



# **Power Plus (XILINX) GigE Vision Protocol Specification**

**STC-GE330X / GEC330X  
STC-GE830X / GEC830X  
STC-GE1520X / GEC1520X  
STC-GE2020X / GEC2020X**

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This document is the protocol specifications for the Sentech Power Plus (XILINX) GigE Vision camera.

STC-GE330X  
STC-GEC33 OX  
STC-GE83 OX  
STC-GEC83 OX  
STC-GE152 OX  
STC-GEC152 OX  
STC-GE202 OX  
STC-GEC202 OX

Note: All specifications are subject to change without prior notice.

## I. Communication Protocol Specifications

This camera has a communication function that enables external devices (i.e. PC) to control the camera functions. Please use the “StCamGigEWare” or “StGigEctl” communication software or use the following communication protocol to communicate to the camera.

### A. The Communication Method

UART (RS232C), Binary communication

### B. Communication Settings

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

### C. The Communication Format

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

#### a. Sending the Read Command

|               |                       |                |                          |                        |                       |                        |               |
|---------------|-----------------------|----------------|--------------------------|------------------------|-----------------------|------------------------|---------------|
| SOF<br>(8bit) | Device code<br>(6bit) | Read<br>(1bit) | Page selection<br>(1bit) | Command code<br>(8bit) | Data length<br>(8bit) | Data<br>(Dummy, 1byte) | EOF<br>(8bit) |
|---------------|-----------------------|----------------|--------------------------|------------------------|-----------------------|------------------------|---------------|

#### b. Sending the Write Command

|               |                       |                 |                          |                        |                       |                            |               |
|---------------|-----------------------|-----------------|--------------------------|------------------------|-----------------------|----------------------------|---------------|
| SOF<br>(8bit) | Device code<br>(6bit) | Write<br>(1bit) | Page selection<br>(1bit) | Command code<br>(8bit) | Data length<br>(8bit) | Data<br>(Data length byte) | EOF<br>(8bit) |
|---------------|-----------------------|-----------------|--------------------------|------------------------|-----------------------|----------------------------|---------------|

2. The format for receiving data from the camera is as follows

#### a. After sending the Read Command

|               |                       |                            |               |
|---------------|-----------------------|----------------------------|---------------|
| SOF<br>(8bit) | Data length<br>(8bit) | Data<br>(Data length byte) | EOF<br>(8bit) |
|---------------|-----------------------|----------------------------|---------------|

#### b. After sending the Write Command

|               |                            |                          |               |
|---------------|----------------------------|--------------------------|---------------|
| SOF<br>(8bit) | Data length<br>(8bit) “00” | Receiving code<br>(8bit) | EOF<br>(8bit) |
|---------------|----------------------------|--------------------------|---------------|

### 3. Descriptions of the Format

| Name           | Descriptions  |
|----------------|---|
| SOF            | Start of Frame<br>Always set (or receives) the value as "02H"   |
| Device Code    | Set "000000" to access the camera function setting.<br>Set "000010" to access the camera extend function setting.<br>Please check the "Camera Command List" and "Description of the Camera Control Commands"  |
| Read / Write   | Set (or receive) "0" when sending the reading command.<br>Set (or receive) "1" when sending the write command.  |
| Page Selection | Set "0" to access the command register of the camera.<br>Receives the current data from the command register when the read command is sent.<br>The data of the command register is replaced by the sent data when the write command is sent.<br><b>The data of the EEPROM is not replaced.</b><br><br>Set "1" to access the EEPROM of the camera.<br>The camera works with the data of the EEPROM when the camera is powered-on.<br>Receives the data from the EEPROM when the read command is sent.<br>The data of the EEPROM is replaced by the sent data when the write command is sent.<br>The camera sends the receiving code as "01H" to the PC after the data of the EEPROM is replaced. |
| Command Code   | <b>Please check from the following page.</b>  |
| Data Length    | Data length (Unit: byte)<br>Receiving data<br>The data length is dependent on the command after sending the read command.<br>The data length is "00H" after sending the write command.<br><br>Sending data<br>The data length is 1 byte when sending the read command.<br>The data length is dependent on the command when sending the write command.   |
| Data           | The value of the data is depending on the command.  |
| EOF            | End of Frame<br>Always set (or receive) the value as "03H"  |
| Receiving Code | Result of sending the command.<br><br>01H: OK (ACK)<br>14H: Time out error (1 second)<br>16H: Data length error (No Match)<br>17H: EEPROM write error   |

## 4. Command Example

Sending the read command to read the 00H address data of the register.

02, 00, 00, 01, 00, 03

SOF, (Device code/Read/Register), Command Code, Data Length, Data, EOF

The return command

02, 01, 00, 03

## D. Camera Control Commands

### 1. The Camera Control Command List

**Notes:**

- The data unit of each command is 1byte (8bit)
- The data can be saved to the EEPROM if an “x” is present in the “Save to EEPROM” column.
- The camera is operating with the data of the EEPROM when the camera is powered on.

| Device Code | Command No. | Read/Write | Save to EEPROM  | Function  | Initial Data               | Data Range                       |
|-------------|-------------|------------|---|---|----------------------------|----------------------------------|
| 000000      | 00 to 0FH   |            |   | Reserved  | -                          | -                                |
|             | 10H         | Read/Write | X   | The camera function mode 1 (8bit: D[7..0])                                    | 89H                        |                                  |
|             | 11H         | Read/Write | X   | The camera function mode 2 (8bit: D[7..0])                                    | 0FH                        |                                  |
|             | 12H         | Read/Write | X   | The camera function mode 3 (8bit: D[7..0])                                    | 00H                        |                                  |
|             | 13H         | Read/Write | X   | The camera function mode 4 (8bit: D[7..0])                                    | 60H                        |                                  |
|             | 14 to 15H   |            |   | Reserved  | -                          | -                                |
|             | 16H         | Read/Write | X   | Software trigger mode (8bit: D[7..0])   | 00H                        |                                  |
|             | 17H         | Read/Write | X   | Image data reset (8bit: D[7..0])  | 00H                        | -                                |
|             | 18 to 1FH   |            |   | Reserved  | -                          | -                                |
|             | 20H         | Read/Write | X   | The exposure time (useconds) of the electronic shutter (24bit: D[7..0])       | 0                          | 0 to 16,777,216                  |
|             | 21H         | Read/Write | X   | The exposure time (useconds) of the electronic shutter (24bit: D[15..8])      |                            |                                  |
|             | 22H         | Read/Write | X   | The exposure time (useconds) of the electronic shutter (24bit: D[24..16])     |                            |                                  |
|             | 23-2FH      |            |   | Reserved  | -                          | -                                |
|             | 30H         | Read/Write | X   | CDS gain (8bit: D[7..0])  | 0                          | 0 to 255                         |
|             | 31H         | Read/Write | X   | The digital gain (8bit: D[7..0])  | The factory adjusted value |                                  |
|             | 32H         | Read/Write | X   | The gain offset (8bit: D[7..0])   |                            |                                  |
|             | 33 to 37H   |            |   | Reserved  | -                          | -                                |
|             | 38H         | Read/Write | X   | The clamp level (8bit: D[7..0])   | 9                          | 0 to 31                          |
|             | 39 to 3DH   |            |   | Reserved  | -                          | -                                |
|             | 3EH         | Read/Write | X   | White clip for the test pattern (16bit: D[15..8])                             | 1,023                      | 0 to 4,095                       |
|             | 3FH         | Read/Write | X   | White clip for the test pattern (16bit: D[7..0])                              |                            |                                  |
|             | 40 to 4FH   |            |   | Reserved  | -                          | -                                |
|             | 50H         | Read/Write | X   | The trigger delay time (useconds) (Integer) (24bit: D[7..0])                  | 0                          | 0 to 2,000,000                   |
|             | 51H         | Read/Write | X   | The trigger delay time (useconds) (Integer) (24bit: D[15..8])                 |                            |                                  |
|             | 52H         | Read/Write | X   | The trigger delay time (useconds) (Integer) (24bit: D[23..16])                |                            |                                  |
|             | 53H         | Read/Write | X   | The trigger delay time (useconds) (Decimal) (24bit: D[7..0])                  |                            |                                  |
|             | 54 to 57H   |            |   | Reserved  | -                          | -                                |
|             | 58H         | Read/Write | X   | Frame rate (Hz) (Integer) (24bit: D[7..0])                                    | GE/GEC330X: 89.91172       | GE/GEC330X: 0.72028 to 360.33325 |
|             | 59H         | Read/Write | X   | Frame rate (Hz) (Integer) (24bit: D[15..8])                                   | GE/GEC830X: 36.42113       | GE/GEC830X: 0.44238 to 147.16356 |
|             | 5AH         | Read/Write | X   | Frame rate (Hz) (Decimal) (24bit: D[7..0])                                    | GE/GEC1520X: 19.25954      |                                  |
|             | 5BH         | Read/Write | X   | Frame rate (Hz) (Decimal) (24bit: D[15..8])                                   | GE/GEC2020X: 15.31668      | GE/GEC1520X: 0.31387 to 71.66965 |
|             | 5CH         | Read/Write | X   | Frame rate (Hz) (Decimal) (24bit: D[23..16])                                  |                            | GE/GEC2020X: 0.29261 to 61.26673 |
|             | 5DH to 77H  |            |   | Reserved  | -                          | -                                |
|             | 78H         | Read/Write | X   | Test pattern selection (8bit: D[7..0])  | 00H                        |                                  |
|             | 79H         | Read/Write | X   | Image effect selection (8bit: D[7..0])  | 00H                        |                                  |
|             | 7A to 7FH   |            |   | Reserved  | -                          | -                                |
|             | 80H         | Read/Write |   | EEPROM control (8bit: D[7..0])  | 00H                        |                                  |
|             | 81 to EFH   |            |   | Reserved  | -                          | -                                |
|             | F0H         | Read/Write | X   | The signals of the power/IO connector (8bit: D[7..0])                         | 20H                        |                                  |
|             | F1H         | Read/Write | X   | User setting signal for the signals of the power/IO connector (8bit: D[7..0]) | 00H                        |                                  |
| F2 to F7H   |             |            | Reserved  | -   | -                          |                                  |
| F8H         | Read/Write  | X          | The signals of the power/IO connector (8bit: D[7..0]) | 00H   |                            |                                  |
| F9H         | Read/Write  | X          | The signals of the power/IO connector (8bit: D[7..0]) | 00H   |                            |                                  |
| FA to FFH   |             |            | Reserved  | -   | -                          |                                  |

