

Kit 31 – Eagle Blinky

The heart of this blinkie is a tiny chip embedded in each of the four LEDs. When power is applied, the chip tells the LED to turn on and off, or fade different colors, independent of the other LED.

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!



First, open up the kit and review the contents.

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

Contents:

- CR2032 battery
- Neckerchief (sash) loop wire
- Power switch
- Battery holder
- Tie tack (clasp and pin – Shown separated)
- Eagle Blinky circuit board
- Two LEDs



Got everything to start? If not, give us a shout. Next, a few words on soldering... Skip right to “Assembly” if you are good at soldering.

Soldering Hints

Soldering is not like gluing. When the circuit board and the wire coming through the hole on the circuit board are hot enough, the solder melts and makes both an electrical connection and a mechanical connection. For the small connections on this project, a 25 or 30 watt soldering iron works well. Rosin core solder is used – the acid core solder sold for plumbing would eat your connections in a short time.

Here’s how to make a good joint:

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

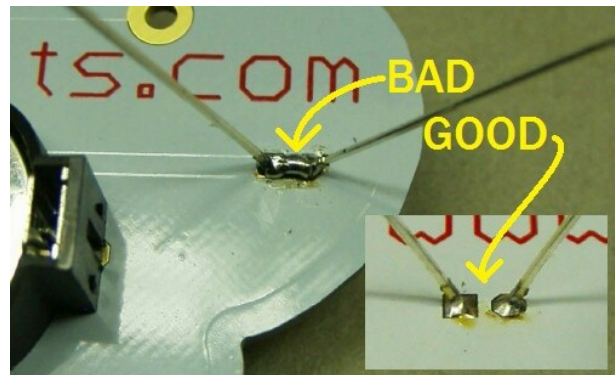
- Prepare the joint. Bend the component lead slightly after it passes through the printed circuit board (this helps hold it in place while soldering).
- Prepare the iron. The soldering iron should be up to temperature. Clean the tip plunging it into the jar of stainless-steel wool. Then melt a little solder (a 2mm length) onto the tip so it's shiny. This is called “tinning”. This solder coating helps conduct heat from the tip to the joint.
- Place the tip in contact with the component lead and the printed circuit board pad for a few seconds to heat them up.
- Place the solder against the joint directly opposite the tool. 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.
- Keep the soldering iron in place until the solder flows freely and completely covers the joint – typically only about 2 seconds. 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. If you see a “ball” maybe you didn't heat the circuit board pad and you only soldered to the wire. Re-melt, pushing the tip down on the board.
- 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 by plunging it into the steel wool several times.

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 only thing that needs to be avoided is solder bridges, which are excess solder making an unexpected connection on the board.

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 *gently* tap to the board on edge to shake off the excess. Beyond that, we are more than happy to demonstrate various techniques.

The goal is to have fun while learning, and your skill will develop as you have fun. Happy soldering!



A bridge between the two leads of the LED = BAD. Current will flow through the bridge, and not the LED, thus the LED will not light up. This is called a “Short”. Fortunately, this is easy to fix.

Assembly

Take a look at the completed picture on the first page. The only components that will be visible on the front are the LEDs. All other components (power switch, battery holder, and tie-tack and/or sash loop will be placed facing the back of the board and soldering will occur on the front of the board – the side with Eagle text on it.

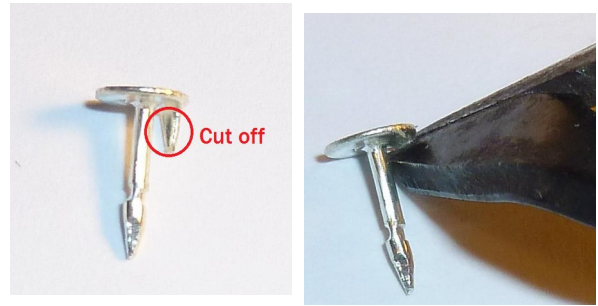
Set the board face-up, so the silk screen printing of Eagle is seen. You are ready to begin.

DECIDE how you want to wear it: PIN back or Neckerchief Slide:

- If you want to pin the blinkie to your clothing: Go to step 1, stop before step 18.
- For a Neckerchief (Sash) slide blinkie, go to step 4, continuing through step 20.

