VEX Cortex Configuration over USB

The VEX Cortex is a fully programmable device, and is what enables you to incorporate motors, sensors, an LCD screen, and remote control signals all in one robot. Inside of the Cortex, there are two separate processors; a user processor handles all of the ROBOTC programming instructions, and a master processor controls lower-level operations, like motor control and VEXnet communication.

This document is a guide for downloading the Master CPU firmware and ROBOTC firmware to the VEX Cortex using the USB A-to-A cable. These steps are required the first time you use your computer to program a VEX Cortex in ROBOTC 3.0 or later. Once your computer has the appropriate software installed and the VEX Cortex has its Master CPU Firmware and ROBOTC Firmware installed, you can download your own programs without revisiting the steps detailed in this document.

You will need:

- 1 VEX Cortex Microcontroller with one 7.2V Robot Battery
- A computer running Windows XP (SP3 or later) or Windows 7 (SP1 or later)
  You will need Administrative privileges for steps 1 through 7 of this document!
- 1 USB A-to-A Cable
- 1 Paperclip or 5/64 Allen Wrench

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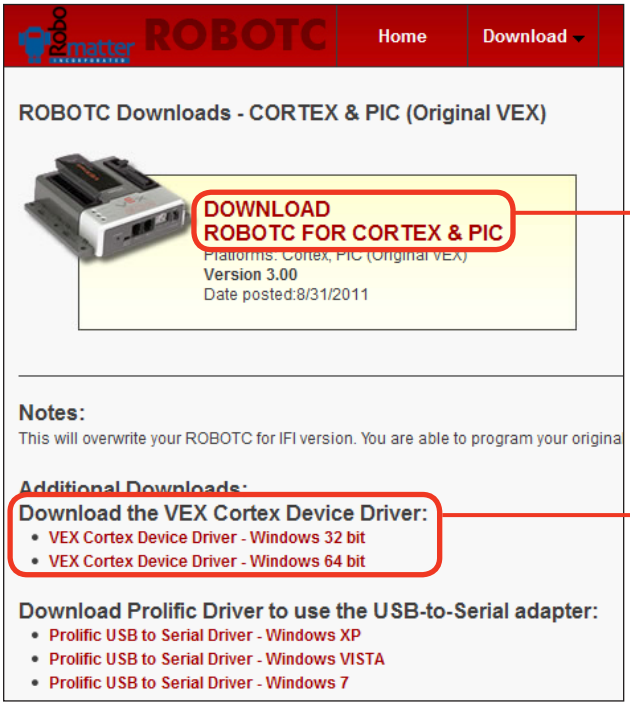
1. If your computer does not already have the latest versions of *ROBOTC for Cortex and PIC* and the *VEX Cortex Device Driver* installed, you can download and install them from *www.ROBOTC.net/download/cortex*. Otherwise, you can proceed at Step 2 of this document.



1a. Download and Install ROBOTC
Download the latest version of ROBOTC for Cortex and PIC from www.ROBOTC.net/download/cortex.

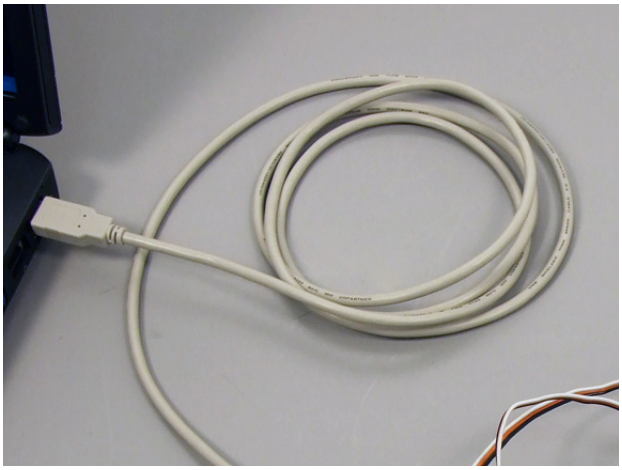
Double-click on the downloaded file to begin the installation. Follow along with the prompts to complete the software installation.

