

Prep Instructions - Classroom Wind Farm

Part I - Labelling the Electric Motors

If a windmill is incorrectly connected to another windmill, electricity will not be produced. In order to simplify the process of correctly connecting the different windmills, a consistent labelling system will be employed.

The following items will be required for the prep of this part of the activity:

- marker
- electric motors
- light-emitting diode (LED)
- two insulated wires with alligator clips at both ends

Step 1

Using the marker, draw a plus sign above the longer of the LED leads and a minus sign over the shorter end (**Figure 1**).

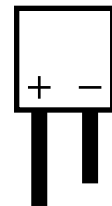


Figure 1

Step 2

Connect the LED to a motor using two insulated wires with alligator clips at both ends (**Figure 2**).

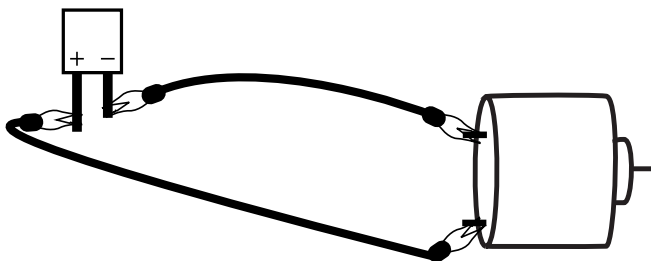


Figure 2

Step 3

Give the shaft of the motor one quick spin clockwise. If the LED lights up, proceed to the next step. If not, switch the alligator clips to the opposite terminals of the motor.

Step 4

Label the terminals of the motor using the marker so that the lead attached to negative side of the LED is labelled with a plus sign and the other motor terminal is labelled with a minus sign (**Figure 3**).

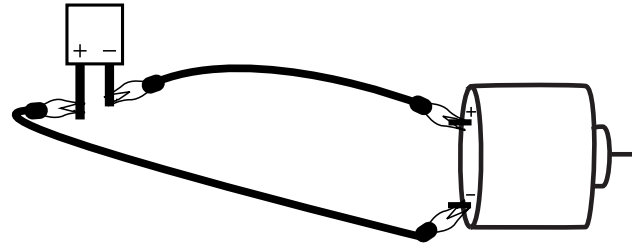


Figure 3

Step 5

Repeat with the remaining motors until all the motor leads are labelled consistently.

Part II - Drilling Pop Bottle Caps

Drilling holes in the pop bottle caps before class greatly speeds up construction of the windmills. The holes should be just large enough to fit a nail.

The following items will be required for the prep of this part of the activity:

- electric drill
- 2 L bottle caps

Step 1

Drill holes in the centre of the bottle caps, as shown in **figure 4**.

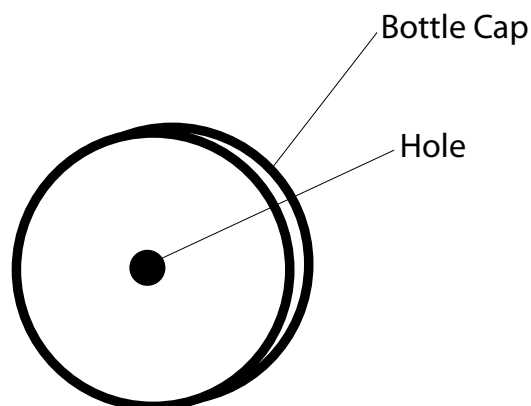


Figure 4

Part III - Building an MP3 Player Battery Charger

Construction of the following circuit (**figure 5**) allows either the classroom wind farm or the 10 ft. windmill to be used to recharge most MP3 players. The instructions call for alligator clips, but the circuit may be constructed on a breadboard if desired.

The following items will be required for the prep of this part of the activity:

- one LM317 three terminal adjustable regulator
- one 240 ohm resistor
- one 0 - 1000 ohm variable resistor
- one USB A female port
- two insulated wires with an alligator clip on each end

