DJ Create

iRobot Education

So you want to impress your friends with a roaming, robotic DJ at your next party, but that speaker that you glued on top of your Create® 2 keeps getting knocked off. Follow along here and see how you can build your own DJ Create.

Get ready to rock with a roaming, robotic DJ! We will show you how put two speakers and a Bluetooth module into your Create 2 bin for less than $15 in parts.

Overview

Preparing your electronics

1) Remove all of your electronics from their packaging and lay them out on your work surface.
2) Choose which speaker will be the left and which will be the right and label them accordingly.

Wiring the audio amplifier board

1) Connect each speaker to the corresponding screw-down terminals on the amplifier board. Be careful to observe the correct speaker polarities, but getting them wrong won't blow anything up.
2) Connect the battery holder to the corresponding power connections on the amplifier board. Be careful to observe the correct polarities—positive voltage to the "+" terminal (usually a red wire), negative to the "-" terminal (usually a black wire). Getting this wrong will likely damage the amplifier.

(See diagram on the next page.)

STEM Skills:

- Mechanical
- Electrical

Experience Level:

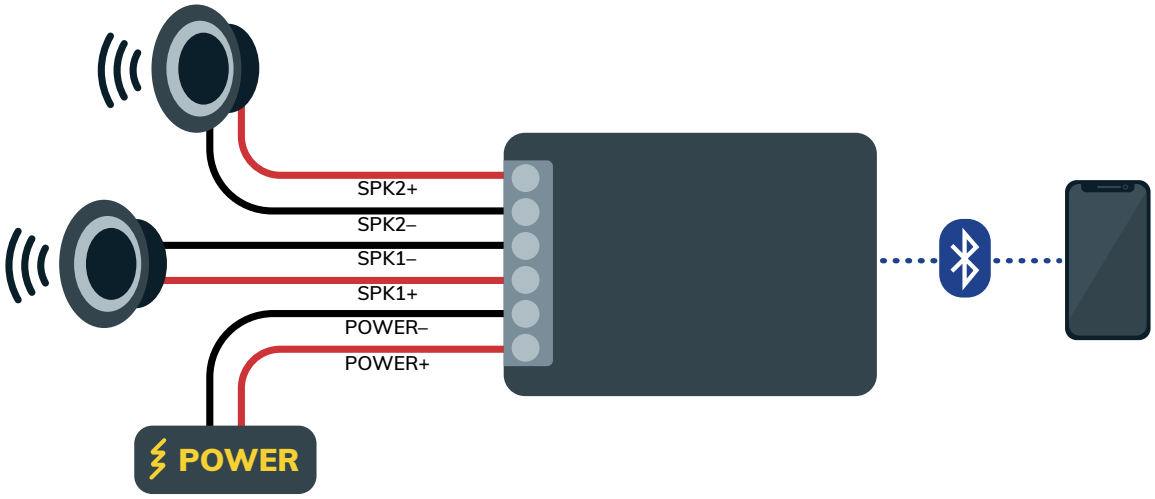
Advanced

Supplies:

- iRobot Create 2
- Screwdrivers (#1 Phillips & Small Flathead)
- Hot Glue Gun
- Soldering Equipment
- Wire Cutters/Strippers
- Heat Shrink Tubing or Electrical Tape
- Flexible Wire
- Rotary Cutting Tool
- Hook and Loop Fastener
- Battery Holder with Cover and Switch for 4 AA Batteries (ex. SparkFun PRT-12083)
- 2 Thin .5W Speaker (ex. SparkFun COM-15350)
- Stereo Bluetooth Amplifier Board (ex. SparkFun DEV-17224)

