Add the lights
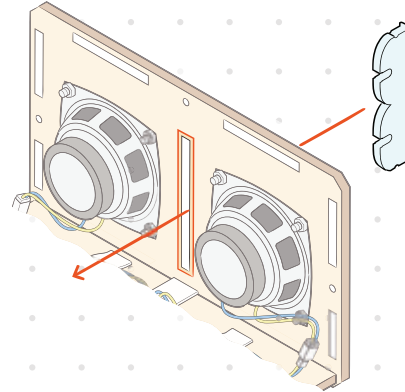
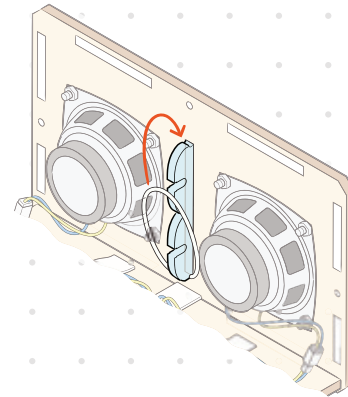**You'll need:**

☐ speaker with large drivers (from Part B)

☐ light bar
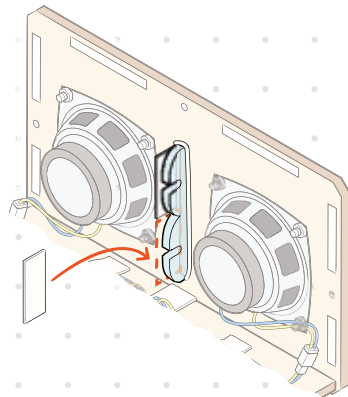
☐ O-ring

☐ sticky foam rectangles

☐ LEDs

Step 1

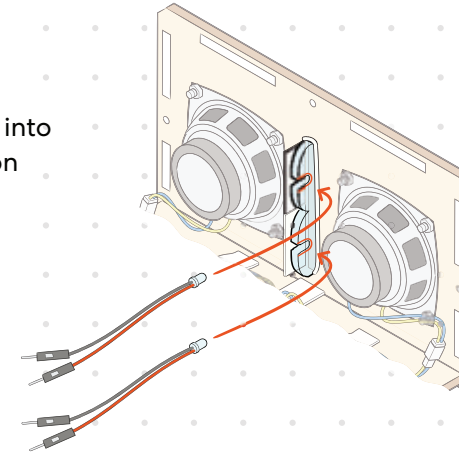From the front, slide the **light bar** through the **speaker's** middle slot.

Step 2
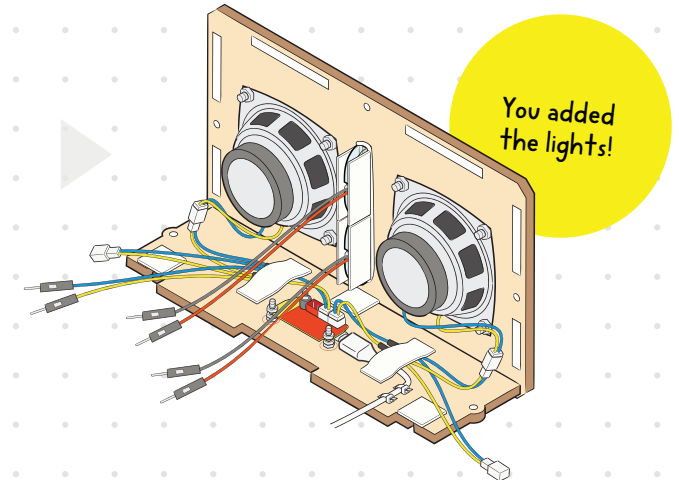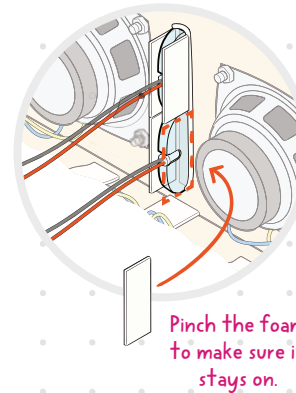
Stretch the **O-ring** around the back of the light bar.

