BlueVision

Instruction Manual

SXGA 2 Wavelength Area Sensor Camera

Model: BV-C8220CL

Bluevision Ltd., Japan

Document Revision v.00

Revision note

Revision	Date	Contents	Note
00	2018/11/10	First issue, Preliminary	
01	2018/11/26	Frame rate calculation formula for ROI ((Offset_Y + Height + 79) * 1480) / 74.25 => ((Height + 79) * 1480) / 74.25	

- Contents -

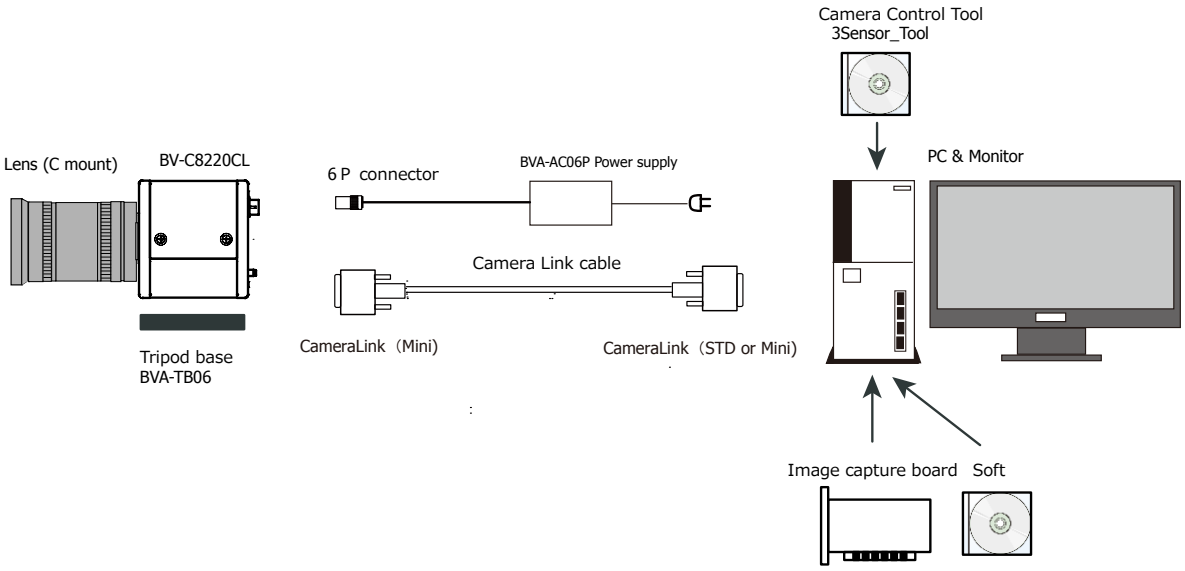
Preparation before using the camera

1. Necessary equipment

- Camera BV-C8220CL
- Lens： C mount, 1/3-inch or larger, Specially designed for 3CCD cameras
  Following lenses are available from Bluevison
  20mm,24mm,28mm,35mm,50mm,105mm
- Power supply: Optional BVA-AC06P (Hirose 6P) or equivalent
- Camera control soft： Sample soft "3Sensor Control Toll" is available.
  Install it to PC with RS-232C COM port.
  This is provided by CD-ROM.
  It includes 1) 3Sensor Control Tool.exe
  2) BV-C8220CL.ini
- Frame Graber board: Use the capture board for 3CCD RGB camera
- Camera link cable： Camera side: Mini CameraLink(SDR),
  Board side: Depending on the used capture board
- Others : PC, Monito TV、 Illumination

2. Preparation for shooting and basic settings of the camera and a Frame Graber board

1. Connection of equipment
   Connect necessary equipment.



2. The setting example of a Frame Graber board

The Frame Graber board to be used is required the type for 3CCD camera (RGB).
The BV-C8220CL is 2 CMOS camera using 2 CMOS sensors.
The interface through CameraLink® assigns a NIR signal for Port A and a Bayer signal for Port B and C. Refer the section 5.1 CameraLink bit assignment for the details.

2.1 The setting example

Camera	Area
Size	X size: 1440, Y size: 1080
Camera bit	24bit or 8bit 2-tap

Note: Refer to the operation manual of the Frame Graber board for the detail settings.

3. Installation of Camera Control Tool and initial settings of the camera

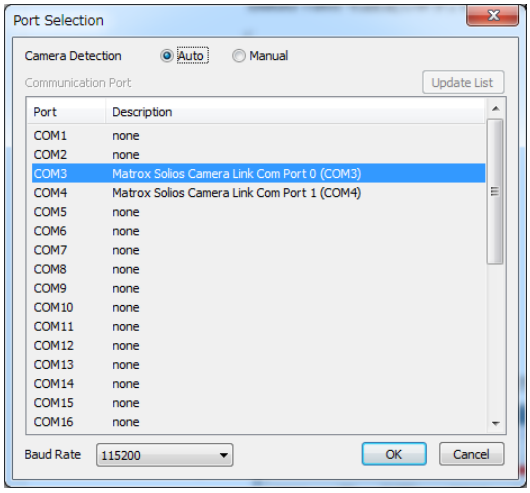
3.1 Turn on the power of PC.

3.2 Create a new folder such as BV-C8220CL.

3.3 Copy the exe file, "3Sensor_Tool.exe" and the initial setting file, "BV-C8220.ini" in the folder "BV-C8220CL".

3.4 Turn on the power of the camera and start up "3Sensor_Tool.exe".
The construction of "3 Sensor Control Tool" is automatically set by BV-C8220.ini".

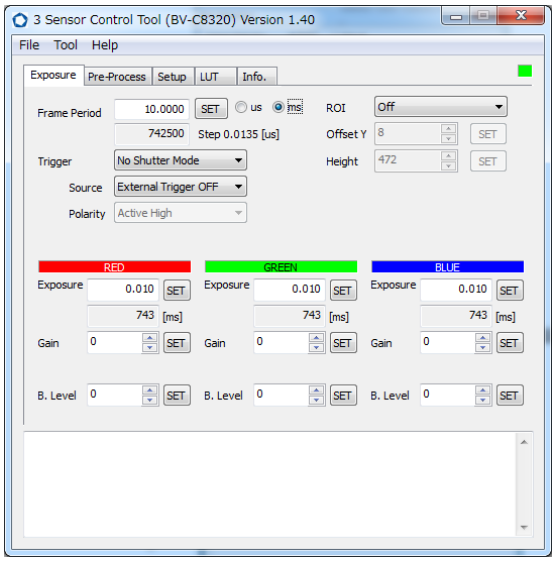
3.5 The following screen for Port and Baud rate settings will be displayed.
Select a com port in accordance with which is set in the frame grabber board.
And set a baud rate. The default setting is 115200.
If "Manual" is selected in Camera Detection, COM port can be selected.



3.6 After finishing the settings, click "OK" button.

3.7 Then the following window will be opened. The default settings of the camera will be displayed.

3.8 Now, it is ready to capture the image. Start up the Frame Graber board and start to capture the image. For the details of camera settings, please refer to the chapter 6, Camera setting.


3 Sensor Control Tool (BV-C8320) Version 1.40
File Tool Help
Exposure Pre-Process Setup LUT Info.
Frame Period 10.0000 SET us ms
742500 Step 0.0135 [us]
Trigger No Shutter Mode
Source External Trigger OFF
Polarity Active High
ROI Off
Offset Y 8 SET
Height 472 SET
RED GREEN BLUE
Exposure 0.010 SET
743 [ms]
Gain 0 SET
B. Level 0 SET

1. General

The BV-C8220CL uses two SONY IMX273 1/3" CMOS area sensors with global shutter and disperses to the NIR wavelength and the visible wavelength by utilizing newly developed prism optics. It provides FULL resolution with the high frame rate of 43 frames per second to capture images in the faster inspection process.

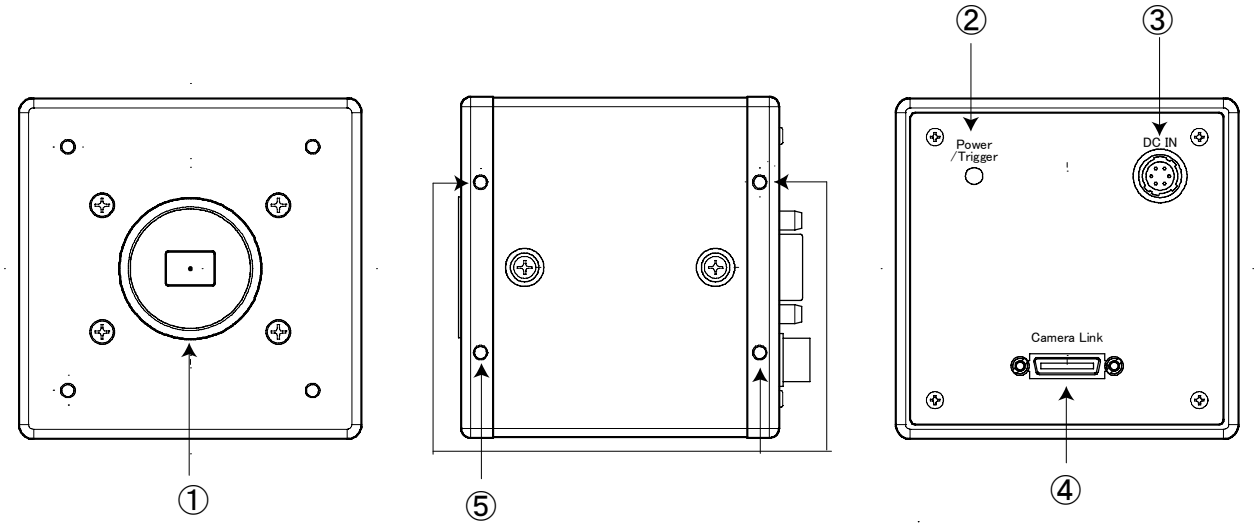
2. Specifications

Model name	**BV-C8220CL**		
Image sensor	Effective pixel: 1440H x 1080V Pixel Size: 3.45μm × 3.45μm Effective output image size: 4.736mm x 3.552mm Sony 1/2.9" Global shutter CMOS sensor IMX273		
Camera Link Pixel clock cycle	74.25MHz		
Frame cycle	Full resolution	43 fps (Full resolution, Max.)	
Standard illumination	Full resolution: 2000 Lx, (F 8.0, Shutter 1/45s, Gain 0 db, G pixel of Bch)		
Video S/N	More than 48dB which is theoretical s/n for 8bit output		
Frame cycle range	FULL: 1440(H) x 1080(V): 43fps ～ 1fps (2326μs ～ 1000000μs) FULL ROI 1440(H) x 960(V) 50fps		
Exposure range	Variable range: 10μs ～ "Frame cycle - 340μs") Variable unit: 1μs		
Gain	Rch(NIR),Bch(Bayer color)	0dB ～ +12dB	
Black level	Rch(NIR),Bch(Bayer color)	0 LSB ～ 31 LSB	
One push auto white balance	Applicable only for Bch(Bayer R,B gain adjust)	R variable range: -6dB ～ +12dB B variable range: -6dB ～ +12dB	
Shading compensation	Flat shading compensation ON-OFF		
ROI	FULL: Offset Y(Vertical): 0 ～ 1072/Height: 8 ～ 1080		
Edge enhancer	1) Edge enhancement 2) High frequency MTF compensation 3)Both Applicable only for Rch(NIR)		
Output format	Full resolution		
Image output	Camera Link	Base Configuration	8bit x 2
Operation mode	No Shutter mode(Trigger mode :OFF, Exposure mode: OFF)		
	Shutter select mode(Trigger mode: ON/OFF, Exposure mode: Timed)		
	PWC mode(Trigger mode: ON, Exposure mode: Pulse width)		
Trigger input	Camera link :LVDS (CC1) ※ Positive logic/ Negative logic selectable。		
Synchronization	Internal / External trigger		
SYNC output	LVAL	Camera link Tx24	
	FVAL	Camera link Tx25	
	DVAL	Camera link Tx26	
	EEN	Camera link Tx23	
Test pattern	Color Bar / Gradation （Horizontal/Vertical）		
Serial communication interface	Camera link :EIA644 Baud rate:115200bps		
Power supply	Input voltage range	DC :12V ～ 24V	
	Current consumption	Typical : 0.4A (at 12V input)	
		Max : 0.5A (at 12V input)	
Lens mount	C Mount		
Flange back	17.526mm Tolerance 0 ～ -0.05mm		
Optical axis accuracy	Center ± 0.1mm(max.)		
Operating temperature/Humidity	- 5℃ ～ +45℃ / 20 ～80% (non-condensing		

Storage temperature/Humidity	-25℃ ～ +60℃ / 20 ～80% (Non-condensing)
Anti-vibration	3G (20Hz～200Hz XYZ directions)
Anti-shock	50G
Regulation	CISPR32/EN55032 Class A
Outlook dimensions	70(W) x 70(H) x 65(D) mm (excluding protrusion and lens mount)
Weight	320g
Connector・LED	・Mini Camera link (SDR) Function：Image output/Communication/External trigger/EEN ・Hirose 6Pin Function: Power input/EEN output ・Rear Panel LED Function：Indications for power input, operating status and trigger input
Other	Field upgrade function Memory function: Each one frame of R,G and B channels can be stored.

