

Introductory Motion and Control

Pressure Data Acquisition Software

Introduction

- These notes describe the LabVIEW software used for the *electronic collection of pressure data* across a flow restriction as required in Part 3 of Lab 1. The overall software characteristics are described.
- This software was written specifically to interface with the *flow restriction, pressure measurement device* in the lab. It interfaces with National Instruments (NI 6052E or NI 6251) data acquisition (DAQ) cards to collect and record pressure data from two TDG03 series pressure transducers. The calibration constant of the transducers (used in this lab) is 0.01 volts/psi.

Front Panel

- The front panel of the LabVIEW *pressure measurement* program is shown in Fig. 1. The program was written to read pressure measurements from the *inlet* and *outlet* ports of a flow restriction.
- The program assumes the *inlet pressure* is available on *analog input Channel 0* and the *outlet pressure* is available on *analog input Channel 1*.

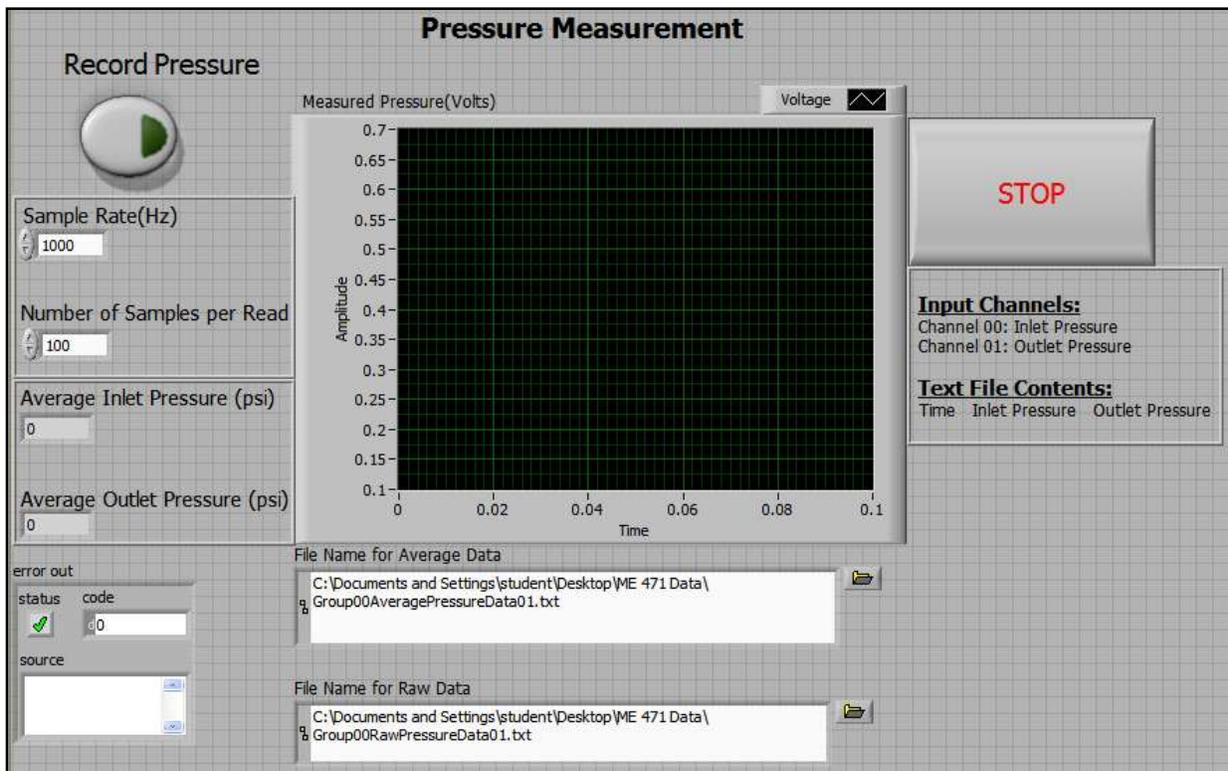


Fig. 1. Front Panel (Graphical User Interface) for Pressure Measurement Program

- The **Sample Rate** input (upper left) specifies the measurement rate in *samples per second*, and the **Number of Samples** input specifies the number of data points for each read operation from the DAQ card.
- The “raw” and “averaged” data are **stored** in two different **text files** as specified in the **File Name** input boxes at the bottom. The **file folder icons** on the right of these boxes allows the user to browse for a file location. The **size** of the files generated is obviously determined by the sampling rate and the total time duration of the measurement.
- Once the information for **sampling rate**, **number of samples per read**, and **file names** are entered, the user **starts** the program **execution**. At this point, the program does nothing until the **Record Pressure** button is clicked (turning it **ON**).
- The program continues to record and average pressure data until the **Record Pressure** button is clicked again (turning it **OFF**).
- The **Stop** button stops program **execution**.

