

# CA378-AOIS\_USB3-IFB

## Software Setup Guide

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Version 1.3.1

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## 1.1. Download

Download the following binary file.

[https://github.com/centuryarks/CA378-AOIS\\_USB3-IFB/releases/download/v1.3.1\\_release/USBCA\\_v1.3.1.zip](https://github.com/centuryarks/CA378-AOIS_USB3-IFB/releases/download/v1.3.1_release/USBCA_v1.3.1.zip)

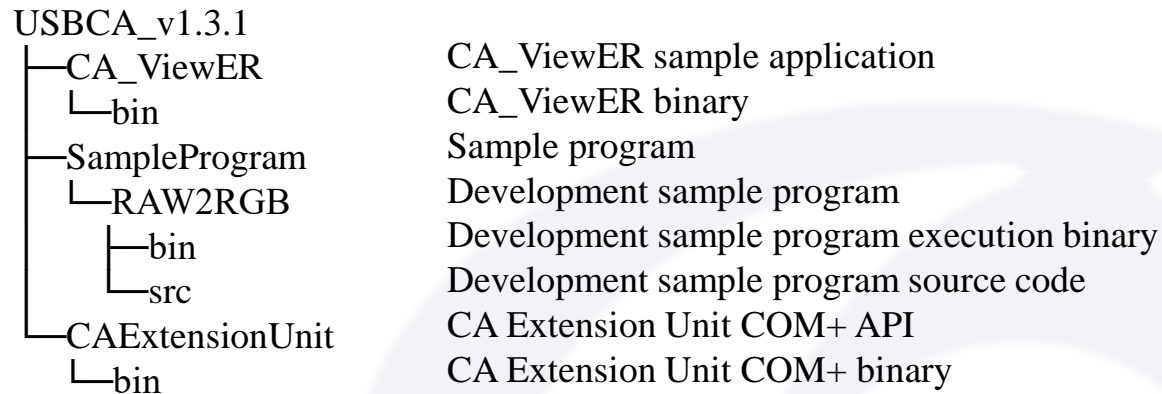
### Supplement

When building from source code, please perform Git Clone from the following URL, and refer to How to build in README.md.

[https://github.com/centuryarks/CA378-AOIS\\_USB3-IFB.git](https://github.com/centuryarks/CA378-AOIS_USB3-IFB.git)

### 2.1. Preparation

The folder structure of the unzipped USBCA\_v1.3.1.zip downloaded from GitHub is as follows.



## 2. Software installation procedure

### 2.2. USB cable connection

When you connect the USB cable, the driver installation will start automatically.

Please wait for a while until preparation is complete.

"USBCA-378" will be recognized in the camera of the device manager after successful setup.

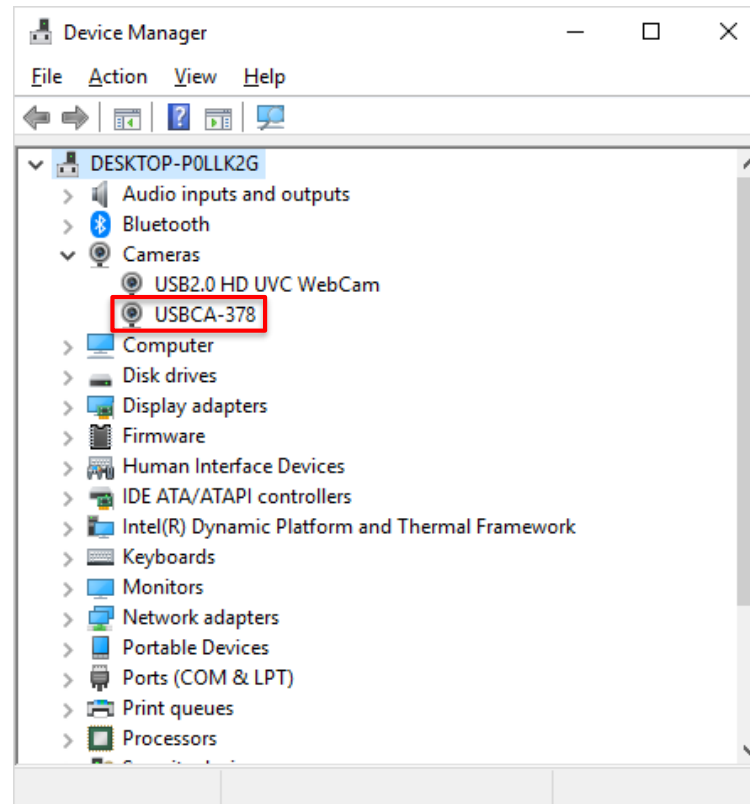


Figure 2.2. Device Manager screen

## 2. Software installation procedure

### 2.3. Visual Studio 2015 Visual C++ Redistributable Package installation

Select a program from the following URL to download and install it.

