User's Manual

Line Scan Camera

Type : RCDL4K8GE

NIPPON ELECTRO-SENSORY DEVICES CORPORATION

GigE Vision is a registered trademark of AIA

For Customers in the U.S.A.

This equipment has been tested and found to comply with the limits for a Class A digital device, in accordance with Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his or her own expense.

For Customers in the EU

This equipment has been tested and found to comply with the essential requirements of the EMC Directive 2004/108/EC, based on the following specifications applied:
EU Harmonised Standards
EN55032:2015 Class A
EN55032:2012 Class A
EN55011:2009+A1:2010 Class A
EN61000-6-2:2005

Directive on Waste Electrical and Electronic Equipment (WEEE)
Please return all End of Life NED products to the distributor from whom the product was purchased for adequate recycling and / or disposal. All costs of returning the Product to NED are borne by the shipper.

Introduction

Thank you for purchasing NED's Line Scan Camera. We look forward to your continued custom in the future.

For safety use

◆ For your protection, please read these safety instructions completely before operating the product and keep this manual for future reference.

◆ The following symbols appear next to important information regarding safe product handling.

⚠ Warning	If the product is not handled properly, this may result in serious injury or possible death.
⚠ Caution	If the product is not handled properly, this may result in physical injury or cause property damage.

Safety precaution

⚠ Warning

◆ Never disassemble or modify this product, unless otherwise specified to do so in this manual.

◆ When hands are wet, avoid handling this product and do not touch any of the connection cable pins or other metallic components.

◆ Do not operate this product in an environment that is exposed to rain or other severe external elements, hazardous gases or chemicals.

◆ If the product is not to be used for an extended period of time, as a safety precaution, always unplug the connection cable from the camera unit.

◆ If the product installation or inspection must be executed in an overhead location, please take the necessary measures to prevent the camera unit and its components from accidentally falling to the ground.

◆ If smoke, an abnormal odor or strange noise is emitted from the camera unit, first turn OFF power, then unplug the cable from the camera unit.

◆ This product is not intended for use in a system configuration built for critical applications.

Instructions before use

◆ Only operate this product within the recommended environmental temperature range.

◆ Use only the specified power source and voltage rating.

◆ Do not drop this product. Avoid exposure to strong impact and vibrations.

◆ Install the camera unit in a well-ventilated environment, in order to prevent the camera from overheating.

◆ If the camera must be installed in an environment containing dust or other particles, take required measures to protect the camera unit from dust adhesion.

◆ Do not unplug the cable while power is being supplied to the camera unit. To prevent product damage, always shut down the power supply before unplugging the power cable.

◆ When the surface of the camera window becomes dirty due to dust or grime, black smudges appear in the displayed image. Use an air blower to remove the dust particles. Dip a cotton swab into ethanol alcohol and clean the camera window. Be careful not to scratch the glass.

◆ Use of non-infrared lighting such as a fluorescent lamp is recommended. If halogen lighting is employed, always install an infrared filter into your system configuration.

◆ Note that exposure to long wavelength light outside of the sensors visible optical range can affect the image.

◆ Sensitivity may fluctuate depending on the spectral response level of the light source. In cases like this, changing the light source to one with a different spectral response level may reduce this problem. Moreover, this irregular sensitivity can be completely lost by using 4.8 pixel correction function. Please refer to 4.8 pixel correction function for details.

◆ Note that when the sensor is exposed to excessive quantities of light, blooming may occur, because this product does not have a special Anti-Blooming function.

◆ Suitable measures should be taken to protect the colour filter on sensor from bright light when it is not in use.

   If the sensor is continually exposed to excessive amount of light over time, the colour filter may become faded.

◆ For stabilized image capturing, turn on the power supply and execute aging for ten to twenty minutes before actually using the camera unit.

◆ Do not share the power supply with motor units or other devices that generate noise interference.

◆ Do not disconnect the camera while rewriting the embedded memory.

◆ When you change the exposure mode that is set at the NED factory, input control signal (CC1) from the capture board.

◆ SG (Signal Ground) and FG (Frame Ground) are connected inside the camera. Please install your system such that a loop is not created by the GND potential difference.

Product Warranty

Warranty Period
◆ The product warranty period, as a general rule, is two years from purchase; however for detailed conditions please contact the sales representative for your region/country.
◆ However, in some cases due to the usage environment, usage conditions and/or frequency of use, this warranty period may not be applicable.

Warranty Scope
◆ Product repair will be performed on a Return To Manufacturer basis. On-site maintenance will incur additional charges.
◆ If defects in material or workmanship occur during the warranty period, the faulty part will be replaced or repaired by us free of charge. Return shipping charges must be paid by the sender. However, the following cases fall outside of the scope of this warranty:
◆ The expired date of the warranty period on the product repaired or replaced during the warranty period of the original product is the same as the expired date of the warranty period on the original product.

Exclusions from Warranty Coverage
◆ We will under no circumstances assume responsibility for the following cases: damage caused by fire, earthquake, other acts of a third party, other accidents, negligent or intentional misuse by the user, or other usage under extraordinary circumstances.
◆ Damages (e.g. loss of business profits, business interruption, etc.) resulting from use or non-use.
◆ Damages caused by use other than as described in this document.
◆ Damages resulting from malfunction due to a connected device.
◆ Damages resulting from repairs or modifications performed by the customer.

Fault Diagnosis
◆ As a general rule, in the first instance fault diagnosis should take the form of a telephone call or an email to enable us to assess the circumstances of the malfunction.
◆ However, depending on the customer's requests, we, or our agent, may require an additional fee for this service.

Exclusion of Liability for Compensation for Missed Opportunities

◆ Regardless of whether within the warranty period or not, our warranty does not cover compensation for missed opportunities for our customers, or our customers' customers, caused by a fault of our products, nor for damage to products other than our own, or related business.

Note about Product Usage

◆ This product has been designed and manufactured as a general-purpose product for general industry. In applications expected to be life-critical or safety-critical, the installer or user is requested to install double or triple failsafe systems.

Repair Service Outline

◆ The cost of dispatching engineers etc. for repair service is not included in the price of purchased and supplied goods. On request, arrangements can be made separately.

Scope of Repair Service

◆ The above assumes business dealings and usage to take place in the customer's region / country. In cases of business dealings and/or usage outside the customer's region/country, separate consultation is required.

Table of Contents

1 Product Outline

1.1 Features

- Color line scan camera with 7µm 4096 x 2 pixels sensor of Bayer color arrangement
- Easy control of gain / offset / video output with external software
- GigE Vision® external interface for easy connection between camera and PC
- Data transmission up to 100m using a CAT-5e cable or above
- Single power source DC12~15V for operation
- Pixel non-linearity / shading correcting function

1.2 Applications

- Inspection of transparent panels and PCBs
- Inspection of high speed moving objects
- Flat panel display inspection
- Inspection of glass and sheet-like objects
- Printed circuit board inspection
- This camera utilizes an Intelligent Transportation System
- Outdoor surveillance

An example of visual inspection of metallic parts is shown below.

■ Example using one camera.　　　　■ Example using three cameras.
　　(Inspection of surface)　　　　　　（Inspection of surface and end faces）

Line scan Camera

Object of inspection
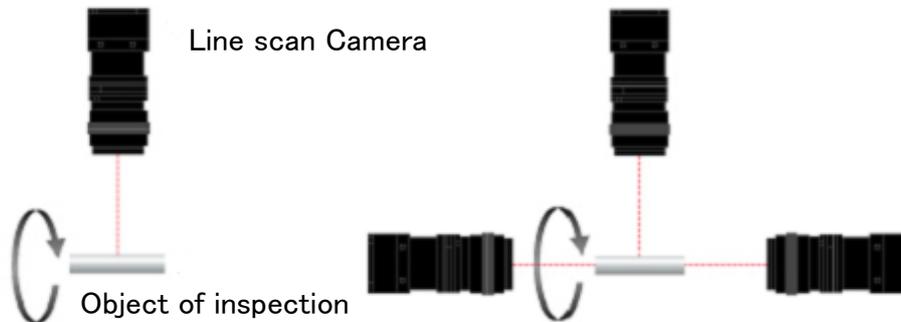
Figure 1-2-1　Visual Inspection of Metallic Cylinder

Object of inspection (example)

Metallic parts with cylindrical/conical shapes (surface and roller end faces)
・Automobile component　　・Architectural reinforcement parts
・Various pin parts

Typical detection item

・Chip　　・Dent　　・Scratch　　・Chipped end faces　　・External dimensions

Device specification

1. Camera: 4096 pixel Line scan camera
2. Controller: Dedicated software for PC system

1.3 Image Sensor

This camera has a Bayer array dual of 4096 pixels with a pixel size of 7 μm x 7 μm

A line color CMOS sensor is used to obtain high sensitivity and high quality images.

・The sensor array is as follows.
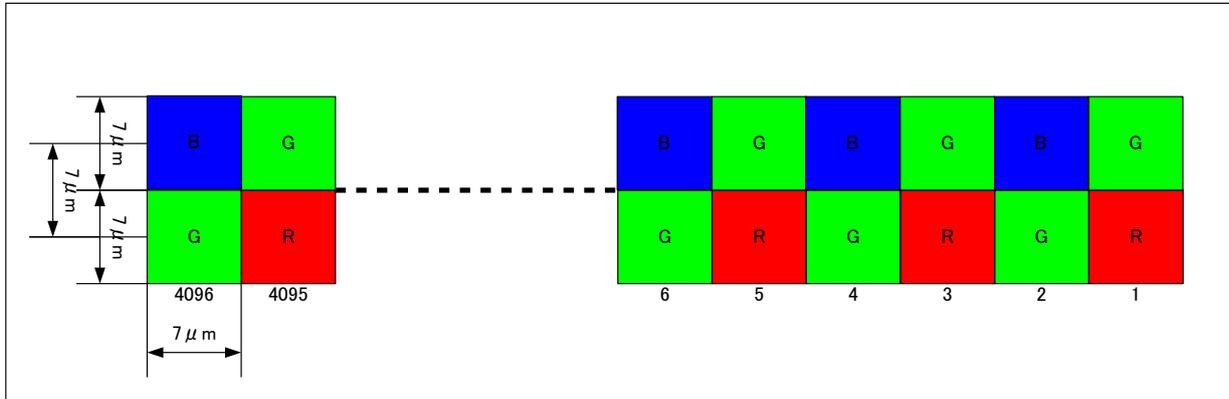
1.4 RGB Synthesis method with Bayer at pixel
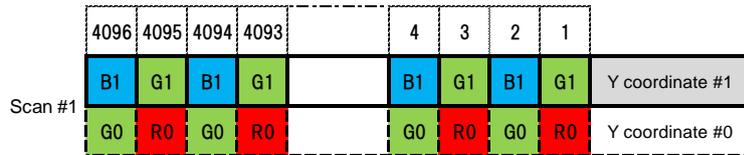
The object moves for one column of pixels and is scanned.

The object moves for next one column of pixels and is scanned.
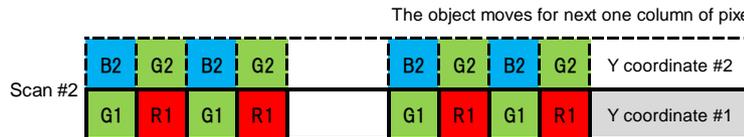
The scanned values of G1 and B1 of the upper column of pixels at Scan #1

and the scanned values of G1 and R1 of the lower column of pixels at Scan #2 are held in memory.
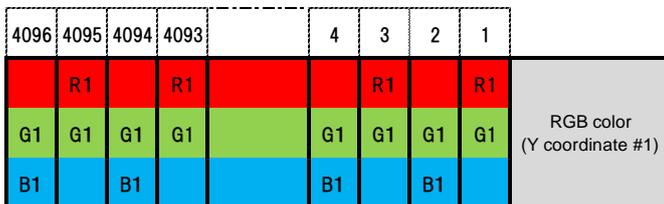
The values of R at even numbering pixels and B at odd numbering pixels are determined by interpolation.

RGB color values at each pixel can be synthesized using the above data.

1.5 Performance Specifications

The Performance Specifications are shown below. The data is shown when the camera is operating at the maximum scan rate, unless otherwise specified.

Table 1-5-1 Performance Specifications

Items		Specifications	
Number of Pixels		4096	
Pixel Size H x V (μm)		7 x 7	
Sensor Length (mm)		28.672	
Data Rate (MHz)		125	
Scan Rate [kHz]/ (μs)		RGB 8 Packed	8.4 / (119.0)
Responsivity (V/ [lx·s]) (typically) [Minimum Gain, Pixel Correction Initial Value]		40 Analog 5V Conversion Sensitivity/	
Gain Adjustable Range Analog Amplifier +Digital		Analog Amplifier : x 1 ～ x 10 Digital(ALL) : x 1 ～ x 2 Digital(R,G,B) : x 1 ～ x 3	
Digital Offset Adjustable Range (DN)		ALL : -40～40 R,G,B : -20～20	
Video output format		GigE	
Control Input		Line In1～3: Exposure trigger, Frame trigger or Encoder signal	
Connectors	Data/Controller	RJ45	
	Power Supply	Hirose: HR10G (6Pin)	
	External Trigger	Hirose: HR10G (12Pin)	
Lens Mount		F Mount	
Operating Temperature (˚C) No Condensation		0 ～ 50	
Power Supply Voltage (V)		DC12 ～ 15[±5%]	
Consumption Current (mA) ＊typically		610	
Size W x H x D (mm)		60x91.3x100 (F Mount)	
Mass (g) (Camera only)		475 (F Mount)	
Additional Functions		1. Auto White Balance 2. Shading Correction 3. Gain/Offset /Video Output Control 4. Programmable Exposure Control 5. Software Torigger 6. Test Pattern Output 7. Two-phase Trigger	

	8. 2 × 2 Binning Mode
	9. RGB Color Matrix Transforming
	10. Gamma Transforming

Remarks: 1）DN : Digital Number (8bit : 0 -255 / 10bit : 0 -1023)

2）Measurements were made at room temperature

The spectral Responsivity is shown below.

Quantum efficiency
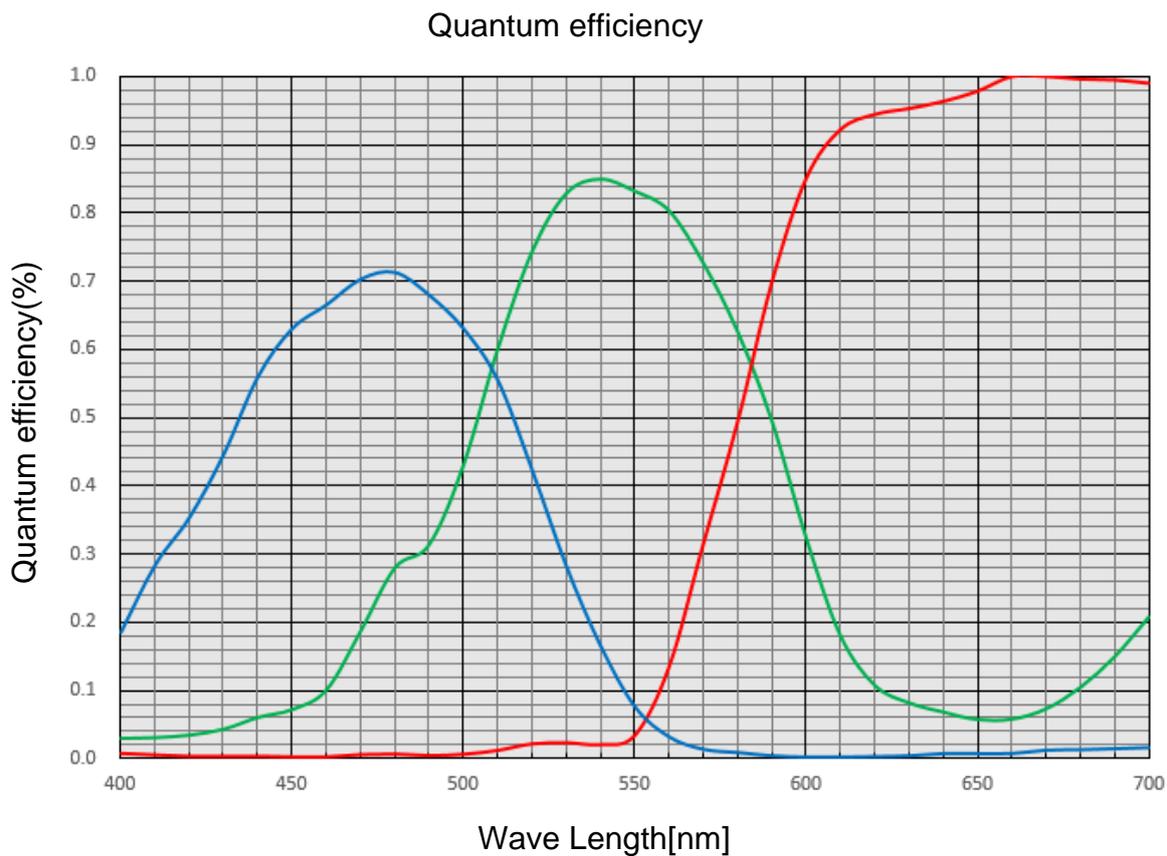
Figure 1-5-1 Spectral Responsivity

2 Camera Setting and Optical Interface

2.1 Setting Camera

Use the M4 screw holes or the screw hole for a tripod to set the camera.

2.2 Fixing Camera

Use the M4 screw holes (4 places at the front, 8 places at the side) to fix the camera. Or use the 1/4"-20UNC screw hole (the screw hole for a tripod, 1 place at the side) to fix the camera.

If using the front panel M4 mounting holes, the screw length for fixing the camera should be less than 6mm.

No X-, Y-axis orientation and tilt adjustment mechanism is available. Please provide an adjustment mechanism yourself as necessary.

The dimensions for camera are shown below.

Figure 2-2-1 Dimensions (F Mount)

2.3 Optical Interface

The amount and wavelengths of light required to capture useful images depend on the intended use. Factors include the property, speed, the object's spectral characteristics, exposure time, the light source characteristics, the specifications of the acquisition system and so on.

The exposure amount (exposure time x light amount) is the most important factor in getting desirable images. Please determine the exposure amount after studying what is most important to your system.

