

Quick Start Guide: Rotary 2 DOF Gantry

STEP 1 Check Components and Details

Make sure your Rotary 2 DOF Gantry module includes the following components:



1. Rotary 2 DOF Joint
2. Set of two 5-pin DIN to 5-pin DIN encoder cables
3. Set of two thumb screws
4. Quanser Workstation Resources* (includes controllers; User Manual, Quick Start Guide and courseware; and other files)

*Download the Student version of the Workstation Resources from the Resources tab at www.ni.com/labviewtools/rcp. For the full Instructor version, contact quanser@ni.com

STEP 2 Additional Components Required for Set Up

To complete the Rotary 2 DOF Gantry module set up, you will also need the following:



1. Quanser Rapid Control Prototyping Toolkit for NI LabVIEW™. Visit www.ni.com/labviewtools/rcp
2. 2 DOF Robot System
3. Power Amplifier (VoltPAQ-X2 pictured)
4. One of the following data acquisition devices:
 - a. NI CompactRIO with set of two Quanser Q1-cRIO modules, or
 - b. Quanser Q8-USB, or
 - c. NI PCI/PCIe with NI M and X Series Terminal Board, or
 - d. Quanser Terminal Board for NI myRIO
5. Set of two RCA to RCA cables
6. Set of two 4-pin DIN to 6-pin DIN motor cables
7. Set of two 5-pin DIN to 5-DIN encoder cables
8. Emergency Stop switch (optional)

Note: These components must be purchased separately.

To set up your Rotary 2 DOF Gantry experiment, please read the following instructions carefully.

STEP 3 Install NI LabVIEW™ and Add-ons

Make sure LabVIEW™ and required add-ons are installed.

1. LabVIEW™
2. NI-DAQmx
3. LabVIEW™ Control Design and Simulation Module
4. LabVIEW™ MathScript RT Module (only used in certain VIs)

5. Quanser Rapid Control Prototyping Toolkit®

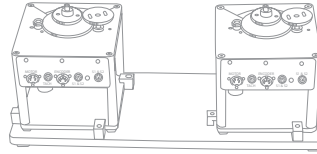
Note: The Quanser Rapid Control Prototyping (RCP) Toolkit must be installed after LabVIEW. See the RCP Toolkit Installation Guide for more information (www.quanser.com/products/rcptk/documentation).

STEP 4 Set Up the Hardware

A

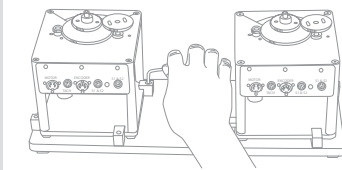
Before proceeding, make sure you set up and test your 2 DOF Robot System as described in its Quick Start Guide.

B



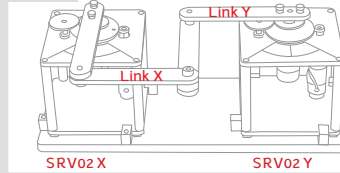
Place the two Rotary Servo Base Units onto the support plate. **Ensure the Rotary Servo Base Unit is setup in the high gear configuration.**

C



The support plate has a total of 8 clamps. Tighten the screws of the 4 clamps on each servo until the Rotary Servo Base Unit is properly fastened to the base. You don't need to overly tighten the clamps.

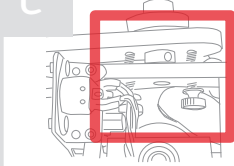
D



Mount the four-bar linkage on the output gear shafts of the servos. Fasten the linkage to each gear using the two thumb screws.

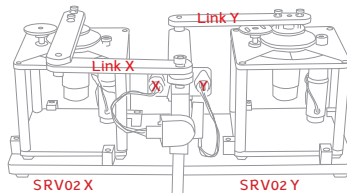
Note: Make sure that link Y is underneath link X.

E



Attach the 2 DOF Joint underneath the tip of the links using the two thumb screws.

F



Make sure that when the SRV02 X rotates, it moves the 2 DOF Joint in the x-direction. Similarly, when the SRV02 Y rotates the 2 DOF Joint should move along the y-axis.

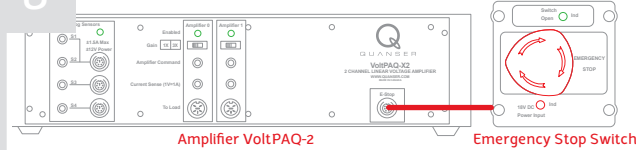
STEP 5 Wiring

The connections shown below are illustrated using a generic data acquisition (DAQ) device and a VoltPAQ-x2 amplifier [e.g., you may have a different DAQ or amplifier]. For detailed instructions, see the 2 DOF Gantry User Manual.