<https://www.microsoft.com/en-us/download/details.aspx?id=48145>

64bit environment: vc\_redist.x64.exe

32bit environment: vc\_redist.x86.exe

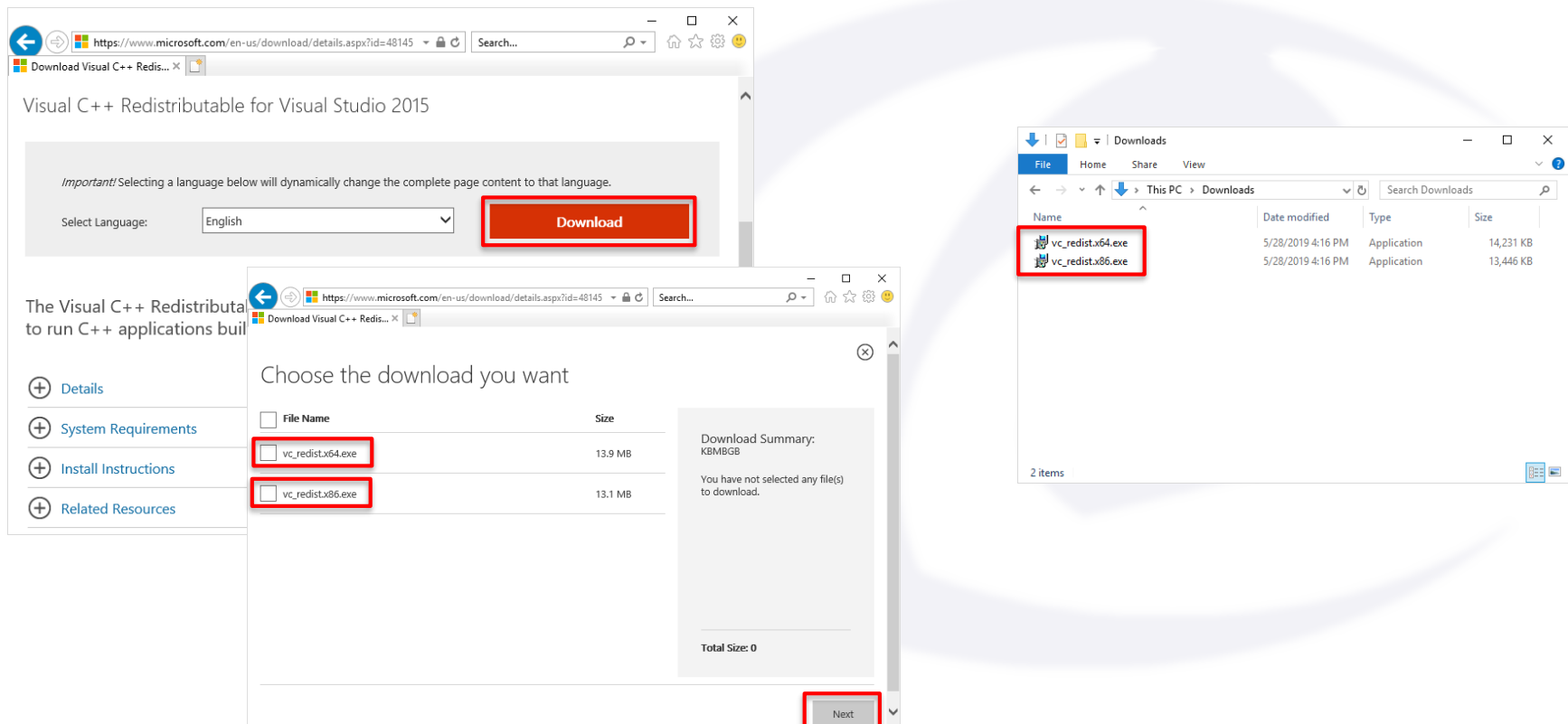


Figure 2.3. Visual Studio 2015 Visual C++ Redistributable Package installation

## 2. Software installation procedure

### 2.4. Register registry of COM

Right click on the bat file stored below and execute it as administrator.

64bit environment: "¥USBCA\_v1.3.1¥CAExtensionUnit¥bin¥x64¥CAExtensionDLL\_Install.bat"

32bit environment: "¥USBCA\_v1.3.1¥CAExtensionUnit¥bin¥CAExtensionDLL\_Install.bat"

\* To cancel the registry of COM, execute "CAExtensionDLL\_Uninstall.bat" as an administrator.