1b. Download and Install the Cortex Driver
Download the appropriate VEX Cortex Device Driver for your Operating System. Download the 32 bit version for computers running a 32 bit version of Windows; download the 64 bit version for computers running a 64 bit version of Windows. Check your System Properties or speak with your administrator to confirm which type of Operating System is installed on your computer.

Double-click on the downloaded file to begin the installation. Follow along with the prompts to complete the software installation.

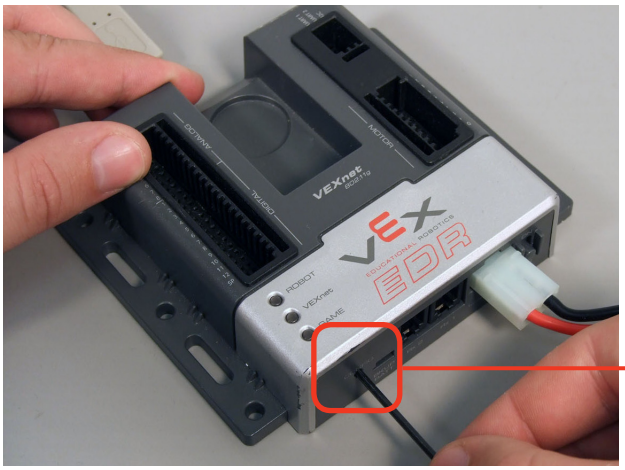
VEX Cortex Configuration over USB *(cont.)*

2. Connect the Cortex to your computer in "Bootload" mode. Keep the Cortex powered OFF.

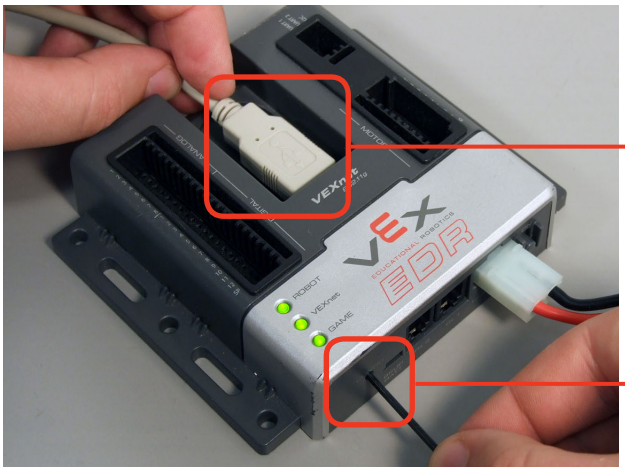


2a. Connect the USB A-to-A Cable
Plug one end of the USB A-to-A Cable into a USB port on your computer. Do not plug the other end into the Cortex.

Note: The order detailed in these steps is crucial. When the Cortex is powered on, it immediately tries to determine how it is connected (over VEXnet, USB, or no connection). Some power is provided to the Cortex over USB, which will allow it to determine that it is connected to your computer.

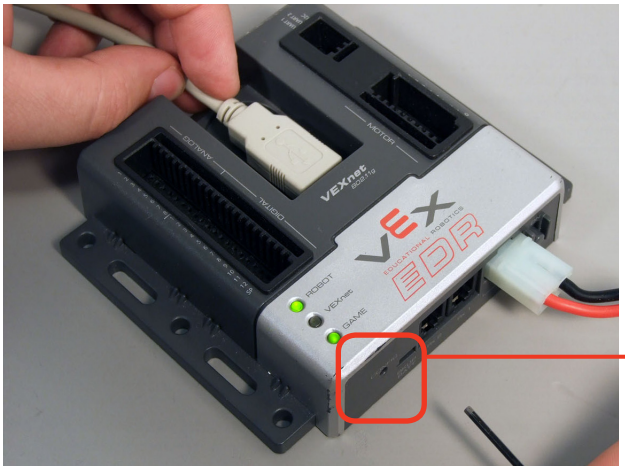


2b. Press in the CONFIG button on the Cortex
Use a paperclip or a 5/64 Allen Wrench to press and hold in the CONFIG button on the Cortex.



