MISTRAL
an AXISCADES company

MRD5165 Eagle Kit

Programming Guide

Revision History

Revision	Date	Description
0.1	Nov 28, 2023	Preliminary version

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1. Introduction

This document provides the instructions to setting up the Eagle-Kit and procedure to program the Eagle Kit board both on Windows and Ubuntu Host PC.

This document is intended for all users of 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 Eagle Kit Programming Guide provides an overall description of the hardware setup and Host PC steps to flash the Eagle Kit

4. Eagle-Kit Programming Accessories

Basic Accessories required for Eagle-Kit Programming:

1. DC Adapter
2. Power Chord
3. Custom power cable
4. USB Type-C Cable
5. USB Micro-B Cable

Note: USB Micro-B cable is not part of the kit accessories.

5. Eagle Kit Setup

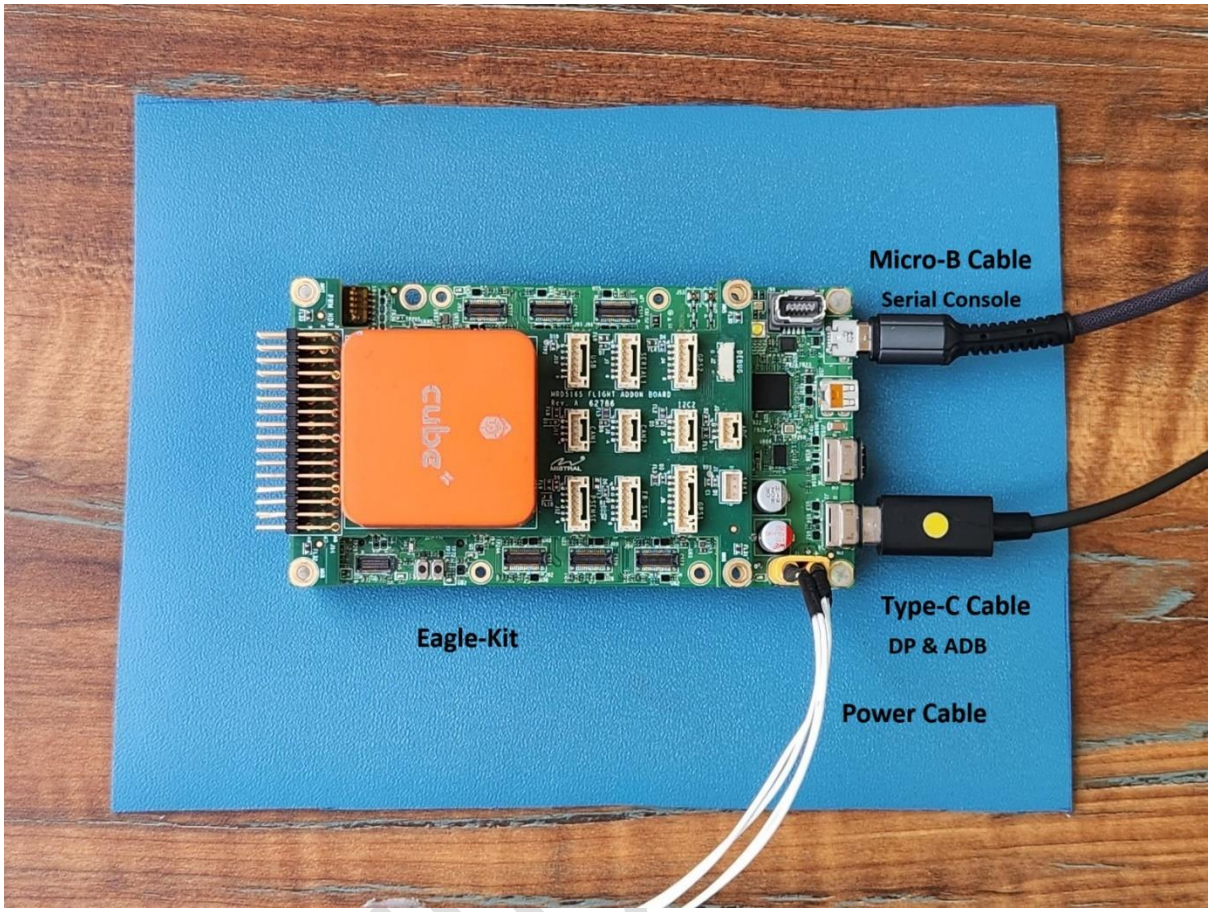

Figure 1 MRD5165 Eagle Kit

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)

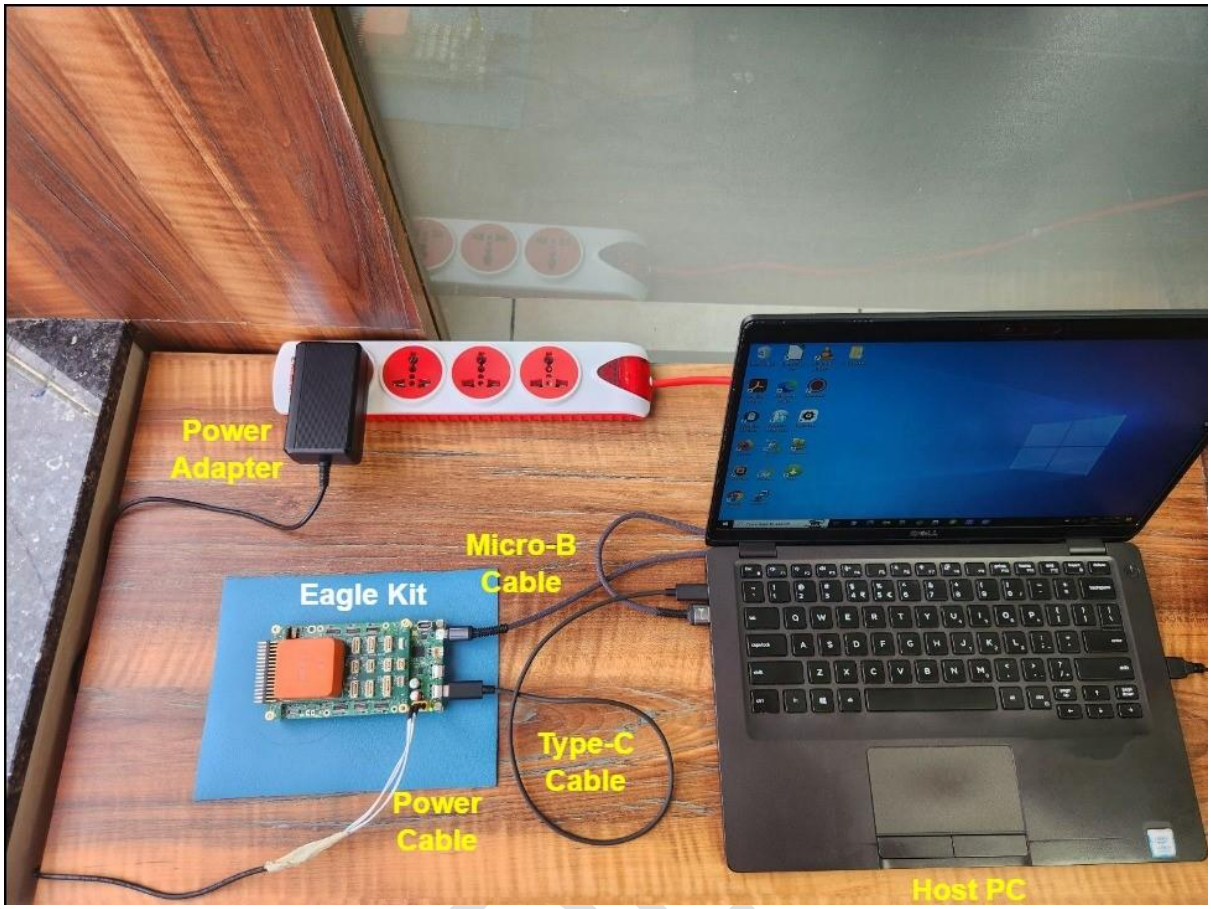

Figure 2 MRD5165 Eagle Kit connection to PC

6. Setting up Eagle Kit in QDL/EDL Mode

1. Disconnect the Type-C cable and Power cable from the Eagle Kit
2. Press and hold the Eagle Kit Main Board SW5 (**SDM_FORCE_USB_BOOT)** switch.
3. Connect the Power cable and Power up the Eagle Kit
4. Connect the Type-C cable between Host PC and Eagle Kit
5. Observe the Eagle Kit device presence on the QFIL tool.
   QFIL Tool Device Detection entry check: **Qualcomm HS-USB QDLoader 9008 (COMxx)**
6. Connect the Micro-B cable between Eagle kit and Host PC for programming logs.

