CIS

English

3G-SDI / HD-SDI

FULL HD CMOS Color

VCC-HD3

Product Specifications & Operational Manual

Preliminary Ver.1

CIS Corporation

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1. Handling Precautions

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. Our warranty does not apply to damages or defects caused by irregular and/or abnormal use of the product.

Please observe all warnings and cautions stated below.
Our warranty does not apply to **damages or malfunctions caused by neglecting these precautions.**

- Do not use or store the camera in the dusty or humid places.
- Do not apply excessive force, vibration, or static electricity that could damage the camera. Handle the camera with caution.
- Do not shoot direct images that are extremely bright (e.g., light source, sun, etc.), and when camera is not in use, please put the lens cap on. When extremely strong light source is shot, smear or blooming may occur.
- Follow the instructions in Chapter 6, "External Connector Pin Assignment" 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 before connecting the camera to other equipments. AC leaks from the connected devices may cause damages or destroy the camera.
- 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.
- Since VCC-HD3 is a highly-dense camera module, appropriate heat dissipation shall be considered. We recommend using a metal base or others to install the camera.

2. Product Outline

VCC-HD3 is a full HD color camera module utilizing a 1/1.8 type global shutter CMOS sensor.
Video output 1080 60p/59.94p/50p (3G-SDI), 1080 60i/59.94i/50i/30p/29.97p/25p/24p/23.97p (HD-SDI), 720 60p/59.94p/50p (HD-SDI) are corresponded.

Features

- ☐ CIS own designed Image Signal Processor, "Clairvu™" for superb imaging quality.
- ☐ Small foot print: 29mm × 29mm × 77mm (without protruding portion)
- ☐ Gen Lock function (3 values analog signals or black burst)
- ☐ Camera can be controlled by RS-232C
- ☐ LTC (Longitudinal Time code)
- ☐ Connecting to an optional remote controller, camera settings can be set by OSD (On Screen Display).

3. Bundled Items

3.1. Standard Bundled Items

- ☐ Camera module, VCC-HD3
- ☐ Lens mount cap (attached to the camera)
- ☐ 6pins connector for power

3.2. Packaging

- ☐ Individual carton
- ☐ Master carton (10pcs/carton)
  * Master carton may change depends on the quantity to be shipped per delivery.

3.3. Optional Items

- ☐ RS-232C conversion cable (φ3.5mm plug <->9pin D-sub) (Planning)
- ☐ Remote controller (Planning)

4. Specifications

4.1. General Specifications

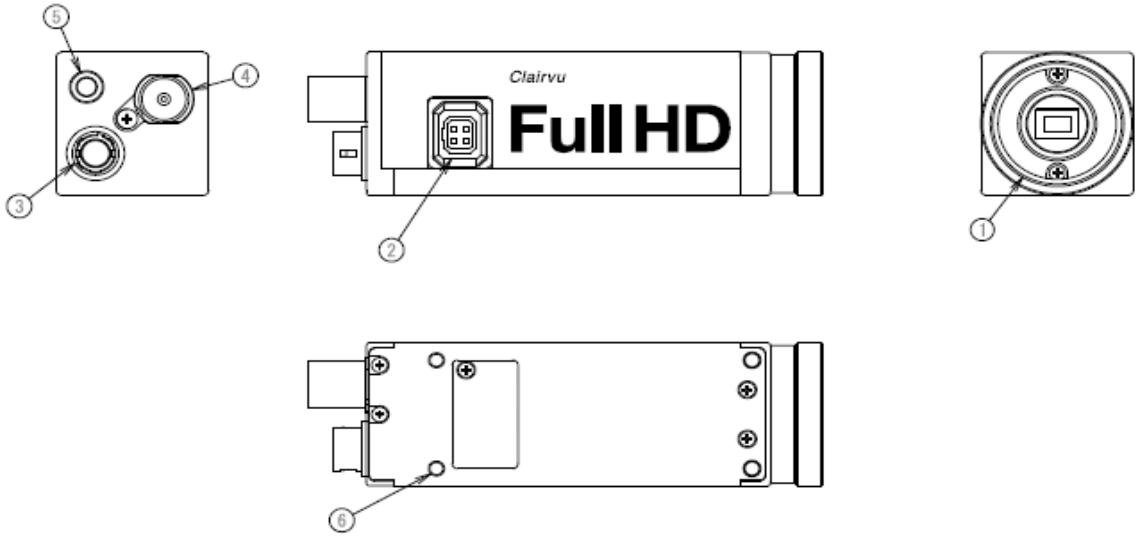
(1)	Pickup Device	Device Type	1/1.8 type CMOS sensor (color)
		Effective Pixel Numbers	2064(H) × 1544(V)
		Unit Cell Size	3.45μm(H) ×3.45μm(V)
		Chip Size	7.121mm(H) × 5.327mm(V) (effective pixels)
(2)	Resolution	1080p,1080i :	1920(H) × 1080(V)
		720p :	1280(H) × 720(V)
(3)	Aspect Ratio	16 : 9	
(4)	Video output format	1920 x 1080p @60fps(Level A)	3G-SDI
		1920 x 1080p @60fps(Level B)	3G-SDI
		1920 x 1080p @59.94fps(Level A)	3G-SDI
		1920 x 1080p @59.94fps(Level B)	3G-SDI
		1920 x 1080p @50fps(Level A)	3G-SDI
		1920 x 1080p @50fps(Level B)	3G-SDI
		1920 x 1080i @60fps	HD-SDI
		1920 x 1080i @59.94fps	HD-SDI
		1920 x 1080i @50fps	HD-SDI
		1920 x 1080p @30fps	HD-SDI
		1920 x 1080p @29.97fps	HD-SDI
		1920 x 1080p @25fps	HD-SDI
		1920 x 1080p @24fps	HD-SDI
		1920 x 1080p @23.97fps	HD-SDI
		1280 x 720p @60fps	HD-SDI
		1280 x 720p @59.94fps	HD-SDI
		1280 x 720p @50fps	HD-SDI
(5)	Sync Systems	Internal / External Sync.	
(6)	Video output standard	3G-SDI/HD-SDI : Y/Pb/Pr(4:2:2 10bit) BNC 75Ω terminal	
(7)	Sensitivity	**F5.6(TBD)** 2000lx	
(8)	Minimum illumination	F1.4 **1.25lx(TBD)**	
		Conditions : VIDEO 50%, AGC 30dB, Electric shutter OFF	
(9)	Dust or stains in optical systems	No dust or stain shall be detected on the testing screen with setting the camera aperture at F16.	
(10)	Power requirement	DC+9～+15V	
(11)	Power consumption (typ.)	**4W(TBD)** at DC+12V IN	
(12)	Dimensions	Refer to overall dimension drawing	
(13)	Weight	Approx. **92g(TBD)**	
(14)	Lens mount	C /CS lens mount (selectable with a conversion ring) ※Please refer to the dimension drawing.	
(15)	Gain setting	AGC (Maximum gain : 0dB～48dB)	
		MANUAL : 0dB～48dB	
(16)	Shutter speed variable range	MANUAL:1/3600s ~ 1/25s	
		*Shutter speed slower than 1/60s will be limited by the frame rate corresponding to the video output format.	
		AUTO: 1/3600s ~ 1/25s (Upper limit and lower limit can be set.)	
		*Same as MANUAL, shutter speed slower than 1/60s will be limited by the frame rate corresponding to the video output format.	
(17)	White balance adjustment range	AUTO, AUTO (Outdoor), ATW, 7 different Preset, MANUAL, User Preset 1~5, and One Push Preset: Daylight(5500K),Cloudy(6500K),Shade(8000K),Tungsten(3200K),Fluorescent(White), Fluorescent(Neutral White), Fluorescent(Daylight)	

