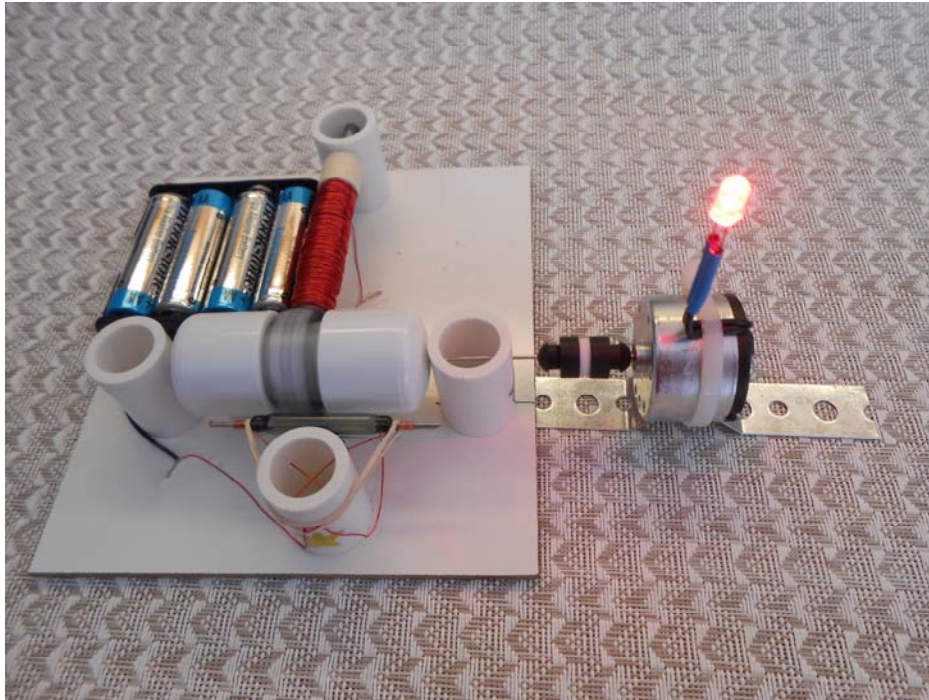


# Generator Assembly Instructions

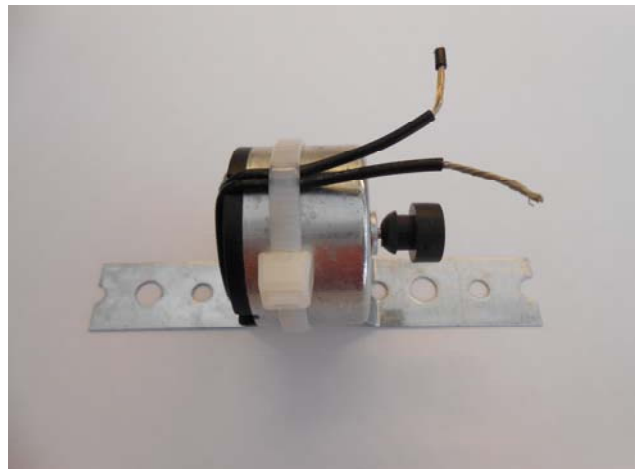
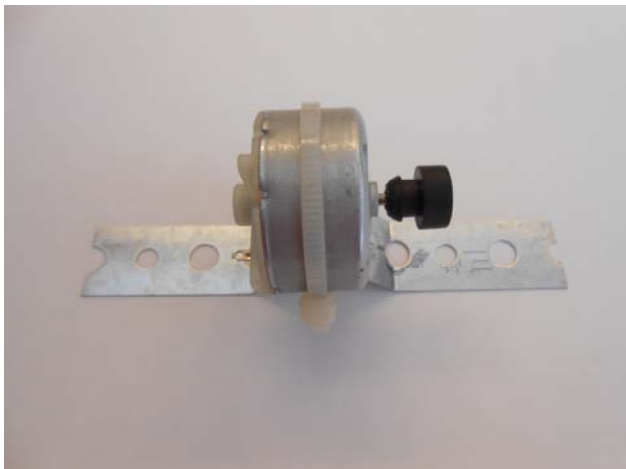


Adding a simple generator to your motor is the best way to demonstrate how electrical energy is converted to mechanical energy, and then back to electrical power. It is also a helpful tool to measure and calculate torque and efficiency of your motor.

