Quick Installation Guide: QUARC™ on NI™ NI ELVIS III

STEP 1 Install MATLAB® and Required Add-Ons

QUARC™ supports 64-bit Microsoft® Windows®.

Ensure one of supported MATLAB versions is installed on the computer with the following required add-ons accompanying the corresponding MATLAB version:

- **Simulink®**
- **Simulink Coder™**
- **MATLAB Coder™** (required by Simulink Coder)
- **Control System Toolbox™** (Optional add-on, but highly recommended as used by most of Quanser's control laboratories)

STEP 2 Install NI CompactRIO™ Device Drivers

Install NI CompactRIO (version 18.0 or later), which can be obtained from the National Instruments™.

Select the default features, and ensure the NI Measurement & Automation Explorer (MAX) is selected to install on the host computer (NI MAX is required for configuring and installing QUARC on the NI ELVIS III).

STEP 3 Install QUARC on Windows

A

Uninstall any previous version of QUARC that may be present on the computer.

Do so by launching the *Programs and Features* dialog or the *Apps & features* dialog depending on which Windows version you have.

B

1. An internet connection is required during the QUARC installation process. Download the QUARC web installer executable using the link provided in the confirmation email that you received.
2. Run the QUARC installer (i.e., install_quarc.exe). The QUARC installation screen should appear.

The installer automatically checks if there is a newer update ready to download.

Tip: To find tips for each installation window, hover the mouse cursor

on the blue information icon on the lower left corner or

click the question mark icon on the upper right corner for more details from the installation guide.

C

If an update is available, choose to *Update* to the latest version [for free].

D

Read over the license agreement displayed in the Quanser License Agreement window.

E

Enter the location of the QUARC license file provided in the confirmation email and click *Next* to continue.

F

The installer will automatically scan the software environment on the host PC to ensure it meets the requirements for QUARC on the NI ELVIS III (e.g., MATLAB, NI MAX).

To start the installation immediately using the default settings click Install and skip to Step I. Otherwise click Options to customize the installation and continue.

G

Provide the destination folder where QUARC will be installed, and click *Next* to continue.

H

Choose the features to be installed. If you don't have the proper license required for a feature, the feature will be disabled and greyed out.

At minimum, make sure to select **NI ELVIS III Cross-Compilers** and **Simulink Development Environment**.

Note: If you don't have NI MAX installed, the *NI ELVIS III Cross-Compilers* will be greyed out.

Click *Install* to continue.

I

A progress bar and embedded video should appear on the installation screen.

J

The QUARC installer automatically configures the Quanser License Manager before completing the installation.

STEP 4 Install QUARC on NI ELVIS III via NI MAX

Ensure CompactRIO drivers and its accompanied software are installed as outlined in Step 2. Also make sure QUARC is installed as outlined in Step 3 above. Then connect the NI ELVIS III to the computer that has QUARC installed via USB and ensure the main power to the NI ELVIS III is turned on.

A

- Open NI MAX by launching it via the Windows Start Menu.
- Expand the *Remote Systems* tree, and find the *NI ELVIS III* device.
- Look at the *System Settings*, and note the *IP Address* of your NI ELVIS III. You will need to use it to setup the QUARC test model in Step 5.

B

- Expand the *NI ELVIS III* device, and select *Software*.
- Right-click on *Software*, and click on *Add/Remove* Software.

C

Once the *Log In* window pops up, use the login information from your NI ELVIS III manual to proceed.

Tip: The default *User name* is *admin*, with no *Password*.

D

When the *LabVIEW Real-Time Software Wizard* dialog pops up, click on *Custom software installation*, and then click *Next»*.

E

This warning dialog will appear, click *Yes* to accept the warning.

F

- Select *QUARC for NI ELVIS III* from the list.
- From the feature drop-down menu, choose *Install the feature*.
- Click *Next*.

G

A dialog showing the selected items will be displayed. Click *Next >>* to continue.

H

A progress bar should appear on the installation screen while NI MAX installs QUARC to the NI ELVIS III.

Note: The NI ELVIS III will reboot a few times during the QUARC installation.

I

When the installation is complete, a message will indicate that the NI ELVIS III has been updated successfully. Click *Finish* to exit the dialog window.

J

- You should see *QUARC for NI ELVIS III* in the list of software.
- You can now exit NI MAX.

STEP 5 Software-only Test

The *QUARC Sine and Scope Demo* used in this section is to confirm that QUARC has been installed properly on both the host PC and on the NI ELVIS III.

A

Make sure the NI ELVIS III is powered (the power LED is lit up).

B

- Launch MATLAB.
- Open the *QUARC preferences* by typing **quarc_preferences_dialog** in the MATLAB Command Window.
- The *QUARC Preferences* dialog window should appear.
- On the **Model** tab, set the following:
  Target type: *linux_rt_armv7*
  Default model URI:
  tcpip:*//ELVIS_III_IP_address*:17001

  where *ELVIS_III_IP_address* is the IP address of your NI ELVIS III, which can be found via NI MAX (refer to Step 4A).
- On the **Target Type** tab, set the following:
  Default target type: linux_rt_armv7
  Default compiler: gcc
- Then press *OK* to close the dialog.

