

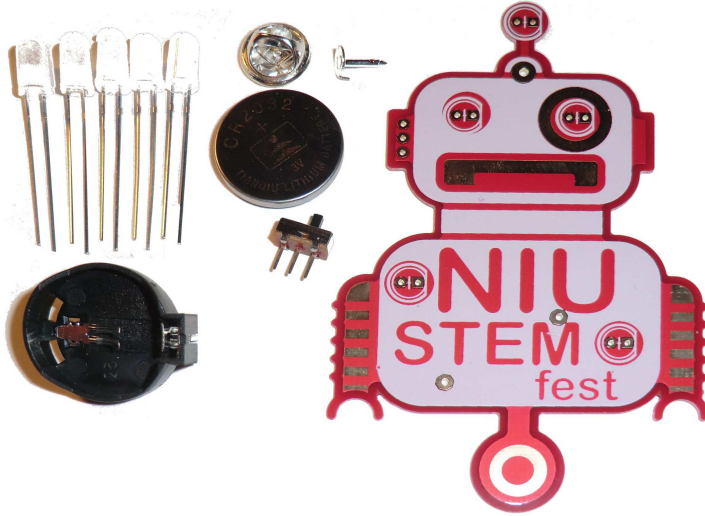
When done, please return these instructions for the next person to use. Thank you.

Kit 48 – NIU 2019 STEMfest Robot

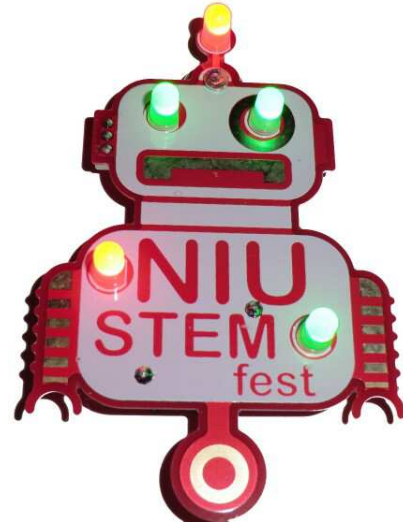
The heart of this blinkie is a tiny chip embedded in each of the five LEDs. When power is applied, the chip tells the LED to blink or fade colors.

By building this blinkie, we hope you have a lot of fun, learn how easy it is to assemble and solder a circuit, and gain a desire to learn more!

From a bag of parts:



to a working Blinkie!



First, open up the kit and review the contents. Looking at the left picture above:

From left to right, and top to bottom there should be the following parts:

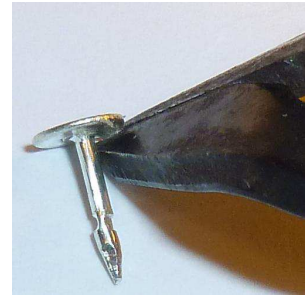
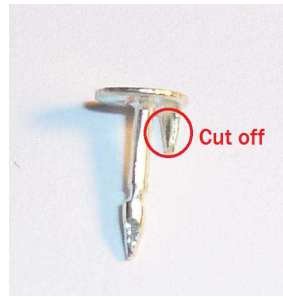
- Five LEDs
- Battery holder
- Tie Tack, separated into Pin back, and Pin
- CR2032 battery
- Power switch
- Red robot circuit board

Got everything to start? If not, give us a shout.

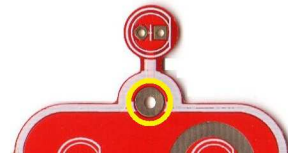
Assembly

Take a look at the completed picture above right. The only components that will be visible on the front are the LEDs. The tie tack pin is soldered to the back. The power switch and battery holder are placed on the back, and soldered on the front.

1. Separate the pin from the clasp of the tie tack (pin and clasp). The pin has a small secondary post we need to remove before soldering.
2. **Use the cutters to remove the smaller post next to the big pin.** If there is a little stub left you can flatten it against the round base of the pin with your pliers.



3. Insert the tie tack pin in the hole on the board:
 - Find the big hole on the front of the circuit board.
 - Insert the pin from the front, then, holding the point of the pin, flip the board onto its back.



