

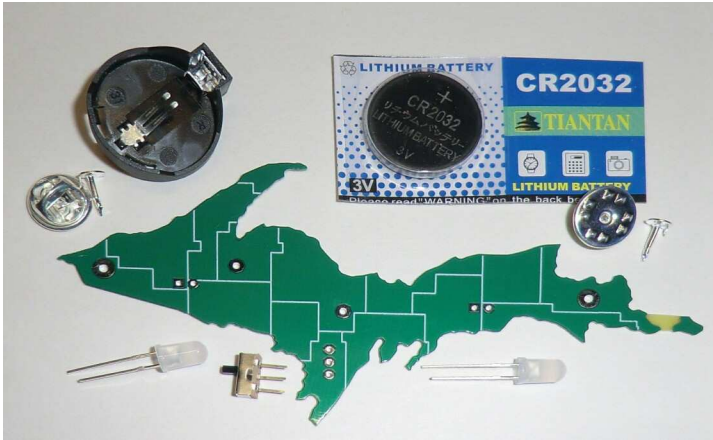
Kit 54 - Michigan U.P. Blinkie Instructions

This *Blinkie* is made with a circuit board, two light emitting diodes (LEDs), a battery and battery holder, a switch, and TWO tie tack pins so you can wear it. You will make it yourself by soldering the parts onto the circuit board.

We hope you have fun building this blinkie, learning soldering or improving your soldering skills.

Start with a bag of parts:

Finish with a Blinkie you can wear!



First, open up the kit and review the contents below, comparing to the parts picture above:

- A CR2032 battery holder
- A CR2032 battery
- 2 Tie Tacks, each separated into its **back**, and **pin**
- The “Michigan Upper Peninsula Map” circuit board with county borders shown!
- 2 color fading or “rainbow” LEDs
- A power switch

Are you ready to start? Do you have all the parts? If not, give us a shout.

“How to solder” will be covered briefly in “Assembly”, but a detailed description may be found on the **last page** of these instructions.

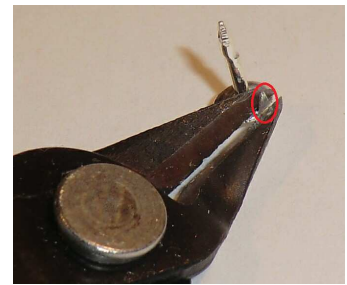
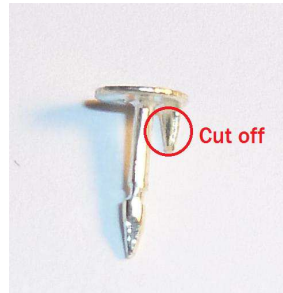
TERMS:

Solder	A metal alloy that melts easily, holds things together, and conducts electricity. You will have a “coil” of it.
Lead	Rhymes with “seed”. The wire that comes out of an LED or resistor that you solder to the circuit board
Pin	Like a lead, but on the battery holders, tie tack pin or switch
Pad	Small shiny areas on the circuit board, usually circles or squares, that you'll be connecting LEDs and other components leads or pins to by soldering.

Assembly

We're going to solder the 2 tie tack pins, then the switch, then the battery holder, and finally the LEDs.

1. Separate the pin from the clasp of both of the tie tacks (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. Catch it so it doesn't fly off!** If there is a little stub left you can flatten it against the round base of the pin with your pliers. **Repeat for the second tie tack pin.**

3. Inserting the tie tack pin:
 - Insert a pin from the front (map side), large hole, left side, the second pin on the right.
 - Hold the pins, and flip the board onto its back for soldering. **If you are on a plastic table, put it on cardboard or the business card to protect the table from the soldering heat.**



