SWIR331 Short-Wavelength Infrared Camera Help Manual

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content

1 The basic characteristics of the SWIR331 series camera

SWIR331 Short-Wavelength Infrared Camera is a C-mount short-wave infrared cooling camera using a nationally produced 640 x 512 InGaAs image sensor, which have CameraLink / USB3 (under development) / 10GigE (under development) and other data transmission methods. It has the advantages of 900 - 1700nm short-wave infrared wide spectral response, 330,000 resolution, high quantum efficiency and low noise.

SWIR331 Short-Wavelength Infrared Camera can be widely used in short-wave infrared imaging, spectral imaging, monitoring (night vision), semiconductor detection, medicine and biology, optical fiber communication, astronomy, high temperature imaging, humidity distribution imaging and other applications.

Figure 1 Front and back views of SWIR331 series cameras

The basic characteristics of SWIR331 Short-Wavelength Infrared Camera are listed below:

- 724FPS high frame rate
- InGaAs SWIR Detector
- 640 x 512
- 15um pixel size
- 900nm-1700nm
- Global shutter
- Built-in TEC refrigeration chip, the temperature difference can reach 45 degrees Celsius below the ambient temperature
- PID precise temperature control, the fluctuation is less than 0.3 degrees
- CameraLink Full / USB3 (under development) / 10GigE (under development)
- 12-bit output (14-bit ADC)
- Multiple working modes: video mode/soft trigger mode/external trigger mode
- There are 100% domestically produced device versions or high-performance versions
- Support field update firmware
- Accept OEM custom development

2 Camera parameters and performance

2.1 Brief list of SWIR331 camera simple parameter

Order Code	Sensor type and size	Pixel size(um)	Data Interface	Camera Type	FPS/Resolution	Exposure Time
SWIR331KMA-CL500	0.33M / 640x512 3/4" (9.60x7.68) Buit-in TEC	15x15	CameraLink	China produced devices	517@640x512	31.25us~1s
SWIR331KMA-CL700				China produced devices	724@640x512	23.81us ~1s
SWIR331KMB-CL500				Global procurement of key chips	517@640x512	31.25us~1s
SWIR331KMB-CL700				Global procurement of key chips	724@640x512	23.81us ~1s

2.2 SWIR331 Camera Specification

Table 1 SWIR331 camera specification

Model Parameter	SWIR331KMA-CL500	SWIR331KMA-CL700	SWIR331KMB-CL500	SWIR331KMB-CL700
	330,000 pixels 3/4" InGaAs CameraLink Camera			
Camera				
Sensor model	National production			
Sensor type	InGaAs CMOS image sensor			
Spectral range	900nm - 1700nm			
pixel size	15 μm x 15 μm			
Target size	3/4"			
ADC	12-bit output /14-bit output (14-bit ADC)			
Frame Rate & Resolution	517 fps @ 640 x 512	724 fps@640 x 512	517 fps @ 640 x 512	724 fps@640 x 512
Memory	512MB			
QE	75%@ 1350nm			
Conversion gain	970.01e-/DN(LG), 18.02e-/DN(MG), 3.31e-/DN (HG)			
Dynamic Range	69.2dB(LG), 63.2dB(MG), 57.4dB(HG) *1			
Read noise	1.3DN(LG), 2.7DN(MG), 5.0DN(HG)			
Full well charge	3.5Me(LG), 70Ke(MG), 12Ke(HG) *1			
Maximum SNR	65.4dB(LG), 48.5dB(MG), 40.7dB(HG)			
Dark current	30fa@0.1V&18℃			
Exposure time range	31.25us~1s	23.81us~1s	31.25us~1s	23.81us~1s
Shutter mode	Global shutter			
Data interface	CameraLink Full			
Digital I/O	1 optocoupler isolated input, 1 optocoupler isolated output			
Data Format	Mono 12 / Mono 14			
Cooling temperature difference	Below room temperature 40 degrees Celsius			
Camera type	Nationally produced devices	Nationally produced devices	High performance	High performance
General parameters				
Power supply	DC12V power supply			
Power consumption	8.4W (TEC OFF) / <16W (TEC ON)			
Temperature	Working temperature -30 ~ 60 ℃, storage temperature - 40 ~ 85 ℃			
Humidity	20%-80% , non-condensing			
Size	68mm×68mm×90.3mm			
Weight	485g			
Lens mount	C-mount interface			
Software	Provide SDK development kit and CL View software based on Delsa acquisition card			

*1： LG: CDS-OFF, DeNoise-ON; MG: CDS-ON, DeNoise-OFF; HG: CDS-ON, DeNoise-OFF.

2.3 Sensor Quantum Efficiency

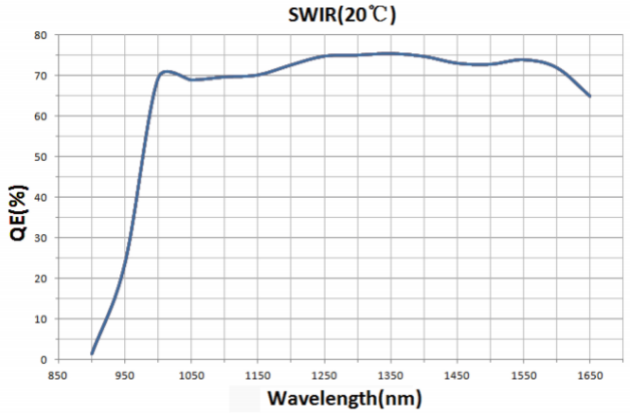


Figure 2 The spectral QE of SWIR331 Short-Wavelength Infrared Camera

2.4 Frame rate and ROI frame rate

The camera supports hardware ROI, the smaller the ROI size, the faster the frame rate

Table 2 CL700 ROI typical frame rate

X Size	Y Size	FPS
640	512	724
640	256	1432
320	256	2201
200	200	3487
120	120	6595

Table 3 CL500 ROI typical frame rate

X Size	Y Size	FPS
640	512	517
640	256	1023
320	256	1572
200	200	2491
120	120	4774

3 The main features of the SWIR331 series camera

Function	Function description
Operating mode	Operating mode: video mode or trigger mode Trigger mode: soft trigger mode or external trigger mode
GenICam	Supports the standard GenICam protocol and can control the camera through third-party software
Serial port control	Support the virtual serial port of the CameraLink capture card to control the camera, and the camera command is open
Denoise	The camera hardware incorporates denoise
Bit depth	Built-in 14bit ADC, output 12bit or 14bit valid data
Automatic exposure	Automatic exposure or manual exposure function
Gain	HG, MG, LG 3 gain modes
Frame rate	Supports precise frame rate control
ROI	Supports single-zone ROI with a maximum frame rate of 8000fps after ROI
Flip	Supports Vertical/horizontal flip
Custom dark field correction	The hardware supports up to 12 groups of user-defined dark field correction image functions
Timestamp function	Timestamps can be turned on or off. After the timestamp function is enabled, the low 8bits of 1-8 pixels, 9-16 pixels, and 17-24 pixels will be modified to: 0-7: frame number; 8-15: Frame time; 16-23: trigger signal count
Firmware update	Supports firmware online update
Pipette function	Supports the display of the gray value of the mouse pixel position
Histogram display	Supports histogram display and statistics
Plane line function	Supports the function of viewing surface data
Regional gray statistics	Support the average gray statistics function of user-defined areas
DC12V power supply and cooling system	1) When the DC12V power supply is disconnected and only the CameraLink cable is connected, the camera cannot work; 2) Connect the 6PIN aviation plug interface of the DC12V adapter to the DC12V interface on the camera. After the power is successfully turned on, the two LED lights will light up; 3) The cooling system of the camera is divided into TEC cooling sheets built in the sensor, using external heat dissipation structure and fan auxiliary heat dissipation, the working temperature can be adjusted to a specific value, the effective cooling temperature can be lower than the ambient temperature of 40°C, and the high-efficiency cooling system ensures extremely low dark current level; 4) The TEC system adopts PID algorithm control, so that TEC can accurately adjust the sensor to the target temperature, and the temperature deviation is 0.3°C;
Acquisition card adaptation	Support mainstream brand CameraLink capture card, through the virtual serial port control, there are two ways: 1） The standard GenICam protocol is used to control the acquisition card software; 2） Capture card software is used to capture and display images, and CLCtrl software is used for control.

