

Installing ruediPy on a Raspberry Pi

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Abstract

The present document provides a practical guide to install and run the ruediPy software for instrument control and data acquisition of RUEDI portable mass spectrometer systems. A general guide on how install ruediPy on Linux-based systems can be found on the website of Gasometrix GmbH.

Contents

1	Hardware requirements	2
2	Basic Raspbian setup	2
3	Preparation of the system to host ruediPy	2
4	Installing mandatory packages and ruediPy	3
5	Remote control options	4

1 Hardware requirements

Following items are required to successfully perform the envisaged tasks:

- 1 miniRUEDI (incl. VICI selector valve, cables, ...)
- 1 Raspberry Pi (models 2 or 3 have been tested so far)
- 1 power supply for Raspberry Pi (5 V, 2.5 A recommended)
- 1 micro SD card
- display, keyboard, and mouse

2 Basic Raspbian setup

Raspbian is the official supported operating system for Raspberry Pi and provides an adequate environment for ruediPy.

- Download the NOOBS operating system installer from <https://www.raspberrypi.org/downloads/noobs/>
- Unzip the downloaded content to the SD card
- Insert the SD card in the Raspberry Pi, connect all devices (screen, keyboard, mouse)
- Turn on the Raspberry Pi and install Raspbian using the graphical interface

3 Preparation of the system to host ruediPy

The steps described in this section must be executed from a terminal window.

- Upgrade all packages:

```
sudo apt-get update
sudo apt-get upgrade
```

- Update the system to the latest distribution:

```
sudo apt-get dist-upgrade
```

Reboot the system.

- The Raspberry Pi firmware version 4.14.70 has issues related to the USB port management that will affect the correct operation of the USB to serial port adapters of the miniRUEDI! Check the firmware version:

```
uname -a
```

If necessary, upgrade the Raspberry Pi firmware to the latest version:

```
sudo rpi-update
```

A reboot will be necessary. At present, the firmware version 4.14.72 provides a sufficiently stable environment for ruediPy.

- The JDK packages might not have been configured properly. To be on the safe side, purge and install these packages:

```
sudo apt-get purge openjdk-8-jre-headless
sudo apt-get install openjdk-8-jre-headless
sudo apt-get install openjdk-8-jre
```

4 Installing mandatory packages and ruediPy

This section follows the general setup for Linux systems (please refer also to the documentation on Gasometrix GmbH). Only the last point modifies `.bashrc` instead of `.profile` (which is commonly found in distributions such as Ubuntu, but is not so helpful under Raspbian).

- Install the basic software requirements for ruediPy

```
sudo apt-get install octave subversion python3-pip
sudo apt-get install python3-serial python3-matplotlib
sudo apt-get install python3-scipy python3-termcolor
sudo -H pip3 install pydigitemp
```

- Download ruediPy:

```
svn co https://github.com/brennmat/ruediPy.git/trunk ~/ruediPy
```

- Set permission for user “pi” (default username in Raspbian) to access the serial ports:

```
sudo usermod -a -G dialout pi
```

- Create directories for ruediPy data files and your measurement scripts:

```
mkdir ~/data
mkdir ~/scripts
```

- Set shell and python paths (adapt `custom_folder` according to the specific needs/tastes):

```
echo PROJECT_SCRIPTS=~/scripts/custom_folder >> ~/ruediPy_paths.txt
echo export PYTHONPATH=~/ruediPy/python >> ~/ruediPy_paths.txt
echo export PYTHONPATH=${PYTHONPATH}:'$PROJECT_SCRIPTS' >> ~/ruediPy_paths.txt
echo export PATH=${PATH}:'$PROJECT_SCRIPTS' >> ~/ruediPy_paths.txt
```

- Add paths at user login:

```
echo source '$HOME'/ruediPy_paths.txt >> ~/.bashrc
```

Now the Raspberry Pi should be ready to run the ruediPy software. Adjust the ruediPy configuration files according to the specific setup of the miniRUEDI in use.

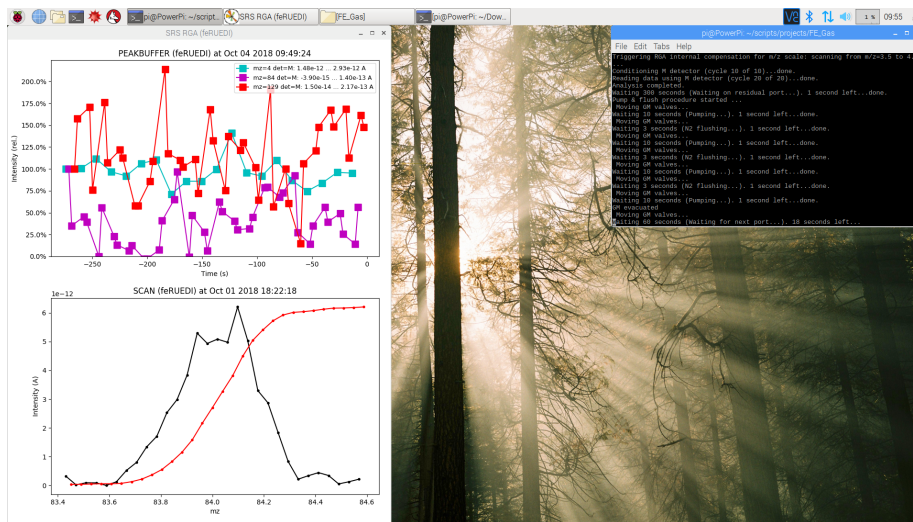


Figure 1: Screenshot of Raspberry Pi 3 running ruediPy. Top panel: Test measurement of He, Kr, and Xe on the electron multiplier detector. Bottom panel: Scan on mass 84.

5 Remote control options

Raspbian comes with VNC as default remote desktop solution. Local network access via IP address can be achieved by activating the VNC service under Preferences > Raspberry Pi Configuration > Interfaces. VNC Viewer (available for different operating systems) can be downloaded from RealVNC. For full remote control (outside of the local network), a RealVNC account is required. Up to five devices can be registered for free.

An alternative to VNC might be TeamViewer. However, during a recent gas monitoring in Japan, mouse and keyboard became useless after almost two months of uninterrupted measurements using this software.