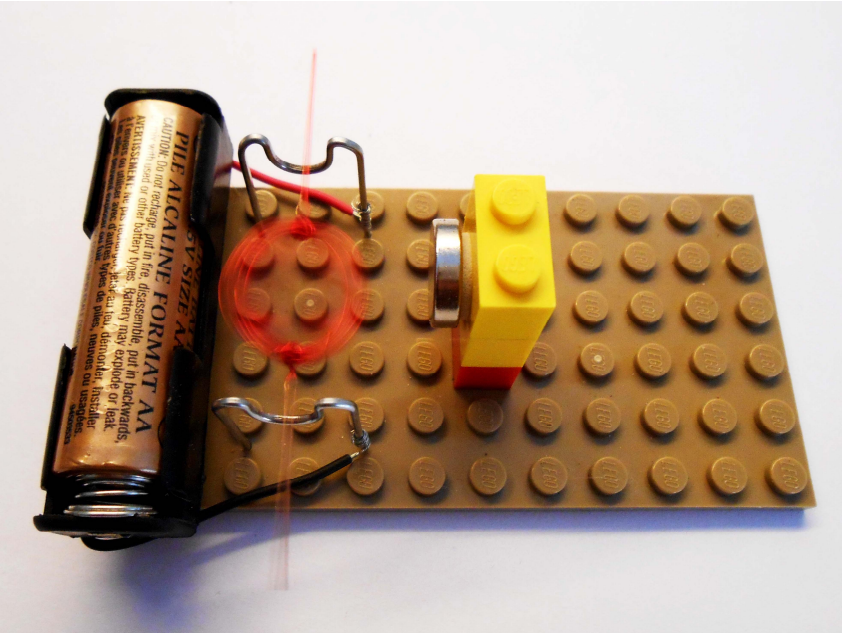
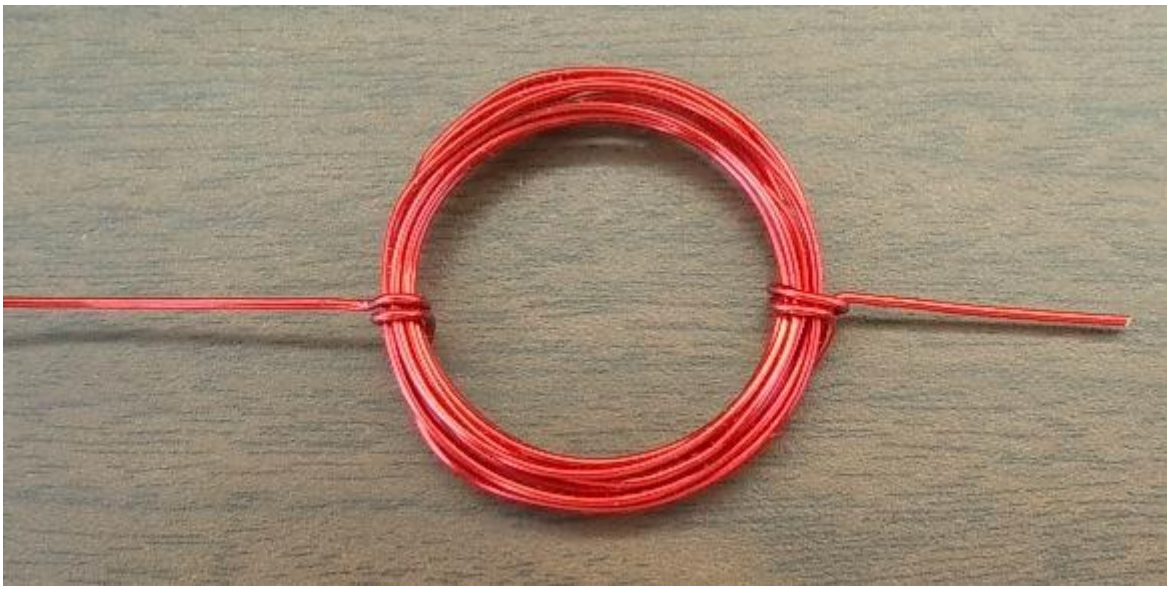
Assembly Instructions: Kit #16
Conventional Brushed Motor

