

WITHROBOT Inc.

USER MANUAL

oCam-1CGN-U

Version 1.0
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www.withrobot.com

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Document version history

Date	Document version	Description
Jul 2017	1.0	Initial release

TABLE OF CONTENTS

DOCUMENT VERSION HISTORY	1
1. INTRODUCTION	4
1.1. Specifications.....	4
1.2. Applications.....	4
1.3. Technical resource.....	5
2. SPECIFICATIONS	6
2.1. PCB dimensions.....	6
2.2. External look.....	6
2.3. Electrical specifications.....	7
2.4. Camera specifications.....	7
3. HOW TO CONNECT OCAM-1CGN-U TO WINDOWS HOST	8
3.1. Connection of oCam-1CGN-U to host computer.....	8
3.2. oCam-Viewer installation	8
3.3. Run the oCam-Viewer.....	8
3.4. Color correction	10
4. HOW TO CONNECT OCAM-1CGN-U TO LINUX HOST	10
4.1. oCam-Viewer download & build.....	10
4.2. Connection of oCam-1CGN-U to host computer.....	11
4.3. Run the oCam-Viewer.....	11
5. FIRMWARE UPDATE	14
6. RECOMMENDATIONS	14
7. FAQs	14
7.1. Image acquisition using OpenCV.....	14
7.2. Guvview	15

- 7.3. Bayer RGB 15
- 7.4. DIY Fixture 15
- 7.5. Technical support..... 15
- APPENDIX..... 16**
- 1. DEFAULT M12 LENS SPECIFICATIONS 16**
- 2. M12 LENS HOLDER DIMENSIONS 18**
- 3. TRIPOD MOUNT: OCAM-TM 19**

1. Introduction

The oCam-1CGN-U is a Global Shutter, 1 Mega pixel, Color, UVC compliant, USB3.0 SuperSpeed camera from WITHROBOT Inc. It uses AR0134 of On Semiconductor as the image sensor and provides the image through USB3.0 interface to be easily connected to hosts with USB3.0 ports. The camera is backward compatible with USB2.0 interface so for the hosts with USB2.0 ports the connection is automatically adjusted to High Speed interface.

As the camera supports UVC1.0 specifications, the images of various resolutions of 1280 x 960(45FPS), 1280 x 720(60FPS), 640 x 480(80FPS), 320 x 240(160FPS) are readily available to hosts of Linux or Windows operating systems without any special drivers. The electronic global shutter mechanism of the camera provides clear images with less blur. The oCam-1CGN-U with M12 lens holder allows various M12 lenses to be interchangeably used on the camera to suit to various applications.

1.1. Specifications

- Sensor: OnSemi AR0134 CMOS image sensor
- Sensor Size: 1/3 inch
- Interface: USB 3.0 SuperSpeed
- Power: USB bus power
- Operating temperature: 0°C~70°C
- Rating: DC5V/180mA
- Shutter: electric global shutter
- Field of View (FOV): 65°
- Camera Control: Exposure, Gain, White Balance Red, White Balance Blue
- Weight: 33.5 g
- PCB Size: 39 x 39 mm
- Case Size: 42 x 42 x 17 mm
- Lens: M12 type lens

1.2. Applications

- Computer vision
- Web cam
- Embedded camera
- Visual servo for face tracking

- Smart camera

1.3. Technical resource

Latest updates of the related firmware and software are available at

<https://github.com/withrobot/oCam/tree/master/Products/oCam-1CGN-U>.

