



English

VISION:elite™
2M Pixel B/W Gig-E Camera
VCC-G60U21GE

Product Specification
& Operational Manual

CIS Corporation

Table of Contents

| | |
|---|----|
| 1. Scope of Application..... | 3 |
| 2. Handling Precautions | 3 |
| 3. Product Outline..... | 4 |
| 4. Specification..... | 5 |
| 4.1. General Specification | 5 |
| 4.2. Camera Output Signal Specification..... | 7 |
| 4.3. CCD Spectral Response (Representative Value) | 8 |
| 4.4. Image output format (Coyote Application Setting)..... | 8 |
| 5. Function Settings..... | 9 |
| 6. External Connector Pin Assignment | 11 |
| 6.1. 12 pins Circular Connector HR10-10R-12PA (HIROSE) | 11 |
| 6.2. RJ-45 Gigabit Ethernet Connector MOD-YSJ88DA03C-CN+ (HONDA TSUSHIN KOGYO CO., LTD) | 12 |
| 7. Timing Chart..... | 13 |
| 7.1. Horizontal Synchronous Signals Timing | 13 |
| 7.2. Full Frame Scan Mode Timing | 13 |
| 7.3. Standard Trigger Mode Timing | 14 |
| 7.4. Pulse Width Trigger Timing | 15 |
| 7.5. Internal Trigger Timing..... | 16 |
| 8. Partial Scan Mode Details | 17 |
| 9. Remote Interface Function | 18 |
| 10. Initial Settings | 19 |
| 11. CCD Optical Axis Accuracy | 20 |
| 12. Dimensions..... | 21 |
| 13. Cases for Indemnity (Limited Warranty)..... | 23 |
| 14. CCD Pixel Defect | 24 |
| 15. Product Support..... | 24 |

1. Scope of Application

This is to describe VCC-G60U21GE, 2M pixels Gig-E B/W CCD Camera. All specifications contained herein are subject to change without prior notice. Reproduction in whole or in part is prohibited.

2. Handling Precautions

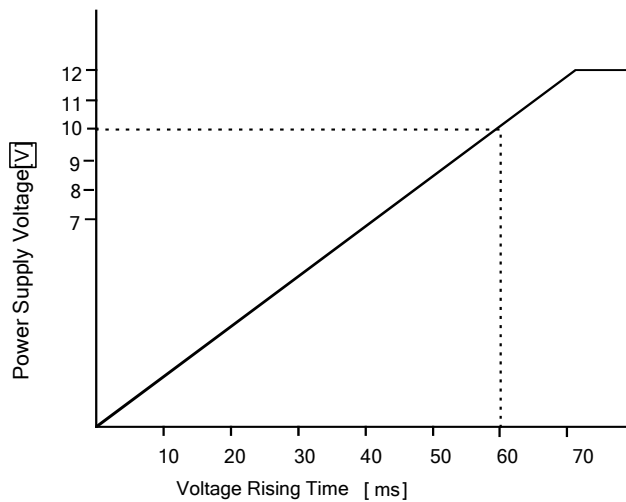
The camera must not be used for any nuclear equipments or aerospace equipments with which mechanical failure or malfunction could result in serious bodily injury or loss of human life. Our warranty does not apply to damages or defects caused by irregular and/or abnormal use of the product.

Please observe all warnings and cautions stated below.

Our warranty does not apply to damages or malfunctions caused by neglecting these precautions.

- Do not use or store the camera in the following extreme conditions:
 - Extremely dusty or humid places.
 - Extremely hot or cold places (operating temperature -5°C to $+40^{\circ}\text{C}$)
 - Close to generators of powerful electromagnetic radiation such as radio or TV transmitters.
 - Places subject to fluorescent light reflections.
 - Places subject to unstable (flickering, etc.) lighting conditions.
 - Places subject to strong vibration.
- Do not apply excessive force or static electricity that could damage the camera.
- Do not shoot direct images that are extremely bright (e.g., light source, sun, etc.), and when camera is not in use, put the lens cap on.
- Follow the instructions in Chapter 6, "External connector pin assignment" for connecting the camera. Improper connection may cause damages not only to the camera but also to the connected devices.
- Confirm the mutual ground potential carefully and then connect the camera to monitors or computers. AC leaks from the connected devices may cause damages or destroy the camera.
- Do not apply excessive voltage.(Use only the specified voltage.) Unstable or improper power supply voltage may cause damages or malfunction of the camera.
- The voltage ripple of camera power DC $+12\text{V} \pm 10\%$ shall be within $\pm 50\text{mV}$. Improper power supply voltage may cause noises on the video signals.

- The rising time of camera power supply voltage shall be less than +10V, Max 60ms. Please avoid noises like chattering when rising.



In case of abnormal operation, contact the distributor from whom you purchased the product.

3. Product Outline

VCC-G60U21GE is a Gigabit Ethernet interfaced, high-resolution industrial black and white video camera module utilizing a 1/1.8 type PS IT CCD. 2M pixels CCD image sensor with on-chip micro-lenses realizes high sensitivity and high resolution. At Full Frame Scan Mode, entire pixels can be read out within approx. 1/30s.

Features

- High speed communication, maximum 108MB/s. (Comform to 1000BASE-T)
- The maximum transmission distance is approx. 100m with cable more than CAT5e.
- Camera settings can be set via LAN.
- Software trigger input via LAN or hardware trigger input via 12pin connector at rear is selectable.
- Shutter speed can be set from 1/30sec ~ 1/54,000sec by 1H.
- At partial scan mode, both capturing start position and capturing width can be set by 3H.

Bundled Items

- Camera
- iPORT Software Development Kit 2.4.1 build 921. ※
- Gig-E Camera Control Software (CamCtlSetup.exe). ※
- Start up manual ※
- ※ Please ask for the details or download it from our web.

4. Specification

4.1. General Specification

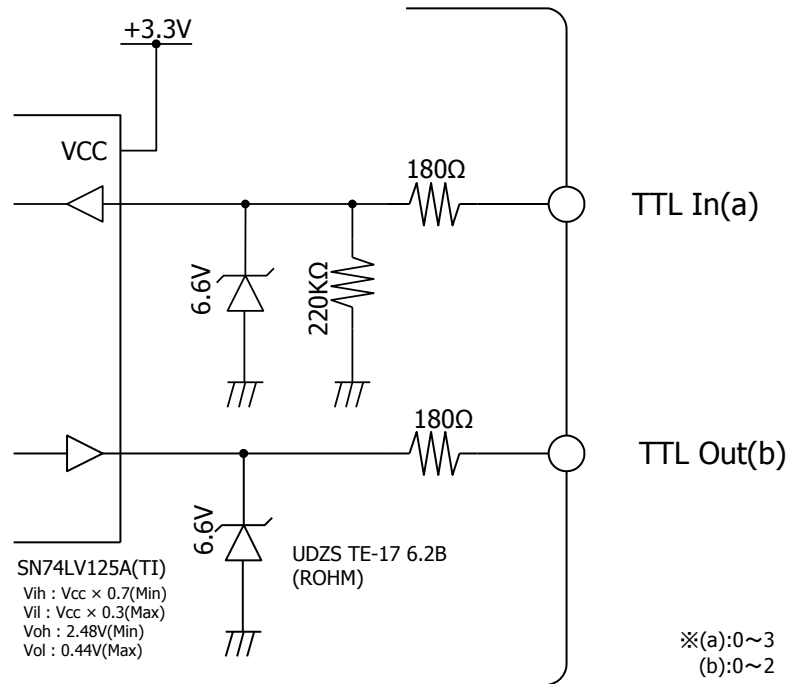
| Item | Specification | |
|----------------------------------|---|--|
| Pickup device | Device Type | 1/1.8 type Interline Transfer B/W CCD, Sony ICX274AL |
| | Effective Pixel Number | 1628 (H) x 1236 (V) |
| | Unit Cell Size | 4.40 μ m (H) x 4.40 μ m (V) |
| | Chip Size | 8.50mm (H) x 6.80mm (V) |
| Videooutput frequency | Pixel Clock | 72 MHz |
| | Horizontal Frequency | 37.5000kHz Pixel Clock: 1920CLK |
| | Vertical Frequency | Full Frame Scan Mode: 1252lines, approx 29.952Hz |
| Sync. system | Internal Sync. System | |
| Video output standard | Gigabit Ethernet (Comform to 1000BASE-T) Trasferring speed: 108MB/s (max) | |
| Resolution | 1200 TV lines | |
| Resolving power | 8bit / 10bit | |
| Sensitivity | F 5.6 2000 lx (Shutter speed 1/30s, Gain 0dB) | |
| Minimum illumination | F 1.4 2.0 lx (Shutter speed 1/30s, Gain Max +12dB) | |
| Dust or stains in optical system | No dust or stain shall be detected on the testing screen with setting the camera aperture at F16. | |
| Power requirements | DC +12V \pm 10% (Max voltage not to exceed +15V) | |
| Power consumption | 5.5 W (At DC +12V IN, normal mode, full frame scan mode or partial scan mode.) | |
| Dimension | Refer to overall dimension drawing (Clause 12) 55mm x 55mm x 60mm (excluding projection) | |
| Mass | Approx. 190 g | |
| Lens mount | C mount (Refer to overall dimension drawing) | |
| Optical axis accuracy | Refer to drawing for CCD Optical Axis Accuracy (Clause 11) | |
| Gain variable range | 0~12dB | |
| Shutter speed variable range | 1/30s (Off) ~1/54000s | |
| Trigger shutter mode | • Standard Trigger Mode • Pulse Width Trigger Mode • Internal Trigger Mode | |

