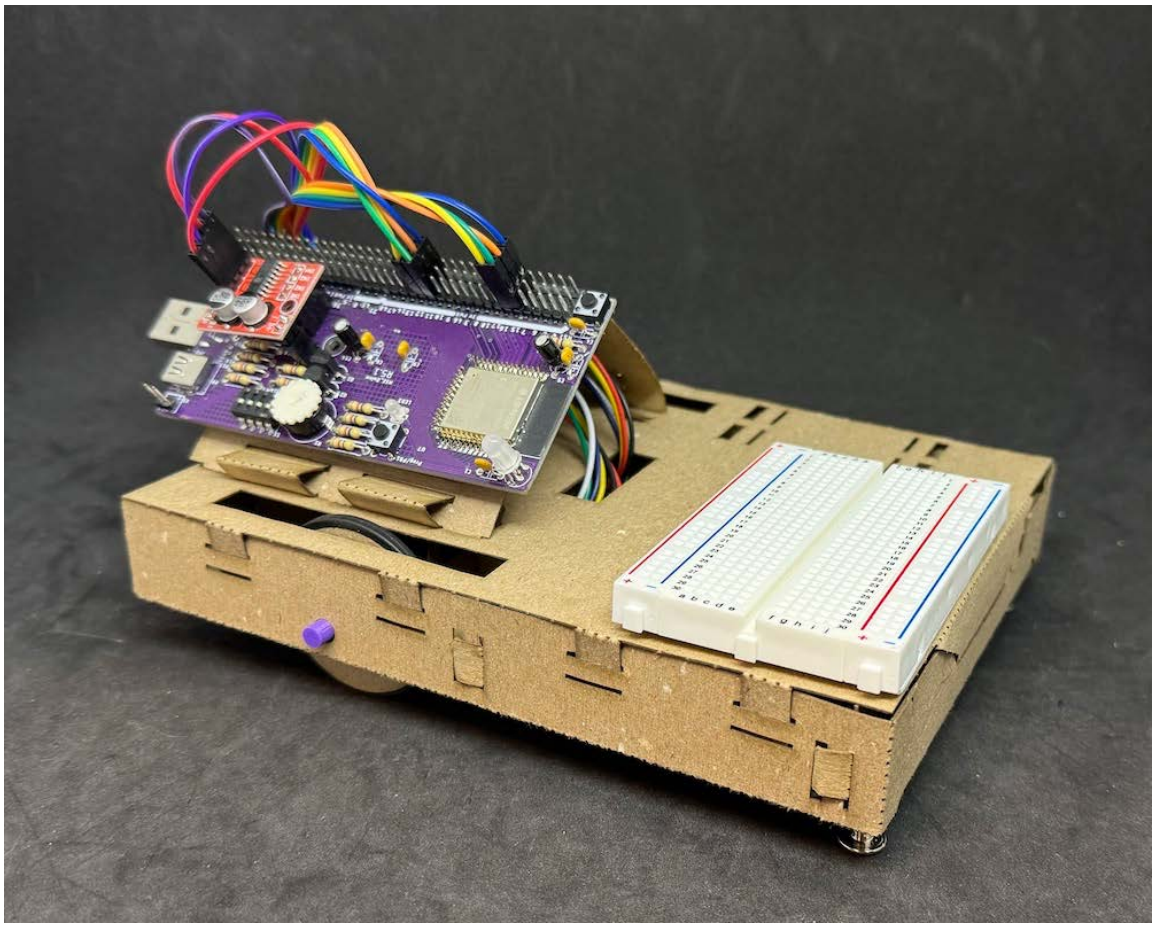
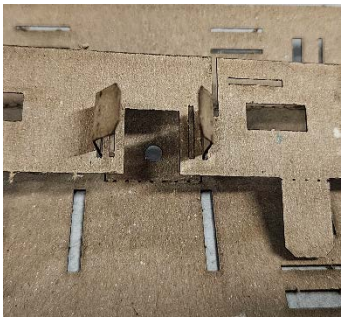
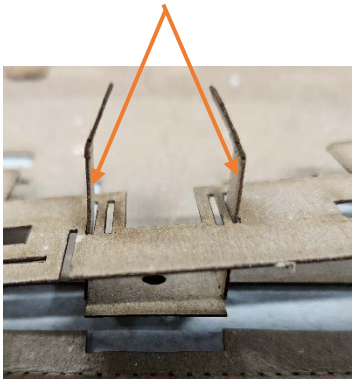
MSEbot Chassis Build Instructions



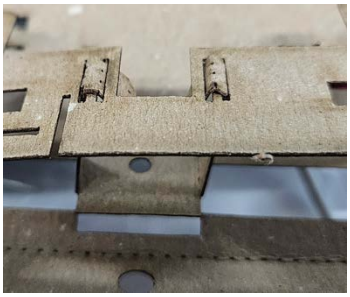
1) DON'T fold more than needed, as this will cause material fatigue and all bends are on the dotted lines.
2) To avoid tearing when pulling on the tabs with needle nose pliers, always hold the piece with the slots firmly to the table behind the pulling direction or between your fingers.

3) Carefully remove Component 1.
4) Clear all holes, without ripping the card stock. This is where material fatigue can be used to your advantage.
5) Fold all dashed lines (blue) up and over (180 degrees), then unfold to original flat location. This part is symmetrical so doesn't matter which side you start on.
6) Remove Component 2 and clear all holes, without ripping the card stock.
7) Slide the motor mount arms though the outer vertical slots of Component 2.

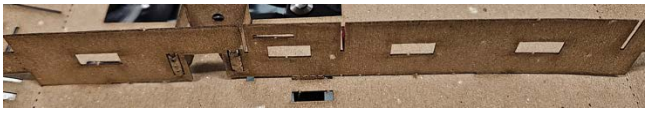


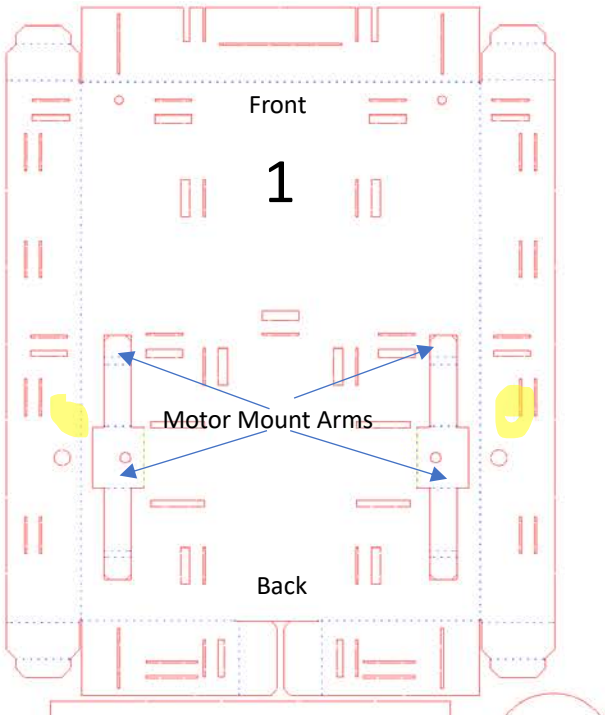


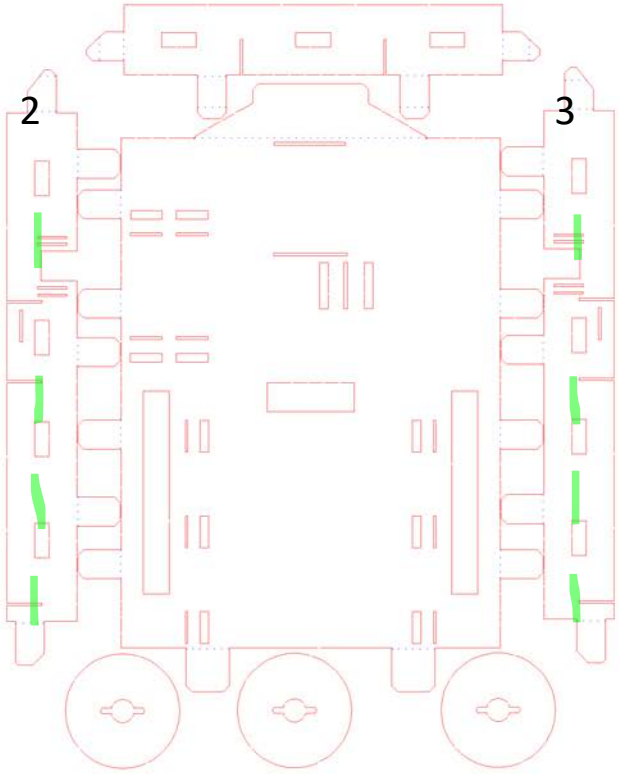
8) Bend over the motor mount arms end tabs, insert into inner vertical slots of Component 2 and snug Component 2 to bend.



