UC Berkeley, ME103, Fall 2026
Equipment and Software Crash Course

The purpose of this document is to serve as a reference for all laboratory experiments in the course, and to be referenced *before* asking the GSIs for help. It is by no means an exhaustive description of how to use the lab software and hardware but should provide a comprehensive overview.

Commonly Used Hardware

Turning on the Equipment and Computer

- The workbench power is the large red switch located at the *top* of each workstation (see left image). The waveform generator, DC power supply, oscilloscope, and multimeter all run off the workbench power.
- The computer power supply is the “light switch” labeled “Computer PXI Power” located *in the back* of each workstation (see left image). This must be on in order to turn on the computer, which is done so *underneath* each workstation (see right image). Note that *only* flipping the labeled switch at the back does not turn on the computer.

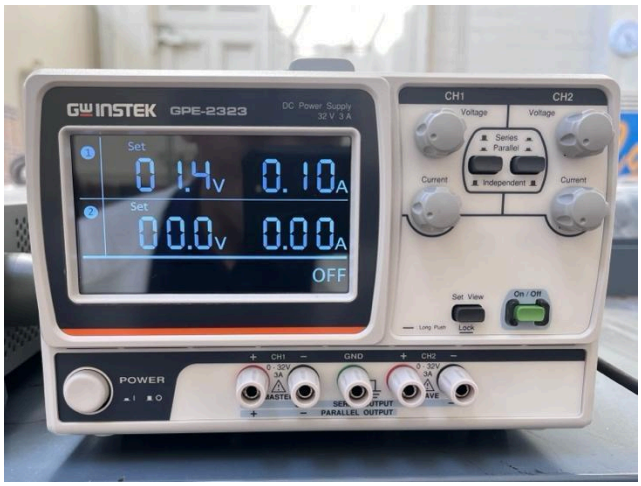
Waveform Generator

The waveform generator creates a voltage signal with a specified frequency, amplitude, offset, phase shift, and waveform (“shape”).

- The power switch for the waveform generator is in the bottom left, highlighted by the red box.
- The central button at the bottom labeled “CH1CH2” allows you to select which output channel to customize.
- The blue pointed buttons on the left correspond to switching “modes” for the corresponding menu item on screen (i.e. pressing the top blue pointed button switches the input mode from frequency to period.
- The buttons at the top specify the waveform of the generated signal.
- The large circular knob on the right or the numerical keypad and arrows can be used to input different values for each of the quantities.
- The yellow and blue buttons at the bottom labeled “Output” switch the corresponding channel on and off.
- Notice that the outputs are BNC adapters.

DC Power Supply

The DC power supply generates a DC (direct current) voltage or current to the user’s specification.

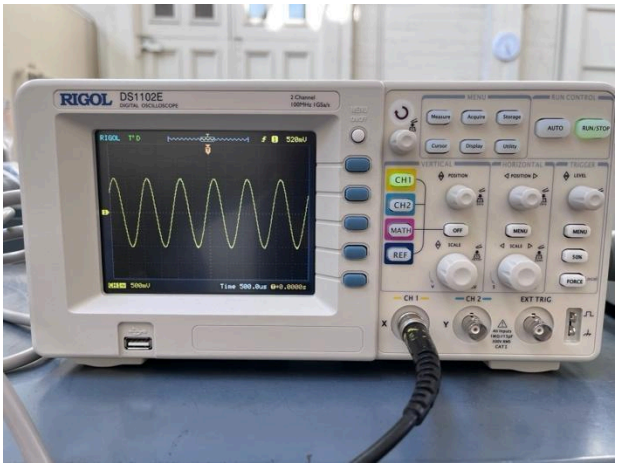


- The power switch for the DC power supply is the large circular button at the bottom left.
- The two channels can be adjusted independently. (Alternatively, the two sources may be placed in series or parallel, though it will not be needed for this course.)

