Thundercomm
AIOT ENABLER

Qualcomm Robotics SDK Manager

User Guide

Rev. M
Mar 14, 2024

Revision History

Revision	Date	Description
A	Jul 30, 2020	Initial release.
B	Oct 27, 2020	• Add information on Windows 10 Professional and Windows 10 Enterprise operation. • Update TROUBLESHOOTING.
C	Dec 14, 2020	Optimize file construction.
D	Jul 29, 2022	Add contents to make this user guide compatible with RB6.
E	Jan 12, 2023	• Add disk requirements in Chapter 2. • Update Step 5 in Chapter 5. • Update Step 4 in Chapter 6. • Update Step 9 - 4) in Chapter 7.
F	Mar 31, 2023	Add contents to make this document compatible with RB2 platform: • Update Chapter 1. Overview. • Update the download link of SDK Manager in Chapter 4. SDK Manager Download and Unzip. • Update Chapter 5. • Add Figure 5-3, Figure 5-4, Figure 7-3 and Figure 7-4. • Fix command font problem.
G	Apr 10, 2023	• Restructure the document. • Add RB5 LU2.0 relevant info. throughout this document: ▫ Chapter 1. Overview ▫ Chapter 3. System and Disk Requirements ▫ Chapter 4. Download SDK Manager ▫ Chapter 5. On Ubuntu Host ▫ Chapter 6. Generate Ubuntu Docker Image ▫ Step 4 and 5 in Chapter 7. On Windows 10 (64-bit) Host
H	Apr 19, 2023	Update the note at the beginning of Chapter 5. On Ubuntu Host.
I	May 08, 2023	Update Chapter 7. On Windows 10 (64-bit) Host.
J	June 09, 2023	• Restructure the document. • Update 4.1.1. OS version is recommended version. • Update 4.2. On Windows 10 (64-bit) Host. • Update Table 5-1. Troubleshooting information. • Update Table 6-1. For additional reference please refer to: .
K	Aug 21, 2023	• Update Chapter 1. Overview. • Update 3.1. OS requirements. • Update Chapter 4. SDK Manager Operation Process .

Revision	Date	Description
L	Dec 19, 2023	• Update the download address in Step 1 of Chapter 4. SDK Manager Operation Process . • Update the commands in Step 4 - 1) of Section 4.1.1. • Update the notes in Step 4 - 7) of Section 4.1.1. • Update in Step 9 - 1) and 3) of 4.2. On Windows 10 (64-bit) Host. • Update Table 5-1. Troubleshooting information.
M	Mar 14, 2024	• Update the following chapters/section: ▫ Chapter 1. Overview ▫ 3.1. OS requirements ▫ Chapter 4. SDK Manager Operation Process ▫ Chapter 6. Reference Documents • Add the following figures: ▫ Figure 4-5 ▫ Figure 4-6 ▫ Figure 4-12 ▫ Figure 4-13

Table List

About This Document

- Illustrations in this documentation might look different from your product.
- Depending on the model, some optional accessories, features, and software programs might not be available on your device.
- Depending on the version of operating systems and programs, some user interface instructions might not be applicable to your device.
- Documentation content is subject to change without notice. Thundercomm makes constant improvements on the documentation of the products, including this guidebook.
- Function declarations, function names, type declarations, attributes, and code samples appear in a different format, for example, `cp armcc armcpp`.
- Code variables appear in angle brackets, for example, `<number>`.
- Button, tool, and key names appear in bold font, for example, click **Save** or press **Enter**.
- Commands to be entered appear in a different font; on the host computer use $ as shell prompt, while on the target device use # as shell prompt, for example,

```
$ adb devices
# logcat
```

- Part of the code that does not contain instructions appear in a different format, for example,

```
SUBSYSTEM=="usb", ATTR{idVendor}=="18d1", MODE="0777", GROUP="adm"
```

- Folders, path and files are formatted in italic, for example, *turbox_flash_flat.sh*.