Front before inserting



Back after inserting

4. Solder the pin. **HOW TO SOLDER:**
 - 1) Heat pin and pad, the soldering iron tip touching both pin and pad.
 - 2) Add solder – maybe 1/4"
 - 3) Remove solder, but keep heating pin and pad to flow the solder around the pad.
 - 4) Remove the iron

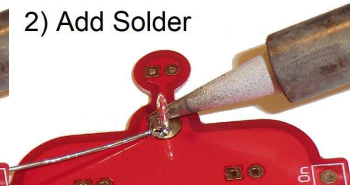
Use these same 4 steps for all soldering!!

Additional soldering tips are on the last page.

1) Heat pin and pad



2) Add Solder



3) Continue heating until flows around the pin



4) Remove iron, let it cool



Put the pin back on the pin so you don't lose it.



5. Insert the power switch from the back. A printed white rectangle shows where it goes. The up/down DIRECTION of the switch doesn't matter.
 - Flip the board over to the front side.
 - With the pins standing straight up, solder ONE PIN using just a LITTLE BIT of solder.
 - Look to see if the switch is straight – if not, you can re-melt the solder with the soldering iron tip, and straighten up the switch, pull the iron back, and hold a bit for solder to harden,
 - Now solder the other two switch pins.

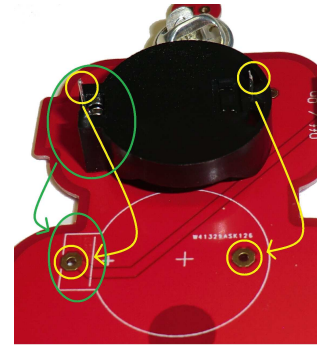


Before Soldering



After soldering ONE pin

6. Flip the board over to the back, and insert the battery holder over the white outline.
- Orientation is important for the battery holder. Make sure the battery holder matches the white printed outline. **Notice one end is squared off** in both the battery holder and the white outline
 - Flip the board over to the front side.



7. Soldering the battery holder pins:
- The battery holder will not sit flat on the circuit board for soldering unless you loosen the pin back as shown in the inset picture to hold the top of the robot up further
 - Solder each of the battery holder pins to the circuit board.



8. Insert the battery. The plus sign (+) will face up.
- Angle it into the battery holder against the metal tab on the squared off end, then press in and down over the black rim. It will snap in place.
 - Turn the power switch ON.



9. Insert the left “eye” LED into the board from the front as shown. You will see a printed white circle outline on the board.

Orientation is important for LEDs.

- Insert the **long wire (lead)** through the hole with the **round pad**.
- Then insert the **short lead** through the **square pad**.
- The LED should blink or flicker as you wiggle the leads. If not it may be inserted the wrong way – OR if it blinks with the leads reversed, then you've soldered the battery holder in backwards – So solder all LEDs backwards to make it work.
- If you can't get it to blink, contact a tech.
- Turn the board over and pull the leads to ensure the LED is flat against the front, then spread the leads out into a “V” as shown, not any flatter.



Insert long lead, round hole on the FRONT as shown.

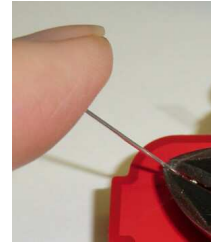


then test by wiggling LED



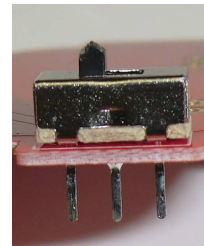
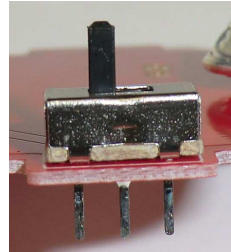
Bending the wires into a “V”

10. Solder the leads, then catch each lead as you trim it.
11. Repeat steps 9-10 for the other robot “eye” LED,
12. Repeat steps 9-10 for the top LED
13. Repeat steps 9-10 for the two body LEDs



14. Turn OFF the switch. IF the LEDs continue to blink, have a Blinkie Tech help you with the switch.

15. If your **switch handle is long** as shown in the picture, trim it to make it less likely to break.
16. Trim the leads on the front of the board from **power switch** and **battery holder**, as they are **sharp**. Again, catch the flying pieces.



