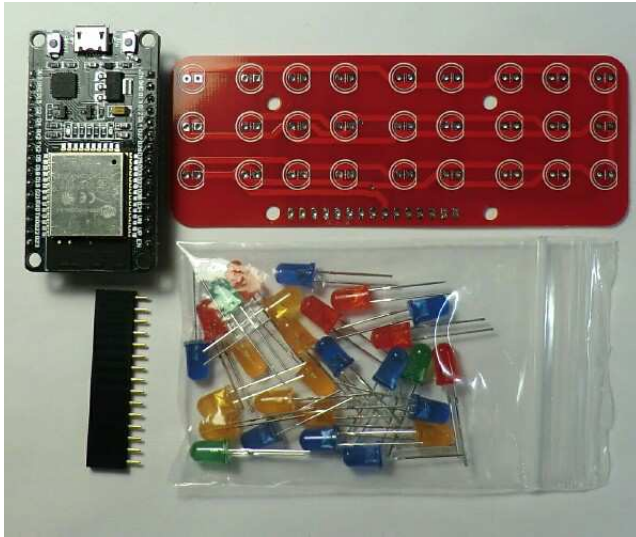


Kit 55 - TixClock Blinkie

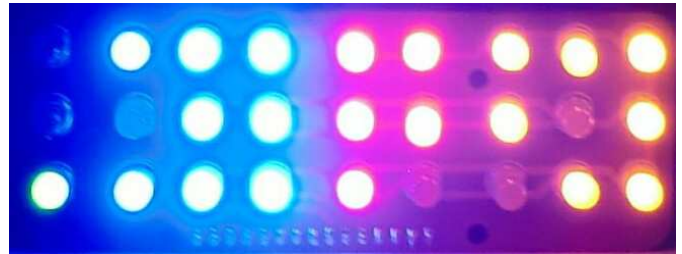
This *Blinkie* is made with an LED circuit board for 27 light emitting diodes (LEDs), and a microprocessor circuit board with USB connector to make it work. You will make it yourself by soldering the parts onto the circuit board.

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 Clock!



Read your clock – much easier than in this photo – which has “18:57” on it, as follows:
Column 1 is the tens-of hours – showing “1”
Columns 2-4 are hours – showing “8”
Columns 5-6 are tens-of-minutes, showing “5”
Columns 7-9 are minutes, showing “7”
The number of LEDs lit always tell the time, but every 4 seconds WHICH LEDs, is random.

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

- The microprocessor board – called an “ESP32” with USB, WiFi and BlueTooth.
- The Tix Clock circuit board
- A 15-pin connector to connect the two circuit boards
- A bag of 27 LEDs

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.

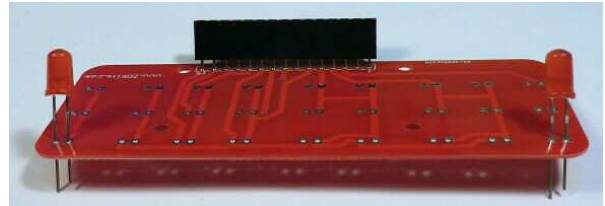
TERMS:

| | |
|--------|--|
| 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

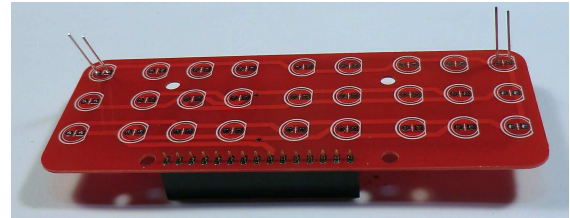
Preview: We're going to solder the connector, then the LEDs, then plug in the ESP32.

1. On the back of the board (where there are no LED outlines), insert any 2 LEDs in the corners as shown. These will keep the board more level when flipping it over.



Then insert the connector as shown:

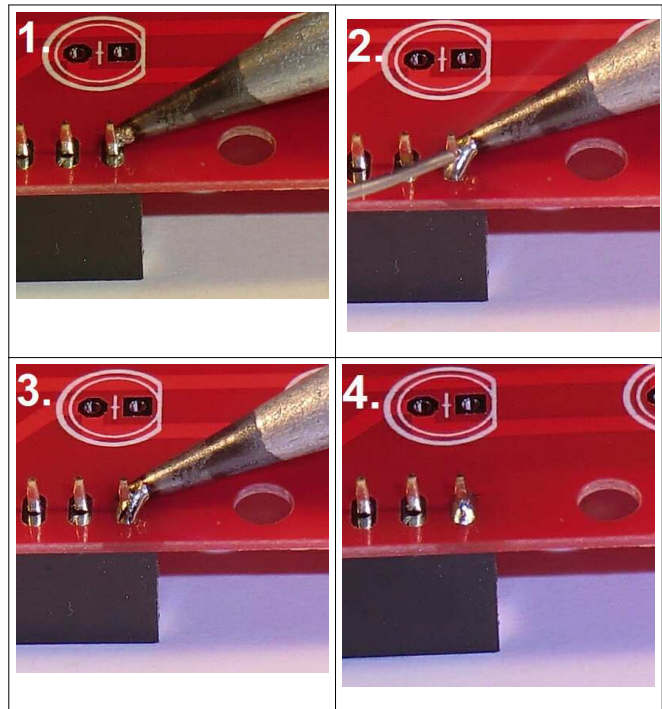
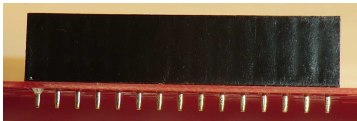
2. Flip the board over and stand it on the connector and the two LEDs.



You will then solder the connector, using the steps outlined below.

Follow the next 4.1) through 4.4) steps for all soldering.

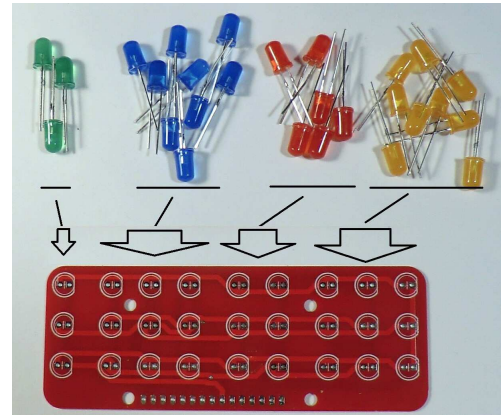
3. Solder **ONE** pin of the connector as follows:
 - 1) Heat pin and pad: the soldering iron tip must touch **both** for the solder to connect them.
 - 2) Melt solder into connection – about 1/8”
 - 3) Remove solder, but **keep heating the pin and pad to flow the solder around them.**
 - 4) Remove the iron. The pad should be covered by the solder you added, with it going up on the pin just a little.
4. Check the connector for being flat against the circuit board and straight up.



5. Repeat the above steps for the rest of the pins

6. Installing the LEDs:

- Remove the 2 LEDs you temporarily placed in the board while soldering the connector.
- Divide the LEDs into 4 piles, by color:
 - 3 Green for tens of hours
 - 9 Orange (they look yellow) for hours
 - 6 Red for tens of minutes
 - 9 Blue for minutes
- Do NOT exchange the blue and orange LEDs!
- Note the 15-pin connector is on the **BOTTOM**



7. You will insert the LEDs from the front, over the LED outlines, as shown to the right.

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.
- Then spread the leads on the other side.

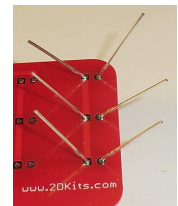
8. Start with the 3 green LEDs in the left column, and 3 blue LEDs on the right-most column.
9. Solder the 6 LEDs, making sure they are tight against the front of the circuit board.



Long-Round,
Short=Square

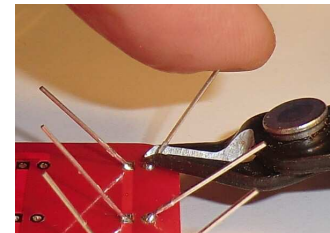


Front



Back

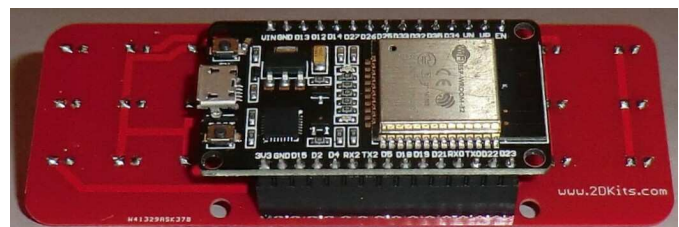
10. Trim the LED leads, being sure to keep them from flying off by putting a finger over the end as shown.



11. **Install all the LEDs, a row at a time**, solder, and trim.

12. You may also want to trim the pins on the 15-pin connector. Again, catch the pieces that might fly off.

13. Now, plug the small ESP board into the 15-pin connector. To know which way is UP, match the picture to the right. - notice how the USB connector is on the left with the connector on the bottom.



This finishes the hardware – the “building” of the blinkie clock. Next we will get it to **talk to your WiFi** so it can get the time from your network.