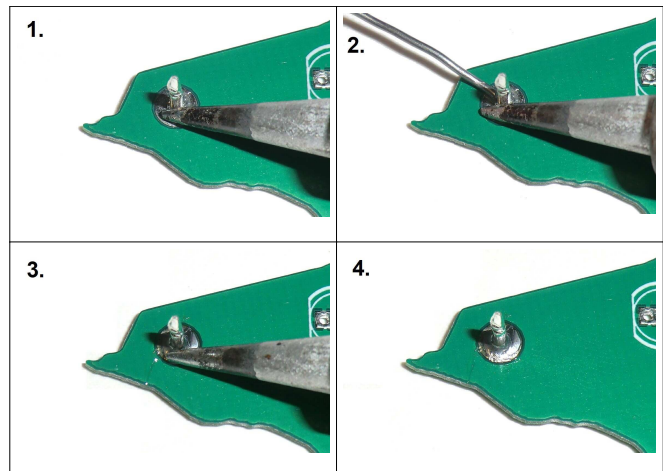
Insert each pin through the **Front**



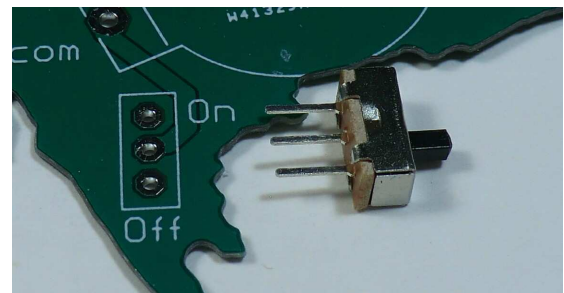
Flip to the **Back** to solder the pins

[Follow the next 4.1\) through 4.4\) steps for all soldering.](#)

4. Solder the pins. **Use these 4 soldering steps:**
 - 1) Heat pin and pad: the soldering iron tip must touch **both** for the solder to connect them.
 - 2) Melt solder into connection – about 1/8"
 - 3) Remove solder, but **keep heating the pin and pad to flow the solder around them.**
 - 4) Remove the iron. Wait 10 seconds to cool and harden so the entire round pad is covered by solder, going up on the pin just a little.
5. **Repeat the above steps for the right side tie tack.** Put the clasps on the pins so you don't lose them.

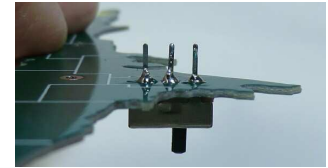
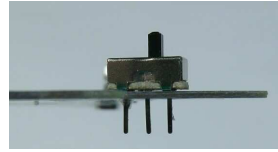


6. Installing the switch
 - 1) Flip the board over to the back side, and insert the switch pins into the 3 holes inside the rectangular outline.
 - 2) Hold the switch pins and flip to the back to solder.
 - 3) With the switch handle resting on the table, you can slide the board to get the pins standing straight up



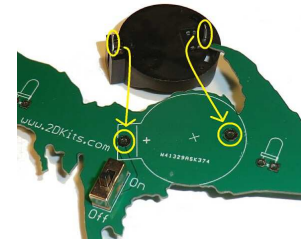
7. **Solder ONLY ONE PIN** - then check...

- If the switch is crooked, re-melt the solder and position it straight, and let it cool.
- Then **solder the other two switch pins**.
(Right picture)



8. On the back side, insert the battery holder over the printed outline, facing as shown.

- The square extension lines up with the outline.
- Hold the battery holder and flip the board over
- Solder each of the battery holder pins to the circuit board.



9. Install the battery

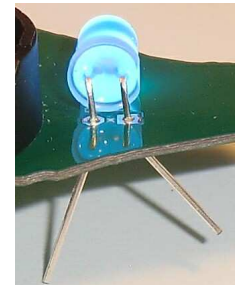
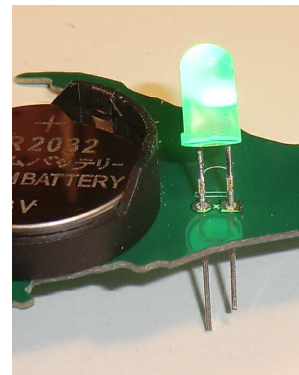
- Turn the switch off.
- Hold the battery with the “+” sign facing up.
- Angle it into the battery holder against the metal tab, and then squeeze down hard, so it snaps in place.
- Turn the power switch on.
- In the next few steps, **the LEDs will be tested before soldering**



10. Installing and testing the LEDs:

Orientation is important when inserting LEDs:

- The **long lead** of each LED goes into the hole with the **round pad**, and the **short lead** in the **square pad** hole.
- The LED should blink as you wiggle the leads. If not it may be inserted the wrong way. If it doesn't blink even when wiggled, check that the battery pins and switch are well soldered.
- **BEND** the LED back 90°, so it lies on the outline of the LED on the circuit board.
- Then spread the leads on the other side.



