

---

---

# CIS

**3G-SDI × 4ch  
4K UHD TV CMOS Color Camera**

# VCC-4K2

## **Product Specification & Operational Manual**

**CIS Corporation**

## Table of Contents

1.	Handling Precautions .....	2
1.1.	Camera Handling Precautions .....	2
1.2.	Restrictions on Applications .....	2
1.3.	Disclaimers (Exception Clause) .....	2
2.	Product Outline .....	3
2.1.	Features .....	3
2.2.	Bundled Items .....	3
3.	Specifications .....	4
3.1.	General Specifications .....	4
3.2.	External Connector .....	6
3.2.1	12pins Circular Connector .....	6
3.2.2	BNC Connector .....	6
4.	Functions .....	7
4.1.	GenLock .....	7
4.2.	LTC (Longitudinal Time code) .....	7
4.3.	Defective Pixels Correction .....	7
4.3.1	Defective Pixels Type .....	8
4.3.2	Details on Defective Pixels Data .....	8
4.3.3	Notes for Defective Pixels Correction .....	9
5.	Serial Communication .....	10
5.1.	Serial Communication Settings .....	10
5.2.	Command List .....	11
5.3.	Quick Reference Table for Gain Settings .....	20
5.4.	Quick Reference Table for Shutter Settings .....	21
5.5.	Factory Settings .....	22
6.	Dimensions .....	23
7.	Case for Indemnity .....	24
7.1.	Product Warranty .....	24
7.2.	CMOS Defective Pixels .....	24
8.	Product Support .....	24

## 1. Handling Precautions

### 1.1. Camera Handling Precautions

- Do not use or store the camera module in the dusty or humid places.
- Do not apply excessive force, vibration, or static electricity that could damage the camera. Handle the camera with care.
- Do not shoot direct images that are extremely bright (e.g., light source, sun, etc). When extremely strong light source is shot, smear or blooming may occur. When the camera is not in use, please put the protection cap on.
- Follow the instructions in Chapter 3.2., "External Connector" for connecting the camera module. Improper connection may cause damages not only to the camera module but also to the connected devices.
- Confirm the mutual ground potential carefully and then connect the camera module to monitors or computers. AC leaks 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 assembly.
- Our warranty does not apply to damages or defects caused by irregular and/or abnormal use of the product.

### 1.2. Restrictions on Applications

- The camera module must not be used for any nuclear equipments or aerospace equipments 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 specified in this manual.

### 1.3. Disclaimers (Exception Clause)

CIS Corporation shall be exempted from taking responsibility and held harmless for damages or losses incurred by the following cases.

- In case damages or losses are caused by fire, flood disaster, earthquake, lighting strike, or other acts of God.
- In case damages or losses are caused by deliberate or accidental misuse by the user, or failure to observe the information contained in the instructions in this Product Specification and Operational Manual.
- In case damage or losses are caused by repair or modification conducted by the customer or any unauthorized third party (such as an unauthorized service representative).

## 2. Product Outline

VCC-4K2 is a small 4K color camera module utilizing a 1.0" type global shutter CMOS image sensor.

4K UHDTV 60p/59.94p/50p/30p/29.97p/25p/24p/23.98p (3G-SDI ×4ch), 1080 60p/59.94p/50p (3G-SDI ×1ch), and 1080 60i/59.94i/50i (HD-SDI ×1ch) are corresponded.

### 2.1. Features

- Global shutter type CMOS image sensor.
- Features CIS original ISP, state-of-the-art "Clairvu™" for superb imaging quality.
- Small foot print: 65mm × 65mm × 110mm (without projection).
- GenLock function (3-value analog signals or Black burst )
- Camera can be controlled by RS-232C.
- LTC (Longitudinal Time code)

### 2.2. Bundled Items

- Standard Bundled Items
  - ◆ Camera module, VCC-4K2
  - ◆ 12 pins connector for power supply.
- Optional Items
  - ◆ Mount conversion ring from M42 to C Mount
  - ◆ Mount conversion ring from M42 to F Mount
  - ◆ Remote controller RU-100 (for OSD control)
  - ◆ Conversion cable HI-MM-12-200 (for power supply, remote controller , and genlock input)

- Software

CIS control panel software for evaluation purpose only is downloadable via our web.

CIS shall be exempted from taking responsibility and held harmless for damage or malfunction of your hardware and software caused by using this control software. The purpose of this control software prepared is for user to check operation and evaluate our products. Please be noted that CIS does not customize the program nor provide source code.

