

## GETTING STARTED

# NI SoftMotion™ Controller for Ormec ServoWire SM Drives

This document provides step-by-step instructions for installing and getting started with the NI SoftMotion Controller for Ormec ServoWire SM 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](http://ni.com/manuals).

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# Conventions

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The following conventions are used in this guide:

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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

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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 XP/2000.
- OHCI compliant IEEE 1394 interface, cable, and documentation.
- Ormec ServoWire SM drive and documentation.
- 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).
  
- ❑ Ardence Real-Time Extensions (RTX) 5.5.
  
- ❑ `SW-PRO-NI.exe`. This file includes installers for the Ormec RTX5-DRV 3.3.3 or later real-time 1394 driver software, ServoWire Pro 3.3.0 or later configuration software, and SMS-SMM-UPG 2.4.0 or later drive firmware.

`SW-PRO-NI.exe` is available for download from the Ormec Web site at [www.ormec.com](http://www.ormec.com). Contact your Ormec representative for more information.
  
- ❑ Application programming software and documentation.
  - To create applications that run under Windows, use one of the following software packages:
    - LabVIEW 7.0 or later
    - LabWindows™/CVI™ 7.0 or later
    - Microsoft Visual C++ 6.0 or later
    - Microsoft Visual Basic 6.0 or later
  - To create applications that run on LabVIEW Real-Time (RT) targets, use the LabVIEW Real-Time Module 7.1 or later.

## Step 2. Install RTX

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Complete the following steps to install RTX on the development computer:



**Tip** Refer to the RTX documentation for more information about completing the following steps.

1. Insert the RTX CD into the CD-ROM drive to display the RTX installation screen.
2. Launch the Windows Device Manager.

3. In the Windows Device Manager, verify that the Hardware Abstraction Layer (HAL) on the development computer is compatible with RTX.
4. If necessary, update the HAL on the development computer to an RTX compatible type.
5. Follow the RTX installer prompts to install RTX.
6. Restart the computer and verify that the computer performs correctly.

RTX is installed.

## Step 3. Configure the IEEE 1394 Port for RTX

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If you are using a third-party device to provide the IEEE 1394 port for the ServoWire SM drive, follow the instructions provided by the manufacturer to correctly install the adapter.

Complete the following steps to configure the IEEE 1394 device for RTX:



**Tip** Refer to the RTX documentation for more information about completing the following steps.

1. Convert the IEEE 1394 device into an RTX device.
2. Update the Windows device driver.
3. Verify that the IEEE 1394 device has a unique Interrupt Request (IRQ) value.
  - a. Launch the Windows Device Manager.
  - b. Select to view the resources by type.
  - c. Determine if the IEEE 1394 device has a unique IRQ value.
    - If the IEEE 1394 device has a unique IRQ value, close the Device Manager and proceed to [Step 4. Install Ormec Software](#).
    - If the IEEE 1394 device does *not* have a unique IRQ value, set the IRQ value to a unique value. Refer to the RTX documentation for information about modifying device properties.



**Note** It may take several tries to find an unused and unshared IRQ value. You may need to insert the IEEE 1394 device into a different PCI slot in the computer in order to find a unique IRQ value.

The IEEE 1394 port is correctly configured for RTX.

## Step 4. Install Ormec Software

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Complete the following steps to install the ServoWire Pro configuration software, RTX5 real-time 1394 driver, and the latest drive firmware on the development computer:

1. Launch `SW-PRO-NI.exe`.
2. On the SW-PRO-NI Installation screen, select **Install Software**.
3. Select **ServoWire Pro, RTX5-DRV Real-time 1394 driver**, and **SMS-SMM-UPG**.
4. Click **Install all checked items**.
5. Follow the installer prompts through the rest of the installation.



**Tip** To avoid having to load the ServoWire RTX drivers manually each time you restart your system, you can select the option to run the drivers at Windows startup in the RTX driver installation wizard.

6. Shut down the development computer.

The Ormec software is installed.

## Step 5. Connect the ServoWire SM Drive

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Complete the following steps to connect the ServoWire SM drive to your motion control system.