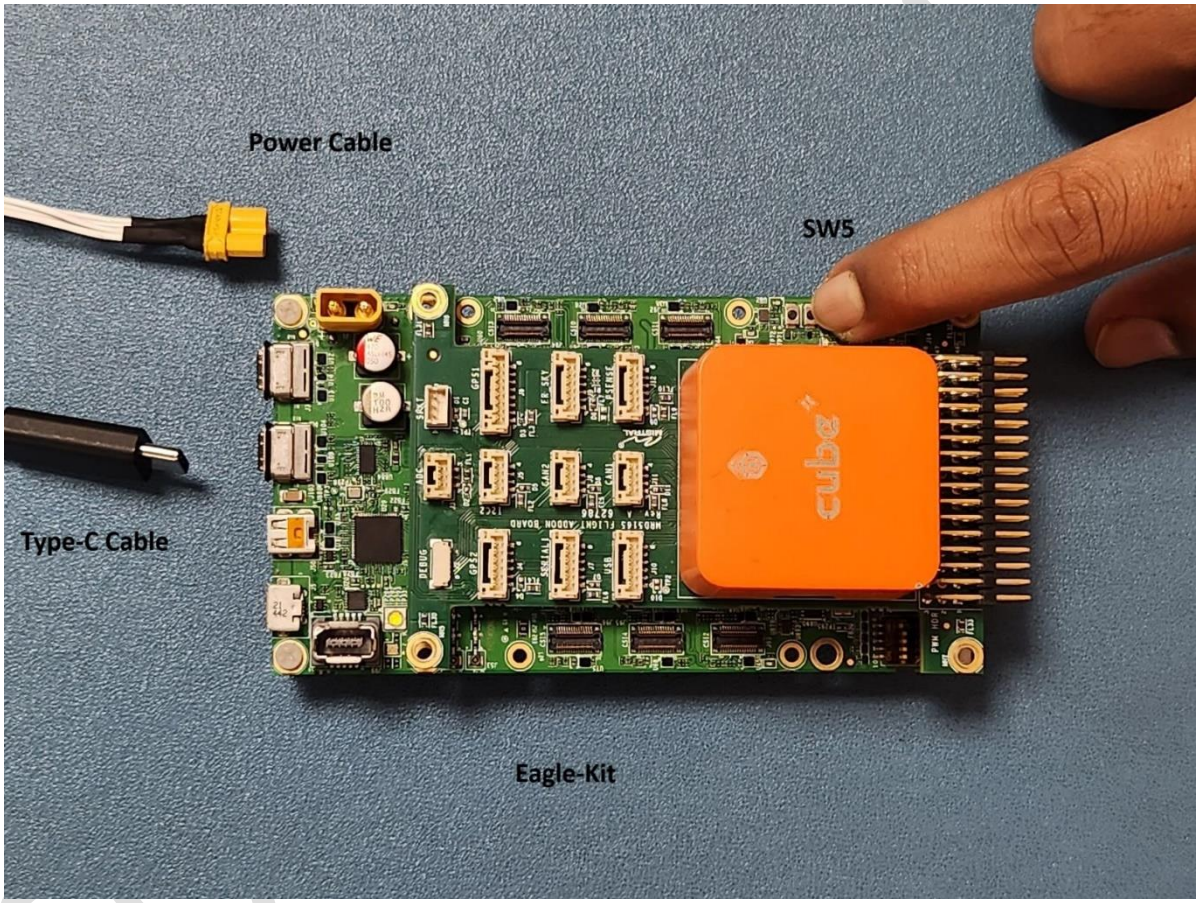

Figure 3 MRD5165 Eagle Kit FORCE-USB SW5 Press

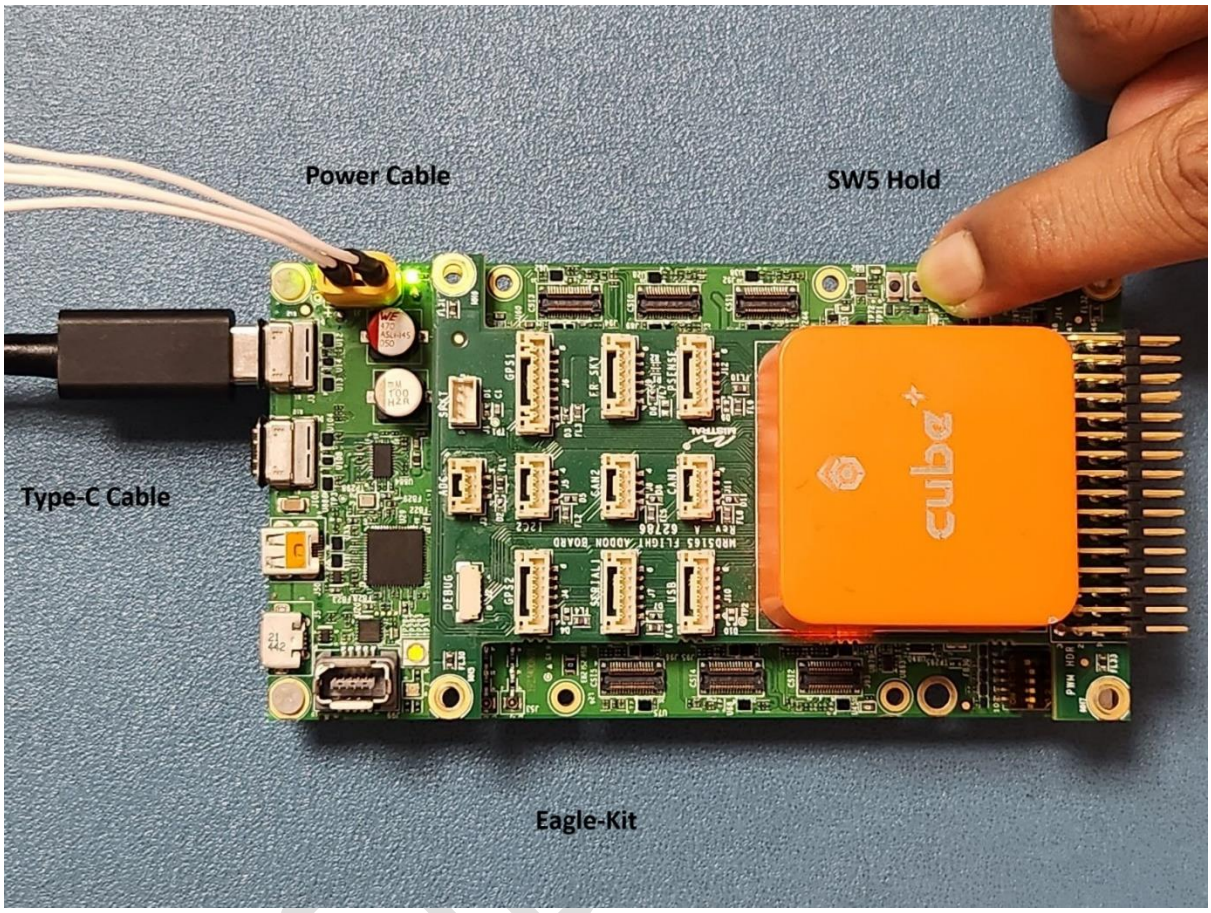

Figure 4 MRD5165 Eagle Kit SW5 Hold, Type-C connected and Power Up

7. Windows HOST PC Setup

1. After purchasing the Eagle Kit, please register at the Mistral website to download the most recent flat build Package.

2. Acquire the newest iteration of QDART that includes QFIL tool for the Windows OS from Qualcomm CreatePoint. The link for this is provided below:
   https://createpoint.qti.qualcomm.com/search/#tools/searchArgs/q||QDART||rows||20||sortField||releaseDate||sortOrder||desc

   Note: QDART/QFIL is required if Windows is used as host machine for programming.

3. Download the Qualcomm USB driver from Qualcomm CreatePoint. The link for this is provided below:
   https://createpoint.qti.qualcomm.com/search/#tools/searchArgs/q||USB%20driver||rows||20||sortField||releaseDate||sortOrder||desc

4. Windows Host PC adb and fastbo ot installation

   Download platform tools for Windows from the link provided below.
   https://developer.android.com/tools/releases/platform-tools

