SENTECH

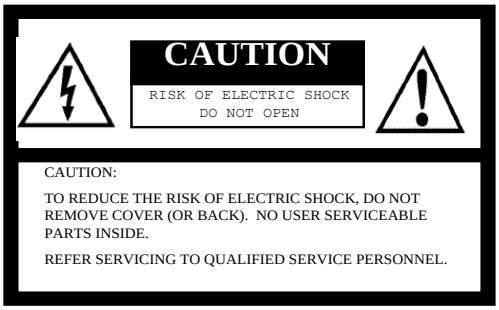
# 1.3 MP GigE CMOS Series

## Product Specifications

### Features

- 1.3 Megapixel Resolution
- CMOS Global Shutter
- Monochrome or Color Models
- Power over Ethernet

## Safety Precautions




The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

For U.S.A.

Warning:

This equipment generates and uses radio frequency energy and if not installed and used properly, I.e., in strict accordance with the instruction manual, may cause harmful interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment.

For Canada

Warning:

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

WARNING:

TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE.

## Product Precautions

- Handle the camera with care. Do not abuse the camera. Avoid striking or shaking it. Improper handling or storage could damage the camera.
- Do not pull or damage the camera cable.
- During camera use, do not wrap he unit in any material. This will cause the internal temperature of the unit to increase.
- Do not expose the camera to moisture, or do not try to operate it in wet areas.
- Do not operate the camera beyond its temperature, humidity and power source ratings.
- While the camera is not being used, keep the lens or lens cap on the camera to prevent dust or contamination from getting in the sensor or filter area and scratching or damaging this area.
- Do not keep the camera under the following conditions:
    - In wet, moist, and high humidity areas
    - Under hot direct sunlight
    - In high temperature areas
    - Near an object that releases a strong magnetic or electric field
    - Areas with strong vibrations
- Use a soft cloth to clean the camera. Use pressured air spray to clean the surface of the glass. DO not scratch the surface of the glass.

# Table of Contents

## 1. Introduction

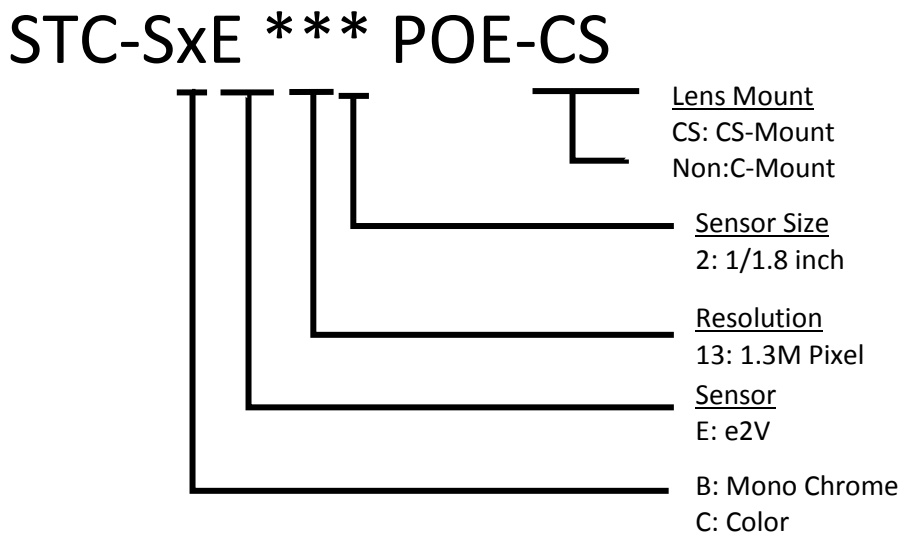
This document describes the specification of the following cameras:

| | |
|---|---|
| STC-SCE132POE | (1.3M Color) |
| STC-SBE132POE | (1.3M Monochrome) |

### 1.1 Features

- CMOS (Rolling Shutter / Global Reset Release)
- GigE Interface
- PoE Support (Power over Ethernet)

### 1.2 Naming Method



# 2 Specifications

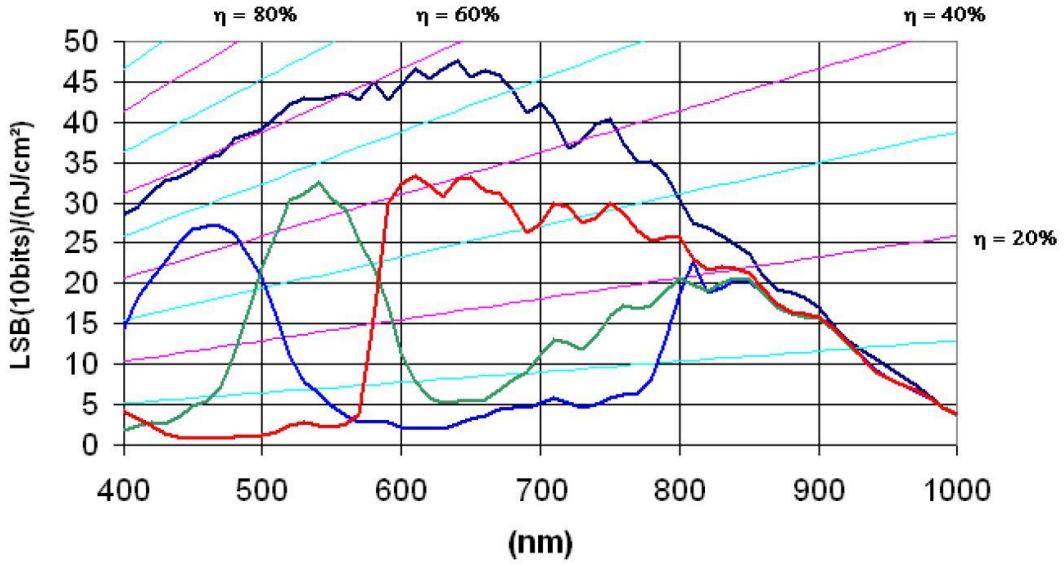
## 2.1 Electronic Specifications

### 2.1.1 STC-SCE132POE / STC-SBE132POE

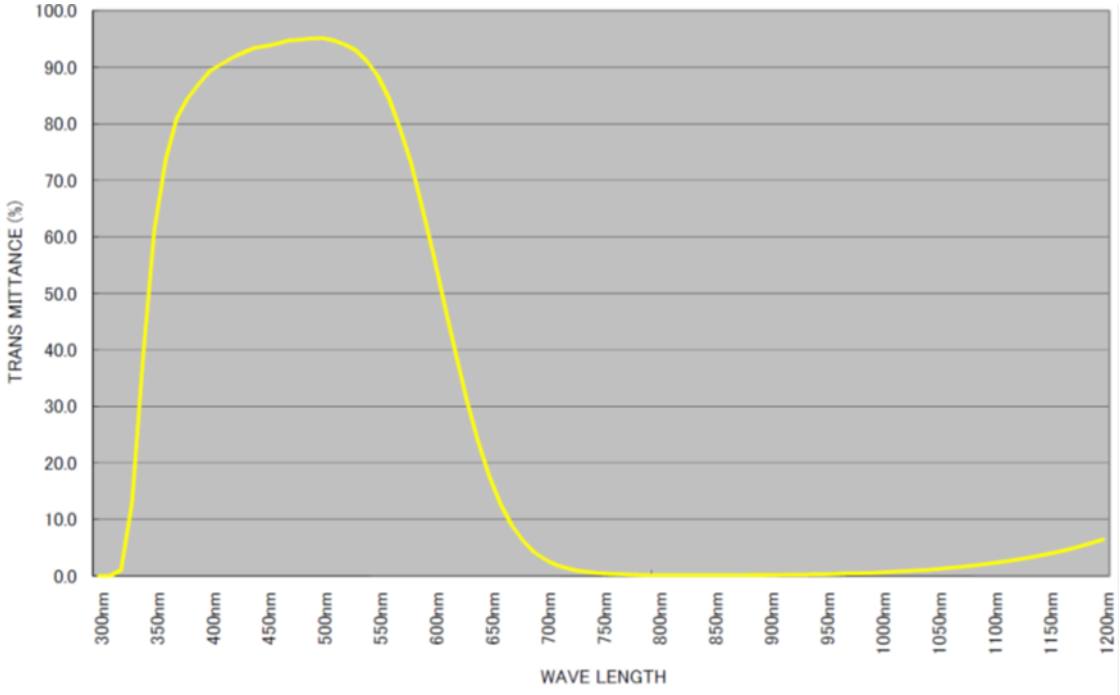
| Model Number | | STC-SCE132POE | STC-SBE132POE |
|---|---|---|---|
| Imager | | 1/1.8″ 1.3M pixel color CMOS (e2V:EV76C560ACT-EQV) | 1/1.8″ 1.3M pixel monochrome CMOS (e2V:EV76C560ABT-EQV) |
| Active Picture Elements | | 1280(H) x 1024(V) | |
| Cell Size | | 5.3 (H) x 5.3 (V) µm | |
| Scanning System | | Progressive | |
| Shutter Type | | Global Reset / Rolling Shutter | |
| Scan Mode | | Full Scan / AOI | |
| Vertical Frequency (Frame Rate on Full Scan) | | SXVGA: 1280 x 1024 : 61fps on Bayer Output, 27fps on RGB Output ((0.95571 to 61.0519fps adjustable via the communication) Minimum AOI (32 x 32): 1272.32fps, | |
| Video Output Format | | Mono8, Mono10, Mono10Packed, BayerRG8, BayerRG10, BayerRG10Packed,RGB8Packed | Mono8, Mono10, Mono10Packed |
| Noise Level | @ 10bit output | ≤ 12 Digit (Gain 0 dB) | ≤ 12 Digit (Gain 0 dB) |
| Minimum Scene Illumination | | TBD Lux at F12 | TBD Lux at F1.2 |
| ALC | | AE and AGC (ON/OFF) (**Default: AE OFF, AGC ON**) | |
| Exposure Time | | Preset continuous mode: 10 useconds to 1,000,719 useconds Preset trigger mode: 10 useconds to 1,000,719 useconds | |
| Gain | Analog | 0 to 5.952 dB | |
| | Digital | 0 to 6 dB | |
| Gamma | | Gamma 1.0 (Factory default) or uploadable gamma table (**Default:1**) | |
| AOI Function | | AOI (H: 32 to 1280 Pixel / V: 32 to 1024 Line) Unit ： H 8 Pixel / V 2 Line | |
| Binning | | H:1/2, V:1/2 | |
| Decimation(Skipping) | | H 1/2, 1/4 V 1/2, 1/4 | |
| Flip Image | | Horizontal | Horizontal / Vertical / Horizontal-Vertical |
| Pixel Blemish Correction | | Maximum 64points (**Default:ON)** | |
| White Balance | | Auto, Manual, Push to Set White Balance are available on both raw data and RGB outputs (**Default:OFF**) | N/A |
| Operational Mode | | FreeRun, Edge preset trigger(**Default:OFF**) | |
| Protocol | | IEEE802.3 (1000BASE-T) | |
| Communication | | GigE Vision® 1.2 , GenICam™ 1.4 | |
| I/O | | One opt-isolated input and two open collector outputs(+3.3V) | |
| Power | Input Voltage | +10.8 to +26.4 Vdc (IO Connector) or Power Over Ethernet(IEEE802.3af compliance) | |
| | Power Consumption | Less than TBD W | |

## 2.2 Spectral Sensitivity Characteristics

### 2.2.1 STC-SCE132POE




### 2.2.2 NF-50D (IF Cut Filter)



## 2.3 Mechanical Specifications

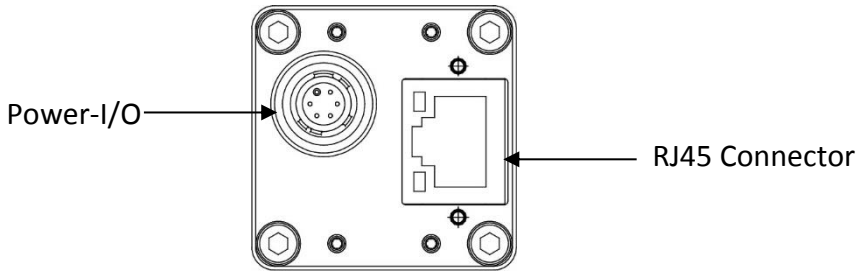
| Model Number | STC-SCE132POE | STC-SBE132POE |
|---|---|---|
| Dimensions | C-Mount Color: 35 (W) x 35 (H) x 54.3(D) mm excluding connectors<br>C-Mount: Monochrome 35 (W) x 35 (H) x 53.5(D) mm excluding connectors<br>CS-Mount Color: 35 (W) x 35 (H) x 49.3(D) mm excluding connectors<br>CS-Mount Monochrome: 35 (W) x 35 (H) x 48.5(D) mm excluding connectors | |
| Optical Filter | With IR Cut Filter | No Filter |
| Optical Center Accuracy | Positional accuracy in H and V directions:: ±0.3 mm<br>Rotational accuracy of H and V: ±1.0 deg | |
| Material | Aluminum (AC) | |
| Lens Mount | C, mount, CS mount | |
| Connectors | RJ45 connector<br>Power- I/O connector: HR10A-7R-6PB (Hirose) or equivalent | |
| Camera Mount Screws | Two 1/4” Tripod screw holes: (One on each top and bottom plate),<br>Twelve M4 screws holes: (Four on each top and bottom plate, two on each side plate) | |
| Weight | Color: Approximately 100 g, Mono: Approximately 98 g | |

## 2.4 Environmental Specifications

| Model Number | | STC-SCE132POE, STC-SBE132POE |
|---|---|---|
| Operational Temperature | Minimum | Environmental Temperature -5$^0$C |
| | Maximum | Camera housing temperature (top plate) shall not exceed 40$^0$C<br>(This corresponds to an environmental temperature of approximately 62$^0$C) |
| Storage temperature | | Environmental Temperature: -30$^0$C to 65$^0$C |
| Vibration | | 20Hz to 200Hz to 20Hz (1.3Min./cycle), acceleration 10G, XYZ 3 directions 30 min. each) |
| Shock | | Acceleration 38G, half amplitude 6ms, 3 directions 3 times each |
| Standard Compliancy | | EMS: EN61000-6-2, EMI: EN55011 |
| RoHS | | RoHS Compliance |

Note: When the camera is used in surrounding temperatures that exceed TBD $^o$C, please make sure that the camera is set up to properly radiate heat (maintaining the cameras top case temperature to be less than TBD $^o$C.

## 3 Connector Specifications




### 3.1 RJ45 Connector

**This product is PoE compliant, please supply power (+10.8 to +26.4Vdc) through the power-I/O connector when using non-PoE compliant NIC.**

Pin Assignment

| Pin No. | Signal Name |
|---|---|
| 1 | TA+ |
| 2 | TA- |
| 3 | TB+ |
| 4 | TC+ |
| 5 | TC- |
| 6 | TB- |
| 7 | TD+ |
| 8 | TD- |

LED

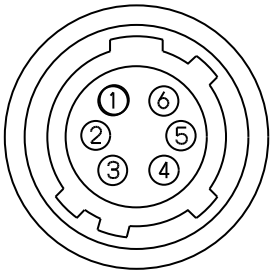
| Green LED | Orange LED | Status |
|---|---|---|
| Green Light ON | Orange Light ON | Power ON(1GB NIC) |
| Green Light OFF | Orange Light OFF | Power ON(100MB NIC) |
| Green Light ON | Orange Light Blinking | 1Gb Transferring |
| Light OFF | Orange Light Blinking | 100 Mb Transferring |

**Please use a 1GB supported NIC, NetWork Switcher & LAN Cable. Check that the NIC and NetWork Switcher being used is "1GB transferring".**

### 3.2 Power & Control Signal Connector

- HR10A-7R-6PB (Hirose) or equivalent.
- This connector is for the power supply (12Vdc) and input / output signals.
- Use HR10A-7P-6S (Hirose) or equivalent for the cable side.

| Pin No. | Signal Name | IN / OUT | Voltage |
|---|---|---|---|
| 1 | GND | IN | 0V |
| 2 | I/O-1 | OUT | +3.3V Open Collector |
| 3 | I/O-2 | OUT | +3.3V Open Collector |
| 4 | TRG_In- (Opt. Isolated -) | IN | Low: Smaller than +1.0V<br>High: +3.0 to +26.4V<br>*potential difference between TRG_In- and TRG_In+ |
| 5 | TRG_In+ (Opt. Isolated +) | IN | |
| 6 | POWER IN | IN | +10.8 to +26.4 Vdc |




- Output Signals can be assigned through the camera setting communication.
  (Device Code = 00H, Command = F0H and F1H)

Configuration of I/O-1 (Pin No. 2), I/O-2(Pin No. 3)

Output pin can be assigned through the register setting or GenICam command.

| Command No. | | | | GenICam command |
|---|---|---|---|---|
| F0H[3..0] | F1[3] | F0H[7..4] | F1[4] | I/O-1 (Pin No.2) / I/O-2 (Pin No.3) |
| For I/O-1 (Pin No. 2) | | For I/O-2 (Pin No.3) | | |
| 0H (initial setting) | - | 0H | - | FrameTriggerWait (initial setting for I/O-1) |
| 1H | Set Value | 1H | Set Value | UserOutput |
| 2H | - | 2H (initial setting) | | ExposureActive (initial setting for I/O-2) |
| 3H | - | 3H | - | TriggerAuxiliary |
| 4H | - | 4H | | TriggerInternal |
| 5H | - | 5H | | SensorReadOut |
| 6H | - | 6H | | StrobeSignal |
| 7H-FH | - | 7H-FH | - | For Test Use Only |

*Note: I/O-1 can be assigned only by F0H[3..0] and F1[3], and I/O-2 can be assigned only be F0H[7..4] and F1[4].

