oCam-1MGN-U-T™

User Manual

2019. 4.

WITHROBOT Inc.

Revision History

Rev	Date	Description	Author
1.0	2019. 4	1st Release	PD
1.1	2020. 6	Comply to Firmware 2006	PD

Note

This product is for indoor use only. Severe electrostatic stress can damage the product.

CONTENTS

1. INTRODUCTION

Features

oCam-1MGN-U-T is a 1 mega pixels global shutter external trigger mono camera with the following features.

- **External Trigger**: It accepts wide range of external trigger signal from 3V to 24V DC to control precise timing of image acquisition and to be synchronized with external lights and even with other cameras.

- **Interface**: USB3.0 SuperSpeed

- **Easy Installation**: With UVC 1.1 support, no additional driver needs to be installed for Windows and Linux.

- **Versatility**: Supports wide range of standard M12 lenses with a lens replaceable structure.

- **Global Shutter**: The electronic global shutter image sensor provides sharp images without image skew.

External View

Protective Case   Replaceable
M12 Lens

Lens Lock Ring

Mounting Hole
for Tripod

Figure 1. External view of oCam-1MGN-U-T

External Trigger
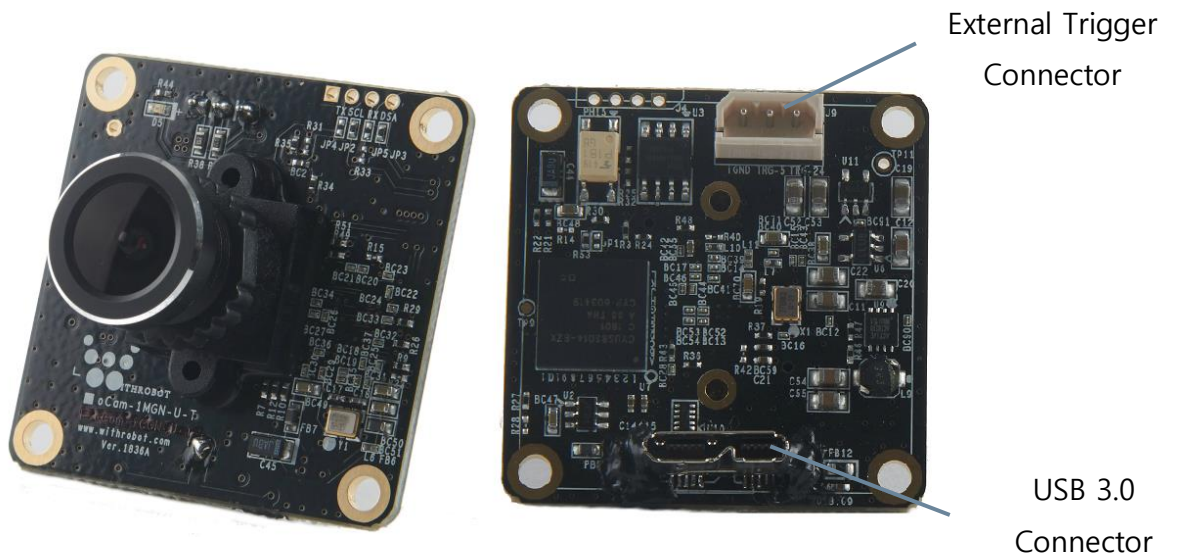Connector

USB 3.0
Connector

Figure 2. oCam-1MGN-U-T board

Additional Technical Information