2c. Connect the USB A-to-A Cable
While pressing in the CONFIG button, connect the other end of the USB A-to-A cable to the USB port on the VEX Cortex. Keep the CONFIG button pressed in for an additional 5 seconds.

VEX Cortex Configuration over USB *(cont.)*

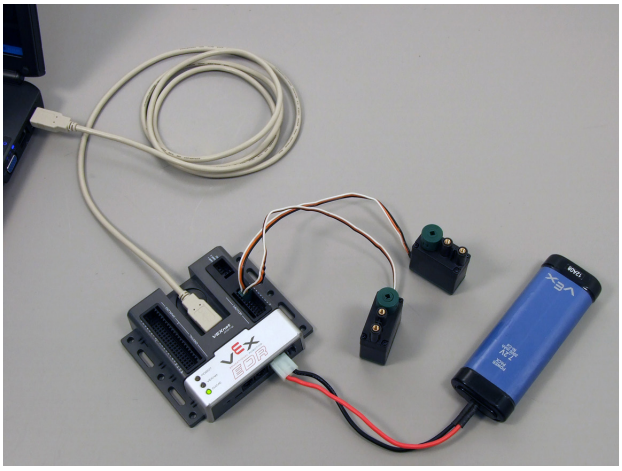


2d. Release the CONFIG Button
Remove the Allen Wrench or paperclip, releasing the CONFIG button. After a few seconds, the ROBOT and GAME lights should blink green. If not, repeat Step 2.

3. Move the POWER switch on the VEX Cortex to the ON position.

3a. Turn the Cortex ON
Make sure a 7.2V Robot battery is connected and move the POWER switch on the Cortex to the ON position.

Note: If your Cortex is connected to a mobile robot, it's recommended that you prop the robot up to prevent its wheels from making contact with a surface. The motors may turn on and off during the firmware download process.

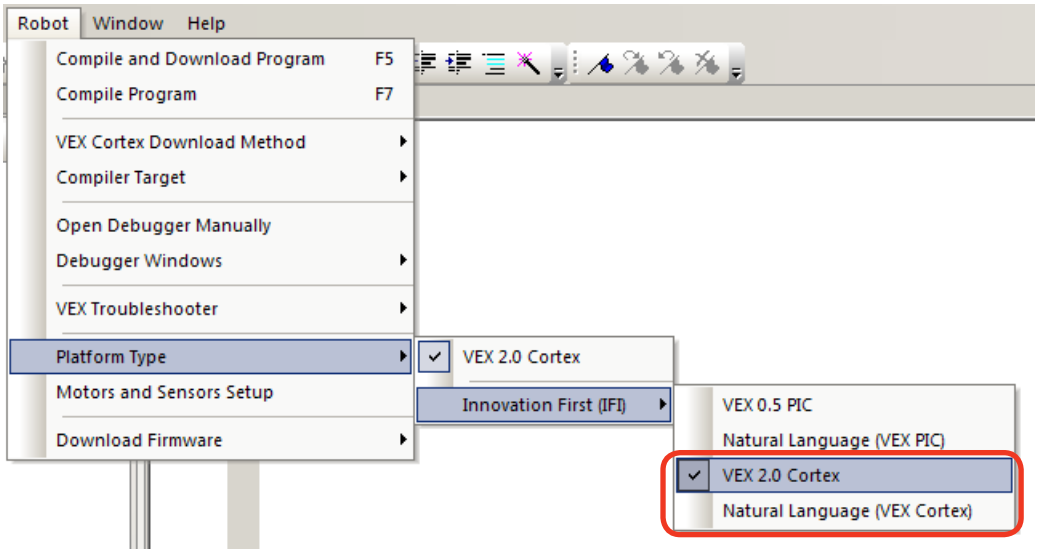


3b. Overall Setup
Your setup should resemble the one in this picture, with the USB A-to-A cable connecting your computer and the VEX Cortex, and the 7.2 Volt Robot Battery powering the VEX Cortex.

