CIS

3G-SDI/HD-SDI
FULL HD CMOS Color Camera
Camera Assembly Unit
DCC-HD3N

Product Specification
& Operational Manual

CIS Corporation

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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.
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 module in the dusty or humid places.
- Do not apply excessive force or static electricity that could damage the camera module.
- Do not shoot direct images that are extremely bright (e.g., light source, sun, etc.). When the camera is not in use, please put the protection cap on.
- 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 and then connect the camera module to monitors or computers. AC leaks from the connected devices may cause damages or destroy the camera module.
- Do not apply excessive voltage. (Use only the specified voltage.) Unstable or improper power supply voltage may cause damages or malfunction of the camera assembly.
- DCC-HD3N is an assembly unit for camera modules. It is designed based on the premise of embedding it in a camera casing. Therefore, appropriate heat dissipation needs to be fully considered when embedding it.
  Assembly without appropriate heat dissipation may cause damages or malfunction.

2. Product Outline

DCC-HD3N is provided as an assembly unit that is a part of CIS full HD color camera module with Gen Lock function, VCC-HD3N.
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

- ☐ Features CIS original ISP, state-of-the-art "Clairvu™" for superb imaging quality.
- ☐ Sensor board 25.4mm×25.4mm, Main board 25.4mm×38mm, Driver board 25.4mm×43mm.
- ☐ GenLock (3-value analog signals or Black burst)
- ☐ Camera can be controlled via RS-232C.
- ☐ LTC (Longitudinal Time code)
- ☐ With connecting the optional remote controller, camera settings can be set on OSD (On Screen Display).

3. Bundled Items

3.1 Standard Bundled Items

- ☐ Sensor board (BI-HD3), Main board (MB-HD2X), Driver board (PD-HD1X)
  *Boards are connected with FPC cable (51 pins) at the time of delivery.
- ☐ 6 pins connector (power, external trigger, and LTC)
- ☐ 4 pins connector (DC IRIS)

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 Accessories

☐ RU-100 remote controller (OSD Control, RS232C-USB conversion)

4. Specifications

4.1 General Specifications

(1) Image Sensor	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) (Entire pixels area) 6.624mm(H) × 3.726mm(V) (Video output area)	
(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. System	Internal /External sync. system		
(6) Video Output Standard	3G-SDI/HD-SDI : Y/Pb/Pr (4:2:2 10bit) BNC 75Ω termination		
(7) Sensitivity	F5.6 2000lx		
(8) Minimum illumination	F1.4 3.5lx		
	Conditions: VIDEO 50%, AGC 30dB, Electric Shutter OFF		
(9) Power Requirements	DC+9 ~ +15V		
(10) Power Consumption (typ.)	4.0 W at DC+12V IN		
(11) Dimensions	Refer to overall dimension drawing.		
(12) Weight	Approx. 26g		
(13) Lens Mount	None. OLPF and a filter on a sensor board are attached at the time of delivery.		
(14) Gain Setting	AGC (Max. Gain: 0dB~48dB)	※ Some noises might be noticeable when gain setting is set to high.	
	MANUAL: 0dB~48dB		