**Tip** Refer to the ServoWire SM drive documentation for more information about completing the following steps.



**Caution** ServoWire SM drives do *not* support hot plugging. Shut down your motion control system completely before adding or removing a ServoWire SM drive to/from your system.

1. Connect the I/O necessary for your application to the drive. Refer to Table 1 for a list of the I/O settings required by the NI SoftMotion Controller.

**Table 1.** ServoWire SM Drive I/O Settings Required by the NI SoftMotion Controller

Terminal	Signal
IN1	Forward limit switch
IN2	Reverse limit switch

**Table 1.** ServoWire SM Drive I/O Settings Required by the NI SoftMotion Controller

Terminal	Signal
IN3	E-Stop, polarity is active low
OUT1	Digital output 0
OUT2	Digital output 1
OUT3	Digital output 2
OUT 4	Inhibit out/brake
OUT5	Digital output 3
ASEN	High speed sensor input
BSEN	High Speed sensor input



**Note** ServoWire SM drives do not provide connections for Home Switch or Inhibit In signals.

2. Connect the ServoWire SM drive to a power supply and motor.
3. Connect the ServoWire SM drive to the development computer using a standard IEEE 1394 cable.
4. Set the drive ID for the ServoWire SM drive.



**Note** Each ServoWire SM drive in your motion control system must have a unique drive ID. Otherwise, your system may exhibit unpredictable behavior.

## Step 6. Configure the ServoWire SM Dive

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Complete the following steps to configure the ServoWire SM drive using ServoWire Pro:



**Tip** Refer to the ServoWire Pro documentation for more information about completing the following steps.

1. Power on the development computer.
2. Verify that the ServoWire RTX drivers are running.

If the ServoWire RTX drivers are not running, select **Start» Programs»Ormec RTX Drivers»Load RTX Drivers** to start the RTX drivers. The ServoWire RTX drivers must be running before you launch ServoWire pro and configure the drive.

3. Launch ServoWire Pro.

4. Create a new ServoWire Pro project.
5. Configure your project system settings.
  - a. Verify that the **This project is for an SMLC** and **Using Motion Objects Library** options are not selected.
  - b. Set the drive type to **SAC-SMS**.
6. Add a drive to your project.
  - a. Select the model your drive.
  - b. Select the drive ID of the drive you are adding.

It is not necessary to use ServoWire Pro 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 inputs to **General Purpose Input** and the drive outputs to **Programmable Output**.

7. Add a motor to the drive, and set the axis input command parameter to **Current**.
8. Configure additional settings based on your application.
9. If necessary, repeat steps 6 and 7 to add additional drives to your project.
10. Save the configuration file as `DMORMCOM.SwSetup` in the `C:\` directory.



**Note** If you do not save your configuration file as `DMORMCOM.SwSetup` in the `C:\` directory, you will not be able to add axes to the NI SoftMotion controller after it is installed.

11. Run the SwUpgrade utility in ServoWire Pro to confirm the drive firmware is version 2.4.0 or later.
12. Run the SwTune utility in ServoWire Pro to test your configuration and tune the motor.
13. Exit ServoWire Pro.

The ServoWire SM drive is configured.

## Step 7. Install the NI SoftMotion Controller

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Complete the following steps to install the NI SoftMotion Controller:

1. Insert the NI SoftMotion Controller CD into your CD-ROM drive to display the NI SoftMotion Controller installation screen.
2. Click **Install NI SoftMotion Controller**.
3. Select **ServoWire SM Drives**, and click **Next**.

4. Follow the installer prompts through the rest of the installation.
5. Refer to the `NI SoftMotion Controller ReadMe.html` file after installation is complete for last-minute information that is not included in this document.

Your NI SoftMotion Controller is installed.



**Tip** To find NI SoftMotion Controller updates, visit [ni.com/motion](http://ni.com/motion) and select **Drivers and Updates**. For support questions, visit [ni.com/support/motion](http://ni.com/support/motion).

