

CMOS Camera

CSCS60BM18

PRODUCT SPECIFICATION

TOSHIBA TELI CORPORATION

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<http://www.toshiba-teli.co.jp/en/>

CONTENTS

Restriction For Use.....	1
CASES FOR INDEMNITY (LIMITED WARRANTY).....	2
USAGE PRECAUTIONS	3
1. Overview.....	5
2. Features	5
3. Configuration	5
4.Option part.....	5
5. Specification	6
6. Communication Protocol	12
7. Register Map	16
8. Function.....	22
9. Warranty rules	28
10. Repair	29
11. Appended figure.....	30

Restriction For Use

- Should the equipment be used in the following conditions or environments, give consideration to safety measures and inform us of such usage:
 - (1) Use of the equipment in the conditions or environment contrary to those specified, or use outdoors.
 - (2) Use of the equipment in applications expected to cause potential hazard to people or property, which require special safety measures to be adopted.
- This product can be used under diverse operating conditions. Determination of applicability of equipment or devices concerned shall be determined after analysis or testing as necessary by the designer of such equipment or devices, or personnel related to the specifications. Such designer or personnel shall assure the performance and safety of the equipment or devices.
- This product is not designed or manufactured to be used for control of equipment directly concerned with human life (*1) or equipment relating to maintenance of public services/functions involving factors of safety (*2). Therefore, the product shall not be used for such applications.
 - (*1) : Equipment directly concerned with human life refers to.
 - Medical equipment such as life-support systems, equipment for operating theaters.
 - Exhaust control equipment for exhaust gases such as toxic fumes or smoke.
 - Equipment mandatory to be installed by various laws and regulations such as the Fire Act or Building Standard Law
 - Equipment related to the above
 - (*2) : Equipment relating to maintenance of public services/functions involving factors of safety refers to.
 - Traffic control systems for air transportation, railways, roads, or marine transportation
 - Equipment for nuclear power generation
 - Equipment related to the above

CASES FOR INDEMNITY (LIMITED WARRANTY)

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

- Natural disasters, such as an earthquake and thunder, fire or any other act of God; acts by third parties; misuse by the user, whether intentional or accidental; use under extreme operating conditions.
- In the case of indirect, additional, consequential damages (loss of business interests, suspension of business activities) are incurred as result of malfunction or non-function of the equipment, we shall be exempted from responsibility for such damages.
- In the case damage or losses are caused by failure to observe the information contained in the instructions in this instruction manual and specifications.
- In the case damage or losses are caused by use contrary to the instructions in this instruction manual and specifications.
- In the case damage or losses are caused by malfunction or other problems resulting from use of equipment or software that is not specified.
- In the case damage or losses are caused by repair or modification conducted by the customer or any unauthorized third party (such as an unauthorized service representative).
- Expenses we bear on this product shall be limited to the individual price of the product.
- The item that is not described in specifications of this product is off the subject of the guarantee.
- The attachment mistake of a cable.

USAGE PRECAUTIONS

- Handle carefully

Do not drop the equipment or allow it to be subject to strong impact or vibration, as such action may cause malfunctions. Further, do not damage the connection cable, since this may cause wire breakage.

- Environmental operating conditions

Do not use the product in locations where the ambient temperature or humidity exceeds the specifications.

Otherwise, image quality may be degraded or internal components may be adversely affected. In particular, do not use the product in areas exposed to direct sunlight.

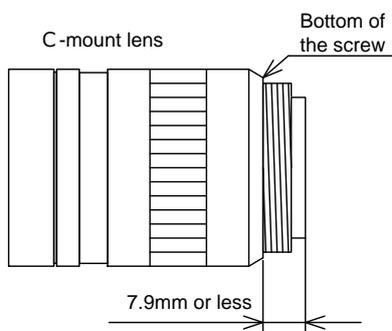
- Combination of C-mount lens

Depending on the lens you use, the performance of the camera may not be brought out fully due to the deterioration in resolution and brightness in the peripheral area, occurrence of a ghost, aberration and others. When you check the combination between the lens and camera, be sure to use the lens you actually use.

When installing a lens in the camera, make sure carefully that it is not tilted.

In addition, use a mounting screw free from defects and dirt. Otherwise, the camera may be unable to be removed.

As for the C-mount lens used combining this product, the projection distance from bottom of the screw should use 7.9mm or less.



- Mounting to a pedestal

When mounting this product to a pedestal, make sure carefully that the lens doesn't touch with the pedestal.

- Do not expose the camera's image-pickup-plane to sunlight or other intense light directly

Its inner CMOS sensor might be damaged CMOS.

- Occurrence of moiré

If you shoot thin stripe patterns, moiré patterns (interference fringes) may appear. This is not a malfunction.

- Occurrence of noise on the scree

If an intense magnetic or electromagnetic field is generated near the camera or connection cable, noise may be generated on the screen. If this occurs, move the camera or the cable

- Handling of the protective cap

If the camera is not in use, attach the lens cap to the camera to protect the image pickup surface.

- If the equipment is not to be used for a long duration

Turn off power to the camera for safety.

- Maintenance

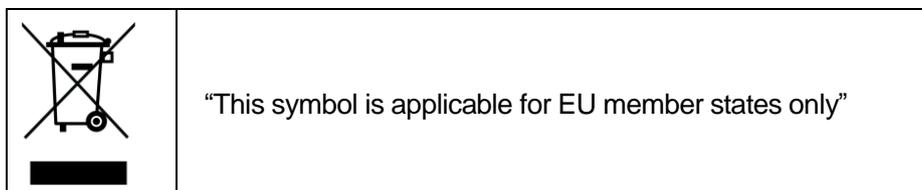
Turn off power to the equipment and wipe it with a dry cloth.

If it becomes severely contaminated, gently wipe the affected areas with a soft cloth dampened with diluted neutral detergent. Never use alcohol, benzene, thinner, or other chemicals because such chemicals may damage or discolor the paint and indications.

If the image pickup surface becomes dusty, contaminated, or scratched, consult your sales representative.

- Disposal

When disposing of the camera, it may be necessary to disassemble it into separate parts, in accordance with the laws and regulations of your country and/or municipality concerning environmental contamination.



[Phenomena specific to CMOS sensor]

■ Defective pixels

A CMOS image sensor is composed of photo sensor pixels in a square grid array. Due to the characteristics of CMOS image sensors, over- or under-driving of the pixels results in temporary white or black areas (as if these are noises) appearing on the screen. This phenomenon, which is not a defect is exacerbated under higher temperatures and long exposure time.

■ Image shading

The brightness of the upper part of the screen may be different from that of the lower part. Note that this is a characteristic of a CMOS image sensor and is not a fault.

1. Overview

This product is an integrated type B/W CMOS camera with a SXGA format all-pixel-data readout CMOS. The model is suited for high-resolution image processing use. Its compact, light-weight body is ideal for system integration.

2. Features

(1) All-pixel reading

The all-pixel reading system allows the camera to read all pixels in just 1/61 second.

(2) Global shutter

As it employs a global electronic shutter similar to a CCD image sensor, clear images of even fast-moving object are obtainable with less blur.

(3) Camera Link interface (power supply type)

By using a Camera Link-capable frame grabber board to which power can be supplied, high-speed transfer of captured images to a PC as well as various types of camera control from the PC are allowed. Power can also be supplied to the camera with only one cable.

(4) Random trigger shutter function

The Random Trigger Shutter function provides images in any timing by input of an external trigger signal.

(5) Scalable

Selectable video output area. This mode achieves higher frame rate by reducing vertical output area.

(6) Compact and lightweight

This product is compact and lightweight; it is easy to integrate into industrial equipment.

(7) EU RoHS & Chinese ROHS

3. Configuration

(1) Camera body..... 1

* No application software and manuals are attached to this product.

4. Option part

(1) Camera mounting kit CPT8560

* Contact your dealer / distributor for details of option units.

