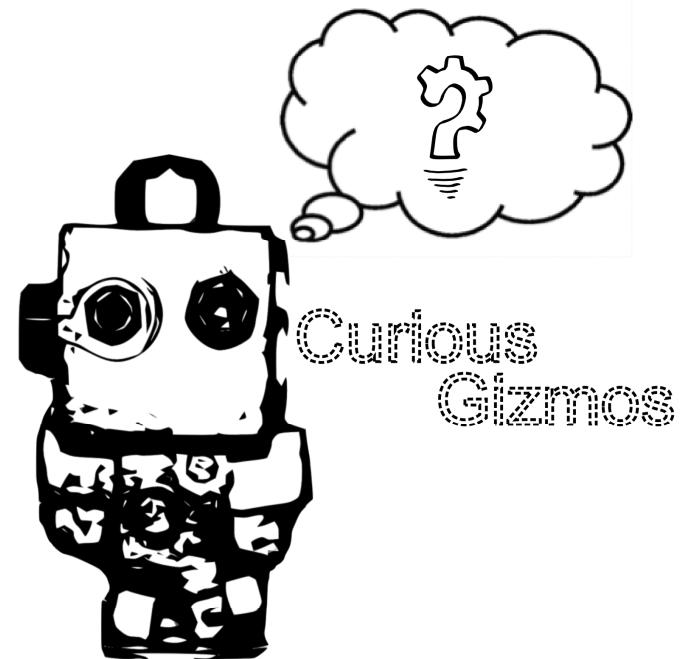


# smartCaster

## MAKER GUIDE



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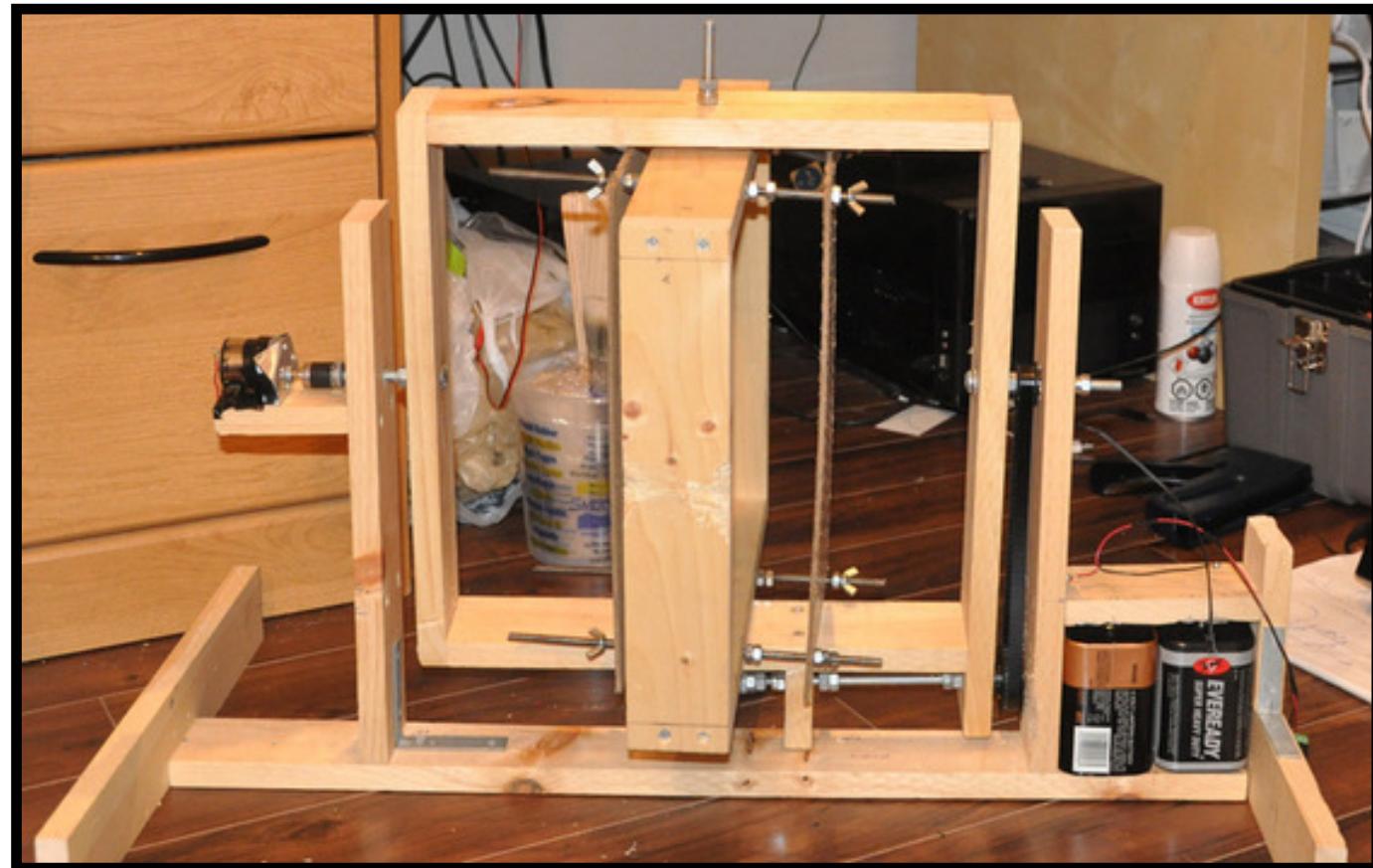
# Hardware List

