

# SPIRIT

## Phase 1 – TekBot Base Assembly Instructions Computer and Electronics Engineering

### Overview

You will:

1. Assemble your TekBot's base.
2. Gain some basic hand tool usage skills.
3. Start learning to solder.

### TekBot Frame Assembly

#### Motor Assembly and Mounting

1. Begin by soldering 13" (approximately) lengths of wire on to each of your motor's terminals. Use your ribbon cable to for this. The wire needs to be split in two wire pieces and the ends need to be stripped to 1/8".

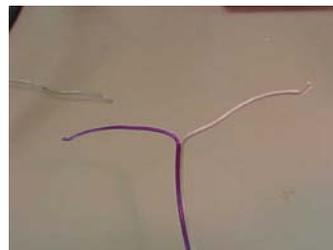


Figure 1: Ribbon cable used to connect motors.

2. Slide 1/2" pieces of shrink tubing onto each wire. Solder the wires onto the terminals of the motor. After the solder has cooled, slide the heat shrink over the motor terminal and the solder joint. Heat the shrink tubing to shrink it into place. To heat the tubing you can gently 'stroke' the heat shrink with a hot soldering iron.

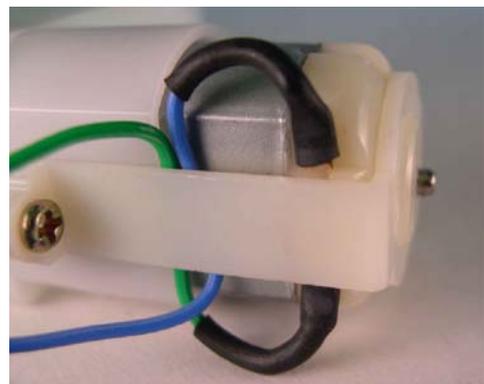


Figure 2: Wires connected to motors, and heat shrunk for protection.

3. Use the 1/2" sheet metal screws included in the kit to attach the motors to the TekBot. Align the motor so that the shaft projects out of the frame and screw in the screws, Fig 3.



Figure 3: Motor mounted to TekBot frame.

4. Be careful to not over-tighten the sheet metal screws holding the motors to the frame. Too much torque can damage the motors enough they may need to be replaced.

### ***Attaching the Batteries***

1. To attach the battery holders, place them inside of the TekBot frame with their leads away from the motors. Insert the 3/8" 4-40 flat head metal bolts through the holes in the battery holders with the head of the bolt inside of the battery compartment. Attach the nuts and tighten till snug.
2. Cut the black wire from one battery holder and the red wire from the other battery holder 2" long. Strip the ends 1/2" and twist them together. Solder these two wires together, Fig 5.

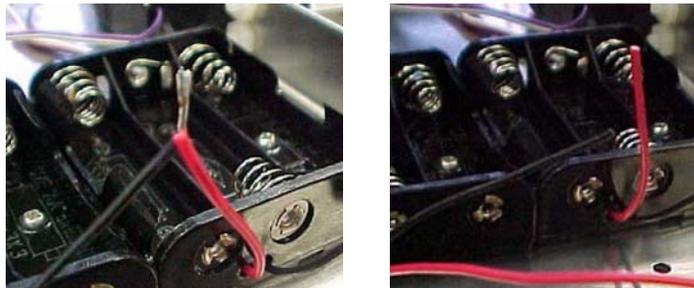


Figure 4: The steps to connect the battery holders together.

3. Cut a 3/4" piece of shrink tubing and slide it over the solder joint. Using a heat gun or a soldering iron apply heat to all sides of the shrink tubing. The tubing will shrink to fit prevent the connection from shorting to the aluminum base.



Figure 5: The step for shrink tubing a connection.

### ***Attaching the Roller Ball***

1. Place the roller ball on the bottom of the TekBot frame. Insert the round head 10-32 3/8" bolts through the holes in the TekBot's frame so that the head of the bolt is inside of the frame. Attach the nuts and tighten, Fig 6.



Figure 6: Roller ball mounted to TekBot's frame

2. If the bolts are put in upside down, you will damage your charger board when you attach it to the frame.

### ***Attaching the Wheels***

1. Most of the kits have had the wheels attached to the hub. If yours looks like the one in Figure 8 you can skip the first two steps.

To attach the wheels to the motors install the adapter disks included in the kit on your wheels. Orient the adapter disk on the wheel with the wider flange against the wheel using the #2 1/2" brass screws in your kits. The predrilled holes are too small for the screws. Enlarge and countersink the holes. Screw through one of the four holes in the adapter disk into the wheel.



Figure 7: Un-aligned and aligned adapter disk

2. Once the screw is tight look at the adapter and wheel. Is the adapter in the center of the wheel? If not, adjust till the adapter is centered even if you have to remove and reinsert the screw. After the wheel and adapter is aligned insert the other three screws.



Figure 8: Disk mounted to wheel

3. To attach the wheels to the motors simply 'press fit' the adapters on the motor shafts. This is a very tight fit and will require quite a bit of force to mount the wheels. Place your finger on the back side of the shaft as shown by the red arrow in Figure 9 to prevent bending the chassis .

