TOPST VCP FreeRTOS SDK

Getting Started

Rev. 1.00 [G]
2025-02-xx

※ The information in this document is subject to change without notice and should not be construed as a commitment by Telechips, Inc.

Kindly visit www.telechips.com for more information.

TABLE OF CONTENTS

Contents

Figures

1 INTRODUCTION

This document provides guidelines for setting up a software development environment for the TOPST VCP-G board on a Linux system. It outlines the required tools, configurations, and toolchain.

2 SETTING HOST ENVIRONMENT

2.1 Ubuntu Installation

It is recommended to set up your development environment on Ubuntu 22.04. This Ubuntu version offers a stable platform with wide community support, ensuring compatibility and ease of use with the TOPST VCP-G board and associated toolchain.

Linux distribution version:

- Ubuntu 22.04 (LTS)

2.2 Install WSL2 Ubuntu (Windows Environment Only)

Note: If you are using Ubuntu host, you can skip installing WSL2.

1. Set Windows Features by clicking **Control Panel** → **Programs** → **Windows Features On/Off** → **Enable Virtual Machine Platform & Hyper-V**
2. Execute Windows Powershell with "**Run with administrator privileges**".
3. Enable WSL.

```
dism.exe /online /enable-feature /featurename:Microsoft-Windows-Subsystem-Linux /all /norestart
```

4. Enable the Virtual Machine feature.

```
dism.exe /online /enable-feature /featurename:VirtualMachinePlatform /all /norestart
```

5. Set WSL to the default version of 2 (WSL2).

```
wsl --set-default-version 2
```

6. Search for Ubuntu 22.04 LTS in Microsoft Store and download it.
7. Check Ubuntu 22.04 in the WSL list.

```
wsl --list -online
```

8. Install Ubuntu 22.04

```
wsl --install Ubuntu-22.04
```

9. Search for WSL2 in the Windows search box and execute it.

2.3 Setting Linux Environment

To set up a Linux environment on your host PC, follow these steps:

1. Execute WSL2 (Windows Environment Only)
   If you are using Windows, start WSL2 by executing one of the following commands in Windows PowerShell.

```
wsl
```

```
ubuntu
```

2. Update Package List
   Before installing any new software, update the list of available packages to ensure you get the latest versions and dependencies. The following command fetches the latest list of available packages from the repositories.

```
sudo apt update && /
sudo apt upgrade
```

3. Install Common Development Tools
   Install common development tools by entering the following command:

```
sudo apt install build-essential git
```

Note: This command installs both the build-essential package and git.

3 TOOLCHAIN

The TOPST VCP-G board uses the **gcc-linaro-7.2.1-2017.11-x86_64_arm-eabi** toolchain.
This toolchain is optimized for the ARM architecture and ensures compatibility with the TCT7045 chip on the TOPST VCP-G board.

3.1 Install and Set Up Toolchain

Follow the steps below to download, extract, and set up the toolchain:

1. **Download the Toolchain**: Enter **wget** command to download the toolchain from the Linaro website:

```
wget https://releases.linaro.org/components/toolchain/binaries/7.2-2017.11/arm-eabi/gcc-linaro-7.2.1-2017.11-x86_64_arm-eabi.tar.xz
```

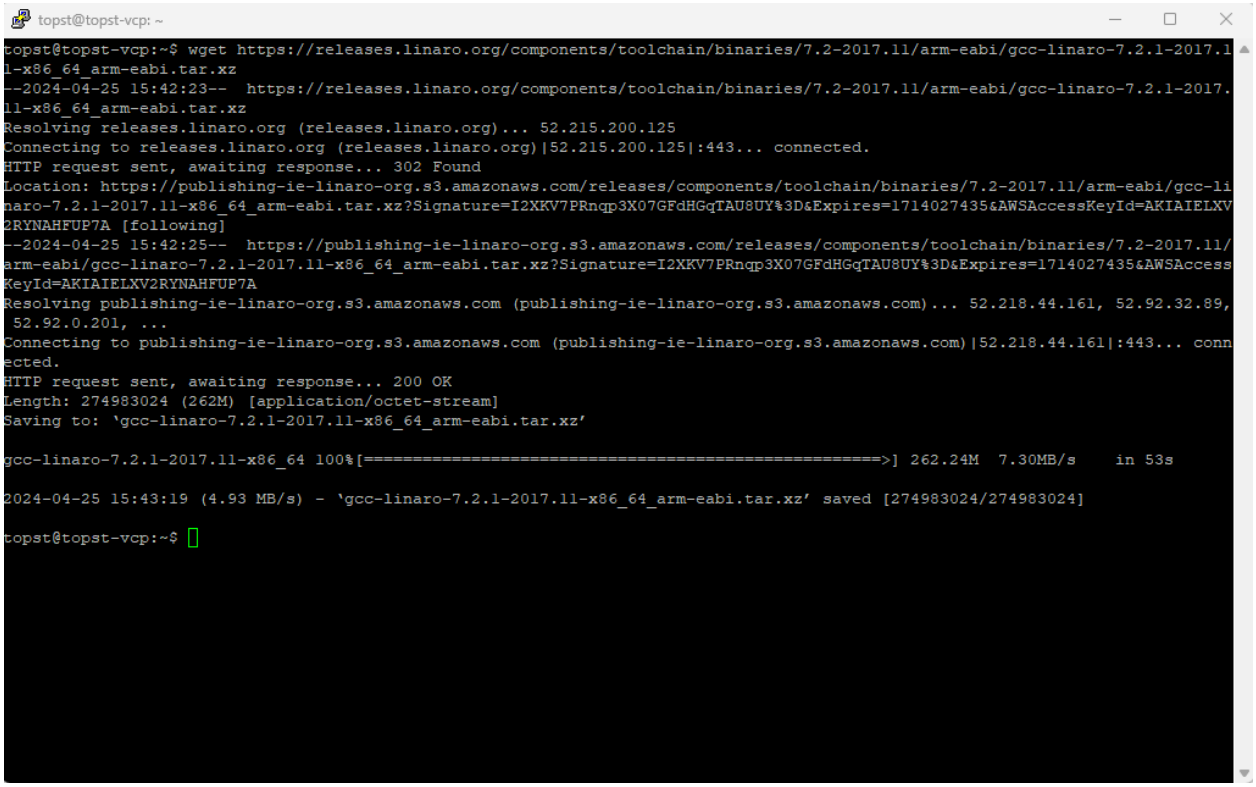

Figure 3.1 Download Toolchain

2. **Extract the Toolchain**: After the download is complete, extract the contents of the ".tar.xz" file.

```
tar -xvf gcc-linaro-7.2.1-2017.11-x86_64_arm-eabi.tar.xz
```

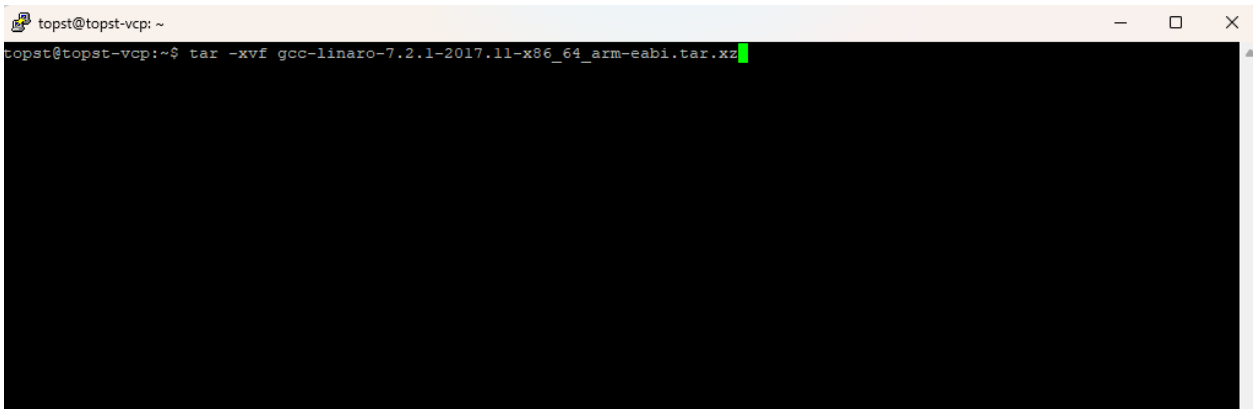

Figure 3.2 Extract Toolchain

3. **Move the Toolchain to /opt**: The /opt directory is a standard location for optional software on Linux. Move the extracted toolchain to this directory.

```
sudo mv gcc-linaro-7.2.1-2017.11-x86_64_arm-eabi /opt/
```

