

WordClock-5 Assembly Guide

A WiFi Based **Colorful** WordClock

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Introduction

WordClock-5 assembly should be attempted only by experienced builders. Although the assembly is relatively straightforward and not difficult, there are several SMD¹ parts that must be carefully soldered to the board. The kit may be returned for a full refund less shipping within 30 days of purchase but only if assembly has not been started.

The single board, English version does not require an SD card, as the format file is built in. An SD card with a format file in the folder, /Language/anyname.fmt, will override the built in format file and is necessary for both any announcement files that wish to be included or a two or three board clock. Modifications to the internal format file can be made by downloading it from the website², making changes, and installing it on an SD card.

Assembly

WARNINGS!

USE ONLY A +5V POWER SUPPLY! THE MORE COMMON 12V POWER SUPPLIES WITH BARREL CONNECTORS, WILL PROBABLY DESTROY ALL THE LEDS.

DO NOT SOLDER THE MICROCONTROLLER DIRECTLY TO THE BOARD, USE THE SUPPLIED HEADERS.

TEST EACH ROW OF LEDS AFTER INSTALLATION FOR SHORTS BETWEEN +5V AND GND (PINS 2 AND 3) WITH A MULTIMETER.

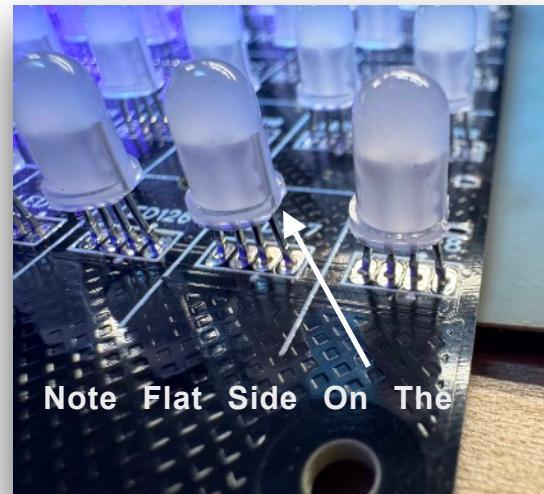
Step 1 – Install the LEDs

The only components that are installed on the top of the board, are the LEDs, optional multi-board connectors, and multi-board power supply barrel connector. All other components are installed on the back of the board.

Start assembly by installing all 128 LEDs.

APA106 Led Version: Note that the longer leads are oriented toward the dot on the third pin. That also puts the flat side of each LED, on the right. DO NOT GET THIS WRONG!

Install one row at a time. LEDs should be installed so that the bottom of each one is around 4mm above the board, you will note there is a small 'knuckle' in the leads, this should be at PCB level. Do not press them down too far, or they will crack.



¹ Surface Mounted Device - https://en.wikipedia.org/wiki/Surface-mount_technology

² stocksclocks.com

After installing each row, use an ohmmeter to verify that there is no continuity between pins 2 and 3. Test on any row. Pins 2 and 3 on each LED on all rows, are connected to +5v and GND. If there is a short, fix it before continuing.



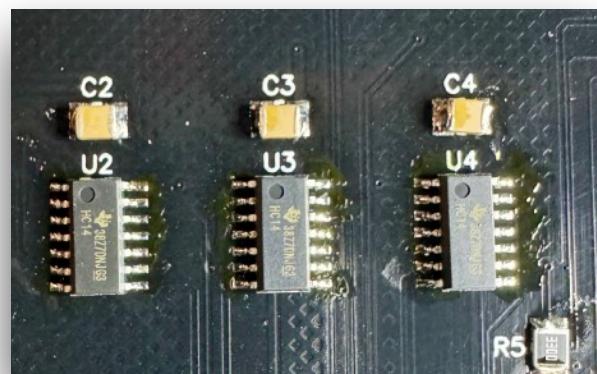
Take your time to install them all at the same height and aligned vertically

WS2812B Led Version: Install these LEDs one row at a time (note the silkscreen orientation). Wet one of the four pads for each LED with a small amount of solder. Attach and align the LED just to that one pad, then proceed to solder the additional three leads for each LED. It is not necessary to make a continuity test after completing each row.

