User Manual

Digital Process Compact UHD Color Camera

Model **MKC-X800**

HDMI™
HIGH-DEFINITION

Ikegami

Cautions when Operating

Important Basic Precautions

(1) Please be sure there are no abnormalities or defects in the construction or function of this device.

(2) This device is not sterile. To maintain cleanliness, place both this device and the microscope on a drape when using.

Safety Precautions

For the proper and safe use of this device

Be sure to thoroughly read these "Safety Precautions" and the user manual before use. Keep this manual handy for future reference.

Symbols

Various symbols are used in these "Safety Precautions" and in the description of product use in order to prevent personal injury and property damage, and to ensure the proper and safe use of this product. These symbols and their meanings are shown below. Be sure to understand them before using.

HAZARD:	Failure to observe this hazard may result in an emergency situation, leading to death or serious injury.
WARNING:	Failure to observe this warning may result in death or serious injury.
CAUTION:	Failure to observe this caution may result in personal injury and/or property damage.

Note: Information calling for attention is described with the symbol.

Examples of Symbols

	⃠This symbol indicates a prohibited action. Specific examples of prohibited items are illustrated in the figure or adjacent area. (The figure on the left means caution during disassembly.)

Examples of Symbols

	● This symbol indicates an instruction and implementation of an action. Specific examples of cautions are illustrated in the figure. (The figure on the left means "Unplug the electrical plug from the power outlet.)
	This symbol advises the operator to read the accompanying documentation.

⚠ WARNING

During use

	Do not put a container filled with water or small metal objects on the device! Spilling water on the device may result in fire and/or electric shock.
	Do not use a power supply voltage other than the voltage indicated! This may result in fire and/or electric shock.
	Do not insert or drop foreign materials (metals, flammable material, etc.) through openings in the device! This may result in fire and/or electric shock.
	Do not modify this device. This may result in fire and/or electric shock.

During installation

	Do not place the device on an unstable surface! The device may drop or turn over, resulting in injury.
	Only connect the designated device! Connecting other devices may cause a fire and/or electric shock.
	Only connect to a commercial power supply! ・In order to avoid risk of electric shock, this device should only be connected to a power supply (commercial) with protective grounding. ・Be sure to use a power outlet with a ground.

When an abnormality is detected

⚠ ⛔	**If abnormal conditions, include smoke, a strange odor or noise are observed, immediately turn off the power and unplug the power plug.** Continued use may result in a fire and/or electric shock. Confirm there is no more smoke, and contact to the sales representative.
⚠ ⛔	**If water or foreign matter gets inside, turn off the power and unplug the power plug.** Continued use may result in fire and/or electric shock. Please contact to the dealer or sales representative.
⚠ ⛔	**If the device is dropped or the case is damaged, turn off the power and unplug the power plug.** Continued use may result in fire and/or electric shock. Please contact to the dealer or sales representative.
⚠ ⛔	**If the device is failed, turn off the power switch and unplug the power plug.** Continued use may result in fire and/or electric shock. Please contact to the dealer or sales representative.
⚠	**Do not use a damaged power cord (exposed core or broken wire)!** Continued use may result in fire and/or electric shock. Please contact to the dealer or sales representative.

⚠ **CAUTION**

During Use

⛔	**Do not put heavy objects on top of the device!** These may tip over or fall off, resulting in injury.
⛔	**Do not stand or sit on the device or the carrying case!** These may break or tip over, resulting in injury.
⛔	**When moving the device, turn off the power, unplug the power plug, and disconnect any cables between devices.** Not doing so may damage the power cord or cables, resulting in fire and/or electric shock.
⛔	**After use, be sure to turn off the power, and then unplug the power plug.** Not doing so may result in damage, fire and/or electric shock.
⛔	**If the device will not used for a long time, be sure to unplug the power plug from a power outlet for safety.** Not doing so may result in fire.

During installation

⛔	**Do not block the vent of this device!** If the vent is blocked, heat may build up inside and cause a fire. Observe the following points. ・Do not place this device face up, on its side, or upside down. ・Do not place this device into a poorly ventilated small space. ・Do not place the device on a carpet, etc. ・Do not cover the device with a tablecloth, etc.
⛔	**Do not place the device in a location with poor power supply access.** To do so may damage the cord, and cause a fire. Install the device in a location where it does not hinder disconnecting the cord.
⚠	**When the camera head is attached to the adapter and microscope, pay attention to the following points. If not securely attached, it may fall off during use, resulting in injury or death.** ・Securely screw the camera head to the C-mount ring of the adapter. ・When attaching the adapter to the beam splitter of microscope, be sure that the accompanying tightening ring or accompanying adapter tightening ring is securely tightened. ・**Check** the connection, make sure it is not loose before using the device.

Instructions for Proper Use

During Use

・**If this device is used in a wet location, be sure water does not get inside the device or cable, etc.** This may result in electric shock.
・**If you hear thunder, consider the environmental conditions before use. If needed, discontinue use and do not touch the device.** This may result in electric shock.
・**Do not connect the device to a power supply(W) exceeding that of the AC outlet.** Refer to the power rating indicated on the AC outlet peripheral area, user manual, operation manual, etc.
・**Do not forcefully bend (twist or pull) the power cord and connection cable during use.** This may tear the coating on the cord or cables causing electric shock.
・**Contact the sales representative for replacement parts (power cable).** If needed, replace the power cable with the same or equivalent product. If the supplied power cable

is damaged, contact the sales representatives for replacement.

During installation

・Avoid areas with high humidity and dust, as well as areas where oily smoke or steam may blow directly onto the device.

　Not doing so may result in electric shock. Do not place the device on the kitchen counter or near a humidifier.

・Secure the device to prevent it from falling over in the event of an earthquake, impact, etc.

　An unsecured device may fall down and cause injury. Avoid falls to maintain safety.

Camera cable

Pay attention to the following points.
・Always use the supplied camera cable.
　Connecting the wrong camera cable may damage the device.
・When removing the camera cable from the camera head or CCU, do not pull the cable. Grasp the connector (plug) to remove.
・Do not crush the cable.
・Do not insert or remove the camera cable while the power is on.
・The acceptable bending radius of the camera cable is approximately 10 times of the external radius of the cable (75mm for φ7.5mm cable). Do not forcefully bend the cable in excess of this radius. If the cable is forcefully bent, the wire rod inside the cable may break.

Camera cable
Radius of 75mm
Connect
Camera head
Radius of 75mm
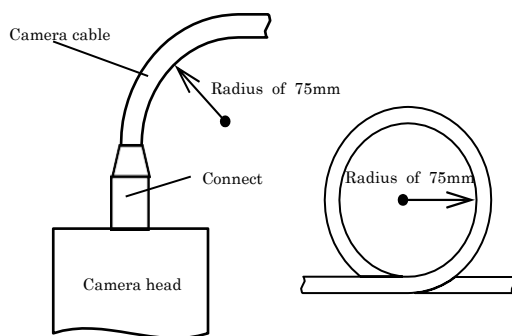
・If the camera head is attached to a rotating platform, etc., clamp the camera cable so excessive force is not applied to the cable when moving. Be sure not to kink (twist, bend) the cable. If the cable is distorted, the wire rod inside the cable may break.
・Before use, check for damage or deterioration of the cable and lacing material.

Cleaning

・For safety, turn off the power and remove the power plug before cleaning. This may result in electric shock.
・Wipe lightly the enclosure and panel with a dry soft cloth.
・"Regular inspections" are recommended to maintain stable performance for a long time. Consult with sales representative to schedule regular inspections.
・This device contains high voltage component. Consequently, inspection, maintenance and repairs should be performed by a professional. Handling by a person without proper knowledge may result in electric shock.

Inspections

Regular inspections are recommended for the safe use of this device.

Maintenance and inspection by users (daily inspection)

1. Visual inspection
(1) Check the exterior
　・Check for any abnormalities including damage and wear on the exterior of the device and cable.
(2) Check for cleanliness
　・Be sure the device is clean.
　・Be sure there are no body fluids, blood, waste material, contrast medium, etc. on the device.
(3) Check the surroundings
　・Be sure there are no objects which may hinder device operation.

2. Function check
(1) Check the condition of the device
　・Be sure the device is operating normally.
　・Check for any unusual noises or odor.
(2) Be sure the device is securely attached.

Inspection list

Before use, be sure the operator of this device has been thoroughly instructed on the proper use of this device.

If the operator has not been properly instructed, this may result in incorrect use and substandard performance such as degraded image.

Inspections

Please check the following before using this device.

(1) Visual inspection

 ☐   The blue indicator is lit when the power is turned on.

(2) External check

 ☐   Camera head

 ☐   CCU

 ☐   Camera cable

 ☐   Peripheral device(s) and cable(s)

 ☐   Power supplied from the AC outlet

 ☐   The cooling fan is working

 ☐   Display and operation of the front operation panel are normal.

 ☐   No damage or wear on any component.

 ☐   The device is properly connected to peripheral devices.

Disposal

Dispose this product in compliance with the laws and regulations of the municipality.

Please consult with your municipality for details.

MKC-X800 is an authorized AAMI ES60601-1/EN60601-1 Class I product. The IP rating of MKC-X800 is IPX0.

The MKC-X800 device is for continuous operation.

Guidelines and manufacturer's declaration - electromagnetic emissions		
The Model MKC-X800 is intended for use in the electromagnetic environment specified below. The customer or user of the Model MKC-X800 should confirm that the environment is in compliance.		
Emissions test	Compliance	Electromagnetic
RF emissions CISPR 11	Group 1	The Model MKC-X800 uses RF energy only for internal functions. Therefore, RF emissions are very low and are unlikely to cause any interference to nearby electronic equipment.
RF emissions CISPR 11	Class A	Emission characteristics of this product are suitable for industrial and hospital environments (CISPR 11 Class A) In a domestic environment, MKC-X800 may cause radio interference, in which case mitigation measures may be required, such as re-orienting, relocating, shielding the unit, or filtering the connection to a public main network.
Harmonic emissions IEC61000-3-2	Class A	
Voltage fluctuations/flicker emissions IEC61000-3-3	in compliance	

Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment conditions
Electrostatic discharge(ESD) IEC61000-4-2	±8kV contact ±15kV air	±8kV contact ±15kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with a synthetic material, relative humidity should be at least 30%.
Electrical fast transient/burst IEC61000-4-4	±2kV for power supply lines ±1kV for input/output lines	±2kV for power supply lines ±1kV for input/output lines	Main power level should be that of a typical commercial or hospital environment.
Surge IEC61000-4-5	±1kV differential mode ±2kV common mode	±1kV differential mode ±2kV common mode	Main power level should be that of a typical commercial or hospital environment
Voltage dips, short interruptions and voltage variations on power supply input lines. IEC61000-4-11	0% Ut For 0.5/1/250/300 cycle 70% Ut (30%dip ln Ut) For25/30 cycle	0% Ut For 0.5/1/250/300 cycle 70% Ut (30%dip ln Ut) For25/30 cycle	Main power level should be that of a typical commercial or hospital environment. If the user of the MODEL MKC-X800 requires continued operation times when the main power may be interrupted, powering the MODEL MKC-X800 with an uninterruptible power supply or battery is recommended.
Power frequency (50/60 Hz) magnetic field IEC61000-4-8	30 A/m	30 A/m	The power frequency magnetic field should meet the characteristics of a typical location such as a commercial or hospital environment.
NOTE: A.C. main voltage prior to application of the test level.			

			Guidelines and manufacturer's declaration - electromagnetic emissions

The Model MKC-X800 is intended for use in the electromagnetic environment specified below. The customer or user of the Model MKC-X800 should confirm that the environment is in compliance.

Immunity test	IEC 60601 test level	Compliance level	Electromagnetic environment conditions
Conducted RF IEC61000-4-6	IEC61000-4-6 3Vrms 150kHz to 80Mhz 6Vrms ISM Band	IEC61000-4-6 3Vrms 150kHz to 80Mhz 6Vrms ISM Band	Portable and mobile RF communications should not be used in close proximity to any part of the MODEL MKC-X800, including cables, and should be kept at the recommended separation distance calculated from the equation according to the transmitter frequency.
Radiated RF IEC61000-4-3	IEC61000-4-3 3V/m 80MHz TO 2.7GHz	IEC61000-4-3 3V/m 80MHz TO 2.7GHz	Recommended separation distance $d=1.2\sqrt{P}$ $d=1.2\sqrt{P}$ 80～800 MHz $d=1.2\sqrt{P}$ 800 MHz～2.5 GHz where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer specifications, d is the recommended separation distance in meters(m). Field strength is from fixed RF transmitters, as determined by an electromagnetic site survey*[a] should be less than the compliance level at each frequency range*[b]. Interference may occur near equipment marked with the following symbol:

NOTE 1: At 80 MHz and 800 MHz, the higher frequency range applies.
NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.

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*a Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radios, AM and FM radio broadcasts and TV broadcasts cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location where the MODEL MKC-X800 is used exceeds the applicable RF compliance level described above, the MODEL MKC-X800 should be watched to confirm normal operations. If operations are abnormal, additional measures may be necessary, such as reorienting or relocating the MODEL MKC-X800.

*b For frequency ranges outside 150 kHz to 80 MHz, field strength should be less than 3 V/m.

Special precautions regarding EMC are required for MKC-X800, and installation and operation should be carried out according to the EMC information provided in the accompanying documents.

Avoid using MKC-X800 next to or stacked with other equipment as this my result in inaccurate operation. If such cannot be avoided, it should be watched to confirm normal operations in configured use conditions.

Except for AC cables, all cables should be shielded.

Use of an accessory device or cable with MKC-X800 other than those specified in this manual may result in increased emissions or decreased immunity.

When using portable RF communication equipment nearby, maintain a distance of at least 30 cm. At distances less than this, degradation of equipment performance may occur.

Table of Contents

1 Introduction

MKC-X800 is a 4K Camera equipped with high-definition 4K video (3840 × 2160) and color reproduction. It is a medical grade camera which can be used with a surgical microscope or shadow-less lamp system.

MKC-X800 employs a 1 CMOS system, performs 3840 x 2160 4K format with 1800TV lines horizontal resolution, S/N ratio with 58dB. In addition to the 4K output signal, HD-SDI output (3G compatible) and DVI system are also available.

2 Construction

Part Name and Function

Camera Head
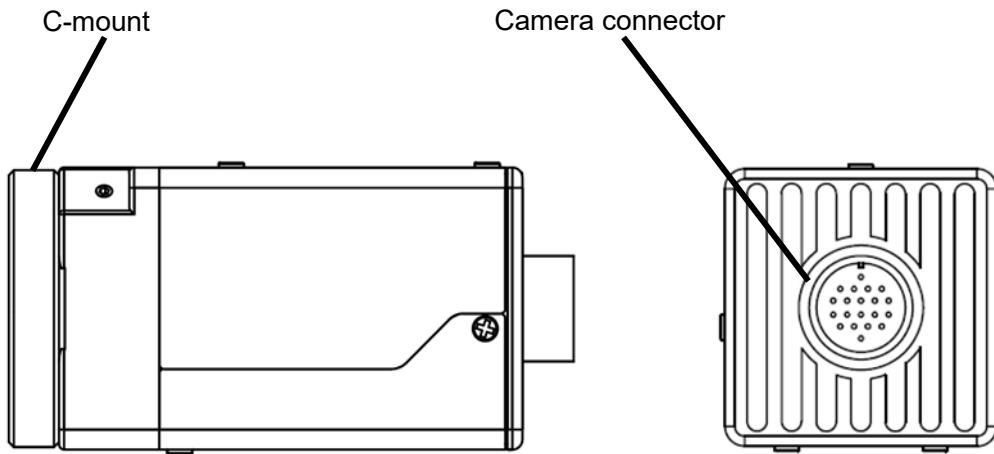
- **C-mount**

    The C-mount is used to mount the lens.

    Various kinds of C-mount lenses and microscope adapters can be used.

- **Camera connector**

    The camera connector is used to connect a dedicated camera cable.

    ⚠ **CAUTION**

    Please note that the camera connector on the camera head side and the CCU side differs in size.

CCU Front
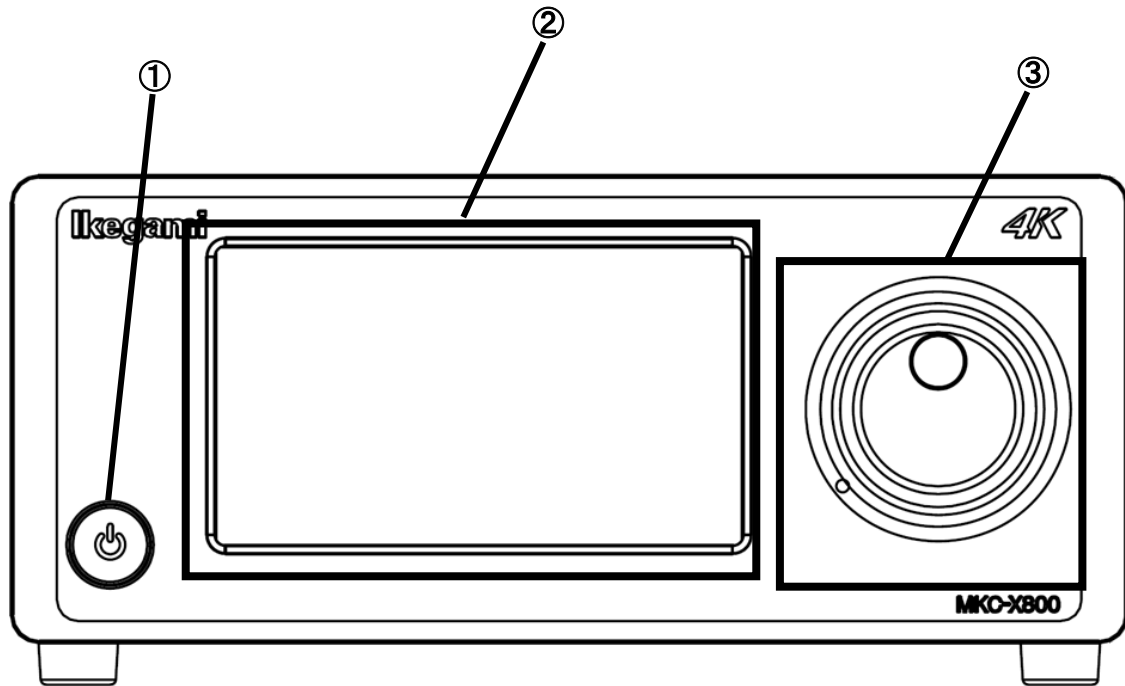
① **Power button**

The power button to turn MKC-X800 ON/OFF.

② **Touch sensor panel**

The touch sensor panel displays the menu screen. Operation of menu screen is possible by touching the screen.

③ **Rotary Switch**

The rotary switch is used to selecting settings and renaming scene files.

Operation can be done by turning the dial or pushing the left or right side.

