Informative Lab (Lab 5)

Understanding/ Learning Lab Equipment

Leonardo Fusser, 1946995

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Department of Computer Engineering Technology
Circuit Analysis & Simulation I
Mohamed Tavakoli

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1.0 Purpose

- Understand how to use resources wisely.
- Understand how to handle lab equipment correctly.
- Understand how to operate the desktop Power Supply.
- Understand how to operate the desktop Digital Multimeter (DMM).
- Understand how use all the functions in the DMM (Ohmmeter, Ammeter, Voltmeter…).

2.0 Equipment Needed

- (1x) Computer for access to lab equipment manuals.
- (1x) desktop Power Supply.
- (1x) desktop Digital Multimeter.

3.0 Theory

The Lab equipment we use

Although we are not measuring the value of resistors or measuring the voltage across the resistor like we did in previous labs, it is important to understand how to conduct our tests using standard Lab equipment efficient and safely. The Desktop power supply (refer to document #1) lets us use this device as a voltage source in our circuits. The Ammeter lets us measure the current in our circuits. Lastly, the Volt Meter lets us measure voltage in our circuits. In our case the Ammeter and Volt Meter is integrated into a desktop digital Multimeter DMM (refer to document #2). It is best for anyone, even with electrical knowledge and experience with Lab equipment, to familiarize themselves with the equipment they are using by referring to its manual.

(Doc #1: Lab Power Supply)

(Doc #2: Lab Multimeter)

4.0 EXPERIEMNTAL RESULTS

Results from the Procedure section:

1) **I saved the desktop Power Supply manual to my Google Drive online. **
2) **Functions of the desktop Power Supply:**
    - The power button turns the desktop Power Supply *on* or *off*.
    - The "select button" (+6V, +25V, +/-25V) under the "Function" section lets the user define which output probes will be used.
    - The "Display Limit button" under the "Function" section lets the user view the current settings set for the voltage and the current (amperes).
    - The "Adjust knob" lets the user set the Voltage and Current (amperes) for any of the outputs on the unit.
    - The "< and > buttons" under the "Adjust" section lets the user toggle between the decimal places on the desktop Power Supply when setting the output Voltage and Current (amperes).
    - The "Voltage/Current button" under the "Adjust" section lets the user toggle between setting the output Current (amperes) and the Voltage.
    - The "Output On/Off button" under the "Function" section lets the user turn on the output to the probes of the desktop Power Supply.
    - The "I/O Config/Secure button" under the "Function" section lets the user configure the power supply for remote interfaces / or secure and unsecure the power supply for calibration.
    - The "Error/Calibrate button" under the "Function" section lets the user view error codes generated during operations, self-test and calibration / or enables calibration mode.
    - The "Store/Local button" under the "Function" section lets the user store an operating state in location "1", "2", or "3" / or returns the power supply to local mode from remote interface mode.
    - The "Recall button" under the "Function" section lets the user return a previously stored operating state from location "1", "2", or "3".

3) **How to set the desktop Power Supply to provide 5V at a current of 250mA:**
    - Make sure the desktop Power Supply is not damaged/probes are in good working order (basic visual check).
    - Make sure before turning on the unit that the Probes are not connected to each other.
    - To start setting the outputs, first turn the unit on using the "On/Off button".
    - Second, make sure the unit reads "***Output Off***".
    - Third, select the "+6V button" under the "*Function*" section (the unit should have a small symbol above the "*Function*" label reading +6V).
    - *Make sure the Probes are connected under the "***6V***" label. *

- Fourth, select the "Display Limit button" under the "*Function*" section to begin setting the output Voltage and Current.
- Fifth, the area that blinks first is what is defined first (usually the Voltage), if the Voltage then use the "< and > buttons" under the "*Adjust*" section to move to the correct decimal place then use the "Adjust knob" under the "*Adjust*" section to set the output Voltage to ***+5V***.
- *Use the "Voltage/Current button" under the "*Adjust*" section to toggle between setting the Voltage and the Current (amperes). *
- Sixth, to set the Current (amperes), repeat what was said in Step 5 but instead set the output Current (amperes) to ***250mA***.
- Finally, it is safe at this point to press the "Output On/Off button" under the "*Function*" section to let the unit output the set Voltage and the set maximum Current (amperes) draw (the unit should show the set Voltage and the Current (amperes) draw when the "Output On/Off button" is set to ***On***.)