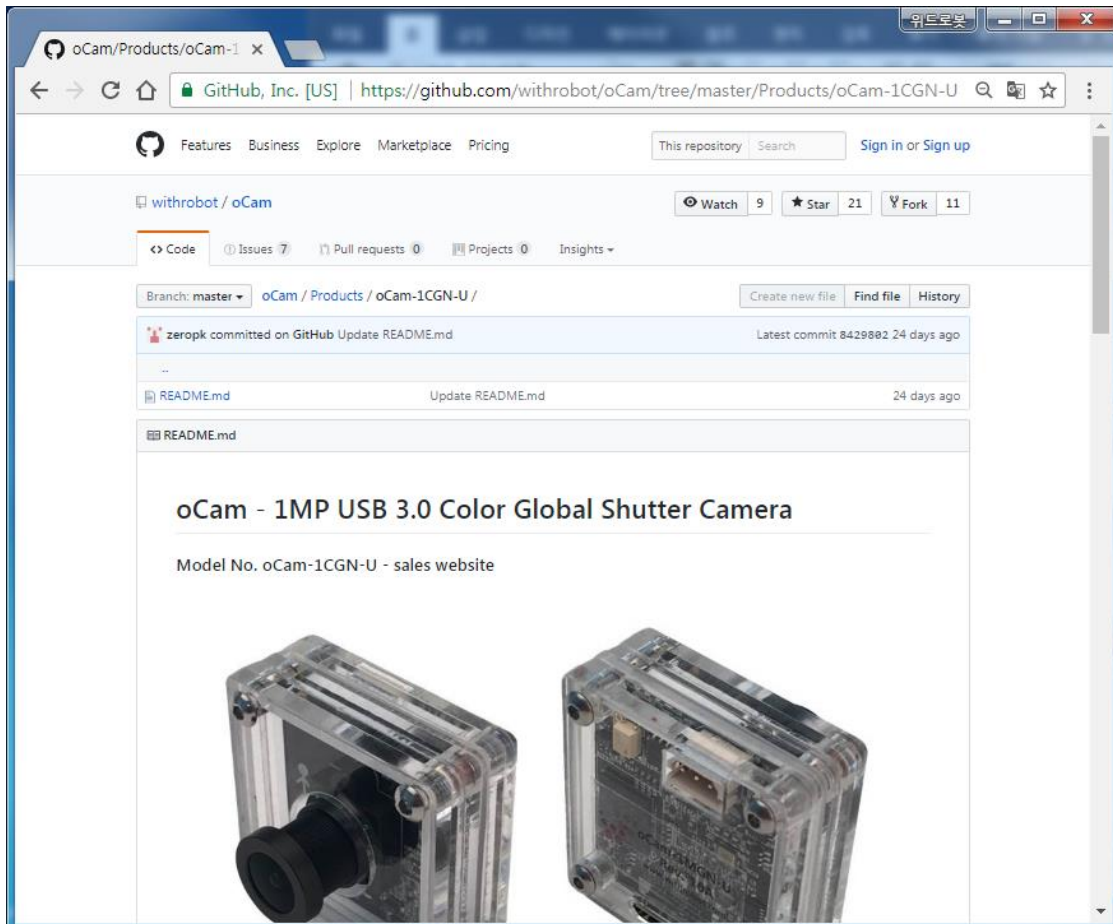


Figure 1. Online technical resource repository.

2. Specifications

2.1. PCB dimensions

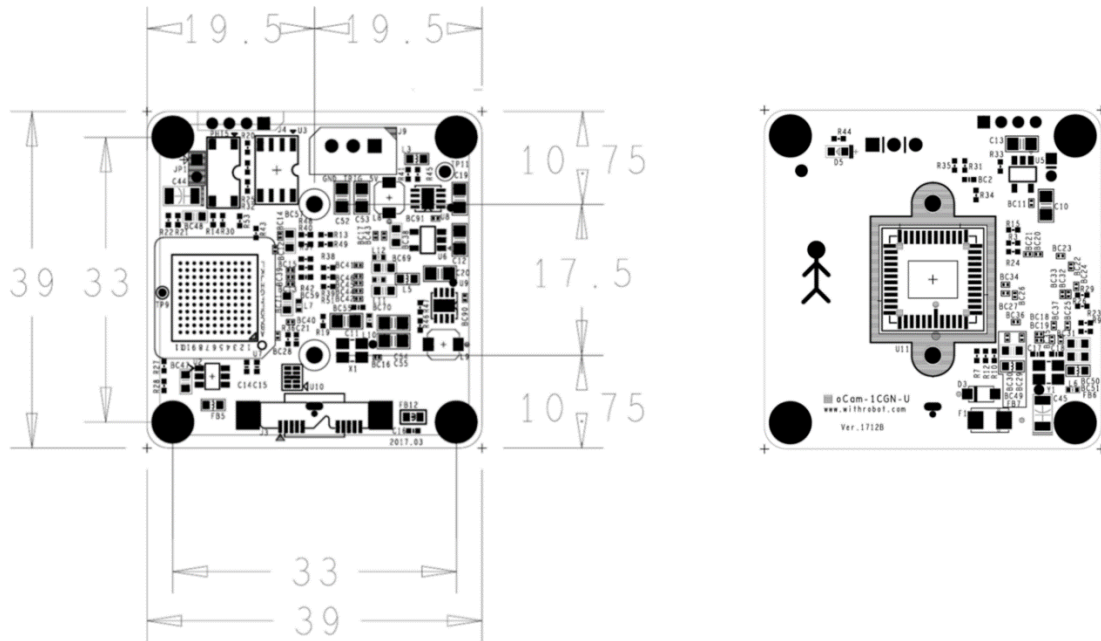


Figure 2. PCB dimensions (in mm)

2.2. External look

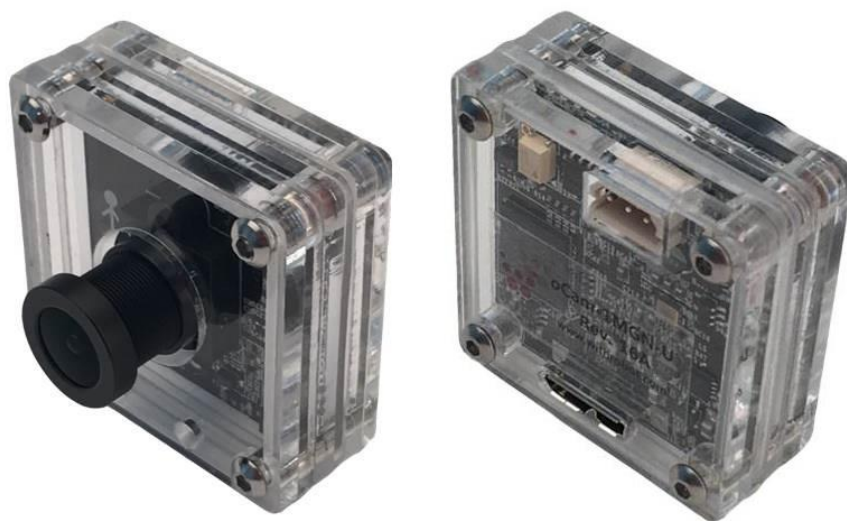


Figure 3. External look (42 x 42 x 17mm)