| Device Code | Command No. | Read/Write | Save to EEPROM  | Function   | Initial Data   | Data Range   |
|-------------|-------------|------------|---|--|--|--|
| 100000      | 00 to 17H   |            |   | Reserved   | -  | -  |
|             | 18H         | Read/Write | X   | JTAG for User configurable FPGA (8bit: D[7..0])                                | 00H  |  |
|             | 19H         | Read/Write |   | User configurable FPGA Enable (8bit: D[7..0])                                  | 00H  |  |
|             | 1A to 1FH   |            |   | Reserved   | -  | -  |
|             | 20H         | Read/Write | X   | Exposure mode (8bit: D[7..0])  | 00H  |  |
|             | 21H         | Read/Write | X   | AGC range (8bit: D[7..0])  | 255  | 0 to 255   |
|             | 22H         |            |   | Reserved   | -  | -  |
|             | 23H         | Read/Write | X   | The upper limit of the electronic shutter for auto shutter (230bit: D[7..0])   | GE/GEC330X: 11,122   | 0 to 1,048,575   |
|             | 24H         | Read/Write | X   | The upper limit of the electronic shutter for auto shutter (230bit: D[15..8])  | GE/GEC830X: 27,458   |  |
|             | 25H         | Read/Write | X   | The upper limit of the electronic shutter for auto shutter (230bit: D[20..16]) | GE/GEC1520X: 51,925<br>GE/GEC2020X: 65,292   |  |
|             | 26H         | Read/Write | X   | The lower limit of the electronic shutter for auto shutter (230bit: D[7..0])   | 0  | 0 to 1,048,575   |
|             | 27H         | Read/Write | X   | The lower limit of the electronic shutter for auto shutter (230bit: D[15..8])  |  |  |
|             | 28H         | Read/Write | X   | The lower limit of the electronic shutter for auto shutter (230bit: D[20..16]) |  |  |
|             | 29H         | Read/Write | X   | Weight1 for ALC (8bit: D[7..0])  |  |  |
|             | 2AH         | Read/Write | X   | Weight2 for ALC (8bit: D[7..0])  | 11H  | D3 to D0: 0 to 15<br>D7 to D4: 0 to 15   |
|             | 2BH         | Read/Write | X   | Weight3 for ALC (8bit: D[7..0])  | 11H  | D3 to D0: 0 to 15<br>D7 to D4: 0 to 15   |
|             | 2CH         | Read/Write | X   | Weight4 for ALC (8bit: D[7..0])  | 11H  | D3 to D0: 0 to 15<br>D7 to D4: 0 to 15   |
|             | 2DH         | Read/Write | X   | Weight5 for ALC (8bit: D[7..0])  | 01H  | D3 to D0: 0 to 15<br>D7 to D4: 0   |
|             | 2EH         | Read/Write | X   | Target brightness for ALC (8bit: D[7..0])                                      | 128  | 0 to 255   |
|             | 2FH         | Read/Write | X   | ALC peak-average (8bit: D[7..0])   | 0  | 0 to 255   |
|             | 30H         | Read/Write | X   | Vertical_1 position for the ALC weight area (16bit: D[7..0])                   | GE/GEC330X: 32<br>GE/GEC830X: 32<br>GE/GEC1520X: 32<br>GE/GEC2020X: 32                               | GE/GEC330X: 0 to 493<br>GE/GEC830X: 0 to 767<br>GE/GEC1520X: 0 to 1,039<br>GE/GEC2020X: 0 to 1,236   |
|             | 31H         | Read/Write | X   | Vertical_1 position for the ALC weight area (16bit: D[15..8])                  |  |  |
|             | 32H         | Read/Write | X   | Vertical_2 position for the ALC weight area (16bit: D[7..0])                   | GE/GEC330X: 196<br>GE/GEC830X: 288<br>GE/GEC1520X: 378<br>GE/GEC2020X: 444                           | GE/GEC330X: 0 to 493<br>GE/GEC830X: 0 to 767<br>GE/GEC1520X: 0 to 1,039<br>GE/GEC2020X: 0 to 1,236   |
|             | 33H         | Read/Write | X   | Vertical_2 position for the ALC weight area (16bit: D[15..8])                  |  |  |
|             | 34H         | Read/Write | X   | Vertical_3 position for the ALC weight area (16bit: D[7..0])                   | GE/GEC330X: 298<br>GE/GEC830X: 480<br>GE/GEC1520X: 662<br>GE/GEC2020X: 792                           | GE/GEC330X: 0 to 493<br>GE/GEC830X: 0 to 767<br>GE/GEC1520X: 0 to 1,039<br>GE/GEC2020X: 0 to 1,236   |
|             | 35H         | Read/Write | X   | Vertical_3 position for the ALC weight area (16bit: D[15..8])                  |  |  |
|             | 36H         | Read/Write | X   | Vertical_4 position for the ALC weight area (16bit: D[7..0])                   | GE/GEC330X: 462<br>GE/GEC830X: 732<br>GE/GEC1520X: 1,008<br>GE/GEC2020X: 1,207                       | GE/GEC330X: 0 to 493<br>GE/GEC830X: 0 to 767<br>GE/GEC1520X: 0 to 1,039<br>GE/GEC2020X: 0 to 1,236   |
|             | 37H         | Read/Write | X   | Vertical_4 position for the ALC weight area (16bit: D[15..8])                  |  |  |
|             | 38H         | Read/Write | X   | Horizontal_1 position for the ALC weight area (16bit: D[7..0])                 | GE/GEC330X: 36<br>GE/GEC830X: 36<br>GE/GEC1520X: 36<br>GE/GEC2020X: 36                               | GE/GEC330X: 0 to 647<br>GE/GEC830X: 0 to 1,023<br>GE/GEC1520X: 0 to 1,359<br>GE/GEC2020X: 0 to 1,623 |
|             | 39H         | Read/Write | X   | Horizontal_1 position for the ALC weight area (16bit: D[15..8])                |  |  |
|             | 3AH         | Read/Write | X   | Horizontal_2 position for the ALC weight area (16bit: D[7..0])                 | GE/GEC330X: 252<br>GE/GEC830X: 377<br>GE/GEC1520X: 489<br>GE/GEC2020X: 577                           | GE/GEC330X: 0 to 647<br>GE/GEC830X: 0 to 1,023<br>GE/GEC1520X: 0 to 1,359<br>GE/GEC2020X: 0 to 1,623 |
|             | 3BH         | Read/Write | X   | Horizontal_2 position for the ALC weight area (16bit: D[15..8])                |  |  |
|             | 3CH         | Read/Write | X   | Horizontal_3 position for the ALC weight area (16bit: D[7..0])                 | GE/GEC330X: 396<br>GE/GEC830X: 647<br>GE/GEC1520X: 871<br>GE/GEC2020X: 1,047                         | GE/GEC330X: 0 to 647<br>GE/GEC830X: 0 to 1,023<br>GE/GEC1520X: 0 to 1,359<br>GE/GEC2020X: 0 to 1,623 |
|             | 3DH         | Read/Write | X   | Horizontal_3 position for the ALC weight area (16bit: D[15..8])                |  |  |
| 3EH         | Read/Write  | X          | Horizontal_4 position for the ALC weight area (16bit: D[7..0])  | GE/GEC330X: 612<br>GE/GEC830X: 988<br>GE/GEC1520X: 1,324<br>GE/GEC2020X: 1,588 | GE/GEC330X: 0 to 647<br>GE/GEC830X: 0 to 1,023<br>GE/GEC1520X: 0 to 1,359<br>GE/GEC2020X: 0 to 1,623 |  |
| 3FH         | Read/Write  | X          | Horizontal_4 position for the ALC weight area (16bit: D[15..8]) |  |  |  |