Step 2 – Install additional components

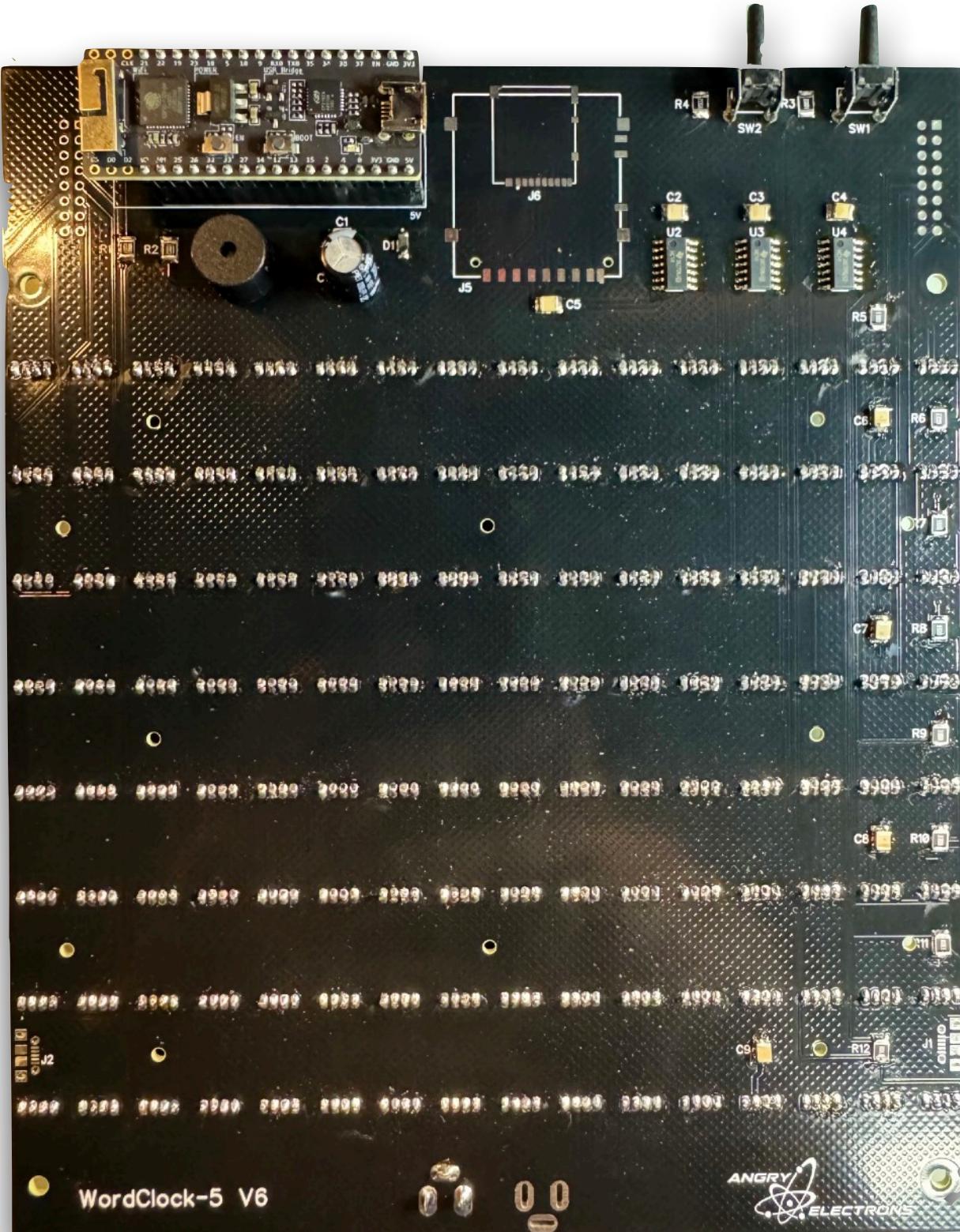
For a main board – Install U2-U4, with pin 1 facing up. Install C1-C9 bypass capacitors, R1-R4, 10k resistors, R5-R12 (330R resistor)s, diode D1 with cathode (bar) facing up, switches SW1-SW2, PZ1 buzzer, and electrolytic capacitor C10.

