



micro:bot Kit Experiment Guide

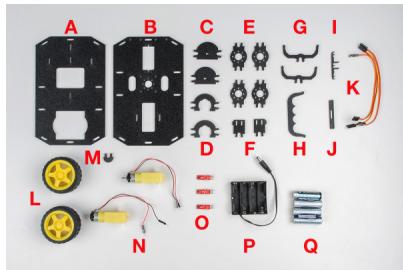
 CONTRIBUTORS:  **D---RUN---**,  **THEDARKSAINT**,  **BBOYHO**,  **ELL C**
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Assembling Your Robot

This section will cover how to assemble your robot chassis. **Assembly time: 30-60 minutes**

The robot chassis requires the following pieces to build. You'll find most of them in your SparkFun micro:bot kit.

Note: Several of the parts need to be snapped out of the main chassis panels.



Click on the image for a closer look.

Letter	Part	Qty
A	Bottom Chassis Plate	1
B	Top Chassis Plate	1
C	Front Motor Mount	2
D	Rear Motor Mount	2
E	Side Strut	4
F	Encoder Mount (Not Used in this Guide)	2
G	moto:bit Mount	2
H	Battery Pack Clip	1
I	Line Follower Mount	1
J	Line Follower Mount Plate	1
K	Jumper Wire — 3-pin, 6"	3
L	Wheels	2
M	Nub Caster	1
N	DC Motors	2
O	Line Follower Boards	3
P	4xAA Battery Holder	1
Q	4xAA Batteries (Not Included)	3

No Tools Necessary

The robot chassis does not require any additional tools.

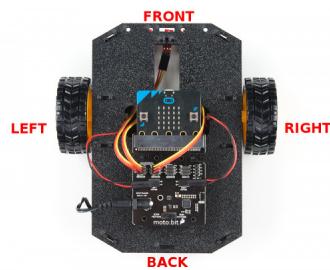
WARNING: Do not attempt to remove chassis parts by squeezing them with pliers. If you try to muscle it too much

you risk breaking them and compromising the structure of your robot. Handle with care. ;)



A Note About Orientation

When we talk about the "front," "left," "right," and "back" of the Shadow Chassis, we are referring to specific sides of the robot when viewed from above.

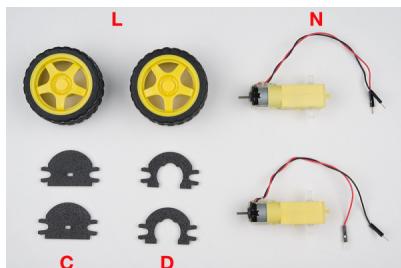


Notice that we consider the SparkFun moto:bit to be on the "back" of the bot and the Bumper Whiskers and Line Follower Boards to be in the "front."

Assembly

Installing Motors

Let's begin by installing the motors that will control the wheels. Locate the following:

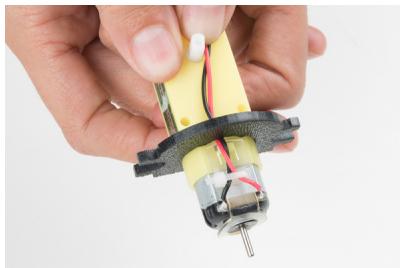


Attach Rear Motor Mounts

Hold the wires near the middle of the Motor (N), and carefully slide a Rear Motor Mount (D) in from the side and over the two motor wires. Be careful not to snag the wires, the cable tie, or the clear plastic strap.



Holding the motor wires, gently twist the Rear Motor Mount counter clockwise so that it snaps in place on the motor and the wires are centered in the gap of the motor mount. Again, be sure not to snag the wires under the motor mount.



Repeat the process for the second motor, ensuring that it is a mirror image of the first.



Attach the Front Motor Mounts

Slide a Front Motor Mount (C) onto the protruding eyelet on the front of a Motor (N). Ensure the rounded sides of the motor mounts are facing the same way.



Repeat the process for the second motor.