1) FrameTriggerWait

The user can check the camera condition (camera exposure and image output processing by the trigger signal with this FrameTriggerWait signal).
This signal is LOW for the period from the trigger input signal to the image output.

a) High status (3.3V): No processing by the trigger signal. The camera accepts the trigger signal.
b) Low status (0V): The camera is exposed and the image output processes by the trigger signal.

The camera default setting is the input trigger signal is INVALID while at the low status of this signal. When the exposure starts while the image output by the next trigger signal, please change the camera setting (Device code: 00H, Command No. :13H) to accept the trigger signal while the image outputs. The noise appears on the image when the exposure begins while the image is output. The noise appears on the image when the start exposure while the image is output. In this case, please change the “H reset” for the exposure start mode (Device code: 00H, Command No. : 12H) to change the exposure start point to the next HD timing.

2) UserOutput

The status of the UserOutput signal can change with the “UserOutputValue”.

3) ExposureActive

The user can check the exposure time with the ExposureActive signal.

4) TriggerAuxiliary

The TriggerAuxiliary signal is the input trigger signal.

5) TriggerInternal

The TriggerInternal signal is the input trigger signal with the trigger delay time.

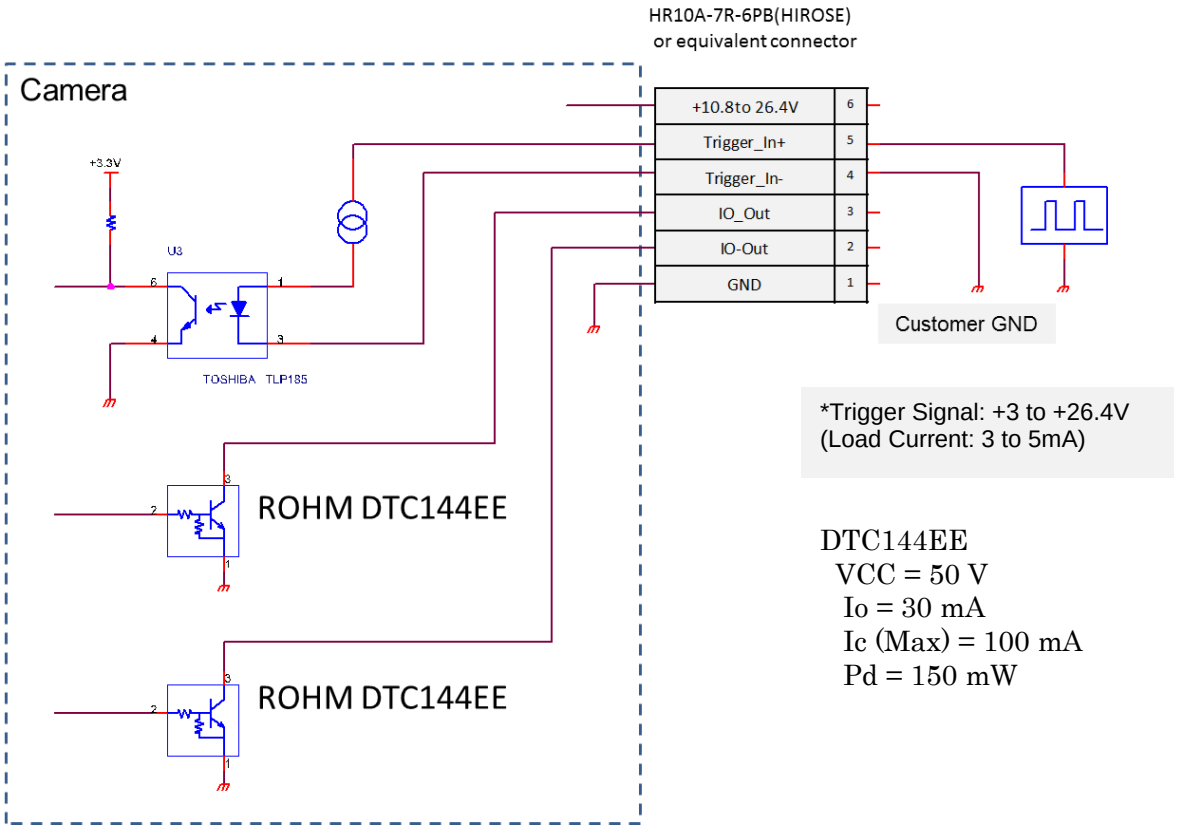
6) SensorReadOut

The SensorReadOut signal is the FVAL signal, which is the image output period of the time.

7) StrobeSignal

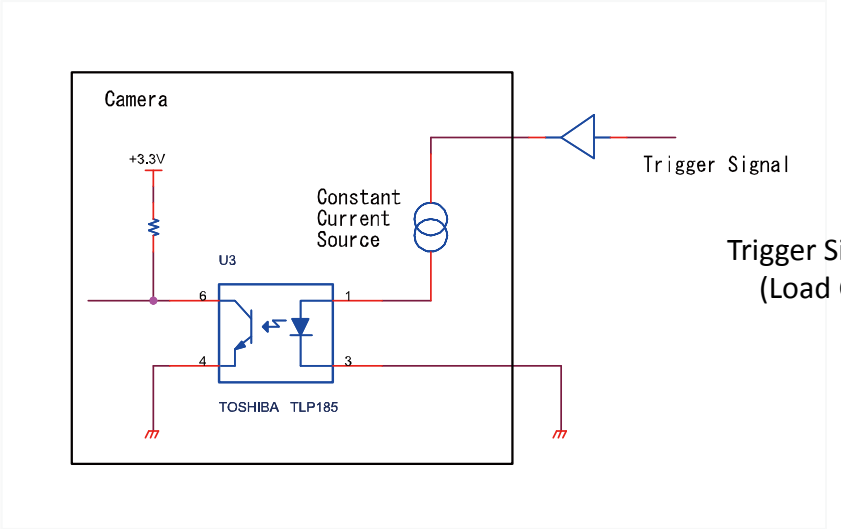
The StrobeSignal signal is the strobe control signal.

### 3.2.1 Equivalent Circuit for the Input Pin of the I/O Connector



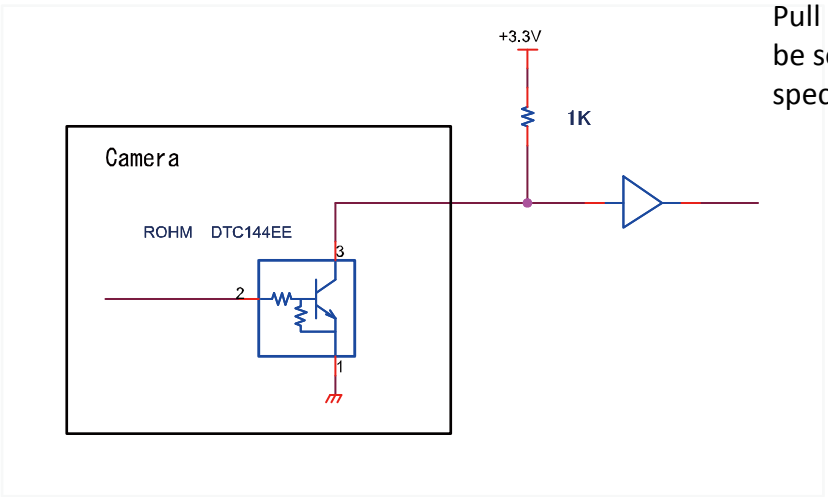

DTC144EE
VCC = 50 V
Io = 30 mA
Ic (Max) = 100 mA
Pd = 150 mW

### 3.2.2 Typical Input Circuit




Trigger Signal:+3.0 to +26.4V
(Load Current: 3 to 5mA )

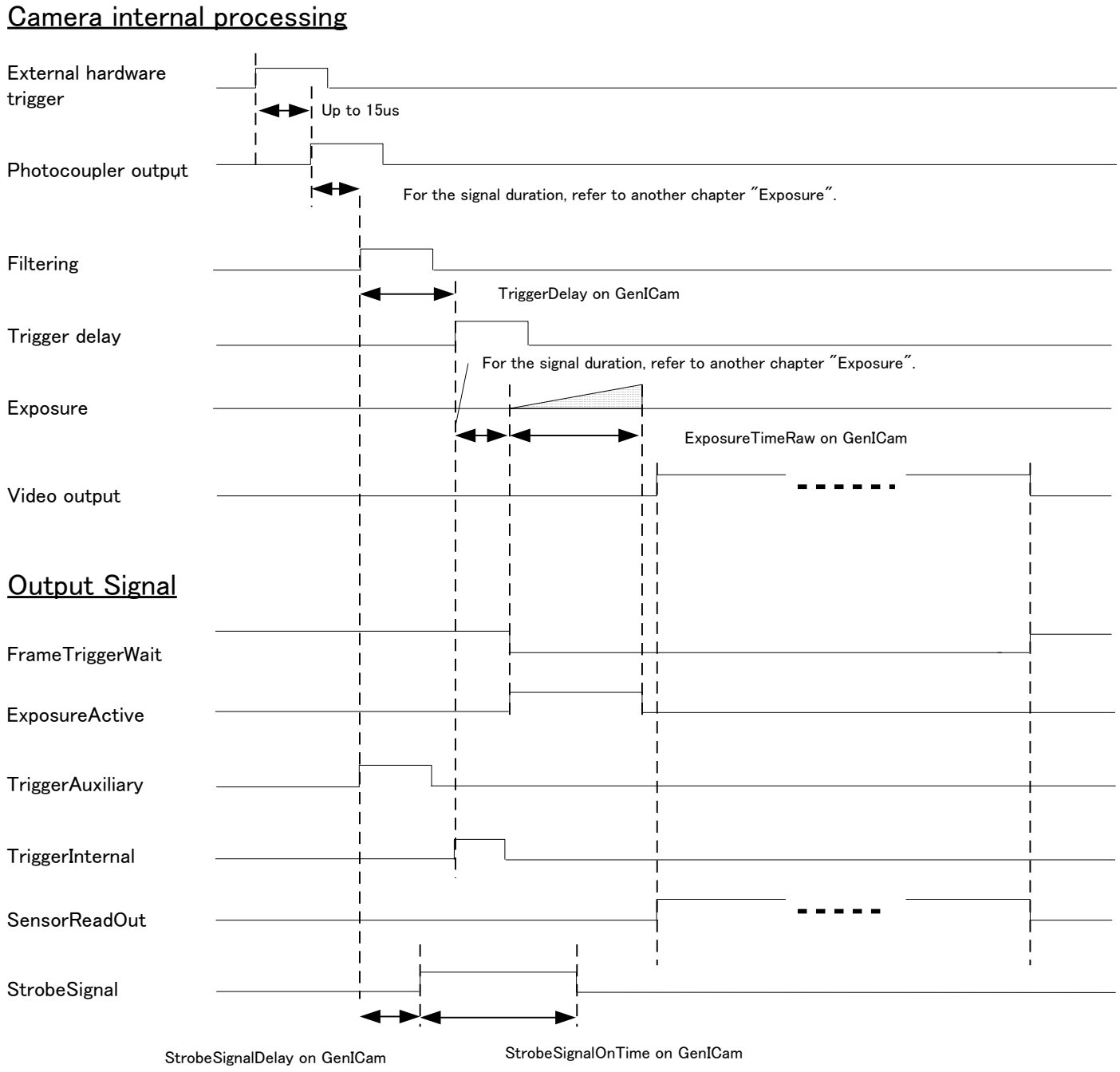
### 3.2.3 Typical Output Circuit




Note;
Value of Vcc and Pull up register can be set within the spec of transistor.

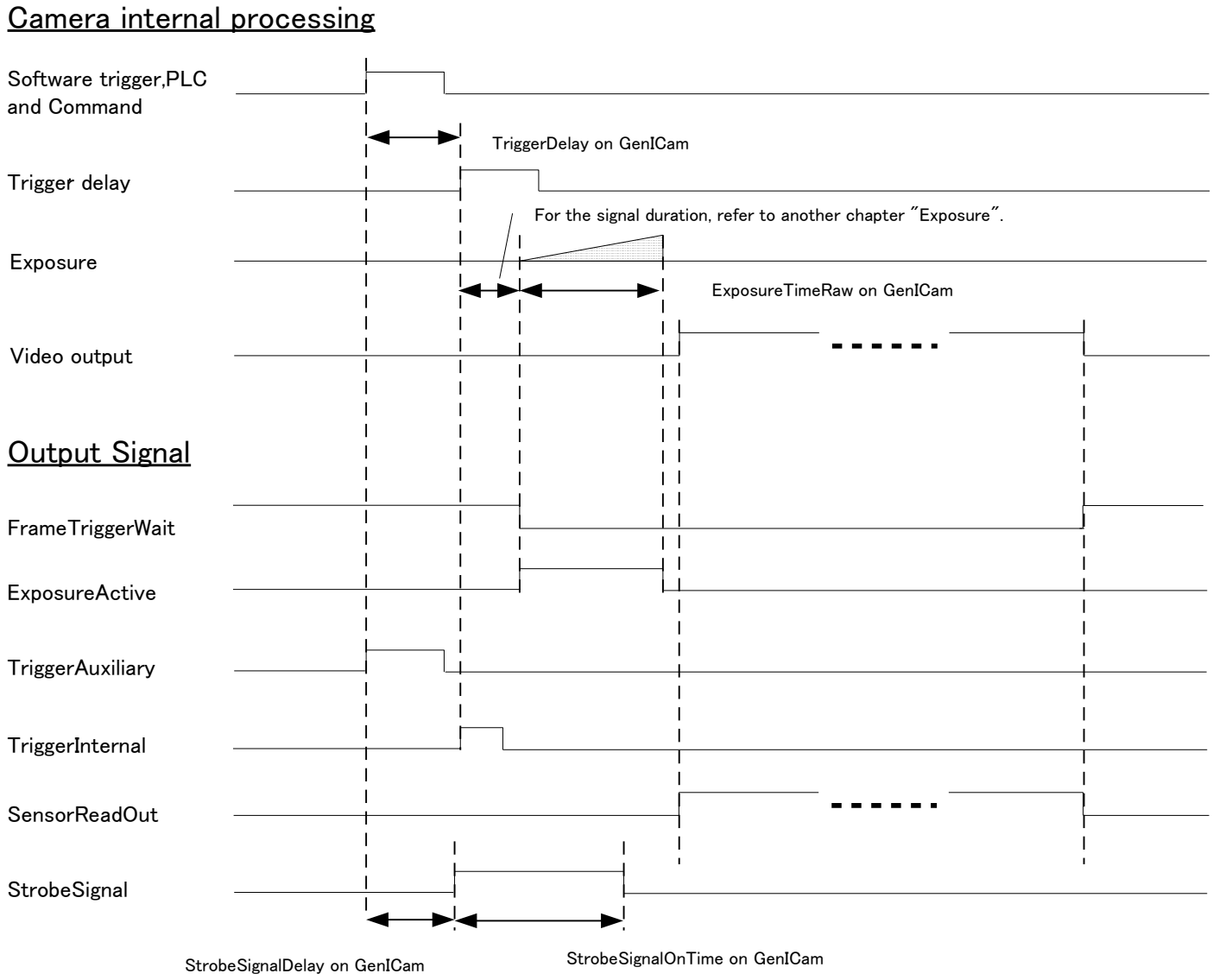
### 3.2.4 Input and Output Signal Timing (Hardware Trigger)

Case of “External Hardware Trigger”, “Positive Edge Trigger”, “Edge Preset Exposure”



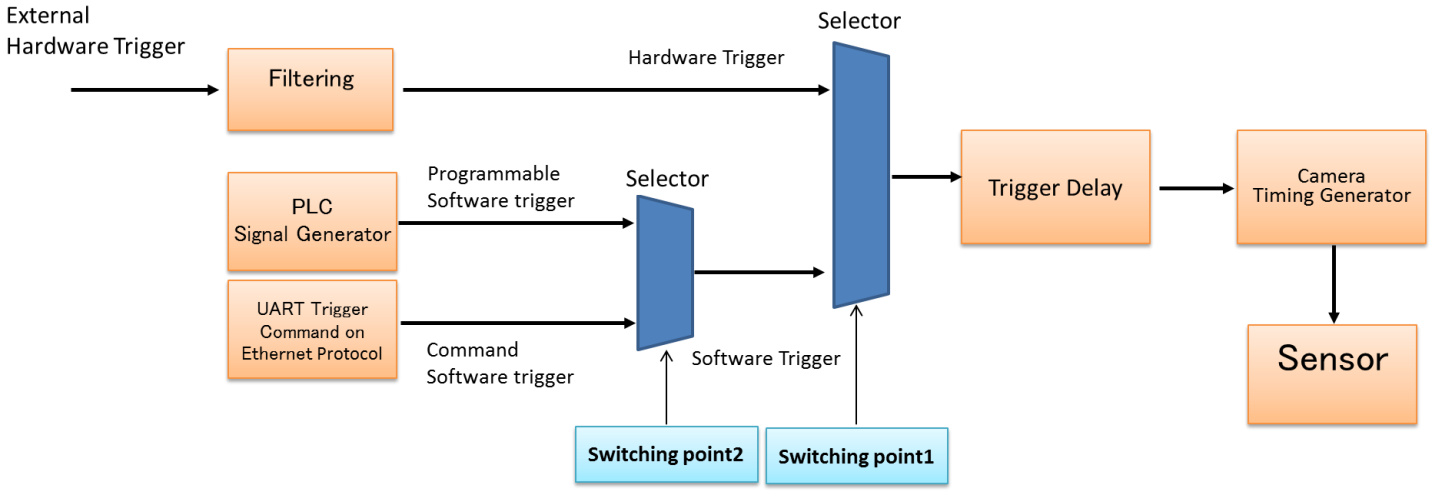
### 3.2.5 Input and Output Signal Timing (Software Trigger)

Case of “Software Trigger”, “Positive Edge Trigger”, “Edge Preset Exposure”



### 3.2.6 Trigger Signal Processing Process

External Hardware Trigger or Software Trigger input the camera's internal process as follows:




Switching Trigger can be done through register access of GenICam commands.