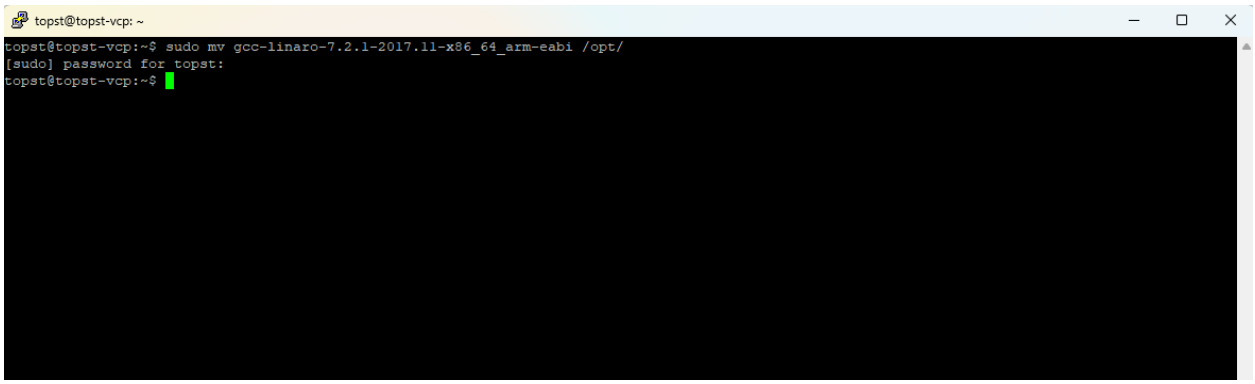

Figure 3.3 Move Toolchain

3.2 Verify Toolchain

To ensure that the toolchainis installed correctly:

1. **Navigate to the Toolchain Directory**

```
cd /opt/gcc-linaro-7.2.1-2017.11-x86_64_arm-eabi
```

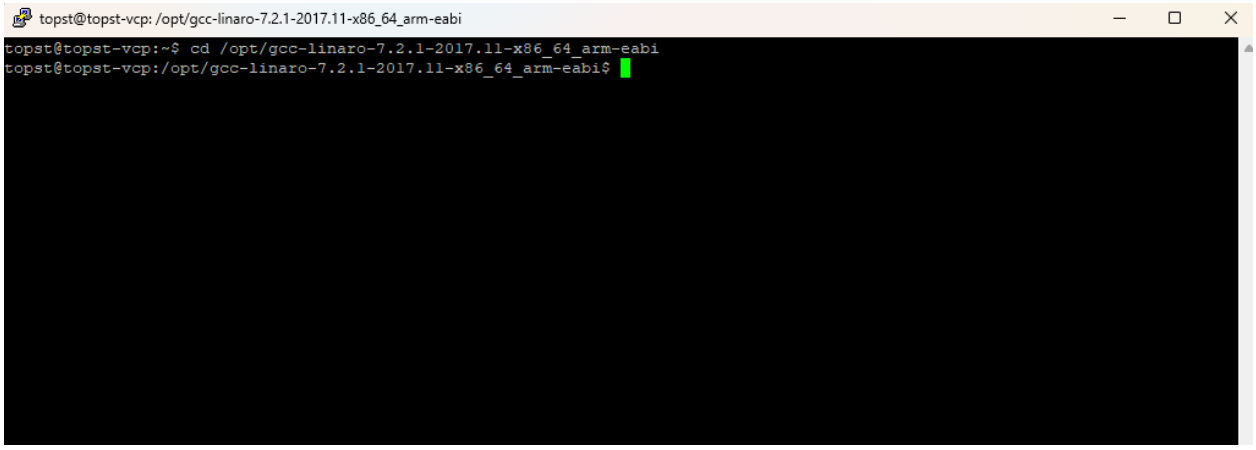

Figure 3.4 Navigate to Toolchain Directory

2. **Check the Version of the Installed GCC Compiler**

```
./bin/arm-eabi-gcc --version
```

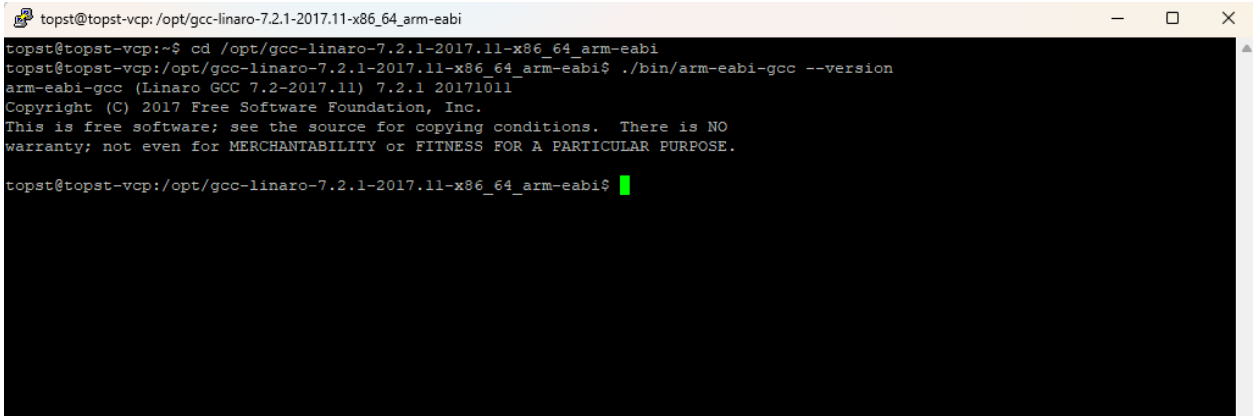

Figure 3.5 Check Version of Installed GCC Compiler

After the successful installation, verify theinstalled GCC compiler version to ensure it matches **`gcc-linaro-7.2.1-2017.11`**.

4 CLONE SOURCE CODE

This chapter describes how to clone the source code using Git.

5.1 Clone TOPST VCP-G Source Code

To obtain the source code for the TOPST VCP-G board, enter the **`git clone`** command. This command creates a copy of the remote repository on your local machine, allowing you to work with the code directly.

