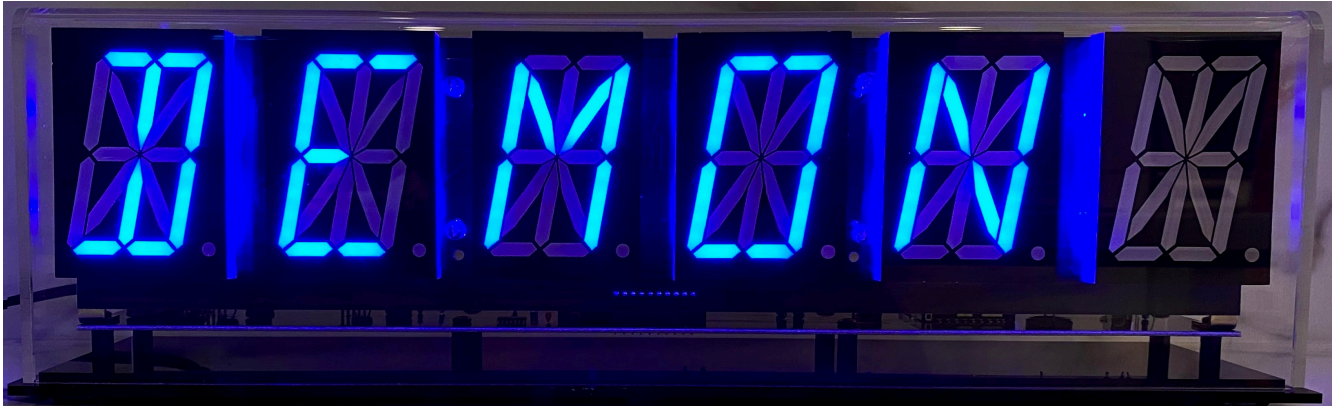




## WordClock-2 Assembly Guide



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## Introduction

WordClock-2 assembly should be attempted only by experienced builders. Although assembly is straightforward and not difficult, there are several surface mount 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 attempted.

