**Raspberry Pi Camera Installation on Raspberry Pi 5 /Ubuntu 24.04 Noble /ROS 2 Jazzy**

**Purpose**

This document describes the installation and running of a **Raspberry Pi Camera V2 or 2.1** connected to a **Raspberry Pi 5/4GB** configured with **ROS2 Humble**. Future update could enable the use of V3 (imx708) or 3rd party cameras, e.g Waveshare IMX219 79.3 0r 120 FOV.

**The purpose of the procedure is to describe the installation and configuration of the Raspberry Pi Camera, and ROS 2 “camera\_ros” package that publishes the camera video of a ros topic**

**Installation and configuration Steps**

* 1. **Install Ubuntu OS**
  2. Configure the following parameters on the **Raspberry Pi 5** SD Card

/boot/firmware/config.sys

**Configure Raspberry Pi /boot/firmware/config.sys file**

[all]

camera\_auto\_detect=1,

# Model 2

dtoverlay=imx219

#Model 3

dtoverlay= Imx708

start\_x=1

display\_auto\_detect=1

[all]

[all]

# Autoload overlays for any recognized cameras or displays that are attached

# to the CSI/DSI ports. Please note this is for libcamera support, \*not\* for

# the legacy camera stack

# camera\_auto\_detect=0

# the legacy camera stack

# for legacy camera with v4l2 Package

camera\_auto\_detect=1

start\_x=1

display\_auto\_detect=1

[all

**1.3 Add User to vídeo group**

sudo usermod -**a** -**G** **video** ubuntu

**1.4 Install ros-jazzy-desktop, build packages and configure workspace**

<https://docs.ros.org/en/jazzy/Installation/Ubuntu-Install-Debs.html>

<https://docs.ros.org/en/jazzy/Tutorials/Beginner-Client-Libraries/Colcon-Tutorial.html>

**1.5 Install Dependencies**

**v4l2 Utilities to manage a camera, a ROS 2 package that publishes camera output as a topic, Raspberry Pi configuration utility, and a ROS 2 package that used to subscribe to and publish images. It provides transparent support for transporting images in low-bandwidth compressed formats.**

Install raspi-config,  v4l-utils. ros-jazzy-image-transport-plugins,

$ sudo apt-get install raspi-config ros-jazzy-image-transport-plugins v4l-utils

* raspi-config: A tool for configuring camera device connection on Raspberry Pi.
* ros-jazzy-image-transport-plugins
* v4l-utils: A utility that assists with connection.

**Raspi-config**

<https://www.raspberrypi.com/documentation/computers/configuration.html>

It helps you configure your Raspberry Pi. Changes to raspi-config will modify [/boot/firmware/config.txt](https://www.raspberrypi.com/documentation/computers/config_txt.html#what-is-config-txt) and other configuration files. This procedure describes directly editing the config.txt file rather than using this package.

**v4l2 Utilities examples**

**Installation follows**

Displays all available information for connected Camera Devices

:~$ v4l2 --all

Shows the device name of a connected Raspberry Pi Camera as device /dev/video0

:~$ v4l2-ctl –list devices

rp1-cfe (platform:1f00110000.csi):

/dev/video0

**Image\_transport** : github: <https://wiki.ros.org/image_transport>

The sue of these plugin packages are not described in a future document revision.

**Note:**

**ros-jazzy-v4l2-camera is a** package that publishes camera output as a topic and should **NOT** be installed on the Raspberry Pi in this procedure

To verify its status: $ sudo apt purge ros-humble-v4l2-camera-package, should confirm this status.

**1.6 Install Libcamera Package**

GW PPA Repository for Raspberry Pi 5 Ubuntu 24.04 Noble arm64 libcamera Packages

<https://launchpad.net/~marco-sonic/+archive/ubuntu/rasppios>

Included Built Packages

* **gstreamer1.0-libcamera** complex camera support library (GStreamer plugin)
* **libcamera-dev** complex camera support library (development files)
* **libcamera-doc** complex camera support library (documentation)
* **libcamera-ipa** complex camera support library (IPA modules)
* **libcamera-tools** complex camera support library (tools)
* **libcamera-v4l2** complex camera support library (V4L2 module)
* **libcamera0.4** complex camera support library
* **python3-libcamera** complex camera support library (Python bindings)

