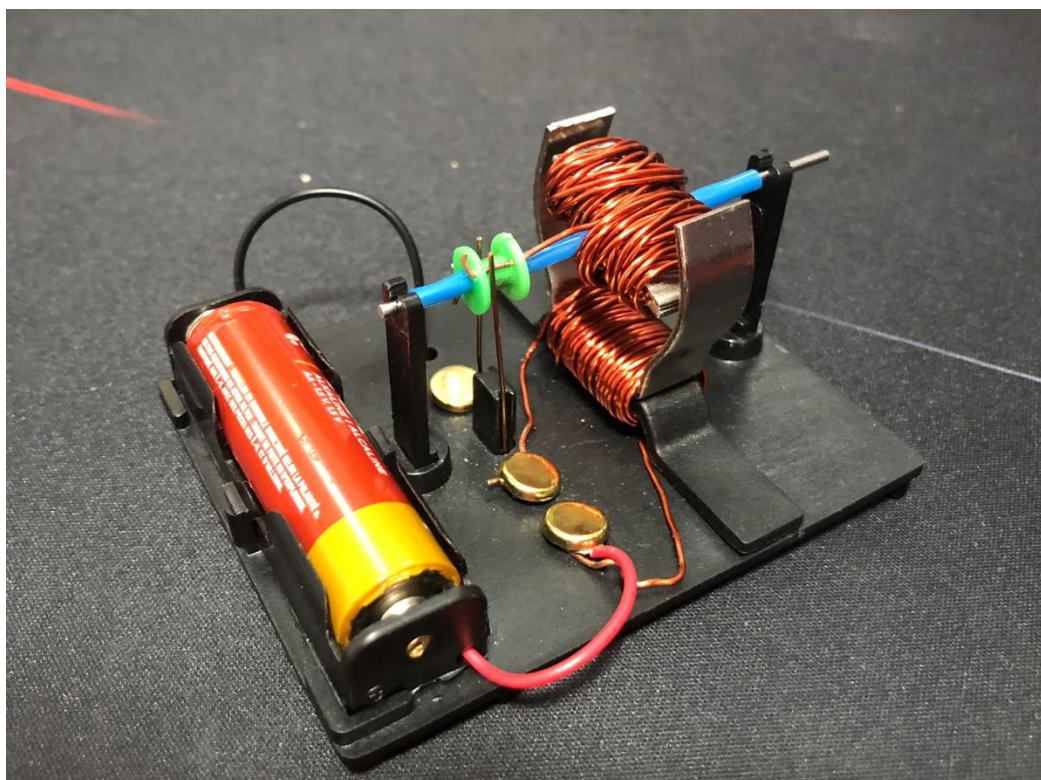


# WiTT STEM Kit

## Brush Motor

Build Instructions

*Adapted from original instructions from Science First*



## Build Instructions

1. Unroll one of the coils of wire.
2. Hold the mounting bracket and the field pole together (Fig. 1). Leaving 2" of the wire free, begin to tightly wind the wire around the two parts starting on one side and making your way to the other side leaving 2" free. Make sure to make the winds tight and as low profile as possible.
3. Using a small strip of sandpaper completely sand off 1" of insulation of each end of the wires. (Fig. 2)
4. Unroll the other coil of wire and sand off 2" of insulation off each end.
5. Place the two halves of the armature around the motor shaft. Leave about 1" on one side of the motor shaft with 1 ¼" on the other side.
6. Leaving 2" of the wire free, begin wrapping the wire around one side 8 times moving to the other side. Cross over the middle to the other side and wrap like the other side 8 times, then cross over the middle. Continue working the same way until you are left with 2". Have the ends of the wires on the same side as the longer part of the shaft. (Fig. 3) Note: Have the windings going in the same direction, wound tightly and as close together as possible.



Figure 1

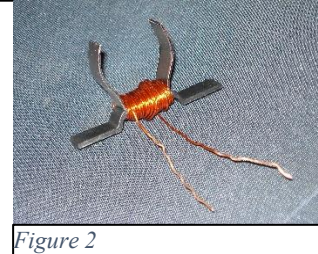


Figure 2

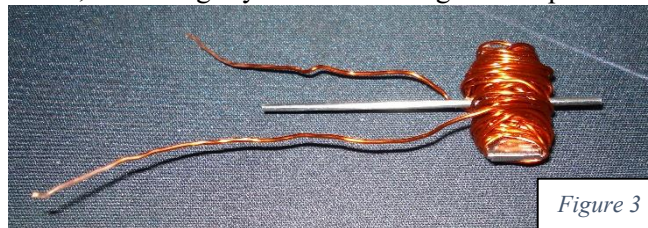


Figure 3

7. Cut a 7/16" piece of the tubing. Slide onto the longer end of the motor shaft and the wire ends. Make sure the tubing is pushed right up to the armature.
8. Put the halves of the commutator together and slide onto the same side as the tubing.
9. Thread both wires from one side of the armature through the holes on the commutator. Make sure the wires are flush against the commutator and trim wires.
10. Cut a ¼" piece of tubing and slide it onto the end of the motor shaft with the commutator.
11. Cut a 7/16" piece of tubing and slide it on the opposite end of the motor shaft.
12. Make sure there is at least ¼" of free space at both ends of the shaft to allow there to be no resistance against the shaft supports. (Fig. 4)

