Stellaris® Stepper Motor Control RDK

Stellaris Reference Design Kits (RDKs) from Texas Instruments accelerate product development by providing ready-to-run hardware, a typical motor and comprehensive documentation including hardware design files. Using the Stepper Motor RDK, designers without prior motor control experience can successfully implement a sophisticated motor control system.

Installing and Using the Stepper Motor Control RDK

Kit Contents

The RDK includes the following items:

- Stepper Motor Control Board
- Stepper Motor NEMA23 (166 oz-in with 12-inch cable)
- Wall Adapter $24V_{dc}$ 15W with plug adapters for US, UK, EU, and AUST.
- USB Cable Mini-B to USB-A (3ft)
- CD containing User's Manual, RDK GUI, source code, and datasheet
- This Quickstart Guide

Step 1: Running the Motor

Follow these steps to start running the motor using the on-board speed/position knob and button.
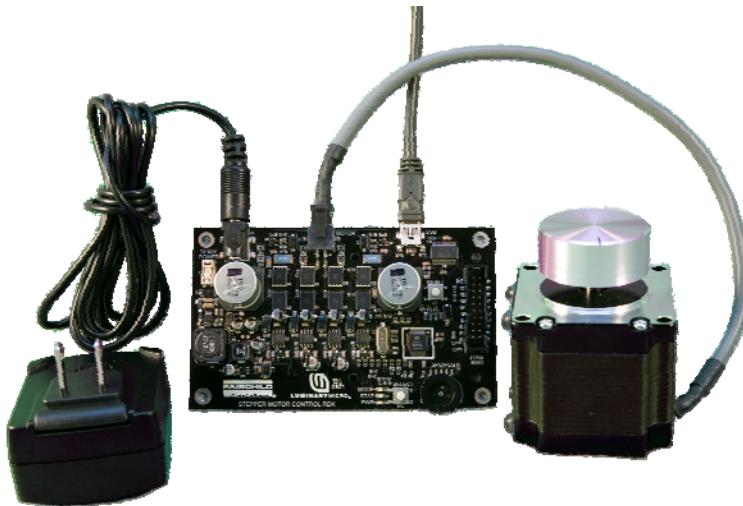
1. Connect the Stepper motor power cable to the control board. The four-position plug should be inserted in the socket labeled MOTOR on the control board. The connector is keyed and cannot be inserted incorrectly.
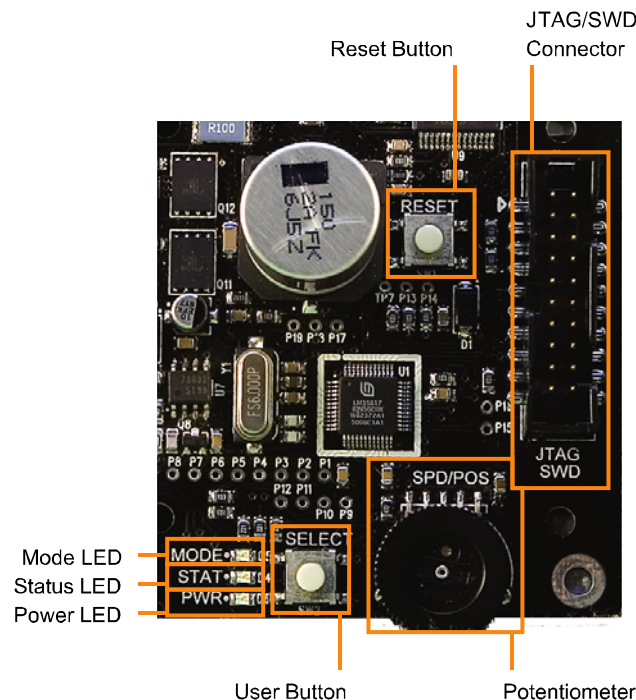
![Texas Instruments]

2. Apply power by selecting the appropriate plug adapter (the RDK includes plugs for most countries) and slide it into the wall adapter. If necessary, the adapter can be removed by pressing the release latch.