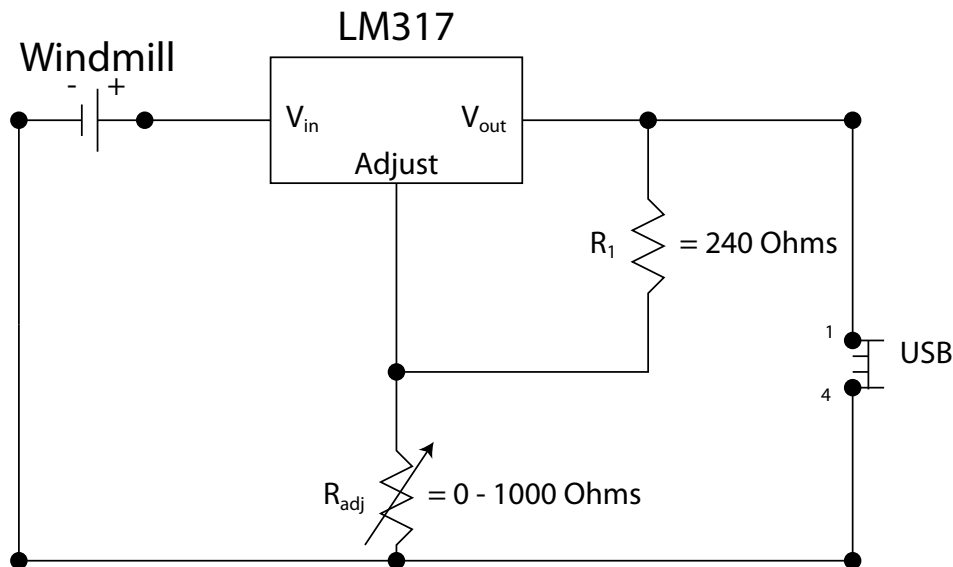


Figure 5: Circuit for charging MP3 player

Step 1

Take the LM317 and connect the V_{out} (middle) lead to one end of the 240 ohm resistor (**Figure 6**).

Step 2

Connect the left lead of the LM317 to the free end of the 240 ohm resistor (**Figure 7**). This lead should be labelled by the manufacturer as "adjust" or "ADJ".

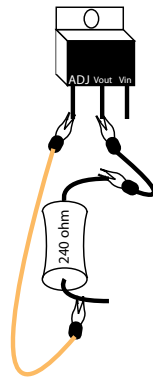


Figure 7

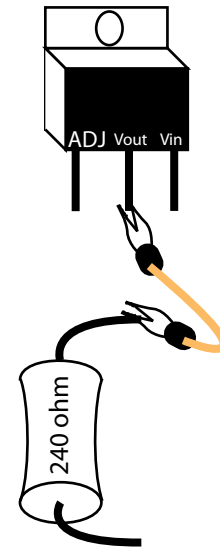


Figure 6

Step 3

Connect this same end of the resistor to one end of the 0 - 1000 ohm variable resistor (**Figure 8**).

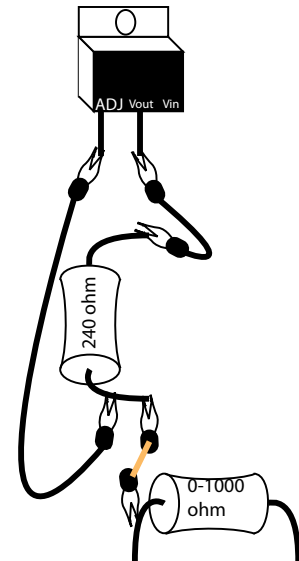


Figure 8

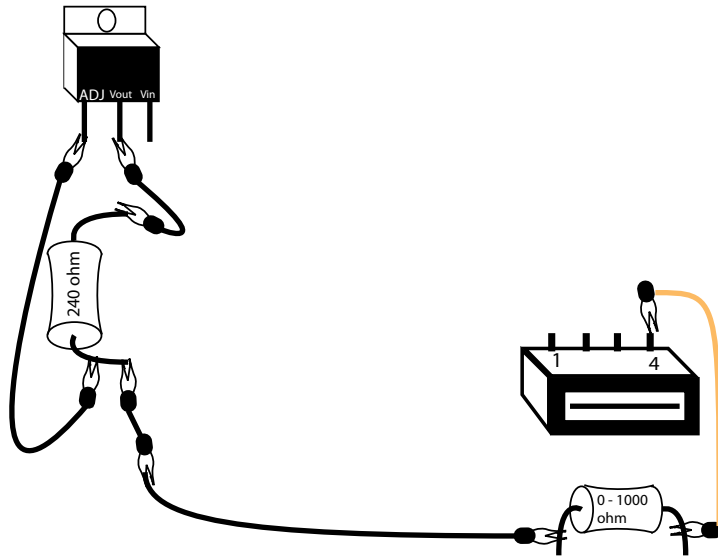


Figure 9

Step 4

Connect the free end of 0 - 1000 ohm variable resistor to the #4 lead of a USB A female port (**Figure 9**). This should be the lead furthest to the right.

Step 5

Connect the end of the 240 ohm resistor already connected to the V_{out} terminal of the LM317 to the #1 lead of the USB A female port (**Figure 10**). This should be the lead furthest on the left.