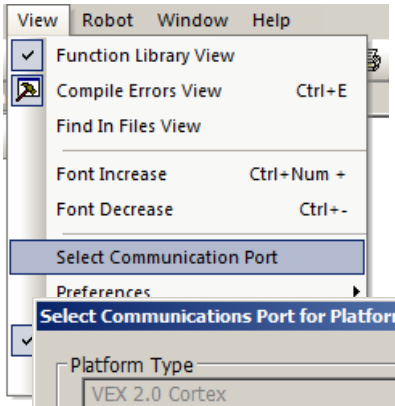
Note (Optional): You can connect two motors to MOTOR Ports 2 and 3 for testing a sample program later in the sequence. You can connect 3-wire motors directly, or the newer 2-wire motors using Motor Controller 29 cables.

VEX Cortex Configuration over USB *(cont.)*

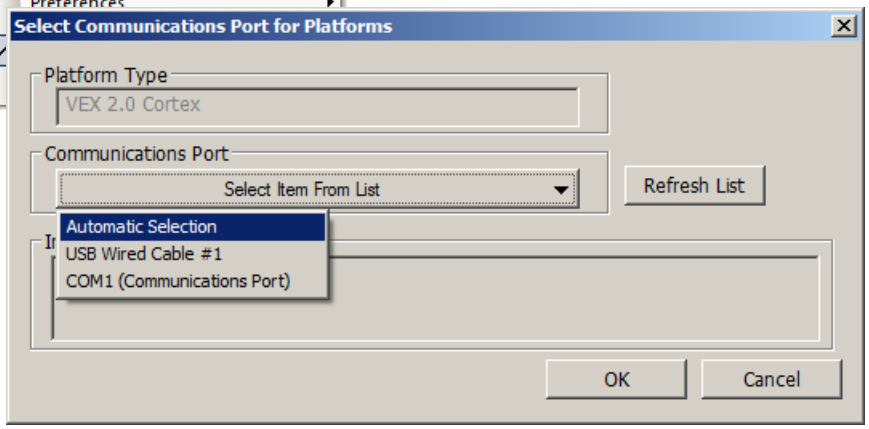
4. Specify that you are using the Cortex and how it is connected to your computer in ROBOTC. Go to Robot > Platform Type > Innovation First (IFI) and select "VEX 2.0 Cortex" or "Natural Language (VEX Cortex)."



Then go to "View" and choose "Select Communication Port".



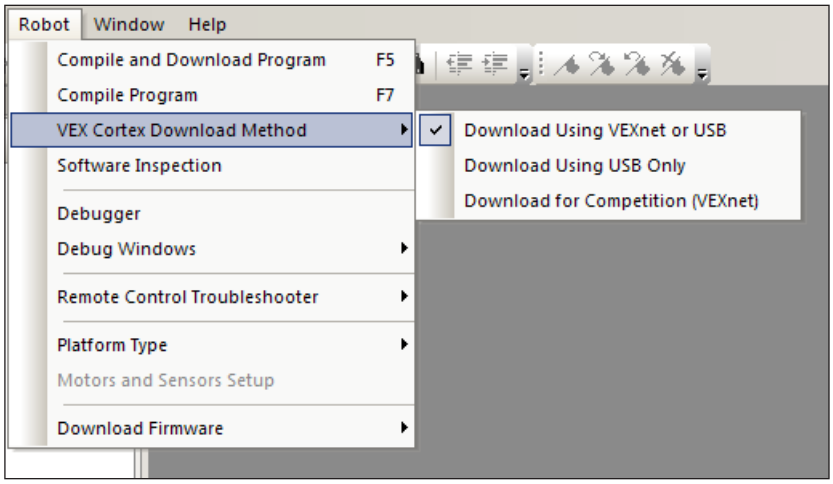
A new window will appear. From the Communications Port dropdown list, make sure that "Automatic Selection" or the "USB Wired Cable" option are selected. If you plan on programming your robot wirelessly over VEXnet, keeping "Automatic Selection" chosen is recommended. Press OK to save your choice.



Note: The Platform Type and Communications Port can also be modified by going to the *View* menu in ROBOTC, selecting ***Preferences > Detailed Preferences***, and choosing from of the available options on the Platform tab.