Switching point 1: Switch to Hardware Trigger and Software Trigger

Register: 12H.5=0

Register: 12H.5=1

Switching point 2: Switch to PLC programmable Software Trigger and command software trigger

Register 16H.7-6=00

Register 16H.7-6=10

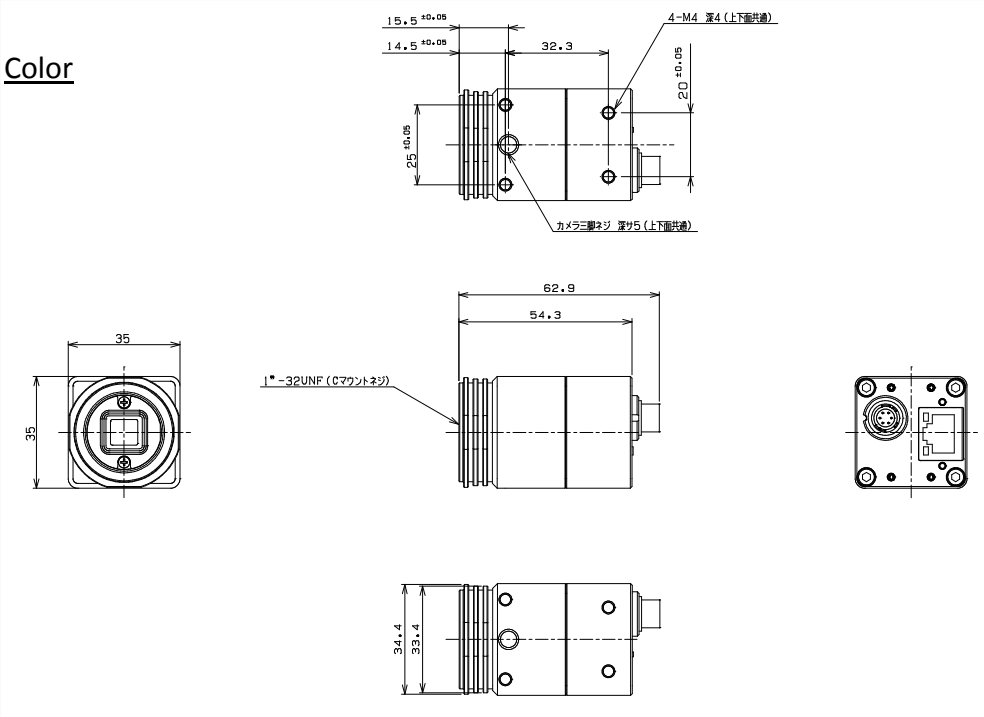
GenICam ✆ TriggerSoftwareSource = PLC

GenICam ✆ TriggerSoftwareSource = Command

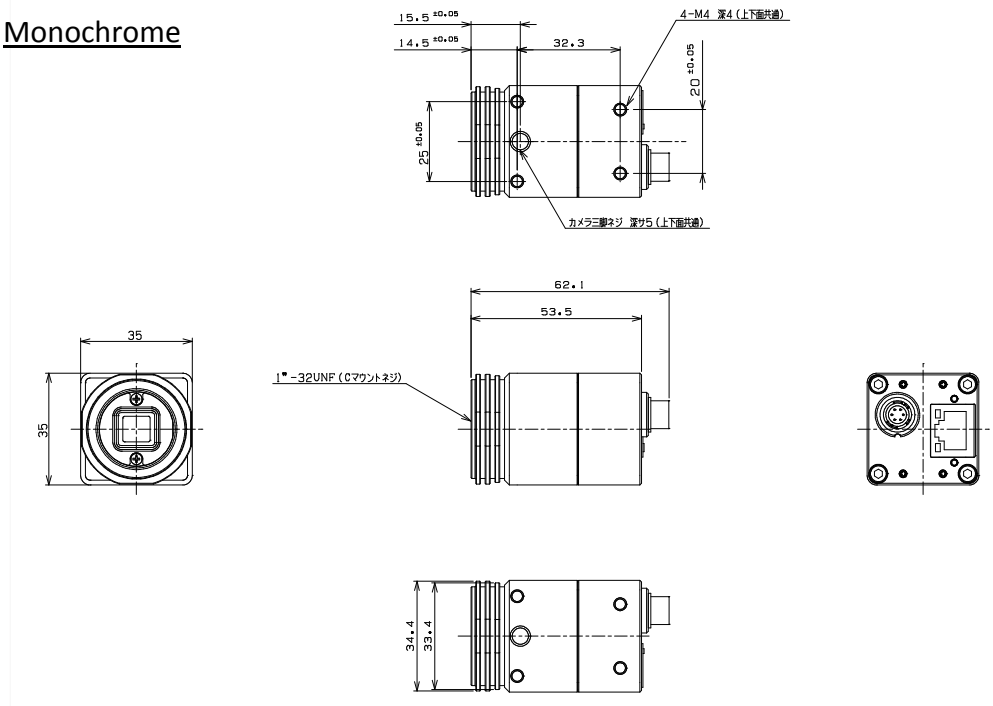
## 4. Dimensions

### 4.1 C-Mount Model

Color

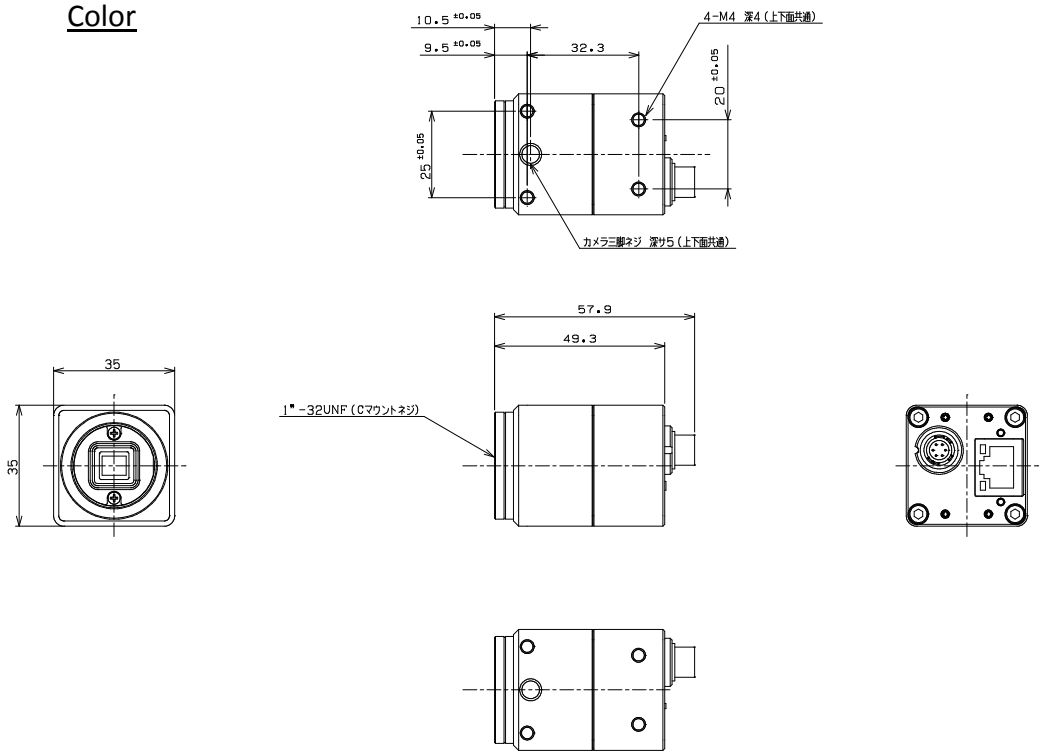



Monochrome

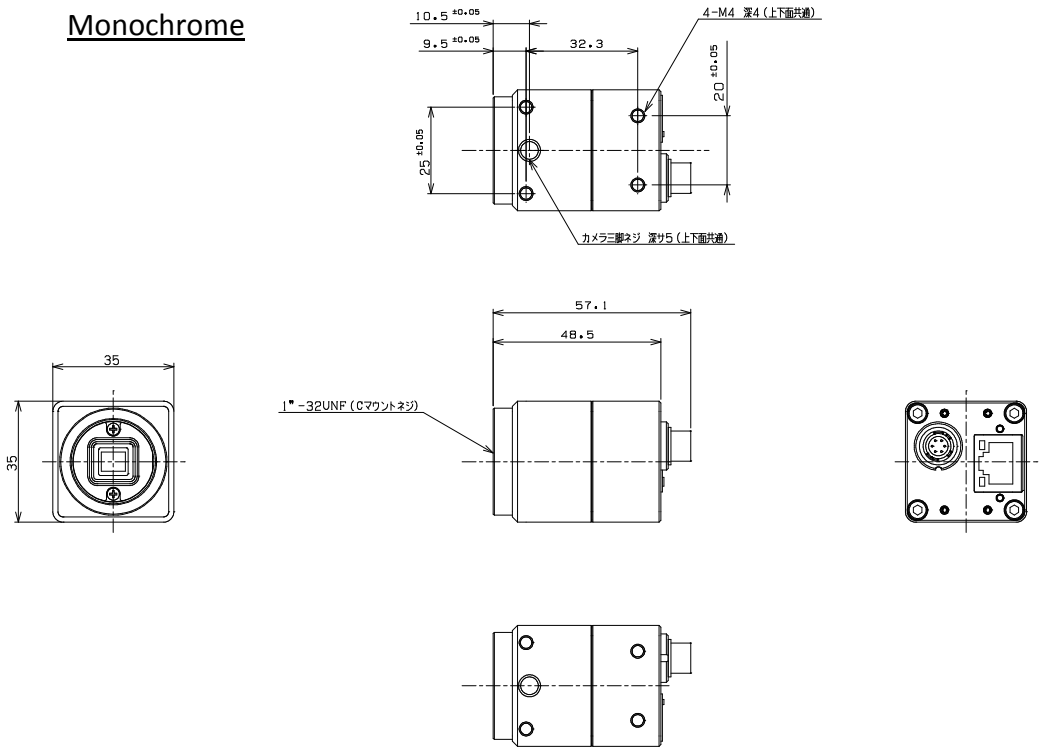


## 4.2 CS-Mount Model

Color




Monochrome

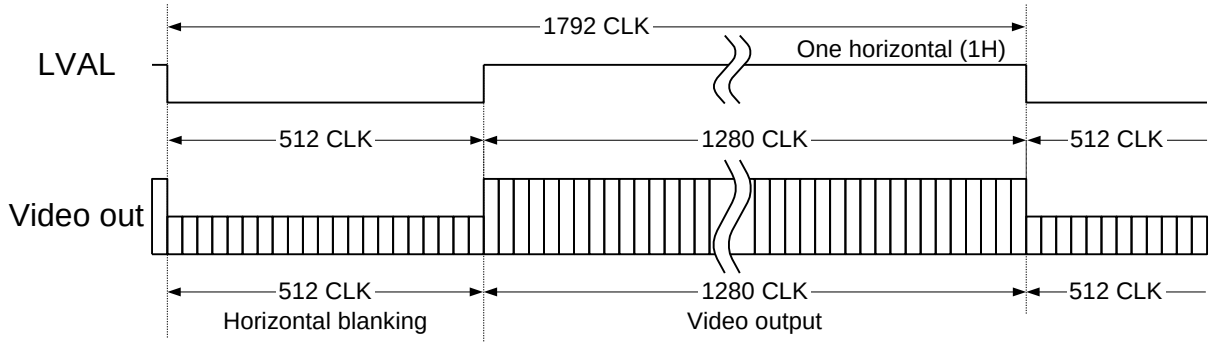


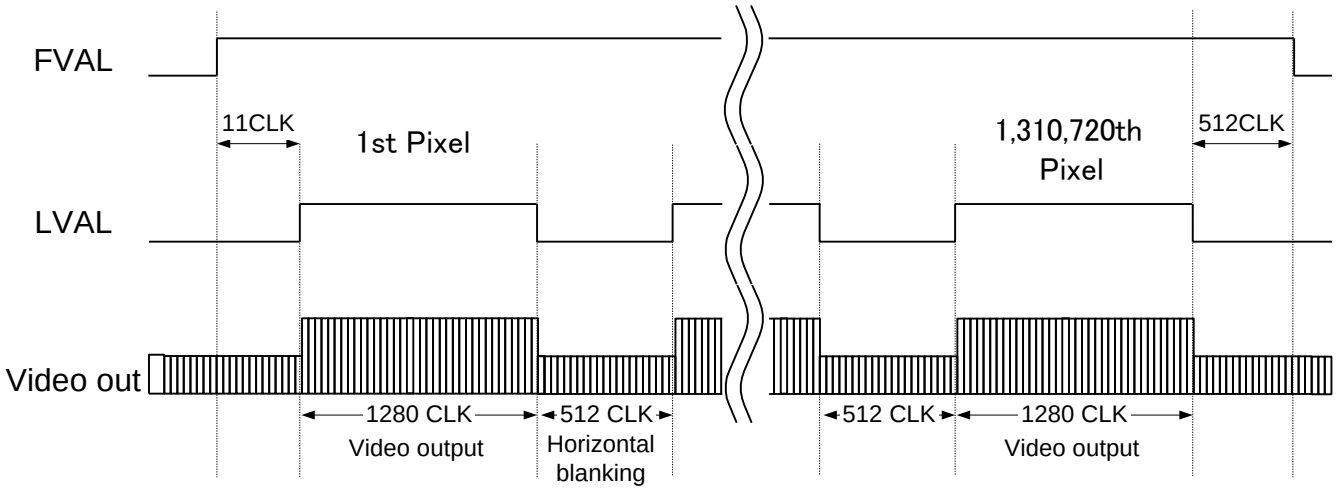
## 5 Camera Output Timing Charts

### 5.1 Horizontal Timing

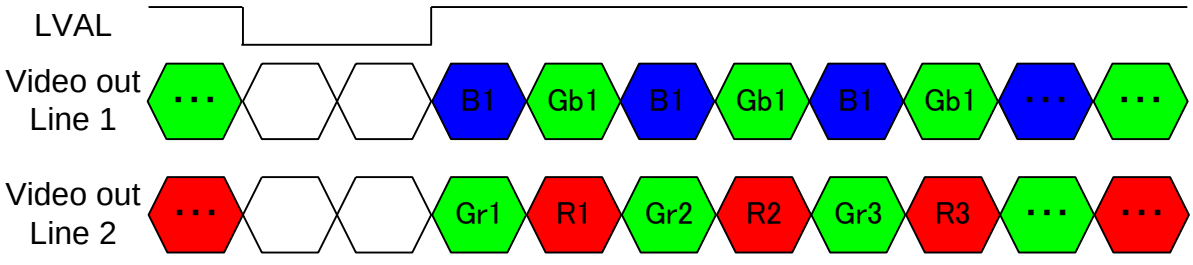
#### 5.1.1 Horizontal Timing (STC-SCE132POE, STC-SBE132POE)

1 CLK = 8.7719 nseconds(STC-SBE132POE, STC-SCE132POE of Bayer)
1 CLK = 11.7647 nseconds(STC-SCE132POE of RGB)



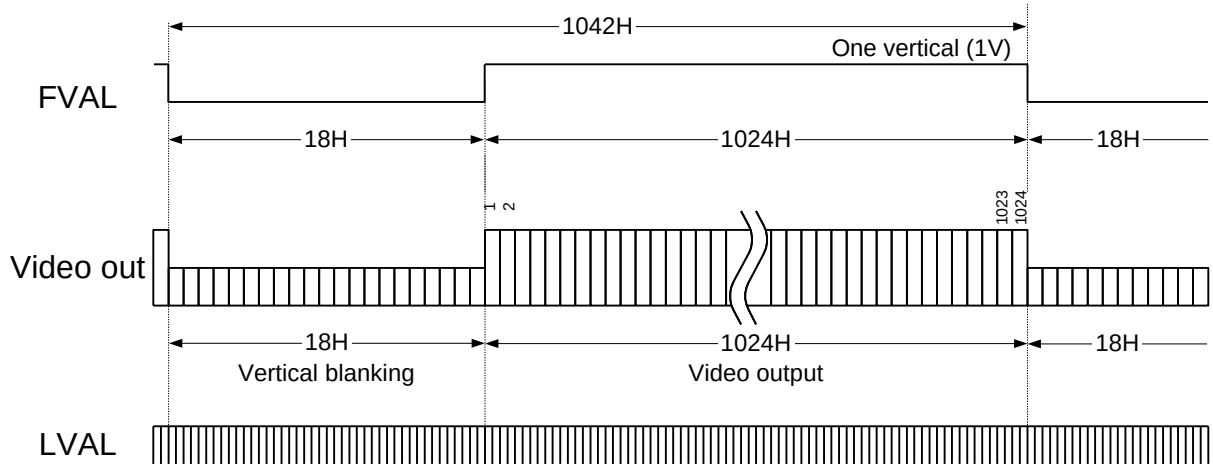

#### 5.1.2 Color Bayer Order (This information is only for STC-SCE132POE)



## 5.2 Vertical Timing

### 5.2.1 Full Scanning (STC-SCE132POE, STC-SBE132POE)

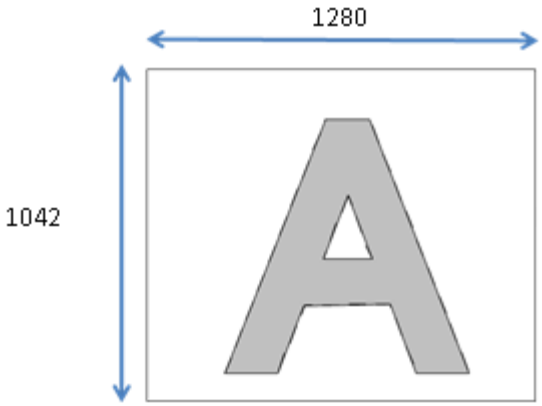
1 H = 15.7194 µseconds, 61 fps on Bayer
1 H = 21.0824 µseconds, 27 fps on RGB *Note1




*Note1: Actual frame rate from sensor is 1 H = 21.0824 µseconds => 45.5fps, however frame rate from camera output 27 fps since GigE bandwidth limitation.

