

CA378-AOIS_USB3-IFB

Software Setup Guide

CenturyArks Co., Ltd.

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Version 1.3.1

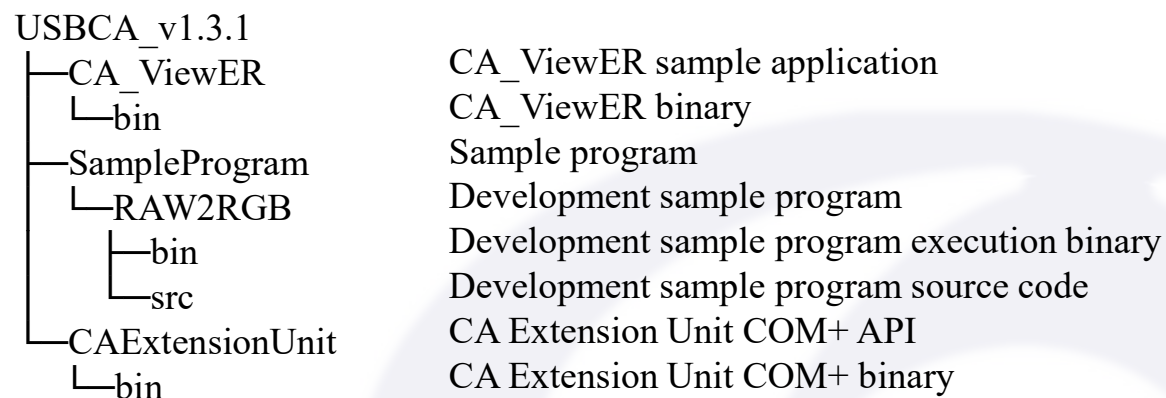
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1. Software installation procedure

1.1. Preparation

The folder structure of the unzipped USBCA_v1.3.1.zip downloaded from GitHub is as follows.



1. Software installation procedure

1.2. 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.