CCU Back
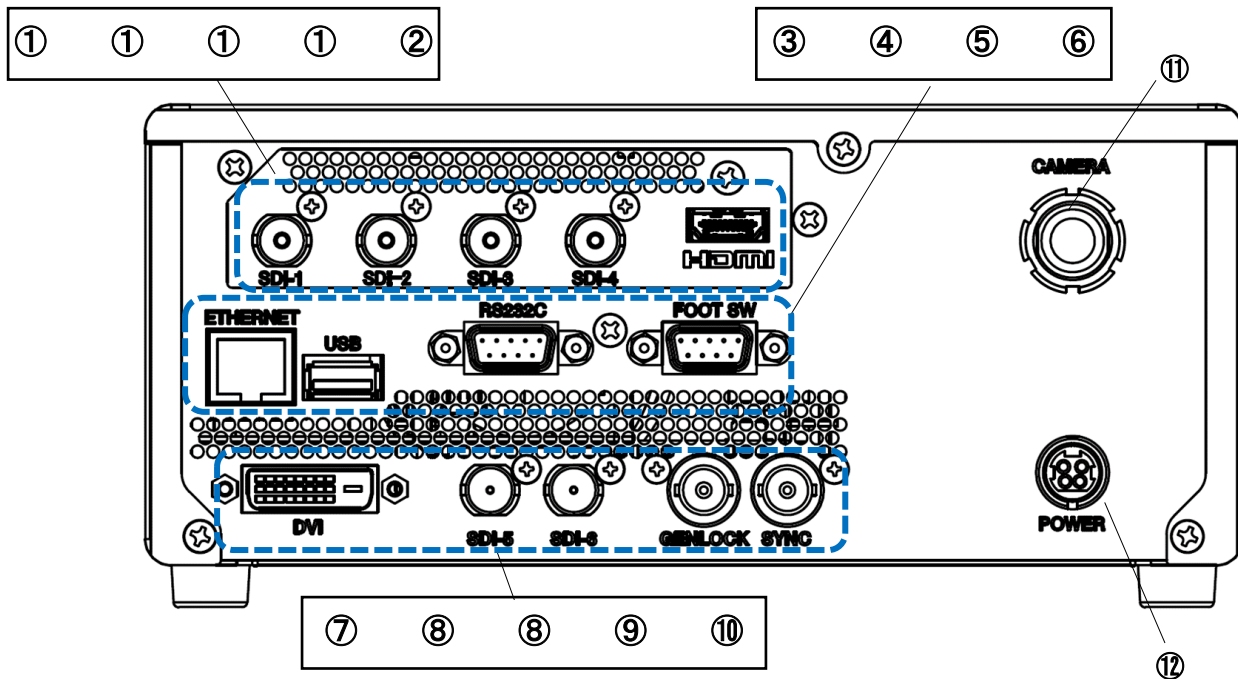
① **4K OUT connector(SDIx4) (12G-SDI)**

A UHD-SDI 2-Sample Interleave Level-A (3G-SDI Quad Link or 12G-SDI) input compatible monitor etc. can be connected here. When output is 4K 12G-SDI, the same video can be output to all four lines.
4K UHD coax cables for 12G-SDI (e.g. D5.5UHDC**E etc.) are recommended.

② **HDMI connector**

An HDMI input compatible monitor etc. can be connected here. When using this port, premium high-speed certified HDMI cables (e.g. DH-HDP14E50BK etc.) are recommended.
4K video output is possible.

③ **ETHERNET connector**

A personal computer etc. can be connected here. A cross cable (option) is required for connection.
CCU operation with a personal computer is possible.

④ **USB connector**

The is a USB port.
A scene file setting can be loaded from here. If the scene file data is in USB, settings can be overwritten.

⑤ **RS-232C connector**

The personal computer etc. can be connected here. A cross cable (option) is required for connection.
CCU operation with a personal computer is possible.

⑥ **FOOT SWITCH connector**

The extension cable from a foot switch (option) can be connected here.

⑦ **DVI-D OUT connector**

This is the image output port

A DVI-D input monitor, etc. can be used with a DVI-D cable with ferrite core (separately sold).

Ferrite core
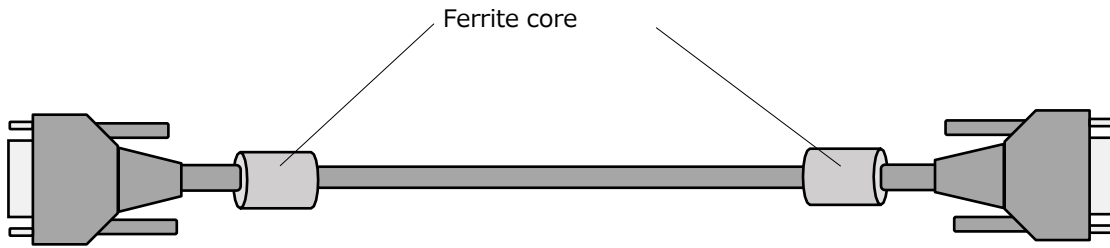
⑧ **HD-SDI(3G-SDI) OUT connector (2 lines)**

An HD-SDI (3G-SDI)-input-compatible monitor etc. can be connected here. The same video is output to two lines. A coaxial cable with a 75 Ω impedance should be used for connection.

⑨ **GEN LOCK connector**

To synchronize the phase of a video with another system, a synchronizing signal from that system is input through the GEN LOCK connector. A tri-level sync (HD) is supported.

⑩ **SYNC connector**

To synchronize the phase of a video with another system, a synchronizing signal to that system is output through the SYNC connector. A tri-level sync (HD) is supported.

※Synchronization of applications between MKC cameras is assumed. Synchronization between other products is not guaranteed.

⑪ **Camera connector**

The camera connector of a dedicated camera cable can be connected here.

⚠**CAUTION**

Please note that the camera connector on the camera head side and the CCU side differs in size.

⑫ **DC inlet**

The power cable and AC adapter included with a commercial power (100 to 240V AC) can be connected here.

Accessories

Open the box and make sure the device and the following accessories are included.

- Camera cable (5m) × 1

- Extension cable (10m) × 1　(Option)

- Power cord × 1
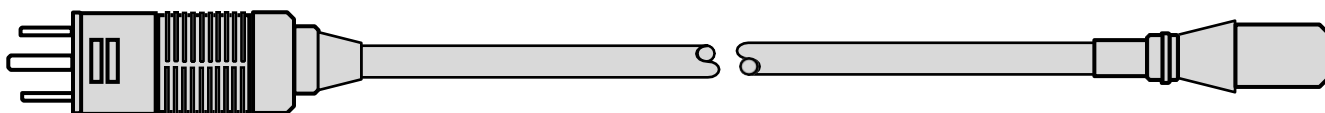
- AC adapter

- User manual (this document)

3 Operation (Basics)

Connection Example

4K-Compatible monitor

MKC-X800
camera head

HDMI cable

Foot switch

Camera cable

SDI-1 SDI-2 SDI-3 SDI-4

CAMERA

ETHERNET USB RS232C FOOT SW

DVI SDI-5 SDI-6 GENLOCK SYNC POWER

DVI-D cable

75Ω coaxial cable

Power cable

Ikegami MDR-600HD

MDR-600HD

DVI monitor
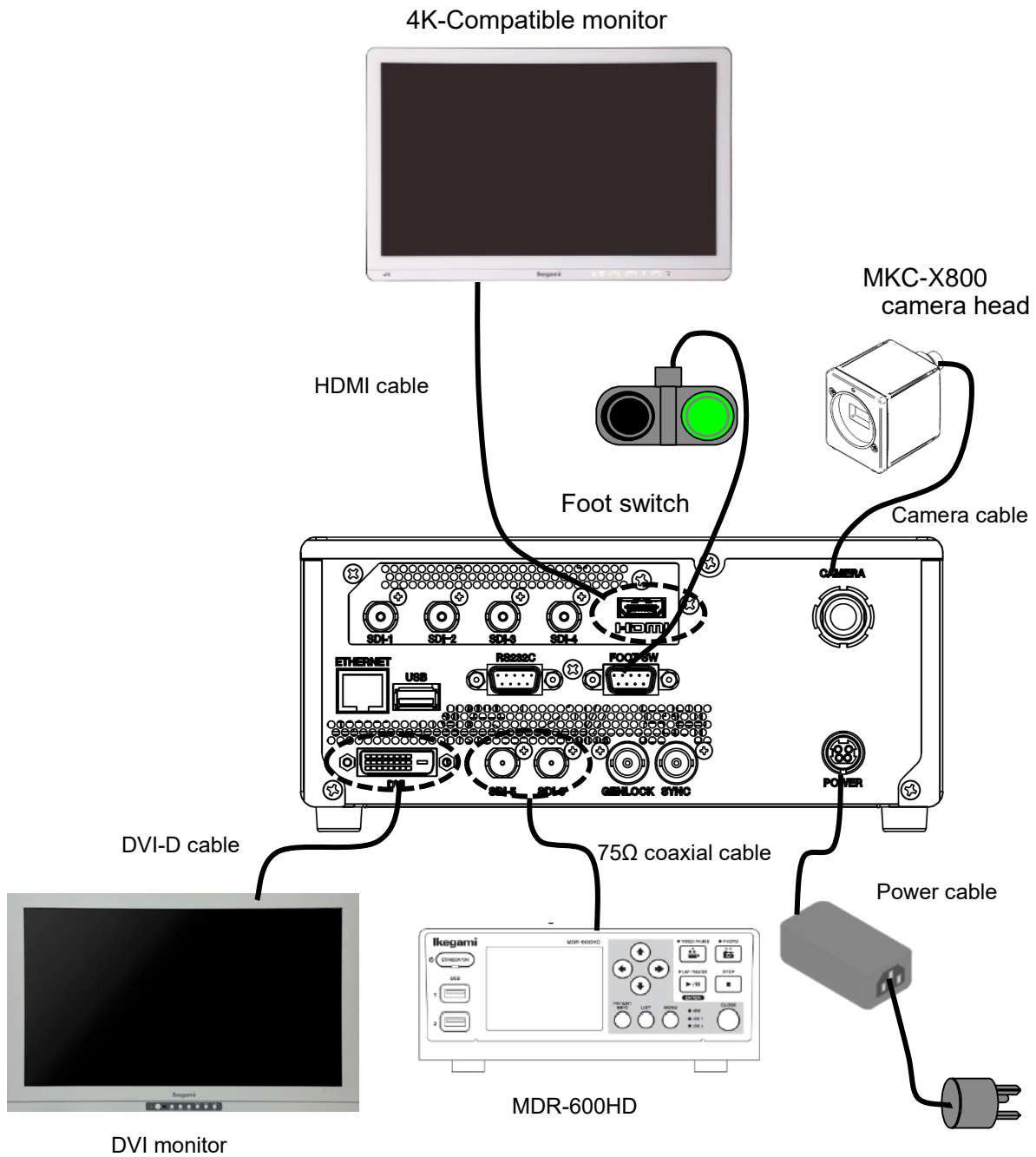
※ To connect a 4K monitor, follow the directions of the operation manual of the monitor.

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⚠ **Notes on the Connection**

· **Be sure to turn off the main unit of camera before connecting.**

· **Connect a dedicated camera head.**

　Connect a different head may result in a malfunction.

· **Image output from the 3G/HD-SDI connector is on the receiving side with 75Ω terminal.**

· **Be sure to use the accompanying power cable to connect the power supply.**

Peripheral equipment

·Use JIS T0601-1 or IEC60601-1 compatible product for the foot switch connected to this device.
·Use JIS T0601-1, IEC60601-1, or a product that complies with the safety standard (IEC standard, JIS standard, PSE, etc.) for other products, except the foot switch connected to this device.

Start-Up and Shut Down of the Main Unit

Start-up and shut down methods for the main unit are explained in this section.

Start-up method

【Step 1】 Preparation before turning on power

Before turning on power, check the following.
・Be sure the external devices including a camera head, monitor, etc. are properly connected.
・Be sure the power cable (accessory) is connected to the DC inlet of the CCU rear panel, and the
 plug of the power cable is connected to the commercial power outlet.
・The power switch light on the front of the CCU is off.
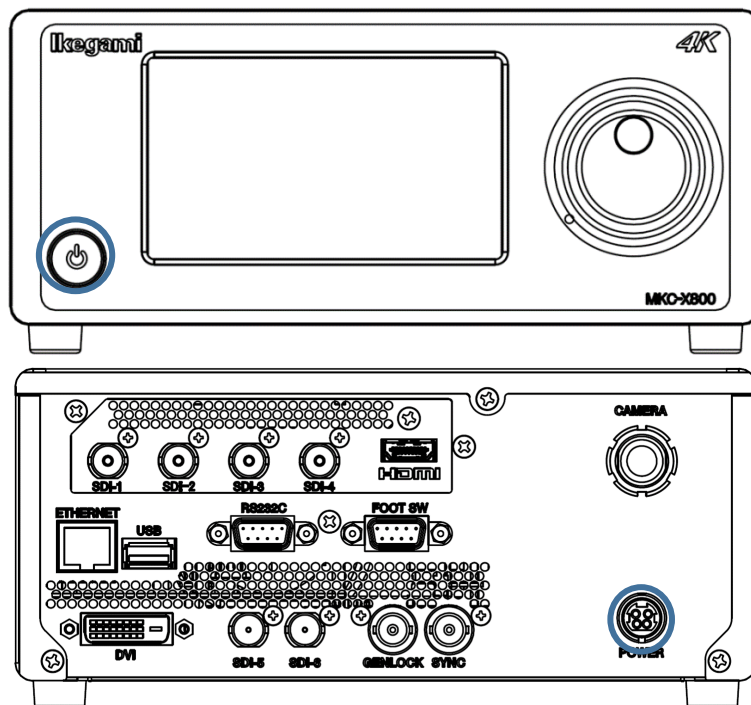
【Step 2】

Turn on the power for external devices including the monitor, etc.

【Step 3】

Press the power switch on the front panel of the CCU to turn on the power. When the power is on, the power switch indicator turns blue.
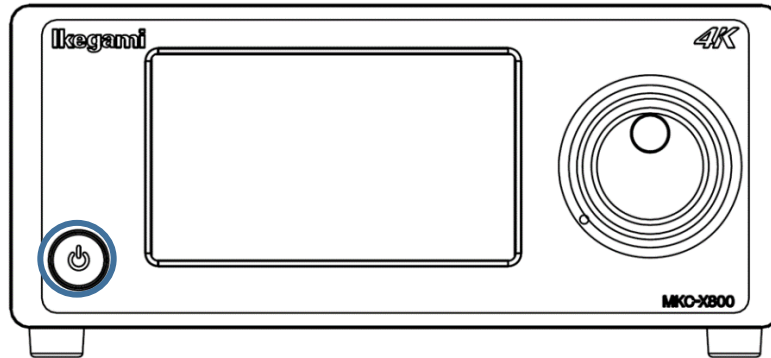
> **Notes on the Camera Image**
> Immediately after turning on the power, initialization of CCU or the camera head automatically begins.
> During this time, an unstable image is displayed on the monitor, this it is not a malfunction.

Perform Step 1 to 3 to output the camera image to the monitor.

* If the cable is disconnected during use, repeat the above procedures.

Shut Down Method

Press the power switch on the front panel of the CCU to turn off the power. When the power is turned off, the power switch indicator will no longer be lit.
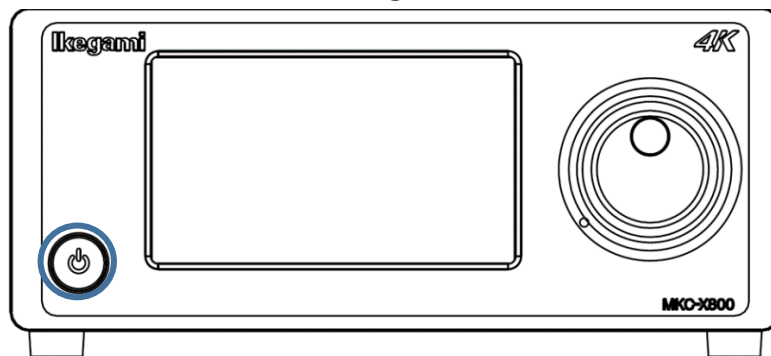
⚠ **Notes when Moving the Device**

When moving the main unit, be sure to turn off the main power supply, unplug the power plug, and remove the connection cable between the devices.

⚠ **Notes when Connecting or Disconnecting the Camera Cable**

When connecting or disconnecting the camera cable connecting the camera head and CCU, be sure to turn off the power of the main unit.

Connecting or disconnecting the camera cable while the power of the main unit is on may cause a malfunction.

Notes on the Camera Image

This device uses a CMOS sensor. As a result, the following phenomena may be observed. These are not malfunctions.

1) Bright spots may appear on the image when sensitivity is increased or the device is used at high temperatures.

2) Flickering and horizontal lines appear on the screen under the lighting of discharge tubes, including fluorescent lights, etc. Set the electronic shutter to 1/100 in the power supply frequency of 50Hz range.

3) Some distortion may occur on the screen for fast-moving objects.

Checking the Camera Image

1. Turn on the camera and other connected devices.

2. Turn on the microscope and lighting.

3. Check image output on the monitor.

3.3.1　Checking and Adjusting the Camera Image

1. To automatically adjust the camera image, press the White Balance button on the accessory chart.

2. Check if a normal image (appropriate brightness, color, resolution, etc.) is output.

For further details and adjustment methods, refer to "3.4 Touch panel operation".

Touch panel operation

3.3.1 TOP MENU
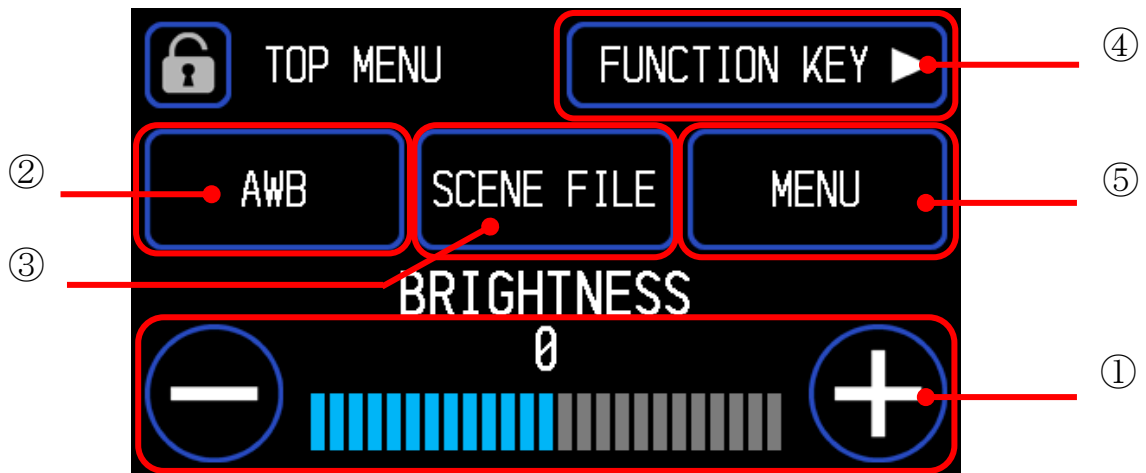
① Direct adjustment with the touch panel or Rotary Switch.
  Up to three functions can be assigned to the [TOP MENU INDICATOR] screen (→4.5.3).
  The assigned functions can be selected from TOP MENU by pressing the Rotary Switch.

② White balance can be adjusted automatically(→4.1).

③ A scene file can be selected (→4.2).

④ Function key can be selected (→4.3).

⑤ Go to the Menu screen (→3.3.2).

3.3.2 Menu screen
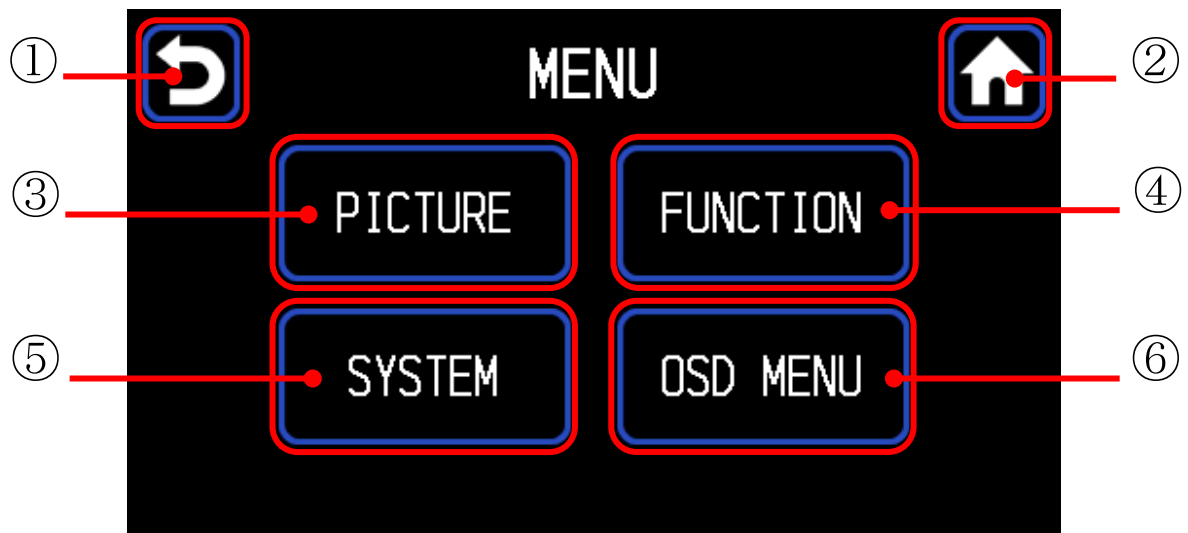
② Return to the previous screen.

③ Return to the TOP MENU.

