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Getting Started with NI-Motion for NI 73*xx* Motion Controllers

This document provides general guidelines for installing and getting started with the NI-Motion driver software and National Instruments 73*xx* motion controllers. Refer to the user manual or technical reference material that came with your computer for specific instructions about the computer.

Refer to the *Documentation* section at the end of this guide for a list of the hardware and software documents included with the 73*xx* motion controller and the NI-Motion driver software.

Installing NI-Motion

The following items are necessary for getting started with the 73*xx* motion controller:

- ❑ NI-Motion driver software and Measurement & Automation Explorer (MAX)
- ❑ One of the following software packages and documentation:
  - LabVIEW
  - LabWindows™/CVI™
  - Microsoft Visual C++
  - Microsoft Visual Basic
- ❑ NI Motion Assistant (optional)
- ❑ A computer with an available PXI or PCI slot or an IEEE 1394 port

NI-Motion Software Installation

You must install the NI-Motion driver software *before* installing a 73*xx* motion controller for the first time. If you are upgrading from a previous version of the NI-Motion driver software, it is not necessary to remove the 73*xx* motion controller before installing the upgrade. The upgrade does not affect the existing Windows configuration.

NATIONAL INSTRUMENTS™

Complete the following steps to install the NI-Motion driver software:

1. Insert the NI-Motion CD into the CD-ROM drive to display the NI-Motion installation screen.
2. Click **Install NI-Motion**.
3. Follow the installer prompts through the remainder of the installation.
4. Refer to the `NI-Motion ReadMe.htm` file for last-minute information.

73*xx* Motion Controller Installation

The following sections explain how to install the PCI, PXI, and IEEE 1394 controllers.

Note When adding or removing a controller from a Windows 2000/XP system, you must be logged on with administrator-level access. After you have restarted the system, you may need to refresh MAX to view the new controller.

PXI Controllers

1. Power off and unplug the chassis.

Caution To protect yourself and the computer from electrical hazards, the computer must remain unplugged until the installation is complete.

2. Choose an unused peripheral slot, and remove the filler panel.
3. Touch a metal part on the chassis to discharge any static electricity that might be on your clothes or body. Static electricity can damage the controller.
4. Insert the PXI controller into the chosen slot. Use the injector/ejector handle to fully secure the device into place.
5. Attach the front panel of the PXI controller to the front panel mounting rails of the chassis with the slot screws on the chassis.
6. Visually verify the installation.
7. Plug in and power on the chassis.

PCI Controllers

1. Power off and unplug the computer.

Caution To protect yourself and the computer from electrical hazards, the computer must remain unplugged until the installation is complete.

2. Remove the cover to expose access to the PCI expansion slots.

3. Choose an unused PCI slot, and remove the corresponding expansion slot cover on the back panel of the computer.
4. Touch a metal part on the computer case to discharge any static electricity that might be on your clothes or body before handling the controller. Static electricity can damage the controller.
5. Gently rock the controller into the slot. The connection may be tight, but *do not force* the controller into place.
6. If required, attach the mounting bracket of the controller to the back panel rail of the computer using the slot screws.
7. Replace the cover.
8. Plug in and power on the computer.

IEEE 1394

Note If you are *not* using the BP-1 battery pack, follow the instructions in this section. If you are using the BP-1 battery pack, follow the installation instructions in the *BP-1 Battery Pack Installation Guide*, and then begin with step 2.

1. Connect the power cord to a wall outlet and the IEEE 1394 controller.
2. Connect the IEEE 1394 cable from the computer or any other IEEE 1394 device to the port on the IEEE 1394 controller. The computer should immediately detect the 73*xx* motion controller. The COM LED on the front panel blinks when the computer recognizes the controller.
3. Verify that the power LED is on.

Use the Power LED and the Communication LED to determine the state of the device, as described below.

- Power LED
  - **Power LED off**—The controller is receiving no power. Either the power cord is unplugged, or the power source is not functioning correctly.
  - **Power LED dim**—The controller is receiving power but is not connected to an active IEEE 1394 port.
  - **Power LED on**—The controller is receiving power and is connected to an active IEEE 1394 port.
- Communication LED—The COM LED blinks when the 73*xx* motion controller sends or receives any commands or data. This LED should blink one time when you first plug in the 73*xx* motion controller. This light remains on or blinks continuously when large amounts of data are transferring.

Caution Make sure you have correctly connected all safety devices before you power on the motion system. Safety devices include inhibits, limit switches, and emergency shut down circuits.

Caution Always power on the 73*xx* motion controller before you power on the rest of the motion system. Power off in the reverse order, leaving the 73*xx* motion controller until last.

Firmware Updates

Firmware is software that is loaded onto the 73*xx* motion controller. Firmware allows you to update the 73*xx* motion controller with new features and updates. The latest firmware is automatically installed on the computer when you install the latest version of NI-Motion.You must download the firmware to the 73*xx* motion controller.