3. Parts allocation and functions

3.1 Parts allocation



Front Bottom Rear

① Lens mount: BV-C8220 uses C mount and applicable lenses are 1/3-inch or larger 3CCD compatible C mount lenses

The following are available for Bluevision

BV-L1020-C	20mm f2.8
BV-L1024-C	24mm f2.8
BV-L1028-C	28mm f2.8
BV-L1035-C	35mm f2.8
BV-L1050-C	50mm f2.8
BV-L1105-C	105mm f2.8

② LED: Indicate the power input and trigger input

③ 6P connecter: Input DC 12V to 24V/EEN output
(Refer to sections 4.3 and 4.4 for the pin assignment)
Note: BVA-AC06P is available as an option

④ Camera Link connector: Mini camera link connector for image output and trigger input
(Refer to sections 4.1 and 4.2 for the details)

⑤ Holes for tripod base These four holes are prepared for attaching the optional tripod base, BVA-TB06 or mounting the camera to the system.
These four holes are also located on the top of the camera.

3.2 LED indication

- Orange lighting: Initializing the camera
- Green lighting: In operation
- Green flashing: Receiving an external trigger

4. Connector pin assignment

4.1 Image output connector Camera link：12226-1100-00PL (3M)

Pin assignment Digital I/F

Camera connector		Cable Name	Channel Link Signal	Note
-	+			
1	14	Inner Shield	Inner Shield	GND
2	15	Pair 1	X0 out	Data
3	16	Pair 2	X1 out	Data
4	17	Pair 3	X2 out	Data
5	18	Pair 4	Xclk	Clock
6	19	Pair 5	X3 out	Data
7	20	Pair 6	SerTC	Serial
8	21	Pair 7	SerTFG	Seral
9	22	Pair 8	CC1	Trigger
10	23	Pair 9	CC2	NC
11	24	Pair 10	CC3	NC
12	25	Pair 11	CC4	NC
13	26	Inner Shield	Inner Shield	GND

Note: As for the bit allocation for TxOUT 0 to 3, refer to section 5.1 Camera link bit allocation.

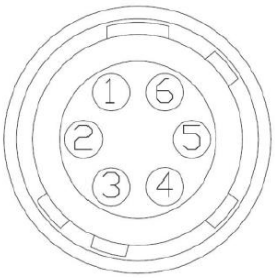
4.2 Compatible connector/Cable Ass'y

No.	Manufacture	Type	Note
Camera side	3M	12226-1100-00PL	
Cable Ass'y	3M	1SF26-L120-00C-xxx	Standard type
	Hirakawa Hewtech	CLS-SS0-SS0-HFCD1-XXXX-00K	

Note 1. "XXX" means a cable length. The compatible cable length is 1 to 7m.

Note 2. If the cable is not compliant with CameraLink® specifications, the cable length is limited to transfer the data.

4.3 Hirose 6Pin connector：HR10A-7R-6PA(73)(Hirose)



No.	Signal name	Note
1	DC in	DC12～24V
2	N.C.	N.C.
3	N.C.	N.C.
4	EEN	Open collector Load condition: Voltage: less 12V Current: less 35mA
5	GND	
6	GND	

4.4 Compatible connector

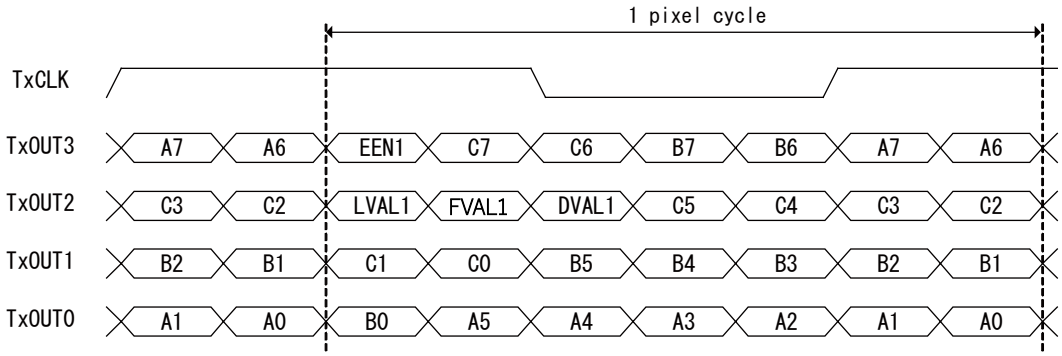
No.	Manufacturer	Type	Note
Camera side	HIROSE	HR10A-7R-6PA(73)	
Cable side	HIROSE	HR10A-7P-6S	plug *

5. Signal Output

5.1 Camera link bit allocation

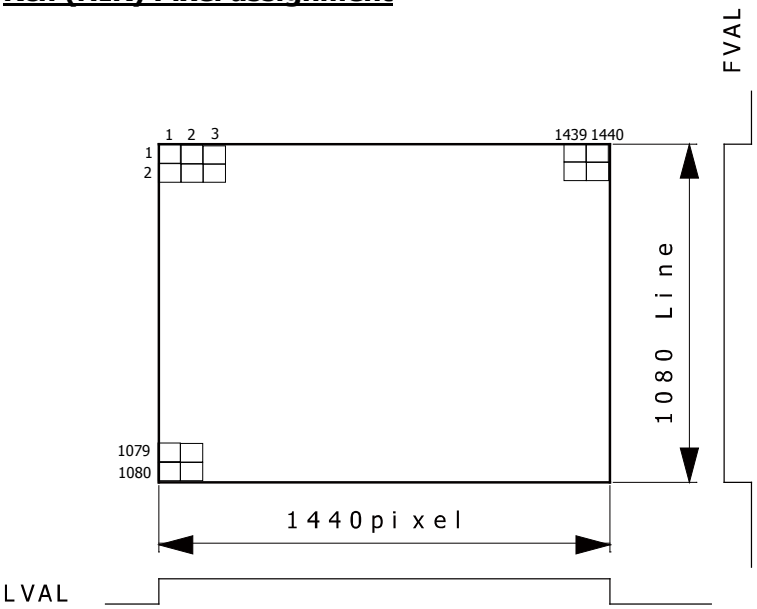
Port/Signal	8bit RGB Output	Connector	Pin Name
LVAL	—	1	TX24
FVAL	—	1	TX25
DVAL	—	1	TX26
EEN	—	1	TX23
Port A0	R0(NIR)	1	TX0
Port A1	R1(NIR)	1	TX1
Port A2	R2(NIR)	1	TX2
Port A3	R3(NIR)	1	TX3
Port A4	R4(NIR)	1	TX4
Port A5	R5(NIR)	1	TX6
Port A6	R6(NIR)	1	TX27
Port A7	R7(NIR)	1	TX5
Port B0	B0(Bayer Color)	1	TX7
Port B1	B1(Bayer Color)	1	TX8
Port B2	B2(Bayer Color)	1	TX9
Port B3	B3(Bayer Color)	1	TX12
Port B4	B4(Bayer Color)	1	TX13
Port B5	B5(Bayer Color)	1	TX14
Port B6	B6(Bayer Color)	1	TX10
Port B7	B7(Bayer Color)	1	TX11
Port C0	B0(Bayer Color)	1	TX15
Port C1	B1(Bayer Color)	1	TX18
Port C2	B2(Bayer Color)	1	TX19
Port C3	B3(Bayer Color)	1	TX20
Port C4	B4(Bayer Color)	1	TX21
Port C5	B5(Bayer Color)	1	TX22
Port C6	B6(Bayer Color)	1	TX16
Port C7	B7(Bayer Color)	1	TX17