④ Go to the PICTURE setting screen (→4.4).

⑤ Go to the FUNCTION setting screen (→4.5).

⑥ Go to the SYSTEM setting screen (→4.6).

⑥ Display the OSD menu (→5).

3.3.3 Screen lock/unlock

To prevent accidental operation, the menu screen can be locked.

①
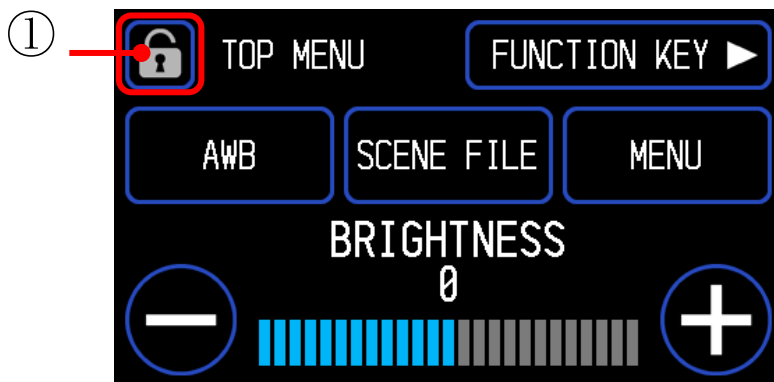
① Long press the button for about 3 seconds.

When the yellow lock mark is displayed, the lock function is activated.

②   ③

<Unlock>
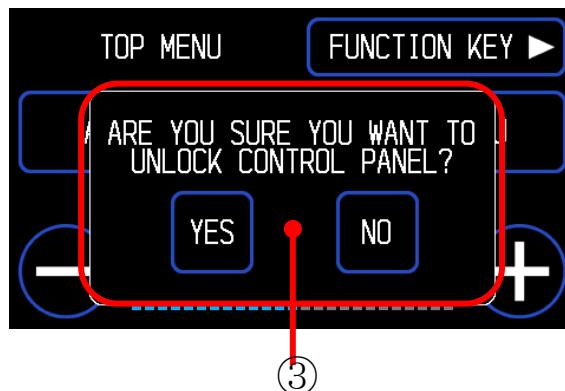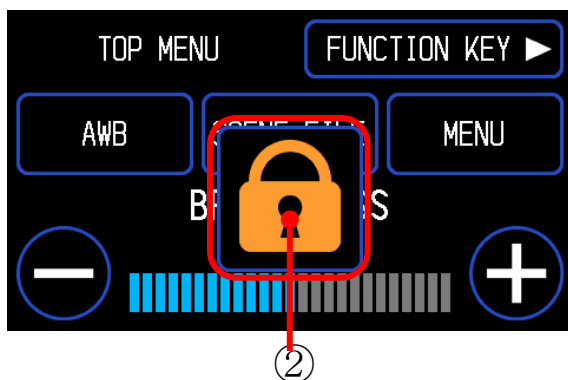
When the ②button is pressed, Screen③ is displayed.

Select [YES] to unlock.

4 Function

4.1 White balance

Adjust the white balance when using the MKC-X800 for the first time or when replacing the light source used. White balance can be adjusted automatically.

＜Operation＞

1. Shoot a white photographic object on the screen, and press the [AWB] button.
   - During automatic adjustment, "AWB BUSY" is displayed on the monitor screen.
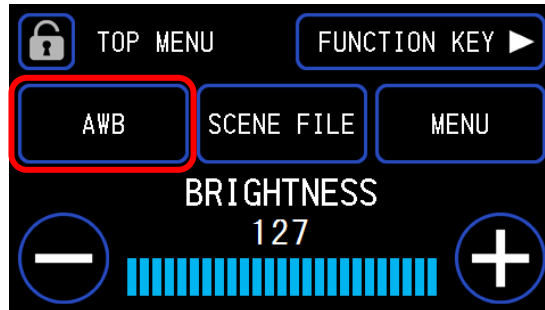
Normal

Displayed as "AWB Completed".

Abnormal

If an error message is displayed, white balance cannot be adjusted.

Error message list

(1) AWB LEVEL OVER

    [Condition]   AWB cannot operate normally due to excessive light intensity.

    [Response]   Adjust the amount of incident light and repeat.

(2) AWB LEVEL UNDER

    [Condition]   AWB cannot operate normally due to insufficient light intensity.

    [Response]   Adjust the amount of incident light and repeat.

(3) AWB NOT WHITE

    [Condition]   AWB cannot operate normally because there are not enough white areas.

    [Response]   Do not move the white photographic sample.

(4) AWB OUT OF RANGE

    [Condition]   White cannot be taken within the adjustable range of AWB.

    [Response]   Do not move the white photographic sample.

(5) AWB ERROR

    [Condition] AWB did not complete in time.

    [Response]   Do not move the white photographic sample.

4.2 Scene file

Up to 4 scene files can be selected according to shooting conditions.
Resetting to factory default settings is also possible.

Select from TOP MENU ⇒ LOAD is selected
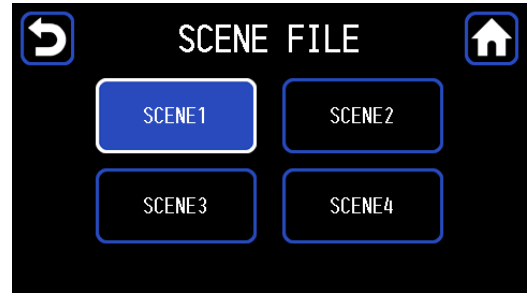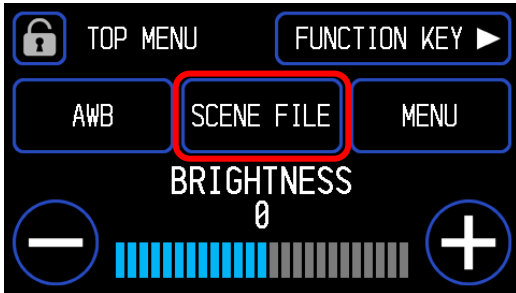
Select [SCENE FILE] from the PICTURE screen ⇒ LOAD/SAVE/INITIALIZE is selected
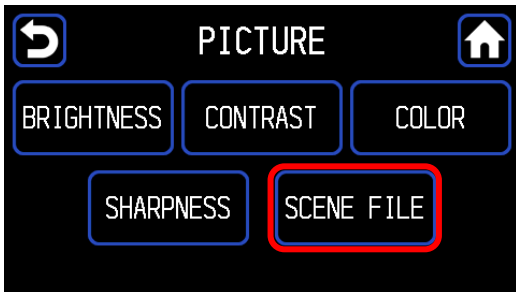
4.2.1 Selecting a scene file (LOAD)
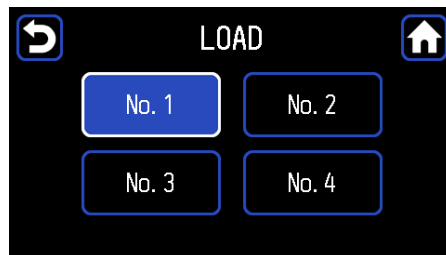
1. The button corresponding to the currently selected scene file is lit.
2. Press the button to select a scene file.
   - The number displayed on the button is the scene file number.
   - The button corresponding to the selected scene file will be lit.
   - Settings of scene file will be immediately reflected.

4.2.2 Saving a scene file (SAVE)
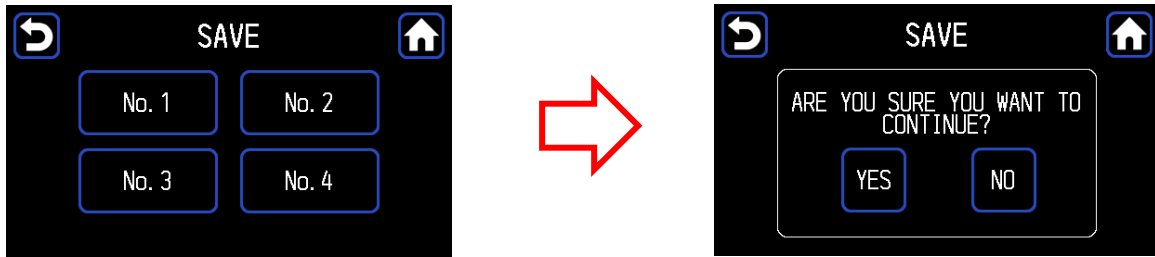
Adjust the desired settings in advance and save in them the scene file.

Select [MENU]⇒[PICTURE]⇒[Scene File]⇒[Save].

When the scene file number for which you want to save the settings from [No.1] to [No.4] is selected, a new window will be displayed.

Press the [YES] button to save the settings are saved in the selected scene file.

4.2.3 Initializing a scene file (INITIALIZE)
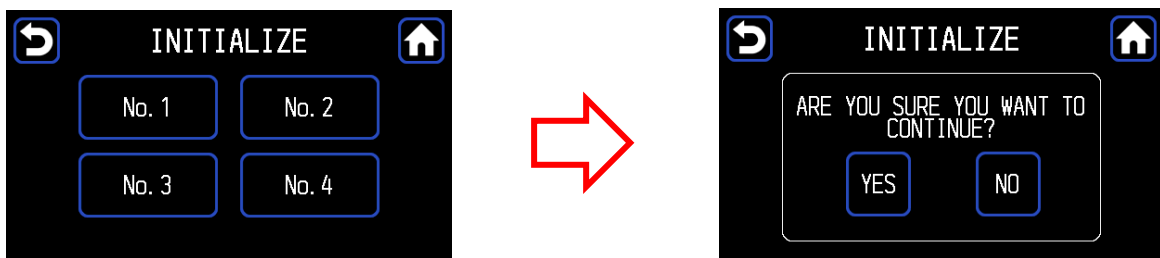
Select [MENU]⇒[PICTURE]⇒[Scene File]⇒[Initialize]

When the scene file number you want to initialize from [No.1] to [No.4] is selected, a new window will be displayed.

By pressing the [YES] button, the settings of the selected scene file will be immediately set to the factory settings.

For efficient use

Switch scene files by assigning functions to the foot switches.

4.2.4 Registering a scene file

You can change the name of the button in the file selection on the [TOP MENU] ⇒ [Scene File] screen.
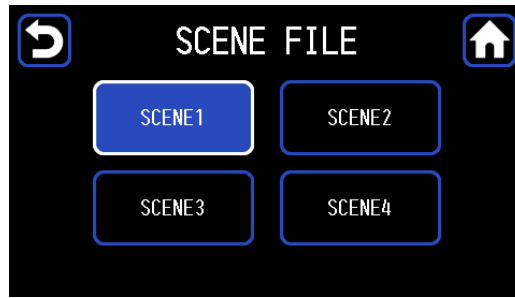
To register a file name, long press the button for about 3 seconds.
Go to the scene file name registration screen.
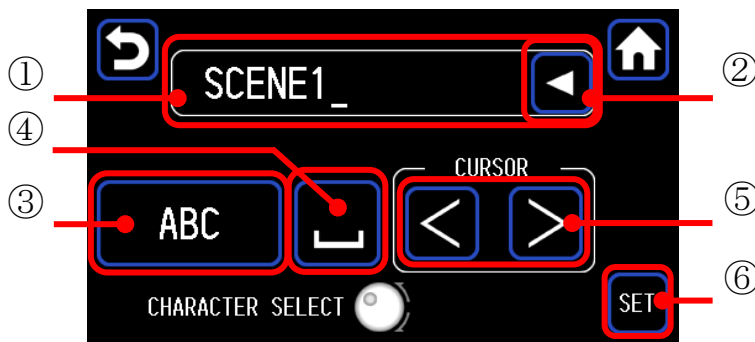
① Input box
② Backspace button
③ Character type change button
④ Space button
⑤ Cursor movement button
⑦　SET (confirm) button

Input characters by operating the Rotary Switch. Select a character type and press the Rotary Switch to move the cursor to the next character input (or use ⑤buttons).
The maximum number of characters that can be input is 28.
Please press the ⑥SET button when finished.
Registration of the scene file name is complete, and the button name will be changed when returning to the scene file selection screen.
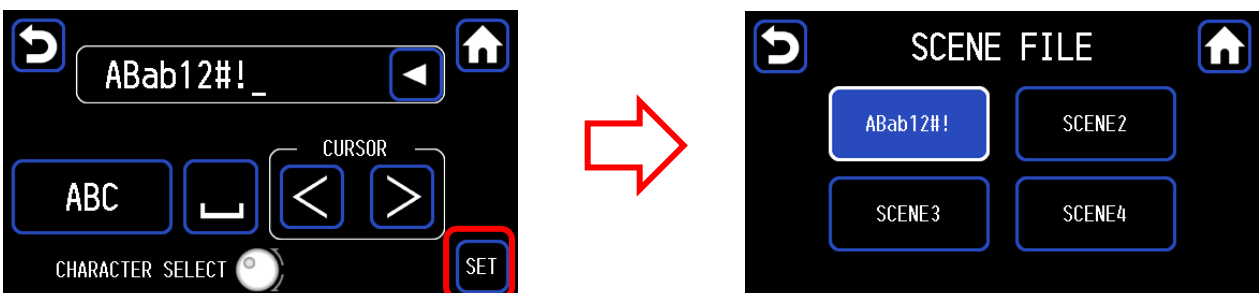
4.3 Function key select

Frequently used functions can be assigned to the [F1] to [F4] buttons in advance.

Select from the TOP MENU ⇒ Execute assigned function
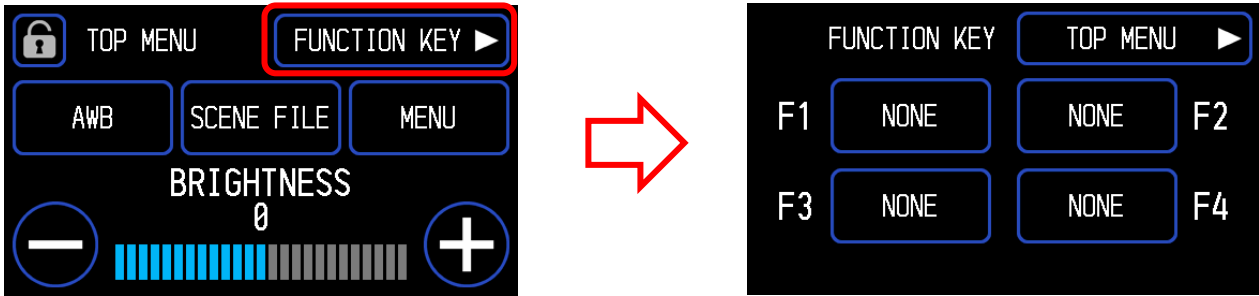
Select [MENU] ⇒ [FUNCTION] ⇒ [FUNCTION KEY]. A function can also be assigned from the OSD menu (→ 4.5.2, 5.8).

4.4 Image quality adjustment (PICTURE)

Select [PICTURE] from the MENU screen.
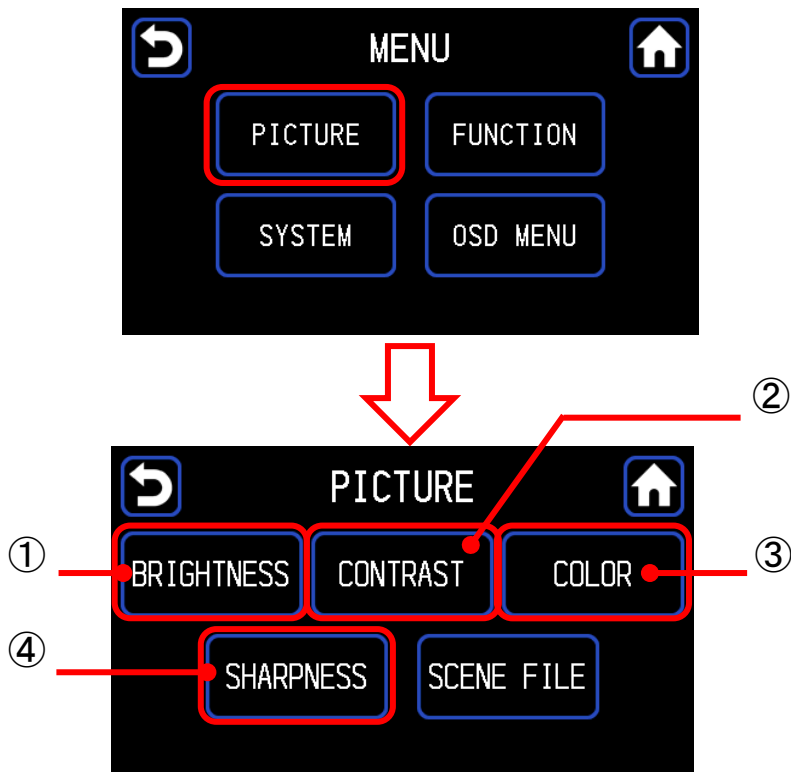
① Go to the BRIGHTNESS setting screen. (→4.4.1)
② Go to the CONTRAST setting screen. (→4.4.2)
③ Go to the COLOR setting screen. (→4.4.3)
④ Go to the SHARPNESS setting screen. (→4.4.4)

4.4.1 Brightness adjustment (BRIGHTNESS)
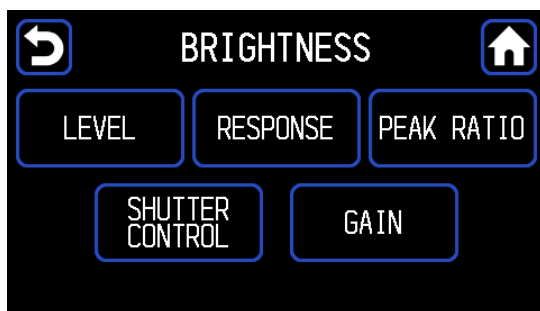
BRIGHTNESS

| LEVEL | RESPONSE | PEAK RATIO |

| SHUTTER CONTROL | GAIN |

① BRIGHTNESS LEVEL

BRIGHTNESS LEVEL

0

② RESPONSE

RESPONSE

| SLOW | MIDDLE | FAST |

③PEAK RATIO

PEAK RATIO

12

④SHUTTER CONTROL

SHUTTER CONTROL

| AUTO | MANUAL |
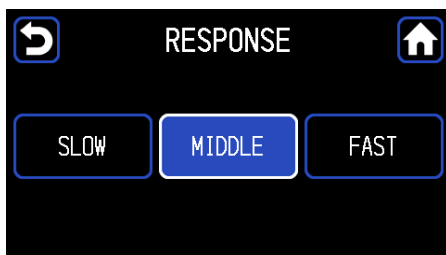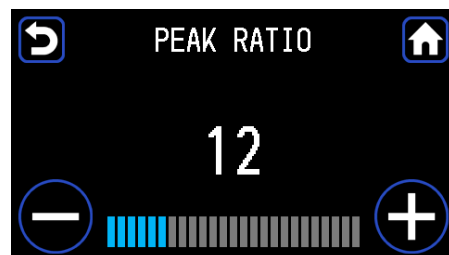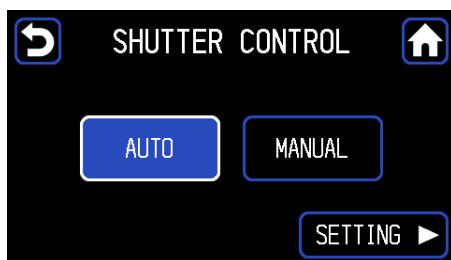
SETTING ▶

From the [SETTING] button go to [SHUTTER CONTROL] ⇒ [AUTO] is selected.