9) Carefully place the three bottom tabs into the thin slots in Component 1. Push Component 2 flush to Component 1.



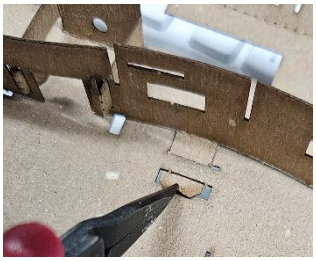




10) Bend the tabs along the dotted lines towards the associated wider slot.

11) Starting from the back end of the bot, lay the tab flat and slightly bend it so that it just peeks into the wider slot. Take a pair of needle nose plyers and carefully grab the end of the tab.
12) With the bot on the table and you holding close to behind the thin slot, pull the tab up and into the wide slot until the dotted end is touching the thin slot.

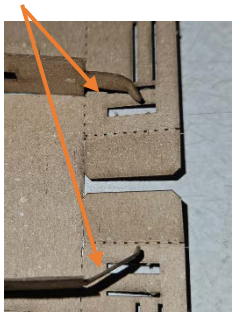
13) Repeat Steps 12 and 13 for the middle tab.

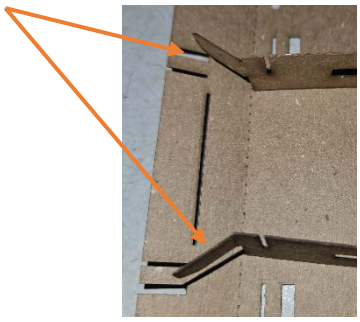


14) Repeat Steps 12 and 13 for the last tab.

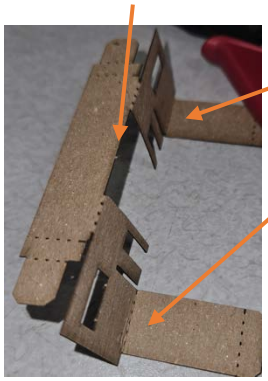
15) Repeat Steps 6 to 15 for Component 3.

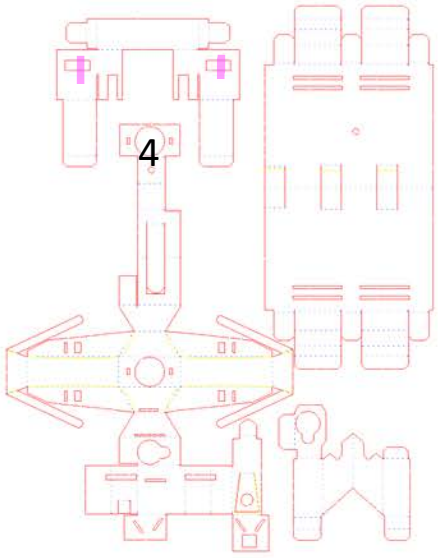
16) Bend front tabs on Components 2 and 3 towards the outer sides of the bot body.
17) Bend the back tabs on Components 2 and 3 towards each other.



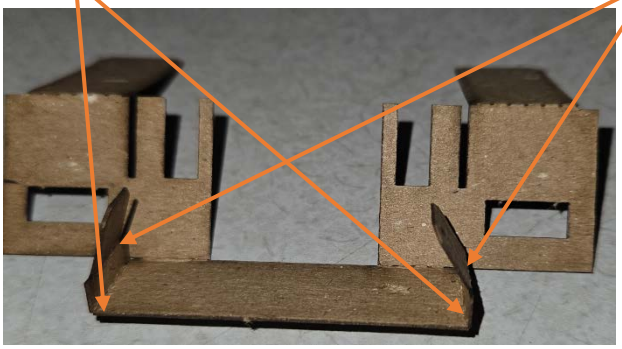


18) Remove Component 4 from sheet and pop out the holes.
19) Bend the top -90 degrees and the two large tabs 90 degrees.

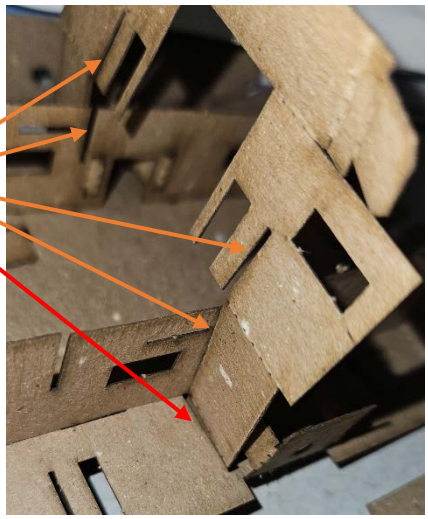




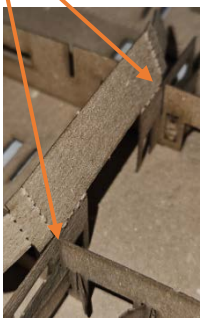
20) Bend the two inner parts of the outer top tabs towards the two large tabs by 90 degrees and then bend the two outer tabs inwards by 45 degrees.



21) Re-flatten Component 4 and slide it into the slots in Component 1 on the outer sides of Components 2 and 3 near front end of the motor mounts.



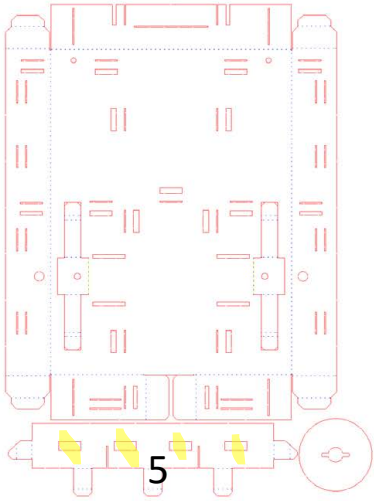
22) Slide Component 4 until it rests Component 1. The two small slots in Component 4 fit into the small slots in Components 2 and 3.



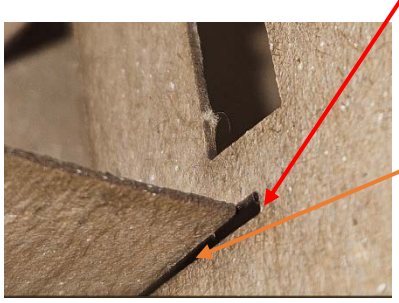
23) Turn the bot over and bend the end tabs (on both sides) enough to feed the tabs into the wider slot.

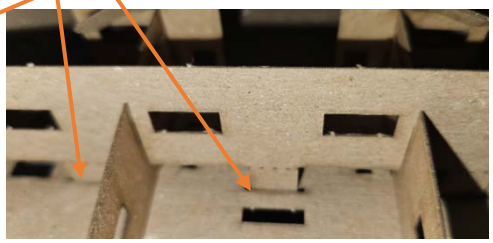
24) Turn back over and pull the tabs (using needle nose pilers) until Component 4 is flush with the motor mounts.

25) Remove Component 5 from the sheet and pull out the holes.

