ARTCAM-991SWIR-TEC-CL
Camera Link Setting Manual

rev.1.00

Contents

1. Introduction

This manual is for overall settings of cameras with Camera Link. Please refer to the camera instruction for more details of cameras.
This manual is especially for the following model:

Table 1-1: Target Model

Model	Pixels	Frame Rate
ARTCAM-991SWIR-TEC-CL	0.32M	137fps

2. Device and System Requirements

To use a Camera Link camera, the following devices and software are required. Please have them prepared before starting up the camera.

Table 2-1: Minimum Requirements

Item	Note
Camera Link Frame Grabber Board	Compatible with Base Configuration
Viewer Software	Software accompanying with grabber board, or ArtMeasure
Serial Communication Software	e.g. Tera Term
PC	Any which can adopt items mentioned above.
Camera	
Camera Link Cable	The connector joining to camera should be SDR.
AC Adapter	Please use the AC adapter we offer

All the settings in this manual are under the condition with following devices which we recommend. While using other devices, users could adapt settings correspondent to the devices.

Table 2-2: Device and System recommended

Item	Recommendation
Camera Link Frame Grabber Board	PIXCI®EB1 (Manufactured by EPIX)
Viewer Software	XCAP for Windows Lite
Serial Communication Software	Tera Term

Operation has been confirmed using the following framegrabbers and software combinations.

Table 2-3: Tested Framegrabbers + Software

Manufacturer	Product name + software
NI	NI PCIe-1433 + NI MAX
AVAL	APX-3318 + AcapLib2Viewer
Dalsa	Xcelera-CL PX4 Full + CamExpert
EPIX	PIXCIEB1 + XCAP

※ Tested CameraLink cable length: 2m

3. Camera Link Format

3.1. Format

The following table shows the format of Camera Link compatible with this camera.

Table 3-1: Format List

Configuration	Tap	Significant Bit	Color	Clock Frequency
Base	12bit×2tap	12bit (MSB Justified)	Grayscale	63.000MHz

3.2. Resolution

The following table shows the maximum pixels of this camera.

Table 3-2: Resolution

Model	Horizontal Pixels	Vertical Pixels
ARTCAM-991SWIR-TEC-CL	640	512

4. Connector Pin Assignment

The connector pin assignment is as follows:

Table 4-1: Connector Pin Assignment

Pin No.	Signal Name	Pin No.	Signal Name
1	GND	14	GND
2	X0-	15	X0+
3	X1-	16	X1+
4	X2-	17	X2+
5	XCK-	18	XCK+
6	X3-	19	X3+
7	RX+	20	RX-
8	TX-	21	TX+
9	CC0-	22	CC0+
10	CC1+	23	CC1-
11	CC2-	24	CC2+
12	CC3+	25	CC3-
13	GND	26	GND

5. Communication Specifications

5.1. About the settings of the product.

To change or check the settings of the Camera Link camera, you can send command to the camera through a serial communication software.

5.2. Communication Method

The serial communication method is as follows:

Table 5-1: Communication Method

Item	Contents
Communication Form	Asynchronous serial communication (In accordance with standards of RS232C)
Baud Rate	9600bps
Data	8 bit
Parity	None
Stop	1 bit
Flow Control	None

5.3. Command Format

Please give command to the camera through serial communication software with the format listed below. If the format is not correct, the camera could not be controlled.

Please be sure to use half-width characters of ASCII code.

Table 5-2: Command Format

	1	2	3	4	5	6
Format	cmd	☐	-opt	☐	val	⏎ (CR or LF or CR+LF)
Details	1: One letter which represents the main purpose of the command. 2: One space (blank) as delimiter. 3: Option correspondent with the main purpose. The format is a letter going after a "-". 4: One space (blank) as delimiter. 5: Value setting: enter the value if necessary. Decimal numerical value: enter the number directly. Hexadecimal numerical value: enter the number after an "x." The default value would be 0 if there is no value entered. 6: Line feed code					
Response	Normal: OK⏎(CR+LF) If response is a value: *"value"*⏎(CR+LF) Abnormal: NG⏎(CR+LF)					
Note	The command will be distinguished once the line feed code is sent out. If any none-half-width characters are typed (e.g. BackSpace) before line feed code, the response must be NG. If you want to cancel the command, type a none-half-width character before line feed code, the response will be NG.					