Keep these guidelines in mind when setting up your light source:
- LED light sources are relatively inexpensive, provide a uniform field and longer life span compared to other light sources. However, they also require a camera with excellent sensitivity.
- Halogen light sources generally provide very little blue relative to infrared light (IR).
- Fiber-optic light distribution systems generally transmit very little blue light relative to IR.
- Metal halide light sources are very bright but have a shorter life span compared to other light sources.

Generally speaking, the brighter light sources, shorter life span.

CMOS image sensors are sensitive to infrared (IR). We recommend using daylight color fluorescent lamps that have low IR emissions. If you use a halogen light source, to prevent infrared from distorting the images use an IR cutoff filter that does not transmit IR wavelengths.

2.4 Calibration with User White Pixel Correction Function

This camera is set to the optimal pixel correction with a daylight fluorescent lamp
(NEC FL20SD) before shipping.
Light sources and lens shading can cause non-uniformity.
Calibrate the camera with a user white pixel correction function to cope with lens
shading and non-uniform illumination by following below steps.
  1) Set the lens and light source which you want to use.
  2) Set NED_FFCMode to "Factory White".
  3) Adjust the exposure time and gain to set the signal level to about 200 DN.
  4) Execute NED_PRNUCalibration.
  5) Change NED_FFCMode to "User White".
This calibration can improve the white balance and the waveform flatness of
the camera signal.
See below for more details.

4.1.2 List of Camera Control Registers
4.2.11 NED additional features
4.8 Pixel Correction

The waveforms at the calibration processing are shown as an example of
this explanation when you use 3-wavelength fluorescent lamp with this camera.

(1) Waveforms using daylight fluorescent lamp
    The waveform using daylight fluorescent lamp NEC FL20SD with
    this camera is flat after adjusting white balance at Factory.
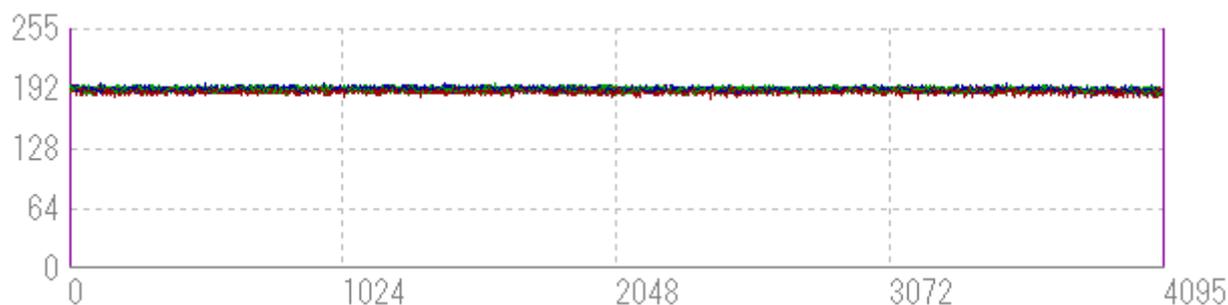
(2) Waveforms using 3-wavelength fluorescent lamp
    The waveforms using 3-wavelength fluorescent lamp with this camera
    at Factory white mode are shown below.
    The white balance is broken.
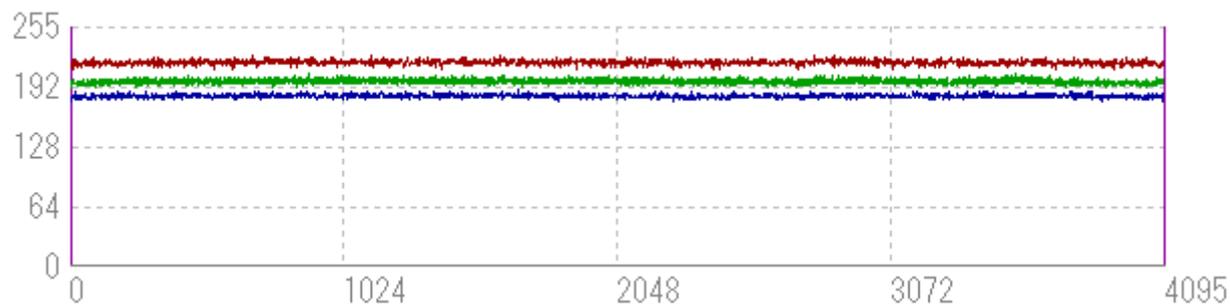
(3) Waveforms using 3-wavelength fluorescent lamp

The waveforms using 3-wavelength fluorescent lamp with this camera
are flat after adjusting white balance with User white mode.

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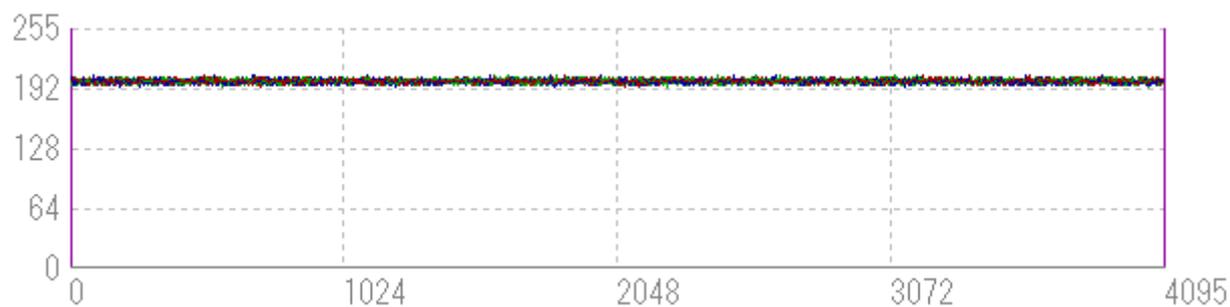
3 Hardware

3.1 Camera Connection

Use the camera in the following way:

1. Connect the camera to the PC with a LAN cable.

   Notes:

   1) Use a CAT-5e or higher grade LAN cable to connect the camera to the PC.

   2) In countries requiring CE certification, use a shielded cable.

   3) Use a Gigabit Ethernet compatible LAN port.

   To add additional cameras use a NIC (Intel: Gigabit CT Desktop Adapter EXPI9301CT etc.) on the PCI or PCI-Express bus.

2. Connect the power to the camera.

   Note:

   Use a power cable to connect the camera power to the camera. Connect the plug end of the cable to the camera, and the open end to the power supply. In addition, a lens, lens mount, illumination, trigger controller, etc. may be required.

   Please choose equipment suitable for your application's requirements.
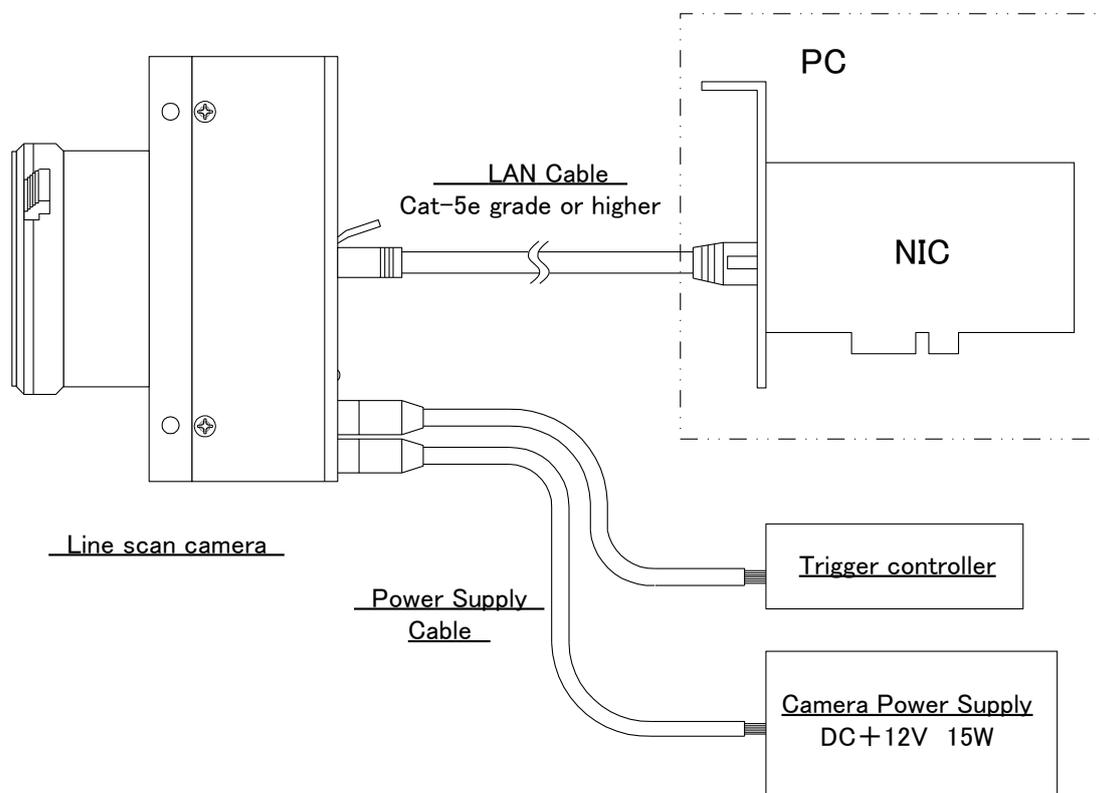
Figure 3-1-1 Connections between Camera and PC etc.

**Example of connection between
1 PC and 1 camera**
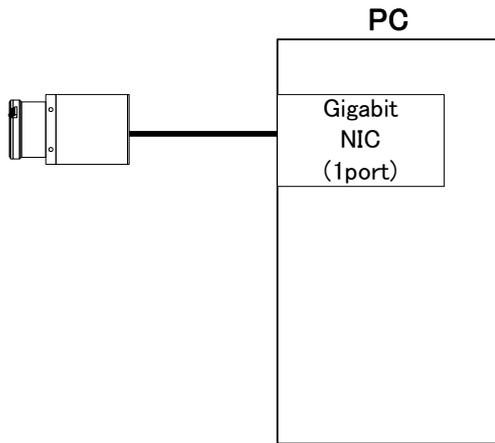
PC

Gigabit
NIC
(1port)

**Example of connection between
1 PC and 3 cameras**

PC

Gigabit
NIC
(1port)

Gigabit
NIC
(1port)

Gigabit
NIC
(1port)

**Example of connection between
1 PC and 3 cameras**

PC

Gigabit
NIC
(Multi port)
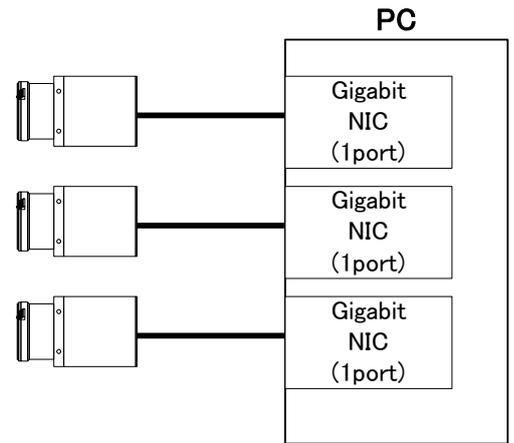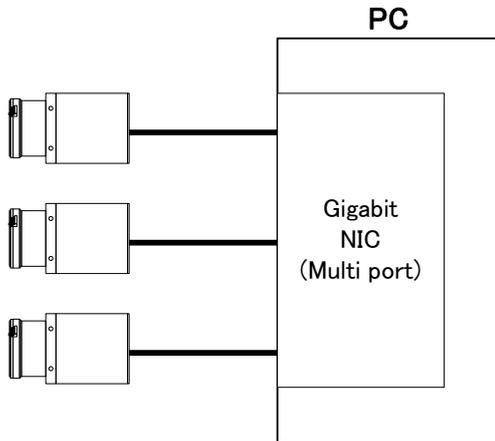
**Example of connection between
of 1 PC and 3 cameras**

PC

Gigabit
Switching
HUB

Gigabit
NIC
(1port)
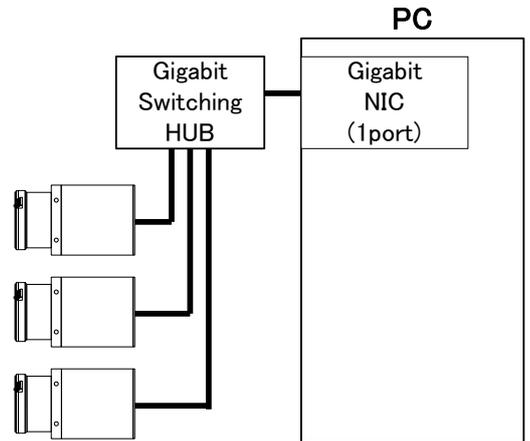
Figure 3-1-2 Example of connection for 1 PC

3.2 Input / Output Connectors and Indicator

The layout of input /output connectors and the indicator lamp are as follows.
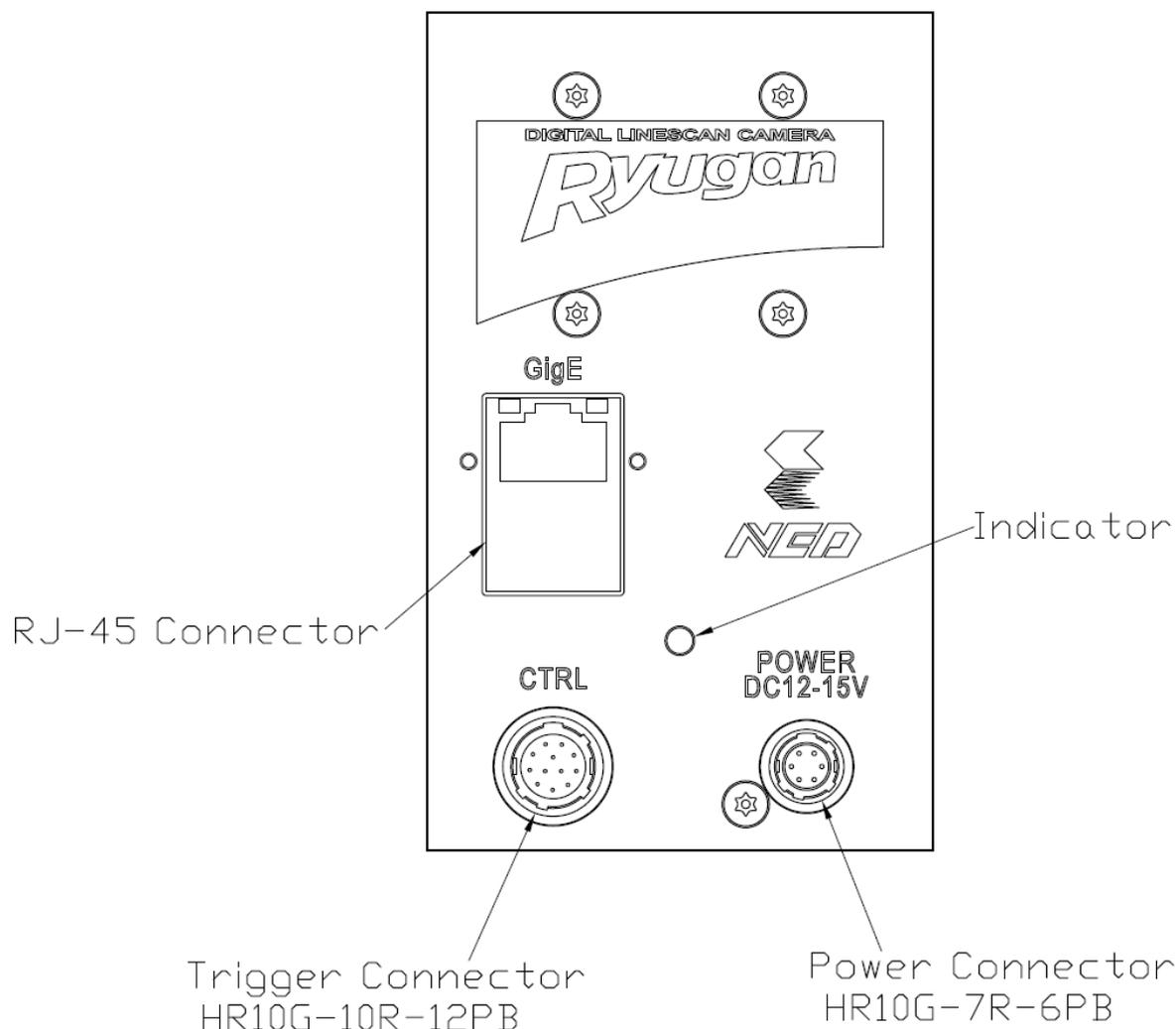
Figure 3-2-1 Input/Output Connectors and Indicator

3.3 Power Supply Connection

6 pin round shape push-pull lock type connector for Power supply.

The pin assignment of the power supply connector is shown below.
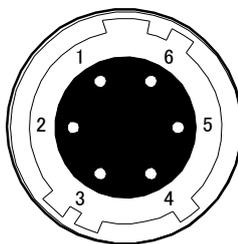
Figure 3-3-1 Power Supply Connector (HR10G-7R-6PB）

Table 3-3-1 Pin Assignment of Power Supply Connection

No	NAME	Color of Cable	No	NAME	Color of Cable
1	DC12〜15V	White	4	GND	Green
2	DC12〜15V	Red	5	GND	Black
3	DC12〜15V	NC	6	GND	NC

The camera requires a single power supply (DC+12 to +15V).

◆ When selecting a power source, choose one with the capacity to allow for in-rush current. (15W or more recommended)

◆ Insert the cable plug securely until it locks into position. This is to prevent the connector from coming loose during power transmission.

◆ Do not remove the cable while image data is being transmitted

● Compatible Cable (Compatible plug):DGPSH -10 (HIROSE : HR10A -7P - 6S)

● Power supply voltage: DC+12 -15V (+/-5%)

● Consumption Current (rated):   DC+12V : 610mA

◆ If the lamp fails to illuminate even after power is switched on, turn off power immediately. Inspect wiring. Check the voltage and capacity of the supplied power source.

◆ Provide a lightning surge protector on the power supply line for the camera used in the region where the possibility of thunder becomes high.

