBS/LIST button to display the list screen or thumbnail screen.

List Screen Display and Operations

List screen display

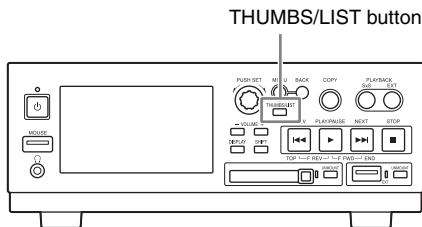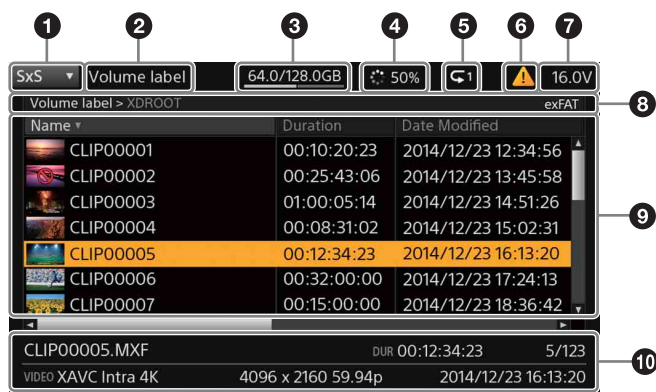The above is an example of an SxS memory card's list. [EXT] is displayed in ❶ for an external storage device, but you can refer to the following for the other items.

❶ **Drive selected for playback (SxS or EXT)**

❷ **Volume label**

❸ **Storage capacity (remaining/total)**

❹ **File loading status**
This may appear when the file list screen is displayed. Playback cannot be started while files are being loaded.

❺ **Various icons**
Displays the status of [PLAY MODE] and other menu items using icons *(page 20)*.

❻ **Warning indicator** *(page 20)*

❼ **Power supply voltage indicator**
This appears when the power supply voltage is less than 18.0 V. A warning indicator will also appear if the voltage drops below the value configured in the [DC IN VOLTAGE ALARM] menu item.

❽ **Folder path and file system**
Displays the folder currently being displayed and the folder above it.

❾ **File list**
Displays the file name, recording format, data size, file length, date, etc. of each file. Files that cannot be played back by the unit will be indicated by an icon on their thumbnails.

❿ **Information on current file**
Displays information on the currently selected file. (File name, file length, file number/total number of files, recording format, date, etc.)

List screen operations

Function	Operation
Selecting a file	Turn the PUSH SET dial. When a folder is selected, press the dial to display the next (lower) level in the directory. You can also press the PREV and NEXT buttons. • When you press the PREV button while holding the SHIFT button, the first file of the current folder will be selected. • When you press the NEXT button while holding the SHIFT button, the last file of the current folder will be selected.
Playing back a selected file	Press the PLAY/PAUSE button.
Opening the selected file in a paused state	Press the PUSH SET dial.
Displaying the previous (higher) level in the directory	Press the BACK button.
Switching to the thumbnail screen	Press the THUMBS/LIST button.
Switching to the menu screen	Press the MENU button *(page 14)*.
Accessing the SxS memory card	Press the PLAYBACK SxS button.
Accessing the external storage device	Press the PLAYBACK EXT button.
Switching to the copy screen	Press the COPY button *(page 13)*.
Displaying file information	Turn the PUSH SET dial while holding the SHIFT button. (Scroll horizontally.)

Thumbnail Screen Display and Operations

Thumbnail screen display

When you press the THUMBS/LIST button in the list screen, the file list is displayed as thumbnails as follows.

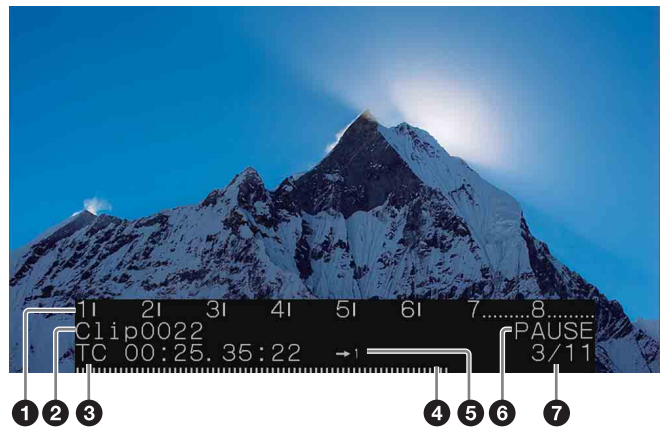File name   Unplayable file

Thumbnail screen operations

Function	Operation
Selecting a file	Turn the PUSH SET dial. When a folder is selected, press the dial to display the next (lower) level in the directory. You can also press the PREV and NEXT buttons. • When you press the PREV button while holding the SHIFT button, the first file of the current folder will be selected. • When you press the NEXT button while holding the SHIFT button, the last file of the current folder will be selected.
Playing back a selected file	Press the PLAY/PAUSE button.
Opening the selected file in a paused state	Press the PUSH SET dial.
Displaying the previous (higher) level in the directory	Press the BACK button.
Switching to the list screen	Press the THUMBS/LIST button.
Switching to the menu screen	Press the MENU button *(page 14)*.
Accessing the SxS memory card	Press the PLAYBACK SxS button.
Accessing the external storage device	Press the PLAYBACK EXT button.
Switching to the copy screen	Press the COPY button *(page 13)*.

File Playback Display and Operations

File playback display

During file playback, the video is displayed on the unit's LCD display and the monitor connected to the unit.
When you press the DISPLAY button on the front panel, the following text information is superimposed on the display.

❶ **Audio level meter/warning message (3-line display mode only)**

❷ **File name**

❸ **Playback timecode**

❹ **Playback position (bar indicator in 3-line display mode)**
Configure using the MAINT menu *(page 16)*.

❺ **Various icons** *(page 20)*

❻ **Playback status (PLAY/PAUSE/F.FWD/F.REV)**

❼ **Playback clip number / Power supply voltage**
Displays the clip number and the number of clips in the current folder during playback.
Displays the supply voltage if the voltage is less than 18.0 V.

