

<Software Manual for Windows PC>

Pressure Testing Application

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Introduction

This manual is created for **Windows** PC.

The application is built with **PyQt** software.

PyQt software consists of 2 parts:

1. Python
 - Python is a programming language and it is used to implement all the functions that's needed for this application
 - Users will run the Python code in 'Visual Studio Code', which is the code editor that helps users to debug and run the code.
2. Qt Designer
 - Qt Designer is a tool to design GUI with Qt Widgets.
 - Users can edit the GUI with Qt Designer.

To run the application, users need to do 4 things:

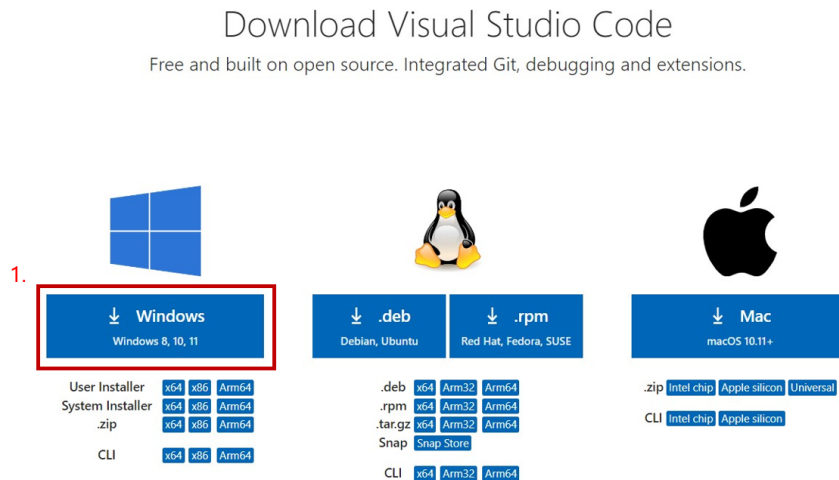
1. Download 'Visual Studio Code'
 - Users will use 'Visual Studio Code' to open and edit the 'source code python file' and the 'GUI Qt Designer file'.
2. Copy and paste the application source code from 'GitHub'
 - Users will copy the source code from 'GitHub' and paste it on 'Visual Studio Code'
3. Install 'LabJack Python'
 - 'LabJack Python' needs to be installed to run the source code, so users will install 'LabJack Python' from the terminal on 'Visual Studio Code'.
4. Download 'Qt Designer'
 - The GUI for this application is made from 'Qt Designer' so users will download 'Qt Designer' software and they will be able to edit the GUI as they wish using this software.

Installation Guide

(This is the guide to install and set up the application.)

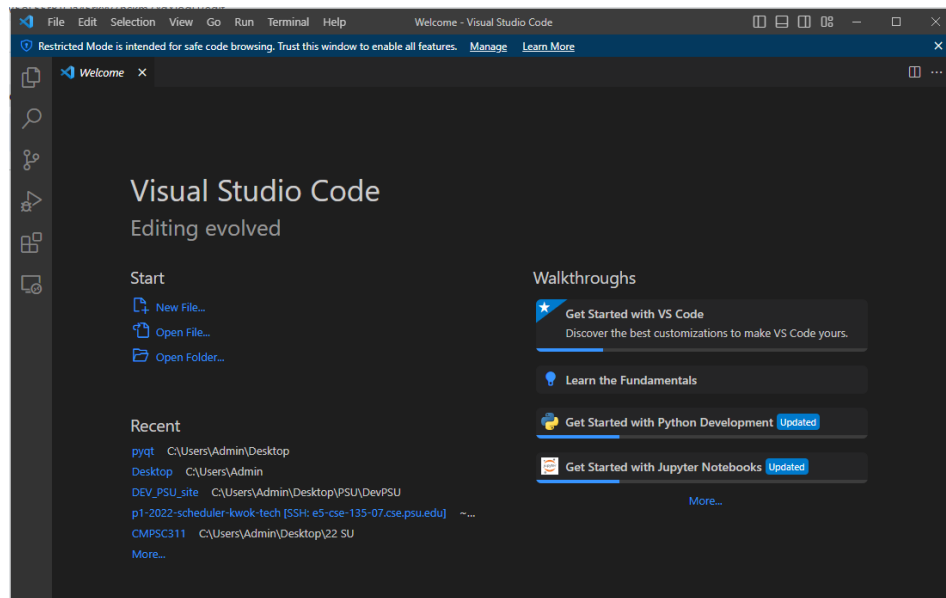
1. Download 'Visual Studio Code'

- Go to <https://code.visualstudio.com/download>
- Click the 'Windows' button (See Figure 1)



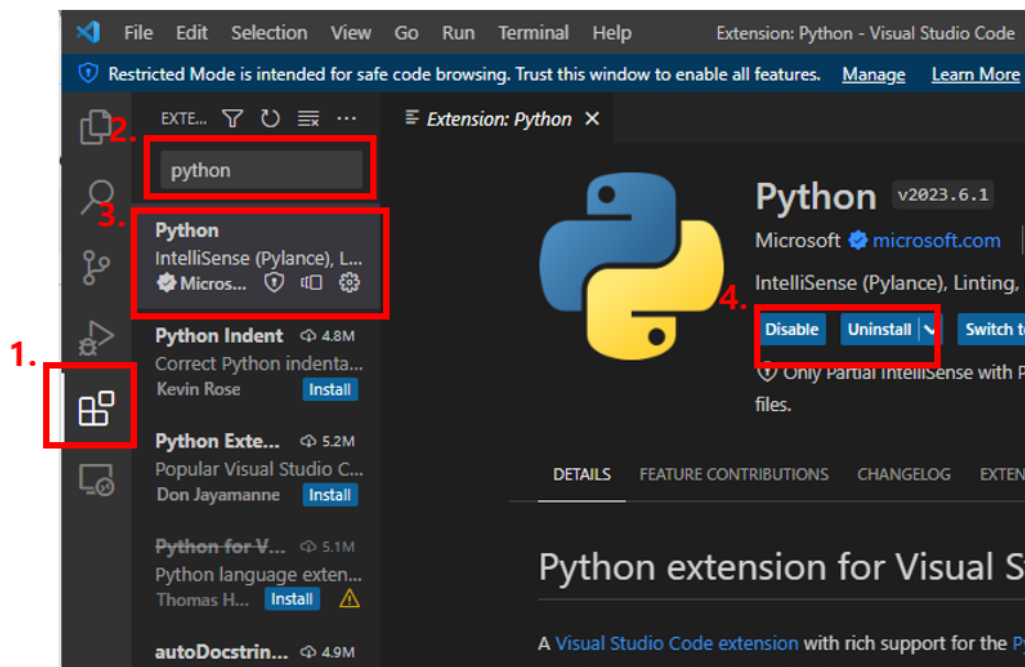
<Figure 1: Download Visual Studio Code>

- Once 'VSCodeUserSetup' is downloaded, run it.
- Keep clicking 'Next' and 'Install'
- If installation is done, run the 'Visual Studio Code'.



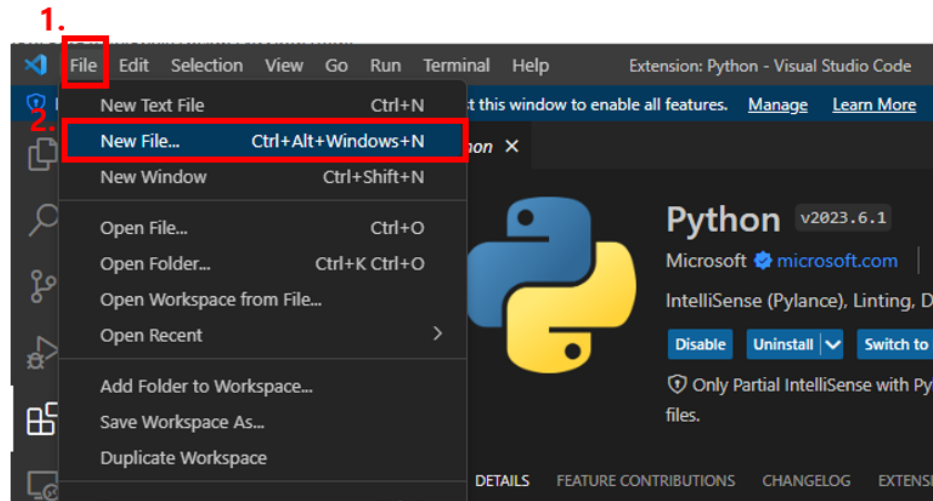
<Figure 2: Visual Studio Code>

- f. Click the 'Extensions' icon on the left bar in the Visual Studio Code and search for 'Python' and install the Python (See Figure 3)