Step 3

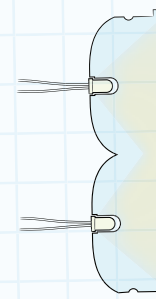Stick 2 **sticky foam rectangles** on one side of the light bar.

Step 4

Press an **LED** into each notch on the light bar.

*The sticky foam holds the LEDs in place.*

Step 5

Stick 2 more sticky foam rectangles to the other side of the light bar.

Pinch the foam to make sure it stays on.

You added the lights!

Light refraction

The light bar's funky shape helps spread out light from the LEDs — so two lights cover as much area as ten. When light moves from one material to another — say, from air to the clear acrylic — it bends. That's **light refraction**! Each bump and divot in the acrylic bends light in a different direction, which sends a glow across the whole bar.
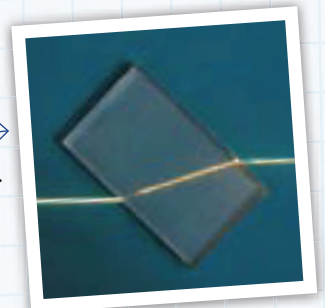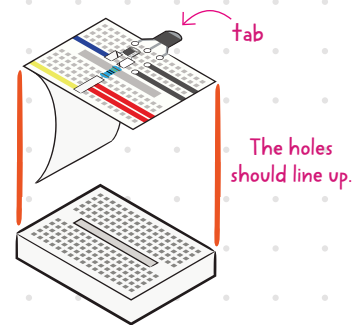
Connect the lights and sound

You'll need:

- ☐ speaker with lights (from Part C)
- ☐ breadboard
- ☐ breadboard guide
- ☐ transistor
- ☐ resistor
- ☐ capacitor

From home:

- ☐ USB power source
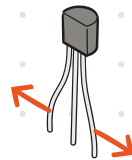- ☐ device with Bluetooth technology

Step 1

Peel the backing off the **breadboard guide**. Stick it to the **breadboard**.
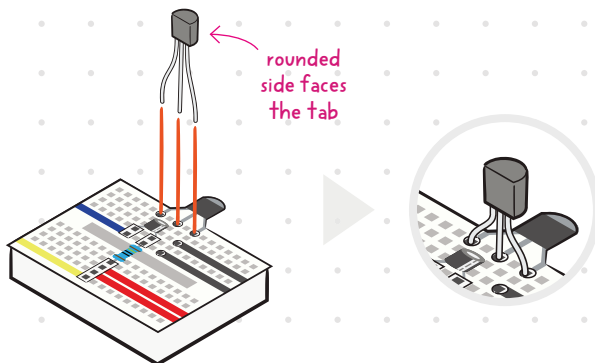
tab

The holes should line up.

Step 2a

Find a **transistor** and gently spread the pins.

Step 2b

Push the pins into the breadboard. The transistor should match up with the symbol on the guide.

rounded side faces the tab

Meet the transistor

The transition's junction is like an on/off switch. It's usually turned off, stopping electricity from passing through. But when an electrical signal (a.k.a. music!) comes through the middle pin, the switch turns on for a moment — and a bit of electricity crosses the junction.

junction

electricity from the power source **+** music signals **=** new, **stronger** signals
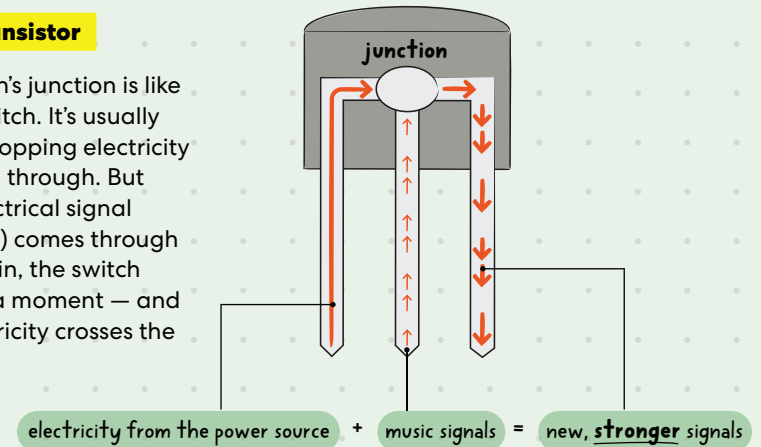
Step 3