- Packaging

- ◆ Individual Carton

## 3. Specifications

## 3.1. General Specifications

Electrical Specifications		
Pickup device	Device type	1.0" type global shutter color CMOS sensor
	Unit cell Size	3.45 $\mu$ m(H) x 3.45 $\mu$ m(V)
Resolution	UHDTV (4ch output)	3840 (H) × 2160(V)
	1080p (1ch output)	1920(H) × 1080(V)
Aspect ratio	16 : 9	
Video output format	3840 x2160p YUV422 @60, 59.94, 50 fps (Level A)	3G-SDI ×4 - 2SI / Square Division
	3840 x2160p YUV422 @60, 59.94, 50 fps (Level B)	3G-SDI ×4 - Square Division
	3840 x2160p YUV444 @30, 29.97, 25, 24, 23.98 fps (Level A)	3G-SDI ×4 - 2SI
	1920 x 1080p YUV422 @60, 59.94, 50 fps (Level A / B)	3G-SDI ×1
	1920 x 1080 i YUV422 @60, 59.94, 50 fps	HD-SDI ×1
Sync system	Internal sync. / External sync.	
Video output standard	HD-SDI or 3G-SDI : Y/Pb/Pr (10bit) BNC 75 $\Omega$ termination	
Sensitivity	F5.6 (2000 lx)	
Minimum illumination	3.0 lx (F1.4) Conditions : VIDEO 50%, Gain 30dB, Shutter OFF	
Gain variable range	AGC : 0dB ~ +48 dB	
	MANUAL : 0dB ~ +48 dB	
Shutter speed variable range	AUTO : 1/13600s ~ 1/23.98s (The upper limit and the lower limit can be set by users. The slowest shutter speed shall be limited by its frame rate.)	
	MANUAL : 1/13600s ~ 1/23.98s (The slowest shutter speed shall be limited by its frame rate.)	
White balance adjustment	AUTO, AUTO(Outdoor), ATW, 7 different Preset, MANUAL, User Preset 1 ~ 5, OnePush	
	Preset : Daylight(5500K), Cloudy(6500K), Shade(8000K), Tungsten(3200K), Fluorescent(White), Fluorescent(Neutral White), Fluorescent(Daylight) 6500K	
Auto exposure detection	Average / Center-Weight / Spot(1/256) / Backlight Compensation	
Flicker cancellation	ON, OFF	
Edge enhancement	OFF, 1~7	
Color correction	Standard, Fluorescent Light, Tungsten Lamp	
Color saturation adjustment	0%(B/W) ~ 100% ~ 200%	
Color saturation suppression	OFF, 1 ~ 7	
Noise reduction	ON, OFF	
Gamma	CIS original curve : Contrast -2, -1, 0, +1, +2	
	BT.709 complied curve : Contrast -2, -1, 0, +1, +2	
Dynamic range	LOW (120% : Priority to Low noise), Normal (200%), Normal x 2 (400%), Normal x 3 (600%)	
Knee point	Off, 100%, 95%, 90%, 85%, 80%, 75%	
Master Pedestal	-100 ~ 0 ~ +100	

Electrical Specifications (cont.)	
Pedestal (R,G,B)	RGB -100 ~ 0 ~ +100
Color balance	RGB 50 ~ 100 ~ 150
Pixel defect correction (white spot)	Corrected at factory setting.
LTC	OFF, ON External SMPTE Time code can be input into the LTC IN terminal. (Internal self-counting time code is resettable.)
Camera preset settings	1, 2, 3, 4 (4 presets can be stored.)
Remote control communications	Camera settings can be set by RS-232C communication via 12 pins circular connector. Refer to the <a href="#">Section 5. Serial Communication</a> for the details.
Power requirements	DC+9 ~ +15V
Power consumption	12.0W (Conditions: DC+12V IN)

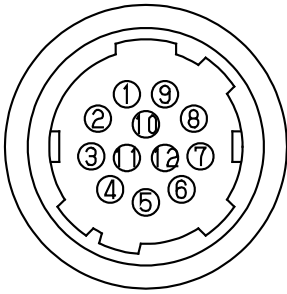
Mechanical Specifications	
Dimensions	H:65mm W:65mm D:110mm excluding projection Refer to the <a href="#">Section 6. Dimensions</a> .
Weight	420g
Lens mount	M42 mount Refer to the <a href="#">Section 6. Dimensions</a> .

Environmental Specifications			
Safety/Quality standards		UL : Conform to UL Standard including materials and others. FCC : CFR 47 part15 subpart B Class A Digital Device CE : EMC : 2014/30/EU Emission : EN61000-6-4:2007+A1:2011 Immunity : EN61000-6-2:2005 RoHS : 2011/65/EU EN50581 (RoHS2)	
Durability	Vibration	Acceleration	: 98m/s <sup>2</sup> (10G)
		Frequency	: 20 ~ 200Hz
		Direction	: X, Y, and Z 3 directions
		Testing time	: 120min for each directions
	Shock	No malfunction shall be occurred with 980m/s <sup>2</sup> (100G) for ±X,±Y, and ±Z, 6 directions. (Without packaging)	
Operation Guaranteed Temperature		-5 ~ +45°C Humidity 20 ~ 80%RH with no condensation.	
Storage Temperature		-25 ~ +60°C Humidity 20 ~ 80%RH with no condensation.	