-

8. Windows Host PC QFIL Configuration and Programming

1. Extract the downloaded flat build zip package.

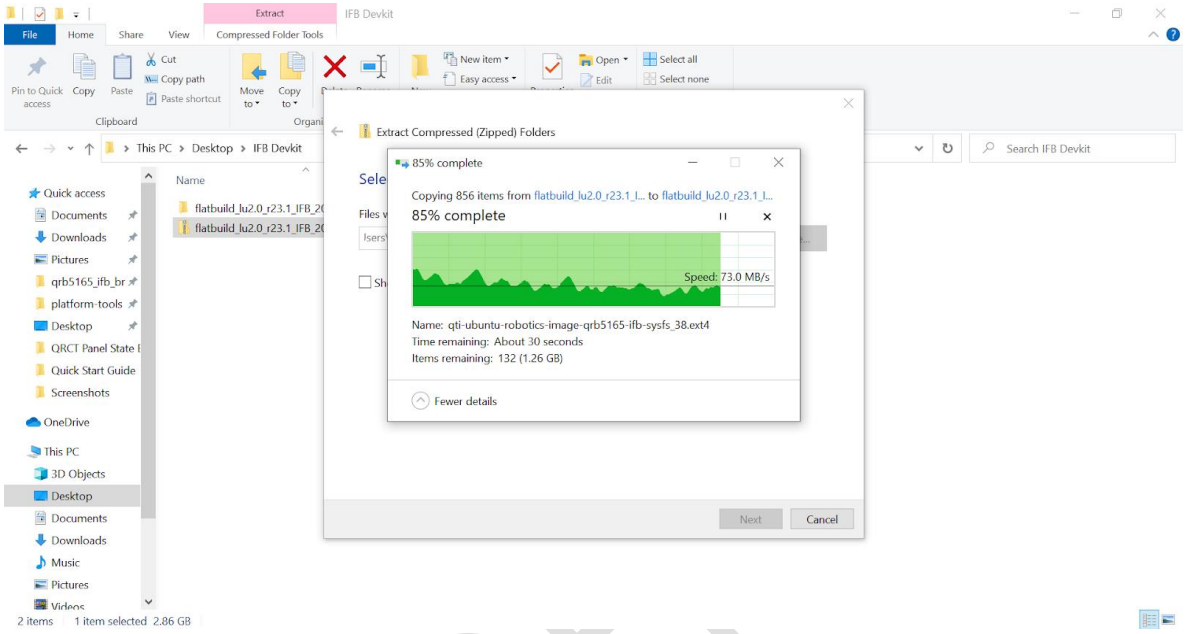

Figure 5 Flatbuild Package unzip/extract

2. Observe the extracted files as below:

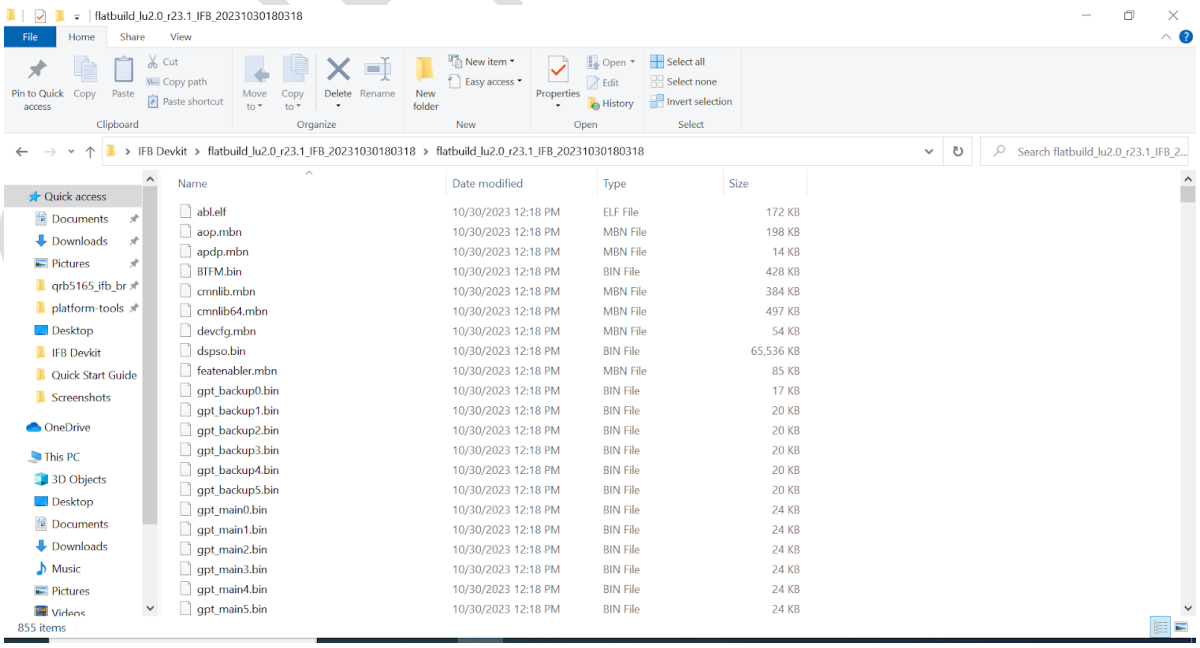

Figure 6 Flat build Package Folder Files

3. Observe and Select the Eagle Kit EDL COM port for programming.

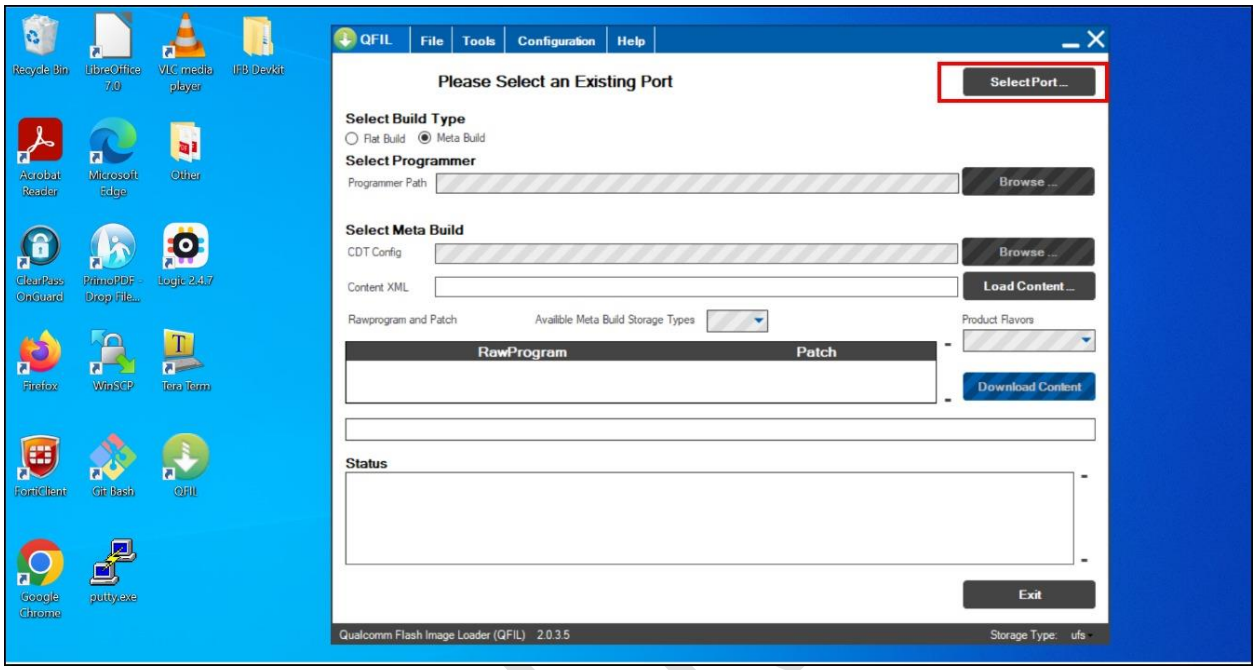

Figure 7 QFIL tool Select Port

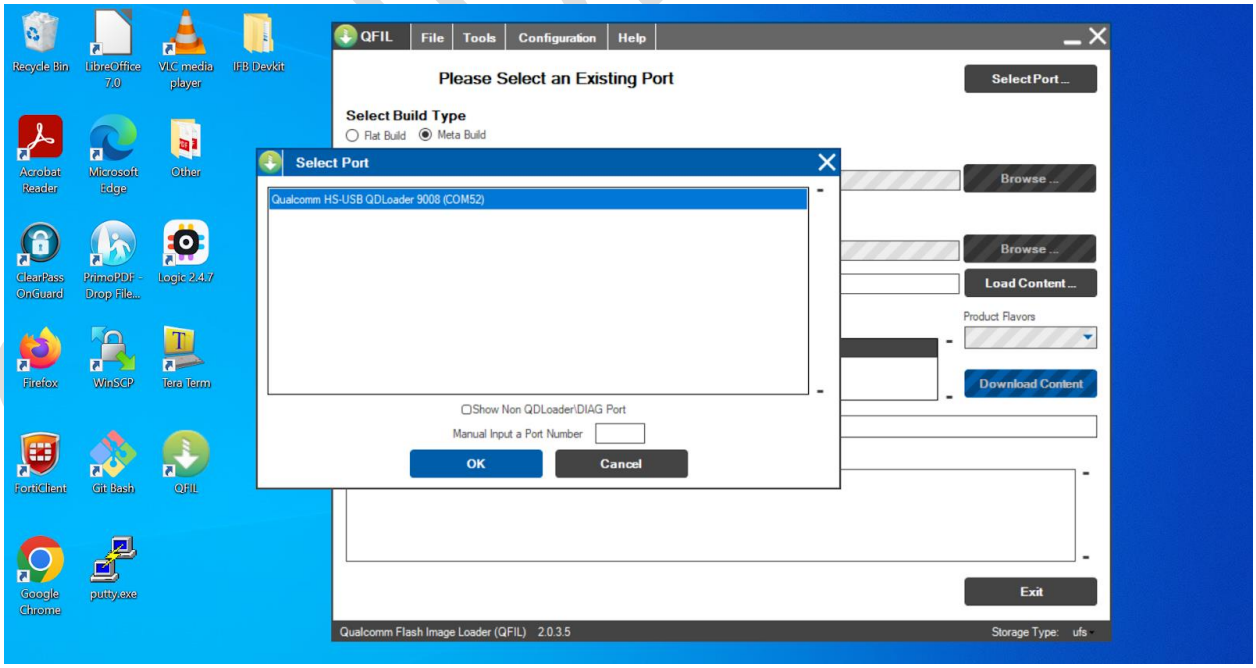

Figure 8 Eagle Kit QDL COM port selection

4. Select Build Type to “Flat Build” In QFIL

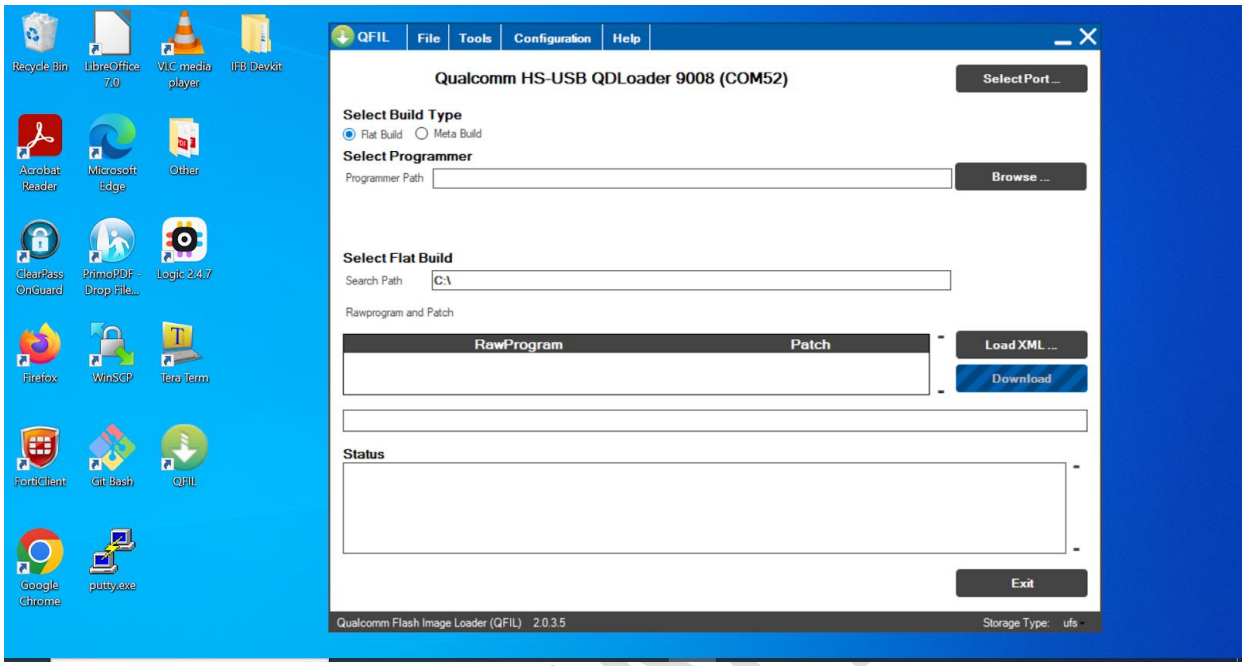

Figure 9 Select Build Type to “Flat Build”