File playback operations

Function	Operation
Playing/pausing	Press the PLAY/PAUSE button.
Fast forwarding (F.FWD) (×2 → ×4 → ×8 → ×16 → ×32 → ×64 → ×128)	Press the NEXT button while holding the PLAY/PAUSE button. The playback speed changes with each press.
Fast rewinding (F.REV) (×1 → ×2 → ×4 → ×8 → ×16 → ×32 → ×64 → ×128)	Press the PREV button while holding the PLAY/PAUSE button. The rewind speed changes with each press.
Moving to the last frame of the file currently being played back	Press the NEXT button while holding the SHIFT button. (During continuous playback, you will move to the last frame of the last file.)
Moving to the starting frame of the file currently being played back	Press the PREV button while holding the SHIFT button. (During continuous playback, you will move to the starting frame of the first file.)
Playing the file currently being played back from the beginning	Press the PREV button. (If pressed within 1 sec. of the start point, the previous file will be played back.)
Playing from the beginning of the previous file in the list	Press the PREV button within 1 sec. of the current file's start point. The first file in the list will always be played back from its start point.

| Function	Operation
Playing from the beginning of the next file in the list	Press the NEXT button. For the last file in the list, this moves to the last frame of the file.
Stopping playback and returning to the previous screen	Press the STOP button.

Notes

- The visual appearance of fast forward and fast rewind operations depends on the file format.
- It may take some time before playback starts, depending on the file size.
- Audio that has been set to non-audio will be muted.
- Folders, such as the XDROOT folder created by camcorders, are special folders. Do not modify such folders on a computer.
- Lists are created in the XDROOT folder based on the metadata stored in the folder.
  In other folders, lists are created as each file is loaded. Therefore, depending on the number of files, list display may take longer.

Mouse Operations

You can operate the unit using a mouse connected to the MOUSE connector on the front panel.
If the mouse is not recognized, try reconnecting it.

Displaying the mouse operation items

When you click a drive type (SxS or EXT) in the list screen or thumbnail screen, the following items appear.

Mouse operation items
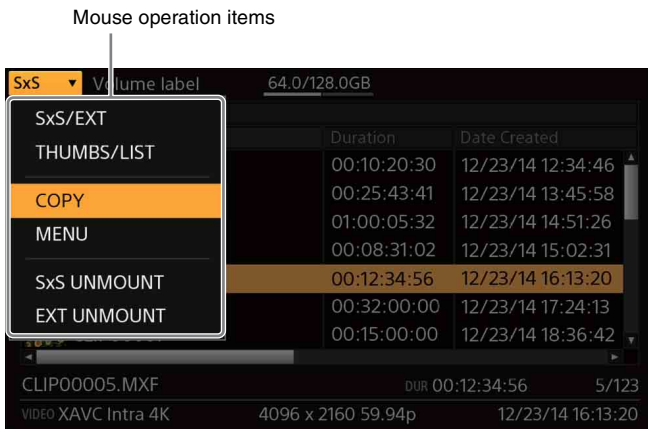
You can perform the following operations by selecting the items. However, operations cannot be performed while copying is in progress.

- Switching the selected drive (SxS/EXT)
- Switching between the list screen and thumbnail screen
- Displaying the copy screen
- Displaying the menu screen
- Safely removing SxS memory cards
- Safely removing external storage devices

File playback operations

Function	Mouse operation
Starting playback	Double-click a file in the list screen or thumbnail screen.
Playing/pausing	Click (during fast forward/fast rewind, this pauses playback, while clicking again returns playback to ×1 speed). Playback switches between play and pause with each press.
Fast forwarding (×2 → ×4 → ×8 → ×16 → ×32 → ×64 → ×128)	Click and drag to the right during playback. The playback speed changes with each press.
Fast rewinding (×1 → ×2 → ×4 → ×8 → ×16 → ×32 → ×64 → ×128)	Click and drag to the left during playback. The rewind speed changes with each press.
Moving to the beginning of the next file	Right-click and drag to the right.
Moving to the beginning of the previous file	Right-click and drag to the left.
Moving to the beginning of the current file	Right-click and drag up.
Moving to the end of the current file	Right-click and drag down.
Stopping playback and returning to the file list screen	Double-click.

Notes

- Do not operate the unit using a browser, a mouse, or the buttons on the unit at the same time.
- Wait for the mouse operation to be reflected on the screen before performing the next operation.
- Reconnect the mouse if the mouse cursor disappears or the screen goes dark.

Special Playback Functions

Frame-by-frame Playback

Pressing the COPY button during file playback or playback pause state switches the mode to STILL mode.
The PLAY/PAUSE button, PREV button, and NEXT button start flashing.
- To play frame-by-frame, press the PREV button or NEXT button.
- To cancel STILL mode, press the COPY button, PLAY/PAUSE button, or STOP button.
- Frame-by-frame playback is not supported for consecutive files, even when [PLAY MODE] is set to "ALL."
- The time required to advance by frame depends on the file format.

Seamless Playback

Files in the same format and with the same system frequency can be played back seamlessly when played consecutively.

Limitations

- Clips of duration of 1 second or less cannot be played seamlessly.
- Seamless playback may not be possible, depending on the data quantity, recording state, and buffering state in the vicinity of the clip end point.
- Seamless playback is not possible if the playback start position or playback mode change position occurs within 1 second prior to the playback end point.
- A region between an IN point and OUT point may not be played seamlessly, depending on the format of the clip.
- If frame advance or frame reverse operation is initiated just before switching files, file switching may occur and playback will move to the start of the next file.
- Seamless playback is not supported on media in devices, such as the PDW-U2, where a finite time is required to switch between files.

