CIS

English

3G-SDI / HD-SDI

FULL HD CMOS

AF ZOOM Camera Module

VCC-HD30ZME1

Product Specifications & Operational Manual

CIS Corporation

Table of Contents

1. Handling Precautions

The camera module 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. Our warranty does not apply to damages or defects caused by irregular and/or abnormal use of the product.
All specifications contained herein are subject to change without prior notice. Reproduction in whole or in part is prohibited.

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. Regardless of its usage conditions, dust-proof measures and humidity resistance measures shall be taken.
- 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.), 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 equipment. 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-HD30ZME1 is a highly-dense camera module, appropriate heat dissipation shall be considered. We recommend using a metal base or others to install the camera. Operating this camera assembly without appropriate heat dissipation considered may cause damages or malfunction.

2. Product Outline

VCC-HD30ZME1 is a full HD color camera module with x30 auto focus zoom lens, utilizing a 1/3 type 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), and 720 60p/ 59.94p/ 50p (HD-SDI) are corresponded.

Features

- ☐ Features CIS own designed Image Signal Processor, "Clairvu™" for superb imaging quality.
- ☐ X30 auto focus zoom lens.
- ☐ Gen Lock function (3 values analog signals or black burst).
- ☐ Camera can be controlled by RS-232C.
- ☐ 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-HD30ZME1
- ☐ Lens cap

3.2. Packaging

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

4. Specifications

4.1. General Specifications

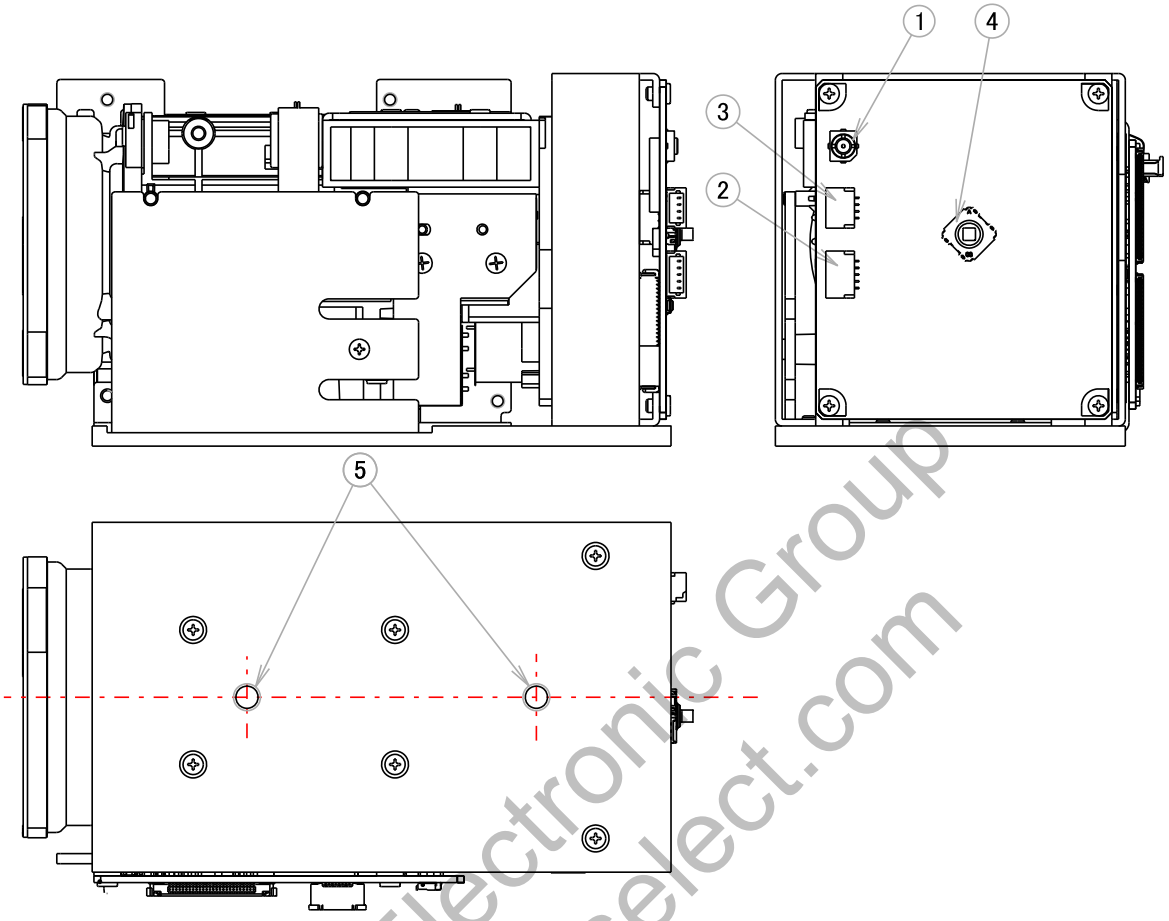
(1) Pickup Device	Device Type	1/3 type CMOS sensor (color)
	Effective Pixel Numbers	1944(H) × 1213(V)
	Unit Cell Size	2.75μm(H) ×2.75μm(V)
	Chip Size	5.346mm(H) × 3.336mm(V) (Effective pixels)
(2) Resolution	1080p,1080i :	1920(H) × 1080(V)
	720p :	1280(H) × 720(V)
(3) Aspect Ratio	16 : 9	
(4) Video output 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	F3.5 2000lx	
(8) Minimum illumination	F1.6 2.5lx Conditions : VIDEO 50%, AGC 30dB, Electric shutter OFF	
(9) Power requirement	DC+10～+15V	
(10) Power consumption	6.5W at DC+12V IN	
(11) Dimensions	Refer to overall dimension drawing	
(12) Weight	Approx. 210g	
(13) Lens	x 30 auto focus zoom lens Focal length: fw=4.3mm , ft=129.0mm Zoom ratio: Nominal x 30 Maximum aperture ratio: wide F1.6 , tele F5.0	
(14) Gain setting	AGC (Maximum gain : 0dB～30dB) Manual : 0dB～30dB	
(15) Shutter speed variable range	Manual :1/8000s～1/4s Auto : 1/8000s～1/4s (Upper limit and lower limit can be set.)	
(16) White balance adjustment range	AUTO, AUTO (Outdoor), ATW, 7 kinds of Preset, MANUAL, User Preset 1～5, One Push Preset: Daylight (5500K),Cloudy (6500K),Shade (8000K),Tungsten (3200K),Fluorescent (White), Fluorescent (Neutral White), Fluorescent (Daylight) 6500K	
(17) IR Cut Filter In/Out	In/Out/Auto selectable	
(18) Auto Exposure measuring method	Average / Center-Weighted / Spot / Backlight Compensation	
(19) Flicker cancel	ON,OFF (typ.)	

(20) Edge enhancement	OFF, 1～7 (typ.3)
(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	OFF, 1～6
(25) Gamma compensation	BT.709, HLG
(26) Master Pedestal	-100 ～ 0 ～ +100
(27) Pedestal (R,G,B)	Each RGB -100 ～ 0 (typ.) ～ +100
(28) Color Balance	Each RGB 50 ～ 100 (typ.) ～ 150
(29) Pixel defect (White spot) correction	Corrected at factory setting before shipment.
(30) Preset (camera setting)	1,2,3,4 (4 kinds of preset can be set.)
(31) Remote control operation	The camera can be controlled via RS-232C communications with 5pins connector. Camera settings can be controlled by control software via PC.
(32) Safety/Quality standards	UL: Conform to UL Standard including materials and others. RoHS: Conform to EN50581 (RoHS2). 2011/65/EU CE: Since this model is a semi-finished structure (board-type) design, CIS does not warrant EMC standards as it is.
(33) Durability	Vibration Frequency : 5～25 Hz (Simple Harmonic Vibration). Total Amplitude : 2mm Direction : X,Y, and Z, 3 directions Variable Cycle : 2 minutes Testing time : 60 minutes for each direction
	Shock No malfunction shall be occurred with 490m/s^2(50G) for ±X,±Y, and ±Z, 6 directions.
(34) Operation environment	Operation guaranteed -5 ～ +45℃ Humidity: 20 ～ 80%RH With no condensation
(35) Storage environment	Storage Temperature: -25 ～ +60℃ Humidity : 20 ～ 80%RH with no condensation

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

The 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 Coaxial connector for video signal output (H.FL-R-SMT)
With a coaxial cable, the camera can be connected to a 3G-SDI input monitor or HD-SDI input monitor. (Analog monitors cannot be connected.) Coaxial cables with high frequency characteristic correspond to 3G-SDI or HD-SDI shall be used.