5. Set the QFIL tool Configuration as below: Select Configuration -> FireHose Configuration

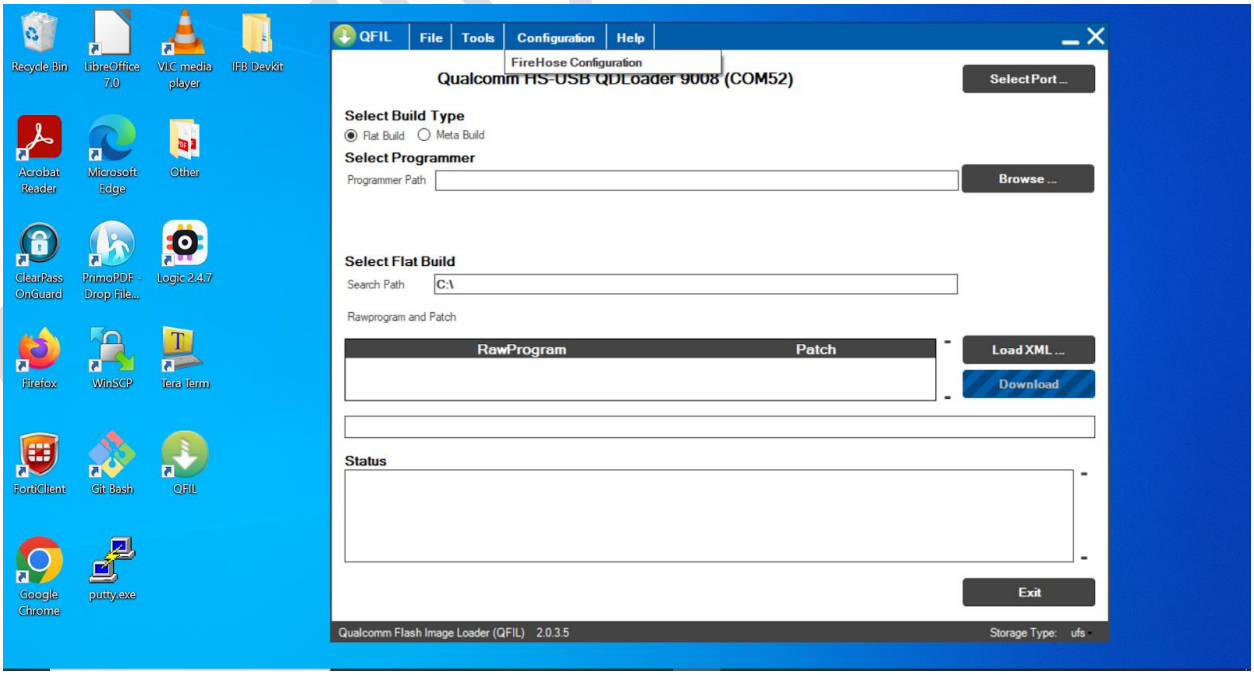

Figure 10 Select “FireHose Configuration”

6. Set the Firehose programmer settings as below:
    a. Download Protocol: **0 - Sahara**
    b. Device Type: **ufs**
    c. Ensure **"Provision"** is unchecked.
    d. Check the "**Erase All Before Download"** checkbox and click "**OK"**

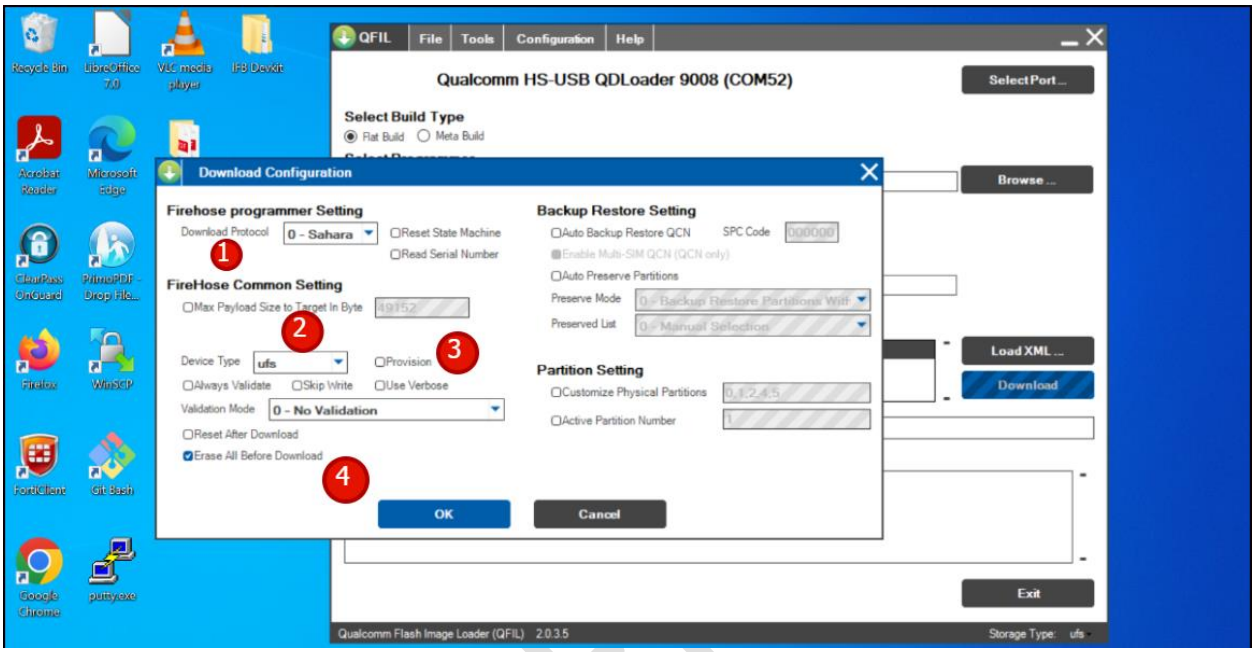

Figure 11 Firehose programmer setting configuration

7. Select QFIL Programmer file and Flat Build package files
    a. Set the **"Programmer Path"** to file "**prog_firehose_ddr.elf"** from the extracted flatbuild package folder.
    b. Select all the rawprogram and patch and load from the extracted flatbuild package folder.

```
rawprogram_unsparse0.xml
rawprogram1.xml
rawprogram2.xml
rawprogram3.xml
rawprogram4.xml
rawprogram5.xml

patch0.xml
patch1.xml
patch2.xml
patch3.xml
patch4.xml
patch5.xml
```

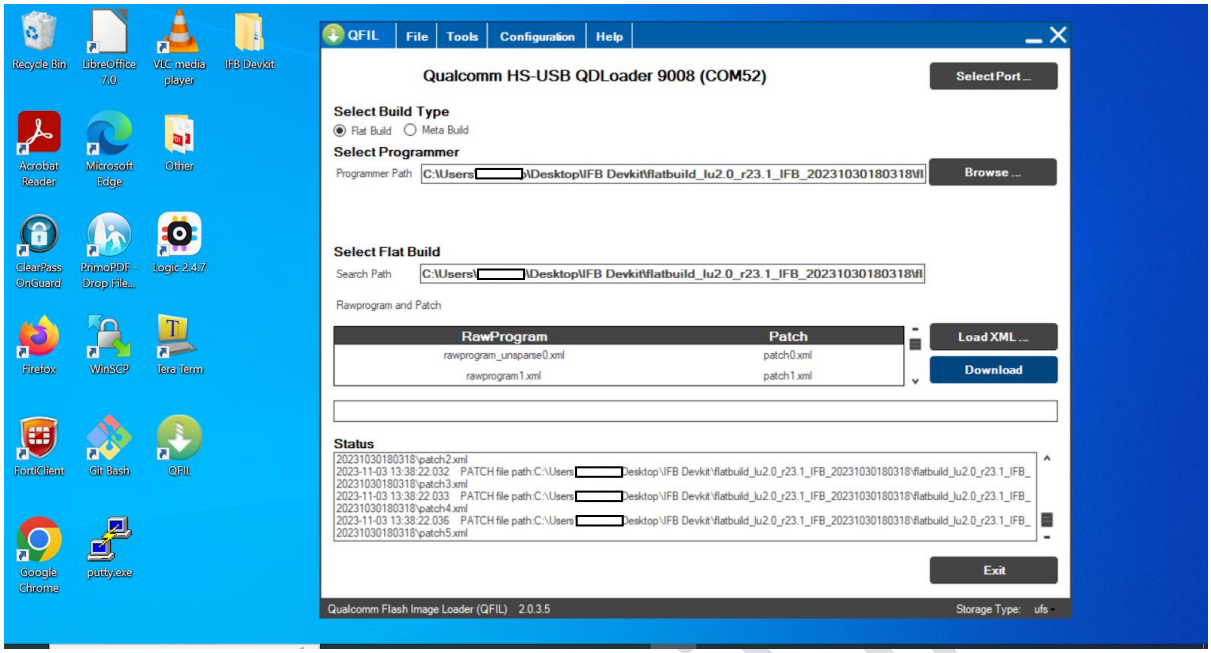

Figure 12 RawProgram and Patch configuration

8. Observe the Programming logs over debug console too. Open Tera Term with Serial console COM port and set baudrate to 115200.