- The bottom knob on each channel sets the current limit. For safety, make sure this is set to zero (all the way counterclockwise) before setting your desired voltage.
- The top knob on each channel sets the desired voltage.
- The green button at the bottom right turns *both* channel outputs on or off. If your current limit is set to zero, as it should be, you should also see the voltage drop to zero when you turn the output on. Slowly adjust the current limit until it exceeds your expected current. You should see the voltage increase up to your desired voltage.
- Notice that the outputs are banana plug adapters.

Oscilloscope

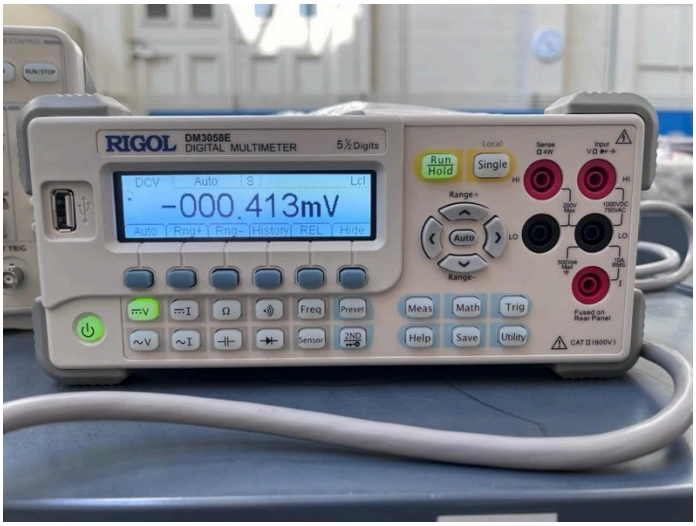
The oscilloscope measures and visualizes time-varying, ideally periodic, signals (such as AC signals).



- The power switch for the oscilloscope is on *top* of the unit (not visible in the picture).
- This oscilloscope has two channels and can therefore measure up to two signals. Each channel can be toggled on or off using the buttons with colored background labeled “CH1” and “CH2”. Alternatively, one can press the “AUTO” button at the top right to automatically detect and display the channels to which a signal is inputted.
- To properly view a signal, you may need to adjust the horizontal and vertical scaling of the display. To do so, use the large knobs labeled “SCALE” beneath the corresponding label “VERTICAL” or “HORIZONTAL.” The volts per division and time per division (i.e., the size of each gridline) are shown in the bottom left and bottom right of the display, respectively.
- To run or stop the oscilloscope, press the lit “RUN/STOP” button at the top right.
- You can also choose to “pan” the view of the signal in any direction by using the “POSITION” knobs.
- Note that the channel inputs for the oscilloscope are BNC adapters.

Digital Multimeter

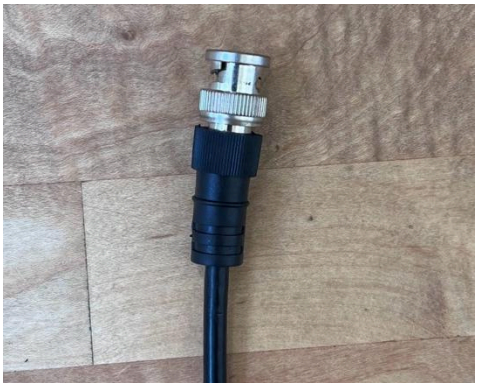
The digital multimeter measures various electrical quantities, most useful of which include DC voltage and current, AC voltage and current, and resistance.



- The power button for the multimeter is the green lit power button at the bottom left.
- The quantity to be measured can be selected using the buttons at the bottom. Make sure that you use the corresponding input plugs under the "Input" column. Pay attention to which red plug to use depending on what quantity you are measuring.
- The blue buttons with lines pointing to the display act as an interface with the display. For example, the left-most button automatically set the range based on the measurement.
- To switch between receiving a live reading and sampling a single reading, press the corresponding "Run/Hold" or "Single" button at the top.
- Notice that the input plugs for the multimeter are banana plugs.