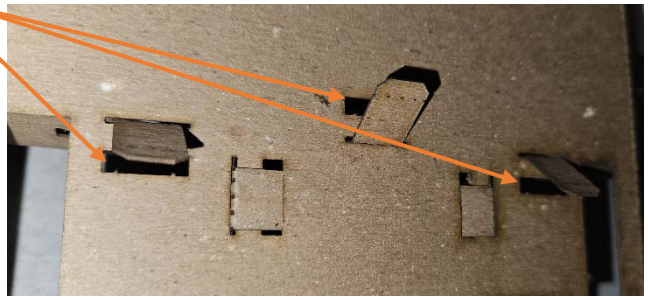


26) Slide the 3 tabs of Component 5 into the 3 thin slots across the middle of Component 1. While Component 5 is being slid, make sure that the thin slots in Component 5 fit into the thin slots of Components 2 and 3. Slide Component 5 down until it reaches Component 1.

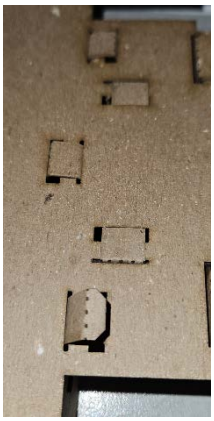




27) Fold the 3 tabs over, towards the wider holes in Component 1.

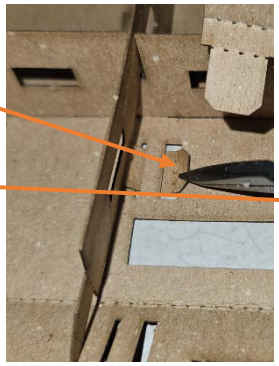


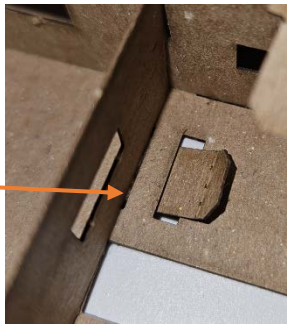
28) Fold along the dotted line at the end of three tabs then tuck the tab into the wide slot.



29) Turn over bot and carefully pull one of the side tabs through slot until Component 5 is snug to thin slot.

30) Repeat Step 29 for the other two tabs.

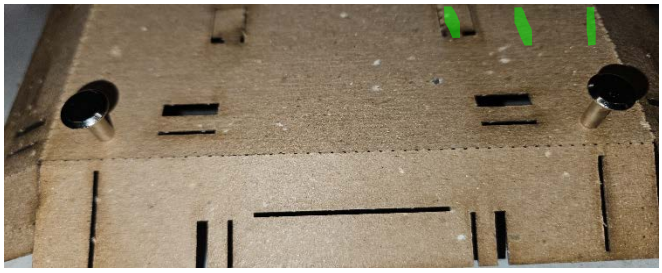




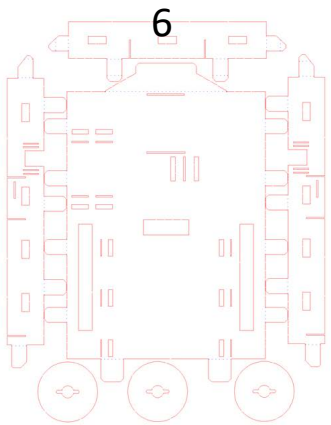
31) Put the two Chicago screws into the small holes at the front of Component 1. The slotted head goes into hole from top side of Component 1.

32)

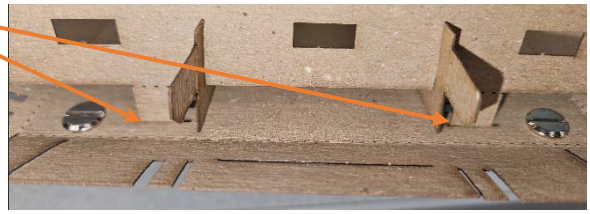
33) Once tightened, align the slots so they are parallel to the thin slots.



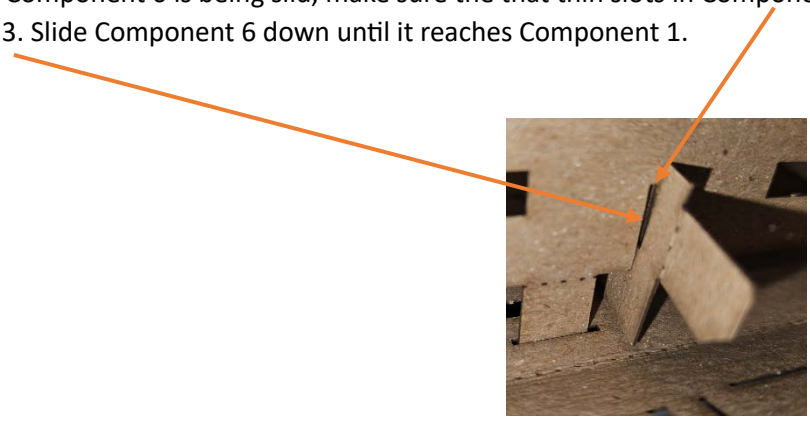
34) Remove Component 6 from the its sheet and pull out the holes.



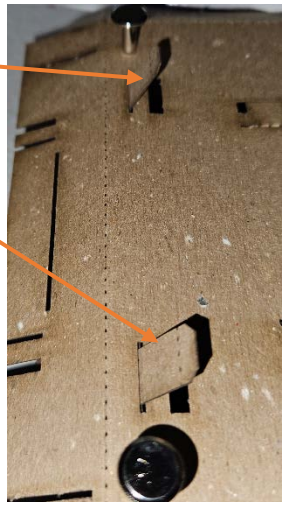
35) Slide the 2 tabs into the 2 thin slots at the front of Component 1.



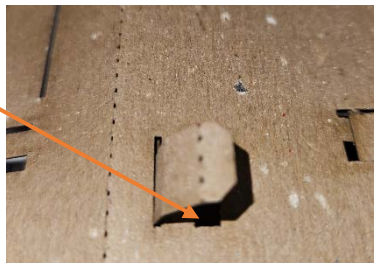
36) While Component 6 is being slid, make sure the that thin slots in Component 6 fit into the thin slots of Components 2 and 3. Slide Component 6 down until it reaches Component 1.



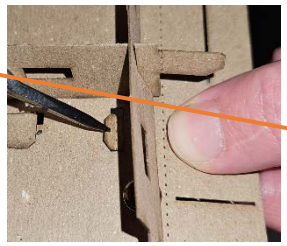
37) Fold the 2 tabs over, towards the wider holes in Component 1.

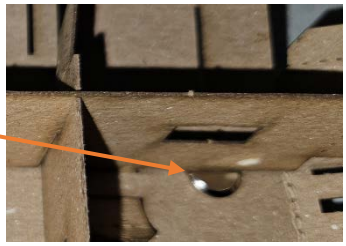


38) Fold along the dotted line at the end of two tabs then tuck the tab into the wide slots.



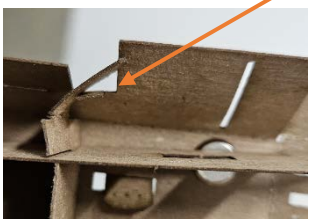
39) Turn the bot over and carefully pull one of the tabs through slot until Component 6 is snug to thin slot. Make sure that Component 6 fits in the Chicago screw head slot.