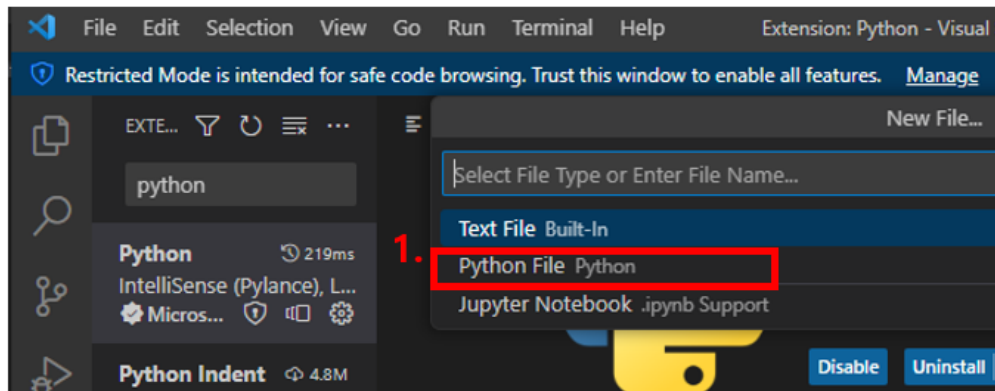
<Figure 3: Install Python from Visual Studio Code>

- g. Click 'File' on the top function bar and click 'New File ...'. (See Figure 4)



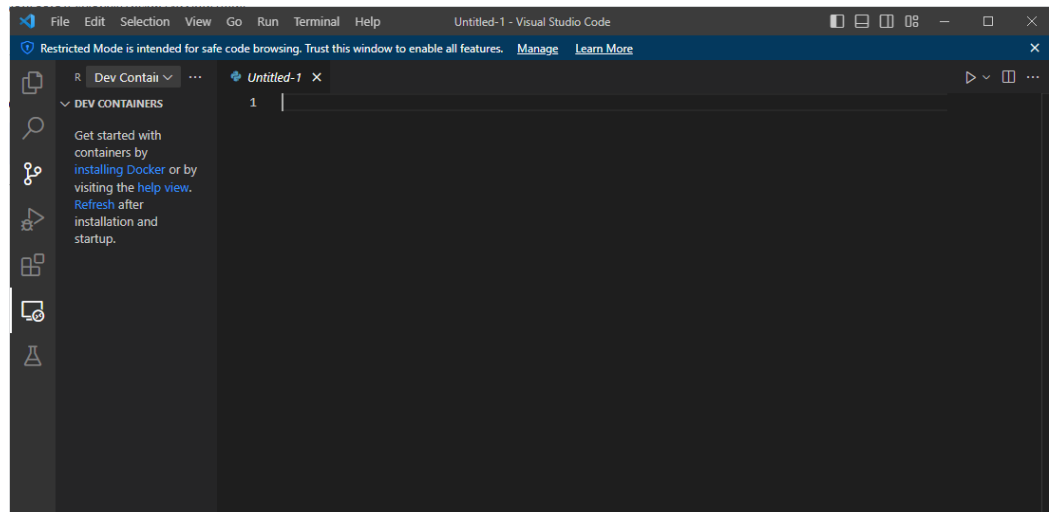
<Figure 4: New File...>

- h. Click 'Python File' (See Figure 5)



<Figure 5: Python File>

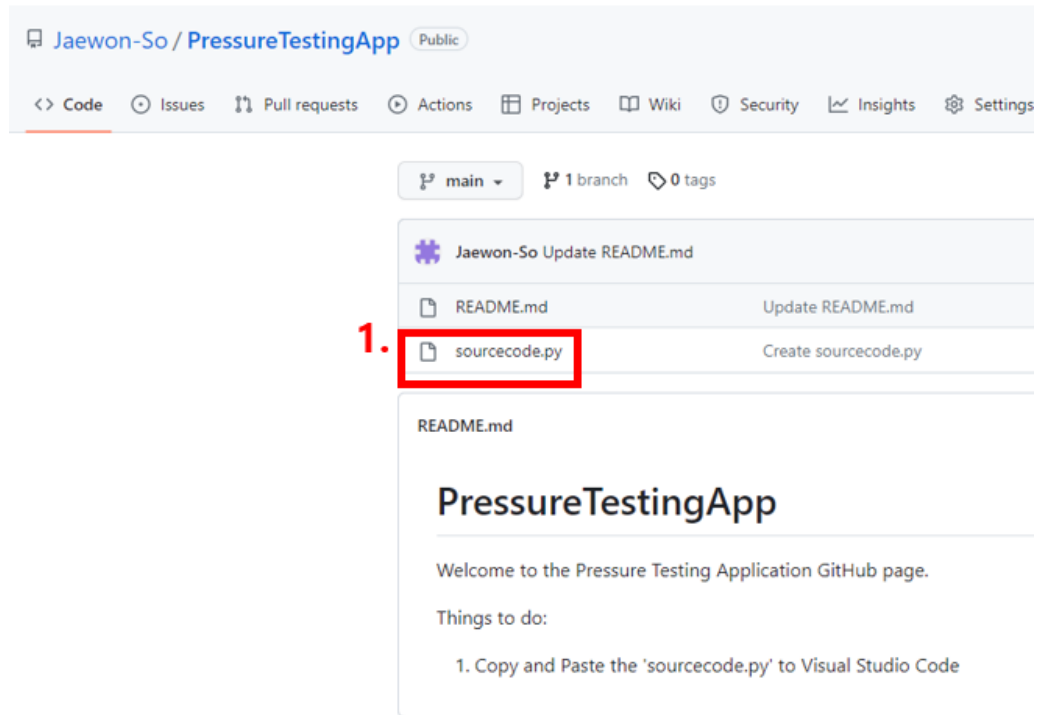
- i. Now, you will see screen like Figure 6




<Figure 6: Untitled Python File>

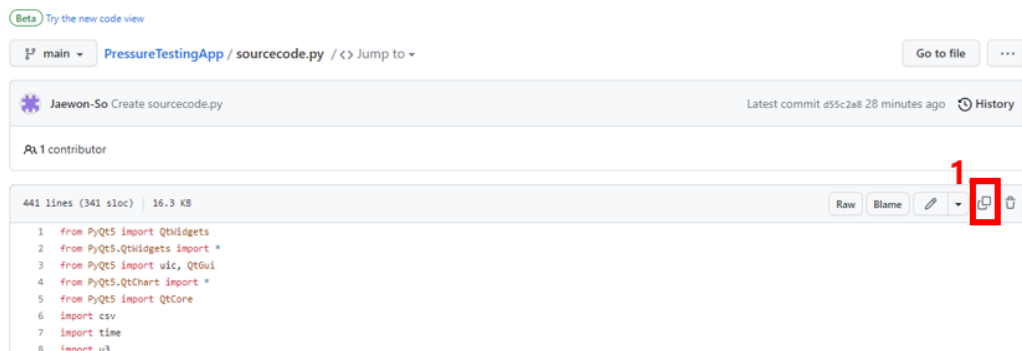
2. Copy and paste the source code from 'GitHub'

- a. Go to <https://github.com/Jaewon-So/PressureTestingApp>
- b. Click 'sourcecode.py' (See Figure 7)