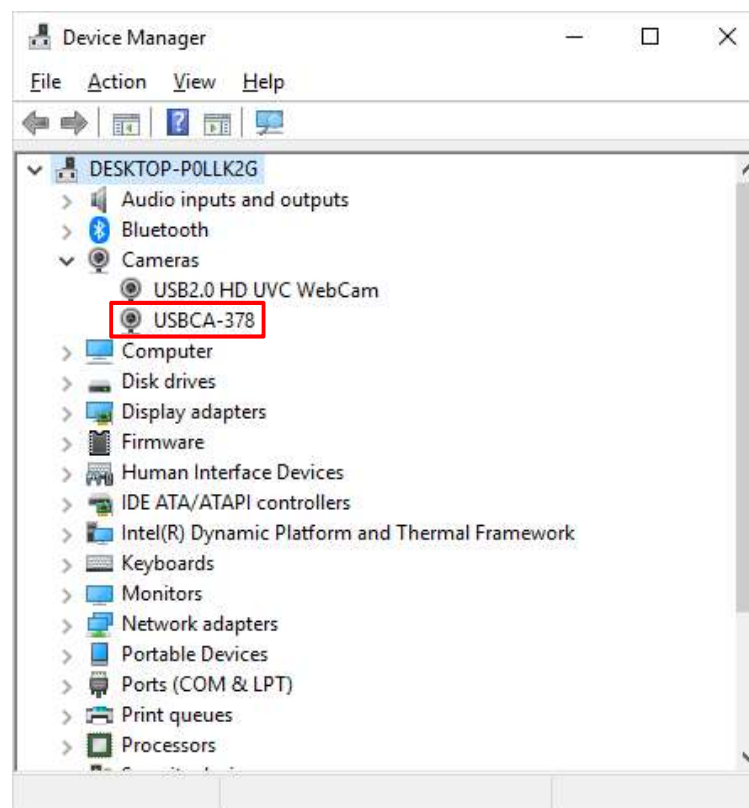


Figure 1.2. Device Manager screen

1. Software installation procedure

1.3. 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

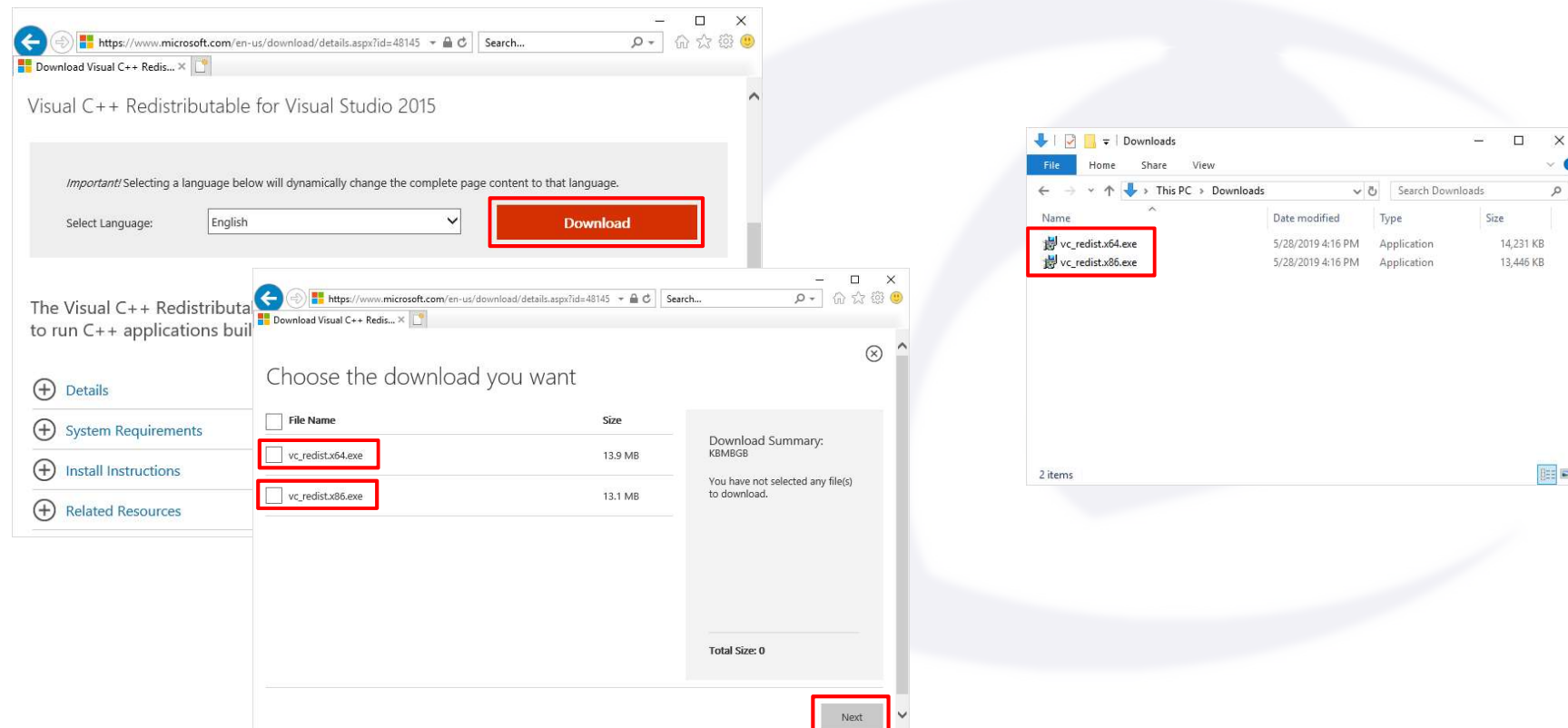


Figure 1.3. Visual Studio 2015 Visual C++ Redistributable Package installation

1. Software installation procedure

1.4. 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.