3. Plug the DC plug into the socket labeled POWER on the control board.

4. Connect the wall adapter to a standard AC electrical outlet (115 or 230 V). The green power LED (PWR) illuminates.

Controlling the Motor Using Speed Mode

1. Press and release the SELECT button to start, stop, and change motor direction.

2. Use the Speed/Position potentiometer to adjust motor speed between 10 steps/second and 1000 steps/second.

Controlling the Motor Using Position Mode

1. To change mode, press and hold the Select button for 5 seconds until the Mode LED flashes twice.

2. Rotate the Speed/Position potentiometer and the motor will follow its position.

3. To return to Speed mode, press and hold the Select button for 5 seconds until the Mode LED flashes once.

Reset Button

JTAG/SWD Connector

Mode LED
Status LED
Power LED

User Button

Potentiometer

![Texas Instruments logo]

Installing and Using the RDK GUI Software

Using the RDK GUI provides a greater level of control than the on-board interface. Through the RDK GUI, you can set specific values for speed, acceleration, and deceleration, as well as a number of other parameters to tune the operation of the motor. The RDK GUI program communicates with the RDK board using a virtual serial port over a USB cable.

Features

- Real-time display of control board parameters
- Control motor speed and direction
- Configure over a dozen parameters to customize operation for specific applications
- Requires a PC, with a USB interface, running Microsoft® Windows 98, 2000, XP, Vista or 2003

Step 1: Insert CD

1. Insert the RDK Documentation and Software CD into the CD-ROM drive of your computer. If Autoplay is enabled on your PC, the index.htm file automatically opens in your default web browser. If not, use Windows Explorer or other browser to open the index.htm file manually.

2. From the CD menu, select the Software button to open a page from which you will be able to download the GUI software and RDK firmware.

To install the GUI software and RDK firmware, you will perform the following steps:

- Install the USB serial and virtual COM port drivers

- Install the GUI software

- Review documentation and other tools on the CD

- Install the firmware development package (optional, not required to run the motor or GUI out of the box)

## Step 2: Install the USB serial and virtual COM port drivers

You must install the USB driver software before you can use the GUI. This includes the drivers for the two parts of the included composite USB device, which are the USB serial converter and the Virtual COM port. To do this:

1. Connect the mini-b (smaller) end of the USB cable to the connector labeled USB on the RDK

2. Connect the other end (Type A) to a free USB port on your host computer.

3. When you plug in the EVB for the first time, Windows starts the Found New Hardware Wizard and asks if Windows can connect to Windows Update to search for software.