| Device Code | Command No. | Read/Write | Save to EEPROM                           | Function   | Initial Data   | Data Range  |
|-------------|-------------|------------|--|--|--|---|
| 100000      | 40H         | Read/Write | X  | White balance mode (8bit: D[7..0])                                 | 00H  |   |
|             | 41H         | Read/Write | X  | Preset_1 white balance (Red gain) (8bit: D[7..0])                  | 0  | 0 to 255  |
|             | 42H         | Read/Write | X  | Preset_1 white balance (Gr gain) (8bit: D[7..0])                   | 0  | 0 to 255  |
|             | 43H         | Read/Write | X  | Preset_1 white balance (Blue gain) (8bit: D[7..0])                 | 0  | 0 to 255  |
|             | 44H         | Read/Write | X  | Preset_1 white balance (Gb gain) (8bit: D[7..0])                   | 0  | 0 to 255  |
|             | 45H         | Read/Write | X  | Preset_2 white balance (Red gain) (8bit: D[7..0])                  | 0  | 0 to 255  |
|             | 46H         | Read/Write | X  | Preset_2 white balance (Gr gain) (8bit: D[7..0])                   | 0  | 0 to 255  |
|             | 47H         | Read/Write | X  | Preset_2 white balance (Blue gain) (8bit: D[7..0])                 | 0  | 0 to 255  |
|             | 48H         | Read/Write | X  | Preset_2 white balance (Gb gain) (8bit: D[7..0])                   | 0  | 0 to 255  |
|             | 49H         | Read/Write | X  | Preset_3 white balance (Red gain) (8bit: D[7..0])                  | 0  | 0 to 255  |
|             | 4AH         | Read/Write | X  | Preset_3 white balance (Gr gain) (8bit: D[7..0])                   | 0  | 0 to 255  |
|             | 4BH         | Read/Write | X  | Preset_3 white balance (Blue gain) (8bit: D[7..0])                 | 0  | 0 to 255  |
|             | 4CH         | Read/Write | X  | Preset_3 white balance (Gb gain) (8bit: D[7..0])                   | 0  | 0 to 255  |
|             | 4DH         |            |  | Reserved   | -  | -   |
|             | 4EH         | Read/Write | X  | Threshold for auto white balance (16bit: D[7..0])                  | 3,072  | 0 to 4,095  |
|             | 4FH         | Read/Write | X  | Threshold for auto white balance (16bit: D[16..8])                 |  |   |
|             | 50H         | Read/Write | X  | Y_offset for AOI (8bit: D[7..0])                                   | 0  | GE/GEC330X: 4 ≤ Y ≤ 494<br>GE/GEC830X: 4 ≤ Y ≤ 768<br>GE/GEC1520X: 4 ≤ Y ≤ 1,040<br>GE/GEC2020X: 4 ≤ Y ≤ 1,236<br>Y: X_offset + width   |
|             | 51H         | Read/Write | X  | Y_offset for AOI (8bit: D[15..8])                                  |  |   |
|             | 52H         | Read/Write | X  | Height for AOI (8bit: D[7..0])                                     | GE/GEC330X: 494<br>GE/GEC830X: 768<br>GE/GEC1520X: 1,040<br>GE/GEC2020X: 1,236   | GE/GEC330X: 4 ≤ Y ≤ 494<br>GE/GEC830X: 4 ≤ Y ≤ 768<br>GE/GEC1520X: 4 ≤ Y ≤ 1,040<br>GE/GEC2020X: 4 ≤ Y ≤ 1,236<br>Y: Y_offset + Height  |
|             | 53H         | Read/Write | X  | Height for AOI (8bit: D[15..8])                                    |  |   |
|             | 54H         | Read/Write | X  | X_offset for AOI (8bit: D[7..0])                                   | 0  | GE/GEC330X: 4 ≤ Y ≤ 648<br>GE/GEC830X: 4 ≤ Y ≤ 1,024<br>GE/GEC1520X: 4 ≤ Y ≤ 1,360<br>GE/GEC2020X: 4 ≤ Y ≤ 1,624<br>X: X_offset + width |
|             | 55H         | Read/Write | X  | X_offset for AOI (8bit: D[15..8])                                  |  |   |
|             | 56H         | Read/Write | X  | Width for AOI (8bit: D[7..0])                                      | GE/GEC330X: 648<br>GE/GEC830X: 1,024<br>GE/GEC1520X: 1,360<br>GE/GEC2020X: 1,624 | GE/GEC330X: 4 ≤ Y ≤ 648<br>GE/GEC830X: 4 ≤ Y ≤ 1,024<br>GE/GEC1520X: 4 ≤ Y ≤ 1,360<br>GE/GEC2020X: 4 ≤ Y ≤ 1,624<br>X: X_offset + width |
|             | 57H         | Read/Write | X  | Width for AOI (8bit: D[15..8])                                     |  |   |
|             | 58H         | Read/Write | X  | Vertical_1 position for the white balance area (16bit: D[7..0])    | 0  | GE/GEC330X: 493<br>GE/GEC830X: 767<br>GE/GEC1520X: 1,039<br>GE/GEC2020X: 1,235  |
|             | 59H         | Read/Write | X  | Vertical_1 position for the white balance area (16bit: D[15..8])   |  |   |
|             | 5AH         | Read/Write | X  | Vertical_2 position for the white balance area (16bit: D[7..0])    | GE/GEC330X: 493<br>GE/GEC830X: 767<br>GE/GEC1520X: 1,039<br>GE/GEC2020X: 1,235   | GE/GEC330X: 493<br>GE/GEC830X: 767<br>GE/GEC1520X: 1,039<br>GE/GEC2020X: 1,235  |
|             | 5BH         | Read/Write | X  | Vertical_2 position for the white balance area (16bit: D[15..8])   |  |   |
|             | 5CH         | Read/Write | X  | Horizontal_1 position for the white balance area (16bit: D[7..0])  | 0  | GE/GEC330X: 647<br>GE/GEC830X: 1,023<br>GE/GEC1520X: 1,359<br>GE/GEC2020X: 1,623  |
|             | 5DH         | Read/Write | X  | Horizontal_1 position for the white balance area (16bit: D[15..8]) |  |   |
|             | 5EH         | Read/Write | X  | Horizontal_2 position for the white balance area (16bit: D[7..0])  | GE/GEC330X: 647<br>GE/GEC830X: 1,023<br>GE/GEC1520X: 1,359<br>GE/GEC2020X: 1,623 | GE/GEC330X: 647<br>GE/GEC830X: 1,023<br>GE/GEC1520X: 1,359<br>GE/GEC2020X: 1,623  |
|             | 5FH         | Read/Write | X  | Horizontal_2 position for the white balance area (16bit: D[15..8]) |  |   |
|             | 60H         | Read/Write | X  | Camera mode 1 (8bit: D[7..0])                                      | 00H  |   |
|             | 61 to 7FH   |            |  | Reserved   | -  | -   |
|             | 80H         | Read/Write | X  | Push set white balance (Red gain) (8bit: D[7..0])                  | 0  | 0 to 255  |
|             | 81H         | Read/Write | X  | Push set white balance (Gr gain) (8bit: D[7..0])                   | 0  | 0 to 255  |
|             | 82H         | Read/Write | X  | Push set white balance (Blue gain) (8bit: D[7..0])                 | 0  | 0 to 255  |
|             | 83H         | Read/Write | X  | Push set white balance (Gb gain) (8bit: D[7..0])                   | 0  | 0 to 255  |
|             | 84 to 8FH   |            |  | Reserved   | -  | -   |
|             | 90H         | Read/Write | X  | Iris lens adjustment (8bit: D[7..0])                               | 80   | 0 to 255  |
|             | 91H         |            |  | Reserved   | -  | -   |
|             | 92H         | Read/Write | X  | Iris lens adjustment (8bit: D[7..0])                               | 01H  |   |
| 93 to FFH   |             |            | Reserved                                 | -  | -  |   |
| C0H         | Read/Write  | X          | Image data between FPGAs (8bit: D[7..0]) | 00H  |  |   |
| C1H         | Read/Write  | X          | Output signal selection (8bit: D[7..0])  | 00H  |  |   |
| C2 to FFH   |             |            | Reserved                                 | -  | -  |   |



| Command No.   | Command Description  |    |    |    |    |    |    |    |    |
|---|--|----|----|----|----|----|----|----|----|
| 13H: MOD4[7..0]   | <p>[The camera function mode 4] Initial data: 60H<br/>Sets the camera function mode.</p> <p>D[7..0]</p> <table border="1"> <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> <p>D7: No Function <u>Please set as 0</u><br/> D6: Trigger signal mask while image out 0: OFF 1: ON (invalid trigger signal while image is out)<br/> D5: No Function <u>Please set as 1</u><br/> D4 to D0: No Function <u>Please set as 00000</u></p>  | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| D7  | D6   | D5 | D4 | D3 | D2 | D1 | D0 |    |    |
| 16H: SOFTRG[7..0]   | <p>[Software trigger setting] Initial data: 00H<br/>Sets the source of the software trigger.</p> <p>D[7..0]</p> <table border="1"> <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> <p>D7 to D6: Software trigger source selection<br/> 00: <u>Programming software trigger</u><br/> 01: No function (Prohibited setting. Do not set this value)<br/> 10: Command Software trigger (100useconds pulse width trigger signal)<br/> 11: No function (Prohibited setting. Do not set this value)</p> <p>D5 to D1: No Function <u>Please set as 00000</u><br/> D0: Generate command software trigger<br/> 0: <u>Hold (Low state)</u><br/> 1: Generate command software trigger (100useconds high state)</p> <p>Note 1: The software trigger source selection is enabled when "Trigger signal type (MOD3-D5)" is the software trigger (Set as 0).<br/> Note 2: When using the "Programming software trigger", please setup the pulse duration, the trigger signal interval and generate the trigger signal with the "StGigE SDK".<br/> Note3: When using "User configurable FPGA generates trigger", please create the trigger signal so that it has more than 200 useconds of pulse duration in the user configurable FPGA.<br/> Note4: When "Command software trigger" is selected, it is necessary to generate the software trigger signal with "Generate command software trigger (SOFTRIG-D0)".</p> | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| D7  | D6   | D5 | D4 | D3 | D2 | D1 | D0 |    |    |
| 17H: IMAGEREST[7..0]  | <p>[Image data reset] Initial data: 00H<br/>Reset the Image data.</p> <p>D[7..0]</p> <table border="1"> <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> <p>D7 to D1: No function <u>Please set as 0</u><br/> D0: Image data reset 0: FVAL/LVAL/Image data reset (FVAL, LVAL and the image data are low state data)<br/> 1: FVAL/LVAL/Image data out</p>   | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| D7  | D6   | D5 | D4 | D3 | D2 | D1 | D0 |    |    |
| 20H: EXPTM[7..0]<br>21H: EXPTM[15..8]<br>22H: EXPTM[23..16] | <p>[The exposure time (useconds) of the electronic shutter]<br/>Initial data; EXPTM[23..0] = 0, data range: 0 to 16,777,216<br/>Sets the exposure time for the electronic shutter.</p> <p>Exposure time = EXPTM[23..0] useconds</p> <p>When set as 0, the electronic shutter is OFF</p>  |    |    |    |    |    |    |    |    |