Playlist Playback

Use the following procedure to create a playlist sequence and play the playlist.
The playlist operation shown below uses the list screen, but the thumbnail screen can also be used.
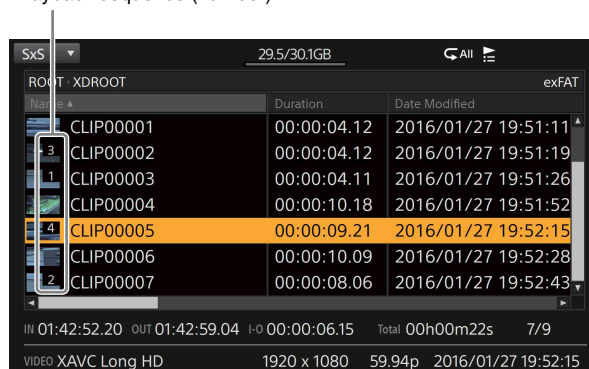
Creating a Playlist

1 Set [PLAYLIST/IN-OUT] to "On" in the menu.

2 Select a file on the list screen, then press and hold the SHIFT button and press the PUSH SET dial.
The playback sequence is indicated by a number on the thumbnail for the file.
The playback sequence is also displayed in the [Playlist] field in the list.

Playback sequence (number)

To delete a file from a playlist, select the file, then press and hold the SHIFT button and press the PUSH SET dial.

> **Note**
>
> Playlists are removed in the following cases.
> - When memory card or external storage is removed.
> - When the unit is turned off.
> - When [PLAYLIST/IN-OUT] is set to "Off" in the menu.
> - When [ALL RESET] is executed in the menu.
> - When the [FILE LISTING] value is changed in the menu.

Playing a Playlist Sequence

1 Check that [PLAYLIST/IN-OUT] is set to "On" in the menu.

2 Press and hold the STOP button and press the PLAY/PAUSE button or PUSH SET dial (when starting from stop state).
Playback starts in sequence from the start of the playlist.
The power supply indicator is lit blue.
(If only the PLAY/PAUSE button is pressed, normal playback of the file at the cursor position occurs.)

IN Point to OUT Point Playback

Setting an IN Point and OUT Point

You can set an IN point and OUT point for each file.

1 Set [PLAYLIST/IN-OUT] to "On" in the menu.

2 Select the file to set and press the PLAY/PAUSE button to start playback.

3 At the point to set as the IN point, press and hold the SHIFT button and press the VOLUME – button.

4 At the point to set as the OUT point, press and hold the SHIFT button and press the VOLUME + button.
The IN point and OUT point information is displayed on the list screen.
(To scroll the list screen left/right, press and hold the SHIFT button and turn the PUSH SET dial.)

IN point and OUT point display

- To delete an IN point or OUT point, press and hold the SHIFT button and press the VOLUME (– or +) button for a few seconds.
(Points can also be deleted on the list screen.)
- If an OUT point has not been set, the end of the file is treated as the OUT point.
- If an IN point has not been set, the start of the file is treated as the IN point.

Notes

- IN points and OUT points are removed in the following cases.
  – When memory card or external storage is removed.
  – When the unit is turned off.
  – When [PLAYLIST/IN-OUT] is set to "Off" in the menu.
  – When [ALL RESET] is executed in the menu.
  – When the [FILE LISTING] value is changed in the menu.
- If an IN point or OUT point is set for a file that already has an IN point or OUT point, the existing point is replaced.
- An IN point cannot be placed to the right of an OUT point. An OUT point cannot be placed to the left of an IN point.
- An IN point and OUT point can only be set during normal playback started using the PLAY/PAUSE button.

Playing the Region Between IN Point and OUT Point

1 Check that [PLAYLIST/IN-OUT] is set to "On" in the menu.

2 Select a file, then press and hold the STOP button and press the PLAY/PAUSE button or PUSH SET dial (when starting from stop state).
The IN point to OUT point region is played back. If the file is in a playlist, the region is also played during playlist playback. The power supply indicator is lit blue.
(If only the PLAY/PAUSE button is pressed, normal playback of the file at the cursor position occurs.)

Copying Files

You can copy files from the SxS memory card to an external storage device.

When you connect the copy source (SxS memory card) and copy destination (external storage device) devices and press the COPY button, the following screen appears.
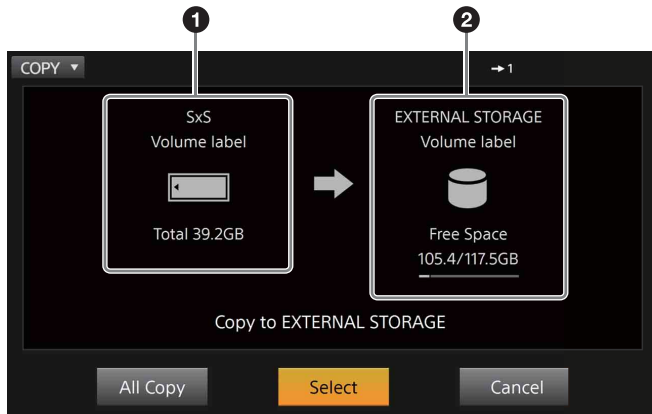
❶ **Copy source SxS memory card information**

❷ **Copy destination external storage device information**

Copying All Files

When you perform copying, a folder is created in the root of the external storage device, and all of the data stored on the SxS memory card will be copied to that folder.

1 **Turn the PUSH SET dial to select [All Copy].**

2 **Press the dial.**
Copying starts, and the following screen appears.

Notes

- A log is created in the copy destination folder.
- If the file system of the external storage device differs from that of the SxS memory card, the copy operation may not complete properly.
- The size displayed before copying starts is a simple estimate. If the storage capacity proves insufficient after copying starts, the copy operation may be canceled.
- Be especially careful of power or cable disconnections during copy operations. If a power or cable disconnection occurs while copying is in progress, you may need to perform a recovery of the external storage device. In such cases, connect the device to a computer, and perform the recovery operation on the computer.

Canceling the copying operation

To cancel while copying is in progress, turn the PUSH SET dial to select [Cancel], and press the dial.
Then select [OK] to cancel copying.

Note

When you cancel copying, the files and folders copied up to that point will remain on the external storage device.

Selecting and Copying Files

1 **Select [Select] on the Copy screen. On screens other than the Copy screen, press and hold the SHIFT button and press the COPY button.**

2 **Select the file or folder you want to copy, then press and hold the SHIFT button and press the SET button.**
A check mark is added.

3 **Repeat step 2 to select all the files you want to copy.**
The total data size of the selected files is displayed at the bottom left.