② 5pins connector for power input and serial communications
Please refer to the external connector pin assignment.

③ 4pins connector for External sync/V sync out
Please refer to the external connector pin assignment.

④ OSD operational switch
Select from up, down, right, and left. Set with the center.

⑤ Screw holes for camera installation
Screw holes (M4 x 2 positions) to be used to install camera.
Screw length with less than 5mm shall be used.

6. External Connector Pin Assignment

6.1. 5pins Connector for Power Input and Serial Communications

Model name:	SM05B-SRSS-TB(JST)
Pin No.	Description
1	Power IN DC+12V
2	GND
3	TXD(Camera)
4	RXD(Camera)
5	GND

6.2. Coaxial Connector for Video Signal Output

CN2

Model name:	H.FL-R-SMT(Hirose)
Pin No.	Description
1	3G-SDI/HD-SDI output
2	GND

6.3. 4pins Connector for External Sync/V Sync Out

CN3

Model name:	SM04B-SRSS-TB(JST)
Pin No.	Description
1	EXT SYNC IN
2	GND
3	VSync OUT
4	GND

7. GenLock

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

		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 signal 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 external signals specified the above are 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.

8. VSync Out

Vertical blanking period is output with positive polarity.
Its cycle corresponds to video format.
Signal Level: VOL max: 0.35V VOH min: 2.8V

9. CMOS Pixel Defect Correction

9.1. Notes for Pixel Defect Correction

If you execute pixel defect detection and execute SAVE command (SU 705 1), the detected values at ex-factory will be overwritten, so that the pixel defect correction data cannot be restored to the factory settings even if you execute INIT (SU 700 0) command.
If you SAVE after executing INIT, the selected preset values (Camera Setting) will be overwritten by the factory setting values. If you do not wish the pre-set values overwritten, load the pre-set values before Save.
All the defective pixel correction data will be saved in one destination regardless of their preset numbers.
Pixel defect correction is only for White pixel defect but not for black pixel defect. Please be noted it's not always true that whole white pixel defect can be perfectly corrected. Also, please be noted that the corrected results may not always be the same depending on temperature, noise, and other conditions.
Please be sure to execute the command with blocking out lights and follow the proper procedures.
Neglecting this instruction may cause not only inappropriate pixel defect correction but also failure of getting proper images.

9.2. How to execute "Defective Pixel Detection"

Execute INIT (SU 700 0) to restore to the factory settings. Then, start Pixel Defect Detection (SDDW 512). The lens diaphragm will close automatically to start correction and go back to the position to end. Save (SU 705 1) when correction is completed.

10. Serial Communication

10.1. Serial Communication Settings

Baud rate : 38400bps
Data length : 8bit
Start Bit : 1bit
Parity Bit : NO
Stop Bit : 1bit

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

There are two kinds of commands, GU (Get User) command to acquire the camera data, and SU (Set User) command to set the camera data. As an exception, detecting defect pixels function is independent as SDDW command.

Separate each command and parameter with a space. Input the command in capital letters. 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).
Identifiable letters from the head are to be analyzed. A 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.
Please do not input any numbers or letters other than the specified above and in the Command List in Section 10.3.
On camera boot, prompt shall be output when the camera gets ready to receive a command.

【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 + Linefeed]
[Returned value]	[¥r] [¥n]	[Linefeed]
[Returned value]	>[sp]	[Prompt + Space]

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

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

[Send]	SU[sp]10[sp]30[¥r]or[¥n]	
[Returned value]	[¥r] [¥n]	[Linefeed]
[Returned value]	>[sp]	[Prompt + Space]

【Example for SAVE】

[Send]	SAVE[¥r]or[¥n]	
[Returned value]	[¥r] [¥n]	[Linefeed]
[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 Level A 1: 1080p 59.94fps Level A 2: 1080p 50fps Level A 3: 1080p 60fps Level B 4: 1080p 59.94fps Level B 5: 1080p 50fps Level B 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	6	To set video format.

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. Since Gain Mode is automatically set when WDR Mode is ON, changing the setting values by the command is restricted.
Gain Value	3	Magnification×0x10000 x1(0dB) ~ x32(30dB)	0x10000 (65536)	To set gain value when gain mode is at Manual. Ex.) To set x2 (6dB): SU 3 0x00020000 ※Refer to 10.4 Quick Reference Matrix for Settings.
Gain Max Value	4	Magnification×0x10000 x1(0dB) ~ x32(30dB)	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 mode. Since Shutter Mode is automatically set when WDR Mode is ON, changing the setting values by the command is restricted.
Shutter Value	6	Exposure time [s]×0x100000 1/4s ~ 1/8000s	0x4444 (17476)	To set shutter value (exposure time) when shutter mode is at Manual. ※Refer to 10.4 Quick Reference Matrix for Settings.

AE related 2～19 (Cont.)				
	Command No.	Set Value	Initial Value	How to set the command. And other information.
Shutter Limit	7	The 1stParam: Max value Exposure time [s]×0x100000 1/4s ~ 1/8000s	0x40000 (262144)	To set the shutter variable range when shutter mode is at Auto. Ex.) To set Max=1/60s, Min=1/8000s: SU 7 0x4444 0x83 ※Refer to 10.4 Quick Reference Matrix for Settings. ※If Max < Min is specified, it will be an error.
		The 2ndParam: Min value Exposure time [s]×0x100000 1/4s ~ 1/8000s	0x83 (131)	
Metering Mode	8	0: Average	1	To set metering mode.
		1: Center-Weighted		
		2: Spot		
		3: Backlight Compensation		
Spot Block	9	1stParam: X value:0 ~15	7	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) Ex.) SU 9 7 7 2 2
		2ndParam: Y value: 0 ~ 15	7	
		3rdParam: W value: 1 ~ 16	2	
		4thParam: H value: 1 ~ 16	2	
AE Speed	10	0 ~ 15	10	To set AE convergence speed.
Exposure Compensation Value	11	0(-12dB) ~ 12(0dB) ~ 24 (12dB)/ per 1dB	12	To set exposure compensation value.
Flicker Cancel	12	0: OFF	0	To set flicker cancel, ON/OFF. Valid only when video format are at 60fps, 59.94fps, 30fps, and 29.97fps.
		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 Speed, 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)
		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)

AE related 2~19 (Cont.)				
	Command No.	Set Value	Initial Value	How to set the command. And other information.
Iris(F-number), Plus Minus	15	-1	None	Lower the Iris F number by 1 step (1/4EV) from the current one. (Aperture value becomes bigger.) A preferred value between F1.6 to F22 can be set anytime. However, the actual F value will be limited by the maximum aperture which varies depending on the zoom position. Valid when Iris Mode is at Manual. (Write Only)
		1		Raise the Iris F number by 1step (1/4EV) from the current one. (Aperture value becomes smaller.) A preferred value between F1.6 to F22 can be set anytime. However, the actual F value will be limited by the maximum aperture which varies depending on the zoom position. Valid when Iris Mode is at Manual. (Write Only)

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: Day Light (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: OnePush 10: Manual 11: Preset1 12: Preset2 13: Preset3 14: Preset4 15: Preset5	0	To set white balance mode.