VEX Cortex Configuration over USB *(cont.)*

5. The *VEX Cortex Download Method* controls how ROBOTC downloads ROBOTC firmware and programs to your Cortex, as well as what types of connections your Cortex checks for when it is powered on. Confirm that your *VEX Cortex Download Method* is set to *Download Using VEXnet or USB* or *Download Using USB Only*.



Option 1: Download Using VEXnet or USB

With this option selected, ROBOTC will download ROBOTC firmware and programs to your Cortex using a VEXnet or USB connection. In this mode, when the Cortex is powered ON **it will look for a VEXnet or USB connection before running your program.** (The Automatic Selection option in the ROBOTC Preferences should be selected if you plan on switching between VEXnet and USB as your download method.)

Option 2: Download Using USB Only

With this option selected, ROBOTC will download firmware and programs to your Cortex using only the USB connection. In this mode, when the Cortex is powered ON it will immediately run your program. This option is NOT recommended if you are using the VEXnet Joysticks to download to the Cortex, or remotely control it.

Option 1: Download for Competition (VEXnet)

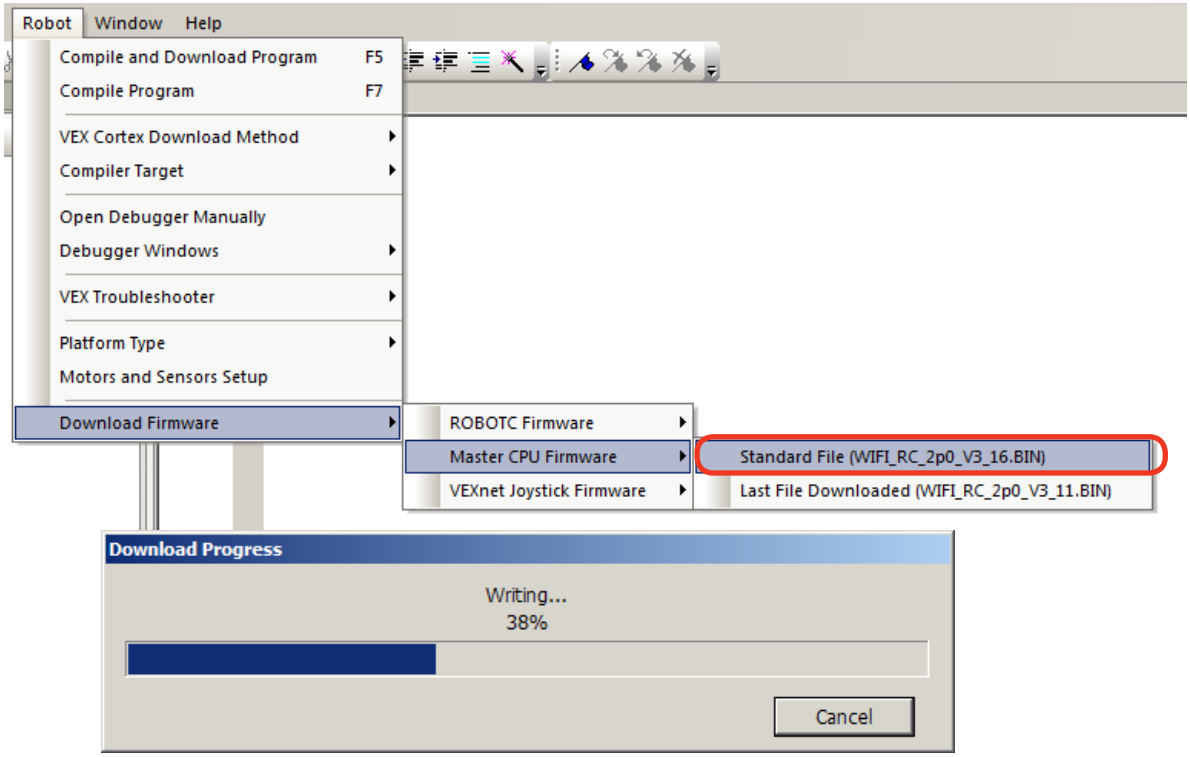
This option disables the ROBOTC debugger, and is not recommended for classroom use.

