

# Lab Work 1

**Objective:** Learning how to work with NI Educational Laboratory Virtual Instrumentation Suite (NI ELVIS) and how to use data acquisition modules to read and write analog data.

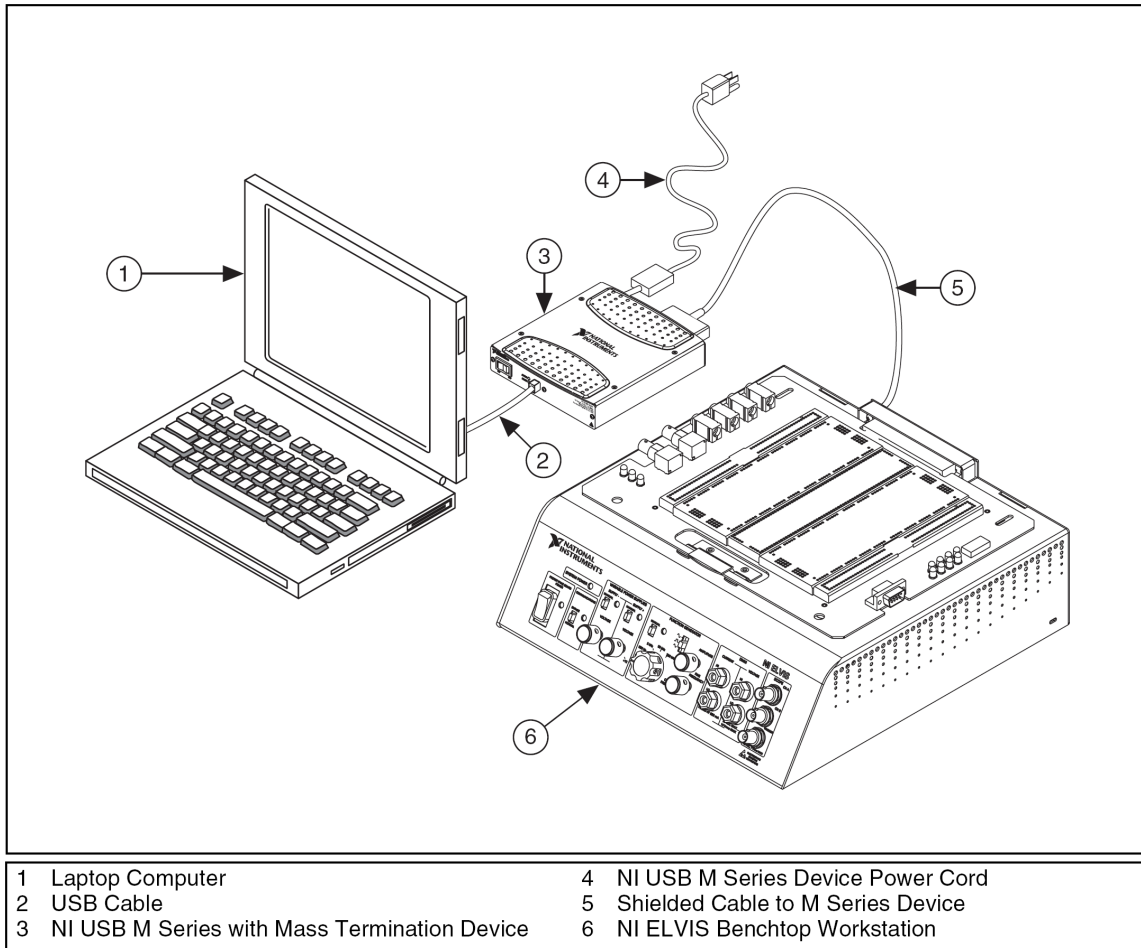


Fig. 1. NI ELVIS system.