| Item | Specification | | |
|--------------------------|---|--|-----------------------------|
| Safety/Quality standards | UL: Conform to UL Standard including materials and others. RoHS: Conform to RoHS CE: EN 55022:2006 (Class A) for Emission EN 61000-6-2:2005 for Immunity FCC: TBD | | |
| Durability | Vibration | Acceleration | 98 m/s ² (10.0G) |
| | | Frequency | 20~200 Hz |
| | | Direction | XYZ 3 directions |
| | | Testing time | 120 min for each direction |
| | Shock | No malfunction shall be occurred with 980m/s ² (100G) for ±X, ±Y, and ±Z, 6 directions. (without package) | |
| Operation environment | Temperature | Performance guaranteed temperature: 0°C~+40°C Camera operation guaranteed temperature: -5°C~+45°C ※ All the specifications specified in this manual is guaranteed under performance guaranteed temperature. ※All the camera functions operate normally under operation guaranteed temperature | |
| | Humidity | RH 20~80% with no condensation | |
| Storage environment | Temperature | -25°C ~ +60°C | |
| | Humidity | RH 20~80% with no condensation | |
| Recommended System | LAN Card | Intel PRO/1000 series | |
| | LAN Cable | MOD-YSP-A1AS-SP series (Honda Tsushin Kogyo) | |
| | | MV series (CEI) | |
| | OS | Windows XP, Windows VISTA | |
| Memory | Over 512 MB (over 1GB recommended) | | |

4.2. Camera Output Signal Specification

| Item | | Specification | |
|---------------------|------------------------|-------------------------------------|---|
| Video output data | Video out | 1642 (H) x 1224 (V) | At Full Frame Scan Mode |
| Sync. Signal I/O | LVAL output | LVTTL (3.3V Output) | HR10-10R-12PA ※ Output pin assignment is set via iPort SDK. Please refer to our VCC-G60/F60 GE series startup manual, section 5.7. Trigger Mode. |
| | FVAL output | LVTTL (3.3V Output) | |
| | DVAL output | LVTTL (3.3V Output) | |
| | SP (Exposure Signal) | LVTTL (3.3V Output) | |
| Trigger input | Polarity | POSI/NEGA Selectable | |
| | Trigger Pulse width | Min. over 2 HD ~ Max. under 2504 HD | |
| | Hardware Trigger input | LVTTL (5.0V Tolerant) | HR10-10R-12PA |
| | Software Trigger input | RJ-45 | |
| Video output signal | White Clip Level | Digital 8bit | : FFh |
| | Setup Level | Digital 8bit | : 08h |
| | Dark Shading | Digital 8bit | : Under 08h for both horizontal and vertical (Conditions: Gain 0dB) |

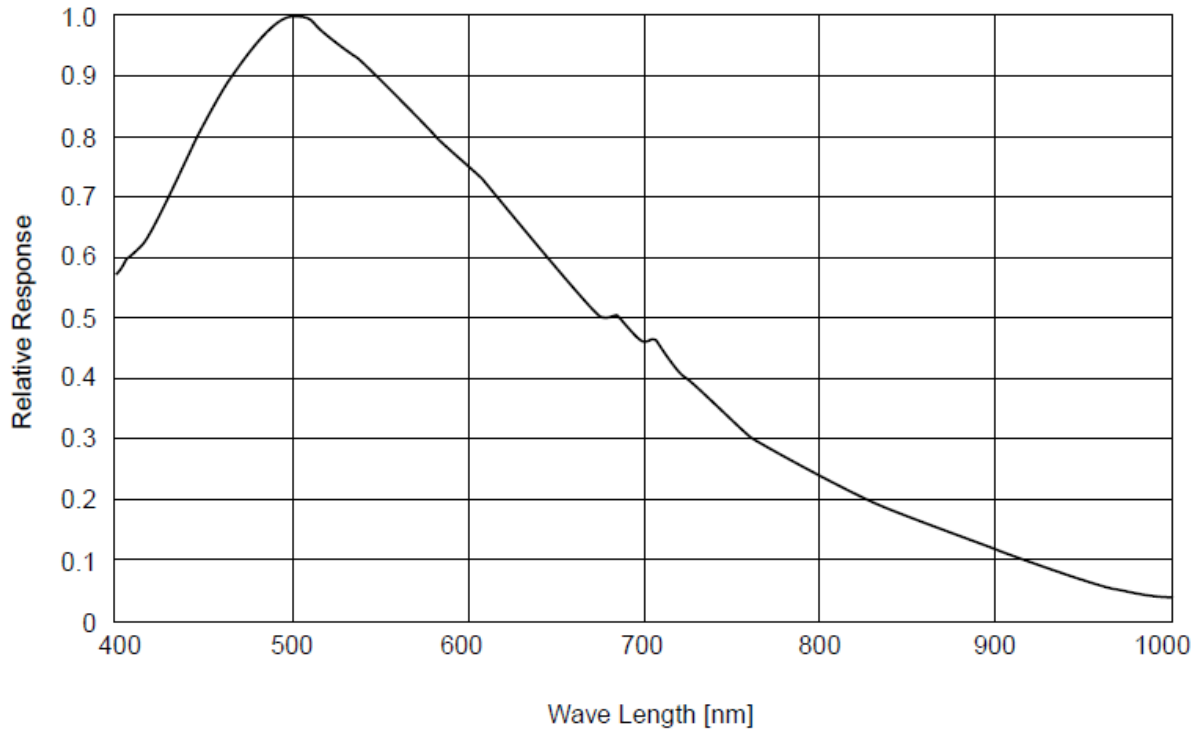
※ 5 seconds shall be waited after turning on power to get proper camera operation.



12 pins circular connector at rear GPIO interface

4.3. CCD Spectral Response (Representative Value)

※ Lens characteristics and luminous source characteristics are not considered.