5.4. List of Commands

The commands listed below shows controllable functions.
For more details of each commands, please refer to “5.5 Commands Details.”

Table 5-3: List of Commands

Function	cmd	-opt	val	Description
Reset	x	—	—	Reset camera
Shutter	i	-v	O	Shutter speed setting
Gain	g	-v	O	Gain setting
Temperature Control	t	-v	—	Sensor Temperature readout [°C]
		-vf	—	FPGA Temperature readout [°C]
Mirror	m	-V	O	Vertical mirror enable/disable
		-H	O	Horizontal mirror enable/disable
Camera Information	n	-c	—	Show camera name
		-v	—	Show firmware version
Peltier Control	p	-y	—	Peltier ON
		-n	—	Peltier OFF
Capture mode	r	-p	—	Sets preview mode
		-t	—	Sets trigger mode

5.5. Commands Details

The details of each commands are as follows. Please refer to the command correspondent to your needs.

5.5.1. Reset

Table 5-4: Reset Camera

	1	2	
Format	x	⏎	
Details	1: x = Reset 2: Line feed code		
Response	Normal: OK⏎ Abnormal: NG⏎		
Note	Resets camera		

5.5.2. Shutter

Table 5-5: Shutter Speed Settings

	1	2	3	4	5	6
Format	i	☒	-v	☒	val	⏎
Details	1: i = Shutter 2: Delimiter 3: -v = Option: shutter speed settings 4: Delimiter 5: Value of shutter speed 6: Line feed code					
Response	Normal: OK⏎ Abnormal: NG⏎					
Note	Sets the shutter speed ※To calculate the shutter speed, please refer to the instruction of the camera.					

5.5.3. Gain

Table 5-6: Gain Settings

	1	2	3	4	5	6
Format	g	☒	-v	☒	val	⏎
Details	1: g = Gain 2: Delimiter 3: -v = Option: gain settings 4: Delimiter 5: Gain settings 6: Line feed code					
Response	Normal: OK⏎ Abnormal: NG⏎					
Note	To change the setting value of gain. ※For details on gain setting, please refer to the to the product manual					

5.5.4. Temperature Control

Table 5-7: Sensor Temperature Readout

	1	2	3	4		
Format	t	☒	-v	⏎		
Details	1: t = Temperature control 2: Delimiter 3: -v = Option: Sensor temperature readout 4: Line feed code					
Response	Normal: *temperature* ⏎ Abnormal: NG⏎					
Note	To show the estimated temperature of camera sensor. The temperature shown here is merely a reference.					

Table 5-8: FPGA Temperature Readout

	1	2	3	4		
Format	t	☒	-vf	⏎		
Details	1: t = Temperature control 2: Delimiter 3: -vf = Option: FPGA temperature readout 4: Line feed code					
Response	Normal: *temperature* ⏎ Abnormal: NG⏎					
Note	To show the estimated temperature of camera FPGA. The temperature shown here is merely a reference.					

5.5.5. Mirror

Table 5-9: Mirror vertical

	1	2	3	4	5	6	
Format	m	☒	-V	☒	val	⏎	
Details	1: m = Mirror 2: Delimiter 3: -V = Option: Vertical 4: Delimiter 5: 0 = disabled, 1 = enabled 6: Line feed code						
Response	Normal: OK⏎ Abnormal: NG⏎						
Note	To enable/disable vertical mirror						

Table 5-10: Mirror horizontal

	1	2	3	4	5	6	
Format	m	☒	-H	☒	val	⏎	
Details	1: m = Mirror 2: Delimiter 3: -H = Option: Horizontal 4: Delimiter 5: 0 = disabled, 1 = enabled 6: Line feed code						
Response	Normal: OK⏎ Abnormal: NG⏎						
Note	To enable/disable horizontal mirror						

5.5.6. Camera Information

Table 5-11: Camera Name

	1	2	3	4		
Format	n	☒	-c	⏎		
Details	1: n = Camera information 2: Delimiter 3: -c = Option: Camera name 4: Line feed code					
Response	Normal: ARTCAM-991SWIR-TEC-CL (example)⏎ Abnormal: NG⏎					
Note	To show camera name.					