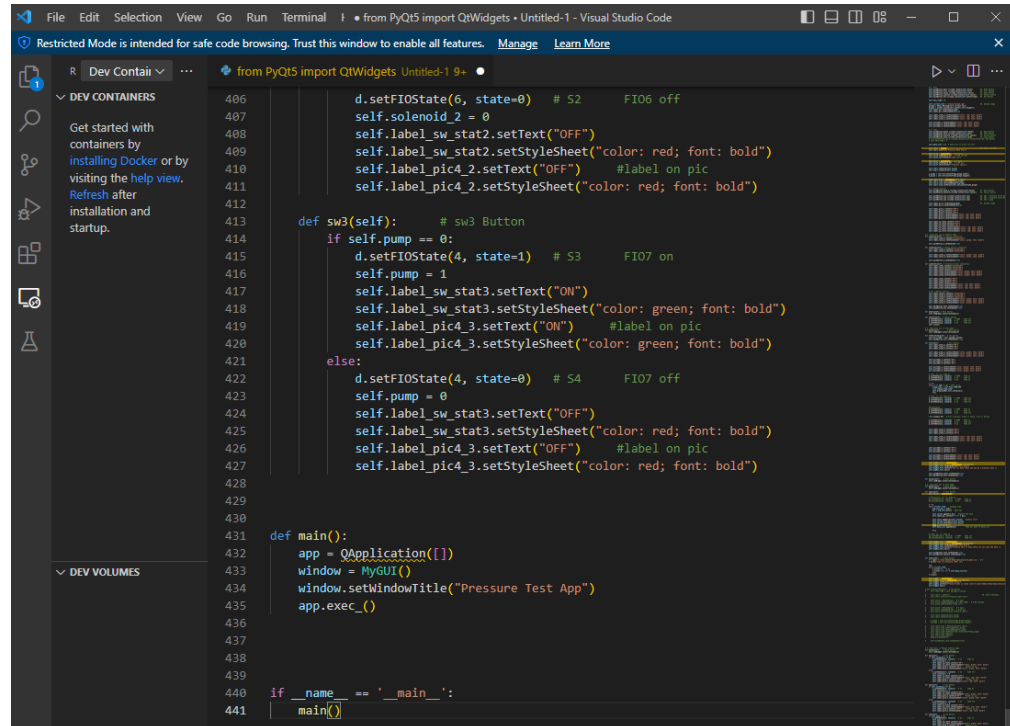
<Figure 7: Click 'sourcecode.py'>

- c. Click  icon to copy raw contents of the code. (See Figure 8)



<Figure 8: Click 'sourcecode.py'>

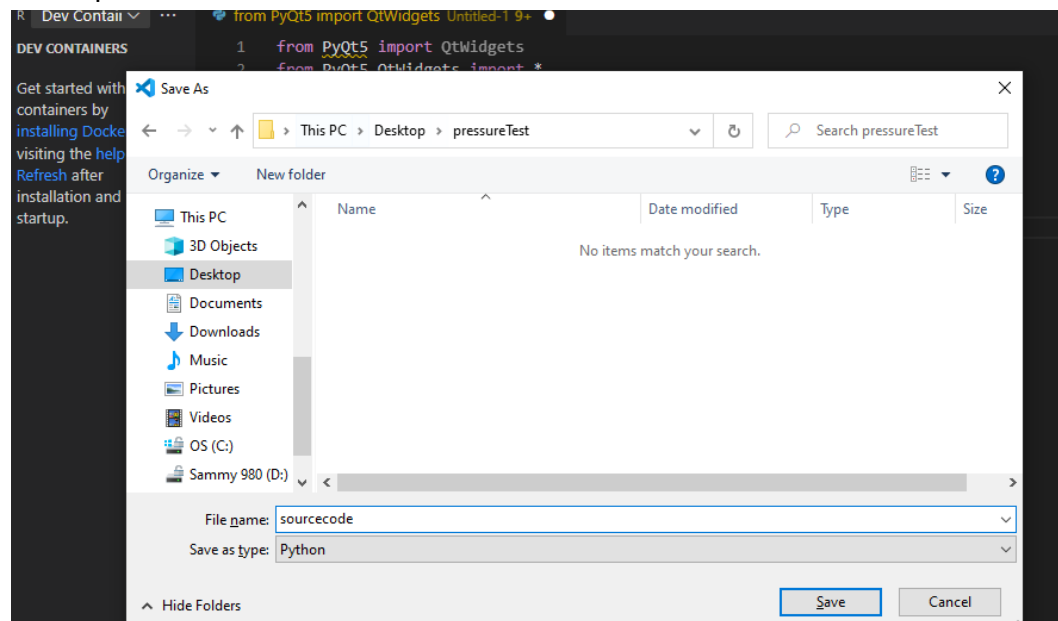
- d. Paste the code (ctrl+v) to the Untitled Python File in Visual Studio Code (See Figure 9)




```
406         d.setFIOState(6, state=0) # S2      FIO6 off
407         self.solenoid_2 = 0
408         self.label_sw_stat2.setText("OFF")
409         self.label_sw_stat2.setStyleSheet("color: red; font: bold")
410         self.label_pic4_2.setText("OFF") #label on pic
411         self.label_pic4_2.setStyleSheet("color: red; font: bold")
412
413     def sw3(self): # sw3 Button
414         if self.pump == 0:
415             d.setFIOState(4, state=1) # S3      FIO7 on
416             self.pump = 1
417             self.label_sw_stat3.setText("ON")
418             self.label_sw_stat3.setStyleSheet("color: green; font: bold")
419             self.label_pic4_3.setText("ON") #label on pic
420             self.label_pic4_3.setStyleSheet("color: green; font: bold")
421         else:
422             d.setFIOState(4, state=0) # S4      FIO7 off
423             self.pump = 0
424             self.label_sw_stat3.setText("OFF")
425             self.label_sw_stat3.setStyleSheet("color: red; font: bold")
426             self.label_pic4_3.setText("OFF") #label on pic
427             self.label_pic4_3.setStyleSheet("color: red; font: bold")
428
429
430
431     def main():
432         app = QApplication([])
433         window = MyGUI()
434         window.setWindowTitle("Pressure Test App")
435         app.exec_()
436
437
438
439
440 if __name__ == '__main__':
441     main()
```

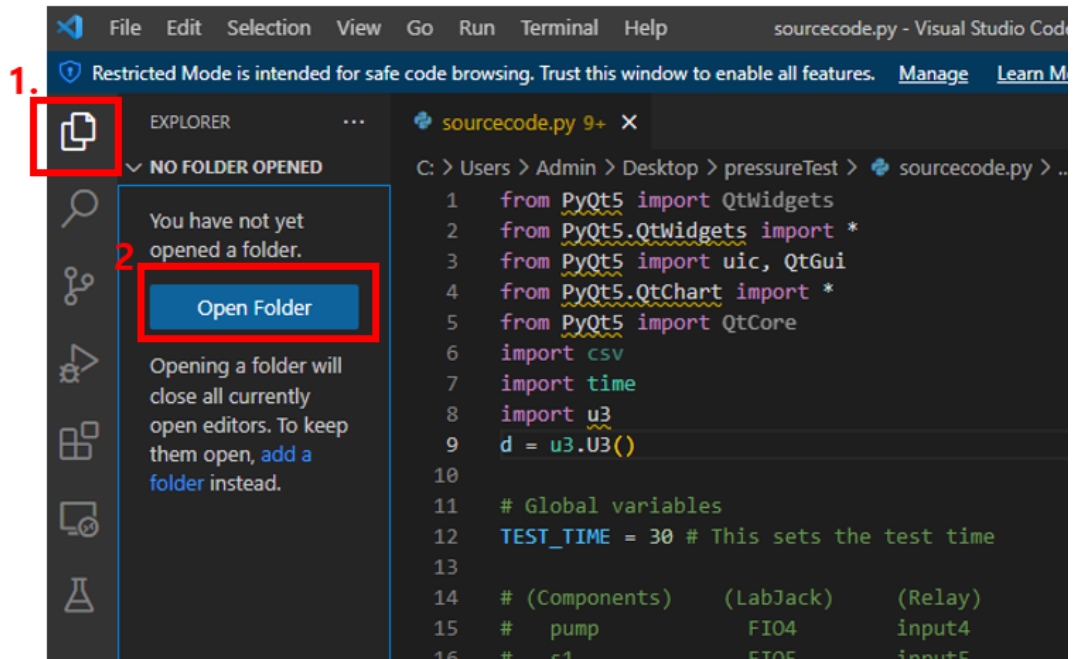
<Figure 9: Paste the code>

- e. Save the file (ctrl+s).
In Figure 10, I change the file name as 'sourcecode' and save it in the folder name 'pressureTest'.



