

# CIS

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**12G/6G/3G/HD-SDI  
4K UHD/Full HD**

**AF ZOOM Color Camera Module**

# **DCC-4K5ZM**

## **Product Specifications & Operational Manual**

**(Preliminary)**

## **CIS Corporation**

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## 1. Handling Precautions

### 1.1. Camera Handling Precautions

- DCC-4K5ZM is a sub-assembly model for manufacturers for further fabrication and incorporation into a final product.
- Due to its high-performance and compact design, the internal circuitry and housing temperature may rise during operation.  
If the module is used without applying appropriate heat dissipation, the increase in internal temperature may cause malfunction, shortened lifespan, or, in the worst case, failure. Please ensure the camera module is integrated in accordance with the thermal design guidelines described in Section 3.4.
- Do not use or store the camera in dusty or humid places.
- Due to the structural characteristics of the zoom lens, particles or dust present outside the camera module may enter and reach the image sensor during lens movement, potentially causing degradation of image output. To prevent such contamination, please ensure that the module is installed in an enclosure with sufficient dust-proof performance.
- When integrating the camera module into the customer's product, it is highly recommended that the assembly be performed in a clean environment, such as a cleanroom, to prevent dust or debris from adhering to the image sensor and surrounding components.
- Do not apply excessive force, vibration, or static electricity that could damage camera. Please handle the camera module with care.
- Do not shoot direct images that are extremely bright (e.g., strong light source, sun, etc.). When extremely strong light source is shot, smear or blooming may occur. Put the lens cap on when the camera is not in use.
- If strong external light is incident on the lens barrel of the camera module, stray light may reach the image sensor and appear in the captured image. It is recommended to use the camera in a light-shielded condition to prevent strong light from directly entering any area other than the lens, or to verify under actual assembly conditions that the stray light does not affect image quality.
- Confirm mutual ground potential carefully before connecting the camera module to monitors or computers. Any AC leak from the connected devices may cause damages or destroy the camera module.
- Do not apply excessive voltage. (Use only the specified voltage.) Unstable or improper power supply voltage may cause damages or malfunction of the camera module.

**Our warranty does not cover damages or defects caused by neglecting the instructions and precautions explained in this manual.**

### 1.2. Restrictions on Applications

- The camera must not be used for any nuclear equipment or aerospace equipment with which mechanical failure or malfunction could result in serious bodily injury or loss of human life.
- The camera must not be used under conditions or environments other than those specified in this manual.

### 1.3. Disclaimer (Exception Clause)

- Damage or malfunction caused by natural disasters such as earthquakes, lightning, floods, fires, or other acts of God is not covered under warranty.
- Damage resulting from customer negligence or failure to comply with the specifications described in this document is not covered under warranty.
- Any malfunction resulting from repairs or modifications performed by parties other than our company is not covered under warranty.
- Any image defects caused by contamination occurring after product shipment, or by scratches on the image sensor or optical components resulting from customer cleaning or handling, shall not be covered by the product warranty.

## 2. Product Outline

DCC-4K5ZM is a 4K UHD TV color camera module with x18 auto focus zoom lens. The camera outputs images with single 12G-SDI output, featuring CIS proprietary ISP, "Clairvu™" image processing engine for superb imaging quality and high-speed processing. Using a 1/1.8" rolling shutter CMOS image sensor, the maximum frame rate achieves 60fps.

Supported outputs are UHD TV 60p/59.94p/50p (12G-SDI), UHD TV 30p/29.97p/25p/24p/23.98p (6G-SDI), HDTV 60p/59.94p/50p (3G-SDI), and HDTV 60i/59.94i/50i/30p/29.97p/25p/24p/23.98p (HD-SDI).

### 2.1. Features

- Features CIS proprietary Image Signal Processor, "Clairvu™" for superb imaging quality.
- x18 auto focus zoom lens.
- Gen Lock function (3-values analog signals or black burst).
- LTC (Longitudinal Time Code)
- Supports RS-232C control and RS-422 control
- Supports OSD (On Screen Display)

### 2.2. Accessories

- Standard Accessories
  - ◆ Lens cap

### 3. Specifications

#### 3.1. General Specifications

Electrical Specifications		
Image sensor	Sensor type	1/1.8" rolling shutter type CMOS sensor (color) SONY IMX678AAQR1
	Effective pixels	3840(H) × 2160(V)
	Unit cell size	2.0μm(H) × 2.0μm(V)
Resolution	2160p: 3840(H) × 2160(V) 1080p, 1080i: 1920(H) × 1080(V)	
Aspect ratio	16 : 9	
Video output format	3840 x 2160p @60fps 3840 x 2160p @59.94fps 3840 x 2160p @50fps 3840 x 2160p @30fps 3840 x 2160p @29.97fps 3840 x 2160p @25fps 3840 x 2160p @24fps 3840 x 2160p @23.98fps 1920 x 1080p @60fps (Level A) 1920 x 1080p @60fps (Level B) 1920 x 1080p @59.94fps (Level A) 1920 x 1080p @59.94fps (Level B) 1920 x 1080p @50fps (Level A) 1920 x 1080p @50fps (Level B) 1920 x 1080i @60fps 1920 x 1080i @59.94fps 1920 x 1080i @50fps 1920 x 1080p @30fps 1920 x 1080p @29.97fps 1920 x 1080p @25fps 1920 x 1080p @24fps 1920 x 1080p @23.98fps	12G-SDI 12G-SDI 12G-SDI 6G-SDI 6G-SDI 6G-SDI 6G-SDI 6G-SDI 3G-SDI 3G-SDI 3G-SDI 3G-SDI 3G-SDI 3G-SDI 3G-SDI HD-SDI HD-SDI HD-SDI HD-SDI HD-SDI HD-SDI HD-SDI
Sync system	Internal / External sync.	
Video output standard	12G-SDI/6G-SDI/3G-SDI/HD-SDI : Y/Pb/Pr (4:2:2 10bit) BNC 75Ω termination	
Sensitivity	F4 2000 lx Conditions : Gain: 0dB, Shutter: 1/60s, D-Range: Normal, Knee: OFF	
Minimum illumination	F1.61 3.2 lx Conditions : VIDEO 50% Gain: 30dB, Shutter: 1/60s, D-Range: Normal	
Gain variable range	AGC (max gain: 0dB~48dB) MANUAL : 0dB~48dB *Noises may become noticeable with high gain setting, over 36dB.	
Shutter speed variable range	AUTO : 1/13600s~1/23.98s (The upper and lower limits can be set) *The lower speed is limited by the frame rate of the video output format. MANUAL : 1/13600s~1/23.98s *The lower speed is limited by the frame rate of the video output format.	
White balance adjustment	AUTO : Standard, Outdoor, Fluorescent MANUAL : Red Gain, Blue Gain, One Push PRESET : Custom (Color temperature settings), Tungsten(3200K), Daylight(5500K), Cloudy(6500K), Shade(8000K)	
Auto exposure detection	Average, Center-Weighted, Spot, Backlight Compensation	
Flicker cancellation	OFF, ON: Power frequency 50Hz, 60Hz	

Edge enhancement	OFF, 1~7
Color correction	Auto, Standard, Fluorescent Light, Tungsten Lamp
Saturation adjustment	0% (B/W)~100%(typ.)~200%
Cyan suppression adjustment	0~15
Color saturation suppression	OFF, 1~7
Noise reduction	OFF, 1~6
Gamma (Contrast)	Complies with BT.709 curve: (Contrast -2, -1, 0, +1, +2), Complies with BT.2100 (HLG)
Dynamic range	Low (for better snr), Normal, High
Knee point	OFF, 100%, 95%, 90%, 85%, 80%, 75%
Color gamut	Complies with BT.709 and BT.2020
Master Pedestal	-100 ~ 0 ~ +100
Pedestal (R,G,B)	RGB independent: -100 ~ 0 ~ +100
Color balance	RGB independent: 0 ~ 100 ~ 200
Buil-in lens	x18 Auto focus zoom lens f=6.8~120mm / maximum aperture F value 1.61 (wide) ~ 4.13 (tele)
Pixel defect correction (white spot)	Corrected upon shipment from the factory.
LTC	OFF, ON Accepts external SMPTE Time code in the LTC IN terminal. (Supports resetting internal time code.)
Camera preset settings	1, 2, 3, and 4 (Four kinds of preset to store.)
Remote control communications	Supports RS-232 signals and RS-422 signals to control camera settings. Supports OSD operation (On Screen Display) as well. Refer to <a href="#">Section 5. Serial Communication</a> for details.
Power requirements	DC+9~+15V
Power consumption	7.3W