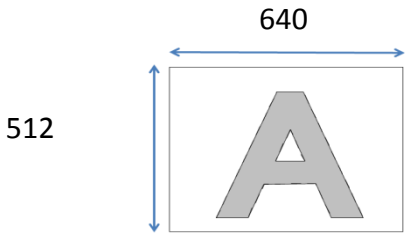
### 5.2.2 Binning Mode

Binning OFF: Binning Vertical = 1, Binning Horizontal = 1
A full resolution (1281 x 1042) images are output. The default frame rate is 61 fps.



Binning Vertical ½: Binning Vertical = 2, Binning Horizontal =1

½ of the Width and height of the “Normal” image is output (640x512). The image becomes the center portion of the “Binning” image. The Binning’s frame rate is about 61 fps.




### 5.2.3 Decimation (Skipping)

Vertical Decimation (Skipping)

The vertical line image is output and decimated.

| Resolution | FPS | Setting |
|---|---|---|
| 1280 x 512 | about120 | DecimationVertical = 2 |
| 1280 x 256 | about232 | DecimationVertical = 4 |

DecimationVertical = 3 cannot be selected.

Horizontal Decimation (Skipping)

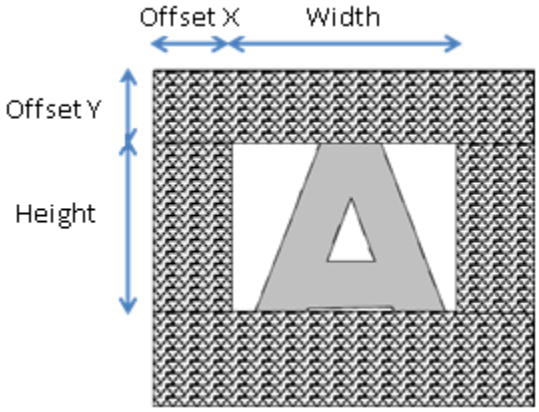
The horizontal pixels are output and decimated.

| Resolution | FPS | Setting |
|---|---|---|
| 640 x 1024 | about 61 | DecimationHorizontal = 2 |
| 320 x 1024 | about 61 | DecimationHorizontal = 4 |

DecimationHorizontal = 3 cannot be selected.

### 5.2.4 AOI

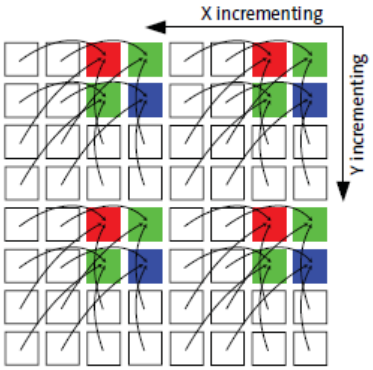
The user can set the desired width and height to extract only the desired portion of the image. Use “Offset X” to set the horizontal cut off point between the ranges of 0 to 1248. Use “Width” to set the number of pixels for the horizontal cutoff, between the ranges of 32 to 1280. Use Offset Y” to set the vertical cut off point, between the ranges of 0 to 992. Use “Height” to set the vertical cutoff line number, between the ranges of 32 to 1024. For AOI, it is possible to set the image size from a minimum of 32x2 up to a maximum of 1280x1024 by using different combinations of vertical / horizontal cutoff and height/width. The adjustment increment is 2 lines in the vertical direction, and 8 pixels in the horizontal direction. The frame rate will adjust according to the image size.



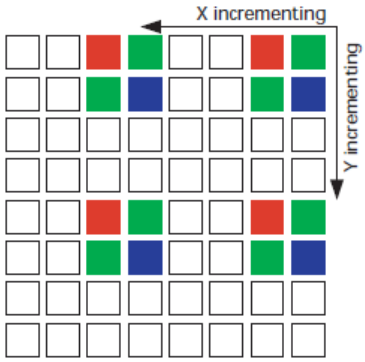

It is possible to set the binning*, decimation**, or both for the extracted image. Use “Binning / Decimation H” and “Binning / Decimation V” to set the combination of binning and decimation in the horizontal and vertical directions.

When horizontal and vertical binning is set to 2, it is possible to add adjacent pixels with the same color data only in the horizontal direction. This is effective for usage with low luminance or reducing the noise level. Turn “Binning Sum” ON.

*Note: Both vertical and horizontal binning are set to ½. The ½ setting creates one pixel by averaging two adjacent pixels with the same color information. **Note: For Decimation, ½ & ¼ can be set for the horizontal and vertical directions. The ½ setting uses pixels with the same color information that are separated by one pixel. Similarly, the ¼ setting skips three pixels.



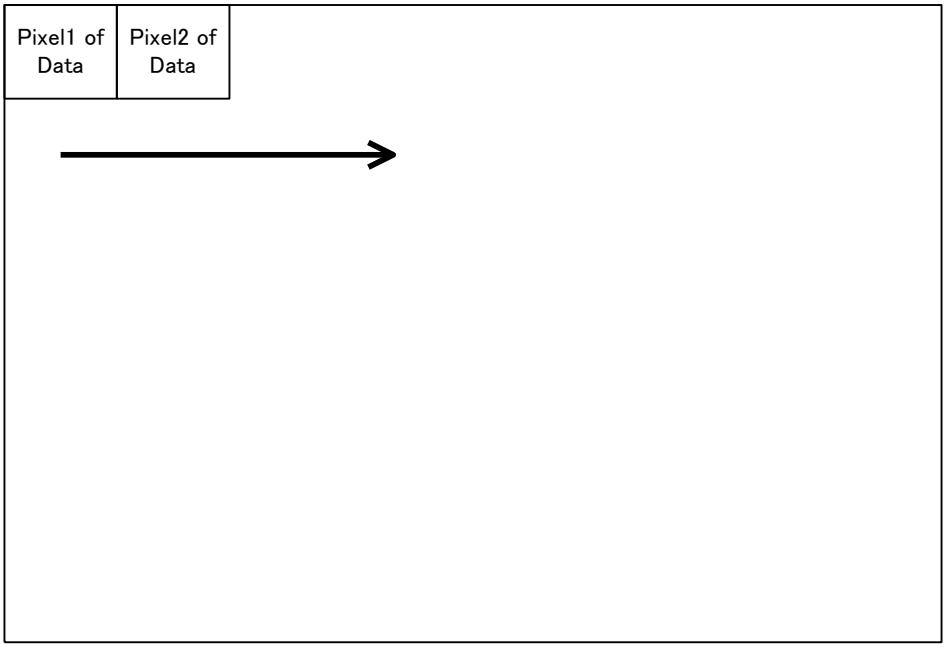

½ Horizontal & Vertical Binning




½ Horizontal & Vertical Decimation

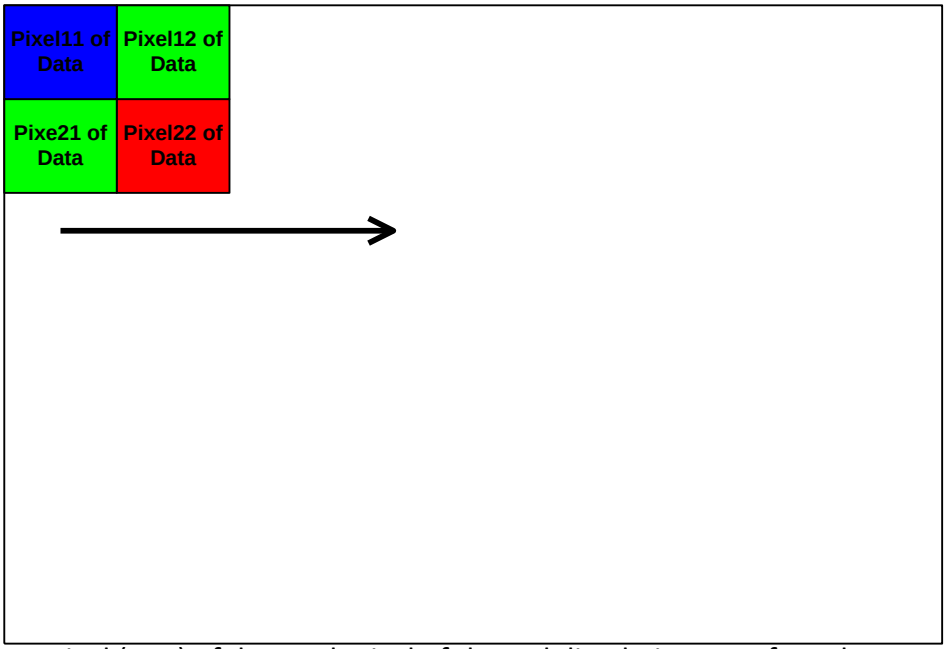
### 5.3 Pixel Transferring Image

STC-SBE132POE (Monochrome)




Pixel (n) of Data: nth pixel being transferred

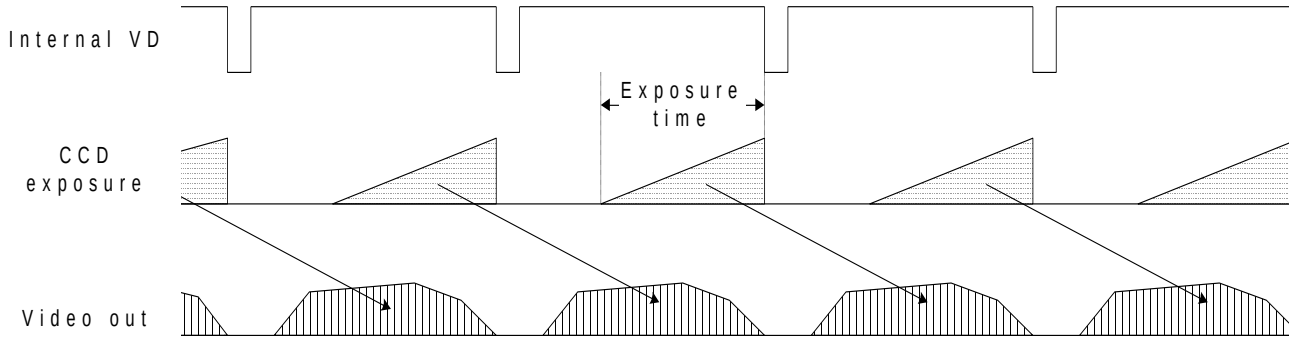
STC-SCE132POE (Color)




Pixel (m,n) of data: nth pixel of the mth line being transferred.

# 6 Camera Operational Modes

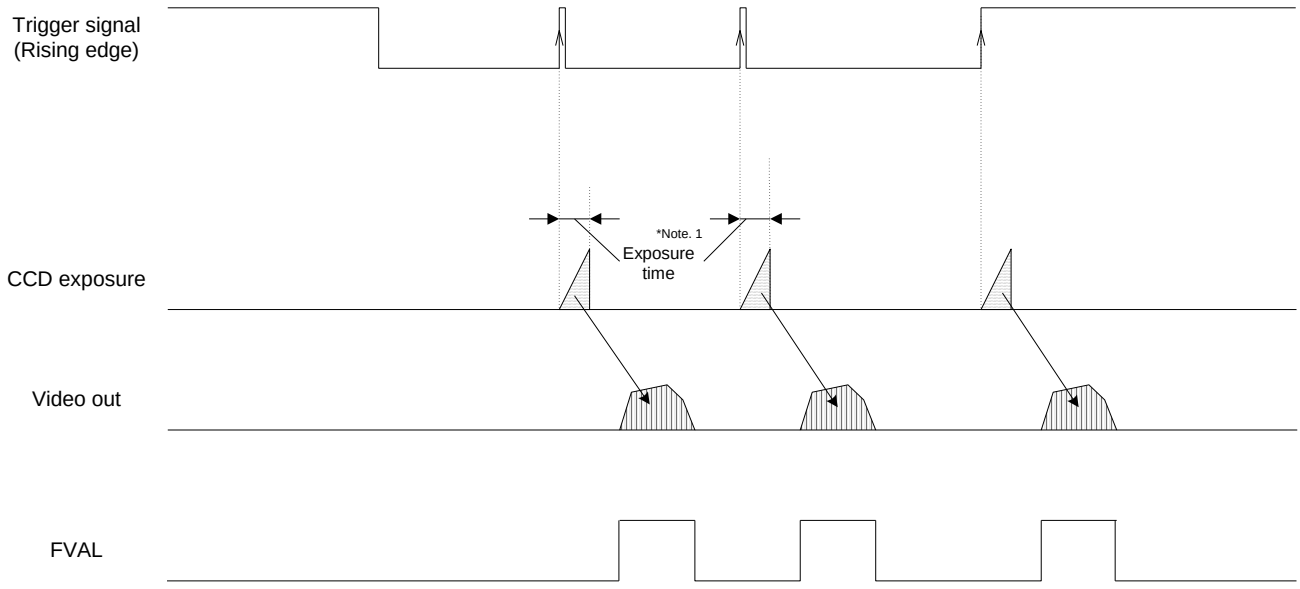
## 6.1 Normal Mode (triggerMode=OFF)




## 6.2 Edge Preset Trigger Mode (ExposureMode=Timed)

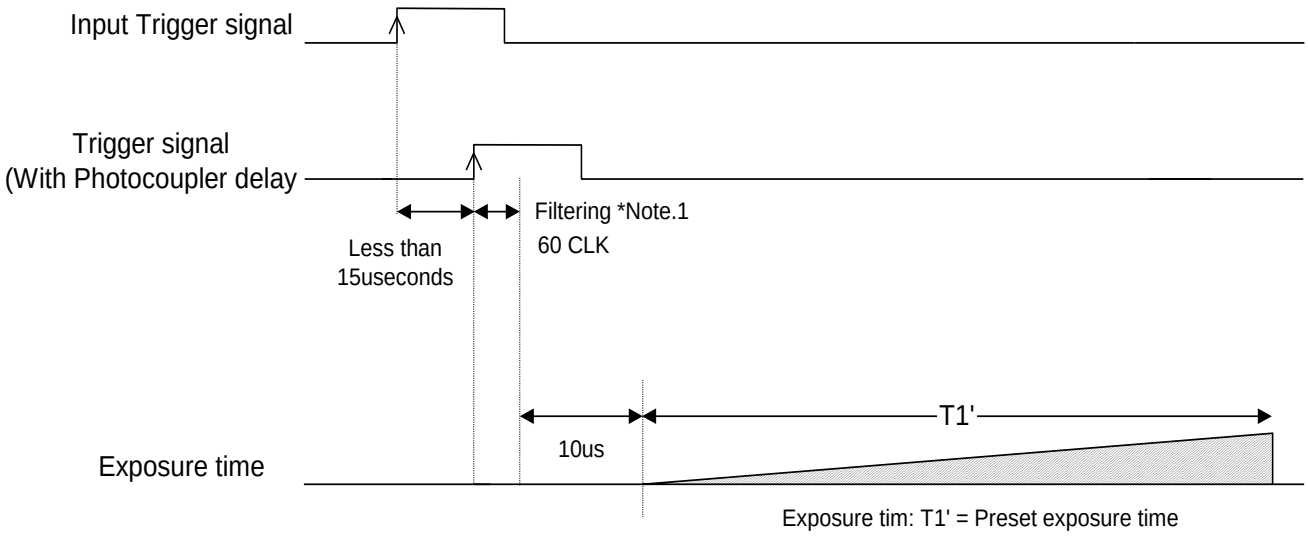
In the “Edge Preset Trigger Mode”, the camera exposure starts at the rising edge of the trigger signal similar to the “Pulse Width Trigger Mode” in the previous sections. However, in this mode, the exposure duration is based on the preset value stored by the camera setting communication.

### 6.2.1 Timing



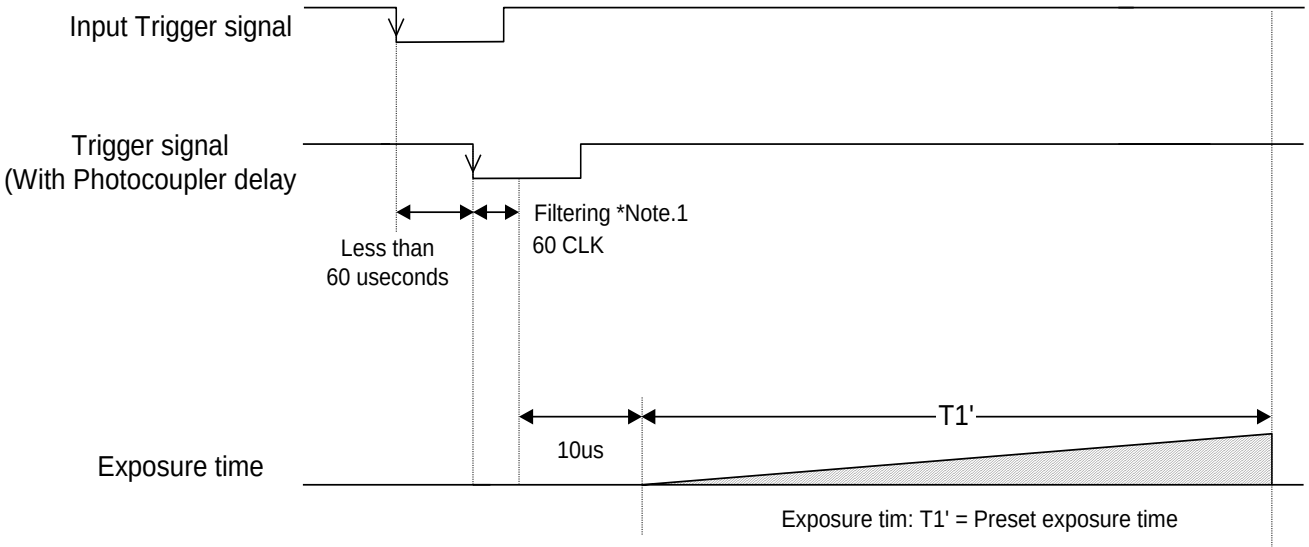

*The exposure time is set by the preset electronic shutter speed.