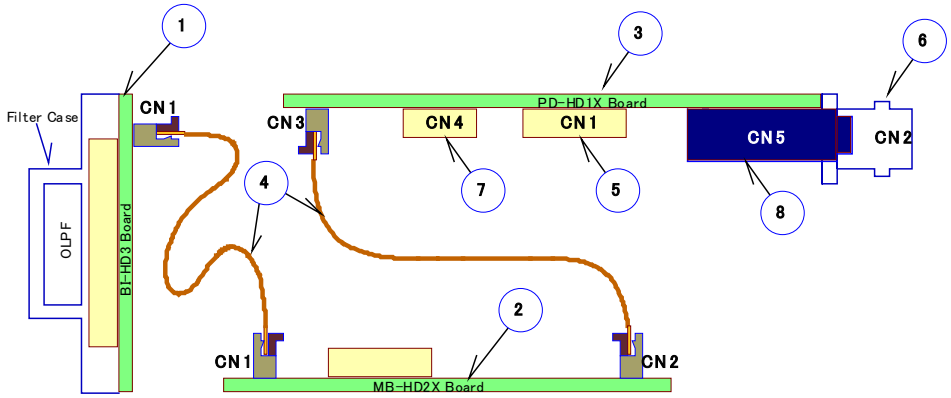
(15) Shutter Speed Variable Range	MANUAL: 1/13600s ~ 1/25s *Shutter speed slower than 1/60s will be limited by the frame rate corresponding to the video output format.			
	AUTO: 1/13600s ~ 1/25s (Upper limit and lower limit can be set.) *Same as MANUAL, shutter speed slower than 1/60s will be limited by the frame rate corresponding to the video output format.			
(16) 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)			
(17) AE Photometric System	Average/Center-Weighted/Spot/Backlight Compensation			
(18) Flicker Cancel	ON, OFF (typ.) *Valid when 60fps, 59.94fps, 30fps, 29.97fps			
(19) Edge Enhancement	OFF,1~7 (typ.2)			
(20) Color Correction	Standard, Fluorescent Light, Tungsten Lamp			
(21) Color Saturation Adjustment	0%(B/W)~100%(typ.)~200%			
(22) Color Compression	OFF, 1~7(typ.5)			
(23) Noise Reduction	ON,OFF			
(24) Gamma (Contrast)	BT.709 -2, BT.709 -1, BT.709, BT.709 +1, BT.709 +2			
(25) Master Pedestal	-100 ~ 0 ~ +100			
(26) Pedestal (R, G, B)	RGB: -100 ~ 0(typ.) ~ +100 each			
(27) Color Balance	RGB: 50 ~ 100(typ.) ~ 150 each			
(28) Pixel Defect (White spot) Correction	Corrected at factory setting.			
(29) LTC	OFF, ON. The external SMPTE Time code can be input to LTC IN terminal (internal self-running time code is resettable).			
(30) Preset (Camera settings)	1, 2, 3, and 4 (4 presets can be set.)			
(31) DC IRIS output	Auto/Open Selectable. Can be used with electric shutter (With priority to electric shutter).			
(32) 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 to the optional remote controller, camera settings can be set on OSD (On Screen Display).			
(33) Safety/Quality standards	UL: Conform to UL Standard including materials and others.			
	RoHS: 2011/65/EU EN50581(RoHS 2)			
	CE and FCC are acquired as VCC-HD3N (chassis typed camera).			
(34) Durability (*1)	Vibration	Acceleration	: 98m/s^2 (10G)	
		Frequency	: 20~200 Hz	
		Direction	: X, Y, and Z 3 directions	
		Testing time	: 120min for each directions	
	Shock	No malfunction shall be occurred with 980m/s^2(100G) for ±X,±Y, and ±Z, 6 directions.		
(35) Operation Environment (*1)	Operation Guaranteed	-5 ~ +45℃	Humidity 20 ~ 80%RH	with no condensation
(36) Storage Environment (*1)	Storage Temperature: -25 ~ +60℃, Humidity: 20 ~ 80%RH with no condensation.			

(*1) Applied when embedded in VCC-HD3N, chassis typed camera.

<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. Parts Name and Functions



1. Sensor board (BI-HD3)
   OLPF and a filter case are attached to the sensor board.
   Protect the OLPF from dusts.
   It has the same serial number as the one on the main board.

2. Main board (MB-HD2X)
   On-board FPGA and CPU are mainly on this board.
   It has the same serial number as the one on the sensor board.

3. Driver board (PD-HD1X)
   On-board 3G-SDI, HD-SDI drive, and power circuit are mainly on this board.
   It has the same serial number as the one on the sensor board.

4. FPC cables (51pins)
   FPC cables which connect each boards.
   Boards are connected at the time of delivery.
   The sensor board and the main board should be paired up because the correction data of the sensor is saved in the main board.

5. Power connector (6 pins)
   This connector is for power input (DC+12V), external sync, and LTC signal input.
   Use the bundled 6pins cable to connect.

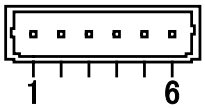
6. 3G-SDI/HD-SDI output connector (BNC)
   This connector is for 3G-SDI/HD-SDI video-out signals.
   Connect to a 3G-SDI/HD-SDI monitor and others using a BNC cable.