| Command No.  | Command Description   |
|--|---|
| 30H:<br>PGA[7..0]  | <p>[CDS gain] Initial data: PGA[7..0] = 0, data range: 0 to 255<br/>Sets the CDS gain (Programmable gain).</p> <p>CDS gain for STC-GE330X/GEC330X<br/>CDS gain = <math>6.16 + 0.04 \times (\text{PGA}[7..0] \times 2 + \text{GOFs}[7..0])</math> dB</p> <p>CDS gain for STC-GE830X/GEC830X<br/>CDS gain = <math>7.44 + 0.04 \times (\text{PGA}[7..0] \times 2 + \text{GOFs}[7..0])</math> dB</p> <p>CDS gain for STC-GE1520X/GEC1520X<br/>CDS gain = <math>7.44 + 0.04 \times (\text{PGA}[7..0] \times 2 + \text{GOFs}[7..0])</math> dB</p> <p>CDS gain for STC-GE2020X/GEC2020X<br/>CDS gain = <math>8.72 + 0.04 \times (\text{PGA}[7..0] \times 2 + \text{GOFs}[7..0])</math> dB</p> <p>*CDS_BASEGAIN[15..0]: The gain base offset (The value of the address 5EH and 5FH)<br/>*GOFs[7..0]: The gain offset (The value of the address 32H)</p> |
| 31H:<br>DGB [7..0]   | <p>[The digital gain]<br/>Initial data: DGB[7..0] = The factory adjusted value</p> <p>Video level = <math>(\text{Input video level} - \text{CLAMP level}) \times (1 + \text{DGB}[7..0] / 128) + \text{CLAMP Level}</math></p> <p>*CLAMP Level: Clamp level (The calculated value of the address 38H)</p>  |
| 32H:<br>GOFs[7..0]   | <p>[The gain offset]<br/>Initial data: GOFs[7..0] = The factory adjusted value, data range: 0 to 255.</p>   |
| 38H:<br>CLAMP[7..0]  | <p>[The clamp level] Initial data: CLAMP[7..0] = 9, data range: 0 to 31<br/>Sets the clamp level (The clamp level of the black signal)</p> <p>Clamp level = <math>\text{CLAMP}[7..0] \times 8 + 56</math> (for 12bit output)<br/>Clamp level = <math>(\text{CLAMP}[7..0] \times 8 + 56) / 4</math> (for 10bit output)<br/>Clamp level = <math>(\text{CLAMP}[7..0] \times 8 + 56) / 16</math> (for 8bit output)</p> <p>When the value is set to be greater than 31, it will automatically set to 31.</p>   |
| 3EH:<br>WHITE_CLIP[15..8]<br>3FH:<br>WHITE_CLIP[7..0]                      | <p>[The white clip level for the white clip test pattern]<br/>Initial data: WHITE_CLIP[15..0] = 1,023, data range: 0 to 4,095<br/>Set the white clip level for the white clip test pattern.</p>   |
| 50H:<br>DELAY_I[7..0]<br>51H:<br>DELAY_I[15..8]<br>52H:<br>DELAY_I[23..16] | <p>[The delay time (usecond, integer) for the trigger signal]<br/>Initial data: DELAY_I[23..0] = 0, data range: 0 to 2,000,000<br/>Sets the delay time from the trigger signal input to the start exposure as useconds.</p> <p>Delay time for the trigger signal = <math>(\text{DELAY\_I}[23..0]) \cdot (\text{DELAY\_F}[7..0])</math> useconds</p>   |
| 53H:<br>DELAY_F[7..0]  | <p>[The delay time (usecond, decimal) for the trigger signal]<br/>Initial data: DELAY_F[23..0] = 0, data range: 0 to 99<br/>Sets the delay time from the trigger signal input to start exposure as useconds.<br/>Delay time for the trigger signal = <math>(\text{DELAY\_I}[23..0]) \cdot (\text{DELAY\_F}[7..0])</math> useconds</p>   |

| Command No.  | Command Description  |    |    |    |    |    |    |    |    |
|--|--|----|----|----|----|----|----|----|----|
| 58H:<br>FPS_I[7..0]  | [Frame rate (Hz, integer)]<br>Initial data: FPS_F[15..0] = see below, data range: 0 to 99,999<br>Sets the frame rate as Hz.  |    |    |    |    |    |    |    |    |
| 59H:<br>FPS_I[15..8]   | Frame rate = (FPS_I[15..0]). (FPS_F[23..0]) Hz<br><br>STC-GE330X/GEC330X<br>Data range: 0.72028 to 360.33325 Hz<br>Max frame rate for full resolution: 89.91172 Hz (as initial data)<br><br>STC-GE830X/GEC830X<br>Data range: 0.44238 to 147.16356 Hz<br>Max frame rate for full resolution: 36.42113 Hz (as initial data)<br><br>STC-GE1520X/GEC1520X<br>Data range: 0.31387 to 71.66965 Hz<br>Max frame rate for full resolution: 19.25954 Hz (as initial data)<br><br>STC-GE2020X/GEC2020X<br>Data range: 0.29261 to 61.26673 Hz<br>Max frame rate for full resolution: 15.31668 Hz (as initial data) |    |    |    |    |    |    |    |    |
| 5AH:<br>FPS_F[7..0]<br>5BH:<br>FPS_F[15..8]<br>5CH:<br>FPS_F[23..16] | [Frame rate (Hz, decimal)]<br>Initial data: FPS_F[23..0] = see FPS_I[15..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   |    |    |    |    |    |    |    |    |
| 78H:<br>TESTP[7..0]  | [Test pattern selection] Initial data: TESTP[7..0] = 00H<br>Sets the test pattern output from the camera.<br><br>D[7..0]<br><table border="1" style="margin-left: 20px;"> <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><u>00H: Video output</u><br>01H: Gray scale<br>02H: Ramp wave<br>03H: 100% white<br>04H: White clip<br>05H: Color bar (RGB bayer)<br>Others: Black  | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| D7   | D6   | D5 | D4 | D3 | D2 | D1 | D0 |    |    |

| Command No.  | Command Description   |    |    |    |    |    |    |    |    |                            |                      |                           |                            |  |                     |                          |                     |   |                     |                             |                      |  |                            |  |  |                          |  |  |  |
|--|---|----|----|----|----|----|----|----|----|----------------------------|----------------------|---------------------------|----------------------------|--|---------------------|--------------------------|---------------------|---|---------------------|-----------------------------|----------------------|--|----------------------------|--|--|--------------------------|--|--|--|
| 79H:<br>EFFCT[7..0]  | <p>[Image effect selection] Initial data: EFFCT[7..0] = 00H<br/>Sets the image effect.</p> <p>D[7..0]</p> <table border="1"> <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> <p>D7: Negative video / Positive video selection<br/>D6 to D0: Image effect</p> <table> <tr> <td>0: Positive image</td> <td>1: Negative image</td> </tr> <tr> <td>00H: No effect (Original)</td> <td>01H: 9bit gradation</td> </tr> <tr> <td>02H: 8bit gradation</td> <td>03H: 7bit gradation</td> </tr> <tr> <td>04H: 6bit gradation</td> <td>05H: 5bit gradation</td> </tr> <tr> <td>06H: 4bit gradation</td> <td>07H: 3bit gradation</td> </tr> <tr> <td>08H: 2bit gradation</td> <td>09H: 1bit gradation</td> </tr> <tr> <td colspan="2">0A to 7FH: No function (Prohibited setting. Do not set these values)</td> </tr> </table>   | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | 0: Positive image          | 1: Negative image    | 00H: No effect (Original) | 01H: 9bit gradation        | 02H: 8bit gradation                                      | 03H: 7bit gradation | 04H: 6bit gradation      | 05H: 5bit gradation | 06H: 4bit gradation   | 07H: 3bit gradation | 08H: 2bit gradation         | 09H: 1bit gradation  | 0A to 7FH: No function (Prohibited setting. Do not set these values) |                            |  |  |                          |  |  |  |
| D7   | D6  | D5 | D4 | D3 | D2 | D1 | D0 |    |    |                            |                      |                           |                            |  |                     |                          |                     |   |                     |                             |                      |  |                            |  |  |                          |  |  |  |
| 0: Positive image  | 1: Negative image   |    |    |    |    |    |    |    |    |                            |                      |                           |                            |  |                     |                          |                     |   |                     |                             |                      |  |                            |  |  |                          |  |  |  |
| 00H: No effect (Original)  | 01H: 9bit gradation   |    |    |    |    |    |    |    |    |                            |                      |                           |                            |  |                     |                          |                     |   |                     |                             |                      |  |                            |  |  |                          |  |  |  |
| 02H: 8bit gradation  | 03H: 7bit gradation   |    |    |    |    |    |    |    |    |                            |                      |                           |                            |  |                     |                          |                     |   |                     |                             |                      |  |                            |  |  |                          |  |  |  |
| 04H: 6bit gradation  | 05H: 5bit gradation   |    |    |    |    |    |    |    |    |                            |                      |                           |                            |  |                     |                          |                     |   |                     |                             |                      |  |                            |  |  |                          |  |  |  |
| 06H: 4bit gradation  | 07H: 3bit gradation   |    |    |    |    |    |    |    |    |                            |                      |                           |                            |  |                     |                          |                     |   |                     |                             |                      |  |                            |  |  |                          |  |  |  |
| 08H: 2bit gradation  | 09H: 1bit gradation   |    |    |    |    |    |    |    |    |                            |                      |                           |                            |  |                     |                          |                     |   |                     |                             |                      |  |                            |  |  |                          |  |  |  |
| 0A to 7FH: No function (Prohibited setting. Do not set these values) |   |    |    |    |    |    |    |    |    |                            |                      |                           |                            |  |                     |                          |                     |   |                     |                             |                      |  |                            |  |  |                          |  |  |  |
| 80H:<br>E2P[7..0]  | <p>[EEPROM control] Initial data: E2P[7..0] = 00H</p> <p>D[7..0]</p> <table border="1"> <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> <p>D7 to D1: No function <u>Please set as 000000</u><br/>D0: Write control to the EEPROM <u>0: Prohibited</u> 1: Accept</p> <p>Note 1: This bit is automatically cleared to "0" by the internal process after the execution of the command.<br/>Note 2: By synchronizing to the EEPROM read/write access, the subject control register is also updated.</p>  | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |                            |                      |                           |                            |  |                     |                          |                     |   |                     |                             |                      |  |                            |  |  |                          |  |  |  |
| D7   | D6  | D5 | D4 | D3 | D2 | D1 | D0 |    |    |                            |                      |                           |                            |  |                     |                          |                     |   |                     |                             |                      |  |                            |  |  |                          |  |  |  |
| FOH:<br>OUTSEL[7..0]   | <p>[The output signal selection for the power/IO connector]<br/>Initial data: OUTSEL[7..0]=20H<br/>Sets the output signal from the power/IO connector.<br/>This section is enabled when the output signal is set from the Sentech FPGA with the setup of C1H for the device code 20H.</p> <p>D[7..0]</p> <table border="1"> <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> <p>D7 to D4: Output signal for 4pin of the power/IO</p> <table> <tr> <td>0: FrameTriggerWait signal</td> <td>1: UserOutput signal</td> </tr> <tr> <td>2: ExposureActive signal</td> <td>3: TriggerAuxiliary signal</td> </tr> <tr> <td>4: TriggerInternal signal (after mask and delay process)</td> <td></td> </tr> <tr> <td>5: SensorReadOut signal,</td> <td></td> </tr> <tr> <td>6 to F: No function (Prohibited setting. Do not set this value)</td> <td></td> </tr> </table> <p>D3 to D0: Output signal for 3pin of the power/IO</p> <table> <tr> <td>0: FrameTriggerWait signal,</td> <td>1: UserOutput signal</td> </tr> <tr> <td>2: ExposureActive signal</td> <td>3: TriggerAuxiliary signal</td> </tr> <tr> <td>4: TriggerInternal signal (after mask and delay process)</td> <td></td> </tr> <tr> <td>5: SensorReadOut signal,</td> <td></td> </tr> <tr> <td>6: No function (Prohibited setting. Do not set this value)</td> <td></td> </tr> </table> <p>Note: When "User setup signal" is selected, it will set the status of the signal with "User setup signal output for the power/IO connector (TEST2-D3.4)".</p> | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | 0: FrameTriggerWait signal | 1: UserOutput signal | 2: ExposureActive signal  | 3: TriggerAuxiliary signal | 4: TriggerInternal signal (after mask and delay process) |                     | 5: SensorReadOut signal, |                     | 6 to F: No function (Prohibited setting. Do not set this value) |                     | 0: FrameTriggerWait signal, | 1: UserOutput signal | 2: ExposureActive signal   | 3: TriggerAuxiliary signal | 4: TriggerInternal signal (after mask and delay process) |  | 5: SensorReadOut signal, |  | 6: No function (Prohibited setting. Do not set this value) |  |
| D7   | D6  | D5 | D4 | D3 | D2 | D1 | D0 |    |    |                            |                      |                           |                            |  |                     |                          |                     |   |                     |                             |                      |  |                            |  |  |                          |  |  |  |
| 0: FrameTriggerWait signal   | 1: UserOutput signal  |    |    |    |    |    |    |    |    |                            |                      |                           |                            |  |                     |                          |                     |   |                     |                             |                      |  |                            |  |  |                          |  |  |  |
| 2: ExposureActive signal   | 3: TriggerAuxiliary signal  |    |    |    |    |    |    |    |    |                            |                      |                           |                            |  |                     |                          |                     |   |                     |                             |                      |  |                            |  |  |                          |  |  |  |
| 4: TriggerInternal signal (after mask and delay process)             |   |    |    |    |    |    |    |    |    |                            |                      |                           |                            |  |                     |                          |                     |   |                     |                             |                      |  |                            |  |  |                          |  |  |  |
| 5: SensorReadOut signal,   |   |    |    |    |    |    |    |    |    |                            |                      |                           |                            |  |                     |                          |                     |   |                     |                             |                      |  |                            |  |  |                          |  |  |  |
| 6 to F: No function (Prohibited setting. Do not set this value)      |   |    |    |    |    |    |    |    |    |                            |                      |                           |                            |  |                     |                          |                     |   |                     |                             |                      |  |                            |  |  |                          |  |  |  |
| 0: FrameTriggerWait signal,  | 1: UserOutput signal  |    |    |    |    |    |    |    |    |                            |                      |                           |                            |  |                     |                          |                     |   |                     |                             |                      |  |                            |  |  |                          |  |  |  |
| 2: ExposureActive signal   | 3: TriggerAuxiliary signal  |    |    |    |    |    |    |    |    |                            |                      |                           |                            |  |                     |                          |                     |   |                     |                             |                      |  |                            |  |  |                          |  |  |  |
| 4: TriggerInternal signal (after mask and delay process)             |   |    |    |    |    |    |    |    |    |                            |                      |                           |                            |  |                     |                          |                     |   |                     |                             |                      |  |                            |  |  |                          |  |  |  |
| 5: SensorReadOut signal,   |   |    |    |    |    |    |    |    |    |                            |                      |                           |                            |  |                     |                          |                     |   |                     |                             |                      |  |                            |  |  |                          |  |  |  |
| 6: No function (Prohibited setting. Do not set this value)           |   |    |    |    |    |    |    |    |    |                            |                      |                           |                            |  |                     |                          |                     |   |                     |                             |                      |  |                            |  |  |                          |  |  |  |