4 Dimension and layout of the the SWIR331 series camera

4.1 The back view and dimension of the SWIR331 series camera

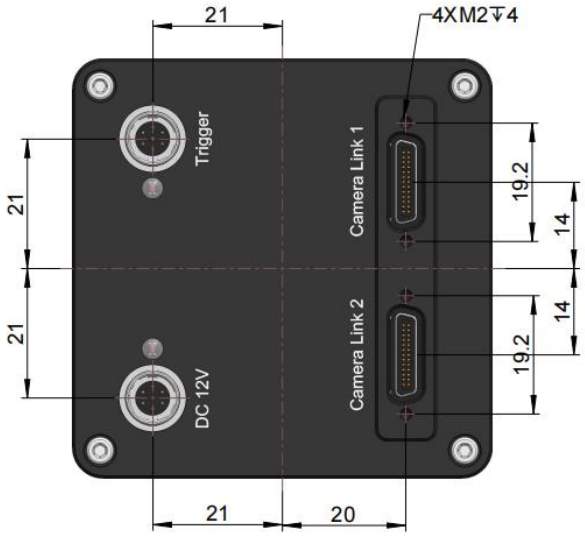


Figure 3 The rear cover interface layout of the SWIR331 Short-Wavelength Infrared Camera (CL interface)

4.2 Dimension of the e SWIR331 series camera

The Front and side view dimensions of the SWIR331 series camera is shown in Figure 4.

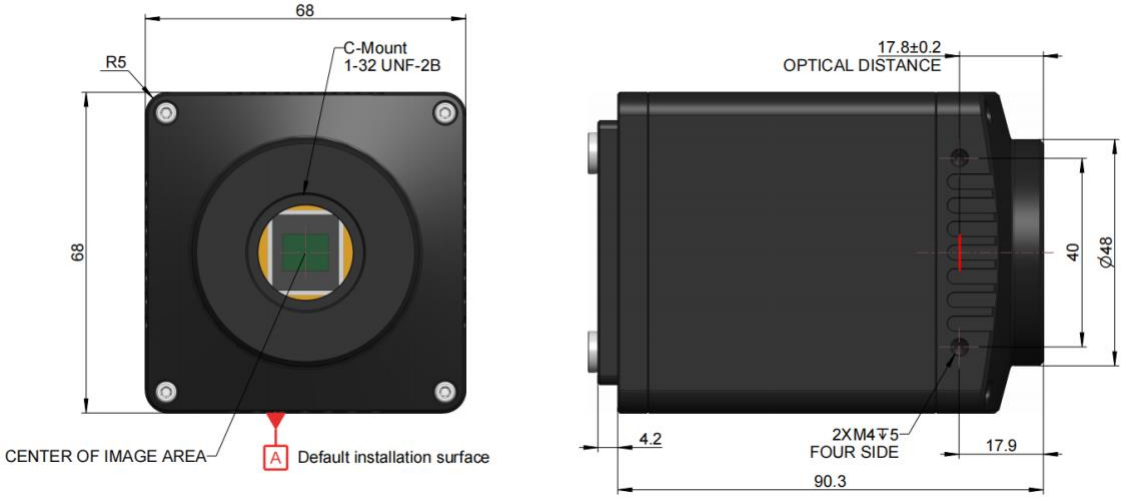


Figure 4 The Front and side view dimensions of the SWIR331 series camera

Table 4 The Dimension of the SWIR331 series camera

Parameter	Specification
Dimension	68*68*90.3mm
The SWIR331 series camera lens interface	Standard C mount

4.3 The back view of the SWIR331 series camera

The rear interface of the SWIR331 series camera is shown in Figure 5, the description is shown in Table 5.

Figure 5 The rear interface of the SWIR331 series camera

Table 5 The rear interface of the SWIR331 series camera

Order	Specification
1	DC 12V power slot
2	External IO connecter
3	CameraLink1
4	CameraLink2

4.4 The packing information

Figure 6 The packing information of the SWIR331series camera

Table 6 The packing information of the SWIR331series camera

Standard Packing information	
A	3-A equipment case: L:28cm W:23cm H:15.5cm (1pcs, 2.8Kg/ box)
B	SWIR331 Short-Wavelength Infrared Camera
C	2 CameraLink cables
D	12V/3A 6 PIN air plug power adapter
E	Power cord. National standard, American standard, European standard, British standard power cord (D1, D2, D3, D4) for choosing
F	One external trigger control cable
Optional accessary	

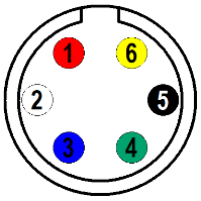
5 External IO connector and electrical characteristics

5.1 Pin signal

The SWIR331 series camera External IO connector is shown in Figure 7, the pin signal definitions is shown in Table 7 and Table 8.

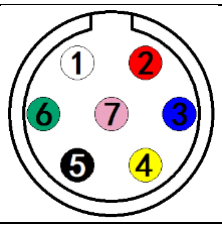
Figure 7 The rear interface of the SWIR331 series camera

Table 7 The SWIR331 series camera DC12V pin signal definitions



Color	Pin	Signal	Description of the signal
Red	1	12V	12V power supply positive
Yellow	6	12V	
Black	5	12V	
White	2	GND	12V power supply negative
Blue	3	GND	
Green	4	GND	

Table 8 SWIR331 series camera Trigger pin signal definitions



颜色	管脚	信号	信号描述说明
Blue	3	OPTO_GND	Opto-isolated signal ground
Green	6	OPTO_IN	Opto-isolated input signal (line0)
Pink	7	OPTO_OUT	Opto-isolated output signal (line1)

5.2 I/O electrical characteristics

5.2.1 Opto-isolated input circuit (line0)

In the I/O control of the camera, the opto-isolated input circuit is shown in

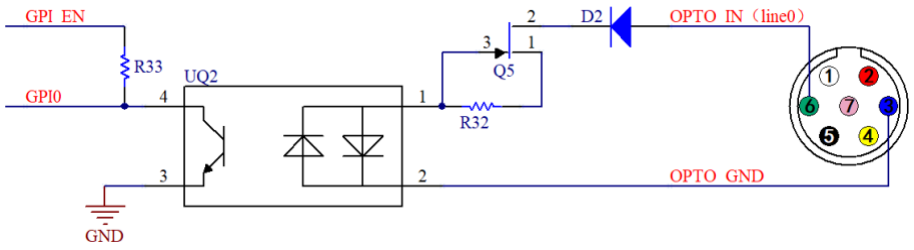


Figure 8 Opto-isolated input circuit

Logic 0 input level: 0~2.2VDC (OPTO_IN pin)

Logic 1 input level: 3.3~24VDC (OPTO_IN pin)

Maximum input current: 30mA

When the input level is between 2.2V and 3.2V, the circuit operation state is uncertain, please do not let SWIR camera work within this voltage range.