3.2. External Connector

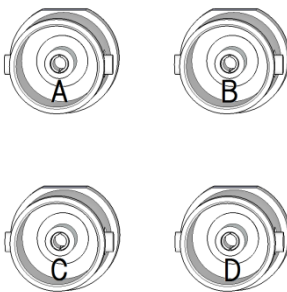
3.2.1 12pins Circular Connector

Model Name : HR10-10R-12PA(73) (HIROSE) or equivalent

	Pin No.	Description
	1	GND
	2	Power IN DC+12V
	3	GND
	4	TXD Out (Camera)
	5	GND
	6	TEST terminate (Do NOT connect)
	7	EXT SYNC IN
	8	GND
	9	LTC IN
	10	Power OUT +5V (Option)
	11	Power IN DC+12V
	12	RXD In (Camera)

3.2.2 BNC Connector

Model Name : BCJ-BPLHA (CANARE)

	Pin No.	Description
	A	3G-SDI output CH0 (Upper left)
	B	3G-SDI output CH1 (Upper right)
	C	3G-SDI output CH2 (Lower left)
	D	3G-SDI output CH3 (Lower right )
Shell	Connected to chassis GND	

## 4. Functions

### 4.1. GenLock

Gen Lock function is available by inputting Analog External Sync signal (Black burst or 3-value SYNC) into the EXT SYNC IN terminal of the 12pins connector. Corresponding external sync signals vary depend on the camera output format. Please refer to the chart below for the details.

CAMERA FORMAT	EXT SYNC IN				
UHD/HD 60p/60i			1080i60	720p60	1080p30
UHD/HD 59.9p/59.9i	NTSC		1080i59.9	720p59.9	1080p29.9
UHD/HD 50p/50i		PAL	1080i50	720p50	1080p25
UHD 30p			1080i60	720p60	1080p30
UHD 29.9p	NTSC		1080i59.9	720p59.9	1080p29.9
UHD 25p		PAL	1080i50	720p50	1080p25
UHD 24p					1080p24
UHD 23.9p					1080p23.9

- Input Black Burst signals for NTSC/PAL signals.
- Input 3-value SYNC signals for other than NTSC/PAL signals.
- EXT SYNC IN is terminated with 75Ω. (When camera power is OFF, it will be high-impedance.).
- When an external signal specified the above is input, the camera will be in external sync mode automatically.
- When no external signal is input, the camera will operate in internal sync mode.
- Right after external signals are input, images may be disturbed but this is not malfunction.
- When a signal other than the specified above chart is input to the EXT SYNC IN terminal, disturbed image or no image may be shown.
- Right after when the camera was booted or when output format was changed, difference between the video signals and the external sync signals would occur with the maximum differences of  $\pm 10$  pixels. If this difference (error) cannot be accepted, lock with external sync automatically, then tune it with user adjustment commands.

### 4.2. LTC (Longitudinal Time code)

Time code can be inserted to 3G-SDI signal. External time code can be inserted with inputting LTC code to the LTC IN terminal of the 12pins connector. And, when no signal is input into the LTC IN terminal, camera internal time code can be inserted.

Internal time code starts with 00:00:00:00 when power is turned ON, and when some signals are input into the LTC IN terminal, it will be changed to external time code. With this situation, if no signal is input to the LTC IN terminal, it becomes self-running from the set time code.

Signal Format : SMPTE Time code  
Signal Level : 0.5 ~ 2 [Vp-p]

### 4.3. Defective Pixels Correction

In addition to the corrected defective pixels data registered at ex-factory, users can detect, register, or delete defective pixels data occurred after shipping out from our factory. Please refer to the [Section 5.2, Command List](#) for the details.



### 4.3.1 Defective Pixels Type

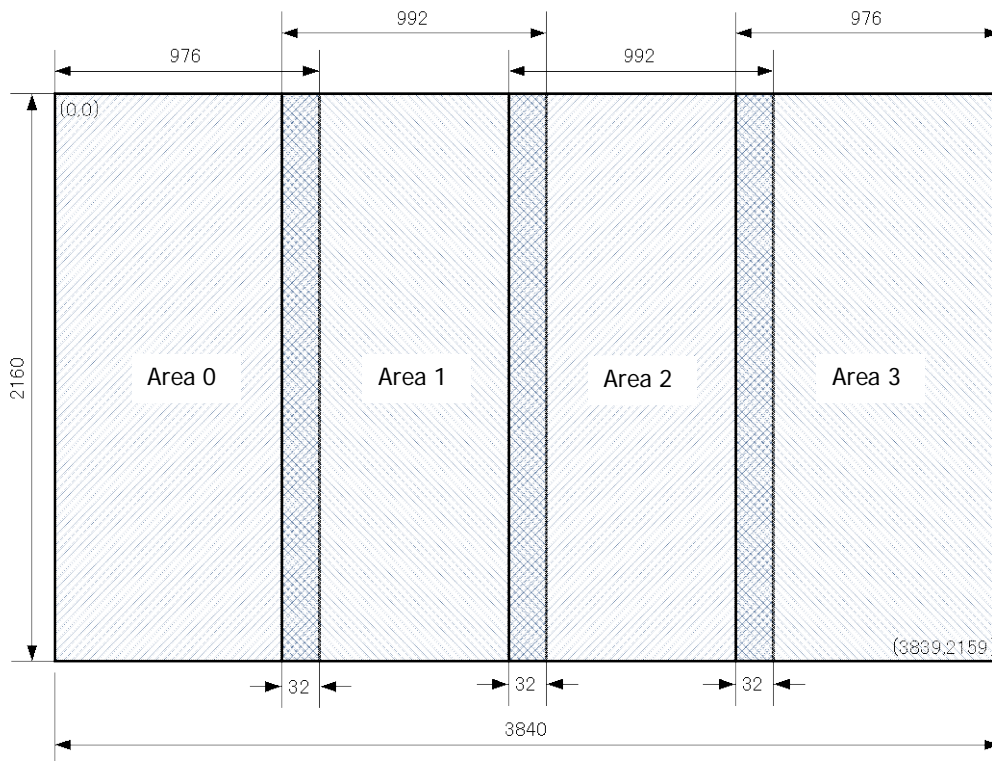
There are two types of defective pixels data.