4.4. Image output format (Coyote Application Setting)

- 1-Tap, Grayscale
- Area of interest Width : 1624 Height : 1224 Offset X : 0 Offset Y : 19

5. Function Settings

Camera functions can be set with serial communications.

| Function | Address | Data |
|------------------------|---------|--|
| Gain | 001 | 0: 0 dB: Analog Fixed Gain |
| | | 1: +3 dB: Analog Fixed Gain |
| | | 2: +6 dB: Analog Fixed Gain |
| | | 3: +12 dB: Analog Gain (+6dB) + Digital Gain (+6dB) |
| | | 4: Manual Gain (Refer to Address 005 and 006) |
| E-Shutter | 002 | 0: 1/30s(Off) |
| | | 1: 1/30s |
| | | 2: 1/60s |
| | | 3: 1/90s |
| | | 4: 1/120s |
| | | 5: 1/150s |
| | | 6: 1/200s |
| | | 7: 1/250s |
| | | 8: 1/500s |
| | | 9: 1/750s |
| | | 10: 1/1000s |
| | | 11: 1/1500s |
| | | 12: 1/2500s |
| | | 13: 1/5000s |
| | | 14: 1/10000s |
| | | 15: 1/54000s |
| | | 16: Manual Shutter (Refer to Address 009 & 010) |
| Trigger Mode | 004 | 0: Normal Mode (Trigger Mode Off) |
| | | 1: Standard Trigger Mode (Shutter speed can be set with address 002.) |
| | | 2: Pulse Width Trigger Mode (Shutter speed can be set with trigger pulse width.) |
| | | 3: Internal Trigger Mode (Generates trigger signals in the camera.) ※Trigger Cycle: Address 240, 241, 242, 243, 244, and 245. Start/Stop: Address 246 |
| Manual Analog Gain | 005&006 | 0~512: 0: 0dB~512: over +12dB (Log Linear) ※ With 10 bit data, 2LSB is invalid. ※ Set the address 001 data to 004. |
| Manual Shutter Control | 009&010 | 0~1251: 1/30s (Off)~1/54000s ※ Set the address 002 data to 016. Address 009 MSB and address 010 LSB makes total 16 bit. Shutter speed = (1251-(009&010)) x 26.27 μs + 18.53 μs Max data = 1251 |
| Trigger Polarity | 011 | 0: Positive Input |
| | | 1: Negative Input |
| Output Data Select | 013 | 0: 8bit Output Data |
| | | 1: 10bit Output Data |

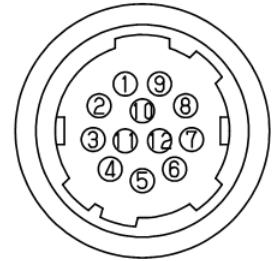
| Function | Address | Data |
|-----------------------------|---------|---|
| Gamma Mode | 014 | 0: Gamma Off (1.0) |
| | | 1: Gamma On (Option) |
| Partial Scan Mode | 015 | 0: Full Frame Scan Mode |
| | | 1: Partial Scan Mode |
| Partial Scan Start Position | 016&017 | 0~407: Set the address 015 data to 001. Address 016 MSB and address 017 LSB makes total 16 bit. Start Position: 3 H/step Min Data: 0 (0H)/Max Data : 407 (1221 H) Start Position (016&017)+ Effective Line (019&020) <= 407 |
| Partial Scan Effective Line | 019&020 | 0~407: Set the address 015 data to 001. Address 019 MSB and address 020 LSB makes total 16 bit. Effective Line: 3 H/step Min Data: 0 (3 H)/Max Data : 407 (1224 H) Start Position (016&017)+ Effective Line (019&020) <= 407 |
| Partial Scan Total Line | 021&022 | 0~1251: Read Only Total line number at Partial Scan Mode or Full Frame Scan Mode minus 1 is set |
| Internal Trigger Period 1 | 240~242 | Trigger Period 1 = (Address 240 「MSB」 - 241 - 242 「LSB」 +1) x t t. = (1920/72M) x 19 = 506.667 μ s (240, 241, and 242) :1 (Min) ~ 131071 (Max) |
| Internal Trigger Period 2 | 243~245 | Trigger Period 2 = (Address 243 「MSB」 - 244 - 245 「LSB」 +1) x t t. = (1920/72M) x 19 = 506.667 μ s (243, 244, and 245) :1 (Min) ~ 131071 (Max) |
| Internal Trigger Start/Stop | 246 | 0: Internal Trigger Start |
| | | 1: Internal Trigger Stop |
| | | ※Please set the data of address 004 to be 003. |
| Data Save | 255 | Input 083 or 053 to save the data in EEPROM. |

Note: When setting the data with 2 Byte, High Byte shall be set first, then Low Byte to the next.
The camera rewrites the internal register when receiving Low Byte.

6. External Connector Pin Assignment

6.1. 12 pins Circular Connector HR10-10R-12PA (HIROSE)

| Pin No. | | Signals which can be controlled by GigE Camera Control Software |
|---------|--------------------------------------|---|
| 1 | GND | |
| 2 | Power In DC +12V | |
| 3 | TTL In3 (LVTTL Input 5V Tolerant) | Trigger Input |
| 4 | TTL Out2 (LVTTL 3.3V Output) | LVAL, FVAL, DVAL ,SP(Exposure) Output |
| 5 | GND | |
| 6 | TTL In2 (LVTTL input 5V Tolerant) | Trigger Input |
| 7 | TTL Out1 (LVTTL 3.3V Output) | LVAL, FVAL, DVAL ,SP(Exposure) Output |
| 8 | TTL In1 (LVTTL input 5V Tolerant) | Trigger Input |
| 9 | TTL Out0 (LVTTL 3.3V Output) | LVAL, FVAL, DVAL ,SP(Exposure) Output |
| 10 | TTL In0 (LVTTL Input 5V Tolerant) | Trigger Input |
| 11 | NC | |
| 12 | NC | |



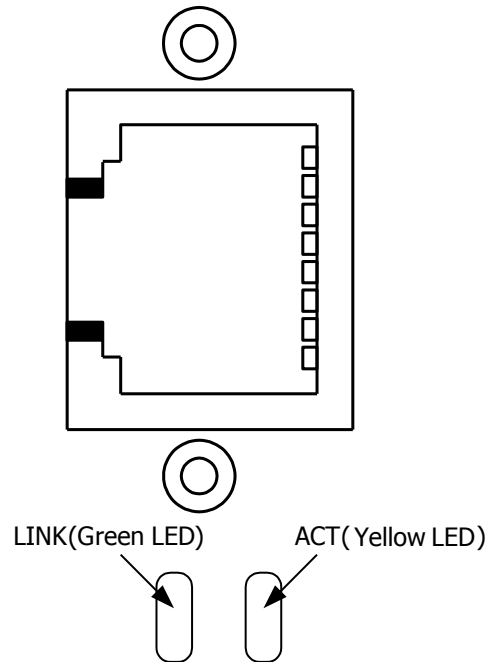
TTL In(a) a:0~3 . . . Trigger Input etc.

TTL Out(b) b:0~2 . . . LVAL, FVAL, DVAL, SP, Pulse Generator etc.

※ Pin assignment and functions can be set arbitrarily via iPORT software.

Please refer to iPORT.Software.Coyote.pdf in ¥ Program Files ¥ Pleora Technologies Inc ¥ iPORT Software ¥ Documentation.

