Coding seminar

Lesson 5: Instrument control – PyVISA

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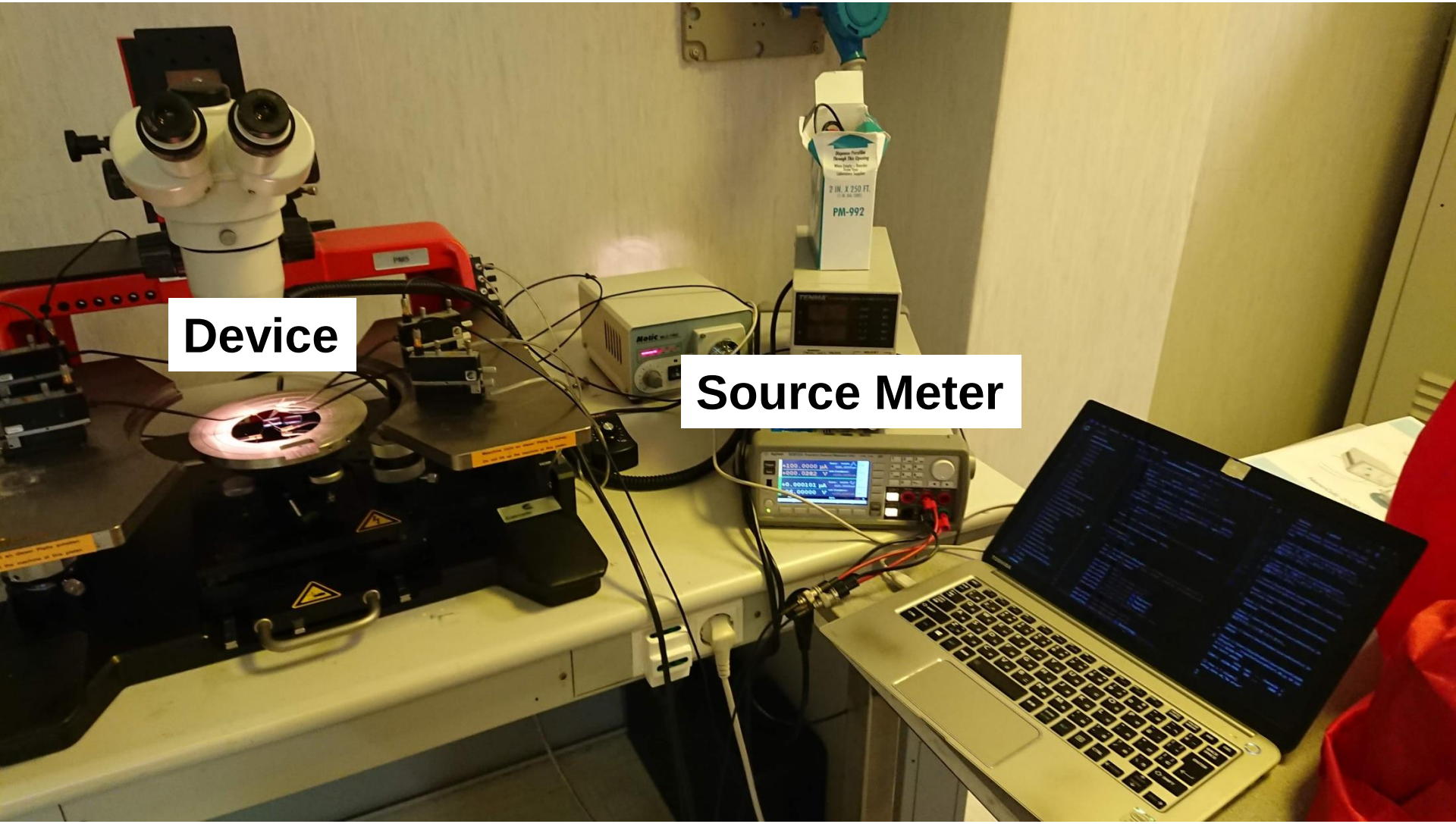
Contents