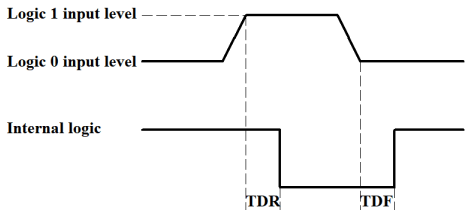


Figure 9 Input logic levels

Input rise delay (TDR): 6us

Input fall delay (TDF): 6us

5.2.2 Opto-isolated output circuit (line1)

In the camera I/O control, the opto-isolated output circuit is shown in Figure 10.

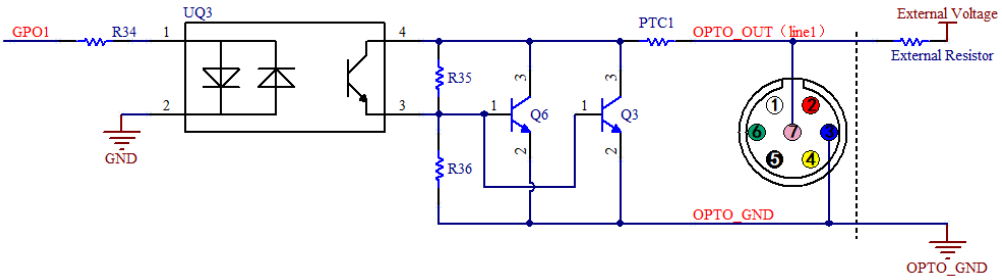


Figure 10 Optocoupler output circuit

The opto-isolated output maximum current is 30mA.

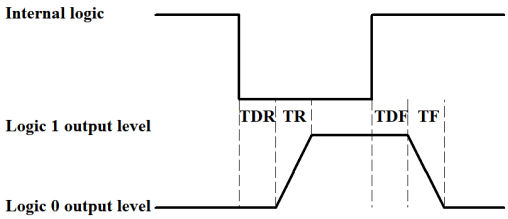


Figure 11 Output logic levels

The electrical characteristics of the opto-isolated output (external voltage 5V, external resistor 1K) are shown in Table 9.

Table 9 Opto-isolated output signal's electrical characteristics

Parameter name	Parameter notation	Parameter value
Output logic low	VL	742mV
Output logic high	VH	4.134V
Output rise time	TR	4us
Output fall time	TF	1.8us
Output rise delay	TDR	12us
Output fall delay	TDF	2us

The output of the corresponding output current and VL when using different voltages and resistors in external circuit are shown in Table 10.

Table 10 Opto-isolated output logic's low levels parameters

External voltage	External resistor	VL	Output current
3.3V	1KΩ	510mV	2.82mA
5V	1KΩ	742mV	4.31mA
12V	2.4KΩ	795mV	4.68mA
24V	4.7KΩ	850mV	4.97mA

6 Connection and Configuration the CameraLink

6.1 Connection to the CameraLink

Connect the two CameraLink cables: the CameraLink1 port on the camera is connected to the CL1 port on the capture card, the CameraLink2 port on the camera is connected to the CL2 port on the capture card.

Attention: if the camera and the acquisition card cross-linking, camera will not work. Please pay special attention.

6.2 Software installation

6.2.1 Install SDK

Windows 10 system can directly select the exe shown in Figure 12 to install SDK; For Windows 7, please install the driver shown in Figure 13.

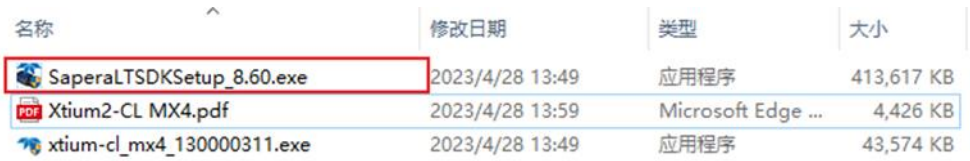


Figure 12

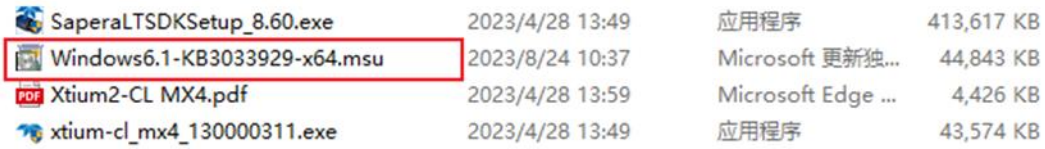


Figure 13

6.2.2 Install options

The following is the interface to be selected, and the rest of the steps can be directly clicked next.

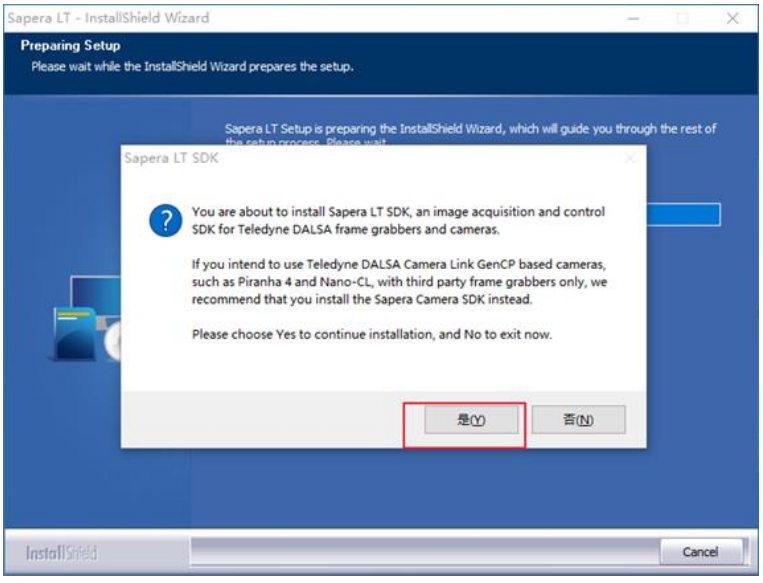


Figure 14

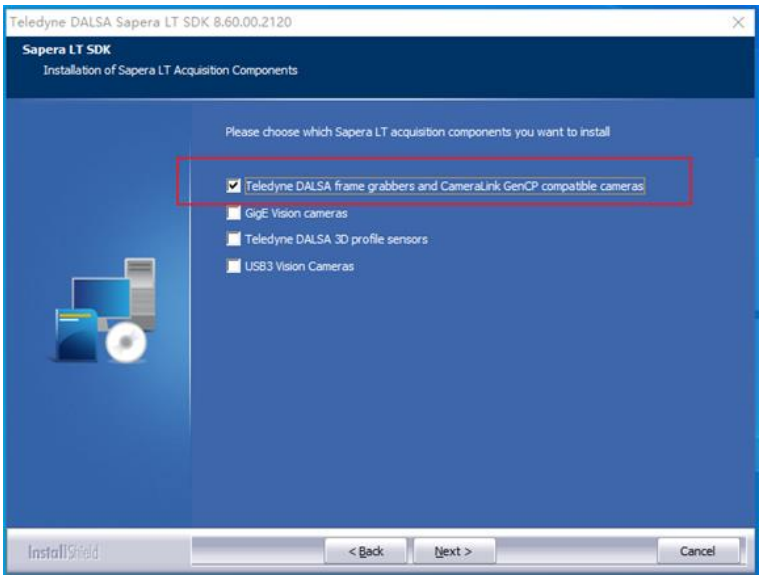


Figure 15

6.2.3 Install the driver

The exe shown in Figure 16 is the driver of the capture card (xtium-cl_mx4) currently used by our company, and the drivers of dalsa acquisition cards are different.