Check marks
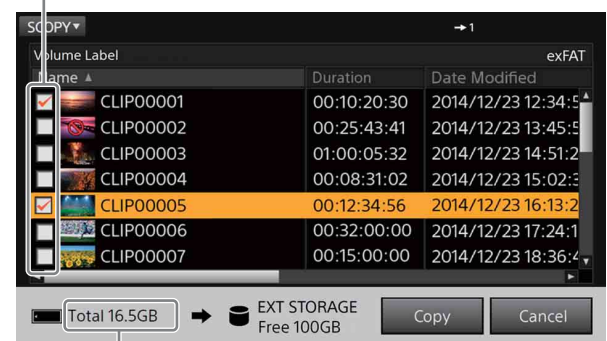
Total data size

4 **Select [Copy].**

Notes

- If a folder is selected, all files in the folder will be copied (including any text or other files not displayed in the list).
- The PDW-U2 cannot be set as the copy destination.
- The file selection is canceled in the following cases.
  – When a folder is moved.

– When switching the screen display using the PLAYBACK SxS button or PLAYBACK EXT button.
– When copying is finished.

Menus

Basic Menu Operations

When you press the MENU button, the following menu screen appears.

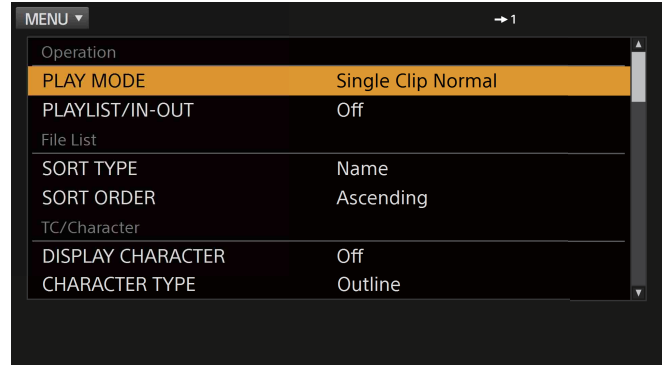| MENU ▼	→1
Operation	
PLAY MODE	Single Clip Normal
PLAYLIST/IN-OUT	Off
File List	
SORT TYPE	Name
SORT ORDER	Ascending
TC/Character	
DISPLAY CHARACTER	Off
CHARACTER TYPE	Outline

1 Turn the PUSH SET dial to select a menu item, and press the dial to confirm.
Setting values appear.

2 Turn the PUSH SET dial to select a setting value, and press the dial to confirm. Then select [OK] or [Cancel], depending on the item.
To return to the previous screen without configuring the setting, press the BACK button.

Menu Items and Setting Values

(Bold and underlined values indicate defaults.)

Category	Item	Description	Setting value/item
Operation	PLAY MODE	Continuous playback mode used during playback	**Single Clip Normal**: Play back a single file, and stop at the last frame when playback ends. Single Clip Repeat: Repeat playback of a single file. All Clip Normal: Continuously play back all files in the folder. All Clip Repeat: Repeat continuous playback of all files in the folder.
	PLAYLIST/ IN-OUT	Playlist playback, IN-OUT playback on/off	**Off** On (Playback mode set using [PLAY MODE].)

| Category	Item	Description	Setting value/item
File List	SORT TYPE	File sorting method	**Name**: File name Duration: File length Date Modified: Modification date Format: Format Resolution: Resolution Frame Rate: Frame rate Type: File type Size: File size Date Created: Creation date (year, month, day) Start TC: Timecode of the beginning of the file Audio Codec: Audio codec Playlist: Playlist In TC: IN-point timecode Out TC: OUT-point timecode I-Out Duration: Duration between IN and OUT points
	SORT ORDER	File sorting sequence	**Ascending**: Ascending order Descending: Descending order
TC/ Character	DISPLAY CHARACTER	Number of text display lines	**Off** 3 Lines 2 Lines
	CHARACTER TYPE	Background color of text display area	With Background Outline: Black **With Translucent Background**: Semi-transparent Outline: White letters with black outlines Without Background: No background
	CHARACTER SDI/HDMI OUT	Whether to superimpose DISPLAY button text information on SDI/HDMI outputs	**Off**: Do not display on SDI/HDMI SDI: Display on SDI HDMI: Display on HDMI SDI/HDMI: Display on both SDI/HDMI
	CHARACTER AUDIO LEVEL METER	Audio level meter display function on/off (when the text display area is set to display 3 lines)	**Off** On

Category	Item	Description	Setting value/item
Audio	PHONE VOLUME	Volume for headphones audio output	**0** to 99
	AUDIO MONITOR SELECT	Channel for headphones audio output	L: **CH1** to CH6 (MIX supported) R: CH1, **CH2** to CH6 (MIX supported) (CH7 and above cannot be selected.)
	AUDIO MONITOR DELAY	Selects the output destination matching the headphones and analog output delay	**SDI** HDMI
	HDMI AUDIO CHANNEL	Selects the number of audio channels to embed in HDMI	**2ch**: 2 channels 6ch: 6 channels (8 channels cannot be output)
Video	HDMI FORMAT LIMIT	HDMI down conversion settings	**Auto**: Set automatically according to the monitor. 4K: Output in formats up to 4K. (For output to PVM-X300) QFHD: Output in formats up to QFHD. HD: Output in HD format.
	SDI FORMAT LIMIT	SDI down conversion settings	**4K**: 4K is output as 4K, and HD is output as HD, without limit. QFHD: Limited to QFHD. HD is output as HD. HD (3G Single) HD (1.5G Single Link)
	SDI MODE (4K 50/60P)	SDI signal format for playback of 4K/QFHD 60P/50P files (parentheses indicate abbreviated display in list)	2-Sample Interleave 3G Level A ×4 (2SI 3G Level A ×4) **2-Sample Interleave 3G Level B ×4 (2SI 3G Level B ×4)** Square Division 3G Level A ×4 (SQD 3G Level A ×4) Square Division 3G Level B ×4 (SQD 3G Level B ×4)
	SDI MODE (4K UNDER 30P)	SDI signal format for playback of 4K/QFHD 30P files or lower (parentheses indicate abbreviated display in list)	**2-Sample Interleave 3G Level B ×2 (2SI 3G Level B ×2)** Square Division 3G Level B ×2 (SQD 3G Level B ×2) Square Division 1.5G ×4 (SQD 1.5G ×4)

