

Week 11

AC/DC --- [big things little things]

AC vs DC?

Do you remember?

DC Direct Current

- Electricity flows in one direction
- Good for low voltages used by common electronic devices
- Can come from batteries or wall adapters
- Typically much safer than AC

AC Alternative Current

- Electricity flows in waves (cycles)
- Flow can reverse
- Good for high voltages & long distances
- Comes directly from power outlets
- Very dangerous! Can kill you

AC and DC can never mix!

DC 5V



AC 120V



Safely triggering AC circuits

IMPORTANT!

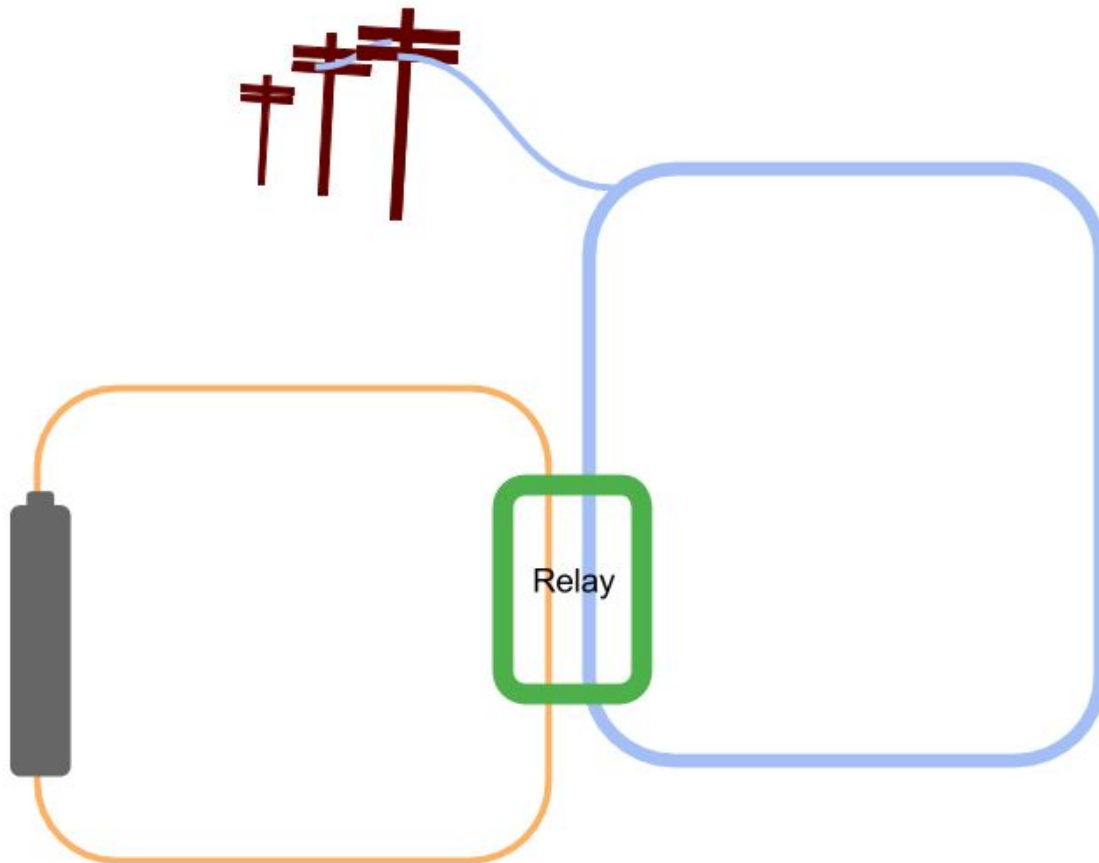
Pay special attention to wiring
when working with AC electricity

