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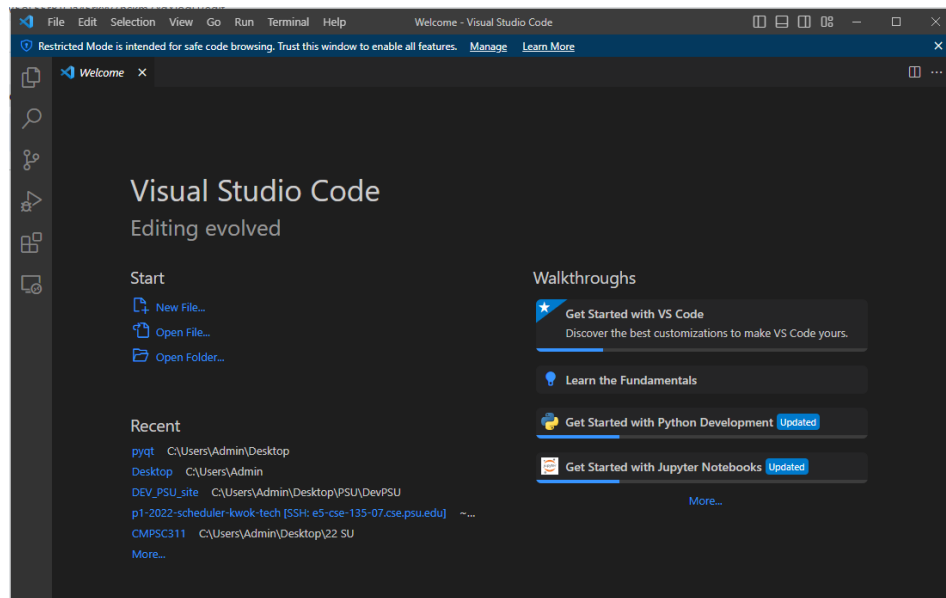# (This is the guide to install and set up the application.)

1. **Download 'Visual Studio Code'**

   a. Go to https://code.visualstudio.com/download

   b. Click the 'Windows' button (See Figure 1)
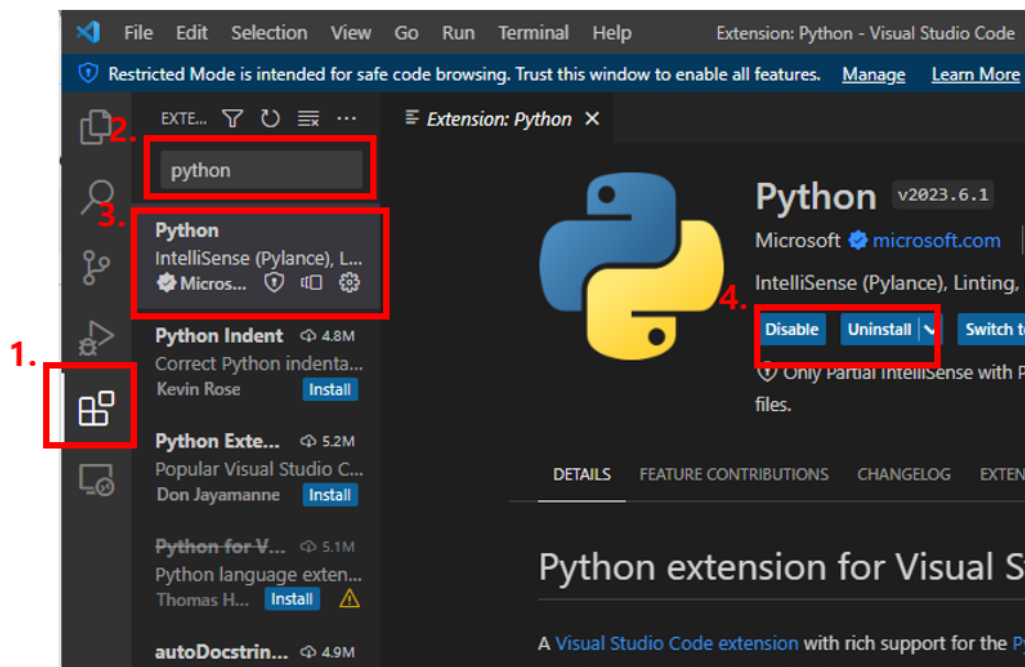

<Figure 1: Download Visual Studio Code>
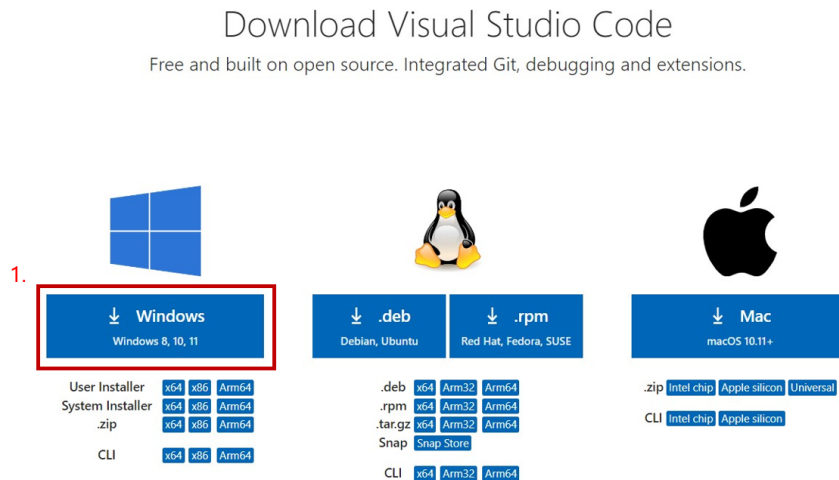
   c. Once 'VSCodeUserSetpup' is downloaded, run it.

   d. Keep clicking 'Next' and 'Install'

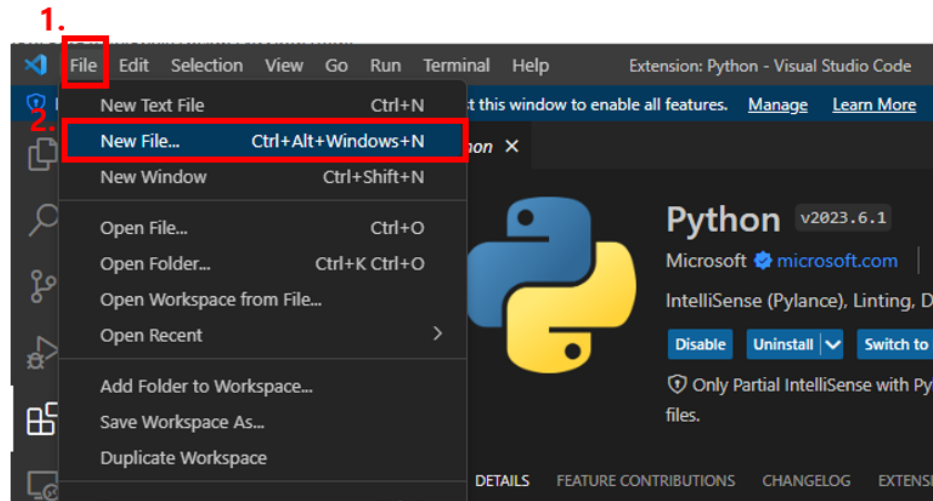   e. If installation is done, run the 'Visual Studio Code'.