(18) Auto Exposure Detection	Average/Center-Weighted/Spot/Backlight Compensation
(19) Flicker cancellation	ON,OFF(typ.)
(20) Edge Enhancement	OFF,1～7 (typ.2)
(21) Color Correction	Standard, Fluorescent Light, Tungsten Lamp
(22) Color Saturation Adjustment	0% (B/W)~100% (typ.)~200%
(23) Color Compression	OFF, 1～7(typ.5)
(24) Noise Reduction	ON,OFF
(25) Contrast/D Range	Contrast-2, Contrast-1,Standard, Contrast+1, Contrast+2, D-range Extension
(26) Master Pedestal	-100 ～ 0 ～ +100
(27) Pedestal (R, G, B)	RGB: -100 ～ 0(typ.) ～ +100 each
(28) Color Balance	RGB: 50 ～ 100(typ.) ～ 150 each
(29) Pixel Defect (White spot) Correction	Corrected at factory setting.
(30) LTC	OFF, ON. The external SMPTE Time code can be input to LTC IN terminal (Internal self-running time code is resettable).
(31) Preset (Camera settings)	1, 2, 3, and 4 (4 presets can be set.)
(32) DC Iris Output	Auto/Open selectable. Can be used with electric shutter. (Electric shutter has priority.)
(33) Remote Control Operation	The camera can be controlled via RS-232C communications with φ3.5 plug (4poles). Camera settings can be controlled by control software via PC. With connecting the optional remote controller, camera settings can be set on OSD (On Screen Display).
(34) Safety/Quality standards	UL: Conform to UL Standard including materials and others. RoHS: Conform to RoHS CE Emission : EN55022:2010 (Class B) (To be applied) Immunity : EN61000-6-2:2005 (To be applied) FCC Class A Digital Device (To be applied) This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
(35) Durability	Vibration Acceleration : 98m/s^2 (10G) Frequency : 20～200 Hz Direction : X,Y, and Z, 3 directions Testing time : 120min for each direction Shock No malfunction shall be occurred with 980m/s^2(100G) for ±X,±Y, and ±Z, 6 directions.
(36) Operation environment	Performance guaranteed 0 ～ +40℃ Humidity 20 ~ 80%RH with no condensation Operation guaranteed 5 ～ +45℃ Humidity 20 ~ 80%RH with no condensation ※Performance guaranteed: All the specifications specified in this manual is guaranteed under performance guaranteed temperature. ※Operation guaranteed: All the camera functions operate normally under operation guaranteed temperature.
(37) Storage Environment	Storage Temperature: -25 ~ +60℃, Humidity: 20 ~ 80%RH with no condensation.

<3G-SDI output Level A and Level B>

A difference between Level A and Level B is a way of mapping Y signal and Cb/Cr signal onto 3G-SDI standard signal. The difference does not affect the resolution of the video signal. Some 3G-SDI receivers correspond to either Level A or B, whereas other receivers correspond to both Levels, so please set the camera mode to match your 3G-SDI receiver.

