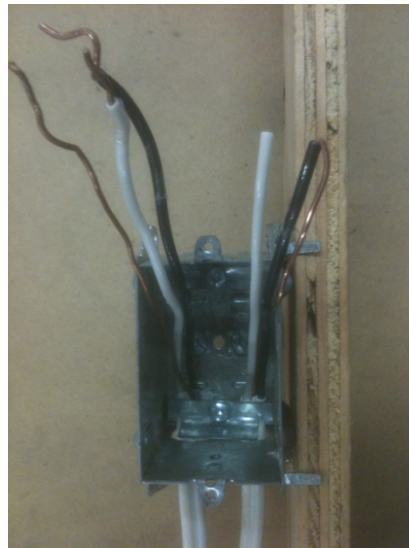


# Electricity Labs 1

## (Build the Frame and Install the Electrical boxes)

1. These labs are to be done individually! Build a wooden frame out of 2x4. The frame will have a 14 1/2" inside width to simulate a standard framed wall. The height can be anywhere from 18" to 24" total. Screw the frame together (you may want to drill a 3/16" hole so the wood does not split).
2. Clamp the frame to the workbench using a C-clamp.
3. Get 3 electrical boxes (two single device boxes and an octagon box)
4. Mount the 3 boxes as follows;
  - One device box on the left 6 inches off the bottom – 1/2" protruding from edge
  - One device box on the right 6 inches off the bottom – 1/2" protruding from the edge
  - Octagon box on the inside at the top in the centre.
5. Run a short 14/2 wire (12"-16") into the RIGHT device box from the bottom with 6 inches of loose wire sticking out. Make sure only 1/2" of the insulation around the wires is in the box and the 3 individual wires are loose. Tighten the internal cable clamp or install a Loomex Connector.
6. Run a longer wire into the bottom of the RIGHT device box and then down, over and back up into the LEFT box. Install the wires with 6 inches sticking out and clamp in place.



**HAVE THE TEACHER CHECK IT BEFORE MOVING ON!!!**

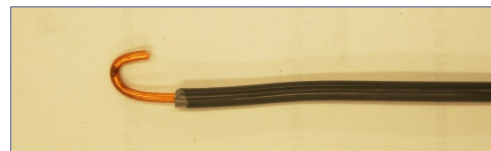
# Electricity Lab # 2

## (Installing a Single Receptacle)

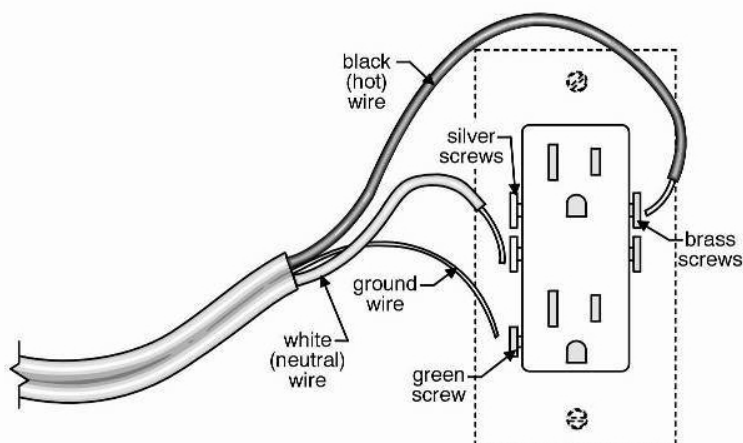
1. Ensure you have a wire running into the RIGHT device box. There should be **6"** of loose wire sticking out.
2. Carefully bend the second set of wires (ones that go to the left device box) back into the box out of the way
3. Now connect the incoming bare ground wire to the device box. Then attach a short piece of bare wire with a marrette from the grounded wire to the receptacle's green screw with a "Pigtail".

4. Strip approximately 3/4" off the hot and neutral wires.

5. Bend a "hook" in the Hot wire (black) end and then install on Brass screw that is connected to the shorter slot on receptacle. Tighten the screw so that the wire is drawn around the screw. Make sure there isn't any bare wire sticking out past the back of the receptacle.



6. Bend a "hook" in the Neutral wire (white) and attach it to the silver screw side (longer slot).



7. Finally, carefully push the wires back into the box – **Ground 1<sup>st</sup>, Neutral 2<sup>nd</sup>, Hot Last**. If connecting to 120V AC then screw the receptacle to the receptacle box.
8. With the teacher, use a multi-meter to check if you have the correct polarity and connectivity or it will short circuit.
9. With the teacher put power to it and test it with a 110v light bulb.