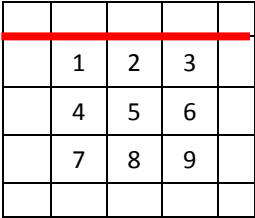
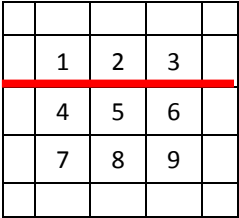
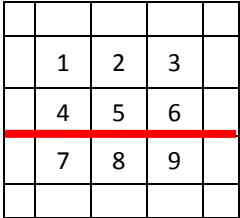


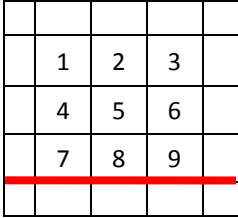
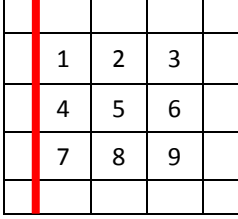
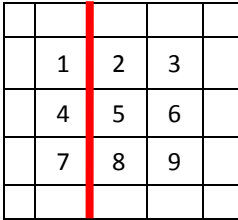
| Command No.           | Command Description   |    |    |    |    |    |    |    |    |
|-----------------------|---|----|----|----|----|----|----|----|----|
| F9H:<br>OUTSEL2[7..0] | <p>[The output signal selection for the power/IO connector]<br/>           Initial data: OUTSEL2[7..0] = 00H<br/>           Sets the output signal from the power/IO connector.<br/>           This selection is Enabled when the user sets the output signal from the Sentech FPGA with the setup of C1H for the 20H device code.</p> <p>D[7..0]</p> <table border="1" style="margin-left: 20px;"> <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> <p>D7 to D4: No function <span style="float: right;"><u>Please set as 0000</u></span><br/>           D3 to D0: Output signal for 7pin of the power/IO<br/> <u>0: FrameTriggerWait signal</u> <span style="float: right;">1: UserOutput signal</span><br/>           2: ExposureActive Signal <span style="float: right;">3: Trigger Auxiliary Signal</span><br/>           4: TriggerInternal signal (after mask and delay process) <span style="float: right;">5: Frame active time</span><br/>           6 to F: No function (Prohibited setting. Do not set this value)</p> <p>Note: When "UserOutput signal" is selected, this sets the status of the signal with "User setup signal output for the power/IO connector (TEST2-D3,4)</p> | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| D7                    | D6  | D5 | D4 | D3 | D2 | D1 | D0 |    |    |

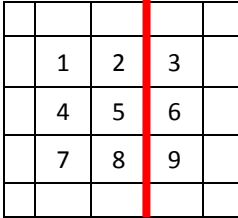
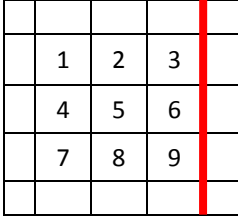
3. Description of the camera control commands (Device code: 100000)  
 (The underline settings are the factory default settings)

| Command No.                                  | Command Description   |    |    |    |    |    |    |    |    |
|--|---|----|----|----|----|----|----|----|----|
| 18H: [7..0]                                  | <p>[JTAG for the user configurable FPGA] Initial data: 00H<br/>                     Sets the JTAG connection ON/OFF for the user configurable FPGA.</p> <p>D[7..0]</p> <table border="1"> <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> <p>D7 to D1: No function                      <u>Please set as 0000000</u><br/>                     D0: JTAG                                      <u>0: OFF</u>                                      1: ON</p>   | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| D7   | D6  | D5 | D4 | D3 | D2 | D1 | D0 |    |    |
| 19H: [7..0]                                  | <p>[The user configurable FPGA enabled] Initial data: 00H<br/>                     Sets the user configurable FPGA to Enable /Disable when the camera starts-up.</p> <p>D[7..0]</p> <table border="1"> <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> <p>D7 to D1: No function                      <u>Please set as 0000000</u><br/>                     D3: User configurable FPGA              <u>0: Disable</u>                                      1: Enable</p>  | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| D7   | D6  | D5 | D4 | D3 | D2 | D1 | D0 |    |    |
| 20H: [7..0]                                  | <p>[Exposure mode] Initial data: 00H<br/>                     Sets the exposure mode (the AGC), the shutter mode and the iris lens control method.</p> <p>D[7..0]</p> <table border="1"> <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> <p>D7 to D4: No function                      <u>Please set as 0000</u><br/>                     D3: AGC                                      <u>0: OFF (Fixed gain)</u>                      1: ON (AGC)<br/>                     D2: Shutter mode                          <u>0: OFF (Fixed shutter)</u>                  1: ON (Auto shutter)<br/>                     D1: Iris lens control method              <u>0: OFF (Manual control)</u>              1: ON (Auto control)<br/>                     D0: No function                              <u>Please set as 0</u></p> | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| D7   | D6  | D5 | D4 | D3 | D2 | D1 | D0 |    |    |
| 21H: [7..0]                                  | <p>[AGC range] Initial data: 255, data range: 0 to 255<br/>                     Sets the range of the AGC (Maximum)</p>   |    |    |    |    |    |    |    |    |
| 23H: [7..0]<br>24H: [15..8]<br>25H: [20..16] | <p>[The upper limit of the electronic shutter for the auto shutter]<br/>                     Initial data: 65,292, data range: 0 to 1,048,575<br/>                     Sets the upper limit of the electronic shutter for the auto shutter as usecond.</p> <p>Initial Data<br/>                     STC-GE33A/GEC33A: 11,122 useconds<br/>                     STC-GE83A/GEC83A: 27,458 useconds<br/>                     STC-GE152A/GEC152A: 51,925 useconds<br/>                     STC-GE202A/GEC202A: 65,292 useconds</p>  |    |    |    |    |    |    |    |    |
| 26H: [7..0]<br>27H: [15..8]<br>28H: [20..16] | <p>[The lower limit of the electronic shutter for auto shutter]<br/>                     Initial data: 0, data range: 0 to 1,048,575<br/>                     Sets the lower limit of the electronic shutter for the auto shutter as usecond.</p>   |    |    |    |    |    |    |    |    |