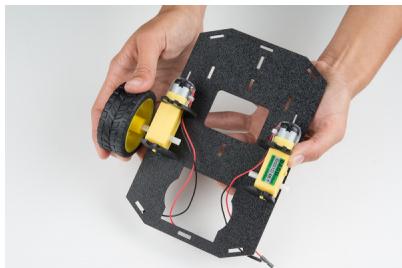
Attach the Motor Assemblies to the Chassis

Snap one of the motor assemblies into the left two horizontal slots of the Bottom Chassis Plate (A). Make sure that the rounded edges of the motor mounts and the wires are facing toward the center of the chassis. Repeat for the opposite motor.



Attach the Wheels

Slide one Wheel (L) onto the plastic shaft of a Motor (N). Look at the motor shaft. Notice it has two flat edges. Make sure to line up the flat edges of the motor shaft with the flat edges of the wheel.

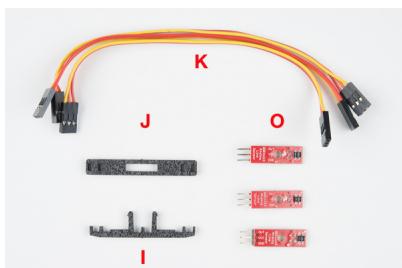


Repeat with the other wheel.



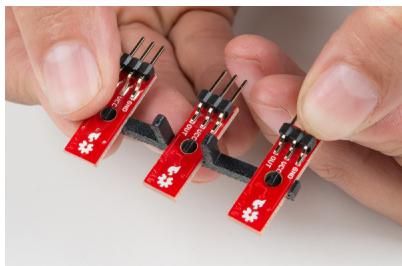
Installing the Line Sensors

This section will cover the Line Following Sensors array assembly. You'll first build the Line Following array and then attach it to the chassis. Locate the following:

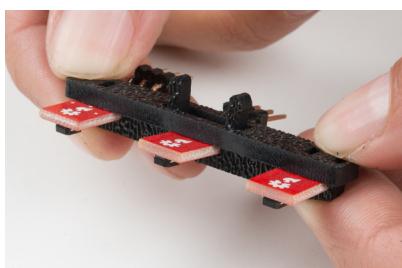


Construct the Line Follower Assembly

Attach the three Line Follower Boards (O) to the Line Follower Mount (I) such that the rectangular pegs in the Line Follower Mount poke through the mounting holes in the Line Follower Boards. Make sure the sensors are facing away/down from the clip of the mount.



Place the Line Follower Mount Plate (J) on top of the Line Follower Mount (I) so that the center clip of the mount is poking through the center slot of the plate.



Attach the Cables

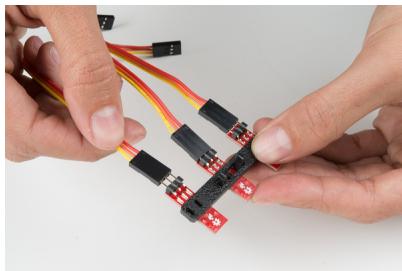
You will need to connect a 3-Wire Jumper Cable (K) to each of the Line Follower Boards (O). Note the color of the wire attached to each pin.

Line Follower Connections:

Jumper Wire Color	RedBot Sensor - Line Follower
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Red	GND
Orange	VCC
Yellow	OUT

Attach all 3 cables to the 3 Line Follower Boards. Notice that the yellow wire should be on the right (out) and the red wire should be on the left (ground).



Attach the Line Follower Assembly to the Chassis

Locate the wide, rectangular slot near the front of the chassis and snap the line follower assembly in from the bottom side of the chassis. Route the cables through the large hole in the bottom plate.

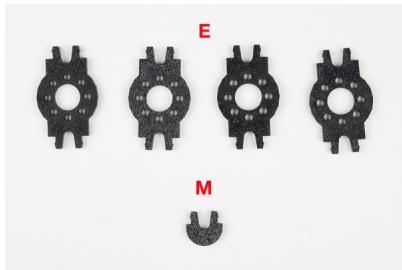


The bottom of your chassis should look like the following image allowing the line sensors to be facing down.



Final Assembly

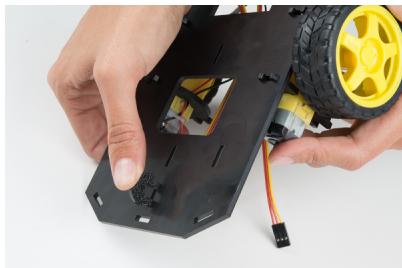
With the motors and a few sensors attached, we can assemble the main body of the robot. Locate the following:



You will also need the **Top Chassis Plate** and **Bottom Chassis Plate** assemblies, which have any additional parts and sensors you attached in previous steps.