AUTO SHUTTER

| SHUTTER LIMIT | SLOW SHUTTER |

SHUTTER LIMIT

1/5000
1/4000
1/2000

SLOW SHUTTER

| ENABLE | DISABLE |

SLOW SHUTTER LIMIT

1/30
1/15
1/8
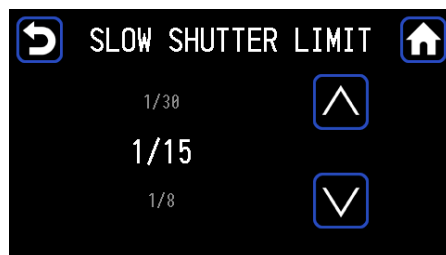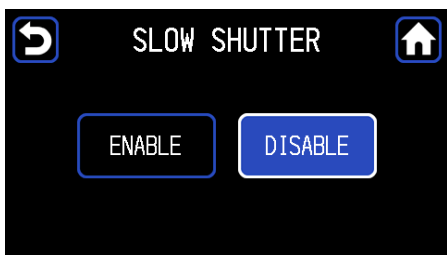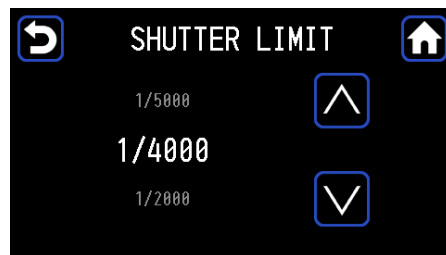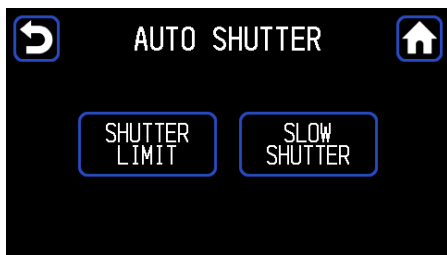
From the [SETTING] button go to [SHUTTER CONTROL] ⇒ [MANUAL] is selected.

```
┌─────────────────────────────┐
│  ⤺      MANUAL SHUTTER    ⌂  │
│                             │
│        1/100          ╱╲    │
│                             │
│        OFF                  │
│                             │
│        1/30           ╲╱    │
└─────────────────────────────┘
```

⑤ GAIN

```
┌─────────────────────────────┐
│  ⤺         GAIN          ⌂  │
│                             │
│                             │
│     ┌───────┐  ┌────────┐   │
│     │ AUTO  │  │ MANUAL │   │
│     └───────┘  └────────┘   │
│                             │
│                 ┌──────────┐│
│                 │SETTING ► ││
│                 └──────────┘│
└─────────────────────────────┘
```
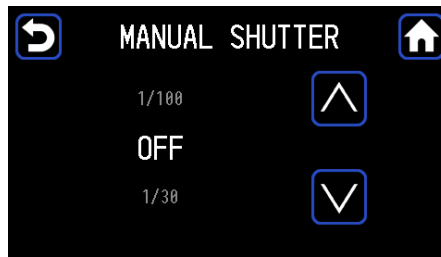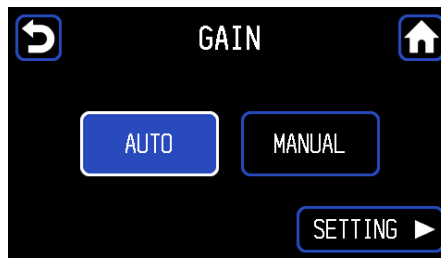
From the [SETTING] button, go to [GAIN] ⇒ [AUTO] is selected.

```
┌─────────────────────────────┐
│  ⤺       AUTO GAIN       ⌂  │
│                             │
│                             │
│   ┌────────┐   ┌────────┐   │
│   │  BASE  │   │ RANGE  │   │
│   └────────┘   └────────┘   │
│                             │
│                             │
└─────────────────────────────┘
```

```
┌─────────────────────────────┐        ┌─────────────────────────────┐
│  ⤺        BASE        ⌂     │        │  ⤺        RANGE       ⌂     │
│                             │        │                             │
│     -3dB          ╱╲        │        │    12dB           ╱╲        │
│                             │        │                             │
│    -6dB                     │        │    9dB                      │
│                             │        │                             │
│     -9dB          ╲╱        │        │    6dB            ╲╱        │
└─────────────────────────────┘        └─────────────────────────────┘
```
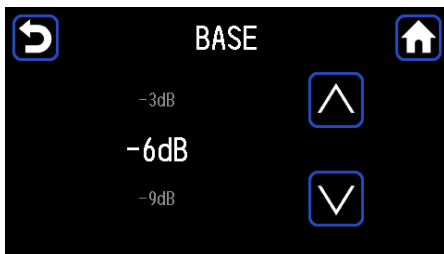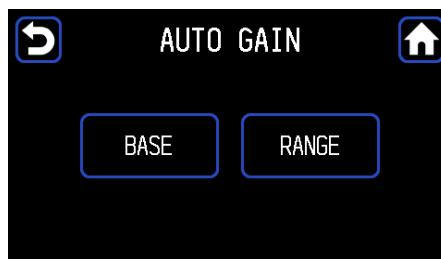
From the [SETTING] button, go to [GAIN] ⇒ [MANUAL] is selected.

```
┌─────────────────────────────┐
│  ⤺       MANUAL GAIN     ⌂  │
│                             │
│        -3dB           ╱╲    │
│                             │
│       -6dB                  │
│                             │
│        -9dB           ╲╱    │
└─────────────────────────────┘
```
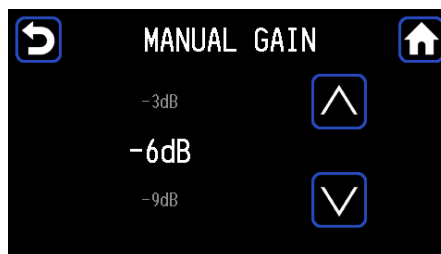
Item	Description
Brightness Level	This item controls brightness, and can be adjusted with the touch panel or Rotary Switch (Linked with the OSD menu→5.1).
Response	Set the control speed when Shutter or Gain is AUTO (Linked with the OSD menu→5.1).
Peak Ratio	This item adjusts the photometric method and can be adjusted with the touch panel or Rotary Switch (Linked with the OSD menu→5.1).
Shutter Control	This item is for automatic adjustment of the shutter (Linked with the OSD menu→5.1).
Gain	This item determines automatic adjustment of gain. When capturing a dark sample, adjusting the brightness is possible. (Linked with the OSD menu→5.1).

4.4.2 Contrast adjustment (CONTRAST)
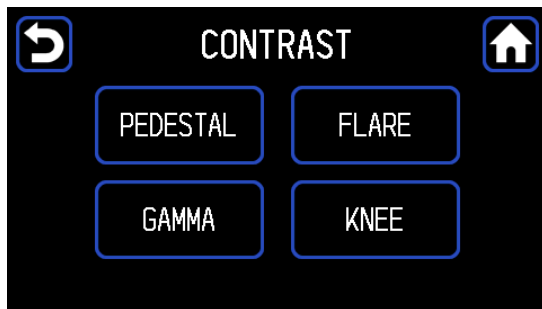
① PEDESTAL

② FLARE
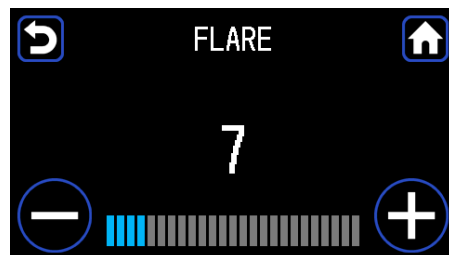
③ GAMMA
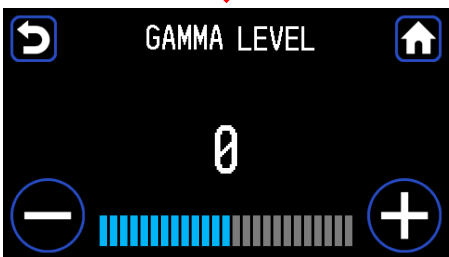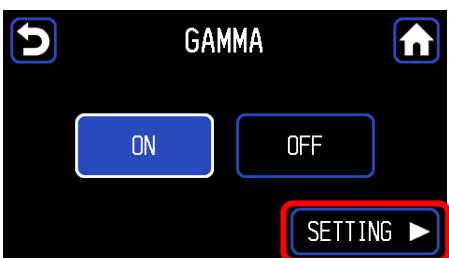
④KNEE
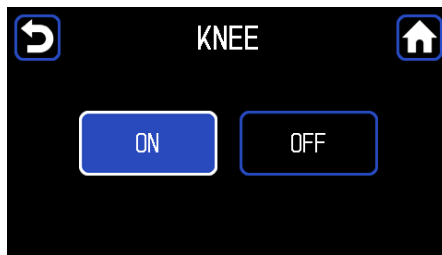
④ HDR

Item	Description
PEDESTAL	This adjusts the black level using the touch panel or Rotary Switch (Linked with the OSD menu→5.2).
FLARE	This performs flare correction using the touch panel or Rotary Switch (Linked with the OSD menu→5.2).
GAMMA	Gamma correction adjusts dark areas of an image so they appear brighter. Gamma level can be adjusted using the touch panel or rotary switch (linked to the OSD menu → 5.2).
KNEE	Knee correction adjusts the bright areas of the image so they are easier to see (Linked with the OSD menu→5.2).
HDR	HDR reduces white and black spots in the image. HDR level can be adjusted using the touch panel or rotary switch (linked to the OSD menu → 5.2).

4.4.3 Color adjustment (COLOR)

① RED LEVEL
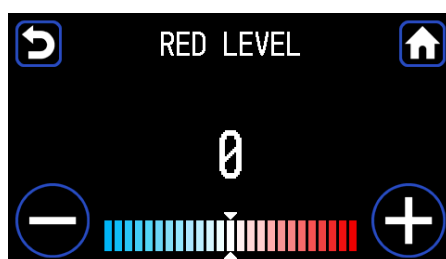
② BLUE LEVEL
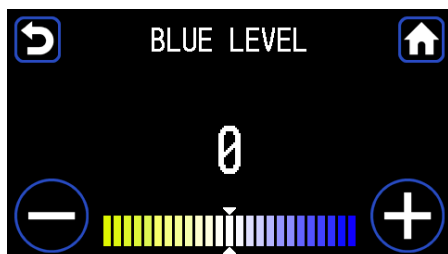
③ CHROMA LEVEL
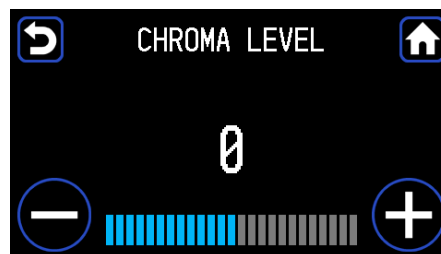
Item	Description
RED LEVEL	This adjusts the red level using the touch panel or Rotary Switch (Linked with the OSD menu→5.3).
BLUE LEVEL	This adjusts the blue level using the touch panel or Rotary Switch (Linked with the OSD menu→5.3).
CHROMA LEVEL	This adjusts color density using the touch panel or Rotary Switch (Linked with the OSD menu→5.3).

4.4.4 Sharpness adjustment (SHARPNESS)
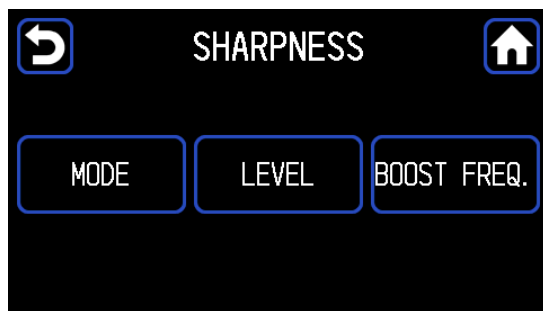
① MODE
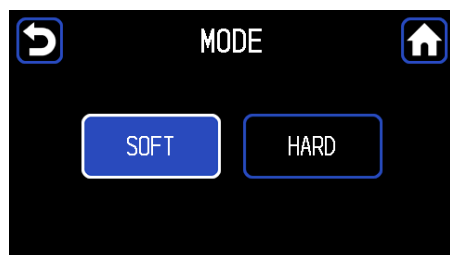
② LEVEL
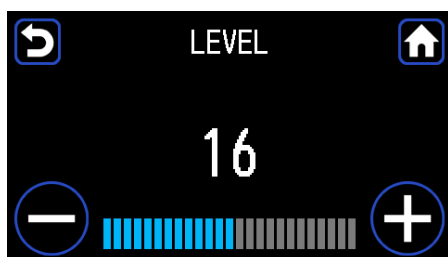
③ BOOST FREQ.

Item	Description
MODE	This changes the mode of outline emphasis. (Linked with the OSD menu →5.4).
LEVEL	This adjusts the level of contour emphasis using the touch panel or Rotary Switch. (Linked with the OSD menu →5.4).
BOOST FREQ.	This adjusts the level of color contour emphasis using the touch panel or Rotary Switch. (Linked with the OSD menu →5.4).

4.5 Function (FUNCTION)

Select [PICTURE] from the MENU screen.
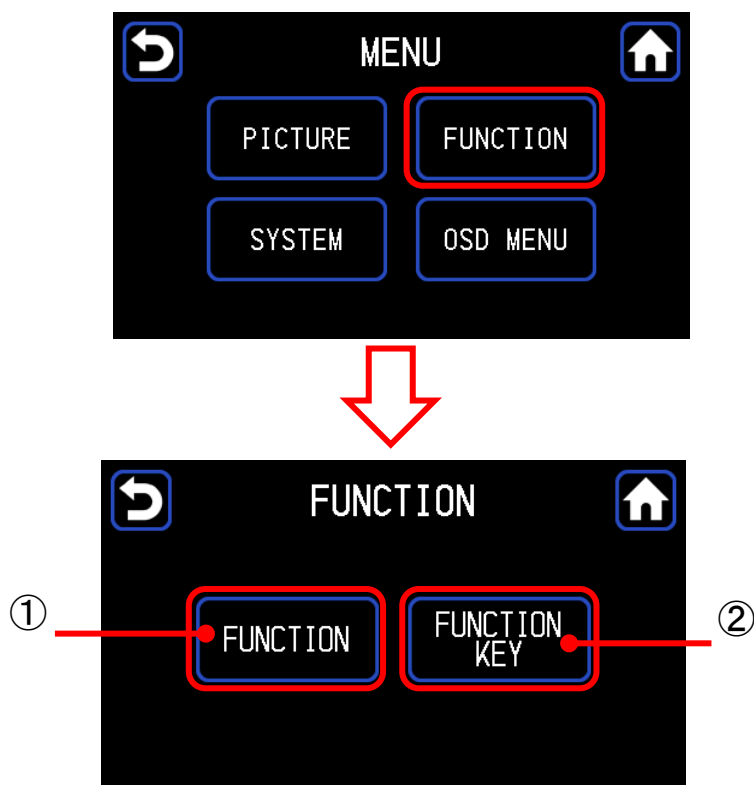
① Go to the FUNCTION screen (→4.5.1)
② Go to the FUNCTION KEY screen(→4.5.2,4.5.3)

4.5.1 Scaling (MAGNIFIER)/Flip(FLIP)
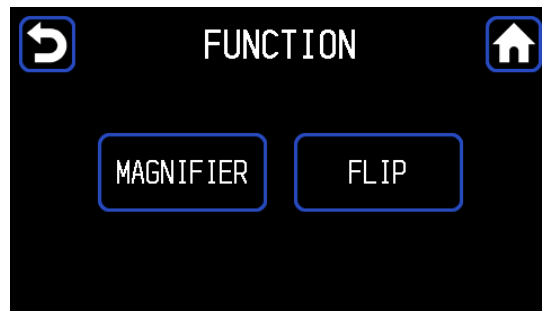
② MAGNIFIER
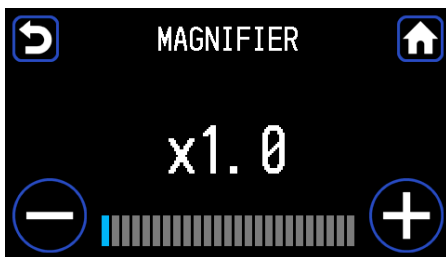
③ FLIP
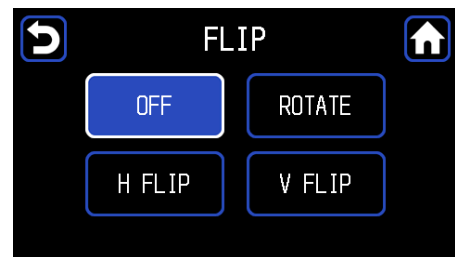
Item	Description
MAGNIFIER	This is the magnification setting of the electronic zoom and can be adjusted using the touch panel or Rotary Switch (Linked with the OSD menu→5.6).
FLIP	This sets the horizontal and vertical flipping of the image. (Linked with the OSD menu→5.6).

4.5.2 Assign a function to a function key (FUCTION KEY)

To set an operation when the function button is pressed, go to the
[TOP MENU] ⇒[FUNCTION KEY] screen.
This works in conjunction with the OSD menu.
Please refer to the menu description for the assigned function. (→5.8)
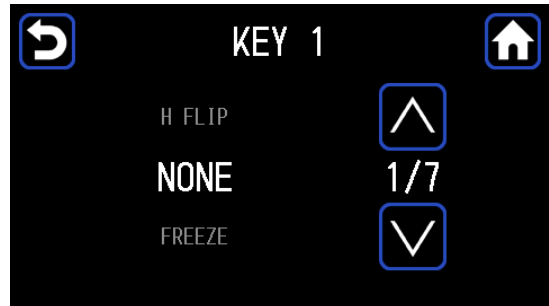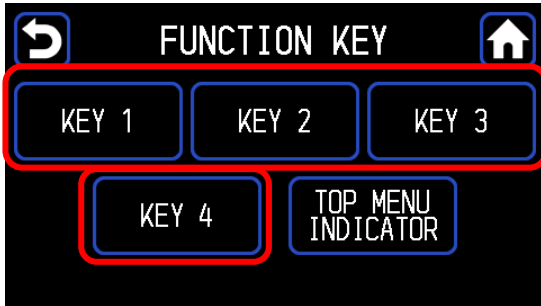
4.5.3 Function assignment of the TOP MENU indicators (TOP MENU INDICATOR)

Assign an indicator function that can be operated from TOP MENU.
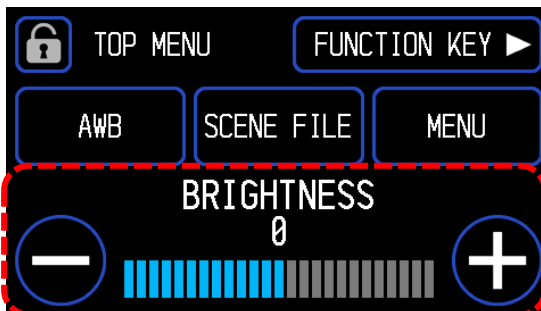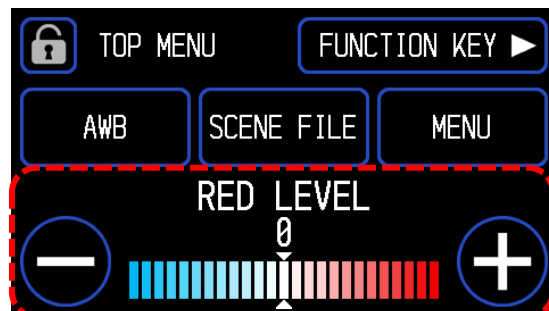
Repeat the steps for [ITEM2] and [ITEM 3].
To switch function, pressing the Rotary Switch in the TOP MENU. Other items can be operated from the TOP MENU.
<Setting items>
NONE (ITEM2, 3 only), BRIGHTNESS, PEAK RATIO, SHARPNESS, CHROMA, RED LEVEL,
BLUE LEVEL

4.6 System settings (SYSTEM)

Select [SYSTEM] from the MENU screen.
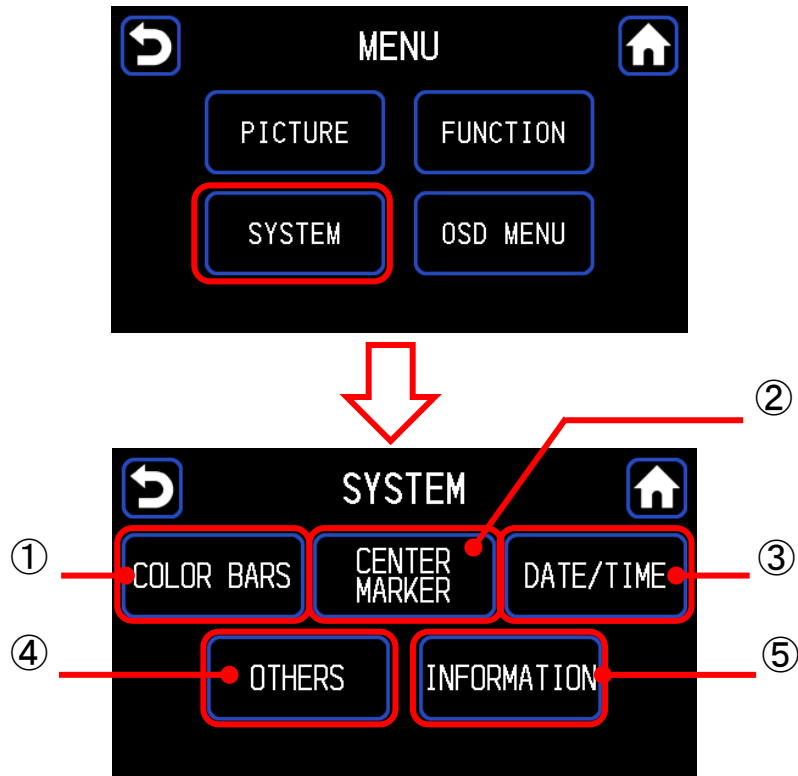
① Go to the COLOR BARS screen (→4.6.1)
② Go to the CENTER MARKER screen (→4.6.2)
③ Go to the DATE/TIME screen (→4.6.3)
④ Go to the OTHERS screen (→4.6.4)
⑤ Go to the INFORMATION screen (→4.6.5)

4.6.1 Color bars output (COLOR BARS)

The camera's built-in color bar signal is sent to the image output.

