



WordClock-1 Assembly Guide



Contents

Introduction	2
Assembly	2
Bill of Materials	6
Warranty Terms and Conditions.....	8
Schematic	9

Introduction

WordClock-1 assembly should be attempted only by experienced builders. Although assembly is straightforward and not difficult, there are several SMD parts that must be carefully soldered to the boards. The kit may be returned for a full refund less shipping within 30 days of purchase, only if assembly has not been started.

Assembly

WARNINGS!

DRILL HOLES IN THE CASE BASE FIRST. USE THE CIRCUIT BOARD AS A TEMPLATE.

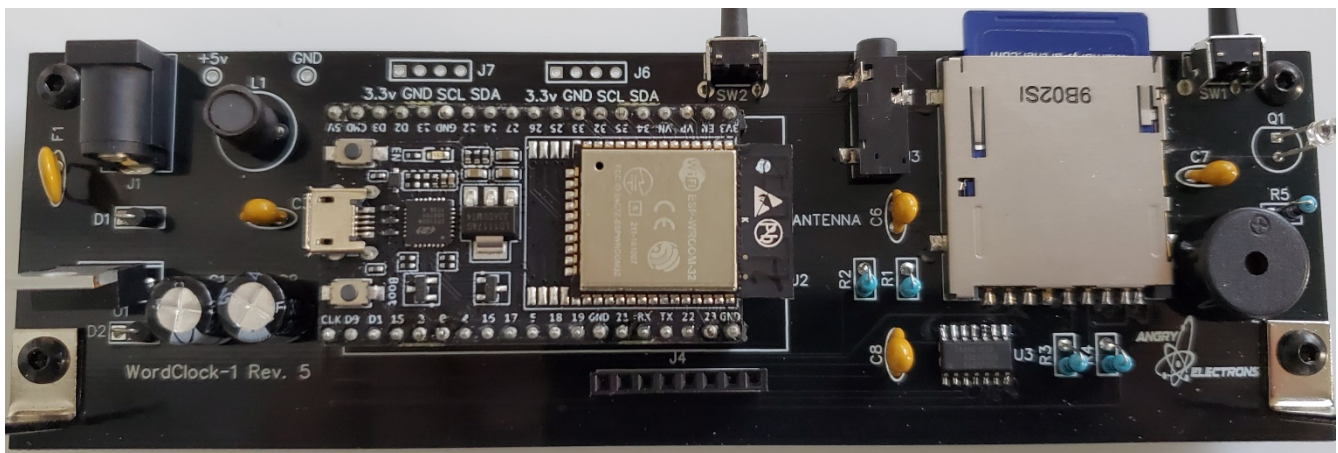
DO NOT INSTALL THE HEADERS FOR THE ALPHANUMERIC LEDs. REMOVE THE PINS, OTHERWISE THE BACKLIGHTING WILL BE BLOCKED.

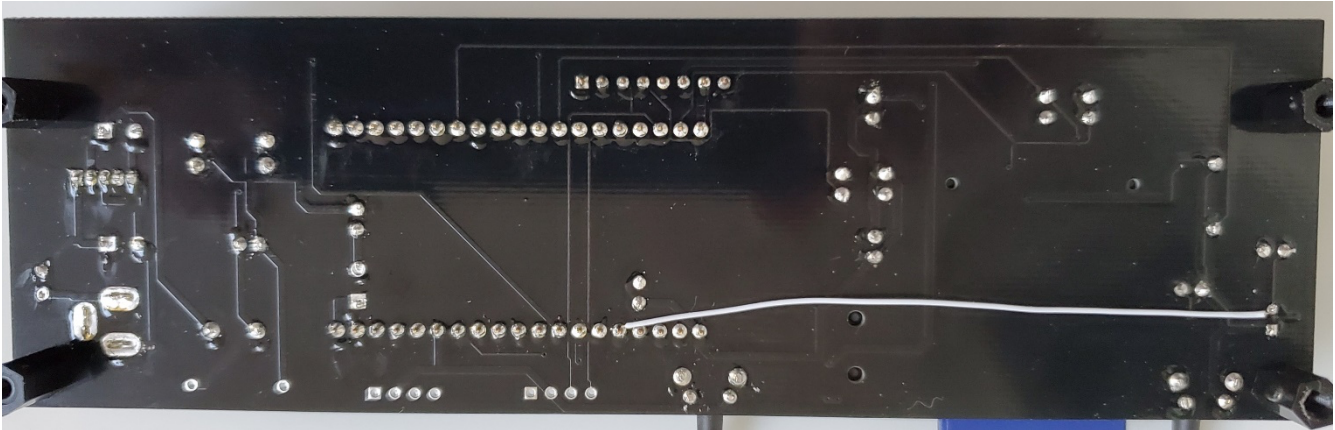
DO NOT SOLDER THE MICROCONTROLLER DIRECTLY TO THE BOARD, USE HEADERS.