4. Select **No, not this time** and then click "Next."
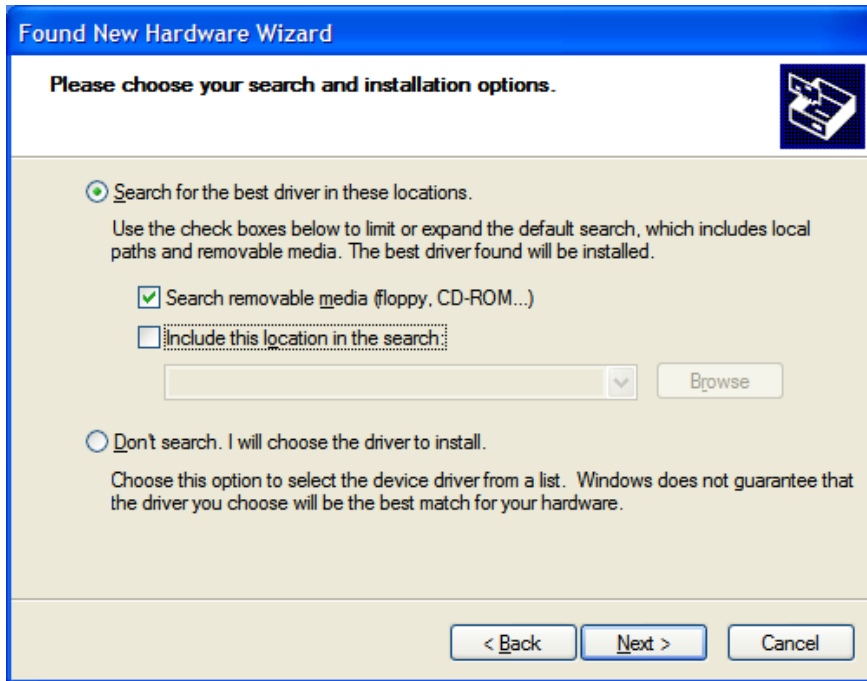
TEXAS INSTRUMENTS

5. Select **Install from a list or specific location** and click **Next**. If needed, insert the documentation and software CD into the CD-ROM drive.
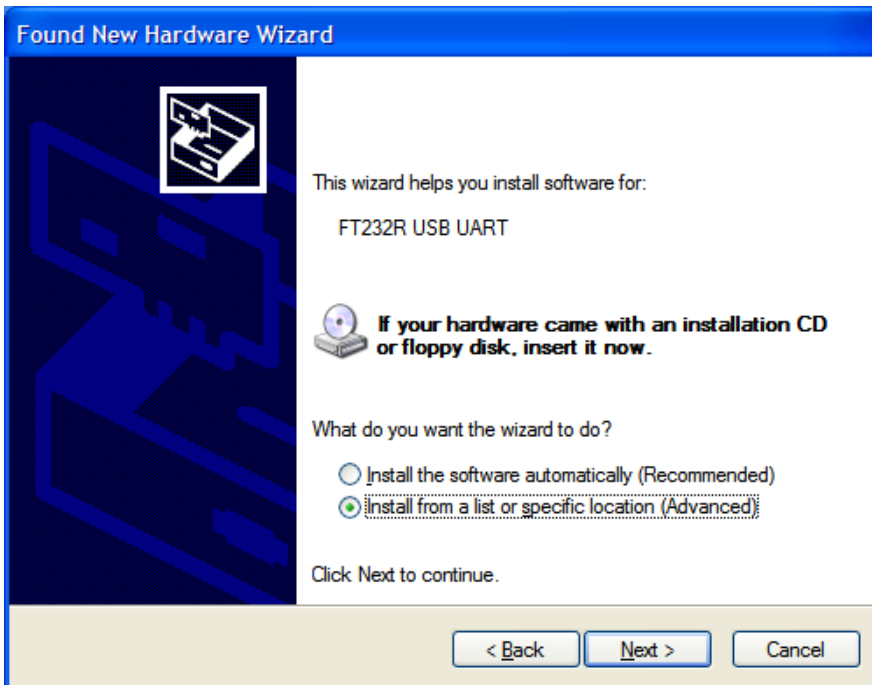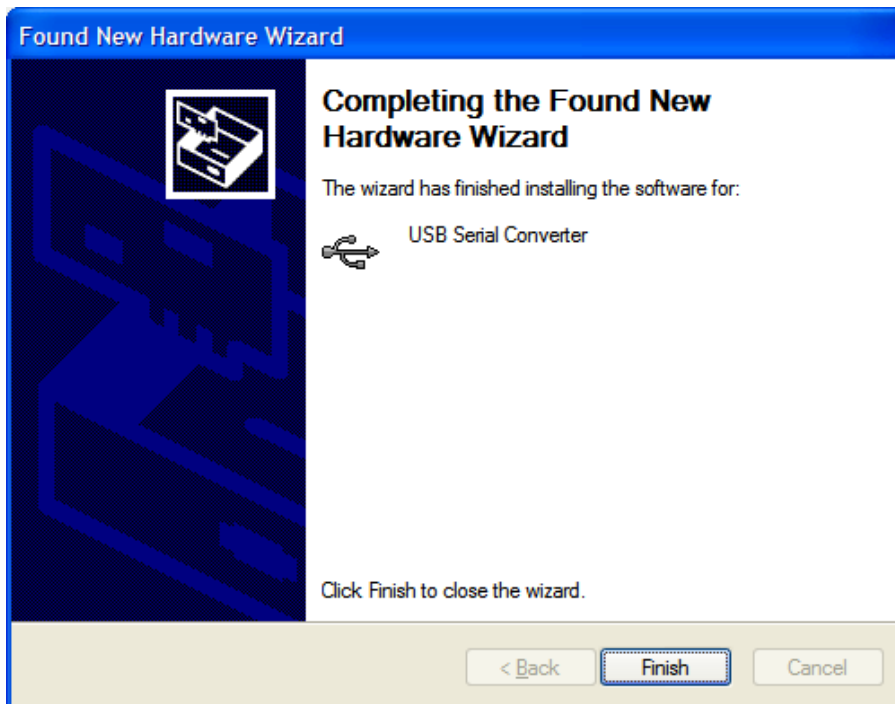