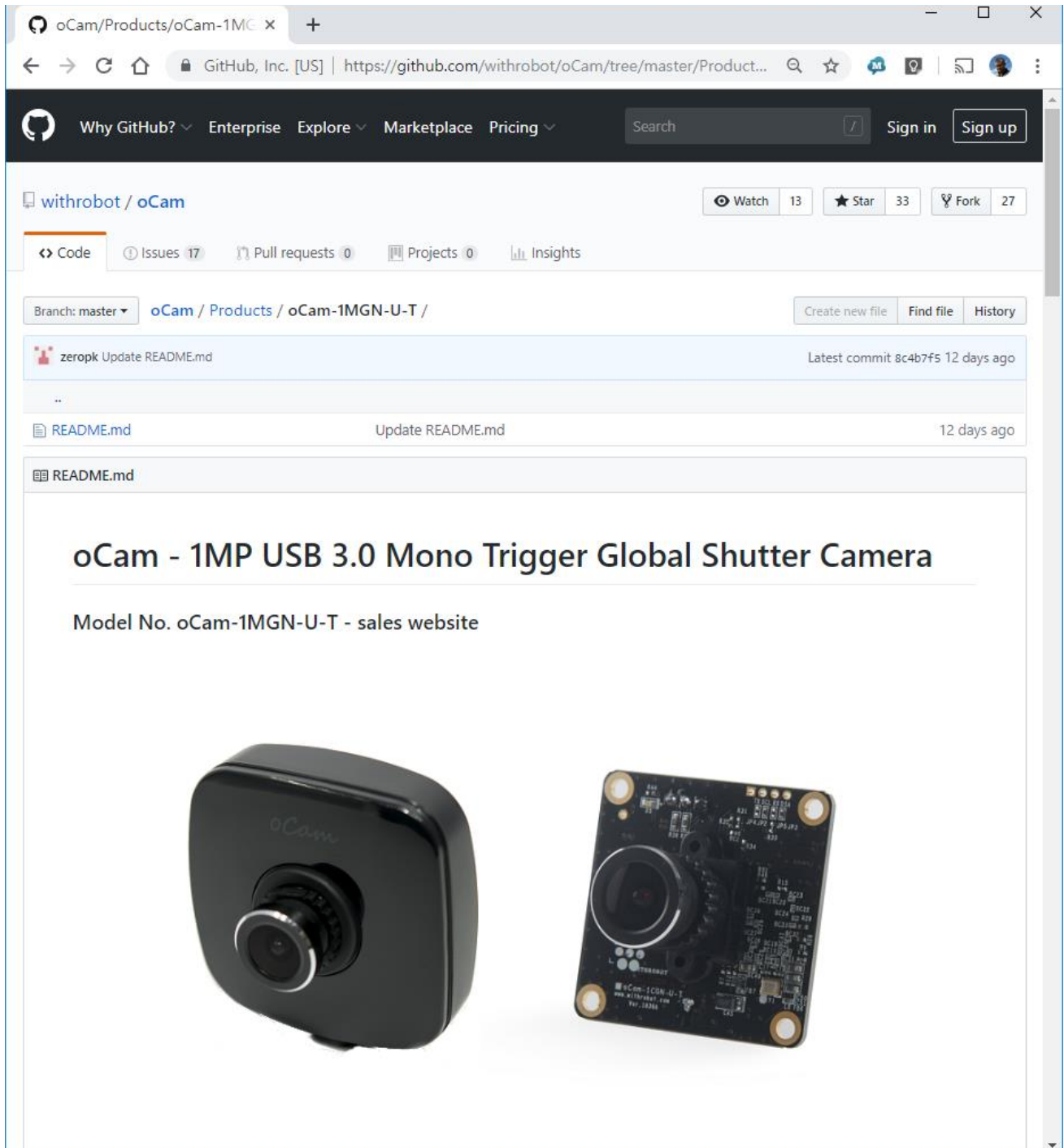Further technical information including the latest firmware and example source codes are available at "https://github.com/withrobot/oCam/tree/master/Products/oCam-1MGN-U-T".

Figure 3. Technical information site

2. SPECIFICATIONS

Camera Specifications

Image Sensor	• OnSemi AR0135 CMOS Image Sensor, 1/3 inches
Interface	• USB 3.0 SuperSpeed
Resolutions	**USB 3.0** ■ 1280 (H) x 960 (V) pixels @30 fps ■ 1280 (H) x 720 (V) pixels @30 fps ■ 640 (H) x 480 (V) pixels @30 fps (binning) ■ 320 (H) x 240 (V) pixels @30 fps (cropping) **USB 2.0** ■ 1280 (H) x 960 (V) pixels @30 fps ■ 1280 (H) x 720 (V) pixels @30 fps ■ 640 (H) x 480 (V) pixels @30 fps (binning) ■ 320 (H) x 240 (V) pixels @30 fps (cropping)
Image Format	• Monochrome
Shutter	• Global Shutter
Camera Controls	• Manual Exposure Control • Brightness
Lens	• Standard M12, Replaceable
Supported OS	• Windows 7 (64bit), Windows 10 (64bit), Linux (64bit)
Power	• USB Bus Power, DC 5V / 180mA
Operating Temperature	• 0°C ~ + 70°C
Field Of View(FOV)	• 50˚(V) x 92.8˚(H) x 110˚(D) (Default Bundle Lens)
Weight	• Approx. 27.2 grams (including protective case)
PCB Size	• 39mm x 39mm
Case Size	• 49mm x 53mm x 20mm

Table 1. Camera specifications

Board Dimensions
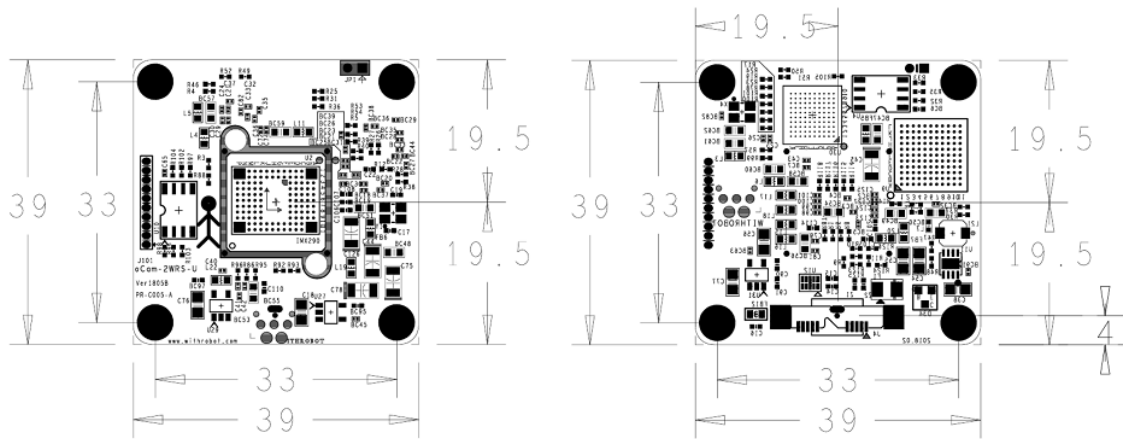

Figure 4. Board size (Unit: mm)

Case Dimensions

Figure 5. Case size (Unit: mm)