Brightness, contrast, etc. of the color monitor can be adjusted.

To display the color bar output, press [ON], to display the camera image press [OFF]

4.6.2 Center marker output (CENTER MARKER)

Displays the center marker on the monitor. Works in conjunction with the OSD menu (→5.9).

To display the center marker, press [ON]. To hide display of the center marker, press [OFF].

4.6.3 Date/Time setting(DATE/TIME)

Sets the date and time. Works in conjunction with the OSD menu (→5.10).
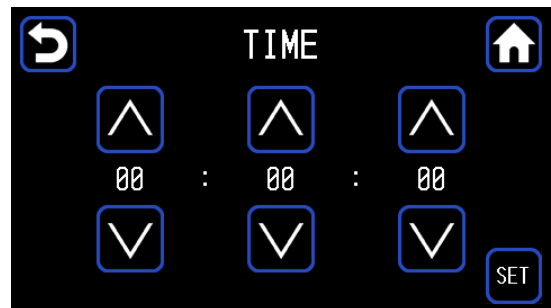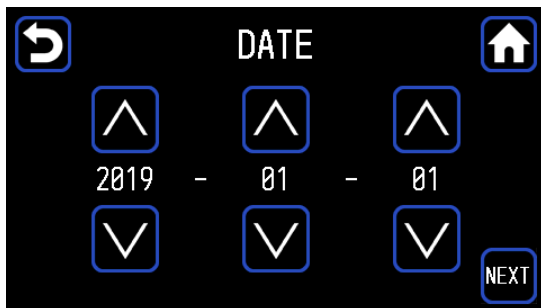
Set the date and time with the up and down buttons. Press the [SET] button to confirm.

4.6.4 Other settings (OTHERS)
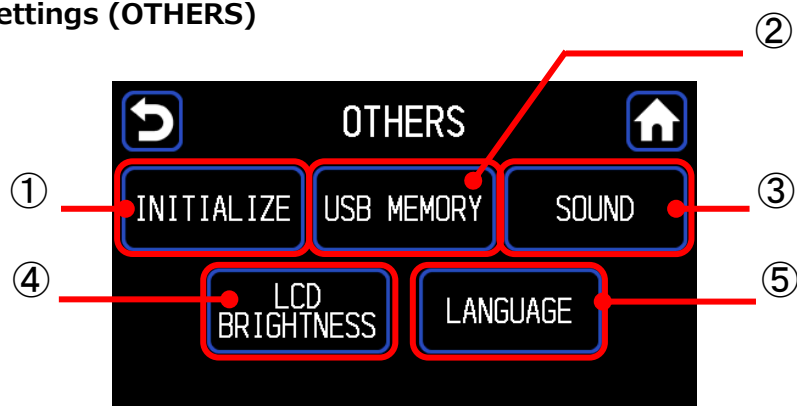
① Go to the INITIALIZE screen (→4.6.4.1).
② Go to the USB MEMORY screen (→4.6.4.2).
③ Go to the SOUND screen (→4.6.4.3).
④ Go to the LCD BRIGHTNESS screen (→4.6.4.4).
⑤ Go to the LANGUAGE screen (→4.6.4.5).

4.6.4.1 Initialization (INITIALIZE)

Setting values are returned at the default factory settings. CCU initialization can also be performed from the OSD menu (→5.12).
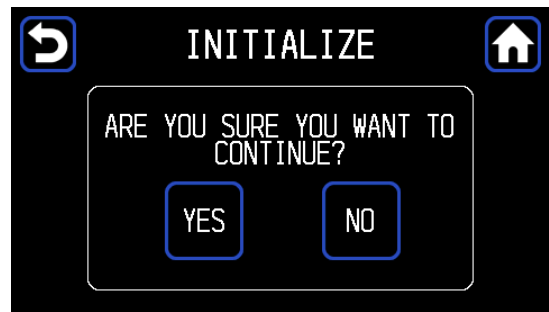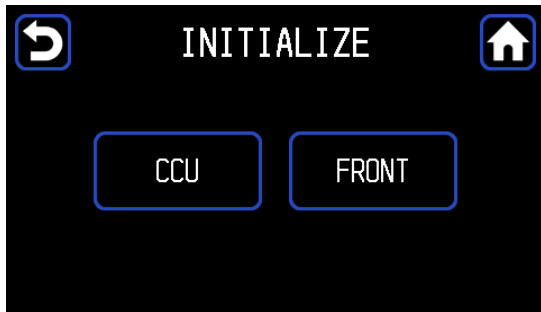
Press the [CCU] and [FRONT] buttons to display the window.

To initialize, press the [YES] button.

4.6.4.2 USB memory (USB MEMORY)

Setting data of CCU can be saved to and read from the USB memory.

< USB not connected button disabled state >

<USB connection Button enabled state >
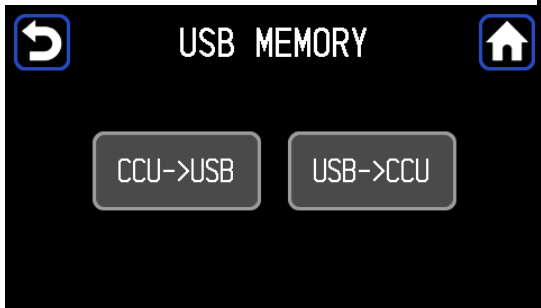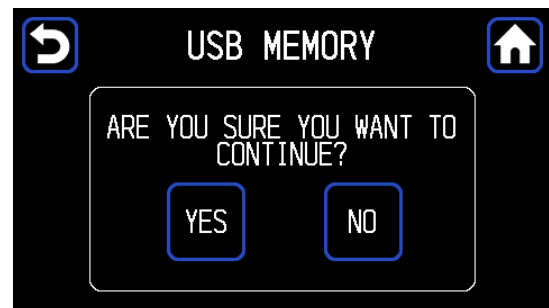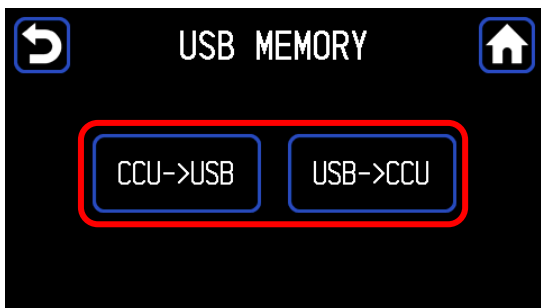
Press the [USB C CCU], [CCU⇒USB] button to display the [CCU⇒USB] window.

Press the [YES] button to confirm.

If the USB memory is not inserted, the button is disabled and cannot be used.

Operation is also possible from the OSD menu, for details, refer to Save and Load Configuration Data. (→5.12)

4.6.4.3   Volume setting (SOUND)
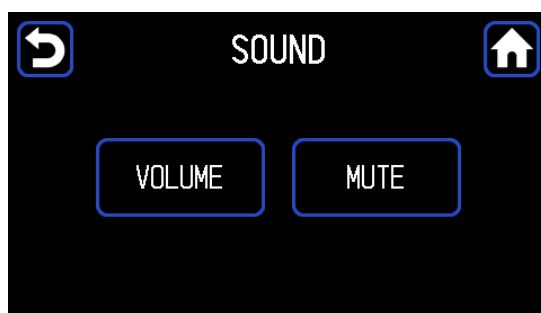
① VOLUME
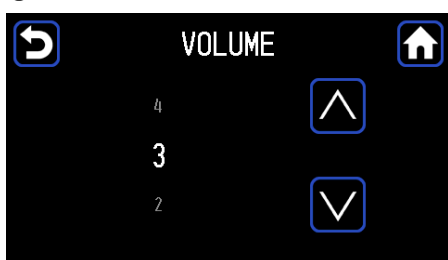
② MUTE
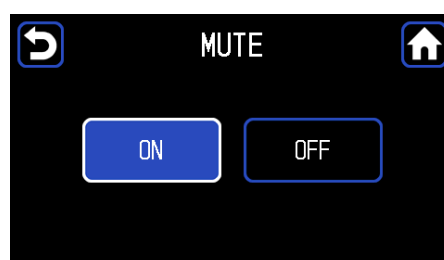
Item	Setting value		Description
VOLUME			Set the touch panel volume.
		1～5	As the value increases, sound becomes louder.
MUTE			
		ON	Sound is muted.
		OFF	Sound is output according to the VOLUME setting.

4.6.4.4　Brightness setting (LCD BRIGHTNESS)
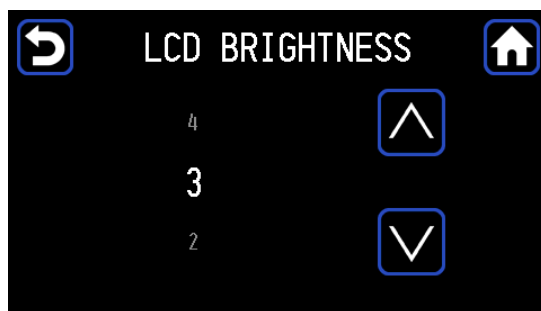
Item	Setting value	Description
LCD BRIGHTNESS		Set the brightness of touch panel.
	1〜5	As the value increases, the panel becomes brighter.

4.6.4.5　Language setting (LANGUAGE)

Set the display language. CCU initialization can also be performed from the OSD menu (→5.12).
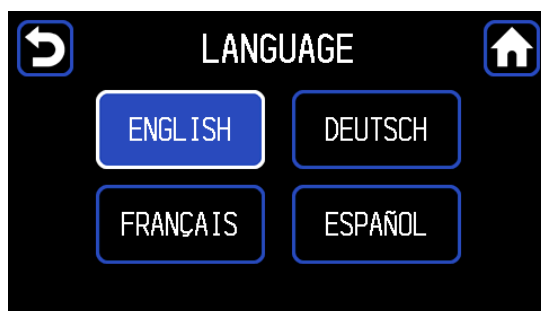
4.6.5 Version information (INFORMATION)

Display camera and touch panel version information.

INFORMATION	
CCU Firmware	V1.00
CCU FPGA1	V1.00
CCU FPGA2	V1.00
CCU FPGA3	V1.00
HEAD FPGA	V1.00

INFORMATION	
FRONT FIRMWARE	V1.00
FRONT CPLD	V1.00
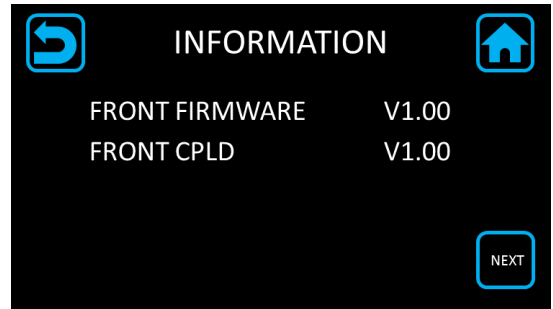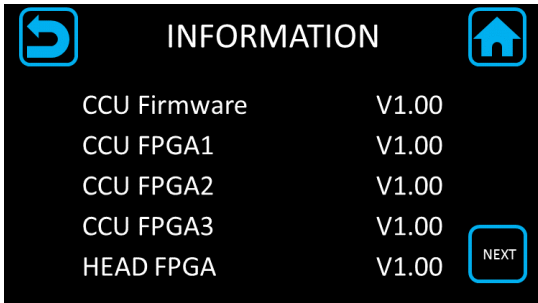
4.7 Initializing indicator settings

Indicator display setting items can be returned to the default values (factory settings) after setting values have been changed.

Press the function name to display the window, then press the [YES] button to return to the initial value.
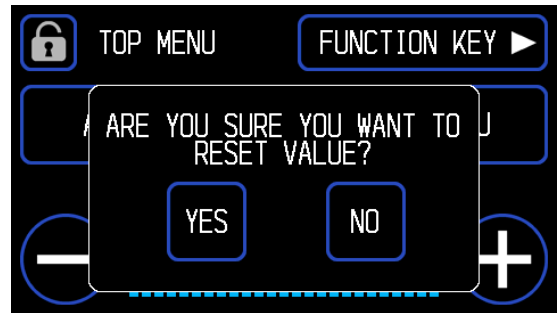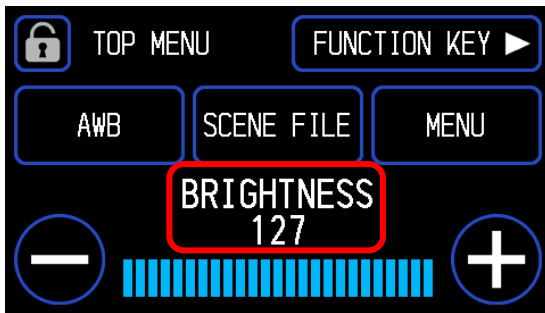
5 OSD menu operations（Professional setting menu）

This section describes operations of the OSD menu screen and the functions that can be set on the OSD menu screen.

```
PICTURE
    Brightness
    Contrast
    Color
    Sharpness
    Scene File
FUNCTION
    Function
    Foot Switch
    Function Key
SYSTEM
    Video Format
    Date/Time
    Network
    Others
    Information
```
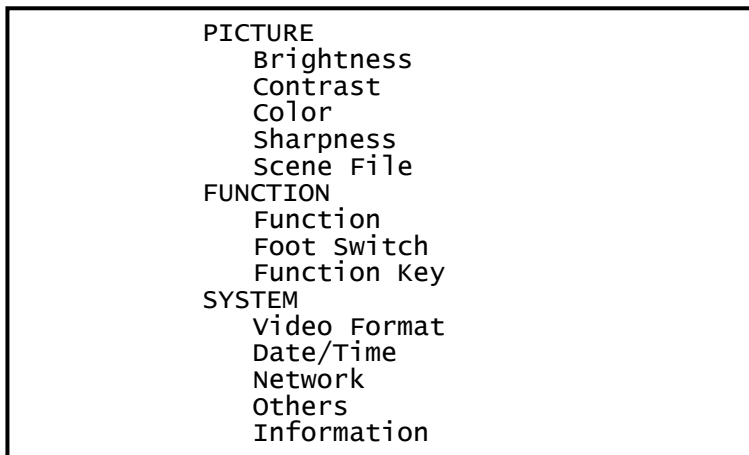
Select [OSD MENU] from the MENU screen

Display OSD menu

Changes the setting value

Return to MENU screen and hide OSD

Return to TOP MEN:@U screen and hide OSD menu

Sets the selected item

Switches item
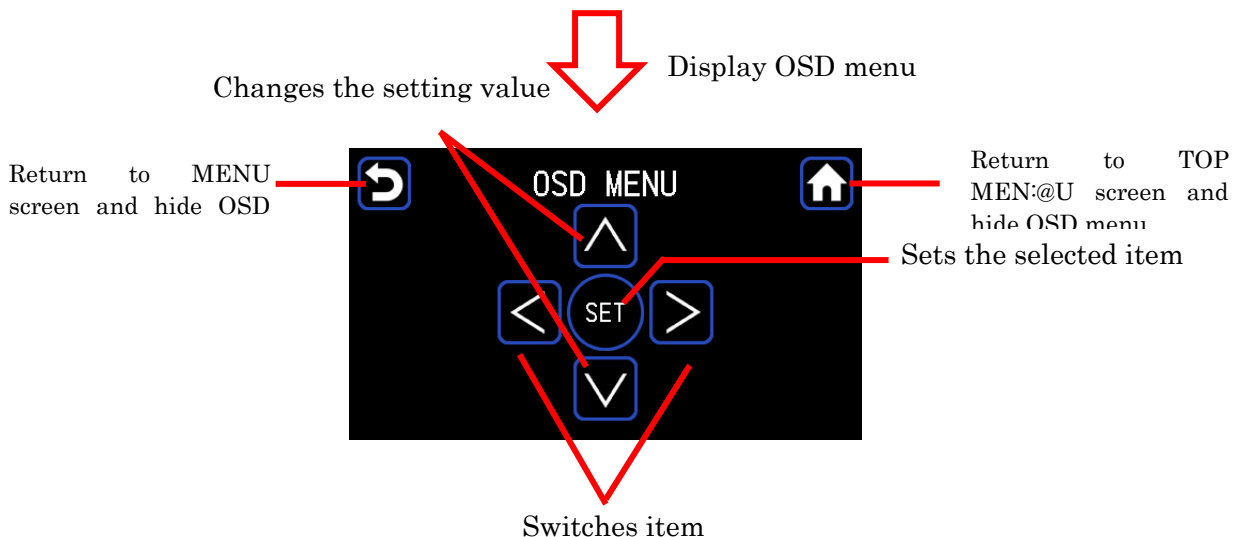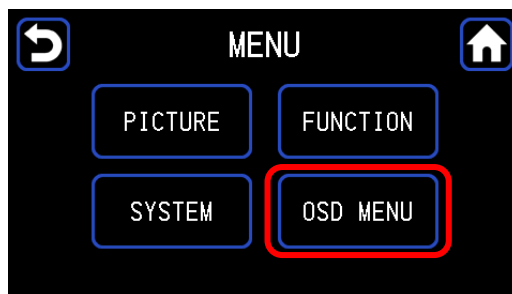
Press the [OSD MENU] button to display the OSD menu on the monitor.

Select an item using ↑ / ↓.→ Press the SET button to enter the submenu screen. Change the value of each setting using ↑ / ↓. Return to the previous menu with ←.

Item selection using the Rotary Switch is also possible by rotating the switch. Pressing the switch performs the same operation as pressing the SET button.

※Exit the [OSD MENU] screen and hide the OSD menu to save the settings and exit.

