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Python Quick Start Guide for Windows: 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. Content and courseware provided in digital form at www.quanser.com/resources

## STEP 2   Install and Test QUARC on Python

A
Follow the QUARC Installation Guide to download it to your computer and to get further installation and testing instructions.
Python (3.8 or later), pip and the numpy library are required for the next steps.

B
Go to **%QUARC_DIR%python** in file explorer. It will open the python folder inside the QUARC installation.
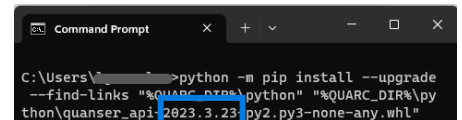Take note of the date in the whl files. You will use it for your install.
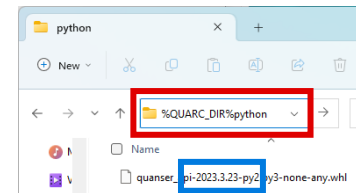
C
Open a command prompt and update pip

```
python -m pip install --upgrade pip
```

D
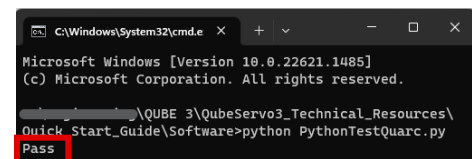In command prompt, install the QUARC python libraries using the date from your whl files


```
python -m pip install --upgrade --find-links
"%QUARC_DIR%\python" "%QUARC_DIR%\python\quanser_api-
2022.10.4-py2.py3-none-any.whl"
```
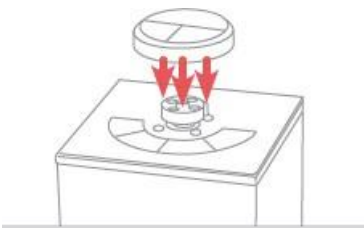
E
Change directories to the **Technical Resources\Quick Start\Software** folder and type `python PythonTestQuarc.py`. If the installation succeeded, it should output Pass.

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

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

Next, connect the **USB C connector** to the Qube-Servo 3 and then to an enabled USB 2.0 (or higher) port on your desktop PC or laptop.

D

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

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

E

If step 2 was done successfully, Windows[1] 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 and the top LED lights should turn red.

G

Go to Windows Device Manager and verify that the Qube-Servo 3 item appears under the *Universal Serial Bus devices*.

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[1] Windows is a registered trademark of Microsoft Corporation in the United States and other countries.

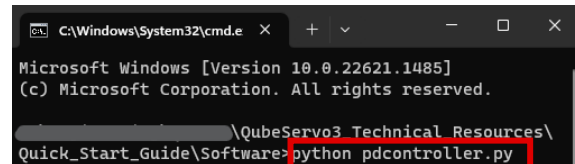Follow the procedure below to test your Qube-Servo 3 experiment.

A   Make sure your PC and the Qube-Servo 3 with the inertia disk 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 command prompt in the **Technical Resources\Quick Start\Software** folder, and type `python pdcontroller.py`. It should run a basic PD control on a square wave input to the Qube-Servo 3.
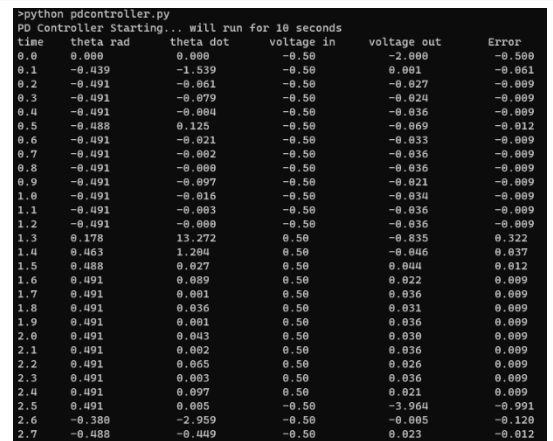


```
C:\Windows\System32\cmd.e  X    +  v            —   □   X
Microsoft Windows [Version 10.0.22621.1485]
(c) Microsoft Corporation. All rights reserved.

                          \QubeServo3_Technical_Resources\
Quick_Start_Guide\Software>python pdcontroller.py
```

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.

```
>python 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    -0.439       -1.539          -0.50          0.001         -0.061
0.2    -0.491       -0.061          -0.50         -0.027         -0.009
0.3    -0.491       -0.079          -0.50         -0.024         -0.009
0.4    -0.491       -0.004          -0.50         -0.036         -0.009
0.5    -0.488        0.125          -0.50         -0.069         -0.012
0.6    -0.491       -0.021          -0.50         -0.033         -0.009
0.7    -0.491       -0.002          -0.50         -0.036         -0.009
0.8    -0.491       -0.000          -0.50         -0.036         -0.009
0.9    -0.491       -0.097          -0.50         -0.021         -0.009
1.0    -0.491       -0.016          -0.50         -0.034         -0.009
1.1    -0.491       -0.003          -0.50         -0.036         -0.009
1.2    -0.491       -0.000          -0.50         -0.036         -0.009
1.3     0.178       13.272           0.50         -0.835          0.322
1.4     0.463        1.204           0.50         -0.046          0.037
1.5     0.488        0.027           0.50          0.044          0.012
1.6     0.491        0.089           0.50          0.022          0.009
1.7     0.491        0.001           0.50          0.036          0.009
1.8     0.491        0.036           0.50          0.031          0.009
1.9     0.491        0.001           0.50          0.036          0.009
2.0     0.491        0.043           0.50          0.030          0.009
2.1     0.491        0.002           0.50          0.036          0.009
2.2     0.491        0.065           0.50          0.026          0.009
2.3     0.491        0.003           0.50          0.036          0.009
2.4     0.491        0.097           0.50          0.021          0.009
2.5     0.491        0.005          -0.50         -3.964         -0.991
2.6    -0.380       -2.959          -0.50         -0.005         -0.120
2.7    -0.488       -0.449          -0.50          0.023         -0.012
```

E   If you stopped the model before it finished, and you are not able to start it again, turn the Qube off and on again using the switch in the back and close the command prompt and open a new one.

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

Check the connections outlined in Step 3 of this guide and ensure that the cables are connected firmly.

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 green *Power* LED on the Qube-Servo 3 is lit. If not, confirm that the power supply is operational (i.e., LED is lit) and properly connected.

The Motor is not responding.

Ensure the green *Power* LED on the Qube-Servo 3 is lit. 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