5. Specification

5.1. Electrical specifications

(1) Imager	CMOS image sensor
- Device	EV76C560ABT (e2v)
- Number of effective pixels	1280 (H) x 1024 (V)
- Pixel size	5.3 μm (H) x 5.3 μm (V)
- Scanning area	6.78 mm (H) x 5.43 mm (V)
- Optical size	Equivalent to 1/1.8type
- Electronic shutter method	Global shutter
(2) Scanning method	Progressive
(3) Aspect ratio	5:4
(4) Synchronization method	Internal synchronization
(5) Sensitivity	500 lx, F5.6, 3200 K, 1/62s
(6) Scan mode	
- All pixels readout	1280(H) x 1024(V) Approx. 61 fps
- Scalable	Minimum unit size : 64(H) x 64(V)
(7) Gain	
- Analog gain	x1 / x1.5 / x2 / x3
- Digital gain	0.0 to +6.0 dB [1step = 0.1dB]

Note on gain setting:

Setting the gain value too high increases noises. When you adjust the brightness of the image, I ask you to have final image quality checked with your environment

(8) Setup level	
- Factory setting	0 LSB
- Setting range	-64 to 255 LSB [@10bit] -16 to 63 LSB [@8bit]
(9) Gamma	1.0
(10) Power supply	DC12 V \pm 10% (ripple 50 mV(p-p) or less)
(11) Power consumption	0.96W or less

5.2. Internal sync signal specification

(1) Driving frequency	50MHz (1CLK)
(2) Horizontal sync frequency	63.776kHz (1H=784CLK)
(3) Vertical sync frequency	61.02Hz (maximum frequency on all pixel readout mode)

5.3. Electrical shutter specifications

(1) Exposure time	<u>Teli-Legacy mode</u> 1/1 to 1/100,000 [sec]
	<u>GenCP-IIDC2 mode</u> 10 [μsec] to 1 [sec] [1step = 17.486 [nsec]
(2) Shutter mode	Normal Shutter / Random Trigger Shutter / Sequential Shutter
(3) Random Trigger Shutter	
- Fix mode	The exposure time is determined by the set value of the ExposureTime register.
- Bulk mode	The exposure time is determined by the set value of the ExposureTime register. Specified multiple frames output by a single trigger input.

5.4. CameraLink specifications

(1) Image output	Compliant with CameraLink standard Version 1.2
- Output mode	Base configuration 2 tap
(2) TRIG	CameraLink I/F input CC1
- Polarity	High active / Low active
- Pulse width	10 μsec or more
(3) Camera control specification	
	<u>Teli-Legacy mode</u>
- Baud rate	9600bps
- Start bit	1bit
- Data bit	8bit
- Stop bit	1bit
- Parity bit	None
- Handshake	None
	<u>GenCP-IIDC2 mode</u>
- Baud rate	9600, 115200, 921600bps
- Start bit	1bit
- Data bit	8bit
- Stop bit	1bit
- Parity bit	None
- Handshake	None

5.5. Mechanical specifications

- | | |
|----------------|-----------|
| (1) Lens mount | C-mount |
| - Flange back | 17.526 mm |

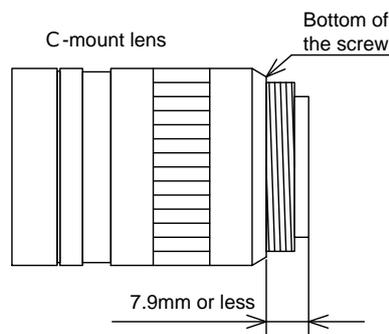
Note on combination of C-mount lens:

Depending on the lens you use, the performance of the camera may not be brought out fully due to the deterioration in resolution and brightness in the peripheral area, occurrence of a ghost, aberration and others. When you check the combination between the lens and camera, be sure to use the lens you actually use.

When installing a lens in the camera, make sure carefully that it is not tilted.

In addition, use a mounting screw free from defects and dirt. Otherwise, the camera may be unable to be removed.

As for the C-mount lens used combining this product, the projection distance from bottom of the screw should use 7.9mm or less.



- | | |
|---|--|
| (2) Dimensions | 29 mm (W) x 29 mm (H) x 26.5 mm (D) |
| | *Not including protrusion |
| (3) mass | approx. 33g |
| (4) Camera body grounding insulation status | Non-conductive between circuit GND and camera body |

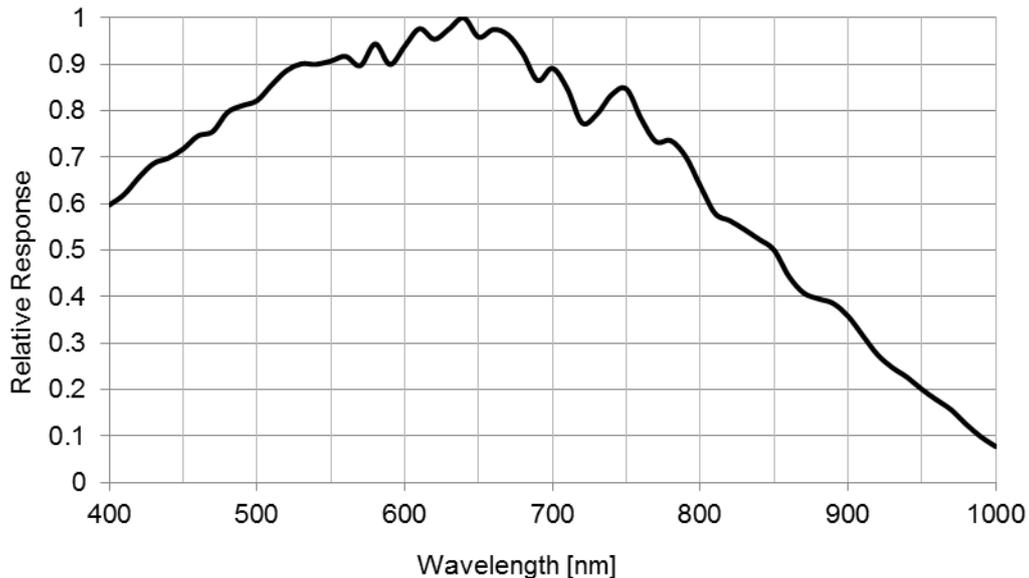
5.6. Optical axis accuracy

	Position accuracy of effective pixels		Rotation accuracy of effective pixels(θ)	Flange back (for 17.526mm)
	(X)	(Y)		
Optical axis accuracy	$\pm 25 \mu\text{m}$	$\pm 25 \mu\text{m}$	$\pm 0.12^\circ$	$\pm 50 \mu\text{m}$

5.7. Operating ambient conditions

- | | |
|-------------------------|---|
| (1) Operation assurance | Temperature : -5 to 45°C
Humidity : 90% or less (no condensation) |
| (2) Storage assurance | Temperature : -20 to 60°C
Humidity : 95% or less (no condensation) |

5.8. Typical spectral response



*The lens characteristics and light source characteristics are not reflected in table.

5.9. Various safety standards.

- | | |
|---|---------------------------------|
| (1) Electro-Magnetic compatibility | |
| - EMI (Electro-Magnetic Interference) | : EN61000-6-4 |
| - EMS (Electro-Magnetic Susceptibility) | : EN61000-6-2 |
| (2) FCC | : FCC Part 15 Subpart B class A |

5.10. Environmental correspondence

- | | |
|--|-----------------|
| (1) RoHS conformity | |
| (2) Administrative Measure on the Control of Pollution Caused by Electronic Information Products
(Popular name: China RoHS) | |
| a) Environmental usage period | : refer to 11.2 |
| b) Poisonous substance content table | : refer to 11.2 |
| c) Toxic substance content table | : refer to 11.2 |

5.11. Connector pin assignment

* When connecting a cable to the camera, please turn off the power supply firstly.