C

- Open the QUARC built-in examples by typing **qc_show_demos** in the MATLAB Command Window.
- The *QUARC Demo Examples* Supplemental Software Help window should appear.
- Click on the **QUARC Sine and Scope Demo** under the *Basic Features* category to open the example page.
- On the top-right corner of the *QUARC Sine and Scope Demo* example page, click on **Open this model**.

D

On the taskbar, right click on the QUARC tray icon and select *Target->Remote…*
The *Select remote target* dialog should appear.

E

On the *Select remote target* dialog, make sure to set the Target URI to:

tcpip://*ELVIS_III_IP_address*:17000

where *ELVIS_III_IP_address* is the IP address of your NI ELVIS III, which can be found via NI MAX (refer to Step 4A). Then press *OK* to close the dialog. The QUARC Tray icon should now appear green.

F

- Click on the **Monitor & Tune** button on the Hardware tab of the Simulink Toolstrip.
- Double-click on the **Scope** block.
- A sine wave of amplitude 1 should be plotted in real-time.

G

- Double-click on the **Sine Wave** block.
- Change the **Amplitude** to 5, then press the **Apply** button.
- The sine wave's amplitude would be changed to 5 in real-time.
- Change the **Frequency (rad/sec)** to 2, then press the **Apply** button
- The sine wave's frequency would be doubled in real-time

H

Click on the **Stop** button on the Hardware tab of the Simulink Toolstrip to stop the running model.

STEP 6 DAQ Test

The *QUARC Analog Loopback Demo* used in this section is to confirm QUARC has been installed properly. It also tests the NI ELVIS III Series Prototyping Board is working properly. Note, it is assumed that the instructions in Step 5 have been followed.

A

- Make sure the **NI ELVIS III Series Prototyping** is connected to the NI ELVIS III.
- Ensure the main power for the NI ELVIS III is turned on.
- Turn on the power for the top board.

B

Using a jumper wire, connect the **Analog Output Channel #0** (AO0) to the **Analog Input Channel #0** (AI0) on the **A connector** on the Prototyping Board.

C

- Open the QUARC built-in examples by typing **qc_show_demos** in the MATLAB Command Window.
- The *QUARC Demo Examples* Supplemental Software Help window should appear.
- Click on the **QUARC Analog Loopback Demo** under the *Using Hardware* category to open the example page.
- On the top-right corner of the *QUARC Analog Loopback Demo* example page, click on **Open this model**.

D

Double-click on the QUARC **HIL Initialize** block.

E

- In the *Board type* option list under the *Main* tab, select **ni_elvisiii**.
- Click on the **OK** button to close the *HIL Initialize* dialog.

F

- Click on the **Monitor & Tune** button on the Hardware tab of the Simulink Toolstrip.
- Double-click on the **Scope** block.

G

A 1-Hz half-wave rectified sine wave of amplitude 1 should be plotted in real-time. If not, go to the *Troubleshooting* section.

In the model, the Simulink Signal Generator block applies a 1-Hz sine wave signal of a 1-Volt amplitude to the NI ELVIS III analog output channel #0. Due to the jumper wire connection, this signal is then acquired and read through the NI ELVIS III analog input channel #0.

H

- Double-click on the **Signal Generator** block.
- Change the **Amplitude** to 2, then press the **Apply** button.
- The sine wave's amplitude would be changed to 2 in real-time.
- Change the **Frequency** to 2, then press the **Apply** button
- The sine wave's frequency would be doubled in real-time

I

Click on the **Stop** button on the Hardware tab of the Simulink Toolstrip to stop the running model.

TROUBLESHOOTING	Review the following recommendations before contacting Quanser's technical support engineers.

The "NI ELVIS III Cross-Compilers" is greyed out in features selection during QUARC install.	• Ensure your QUARC license file includes the NI ELVIS III feature. • Ensure you have installed NI MAX prior to installing QUARC. Note that you can continue installing QUARC without NI MAX, however support for NI ELVIS III will not be available. In this case, install NI MAX after installing QUARC, then re-run the QUARC web installer again, and choose **Change** to allow you to select the **NI ELVIS III Cross-Compilers** feature to be installed.
The NI ELVIS III does not appear in the NI Measurement & Automation Explorer (MAX).	• Refer to the National Instruments troubleshooting guide for the NI CompactRIO device at www.ni.com/getting-started/set-up-hardware/compactrio/troubleshoot-max.
When running the Analog Loopback Demo, the Scope does not display a sine wave.	• Ensure the jumper loopback connection is made on the prototype board A connector, as described in Step 6A. • Verify that ni_elvisiii was selected in the HIL Initialize dialog, as described in Step 6E.
Getting error: '*Error occurred while executing External Mode MEX- file 'quarc_comm': An operating system specific kernel-level... driver for the specified card could not be found. The card or driver may not be installed...*' when building a model	• Ensure the USB cable is properly connected between the host PC and the NI ELVIS III. • Verify the NI ELVIS III Series Prototyping Board is properly connected to the NI ELVIS III. • Ensure QUARC is installed on the NI ELVIS III as outlined in Step 4.

LEARN MORE	To find out about the full range or Quanser control experiments, visit www.quanser.com

©2020 Quanser Inc. All rights reserved. Specifications are subject to change without notice. Products and/or services mentioned herein are trademarks of Quanser Inc. and/or their respective owners. MATLAB® is a registered trademark of The MathWorks® Inc. Windows® is a registered trademark of Microsoft® Corporation in the United States and other countries.