（Output timing）

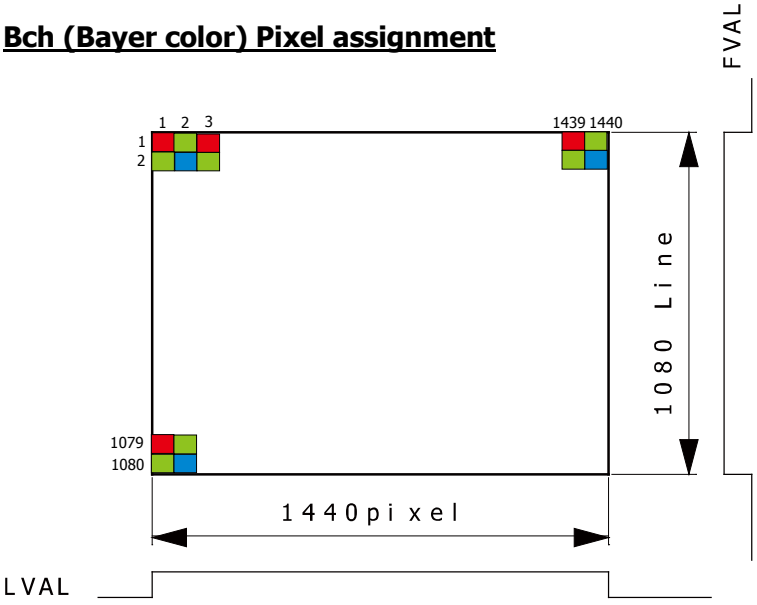


5.2 Pixel assignment of the sensor and timing

Rch (NIR) Pixel assignment

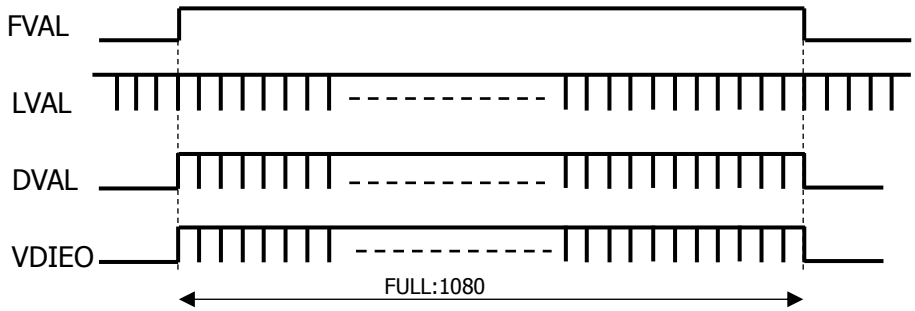


Bch (Bayer color) Pixel assignment

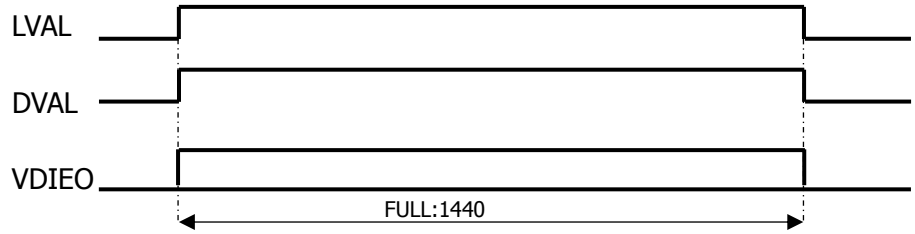


Video output timing

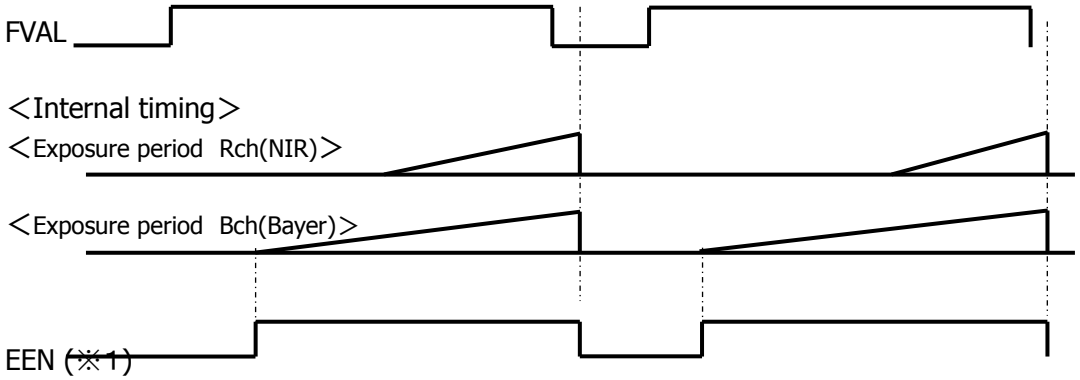
■ **Vertical timing**



■ **Horizontal timing**

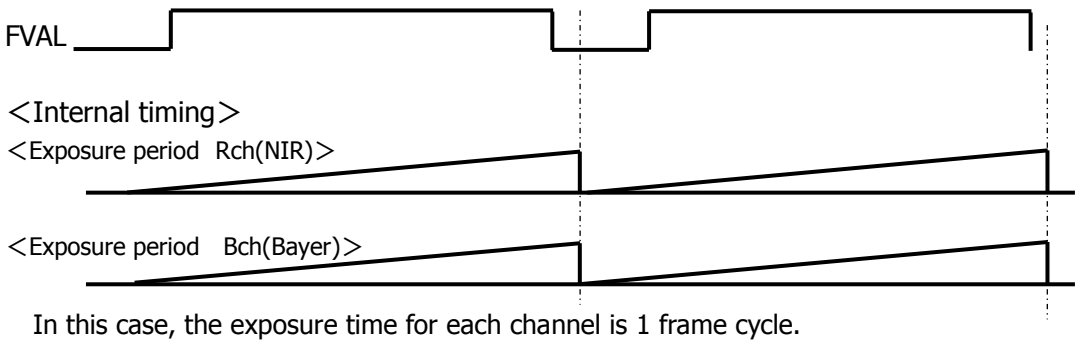


5.3 Exposure timing: Trigger source= External trigger OFF, Exposure mode= Timed



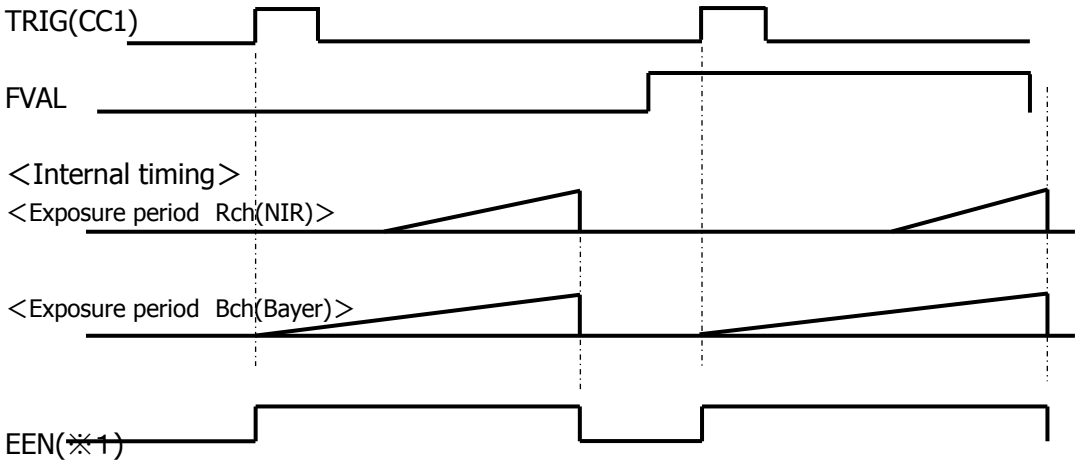
※1:EEN in this drawing uses Bch(Bayer) exposure period. It is possible to change it to Rch(NIR).

5.4 Exposure timing: Trigger source= External Trigger OFF, ExposureMode= OFF



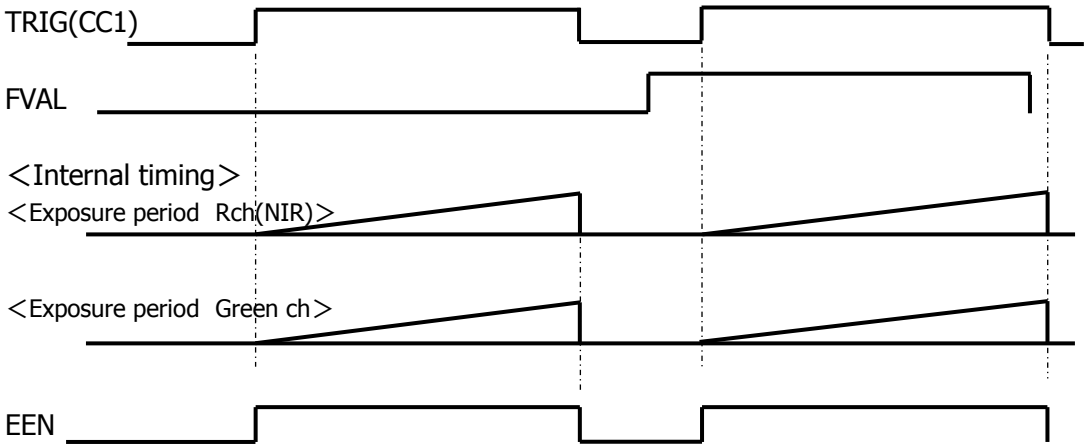
In this case, the exposure time for each channel is 1 frame cycle.
EEN output is fixed at HIGH.

5.5 Exposure timing: Trigger Source= External Trigger ON, ExposureMode=Timed



※1: EEN in this drawing uses Bch(Bayer) exposure period. It is possible to change it to Rch(NIR).

5.6 Exposure timing: Trigger source= External Trigger ON, ExposureMode= PulseWidth



※1:The exposure period for Rch and Bch is the same for all.

The exposure period equals to the duration of HIGH level of the trigger.
If the trigger polarity is set at "LOW level", the exposure period is the "LOW level" of the trigger.

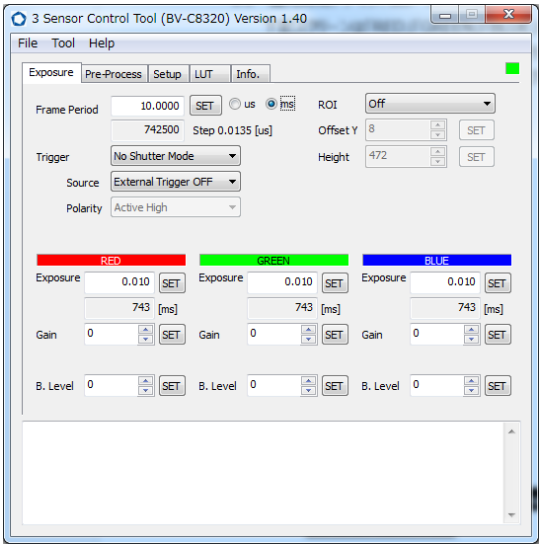
6. Camera setting

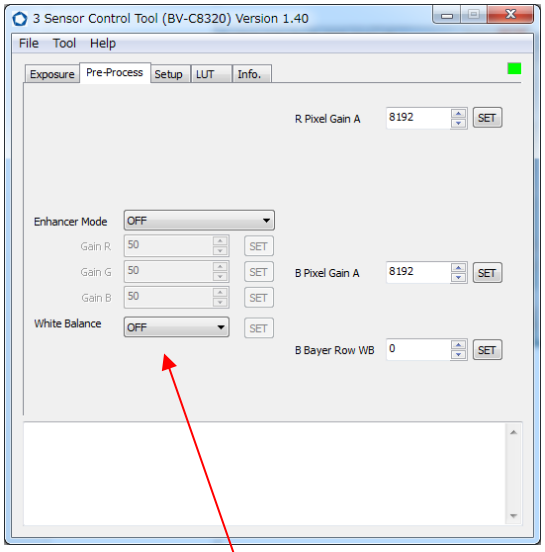
Note: In the following GUI pictures, RED means for Rch(NIR) and BLUE does for Bch(Bayer) GREEN is not used.

6.1 Setting of the exposure, gain and black level

The following screen is for the adjustment of the exposure, gain and black level for "Rch(NIR)" and "Bch(Bayer color)" channels.

The gain can be set by inputting the value and clicking "SET". The value is from 0 (0dB) to 120 (12dB), and 1 step is 0.1dB.





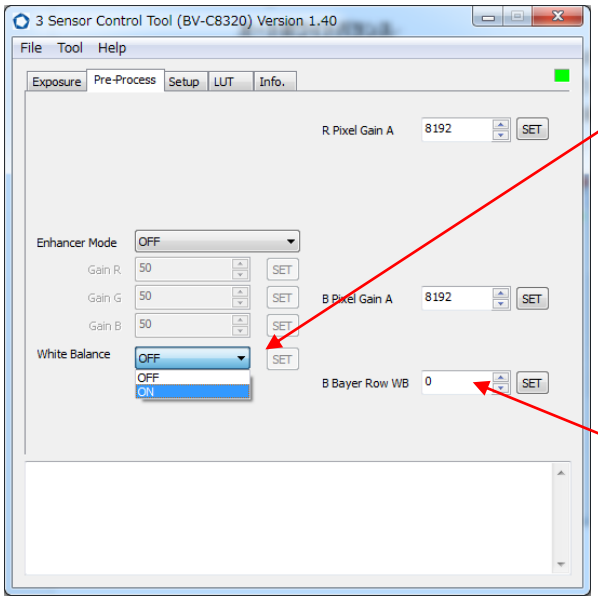
NOTE: When the gain is set, "White Balance" in the "Pre-Process" screen must be set at "OFF".

6.2 Setting the "Pre Process"

Auto white balance

This function is available only for Bch(Bayer RGB).

The auto white balance is one time adjustment.
When "White Balance" is selected "ON", then the white balance adjustment is executed.
The detecting area for the white balance adjustment is 480 pixels x 360 pixels in the center of the picture. Please shoot the object in this area. When adjusting, set the gain of R,G and B pixels of Bch(Bayer) should not be saturated.
"Auto White Balance" is also done by inputting "32" directly in the "B Bayer Row WB" box.



When selecting "ON" in the pull down menu of "White Balance", it activates the white balance adjustment at only that instant.

If selecting "OFF", the white balance reverts to the condition before the white balance is done.

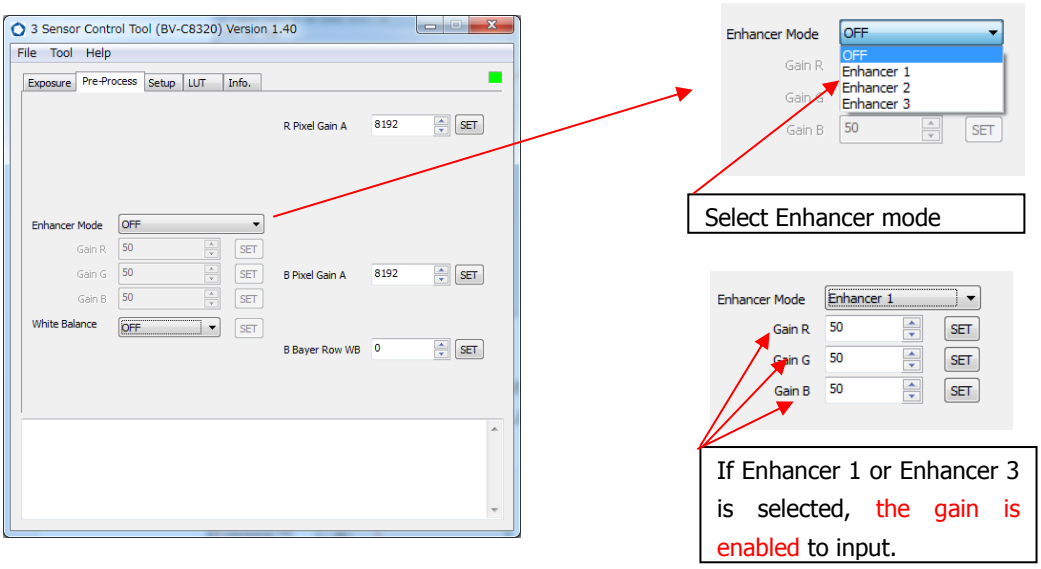
Alternative way to set the white balance

Input "32" and click "SET".