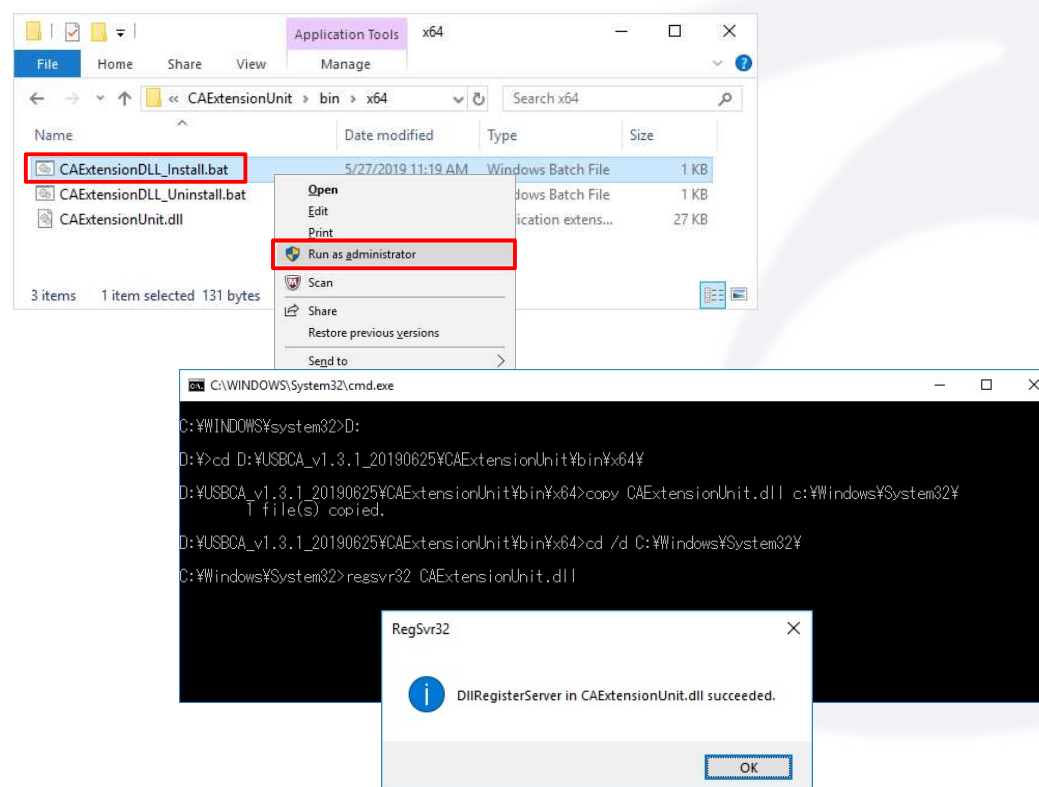


Figure 1.4. Registering the COM registry

2. 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

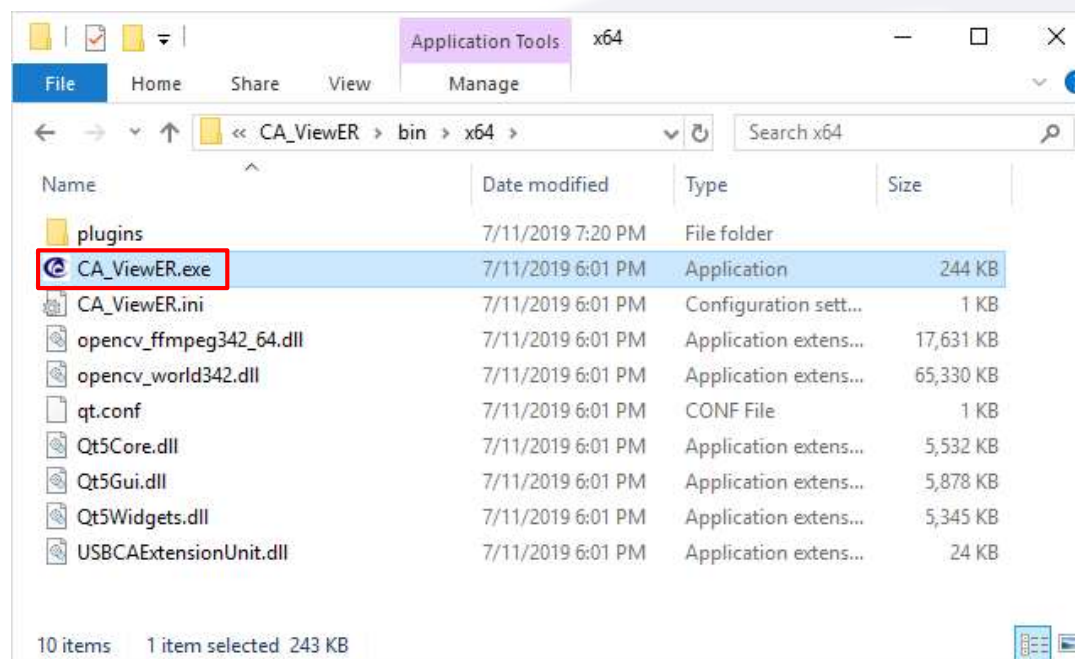


Figure 2.1. Starting the imaging application

3. Procedure for operating the imaging application

1) Adjust the following parameters on the Sensor tab.