Table 5-12: Firmware Version

	1	2	3	4		
Format	n	☒	-v	⏎		
Details	1: n = Camera information 2: Delimiter 3: -v = Option: Firmware version 4: Line feed code					
Response	Normal: Version: *202012041730* (example)⏎ Abnormal: NG⏎					
Note	To show firmware version.					

5.5.7. Peltier

Table 5-13: Peltier ON

	1	2	3	4		
Format	p	☒	-y	⏎		
Details	1: p = Peltier 2: Delimiter 3: -y = Peltier ON 4: Line feed code					
Response	Normal: OK⏎ Abnormal: NG⏎					
Note	To enable peltier					

Table 5-14: Peltier OFF

	1	2	3	4		
Format	p	☒	-n	⏎		
Details	1: p = Peltier 2: Delimiter 3: -n = Peltier OFF 4: Line feed code					
Response	Normal: OK⏎ Abnormal: NG⏎					
Note	To disable peltier					

5.5.8. Capture mode

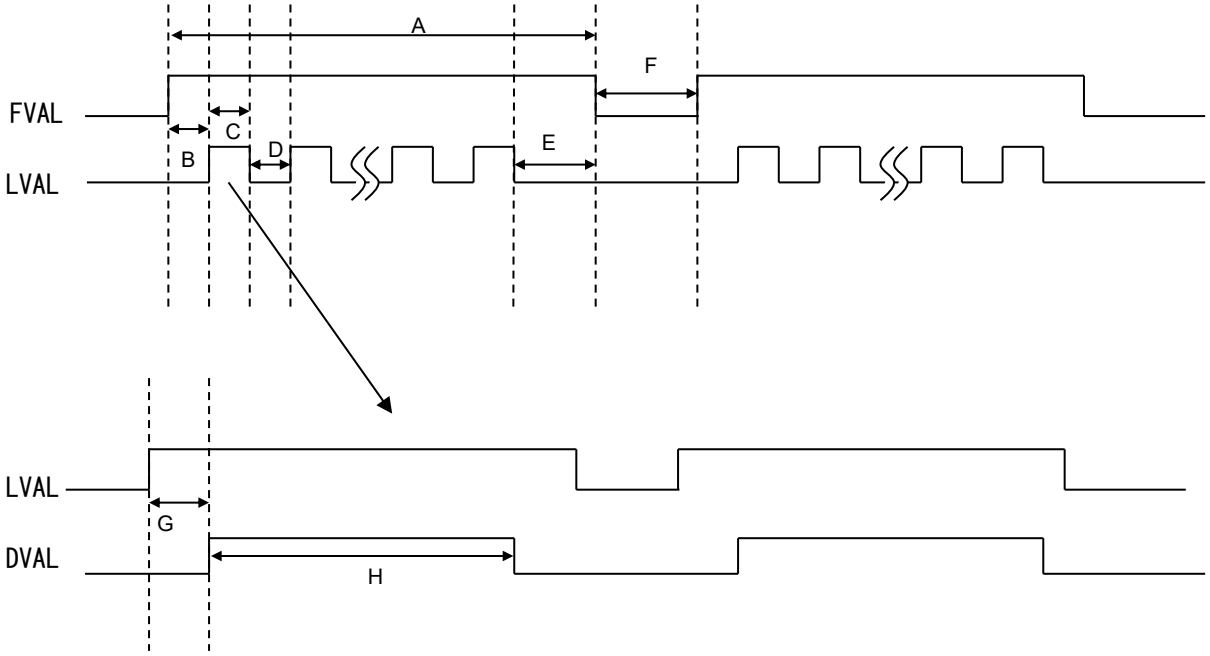
Table 5-12: Preview Mode

	1	2	3	4		
Format	r	☒	-p	⏎		
Details	1: r = Capture mode 2: Delimiter 3: -p = Preview 4: Line feed code					
Response	Normal: OK⏎ Abnormal: NG⏎					
Note	Configures capture as preview mode					

