

GETTING STARTED

NI SoftMotion™ Controller for Copley Controls CANopen Drives

This document provides step-by-step instructions for installing and getting started with the NI SoftMotion Controller for Copley Controls Accelnet and Xenus CANopen drives.

Refer to the [Related Documentation](#) section of this guide for a list of additional documents associated with the NI SoftMotion Controller. Many of these documents are available in Portable Document Format (PDF) on ni.com/manuals.

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Conventions

The following conventions are used in this guide:

»

The » symbol leads you through nested menu items and dialog box options to a final action. The sequence **File»Page Setup»Options** directs you to pull down the **File** menu, select the **Page Setup** item, and select **Options** from the last dialog box.



This icon denotes a tip, which alerts you to advisory information.



This icon denotes a note, which alerts you to important information.



This icon denotes a caution, which advises you of precautions to take to avoid injury, data loss, or a system crash.

bold

Bold text denotes items that you must select or click in the software, such as menu items and dialog box options. Bold text also denotes parameter names.

italic

Italic text denotes variables, emphasis, a cross reference, or an introduction to a key concept. This font also denotes text that is a placeholder for a word or value that you must supply.

monospace

Text in this font denotes text or characters that you should enter from the keyboard, sections of code, programming examples, and syntax examples. This font is also used for the proper names of disk drives, paths, directories, programs, subprograms, subroutines, device names, functions, operations, variables, filenames, and extensions.

Step 1. Verify Components

Before you begin installing and configuring your motion control system, make sure you have the following hardware and software components:

Hardware

- Development computer running Windows 2000/XP for configuring the CANopen drive and developing your application.
- LabVIEW Real-Time (RT) 7.1 target with NI-CAN support and documentation.
 - NI RT Series PXI embedded controller running the Ardence Phar Lap Embedded Tool Suite (ETS) real-time operating system.
 - Embedded LabVIEW target CD.

- NI CAN (Controller Area Network) series 2 high-speed interface card and documentation.
- NI-CAN 2.2 or later driver software.
- Copley Controls Accelnet or Xenus CANopen drive and documentation.
 - Copley Controls Connector/Cable Kit for connecting to your I/O.
 - Copley Controls RS-232 Serial Cable Kit for connecting to the development computer.
 - Copley Controls CANopen Network Kit for connecting to a CAN interface on the RT target.
- Compatible motor and power supply for the drive.

Software

- NI SoftMotion Controller CD. This CD contains the following NI software products:
 - NI SoftMotion Controller 1.0 or later.
 - NI-Motion 7.0 or later driver software.
 - Measurement & Automation Explorer (MAX) 3.1.1 or later configuration software.
 - NI Motion Assistant 1.3 or later application prototyping software (optional).
- Copley Controls Motion Explorer (CME 2) 4.0 or later configuration software and documentation.
- Copley Controls drive firmware 4.12 or later. Drive firmware is available for download from the Copley Controls Web site at www.copleycontrols.com.
- Application programming software and documentation.
 - To create applications that run under Windows, use one of the following software packages:
 - LabVIEW 7.0 or later
 - LabWindowsTM/CVI 7.0TM or later
 - Microsoft Visual C++ 6.0 or later
 - Microsoft Visual Basic 6.0 or later
 - To create applications that run on LabVIEW RT targets, use the LabVIEW Real-Time Module 7.1 or later.

Step 2. Install Copley Controls Software

Complete the following steps to install the CME 2 configuration software on the development computer.



Note To install software on the computer, you must be logged on with administrator-level access.

1. Insert the CME 2 CD into your CD-ROM drive to launch the CME 2 installation wizard.
2. Follow the installer prompts through the rest of the installation.
3. Shut down the development computer.

The CME 2 configuration software is installed.

Step 3. Connect the CANopen Drive

Complete the following steps to connect your I/O, motor, and power supply to the CANopen drive:



Tip Refer to the CANopen drive documentation for more information about completing the following steps.

1. Connect the I/O necessary for your application to the drive using the Connector Kit available from Copley Controls. Refer to Table 1 for a list of the I/O settings required by the NI SoftMotion Controller.