6. Select **Search for the best driver in these locations** and **Search removable media**. Click **Next**.

TEXAS INSTRUMENTS

7. Windows finishes installing the drivers for the "USB Serial Converter" and the Found New Hardware wizard reports the completion of the process.

8. Click "Finish." The dialog box closes.

9. The Found New Hardware Wizard reopens for installation of the next driver.

TEXAS INSTRUMENTS

10. Repeat these steps to install the driver for the virtual COM port.

Installation of all drivers required for the Stepper RDK is now complete.

Step 3: Install the GUI software

1. Click the RDK-Stepper GUI Software link. Your web browser prompts you to save a zip archive containing the GUI software to your PC. Once downloaded, extract the contents of this file to a convenient location (for example, your Desktop).

2. Within the extracted `SW-RDK-Stepper-gui-nnn` directory, double-click `setup.exe`. Installation of the GUI software begins.

3. The first screen of the installer allows you to select the installation path for the target application and Run-Time Engine. If you are satisfied with the default location, click "Next".

4. After selecting the installation location, the installer assumes you accept the license agreement and continues. When the installer completes, complete the installation by clicking "Finish."

Step 4: Review documentation and other tools on the CD

On the Software page of the CD, you will find links to the user's guides for the RDK-Stepper Firmware Development Package, the StellarisWare® Peripheral Driver Library, and the boot loader. You will also find a link for installing the LM Flash Programmer tool. There is also a link for the FTDI USB driver in case you need to reinstall it on your system (it should have been installed in Step 2).

On the Documentation page of the CD, you will find detailed documentation for the RDK board, including a board user's manual, schematics, and other design files. There are also data sheets for the Stellaris microcontroller and other devices used in the RDK design. You will also find documentation for the ARM® Cortex™-M3.

Optional Step: Install the firmware development package

Installing the firmware development package is not required to run the motor or the GUI out of the box.

1. Click the "Install" link next to "StellarisWare RDK-Stepper Firmware Development Package". Your web browser prompts you to save an executable file containing the Firmware Development Package to your PC.

2. Find the location where the SW-RDK-Stepper-nnnn.exe file was saved (for example, your Desktop), and double-click the file name. The installer should run and show you the opening screen. Click the Next button.