WB related 20~29 (Cont.)				
	Command No.	Set Value	Initial Value	How to set the command. And other information.
Preset	21	1: Preset1 2: Preset2 3: Preset3 4: Preset4 5: Preset5	None	Store the current WB value as a preset value. Stored value will not be saved unless otherwise executing SAVE. (Write Only)
Blue Gain	22	100 ~ 1600 (%)	138	To set B gain when WB mode is at Manual.
Red Gain	23	100 ~ 1600 (%)	318	To set R gain when WB mode is at Manual.
One Push Trigger	24	1: Trigger Start	None	To start operation when WB mode is at One Push. (Write Only)

Image Quality related 30~59				
	Command No.	Set Value	Initial Value	How to set the command. And other information.
Detail	30	0: Off 1:1 2:2 3:3 4:4 5:5 6:6 7:7	3	To set the details.
WDR Mode	31	0: OFF 1: ON 2: ON (Auto 1) 3: ON (Auto 2)	0	To set WDR ON/OFF and Auto/Manual. OFF: WDR is not valid. ON (Manual): WDR is valid. Gain, shutter, iris, and WDR Ratio are to be set manually. ON (Auto1/2): WDR is valid. Gain, shutter, iris, and WDR Ratio are to be set automatically. When Auto 2 is set, you'll get less halation and black crushed parts than the one with Auto 1. Since gain Mode, shutter mode, and iris mode are to be set automatically when WDR Mode is ON, changing these values by the command is restricted.
WDR Ratio Value	32	The 1st Param: 0 fixed	0	To set the magnification of exposure time when WDR Mode is ON. Only the specified values are valid. Ex.) To specify x2: SU 32 0 0x200
		The 2nd Param: Magnification x0x100 0x200: (x2) 0x400: (x4) 0x800: (x8) 0x1000: (x16) 0x2000: (x32)	0x200 (x2)	

Image Quality related 30~59 (Cont.)				
	Command No.	Set Value	Initial Value	How to set the command. And other information.
WDR MBC Mode	34	0: OFF 1: ON (Type1) 2: ON (Type2)	0	Type 1: Controls false color noticeable in the active area when WDR is ON. Type 2: Controls false color and blur of moving objects in the active area when WDR is ON.
Gamma	35	0: BT.709 -2 1: BT.709 -1 2: BT.709 3: BT.709 +1 4: BT.709 +2 5: HLG 75	2	To set contrast and type of Gamma. 0~4: are the Gamma curves complied with BT.709. Contrast is selectable in the range of -2~+2. + Side is higher contrast. 5: is the one for BT.709 100% output signal converted to HLG 75% signal level. Invalid when WDR mode is ON. (Regarded as the setting of BT.709).
Knee	36	0: OFF 1: 100% 2: 95% 3: 90% 4: 85% 5: 80% 6: 75%	4	To set Knee point. Invalid when Gamma is HLG 75, or when D-range is Low.
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.
D-Range	44	0: Low Equivalent to 120% at BT.709.Invalid at HLG. (Regarded as normal). 1: Normal Equivalent to 200% at BT.709. Equivalent to 600% at HLG. 2: High Equivalent to 400% at BT.709. Equivalent to 1200% at HLG.	1	To set dynamic range. When Low is selected, both D-range and sensitivity are reduced but you will have lower noises. When High is selected, the lower limit of gain becomes 0x20000. (Actually, it could go lower but it is regarded as 0x20000). Invalid when WDR Mode is ON. (Normal/Auto1/Auto2) (Regarded as Normal). ※The base of D-Range values differ from BT.709 and HLG. BT.709: Input range is the one to be 100% when Knee is OFF. HLG: Input range is the one to be 50% when Knee is OFF.

Image Quality related 30~59 (Cont.)				
	Command No.	Set Value	Initial Value	How to set the command. And other information.
Color Saturation	45	0 ~ 200 (%)	100	To set color saturation control.
Shading Correction	48	0 : OFF 1 : ON	0	ON/OFF of shading correction
Shading Correction Level	49	0 ~ 100 (%)	100	To set shading correction level.
Noise Reduction	51	0 (OFF) ~ 6	0	To set noise reduction. 0 (OFF) 1 (less) ~ 6 (strong)
Color Correction	52	0: Auto 1: Standard 2: Fluorescent Light 3: Tungsten Lamp	0	To set color correction. 0: Auto 1: Standard 2: Suitable for fluorescent light 3: Suitable for tungsten lamp
Color Suppression	53	0 ~ 7	5	To set color suppression. 0 (OFF) 1 (less) ~ 7 (strong)

Lens Control related 60~				
	Command No.	Set Value	Initial Value	How to set the command. And other information.
Iris Mode	61	0:Manual 1: Auto	1	To set Iris control mode. Since Iris Mode is automatically set when WDR Mode is ON (Manual/Auto1/Auto2), changing the setting value by the command is restricted.
Aperture Value [Set]	64	To set Aperture Value. Aperture Value = 0x100000 / (F x F) Note, F=F number Setting range: 0x64000(F1.6) ~ 0x800(F22) Or 0 (CLOSE)	0 x 64000 (F1.6)	Valid when Iris Mode is at Manual. Ex.) To set F2.0 SU 64 0 0x40000 ※Refer to 10.4 Quick Reference Matrix for Settings. ※A preferred value between F1.6 to F22 can be set anytime. However, the actual F value will be limited by the maximum aperture which varies depending on the zoom position. Refer to 10.5 Quick Reference Matrix for the Maximum Aperture.

Lens Control related 60~ (Cont.)				
	Command No.	Set Value	Initial Value	How to set the command. And other information.
Aperture Value [Get]	64	The 1stParam: Mode 0: Value set by a command 1: The Maximum Aperture	0 x 64000 (F1.6)	When Mode is 0: The current Aperture Value set by the command is acquired. When Mode is 1: The Aperture Value corresponds to the maximum aperture with the current zoom position is acquired. ※Refer to 10.5 Quick Reference Matrix for the Maximum Aperture The actual F number becomes the bigger one out of two acquired by Mode 0 and Mode 1. (For Aperture Value, it becomes the smaller one.)
Aperture Limit	65	The 1stParam: Max Aperture Value 0x64000 ~ 0x800	0x64000 (F1.6)	To set the variable range of Aperture Value when Iris Mode is at Auto. Ex.) To set the minimum F number to be F2.0 and the maximum F number to be F8.0, SU 65 0x40000 0x4000 ※If Max < Min is specified, it will be an error.
		The 2ndParam: Min Aperture Value 0x64000 ~ 0x800	0x800 (F22)	
Zoom Drive [Set]	66	The 1stParam: Drive Mode 0: To specify zoom position 1: To specify the zoom position relatively 2: To specify Start/Stop of zoom position	None	To select how to change the zoom position.
		The 2ndParam When Mode is 0: (Wide) 0 ~ 1024 (Tele) When Mode is 1:-1024 ~ 1024 When Mode is 2:-1 ~ 1 1:Start moving (Tele) -1:Start moving (Wide) 0:Stop	0	Mode = 0, to specify the zoom position. Mode =1, to specify the zoom position relatively to the current position. Negative number: Move to the Wide side from the current position. Positive number: Move to the Tele side from the current position. 0: Zoom position does not change. Mode = 2, When ±1 is set, zoom starts moving. When 0 is set, zoom stops. ※When zoom moves to the edge of Tele or Wide, it stops automatically.
		The 3rdParam: Zoom moving speed 0 ~ 64	None	To set the speed of zoom moving.