Follow these steps to clone the TOPST VCP-G source code:

1. **Open Terminal**: Launch the terminal application on your Ubuntu 22.04 system.
2. **Navigate to the desired directory:** Choose a suitable location to save the source code. For example, if you want to save the repository in the home directory, use the following command.

```
cd ~
```

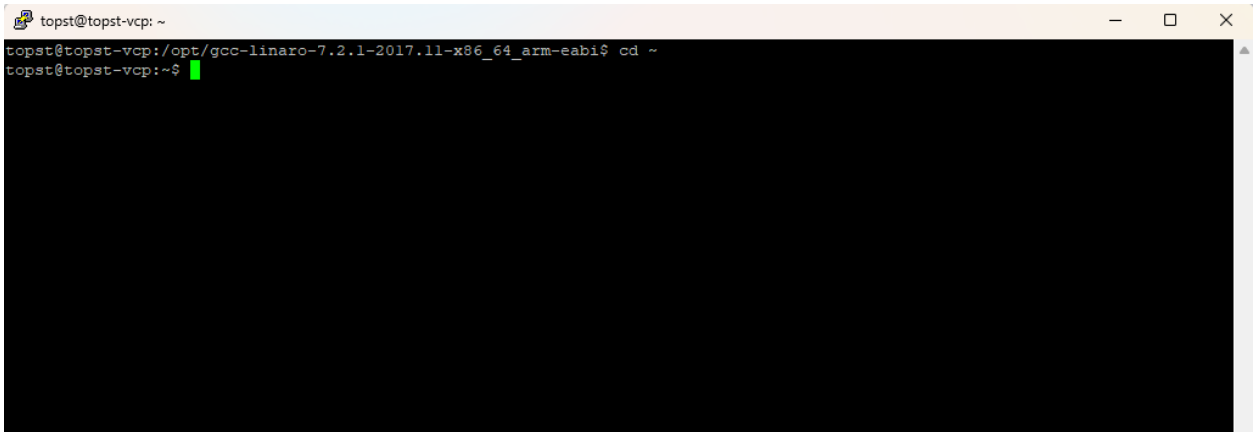

Figure 4.1 Navigate to Desired Directory

3. **Clone the Repository:** Use the following command to clone the TOPST VCP-G source code from the provided git address.

```
git clone git@gitlab.com:topst-private-release/vcp.git topst-vcp
```

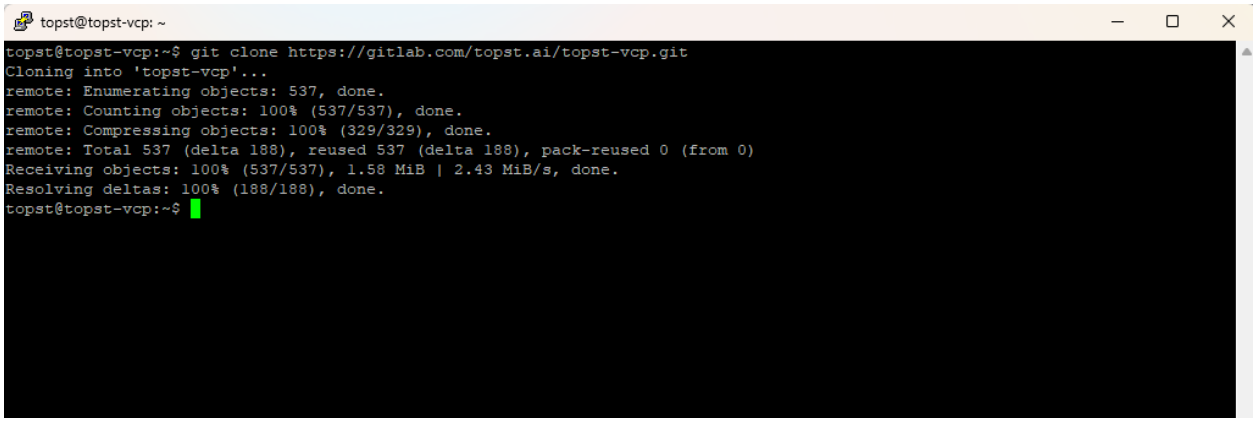

Figure 4.2 Clone Repository

4. **Navigate to the Cloned Directory**: After the cloning process is complete, use the following command to navigate to the directory containing the source code.

```
cd topst-vcp
```

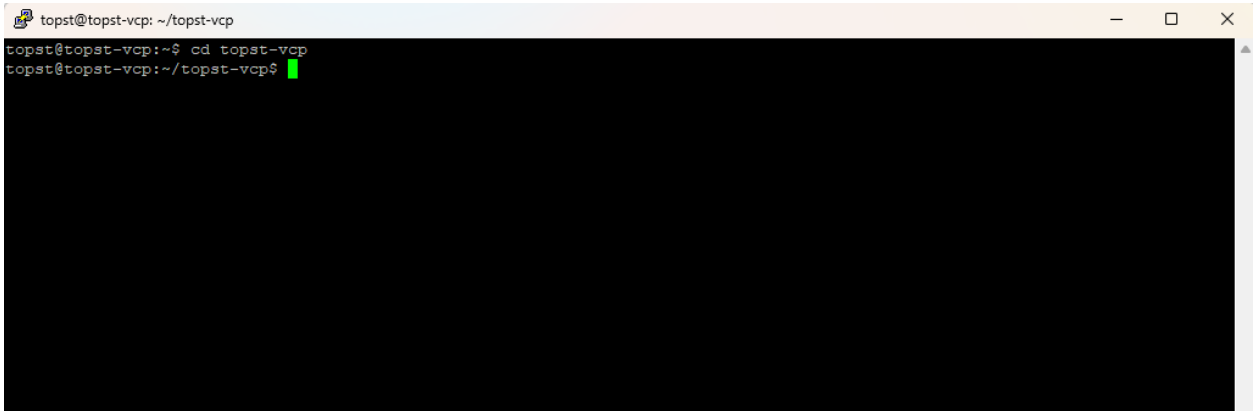

Figure 4.3 Navigate to Cloned Directory

The TOPST VCP-G source code is now available locally for building and development.

5.2 Source Code Structure

After cloning, enter the **ls** command to list the directory contents and review key files to understand the source code structure.

```
ls -al
```

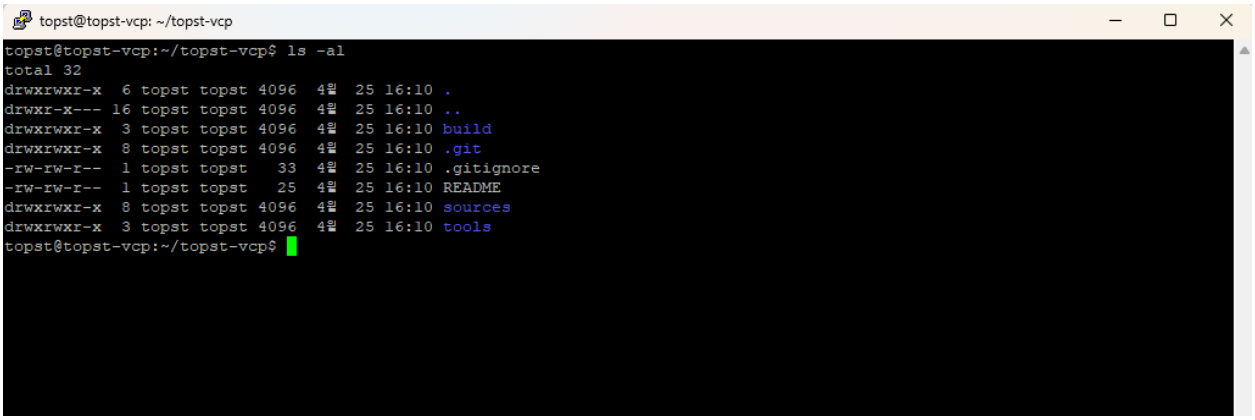

Figure 4.4 Source Code Structure

5 BUILD GUIDE

5.1 Makefiles and Build Systems

A Makefile is a key component of many build systems. It contains rules and directives for the **make** utility to compile and link programs. By utilizing a Makefile, you can automate the build process, ensuring consistency and efficiency.

5.2 Initiate Build Process

To build the source code, follow these steps:

1. **Navigate to the Build Directory:**

```
cd build/tcc70xx/gcc/
```

2. **Run the `make` command:**

```
make
```

The **`make`** command reads the Makefile in the current directory and executes the build process.