Capture card driver installation steps can be all click Next.

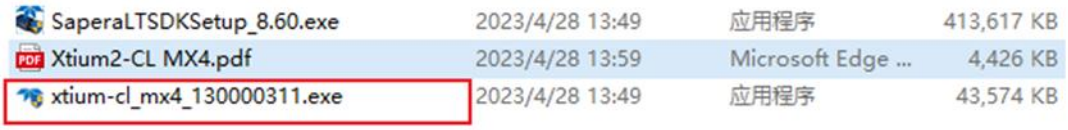


Figure 16

Restart your computer after the installation is complete.

6.3 Configure the Delsa capture card

6.3.1 Serial port configuration

Find the software Sapera Configuration in Figure 17 of the DALSA supporting tool, open it, change COM port mapping (optional) to the required port (currently COM2) as shown in Figure 18, and restart the computer according to the program requirements.

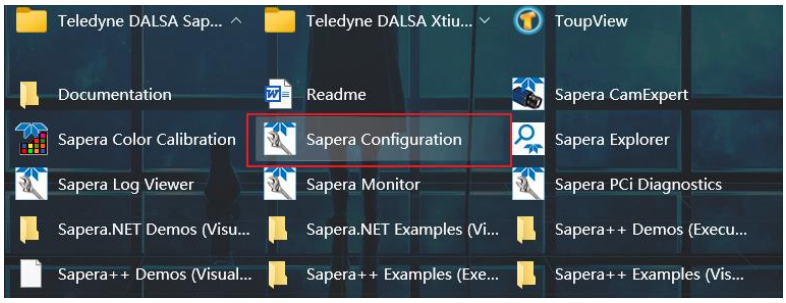


Figure 17

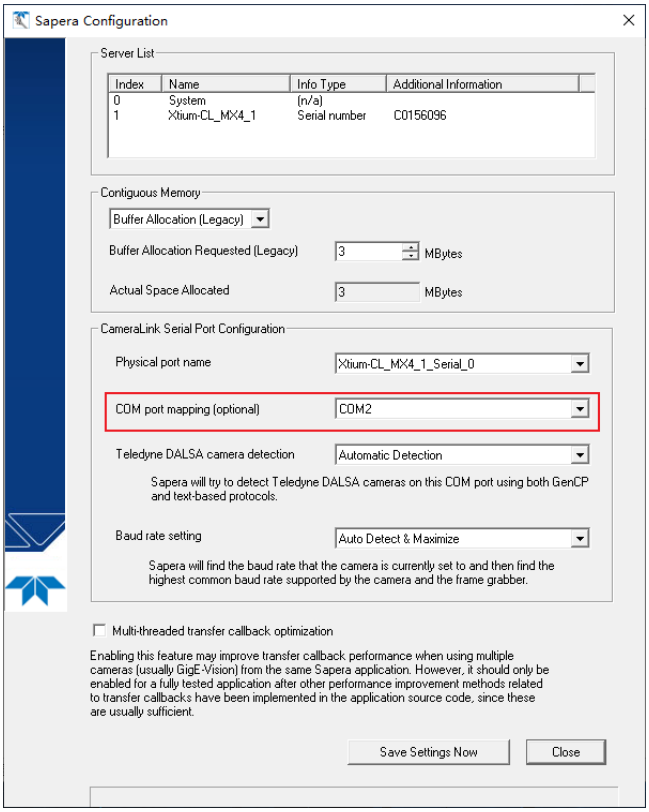


Figure 18 Serial port configuration dialog box

6.3.2 CameraLink mode configured

Open the software in Figure 19 and verify that it looks like Figure 20. If not, please click the Manual button in Figure 20 to modify the tart as shown in Figure 21, and click the tart Updat button to wait for the completion of the update. If an error occurs, please confirm whether the serial port control is turned off.

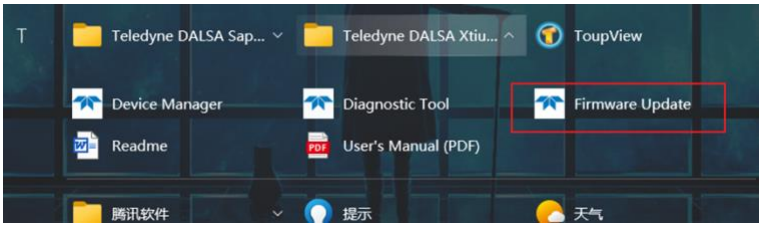


Figure 19

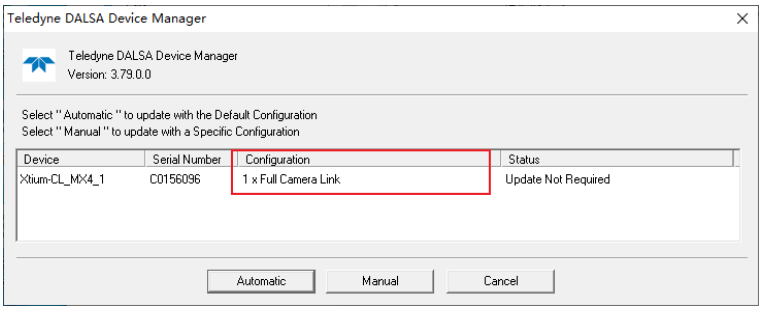


Figure 20

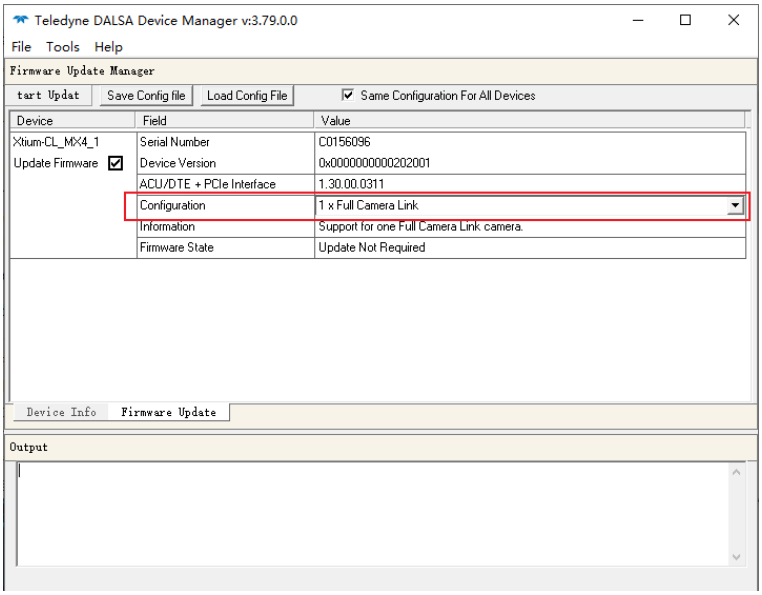


Figure 21

6.3.3 Configuring CameraLink Receiving

Opening the Sapera CamExpert software of DALSA, click the arrow position in Figure 22 and select SWIR331KMA_CL_Medium_12bit_4Ports_640x512_V1.0.ccf to load the configuration information of the receiving format of CameraLink.