### 6.2.2 Exposure Timing with the Positive Polarity Trigger Signal




*Note1: The trigger signal will be removed by the filtering if the pulse width of the input trigger signal is less than 60CLK. Please input a trigger signal with more than 61CLK pulse width.
*Note2: The exposure will start 10us after the rising edge of the trigger signal.

### 6.2.3 Exposure Timing with the Negative Polarity Trigger Signal

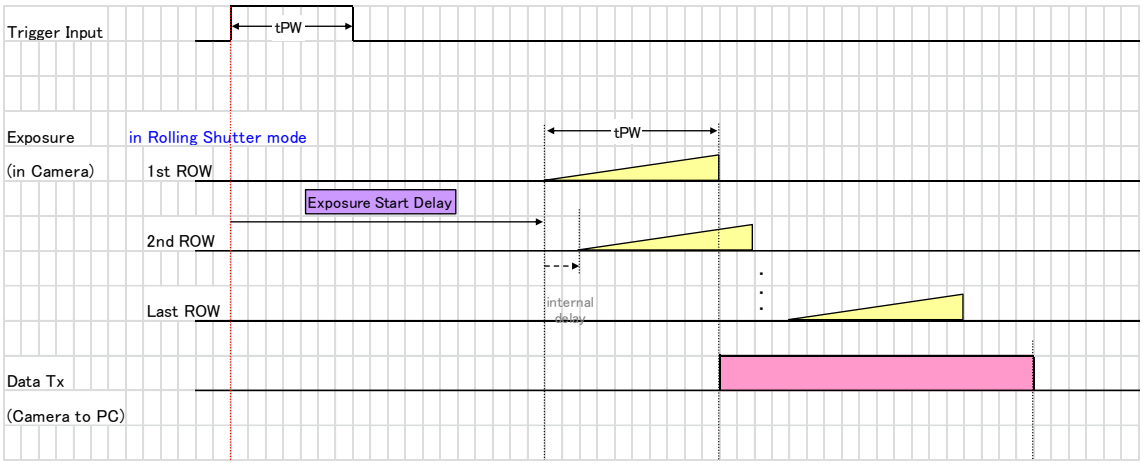



*Note1: The trigger signal will be removed by the filtering is the pulse width of the input trigger signal is less than 60CLK. Please input a trigger signal with more than 61CLK pulse width.
*Note2: The exposure will start 10us after the rising edge of the trigger signal.

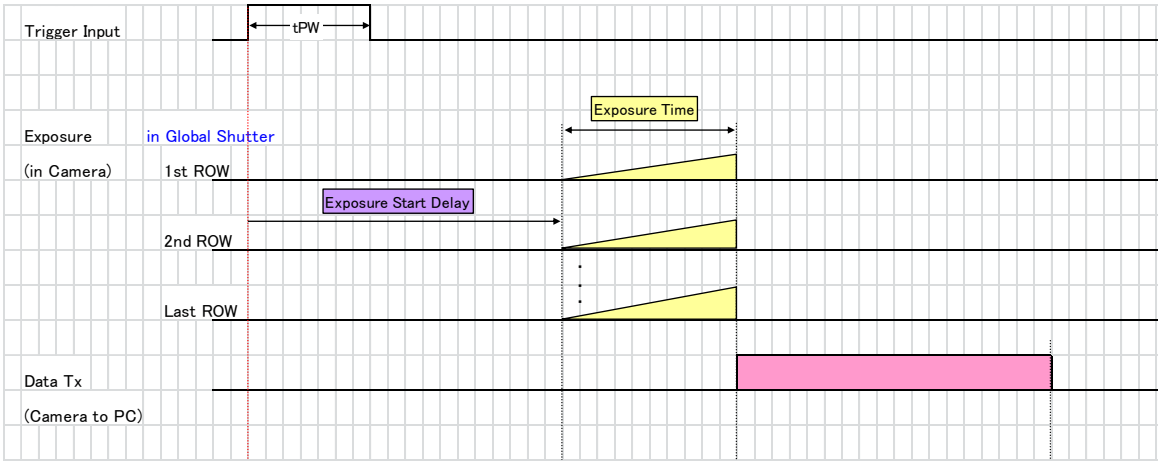
### 6.3 CMOS Rest Type

With this camera, the user can select the sensor exposure type as either “Electronic Rolling Shutter (ERS)” or “Global Reset (GR)”.

**ERS (for Edge Preset)**




**GR (for Edge Preset) Note: This function works on Trigger-Mode**



## 7 Communication Protocol

This camera has a communication function that enables external devices, such as a PC, to control the camera's functions.

Please use the "StCamGigEWare" communication software or the following communication protocol to communicate to the camera.

### 7.1 Communication Method

UART (RS232C) Binary Communication

### 7.2 Communication Settings

| | Settings |
|---|---|
| Baud Rate | 115,200 bps |
| Data Bit | 8 bit |
| Parity | None |
| Stop Bit | 1 bit |
| Flow Control | None |

### 7.3 Communication Format

The format for sending data from the PC to the camera is as follows:

| SOF | Device Code | Read/Write | Page Selection | Command Code | Data Length | Data | EOF |
|---|---|---|---|---|---|---|---|
| (8bit) | (6bit) | (1bit) | (1bit) | (8bit) | (8bit) | (R: 1 byte)<br>(W: n bytes) | (8bit) |

The format for receiving data from the camera is as follows:

After the read command has been sent:

| SOF | Data Length | Data | EOF |
|---|---|---|---|
| (8bit) | (8bit) | (n bytes) | (8bit) |

After sending the write command:

| SOF | Data Length | Receiving Code | EOF |
|---|---|---|---|
| (8bit) | (8bit) "00" | (1 byte) | (8bit) |

The description of the format is as follows:

| Name | Descriptions |
|---|---|
| SOF | Start of Frame. Always set or receive the value as “02H” |
| Device Code | This indicates the destination of communication.<br><br>Set “000000” when accessing the camera’s function settings<br>Set “100000” when accessing the camera’s extended function settings.<br>Please refer to the “Camera Command List” and “Description of the Camera Control Commands”. |
| Read / Write | This specifies “Read” or “Write” to command numbers.<br><br>Set (or receive) “0” to send the read command.<br>Set (or receive) “1” to send the write command. |
| Page Selection | This specifies page selection (access selection to registers or EEPROM) of command.<br><br>Set “0” to access the command register of the camera.<br>Read command: To obtain the current data from the command register.<br>Write command: To set a data into the command register.<br>The previously stored data is replaced by this data. However, the data in the EEPROM is not replaced.<br><br>Set ”1” to access the EEPROM of the camera.<br>Read command: To read stored data from the EEPROM.<br>Write command: To store data into the EEPROM as default value.<br>The camera returns the receiving code “01H” to the PC after storing data in the EEPROM. |
| Command Code | This indicates the contents of the data sent or received. Refer to the following page for the details. |
| Data Length | This indicates the data length (unit: byte).<br><br>Receiving Frame:<br>The data length is dependent on each read command sent.<br>The data length is defined as “00H” when sending the write command.<br>The data length of error response is defined as “00H”.<br><br>Sending frame:<br>The data length is 1 byte dummy data when sending the read command, and that data is not referenced.<br>The data length is dependent on each “write command” sent. |
| Data | This indicates write data or read data according to command type. |
| EOF | End of Frame. Always set or receive the value as “03H” |
| Receiving Code | This indicates results of the command sent<br><br>01H: OK (ACK), 10H: NG (NAC), 12H: Command number error (Not matching),<br>13H: Communication frame error (only for Gamma data upload),<br>14H: Time out error (Two seconds),<br>15H: Check sum error (only for Gamma data upload),<br>16H: Data length error (Not matching), 17H: EEPROM write error |

Sequence for saving commands to the EEPROM

Please use the following sequence for saving commands to the EEPROM:

1) Set “1” to the 80H.0 to enable writing to the EEPROM

2) Send the save data with the page selection “1”

3) The camera sends back one of the following receiving codes after writing to the EEPROM:
   01H: OK
   17H: EEPROM write error

4) 80.0H is cleared to “0” automatically after writing to the EEPROM.

*Note1: The data cannot be saved to the EEPROM when 80H.0 is “0”.

*Note2: When saving the consecutive sequences of commands, the above steps, 1) to 4), are necessary only once.

*Note3: When saving the non-consecutive sequence of commands, the above steps, 1) to 4), are necessary for the same number of lines.

### 7.4 Camera Control Command

- The data unit of each command is 1 byte (8 bit)
- The data can be saved to the EEPROM if there is an “X” in the “Save to EEPROM” column in the following list.
- The camera initializes based on the stored data in the EEPROM when the power is applied.

#### 7.4.1 Camera Command List (Device Code: 000000)

| Device Code = 000000 | | | | | |
|---|---|---|---|---|---|
| **Command No.** | **R/W** | **Save to EEPROM** | **Function** | **Initial Data** | **Data Range** |
| 00 to 0FH | | | *reserved* | - | - |
| 10H | R/W | x | *camera function mode 1 (8bit: D[7..0])* | 90H | |
| 11H | R/W | x | *camera function mode 2 (8bit: D[7..0])* | 08H | |
| 12H | R/W | x | *camera function mode 3 (8bit: D[7..0])* | 40H | |
| 13 to 14H | | | *reserved* | - | |
| 15H | R/W | x | *camera function mode 4 (8bit: D[7..0])* | 09H | - |
| 16H | R/W | x | *software trigger mode (8bit: D[7..0])* | 80H | |
| 17H | R/W | x | *image data reset (8bit: D[7..0])* | 00H | |
| 18H | | | *reserved* | - | - |
| 19H | R/W | x | *image output format (8bit: D[7..0])* | 00H | |
| 1A to 1FH | | | *reserved* | - | - |
| 20H | R/W | x | *exposure time (us) of the electronic shutter (24bit: D[7..0])* | 16379 | 10 to 1000719 |
| 21H | R/W | x | *exposure time (us) of the electronic shutter (24bit: D[15..8])* | | |
| 22H | R/W | x | *exposure time (us) of the electronic shutter (24bit: D[24..16])* | | |
| 23 to 2FH | | | *reserved* | - | - |
| 30H | R/W | x | *CMOS analog gain (8bit: D[7..0])* | 0 | 0 to 63 |
| 31H | R/W | x | *digital gain (8bit: D[7..0])* | 00H | 0 to 255 |
| 32H | | | *reserved* | - | - |
| 33 to 37H | | | *reserved* | - | - |
| 38H | R/W | x | *Black level (8bit: D[7..0])* | 10 | 0 to 31 |
| 39 to 3DH | | | *reserved* | - | - |
| 3EH | R/W | x | *white clip for the test pattern (16bit: D[15..8])* | 4,095 | 0 to 4,095 |
| 3FH | R/W | x | *white clip for the test pattern (16bit: D[7..0])* | | |
| 40H | | | *reserved* | - | - |
| 41H | R/W | x | Aptina1.3M ROW COLUMN Decimation (8bit ： D[7..0]) | | |
| 42 to 4FH | | | *reserved* | - | - |
| 50H | R/W | x | *trigger delay time (us) (Integer) (24bit: D[7..0])* | 0 | 0 to 2,000,000 |
| 51H | R/W | x | *trigger delay time (us) (Integer) (24bit: D[15..8])* | | |
| 52H | R/W | x | *trigger delay time (us) (Integer) (24bit: D[23..16])* | | |
| 53H | R/W | x | *trigger delay time (us) (Decimal) (8bit: D[7..0])* | | |
| 54H | R/W | x | *strobe signal delay time (us) (Integer) (24bit: D[7..0])* | 0 | 0 to 2,000,000 |
| 55H | R/W | x | *strobe signal delay time (us) (Integer) (24bit: D[15..8])* | | |
| 56H | R/W | x | *strobe signal delay time (us) (Integer) (24bit: D[23..16])* | | |
| 57H | R/W | x | *strobe signal delay time (us) (Decimal) (8bit: D[7..0])* | | |

| Device Code = 000000 | | | | | |
|---|---|---|---|---|---|
| **Command No.** | **R/W** | **Save to EEPROM** | **Function** | **Initial Data** | **Data Range** |
| 58H | R/W | x | *frame rate (Hz) (Integer) (16bit: D[7..0])* | 61.05190 | 0.95571 to 1272.32 |
| 59H | R/W | x | *frame rate (Hz) (Integer) (16bit: D[15..8])* | | |
| 5AH | R/W | x | *frame rate (Hz) (Decimal) (24bit: D[7..0])* | | |
| 5BH | R/W | x | *frame rate (Hz) (Decimal) (24bit: D[15..8])* | | |
| 5CH | R/W | x | *frame rate (Hz) (Decimal) (24bit: D[23..16])* | | |
| 5DH | R/W | x | *I/O signal polarity (8bit: D[7..0])* | 00H | |
| 5EF | | | *reserved* | - | - |
| 5FH | | | *reserved* | | |
| 60 to 77H | | | *reserved* | - | - |
| 78H | R/W | x | *test pattern selection (8bit: D[7..0])* | 00H | |
| 79H | R/W | x | *image effect selection (8bit: D[7..0])* | 00H | |
| 7A to 7FH | | | *reserved* | - | - |
| 80H | R/W | | *EEPROM control (8bit: D[7..0])* | 00H | |
| 81 to 8FH | | | *reserved* | - | - |
| 90H | R/W | x | *strobe signal active time (us) (Integer) (24bit: D[7..0])* | 10 | 0 to 2,000,000 |
| 91H | R/W | x | *strobe signal active time (us) (Integer) (24bit: D[15..8])* | | |
| 92H | R/W | x | *strobe signal active time (us) (Integer) (24bit: D[23..16])* | | |
| 93H | R/W | x | *strobe signal active time (us) (Decimal) (8bit: D[7..0])* | | |
| 94 to EFH | | | *reserved* | - | - |
| F0H | R/W | x | *signals of the power-/IO connector (8bit: D[7..0])* | 20H | |
| F1H | R/W | x | *user output signal for the power-I/O connector (8bit: D[7..0])* | 00H | |
| F2 to FFH | | | *reserved* | - | - |

### 7.4.2 Camera Command List (Device Code: 100000)

| Device Code = 100000 | | | | | |
|---|---|---|---|---|---|
| **Command No.** | **R/W** | **Save to EEPROM** | **Function** | **Initial Data** | **Data Range** |
| 00 to 1FH | | | *reserved* | - | - |
| 20H | R/W | x | *exposure mode (8bit: D[7..0])* | 00H | |
| 21H | R/W | x | *AGC maximum limit (8bit: D[7..0])* | 63 | 0 to 63 |
| 22H | | | *reserved* | - | - |
| 23H | R/W | x | *upper limit of the auto electronic shutter (20bit: D[7..0])* | 1,000,719 | 10 to 1,000,719 |
| 24H | R/W | x | *upper limit of the auto electronic shutter (20bit: D[15..8])* | | |
| 25H | R/W | x | *upper limit of the auto electronic shutter (20bit: D[20..16])* | | |
| 26H | R/W | x | *lower limit of the auto electronic shutter (20bit: D[7..0])* | 10 | 10 to 1,000,719 |
| 27H | R/W | x | *lower limit of the auto electronic shutter (20bit: D[15..8])* | | |
| 28H | R/W | x | *lower limit of the auto electronic shutter (20bit: D[20..16])* | | |
| 29H | R/W | x | *weight1 for ALC (8bit: D[7..0])* | 11H | D3 to D0: 0 to 15<br>D7 to D4: 0 to 15 |
| 2AH | R/W | x | *weight2 for ALC (8bit: D[7..0])* | 11H | |
| 2BH | R/W | x | *weight3 for ALC (8bit: D[7..0])* | 1AH | |
| 2CH | R/W | x | *weight4 for ALC (8bit: D[7..0])* | 11H | |
| 2DH | R/W | x | *weight5 for ALC (8bit: D[7..0])* | 01H | D3 to D0: 0 to 15<br>D7 to D4: 0 |
| 2EH | R/W | x | *target brightness for ALC (8bit: D[7..0])* | 128 | 0 to 255 |
| 2FH | R/W | x | *ALC peak-average (8bit: D[7..0])* | 0 | 0 to 255 |
| 30H | R/W | x | *vertical_1 position for the ALC weight area (16bit: D[7..0])* | 32 | 1023 |
| 31H | R/W | x | *vertical_1 position for the ALC weight area (16bit: D[15..8])* | | |
| 32H | R/W | x | *vertical_2 position for the ALC weight area (16bit: D[7..0])* | 373 | 1023 |
| 33H | R/W | x | *vertical_2 position for the ALC weight area (16bit: D[15..8])* | | |
| 34H | R/W | x | *vertical_3 position for the ALC weight area (16bit: D[7..0])* | 651 | 1023 |
| 35H | R/W | x | *vertical_3 position for the ALC weight area (16bit: D[15..8])* | | |
| 36H | R/W | x | *vertical_4 position for the ALC weight area (16bit: D[7..0])* | 992 | 1023 |
| 37H | R/W | x | *vertical_4 position for the ALC weight area (16bit: D[15..8])* | | |
| 38H | R/W | x | *horizontal_1 position for the ALC weight area (16bit: D[7..0])* | 36 | 1279 |
| 39H | R/W | x | *horizontal_1 position for the ALC weight area (16bit: D[15..8])* | | |
| 3AH | R/W | x | *horizontal_2 position for the ALC weight area (16bit: D[7..0])* | 462 | 1279 |
| 3BH | R/W | x | *horizontal_2 position for the ALC weight area (16bit: D[15..8])* | | |
| 3CH | R/W | x | *horizontal_3 position for the ALC weight area (16bit: D[7..0])* | 818 | 1279 |
| 3DH | R/W | x | *horizontal_3 position for the ALC weight area (16bit: D[15..8])* | | |
| 3EH | R/W | x | *horizontal_4 position for the ALC weight area (16bit: D[7..0])* | 1244 | 0 to 2591 |
| 3FH | R/W | x | *horizontal_4 position for the ALC weight area (16bit: D[15..8])* | | |
| 40H | R/W | x | *white balance mode (8bit: D[7..0])* | 00H | |
| 41H | R/W | x | *preset_1 white balance (Red gain) (8bit: D[7..0])* | 0 | 0 to 255 |
| 42H | R/W | x | *preset_1 white balance (Gr gain) (8bit: D[7..0])* | 0 | 0 to 255 |
| 43H | R/W | x | *preset_1 white balance (Blue gain) (8bit: D[7..0])* | 0 | 0 to 255 |
| 44H | R/W | x | *preset_1 white balance (Gb gain) (8bit: D[7..0])* | 0 | 0 to 255 |
| 45H | R/W | x | *preset_2 white balance (Red gain) (8bit: D[7..0])* | 0 | 0 to 255 |
| 46H | R/W | x | *preset_2 white balance (Gr gain) (8bit: D[7..0])* | 0 | 0 to 255 |
| 47H | R/W | x | *preset_2 white balance (Blue gain) (8bit: D[7..0])* | 0 | 0 to 255 |
| 48H | R/W | x | *preset_2 white balance (Gb gain) (8bit: D[7..0])* | 0 | 0 to 255 |