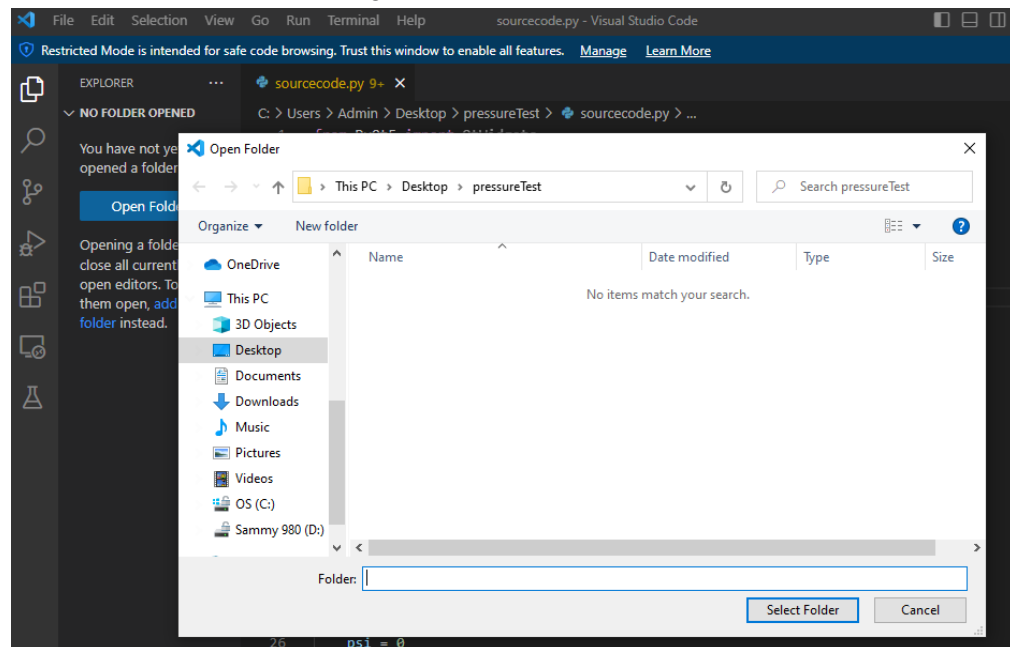
<Figure 10: Save the code>

- f. After save, click  icon and click 'Open Folder' (See Figure 11)



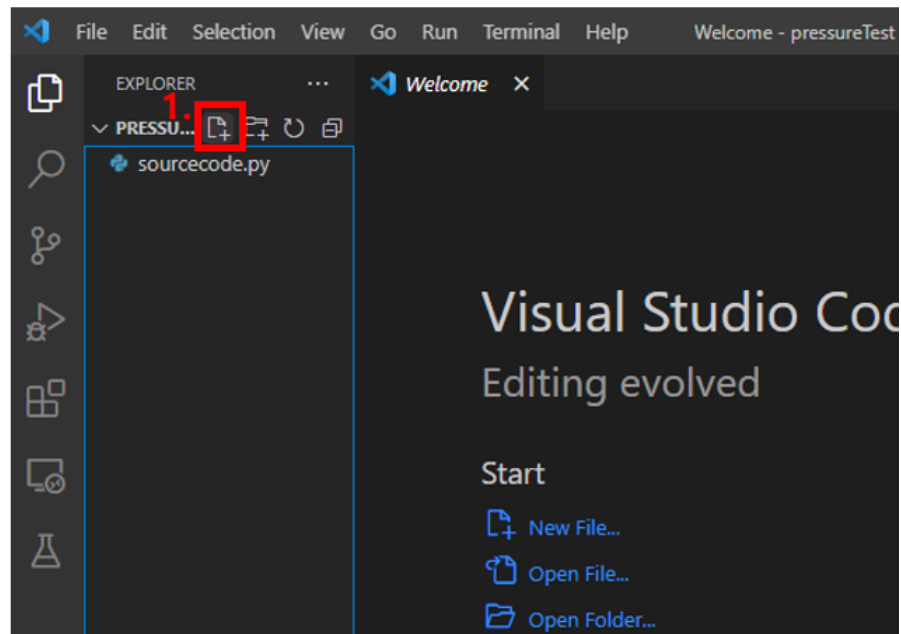
<Figure 11: Open Folder>

- g. Click 'Select Folder' (See Figure 12)



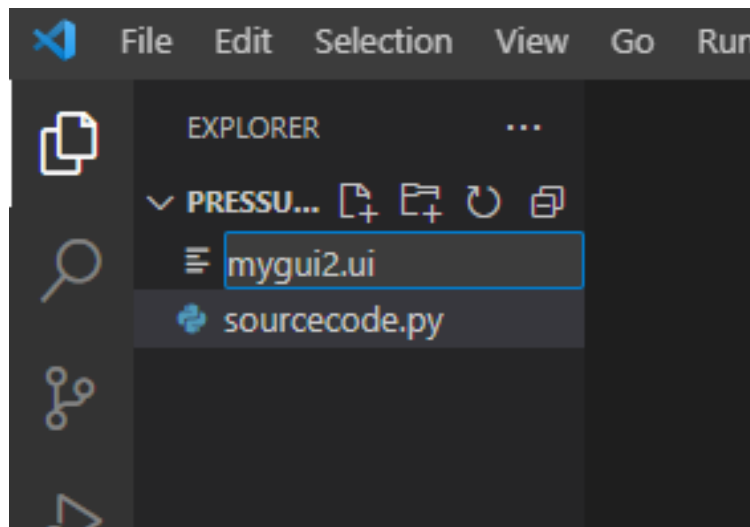
<Figure 12: Select Folder>

- h. Click 'New File' button (See Figure 13)




<Figure 13: New File>

- i. Type 'mygui2.ui' and hit 'enter' key (See Figure 14)

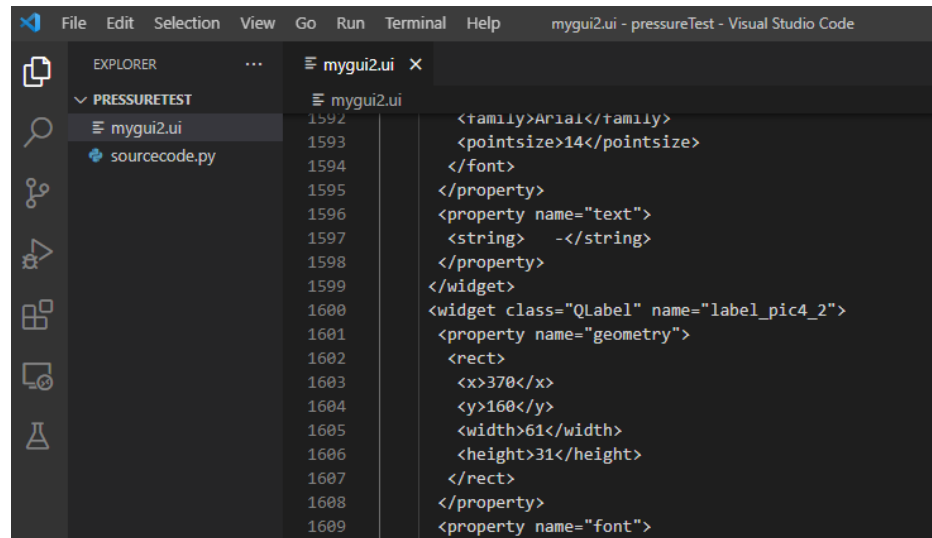


<Figure 14: 'mygui2.ui'>

- j. Go to <https://github.com/Jaewon-So/PressureTestingApp> again.

- k. Click 'mygui2.ui' and Click  icon to copy raw contents of the code. (just like the step c.)

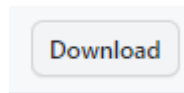
- l. Paste the code (ctrl+v) to the 'mygui2.ui' in Visual Studio Code and save it (ctrl+s). (See Figure 15)



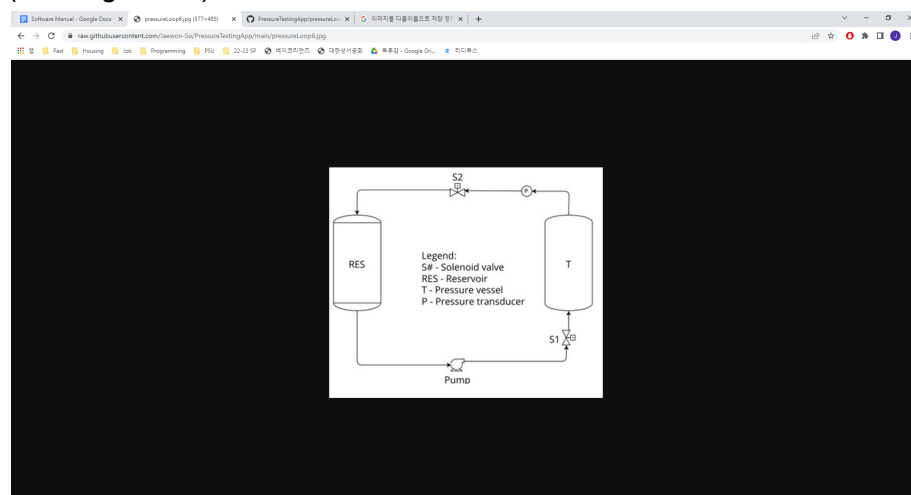
```
1592 <family>Arial</family>
1593 <points>14</points>
1594 </font>
1595 </property>
1596 <property name="text">
1597 <string> -</string>
1598 </property>
1599 </widget>
1600 <widget class="QLabel" name="label_pic4_2">
1601 <property name="geometry">
1602 <rect>
1603 <x>370</x>
1604 <y>160</y>
1605 <width>61</width>
1606 <height>31</height>
1607 </rect>
1608 </property>
1609 <property name="font">
```

<Figure 15: paste the code to 'mygui2.ui'>

- m. Go to <https://github.com/Jaewon-So/PressureTestingApp> again.

