MISTRAL

an AXISCADES company

MRD5165 Eagle Kit

Software User Guide

Revision History

Revision	Date	Description
0.1	Nov 28, 2023	Preliminary version
0.2	17 January 2023	Added Section-8

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1. Introduction

This document provides the instructions to setting up the Eagle-Kit and procedure to quickly validate all the peripherals of the Eagle Kit.

2. Eagle Kit Overview

The Mistral MRD5165 Eagle Kit is based on Qualcomm's QRB5165 processor. The MRD5165 Eagle kit provides high-performance compute platform for precise artificial intelligence (AI) and machine-learning inferencing technology to facilitate the accelerated development of innovative, power-efficient, high-computing robots and drones for enterprise, industrial, and professional service applications. It offers readily deployable SDKs, Ubuntu Root-FS and tools for product development to facilitate quick prototyping and proof-of-concept evaluations. Additionally, this kit includes high performance connectivity interfaces making it an ideal platform for connected Eagle device in IOT, Drones and Robotics.

3. Getting Started

The Mistral MRD5165 Eagle Kit offers a versatile platform for product developers to evaluate system functionality, experiment with sample applications, migrate existing applications, create new features, and integrate with a variety of peripheral devices. This kit provides a Linux software environment for application development, with the option to customize and update the system software using a chosen release of the QRB5165 system software.

The Development Kit Software User Guide provides an overall description of the hardware and software for this platform and includes instructions for setting up the platform and validating all the peripherals.

4. Eagle-Kit Accessories

Basic Accessories:

1. DC Adapter
2. Power Chord
3. Custom power cable
4. I-PEX cable
5. Camera Adapter Board
6. Wi-Fi Antenna
7. USB Type-C Cable

Vision Accessories:

1. IMX577 Camera Module and corresponding Adapter Board
2. OV9282 Camera Module and corresponding Adapter Board

Connectivity Accessories:

1. 5G modem
2. 5G antenna

Note: USB Micro-B cable and Ethernet cable are not part of the kit accessories.

5. Eagle Kit Setup

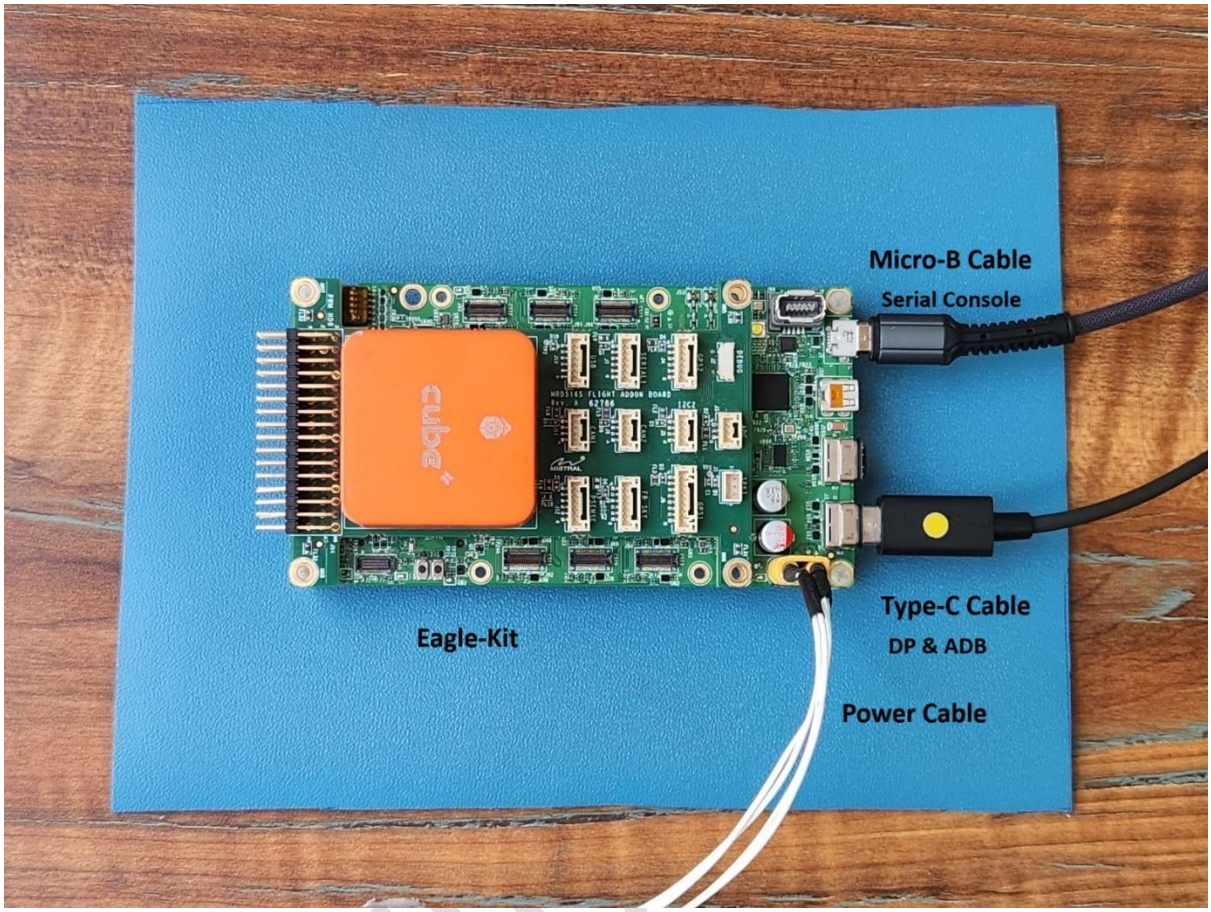

Figure 1 MRD5165 Eagle Kit

1. Connect the DC adapter using Power cable to J1
2. Connect a USB Type-C cable to J103 (adb connection)
3. Connect a Micro-B cable to J5 (Debug console)

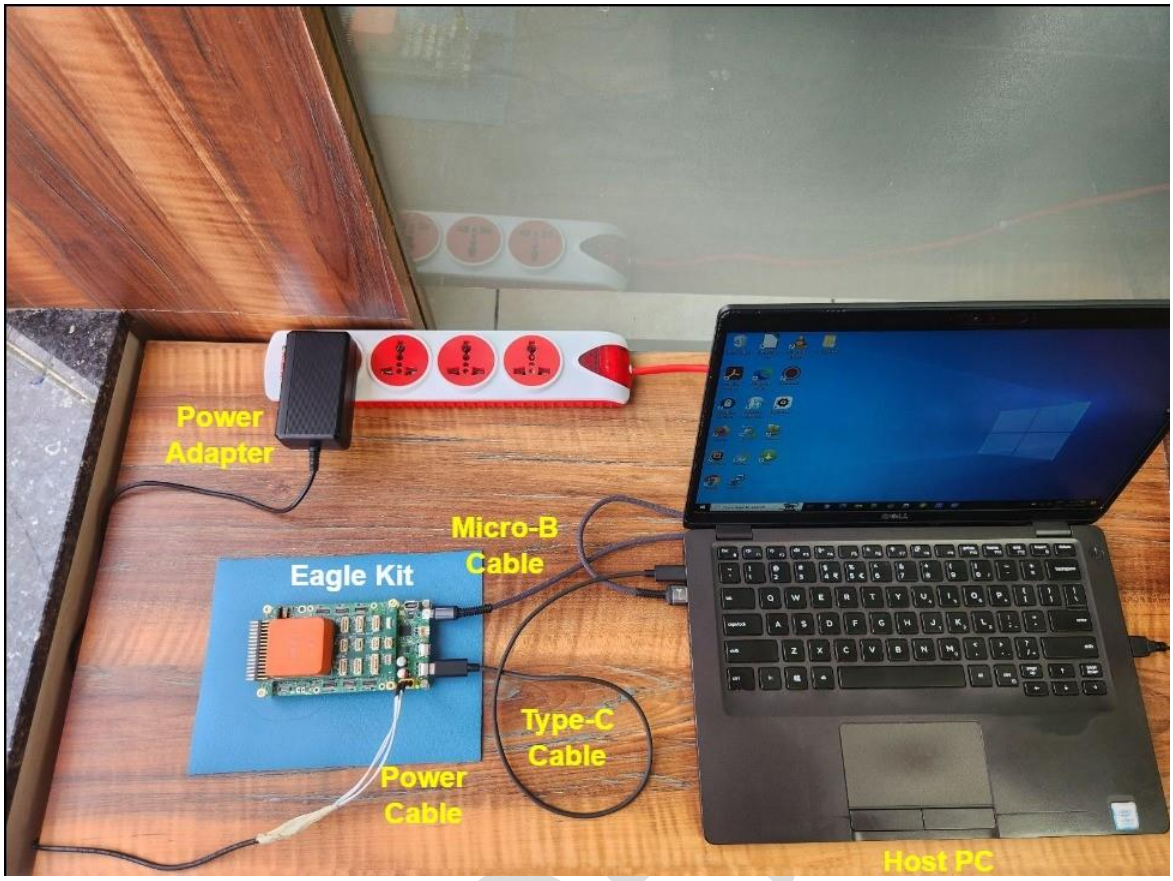

Figure 2 MRD5165 Eagle Kit connection to PC

6. Powering up Eagle Kit Board

The Eagle Kit is Pre-Flashed with the Linux Ubuntu software.

1. Connect the DC adapter using custom power cable to Eagle-Kit J1 connector.
2. Connect a Type-C cable to USB0 Type-C port J103 of the Eagle-Kit for adb access.
3. Connect a Micro-B cable to Micro-B port J5 of the Eagle-Kit for debug console access.
4. Power up the setup

Refer to the "Figure 1 MRD5165 Eagle Kit" and "Figure 2 MRD5165 Eagle Kit connection to PC" for the setup.

6.1. Host PC setup

- Windows Host PC adb and fastbooot installation
  Download platform tools for Windows from the link provided below.

  https://developer.android.com/tools/releases/platform-tools

- Ubuntu Host PC adb and fastbooot installation
  Use the commands below to install adb and fastboot.

```
$ sudo apt-get update

$ sudo apt-get install android-tools-adb android-tools-fastboot
```

6.2. Serial/Debug Console

- Connect the Eagle Kit Micro-B connector to Host PC as shown in Figure 2 MRD5165 Eagle Kit connection to PC.
- Open a Tera Term application on Host PC to observe boot logs and access the board.

  a) Select Eagle Kit Serial Console (Micro-B connection) COM port.
  b) Set Baud Rate to 115200–8-N-1

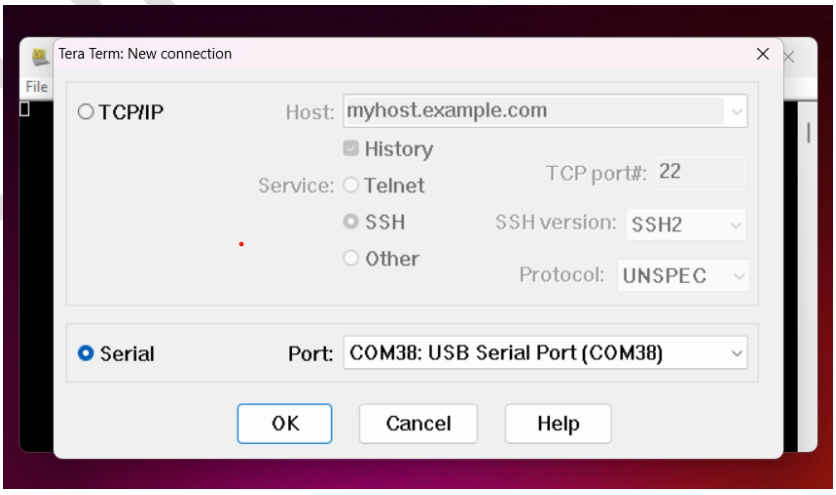

Figure 3 Eagle Kit Serial COM port selection

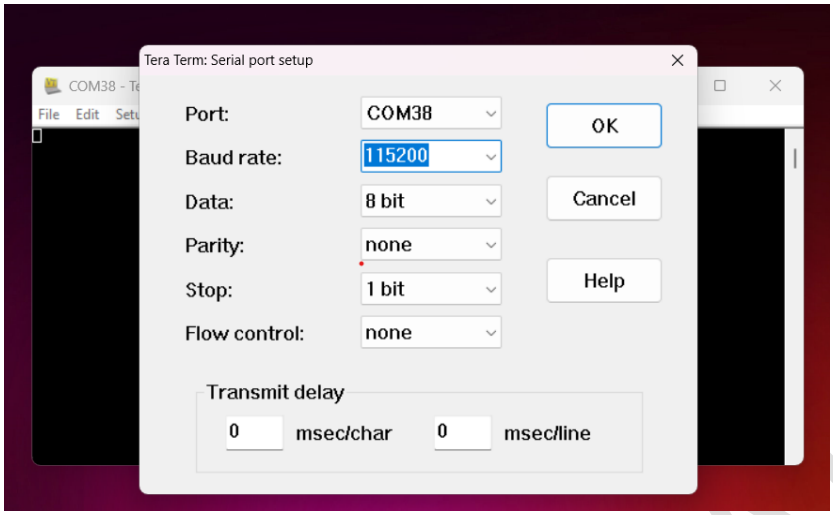

Figure 4 Eagle Kit Serial Baud rate set and settings for 115200 -8N1

Figure 5 Eagle Kit Boot Logs

```
Serial Console Login:
Username: root
Password: oelinux123
```

Figure 6 Eagle Kit Serial Console Login

6.3. Setting up ADB over Type-C

- Connect the Eagle Kit Type-C connector to Host PC as shown in **Figure 2 MRD5165 Eagle Kit connection to PC**.
- Power up the Eagle Kit
- Open a CMD terminal on Host PC and run the following commands.

```
$ adb root
$ adb shell
```

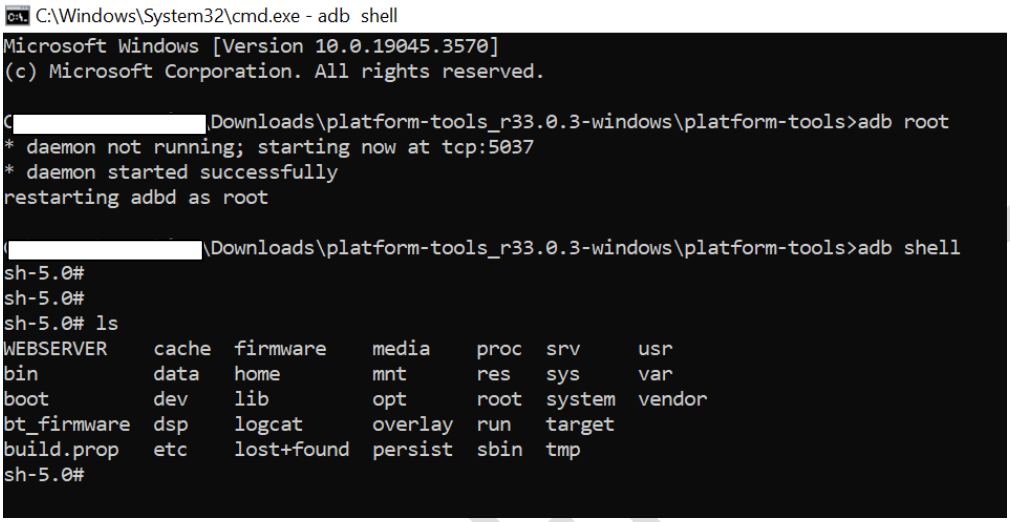

Figure 7 Eagle Kit ADB Type-C connection

6.4. Setting up ADB over Wi-Fi

The Eagle-Kit device offers a hotspot connection, requiring the Host PC to establish a Wi-Fi connection.