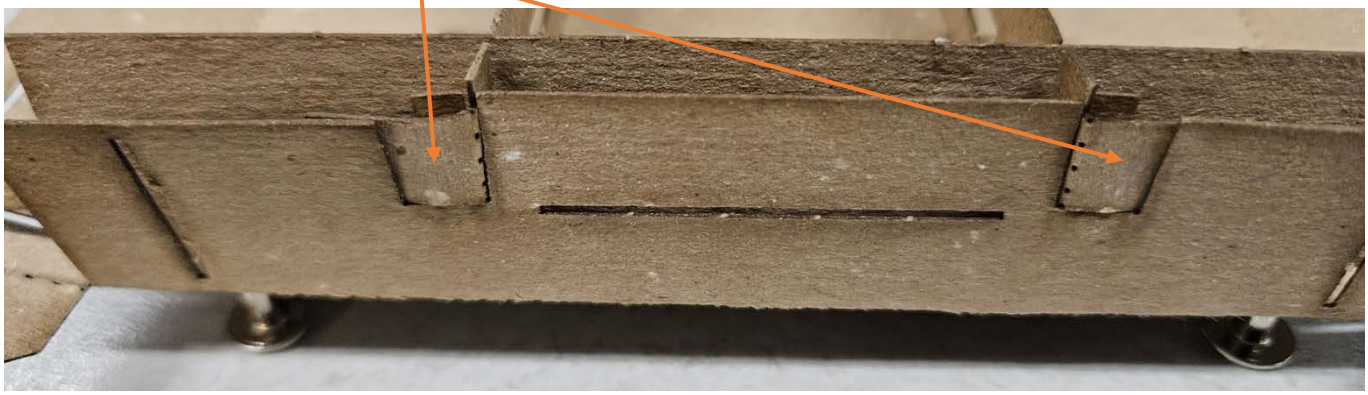


40) Repeat Step 38 for the other tab.

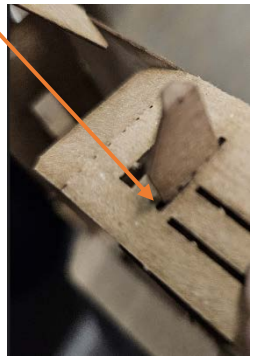
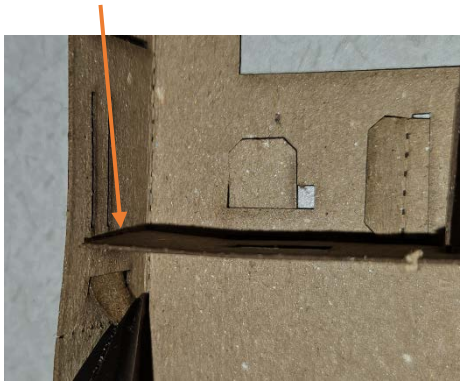
41) Fold up the front of Component one and carefully slide the tab of Component 2 through the two (thin and wide slots). You can bend the tab between the slots back a little (don't crease) to aid in this step.



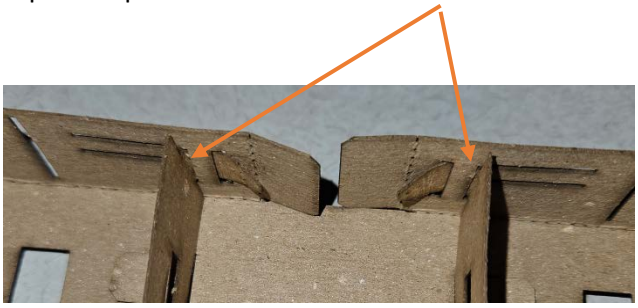
42) Repeat step 40 for the other side.



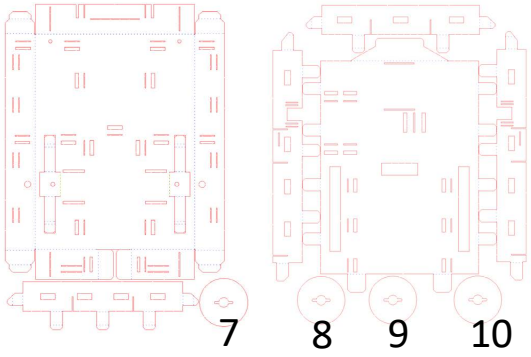
43) Turn to the back of the bot. Fold one of the back slots over the tab on Component 2 (or 3, whichever you started with), feeding the tab through the thin slot.
44) Bend tab at dotted line and feed tab through wide slot.
45) Gently pull tab through until Component 2 (or 3) sits against the back slot of Component 1.

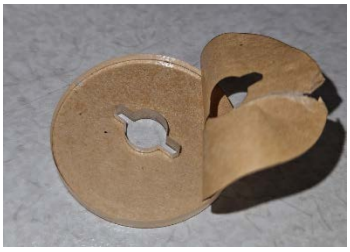
46) Repeat steps 42 to 44 for other back tab.




47) Remove Components 7, 8, 9 and 10 from the sheets and pop out the centres.

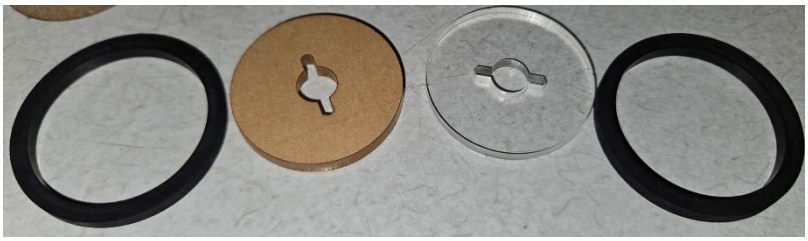


48) Gather the acrylic wheels, black rubber tires, 3D-printed wheel hubs and ¼" machine screws.
49) You *can* remove the paper from the acrylic wheels, but *there is no need to*.



50) Carefully thread one ¼” machine screw into the wheel hub. Drive the screw down until either the head bottoms out or the end bottoms out. **Don’t over tighten**, stop when it just reaches the bottom, or you will strip the plastic.

51) Repeat for the second hub.
52) Back out the screws so that the threaded end of the screw is recessed from the “D” hole.
53) Fit the black tires onto the plastic wheels.

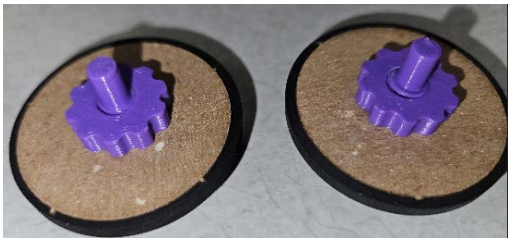


54) Stack Component 7 on one hub and Component 8 on the other.

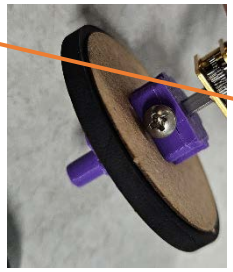
55) Stack the wheels on the hubs.

56) Stack Component 9 and Component 10 on the plastic wheels.

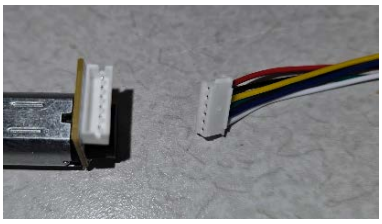
57) Put the hub nuts onto the hubs. If you find it difficult to start the nut, turn over the nut and try again.

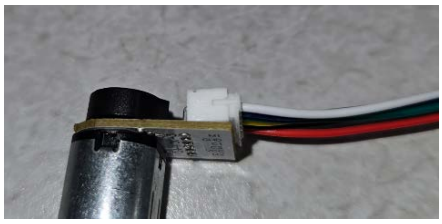
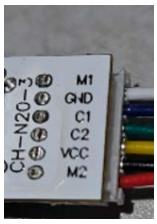


58) Try putting the motors on the hub. Don't screw it in place. This is a fit test. Make sure you can seat motor shaft until it bottoms out. The motor shaft is a "D" shape and so is the hole in the hub. Don't force it in the wrong way.

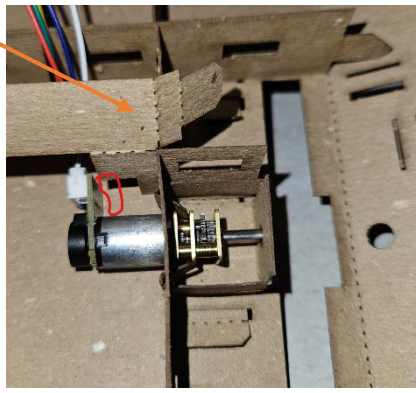




59) Connect the motors to the motor connector wires that were soldered in Lab 1. Once connected, write down the receptacle wire colour or take a picture (not the motor connector wire colour, unless they are the same) to motor connector designation. You will need this when making connections to the MSEduino.