2.3. Electrical specifications

Item	Min	Max	Unit
Source Voltage, VDD		5.0	V
Current		180	mA
Operating Temperature	-40	85	°C

Table 1. Electrical specifications

2.4. Camera specifications

Item	Specification	Notes
Image format	Bayer RGB	
Image resolutions	1280 x 960(45fps)	
Horizontal x Vertical (FPS)	1280 x 720(60fps)	
	640 x 480(80fps)	
	320 x 240(160fps)	
Shutter	Global Shutter	
Camera control	Gain	
	Exposure (Absolute)	
	White Balance Red	
	White Balance Blue	
Auto Exposure	Not supported	
Auto White Balance	Not supported	
External Trigger	Not supported	
Lens Correction	Not supported	
White Balance Auto Setup	Supported	oCam_Viewer

Table 2. Camera specifications

3. How to connect oCam-1CGN-U to Windows host

3.1. Connection of oCam-1CGN-U to host computer

- Insert USB3.0 cable to oCam-1CGN-U.
- Connect USB3.0 cable to USB3.0 port of the host computer.
- Wait about 1 minute until the message window appears.

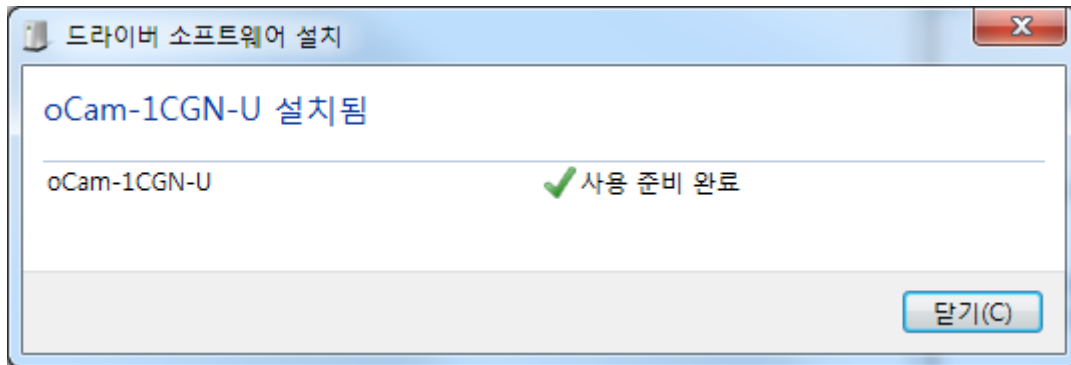


Figure 4 . Connection success message window

3.2. oCam-Viewer installation

- Open the site https://github.com/withrobot/oCam/tree/master/Software/oCam-viewer_Win/bin.
- Download the oCam-Viewer:
 - For 64bit system, download “libCamCap-amd64.dll” and “oCam-Viewer-amd64.exe”.
 - For 32bit system, download “libCamCap.dll” and “oCam-Viewer.exe”.

3.3. Run the oCam-Viewer

- Start oCam-Viewer.
- Once the oCam-1CGN-U is connected successfully, the viewer main window will appear as follows.

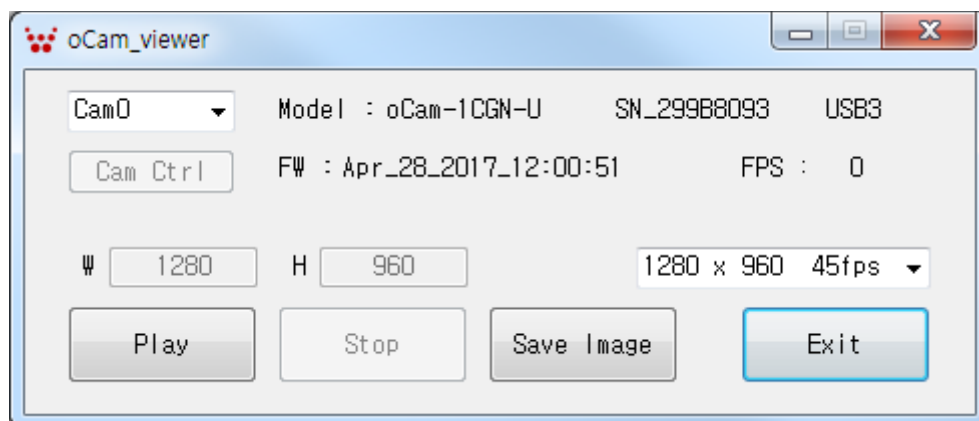


Figure 5. oCam-Viewer main window

- Click **[Play]** to show the image window.



Figure 6. Camera image view window

- Click **[Stop]** and click the dropdown arrow to open the list of resolutions supported by the connected camera.