5. Part Names and Functions



① C/CS Mount
To mount a C or CS mount lens.
To mount a C mount lens, keep the C/CS conversion ring attached. (Shipped from our factory with conversion ring attached.) To mount a CS mount lens, remove the C/CS conversion ring.
Screw length from the lens mount surface shall be less than 6mm. And protruding portion of the lens shall be less than 8mm. When lens is not mounted, please put the attached lens mount cap on.

② DC IRIS Connector
Connector for DC IRIS lens

③ Connector for Power input, Gen Lock, and LTC signal input
Please refer to the external connector pin assignment.

④ Video Signal Output
With BNC cable, connect to a 3G-SDI input monitor or HD-SDI input monitor. (Analog monitors cannot be connected.)
BNC cables with high frequency characteristics correspond to 3G-SDI or HD-SDI shall be used.

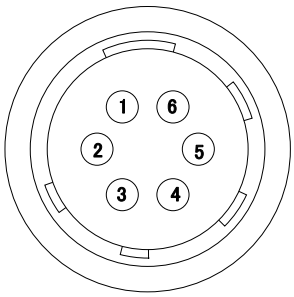
⑤ φ3.5(4 poles) connector (RS-232C)
Connector for RS-232C
Please refer to the external connector pin assignment.
Please refer to the other materials for the details on serial communications.

* Do not connect it to any audio equipment such as earphones and headsets.
Connecting to such equipments may cause malfunction.

⑥ Screw Holes for camera installation
4 screw holes to install the camera.
Please be noted that the depth of the front screw holes and the rear screw holes are different.

6. External Connector Specifications

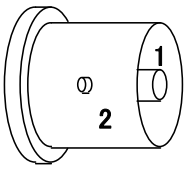
6.1. 6 pins Circular Connector



Model Name HR10-7R-6PA (HIROSE)

Pin No.	
1	Power IN DC+12V
2	EXT SYNC IN
3	LTC IN
4	N.C.
5	GND
6	GND

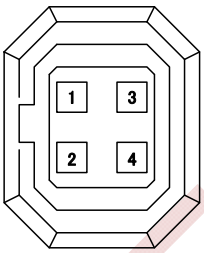
6.2. BNC



Model Name BCJ-BPLHA (CANARE)

Pin No.	
1	3G-SDI/HD-SDI output
2	GND

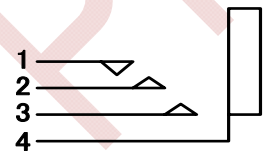
6.3. DC IRIS Connector



Model Name D4-156N-200A (Technical Electron. Co. LTD)

Pin No.	
1	DAMP-
2	DAMP+
3	DRIVE+
4	DRIVE-(GND)

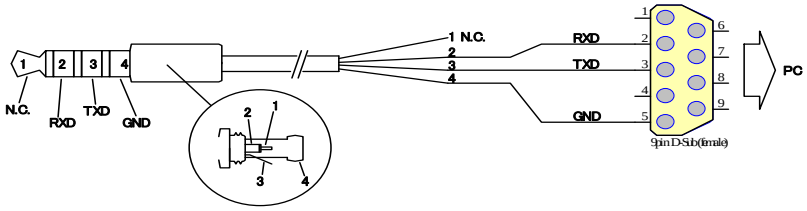
6.4. φ3.5mm 4 poles (RS-232C) connector



Model Name MJ

Pin No.	
1	Power(+5V) *For optional
2	TXD(Camera)
3	RXD(Camera)
4	GND

Connection of φ3.5 (4 poles) Connector (RS-232C)



7. GenLock

Input analog external sync signals (black burst or 3-value SYNC) to the EXT SYNC IN terminal of 6pins connector to enable Gen Lock function.
The external sync signals to be supplied shall depend on its video output format, therefore, please refer to the chart below and input appropriate signals.

		EXT SYNC IN				
CAMERA FORMAT	1080p60A			1080i60	720p60	1080p30
	1080p59.9A	NTSC		1080i59.9	720p59.9	1080p29.9
	1080p50A		PAL	1080i50	720p50	1080p25
	1080p60B			1080i60	720p60	1080p30
	1080p59.9B	NTSC		1080i59.9	720p59.9	1080p29.9
	1080p50B		PAL	1080i50	720p50	1080p25
	1080i60			1080i60	720p60	1080p30
	1080i59.94	NTSC		1080i59.9	720p59.9	1080p29.9
	1080i50		PAL	1080i50	720p50	1080p25
	1080p30			1080i60	720p60	1080p30
	1080p29.9	NTSC		1080i59.9	720p59.9	1080p29.9
	1080p25		PAL	1080i50	720p50	1080p25
	1080p24					1080p24
	1080p23					1080p23.9
	720p60			1080i60	720p60	1080p30
	720p59.9	NTSC		1080i59.9	720p59.9	1080p29.9
	720p50		PAL	1080i50	720p50	1080p25

- Input Black Burst signals for NTSC/PAL signal.
- Input 3-value SYNC signals for other than NTSC/PAL signal.
- EXT SYNC IN is terminated with 75Ω. (It becomes high impedance when camera power is OFF).
- When the external signals specified above are input, the camera becomes external sync mode automatically.
- When no external signal is input, the camera operates in internal sync mode.
- The image may be disturbed right after the external signal is input, but this is not malfunction.
- When a signal other than specified above combination is input to the EXT SYNC IN terminal, the image might be disturbed or no image might be output.