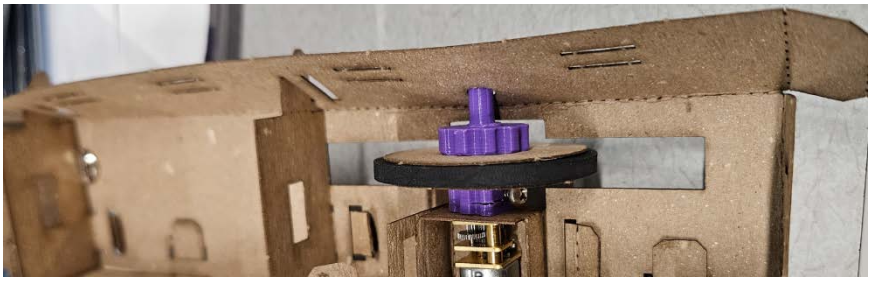
60) If thin tab on Component 4, where red loop is, is on your kit, cut it away with side cutters.
61) Slide motor into motor mount but not all the way through motor shaft should be just through the hole.

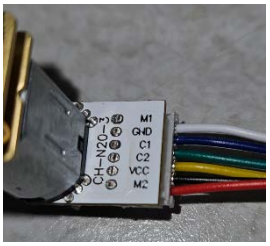


62) At front of bot, pull up the side flap of Component 1 and slide the tab of Component 6 though the thin slot.

63) Put a wheel in the Component 1 side flap hole by the motor mount and slide the side flap through the thin slot over the tab of Component 5.

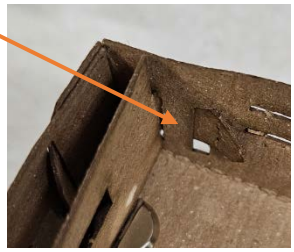
64) Slide the wheel onto the motor shaft. If you can reach the screw, tighten it until the screw is snug. Don't over tighten or hub will crack. If you can't reach the screw, power the motor (the M1 and M2 wires) from a power supply with 3 V and turn the motor until the screw is reachable.





65) Fold the Component 1 side flap front end tab into the thin slot on the front flap.

66) Bend the tab of Component 6 along the dotted lines and feed it through the wide slot in Component 1. It may be a bit tight, but it will fit. Once the tab is through the slot, pull it tight with needle nose pliers.

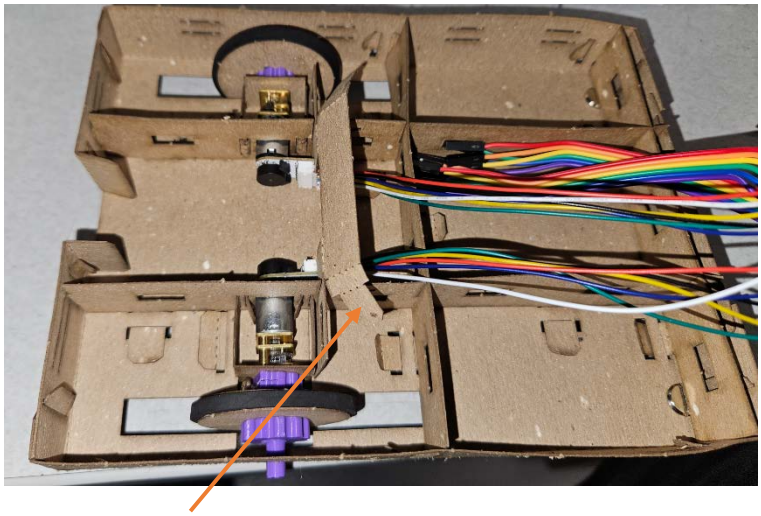


67) Bend the tab of Component 5 along the dotted lines and feed it through the wide slot in Component 1. Then pull it tight with needle nose pliers.

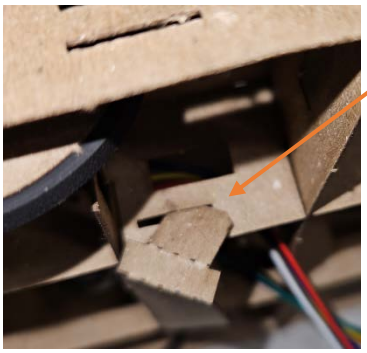
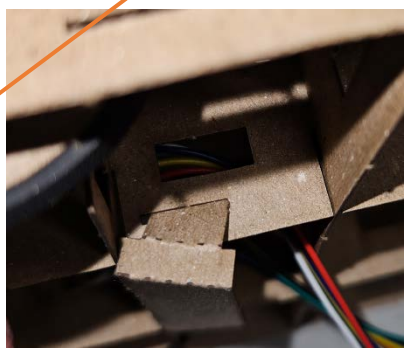
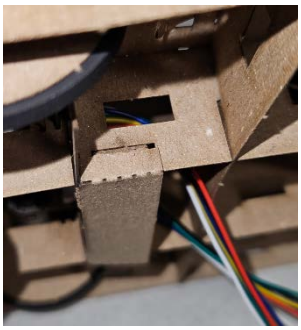
68) Fold the Component 1 side flap back-end tab into the thin slot on the back flap.



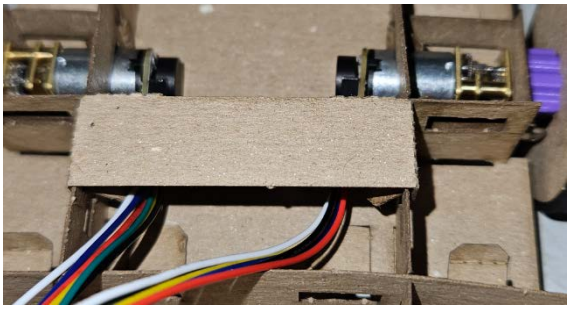
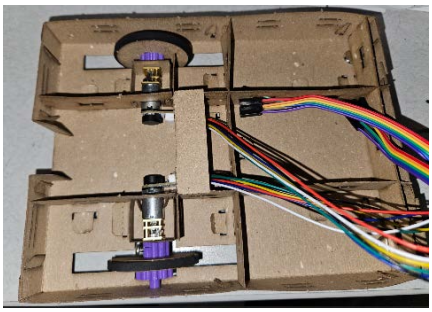
69) Repeat steps 60 to 68 for other side of the bot and motor.



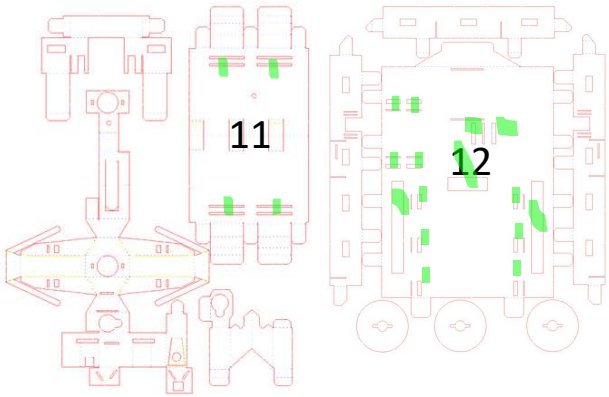
70) Tuck top tab of Component 4 into thin slot of Component 2. It is tight, but it does fit.

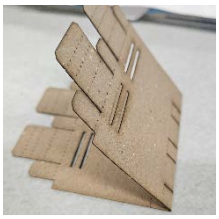
71) Tuck other top tab of Component 4 into the thin slot of Component 3.