Attach the Nub Caster

Snap the Nub Caster (M) into the slot on the back of the Bottom Chassis Plate assembly. Make sure the Nub Caster is on the side opposite the motors (the bottom side).



Add the Side Struts

Snap the four Side Struts (E) into the diagonal slots on the four corners of the Bottom Chassis Plate assembly.



Pull the cables through the cutouts on the chassis.



Route the Cables

Position the Top Chassis Plate over the Bottom Chassis Plate -- but do not snap the two plates together yet. Make sure that the front sides of each plate line up.

Route the wires and cables through the left and right oval slots in the Top Chassis Plate assembly as shown. For the center line follower sensor, route this cable through the left oval slot.

NOTE: It might be a good idea to use some pieces of masking tape to mark which cables go to which component. It's not necessary, but it might help keep things organized.

Cable Routing:

Cable Connection	Oval Side
Left Line Follower	Left
Center Line Follower	Left
Right Line Follower	Right
Left Motor Wires (red and black)	Left
Right Motor Wires (red and black)	Right



Attach Top Chassis Plate Assembly

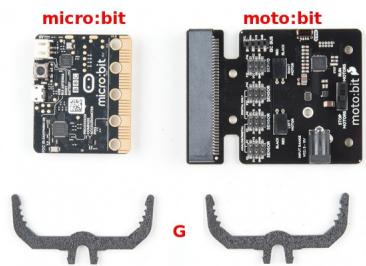
Line up the Top Chassis Plate on top of all the struts, and carefully snap the Top Chassis Plate assembly onto the side struts and motor mounts. Press gently above each side strut individually until they each snap into place. If you have the Bumpers installed, make sure the boards are between the top and bottom plates.



If you need to remove the plate to change anything, gently pull upward on each side strut individually. Do not attempt to use pliers or hand tools, or you may end up snapping the plastic clip.

Attaching the moto:bit

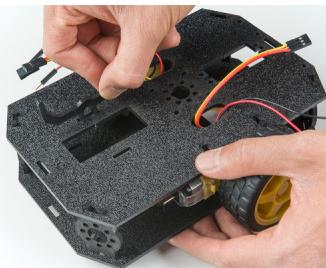
In this section, you will add brains of the robot: the micro:bit and SparkFun moto:bit. Locate the following:



You will also need the full chassis assembly, which contains any additional parts you attached in previous steps.

Attach the moto:bit Mounts

Snap the two moto:bit mounts (G) into the vertical slots in the back of the top chassis plate near the large rectangular opening.

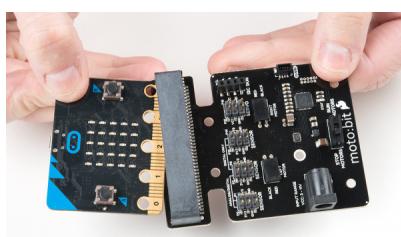


Both of these mounts will enable your moto:bit board to be mounted to the chassis.

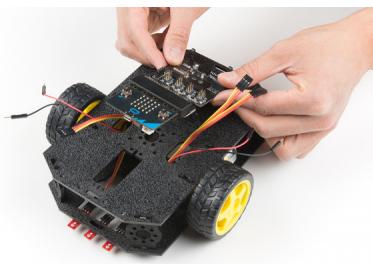


Add the moto:bit

Before you snap in the moto:bit board, insert your micro:bit into the moto:bit as shown here.



The moto:bit snaps into the lowest of the notches on the moto:bit Mounts (G). Make sure the power jack is facing the left side of the robot. Push gently and evenly until it snaps into place.



Note: The other slots in the moto:bit mounts can be used to hold the Arduino Uno or the Sparkfun RedBoard.

Once snapped, your setup should look like the image below without the wires connected to the moto:bit board

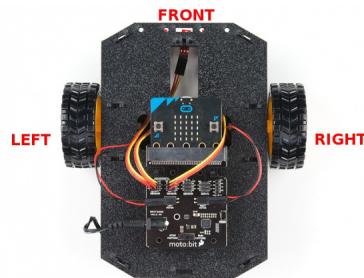


Connecting the Cables

It is time to connect the jumper wires; it is really important that these connections are right.