8. LTC (Longitudinal Time Code)

- Time code can be inserted into 3G/HD SDI signals.
- Input LTC signals (time code) to the LTC IN terminal of the 6pins connector to insert external time code.
- And, when no signal is input into the LTC IN terminal, internal time code can be inserted.
- Internal time code starts with 00:00:00. 00 when power is ON, and when any signals are input into the LTC IN terminal, it will be switched to the external time code.
- With this situation, if no signal is input into the LTC IN terminal, it starts self-running from the set time code.
- Signal Format: SMPTE Time code Signal Level: 0.5 ~ 2[Vp-p]

9. Defective Pixel Correction

9.1. Precautions

When the user executes Defective Pixel Correction and "SAVE", the data at the factory setting will be over-written, so that the data cannot be back to the factory setting data even when "INIT" command was executed. Execute "INIT", then "SAVE" to overwrite the preset data (camera settings) with the factory setting data.
If you do not wish to overwrite the preset data, load the preset data before executing SAVE. The defective pixel correction data will be saved in one area regardless of its preset number.

Since the function only supports the white defects correction, the black defects cannot be corrected. And, the function is not necessarily able to correct all the white defects. In addition, due to the effect from the noise or the temperature conditions, the correction result may not be always the same.
Please be noted that improper command execution such as under no light-blocking, or taking wrong procedure, may cause incorrect operation of the executed command function or abnormal images.

9.2. How to execute "Defective Pixel Correction"

- Execute "INIT" to return to the factory settings.
- Attach the bundled cap to the lens mount for light-blocking, then wait for about 5 seconds..
- Execute "Defective Pixel Correction" and SAVE.

10. Serial Communication

10.1. Serial Communication Settings

Transmit Speed:	9600bps
Data Length:	8 bit
Start bit:	1 bit
Parity bit:	NO
Stop bit:	1 bit

10.2. Command

Command	Parameter 1	Parameter 2	Function
GU	Command number	Usually “None”	Acquire the camera data
SU	Command number	Data 1, Data 2, …	Set the camera data
SAVE	None	None	Save the camera data
INIT	None	None	Initialize the camera settings

There are several kinds of commands, GU (Get User) command to acquire the camera data, SU (Set User) command to set the camera data, SAVE command to save the set data, and others.

- Separate COMMAND and PARAMETER by a space.
- Input COMMAND in capital letters.
- Parameters with 0x are regarded as hexadecimal, the one with 0 are as octal, and the one as-is are as decimal to parse.
- Numbers (0～9), decimal point, and alphabet other than hexadecimal (0～9, a～f) cannot be input.
- Identifiable letters from the head are to be analyzed.
- Command from the head to the linefeed code, [¥r]or[¥n], is to be regarded as one command to be analyzed.
- The returned command from the PC will be received by the camera, and then echoed back.

【Example for Get Command】
To get the information on the Command No.10

[Send]	GU[sp]10[¥r] or[¥n]	
[Returned value]	50[¥r] [¥n]	[Acquired Data + line feed]
[Returned value]	[¥r] [¥n]	[Line feed]
[Returned value]	>[sp]	[Prompt + space]

[¥r]=CR(0x0D)
[¥n]=LF(0x0A)
[sp]=Space(0x20)

【Example of Set Command】
To set 30 to the Command No.10

[Send]	SU[sp]10[sp]30[¥r]or[¥n]	
[Returned value]	[¥r] [¥n]	[Line feed]
[Returned value]	>[sp]	[Prompt + space]

【Example of SAVE Command】

[Send]	SAVE[¥r]or[¥n]	
[Returned value]	[¥r] [¥n]	[Line feed]
[Returned value]	>[sp]	[Prompt + space]

10.3. Command List

Video Format 1

	Command No.	Set Value	Initial Value	How to set the command. And other information.
Video Format	1	0: 1080p 60fps LevelA	6	To set video format.
		1: 1080p 59.94fps LevelA		
		2: 1080p 50fps LevelA		
		3: 1080p 60fps LevelB		
		4: 1080p 59.94fps LevelB		
		5: 1080p 50fps LevelB		
		6: 1080i 60fps		
		7: 1080i 59.94fps		
		8: 1080i 50fps		
		9: 1080p 30fps		
		10: 1080p 29.97fps		
		11: 1080p 25fps		
		12: 1080p 24fps		
		13: 1080p 23.97fps		
		14: 720p 60fps		
		15: 720p 59.94fps		
		16: 720p 50fps		