- Connect Host PC WiFi to the Eagle Kit hotspot. (SSID “Eagle-Kit-XXXXXXXX)
- Open a CMD terminal on Host PC and run the following commands.

```
$ adb connect 192.168.2.1:5555
```

```
$ adb root & adb shell
```

Figure 8 Eagle Kit Hotspot Wi-Fi Connection

```
C:\Users\[redacted]\Desktop\qrb5165\Android_Platform_Tools\platform-tools>adb devices
List of devices attached


C:\Users\[redacted]\Desktop\qrb5165\Android_Platform_Tools\platform-tools>adb connect 192.168.2.1:5555
connected to 192.168.2.1:5555

C:\Users\[redacted]\Desktop\qrb5165\Android_Platform_Tools\platform-tools>adb devices
List of devices attached
192.168.2.1:5555        device


C:\Users\[redacted]\Desktop\qrb5165\Android_Platform_Tools\platform-tools>adb root & adb shell
sh-5.0#
sh-5.0#
sh-5.0#
```

Figure 9 Eagle Kit ADB connection Over Wi-Fi

To disconnect the adb device from the Host PC, run the following commands and then disconnect the Wi-Fi connection on Host PC.

```
$ adb disconnect 192.168.2.1:5555
```

7. Peripherals Validation

7.1. RGB LEDs

Eagle Kit Setup:

- Open an adb shell over Wi-Fi (Follow the ADB over Wi-Fi steps) and execute the following commands to control the RGB LEDs
  LEDs ON:

```
# echo 255 > /sys/class/leds/red/brightness
# echo 255 > /sys/class/leds/green/brightness
# echo 255 > /sys/class/leds/blue/brightness
```

  LEDs OFF:

```
# echo 0 > /sys/class/leds/red/brightness
# echo 0 > /sys/class/leds/green/brightness
# echo 0 > /sys/class/leds/blue/brightness
```

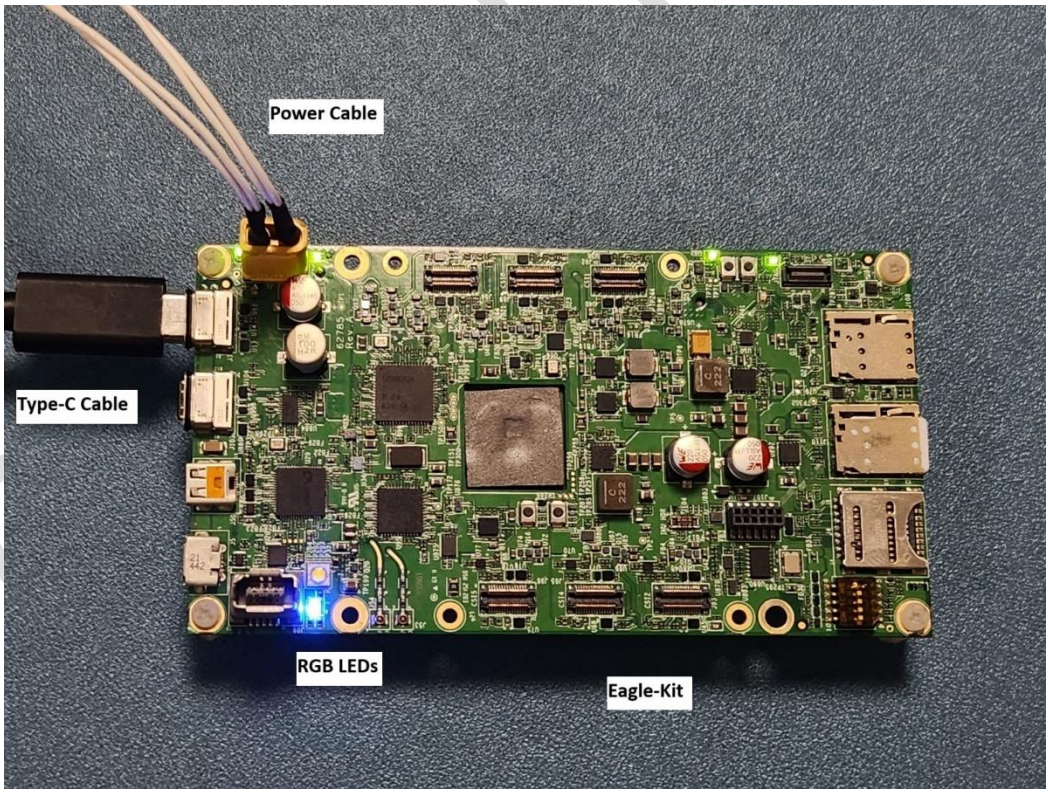

Figure 10 Eagle Kit RGB LEDs, Here BLUE LED state is ON

7.2. Switches

Eagle Kit Setup:

- Open an adb shell over Wi-Fi (Follow the ADB over Wi-Fi steps) and execute the following commands to verify the VOL-UP, VOL-DOWN, POWER switches events.

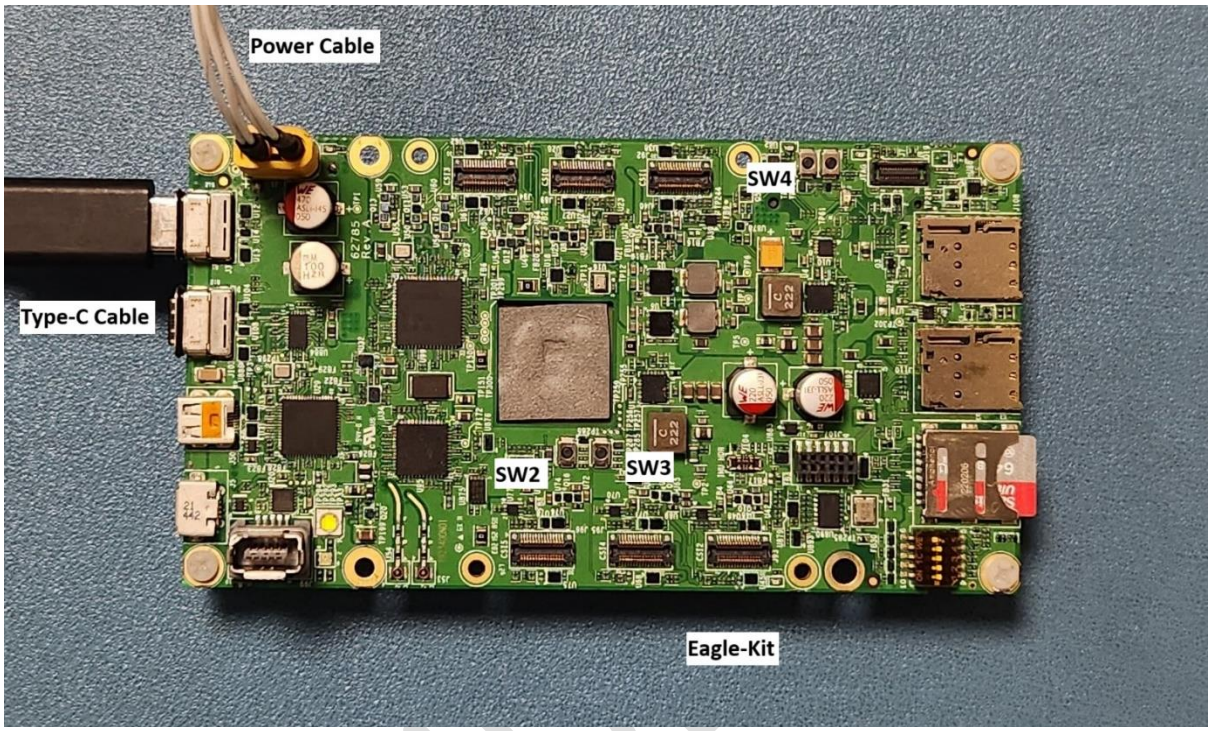

Figure 11 Eagle Kit Switches

SW2: VOL-UP, SW3: VOL-DOWN, SW5: POWER

VOL-UP KEY:

- Execute the following command and press the VOL-UP: SW2 button.
  `# evtest /dev/input/event1`

  Observe the event logs for KEY_VOLUMEUP button press.

```
sh-5.0# evtest /dev/input/event1
Input driver version is 1.0.1
Input device ID: bus 0x19 vendor 0x1 product 0x1 version 0x100
Input device name: "gpio-keys"
Supported events:
  Event type 0 (EV_SYN)
  Event type 1 (EV_KEY)
    Event code 115 (KEY_VOLUMEUP)
Properties:
Testing ... (interrupt to exit)
Event: time 1679939996.1679939996, type 1 (EV_KEY), code 115 (KEY_VOLUMEUP), value 1
Event: time 1679939996.1679939996, -------------- SYN_REPORT ------------
Event: time 1679939996.1679939996, type 1 (EV_KEY), code 115 (KEY_VOLUMEUP), value 0
Event: time 1679939996.1679939996, -------------- SYN_REPORT ------------
```

Figure 12 Eagle Kit VOLUME-UP KEY event

VOL-DOWN KEY:

- Execute the following command and press the VOL-DOWN: SW3 button.

  ```
  # evtest /dev/input/event0
  ```

  Observe the event logs for KEY_VOLUMEDOWN button press.

```
sh-5.0# evtest /dev/input/event0
Input driver version is 1.0.1
Input device ID: bus 0x0 vendor 0x0 product 0x0 version 0x0
Input device name: "qpnp_pon"
Supported events:
  Event type 0 (EV_SYN)
  Event type 1 (EV_KEY)
    Event code 114 (KEY_VOLUMEDOWN)
    Event code 116 (KEY_POWER)
Properties:
Testing ... (interrupt to exit)
Event: time 1679940045.1679940045, type 1 (EV_KEY), code 114 (KEY_VOLUMEDOWN), value 1
Event: time 1679940045.1679940045, -------------- SYN_REPORT ------------
Event: time 1679940045.1679940045, type 1 (EV_KEY), code 114 (KEY_VOLUMEDOWN), value 0
Event: time 1679940045.1679940045, -------------- SYN_REPORT ------------
```

Figure 13 Eagle Kit VOLUME-DOWN KEY event

POWER KEY:

- Execute the following command and press the POWER: SW4 button.

  ```
  # evtest /dev/input/event0
  ```

  Observe the event logs for KEY_POWER button press.

```
sh-5.0# evtest /dev/input/event0
Input driver version is 1.0.1
Input device ID: bus 0x0 vendor 0x0 product 0x0 version 0x0
Input device name: "qpnp_pon"
Supported events:
  Event type 0 (EV_SYN)
  Event type 1 (EV_KEY)
    Event code 114 (KEY_VOLUMEDOWN)
    Event code 116 (KEY_POWER)
Properties:
Testing ... (interrupt to exit)
Event: time 1679940092.1679940092, type 1 (EV_KEY), code 116 (KEY_POWER), value 1
Event: time 1679940092.1679940092, -------------- SYN_REPORT ------------
Event: time 1679940092.1679940092, type 1 (EV_KEY), code 116 (KEY_POWER), value 0
Event: time 1679940092.1679940092, -------------- SYN_REPORT ------------
```

Figure 14 Eagle Kit POWER KEY event

7.3. Wi-Fi Station Mode

Eagle-Kit Setup:

- Open an adb shell over Type-C (Follow the ADB over Wi-Fi steps) and execute the following commands to verify the Wi-Fi Station mode connection.

  a. Add either a “open” network configuration or secured network configuration to the **/data/misc/wifi/wpa_supplicant.conf** file as shown below.

  Open networks connect configuration:

```
network= {
ssid="Open-AP-Wifi-Name"
key_mgmt=NONE
}
```

  Secured networks connect configuration:

```
network= {
ssid="Secured-AP-Wi-Fi-Name"
key_mgmt=WPA-PSK
pairwise=TKIP CCMP
group=TKIP CCMP
psk=”AP-Wi-Fi-password”
}
```

  b. Kill all the running wpa_supplicant and hostapd daemons.

```
# killall wpa_supplicant
# killall hostapd
```

  c. Run the “wpa_supplicant” with network configure wpa_supplicant.conf file

```
# wpa_supplicant -Dnl80211 -iwlan0 -c
/data/misc/wifi/wpa_supplicant.conf &
```

  d. Run “dhcpcd” to request the IP address

```
# dhcpcd
```

  e. Check the “wlan0” iface IP address

```
# ifconfig wlan0
```

```
sh-5.0# ifconfig wlan0
wlan0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.43.145  netmask 255.255.255.0  broadcast 192.168.43.255
        inet6 fe80::d243:67c6:eab6:6707  prefixlen 64  scopeid 0x20<link>
        ether 00:03:7f:12:9f:d2  txqueuelen 3000  (Ethernet)
        RX packets 80  bytes 6474 (6.4 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 84  bytes 6658 (6.6 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

Figure 15 Eagle Kit Wi-Fi Station mode IP address

f. Run ping command to test the network connection.