Item	Part #	Quantity
5/16 fully threaded bolt, 8"		1
1/4 fully threaded bolt, 6"		4
Motor bracket metal		1
Battery contact metal sheet		1
Wood Screws		24
Corner brace		4
Big Pulley (SDP-SI)	A 6Z 3-28DF03710	1
Small Pulley (SDP-SI)	A 6Z 3-15DF03710	1
Timing Belt (SDP-SI)	A 6G 3-110037	1
Shaft Coupling (SDP-SI)	A 5C 9-0810	1
Miter Gear (2) (SDP-SI)	A 1M 4-Y24030	1
5/16 Sleeve Bearings (igus)	RSI-0507-12	6
5/16 nuts		16
1/4 nuts		24
5/16 threaded bolt, 3"		4
#10 1-1/2" wood screws		26
1/8" Pegboard		1

# Wood Cuts List

Purpose	Width&Depth	Length	Wood	Quantity
Inside Frame	1x2"	11"	Pine	2
Inside Frame	1x2"	12.5"	Pine	2
Outside Frame	1x2"	14"	Pine	2
Outside Frame	1x2"	17.5"	Pine	1
Outside Frame	1x2"	15.5"	Pine	1
Support wings	1x2"	15"	Pine	2
Side Arms	1x2"	15"	Pine	2
Motor Base	1x2"	3.5"	Pine	1
Base	1x2"	29.4"	Pine	1
Shaft Brace	1x2"	2"	Pine	1
Battery compartment (top)	1x2"	5.365	Pine	1
Battery compartment (side)	1x2"	3.445"	Pine	1

No warranty is expressed or implied. Use caution when working with electricity and tools and make at your own risk.

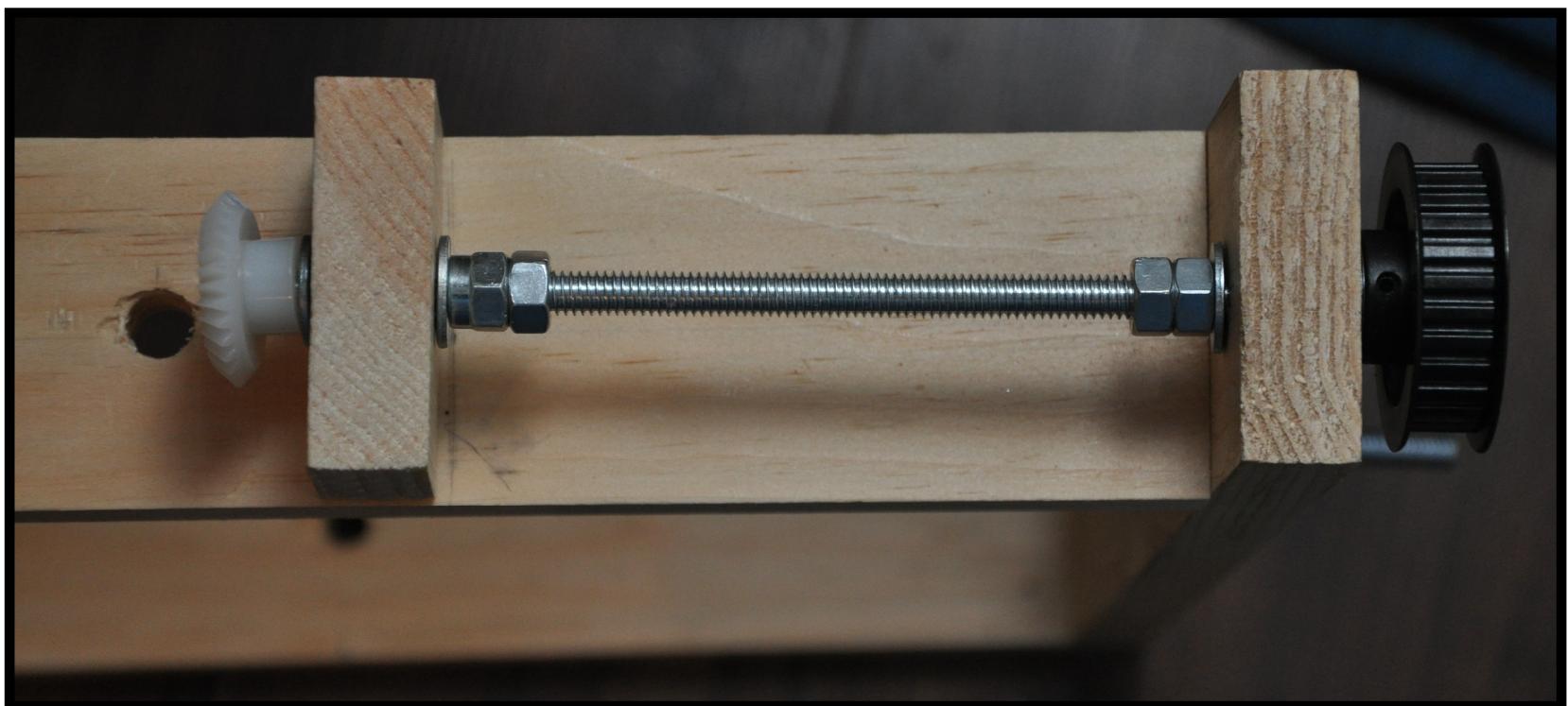


## **Outside Frame**

1. On 15.5" piece drill pilot hole at each corner. 0.5" from long side, 0.375" from short side.
2. Drill countersinks at each hole (optional)
3. Attach both 14" boards to each corner.
4. Place 17.5" side so that it is flush with the bottom edge. Line up with 14" boards, drill pilot holes, countersink and screw into place. This should leave a 2" excess at the top.