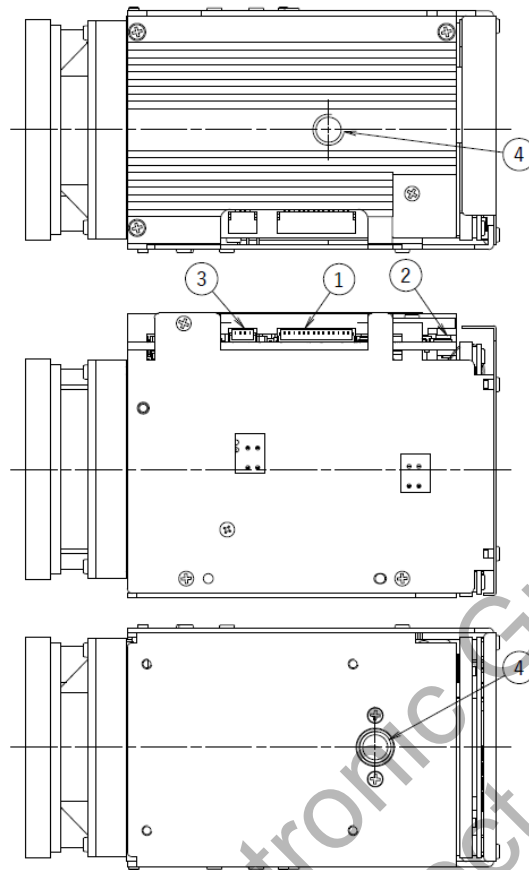
Mechanical Specifications	
Dimensions	Refer to Section 7. Dimensions for details.
Weight	275g
Environmental Specifications	
Safety/Quality standards	RoHS: 2011/65/EU (EU)2015/863 Applicable standards: EN50581(RoHS2)
Durability	Vibration
	Acceleration: 3G
	Frequency: 10~150Hz
	Direction: X, Y, and Z 3 directions
	Testing time: 30 minutes each
	Shock
	When packaged, the product shall withstand a total of ten drops from a height of 60 cm, performed in the following sequence: six faces, three edges, and one corner.
Operational Temperature	-5 ~ +45°C Humidity: 20 ~ 80%RH with no condensation The maximum operating temperature shall not exceed +45 °C, and device temperatures must remain within the following limits: FPGA ≤ +100 °C, MCU ≤ +85 °C, and Lens ≤ +70 °C.  Please follow the thermal design guidelines described in Section 3.4.
Storage Temperature	-25 ~ +60°C Humidity: 20 ~ 80%RH with no condensation.

※ This model is a sub-assembly model for manufacturers for further fabrication and incorporation into a final product. The equipment manufacturer who buys this model is responsible for obtaining the necessary Safety standards authorization such as CE and FCC prior to further marketing.

[3G-SDI output Level A and Level B]

The difference between Level A and Level B is the mapping of Y and Cb/Cr signals to 3G-SDI standard signals, and it does not affect the resolution of video signals. Depending on the 3G-SDI receiver, there are some that support only Level A, some that support only Level B, and some that support both Level A and B. Therefore, please set the camera mode according to the 3G-SDI receiver you are using

### 3.2. Component Descriptions and Their Specifications



① Power input, I/O connector 14pin CN1

Ensure connections are made following the specifications of the external connector.

② Video signal output connector CN2 (D.FL75-R-SMT)

Please connect the dedicated cable for video output. Prior to connecting the cable, release the connector latch before attaching the cable connector. After connection, secure the connector latch to the main unit again.

Note: Using the product without the connector latch may result in the cable connector becoming detached due to cable routing.

③ Connector CN3 for updating

Use this interface only for firmware or FPGA updates. It is not intended for normal operation.

Although it carries USB signals, the connector is not a standard USB type. Please connect according to the external connector specifications described in Section 3.3.

④ Screw hole for camera installation

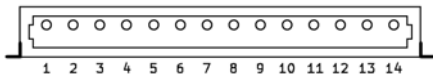
Camera mounting screw hole: 1/4-20 UNC (tripod standard).

The effective thread depth is 5 mm; therefore, use tripod screws with a total length of 5 mm or less.

**3.3. External Connectors**

**3.3.1 Power, I/O connector CN1**

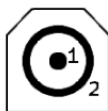
Model name: JST:  
SM14B-SRSS-TB(LF)(SN)



Pin No.	Signals
1	Power IN DC+12V
2	
3	GND
4	
5	EXT. SYNC IN
6	LTC IN
7	GND
8	Power OUT(+5V) *Option
9	RS232C TXD
10	RS232C RXD
11	RS422 TX-
12	RS422 TX+
13	RS422 RX-
14	RS422 RX+

**3.3.2 Video output connector CN2**

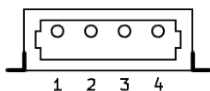
Model name: Hirose Electric:  
D.FL75-R-SMT-1(01)



Pin No.	Signals
1	12G/6G/3G/HD SDI output
2	GND

**3.3.3 UPDATE (USB) connector CN3**

Model name: JST:  
SM04B-SRSS-TB(LF)(SN)



Pin No.	Signals
1	GND
2	USB DP
3	USB DM
4	USB VBUS

### 3.4. Thermal Guideline

This product is designed for embedded use in equipment. When integrating the camera module into an enclosure, the design must adequately account for heat dissipation and airflow.

Ensure that thermal paths are provided using a metal base, heat sink plate, or similar means to prevent heat from accumulating around the module, and that the maximum allowable temperatures of the devices listed below are not exceeded.

Note: Effective heat dissipation can be achieved by implementing thermal measures on the top side of the module.

FPGA	: 100°C
MCU	: 85°C
LENS	: 70°C

※ The temperatures of each device can be read through remote communication at address 180.

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## 4. Camera Functions

### 4.1. GenLock

- Gen Lock function is available by inputting analog external sync signals (black burst or 3-values SYNC) into the EXT SYNC IN terminal of the CN1.
- The type of external synchronization signal supported varies depending on the camera's output format. Please refer to the chart below for details.

		EXT SYNC IN					
CAMERA FORMAT	2160/1080 60p			1080i60	720p60	1080p30	1080p60
	2160/1080 59.94p	NTSC		1080i59.94	720p59.94	1080p29.97	1080p59.94
	2160/1080 50p		PAL	1080i50	720p50	1080p25	1080p50
	2160/1080 30p			1080i60	720p60	1080p30	1080p60
	2160/1080 29.97p	NTSC		1080i59.94	720p59.94	1080p29.97	1080p59.94
	2160/1080 25p		PAL	1080i50	720p50	1080p25	1080p50
	2160/1080 24p					1080p24	
	2160/1080 23.98p					1080p23.97	
	1080 60i			1080i60	720p60	1080p30	1080p60
	1080 59.94i	NTSC		1080i59.94	720p59.94	1080p29.97	1080p59.94
	1080 50i		PAL	1080i50	720p50	1080p25	1080p50

[Note]

- ◆ Input Black Burst signals for NTSC/PAL signals.
- ◆ Input 3-values SYNC signals for non-NTSC/PAL signals.
- ◆ EXT SYNC IN terminal is 75Ω terminated.
- ◆ When an external signal in the above list is input, the camera automatically enters the external sync mode.
- ◆ When no external sync signal is input, the camera operates in internal sync mode.
- ◆ Immediately after an external sync signal is input, the image will be distorted, but this is not a malfunction.
- ◆ If a signal is input to the EXT SYNC IN terminal in a combination other than the above, the image may be distorted or may not be output.