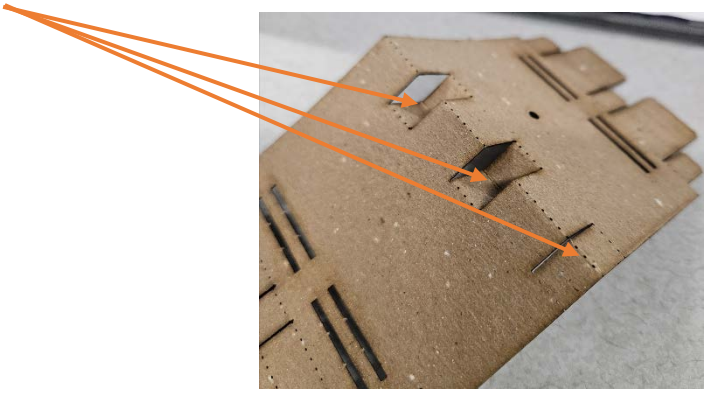
72) Remove Components 11 and 12 from their sheets and pop out the holes.



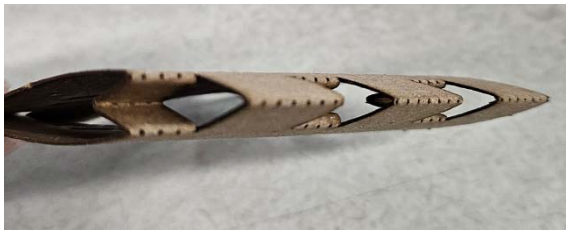
73) Fold Component 11 in half along the middle dotted line.

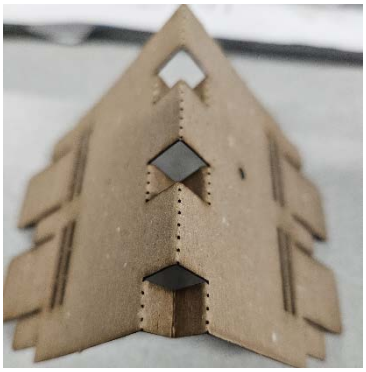


74) Mostly unfold and carefully push down on the three middle tabs.

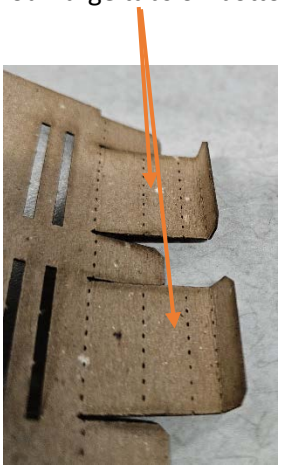


75) Then refold to re-enforce these folds.

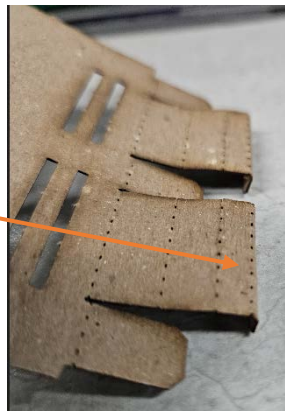




76) The following steps are preformed on the four large tabs on bottom of Component 11. There are two on each side.

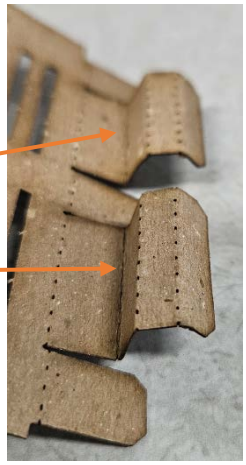


77) Fold the bottom dotted line up and then down.

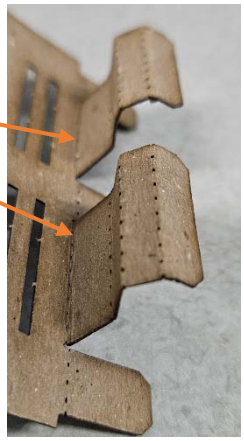


78) Fold down the next dotted line.

79) Fold the third dotted line up.



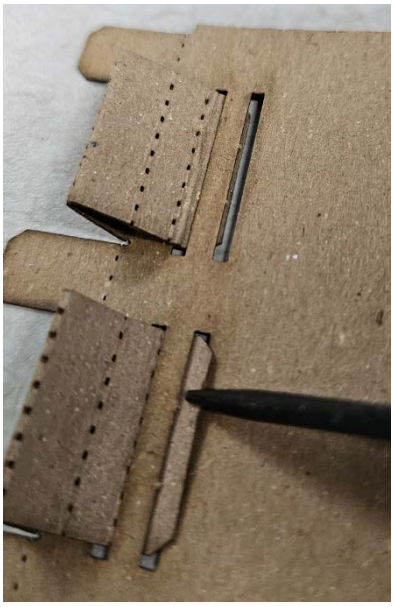
80) Fold the last dotted line up.



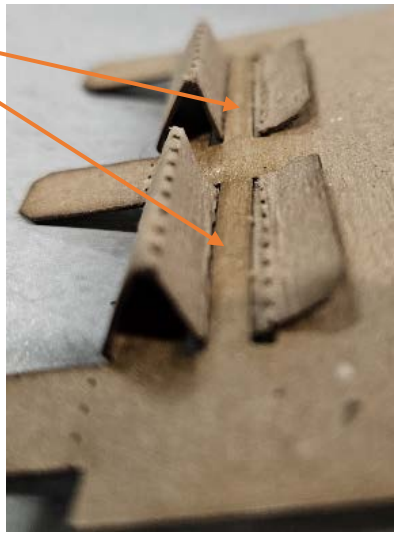
81) Repeat the folds from Steps 77 to 80 on the other side of Component 11.

82) Tuck the tabs into the lower thin slot.

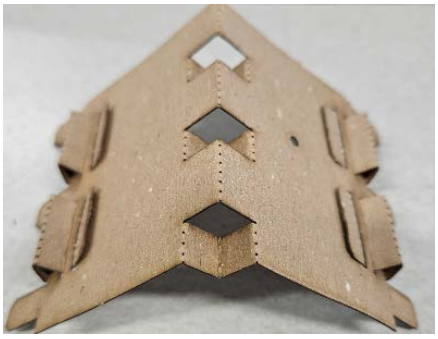
83) Carefully pull the tab through the upper thin slot. You may need to push the edge of the tab so the tab will slide through.



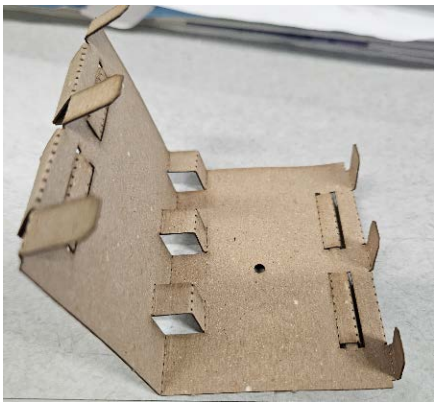
84) Slide tab until the second dotted line from the tab end is upto the thin bridge between thin slots.



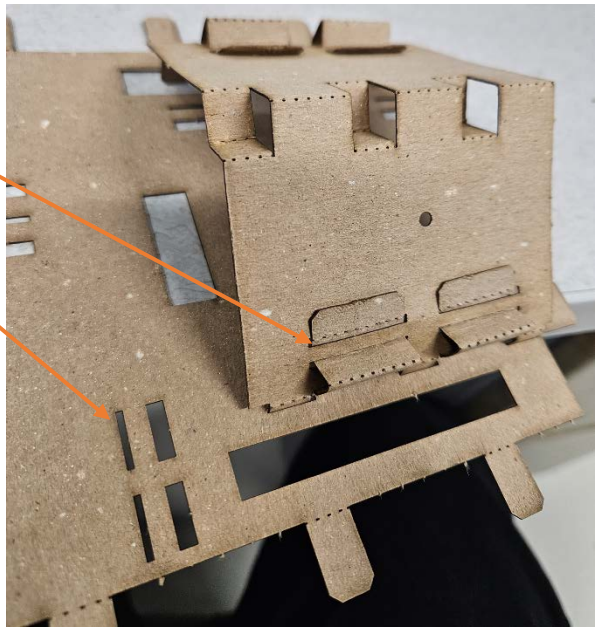
85) Once finshed, Component 11 should look like this.