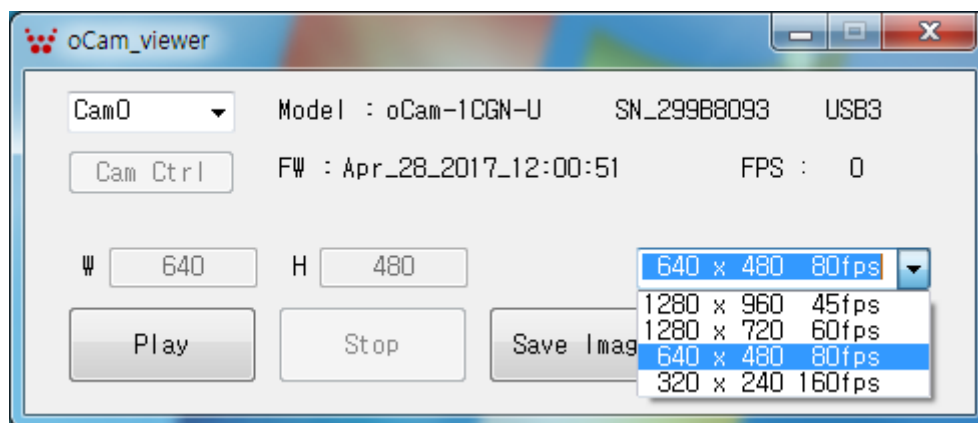


Figure 7. Image resolution list

- Click **[Stop]** and click **[Cam Ctrl]** to open the camera control window.

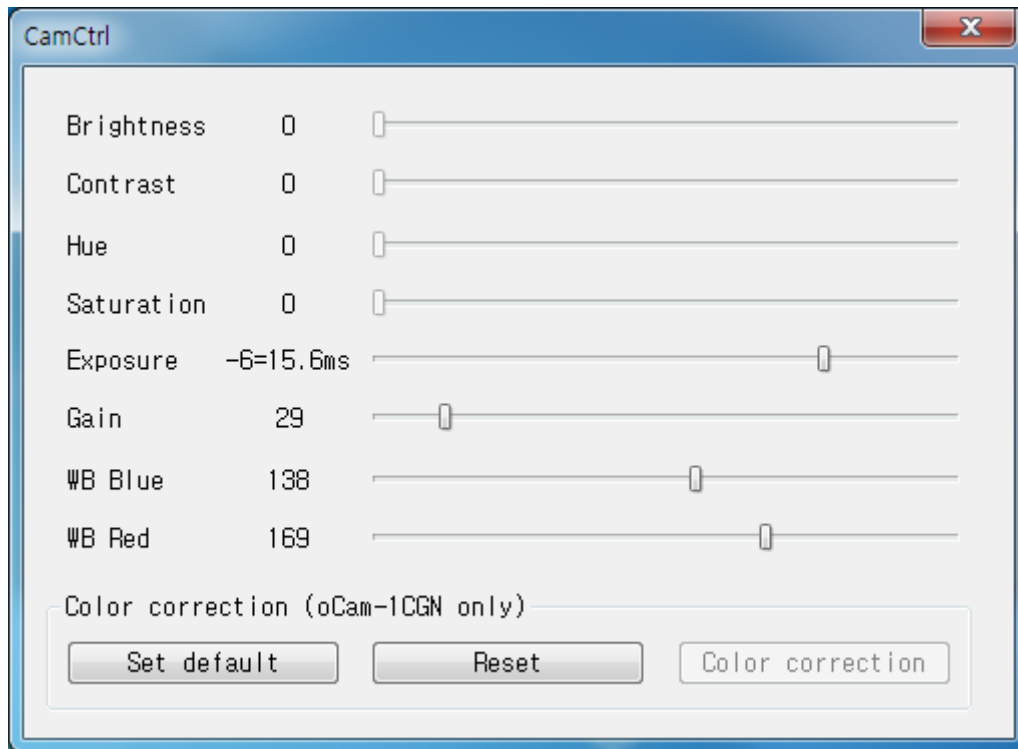


Figure 8. Camera control window

- Click **[Exit]** to terminate the program.

3.4. Color correction

The viewer program provides special function for oCam-1CGN-U camera to adjust the White Balance automatically.

- Click **[Reset]** to enable the **[Color Correction]** button.
- Click **[Color Correction]** to set the White Balance based on the current image.

4. How to connect oCam-1CGN-U to Linux host

4.1. oCam-Viewer download & build

- Install the packages using the following commands.

```
$ sudo apt-get update
$ sudo apt-get install qt4-default libv4l-dev libudev-dev
```

- Create a working directory and download the source code into the working directory.

- Here, the YOUR_WORKING_DIRECTORY should be set as the directory name that you choose.
- The name of the source code can be different from the shown below as it is updated.

```
$ mkdir YOUR_WORKING_DIRECTORY
$ cd YOUR_WORKING_DIRECTORY
$ svn export
https://github.com/withrobot/oCam/trunk/Software/oCam_viewer_Linu
x_1705
```

- Build the code using the following commands.

```
$ cd oCam_viwer_Linux_1705
$ mkdir build
$ cd ./build
$ qmake ..
$ make release
```

- Run the viewer using the following command.

```
$ ./oCam-viewer
```

4.2. Connection of oCam-1CGN-U to host computer

- Insert USB3.0 cable into the oCam-1CGN-U.
- Connect USB3.0 cable to USB3.0 port of the host computer.
- Run “lsusb” to check the connection status.
 - “Cypress Semiconductor Corp” should appear as Cypress FX3 is used in the oCam-1CGN-U.
 - On successful connection of USB3.0, ID appears as “04b4:00f9”.
 - If the connection is made as USB2.0, ID appears as “04b4:00f8”.

```
$ lsusb
Bus 004 Device 026: ID 04b4:00f9 Cypress Semiconductor Corp.
```

4.3. Run the oCam-Viewer

- If the oCam-1CGN-U is connected successfully, the following window should appear on the execution of the oCam-Viewer.
 - The device name and the serial number should appear correctly.