Table 5-13: Trigger Mode

	1	2	3	4		
Format	r	☒	-t	⏎		
Details	1: r = Capture mode 2: Delimiter 3: -t = Trigger 4: Line feed code					
Response	Normal: OK⏎ Abnormal: NG⏎					
Note	Configures capture as trigger mode					

5.6. Timing chart



	Description	Value	Units
A	FVAL High	222720	clk
B	FVAL pos. edge to LVAL pos. edge	2	clk
C	LVAL High	320	clk
D	LVAL Low	115	clk
E	LVAL neg. edge to FVAL neg. edge	112	clk
F	FVAL Low	230517	clk
G	LVAL pos. edge to DVAL pos. edge	0	clk
H	DVAL High	320	clk

5.7. Camera output bit assignment

Cameralink base configuration (12 bits x 2 taps):

CL Port/Bit	Data 12bit
A0	A[0]
A1	A[1]
A2	A[2]
A3	A[3]
A4	A[4]
A5	A[5]
A6	A[6]
A7	A[7]
B0	A[8]
B1	A[9]
B2	A[10]
B3	A[11]
B4	B[8]
B5	B[9]
B6	B[10]
B7	B[11]
C0	B[0]
C1	B[1]
C2	B[2]
C3	B[3]
C4	B[4]
C5	B[5]
C6	B[6]
C7	B[7]

Camera out	12 Bit
Tap1	A[11:0]
Tap2	B[11:0]

	COL 0			COL 639
ROW 0	A[11:0]	B[11:0]	A[11:0]	B[11:0]
		...		
		...		
		...		
ROW 511	A[11:0]	B[11:0]	A[11:0]	B[11:0]

6. Settings

6.1. Preparation

Before connecting camera to your PC, please install Camera Link frame grabber board, including driver and all the software necessary.

In some cases, it is required to register the license of the product, please complete the registration before starting using the camera.

After installing, please open device manager to check if the grabber board is recognized normally.

If you use our recommendations listed in table 2-2, the device names should be recognized as follows:

Table 6-1: Devices Recognized

No.	Device
1	PIXCI®EB1 PCI Express Camera Link Video Capture Board for Win XP/Vista/7/8/10-64bit
2	PIXCI® Camera Link Serial Port (COM3※1)

※1: Will be differ depending on systems.