Find the **capacitor** and hold it so the white stripe is on the right. Push the pins in by the capacitor symbol.

white stripe

Make sure the legs don't cross.
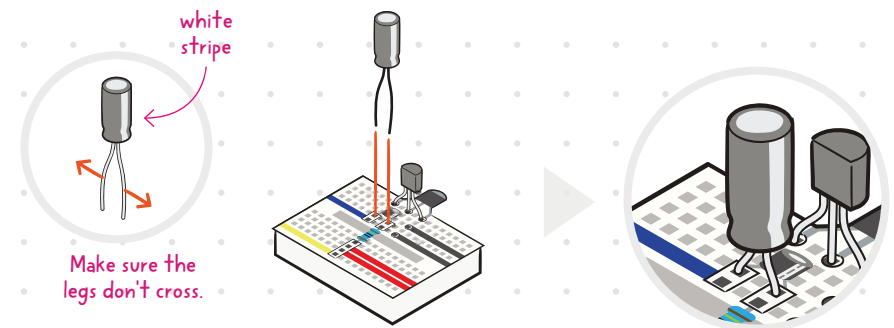
Meet the capacitor

The **capacitor** acts kind of like a sponge for electricity. Two coiled metal sheets "soak up" the incoming power.

The power can only be released when certain kinds of signals come through the circuit. Until then, the capacitor holds on to the electricity.

2 coiled metal sheets
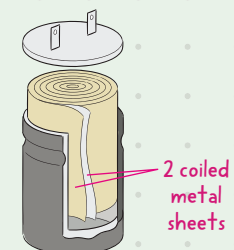
Step 4

Find a **resistor**. Push the pins in over the resistor symbol.

**tip!** You can connect it either way! Resistors work in both directions.
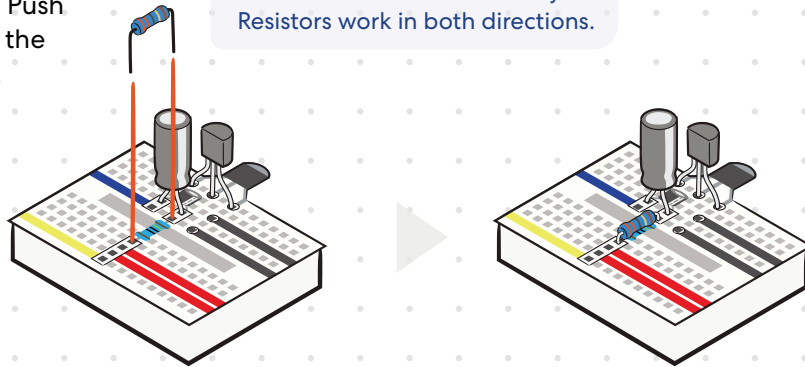
Meet the resistor