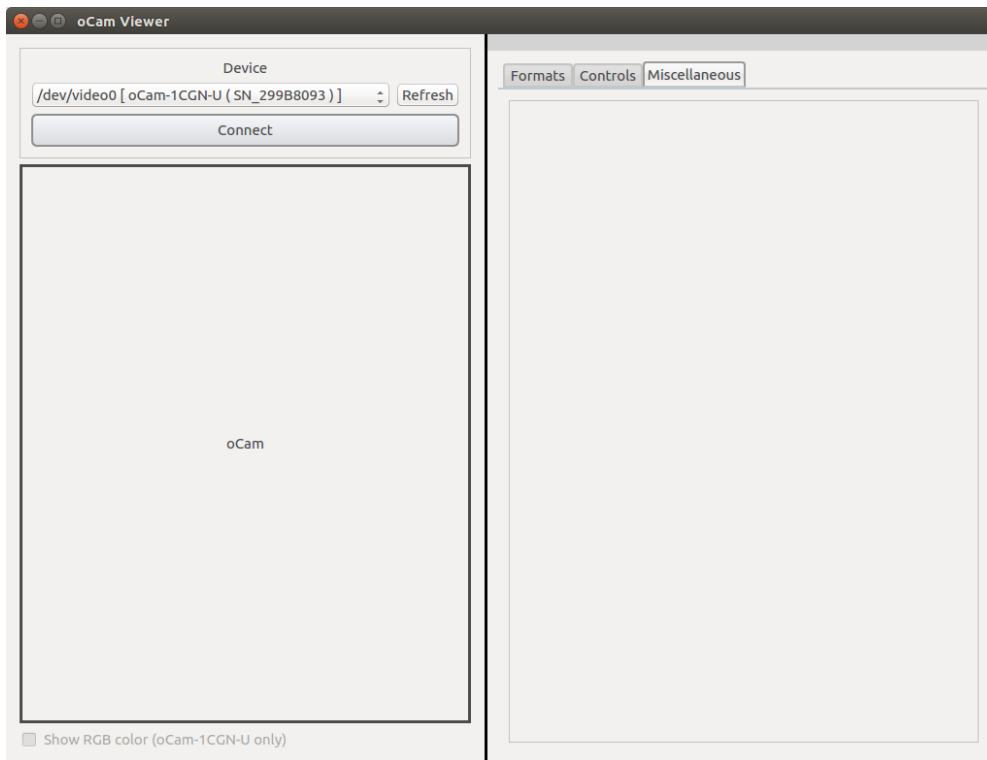


Figure 9. oCam-Viewer window on Linux host

- Click **[Connect]** to open the image window.
- Select tabs on the right.
 - **[Formats]** shows the image formats.

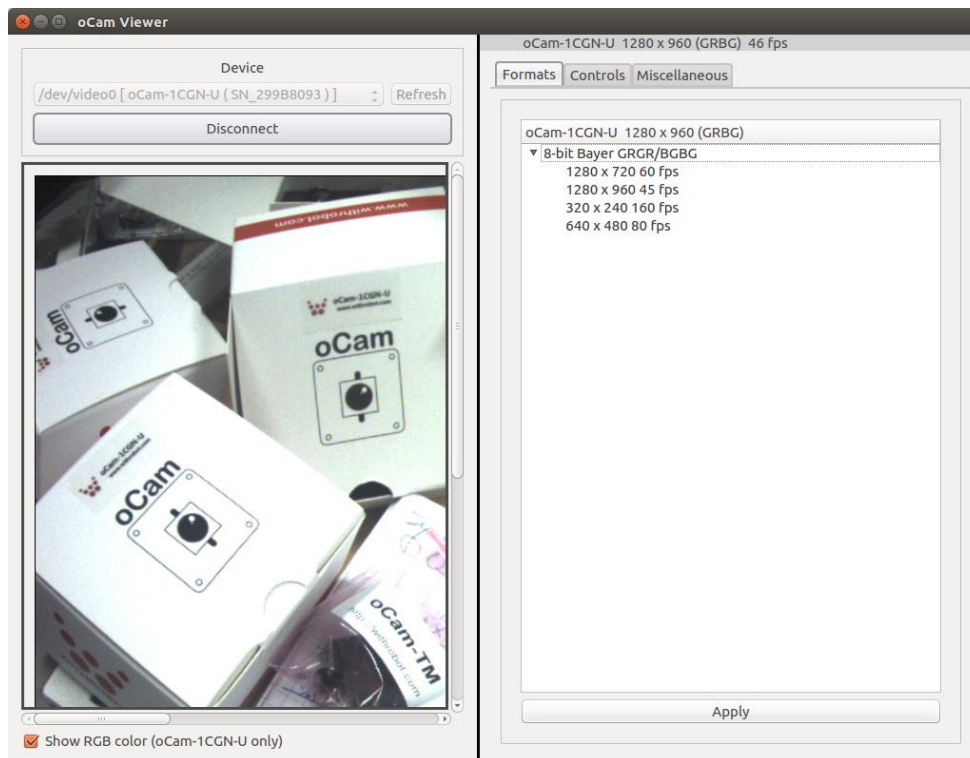


Figure 10. Image formats

- **[Controls]** shows the control parameters.