### 4.2. LTC (Longitudinal Time Code)

- Supports Time Code insertion to 12G/6G/3G/HD SDI signals.
- By inputting an LTC (longitudinal time code) signal to the LTC IN terminal of CN1, an external time code can be inserted. If there is no input to the LTC IN terminal, the internal time code will be inserted.

The internal time code starts from 00:00:00.00 when the power is turned on.

When an LTC signal is applied to the LTC IN terminal, the internal time code is synchronized to the external time code. If the LTC signal is lost while in this state, the internal time code continues to run autonomously from the last synchronized (set) value.

Signal format: SMPTE Timecode

Signal level: 0.5~2[Vp-p]

### 4.3. Defective Pixel Correction

In addition to the correction of defective pixel data registered upon shipment, we provide a method to update the defective pixel data up to 256 points. Please refer to [Section 5.2, Command List](#) for details.

#### 4.3.1 Defective Pixel Data Type

There are two types of defective pixel data.

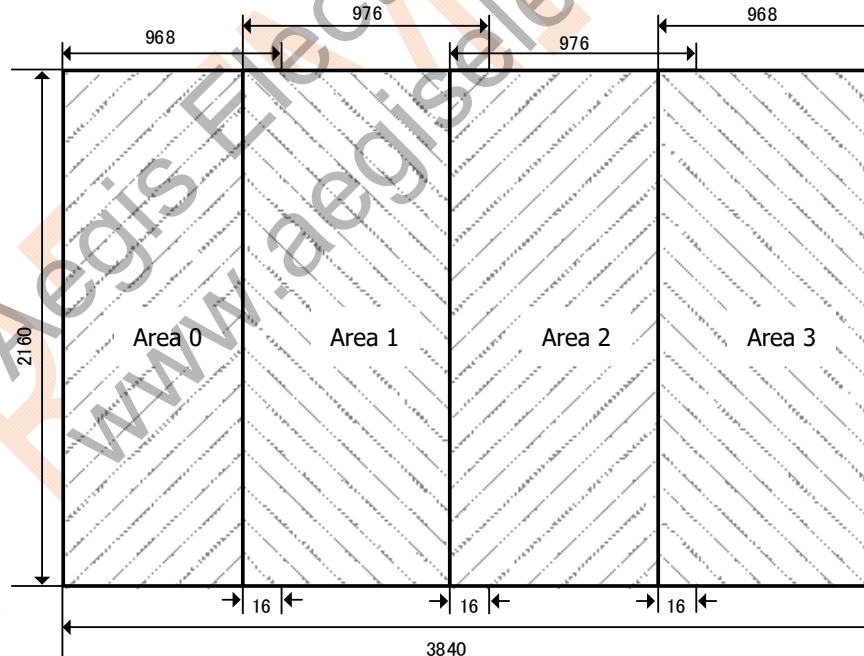
- Defective data registered at factory  
Defective pixel data registered upon shipment from our factory.  
This data cannot be overwritten.
- Defective data registered by user  
Data registered by user. In addition to the correction of defective pixel data registered upon shipment, user can update the defective pixel data by using commands explained later. This data can be overwritten.

Defective pixel data is automatically converted based on the H Flip and V Flip settings, using common data for both configurations.

Note that, due to the image sensor specifications, the converted coordinates are offset by one pixel instead of being a perfectly mirrored position.

#### 4.3.2 Details on Defective Pixel Data

Defective pixel data are stored and controlled per four vertically divided regions. User can register up to 64 points per region, which makes it a total of 256 points as user register data. There are overlaps of 16 pixels (width) between the regions. The command registers the defective pixel coordinates in the overlapping area to both regions. Please refer to the below for the definition of regions.



The upper left is the origin of coordinate system. Definition of each region is

- Reed Area 0: (0,0) – (967,2159)
- Reed Area 1: (952,0) – (1927,2159)
- Reed Area 2: (1912,0) – (2887,2159)
- Reed Area 3: (2872,0) – (3839,2159)

For example, if the defective pixel is at (951,0), the data is registered only to region 0.

However, if the defective pixel is at (952,0), the data is registered to both region 0 and 1.

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#### 4.3.3 Notes for Defective Pixel Correction

- To save the data registered or deleted with defective pixel correction command (SU 200~203), execute SAVE command (SU705).
- Init command (SU 700) does not restore defective pixel correction data. Use SU 203 to delete all data.
- Defective pixel correction data is not subject to Camera Setting Store/Load command (SU 100/101).
- Factory data and user register data cannot be the same. Therefore, if user detects the same defective points, this function ignores those points.
- If user specifies the same coordinates as factory setting data, error will occur.
- Specify the coordinates based on the 3840x2160 standard regardless of video format.
- Please note that the detected results may not always be the same due to temperature, noise, and other conditions.

Neglecting these instructions may cause not only incorrect pixel defect correction, but also failure of acquiring proper images.

**5. Remote Communication**

**5.1. Serial Communication Settings**

(1) Please refer to the chart below for serial communication settings.

Baud rate	9600bps (factory setting), 38400bps, 115200bps
Data	8bit
Stop bit	1bit
Parity	None
XON/XOFF	No control

(2) Control specifications

- Text-based communication executes camera control. Only ASCII 0x20~0x7E, 0x0A (LF=¥n), and 0x0D (CR=¥r) must be used. Please do not use other than these codes.
- By sending command, Parameter, and CR (0x0D) from PC to camera, user can change camera settings and acquire camera-setting Parameters. Either CR or LF can be a linefeed code.
- There are two types of commands. One is SU command to send settings and instructions to the camera ("S" for "Set"), and the other is GU command ("G" for "Get") to obtain information from the camera.

Command	Parameter 1	Parameter 2	Function
GU	Address	None (with some exceptions)	To obtain camera setting information.
SU	Address	Data (There may be more than one)	To change camera settings.

(3) How to set a command

- ">" must be output from the camera as a prompt.
- Commands are not case-sensitive.
- Separate between a command and a Parameter by single space (0x20).
- From the head of the input character to the linefeed code (CR) is defined as a single serial command.
- Parameters start with 0x are regarded as hexadecimal, Parameters start with 0b are regarded as binary, and others are regarded as decimal.
- Commands analyze Parameters from the head to identifiable letters.
- Please refer to "Section 5.2. Command List" for details on address and data.
- Do not input values and letters other than those explained in the above and those mentioned in "Section 5.2. Command List."
- Camera receives the returned command from Host and echo the command back. At this time, camera converts the linefeed code (CR) to CR LF and echo the code back.

(4) Setting examples

【Example of GU command】

To get information of address 10

[Send] GU [sp] 10[¥r]

[Returned value] GU [sp] 10[¥r] [¥n]

[Returned value] 50[¥r] [¥n]

[Returned value] [¥r] [¥n]

[Returned value] > [sp]

[Echo back]

[Acquired data + Linefeed]

[Linefeed]

[Prompt (> and space)]

[¥r]=CR (0x0D)

[¥n]=LF (0x0A)

[sp]=Space (0x20)

**【Example of SU command】**

To set 30 to address 10

[Send]	SU [sp] 10[sp] 30[¥r]	
[Returned value]	SU [sp] 10[sp] 30[¥r] [¥n]	[Echo back]
[Returned value]	[¥r] [¥n]	[Linefeed]
[Returned value]	> [sp]	[Prompt (> and space)]

**5.1.1 Changing Speed of Serial Communication**

Baud rate command (SU 725) changes transfer rate of serial communication out of 9600bps, 38400bps, and 115200bps.

- The changes made are reflected after re-booting camera, not immediately after executing the command.
- Execute SAVE command (SU 705) to save the setting values.
- Baud rate command is not subject to Init command (SU 700) so that executing Init command does not restore settings.
- Baud rate command is not subject to Camera Setting Store/Load command (SU 100/101).
- Only when baud rate setting is 9600bps, user can use the optional remote controller RU-100.