17. Turn on the board! Enjoy.

Troubleshooting

If the LEDs don't flash, then you'll need to do a little troubleshooting to finish your project. The following steps should isolate most problems.

Check for, and if found, remove solder bridges. What's a solder bridge? Excess solder making an unexpected connection on the board, such that the power flows through the bridge, instead of the LED.

If you make a bridge, it is easy to fix. You can often just reheat and pull the tip of the soldering iron through the bridge, breaking it. Or, reheat all the solder and tap to the board on edge to shake off the excess while it is still melted. Beyond that, we are more than happy to help.



- Recheck your solder connections. 80% of all problems are traced to this. Cold solder joints – dull, not shiny – and broken joints will cause erratic performance or failure. Reheat any questionable solder connections until they flow and look shiny and secure.
- Check for bits of solder, lead ends, or other foreign matter which may be lodged in the wiring.
- LEDs reversed. You will need to remove the LED by desoldering, and then solder it in the correct way. Ask a Tech to do this for you. Incorrectly pulling off an LED can ruin the circuit board!
- The battery is incorrectly inserted. The “+” side of the battery should always be inserted facing up.
- Bad part – it does happen. In over a thousand boards assembled, we've seen two or three parts fail. Send us email, and we will send a replacement part.
- A part got lost/melted/damaged/destroyed while building the kit. It happens – you're not the first (or second, or fiftieth). If you are doing this at a convention, seminar, or class, just let us know. Otherwise, send us email, and we'll see what we can do. We have no problem selling just the parts you need to get it working.

Caring for and using your blinkie

Once built, the use of this blinkie is fairly straightforward. Don't get it wet. Don't stick it in a pocket with a bunch of coins or metal where it might short out. Don't set it on a metal table top or in a metal dish, etc. To prevent it shorting out, you may want to keep it in the bag it came in.

Soldering Hints

Soldering is not like gluing: Both the “pad” (shiny circle or square on the circuit board) and the component (lead coming up through the hole) must be hot enough so the solder flows around them, making an electrical connection.

For the purposes of learning how to solder, you do not need to be perfect. With a little bit of practice, your soldering skills will rapidly improve. The goal is to have fun while learning, and your skill will develop as you have fun. Happy soldering!

Here's how to make a good solder joint or connection:

- Prepare the joint. Bend the component lead slightly after it passes through the printed circuit board (this helps hold it in place while soldering). Ex: Bend LED leads into a “V”.
- Prepare the tool. The soldering iron should be up to temperature. Clean the tip by plunging it into the stainless steel wool in the jar. Melt a little solder (a 2mm length) onto the tip so it's shiny. This is called “tinning”. The solder coating helps conduct heat from the tip to the joint. If the iron doesn't get shiny, contact a Tech who has special tip cleaner.
- Place the tip in contact with the component lead AND the printed circuit board pad.
- Place the solder against the joint directly opposite the tip. It should melt within 2 seconds, and flow around the joint. If it takes longer than that, you're not getting enough heat into the joint. Use only a TINY bit of solder.
- Pull back the solder, but keep the soldering iron in place until the solder flows freely and completely covers the joint. If the heat is removed too soon, the solder will tend to “ball up” and not stick well to the conductors. The solder joint should look "wetted", with concave shapes.
- Let the joint cool without movement at room temperature. This usually takes only a few seconds.
- If a joint is moved before it cools, it will take on a dull, satin look that is characteristic of a cold solder joint. A cold solder joint is fragile and conducts poorly – reheat the joint until the solder flows freely, and hold it still until it cools.
- Keep the tip of the soldering iron clean. Push it into and pull it out of the tip cleaner jar several times until it is shiny.

Directions by Dale Sulak, updated by Ward Christensen, WardC@2dkits.com. Feedback welcome!