5.1 Brightness

Exposure time can be adjusted.

```
                Brightness

        Quit
        Brightness Level     0
        Response             MIDDLE
        Photometry           ENTER ⇒
        Shutter Control      AUTO ⇒
        Gain                 AUTO ⇒
        High Sensitivity     OFF
        Line Mix             OFF
```

Item	Setting value	Description
Brightness Level		This controls brightness. When Shutter or Gain is set at AUTO, brightness is automatically adjusted according to the level set here.
	-128~127	If the screen is too dark, set the value higher, if it is too bright set the value lower.
Response		When Shutter or Gain is set at AUTO, this controls response speed.
	MIDDLE	Adjusts at standard speed.
	SLOW	Adjusts slowly.
	FAST	Adjusts quickly.
Photometry	Measurement Area	This adjusts the range of the photometry area. Shutter, Gain, etc. are automatically adjusted based on the image in the frame displayed on the screen.
	NARROW	Measurement area is approx. 40% of the screen center.
	MIDDLE	Measurement area is approx. 60% of the screen center.
	FULL	Measurement area is the entire screen.
	CIRCLE	Measurement is area is a circular area of the screen center.
	USER	Measurement is manually set. Press the SET button to go to the settings screen.
	Peak Ratio	This determines the photometric method. When Shutter or Gain is at AUTO, brightness can be changed by adjusting the metering method. If most of the background area is dark and the sample is bright, set it to peak photometry. If the difference in luminance over the entire screen is small, set it to the average measurement side.
	0~63	Peak measurement is performed at 63, and average measurement is performed at 0.

Shutter Control			This controls shutter operation. When shutter speed is increased, brightness changes according to the speed. In addition, flicker may increase under a fluorescent lamp and other discharge lamp lighting.
		MANUAL	Shutter speed is set according to the determined Shutter Speed value.
		Shutter Speed	Sets the shutter speed.
		AUTO	Optimal shutter speed is automatically adjusted according to the brightness of the image.
		Shutter Limit	Optimal shutter speed is automatically adjusted according to the brightness of the image.
		Slow Shutter	Enables or disables the Slow Shutter function.
		Slow Shutter Limit	Limits the accumulated shutter speed.
Gain			This controls the adjustment of Gain. When taking an image of a dark sample, brightness can be adjusted.
		MANUAL	Gain is set according to the value set in Normal Gain.
		Normal Gain	Sets the gain value.
		AUTO	Gain is automatically adjusted according to the brightness of the video input for a consistent output level.
		Base	Sets offset.
		Range	Sets the upper limit of gain setting when Gain is AUTO.
High Sensitivity			This function increases sensitivity.
		OFF	Function is disabled.
		ON	Sensitivity is doubled. However, horizontal resolution is degraded.
Line Mix			This function increases sensitivity.
		OFF	Feature is disabled.
		ON	Sensitivity is doubled. However vertical resolution is degraded.

5.2 Contrast

Video level settings are adjusted here.

```
                    Contrast

        Quit
        Pedestal              0
        Flare                 7
        Gamma                 ON ⇒
        Knee                  ON ⇒
        HDR                   OFF
        White Shading         OFF
        Black Stretch         OFF
```

Item	Setting value	Description
Pedestal		This determines black level.
	-64~64	As the value increases, black becomes brighter .
Flare		This determines flare correction.
	0~50	As the value increases, the correction becomes stronger, and the image becomes tighter.
Gamma		Gamma correction lightens dark areas of the image.
	OFF	Settings are disabled.
	ON	Settings are enabled.
	-128~127	As the value increases, the darker areas of the image become brighter.
Knee		Perform knee correction to make bright areas of the image easier to see.
	OFF	Settings are disabled.
	ON	Settings are enabled.
	Mode	AUTO or MANUAL settings are possible.
	Point	Sets the knee point.
	Slope	Sets the knee slope.
HDR		HDR reduces white spots and black spots in video.
	OFF	Settings are disabled.
	ON	Settings are enabled.
	-128~127	As the value increases, the HDR function becomes stronger.
White Shading		Adjusts white shading.
	OFF	Correction is disabled
	ON	Settings are enabled.
Black Stretch		Adjusts the black stretch.
	OFF	Correction is disabled.
	ON	Correction is enabled

		0～63	As the value increases, the Black Stretch function becomes stronger.

5.3 Color

Settings related to image color are made here.

```
                    Color

        Quit
        Red Level              0
        Blue Level             0
        White Balance          AWB  ⇒
        Chrome Level           0
        Matrix                 OFF
        Color Correct          OFF
```

Item	Setting value	Description
Red Level		This adjusts the red level.
	-128~127	As the value increases, red becomes darker.
Blue Level		This adjusts the blue level.
	-128~127	As the value increases, blue becomes darker.
White Balance		White balance operations are set here.
	AWB	White balance is automatically adjusted.
	ATW	White balance automatically adjusted according to the sample to be imaged.
	MANUAL	White balance can be manually adjusted.
	Red Level	Adjusts the red gain.
	Blue Level	Adjusts the blue gain.
Chroma Level		This adjusts color saturation.
	-128~127	As the value increases, the color becomes darker. As the value decreases, the color becomes lighter.
Matrix		The color matrix is adjusted here. Normally, set it to OFF.
	OFF	Adjustment is disabled.
	ON	Adjustment is enabled.
Color Correct		Color collection is adjusted here. Normally, set it to OFF.
	OFF	Adjustment is disabled.
	ON	Adjustment is enabled.

5.4 Sharpness

Outline emphasis can be adjusted here.

```
                    Sharpness

          Quit
          Level                16
          Boost Freq.          2MHz
          Mode                 SOFT
```

Item	Setting value		Description
Level			The level of outline emphasis can be adjusted.
		0~31	As the value increases, the image becomes sharper.
Boost Freq.			Boost frequency can be adjusted to emphasize the contour.
	2MHz~16MHz		As the value decreases, the outline can be applied to the whole screen more easily.
Mode			Outline emphasis mode can be switched
		SOFT	Standard outline emphasis setting.
		HARD	Outline emphasis becomes stronger.

5.4 Scene File

Setting value information can be saved and read as a scene file.

Up to 4 scene files can be created.

```
                  Scene File

        Quit
        Load                No.1
        Save                READY
        Initialize          READY
```

Item	Description
Load	Selects and reads the set scene file.
Save	Saves the set conditions in the scene file. Select the scene file to be saved, and press the OK button.
Initialize	Initializes the scene file settings at factory default settings. Select the scene file to initialize and press the ENTER button.

5.6 Function

Various functions can be set here.

```
                    Function

        Quit
        Magnifier           x 1.0
        Flip                OFF
        DNR Level           7
```

Item		Setting value	Description
Magnifier			The magnification setting of the electronic zoom can be set here.
		x1.0~x4.0	The center of the screen can be zoomed in at 0.1x increments.
Flip			Horizontal and vertical aspects of the image can be flipped.
		OFF	Both horizontal and vertical aspects are output as is.
		H FLIP	A horizontally inverted image is output.
		V FLIP	A vertically inverted image is output.
		ROTATE	A both horizontally and vertically inverted image is output.
DNR Level			Adjusts the level of noise reduction.
		0~31	As the value increases, noise will decrease, but resolution degrades.

5.7 Foot Switch

The function assigned to the foot switch can be set here. Up to 4 footswitch functions can be individually set.

```
                        Foot Switch

           Quit
           Switch1                  NONE
           Switch2                  NONE
           Switch3                  NONE
           Switch4                  NONE
```

Item	Setting value	Description
Switch1~4		Which function will occur when the foot switch is operated can be set here. The foot switch function supports up to 4 operations, and each can be individually set.
	NONE	No function is set.
	FREEZE	Outputs a still image. Operate the foot switch again to return to the video.
	SCENE F(ROT)	Switches the selected scene file.
	H FLIP	A horizontally inverted video is output.
	V FLIP	A vertically inverted video is output.
	ROTATE	The image is rotated 180 degrees and output.
	ZOOM IN	Performs electronic zoom in.
	ZOOM OUT	Performs electronic zoom out.
	AWB	Adjusts the white balance.
	SCENE1	Displays scene file1.
	SCENE2	Displays scene file2.
	SCENE3	Displays scene file3.
	SCENE4	Displays scene file4.
	SCENE1<->2	Switches between scene file 1 and 2.
	SCENE1<->3	Switches between scene file1 and 3.
	SCENE1<->4	Switches between scene file1 and 4.
	SCENE2<->3	Switches between scene file2 and 3.
	SCENE2<->4	Switches between scene file2 and 4.
	SCENE3<->4	Switches between scene file3 and 4.

5.8 Function Key

A function can be assigned to a function button here.

```
                      Function Key

        Quit
        Key1                    NONE
        Key2                    NONE
        Key3                    NONE
        Key4                    NONE
```

Item	Setting value	Description
Key1~4		Which function will occur when the function key is pressed can be set here.
	NONE	No function is set.
	H FLIP	A horizontally inverted image is output.
	V FLIP	A vertically inverted video is output.
	ROTATE	The image is rotated 180 degrees and output.
	ZOOM IN	Performs electronic zoom in.
	ZOOM OUT	Performs electronic zoom out.
	FREEZE	Outputs a still image. Operate the function button again to return to the video.

5.9 Video Format

Video signal related aspects can be set here.

```
                    Video Format

         Quit
         Frame Rate            59.94Hz
         4K SDI Output         2SI
         2K SDI Output         1080i
         DVI Output            1080p
         HDMI output           AUTO
         Color Gamut           BT.709
         H Position            0
         V Position            0
         Genlock               OFF
         Center Marker         OFF
```

Item	Setting value	Description	
Frame Rate		Selects the frequency of the video output signal.	
	59.94Hz	Output at 59.94 Hz.	
	50Hz	Output at 50 Hz.	
4K SDI Output		Selects the frequency of the video output signal.	
	2SI	Outputs in 2 Sample Interleave format.	
	12G	Outputs in 12G-SDI format.	
2K SDI Output		Selects the output signal of 2K SDI.	
	1080p	Outputs a progressive signal.	
	1080i	Outputs an interlace signal.	
DVI Output		Selects the output signal of DVI.	
	1080p	Outputs a progressive signal.	
	1080i	Outputs an interlace signal.	
HDMI Output			
	AUTO	This setting is normally used.	
	4K		
		4:2:2 10bit	Outputs YCbCr and a 10-bit signal at a ratio of 4: 2: 2.
		4:4:4 8bit	Outputs RGB as 8-bit signal.
	2K		
		1080p 4:2:2 10bit	Outputs YCbCr and a 10-bit progressive signal at a ratio of 4: 2: 2.
		1080p 4:4:4 8bit	Outputs RGB as an 8-bit progressive signal.
		1080i 4:2:2 10bit	Outputs YCbCr and a 10: 2 interlaced signal at a ratio of 4: 2: 2.
		1080i 4:4:4 8bit	Outputs RGB as an 8-bit interlaced signal.

Color Gamut		Selects the color gamut for 4K output.
	BT.709	Sets the color gamut for 4K output at BT.709.
	BT.2020	Sets the color gamut for 4K output at BT.2020.
H Position	-32~32	The horizontal display of the screen can be adjusted in 1-pixel units.
V Position	-8~8	The vertical display of the screen can be adjusted in single line units.
Genlock		Genlock can be set here.
	OFF	The genlock feature is disabled.
	AUTO	When a SYNC signal is input to the genlock terminal, it automatically switches to external synchronization.
	H Phase	Adjusts the horizontal phase of genlock input.
	V Phase	Adjusts the vertical phase of genlock input.
	3D Support	Sets whether to operate as master or slave at 3D configuration.
Center Maker		Displays the center marker.

5.10 Date/Time

To set the time of the clock function installed in this unit.

The update date and time of the setting data must be matched.

```
                        Date/Time

          Quit
          Year                2019
          Month               3
          Day                 2
          Hours               11
          Minutes             34
          Seconds             20
          Setting             READY

                  2019-03-02
                   11:34:20
```

Item	Description
Year	Each aspect to set the time.
Month	
Day	
Hours	
Minutes	

5.11 Network

This unit can be externally controlled by a LAN connection. The network can be set up here.

```
                    Network

        Quit
        IP Address1              192
        IP Address2              168
        IP Address3              2
        IP Address4              100

        Subnet Mask1            192
        Subnet Mask2            168
        Subnet Mask3            2
        Subnet Mask4            1
        Setting                 READY

                IP Address
                192.168.2.100
                Subnet Mask
                192.168.2.1
```

Item	Description
IP Address1~4	Sets the IP Address.
Subnet Mask1~4	Sets the subnet mask.
Setting	To change settings, switch from [READY] to [START] and press the ENTER button.

Current settings are displayed in the lower part of the screen.

※After changing the settings, restart the camera.

  If "Please Restart Camera" is displayed at the bottom of the screen, please restart.

  Changes to the network configuration are complete.

5.13 Information

Software version information is displayed here.

```
                    Information

        CCU Firmware        V1.00-6368
        CCU FPGA1           V1.00-6305
        CCU FPGA2           V1.00-6306
        CCU FPGA3           V1.00-6255
        Head FPGA           V1.00-6209
```

6 Advance Use

External Synchronization

To use this machine in external synchronization mode, connect the SYNC terminal to the GENLOCK terminal on the CCU back. When SYNC terminal is connected to the GENLOCK terminal, the camera will automatically switch from internal synchronization mode to external synchronization mode.

SYNC input conditions: Tri-level SYNC: 0.6 Vp-p / 75 Ω

Wiring Example

Prepare two sets comprised of a CCU and a MKC-X800 camera. Use a coaxial cable to connect the SYNC connector on the CCU (master) and the GENLOCK connector on the CCU (slave).
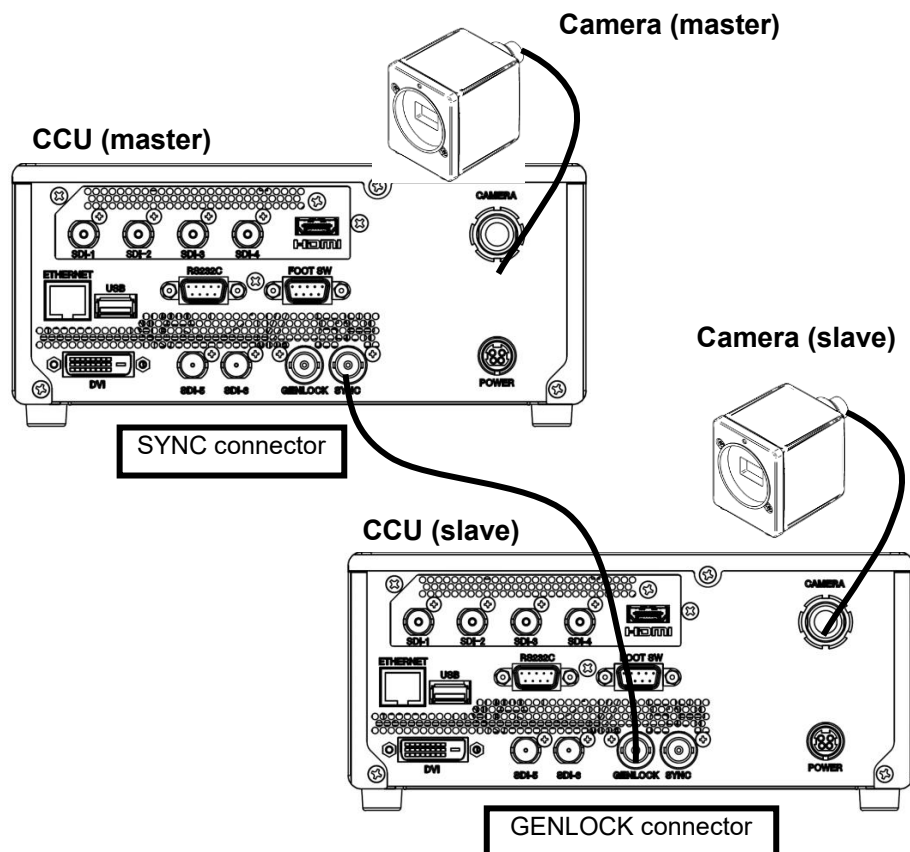
Settings

Check the SYNC output waveforms of the master CCU and the slave CCU, and adjust PHASE so that both H/V phases are the same. The slave (unit with the GENLOCK connector connected) should be targeted for adjustment. The master unit does not need the phase adjustments.

Master SYNC

Make phases consistent with each other

Slave SYNC
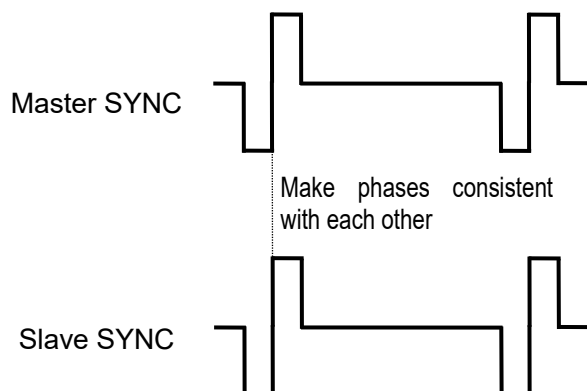
3D support function

This device has a 3D support function. The settings of various camera functions of the left and right units can be synchronized and easily adjusted when the 3D system is constructed.

Connections and settings

The 3D system for this equipment is comprised of one master machine, one slave machine and a 3D-compatible monitor. Connect each device as shown in the figure below.

■Connection Example

RS-232C cross cable

CCU (Master)

CCU (Slave)

Coaxial cable

Video output cable
HD-SDI or DVI

Video output cable
HD-SDI or DVI

3D-compatible monitor
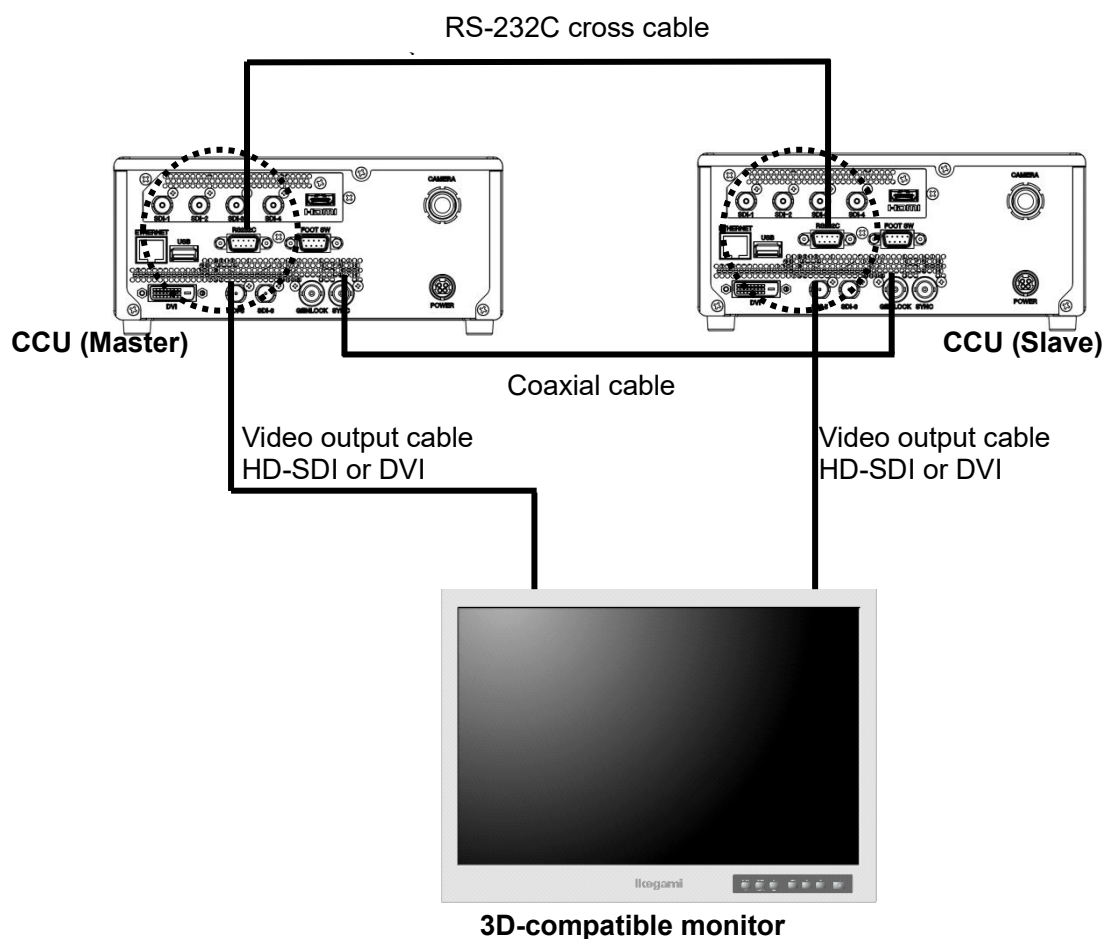
■Setting the master and the slave

1． Use a coaxial cable to connect the SYNC connector of the master CCU and the GENLOCK connector of the slave CCU. Next, connect RS-232C connector comrade using a RS-232Ccross cable (D-Sub 9-pin Female).