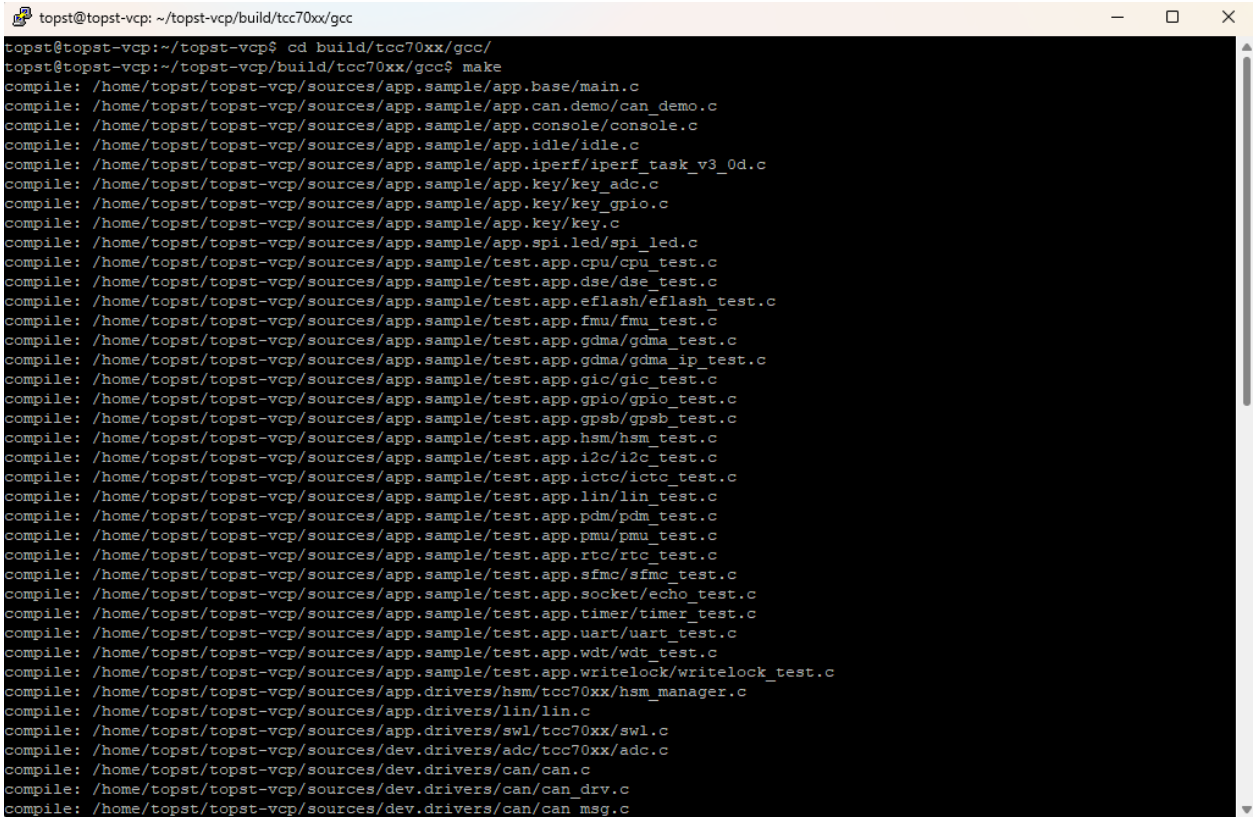

Figure 5.1 Run make Command

3. **Verify the Build Output**: After the build process is complete, the following output files should be listed in the terminal.
   - output/tcc70xx_pflash_boot.rom
   - output/tcc70xx_pflash_boot_2M_ECC.rom
   - output/tcc70xx_pflash_boot_3M_ECC.rom
   - output/tcc70xx_pflash_boot_4M_ECC.rom

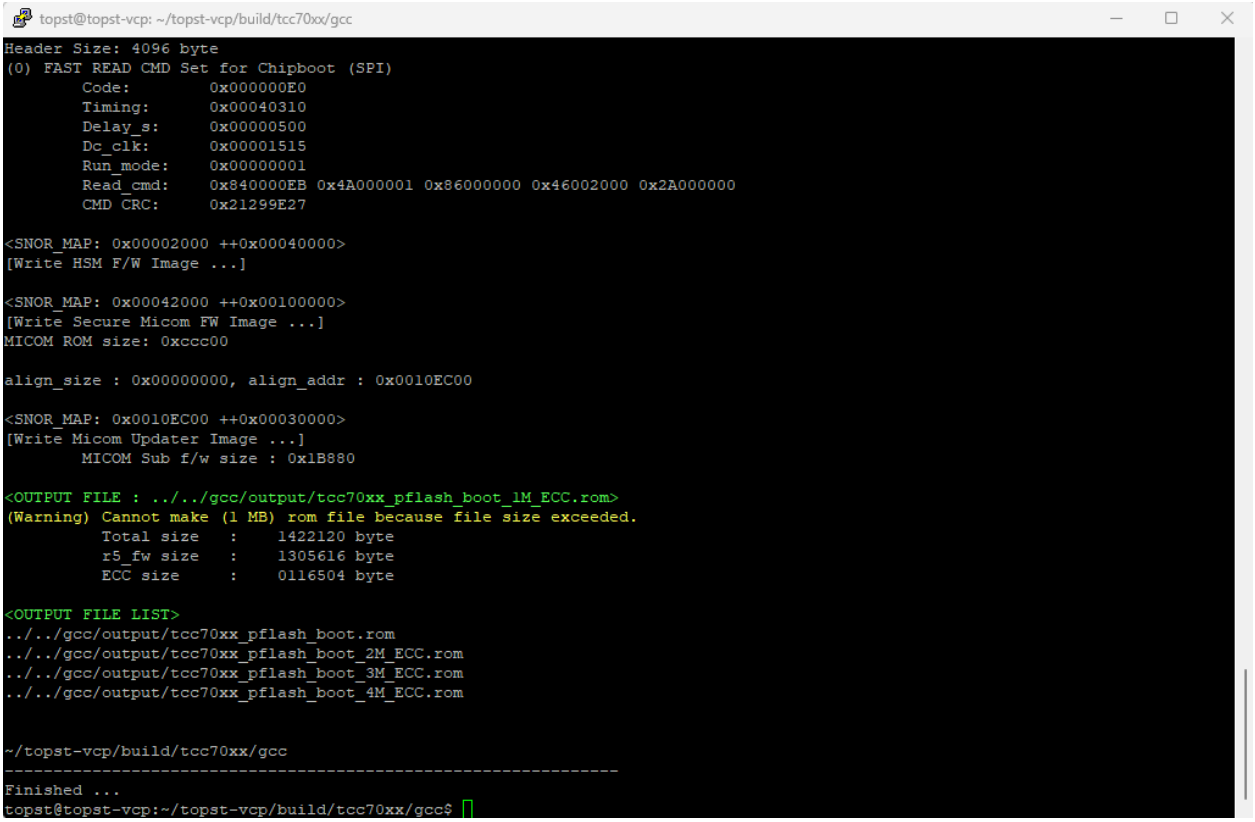

Figure 5.2 Verify Build Output

To check the list of output files, use the following command:

```
ls output/ -al
```

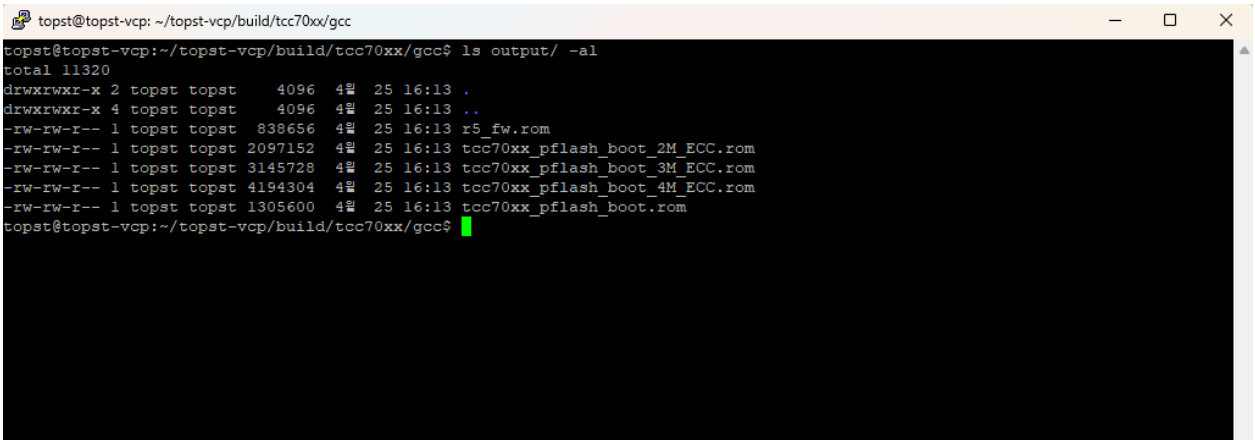

Figure 5.3 Build Output File

6 FIRMWARE DOWNLOAD

This chapter describes how to download ***FWDN*** to the TOPST VCP-G board in a Linux-based development environment.