Lens Control related 60~ (Cont.)				
	Command No.	Set Value	Initial Value	How to set the command. And other information.
Zoom Drive [Get]	66	The 1st Param : 0 fixed	0	Set 0
		The 1st returned value: 0 fixed	0	
		The 2nd returned value: (Wide)0 ~ 1024(Tele): zoom position -1: Undetermined zoom position	None	To acquire the current zoom position. The zoom position is undetermined right after turning the power ON because it detects the initial lens position.
		The 3rd returned value: Moving speed of zoom 0 ~ 64		To acquire moving speed of the current zoom.
Focus Drive(Set)	67	The 1st Param: Drive Mode 0: To specify focus position 1: To specify the focus position relatively 2: To specify Start/Stop of focus position	None	To select how to change the focus position.
		The 2nd Param When Mode is 0: (Far) 0 ~ 3840 (Near) When Mode is 1:-3584~3584 When Mode is 2: 1:Move to the Near side -1:Move to the Far side 0:Stop	None	Mode=0, To specify the focus position. Mode=1, To specify the focus position relatively from the current position. Negative number: Move to the far side from the current position. Positive number: Move to the Near side from the current position. Set Mode=2, ±1 to start moving focus position. Set 0 to stop moving focus. ※ If it moves to the Near edge or to the Far edge, it stops automatically.
		The 3rd Param: Moving speed of focus 0 ~ 64	None	To set moving speed of focus.
Focus Drive(Get)	67	The 1st Param : 0 fixed	0	To set 0.
		The 1st returned value: 0 fixed	0	
		The 2nd returned value: (Far) 0 ~ 3584 (Near) -1: Undetermined focus position	None	To acquire the current focus position. Valid only when AF is stopped with Manual Focus mode or One Push Trigger AF mode. The focus position is undetermined right after turning the power ON because it detects the initial focus position.
		The 3rd returned value: Moving speed of focus 0 ~ 64		To acquire the moving speed of the current focus.

Lens Control related 60~ (Cont.)				
	Command No.	Set Value	Initial Value	How to set the command. And other information.
Focus Mode	68	0: Auto Focus mode 1: Manual Focus mode 2: One Push Trigger AF mode	0	To set focus mode.
Focus One Push Trigger (Set)	69	1:Trigger on	None	Initiate One Push Trigger AF.
Focus One Push Trigger (Get)	69	0:Stop 1:In operation	None	To acquire the condition/state of One Push Trigger AF.
AF Frame	73	The 1st Param: (Left edge of screen) 0 ～ 1919 (Right edge of screen)	240	To specify the x coordinate at the left top of AF frame.
		The 2nd Param: (Top of screen) 0 ～ 1079 (Bottom of screen)	135	To specify the y coordinate at the left top of AF frame.
		The 3rd Param: 1～1920	1440	To specify the width of AF frame. When less than 320 is specified, AF may not operate properly.
		The 4th Param: 1～1080	810	To specify the height of AF frame. When less than 180 is specified, AF may not operate properly.
IR Cut Filter Mode	75	0: IR cut filter Out 1: IR cut filter In 2: IR cut filter Auto	1	To set IR cut filter mode. When Auto is set, IR cut filter Out/In will be controlled automatically by the Gain Value.
Auto ICF Threshold	76	The 1stParam: Out Threshold 0x10000 ~ 0x200000	0x200000	To set IR cut filter Out/In Auto Control Threshold. Out Threshold: Gain Value that IR cut filter changes from IN to OUT. In Threshold: Gain Value that IR cut filter changes from OUT to IN.
		The 2ndParam: In Threshold 0x10000 ~ 0x200000	0x10000	

OSD related 90~				
	Command No.	Set Value	Initial Value	How to set the command. And other information.
OSD UP button	90	0: 1 push 1: continuous push	None	Command to operate OSD. Send the commands every 60msec for continuous push.
OSD DOWN button	91	0: 1 push 1: continuous push	None	
OSD R button	92	0: 1 push 1: continuous push	None	
OSD L button	93	0: 1 push 1: continuous push	None	
OSD CENTER button	94	0: 1 push 1: continuous push	None	Use as Set button.
Menu Color	95	0: Black 1: Blue 2: Red 3: Magenta 4: Green 5: Cyan 6: Yellow 7: White	7	To set the font color of OSD.
Highlight Color	96	0: Black 1: Blue 2: Red 3: Magenta 4: Green 5: Cyan 6: Yellow 7: White	5	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	Four kinds of camera settings can be stored. The stored values cannot be saved unless otherwise SAVE command is executed. The stored data and the set values will not be initialized by executing INIT command. ※The last saved camera settings will be reflected when turning the power ON.
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 values 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: (fixed)	None	(Write Only) To reset the internal free-running timer of LTC.
V Phase Offset	106	-1024～1023	0	To set GenLock V phase adjustment.
H Phase Offset	107	-2048～2047	0	To set GenLock H phase adjustment. ※Note 1

※ Note 1). There might be some errors between the actual values and the set values by re-booting, by changing format, by adjusting V phase/H phase, and others.

Others in 700s				
	Command No.	Set Value	Initial Value	How to set the command. And other information.
Init	700	0 (Fixed value)	None	(Write only) To restore camera settings.
Save	705	1 (Fixed value)	None	(Write only) To save the camera settings. ※As to pixel defects correction, only one table can be saved.
Version Information	721	1: Microcomputer's version 2:FPGA's version	-	(Read only) To acquire the firmware's version. The letter strings such as 0.1 shall be responded.

No command number				
	Command No.	Set Value	Initial Value	How to set the command. And other information.
SDDW	None	512	-	To start detection of pixel defects Please refer to the Section 9. Notes for CMOS Pixel Defect, for the details.

Other Commands				
	Command No.	Set Value	Initial Value	How to set the command. And other information.
Color Bar	80	0: OFF (Camera Image) 1: ON	0	To output color bar instead of outputting the camera image. It is effected by white balance and/or image settings. This setting cannot be saved.
OSD OFF	99	1: (Fixed value)	None	(Write Only) To end OSD menu.

10.4. Quick Reference Matrix for Settings

Magnification	dB	Gain Value (Magnification x 0 x 10000)	
		DEC	HEX
1.000	**0.000**	**65536**	**00010000**
1.122	1.003	73561	00011F59
1.260	2.007	82570	0001428A
1.414	3.010	92681	00016A09
1.587	4.014	104031	0001965F
1.782	5.017	116771	0001C823
2.000	**6.021**	**131072**	**00020000**
2.245	7.024	147123	00023EB3
2.520	8.027	165140	00028514
2.828	9.031	185363	0002D413
3.175	10.034	208063	00032CBF
3.564	11.038	233543	00039047
4.000	**12.041**	**262144**	**00040000**
4.490	13.045	294246	00047D66
5.040	14.048	330280	00050A28
5.657	15.051	370727	0005A827
6.350	16.055	416127	0006597F
7.127	17.058	467087	0007208F
8.000	**18.062**	**524288**	**00080000**
8.980	19.065	588493	0008FACD
10.079	20.069	660561	000A1451
11.314	21.072	741455	000B504F
12.699	22.076	832255	000CB2FF
14.254	23.079	934175	000E411F
16.000	**24.082**	**1048576**	**00100000**
17.959	25.086	1176986	0011F59A
20.159	26.089	1321122	001428A2
22.627	27.093	1482910	0016A09E
25.398	28.096	1664510	001965FE
28.509	29.100	1868350	001C823E
32.000	**30.103**	**2097152**	**00200000**