Complete the following steps to download firmware to a 73*xx* motion controller:

1. Click the MAX icon on the desktop, or select **Start»Programs» National Instruments»Measurement & Automation** to open MAX.
2. Expand **Devices and Interfaces**, and then expand NI Motion Devices in the configuration tree.
3. Select the motion controller you want to download firmware for.

   An exclamation point on the 73*xx* motion controller icon indicates that the firmware is outdated and must be updated.
4. Click the **Firmware** tab at the bottom of the window. An exclamation point appears for each firmware sector that requires an update.
5. Right-click the folder icon at the top of the firmware tree, and select **Update All Firmware Sectors**, as shown in Figure 1.

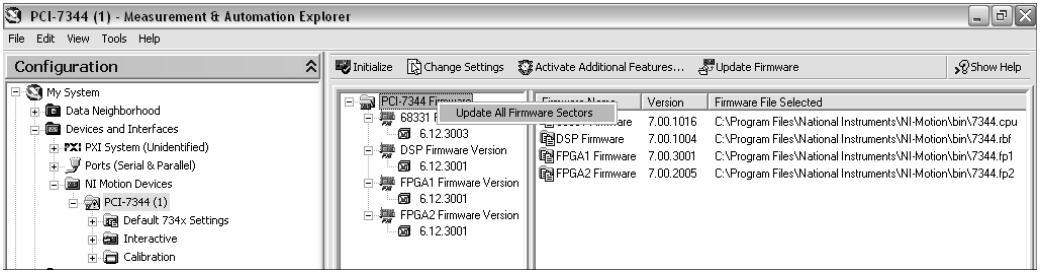


Figure 1. Updating the Firmware

Tip To find NI-Motion updates, visit `ni.com/motion` and select **Drivers & Downloads**. For support questions, visit `ni.com/support/motion`.

LabVIEW Real-Time Module Setup

Using 73*xx* motion controllers with the LabVIEW Real-Time Module and a remote PXI system is very similar to using NI-Motion with a PCI 73*xx* motion controller in the host machine. The only difference is that you must map the remote PXI system to the local machine before you configure and initialize the motion system. Figure 2 shows a remote 73*xx* motion controller mapped to the local machine. The IP address in the device name indicates that it is a remote device.

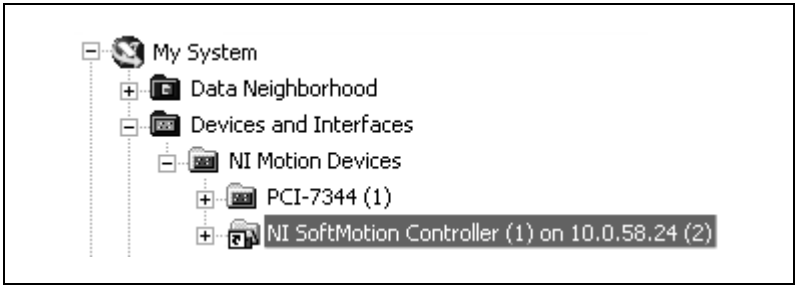


Figure 2. Mapped Remote 73*xx* Controller

When the 73*xx* motion controller is initialized, you can create a a deterministic, real time motion control application using the LabVIEW Real-Time Module and target the application to the remote device in the PXI system. Refer to the *Remote Systems* topic in the *Measurement & Automation Explorer Help for Motion* for information about mapping the remote system to the local machine.

Configuring Your Motion Control System

Before you configure your motion control system, install your motion hardware, including 73*xx* motion controller, motors, drives, encoders, UMI (if necessary), limits, and home switches. Refer to the appropriate hardware documentation for installation instructions.

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

Note National Instruments recommends you connect the 73*xx* motion controller axis inhibit outputs to the drive. Inhibit outputs are typically used to disable the servo or stepper drive for power savings, safety, or specific application reasons. Refer to the *NI-Motion User Manual* for information about inhibit outputs.

National Instruments recommends you use MAX to configure and test your motion control system. Refer to the *Measurement and Automation Explorer Help for Motion* for step-by-step configuration procedures.

Measurement & Automation Explorer (MAX)

Measurement & Automation Explorer (MAX) is the National Instruments configuration utility you use to configure National Instruments hardware products and update the firmware on those products. MAX installs with the NI-Motion driver software.

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

Figure 3 shows an illustration of the MAX configuration window.