2． Connect the two CCUs and the monitor.
　※Connect both CCU output signals to the 3D-compatible monitor
　※Either camera can be set as the master.
　※Check the specifications of the monitor regarding output connection of the left or right camera.

3． Turn ON the main power switch．（possible from either CCU.）

4． From the MENU, go to [Video Format]→[Genlock]→[3D Support]. Next, change camera settings in 'Master' for the Master CCU, and in 'Slave' for the Slave CCU.

```
            Video Format

    Frame Rate          59.94Hz
    4K SDI Output       2SI
    2K SDI Output       1080p
    DVI Output          1080p
    HDMI Output         4K⇨
    H Position          0
    V Position          0
    Genlock             OFF
    Center Marker       OFF
```

```
         Video Format→Genlock

    H Phase          0
    V Phase          0
    3D Support       SLAVE
```

Caution During Connection
・　Before connecting, be sure the power to the camera is OFF.

Linking the operation panel and menu

When settings are complete, [White balance], [Auto shutter], [Auto sensitivity], [Auto Iris] and [Set value of each volume] etc. are interlocked between the master and the slave, and settings of the master CCU are automatically reflected in the slave CCU.

Manually Setting a Measuring Frame

The range of a measuring frame can be adjusted. When the measuring frame is adjusted, the video will automatically be adjusted according to the use environment.

Settings

Select [Exposure]→[Measurement Area]→[USER] from the menu, and press the set button. The manual setting screen for the measuring frame will be displayed.

Pressing the SET button will change in order of [Quit]→[Position]→[Top&Left]→[Bottom&Right]→[Quit].

```
┌─────────────────────────────────┐
│                                 │
│       ┌───────────────┐         │
│       │               │         │
│       │   Position     │         │
│       │               │         │
│       │               │         │
│       └───────────────┘         │
│                                 │
└─────────────────────────────────┘
```
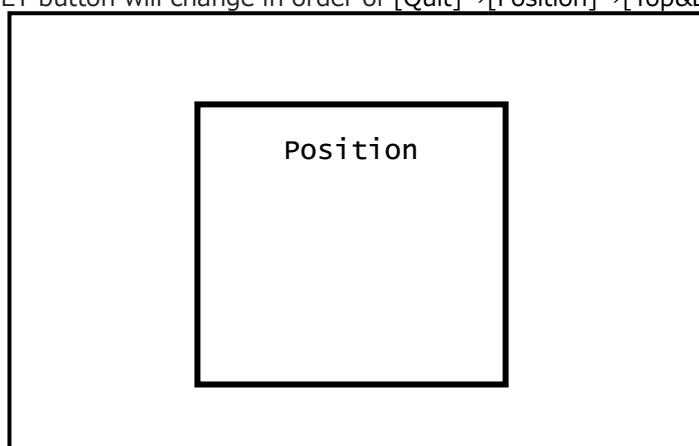
Position and size of a measuring frame can be adjusted. When settings are complete, select QUIT and press the SET button.

Setting the Position

To adjust the position of a metering frame, select [Position] and press the SET button. Frame size will not changed.

```
┌─────────────────────────────────┐
│                                 │
│      ┌───────────────┐          │
│      │ ┌···········┐  │          │
│      │ :  Position  :  │          │
│      │ :            :  │          │
│      │ :            :  │          │
│      └─┼────────────┼─┘          │
│        └···········┘             │
│      ↙                           │
│   Move a frame.                  │
└─────────────────────────────────┘
```
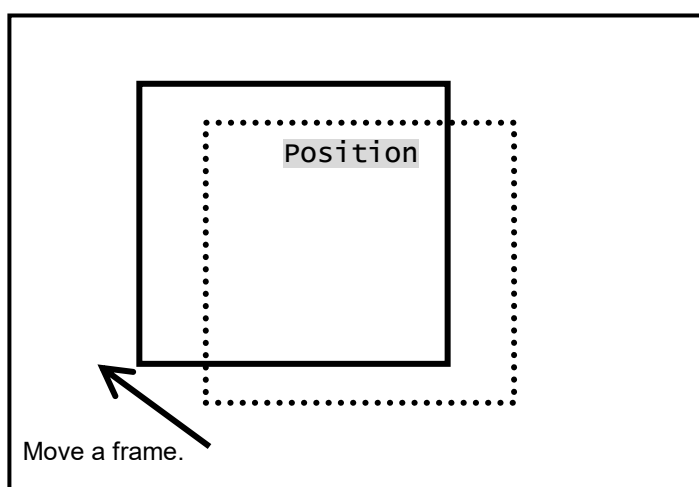
Use the ⇧/⇨/⇩/⇦keys to adjust the position.

Setting the Size

Select [Top&Left] or [Bottom&Right] to adjust the size of a measuring frame.

```
        [Bottom&Right]
        
        
        
        ...................→  Changing  the  frame
                             size
```
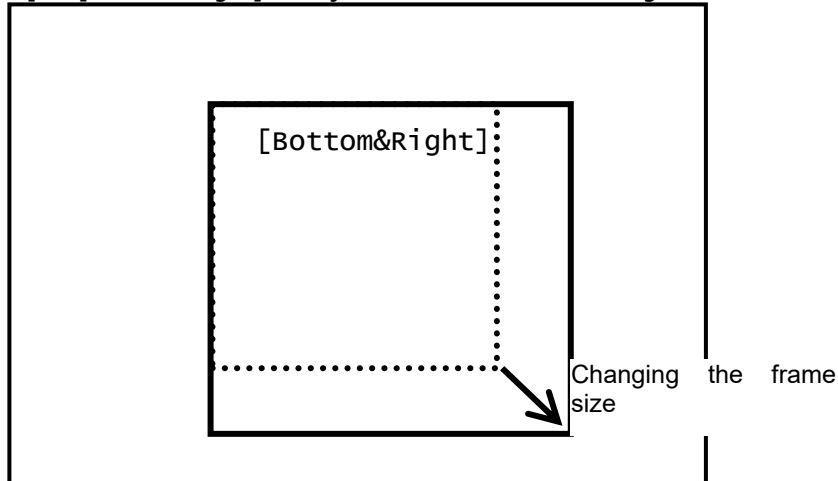
Use the ⇧/⇨/⇩/⇦ keys to adjust the position.

[Top&Left]   : Adjusts the size of left and upper sides of a metering frame.

Enlarges with "↑"/"←"key. Reduces with "↓"/"→"key.

[Bottom&Right]   : Adjusts the size of lower and right sides of a metering frame.

Enlarges with "↓"/"→"key. Reduces with "↑"/"←"key.

5.12 Others

Settings can be set to factory default settings.

Save or overwrite the setup data in the USB memory.

```
                    Others

        Initialize          READY
        USB Memory          NO MEDIA
        Language            ENGLISH
```
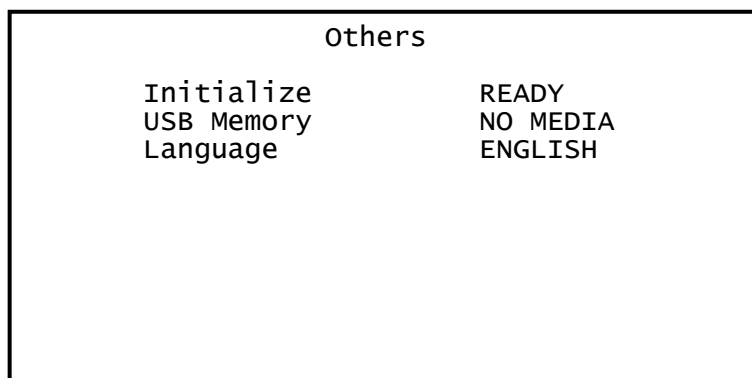
Item	Setting value		Description
Initialize			Initialize all settings except the scene file to factory default settings. Switch from [READY] to [START] and press the ENTER button.
USB Memory			Data can be read and saved on USB memory
		NO MEDIA	USB memory is not inserted.
		READY	USB memory is inserted and data can be read and saved.
		CCU→USB	Saves CCU data on USB memory.
		USB→CCU	Loads data from USB memory into CCU.
Language			Various languages can be displayed

Scene File

Up to four scene files can be set according to photographic conditions. Resetting to factory default settings is also possible.

Saving a Scene File

A scene file can be created from the menu. Since the present settings are saved in the scene file, set the desired settings first.

From [Scene File] on the menu, select one of the alternatives: [Save Scene 1] to [Save Scene 4], and press the SET button. The new settings will be saved immediately to the scene file. (refer to 4.2 Scene File.)

Initializing a Scene File

From [Scene File] on the menu, select a file to initialize from the alternatives: [Initialize Scene 1] to [Initialize Scene 4], and press the SET button. The selected scene file will immediately be initialized.

Setting a Scene File

To use a saved scene, use the front panel (Please see 4.2.1).

USB

Settings data can be saved in a USB memory. Also, settings data saved in the USB memory can be loaded.

■ **Connection port**
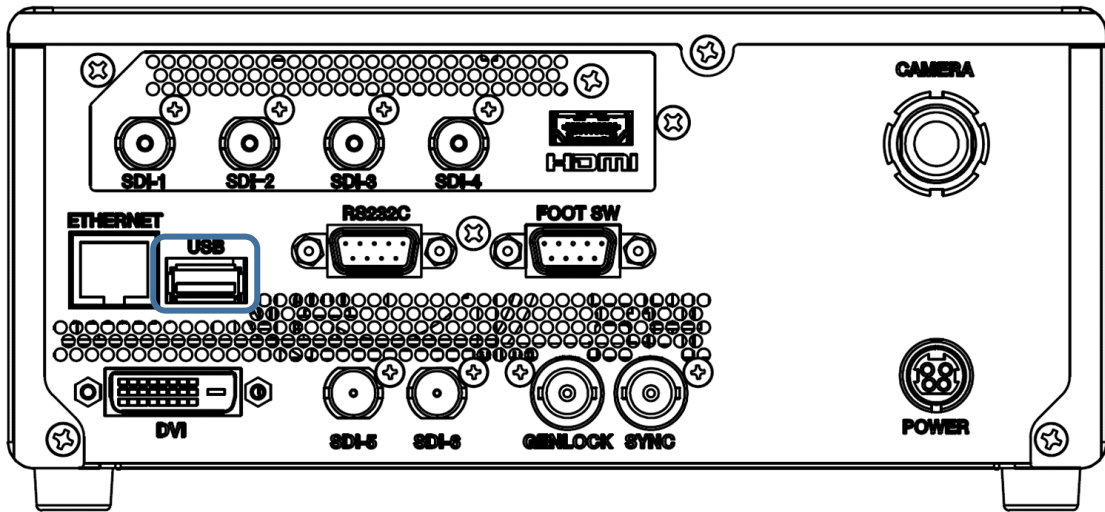
■ **Before using**

Compatible USB Memory
・USB memory protected by a password is not supported.
・FAT32 and FAT16 for the file system of USB memory are supported. USB memory formatted with another file system is not supported.
・Use a USB memory with 1MB or more of free space.

Saving a set data

When a USB memory is inserted, [USB Memory] status of [Others] changes from [NO MEDIA] to [READY].

```
                    Others

          Initialize          READY
          USB Memory          READY
          Language            ENGLISH
```
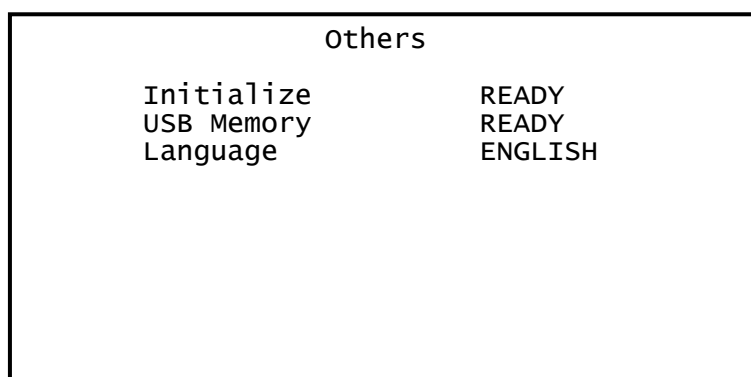
Move the cursor to [USB Memory] [READY], selects [CCU⇒USB] using the [↑] [↓] buttons, press [SET]. The set data is saved to the USB memory.

When data is being saved to the USB memory, ″USB Memory Busy″ will be displayed on the bottom of the screen.

When the data has been saved, ″USB Memory Completed″ will be displayed and the [USB Memory] returns to [READY]. Saving takes about 15-60 sec.

```
           Others                              Others

Initialize          READY           Initialize          READY
USB Memory          CCU⇒USB         USB Memory          READY
Language            ENGLISH         Language            ENGLISH




      USB Memory Busy                     USB Memory Completed
```
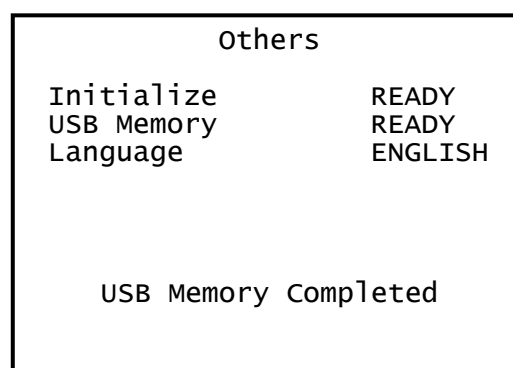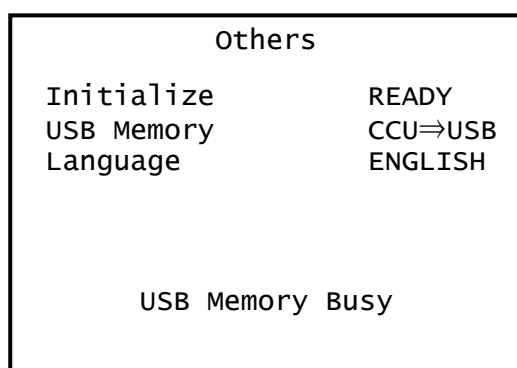
If 'NO MEDIA' is displayed,

the USB memory is not recognized. Check the following.

・Be sure the USB memory is inserted all the way.

・Remove the USB memory, and the re-insert it.

・Increase the amount of free space on the USB memory (recommended: 1MB or more), and try again.

Cautions regarding USB memory access.

CAUTION: Do not remove the USB memory or turn off the power, while "USB Memory Busy" is displayed.
If the USB memory is removed while being accessed, or the equipment is turned off, data in the USB memory may become corrupt.

Use a USB memory that has more than 1MB of a free space when saving a set data. A set data is saved with the file name extension "msf" in the root directory of the USB memory. The file name to be saved cannot be changed.

Cautions when saving a set data.

When a setting data is saved on a USB memory, any past set data will be overwritten and lost.

When saving of the set data is unsuccessful, "USB Memory Error" will appear.

```
                      Others

         Initialize          READY
         USB Memory          READY
         Language            ENGLISH




              USB Memory Error

```
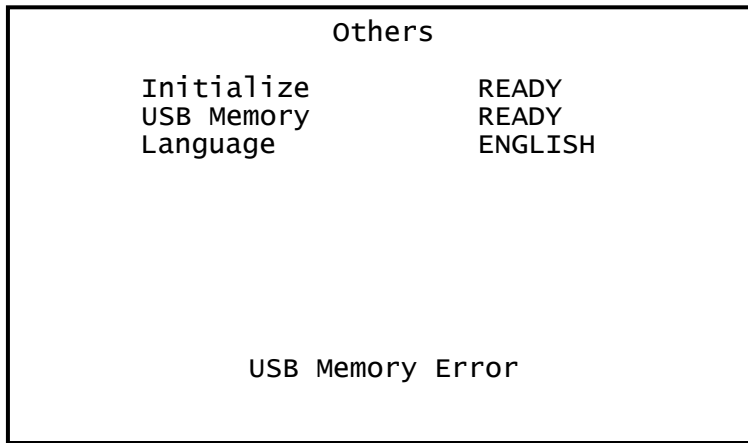
Cautions when saving is unsuccessful.

When saving a set data is unsuccessful, delete the data in the USB memory and increase the free space or use another USB memory.

Loading a set data

Move the cursor to [USB Memory] [READY], select [USB⇒CCU] using the [↑] [↓] buttons, press [SET]. The set data is read from the USB memory.

When data is being read from the USB memory, "USB Memory Busy" will be displayed on the bottom of the screen.

When the data has been read, "USB Memory Completed" will be displayed and the [USB Memory] returns to [READY]. Reading takes about 30 sec.
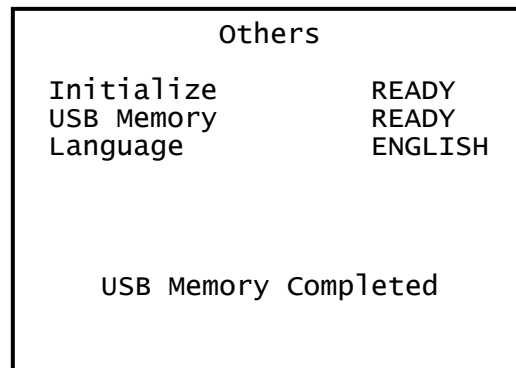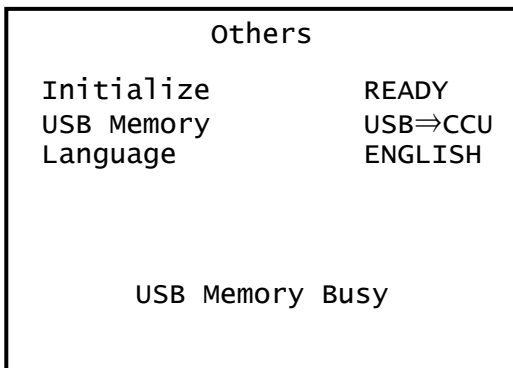
```
          Others                              Others

Initialize        READY              Initialize        READY
USB Memory        USB⇒CCU            USB Memory        READY
Language          ENGLISH            Language          ENGLISH




     USB Memory Busy                      USB Memory Completed

```

Cautions regarding USB memory access.

CAUTION: Do not remove the USB memory or turn off the power, while "USB Memory Busy" is displayed.

⚠ If the USB memory is removed while being accessed, or the equipment is turned off, data in the USB memory may become corrupt.

Cautions when loading a set data.

A set data saved in another IKEGAMI model cannot be read in MKC-X800.

⚠ **Notes on USB Memory Access**

Do not remove the USB memory or turn off the power while "USB Memory Busy" is displayed. Removing the USB memory or turning off the power while accessing may damage the data in the USB memory.

Notes on Saving Setting Data

When a setting data is saved on a USB memory, any past set data will be overwritten and lost.

⚠ **Notes on the Setting Data**

・Setting data saved on other IKEGAMI devices cannot be loaded to MKD-800IR. This may also result in a malfunction. Do not change the data.

・Do not change the file name of the setting data. If the file name is changed, MKD-800IR cannot recognize the data. It may also result in malfunction. Do not change the data.