7. DC IRIS LENS connector (4 pins)
   This connector is for DC IRIS LENS signals.
   Use the bundled 4pins cable to connect to the DC IRIS LENS. No connection is needed when DC IRIS is not in use.

8. RS-232C I/F jack (φ3.5mm 4pins)
   This jack is for RS-232C signals.
   Use a 4 pins plug of your own to connect to the RS-232C signals. (Please be noted no 4 pins plug is bundled.)
   With connecting to the optional remote controller, OSD (On Screen Display) operation will be enabled.

6. External Connector Specifications

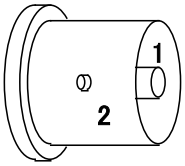
6.1 PD-HD1X CN1 (6pins)



Model: BM6B-SRSS-TB (JST)

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

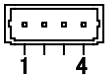
6.2 PD-HD1X CN2 (BNC)



Model: BCJ-BPLHA (CANARE)

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

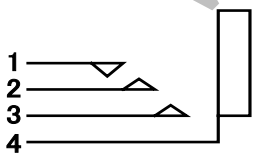
6.3 PD-HD1X CN4 (4 pins)



Model: BM4B-SRSS-TB (JST)

Pin No.	
1	IRIS_DUMP+
2	IRIS_DUMP-
3	IRIS_DRIVE-
4	IRIS_DRIVE+

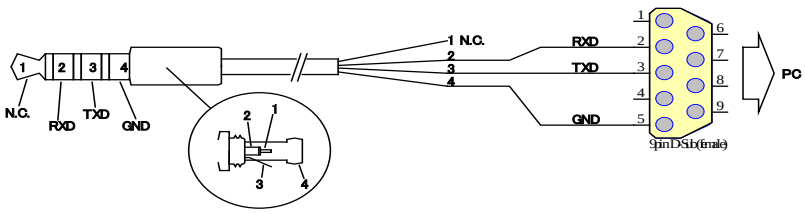
6.4 PD-HD1X CN5 φ3.5mm 4poles (RS-232C) Connector



Model: 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. Guideline for Thermal Design

This camera module is designed for embedding into a chassis. Therefore, operating the board itself without heat dissipation will exceed the tolerance of the operation temperature of component parts. The operation temperature will reach 130°C when operating the FPGA without casing. Never leave it operating without casing as it may cause burn injury and damages to the camera. Please refer to the guideline below for designing heat dissipation.

7.1 Operating Temperature of Main Parts

	Board (ref)	Data sheet value	Upper limit temperature of IC package surface
Image sensor	BI-HD3(IC1)	ta=75°C	85°C
FPGA	MB-HD2X(IC1)	tj=85°C	80°C
CPU	MB-HD2X(IC4)	ta=85°C	95°C
SDI IC	PD-HD1X(IC3)	ta=85°C	95°C

The upper limit temperature of the package is ta+10°C for parts defined as "ta" on a data sheet.
As the data sheet value of FPGA is defined as "tj," the upper limit temperature of FPGA shall be 80°C based on the thermal conductivity of the package and power consumption.

Please dissipate heat so that the surface temperature of the IC package on a board in the chassis will not exceed the upper limit temperature. Please measure the temperature in the usage environment.
Give the first priority of heat dissipation to the FPGA because it is the major heat source.

7.2 How to measure the temperature of the device surface

Tape a thermocouple on the device surface, make a slit in the heat conducting sheet, and then make the heat-sink be appressed onto it to measure temperature.

(E.g.: Temperature measurement of the FPGA surface)

7.3 <Reference> Surface temperature of each device in the CIS chassis (29mm×29mm×77mm)

Ambient temperature	25°C	40°C	45°C
Image sensor	58	73	78
FPGA	55.7	70.7	75.7
CPU	51.7	66.7	71.7
SDI IC	55.1	70.1	75.1

8. 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.

9. 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]

10. Defective Pixel Correction

10.1 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 restored 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.

10.2 How to execute “Defective Pixel Correction”:

- Execute “INIT” to restore 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.

11. Serial Communication

11.1 Serial communication settings:

Baud rate	:	9600bps
Data length	:	8bit
Start bit	:	1bit
Parity bit	:	NO
Stop bit	:	1bit

11.2 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 command sent from the PC will be received by the camera, and then echoed back.
- The end of the command shall be judged by >[sp].
- Please issue the next command when the prior command is completed.