<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)
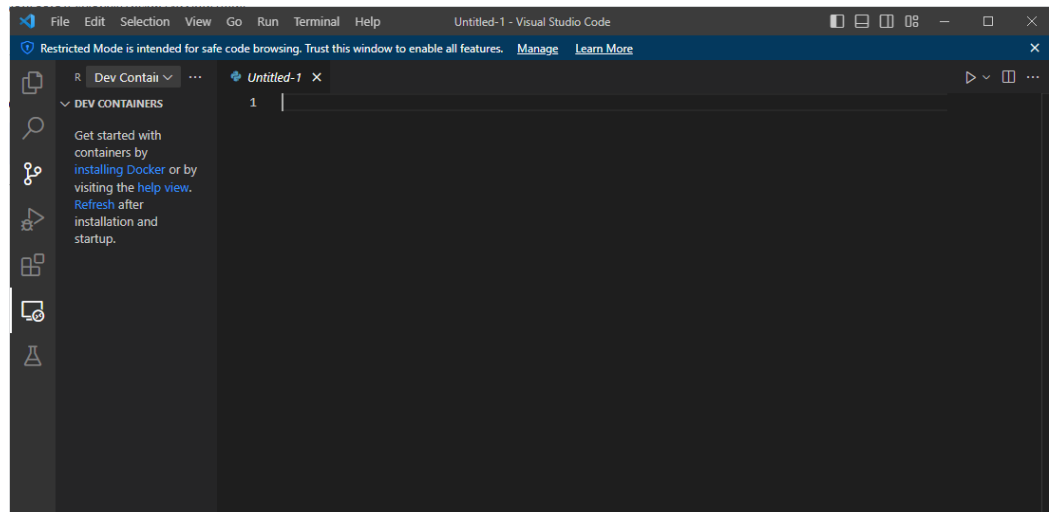

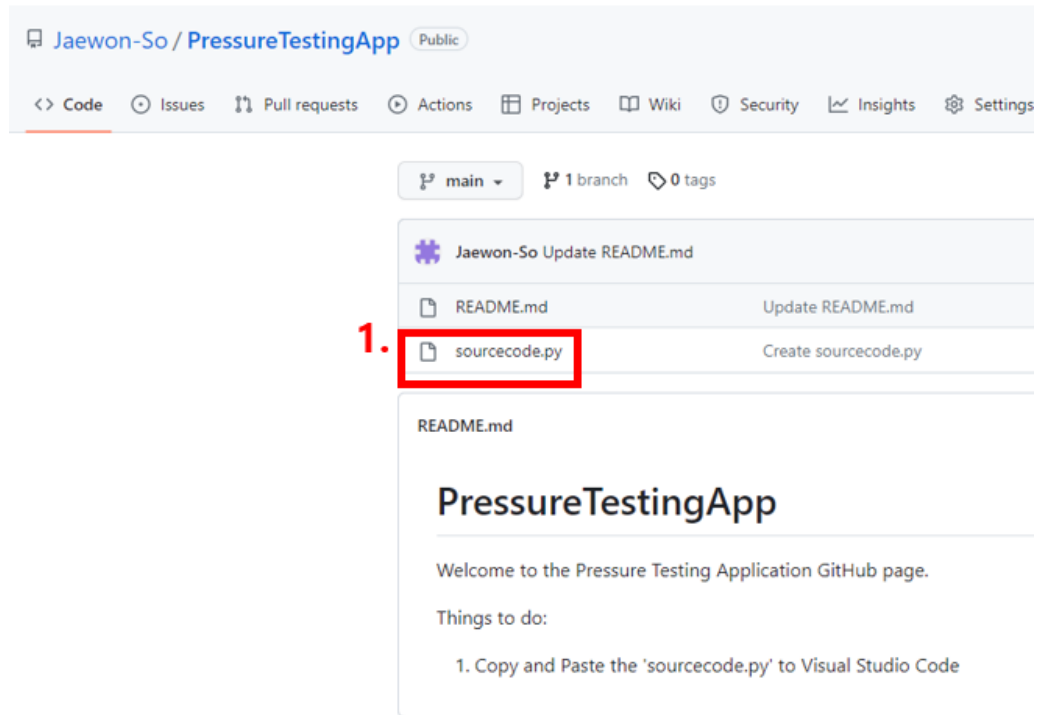<Figure 4: New File…>

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

<Figure 5: Python File>
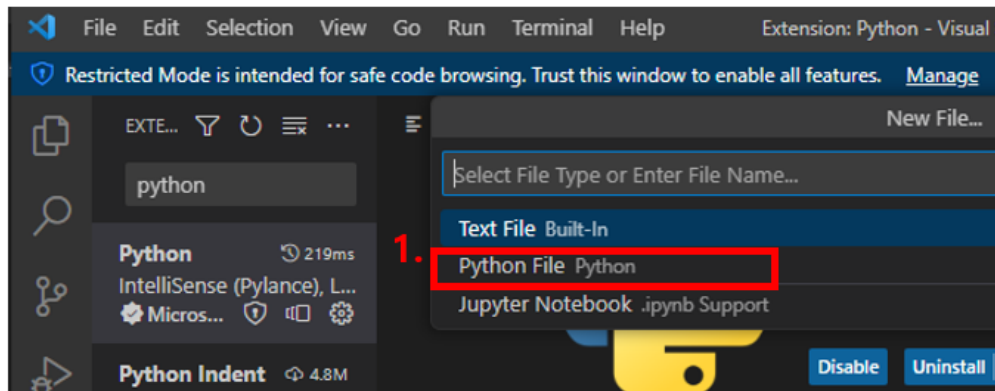
i. Now, you will see screen like Figure 6