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Chapter 1. Overview

SDK Manager provides a complete set of tools for generating and flashing the RBx and C6490 firmware, supporting systems including Ubuntu 16.04, Ubuntu 18.04, Ubuntu 20.04, Windows 10 Professional (64-bit) and Windows 10 Enterprise (64-bit).

V4.1.0 supports the following products:

- C6490 Platform
- Robotics RB1 Platform
- Robotics RB2 Platform
- Robotics RB3 Gen2 Platform
- Robotics RB5 Platform
- Robotics RB5N (Non-Pop) Platform
- Robotics RB6 Platform

Chapter 2. Read This First

- To register a Thundercomm Account, go to http://www.thundercomm.com.
- Keep the internet connected during the image generation.
- The full process lasts for at least 40 minutes, depending on Internet speed.
- A working directory is needed to be built with the write and read permission in SDK Manager. For Docker container user, create your target directory under */home/hostPC/*.
- Docker Desktop is only supported on Windows 10 Professional (64-bit) and Windows 10 Enterprise (64-bit) system.
- Before flashing full build, generate the image first.
- USB 3.0 port and USB 3.0 cable are recommended for flashing images.
- When flashing the device on a Linux host, run the command below before connecting the device to the host.

```
$ sudo systemctl stop ModemManager
```

- Plug in a USB device before starting Option 2 (**EDL** programming sequence), if an Ubuntu 18.04 host is running the SDK Manager by the Ubuntu 18.04 Docker.

Chapter 3. System and Disk Requirements

3.1. OS requirements

- **For C6490, RB3 Gen2, RB5 LU2.0, and RB5N LU2.0 platform**
  - Recommended OS (Operating System): Ubuntu 20.04.
  - Alternatively, run an Ubuntu 20.04 Docker on a host of Ubuntu 16.04, Ubuntu 18.04, Ubuntu 20.04, Windows 10 Professional (64-bit), or Windows 10 Enterprise (64-bit) system.
- **For RB1, RB2, RB5LU1.0 and RB6 platforms**
  - Recommended OS: Ubuntu 18.04.
  - Alternatively, run an Ubuntu 18.04 Docker on a host of Ubuntu 16.04, Ubuntu 18.04, Ubuntu 20.04, Windows 10 Professional (64-bit), or Windows 10 Enterprise (64-bit) system.

3.2. Disk requirements

Make sure that the following minimum disk requirements are met.

- At least 1.5GB disk space to download a software version.
- It requires at least 50GB disk space to download LU resources and generate *system.img* with current release.

Chapter 4. SDK Manager Operation Process

Step 1. Download SDK Manager via the following link:

https://thundercomm.s3.ap-northeast-1.amazonaws.com/uploads/web/common/TC-sdkmanager-4.1.0.zip

Step 2. Unzip the SDK Manager file with the following command:

```
$ unzip TC-sdkmanager-x.x.x.zip
```

4.1. On Ubuntu Host

4.1.1. For recommended OS versions

➲ **NOTE:** It is required to observe the following requirements on package version.

- **For C6490, RB3 Gen2, RB5 LU2.0 and RB5N LU2.0 Platform (recommended OS: Ubuntu 20.04)**
  - Required minimum package version: coreutils 8.30, fakechroot 2.19, fakeroot 1.24, kmod 27-1ubuntu2.1, libc6-arm64-cross 2.31, python 2.7.18, qemu-user-static 1:7.2+dfsg-5ubuntu1, udev 245.4-4ubuntu3.20, unzip 6.0, wget 1.20.3.
  - Run these commands to create soft links:

```
$ sudo rm -rf /lib/ld-linux-aarch64.so.1
$ sudo ln -sf /usr/aarch64-linux-gnu/lib/ld-2.31.so /lib/ld-linux-aarch64.so.1
$ sudo ln -sf /bin/bash /bin/sh
$ sudo dpkg -P qemu-user-static
$ wget http://archive.ubuntu.com/ubuntu/pool/universe/q/qemu/qemu-user-static_6.2+dfsg-2ubuntu6_amd64.deb
$ sudo dpkg -i qemu-user-static_6.2+dfsg-2ubuntu6_amd64.deb
```