```
# ping www.google.com
```

```
sh-5.0# ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8): 56 data bytes
64 bytes from 8.8.8.8: icmp_seq=0 ttl=112 time=329.715 ms
64 bytes from 8.8.8.8: icmp_seq=1 ttl=112 time=54.053 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=112 time=55.244 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=112 time=63.904 ms
^C--- 8.8.8.8 ping statistics ---
4 packets transmitted, 4 packets received, 0% packet loss
round-trip min/avg/max/stddev = 54.053/125.729/329.715/117.833 ms
```

Figure 16 Eagle Kit Wi-Fi Station mode Ping test

Note: **Reboot the board to enable the Eagle-Kit in Wi-Fi Hotspot mode (Default mode)**

7.4. Wi-Fi Access Point Mode

NOTE: By default, Eagle-Kit boot enables Wi-Fi in Access Point mode.

To override the default AP mode configuration, follow the below steps.

Eagle-Kit Setup:

- Open an adb shell over Type-C (Follow the ADB over Wi-Fi steps) and execute the following commands to verify the Wi-Fi AP mode connection.

a. Kill all the running wpa_supplicant and hostapd daemons
```
# killall wpa_supplicant
# killall hostapd
```

b. Run the hostapd daemon with the default "/etc/hostapd/hostapd.conf" configuration file.
```
# hostapd /etc/hostapd/hostapd.conf &
```

Modify the ""/etc/hostapd/hostapd.conf" "ssid" parameter for hotspot name and "wpa_passphrase" for WPA password.

c. Setup the "wlan0" iface and dhcp server
```
# ifconfig wlan0 192.168.2.1 netmask 255.255.255.0 up
# dnsmasq  --dhcp-range=192.168.2.10,192.168.2.100,12h --port=5353
```

d. Connect a external Wi-Fi device to Eagle-Kit Hotspot
Default WPA password is "1234567890"

7.5. Ethernet

Eagle-Kit Setup:

- Open an adb shell over Type-C (Follow the ADB over Wi-Fi steps) and execute the following commands to verify the Ethernet connection.

1. Connect ethernet cable to the Eagle-Kit as shown below

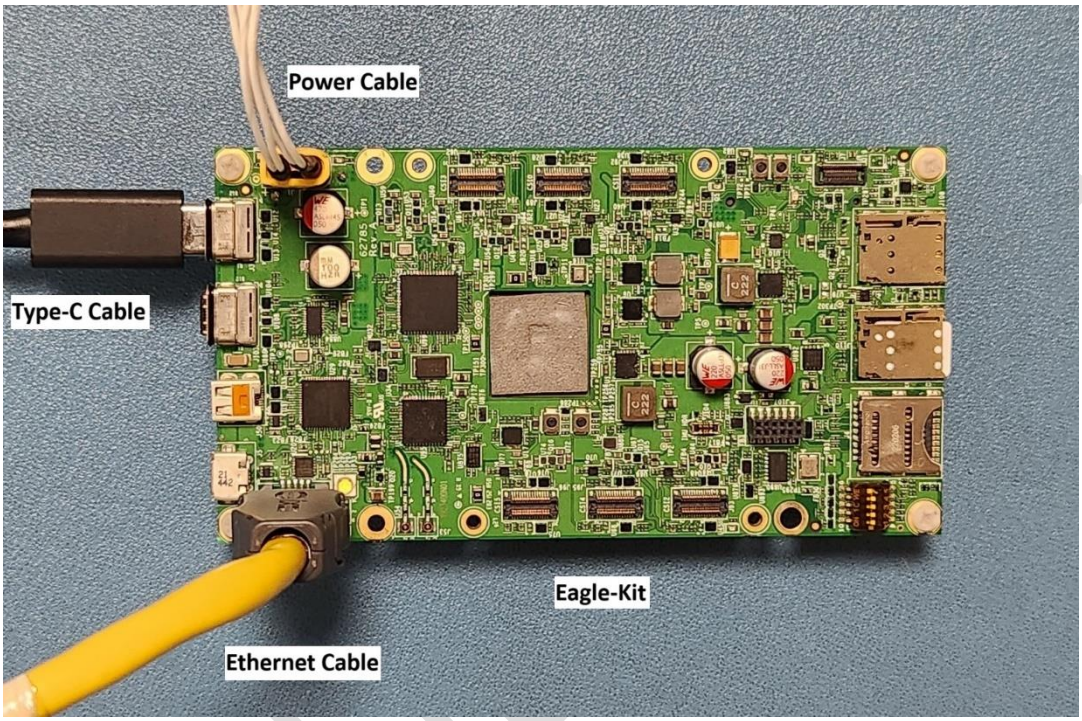

Figure 17 Eagle Kit Ethernet test

2. Verify the ethernet iface "eth0" IP address
   # ifconfig eth0

```
sh-5.0# ifconfig eth0
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.13.159  netmask 255.255.255.0  broadcast 192.168.13.255
        inet6 fe80::d34f:86ee:97d0:a560  prefixlen 64  scopeid 0x20<link>
        ether 00:1e:c0:e1:2c:8a  txqueuelen 1000  (Ethernet)
        RX packets 824  bytes 71664 (71.6 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 30  bytes 3012 (3.0 KB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

Figure 18 Ethernet Iface IP address

3. Delete if any “default” route with gateway IP 0.0.0.0 is present.

```
# route (Will list all the route gateway)
# route del default
```

```
root@qrb5165-ifb:~#
root@qrb5165-ifb:~# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
default         0.0.0.0         0.0.0.0         U     0      0        0 eth0
default         192.168.13.1    0.0.0.0         UG    210    0        0 eth0
link-local      0.0.0.0         255.255.0.0     U     312    0        0 wlan0
192.168.2.0     0.0.0.0         255.255.255.0   U     0      0        0 wlan0
192.168.13.0    0.0.0.0         255.255.255.0   U     0      0        0 eth0
192.168.13.0    0.0.0.0         255.255.255.0   U     210    0        0 eth0
192.168.225.0   0.0.0.0         255.255.255.0   U     0      0        0 bridge0
root@qrb5165-ifb:~#
root@qrb5165-ifb:~# route del default
root@qrb5165-ifb:~#
root@qrb5165-ifb:~# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
default         192.168.13.1    0.0.0.0         UG    210    0        0 eth0
link-local      0.0.0.0         255.255.0.0     U     312    0        0 wlan0
192.168.2.0     0.0.0.0         255.255.255.0   U     0      0        0 wlan0
192.168.13.0    0.0.0.0         255.255.255.0   U     0      0        0 eth0
192.168.13.0    0.0.0.0         255.255.255.0   U     210    0        0 eth0
192.168.225.0   0.0.0.0         255.255.255.0   U     0      0        0 bridge0
root@qrb5165-ifb:~#
```

Figure 19 Ethernet Ping test

7.6. Bluetooth

Eagle-Kit Setup:

- Open an adb shell over Type-C (Follow the ADB over Wi-Fi steps) and execute the following commands to verify the Bluetooth connection.
- Keep an external Bluetooth device in discover mode to pair with the Eagle-kit and find the BT device address with "inquiry" command execution below and provide the same for "pair" command.

1. Delete the below Bluetooth configuration files

```
# rm /data/misc/bluetooth/bt*

# rm /data/misc/bluetooth/interop_database_dynamic.conf
```

2. Edit the "bt_app.conf" as below.

```
# vi /etc/Bluetooth/bt_app.conf
```

Configure the below parameters to false.

```
BtA2dpSinkEnable=false
BtHfClientEnable=false
```

3. Validating Bluetooth

Excute the "btproperty" and "btapp" and run the following commands to pair a BT device.

```
# btproperty & btapp
```

- gap_menu
- enable
- inquiry
- pair <external BT device address>
- yes
- bonded_list

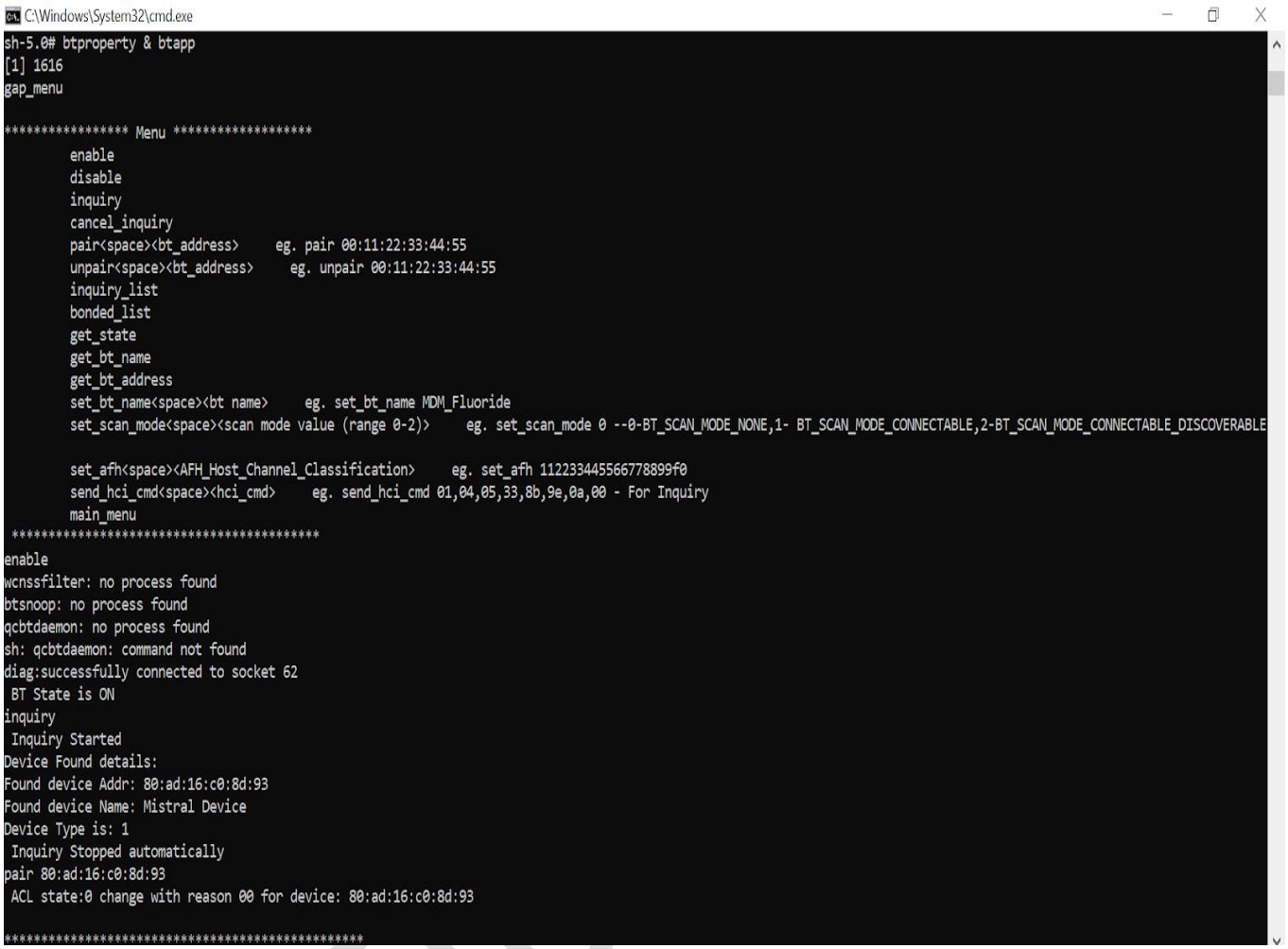

Figure 20 Eagle Kit Bluetooth test

Run the below commands to exit the btapp

- `main_menu`
- `exit`

7.7. SD Card

Eagle-Kit Setup:

- Connect a SD card to the Eagle Kit board.

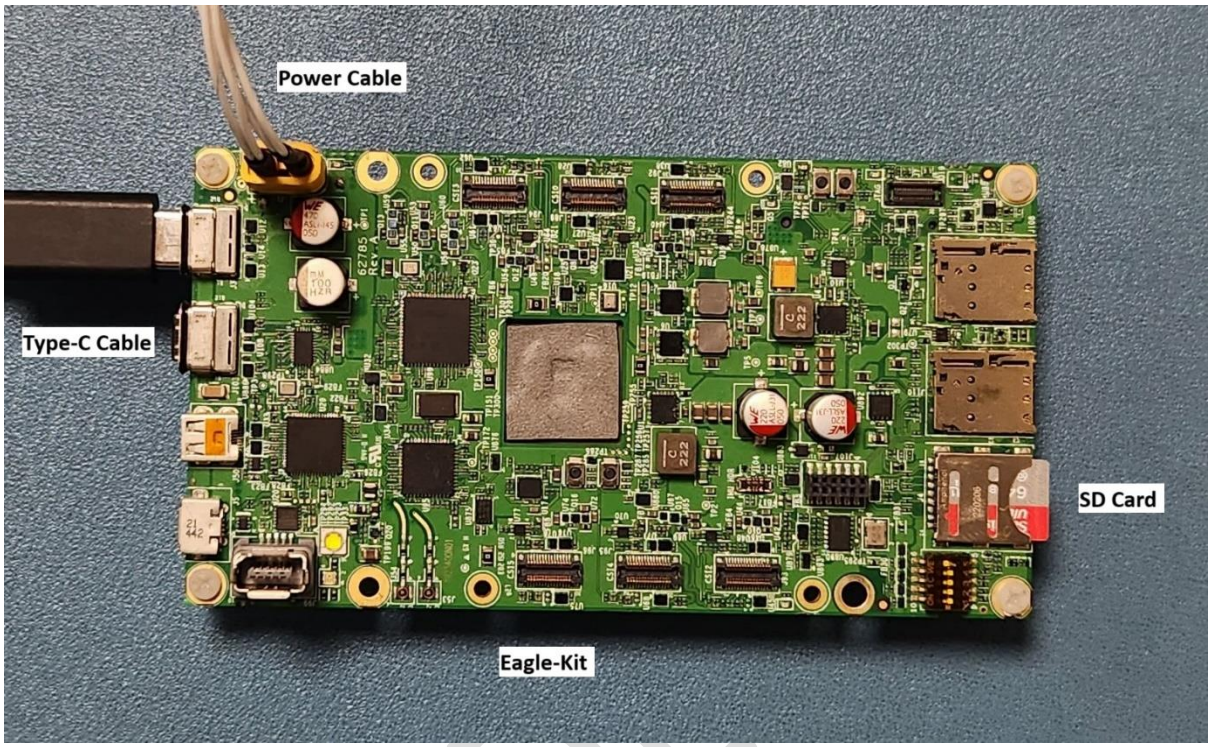

Figure 21 Eagle Kit SD card

- Open an adb shell over Wi-Fi (Follow the ADB over Wi-Fi steps) and execute the following commands to verify the SD card.

  a. Find the SD card device node
  ```
  # ls -la /dev/mmcblk*
  ```

  b. Mount the SD card partition device node
  ```
  # mkdir -p /mnt/sdcard
  ```

  Example command:
  ```
  # mount /dev/mmcblk2p1 /mnt/sdcard
  ```

  c. Perform file write operation
  ```
  # dd if=/dev/urandom of=/mnt/sdcard/test.txt bs=30M count=2
  conv=fsync
  ```

  Verify the file presence after the above command execution.

d. Unmount the SD card

Example command:

```
# umount /dev/mmcblk2p1
```

```
sh-5.0# ls -la /dev/mmcblk*
brw-rw---- 1 root disk   179, 0 Nov  7 06:11 /dev/mmcblk2
brw-rw---- 1 root system 179, 1 Nov  7 06:11 /dev/mmcblk2p1
brw-rw---- 1 root system 179, 2 Nov  7 06:11 /dev/mmcblk2p2
brw-rw---- 1 root system 179, 3 Nov  7 06:11 /dev/mmcblk2p3
sh-5.0# fdisk -l /dev/mmcblk2
Disk /dev/mmcblk2: 29.74 GiB, 31914983424 bytes, 62333952 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0xd35b7e18

Device         Boot   Start      End  Sectors  Size Id Type
/dev/mmcblk2p1 *       2048   411647   409600  200M  b W95 FAT32
/dev/mmcblk2p2       411648  8800255  8388608    4G 83 Linux
/dev/mmcblk2p3      8800256 62332927 53532672 25.5G 83 Linux
sh-5.0# mkdir /mnt/sdcard
sh-5.0# mount /dev/mmcblk2p1 /mnt/sdcard
sh-5.0# dd if=/dev/urandom of=/mnt/sdcard/test.txt bs=30M count=2 conv=fsync
2+0 records in
2+0 records out
62914560 bytes (63 MB, 60 MiB) copied, 4.90529 s, 12.8 MB/s
sh-5.0# umount /dev/mmcblk2p1
sh-5.0#
```

Figure 22 Eagle Kit SD card test

7.8. Sensors

Eagle-Kit Setup:

- Open an adb shell over Wi-Fi (Follow the ADB over Wi-Fi steps) and execute the following commands to verify all the sensors.