Category	Item	Description	Setting value/item
Video	SDI MODE (HD 50/60P)	3G SDI data mapping type for menu screen display and HD 60P/50P file playback	3G Level A: 1.5G-only formats are output at 1.5G. **3G Level B**: 1.5G-only formats are output at 1.5G.
	SDI P/PsF OUT	SDI signal format for playback of HD 30P files or lower (parentheses indicate abbreviated display in list)	**Progressive (P)** Progressive Segmented Frame (PsF)
Copy	COPY VERIFY	Verify function for copying operations	Disable: Disable **Enable**: Enable
Brightness	LCD BRIGHTNESS	LCD brightness adjustment	1 to **8** to 15
	GRAPHIC BRIGHTNESS	Brightness of list screens, etc. (no effect on playback screen)	**Max**: Bright High: Moderately bright Middle: Moderately dark Low: Dark
Network	NETWORK CONNECTION	Network function enable/disable	**Disable**: Disable Enable: Enable
	NETWORK CONFIGURATION (TCP/IPv6)	IPv6 address settings	Obtain IP address automatically (obtains address from DHCP server) IP address Subnet prefix length
	NETWORK CONFIGURATION (TCP/IPv4)	IPv4 address settings	Obtain IP address automatically (obtains address from DHCP server) IP address Subnet prefix length
	NETWORK PASSWORD	Password setting used when connecting from a network	Default password: pmw-pz1

Category	Item	Description	Setting value/item
System	FILE LISTING	Sets whether to display all files/folders in the XDROOT, BPAV, PDROOT, and M4ROOT folders.	**Listing with Index (Quick)**: List items based on enabled index, where available. Listing without Index (All Files): List items normally, even if enabled data is available (disabled when a PDW-U2 is connected).
	WARNING MESSAGE	Display issued warning messages	–
	TIME ZONE	Difference from UTC (Coordinated Universal Time)	**00:00 UTC** −12:00 to +13:00
	LOCAL DATE	Year, month, day	Year, Month, Day **Preset date and time**
	LOCAL TIME	Hour, minute, second	Hour, Minute, Second **Preset date and time**
	DC IN VOLTAGE ALARM	Value at which low voltage warnings are started	11.0 to **11.9** to 15.0 V (0.1 V increments)
	SETUP RESET	Restore default menu setting values. (Excluding TIME ZONE, LOCAL DATE, LOCAL TIME)	OK: Execute **Cancel**: Cancel
	VERSION	Model name / serial number, software version, hardware version display	–

MAINT Menu

The MAINT menu is displayed by pressing and holding the SHIFT button and then pressing the MENU button. The following functions can be activated.
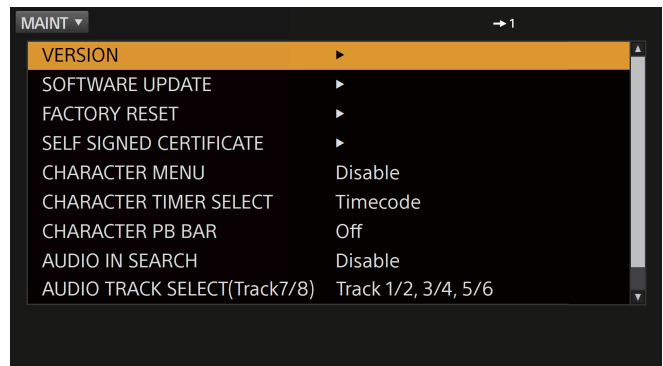
Item	Description	Display/item
VERSION	Displays the version of each item.	OK: Return to level above.
SOFTWARE UPDATE	Update the unit.	OK: Execute Cancel: Abort update and return to previous level.
FACTORY RESET	Restore default setting values.	OK: Execute Cancel: Cancel
SELF SIGNED CERTIFICATE	Configure a self-signed certificate.	**Default** Change common name IPv6 Change common name IPv4
CHARACTER MENU	Enable the menu function in the character area.	**Disable**: Disable Enable: Enable
CHARACTER TIMER SELECT	Set the timecode for display in the character area.	**Timecode** Timer
CHARACTER PB BAR	Display the current playback position in the character area.	**Off** ON
AUDIO IN SEARCH	Output audio during searches.	**Disable**: Disable Enable: Enable
AUDIO TRACK SELECT (Track7,8)	Set audio output on tracks 7 and 8. (8 tracks cannot be output simultaneously)	**Track1,2, 3,4, 5,6** Track1,2, 3,4, 7,8 Track1,2, 7,8, 5,6 Track7,8, 3,4, 5,6
MPEG 1440×1080 SIMPLE PB	Perform simple playback of MPEG 1440×1080 files. (using 1440 × 1920 simple filter)	**Disable**: Disable Enable: Enable

Network Function

The following actions can be controlled using a web browser by connecting the unit to a PC, tablet, or other device using a LAN cable.
- Basic operations on the list screen.
- Change menu settings (excluding network-related items)
- File playback operations

Connecting

Connect the CONTROL connector on the rear panel of the unit to a PC, tablet, or other device using a LAN cable.

Note

If there is a cover on the rear panel, unscrew the two screws securing the cover and remove the cover.

CAUTION

- For safety, do not connect the connector for peripheral device wiring that might have excessive voltage to the CONTROL connector. Follow the instructions for this connector.
- When you connect the CONTROL connector of the unit to peripheral device, use a shielded-type cable to prevent malfunction due to radiation noise.

CONTROL connector
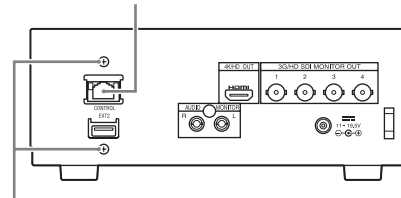
Cover retaining screws

Configuring the Network Settings

1 **Set [NETWORK CONNECTION] to "Enable" in the menu.**
The network connection is enabled.