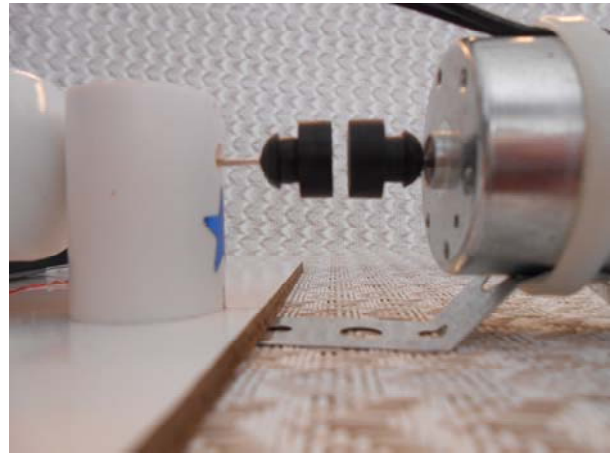
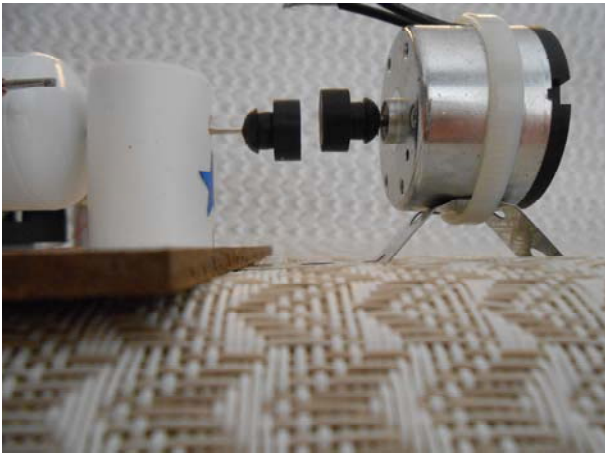
We use high precision industrial motors with precious metal brushes as generators. You may receive one of two slightly different motors.

## *Instructions*

1. Attach the motor to the bracket using a cable tie.



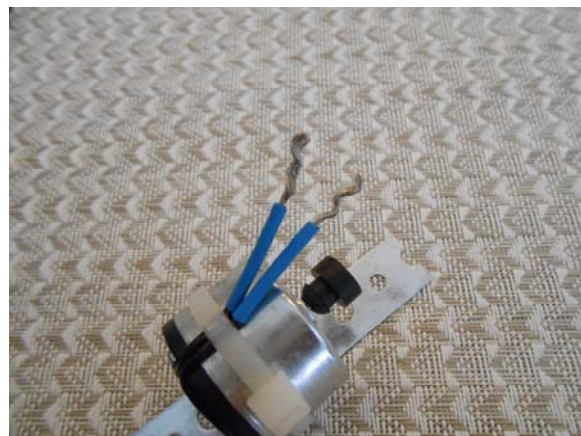
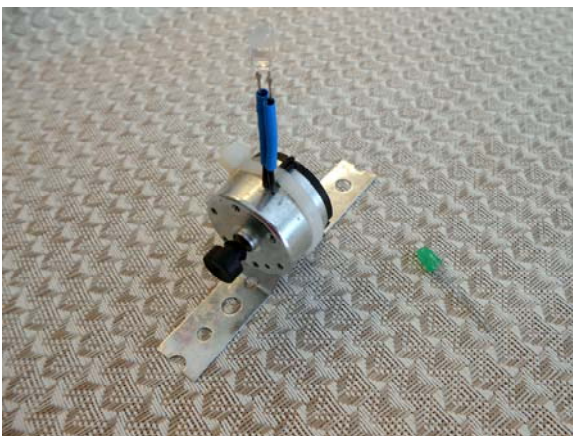
2. The flange of the bracket goes under the motor board. It is soft enough to allow easy bending for height adjustment. Place the generator next to your motor as shown in the first picture then adjust the bracket so the motor and generator axles are at the same height as shown on the second picture. Take your time – this step is important!



