25085 MTR4 - Developing Motor Control Applications using Model Based Design

Last modified by Mark Reynolds (/xwiki/bin/view/XWiki/MarkReynolds) on 2025/07/22 11:49

Introduction

The purpose of this class and lab manual is to explore model-based design with embedded drive applications.

The labs incorporate various software and hardware tools to introduce you to the basics of model-based design and the development process. The lab begins with simple frequency modulation simulation and embedded code generation processes. In the later sections, it delves into more complex motor control models to demonstrate control loop tuning, showcasing real engineering use cases.

Upon completion, you will be able to :

- Build a model-based project from the very beginning
- Use the Scilab® tool to design a model
- Use X2C® communicator to analyse signals within the model
- Optimize control loops with model-based design techniques

Lab 1 - Model-Based Design – "HelloWorld" (/xwiki/wiki/masters/view/masters-2025-lab-manuals/25085/lab1/)

Lab 2 - Torque Mode (/xwiki/wiki/masters/view/masters-2025-lab-manuals/25085/lab2/)

Lab 3 - Speed Control Mode (/xwiki/wiki/masters/view/masters-2025-lab-manuals/25085/lab3/)

Prerequisites

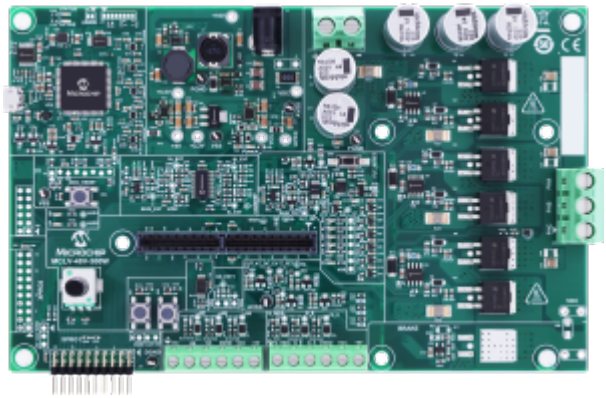
The lab material assumes you have prior experience with:

- MPLAB® X Integrated Development Environment (IDE)
- MPLAB development ecosystem-based programming/debugging fundamentals
- MPLAB Code Configurator (MCC) Melody
- C language programming
- Motor control fundamentals
- Real-time control loop fundamentals

Hardware Requirements

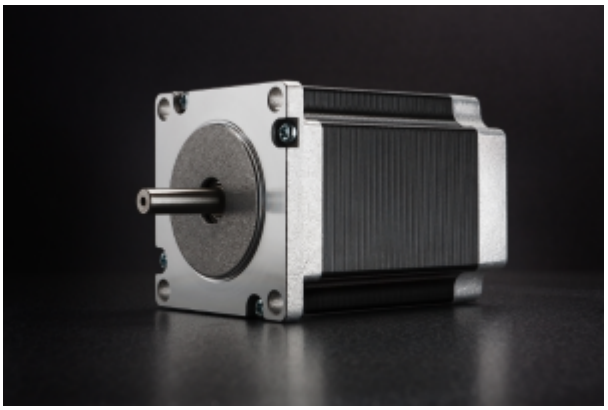
Here is the list of hardware needed to complete the labs:

- MCLV-48V-300W Part number: EV18H47A (https://www.microchip.com/en-us/development-tool/EV18H47A)



- dsPIC33AK128MC106 MC DIM Part number: EV68M17A (https://www.microchipdirect.com/dev-tools/EV68M17A)

- Brushless DC Motor ACT 57BLF02



Software Requirements

Here is the list of software needed to complete the labs:

✓ MPLAB® X IDE (version 6.25) (https://www.microchip.com/en-us/tools-resources/develop/mplab-x-ide)
✓ MPLAB® XC16 Compiler (version 2.10) (https://www.microchip.com/en-us/tools-resources/develop/mplab-xc-compilers/xc16)
✓ Scilab® (https://www.scilab.org/)
✓ X2C® (https://x2c.lcm.at/)

> Scilab: v2024.1.0 is preferred (64-bit) (version 6 or newer supported)
> X2C: v6.5 Free (latest nightly build)

Next

Lab 1 - Model-Based Design – “HelloWorld” (/xwiki/wiki/masters/view/masters-2025-lab-manuals/25085/lab1/)

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