Table 1. CANopen Drive I/O Settings Required by the NI SoftMotion Controller

Terminal	Accelnet Signal	Xenus Signal
IN1	Inhibit in/drive fault	Inhibit in/drive fault
IN2	Forward limit	Forward limit
IN3	Reverse limit	Reverse limit
IN4	Home	Home
IN5	E-Stop, polarity is active-low	E-Stop, polarity is active-low
IN6	Digital input 1	Digital input 1
IN7	Digital input 2	Digital input 2
IN8	Digital input 3	Digital input 3
IN9	Digital input 4	Digital input 4

Table 1. CANopen Drive I/O Settings Required by the NI SoftMotion Controller (Continued)

Terminal	Accelnet Signal	Xenus Signal
IN10	Digital input 5	Digital input 5
IN11	Digital input 6	Digital input 6
IN12	Digital input 7	Digital input 7
Ref +	—	Analog positive input
Ref –	—	Analog negative input
OUT1	Inhibit out/brake	Digital output 1
OUT2	Digital output 1	Digital output 2
OUT3	Digital output 2	Digital output 3
OUT 4	—	Inhibit out/brake

2. Connect the motor and power supply to the drive.
3. Connect the drive to the development computer using the CME 2 RS-232 cable kit available from Copley Controls.

Step 4. Configure the CANopen Drive

Complete the following steps to configure the CANopen drive using the CME 2 configuration software.



Tip Refer to the documentation installed with CME 2 for specific instructions about completing these steps.

1. Power on the development computer.
2. Launch CME 2.
3. Configure a communications port on the development computer through which you want to communicate with the drive.
4. Set the drive operating mode to **Position**, and the position loop input to **CAN**.
5. Confirm the firmware on the drive is version 4.12 or later. If necessary, use CME 2 to update the drive firmware.

6. Set the motor/feedback parameters for the motor connected to the drive.
7. Set the CAN address for the drive.



Note Each CANopen drive in your system must have a unique CAN address that is less than or equal to the number of licensed axes on the NI SoftMotion Controller. Otherwise, the system will not recognize the drive.

8. Set the CAN bit rate to **1 Mbit/s**.
9. Tune the current, position, and velocity loops.
10. Select either **Pull Up +5 V** or **Pull Down** for the drive digital inputs depending on your motion control system.

Other than configuring the digital inputs for pull up or pull down, it is not necessary to use CME 2 to configure the drive I/O. The NI SoftMotion Controller uses the I/O settings specified in Table 1. However, to avoid confusion, National Instruments recommends that you set the drive I/O to **Not Configured** wherever possible.

11. Configure any additional settings necessary for your application.
12. Save the configuration data to the Flash memory on the drive.



Tip To configure multiple drives using the same configuration settings, save the configuration data to a disk before saving it to the Flash memory on the drive. You can then reload the saved configuration settings from the disk and configure additional drives.

The CANopen drive is configured.

Step 5. Install LabVIEW RT Target Support

Complete the following steps to install LabVIEW RT Target support on the development computer.

1. On the development computer, insert the embedded LabVIEW target CD into the CD-ROM drive to display the installation wizard.
2. Follow the installer prompts through the rest of the installation.

LabVIEW RT target support is installed on the development computer.

Step 6. Install NI-CAN Software and NI CAN Hardware

Complete the following steps to install the NI-CAN driver software and NI CAN interface card:

1. On the development computer, insert the NI-CAN CD into your CD-ROM drive to display the NI-CAN installation wizard.
2. In the Features dialog box, expand the **LabVIEW *xx* Support** branch of the feature tree, where *xx* is the version of LabVIEW you will use to develop your application.
3. Verify that **LabVIEW RT *xx* Support** is selected. If necessary, manually select to install **LabVIEW RT *xx* Support**.
4. Follow the installer prompts through the rest of the installation.
5. Install the NI CAN interface card in the RT target. Refer to the *CAN Hardware and NI-CAN Software for Windows Installation Guide* for specific installation instructions.

The NI-CAN software has been installed on the development computer. The NI CAN interface card has been installed in the RT target.

Step 7. NI SoftMotion Controller Installation

Complete the following steps to install the NI SoftMotion Controller on the development computer.

1. Insert the NI SoftMotion Controller CD into your CD-ROM drive to display the NI SoftMotion Controller installation wizard.
2. Click **Install NI SoftMotion Controller**.
3. Select **CANopen Drives**, and click **Next**.
4. Follow the installer prompts through the rest of the installation.
5. Refer to the `NI_SoftMotion_Controller_ReadMe.htm` file after installation is complete for last-minute information not contained in this document.

The NI SoftMotion Controller is installed on the development computer.



Tip To find updates for the NI SoftMotion Controller, visit ni.com/motion and select **Drivers and Updates**. For support questions, visit ni.com/support/motion.