5. From this excess measure out 5" from it along the 14" board. Place the 2" piece and screw into place.  
Place the large pulley on the other side of the long piece hole and slide the 8.25" shaft through, securing with the set screw.
6. Place two sets of nuts with matching washers at each connection along the length of the shaft in a locking fashion. The shaft should freely spin but be secured to its position
7. At the end of the shaft place the bevel gear and secure with a bolt and washer. Use a high strength epoxy, thread locker or super glue to secure the gear in place.



## **Inside Frame**

1. Secure the 11" board to a vice or grip and measure two points 3.5" lengthwise from each edge. Carefully drill a 1/4" hole along the width of the board at each point. This should be 0.375" from the edge. Do this for the second 11" board.
2. On the same 11" board, drill a 5/16" hole at the exact center --- ~5.5" lengthwise and 1.25" from the edge inside the wide side. Do the same for the second board.
3. Starting with the 12.5" board drill pilot holes at each corner and connect to the 11" boards. Connect the other 12.5" board in the same way forming a square frame.

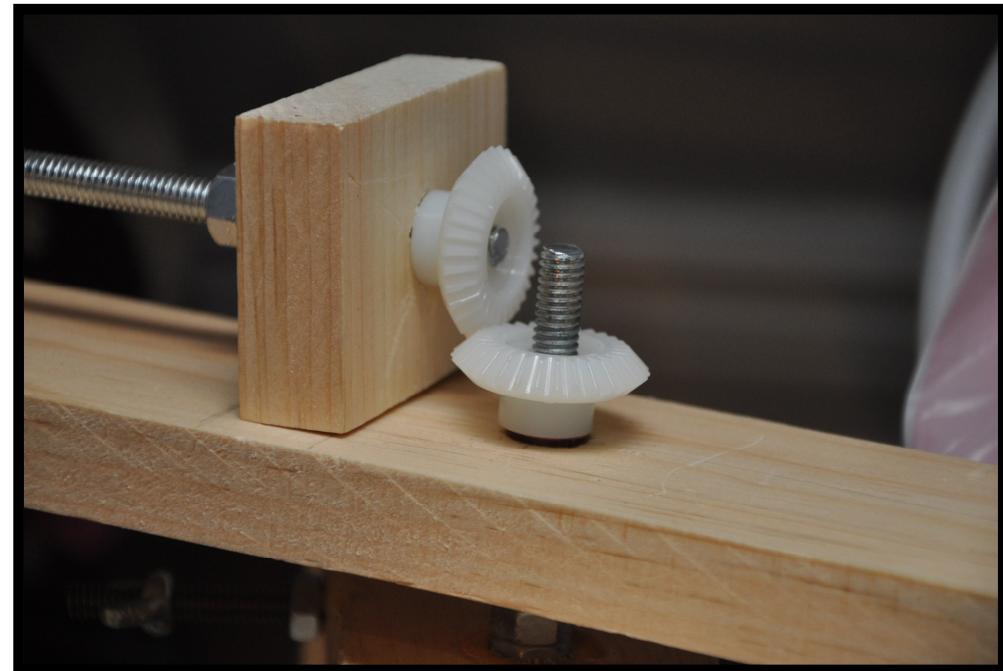


## Attaching Frames and Bevel Gear

1. Insert sleeve bearings into outside frame top and bottom holes.
2. Slide 3.5" 5/16 bolt through top of inside frame and secure with three nuts.
3. Slide the assembly through the outside frame top hole then repeat the previous step but this time with the bottom of the inside frame.

NOTE: you may want to wait to attach the bottom board of the outside frame until this step to make things easier.

4. Where the top bolt enters the outside frame place a washer and secure the bevel gear with two nuts on top.
5. At the bottom insert the bolt along with a washer. Two nuts locked together should be used to keep the bolt in place.
6. The inside frame should now be secured (though not snug) to the outside frame and able to freely spin around the central axis. The bevel gears should also now line up and touch.



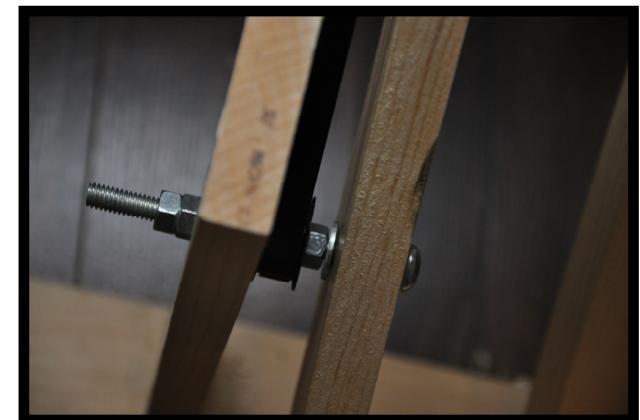
## **Left arm and Frame Motor Shaft**

1. From either end measure out 4.5". At the center drill a 5/16 hole. Secure a sleeve bearing to this hole.
2. Slide a 5/16" bolt through the outside frame and through this hole to ensure that the shaft rests easily on the arm.



## **Right arm**

1. From either end measure out 4.5". At the center drill a 5/16 hole.
2. Using a Forstner or Countersink bit drill a slight depression on the inside of this hole.
3. Place the smaller pulley so that the flange rests in this depression
4. With the outside frame place a sleeve bearing on the right side hole and slide a 3.5" 5/16 bolt through along with washers at both sides of the board.
5. Place a nut after the washer and push the rest of the bolt through the pulley and finally the arm itself.
6. Brace the end of the bolt with two nuts so that the shaft is fully secured.