6.1 Prepare TOPST VCP-G

Before beginning the download process, ensure that the TOPST VCP-G board is in a stable position and free from any potential disturbances. Ensure that all switches and connectors are easily accessible and 3.3V power cable should be connect correctly.

6.2 Connect Hardware to Host PC

If you use Ubuntu host, proceed directly to step 3.

1. **Download usbipd-win:** usbipd-win project is required to use USB in WSL2.
   Download usbipd-win from https://learn.microsoft.com/ko-kr/windows/wsl/connect-usb#attach-a-usb-device.

2. **Run PowerShell and attach the VCP-G (recognized as a COM port in Windows) to WSL2**:
   Execute the following commands in Windows PowerShell (not Linux).

```
usbipd list
usbipd bind --busid 4-X
usbipd attach --wsl --busid <busid>
```

3. **Connect USB Type-C Cable:** Use a USB Type-C cable to connect the TOPST VCP-G board to the development host PC.

4. **Verify USB Connection:** In WSL2, execute the following commands.

```
sudo apt-get install usbutils && lsusb
sudo dmesg | grep tty
```

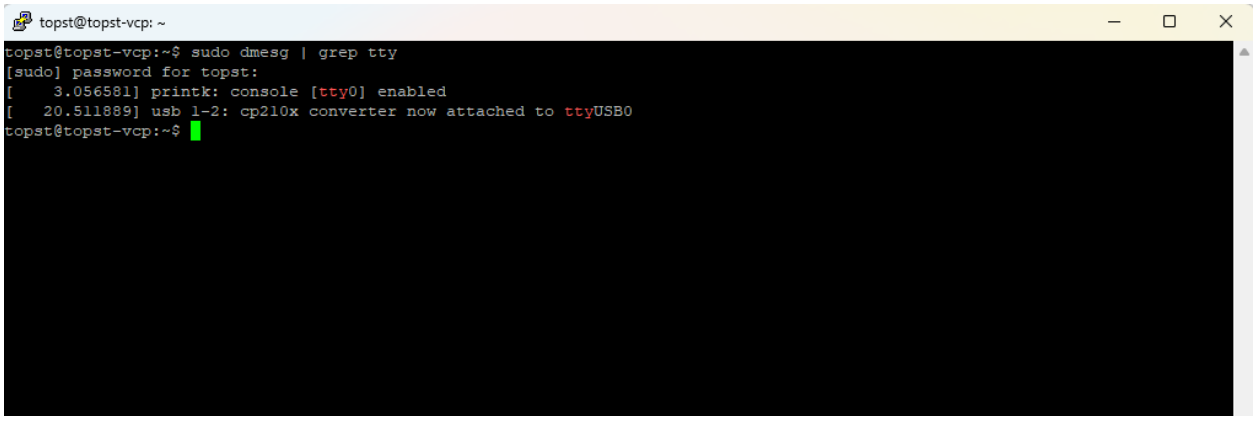

Figure 6.1 Verify USB Connection

If the output displayed in Figure 6.1 appears, the connection is successfully established.

6.3 Download Software on TOPST VCP-G Board

1. **Set the Board to Download Mode:** Connect the power cable to the TOPST VCP-G board while pressing the FWDN switch.

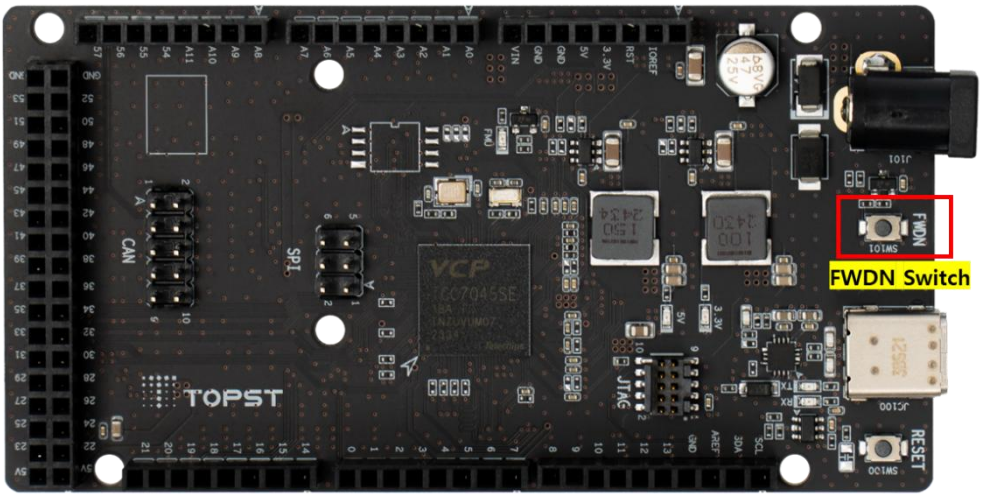

Figure 6.2 Set Board to Download Mode

2. **Execute the Download Command**: Use ***FWDN*** to download the built software to the 4 MB flash on the VCP-G board.

```
sudo ../../../tools/fwdn_vcp/fwdn --fwdn ../../../tools/fwdn_vcp/vcp_fwdn.rom -w
output/tcc70xx_pflash_boot_4M_ECC.rom
```

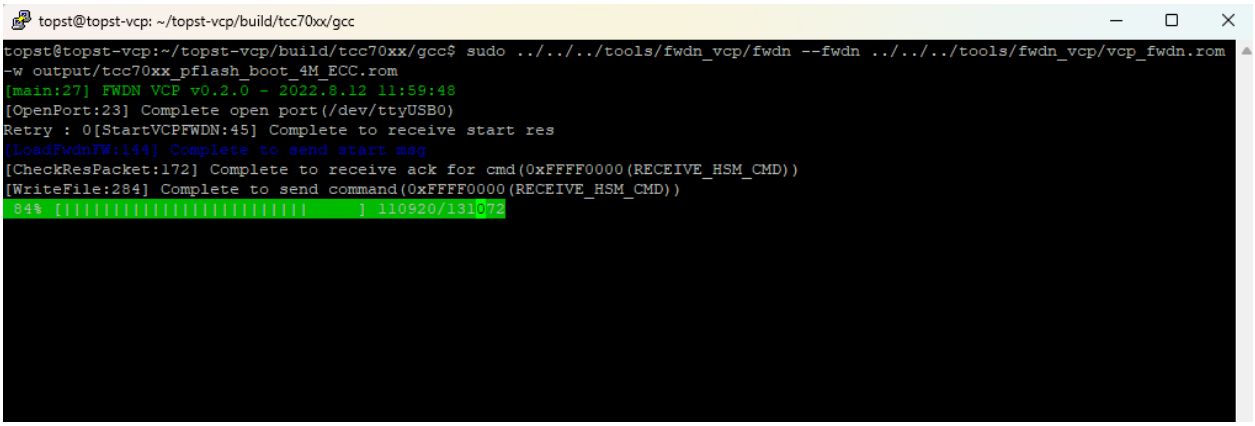

Figure 6.3 Execute Download Command

3. **Reset the Board:** After the download process is complete, disconnect and reconnect the power cable.