Package Files

* [gstreamer1.0-libcamera\_0.4.0+rpt20250213-1ubuntu1~marco1\_arm64.deb](https://launchpad.net/~marco-sonic/+archive/ubuntu/rasppios/+files/gstreamer1.0-libcamera_0.4.0+rpt20250213-1ubuntu1~marco1_arm64.deb) (58.0 KiB)
* [libcamera-dev\_0.4.0+rpt20250213-1ubuntu1~marco1\_arm64.deb](https://launchpad.net/~marco-sonic/+archive/ubuntu/rasppios/+files/libcamera-dev_0.4.0+rpt20250213-1ubuntu1~marco1_arm64.deb) (33.2 KiB)
* [libcamera-doc\_0.4.0+rpt20250213-1ubuntu1~marco1\_all.deb](https://launchpad.net/~marco-sonic/+archive/ubuntu/rasppios/+files/libcamera-doc_0.4.0+rpt20250213-1ubuntu1~marco1_all.deb) (16.3 MiB)
* [libcamera-ipa\_0.4.0+rpt20250213-1ubuntu1~marco1\_arm64.deb](https://launchpad.net/~marco-sonic/+archive/ubuntu/rasppios/+files/libcamera-ipa_0.4.0+rpt20250213-1ubuntu1~marco1_arm64.deb) (441.8 KiB)
* [libcamera-tools\_0.4.0+rpt20250213-1ubuntu1~marco1\_arm64.deb](https://launchpad.net/~marco-sonic/+archive/ubuntu/rasppios/+files/libcamera-tools_0.4.0+rpt20250213-1ubuntu1~marco1_arm64.deb) (261.8 KiB)
* [libcamera-v4l2\_0.4.0+rpt20250213-1ubuntu1~marco1\_arm64.deb](https://launchpad.net/~marco-sonic/+archive/ubuntu/rasppios/+files/libcamera-v4l2_0.4.0+rpt20250213-1ubuntu1~marco1_arm64.deb) (45.9 KiB)
* [libcamera0.4\_0.4.0+rpt20250213-1ubuntu1~marco1\_arm64.deb](https://launchpad.net/~marco-sonic/+archive/ubuntu/rasppios/+files/libcamera0.4_0.4.0+rpt20250213-1ubuntu1~marco1_arm64.deb) (488.7 KiB)
* [libcamera\_0.4.0+rpt20250213-1ubuntu1~marco1.debian.tar.xz](https://launchpad.net/~marco-sonic/+archive/ubuntu/rasppios/+sourcefiles/libcamera/0.4.0+rpt20250213-1ubuntu1~marco1/libcamera_0.4.0+rpt20250213-1ubuntu1~marco1.debian.tar.xz) (19.5 KiB)
* [libcamera\_0.4.0+rpt20250213-1ubuntu1~marco1.dsc](https://launchpad.net/~marco-sonic/+archive/ubuntu/rasppios/+sourcefiles/libcamera/0.4.0+rpt20250213-1ubuntu1~marco1/libcamera_0.4.0+rpt20250213-1ubuntu1~marco1.dsc) (2.9 KiB)
* [libcamera\_0.4.0+rpt20250213.orig.tar.xz](https://launchpad.net/~marco-sonic/+archive/ubuntu/rasppios/+sourcefiles/libcamera/0.4.0+rpt20250213-1ubuntu1~marco1/libcamera_0.4.0+rpt20250213.orig.tar.xz) (1.3 MiB)
* [python3-libcamera\_0.4.0+rpt20250213-1ubuntu1~marco1\_arm64.deb](https://launchpad.net/~marco-sonic/+archive/ubuntu/rasppios/+files/python3-libcamera_0.4.0+rpt20250213-1ubuntu1~marco1_arm64.deb) (227.7 KiB)

Install these arm64 packages from this PPA

* + 1. sudo add-apt-repository ppa: https://launchpad.net/~marco-sonic/+archive/ubuntu/rasppios/+sourcepub/17057732/+listing-archive-extra