## 5.2. Command List

### Video Format

Function	Adress	Setting Value	Initial Value	Description
Video Format	1	0: 3840 x 2160p @60fps 1: 3840 x 2160p @59.94fps 2: 3840 x 2160p @50fps 3: 3840 x 2160p @30fps 4: 3840 x 2160p @29.97fps 5: 3840 x 2160p @25fps 6: 3840 x 2160p @24fps 7: 3840 x 2160p @23.98fps 8: 1920 x 1080p @60fps (Level A) 9: 1920 x 1080p @59.94fps (Level A) 10: 1920 x 1080p @50fps (Level A) 11: 1920 x 1080p @60fps (Level B) 12: 1920 x 1080p @59.94fps (Level B) 13: 1920 x 1080p @50fps (Level B) 14: 1920 x 1080i @60fps 15: 1920 x 1080i @59.94fps 16: 1920 x 1080i @50fps 17: 1920 x 1080p @30fps 18: 1920 x 1080p @29.97fps 19: 1920 x 1080p @25fps 20: 1920 x 1080p @24fps 21: 1920 x 1080p @23.98fps	0	This is to set video output format.

### AE related

Function	Address	Setting Value	Initial Value	Description
Gain Mode	2	0: Manual 1: Auto	1	This is to set gain control mode.
Gain Value	3	Magnification×0x10000 Setting range: 1~approx. 251 (0x10000~0xFB304B)	0x10000 (65536)	This is to set gain value when gain mode is Manual. (*1) e.g.) To set x2 (approx. 6dB): SU 3 0x00020000 ※ Please Refer to <a href="#">Section 5.3. Quick Reference Table for Gain Settings.</a>
Gain Max Value	4	Magnification×0x10000 Setting range: 1~approx. 251 (0x10000~0xFB304B)	0x200000 (2097152)	This is to set the maximum gain value when gain mode is Auto. (*1) ※ Please refer to <a href="#">Section 5.3. Quick Reference Table for Gain Settings.</a>
Shutter Mode	5	0: Manual 1: Auto	1	This is to set shutter control mode.

**AE related**

Function	Address	Setting Value	Initial Value	Description
Shutter Value	6	Exposure [s]×0x100000 Setting range: 1/13600~1/23.98s (0x4D~0xAAD6)	0x4444 (17476) 1/60s	This is to set shutter value (exposure time) when shutter mode is Manual. (*1) Set a shorter value than 1 frame length. For example, when video format is 60fps, the maximum shutter value will be 0x4444 (1/60s). ※ Please refer to <a href="#">Section 5.3 Quick Reference Table for Shutter Settings</a> .
Shutter Limit	7	The 1 <sup>st</sup> Parameter: Max value Exposure [s]×0x100000 Setting range: 1/13600~1/23.98s (0x4D~0xAAD6)	0x4444 (17476) 1/60s	This is to set shutter variable range when shutter mode is Auto. (*1) Set a shorter value than 1 frame length. Max<Min is invalid. e.g.) To set Max=1/60s, Min=1/8000s: SU 7 0x4444 0x83 ※ Please refer to <a href="#">Section 5.3 Quick Reference Table for Shutter Settings</a> .
		The 2 <sup>nd</sup> Parameter: Min value Exposure [s]×0x100000 Setting range: Same as Max value.	0x4D (77) 1/13600s	
Iris Mode	61	0: Manual 1: Auto	1	This is to set iris control mode.
Maximum Aperture	63	None	None	This is to acquire the current maximum aperture F value. (GU only). F value varies depending on zoom position.
Aperture Value	64	0: Close 0x800(F22.6)~0x62C30(F1.61)	0x62C30 (404528)	This is to set aperture value when Iris Mode is Manual (*1). Calculates aperture value with F value. Aperture Value = 0x100000 / (F value×F value) e.g.) To set F4.0: SU 64 0x10000 Please refer to <a href="#">Section 5.4 Iris Settings</a> .
Aperture Limit	65	The 1 <sup>st</sup> Parameter: Max value 0x800~0x62C30	0x62C30 (404528)	This is to set variable range of aperture values when Iris Mode is Auto. (*1) Max < Min is invalid. e.g.) To set Max=F2.0, Min=F8.0; SU 65 0x40000 0x4000
		The 2 <sup>nd</sup> Parameter: Min value 0x800~0x62C30	0x800 (2048)	
Metering Mode	8	0: Average 1: Center-Weighted 2: Spot 3: Backlight Compensation	1	This is to set metering mode.
Spot Block	9	The 1 <sup>st</sup> Parameter: X value: 0~15	7	This is to set X, Y, W, and H values for Spot metering. X: Far left of metering field Block, X coordinate Y: Top of metering field Block, Y coordinate W: Width of metering field (number of block) H: Height of metering field (number of block) e.g.) Execute SU 9 6 7 4 2 to set 4x2 block from the coordinate (6, 7).
		The 2 <sup>nd</sup> Parameter: Y value: 0~15	7	
		The 3 <sup>rd</sup> Parameter: W value: 1~16	2	
		The 4 <sup>th</sup> Parameter: H value: 1~16	2	

**AE related**

Function	Address	Setting Value	Initial Value	Description
AE Speed	10	0~15	10	This is to set AE convergence speed.
Exposure Compensation Value	11	0(-12dB)~12(0dB)~24(+12dB) /per 1dB	12	This is to set exposure compensation value.
Flicker Cancel	12	0: Off 1: 50Hz power mode 2: 60Hz power mode	0	This is to enable/disable flicker cancel. Choose a mode corresponding to power frequency.
Gain Value, Plus Minus	13	-1: decrease 1dB 1 : increase 1dB	None	This is to change gain value by $\pm 1$ dB from the current setting. (*1) Enabled when gain mode is Manual. (Dedicated to SU)
Shutter Speed, Plus Minus	14	-1: decrease 1step (1/4EV) 1 : increase 1step (1/4EV)	None	This is to change shutter speed by $\pm 1$ step (1/4EV) from the current value. Decreasing shutter speed by 1step makes shutter value become bigger. (*1) Enabled when shutter mode is Manual. (Dedicated to SU)
Iris(F-number), Plus Minus	15	-1: decrease 1step (1/4EV) 1 : increase 1step (1/4EV)	None	This is to change F value of iris by $\pm 1$ step (1/4EV) from the current setting. Decreasing F value by 1step makes aperture value become bigger. (*1) Enabled when iris mode is Manual. (Dedicated to SU)
High Sensitivity Mode	19	0: Off 1: On	0	This is to set high-sensitivity mode. This mode is not controlled by the AE (Auto Exposure) system. When enabled, the sensitivity increases by approximately 8.6 dB, but the signal becomes more susceptible to saturation. (*2)
Current Gain	55	None	None	This is to acquire the current gain. (Dedicated to GU) (*1)
Current Shutter	56	None	None	This is to acquire the current shutter value. (Dedicated to GU) (*1)
Current Aperture	57	None	None	This is to acquire the current aperture value. (Dedicated to GU) (*1)

(\*1) Control of gain, shutter, and iris is performed based on the specifications of the sensor, lens, and related components. Therefore, the actual control may not follow the exact Value or Limit set by command. In particular, the iris is limited by the maximum aperture (F-number) that varies depending on the zoom position.

The actual control values can be verified using the Current Gain, Current Shutter, and Current Aperture commands.

(\*2) The sensitivity increase provided by High-Sensitivity Mode is not included in the settings of Gain Value or Gain Max Value.