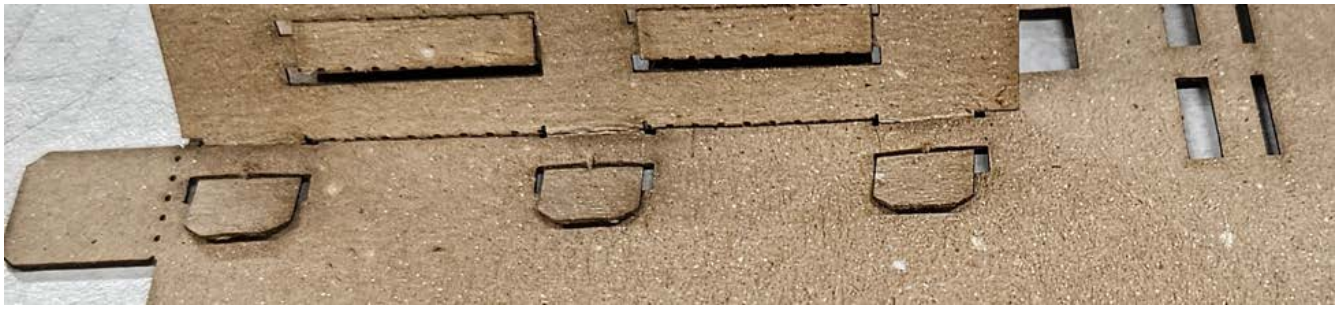
86) Flip Component 11 over and fold the 6 smaller tabs inwards.



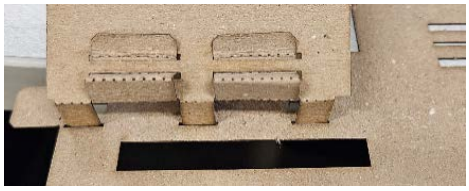
87) WATCH ORIENATION of COMPONENT 12. Slide three of the small tabs of Component 11 into the thin slots on Component 12.



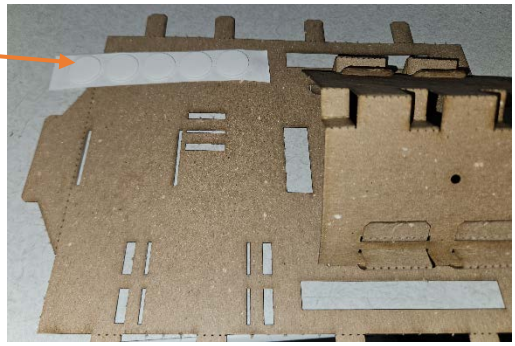
88) Starting at one end, insert the tabs but do not fully pull them through until all three tabs are started. Pull the tabs through wide slot until snug against thin slot.



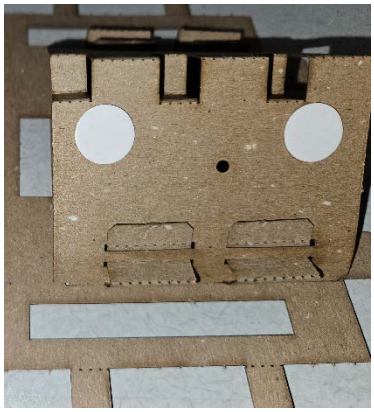
89) Slide the other three tabs into the thin slots on the opposite side of Component 12. Follow the same advice from Step 88. Be patient, this step is a bit tricky since you are working inside Component 11.

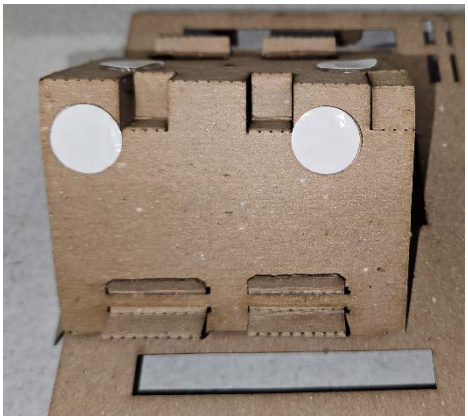


90) Find the strip of 5 Gecko sticky dots.

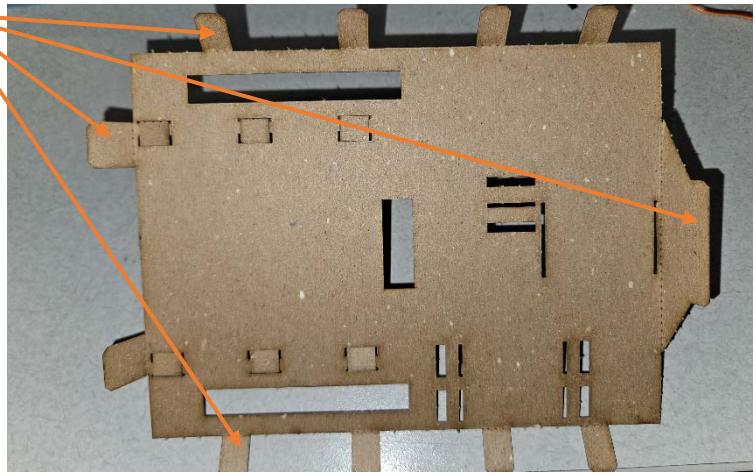


91) Put two on one side of Component 11 and two of the other side of Component 11.

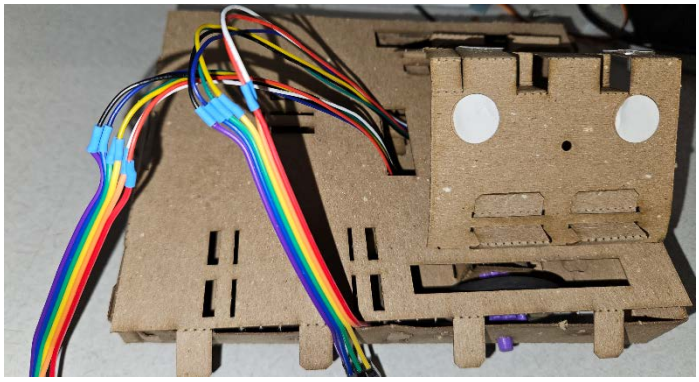




92) Fold all of the outside tabs on Component 12 downwards (away from the side with Component 11).



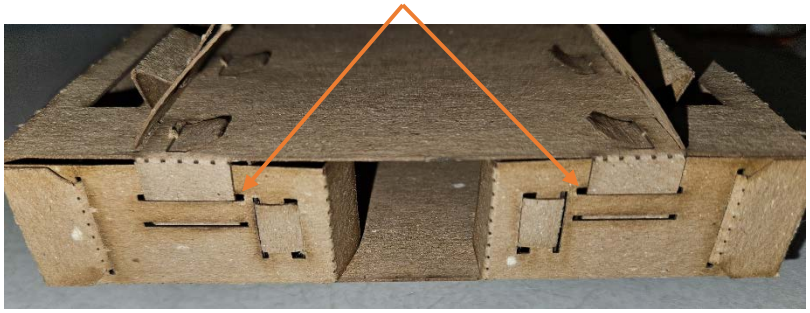
93) Feed the motor wires through the middle wide slot of Component 12.



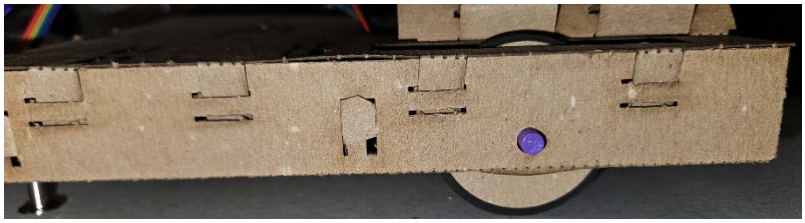
94) The outside tabs of Component 12 do not need to be threaded through the double slots in Component 1 at this stage. You just need the top slot for the next few steps.