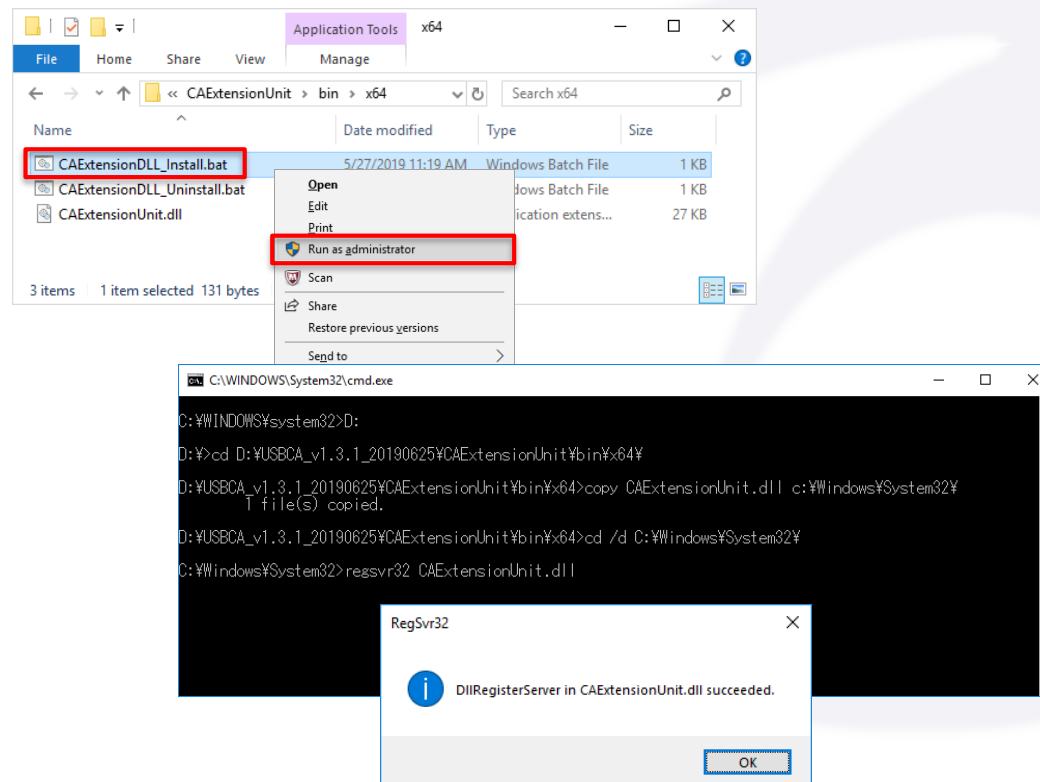


Figure 2.4. Registering the COM registry

### 3. Procedure for starting the imaging application

1) Launch CA\_ViewER.exe in the CA\_ViewER folder.

64bit environment: ¥USBCA\_v1.3.1¥CA\_ViewER¥bin¥x64¥CA\_ViewER.exe

32bit environment: ¥USBCA\_v1.3.1¥CA\_ViewER¥bin¥x86¥CA\_ViewER.exe

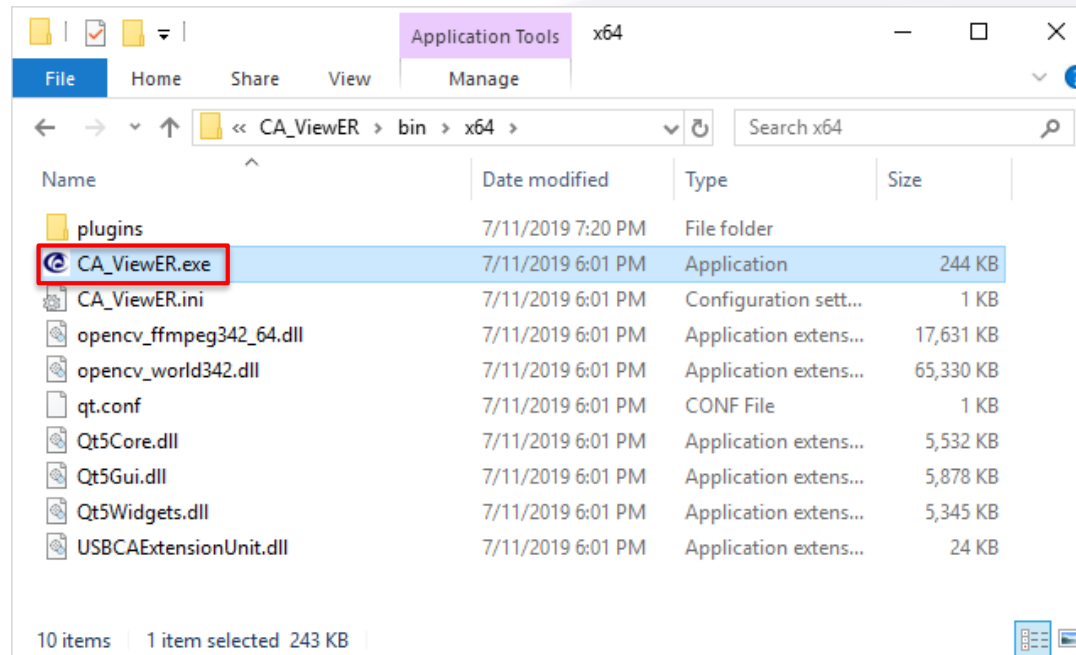


Figure 3.1. Starting the imaging application



# 4. Procedure for operating the imaging application

1) Adjust the following parameters on the Sensor tab.