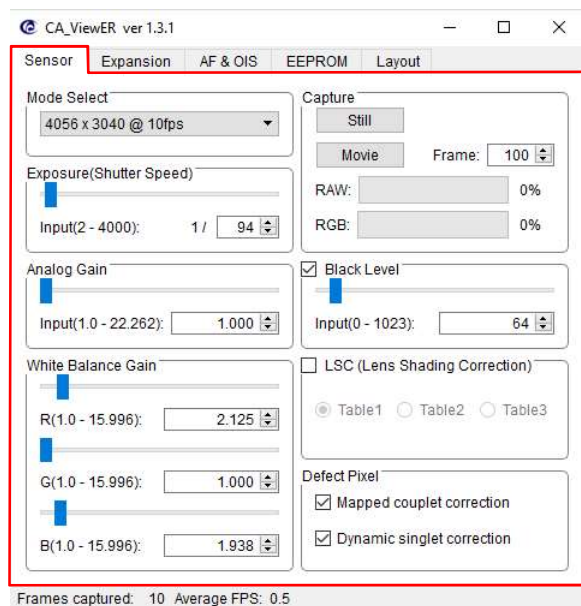


Figure 3.1. Sensor tab parameter adjustment

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).*

3. Procedure for operating the imaging application

2) Adjust the following parameters on the Expansion tab.

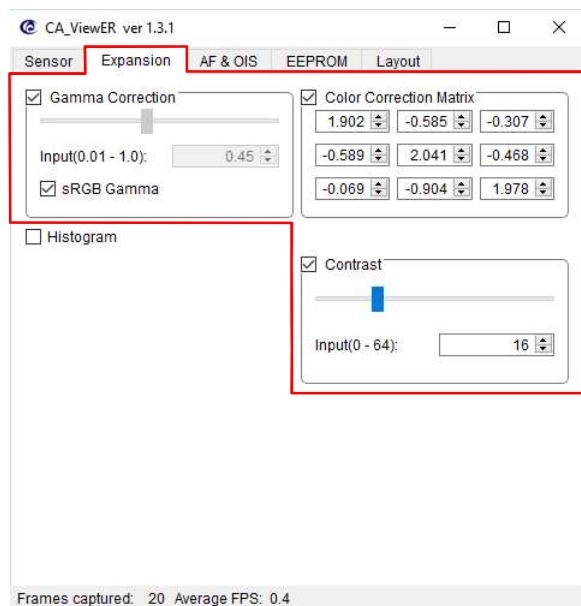
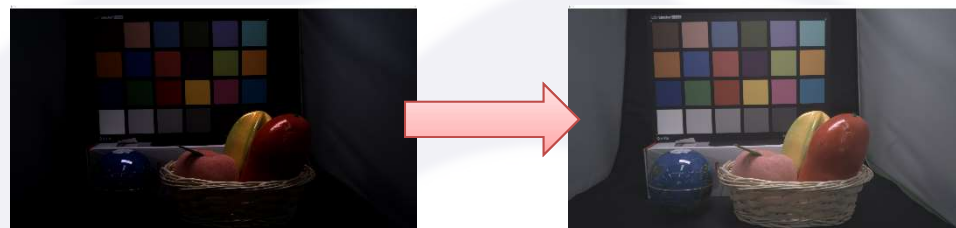


Figure 3.2. Expansion tab parameter adjustment

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

Enable gamma correction



Enable Color Correction Matrix



3. Procedure for operating the imaging application

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

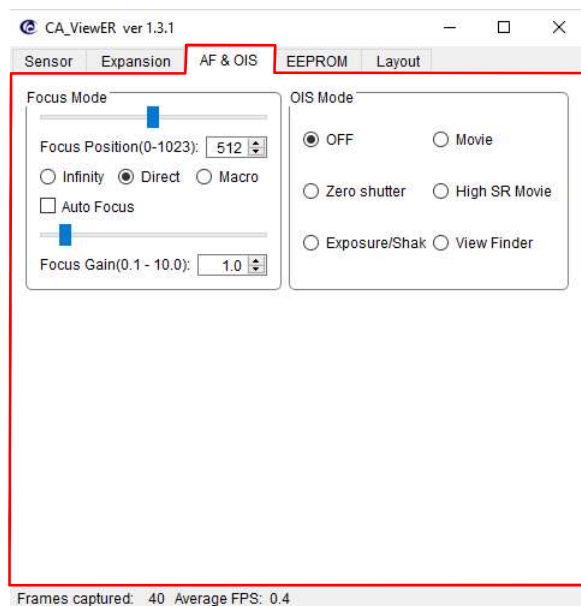
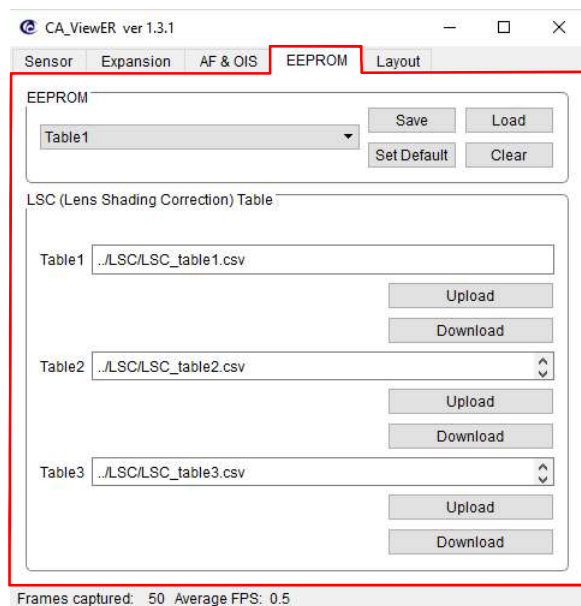