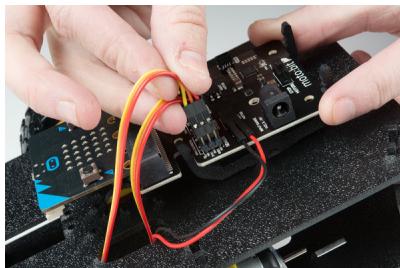
Follow along with the tables and annotated image with the cables connected for reference. Trace each cable poking through the top chassis plate to make sure you know what it is connected to.



Please Note: When you have the micro:bit upright and the front of the chassis facing away from you, "left" sensors/motors will be on the left side and "right" sensors/motors will be on the right side. Also, the motor wires are intentionally switched for the right motor -- see notes below.

Line Followers

Below is a table for each connection between moto:bit and analog line follower. Start with the left line follower.



Left Line Follower:

SparkFun moto:bit Pins	Jumper Wires	Left Line Follower Board
P0	3-Wire Jumper Cable - Yellow	OUT
3.3V	3-Wire Jumper Cable - Orange	VCC
GND	3-Wire Jumper Cable - Red	GND

Center Line Follower:

SparkFun moto:bit Pins	Jumper Wires	Center Line Follower Board
P1	3-Wire Jumper Cable - Yellow	OUT
3.3V	3-Wire Jumper Cable - Orange	VCC
GND	3-Wire Jumper Cable - Red	GND

Right Line Follower:

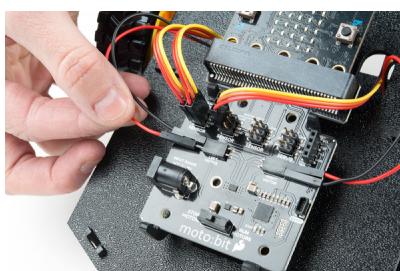
SparkFun moto:bit Pins	Jumper Wires	Right Line Follower Board
P2	3-Wire Jumper Cable - Yellow	OUT
3.3V	3-Wire Jumper Cable - Orange	VCC
GND	3-Wire Jumper Cable - Red	GND

Once connected, the wires should look similar to the image below.



Motors

Choose a pair of motor wires to begin wiring up to the moto:bit. The way the motors are wired up to the moto:bit will affect how the micro:bot drives. Make sure to follow the color of the wire with the silkscreen on the board.



Below is a table for each connection between moto:bit and motor.

Left Motor:

SparkFun moto:bit Pins	Left Motor Jumper Wires
LEFT MOTOR - RED	Soldered on Motor Jumper Wire - RED

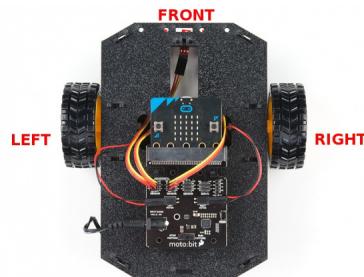
LEFT MOTOR - BLACK

Soldered on Motor Jumper Wire - BLACK

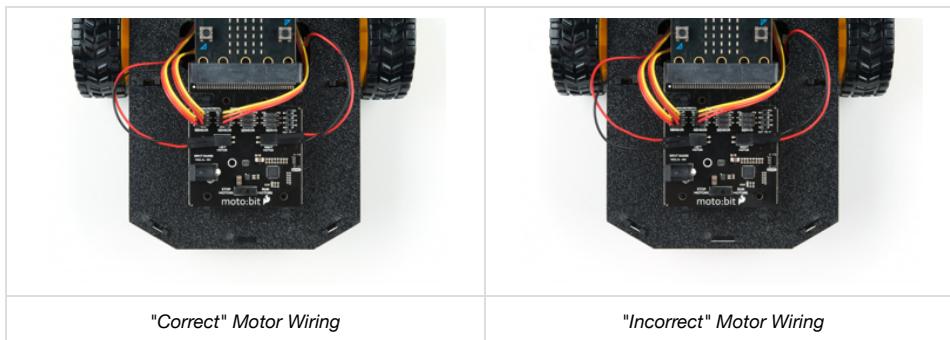
Right Motor:

moto:bit Pins	Right Motor Jumper Wires
RIGHT MOTOR - RED	Soldered on Motor Jumper Wire - BLACK
RIGHT MOTOR - BLACK	Soldered on Motor Jumper Wire - RED

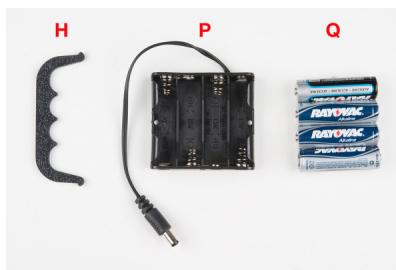
Once all wires are connected it should look like the following image.