【Example of Get Command】

To get the information on the Command No.10

[Send] GU[sp]10[¥r] or[¥n]

[Returned value] 50[¥r] [¥n] [Data obtained + Linefeed]

[Returned value] [¥r] [¥n] [Linefeed]

[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] [Linefeed]

[Returned value] >[sp] [Prompt + Space]

【Example of SAVE Command】

[Send] SAVE[¥r]or[¥n]

[Returned value] [¥r] [¥n] [Linefeed]

[Returned value] >[sp] [Prompt + Space]

11.3 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 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	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.
Gain Value	3	Magnification×0x10000 X1(0dB) ~ X251(48dB)	0x10000 (65536)	To set gain value. Valid when gain mode is at Manual. Ex.) To set x2 (6dB) SU 3 0x00020000 ※Refer to 11.4.1 Quick Reference Matrix.
Gain Max Value	4	Magnification×0x10000 X1(0dB) ~ X251(48dB)	0x200000 (2097152)	To set the Max gain value when gain mode is at Auto. ※Refer to 11.4.1 Quick Reference Matrix.
Shutter Mode	5	0: Manual 1: Auto	1	To set shutter mode.
Shutter Value	6	Exposure time[s]×0x100000 1/25s ~ 1/13600s	0x4444 (17476) 1/60s	To set shutter value (Exposure time) 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 11.4.2 Quick Reference Matrix. ※Note 1

Shutter Limit	7	The 1st Parameter: Max value Exposure time [s]×0x100000 1/25s ~ 1/13600s	0x4444 (17476) 1/60s	To set the shutter range when shutter mode is at Auto. Ex.) 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 be error if Max < Min is set. * Refer to 11.4.2 Quick Reference Matrix. ※Note 1.
		The 2nd Parameter: Min value Exposure time [s]×0x100000 1/25s ~ 1/13600s	0x4D (77)	
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 values at Spot metering. X value: X coordinate of the left side Block. Y value: Y coordinate of the top side Block. W: Metering area width (Block number) H: Metering area height (Block number) Ex.) 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.
Exposure Compensation Value	11	0 (-18dB) ~ 18 (0dB) ~ 36 (18dB) / per 1dB	18	To set exposure compensation value.
Flicker Cancel	12	0: OFF 1: ON	0	To set flicker cancel, ON/OFF. ※Note 2
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) ※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 would be a margin of error between the set shutter value and the actual shutter value. Please refer to the chart in the Section 11.4.3 for the details.

※Note 2) Flicker cancel function is invalid at 50fps, 25fps, 24fps, and 23.97fps regardless of their settings.

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(%)	190	To set B gain when WB mode is at Manual and at Preset.
Red Gain	23	0 ~ 800(%)	199	To set R gain when WB mode is at Manual and at Preset.
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.
Gamma	35	0: BT.709 -2 1: BT.709 -1 2: BT.709 3: BT.709 +1 4: BT.709 +2	2	To set gamma. Contrast level can be changed by 0~4.
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: Auto 1: Standard 2: Fluorescent light 3: 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.
DC Iris Mode	61	0: Open 1: Auto	0	To set Iris control mode. Set to OPEN when a DC Iris Lens is NOT in use. ※Note 3
DC Iris Response Speed	77	0 Low 1: Mid 2: High	1	To set the response speed of DC Iris when DC Iris Mode is at Auto. When High is set, the response speed of DC Iris becomes faster. When Low is set, the speed becomes slower.

※Note 3) With DC Iris, hunting might occur depending on conditions when shooting bright objects. In such case, adjusting DC Iris Response speed or Exposure Compensation values might help.

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.
Select 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	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.
VPHASE	106	-1024~1023	0	To set V phase of GenLock.
HPHASE	107	-2048~2047	0	To set H phase of GenLock. ※Note 4
H Flip	110	0: OFF 1: ON	0	Flip the horizontal images.
V Flip	111	0: OFF 1: ON	0	Flip the vertical images.

※Note 4) Differences may occur for the set value due to the power rebooting, changing format, and V phase/ H phase adjustment.

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 10. Defective Pixel Correction, for the details.