**WB related**

Function	Address	Setting Value	Initial Value	Description
WB Mode	20	0: Manual 1: Auto 2: Preset	1	This is to set White Balance (WB) mode.
WB Manual Memory	21	0~4	0	This is to choose the memory to store setting values when WB Mode is Manual. Memory stores up to 5 types of settings (0~4).
Manual Red Gain	22	100~1600(%)	226	This is to set Red Gain when WB Mode is Manual.
Manual Blue Gain	23	100~1600(%)	187	This is to set Blue Gain when WB Mode is Manual.
One Push Trigger	24	1: W × H 2: W/2 × H/2 3: W/4 × H/4	None	This is to execute One Push WB when WB mode is Manual. Choose a detection range with setting values. If execution of One Push WB is not properly processed, camera will return Run Time Error. (Do not shield light to execute this command). (Dedicated to SU)
WB Auto Func	25	0: Standard 1: Outdoor 2: Fluorescent	0	This is to choose the condition when WB Mode is Auto.
WB Preset Func	26	0: Custom 1: Tungsten (3200K) 2: Daylight (5500K) 3: Cloudy (6500K) 4: Shade (8000K)	2	This is to choose the environmental lighting condition when WB Mode is Preset.
WB Preset Temp	27	2500~15000(K)	5500	This is to set color temperature when WB Preset Func is Custom.
WB LB Shift	28	-10~10	0	This is to set shift amount of WB gain toward black.
WB CC Shift	29	-10~10	0	This is to set the shift amount of WB gain toward green magenta.
Current Red Gain	58	None	None	This is to acquire the current Red Gain. (Dedicated to GU)
Current Blue Gain	59	None	None	This is to acquire the current Blue Gain. (Dedicated to GU)

**Image Quality related**

Function	Address	Setting Value	Initial Value	Description
Detail (Edge Enhancement)	30	0: Off 1: (Low)~7(High)	3	This is to set the strength of edge enhancement.
Gamma	35	0: BT.709 -2 1: BT.709 -1 2: BT.709 3: BT.709 +1 4: BT.709 +2 5: HLG75	2	This is to set gamma type and contrast. 0~4 are the curves comply with BT.709. Contrast changes in the range of -2 ~ +2. 5 is for HLG75 that means 75% output level is regarded as 100% input level.

**Image Quality related**

Function	Address	Setting Value	Initial Value	Description
Knee	36	0: Off 1: 100% 2: 95% 3: 90% 4: 85% 5: 80% 6: 75%	4	This is to set knee point. Enabled except when Gamma is BT.709 and D-range is Low. Knee slope varies according to the selected maximum D-Range.
Master Pedestal	37	-100~+100	0	This is to set Master pedestal.
Red Pedestal	38	-100~+100	0	This is to set Red pedestal.
Green Pedestal	39	-100~+100	0	This is to set Green pedestal.
Blue Pedestal	40	-100~+100	0	This is to set Blue pedestal.
Red Balance	41	0~200	100	This is to set Red balance.
Green Balance	42	0~200	100	This is to set Green balance.
Blue Balance	43	0~200	100	This is to set Blue balance.
D-Range	44	0: Low Equivalent to 120% for BT.709 Disabled with HLG (Handled as Normal)  1: Normal Equivalent to 200% for BT.709 Equivalent to 600% for HLG  2: High 400% for BT.709 Equivalent to 1200% for HLG	1	This is to set Dynamic range. With Low, both D range and sensitivity decrease, but noise level becomes the lowest. With High, the minimum gain value will be limited to 0x20000. (Even if a lower value is set, gain value becomes 0x20000.)  ※ The definition of D-range for BT.709 and HLG are different, ref. below.  [BT.709] 100% output level (without Knee) is regarded as 100% input level.  [HLG] 50% output level is regarded as 100% input level.
Color Saturation	45	0~200	100	This is to set color saturation.
Cyan Suppression	46	0~15	15	This is to set suppression for Cyan saturation.

**Image Quality related**

Function	Address	Setting Value	Initial Value	Description
Color Adjustment	47	The 1 <sup>st</sup> Parameter: Selection of color. 0: Magenta 1: Red 2: Yellow 3: Green 4: Cyan 5: Blue	All 0	This is to set color adjustment values. There are three kinds of adjustment items for each 6 color, which makes it total of 18 parameters for color adjustment.  e.g.) To set -3 to Cyan Hue SU 47 4 0 -3 To execute GU, please specify the 1 <sup>st</sup> parameter and the 2 <sup>nd</sup> parameter as well. e.g.) To acquire adjustment value of Cyan Hue GU 47 4 0
		The 2 <sup>nd</sup> Parameter: Selection of item to adjust 0: Hue 1: Saturation 2: Depth		
		The 3 <sup>rd</sup> Parameter: Adjustment value -20~2		
Noise Reduction	50	0: OFF 1: Level 1 (Low) 2: Level 2 ... 6: Level 6 (High)	0	This is to set the level of noise reduction.
Color Correction	52	0: Auto 1: Standard 2: Fluorescent Light 3: Tungsten Lamp	0	This is to set color correction.
Color Suppression	53	0: Off 1 (Low) ~7 (High)	0	This is to set color suppression.
Color Space	54	0: BT.709 1: BT.2020	0	This is to set color gamut.

**Lens Control related**

Function	Address	Setting Value	Initial Value	Description
Zoom Drive	66	The 1 <sup>st</sup> Parameter: Move mode 0: To specify absolute zoom position 1: To specify relative zoom position 2: To specify direction for zoom to move.	0	This is to move the zoom lens. There are three kinds of ways to specify. Select with move mode.  When move mode is 0 and 1, lens moves to the specified position and stops. When move mode is 2, lens starts moving according to the setting of -1 or 1 and stops with 0. (It also stops when lens reaches the wide edge or the tele edge). This command is non-blocking so that it returns prompt before completion of movement. (*3)
		The 2 <sup>nd</sup> Parameter: 【When move mode is 0】 0 (wide edge)~1024 (tele edge) 【When move mode is 1】 -1024 (wide)~1024 (tele) 【When move mode is 2】 -1: Move to wide direction 1: Move to tele direction 0: Stop	0	
		The 3 <sup>rd</sup> Parameter: Move speed 0~64	64	

**Lens Control related**

Function	Address	Setting Value	Initial Value	Description
Focus Drive	67	The 1 <sup>st</sup> Parameter: Move mode 0: To specify absolute focus position 1: To specify relative focus position 2: To specify direction for focus to move.	0	This is to move focus lens when focus mode is Manual. There are three kinds of ways to specify. Select with move mode.
		The 2 <sup>nd</sup> Parameter: 【When move mode is 0】 0 (far edge)~3584 (near edge) 【When move mode is 1】 -3584 (far)~3584 (near) 【When move mode is 2】 -1: Move to far direction 1: Move to near direction 0: Stop	0	When move mode is 0 and 1, lens moves to the specified position and stops. When move mode is 2, lens starts moving according to the setting of -1 or 1 and stops with 0. (It also stops when lens reaches the far edge or the near edge).
		The 3 <sup>rd</sup> Parameter: Move speed 0~64	64	This command is non-blocking so that it returns prompt before completion of movement.  (*3)(*4)(*5)
Focus Mode	68	0: Manual 1: Auto	1	This is to set focus control mode. (*6)
Focus One Push Trigger	69	1 (Fixed)	None	This is to execute One Push AF when focus mode is Manual. This command is non-blocking so that it returns prompt before completion of movement. With GU 69, user can acquire operating status of One Push AF. (0=stop, 1=in operation).
Focus Limit	70	The 1 <sup>st</sup> Parameter: Near Edge Limit 0(Far edge)~3584(Near edge)	3584	This is to control focus adjustment range when Focus Mode is Auto, or when adjusting the range with Focus One Push Trigger.
		The 2 <sup>nd</sup> Parameter: Far Edge Limit 0(Far edge)~3584(Near edge)	0	

(\*3) When the Video Format is changed while the lens is in motion, the lens movement is forcibly stopped at its current position.

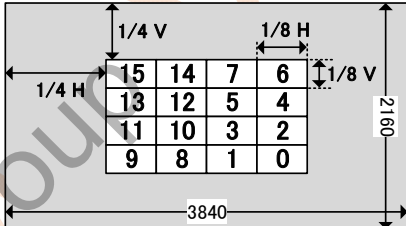
(\*4) The movement speed refers to the motor rotation speed; therefore, the rate of change in the focus position differs between the telephoto and wide ends of the zoom range.

Even when the same movement speed is set, the focus position changes more rapidly toward the wide end.

(\*5) During zoom operation, the focus moves at the maximum speed.

(\*6) When the focus control mode is set to Auto, the autofocus (AF) may fail to track properly if the distance between the subject and the camera changes rapidly, such as during sudden frame-in or frame-out situations.