1.6.2 sudo apt-get update && upgrade

1.6.3 sudo apt-get install <\*\*>

sudo apt-get install **gstreamer1.0-libcamera**

sudo apt-get install **libcamera-dev**

sudo apt-get install **libcamera-doc**

sudo apt-get install **libcamera-ipa**

sudo apt-get install **libcamera-tools**

sudo apt-get install **libcamera-v4l2**

sudo apt-get install **libcamera0.4**

sudo apt-get install **python3-libcamera**

**After doing this, check the installation with the dpkg command**

sudo dpkg -l |grep libcamera

**A future release is rpicam-apps**

* 1. **Install camera\_ros from Source, a ROS 2 package that publishes camera output as a topic**

A helpful background reference for a similar camera package installation is: that: Reference: https://emanual.robotis.com/docs/en/platform/turtlebot3/sbc\_setup/#sbc-setup

**Install camera\_ros Package from Source**

[**https://github.com/christianrauch/camera\_ros**](https://github.com/christianrauch/camera_ros)

$ mkdir -p camera\_ws/src

$ cd camera\_ws

$ git clone git clone <https://github.com/christianrauch/camera_ros.git>

$ # resolve binary dependencies and build workspace

$ source /opt/ros/$ROS\_DISTRO/setup.bash

$ cd ~/camera\_ws/

$ rosdep install -y --from-paths src --ignore-src --rosdistro $ROS\_DISTRO --skip-keys=libcamera

colcon build --event-handlers=console\_direct+

$ . install/setup.bash

OR to permanently configure this package to run from anywhere

With $ nano edit .bashrc, and add the line:

source /home/ubuntu/camera\_ws/install/setup.bash

Now, any Terminal that opens will source this package.

In a Terminal,

$ ros2 run camera\_ros camera\_node -–ros-args -p camera:=0 -p role:=viewfinder

In a 2nd Terminal,

$ ros2 run rqt\_image\_view rqt\_image\_view /camera/image\_raw

**Node, topic and param are as follows:**

**ubuntu@rp5-ub24j-mb**:**~**$ ros2 node list

/camera

**ubuntu@rp5-ub24j-mb**:**~**$ ros2 topic list

/camera/camera\_info

/camera/image\_raw

/camera/image\_raw/compressed

/parameter\_events

/rosout

**ubuntu@rp5-ub24j-mb**:**~**$ ros2 param dump /camera

/camera:

ros\_\_parameters:

camera: 0

format: ''

height: 0

jpeg\_quality: 95

qos\_overrides:

/parameter\_events:

publisher:

depth: 1000

durability: volatile

history: keep\_last

reliability: reliable

role: raw

start\_type\_description\_service: true

use\_sim\_time: false

If Camera Calibration is not done, on running “camera\_node, an error message may be displayed:

The error message Unable to open camera calibration file [/home/ubuntu/.ros/camera\_info/imx219\_\_base\_soc\_i2c0mux\_i2c\_1\_imx219\_10\_640x480.yaml]appears because the calibration file is missing. After performing the calibration, place the corresponding info file in the specified folder.  
The camera\_name should be set as imx219\_\_base\_soc\_i2c0mux\_i2c\_1\_imx219\_10\_640x480

A sample yaml file

mage\_width: 640

image\_height: 480

camera\_name: imx219\_\_base\_soc\_i2c0mux\_i2c\_1\_imx219\_10\_640x480

frame\_id: camera

camera\_matrix:

rows: 3

cols: 3

data: [322.0704122808738, 0, 199.2680620421962, 0, 320.8673986158544, 155.2533082600705, 0, 0, 1]

distortion\_model: plumb\_bob

distortion\_coefficients:

rows: 1

cols: 5

data: [0.1639958233797625, -0.271840030972792, 0.001055841660100477, -0.00166555973740089, 0]

rectification\_matrix:

rows: 3

cols: 3

data: [1, 0, 0, 0, 1, 0, 0, 0, 1]

projection\_matrix:

rows: 3

cols: 4

data: [329.2483825683594, 0, 198.4101510452074, 0, 0, 329.1044006347656, 155.5057121208347, 0, 0, 0, 1, 0]

* + 1. Camera Calibration

<https://docs.ros.org/en/rolling/p/camera_calibration/>

Full description in a future document revision