**CAUTION:** be certain that the frame is still able to freely spin around the shaft axis after securing the frame to the arm. If it isn't, loosen the nuts and push the bolt back through until it is free.

## **Base**

1. Starting from the right side of the 29.5" base board, measure out 5.5". This will be the battery compartment.
2. Place one of the 15 inch arm boards so that it lines up perpendicularly to the base support. From underneath measure out and drill pilot holes, countersink and screw them in.
3. Measure out 17" to the left of the right arm and place the left arm to the left of this. Drill into place same as the other.



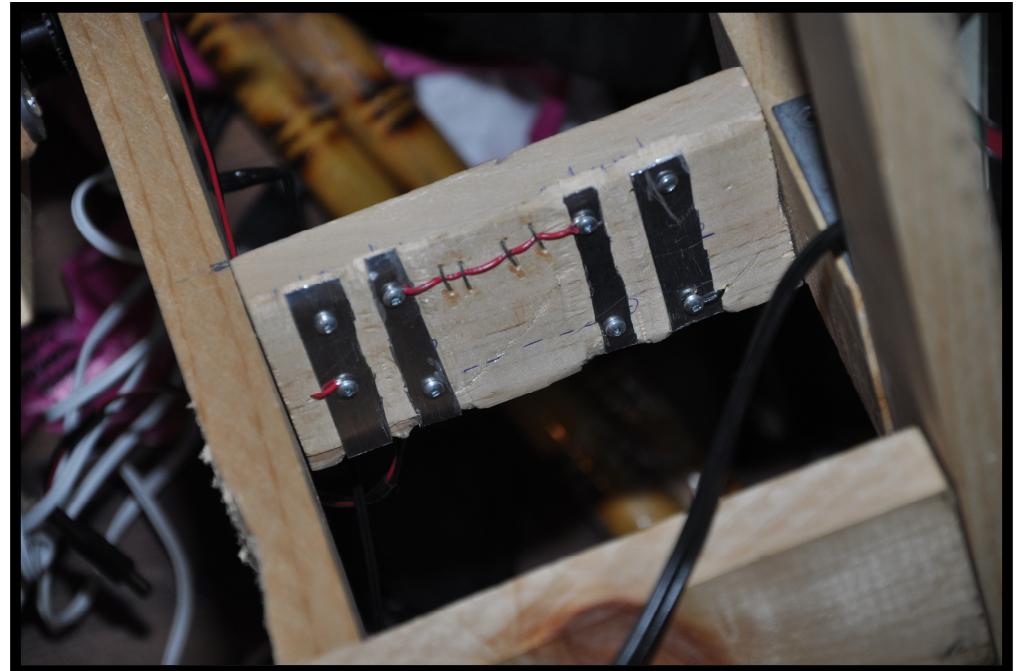
## **Base side supports (wings/feet)**

1. Place main base board on a flat surface and line up two 15" side wings so they are centered, upright and flush against the base. Drill pilot holes and screw into place.



## Battery compartment

1. Take the battery compartment top and bottom piece and form an L. Drill pilot holes and screw together.
2. Using two 6v lantern batteries as a guide mark on the long piece where the + and – contacts touch the wood.
3. Cut 4 metal strips roughly the length of the top piece and 0.5" wide and screw them into place. Attach wires to center contacts as the figure shows
4. Drill a hole for + and – and snake wire through.
5. Make two posts on top using screws and attach wire. Secure with staples as needed.
6. Place L on wing with the shorter end sticking out and line up with right arm. Mark where they meet on the arm. Drill pilots and screw together.



## Storage compartment

1. Run the 6" 1/4 bolts through the pre-drilled holes. Using 1/4 nuts secure the bolts in place so that they come out of either end equally.
2. Ensure two bolts are 4" apart and roughly 3.5" from each end
3. Attach the two pre-drilled and cut 1/8" pegboard to each side of the frame and secure with wingnuts (8 total, one at each bolt end).
4. Adjust peg-boards for payload and secure with wingnuts by tightening until cargo no longer moves freely.

NOTE: make sure to balance mold position to account for the top-heavy frame (due to top pulley and shaft).

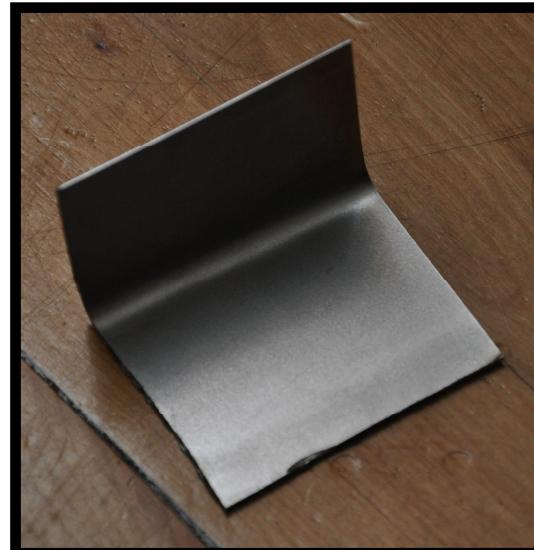


## **Motor Bracket**

For the motor bracket you will need the motor bracket stencil, a rubber mallet, a felt-tip permanent marker and a 22 gauge (0.025") piece of steel sheet metal.