**Lens Control related**

Function	Address	Setting Value	Initial Value	Description
Current Zoom Speed	71	None	None	This is to acquire the current zoom speed. (GU Only) (*7)
Current Focus Speed	72	None	None	This is to acquire the current focus speed. (GU Only) (*7)
AF Frame	73	The 1 <sup>st</sup> Parameter: Area 0: Area0 1: Area1 ... 15: Area15	All 1	Each focus area corresponds to the following positional relationship with respect to the output image.(*8) 
		The 2 <sup>nd</sup> Parameter: Enable 0: Off 1: On		
Current ICF Position	74	None	None	This is to acquire the current position of IR cut filter. (GU Only). Returns 0=Out or 1=In.
IR Cut Filter Mode	75	0: IR cut filter Out 1: IR cut filter In 2: IR cut filter Auto	1	This is to set the IR cut filter mode. Normally, set to IN. To remove the IR cut filter, set to OUT. In this case, the image will automatically switch to monochrome mode. When set to Auto, the IR cut filter is automatically controlled (Out/In) according to the Gain Value.
Auto ICF Threshold	76	The 1 <sup>st</sup> Parameter: Out Threshold 0x10000~0xFB304B	0x200000	This is to set the threshold values when IR Cut Filter mode is set to Auto. •Out Threshold: When the IR cut filter is IN, it switches to OUT if the Gain Value exceeds this value. •In Threshold: When the IR cut filter is OUT, it switches to IN if the Gain Value falls below this value. Setting Out Threshold ≤ In Threshold is not allowed.
		The 2 <sup>nd</sup> Parameter: In Threshold 0x10000~0xFB304B	0x10000	
Current Zoom Position	78	None	None	This is to acquire the current zoom position. (GU Only). (*9)
Current Focus Position	79	None	None	This is to acquire the current focus position. (GU Only) (*9)

(\*7) If Zoom Drive or Focus Drive is executed immediately after the move is instructed, the function may return a value of 0 before the movement actually starts. If you wish to execute the Zoom Drive or Focus Drive to check the completion of movement, ensure that at least one frame interval is inserted after executing Zoom Drive or Focus Drive.

(\*8) Enable at least one Focus Area.

(\*9) Since the zoom and focus positions use normalized values, they may not exactly match the values set by Zoom Drive or Focus Drive.

**OSD related**

Function	Address	Setting Value	Initial Value	Description
OSD Up button	90	0: 1 push 1: continuous push	None	Commands to operate OSD. Send commands every 60msec for continuous push. (SU Only)
OSD Down button	91	0: 1 push 1: continuous push	None	
OSD Right button	92	0: 1 push 1: continuous push	None	
OSD Left button	93	00: 1 push 1: continuous push	None	
OSD Center button	94	0: 1 push 1: continuous push	None	
Text Color	95	0: Black 1: Blue 2: Red 3: Magenta 4: Green 5: Cyan 6: Yellow 7: White	7	This is to set the text color of OSD menu.
Highlight Color	96	0: Black 1: Blue 2: Red 3: Magenta 4: Green 5: Cyan 6: Yellow 7: White	5	This is to set the color of the selected text in the OSD menu. An error will occur if the same color as Text Color is set, as the selected text would become indistinguishable.
OSD Off	99	1 (fixed)	None	This is to close OSD menu. (SU only)

**Others**

Function	Address	Setting Value	Initial Value	Description
Camera Setting Store	100	0~3	0	Users can store four kinds of camera settings. Execute SAVE (SU 705 1) to save the registered values into the nonvolatile memory. The registered data and address to store (the set value of this address) are not subject to Init command (SU 700 0).
Camera Setting Load	101	0~3		This is to read out and reflect the registered values set by Camera Setting Store to the camera. Selection of address to store and address to load are common so that this command keeps the last set values with Store or Load. (GU 100 and GU 101 always return the same value).

**Others**

Function	Address	Setting Value	Initial Value	Description
LTC Mode	103	0: Off 1: On	0	This is to configure the LTC signal insertion.
LTC Reset	104	1: Reset	None	This is to reset the internal free running timer for LTC. (Only SU)
GenLock V Offset	106	-1024~1023	0	Adjustment of V phase at external sync. mode
GenLock H Offset	107	-2048~2047	0	Adjustment of H phase at external sync. mode
H Flip	110	0: Off 1: On	0	This is to set horizontal flip of the video output image.
V Flip	111	0: Off 1: On	0	This is to set vertical flip of the video output image.
Test Pattern	120	0: Off 1: Cross Line 2: Color Bar	0	This is to set test pattern indication. H Flip and V Flip setting does not affect the test pattern. (Test pattern does not flip).
Cross Line Position	121	The 1 <sup>st</sup> Parameter: X coordinate 0~3839	1920	This is to set the display position of the Test Pattern when Cross Line is selected, using the coordinates of the crossing point.
		The 2 <sup>nd</sup> Parameter: Y coordinate 0~2159	1080	
Init	700	0 (fixed)	None	This is to restore camera settings to initial values. Camera store-data, address to store, defective pixel correction data, and baud rate are not subject to this command. (SU Only)
Save	705	1 (fixed)	None	This is to save camera settings. After storing the current camera settings by Store (Equivalent to SU100), this command saves the stored data, the address to store, defective pixel correction data, and baud rate. (SU Only)
Version Information	721	1: Microcomputer version 2: FPGA version	None	This is to acquire version information. (GU Only)
Baud Rate	725	9600, 38400, 115200 (bps)	9600	This is to set the speed of serial communication. Refer to Section 5.1.1. Changing Speed of Serial Communication for details.
Temperature	180	0: FPGA temperature 1: MCU temperature 2: Lens temperature	None	This is to acquire the temperature of each device in degrees Celsius (Only GU)

**Others**

Function	Address	Setting Value	Initial Value	Description
SDI Compatibility Mode	750	0: Off 1: On	0	With factory setting (Off), selecting HLG75 or BT.2020 is also reflected in the SDI Payload ID. With SDI compatibility mode ON however, this reflection is disabled. Set this mode ON if your receiving equipment cannot display an image when HLG75 or BT.2020 is selected.
User String	770	Any string using ASCII codes from 0x21 to 0x7E (Maximum 30 letters)	None	The configured string is not initialized by the Initl command. <i>Note:</i> The ASCII space character (0x20) cannot be used.
User String Clear	771	1: Delete	None	This is to delete User String. (Only SU)

**Defective Pixel Correction**

Function	Address	Setting Value	Description
Detection of defective pixel	200	The 1 <sup>st</sup> Parameter: Threshold level: 0 ~ 4095	This is to detect defective pixels (white defects) and register them as user register data. Pixels whose output values exceed the threshold value are identified as defective. Execute this command with the light shielded and Gain and Shutter values properly adjusted.
		The 2 <sup>nd</sup> Parameter: Registration mode 0: New registration 1: Additional registration	
Registration of defective pixel	201	The 1 <sup>st</sup> Parameter: X coordinate 0 ~ 3839	This is to register defective pixels as user register data by specifying their coordinates.
		The 2 <sup>nd</sup> Parameter: Y coordinate 0 ~ 2159	
Deletion of defective pixel	202	The 1 <sup>st</sup> Parameter: X coordinate: 0 ~ 3839	This is to delete defective pixels from user register data by specifying their coordinates. (Dedicated to SU)
		The 2 <sup>nd</sup> Parameter: Y coordinate 0 ~ 2159	
Deletion of defective pixel correction data	203	1: Entire deletion	This is to delete all user register Data. (Dedicated to SU)
Indication of defective pixel correction data	204	1: Indicate the coordinates and their attributes of all defective pixels. 2: Indicate the coordinates and their attributes of user register data. 3: Indicate the total number of all registered defective pixels. 4: Indicate the number of user register data	This is to indicate information on the registered defective pixel correction data. (Dedicated to GU)

- When user specifies "new registration" with defective pixel detection command, the command deletes only data registered by the defective pixel detection command. Data registered via the Defect Pixel Registration command is not deleted.
- The command classifies the registered defective pixels into four types. Attribute [W] and [B] are for the data registered at factory, attribute [U] is the data registered by user with defective pixels detection command, and attribute [P] is the data registered by user with defective pixels registration command.
- [GU 200] command shows the number of pixels classified under [U] attribute, and [GU 201] command shows the number of pixels classified under [P] attribute.
- Only user-registered data can be changed, and users cannot remove the factory setting data.
- Pixels already registered as factory default data cannot be registered as user data.

