

# Pymoku for Moku:Lab

## Getting started guide

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Pymoku is a Python library for the command, control, and monitoring of the Liquid Instruments' Moku:Lab. It takes Moku:Lab to the next level, turning it into an automated test, measurement, and control device for your lab. This guide provides step-by-step instructions on how to install the library on Windows, MacOS, or Linux environment.



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# Prerequisites

## Install Python

Pymoku currently supports Python version 2.7.X and 3.6.X. MacOS and most Linux operating systems come with Python pre-installed. A Windows installer can be found on the [official website](#). To confirm Python environment, open a terminal (MacOS or Linux) or command prompt (Windows) and type:

```
python
```

A Python shell should open. Note that for some operating systems (i.e., Ubuntu 16.04), Python 3.X is called by python3.

```
Python 2.7.10 (default, Feb 22 2019, 21:17:52)
[GCC 4.2.1 Compatible Apple LLVM 10.0.1 (clang-1001.0.37.14)] on darwin
Type "help", "copyright", "credits" or "license" for more information.
>>> █
```

Note that you may have to manually add the Python folder to the Windows path in order to use it in the command prompt.

## Install pip

pip is a package management system for Python that is used to install and manage Python libraries. Detailed instructions on installing pip can be found [here](#). To confirm the installation of pip, type:

```
pip
```

in the terminal or command prompt. The options for pip should show on your screen. Note that for some operating systems, pip for Python 3.X is called by **pip3**.

```
Usage:
  pip <command> [options]

Commands:
  install          Install packages.
  download        Download packages.
  uninstall       Uninstall packages.
  freeze          Output installed packages in requirements format.
  list            List installed packages.
  show            Show information about installed packages.
  check           Verify installed packages have compatible dependen
cies.
```

## Install Bonjour

Bonjour is a software protocol used to establish communication between computers and other hardware devices. MacOS comes with Bonjour pre-installed. Linux users can install the *dnssd* compatibility libraries. For Linux with APT support, type the following line in a terminal:

```
sudo apt-get install libavahi-compat-libdnssd1
```

Windows users can install Bonjour Printer Services with an [installer](#).

Note that you can still access the Moku:Lab by its IP address if you don't have Bonjour installed. However, you won't be able to connect Moku:Lab automatically by name or serial number, or find it using `moku list`.

## Connect Moku:Lab to the same network as your computer

Plug in the ethernet cable and ensure the orange activity light is on or blinking. A DHCP server on the network is required to assign an IP address to the Moku:Lab. Alternatively, to connect the Moku:Lab to an existing wireless network, please refer to the instructions on page 2 of the [Quick Start Guide](#). For additional information, please check [Connecting to your Moku:Lab](#).

## Connect the local network to the internet

To install packages with pip and update the Moku:Lab firmware, internet access is required. Note that the internet is only required for pymoku installation and firmware update. Once the library is installed, the Moku:Lab can work offline.

# Pymoku Installation

## Install the pymoku library via pip

Open a terminal (MacOS, Linux) or Command Prompt (Windows), and type:

```
pip install pymoku
moku update fetch
```

To ensure pymoku has been successfully installed in your Python distribution by opening a **Python shell** and running:

```
import pymoku
```

No error indicates a successful installation.

## Update to the latest Moku:Lab Firmware

In the terminal or command prompt, type:

```
moku --serial=123456 update install
```

The serial number is the middle six digits found on the sticker on the bottom of the Moku:Lab. For example: XXX-123456-X.

Alternatively, you can connect and update the Moku:Lab by its IP address:

```
moku --ip=192.168.0.1 update install
```

The IP address of the Moku:Lab device can be found with:

```
moku list
```

## Run Python Script

You are now ready to control your Moku:Lab using Python! You can find a few example scripts in the examples folder on the [GitHub](#). Here is a simple example of how to connect to a Moku:Lab, deploy the Oscilloscope, and fetch a single hi-res data trace. Open a **Python shell** and run the following code:

```
from pymoku import Moku
from pymoku.instruments import Oscilloscope

m = Moku.get_by_serial(123456)
i = m.deploy_instrument(Oscilloscope)

i.set_timebase(-1e-3, 1e-3) # 1ms before and after trigger event
i.set_trigger('in1', 'rising', 0) # rising edge through 0 volts

data = i.get_data()
print(data.ch1, data.ch2, data.time)

m.close()
```

For detailed instrument programming tutorials, see [Moku:Lab Python Interface](#) and [Moku:Lab Software Package Documentation](#).

# Troubleshooting

## moku: command not found

**Solution:** Ensure pymoku has been successfully installed in your Python distribution by opening a Python shell typing:

```
import pymoku
```

No error indicates a successful installation.

## ImportError: No Module named pymoku Create a Python 2.7 or 3.6 Environment

**Solution:** Make sure you are running the version of Python you installed pymoku to. Often a system has multiple Python installations. Try substituting `pip` with `python -m pip` in the installation. If you installed pymoku inside an environment (i.e. via virtualenv or conda-env), ensure that the environment is activated. You can check that pymoku is installed in your currently running environment using:

```
pip list
```

## zmq.error.Again: Resource temporarily unavailable

**Solution:** Ensure your Moku:Lab is discoverable on the network by calling `moku list` or searching for the Moku:Lab using *BonjourBrowser*. Make sure you are using the latest version of pymoku and firmware for Moku:Lab.

## Pymoku.DeployException: Deploy Error 3

**Solution:** Confirm you have the latest binary data pack and your Moku:Lab is running the latest firmware. To update the binary data, type:

```
moku update fetch  
moku --serial=123456 update install
```