◆ Do not share the power supply and ground connection with the apparatus such as the inverter controlled motor units or other devices that generate noise interference to avoid the failure and malfunction of the camera. Place the camera far away from the apparatus generating noise. Do not arrange the signal cables and the power supply cable for camera adjacently.

3.4 External Trigger Connector（HR10G-10R-12PB）

◆ Round shape push-pull lock type.

◆ The pin assignment of the External Trigger connector is shown below.
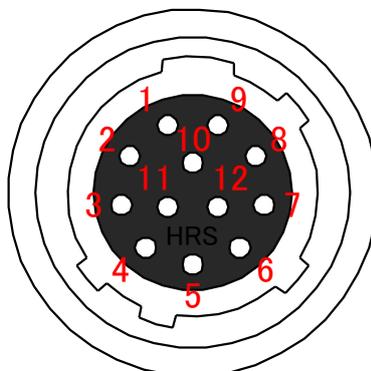
Figure 3-4-1 External Trigger Connector（HR10G-10R-12PB）

This is used in External Trigger mode, or External Frame Trigger mode.

Table 3-4-1 External Trigger Connector Pin Assignments

No	NAME	I/O	No	NAME	I/O
1	LineIn1-	IN	7	LineOut1+	OUT
2	LineIn1+	IN	8	LineIn2-	IN
3	LineIn3-	IN	9	LineIn2+	IN
4	LineIn3+	IN	10	Unused	NC
5	GND	GND	11	LineOut2-	OUT
6	LineOut1-	OUT	12	LineOut2+	OUT

Notes:

1) In order to ensure correct function of the external trigger, make sure to connect Pin 5 (Ground).

2) It is recommended to connect the external trigger cable's shield to GND on the power side.

3) Use a twisted pair cable, such that + and – are paired.

● RS-422, LVDS and TTL are supported for input/output.

● Polarity reversal & chatter prevention functions can be used on the input.

3.4.1 RS-422 Input

When using RS-422 for input, connect a differential input via twisted pair as shown in figure 3-4-2.
For correct operation, make sure to connect GND.

With RS-422, multiple receivers can be connected to one driver.
In such a case, only terminate the furthest receiver.
On this camera, setting the Terminate setting to ON activates the terminator.

Notes:
Do not terminate multiple receivers. The signal level will decrease and the signal will not be received correctly.
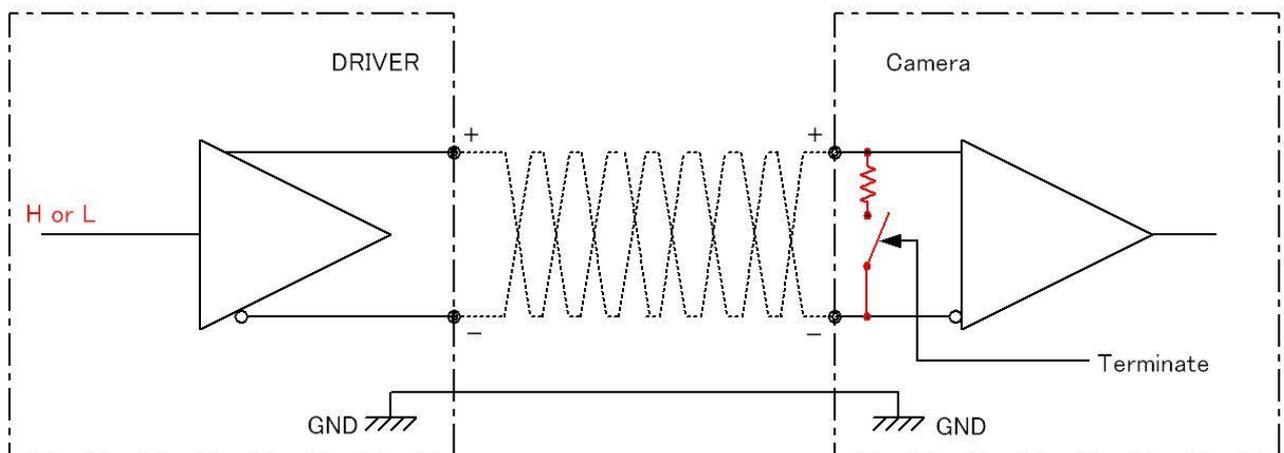
Figure 3-4-2 External Trigger Input Connection Diagram (differential)

3.4.2 LVDS Input

When using LVDS for input, connect in the same way as for RS-422, as Figure 3-4-2.
Again, be sure to set Terminate to ON and activate the terminator. If the terminator is not activated the signal may not be received correctly.

Notes:
The LVDS Multidrop function is not supported. Only connect 1 device per driver.
If you need to send the signal to multiple cameras, it is possible to use the camera's external trigger output for a cascade connection.

3.4.3 TTL Input

To use TTL input, connect the camera as in figure 3-4-3 below.

To avoid damaging the device, do not input a signal to the – pin.

In addition, make sure that the Terminate setting is OFF and the terminator is inactive. If the terminator is active, the signal may not be received correctly.
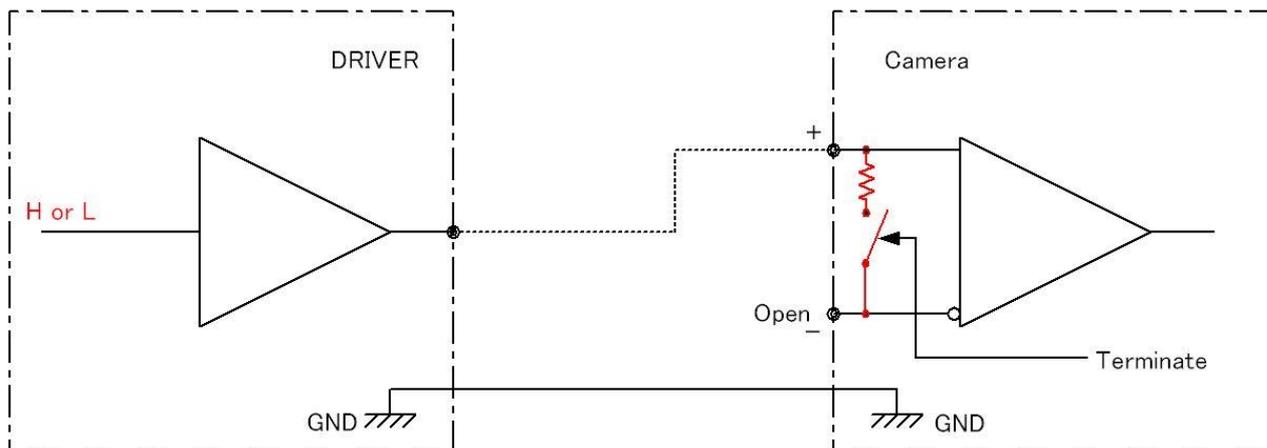
Figure 3-4-3 External Trigger Input Connection Diagram (TTL)

3.4.4 RS-422 Output

To use the RS-422 output, connect the camera with a differential twisted pair as shown in figure 3-4-4. For correct operation, make sure to connect GND.

Multiple receivers can be connected to 1 camera when using RS-422.

In such a case, only terminate the furthest receiver.

Notes:

Do not terminate multiple receivers. The signal level will decrease and the signal will not be received correctly.
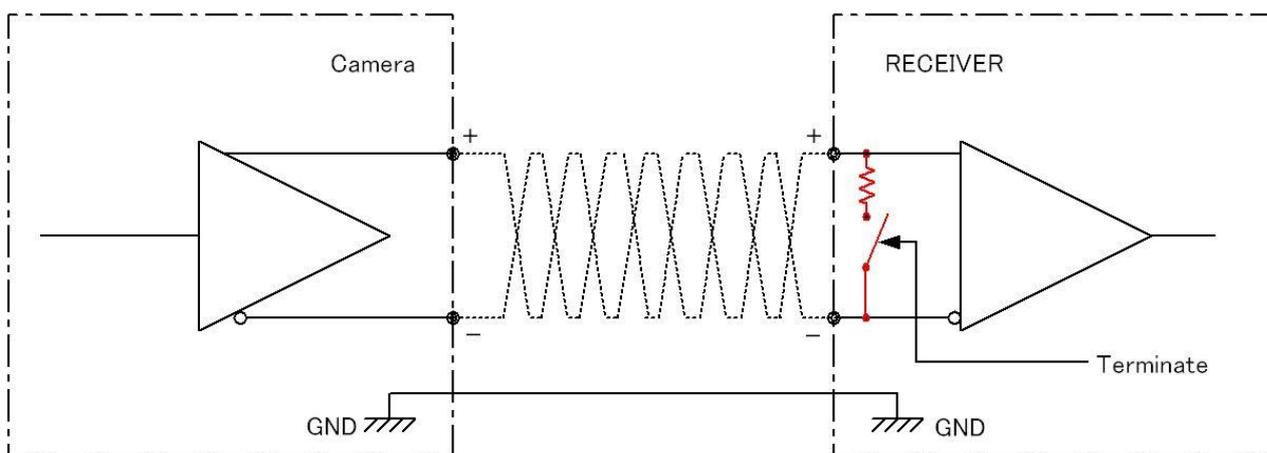
Figure 3-4-4 External Trigger Output Connection Diagram (RS-422)

3.4.5 LVDS Output

If the receiver requires LVDS input, it can be connected by attaching resistors to the camera outputs.

Multidrop is not supported. Connect only 1 receiver per camera.

In addition, be sure to check that the receiver side must be terminated.

If not, correct signals may not be received.
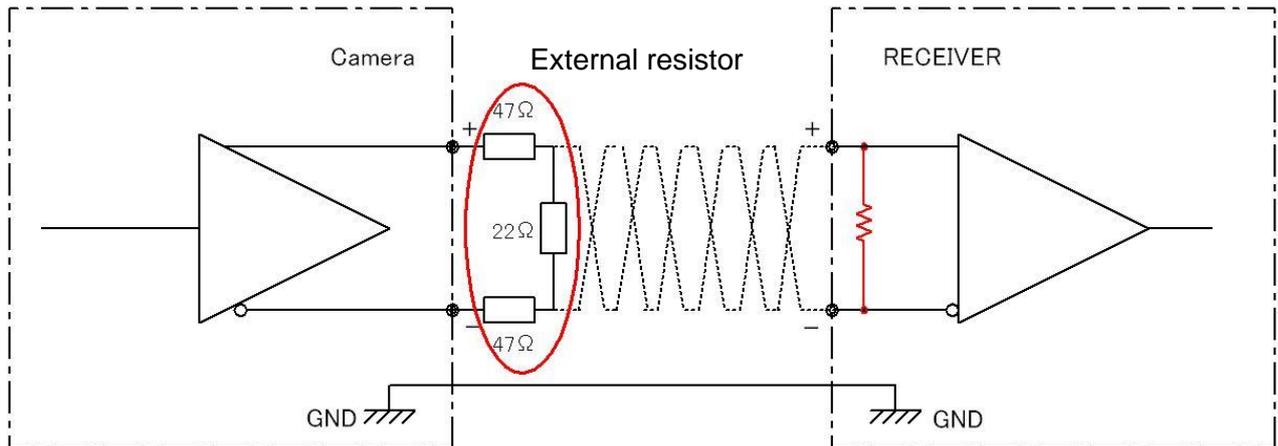
Figure 3-4-5 External Trigger Output Connection Diagram (LVDS)

3.4.6 TTL Output

To use TTL output, connect the camera output as shown in figure 3-4-6.

The Lo level output is 0V, the Hi level output is 3.3V.

To avoid damaging the device, do not connect the – pin.
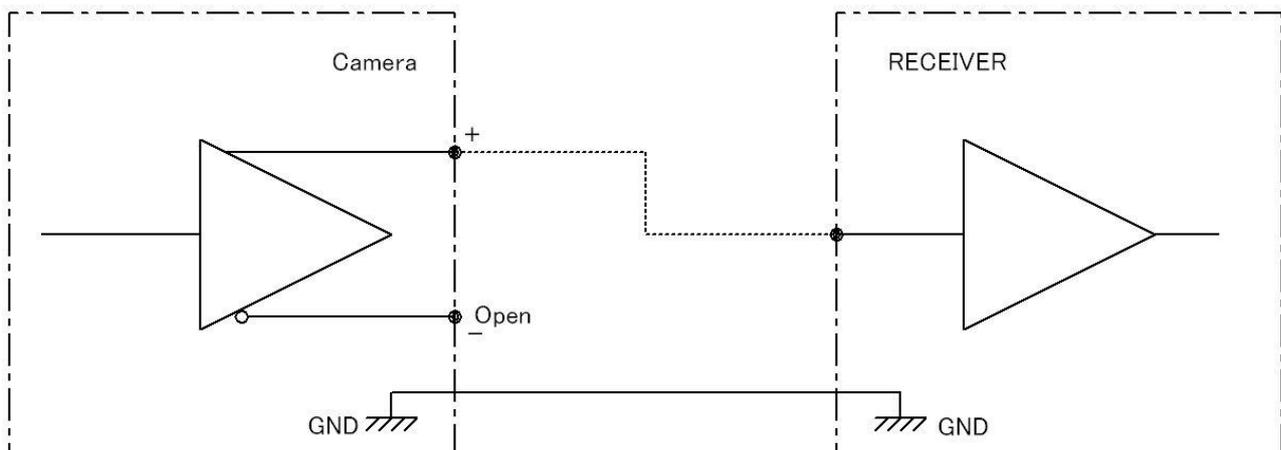
Figure 3-4-6 External Trigger Output Connection Diagram (TTL)

3.4.7 Relation of External Trigger Input and Output

The external trigger output uses the external trigger input driver as an intermediary as shown in figure 3-4-7. Therefore it is possible to switch the output ON/OFF by use of an enable resistor. For settings, see "4.2.6.4 Setting Line Source".
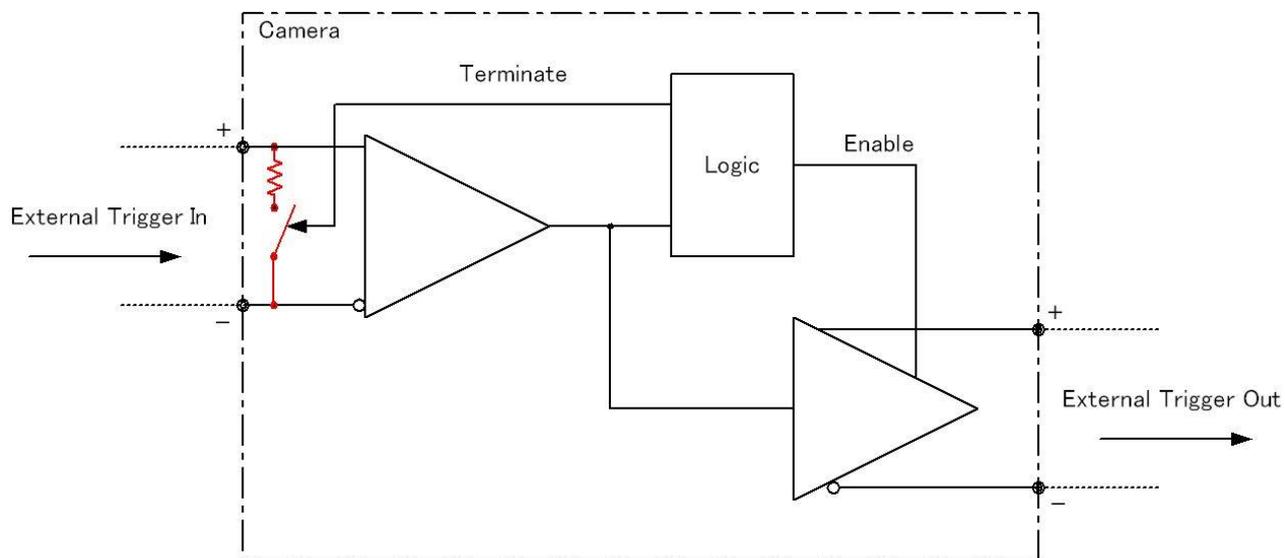
Figure 3-4-7 Relation of External Trigger Input and Output

3.5 RJ-45 Connector

The camera uses an RJ-45 connector complying with the Gigabit Ethernet standard (1000BASE-T). It can be connected to the LAN connector of your PC via a LAN cable (CAT-5e or above). For applications where there is a lot of vibration or movement, a screw-lock cable can be used.

Table 3-5-1 RJ-45 Connector pin assignments
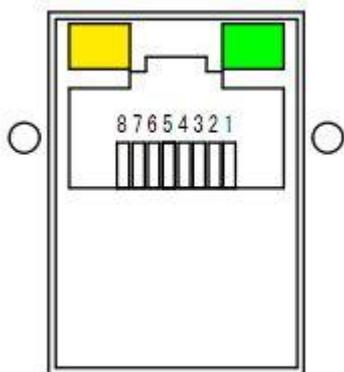
No.	Name
1	TRP1+
2	TRP1-
3	TRP2+
4	TRP2-
5	TRP3+
6	TRP3-
7	TRP4+
8	TRP4-

Figure 3-5-1 RJ-45 connector

3.6 LED indicating camera status

The LED is used to indicate power present and to the camera status.

Table 3-6-1 LED indication

Camera Status by LED Indicator	LAN is connected	LAN is not connected
Camera Power Supply is off	off (LED indication)	off (LED indication)
Camera Booting Up (Power On)	Lights orange	Lights orange
Disconnected cable	-	Lights red
Device Discovery	Blinks orange	-
Stand-by transmitting image packets	Lights green	-
Transmitting image packets	Blinks green	-

4 Camera Control

The camera supports the industrial camera control API Gen<I>Cam, and so camera settings can be easily changed from your application. The camera control registers are listed below. For instructions on how to change the settings, see the manual for your viewer software.

4.1 Flow of Camera Control

4.1.1 GenICam overview
- The camera control register information is saved inside the camera (XML file).
- The frame grabber board reads the XML file during Discovery, and acquires the register information.
- Camera control is enabled after Discovery.
  Check your frame grabber's manual for how to perform device discovery.

4.1.2 List of Camera Control Registers
This camera supports GenICam SFNC 2.3 and the camera setting of the features shown in the table below can be controlled by software attached to the frame grabber board.