Control instrument



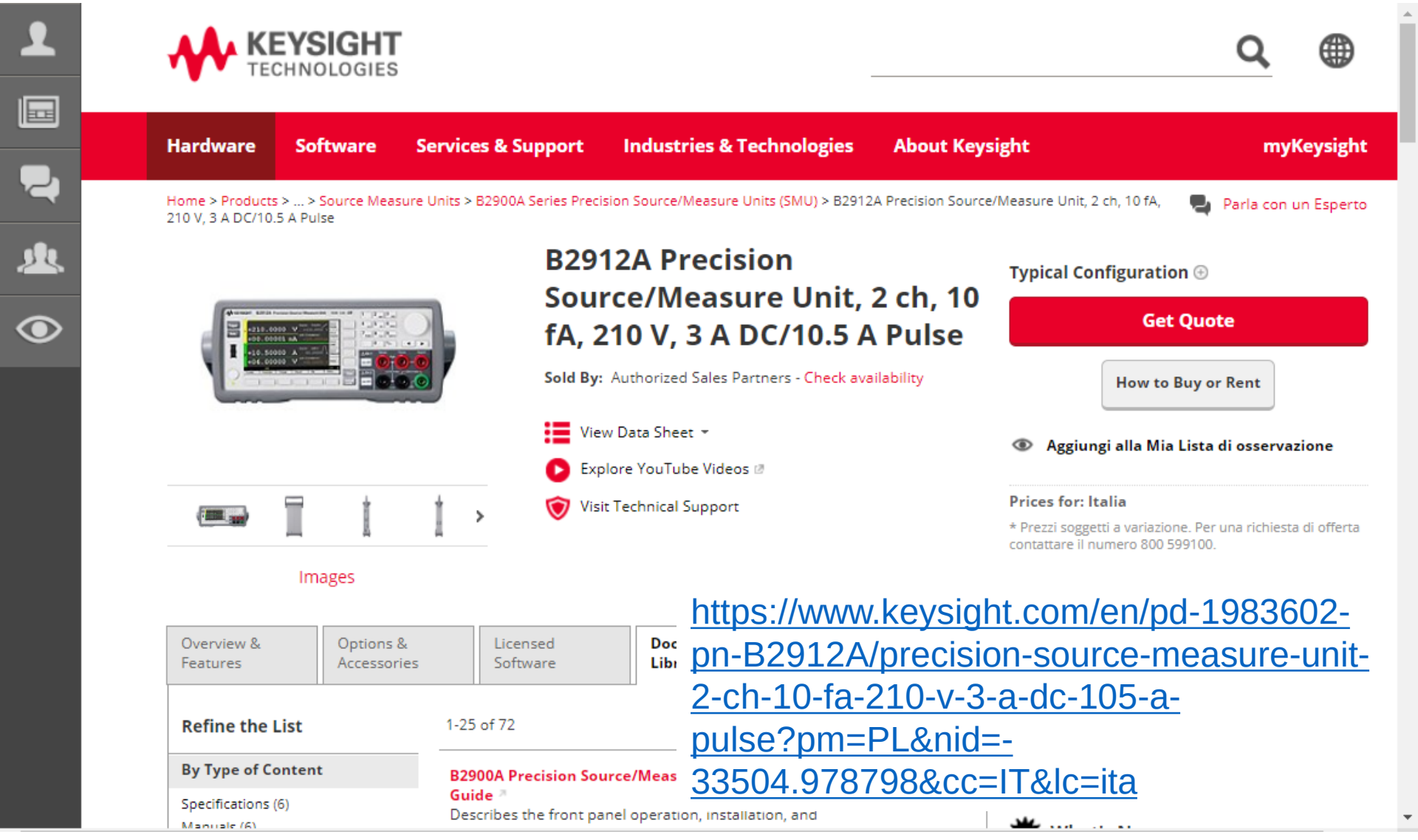
The first thing to do: RTFM

1.1. Documentation

The acronym RTFM ('read the field manual', or more rudely 'read the f***ing manual' (Wikipedia.org, 2013)) is often used to exhort users to refer to user manuals, but several authors have claimed that this is often not what people do. For example,

[1] A.L. Blackler, R. Gomez, V. Popovic, M.H. Thompson, Life Is Too Short to RTFM: How Users Relate to Documentation and Excess Features in Consumer Products, Interact. Comput. 28 (2016) 27–46. doi:10.1093/iwc/iwu023.

Find the manual



https://www.keysight.com/en/pd-1983602-pn-B2912A/precision-source-measure-unit-2-ch-10-fa-210-v-3-a-dc-105-a-pulse?pm=PL&nid=-33504.978798&cc=IT&lc=ita

3 important documents

Refine the List

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Sort: Date

remove all refinements

By Type of Content

Document Library

Manuals

- Operation Manual (1)
- Programming and Syntax Guide (2)
- Quick Start Guide (1)
- User Manual (2)

B2900A Precision Source/Measure Unit User's Guide — PDF 7.27 MB, Languages
Describes the front panel operation, installation, and functions of Keysight B2900.
User Manual 2019-03-31

B2900A Precision Source/Measure Unit SCPI Command Reference — PDF 3.58 MB
Contains reference information to help you program Keysight B2900 over the remote interface using the SCPI programming language.
Programming and Syntax Guide 2019-03-31

B2900A Precision Source/Measure Unit Programming Guide — PDF 595 KB
Provides the information for controlling Keysight B2900 by using an external computer.
Programming and Syntax Guide 2016-12-30

User Manual
Programming and Syntax Guide

How to use Keysight B2900A Quick I/V Measurement Software — PDF
The Quick I/V is a free PC software dedicated to Keysight B2900A series. You can start using this software with this quick start guide consisting of step guide on the real PC display.
Quick Start Guide 2013-07-11

- Technical Support
  manuals, drivers, application notes, firmware, software, ...