(1) Video output / control (Camera Link Base Configuration)

- Connector type : HDR-EC26FYTG2+ (Manufactured by HTK)

Pin No.	I/O	Signal name	Pin No.	I/O	Signal name
1	-	DC+12V (PoCL)	14	-	GND
2	O	X0-	15	O	X0+
3	O	X1-	16	O	X1+
4	O	X2-	17	O	X2+
5	O	X CLK-	18	O	X CLK+
6	O	X3-	19	O	X3+
7	I	Ser TC+	20	I	Ser TC-
8	O	Ser TFG-	21	O	Ser TFG+
9	I	CC1- (TRIG)	22	I	CC1+ (TRIG)
10	I	CC2+ (Not used)	23	I	CC2- (Not used)
11	I	CC3- (Not used)	24	I	CC3+ (Not used)
12	I	CC4+ (Not used)	25	I	CC4- (Not used)
13	-	GND	26	-	DC+12V (PoCL)

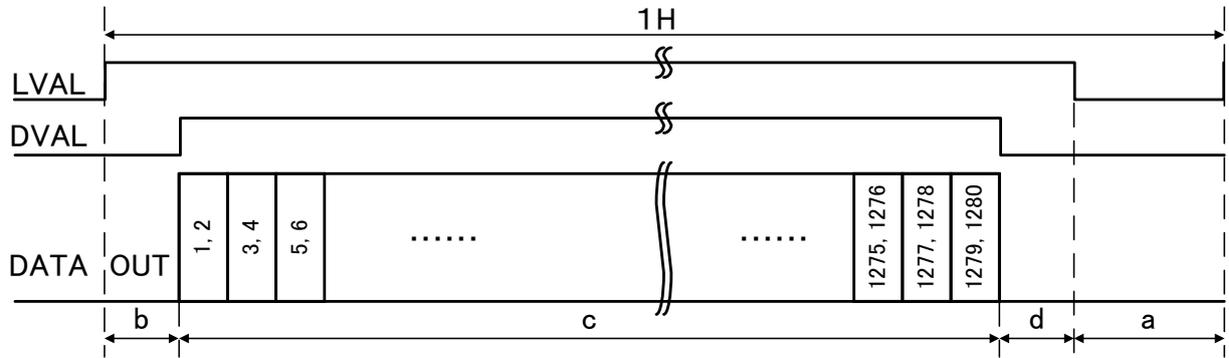
5.12. Camera output bit assignment

Port / Bit	8bit	10bit	Port / Bit	8bit	10bit	Port / Bit	8bit	10bit
Port A0	A[0]	A[0]	Port B0	B[0]	A[8]	Port C0	n/a	B[0]
Port A1	A[1]	A[1]	Port B1	B[1]	A[9]	Port C1	n/a	B[1]
Port A2	A[2]	A[2]	Port B2	B[2]	n/a	Port C2	n/a	B[2]
Port A3	A[3]	A[3]	Port B3	B[3]	n/a	Port C3	n/a	B[3]
Port A4	A[4]	A[4]	Port B4	B[4]	B[8]	Port C4	n/a	B[4]
Port A5	A[5]	A[5]	Port B5	B[5]	B[9]	Port C5	n/a	B[5]
Port A6	A[6]	A[6]	Port B6	B[6]	n/a	Port C6	n/a	B[6]
Port A7	A[7]	A[7]	Port B7	B[7]	n/a	Port C7	n/a	B[7]

*The allocation of the port conforms to the CameraLink standard.

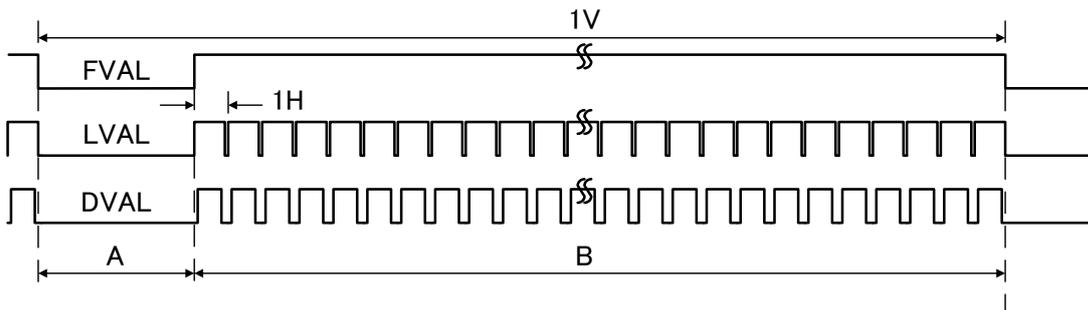
5.13. Timing chart (at all pixel readout)

(1) Horizontal timing



$a=62\text{CLK}$, $b=36\text{CLK}$, $c=640\text{CLK}$, $d=46\text{CLK}$, $1\text{H}=784\text{CLK}$, $1\text{CLK}=50\text{MHz}$

(2) Vertical timing



- Defective pixel correction : OFF

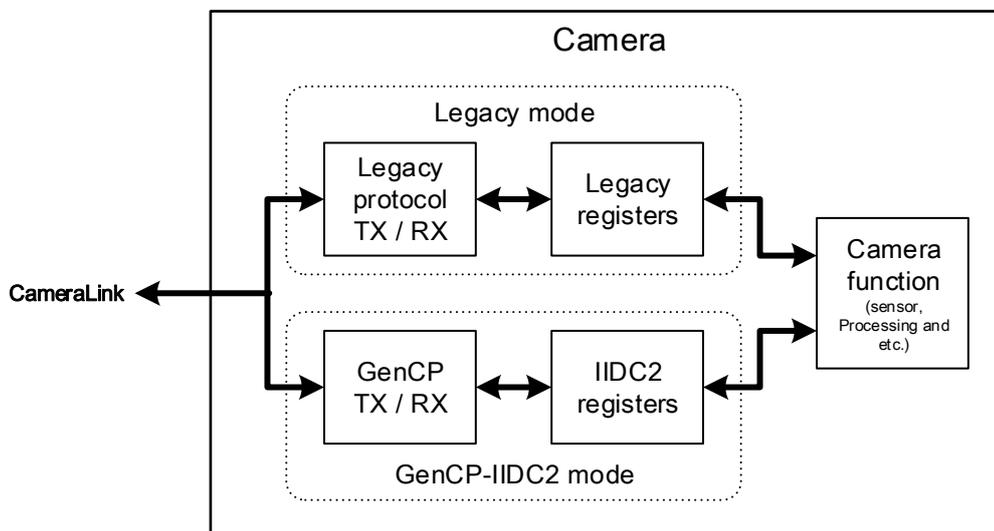
$A= 17.28\text{H}$, $B=1024\text{H}$, $1\text{V}=1041.28\text{H}$, $1\text{H}=784\text{ CLK}$

- Defective pixel correction : ON

$A= 21.25\text{H}$, $B=1024\text{H}$, $1\text{V}=1045.25\text{H}$, $1\text{H}=784\text{ CLK}$

6. Communication Protocol

This camera has two communication protocols: “Teli-Legacy protocol” and “GenCP.”. The camera will change automatically the suitable communication protocol by detecting the receiving packets. Each protocol has the respective register. Please refer the below figure.



Teli-Legacy protocol, Teli-Legacy register

The protocol and register are adopted on the CSC series in our previous product. They are available in this camera for ease to the CSC series customers.

GenCP

This is a communication protocol including transaction flow and packet structure, which is standardized by the European Machine Vision Association (EMVA). It is used for CameraLink, USB 3.0 and various interfaces.

You can find this specification as following web page.

<http://www.emva.org/>

IIDC2

This is a register mapping of machine vision cameras, which is standardized by Japan Industrial Imaging Association (JIIA). Because It is not included transport layer, IIDC2 can be used on various interfaces.

You can find this specification as following web page.