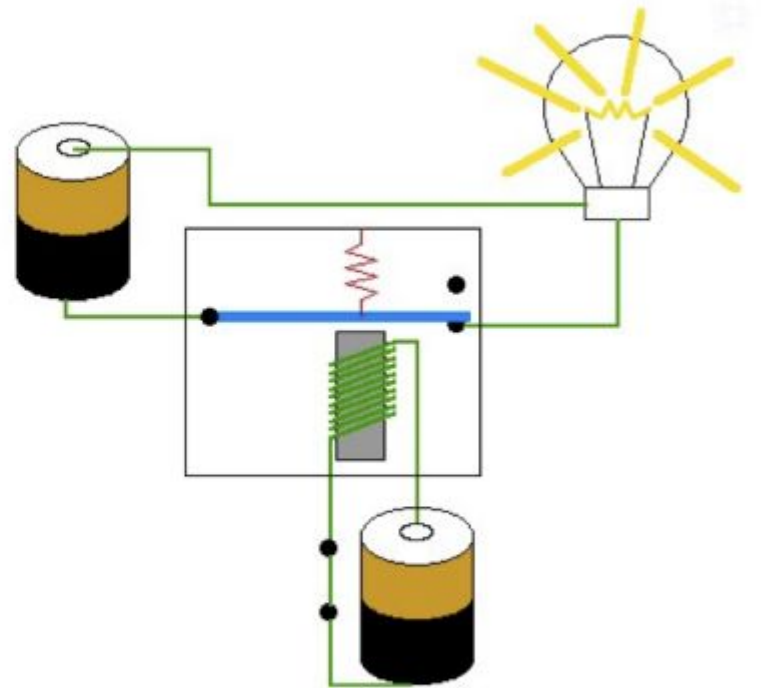
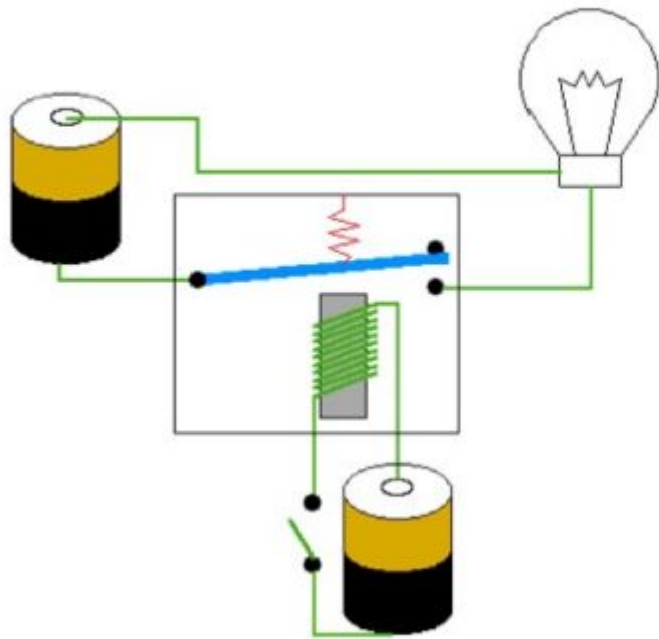
AC Electricity can kill you!
Proceed with caution.