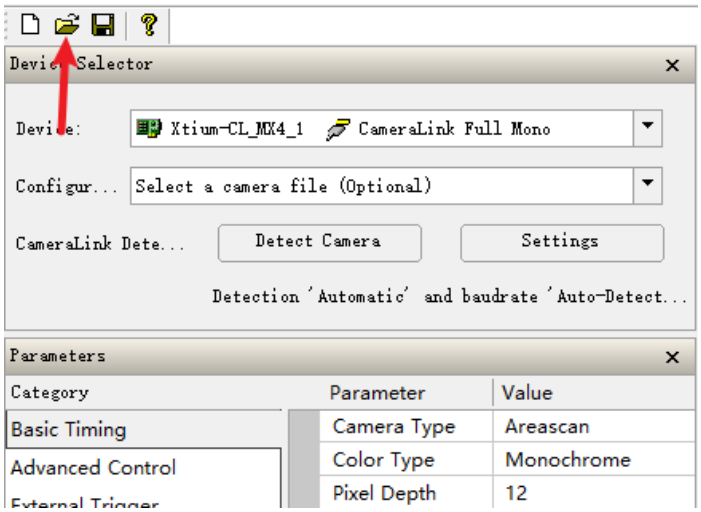


Figure 22 Load the CameraLink receive format configuration information

The arrangement is shown in Figure 23(You do not need to change the arrangement of the ccf files mentioned above).

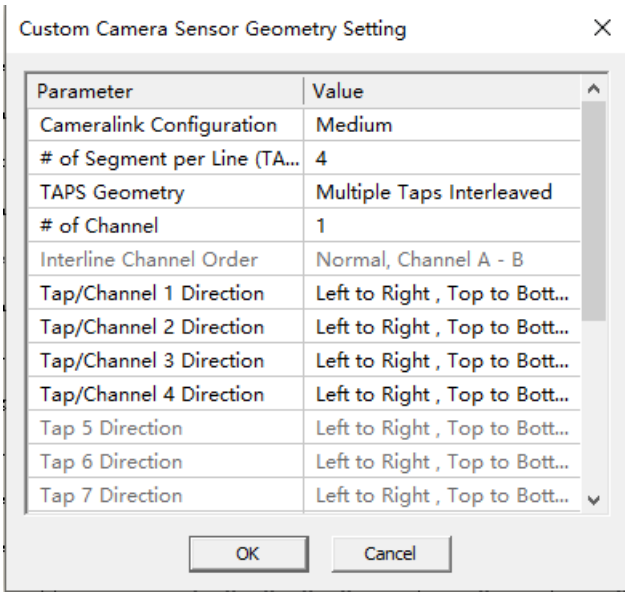


Figure 23 Arrangement

6.3.4 CameraLink Receiving the configuration content

The image below shows the resolution and bit depth Settings.

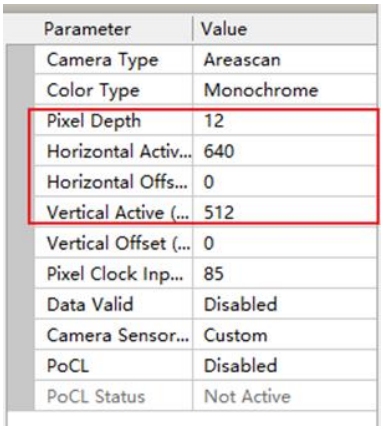


Figure 24

The steps of Camera Sensor Geometry Setting are shown in Figure 25 and Figure 26.

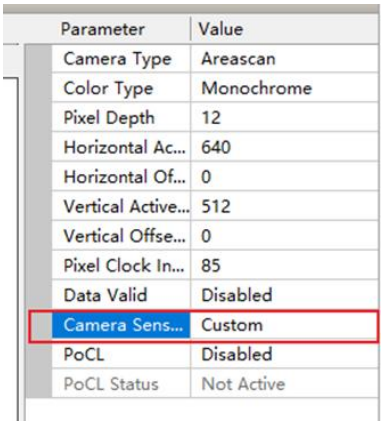


Figure 25

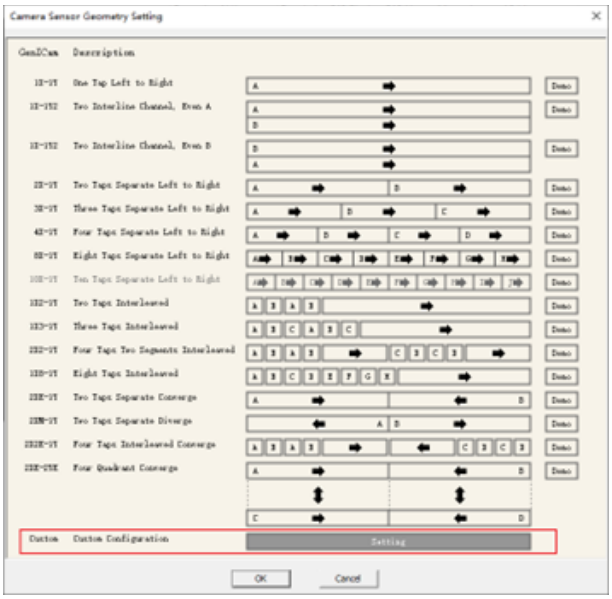


Figure 26

The Settings are as follows:

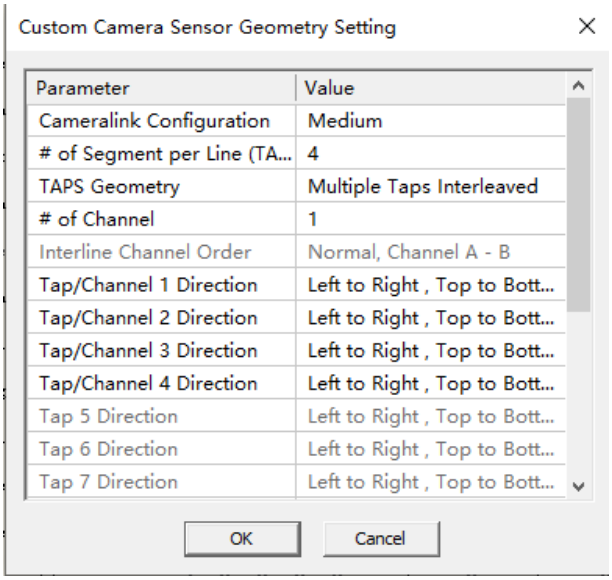


Figure 27

6.4 Using GenIcam

6.4.1 Communication Settings

Enter the interface shown in Figure 28 and set the content as shown in Figure 29.