<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'>
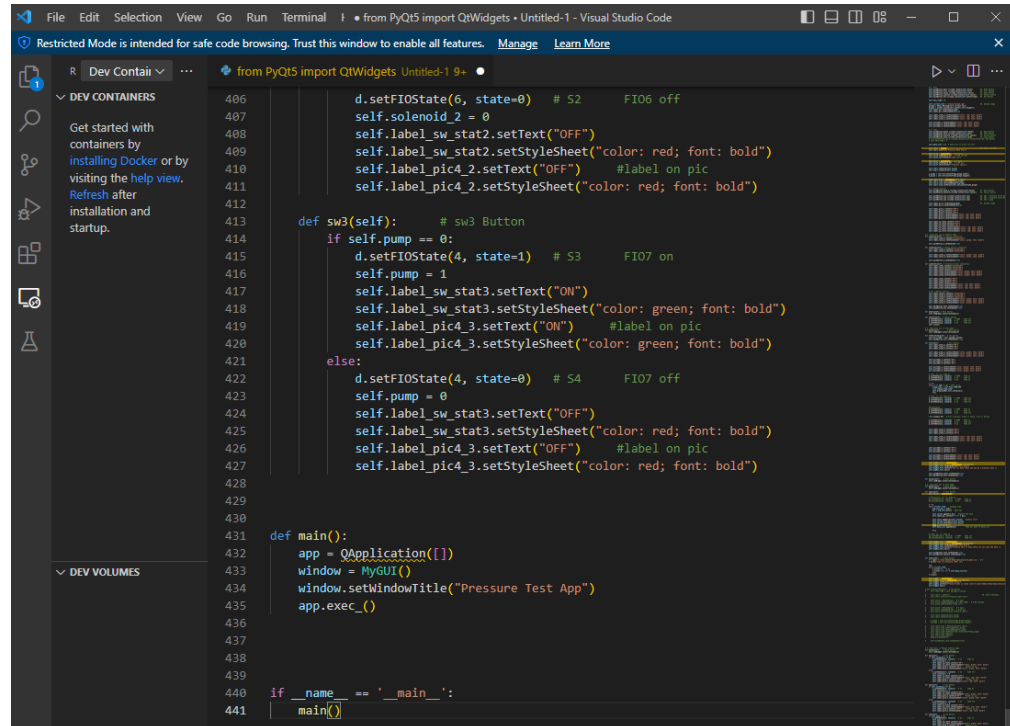
c. Click ⎘ icon to copy raw contents of the code. (See Figure 8)
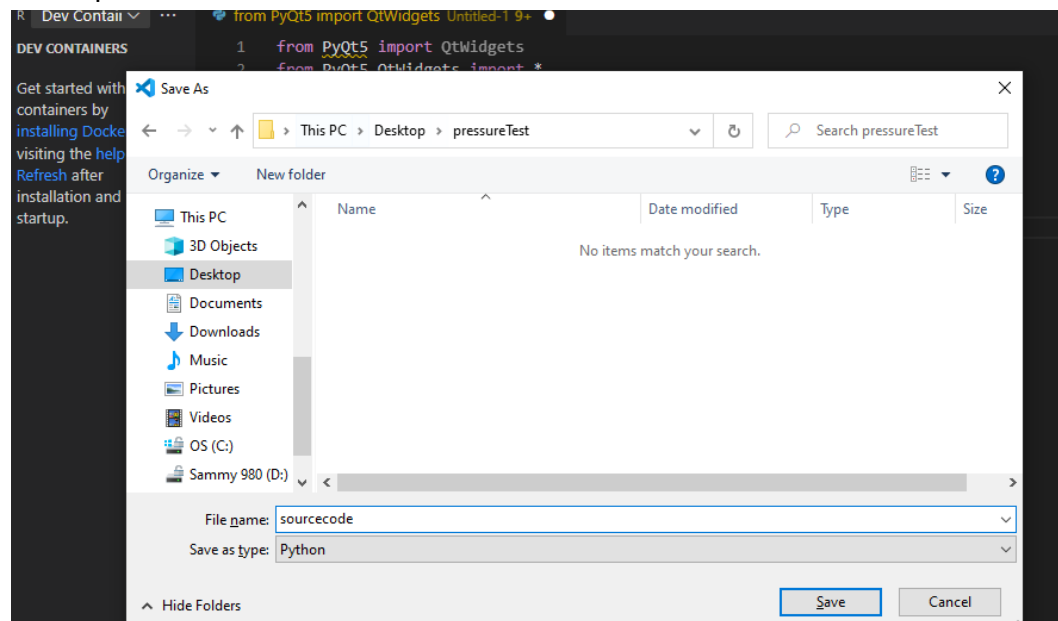

<Figure 8: Click 'sourcecode.py'>
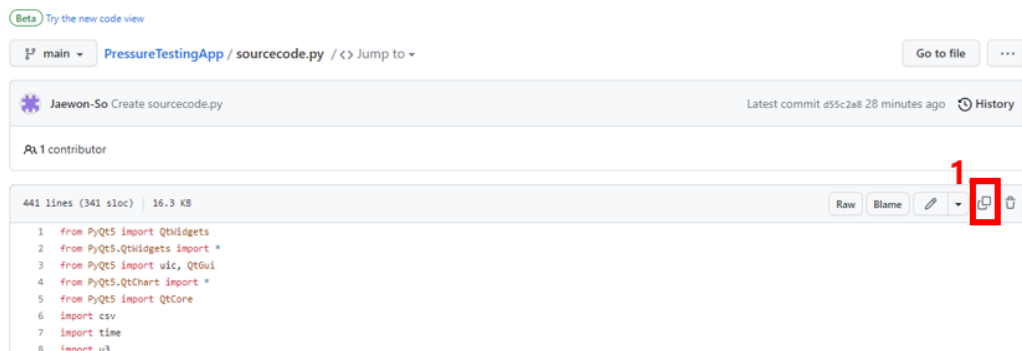
d. Paste the code (ctrl+v) to the Untitled Python File in Visual Studio Code
    (See Figure 9)