Figure 3.3. Adjusting the parameters of the AF & OIS tab

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.

3. Procedure for operating the imaging application

4) Adjust the following parameters on the EEPROM tab.

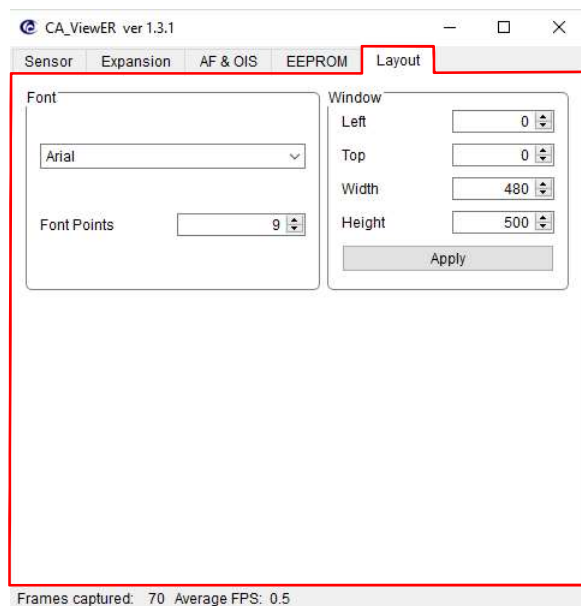


Item	Description
EEPROM	Select Table 1-16 in the combo box. Use the Save button to write the adjustment parameters to the EEPROM. Use the Load button to read the adjustment parameters from the EEPROM. Set the table number at startup with the Set Default button. Clear the adjustment parameters from the 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 3.4. Parameter Adjustment of EEPROM Tab

3. Procedure for operating the imaging application

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 3.5. Parameter Adjustment of Layout Tab

3. 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

rgb_yyyymmdd_hhmmss.tif

video_raw10_yyyymmdd_hhmmss.avi

video_rgb_yyyymmdd_hhmmss.avi

Example:

raw10_20190712_190624.bmp

rgb_20190712_190624.tif

video_raw10_20190712_190651.avi

video_rgb_20190712_190651.avi

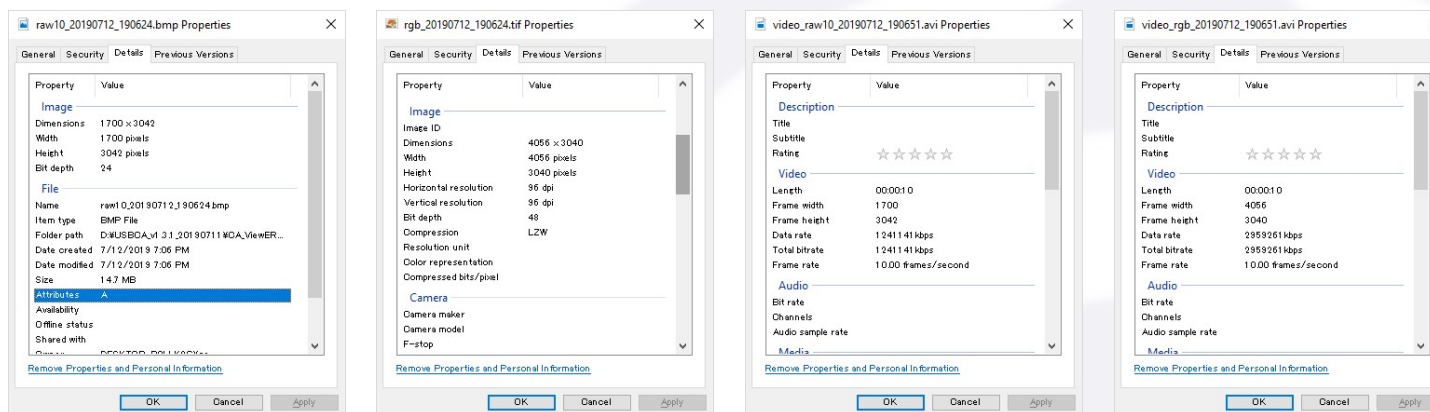


Figure 3.6. File format

*** 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

4. 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.