- Defective Data at EX-Factory  
Registered data at ex-factory, and these data cannot be over written.
- Defective Data registered by users  
Registered data by users after shipment, and these data can be over written freely.

There are four groups of position data for defective pixels, No Flip, H Flip only, V Flip only, and both H/V Flip. According to the combination of H Flip and V Flip settings, it changes automatically. When executing commands, the data corresponds to the Flip settings at that time shall be the one to be detected, registered, or deleted.

### 4.3.2 Details on Defective Pixels Data

Defective pixels data are stored and controlled per four vertically divided area. Up to 64 points per reed, which makes total 256 points, can be registered as user register data. Each area is overlapped with the adjacent area with 32 pixels width, and the points in the overlapped area shall be registered to both reeds. Please refer to the below for the definition of reeds.



The coordinate system is based on the upper left origin. Each reed is defined as;

- Reed Area 0 : (0,0) - (975, 2159)
- Reed Area 1 : (944,0) - (1935, 2159)
- Reed Area 2 : (1904,0) - (2895, 2159)
- Reed Area 3 : (2864,0) - (3839, 2159)

For example, if the defective pixel is at (943,0) position, the data shall be registered only to the reed Area 0.

However, if the defective pixel is at (944,0) position, the data shall be registered to both of the reed Area 0 and 1.

#### 4.3.3 Notes for Defective Pixels Correction

Like other camera settings, the registered data cannot be saved unless otherwise SAVE command is executed.

Unlike other camera settings however, four kinds of data cannot be registered by using camera setting store. (Defective pixels correction data are in common regardless of its preset number.) The same defective points cannot be saved as both Ex-factory data and user registered data. Therefore, if the same defective points as ex-factory data were detected, those points shall be ignored. If the user specify the pixel data with coordinates and if that coordinates are the same as the one of ex-factory data, error shall be returned.

Please be noted that the detected results may not always be the same due to temperature, noise, and other conditions. Even if the user specify a defective point with coordinate to register or delete, it cannot be executed if the data was one of the ex-factory data. Neglecting this instruction may cause not only inappropriate pixel defect correction but also failure of getting proper images.

## 5. Serial Communication

### 5.1. Serial Communication Settings

Camera can be controlled by RS-232C signals via 12pins circular connector at the camera rear.

#### (1) RS-232C Configuration

Baud rate	9,600bps
Data	8bit
Stop bit	1bit
Parity	None
XON/XOFF	No Control

#### (2) Control code

- The total control code conforms to ASCII code.
- A control code consists of command, parameter and CR (0Dh). The changes and acquisition of camera setting parameters can be done by issuing commands from PC.

Commands	Parameter 1	Parameter 2, and after	Function
GU	Address	None	To obtain camera setting information.
SU	Address	Data 1, Data 2,....	To change camera settings.
INIT	None	None	To restore to the factory settings.
SAVE	None	None	To save the camera settings.

#### (3) How to set a command

- Input a command in capital letters
- Separate between a command and a parameter by one space (20h).
- From the head of the input character to the linefeed code is defined as one command.
- Parameters with 0x are regarded as Hexadecimal, the one with 0 are regarded as Octal, and the one as-is are regarded as Decimal.
- Do not input any letters other than numbers (0~9), Decimal Point, and Hexadecimal (0~9, and A~F).
- Refer to "[Section 5.2. Command List](#)" for the details on address and data.
- Do not input values and letters other than the specified above command and those mentioned in "[Section 5.2. Command List](#)".

#### (4) Linefeed code CR(0Dh) or LF(0Ah)

Make sure to input to indicate the end of the command.

#### (5) Initial command

Input "INIT" to restore to the initial settings. (Cannot be saved at this point).

#### (6) Data save command

Input "SAVE" to save the camera settings.