   Expected logs after flash is completed.

```
Format: Log Type - Time(microsec) - Message - Optional Info
Log Type: B - Since Boot(Power On Reset),  D - Delta,  S - Statistic
S - QC_IMAGE_VERSION_STRING=BOOT.XF.3.2.c2-00012-SM8250-5
S - IMAGE_VARIANT_STRING=Soc8250LAA
S - OEM_IMAGE_VERSION_STRING=d41cf1e6f4fa
S - Boot Interface: USB
S - Secure Boot: Off
S - Boot Config @ 0x00786070 = 0x00000001
S - JTAG ID @ 0x00786130 = 0x0015a0e1
S - OEM ID @ 0x00786138 = 0x00000000
S - Serial Number @ 0x00786134 = 0x450402c1
S - OEM Config Row 0 @ 0x007841e0 = 0x0000000000000000
S - OEM Config Row 1 @ 0x007841e8 = 0x0000000000000000
S - Feature Config Row 0 @ 0x007841f8 = 0x0040200000000400
S - Feature Config Row 1 @ 0x00784200 = 0xc000000000000000
S - Core 0 Frequency, 1516 MHz
S - PBL Patch Ver: 5
S - PBL freq: 600 MHZ
D -       6207 - pbl_apps_init_timestamp
D -    2878668 - bootable_media_detect_timestamp
D -   38084015 - bl_elf_metadata_loading_timestamp
D -        724 - bl_hash_seg_auth_timestamp
D -      98681 - bl_elf_loadable_segment_loading_timestamp
D -       6188 - bl_elf_segs_hash_verify_timestamp
D -       7006 - bl_sec_hash_seg_auth_timestamp
D -        821 - bl_sec_segs_hash_verify_timestamp
D -         34 - pbl_populate_shared_data_and_exit_timestamp
S -   41082344 - PBL, End
B -   40903946 - SBL1, Start
B -   41018962 - SBL1 BUILD @ 12:43:28 on Jul 10 2023
D -       1220 - sbl1_hw_init
D -          0 - boot_flash_init
D -        945 - sbl1_xblconfig_init
D -          0 - sbl1_feature_config_init
D -          0 - boot_config_data_table_default_init
B -   41039031 - Using default CDT
D -       4727 - boot_config_data_table_init
B -   41046869 - CDT Version:3,Platform ID:8,Major ID:1,Minor ID:0,Subtype:0
D -      17294 - sbl1_hw_platform_pre_ddr
D -       6344 - pmic DevPrg init
D -       6344 - sbl1_hw_pre_ddr_init
D -          0 - boot_dload_handle_forced_dload_timeout
D -         61 - sbl1_ddr_set_params
B -   41081914 - Can't detect if LP5 or LP4. If it fails to start check build/harware combo
B -   41106588 - eCDT MRR - Data Starting Address: 0x09066D00

B -   41108876 - DSF version = 156.8.18
B -   41112200 - Manufacturer ID = 1, Device Type = 8
B -   41115769 - Rank 0 size = 8192 MB, Rank 1 size = 0 MB
D -      38826 - sbl1_ddr_init
D -          0 - boot_pre_ddi_entry
D -         91 - sbl1_do_ddr_training
B -   41132025 - DevProg DDR Entry
B -   41135258 - usb: init start
B -   41138339 - usb: enum_carried_from_pbl
B -   41141267 - usb: HIGH , 0x900e
B -   41145293 - usb: ENUM success
B -   41148526 - usb: vbus_det_pm_unavail
B -   44095222 - usb: host sends ZLP
B -   44300914 - UFS INQUIRY ID: KingstonTX17-128        003A
B -   44304574 - UFS Boot LUN: 0
B -   44636780 - usb: host sends ZLP
B -   44955231 - usb: host sends ZLP
B -   45286308 - usb: host sends ZLP
B -   45602136 - usb: host sends ZLP
B -   45934098 - usb: host sends ZLP
B -   47862186 - usb: host sends ZLP
B - 316071073 - usb: host sends ZLP
B - 319002702 - usb: host sends ZLP
```

Figure 13 Serial Console Programming logs

9. Start Programming
    a. Once all the above steps are done click the QFIL **"Download"** button
    b. Observe the Download progress bar and status logs

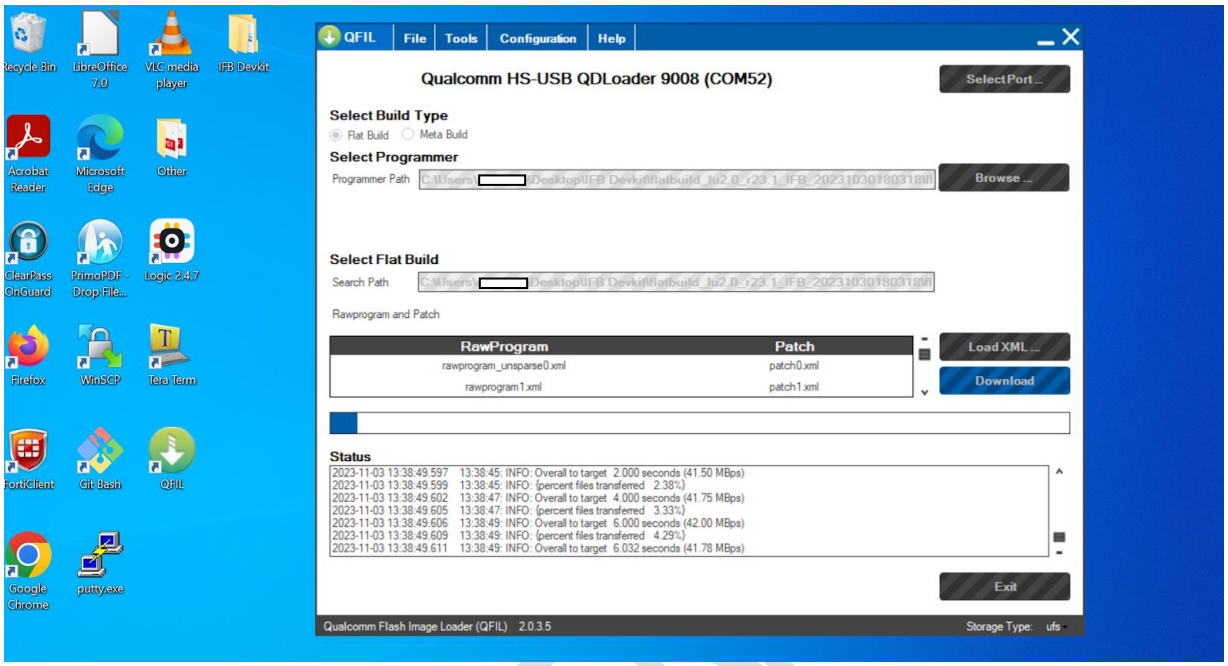

Figure 14 QFIL Flash Download In-Progress

c. Upon successful completion observe "Download Succeed" and "Finish Download" on status logs.