Step 8. LabVIEW RT Target Configuration

Complete the following steps to install software on the RT target and configure the target for use with the NI SoftMotion Controller:

1. Make sure the RT target is connected to the same network as the development computer. If necessary, connect the RT target to the network.
2. Use the development computer to install the following software on the RT target. Refer to the *Remote Systems Help* topic of the *Measurement & Automation Explorer Help* for information about installing software on an RT target.
 - NI-CAN
 - LabVIEW Real-Time
3. Verify the NI-CAN installation on the RT target and assign an interface name to each physical CAN port on the target. Refer to the *NI-CAN Hardware and Software Manual* for instructions about verifying the installation.



Note You will need the interface name assigned to the RT target CAN port to which you want to connect the drive in order to properly configure the NI SoftMotion Controller in MAX.

4. Use the development computer to install the following software on the RT target. Refer to the *Remote Systems Help* topic of the *Measurement & Automation Explorer Help* for information about installing software on an RT target.
 - NI-Motion SoftMotion Controller Support
 - NI SoftMotion Controller for CANopen
5. Map the NI SoftMotion Controller on the RT target to a local system such as the development computer. Refer to *Measurement & Automation Explorer Help* for more information.
6. Connect the CANopen drive to the CAN port on the RT target using the CANopen network kit available from Copley Controls.

The RT target is configured.

Step 9. Activate the NI SoftMotion Controller

This section describes how to activate the NI SoftMotion Controller and add an axis to the controller.

Complete the following steps on the development computer to activate the NI SoftMotion Controller:

1. Launch MAX.
2. In the MAX configuration tree, expand **Devices and Interfaces** to obtain a list of installed devices.
3. Expand **NI Motion Devices** to obtain a list of available motion controllers.
4. Click the name of the motion controller you wish to activate.
5. On the MAX toolbar, click **Activate Device**.
6. Follow the prompts through the rest of the activation process.

The NI SoftMotion Controller is activated.

Step 10. Add an Axis to the Controller

Complete the following steps to add an axis to the NI SoftMotion Controller:

1. Right-click the name of the motion controller and select **Add Axis**.
2. Verify that the axis information is correct in the dialog box that appears, and click **Next**.
To change the axis information, double-click the **Name** and **Axis Number** fields and enter the correct information.
3. Click **Finish**.

An axis has been added to the NI SoftMotion Controller.

Step 11. Initialize the Axis

Before you initialize the axis and test your motion control system, verify that all the motion hardware—including motors, amplifiers, encoders, and limits—is correctly installed. Refer to the appropriate hardware documentation for installation instructions.



Note You must have a complete hardware setup to configure and test your motion control system.

Use MAX to initialize the axis and test your motion control system. Refer to the *Measurement & Automation Explorer Help for Motion* for specific instructions.

Related Software

The following sections describe National Instruments software packages that are useful for setting up and developing your motion control application.

Measurement & Automation Explorer (MAX)



MAX, the National Instruments configuration utility, installs with the NI SoftMotion Controller. You can use MAX to configure your motion controller and other National Instruments hardware devices and to update your National Instruments software.

To run MAX, double-click the MAX icon on your desktop, or navigate to **Start»Programs»National Instruments»Measurement & Automation**.

Figure 1 shows the MAX configuration window.

