

## Introduction to the NI myDAQ

The NI myDAQ is a low-cost portable data acquisition (DAQ) device that uses NI LabVIEW-based software instruments, allowing students to measure and analyze real-world signals. A myDAQ (shown in Figure 1) is ideal for exploring electronics and taking sensor measurements. Combined with NI LabVIEW on the PC, students can analyze and process acquired signals and control simple processes anytime, anywhere. (See also the *myDAQ User Guide and Specifications* available on the class website.

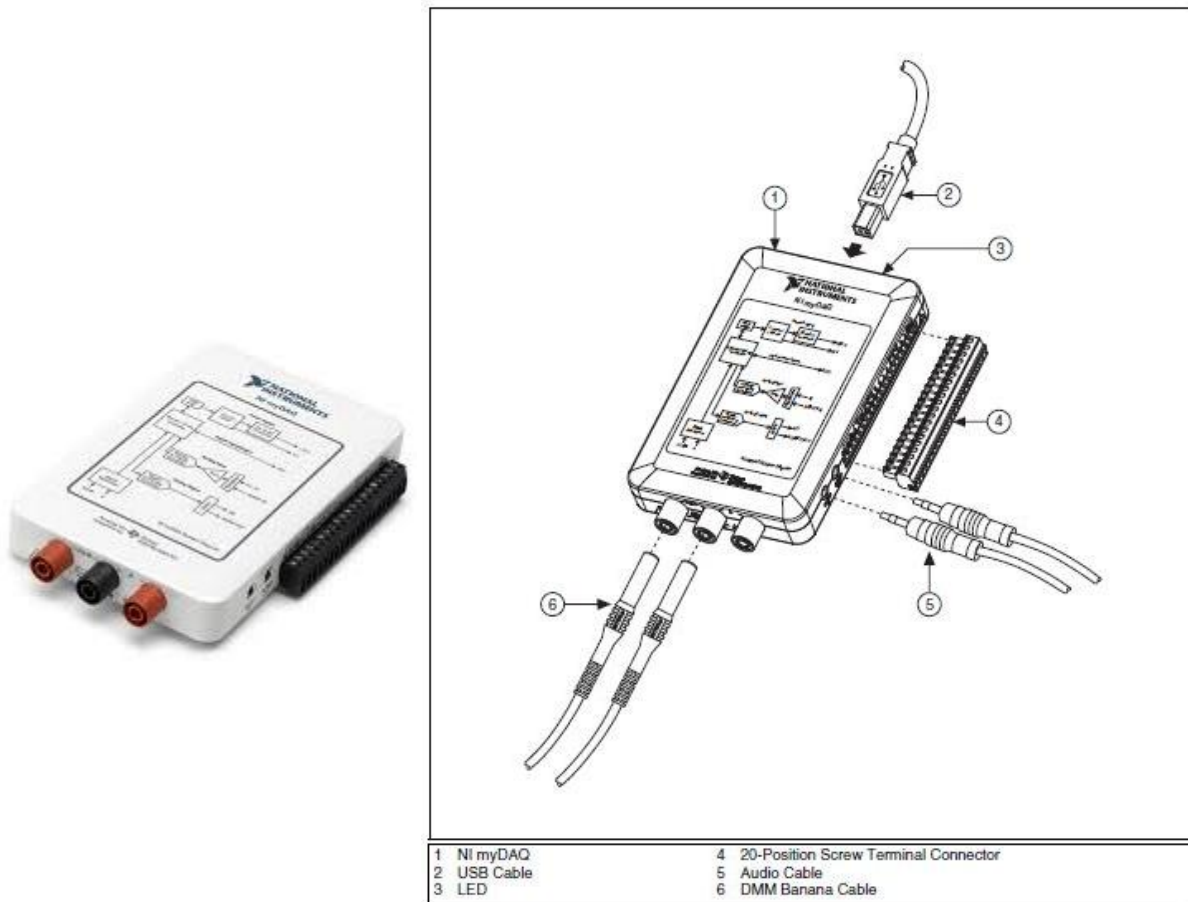


Fig. 1 NI myDAQ picture (left) and myDAQ Connection Diagram (right)

The myDAQ provides analog input (AI), analog output (AO), digital input and output (DIO), audio input and output, DC power supplies, and digital multimeter (DMM) functions in a compact USB device. Integrated circuits supplied by Texas Instruments form the power and analog I/O subsystems of a myDAQ. Figure 2 depicts the arrangement and function of the NI myDAQ subsystems. Details of the hardware configuration could be found in *myDAQ User Guide and Specifications*.