#### (7) Command examples

To change the shutter mode to "Auto" : [SU 5 1]

To confirm the shutter mode : [GU 5]

## 5.2. Command List

**Video Format**

	Command number	Value (2 <sup>nd</sup> Parameter)	Initial Value	Description
Video Format	1	0: UHDTV 2-Sample Interleave 60p (Level A)	3	This is to set video output format.
		1: UHDTV 2-Sample Interleave 59.94p (Level A)		
		2: UHDTV 2-Sample Interleave 50p (Level A)		
		3: UHDTV Square Division 60p (Level A)		
		4: UHDTV Square Division 59.94p (Level A)		
		5: UHDTV Square Division 50p (Level A)		
		6: Full-HD 60p (Level A)		
		7: Full-HD 59.94p (Level A)		
		8: Full-HD 50p (Level A)		
		9: Full-HD 60p (Level B)		
		10: Full-HD 59.94p (Level B)		
		11: Full-HD 50p (Level B)		
		12: UHDTV Square Division 60p (Level B)		
		13: UHDTV Square Division 59.94p (Level B)		
		14: UHDTV Square Division 50p (Level B)		
		15: Full-HD 60i		
		16: Full-HD 59.94i		
		17: Full-HD 50i		
		18: UHDTV 2-Sample Interleave 30p 444 (Level A)		
		19: UHDTV 2-Sample Interleave 29.97p 444 (Level A)		
		20: UHDTV 2-Sample Interleave 25p 444 (Level A)		
		21: UHDTV 2-Sample Interleave 24p 444 (Level A)		
22: UHDTV 2-Sample Interleave 23.98p 444 (Level A)				

**AE related**

	Command number	Value (2 <sup>nd</sup> Parameter)	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: x1 ~ x251	0x10000 (65536)	This is to set gain value. Valid when gain mode is at Manual. e.g. To set x2 (6dB): SU 3 0x00020000 ※Refer to the <a href="#">Section 5.3. Quick Reference Table for Gain Settings.</a>
Gain Max Value	4	Magnification ×0x10000 Setting range : x1 ~ x251	0x200000 (2097152)	This is to set the Max gain value when gain mode is at Auto. ※Refer to the <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.
Shutter Value	6	Exposure [s]×0x100000 Setting range : 1/13600 ~ 1/23.98s	0x4444 (17476) 1/60s	This is to set shutter value (exposure time). Valid when shutter mode is at Manual. Shutter speed slower than 1/60s shall be limited according to the frame rate of its video output format. ※Refer to the <a href="#">Section 5.4 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	0x4444 (17476) 1/60s	This is to set the shutter variable range when shutter mode is at Auto. e.g. To set Max=1/60s, Min=1/8000s: SU 7 0x4444 0x83 Shutter speed slower than 1/60s shall be limited according to the frame rate of its video output format. ※If Max < Min is specified, it will be an error. ※Refer to the <a href="#">Section 5.4 Quick Reference Table for Shutter Settings.</a>
		The 2 <sup>nd</sup> Parameter: Min value Exposure[s] × 0x100000 Setting range : 1/13600 ~ 1/23.98s	0x4D (77) 1/13600s	
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> Param: X value: 0 ~ 15	7	This is to set X, Y, W, and H values at Spot metering. X: Far left of metering field, Block X coordinate Y: Top of metering field, Block Y coordinate W: Width of metering field (Block number) H: Height of metering field (Block number) e.g. SU 9 7 7 2 2
		The 2 <sup>nd</sup> Param: Y value : 0 ~ 15	7	
		The 3 <sup>rd</sup> Param: W value: 1 ~ 16	2	
		The 4 <sup>th</sup> Param: H value: 1 ~ 16	2	
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 the exposure compensation value.

**AE related (Continued)**

	Command number	Value (2 <sup>nd</sup> Parameter)	Initial Value	Description
Flicker Cancel	12	0: OFF	0	This is to set ON/OFF of flicker cancel. Invalid when output format is at 50p.
		1: ON		
Gain Value, Plus Minus	13	-1	None	This is to lower the gain value by 1dB from the current one. Valid when gain mode is at Manual. (Write Only)
		1		This is to raise the gain value by 1dB from the current one. Valid when gain mode is at Manual. (Write Only)
Shutter Speed, Plus Minus	14	-1	None	This is to lower the shutter speed by 1 step (1/4EV) from the current one. (Shutter value becomes bigger.) Valid when shutter mode is at Manual. (Write Only)
		1		This is to raise the shutter speed by 1 step (1/4EV) from the current one. (Shutter value becomes smaller.) Valid when shutter mode is at Manual. (Write Only)

