# Kit 49 - Pirate

The heart of this blinkie is a tiny chip embedded in each of the two 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!

Here's what you will do:

|  **Take a bag of parts:**  |  **and make it into 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:
- Two Light Emitting Diodes – LEDs
- Tie Tack, separated into Pin back, and Pin.  Used to pin it to your clothing.
- Pirate blinkie circuit board (Arrrrr!)
- Power switch
- Battery holder
- CR2032 battery

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 on 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. 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.



Cut off
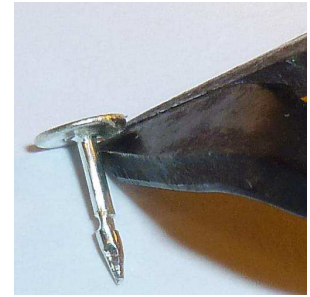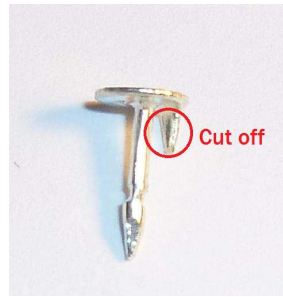
3.  Insert the tie tack pin in the hole on the board:
    *   Find the big hole on the front of the circuit board.  It is at the top of the hat.
    *   Insert the pin from the front, then, holding the pin, flip the board onto its back.
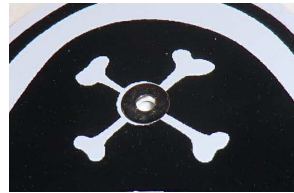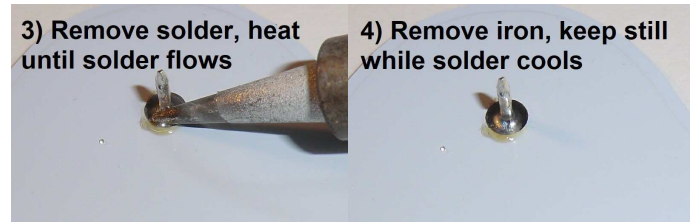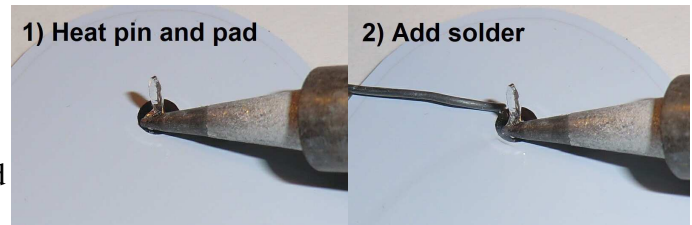


Front before inserting          Back after inserting

4.  Solder the pin.  **A soldering tutorial:**
    1)  Heat pin/wire and pad:  soldering iron tip touching pad and pin/wire
    2)  Add solder – maybe 1/8"
    3)  Remove solder, but keep heating pin and pad to flow the solder around the pad.
    4)  Remove the iron



1) Heat pin and pad          2) Add solder

3) Remove solder, heat until solder flows          4) Remove iron, keep still while solder cools

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

5.  Insert the power switch from the back.  **A printed black rectangle shows where it goes**.  The DIRECTION of the switch doesn't matter.
    *   Hold the pins and 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 wait a bit for solder to harden,
    *   Once straight, solder the other two switch pins.
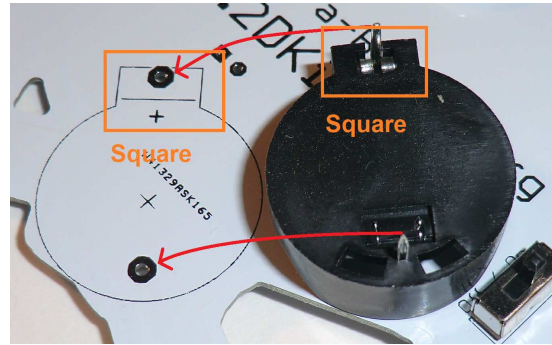


Before Soldering          After soldering ONE pin

6. Flip the board over to the back, and insert the battery holder over the black outline.
   - Orientation is important for the battery holder. Make sure the battery holder matches the black printed outline. **Notice one end is round, the other square** on both the battery holder, and the black outline on the board

7. How to solder the battery holder pins:
   - Loosen the pin-back a bit so the board sits on it and the battery holder, not wobbly
   - Flip the board over to the front.
   - Solder the two battery holder pins
   - Put the loosened pin-back back tightly on the pin

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.  It often takes a very strong squeeze!
   - **Turn the power switch ON.**
   - In the next few steps, the LEDs will be inserted and **tested before soldering**

9. Insert ONE of the two LEDs into the board from the front. You will see a printed black circle outline on the board in the eye of the pirate.  **Orientation is important** for LEDs.
   - Insert the **long lead (wire)** 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 it.  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!
   - If you can't get it to light:
     - Did you turn the switch on in step 8 above?
     - Check that the battery is inserted, so the "+" shows
     - Check that the battery holder and switch leads are properly soldered.
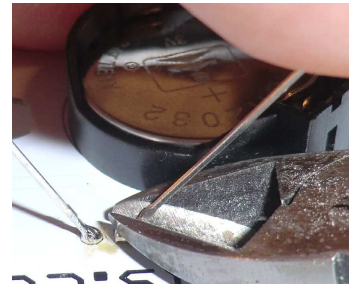     - Otherwise, contact a tech
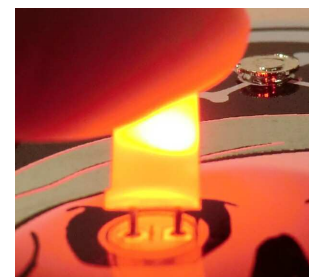
- Turn the board over and pull the leads to ensure the LED is flat against the front, then spread the leads out into a "V" as shown, not any wider or flatter.

- Solder the leads

- Trim the leads with your wire cutter as shown, CATCHING the leads so they don't fly off

- Now do the second LED:
    - Insert it from the front "in the pirate eye" where the double circle pattern shows, **long lead, round hole**, and make sure it blinks or fades.
    - Turn off the switch, we're done testing.  If an LED falls out, turn on the switch and test again
    - 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".
    - Solder the leads
    - Trim the leads, catching them so they don't fly off

- IF the LEDs continue to blink with the switch turned **off**, have a Blinkie Tech help you with the switch.  The tech may slide a thumbnail under the "on" side of the switch, to pull it away from the board, then re-melt the switch pin on the on-side and the one in the middle.

- You may also want to trim the pointy leads on the front of the board from the power switch and battery holder.  Again, catch the flying leads.

- 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 the edge of the board on the table to shake off the excess while it is still melted.  ...or ask for help from a tech.

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

- 6 -
Kit 49 Pirate, V1.0 October 2019