## Assembly

### WARNINGS!

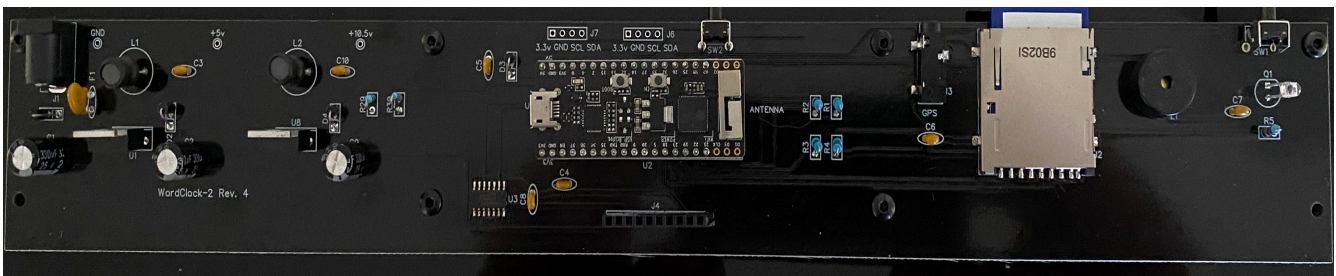
**DRILL HOLES IN THE CASE BASE FIRST. USE THE CIRCUIT BOARD AS A TEMPLATE.**

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

**EVERYTHING ON THE DISPLAY BOARD GOES ON THE BACK, SILK SCREENED SIDE, EXCEPT THE DISPLAYS AND THE COLON LEDs.**

**USE A GOOD QUALITY, UL LISTED, 12V POWER SUPPLY.**

### Step 1 – Build the Main Board

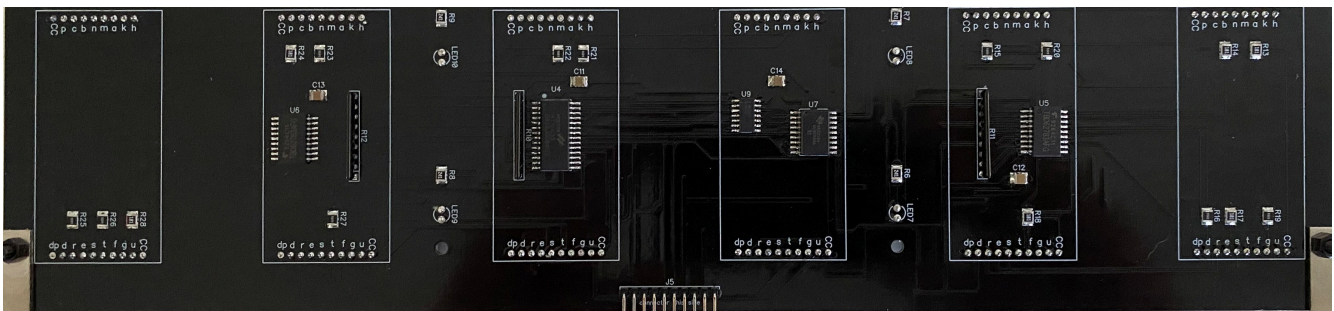


- Separate the main board from the display board by bending along the V-score line, if not shipped already separated.
- Build the power 5v supply on the main board. Install J1, F1, C1, C2, C3, D1, D2, L1, and U1. Note that C1, C2, D1, and D2 must be installed in the direction noted on the board.
- Connect a 12v-18v power supply with a center positive, 2.1mm connector to J1, and check the test point for 5v. Do not continue assembly if 5v is not present at the test point.
- Build the 10.5v power supply on the main board. Install C9, C10, D4, R29, R30, L2, and U8. Note that C9 and D4 must be installed in the direction noted on the board.
- Connect the power supply, and check the test point for approximately 10.5v. Do not continue assembly if approximately 10.5v is not present at the test point.

- Install the remaining components on the main board. Save Q1, the ambient light sensor, for last. 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 on the board. 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. Always use a magnifier to check for solder bridges and bad solder joints. Note that the LM2576 marked 'ADJ' must be installed at U8. These two parts are not interchangeable.
- 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, 17 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.
- 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

**All parts are installed on the back of the board (silk screen side) except for the background lighting LEDs, and the alphanumeric displays.**



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

- Install LED11-LED34. 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 upper-left corner of the silkscreen. If an LED must be removed, be careful not to damage the board. The best way to do this is to cut the

LED horizontally with diagonal cutters, exposing the pins. Then lift each pin to unsolder individually.

- Install surface mount resistors at R6-R9. The exact value depends on the color of the display. The correct value is supplied with the displays. These resistors are used to equalize the brightness between the display and colons. See the bill of materials for the correct value.
- Install C11-C14, the surface mount capacitors. They are usually unmarked, tan colored components.
- 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 pin headers to size, and fit them to display LED1-LED6. Each LED uses a 9-pin header on top, and a 10-pin header on the bottom. Use masking tape to hold the headers in place. Position the display board upside down on a flat surface, and solder one pin on each header. Check that the headers are perpendicular to the display board and adjust if necessary. Then solder the remaining pins.
- If individual pins are provided, install them on each display before soldering. Use masking tape to hold the displays. Then solder all pins.
- Solder U4-U7 to the back of the display board. Note the direction. **Pin one is up on all ICs except U6**. Again, follow the above procedure to install surface mount parts.
- Solder resistor arrays R10-R12, to the back of the board. Note the polarity. The mark on the arrays must be aligned with the square side of the silk screen. **Pin 1 is up on R10-R11, down on R12**.
- **Six digit version only** - Install LED7-LED10, the colon LEDs. Don't solder yet. The short pin goes toward the top of the display board. Turn the display board over so it is face down. Make sure the LEDs are touching the work surface, and solder one lead on each LED. Check the alignment and adjust as necessary. Solder the second lead of each LED.

### Step 3 – Final Assembly

- Install four, 10mm standoffs into the holes on the bottom of the main board on the side with the buttons, using four screws.
- Install two standoffs into the holes on the bottom of the main board on the front side, on each outer edge, with 90-degree brackets. Put the screws through the short side of the bracket, then the board, and screw into the standoffs. Install screws and standoffs only, onto the six remaining holes.

- Plug the display board into the main board. The brackets should be behind the display board. Install two screws and nuts to secure it to the brackets
- Remove protective film from the alphanumeric displays.

This completes WordClock-2 assembly. Refer to the User Manual for setup and operation.