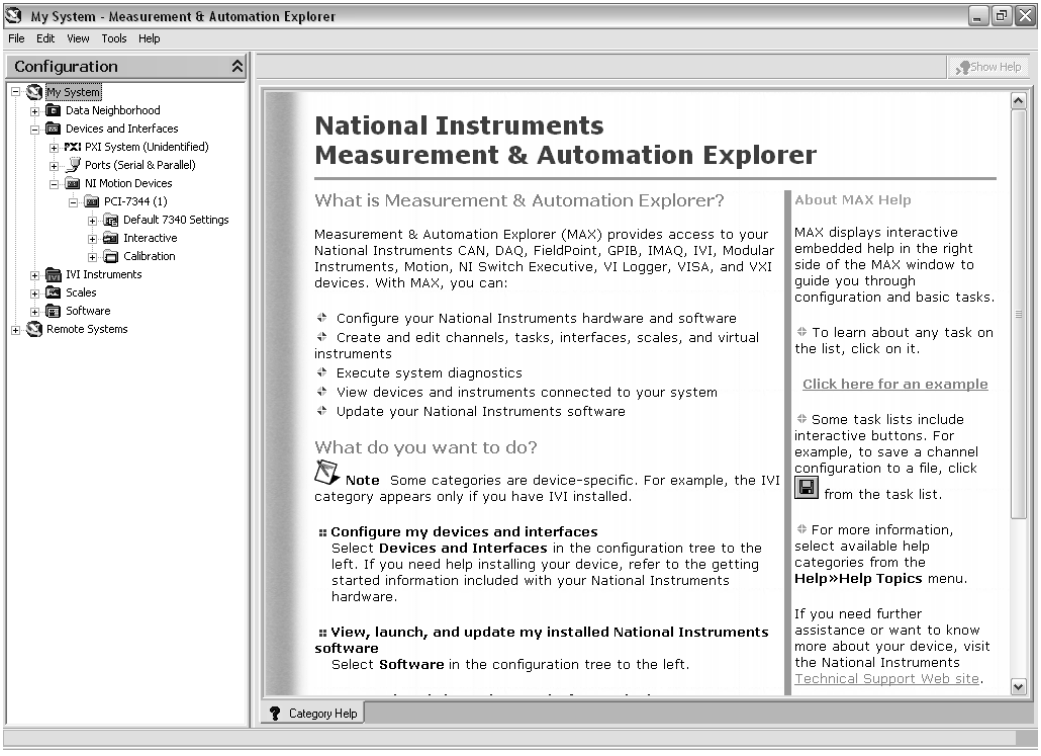


Figure 3. MAX Configuration Window

NI Motion Assistant

National Instruments Motion Assistant is a graphical prototyping tool you can use to prototype motion control applications. Motion Assistant contains the following features: 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 include home and index moves.
- 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 all 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, C, or 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 and position compare output features that are available on73*xx* motion controllers. These features are designed to be used with motion control to synchronize or coordinate external processes with moves.

The digital output feature allows you to write to an ancillary digital output line on the 73*xx* motion controller under he following move conditions:

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

The position compare output feature allows you to write to the position compare output lines on the 73*xx* motion controller at a specified position in the move. If you are using a 735*x* motion controller, you can configure multiple or periodic position compare outputs. Both options add multiple position compare outputs to a single move.

Hardware Support

Motion Assistant 1.3 is compatible with NI-Motion 7.0 and later. To create LabVIEW code from a Motion Assistant prototype, you must have LabVIEW 7.0 or later installed.

Motion Assistant requires that either the actual controller or the virtual representation of one of the following 73*xx* motion controllers be installed in the computer:

- 735*x*—All Motion Assistant features are available for this family of controllers.
- 734*x*—All Motion Assistant features are available for this family of controllers, excluding multiple and periodic position compare outputs.
- 733*x*—Motion Assistant reference, straight-line, and arc move features are available for this family of controllers, excluding multiple and periodic position compare outputs.

Using Motion Assistant Without Hardware

If you do not have one of the listed 73*xx* motion controllers, you can use a virtual 73*xx* motion controller in MAX to preview the functionality of Motion Assistant. Follow the instructions in the *Motion Assistant Help* to install a virtual 73*xx* motion controller.

Documentation

This section summarizes each document included with the 73*xx* motion controller and the NI-Motion driver software. Use this information to determine which document is most useful for the task you are performing:

- **Motion controller hardware user manual**—The hardware user manual describes the electrical and mechanical aspects of the 73*xx* motion controller, and contains information about installing and operating the device.
- ***NI-Motion User Manual***—The software user manual is task-based and takes you through each phase of designing and executing a motion application. This document contains information about selecting a motor, designing a basic move, designing a multi-axis move, incorporating vision and DAQ into motion applications, and working with common motion concepts, such as contouring and breakpoints.
- ***NI-Motion Release Notes***—This HTML document contains system requirements, installation instructions, descriptions of any changes made to the software, information about new features in the release, and information about late-breaking known issues that are not documented in other NI-Motion documents.
- ***NI-Motion Function Help***—This help file for C and Visual Basic environment applications includes dedicated function reference files, and provides details about each function, including a description of the function, a list of the function parameters, illustrations, and error codes.
- ***NI-Motion VI Help***—This help file for LabVIEW applications includes dedicated VI reference files, and provides details about each VI, including VI descriptions, lists of control and input terminals, usage, illustrations, and error codes.
- ***Measurement & Automation Explorer Help for Motion***—This help file provides information about using MAX to configure the 73*xx* motion controller as well as some advanced conceptual information about topics such as BODE analysis and control loop parameters.

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