2 **Set [IP Address] and [Subnet prefix length] in the [NETWORK CONFIG (TCP/IPv4)] or [NETWORK CONFIG (TCP/IPv6)] settings.**
- To obtain an IP address automatically, place a check mark in [Obtain IP address automatically].
- To set the address manually, clear the check mark in [Obtain IP address automatically] and set the [IP address] and [Subnet prefix length].
The currently configured IP address can be checked using [VERSION] in the menu.

3 **Press [OK].**
The network configuration is applied.

Operating the Unit using a Browser

Recommended operating system: Windows 7 or later
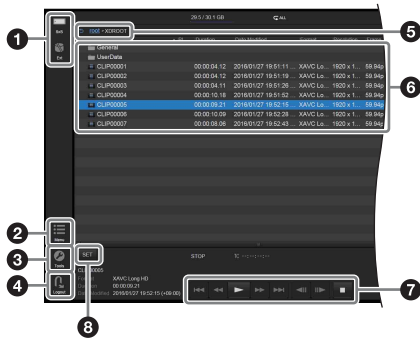Recommended browser: Google Chrome

1 **Launch the browser, and access the following URL.**
https://[IP ADDRESS]/

2 **Enter the following on the log on screen.**
Access user name: **admin**
Default password: **pmw-pz1**
The list screen appears in the browser.

Parts and functions of browser screen

No.	Display	Mouse operation
❶	SxS, EXT	Click to switch the target media for playback. The function is identical to the PLAYBACK SxS/EXT buttons on the front panel of the unit.
❷	MENU	Click to display the menu. The function is identical to the MENU button on the front panel of the unit.
❸	Tools	Click to select the following options. • Upload: Upload PC files to the root directory of external storage (HDD or SSD) connected to the unit (excluding ODA and PD). • Refresh: Reload files. • About PMW-PZ1 Controller: Displays information about the unit.
❹	Logout	Click to log out.
❺	Folder path	Click a link in the path to move to that folder.
❻	File list	Double-click a file to start playback. The list displays the folder contents.
❼	Control buttons	Click during file playback to control playback.
❽	SET button	• Not during file playback: Select a folder and click to move to that folder. Select a file and click to start playback and pause at the first frame. • During file playback: Select a file and click to start playback.

(During file playback, only the control buttons and SET button can be operated.)

Notes

• Playing a file while uploading the file may result in an underflow condition (playback file loading is too slow). If the ⚠ icon appears in the text display area while uploading, finish uploading the file and then start playback.
• Thumbnails are not displayed in a browser.

• The unit should not be operated from a browser and directly using the buttons on the unit at the same time.
• Do not connect using two or more browsers at the same time.
• Copying from SxS to EXT is not supported from a browser.
• Some menu items, such as network-related items, cannot be set from a browser.
• If an error is displayed when uploading files, change the file name and try to upload again.

Changing the Network Password

Use the following procedure to change the password used for network log on from a browser.

1 **Select [New Password] in [NETWORK PASSWORD] in the menu.**
Turn the PUSH SET dial to select a character, and press [SET] to enter the character.
Repeat the operation to set the password.

2 **Use the same procedure to set the "Confirm Password" field.**

3 **Press [OK].**
The password is updated.

Note

The "admin" access user name cannot be changed.

Other Functions

Previewing PDW-U2 Files

You can preview files on a Professional Disc in a PDW-U2 drive.

1 **Connect the PDW-U2 to the EXT connector on the unit using a USB 3.0 cable.**
Selecting "EXT" on the list screen displays the PDW-U2 file list.

2 **Select the file to preview, and press the PLAY/PAUSE button.**

Supported files for previewing
Refer to the following items in the table at the back of this document.
- XDCAM MPEG HD422
- XDCAM MPEG HD420

Notes

- Files cannot be copied to the PDW-U2.
- There may be a short delay before previewing starts.
- An underflow condition may occur.
- Response to rapid operations may not reflected.

Copying Files to ODS-D77U/ODS-D55U/ODS-D280U

You can copy files on an SxS memory card to the ODS-D77U/ODS-D55U/ODS-D280U.
Connect the ODS-D77U/ODS-D55U/ODS-D280U to the EXT connector of the unit using a USB 3.0 cable to display the device as the copy destination on the Copy screen.
You can copy a file or multiple files at the same time.

Notes

- Files on the ODS-D77U/ODS-D55U/ODS-D280U cannot be previewed on the unit.
- Uploading from a browser is not supported.
- The maximum number of files on an ODA cartridge is 30,000 files per reel.

Down Conversion Function

You can set the output format limit using the following menu items.
- HDMI FORMAT LIMIT
- SDI FORMAT LIMIT
Formats that exceed the limit are down converted for output.
The down-conversion processing of this unit is calculated by simple average of neighboring pixels (maximum of 8 points).

Notes

- The left and right edges are cut when down converting from 4K only (not QFHD) to HD.
- When a PVM-X300 is connected to the unit using an HDMI connection, set [HDMI FORMAT LIMIT] to "4K" in the menu.
- When down converting 4K 59.94P/50P files to HD, HD 59.94P/50P is output from the HDMI connector.

SSD Playback after Linear Editing in XDCAM Station

Playback of PSZ-SA25/SA48 after linear editing using XDS-PD2000 is supported.

Usage Precautions

If the unit is suddenly taken from a cold to a warm location, or if ambient temperature suddenly rises, moisture may form on the outer surface of the unit and/or inside of the unit. This is known as condensation. If condensation occurs, turn off the unit and wait until the condensation clears before operating the unit. Operating the unit while condensation is present may damage the unit.

The LCD panel fitted to this unit is manufactured with high precision technology, giving a functioning pixel ratio of at least 99.99%. Thus a very small proportion of pixels may be "stuck", either always off (black), always on (red, green, or blue), or flashing. In addition, over a long period of use, because of the physical characteristics of the liquid crystal display, such "stuck" pixels may appear spontaneously. These problems are not a malfunction.

The fan and battery are consumable parts that will need periodic replacement.
When operating at room temperature, a normal replacement cycle will be about 5 years.
However, this replacement cycle represents only a general guideline and does not imply that the life expectancy of these parts is guaranteed. For details on parts replacement, contact your dealer.