Table 4-1-1 List of Camera Control Registers

Control Item	RW	VAL <factory settings>	Description
Device Control			
DeviceUserID	RW	(ASCII code) <0x00>	User define ASCII code ASCII code is up to 15 characters The last of ASCII code is "NULL(0x00)"
DeviceTemperature Selector	RW	Mainboard	No need of Setting change
DeviceTemperature	R		DeviceTemperature (℃)
Image Format Control			
Width	RW	8～4096 <4096>	Number of pixels in a line. Must be a multiple of 4.
Height	RW	16～4096 <512>	Number of lines in a frame.

OffsetX	RW	0～4088 <0>	X Offset Pixel No. Number of pixels in a line. Must be a multiple of 4.
Binning Horizontal Mode	RW	Sum / Average <Sum>	Addition/ Addition Average
Binning Horizontal	RW	1 / 2 <1>	1(OFF) / 2 pixels
Binning Vertical Mode	RW	Sum / Average <Sum>	Addition / Addition Average
Binning Vertical	RW	1 / 2 <1>	1(OFF) / 2 pixels
ReverseX	RW	True / False <False>	True ： Reverse False ： Forward
PixelFormat	RW	RGB8Packed	No need of Setting change
TestPattern	RW	Off / GreyHorizontalRamp / NED_GreyDiagonalRamp / Color Bar <Off>	Test Pattern Output
Acquisition Control			
AcquisitionLineRate	RW	300 ～ 30030 <2640>	Hz(unit)
TriggerSelector	RW	FrameActive / ExposureStart / DummyFrameOutput <ExposureStart>	FrameActive ： Enabling frame ExposureStart ： Start (Each line) DummyFrameOutput：Dummy Output
TriggerMode	RW	Off / On <Off>	Off ： Disabling External trigger On ： Enabling External trigger
TriggerSource	RW	NoConnect/ Software/ Encorder1/ LineIn1/ LineIn2/ LineIn3 <NoConnect>	NoConnect ： No connection Software ： Software Torigger Encorder1 ： Encoder selection LineIn1 ： External trigger LineIn2 ： External trigger LineIn3 ： External trigger

TriggerActivation	RW	Rising Edge/ Falling Edge/ Any Edge/ Level High/ Level Low < Rising Edge>	Rising Edge ： Rising Edge Falling Edge ： Falling Edge Any Edge ： Rising & Falling Edge Level High ： "H" level activation Level Low ： "L" level activation
NED_DummyFrame OutputTimeout	RW	0.0 ～ 600000000.0 <0.0>	μsec.(unit)
ExposureMode	RW	Timed / Trigger Width <Timed>	Timed ： Value of ExposureTime TriggerWidth ： "H" time of External trigger
ExposureTime	RW	2.0～3331.0 <376.4>	0.1 μsec / step
Analog Control			
NED_AnalogGain	RW	x100～x1000 <x100>	x1 / x2 / x3 / x4 / x5 / x6 / x8 / x10
Gain Selector	RW	All / Red / Green / Blue <All>	All ： Red,Green,Blue Red ： Red Green ： Green Blue ： Blue
Gain	RW	1.000000～2.000000 <1.000000>	x1～x2 0.001957 / step
Black Level Selector	RW	All / Red / Green / Blue <All>	All ： Red,Green,Blue Red ： Red Green ： Green Blue ： Blue
Black Level	RW	-80 ～ 80 <0>	-80...80 1.000000 / step
Balance White Auto	RW	Off / Once / Reset <Off>	Controls the mode for automatic white balancing between the color channels.
Gamma	RW	0.250～4.000 <1.000>	0.250～4.000 0.001000 / step

Color Transformation Control			
Color Transformation Enable	RW	True / False <False>	True ： On False ： Off
Color Transformation Value Selector	RW	Gain 00 / Gain 01 / Gain 02 / Gain 10 / Gain 11 / Gain 12 / Gain 20 / Gain 21 / Gain 22 / Offset 0 / Offset 1 / Offset 2	Selects the Gain factor or Offset of the Transformation matrix to access in the selected Color Transformation module.
Color Transformation Value	RW	Gain ** : -3.0 ～ 3.0 Offset * : -512 ～ 512	Represents the value of the selected Gain factor or Offset inside the Transformation matrix.
Digital IO Control			
Line Selector	RW	LineIn1/ LineIn2/ LineIn3/ LineOut1 / LineOut2 <LineIn1>	Input ： LineIn1 / LineIn2 / LineIn3 Output ： LineOut1 / LineOut2
Line Mode	R	Input/Output	No need of Setting change
Line Inverter	RW	True / False <False>	True ： Input Invert ON False ： Input Invert Off
Line Status	R	True / False <False>	No need of Setting change
Line Source	RW	Off / Acquisition Active / Frame Active / Exposure Active / Encoder 1 / LineIn1 / LineIn2 / LineIn3	Selects which internal acquisition or I/O source signal to output on the selected Line. **LineMode** must be **Output.**
Line Format	RW	TTL / RS422NotTerminate / RS422Terminate	TTL ： TTL Output RS422NotTerminate ： RS422 (without terminal resistance) RS422Terminate ： RS422

		/LVDS \<TTL\>	(with terminal resistance) LVDS ： LVDS Output
NED_LineMaskTimeR	RW	0 ～ 100000 \<0\>	0 ～ 100000 µsec.
NED_LineMaskTimeF	RW	0 ～ 100000 \<0\>	0 ～ 100000 µsec.
Encoder Control			
Encoder Selector	R	Encorder1	No need of Setting change
Encoder Source A	RW	Off / LineIn1 / LineIn2 / LineIn3	Encoder signal (A-phase)
Encoder Source B	RW	Off / LineIn1 / LineIn2 / LineIn3	Encoder signal (B-phase)
Encoder Mode	RW	Four Phase / High Resolution < Four Phase >	Four Phase ： Combination of A & B phases One cycle of 4-state (with filtering) High Resolution ： One cycle of 1-state(without filtering)
Encoder Divider	RW	1～200 \<1\>	One pulse by Pulse number input
Encoder Output Mode	RW	Off / Position Up / Position Down / Direction Up / Direction Down / Motion \<Off\>	Signal output setting mode for status of moving object.
Encoder Status	R	Encoder Static	No need of Setting change
Encoder Timeout	RW	0.000～60000000.000 \<0.000\>	Time out period 0～60000000 µsec
Encoder Reset Source	RW	Off / Acquision Start / Acquision End / Frame Start / Frame End / Exposure Start / Exposure End / LineIn1 /	Selects the signals that will be the source to reset the Encoder.

		LineIn2 / LineIn3 <Off>	
Encoder Reset Activation	RW	Rising Edge / Falling Edge / Any Edge / Level High / Level Low < Rising Edge >	Selects the Activation mode of the Encoder Reset Source signal.
Encoder Reset	W		Software reset of encoder （Independent of ncoderResetSource）
Encoder Value	RW	0～999999 <0>	Reads and writes Encoder counting
Encoder Value At Reset	R	0 ～ 4294967295 <0>	Reads the value of the of the position counter of the selected Encoder when it was reset by a signal or by an explicit **EncoderReset** command.
User Set Control			
User Set Selector	RW	Default / UserSet1 < UserSet1>	Default ： factory settings UserSet1 ： user settings 1
User Set Load	W		Loads the User Set specified by UserSetSelector to the device and makes it active.
User Set Save	W		Saves Current camera set values by UserSetSelector in the memory.
User Set Default	RW	UserSet1	No need of Setting change
Transport Layer Control			
Gev Current IP Configration Persistent IP	RW	True / False <False>	True ： ON False ： Off
Gev SCPS Packet Size	RW	512 ～ 9152	This GigE Vision specific feature corresponds to DeviceStreamChannelPacketSize and should be kept in sync with it. It specifies the stream packet size, in bytes, to send on the selected channel for a GVSP transmitter or specifies the

			maximum packet size supported by a GVSP receiver.
Gev SCPD	RW	0 ～ 4294967295 <50>	Controls the delay (in GEV timestamp counter unit) to insert between each packet for this stream channel.
NED additional features			
NED_FFCMode	RW	Disable / Factory white / User white / User black+Factory white / User black+User white <Factory white>	Correction OFF / Factory black correction+ Factory white correction / Factory black correction+ User arbitrary white correction / User arbitrary black correction+ Factory white correction / User arbitrary black correction+ User arbitrary white correction
NED_PRNUTarget	RW	1～1023 <800>	Target value of correction level （10bit DN）
NED_PRNUCalibration	W		Acquiring the data of user arbitrary white correction and saving it in the memory
NED_FPNCalibration	W		Acquiring the data of user arbitrary black correction and saving it in the memory

4.2 Details on register system

4.2.1 Category

The following eleven(11) categories are available as the camera control register.
When you select the camera type number from the list of "Features name",
these categories are shown.

Categories	(Reference)
1. Device Control	(for Device temperature)
2. Image Format Control	(for Imaging)
3. Acquisition Control	(for Exposure, Trigger)
4. Analog Control	(for Gain, Offset)
5. Color Transformation Control	(for Color Transformation)
6. Digital IO Control	(for Line selector)
7. Encoder Control	(for Encoder)
8. User Set Control	(for Memory Loading and saving)
9. Transport Layer Control	(for GIG-E IF)
10. NED additional features	(for Pixel Correction)
11.NED factory only	(No use)
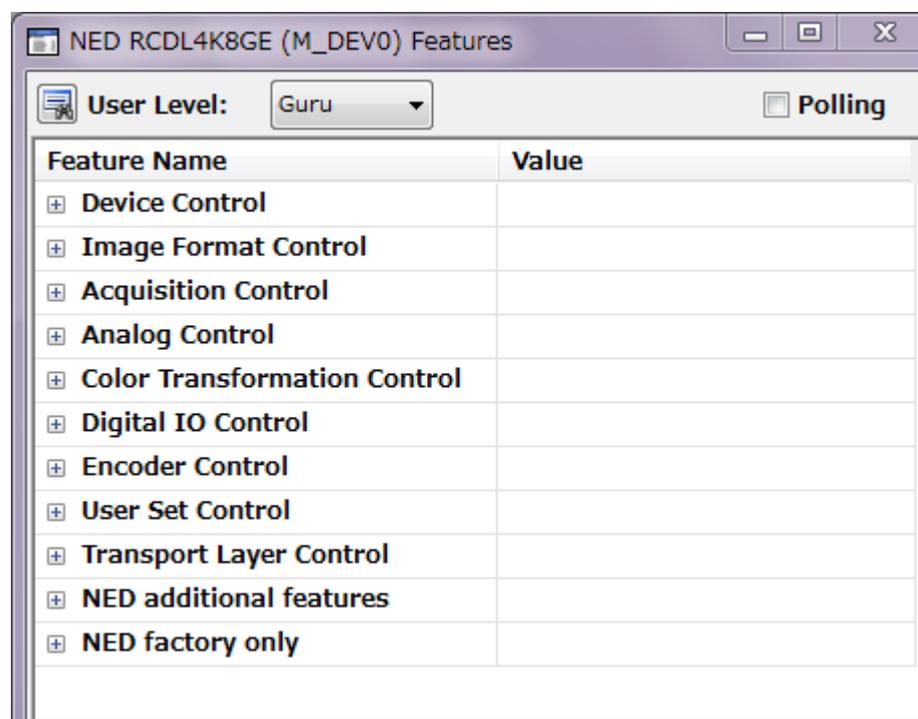
Figure 4-2-1 Features

4.2.2 Device Control

4.2.2.1 Displaying Temperature of Camera

Displays the temperature of camera inside.

      ・Register name　　　　　Device Temperature
      ・Displaying Value　　　　（℃）

Feature Name	Value
⊟ **Device Control**	
Device Scan Type	Linescan
Device Vendor Name	NED
Device Model Name	RCDL4K8GE
Device Manufacturer Info	color line sensor
Device Version	0.96_0x501c
Device Serial Number	00C0002
Device User ID	
NED_DeviceFirmwareStartupMode	Golden (Factory default)
Device SFNC Version Major	2
Device SFNC Version Minor	3
Device SFNC Version Sub Minor	0
⊞ **Device Manifest Entry Selec...**	0
Device TL Type	GigE Vision
Device TL Version Major	1
Device TL Version Minor	2
⊞ **Device Link Selector**	0
Device Character Set	UTF 8
Device Registers Endianness	Big
⊟ **Device Temperature Selector**	Mainboard ▼
Device Temperature	47.300
Timestamp Reset	Execute()
Timestamp Latch	Execute()
Timestamp Latch Value	0
⊞ **Image Format Control**	

Figure 4-2-2-1 Device Temperature

4.2.3 Image Format Control

4.2.3.1 OffsetX and Width Settings

By using the 2 settings OffsetX and Width, a specific region only can be read out from the camera. The range of values is as follows:

・OffsetX : 0 ~ 4088

・Width   : 8 ~ 4096

Height	512	
Offset X	0	
Offset Y	0	

Figure 4-2-3-1-1 Offset X

Height Max	4096	
Width	4096	
Height	512	

Figure 4-2-3-1-2 Width

Notes:

OffsetX and Width can both only be set in multiples of 4.

e.g. OffsetX = 5 is not possible.

In addition, if the total of OffsetX and Width exceeds 4096, the input will not be accepted.

First, reduce one value, then increase the other.

(e.g. 1) To go from OffsetX = 0, Width = 4096 to OffsetX = 548, Width = 3000.
First, set Width to 3000, then set OffsetX to 548.

(e.g. 2) To go from OffsetX = 548, Width = 3000 to OffsetX = 0, Width = 4096.
First, set OffsetX to 0, then set Width to 4096.

As shown below, setting OffsetX = a, Width = b results in the region a＋1~a＋b being specified.

(e.g.) To specify pixel 513~ pixel 1536, set OffsetX = 512、Width = 1024.
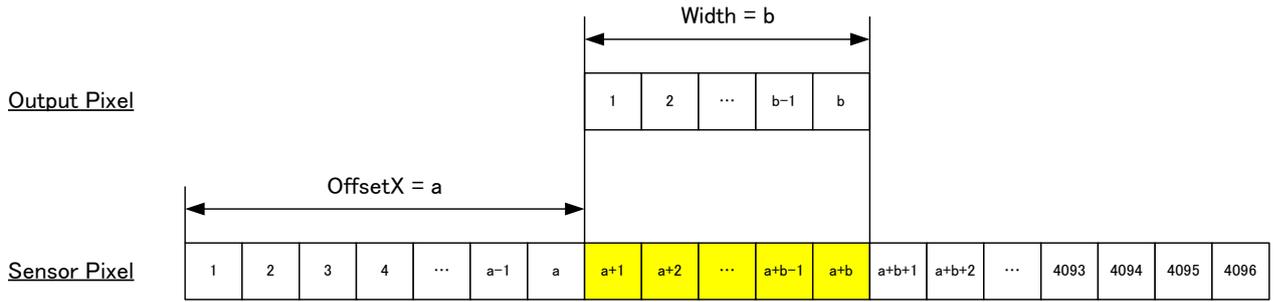
Figure 4-2-3-1-3 Valid Pixel Region

4.2.3.2 Height Setting

The Height parameter is used to set the number of lines in 1 frame.

The range of values is as follows:

・Height：16~4096
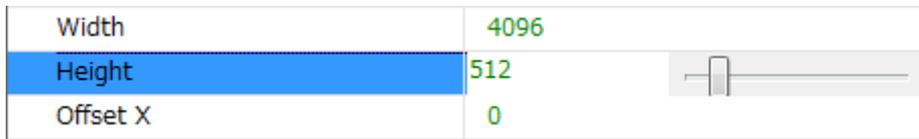
Figure 4-2-3-2-1 Height
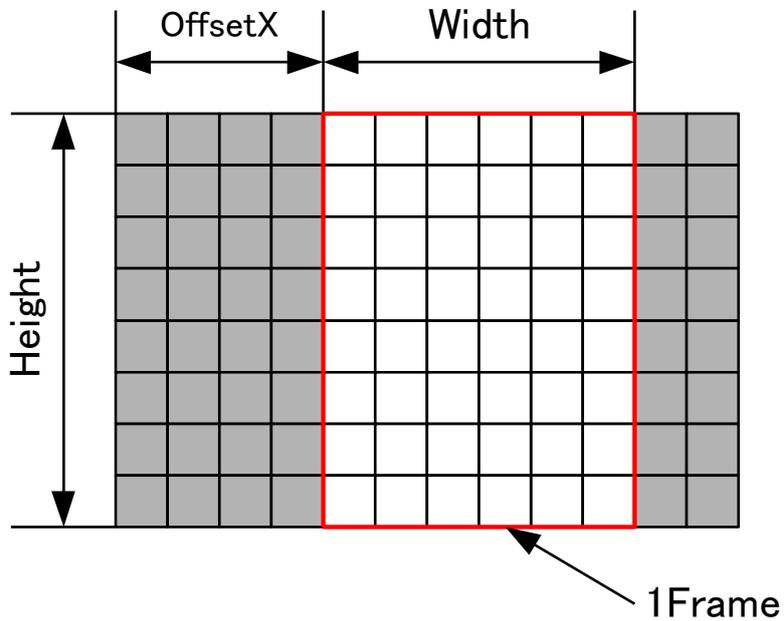
Figure 4-2-3-2-2 Area of 1 Frame

Notes:

The time for 1 frame can be calculated as follows:

1 Frame period (us)＝1 Line Scan Period (us) x Height

Depending on the scan period and the height setting, it is possible that your application may time out.

In such a case, either change the above settings or the timeout period in your application.

4.2.3.3 Setting Pixel Horizontal Binning Mode

Sets the horizontal pixel binning mode for the camera output signal.

・Register name   Binning Horizontal Mode

・VAL   Sum (Addition) / Average (Addition average)

(Example)

Binning Horizontal Mode : Sum (Addition)

Binning Horizontal Mode	Sum ▼
Binning Horizontal	Sum
Binning Vertical Mode	Average
Binning Vertical	1

Figure 4-2-3-3 Binning Horizontal Mode

4.2.3.4 Setting Horizontal Pixel Binning

Sets the number of horizontal pixel binning of the output signal of the camera.

・Register name   Binning Horizontal

・VAL   1(1 pixel, OFF of horizontal pixel binning) / 2(2 pixels)

(Example)

Binning Horizontal : 1(OFF)

Binning Horizontal Mode	Sum	
Binning Horizontal	1	
Binning Vertical Mode	Sum	

Figure 4-2-3-4 Binning Horizontal

4.2.3.5 Setting Pixel Vertical Binning Mode

Sets the Vertical pixel binning mode for the camera output signal.