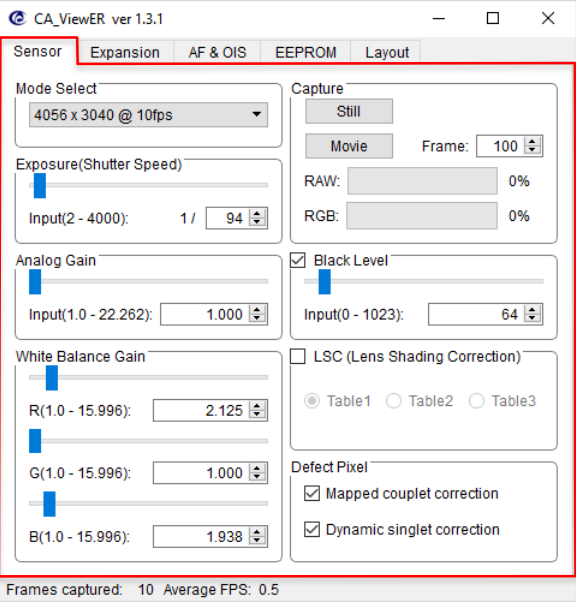


Figure 4.1. Sensor tab parameter adjustment

Item	Description
Mode Select	Select the following resolution setting. 4056 x 3040 @ 10fps      In case of USB 2.0 connection 3840 x 2160 @ 12fps      Only 640 x 480 @ 30 fps 1920 x 1080 @ 48fps 640 x 480 @ 60fps
Capture	Still button to record still images. Movie recording with the Movie button. Specify the number of saved frames in Frame. Refer to 6) for details.
Exposure	Adjust the exposure time(Shutter speed).
Analog Gain	Adjust the Analog gain.
White Balance Gain	Adjust the white balance gain of R / G / B.
Black Level	Adjust the black level correction.
Defect Pixel	Set enable / disable of defect correction.
LSC (Lens Shading Correction)	Set enable / disable of lens shading correction Select the correction table.

**\*To reset the Sensor adjustment value to the default value, press the reset button of CA378-AOIS\_USB3-IFB or disconnect the USB cable, and start the imaging application (CA\_ViewER.exe).**

# 4. Procedure for operating the imaging application

2) Adjust the following parameters on the Expansion tab.

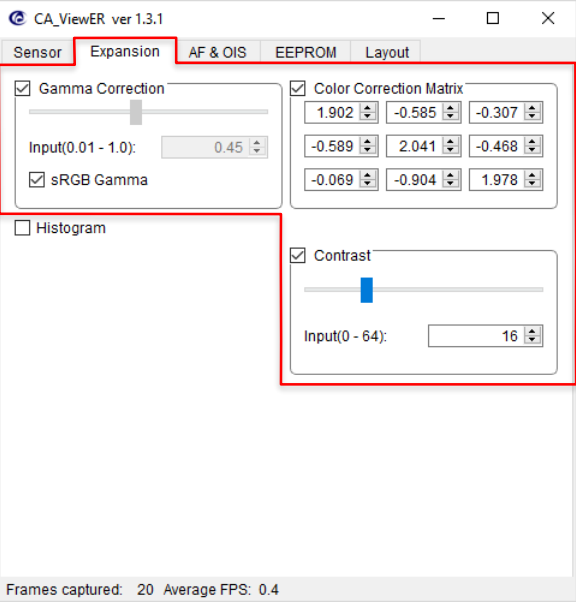
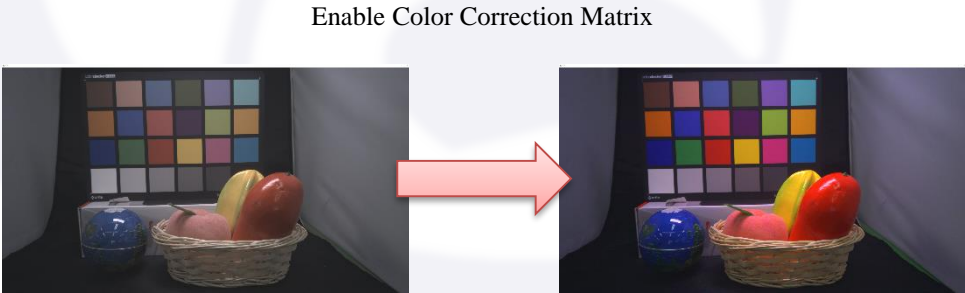
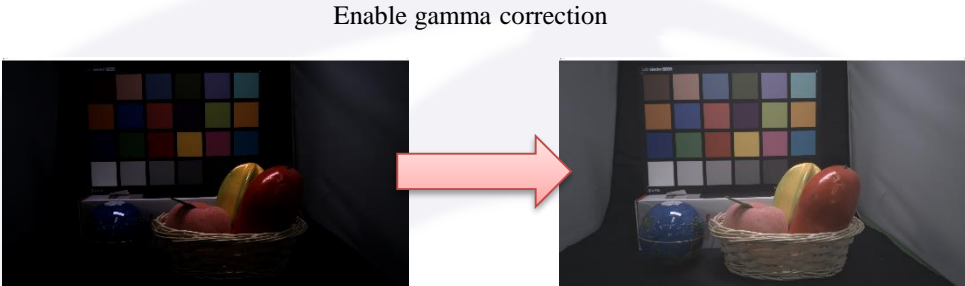


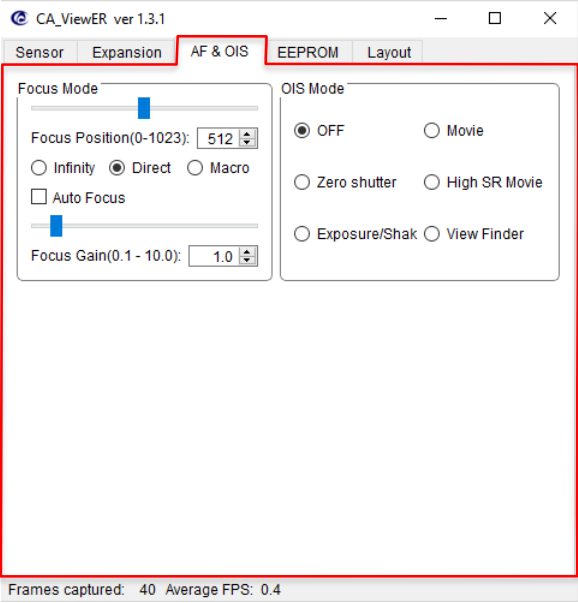
Figure 4.2. Expansion tab parameter adjustment

Item	Description
Gamma Correction	Adjust gamma correction.
Color Correction Matrix	Perform color correction with 3 x 3 matrix.
Contrast	Adjust the contrast.