Accelerometer Sensor:

Run Driver Acceptance Test:

```
# ssc_drva_test -sensor=accel -duration=5 -sample_rate=50
```

Observe the "total sample" count value and "received event" result PASS.

Here duration is set 5 seconds and sample_rate set to 50, expected total samples count would be approximately 5*50=250.

```
sh-5.0# ssc_drva_test -sensor=accel -duration=5 -sample_rate=50
1 ssc drva test version 1.13
1 ssc_drva_test -sensor=accel -duration=5 -sample_rate=50
1 handle_event
1 event_cb attribute event for da_test
1 handle_event
1 event_cb attribute event for da_test
1 using da_test name=da_test, suid = [high addeaddeaddeadde, low addeaddeaddeadde
1 enter send_memory_log_req cookie: 1
1 exit send_memory_log_req
1 enter da_test runner
1 handle_event
1 -time_to_first_event=2258062
1 -time_to_last_event=-156733
1 -sample_ts=11537668924
1 -total_samples=247
1 -avg_delta=378991
1 -recvd_phy_config_sample_rate=50
1 -random_seed_used=2851690000
1 -num_request_sent=2
1 -first_sample_timestamp=11443923159
1 handle_event
1 received event: PASS
1 enter send_memory_log_req cookie: 1
1 exit send_memory_log_req
1 PASS
sh-5.0#
```

Figure 23 Eagle Kit Accelerometer Sensor test

Gyro Sensor:

Driver Acceptance Test:

```
# ssc_drva_test -sensor=gyro -duration=5 -sample_rate=50
```

Observe the "total sample" count value and "received event" result PASS.

Here duration is set 5 seconds and sample_rate set to 50, expected total samples count would be approximately 5*50=250.

```
sh-5.0# ssc_drva_test -sensor=gyro -duration=5 -sample_rate=50
2 ssc_drva_test version 1.13
2 ssc_drva_test -sensor=gyro -duration=5 -sample_rate=50
2 handle_event
2 event_cb attribute event for da_test
2 handle_event
2 event_cb attribute event for da_test
2 using da_test name=da_test, suid = [high addeaddeaddeadde, low addeaddeaddeadde
2 enter send_memory_log_req cookie: 2
2 exit send_memory_log_req
2 enter da_test runner
2 handle_event
2 -time_to_first_event=2776890
2 -time_to_last_event=-277916
2 -sample_ts=12247071021
2 -total_samples=245
2 -avg_delta=379476
2 -recvd_phy_config_sample_rate=50
2 -random_seed_used=3561088963
2 -num_request_sent=2
2 -first_sample_timestamp=12153843651
2 handle_event
2 received event: PASS
2 enter send_memory_log_req cookie: 2
2 exit send_memory_log_req
2 PASS
sh-5.0#
```

Figure 24 Eagle Kit Gyro Sensor test

Magnetometer Sensor:

Run Driver Acceptance Test:

```
# ssc_drva_test -sensor=mag -duration=5 -sample_rate=10
```

Observe the "total sample" count value and "received event" result PASS.

Here duration is set 5 seconds and sample_rate set to 10, expected total samples count would be approximately 5*10=50.

```
sh-5.0# ssc_drva_test -sensor=mag -duration=5 -sample_rate=10
3 ssc_drva_test version 1.13
3 ssc_drva_test -sensor=mag -duration=5 -sample_rate=10
3 handle_event
3 event_cb attribute event for da_test
3 handle_event
3 event_cb attribute event for da_test
3 using da_test name=da_test, suid = [high addeaddeaddeadde, low addeaddeaddeadde
3 enter send_memory_log_req cookie: 3
3 exit send_memory_log_req
3 enter da_test runner
3 handle_event
3 -time_to_first_event=2146058
3 -time_to_last_event=-1760757
3 -sample_ts=12892869548
3 -total_samples=49
3 -avg_delta=1880816
3 -recvd_phy_config_sample_rate=10
3 -random_seed_used=4206894614
3 -num_request_sent=2
3 -first_sample_timestamp=12799012430
3 handle_event
3 received event: PASS
3 enter send_memory_log_req cookie: 3
3 exit send_memory_log_req
3 PASS
```

Figure 25 Eagle Kit Magnetometer Sensor test

Pressure Sensor:

Run Driver Acceptance Test:

```
# ssc_drva_test -sensor=pressure -duration=5 -sample_rate=25
```

Observe the "total sample" count value and "received event" result PASS.

Here duration is set 5 seconds and sample_rate set to 25, expected total samples count would be approximately 5*25=125.

```
sh-5.0# ssc_drva_test -sensor=pressure -duration=5 -sample_rate=25
4 ssc_drva_test version 1.13
4 ssc_drva_test -sensor=pressure -duration=5 -sample_rate=25
4 handle_event
4 event_cb attribute event for da_test
4 handle_event
4 event_cb attribute event for da_test
4 using da_test name=da_test, suid = [high addeaddeaddeadde, low addeaddeaddeadde
4 enter send_memory_log_req cookie: 4
4 exit send_memory_log_req
4 enter da_test runner
4 handle_event
4 -time_to_first_event=2489724
4 -time_to_last_event=-595196
4 -sample_ts=13490701676
4 -total_samples=122
4 -avg_delta=761705
4 -recvd_phy_config_sample_rate=25
4 -random_seed_used=509759345
4 -num_request_sent=2
4 -first_sample_timestamp=13397188127
4 handle_event
4 received event: PASS
4 enter send_memory_log_req cookie: 4
4 exit send_memory_log_req
4 PASS
sh-5.0#
```

Figure 26 Eagle Kit Pressure Sensor test

7.9. SOM Thermistors

Eagle-Kit Setup:

- Open an adb shell over Wi-Fi (Follow the ADB over Wi-Fi steps) and execute the following commands to verify all the sensors.

pm8250-wifi-usr:

```
# cat /sys/class/thermal/thermal_zone63/temp
```

pm8150l-therm-usr:

```
# cat /sys/class/thermal/thermal_zone64/temp
```

pm8250-xo-therm-usr:

```
# cat /sys/class/thermal/thermal_zone65/temp
```

pm8150l-skin-step:

```
# cat /sys/class/thermal/thermal_zone66/temp
```

Example:

```
sh-5.0# cat /sys/class/thermal/thermal_zone65/type
pm8250-xo-therm-usr
sh-5.0# cat /sys/class/thermal/thermal_zone65/temp
36041
```

Figure 27 Eagle Kit Thermistors test

7.10. SOM Current and Voltage Monitor Sensor

Eagle-Kit Setup:

- Open an adb shell over Wi-Fi (Follow the ADB over Wi-Fi steps) and execute the following commands to verify all the sensors.

INA sensor is a current shunt and power monitor sensor. This sensor measures the MRD5165 SOM current consumption and voltage level.

INA Sensor device sysfs entry check:
```
# cat /sys/class/hwmon/hwmon5/name
```

Current consumption value in mA:
```
# cat /sys/class/hwmon/hwmon5/curr1_input
```

Voltage Drop value in mV:
```
# cat /sys/class/hwmon/hwmon5/in0_input
```

Voltage in value in mV:
```
# cat /sys/class/hwmon/hwmon5/in1_input
```

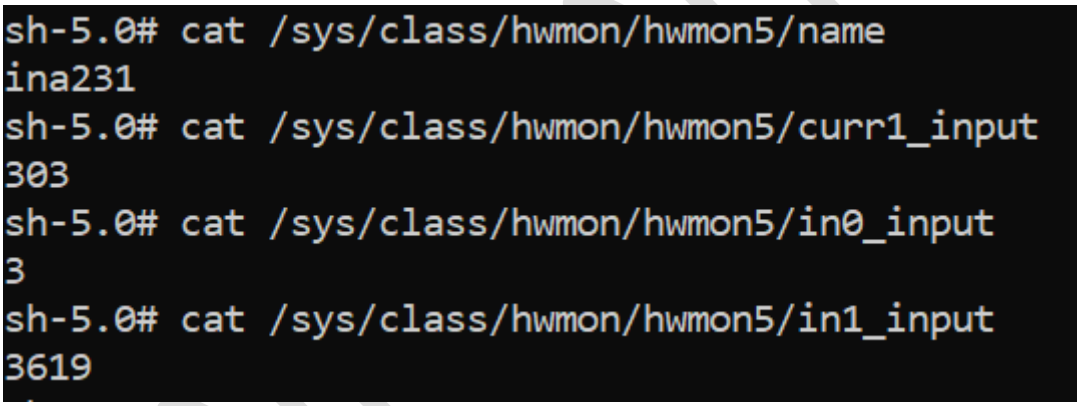

Figure 28 Eagle Kit INA Sensor test

7.11. 5G Module

Eagle Kit Setup:

- Connect a 5G module with antenna to the Eagle Kit and power up the setup.
- Connect a SIM card to SIM1 slot.
- Open an adb shell over Wi-Fi (Follow the ADB over Wi-Fi steps) and execute the following commands to verify the 5G module connection.

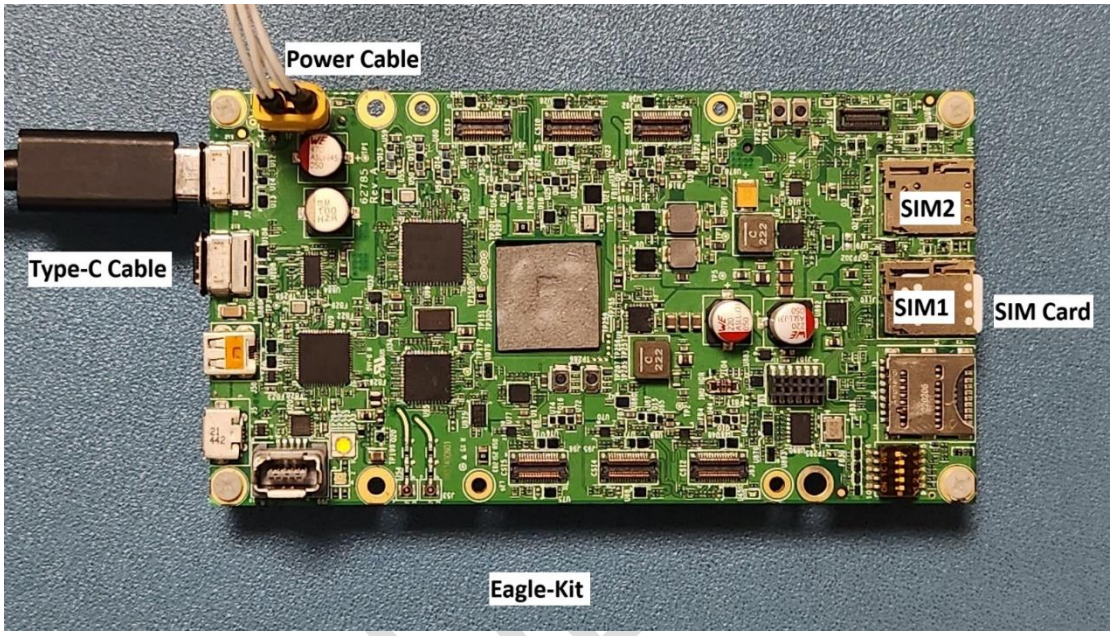

Figure 29 Eagle Kit SIM card slots

Figure 30 Eagle Kit 5G Module

1. Export the 5G module power enable GPIO_69 and driver high.
   GPIO base address is 328
   328 + 69 = 397

```
# echo 397 > /sys/class/gpio/export
# echo out > /sys/class/gpio397/direction
# echo 1 > /sys/class/gpio397/value
```

2. Verify the 5G Module presence over PCIe list
   # lspci

3. Run the following commands to start the network

```
# qmi_dev=/dev/mhi_0306_01.01.00_pipe_14
# qmicli -d $qmi_dev --device-open-proxy --wds-set-ip-family=4 --
client-no-release-cid --device-open-qmi

# qmicli -d $qmi_dev --device-open-proxy --uim-get-card-status --
device-open-qmi

# qmicli -d $qmi_dev --device-open-proxy --wds-start-network="ip-
type=4,apn=fast.t-mobile.com" --client-no-release-cid --client-cid=15
--device-open-qmi
<Configure the apn based on the SIM service provider>


# qmicli -d $qmi_dev --wds-get-current-settings --device-open-proxy -
-client-no-release-cid --client-cid=15 --device-open-qmi

# udhcpc -q -f -n -i rmnet_mhi0

# ifconfig rmnet_mhi0

# ping www.google.com
```

7.12. HDMI-in Camera Preview on Type-C Display

Eagle Kit Setup:

- Connect the Type-C DP port to a display monitor.
- Connect a HDMI camera to HDMI-in port.