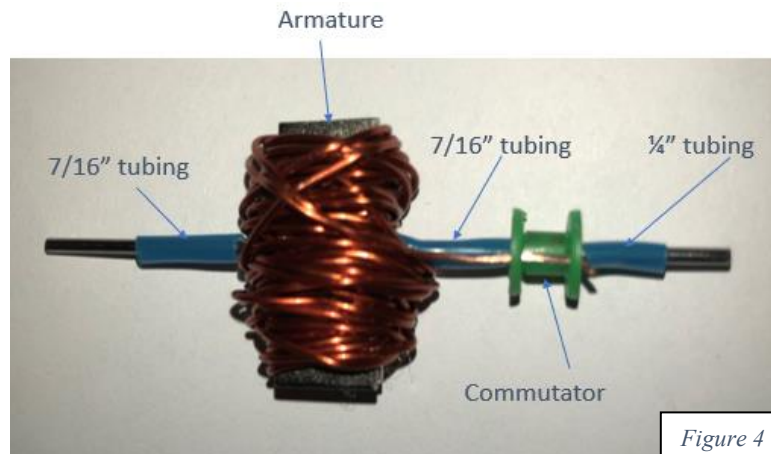


Figure 4

## Motor Assembly

1. Attach the completed field coil to the plastic base in holes 1. Wire ends should be facing to the right (towards 8).
2. Place support shafts in rectangular holes 2 and 7.
3. Loop the end of one of the 2" wires from the field pole around one of the fasteners and twist. Slide the fastener through hole 3 and slightly open it.
4. Loop the other end of the field coil through another fastener and twist. Slide this fastener through hole 10 and slightly open it.
5. Bend both brushes 90 degrees (Fig. 5).
6. Turn the base over and slide one brush through hole 5 and slide the loop over the fastener in hole 3.
7. Push a fastener through the top of hole 4 and slide the other brush through the bottom in hole 6 while sliding the loop over the fastener in hole 4.
8. Place the armature on the two shaft supports and snap into place. Brushes are to be on the outside of the commutator. The commutator should be touching the brushes.
9. Place the battery holder in the mounting tabs in area 8.
10. Trim the insulation off the end of the red lead and loop it around the fastener in hole 4. This should contact the brush in hole 6. You can run the lead through hole 11 for neatness.
11. Trim the insulation of the end of the black lead and loop the black lead around the fastener in hole 10. It should contact the wire from the field coil.
12. Spread all the fasteners open completely and secure the fasteners in place. Make sure they do not contact each other, as this could cause a short.
13. Install the battery. You may have to start the motor by spinning the shaft. You may have to adjust the angle of the commutator by turning it (Fig. 7).

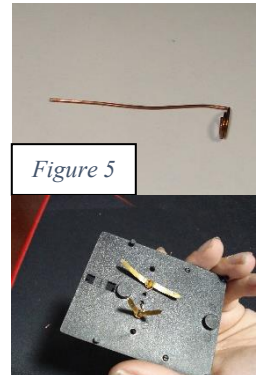


Figure 5



Figure 6

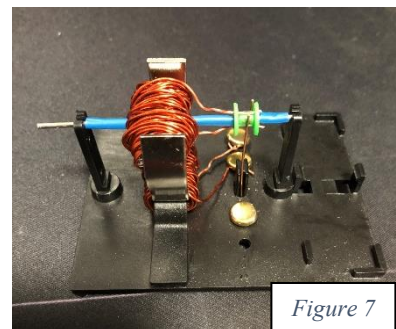
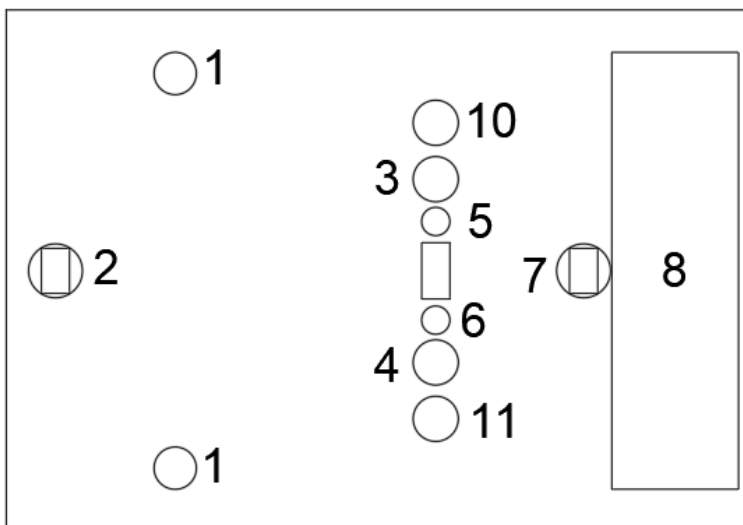


Figure 7



## Wiring Diagram

1. Fastener with negative lead and wire from the field coil
2. Fastener with brush and positive battery lead
3. Fastener with brush and wire from the field coil
4. Positive battery lead
5. Negative battery lead
6. The wire from the field coil
7. The wire from the field coil