| Device Code = 100000 | | | | | |
|---|---|---|---|---|---|
| **Command No.** | **R/W** | **Save to EEPROM** | **Function** | **Initial Data** | **Data Range** |
| 49H | R/W | x | *preset_3 white balance (Red gain) (8bit: D[7..0])* | 0 | 0 to 255 |
| 4AH | R/W | x | *preset_3 white balance (Gr gain) (8bit: D[7..0])* | 0 | 0 to 255 |
| 4BH | R/W | x | *preset_3 white balance (Blue gain) (8bit: D[7..0])* | 0 | 0 to 255 |
| 4CH | R/W | x | *preset_3 white balance (Gb gain) (8bit: D[7..0])* | 0 | 0 to 255 |
| 4DH | | | *reserved* | - | - |
| 4EH | R/W | x | *threshold for auto white balance (16bit: D[7..0])* | 3072 | 0 to 4,095 |
| 4FH | R/W | x | *threshold for auto white balance (16bit: D[16..8])* | | |
| 50H | R/W | x | *Y_offset for AOI (8bit: D[7..0])* | 0 | 0 <= Y <= 1024, where Y = offset + height |
| 51H | R/W | x | *Y_offset for AOI (16bit: D[15..8])* | | |
| 52H | R/W | x | *height for AOI (8bit: D[7..0])* | 1024 | |
| 53H | R/W | x | *height for AOI (16bit: D[15..8])* | | |
| 54H | R/W | x | *X_offset for AOI (8bit: D[7..0])* | 0 | 0 <= X <= 1280, where X = offset + width |
| 55H | R/W | x | *X_offset for AOI (16bit: D[15..8])* | | |
| 56H | R/W | x | *width for AOI (8bit: D[7..0])* | 1280 | |
| 57H | R/W | x | *width for AOI (16bit: D[15..8])* | | |
| 58H | R/W | x | *vertical_1 position for the white balance area (16bit: D[7..0])* | 0 | 0 to 1022 |
| 59H | R/W | x | *vertical_1 position for the white balance area (16bit: D[15..8])* | | |
| 5AH | R/W | x | *vertical_2 position for the white balance area (16bit: D[7..0])* | 1023 | 0 to 1023 |
| 5BH | R/W | x | *vertical_2 position for the white balance area (16bit: D[15..8])* | | |
| 5CH | R/W | x | *horizontal_1 position for the white balance area (16bit: D[7..0])* | 0 | 0 to 1278 |
| 5DH | R/W | x | *horizontal_1 position for the white balance area (16bit: D[15..8])* | | |
| 5EH | R/W | x | *horizontal_2 position for the white balance area (16bit: D[7..0])* | 1279 | 0 to 1279 |
| 5FH | R/W | x | *horizontal_2 position for the white balance area (16bit: D[15..8])* | | |
| 60H | R/W | x | *camera mode1 (8bit: D[7..0])* | 00H | |
| 61H | R/W | x | *camera mode2 (8bit: D[7..0])* | 00H | - |
| 62H | R/W | x | *camera mode3 (8bit: D[7..0])* | 80H/81H | |
| 63 to 7FH | | | *reserved* | | |
| 80H | R/W | x | *push set white balance (Red gain) (8bit: D[7..0])* | 0 | 0 to 255 |
| 81H | R/W | x | *push set white balance (Gr gain) (8bit: D[7..0])* | 0 | 0 to 255 |
| 82H | R/W | x | *push set white balance (Blue gain) (8bit: D[7..0])* | 0 | 0 to 255 |
| 83H | R/W | x | *push set white balance (Gb gain) (8bit: D[7..0])* | 0 | 0 to 255 |
| 84 to FFH | | | *reserved* | - | - |

### 7.4.3 Descriptions of the Camera Commands (Device Code: 000000)

The underlined settings are the factory default settings.

<table>
<tr><th>Command No.</th><th>Command Description</th></tr>
<tr><td>10H:<br>MOD1[7..0]</td><td>[camera function mode 1] Initial data: MOD1[7..0] = 90H<br>Sets the camera function mode.<br>D[7..0]<br>
<table>
<tr><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td></tr>
</table>
<br>
D7: Shutter Type — 0:ERS — <u>1:GS</u><br>
D6: Trigger Polarity — <u>0: Positive</u> — 1: Negative<br>
D5 to D4: Exposure Mode — <u>00:ShutterOff(FreeRun)</u> — 01:Edge Preset<br>
Another: No Function<br>
D3 to D0: No Function — <u>Always set as “0000”</u><br><br>
Note 1: The trigger polarity is automatically set to positive when using the software trigger; the trigger polarity cannot be changed.</td></tr>
<tr><td>11H:<br>MOD2[7..0]</td><td>[Camera function mode 2] Initial data: MOD2[7..0] = 08H<br>Sets the camera function mode.<br>D[7..0]<br>
<table>
<tr><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td></tr>
</table>
<br>
D7 to D4: No Function — <u>Always set as “0000”</u><br><br>
D3: Operational Mode — 0: Trigger Mode — <u>1: Continuous Mode</u><br>
D2 to D0: No Function — <u>Always set as “000”</u><br><br>
Note 1: The function mode is enabled whenever the “Continuous/Trigger mode (MOD1-D7)” is manual.<br>
Note 2: While the camera is in Trigger Mode, the video will not output without the trigger signal input.</td></tr>
<tr><td>12H:<br>MOD3[7..0]</td><td>[Camera function mode 3] Initial data: MOD3[7..0] = 40H<br>Sets the camera function mode.<br>D[7..0]<br>
<table>
<tr><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td></tr>
</table>
<br>
D7 to D6 — No Function — <u>Always set as “00”</u><br>
D5: Trigger Signal Type — <u>0: Software Trigger</u> — 1: Hardware Trigger (from No.5 pin of Power-I/O connector)<br>
D4 to D2: No Function — <u>Always set as “000”</u><br>
D1 to D0 Mirror Flip — 00:Normal — 1:Horisontal Mirror<br>
10:Vertical Flip — Another: No Function<br>
Note 1: The trigger polarity is automatically set to positive when using the software trigger; the trigger polarity cannot be changed.</td></tr>
</table>

<table>
<tr><th>Command No.</th><th>Command Description</th></tr>
<tr><td>15H:<br>MOD4[7..0]</td><td>[Camera function mode 4] Initial data: MOD4[7..0] = 09H<br>Sets the camera function mode.<br>D[7..0]<br>
<table>
<tr><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td></tr>
</table>
<br>
D7 to D6: Binning Mode — 00: Average; 01: Sum; 10: No function; 11: No function<br>
D5 to D3: Vertical Binning Mode — 000: No function; 001: Full Scan; 010:Binning x2; 011: No function; 100: No function; Another: Not Use<br>
D2 to D0 Horizontal Binning Mode — 000: No function; 001: Full Scan; 010:Binning x2; 011: No function; Another: Not Use</td></tr>
<tr><td>16H:<br>SOFTRG[7..0]</td><td>[Software Trigger Setting] Initial data: SOFTRG[7..0] = 80H<br>Sets the source of the software trigger.<br>D[7..0]<br>
<table>
<tr><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td></tr>
</table>
<br>
D7 to D6: Software trigger source selection — 00: Programming software trigger; 10: Command software trigger (200 useconds pulse width trigger signal); 01, 11: No function (Prohibited settings. Do not set these values)<br>
D5 to D1: No Function — Always set as “00000”<br>
D0: Generate software trigger command — 0: Hold (Low State); 1: Generate command software trigger (200 useconds high state)<br><br>
Note 1: The software trigger source selection is enabled whenever “Trigger signal type (MOD3-D5)” is the software trigger (set as 0)<br>
Note 2: The “Programming software trigger” is used to set up the pulse duration, trigger signal interval and generate the trigger signal.<br>
Note 3: When selecting “Command software trigger”, it is necessary to generate the software trigger signal with the “Generate command software trigger (SOFTRIG-D0)”.</td></tr>
<tr><td>17H:<br>IMAGEREST<br>[7..0]</td><td>[Image Data Reset] Initial data: IMAGEREST[7..0] = 00H<br>Reset the Image data (FVAL, LVAL and the image data).<br>Change from the reset to the image data out after starting the image acquisition.<br>The image data is not output when resetting the image data.<br>D[7..0]<br>
<table>
<tr><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td></tr>
</table>
<br>
D7 to D1: No Function — Always set as “0000000”<br>
D0: Image Data Reset — 0: FVAL/LVAL/Image data reset (FVAL, LVAL and the image data are low state data); 1: FVAL/LVAL/Image data out</td></tr>
</table>

<table>
<tr><th>Command No.</th><th>Command Description</th></tr>
<tr><td>19H<br>FORMAT[7..0]</td><td>[Image output format] initial data: Monochrome FORMAT[7..0] = 00H, Color FORMAT[7..0] = 00H<br>Sets the output format of the image data.<br>D[7..0]<br>
<table>
<tr><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td></tr>
</table>
<br>D7 to D3: No Function Always set as “0000”<br>D2 to D0: Output format 0000: Mono8<br>0001: Mono10<br>0010: Mono10Packed<br>0011: No function<br>0100: No function<br>0101: BayerRG8<br>0110: BayerRG10<br>0111: No function<br>1010: RGB8Packed<br>1011 to 1111: No function (Prohibited setting. Do not set these values)</td></tr>
<tr><td>20H:<br>EXPTM[7..0]<br>21H:<br>EXPTM[15..8]<br>22H:<br>EXPTM[23..16]</td><td>[Exposure time (useconds) of the electronic shutter]<br>Initial data: EXPTM[23..0] = 16379, data range: 10 to 1,000,719<br>Sets the exposure time for the electronic shutter.<br><br>Exposure time = EXPTM[23..0] useconds</td></tr>
<tr><td>30H:<br>PGA[7..0]</td><td>[CMOS Analog gain] Initial data: PGA [7..0] = 0, data range: 0 to 55<br>Sets the CMOS Analog gain (programmable gain)<br><br>CMOS Analog gain = 20 x log ( 1 + PGA[7..0] / 64 ) dB</td></tr>
<tr><td>31H:<br>DGB[7..0]</td><td>[Digital gain] Initial data: DGB [7..0] = 0, data range: 0 to 255<br><br>Video level = (Input video level – Black level) x (1 + DGB[7..0]/128) + Black Level<br><br>* Black Level Black level (The calculated value of the address 38H)</td></tr>
<tr><td>38H<br>CLAMP[7..0]</td><td>[Clamp Level] Initial data: CLAMP[7..0] = 0, data range: 0 to 31<br>Sets the Clamp level(Black level of clamp).<br><br>Clamp Level = CLAMP[7..0] x 4</td></tr>
</table>

<table>
<tr><th>Command No.</th><th>Command Description</th></tr>
<tr><td>3EH: WHITE_CLIP[15..8]<br>3FH: WHITE_CLIP[7..0]</td><td>[White clip level for the white clip test pattern]<br>Initial data: WHITE_CLIP[15..0] = 4,095; data range: 0 to 4,095<br><br>Sets the white clip level of the white clip test pattern.</td></tr>
<tr><td>41H:<br>ROW_CLOUMN_SKIP[7:0]</td><td>[Aptina1.3M ROW COLUMN Decimation] Initial data: ROW_CLOUMN_SKIP[7:0] = 09H<br>Sets the Decimation .mode<br>D[7..0]
<table>
<tr><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td></tr>
</table>
<table>
<tr><td>D7 to D6</td><td>No Function</td><td><u>Always set as “00”</u></td><td></td></tr>
<tr><td>D5 to D3:</td><td>Vertical Decimation</td><td>000: No Function</td><td><u>001:Ful Scan</u></td></tr>
<tr><td></td><td></td><td>010: Decimation 1x</td><td>011: Decimation 2x</td></tr>
<tr><td></td><td></td><td>100: Decimation 3x</td><td>101: No Function</td></tr>
<tr><td></td><td></td><td>110: No Function</td><td>111: No Function</td></tr>
<tr><td>D2 to D0:</td><td>Horizontal Decimation</td><td>000: No Function</td><td><u>001:Ful Scan</u></td></tr>
<tr><td></td><td></td><td>010: Decimation 1x</td><td>011: Decimation 2x</td></tr>
<tr><td></td><td></td><td>100: Decimation 3x</td><td>101: No Function</td></tr>
<tr><td></td><td></td><td>110: No Function</td><td>111: No Function</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Command No.</th><th>Command Description</th></tr>
<tr><td>50H: DELAY_I[7..0]<br>51H: DELAY_I[15..8]<br>52H: DELAY_I[23..16]<br>53H: DELAY_F[7..0]</td><td>[Delay time (us) for the trigger signal]<br>Initial data: DELAY_I[23..0] = 0, DELAY_F[7..0] = 0, data range: 0 to 2,000,000<br>Sets the delay time that is from the trigger signal input to the start of the exposure as useconds.<br><br>Delay time for the trigger signal = (DELAY_I[23..0]). (DELAY_F[7..0]) useconds</td></tr>
<tr><td>54H:<br>STROBEDELAY_I[7..0]<br>55H:<br>STROBEDELAY_I[15..8]<br>56H:<br>STROBEDELAY_I[23..16]<br>57H:<br>STROBEDELAY_F[7..0]</td><td>[Delay time (us) for the strobe signal]<br>Initial data: STROBEDELAY _I[23..0] = 0, STROBEDELAY _F[7..0] = 0, data range: 0 to 2,000,000<br><br>Delay time for the strobe signal = (STROBEDELAY _I[23..0]). (STROBEDELAY _F[7..0]) useconds</td></tr>
<tr><td>58H: FPS_I[7..0]<br>59H: FPS_I[15..8]<br>5AH: FPS_F[7..0]<br>5BH: FPS_F[15..8]<br>5CH: FPS_F[23..16]]</td><td>[Frame rate (Hz)]<br>Initial data: FPS_I[15..0] = 61.0519, data rage: 0.95571 to 1272.32<br>Initial data: FPS_F[15..0] = 0, data range: 0 to 99,999<br>Sets the frame rate as Hz<br><br>Frame rate = (FPS_I[15..0]). (FPS_F[23..0]) Hz<br>data range of frame rate: 0.95571 to 1272.32 Hz<br>Maximum frame rate for full resolution: 61.0519 Hz<br><br>Note 1: The maximum frame rate depends on the AOI setting</td></tr>
<tr><td>5DH:<br>IOSIGNAL_POL[7..0]</td><td>[I/O signal polarity] Initial data: IOSIGNAL_POL[7..0] = 00H,<br>Sets the No.2 pin and No.3 pin of the I/O signal polarity.<br>D[7..0]<br><table><tr><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td></tr></table><br>D7 to D2: No Function Always set as “000000”<br>D1 No.3 pin (I/O-2) polarity 0: Non-invert 1: Invert<br>D0: No.2 pin (I/O-1) polarity 0: Non-invert 1: Invert</td></tr>
</table>