**HAVE THE TEACHER MARK IT and test with POWER ON!!!!**

# Electricity Lab # 3

## (Installing a second receptacle)

1. From Lab #1, make sure you have the second wire running out of the device box on the right down and along the bottom of your frame and up into the left device box. Both ends should have between 6-8 inches of wire sticking out. Strip approximately 1" off the hot and neutral wires at both device boxes if it is not already done.
2. Remove the first receptacle from the RIGHT box. Attach the three loose wires that are not connected to the receptacle ALL WITH "Pigtails" using Marettes; hot to hot, neutral to neutral and ground to ground.
3. In the LEFT device box now connect another receptacle. Hot wire (black) onto the brass screw, neutral wire (white) onto the silver screw and the bare ground wire to the device box first, then the green screw of the receptacle with a pigtail.
4. Carefully push the wires back into the boxes – Ground 1<sup>st</sup>, Neutral 2<sup>nd</sup>, Hot Last. Finally, screw the receptacles to the receptacle box.
5. Use a multi-meter to check to see if you have the correct polarity on both receptacles. Hot is the small blade, neutral is the longer blade and the grounds are connected.
6. Have the teacher check your receptacles and put power to it.

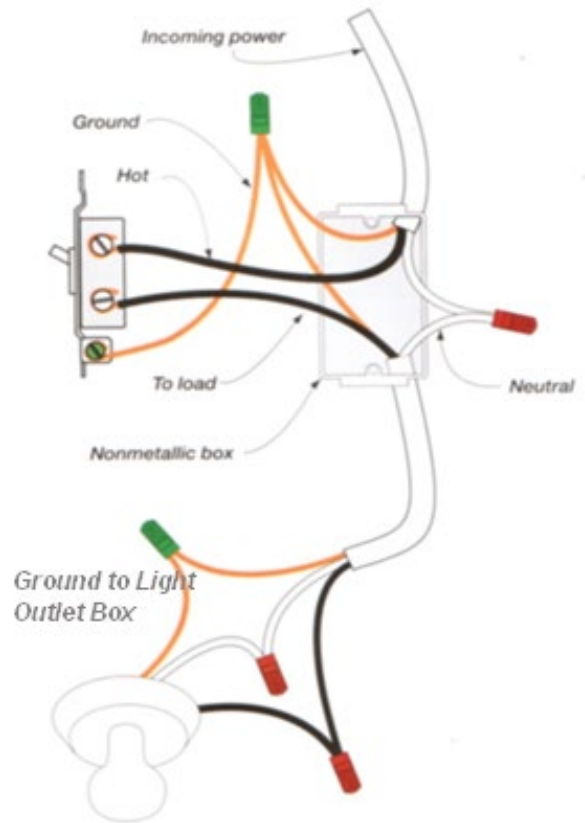


**HAVE THE TEACHER MARK IT BEFORE POWER ON!!!!**

# Electricity Labs #4

## (Installing a switched light)

1. Remove the receptacle on the LEFT that you wired in Lab #3. Leave the 3 wires hanging out of the device box.
2. Run a wire from the octagonal box down to the left device box (Leave 6" of wire to work with at both ends)
3. Now you have power at the device box (where the switch will go) and a wire running up to the octagonal box (where the light will go).
4. Connect the light fixture (hot to the brass screw, neutral to the silver and the bare ground to the light box).
5. Connect the neutrals together in the device box where the SWITCH will go using a marrette.
6. Connect the two black wires to a single pole switch (2 terminals ONLY).
7. Make sure the grounds are connected in the device box with a pigtail.
8. Have it checked by the teacher.
9. Push all the wires in carefully.