<http://jiia.org/>

Note: It is not supported accessing IIDC2 registers with Teli-Legacy protocol, or Teli-Legacy registers with GenCP.

(1) Teli-Legacy protocol

This communication protocol is the TELI standard method (method in which parameters are set in the registers in the camera).

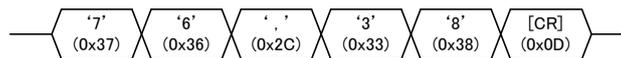
In command send/receive operation, hexadecimal address and data are converted to ASCII data. All ASCII alphabetic characters are uppercase.

- Write to register

To write data in a register, send a command, as follows. (Address' max-length is 2 bytes, and Data's max-length is 8 bytes.

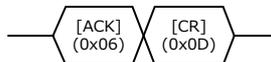


For example, to write data 0x38 to address 0x76, send a command, as follows.

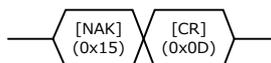


The camera responds to the write command with No Error (ACK) or Error (NAK), as follows.

No Error (ACK)



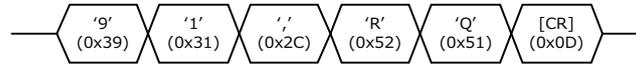
Error (NAK)



*Setting scalable is reflected by writing the "Scalable update" register.

- Read from register

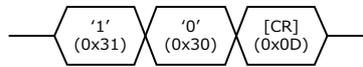
To read data from a register, send ',', (comma)', 'R', 'Q' and [CR] code following the address. For example, to read data in address 0x91, send a command, as follows.



The camera responds to the read request, as follows (Data's max-length is 8 bytes).



Actually, the camera responds to the read request as minimum data length: For example, to read data 0x10 to address 0x91, the camera responds as follows.



(2) GenCP

Communicates with the camera, by the packet that is defined by GenCP. Communication flow control, packet structure and others, refer to the specifications of GenCP.

For packets to be used, refer to below.

- READMEM_CMD

	+0x0	+0x1	+0x2	+0x3
0x00	0x0100 (preamble)		CCD checksum	
0x04	SCD checksum		0x0000 (channel_id)	
0x08	0x4000 (flags)		0x0800 (command_id)	
0x0C	0x000C (length)		request_id	
0x10	register address (hi)			
0x14	register address (lo)			
0x18	0x0000 (reserved)		read length	

- READMEM_ACK

	+0x0	+0x1	+0x2	+0x3
0x00	0x0100 (preamble)		CCD checksum	
0x04	SCD checksum		0x0000 (channel_id)	
0x08	status code		0x0801 (command_id)	
0x0C	length		request_id	
0x10	data			
...				
(0x10+length-4)				

- WRITEMEM_CMD

	+0x0	+0x1	+0x2	+0x3
0x00	0x0100 (preamble)		CCD checksum	
0x04	SCD checksum		0x0000 (channel_id)	
0x08	0x4000 (flags)		0x0802 (command_id)	
0x0C	length		request_id	
0x10	register address (hi)			
0x14	register address (lo)			
0x18	data			
...				
(0x10+length-4)				

- WRITEMEM_ACK

	+0x0	+0x1	+0x2	+0x3
0x00	0x0100 (preamble)		CCD checksum	
0x04	SCD checksum		0x0000 (channel_id)	
0x08	status code		0x0803 (command_id)	
0x0C	0x0004 (length)		request_id	
0x10	0x0000 (reserved)		length written	

7. Register Map

The following accesses are available via the camera link serial interface.

(1) Teli-Legacy mode

Register Address	Read Write	Memory	Default	Register Name	Remark
0x00 0x0F	R.O.	-	-	Manufacture Name ASCII format	Toshiba-Teli
0x10 0x1F	R.O.	-	-	Model Name ASCII format	CSCS60BM18
0x20 0x2F	R.O.	-	-	Family Name ASCII format	CSC
0x30 0x3F	R.O.	-	-	Serial Number ASCII format	ex) 0100011
0x48 0x4F	R.O.	-	-	FPGA version ASCII format	ex) 1.0.0
0x60 0x67	R.O.	-	-	Register map version ASCII format	ex) 01.01
0x69	R.O.	-	-	Status	Status information after the camera controlling
0x6A	R.O.	-	-	Extended Status	Detail information of the status
0x6C	R/W	-	-	Check Memory Bank	Checked memory bank 0x0 : Not saved, 0x1 : Saved
0x6D	W.O.	-	-	Save Memory	0x1 : Save in memory
0x6E	W.O.	-	-	Load Memory	0x1 : Load from memory
0x70	R/W	✓	0x00	Setup Level	0xFFFFFC0 (-16LSB) to 0x00 (0LSB) to 0xFF (63LSB)
0x76	R/W	✓	0x00	Digital Gain	0x00 (0dB) to 0x3C (6dB) *Image quality is not guaranteed
0x77	R/W	✓	0x00	Analog Gain	0x0 : x1, 0x1 : x1.5, 0x2 : x2, 0x3 : x3
0x80	R.O.	-	0x3D	Frame Rate	All pixels readout : 61fps Scalable : The calculation from Scalable Vertical Height (Omit it after the decimal point)

Register Address	Read Write	Memory	Default	Register Name	Remark
0x82	R.O.	-	0x500	Horizontal Resolution	All pixels readout : 0x500(1280) Scalable : 0x40(64) to 0x500(1280)
0x84	R.O.	-	0x400	Vertical Resolution	All pixels readout : 0x400(1024) Scalable : 0x40(64) to 0x400(1024)
0x87	R/W	✓	0x08	Number of output bits	0x08 : 8bit, 0x0A : 10bit
0x88	R/W	✓	0x00	Test Pattern	0x0 : OFF, 0x01 : Horizontal Ramp, 0x02 : Vertical Ramp, 0x03 : Checkered pattern, 0x04 : A centering white box on black background
0x89	R/W	✓	0x01	Defective Pixel Correction	0x0 : OFF, 0x01 : ON
0x8A	R/W	✓	0x00	ReverseX	0x0 : OFF, 0x01 : ON
0x8B	R/W	✓	0x00	ReverseY	0x0 : OFF, 0x01 : ON
0x90	R/W	✓	0x00	Scan Mode	0x0 : All pixels readout, 0x01 : Scalable
0x91	R/W	✓	0x00	Shutter Mode	0x0 : Normal Shutter, 0x01 : RandomTrigger Shutter
0x92	R/W	✓	0x00	RandomTrigger Mode	0x0 : Fix mode, 0x06 : Bulk mode
0x93	R/W	✓	0x00	Trigger Polarity	0x0 : Low active, 0x01 : High active
0x94	R/W	✓	0x01	Number of Frame for Bulk Mode	0x01 to 0x04
0xA0	R/W	✓	0x03E	ExposureTime Denominator	0x01 to 0x186A0(100000)
0xA4	R/W	✓	0x001	ExposureTime Numerator	0x01 to 0x08
0xC0	W.O.	-	-	Scalable update	0x01 : Update registers related with Scalable
0xC4	R/W	✓	0x000	Scalable Vertical Start Address	0x0(0) to 0x3C0(960)
0xC8	R/W	✓	0x400	Scalable Vertical Height	0x40(64) to 0x400(1024)
0xCC	R/W	✓	0x000	Scalable Horizontal Start Address	0x0(0) to 0x4C0(1216)
0xD0	R/W	✓	0x500	Scalable Horizontal Width	0x40(64) to 0x500(1280)
0xD8	R/W	-	0x00	User area Address	Set the address of the user area for writing the data 0x0(0) to 0x0F(15)
0xDA	R/W	-	-	User area Data	Read/Write data with a length of "User area Number of Bytes" to the start address that set in the "User area Address".
0xDB	W.O.	-	-	User area Erase	0x01 : Erase data of user area