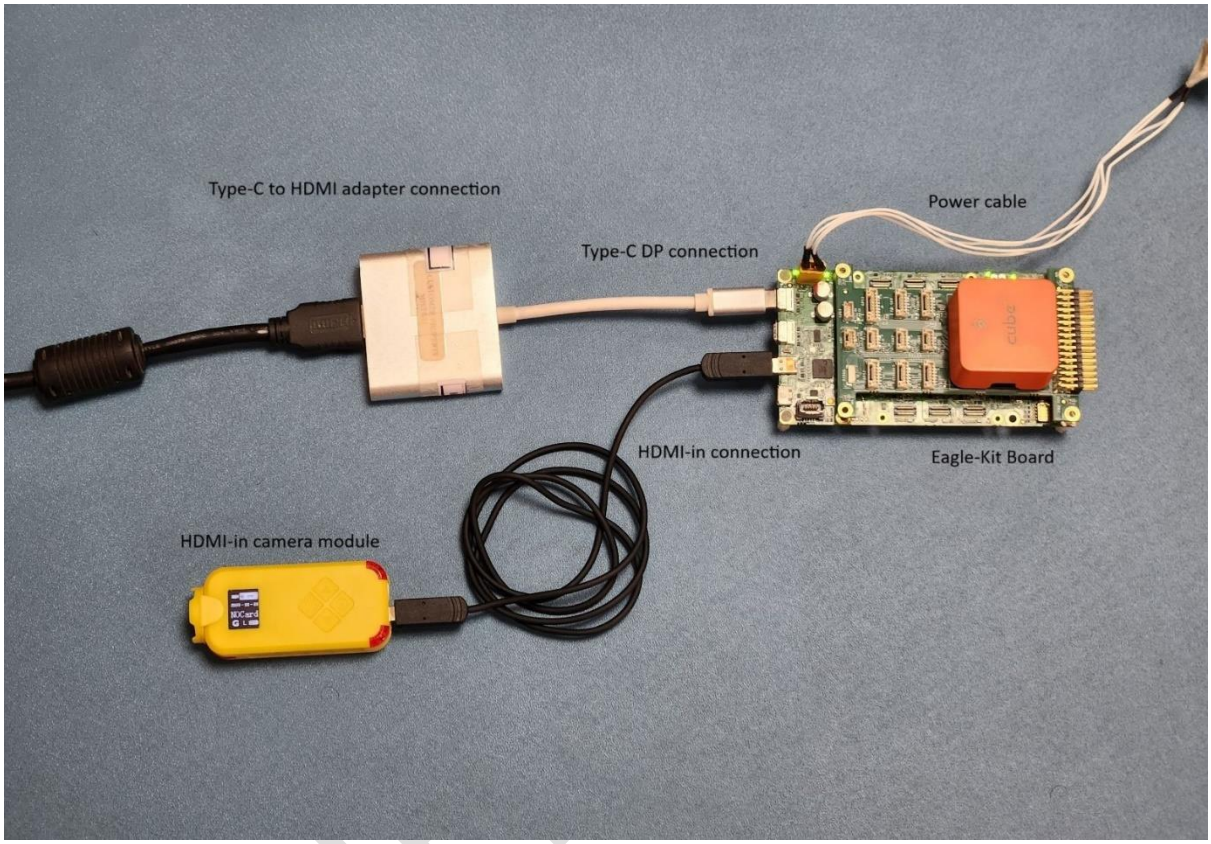

Figure 31 Eagle Kit HDMI-in Camera Setup

Open an adb shell over Wi-Fi (Follow the ADB over Wi-Fi steps) and execute the following command to preview the HDMI-In camera on Type-C Display.

```
# export XDG_RUNTIME_DIR=/run/user/root && gst-launch-1.0 -e qtiqmmfsrc
camera=0 name=camsrc ! video/x-
raw,format=NV12,width=3840,height=2160,framerate=60/1 ! waylandsink
fullscreen=true async=true sync=false
```

```
sh-5.0#
sh-5.0#
sh-5.0#
sh-5.0# export XDG_RUNTIME_DIR=/run/user/root && gst-launch-1.0 -e qtiqmmfsrc camera=0 name=camsrc ! video/x-raw,format=NV12,width=3840,height=2160,framerat
e=60/1 ! waylandsink fullscreen=true async=true sync=false
gbm_create_device(192): Info: backend name is: msm_drm
Setting pipeline to PAUSED ...
gbm_create_device(192): Info: backend name is: msm_drm
Pipeline is live and does not need PREROLL ...
Setting pipeline to PLAYING ...
New clock: GstSystemClock
```

Figure 32 Eagle Kit HDMI-in Camera Preview Command Execution

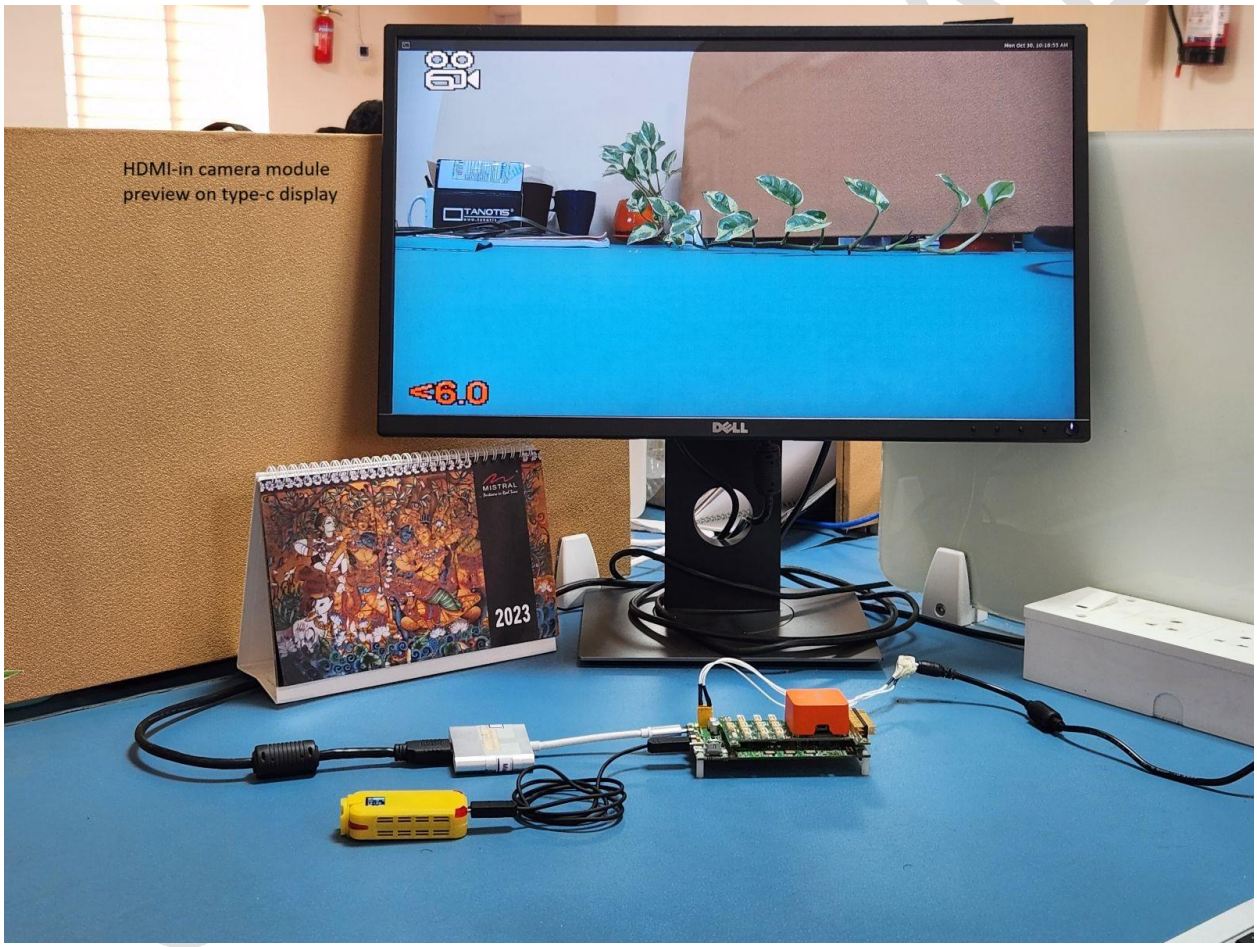

Figure 33 Eagle Kit HDMI-in Camera Preview on Type-C Display Monitor

7.13. HDMI-in Camera Stream Over Wi-Fi

Eagle Kit Setup:

- Connect the HDMI-in port to an HDMI-in camera as shown in the Fig 10 image.

Open an adb shell over Wi-Fi (Follow the ADB over Wi-Fi steps) and execute the following command to stream HDMI-In camera video over Wi-Fi.

```
# gst-launch-1.0 -e qtiqmmfsrc camera=0 name=camsrc ! video/x-
raw,format=NV12,width=3840,height=2160,framerate=60/1 ! qtic2venc !
queue ! h264parse ! rtph264pay config-interval=1 pt=96 ! udpsink
host = <Host PC IP Address> port=5502
```

Example Command:

```
# gst-launch-1.0 -e qtiqmmfsrc camera=0 name=camsrc ! video/x-
raw,format=NV12,width=3840,height=2160,framerate=60/1 ! qtic2venc !
queue ! h264parse ! rtph264pay config-interval=1 pt=96 ! udpsink
host = 192.168.2.52 port=5502
```

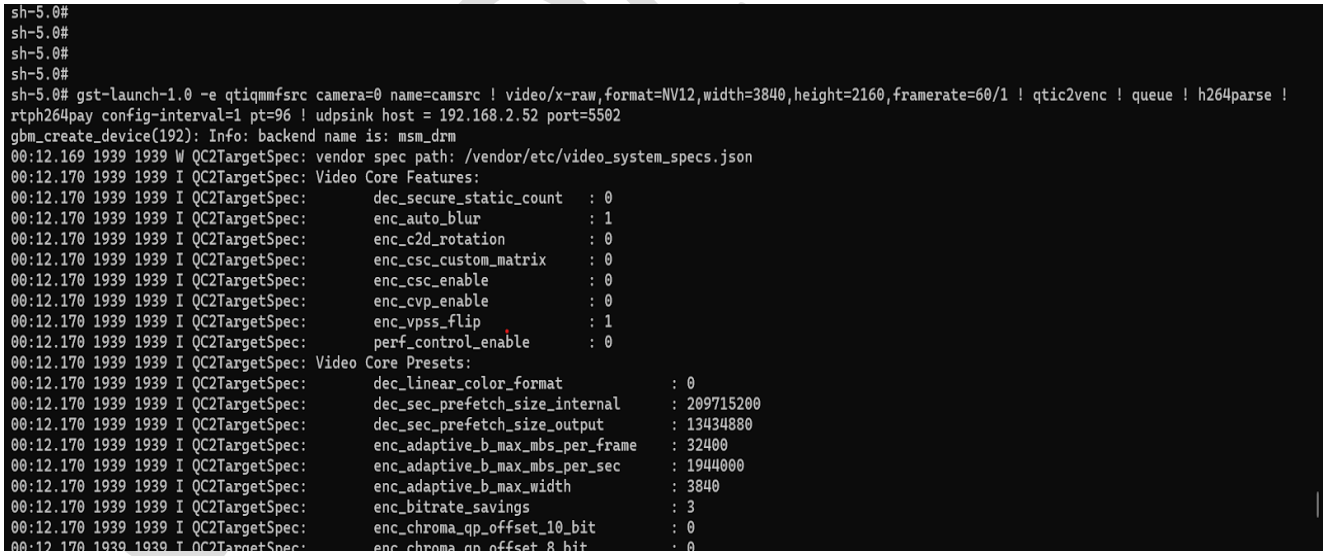

Figure 34 Eagle Kit HDMI-in Camera Wi-Fi Stream Command Execution

```
gbm_create_device(192): Info: backend name is: msm_drm
00:12.295 1939 1939 W StandardCaps: Preconditions for b-frame didn't meet. Disabling b-frame!
00:12.295 1939 1961 I QC2Registry: Build pipelined codec for session
00:12.295 1939 1961 I QC2Registry: Getting stages for pipelined codec
00:12.296 1939 1961 I QC2Registry: Pipelining not enabled
00:12.296 1939 1961 I QC2Registry: Doesn't support pipelining. Create standalone codec
00:12.297 1939 1961 I QC2V4l2Driver: [avcE_0] Device /dev/video33 opened with fd: 16
00:12.298 1939 1961 E QC2V4l2Driver: [avcE_0] failed to set buffer size limit to 4
00:12.299 1939 1961 E QC2V4l2Caps: c2 format not found for v4l2 format 0x34363248
00:12.299 1939 1961 E QC2V4l2Caps: c2 format not found for v4l2 format 0x43564548
00:12.300 1939 1961 W QC2V4l2Codec: [avcE_0] unknown/unsupported param coded.p-frame-count index = 0x5200C001
00:12.300 1939 1961 W QC2V4l2Codec: [avcE_0] unknown/unsupported param qti-ext-enc-b-frame-preconditions index = 0x9200C043
00:12.300 1939 1961 W QC2V4l2Codec: [avcE_0] unknown/unsupported param qti-ext-enc-adaptive-b-preconditions index = 0x9200C044
00:12.300 1939 1961 W QC2V4l2Codec: [avcE_0] unknown/unsupported param qti-ext-enc-hier-b-preconditions index = 0x9200C045
Pipeline is live and does not need PREROLL ...
Setting pipeline to PLAYING ...
New clock: GstSystemClock
00:12.406 1939 1961 E QC2Interface: Failed to query parameters
00:12.429 1939 1961 E QC2Interface: Failed to query parameters
00:12.801 1939 1961 I QC2Comp: [avcE_0] Stats: Pending(0) i/p-done(0) Works: Q: 11/Done 11|Work-Rate: Q(21.7/s Avg=21.7/s) Done(21.687/s Avg=21.687/s)| Stre
am: 30.00fps 43.5Mbps
Mem-usage:  [In-2D - 8 bufs 120.000 MB] [1D-0 - 15 bufs 179.297 MB] [1D-0 - 1 bufs 0.004 MB]
Total Mem-usage: 299.301 MB
00:17.801 1939 1961 I QC2Comp: [avcE_0] Stats: Pending(0) i/p-done(0) Works: Q: 161/Done 161|Work-Rate: Q(30.0/s Avg=29.2/s) Done(29.999/s Avg=29.233/s)| St
ream: 30.00fps 43.3Mbps
Mem-usage:  [In-2D - 9 bufs 135.000 MB] [1D-0 - 65 bufs 776.953 MB] [1D-0 - 1 bufs 0.004 MB]
Total Mem-usage: 911.957 MB
00:22.802 1939 1961 I QC2Comp: [avcE_0] Stats: Pending(0) i/p-done(0) Works: Q: 311/Done 311|Work-Rate: Q(30.0/s Avg=29.6/s) Done(29.996/s Avg=29.596/s)| St
ream: 30.00fps 43.3Mbps
Mem-usage:  [In-2D - 9 bufs 135.000 MB] [1D-0 - 65 bufs 776.953 MB] [1D-0 - 1 bufs 0.004 MB]
Total Mem-usage: 911.957 MB
```

Figure 35 Eagle Kit HDMI-in Camera Wi-Fi Stream Command Execution Logs

Host PC Wi-Fi Video Playback:

Open VLC player with the following Wifi-Stream.sdp file.