For a two board version – on the second board, only install C1-C9 bypass capacitors, and the 16 pin male connector. The connector goes on the top of the board, same side as the LEDs, and on the left side. Ignore the silkscreen, if it is on the

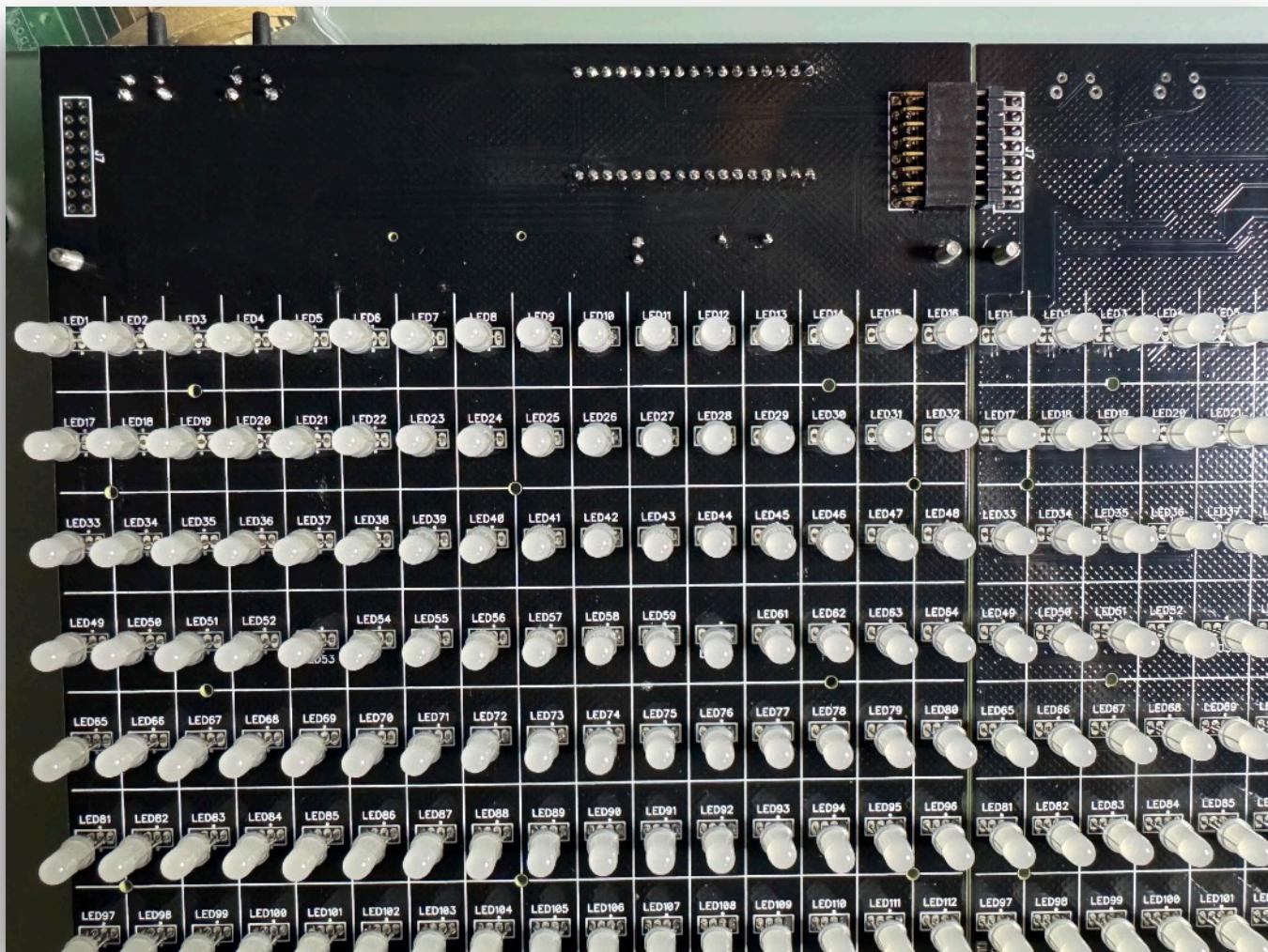


Note IC dot at top left

bottom. For three board versions, install a female, 16 pin connector on the right side and on the third board, install a male connector on the left side.