**Lens Adjustment**

Function	Address	Setting Value	Initial Value	Description
Focus position fine-tuning gain	270	0 (0×) to 32 (2×)	16	<p>This parameter sets the gain for fine adjustment of the focus position.</p> <p>It is applied as a gain to the temperature compensation parameter.</p> <p>For the setting value, specify the value multiplied by 16 (e.g., the default value of 16 indicates a gain of 1×).</p> <p>Normally, use this parameter with the default value.</p> <p>This parameter is not subject to Camera Setting Store/Load or initialization.</p>
Focus position fine-tuning offset	271	-16~16	0	<p>This parameter sets the offset for fine adjustment of the focus position.</p> <p>It is applied as an offset to the tracking curve.</p> <p>Normally, use this parameter with the default value.</p> <p>This parameter is not subject to Camera Setting Store/Load or initialization.</p>

### 5.3. Quick Reference Table

#### 5.3.1 Gain Settings

	Magnification	dB	GainValue (Mag.×0x10000)	
			DEC	HEX
<b>0</b>	<b>1.000</b>	<b>0.000</b>	<b>65536</b>	<b>00010000</b>
1	1.122	1.003	73561	00011F59
2	1.260	2.007	82570	0001428A
3	1.414	3.010	92681	00016A09
4	1.587	4.014	104031	0001965F
5	1.782	5.017	116771	0001C823
<b>6</b>	<b>2.000</b>	<b>6.021</b>	<b>131072</b>	<b>00020000</b>
7	2.245	7.024	147123	00023EB3
8	2.520	8.027	165140	00028514
9	2.828	9.031	185363	0002D413
10	3.175	10.034	208063	00032CBF
11	3.564	11.038	233543	00039047
<b>12</b>	<b>4.000</b>	<b>12.041</b>	<b>262144</b>	<b>00040000</b>
13	4.490	13.045	294246	00047D66
14	5.040	14.048	330280	00050A28
15	5.657	15.051	370727	0005A827
16	6.350	16.055	416127	0006597F
17	7.127	17.058	467087	0007208F
<b>18</b>	<b>8.000</b>	<b>18.062</b>	<b>524288</b>	<b>00080000</b>
19	8.980	19.065	588493	0008FACD
20	10.079	20.069	660561	000A1451
21	11.314	21.072	741455	000B504F
22	12.699	22.076	832255	000CB2FF
23	14.254	23.079	934175	000E411F
<b>24</b>	<b>16.000</b>	<b>24.082</b>	<b>1048576</b>	<b>00100000</b>
25	17.959	25.086	1176986	0011F59A
26	20.159	26.089	1321122	001428A2
27	22.627	27.093	1482910	0016A09E
28	25.398	28.096	1664510	001965FE
29	28.509	29.100	1868350	001C823E
<b>30</b>	<b>32.000</b>	<b>30.103</b>	<b>2097152</b>	<b>00200000</b>
31	35.919	31.106	2353974	0023EB36
32	40.317	32.110	2642246	00285146
33	45.255	33.113	2965821	002D413D
34	50.797	34.117	3329021	0032CBFD
35	57.018	35.120	3736700	0039047C
<b>36</b>	<b>64.000</b>	<b>36.124</b>	<b>4194304</b>	<b>00400000</b>
37	71.838	37.127	4707947	0047D66B
38	80.635	38.130	5284492	0050A28C
39	90.510	39.134	5931642	005A827A
40	101.594	40.137	6658043	006597FB
41	114.035	41.141	7473400	007208F8
<b>42</b>	<b>128.000</b>	<b>42.144</b>	<b>8388608</b>	<b>00800000</b>
43	143.675	43.148	9415894	008FACD6
44	161.270	44.151	10568984	00A14518
45	181.019	45.154	11863283	00B504F3
46	203.187	46.158	13316085	00CB2FF5
47	228.070	47.161	14946800	00E411F0
48	251.189	48.000	16461899	00FB304B

### 5.3.2 Shutter Settings

Exposure time [s]	ShutValue (Exposure time [s]×0x100000)	
	DEC	HEX
1/23.98	43734	0000AAD6
1/24	43691	0000AAAB
1/25	41943	0000A3D7
1/29.97	34987	000088AB
1/30	34953	00008889
1/50	20972	000051EC
1/59.94	17494	00004456
1/60	17476	00004444
1/90	11651	00002D83
1/100	10486	000028F6
1/125	8389	000020C5
1/180	5825	000016C1
1/250	4194	00001062
1/350	2996	00000BB4
1/500	2097	00000831
1/725	1446	000005A6
1/1000	1049	00000419
1/1500	699	000002BB
1/2000	524	0000020C
1/3000	350	0000015E
1/4000	262	00000106
1/6000	175	000000AF
1/8000	131	00000083
1/9600	109	0000006D
1/11200	94	0000005E
1/13600	77	0000004D

## 5.4. Iris Settings

F Value	Aperture Value ((1/F <sup>2</sup> ) × 0x100000)	
	DEC	HEX
22.6	2048	0000800
19.0	2896	0000B50
<b>16.0</b>	<b>4096</b>	<b>0001000</b>
13.5	5792	00016A0
11.3	8192	0002000
9.51	11585	0002D41
<b>8.00</b>	<b>16384</b>	<b>0004000</b>
6.73	23170	0005A82
5.66	32768	0008000
4.76	46340	000B504
<b>4.00</b>	<b>65536</b>	<b>0010000</b>
3.36	92681	0016A09
2.83	131072	0020000
2.38	185363	002D413
<b>2.00</b>	<b>262144</b>	<b>0040000</b>
1.68	370727	005A827
<b>1.61</b>	<b>404528</b>	<b>0062C30</b>

### 5.5. Focal Length Settings

Focal Length (Unit:mm)	Zoom Drive (Move mode 0: Zoom absolute position)	
	DEC	HEX
6.83	0	0000
7.21	32	0020
7.63	64	0040
8.08	96	0060
8.56	128	0080
9.10	160	00A0
9.67	192	00C0
10.29	224	00E0
10.99	256	0100
11.73	288	0120
12.55	320	0140
13.48	352	0160
14.47	384	0180
15.56	416	01A0
16.81	448	01C0
18.16	480	01E0
19.66	512	0200
21.37	544	0220
23.24	576	0240
25.39	608	0260
27.74	640	0280
30.38	672	02A0
33.35	704	02C0
36.81	736	02E0
40.65	768	0300
45.16	800	0320
50.24	832	0340
56.14	864	0360
63.29	896	0380
71.68	928	03A0
82.08	960	03C0
96.27	992	03E0
119.94	1024	0400

- Focal length values in the above table are not based on actual measurements or adjustments, but only reference values as a guide. Please adjust the field of view while observing the actual image as needed.

## 6. How to Operate the Camera with OSD Function

By connecting a remote control (sold separately) to the camera's remote terminal, you can display the OSD menu on the monitor and operate it.

When settings are changed by commands other than menu operations while the OSD menu is displayed, some functions may be restricted.

### 6.1. How to Operate OSD Menu by Remote Controller

[CENTER]	Pressing this button when the OSD menu is hidden will display the OSD top menu on the monitor. It is also used to confirm the selected menu item.
[▲]	Move up.
[▼]	Move down.
[◀]	Change the option of the item.
[▶]	Change the option of the item.