Gain Settings (per 0.1dB)			
dB	Magnification	Gain Value	
		DEC	HEX
0.0	1.000	65536	0x10000
0.1	1.012	66295	0x102F7
0.2	1.023	67063	0x105F7
0.3	1.035	67839	0x108FF
0.4	1.047	68625	0x10C11
0.5	1.059	69419	0x10F2B
0.6	1.072	70223	0x1124F
0.7	1.084	71036	0x1157C
0.8	1.096	71859	0x118B3
0.9	1.109	72691	0x11BF3
1.0	1.122	73533	0x11F3D
1.1	1.135	74384	0x12290
1.2	1.148	75245	0x125ED
1.3	1.161	76117	0x12955
1.4	1.175	76998	0x12CC6
1.5	1.189	77890	0x13042
1.6	1.202	78792	0x133C8
1.7	1.216	79704	0x13758
1.8	1.230	80627	0x13AF3
1.9	1.245	81561	0x13E99
2.0	1.259	82505	0x14249
2.1	1.274	83460	0x14604
2.2	1.288	84427	0x149CB
2.3	1.303	85404	0x14D9C
2.4	1.318	86393	0x15179
2.5	1.334	87394	0x15562
2.6	1.349	88406	0x15956
2.7	1.365	89429	0x15D55
2.8	1.380	90465	0x16161
2.9	1.396	91512	0x16578
3.0	1.413	92572	0x1699C
3.1	1.429	93644	0x16DCC
3.2	1.445	94728	0x17208
3.3	1.462	95825	0x17651
3.4	1.479	96935	0x17AA7
3.5	1.496	98057	0x17F09
3.6	1.514	99193	0x18379
3.7	1.531	100341	0x187F5
3.8	1.549	101503	0x18C7F
3.9	1.567	102679	0x19117
4.0	1.585	103868	0x195BC
4.1	1.603	105070	0x19A6E
4.2	1.622	106287	0x19F2F
4.3	1.641	107518	0x1A3FE
4.4	1.660	108763	0x1A8DB
4.5	1.679	110022	0x1ADC6
4.6	1.698	111296	0x1B2C0
4.7	1.718	112585	0x1B7C9
4.8	1.738	113889	0x1BCE1
4.9	1.758	115207	0x1C207
5.0	1.778	116541	0x1C73D
5.1	1.799	117891	0x1CC83
5.2	1.820	119256	0x1D1D8
5.3	1.841	120637	0x1D73D
5.4	1.862	122034	0x1DCB2
5.5	1.884	123447	0x1E237
5.6	1.905	124876	0x1E7CC
5.7	1.928	126322	0x1ED72
5.8	1.950	127785	0x1F329
5.9	1.972	129265	0x1F8F1

Gain Settings (per 0.1dB)			
dB	Magnification	Gain Value	
		DEC	HEX
6.0	1.995	130762	0x1FECA
6.1	2.018	132276	0x204B4
6.2	2.042	133807	0x20AAF
6.3	2.065	135357	0x210BD
6.4	2.089	136924	0x216DC
6.5	2.113	138510	0x21D0E
6.6	2.138	140113	0x22351
6.7	2.163	141736	0x229A8
6.8	2.188	143377	0x23011
6.9	2.213	145037	0x2368D
7.0	2.239	146717	0x23D1D
7.1	2.265	148416	0x243C0
7.2	2.291	150134	0x24A76
7.3	2.317	151873	0x25141
7.4	2.344	153631	0x2581F
7.5	2.371	155410	0x25F12
7.6	2.399	157210	0x2661A
7.7	2.427	159030	0x26D36
7.8	2.455	160872	0x27468
7.9	2.483	162735	0x27BAF
8.0	2.512	164619	0x2830B
8.1	2.541	166525	0x28A7D
8.2	2.570	168453	0x29205
8.3	2.600	170404	0x299A4
8.4	2.630	172377	0x2A159
8.5	2.661	174373	0x2A925
8.6	2.692	176392	0x2B108
8.7	2.723	178435	0x2B903
8.8	2.754	180501	0x2C115
8.9	2.786	182591	0x2C93F
9.0	2.818	184706	0x2D182
9.1	2.851	186844	0x2D9DC
9.2	2.884	189008	0x2E250
9.3	2.917	191196	0x2EADC
9.4	2.951	193410	0x2F382
9.5	2.985	195650	0x2FC42
9.6	3.020	197916	0x3051C
9.7	3.055	200207	0x30E0F
9.8	3.090	202526	0x3171E
9.9	3.126	204871	0x32047
10.0	3.162	207243	0x3298B
10.1	3.199	209643	0x332EB
10.2	3.236	212070	0x33C66
10.3	3.273	214526	0x345FE
10.4	3.311	217010	0x34FB2
10.5	3.350	219523	0x35983
10.6	3.388	222065	0x36371
10.7	3.428	224636	0x36D7C
10.8	3.467	227237	0x377A5
10.9	3.508	229869	0x381ED
11.0	3.548	232531	0x38C53
11.1	3.589	235223	0x396D7
11.2	3.631	237947	0x3A17B
11.3	3.673	240702	0x3AC3E
11.4	3.715	243489	0x3B721
11.5	3.758	246309	0x3C225
11.6	3.802	249161	0x3CD49
11.7	3.846	252046	0x3D88E
11.8	3.890	254965	0x3E3F5
11.9	3.936	257917	0x3EF7D

Gain Settings (per 0.1dB)			
dB	Magnification	Gain Value	
		DEC	HEX
12.0	3.981	260904	0x3FB28
12.1	4.027	263925	0x406F5
12.2	4.074	266981	0x412E5
12.3	4.121	270072	0x41EF8
12.4	4.169	273200	0x42B30
12.5	4.217	276363	0x4378B
12.6	4.266	279563	0x4440B
12.7	4.315	282800	0x450B0
12.8	4.365	286075	0x45D7B
12.9	4.416	289388	0x46A6C
13.0	4.467	292739	0x47783
13.1	4.519	296128	0x484C0
13.2	4.571	299557	0x49225
13.3	4.624	303026	0x49FB2
13.4	4.677	306535	0x4AD67
13.5	4.732	310084	0x4BB44
13.6	4.786	313675	0x4C94B
13.7	4.842	317307	0x4D77B
13.8	4.898	320981	0x4E5D5
13.9	4.955	324698	0x4F45A
14.0	5.012	328458	0x5030A
14.1	5.070	332261	0x511E5
14.2	5.129	336109	0x520ED
14.3	5.188	340001	0x53021
14.4	5.248	343938	0x53F82
14.5	5.309	347920	0x54F10
14.6	5.370	351949	0x55ECD
14.7	5.433	356025	0x56EB9
14.8	5.495	360147	0x57ED3
14.9	5.559	364317	0x58F1D
15.0	5.623	368536	0x59F98
15.1	5.689	372803	0x5B043
15.2	5.754	377120	0x5C120
15.3	5.821	381487	0x5D22F
15.4	5.888	385905	0x5E371
15.5	5.957	390373	0x5F4E5
15.6	6.026	394893	0x6068D
15.7	6.095	399466	0x6186A
15.8	6.166	404092	0x62A7C
15.9	6.237	408771	0x63CC3
16.0	6.310	413504	0x64F40
16.1	6.383	418292	0x661F4
16.2	6.457	423136	0x674E0
16.3	6.531	428036	0x68804
16.4	6.607	432992	0x69B60
16.5	6.683	438006	0x6AEF6
16.6	6.761	443078	0x6C2C6
16.7	6.839	448208	0x6D6D0
16.8	6.918	453398	0x6EB16
16.9	6.998	458648	0x6FF98
17.0	7.079	463959	0x71457
17.1	7.161	469332	0x72954
17.2	7.244	474766	0x73E8E
17.3	7.328	480264	0x75408
17.4	7.413	485825	0x769C1
17.5	7.499	491451	0x77FBB
17.6	7.586	497141	0x795F5
17.7	7.674	502898	0x7AC72
17.8	7.762	508721	0x7C331
17.9	7.852	514612	0x7DA34