Wifi-Stream.sdp file content is as follows.

```
v=0
m=video 5502 RTP/AVP 96
c=IN IP4 127.0.0.1
a=rtpmap:96 H264/90000
```

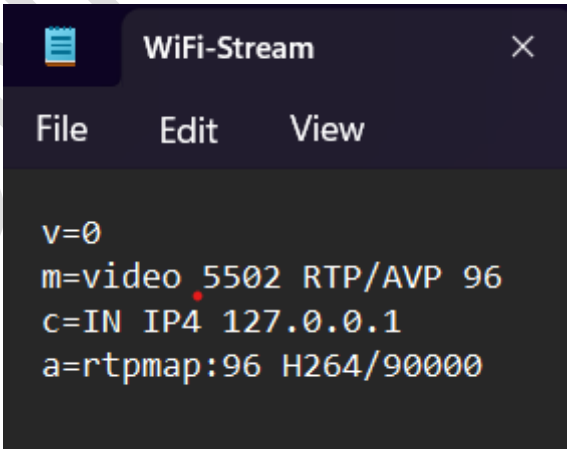

Figure 36 WiFi-Stream.sdp file content

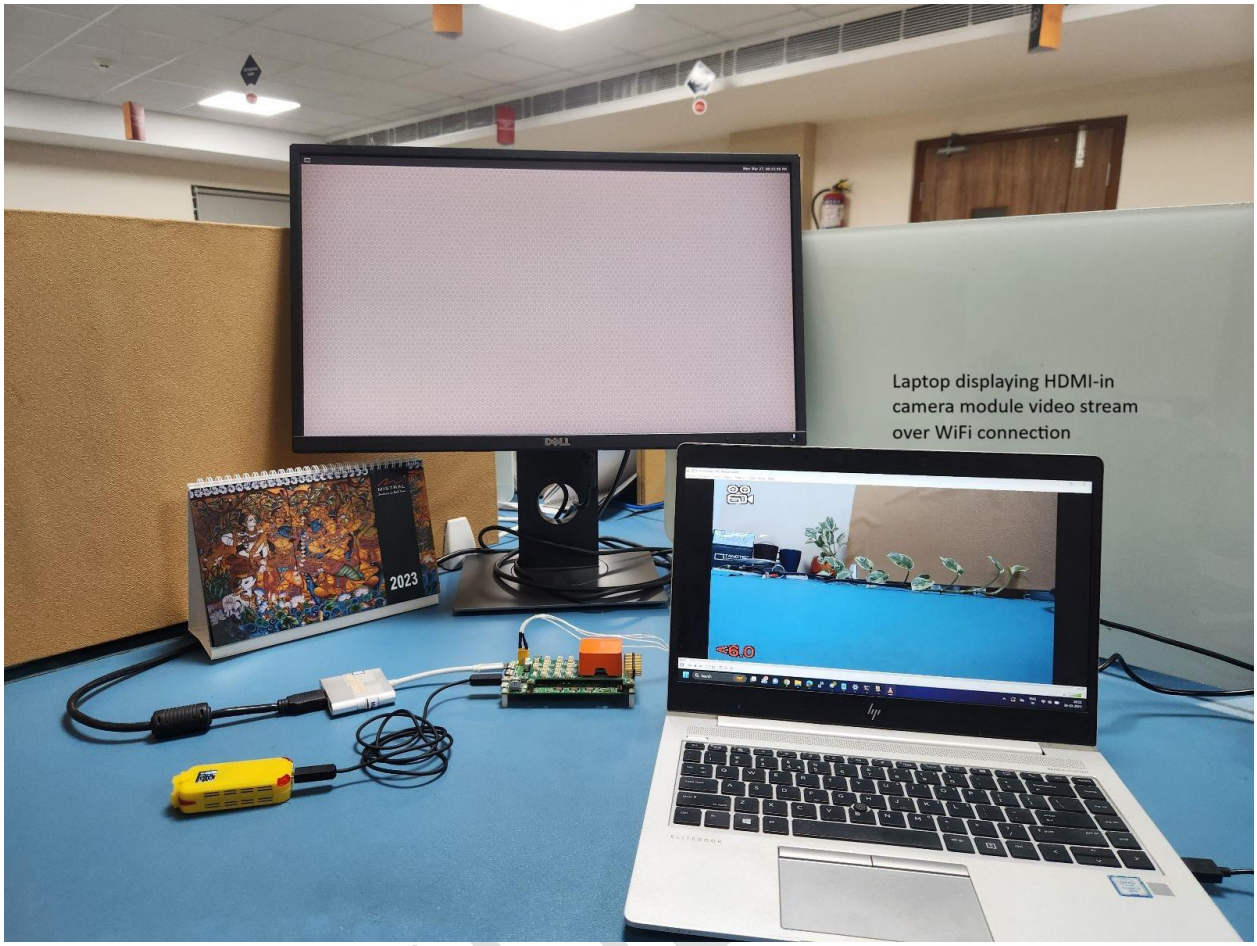

Figure 37 HDMI-in Camera Video Stream over Wi-Fi on Host PC

7.14. Eagle Kit Camera Ports`

Eagle Kit Camera Ports:

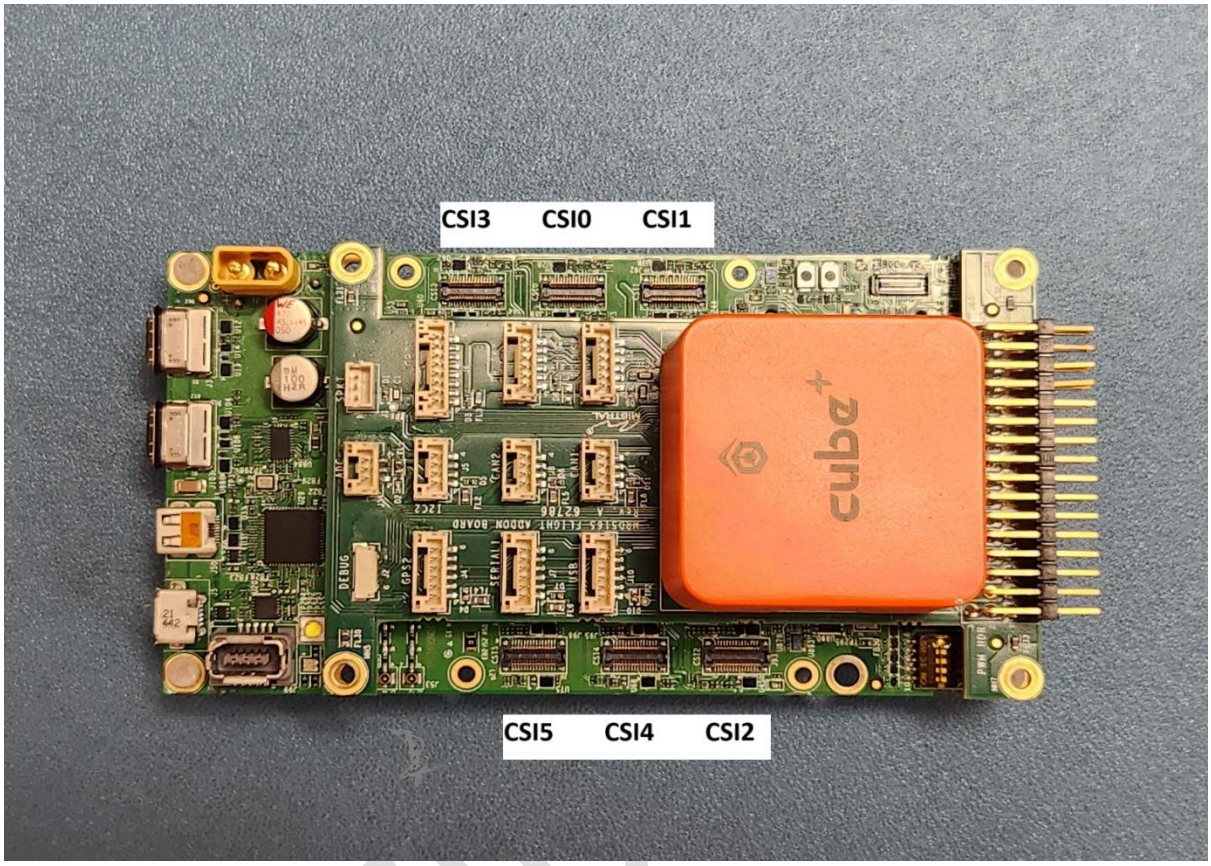

Figure 38 Eagle Kit Camera Ports

Note:

- HDMI-in and CSI-0 MIPI port are using the same CSI-0 signal. HDMI-in and CSI-0 MIPI connector are mutually exclusive. By default, HDMI-in port is enabled. To enable the CSI-0 MIPI connector, drive the camera control GPIO number 88 to low.
- CSI-2 and CSI-4 are using the common CCI-2 bus and CSI-3 and CSI-5 are using the common CCI-3 bus.
- The present software doesn't support OV9282 on CSI-2 MIPI connector.
- Presently, the camera module driver on the software side supports CSI0 to CSI5. Both IMX577 and OV9282 camera modules can be connected, with the exception that CSI2 does not support the OV9282 camera module.

7.15. Eagle Kit CSI adapter board configuration

The CSI adapter board enables the connection of various camera modules using an IPEX cable.

Regarding the IMX577 and OV9282 camera modules, the Eagle Kit CSI adapter board facilitates the connection of camera modules in the following manner only:

The solitary center I-PEX connector exclusively supports the IMX577 camera module, while the other two I-PEX connectors support the OV9282 camera module.

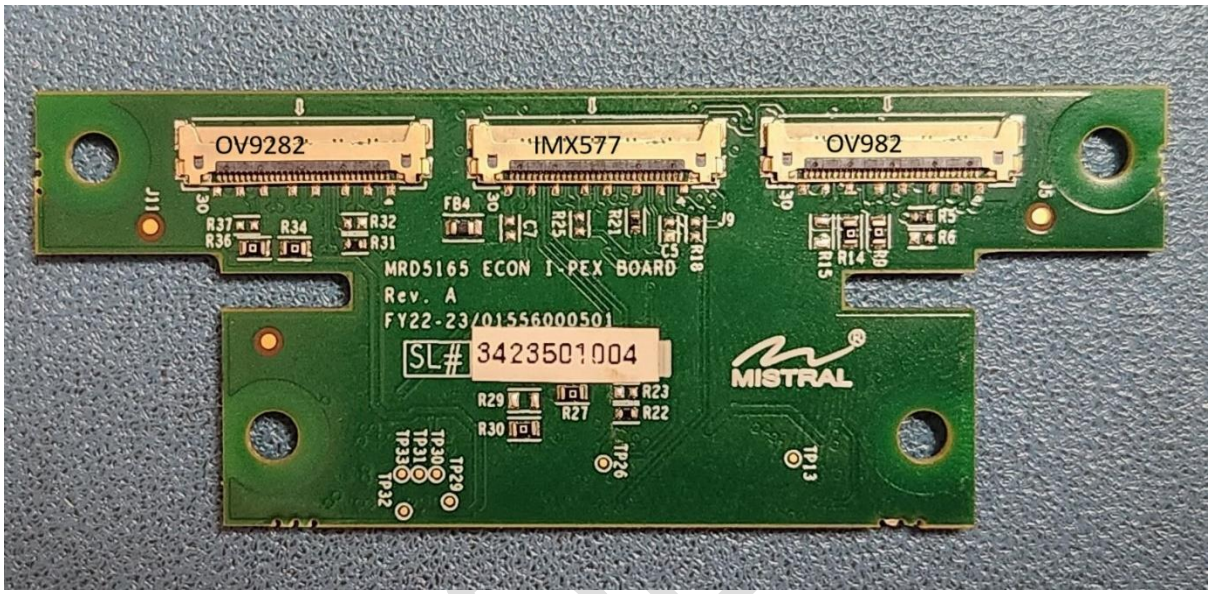

Figure 39 Eagle Kit CSI Camera Adapter

7.16. IMX577, OV9282 Camera Preview and IMX577 Wi-Fi Stream

7.16.1. Eagle Kit Camera Setup 1

1. CSI-0 port connected to IMX577 camera module.
2. CSI-1 port connected to OV9282 camera module.

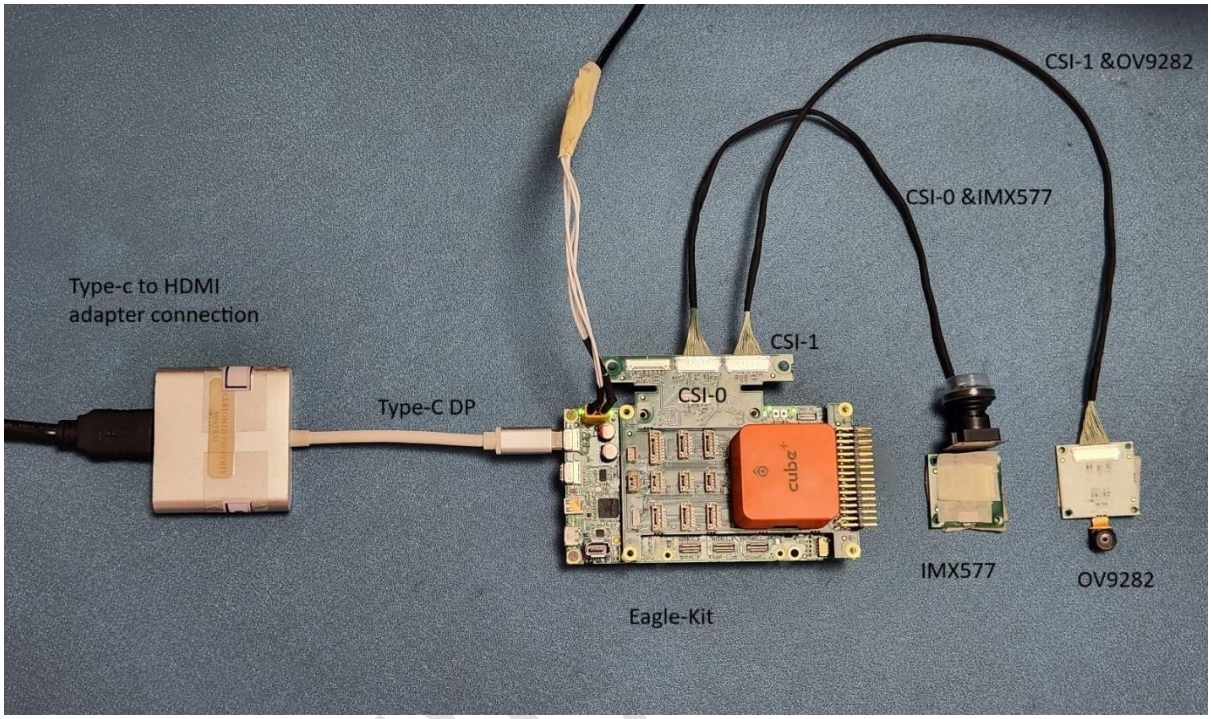

Figure 40 Eagle Kit Camera Setup 1

CSI-0 IMX577 Camera Preview:

Open an adb shell over Wi-Fi (Follow the ADB over Wi-Fi steps) and execute the following command to preview CSI-0 IMX577 camera on Type-c Display monitor.

```
# echo 416 > /sys/class/gpio/export; echo out >
/sys/class/gpio/gpio416/direction; echo 0 >
/sys/class/gpio/gpio416/value; echo 416 > /sys/class/gpio/unexport
```