Case

If you purchased the optional acrylic case, this would be a good time to mark and drill the holes in the base. It is easiest to use an unpopulated circuit board for this purpose. The precise distance between holes is 156mm wide by 34.5mm deep. **The board should not be centered on its base because the LED displays extend beyond the front of the board.**

Step 1 – Build the Main Board

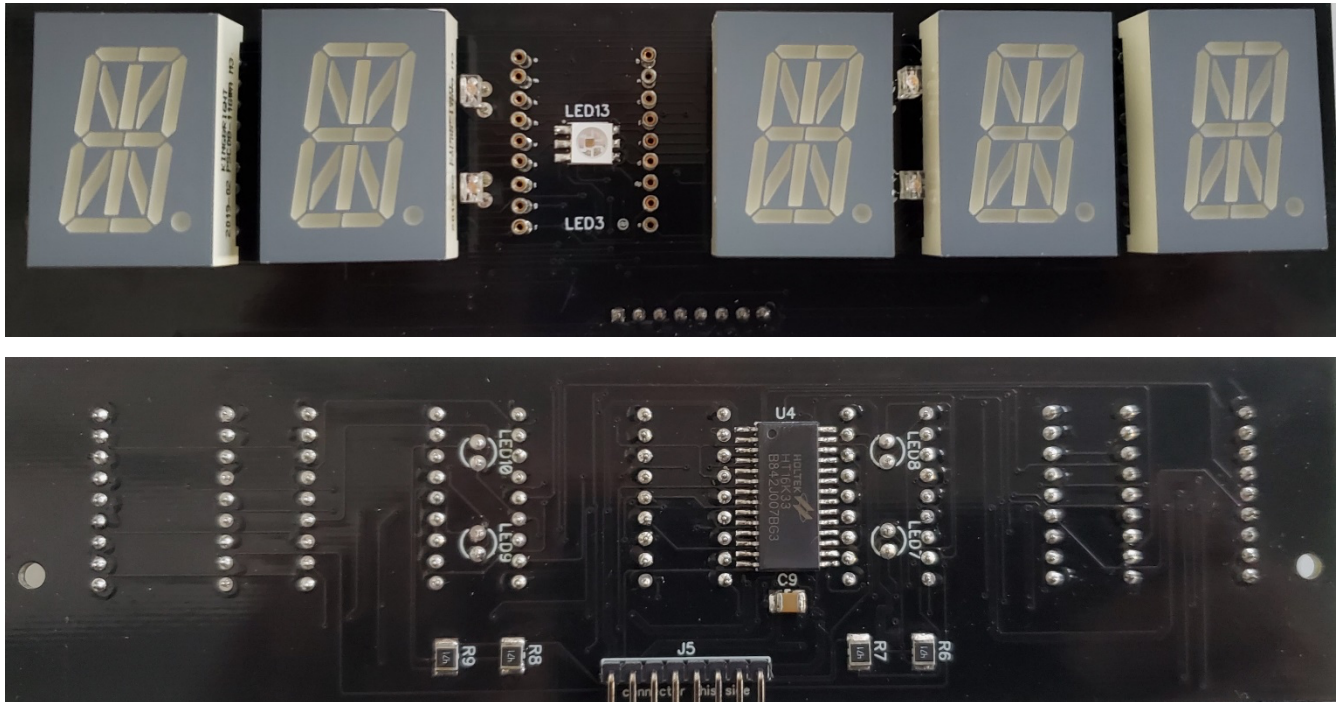




- Separate the main board from the display board by bending along the V-score line.
- Build the power supply on the main board. Install J1, F1, C1, C2, C3, D1, D2, L1, and U1. Note that C1, C2, D1, and D2 must be installed in the direction noted on the board.
- Connect a 9-12v power supply with a center positive, 2.1mm connector, and check the test point for 5v. Do not continue assembly if 5v is not present at the test point.
- Install the remaining components on the main board. Start with U3, the 74AHC125D, 14-SOHC chip. The line or dot on one side of the chip must be installed toward the cutout on one side of the silkscreened pattern. The best way to install a surface mount chip is to add a very small amount of solder to one of the corner pads for the part. Then quickly and carefully solder the corresponding pin to the pad. Check the alignment of all 14 pins and if correct, solder the opposite corner pin. Check the alignment again, then solder the remaining pins quickly and carefully.
- Install the SD card connector next. It is not necessary to solder the three small leads on the side of the board closest to SW1. Solder quickly and carefully. Plastic parts can be damaged by too much heat. Then install J3, the GPS connector.
- The ambient light sensor, Q1, should be installed about 10mm above the board. The shorter lead goes toward the back of the board.
- Cut the 40 pin female header into two, 19 pin pieces. Install at the U2 location.
DO NOT solder the microcontroller to the board!
- Install the remaining parts to the main board. J6 and J7 are not used.
- Connect a jumper on the bottom of the board from Q1, the TEPT4400 pin farthest from the switch immediately behind it, to pin 5 on the microcontroller, U2, labeled IO34 or G34.