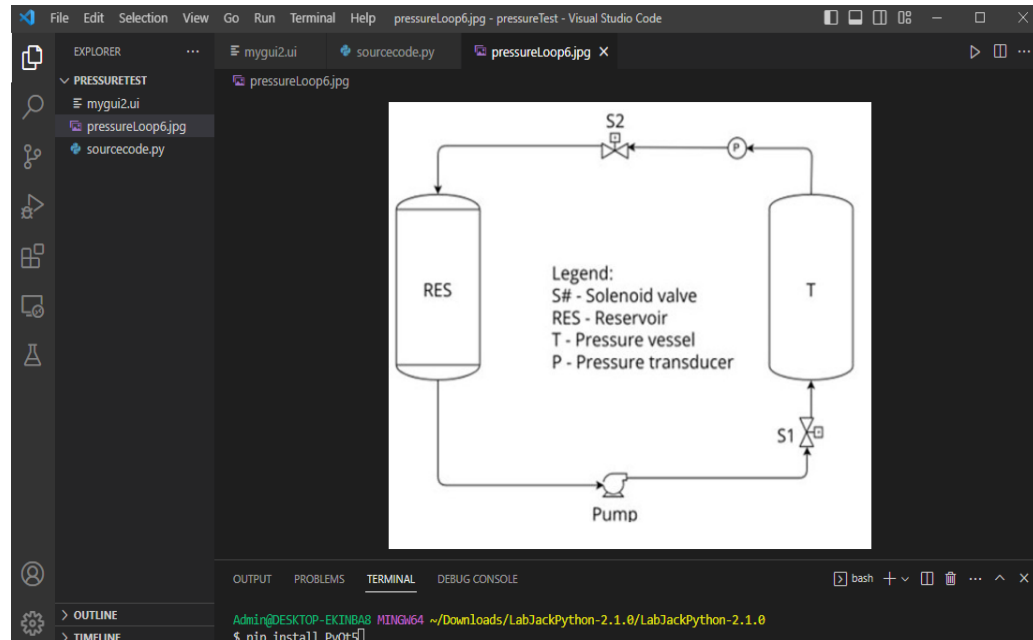


- n. Click 'pressureLoop6.jpg' and Click icon
- o. Right click on the image and click 'save as' to save the image to your PC. Save the image with the name "pressureLoop6". (See Figure 16)



<Figure 16: 'pressureLoop6.jpg'>

- p. Drag and drop the downloaded image 'pressureLoop6.jpg' to the Visual Studio Code. (See Figure 17)



<Figure 17: 'pressureLoop6.jpg'>

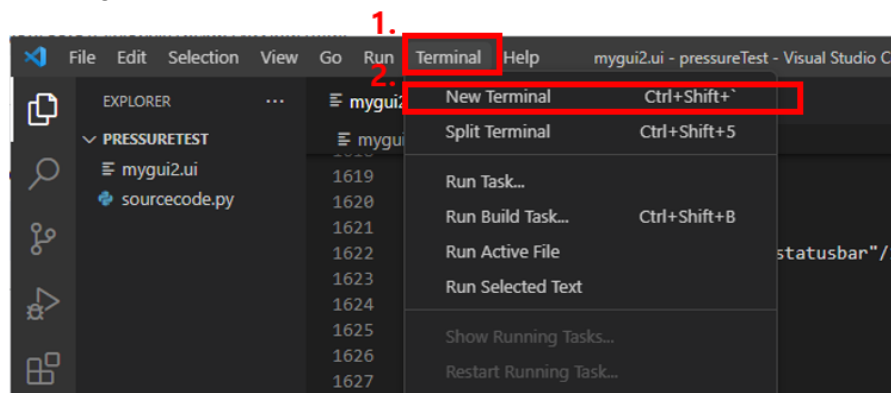
3. Install 'LabJack Python'

- a. Go to <https://labjack.com/pages/support?doc=%2Fsoftware-driver%2Fexample-codewrappers%2Flabjackpython-for-ud-exodriver-u12-windows-mac-linux%2F>
(LabJackPython for UD, Exodriver, U12 - Windows, Mac, Linux)
- b. Click "LabJackPython-2.1.0.zip" and it will download it to the 'Downloads' folder in your local PC. (See Figure 18)



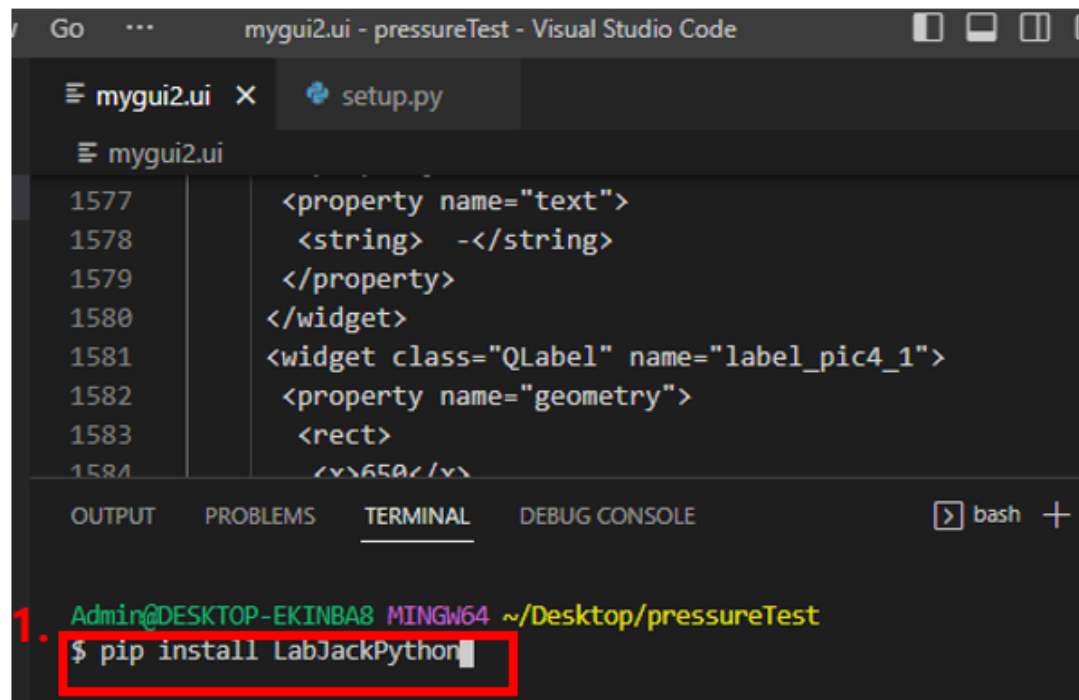
<Figure 18: LabJackPython-2.1.0.zip>

- c. Unzip the "LabJackPython-2.1.0.zip" in the 'Downloads' folder.
- d. Go back to 'Visual Studio Code' and Click 'Terminal' and 'New Terminal' (See Figure 19)



<Figure 19: New Terminal>

- e. Type 'pip install LabJackPython' in the Terminal (See Figure 20)



The screenshot shows the Visual Studio Code interface. The top bar indicates the file 'mygui2.ui - pressureTest' is open. The editor area shows the 'mygui2.ui' file with XML-like code. The bottom panel is the 'TERMINAL' tab, showing a command prompt with the command 'pip install LabJackPython' entered. The prompt is 'Admin@DESKTOP-EKINBA8 MINGW64 ~/Desktop/pressureTest'. The command is highlighted with a red box.