Gain Settings (per 0.1dB)			
dB	Magnification	Gain Value	
		DEC	HEX
18.0	7.943	520571	0x7F17B
18.1	8.035	526599	0x80907
18.2	8.128	532697	0x820D9
18.3	8.222	538865	0x838F1
18.4	8.318	545105	0x85151
18.5	8.414	551417	0x869F9
18.6	8.511	557802	0x882EA
18.7	8.610	564261	0x89C25
18.8	8.710	570795	0x8B5AB
18.9	8.810	577404	0x8CF7C
19.0	8.913	584090	0x8E99A
19.1	9.016	590854	0x90406
19.2	9.120	597695	0x91EBF
19.3	9.226	604616	0x939C8
19.4	9.333	611618	0x95522
19.5	9.441	618700	0x970CC
19.6	9.550	625864	0x98CC8
19.7	9.661	633111	0x9A917
19.8	9.772	640442	0x9C5BA
19.9	9.886	647858	0x9E2B2
20.0	10.000	655360	0xA0000
20.1	10.116	662949	0xA1DA5
20.2	10.233	670625	0xA3BA1
20.3	10.351	678391	0xA59F7
20.4	10.471	686246	0xA78A6
20.5	10.593	694193	0xA97B1
20.6	10.715	702231	0xAB717
20.7	10.839	710362	0xAD6DA
20.8	10.965	718588	0xAF6FC
20.9	11.092	726909	0xB177D
21.0	11.220	735326	0xB385E
21.1	11.350	743841	0xB59A1
21.2	11.482	752454	0xB7B46
21.3	11.614	761167	0xB9D4F
21.4	11.749	769981	0xBBFBD
21.5	11.885	778897	0xBE291
21.6	12.023	787916	0xC05CC
21.7	12.162	797040	0xC2970
21.8	12.303	806269	0xC4D7D
21.9	12.445	815605	0xC71F5
22.0	12.589	825049	0xC96D9
22.1	12.735	834603	0xCBC2B
22.2	12.882	844267	0xCE1EB
22.3	13.032	854043	0xD081B
22.4	13.183	863933	0xD2EBD
22.5	13.335	873937	0xD55D1
22.6	13.490	884056	0xD7D58
22.7	13.646	894293	0xDA555
22.8	13.804	904649	0xDCDC9
22.9	13.964	915124	0xDF6B4
23.0	14.125	925721	0xE2019
23.1	14.289	936440	0xE49F8
23.2	14.454	947283	0xE7453
23.3	14.622	958252	0xE9F2C
23.4	14.791	969348	0xECA84
23.5	14.962	980573	0xEF65D
23.6	15.136	991927	0xF22B7
23.7	15.311	1003413	0xF4F95
23.8	15.488	1015032	0xF7CF8
23.9	15.668	1026786	0xFAAE2

Gain Settings (per 0.1dB)			
dB	Magnification	Gain Value	
		DEC	HEX
24.0	15.849	1038676	0xFD954
24.1	16.032	1050703	0x10084F
24.2	16.218	1062869	0x1037D5
24.3	16.406	1075177	0x1067E9
24.4	16.596	1087627	0x10988B
24.5	16.788	1100221	0x10C9BD
24.6	16.982	1112961	0x10FB81
24.7	17.179	1125848	0x112DD8
24.8	17.378	1138885	0x1160C5
24.9	17.579	1152073	0x119449
25.0	17.783	1165413	0x11C865
25.1	17.989	1178908	0x11FD1C
25.2	18.197	1192559	0x12326F
25.3	18.408	1206368	0x126860
25.4	18.621	1220337	0x129EF1
25.5	18.836	1234468	0x12D624
25.6	19.055	1248763	0x130DFB
25.7	19.275	1263223	0x134677
25.8	19.498	1277850	0x137F9A
25.9	19.724	1292647	0x13B967
26.0	19.953	1307615	0x13F3DF
26.1	20.184	1322757	0x142F05
26.2	20.417	1338073	0x146AD9
26.3	20.654	1353568	0x14A760
26.4	20.893	1369241	0x14E499
26.5	21.135	1385096	0x152288
26.6	21.380	1401135	0x15612F
26.7	21.627	1417359	0x15A08F
26.8	21.878	1433771	0x15E0AB
26.9	22.131	1450374	0x162186
27.0	22.387	1467168	0x166320
27.1	22.646	1484157	0x16A57D
27.2	22.909	1501343	0x16E89F
27.3	23.174	1518728	0x172C88
27.4	23.442	1536314	0x17713A
27.5	23.714	1554103	0x17B6B7
27.6	23.988	1572099	0x17FD03
27.7	24.266	1590303	0x18441F
27.8	24.547	1608718	0x188C0E
27.9	24.831	1627346	0x18D4D2
28.0	25.119	1646190	0x191E6E
28.1	25.410	1665252	0x1968E4
28.2	25.704	1684535	0x19B437
28.3	26.002	1704041	0x1A0069
28.4	26.303	1723772	0x1A4D7C
28.5	26.607	1743733	0x1A9B75
28.6	26.915	1763924	0x1AEA54
28.7	27.227	1784350	0x1B3A1E
28.8	27.542	1805011	0x1B8AD3
28.9	27.861	1825912	0x1BDC78
29.0	28.184	1847055	0x1C2F0F
29.1	28.510	1868443	0x1C829B
29.2	28.840	1890079	0x1CD71F
29.3	29.174	1911965	0x1D2C9D
29.4	29.512	1934104	0x1D8318
29.5	29.854	1956500	0x1DDA94
29.6	30.200	1979156	0x1E3314
29.7	30.549	2002073	0x1E8C99
29.8	30.903	2025256	0x1EE728
29.9	31.261	2048707	0x1F42C3

Gain Settings (per 0.1dB)			
dB	Magnification	Gain Value	
		DEC	HEX
30.0	31.623	2072430	0x1F9F6E

Shutter Settings		
Exposure Time [s]	Shutter Value (Exposure Time[s] × 0x100000)	
	DEC	HEX
1/4	262144	00040000
1/8	131072	00020000
1/15	69905	00011111
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

Iris Settings		
F Value	Aperture Value ((1/F^2) × 0x100000)	
	DEC	HEX
22.6	2048	00000800
19.0	2896	00000B50
16.0	**4096**	**00001000**
13.5	5792	000016A0
11.3	8192	00002000
9.51	11585	00002D41
8.00	**16384**	**00004000**
6.73	23170	00005A82
5.66	32768	00008000
4.76	46340	0000B504
4.00	**65536**	**00010000**
3.36	92681	00016A09
2.83	131072	00020000
2.38	185363	0002D413
2.00	**262144**	**00040000**
1.68	370727	0005A827
1.6	**409600**	**00064000**

Iris Settings (per 1/32Ev)		
F-number	Aperture Value	
	DEC	HEX
22.627	2048	0x800
22.143	2139	0x85B
21.668	2233	0x8B9
21.204	2332	0x91C
20.749	2435	0x983
20.305	2543	0x9EF
19.870	2656	0xA60
19.444	2774	0xAD6
19.027	2896	0xB50
18.620	3025	0xBD1
18.221	3158	0xC56
17.830	3298	0xCE2
17.448	3444	0xD74
17.074	3597	0xE0D
16.708	3756	0xEAC
16.350	3922	0xF52
16.000	4096	0x1000
15.657	4277	0x10B5
15.322	4467	0x1173
14.993	4664	0x1238
14.672	4871	0x1307
14.358	5087	0x13DF
14.050	5312	0x14C0
13.749	5547	0x15AB
13.454	5793	0x16A1
13.166	6049	0x17A1
12.884	6317	0x18AD
12.608	6597	0x19C5
12.338	6889	0x1AE9
12.073	7194	0x1C1A
11.815	7512	0x1D58
11.561	7845	0x1EA5
11.314	8192	0x2000
11.071	8555	0x216B
10.834	8933	0x22E5
10.602	9329	0x2471
10.375	9742	0x260E
10.152	10173	0x27BD
9.935	10624	0x2980
9.722	11094	0x2B56
9.514	11585	0x2D41
9.310	12098	0x2F42
9.110	12634	0x315A
8.915	13193	0x3389
8.724	13777	0x35D1
8.537	14387	0x3833
8.354	15024	0x3AB0
8.175	15689	0x3D49