The myDAQ provides a soft front panel (from LabVIEW) to control the functionality of the device, which can launch several instruments including a digital multi-meter (DMM), Oscilloscope, function generator, Bode analyzer, Dynamic Signal Analyzer (DSA), Arbitrary Waveform Generator (ARB) and Digital Reader/Writer. The myDAQ also provides the express VI of such instruments which can be included in the user written LabVIEW program to perform the supposed functionality.

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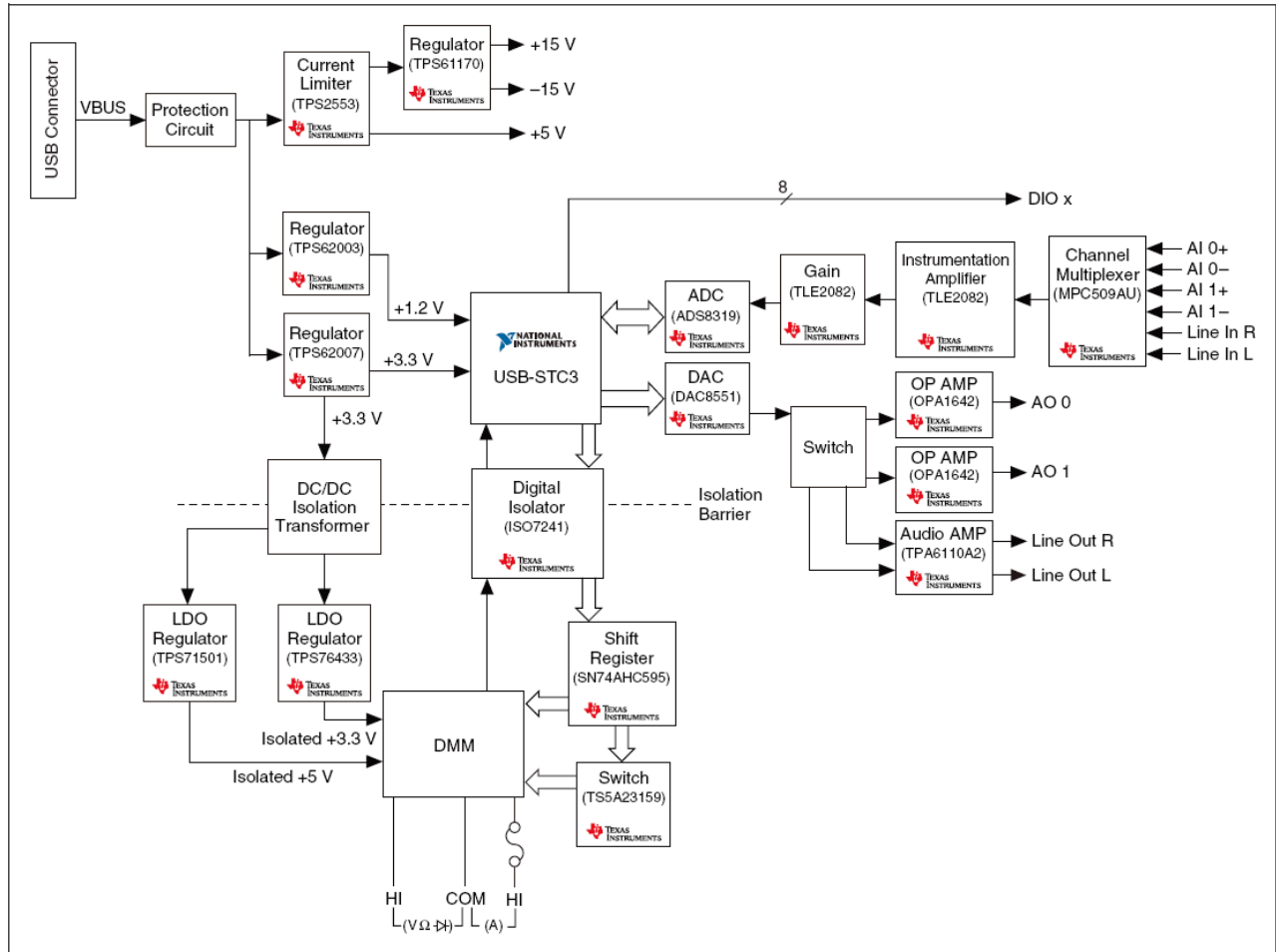


