

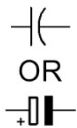

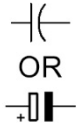





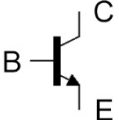

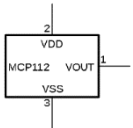

In addition to your kit, you'll need the following tools. (Visit FVResearch.com/soldering-tools for our recommendations):





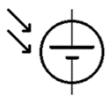




- Eye protection
- Electronics soldering iron and solder
- Circuit board holder
- Scissors
- Wire cutters
- Long-nose / Flat-nose pliers
- Masking tape or electrical tape

The following parts are provided in your kit.

Be sure you double check all your parts as soon as you receive your order.

If any parts are missing, please contact Sales@FVResearch.com right away.

Capacitors (Package Size and Color May Vary)			
Symbol	Kit QTY	Image	Description and Schematic Name
	3		1000µF capacitor 10V C1, C2, & C3
	1		1µF electrolytic capacitor 50V C4
Diodes, Transistors, and Integrated Circuits			
	1		1N4148 general purpose diode 100V 200mA D1
	1	 1N4007	1N4007 general purpose diode 1,000V 1A D2
	1	 PN2222	2N2222 NPN 40V 1A Transistor in TO-92 package Be careful! This looks just like U1! T1
	1	 MCP112-315E	MCP112-315E voltage supervisor - 3.08V threshold Be careful! This looks just like T1! U1

Motor and Bracket			
	1		Vibration Eccentric Rotating Mass (ERM) Motor – 12000RPM 3V M1
	1		PCB mount fuse clip (used to hold the vibration motor)
Power Supply			
	1		Solar Cell – 5.53V 179.6mW SC1
N/A	1		27mm square piece of double sided foam tape Used to adhere the solar cell to the PCB
Hookup Wire			
N/A	1		Hook-up wire, 24 AWG, Solid Tinned-Copper, 20cm (7.9") Used to connect SC1 to the circuit board
Printed Circuit Board (PCB)			
N/A	1		Printed Circuit Board

Assembly Instructions

Many parts look similar to each other.

Be sure to use the checklist to confirm each part's appearance and value.

Examine the printed circuit board and find the words "SOLAR CELL". (Figure 1)
The parts for steps 1-5 will be inserted from this side of the board.

1) Install D1, the 1N4148 diode. Match the line on the part with the line on the PCB. This marks the cathode side of the diode. This part will sit flush against the circuit board.

2) Install D2, the 1N4007 diode. This part will sit flush against the circuit board.

3) Install T1, the PN2222 transistor. Be sure to double check the part number because it looks exactly like U1. You will need to gently push the middle pin away from the flat side of the transistor before inserting it into the three PCB holes. This part will sit a few millimeters off the circuit board.

4) Install U1, the MCP112-315E voltage supervisor. You will need to gently push the middle pin away from the flat side of this part before inserting it into the three PCB holes. This part will sit a few millimeters off the circuit board and should be the same height as the transistor, T1.

5) Install C4, the 1 μ F capacitor. Notice that there is a white stripe marking the negative side of the capacitor. The negative lead is also shorter than the positive lead. Be sure to install the negative lead into the hole marked as negative. Insert the two leads all the way into the circuit board such that the capacitor sits almost directly on the PCB.

For the next few steps, turn the PCB over so you can see that text that says, "Attach C1, C2, C3, and BRKT1 on this side of the board". (Figure 2)

6) Install BRKT1, this is the clip that will hold the motor in place. Ensure that you insert this bracket on the side that has the silkscreen term "BRKT1". Place the bracket in place so it sits flush against the board. Allow gravity to hold the bracket in place and solder the top of the two bracket pins. This will hold the bracket in place after you turn the board over. Turn the board over and fully solder the two pins. Flip the board back to the bottom side and wait for the bracket to cool before moving on to the next step.

7) Install the motor. Clip the motor into the bracket such that the leads face the edge of the board and the motor spindle faces the middle of the board. Loop the motor wires around the edge of the board and solder one lead in the pad marked MTR1 and the other in the pad marked MTR2. You can solder either wire into either pad because the motor can spin either direction.