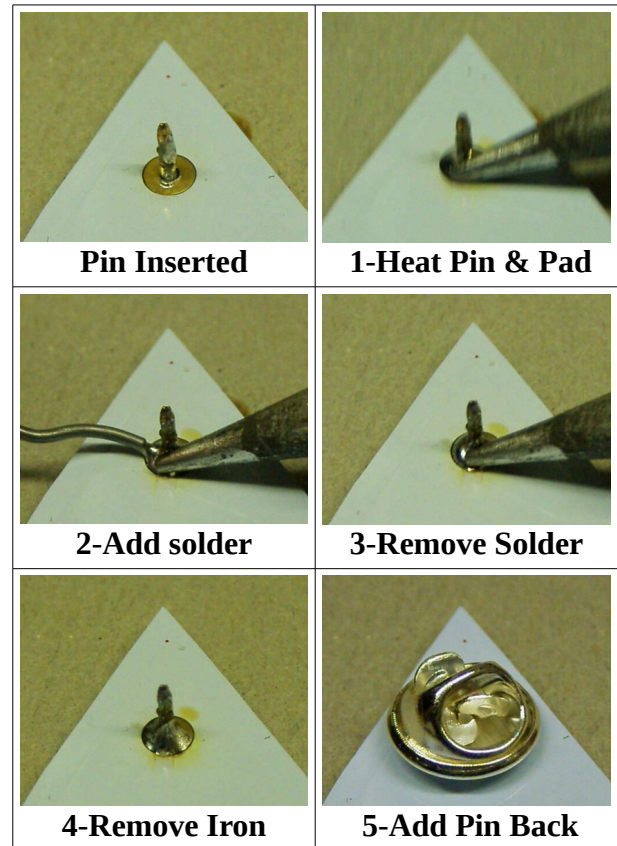
1. You decided “PIN”: Installing clothing pin

Separate the pin from the clasp of the tie tack (pin and clasp). There is a small secondary post. **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.

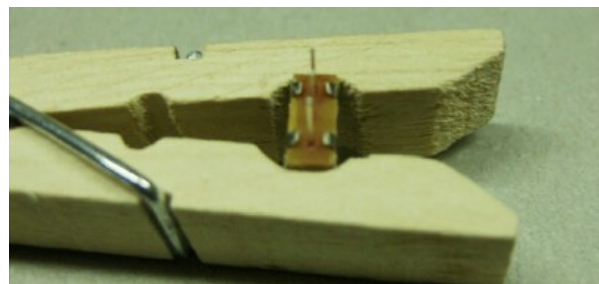


2. Place the pin through the hole on the Eagle side, then hold the pin and set the blinkie on the table – Eagle side down.
3. Solder the pin. A soldering review:
 1. Heat pin/wire and pad: soldering Iron tip on pad and touching pin/wire.
 2. Add solder – maybe 1/8”
 3. Remove solder – it should flow around the pin and the pad – NOT just on the pin/wire.
 4. Remove the iron, let it cool down (about 10 seconds). **NOTE** how the solder “wet” – covers – the pad, and goes a little bit up the pin.
 5. Add the pin back so you don't forget it.

These same steps – 1-4 – are how you solder everything else – LEDs, switch, battery holder, etc.



4. To make soldering the switch easier, place the switch in a clothespin as shown.



5. Set the board – Eagle side up – on the switch.
Solder **one** wire of the power switch - so you can check that the switch is not crooked, nor too far away from the board – if so, just heat, move into place, then remove the iron and let it cool

Then **solder the other 2 wires of the switch.**

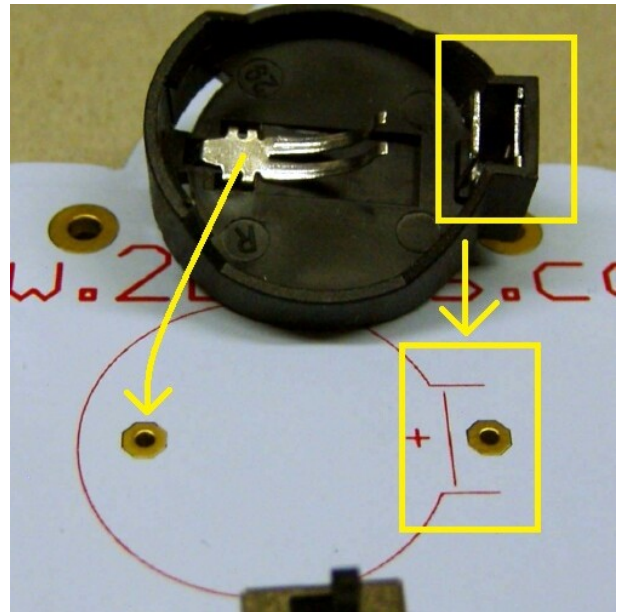


6. Flip the board over and insert the battery holder.

Remember, orientation is important for the battery holder. Make sure the battery holder matches the printed outline.

Flip the board over to the Eagle side.

Solder the battery holder.



7. Insert the battery. The plus sign “+” will face up. Angle it into the battery holder on the left side first, and then press down. It will snap in place. Verify the power switch is on. In the next few steps, the LEDs will be inserted and tested before they are soldered into the board.