| Command No. | Command Description  |    |    |    |    |    |    |    |    |
|-------------|--|----|----|----|----|----|----|----|----|
| 29H: [7..0] | <p>[Weight1 for ALC] Initial data: 11H<br/>Sets the weight for ALC weight area 1 and 2.</p> <p>D[7..0]</p> <table border="1"> <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> <p>D7 to D4: Weight for ALC weight area 4 <u>1</u> Range: 0 to 15<br/>D3 to D0: Weight for ALC weight area 3 <u>1</u> Range: 0 to 15</p> <p>*Please set the ALC weight area with "30H to 3FH".</p>  | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| D7          | D6   | D5 | D4 | D3 | D2 | D1 | D0 |    |    |
| 2AH: [7..0] | <p>[Weight2 for ALC] Initial data: 11H<br/>Sets the weight for ALC weight area 3 and 4.</p> <p>D[7..0]</p> <table border="1"> <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> <p>D7 to D4: Weight for ALC weight area 6 <u>1</u> Range: 0 to 15<br/>D3 to D0: Weight for ALC weight area 5 <u>1</u> Range: 0 to 15</p> <p>*Please set the ALC weight area with "30H to 3FH".</p>  | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| D7          | D6   | D5 | D4 | D3 | D2 | D1 | D0 |    |    |
| 2BH: [7..0] | <p>[Weight3 for ALC] Initial data: 11H<br/>Sets the weight for ALC weight area 5 and 6.</p> <p>D[7..0]</p> <table border="1"> <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> <p>D7 to D4: Weight for ALC weight area 8 <u>1</u> Range: 0 to 15<br/>D3 to D0: Weight for ALC weight area 7 <u>10</u> Range: 0 to 15</p> <p>*Please set the ALC weight area with "30H to 3FH".</p> | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| D7          | D6   | D5 | D4 | D3 | D2 | D1 | D0 |    |    |
| 2CH: [7..0] | <p>[Weight4 for ALC] Initial data: 11H<br/>Sets the weight for ALC weight area 7 and 8.</p> <p>D[7..0]</p> <table border="1"> <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> <p>D7 to D4: Weight for ALC weight area 2 <u>1</u> Range: 0 to 15<br/>D3 to D0: Weight for ALC weight area 1 <u>1</u> Range: 0 to 15</p> <p>*Please set the ALC weight area with "30H to 3FH".</p>  | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| D7          | D6   | D5 | D4 | D3 | D2 | D1 | D0 |    |    |
| 2DH: [7..0] | <p>[Weight5 for ALC] Initial data: 01H<br/>Sets the weight for ALC weight area 9.</p> <p>D[7..0]</p> <table border="1"> <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> <p>D7 to D4: No function <u>Please set as 0000</u><br/>D3 to D0: Weight for ALC weight area 9 <u>1</u> Range: 0 to 15</p> <p>*Please set the ALC weight area with "30H to 3FH".</p>                       | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| D7          | D6   | D5 | D4 | D3 | D2 | D1 | D0 |    |    |
| 2EH: [7..0] | <p>[Target brightness for ALC] Initial data: 128, data range: 0 to 255<br/>Sets the target brightness for the ALC function (AGC, auto shutter or iris lens control).</p>   |    |    |    |    |    |    |    |    |

| Command No.                 | Command Description  |
|-----------------------------|--|
| 2FH: [7..0]                 | <p>[ALC peak-average] Initial data: 0, data range: 0 to 255<br/>Sets the control standard for the ALC function (AGC, auto shutter or iris lens auto control).</p> <p>When it is set as 0 (Average: 100%, Peak: 0%) the ALC function with the average brightness of the photometry area. When it is set as 255 (Average: 0%, Peak 100%), the ALC function with the peak brightness of the photometry area.</p>  |
| 30H: [7..0]<br>31H: [15..8] | <p>[Vertical_1 position for the ALC weight area]<br/>Initial data: check below, data range: check below<br/>Sets the vertical 1 position for ALC weight area.</p> <p>STC-GE330X/GEC330X<br/>Initial data: 32 Data range: 0 to 493</p> <p>STC-GE830X/GEC830X<br/>Initial data: 32 Data range: 0 to 767</p> <p>STC-GE1520X/GEC1520X<br/>Initial data: 32 Data range: 0 to 1,039</p> <p>STC-GE2020X/GEC2020X<br/>Initial data: 32 Data range: 0 to 1,235</p>        |
| 32H: [7..0]<br>33H: [15..8] | <p>[Vertical_2 position for the ALC weight area]<br/>Initial data: check below, data range: check below<br/>Sets the vertical 1 position for ALC weight area.</p> <p>STC-GE330X/GEC330X<br/>Initial data: 196 Data range: 0 to 493</p> <p>STC-GE830X/GEC830X<br/>Initial data: 288 Data range: 0 to 767</p> <p>STC-GE1520X/GEC1520X<br/>Initial data: 378 Data range: 0 to 1,039</p> <p>STC-GE2020X/GEC2020X<br/>Initial data: 444 Data range: 0 to 1,235</p>  |
| 34H: [7..0]<br>35H: [15..8] | <p>[Vertical_3 position for the ALC weight area]<br/>Initial data: check below, data range: check below<br/>Sets the vertical 3 position for ALC weight area.</p> <p>STC-GE330X/GEC330X<br/>Initial data: 298 Data range: 0 to 493</p> <p>STC-GE830X/GEC830X<br/>Initial data: 480 Data range: 0 to 767</p> <p>STC-GE1520X/GEC1520X<br/>Initial data: 662 Data range: 0 to 1,039</p> <p>STC-GE2020X/GEC2020X<br/>Initial data: 792 Data range: 0 to 1,235</p>  |

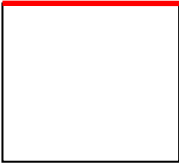


| Command No.                 | Command Description  |
|-----------------------------|--|
| 36H: [7..0]<br>37H: [15..8] | <p>[Vertical_4 position for the ALC weight area]<br/>Initial data: check below, data range: check below<br/>Sets the vertical 4 position for ALC weight area.</p> <p>STC-GE330X/GEC330X<br/>Initial data: 462 Data range: 0 to 493</p> <p>STC-GE830X/GEC830X<br/>Initial data: 736 Data range: 0 to 767</p> <p>STC-GE1520X/GEC1520X<br/>Initial data: 1,008 Data range: 0 to 1,039</p> <p>STC-GE2020X/GEC2020X<br/>Initial data: 1,204 Data range: 0 to 1,235</p>      |
| 38H: [7..0]<br>39H: [15..8] | <p>[Horizontal_1 position for the ALC weight area]<br/>Initial data: Check below, data range: check below<br/>Sets the horizontal 1 position for ALC weight area.</p> <p>STC-GE330X/GEC330X<br/>Initial data: 36 Data range: 0 to 647</p> <p>STC-GE830X/GEC830X<br/>Initial data: 36 Data range: 0 to 1,023</p> <p>STC-GE1520X/GEC1520X<br/>Initial data: 36 Data range: 0 to 1,359</p> <p>STC-GE2020X/GEC2020X<br/>Initial data: 36 Data range: 0 to 1,623</p>      |
| 3AH: [7..0]<br>3BH: [15..8] | <p>[Horizontal_2 position for the ALC weight area]<br/>Initial data: Check below, data range: check below<br/>Sets the horizontal 2 position for ALC weight area.</p> <p>STC-GE330X/GEC330X<br/>Initial data: 252 Data range: 0 to 647</p> <p>STC-GE830X/GEC830X<br/>Initial data: 377 Data range: 0 to 1,023</p> <p>STC-GE1520X/GEC1520X<br/>Initial data: 489 Data range: 0 to 1,359</p> <p>STC-GE2020X/GEC2020X<br/>Initial data: 577 Data range: 0 to 1,623</p>  |


| Command No.                 | Command Description   |    |    |    |    |    |    |    |    |
|-----------------------------|---|----|----|----|----|----|----|----|----|
| 3CH: [7..0]<br>3DH: [15..8] | <p>[Horizontal_3 position for the ALC weight area]<br/>Initial data: Check below, data range: check below<br/>Sets the horizontal 3 position for ALC weight area.</p> <p>STC-GE330X/GEC330X<br/>Initial data: 396 Data range: 0 to 647</p> <p>STC-GE830X/GEC830X<br/>Initial data: 647 Data range: 0 to 1,023</p> <p>STC-GE1520X/GEC1520X<br/>Initial data: 871 Data range: 0 to 1,359</p> <p>STC-GE2020X/GEC2020X<br/>Initial data: 1,047 Data range: 0 to 1,623</p>   |    |    |    |    |    |    |    |    |
| 3EH: [7..0]<br>3FH: [15..8] | <p>[Horizontal_4 position for the ALC weight area]<br/>Initial data: Check below, data range: check below<br/>Sets the horizontal 4 position for ALC weight area.</p> <p>STC-GE330X/GEC330X<br/>Initial data: 612 Data range: 0 to 647</p> <p>STC-GE830X/GEC830X<br/>Initial data: 988 Data range: 0 to 1,023</p> <p>STC-GE1520X/GEC1520X<br/>Initial data: 1,324 Data range: 0 to 1,359</p> <p>STC-GE2020X/GEC2020X<br/>Initial data: 1,588 Data range: 0 to 1,623</p>   |    |    |    |    |    |    |    |    |
| 40H: [7..0]                 | <p>[White balance mode] Initial data: 00H<br/>Sets the white balance mode for the color camera.</p> <p>D[7..0]</p> <table border="1" data-bbox="300 1413 875 1446"> <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> <p>D7 to D4: No function <u>Please set as 0000</u></p> <p>D3: Push to set white balance operation <u>0: OFF</u> 1: ON</p> <p>D2 to D0: White balance mode <u>000: OFF</u> 001: Preset 1</p> <p>010: Preset 2 011: Preset 3</p> <p>101: Push to set white balance</p> <p>110 to 111: No function (Prohibited setting. Do not set these values)</p> <p>*When use the push to set white balance, set the white balance mode as “Push to set white balance” then change “0” to “1” for Push to set white balance operation.</p> | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| D7                          | D6  | D5 | D4 | D3 | D2 | D1 | D0 |    |    |