3. Attach the double sided pad to one of the rubber plugs.

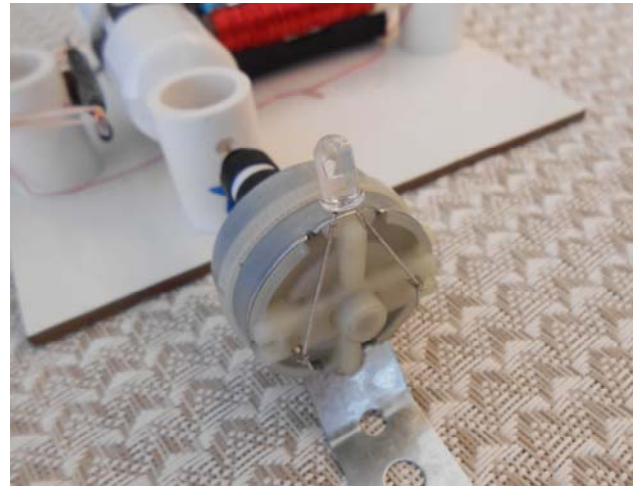


4. If you have a generator motor with connected wires, put on two pieces of the shrink tubing and insert an LED. You may form the wires as shown to provide a better electrical contact.



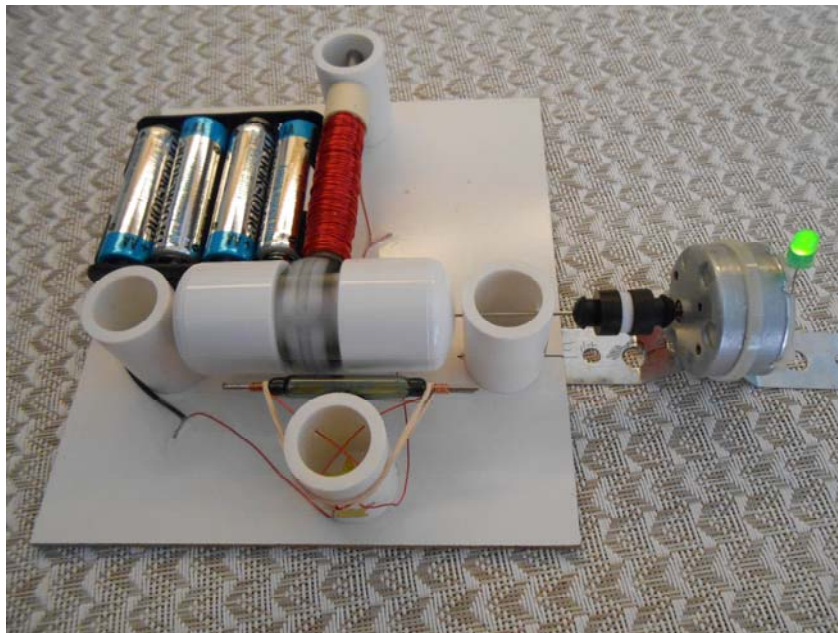


5. If your generator motor does not have wires, form LED pins as shown. They are slightly springy – insert them in motor connector tabs carefully so they push against the tabs.



6. Connect the generator to your motor. Manually spin the rotor to make sure that it can rotate without excessive effort, otherwise check your alignment.

