

Homework #4

LabVIEW

Dr. Pogo

Assignment is due on Tuesday, October 3, 2023

Assigned September 19, 2023

Assignment #4: Voltage to Pressure Conversion

Inputs: A Ring to select the USB analog input channel, and a ring to select pressure units.
A digital frequency control and a digital duration control
Buttons for “acquire”, “abort”, “quit”, “report”, and “save”.

Outputs: A waveform chart.
Lights for “USB Found”, “USB missing”, “In Progress”, and “Voltage warning”.
Pop-up dialog for saving, and a pop-up sub-vi for the data report.
A CSV file containing each data point #, time, and pressure in the chosen units (with a header row)

This assignment is considerably harder than the previous ones. You have been given an extra week to do it. If you think this means that you can wait two more days before starting, then you will not complete it. The reason it is hard is because you are still doing things *your* way instead of *my* way, as if it didn't matter. If you do this *your* way, you'll never get it done.

We are now converting real voltage into pressure using:

$$p \text{ (kPa)} = -101.3 + 56.8V + 7.9V^2 \quad (0 \text{ volt} \leq V \leq +5 \text{ volt})$$

Voltages will actually be generated by any power supply unit (e.g., the HP E3614A). When the program is started, all indicators are off. If the USB-6001 is missing, the program terminates, and the USB warning light comes on. Otherwise, the “USB detected” light comes on. After detection, the user can choose a USB channel (unless a “run” is in progress). After detection, the analog voltage is continually monitored, and the corresponding pressure displayed on the chart (which starts blank). Any time the voltage is out of range, the warning light comes on, and the result is pegged. The physical voltage on the power supply may vary between -10v and $+10\text{v}$. The chart and any stored data are cleared when the units are changed. If there is no stored data, the user may not save or create a report.

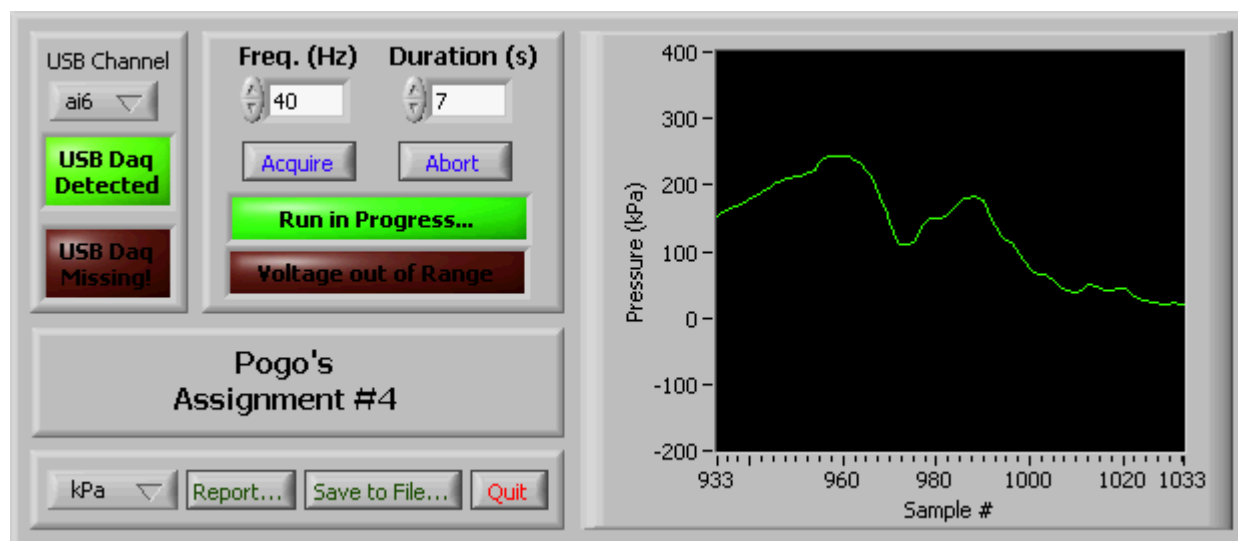
The label and scale of the chart should automatically adjust as follows:

kPa:	$-200 \leq p \leq +400$
psi:	$-20 \leq p \leq +60$
atmospheres:	$-2 \leq p \leq +4$
torr	$-1000 \leq p \leq +3000$

Frequencies between 10 and 50 Hz are permitted, and durations between 5 and 20 seconds are permitted. A “run” is initiated when the user presses the “acquire” button, which temporarily locks out all controls except “abort” and “quit”. It also lights the “in progress” light. During a run, voltages are recorded into an array at the chosen frequency, for the chosen total duration. The run ends when the duration time is reached, or when the abort button is pressed. During a run, the program may not use a metronome (or equivalent) to slow itself down, period. Obviously, pressing “abort” does nothing unless a run is in progress.

An onscreen “Report” is generated by pressing the report button after any run (even an aborted run). The report includes indicators for the maximum, minimum, and average pressures recorded (in the units shown on the ring when “report” was pressed), the actual frequency and duration, the number of points recorded, and an *xy* plot of the run (pressure vs. time since the start of the run). The plot scales the same as the chart.

Pressing “save” after any run opens a pop-up dialog box, requesting a filename from the user. The user may choose to cancel the save. The data file should appear in the same directory as the VI.



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Some tips for assignment #4

Here are some CASE structures your program should probably have:

1. Start a new run.
2. What should I do if I am already in a run? This is NOT a subcase of the previous one!!
3. End a run. This should be a sub-CASE of the previous one.
4. Is it OK to update the plot? This is not a subcase of any previous one!
5. What to do if units are changed.
6. Save my data.
7. Create a report for my data.

Here are some Shift Registers your program should probably have:

1. What were the units a moment ago?
2. Am I in a run?
3. At what time did the current run start?
4. At what time was the last recorded data point?
5. A list of all recorded times.
6. A list of all recorded voltages.
7. Am I permitted to save this data? (actually, this goal can be achieved without a new shift register)