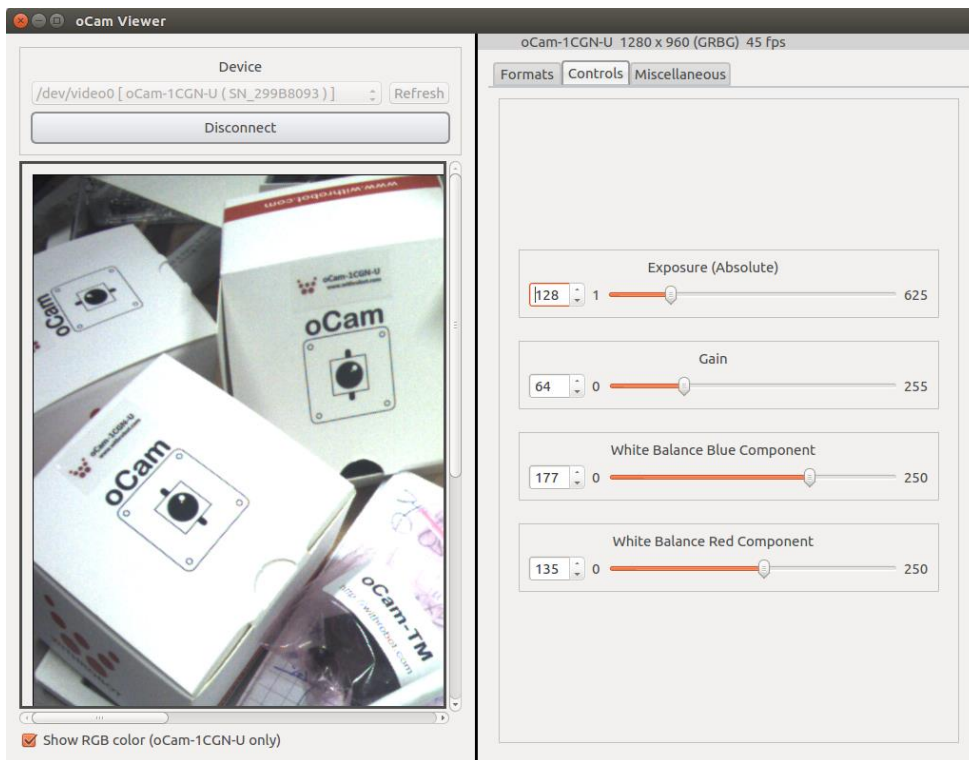


Figure 11. Image control parameters.

- **[Miscellaneous]** shows the White Balance control

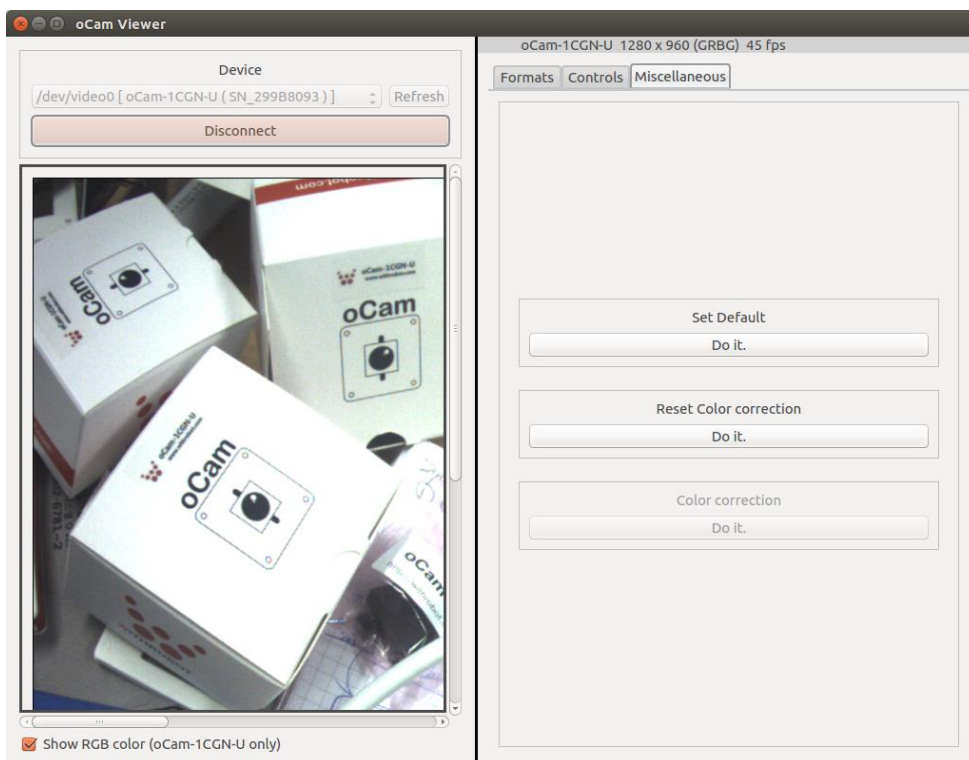


Figure 12. White Balance controls.