### 6.2. Indication of OSD Menu

- Items with ▼ at the end of the line enter a lower-level menu when [CENTER] is pressed.
- Items with ◀ at the end of the line return to the upper-level menu when [CENTER] is pressed.
- Items with ▼ at the beginning of the line execute a command with the selected option when [CENTER] is pressed (some items may have no selectable options). For other menu items, commands are executed each time the option is changed using [▲] or [▼].
- Only representative values can be selected for settings such as Gain or Shutter; not all possible values are available. For more detailed adjustments, use serial commands.
- Some items may be hidden depending on the mode setting. For example, when Gain Mode is set to Auto, Gain Value will not be displayed.

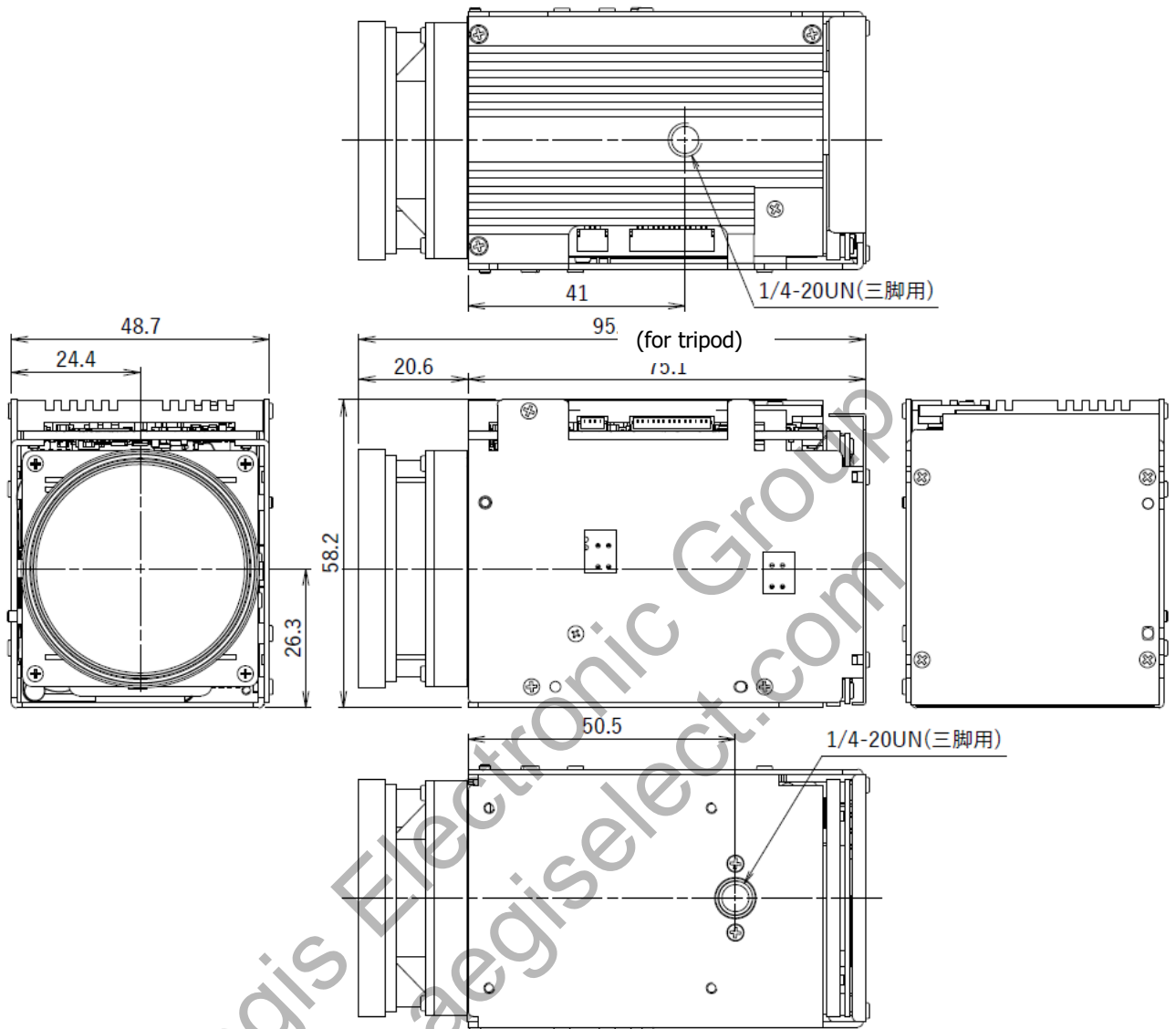
### 6.3. OSD Menu Hierarchical Structure

The hierarchical structure of the OSD menu is as follows. (Items for moving through the hierarchy are omitted.)

- └ Output Format
  - | └ Video Format
- └ Gain/Shutter/Iris
  - | └ Gain Mode
  - | └ Gain Value
  - | └ Gain Max Value
  - | └ Shutter Mode
  - | └ Shutter Value
  - | └ Shutter Limit
  - | └ Iris Mode
  - | └ F-Number
  - | └ Iris Limit
  - | └ AE Speed
  - | └ Exp Comp Value
  - | └ Metering Mode
  - | └ Spot Block
  - | └ Flicker Cancel
  - | └ High Sensitivity
- └ White Balance
  - | └ WB Mode
  - | └ Auto Func
  - | └ Preset Func
  - | └ Preset Temp
  - | └ Manual Memory
  - | └ Manual Red Gain
  - | └ Manual Blue Gain
  - | └ One Push WB
  - | └ LB Shift
  - | └ CC Shift
- └ Image Control
  - | └ Red Balance
  - | └ Green Balance
  - | └ Blue Balance
  - | └ Master Pedestal
  - | └ Red Pedestal
  - | └ Green Pedestal
  - | └ Blue Pedestal
  - | └ Detail
  - | └ Gamma
  - | └ Knee
  - | └ D-Range
  - | └ Noise Reduction
  - | └ Color Correction
  - | └ Color Saturation
  - | └ Color Suppression
  - | └ Cyan Suppression
  - | └ Color Space

- |   └ Color Adjustment
  - |    |   └ Magenta (Hue/Saturation/Depth)
  - |    |   └ Red    (Hue/Saturation/Depth)
  - |    |   └ Yellow (Hue/Saturation/Depth)
  - |    |   └ Green  (Hue/Saturation/Depth)
  - |    |   └ Cyan  (Hue/Saturation/Depth)
  - |    |   └ Blue  (Hue/Saturation/Depth)
  - |    └ SDI Compatibility
- └ Lens Control
  - |   └ Zoom Position
  - |   └ Zoom Speed
  - |   └ Focus Mode
  - |   └ Focus Limit
  - |   └ Focus Position
  - |   └ Focus Speed
  - |   └ One Push Focus
  - |   └ Focus Frame
- └ Flip
  - |   └ Horizontal Flip
  - |   └ Vertical Flip
- └ LTC
  - |   └ LTC Mode
  - |   └ LTC Reset
- └ GenLock
  - |   └ V Offset
  - |   └ H Offset
- └ Test Pattern
  - |   └ Test Pattern
  - |   └ Position X
  - |   └ Position Y
- └ OSD Color
  - |   └ OSD Color (Text/Highlight)
  - |   └ Default
- └ Save/Load/Init
  - |   └ Save Settings
  - |   └ Load Settings
  - |   └ Init Settings

7. Dimensions



935-0218-00  
(Unit:mm)

## **8. Case for Indemnity (Limited Warranty)**

### **8.1. Product Warranty**

The warranty period for this product is one and half (1.5) years from the date of shipment from our factory.

If you use the product properly and discover a defect during this period, and if that was caused by designing or manufacturing, CIS Corporation, at its option, repairs or replaces it free of charge. However, failures or damages resulting from customer mishandling, or from natural disasters such as fire, earthquake, lightning, storm, or flood, as well as other force majeure events, are not covered under this warranty.

After the warranty period has expired, repairs will be carried out on a chargeable basis, provided that repair is technically possible.

### **8.2. CMOS Defective Pixels**

CIS applies defective pixel correction prior to the shipment of the product. However, the number of defective pixels is subject to increase primarily due to the effect of cosmic rays. Due to this nature, CIS should not hold responsible for the natural increase of defective pixels.

### **8.3. Product Support**

Should you have any problems in function of the product you purchased, and if you need our further analysis and/or repair, please contact your distributor.