・Register name   Binning Vertical Mode

・VAL   Sum (Addition) / Average (Addition average)

(Example)

Binning Horizontal Mode : Sum (Addition)

Figure 4-2-3-5 Binning Vertical Mode

4.2.3.6 Setting Vertical Pixel Binning

Sets the number of Vertical pixel binning of the output signal of the camera.

・Register name   Binning Vertical

・VAL   1(1 pixel, OFF of Vertical pixel binning) / 2(2 pixels)

(Example)

Binning Horizontal : 1(OFF)

Figure 4-2-3-6 Binning Vertical

4.2.3.7 Scan Direction

Switches scanning direction.

・Register name   ReverseX

・VAL   clear the check box(Forward) / check box (Reverse)

(Example)

Reverse : check box (Reverse)

Figure 4-2-3-7 Scan Direction

4.2.3.8 Pixel Format Setting

Set the pixel format.

Only RGB8Packed can be selected.

・Register name   Pixel Format

・VAL   RGB8Packed
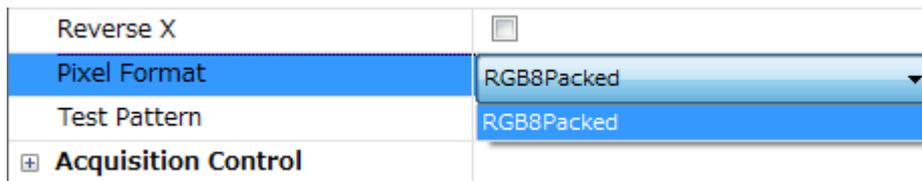
Figure 4-2-3-8 Pixel Format

4.2.3.9 Test Pattern

The test pattern function allows you to check that data is being transferred correctly from the camera.

・Register name   Test Pattern
・VAL   Off / Grey Horizontal Ramp /
                               NED_Grey Diagonal Ramp / Color Bar
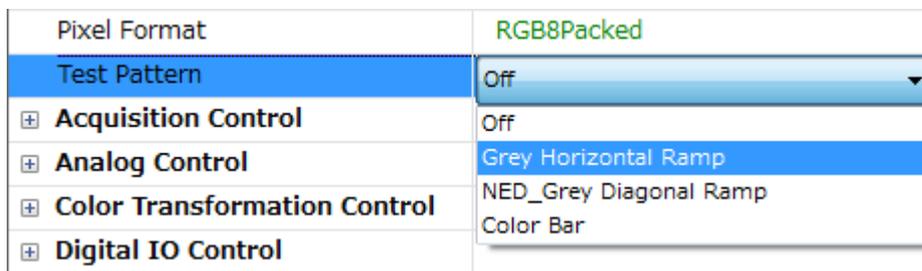
Figure 4-2-3-9-1 Test Pattern

When GreyHorizontalRamp is selected, the below pattern is output.
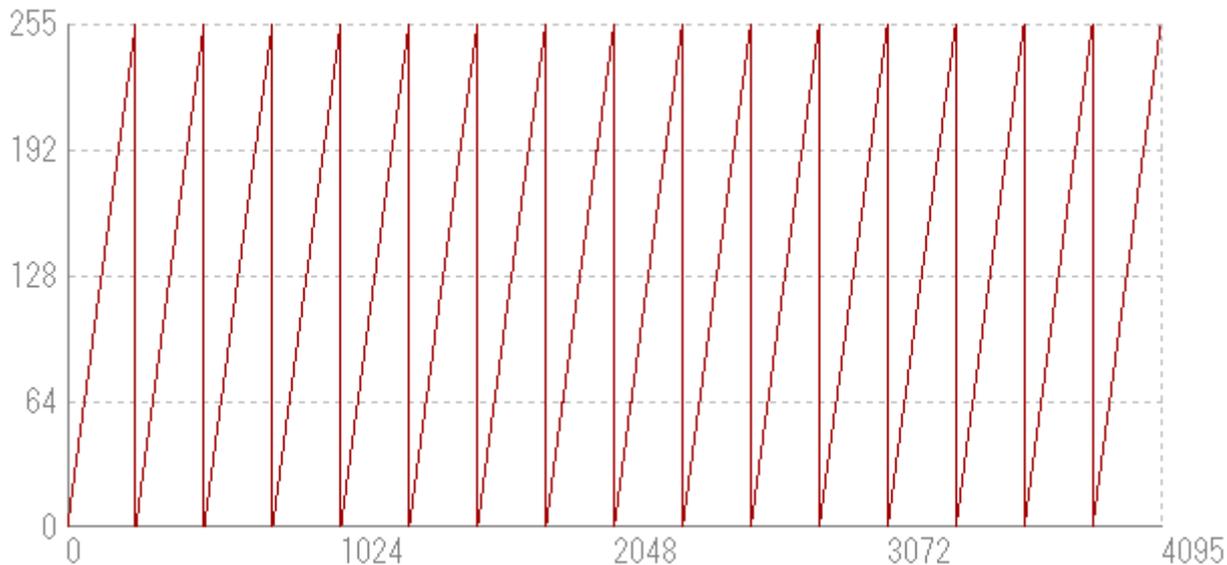
Figure 4-2-3-9-2 GreyHorizontalRamp
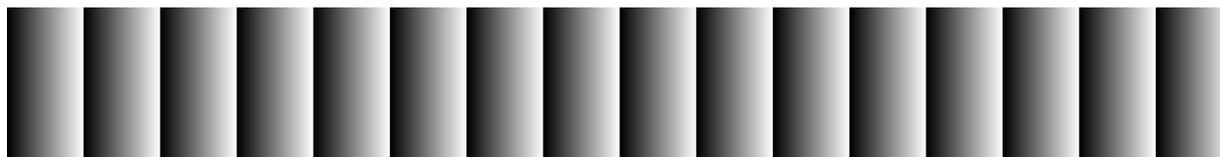
Figure 4-2-3-9-3 GreyHorizontalRamp

It increases in increments of 1DN to 255DN in order from the first pixel 0DN. This pattern is repeatedly output.

When NED_GreyDiagonalRamp is selected, the below pattern is output.
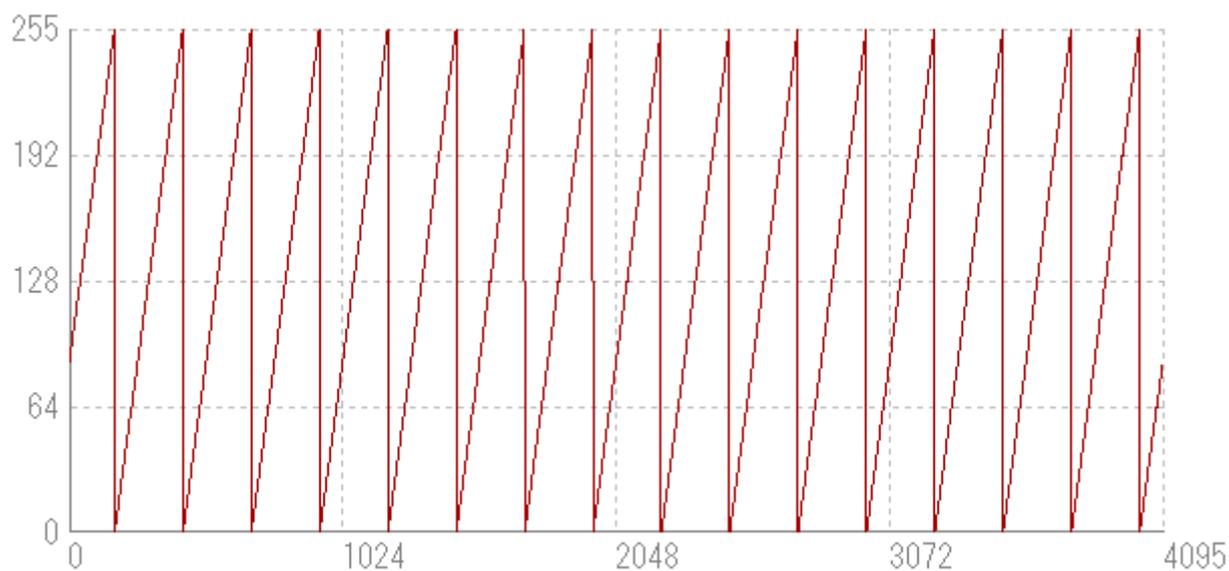
Figure 4-2-3-9-4 NED_GreyDiagonalRamp

Figure 4-2-3-9-5 NED_GreyDiagonalRamp

The value increases by 1DN each pixel, up to 255DN from 0DN in both X-direction (horizontal direction) and Y-direction (vertical direction) in 8-bit mode, the pattern repeats.

When ColorBar is selected, the below pattern is output.
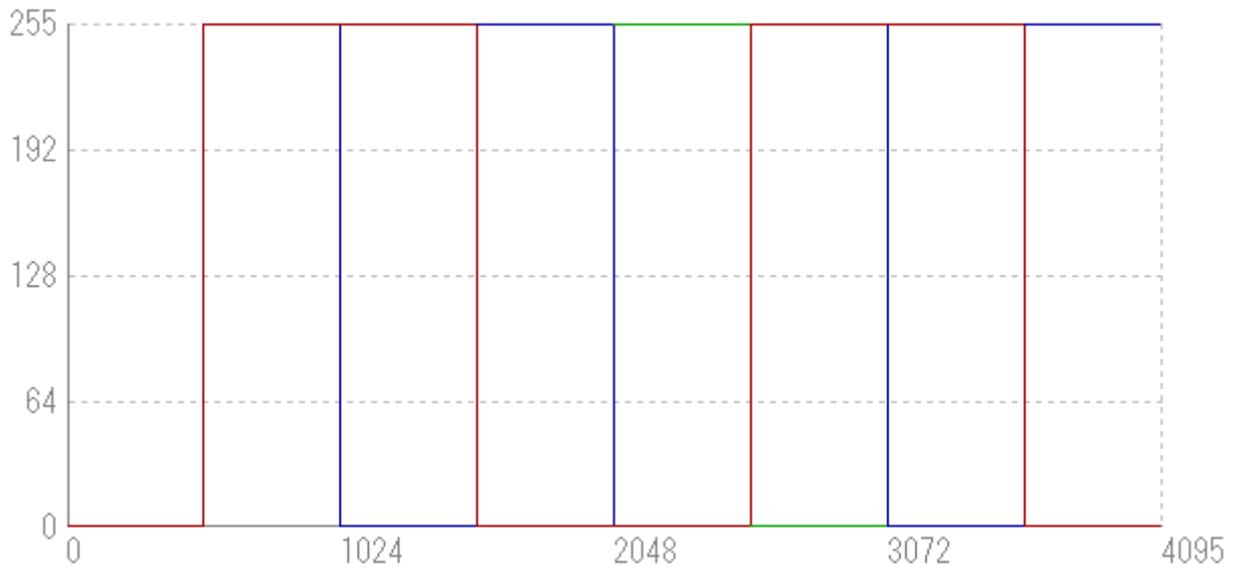
Figure 4-2-3-9-6 ColorBar
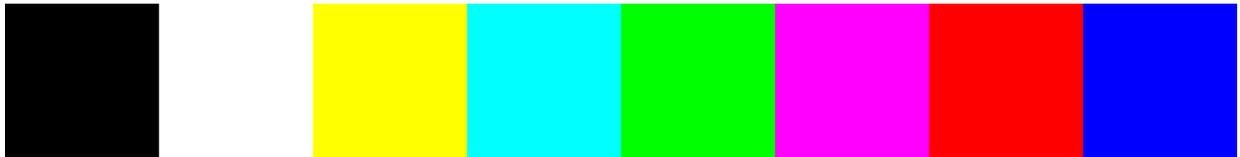
Figure 4-2-3-9-7 ColorBar

512 pixels in order from the first pixel,Black R:0,G:0,B:0 → White R:255,G:255,B:255
→ Yellow R:255,G:255,B:0 → Light blue R:0,G:255,B: 255 → Green R:0,G:255,B:0 →
Pink R:255,G:0,B:255 → Red R:255,G:0,B:0 → Blue R:0,G:0, B:255

4.2.4 Acquisition Control

4.2.4.1 Setting Line Rate

Sets the Line Rate.

        ・Register name   Acquisition Line Rate

        ・VAL   300.000 ～ 30030.000 (*1)   (Hz)

      (Example)   (When 2640Hz is set as the line rate)

    Acquisition Line Rate : 2640

Acquisition Stop	Execute()	
Acquisition Line Rate	2640.000	
Acquisition Line Rate Enable	✓	

Figure 4-2-4-1 Acquisition Line Rate

(*1) The maximum acquisition line rate at the time of the use of 4K pixels becomes 8kHz(RGB8Packed) (but, it may become lower than 8kHz depending on the processing time of PC)

(*2) The reciprocal of the line rate (1/Acquisition Line Rate）is set in increments of 0.100μs.

    When a value of (1/Acquisition Line Rate）is not divisible in 100ns, the real set value is different as follows.

(Example)

・When Acquisition Line Rate is set to 7000Hz, the real set value becomes 7002Hz.

・When Acquisition Line Rate is set to 7900Hz, the real set value becomes 7905Hz.

  The value of Exposure Time may be changed automatically when the value of Acquisition Line Rate is too large.

    The values are roughly set according to the following formula.

      Exposure Time ＜＝ （1 / Acquisition Line Rate）- 2.3 μs

4.2.4.2 Setting Trigger Selector

Sets the Trigger.

  ・Register name   Trigger Selector

  ・VAL   Frame Active,

           Exposure Start or

           DummyFrameOutput

 (Example)

  Trigger Selector : Exposure Start

Figure 4-2-4-2 Trigger Selector

4.2.4.3 Setting Permission for using External Trigger

 Sets the "Trigger Mode" of Register name to get permission for using the External trigger. Select "On" on the "Trigger Mode" if the External trigger is used.

  ・Register name   Trigger Mode

  ・VAL   Off / On (Disable/Enable)

 (Example)

  Trigger Mode: On

Figure 4-2-4-3 Trigger Mode

＊Make sure that the trigger packet is supplied from the frame grabber board to the camera before the "Trigger Mode" is changed from "Off(Disable) to "On(Enable)" to get permission for using the External trigger.

 See 4.3 Examples of External trigger setting.

4.2.4.4 Setting Trigger signal

Sets the "Trigger Source" of Register name when the "Trigger Mode" is set
to "On" (Enable).

     ・Register name   Trigger Source

     ・VAL   NoConnect (No connection)

                              Software (Software Torigger)

                              Encoder 1 (Encoder selection)

                              LineIn1 (External trigger)

                              LineIn2 (External trigger)

                              LineIn3 (External trigger)

(Example)

    Trigger Sourse : Encoder 1
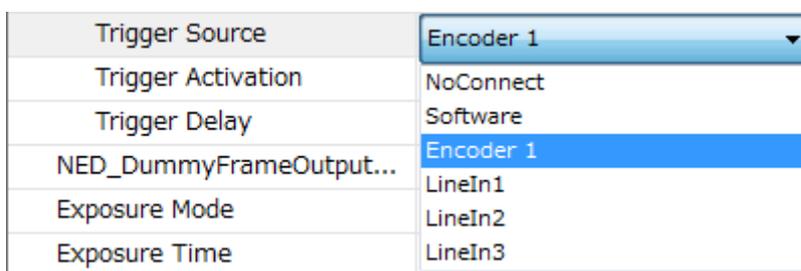
Figure 4-2-4-4 Trigger Source

4.2.4.5 Setting Exposure Mode

Sets the "Exposure Mode" of Register name when the "Trigger Mode" is set
to "On" (Enable).

     ・Register name   Exposure Mode

     ・VAL   Timed (The set value of the "Exposure Time" is used as the exposure time)

                              Trigger Width (The "H" time of "Trigger pulse" of the "External Start" is used as the exposure time)

(Example)

    Exposure Mode : Timed
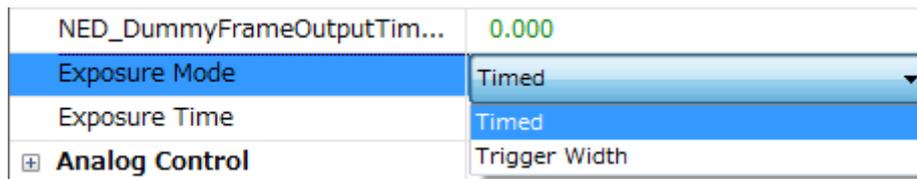
Figure 4-2-4-5 Exposure Mode

4.2.4.6 Setting Exposure Time

Sets the value of the exposure time.

The setting is enable;

  when "Off" on the "Trigger Mode" is set, or

  when "On" on the "Triger Mode" and "Timed" on the "Exposure Mode" are set.

・Register name   Exposure Time

・VAL   2.000～3331.000   (0.1100μs step)

(Example)

Exposure Time : 376.400

Exposure Mode	Timed	
Exposure Time	376.400	─⊓─
⊞ Analog Control		
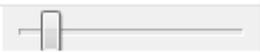
Figure 4-2-4-6 Exposure Time

* The value of the Acquisition Line Rate" may be changed automatically when the value of the
   "Exposure Time" is too large.

   The values are roughly set according to the following formula.

   Acquisition Line Rate ＜＝ 1 /   (Exposure Time ＋ 2.3) μs

4.2.5 Analog Control

4.2.5.1 Setting Analog gain

The camera can adjust the analog gain (x1 to x10 in 8 steps).

・Register name   NED_AnalogGain

・VAL   X 1.00 〜 X 10.00

(Example)

 Analog Gain : × 1.00 （Setting analog gain (x1.00)）
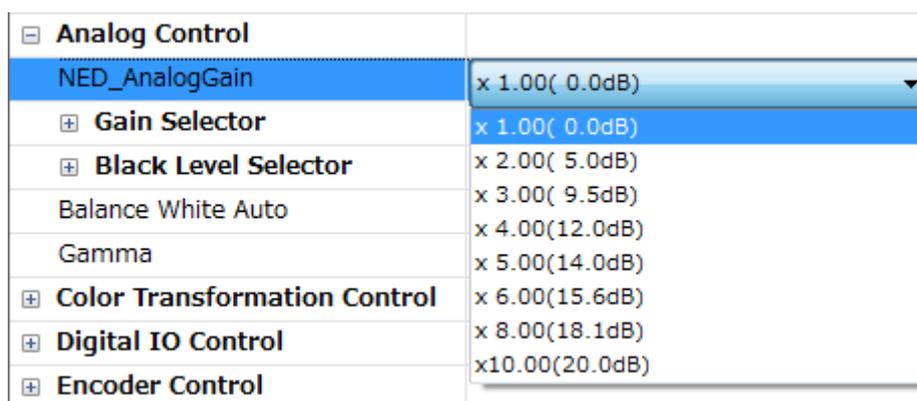
Figure 4-2-5-1 NED_AnalogGain

4.2.5.2 Gain type selection

Select a color to set the digital gain of the camera.