**WB related**

	Command number	Value (2 <sup>nd</sup> Parameter)	Initial Value	Description
WB Mode	20	0: Auto	0	This is to set White Balance mode.
		1: Auto(Outdoor)		
		2: DayLight (Sunlight)		
		3: Cloudy		
		4: Shade		
		5: Tungsten (Light bulb)		
		6: Flw (Fluorescent light White)		
		7: Fln (Fluorescent light noon/daytime White)		
		8: Fld (Fluorescent light daylight)		
		9: Auto(ATW)		
		10: OnePush		
		11: Manual		
		12: Preset1		
		13: Preset2		
		14: Preset3		
		15: Preset4		
16: Preset5				
Preset	21	1: Preset1	None	(Write Only) This is to store the current WB value as a preset value. The stored value will not be saved unless otherwise executing SAVE command.
		2: Preset2		
		3: Preset3		
		4: Preset4		
		5: Preset5		
Blue Gain	22	0 ~ 800(%)	192	This is to set B Gain when WB Mode is at Manual.
Red Gain	23	0 ~ 800(%)	167	This is to set R Gain when WB Mode is at Manual.
One Push Trigger	24	1: Trigger Start	None	(Write Only) This is to start operation when WB mode is at One Push.
Current B Gain	25	None	None	(Read Only: dedicated for GU) This is to respond the current Blue gain value.
Current R Gain	26	None	None	(Read Only: dedicated for GU) This is to respond the current Red gain value.

*Image Quality related*

	Command number	Value	Initial Value	Description
Edge Level	30	0: Off	3	This is to set the edge enhancement level (sharpness).
		1:1		
		2:2		
		3:3		
		4:4		
		5:5		
		6:6		
		7:7		
Gamma	35	0: Standard -2	2	This is to set gamma and contrast. "Standard" is the CIS original curve "BT.709" is the curve complies to ITU-R BT.709. Contrast can be changed with -2 ~ +2.
		1: Standard -1		
		2: Standard		
		3: Standard +1		
		4: Standard +2		
		5: BT.709 -2		
		6: BT.709 -1		
		7: BT.709		
		8: BT.709 +1		
		9: BT.709 +2		
Knee	36	0: OFF	4	This is to set knee point. Valid except when Gamma is at BT.709 and D-range is at Low. Knee slope is to be selected with its maximum D-Range.
		1: 100%		
		2: 95%		
		3: 90%		
		4: 85%		
		5: 80%		
		6: 75%		
Master Pedestal	37	-100 ~ +100	0	This is to set the Master pedestal.
Red Pedestal	38	-100 ~ +100	0	This is to set the Red pedestal.
Green Pedestal	39	-100 ~ +100	0	This is to set the Green pedestal.
Blue Pedestal	40	-100 ~ +100	0	This is to set the Blue pedestal.
Red Balance	41	0 ~ 200	100	This is to set the Red balance.
Green Balance	42	0 ~ 200	100	This is to set the Green balance.
Blue Balance	43	0 ~ 200	100	This is to set the Blue balance.
D-Range	44	0: Low	1	This is to set Dynamic range. With Normal x 2 and Normal x 3, D range itself becomes double or triple, but noises increase. At Low setting, both D range and sensitivity decrease, but noise level becomes the lowest. At Normal x 2 setting, Gain can go low only up to 0x20000. At Normal x 3 setting, Gain can go low only up to 0x30000.
		1: Normal		
		2: Normal x2		
		3: Normal x3		



**Image Quality related (Continued).**

Color Saturation	45	0 ~ 200	100	This is to set color saturation.
Noise Reduction	50	0 : Noise reduction OFF	0	This is to set noise reduction.
		1 : Noise reduction ON		
Color Correction	52	0 : Auto	0	This is to set color correction.
		1 : Standard		
		2 : Fluorescent light		
		3 : Tungsten lamp		
Color Suppression	53	0 ~ 7	5	This is to set color suppression.

**OSD related**

	Command number	Value	Initial Value	Description
OSD UP BUTTON	90	0: One push	None	This is to operate OSD. At continuous push operation, a command shall be issued every 60msec.
		1: Continuous push		
OSD DOWN BUTTON	91	0: One push	None	
		1: Continuous push		
OSD RIGHT BUTTON	92	0: One push	None	
		1: Continuous push		
OSD LEFT BUTTON	93	0: One push	None	
		1: Continuous push		
OSD CENTER BUTTON	94	0: One push	None	This is to be used as Set button to determine.
		1: Continuous push		
Menu Color	95	0: Black 1: Blue 2: Red 3: Magenta 4: Green 5: Cyan 6: Yellow 7: White	7	This is to set the font color of OSD.
Select Color	96	0: Black 1: Blue 2: Red 3: Magenta 4: Green 5: Cyan 6: Yellow 7: White	5	This is to set the font color of the selected text of OSD. If the same color as the Menu color is selected, it shall be an error.

*Camera Preset, and LTC*

	Command number	Value	Initial Value	Description
Camera Setting Store	100	0 ~ 3	Initial is 0	Up to 4 kinds of camera settings can be stored. The stored values cannot be saved unless otherwise SAVE command is executed. The stored data and set values shall not be initialized by executing INIT command.
Camera Setting Load	101	0 ~ 3	Initial is 0	This is to reflect the stored setting values set by Camera Setting Store, to the camera. The set value shall not be initialized by executing INIT command.  *When Camera Setting Store is executed, the setting values forcibly become the one set by Camera Setting Store.
LTC OFF/ON	103	0: OFF 1: ON	0	This is to insert LTC signals.
LTC Reset	104	1: Reset	None	(Write Only) This is to reset the internal free-running timer of LTC.
GenLock V Offset	106	-1024 ~ 1023	0	This is to adjust the GenLock phase by user.
GenLock H Offset	107	-2048 ~ 2047	0	
H Flip	110	0: OFF 1: ON	0	Horizontal flip of the video output image.
V Flip	111	0: OFF 1: ON	0	Vertical flip of the video output image.