Important Note: Restarting the Cortex

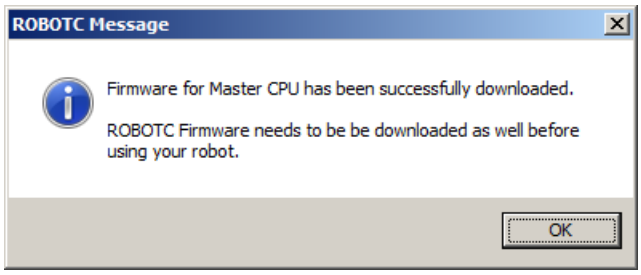
The VEX Cortex Download Method setting is stored in ROBOTC and on the Cortex. If you change the setting in ROBOTC, you must transfer the change to the Cortex by downloading a program (any program) to the Cortex. The Cortex must then be power cycled (disconnected from the computer, turned fully off, and then back on) before the change will take effect.

VEX Cortex Configuration over USB *(cont.)*

6. Go to ***Robot*** > ***Download Firmware*** > ***Master CPU Firmware*** and select ***Standard File*** to download the latest Master CPU Firmware to your robot.



6. ***Download Progress***
A ***Download Progress*** window will appear and begin the download process. When the window closes, the firmware download is complete. A ROBOTC Message will appear, and remind you to also download the ROBOTC Firmware.



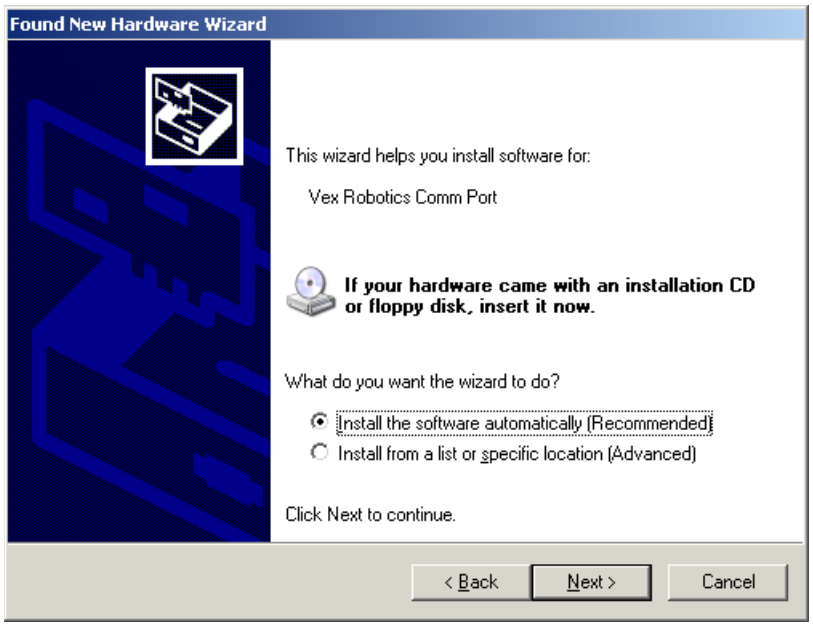
Note: You should only need to download the Master CPU Firmware once, when you first start using a VEX Cortex with ROBOTC, or when you upgrade to a newer version of ROBOTC. Switching programs or download methods does not require a re-download.

VEX Cortex Configuration over USB *(cont.)*

7. Once the Master CPU Firmware has been updated, the Cortex may come up as a "new device" in Windows, prompting you to install the device driver software. If you successfully installed the latest VEX Cortex Device Driver in Step 1, you can follow the steps listed here. If not, make sure you follow the instructions in Step 1.