The **resistor** uses a long, thin spiral of electricity-resistant wire to slow down the electrical current. Electricity has to travel along the whole length of the wire, like it's going along a twisty, bumpy, muddy road.
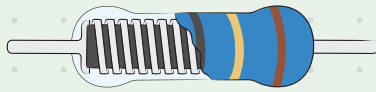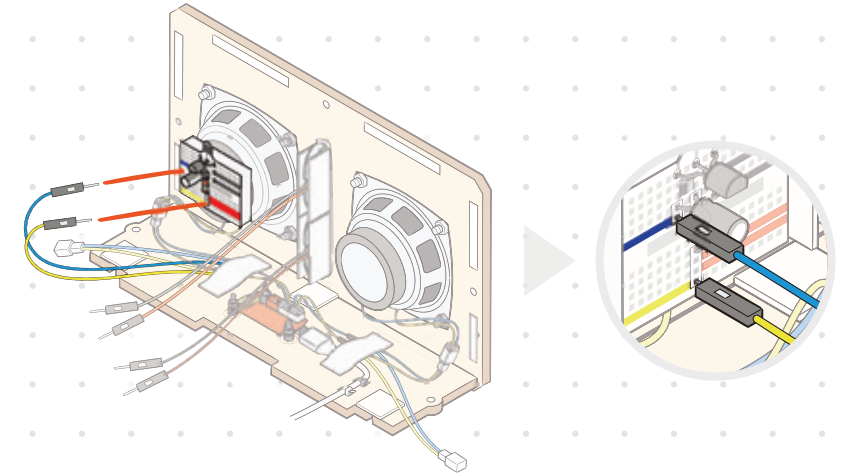

Step 5

Peel the backing off the breadboard. Stick it to the back of the driver on the left.
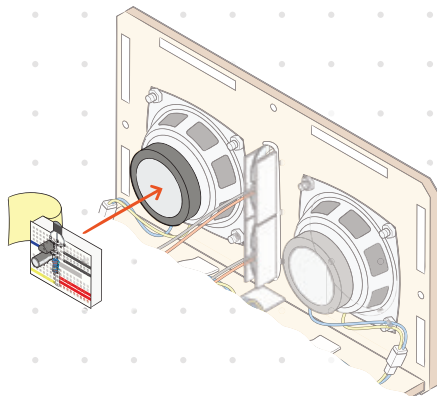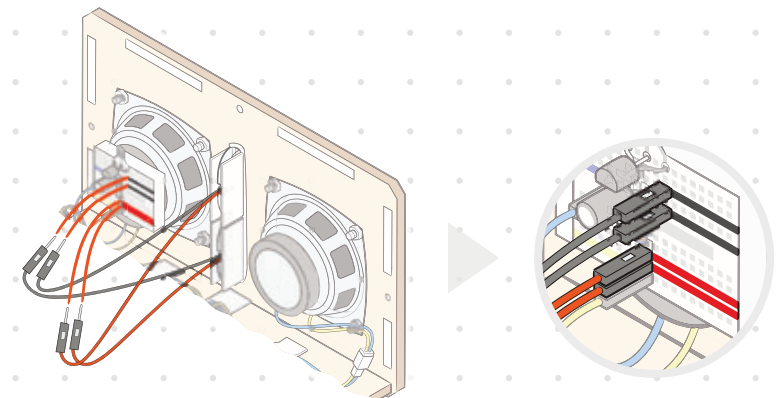

Step 6

Push the loose **yellow** and **blue** wires on the left into the **yellow** and **blue** holes.
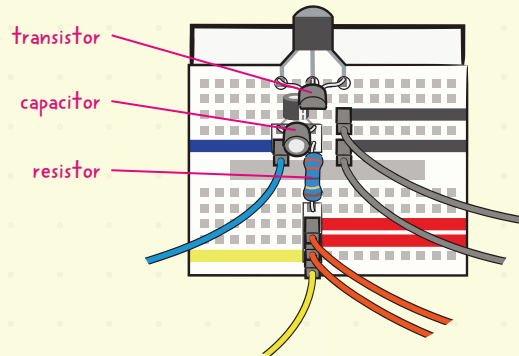

Step 7

Push the **black** and **red** LED wires into the **black** and **red** holes.
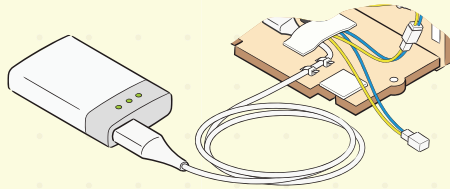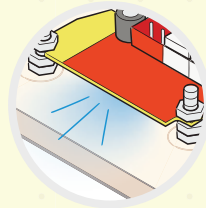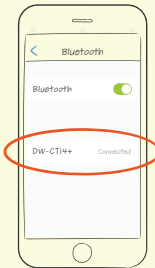
1. Make sure your breadboard looks like this.

