Python Quick Start Guide for Linux: Qube-Servo 3

STEP 1 Check Components and Details

Make sure your Qube-Servo 3 Platform includes the following components.

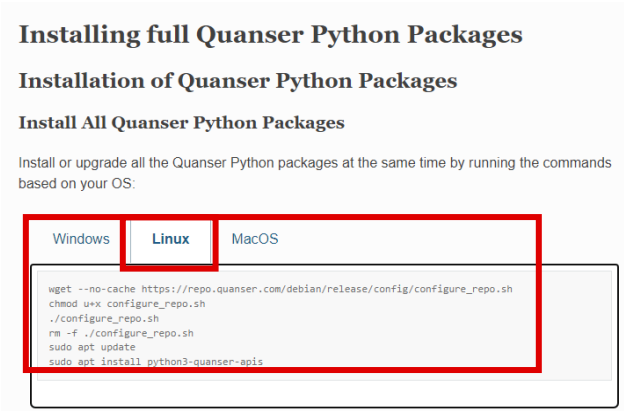
1. Quanser Qube-Servo 3
2. Rotary pendulum module
3. Inertial disc module
4. 24V, 2.71A power supply and power cable
5. USB A/C cable
6. Qube-Servo 3 Resources. Technical resources and courseware provided digitally at www.quanser.com/resources

STEP 2 Install and Test Quanser's Python Packages

A

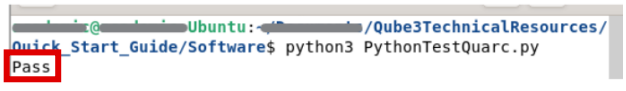
Follow the installation of Quanser Python Packages: https://docs.quanser.com/quarc/documentation/python/installation.html using the commands under the Linux tab. The first 4 lines should only be used for the first install. To update your packages, you only need to use the last two commands that start with sudo.

Python (3.8 or later), pip and the numpy library are required for the next steps.



B

Open a terminal to the **Technical Resources\Quick Start\Software** folder (downloaded from step 1) and type `python3 PythonTestQuarc.py`.



If the libraries installation succeeded, it should output **Pass**.

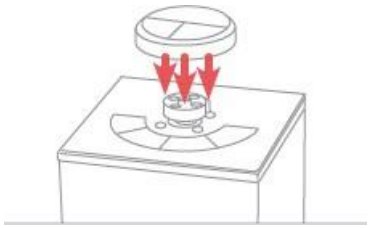
STEP 3 Set Up the Hardware

The steps below outline the instructions to setup the Qube-Servo 3.

A

Place the Qube-Servo 3 on a flat surface with enough space so that the modules will not be obstructed.

B



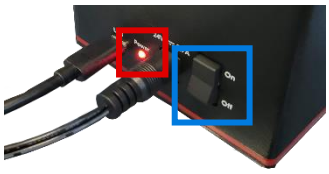
Connect the inertia disc module to Qube-Servo 3 base by aligning the inertia disc magnets with the magnets on the Qube-Servo 3 module connector. The module should snap into place.

C

Connect the supplied 24V power supply to the **Power connector** on the Qube-Servo 3 and to a wall outlet using the included power cable.

Connect the **USB C connector** to the Qube-Servo 3 and to a USB port on your desktop PC or laptop.

D



Move the **power switch** to the **On** position.

The **Power LED** and the **top LED light strip** on the Qube-Servo 3 should light up red.

E

If QUARC was installed properly as described in Step 2, Linux should automatically detect the presence of the Qube-Servo 3.

F

The **Power LED** on the Qube-Servo 3 should change from red to green.

G

In a terminal type ***lsusb |grep Qube*** to confirm your computer recognizes the Qube.

```
[redacted]@[redacted]-Ubuntu:~$ lsusb |grep Qube
Bus 001 Device 005: ID 21df:0024 Quanser Inc. Qube-Servo 3
```

STEP 4 Testing the Qube-Servo 3

Follow the procedure below to test your Qube-Servo 3 experiment.

A

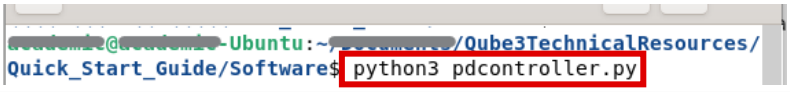
Make sure your PC and the Qube-Servo 3 with the inertia disc are powered ON and connected.

B

1. Download the Qube-Servo 3 **Simulink Technical Resources** and **Simulink Courseware Resources** from www.quanser.com/resources. This will include the Python resources.
2. Extract the **Technical Resources** file to a folder on your local hard drive.

