

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

Kit 05B - 14 RGB Stick Blinkie



The heart of this circuit is a tiny yet powerful computer -- a 16F18324 PIC made by Microchip.

We've programmed **17** blinkie patterns in it, which show up on the 14 Red-Green-Blue Light Emitting Diodes (RGB LEDs)

You can change which pattern is showing via two **pushbuttons**, one for “next” one for “previous”.

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, there should be the following parts in the kit bag:

Power Switch	16F688 PIC Chip	2 jigs to align LEDs	2 CR2032 Batteries
Battery Holder	PIC Chip 14-pin socket	7 56 ohm resistors	
2 pushbutton switches	14 RGB LEDs	14RGB Circuit Board	



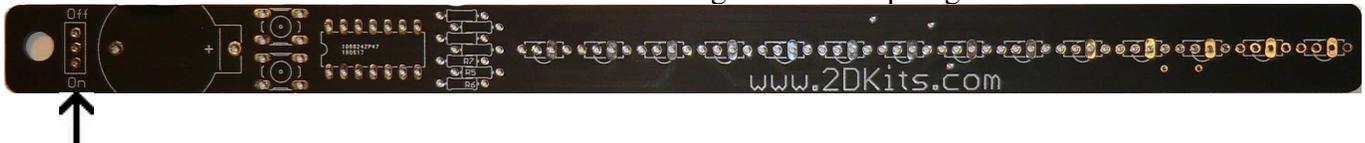
Got everything to start? If not, give us a shout.

Assembly

Place the board horizontally as in the **picture below**:

EVERYTHING is inserted from the front and Soldered on the back.

You will see a white outline showing where each part gets inserted:



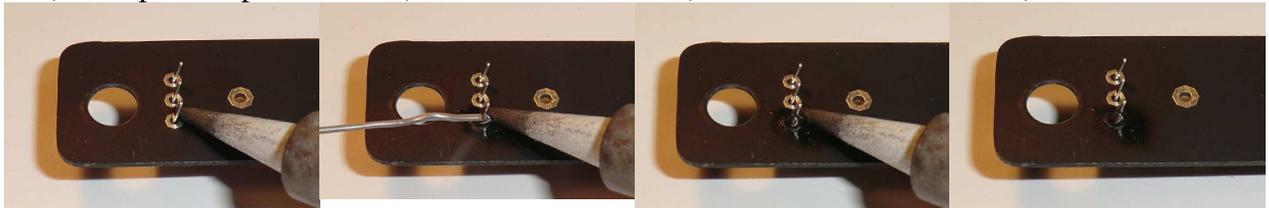
1. Place the power switch into the board. Turn the switch to “OFF”. Lift the board and, holding the pins, flip the board over.
 - Position the board so the pins face straight up from the back of the board.
 - this can be done by sliding the board left-right while the switch handle stays put
 - NOTE I was a bit crooked, so I will show you that result and how to fix it below.
 - Solder the pin closest to you, using the following **HOW TO SOLDER:** steps:

1) Heat pin and pad

2) Add solder

3) Heat until flows

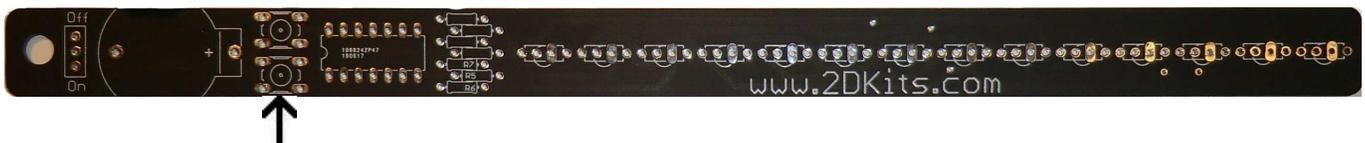
4) Remove iron



2. Check that the switch is flat against the board, and not at an angle like this:
 - if it is crooked or not flat, heat the one solder connection and when melted move the switch flat on the board and straight, hold, and remove the iron
 - Then solder the other two pins

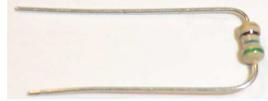


3. Place the socket into the board. **Line up the socket notch with the picture on the board**, as shown in the enlargement to the right above.
 - Hold the socket in and turn the board over and set it on the socket.
 - Solder ONE corner pin, then make sure the socket was flat on the front of the board.
 - If not, re-melt that pin's solder and press down on the board so it is flat, remove the soldering iron, holding the socket in place until the solder cools – about 2 seconds
 - Solder the opposite corner and repeat the above checks for flatness against the board
 - Solder the remaining socket pins. **Reminder:** Use soldering's 4 steps as shown in step 1.