(To enable the CSI-0 MIPI connector CSI signals)

```
#export XDG_RUNTIME_DIR=/run/user/root && gst-launch-1.0 -e
qtiqmmfsrc camera=0 name=camsrc ! video/x-
raw,format=NV12,width=3840,height=2160,framerate=30/1 ! waylandsink
fullscreen=true async=true sync=false
```

```
sh-5.0#
sh-5.0#
sh-5.0# echo 416 > /sys/class/gpio/export; echo out > /sys/class/gpio/gpio416/direction; echo 0 > /sys/class/gpio/gpio416/value; echo 416 > /sys/class/gpio/
unexport
sh-5.0#
sh-5.0# export XDG_RUNTIME_DIR=/run/user/root && gst-launch-1.0 -e qtiqmmfsrc camera=0 name=camsrc ! video/x-raw,format=NV12,width=3840,height=2160,framerat
e=30/1 ! waylandsink fullscreen=true async=true sync=false
gbm_create_device(192): Info: backend name is: msm_drm
Setting pipeline to PAUSED ...
gbm_create_device(192): Info: backend name is: msm_drm
Pipeline is live and does not need PREROLL ...
Setting pipeline to PLAYING ...
New clock: GstSystemClock
```

Figure 41 CSI-0 IMX577 Camera Setup 1 Preview Command Execution

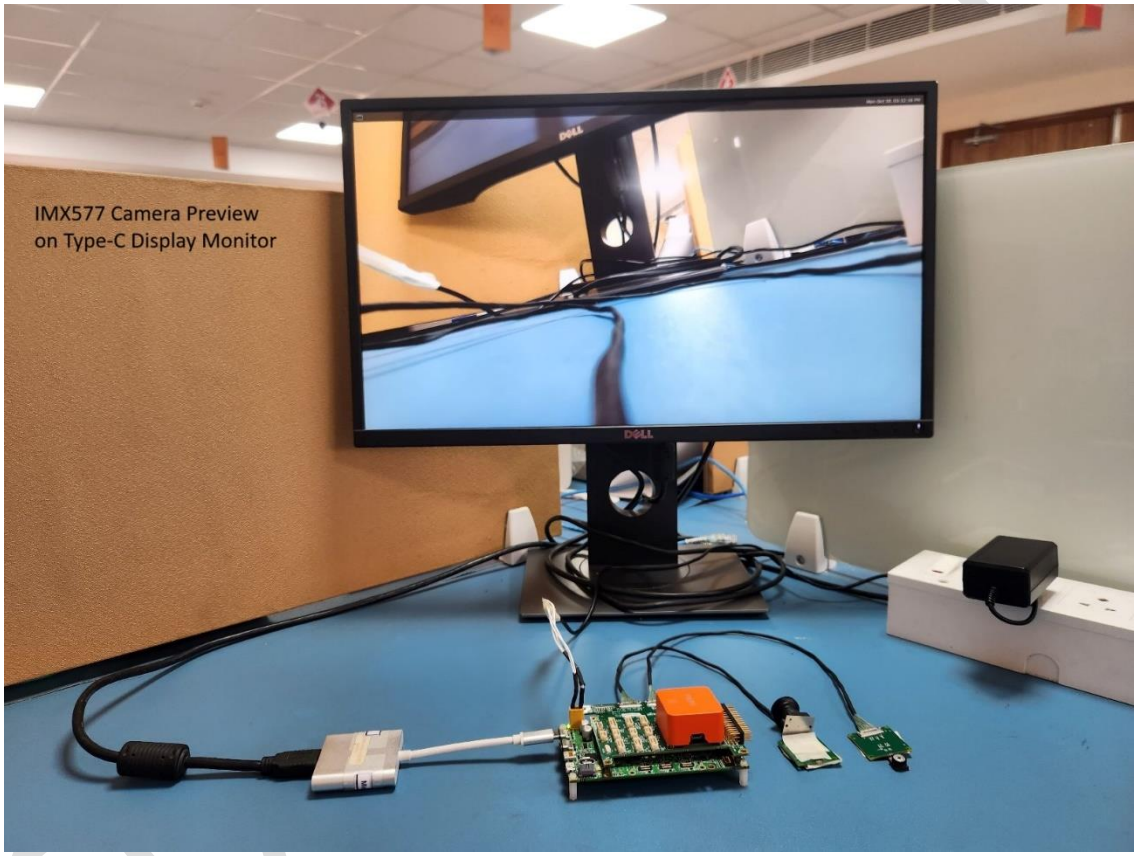

Figure 42 IMX577 Camera Setup 1 Preview on Type-C Display Monitor

CSI-1 OV9282 Camera Preview:

Open an adb shell over Wi-Fi (Follow the ADB over Wi-Fi steps) and execute the following command to preview CSI-1 OV9282 camera on Type-c Display monitor.

```
# export XDG_RUNTIME_DIR=/run/user/root && gst-launch-1.0 -e
qtiqmmfsrc camera=1 name=camsrc ! video/x-
raw,format=NV12,width=1280,height=720,framerate=90/1 ! waylandsink
fullscreen=true async=true sync=false
```

```
sh-5.0#
sh-5.0#
sh-5.0#
sh-5.0# export XDG_RUNTIME_DIR=/run/user/root && gst-launch-1.0 -e qtiqmmfsrc camera=1 name=camsrc ! video/x-raw,format=NV12,width=1280,height=720,framerate
=90/1 ! waylandsink fullscreen=true async=true sync=false
gbm_create_device(192): Info: backend name is: msm_drm
Setting pipeline to PAUSED ...
gbm_create_device(192): Info: backend name is: msm_drm
Pipeline is live and does not need PREROLL ...
Setting pipeline to PLAYING ...
New clock: GstSystemClock
```

Figure 43 CSI-1 OV9282 Camera Setup 1 Preview Command Execution

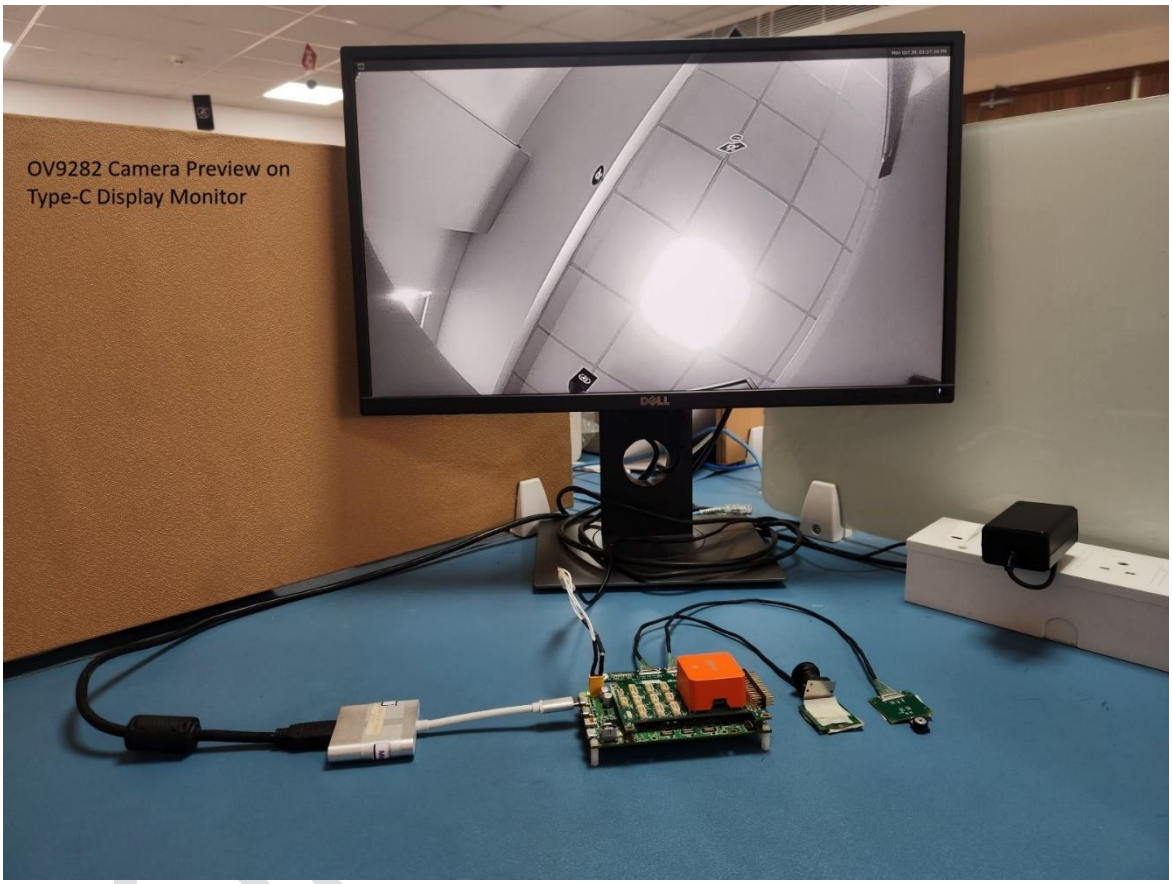

Figure 44 OV9282 Camera Setup 1 Preview on Type-C Display Monitor

CSI-0 IMX577 Camera Wi-Fi Stream:

Open an adb shell over Wi-Fi (Follow the ADB over Wi-Fi steps) and execute the following command to stream CSI-0 IMX577 camera video on Wi-Fi.

```
# echo 416 > /sys/class/gpio/export; echo out >
/sys/class/gpio/gpio416/direction; echo 0 >
/sys/class/gpio/gpio416/value; echo 416 > /sys/class/gpio/unexport
```

(To enable the CSI-0 MIPI connector CSI signals)

```
# gst-launch-1.0 -e qtiqmmfsrc camera=0 name=camsrc ! video/x-
raw,format=NV12,width=3840,height=2160,framerate=30/1 ! qtic2venc !
queue ! h264parse ! rtph264pay config-interval=1 pt=96 ! udpsink
host = 192.168.2.52 port=5502
```

Host PC Wi-Fi Video Playback:

Open VLC player with the following Wifi-Stream.sdp file.

Wifi-Stream.sdp file content is as follows.

```
v=0
m=video 5502 RTP/AVP 96
c=IN IP4 127.0.0.1
a=rtpmap:96 H264/90000
```

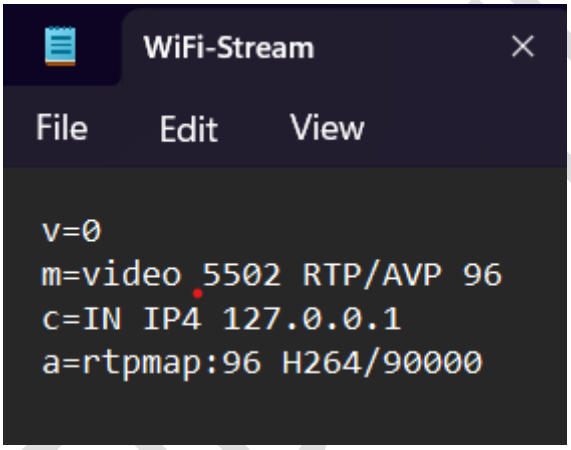

Figure 45 WiFi-Stream.sdp file content

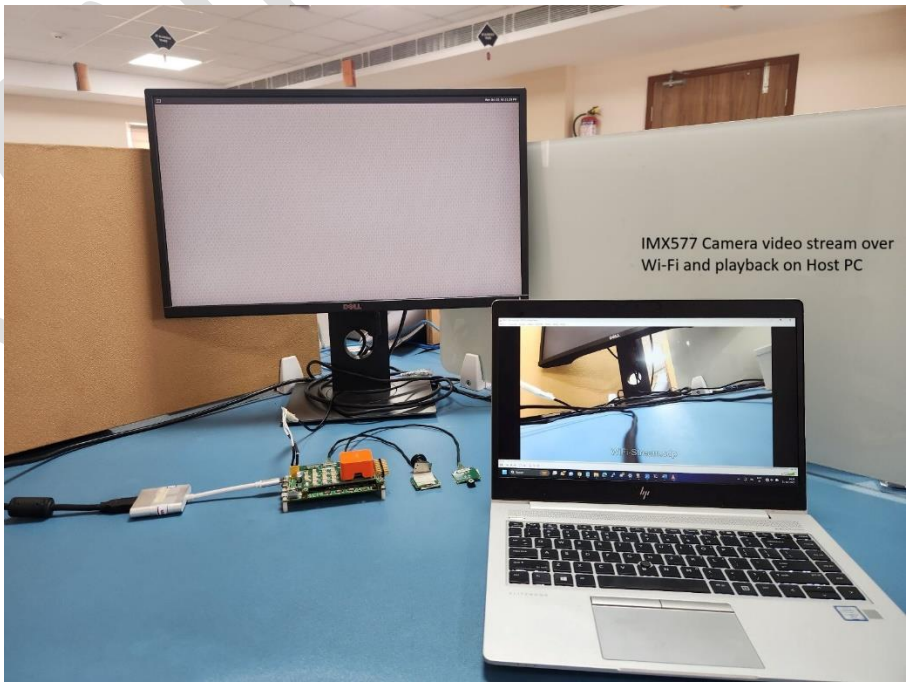

Figure 46 Camera Setup 1: CSI-0 IMX577 Camera Video Stream over Wi-Fi and Playback on Host PC