・Register name   Gain Selector

・VAL   All / Red / Green / Blue

(Example)
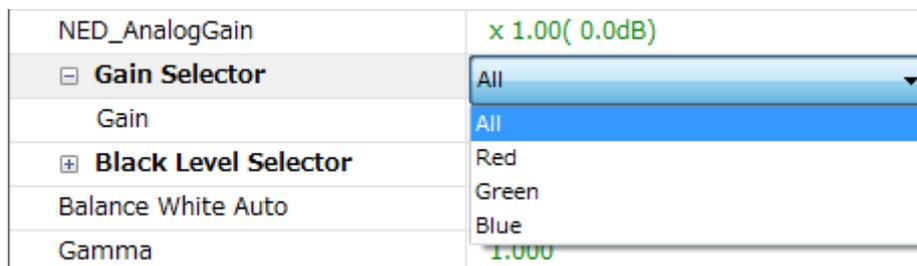
 Gain elector : All

Figure 4-2-5-2 Gain Selector

4.2.5.3 Setting Digital gain

The camera can adjust the digital gain(x1 to x2 in 512 steps).

   ・Register name   Gain

   ・VAL   1.000～2.000（0.001957step）

  (Example)

   Gain : 1.327

Figure 4-2-5-3 Gain

4.2.5.4 Offset type selection

Select a color to set the offset of the camera.

   ・Register name   Black Level Selector

   ・VAL   All / Red / Green / Blue

  (Example)

   Gain elector : All

Figure 4-2-5-4 Black Level Selector

4.2.5.5 Setting Digital Offset

The offset can be adjusted. It is possible to set it in the adjustable range of–40~40(DN).

  ・Register name   Black Level

  ・VAL   -80 〜 80（1.000000 step）

 (Example)

  BlackLevel : 10

⊟ **Black Level Selector**	All	
Black Level	10.000	
Balance White Auto	Off	

Figure 4-2-5-5 Black Level

4.2.5.6 Setting Balance White Auto

Sets the Balance White Auto.

  ・Register name   Balance White Auto

  ・VAL   Off / Once / Reset

 (Example)

  Balance White Auto : Once

⊞ **Black Level Selector**	Blue	
Balance White Auto	Once	▼
Gamma	Off	
⊞ **Color Transformation Co...**	Once	
⊞ **Digital IO Control**	Reset	

Figure 4-2-5-6 Balance White Auto

4.2.5.7 Setting Gamma correction

Sets the gamma correction value.

  ・Register name   gamma

  ・VAL   0.250 〜 4.000

 (Example)

  gamma : 1.000

Balance White Auto	Off	
Gamma	1.000	
⊞ **Color Transformation Control**		

Figure 4-2-5-7 Gamma

 See 4.9 Gamma Correction setting.

4.2.6 Color Transformation Control

4.2.6.1 Color Transformation settings

Set whether Color Transformation is enabled or disabled.

Color Transformation is a function that converts an RGB value into another RGB value using the following formula.

$$
\begin{bmatrix} R' \\ G' \\ B' \end{bmatrix} = \begin{bmatrix} Gain00 & Gain01 & Gain02 \\ Gain10 & Gain11 & Gain12 \\ Gain02 & Gain21 & Gain22 \end{bmatrix} \begin{bmatrix} R \\ G \\ B \end{bmatrix} + \begin{bmatrix} Offset0 \\ Offset1 \\ Offset2 \end{bmatrix}
$$

When using Color Transformation, turn it on (On).

    ・Register name   Color Transformation Enable

    ・VAL   False / True   (Disable/Enable)

   (Example)

    Color Transformation Enable : False

⊟ **Color Transformation Control**	
Color Transformation Enable	☑
⊞ **Color Transformation Value Selector**	Gain 00
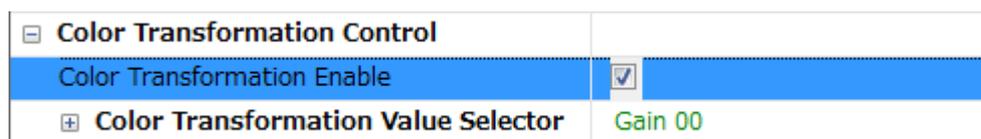
Figure 4-2-6-1 Color Transformation Enable

4.2.6.2 Select Color Transformation item

Select the setting item of Color Transformation Value.

Select 9 types from Gain 00 to Gain 22 and 3 types from Offset 0 to Offset 2.

    ・Register name   Color Transformation Value Selector

    ・VAL   Gain 00,Gain 01,Gain 02,Gain 10,Gain 11,Gain 12,Gain 20,

                                 Gain 21,Gain 22,Offset 0,Offset 1,Offset 2

   (Example)

    Color Transformation Value Selector : Gain 01

Color Transformation Enable	☑	
⊟ **Color Transformation Value Selector**	Gain 01 ▼	
Color Transformation Value	Gain 00	
⊞ **Digital IO Control**	Gain 01	
⊞ **Encoder Control**	Gain 02	
⊞ **User Set Control**	Gain 10	
⊞ **Transport Layer Control**	Gain 11	
⊞ **NED additional features**	Gain 12	
⊞ **NED factory only**	Gain 20	
	Gain 21	
	Gain 22	
	Offset 0	
	Offset 1	
	Offset 2	
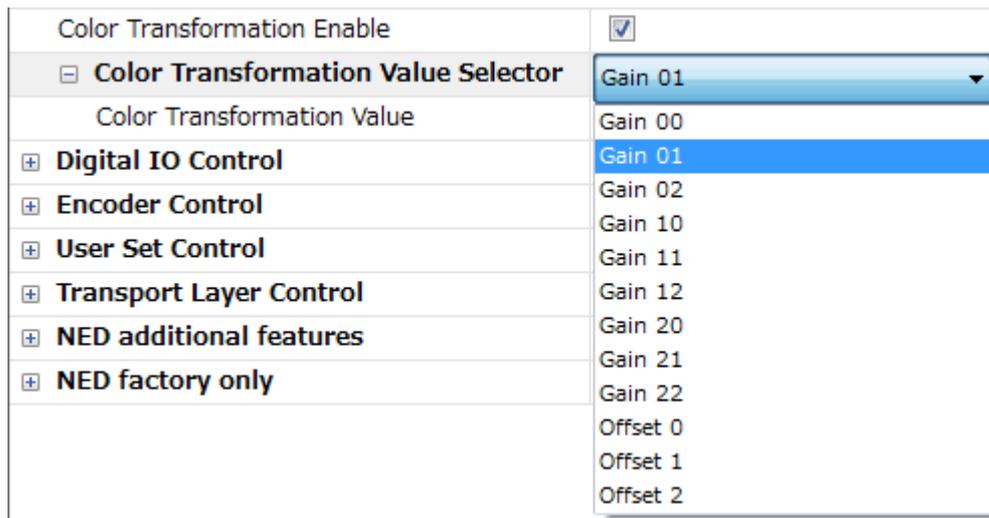
Figure 4-2-6-2 Color Transformation Value Selector

4.2.6.3 Setting Color Transformation Value

Set the Color Transformation Value.

Enter values for Gain 00 to Gain 22 and Offset 0 to Offset 2.

   ・Register name   Color Transformation Value

   ・VAL   Gain ** : -3.0 ～ +3.0

             Offset * : -512 ～ +512

  (Example)

   Color Transformation Value ： 1.000

Color Transformation Value Selector	Gain 01	
Color Transformation Value	1.000	
Digital IO Control		
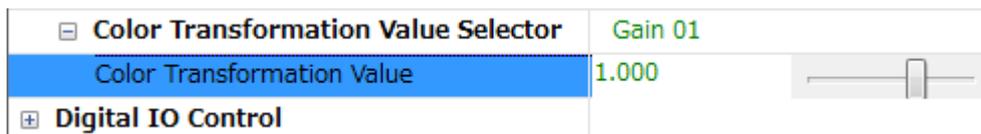
Figure 4-2-6-3 Color Transformation Value

4.2.7 Digital IO Control

4.2.7.1 Setting I/O signal

Sets I/O signal.

   ・Register name   Line Selector

   ・VAL   LineIn1 / LineIn2 / LineIn3(input) /

             LineOut1 / LineOut2(output)

  (Example)

   Line Selector : LineIn1

Line Selector	LineIn1
Line Mode	LineIn1
Line Inverter	LineIn2
Line Status	LineIn3
Line Source	LineOut1
Line Format	LineOut2
	TTL
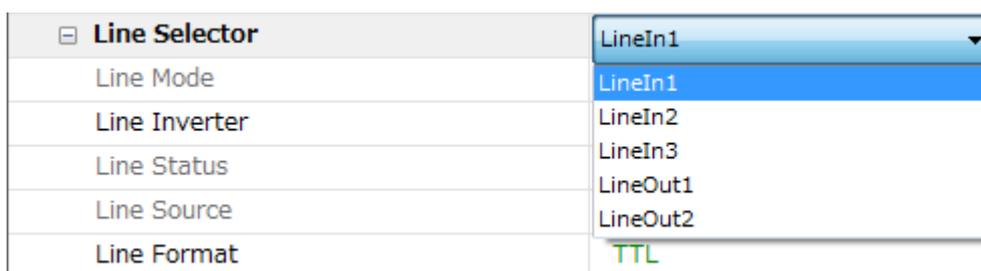
Figure 4-2-7-1 Line Selector

＊See Table 3-4-1 External Trigger Connector Pin Assignments for the relation with
 VAL (LineIn/ LineOut) and the corresponding pins.

4.2.7.2 Setting Line Mode

The "Line Mode" can be set automatically when the"Line Selector" is set.

When "LineIn" of "Line Selector" is set, "Input" appears.

When "LineOut" of "Line Selector" is set, "Output" appears.

Figure 4-2-7-2 Line Mode

4.2.7.3 Setting Input Signal Polarity Reversal

Sets Input signal polarity reversal.

・Register name   Line Inverter

・VAL   False(Uncheck the box)

                              (Disabling Input signal polarity reversal)

                        True(Check the box)

                              (Enabling Input signal polarity reversal)

(Example)   (Enabling Input signal polarity reversal)

   Line Inverter : On

Figure 4-2-7-3 Line Inverter

4.2.7.4 Setting Line Source

Sets Line Source.

・Register name   Line Source

・VAL   Off / Acquisition Active / Frame Active /

                        Exposure Active/Encorder1 /

                        LineIn1/LineIn2/LineIn3(input) /

                        LineOut1/LineOut2(output）

(Example)

   Line Source : LineIn1

Figure 4-2-7-4 Line Source

4.2.7.5 Setting I/O Signal Format

Sets I/O signal format.

    ・Register name   Line Format

    ・VAL   TTL / RS422NotTerminate / RS422Terminate / LVDS

  (Example)

    Line Format : TTL

Figure 4-2-7-5 Line Format

＊See Section 3.4.1 to 3.4.7 for Input and Output of RS422、LVDS and TTL.

4.2.7.6 Setting External Line Trigger Chattering Prevention

This register enables the feature to prevent chattering or other unexpected variations in the signal.

   ・Register name   NED_LineMaskTimeR

               NED_LineMaskTimeF

   ・VAL   0～1000000 (change invalid period)：(µs)
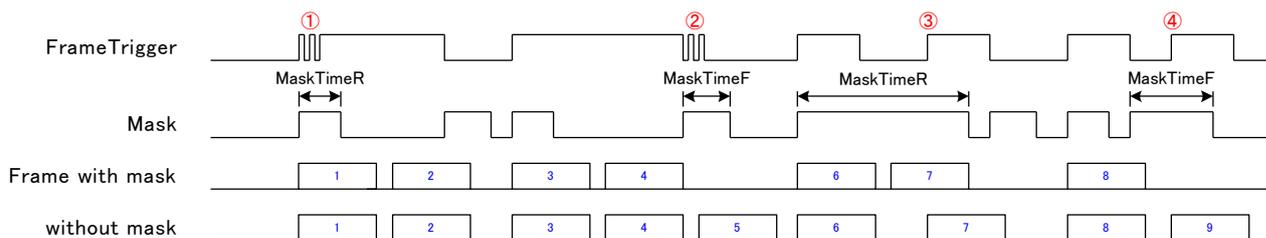
Figure 4-2-7-6 External Line Trigger Input Mask Effect

①NED_LineMaskTimeR : The time during which changes in the signal rising edge are invalid
②NED_LineMaskTimeF : The time during which changes in the signal falling edged are invalid
 Using this function you can control the generation of unwanted frames due to unexpected variations in the signal.
③If you set NED_LineMaskTimeR to too large a value, valid trigger changes may go undetected and frames will not be generated, so set the value as small as possible.
④If you set NED_LineMaskTimeF to too large a value, valid trigger changes may go undetected and unwanted frames will be generated, so set the value as small as possible.

4.2.8 Encoder Control

4.2.8.1 Setting Encoder Control

Sets Encoder control.

Only "Encoder1" can be selected.

   ・Register name   Encoder Selector

   ・VAL   Encoder1

Figure 4-2-8-1 Encoder Selector

4.2.8.2 Setting Input Signal for Encoder Source A

Sets Input signal for Encoder Source A.

・Register name   Encoder Source A

・VAL   off / LineIn1 / LineIn2 / LineIn3

(Example)   (when "LineIn1" is set on "Encoder Source A")

Line Format : LineIn1

Figure 4-2-8-2 Encoder Source A

4.2.8.3 Setting Input Signal for Encoder Source B

Sets Input signal for Encoder Source B.

・Register name   Encoder Source B

・VAL   Off / LineIn1 / LineIn2 / LineIn3

(Example)   (when "LineIn2" is set on "Encoder Source B")

Line Format : LineIn2

Figure 4-2-8-3 Encoder Source B

4.2.8.4 Setting Encoder Mode

Selects the method to decode the encoder pulse.

This can be usedfor trigger signals.

・Register name   Encoder Mode

・VAL   Four Phase(The combination by rising and falling edges on

                        pulses of Phase A and Phase B makes four states.

                        Four states are counted as one cycle of pulse of

                        "Four-phase". This can filter the unnecessary signals such

as the chattering signals by noise)

High Resolution(Any changes by rising and falling edges on pulses of Phase A or Phase B are counted as one cycle of pulse of "High Resolution". This may not work as noise filter for the chattering signals)

(Example)

Encoder Mode: Four Phase (when "Four Phase " is set on "Encoder Mode")

Figure 4-2-8-4-1 Encoder Mode
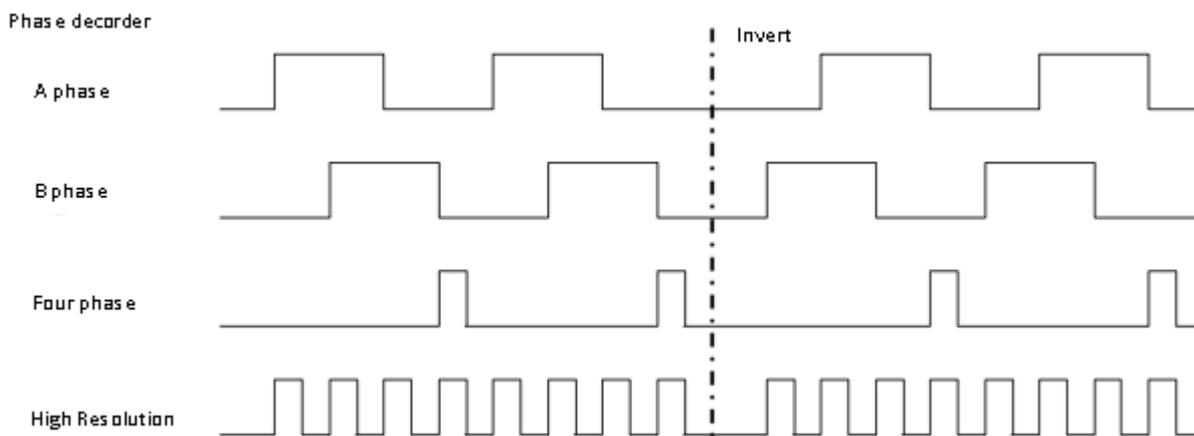
Figure 4-2-8-4-2 Encoder Mode

4.2.8.5 Setting Encoder Divider

Sets numbers of Encoder Divider for outputting the pulse when the encoder input of the specified number is acquired.

    ・Register name   Encoder Divider

    ・VAL   1～200

(Example)   (when "10" is set on "Encoder Divider")

Encoder Divider : 10

Figure 4-2-8-5 Encoder Divider

4.2.8.6 Setting Encoder Output Mode

Sets the Encoder Output Mode to output the pulse.

・Register name   Encoder Output Mode
・VAL   Off(Output no pulse)
                        Position Up(Pulse output when new position in normal
                        rotation direction is detected)
                        Position Down(Pulse output the pulse when new position in
                        reverse rotation direction is detected)
                        Direction Up(Pulse output in normal rotation direction)
                        Direction Down(Pulse output in reverse rotation direction)
                        Motion(Pulse output in normal and reverse rotation
                        directions)

(Example)   (when "Position Up " is set on "Encoder Output Mode")

Encoder Output Mode : Position Up

Figure 4-2-8-6 Encoder Output Mode

4.2.8.7 Setting Encoder Status

Reads the Encoder status.

・Register name   Encoder Status
・VAL   Encoder Up(Encoder counter increasing)
                        Encoder Down(Encoder counter decreasing)
                        Encoder Idle(Encoder counter stopping)
                        Static(No operation in time of Encoder Timeout)

4.2.8.8 Setting Time of Encoder Timeout

Sets the time of Encoder Timeout.
The status becomes "Encoder Idle" if the Encoder counter does not change during this
time.