7 Default Settings

Brightness

Item	Initial Value	Setting Range
Brightness Level	0	-128～127
Response	MIDDLE	FAST, MIDDLE, SLOW
Photometry	ENTER→	ENTER→
Photometry->Measurement Area	MIDDLE	NARROW, MIDDLE, FULL, USER CIRCLE
Photometry->Peak Ratio	12	0～63
Shutter Control	AUTO	MANUAL, AUTO
Shutter->Shutter Limit (Shutter = AUTO)	1/4000	1/100, 1/125, 1/250, 1/500, 1/1000, 1/2000, 1/4000, 1/5000, 1/6400, 1/8000, 1/10000
Shutter->Slow Shutter (Shutter = AUTO)	DISABLE	ENABLE, DISABLE
Shutter->Slow Shutter Limit (Shutter = AUTO)	50Hz　　　: 1/12 59.94Hz　: 1/15	50Hz　　　: 1/3, 1/6, 1/12, 1/25 59.94Hz　: 1/4, 1/8, 1/15, 1/30
Shutter->Shutter Speed (Shutter = MANUAL)	OFF	50Hz　　　: 1/3, 1/6, 1/12, 1/25, 59.94Hz　: 1/4, 1/8, 1/15, 1/30, OFF, 1/100, 1/125, 1/250, 1/500, 1/1000, 1/2000, 1/4000, 1/10000
Gain	AUTO	MANUAL, AUTO
Gain->Base (Gain = AUTO)	3dB	0dB 3dB, 6dB, 9dB, 12dB, 15dB
Gain->Limit (Gain = AUTO)	9dB	3dB, 6dB, 9dB, 12dB, 15dB, 18dB
Gain->Normal Gain (Gain = MANUAL)	3dB	0dB 3dB, 6dB, 9dB, 12dB, 15dB, 18dB, 21dB, 24dB, 27dB, 30dB, 33dB
High Sensitivity	OFF	OFF, ON
Line Mix	OFF	OFF, ON

Contrast

Item	Initial Value	Setting Range
Pedestal	0	-64～64
Flare	7	0～50
Gamma	ON	OFF, ON
Gamma->Level (Gamma= ON)	0	-128～127
Knee	ON	OFF, ON
Knee->Mode (Knee = ON)	AUTO	AUTO, MANUAL
Knee->Point (Knee = ON, Mode = AUTO)	-56	-128～127
Knee->Slope (Knee = ON, Mode = AUTO)	50	-128～127
Knee->Point (Knee = ON, Mode = MANUAL)	-56	-128～127
Knee->Slope (Knee = ON, Mode = MANUAL)	50	-128～127
HDR	OFF	OFF, ON
HDR->ON	0	-128～127
White Shading	OFF	OFF, ON
White Shading->AUTO (White Shading = ON)	READY	READY,START
White Shading->Initialize (White Shading = ON)	READY	READY,START
Black Stretch	OFF	OFF, ON
Black Stretch->Slope (Black Stretch = ON)	0	0～63

Color

Item	Initial Value	Setting Range
Red Level	0	-128～127
Blue Level	0	-128～127
White Balance	AWB	ATW, AWB, MANUAL
White Balance->AUTO (White Shading = AWB)	READY	READY,START
White Balance->Red Level (White Balance = MANUAL)	0	-128～127
White Balance->Blue Level (White Balance = MANUAL)	0	-128～127
Chroma Level+C59:C100	0	-128～127
Matrix	OFF	OFF, ON
R-G	0	-170～342
R-B	0	-170～342
G-R	0	-170～342
G-B	0	-170～342
B-R	0	-170～342
B-G	0	-170～342
Color Correct	OFF	OFF, ON
Page	1/2	1/2, 2/2
Mg1 Gain	0	-64～63
Mg1 Phase	0	-32～31
Mg2 Gain	0	-64～63
Mg2 Phase	0	-32～31
Mg3 Gain	0	-64～63
Mg3 Phase	0	-32～31
R1 Gain	0	-64～63
R1 Phase	0	-32～31
R2 Gain	0	-64～63
R2 Phase	0	-32～31
R3 Gain	0	-64～63
R3 Phase	0	-32～31
Ye1 Gain	0	-64～63
Ye1 Phase	0	-32～31
Ye2 Gain	0	-64～63
Ye2 Phase	0	-32～31
G1 Gain	0	-64～63
G1 Phase	0	-32～31
G2 Gain	0	-64～63

G2 Phase	0	-32～31
G3 Gain	0	-64～63
G3 Phase	0	-32～31
Cy1 Gain	0	-64～63
Cy1 Phase	0	-32～31
Cy2 Gain	0	-64～63
Cy2 Phase	0	-32～31
Cy3 Gain	0	-64～63
Cy3 Phase	0	-32～31
B1 Gain	0	-64～63
B1 Phase	0	-32～31
B2 Gain	0	-64～63
B2 Phase	0	-32～31

Scene File

Item	Initial Value	Setting Range
Load	No.1	READY, No.1～No.4
Save	READY	READY, No.1～No.4
Initialize	READY	READY, No.1～No.4

Function

Item	Initial Value	Setting Range
Magnifier	x1.0	x1.0～x4.0（x0.1 intervals）
Flip	OFF	OFF, H Flip, V Flip, Rotate
DNR Level	7	0～31

Foot Switch

Item	Initial Value	Setting Range
Switch 1~4	NONE	NONE, FREEZE, SCENE F(ROT), H FLIP, V FLIP, ROTATE, ZOOM IN, ZOOM OUT, SHUT CONT, GAIN CONT, IRIS CONT, AWB, SCENE 1<->2, SCENE 1<->3, SCENE 1<->4, SCENE 2<->3, SCENE 2<->4, SCENE 3<->4,

Function Key

Item	Initial Value	Setting Range
Key 1~4	NONE	NONE, FREEZE, H FLIP, V FLIP, ROTATE, ZOOM IN, ZOOM OUT,

Video Format

Item	Initial Value	Setting Range
Frame Rate	59.94Hz	59.94Hz, 50Hz
4K SDI Output	2SI	2SI,12G
2K SDI Output	1080i	1080p,1080i
DVI Output	1080p	1080p,1080i
HDMI Output	AUTO	AUTO, 4K, 2K
HDMI Output->Format (HDMI Output = 4K)	4:4:4 8bit	4:4:4 8bit, 4:2:2 10bit
HDMI Output->Format (HDMI Output = 2K)	1080p 4:4:4 8bit	1080p 4:4:4 8bit, 1080p 4:2:2 10bit, 1080i 4:4:4 8bit, 1080i 4:4:4 10bit
Color Gamut	BT.709	BT.709, BT.2020
H Position	0	-32~32
V Position	0	-32~32
Genlock Mode	OFF	AUTO, OFF
Genlock->H Phase (Genlock Mode = AUTO)	0	-128~127
Genlock->V Phase (Genlock Mode = AUTO)	0	-128~127
3D Support (Genlock Mode = AUTO)	SLAVE	SLAVE, MASTER
Center Marker	OFF	OFF, ON

Date/Time

Item	Initial Value	Setting Range
Year	2000～2099	
Month	1～12	
Day	1～31	
Hours	0～23	
Minutes	0～59	
Seconds	0～59	
Setting	READY, SET	READY

Network

Item	Initial Value	Setting Range
IP Address1	192	0～255
IP Address2	168	0～255
IP Address3	2	0～255
IP Address4	100	0～255
Subnet Mask1	192	0～255
Subnet Mask2	168	0～255
Subnet Mask3	2	0～255
Subnet Mask4	1	0～255
Setting	READY	READY, SET

Others

Item	Initial Value	Setting Range
Initialize	READY	READY, START
USB Memory	READY	CCU→USB, USB→CCU
Language	ENGLISH	ENGLISH, DEUTSCH, FRANÇAIS,ESPAÑOL

8 Specifications

Rating

(1)	Lens mount	C-mount
(2)	Image pickup device	1/2.52-inch CMOS sensor
(3)	Output (pixels)	4K output 3840×2160 pixels
(4)	Scan mode	Progressive scan
(5)	External synchronization input	Tri-level SYNC: 0.6 Vp-p / 75 Ω
(6)	Video output signal	

4K output	3840×2160P 59.94/50Hz
	3G/HD-SDI (4 lines)
	12G-SDI
	HDMI2.0
2K output	1920×1080P 59.94/50Hz
	1920×1080I 59.94/50Hz
	DVI (1 line)
	HDMI2.0

|		
(7)	Input Control Signal	RS-232C (1 line), 9-pin D-Sub, male
		FOOT SWITCH (1 line), 9-pin D-Sub, female
(8)	Power supply	AC 100-230V ±10% (50/60Hz)
		DC +12V
(9)	Power consumption	Camera head:2.7W or less/CCU:30W or less
(10)	Operating Temperature	0℃ to +40℃
(11)	Storage Temperature	-20℃ to +60℃ (No moisture condensation, with humidity less than 90%)
(12)	Relative Humidity	0% to 90% (No moisture condensation)
(13)	Atmospheric pressure	700hPa to 1060hPa
(14)	Outline dimensions/weight	Camera head:W27.5×H28×D50mm/80g or less
		CCU: W210×H88×D274mm/3kg or less
(15)	Camera cable (standard option)	5+10m cable (Microscope application)/5m (Rigid scope application)
(16)	Accessories	Operation Manual, Camera cable, AC adapter, AC cable

## Performance

|		
(1)	Resolution（center)	1800TV lines
(2)	S/N ratio	58 dB targeted
(3)	Sensitivity	Standard : F5,6 (2000lux/3200k) (visible light)

Function

No	Item	Details
1	Manual gain setting	0db to +33db
2	Auto gain setting	Base : 0db to +15db
3		Range : +3db to +18db
4	Sensitivity up	Horizontal addition, vertical addition, horizontal vertical addition
5	Shutter setting	OFF to 1/10000 sec
6	Slow shutter setting	59.94Hz : 1/30 to 1/4 sec
7		50Hz : 1/25 to 1/3 sec
8	Auto shutter setting	1/100 to 1/10000 sec
9	Auto control	Auto white balance
10		Auto gain
11		Auto shutter
12		Auto KNEE
13	AE area	Narrow / Middle / Full / Circle / User
14	AE level adjustment	
15	AE speed adjustment	Slow / Middle / Fast
16	Peak ratio adjustment	
17	Pedestal adjustment	
18	Flare correction	
19	Shading correction	
20	Paint	R, Bch ± 3dB
21	GAMMA correction	
22	KNEE correction	
23	Contrast enhancement	
24	DTL	
25	NR	
26	16-axis color matrix	
27	Freeze	
28	Video reversal	Left and right/ Up and down/ Up down left right
29	Digital zoom	Up to 4 times
30	Center marker indication	
31	Color bar internal organs	
32	Picture shift	V : ±8 line / H : ±32 pixel
33	Scene file	SAVE / LOAD
34	3D support	MASTER / SLAVE
35	Firmware update	Update data from USB (CCU board only)
36	HD cut out	
37	OSD menu	Multilingual support (English / French / German / Spanish)

9 Appearance

Camera Head

CCU

274

210

88
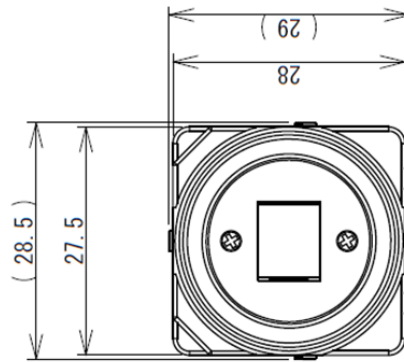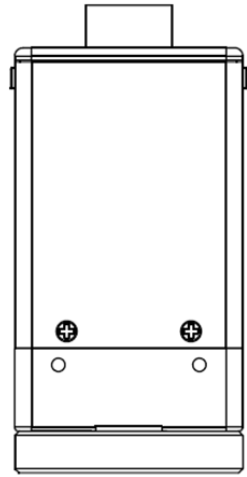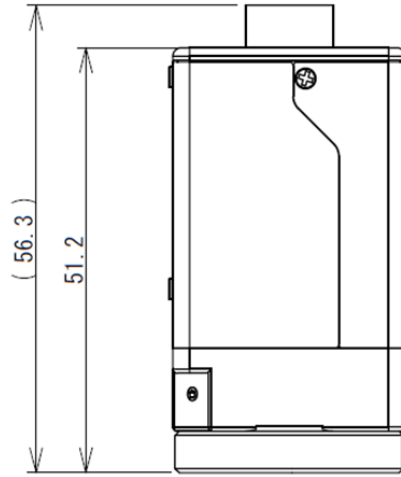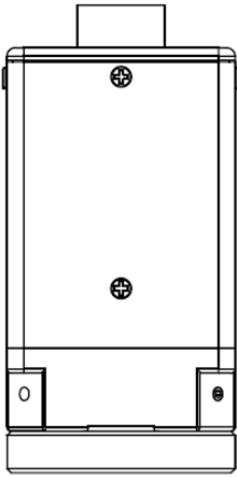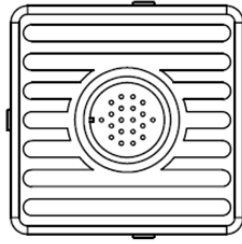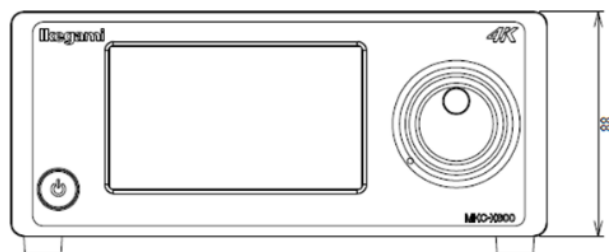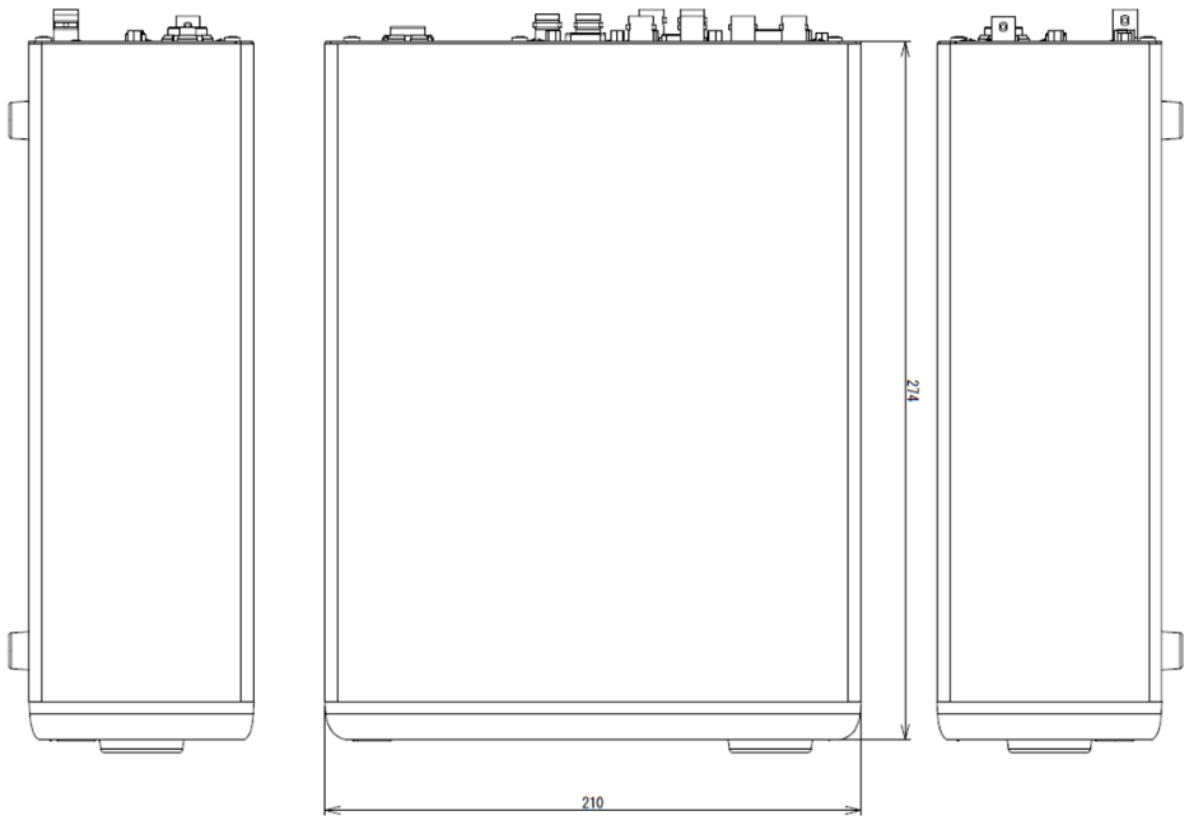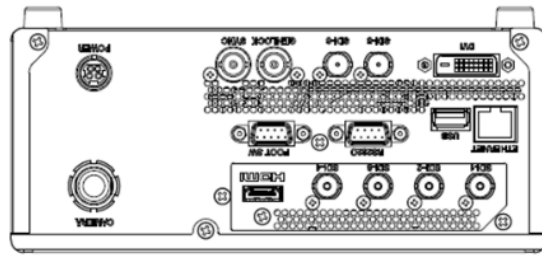
10 Troubleshooting

Some problems may not be due to malfunction of the device. Please check the following before requesting repair.

Common problems and solutions

Start-up

Symptom	Cause	Solution
The device does not start when the power switch is turned on. The blue indicator is not lit.	The device is not connected to an AC power supply.	Turn off the power switch, and check the connection of the power cable. After confirming the connection, turn on the power switch and check it again. If the problem is not solved, repair may be needed. Please contact to the sales representatives.

Shooting

Symptom	Cause	Solution
Only a black screen is displayed.	The CCU and monitor is not properly connected.	Check the connection to the monitor.
	The shutter is completely closed.	Change the AE setting.

Symptom	Cause	Solution
The screen shows color bars when the color bar button is not pressed.	This device automatically shows the color bars when the camera head and CCU cannot communicate normally. This is not malfunction.	Turn off the power switch, and check the following. 1. Check the camera cable connection. 　Be sure the camera cable of the camera head side is firmly inserted, then turn and tighten the connector. 　If the problem is not solved, go to Step 2 2. Replace the camera cable, and check it again. 　If a new camera cable is needed, contact the sales representative. 　If the problem is not solved, go to Step 3. 3. Further professional examination is needed, contact the sales representative and return the device. .
The screen suddenly turns black.	・The output cable has been removed or broken ・Forced stop due to a thermal runaway	1. Check the output cable connection. If the problem is not solved, go to Step 2. 2. Replace the output cable and check it again. If the problem is not solved, go to Step 3. 3. Check if the lights of the front panel switch are on. If all lights are off, thermal runaway may have been occurred. The device may have experienced a forced stop because it was operated for a prolonged period under conditions which exceeded recommended operating temperature and humidity (Refer to P7.1 Rating). ・Continued use of the device may result in unexpected accidents. Immediately turn off the power. Confirm that operating conditions are appropriate, and check if the device starts up normally. ・If the lights are on, professional examination is needed. Contact to a sales representative and return the device.

Symptom	Cause	Solution
The device is making a strange noise or the image is distorted.	· The camera head and camera cable are not firmly connected. · Camera cable failure · Others	1. Check the camera cable connection. Be sure the camera cable of the camera head side is firmly inserted, then turn and tighten the connector. If the problem is not solved, go to Step 2 2. Replace the camera cable, and check it again. . If a new camera cable is needed, contact the sales representative. If the problem is not solved, go to Step 3 3. Further professional examination is needed, contact the sales representative and return the device.

Error Message

An error message regarding camera head connection monitoring	
Message	**Menu**
Head communication interrupted	An error occurred in communication with the camera head.
Head response failed	An error occurred in the camera head.
Check the head connection	An error occurred in the video signal.

The error message regarding Auto White Balance	
Message	**Menu**
AWB LEVEL OVER	The sample is too bright.
AWB LEVEL UNDER	The sample is too dark.
AWB NOT WHITE	A white area cannot be detected on the sample.
AWB OUT OF RANGE	The control range of R gain or B gain has been exceeded.
AWB ERROR	The AWB pull-in operation could not be completed within the specified time (20 seconds).

The error message regarding Auto White Shade	
Message	**Menu**
ERROR	The difference in brightness level of the sample is too large.

The error message regarding USB memory function	
Message	**Menu**
USB Function Aborted	The USB function has been interrupted.
USB File Error	The file is invalid.
USB Memory Error	An error occurred in communication with the USB board.

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Operation Manual

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