NI ELVIS (Fig. 1) consists of LabView based software, a DAQ (data acquisition) device and a benchtop workstation and a prototyping board which provides a suitable device for data recording and analysis. The NI ELVIS hardware provides a function generator and variable power supplies which could be controlled either manually or through the NI ELVIS software. The NI ELVIS LabView soft front panel (SFP) instruments combined with the DAQ device and the NI ELVIS workstation provides different SFP modules including arbitrary waveform generator (ARB), bode analyzer, digital bus reader, digital bus writer, digital multimeter (DMM), dynamic signal analyzer (DSA), function generator (FGEN), impedance analyzer, oscilloscope (scope), two-wire current voltage analyzer, three-wire current voltage analyzer and variable power supplies. These SFP instruments

could be handled and controlled using NI ELVIS software (Start»All Program Files»National Instruments»NI ELVIS 3.0»NI ELVIS.).

In this lab we work with function generator and oscilloscope SFP instruments.

- 1- Turn on the NI USB M series (module 3, Fig. 1) and the NI ELVIS benchtop workstation (module 6, Fig. 1).
- 2- Run the NI ELVIS software (Start»All Program Files»National Instruments»NI ELVIS 3.0»NI ELVIS.).
- 3- Run the configuration to make sure of the connections.
- 4- On the prototype board connect the FUNC\_OUT and GROUND connections (left-bottom of the board) to the scope CHA connections. For scope inputs you can either use the connections on the prototype board (left-top of the board) or the BNC inputs on the front panel.
- 5- On the front panel of the benchtop workstation set the function generator to the manual mode.
- 6- From the NI ELVIS software panel run the oscilloscope SFP instrument.
- 7- Change the parameters of the function generator output and see the output waveform on the oscilloscope SFP window.
- 8- From the NI ELVIS software panel run the function generator SFP instrument.
- 9- On the front panel of the benchtop workstation turn of the manual mode of the function generator.
- 10- Turn on the function generator from the function generator SFP instrument and change the output parameters. Check your results with the oscilloscope SFP instrument.

You can follow the same procedure to use other SFP instruments of NI ELVIS.

In this part we want to use LabView to read an analog data and plot the data.

- 1- Open the ReadIO.vi.
- 2- Close the oscilloscope SFP instrument (this instrument can not be run with another data recording software simultaneously).
- 3- Disconnect the FUNC\_OUT and GROUND connections from the scope CHA connections.
- 4- Connect the FUNC\_OUT and GROUND connections to the ACH0+ and ACH0- connections (left-top of the board).
- 5- On the front panel of the ReadIO.vi set the following parameters:
  - a. "physical channel" to Dev1/ai0.
  - b. "Sampling rate" to 100.
  - c. "Samples to read" to 50.
  - d. "Total buffer size" to 2000.
- 6- Run the ReadIO.vi.
- 7- Run the function generator SFP instrument.
- 8- Change the frequency of the output waveform of the function generator from 10Hz to 60 Hz and see the results on the measurement graph. Discuss your observations.

In the last experiment we use the DAQ to write on the output.

- 1- Close the function generator SFP instrument.

- 2- Disconnect the FUNC\_OUT and GROUND connections from the ACH0+ and ACH0- connections (left-top of the board).
- 3- On the prototype board connect the DAC0 and GROUND connections (left-bottom of the board) to the scope CHA connections.
- 4- From the NI ELVIS software panel run the oscilloscope SFP instrument.
- 5- Open the writelO.vi. This program makes a waveform and writes it in the output buffer. "Samples per buffer" and "Cycles per buffer" define the sampling rate of the output the signal.
- 6- On the front panel of the writelO.vi set the following parameters:
  - a. "physical channel" to Dev1/ao0.
  - b. "Desired frequency" to 10.
  - c. "Samples per buffer" to 100.
  - d. "Cycles per buffer" to 5.
- 7- Run the writelO.vi and see the results on the oscilloscope SFP instrument.
- 8- Change the "Samples per buffer" from 20 to 200 and discuss your observations. Note that in order to change the value of "Samples per buffer" parameter you need to stop the writelO.vi and run it again.