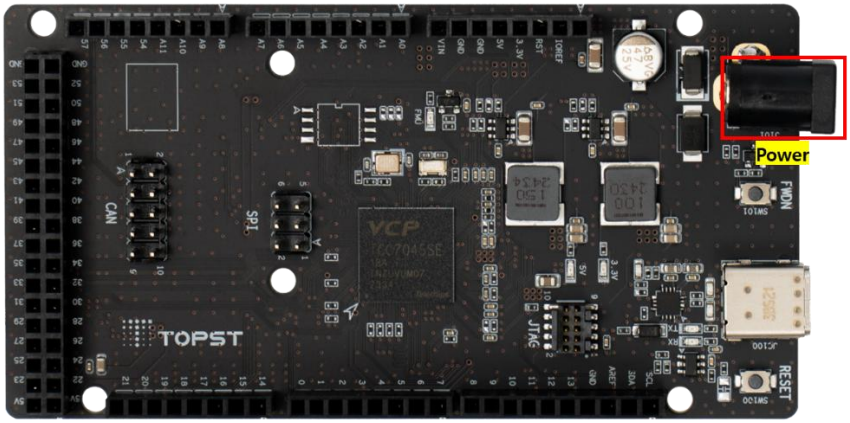

Figure 6.4 Reset the Board

6.4 Verify Software on Board

After downloading the software to the board, follow these steps to verify that it is operating correctly.

1. **Install Minicom**

```
sudo apt install minicom
```

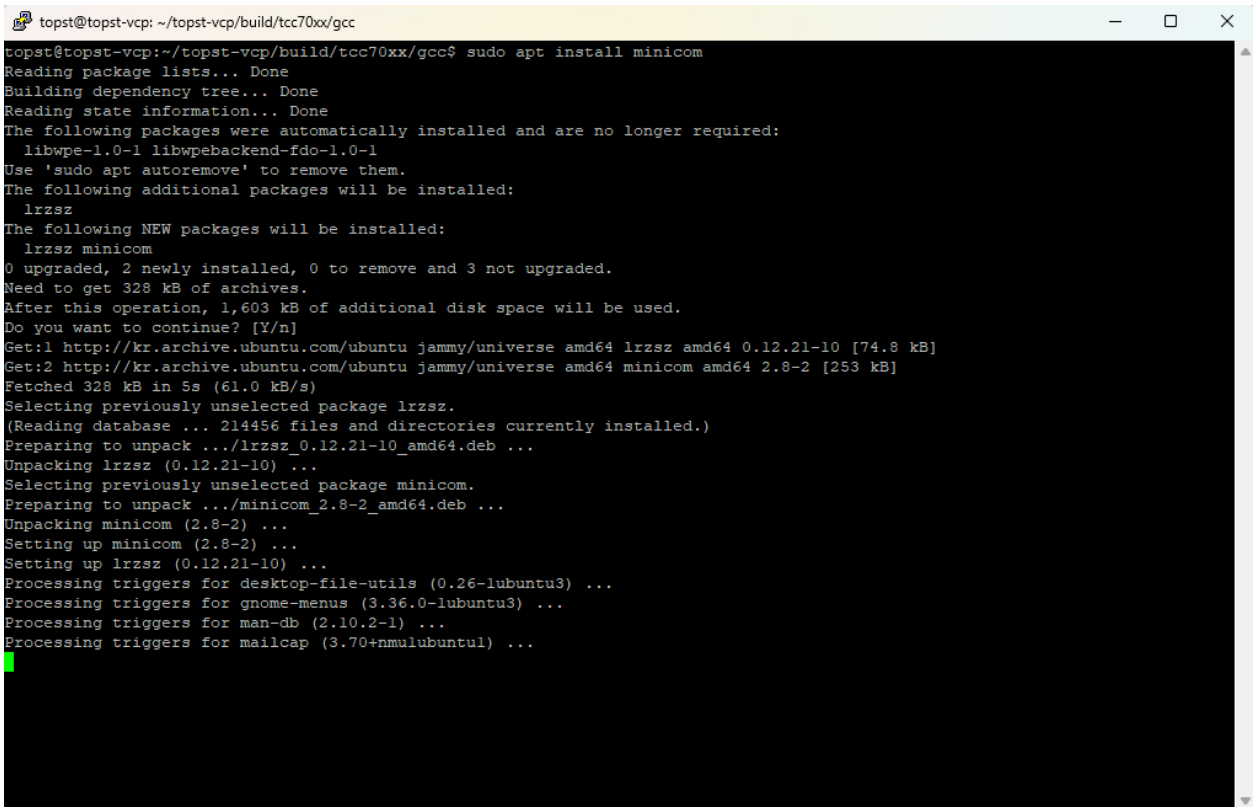

Figure 6.5 Install Minicom

2. **Open a Serial Connection**: Use the following command to initiate a serial connection.

```
minicom -D /dev/ttyUSB0 -b 115200 -8
```

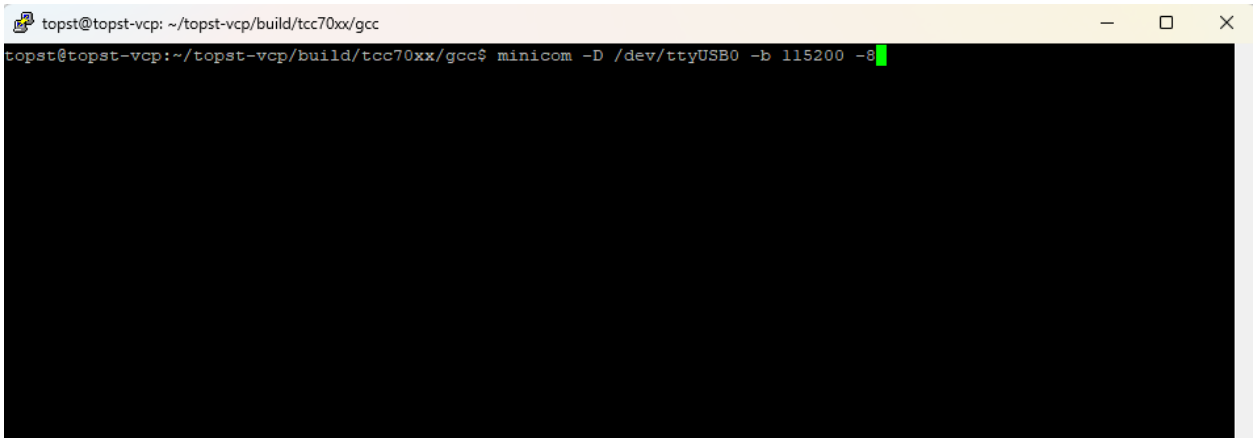

Figure 6.6 Open Serial Connection

After completing steps 1 and 2, the following output appears on the terminal. If the connection is successful, the board should respond to interactions, confirming that the software is downloaded and is operating correctly on the TOPST VCP-G board.