Fig. 2 NI myDAQ Hardware Block Diagram

## I. Launching the DMM Panel

- The first thing that you need to do is to connect the myDAQ to your computer with the USB cable that came with the myDAQ. When the connection is established, a blue LED (light) near the USB connection point on the myDAQ will light up, indicating that the myDAQ has power.
- Start NI ELVISmx Instrument Launcher by going to the Windows *Start* menu and selecting *Programs -> National Instruments -> NI ELVISmx for NI ELVIS & NI myDAQ-> NI ELVISmx Instrument Launcher*. The following instrument panel will appear like Fig. 3.



Fig. 3 NI ELVISmx Instrument Launcher

The buttons in light show all the available instruments in NI myDAQ. The buttons in gray show the instruments which are previously available in NI ELVIS workstation and currently not available in NI myDAQ.

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- c. You can launch the DMM by pressing the *DMM* button from the menu. Once active, you should have a new panel similar to the one depicted in Fig. 4. The DMM can be used for a variety of operations including measuring AC and DC voltages and currents, resistance, and Diode.

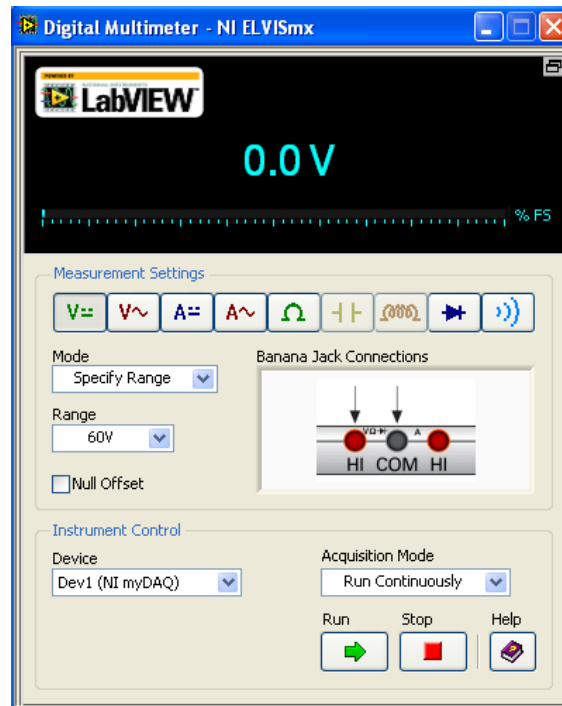




Fig. 4 Soft Front Panel for DMM (Digital Multi-Meter)

## II. Voltage Measurements

Measuring AC or DC voltage with the NI myDAQ DMM is available only through the banana jacks and can be done as follows:

- For AC and DC voltage measurements, connect the  $V\Omega \rightarrow$  (red) and COM (black) connectors on the bottom side of NI myDAQ to red banana jack and black banana jack, respectively.
- The DMM is set in measuring DC Voltage mode when launched. Select the  or  button on the front panel of the DMM, depending on the signal to be measured, and the measurement type changes to show the value of the signal. Auto scaling should work best for most applications. If you want to specify the range, please start from the largest range and decrease the range according to the measure result in order to protect the device from overdriven damage.
- Using the probes to contact the corresponding signal leads. Remember that voltage is measured in **PARALLEL** to the device in question.
- Until now you have finished all the necessary setting and connections for voltage measurement. Then press the *Run* or *Stop* button from the soft front panel. Selecting the *Run* button provides continuous measurements of voltage. Selecting the *Stop* button stops the



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measurement and displays the instantaneous value of the voltage just before stopping the measurement.