- **For RB5LU1.0, RB6, RB1, RB2 Platforms (recommended OS: Ubuntu 18.04)**

  Required minimum package version: coreutils 8.28, fakechroot 2.19, fakeroot 1.22, kmod 24-1ubuntu3.2, libc6-arm64-cross 2.27, python 2.7.15, qemu-user-static 1:2.11+dfsg- 1ubuntu7.28, udev 237-3ubuntu10.42, unzip 6.0, wget 1.19.4.

Step 1. Install the dependency libraries to the host computer:

```
$ sudo apt-get install coreutils fakechroot fakeroot \
  kmod libc6-arm64-cross  python2.7 qemu-user-static wget udev openssh-server
```

Step 2. Unzip *TC-sdkmanager-x.x.x.zip* and navigate to *TC-sdkmanager-x.x.x* directory from a terminal window, and install or re-install SDK Manager:

```
$ sudo dpkg -i tc-sdkmanager-vx.x.x_amd64.deb
```

Step 3. Launch SDK Manager.

```
$ sdkmanager
```

Step 4. Run SDK Manager.

1) Provide Thundercomm login credentials:

```
Thundercomm Account Checking ...
Enter your Thundercomm user email:
Enter your Thundercomm password:
```

2) To change the installation path, you should specify a working directory (for example, "*/home/user*") when prompted for a target directory. Then, enter the absolute target directory (default directory: */home/user*) where the SDK Manager will overwrite any existing files.

```
Enter absolute target directory for Image resources (overwrites existing files, default: /home/user/):
```

➲ **NOTE:** Docker users must specify a working directory as */home/hostPC/[workingdirectory]*.

3) Enter the number of the selected product, for example, **1**.

```
Select your product:
1: RB1
2: RB2
3: RB3 Gen2
4: RB5
5: RB5N (Non-Pop)
6: RB6
7: C6490
Select one number of product ( 1 | 2 | 3 ...) to continue with:
```

➲ **NOTE:** If the product is only compatible with a single platform, SDK Manager will automatically omit Step 4 - 4) and proceed directly to Step 4 - 5).

4) Enter the number of the available platform for Robotics RBx device, for example, **1**.

```
Choose a platform for Robotics RBx device
Enter 1 to use LU platform, 2 to use LE platform:
```

5) Enter the number of the available version for image repack, for example, **1**:

```
Checking current versions of release ...
Available versions:
1: QRB5165.x.x.x-xxxxxx
… …
Select one number of available version ( 1 | 2 | 3 ...) to continue with:
```

6) Enter **1** when the message below appears on your screen:

```
--------------------------------------------------------------------------------
SDK has been successfully set up and is ready to be used
Type 'help' for commands
--------------------------------------------------------------------------------
>
```

➲ **NOTES:**

- This step lasts for at least 40 minutes.
- Enter `help` for more information:

```
> help
commands:
help = Show usage help for LU platform
1 = Download LU resources and generate system.img with current release
2 = Flash full build (require system.img generation first)
q = exit sdk manager
```

7) The system images are successfully generated in the working directory with the following messages displayed:

```
--------------------------------------------------------------------------------
Move sparse images to full_build ...done
You may proceed to flash full_build to your device
--------------------------------------------------------------------------------
```

➲ **NOTES:**

- For Docker users, the system image is generated at */home/hostPC/[workingdirectory]*.
- In case of any error, please refer to Chapter 5. Troubleshoot.
- The default support of 6490DK is 8G DDR + 128G UFS.

Step 5. Disconnect the device from the computer, then follow the steps below to flash full build:

➲ **NOTE:** When flashing the device on a Linux host, run the command below before connecting the device to the host.

```
$ sudo systemctl stop ModemManager
```

1) Power off the device by disconnecting the power cable and USB cable.