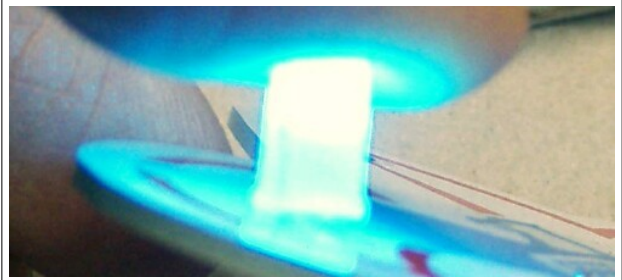


8. Insert one LED into the board from the Eagle side – the side with the circle outlines for the LEDs.

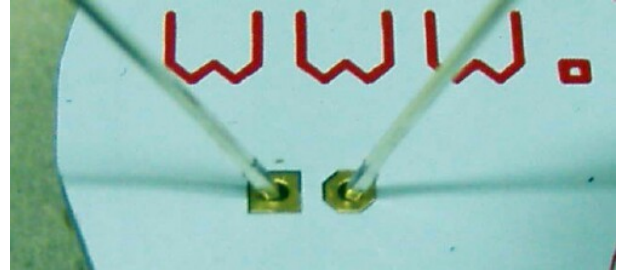
Orientation is important for LEDs.
Long lead, round pad hole.
Short lead, square pad hole.



9. Turn the switch to “on” (up). Check the LED. Does it blink? You may need to gently wiggle so it makes contact. If not, reverse the wires on the LED. If that still doesn’t work, let us know.



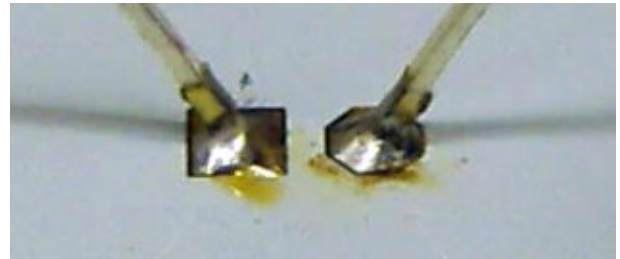
10. Then spread the wires on the back side of the board into a “V”, pulling the LED tightly to the front of the board. This will keep it from falling out and make it easier to solder.



11. Insert, test, and “V” the second LED.

12. Turn the power switch off. Flip the board over and solder the LEDs.

Use only a little solder – be sure to avoid a “short” or “bridge” between the wires: each wire must be soldered individually.



Note how little solder is needed -- just a little “mound”.

13. Trim the excess LED wires with the cutters. Hold the wire to keep it from flying off when cut.

14. You may also want to trim the leads on the front of the board from power switch and battery holder, as they are somewhat “sharp”.



15. Turn on the switch! Your Eagle should begin blinking or color fading.

16. Make sure the switch also turns OFF. If it doesn't, contact a blinkie tech – solder may have gotten under the switch and needs to be fixed.

17. **If you're going to wear it via the pin, you are done.**

For the neckerchief slide, continue with next step.

18. Installing Neckerchief Slide

A piece of 12 gauge copper wire will make a Neckerchief slide loop.

Place the wire as shown in the picture – just BARELY poking through the front of the board. If the wire does not hold itself in place for soldering, take it out and spread the two ends a little to make it a tighter fit.

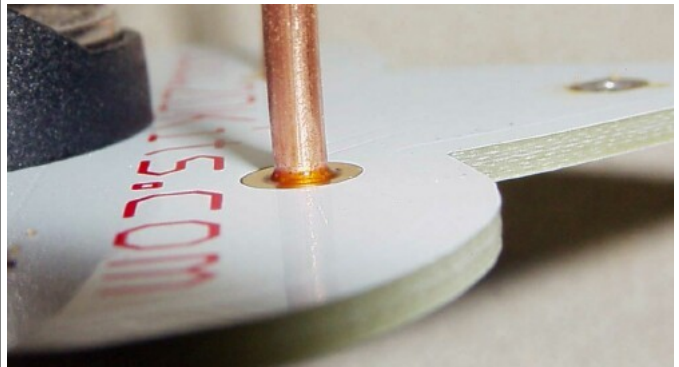
Flip the board over to the Eagle side.

Solder **one** side of the wire. It will take a while to get hot as the copper conducts the heat away – and the **wire gets very hot – do not touch.**



19. Before soldering the 2nd side, make sure the wire is perpendicular to the board – remember **don't TOUCH the HOT wire**, use the clothespin for example, heating the SINGLE solder connection until it can be moved to perpendicular if it was not.

20. Once the loop is perpendicular, solder the 2nd end of the wire.



You are done!

Enjoy!

Say “I made this!”



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.

- Recheck your solder connections. 80% of all problems are traced to this. Cold solder joints 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, wire 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.
- The battery is incorrectly inserted. The "+" side of the battery should always be inserted facing up.
- Bad part – it does happen. In the hundreds of 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.

Use

Once built, the use of this blinkie is fairly straightforward. Don't get it wet. Don't stick it in a pocket, drawer, box, bag, etc with anything metal – such as coins in your pocket – where it might short out.