A

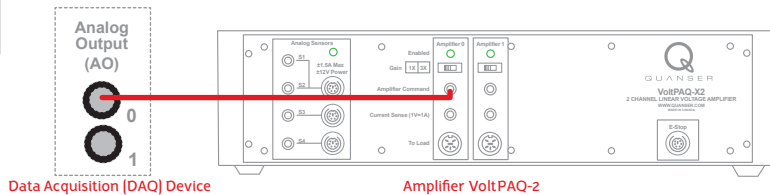
Make sure everything is powered off before making any of these connections. This includes turning off your PC and the amplifier.

B



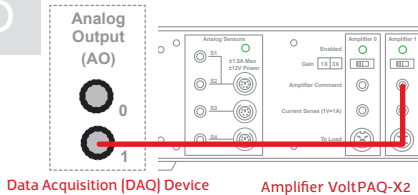
Connect the Emergency Stop Switch to the E-Stop connector on the VoltPAQ-X2. (Optional)

C



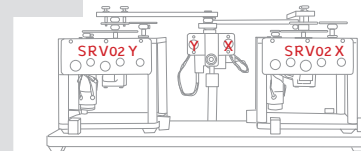
Using one RCA to RCA cable, connect **Analog Output Channel #0 (AO #0)** on the data acquisition (DAQ) device to the **Amplifier Command #0** socket on one of the amplifier.

D



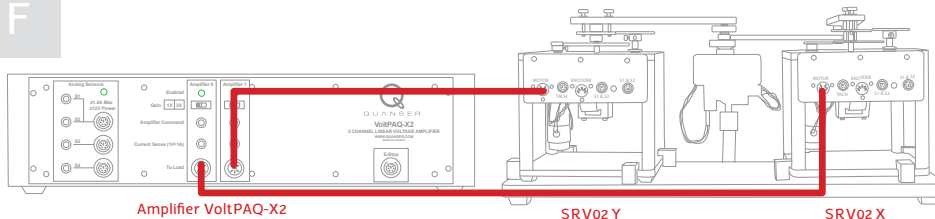
Using another RCA to RCA cable, connect **Analog Output Channel #1 (AO #1)** on the data acquisition (DAQ) device to the **Amplifier Command #1** socket on one of the amplifier.

E



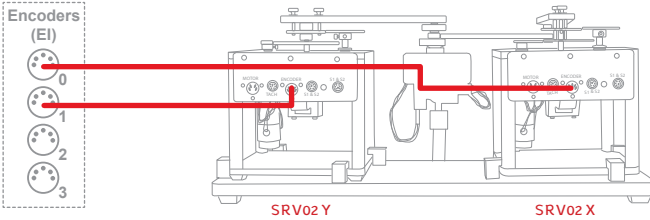
For the upcoming connections, denote the servo on the left as "SRV02 Y" and the servo on the right as "SRV02 X".

F



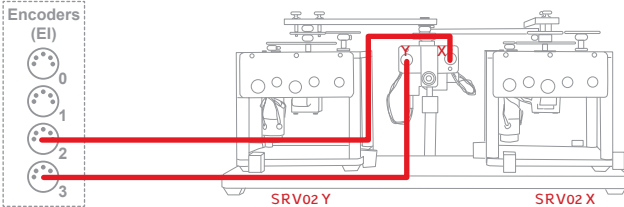
1. Connect the 4-pin-DIN to 6-pin-DIN motor cable from **To Load #0** on the amplifier to the **Motor** connector on the SRV02 X
2. Using another 4-pin-DIN to 6-pin-DIN motor cable connect **To Load #1** on the amplifier to the **Motor** connector on the SRV02 Y.

G



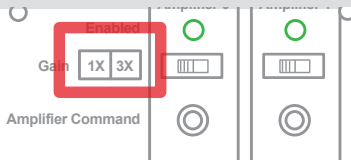
1. Using the 5-pin DIN to 5-pin DIN encoder cable, connect the **Encoder** socket on the **SRV02 X** panel to the **Encoder Input #0** socket on the data acquisition (DAQ) device.
2. Using another 5-pin DIN to 5-pin DIN encoder cable, connect the **Encoder** socket on the **SRV02 Y** panel to the **Encoder Input #1** socket on the data acquisition (DAQ) device.

H



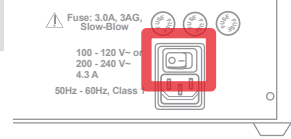
1. Using the 5-pin DIN to 5-pin DIN encoder cable, connect the **X Encoder** socket on the **2 DOF Joint** to the **Encoder Input #2** socket on the data acquisition (DAQ) device.
2. Using another 5-pin DIN to 5-pin DIN encoder cable, connect the **Y Encoder** socket on the **2 DOF Joint** to the **Encoder Input #3** socket on the data acquisition (DAQ) device.

I



Make sure you set both amplifiers Gain switch to 1.

J



Turn ON the power switch of the VoltPAq-X2. It is located on the rear of the device.

STEP 6 Testing the Rotary 2 DOF Gantry

Follow the procedure below to test your Rotary 2 DOF Gantry module.

A

Make sure your PC and amplifier are powered ON.