・Register name   Encoder Timeout
・VAL   0～60000000

(Example)   (when "10μsec" is set on "Encoder Timeout")

Encoder Timeout : 10

Encoder Status	Encoder Static
Encoder Timeout	10.000
Encoder Reset Source	Off
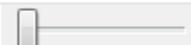
Figure 4-2-8-8 Encoder Timeout

4.2.8.9 Setting Encoder Reset Signal

Sets the Encoder Reset signal.

・Register name   Encoder Reset Source

・VAL   Off(No Reset Source) / Acquisition Start / Acquisition End /

Frame Start / Frame End / Exposure Start / Exposure End /

LineIn1 / LineIn2 / LineIn3

(Example)   (when "Frame End" is set on "Encoder Reset Source")

Encoder Reset Source : Frame End

Encoder Timeout	10.000
Encoder Reset Source	Frame End ▼
Encoder Reset Activation	Off
Encoder Reset	Acquisition Start
Encoder Value	Acquisition End
Encoder Value At Reset	Frame Start
⊞ **User Set Control**	Frame End
⊞ **Transport Layer Control**	Exposure Start
⊞ **NED additional features**	Exposure End
⊞ **NED factory only**	LineIn1
	LineIn2
	LineIn3

Figure 4-2-8-9 Encoder Reset Source

4.2.8.10 Setting Encoder Reset Activation

Sets the "Encoder Reset Source" to reset.

・Register name   Encoder Activation

・VAL   Rising Edge(Reset by rising edge of Input signal)

Falling Edge(Reset by falling edge of Input signal)

Any Edge(Reset by rising and falling edges of Input signal)

Level High

(Reset state during the period of "High" of Input signal)

Level Low

(Reset state during the period of "Low" of Input signal)

(Example)

Encoder Activation : Rising Edge

Figure 4-2-8-10 Encoder Activation

4.2.9 User Set Control

4.2.9.1 Setting Memory Selection

Selects the location of camera setting data saved in the flash memory.

・Register name   User Set Selector

・VAL   Default / User Set 1(Factory setting / User setting)

(Example)

User Set Selector : User Set 1

Figure 4-2-9-1 User Set Selector

4.2.9.2 Setting Memory Loading

(Reading the camera setting data from the flash memory)

The camera setting data selected by "User Set Selector" is read from the flash memory and is used to operate the camera.

・Register name   User Set Load

・VAL   Execute()

(Example)

User Set Selector : User Set 1(Selecting User setting)

User Set Load : Execute()(Loading User setting data)

Figure 4-2-9-2 User Set Load

4.2.9.3 Setting Memory Saving

(Saving the camera setting data into the flash memory)

The current camera setting data is saved in the flash memory.

・Register name   User Set Save

・VAL   Execute()

(Example)

User Set Selector : User Set 1(Selecting User setting)

User Set Save : Execute()(Saving User setting data)

User Set Load	Execute()	
User Set Save	Execute()	
User Set Default	User Set 1	
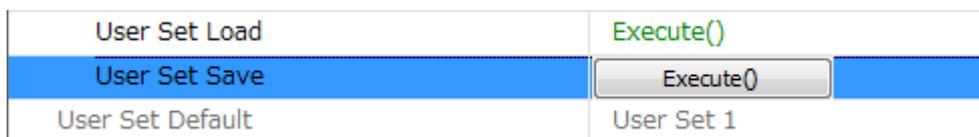
Figure 4-2-9-3 User Set Save

4.2.9.4 Resetting Factory camera setting

Follow the steps below to set the camera setting at the time of factory shipping.

①Select "Default" on "User Set Selector"

User Set Selector : Default

⊟ **User Set Control**	
⊟ **User Set Selector**	Default ▾
User Set Load	Default
User Set Save	User Set 1
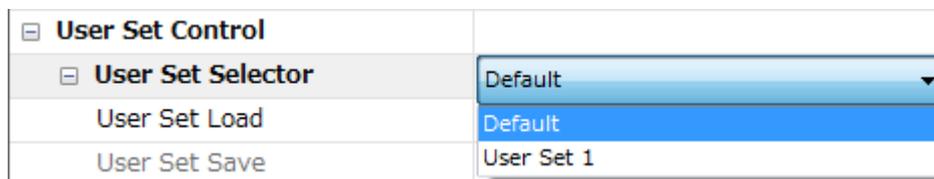
Figure 4-2-9-4-1 User Set Selector

②Set the "Execute()" on "User Set Load "

User Set Load : Execute()

The camera setting data at the time of factory shipping is read from the flash momory and is used to operate the camera.

⊟ **User Set Selector**	Default	
User Set Load	Execute()	
User Set Save	Execute()	

Figure 4-2-9-4-2 User Set Load

* The camera setting data at factory shipping can be used to operate the camera by the step ② until the power for camera is off.

After the power is off and then on, the previous camera setting data is used to operate

the camera unless the step ③ below is not followed.

③Set the "Execute()" on "User Set Save "

User Set Save : Execute()

The camera setting data at factory shipping can be used to operate the camera even after the power for camera is off.

User Set Load	Execute()
User Set Save	**Execute()**
User Set Default	User Set 1

Figure 4-2-9-4-3 User Set Save

4.2.10 Transport Layer Control

4.2.10.1 Setting Persistent IP

Sets IP by checking the box.

・Register name   Gev Current IP Configuration Persistent IP

・VAL   True/False

Transport Layer Control	
Payload Size	6291456
GigE Vision	
Gev Supported Option Selector	User Defined Name
Gev Interface Selector	0
Gev MAC Address	D8-16-0A-00-C0-01
Gev Current IP Configuration LLA	☑
Gev Current IP Configuration DHCP	☑
Gev Current IP Configuration Persistent IP	☐
Gev Current IP Address	169.254.19.134
Gev Current Subnet Mask	255.255.0.0
Gev Current Default Gateway	0.0.0.0
Gev Persistent IP Address	
Gev Persistent Subnet Mask	
Gev Persistent Default Gateway	

Figure 4-2-10-1 Gev Current IP Configuration Persistent IP

When the box is checked, Persistent IP address, Persistent Subnet mask and Persistent Default gateway are effective.

4.2.10.2 Packet Size

Packet size can be changed via the GevSCPSPacketSize camera register.

　・Register name　　　　　　　 Gev SCPS Packet Size
　・VAL　　　　　　　　　　　 512 ～ 9152 *
　　　(Example)
　　　　Gev SCPS Packet Size　 :　8964

Figure 4-2-10-2 Gev SCPS Packet Size

1 packet contains not only image data, but also a data header with transmission information. Therefore, by increasing the packet size, the number of packets to send can be reduced, reducing the overall data volume.

Notes:

Do not set the size larger than your network's MTU (Maximum Transmission Unit).Doing so will result in image data not being able to be sent.

4.2.10.3 Packet Delay

Packet Delay can be set via the following register.

・Register name   Gev SCPD

・VAL   0～4294967295

(Example)

Gev SCPD ： 50

Gev SCPS Packet Size	8964	
Gev SCPD	50	
Gev SCDA	169.254.132.111	
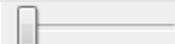
Figure 4-2-10-3 Gev SCPD

Notes:

Packet Delay is set to 0 at the time of shipping; however it should be set to as large a value as possible to obtain stable image data.

However, if the value is too large, the frame rate will drop. See 4.4 "Calculating the maximum value of packet delay" to set the most suitable value.

4.2.11 NED additional features

4.2.11.1 Setting Pixel Correction

Sets the method of the pixel correction.

・Register name   NED_FFCMode

・VAL   Disable   (Factory black correction)

Factory white   (Factory black and white correction)

User white   (Factory black and user white correction)

User black + Factory white

(User black and factory white correction)

User black + User white

(User black and user white correction)

(Example)

NED_FFCMode : User white

Figure 4-2-11-1 NED_FFCMode

4.2.11.2 Setting Pixel Correction Target Value

Sets the target level of the white pixel correction data.
Usually use "800" of factory setting as the target level but changeit
correspondingly.

・Register name   NED_PRNUTarget

・VAL   0 to 1023 (in increments of 1DN))

(Example)

NED_PRNUTarget : 800

Figure 4-2-11-2 NED_PRNUTarget

4.2.11.3 Saving White Pixel Correction Data

Acquires current white pixel correction data and saves it in the flash memory.

One set of correction data can be saved for each step of analog gain.

    ・Register name   NED_PRNUCalibration

    ・VAL   Execute()

(Example)

    NED_PRNUCalibration : Execute()

NED_PRNUTarget	800
NED_PRNUCalibration	Execute()
NED_FPNCalibration	Execute()

Figure 4-2-11-3 NED_PRNUCalibration

4.2.11.4 Saving Black Pixel Correction Data

Acquires current black pixel correction data and saves it in the flash memory.

One set of correction data can be saved for each step of analog gain.

    ・Register name   NED_FPNCalibration

    ・VAL   Execute()

(Example)

    NED_FPNCalibration : Execute()

NED_PRNUCalibration	Execute()
NED_FPNCalibration	Execute()
NED_ObjectDirectionMode	Forward

Figure 4-2-11-4 NED_FPNCalibration

4.2.11.5 Setting conditions of White pixel correction and Black correction

◆ Setting conditions of white pixel correction

Remove the lens cap so that light enters the camera. Place a uniformly white object fully in the camera view. Now Arbitrary white correction data can be acquired.

When this is done with the lens attached, lens and illumination shading will also be corrected at the same time.　However, dark and light details of the white object will be picked out, so the lens should be defocused.

◆ Setting condition of black pixel correction

 Put on a lens cap to darken the camera view.

4.3 Setting Procedure of External Trigger Settings (for Examples)

4.3.1 One-phase Trigger setting (for Example)

This is the setting procedure in the case that "LineIn3" as "Line Selector" and "TTL" as "Line Format" are used.

① Setting No-Permission before using External Trigger
   After selecting "Trigger Selector"in the categories of "Acquisition Control", set as follows.

   Trigger Selector : Exposure Start   (See section 4.2.4.2)
   Trigger Mode: Off   (See section 4.2.4.3 but set "Off" at this time)

   Note: Do not skip the step ① above, otherwise the wave pattern and the image may not be output properly.

② Setting "Line Selector" and "Format" of External Trigger Signal
   (LineIn1/ LineIn2/ LineIn3)
   (TTL/RS422NotTerminate/RS422Terminate/LVDS)
   After selecting "Line Selector"in the categories of "Digital IO Control",
   (Example)   "LineIn3" and "TTL"
   Line Selector : LineIn3   (See section 4.2.6.1)
   Line Format : TTL   (See section 4.2.6.5)

   Remark: Other External Trigger Signal format can be set on the remaining selection of "Line Selector".   These settings can be saved in selection of "Line Selector" respectively.

③ Selecting External Trigger Signal Type
   External Trigger Signal Type can be set below.
   After selecting "Trigger Sourcer" in the categories of "Acquisition Control", set as follows.
   (Example)   "LineIn3" and "Rising Edge"
   Trigger Source : LineIn3
   Trigger Activation : Rising Edge

④ Setting Permission before using External Trigger Setting
   After selecting "Trigger Mode" in the categories of "Trigger Selector", set as follows.

Trigger Mode : On   (See section 4.2.4.3)

Remark: The above settings can be saved. (See section 4.2.8.3 "Setting
          Memory Saving")

4.3.2 Two-phase Trigger setting (for Example)

This is the setting procedure in the case that "LineIn1" and "LineIn2" as
"Line Selector" and "HighResolution" as "Encoder Mode" are used.

①   Setting No-Permission before using External Trigger
    After selecting "Trigger Selector" in the categories of "Acquisition Control",
    set as follows.
    Trigger Selector : Exposure Start   (See section 4.2.4.2)
    Trigger Mode : Off   (See section 4.2.4.3 but set "Off" at this time)

Note: Do not skip the step ① above, otherwise the wave pattern and
      the image may not be output properly.

②   Setting External Trigger Signal Format
    (LineIn1/ LineIn2/ LineIn3) and
    (TTL/RS422NotTerminate/RS422Terminate/LVDS)
     Set this according to sections 4.2.6.1 and 4.2.6.5.
     This setting is not required if the existing setting remains.

③   Selecting External Trigger Signal Type for Encoder Source A   (LineIn1)
    After selecting "Encoder Source A" in the category of "Encoder Control",
    set as follows.
    (Example) LineIn1
       Encoder Source A: LineIn1
       See section 4.2.7.2

④   Selecting External Trigger Signal Type for Encoder Source B
    After selecting "Encoder Source B" in the category of "Encoder Control",
    set as follows.
    (Example) LineIn2
       Encoder Source B: LineIn2
       See section 4.2.7.3

⑤   Selecting Encoder Mode
　　After selecting "Encoder Mode" in the category of "Encoder Control"
　　set as follows.
　　(Example)   HighResolution
　　　Encoder Mode: HighResolution
　　　See section 4.2.7.4

⑥   Selecting External Trigger Signal Type
　　"External Trigger Signal Type" can be set below.
　　　After selecting "Trigger Selector" in the category of "Acquisition Control",
　　　set as follows.
　　　(Example) Encoder 1 and Rising Edge
　　　　Trigger Source : Encoder1
　　　　Trigger Activation : Rising Edge

⑦   Setting Permission before using External Trigger Setting
　　After selecting "Trigger Mode" in the categories of "Trigger Selector",
　　set as follows.
　　　Trigger Mode : On　　　　　(See section 4.2.4.3)

Remark:　The above settings can be saved. (See section 4.2.8.3　"Setting
　　　　　Memory Saving")

4.3.3 Software Trigger setting (for Example)
This is the setting procedure in the case that "Software Trigger" are used.

①   Select the trigger type.
　　Set the TriggerSelector in the Acquisition Control category to Frame Active.
　　Trigger Selector : Frame Active

②   Turn on the trigger mode.
　　Trigger Mode : On

③   Selection of the external trigger signal
　　Set TriggerSource in the Acquisition Control category to Software.
　　　Trigger Source : Software

④   Trigger signal input
The trigger signal is entered when the TriggerSoftware in the Acquisition Control
category is executed.
Trigger Software : Execute()

Remark: The above settings can be saved. (See section 4.2.8.3   "Setting
Memory Saving")

4.4 Calculating the Maximum Value of Packet Delay

   The maximum value for the packet delay setting can be calculated as below.
In order to achieve the desired frame rate without dropping frames, it is necessary to
set a value smaller than the maximum packet delay.

Payload Size = Width x Height x (No. of Bytes/pixel)
                                RGB8Packed : 3 Byte/pixel
 No. of packets in 1 frame = Payload Size / (Packet Size-Data Header:36 Bytes)
    Transfer time for 1 frame=(Payload Size+No. of packets/frame x Data Header)
                                /Gigabit Ethernet Transfer Rate (Max 125 Mbyte/s)
 Notes:
The maximum Gigabit Ethernet transfer rate may vary depending on the processing
power of your PC and NIC. Allowing some margin, it is recommended to calculate
around 110~120 Mbytes/s.

   1 Frame Scan Period = 1 Line Scan Period x Height

   1 Frame Time Margin = 1 Frame Scan Period - 1 Frame Transfer Period
   Packet Delay Time = 1 Frame Time Margin / No. of packets/frame

   Max. Packet delay value = Packet Delay time [ns] x 60 / 1000

e.g. Minimum scan period at 4096 pixels (Width: 4096, Height: 2048, RGB8Packed,
     1 Line Scan Period: 200.0us. Packet Size: 4000, Transfer Rate: 120Mbyte/s)

   Payload Size   = 25165824 (Bytes/Pixel)
   No. of packets/frame   = 6349
   Transfer Period for 1 frame = 211620 [us]
   1 Frame Scan Period   = 409600 [us]
   1 Frame Time Margin   = 197980 [us]
   Packet Delay Time   = 31182.9 [ns]
   Packet Delay Setting Value = **1871**

   (Framerate = 2.5 [fps])

4.5 Exposure Mode and Timing

The camera has three exposure modes.

4.5.1 Free run Exposure Mode

The free run exposure mode can be used when the "Trigger Mode" is "Off" (Disable).   (See section 4.2.4.3 but set "Off" at this time)

The Acquisition Line Rate and the Programmable Exposure Time are set in the camera control registers.

The range of the settable Line rate and the programmable exposure time are shown below.

Table 4-5-1-1 Free Run Exposure Time

1/scan	Acquisition Line Rate (Hz)	300～30030
p	Exposure Time (μs)	2.000～3331.000 *1

*1：The programmable exposure time (μs) can be set in increments of 0.100μs.

The relations of the programmable exposure time (μs) and the line rate (Hz) are as follows.

Programmable exposure time ＜＝   （1 / Line rate）- 2.3 μs
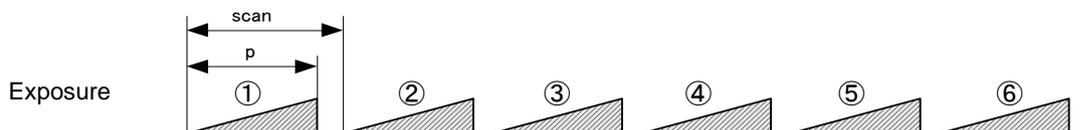
Figure 4-5-1 Free Run Exposure Mode

4.5.2 External Trigger (Timed) Exposure Mode

The external trigger (Timed) exposure mode can be used when "On" (Enable) on "Trigger Mode" and "Timed" on "Exposure Mode" are set.

The line period is determined by the time from rising edge to rising edge of the trigger pulse cycle.   The start of each exposure is determined by the rising edge of the trigger pulse cycle.   The exposure time is set by the programmable exposure time.

The range of the settable line period and the programmable exposure time are shown below.

Table 4-5-2 External Trigger (Timed) Exposure Time

a	Trigger pulse H time (μs)	≧2.9
b	Trigger pulse L time (μs)	≧2.9
c	Trigger pulse cycle (μs)	≧119.0
p	Programmable exposure time (μs)	2.000〜3331.000 *1

*1：The programmable exposure time (μs) can be set in increments of 0.100μs.

The relations of the programmable exposure time (μs) and the line period (μs) are as follows.