* 51mm with tripod mounting adapter

3. TRIGGER SIGNAL

Trigger Signal Connector Specifications

The oCam-1MGN-U-T accepts an external trigger signal through the 3-pin connector on the back side of the camera. The pin descriptions are as follows:

- Pin 1: Signal ground

- Pin 2: For trigger signals in the range of 3V ~ 5V DC

- Pint 3: For trigger signals in the range of 5V ~ 24V DC

Input pin for Trigger Signal (3V ~ 5V)
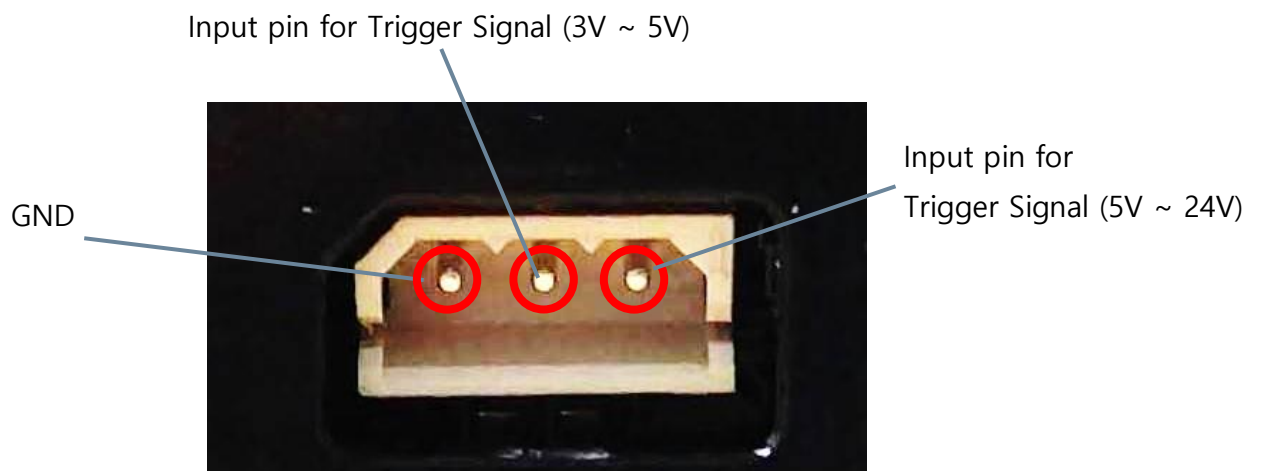
Input pin for Trigger Signal (5V ~ 24V)

GND

Figure 6. Pin description of the external trigger input signal connector

The circuit diagram of external trigger input is shown in the next figure. The input pins and the internal circuit are isolated with a photo coupler. Therefore, the external input trigger signal needs to supply more than 2 mA current to activate properly the trigger.
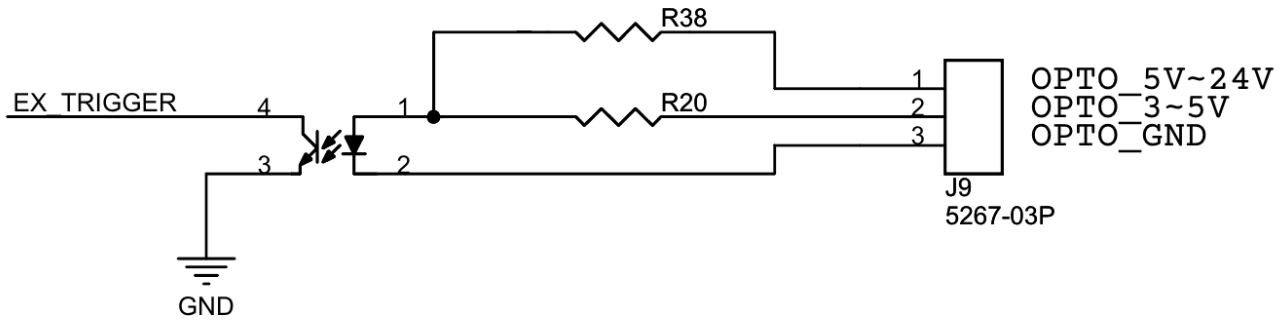
Figure 7. Trigger input circuit

Trigger Signal Specifications

The camera acquires image at the falling edge of the trigger signal. Depending on the trigger signal, the camera operates in one of the 3 modes described as follows.

One Shot Mode

With this mode, the camera acquires one frame of image. The trigger signal should maintain the low level at least 1 msec(T1).
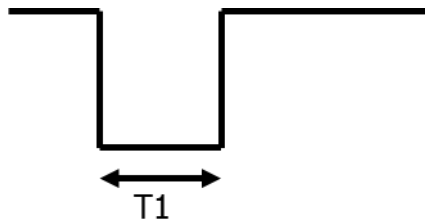
Figure 8. One shot mode

Multi Shot Mode

With this mode, the camera acquires multiple frames of images. The interval between the two adjacent trigger pulses should be at least 2 msec (T2). To get images as specified by the trigger signal frequency, it is needed to set the camera speed at least twice the trigger signal frequency. If the camera speed is set below this, the trigger signal will be applied while the previously acquired image frame is being transmitted. For example, to apply 30 Hz trigger signal, the camera should be set at least 60 fps.