Software Setup

Overview

- The ESP32 chip on the clock contains a web server, accessed directly via WiFi to its “hot spot”, or on your network via its WiFi access point (AP).
 - We will set it up to access your WiFi, from which it can get the time using NTP – Network Time Protocol. That way when you move the clock, and plug it back in, it can access your WiFi and set the time. The clock is reset when unplugged. It must get its initial time your network.
 - There are two methods of setup
 - Web browser to the blinkie
 - USB based serial terminal.

Setting up the clock using a web browser

- Plug your blinkie into a source of USB power, i.e. a transformer or computer.
 - The blinkie should light up and after a few seconds show some random time.
- On your PC, Mac, tablet, or phone, go to WiFi setup, and you should see “blinkie-xxxx” the web server ON the blinkie.
- Connect to “blinkie-xxxx”, and wait for the connection to complete. It may take up to a half a minute
- Go to your web browser, and browse to <http://192.168.4.1> the blinkie's web server address.
- Once the web page comes up, click on “Settings” in the left column, this may take 10 seconds.
- In the WiFi Network table, enter your WiFi's SSID – the same thing you'd use to initially connect a device to YOUR network.
- Assuming your network has a password – It should! – enter your network's password.
- Then scroll down and set your time zone, for ex. CST for Central Standard Time, and click “Save Settings”

| SSID | Passcode |
|------------|-------------------|
| WardsWiFi | EatPizzaInJammies |
| [Not Used] | [Not Used] |

Time

o Timezone

- Now, unplug your blinkie, wait a few seconds, and plug it back in.
- After about 10 seconds it should connect to your network and start displaying the correct time.
- **Reading the time:** You read the time by counting the number of LEDs of each color – ex 1 green, 6 orange, 4 red, NO blue would be 16:40. **It is always in 24-hour mode.** 16:40 is 4:40 PM

Setting up the clock using a serial terminal program

- Plug your blinkie's USB cable into a PC, Mac, etc.
 - The blinkie should light up and after a few seconds show some random time.
- The FIRST time it is plugged in, it may say that for example Windows 10 assigned it “COM5:”
- If the serial port didn't identify itself or you missed the message, do the following
 - On Windows 10 for example, hit the windows key, and type: device manager
 - Look for “Ports” and expand it, which in this example says the blinkie is on COM5:



- Set your terminal program to 115,200 baud, and COM5 or what ever yours is, and open the session.

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

- If it doesn't respond, unplug the blinkie, wait a few seconds, plug it back in, and restart your terminal program.
- Once the terminal responds, you can type: **help**
- You then run the **addwifi** command. Using the same example as above, supply a password:
`addwifi WardsWifi -p EatPizzaInJammies`
- You should see a flurry of messages, then you can type:
`winfo`
which will show you your WiFi information. You can use the WiFi AP: IP address to connect to it.
- Your clock should now start showing the correct time. If it does not, unplug it, wait a few seconds, and plug it back in.

Using your clock

- You may now move your clock to a more permanent location and use it as a – Clock!
- You can't MOVE it outside of your WiFi range, without going through the setup for a new SSID.

Troubleshooting

NO LEDs light up when connected to USB for power

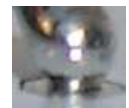
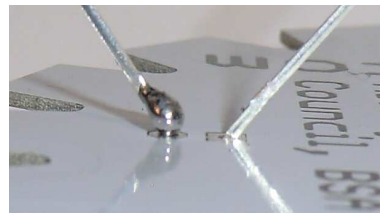
- Are the blue and red LEDs on the back of the board – on the ESP board lit?
 - If not, then unplug the ESP board from the 15-pin connector, and see if they light up. Something could be shorting out the power to the TIX board.
 - IF the LEDs are on on the ESP board, when plugged in, then look for missed soldering on the connector.

Some digits show incorrectly such as after 10:00 PM having either 1 **or** 2 LEDs in green

- You may have soldered an LED in backwards. For example, if the middle green LED is backwards, it is “trying” to light 2 random green LEDs, but will light 2 (top and bottom) or 1 (top **or** bottom), because it cannot light the backwards middle LED. See “**LEDs reversed**” below.
- You may have missed soldering an LED, or not soldered it well. Check all LEDs leads.
- You may have missed soldering a pin on the connector, or not soldered it well. Check, and if necessary re-melt the solder to be sure it connects each pin to its pad, and there is no **bridge** of solder between two pins.

If you've made a solder **bridge**, 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.



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

- Check for bits of solder, LED 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 solder it in the correct way. Trying to remove it yourself CAN break the circuit board.
- Bad part – it does happen. In over a thousand 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 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 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, satin 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!