Additional Resources

- Getting Started with Create 2



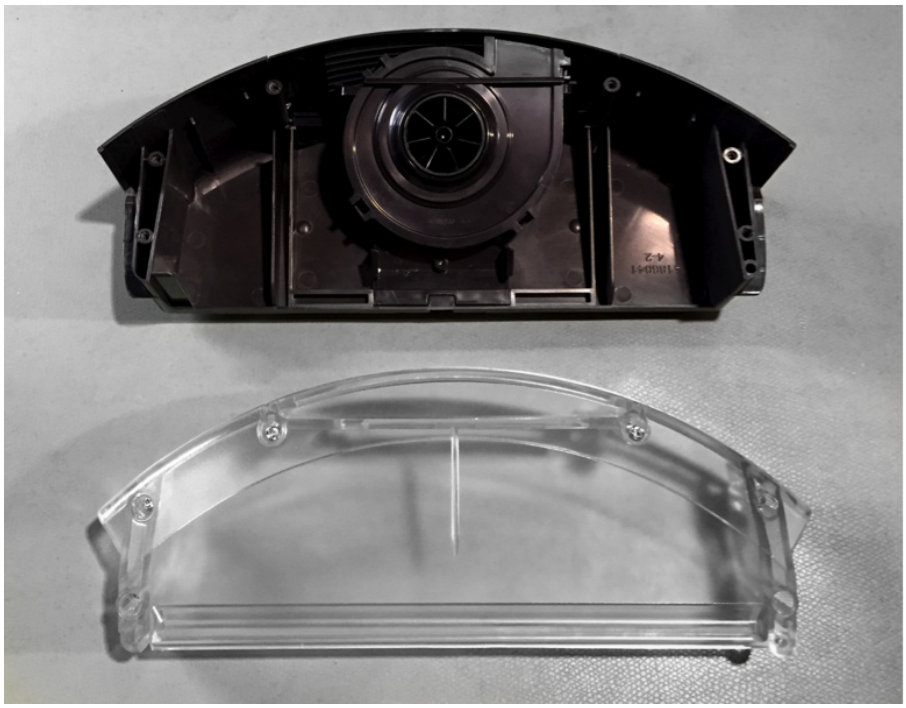
Testing your electronics

1) Install 4x AA batteries into the battery holder and slide the power switch to ON.
2) A blue LED on the Bluetooth module should start flashing and the speakers should beep to indicate pairing mode.
3) Connect your Bluetooth music player by going to your settings screen and selecting the new Bluetooth device "XY-P40W."
4) Select a song and make sure your speakers are playing properly. The indicator should stay on while connected and blink slowly while playing audio.

Installing the electronics in your vacuum bin

1) Remove the vacuum bin from your robot and flip it upside down.
2) Use your #1 Phillips screwdriver to remove the six screws (circled in the image below) holding the bin together and set them aside.

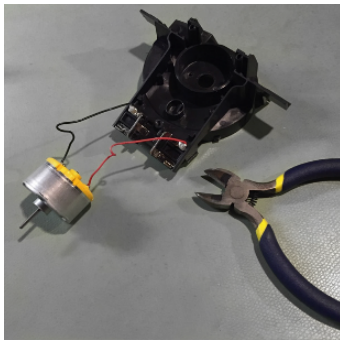
3) Separate the upper and lower bin housings.



4) Remove the screws holding the vacuum fan in place and slide it out of the bin.

5) Use a flathead screwdriver to release the four snap clips holding the top cover on. Remove the cover and pull the vacuum impeller off of the motor shaft. This can be achieved by twisting and pulling or by prying from underneath with a flathead screwdriver.

6) Remove the two Phillips screws holding the motor in place. Remove the motor from the plastic housing, cut the red and black wires about an inch from the back of the motor, and put it aside for use in a future project.

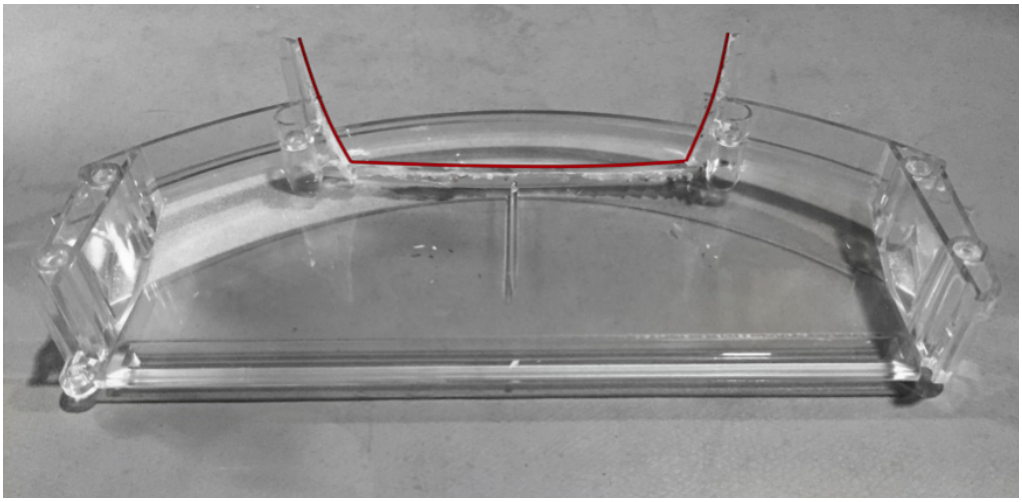


7) Use a rotary cutting tool to trim the vacuum housing pieces in half to create space in the bin for the speakers.

8) Reinstall the smaller plastic piece and the latch spring into the top bin housing and screw it into place. Make sure you have the plastic latch seated properly too.

9) Turn on your hot glue gun and apply glue to the two pivot arms on the latch at the back edge of the bin.

10) Now use your rotary tool to remove the plastic lip at the rear of the bin bottom as shown in the image below.