6.3 Setting of "Edge Enhancer"

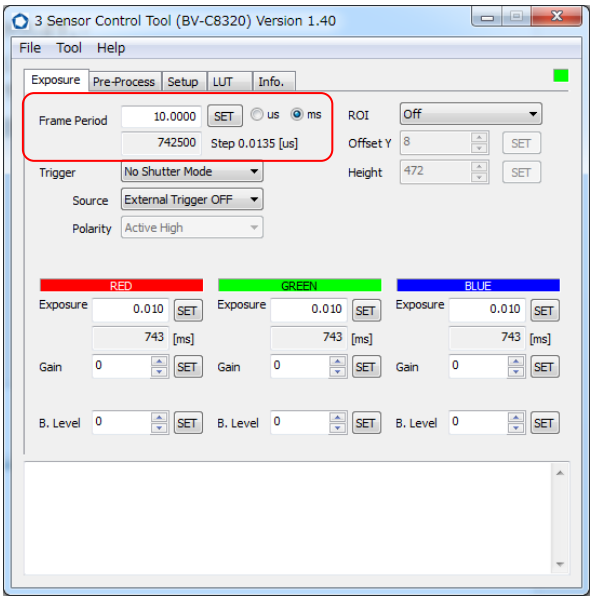
This function is available only for Rch(NIR).

"Edge Enhancer" emphasizes the edge of the image or compensates MTF or both.
This setting is available in "Pre-Process" tab.
This has three modes, Enhancer 1, 2 and 3.
Enhancer 1: Emphasize the edge of the image.
It is recommended to use the gain value from 0 to 100.
Enhancer 2: Compensate MTF deterioration on high frequency area.
Enhancer 3: Perform both edge enhancement and MTF compensation.
OFF: No edge enhancement is used



6.4 Setting of the frame cycle (frame rate)

Select "Exposure" tab on the control tool.
Input the frame rate in "Frame Period" box. The unit is displayed by μs or ms. The picture shows 10ms which is 100 fps.
It is possible to select "μs" or "ms" on the right side of "SET" button.

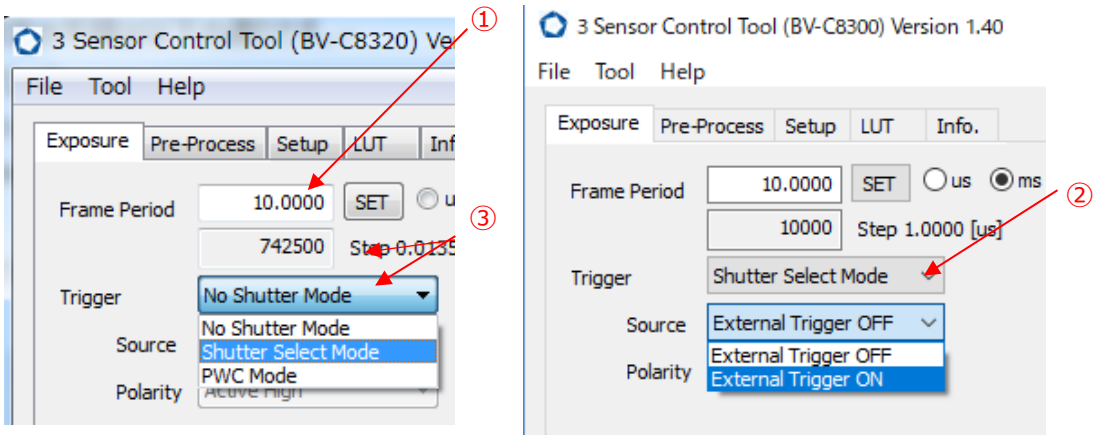


6.5 Setting of the continuous operation (Trigger mode OFF)

This is the setting of Trigger mode OFF.
The continuous operation is set in "Exposure" setting screen.
The camera operates in a free running mode.

The setting procedure for this operation is as follows.

① Input the frame cycle. The unit is micro second (μs).
② In the "Trigger" drop down menu, select "External Trigger OFF".
③ In the "Source" drop down menu, select "No Shutter Mode" or "Shutter Select Mode".
NOTE: PWC mode cannot be used in this operation mode.



NOTE: The exposure time must be set within the range of the frame cycle.
If the exposure time is to set longer period than the frame cycle, the frame cycle should be adjusted to the longer than or equal to "Exposure time + 10μs" again.

6.6 Setting of the trigger mode

Two trigger modes are available.

1. Shutter select mode

   The exposure can be set for Rch(NIR) and Bch(Bayer) individually.

   In this mode, as the end of the exposure for each channel is set at the same timing, the exposure will start from the channel having the longest exposure time.

   Other channels will start with some delay so that the end of the exposure will be at the Same timing.

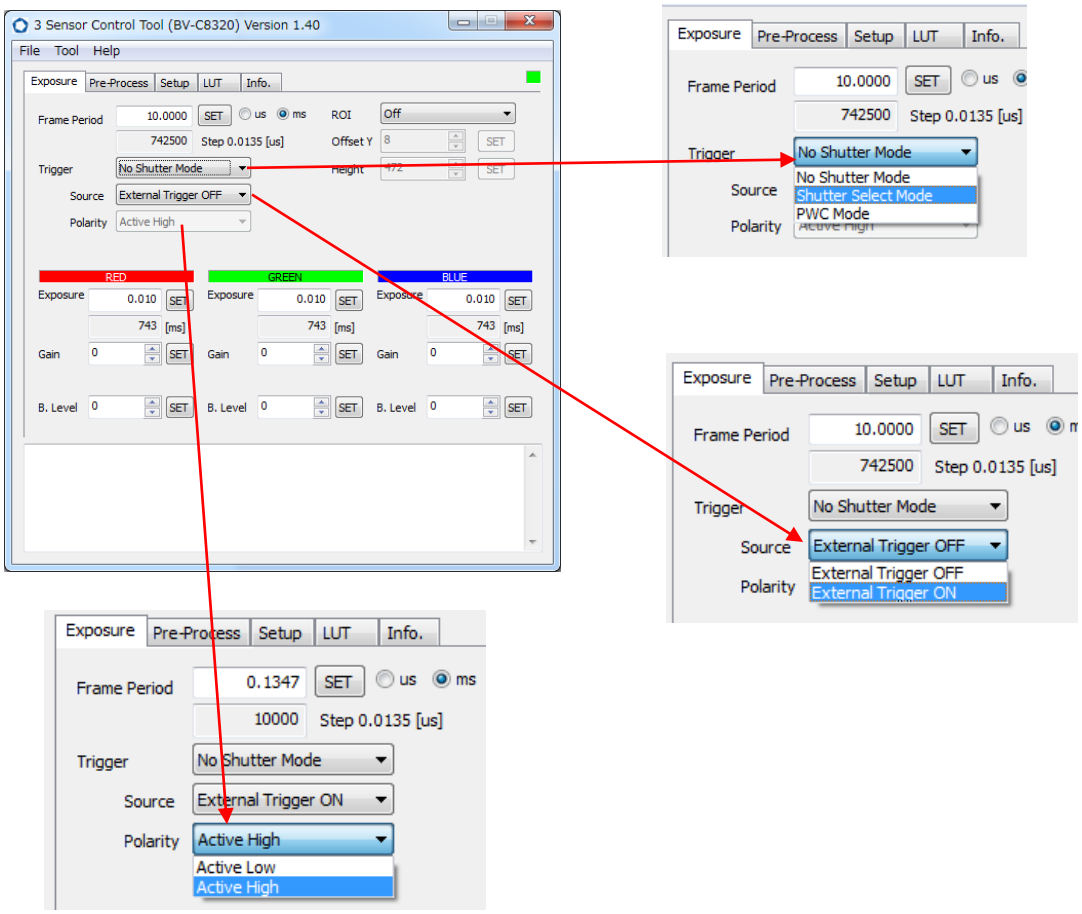
2. PWC mode

   The exposure for each channel is controlled by the trigger pulse width.

   The exposure time is always the same for two channels and the white balance is adjusted by the gain only. The exposure time cannot be used for the white balance.

The trigger can be set as the following procedure.

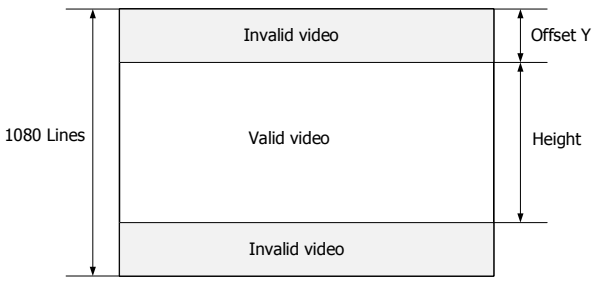
1) In the dropdown menu of "TRIGGER", select "Shutter select mode" or "PWC mode".
2) In the dropdown menu of "Source", select " External Trigger ON".
3) In the dropdown menu of "Polarity", select the polarity of the trigger to be applied.



4) After the setting s from 1) to 3) are finished, the trigger becomes the waiting condition. When the trigger pulse is input to the camera link CC1, the image is output after the exposure is completed.
In order to indicate when the camera receives a trigger pulse, the LED located on the rear panel will light off at the time when the camera receives one trigger pulse.
However, if the cycle of the trigger pulse is less than 0.25s, LED will periodically flash.

6.7 Setting of the vertical ROI

In the "Exposure" tab, the vertical ROI function is available. This sets vertical lines to capture.
Setting parameters are the start line (Offset Y) and line number (Height).
The following drawing shows the relations between Offset Y and Height.
When ROI mode is used, the frame rate is faster than the full image readout.
The following is the calculation formula to get higher frame rate by using ROI function.

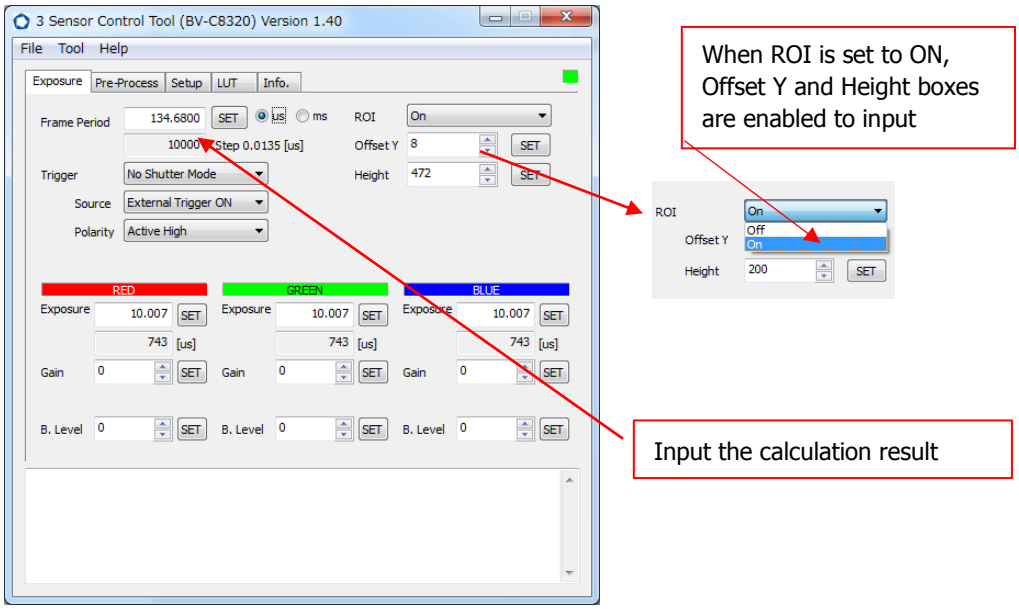


Frame rate calculation formula for ROI

Frame_cycle(us)

= ((Height + 79) * 1480) / 74.25

NOTE: "Offset Y + Height" should be less 1080.