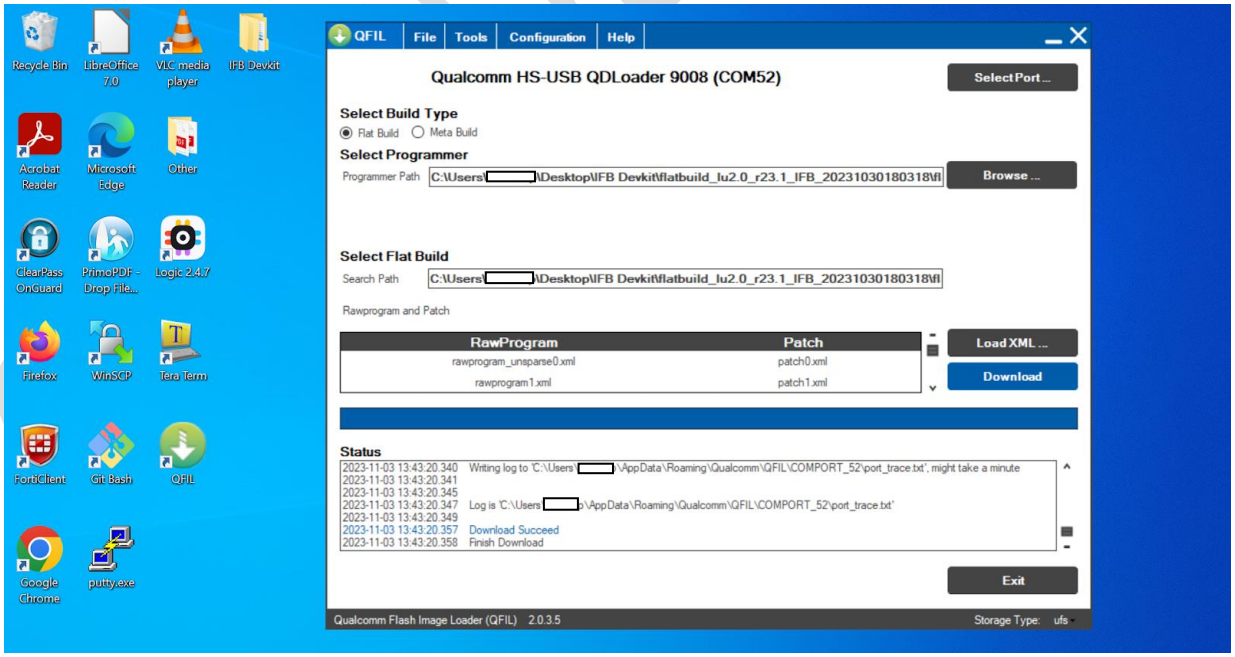

Figure 15 QFIL Flash Download Succeed

9. Ubuntu Host PC Programming

1. Follow the procedure "Setting up Eagle Kit in QDL/EDL Mode" to set the Eagle Kit in EDL mode.
2. Extract the downloaded Flatbuild zip file $ unzip "flatbuild_package.zip"
3. Ubuntu Host PC adb and fastboot installation
   Use the commands below to install adb and fastboot.

```
$ sudo apt-get update

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

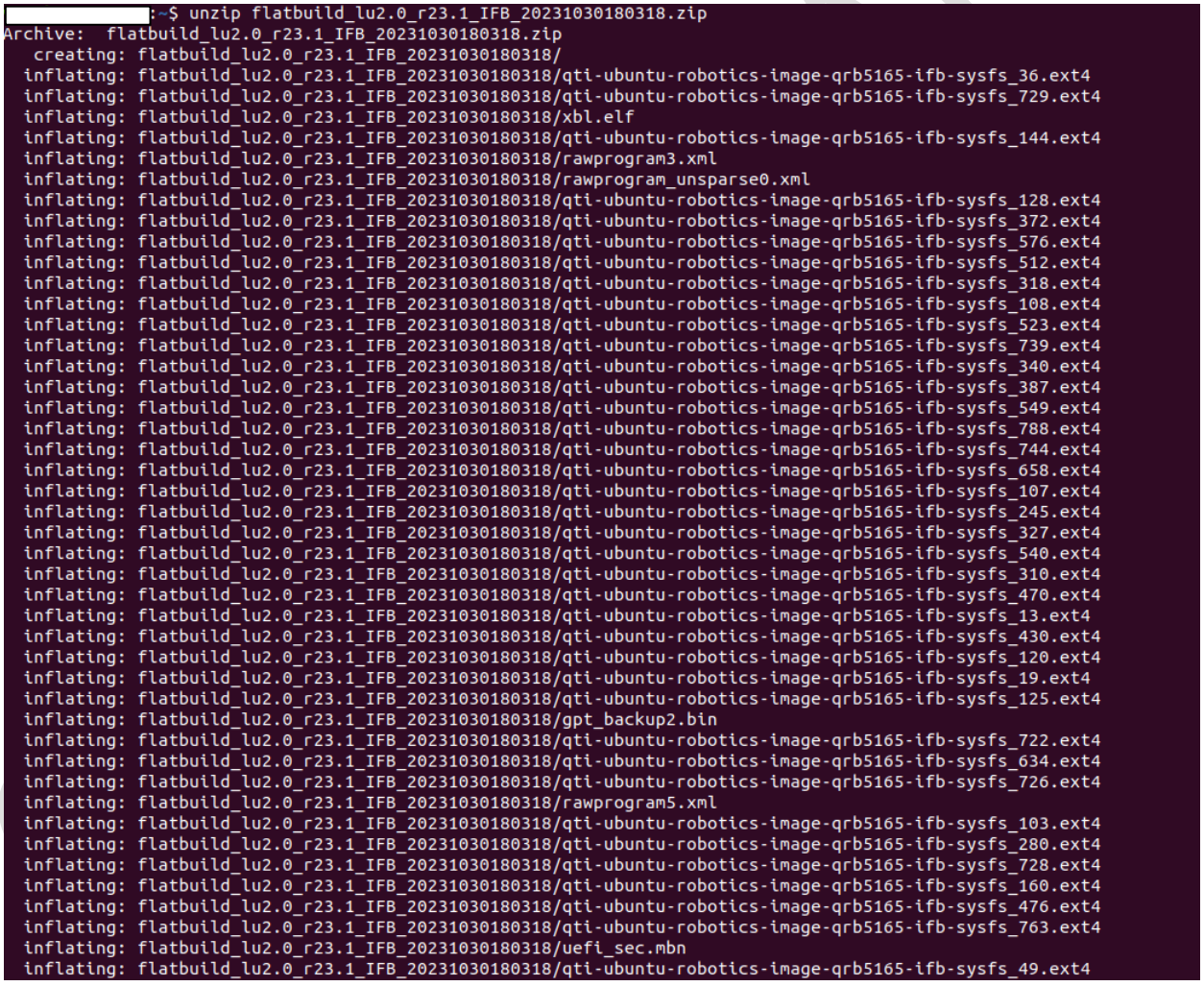

Figure 16 Ubuntu Host PC Flatbuild Package zip file extraction

4. Verify the Eagle Kit device is in EDL mode
   `$ lsusb`

   Observe Qualcomm device entry mentioned with “(QDL mode)”

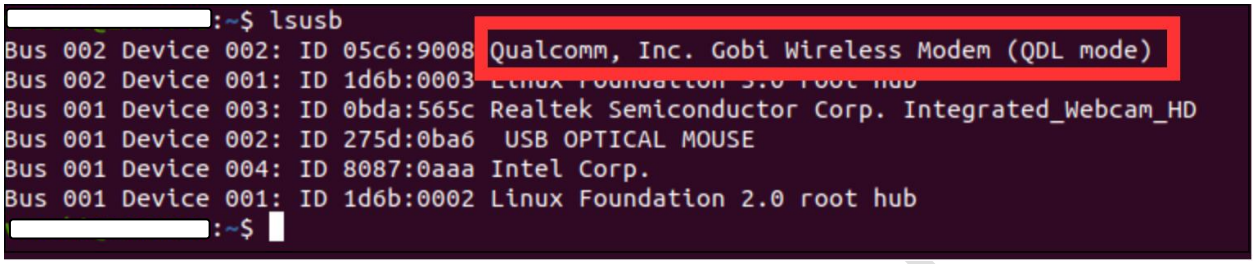

Figure 17 Ubuntu Host PC Eagle Kit QDL mode check

5. Observe the Programming logs over debug console too. Run the minicom command with Serial console device node and set baud rate to 115200.
   `$ sudo minicom -D /dev/ttyUSB0 -b 115200`

   Expected logs after flash is completed.

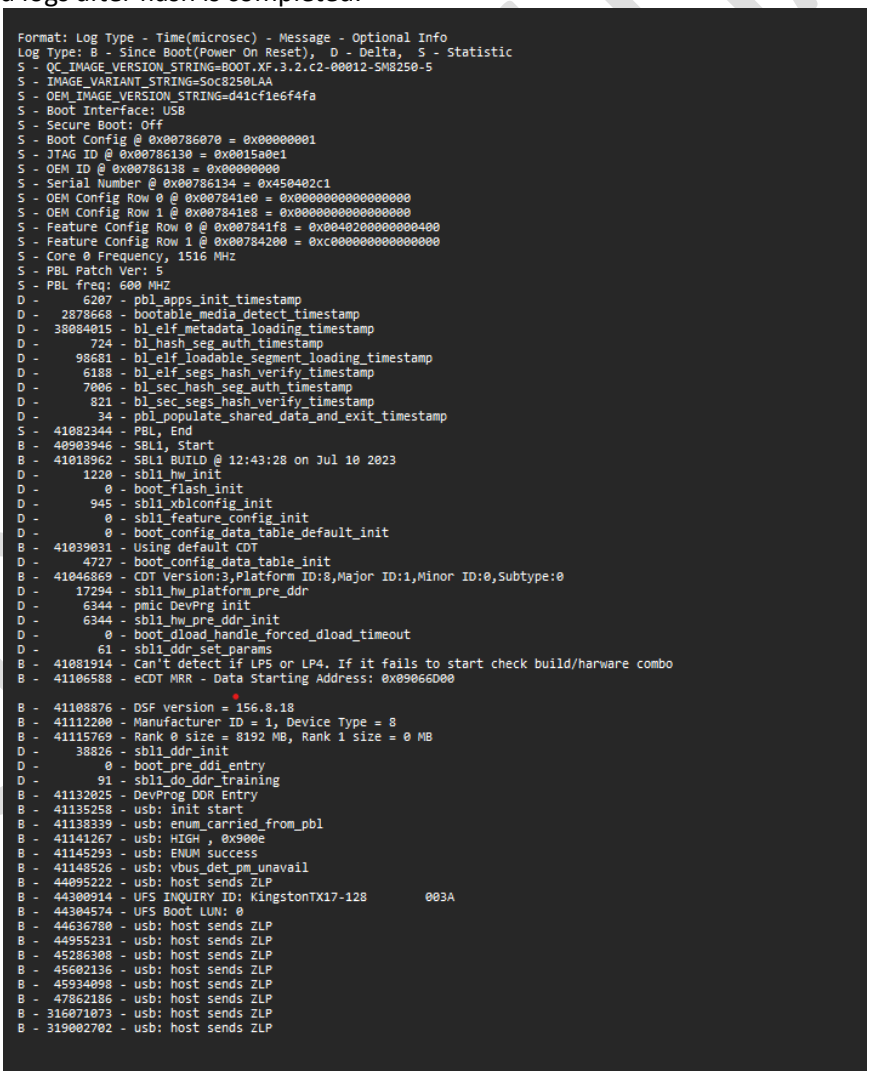

Figure 18 Ubuntu Host PC Serial Console Logs

6. Start Programming: Run the below command.