The life expectancy of the AC adapter and the electrolytic capacitor is about 5 years under normal operating temperatures and normal usage (8 hours per day; 25 days per month). If usage exceeds the above normal usage frequency, the life expectancy may be reduced correspondingly.

Messages and Icons

Warning Messages

ID	Message	Description	Solution
W101	Low voltage	DC IN voltage is low.	Check the supply voltage.
W102	Backup Battery Low	Backup battery remaining capacity is low.	Request battery replacement with Sony service representative.
W103	Backup Battery End	Backup battery is dead.	
W201	Fan Stopped	Fan has stopped.	Replace the fan.
W202	High temperature	Internal temperature is high.	Check the ventilation and air intake/exhaust vents.
W301	Restore SxS Card	An SxS card error occurred, and restoration is required.	Run storage error check using a PC.
W302	Restore EXT Device	An EXT error occurred, and restoration is required.	
W304	Not SuperSpeed USB	The EXT connection is not USB 3.0.	Check the connector, connection, and storage.
W401	SxS Underflow	An SxS underflow occurred.	Use storage with a higher transfer rate.
W402	EXT Underflow	An EXT underflow occurred.	
W802	Set LOCAL DATE/TIME	A local date/time mismatch occurred.	Reconfigure the date and time in the menu.

Icons

Icon	Meaning	
	List screen/thumbnail screen	**Text display area during playback**
⚠	A warning was issued. For details, see *"Warning Messages" (page 20)*.	
→1	[PLAY MODE] is set to "Single Clip Normal" in the menu.	
↻1	[PLAY MODE] is set to "Single Clip Repeat" in the menu.	
→All	[PLAY MODE] is set to "All Clip Normal" in the menu.	
↻All	[PLAY MODE] is set to "All Clip Repeat" in the menu.	
▶	[PLAYLIST/IN-OUT] is set to "ON."	Playlist playback or IN/OUT region playback using the STOP+PLAY/PAUSE button combination is in progress.
⚠	File upload is in progress.	

Specifications

General

Power supply
  11 V to 19.5 V DC
Power consumption
  Approx. 30 W (during 4K XAVC Intra 60P playback)
  Approx. 35 W (during copy from SxS memory card to external storage device)
Operating temperature
  5 °C to 40 °C (41 °F to 104 °F)
Storage temperature
  –20 °C to +55 °C (–4 °F to +131 °F)
Dimensions (WHD) (approx. values)
  212 × 84 × 200 mm (8 $^3/_8$ × 3 $^3/_8$ × 7 $^7/_8$ in.) (excluding protrusions, including feet)
Mass
  Approx. 2.3 kg (5 lb. 1.1 oz.)

File systems

SxS, XQD: exFAT, SxS UDF, FAT32
External storage devices: exFAT, NTFS

Playback formats (video)

See *"Playback Formats" (page 23)*.

Playback formats (audio)

Linear PCM 24 bits, 48 kHz
4 channels / up to 6 channels

Media drive

Media type: SxS Memory Card (ExpressCard/34) slot (1)

Inputs/outputs

3G/HD-SDI Monitor output
  BNC (4), 3G-SDI/HD-SDI
  SMPTE ST 424/425 Level A/B, SMPTE ST 292M standards
  Normally 4:2:2 10-bit (including 4K 50P/60P)
HDMI/4K/HD output
  Type A 19-pin (1) output
  4K 30P or lower: 4:2:2 10-bit
  4K 50P/60P: 4:2:0 8-bit
Analog audio output
  Phono jack (L, R), –11 dBu (reference level)
Headphones output
  Stereo mini jack (1)
Mouse connector
  Supports Microsoft USB Basic Optical Mouse (1)
External storage connector
  USM128GQX, PSZ-SA25, and PSZ-SA48 (Sony) USB 3.0 storage compatible
  Front panel (1), Rear panel (1)
  (Front and rear panel connectors cannot be used simultaneously.)
CONTROL connector
  1000BASE-T Ethernet (1)
DC input
  DC jack, 11 V to 19.5 V

Miscellaneous functions

Display
  3.5-inch color LCD monitor: 960 (H) × 3 (RGB) × 540 (V), 16:9

Supplied accessories

AC adapter (19.5 V (excluding AC cable))
Before Using This Unit (1)
Operating Instructions (CD-ROM) (1)

Optional accessories

AC-DN10 AC adapter
QDA-EX1 XQD ExpressCard adapter
XLR 4-pin - DC power adapter cable
  (service part number: 1-849-004-xx)

Design and specifications are subject to change without notice.

Notes

- Always verify that the unit is operating properly before use. SONY WILL NOT BE LIABLE FOR DAMAGES OF ANY KIND INCLUDING, BUT NOT LIMITED TO, COMPENSATION OR REIMBURSEMENT ON ACCOUNT OF THE LOSS OF PRESENT OR PROSPECTIVE PROFITS DUE TO FAILURE OF THIS UNIT, EITHER DURING THE WARRANTY PERIOD OR AFTER EXPIRATION OF THE WARRANTY, OR FOR ANY OTHER REASON WHATSOEVER.
- SONY WILL NOT BE LIABLE FOR CLAIMS OF ANY KIND MADE BY USERS OF THIS UNIT OR MADE BY THIRD PARTIES.
- SONY WILL NOT BE LIABLE FOR THE TERMINATION OR DISCONTINUATION OF ANY SERVICES RELATED TO THIS UNIT THAT MAY RESULT DUE TO CIRCUMSTANCES OF ANY KIND.