<table>
<tr><th>Command No.</th><th>Command Description</th></tr>
<tr><td>78H:<br>TESTP[7..0]</td><td>[Test Pattern] Initial data: TESTP [7..0] = 00H<br>Sets the test pattern video output.<br>D[7..0]<br>
<table>
<tr><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td></tr>
</table>
<br>0: Normal Video Image<br>1: Gray Scale<br>2: Ramp<br>3: 100% White<br>4: White Clip<br>6: Color Bar<br>Others: Black</td></tr>
<tr><td>79H:<br>EFFCT[7..0]</td><td>[Image effect selection] Initial data: EFFCT[7..0] = 00H<br>Sets the image effect.<br>D[7..0]<br>
<table>
<tr><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td></tr>
</table>
<br>D7: Negative / Positive video selection<br>0: Positive image<br>1: Negative image<br>D6 to D0: Image effect<br>00H: No effect (Original)<br>01H: 9bit gradation<br>02H: 9bit gradation<br>03H: 7bit gradation<br>04H: 6bit gradation<br>05H: 5bit gradation<br>06H: 4bit gradation<br>07H: 3bit gradation<br>08H: 2bit gradation<br>09H: 1bit gradation<br>0A to 7FH: No function<br>(Prohibited settings. Do not set these values)</td></tr>
<tr><td>80H: E2P[7..0]</td><td>[EEPROM control] Initial data: E2P[7..0] = 00H<br>D[7..0]<br>
<table>
<tr><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td></tr>
</table>
<br>D7 to D1: No function<br>Always set as “0000000”<br>D6 to D0: Write control to the EEPROM<br>0: Prohibited<br>1: Accept<br><br>Note: This bit is cleared to “0” automatically by the internal processes after the execution of the command.</td></tr>
<tr><td>90H:<br>STROBEON_I[7..0]<br>91H:<br>STROBEON_I[15..8]<br>92H:<br>STROBEON_I[23..16]<br>93H:<br>STROBEON_F[7..0]</td><td>[Active time (us) for the strobe signal]<br>Initial data: STROBEON _I[23..0] =10, STROBEDELAY _F[7..0] = 0, data range: 0 to 2,000,000<br><br>Active time for the strobe signal = (STROBEON _I[23..0]). (STROBEON _F[7..0]) useconds<br><br>Active time for the strobe signal is set as below.<br>0: No strobe signal output<br>1 to 9: 10 us<br>Greater than 9: set value</td></tr>
</table>

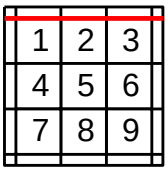
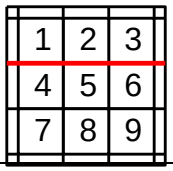
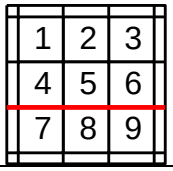
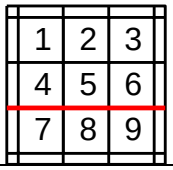
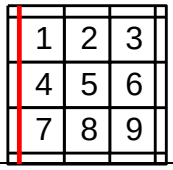
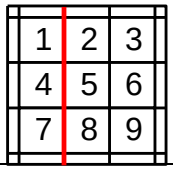
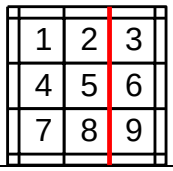
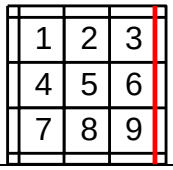
<table>
<tr><th>Command No.</th><th>Command Description</th></tr>
<tr><td>F0H:<br>OUTSEL<br>[7..0]</td><td>[Output signal selection for the power-I/O connector] Initial data: OUTSEL[7..0] = 20H<br>Sets the output signal from the power/IO connector.<br>D[7..0]<br>
<table>
<tr><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td></tr>
</table>
<br>D7 to D4: Output signal for 3pin of the power/IO connector<br>0: FrameTriggerWait signal 1: UserOutput signal<br>2: ExposureActive signal 3: TriggerAuxiliary signal<br>4: TriggerInternal signal (after mask and delay process)<br>5: SensorReadOut signal<br>6 to F: No Function (Prohibited setting. Do not set these values)<br>D3 to D0: Output signal for 2pin of the power/IO connector<br>0: FrameTriggerWait signal 1: UserOutput signal<br>2: ExposureActive signal 3: TriggerAuxiliary signal<br>4: TriggerInternal signal (after mask and delay process)<br>5: SensorReadOut signal<br>6 to F: No Function (Prohibited setting. Do not set these values)<br>Note: When “UserOutput signal” is selected, set the status of the signal with “UserOutput signal for the power/IO connector (TEST2-D3,4)”.</td></tr>
<tr><td>F1H: TEST2[7..0]</td><td>[UserOutput signal for the power-I/O connector] Initial data: TEST2[7..0] = 00H<br>Sets the status of the UserOutput signal.<br>D[7..0]<br>
<table>
<tr><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td></tr>
</table>
<br>D7 to D5: No function Always set as “000”<br>D4: UserOutput signal for 3pin of the power/IO connector 0: Low 1: High<br>D3: UswerOuput signal for 2pin of the power/IO connector 0: Low 1: High<br>D2 to D0: No function Always set as “000”<br>Note: The UserOutput signal is enabled whenever “UserOutput signal” is selected at the “Output signal selection (OUTSEL)”.</td></tr>
</table>

### 7.4.4 Descriptions of the Camera Commands (Device Code: 100000)

The underlines settings are the factory default settings.

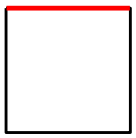
<table>
<tr><th>Command No.</th><th>Command Description</th></tr>
<tr><td>20H: [7..0]</td><td>[Exposure mode] Initial data: 00H<br>Sets the exposure mode, which is the AGC.<br>D[7..0]<br>
<table>
<tr><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td></tr>
</table>
<br>
D7 to D4: No Function — Always set as “0000”<br>
D3: AGC — 0: OFF (Fixed gain) — 1: ON (AGC)<br>
D2: Shutter Mode — 0: OFF (Fixed shutter) — 1: ON (Auto shutter)<br>
D1: No Function — Always set as “0”<br>
D0: No Function — Always set as “0”</td></tr>
<tr><td>21H: [7..0]</td><td>[AGC maximum limit] Initial data: 63, data range: 0 to 63<br>Sets the maximum limit for the AGC.</td></tr>
<tr><td>23H: [7..0]<br>24H: [15..8]<br>25H: [20..16]</td><td>[Upper limit of the electronic shutter for auto shutter]<br>Initial data: 1,000,719; data range: 10 to 1,000,719<br>Sets the upper limit of the electronic shutter for the auto shutter as usecond.</td></tr>
<tr><td>26H: [7..0]<br>27H: [15..8]<br>28H: [20..16]</td><td>[Lower limit of the electronic shutter for auto shutter]<br>Initial data:10; data range: 10 to 1,000,719<br>Sets the upper limit of the electronic shutter for the auto shutter as usecond.</td></tr>
<tr><td>29H: [7..0]</td><td>[Weight1 for ALC] Initial data: 11H<br>Sets the weight for ALC weight area 1 and 2.<br>D[7..0]<br>
<table>
<tr><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td></tr>
</table>
<br>
D7 to D4: Weight for ALC weight area 2 — 1 — Range: 0 to 15<br>
D3 to D0: Weight for ALC weight area 1 — 1 — Range: 0 to 15<br><br>
*Please set the ALC weight area with “30H to 3FH”</td></tr>
<tr><td>2AH: [7..0]</td><td>[Weight2 for ALC] Initial data: 11H<br>Sets the weight for ALC weight area 3 and 4.<br>D[7..0]<br>
<table>
<tr><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td></tr>
</table>
<br>
D7 to D4: Weight for ALC weight area 4 — 1 — Range: 0 to 15<br>
D3 to D0: Weight for ALC weight area 3 — 1 — Range: 0 to 15<br><br>
*Please set the ALC weight area with “30H to 3FH”</td></tr>
</table>

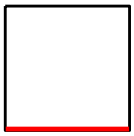
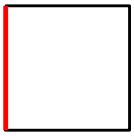
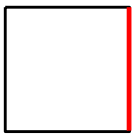
<table>
<tr><th>Command No.</th><th>Command Description</th></tr>
<tr><td>2BH: [7..0]</td><td>[Weight3 for ALC] Initial data: 1AH<br>Sets the weight for ALC weight area 5 and 6.<br>D[7..0]<br>
<table>
<tr><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td></tr>
</table>
D7 to D4: Weight for ALC weight area 6 1 Range: 0 to 15<br>D3 to D0: Weight for ALC weight area 5 10 Range: 0 to 15<br><br>*Please set the ALC weight area with “30H to 3FH”</td></tr>
<tr><td>2CH: [7..0]</td><td>[Weight4 for ALC] Initial data: 11H<br>Sets the weight for ALC weight area 7 and 8.<br>D[7..0]<br>
<table>
<tr><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td></tr>
</table>
D7 to D4: Weight for ALC weight area 8 1 Range: 0 to 15<br>D3 to D0: Weight for ALC weight area 7 1 Range: 0 to 15<br><br>*Please set the ALC weight area with “30H to 3FH”</td></tr>
<tr><td>2DH: [7..0]</td><td>[Weight5 for ALC] Initial data: 01H<br>Sets the weight for ALC weight area 9.<br>D[7..0]<br>
<table>
<tr><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td></tr>
</table>
D7 to D4: No Function Always set as “0000”<br>D3 to D0: Weight for ALC weight area 9 1 Range: 0 to 15<br><br>*Please set the ALC weight area with “30H to 3FH”</td></tr>
<tr><td>2EH: [7..0]</td><td>[Target Brightness for ALC] Initial data: 128, data range: 0 to 255<br>Sets the target brightness for the ALC function (AGC, auto shutter).</td></tr>
<tr><td>2FH: [7..0]</td><td>[ALC peak-average] Initial data: 0, data range: 0 to 255<br>Sets the control standard for the ALC function (AGC, auto shutter )<br><br>When set as 0 (Average: 100%, Peak: 0%), the ALC function with the average brightness of the photometry area.<br><br>When set as 255 (Average: 0%, Peak: 100%), the ALC function with the peak brightness of the photometry area.</td></tr>
</table>

| Command No. | Command Description |
|---|---|
| 30H: [7..0]<br>31H: [15..8] | [Vertical_1 position for the ALC weight area]<br>Initial data: 32, data range: 0 to 1023<br>Sets the vertical 1 position for the ALC weight area.  |
| 32H: [7..0]<br>33H: [15..8] | [Vertical_2 position for the ALC weight area]<br>Initial data:373, data range: 0 to 1023<br>Sets the vertical 2 position for the ALC weight area.  |
| 34H: [7..0]<br>35H: [15..8] | [Vertical_3 position for the ALC weight area]<br>Initial data:651, data range: 0 to 1023<br>Sets the vertical 3 position for the ALC weight area.  |
| 36H: [7..0]<br>37H: [15..8] | [Vertical_4 position for the ALC weight area]<br>Initial data:992, data range: 0 to 1023<br>Sets the vertical 4 position for the ALC weight area.  |
| 38H: [7..0]<br>39H: [15..8] | [Horizontal_1 position for the ALC weight area]<br>Initial data: 36, data range: 0 to 1279<br>Sets the horizontal 1 position for the ALC weight area.  |
| 3AH: [7..0]<br>3BH: [15..8] | [Horizontal_2 position for the ALC weight area]<br>Initial data: 4626, data range: 0 to 1279<br>Sets the horizontal 2 position for the ALC weight area.  |
| 3CH: [7..0]<br>3DH: [15..8] | [Vertical_3 position for the ALC weight area]<br>Initial data:818, data range: 0 to 1279<br>Sets the horizontal 3 position for the ALC weight area.  |
| 3EH: [7..0]<br>3FH: [15..8] | [Vertical_4 position for the ALC weight area]<br>Initial data: 1244, data range: 0 to 1279<br>Sets the horizontal 4 position for the ALC weight area.  |

<table>
<tr><th>Command No.</th><th>Command Description</th></tr>
<tr><td>40H: [7..0]</td><td>[White Balance mode] Initial data: 00H<br>Sets the white balance mode for the color camera.<br>D[7..0]<br>
<table>
<tr><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td></tr>
</table>
<br>D7 to D4: No Function — Always set as “0000”<br>D3: Push to set white balance operation — 0: OFF — 1: ON<br>D2 to D0: White balance mode — 000: OFF — 001: Preset 1, — 010: Preset 2 — 011: Preset 3 — 100: Auto white balance — 101: Push to set white balance — 110 to 111: No Function<br>(Prohibited settings. Do not set these values)<br><br>* When using the push-to-set white balance, set the white balance mode as “Push to set white balance” then change “0” to “1” for the push-to-set white balance operation.</td></tr>
<tr><td>41H:<br>GainR1[7..0]</td><td>[Preset_1 white balance (Red gain)] Initial data: 0, data range: 0 to 255<br>Sets the Red gain for the preset_1 white balance.<br><br>Red of the camera output image data = (SENSOR_R – Black Level) x (1+ GainR1[7..0] / 64) + Black Level<br><br>* SENSOR_R: Red of the Sensor output image data<br>* Black Level: Black level (The calculated value of 38H)</td></tr>
<tr><td>42H:<br>GainGr1[7..0]</td><td>[Preset_1 white balance (Gr gain)] Initial data: 0, data range: 0 to 255<br>Sets the Gr gain for the preset_1 white balance.<br><br>Gr of the camera output image data = (Sensor _Gr – BLACK Level) x (1+ GainGr1[7..0] / 64) + BLACK Level<br><br>* Sensor _Gr: Red of the Sensor output image data<br>* BLACK Level: Black level (The calculated value of 38H)</td></tr>
<tr><td>43H:<br>GainB1[7..0]</td><td>[Preset_1 white balance (Blue gain)] Initial data: 0, data range: 0 to 255<br>Sets the Blue gain for the preset_1 white balance.<br><br>Blue of the camera output image data = (Sensor _B – BLACK Level) x (1+ GainB1[7..0] / 64) + BLACK Level<br><br>* Sensor _B: Blue of the Sensor output image data<br>* BLACK Level: Black level (The calculated value of 38H)</td></tr>
<tr><td>44H:<br>GainGb1[7..0]</td><td>[Preset_1 white balance (Gb gain)] Initial data: 0, data range: 0 to 255<br>Sets the Gb gain for the preset_1 white balance.<br><br>Gb of the camera output image data = (Sensor _Gb – BLACK Level) x (1+ GainGb1[7..0] / 64) + BLACK Level<br><br>* Sensor _Gb: Gb of the Sensor output image data<br>* BLACK Level: Black level (The calculated value of 38H)</td></tr>
</table>

| Command No. | Command Description |
|---|---|
| 45H:<br>GainR2[7..0] | [Preset_2 white balance (Red gain)] Initial data: 0, data range: 0 to 255<br>Sets the Red gain for the preset_1 white balance.<br><br>Red of the camera output image data = (Sensor _R – BLACK Level) x (1+ GainR2[7..0] / 64) + BLACK Level<br><br>* Sensor _R: Red of the Sensor output image data<br>* BLACK Level: Black level (The calculated value of 38H) |
| 46H:<br>GainGr2[7..0] | [Preset_2 white balance (Gr gain)] Initial data: 0, data range: 0 to 255<br>Sets the Gr gain for the preset_2 white balance.<br><br>Gr of the camera output image data = (Sensor _Gr – BLACK Level) x (1+ GainGr2[7..0] / 64) + BLACK Level<br><br>* Sensor _Gr: Red of the Sensor output image data<br>* BLACK Level: Black level (The calculated value of 38H) |
| 47H:<br>GainB2[7..0] | [Preset_2 white balance (Blue gain)] Initial data: 0, data range: 0 to 255<br>Sets the Blue gain for the preset_2 white balance.<br><br>Blue of the camera output image data = (Sensor _B – BLACK Level) x (1+ GainB2[7..0] / 64) + BLACK Level<br><br>* Sensor _B: Blue of the Sensor output image data<br>* BLACK Level: Black level (The calculated value of 38H) |
| 48H:<br>GainGb2[7..0] | [Preset_2 white balance (Gb gain)] Initial data: 0, data range: 0 to 255<br>Sets the Gb gain for the preset_2 white balance.<br><br>Gb of the camera output image data = (Sensor _Gb – BLACK Level) x (1+ GainGb2[7..0] / 64) + BLACK Level<br><br>* Sensor _Gb: Gb of the Sensor output image data<br>* BLACK Level: Black level (The calculated value of 38H) |
| 49H:<br>GainR3[7..0] | [Preset_3 white balance (Red gain)] Initial data: 0, data range: 0 to 255<br>Sets the Red gain for the preset_3 white balance.<br><br>Red of the camera output image data = (Sensor _R – BLACK Level) x (1+ GainR3[7..0] / 64) + BLACK Level<br><br>* Sensor _R: Red of the Sensor output image data<br>* BLACK Level: Black level (The calculated value of 38H) |
| 4AH:<br>GainGr3[7..0] | [Preset_3 white balance (Gr gain)] Initial data: 0, data range: 0 to 255<br>Sets the Gr gain for the preset_3 white balance.<br><br>Gr of the camera output image data = (Sensor _Gr – BLACK Level) x (1+ GainGr3[7..0] / 64) + BLACK Level<br><br>* Sensor _Gr: Red of the Sensor output image data<br>* BLACK Level: Black level (The calculated value of 38H) |

| Command No. | Command Description |
|---|---|
| 4BH:<br>GainB3[7..0] | [Preset_3 white balance (Blue gain)] Initial data: 0, data range: 0 to 255<br>Sets the Blue gain for the preset_3 white balance.<br><br>Blue of the camera output image data = (Sensor _B – BLACK Level) x (1+ GainB3[7..0] / 64) + BLACK Level<br><br>* Sensor _B: Blue of the Sensor output image data<br>* BLACK Level: Black level (The calculated value of 38H) |
| 4CH:<br>GainGb3[7..0] | [Preset_3 white balance (Gb gain)] Initial data: 0, data range: 0 to 255<br>Sets the Gb gain for the preset_3 white balance.<br><br>Gb of the camera output image data = (Sensor _Gb – BLACK Level) x (1+ GainGb3[7..0] / 64) + BLACK Level<br><br>* Sensor _Gb: Gb of the Sensor output image data<br>* BLACK Level: Black level (The calculated value of 38H) |
| 4EH: [7..0]<br>4FH: [15..8] | [Bright level threshold fro auto white balance process] Initial data: 0, data range: 0 to 4,095<br>Sets the bright level threshold for auto white balance process.<br>Auto white balance process uses the color information of the pixel (the brightness of the pixel that is greater than this value). |
| 50H: [7..0]<br>51H: [15..8] | [Y_offset for AOI]<br>Initial data: 0, data range:0 ≤ “Y_offset + Height” ≤ 1024<br>Sets the Y_offset (the vertical start position of the image for the AOI) |
| 52H: [7..0]<br>53H: [15..8] | [Height for AOI]<br>Initial data: 1024, data range: 2 ≤ “Y_offset + Height” ≤ 1024<br>Sets the height (the vertical size of the image for the AOI) |
| 54H: [7..0]<br>55H: [15..8] | [X_offset for AOI]<br>Initial data: 0, data range: 8 ≤ “Y_offset + Height” ≤ 1280<br>Sets the X_offset (the horizontal start position of the image for the AOI) |
| 56H: [7..0]<br>57H: [15..8] | [Width for AOI]<br>Initial data: 1280, data range: 8 ≤ “Y_offset + Height” ≤ 1280<br>Sets the width (the horizontal size of the image for the AOI) |
| 58H: [7..0]<br>59H: [15..8] | [Vertical_1 position for the white balance area]<br>Initial data: 0, data range: 0 to 1022<br>Sets the vertical 1 position, which is the vertical start position for the white blance area.<br>This area is used for the gain calculation of the auto white balance and the push-to-set white balance.<br>  |