| Command No.            | Command Description  |
|------------------------|--|
| 41H:<br>GainR1 [7..0]  | <p>[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/>Red of the camera output image data = <math>(\text{CCD\_R} - \text{CLAMP Level}) \times (1 + \text{GainR1}[7..0]/64) + \text{CLAMP Level}</math></p> <p>*CCD_R: Red of the CCD output image data<br/>*CLAMP Level: Clamp level (The calculated value of 38H)</p>     |
| 42H:<br>GainGr1 [7..0] | <p>[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/>Gr of the camera output image data = <math>(\text{CCD\_Gr} - \text{CLAMP Level}) \times (1 + \text{GainGr1}[7..0]/64) + \text{CLAMP Level}</math></p> <p>*CCD_Gr: Gr of the CCD output image data<br/>*CLAMP Level: Clamp level (The calculated value of 38H)</p>      |
| 43H:<br>GainB1 [7..0]  | <p>[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/>Blue of the camera output image data = <math>(\text{CCD\_B} - \text{CLAMP Level}) \times (1 + \text{GainB1}[7..0]/64) + \text{CLAMP Level}</math></p> <p>*CCD_B: Blue of the CCD output image data<br/>*CLAMP Level: Clamp level (The calculated value of 38H)</p> |
| 44H:<br>GainGb1[7..0]  | <p>[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/>Gb of the camera output image data = <math>(\text{CCD\_Gb} - \text{CLAMP Level}) \times (1 + \text{GainGb1}[7..0]/64) + \text{CLAMP Level}</math></p> <p>*CCD_Gb: Gb of the CCD output image data<br/>*CLAMP Level: Clamp level (The calculated value of 38H)</p>      |
| 45H:<br>GainR2 [7..0]  | <p>[Preset_2 white balance (Red gain)] Initial data 0, data range: 0 to 255<br/>Sets the Red gain for the preset_2 white balance.<br/>Red of the camera output image data = <math>(\text{CCD\_R} - \text{CLAMP Level}) \times (1 + \text{GainR2}[7..0]/64) + \text{CLAMP Level}</math></p> <p>*CCD_R: Red of the CCD output image data<br/>*CLAMP Level: Clamp level (The calculated value of 38H)</p>     |
| 46H:<br>GainGr2 [7..0] | <p>[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/>Gr of the camera output image data = <math>(\text{CCD\_Gr} - \text{CLAMP Level}) \times (1 + \text{GainGr2}[7..0]/64) + \text{CLAMP Level}</math></p> <p>*CCD_Gr: Gr of the CCD output image data<br/>*CLAMP Level: Clamp level (The calculated value of 38H)</p>      |
| 47H:<br>GainB2 [7..0]  | <p>[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/>Blue of the camera output image data = <math>(\text{CCD\_B} - \text{CLAMP Level}) \times (1 + \text{GainB2}[7..0]/64) + \text{CLAMP Level}</math></p> <p>*CCD_B: Blue of the CCD output image data<br/>*CLAMP Level: Clamp level (The calculated value of 38H)</p> |
| 48H:<br>GainGb2[7..0]  | <p>[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/>Gb of the camera output image data = <math>(\text{CCD\_Gb} - \text{CLAMP Level}) \times (1 + \text{GainGb2}[7..0]/64) + \text{CLAMP Level}</math></p> <p>*CCD_Gb: Gb of the CCD output image data<br/>*CLAMP Level: Clamp level (The calculated value of 38H)</p>      |

| Command No.                 | Command Description  |
|-----------------------------|--|
| 49H:<br>GainR3 [7..0]       | <p>[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.</p> <p>Red of the camera output image data = <math>(\text{CCD\_R} - \text{CLAMP Level}) \times (1 + \text{GainR3}[7..0]/64) + \text{CLAMP Level}</math></p> <p>*CCD_R: Red of the CCD output image data<br/>*CLAMP Level: Clamp level (The calculated value of 38H)</p>  |
| 4AH:<br>GainGr3 [7..0]      | <p>[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.</p> <p>Gr of the camera output image data = <math>(\text{CCD\_Gr} - \text{CLAMP Level}) \times (1 + \text{GainGr3}[7..0]/64) + \text{CLAMP Level}</math></p> <p>*CCD_Gr: Gr of the CCD output image data<br/>*CLAMP Level: Clamp level (The calculated value of 38H)</p>   |
| 4BH:<br>GainB3 [7..0]       | <p>[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.</p> <p>Blue of the camera output image data = <math>(\text{CCD\_B} - \text{CLAMP Level}) \times (1 + \text{GainB3}[7..0]/64) + \text{CLAMP Level}</math></p> <p>*CCD_B: Blue of the CCD output image data<br/>*CLAMP Level: Clamp level (The calculated value of 38H)</p>  |
| 4CH:<br>GainGb3[7..0]       | <p>[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.</p> <p>Gb of the camera output image data = <math>(\text{CCD\_Gb} - \text{CLAMP Level}) \times (1 + \text{GainGb3}[7..0]/64) + \text{CLAMP Level}</math></p> <p>*CCD_Gb: Gb of the CCD output image data<br/>*CLAMP Level: Clamp level (The calculated value of 38H)</p>   |
| 4EH: [7..0]<br>4FH: [15..8] | <p>[Bright level threshold for auto white balance] Initial data: 3,072, data range: 0 to 4,095<br/>Sets the bright level threshold for the auto white balance process.<br/>The auto white balance process uses the color information of the pixel, which is when pixel brightness is greater than this value.</p>  |
| 50H: [7..0]<br>51H: [15..8] | <p>[Y_offset for AOI] Initial data: 0, data range: check below<br/>Sets the Y_offset, which is the vertical start position of the image for the AOI.</p> <p>STC-GE330X / GEC330X<br/>Data range: <math>4 \leq \text{Y\_offset} + \text{Height} \leq 494</math></p> <p>STC-GE830X / GEC830X<br/>Data range: <math>4 \leq \text{Y\_offset} + \text{Height} \leq 768</math></p> <p>STC-GE1520X / GEC1520X<br/>Data range: <math>4 \leq \text{Y\_offset} + \text{Height} \leq 1,040</math></p> <p>STC-GE2020X / GEC2020X<br/>Data range: <math>4 \leq \text{Y\_offset} + \text{Height} \leq 1,236</math></p> |

| Command No.                 | Command Description  |
|-----------------------------|--|
| 52H: [7..0]<br>53H: [15..8] | <p>[Height for AOI] Initial data: 0, data range: check below<br/>Sets the height, which is the vertical size of the image for the AOI.</p> <p>STC-GE330X / GEC330X<br/>Initial data: 494    Data range: <math>4 \leq \text{"Y\_offset + Height"} \leq 494</math></p> <p>STC-GE830X / GEC830X<br/>Initial data: 768    Data range: <math>4 \leq \text{"Y\_offset + Height"} \leq 768</math></p> <p>STC-GE1520X / GEC1520X<br/>Initial data: 1,040    Data range: <math>4 \leq \text{"Y\_offset + Height"} \leq 1,040</math></p> <p>STC-GE2020X / GEC2020X<br/>Initial data: 1,236    Data range: <math>4 \leq \text{"Y\_offset + Height"} \leq 1,236</math></p>     |
| 54H: [7..0]<br>55H: [15..8] | <p>[X_offset for AOI] Initial data: 0, data range: check below<br/>Sets the X_offset, which is the horizontal start position of the image for the AOI.</p> <p>STC-GE330X / GEC330X<br/>Data range: <math>8 \leq \text{"X\_offset + Height"} \leq 648</math></p> <p>STC-GE830X / GEC830X<br/>Data range: <math>8 \leq \text{"X\_offset + Height"} \leq 1,024</math></p> <p>STC-GE1520X / GEC1520X<br/>Data range: <math>8 \leq \text{"X\_offset + Height"} \leq 1,360</math></p> <p>STC-GE2020X / GEC2020X<br/>Data range: <math>8 \leq \text{"X\_offset + Height"} \leq 1,624</math></p>   |
| 56H: [7..0]<br>57H: [15..8] | <p>[Width for AOI] Initial data: 0, data range: check below<br/>Sets the width, which is the horizontal size of the image for the AOI.</p> <p>STC-GE330X / GEC330X<br/>Initial data: 648    Data range: <math>8 \leq \text{"X\_offset + Height"} \leq 648</math></p> <p>STC-GE830X / GEC830X<br/>Initial data: 1,024    Data range: <math>8 \leq \text{"X\_offset + Height"} \leq 1,024</math></p> <p>STC-GE1520X / GEC1520X<br/>Initial data: 1,360    Data range: <math>8 \leq \text{"X\_offset + Height"} \leq 1,360</math></p> <p>STC-GE2020X / GEC2020X<br/>Initial data: 1,624    Data range: <math>8 \leq \text{"X\_offset + Height"} \leq 1,624</math></p> |

| Command No.                 | Command Description  |
|-----------------------------|--|
| 58H: [7..0]<br>59H: [15..8] | <p>[Vertical_1 position for the white balance area]<br/>Initial data: check below, data range: check below<br/>Sets the vertical 1 position, which is the vertical start position for the white balance area.<br/>This area is used for gain calculation for the auto white balance and the push to set white balance.</p> <p>STC- GEC330X<br/>Initial data: 0    Data range: 0 to 493</p> <p>STC- GEC830X<br/>Initial data: 0    Data range: 0 to 767</p> <p>STC- GEC1520X<br/>Initial data: 0    Data range: 0 to 1,039</p> <p>STC- GEC2020X<br/>Initial data: 0    Data range: 0 to 1,235</p>                |
| 5AH: [7..0]<br>5BH: [15..8] | <p>[Vertical_2 position for the white balance area]<br/>Initial data: check below, data range: check below<br/>Sets the vertical 2 position, which is the vertical start position for the white balance area.<br/>This area is used for gain calculation for the auto white balance and the push to set white balance.</p> <p>STC- GEC330X<br/>Initial data: 493    Data range: 0 to 493</p> <p>STC- GEC830X<br/>Initial data: 767    Data range: 0 to 767</p> <p>STC- GEC1520X<br/>Initial data: 1,039    Data range: 0 to 1,039</p> <p>STC- GEC2020X<br/>Initial data: 1,235    Data range: 0 to 1,235</p>  |
| 5CH: [7..0]<br>5DH: [15..8] | <p>[Horizontal_1 position for the white balance area]<br/>Initial data: check below, data range: check below<br/>Sets the horizontal 1 position, which is the horizontal start position for the white balance area.<br/>This area is used for gain calculation for the auto white balance and the push to set white balance.</p> <p>STC- GEC330X<br/>Initial data: 0    Data range: 0 to 647</p> <p>STC- GEC830X<br/>Initial data: 0    Data range: 0 to 1,023</p> <p>STC- GEC1520X<br/>Initial data: 0    Data range: 0 to 1,359</p> <p>STC- GEC2020X<br/>Initial data: 0    Data range: 0 to 1,623</p>      |

