



LAB 2 : Installation Guide for Controlling the TI F28335

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As part of the course :

Programming on Electronic Card

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1 Introduction

1.1 Presentation of the Practical Work and the TI F28335 Card

In this lab module, we will focus on the TI F28335 board from Texas Instruments, designed for digital control and signal processing applications. This board incorporates a TMS320F28335 processor from the C2000 family, capable of operating up to 150 MHz, ideal for applications such as motor control and energy conversion.



FIGURE 1 - TI F28335 Board

The TI F28335 board offers various connectivity options, including CAN ports and analog and digital inputs/outputs. It is also compatible with expansion modules, thereby increasing its flexibility for various projects. During this lab, you will learn to use and program this board, exploiting its capabilities through practical exercises that cover the fundamentals of digital control and automation.

1.2 Objectives of the Practical Work

The main objective of this lab with the TI F28335 board is to introduce you to digital control and automation. By the end of this module, you should be able to :

- 1. Install and Configure the Necessary Software :
 - Master the installation of MATLAB, Simulink, and the necessary add-ons for communicating with the board.
- 2. Program and Experiment with the Board :
 - Program the board for basic applications such as sensor reading and actuator control.
 - Apply digital control concepts to design simple systems.
- 3. Develop Problem-Solving Skills :
 - Solve technical problems encountered during the lab.
 - Use available resources to find solutions to challenges.
- 4. Collaborate and Communicate :
 - Work in groups to complete exercises.
 - Present results and share learnings with peers.

These objectives aim to give you a practical understanding of the TI F28335 board, while developing both your technical and collaborative skills.

2 Software Installation

2.1 Downloading and Installing MATLAB

To start practical work with the TI F28335 board, the first step is to install MATLAB, an essential programming environment for manipulating embedded systems. Here are the detailed steps to download and install MATLAB :

1. Access the MathWorks Site :

- Open your web browser and go to the official MathWorks site at http://www.mathworks.com.
- If you already have an account, log in. Otherwise, create an account by following the on-screen instructions.
- 2. Obtain a License :
 - Students and teachers can often benefit from free or reduced-price licenses. Check if your institution offers a MATLAB license.
 - Otherwise, select the version of MATLAB you wish to purchase or try a free trial version if available.

3. Download the Software :

- Once logged in and the license acquired, go to the download section.
- Select the version of MATLAB you want to install. For this lab, it is recommended to use MATLAB 2022 or an earlier version, as later versions might not be compatible with the tools required for the lab.
- Download the installer corresponding to your operating system (Windows, MacOS, or Linux).

4. Installation :

- Launch the downloaded installer. You may need administrative rights to run the installation program.
- Follow the on-screen instructions to install MATLAB. Choose a destination folder for the installation and ensure that the necessary components for this lab, such as Simulink, are included in the installation.
- The installation may take some time depending on your Internet connection speed and your computer's performance.

5. Installation Verification :

- Once the installation is complete, open MATLAB to verify that the software is working properly.
- You can run a simple test script or open Simulink to ensure everything is correctly configured.

By following these steps, you will be ready to use MATLAB for the development and simulation of your projects on the TI F28335 board. Be sure to keep your software up-to-date to benefit from the latest improvements and bug fixes.

2.2 Verification and Installation of Simulink

After installing MATLAB, it is essential to ensure that Simulink, a crucial component for modeling and simulating dynamic and embedded systems, is properly installed and configured. Here are the steps to check and install Simulink :

1. Verification of Simulink Installation :

- Launch MATLAB by double-clicking on the application icon on your desktop or by searching for it in the start menu.
- Once in the MATLAB interface, check for the Simulink icon on the 'Home' tab. If you see the icon, this indicates that Simulink is already installed.

2. Installing Simulink if necessary :

- If the Simulink icon does not appear on the 'Home' tab, you need to install Simulink.
- Go to the 'Add-Ons' tab located on the MATLAB toolbar. Click on 'Get Add-Ons' to open the MATLAB Add-On Explorer.
- In the search bar of the Add-On Explorer, type "Simulink" and press Enter.
- Find Simulink in the search results, then click on the 'Install' button next to it. Follow the on-screen instructions to complete the installation.

3. Installing Simulink Coder :

- For work requiring code generation from Simulink models, Simulink Coder is also necessary.
- Repeat the process in the Add-On Explorer by searching for "Simulink Coder". Install it by following the same steps as for Simulink.

4. Initial Configuration :

— After installation, it is advisable to restart MATLAB to ensure that all new features are properly integrated.

- Open Simulink via the icon in the 'Home' tab and explore the sample models to familiarize yourself with the environment and confirm that the installation is functional.

5. Updating Simulink :

— MATLAB regularly provides updates for Simulink that include new features and bug fixes. It is recommended to check for available updates by going to the 'Help' tab in MATLAB, then select 'Check for Updates'.

By following these steps, you ensure that Simulink is ready to be used for your modeling and simulation projects on the TI F28335 board, thus enabling an optimal learning and development experience.

2.3 Installation of Necessary Add-ons

To optimize the use of MATLAB and Simulink for practical work with the TI F28335 board, certain specific add-ons are necessary. Here are the steps to install Simulink Coder, Embedded Coder, and MATLAB Coder :

1. Access to MATLAB Add-On Explorer :

- Launch MATLAB and, in the 'Home' tab, click on 'Add-Ons' to open the Add-On Explorer.
- This platform allows you to search for and install various tools and libraries that extend the capabilities of MATLAB and Simulink.