Register Address	Read Write	Memory	Default	Register Name	Remark
0xDC	R/W	-	0x10	User area Number of Bytes	Set the number of bytes of user area for loading the data. 0x01(1), 0x04(4), 0x08(8), 0x10(16)
0xF0	R/W	-	0x00	SequentialShutterEnable	0x0 : OFF, 0x01 : ON
0xF1	R/W	-	0x01	SequentialShutter TerminateAt	Set the number of SequentialShutterEntry to repeat the sequence. 0x01 to 0x04
0xF2	R/W	-	0x01	SequenceMemory Selector	Set the SequenceMemory number. 0x01 to 0x04
0xF3	R/W	-	0x01	SequentialShutter Entry1	Set the order applying the SequenceMemory. 0x01 to 0x04
0xF4	R/W	-	0x02	SequentialShutter Entry2	Set the order applying the SequenceMemory. 0x01 to 0x04
0xF5	R/W	-	0x03	SequentialShutter Entry3	Set the order applying the SequenceMemory. 0x01 to 0x04
0xF6	R/W	-	0x04	SequentialShutter Entry4	Set the order applying the SequenceMemory . 0x01 to 0x04
0xF7	W.O.	-	-	SequenceMemory Load	0x01 : Load parameters of the sequence table specified in SequenceMemorySelector.
0xF8	W.O.	-	-	SequenceMemory Save	0x01 : Save the parameters to the sequence table specified in SequenceMemorySelector. Whole parameters of respective sequence tables will be erased when turning OFF the camera.

R/W : Read / Write possible

R.O. : Read only

W.O. : Write only

N.A. : Not available

(2) GenCP-IIDC2 mode

GenCP Bootstrap area (excerpt)

Register Address	Read Write	Memory	Default	Register Name	Remark
0x0000 0000	R.O.	-	-	GenCP Version	0x0001 0000 (GenCP Ver.1.0)
0x0000 0004 ~0x0000 0043	R.O.	-	-	Manufacture Name	Toshiba-Teli
0x0000 0044 ~ 0x0000 0083	R.O.	-	-	Model Name	CSCS60BM18
0x0000 0084 ~ 0x0000 00C3	R.O.	-	-	Family Name	CSC
0x0000 00C4 ~ 0x0000 0103	R.O.	-	-	Device Version	Camera version. ex)1.0.0
0x0000 0104 ~ 0x0000 0143	R.O.	-	-	Manufacture Info	1.3M 1/1.8 B/W
0x0000 0144 ~ 0x0000 0183	R.O.	-	-	Serial Number	ex)0100011
0x0000 0184 ~ 0x0000 0193	R/W	✓	Null	User Define Name	Store string containing the user defined name of the Device.
0x0000 01F0 ~ 0x0000 01F7	R.O.	-	0x00	Timestamp	Last saved TimeStamp value.
0x0000 01F8	W.O.	-	-	Timestamp Latch	0x01 : Save the current Timestamp
0x0001 0000	R.O.	-	0x91	Supported Baudrates	9600 bps, 115200 bps, and 921600 bps are supported
0x0001 0004	R/W	-	0x00	Current Baudrate	Current baudrate. 0x00 : Auto, 0x01 : 9600 bps, 0x10 : 115200 bps, 0x80 : 921600 bps

* For the registers other than the above described, refer to GenCP Standard Ver.1.0.

IIDC2 camera control (excerpt)

Register Address	Read Write	Memory	Default	Register Name	Remark
0x0020 005C	R.O	-	0x00	ApplyImageFormat	0x00 : No error, 0x10 : Scalable error
0x0020 2094	R/W	✓	0x000	OffsetX	0x0(0) to 0x4C0(1216)
0x0020 2098	R/W	✓	0x500	Width	0x40(64) to 0x500(1280)
0x0020 209C	R/W	✓	0x000	OffsetY	0x0(0) to 0x3C0(960)
0x0020 20A0	R/W	✓	0x400	Height	0x40(64) to 0x400(1024)
0x0020 20FC	R/W	✓	0x08	PixelSize	0x08 : Mono8, 0x0A : Mono10
0x0020 303C	R/W	-	0x08	AcquisitionCommand	0x00 : Video output abort, 0x08 : Video output start
0x0020 30BC	R.O.	-	0x3564	AcquisitionFrameRate	Set the frame rate
0x0020 403C	R/W	✓	0x1C261	ExposureTime	0x47 (10usec) to 0x6D1396 (1sec)
0x0020 405C	R/W	✓	0x00	BlackLevel	0xFFFFFC0 (-16LSB) to 0x00 (0LSB) to 0xFF (63LSB)
0x0020 407C	R/W	✓	0x00	Gain	0x00 (0dB) to 0x3C (6dB) *Image quality is not guaranteed
0x0020 703C	R/W	✓	0x00	TriggerMode	0x0 : Normal Shutter, 0x1 : RandomTrigger Shutter
0x0020 705C	R/W	✓	0x00	TriggerSequence	0x0 : Fix mode, 0x6 : Bulk mode
0x0020 709C	R/W	✓	0x01	TriggerAdditionalParameter	Number of frame for Bulk mode 0x01 to 0x04
0x0020 809C	R/W	-	0x00	UserSetCommand	Memory save or Load 0x0 : Done, 0x08 : Load, 0x09 : Save
0x0020 9050	R/W	✓	0x00	IOLineInverterAll	Trigger polarity 0x0 : Low active, 0x1 : High active
0x0021 F13C	R/W	✓	0x00	TestPattern	0x0 : OFF, 1 :Horizontal Ramp, 0x2 : Vertical Ramp, 0x3 : Checkered pattern, 0x4 : A centering white box on black background
0x0021 F1D0	R/W	✓	0x00	ReverseX	0x0 : OFF, 0x1 : ON
0x0021 F1F0	R/W	✓	0x00	ReverseY	0x0 : OFF, 0x1 : ON
0x0021 F29C	R/W	✓	0x01	DPCEnable	Defective pixel correction 0x0 : OFF, 0x01 : ON
0x0021 F31C	R/W	-	0x00	SequentialShutter Enable	0x0 : OFF, 0x01 : ON
0x0021 F33C	R/W	-	0x01	SequentialShutter TerminateAt	Set the number of SequentialShutterEntry to repeat the sequence. 0x01 to 0x04
0x0021 F41C	R/W	-	0x01	SequenceMemory Selector	Set the SequenceMemory number. 0x01 to 0x04

Register Address	Read Write	Memory	Default	Register Name	Remark
0x0021 F43C	R/W	-	0x00	SequenceMemory Command	Save or Load the parameters to the sequence table specified in SequenceMemorySelector. 0x00 : Done, 0x08 : Load, 0x09 : Save
0x0021 F45C	R/W	✓	0x00	AnalogGain	0x0 : x1, 0x01 : x1.5, 0x02 : x2, 0x03 : x3
0x0050 0040	R/W	-	0x01	SequentialShutter Entry1	Set the order applying the SequenceMemory. 0x01 to 0x04
0x0050 0044	R/W	-	0x02	SequentialShutter Entry2	Set the order applying the SequenceMemory. 0x01 to 0x04
0x0050 0048	R/W	-	0x03	SequentialShutter Entry3	Set the order applying the SequenceMemory. 0x01 to 0x04
0x0050 004C	R/W	-	0x04	SequentialShutter Entry4	Set the order applying the SequenceMemory. 0x01 to 0x04

* For the registers other than the above described, refer to IIDC2 Digital Camera Control Specification Ver.1.0.0.

8. Function

8.1. Shutter mode / Trigger mode

8.1.1. Normal Shutter / TriggerMode =OFF

In this mode, the shutter speed can be handled by the value in the register.

Shutter speed can be selected from 1/1 sec to 1/100,000 sec.

If shutter speed is longer than readout time, the frame rate changes according to shutter speed.