```
$ sudo chmod +x ./ubuntu_flash_flat.sh

$ sudo ./ubuntu_flash_flat.sh -x
rawprogram_unsparse0.xml,rawprogram1.xml,rawprogram2.xml,rawprogram3.
xml,rawprogram4.xml,rawprogram5.xml,patch0.xml,patch1.xml,patch2.xml,
patch3.xml,patch4.xml,patch5.xml -i ./ -f prog_firehose_ddr.elf -s
ufs
```

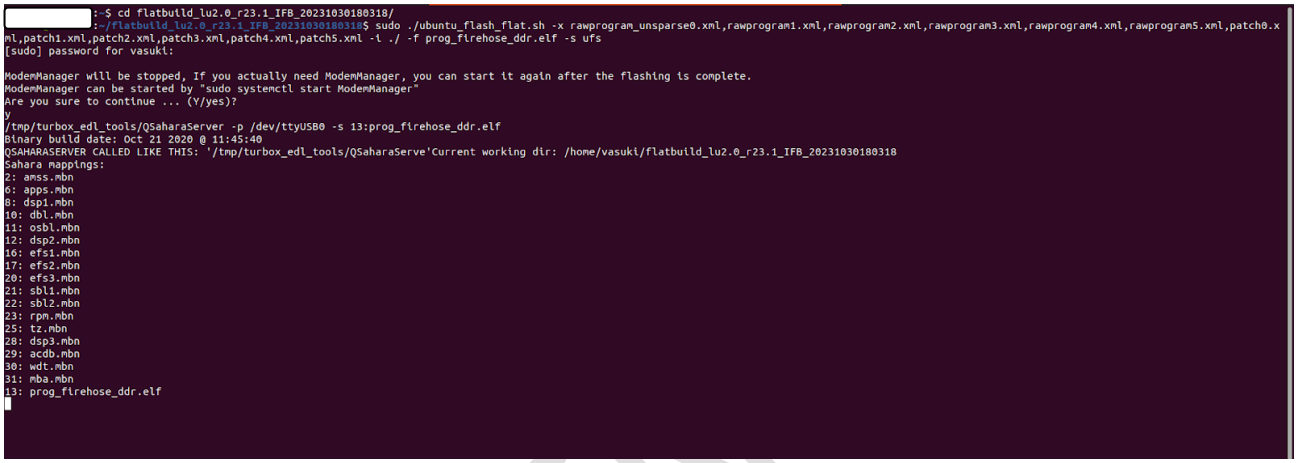

Figure 19 Ubuntu Host PC Programming command execution

7. Once the flashing is completed, "All Finished Successfully" logs will appear on the screen as shown below.

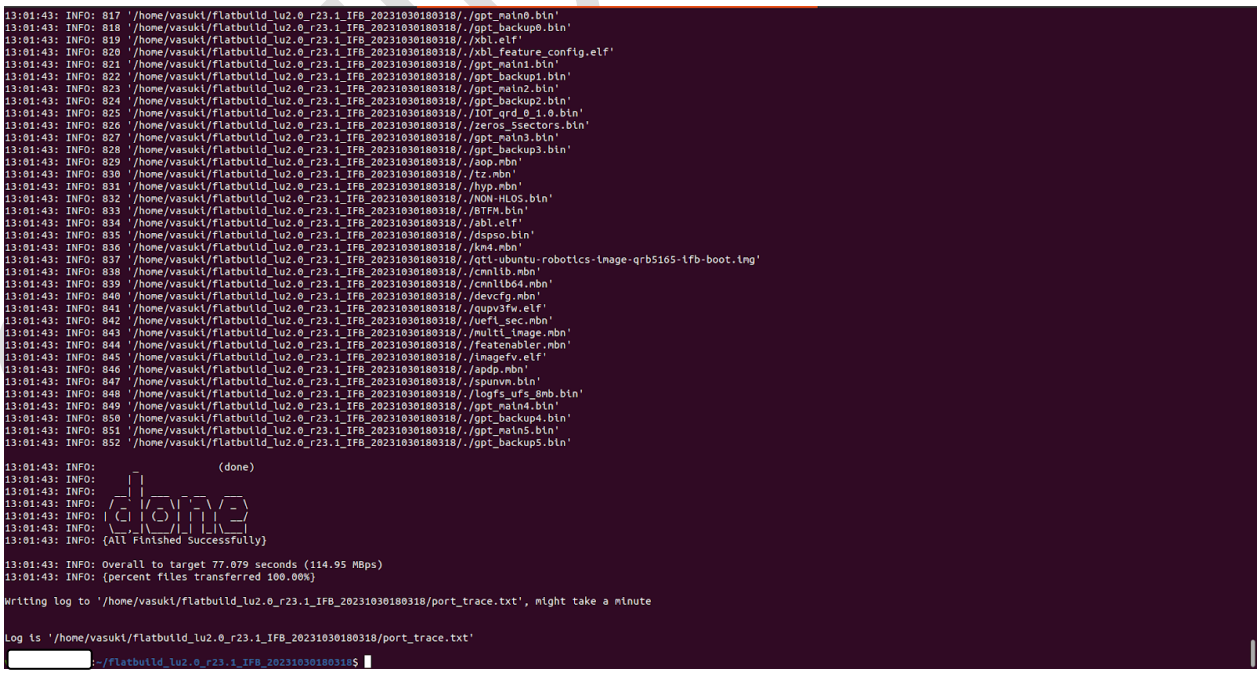

Figure 20 Ubuntu Host PC Program Successfully

10. Eagle Kit Boot and Login Verify

1. Power up the Eagle Kit normally
2. Observe the Boot logs over Serial Console/Micro-B connection.

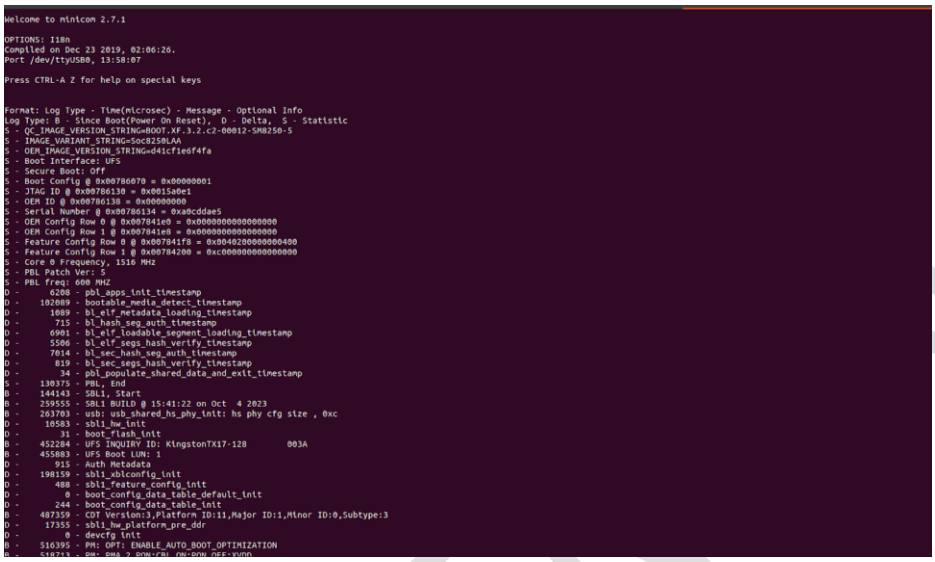

Figure 21 Ubuntu Host PC Eagle Kit Initial Boot Logs

Serial Console Login: Username: root Password: oelinux123

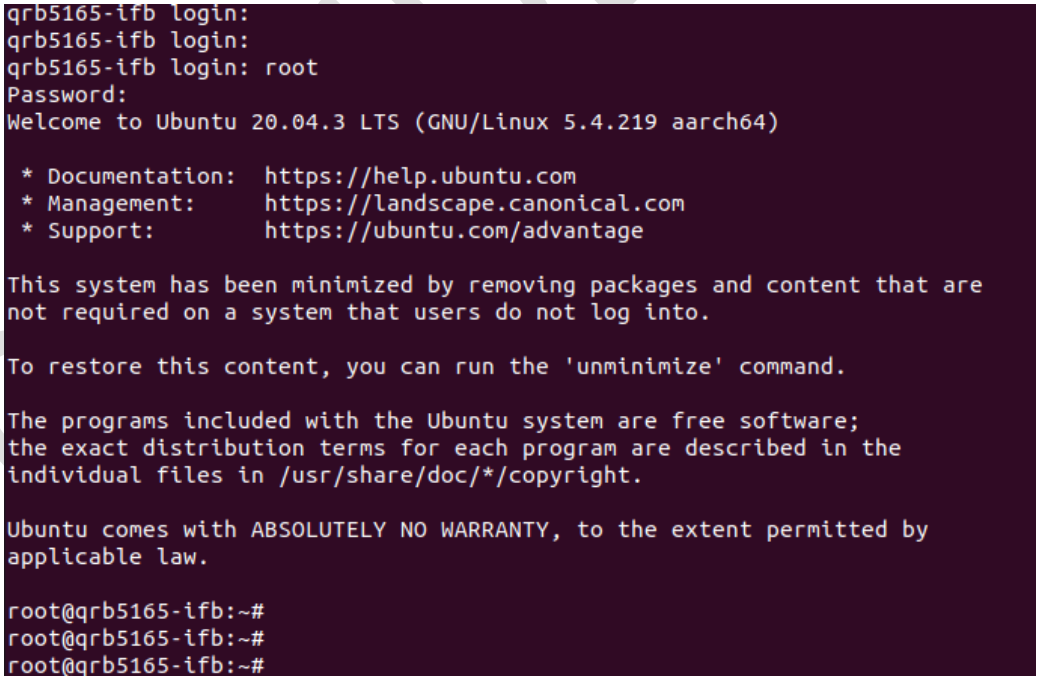

Figure 22 Ubuntu Host PC Eagle Kit Complete Boot and Login Prompt

11. Fastboot Programming

1. Host PC setup
   a. Windows Host PC adb and fastboot installation
      Download platform tools for Windows from the link provided below.

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

   b. Ubuntu Host PC adb and fastboo-t installation
      Use the commands below to install adb and fastboot.

      ```
      $ sudo apt-get update
      ```

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

2. Eagle Kit fastboot mode set
   a. Fastboot mode set using adb commands
      - Connect the device over adb, verify the device presence in adb mode
        `$ adb devices`
      - Enter as a root user
        `$ adb root`
      - Enter into fastboot mode
        `$ adb reboot bootloader`
      - After few seconds, check the device presence in fastboot mode
        `$ fastboot devices`

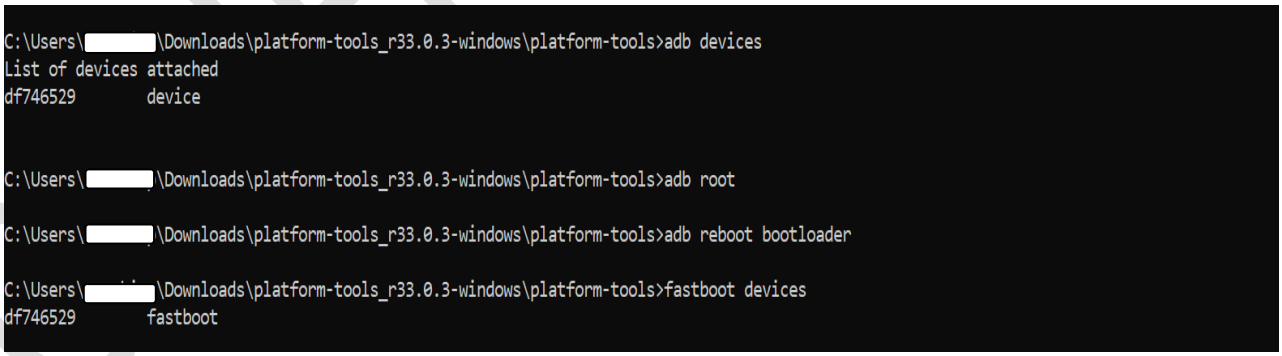

Figure 23 Eagle-Kit fastboot mode set using adb commands

b. Fastboot mode set using VOL- key
   - Disconnect the Type-C and Power cable
   - Press Vol- Key/SW3 switch

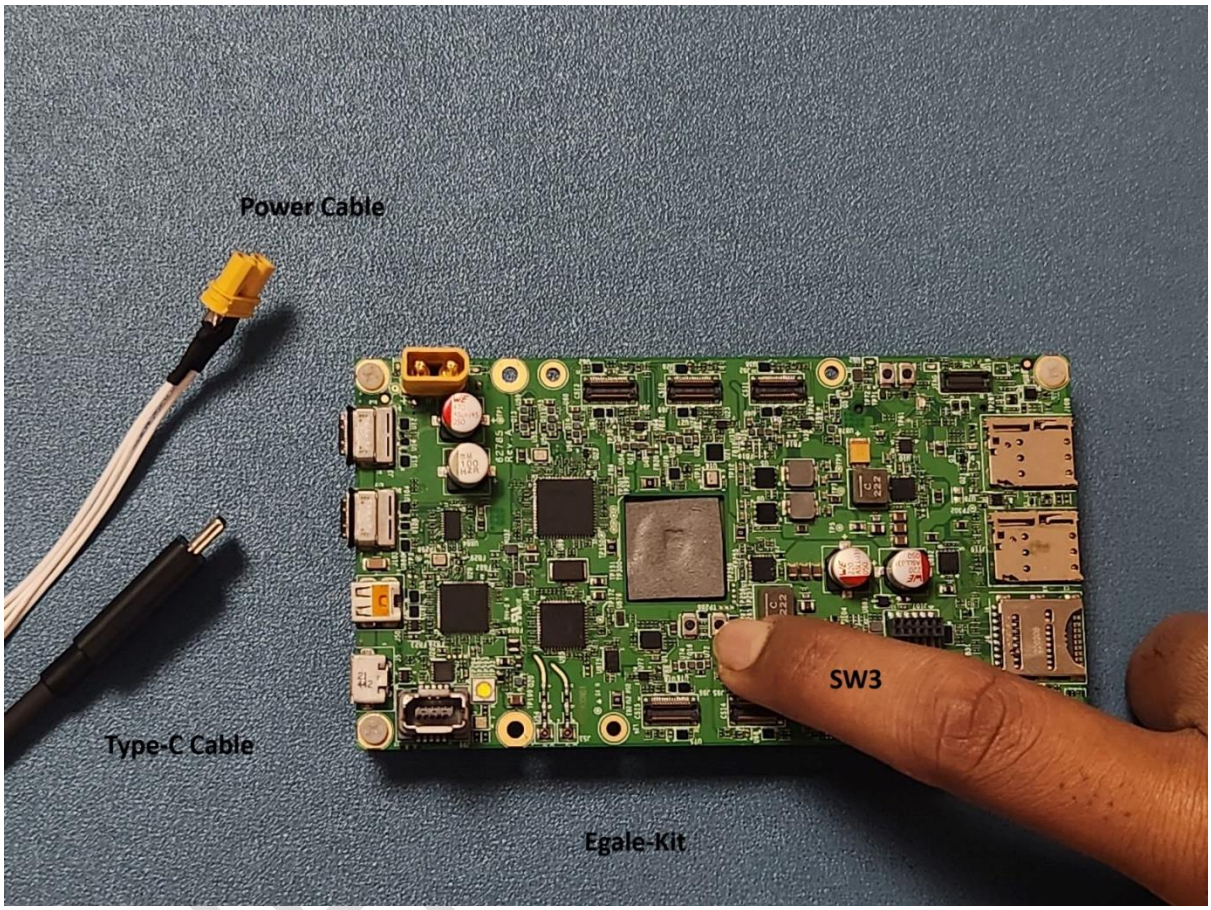

Figure 24 Eagle-Kit fastboot mode set using Vol- Key press

- Hold the VOL- key
- Connect the type-c cable to host pc
- Power up the Eagle Kit

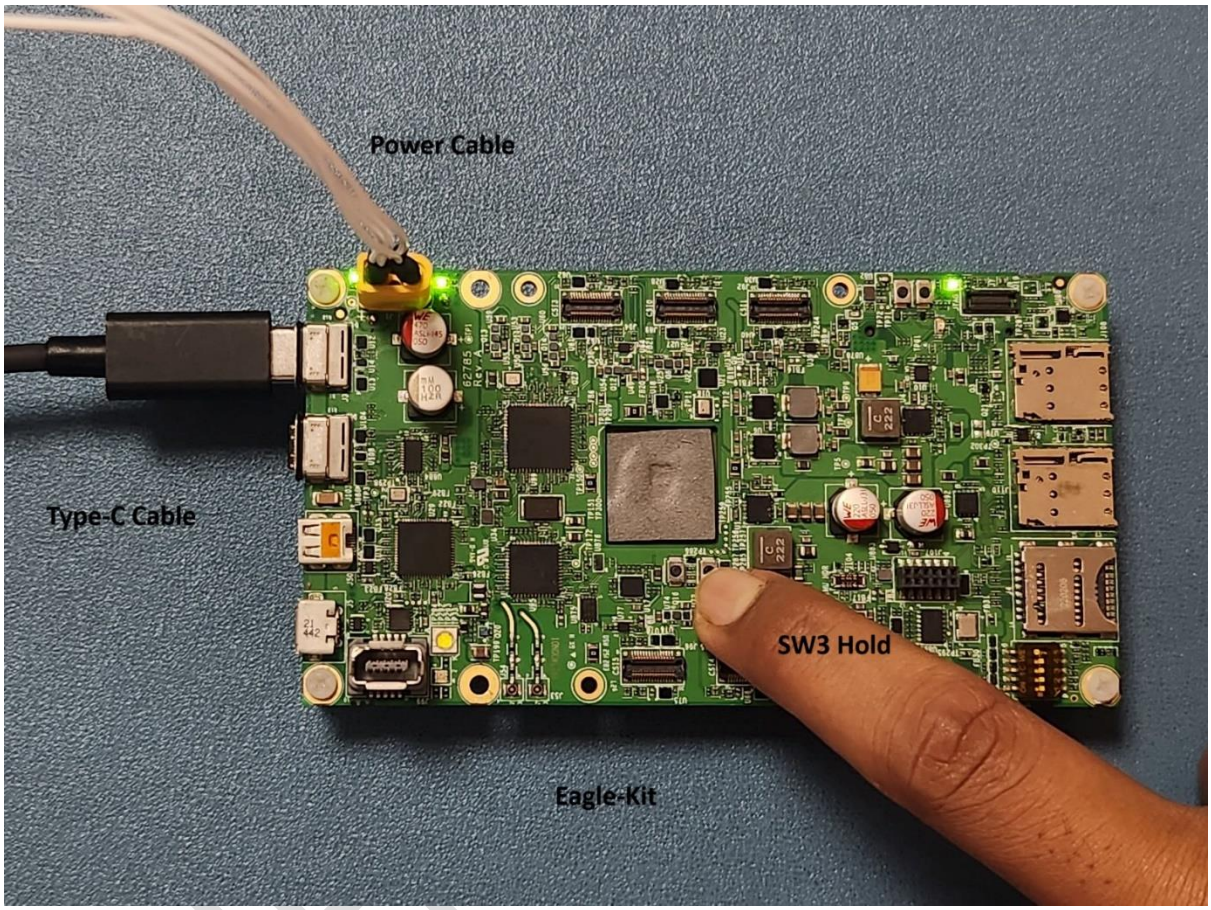

Figure 25 Eagle-Kit fastboot mode set using Vol- Key press and power up

- After few seconds, check the device presence in fastboot mode