| Command No.                 | Command Description  |    |    |    |    |    |    |    |    |
|-----------------------------|--|----|----|----|----|----|----|----|----|
| 5EH: [7..0]<br>5FH: [15..8] | <p>[Horizontal_2 position for the white balance area]<br/>Initial data: check below, data range: check below<br/>Sets the horizontal 2 position, which is the horizontal end position for white balance area.<br/>This area is used for the gain calculation for the auto white balance and the push to set white balance.</p> <p>STC- GEC330X<br/>Initial data: 647     Data range: 0 to 647</p> <p>STC- GEC830X<br/>Initial data: 1,023     Data range: 0 to 1,023</p> <p>STC- GEC1520X<br/>Initial data: 1,359     Data range: 0 to 1,359</p> <p>STC- GEC2020X<br/>Initial data: 1,623     Data range: 0 to 1,623</p>  |    |    |    |    |    |    |    |    |
| 60H: [7..0]                 | <p>[Camera mode1] Initial data: 00H<br/>Sets the white balance area ON/OFF and the gamma table ON/OFF.</p> <p>D[7..0]</p> <table border="1" data-bbox="300 953 875 989"> <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> <p>D7 to D5:     No function     <u>Please set as 000</u><br/>D4:            White balance area ON/OFF     0: OFF (Full screen),     1: ON (setup area)<br/>D3 to D1:     No function     <u>Please set as 000</u><br/>D0:            Gamma table ON/OFF     0: OFF (Gamma=1.0),     1: ON</p>  | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| D7                          | D6   | D5 | D4 | D3 | D2 | D1 | D0 |    |    |
| 80H:<br>GainRP [7..0]       | <p>[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 balance.</p> <p>Red of the camera output image data = (CCD_R – CLAMP Level) x (1 + GainRP[7..0] / 64) + CLAMP Level</p> <p>*CCD_R: Red of the CCD output image data<br/>*CLAMP Level: Clamp level (The calculated value of 38H)</p>  |    |    |    |    |    |    |    |    |
| 81H:<br>GainGrP [7..0]      | <p>[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 balance.</p> <p>Gr of the camera output image data = (CCD_Gr – CLAMP Level) x (1 + GainGrP [7..0] / 64) + CLAMP Level</p> <p>*CCD_Gr: Gr of the CCD output image data<br/>*CLAMP Level: Clamp level (The calculated value of 38H)</p>  |    |    |    |    |    |    |    |    |
| 82H: [7..0]                 | <p>[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 balance.</p> <p>Blue of the camera output image data = (CCD_B – CLAMP Level) x (1 + GainBR [7..0] / 64) + CLAMP Level</p> <p>*CCD_B: Blue of the CCD output image data<br/>*CLAMP Level: Clamp level (The calculated value of 38H)</p>   |    |    |    |    |    |    |    |    |

| Command No. | Command Description   |    |    |    |    |    |    |    |    |
|-------------|---|----|----|----|----|----|----|----|----|
| 83H: [7..0] | <p>[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 balance.<br/>Gb of the camera output image data = (CCD_Gb – CLAMP Level) x (1 + GainGbp [7..0] / 64) + CLAMP Level</p> <p>*CCD_Gb: Gb of the CCD output image data<br/>*CLAMP Level: Clamp level (The calculated value of 38H)</p>  |    |    |    |    |    |    |    |    |
| 90H: [7..0] | <p>[Iris lens adjustment] Initial data: 80, data range: 0 to 255<br/>Sets the driving voltage of the iris lens for the iris lens auto control.</p>  |    |    |    |    |    |    |    |    |
| 92H: [7..0] | <p>[Iris lens manual adjustment] Initial data: 01H<br/>Sets the iris lens manual adjustment operation.</p> <p>D[7..0]</p> <table border="1" style="margin-left: 20px;"> <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> <p>D7 to D2: No function <span style="float: right;"><u>Please set as 000000</u></span><br/> D1 to D0: Manual adjustment operation <span style="float: right;">00: Hold <span style="margin-left: 20px;"><u>01: Open</u></span><br/> 10: Close<br/> 11: No function (prohibited setting. Do not set this value)</span></p>   | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| D7          | D6  | D5 | D4 | D3 | D2 | D1 | D0 |    |    |
| COH: [7..0] | <p>[Image data between FPGAs] Initial data: 00H</p> <p>D[7..0]</p> <table border="1" style="margin-left: 20px;"> <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> <p>D7 to D6: No Function <span style="float: right;"><u>Please set as 00</u></span><br/> D5 to D4: Image process after the image data from the user configurable FPGA<br/> <span style="float: right;"><u>00: No process (No data from use FPGA)</u></span><br/> <span style="float: right;">(No image data from the user configurable FPGA)</span><br/> <span style="float: right;">01: White balance, gamma and color interpolation</span><br/> <span style="float: right;">10: Gamma and color interpolation</span><br/> <span style="float: right;">11: Color interpolation</span><br/> D3 to D2: No Function <span style="float: right;"><u>Please set as 00</u></span><br/> D1 to D0: Image data from Sentech FPGA to the user configurable FPGA<br/> <span style="float: right;"><u>00: CCD out image data</u></span><br/> <span style="float: right;">01: White balance processed image data</span><br/> <span style="float: right;">10: White balance and gamma processed image</span><br/> <span style="float: right;">11: No function (Prohibited settings. Do not set this value)</span></p> <p>Note: The white balance and color interpolation processes are available only for color cameras.</p> | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| D7          | D6  | D5 | D4 | D3 | D2 | D1 | D0 |    |    |

| Command No. | Command Description   |    |    |    |    |    |    |    |    |
|-------------|---|----|----|----|----|----|----|----|----|
| C1H: [7..0] | <p>[Output signal selection] Initial data: 00H</p> <p>D[7..0]</p> <table border="1"> <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> <p>D7 to D5: No function      <u>Please set as 000</u></p> <p>D4:            Output signal for 7pin (Out4) of the power/IO connector<br/>                   <u>0: Output signal from Sentech FPGA</u>    1: Output signal from the user configurable FPGA</p> <p>D3:            Output signal for 6pin (Out3) of the power/IO connector<br/>                   <u>0: Output signal from Sentech FPGA</u>    1: Output signal from the user configurable FPGA</p> <p>D2:            Output signal for 5pin (Out2) of the power/IO connector<br/>                   <u>0: Output signal from Sentech FPGA</u>    1: Output signal from the user configurable FPGA</p> <p>D1:            Output signal for 4pin (Out1) of the power/IO connector<br/>                   <u>0: Output signal from Sentech FPGA</u>    1: Output signal from the user configurable FPGA</p> <p>D0:            Output signal for 3pin (Out0) of the power/IO connector<br/>                   <u>0: Output signal from Sentech FPGA</u>    1: Output signal from the user configurable FPGA</p> <p>Note: When “Output signal from Sentech FPGA” is selected, select the output signal from the Sentech FPGA for the power/IO connector with the “Output signal selection (F0H, F8H, and F9H)”.</p> | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| D7          | D6  | D5 | D4 | D3 | D2 | D1 | D0 |    |    |

## 4. Sequence for Saving the Command to the EEPROM

Please use the following sequence to save the command to the EEPROM

- a. Set “1” to the 80H.0 to accept the “write control to the EEPROM”.
- b. Send the command and save the data with the EEPROM access command, which is set “1” for the page selection.
- c. The camera sends back one of the following receiving codes after writing the EEPROM:
  - 01H: OK
  - 17H: EEPROM write error
- d. 80H.0 automatically changes to “0” after writing the EEPROM.

Note 1: Does NOT save to the EEPROM when 80H.0 is “0”.

Note2: When multiple sequence of commands is saved to the EEPROM, all data will save to the EEPROM with one attempt of operation from steps a.~d. above. Example of a multiple sequence of command: “10H, 11H, 12H and 13H” or “22H, 23H and 24H”

Note 3: When saving multiple command data, which is not a sequence command to the EEPROM, it is necessary to operate steps a.~d. above multiple times. An example of a multiple command is “10H, 13H, 19H and 1BH” or “20H, 23H and 25H”.

## Revision

| Rev | Date       | Changes   | Note |
|-----|------------|---|------|
| 1.0 | 2010/12/6  | New Document  |      |
| 1.1 | 2010/12/21 | Update<br>Change the receiving code 14H (Change the time out time to two seconds)<br>Change the camera function mode 2 (Change the initial data)<br>Change the exposure time of the electronic shutter (Change the data range)<br>Change from "AGC range" to "AGC maximum limit"<br>Change the upper limit of the electronic shutter for auto shutter (Change the initial data)<br>Change the weight3 for ALC (Change the initial data)<br>Change the pulse duration for the software trigger to 200 useconds<br>Change the formula for the CDS gain<br>Change the description for the EEPROM control<br>Change the description for the output signal selection for the power/IO connector (Add the selection 7 to F)<br>Change the camera function mode 1<br>Change the camera function mode 4 |      |
| 1.2 | 2011/1/17  | Update<br>Change the image data reset<br>Change the bright level threshold for auto white balance process<br>Change the ALC peak average<br>Change the software trigger setting<br>Change the description of the output signal selection for the power/IO connector   |      |
| 1.3 | 2011/2/18  | Update<br>Revise "The output signal select ion for the power/IO connector (initial)"<br>Change "The camera function mode 2"<br>Change "Weight for ALC"  |      |
| 1.4 | 2011/4/1   | Update<br>Changed "White balance area" (delete the monochrome model)<br>Changed the description for the device code   |      |
| 1.5 | 2011/7/27  | Update<br>Add "User configurable FPGA Enable" command   |      |
| 1.6 | 2011/7/27  | Update<br>Revise the formula for the CDS gain<br>Revise the formula for the video level<br>Revise the formula for the clamp level<br>Add the formula for the white balance gain   |      |
| 1.7 | 2011/8/17  | Update<br>Changed the output signal name from FrameActive to SensorReadOut  |      |

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