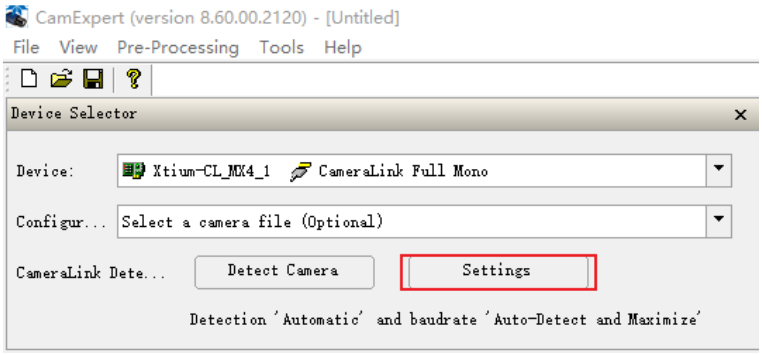


Figure 28

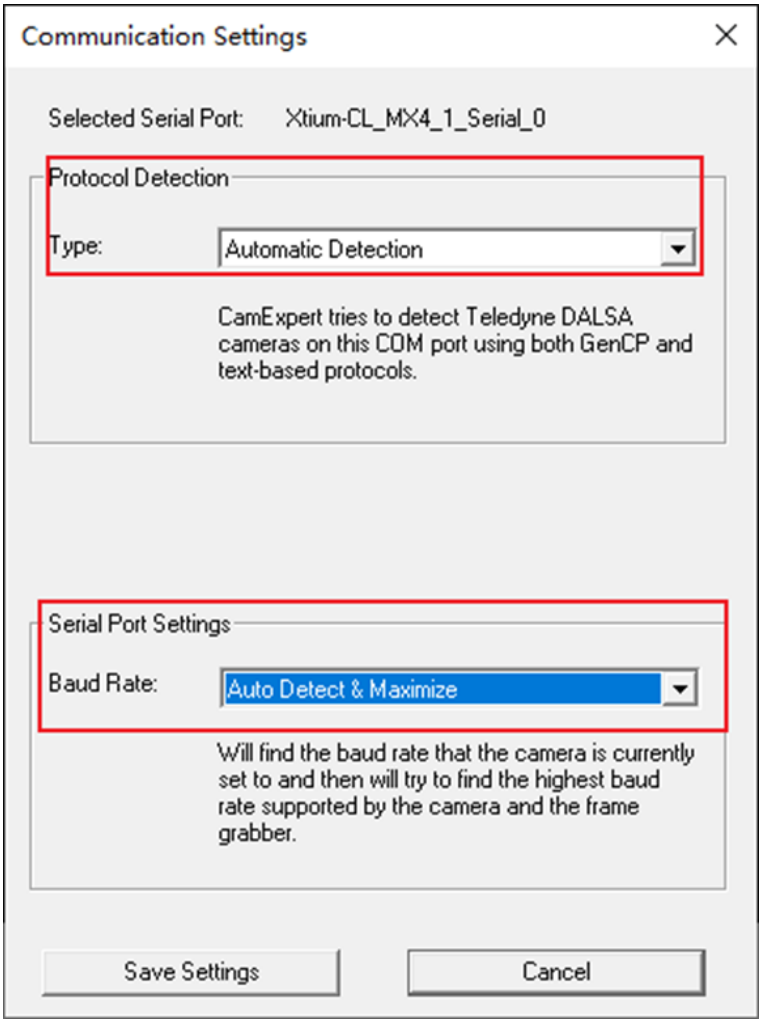


Figure 29

After the Settings are complete, properly connect the camera and restart CamExpert. Figure 30 will appear on the software interface.

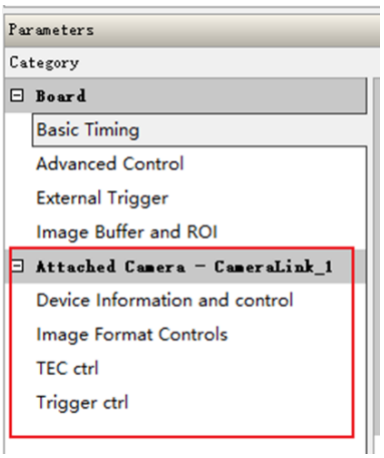


Figure 30

6.5 Description of GenIcam

6.5.1 Device Information and control

As shown in Figure 31, it contains the basic information of the equipment, including exposure time control, gain control, frame rate control and TEC temperature display.

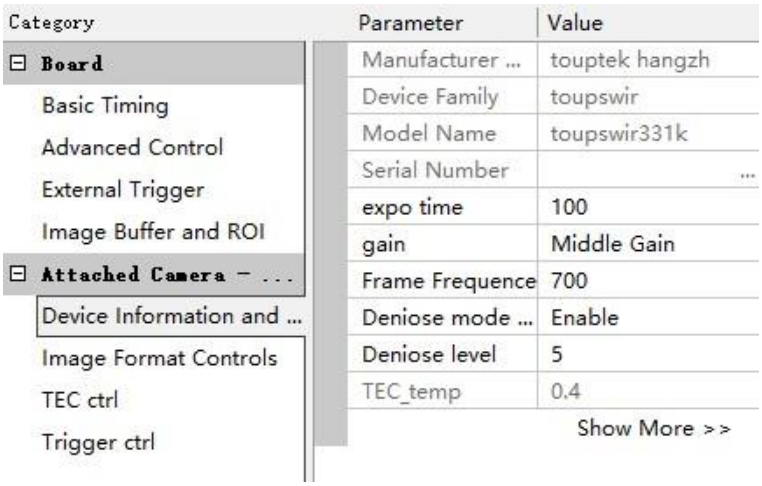


Figure 31

6.5.2 Image Format Controls

Figure 32 shows the ROI control.

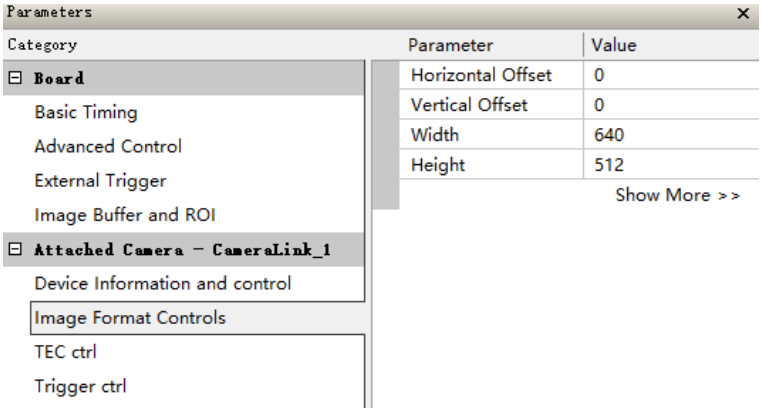


Figure 32

6.5.3 TEC Ctrl

As shown in Figure 33, TEC Ctrl contains TEC temperature control, TEC switch, fan switch, and TEC temperature display in degrees Celsius.