11.4 Quick Reference Matrix for Settings

11.4.1 Gain Settings

Gain Value				
	Magnification	dB	Gain Value (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
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

11.4.2 Shutter Settings

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

11.4.3 Actual Shutter Values Limited by Video Output Format

Setting 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			

12. 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. (Optional accessory, the remote controller, shall be purchased separately).

12.1 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.

12.2 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.

12.3 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 slower than 1/60s will be limited by the frame rate corresponding to the video output format. ※Note 1 ※Note 2 ※Note3
		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 Min Shutter Limit when Shutter Mode is at Auto. ※Note 1/※Note 2
	Shutter Max Limit	Same as Shutter Value	To set the Max 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.
	Iris Mode	OPEN AUTO	To set Iris Mode. Set it to Open when the DC Iris lens is not in use. ※Note 5
	Iris Response Speed	0: Low 1: Mid 2: High	To set the response speed of DC Iris when DC Iris Mode is at AUTO. When it is set to High, DC Iris response speed becomes faster and when it is set to Low, it will be slower.
	AE Speed	0~15	To set AE convergence speed.
	ExpCompValue	-18~0~18 [dB]	To set Exposure compensation value
	Metering Mode	Average Center Weighted Spot Backlight Comp	To set metering mode. Average: Averaging metering Center Weighted: Center weighted metering Spot: Spot metering Backlight Compensation: Backlight compensation metering
	Spot Block X	0~15	To select the X coordinate value of the left Block when Metering Mode is set to “Spot”.
	Spot Block Y	0~15	To select the Y coordinate value of the top Block when Metering Mode is set to “Spot”.
	Spot Block W	1~16	To select the metering area width (Block number) when Metering Mode is set to “Spot”.
	Spot Block H	1~16	To select the metering area height (Block number) 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 4

※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 are marginal errors between the set shutter values and the actual shutter values. Please refer to the Section 11.4.3. for the details.

※Note 4) Flicker cancel function is invalid at 50fps, 25fps, 24fps, and 23.97fps, regardless of their settings.

※Note 5) With DC Iris, hunting might occur depending on conditions when shooting bright objects. In such case, adjusting DC Iris Response speed or ExpCompvalue might help.

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 6
	Green Balance	50~150	To set Green Balance ※Note 6
	Blue Balance	50~150	To set Blue Balance ※Note 6
	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.
	Gamma	BT.709 -2	To set the contrast of BT.709.
		BT.709 -1	
		BT.709	
		BT.709 +1	
		BT.709 +2	
	Noise Reduction	OFF/ON	To set Noise Reduction. Noise reduction OFF/ON
	Color Saturation	0~200	To set Color Saturation.
	Color Correction	Auto	To set Color Correction.
		Standard	
		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.
GenLock	V Phase Offset	-1024~1023	To set V phase offset of GenLock ※Note 7
	H Phase Offset	-2048~2047	To set H phase offset of GenLock ※Note 7

※Note 6) The values 0~200 can be set via serial command.