C

Open a terminal in the **Technical Resources\Quick Start\Software** folder, and type `python3 pdcontroller.py`. It should run a basic PD control on a square wave input to the Qube-Servo 3.

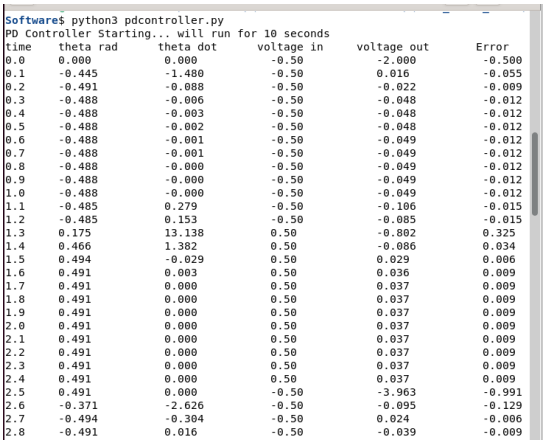


D

1. The output prints results every 0.1 seconds and it will run for 10 seconds.

2. The results should look like the ones in the image. It is a Python equivalent of the Simulink test file.

3. This example is only using the motor encoder output. However, the Python file does all the available reads to be used as reference.



```
Software$ python3 pdcontroller.py
PD Controller Starting... will run for 10 seconds
time    theta rad       theta dot       voltage in      voltage out       Error
0.0     0.000           0.000           -0.50           -2.000          -0.500
0.1     -0.445          -1.480          -0.50           0.016           -0.055
0.2     -0.491          -0.088          -0.50           -0.022          -0.009
0.3     -0.488          -0.006          -0.50           -0.048          -0.012
0.4     -0.488          -0.003          -0.50           -0.048          -0.012
0.5     -0.488          -0.002          -0.50           -0.048          -0.012
0.6     -0.488          -0.001          -0.50           -0.049          -0.012
0.7     -0.488          -0.001          -0.50           -0.049          -0.012
0.8     -0.488          -0.000          -0.50           -0.049          -0.012
0.9     -0.488          -0.000          -0.50           -0.049          -0.012
1.0     -0.488          -0.000          -0.50           -0.049          -0.012
1.1     -0.485          0.279           -0.50           -0.106          -0.015
1.2     -0.485          0.153           -0.50           -0.085          -0.015
1.3     0.175           13.138          0.50            -0.802          0.325
1.4     0.466           1.382           0.50            -0.086          0.034
1.5     0.494           -0.029          0.50            0.029           0.006
1.6     0.491           0.003           0.50            0.036           0.009
1.7     0.491           0.000           0.50            0.037           0.009
1.8     0.491           0.000           0.50            0.037           0.009
1.9     0.491           0.000           0.50            0.037           0.009
2.0     0.491           0.000           0.50            0.037           0.009
2.1     0.491           0.000           0.50            0.037           0.009
2.2     0.491           0.000           0.50            0.037           0.009
2.3     0.491           0.000           0.50            0.037           0.009
2.4     0.491           0.000           0.50            0.037           0.009
2.5     0.491           0.000           -0.50           -3.963          -0.991
2.6     -0.371          -2.626          -0.50           -0.095          -0.129
2.7     -0.494          -0.304          -0.50           0.024           -0.006
2.8     -0.491          0.016           -0.50           -0.039          -0.009
```

E

If you stopped the file before it finished running (with CTRL-C), it should properly close the HIL device and you should be able to start it again. If you are unable to start it, turn the Qube off and on again using the switch in the back and try to run it again.

TROUBLESHOOTING

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

Confirm connections and switch position from Step 3 of this guide to connect and turn on the Qube.

You see 'An operating system specific kernel-level driver for the specified card could not be found' message.	A. Make sure the Qube-Servo 3 is connected to your PC/Laptop with the supplied USB cable to an enabled USB port. B. Ensure the *Power* LED on the Qube-Servo 3 is lit green. If not, confirm that the switch in the back of the Qube Servo is set to the ON position and the power supply is operational (i.e., LED is lit) and properly connected.
The motor is not responding.	Ensure the *Power* LED on the Qube-Servo 3 is lit green. If not, make sure the power supply is operational and properly connected.

LEARN MORE

To browse and download the latest Quanser resources visit www.quanser.com/courseware

STILL NEED HELP

For further assistance from a Quanser engineer, contact us at tech@quanser.com