Iris Settings (per 1/32Ev)		
F-number	Aperture Value	
	DEC	HEX
8.000	16384	0x4000
7.829	17109	0x42D5
7.661	17867	0x45CB
7.497	18658	0x48E2
7.336	19484	0x4C1C
7.179	20347	0x4F7B
7.025	21247	0x52FF
6.874	22188	0x56AC
6.727	23170	0x5A82
6.583	24196	0x5E84
6.442	25268	0x62B4
6.304	26386	0x6712
6.169	27554	0x6BA2
6.037	28774	0x7066
5.907	30048	0x7560
5.781	31379	0x7A93
5.657	32768	0x8000
5.536	34219	0x85AB
5.417	35734	0x8B96
5.301	37316	0x91C4
5.187	38968	0x9838
5.076	40693	0x9EF5
4.967	42495	0xA5FF
4.861	44376	0xAD58
4.757	46341	0xB505
4.655	48393	0xBD09
4.555	50535	0xC567
4.458	52773	0xCE25
4.362	55109	0xD745
4.269	57549	0xE0CD
4.177	60097	0xEAC1
4.088	62757	0xF525
4.000	65536	0x10000
3.914	68438	0x10B56
3.830	71468	0x1172C
3.748	74632	0x12388
3.668	77936	0x13070
3.589	81386	0x13DEA
3.513	84990	0x14BFE
3.437	88752	0x15AB0
3.364	92682	0x16A0A
3.292	96785	0x17A11
3.221	101070	0x18ACE
3.152	105545	0x19C49
3.084	110218	0x1AE8A
3.018	115098	0x1C19A
2.954	120194	0x1D582
2.890	125515	0x1EA4B

Iris Settings (per 1/32Ev)		
F-number	Aperture Value	
	DEC	HEX
2.828	131072	0x20000
2.768	136875	0x216AB
2.709	142935	0x22E57
2.650	149263	0x2470F
2.594	155872	0x260E0
2.538	162773	0x27BD5
2.484	169979	0x297FB
2.430	177505	0x2B561
2.378	185364	0x2D414
2.327	193571	0x2F423
2.278	202141	0x3159D
2.229	211090	0x33892
2.181	220436	0x35D14
2.134	230195	0x38333
2.089	240387	0x3AB03
2.044	251030	0x3D496
2.000	262144	0x40000
1.957	273750	0x42D56
1.915	285870	0x45CAE
1.874	298527	0x48E1F
1.834	311744	0x4C1C0
1.795	325546	0x4F7AA
1.756	339959	0x52FF7
1.719	355010	0x56AC2
1.682	370728	0x5A828
1.646	387141	0x5E845
1.610	404281	0x62B39

10.5. Quick Reference Matrix for the Maximum Aperture with Zoom Position

Zoom position	Maximum Aperture F number (Aperture Value) (DEC)
0	409600
64	378790
128	342163
192	302391
256	267203
320	232711
384	201995
448	174937
512	148131
576	122280
640	98920
704	83002
768	73895
832	67047
896	64825
960	66049
992	63802
1024	50697

10.6. Focus Position and Subject Distance

Focus Position	Distance[mm]
0	Over Inf
256	30000
512	10000
768	6000
1024	3000
1280	2000
1536	1500
1792	1300
2048	1150
2304	1000
2560	800
2816	500
3072	300
3328	200
3584	100

※The above correspondence is only as a guide.

11. How to Operate the Camera with OSD Function

You can operate the camera with OSD menu on a monitor screen by using the rear switch for OSD operation.

11.1. Switch Operation of OSD Menu

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

11.3. Switch Operation when OSD Menu is not shown

[▲] Move the Zoom position to Tele side.
[▼] Move the Zoom position to Wide side.
[◀] Move the Focus position to Far side.
[▶] Move the Focus position to Near side.

11.4. 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 A	To set video format. Select video format with ◀／▶ button, then push the CENTER button to determine.
		1080p 59.94fps A	
		1080p 50fps A	
		1080p 60fps B	
		1080p 59.94fps B	
		1080p 50fps 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	0～30dB	To set the Gain Value when Gain Mode is at Manual. ※Note 1
	Gain Max Value	0～30dB	To set the Max Gain Value when Gain Mode is at Auto. ※Note 1
	Shutter Mode	Manual/Auto	To set Shutter Mode.
	Shutter Value	1/4,1/5,1/6,1/7,1/8, 1/9,1/11,1/13,1/15, 1/18,1/21,1/25,1/30, 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	To set Shutter Value when Shutter Mode is at Manual. ※Note 1

Top Menu	Setting Menu	Selected Items	Explanation
Gain/Shutter/IRIS	Shutter Min Limit	Same as Shutter Value	To set the Min Shutter Limit when Shutter Mode is at Auto. ※Note 1
	Shutter Max Limit	Same as Shutter Value	To set the Max Shutter Limit when Shutter Mode is at Auto. ※Note 1
	Set Shutter Limit	None	Push the CENTER button to determine the shutter limit. When Max < Min is set, the setting will not be valid.
	Iris Mode	Manual	To set Iris Mode
		Auto	
	F Number	F1.6,F1.8,F2,F2.2 F2.4,F2.6,F2.8,F3 F3.4,F3.6,F4,F4.4 F4.8,F5.2,F5.6,F6.1 F6.7,F7.3,F8,F8.7 F9.5,F10,F11,F12 F13,F15,F16,F17 F19,F20,F22, CLOSE	To set F number when Iris Mode is at Manual. ※Note 1 ※Note 2
	Iris Min Limit	Same as F Number (Except CLOSE)	To select Iris Min Limit when Iris Mode is at Auto.
	Iris Max Limit	Same as F Number (Except CLOSE)	To select Iris Max Limit when Iris Mode is at Auto.
	Set Iris Limit	None	To set the Iris Limit when Iris Mode is at Auto.
	AE Speed	0～15	To set AE convergence speed.
	ExpCompValue	-12～0～12[dB]	To set exposure compensation value.
	WDR Mode	OFF	To set WDR mode. When Auto 2 is set, you'll get less halation and black crushed parts than the one with Auto 1.
		Manual	
		Auto1	
		Auto2	
	WDR Ratio Value	1:2	To select exposure time ratio when WDR Mode is at Manual.
		1:4	
		1:8	
		1:16	
		1:32	
	WDR MBC Mode	OFF	Type 1: To control the false color occurred in the active area when WDR is ON. Type 2: To control the blur and the false color occurred in the active area when WDR is ON.
		ON (Type1)	
		ON (Type2)	

Top Menu	Setting Menu	Selected Items	Explanation
Gain/Shutter/IRIS (Continue)	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 Block X coordinate in the far left of metering field when Metering Mode is at Spot metering.
	Spot Block Y	0～15	To select the Block Y coordinate in the top of metering field when Metering Mode is at Spot metering.
	Spot Block W	1～16	To select the width of metering field (number of block) when Metering Mode is at Spot metering.
	Spot Block H	1～16	To select the height of metering field (number of block) when Metering Mode is at Spot metering.
	Set Spot Block	None	Push the CENTER button to determine the 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: Preferred value in the range of F1.6 to F22 can always be set regardless of zoom position. However, the actual F value will be limited by the maximum aperture which varies according to the zoom position.