Figure 9. Multi shot mode

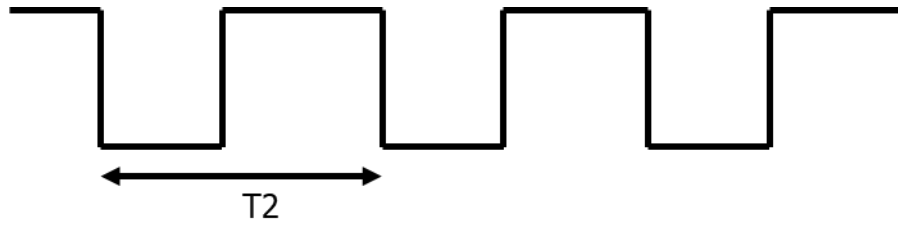## Continuous Mode

With this mode, the camera acquires images continuously at the interval set as camera speed. For example, in the following figure, the camera starts to acquire the image after the trigger signal goes low and acquires the images at the interval of T3 set as the camera fps. When the trigger signal goes high, the camera stops to acquire the images.
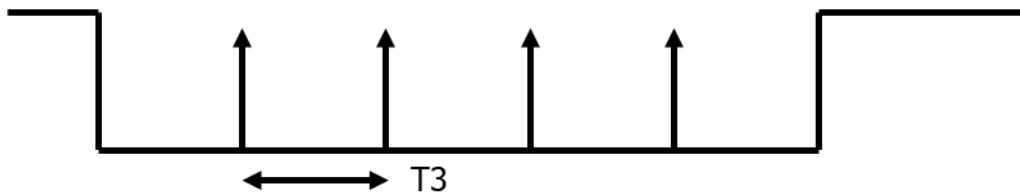
Figure 10. Continuous mode

4. HOW TO USE ON WINDOWS SYSTEM

Connection to Windows PC

Connect the USB cable, either USB 2.0 or USB 3.0, to the USB port of the computer. After the camera is detected, the computer will show a message that the camera is connected. To check if the camera is connected successfully, open the device manager and check if the oCam-1MGN-U-T appears correctly as shown below.
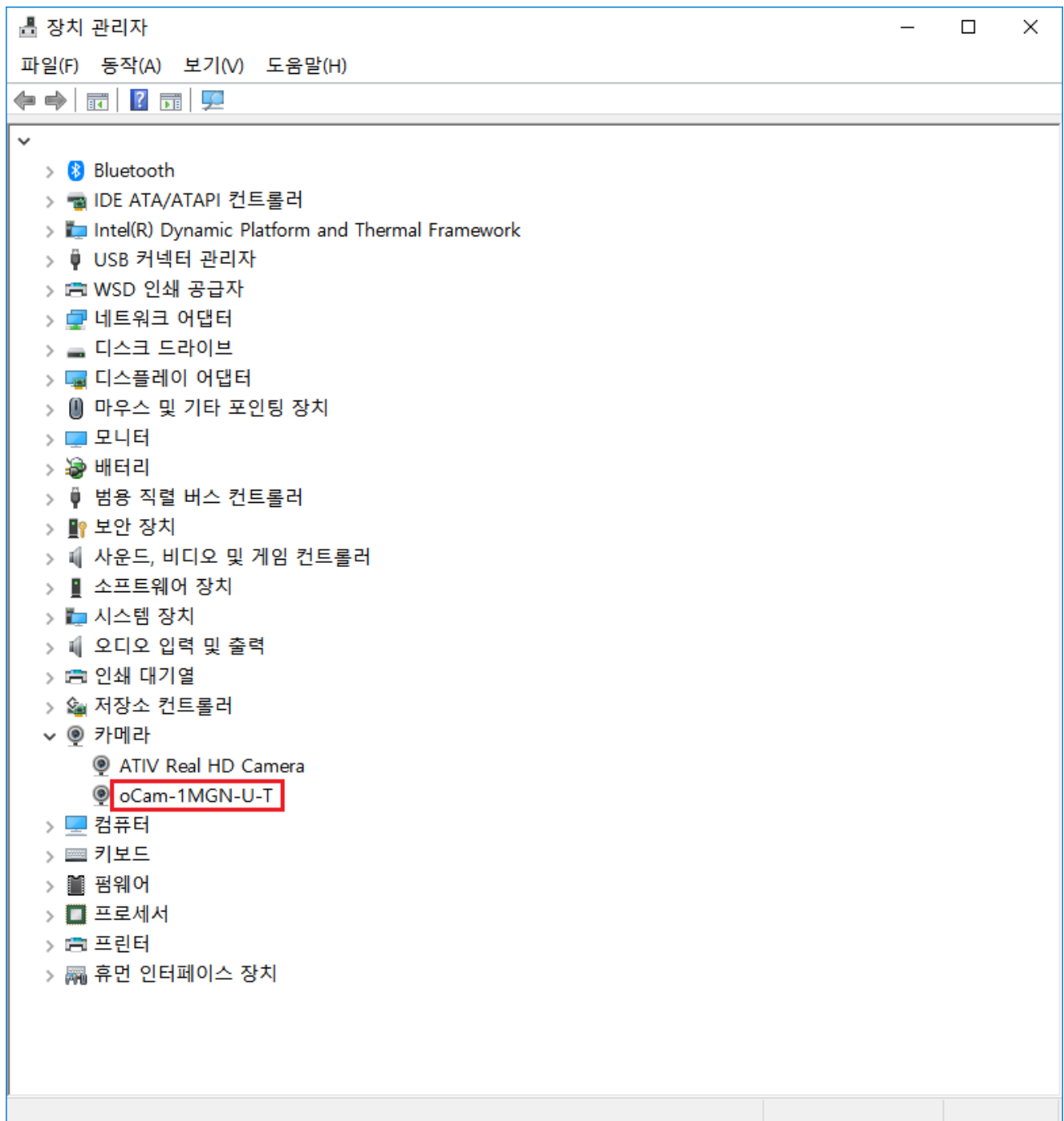