2) Press the F_DL Key.

3) Power on the device (required voltage: 12 V).

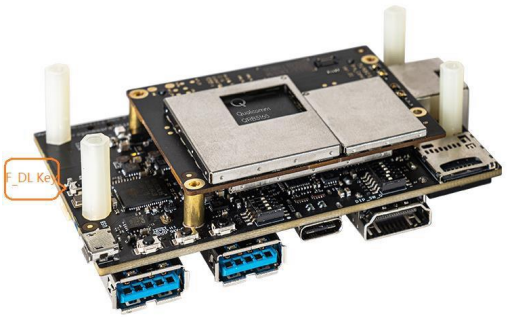

Figure 4-1. RB5 F_DL Key

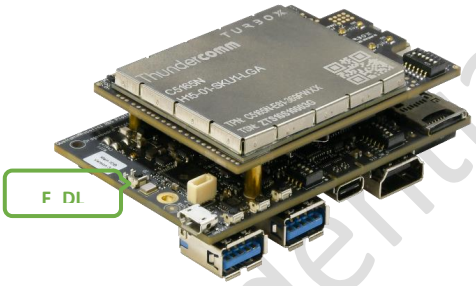

Figure 4-2. RB6/RB5N F_DL Key

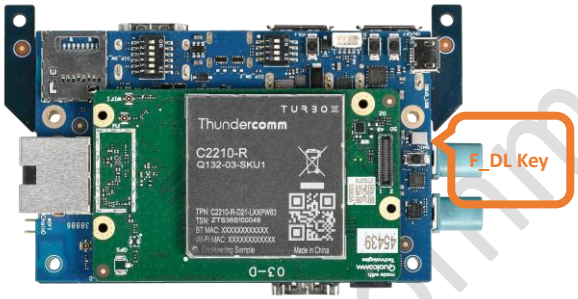

Figure 4-3. RB1 F_DL Key

Figure 4-4. RB2 F_DL Key

Figure 4-5. RB3 Gen2 F_DL Key

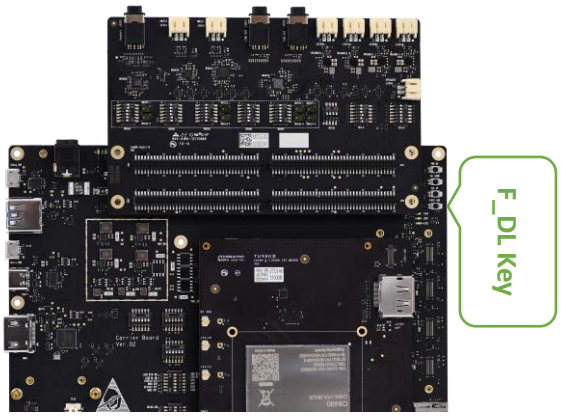

Figure 4-6. C6490 F_DL Key

4) Keep pressing **F_DL Key** while connecting the board to your computer with a Type-C USB (This step will switch the device to **EDL** mode).

5) Release **F_DL Key** after connecting the board to your computer.

6) Start flashing process from the SDK Manager with "`Flash full build`".

7) SDK Manager shall detect the device and start the flashing process automatically.

8) After the flashing process is complete, the board will reboot automatically. This may take some time.

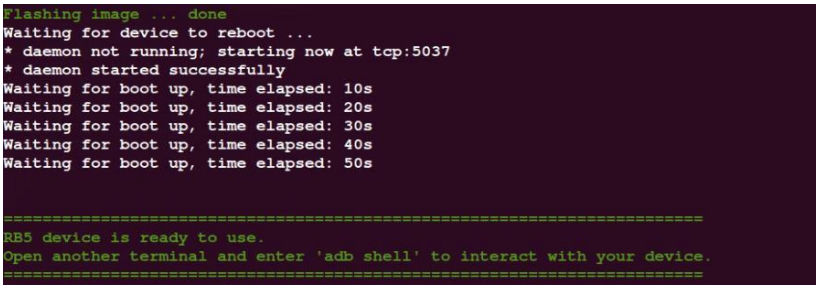

Figure 4-7.Board Reboot

9) Once your device has completed the booting process, please open a new terminal window on your host computer and enter the following command:

```
$ adb wait-for-device shell
```

4.1.2. For other OS versions

➲ **NOTES:** Different OS versions require different Docker images.