Appendix

Recommended Media (XQD Memory Cards)

Yes: Recommended media
No: Normal operation not guaranteed

Format			XQD G XQD S (EB Stream)	XQD N	Discontinued XQD H XQD S (non EB Stream)
			32/64/128 GB	32/64 GB	16/32/64 GB
XAVC-I	4096×2160	59.94P	Yes	No	No
		50P	Yes	No	No
		29.97P	Yes	No	No
		25P	Yes	No	No
		23.98P	Yes	No	No
	3840×2160	59.94P	Yes	No	No
		50P	Yes	No	No
		29.97P	Yes	No	No
		25P	Yes	No	No
		23.98P	Yes	No	No
	1920×1080	59.94P	Yes	No	No
		50P	Yes	No	No
		29.97P	Yes	Yes	No
		25P	Yes	Yes	No
		23.98P	Yes	Yes	No
XAVC-L	3840×2160	59.94P	Yes	Yes	No
		50P	Yes	Yes	No
		29.97P	Yes	Yes	No
		25P	Yes	Yes	No
		23.98P	Yes	Yes	No
	1920×1080	59.94P	Yes	Yes	Yes
		50P	Yes	Yes	Yes
		29.97P	Yes	Yes	Yes
		25P	Yes	Yes	Yes
		23.98P	Yes	Yes	Yes

Playback Formats

✓ : available

4K (4096 × 2160)	59.94P	50P	29.97P	25P	24P	23.98P
XAVC Intra 4K (.MXF) Class 480	–	–	✓	✓	✓	✓
XAVC Intra 4K (.MXF) Class 300	✓	✓	✓	✓	✓	✓

QFHD (3840 × 2160)	59.94P	50P	29.97P	25P	23.98P
XAVC Intra QFHD (.MXF) Class 480	–	–	✓	✓	✓
XAVC Intra QFHD (.MXF) Class 300	✓	✓	✓	✓	✓
XAVC Long QFHD (.MXF)	✓	✓	✓	✓	✓
XAVC S QFHD (.MP4)	✓	✓	✓	✓	✓

Full HD (1920 × 1080)	59.94P	50P	29.97P	25P	23.98P	59.94i	50i
XAVC Intra HD (.MXF) (Class 100)	✓	✓	✓	✓	✓	✓	✓
XAVC Long HD (.MXF)	✓	✓	✓	✓	✓	✓	✓
XAVC S HD (.MP4)	✓	✓	✓	✓	✓	–	–
XDCAM MPEG HD 422 (.MXF)	–	–	✓	✓	✓	✓	✓
XDCAM MPEG HD 420 (.MXF)	–	–	✓	✓	✓	✓	✓
XDCAM EX MPEG HD 420 (.MP4)	–	–	✓	✓	✓	✓	✓

HD 1440 (1440 × 1080) Simple Playback	59.94P	50P	29.97P	25P	23.98P	59.94i	50i
XDCAM MPEG HD 420 (.MXF)	–	–	✓	✓	✓	✓	✓
XDCAM EX MPEG HD 420 (.MP4)	–	–	✓	✓	✓	✓	✓

720P (1280 × 720)	59.94P	50P
XAVC Intra HD (.MXF)	✓	✓
XAVC Long HD (.MXF)	✓	✓
XDCAM MPEG HD 422 (.MXF)	✓	✓
XDCAM MPEG HD 420 (.MXF)	✓	✓
XDCAM EX MPEG HD 420 (.MP4)	✓	✓

Licenses

MPEG-4 Visual Patent Portfolio License

THIS PRODUCT IS LICENSED UNDER THE
MPEG-4 VISUAL PATENT PORTFOLIO LICENSE FOR THE
PERSONAL AND NON-COMMERCIAL USE OF A
CONSUMER FOR

(i) ENCODING VIDEO IN COMPLIANCE WITH THE MPEG-4
VISUAL STANDARD ("MPEG-4 VIDEO")
AND/OR
(ii) DECODING MPEG-4 VIDEO THAT WAS ENCODED BY A
CONSUMER ENGAGED IN A PERSONAL AND NON-
COMMERCIAL ACTIVITY AND/OR WAS OBTAINED FROM
A VIDEO PROVIDER LICENSED BY MPEG LA TO PROVIDE
MPEG-4 VIDEO.

NO LICENSE IS GRANTED OR SHALL BE IMPLIED FOR ANY
OTHER USE. ADDITIONAL INFORMATION INCLUDING
THAT RELATING TO PROMOTIONAL, INTERNAL AND
COMMERCIAL USES AND LICENSING MAY BE OBTAINED
FROM MPEG LA, LLC. SEE
HTTP://WWW.MPEGLA.COM

MPEG LA is offering licenses for (i) manufacturing/sales of any
storage media storing MPEG-4 Visual video information (ii)
distribution/broadcasting of MPEG-4 Visual video information in
any manner (such as online video distribution service, internet
broadcasting, TV broadcasting). Other usage of this product may be
required to obtain license from MPEGLA. Please contact MPEG LA
for any further information. MPEG LA, L.L.C., 250 STEELE
STREET, SUITE 300, DENVER, COLORADO 80206,
http://www.mpegla.com

MPEG-2 Video Patent Portfolio License

ANY USE OF THIS PRODUCT OTHER THAN CONSUMER
PERSONAL USE IN ANY MANNER THAT COMPLIES WITH
THE MPEG-2 STANDARD FOR ENCODING VIDEO
INFORMATION FOR PACKAGED MEDIA IS EXPRESSLY
PROHIBITED WITHOUT A LICENSE UNDER APPLICABLE
PATENTS IN THE MPEG-2 PATENT PORTFOLIO, WHICH
LICENSE IS AVAILABLE FROM MPEG LA, L.L.C., 250
STEELE STREET, SUITE 300, DENVER, COLORADO 80206.

"PACKAGED MEDIA" means any storage media storing MPEG-2
video information such as DVD movie which are sold/distributed to
general consumers. Disc replicators or sellers of the PACKAGED
MEDIA need to obtain licenses for their own business from MPEG
LA. Please contact MPEG LA for any further information. MPEG
LA, L.L.C., 250 STEELE STREET, SUITE 300, DENVER,
COLORADO 80206
http://www.mpegla.com

End User License Agreement (EULA)

On the basis of license contracts between Sony and the software
copyright holders, this product uses open software.
To meet the requirements of the software copyright holders, Sony is
obligated to inform you of the content of these licenses.
For the content of these licenses, see each document in the "License"
folder of the supplied CD-ROM.
• Software license: "License" folder > "License1.pdf"
• Microsoft: "License" folder > "License2.pdf"
• McAfee: "License" folder > "License3.pdf"