Programmable exposure time ＜＝   Line period - 2.3 μs

c: Line period (μs)
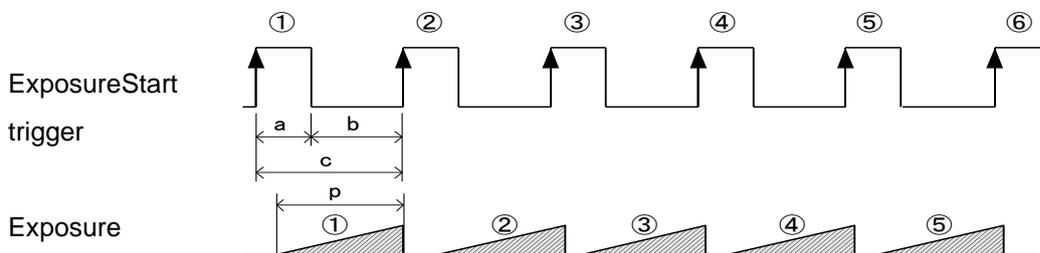
Figure 4-5-2 External Trigger (Timed) Exposure Mode

4.5.3 External Trigger (TriggerWidth) Exposure Mode

The external trigger (Trigger Width) exposure mode can be used when "On" (Enable) on "Trigger Mode" and "Trigger Width" on "Exposure Mode" are set.

The line period is determined by the time from rising edge to rising edge of the trigger pulse cycle.   The start of each exposure is determined by the rising edge of the trigger pulse cycle.   The exposure time is set by the trigger pulse H time.

The range of the settable line period is shown below.

Table 4-5-3 External Trigger (Trigger Width) Exposure Time

a	Trigger pulse H time (μs)	≧15.9
b	Trigger pulse L time (μs)	≧2.9
c	Trigger pulse cycle (μs)	≧119.0
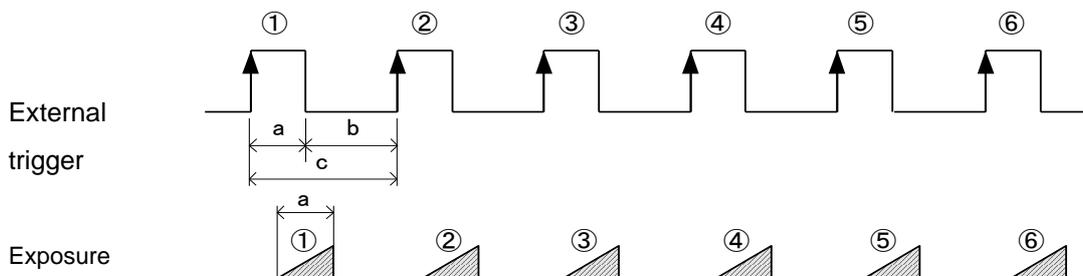
Figure 4-5-3 External Trigger (Trigger Width) Exposure Mode

4.6 Setting Offset

In the diagram below, the horizontal axis indicates the volume of light and vertical axis indicates the output.

Fs shows the output at saturation. Dd shows the output at darkness. (Both Fs and Dd are digital.) Se shows for the saturation current, or the amount of exposure when the output saturates.
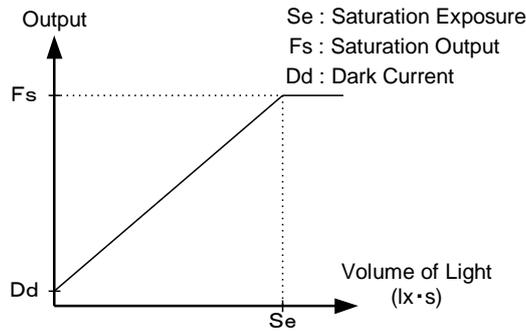
Figure 4-6-1 Saturation Exposure and Dark Current Output

By setting the offset, you can set the Y-intercept arbitrarily. DF shows the digital offset value. The gradients of lines do not change.

See section 4.2.5.3 for setting Offset.
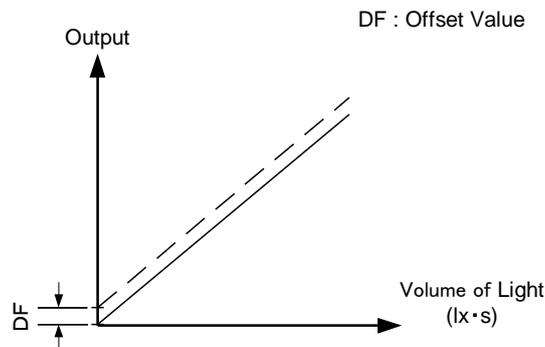
Figure 4-6-2 Offset Adjustment

◆ Adjust gain and offset to meet your system's requirements.

4.7 Setting Gain

The camera can adjust the analog gain (x1 to X10.0 in 8 steps) and the digital gain.

As the diagram below indicates, increasing the gain setting increases the slope of the camera's response curve and results in a higher camera output for a given amount of light.

See section 4.2.5.1 for setting Analog gain and section 4.2.5.2 for setting Digital gain.
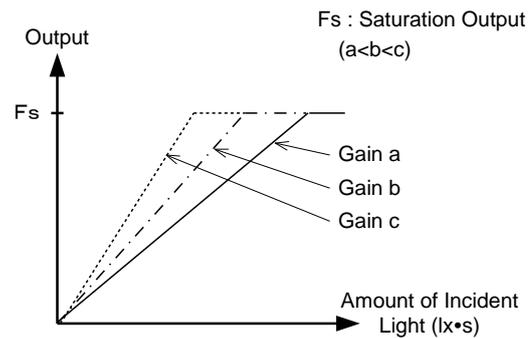
Figure 4-7-1 PGA Gain Adjustment

◆   Gain and noise values are proportionally related.

◆ Adjust amount of gain in accordance with the requirements of your camera system.

Gain-Sensitivity is shown below.

Table 4-7-1 Gain-Sensitivity

	Analog Amplifier		Sensitivity (V/lx□s)
0	x1.00	0.0dB	40
1	x2.00	6.0dB	80
2	x3.00	9.5dB	120
3	x4.00	12.0dB	160
4	x5.00	14.0dB	200
5	x6.00	15.6dB	240
6	x8.00	18.1dB	320
7	x10.00	20.0dB	400

Digital gain x1, Pixel correction: default, (Factory white correction data, Correction level 800DN)

4.8 Pixel Correction

Generally speaking, image sensors (CCD, CMOS and so on) have fixed pattern noise and photo response non-uniformity. When you use the lens,   lens shadings and light sources also can cause non-uniformity. The camera is set to the optimal correction before shipping in order to provide images of high grade. The camera also has the function of user white correction to cope with lens shading and non-uniform illumination.

Cal_bl : Output data of each pixel at perfectly dark (factory correction)
Cal_wh : Output data of each pixel in uniform illumination (factory correction)
         or in taking a picture of subject for correction (user white correction)
Target_Val : Target value for user correction (10bit output conversion value)
Vin:Input data (Before correction)   Vout :Output data (After correction)
The corrected data is expressed in the following equation.
Vout=(Vin-Cal_bl) x Target_val / (Cal_wh-Cal_bl)
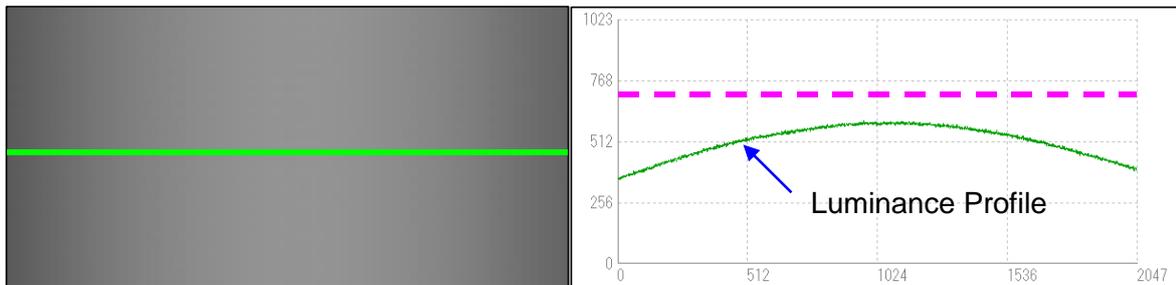
Image "before" user arbitrary pixel is corrected.   Green line is Luminance Profile
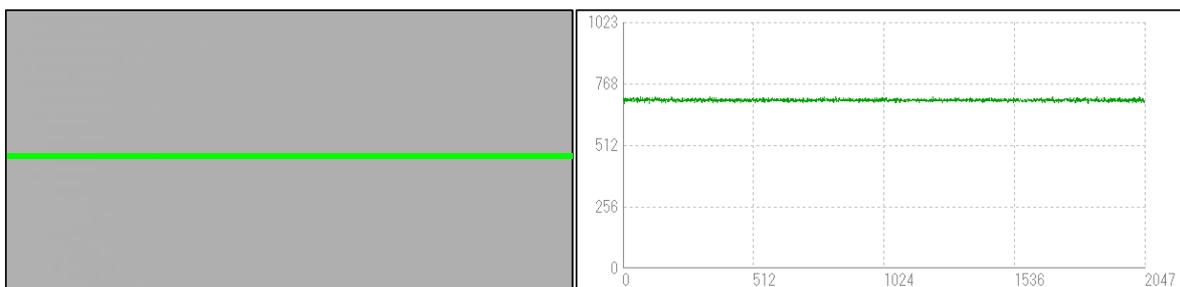
Image "after" user arbitrary pixel is corrected.   Green line is Luminance Profile

Figure 4-8-1 Waveform and image before and after bit correction

4.9 Gamma Correction Setting

Switches Gamma correction value.

The relation between Input and Output should be calculated to the following formula.

Output = 1023* (Input / 1023) ^ (gamma)
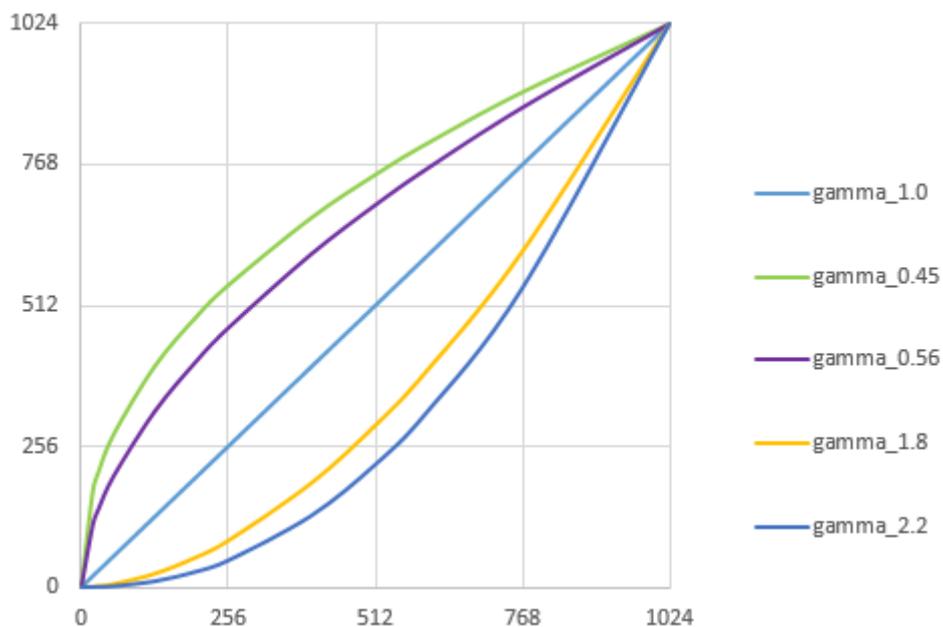
Figure 4-9-1 Gamma Correction Characteristics

5 Basic Camera Setting Checks

5.1 Before Power On

Check whether there are any dents or scratches on the camera. There might have been damage to the camera's connectors or internals during transport.

①Check the pin assignments of the power cable(See figure 3-3-1 and table 3-3-1)

②Check that your network device supports 1000-Base T and Jumbo Frames.

Note:

If your device does not support the above, the network transfer speed will be adjusted to that of the slowest device. It may not be possible to capture images correctly due to data loss.

③Check the devices' interconnectivity.

Note:

Use a CAT-5e or above LAN cable. In cases where cable length is long, CAT-6 or above is recommended.

Be sure that the network on which you connect your GigE camera is a dedicated network and not shared with any other data transmitting devices. Not only will image data not be correctly obtained, it may also interfere with the data transmission.

If you are connecting multiple cameras, check the camera output data rate and the network bandwidth, and set the packet delay appropriately.(See 4.4)

5.2 After Power On

①Using a GENiCAM™ compatible camera control software package (such as the included GigEGrab), execute camera discovery and confirm that the camera features can be read.

②Set the exposure mode (trigger mode), video output format, etc.

③Start image capture with a GigE Vision® compatible viewer software package.

Note:

If you are using a firewall or security software, it may not be possible to receive image data. In this case either change the settings or stop the software.

6 Sensor Handling Instructions

6.1 Electrostatic Discharge and the Sensor

The CMOS sensors are susceptible to damage from electrostatic discharge and can deteriorate as a result. Take care when handing the sensor.

6.2 Protecting Against Dust, Oil and Scratches

The CMOS sensor window is part of the optical path and should be handled like other optical components with care. If you use the camera in a dusty area, prepare a dust-proof enclosure. Dust can obscure pixels, producing dark lines on the image.

6.3 Cleaning the Sensor Window

Dust: Can usually be removed by blowing the window surface using a compressed air blower.

Oil: Wipe the window with a lint-free cloth wiper moistened with ethyl alcohol carefully and slowly.

When there is dust or smudges on the sensor window, it appears in the same way as noise on the image. Please remove it appropriately.

7 Troubleshooting

The following pages contain several troubleshooting charts that can help you find the cause of problems users sometimes encounter.

7.1 No Image

| The indicator is glowing. | **No** → | The camera has the correct connections with the power source. | **No** |

Yes ↓

Yes ↓

| The power source meets the specified voltage. | **No** |

Yes ↓

| After power on, the power source meets the specified voltage. | **No** |

Yes ↓

| The capacity of the power source is sufficient | **No** |

The camera may be out of order. Please contact us for service.

Yes

Use a power source that meets the specifications.

| The camera has the correct connection with the LAN cables. | **No** → | **Connect the camera and the PC with LAN cables.** |

Yes ↓

| Is the connected device 1000BASE-T compatible? | **No** → | **Use a 1000BASE-T compatible device as your network adapter.** |

Yes ↓

| Can discovery be performed and feature registers read? | **No** → | Are you using the supplied GigEGrab software? | **No** |

Yes

| Can the feature registers be read using the supplied GigEGrab software? | **No** |

To next page
B

Yes ↓

To next page
A

To next page
B

Yes

Check whether the software supports GENiCAM, and whether the registers are set correctly.

A **B** → Is the LAN port set up correctly?

Yes ↓ | **No** →

Set up the LAN port correctly.

The camera may be out of order. Please contact us for service.

The capture software program is custom made. | **No** → Check whether the software included on the GigEGrab can capture images.

Yes ↓

With the GigEGrab sample software program provided, no image is captured. | **No** → The capture software must support the camera's pixel format.

Yes ↓

Images cannot be captured even when the firewall/security software is turned off. | **No** → Change the firewall/security software settings

Nothing blocks off the light. | **No** → If a lens cap is attached, take it off.

Yes ↓

The amount of illumination is enough. | **No** →

Yes ↓

No image at the full aperture. | **No** →

Yes ↓

The optical axes of the camera and the image sensor are aligned. | **No** → Check the light source. If the images are too dark, try to increase the light intensity, and vice versa.

↓

The camera may be out of order. Please contact us for service.

7.2 Noise on Image

Noise is present from the beginning.

No → The camera has been used for 3 or more years, or the ambient temperature is higher than room temperature.

Yes ↓

A servomotor or a magnetic valve is placed near the camera.

Yes ↓

Turning on a servomotor or a magnetic valve generates noise.

No

Yes ↓

Prevent the noise source from disturbing LAN cables and the power cable.

The camera has been used for 3 or more years, or the ambient temperature is higher than room temperature.

No

Yes ↓

There are some consumable parts in the camera. Please contact us for service.

The power supply has been used for 3 or more years, or the ambient temperature is higher than room temperature.

No

Yes ↓

Check the deterioration of the power supply.

The camera, LAN cables and the power source cable are in swinging motion.

No

Yes ↓

Check the deterioration of LAN cables and the power supply cable.

The camera may be out of order. Please contact us for service.

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C

C

The power source has no fluctuation in voltage and is not deteriorated.

No

Yes

Use a stable power supply.

When the camera gain is on a high level, bright spots occur without incident light.

No

Yes

Secondary radiation (rays) could cause bright spots, but this is not a malfunction.

The camera may be out of order. Please contact us for service.

7.3 Camera becomes hot

The consumption current of the power supply is larger than the rating.

No

Yes

The camera is too hot to touch.

No

Yes

The camera will become hotter than the ambient temperature while in operation because of self-heating. Allow sufficient air circulation around the camera to give it a longer life.

Keep the ambient temperature within the range the specifications specify.

The camera may be out of order. Please contact us for service.

8 Others

8.1 Notice

- No part of this document may be reproduced in any form, in whole or in part, without the express written consent of NED.

- The contents of this document are subject to change without prior notice.

- Every care has been taken in the preparation of this User's Manual. If you should discover any errors or omissions, please notify your nearest NED representative.

8.2 Contact for support

Nippon Electro-Sensory Devices Corporation

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2-5-12, Itachibori, Nishi-Ku, Osaka 550-0012, Japan

Phone +81-6-6534-5300

Fax +81-6-6534-6080

Tokyo Office

Gibraltar Ohi BLD., Room No.402

1-45-2, Ohi, Shinagawa-Ku, Tokyo 140-0014, Japan

Phone +81-3-5718-3181

Fax +81-3-5718-0331

West Japan Office

Twin Square 1-8-28 Enokida, Hakata-Ku, Fukuoka, 812-0004, Japan

Phone +81-92-451-9333

Fax +81-92-451-9335

URL

http://ned-sensor.co.jp/en

E-Mail

sales@ned-sensor.com

8.3 Product Support

If there is a problem with your camera after checking it in accordance to the troubleshooting, turn off the power and call your NED representative.

When contacting us with a problem, please inform us of the status of the camera.

Revision History

Revision Number	Date	Changes
01	01 Oct 2020	Initial release