1. Take the motor bracket cutting stencil and cut out the black holes with scissors or a sharp hobby knife.
2. Place the stencil on the sheet metal and with the marker fill in holes. Mark the points where the dashed line starts and ends.
3. Using the markings as a guide cut out the holes and perimeter of the bracket using a drill or heavy duty hole puncher. Make sure the holes line up with the motor face screw holes and shaft perimeter.
4. Place the metal cutout on the edge of a flat surface with the dashes on the edge. Using a rubber mallet hit the part of the cutout that passes the edge, bending it into an L shape.

**IMPORTANT:** make sure the screws line up so that the motor shaft faces away from the bottom side.



## **Attach Motor to Motor Bracket and Motor Base**

1. Insert the motor through the central axis hole, line up the M3 screw holes and screw them in so that the mount is secure with the motor.
2. Place the shaft coupler on the 1/4 motor shaft and line up with the 5/16 shaft from the Outside Frame. Secure using the coupler set screw.
3. Now that the motor is secured to the bracket and attached to the frame line up the Bracket with the Motor Base so that the edges away from the Arm are flush. Screw the bottom of the bracket into the motor base using 6 1/4" 4-40 screws.

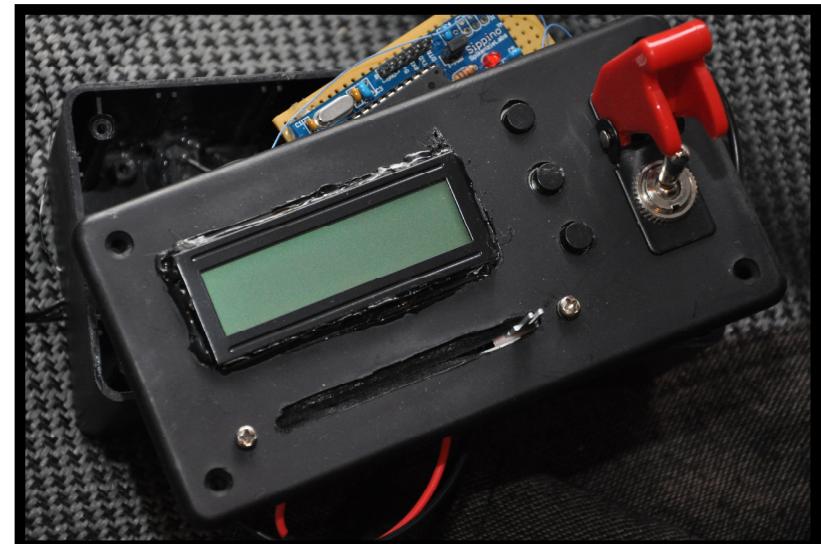
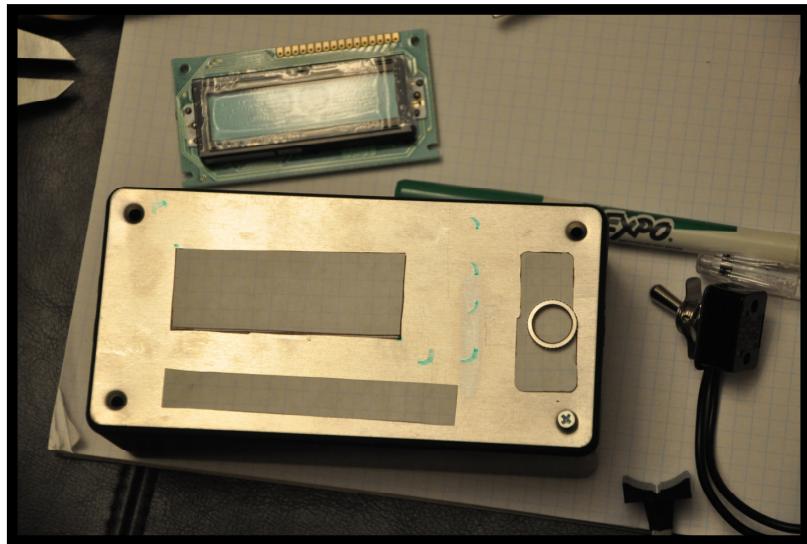
## **Attach Motor Base onto Left Arm**

1. Take the motor base assembly and place so that the Frame Motor Shaft and Coupler lineup with the 5/16 bolt that will be coming from the left arm hole (this should be roughly 4.9" from the top). Draw a line to maintain this location. Drill pilot holes and screw motor base to arm.
2. Install corner brace underneath for additional support (optional).



## Control Unit Faceplate

1. Take the faceplate cutting stencil and trim along the dashed lines with scissors or a sharp hobby knife.
2. Secure the stencil onto the plastic faceplate with masking tape and with a felt-tip marker trace the interior areas of the cutout.
3. Using a drill, router, hole punch, nibbler or your favorite rotary tool cut along the traces to make the required holes.
4. Holes for 3mm/4-40 screws should be done with 7/16" bit.
5. Hole for switch is drilled with 1/2" bit.
6. Hole for buttons should be 5/16".
7. Consider using hot glue or some other sealant to seal any seems that may allow moisture to seep into the control unit.