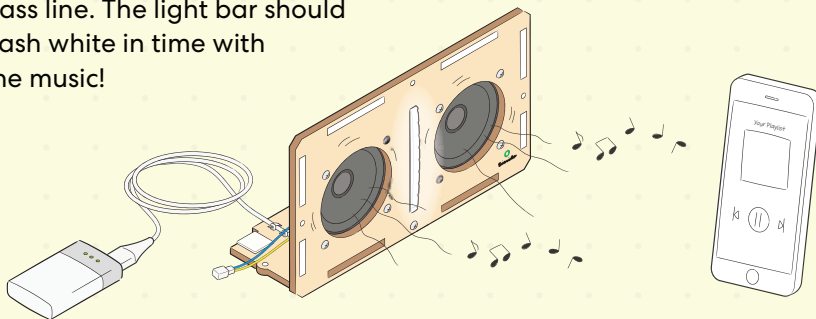transistor

capacitor

resistor

2. Plug the USB cable into a **USB power source**. The light bar should blink.

3. Pair the speaker with a **device with Bluetooth technology** (if it's not already connected).

Bluetooth

Bluetooth

DW-CTi4+   Connected

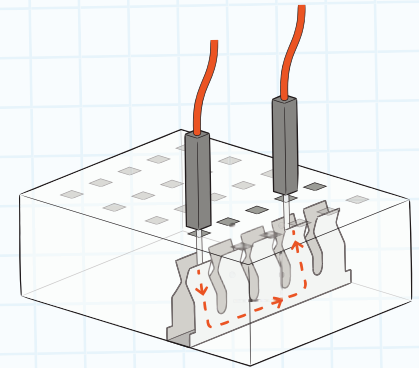4. Play some music with a strong bass line. The light bar should flash white in time with the music!

Stop!
*Before you keep building, unplug the USB cable from the power source.*
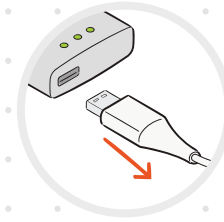
Breadboard

A **breadboard** makes it super easy to build a circuit. Each column of holes has a metal rail under it. So if you plug wires into any two holes in a column, they'll be connected to each other!

Did you know?
The name *breadboard* comes from the early days of electronics, when people would build circuits by hammering nails into wooden boards (like the kind people slice bread on) and wrapping wires around the nails.
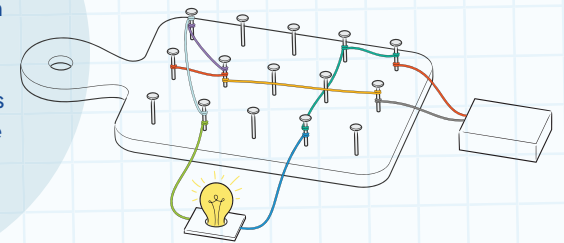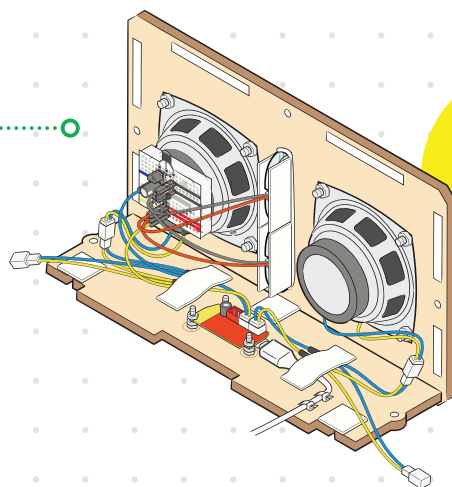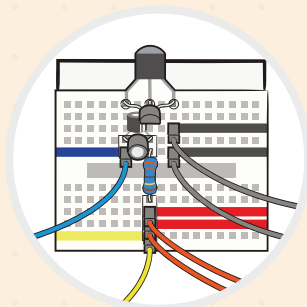
Troubleshooting

If the wireless board doesn't light up or pair, check the troubleshooting steps on Page 15.