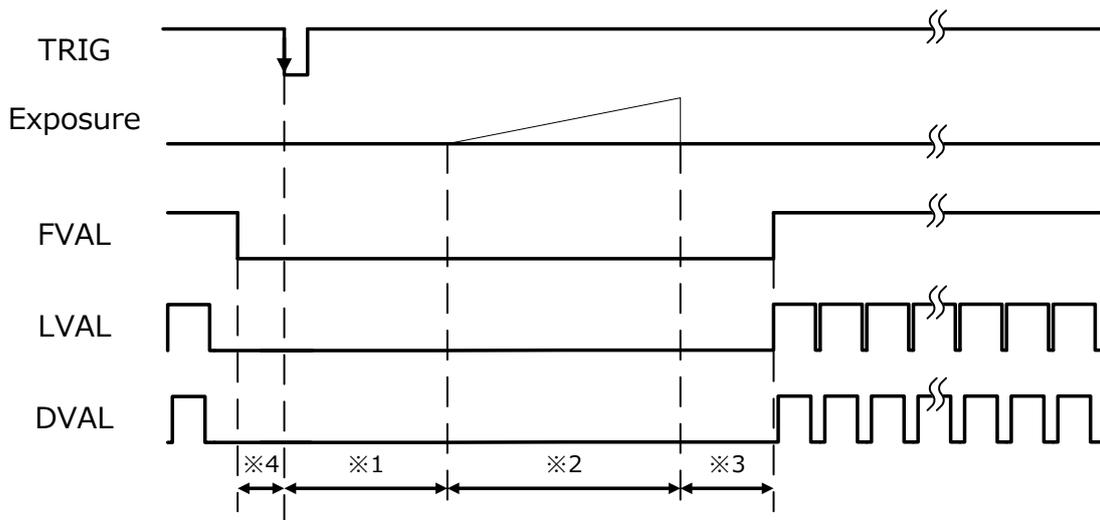
8.1.2. Random Trigger Shutter

An images is captured at the desired timing using trigger signal input. External trigger signal from CmaeraLink I/F CC1 and software trigger (Only in GenCP-IIDC2 mode). Trigger polarity is selectable (High active / Low active).

Sequential Shutter function is available in a Random Trigger Shutter.

(1) Fix mode

The exposure time is determined by the set value of the ExposureTime register.



*1=approx. 16.2 μ s

*2= The set value of the ExposureTime register

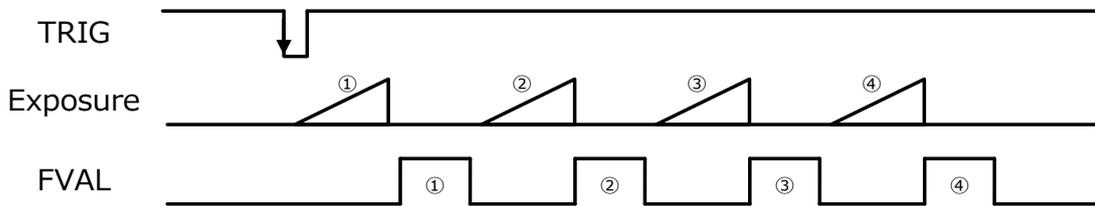
*3=157 μ s (Defective pixel correction : OFF) / 220 μ s (Defective pixel correction : ON)

*4=130 μ s or more

(2) Bulk mode

Specified multiple frames output by a single trigger input.

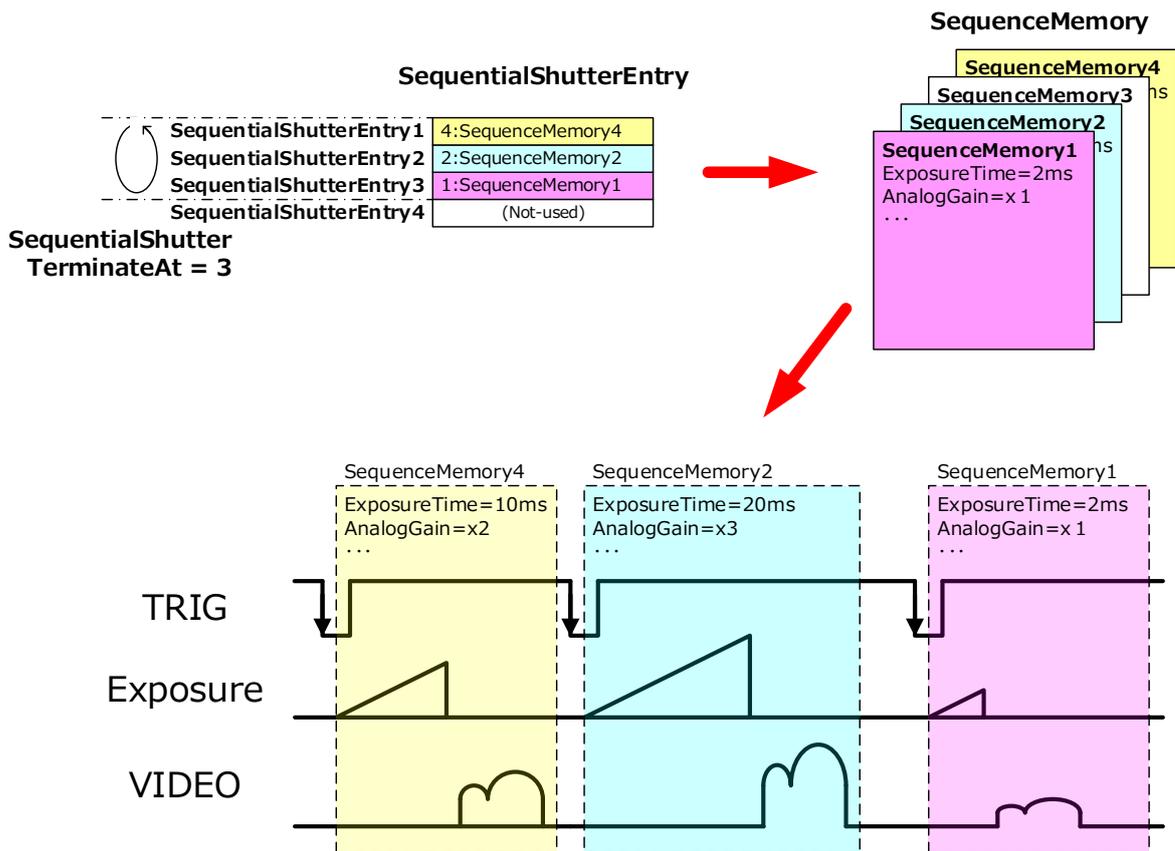
The exposure time is determined by the set value of the ExposureTime register.



8.2. Sequential Shutter

Save the parameters of the camera in advance, do the video output while sequentially switched to each exposure.

Sequence examples refer to below.

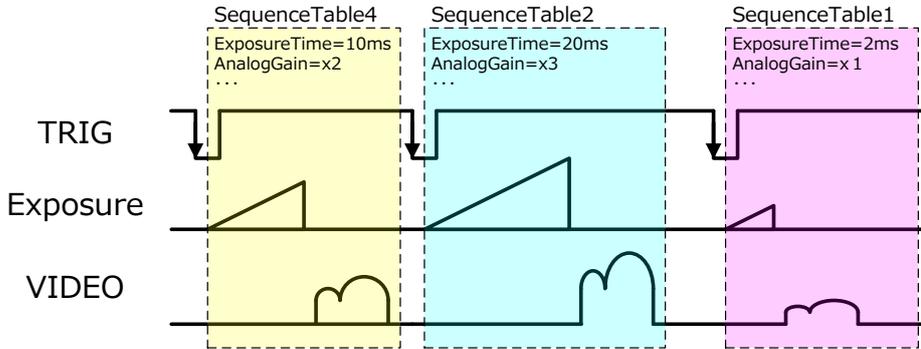


8.2.1. Combination of Random Trigger Shutter and Sequential Shutter

It is possible using a Sequential Shutter in Fix mode and Bulk mode.