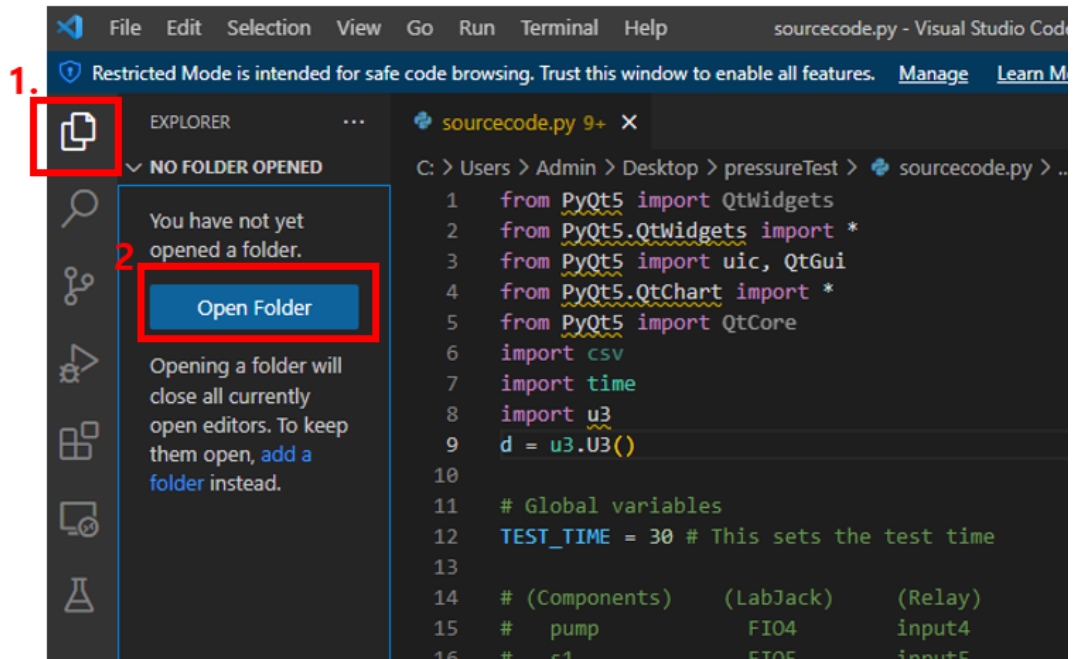<Figure 9: Paste the code>

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>

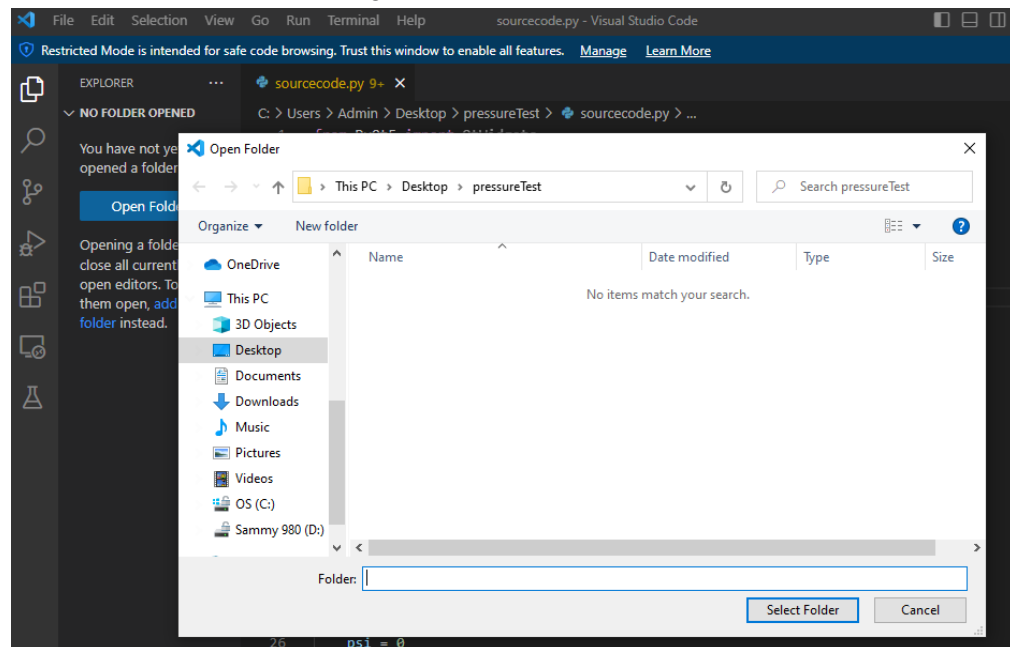f. After save, click icon and click 'Open Folder' (See Figure 11)

<Figure 11: Open Folder>
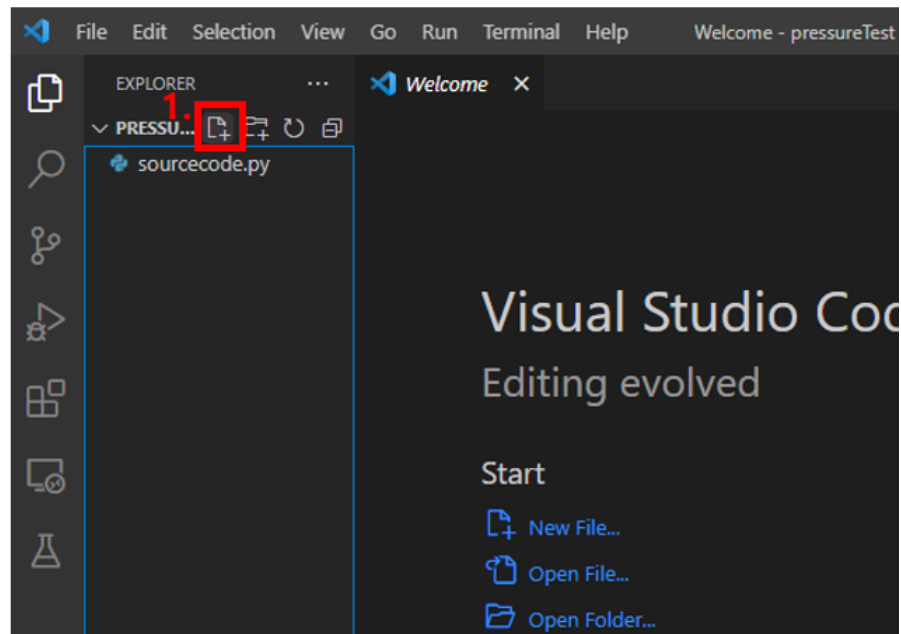
g. Click 'Select Folder' (See Figure 12)