## **Control Unit Side Holes**

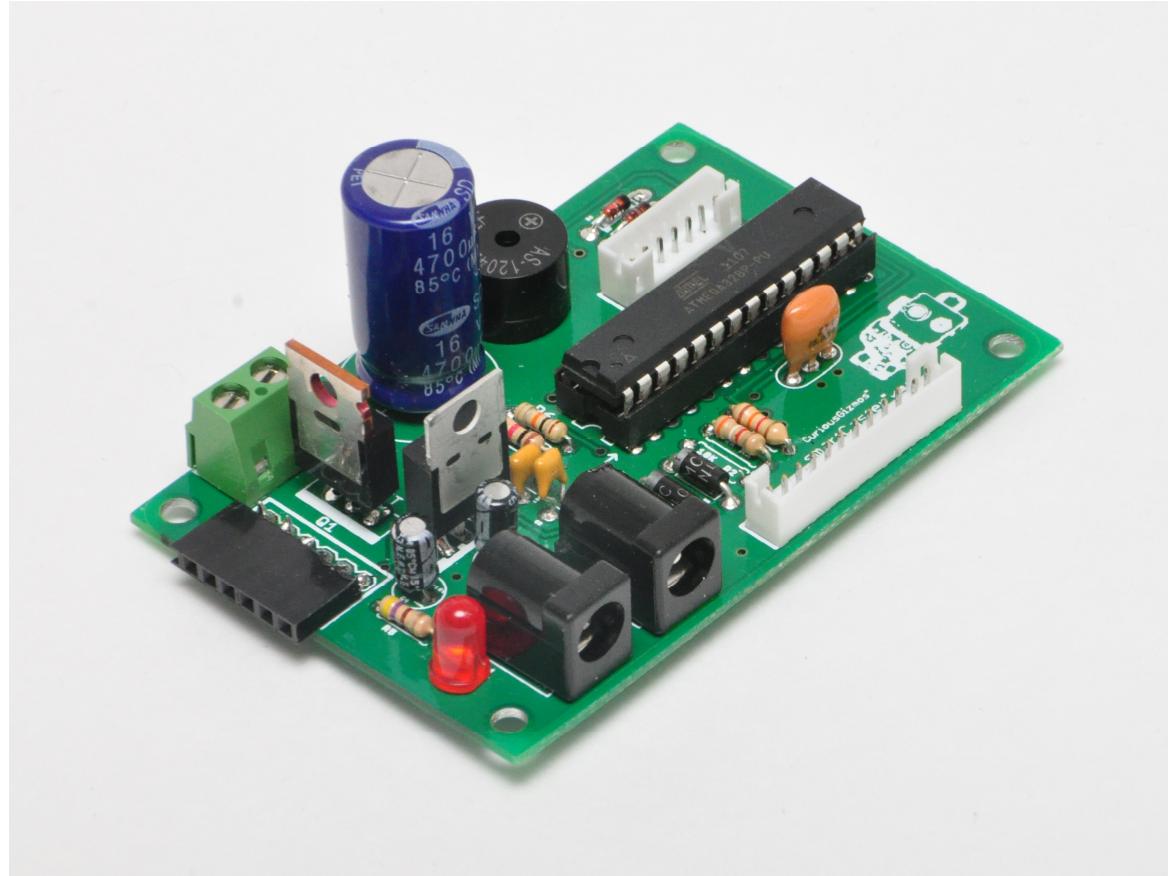
1. Place the circuit board so that its holes lines up with the standoffs built into the base of the project box.
2. Using a ruler or caliper, measure the points at which the DC Jack and FTDI Header meet the sides. Mark the extents and cut with a router, drill or rotary tool.
3. On the side where the motor power exits the board drill 2 holes with a 7/16 bit.
4. Pull the wires that come from the molex connector through the holes so that they can be attached to the circuit board.