If the light bar doesn't flash white, try turning up the volume or picking a song with a stronger bass line.
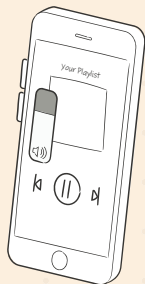
If the light bar still doesn't light up, make sure all the wires are plugged into the right spots on the breadboard.

You connected the **lights and sound**!

Bass-ic circuitry

High five, engineer! You just wired up a **low-pass filter**, so named because only *low* notes can *pass* through it.

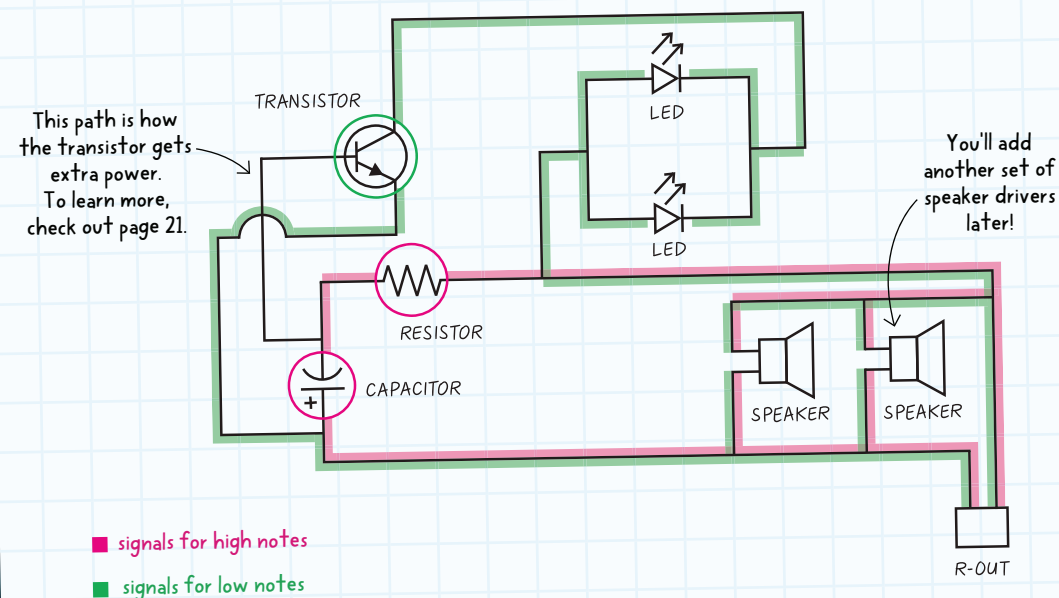**If a signal plays a high note, it's (mostly) blocked by the filter.**

Signals for high notes go into the **capacitor** and then through the **resistor** — which bogs the electric signals down so much there's not enough power to turn on the lights.

If a signal plays a low note, it's allowed through the filter.

The capacitor can't process the signals that play low notes. So instead, they go along the easiest path: toward the **transistor** (which boosts their power) and onward to the lights. Flash!

Talk about an *electrifying* performance.

Here's how it all connects with your right speaker drivers . . .

This path is how the transistor gets extra power. To learn more, check out page 21.

TRANSISTOR

LED

LED

You'll add another set of speaker drivers later!

RESISTOR

CAPACITOR

SPEAKER

SPEAKER

R-OUT

■ signals for high notes

■ signals for low notes

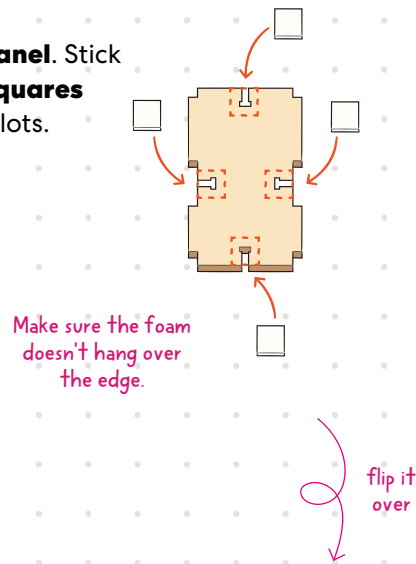# Add the small speaker drivers

You'll need:

- ☐ speaker with breadboard (from Part D)
- ☐ side panels
- ☐ long screws
- ☐ small speaker drivers
- ☐ gaskets
- ☐ short screws
- ☐ washers
- ☐ square nuts
- ☐ sticky foam squares
- ☐ screwdriver
- ☐ foam balls
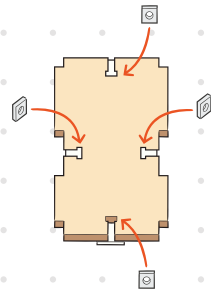
From home:

- ☐ USB power source

Step 1

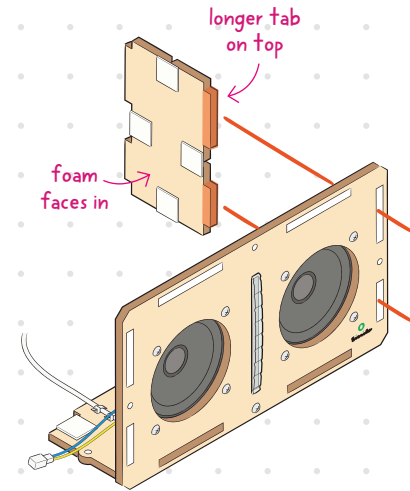Grab a **side panel**. Stick **sticky foam squares** over all the T slots.

Make sure the foam doesn't hang over the edge.

flip it over

Step 2

Press a **square nut** into each T slot.

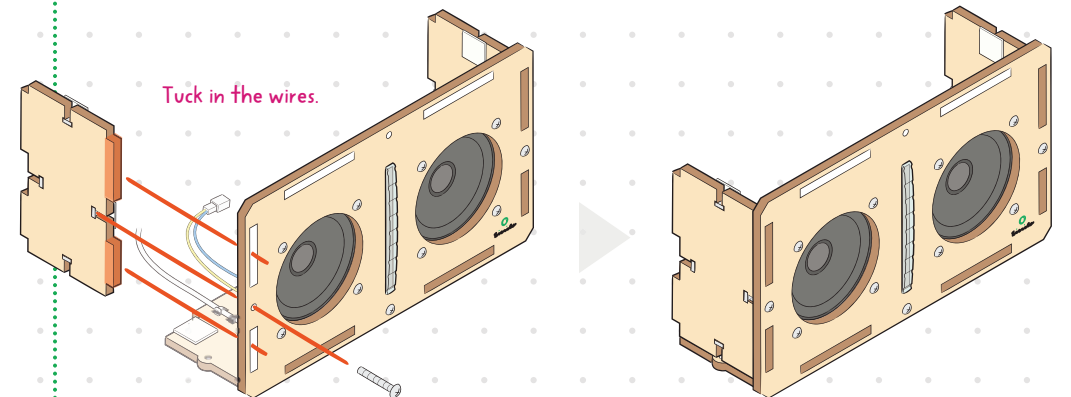## Step 3

Slide the side panel into the front panel.

longer tab on top

foam faces in

Step 4

Twist a **long screw** into the front hole. Secure it with the **screwdriver**.

Use this!
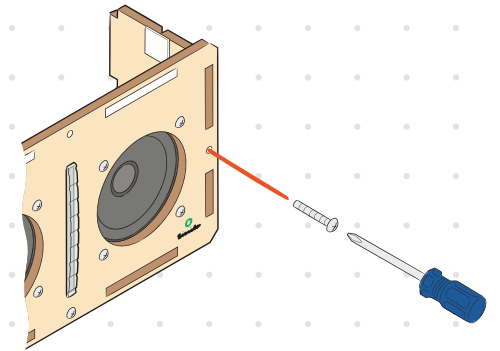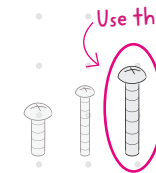
Step 5