## Step 8. Activate the NI SoftMotion Controller

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

Complete the following steps to activate the NI SoftMotion Controller:

1. Make sure that both the ServoWire RTX drivers and the LabVIEW Run-Time Engine are running before you launch MAX. If necessary, refer to the following instructions to start the ServoWire RTX drivers and LabVIEW Run-Time Engine:
  - To load the ServoWire RTX drivers, select **Start»Programs»Ormec RTX Drivers»Load RTX Drivers**.
  - To start the LabVIEW Run-Time Engine, right-click on the LabVIEW for RTX Manager icon in the Windows system tray, and select **Start LabVIEW for RTX**.



**Note** If the ServoWire RTX drivers and/or the LabVIEW Run-Time Engine is not running before you launch MAX, a red circle with a white X will appear next to the NI SoftMotion controller in MAX.

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

The NI SoftMotion Controller is activated.

## Step 9. Add an Axis to the Controller

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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**.



**Note** To change the axis information, double-click the **Device** and **Axis Number** fields and enter the correct information.

3. Click **Finish**.

An axis has been added to the NI SoftMotion Controller.

## Step 10. Initialize the Axis

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Before you initialize the axis and test your motion control system, verify that all the motion hardware—including motors, drives, 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

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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.

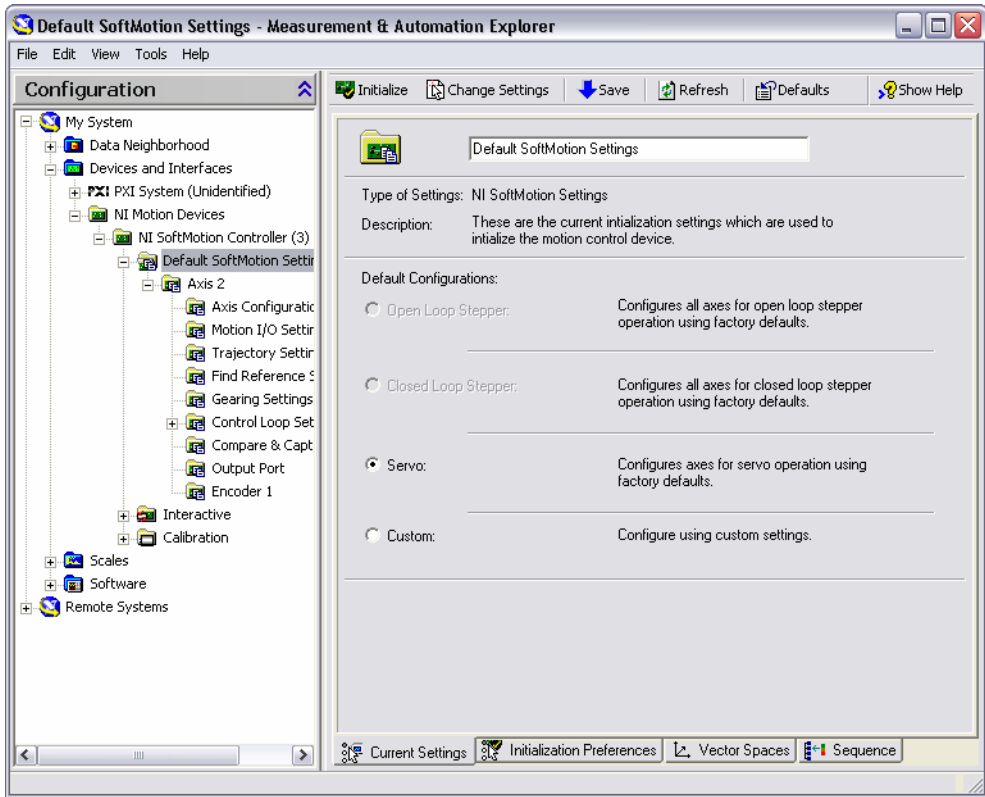


Figure 1. MAX Configuration Window

## 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 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

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This section summarizes each piece of documentation associated with your NI SoftMotion Controller. Use this information to determine which piece of documentation will be useful for your task.

- *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.
- *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.
- *Measurement & Automation Explorer Help for Motion*—This help file provides information on using MAX to configure your motion controller.
- Refer to the documentation included with your Ormec ServoWire SM drive for specific information about the ServoWire SM drive and ServoWire Pro software.

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