Figure 11. Connection check (example of Windows 10)

Viewing the Camera Image

- As the oCam-1MGN-U-T sends the image in Bayer RGB format, other than the typical YUV format, you need to use image viewing software that can handle this format, such as the oCamViewer program provided by the WITHROBOT Inc.

- On starting the oCamViewer, the main window will appear as shown below.
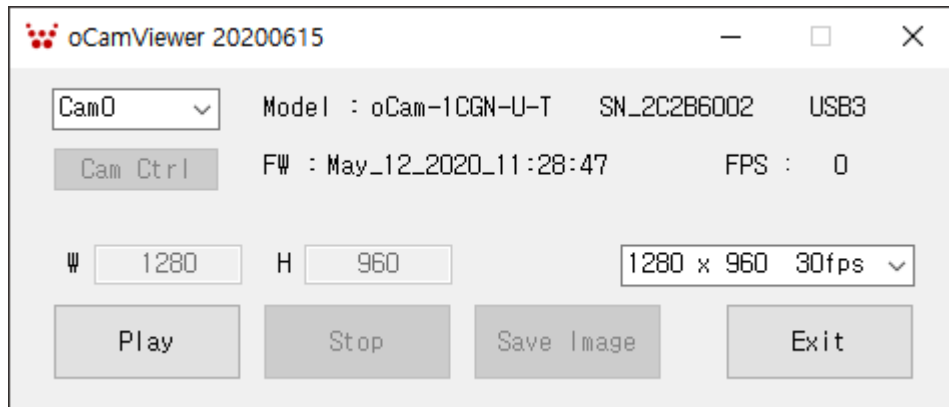
Figure 12. Main window of the oCamViewer for Windows

- Select the resolution and the fps on the dropdown list.
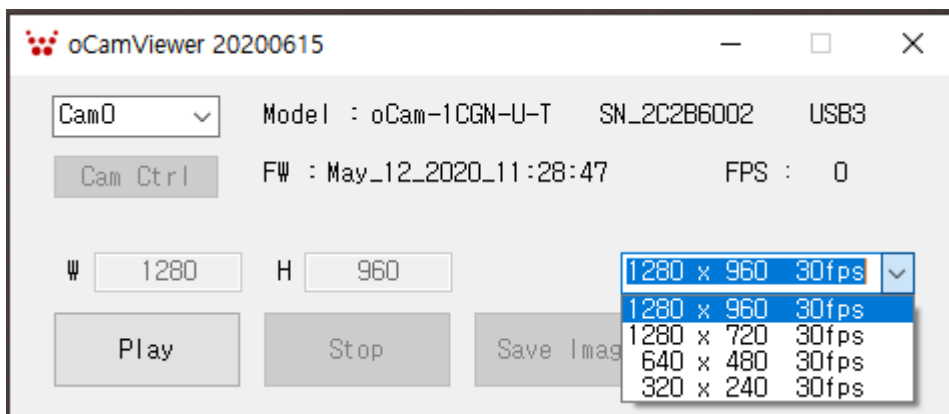
Figure 13. Resolution selection on the oCamViewer

- Click the [Play] button.

- To change the resolution/fps, click the [Stop] button first and then select one on the dropdown list, and then click the [Play] button.

- To check or change the camera parameters, click the [CamCtrl] button while the camera is being displayed to open the control window. Use the slide bar to change a parameter.

Figure 14. Control window of the oCamViewer for Windows

- To stop viewing the camera image, click the [Stop] button on the main window.

- To terminate the oCamViewer, click the [Exit] button on the main window.

- Full source code of the oCamViewer is available at the following site:

    https://github.com/withrobot/oCam/tree/master/Software

4. HOW TO USE ON LINUX SYSTEM

Connection to Linux PC

Viewing the Camera Image

(1) Viewing the Camera Image with the oCamViewer

- As the oCam-1MGN-U-T sends the image in Grey format, other than the typical YUV format, you need to use image viewing software that can handle this format, such as the oCamViewer program provided by the WITHROBOT Inc.

- On starting the oCamViewer, the main window will appear as shown below.
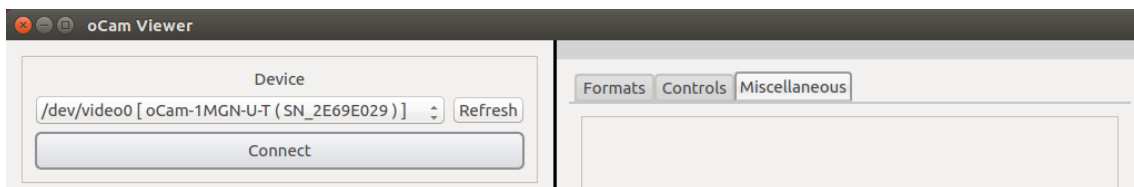
Figure 15. Main window of the oCamViewer for Linux

- Select the oCam-1MGN-U-T in the "Device" list. On clicking the [Connect] button, the camera image will appear.