- Insert the microcontroller, U2, into the headers aligning the direction of the USB connector and the antenna with the marks on the board.

Step 2 – Build the Display Board



For ease of assembly, parts should be installed in the order noted here.

- Install LED11-LED16. Follow the same procedure noted above to install surface mount parts. The LEDs must be soldered quickly and carefully. Note the direction. Align the angled corner with the mark on the board.
- Install 470 ohm surface mount resistors at R6-R9. These resistors are used to equalize the brightness between the display and colons. If a different color colon is used, this value may have to be adjusted.
- Install C9, the surface mount capacitor to the back of the display board.
- Install J5, the 90 degree male connector, to the back of the display board. Solder one pin first, then check the alignment to verify that the pins are parallel to the board.
- Cut the silver tape into six pieces and stick to the back of each alphanumeric display, LED1-LED6. Verify that the tape does not contact any of the pins. The displays are somewhat translucent so backlighting will show through some segments without the tape installed. Also, the tape's reflectivity will increase the visibility of the backlighting.

- **Do not install the pins in the headers! Remove the pins from the headers!** If the round pins are provided on black plastic headers, they should be removed and individually installed to allow more visible light around the displays. Hold each header upside down on the sharp corner of a bench, piece of wood, etc. Grab the back of the pin with a needle nose plier, and push down hard. The pins will pop out.
- Install a round pin onto each pin of LED1-LED6. Use masking tape to hold the displays in place. Position the display board upside down on a flat surface and solder all pins.
- Solder U4 to the back of the display board. Note the direction. Again follow the above procedure to install surface mount parts.
- Install LED7-LED10, the colon LEDs. The short pin goes toward the top of the display board. Align the colon LEDs so the top is even with the front of the alphanumeric displays.