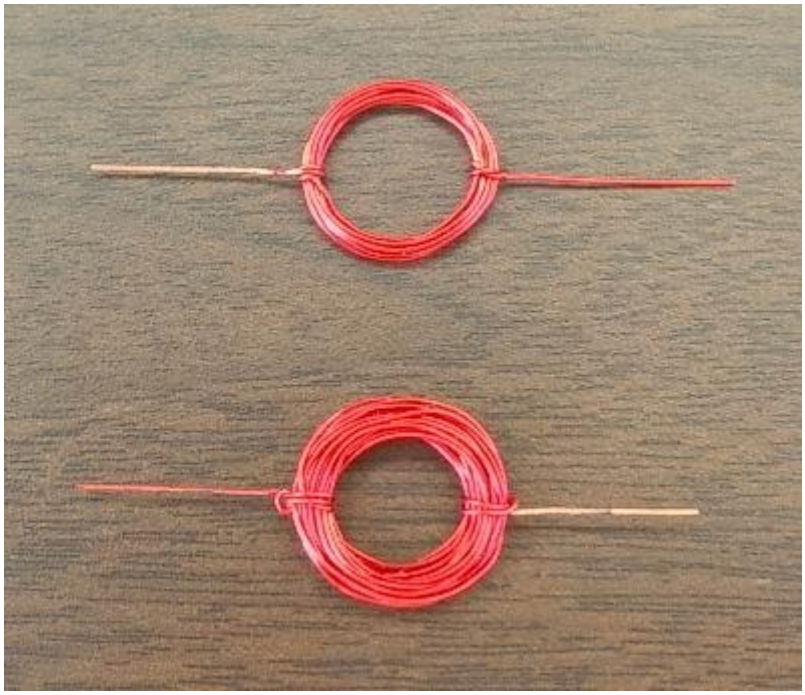


1. Leave about 3" (7-8 cm) and wind the wire 10-35 times around the AA battery. You do not have to be neat as some randomness does not affect the motor performance and may help the coil to hold its shape better. Leave 3" (7-8 cm) at the other end of the coil.

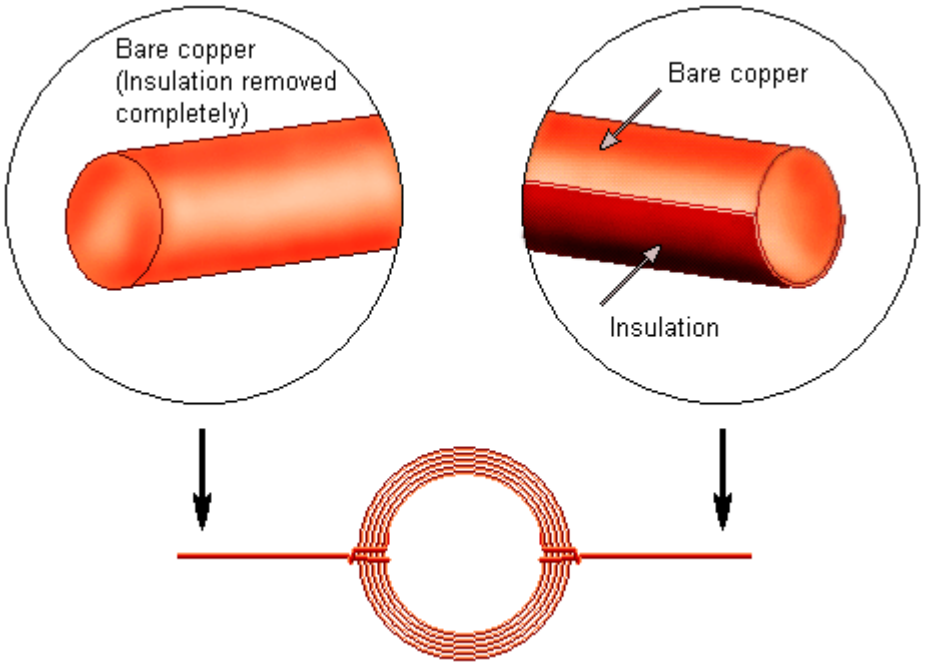
2. Carefully remove the battery and wrap the ends around the coil 2-3 times to hold the coil together with both ends extending perpendicular to the coil as shown below. The ends should be aligned in a straight line to form a good axle. This step requires a lot of accuracy because the balance of the coil is extremely important.



