

Traditional: 09-09

Themed: 06-09

Multimeter and circuit board Intro

Care for boards

- Note your board number (same each time)
- Always paper underneath
- Battery voltage (ALL alkaline batteries are 1.5V DC...know this!)
- Weak solders sometimes, treat carefully, especially bulbs – NEVER pick up by battery holder!
- NEVER twist or bend a resistor!
- Show bulb side and bottom

Multimeter – intro and plug placement

- Multimeter is 3-in-1 meter
 - Ohmmeter: measures resistance
 - Voltmeter: measures voltage drops (difference)
 - Ammeter: measures amps (current)



- Multimeter is a circuit itself, so must have a “return” lead – black lead into COM port
- Black port never changes
- Red port V Ω plug: Volt or ohmmeter
 - High resistance
- Red port 10A: ammeter
 - Low resistance

Multimeter – Dial Setting

- Multimeter has three dial settings:

1. Voltage (DC voltage..what we're using)
2. Amps (ammeter)
3. Ohms (ohmmeter)



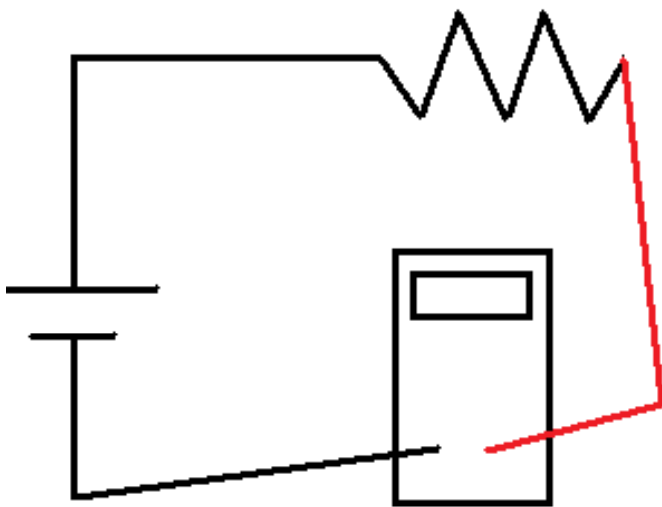
- We won't use AC voltage region – this is for dangerous voltages we don't experiment with
- Top setting is OFF, leave here or battery drains
- Bottom setting is conductivity tester – sees two spots on board are SAME

Multimeter – Conductivity Tester

- Beeps when leads are placed on conductive path (dial is set at “6:00”, pointed downward)
- Useful for testing if spring points are electrically the same
- Useful to check for burnt out bulb, break in circuit (de-soldered piece, etc.)
- Try checking all your bulbs now
- Check battery voltages are at least 1.1 V (let me know if below 1.25 V)
- Do Multimeter lab (2 pages)

Multimeter – Where ammeter goes & why

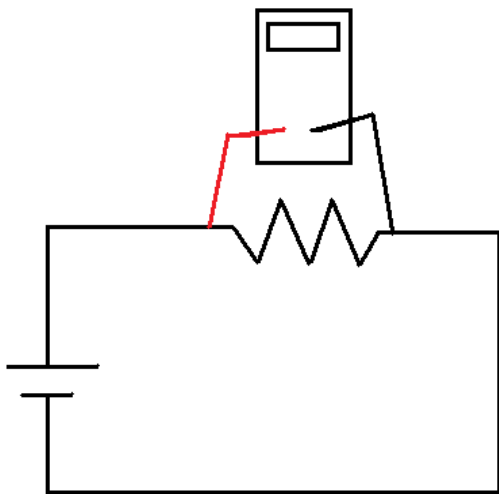
- Ammeter counts how many charges per second (this is what current is! – a charge CENSUS TAKER)
- All current must pass through ammeter for accurate count
- Ammeter can't have resistance, or would change circuit (would add resistance!)
- Ammeter must behave like wire – no resistance and be part of circuit (count all charges)



- Like always, red lead is on more positive side (though almost zero voltage drop)
- Reverse this & get negative current

Multimeter – Where voltmeter & ohmmeter goes & why

- Voltmeter compares voltage in two locations and subtracts black value from red value
- Voltmeter is high resistance device (**otherwise would short circuit what it's measuring!**)
- Not counting charges (want tiny amt. of current)



- Resistance like voltage (compare entrance to exit, not counting number of charges)
- For SAME REASON, want device to have huge resistance
- BOTTOM LINE: These devices are placed in series (opposite of ammeter)

Multimeter – dial placement/practice

- Set dial to max value you expect, if value too high, get error message (-1?) and not a real value
 - Plug AND dial in correct locations? Red lead in right place?
 - Example: Measure two batteries in series with setting of 2 and setting of 20...which works? Any batteries <1.1 V?



- Place a resistor on boardPLEASE DON'T TWIST!
- Find the resistance (dial and plug!)
- Connect via wire and measure current (dial and plug and part of circuit)

Board and make wires

- Every pair make 3 or 4 wires
- Make wires 9", strip ends enough to easily grasp
- Will help with robot project?