- **C6490, RB3 Gen2, RB5 LU2.0 and RB5N LU2.0 Platform**

  For an Ubuntu 16.04 or 18.04 host, an Ubuntu 20.04 Docker image is required.

- **RB1, RB2, RB5LU1.0 and RB6 Platforms**

  For an Ubuntu 16.04 or 20.04 host, an Ubuntu 18.04 Docker image is required.

Step 1.Install qemu-user-static, openssh-server and udev to the host PC.

```
$ sudo apt-get install qemu-user-static openssh-server udev -y
```

Step 2.To install Docker, refer to: https://docs.docker.com/engine/install/ubuntu/.

Step 3.Generate Ubuntu 18.04/20.04 docker image:

Unzip *TC-sdkmanager-x.x.x.zip* and navigate to the *TC-sdkmanager-x.x.x* directory from a new terminal window, then execute the following commands:

```
# Ubuntu terminal #
# Generate Ubuntu 18.04 docker image #
$ ln -sf Dockerfile_18.04 Dockerfile
$ sudo docker build -t ubuntu:18.04-sdkmanager .

# Generate Ubuntu 20.04 docker image #
$ ln -sf Dockerfile_20.04 Dockerfile
$ sudo docker build -t ubuntu:20.04-sdkmanager .
-------------------------------------------------------------------------
```

➲ **NOTES:**

- Make sure to include the space and full stop at the end of the command: **.**.
- Generated Docker image name: “ubuntu:18.04-sdkmanager” or “ubuntu:20.04-sdkmanager”.

Step 4. Create a Docker container:

```
# Ubuntu 18.04 docker image #
$ sudo docker run -v /home/${USER}:/home/hostPC/ --privileged -v /dev/:/dev -v
/run/udev:/run/udev -d --name sdkmanager_container -p 36000:22
ubuntu:18.04-sdkmanager

# Ubuntu 20.04 docker image #
$ sudo docker run -v /home/${USER}:/home/hostPC/ --privileged -v /dev/:/dev -v
/run/udev:/run/udev -d --name sdkmanager_container -p 36000:22
ubuntu:20.04-sdkmanager
--------------------------------------------------------------------------------
Host PC's /home/${USER} is mounted on /home/hostPC in Docker container
sdkmanager_container: container name
```

➲ **NOTE**: With the above commands, a Docker container name will be generated after `sdkmanager_container:`.

Step 5. Launch SDK Manager in the Docker container.

```
$ sudo docker exec -it sdkmanager_container sdkmanager
```

Step 6. Run SDK Manager. Refer to Step 4 of 4.1.1. OS version is recommended version.

Step 7. Disconnect the device from the computer, then flash full build by proceeding with Step 5 of 4.1.1. OS version is recommended version.

Step 8. After your device has successfully booted up, open a new terminal window on the host computer and enter the following command:

```
$ adb wait-for-device shell
```

4.2. On Windows 10 (64-bit) Host

Step 1. To download Docker Desktop, go to:

https://hub.docker.com/editions/community/docker-ce-desktop-windows/

Step 2. Open **Dashboard** from the Docker notification menu to launch Docker Desktop.

Step 3. Open Windows PowerShell and enter `docker images` to verify docker installation.

➲ **NOTE:** If an error is displayed in the PowerShell console, it indicates that either the installation or operation of Docker Desktop has failed.

Step 4. Generate Ubuntu docker image.

1) Unzip the *TC-sdkmanager-x.x.x.zip* file and navigate to the *TC/sdkmanager/x.x.x* directory from a Windows PowerShell.