The kit contains enough wire to experiment with the coils of different size (10 and 30 windings shown).



3. Strip off the insulation completely at one end and only half of it at the other. This step is very important, try to be very accurate.

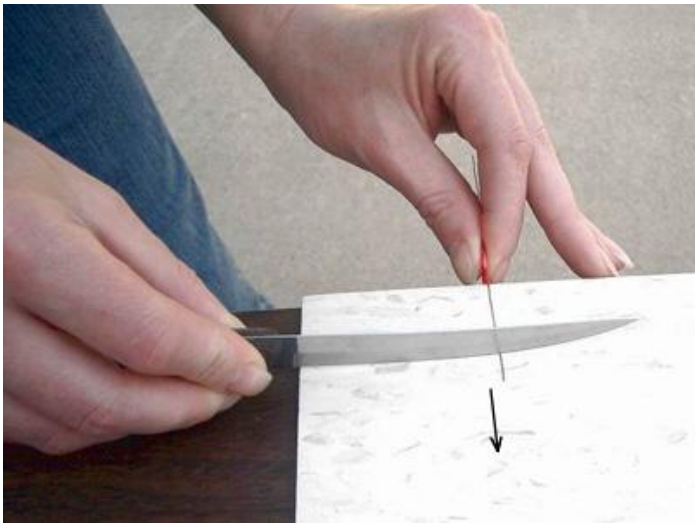


The following picture shows how to remove the insulation using the knife. Do not scratch the table - put a piece of cardboard or similar material on it. Hold the coil with one of the ends lying on the surface and remove the insulation by moving the knife in the direction shown with the arrow. Hold the blade of the knife in vertical position.

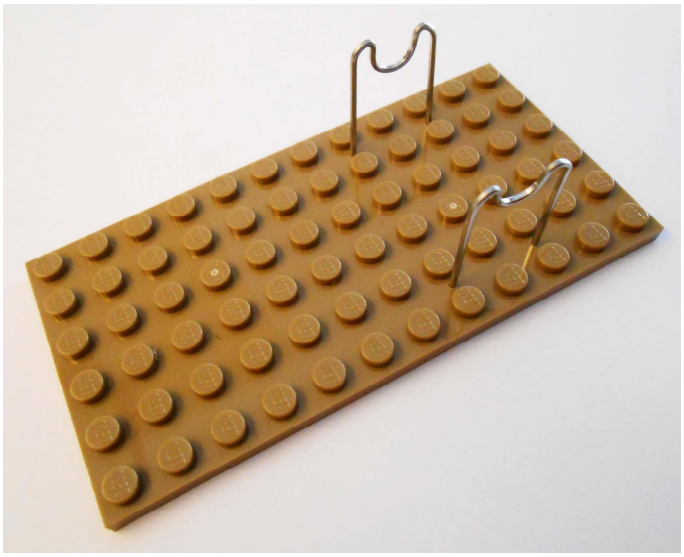
As the magnet in this kit is located on the side you should lay the coil flat on the table or hold it so it is in a horizontal position when removing half of insulation. Rotate the coil slightly in both clockwise and counterclockwise directions.