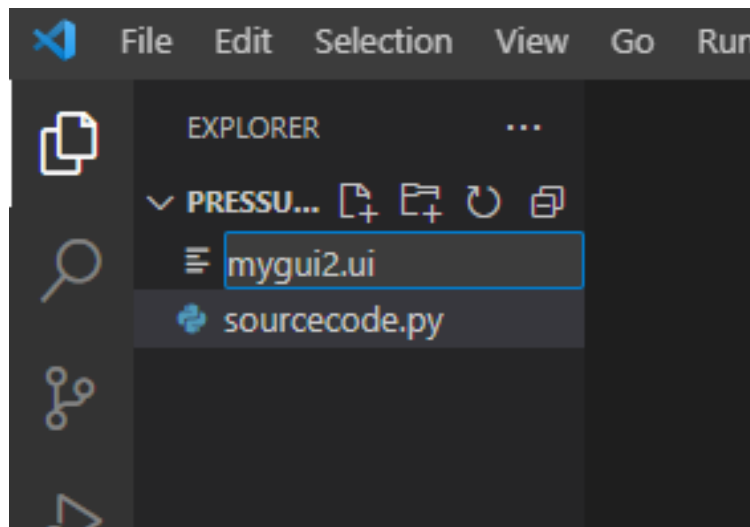
<Figure 12: Select Folder>

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

<Figure 13: New File>

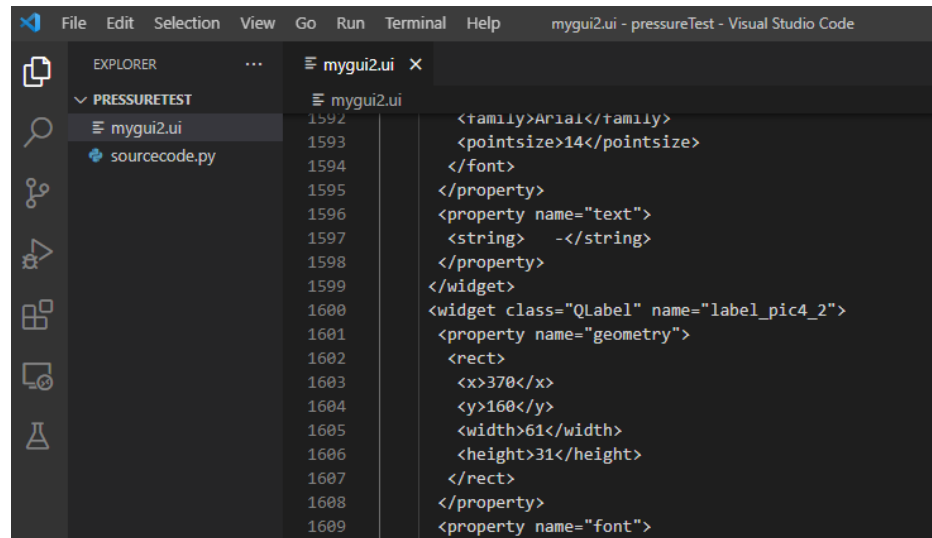i. Type 'mygui2.ui' and hit 'enter' key (See Figure 14)

<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)

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

m. Go to https://github.com/Jaewon-So/PressureTestingApp again.
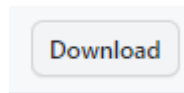
n.   Click 'pressureLoop6.jpg' and Click [Download] icon

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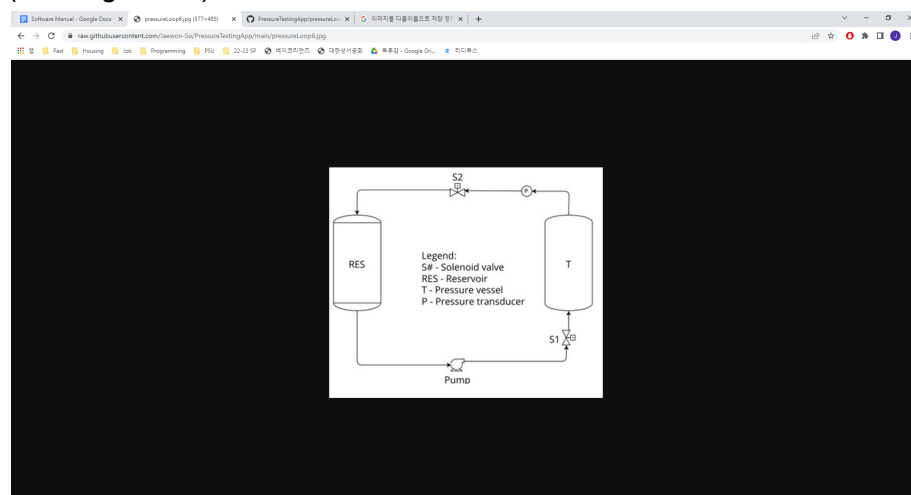
p.   Drag and drop the downloaded image 'pressureLoop6.jpg' to the Visual Studio
     Code. (See Figure 17)

<Figure 17: 'pressureLoop6.jpg'>

3. Install 'LabJack Python'

    a. Go to
       https://labjack.com/pages/support?doc=%2Fsoftware-driver%2Fexample-codewr
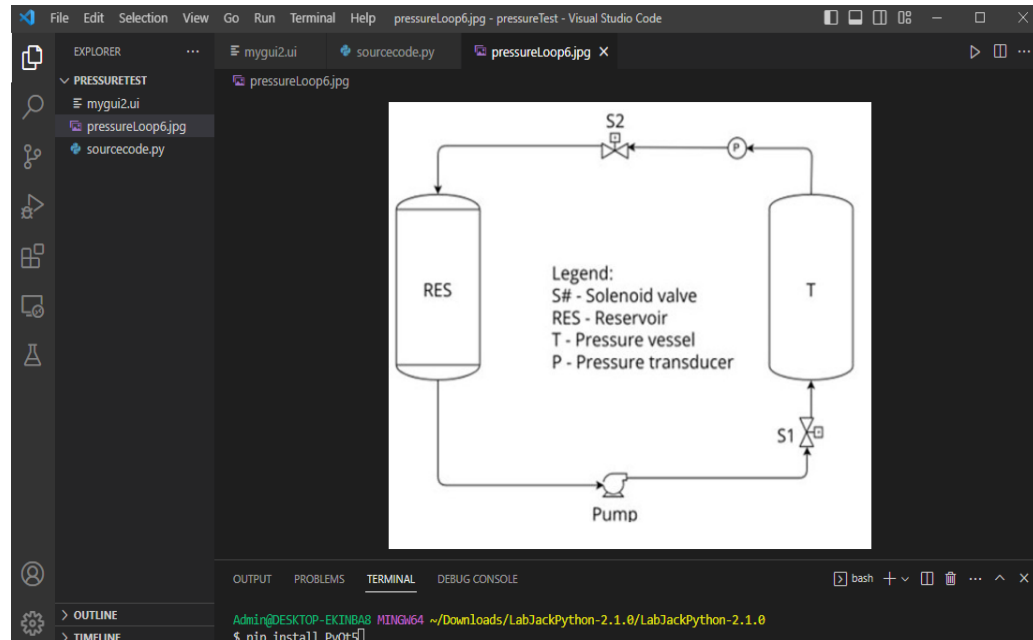   appers%2Flabjackpython-for-ud-exodriver-u12-windows-mac-linux%2F
       (LabJackPython for UD, Exodriver, U12 - Windows, Mac, Linux)