5. Firmware update

- You can find the latest firmware at <https://github.com/withrobot/oCam/tree/master/Firmware> .
 - Correct file for the oCam-1CGN-U should be selected for the firmware update.
- You can find the firmware writing program at <https://github.com/withrobot/oCam/tree/master/Firmware> .
 - Uncompress the downloaded "UpdateFW.ZIP".
 - Follow the instruction described at <https://github.com/withrobot/oCam/tree/master/Firmware>.

6. Recommendations

- The oCam-1CGN-U supports interchangeable M12 lens. Accordingly, the lens can be rotated under vibration. It is recommended to fix the lens in vibrating environment with glue.
- On the resolution of 320 x 240, the image is cropped from the full resolution. Therefore, the field of view will be reduced accordingly.
- The exposure time affects the image rate. With higher exposure, the FPS will drop as the camera uses longer time for acquiring the image. For higher FPS, the exposure time should be reduced.
- There are differences on the sensitivity of pixels in an image sensor with the global shutter mechanism. For high gain, the output of those pixels with higher sensitivity will be saturated, providing noises as a consequence. It is recommended to use low gain for less noisy image.

7. FAQs

7.1. Image acquisition using OpenCV

- The VideoCapture Class of the OpenCV cannot read the BAYER_RGB image which the oCam-1CGN-U uses.
- On Linux hosts, you can read the image of the oCam-1CGN-U using V4L and convert it to RGB image using the `cvtColor(BAYER2RGB)` function of the OpenCV.
 - You can refer the source code at https://github.com/withrobot/oCam/tree/master/Examples/opencv-basic_1MGN .

- On Windows hosts, you can use the dll file of the oCam-Viewer to acquire the image. You can use `cvtColor(BAYER2RGB)` function of the OpenCV to get the RGB image as in the Linux host.
 - You can refer the source code at <https://github.com/withrobot/oCam/tree/master/Examples/libCamCap-withOpenCV> .

7.2. Gvvcview

- On Linux host, you can use `gvvcview` to view the image of the oCam-1CGN-U.
- Download the `gvvcview` using the following commands.

```
$ sudo apt-get install gvvcview
$ gvvcview -d /dev/video0
```

7.3. Bayer RGB

- The Bayer RGB format shows the image as captured by the image sensor.
 - Refer https://en.wikipedia.org/wiki/Bayer_filter for further information.
- It is recommended to resize the 1280 x 960 to 640 x 480 for better image quality.

7.4. DIY Fixture

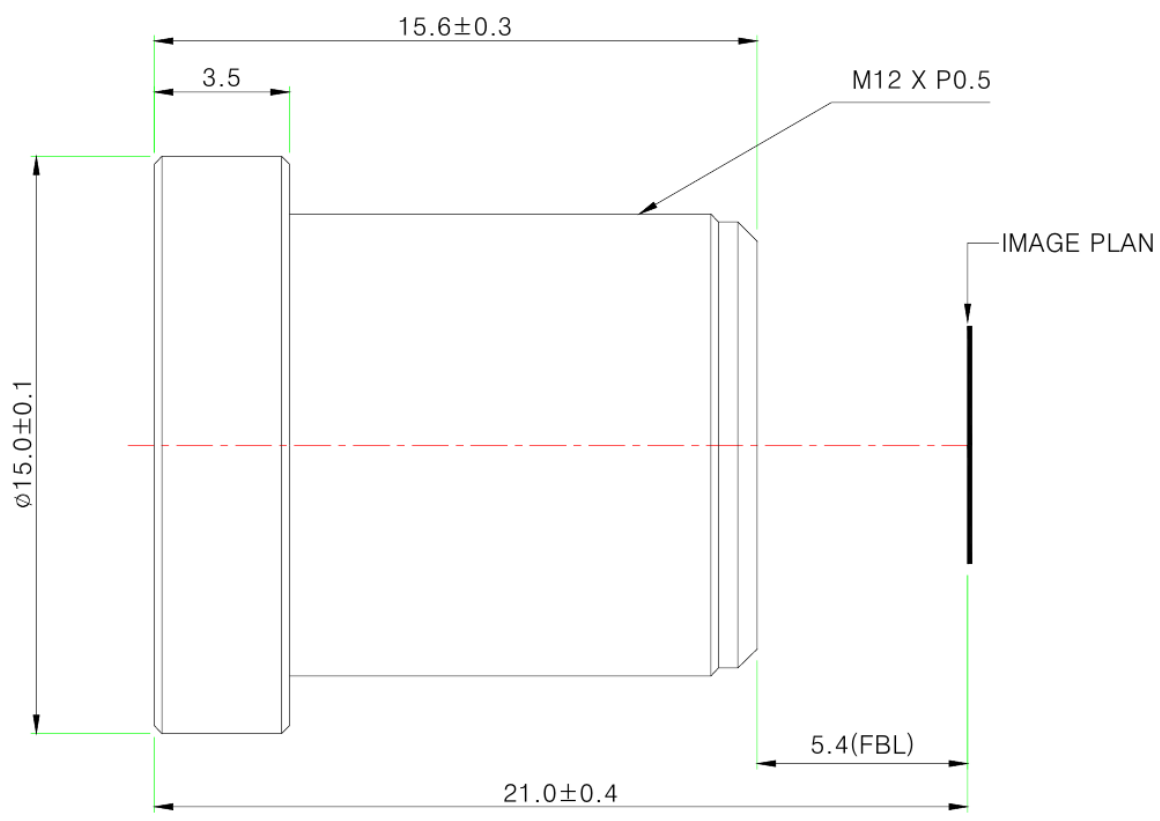
- As a DIY fixture for oCam-1CGN-U, the 3D printable files are available at https://github.com/withrobot/oCam/tree/master/DIY_Fixture.