- To change the resolution/fps, select "Format" on the right panel and select one on the dropdown list, and then click the [Apply] button at the bottom.
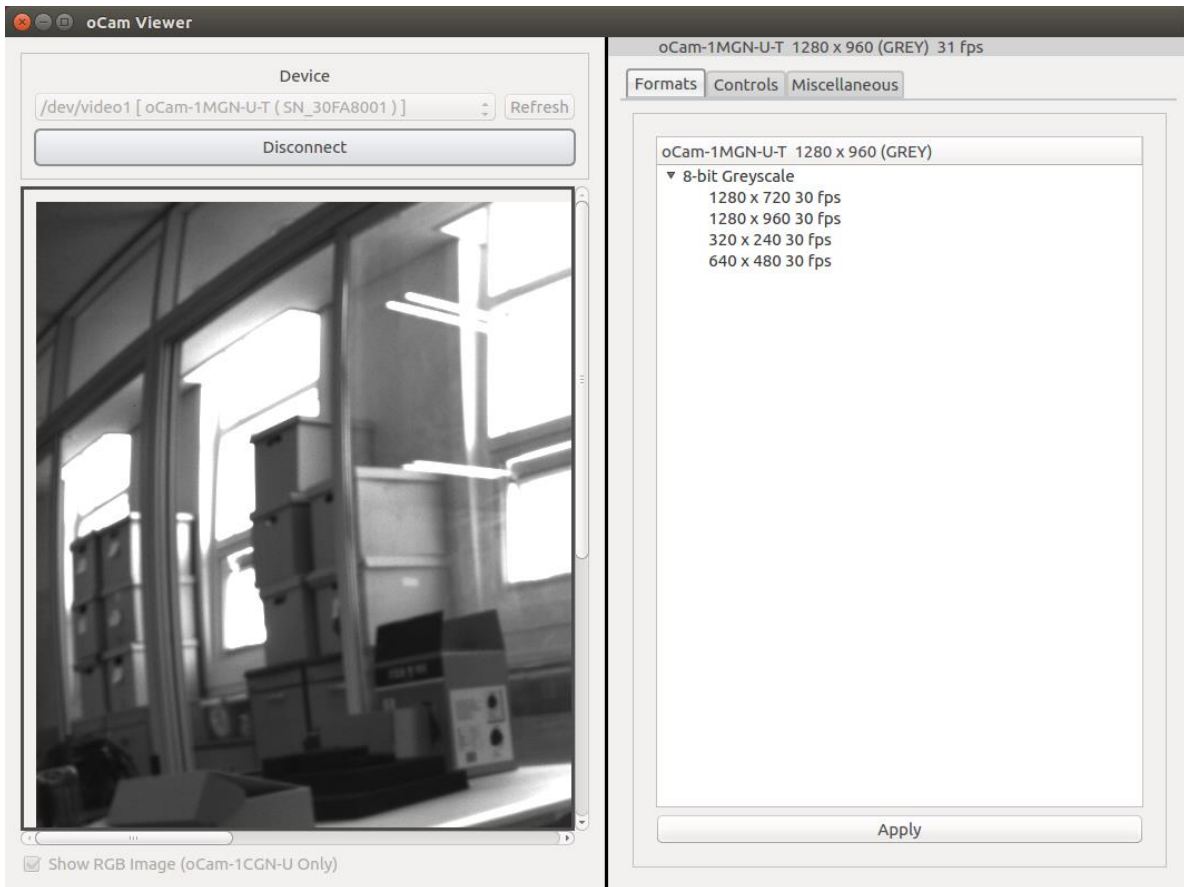
Figure 16. Resolution selection on the oCamViewer

- To change the camera parameters, select "Controls" on the right panel and use the slide

  bar to change a parameter.

Figure 17. Camera controls of the oCamViewer for Linux

(2) Viewing the Camera Image with the Guvcview

- Start the Guvcview by entering the "guvcview" command on the terminal window.
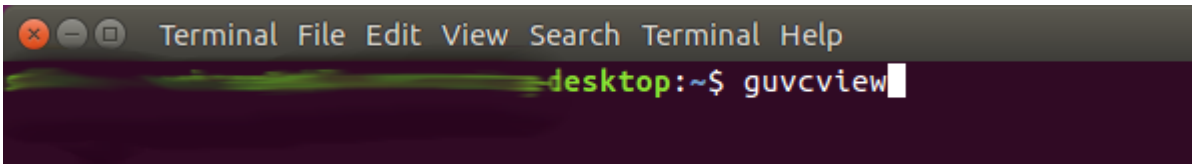
Figure 18. Starting the Guvcview

Figure 19. Guvcview image window

- On the Guvcview camera image window, the current frame rate is shown on the top bar.