What's New

- New M9601A PXIe Precision Source/Measure Unit is released

Training & Events

- Small signal, low level, DC Parametric measurements: Back to Basics Part 1
- Semiconductor Parametric Test: Back to Basics Part 2
- Modern Remote and Wireless Test Setup and Considerations

Check the interface: GPIB/USB/LAN

Stated in the manual

PyVISA

PyVISA
latest

Search docs

User guide
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FAQ
API Documentation

Read the Docs v: latest

Docs » PyVISA: Control your instruments with Python

Edit on GitHub

PyVISA: Control your instruments with Python

PyVISA is a Python package that enables you to control all kinds of measurement devices independently of the interface (e.g. GPIB, RS232, USB, Ethernet). As an example, reading self-identification from a Keithley Multimeter with GPIB number 12 is as easy as three lines of Python code:

```
>>> import pyvisa
>>> rm = pyvisa.ResourceManager()
>>> rm.list_resources()
('ASRL1::INSTR', 'ASRL2::INSTR', 'GPIB0::12::INSTR')
>>> inst = rm.open_resource('GPIB0::12::INSTR')
>>> print(inst.query("*IDN?"))
```

(That's the whole program; really!) It v

https://pyvisa.readthedocs.io/en/latest/

(e.g. National Instruments, Agilent, Tektronix, Stanford Research Systems).

Install PyVISA

You can install it using pip:

```
$ pip install -U pyvisa
```

Measurement procedure

1. General parameters setup
   - Save file name
   - Voltage, sweep direction, etc.
2. Open instrument
3. Instrument setup
4. Run measurement
5. Save (and plot)

General parameters setup

File Edit Selection ··· simplemeasurement.py - semin...

simplemeasurement.py

sers > Ikue > Dropbox > PythonCourse > Lesson5 > simplemeasurement.py > ...

```python

# sweep parameters
base = 20.
sweepstart = 1. # frequency sweep from base**sweepstart
sweepstop = 5.6 # frequency sweep end at base**sweepsto
numberOfPoints = 101
fillMode = "log" # parameter steps. linear or log
amp = 0.1 # voltage amplitude
averaging = 1 # number of averaging
bias = 0 # dc bias
aperture = "MED" # measurement time
correction_open = "OFF" # open correction status

```

sys.argv

```python
import sys
for (i, e) in enumerate(sys.argv):
    print(f"sys.argv[{i}] is {e}")
```

In [2]:

```
!python Lesson5/sysargvtest.py a b c d e
```

```
sys.argv[0] is Lesson5/sysargvtest.py
sys.argv[1] is a
sys.argv[2] is b
sys.argv[3] is c
sys.argv[4] is d
sys.argv[5] is e
```

sys.argv

```
$ python measurement.py device1 10
```

sys.argv[0]	sys.argv[1]	sys.argv[2]
	save file name	measurement voltage

Open instrument

```
# open instrument
rm = visa.ResourceManager("C:/Windows/System32/visa64.dll")
pia = rm.open_resource('USB0::0x0957::0x0909::MY46204132::0::INSTR')
```

USB address of the instrument: how to find it?

Find the address

```
>>> import pyvisa
>>> rm = pyvisa.ResourceManager()
>>> rm.list_resources()
('ASRL1::INSTR', 'ASRL2::INSTR', 'GPIB0::14::INSTR')
```

https://pyvisa.readthedocs.io/en/latest/introduction/communication.html#an-example

Setup: commands to send?

```
pia.write(COMMAND)
```

Find some examples in the manual

Find in examples

```
pia.write(f":VOLT {amp}") # oscillator mode to votage 0.1 V
pia.write(":BIAS:STAT OFF")# DC bias off :BIAS:STAT?

pia.write(":SYST:BEEP:STAT ON") # enables beep
pia.write(":COMP:BEEP PASS") # beeps when measurement passes: default

pia.write(f":CORR:OPEN:STAT {correction_open}") # open correction

pia.write(":STAT:OPER:ENAB 0")
pia.write(":ABOR;:INIT")

pia.write(":TRIG") # trigger measurement
pia.write("*WAI") # wait until finishes
```

Measurement procedure

1. General parameters setup → sys.argv
   - Save file name
   - Voltage, sweep direction, etc.
2. Open instrument → pia = rm.open_resource()
3. Instrument setup → pia.write(*commands*)
4. Run measurement → pia.write(“:TRIG”)
5. Save (and plot) → pia.write(“FETC?”)

Some elements skipped for learning Python in depth

- Class
- struct
- figure, ax objects in matplotlib.pyplot
- object-oriented vs. process-oriented
- conditional statements: all(), any()

Study by yourself

PyVISA official document

https://pyvisa.readthedocs.io/en/latest/index.html

Manuals of instruments of your choice