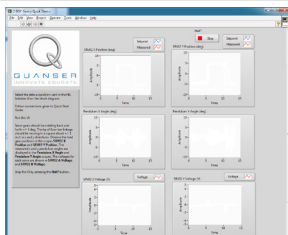
B

Download the Quanser Workstation Resources (www.ni.com/labviewtools/rcp) and locate the **Quick Start** folder: Rotary\2 DOF Gantry\Quick Start. Copy the Quick Start folder to your local hard drive.

C

Open the LabVIEW™ Project file (.lvproj) found under the **Quick Start** folder on your hard drive.

D



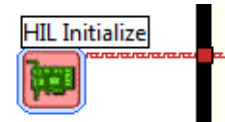
LabVIEW™ VI Front Panel

In the LabVIEW™ Project file, open the LabVIEW™ Virtual Instrument (.vi) found under *My Computer*.

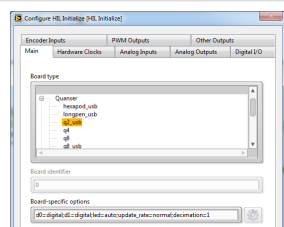
Attention, Quanser Q1-cRIO users: Before proceeding, make sure your LabVIEW™ Project file is configured with your NI CompactRIO (refer to the RCP Toolkit Installation Guide).

E

Go to the block diagram (CTRL-E) and double click on the **HIL Initialize** Express VI.



F



Configure HIL Initialize window

Under the Main tab, select the data acquisition device that is installed on your system in the Board type section (e.g., Q8-USB).

G

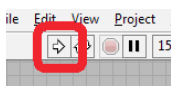
Click on the OK button.

H

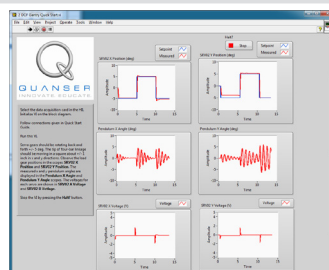
Go to the Front Panel (CTRL-E) of the VI (pictured in Step 6D).

I

Click on the white arrow button to run the VI.



J

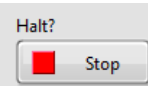


Scope view of the VI Front Panel

The servos should be tracking ± 5 deg square reference. Make sure the scopes look similar those shown here. Otherwise, consult the *Troubleshooting* section at the end of this guide.

K

Click on the STOP button to stop running the VI.



1. Make sure cables are firmly connected.
2. Verify the connections outlined in Step 5 in this Guide.
3. Make sure the Rotary Servo Base Unit has been set up and tested successfully. Go through the Rotary Servo Base Unit Quick Start Guide or User Manual set up and troubleshooting section for more information.

You are getting
'VI Missing'
messages.

- A. Make sure you installed all the LabVIEW™ add-ons listed in Step 3.
- B. Verify that the correct LabVIEW™ version is installed for your Quanser Rapid Control Prototyping Toolkit®. Refer to the RCP Toolkit Installation Guide for complete details.
- C. Additional add-ons may be required depending on your data acquisition (DAQ) device. Make sure your DAQ device (e.g., Q1-cRIO, Q2-USB) has been configured and tested according to the instructions in its Quick Start Guide.

The Motor is
not responding.

- A. If the Emergency stop switch is connected to the amplifier, make sure the red button is in the upper position to enable the amplifier. The amplifier cannot be enabled when the button is in the lower position. Twist the button to ensure it is in the enabled position.
- B. Review connections in Step 5C to 5F.
- C. Ensure the power amplifier is powered on and operational, i.e., when using VoltPAQ-X2, verify that the green LED is lit.
- D. Verify the data acquisition (DAQ) device is functional. Go through the DAQ User Manual for troubleshooting guidelines.

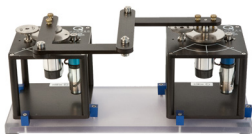
The Encoder is
not reading.

- A. Review connection in Steps 5G and 5H.
- B. Verify that the data acquisition (DAQ) device is functional. Go through the DAQ User Manual for troubleshooting guidelines.

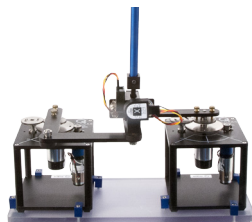
STILL NEED HELP? For further assistance visit ni.com/support or contact NI Support at 866-275-6964.

Expand the Rotary Servo Base Unit to the following popular experiments using the Quanser control add-on modules.

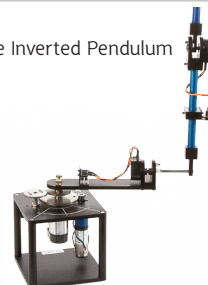
2 DOF Robot



2 DOF inverted Pendulum



Double Inverted Pendulum



Gyroscope Stable/Platform



LEARN MORE

To find out about the full range of Quanser Rotary control modules, visit www.quansercontrollab.com