95) If you have trouble getting the tab into the slot, you can use a flat head screw driver (or some other flat object) to bend the slot open.

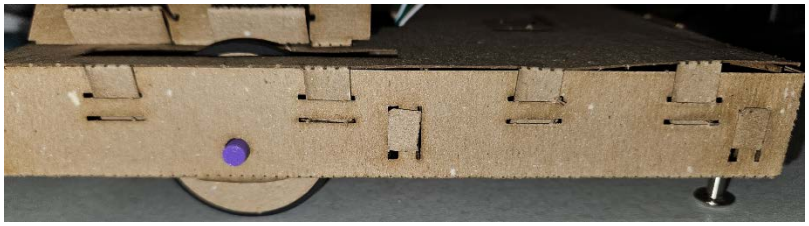
96) Tuck the two back tabs of Component 12 into the top thin slots of Component 1 (robot base).



97) Feed the four left side tabs of Component 12 into the top thin slots on left side of Component 1.

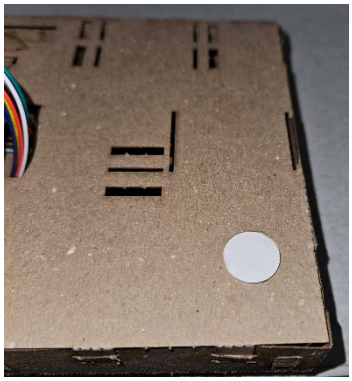
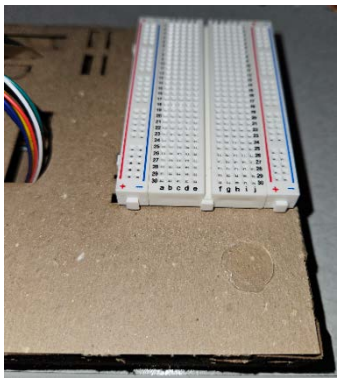
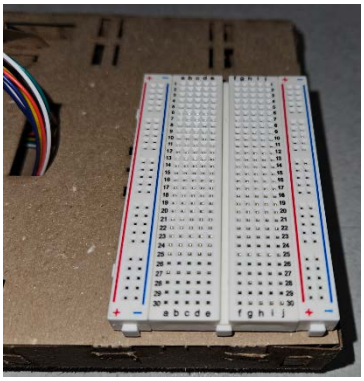


98) Turn bot to the right side and tuck the four right tabs into the thins slots.



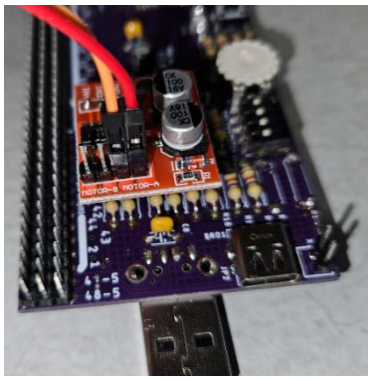
99) Slide the large front tab of Component 11 into the large thin slot of Component 12.

100) Place the last Gecko sticky dot on the front of the bot. Remove the dot's paper and stick the modular solderless breadboard to the top front of the robot.

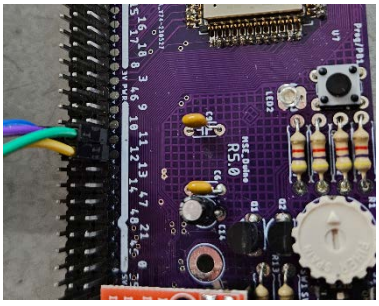
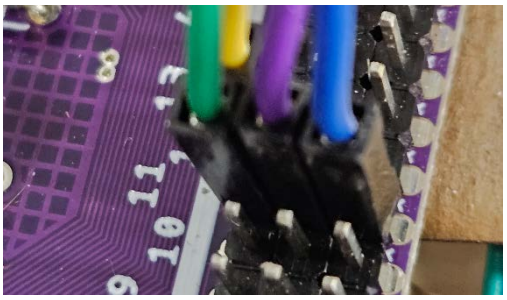




101) Feed the motor the wires through the middle of item 11 and out to the back of the MSEbot.

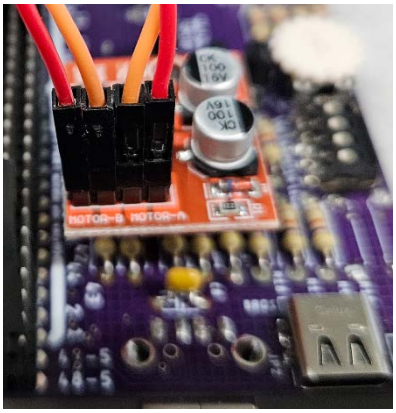
102) Plug the right motor wires M1 and M2 into the Motor A pins of the MX1508 motor controller.



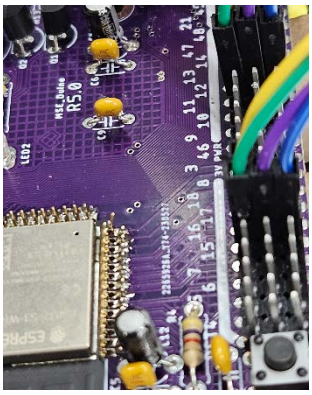
103) Plug the right motor encoder wires into the MSEduino board. Plug C1 into the top pin (closest to inside of board) of header slot 11 (GPIO 11). Plug the encoder VCC wire into the middle pin of slot 11 and the encoder ground pin into the bottom (outside) pin. Plug C2 into the top pin (closest to inside of board) of header slot 12 (GPIO 12).

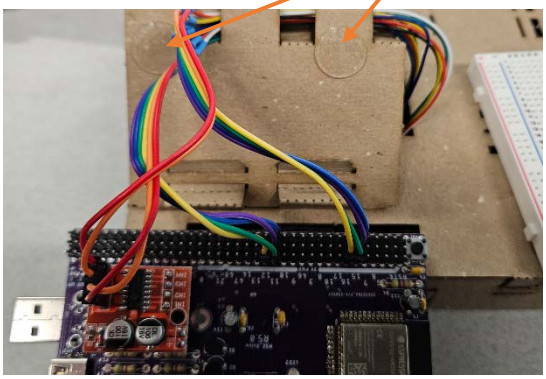

104) Plug the left motor wires M1 and M2 into the Motor B pins of the MX1508 motor controller.

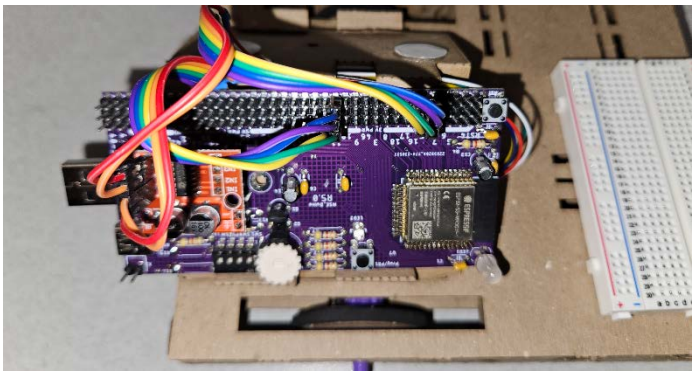


105) Plug the left motor encoder wires into the MSEduino board. Plug C1 into the top pin (closest to inside of board) of header slot 15 (GPIO 16). Plug the encoder VCC wire into the middle pin of slot 15 and the encoder ground pin into the bottom (outside) pin. Plug C2 into the top pin (closest to inside of board) of header slot 16 (GPIO 16).



106) Peel the white paper from the Gecko sticky dots on the right side of Component 11 and place the MSEduino board onto the dots.





Done!!!