Rotate the coil 360° to remove the insulation completely from the other end.

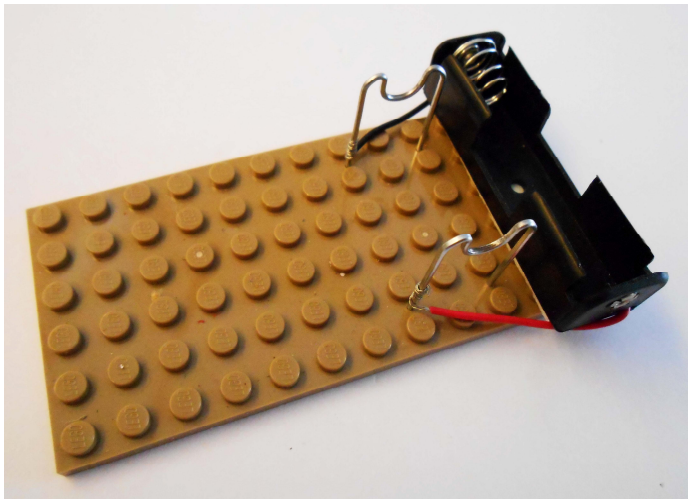
Apply only a slight pressure or you may cut the wire end off.



4. Fully insert two metallic stands into predrilled holes in the board. You might need to push hard.

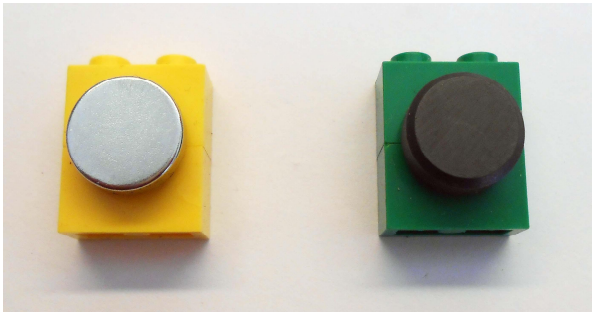


5. Attach the battery holder to the board and connect its wires to the stands as shown below.

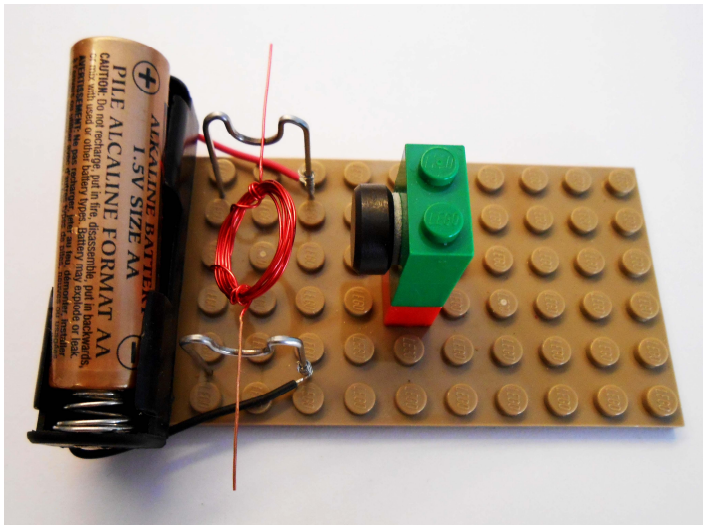


6. Attach double sided sticky pads to the magnets.

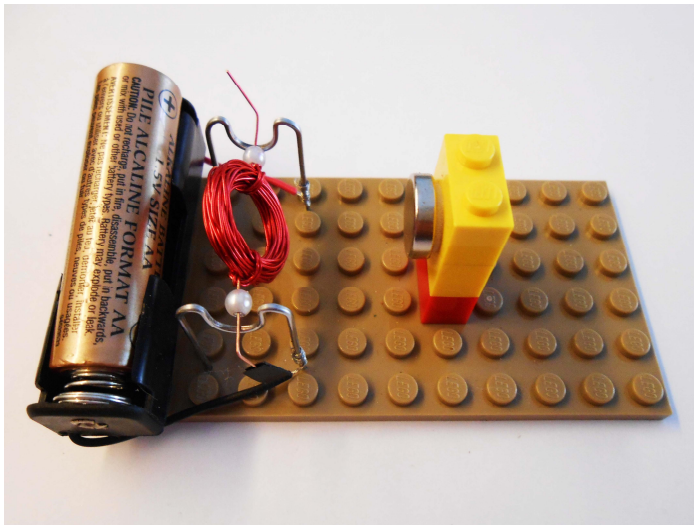
7. Attach the magnets to the 1x2 bricks.



8. Place the coil on the stands and try to spin it slightly. Well balanced coil should spin freely. Ideally it should stop in random positions. Take time to balance it. You might need to move the ends up and down along the coil slightly to find the most balanced position.



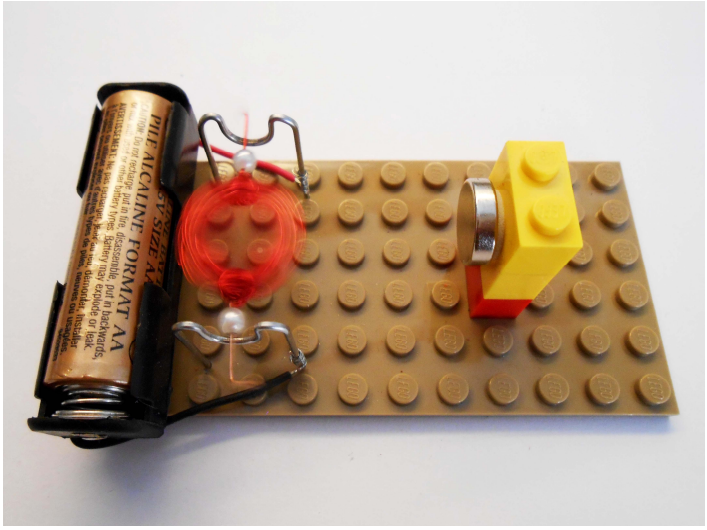
9. You may add two beads on the coil ends. These beads reduce the friction between the coil and the stands.



If you want to measure the speed of your motor bend the coil ends as shown. Visit http://simplemotor.com/motor-speed-measurement/ for information on how to measure the speed of rotating coil in RPM.

Your motor is ready! Depending on the coil position the motor may start immediately or you might need to give it a slight push. The motor usually spins in one direction so you should try to spin it slightly in both directions.

This kit allows to experiment with the magnets of different strength (ceramic magnet is grade 5 or 8, and neodymium magnet is much stronger grade N50). You may also change the distance between the coil and the magnet by moving the bricks along the base plate (3 different positions shown in steps 8, 9, and below).



If your motor doesn't work, ensure that the rotor is balanced and can rotate freely and check the insulation. Properly removed insulation leaves shiny copper on one end. Half of the other end should also have shiny copper color while the other half should be the color of the original insulation as shown in step 3. Make sure the battery is fresh. If the motor still does not work – check Troubleshooting section at our web site at www.simplemotor.com.

Clean carbon buildup (black stuff) on coil ends and metal stands often.

CAUTION: Do not leave the motor connected to the batteries if the rotor is stalled. This motor consumes a lot of electricity and could drain the batteries quickly even if it does not spin.

How it works

When un-insulated (bare copper) parts of the coil wire contact the metal stands the current from the battery flows through the coil making it an electromagnet with North and South poles. This electromagnet interacts with the permanent magnet (North and South poles attract each other while the same poles repel). Motor starts to spin until the contact is broken when an insulated part of the coil end comes into contact with the stand. However, the coil continues to spin due to inertia and then the process continues. Technically speaking this motor is a single pole pulse motor.