AE related 2～19

	Command No.	Set Value	Initial Value	How to set the command. And other information.
Gain Mode	2	0: Manual 1: Auto	1	To set gain mode.
Gain Value	3	Magnification×0x10000 x1 (0dB)~x256 (48dB)	0x10000 (65536)	To set gain value when gain mode is at Manual EX.) To set x2 (6[dB]): SU 3 0x00020000 ※Refer to 10.4. Quick Reference Matrix for Settings.
Max Gain	4	Magnification×0x10000 x1 (0dB)~x256 (48dB)	0x200000 (2097152)	To set the Max gain value when gain mode is at Auto. ※Refer to 10.4. Quick Reference Matrix for Settings.
Shutter Mode	5	0: Manual 1: Auto	1	To set shutter control mode.
Shutter Value	6	Exposure time [sec]×0x100000 1/25s ～ 1/13600s	0x4444 (17476) 1/60s	To set shutter value when shutter mode is at Manual. *Shutter speed slower than 1/60s will be limited by the frame rate corresponding to the video output format. ※Refer to 10.4. Quick Reference Matrix for Settings.
Shutter Limit	7	The 1st Parameter: Max. value Exposure time [sec]×0x100000 1/25s ～ 1/13600s	0x4444 (17476) 1/60s	To set the shutter range when shutter mode is at Auto. Example)To set Max=1/60s, Min=1/8000s. SU 7 0x4444 0x83 *Shutter speed slower than 1/60s will be limited by the frame rate corresponding to the video output format. Setting value will not be reflected if Max > Min is set. * Refer to 10.4. Quick Reference Matrix for Settings.
Metering Mode	8	0: Average 1: Center-Weighted 2: Spot 3: Backlight Compensation	1	To set metering mode.
Spot Block	9	The 1st Parameter: X value: 0～15	7	Set the X, Y, W, and H value at Spot metering. X: X coordinate of the left edge block Y: Y coordinate of the top block W: Width of the metering area (number of block H: Height of the metering area (number of block) Example) SU 9 7 7 2 2
		The 2nd Parameter: Y value: 0～15	7	
		The 3rd Parameter: W value: 1～16	2	
		The 4th Parameter: H value: 1～16	2	
AE Speed	10	0～15	10	To set AE convergence speed.

	Command No.	Set Value	Initial Value	How to set the command. And other information.
Exposure Compensation Value	11	0(-18dB)～18(0dB)～36(18dB)／per 1dB	18	To set exposure compensation value..
Flicker Cancel	12	0: OFF	0	To set flicker cancel, ON/OFF.
		1: ON		
Gain Value, Plus Minus	13	-1	None	Lower the gain value by 1dB from the current one. Valid when Gain Mode is at Manual. (Write only)
		1		Raise the gain value by 1dB from the current one. Valid when Gain Mode is at Manual. (Write only)
Shutter Value, Plus Minus	14	-1	None	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) ※Note 1
		1		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) ※Note 1

※Note 1: There may be error (small differences) between the set shutter value and the actual shutter value. For the actual shutter value, please refer to Section 10.4.3. Actual Shutter Value limited by output format.

WB related 20～29

	Command No.	Set Value	Initial Value	How to set the command. And other information.
WB Mode	20	0: Auto 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	0	To set white balance mode.
Preset	21	1: Preset1 2: Preset2 3: Preset3 4: Preset4 5: Preset5	None	(Write Only) Store the current WB value as a preset value. Stored value will not be saved unless otherwise executing SAVE.
Blue Gain	22	0～800(%)	161	To set B gain when WB mode is at Manual.
Red Gain	23	0～800(%)	220	To set R gain when WB mode is at Manual.
One Push Trigger	24	1: Trigger Start	None	(Write Only) To start operation when WB mode is at One Push.

Image Quality related 30～59

	Command No.	Set Value	Initial Value	How to set the command. And other information.
Edge Level	30	0: Off 1:1 2:2 3:3 4:4 5:5 6:6 7:7	2	To set the level of edge
Contrast / D-Range	35	0: Contrast -2 1: Contrast -1 2: Standard 3: Contrast +1 4: Contrast +2 5: D-range Extension	2	To set contrast and dynamic range 0~4：Dynamic range remains as the standard but contrast changes. 5: Dynamic range becomes double of the standard. This is effective to shoot an image with big differences between light and dark part (big contrast). Contrast would be as the standard. ※ When D-range extension is selected, the minimum Gain value with GU 3 command shall be 6dB.
Master Pedestal	37	-100～+100	0	To set master pedestal.
Red Pedestal	38	-100～+100	0	To set Red pedestal.
Green Pedestal	39	-100～+100	0	To set Green pedestal.
Blue Pedestal	40	-100～+100	0	To set Blue pedestal.
Red Balance	41	0～200	100	To set Red balance.
Green Balance	42	0～200	100	To set Green balance.
Blue Balance	43	0～200	100	To set Blue balance.
Color Saturation	45	0～200	100	To set color saturation control.
Noise Reduction	50	0 : Noise reduction OFF 1 : Noise reduction ON	0	To set the Noise Reduction.
Color Correction	52	0: Standard 1: Fluorescent light 2: Tungsten lamp	0	To set color correction.
Color Suppression	53	0～7	5	To set color suppression.

Lens Control related 60～

	Command No.	Set Value	Initial Value	How to set the command. And other information.
Iris Mode	61	0： OPEN 1： Auto	0	To set Iris control mode. Set to AUTO when a DC Iris Lens is in use.

OSD related 90～

	Command No.	Set Value	Initial Value	How to set the command. And other information.
OSD UP button	90	0: One push 1: Continuous push	None	Command to operate OSD. With continuous push operation, send the command every 60msec.
OSD DOWN button	91	0: One push 1: Continuous push	None	
OSD R button	92	0: One push 1: Continuous push	None	
OSD L button	93	0: One push 1: Continuous push	None	
OSD CENTER button	94	0: One push 1: Continuous push	None	Use as a Set button.
Menu Color	95	0: Black 1: Blue 2: Green 3: Cyan 4: Red 5: Magenta 6: Yellow 7: White	7	To set the font color of OSD.
Select Color	96	0: Black 1: Blue 2: Green 3: Cyan 4: Red 5: Magenta 6: Yellow 7: White	3	To set the selected letter's font color of OSD. If the same color as the menu color is specified, it will be an error, because the selected letters cannot be recognized.