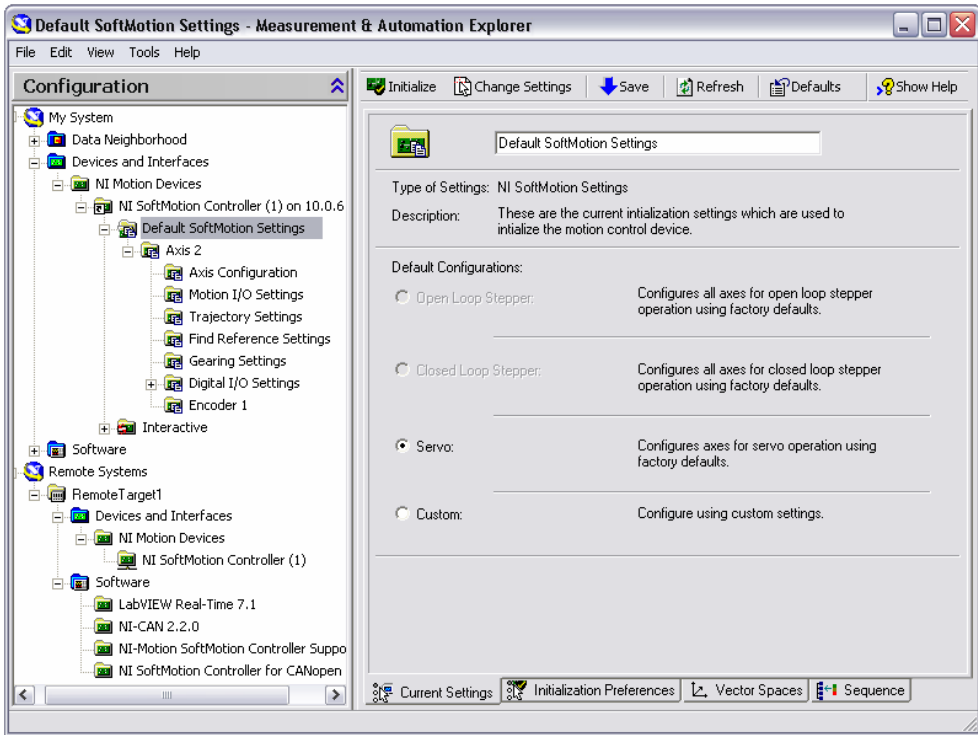


Figure 1. MAX Configuration Window

NI-Motion

NI-Motion is the driver software for National Instruments motion controllers. You can use NI-Motion to create motion control applications using LabVIEW, C/C++, and Microsoft Visual Basic.

Refer to the *NI-Motion User Manual* for more information about creating motion control applications using NI-Motion.

NI Motion Assistant

National Instruments Motion Assistant is a graphical prototyping tool you can use to prototype motion control applications. Motion Assistant contains features for simple and complex moves, graphical prototyping, and code creation.

Simple and Complex Moves

Motion Assistant offers several move types that represent the most often used moves in motion control. Supported moves include the following:

- Reference moves reset axes to a known location or state.
- Straight-line moves create simple point-to-point movement for basic motion applications.
- Arc moves enable circular, three-dimensional, and helical arc types.
- Contouring moves allow any trajectory specified by a series of coordinates.

Graphical Prototyping

Motion Assistant is a fully graphical interface that makes it easy for you to prototype a motion application by creating a series of moves. The position, velocity, and acceleration of the moves are graphed and editable in two and three dimensions.

Code Creation

When you are finished creating a prototype of a motion control application, you can use the Motion Assistant code creation feature to export LabVIEW VIs or C/C++ code. You can use the exported code to complete the application in LabVIEW, C, or C++. You also can use Motion Assistant to generate code recipes that you can use to code a motion control application in other text languages, such as Microsoft Visual Basic.

The code generation feature of Motion Assistant also creates placeholders in the generated code or code recipes for non-motion code, such as data or image acquisition, in any location you specify.

Advanced Features

Motion Assistant supports the digital output feature available with NI SoftMotion Controllers. This feature is designed to synchronize or coordinate external processes with moves.

The digital output feature allows you to write an ancillary digital output line to the NI SoftMotion Controller under the following conditions:

- Before Move Completes
- After Move Completes
- After Blend Completes

Hardware Support

Motion Assistant is compatible with the NI SoftMotion Controller 1.0 or later. The NI SoftMotion Controller supports Motion Assistant reference, straight-line, and arc moves. Position Compare is not currently supported.

Related Documentation

This section summarizes the documentation associated with the NI SoftMotion Controller. Use this information to determine which document is appropriate for your task. Many of the documents listed are available as PDFs on ni.com/manuals.

- *NI SoftMotion Controller ReadMe*—This document contains information about changes made to the NI SoftMotion Controller, “What’s New” information, system requirements, and known issues.
- *Measurement & Automation Explorer Help for Motion*—This help file provides information on using MAX to configure your motion controller.
- *NI-Motion ReadMe*—This document contains information about changes made to the NI-Motion software, “What’s New” information, system requirements, and known issues.
- *NI-Motion User Manual*—This document provides task-based information to guide you through each phase of designing and executing a motion application. This document contains information on selecting a motor, designing a basic move, designing a multi-axis move, incorporating machine vision and data acquisition into motion applications, and other common motion concepts, such as Bode analysis, contouring, and breakpoints.
- *NI-Motion VI Help*—This help file for LabVIEW applications provides detailed information about each VI, including a description, control and input terminals, usage, illustrations (diagram or code), and error codes.

- *NI-Motion Function Help*—This help file for C and Visual Basic applications includes dedicated function reference files, and provides detailed information about each function, including a description of the function, a list of the function parameters, illustrations, and error codes.
- Refer to the documentation included with your NI CAN interface card for specific information about the NI CAN Interface card and NI-CAN driver software.
- Refer to the documentation included with your CANopen drive for specific information about the CANopen drive and CME 2 configuration software.

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