6.2. RJ-45 Gigabit Ethernet Connector MOD-YSJ88DA03C-CN+ (HONDA TSUSHIN KOGYO CO., LTD)

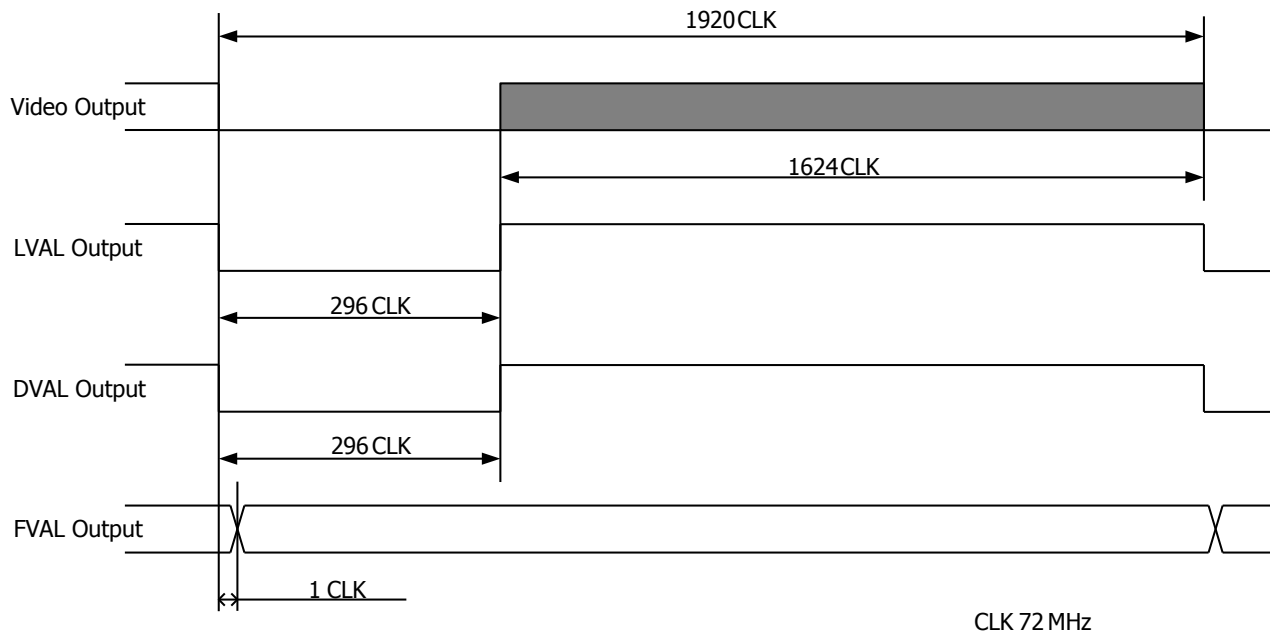


LINK LED: Lighting-off . . . Unconnected to LAN
 Lighting-on . . . Connected to LAN
 Blinking . . . Transmitting the data

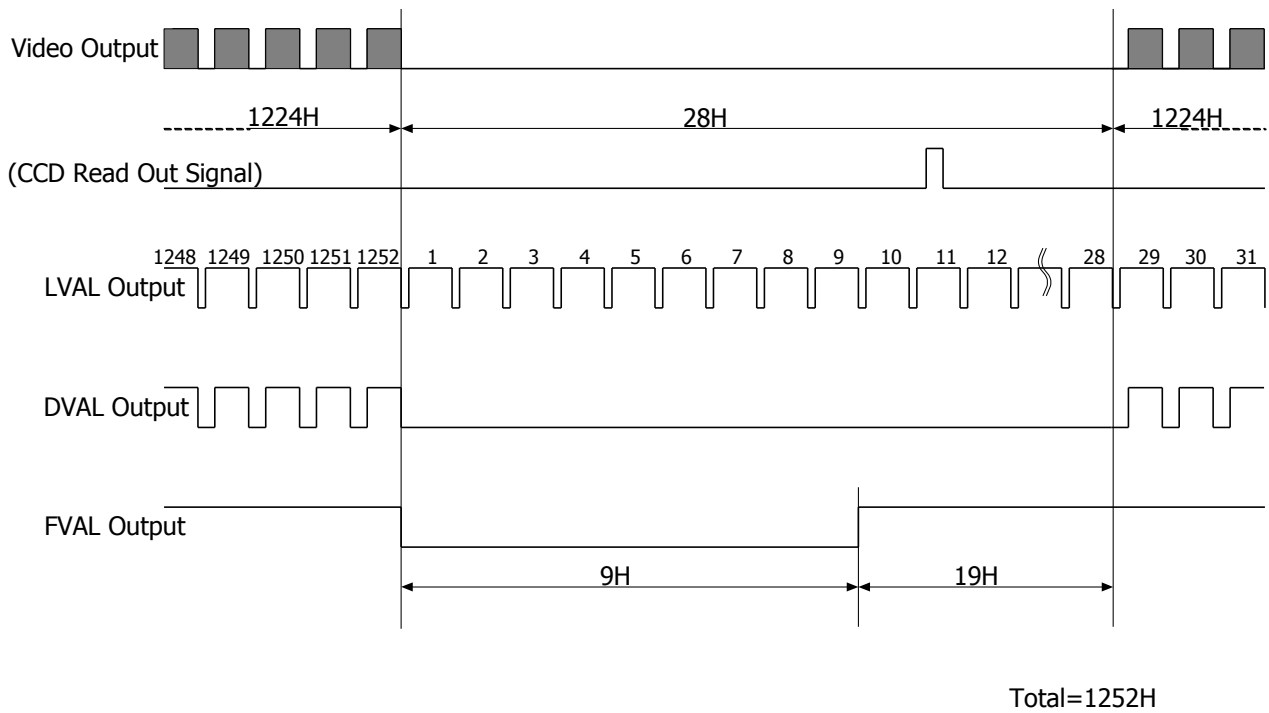
ACT LED: Lighting-off . . . Unconnected or connected with 10Mbps/100Mbps
 Lighting-on . . . Connected with 1000Mbps