TEXAS INSTRUMENTS
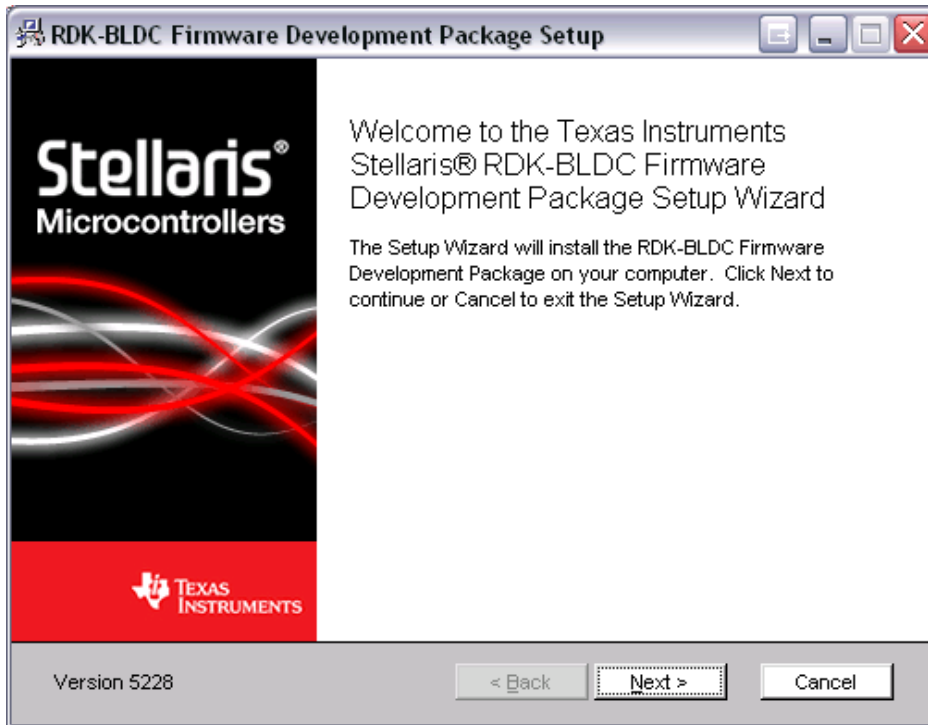
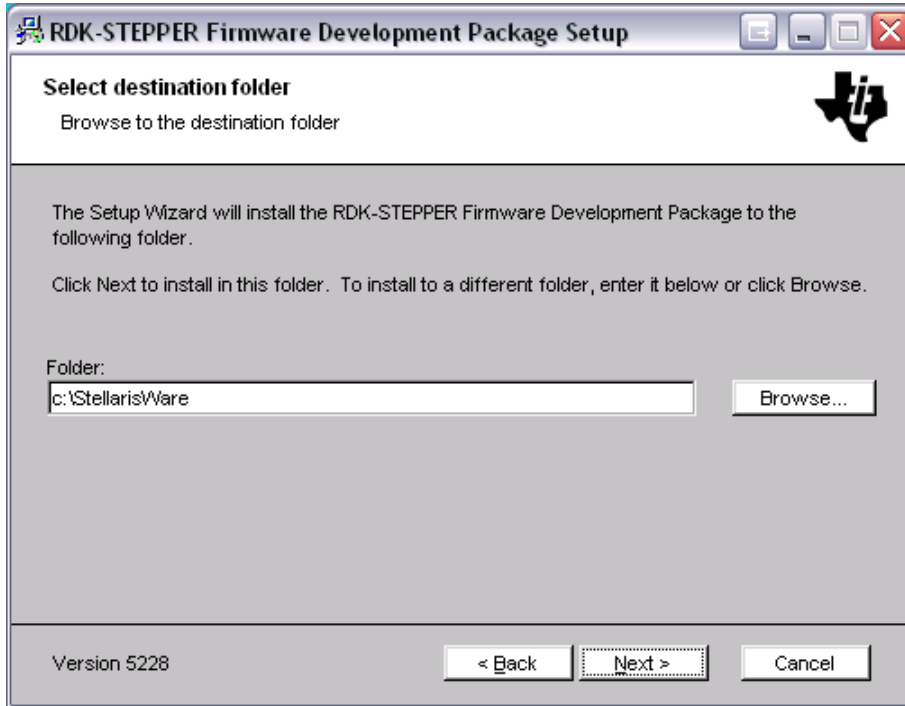3. Read the license agreement. Select the button that says "I accept ..." and then click the Next button.
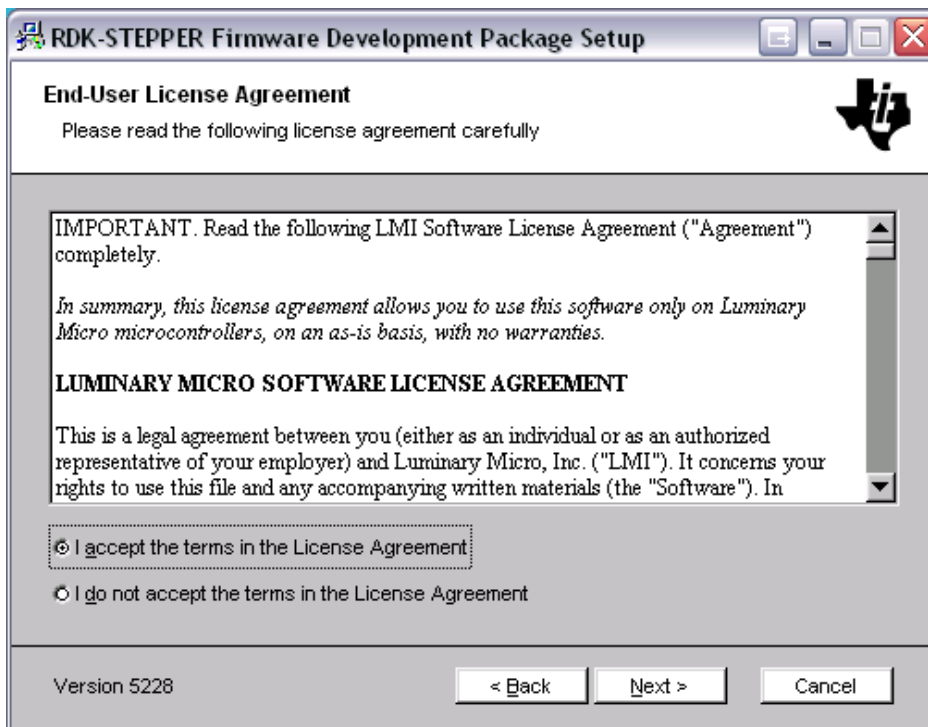
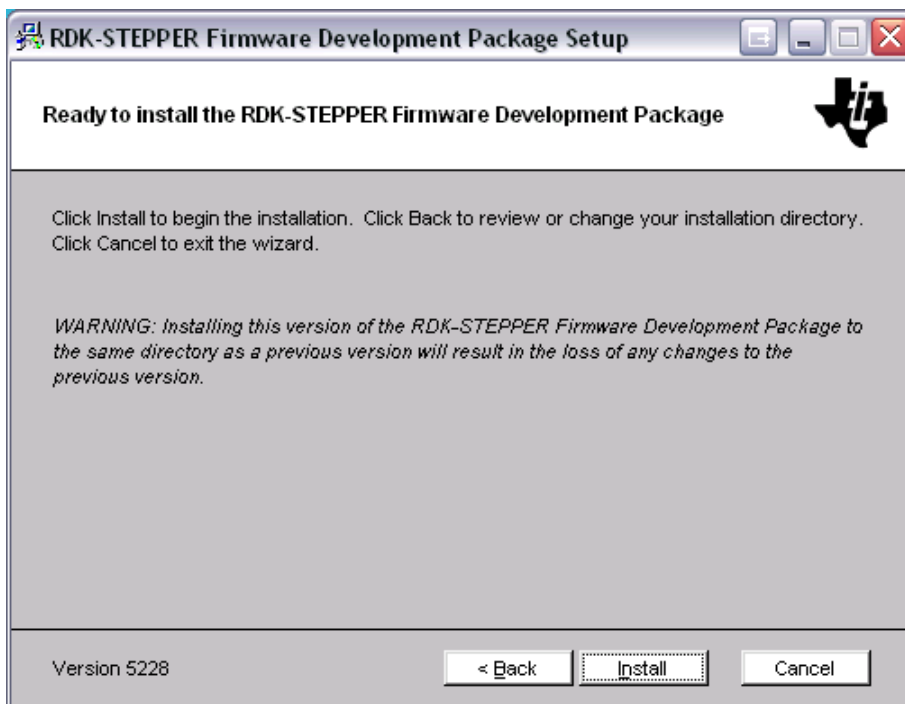4. The installation path for the RDK firmware