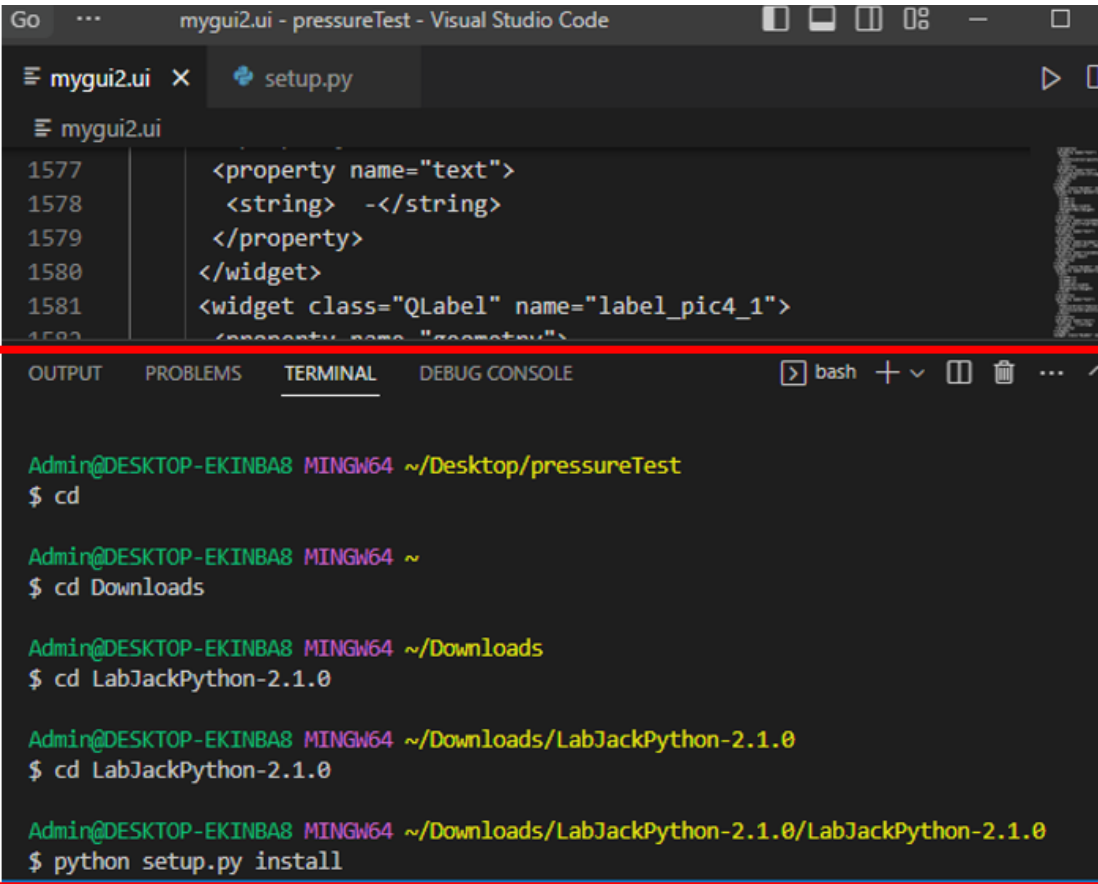
```
1. Admin@DESKTOP-EKINBA8 MINGW64 ~/Desktop/pressureTest
$ pip install LabJackPython
```

<Figure 20: Type 'pip install LabJackPython'>

- i. If you can't run 'pip install LabJackPython' command, then it may be because of these 2 follow problems:
1. 'Python' hasn't been installed
 - a. Check this website. This website gives instruction for downloading python,
<https://www.geeksforgeeks.org/how-to-install-python-on-windows/>
 2. 'PIP' hasn't been installed
 - a. Check this website. This website gives instructions for downloading pip.
<https://www.geeksforgeeks.org/how-to-install-pip-on-windows/>

- f. If 'pip install LabJackPython' command worked, then type the following commands in the Terminal. (See Figure 21)
- cd
 - cd Downloads
 - cd LabJackPython-2.1.0
 - cd LabJackPython-2.1.0
 - python setup.py install

1.



```
mygui2.ui x setup.py
mygui2.ui
1577 <property name="text">
1578 <string> -</string>
1579 </property>
1580 </widget>
1581 <widget class="QLabel" name="label_pic4_1">
1582 <property name="geometry">

Admin@DESKTOP-EKINBA8 MINGW64 ~/Desktop/pressureTest
$ cd

Admin@DESKTOP-EKINBA8 MINGW64 ~
$ cd Downloads

Admin@DESKTOP-EKINBA8 MINGW64 ~/Downloads
$ cd LabJackPython-2.1.0

Admin@DESKTOP-EKINBA8 MINGW64 ~/Downloads/LabJackPython-2.1.0
$ cd LabJackPython-2.1.0

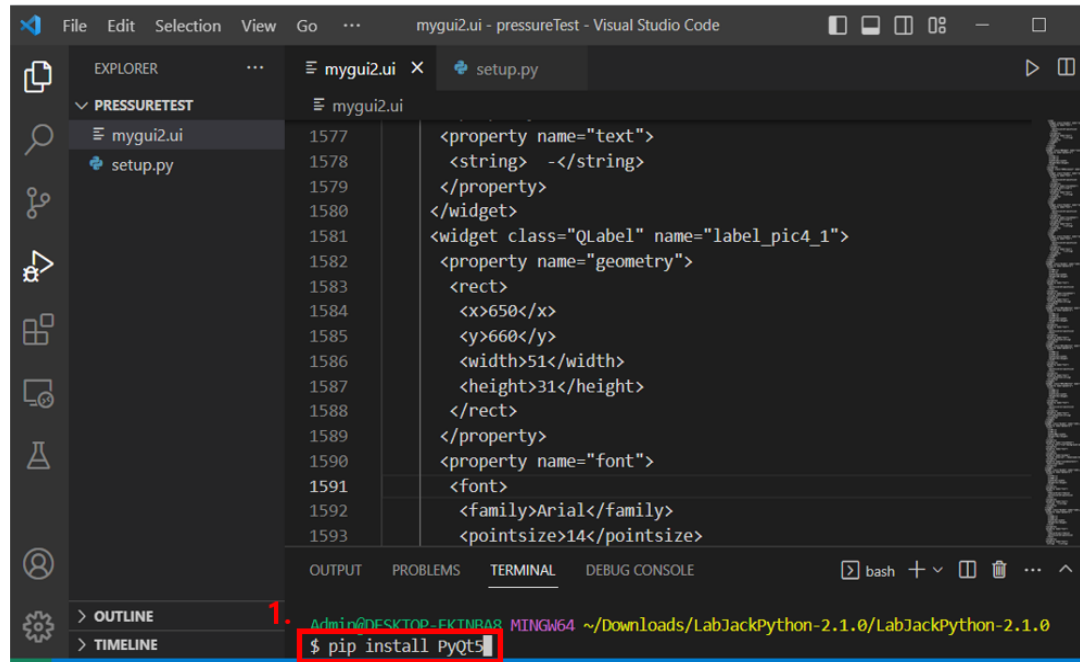
Admin@DESKTOP-EKINBA8 MINGW64 ~/Downloads/LabJackPython-2.1.0/LabJackPython-2.1.0
$ python setup.py install
```

<Figure 21: run commands on Terminal>

- g. This is the end of installation of LabJack Python.