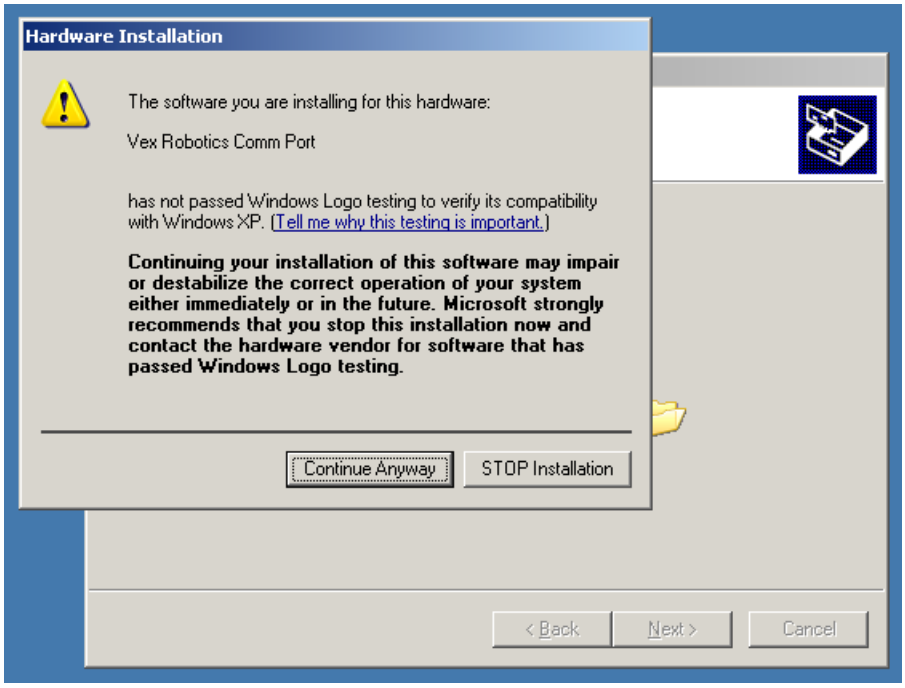
Note: The actual steps detailed here may vary from your system, depending on your computer's Operating System, previous installations of the driver and your user privileges.

7a. Decline Windows Update Search
Windows will offer to search online for the appropriate software. Choose "No, not at this time" and press Next.

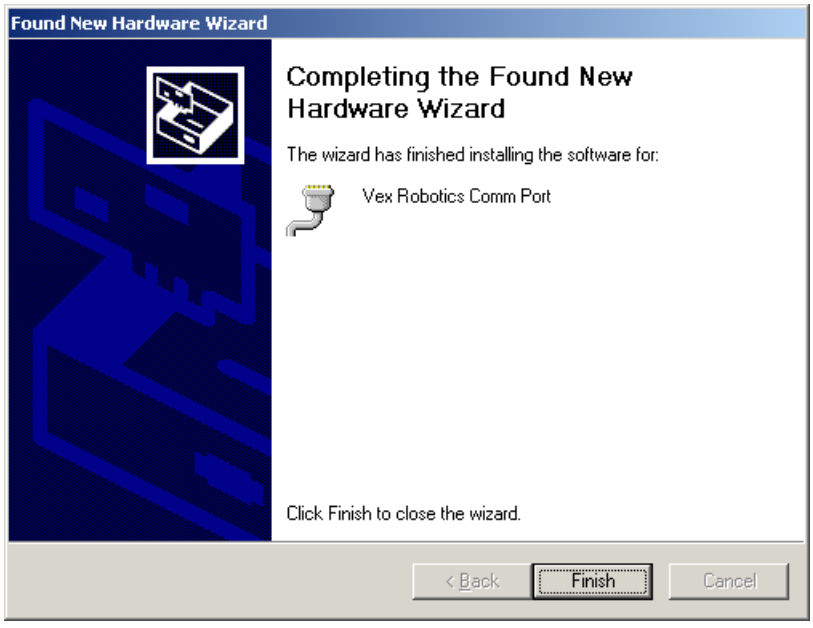


7b. Install Automatically
Choose "Install the software automatically (Recommended)" and press Next.

VEX Cortex Configuration over USB *(cont.)*



7c. Confirmation
Windows may prompt you to confirm that you want to install the device driver. Press "Continue Anyway".