package displays. You can use the suggested path or change it. When you are satisfied with the location, click the Next button.
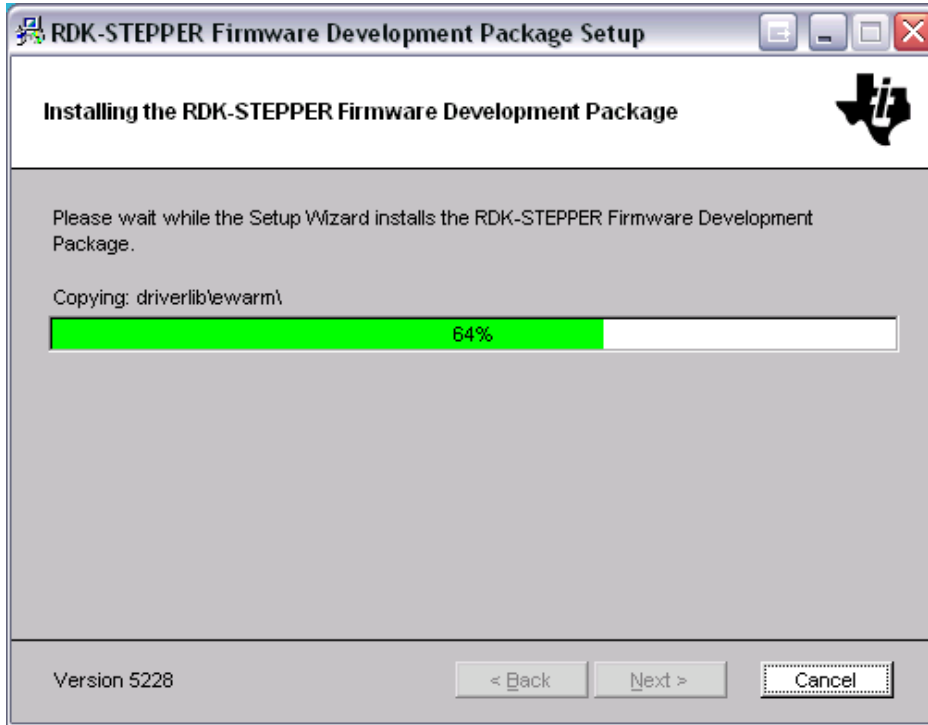