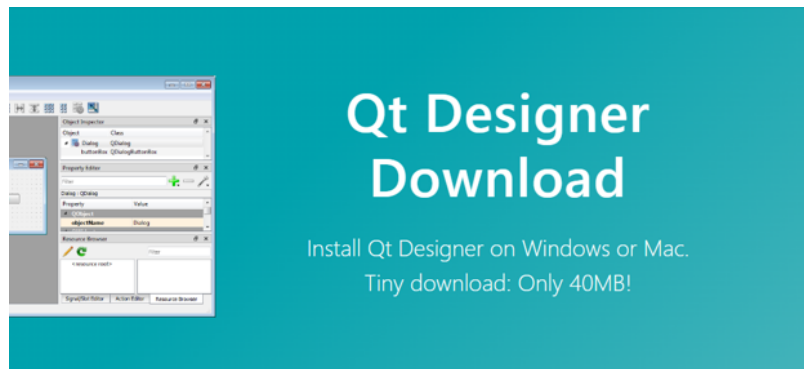
4. Download 'Qt Designer'

- a. Type 'pip install PyQt5' on Terminal (See Figure 22)



<Figure 22: 'pip install PyQt5' on Terminal>

- b. Go to <https://build-system.fman.io/qt-designer-download> and Download 'Qt Designer' (See Figure 23)




Many people want to use Qt Designer without having to download gigabytes of other software. Here small, standalone installers of Qt Designer for Windows and Mac:

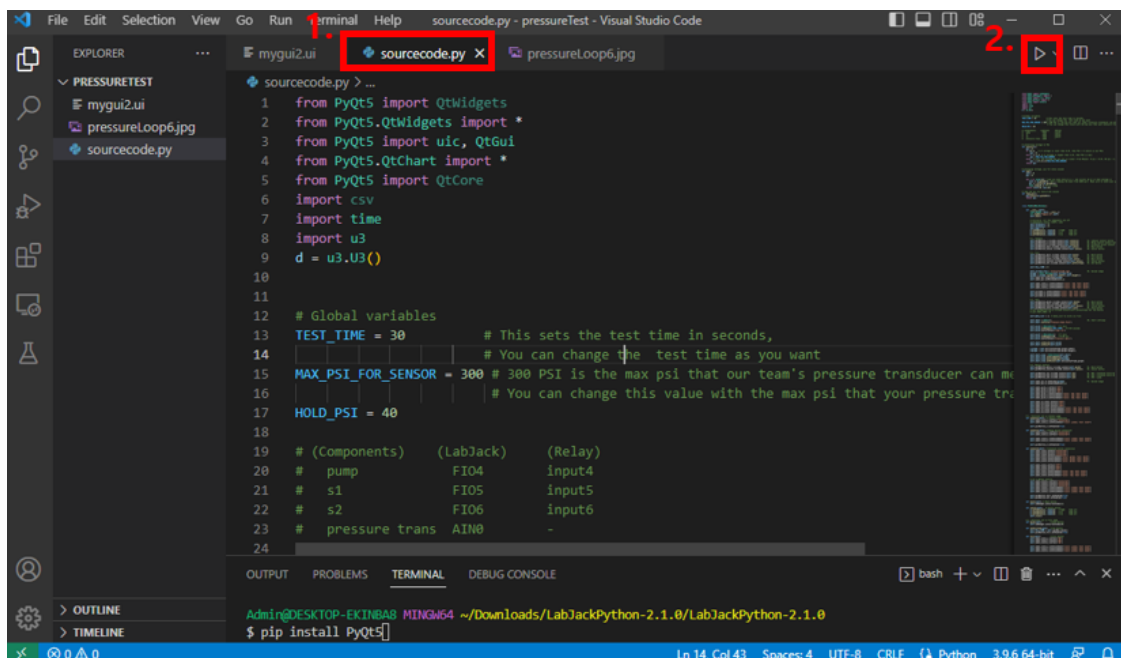


<Figure 23: Download 'Qt Designer'>

Running the Application

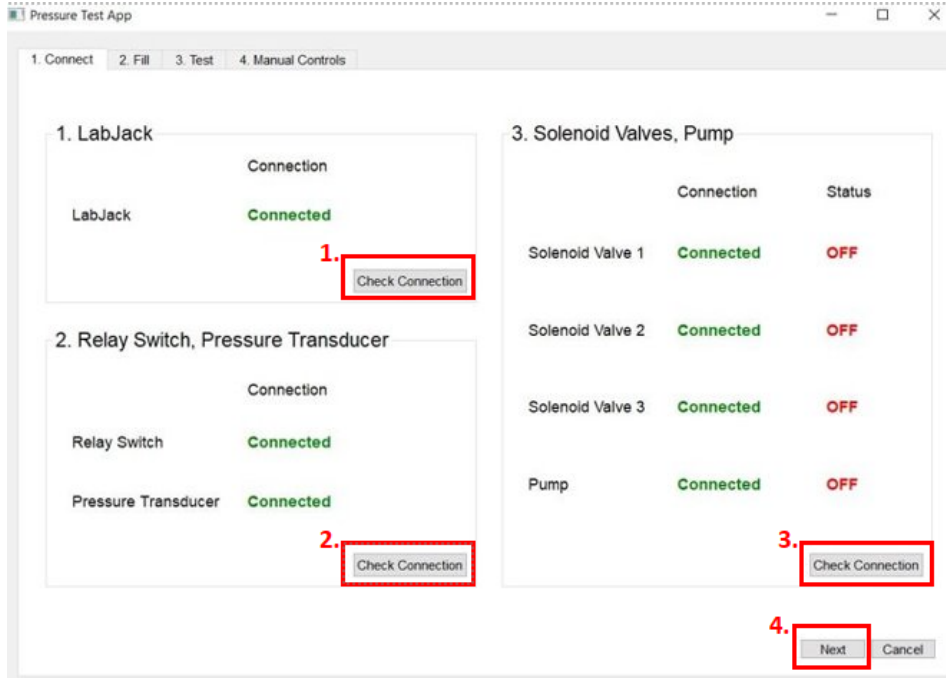
1. If you follow the installation guide, 'mygui2.ui', 'pressureLoop6.jpg' and 'sourcecode.py' file will be on the Visual Studio Code.
2. Connect the LabJack to the PC with USB.
3. Make sure you're on the 'sourcecode.py' tab on the Visual Studio Code.

And click  (Run Code) button. Then it will launch the application. (See Figure 24)



<Figure 24: 'sourcecode.py' and Run Code>

4. Step 1. Connect: check connection with the components. (See Figure 25)
 1. LabJack
Click 'Check Connection' button to check connection with LabJack
 2. Relay Switch, Pressure Transducer
Click 'Check Connection' button to check connection with relay switch and pressure transducer
 3. Solenoid Valves, Pump
Click 'Check Connection' button to check connection and status of solenoid valves and pump
 4. Next
Click 'Next' button to proceed to next step



<Figure 25: Step 1. Connect>

5. Step 2. Fill: circulate water to fill a pressure vessel (See Figure 26)

1. Time

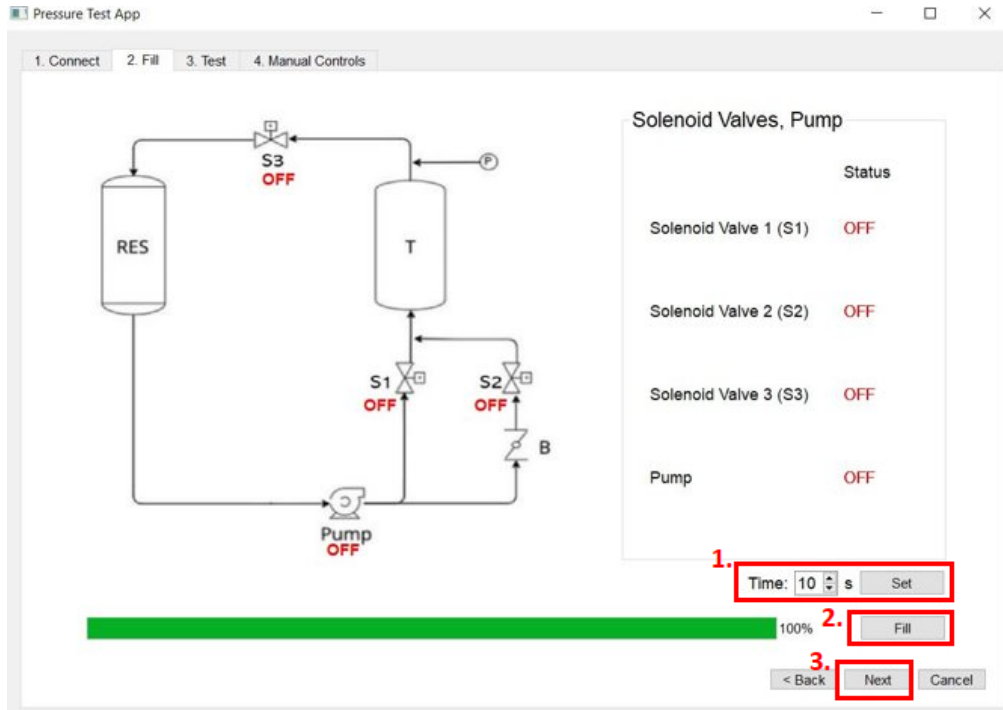
Put time in a spin box and click 'Set' button. It will set circulation time.

2. Fill

Once the time is set, click 'Fill' button. It will circulate water and fill a pressure vessel for the time you've set.