Others in 100s

	Command No.	Set Value	Initial Value	How to set the command. And other information.
Camera Setting Store	100	0～3	Initial is 0	4 kinds of camera settings can be stored. The stored values cannot be saved until SAVE command is executed. The stored data and set values will not be initialized by executing INIT command.
Camera Setting Load	101	0～3	Initial is 0	To reflect the stored setting values set by Camera Setting Store, to the camera. The set value will 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	To set LTC signals OFF/ON.
LTC Reset	104	1: Reset		(Write Only) To reset the internal free-running timer of LTC.

No Command Numbers

	Command No.	Set Value	Initial Value	How to set the command. And other information.
SAVE	None	None	None	To save camera settings. SAVE with capital letters. *As to pixel defects correction, only one table can be saved.
INIT	None	None	None	To initialize the camera settings. INIT with capital letters.
GVI	None	1: Microcomputer's version 2: FPGA's version	None	To acquire the firmware's version. The letter strings such as 0.1 shall be responded.
SDDW	None	512	0	To start detection of pixel defects Please refer to the Section 9, Defective Pixel Correction, for the details.

10.4. Quick Reference Matrix for Settings

10.4.1. Gain Settings

	Magnification	dB	GainValue (Magnification *0x10000)	
			DEC	HEX
0	**1.000**	**0.000**	**65536**	**00010000**
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
6	**2.000**	**6.021**	**131072**	**00020000**
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
12	**4.000**	**12.041**	**262144**	**00040000**
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
18	**8.000**	**18.062**	**524288**	**00080000**
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
24	**16.000**	**24.082**	**1048576**	**00100000**
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
30	**32.000**	**30.103**	**2097152**	**00200000**
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
36	**64.000**	**36.124**	**4194304**	**00400000**
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

	Magnification	dB	GainValue (Magnification *0x10000)	
			DEC	HEX
42	**128.000**	**42.144**	**8388608**	**00800000**
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

10.4.2. Shutter Settings

Exposure Time (sec)	ShutValue(sec*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

10.4.3. Actual Shutter Value limited by output format

Set Value	Shutter Value	Actual Shutter Value							
		60fps	59.94fps	50fps	30fps	29.97fps	25fps	24fps	23.976fps
1/4000	262	1/3988	1/3984	1/4084	1/3988	1/3984	1/3808	1/4238	1/4234
1/4800	218	1/4847	1/4842	1/4778	1/4522	1/4518	1/5222	1/5027	1/5023
1/5600	187	1/5660	1/5654	1/5756	1/5222	1/5217		1/6177	1/6172
1/6800	154	1/6800	1/6794	1/7237	1/7562	1/7555	1/6412		
1/8000	131	1/7562	1/8508	1/8306			1/8306	1/8010	1/8003
1/9600	109	1/9745	1/9736	1/9745	1/9745	1/9736		1/11389	1/11379
1/11200	94	1/11389	1/11379	1/11787			1/11787		
1/13600	77	1/13701	1/13690	1/14911	1/13701	1/13689			

11. How to Operate the Camera with OSD Function

You can operate the camera with OSD menu on a monitor screen by connecting an optional remote controller to the camera remote controller terminal.

11.1. Switch Operation of OSD Menu by Remote Controller

[CENTER]: To indicate OSD top menu on your monitor screen when it is not shown. And, it is also used to settle the selected menu.

[▲] Go up the selected item by one.
[▼] Go down the selected item by one.
[◀] Change the options.
[▶] Change the options.

11.2. Indication of OSD Menu

Menu with ▼ at the line end indicates that submenu can be opened with the CENTER button.
Menu with ▶ at the line head indicates that the item is settled with the CENTER button.

11.3. OSD Menu

Top Menu	Setting Menu	Selected Items	Explanation
EXIT	None	None	Push the CENTER button to close OSD menu.
Output Format	Set Video Format	1080p 60fps (Level A)	To set video format. Select video format with ◀／▶ button, then push the CENTER button to confirm.
		1080p 59.94fps (Level A)	
		1080p 50fps (Level A)	
		1080p 60fps (Level B)	
		1080p 59.94fps (Level B)	
		1080p 50fps (Level B)	
		1080i 60fps	
		1080i 59.94fps	
		1080i 50fps	
		1080p 30fps	
		1080p 29.97fps	
		1080p 25fps	
		1080p 24fps	
		1080p 23.97fps	
		720p 60fps	
		720p 59.94fps	
		720p 50fps	

Top Menu	Setting Menu	Selected Items	Explanation
Gain/Shutter/IRIS	Gain Mode	Manual/Auto	To set Gain Mode.
	Gain Value	0～48dB	To set the Gain Value when Gain Mode is at Manual. ※Note 1/ ※Note 2
	Gain Max Value	0～48dB	To set the Max Gain Value when Gain Mode is at Auto. ※Note 1/※Note 2
	Shutter Mode	Manual/Auto	To set Shutter Mode.
	Shutter Value	1/25	To set the Shutter Value when Shutter Mode is at Manual. Shutter speed lower than 1/60 shall be limited by the frame rate correspond to the video output format. ※Note 1 ※Note 2 ※Note 3
		1/30	
		1/36	
		1/42	
		1/50	
		1/60	
		1/75	
		1/90	
		1/100	
		1/105	
		1/120	
		1/125	
		1/150	
		1/180	
		1/210	
		1/250	
		1/300	
		1/350	
		1/420	
		1/500	
		1/600	
		1/700	
		1/840	
		1/1000	
		1/1200	
		1/1400	
		1/1700	
		1/2000	
		1/2400	
		1/2800	
		1/3400	
		1/4000	
		1/4800	
		1/5600	
		1/6800	
		1/8000	
		1/9600	
		1/11200	
		1/13600	

