Lesson 6: Teacher Reference 1

Ammeter Construction Directions

Follow these steps to build an ammeter. This video https://www.youtube.com/watch?v=F_vvuk_GjlU&list=PLSLDxqPb5NQmKp9RwUjcib82h4QO6x4G_&index=9 also shows these same steps.

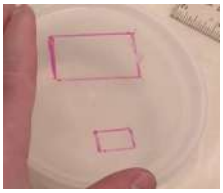
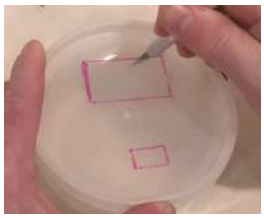
Each ammeter you build will require these materials:

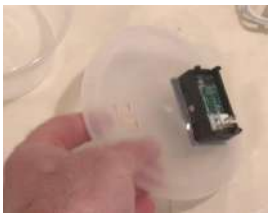
- LED voltmeter ammeter, red and blue digital multimeter display voltage current tester (DC 0-100V 10A)
- 9V battery connector
- 2-pin rocker boat switch
- 9V battery
- 8 oz deli container (bowl and lid)

These materials will be reused or divided across all the ammeters you build:

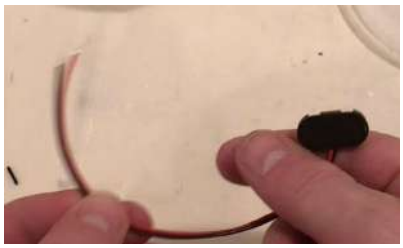
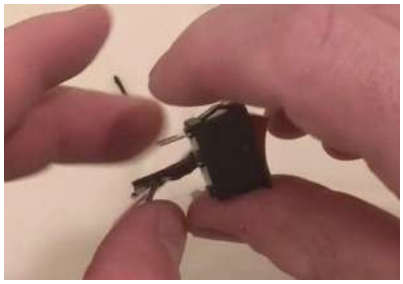
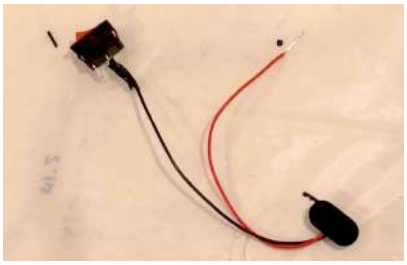
- ruler
- utility knife
- scissors
- marker
- roll of electrical tape (1 ft)

Stage 1: Fitting holes in the lid

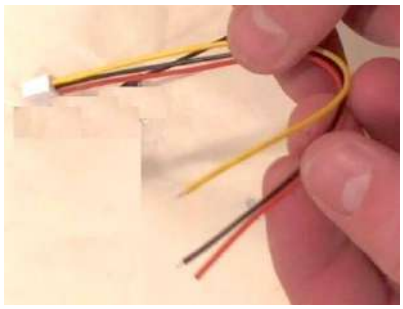
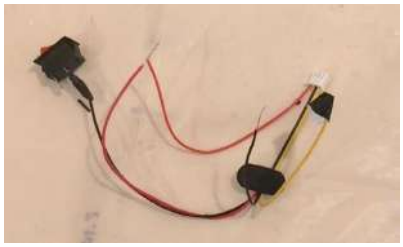
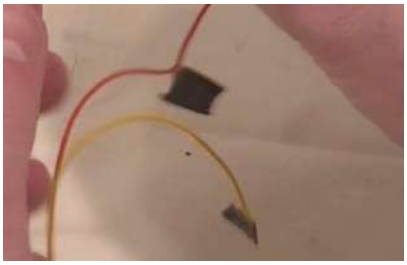
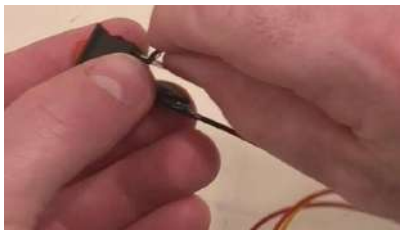
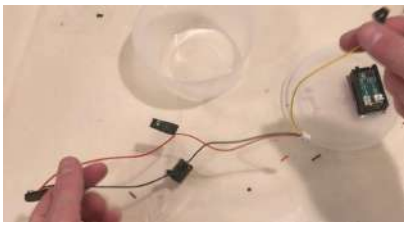
Instruction Steps	Associated Images
Measure the dimensions of the base of the LED voltmeter ammeter. Draw a rectangle with those same dimensions on the top half of the deli container lid.	 
Measure the dimensions of the base of the switch as well. Draw a rectangle with those same dimensions on the bottom half of the lid.	 
Secure the lid to the deli container bowl. Cut out the two rectangles you drew on the lid, using a box cutter or hobby knife. Remove the lid and remove the pieces you cut out.	 
Secure the lid to the bowl. Push the LED voltmeter ammeter into the large rectangular hole in the lid.	