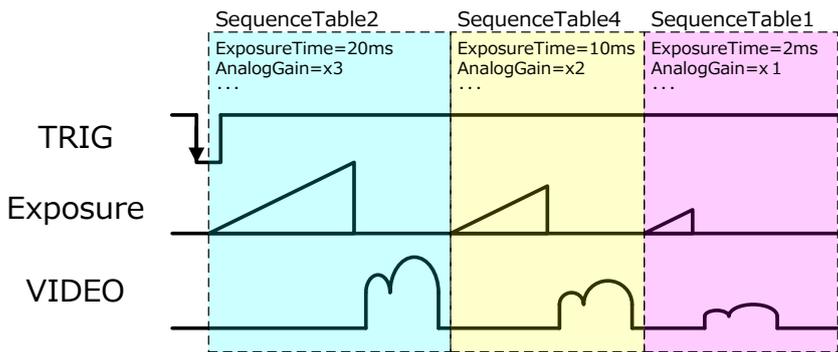
(1) Fix mode / TriggerSequence = 0

SequenceTable is switched to each trigger signal input.



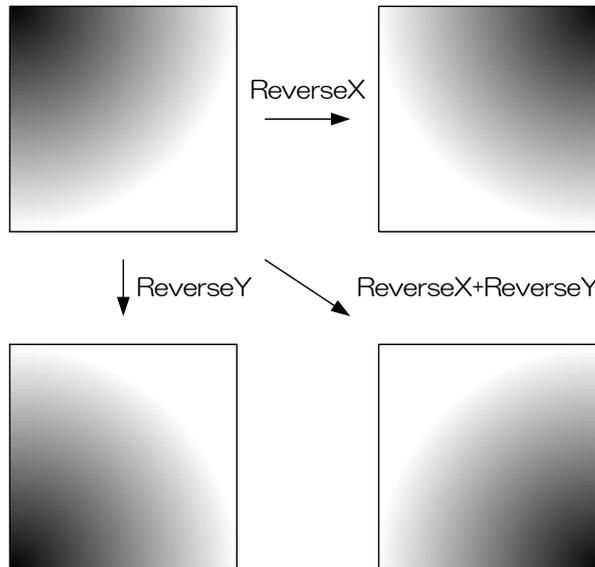
(2) Bulk mode / TriggerSequence = 6

SequenceTable is switched to the output of a specified multiple frames by a single trigger input.



8.5. ReverseX, ReverseY

Image can be flipped in horizontal and/or vertical direction.



8.6. Output control

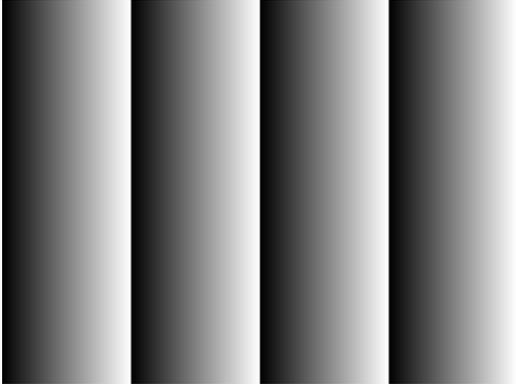
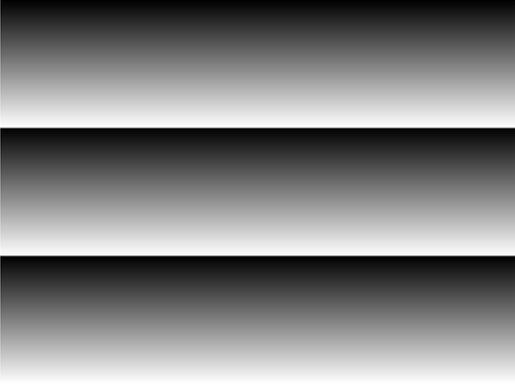
The camera output is possible to switch to the sensor image or some test patterns.

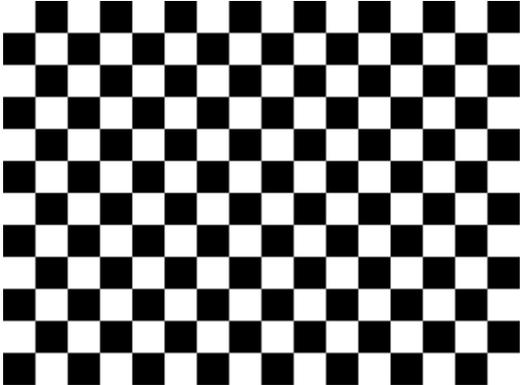
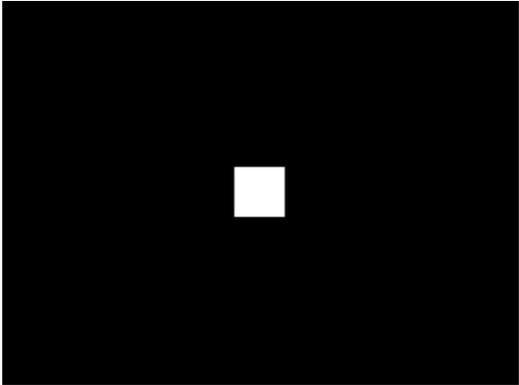
(1) Output of sensor image

The image which entered into the sensor is outputted.

(2) Output of test pattern

Some test patterns can be output by cutting the output of the sensor. It is output for the Random Trigger Shutter by the external trigger signal input.

Test pattern1 Horizontal Ramp	Test pattern2 Vertical Ramp
	

Test pattern3 Checkered pattern	Test pattern4 A centering white box on black background
	

8.7. Save memory / UserSet

You are able to save a user setting to the non-volatile memory of the camera.

By using user memory, you are able to restore frequent used settings at the time of next start-up.

The following table is the list of registers applied to “Load” / “Save”.

Setup / BlackLevel	RandomTriggerMode / TriggerSequence
DigitalGain / Gain	TriggerPolarity / IOLineInverterAll
AnalogGain / AnalogGain	NumberOfFrameForBulkTrigger / TriggerAdditionalParameter
NumberOfOutput bits / PixelSize	ShutterSpeedDenominator, Numerator / ExposureTime
TestPattern / TestPattern	StartAddressV / OffsetY
DefectivePixelCorrection / DPCEnable	WindowSizeV / Height
ReverseX	StartAddressH / OffsetX
ReverseY	WindowSizeH / Width
ScanMode	
ShutterMode / TriggerMode	

9. Warranty rules

9.1. Warranty term

Warranty term is 36 months after your purchase. We may assume the date of the purchase from our shipping date when the date is unidentified.

9.2. Limited Warranty

Free warranty is not applicable for the troubles, damages or losses caused by the cases of the followings, even if it is during the warranty term.

- (1) Natural exhaust, wear or degradation of a component parts
- (2) Handling against the instructions and conditions described in the instruction manual
- (3) Remodeling, adjustment and the part exchange. (including the opening of the enclosure box and the alteration)
- (4) Using the accessories not included with the product or our non-designated optional articles
- (5) Damages caused during the transportation or deficiency of the handling such as drop or fall of the products after the products having been transferred to customers, leaving the products to corrosive environment such as sunlight, fire, sand, soil, heat, moisture, or an inappropriate storing method
- (6) A fire, an earthquake, a flood, a lightning, or other natural disasters, pollution and a short circuit, abnormal voltage, excessive physical pressure, theft, other accident
- (7) When connected to a product which is not recommended
- (8) When connected to the power supply which is not suitable
- (9) Forgery product, products which does not have proper serial number, products of which serial number is forged, damaged or deleted
- (10) All defects that happened after the expiration for a warranty term

10. Repair

10.1. Repair methods

Exchange to a replacement or an equal function product.