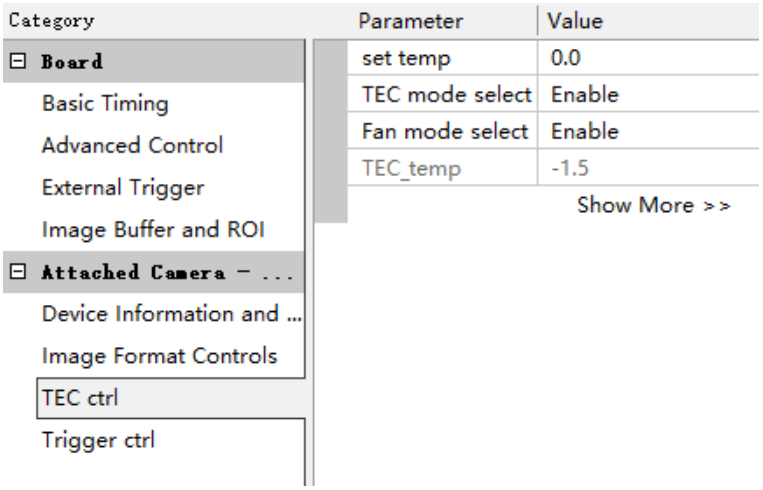


Figure 33

6.5.4 Trigger ctrl

The trigger control content Settings are shown in Figure 34 and contain the basic trigger Settings.

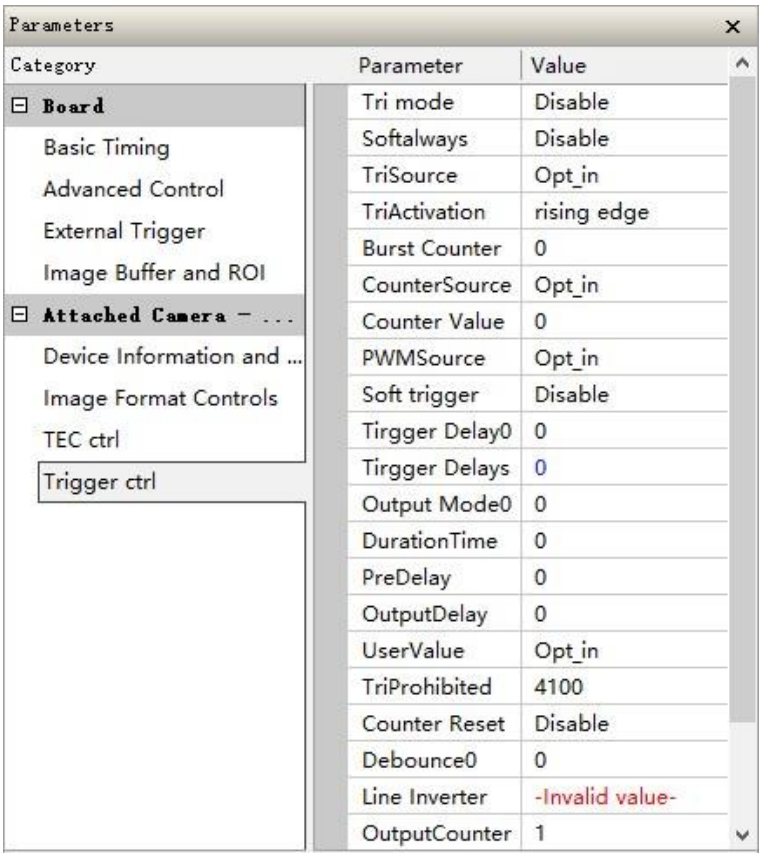

Parameters
Category
Parameter
Value
Board
Basic Timing
Advanced Control
External Trigger
Image Buffer and ROI
Attached Camera - ...
Device Information and ...
Image Format Controls
TEC ctrl
Trigger ctrl
Tri mode
Disable
Softalways
Disable
TriSource
Opt_in
TriActivation
rising edge
Burst Counter
0
CounterSource
Opt_in
Counter Value
0
PWMSource
Opt_in
Soft trigger
Disable
Tirgger Delay0
0
Tirgger Delays
0
Output Mode0
0
DurationTime
0
PreDelay
0
OutputDelay
0
UserValue
Opt_in
TriProhibited
4100
Counter Reset
Disable
Debounce0
0
Line Inverter
-Invalid value-
OutputCounter
1

Figure 34

7 Camera Commands

7.1 Basic Formats

The serial port of the camera CameraLink is used as the communication port. The baud rate of the serial port is 115200, and the serial port has 8 bits without check bit mode.

The protocol format is compatible with GENICAM gencp 1.0. For details, refer to GENICAM protocol.

The protocol instruction is realized by register access, each function is distinguished and defined by different register addresses, and the protocol data is divided into general part and special part. The protocol data is preceded by the general part and followed by the special part. The general part is fixed to the length of 16 bytes, and the length of the special part is variable according to the different length of the function.

The general 16-byte format is described as follows (all fields in the general part are in Big-Endian format with high bytes before them) :

Suppose the sixteen bytes of data are D0, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15. For command execution, the protocol stipulates that the host computer is the active initiator and the device is the passive responder.

1. D0, D1 is two prefix bytes, fixed as 0x01 and 0x00.
2. D2 and D3 are the check words of the universal partial data. The check part ranges from D6, D7 to D14, and D15 adopts double-byte CRC redundancy check, with the high byte coming first (Big-Endian).
3. D4 and D5 are the check words for the total protocol data. The check part runs from D6 and D7 to the end of the entire protocol data. Double-byte CRC redundancy check is also adopted, with the high byte in the front (Big-Endian).
4. D6 and D7 are channel ids. At present, the device channel is fixed to 0, and the data is 0x00 and 0x00.
5. D8 and D9 are common flag fields. For the upper computer, if the value is 0x40, 0x01 indicates that the normal function request is sent and the device needs to respond. If the value is 0x00, 0x01 indicates that the normal function request is sent and the device does not need to respond. For the response of the device, the field is 0x00. 0x00 indicates that the device receives the response correctly and there is no exception.
6. D10 and D11 are command ids, which are general command definition fields. For the upper computer, the values are 0x08 and 0x00 when reading data and 0x08 and 0x02 when writing data. For the device, the value is 0x08, 0x01 when it responds to read data, 0x08, 0x03 when it responds to write data.
7. D12, D13 indicates the length of the dedicated part data.
8. D14 and D15 are sequence ids. For the upper computer, the sequence ID needs to be increased by one for each command sent. The sequence ID remains the same for a device-side response to ensure that the host machine receives confirmation that the device-side instruction is executed correctly.

7.2 Dedicated Part Format

For the special part of the format is mainly divided into two read and write registers (register and length field is fixed in the Big-Endian format before the high byte, the rest of the data can be Big-Endian or Little-Endian, according to the custom)

1. Format description of the special part when the upper computer reads the register data

The whole dedicated data length is 12 bytes, if the data is R0, R1, R2, R3, R4, R5, R6, R7, X0, X1, X2, X3, where R0~R7 is the register address that needs to be read; X0, X1 is fixed to 0x00, 0x00; X2, X3 are the length of the data to be read (the length is the legal length defined by the register, and the length of each register is specified).

2. Format description of the special part when the device responds to the upper computer reading register data

The whole private data is the data that needs to be read, there are no other fields; The length varies according to the length of the data read, such as X1, X2, X3..... Xn; The length of the read data is n.

