Computer Fundamentals

(Last Revision: August 20, 2020)

ABSTRACT: A program, LabVIEW, is used to enable a PC to acquire and manipulate data and to generate output voltages.

TEXT REFERENCE: "Experiments in Physical Chemistry", Garland, Nibler, and Shoemaker, Eighth Ed., McGraw-Hill, 2009, pp. 85-90

OTHER REFERENCES: “LabVIEW 7 Express: Getting Started with LabVIEW.” pp. 1-1 – 1-17; 2-1 -2-14.

GENERAL DESCRIPTION AND THEORY: The student will learn how to build a virtual instrument (VI) using LabVIEW 2020. Then, the student will use a different LabVIEW VI to obtain the voltages of a number of laboratory batteries.

EQUIPMENT: The PC in the laboratory has a National Instruments Data Acquisition module (NI-DAQ) connected to it via a USB cable. The NI-DAQ (NI USB-6008) is powered through the computer’s USB and can be used to acquire or produce digital or analog signals. Screw terminals on the module allow wiring connections to the 8 analog input channels, 2 analog output channels and 13 digital channels. The LabVIEW software allows you to construct VIs that can interface with the NI-DAQ.

LABORATORY PROCEDURE:

Part I

Open LabVIEW 2020. In the LabVIEW dialog box, click the **New** button to open a new VI. Follow the instructions in the Getting Started booklet to build a VI that generates a simulated signal, then add controls that will allow you to manipulate the simulated signal. If LabView prevents you from doing this, the CHEM 362L folder on the desktop has a subfolder for this experiment which contains a VI with the title “Acquiring a Signal”. Double-click on the icon for this VI.

Part II

Open the **voltmeter** VI in the CHEM 362L folder. Two wires are attached to the NI-DAQ: attach the free ends of these to the terminals on one of the batteries. Do not worry about polarity when making the connections. Push the **start** button on the control panel and allow the VI to acquire data for at least one minute. Then, push the **stop** button on the control panel. You will be prompted to give a name for a file: the first file will be the measured voltages, give it a descriptive file name and save the file in a folder designated for today’s experiment. Once the file has been saved, you will be prompted once again: this is for the standard deviation data for your measurements. Again, give the file a descriptive name and save it in the same folder. Repeat this procedure for each battery on the lab table.

It is important to gain familiarity with the system since it will be used in several other experiments.

REPORT:

The report should contain a table with an average voltage for each battery. Use the standard deviations to determine the number of digits to be reported and the precision of the measurements. For example, if the voltage for a battery was measured to be 1.482367 V and the standard deviation was found to be 0.021653 V, you would report the voltage to be 1.48±0.02 V. The first digit in the standard deviation determines which digit in the measurement is the least significant digit.