Push the switch into the small rectangular hole in the lid. Once you've confirmed these fits, remove the lid and remove the switch from the small hole for now.		

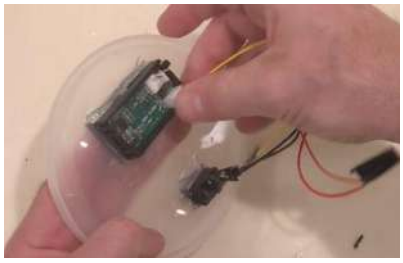
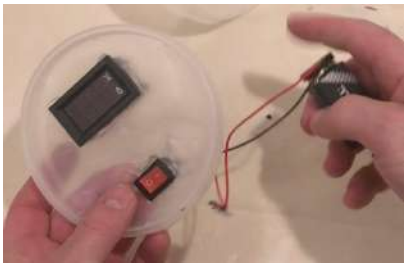
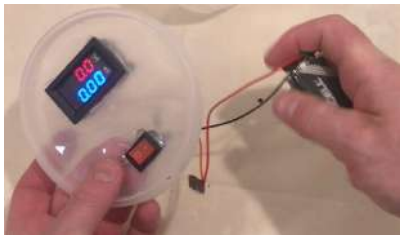
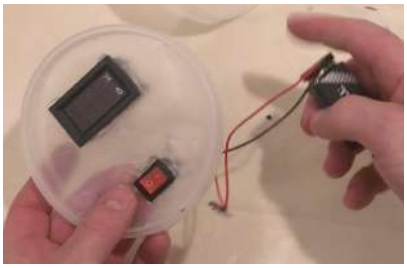
Stage 2: Attaching the battery connector to the switch

Instruction Steps	Associated Images
Strip ½”-1” of insulation off the end of each wire on the 9V battery connector. You can do this by using the end of a pair of scissors opened up a bit and held together lightly. Drag the end of each wire through the scissor blades. This should pull the insulation off.	 
Thread the stripped end of the black wire of the battery connector through the hole in one of the metal prongs on the back of the switch.	 
Wrap a small piece of electrical tape around this twisted end and the metal prong on the switch, so no metal is visible. The image to the far right shows how the battery connector is attached to the switch at this stage of the build.	 