BNC Connectors

BNC (Bayonet Neill-Concelman) connectors are named for their bayonet-type connection and inventors Paul Neill and Carl Concelman.[1] To attach a BNC connector to an adapter, insert the cable and twist clockwise. To remove the cable, twist counterclockwise and pull straight out.



The BNC connectors in the lab are all attached to *coaxial* cables, which have concentric layers of conducting and insulating materials. There are various types of coaxial cables in the lab (i.e. BNC-to-gripper, BNC-to-BNC, or BNC-to-alligator)

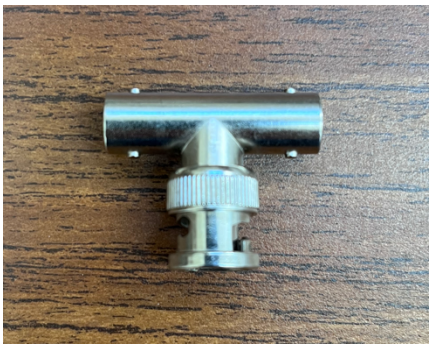
[1] https://connectorsupplier.com/bnc-connectors/

Banana Plugs

Banana plugs (named for their shape) are a universal connector type. The banana plugs in the lab have different types of opposite ends. Some have grippers and some have alligator clips.

T-junctions

T-junctions are named for their shape. They have a BNC connector on one side and two BNC adapters on the other. This allows them to send two identical copies of one signal (from the connector side) to two different locations (via the adapters side). In other words, T-junctions can “split” a signal if needed.



Working With LabView

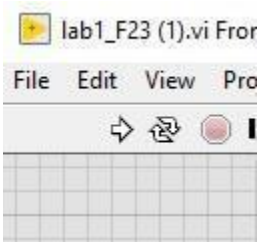
The National Instruments Data Acquisition (DAQ) Extension

The DAQ in the ME103 lab is the National Instruments USB-6211 extension. LabView reads the data that is inputted into the DAQ, and each channel is labeled AI [#] (Analog Input [#]).

LabView Virtual Instruments (Vis)

Programs created in LabView are called Virtual Instruments (VIs) and have the `.vi` extension. When a VI is first opened, the interface displayed is called the “Front Panel.” It is possible to double-click on any object to open the “Block Diagram” for the VI (you can think of this as the “back panel”). This is where the “code” of the program resides. You may explore this if you'd like, but understanding the block diagrams is outside the scope of this course. We are simply using LabView to collect and view data; therefore, the two important actions to understand are running VIs and viewing graphs.

Running a VI



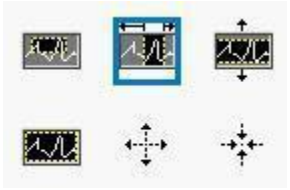
- To run a VI, click the white arrow in the upper left corner (see image above). If a VI is running, the arrow will become shaded.

- Some Vis will stop after a predetermined amount of time; others will have a built-in button to stop it on the Front Panel.

Viewing Graphs in LabView

- It is important to understand how to manipulate the viewing window of graphs in a VI as you will often need to zoom in or out to see the relevant data. On any graph, you should see the “Graph Palette” attached to the graph (see image below); if you don't, right-click and click “Show Graph Palette”).

- To adjust the window of a graph, click the middle button on the Graph Palette. This will bring up a window like that below:



- Each of these buttons allows you to zoom in or out in a different way.
    - Top row, from left to right: (1) zoom to a selected window; (2) zoom to a specified horizontal range (keeping vertical range constant); (3) zoom to a specified vertical range (keeping horizontal range constant)
    - Bottom row, from left to right: 1) autoscale to show all data; (2) zoom in towards a point; (3) zoom out from a point
- When using a selection from the top row, click and drag to zoom. If using (2) or (3) in the bottom row, click on a point to zoom in or out of.