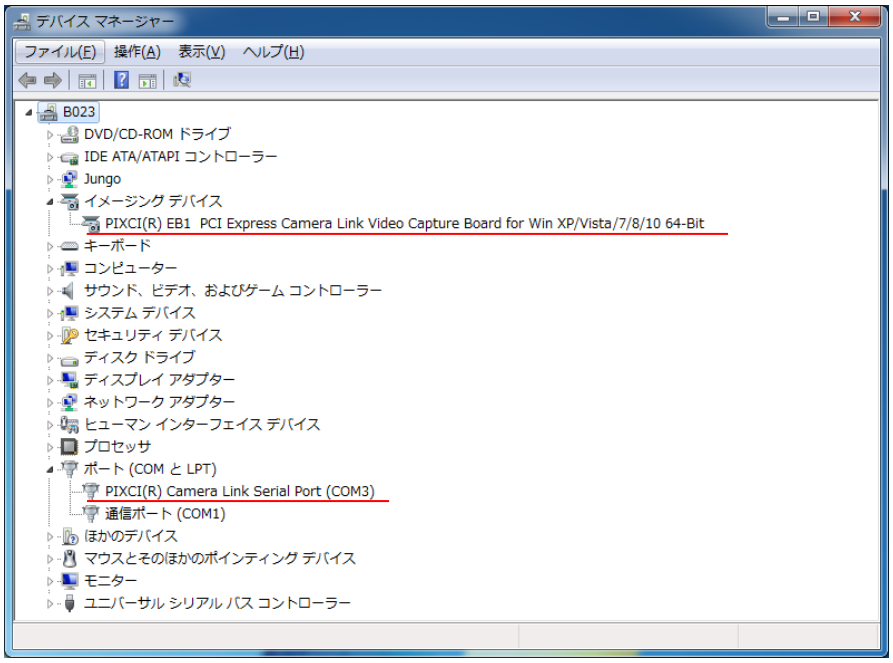


Figure 6-1: Sample of device manager

6.2. Connect to Camera

Please connect camera to the Camera Link frame grabber board with Camera Link cable.

Before connect AC adapter to the camera, please start up the serial communication software.

Command will be sent from the camera once it is connected to the power.

6.3. Example of Serial Communication Software Settings

Here we take “Tera Term” as the example of Serial Communication Software settings.
Please start up “Tera Term” before connecting AC adapter to the camera.

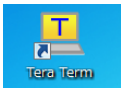


Figure 6-2: Icon of Tera Term

After starting the software, please choose the port correspondent with the name shown in device manager. (At the time this manual is made, it is shown as COM3.)

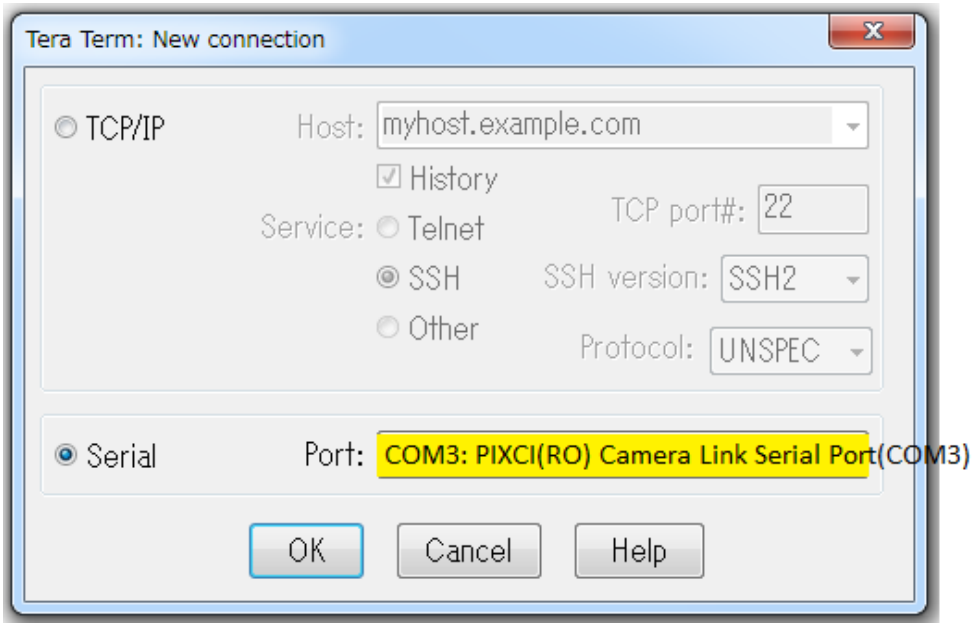


Figure 6-3: To Choose Serial Port on Tera Term

Please click “Setup” on menu bar, then choose “Serial Port” for communication method settings.
Please refer to table 5-1 Communication Method for details of the settings.