**Defective Pixels Correction**

	Command number	Value	Description
Detection of Defective Pixels	200	The 1 <sup>st</sup> Parameter: Threshold level : 0 ~ 4095	This is to detect the defective pixels and register them as user register data. Output values which exceeded the threshold level shall be defined as the defective pixels.
		The 2 <sup>nd</sup> Parameter: Registration mode. 0: New registration 1: Additional registration	
Registration of Defective pixels	201	The 1 <sup>st</sup> Parameter: X coordinate: (0 ~ 3839)	This is to register the defective pixels as user register data by specifying their coordinates.
		The 2 <sup>nd</sup> Parameter: Y coordinate: (0 ~ 2159)	
Deletion of Defective pixels	202	The 1 <sup>st</sup> Parameter: X coordinate: (0 ~ 3839)	(Write Only) This is to delete defective pixels from user register data by specifying their coordinates.
		The 2 <sup>nd</sup> Parameter: Y coordinate: (0 ~ 2159)	
Entire deletion of Defective pixels correction data	203	1: Entire deletion	(Write Only) Delete all of the User register Data.
Indication of Defective pixels 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 the registered defective pixels per read. 4: Indicate the number of user registered defective pixels per read.	(Read Only: GU command is used.) This is to indicate the registered defective pixels correction data according to the specified format.

## Note:

When "New registration" is specified with defective pixels detection command, only user registered data by defective pixels detection shall be deleted, and no data registered by defective pixels registration command shall be deleted.

The registered defective pixels are classified to four types of attribute. Attribute [W] and [B] are for the data registered at EX-Factory, attribute [U] is the data registered by user by defective pixels detection command, and attribute [P] is the data registered by user by defective pixels registration command.

[GU 200] command shows the number of pixels classified with [U] attribute, and [GU 201] command shows the number of pixels classified with [P] attribute.

Only user registered data can be changed, but the data at Ex-Factory would never be able to be changed.

***No Command Numbers***

	Command number	Value	Initial Value	Description
SAVE	None	None	None	This is to save the camera settings.
INIT	None	None	None	This is to restore the camera settings. Defective pixels correction data shall not be initialized.
REBOOT	None	None	None	This is to reboot the camera. This command is intended to recover the camera from unexpected conditions.
GVI	None	1: MCU Firmware version 2: FPGA Hardware version	None	This is to acquire the firmware's version. The letter strings such as 0.1 shall be responded.

## 5.3. Quick Reference Table for Gain Settings

	Magnification	dB	GainValue (Mag. x 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

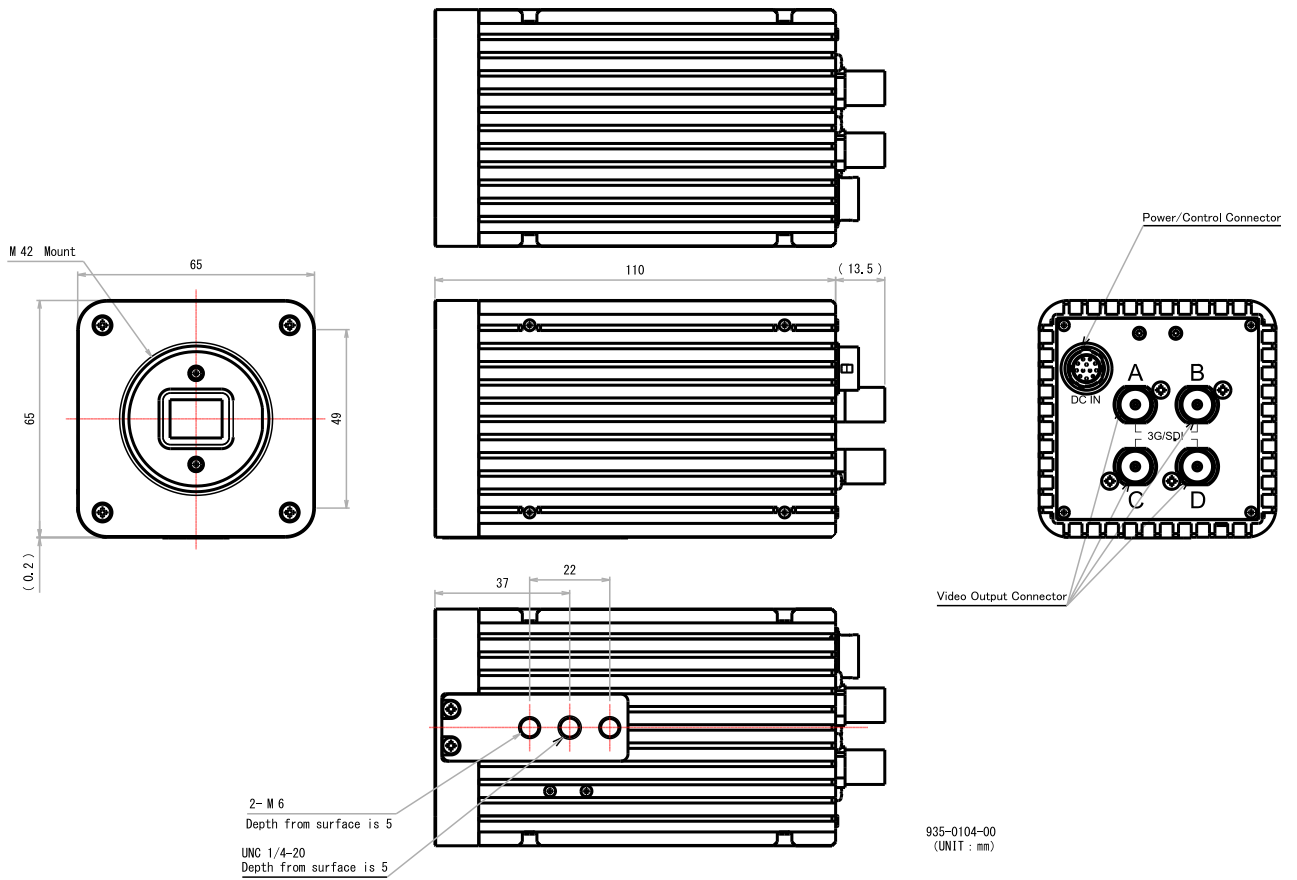
## 5.4. Quick Reference Table for Shutter Settings