Step 3 – Final Assembly

- Install two, 10mm standoffs into the holes on the bottom of the main board on the side with the buttons, using two screws.
- Install two standoffs into the holes on the bottom of the main board on the front, along with the short side of the 90 degree brackets. Put the screw into the short side of the bracket, then through the main board, and into the standoff.
- Plug the display board into the main board, and install two screws and nuts to secure it to the brackets. The display board should be in front of the brackets.

This completes WordClock-1 assembly. Refer to the User Manual for setup and operating instructions.

Bill of Materials

Reference	Qty	Part	Value	Note
R1-R2	2	Resistor	4.7k ¼ watt	yellow-violet-red-gold or yellow-violet-black-brown-gold
R3-R4	2	Resistor	10k ¼ watt	brown-black-orange-gold or brown-black-black-red-gold
R5	1	Resistor	120k ¼ watt	brown-red-yellow-gold or brown-red-black-orange-gold
R6-R9	4	Resistor	470R ¼ watt or 315R	Surface mount. 470R for Orange, Super Red, and Light Green, Others 315R
C1-C2	2	Capacitor	330uf 25v	Electrolytic
C3-C8	5	Capacitor	100nf	
C9	1	Capacitor	100nf	Surface mount 1210 marked 104
D1	1	Diode	1N4001	
D2-D3	2	Zener Diode	1N5819	
F1	1	Poly Fuse	500mA	Labeled .050
J1	1	Power Jack	2.1mm	
J2	1	SD Card Connector		DM1AA-SF-PEJ
J3	1	Audio Jack	3.5mm	SJ-3523-SMT-TR CUI,Inc.
J4	1	Header	1x8 2.54mm	Female
J5	1	Header	1x8 2.54mm	Male 90 degree
J6-J7	2	Header	1x4	Not used
	1	Header	1x40	Cut in two 19 pin for microcontroller
L1	1	Inductor	100uH	
LED1-6	6	LED		16 segment .8" LED alphanumeric display
LED7-10	4	LED		3mm LED
LED11-16	7	LED		APA102 SMD RGB LED
Q1	1	Sensor	TEPT4400	Ambient light sensor. Looks like an LED, clear lens, long leads.
PZ1	1	Buzzer		Piezo buzzer, 11mm lead spacing
SW1-2	2	Button		90 degree pushbutton
U1	1	IC	LM2576T5.0	Switching 5v regulator

Reference	Qty	Part	Value	Note
U2	1	Microcontroller	ESP32	Programmed with WordClock software
U3	1	IC	74AHC125D	Quad buffer SMD
U4	1	IC	HT16K33	LED driver SOP28
	108	Pin		Female pins for 16 segment display LEDs
	2	Bracket		Keystone 4326
	4	Standoff		Threaded 10mm
	6	Screw		M3 8mm
	2	Nut		M3
	1	Silver Tape		Cut to cover the back of each alphanumeric display
	1	SD Card		Programmed with WordClock database
		Circuit Board		Display and Main with V-score

Warranty Terms and Conditions

This software and hardware product is Copyright (C) 2019 by Mitchell Feig. It is exclusively distributed by StocksClocks LLC. All Rights Reserved. StocksClocks warrants that for a period of 90 days following delivery, kit parts will (a) perform in accordance with published specifications, and (b) will be free from defects in materials and workmanship. In the event a kit part does not meet this warranty, subject to the conditions set forth in these terms and conditions, StocksClocks sole obligation will be, at its election, to repair or replace the kit part in question. We may require return of the part for examination and replacement. Replacement will be completed at the sole discretion of StocksClocks, after examining the returned part. Correct assembly is the responsibility of the builder.

StocksClocks MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY, NON-INFRINGEMENT, AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. IN NO EVENT WILL Stocksclocks BE LIABLE FOR PUNITIVE, SPECIAL OR CONSEQUENTIAL DAMAGES, OR FOR AN AMOUNT IN EXCESS OF THE PURCHASE PRICE OF THE DEFECTIVE Stocksclocks PART OR PRODUCT.

Schematic