5. NOTES

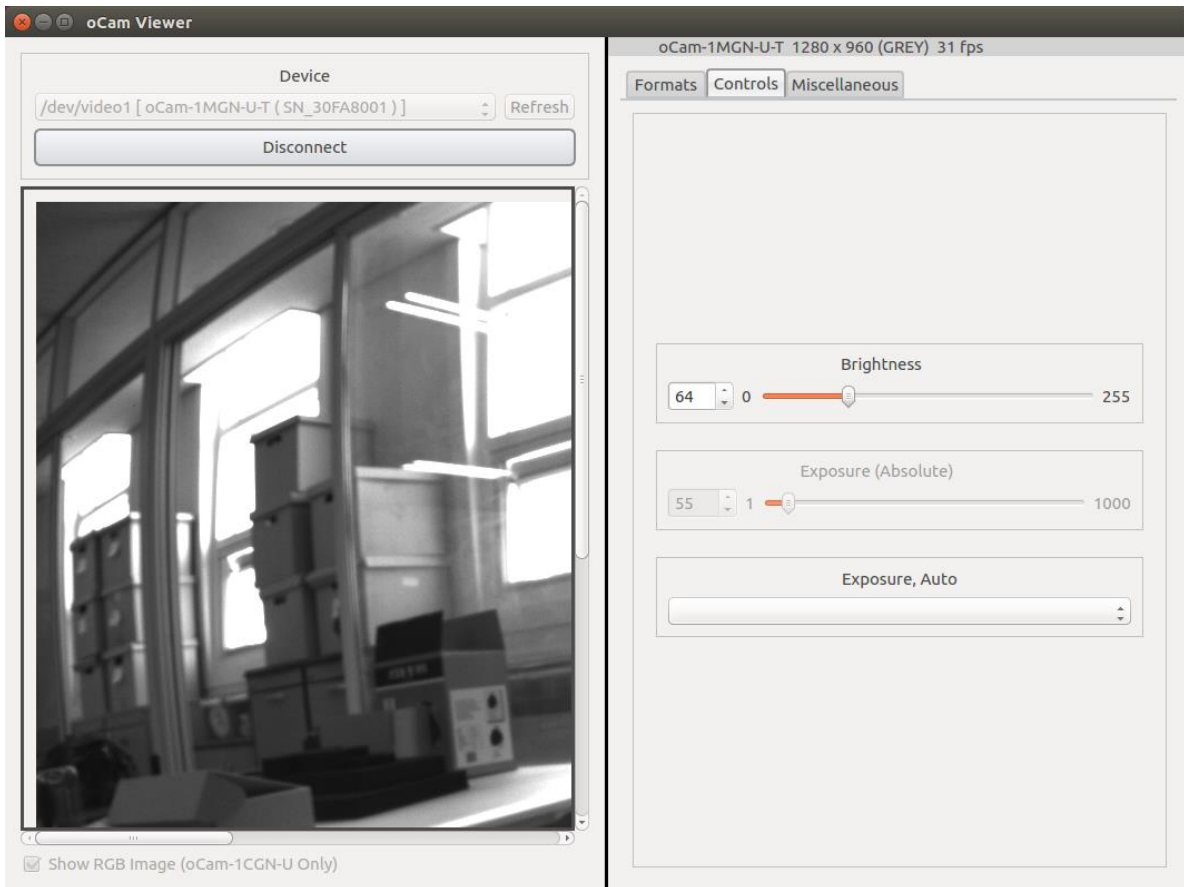On the oCam-1MGN-U-T, you can adjust the focus by rotating the lens by hand. Therefore, in a vibrating environment, the lens can be loosened by being rotated by itself. To prevent this, it is recommended to lock the lens by using the supplied lens lock ring after you finish adjusting the focus.

To change the lens, you need to loosen the lock ring first before you take out the lens from the holder.

6. TRIGGER SIGNAL BOARD

The oCam-1MGN-U-T can be used with any signal source as long as it meets the input signal specification. It is recommended to use the mTrigger, however, which is a trigger signal board supplied by the WITHROBOT Inc. for full compatibility and verified operation.

The mTrigger signal board supports the following 4 signal modes which are all user programmable to set the detailed signal parameters.

Reference	Signal Type	Modes	Operation
Internal	Synchronous	Internal Synchronous	Provides 8 time-synchronized autonomous trigger signals
	Asynchronous	Internal Asynchronous	Provides 8 time sequential autonomous trigger signals
External	Synchronous	External Synchronous	Provides 8 time-synchronized trigger signals driven by an external signal source
	Asynchronous	External Asynchronous	Provides 8 time sequential trigger signals driven by an external signal source

Table 2. Trigger modes

Multiple mTrigger boards can be connected in a cascade configuration to provide unlimited number of trigger signals.

The following is the major specifications of the mTrigger signal board.

Item	Value
Number of output ports	8 for each board
Output level	Low Level: 0V / High Level: 5V
External source input level	Low Level: 0V / High Level: 5V
Accuracy between time-synchronized trigger signal output	Within 3 μsec

Item	Value
Range of trigger pulse period(user programmable)	5 msec ~ 30,000 msec
Range of interval between trigger pulse(user programmable)	0 msec ~ 30,000 msec
Range of trigger signal asynchronous trigger pulse width(user programmable)	5 msec ~ 30,000 msec
Range of number of trigger pulses(user programmable)	0 ~ 30,000