7. Timing Chart

7.1. Horizontal Synchronous Signals Timing



7.2. Full Frame Scan Mode Timing

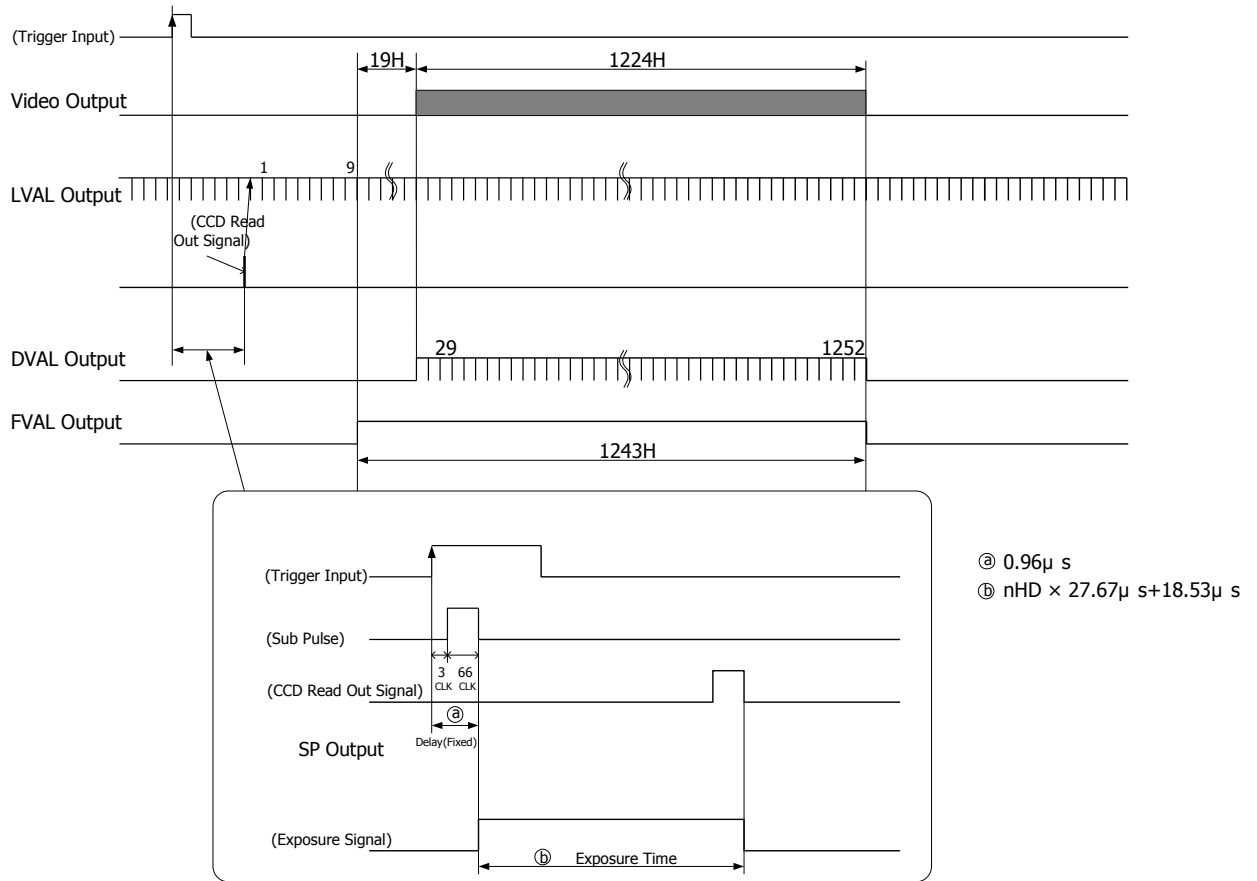


7.3. Standard Trigger Mode Timing

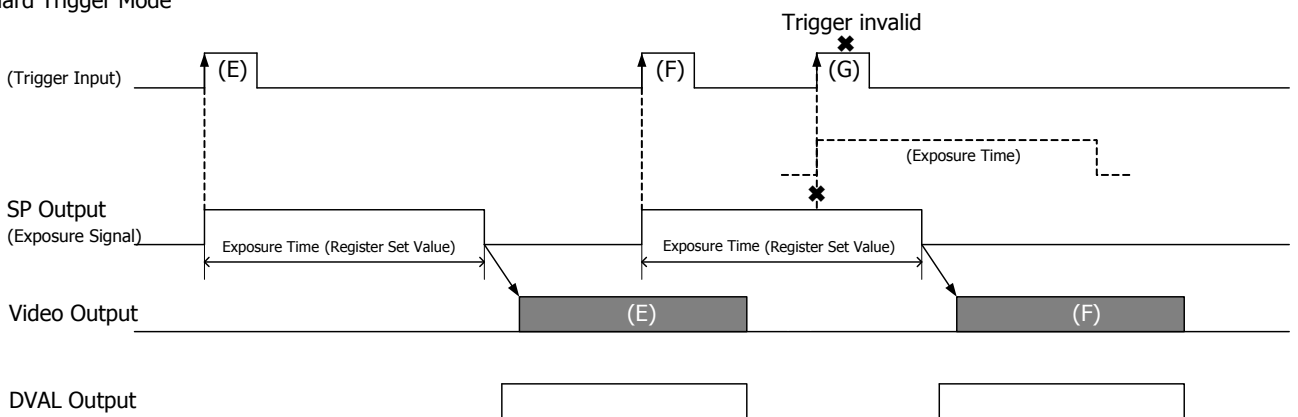
- Trigger operation is CLK sync, V-Sync Reset.

Delay time, from detecting the trigger edge to starting exposure, is $0.96 \mu s$.

- Trigger input can be accepted even when the camera is outputting video signals. However, a shutter timing, to start the next video output before completion of transferring video output for the prior signals, can not be worked. To input trigger signals when the camera is outputting video signals for the prior signals, it shall be synchronized with the down edge of camera LVAL output.
- Trigger input during the execution of exposure (exposure time) shall be ignored. (Refer to the "G" below.)



Standard Trigger Mode

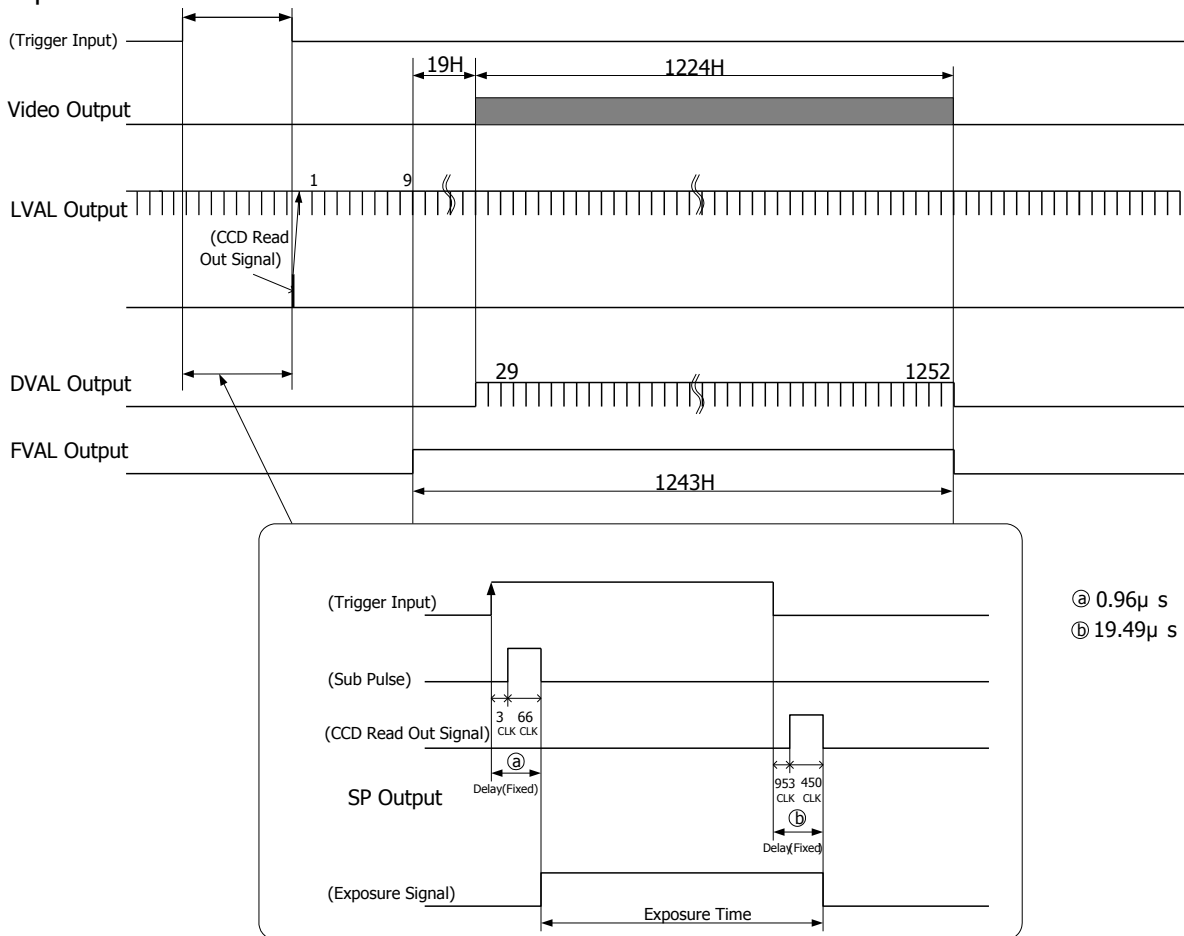


7.4. Pulse Width Trigger Timing

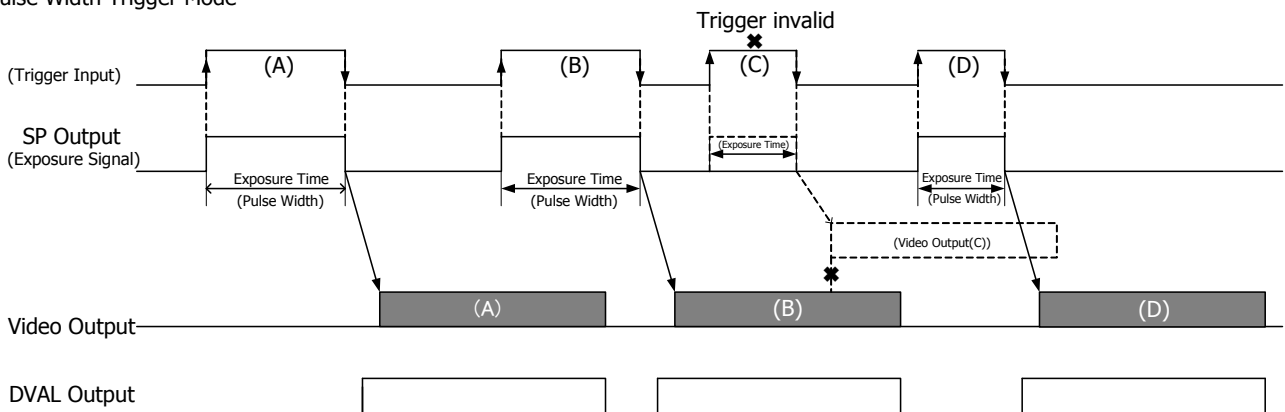
- Trigger operation is CLK sync, V-Sync Reset.