7.16.2. Eagle Kit Camera Setup 2

1. CSI-0 port connected to IMX577 camera module.
2. CSI-3 port connected to OV9282 camera module.

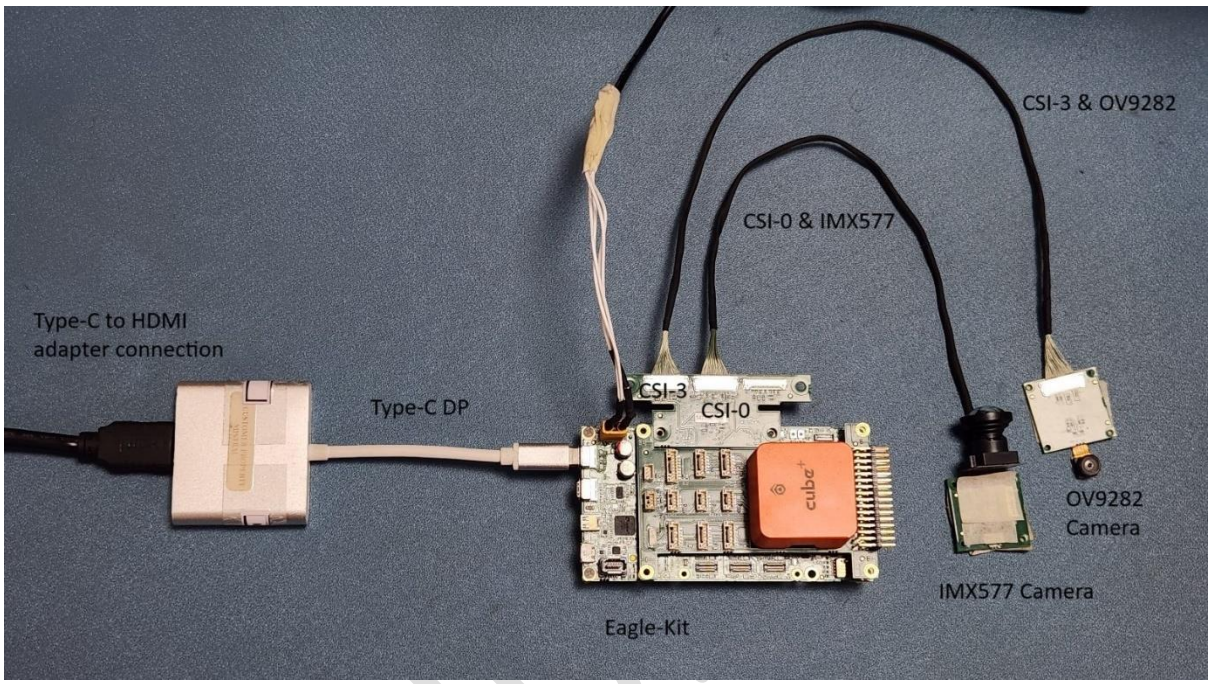

Figure 47 Eagle Kit Camera Setup 2

CSI-0 IMX577 and CSI-3 OV9282 Camera Preview: The procedure is identical to the Eagle Kit Camera Setup 1

CSI-0 IMX577 Wi-Fi Stream: The procedure is identical to the Eagle Kit Camera Setup 1

7.16.3. Eagle Kit Camera Setup 3

1. CSI-4 port connected to IMX577 camera module.
2. CSI-5 port connected to OV9282 camera module.

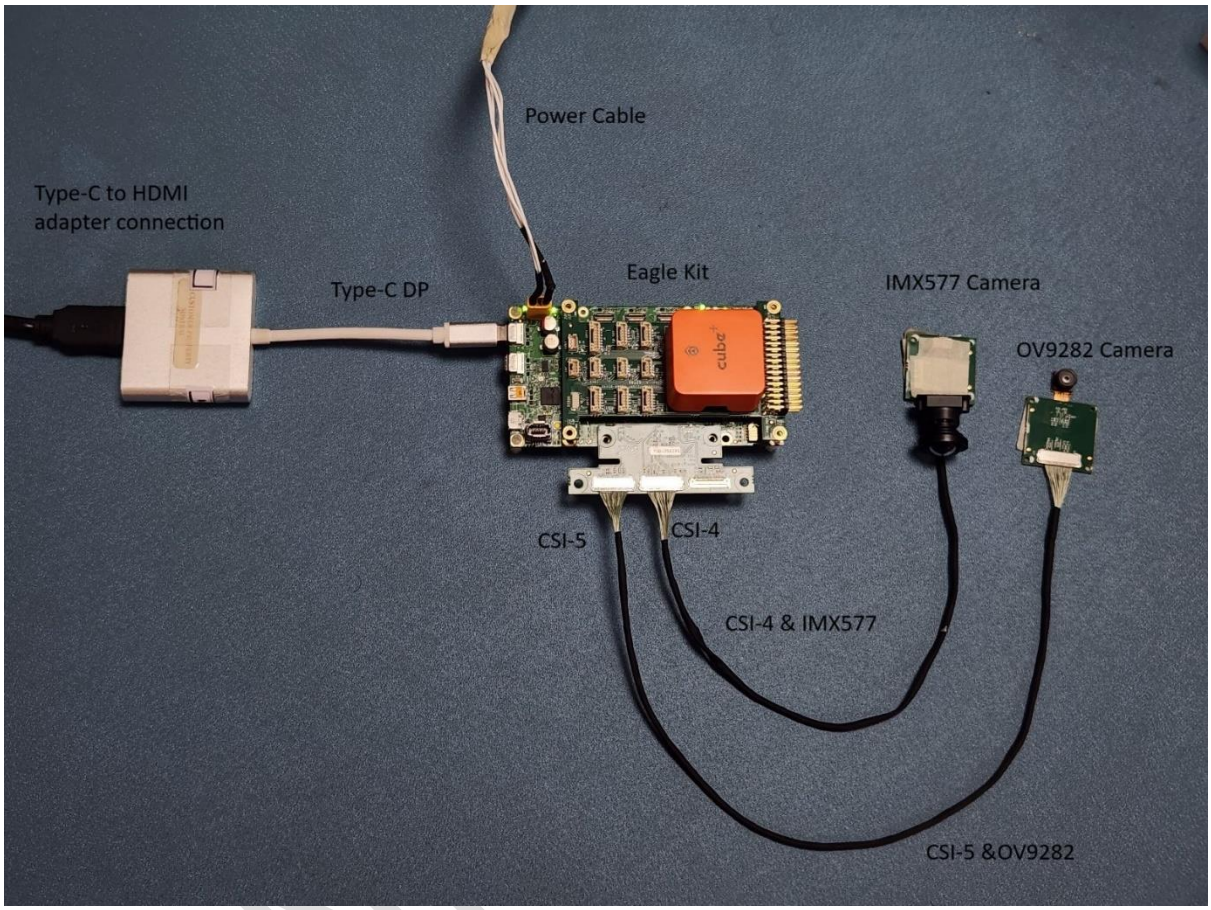

Figure 48 Eagle Kit Camera Setup 3

CSI-4 IMX577 Camera Preview:

Open an adb shell over Wi-Fi (Follow the ADB over Wi-Fi steps) and execute the following command to preview CSI-4 IMX577 camera on Type-c Display monitor.

```
#export XDG_RUNTIME_DIR=/run/user/root && gst-launch-1.0 -e
qtiqmmfsrc camera=2 name=camsrc ! video/x-
raw,format=NV12,width=3840,height=2160,framerate=30/1 ! waylandsink
fullscreen=true async=true sync=false
```

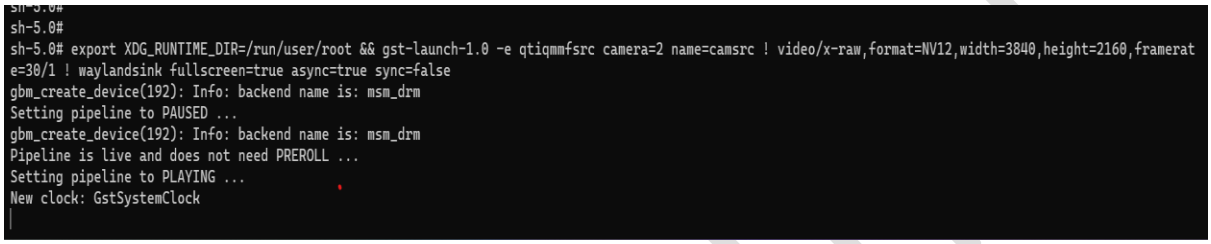

Figure 49 Camera Setup 3, CSI-4 IMX577 Camera Preview Command Execution

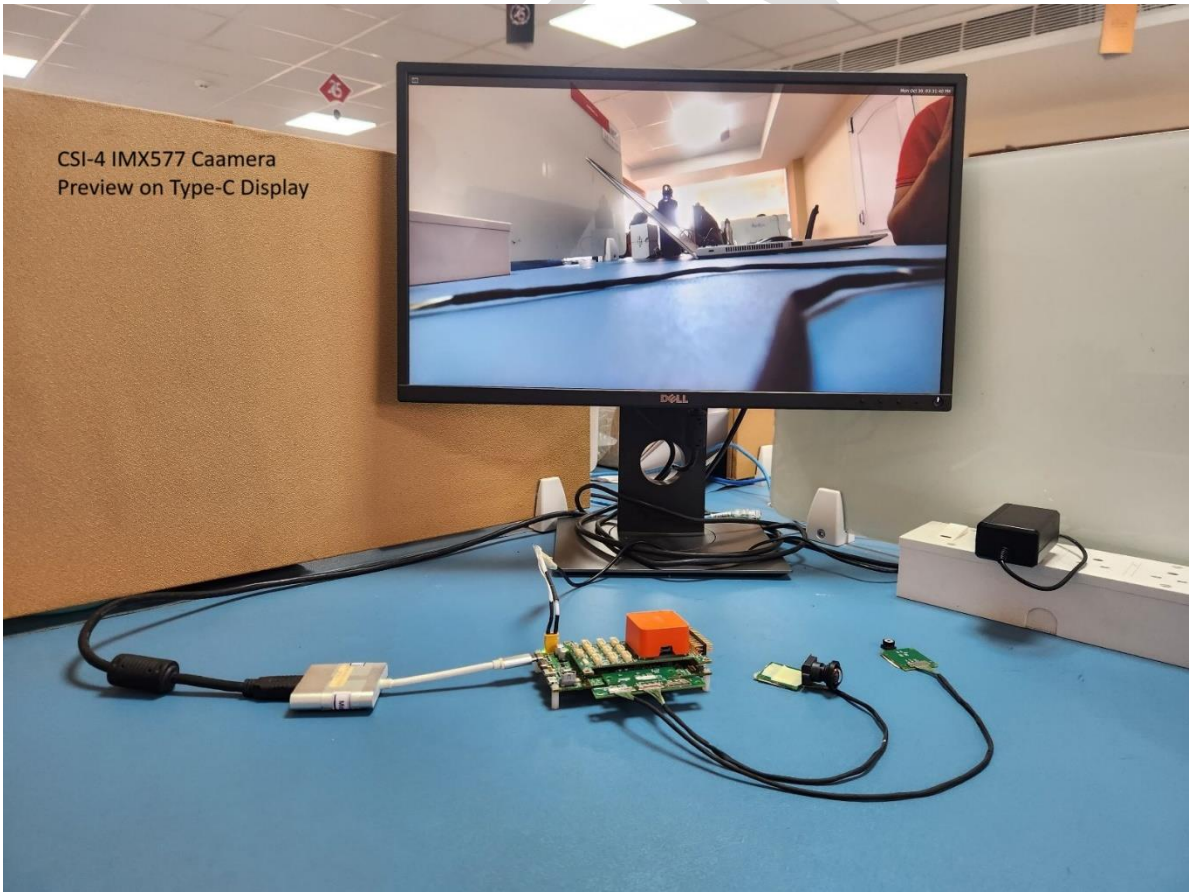

Figure 50 Camera Setup 3, CSI-4 IMX577 Camera Preview

CIS-5 OV9282 Camera Preview: The procedure is identical to the Eagle Kit Camera Setup 1

8. Configuration to connect Eagle Kit with the host computer

1. Power on the EagleKit from external power supply.

2. Configure the host computer's wireless LAN to connect to the access point hosted by Eagle Kit. (AP: EAGLE-KIT-$SERIAL_NUMBER and Password: 1234567890)

3. Once connected to the EagleKit AP, open the following URL in a web browser: http://192.168.2.1:3001/controller. This will open RPanion WEB UI.

4. On the web page, click on the "Flight Controller" section and configure the serial as shown below:
   Serial Device: /dev/ttyHS5
   BaudRate: 921600
   Mavlink Version: 2.0

   Then, click on "**START TELEMETRY**" button.

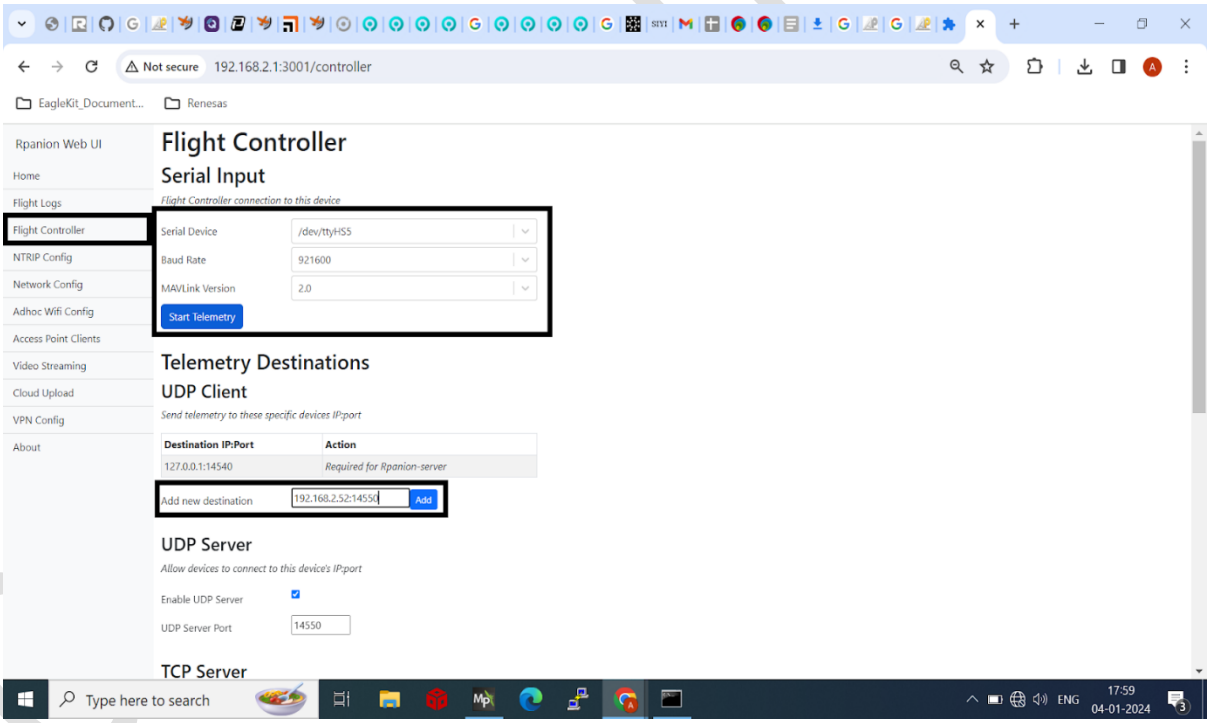

Figure 51: Rpanion Web UI

5. Enter host Computer's IP Address obtained after connecting to EagleKit's AP and enter in the "Add New Destination'' field, the information in the following format <$HOST_IP>:14550

   For Example: If IP address of host computer is 192.168.2.52 then Enter: 192.168.2.52:14550, where 14550 is default port address. Click on "**ADD**", as shown in **Figure *51*: Rpanion Web UI**.

6. Install ground control station: Mission Planner; Get the latest zipped version of Mission Planner here: firmware.ardupilot.org/Tools/MissionPlanner/MissionPlanner-latest.zip

7. Unzip package and navigate to the directory and run the Mission Planner application.

8. Open the Mission Planner Application in host Computer and connection to the EagleKit's FCU should be established automatically.