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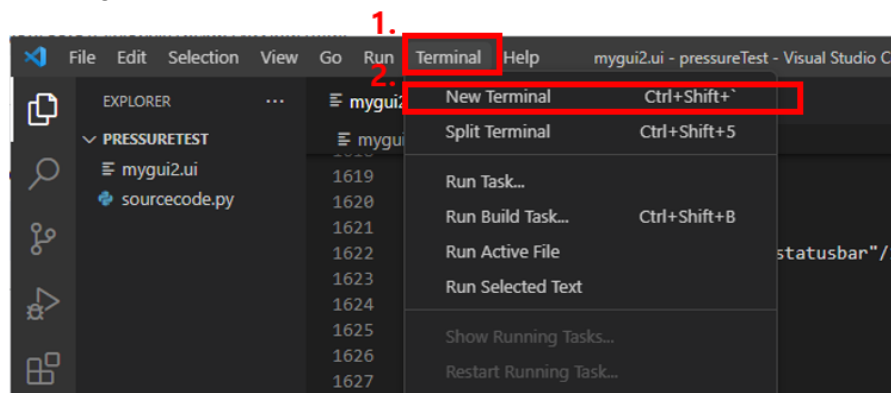
e. Type 'pip install LabJackPython' in the Terminal (See Figure 20)

<Figure 20: Type 'pip install LabJackPython'>

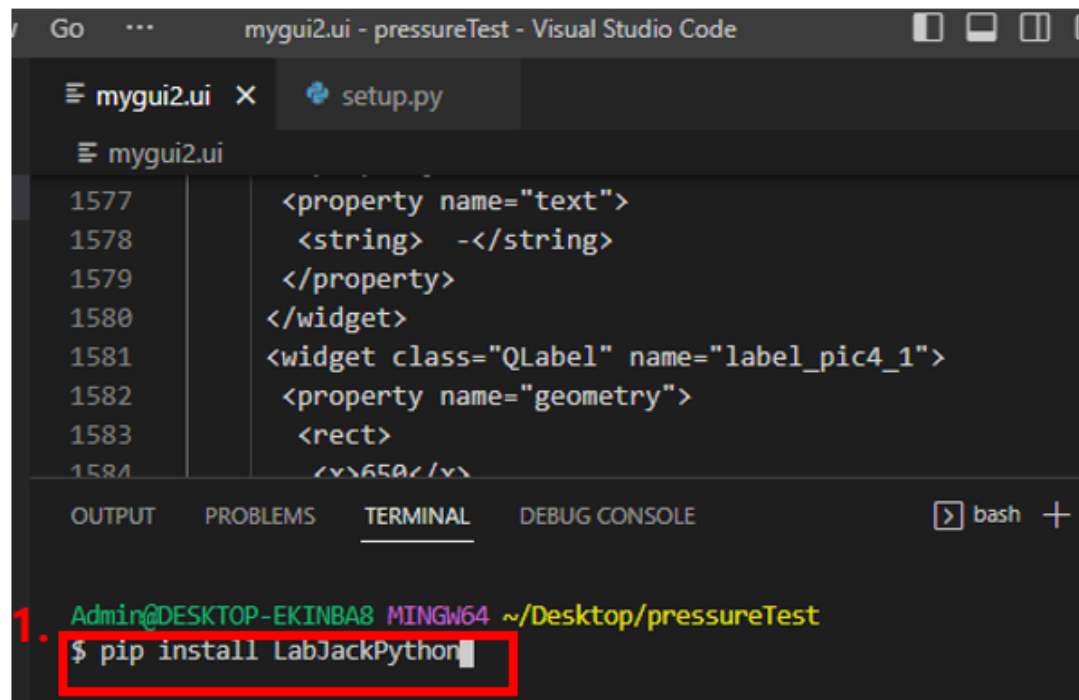 i. If you can't run 'pip install LabJackPython' command, then it may be because of these 2 follow problems:
      1. 'Python' hasn't been installed
          a. Check this website. This website gives instruction for downloading python,
             https://www.geeksforgeeks.org/how-to-install-python-on-windows/
      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)
    i.   cd
    ii.   cd Downloads
    iii. cd LabJackPython-2.1.0
    iv.   cd LabJackPython-2.1.0
    v.   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>
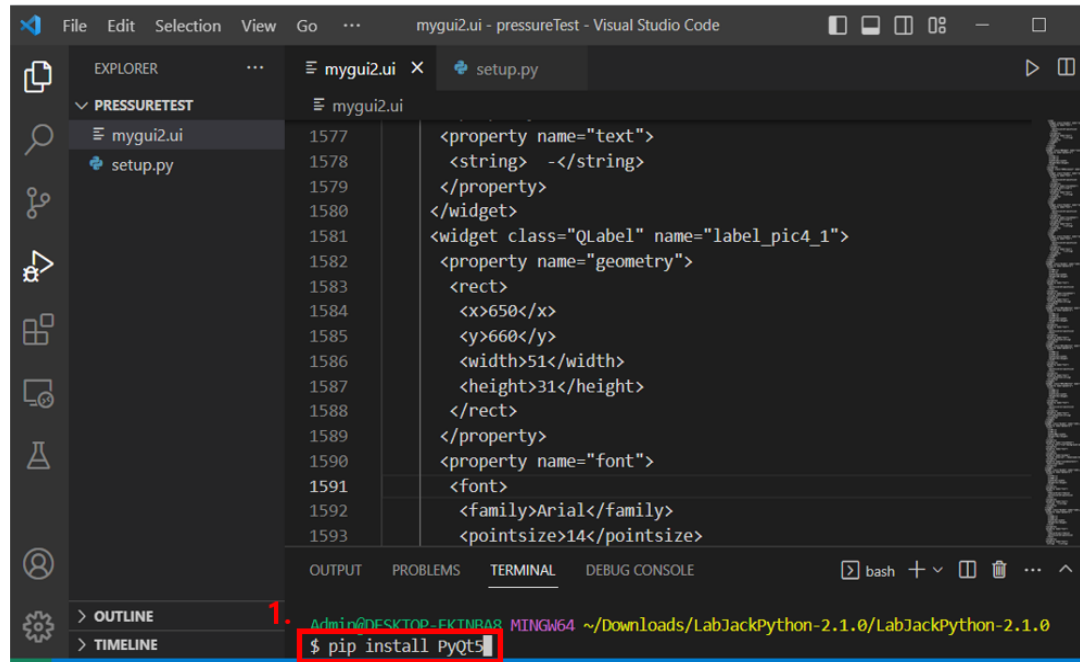
    b. Go to https://build-system.fman.io/qt-designer-download and Download 'Qt Designer' (See Figure 23)
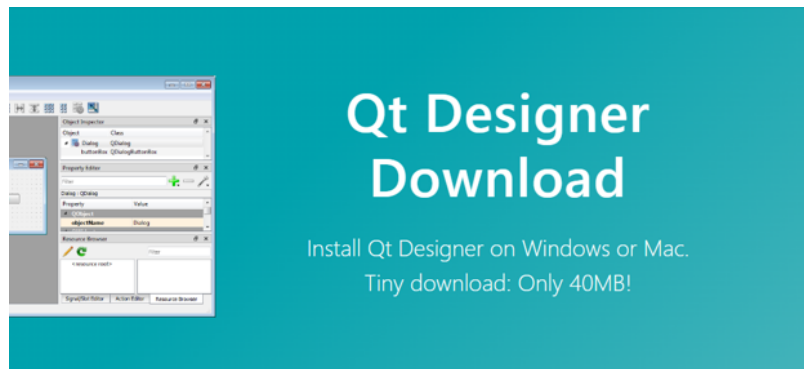
<Figure 23: Download 'Qt Designer'>

