



Qube-Servo 3

Block Diagram Modeling

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FCC Notice This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

Industry Canada Notice This Class A digital apparatus complies with CAN ICES-3 (A). Cet appareil numérique de la classe A est conforme à la norme NMB-3 (A) du Canada.

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VCCI-A



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电子信息产品污染控制管理办法 (中国 RoHS)



中国客户 Quanser Consulting Inc. 关于关于限制在电子电气设备中使用某些有害成分的指令 (RoHS)。

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This product meets the essential requirements of applicable European Directives as follows:

- 2014/30/EU; Electromagnetic Compatibility Directive (EMC)

Warning: This is a Class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.

Qube-Servo 3 – Application Guide

Block Diagram Modeling

Why explore Block Diagram Modeling?

Block diagram modeling provides a visual way to represent how different parts of a DC motor system interact. Think of it as creating a flow chart showing how electrical input becomes mechanical output.

The diagram typically includes blocks for the electrical system (representing current response), mechanical system (representing motion), and various feedback paths like back-EMF. This modeling approach helps visualize the relationships between system components and is particularly valuable for understanding system behavior and designing control systems. In the case of a DC motor using these parameters and equations, the angular velocity can be predicted from the input voltage using a block diagram.

Background

This is one of multiple labs describing how to model a servomotor. Any of these labs can be done in any order. These modeling labs include modeling through frequency response, step response, parameter estimation, block diagrams and state space.

Prior to starting this lab, please review the following concept reviews (should be located in Documents/Quanser/4_concept_reviews/),

- Concept Review – Modeling & IO → Modeling (Fundamental DC Motor Concepts section). You will need to understand the motor parameters as well as the mechanical and electrical equations.

Getting started

In this lab you will use the parameters found in the user manual and DC motor equations of motion from the concept review to create a block diagram model of the system response of the Qube-Servo 3.

Ensure you have completed the following labs

- **Hardware Interfacing Lab**
- **Filtering Lab**

Before you begin this lab, ensure that the following criteria are met.

- If using a physical Qube-Servo 3, make sure it has been setup and tested. See the Qube-Servo 3 Quick Start Guide for details on this step. Make sure the inertia disc load is attached to the Qube-Servo 3.
- If using the virtual Qube-Servo 3, make sure you have Quanser Interactive Labs open in the Qube 3 - DC Motor → Servo Workspace.
- **You have the Qube-Servo 3 User Manual.** It will be required to find relevant system information for some of the exercises.
- You are familiar with the basics of Simulink. See the [Simulink Onramp](#) for more help with getting started with Simulink.