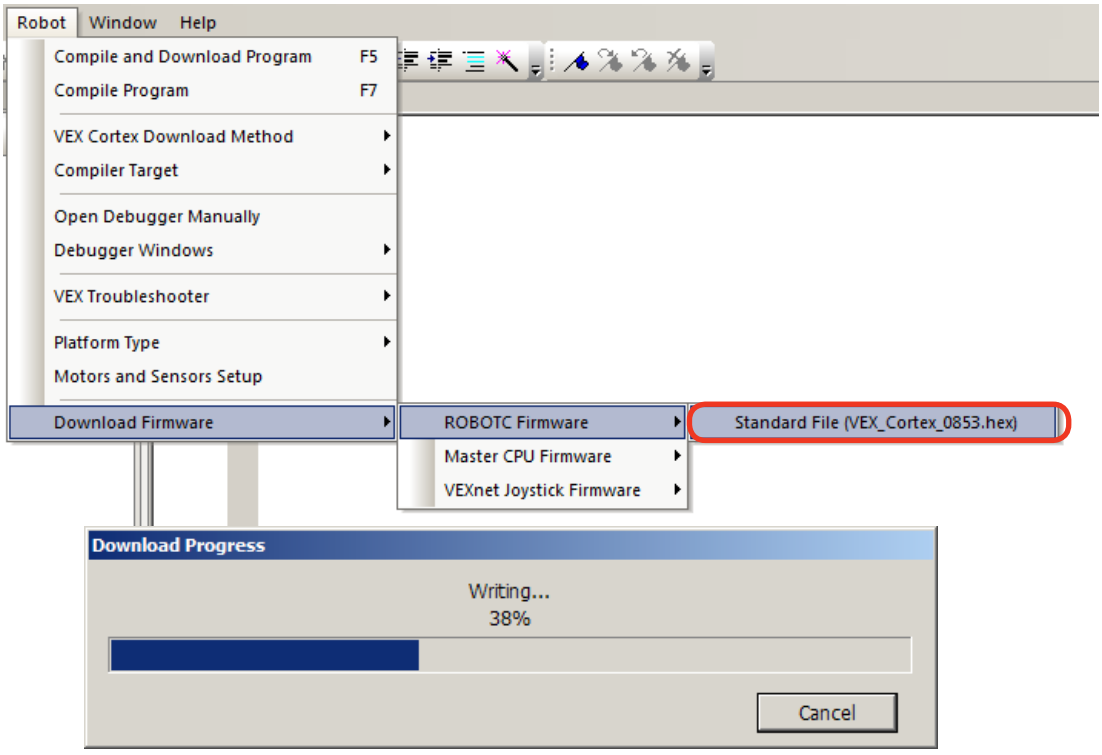


7d. Finalize Installation
Press "Finish" to finalize the device driver installation.

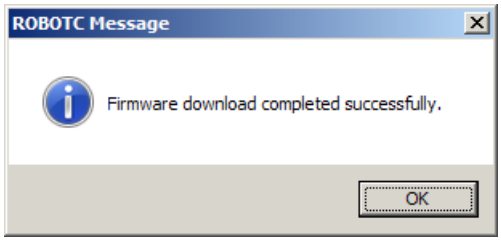
Note: Once the device driver installation is complete, you should no longer need Administrative privileges on your computer; you should be able to download Master CPU Firmware, ROBOTC firmware, and ROBOTC programs in a permissions-restricted account. Only future updates to ROBOTC and the VEX Cortex Device Driver will require Administrative privileges.

VEX Cortex Configuration over USB *(cont.)*

8. The ROBOTC Firmware enables you to download ROBOTC programs to your robot and utilize the various debug windows. Go to ***Robot*** > ***Download Firmware*** > ***ROBOTC Firmware*** and select ***Standard File*** to download the ROBOTC Firmware to your robot.



8. Download Progress
A ***Download Progress*** window will appear and begin the download process. A ROBOTC Message window will appear, informing you that the download was successful.



Note: You should only need to download the ROBOTC Firmware once, when you first start using a VEX Cortex with ROBOTC, or when you upgrade to a newer version of ROBOTC.

End of Lesson
Your VEX Cortex is now ready to be programmed in ROBOTC.

If you are also using the VEXnet Joysticks, you can follow the provided instructions in the VEXnet Joysticks Setup document. Otherwise, move on to the Downloading Sample Programs over USB guide to learn how to download sample code, and verify that your setup is fully functional.