```
$ fastboot devices
```

s

3. Fastboot mode programming

Once the device is present in fastboot mode, run the following command for fastboot programming/flashing.

```
$ fastboot flash <partition_name> <file_name>
```

Example: Boot image flash

```
$ fastboot flash boot_a qti-ubuntu-robotics-image-qrb5165-ifb-boot.img
$ fastboot flash boot_b qti-ubuntu-robotics-image-qrb5165-ifb-boot.img
```

Once flash is completed, reboot the device to boot the flashed images

```
$ fastboot reboot
```

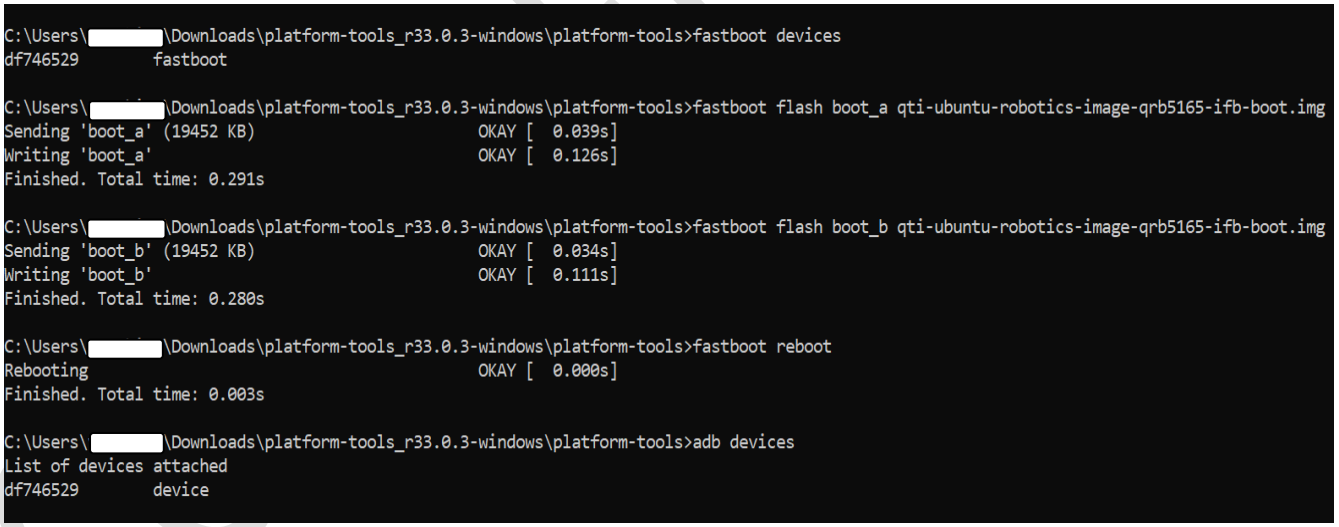

Figure 26 Eagle-Kit fastboot mode flash example