4) **Procedure was conducted and tested. **
5) **Setup from Procedure 3 was saved in STORE 2 on the desktop Power Supply. **
6) **I saved the manual of the Volt Meter to my Google Drive. **

7) **Functions of the desktop Volt Meter *(talking about the Volt Meter function in the multimeter)*:**
   - The "DCV button" measures DC voltage.
   - The "ACV button" measures AC voltage.
     [The following applies when measuring DC voltage]
   - The "Range button" lets the user select the range of the value being tested, if not, it is set to auto for the unit to automatically detect the range.
   - The "NPLC Aperture" function lets the user select the number of power-line cycles (PLCs) to use for the measurement.
   - The "Aperture Time" function lets the user specify integration time in seconds.
   - The "Auto Zero button" lets the user enable/disables this function. When selected on, the DMM internally measures the offset following each measurement.
   - The "Input Z button" lets the user specify the measurement terminal input impedance, which is either Auto or 10MΩ.
   - The "DCV Ratio" button lets the user enable/disable the DCV Ratio measurement.
     [The following applies when measuring AC voltage]
   - The "Range button" lets the user select the range of the value being tested, if not it is set to auto for the unit to automatically detect the range.
   - The "AC Filter" lets the user choose the filter for the measurement.

8) **How to set the Volt Meter to read a measurement of 25V:**
   - Ensure the unit is operational, safe check before operation.
   - Ensure the test probes are set in the correct place.
   - Set the unit to read DC volts.
   - Set the Range to 100V.
   - Set Auto Zero to on.
   - Leave DCV Ratio to off.
   - Set Input Z to Auto.
   - Leave the Aperture Time to default settings.
   - Set the Aperture NPLC to 100 PLC.
   - **Make sure the probes are measuring across the element otherwise you will not get a correct reading on the Volt Meter.**

9) **Procedure was conducted and tested. **
10) **I saved the manual of the Ammeter to my Google Drive. **
11) **Functions of the desktop Ammeter *(talking about the ammeter function in the multimeter)*:**

    [The following applies to measuring DC current]
   - The "DCI button" (second function from the DCV button) measures DC current.
   - The "ACI button" (second function from the ACV button) measures AC current.
   - The "Terminals button" lets the user select between which input terminals are being used for the measurement (either 3A or 10A terminals).
   - The "Range button" lets the user select the range of the value being tested, if not, it is set to auto for the unit to automatically detect the range.
   - The "NPLC Aperture" function lets the user select the number of power-line cycles (PLCs) to use for the measurement.
   - The "Aperture Time" function lets the user specify integration time in seconds.
   - The "Auto Zero button" lets the user enable/disables this function. When selected on, the DMM internally measures the offset following each measurement.

     [The following applies to measuring AC current]
   - The "Terminals button" lets the user select between which input terminals are being used for the measurement (either 3A or 10A terminals).
   - The "Range button" lets the user select the range of the value being tested, if not, it is set to auto for the unit to automatically detect the range.
   - The "AC Filter" lets the user choose the filter for the measurement.

12) **<u>Procedure to set the Ammeter to read 25mA</u>:**

- Ensure the unit is operational, safe check before operation.
- Connect the red probe to the 3A terminal and the black probe to the COM terminal.
- Select the terminals to 3A.
- Select the range to read 100mA.
- Leave the AC filter to default settings.
- **Make sure the probes are not measuring across an element, but measuring through an element otherwise you risk destroying your circuit and/or blow the fuse in the Ammeter.**

13) **Procedure was conducted and tested. **

5.0 Conclusion

- Purpose of this lab has been achieved.
- Understood how to use my workspace safely.
- Understood how to use the desktop Power Supply safely.
- Understood how to use the desktop Multimeter safely.
- Understood how to use resources wisely.
- Learned some advanced functions in these lab equipment (PLCs, store function, etc…)