6.8 Setting of the "SET UP"

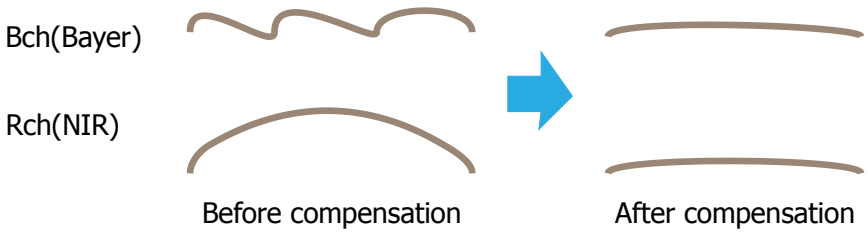
In this screen, the shading, test pattern display and user set to save the data can be configured.

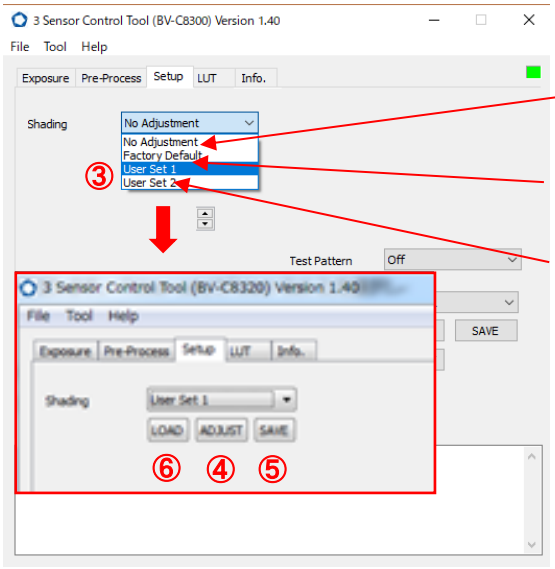
Shading compensation

This compensates the shading caused by mainly lens and prism optics.

This function compensates the level difference of maximum 30 % against pixels at the center.

The following drawing is the sample image.





⑦

No Adjustment: Shading compensation OFF

Factory Default: Use factory default value

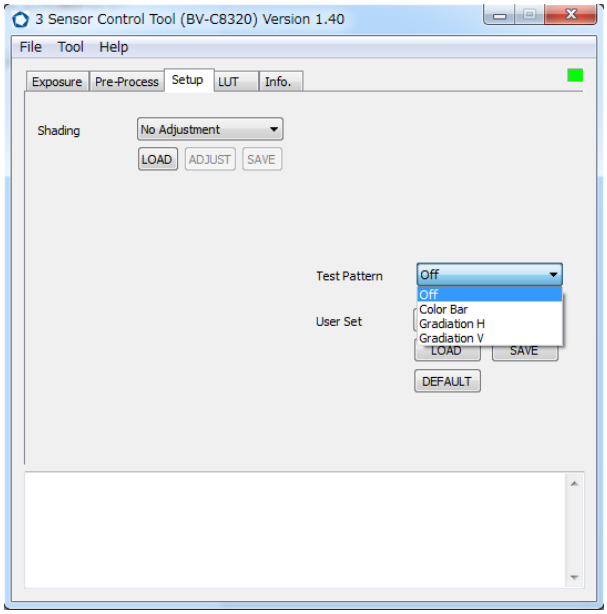
User Set 1,2: Execute the saved data

Procedure

1) Shoot the uniform white object and activate the auto white balance..
2) Adjust the video level of Rch(NIR) and Bch(Bayer) ~~, G and B channels~~ so that the level of each channel becomes 50% to 90%.
3) Select "User Set 1" or "User Set 2" in the dropdown menu of "Shading".
4) Click "LOAD" button.
5) Click "ADJUST" button. The shading compensation will be executed.
6) Click "SAVE" to save the compensated condition.
7) When the compensated data is reused, select the saved file, "User Set 1" or "User set 2" and click "LOAD" button.
8) In order to make the shading compensation OFF, select "No Adjustment" in the dropdown menu and click "LOAD" button. Then the shading status returns to the condition before the adjustment is executed.

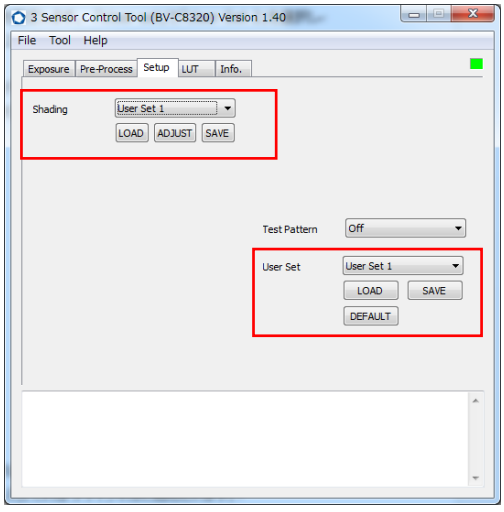
Test pattern and User set

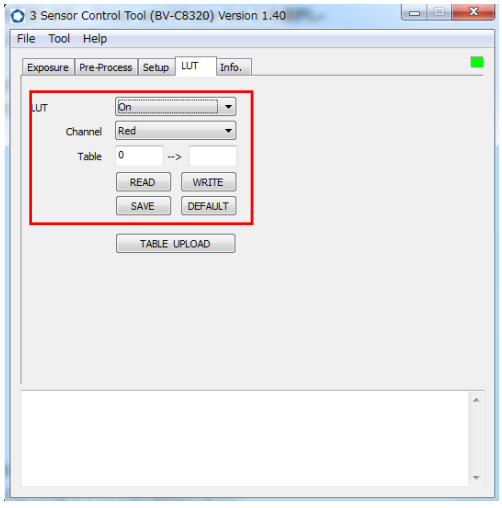
Test pattern can be selected from color bar, gradation H and gradation V.



In this screen, the data can be saved or loaded. Click "User set" pull down menu and select "User Set 1" or "User Set 2". Click "SAVE" to save the data or click "LOAD" to load the data. "DEFAULT" sets the data area at the next start-up. If "User set" is set to User set 2, and "DEFAULT" is clicked, the user set 2 is the next start up area.

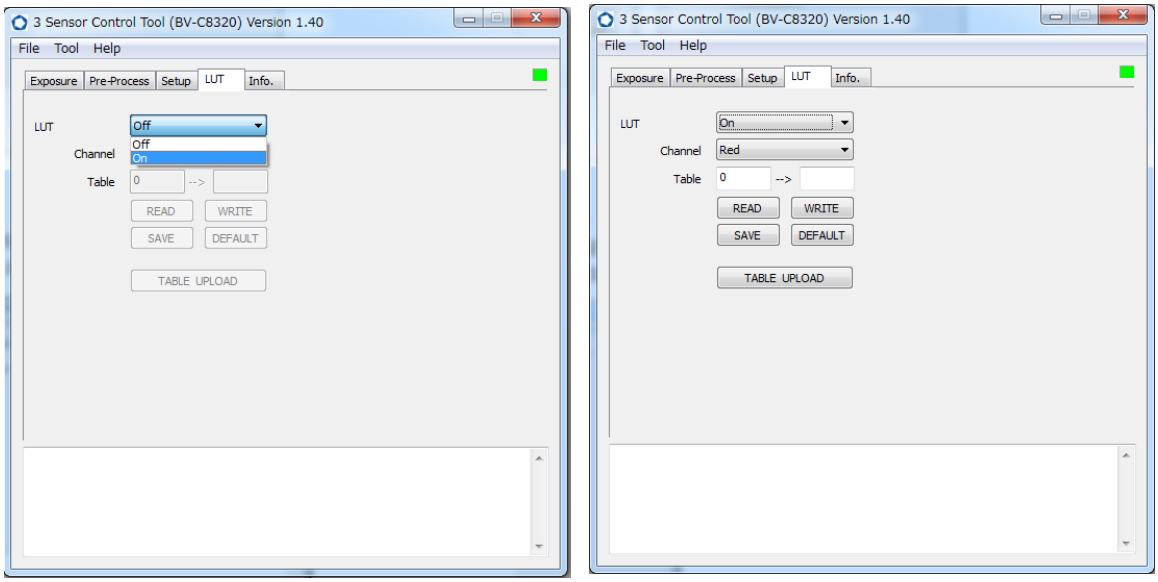
The data means all setting data in this control tool but LUT data and Shading compensation data must be saved or loaded in each screen.





6.9 Setting the Gamma and LUT

In this screen, "LUT (Look Up Table)" can be configured.
This function can change the characteristics of the output image. This is applied to Rch(NIR), Bch(Bayer RGB) respectively.
If "LUT" is set to OFF, the video characteristics from the dark to bright is linear (γ =1.0).
This is applied to Rch(NIR) and Bch(Bayer RGB) at the same time.



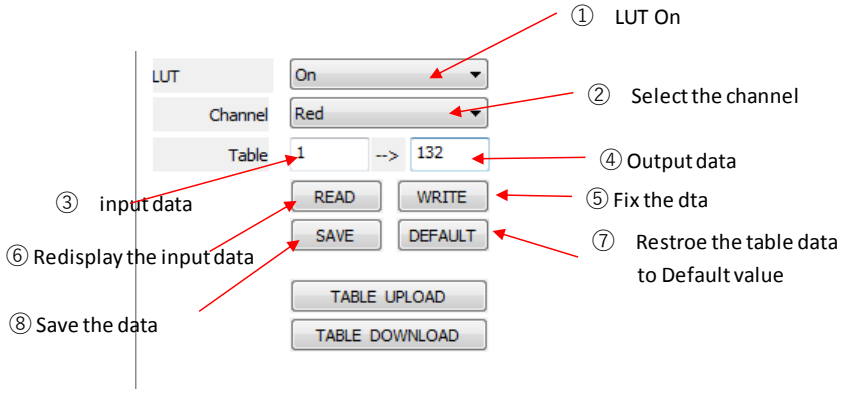
In the dropdown menu of "Channel", Rch(NIR) or Bch(Bayer) is selected to input the data of table.
If the data for R(NIR) channel table is to input, this should select "RED" and the same for other channel.

The way to input the table.

1. Input the data one by one.

1) Use Table.

2) As an example, set the output 132 against input 1
Input as following drawing and click "Write".
In order to check the input data, click "READ".

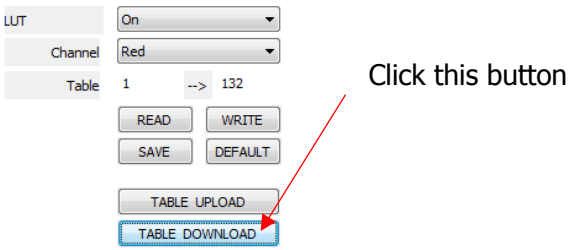


2. To prepare the input and output data table in advance

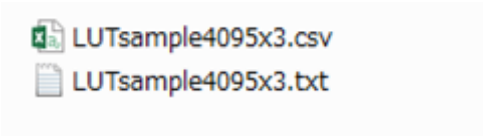
The data format is .txt or .csv. And Click "TABLE DOWNLOAD" to transfer the prepared data to the camera.

Procedure

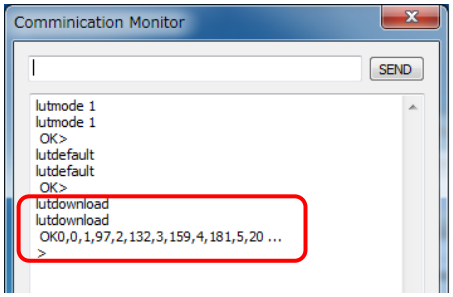
1) Prepare the data table in the folder, for instance "LUT data".
2) Click "TABLE DOWNLOAD".



3) Open "Communication monitor" in "TOOL" tab in order to monitor the data download result.
4) Open the LUT data in.txt or .csv. Then the writing the data to the camera will start. The following is an example of the data table.