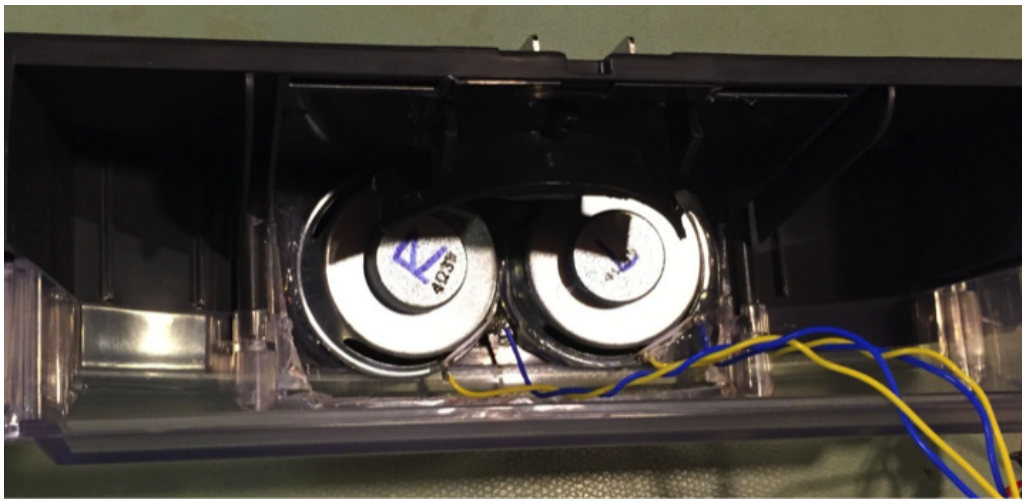


11) Reassemble the bin, being sure to capture the rear grill in place properly. Reinstall the six screws to clamp the bin back together.

12) Grab your hot glue gun again and position the speakers up against the plastic grill at the rear of the bin while you wait for it to heat up. Be sure to position the speakers on the appropriate side of the bin.

13) When ready, tack both speakers in place with dots of hot glue. Then, run a small bead of hot glue around the perimeter of the speakers.

14) While the glue is still hot, clean up any excess glue that may have leaked through the plastic grill to the outside of the bin.



15) Position the electronics in the bin and fixture them in place using Velcro or a similar method. This will prevent the components from rattling around in the bin and possibly shorting against each other.

Install your new DJ Create 2 bin into the robot, turn on the power, and enjoy the music!

Optional Upgrade #1: Upgrade your battery pack

Replace your 4xAA battery holder with a portable USB power bank. Then, use a DIY USB A connector shell (example: Adafruit 1387) to wire a male USB A plug to the power input of the audio amplifier board instead of the AA battery pack, and simply plug the USB connector into the power bank. Be sure to check your polarity before starting everything!

Optional Upgrade #2:
Power your electronics using Create's internal battery

Connect a 5V UBEC (Buck) Converter to the dust bin electrical contacts and use power from your Create 2 internal battery to power your electronics.

Shopping List:

- UBEC DC/ DC Step-Down (Buck) Converter – 5V @ 3A Output (Ex. Adafruit 1385)
- Inductor 2.2mH 500mA
  Examples:
  - Abraco Corporation AIAP-03-222-K
  - Vishay Dale IHD3EB222L
  - Bourns Inc. 5900-222-RC

Instructions:

1) Instead of attaching the battery holder wires to the amplifier module, cut off the connector on the output.
2) of the UBEC, strip the insulation off the wires, and screw the UBEC output wires to the power terminals on the amplifier module.
3) Solder the red UBEC input wire to the red vacuum motor wire (the left vacuum bin contact).
4) Solder one lead of the inductor to the black vacuum motor wire (the right vacuum bin contact).
5) Solder the black UBEC input wire to the other lead of the inductor.
6) Use hot glue to secure the inductor somewhere in the bin so it doesn't pull on the wires.
7) Plug the bin into the robot and command the robot to drive to apply power to the bin contacts (either by pressing Clean to start a mission or using the Open Interface command Motor – 138).

Now your electronics are powered by Create's internal battery!

Why is the inductor necessary?

The motor driver was designed to drive an inductive load (motors have a lot of inductance). The input to the UBEC is a large capacitor. If you were to connect the input directly to the motor driver output then it effectively shorts the UBEC input capacitor to the battery voltage when the motor driver turns on.

Since the capacitor is initially discharged, a very large current flows in quickly and causes the motor driver to trip the current limit and turn off to protect itself. Installing the inductor between the motor driver and the UBEC adds the inductance back into the circuit and limits the rate of current rise so that the input capacitor can be charged without tripping the current limit.

How do inductors work?

An inductor obeys the following formula: V = L * di/dt

V Voltage across the inductor (volts)
L Value of inductance (Henrys)
di Change in current (amps)
dt Change in time (seconds)

If a positive voltage is applied across an inductor then the current flowing through it increases over time. There is also energy stored in the inductor. If a negative voltage is applied across the same inductor then the current flowing through the inductor decreases over time and the energy stored in the inductor is transferred to the other circuitry. Inductors are used in power supplies to control current and store energy.

Acknowledgments

Thanks to Instructables user ASCAS for the inspiration:
https://www.instructables.com/member/ASCAS/instructables/

So What's Next?

Start your party! Your DJ Create can roam the house, wake you up to your favorite tunes, or just be your best buddy singing along with you. Don't worry, there's no camera so dance like no one is watching! Share your project with Create@irobot.com