2) Execute the following commands:

```
# Windows PowerShell #
# For RB1, RB2, RB5LU1.0 and RB6 Platforms : Generate Ubuntu 18.04 docker image #
$ rm .\Dockerfile
$ cmd /c mklink Dockerfile Dockerfile_18.04
$ docker build -t ubuntu:18.04-sdkmanager .

# For C6490, RB3 Gen2, RB5 LU2.0 and RB5N LU2.0 Platform : Generate Ubuntu 20.04
docker image #
$ rm .\Dockerfile
$ cmd /c mklink Dockerfile Dockerfile_20.04
$ docker build -t ubuntu:20.04-sdkmanager .
--------------------------------------------------------------------------------
```

➲ **NOTES**:

- Make sure to include the space and period at the end of the command.
- Generated docker image name: “ubuntu:18.04-sdkmanager” or “ubuntu:20.04-sdkmanager”.

Step 5. Create a docker container.

```
# For RB1, RB2, RB5LU1.0 and RB6 Platforms : Generate Ubuntu 18.04 docker image #
$ docker run -it -d --name sdkmanager_container ubuntu:18.04-sdkmanager

# For C6490, RB3 Gen2,RB5 LU2.0 and RB5N LU2.0 Platform : Generate Ubuntu 20.04
docker image #
$ docker run -it -d --name sdkmanager_container ubuntu:20.04-sdkmanager
```

➲ **NOTE:** With the above commands, a docker container name can be generated after `sdkmanager_container` with the above command.

Step 6. Launch SDK Manager.

```
$ docker exec -it sdkmanager_container sdkmanager
```

Step 7. Run SDK Manager. Refer to Step 4 of 4.1.1. OS version is recommended version.

Step 8. Copy the full build from the Docker container to a Windows Host computer.

```
$ docker cp  sdkmanager_container:[target_directory]/[name_of_selected_re-
lease]/full_build [destionation path on Windows host PC]
--------------------------------------------------------------------------
Example: docker cp sdkmanager_container:/home/hostPC/demo_0803/QRB5165.x.x.x-
xxxxxx/full_build D:\
--------------------------------------------------------------------------
```

Step 9. Flash the device.

1) Download the *thundercomm-tflash-windows.msi* file and install **Tflash (TurboX Flash)**.

- RB5: https://docs.thundercomm.com/turbox_doc/products/qualcomm-robotics-developement-kit/qualcomm-robotics-rb5-development-kit
- RB6: https://docs.thundercomm.com/turbox_doc/products/qualcomm-robotics-developement-kit/qualcomm-robotics-rb6-development-kit
- RB1/RB2: https://docs.thundercomm.com/turbox_doc/products/qualcomm-robotics-developement-kit/qualcomm-robotics-rb1-rb2-platform
- RB3 Gen2: https://docs.thundercomm.com/turbox_doc/products/qualcomm-robotics-developement-kit/qualcomm-robotics-rb3-gen2-platform
- C6490: https://docs.thundercomm.com/turbox_doc/products/smart-modules/turbox-c6490
- Tflash: TurboX Flash User Guide

2) Follow the steps below to check if your device is in EDL (Emergency Download) mode:

Option 1: Enter `adb reboot edl`.

Option 2: Press **F_DL Key** to power on your device.

➲ **NOTE:** Check if the device has been recognized as Qualcomm HS-USB QLoader 9008 (COMx) in the Device Manager. If it is not recognized, it may be necessary to download and install the appropriate USB drivers.