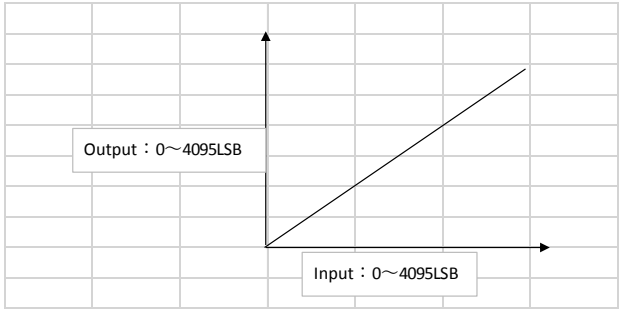


5) When the data was written completely and successfully, "Communication Monitor" displays as follows. At the end of the script, it shows ">".



ABOUT LUT data

Although the camera output is 8bit (0 - 255), the LUT table uses 12bit (0 – 4095)
The camera output uses upper 8bit.



LUT data format is .txt or .csv

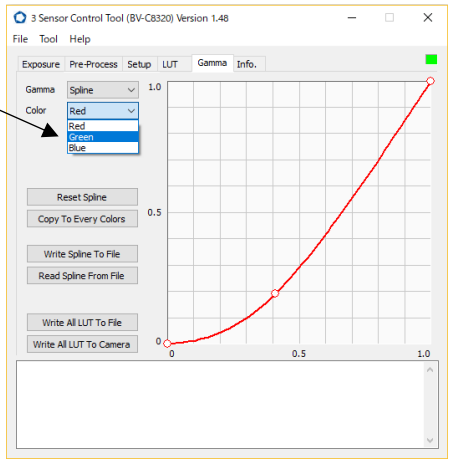
input value,output value,input value,output value・・・・・

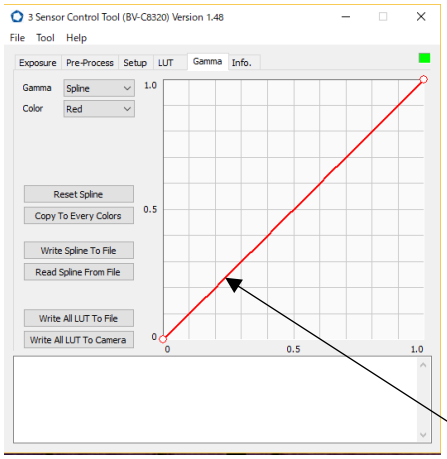
Example: 0,1,1,20,2,33,3,43 ・・・・・・・・4094,3033,4095,3034

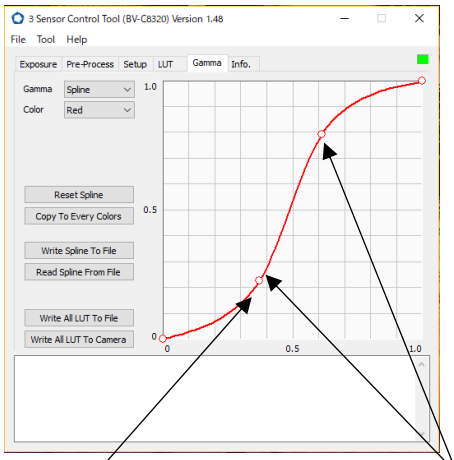
3. Setting LUT using LUT curve

The LUT data is created and set by changing the LUT curve in “GAMMA” screen.

LUT curve is set for Rch(NIR) and Bch(Bayer) respectively. Select the LUT curve of Rch(NIR) or Bch(Bayer) in the drop down menu of “Color”.
As GREEH is not used, it is disabled.



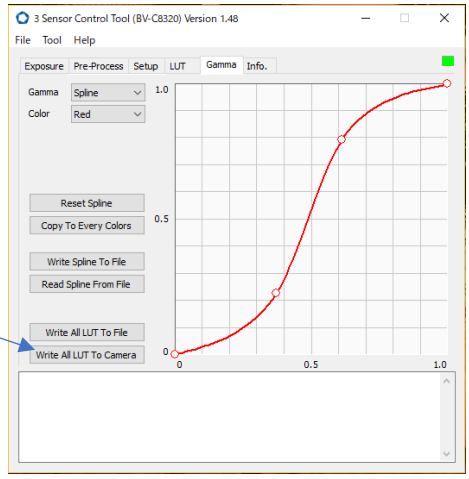




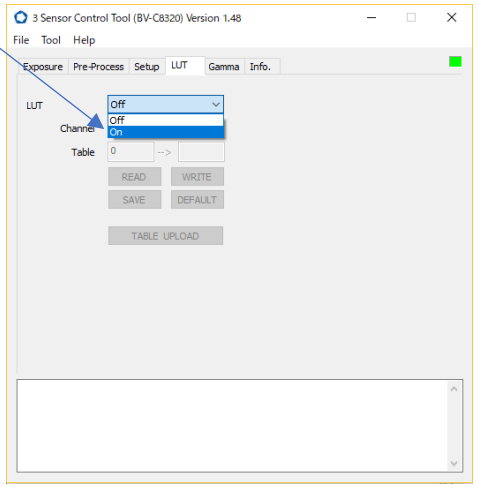
Modify the curve by dragging the point by the mouse. Maximum two points can be modified.

When click modified points by the right button of the mouse, modified points can be reverted.

After setting each LUT of Rch(NIR) and Bch(Bayer), click “Write All LUT To Camera” button. The LUT data can be transferred to the camera.



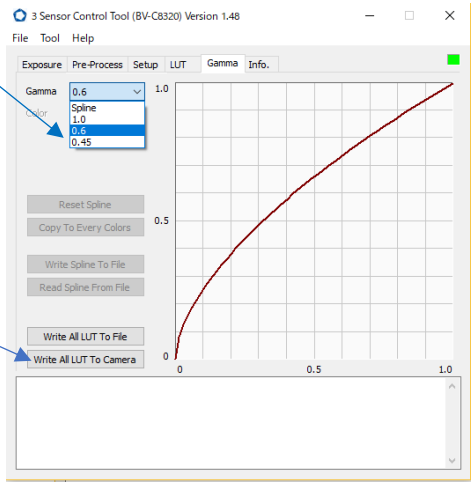
Select "ON" in the drop down menu in the "LUT" screen. The LUT data transferred to the camera is applied to the video image.。



4. Setting the GAMMA curve

Two types of the GAMMA curve can be selected.

Select either 0.6 or 0.45 in the dropdown menu.
The characteristics is the same for Rch(NIR) and Bch(Bayer).



After the gamma characteristics is selected, click "Write All LUT To Camera" button to transfer the gamma data to the camera.
After the transfer is completed, select "ON" in the dropdown menu of "LUT" screen.
The transferred data will be applied to the video image.。

5. Description of each button in the Gamma screen

Gamma box:
Spline：LUT curve
1.0 : GAMMA 1.0
0.6 : GAMMA 0.6
0.45 : GAMMA 0.45

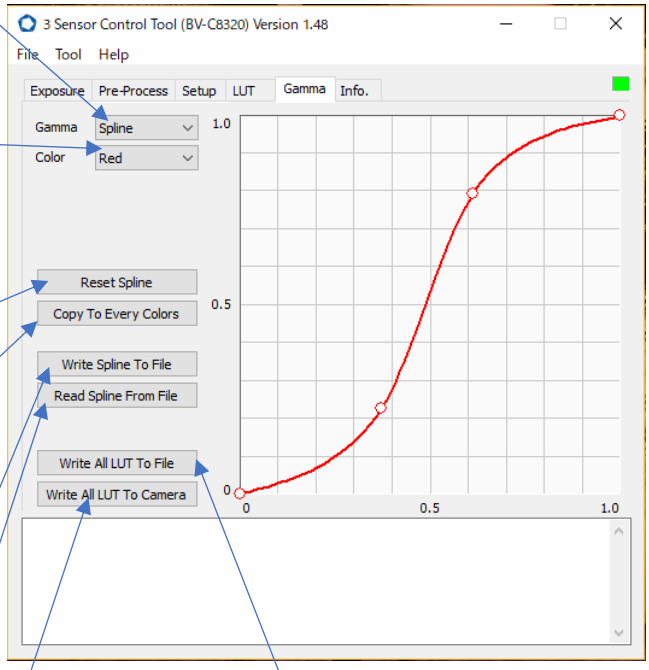
Color box:
When "Spline" is selected, "Color" box can show Rch(NIR) or Bch(Bayer to select.pectively.

Set "LUT" curve back to the gamma 1.0.

Copy "LUT" curve to other channels. A "LUT" curve for any one channel of Rch(NIR) or Bch(Nayer) is set and when "Copy To Every Colors" button is clicked, its "LUT" curve will be copied to other channel.。

Output the "LUT" curve by "Spline" as the file.

Read the "LUT" curve by Spline from the file,

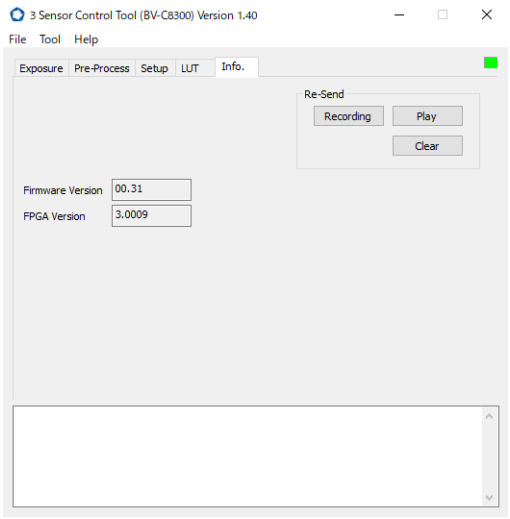


Output the "LUT" data of each Rch(NIR) or Bch(Bayer) as the file.

Transfer the "LUT" data of each Rch(NIR) or Bch(Bayer) to the camera.

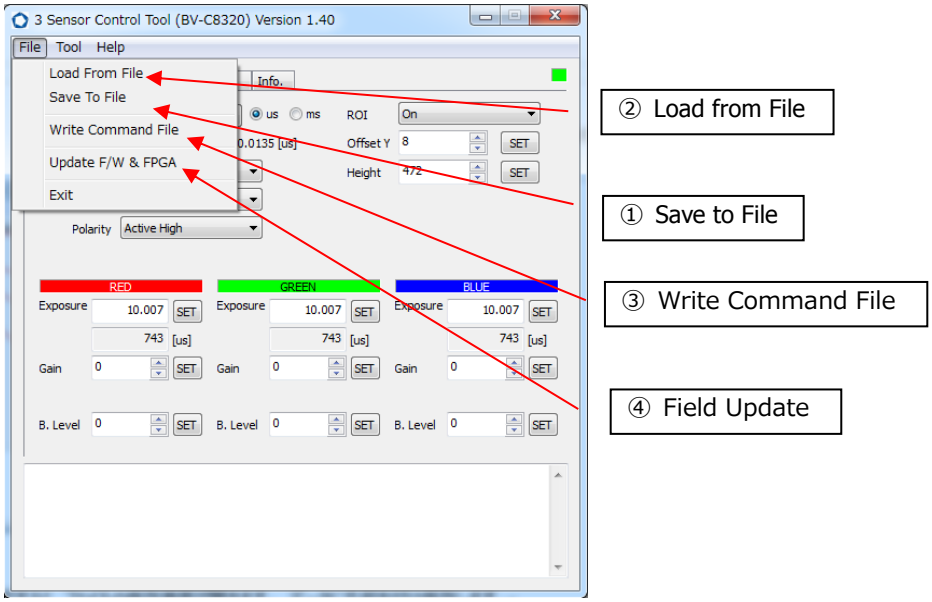
6.11 formation tab

This shows the firmware version and FPGA version.



6.12 File tab

In the file menu, the camera setting data can be saved or loaded in the .txt file format.



① Save to File

When "Save to File" is selected, File Save Screen will be opened.
Create the file name to the data and save it.

② Load from File

When "Load from File" is selected, the folder which has the saved data will be opened.
Select the necessary file and open it.

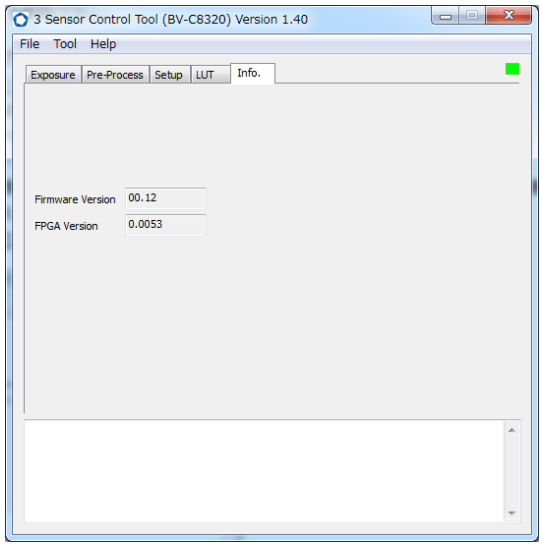
③ Write Command File

Refer to the section 6.12 TOOL.