Single board Clock (APA106) - All components in their place (except the SD Card Holder - Optional)



For a multi-board clock, note the installation of the right angled connectors, the left hand board is the processor board and the right hand the add-on display

If this is the main board for a multi-board version or any language other than English, install the SD card socket and the provided SD card. A micro SD card socket can be used instead, but it is extremely difficult to hand solder. Also install the female 16 pin connector at J7 on the same side of the board as the LEDs, regardless of the silkscreen position.

Install the headers at U1, for the microcontroller. One long header strip is cut in two pieces. You will find it easier if you place the strip on one set of processor pins *and then cut* the strip, then repeat the process for the other side.

For a single board version only, a micro USB connector³ can be used to connect the +5V supply. It can be placed on either side of the board. USB power should not be used for multi-board clocks. A barrel connector is required for multi-board versions, and optionally instead of a USB connector, for single board clocks. Two placements are available facing left and right for both the barrel connector, and USB connector. Shorts between the small pins on the USB connector will not affect operation, as only the +5V pin is used.

³ If using a USB supply, make sure it can supply *at minimum* 2.5A.

Plug in the microcontroller. The USB connector side faces right. This completes assembly of the clock board, proceed now to the case assembly. Any questions then please contact us at stocks@clocks@gmail.com.

Bill of Materials

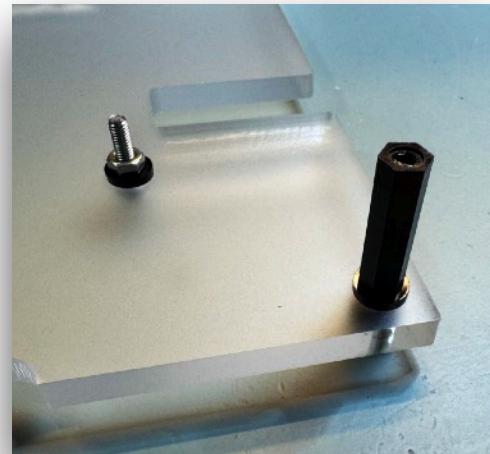
Part No.	Quantity	Component Type	Value	Comments
R1-R4	4	Resistor	10k	
R5-R12	8	Resistor	330R	
C1-C9	9	Capacitor	100nf	
C10	1	Capacitor	330 μ f	
D1	1	Diode	1N5819	
J1 or J2	1	Power Jack	Micro USB	
J4 or J5	1	SD Card Connector		SD or micro SD (multi-board or non-English, only)
J6	1	16 pin header	Female	Multi-board only
J7	1	16 pin header	Male	Multi-board only
LEDs	128, 256 or 384	APA106 or WS2812B		Number depends on clock type
	1	Header	1x40	Cut in two for microcontroller
PZ1	1	Buzzer		Piezo buzzer
SW1-2	2	Button		90 degree pushbutton
U1	1	Microcontroller	ESP 32	Programmed with WordClock-5 software
U2-U4	3	IC	74HC14D	Quad buffer SMD
	1	SD Card		Programmed with language format file
	1	Circuit Board		

Case Construction

Note that the engraved faceplate for the clock is quite delicate, so take care not to scrape any paint off of the rear and it is advised to wear some cotton gloves or other protective gear to avoid getting greasy finger prints all over the acrylic!