3. Format description of the special part of the upper computer when writing register data

When the upper computer writes register data, the special part of the data consists of two parts: register and data, such as R0, R1, R2, R3, R4, R5, R6, R7, X1, X2, X3..... Xn; R0 to R7 indicates the register address (REG_ADDR). X1 to Xn indicates the data to be written. The length of the data to be written is n, which is the legal length specified by the register.

4. Format description of the special part when the device responds to the host computer to write register data

When the device successfully writes data from the host computer, the dedicated data part of the device response is fixed as 0x00, 0x00, 0x00, 0x00.

7.3 Definition of each register

ADDR_BASE =0x0000000020000000

REG_ADDR= ADDR_BASE + ADDR_OFFSET

Number	Register function	Register address (ADDR_OFFSET)	Register value	default parameters	data length	R/W	Data sequence
1	ROI columns	0x070	32 to 640- Column start position	0	4byte	RW	little
2	ROI column starting position	0x080	0~608	640	4byte	RW	little
3	ROI rows	0x090	4 to 512- The starting position of the line	0	4byte	RW	little
4	ROI row starting position	0x0A0	0~508	512	4byte	RW	little
5	Exposure	0x200	16~100000(us)	100	4byte	RW	Big
6	Gain	0x210	0/1/2(Hg/Mg/Lg)	1	4byte	RW	Big
7	Frame rate control	0x230	1~700	700	4byte	RW	Big
8	Denoising level	0x280	1~10	5	4byte	RW	Big
9	Algorithm control	0x2b0	0bit: Delect defective pixel switch 1bit: Dark field correction switch 2bit: Denoise switch	7	4byte	RW	Big
10	Defective pixel reload	0x320			4byte	W	Big
11	TEC Temperature Setting	0x330	T(℃)=data/10, complement-on-two	0	4byte	RW	Big
12	TEC temperature reading	0x340	T(℃)=data/10, complement-on-two		4byte	R	Big
13	TEC switch control	0x350	1 is on and 0 is off	1	4byte	RW	Big
14	Fan control	0x360	1 is on and 0 is off	1	4byte	RW	Big
15	Automatic dark field switch	0x370	1 is on and 0 is off	1	4byte	RW	Big
16	Manual dark field selection	0x380	1~15	1	4byte	RW	Big
17	Auto exposure switch	0x390	1 is on and 0 is off(Not supported yet)	0	4byte	RW	Big
18	tri_mode	0x400	0-Normal Mode 1-Trigger Mode	0	4byte	RW	Big
19	soft_always_en	0x410	0-soft disable 1-soft always enable	0	4byte	RW	Big
20	tri_source_i	0x420	trigger source: 0-Opt_in	0	4byte	RW	Big

			1-GPIO_0 2-GPIO_1 3-counter 4-PWM 5-software				
21	tri_activation_i	0x430	0-rising edge; 1-falling edge; 2-level high; 3-level low	0	4byte	RW	Big
22	burst_counter_i	0x440	continuous acquisition 0-65535	0	4byte	RW	Big
23	counter_source_i	0x450	0-Opt_in 1-GPIO_0 2-GPIO_0	0	4byte	RW	Big
24	counter_value_i	0x460	Frequency division coefficient	0	4byte	RW	Big
25	pwm_source_i	0x470	0-Opt_in 1-GPIO_0 2-GPIO_1	0	4byte	RW	Big
26	IO_link	0x480	0bit: GPIO_0: 0-input,1-output 1bit: GPIO_1: 0-input,1-output	0	4byte	RW	Big
27	soft_start	0x490	software trigger	0	4byte	W	Big
28	tri_delay_0_i	0x4a0	when the Opt_in tirgger assert, the start of exposure will delay 0-32xffff_ffff(cycle)	0	4byte	RW	Big
29	tri_delay_1_i	0x4b0	when the GPIO_0 tirgger assert, the start of exposure will delay 0-32xffff_ffff(cycle)	0	4byte	RW	Big
30	tri_delay_2_i	0x4c0	when the GPIO_1 tirgger assert, the start of exposure will delay 0-32xffff_ffff(cycle)	0	4byte	RW	Big
31	tri_delay_s_i	0x4d0	when the software tirgger assert, the start of exposure will delay 0-32xffff_ffff(cycle)	0	4byte	RW	Big
32	output_mode_0_i	0x4e0	Opt_out output mode: 0-Frame Trigger Wait 1-Exposure Active 2-Strobe 3-User output	0	4byte	RW	Big
33	output_mode_1_i	0x4f0	GPIO_0 Output mode: 0-Frame Trigger Wait 1-Exposure Active 2-Strobe 3-User output	0	4byte	RW	Big
34	output_mode_2_i	0x500	GPIO_1 output mode: 0-Frame Trigger Wait 1-Exposure Active 2-Strobe 3-User output	0	4byte	RW	Big
35	duration_time_i	0x510	Strobe duration time:effective time 0-32xffff_ffff(cycle)	0	4byte	RW	Big
36	pre_delay_i	0x520	advance the exposure time 0-32xffff_ffff(cycle)	0	4byte	RW	Big
37	output_delay_i	0x530	later than exposure time 0-32xffff_ffff(cycle)	0	4byte	RW	Big
38	user_value	0x540	Opt_out--user value	0	4byte	RW	Big
39	tri_prohibited_i	0x550	next trigger rising prohibited time 4100~32xffff_ffff(cycle)	4100	4byte	RW	Big

40	counter_reset	0x560	When counter_reset assert, the counter of trigger will be reseted	0	4byte	W	Big
41	debounce_0	0x570	debounce time: 0-20000us	0	4byte	RW	Big
42	debounce_1	0x580	debounce time: 0-20000us	0	4byte	RW	Big
43	debounce_2	0x590	debounce time: 0-20000us	0	4byte	RW	Big
44	line_inverter	0x5a0	1-enable	3'b111	4byte	RW	Big
45	output_counter_i	0x5b0		1	4byte	RW	Big
46	pause	0x5c0		0	4byte	RW	Big
47	Frame count cleared to zero	0x5d0	0bit: frame_clr 1bit: tri_clr 2bit: time_clr 3bit: all_clr	0	4byte	W	Big
48	Frame count display switch	0x5e0		0	4byte	RW	Big
49	Dark field threshold control	0x5f0	0-16384	16383	4byte	W	Big
50	Version	0x3a0	MCU Version + maximum frame rate + Firmware version + Firmware date		16byte	R	Big
51	Read mode switching	0x1f0	0: IWR(Integrate while reading) 1: ITR(Integrate then read)	1	4byte	RW	Big

8 SDK & CLView application

8.1 SDK

The camera control supports two modes: 1) Controlled through private SDK development kit; 2) Controlled by GenICam interface.

8.2 CLView application

Figure 35 Software interface

CLView software can achieve complete control of the camera, and open source to customers to use, while providing technical support.

Description of the main functions of CLView software:

Serial port control;

Exposure time control;

Gain mode control;

ROI control;

Frame rate control;

Trigger mode control;

Dark field correction control;

TEC and Fan control;

Refrigeration temperature control;

Real-time frame rate display;

Real-time temperature monitoring;

Save picture;

Video;

Update online;

Accept customer OEM functions customized.

8.3 CLCtrl software

The camera can capture and display images through the software CameraLink capture card, and use the CLCtrl software to control. Start the CLCtrl software first, and then start the acquisition card software after obtaining the control of the serial port.