Exposure Time [s]	ShutValue (Exp. [s]×0x100000)	
	DEC	HEX
1/25	41943	0000A3D7
1/30	34952	00008888
1/60	17476	00004444
1/90	11650	00002D82
1/100	10485	000028F5
1/125	8388	000020C4
1/180	5825	000016C1
1/250	4194	00001062
1/350	2995	00000BB3
1/500	2097	00000831
1/725	1446	000005A6
1/1000	1048	00000418
1/1500	699	000002BB
1/2000	524	0000020C
1/3000	349	0000015D
1/4000	262	00000106
1/6000	174	000000AE
1/8000	131	00000083
1/9600	109	0000006D
1/11200	94	0000005E
1/13600	77	0000004D

## 5.5. Factory Settings

Items	Default Configuration
Video Format Setting	UHDTV Square Division 60p (LevelA)
Gain Mode	Auto
Manual Gain	65536(0dB)
Max Gain	2097152(Approx. 30dB)
Shutter Mode	Auto
Shutter Limit Max	17476(1/60)
Shutter Limit Min	77(1/13600s)
Manual Shutter	17476(1/60)
AE Mode	Center-Weight
Spot Block	X=7,Y=7, W=2,H=2
Exposure Compensation Value	12 (0dB)
AE Speed	10
Flicker Cancel	OFF
White Balance Setting	Auto
Manual Red Gain	167
Manual Blue Gain	192
Color Correction	Auto
Color Suppression	5
Color Saturation	100
Edge Enhancement	3
Noise Reduction	0
Gamma	Standard
Knee	85%
D-Range	Normal
Master Pedestal	0
Pedestal (RGB)	0
Color Balance (RGB)	100
LTC	OFF
OSD Menu Color	White
OSD Select Color	Cyan

6. Dimensions





## 7. Case for Indemnity

### 7.1. Product Warranty

The term of warranty of this product is within 1.5 years from the date of shipping out from our factory.

If you use the product properly and discover a defect during the warranty period, and if that was caused by designing or manufacturing, CIS Corporation, at its option, repairs or replaces it at no charge to you. Products out of warranty period will be subject to charge. CIS repairs the products as long as it is repairable.

CIS shall be exempted from taking responsibility and held harmless for damages or losses incurred by the following cases.

- In case damages or losses are caused by earthquake, lightning strike, fire, or other acts of God.
- In case damages or losses are caused by deliberate or accidental misuse by the user, or failure to observe the information contained in the instructions in this Product Specification and Operational Manual.
- In case damages or losses are caused by repair or modification conducted by the customer or any unauthorized party.

### 7.2. CMOS Defective Pixels

CIS compensates the noticeable CMOS pixel defects found at the shipping inspection prior to our shipment. On very rare occasions, however, CMOS pixel defects might be noted with time of usage of the products. Cause of the CMOS pixel defect is the characteristic phenomenon of CMOS sensor itself and CIS is exempted from taking any responsibilities for them. Should you have any questions on CMOS pixel defects compensation please contact us.

## 8. Product Support

Should you have any problems in function of the product you purchased, and if you would like us to investigate on the cause and repair, please contact the dealer you purchased it from to consult.