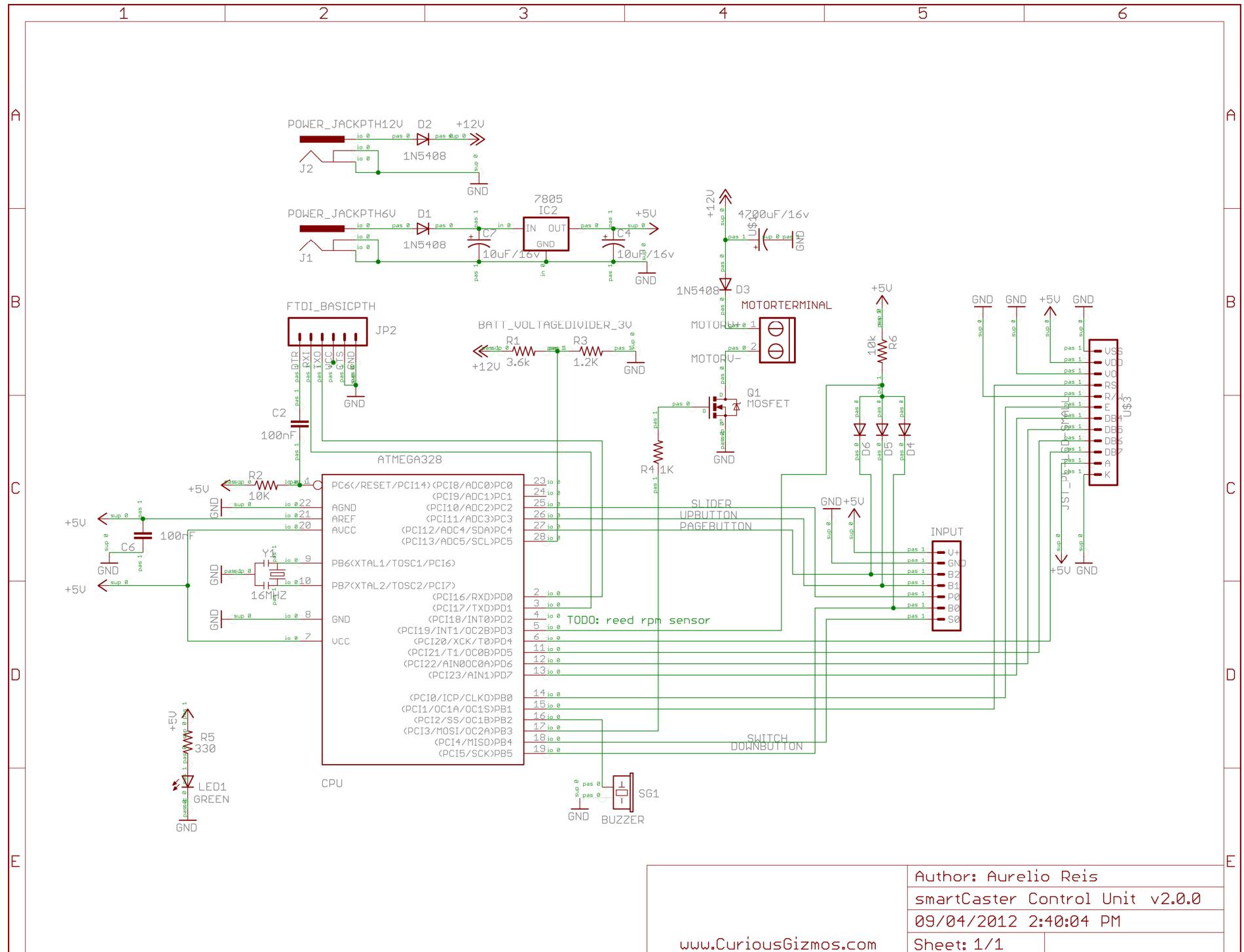
## **Wiring**

1. Starting from the two posts/terminals atop the battery compartment string wire along the bottom of the frame until you get to the motor.
2. Using a staple gun or nails secure the wire to the frame.
3. Solder the end pieces to the motor power terminals (+ to + and - to -).
4. (Optional) Solder a 4700uF capacitor across the motor terminals and 0.1uF from each motor terminal to the motor case itself for additional noise suppression.
5. For safety, seal the exposed electrical connections with hot glue and electrical tape.

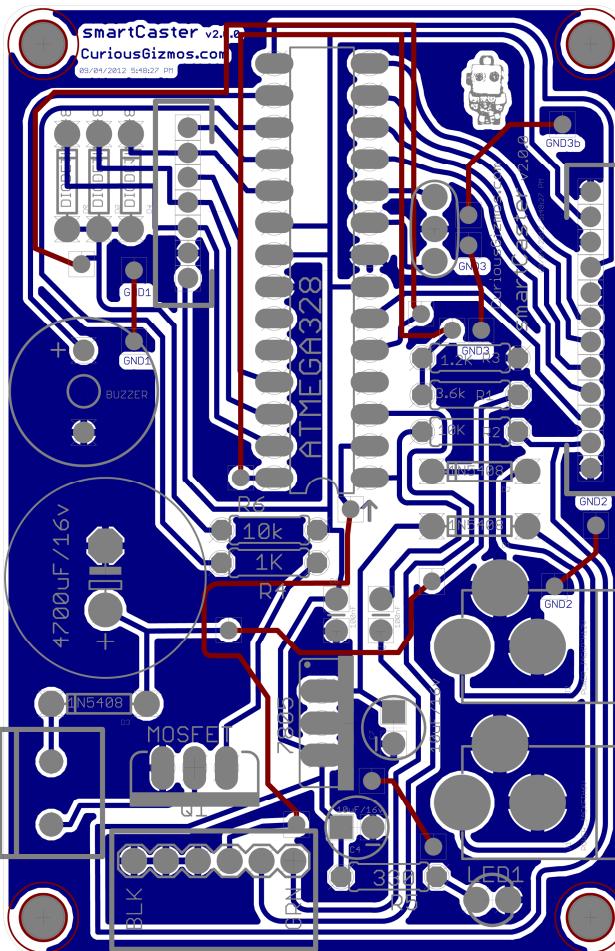
## Circuit board

Using the supplied schematic and board guide you can etch your own PCB or alternatively purchase a pre-fabricated PCB from [www.CuriousGizmos.com/smarterCaster](http://www.CuriousGizmos.com/smarterCaster).