4. Insert the two pushbuttons – they will “snap in” and stay in place.
 - turn the board over and solder the 8 pins.

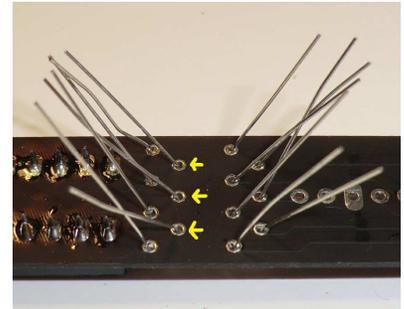
5. Cut the 7 resistors from their tape, then form each to insert as follows:



- Insert the resistors from the front where the matching printing is:

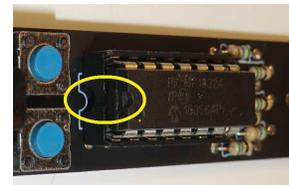


6. After inserting each resistor, hold it tight against the board, and bend its leads into a “V” on the back to hold them in place.
- Flip the board over to solder – See picture on right:
- Solder only 3-4 leads at a time – see the yellow arrows in the picture to the right – then trim them (be careful not to snip any un-soldered leads). You can flip the board around right-left to get to the remaining leads easily with the soldering iron tip
- then solder 3-4 more leads and trim them, and repeat until you are done.



7. Before installing the batteries and PIC chip, check all solder connections, and also make sure there are no **solder bridges** (solder between two adjacent pads).

8. The PIC chip is inserted so the notch is aligned with the notches in the socket and on the white printing on the board – but most importantly: facing the pushbuttons:



INSTALLING the LEDS:

9. To make the LEDS easy to install, we've included 2 “jigs” to hold the LEDS while you solder. Put 2 LEDS in jigs:
- Notice the jig has a slot, and the LED will go in only one way, as shown:
- Push it all the way down, make sure the leads are straight up and down.

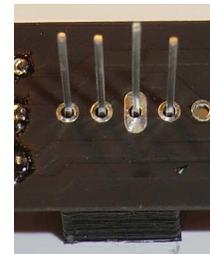
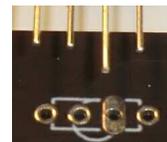


Jig and LED



LED in JIG

10. Insert the LEDS on the FRONT of the board, **long lead in larger oval pad**
- Place them apart so the board will stand up on the jigs.
- Flip the board over and stand them on the jigs – it should look as shown in the last picture:



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

11. Solder **ONE** wire of one of the LEDs. If the board is not flat on the jig, melt that solder connection and press down on the board, then remove the iron and wait a few seconds for it to cool down. Double check the wires are perfectly vertical, and the jig is tight, and solder the remaining wires.

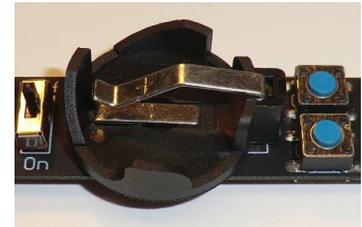
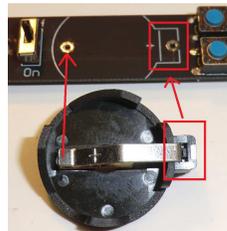
- Repeat for the LED in the other jig.

12. Continue putting 2 LEDs in jigs, inserting them from the front, and flipping the board over and standing it on the jigs, and solder as in step **11**.

13. Insert the battery holder from the front of the board, lining up the square end:

- Prop up the opposite end of the board by placing a jig on the last (already soldered-in) LED.

- Flip the board over and solder the leads



14. Insert one battery at a time, so the “+” on each battery is facing up. They “stack”.



15. Turn on the board! Enjoy.

Use

Once built, the use of this blinkie is fairly straightforward. Don't get it wet. Don't stick it in a pocket or drawer with keys or a bunch of change where it might short out.

Your blinkie has **additional patterns** stored in the PIC. To change patterns, press a push button and hold. The LED closest to the batteries will light, indicating “1” and then the LEDs will count up in a binary sequence. Each binary number represents a stored pattern. If the push button is released, the pattern associated with that particular binary number will then be displayed on your badge blinkie.

- One button goes to the NEXT pattern, the other to the PREVIOUS.
- Tap – not hold – a button to see which pattern number you are currently in

To turn **DEMO MODE on and off**, press and hold down **BOTH buttons** and switch it on.

- The 3 LEDs on the right will be **on** for demo mode, switching to the next pattern every few seconds
- The 3 LEDs on the right will be **off** when you are out of demo mode.
- The mode you are in will stay when you release the buttons, even after switching it off.

Troubleshooting

If your blinkie doesn'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 related to this problem. 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.
- Batteries incorrectly inserted. The “+” side of the battery should always be inserted facing up.
- PIC chip inserted backwards. The notch which represents pin 1 should be closest to the batteries.
- Bad part – it does happen. In the hundreds of boards assembled, we've seen the rare part fail.

Soldering Hints

Soldering is not like gluing; the solder forms an alloy with the metals to be connected that creates a stable electrical path and a certain amount of mechanical attachment. 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 components in a short time.

Here's how to make a good joint:

- 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 soldering iron. It should be up to temperature. Clean the tip by quickly brushing it against a damp sponge or cloth, or plunging it into steel wool several times. 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.
- Place the tip in contact with the component lead and the printed circuit board pad.
- 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. If the heat is removed too soon, the solder will tend to “ball up” and not stick well to the lead and pad. The solder joint should look “wetted”, with concave shapes.
- Remove the iron and let the joint cool without movement. 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. Wipe off flux and excess solder regularly in the damp sponge or cloth, or plunging into steel wool several times, and re-tin if needed.
- Wash your hands after finishing the soldering.

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