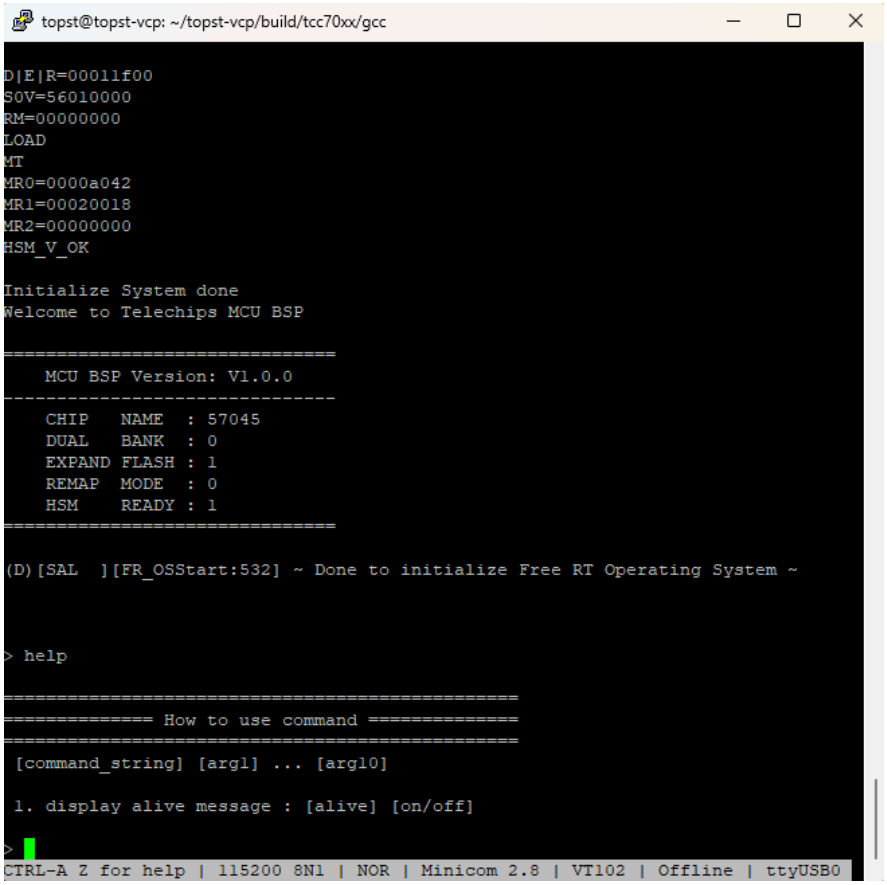

Figure 6.7 Open Serial Connection

6.5 Troubleshooting Common Issues

This chapter provides solutions to common issues encountered while working with the TOPST VCP-G board.

Issue : The ***FWDN*** reports a lack of permission to access the ttyUSB0 device.
Solution : This issue occurs when your user account (**$USER**) does not have the necessary permissions to access serial devices. To resolve this, add the user account to the dialout group.

1. **Modify User Group Permissions**: Execute the following command.

```
sudo usermod -aG dialout $USER
```

2. **Log Out and Log Back In**: Log out of the current session and log back in to apply the changes. After this, try accessing the ttyUSB0 device again.

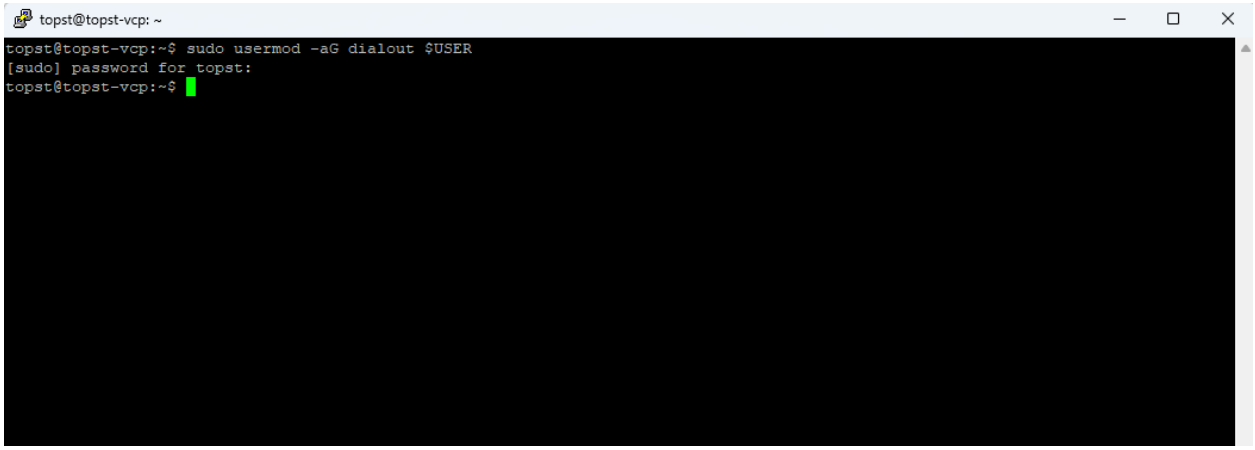

Figure 6.8 Modify User Group Permissions

Issue : When using minicom, there is no proper communication or irregular behavior with the TOPST VCP-G board.
Solution : This issue may occur if minicom's default flow control setting is set to **hardware**. The hardware flow control must be set to **No** for proper operation

1. **Start Minicom:** Use the following command.

```
minicom -D /dev/ttyUSB0 -b 115200 -8
```

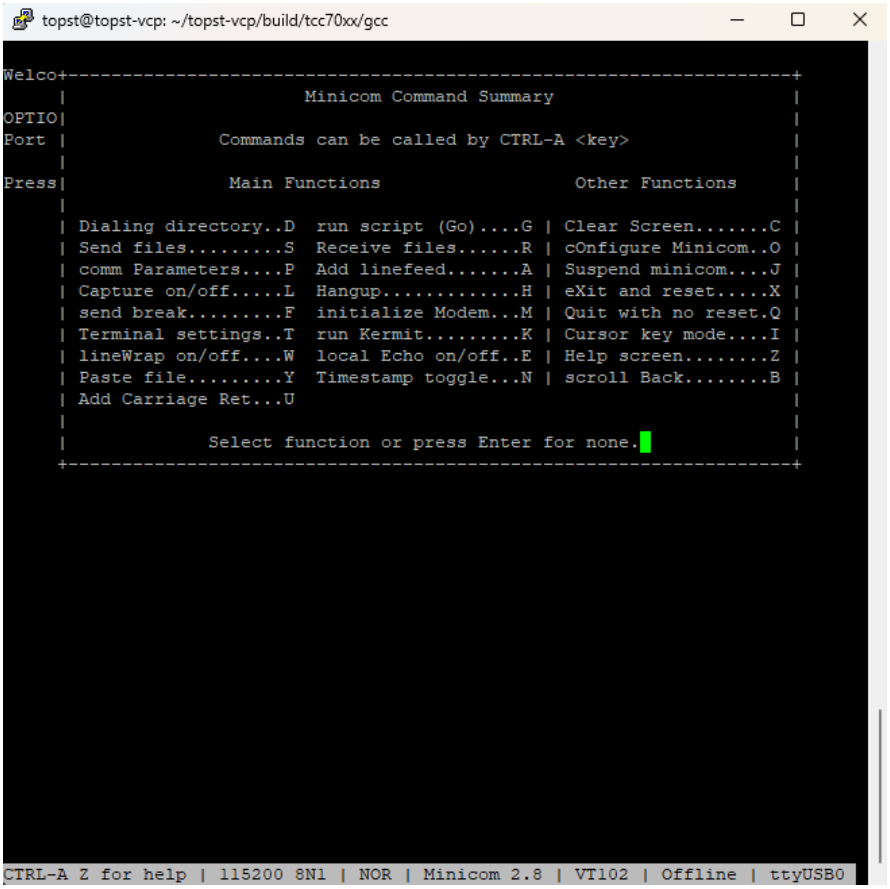

Figure 6.9 Launch Minicom

2. **Access the Setup Screen:** While in minicom, press **Ctrl-A** then press **o** to open the setup menu.