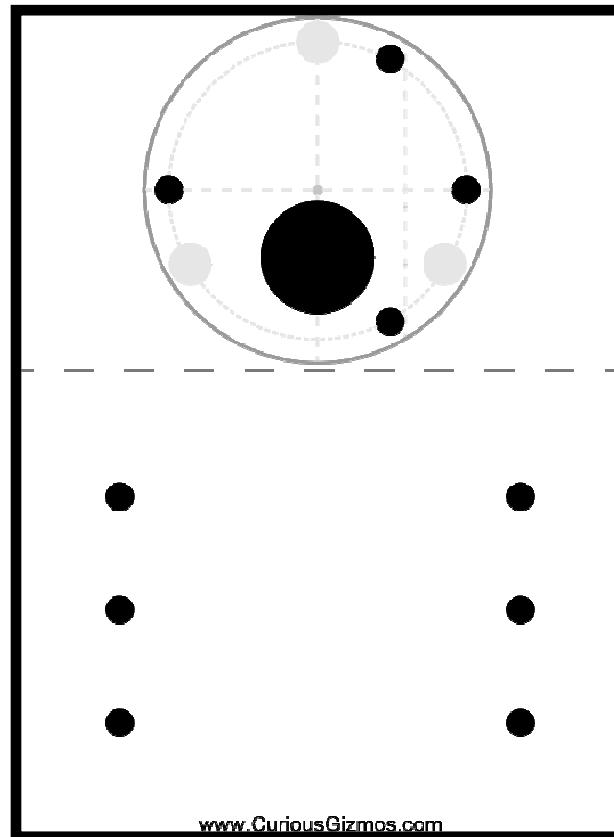




## CIRCUIT BOARD LAYOUT

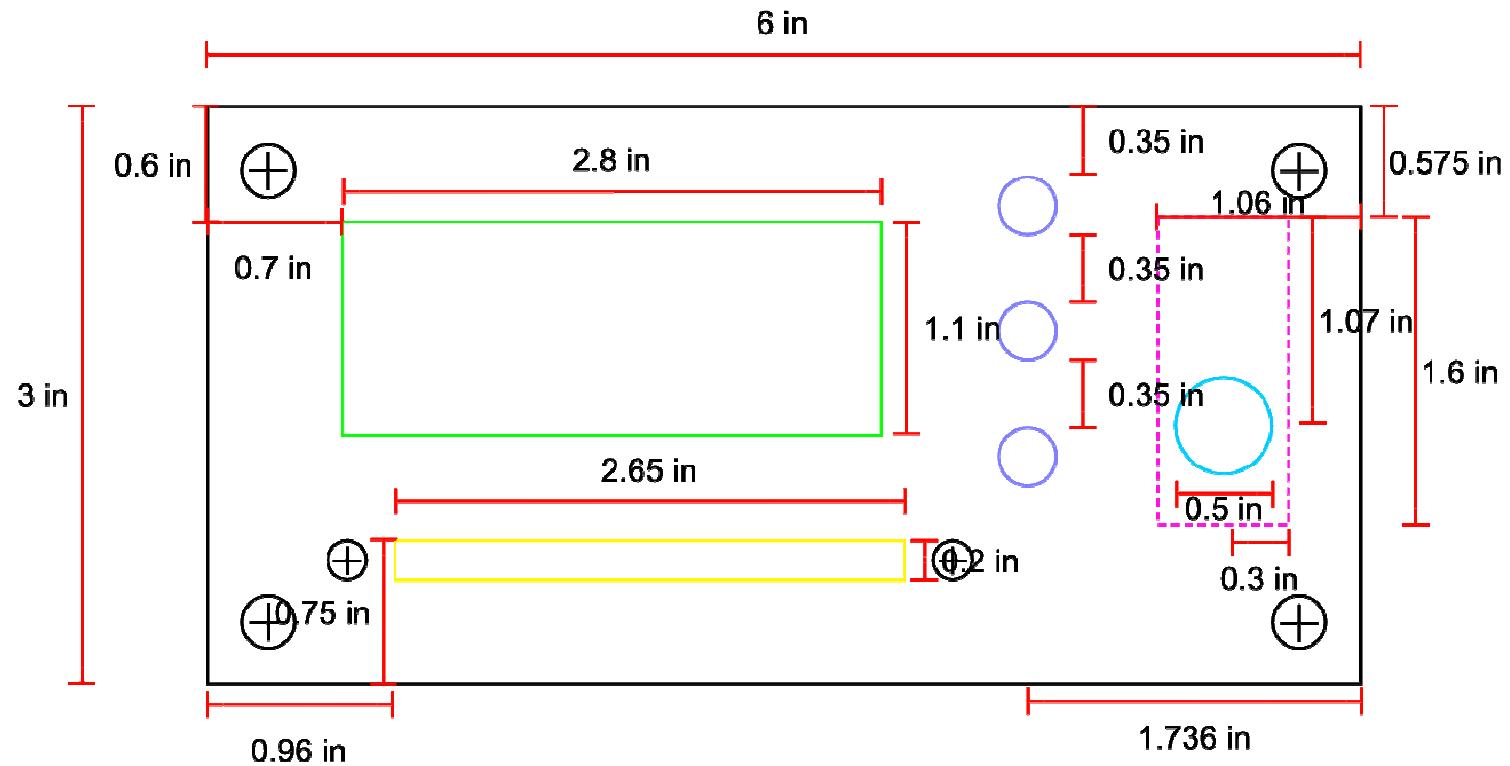


## MOTOR BRACKET TEMPLATE



[www.CuriousGizmos.com](http://www.CuriousGizmos.com)

## FACEPLATE TEMPLATE



## SMARTCASTER SOFTWARE

To program the smartCaster with new functionality or updated firmware:

- 1) Start the latest version of the Arduino IDE (1.0.1 as of this writing) and open the smartCaster source code file (smartCaster.ino).
- 2) Attach an FTDI cable from your computer to the FTDI header on the board.
- 3) If the FTDI software was installed correctly the Arduino IDE should find the new virtual com port.
- 4) Press the upload button and the updated code should compile and upload to the smartCaster processor.

**TIP:** you can open up the serial output window for additional status information from the smartCaster as well as to upload/download settings.

**TIP:** if the new com port does not show up make sure you connected the FTDI cable to the header in the correct orientation.

## HELPFUL HINTS

- For straight cuts, use a band saw or jig saw, milling machine, or Dremel with straight edge guide
- For a smooth finish that can be (spray)painted, file evenly with medium then low grit sandpaper.
- For round holes use a manual or automatic drill press or drill power tool.
- Make sure to tightly secure sleeve bearing to ensure proper operation as well as reduce wear.
- Before starting the smartCaster make sure to balance the payload to reduce wear on the motor and maintain rotational speed.
- Check out this guide on Mold Making for some advice on making your own:  
<http://j.mp/OGdEzV>
- When appropriate, wear the proper safety gear (goggles, mask, gloves).
- **ALWAYS** clear the area of objects and people before starting the smartCaster
- **Have fun!**