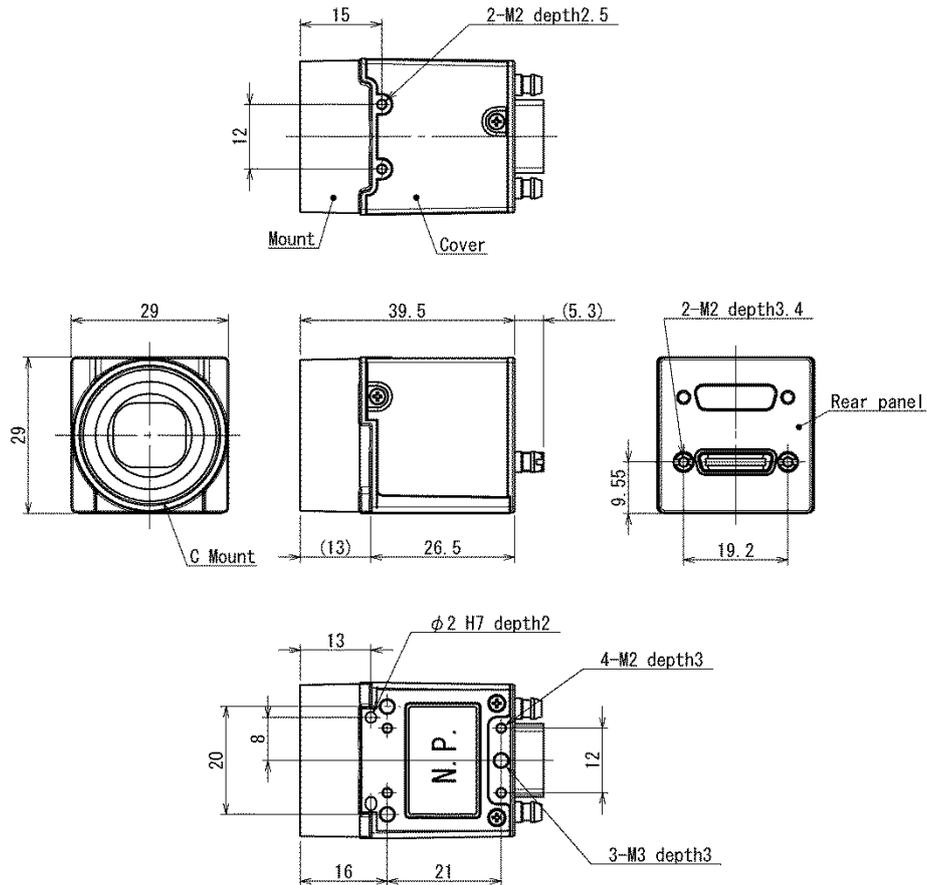
10.2. Repair request methods

On the occasion of a repair request, please return the defective product with the failure situation report sheet to be filled out.

- (1) Please return our product alone, taking out of your equipment in case that our product is installed to an equipment.
- (2) We are unable to return the information such as your own serial numbers, control number, the identification seal, if it is attached to the returned products. Please keep record before you return the product.
- (3) As the data saved in the camera will not be kept after the repair, please take out data before return.
- (4) We are unable to accept the cancellation after the repair request by the customer's reason.
- (5) About the repair product shipping expenses, please bear the charges when you return the product to us. We bear the charges to you from us only for a warranty period.
- (6) We are unable to accept your request of a delivery date and time of the product return, or the delivery method.
- (7) We are unable to accept a trouble factor investigation, the request of the repair report.
- (8) We accept a repair of out of warranty product, if it is reparable.
- (9) The proprietary rights of the repair request products after the exchange repair belong to us.
- (10) The immunity from responsibility of the product is applied in the repair completion products.

11. Appended figure

11.1. Outline drawing



Specification

Material

Mount, Rear panel : Aluminium die-cast metal
 Cover : Aerio aluminium

Processing

Mount, Rear panel : Cationic coating (Black)
 Cover : laser satin print (Black)

11.2. Administrative Measure on the Control of Pollution Caused by Electronic Information Products (Popular name: China RoHS) Related information

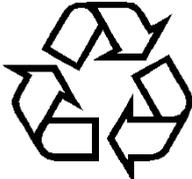
 中华人民共和国 环保使用期限	<p>环保使用期限标识, 是根据电子信息产品污染控制管理办法以及, 电子信息产品污染控制标识要求(SJ/T11364-2014)、电子信息产品环保使用期限通则, 制定的适用于中国境内销售的电子信息产品的标识。</p> <p>电子信息产品只要按照安全及使用说明内容, 正常使用情况下, 从生产月期算起, 在此期限内, 产品中含有的有毒有害物质不致发生外泄或突变, 不致对环境造成严重污染或对其人身、财产造成严重损害。</p> <p>产品正常使用后, 要废弃在环保使用年限内或者刚到年限的产品时, 请根据国家标准采取适当的方法进行处置。</p> <p>另外, 此期限不同于质量/功能的保证期限。</p> <p>The Mark and Information are applicable for People's Republic of China only.</p>
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<产品中有毒有害物质或元素的名称及含量>

部件名称	有毒有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr (VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
相机本体	×	○	○	○	○	○

「本表格依据SJ/T 11364的规定编制」
 ○: 表示该有毒有害物质在该部件所有均质材料中的含量均在电子信息产品中有毒有害物质的限量要求标准规定的限量要求 (GB/T26572) 以下
 ×: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出电子信息产品中有毒有害物质的限量要求标准规定的限量要求 (GB/T26572)
 This information is applicable for People's Republic of China only.

リサイクルに関する情報 (包装物) 有关再利用的信息 (包装物) Information on recycling of wrapping composition

箱/箱子/Box  ペーパーボード 纸板 Paper board	内部緩衝材料・袋 内部缓冲材料・袋 Internal buffer materials・Bag  PE-LD
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In order to grasp the details of failure, please fill out the following information, and send us the defective product with this report sheet enclosed.

(1) Customer information

Company Name		Department	Your Name
Telephone number	E-Mail address		FAX number
Postal code number	Address		

(2) Return address Please fill out this information, if the return address is different from above address (1).

The offered personal information is not used for any purposes other than after-sale service, such as repair of a product and an inquiry, and the questionnaire of the improvement in customer satisfaction. Moreover, except for the case where it commissions within limits required for the above-mentioned purpose achievement, it does not indicate to a third party without a visitor's consent. We pay careful attention and manage a visitor's information.

(3) We suggest a possible solution before your repair request.

Please ensure your safety when you check following items.

Please handle power supply with proper procedure, and make sure it does not impede any operation.

a) Restart the power supply of this product.	Check → <input type="checkbox"/> Tried <input type="checkbox"/> Not Tried
Please turn off this product once, switch on a power supply again after passing for a while, and confirm operation.	
b) Exchange for other products.	Check → <input type="checkbox"/> Tried <input type="checkbox"/> Not Tried
Please exchange for other same products, and confirm operation.	
c) Connect to other PC systems.	Check → <input type="checkbox"/> Tried <input type="checkbox"/> Not Tried
Please connect this product to other PCs, and confirm operation.	
d) Check Specifications of this product.	Check → <input type="checkbox"/> Tried <input type="checkbox"/> Not Tried
Please confirm that specifications of this product conform to usage environment referring to following URL. URL:http://www.toshiba-teli.co.jp/index.htm	Please check our website for the latest information.

(4) Failure situation

■ Accrual date

Model name	Serial No.	Your dealer
		Purchase date
Failure condition: (Please fill out the phenomenon in detail.)		
<hr/>		

(5) From when

- Unknown From the beginning After a while
 After environment was changed.

(Others _____)

(6) Occurrence frequency

- Unknown It certainly occurs. It sometimes occurs.
 It occurs, after time passes.

(Others _____)

<For dealer use>

Reception date :

Receipt No. :

JOB No. :

Check :