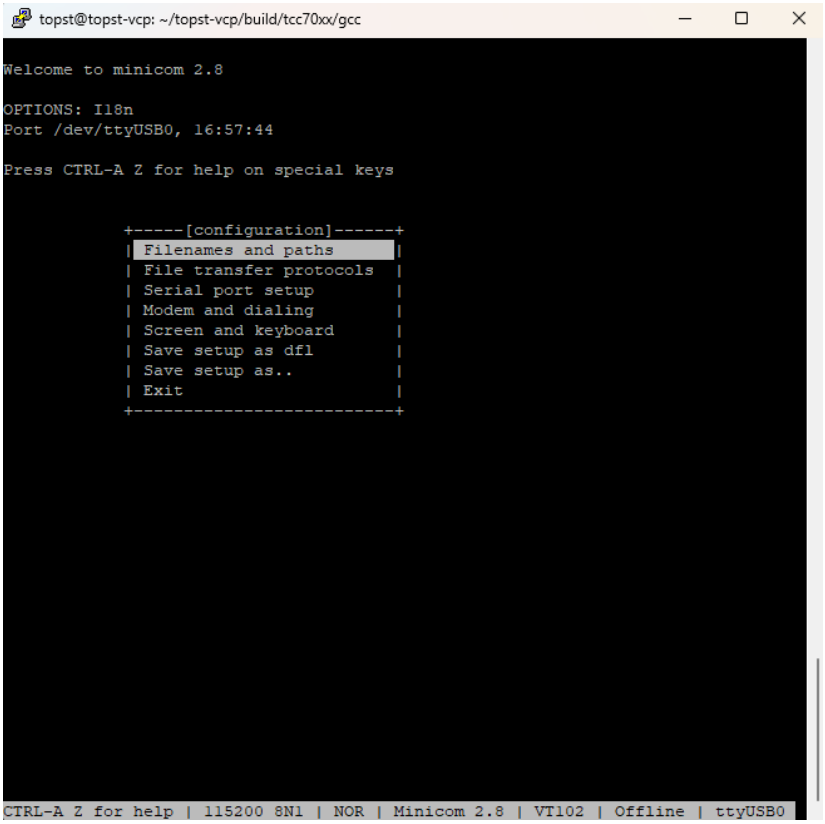

Figure 6.10 Access Set up Screen

3. **Navigate to Serial Port Setup**: Select `Serial port setup` from the options.
4. **Modify Flow Control:** Inside the serial port setup, press **F** to set the hardware flow control to **No**.

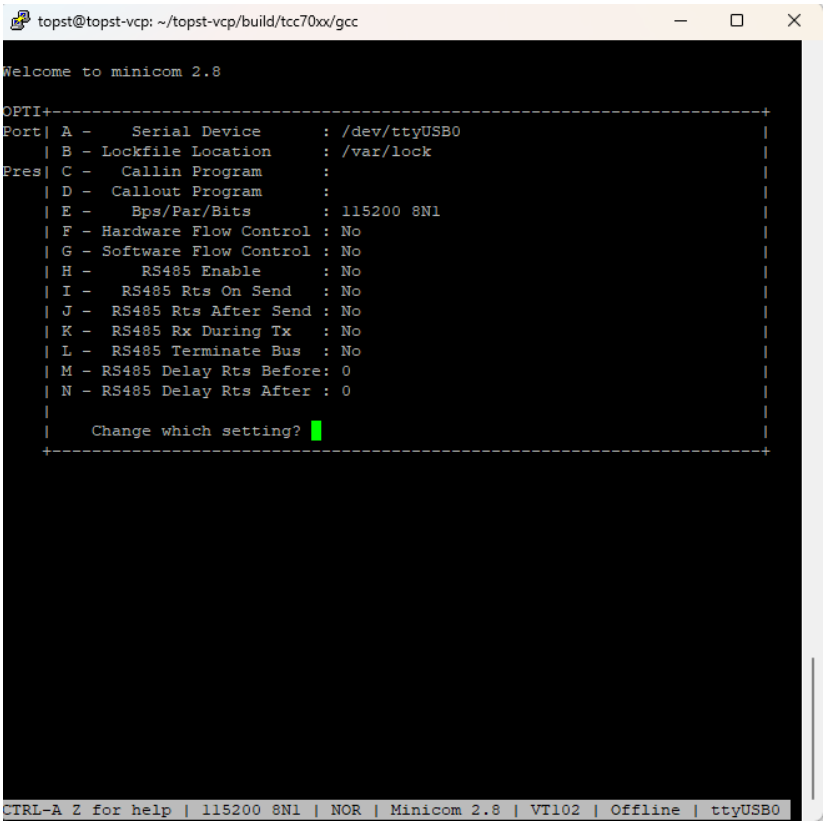

Figure 6.11 Modify Flow Control

5. **Exit and Save**: Exit the setup and save the configuration. Minicom should now communicate properly with the TOPST VCP-G board.

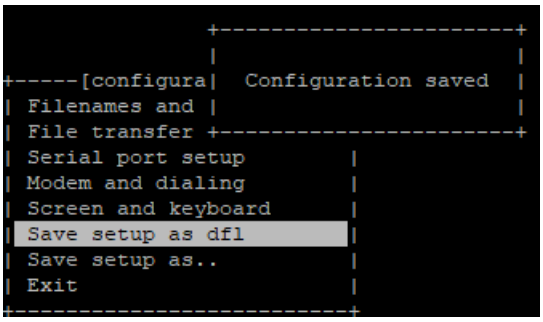

Figure 6.12 Save and Exit

Note: If you are using a different serial communication tool instead of minicom, ensure its flow control setting is also set to **no** for proper operation.

7 REFERENCES

[1] Contact TOPST for more details: topst@topst.ai

Note: Reference documents can be provided whenever available, depending on the terms of a contract. If the reference documents are unavailable, the contents directly related to your development can be guided.

8 REVISION HISTORY

Rev. 1.00: 2025-02-xx

- Official version release

DISCLAIMER

This material is being made available solely for your internal use with its products and service offerings of Telechips, Inc ("Telechips"). and/or licensors and shall not be used for any other purposes. This material may not be altered, edited, or modified in any way without Telechips' prior written approval. Unauthorized use or disclosure of this material or the information contained herein is strictly prohibited, and you agree to indemnify Telechips and licensors for any damages or losses suffered by Telechips and/or licensors for any unauthorized uses or disclosures of this material, in whole or part. Further, Telechips, Inc. reserves the right to revise this material and to make changes to its content, at any time, without obligation to notify any person or entity of such revisions or changes.

THIS MATERIAL IS BEING PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, WHETHER EXPRESSED, IMPLIED, STATUTORY OR OTHERWISE. TO THE MAXIMUM EXTENT PERMITTED BY LAW, TELECHIPS AND/OR LICENSORS SPECIFICALLY DISCLAIM ALL WARRANTIES OF TITLE, MERCHANTABILITY, NON-INFRINGEMENT, FITNESS FOR A PARTICULAR PURPOSE, SATISFACTORY QUALITY, COMPLETENESS OR ACCURACY, AND ALL WARRANTIES ARISING OUT OF TRADE USAGE OR OUT OF A COURSE OF DEALING OR COURSE OF PERFORMANCE. MOREOVER, NEITHER TELECHIPS, INC. NOR LICENSORS, SHALL BE LIABLE TO YOU OR ANY THIRD PARTY FOR ANY EXPENSES, LOSSES, USE, OR ACTIONS HOWSOEVER INCURRED OR UNDERTAKEN BY YOU IN RELIANCE ON THIS MATERIAL.

THIS MATERIAL IS DESIGNED FOR GENERAL PURPOSE, AND ACCORDINGLY YOU ARE RESPONSIBLE FOR ALL OR ANY OF INTELLECTUAL PROPERTY LICENSES REQUIRED FOR ACTUAL APPLICATION. TELECHIPS, INC. DOES NOT PROVIDE ANY INDEMNIFICATION FOR ANY INTELLECTUAL PROPERTIES OWNED BY THIRD PARTY.

COPYRIGHT STATEMENT