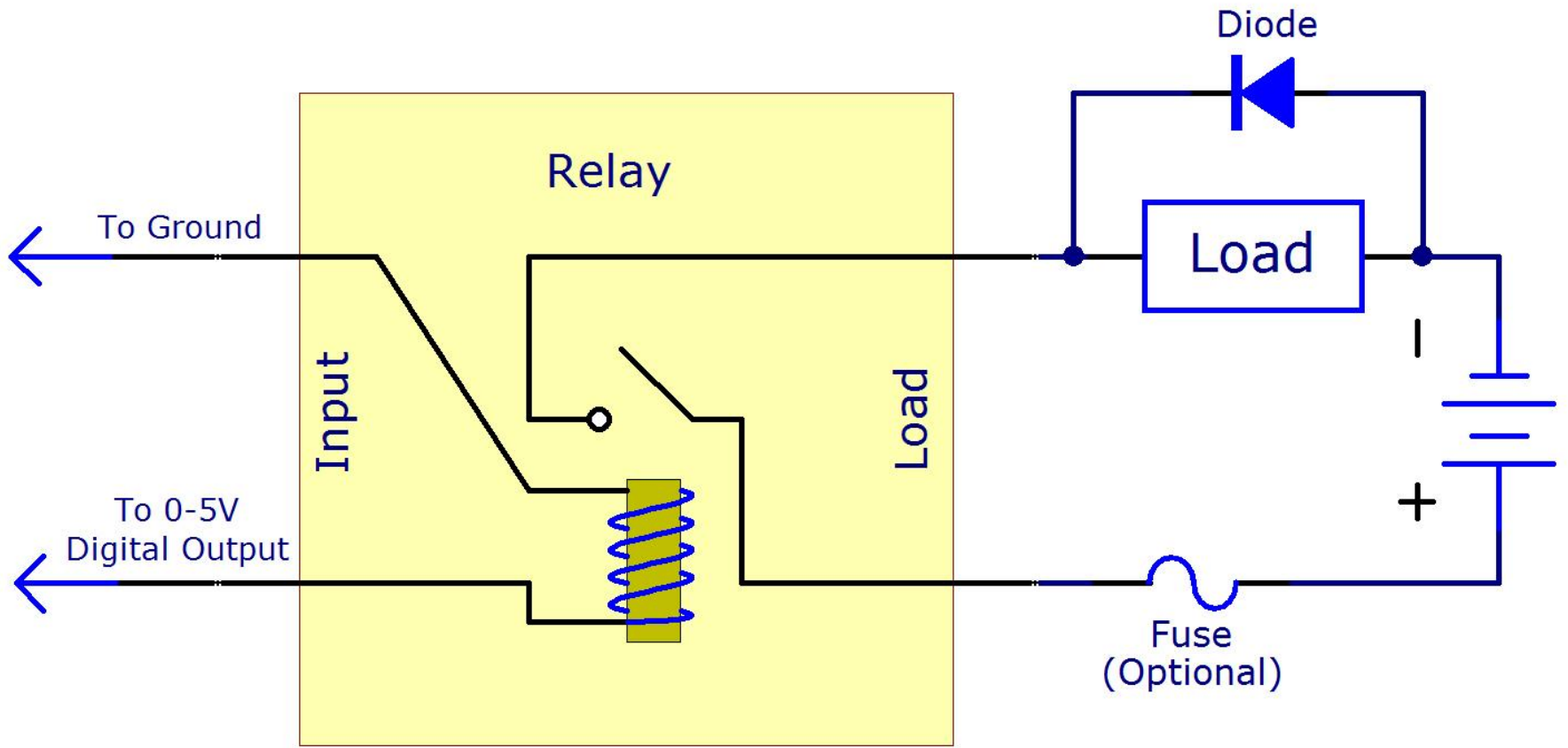
Always unplug when you are changing
anything!

Relays

Relays are electromechanical components which can be used to close an isolated circuit, AC or DC even if it is much higher in voltage or current.