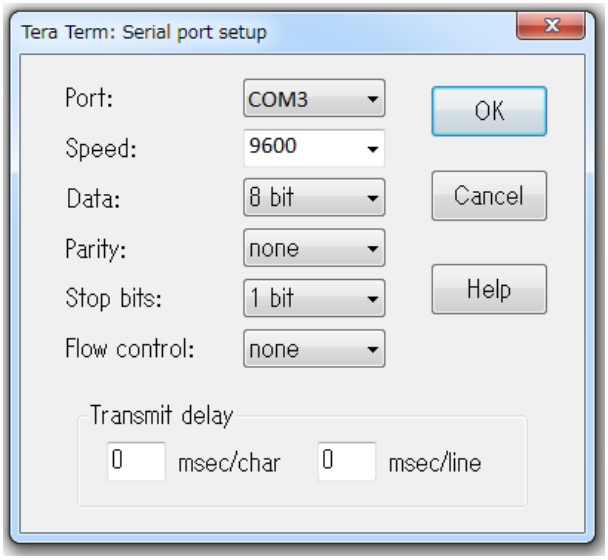


Figure 6-4: To Set up Serial Port on Tera Term

Please click “Setup” on menu bar, then choose “Terminal” for communication protocol settings.
The following table shows the recommended settings.
Please note that these settings are recommended for a smoother operation, but not necessary to be.

Table 6-2: Communication Protocol

Item	Settings
New-line (Receive)	CR
New-line (Transmit)	CR+LF
Local echo	Check the box

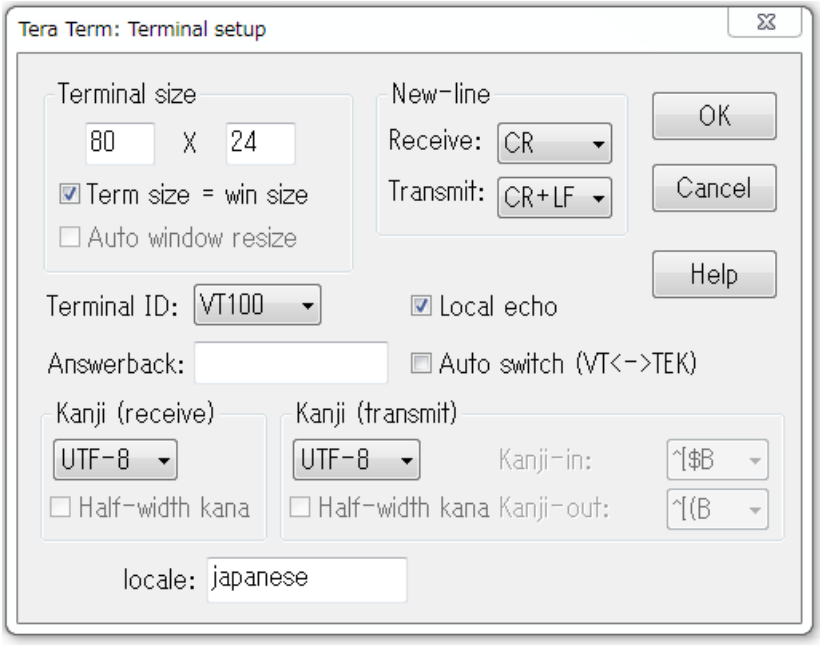


Figure 6-5: To Set up Terminal on Tera Term

After connecting camera with power, Tera Term will be initialized. Once the initialization is finished, you will see “OK” on the dialog box. Then you can send command to control camera. Please note that camera will start up only when you send out the command.