- C6490: https://docs.thundercomm.com/turbox_doc/products/smart-modules/turbox-c6490
- RB1/RB2: https://docs.thundercomm.com/turbox_doc/products/qualcomm-robotics-developement-kit/qualcomm-robotics-rb1-rb2-platform
- RB3 Gen2: https://docs.thundercomm.com/turbox_doc/products/qualcomm-robotics-developement-kit/qualcomm-robotics-rb3-gen2-platform
- RB5: https://docs.thundercomm.com/turbox_doc/products/qualcomm-robotics-developement-kit/qualcomm-robotics-rb5-development-kit
- RB6: https://docs.thundercomm.com/turbox_doc/products/qualcomm-robotics-developement-kit/qualcomm-robotics-rb6-development-kit

3) Flash the full build with **Tflash**:

a) Launch **Tflash**.

b) Select "UFS" as the **storage type**.

c) Click **Browse** to select the programmer file (*prog_firehose_ddr.elf*) and load XML files. When prompted to select XML files, choose all XML files and all Patch files in the *full_build ufs* folder. Leave all other settings as default.

d) Disconnect the device from the computer and power it off.

e) Press the F_DL Key.

f) Power on the device (required voltage: 12 V).

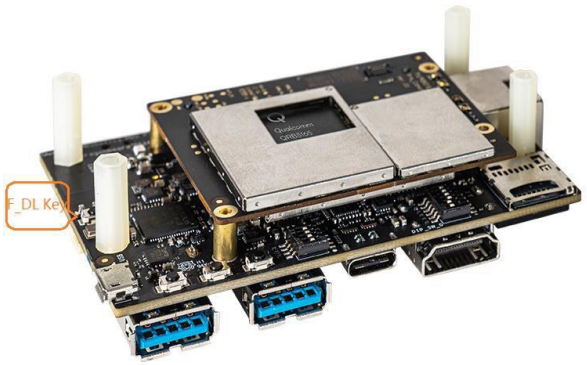

Figure 4-8.RB5 F_DL Key

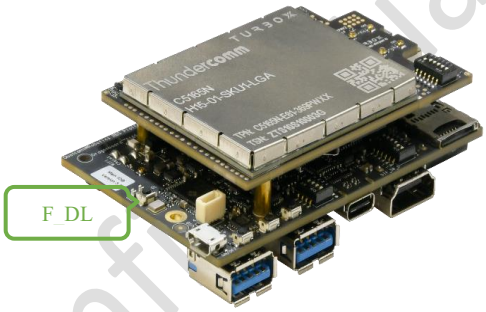

Figure 4-9.RB6/RB5N F_DL Key

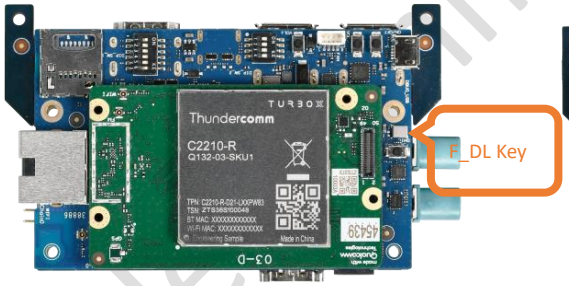

Figure 4-10.RB1 F_DL Key

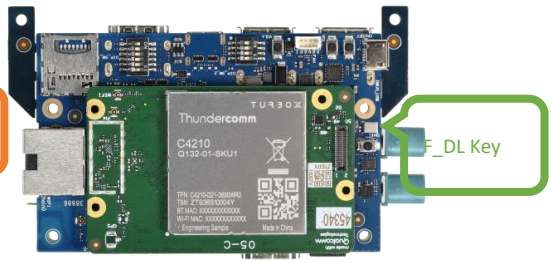

Figure 4-11.RB2 F_DL Key

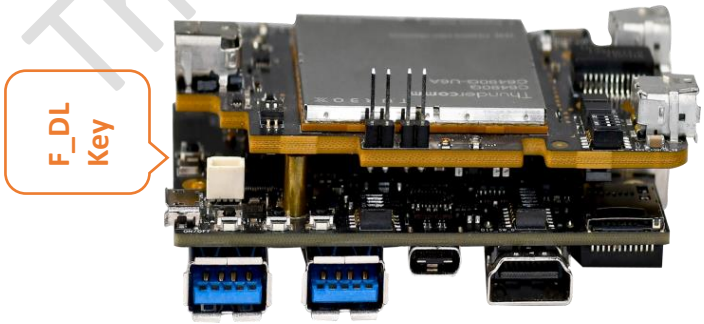

Figure 4-12.RB3 Gen2 F_DL Key

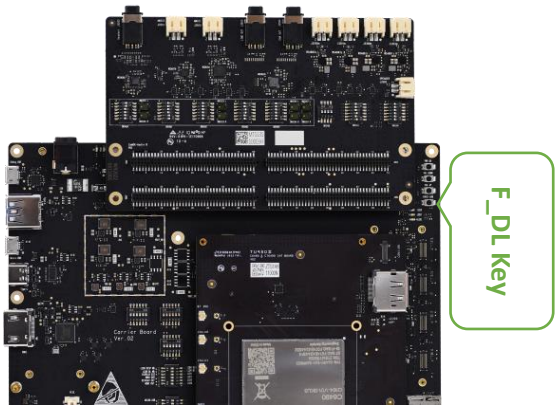

Figure 4-13.C6490 F_DL Key

g) Press and hold **F_DL Key** while connecting the board to your computer with a Type-C USB cable.

➲ **NOTE:** This step will switch the device to EDL mode.

h) Release **F_DL Key** after the board has been connected to your computer.

i) Select the device by clicking **UpdatePort**.

j) Start flashing by clicking the **Download** button that corresponds to your device port in the **Tflash** window.

k) Upon completion of the flashing process, the board will reboot automatically.

➲ **NOTE:** This step may take some time.

Chapter 5. Troubleshoot

Refer to Table 5-1 for the solutions to problems that have definite symptoms.

Table 5-1. Troubleshooting information

Problem	Solution

Internet Timeout Issue:
Internet timeout issue may occur during the image generation process, such as “Unable to fetch”.
	Try to run **Command 1** again.
	`commands:`
	`help = Show usage help for XX platform`
	`1 = Download LU resources and generate system.img with current release`
	`2 = xxxx`
	`>1`

APT Source Issue	If the download fails, check the internet connection and the source list.
Device Boot Up Issue: SDK Manager cannot detect the device after reboot.	• If Ubuntu 18.04 is used on Docker, check whether `adb kill-server` is entered on the host PC before flashing image. • Reboot your device manually, open a terminal, then enter `adb shell`. • Check if any Debian packages are modified.
Process Issue: The flashing process of Ubuntu system does not function well.	Copy the full folder to a computer with Windows system, then flash the image using **TurboX Flash**. For further information, refer to: TurboX Flash User Guide.
SDK Manager Flash Issue	Enter the following command on the host machine before restarting the flash: `$ sudo systemctl stop ModemManager`
Generating System Image Issue: The execution of `chroot` command failed. For example: `/usr/sbin/chroot:failed to run command '/bin/bash': Exec format error`	Enter the following command on the host machine before generating system image: `$ docker run --rm --privileged multiarch/qemu-user-static:register --reset`

Chapter 6. Reference Documents

- **Robotics C6490 Platform:**
  - Quick Start Guide: https://docs.qualcomm.com/bundle/80-64868-300/resource/80-64868-300_REV_AB_QCS6490_UBUN_1_0_Linux_Ubuntu_Quick_Start_Guide.pdf
- **Robotics RB1/RB2 Platform:**
  - Quick Start Guide: https://developer.qualcomm.com/hardware/qualcomm-robotics-rb1-rb2-kits/quick-start-guides
  - Hardware Reference Guide: https://developer.qualcomm.com/hardware/qualcomm-robotics-rb1-rb2-kits/hardware-reference-guide
- **Robotics RB5 Platform:**
  - Quick Start Guide: https://developer.qualcomm.com/qualcomm-robotics-rb5-kit/quick-start-guide
  - Hardware Reference Guide: https://developer.qualcomm.com/qualcomm-robotics-rb5-kit/hardware-reference-guide
  - Software Reference Manual: https://developer.qualcomm.com/qualcomm-robotics-rb5-kit/software-reference-manual

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