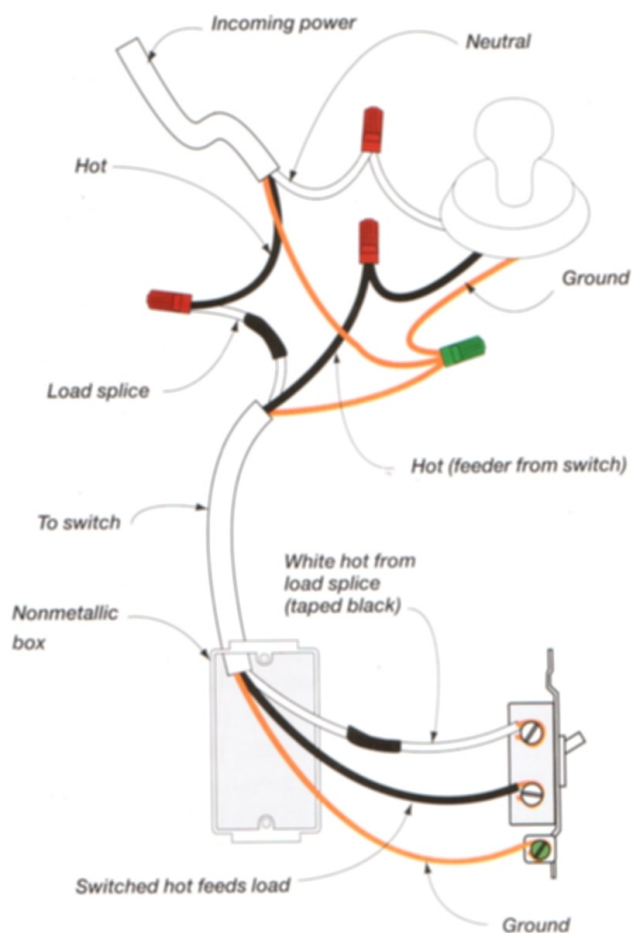


**HAVE THE TEACHER MARK IT BEFORE POWER ON!!!!**

# Electricity Labs #5

(Installing a switched light – Power at load)

1. First, disconnect all wires in the existing light box and the switch box from lab #4 and remove the power cable that comes up from the bottom out of the switch box.
2. Run the piece of wire you removed in step #1 into the octagonal box that is long enough to stick out 6" from the box and about 12" out the back so we can connect power to it.
3. To begin, in the octagonal box, connect the grounds together. Next connect the incoming power's neutral wire to the light fixture. Finally, connect the hot wire coming from the switch to the light fixture.
4. Now tape the neutral wire that runs between the switch box and the light box at BOTH ends with BLACK tape – this now becomes a HOT wire. Connect the hot wire and taped hot wire in the light box.
5. In the switch box, connect the taped hot wire to the top of the switch and the regular hot wire to the bottom. Remember the ground wire as well.
6. Have it checked by the teacher.
7. Push all the wires in carefully and secure light fixture and switch.
8. TEST.



**HAVE THE TEACHER MARK IT  
BEFORE GOING ON!!!!**

# Electricity Lab #6

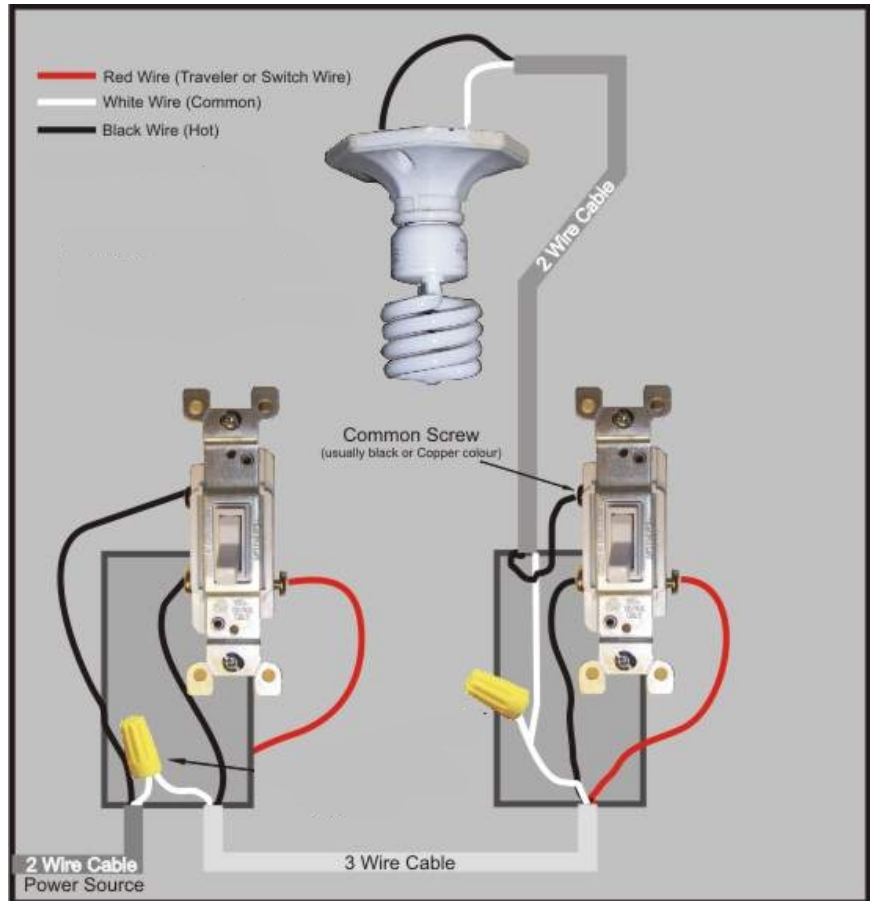
(Wiring a 3 way Switch – power at switch)

1. Remove all wires from the previous lab
2. Re-install a power wire into the switch box on the right.
3. Get one 14/3 wires from the teacher and run it between each switch box. Remember to leave 6" of wire to work with.
4. Get a 14/2 wire and run it from the switch box on the left up to the light.
5. Finally, get two 3 way switches from the back drawers. You are now ready to follow the diagram to the right.