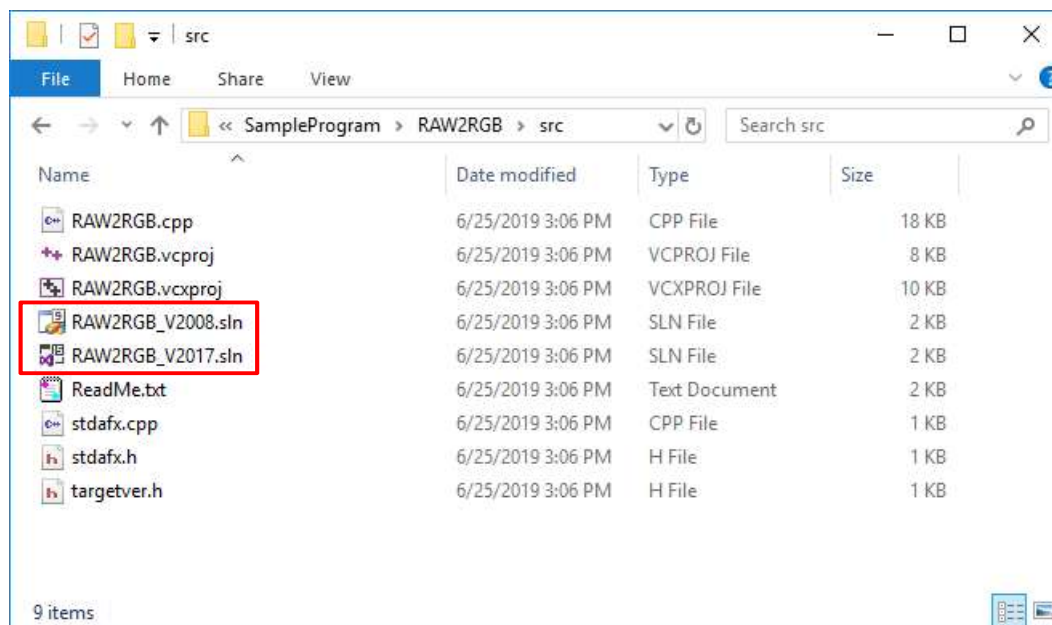
Option	Description
-i	Input file name (RAW 10 file)
-o	Output file name (RGB file)
-offset	Offset Subtraction
-gain	Gain adjustment of R / G / B (software)
-gamma	Gamma correction (default 0.45)
-interp	0: Nearest neighbor 1: Bilinear interpolation (bilinear interpolation)
-flip	0: No reverse 1: Flip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

4. Development sample program

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

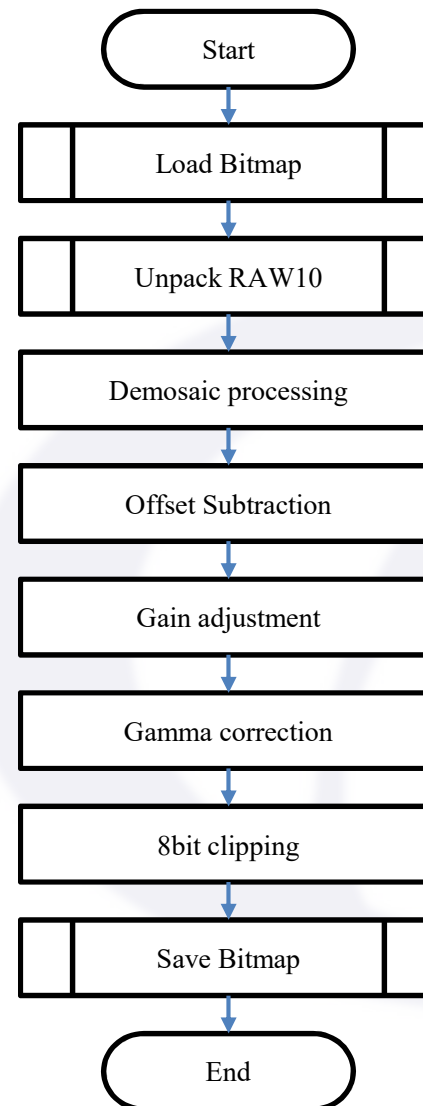
For Visual Studio 2017, please use "RAW2RGB_V2017.sln".