You may need to strip a little insulation from the tip of the two wires so the bare wire can sit comfortably in the pad. Alternatively, you can use a piece of masking tape to hold the wire in place while you solder it. **But, be sure that only bare copper wire is inserted into the PCB hole.**

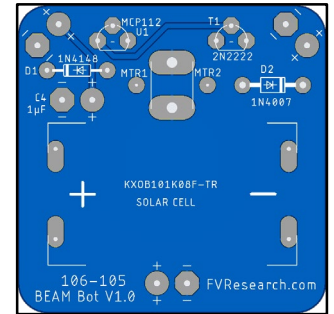


Figure 1 – PCB Top

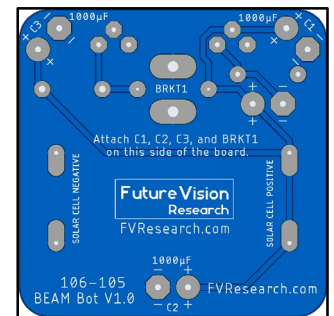


Figure 2 – PCB Bottom

8) Install C1, C2, and C3. These are the three 1000 μ F capacitors and act as the feet for your BEAM Bot. Instead of sitting flush against the PCB, these three capacitors will extend away from the board so you can adjust their position.

Use flat nose pliers to put a bend close to the end of the two leads. Leave enough lead so they can hang from the PCB. (Figure 3)

Be sure to place the lead marked as negative into the PCB hole marked negative. Insert one capacitor at a time on solder it into place before moving to the next one.

9) The last step is installation of solar cell SC1. This solar cell sits on the top of the board, so be sure to flip back to the top side, which displays the words "SOLAR CELL". (Figure 2)

- a) **Be very careful with the installation of SC1. It is very difficult to remove the solar cell if you put it in backwards.** It is recommended to ask a second person to double check your placement before soldering the solar cell in place.
- b) Before you can solder the solar cell to the board, you need to attach wires to the positive and negative terminals.
- c) Take the segment of 24-gauge wire from your kit, straighten it out and cut it in half. (the two pieces of wire should be approximately equal in size.)
- d) Remove the solar cell from the plastic container and place it face down so you can see the two rectangular solder pads. Stretch a piece of wire across each pad. The ends of the wires should be about even on both sides. (Figure 4)
- e) Ensure each wire is sitting across the rectangular pad, and use masking tape to hold the wires in place. (Figure 5)
- f) Use a pair of scissors to trim the square of two sided tape into a rectangle that fits the bottom of the solar cell. But don't cover the + and - side on the bottom of the cell. Peel one side of the tape and attach it to the bottom of the cell.
- g) Now it's time to mount the solar cell to the PCB, make absolutely sure that the negative and minus signs on the solar cell match same signs on the PCB. (Figure 6) Peel the backing from the other side of the tape, insert the wires into all four PCB holes, and set the solar cell onto the PCB. **Ensure the "+" sign on the solar cell is sitting on top of the "+" sign on the PCB.** You do not need to press the solar cell onto the board.
- h) Turn the board over and twist each wire to itself on the bottom of the board to help hold the solar cell in place.
- i) Solder all four connections and trim the excess wire.

Using your BEAM Bot

Your new BEAM Bot will work best in direct sunlight. Alternatively, you can provide light from an incandescent light source (something with a filament). BEAM Bot will not be able to obtain power from LED or fluorescent light sources.

Never leave your BEAM Bot unattended. It may not be where you left it when return.

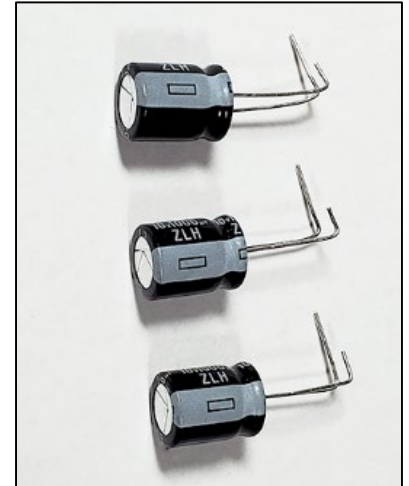


Figure 3 - C1, C2, and C3 with bent leads

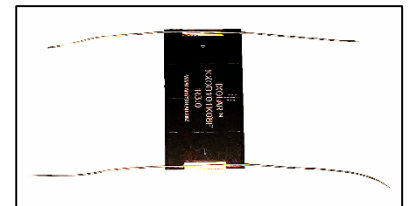


Figure 4 - Wire placement



Figure 5 - Use masking tape to hold wires in place



Figure 6 - Match up polarity signs on solar cell and PCB