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)	
		One push	
		Manual	
		Preset1	
		Preset2	
		Preset3	
		Preset4	
		Preset5	
	WB Red Gain	100～1600	To set Red Gain or Blue Gain when WB Mode is at Manual.
	WB Blue Gain	100～1600	
	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.
	Detail	0～7	To set the Details. 0 is OFF.
	Gamma	BT.709 -2	To set the Type and Contrast of Gamma.
		BT.709 -1	
		BT.709	
		BT.709 +1	
		BT.709 +2	
		HLG 75	
	Knee	OFF	To set Knee point.
		100%	
		95%	
		90%	
		85%	
		80%	
		75%	
	D-Range	Low	To set Dynamic range.
		Normal	
		High	
	Shading Correction	OFF/ON	Shading correction OFF/ON.
	Shading Level	0～100	To set the level when shading correction is ON.
	Noise Reduction	0～6	To set Noise Reduction. 0 (OFF) 1 (less) ～ 6 (strong)
	Color Saturation	0～200	To set color saturation control. 0～200 (%)
	Color Correction	Auto	To set color correction.
		Standard	
		Fluorescent	
		Tungsten	
	Color Suppression	0～7	To set color suppression. 0 (OFF) 1 (less)～7 (strong)

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

Top Menu	Setting Menu	Selected Items	Explanation
Lens Control	Focus Mode	Auto Focus	To select Focus Mode.
		Manual Focus	
		AF One Push Trigger	
	Set One Push Focus	None	To execute One Push Focus when Focus Mode is at AF One Push Trigger.
	Focus Position	0～3584	To set Focus Position when Focus Mode is at Manual.
	Focus Speed	1～64	To set Focus speed.
	Zoom Position	0～1024	To set Zoom Position.
	Zoom Speed	1～64	To set Zoom speed.
	IR Cut Filter Mode	Out	To set IR Cut Filter Mode.
		In	
		Auto	
	IR Cut Out Threshold	Same as Gain Value	To select Out Threshold when IR Cut Filter Mode is at Auto.
	IR Cut In Threshold	Same as Gain Value	To select In Threshold when IR Cut Filter Mode is at Auto.
	Set IRCut Threshold	None	To set the Threshold between On⇔Off when IR cut filter mode is at AUTO.

Top Menu	Setting Menu	Selected Items	Explanation
LTC	LTC	OFF/ON	LTC OFF/ON.
	Set LTC Reset	None	To reset LTC with the CENTER button.

Top Menu	Setting Menu	Selected Items	Explanation
Gen Lock	V Phase Offset	-1024～1023	To set V Phase adjustment of GenLock.
	H Phase Offset	-2048～2047	To set H Phase adjustment of GenLock. ※Note 4.

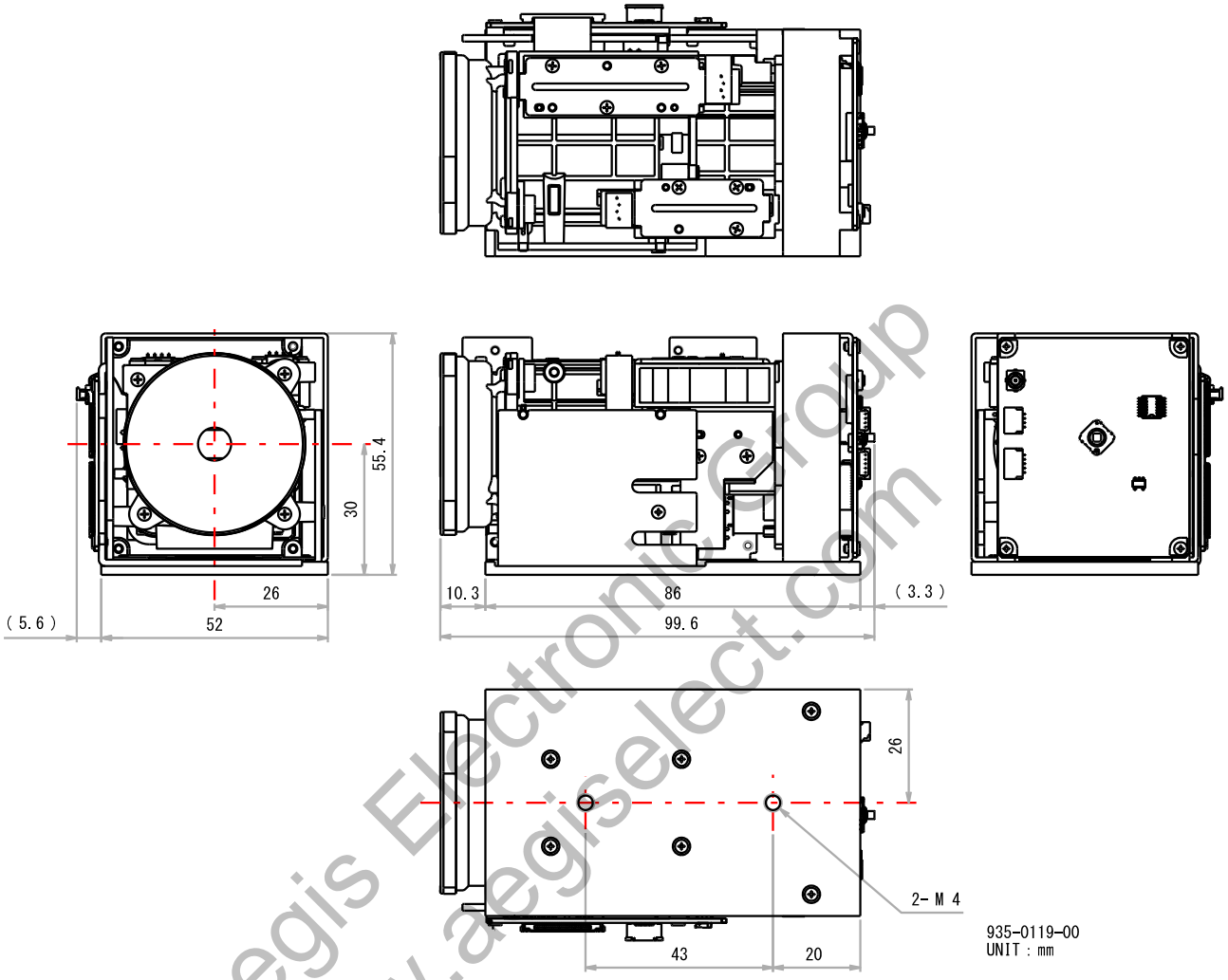
※Note 4). There might be some errors between the actual values and the set values by re-booting, by changing format, by adjusting V phase/H phase, and others.

Top Menu	Setting Menu	Selected Items	Explanation
OSD Color Change	Default Set (White & Cyan)	None	To restore the OSD color 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	
		Red	
		Magenta	
		Green	
		Cyan	
		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	Determine 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 determined.
INIT	None	None	To restore the camera settings to the initial settings with the CENTER button.
Save/Load	Save Data	0～3	To save the data to the preset number with the CENTER button. (Confirmation requested before saving).
	Really?	NO/YES	To make sure if you really want to save the data to the selected preset.
	Load Data	0～3	To load the data of the preset number selected by the CENTER button, and reflect it to the image. (Confirmation requested before loading).
	Really?	NO/YES	To make sure if you really want to load the data of the preset number selected.

12. Factory Settings

Items		Initial Settings
Video Format		1920 x 1080i 60fps
Gain Mode		Auto
Gain Value		65536 (0dB)
Gain Max Value		2097152 (30dB)
Shutter Mode		Auto
Shutter Value		17476 (1/60)
Shutter Limit Max		262144 (1/4)
Shutter Limit Min		131 (1/8000)
Iris Mode		Auto
Aperture Value		0x64000 (F1.6)
Aperture Limit, MAX/MIN		0x64000 (F1.6) / 0x800 (F22)
AE Speed		10
Exposure Compensation Value		12 (0dB)
WDR Mode		OFF
WDR Ratio Value		0x200 (2 times)
WDR MBC Mode		OFF
Metering Mode		Center-Weighted
Spot Block		X=7,Y=7,W=2,H=2
Flicker Cancel		OFF
White Balance		Auto
Red Gain		318
Blue Gain		138
Color Balance (RGB)		100
Master Pedestal		0
Pedestal (RGB)		0
Detail		3
Gamma		BT.709
Knee		85%
D-Range		Normal
Shading Correction		OFF
Shading Correction Level		100
Noise Reduction		0
Color Saturation		100
Color Correction		Auto
Color Suppression		5
Zoom Position		0
Focus Position		256
Focus Mode		0 (Auto)
IR Cut Filter Mode		IR cut filter In
Auto ICF Threshold	Out Threshold	0x200000 (30dB)
	In Threshold	0x10000 (0dB)
Menu Color		White
Highlight Color		Cyan
LTC		OFF
V Phase Offset		0
H Phase Offset		0

13. Dimensions



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.