Table 3. mTrigger specifications

APPENDIX

Specifications of the Bundle M12Lens
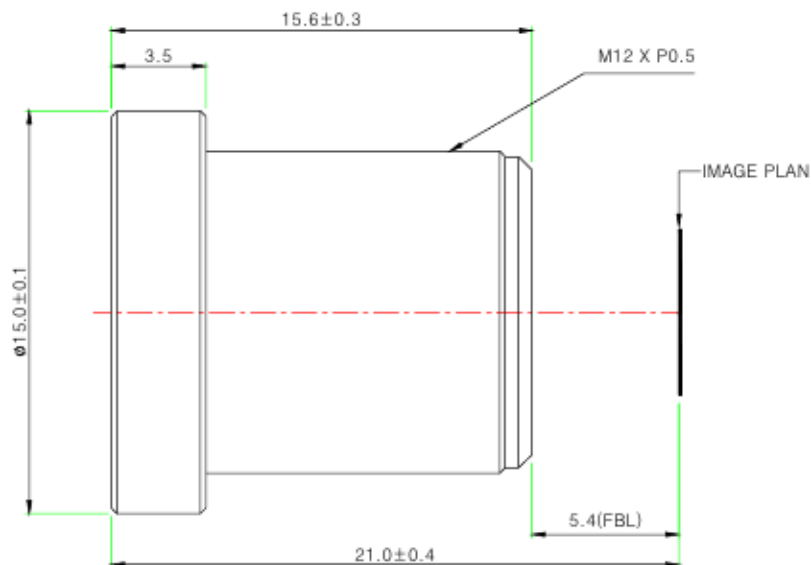
Specifications

USE :   The lens is intended for use in 1/2.9", 1/2.7"   C-MOS camera.

Focal Length	3.6mm ±5%
Relative Aperture	2.0
Image Size	1/2.9'' 1/2.7"
	1/2.9'' : 50°(V) X 92.8°(H) X 110°(D)
Angle Of View	1/2.7" : 59°(V) X 103°(H) X 125°(D)
Back Focal Length	6.17mm ±5%
Flange Back Length	5.4mm ±0.2mm
Lens Length	15.6mm ±0.3mm
TTL	21.0mm ±0.4mm
MTF on–axis(at 50 lp/mm)	87.5%
0.7F (at 50 lp/mm)	86.2%(R), 78.4%(T)
Relative Illumination	44.5%(Full image circle)
Flange Type	M12 ∗ P0.5
Head Size	⌀ 15.0
Operating Temperature Range	−20℃ ～ +70℃ , Under RH 90%
Storage Temperature Range	−25℃ ～ +85℃ , Under RH 99%
Lens Construction	4G [All Glass]
	With Ir Cut Filter(650nm)

Specifications of the Onboard M12 Lens Holder
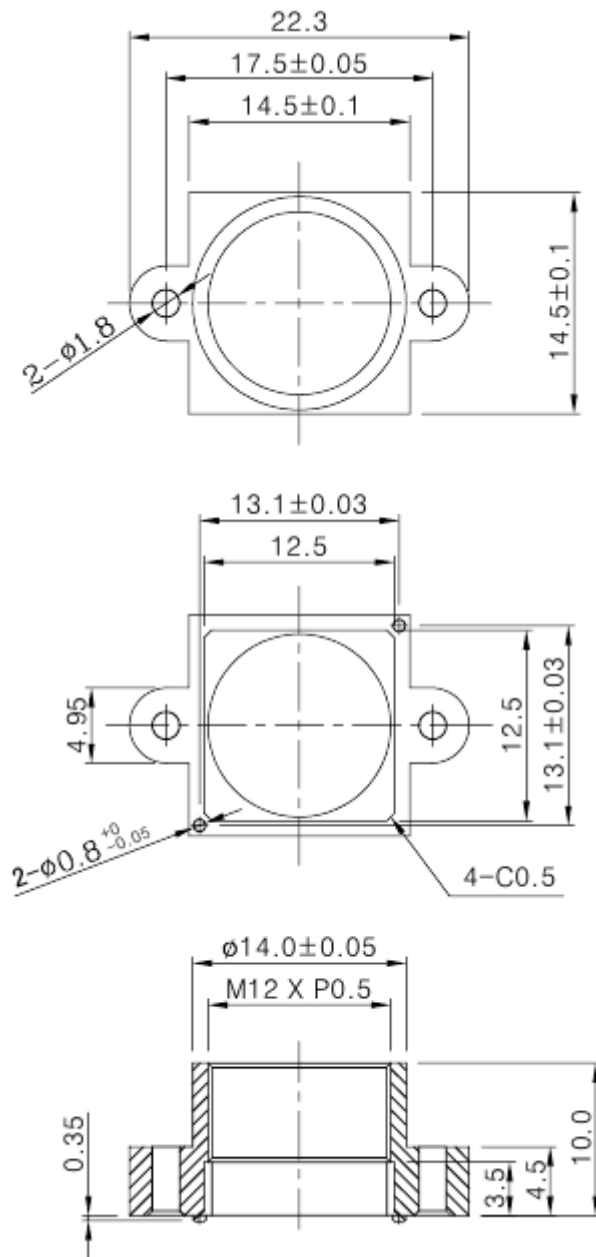
How to Update the Camera Firmware

- The latest camera firmware is available at the following site.

    https://github.com/withrobot/oCam/tree/master/Firmware

- The firmware update software (UpdateFW.exe) is available at the following site.

    https://github.com/withrobot/oCam/tree/master/Firmware/Update FW

- The instruction to use the UpdateFW.exe is available at the following site.

    https://github.com/withrobot/oCamS/tree/master/Firmware

- The oCamViewer source code is available at the following site.

    https://github.com/withrobot/oCam/tree/master/Software

Technical Support

- E-Mail: withrobot@withrobot.com

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