**USE these 4 Rules to help!!!!**

- #1 Connect the incoming power hot wire to the common on one of the switches.
- #2 Connect the incoming power neutral wire to the load.
- #3 Connect the load hot wire to the common on the other switch.
- #4 Connect the traveler wires (no polarity) to the two leftover terminals on each switch.

**REMEMBER TO ATTACH THE GROUND WIRE TO EACH BOX!!!!**



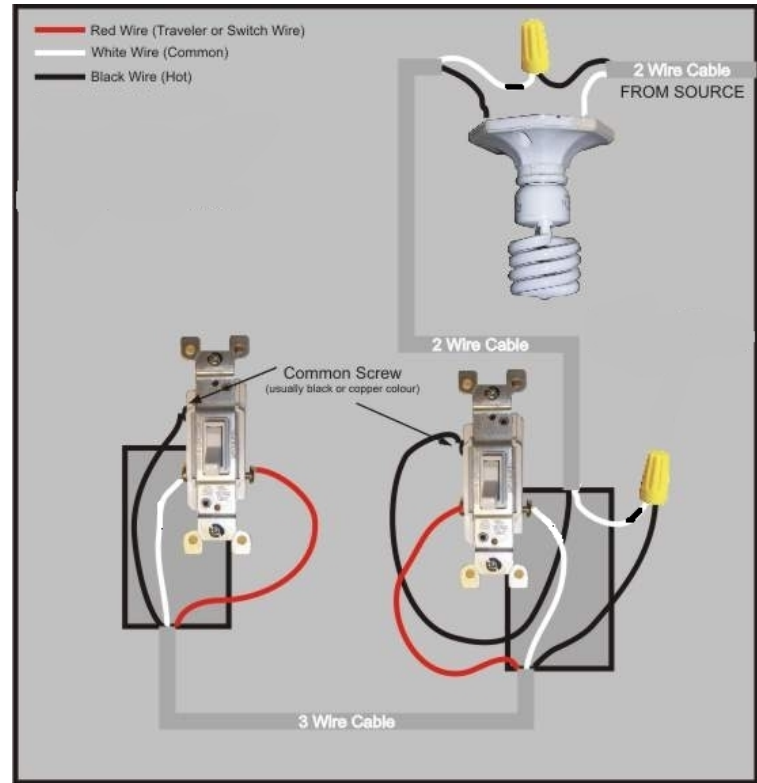
**HAVE THE TEACHER MARK IT BEFORE GOING ON!!!!**

# Lab #7

(Wiring a 3 way Switch – power at light)

Mark /5

1. Remove all connections to the switches and light.
2. Remove the power wire from the right switch box and run it into the light box at the top instead.
3. Keep the 14/3 wire that goes between the switches.
4. You are now ready to follow the diagram on the following page.



## USE these 4 Rules to help!!!!

- #1 Connect the incoming power hot wire to the common on one of the switches.
- #2 Connect the incoming power neutral wire to the load.
- #3 Connect the load hot wire to the common on the other switch.
- #4 Connect the traveler wires (no polarity) to the two leftover terminals on each switch

**REMEMBER TO ATTACH THE GROUND WIRE TO EACH BOX**

**And don't forget to TAPE the white wire as HOT!!!**

**HAVE THE TEACHER MARK IT BEFORE GOING ON!!!!**



# Electricity Lab #8

## (Apply what have you learned)

This lab requires you to take what you have learned from the first 8 labs and apply it to the following scenario.

### Scenario

You have a 14/2 power wire that enters at the light. There needs to be 2 switches installed on the opposite sides of a HUGE room. You will have to run two separate wires from the light to the switches as it is impractical to run a wire between the two switches around the room.

1. Draw a wiring diagram below that includes the incoming power, light box, and the two 3-way switches required to complete the above scenario. Have the teacher check the wiring diagram and initial it.
  
2. Once the teacher has initialed the wiring diagram, physically wire it up in the wooden frame. **REMEMBER TO ATTACH THE GROUND WIRE TO EACH BOX.** When it is complete, have the teacher check that it works.