# 4. Procedure for operating the imaging application

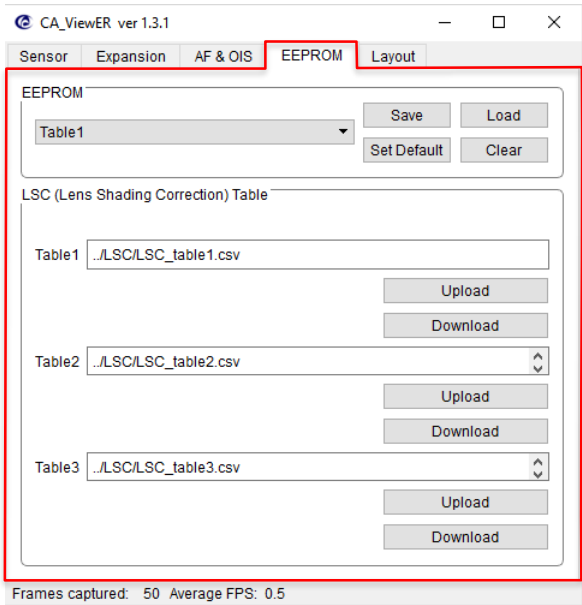
3) Adjust the following parameters on the AF & OIS tab.



項目	説明
Focus Mode	Focus Position: Specify the focus position. Each radio button Infinity: Set the focus position to infinity. Direct: Directly specifies the focus position. Macro: Set the focus position to a short distance. Auto Focus: Turns auto focus ON / OFF. Focus Gain: Adjust the autofocus gain.
OIS Mode	OFF: Disable OIS. Zero Shutter: It takes no time for exposure to start. It is suitable for realizing Zero Shutter Lag. Movie: It is easy to follow the movement of the camera, and it is suitable for active motion targets. High SR Movie: It is difficult to follow the movement of the camera, so it is suitable for inactive subjects. View Finder: Exposure Shake: Use View Finder mode and Exposure mode in combination. Since the lens moves to the center just before the exposure is started, the effective range of OIS is wide and the influence of optical distortion is small.

Figure 4.3. Adjusting the parameters of the AF & OIS tab

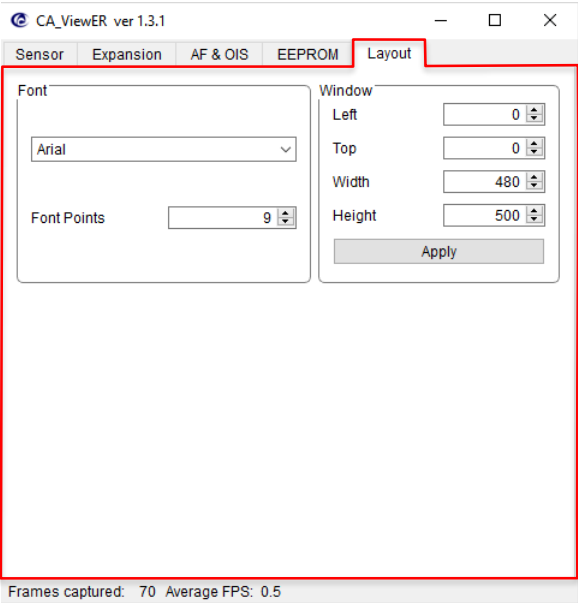
4) Adjust the following parameters on the EEPROM tab.



Item	Description
EEPROM	Select Table 1-16 in the combo box. Use the Save button to write the adjustment parameters to the EEPROM. Use the Load button to read the adjustment parameters from the EEPROM. Set the table number at startup with the Set Default button. Clear the adjustment parameters from the EEPROM with the Clear button.
LSC (Lens Shading Correction) Table	Specify the path and write the lens shading table to the EEPROM with the Upload button. Specify the path, read the lens shading table from the EEPROM with the download button, and save it in a file.

Figure 4.4. Parameter Adjustment of EEPROM Tab

5) Adjust the following parameters on the Layout tab.



Item	Description
Font	Select a font in the combo box. Font Points: Adjust font size.
Window	Left: Adjust the left position of the window. Top: Adjust the upper position of the window. Width: Adjust the width of the window. Height: Adjust the height of the window. Apply with Apply button.