| Command No. | Command Description |
|---|---|
| 5AH: [7..0]<br>5BH: [15..8] | [Vertical_2 position for the white balance area]<br>Initial data: 1023, data range: 0 to 1023<br>Sets the vertical 2 position, which is the vertical end position for the white blance area.<br>This area is used for calculating the gain of the auto white balance and the push-to-set white balance.<br>  |
| 5CH: [7..0]<br>5DH: [15..8] | [Horizontal_1 position for the white balance area]<br>Initial data: 0, data range: 0 to 1278<br>Sets the horizontal 1 position, which is the vertical end position for the white blance area.<br>This area is used for calculating the gain of the auto white balance and the push-to-set white balance.<br>  |
| 5EH: [7..0]<br>5FH: [15..8] | [Horizontal_2 position for the white balance area]<br>Initial data: 1279, data range: 0 to 1279<br>Sets the horizontal 2 position, which is the vertical end position for the white blance area.<br>This area is used for the calculating the gain of the auto white balance and the push-to-set white balance.<br>  |

| Command No. | Command Description |
|---|---|
| 60H: [7..0] | [Camera mode 1] Initial data: 00H<br>Sets the white balance area ON/OFF and the gamma table ON/OFF.<br>D[7..0]<br>D7 \| D6 \| D5 \| D4 \| D3 \| D2 \| D1 \| D0<br><br>D7: Gamma Reload (EEPROM > Register) — 0 -> 1 : Reload Gamma Table after reloaded, automatically 1 ->0<br>D6 to D5: No function — Always set at "00"<br>D4: White balance area ON/OFF — 0: OFF (Full screen) — 1: ON (setup area)<br>D3 to D1: No function — Always set as "000"<br>D0: Gamma table ON/OFF — 0: OFF (Gamma=1.0) — 1: ON |

| Command No. | Command Description |
|---|---|
| 80H:<br>GainRP[7..0] | [Push to set white balance (Red gain)] Initial data: 0, data range: 0 to 255<br>Sets the Red gain for the Push to set white blance.<br><br>Red of the camera ouptut image data = (Sensor_R – BLACK Level) x (1 + GainRP[7..0] / 64) + BLACK Level<br><br>* Sensor _R: Red of the Sensor output image data<br>*BLACK Level: Black level (The calculated value of 38H)<br>* Sensor _Gr: Gr of the Sensor output image data<br>*BLACK Level: Black level (The calculated value of 38H) |
| 81H:<br>GainGrP[7..0] | [Push to set white balance (Gr gain)] Initial data: 0, data range: 0 to 255<br>Sets the Gr gain for the Push to set white blance.<br><br>Gr of the camera ouptut image data = (Sensor_Gr – BLACK Level) x (1 + GainGrP[7..0] / 64) + BLACK Level |
| 82H:<br>GainBR[7..0] | [Push to set white balance (Blue gain)] Initial data: 0, data range: 0 to 255<br>Sets the Blue gain for the Push to set white blance.<br><br>Red of the camera ouptut image data = (Sensor_B – BLACK Level) x (1 + GainBR[7..0] / 64) + BLACK Level<br><br>* Sensor _B: Blue of the Sensor output image data<br>*BLACK Level: Black level (The calculated value of 38H) |
| 83H:<br>GainGbP[7..0] | [Push to set white balance (Gb gain)] Initial data: 0, data range: 0 to 255<br>Sets the Gb gain for the Push to set white blance.<br><br>Gb of the camera ouptut image data = (Sensor_Gb – BLACK Level) x (1 + GainGbP[7..0] / 64) + BLACK Level<br><br>* Sensor _Gb: Gb of the Sensor output image data<br>*BLACK Level: Black level (The calculated value of 38H) |

### 7.5 GenICam Command / Camera Command Reference Table

| GenICam command | Camera command | | |
|---|---|---|---|
| | Device | Command | Function |
| Width | 100000 | 56-57H | Width for AOI (pixel) |
| Height | 100000 | 52-53H | Height for AOI (pixel) |
| PixelFormat | 000000 | 19H.0-3 | Video out (bit) |
| OffsetX | 100000 | 54-55H | X offset for AOI (pixel) |
| OffsetY | 100000 | 50-51H | Y offset for AOI (pixel) |
| BinningHorizontal | 000000 | 15H.0-2 | Horizontal Binning |
| BinningVertical | 000000 | 15H.3-5 | Vertical Binning |
| BinningMode | 100000 | 15H.6-7 | Binning Mode |
| DecimationHorizontal | 000000 | 41H.0-2 | Horizontal Decimation(Skipping) |
| DecimationVertical | 000000 | 41H.3-5 | Vertical Decimation(Skipping) |
| ExposureMode | 000000 | 10H.1-5 | Trigger mode |
| ExposureShutterType | 000000 | 10H.7 | Electric shutter type |
| ExposureTime | 000000 | 20-22H | Exposure time (us) of the electronic shutter |
| ExposureTimeAbs | 000000 | 20-22H | Exposure time (us) of the electronic shutter |
| ExposureTimeRaw | 000000 | 20-22H | Exposure time (us) of the electronic shutter |
| ExposureAuto | 100000 | 20H.2 | Shutter mode |
| AcquistionFrameRate | 000000 | 58-5CH | Frame rate |
| TriggerDelay | 000000 | 50-53H | The delay time for the trigger signal |
| TriggerActivation | 000000 | 10H.6 | Trigger polarity |
| TriggerSource | 000000 | 12H.5 | Trigger signal type |
| TriggerSoftware | 000000 | 16H.0 | Generate command software trigger |
| TriggerSoftwareSource | 000000 | 16H.6-7 | Software trigger source selection |
| TriggerMode | 000000 | 11H.3 | Function mode |
| LineSource0 | 000000 | F0H.0-3 | Output signal for 2 pin of the power-I/O connector |
| LineSource1 | 000000 | F0H.4-7 | Output signal for 3 pin of the power-I/O connector |
| UserOutputValue0 | 000000 | F1H.3 | UserOutput signal for 2 pin of the power-I/O connector |
| UserOutputValue1 | 000000 | F1H.4 | UserOutput signal for 3 pin of the power-I/O connector |
| LineInverter0 | 000000 | 5DH.0 | Output signal polarity for 2 pin of the power-I/O connector |
| LineInverter1 | 000000 | 5DH.1 | Output signal polarity for 3 pin of the power-I/O |

| | | | |
|---|---|---|---|
| | | | connector |
| StrobeSignalOnTime | 000000 | 90-93H | Strobe signal active time |
| StrobeSignalDelay | 000000 | 54-57H | The delay time for the strobe signal (us) |

| GenICam command | Camera command | | |
|---|---|---|---|
| | Device | Command | Function |
| BalanceWhiteAuto | 100000 | 40H.0-2 | White balance mode |
| BalanceRatio_R_Preset1 | 100000 | 41H | Preset1 white balance (Red gain) |
| BalanceRatio_Gr_Preset1 | 100000 | 42H | Preset1 white balance (Gr gain) |
| BalanceRatio_B_Preset1 | 100000 | 43H | Preset1 white balance (Blue gain) |
| BalanceRatio_Gb_Preset1 | 100000 | 44H | Preset1 white balance (Gb gain) |
| BalanceRatio_R_Preset2 | 100000 | 45H | Preset2 white balance (Red gain) |
| BalanceRatio_Gr_Preset2 | 100000 | 46H | Preset2 white balance (Gr gain) |
| BalanceRatio_B_Preset2 | 100000 | 47H | Preset2 white balance (Blue gain) |
| BalanceRatio_Gb_Preset2 | 100000 | 48H | Preset2 white balance (Gb gain) |
| BalanceRatio_R_Preset3 | 100000 | 49H | Preset3 white balance (Red gain) |
| BalanceRatio_Gr_Preset3 | 100000 | 4AH | Preset3 white balance (Gr gain) |
| BalanceRatio_B_Preset3 | 100000 | 4BH | Preset3 white balance (Blue gain) |
| BalanceRatio_Gb_Preset3 | 100000 | 4CH | Preset3 white balance (Gb gain) |
| BalanceRatio_R_Once | 100000 | 80H | Push to set white balance (Red gain) |
| BalanceRatio_Gr_Once | 100000 | 81H | Push to set white balance (Gr gain) |
| BalanceRatio_B_Once | 100000 | 82H | Push to set white balance (Blue gain) |
| BalanceRatio_Gb_Once | 100000 | 83H | Push to set white balance (Gb gain) |
| Gain | 000000 | 30H | CMOS Analog gain |
| GainAbs | 000000 | 30H | CMOS Analog gain |
| GainRaw | 000000 | 31H | CMOS Analog gain |
| GainAuto | 100000 | 20H.3 | AGC |
| BlackLevel | 000000 | 38H | Black Level |
| BlackLevelAbs | 000000 | 38H | Black Level |
| BlackLevelRaw | 000000 | 38H | Black Level |
| GammaMode | 100000 | 60H.0 | Gamma table ON/OFF |
| ReloadGammaData | 100000 | 60H.7 | Gamma table ON/OFF |
| Min_ShutterTime | 100000 | 26-28H | The lower limit of the electronic shutter for auto shutter (us) |

| | | | |
|---|---|---|---|
| Max_ShutterTime | 100000 | 23-25H | The upper limit of the electronic shutter for auto shutter (us) |
| AGCRange | 100000 | 21H | AGC maximum limit |
| TargetBrightness | 100000 | 2EH | Target brightness for ALC |
| ALC_Peak_Average | 100000 | 2FH | ALC peak-average |

| **GenICam command** | **Camera command** | | |
|---|---|---|---|
| | **Device** | **Command** | **Function** |
| ALCWeight1 | 100000 | 29H.0-3 | Weight1 for ALC |
| ALCWeight2 | 100000 | 29H.4-7 | Weight2 for ALC |
| ALCWeight3 | 100000 | 2AH.0-3 | Weight3 for ALC |
| ALCWeight4 | 100000 | 2AH.4-7 | Weight4 for ALC |
| ALCWeight5 | 100000 | 2BH.0-3 | Weight5 for ALC |
| ALCWeight6 | 100000 | 2BH.4-7 | Weight6 for ALC |
| ALCWeight7 | 100000 | 2CH.0-3 | Weight7 for ALC |
| ALCWeight8 | 100000 | 2CH.4-7 | Weight8 for ALC |
| ALCWeight9 | 100000 | 2DH.0-3 | Weight9 for ALC |
| ALCWindowV1 | 100000 | 30-31H | Vertical1 position for the ALC weight area (pixel) |
| ALCWindowV2 | 100000 | 32-33H | Vertical2 position for the ALC weight area (pixel) |
| ALCWindowV3 | 100000 | 34-35H | Vertical3 position for the ALC weight area (pixel) |
| ALCWindowV4 | 100000 | 36-37H | Vertical4 position for the ALC weight area (pixel) |
| ALCWindowH1 | 100000 | 38-39H | Horizontal1 position for the ALC weight area (pixel) |
| ALCWindowH2 | 100000 | 3A-3BH | Horizontal2 position for the ALC weight area (pixel) |
| ALCWindowH3 | 100000 | 3C-3DH | Horizontal3 position for the ALC weight area (pixel) |
| ALCWindowH4 | 100000 | 3E-3FH | Horizontal4 position for the ALC weight area (pixel) |
| WB_WindowH1 | 100000 | 58-59H | Vertical1 position for the white balance area |
| WB_WindowH2 | 100000 | 5A-5BH | Vertical2 position for the white balance area |
| WB_WindowV1 | 100000 | 5C-5DH | Horizontal1 position for the white balance area |
| WB_WindowV2 | 100000 | 5E-5FH | Horizontal2 position for the white balance area |
| WB_WindowMode | 100000 | 60H.4 | White balance area ON/OFF |
| YThreshold | 100000 | 4E-4FH | Bright level threshold for auto white balance |
| ReverseX | 000000 | 12H.0-1 | Horizontal Flip |
| ReverseY | 000000 | 12H.0-1 | Vertical Flip |
| SensorDigitizataionTaps | | | |

Caution:

Width, Height and PixelFormat are effect to the image data size.
Please use GenICam command name command when these values are changed like the sample code below:

In order to change the Width

```
BOOL SetWidth( PvDevice *pDevice, PvInt64 lValue )
{
        PvGenInteger* lGenInteger = dynamic_cast<PvGenInteger*>( pDevice->GetGenParameters()->Get( "Width" ) );
        PvResult lResult = lGenInteger->SetValue(lValue);
        return lResult.IsOK();
}
```

## 8 Saving and Loading a User Set Data

This camera can save and load the camera parameters. It is included restoring the factory defaults. There are two kids of data that exist.

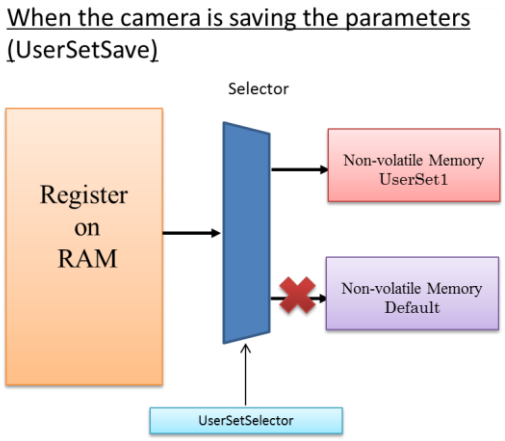
Default: The factory default data
UserSet1: User accessible data for saving

The data is loaded and written into the register on RAM of the camera.
These functions can be accessed through the parameters (UserSetSelector, UserSetDefaultSelector) and commands (UserSetLoad, UserSetSave) on UserSetControl category of GenICam.

For the descriptions of the parameters and commands, please see the table as follows:

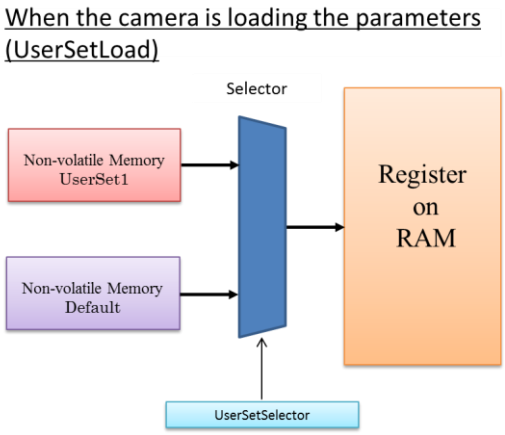
| | |
|---|---|
| UserSetSelector | Select the feature User Set to load, save or configure. |
| UserSetDefaultSelector | Select the feature User Set to load and make active when the device is reset. |
| UserSetLoad | Load the User Set specified by UserSetSelector to the device and make it active. |
| UserSetSave | Save the User Set specified by UserSetSelector to the non-volatile memory if of the device. |

### 8.1.1 When the Camera is Saving the Parameters



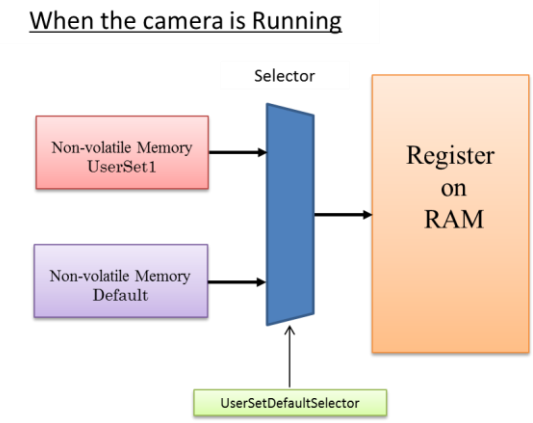

When UserSetSave is executed,
The camera data on the register on RAM is saved into the memory that was selected by UserSetSelector.
Caution: UserSetSave does not work with Default on UserSetSelector.

### 8.1.2 When the Camera is Loading the Parameters




When UserSetLoad is executed, The camera data on the register on RAM is loaded from the memory that was selected by UserSetSelector.

### 8.1.3 When the Camera is Running




When the camera is running, The camera data is loading into the register on RAM that was selected by UserSetDefaultSelector.

### 8.1.4 Camera Initialization (Factory Defaults)

In order to recover the factory default settings, please execute the following procedure:

1. Execute UserSetLoad Default is selected on UserSetSelector.
2. Execute UserSet1 is selected on UserSetSelector.

**Revision History**

| Rev. | Date | Changes | Note |
|---|---|---|---|
| .01 | February 17, 2014 | New Document | RM |
| .02 | April 29, 2014 | Updated | RM |
| 1.00 | July 2, 2014 | Updated to Release Version | RM |