The Block Diagram

- The LabVIEW **code** is depicted in the form of a block diagram. Descriptions of the basic operation of the various segments of code follow.

Pause State

- After the program is started, the input data from the front panel is noted, and the program waits until the **Record Pressure** button is clicked. See Fig. 2.

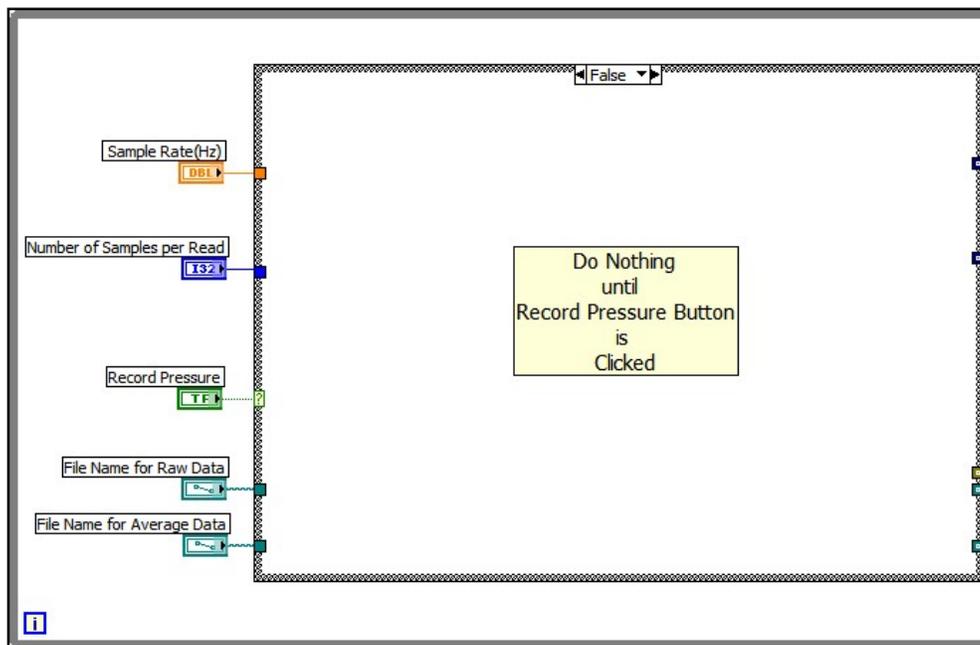


Fig. 2. Waiting for the Record Pressure Button to be Clicked

Read and Average Pressure Data

- After the **Record Pressure** button is clicked (turned **ON**), the data collection process begins. See Fig. 3.
- The **DAQ Assistant** is used to:
 - **Initialize** the input **channels**
 - **Define** the **physical device** from which to collect data, the **max** and **min voltages**, the **type** of measurement (RSE), and the **collection mode** (N point mode)
 - **Read** the data
- The **sample rate** (samples/sec) and the **number of samples per read** are both input variables to the DAQ Assistant.
- The **raw** data (voltages) for both inlet and outlet pressures are **read** and **sent on** to be written to a text file.
- The raw data for inlet and outlet pressures are **separated** so mean values can be calculated and then **recombined** and **sent on** to be written to a text file. **Mean values** are calculated for each set of samples read for both the inlet and outlet pressures. The mean values are multiplied by 100 to **convert** from “volts” to “psi”. The resulting average pressures are then **displayed** on the front panel.
- The **file names** for the raw and averaged data and the **error signal** are **passed through** the case loop for later use.