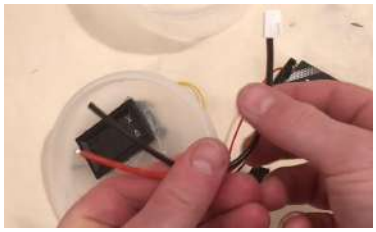
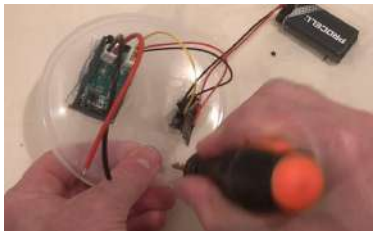
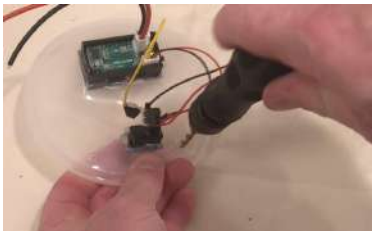
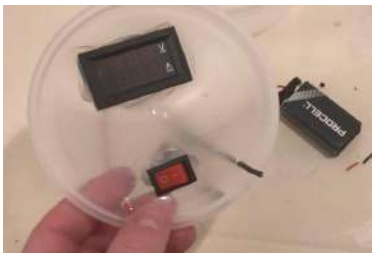
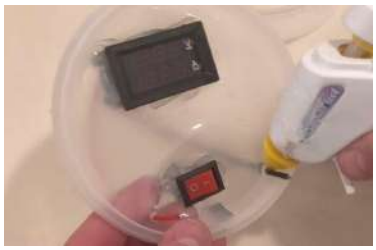
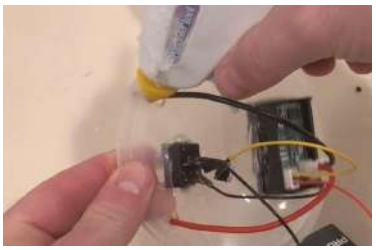
Stage 3: Hooking up the first adapter to the switch and battery connector

Instruction Steps	Associated Images
Find the three wire adapters included in the package of the ammeter panel. Strip ½”-1” of insulation off the end of the red wire and the black wire. **Do not** do this for the yellow wire.	 
Twist the exposed end of the red wire you just stripped to the exposed end of the red wire from the battery connector. Wrap a small piece of electrical tape around the twisted end of these wires. Wrap a small piece of electrical tape around this end of the yellow wire. This wire is for measuring voltage and is not used in this unit.	 
Thread the exposed end of the black wire you just stripped through the hole in the other metal prong on the back of the switch. Twist the end of the wire back on the rest of the wire, like you would a twist tie. Wrap a small piece of electrical tape around this twisted end and the metal prong on the switch, so no metal is visible. The image to the far right shows the assembly at this stage of the build.	 

Stage 4: Hooking up the power source to the ammeter panel

Instruction Steps	Associated Images
Thread the battery connector through the small hole in the lid. Pull all the related wires though as well, so only the switches are left on the outside of the lid. Push the switch flush into the hole, so all the wires attached to it and the battery connector are on the back side of the lid.	 
Use the hot glue gun to put a bead of glue along where the edges of the switch meet the lid on the back side of the lid. Do the same for the LED voltmeter ammeter.	 
Push the white coupling clip for the three-wire adapter to the bottom white port on the back of the ammeter panel, aligned so the clip can snap into the port. Attach a 9V battery to the battery connector.	 
Turn on the switch to test that the ammeter display turns on. Turn off the switch for now.	 

Stage 5: Positioning the circuit leads

Instruction Steps	Associated Images
Find the two wire adapters included in the package of the ammeter panel. Push the white coupling clip for the wires into the top port on the back of the ammeter panel, aligned so the clip can snap into the port.	 
Use the hand drill from Lessons 2 and 3 to make two holes in the lid. Put one hole on each side of the lid below where the switch is located, about 1” away from the switch.	 
Thread the red wire through the left hole (when seen from the front of the lid). Thread the black wire through the right hole (when seen from the front of the lid).	 
Use the hot glue gun to put a bead of glue along where each wire meets the lid. Do this on both the front and back of the lid.	 
Turn on the switch to test that the ammeter panel still works. Guide all the wires and the battery into the bowl. Secure the lid to the bowl. You may want to test the connections by giving the container a slight shake. If the connections between all the twisted wires remain, the panel will remain powered.	 

If the panel's power goes off when you shake it, disassemble the container and pinch various connections that are taped where you twisted the wire together. When you find and pinch the loose one, the power will go back on. Take the tape off that location, tighten that connection, tape it back up, and test it again.