2. Installation of Simulink Coder :

- In the Add-On Explorer, use the search bar to find "Simulink Coder".
- Select Simulink Coder from the results and click on the 'Install' button. Follow the on-screen instructions to complete the installation.
- Simulink Coder allows for generating C and C++ code from Simulink models, which is essential for programming embedded systems like the TI F28335 board.

3. Installation of Embedded Coder :

- Search for "Embedded Coder" in the Add-On Explorer.
- Select Embedded Coder and install it following the provided procedure. Embedded Coder offers
 additional features to optimize and customize the generated code for embedded systems.
- This add-on is particularly useful for deploying models on processors like those in the Texas Instruments C2000 series.

4. Installation of MATLAB Coder :

- Search for "MATLAB Coder" in the Add-On Explorer.
- Click on the 'Install' button next to MATLAB Coder and complete the installation following the proposed steps.
- MATLAB Coder enables the conversion of MATLAB scripts and functions into standalone C/C++ code, which is crucial for integrating MATLAB algorithms into embedded applications and devices.

5. Verification of Installations :

- After installing each add-on, it is recommended to restart MATLAB to ensure that the new tools are properly integrated and operational.
- Test each add-on by opening project examples or running simple scripts to verify that code generation works without errors.

6. Regular Updates :

Keep your add-ons up to date by regularly checking for available updates via the Add-On Explorer.
 Updates may include significant performance and compatibility enhancements.

By properly installing and configuring these add-ons, you will be well-equipped to develop and deploy effective and high-performance embedded applications for the TI F28335 board.

3 Configuration of Packages for TI C2000

To program the TI F28335 board effectively, installing the "Embedded Coder Support Package for Texas Instruments C2000 Processors" is essential. Here are the detailed steps to install this package :

1. Search for the Package in MATLAB :

- Open MATLAB and access the Add-On Explorer from the 'Home' tab.
- In the search bar, type "Embedded Coder Support Package for Texas Instruments C2000 Processors" and press Enter.



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FIGURE 2 – Screenshot of the "Embedded Coder Support Package for Texas Instruments C2000 Processors"

2. Installation of the Package :

- Click on 'Install' to start the installation of the package.
- Accept various prompts that appear on the screen to continue with the installation. A page showing the progress of the installation will open.



FIGURE 3 – Progress of the Embedded Coder package installation.

3. Package Configuration :

— Once the installation is complete, click on 'Set Up Now'.



📣 Add-On Explorer



FIGURE 4 – Setup now

— A new window will open. Select all available processors by clicking on 'Select All', then click on 'Next'.

— Check the box 'Automatically install the licenses', then click on 'Install'.

📣 Hardware Setup

Install Third-Party Software (Step 1 of 2)

Choose the action for third-party tools:

Automatically download and install

Manually download and install

Click on the install button to download and install the required third-party tools. By clicking install button, you will be installing the software below which may contain open source software that may be under the terms of General Public License (GPL).

Name	Version	Details
TI C2000 Code Generation Tools	20.2.1	License
TI ARM Code Generation Tools	20.2.1	License

About Your Selection

Install the third-party tools or select 'Manually download and install' option to proceed further.

Х

What to Consider

The TI C2000 / ARM Code Generation Tools are required to create the executable from generated code for C28x / ARM core.

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4. Installation of Necessary Third-Party Software :

- Note, it is crucial to install the versions specified by MATLAB to ensure compatibility.
- You must install four main elements, you can follow the links marked by MATLAB to install these four elements this is even recommended :

a. TI controlSUITE :

- Access the download link for TI controlSUITE on TI.com.
- Create an account on Texas Instruments and log in to download. Fill out the required form, checking the box for civilian use and certify that the information is correct.

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FIGURE 6 – Screenshots of the TI controlSUITE download and approval process.

- Download the zip file, extract it and run the .exe file.
- b. TI Code Composer Studio (Version 11.0.0.00012) :
 - Download this specific version from TL.com. Be careful to select the specified version to ensure compatibility; otherwise, it will not work.



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12.1.0 (30 Sep 2022)		MD5 checksum	3fc1fab	e5645715e0	f90d27ed9	92c8b15			
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10.3.1.00003 (01 May 2021)	V								

FIGURE 7 – Download page for TI Code Composer Studio indicating version 11.0.0.00012.

- Follow the same procedure as for controlSUITE to download and install the software.
- c. TI C2000Ware (Version 4 00 00 00) :
 - Access the specific version of C2000Ware using the same download process as for the TI controlSUITE. The package is available at this address : TI C2000Ware 4 00 00 00.

d. TI F28044 Headers (Version 130) :

- I no longer have the exact link that is displayed on MATLAB unlike you who have not yet installed it. Therefore, I advise you to follow the link that is on your MATLAB and follow the installation procedure like the second software. Otherwise, you can download the following two links and also follow the installation procedure like the second :
 - SPRC191
 - SPRC324

Make sure to choose the specific version required for your needs and install it according to the detailed instructions provided.

5. Finalizing the Installation :

 After installing all third-party software, you will need to validate the installation directory in the software interface.





FIGURE 8 – Validation of the installation location of controlSUITE.

With these steps, all necessary installations to work with the TI F28335 board are complete. You are now ready to start familiarizing yourself with the board and begin your programming projects.