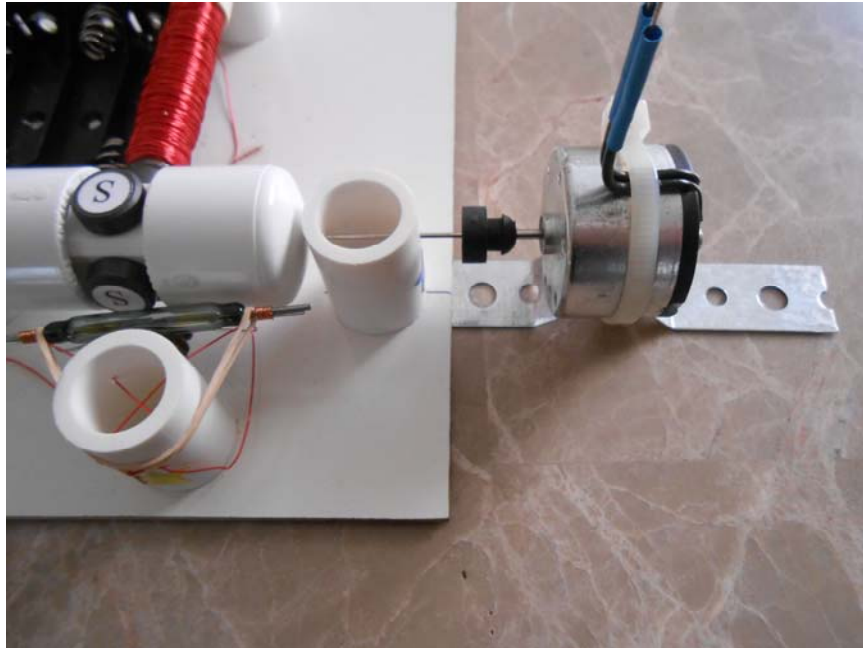
If you assembled your motor from the kit properly it should be able to provide enough rotational speed to light an LED on 3 or 4 AA batteries (4.5 - 6 V). If the generator spins fast enough but LED does not light – reverse the LED contacts.



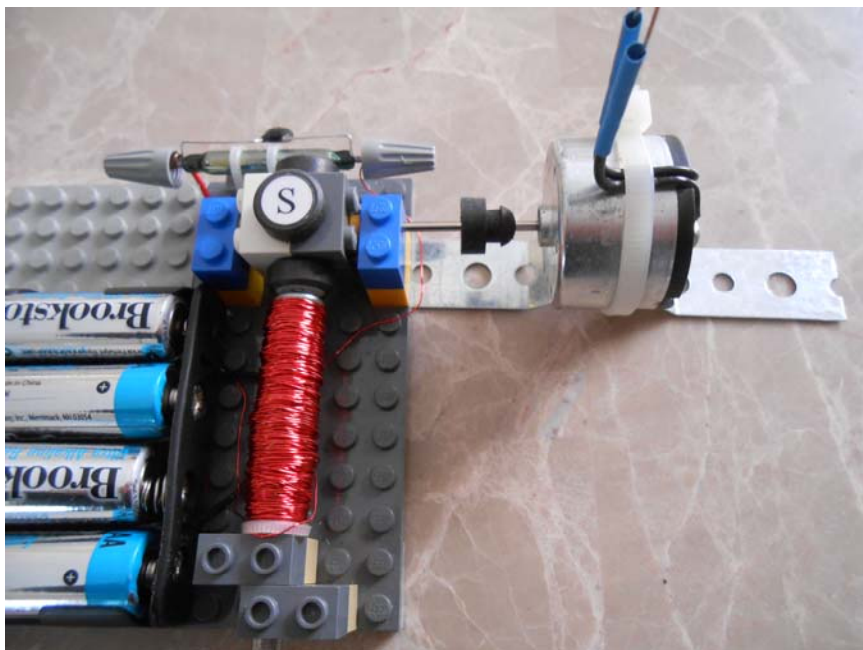
Please note that LED is connected to generator directly. Technically there should be a current limiting resistor connected in series with an LED. However in our experiments we found that in most cases the generated current does not exceed the maximum allowed current through an LED and therefore simplified this design. Also the generator kit includes a super bright red LED that has better maximum ratings (it can withstand up to 50 mA). You may want to use it first and measure the current. Typically it should be 20 mA or less.

If you plan to experiment with higher voltages you need to add a limiting resistor. You may calculate its value using Ohm's law – see [Calculations](#).

If double sided pads lost their stickiness during the experiments or you do not have them you may connect the generator directly. Slide out the generator rubber plug half way and insert motor axle into it. Make sure that they are centered.



QuikLock motors should also be connected directly. We advise to hold the QuikLock motor axle with pliers as it requires some effort.



Note that if you are experimenting with a reed switch motor it is strongly advised to use a ZNR. Additional load on a reed switch motor axle increases the spark inside the reed switch significantly and this may destroy it quickly unless you use the ZNR as a spark suppressor.

Please visit [Generator Experiments](#) and [Torque and Efficiency Calculation](#) for information on experiments with this generator.