④ Field Update

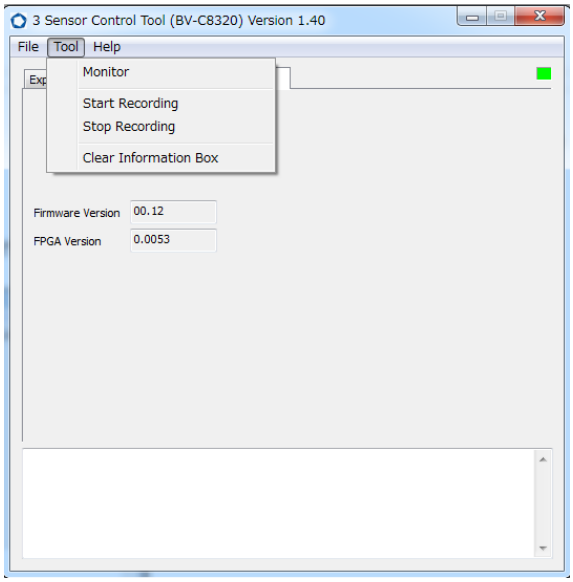
In order to update the firmware and FPGA, click Update F/W and FPGA.

1) Select Update F/W and FPGA and open the folder.
2) Select the .zip file for the update.
3) Click "Open" to write the update file.
4) While the data is written, the progress for data transferring is displayed. When the progress display is disappeared, the data is completely written. It will take approx. 30 minutes.
5) Updated version for Firmware and FPGA can be confirmed in "Info." Screen.



6.13 Tool tab

In this screen, they are used to supprt command input and save.



1) Monitor

This is to input commands by TEXT.

After input, OK or Error, other infomation will be returned.

This is mainly used to confirm the LUT data after writing.

2) Start Recording and Stop Recording

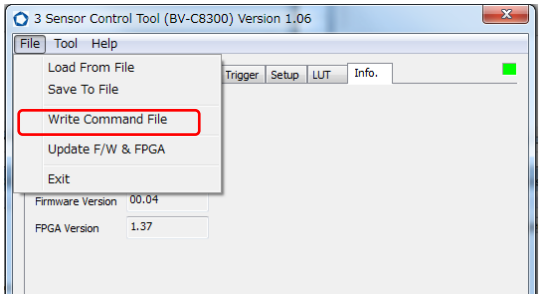
The data set in the tool screen are recorded sequencially.

After recording, it is possile to reproduce by "Write command file" in "FILE" tab.

a) If "Start recording" is selected, the folder to save the data will be opened. The file type is the text files (*.txt). Then create arbitrary file name such as "Command_record" and save it.

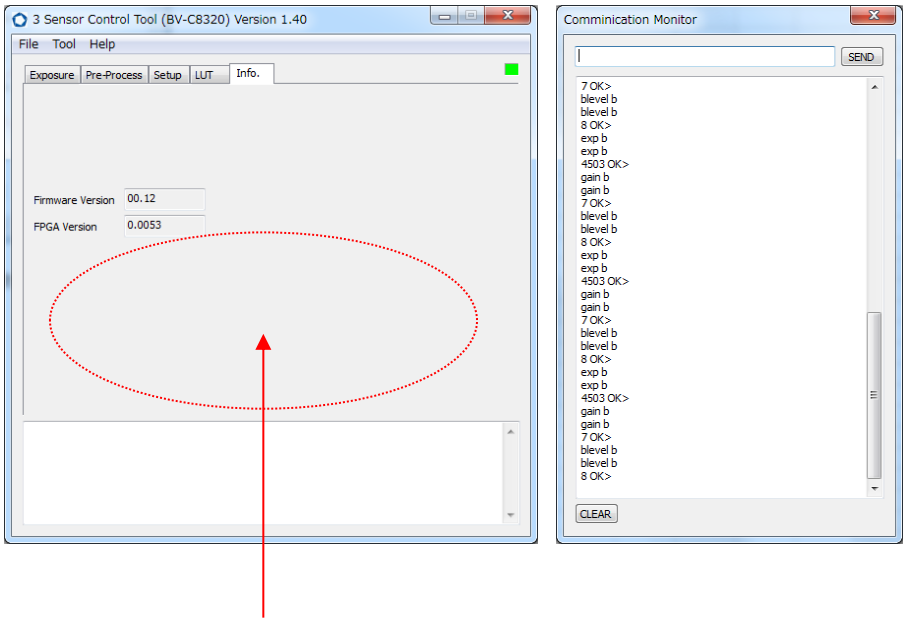
b) After recording is finished, click "Stop recording".

c) In order to reproduce the recorded file , select "Write Command File" in "FILE" tab.



d) The folder to record the data will be opened and select the recorded file "Command_record.txt".

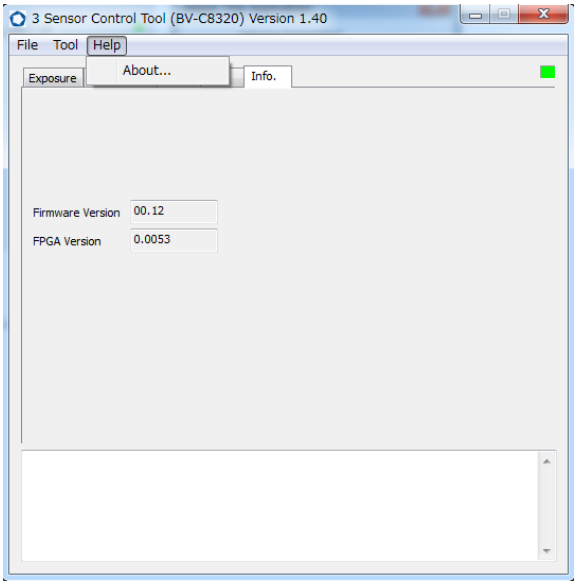
e) Click the blank area in the control tool for the selected tab, the recorded command will be executed.

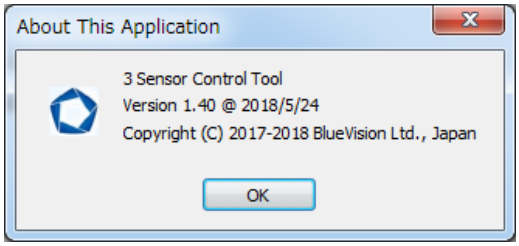


Click the blank area and then recoded commands are executed.

6.14 Help/About

This shows the revision of "3 Sensor Control Tool".





6.15 Image storage function

The BV-C8220CLCL has one frame memory function. The followings describe how to save and display. As this function aims to save the still image, it is suggested not to move the camera and objects.

The procedure to save and read out is as follows.

1. The acquisition and saving of the iamge take a few seconds and as it may be affected by the flicker of the illumination and others, it is recommended to use the following settings.

   Trigger mode OFF: "External Trigger OFF"
   Exposure mode OFF or ON: "Shutter select mode" or "No shutter mode"
   Frame rate 43fps; "Frame period" 20.000ms (325μs)

2. To acquire and save the image
   1) Click "Recording" ① in the "Info" screen.
   2) In the communication txt area, "Erase flash", "Start Recording Image", "Save Start" and "End Recording" are displayed in sequernce.
      At the end, when "Finish" is displayed, the iamge can be aquired and saved sucessfully.

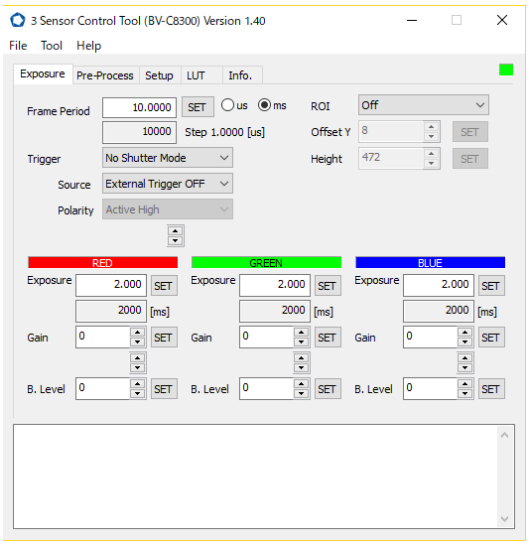
3. To read out the image
   1) Click "Play" ②in the "Info" screen.
   2) In the communication area, "Start Playing Image" and "End Playing" are displayed in sequence.
      When "Finish" is displayed, the saved image of one frame can be read out.
      After reading out one farme, FVAL and LAVL from the camera will stop in order to remain the image on the display screen.

4) To return to the normal operation

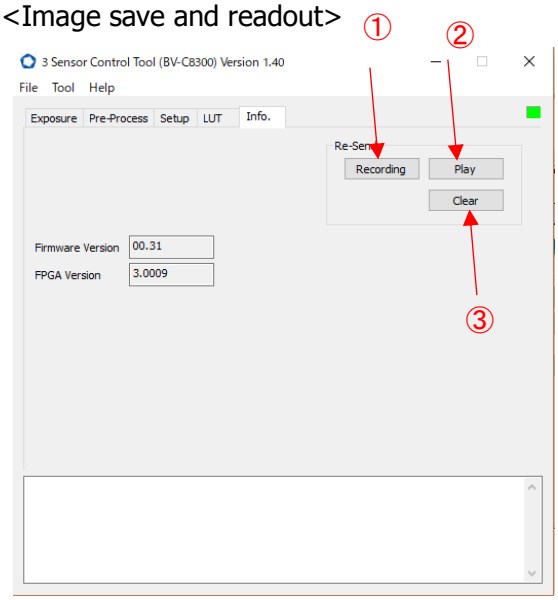
1) Click "Clear" ③ in the"Info" sreen and then, the camera returns to the normal operation.

2) Even though it is in the above procedure 2 and 3, if "Clear" is clicked, each operation will be forced to stop and returns to the normal operation.

<Camera setting>



<Image save and readout>



7. Serial communication

7.1 Serial communication protocol

The camera control tool "3Sensor Tool" to be provided is used to control a camera using a serial communication protocol.

Serial communication protocol

Parameter	Setting value
BIT/sec	115200bps
Data Bit	8Bit
Parity	None
Stop Bit	1Bit
Flow control	None

7.2 Command input specifications

The followings are the format to input a command.

・Read command

Command␣Channel [Enter]	Required to set a channel number
Command [Enter]	Not required to set a channel number

・Write command

Command␣Channel␣Parameter1 [Enter]	Required to set a channel number
Command_Parameter1[Enter]	Not required to set a channel number

※ Input example
Set the exposure time for R channel at 10000(10ms)
exp␣r␣10000

7.3 Command output specifications

After a command is input, the information whether it is finished correctly or incorrectly, is output. The followings describe the information.