3. Next

Click 'Next' button to proceed to next step



<Figure 26: Step 2. Fill>

6. Step 3. Test: start pressure test for 30 seconds and save the data to a CSV file.
(See Figure 27)

1. Test

Click 'Test' button and it will start pressure test for 30 seconds and plot the data.

2. Save

Click 'Save' button and it will save the data to a CSV file in your local PC.
(C:/Users/Admin/Downloads/pressure_data.csv)

3. Finish

Click 'Finish' button to end this application.

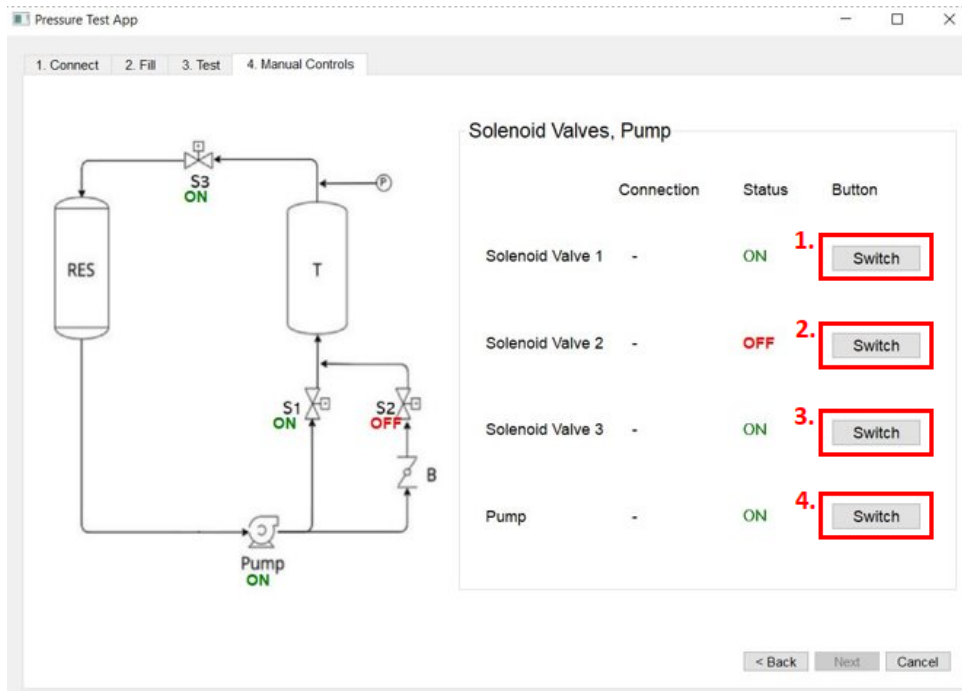
4. Manual Controls

Click 'Manual Controls' tab if a user wants a manual control for the components.



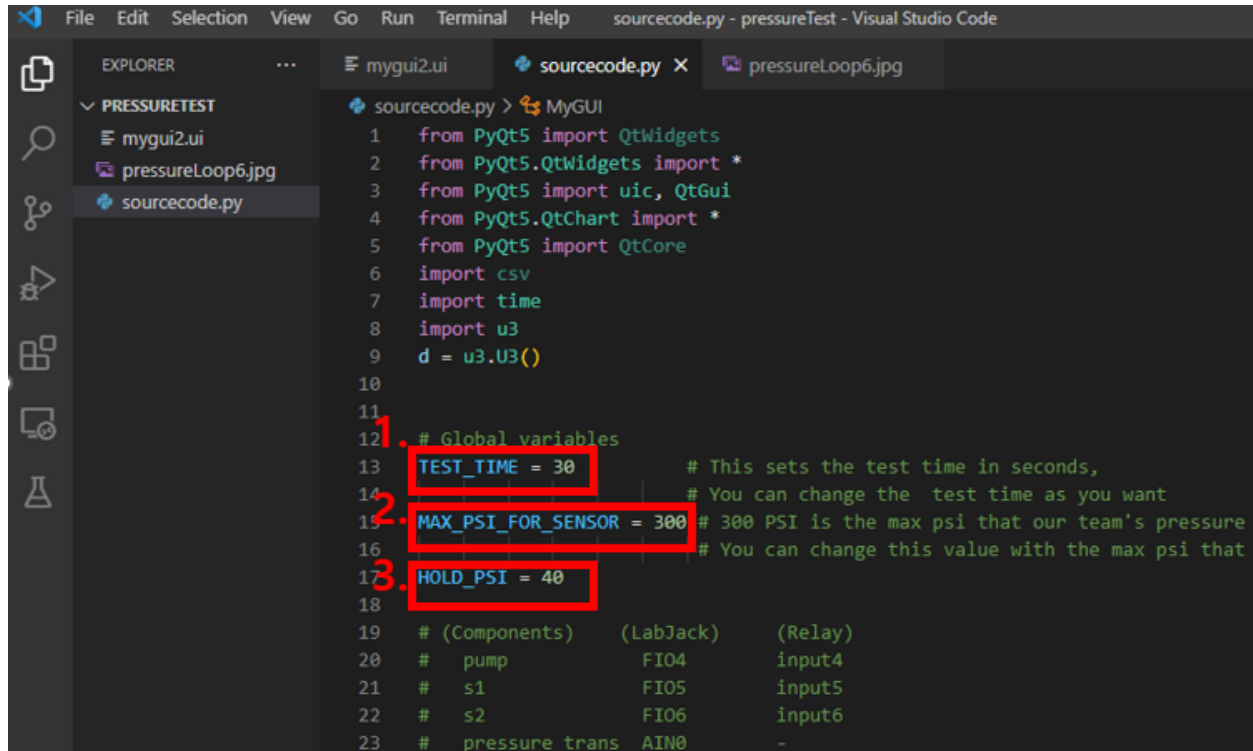
<Figure 27: Step 3. Test>

7. Step 4. Manual Controls: control valves and pump to conduct manual test.
(See Figure 28)
 1. Switch for valve 1
Click 'Switch' button and it will turn on/off the solenoid valve 1.
 2. Switch for valve 2
Click 'Switch' button and it will turn on/off the solenoid valve 2.
 3. Switch for valve 3
Click 'Switch' button and it will turn on/off the solenoid valve 3.
 4. Switch for pump
Click the 'Switch' button and it will turn on/off the pump.



<Figure 28: Step 4. Manual Controls>

Future Recommendations for Revising the Source Code (See Figure 29)



```
1  from PyQt5 import QtWidgets
2  from PyQt5.QtWidgets import *
3  from PyQt5 import uic, QtGui
4  from PyQt5.QtChart import *
5  from PyQt5 import QtCore
6  import csv
7  import time
8  import u3
9  d = u3.U3()
10
11
12  # Global variables
13  TEST_TIME = 30 # This sets the test time in seconds,
14                # You can change the test time as you want
15  MAX_PSI_FOR_SENSOR = 300 # 300 PSI is the max psi that our team's pressure
16                           # You can change this value with the max psi that
17  HOLD_PSI = 40
18
19  # (Components) (LabJack) (Relay)
20  # pump         FI04      input4
21  # s1           FI05      input5
22  # s2           FI06      input6
23  # pressure trans AIN0    -
```

<Figure 29: Setting Global Variables>

1. Setting the test time

Default setting for the test time is 30 seconds. It means the application will hold the pressure for 30 seconds. If you want to change the test time, you can simply change the value for 'TEST_TIME'.

For example, if you want the test time to be 60 seconds. Then change the code from 'TEST_TIME=30' to 'TEST_TIME=60'.

Once you change the time, make sure to **save (ctrl+s) first, then run the application.**

2. Setting the Max PSI

Default setting for the max PSI is 300 PSI because the capstone team used the pressure transducer that can measure up to 300 PSI.

If your pressure transducer can measure up to 5,000 PSI, then change the code from 'MAX_PSI_FOR_SENSOR = 300' to 'MAX_PSI_FOR_SENSOR = 5000'.

Once you change the max PSI, make sure to **save (ctrl+s) first, then run the application.**

3. Setting the holding PSI

Default setting for the holding PSI is 40 PSI because the capstone team wanted to hold pressure at 40 PSI.

If you want the holding PSI to be 1000 PSI, then change the code from 'HOLD_PSI = 40' to 'HOLD_PSI = 1000'.

Once you change the holding PSI, make sure to **save (ctrl+s) first, then run the application.**