Top Menu	Setting Menu	Selected Items	Explanation
Gain/Shutter/IRIS	Shutter Min Limit	Same as Shutter Value	To set the Minimum Shutter Limit when Shutter Mode is at Auto. ※Note 1／※Note 2
	Shutter Max Limit	Same as Shutter Value	To set the Maximum Shutter Limit when Shutter Mode is at Auto. ※Note 1／※Note 2
	Set Shutter Limit	None	Push the CENTER button to settle the shutter limit. When Max < Min is set, the setting will not be valid.
	AE Speed	0～15	To set AE convergence speed.
	ExpCompValue	-18～0～18 [dB]	To set Exposure Compensation Value.
	Metering Mode	Average	To set metering mode. Average：Averaging metering Center Weighted：Center weighted metering Spot：Spot metering Backlight Compensation: Backlight compensation metering
		Center Weighted	
		Spot	
		Backlight Comp	
	Spot Block X	0～15	To select the X coordinate value of the Left edge Block of the metering area when Metering Mode is set to “Spot”.
	Spot Block Y	0～15	To select the Y coordinate value of the Top Block of the metering area when Metering Mode is set to “Spot”.
	Spot Block W	1～16	To select the width (Block number) of the metering area when Metering Mode is set to “Spot”.
	Spot Block H	1～16	To select the height (Block number) of the metering area when Metering Mode is set to “Spot”.
	Set Spot Block	None	Push the CENTER button to confirm Spot Block, X, Y, W, and H.
	Flicker Cancel	ON/OFF	To set flicker cancel.

※Note 1: If you prefer setting further details, please set them via serial commands.

※Note 2: The values set via serial commands will be reflected to key operation.

※Note 3: There may be error (small differences) between the set shutter value and the actual shutter value. For the actual shutter value, please refer to Section 10.4.3. Actual Shutter Value limited by output format.

Top Menu	Setting Menu	Selected Items	Explanation
White Balance	WB Mode	Auto	Select and set WB Mode with ◀／▶ button.
		Outdoor	
		Daylight (Sun light)	
		Cloudy	
		Shade	
		Tungsten	
		Flw (Fluorescent White)	
		Fln (Fluorescent noon white)	
		Fld (Fluorescent day light)	
		Auto(ATW)	
		One push	
		Manual	
		Preset1	
		Preset2	
		Preset3	
		Preset4	
		Preset5	
	WB Red Gain	0～800	To set Red Gain/Blue Gain when WB Mode is at Manual.
	WB Blue Gain	0～800	
	One Push Start	None	Valid only when WB mode is at One Push. Execute One Push WB with the CENTER button.
	Set Preset Number	1～5	Select the preset number with the ◀／▶ button, and push the CENTER button to save the current WB value.

Top Menu	Setting Menu	Selected Items	Explanation
Image Control	Red Balance	50～150	To set Red Balance. ※Note 3
	Green Balance	50～150	To set Green Balance. ※Note 3
	Blue Balance	50～150	To set Blue Balance. ※Note 3
	Master Pedestal	-100～100	To set Master Pedestal.
	Red Pedestal	-100～100	To set Red Pedestal.
	Green Pedestal	-100～100	To set Green Pedestal.
	Blue Pedestal	-100～100	To set Blue Pedestal.
	Edge Level	0～7	To set the edge enhancement Level. 0 is OFF.
	Contrast	Contrast -2	To set Contrast and Dynamic range. When D-range Ext is selected, dynamic range will be double of the standard. (Contrast remains as standard level).
		Contrast -1	
		Standard	
		Contrast +1	
		Contrast +2	
		D-range Ext	
	Noise Reduction	OFF/ON	To set Noise Reduction Noise reduction OFF/ON.
	Color Saturation	0～200	To set color saturation.
	Color Correction	Standard	To set color correction.
		Fluorescent light	
		Tungsten lamp	
	Color Suppression	0～7	To set color suppression.
LTC	LTC	ON/OFF	LTC ON/OFF.
	Set LTC Reset	None	To reset LTC with the CENTER button.