- e. Measuring DC voltage gives you the actual DC voltage, while measuring AC voltage gives you the RMS value of the AC voltage you are measuring.



### III. Current Measurements

Measuring AC or DC current with the NI myDAQ DMM is available only through the banana jacks and can be done as follows:

- a. For AC and DC current measurements, connect the A (red) and COM (black) connectors on the bottom side of NI myDAQ to red banana jack and black banana jack, respectively.
- b. The DMM is set in measuring DC Voltage mode when launched. Select the  or  button on the front panel of the DMM, depending on the signal to be measured, and the measurement type changes to show the value of the signal. Auto scaling should work best for most applications. If you want to specify the range, please start from the largest range and decrease the range according the measure result in order to protect the device from overdriven damage.
- c. Using the probes to contact the corresponding signal leads. Remember that current is measured in **SERIES** with the device in question.
- d. Until now you have finished all the necessary setting and connections for current measurement. Then press the **Run** or **Stop** button from the soft front panel. Selecting the **Run** button provides continuous measurements of current. Selecting the **Stop** button stops the measurement and displays the instantaneous value of the current just before stopping the measurement.
- e. Measuring DC current gives you the actual DC current, while measuring AC current gives you the RMS value of the AC current you are measuring.

### IV. Resistance Measurements

Measuring the resistance with the NI myDAQ DMM is available only through the banana jacks and can be done as follows:

- a. For the resistance measurements,  $V\Omega$   (red) and COM (black) connectors on the bottom side of NI myDAQ to red banana jack and black banana jack, respectively.
- b. The DMM is set in measuring DC Voltage mode when launched. Select the  button on the front panel of the DMM to measure the resistance. Auto scaling should work best for most applications. If you want to specify the range, please start from the largest range and decrease the range according the measure result in order to protect the device from overdriven damage.
- c. Using the probes to contact the resistor leads. Remember that the resistance is measured in **Parallel** with the device in question. The resistor in measurement should be disconnected from the circuit it is placed in, and otherwise the reading will not be correct.
- d. Until now you have finished all the necessary setting and connections for resistance measurement. Then press the **Run** or **Stop** button from the soft front panel. Selecting the **Run** button provides continuous measurements of current. Selecting the **Stop** button stops the

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measurement and displays the instantaneous value of the resistance just before stopping the measurement.

### V. Power Supply

There are three power supplies available for use on NI myDAQ. +15 V and -15 V can be used to power analog components such as operational amplifiers and linear regulators. +5 V can be used to power digital components such as logic devices.

- Connect the wire from +15V screw terminal on NI myDAQ to the +15V power rail in your breadboard, and then connect the wire from AGND (Analog Ground) screw terminal on NI myDAQ to the ground rail in your breadboard.
- Connect NI myDAQ to your computer through the USB cable to power it up. When the blue LED lights, the power supply should be running.
- You can utilize the -15 V and +5 V power supply as the same way.

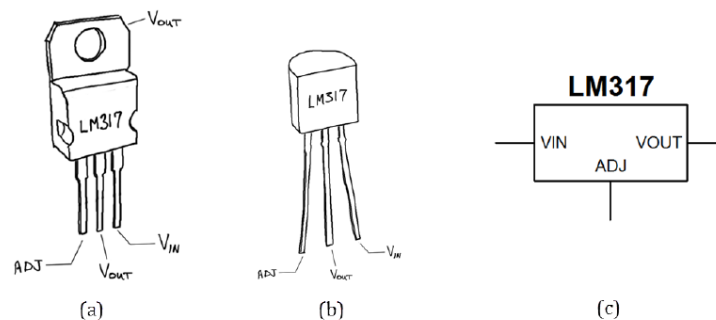
### VI. Variable Power Supply

The myDAQ can be used to generate a varying power supply from the Analog output screw terminals (AO0 and AO1) using the LabView software as follows:

- Connect the myDAQ to your computer via the USB port.
- Download the file “VPS\_myDAQ.vi” (from our class website) and run it using the LabView software.
- Adjust the Supply+ to give 0V to 10V from the analog output **AO0** on the myDAQ and/or adjust Supply- to give -10V to 0V from analog output **AO1** on the myDAQ.

The myDAQ needs to be connected as Dev2 on your computer. To check this, launch the DMM as instructed above in section I. Under “Device”; check to see if it reads “Dev2 (NI myDAQ)” (see Fig. 4). If it does not, click “stop” on the front panel of the file “VPS\_myDAQ.vi” and press “Ctrl + E” on your laptop to open the “VPS\_myDAQ.vi” block diagram and follow the troubleshooting instructions.

~~The Texas Instruments LM317 adjustable voltage regulator is a flexible device that when combined with suitable external resistors and the NI myDAQ power supply can serve as the basis for a fixed or variable voltage source. The package terminal and schematic of LM 317 are in Fig. 5 below.~~



~~Fig. 5 LM317 adjustable voltage regulator: (a) package and terminals for 1.5 amp device (TO-220 package), (b) package and terminals for 100 mA device (TO-92 package), and (c) schematic symbol.~~

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The circuit in Fig. 6 produces a variable voltage in the range 1.5 V to 13.5 V from the NI myDAQ +15V power supply. There is a 1kΩ resistor and a 10kΩ range potentiometer involved in the circuit. When running the circuit, you can adjust the output voltage by changing the resistance of the potentiometer.

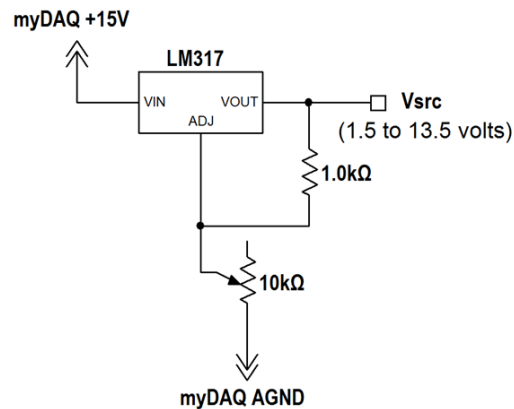


Fig. 6 LM317 as a variable voltage source

### VII. Exercise

This part of the experiment will demonstrate the NI myDAQ's ability in making both voltage and current measurements.

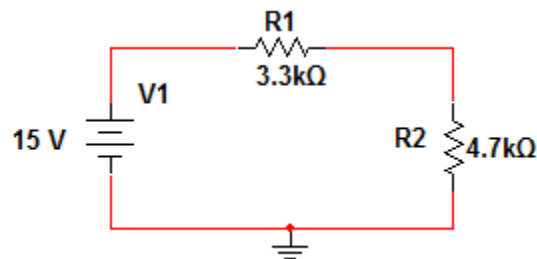


Fig. 7 Exercise Circuit

1. Set up the circuit in Fig. 7. Do not forget to ground your circuit. Use the +15V and AGND terminals on the NI myDAQ to serve as the 15V DC voltage source.
2. Measure the voltage across all the branches, including V1 in Fig. 7 using the procedure described in step II.
3. Measure all branch currents in Fig. 7 using the procedure described in step III.
4. Measure the above voltages by also using the hand-held multimeter. Compare these values to those obtained in step 2.
5. Measure the above branch currents by also using the hand-held multimeter. Compare these values to those obtained in step 3.
6. Compare these results with theoretical values given to you by the instructor. Make sure to include percent error calculations as well.

$$\frac{|\text{your result} - \text{accepted value}|}{\text{accepted value}} * 100$$