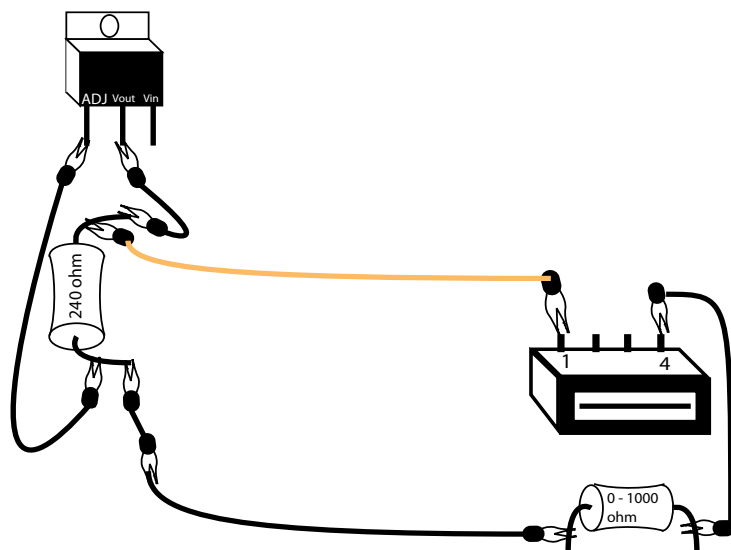


Figure 10

Step 6

Connect the positive output from the wind farm or large windmill to the V_{in} terminal of the first LM317 and the negative output to the #4 lead of the USB port. Attach an MP3 player to the USB charger and begin charging (**Figure 11**).

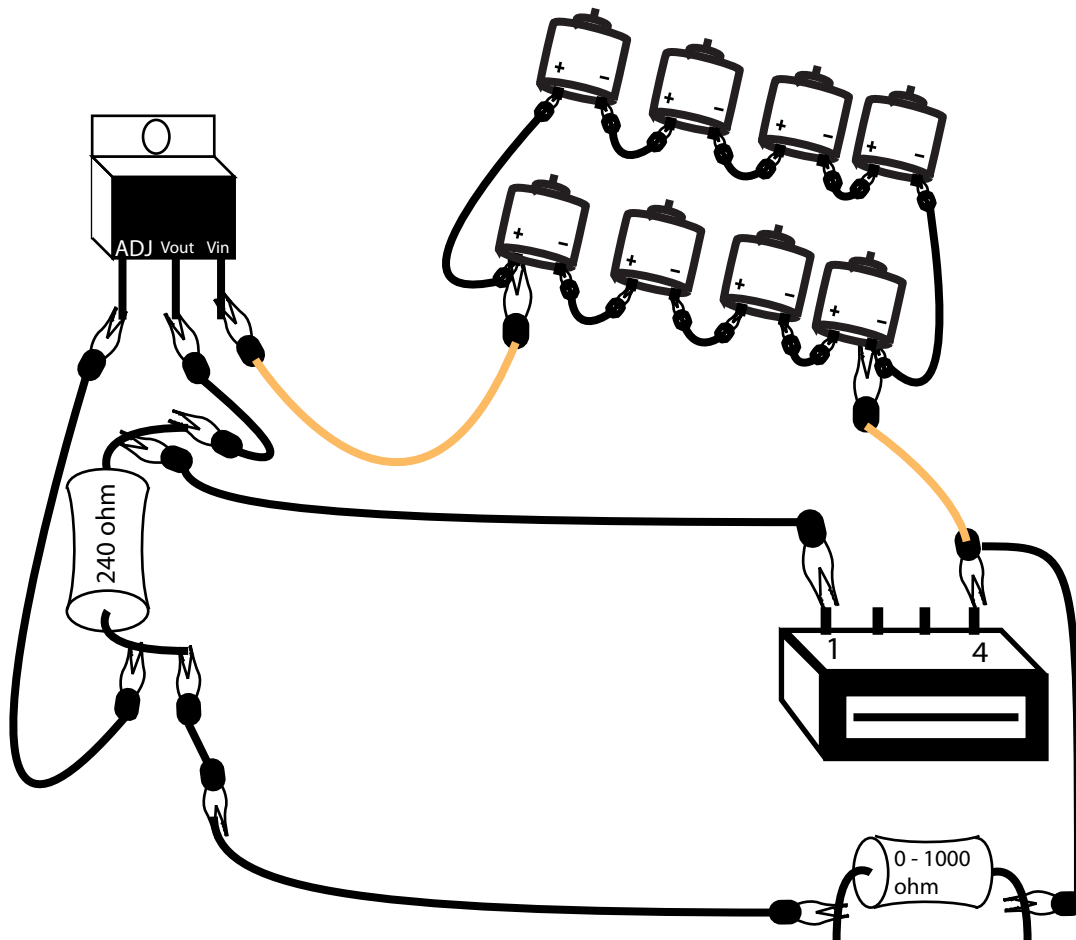


Figure 11