



Pivariety Motorized Focus Camera Module for Raspberry Pi



21MP IMX230

(SKU: B0324)

QUICK START GUIDE

SPECS

Image Sensor	21MP IMX230
Max. Resolution	5344H x 4016V
Pixel Size	1.12um x 1.12um
Optical Format	1/2.4"
Lens Spec	Focal length: 4.77mm, F.NO: 1.75±5%, FOV: horizontal 64deg
IR Sensitivity	Integral IR filter, visible light only
Focus Type	Motorized focus, programmable focus control
Frame Rate	5344x4012@9 fps, 3840x2160@10 fps, 2592x1944@15 fps, 2656x2004@30 fps, 1920x1080@30 fps, 1280x960@120 fps, 1280x720@120 fps, 640x480@120 fps
Sensor Output Format	RAW10
ISP Output Format	Output image format of JPG, YUV420, RAW, DNG; output video format of MJPEG, H.264
Interface Type	2-Lane MIPI
Board Size	38x38mm

INTRODUCTION

• About Arducam

Arducam has been a professional designer and manufacturer of SPI, MIPI, DVP and USB cameras since 2012. We also offer customized turnkey design and manufacturing solution services for customers who want their products to be unique.

• About Pivariety Camera

Arducam Pivariety is a Raspberry Pi camera solution to take the advantage of using its hardware ISP functions. Using Arducam Pivariety camera modules, users can get better performance and a wider variety of camera, lens options. For a long time, Raspberry Pi users are limited to use the closed-source official supported camera driver and camera modules (V1/V2/HQ). Now Arducam made it possible to provide well-tuned ISP for Pivariety camera modules with Auto Exposure, Auto White Balance, Auto Gain Control, Lens Shading Correction, etc.

• About Customer Service

If you need our help or want to customize other models of Pi cameras, feel free to contact us at support@arducam.com.

Website: <https://www.arducam.com/docs/cameras-for-raspberry-pi/pivariety/>

SOFTWARE

1. Driver Installation

To facilitate copying, please refer to git clone: <https://github.com/ArduCAM/Arducam-Pivariety-V4L2-Driver>
We will keep online up-to-date continuously.

• Download the driver

```
wget https://github.com/ArduCAM/Arducam-Pivariety-V4L2-Driver/releases/download/Arducam_pivariety_v4l2_v1.0/arducam_pivariety_v4l2.tar.gz
```

• Decompress the driver

```
tar -zxvf arducam_pivariety_v4l2.tar.gz Release/
```

• Install the driver

```
cd Release/  
./install_driver.sh
```

press **y** to reboot

NOTE: The kernel driver installation only supported by the latest version 5.10. For other kernel versions, please go to our Doc page: <https://www.arducam.com/docs/cameras-for-raspberry-pi/pivariety/>

2. Test the Driver and Camera

After you've finished the hardware assembly and driver installation, you can test whether the camera is detected and working.

• View the Status of Driver and Camera

```
dmesg | grep arducam
```

It will display **arducam-pivariety** if driver installed successfully and **firmware version** if the camera can be detected.

The display should be **probe failed** if the camera can't be detected, you might have to check the ribbon connection, then reboot the Raspberry Pi.

• View the Video Node

The Pivariety camera modules are emulated as the standard video device under **/dev/video*** node, so you can use the **ls** command for listing the contents in the **/dev** folder.

```
ls /dev/video* -l
```

Since the camera module is V4L2 compliant, you can use the V4L2 controls to list the supported color space, resolutions, and frame rates.

```
v4l2-ctl --list-formats-ext
```

NOTE: The v4l2 node can't be used if you need the camera with ISP function.

3. Official Libcamera App Installation

Please note that Pivariety can't be supported by Raspistill, you need download libcamera to make it work. You can follow the installation steps listed in the code library: <https://github.com/raspberrypi/libcamera-apps/blob/main/README.md#libcamera>

* Install Optional Dependency for Gstreamer

If you need to use plugin gstreamer, please install the gstreamer dependency before compiling libcamera.

```
sudo apt update
```

```
sudo apt install -y libgstreamer1.0-dev \
```

```
libgstreamer-plugins-base1.0-dev
```

• Modify the Code

After downloading and compiling libcamera, you need to replace the code **ipa_rpi.so** with:

```
cd ~
```

```
wget https://github.com/ArduCAM/Arducam-Pivariety-V4L2-Driver/releases/download/ipa-v0.01/ipa_rpi.tar.xz
```

```
tar xvf ipa_rpi.tar.xz
```

```
cp ipa_rpi.so libcamera/build/src/ipa/raspberrypi/
```

```
cd libcamera && sudo ninja -C build install
```

Then, please go ahead the installation step **download and compile libepoxy**.

4. Capture Image and Record Video

• Capture image

For example, preview for **5s** and save the image named **test.jpg**

```
cd libcamera-apps/build
```

```
./libcamera-still -t 5000 -o test.jpg
```

• Record video

For example, record a **H.264 10s** video with the frame size **1920W x 1080H**

```
cd libcamera-apps/build
```

```
./libcamera-vid -t 10000 --width 1920 --height 1080 -o test.h264
```

• Plugin gstreamer installation

Install gstreamer

```
sudo apt update
```

```
sudo apt install -y gstreamer1.0-tools
```

Preview

```
cd ~/libcamera
```

```
export GST_PLUGIN_PATH=$(pwd)/build/src/gstreamer
```

```
gst-launch-1.0 libcamerasrc ! video/x-raw,width=1920,height=1080 ! videoconvert ! autovideosink
```

5. Manually Control the Focal Length

This Pivariety is a program controllable motorized focus camera, its focal length can be adjusted via v4l2-ctl

```
v4l2-ctl -c focus_absolute=300
```

TROUBLESHOOT

1. Cannot Allocate Memory

```
[3:45:35.833744413] [6019] INFO RPI raspberrypi.cpp:611 Sensor: /base/soc/i2c0mux/i2c@1/arducam@0c - Selected mode: 5344x4012-pRAA
```

```
[3:45:35.948442507] [6019] ERROR V4L2 v4l2videodevice.cpp:1126 /dev/video14[17:cap]: Unable to request 4 buffers: Cannot allocate memory
```

```
[3:45:35.948551358] [6019] ERROR RPI raspberrypi.cpp:808 Failed to allocate buffers
```

```
ERROR: *** failed to start camera ***
```

Edit **/boot/cmdline.txt** and add **cma=400M** at the end

More details: <https://lists.libcamera.org/pipermail/libcamera-devel/2020-December/015838.html>

2. The Image Displays Color Dots

Add code **--denoise cdn_off** at the end of command

```
./libcamera-still -t 5000 -o test.jpg --denoise cdn_off
```

More details: <https://github.com/raspberrypi/libcamera-apps/issues/19>

3. Failed to Install the Driver

Please check the kernel version, we only provide the driver for the latest official kernel version image when this Pivariety camera released. You can follow Arducam Doc page to get the drivers for other kernel versions.

Other problems, please feel free to contact us at support@arducam.com.