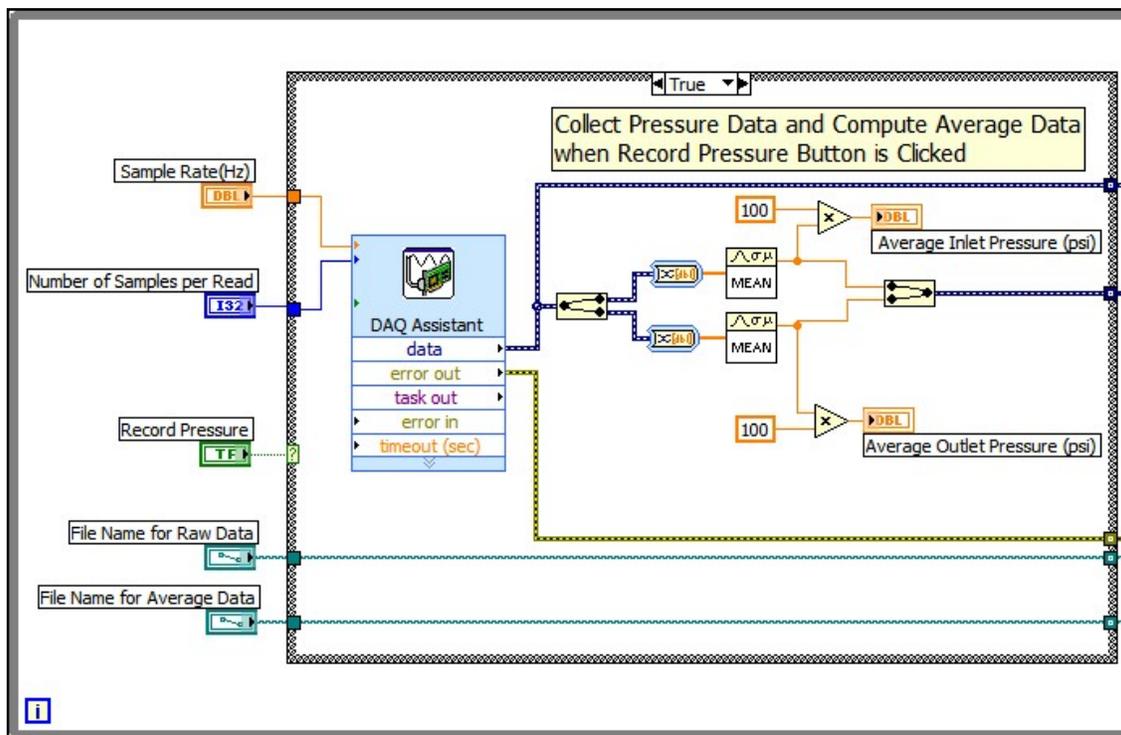


Fig. 3. Reading Inlet and Outlet Pressure Data and Computing Averages

Displaying Data to a Waveform Chart and Storing It

- Data is **read**, **averaged**, **displayed**, and **written to files** until the **STOP** button is clicked or until an error occurs in the reading process. See Fig 4.
- The file names specified on the front panel and the collected data are input to the **Write to Measurement File** blocks.

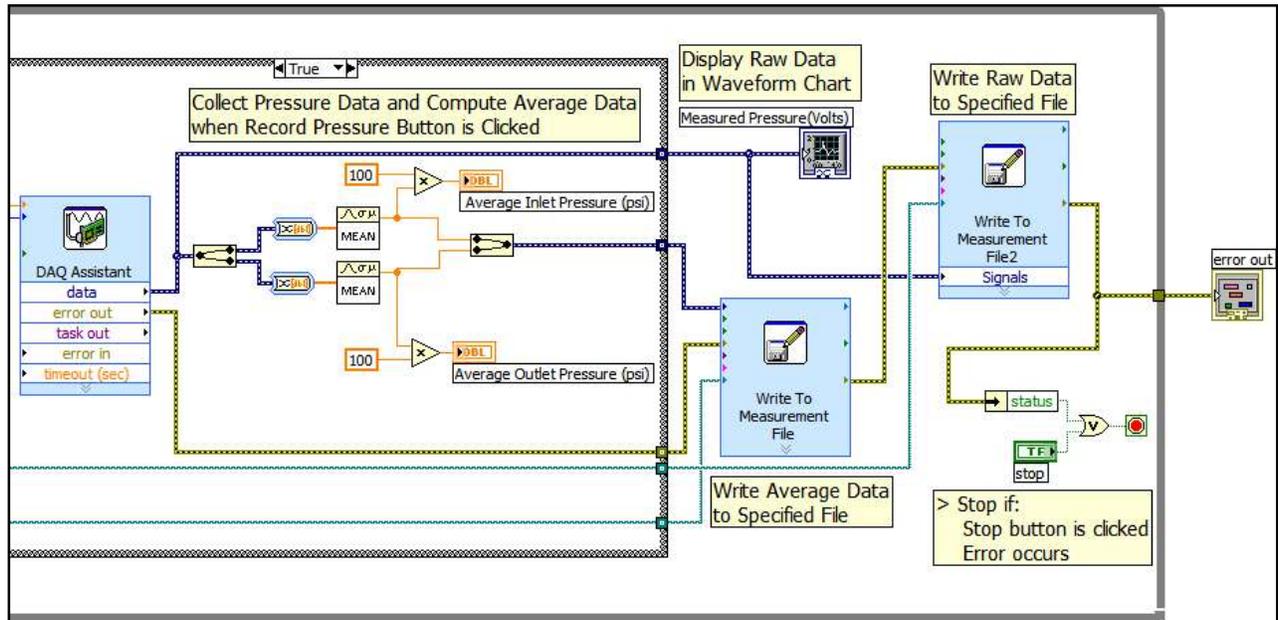


Fig. 4. Display and Record Data