7.5. Technical support

- E-mail technical support is available at withrobot@withrobot.com.

APPENDIX

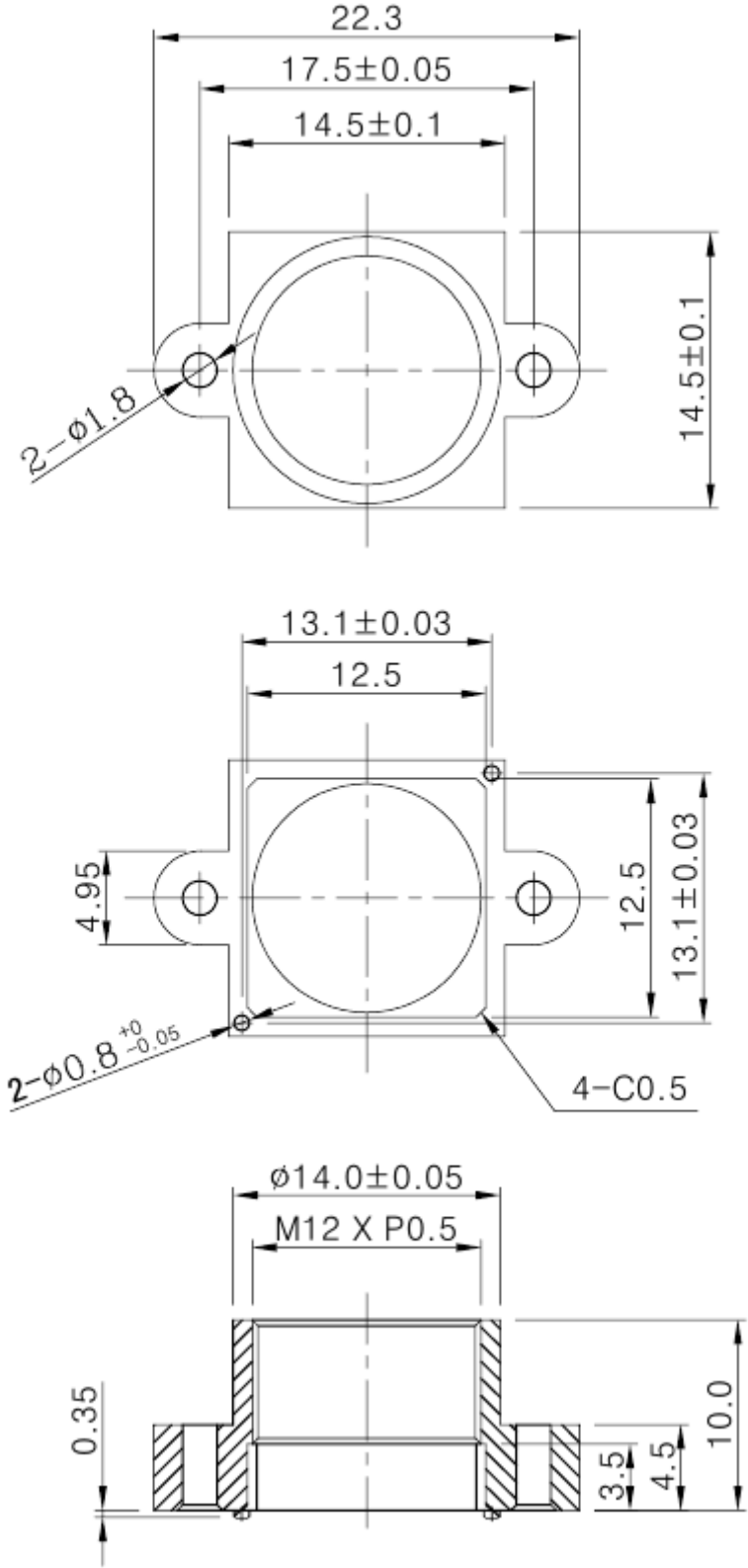
1. Default M12 lens specifications



Item	Description
Focal Length	3.6mm ±5%
Relative Aperture	2.0
Image Size	1/2.9", 1/2.7"
Angle Of View	1/2.9" : 50°(V) X 92.8°(H) X 110°(D) 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) 0.7F (at 50 lp/mm)	87.5% 86.2%(R), 78.4%(T)

Relative Illumination	44.5%(Full image circle)
Flange Type	M12 * P0.5
Head Size	φ 15.0
Operating Temperature Range	-20°C ~ +70°C, Under RH 90%
Storage Temperature Range	-25°C ~ +85°C , Under RH 99%
Lens Construction	4G [All Glass] With IR Cut Filter(650nm)

2. M12 lens holder dimensions



3. Tripod mount: oCam-TM

- Optionally available sold separately

