

Digital Multimeter

Safety and Usage Handout

Last Revised February 16, 2007

The Department of Engineering owns a number of digital multimeters, including the following models:

- Fluke 83-III
- Fluke 87-V
- BK Precision 2905
- ExTech 430

Digital multimeters are simple to operate and provide a wealth of useful information. However, proper caution and care is required to avoid damaging the meter. Here is a short list of safety and usage guidelines:

Things To ALWAYS Do

- ALWAYS double check proper lead connection before applying power to the meter.
- ALWAYS ensure that the circuit you are measuring is not energized when making resistance, capacitance, or diode measurements.
- ALWAYS disconnect the meter from all sources of power when you are not actively making measurements.
- ALWAYS disconnect the meter leads prior to opening the case or changing the battery.
- ALWAYS respect any instructions or warnings written on the meter.
- ALWAYS read the meter manual if you are unsure of how to properly use the meter!

Things To NEVER Do

- NEVER try to measure voltage with the meter leads in the current position.
- NEVER try to measure current with the meter leads in the voltage position.
- NEVER leave connect the your meter directly across a power source while the leads are in the current measurement position or while the meter is set to make current, resistance, capacitance, or diode measurements.
- NEVER attempt to measure voltage or current greater than the limits specified on the meter.
- NEVER connect a meter to measure current into a live circuit! (Make the connection first, then apply power to the circuit.)
- If you are ever unsure of how to proceed, NEVER guess! Read the meter manual or ask someone with experience for help.

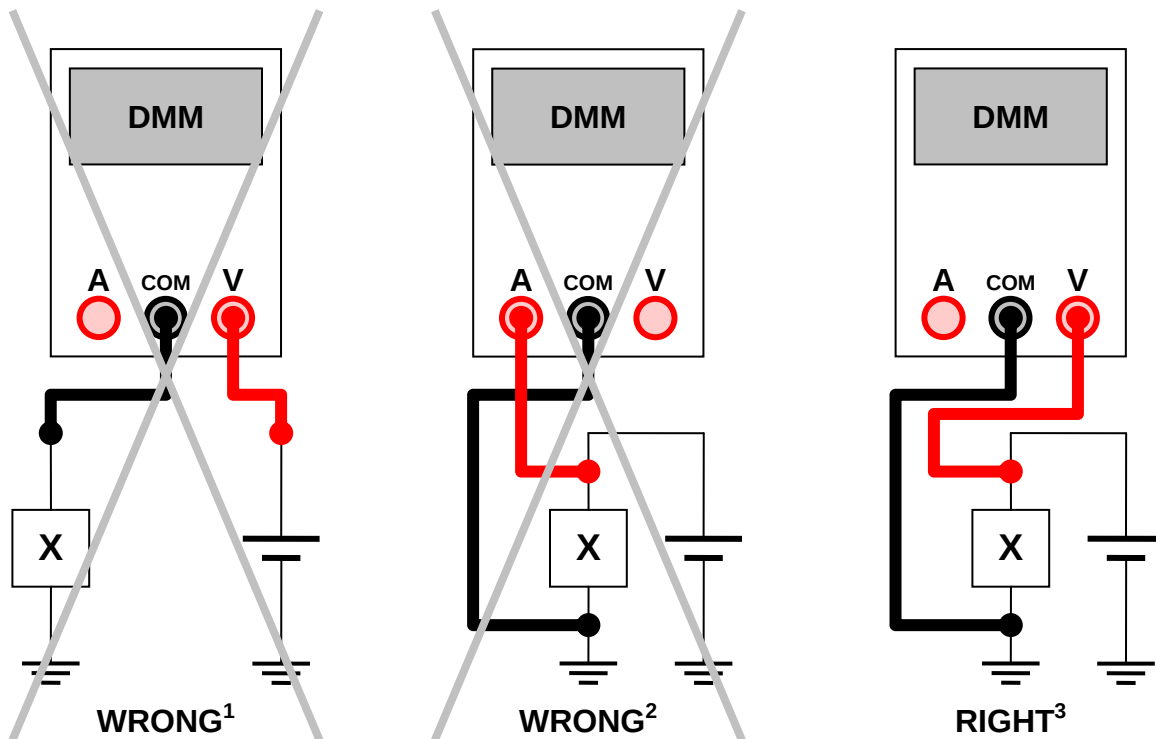
Measuring Voltage and Current Properly

Many people have difficulty properly using a digital multimeter to measure voltage and current. The result is very often a blown meter fuse and a non-functional meter, not to mention much confusion on the part of the user! When you are measuring voltage or current, be sure to check that the meter leads are installed in the proper sockets on the meter, depending on what you are measuring. Also check the connections to the circuit. **For voltage measurements, the meter must be connected in parallel. For current measurements, the meter must be connected in series.**