Delay time, from detecting the trigger edge to starting exposure, is $0.96 \mu s$. Delay time, from detecting the trigger edge to completion of exposure, is $19.46 \mu s$.

- Trigger input can be accepted even when the camera is outputting video signals. However, a shutter timing, to start the next video output before completion of transferring video output for the prior signals, can not be worked. Please refer to the "C" below. To input trigger signals when the camera is outputting video signals for the prior signals, it shall be synchronized with the down edge of camera LVAL output.

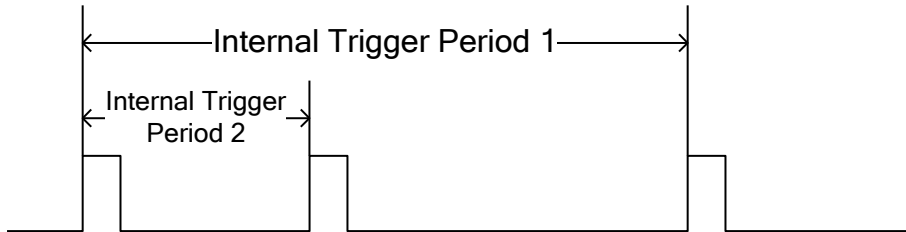


Pulse Width Trigger Mode



7.5. Internal Trigger Timing

- With this mode, trigger signals can be generated in the camera.
Trigger cycle can be changed by the register settings.



Internal Trigger Cycle 1=(Address240[MSB] · 241 · 242[LSB]+1)×t
 Internal Trigger Cycle 2=(Address243[MSB] · 244 · 245[LSB]+1)×t

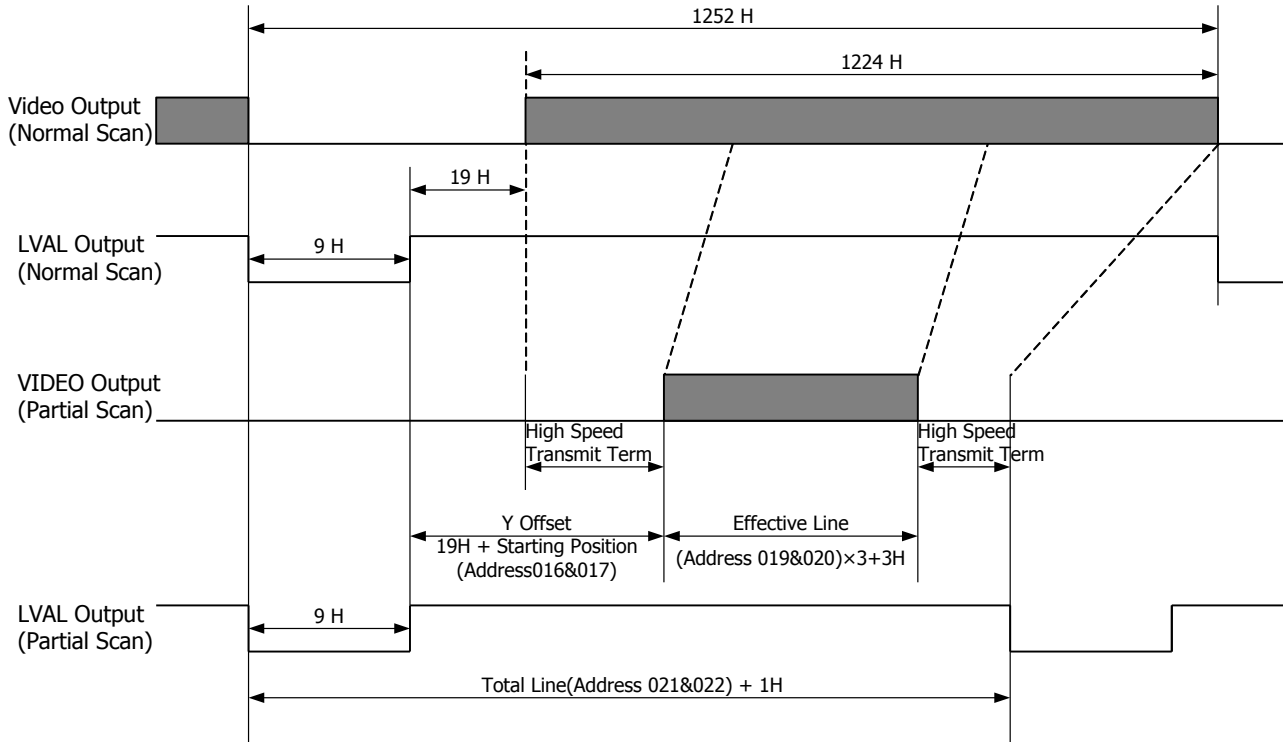
t=(1920/72M)×19=506.667µs
 (240&241&242, 243&244&245):1(Min)~131071(Max)

Internal Trigger Mode Address: 004 Data: 003
 Internal Trigger Start/Stop Address: 246 Data: 000 Stop
 001 Start

- Trigger Period 1 > Trigger Period 2 (conditions to be met)
- Internal Trigger Period settings shall be set when it is under Stop conditions (Address: 246 Data: 000).
If internal trigger period are set under Start conditions, trigger cycle right after changing the settings may not be reflected properly.
- Frame rate of VCC-G60U21GE is 30fps (33.333ms). Internal Trigger Period, longer than 33.333ms, should be set.

8. Partial Scan Mode Details

Capturing start position and capturing width can be set by 3H via LAN.



Reading out position register (Address 016 & 017): 0(0H) ~ 407(1221H) 3H/step
 Effective line register (Address 019 & 020): 0(3H) ~ 407(1224H) 3H/step
 Total line register (Address 021 & 022): 435H + (Effective line register × 2) + 2 (Read Only)

Note: Reading out position and effective line shall meet the following condition.

Reading out position register + Effective line register = < 407

Otherwise, the value, **407 – reading out position register**, will be set to the effective line register.

<Example 1> Conditions: Reading out position register (Address 016 & 017) = 000

| Effective Line Register (Address 019&020) | Effective Lines | Total Line Register + 1H | Frame Rates |
|--|-----------------|-----------------------------|-------------|
| 0 | 3 H | 438 H | 86 fps |
| . | . | . | . |
| 159 | 480 H | 756 H | 50 fps |
| . | . | . | . |
| 255 | 768 H | 948 H | 40 fps |
| . | . | . | . |
| 341 | 1026 H | 1120 H | 33 fps |
| . | . | . | . |
| 407 | 1224 | 1252 H | 30 fps |

9. Remote Interface Function

Through LAN, the camera can be controlled.