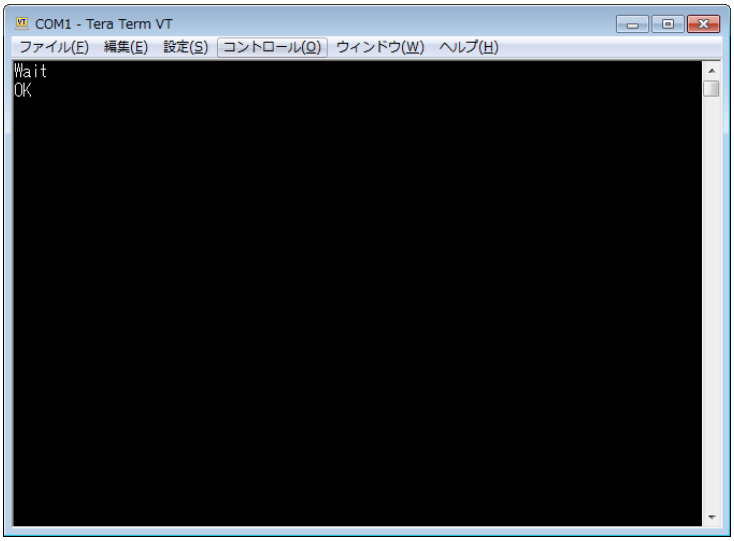


Figure 6-6: Initialization

6.4. Example of Viewer Software Settings

Here we take “EPIX®XCAP-LITE” as the example of viewer software settings.
Please start up “XCAP”.

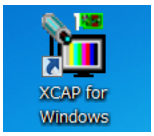


Figure 6-7: Icon of XCAP

After starting up the software, you will see welcome message and license information. If you have already registered, please click OK directly.
If a warning or precaution concerning the license shows up, you may not complete the registration. In that case please register the license to continue.

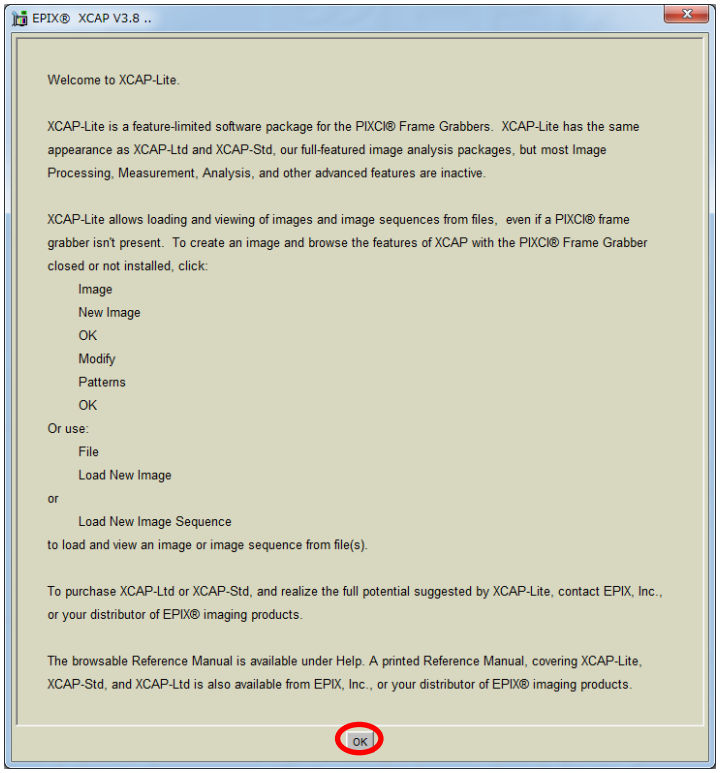


Figure 6-8: Welcome message

Please click “PIXCI®” from XCAP menu, then choose “PIXCI®Open/Close” to open the dialog box.
Please click “Open” to start the camera.

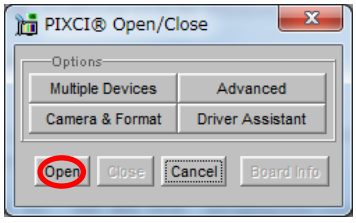


Figure 6-9: To Open Camera

After starting, you will see the settings of camera and display area.
First, please set communication settings: choose “Configure” to set Camera Link configuration, bit, tap and color.
Please refer to table 3-1 to confirm the Camera Link format.