For other versions, convert "RAW2RGB_V2008.sln" and use it.



4. Development sample program

The development process is as follows.



4. 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 st byte	P0[9]	P0[8]	P0[7]	P0[6]	P0[5]	P0[4]	P0[3]	P0[2]
2 nd byte	P1[9]	P1[8]	P1[7]	P1[6]	P1[5]	P1[4]	P1[3]	P1[2]
3 rd byte	P2[9]	P2[8]	P2[7]	P2[6]	P2[5]	P2[4]	P2[3]	P2[2]
4 th byte	P3[9]	P3[8]	P3[7]	P3[6]	P3[5]	P3[4]	P3[3]	P3[2]
5 th 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.

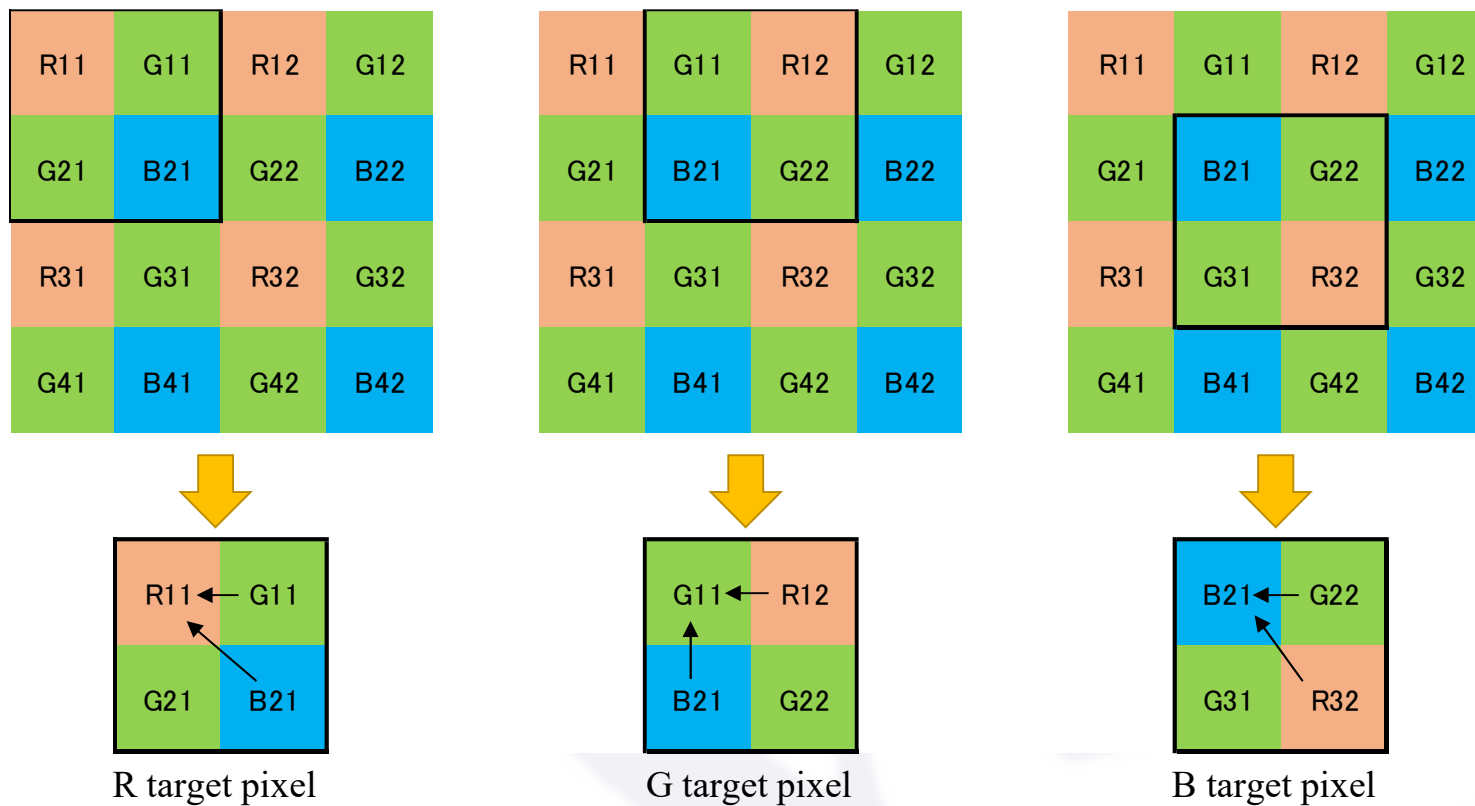
If the output size is 4056 x 3040, it will be 1700 x 3040 and the right end will be filled with 0 and the data will be sent.