(1) The settings for RS-232C

Baud rate : 9600bps
 Data : 8bit
 Stop bit : 1bit
 Parity : None
 XOn/XOff : Not controlled

(2) Control code

- The total control code is 14 bits, which conforms to ASCII code.
- The control code consists of camera No. process code, remote controller address, remote controller data, and CR. Execute Read/Write through PC, and the camera will reply the data.

| 1 | 2 | 3 | 4 | 5 | 6 | 7th Byte | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---------------|---|---|---|---|---|-----------------|--|---|----|------------------------|----|----|------|
| Camera No. | | | | | | Process code | Remote controller address | | | Remote controller data | | | CR |
| 000000: fixed | | | | | | "R" Read mode | Please refer to the address table of Section 5. Function Settings. | | | 000~255 | | | 0 Dh |
| | | | | | | "W" Write mode | | | | | | | |
| | | | | | | "C" Camera mode | | | | | | | |

Camera No. is fixed with 6 bite numerical strings, "000000".

Process code

Input any one of R, W, or C to the process code.

R (read mode) is to read the data of remote controller address.

Please be noted to set any dummy data (000~255) to 11th ~13th, since a command shall consists of 14 bytes.

W (write mode) is to write the data to the remote controller address.

Please be noted that the data cannot be saved into EEPROM of the camera.

(Reboot the camera, and the data is reset to the initial setting.)

To save the data into EEPROM, please refer to Section 5. Function Settings.

C is the code to send the data back from the camera.

Note: Do not set code C when sending the data from PC side.

Remote controller address

Note: Do not write the data into the address other than specified, since it may cause the damages or malfunction of the camera.

Remote controller data

Set the decimal number (000~255) for the remote controller data. Please be noted to set any dummy data at read control mode.

CR

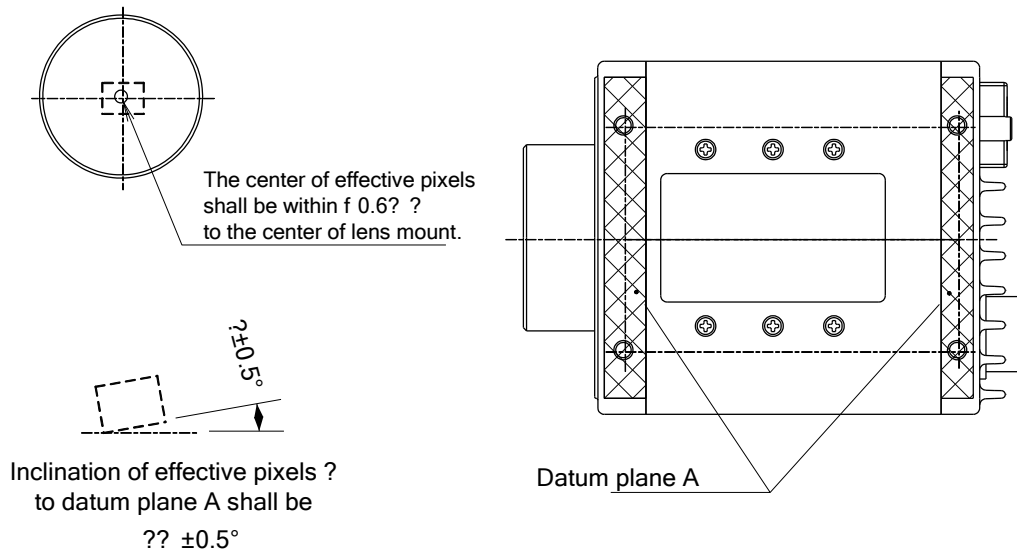
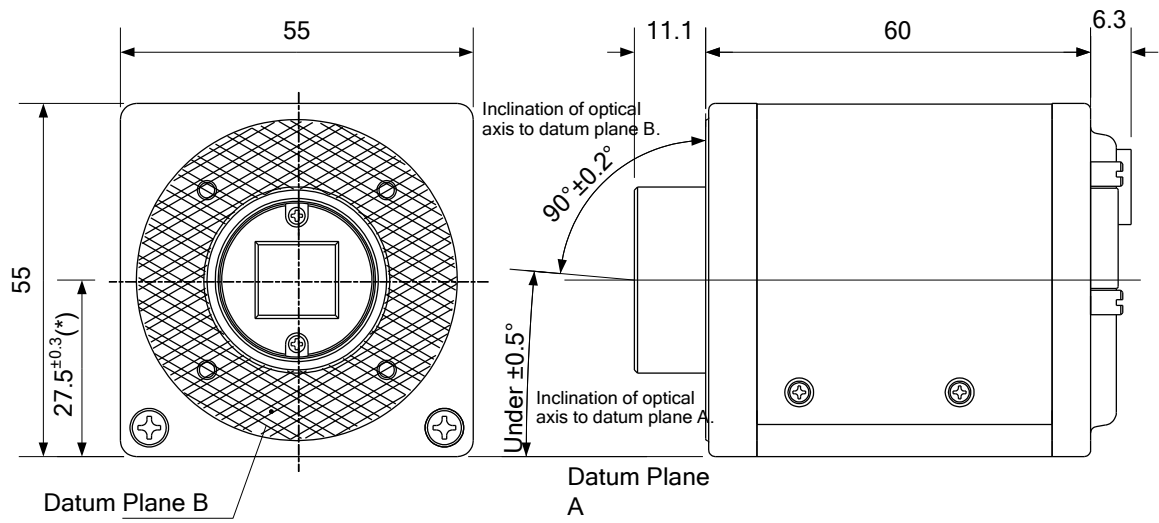
Be sure to input "CR" to confirm the end of the command.

※ Note: When setting the data with 2 Byte, High Byte shall be set first, then Low Byte to the next. The camera rewrites the internal register when receiving Low Byte.

10. Initial Settings

| Function | Address | Data |
|--------------------------|-----------|-----------------------------------|
| Gain | 001 | 0: 0dB |
| E-Shutter | 002 | 0: 1/30s (Off) |
| Trigger Mode | 004 | 0: Normal Mode (Trigger Mode Off) |
| Trigger Polarity | 011 | 0: Positive Input |
| Output Data Select | 013 | 0: 8 bit Output Data |
| Partial Scan Mode | 015 | 0: Full Frame Scan Mode |
| Partial Scan Total Lines | 021 & 022 | 1251: Read Only |