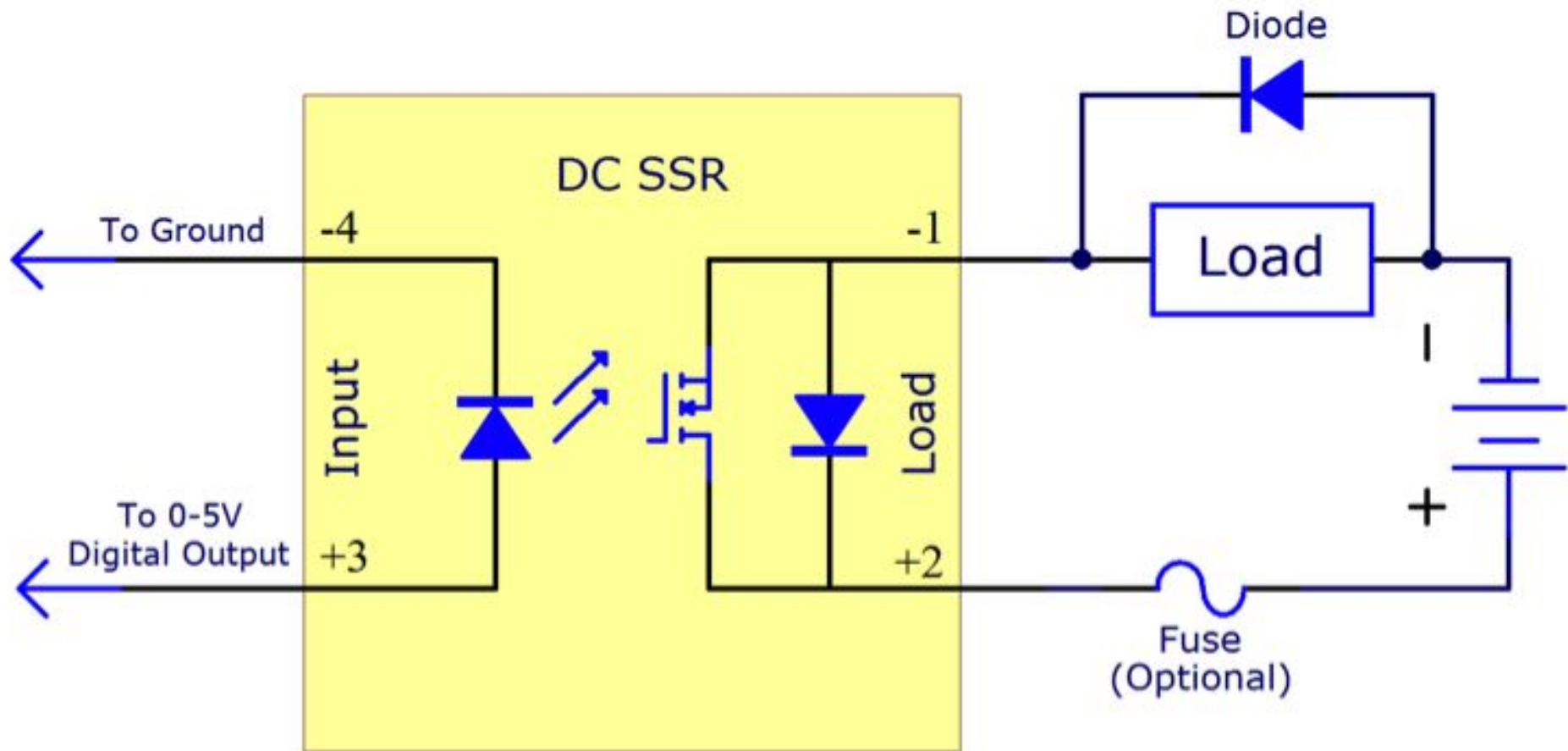


Mechanical relays

1. Mechanical relays have some moving parts and they can wear out when you trigger them constantly
2. Make satisfying clicking noises
3. Typically cheaper
4. Not suited for very fast triggering cycles
5. Unplug your relay from the wall when you upload a new code to arduino (When you are uploading a code, some digital pin gets triggered rapidly)

Solid State Relays (SSR)





Solid State Relays (SSR)

1. No moving parts!
2. Tend to heat up with load (use heatsink if you need!)
3. Expensive
4. Silent!
5. Typically bigger and bulkier than Mechanical relays
6. AC Terminals are exposed, don't touch them! Conceal the connection with electric tape

PowerSwitch Tail



PowerSwitch Tail

Enclosed Mechanical relay

Input: 3 - 12 VDC

Switch: 15 amps @ 120vac

Testing the Tail

1. Connect [1:+in] to digital output pin of your arduino (Pin 13 for example)
2. Connect [2: -in] to ground pin of your arduino
3. Upload blink sketch to start Examples>Basics>Blink
4. Before you plug them into the wall, check if Red LED is blinking on the PowerSwitch Tail
5. Plug in your appliances to the Tail and then plug in the Tail to the wall



Wiring Solid State Relays (SSR)

1. Identify Input side (DC) and Output side (AC)
Output (AC) side usually has bigger terminal screws
2. Connect (+) side of DC input to arduino **digital output**
3. Connect (-) side of DC input to arduino **ground**
4. Cut a line side of extension cord and connect each side to AC terminals



Which wire to cut?



“live” or “hot” blade

Carefully cut only the wire connected to the live blade.

The live blade is the narrower blade of a 2 prong plug.

Make the cut roughly 8~10 inches away from the male plug (the one that goes into the wall.)

Using dimmers



<http://www.instructables.com/id/Make-an-Inline-Lighting-Dimmer-for-725/>

Bring some AC appliances!

1. Avoid an appliance that uses excessive amount of current like refrigerators, large space heaters, microwaves
2. Bring one that can turn on when you plug into the wall with switch on
3. Avoid precious and expensive appliance you rely on (just incase)
4. Good candidates are something like
lamps, fans, small heaters, electric drills, clocks, food grinders, food processors, TV(maybe), power tools, vacuum cleaner, coffee maker, toasters, hair dryers and more!

Bypassing switches of DC powered device