Calculating by integer operation yields the following expression.

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

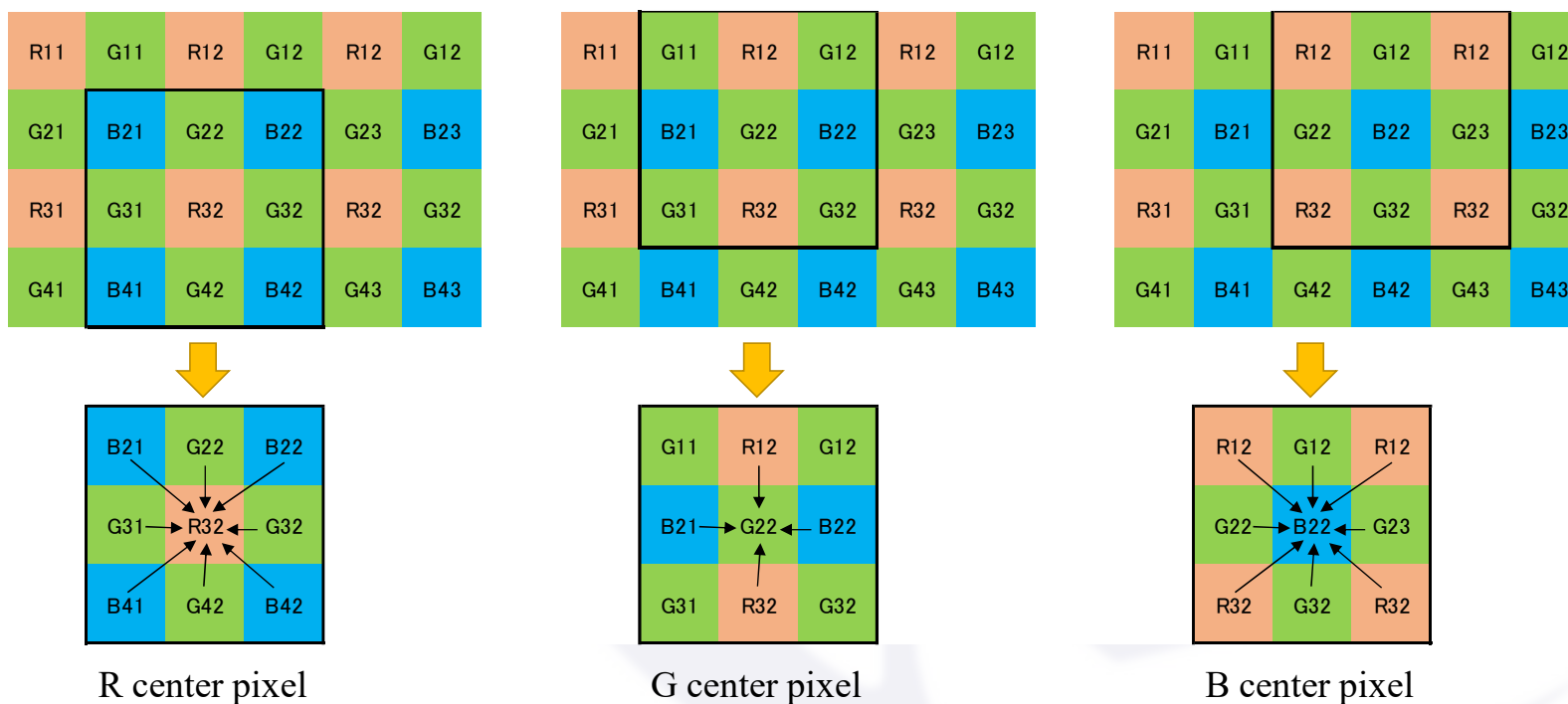
4. Development sample program

Demosaic processing (nearest neighbor method)



4. Development sample program

Demosaic processing (bilinear interpolation)



5. ON / OFF of LED

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.