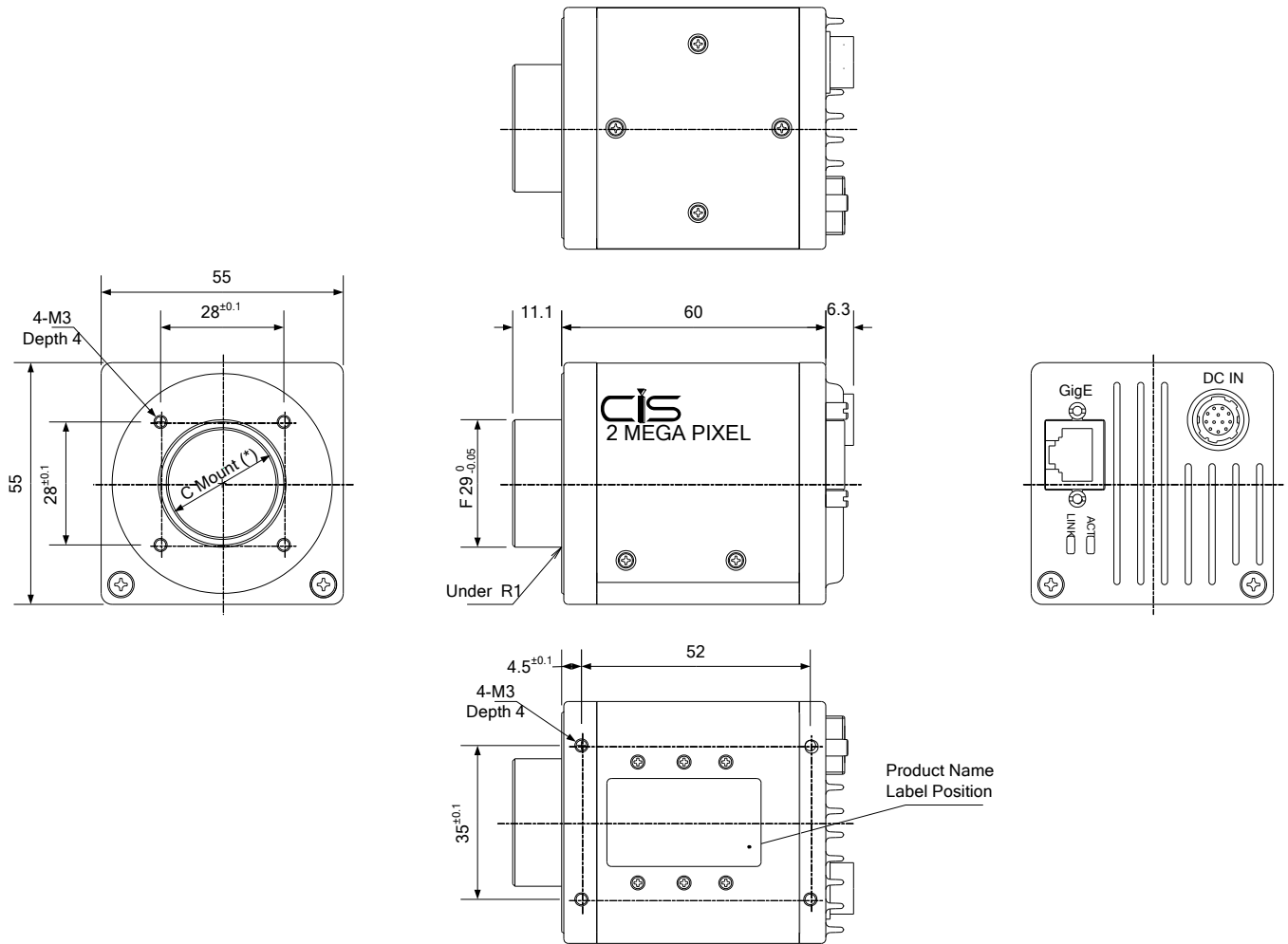
11. CCD Optical Axis Accuracy



*)Dimensions from datum plane A to the center of lens mount.

910-003-00-00
(Unit:mm)

12. Dimensions

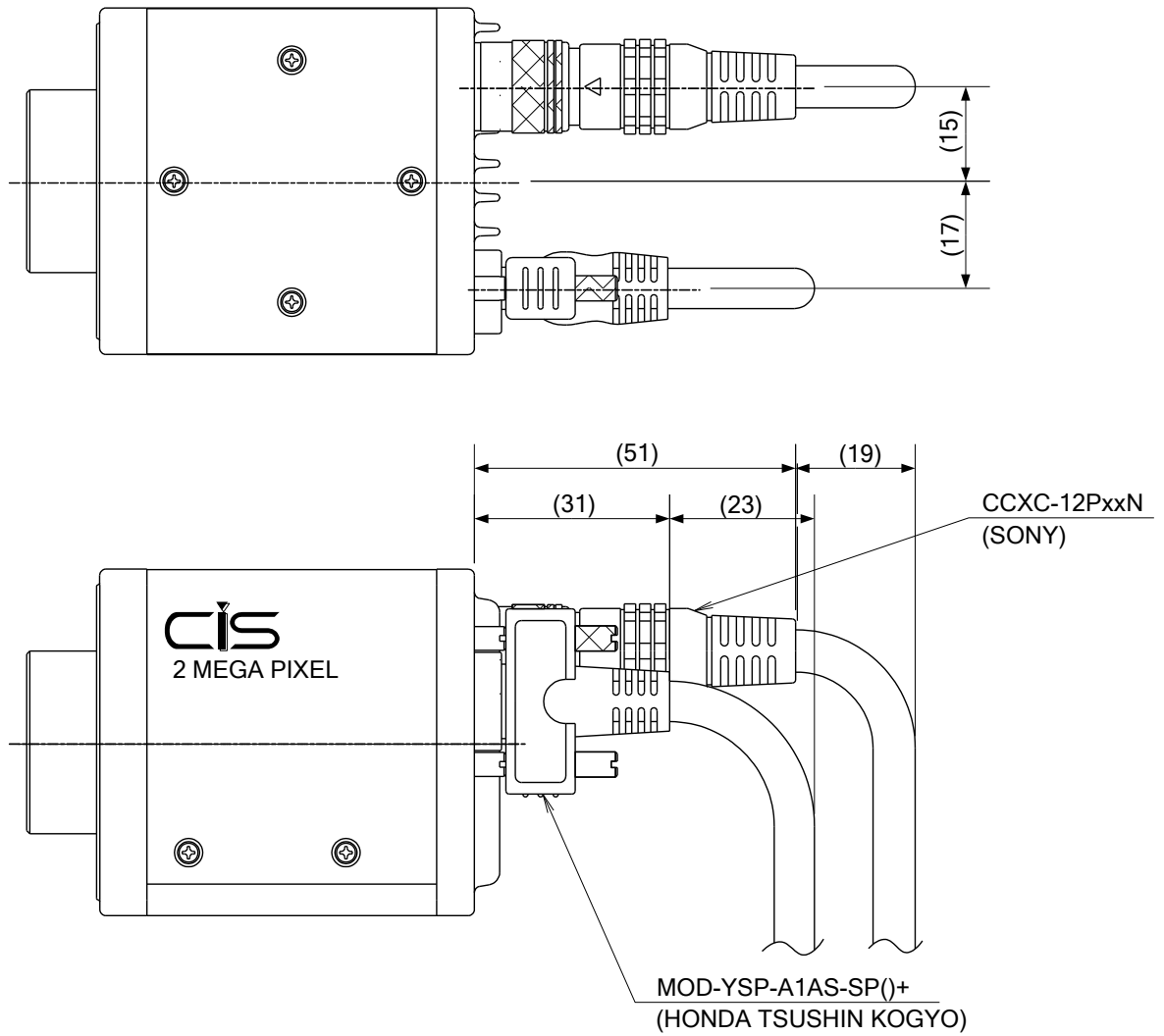


*1) C Mount screws comply with ANSI/ASME B1.1, 1-32UN(2B).

*2) Screw length from C mount lens surface shall be under 6mm. And protruding portion shall be less than 10mm.

999-513-00-00(1/2)

(Unit:mm)



Cable Reference Drawing

999-513-00-00(2/2)

(Unit:mm)

13. Cases for Indemnity (Limited Warranty)

We shall be exempted from taking responsibility and held harmless for damage or losses incurred by the user in the following cases.

- ✧ In case damage or losses are caused by fire, earthquake, or other acts of God, acts by third party, deliberate or accidental misuse by the user, or use under extreme operating conditions.
- ✧ In case indirect, additional, consequential damages (loss of business interests, suspension of business activities) are incurred as result of malfunction or non-function of the equipment, we shall be exempted from responsibility for such damages.
- ✧ In case damage or losses are caused by failure to observe the information contained in the instructions in this product specification & operation manual.
- ✧ In case damage or losses are caused by use contrary to the instructions in this product specification & operation manual.
- ✧ In case damage or losses are caused by malfunction or other problems resulting from use of equipment or software that is not specified.
- ✧ In case damage or losses are caused by repair or modification conducted by the customer or any unauthorized third party (such as an unauthorized service representative).
- ✧ Expenses we bear on this product shall be limited to the individual price of the product.

14. CCD Pixel Defect

CIS compensates the noticeable CCD pixel defects found at the shipping inspection prior to our shipment. After our delivery however, CCD pixel defects might be noted with time of usage of the products.

Cause of the CCD pixel defects is the characteristic phenomenon of CCD itself and CIS is exempted from taking any responsibilities for them.

Should you have any questions on CCD pixel defects compensation, please contact us.

15. Product Support

When defects or malfunction of our products occur, and if you would like us to investigate on the cause and repair, please contact your distributors you purchased from to consult and coordinate.