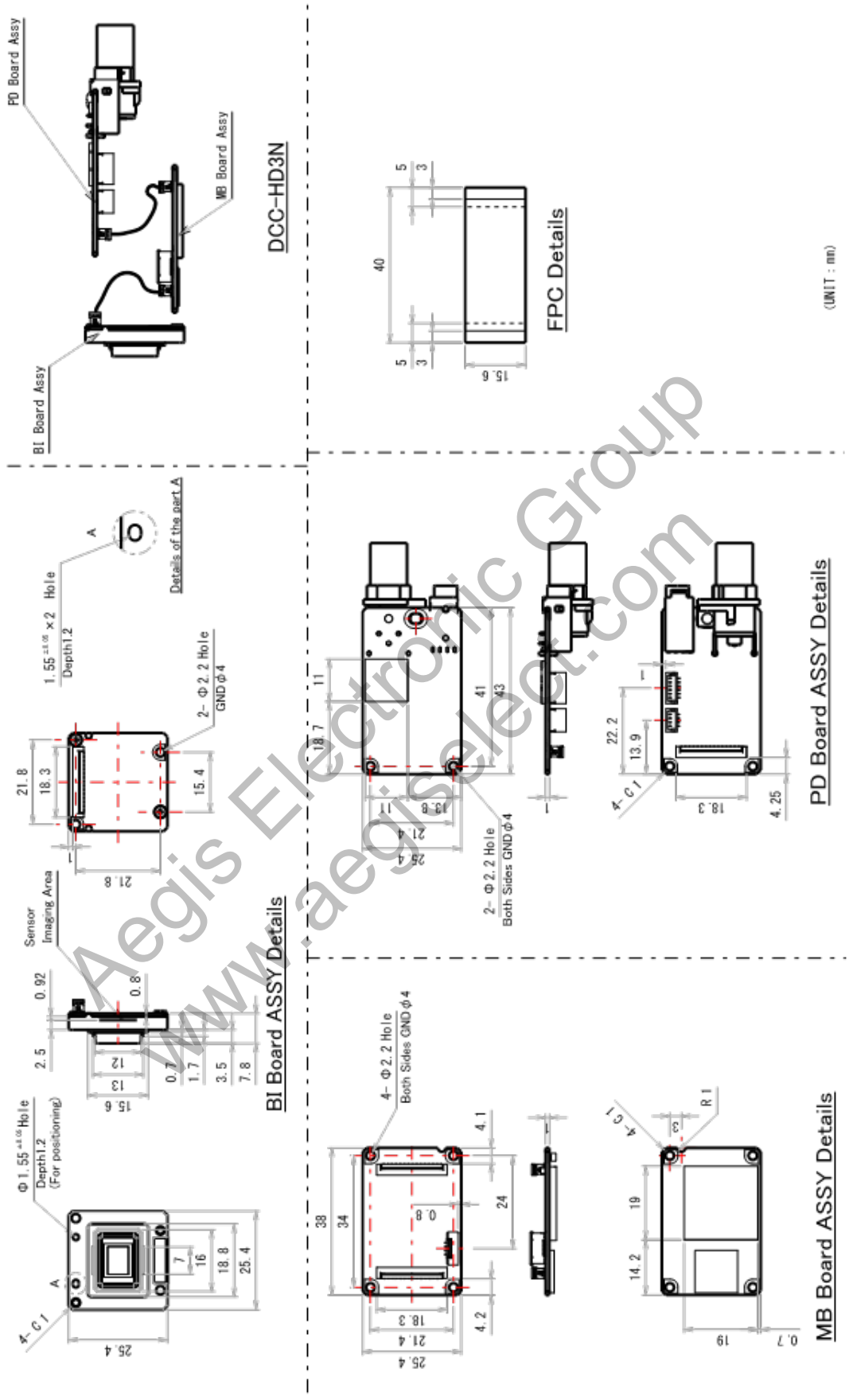
※Note 7) Differences may occur for the set value due to the power rebooting, changing format, and V phase/ H phase adjustment.

Top Menu	Setting Menu	Selected Items	Explanation
OSD Color Change	Default Set(White & Cyan)	None	To restore 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.
Flip	Horizontal Flip	OFF/ON	Horizontal flip OFF/ON.
	Vertical Flip	OFF/ON	Vertical flip OFF/ON.
INIT	None	None	To restore 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 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.

13. Factory Settings

Setting Items	Initial Settings
Video Format Setting	1920 x 1080i @60fps
Gain Mode	Auto
Gain Value (Manual Gain)	65536(0dB)
Max Gain	2097152 (30dB)
Shutter Mode	Auto
Shutter Limit Max	17476(1/60s)
Shutter Limit Min	77(1/13600s)
Shutter Value (Manual Shutter)	17476(1/60s)
DC Iris Mode	Open
DC Iris Response Speed	Mid
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	199
Manual Blue Gain	161
Color Correction	Standard
Color Suppression	5
Color Saturation	100
Edge Enhancement	2
Noise Reduction	0
Gamma	BT.709
Master Pedestal	0
Pedestal(RGB)	0
Color Balance (RGB)	100
LTC	OFF
OSD Menu Color	White
OSD Select Color	Cyan
H Flip	OFF
V Flip	OFF
GenLock V Offset	0
GenLock H Offset	0

14. Dimensions



935-0136-00

(Unit:mm)

15. Cases for Indemnity

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, flood 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.

16. 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.

17. 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.
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