11. Insert the second LED just as you did the first:

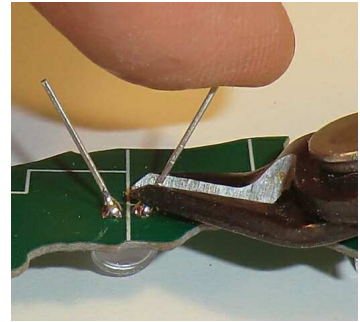
- With the LED facing up and the long lead to the left, bend the LED back 90°
- Insert it (long=round) from the **back** of the board so it lines up with the LED outline
- Spread the leads on the front into a “V” to hold it in place

12. Turn OFF the switch. IF the LEDs continue to blink, have a Blinkie Tech help you with the switch – or – if there are no blinkie techs, check the solution under “Troubleshooting” below.

13. **Solder the LED leads** making sure the LED is flat against the back of the blinkie.

- Solder **one** lead, then if the LED isn't flat, re-melt the solder as you hold the LED against the back of the circuit board, then solder each LEDs second lead.

14. Trim the excess leads with the cutters.
Hold your finger over the ends of each lead to keep it from flying off when cut.
15. You may also want to trim the pins on the power switch and battery holder. Again, catch the pieces that might fly off.



That's it – you should have a working blinkie now!

Troubleshooting

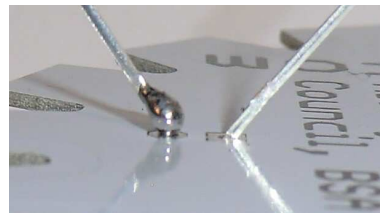
If the switch doesn't turn off, this is probably NOT your fault.

- If the switch is tight against the board, the little metal tabs that hold the top of the switch on can make a connection, so “off” doesn't work.
 - The solution is to move the switch a tiny bit off the board.
 - Put your thumbnail under the switch, on the end next to the battery holder.
 - Pull a bit away from the board with your thumbnail, then re-melt the top pin on the front so the switch can pull away from the board on the bottom.
 - The blinkie should then turn off. If not, repeat with the middle, then again top, pin.
- If the switch still doesn't turn off, it is either a defective switch, or, you have used too much solder and some flowed under the pins and are shorting the board.
 - Ask a blinkie tech to use the solder sucker to remove, test and reinstall or replace the switch.

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. Be sure the power is off to save the battery.

If you've made a solder **bridge** (meaning the leads of an LED are soldered together), it is easy to fix. You can often just re-melt the solder and pull the tip of the soldering iron through the bridge, breaking it, then shake any captured solder off the iron. Or, reheat all the solder and tap to the board on edge to shake off the excess while it is still melted. Ask a tech if you need help.

- **A common soldering problem** is to have solder on the pin or lead but NOT connecting it to the pad. Notice the pad UNDER the solder in the picture:
- Re-heat the connection, being sure to press DOWN on the pad with the soldering iron tip and wait for the solder to “puddle” around the pad and pin.



- Recheck your solder connections. 80% of all problems are traced to this. Cold solder connections (dull, not shiny) and broken connections 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 having a tech desolder it, and then insert it the correct way and solder it. Trying to remove it yourself can **BREAK** the circuit board.
- The battery is incorrectly inserted. The “+” side of the battery should always be inserted facing up.

Any Questions? Contact us – dwayne@2dkits.com or drsulak@2dkits.com

- The battery holder is inserted backwards – and if you tested the LEDs and they worked, so are they. This actually “works”, and is usually left alone.
- A bad part: it does happen. In thousands of boards assembled, we’ve seen two or three parts fail. If bought online, 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 an event, just let a tech 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 connection:

- Prepare the connection. 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 soldering iron. 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 connection. 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 connection directly opposite the tip. It should melt within 2 seconds, and flow around the connection. If it takes longer than that, you’re not getting enough heat into the connection. 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 connection. If the heat is removed too soon, the solder will tend to “ball up” and not stick well to the conductors. The solder connection should look “wetted”, with concave shapes.
- Let the connection cool without movement at room temperature. This usually takes only a few seconds.
- If a connection is moved before it cools, it will take on a dull look that is characteristic of a cold solder connection. A cold solder connection is fragile and conducts poorly – reheat the connection until the solder flows freely, and hold it still until it cools.
- Keep the tip of the soldering iron clean. Jab it into the steel wool tip cleaner jar several times until it is shiny.

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