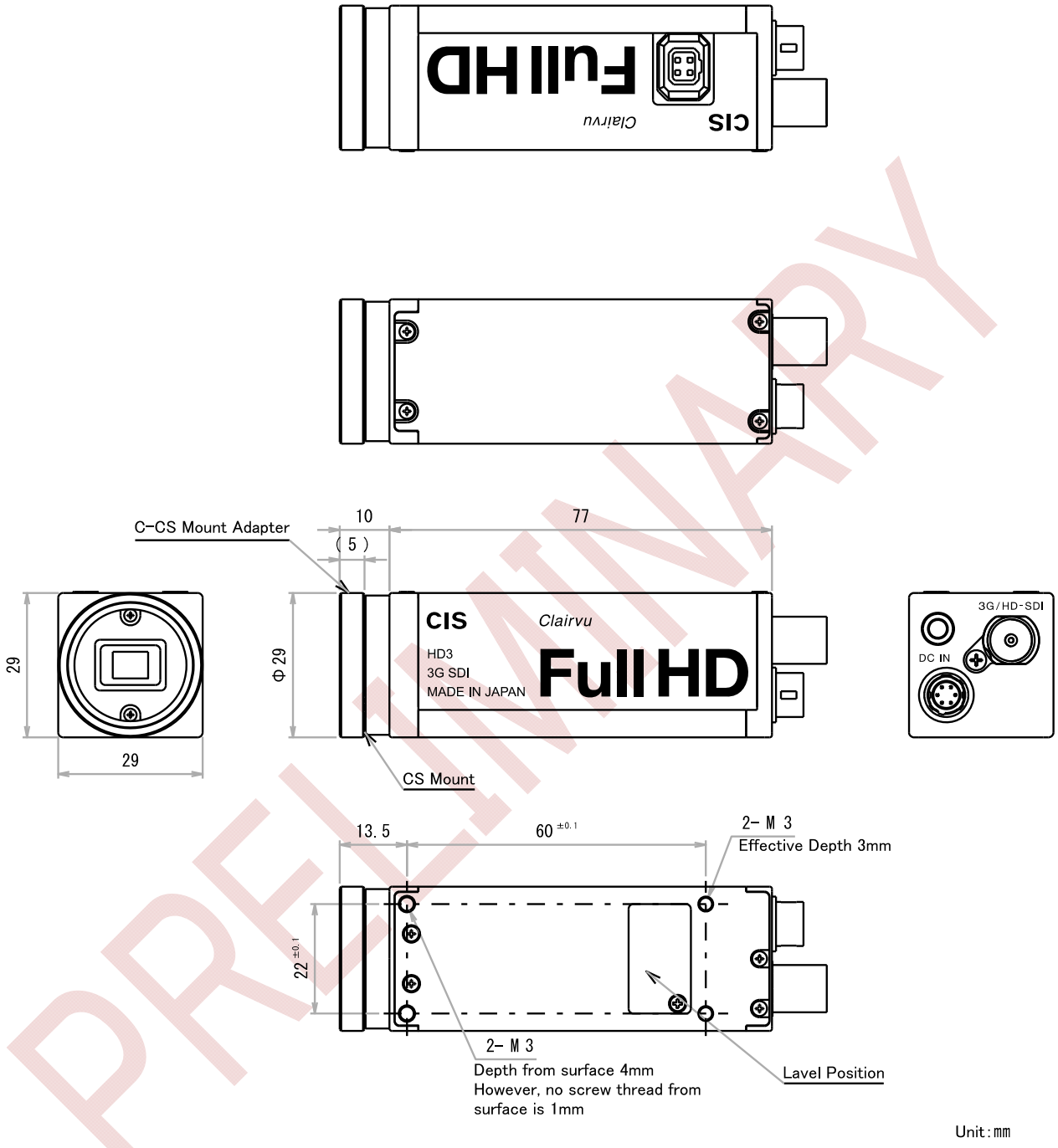
※Note 3：The values 0～200 can be set via serial command.

Top Menu	Setting Menu	Selected Items	Explanation
OSD Color Change	Default Set (White & Cyan)	None	To get the OSD color back to the default setting with the CENTER button.
	User Setting		To set the color to display the OSD menu.
	Menu Color	Black	To select the color to display the OSD menu with the ◀／▶ button.
		Blue	
		Green	
		Cyan	
		Red	
		Magenta	
		Yellow	
		White	
	Highlight Color	Same as Menu Color	To select the highlight color to display on the OSD menu with the ◀／▶ button.
	Set Color	None	Confirm the menu color and the highlight color with the CENTER button. When the same colors are specified for both menu color and highlight color, they will not be settled.
INIT	None	None	To get the camera settings back to the initial settings with the CENTER button.
Save/Load	Set Save Data	0～3	To save the data to the preset number selected, with the CENTER button.
	Really?	NO/YES	To make sure if you really want to save the data to the selected preset.
	Enter	None	To execute SAVE or NOT SAVE, then get back to the original screen.
	Get Save Data	0～3	To call up the data of the selected preset number and reflect it on the screen with the CENTER button.

12. Factory Settings

Function	Default Settings
Video Format Setting	1920 x 1080i @60fps
Gain Mode	Auto
Gain Value (Manual Gain)	65536(0dB)
Max Gain	16461899 (48dB)
Shutter Mode	Auto
Shutter Limit Max	17476(1/60s)
Shutter Limit Min	77(1/13600s)
Shutter Value (Manual Shutter)	17476(1/60s)
Metering Mode	Center-Weight
Spot Block	X=7,Y=7, W=2, H=2
Exposure Compensation Value	18 (0dB)
AE Speed	10
Flicker Cancel	OFF
White Balance Setting	Auto
Manual Red Gain	220
Manual Blue Gain	161
Color Correction	Standard
Color Suppression	5
Color Saturation	100
Edge Enhancement	2
Noise Reduction	0
Contrast	Standard
Master Pedestal	0
Pedestal(RGB)	0
Color Balance (RGB)	100
LTC	OFF
OSD Menu Color	White
OSD Select Color	Cyan

13. Dimensions



∗2-M3 Depth from the surface is 4mm. However, there is no screw thread up to 1mm from the surface.

935-XXXX-00-00
(Unit : ㎜)

14. Cases for Indemnity (Limited 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.

15. CMOS Pixel Defect

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.

16. 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 the dealer you purchased it from.

Camera Control Sample Software is downloadable via our web but we 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 the control software prepared is for you to check operation and evaluate our products.
Please be noted that CIS does not customize the program nor provide source code.

URL: http://www.ciscorp.co.jp/support_en.php