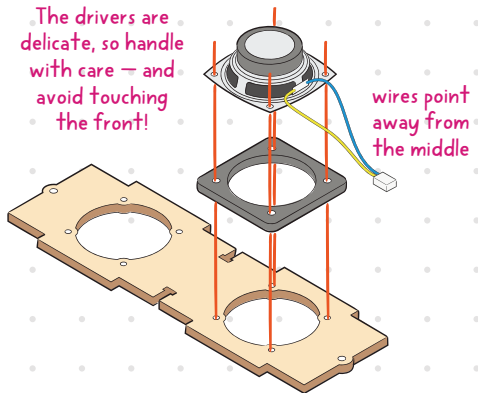Repeat Steps 1–4 to add the other side panel.

Tuck in the wires.

Step 6

Grab the **top panel**. Line up a **gasket** with a set of holes.

Then place a **small speaker driver** on top of the gasket.

The drivers are delicate, so handle with care — and avoid touching the front!

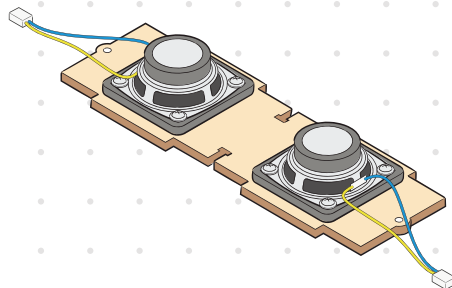wires point away from the middle

Step 7

Slide a **washer** onto a **short screw**. Then twist the screw into a corner of the speaker driver.

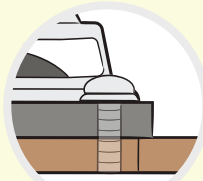Repeat to add screws and washers to the other 3 corners.

Use this!

short screw

washer
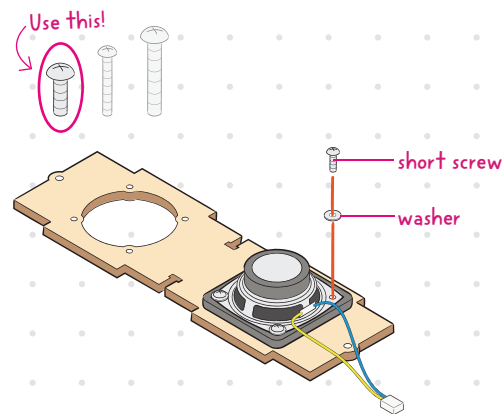
Step 8

Repeat Steps 6–8 to add the other small speaker driver.

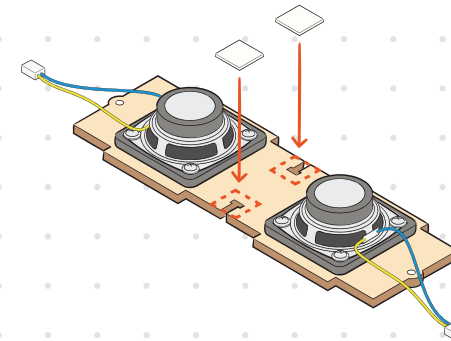### Stop & Check

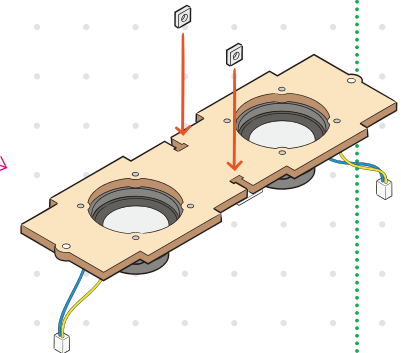Make sure all the short screws are flush with the front of the top panel.

Step 9a

Stick two sticky foam squares over the T slots.

Step 9b

Press a square nut into each slot.

flip it over

Step 10

Slide the top panel into the front panel. Twist a long screw into the front hole.

Tuck the wires in.