⚠ Warning! So what happens when you wire the motors the other way? Well, your motor may move a different direction when using the example code provided in this tutorial. There are two options if you notice the micro:bot moving in the wrong direction. You can flip the wiring of your motors or use the adjust the code blocks to change what is forward vs reverse. It's relative so either connection can be "correct" if the code you are using is consistent. We recommend following the silkscreen to reduce the amount of time troubleshooting.

**Batteries**

The last step is to provide a power source for the micro:bot. You will need to provide your own AA batteries (Q). Locate the following:

**Insert Batteries**

Insert the AA batteries into the Battery Holder (P). Makes sure the batteries are facing the correct direction, as per the markings inside of the Battery Holder.

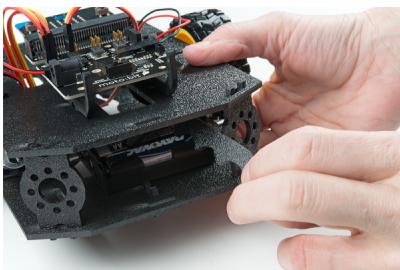


Attach Battery Pack

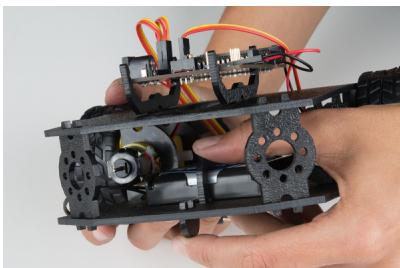
Insert the Battery Holder (P) with batteries into the back cavity of the chassis. Position the Battery Holder so that the barrel jack cable comes out on the left side of the robot.



Insert the Battery Pack Clip (H) on top of the battery pack.



Twist and position the clip so that it rests on top of the battery pack.



Push the clip down into the vertical slots in the Bottom Chassis Plate so it snaps in place.



Route the barrel jack cable out of the left side of the chassis and up to the moto:bit.

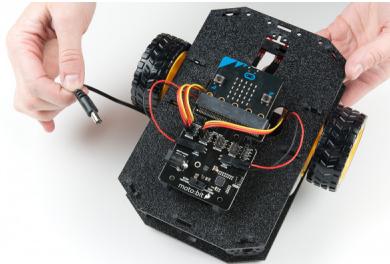


Plug the barrel jack cable into the barrel connector on the side of the moto:bit carrier board.



Changing the Batteries

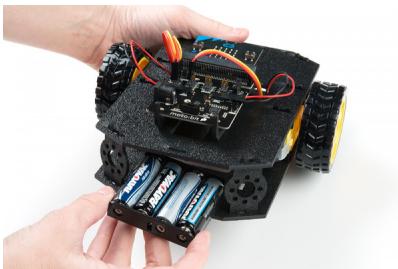
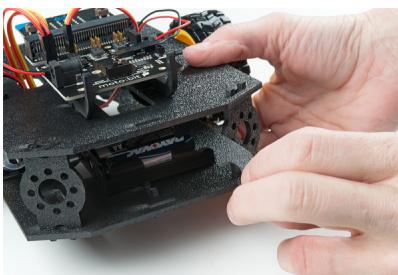
If you find that you need to replace the batteries in the micro:bot, the process is simple. Unplug the battery pack from the moto:bit.



Turn the micro:bot over and push on the Battery Holder through the hole in the Bottom Chassis Plate. This will cause the Battery Pack Clip to unsnap from the Bottom Chassis Plate.



Slide the Battery Pack and Clip out from the back of the micro:bot.



Change the batteries, and follow the steps in *Attach Battery Pack* section above to put the Battery Pack back in the micro:bot.

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[ABOUT THE MOTO:BIT BOARD](#)