Figure 4.5. Parameter Adjustment of Layout Tab

# 4. Procedure for operating the imaging application

6) Still images and movies are saved in the CA\_ViewER folder in the following format.

raw10\_yyyymmdd\_hhmmss.bmp

video\_raw10\_yyyymmdd\_hhmmss.avi

Example:

raw10\_20190712\_190624.bmp

video\_raw10\_20190712\_190651.avi

rgb\_yyyymmdd\_hhmmss.tif

video\_rgb\_yyyymmdd\_hhmmss.avi

rgb\_20190712\_190624.tif

video\_rgb\_20190712\_190651.avi

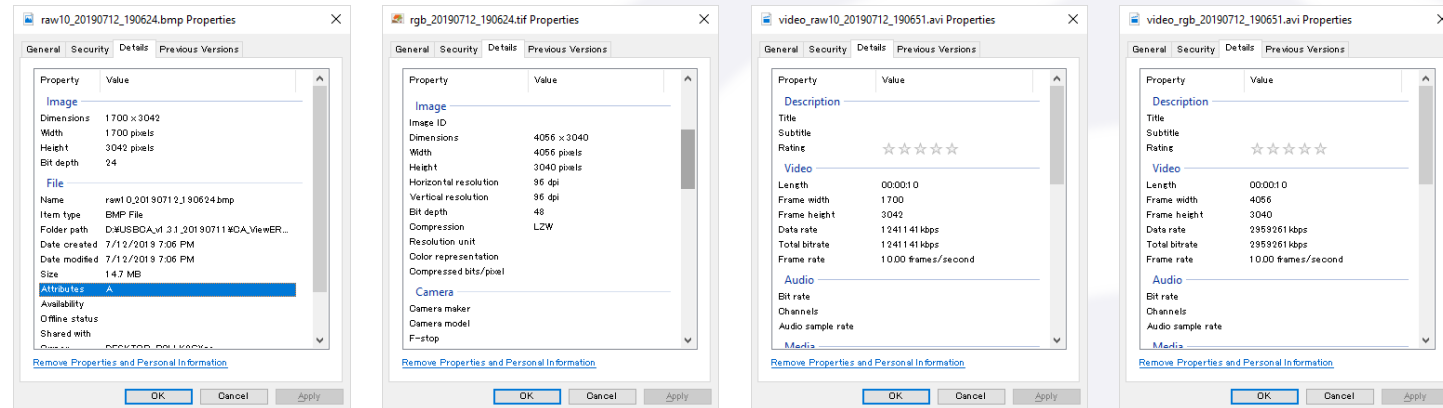


Figure 4.6. File format

**\* The maximum number of frames that can be saved in the AVI file is as follows because of size limit of 4 GB.**

**4056 x 3040: 116 frame**

**3840 x 2160: 172 frame**

**1920 x 1080: 690 frame**

**640 x 480: 4660 frame**

## 5. Development sample program

There is a sample program to convert from RAW 10 to RGB in the SampleProgram folder.  
Please refer to the following RAW2RGB.bat for usage.

The folder structure is as follows.

- └─RAW2RGB     Convert from RAW10 to RGB
  - └─bin         Binary file
  - └─src         Source code

1) If you ran "RAW2RGB. Bat" in the bin folder, an image will be created with the sample program.

```
RAW2RGB.exe -i raw10_sample_3M.bmp -o rgb24_sample_3M.bmp -offset 16 -gain 2.0 2.0 2.0 -gamma 0.45 -interp 1 -flip 1
```

The parameters are as follows.

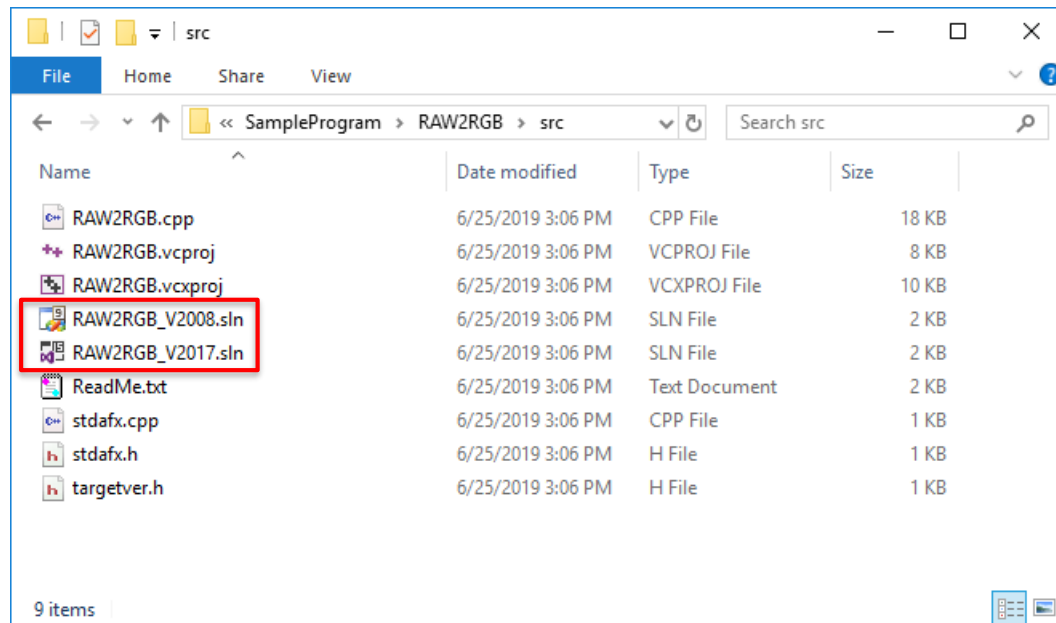
Option	Description
-i	Input file name (RAW 10 file)
-o	Output file name (RGB file)
-offset	Offset Subtraction
-gain	Gain adjustment of R / G / B (software)
-gamma	Gamma correction (default 0.45)
-interp	0: Nearest neighbor 1: Bilinear interpolation (bilinear interpolation)
-flip	0: No reverse 1: Flip in the vertical direction

## 5. Development sample program

2) Since the source code of the src folder is released, it is possible to build it.