Single board clocks

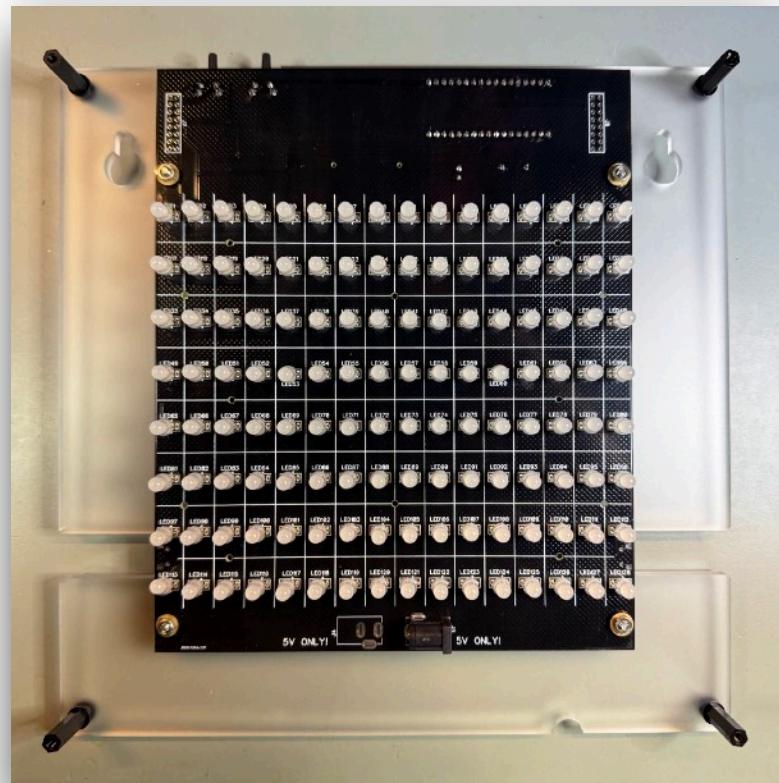
First, install the four M3 x 16mm screws from the backside of the rear faceplate and add an M3 washer and nut on the inside of the case, the PCB will rest on these four mounts. Install the 20 mm black nylon standoffs using M3 x 12mm socket head bolts and also use another M3 washer on the inside of the case (see photo to the right).



Here is the backplate of the clock case ready to accept the clock board. Note the cutouts for a wall hanging option should you wish to do so. The kit is also supplied with a 3D printed stand to stop it getting knocked over.⁴



Place the PCB over the four screws and then add four more of the plastic washers and tighten with 4 x M3 nuts. If the PCB does not line up over all four screws, loosen them slightly from the rear of the case.



⁴ We cannot promise that this is cat-proof though.....

Baffles isolate the light from each LED. Start with the 9 horizontal ones and place them from top to bottom, they will be a tight fit, but that is by design (if they are too tight, then a very light filing on the inside of the bottom notch on each side will help). Then slot the vertical ones in place until the baffle array looks like the picture here. Now is a good time to plug in the power pig tail if you elected to use the 5V power socket.

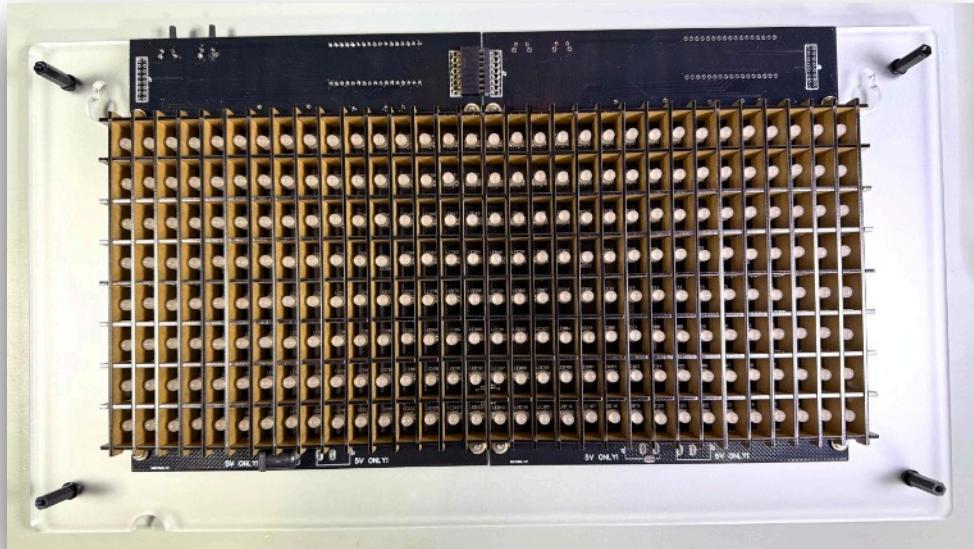


Gently remove the paper from the faceplate and attach it to the clock using 4 of the M3 x 12 mm socket head screws and washers. You're done! Plug the clock in and follow the operation instructions (separate document).



Double board clocks

Putting a double board clock together is very similar to the single board with one notable exception. There are three horizontal baffle parts that have small nubs on the bottom edge which slot into the holes on the PCBs. Where they go is obvious and the other horizontal ones follow as before.



Note the right angled connector on the same side as the LEDs



All Done!

Warranty Terms and Conditions

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Schematic

R5-R12 and LEDs are not included on the schematic.