This page and the next display diagrams and notes for measuring voltage and current showing the proper positioning of meter leads both on the meter and in the circuit. These diagrams are shown as a reference only! **Be sure to check you particular meter for relative positioning of the leads and specific labeling.**

MEASURING VOLTAGE

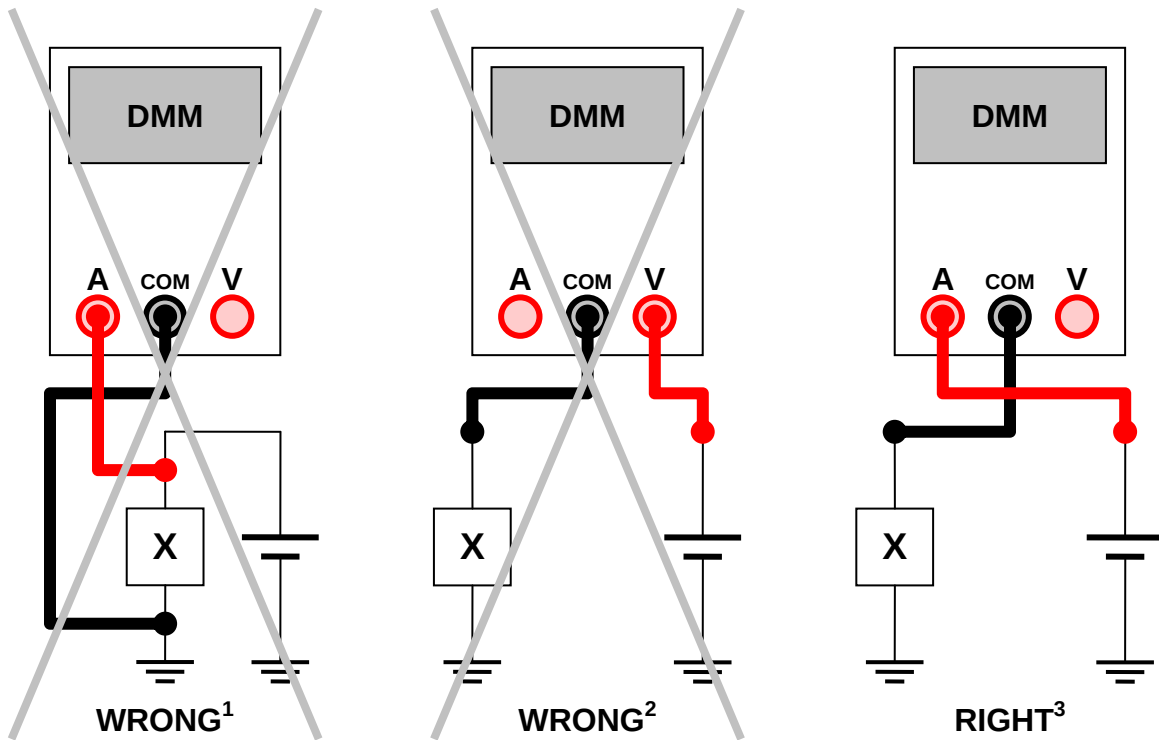
Objective: Measure the voltage across element X



1. The first diagram displays an incorrect method of measuring voltage. The diagram is incorrect because the meter is shown hooked up in series to measure voltage. *Voltage* must always be measured in *parallel* to the circuit.
2. The second diagram is also incorrect for measuring voltage. Although the meter is hooked up in parallel to the circuit, the positive meter lead is incorrectly connected to the current input, "A"! **This will not only work incorrectly, it will also likely blow a meter fuse.**
3. The third diagram displays the correct method of measuring the voltage across element X. The meter is hooked up in parallel to the circuit, and the positive meter lead is correctly connected to the voltage input, "V".

MEASURING CURRENT

Objective: Measure the current through element X



1. The first diagram displays an incorrect method of measuring current. The diagram is incorrect because the meter is shown hooked up in parallel to measure current. **This will not only work incorrectly, it will also likely blow a meter fuse.** Current must always be measured in *series* with the circuit.
2. The second diagram is also incorrect for measuring voltage. Although the meter is hooked up in series with the circuit, the positive meter lead is incorrectly connected to the voltage input, “V”.
3. The third diagram displays the correct method of measuring the current through element X. The meter is hooked up in series with the circuit, and the positive meter lead is correctly connected to the current input, “A”.