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>
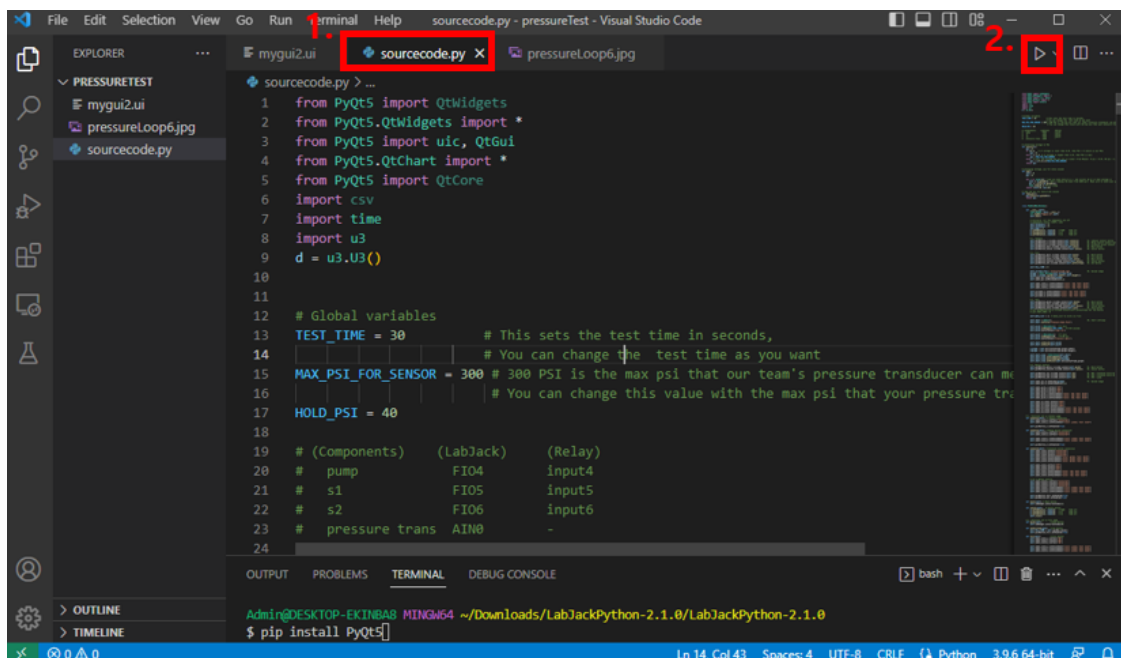
4. Step 1. Connect: check connection with the components. (See Figure 25)
   1. LabJack
      Click 'Check Connection' button to check connection with LabJack
   2. Relay Switch, Pressure Transducer
      Click 'Check Connection' button to check connection with relay switch and pressure transducer
   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>
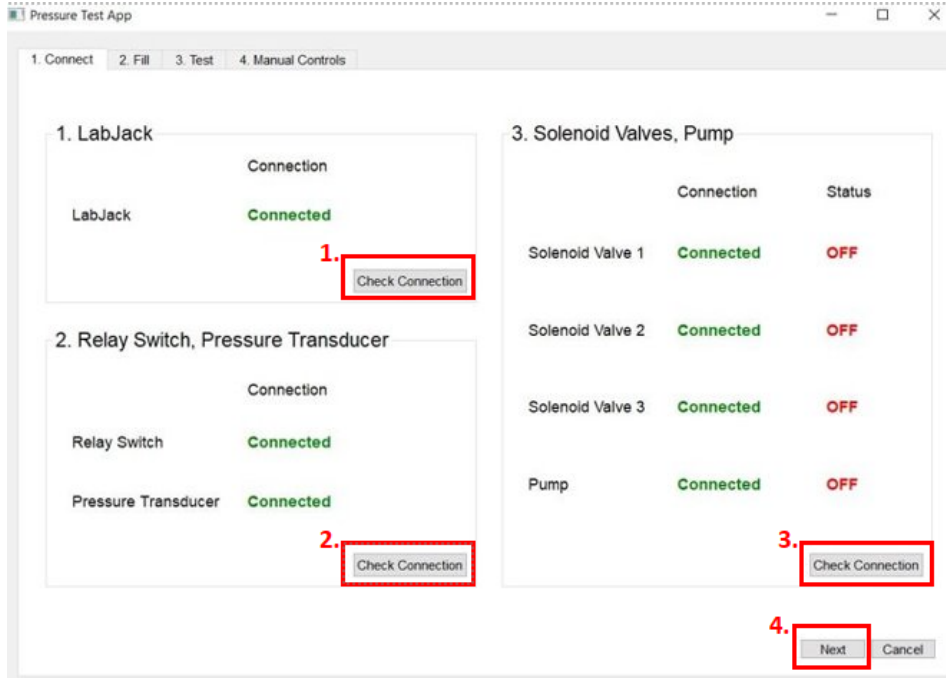
5. Step 2. Fill: circulate water to fill a pressure vessel (See Figure 26)
    1. Time
        Put time in a spin box and click 'Set' button. It will set circulation time.
    2. Fill
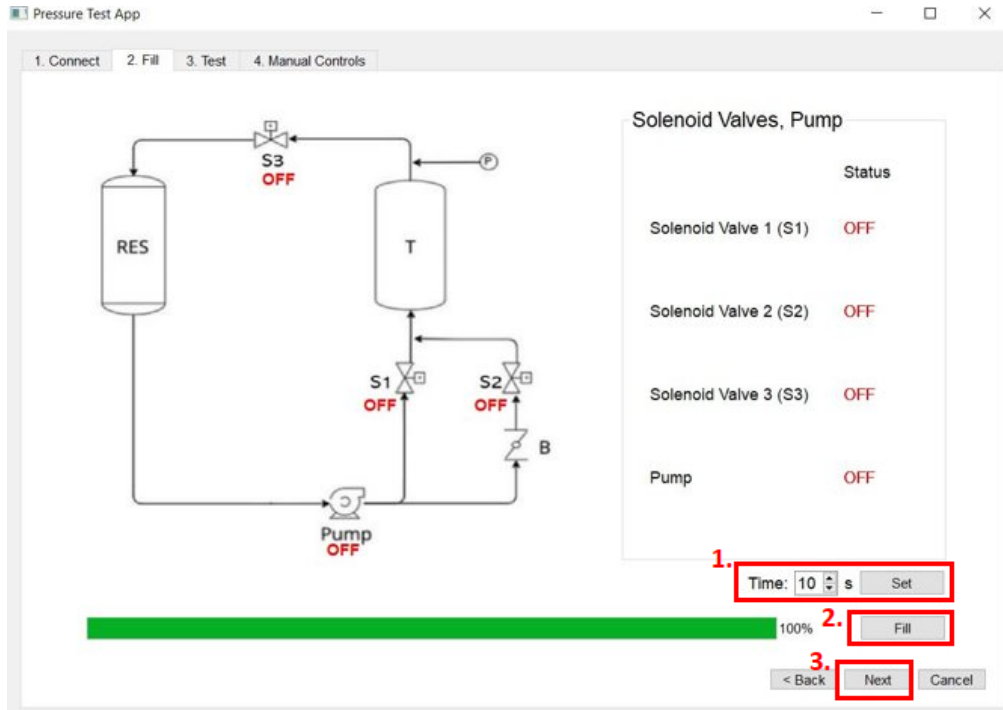   Once the time is set, click 'Fill' button. It will circulate water and fill a pressure vessel for the time you've set.
    3. Next
        Click 'Next' button to proceed to next step