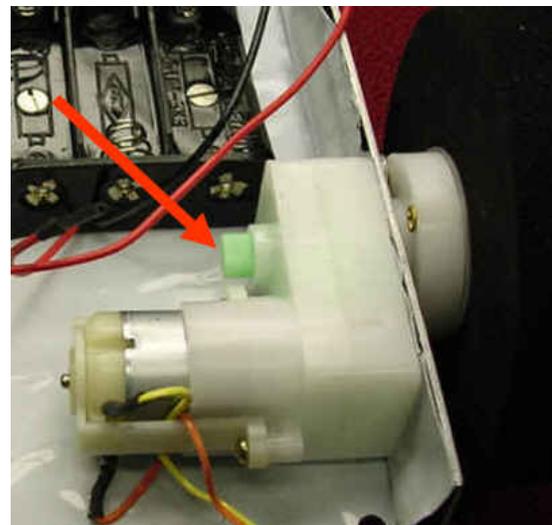


Figure 9. Mounting of wheel to motor.

Congratulations, you have completed the basic assembly of your robotic base. Yours should look like figure 10.

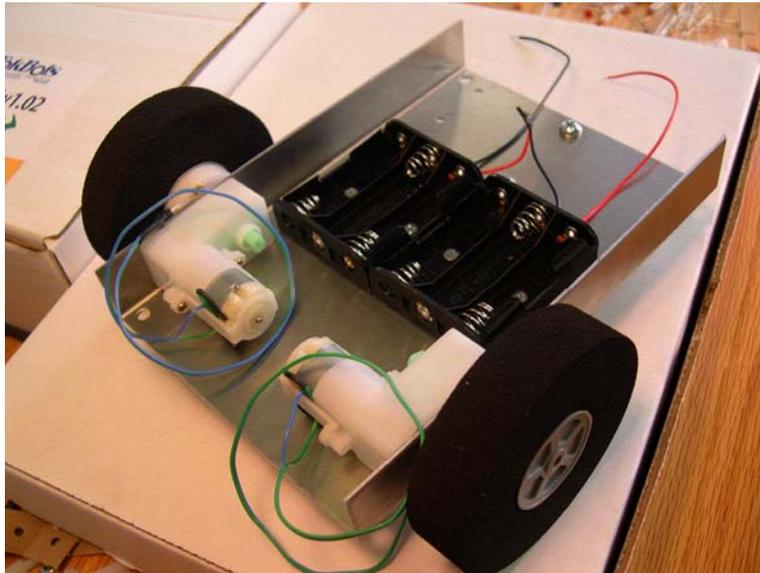
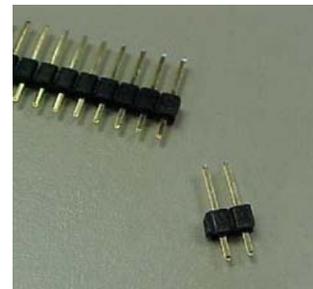


Figure 10: A completed TekBot base.

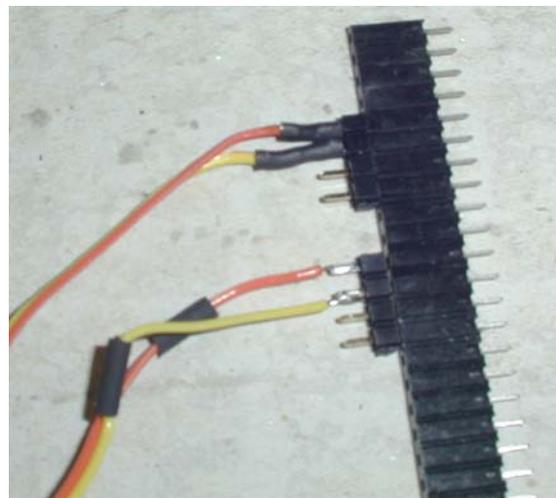
4. Now you need to solder a male header onto the battery leads so that they can be 'plugged' into the charger board which will be assembled later.

#### **Making Male Headers/Jumpers**

To make connector you should find a long strip of 'male header'. Use a pair of diagonal cutters to clip off as many pins as you need for the jumper, two in this case. Strip 1/8" from the two battery leads and tin the leads by heating the conductor and applying solder until the conductor has a shiny appearance. Do not use so much solder as to create a blob or drop of solder. When the solder has cooled, cut two 1/4" pieces of shrink tubing and slide one onto each wire.



Place the male connector into a long strip of female connectors to make it easier to hold. Put a light coat of solder on the short end on the male connector. Place the tinned wire on the tinned connector and heat with the soldering iron until you see the solder flow between the two parts. You should not need any more solder other than what was already on the parts.



Hold the connection steady for a few seconds until the solder solidifies. When the joint is cool, slide the shrink tubing down around the joint, and shrink it to fit around the soldered area.

5. Solder a two-pin male connector onto each of the motor's leads.

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