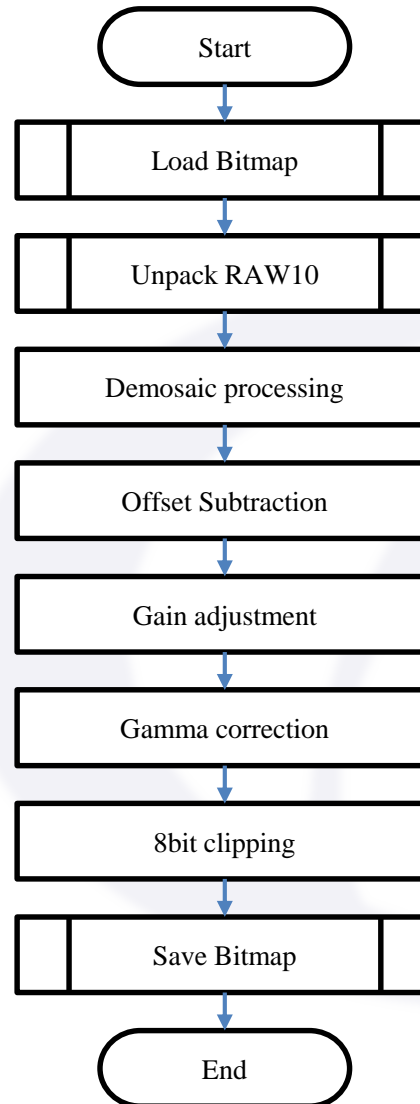
For Visual Studio 2017, please use "RAW2RGB\_V2017.sln".

For other versions, convert "RAW2RGB\_V2008.sln" and use it.





The development process is as follows.



## 5. Development sample program

### About RAW10 format

As shown below, 4 pixels are packed into 5 bytes and sent.

	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
1 <sup>st</sup> byte	P0[9]	P0[8]	P0[7]	P0[6]	P0[5]	P0[4]	P0[3]	P0[2]
2 <sup>nd</sup> byte	P1[9]	P1[8]	P1[7]	P1[6]	P1[5]	P1[4]	P1[3]	P1[2]
3 <sup>rd</sup> byte	P2[9]	P2[8]	P2[7]	P2[6]	P2[5]	P2[4]	P2[3]	P2[2]
4 <sup>th</sup> byte	P3[9]	P3[8]	P3[7]	P3[6]	P3[5]	P3[4]	P3[3]	P3[2]
5 <sup>th</sup> byte	P3[1]	P3[0]	P2[1]	P2[0]	P1[1]	P1[0]	P0[1]	P0[0]

In the case of RAW10, it is necessary to send with a pixel number of 5.

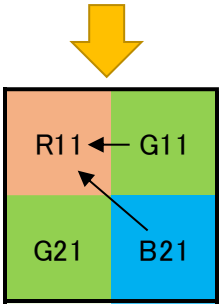
For the RGB24 format, it must be sent with a multiple of 4 pixels.

If the output size is 4056 x 3040, it will be 1700 x 3040 and the right end will be filled with 0 and the data will be sent.

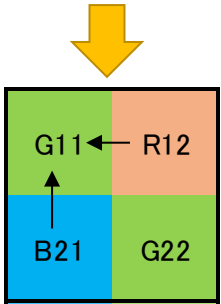
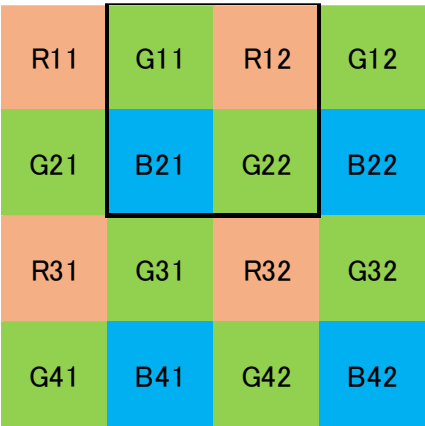
Calculating by integer operation yields the following expression.

$$((4056 / 24 * 10) / 20) + 1 * 20 = 1700$$

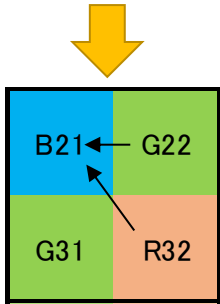
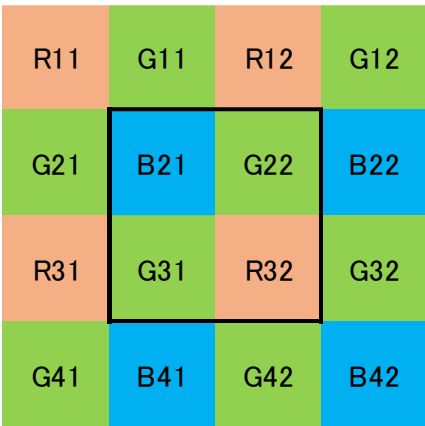
## Demosaic processing (nearest neighbor method)