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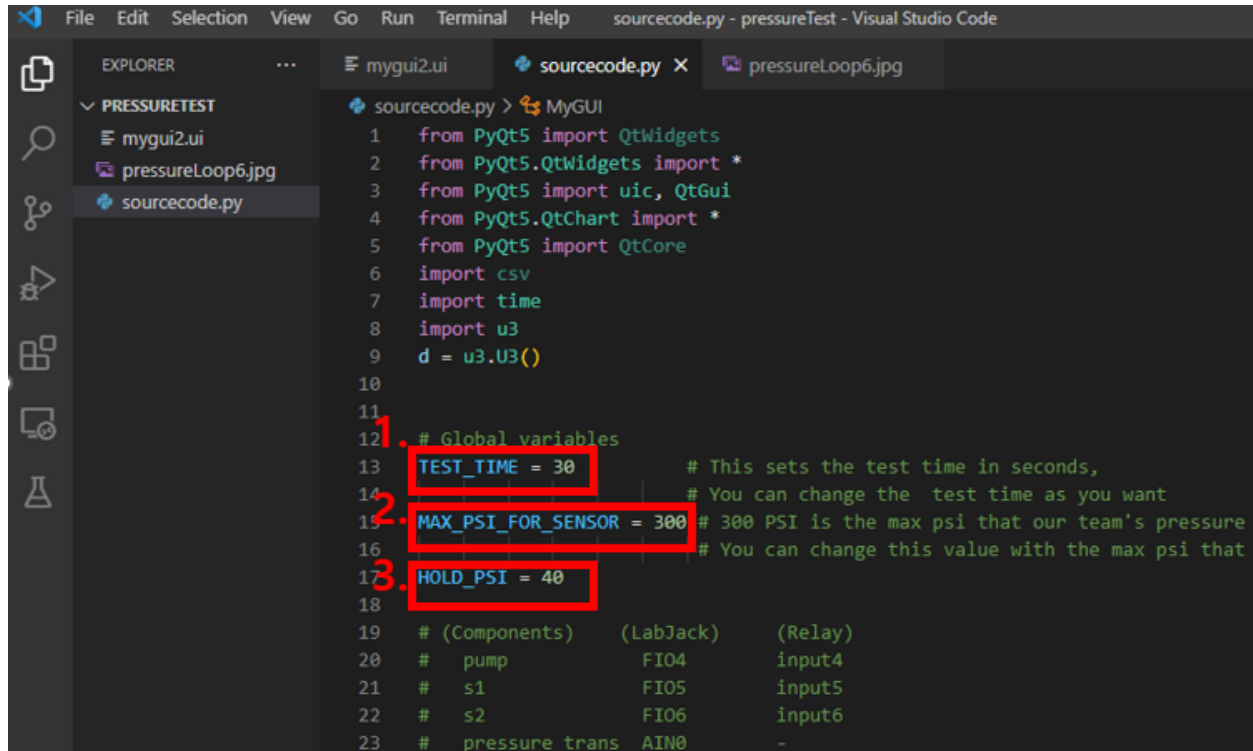
7. Step 4. Manual Controls: control valves and pump to conduct manual test.
    (See Figure 28)
        1. Switch for valve 1
            Click 'Switch' button and it will turn on/off the solenoid valve 1.
        2. Switch for valve 2
            Click 'Switch' button and it will turn on/off the solenoid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

<Figure 28: Step 4. Manual Controls>
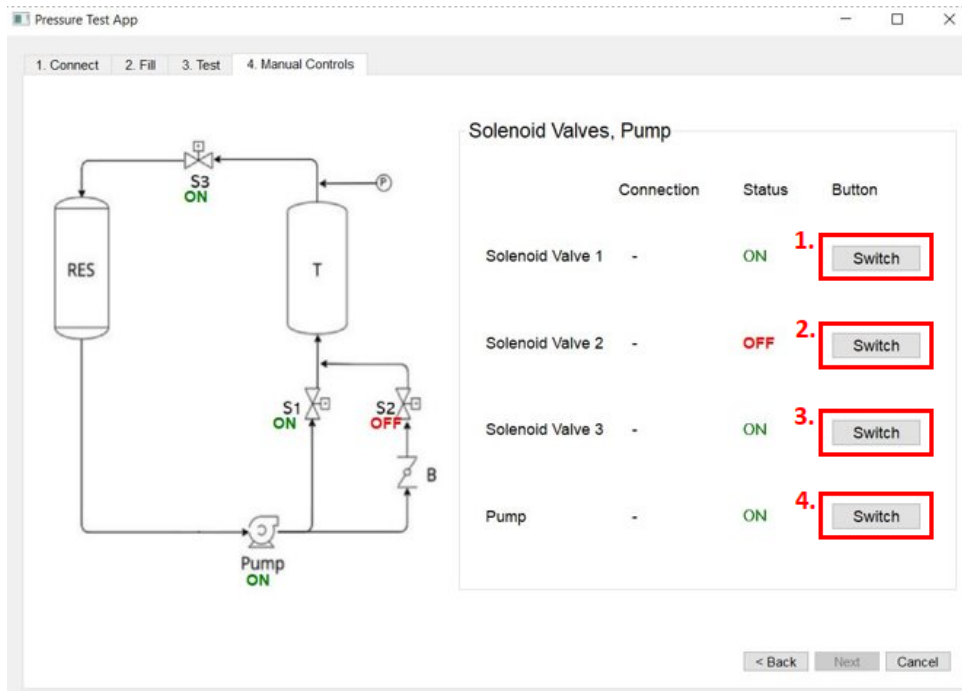
Future Recommendations for Revising the Source Code
(See Figure 29)

<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.**