・Finished correctly

OK>	If the parameter needs to be displayed
OK␣Parameter1>	If the parameter does not need to be displayed

・Finished incorrectly

Invalid Command.ERROR>	An illegal command
Invalid Argument Number.ERROR>	An illegal argument
Invalid Parameter.ERROR>	An illegal parameter
Access Denied.ERROR>	An access restriction
Device Access.ERROR>	Device access error
Resource Insufficiency.ERROR>	Insufficient resources

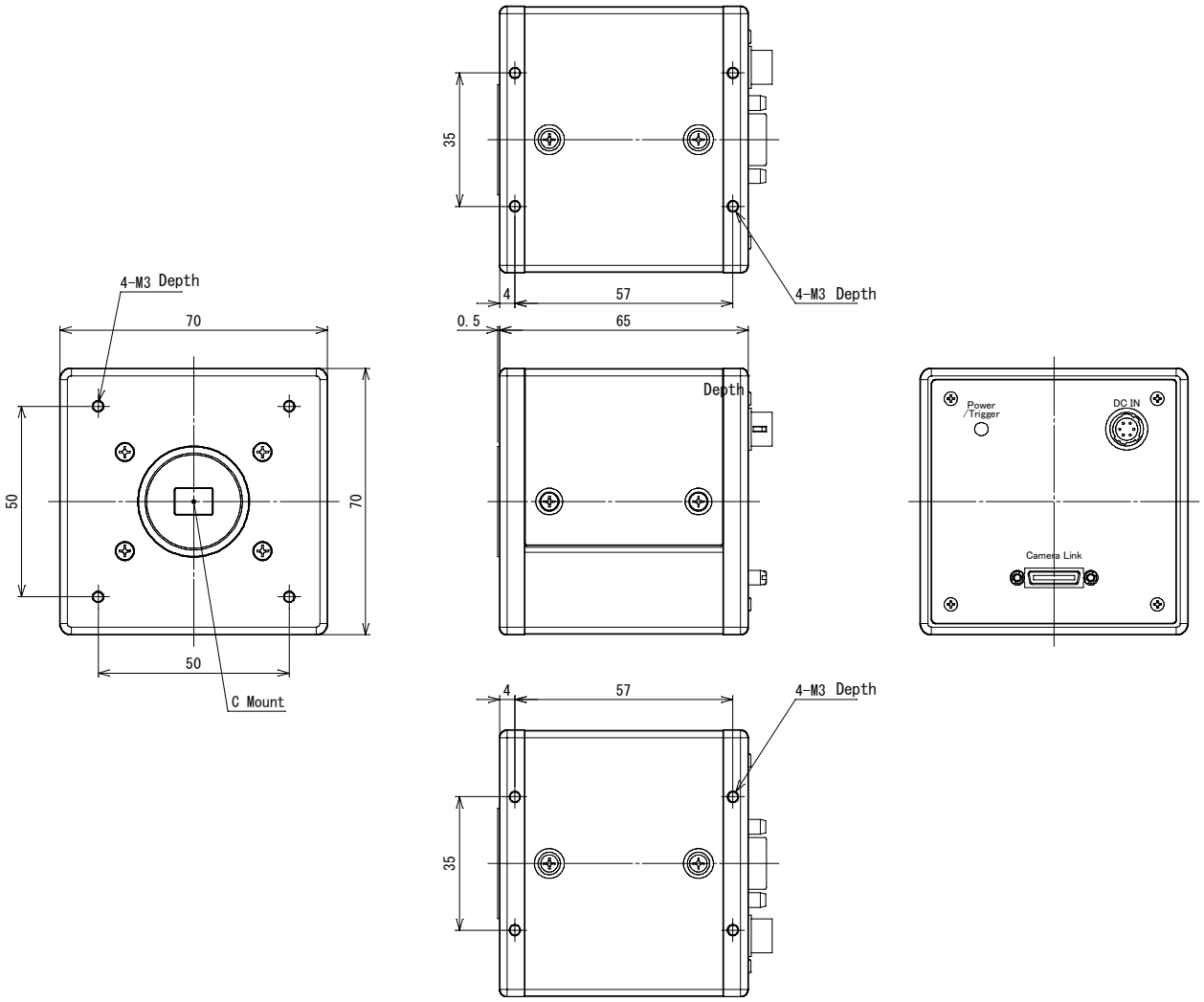
7.4 Command list (Will be revised)

Item	Command	Parameter	Description
Exposure	exp␣[ChNum]	[ChNum] : Channel r/g/b	Acquire the current exposure time to be set for each channel
	exp␣[ChNum]␣[PRAM①]	[ChNum]: Channel r/g/b [PRAM①]: Exposure time 10 ～(Frame period – 340)	Set the exposure time for each channel 1μs/1 step
Frame Period	frame [ChNum]		Acquire the current frame rate to be set.
	frame␣[PRAM①]	[PRAM①]: Frame period FULL:1735 ～ 1000000 VGA:645 ～ 1000000	Set the frame rate . 1μs/1 step
Trigger	trgmode		Acquire the current trigger mode to be set
	trgmode␣[PRAM①]	[PRAM①]: Trigger mode 0：No shutter mode 1：Shutter select mode 2: PWC Mode)	Select the trigger mode If "No Shutter mode" is selected, the trigger mode is OFF. Trigger Source should be selected OFF.
	trgsource		Acquire the current trigger source to be set
	trgsource␣[PRAM①]	[PRAM①]: Trigger source 0：External trigger OFF 1：External trigger ON（CC1）	Select the trigger source
	trgpolarity		Acquire the current trigger polarity to be set
	trgpolarity␣[PRAM①]	[PRAM①]: Trigger polarity 0：Active Low 1：Active High	Select the trigger polarity
Balance White Manual	whitebalance		Acquire the current white balance setting to be set.
Balance White Auto	b_bayer_row_wb		Use G ch as the reference level and adjust R and B ch to get the proper white balance. R and B gain are compensated when "32" is input to get the proper white balance. When the white balance is achieved again, set 0 and 32 in order.
	b_bayer_row_wb [PRAM①]	[PRAM①] 32 0: OFF 32: Execute	
Black Level	blevel␣[ChNum]	[ChNum]: Channel r/g/b	Acquire the current black level value to be set
	blevel␣[ChNum]␣[PRAM①]	[ChNum]: channel r/g/b [PRAM①]	Set the black level for each channel
Gain	gain␣[ChNum]	[ChNum]: Channel r/g/b	Acquire the current gain to be set
	gain␣[ChNum]␣[PRAM①]	[ChNum]: Channel r/g/b [PRAM①]: 0 ～ 120	Set the gain for each channel 0db to 12dB: 0.1dB/step
Shading	shading		Acquire the current shading setting number to be set Adjustment must be done in FULL readout format.
	shading␣[PRAM①]	[PRAM①] Setting number 0: No shading compensation 1: Factory default 2 ～3: User setting	Set the shading setting by [PRAM①]
	shadingadjust		Execute the Shading compensation
	shadingsave [PRAM①]	[PRAM①] Setting number 2～3	Save the adjusting value for the shading compensation in [PRAM①]
LUT	lutmode		Acquire the current LUT setting number to be set
	lutmode␣[PRAM①]	[PRAM①] Setting number 0：LUT disabled 1：LUT enabled	Set the LUT setting by [PRAM①]

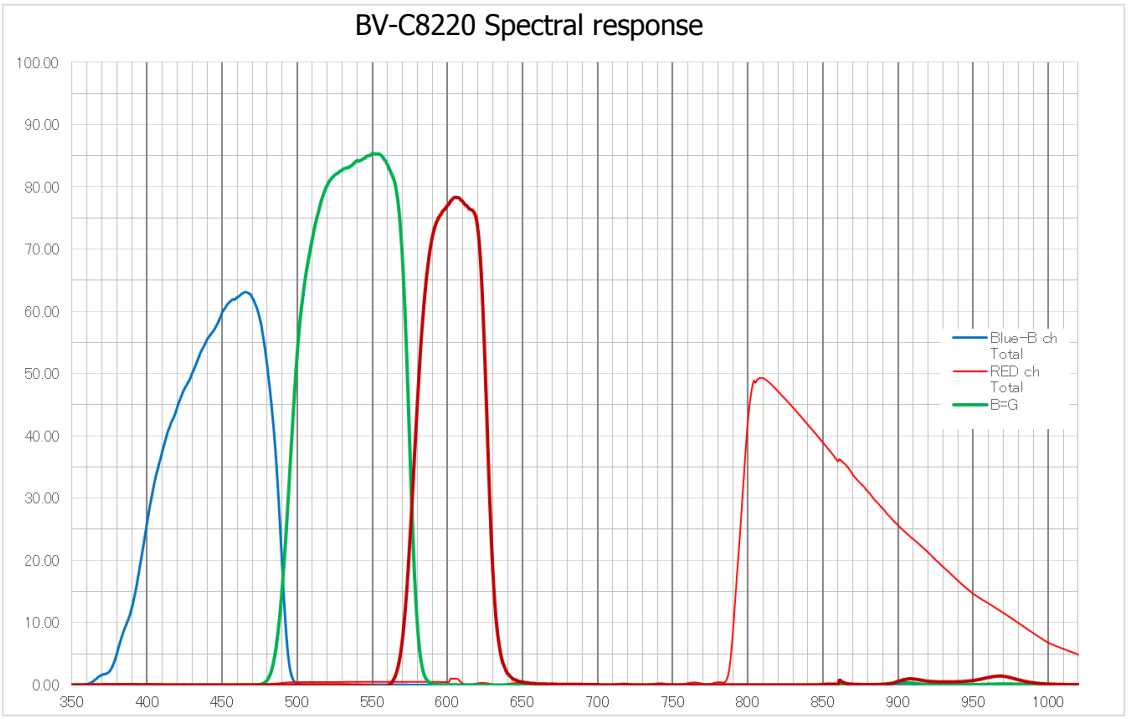
	lut␣[ChNum] [PRAM①]	[ChNum] Channel r/g/b [PRAM①] Table value (Input)	Acquire the current output table value for the input value [PRAM①] to be set
	lut␣[ChNum] [PRAM①]␣[PRAM②]	[ChNum] Channel r/g/b [PRAM①] Table value(Input) 0～4095 [PRAM②] Table value(Output) 0～4095	Set the LUT table output value [PRAM②] against the LUT table input value [PRAM①]
	lutsave		Save the LUT table data
	lutdefault		Restore the LUT table data to the default settings(Initialization)
	lutdownload		Download the LUT table data from PC to the camera. (csv file format)
Test Pattern	tpmode		Acquire the current Test pattern setting number to be set
	tpmode␣[PRAM①]	[PRAM①] Setting number 0：Test pattern OFF 1: Color bar 2: H Gradation 3: V Gradation	Set the test pattern by [PRAM①]
User Set	userset		Acquire the current camera setting number to be set
	userset␣[PRAM①]	[PRAM①] Setting number 0：Factory default setting （Cannot be changed） 1～2: User setting	Set the camera setting by PRAM①
	save␣[PRAM①]	[PRAM①] Setting number 1～2	Save the current camera settings in PRAM①
	default␣[PRAM①]	[PRAM①] Setting number 0～2	Set the camera settings when the camera is started up, by PRAM①
	factory␣[PRAM①]	[PRAM①] Setting number 1～2	Restore the setting in PRAM① to the factory default setting (Initialization)
Update	update [PRAM①]	[PRAM①] Update file Byte number	Execute the update of Firmware and FPGA
Information	firmversion		Acquire the firmware information
	fpgaversion		Acquire the FPGA version
ROI	roi		Acquire current ROI ON/OFF information
	roi [PRAM①]	[PRAM①] ROI ON/OFF 0：OFF 1：ON	ROI ON/OFF setting
	height		Acquire current height setting value
	height [PRAM①]	[PRAM①] Height setting FULL: 8 ～ 1080 VGA: 8 ～ 480	Set the height value in [PRAM①]
	offsety		Acquire current start line number of ROI。
	offsety [PRAM①]	[PRAM①] Setting of Start line number of height FULL: 0 ～ 1072 VGA: 0 ～ 472	Set the start line number in [PRAM①]
Enhancer	enhancermode		Acquire the information of current enhancer mode
	enhancermode [PRAM①]	[PRAM①] Setting number 0～3 0 : Enhancer mode OFF 1 : Edge enhancer 2 : MTF correction 3 : Edge enhancer + MTF	Set the enhancer number in [PRAM①]。

		correction	
	enhancergain [ChNum]	[ChNum] Sensor ch r/g/b	Acquire current enhancer gain value for R,G and B
	enhancergain [ChNum] [PRAM①]	[ChNum] Sensor ch, r/g/b [PRAM①] Gain value 0～100	Set the enhancer gain of R,G and B in [PRAM①]. Enhancer mode 1 and 3 are effective
Re-send	Re-send		Save one frame Available only when FULL readout is selected the video putput format.
	resend [PRAM①]	[PRAM①] Setting number 0～2 0 : Record 1 : Play 2 : Clear	Record : Image acquire and save。 Play : Image readout, after 1 frame is readout, it will stop。 Clear : Return to the normal operation
reso	Reso [PRAM①]	[PRAM①] 0,1 0: FULL 1: VGA	FUL: 1440(H) x 1080(V) VGA: 640(H) x 480(V)

8. Outlook dimensions



9. Total Spectral response (Prism plus Sensors)



Bayer sensor NIR sensor

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