5. You are now ready to install the Firmware Development Package. Click the Next button to begin the installation.

6. You will be shown a progress screen as the software is installed.

7. When the installation is finished, click the Finish button to close the installer. The RDK firmware development package is now installed on your system.

Starting the RDK GUI

The following figure shows information about connecting to and operating the motor control using the RDK GUI. For now, use the main window for monitoring and control only. Read the *Stepper RDK User's Manual* before attempting to adjust operating parameters using the Configuration window.

Upon starting the RDK GUI program, the on-board interface on the RDK board is disabled, and the Speed/Position potentiometer and Select button will have no effect.

If the program has not been used before, then a dialog box appears that lets you select the COM port. Once you select a COM port, the program remembers the choice and does not ask again. However, at any time you can reopen the COM port dialog box by double-clicking on the COM port indicator on the main window (see next figure).
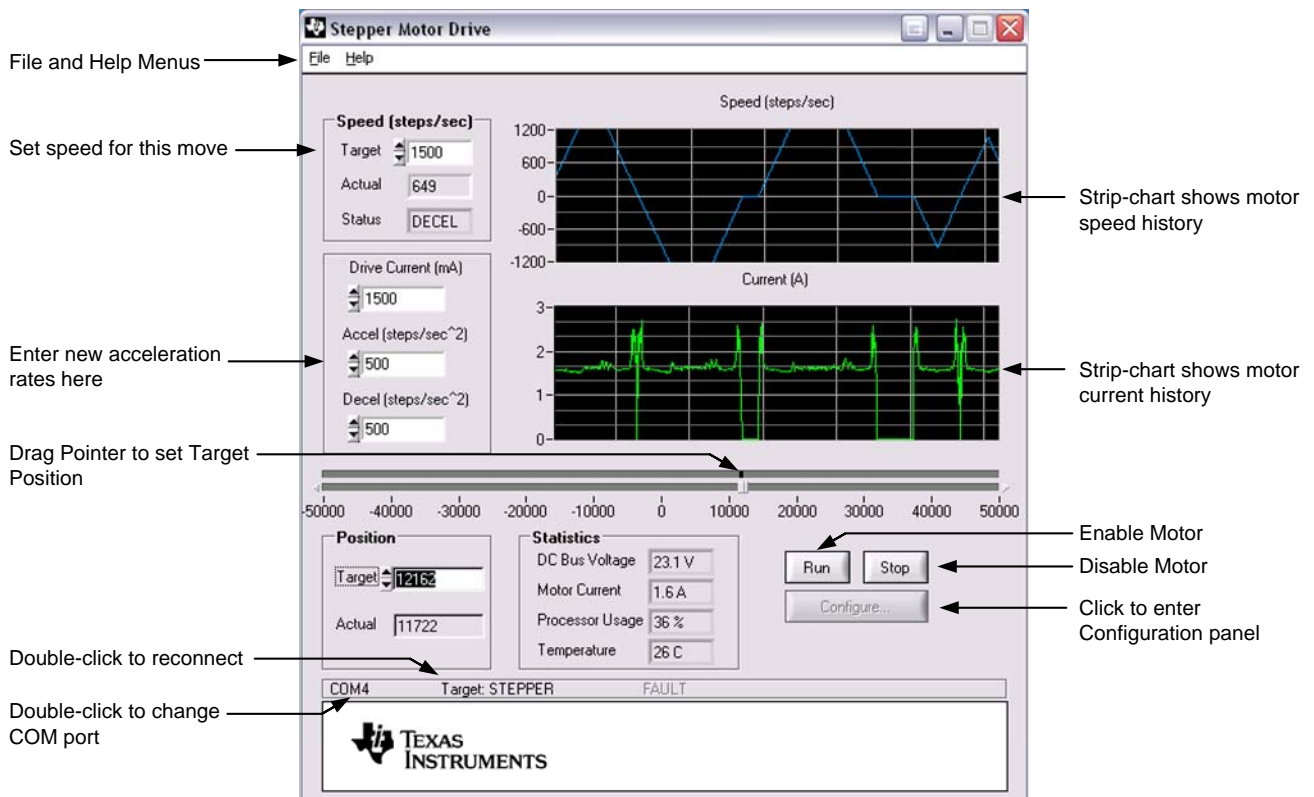
Other window controls are explained in the detail in the *Stepper Motor RDK User's Manual*.

Troubleshooting

Getting started with the Stepper RDK is easy, however, in case of problems with the Stepper RDK, here is some basic troubleshooting information. Additional troubleshooting information can be found in the *Stepper Motor RDK User's Manual*.

TEXAS INSTRUMENTS

Power LED is not ON when power is applied

- Check the fuse (see *Stepper Motor RDK User's Manual* for instructions on fuse replacement)
- Try reducing the motor Drive Current. The RDK power supply is limited to 15 W peak and is recommended primarily for initial evaluation.
- Cycle power to the wall adapter power supply.

Unable to connect to control using RDK GUI over USB

- Check virtual COM port assignment using Windows Device Manager. Windows may periodically assign a different COM port number when the Stepper RDK is connected.
- Remove any other virtual COM port devices from the PC.
- Reset the motor control board by pressing the RESET button.

The motor is no longer running smoothly

- The parameter settings have changed and are no longer optimal. Refer to the *Stepper Motor RDK User's Manual* for a detailed explanation on tuning motor parameters.
- The torque and/or inertia of the load may have changed. Stepper motors have complex characteristics that may require parameter adjustments for new operating conditions.

Conclusion

You have now successfully operated the stepper motor using the RDK in both standalone and RDK GUI-controlled modes. From here we recommend reading the *Stepper Motor RDK User's Manual*, which explains how to use the parameters accessible through the RDK GUI. Once you have completed that step, you'll be prepared to start adapting the software and hardware for a specific application. The *Stepper Motor RDK User's Manual* also contains information to assist with that process.

TEXAS INSTRUMENTS

References

The following references are included on the Stepper Motor Control RDK documentation CD and are also available for download at www.luminarymicro.com:

- *Stellaris Stepper Motor Control RDK User's Manual*, publication number RDK-Stepper

- *Stellaris Stepper Motor RDK Software Reference Manual,* publication number RDK-Stepper-srm

 In addition, the following website may be useful:

- *Control of Stepping Motors – A Tutorial*, by Douglas W. Jones at http://www.cs.uiosw.edu/~jones/step/

IMPORTANT NOTICE