R target pixel



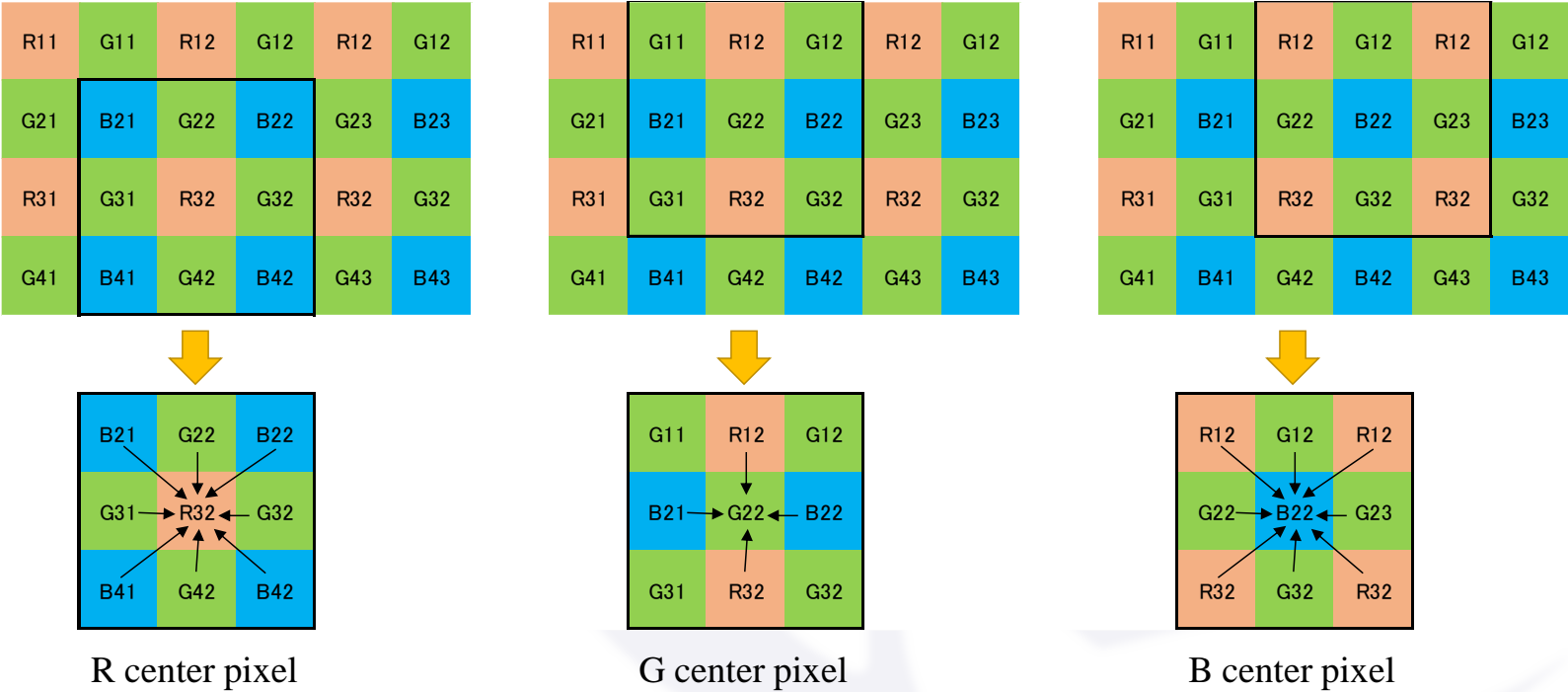
G target pixel



B target pixel

# 5. Development sample program

Demosaic processing (bilinear interpolation)



Regarding the ON / OFF of the LED, it is specified in the following condition.  
However, if a system freeze or a fatal error occurs, there is a possibility that it can not be controlled.

Status	OK	NG
Power on	ON (3 blinks)	OFF
Launch imaging application	ON	OFF
Image transfer	ON	OFF
Extension Unit communication	ON	OFF
System error occurred	—	OFF
System Freeze / Fatal Error	—	—

The development algorithm is published to the SampleProgram folder for the same source code.

We have created it using a very standard algorithm, so please use it freely.

Please refer to the source code freely because USBCAExtensionUnit is the process that prescribes the communication protocol.

CAExtensionUnit refers to Microsoft's UVC extension unit code sample.

<https://docs.microsoft.com/en-us/windows-hardware/drivers/stream/uvc-extension-unit-code-samples>

CA\_ViewER source code is released as a BSD license to the public.

Please note that OpenCV is BSD license, Qt is GPLv3 is LGPLv3 license.

### Development environment

Windows version: 10 (Version 1703(OS Build 15063.1387))

Windows SDK version: 10.0.17134.0

Visual Studio version: 2008 and 2017

### Operation confirmed PC

All-in-One Desktop PC:

CPU: Intel Celeron 1.6 GHz 1.6 GHz

Memory: 4 GB

OS: 64bit Windows 10 Pro

Notebook PC:

CPU: Intel Core i5 1.7 GHz 1.9 GHz

Memory: 8 GB

OS: 64bit Windows 10 Pro

### Software Disclaimer

\* This software does not guarantee the operation of all Windows 10 computers.