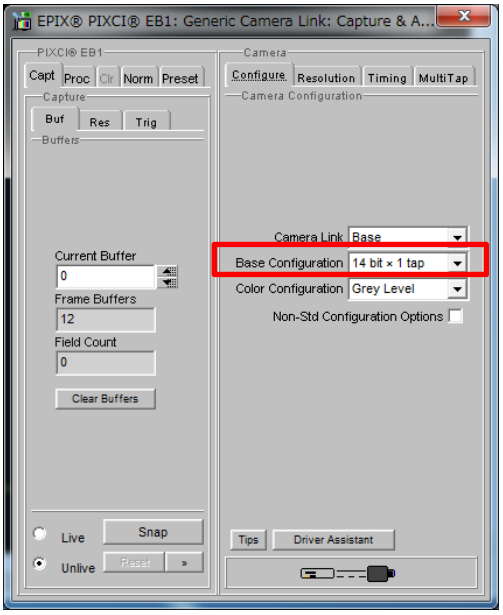


Figure 6-10: Configure Settings

Second, please set the resolution. Please refer to table 3-2 to confirm the resolution of each model.

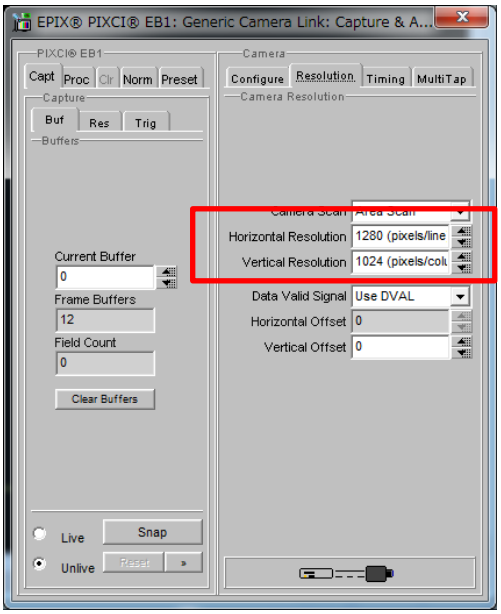


Figure 6-11: Resolution Settings

Third, please set clock frequency of Camera Link in “Timing.” Please refer to table 3-1 to confirm the Camera Link format.

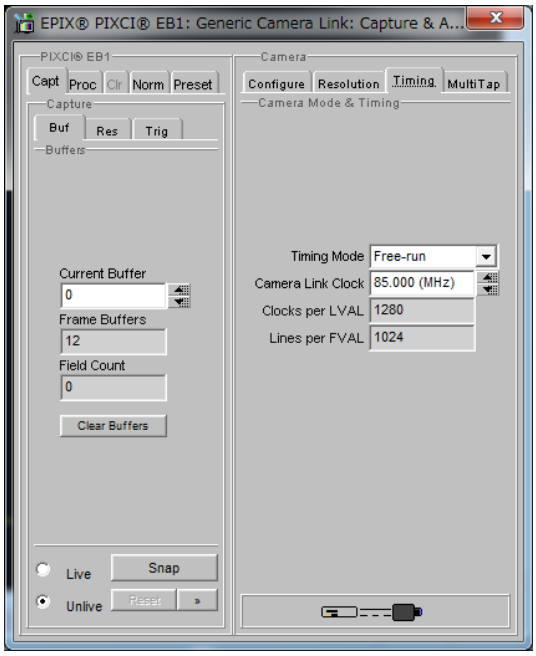


Figure 6-12: Timing Settings

The settings are finished now. The image will be displayed either by clicking “Live” in “Capture” on the sub-window, or simply by clicking “Live Icon” on the left side of the sub-window.

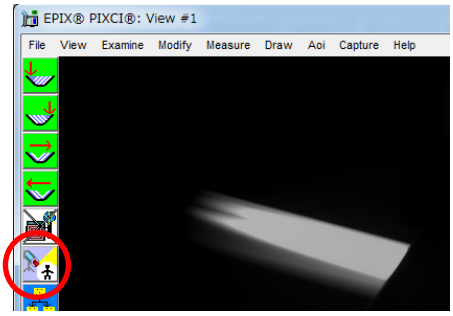


Figure 6-13: Live Icon