## Bill of Materials

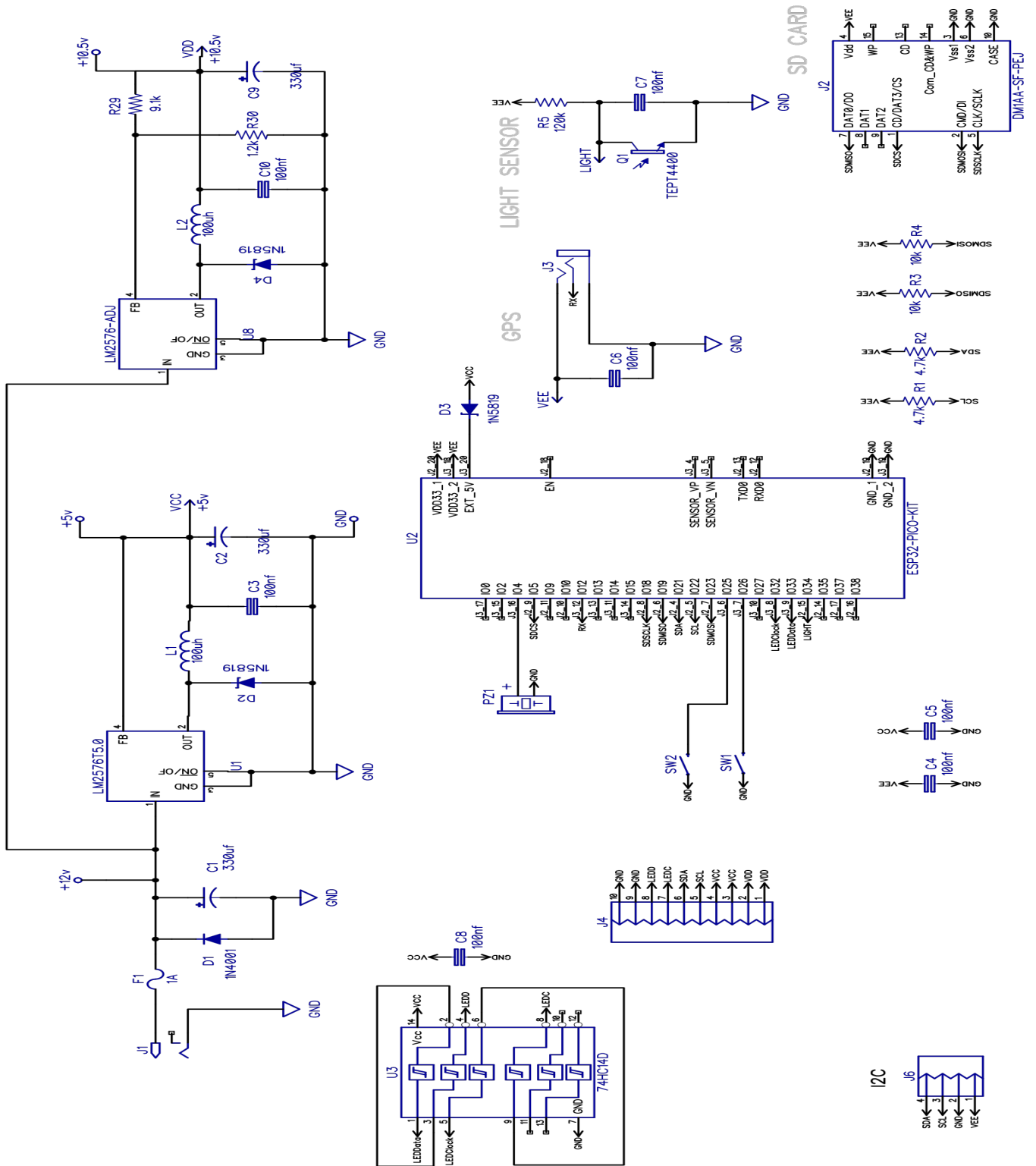
Reference	Qty	Part	Value	Note
C1-C2, C9	3	Capacitor	330uf 25v-50v	electrolytic
C3-C8, C10	7	Capacitor	100nf	through hole
C11-C14	4	Capacitor	100nf	surface mount
D1	1	Diode	1N4001- 1N4007	supplied value may vary
D2-D4	3	Zener Diode	1N5819	zener diode
F1	1	Poly Fuse	.5A – 1A	
J1	1	Power Jack		2.1mm power jack
J2	1	SD Card Connector		DM1AA-SF-PEJ SD card jack
J3	1	GPS Jack		3.5mm SMD GPS jack
J4	1	Header		HDR-1x10 female
J5	1	Header		HDR-1x10 male
J6, J7		Not used		
L1, L2	2	Inductor	100uh	
LED1-LED6 LED-1LED8	6 or 8	Display		16 SEGMENT LED 2.3" CC
LED7- LED10	4	Colon		5mm LED color matched to display Six-digit version only
Six LED11- LED34 Eight LED11- LED42	24 or 32	Backlight		APA102 LED
PZ1	1	Buzzer		buzzer
Q1	1	Sensor	TEPT4400	light sensor
R1, R2 processor	2	Resistor	4.7k ¼ watt	yellow-violet-red-gold or Yellow-violet-black-brown-gold
R1, R2 display	2	Resistor	330R	orange-orange-brown-gold or orange-orange-black-black-gold
R3-R4	2	Resistor	10k	brown-black-orange-gold or Brown-black-black-red-gold

Reference	Qty	Part	Value	Note
R5	1	Resistor	120k	brown-red-yellow-gold or brown-red-black-orange-gold
R6 - R9	4	Resistor SMD	230R or 315R	Orange and Super Red – 315R, Others 230R (supplied value may vary slightly)
R10 - R12	3	Resistor	4.7k	Resistor array
R13, R14, R17, R18, R24, R28	6	Resistor SMD	270R or 180R	Orange and Super Red – 270R, Others 180R (supplied value may vary slightly)
R15, R16, R19, R20, R21, R22, R23, R25, R26, R27	10	Resistor SMD	150R or 90.9R	Orange and Super Red – 150R, Others 90.9R (supplied value may vary slightly)
R29	1	Resistor	9k	white-black-red-brown or white-black-black-brown-brown
R30	1	Resistor	1.2k	brown-red-red-brown or brown-red-black-brown-brown
SW1, SW2	2	Button		90 degree pushbutton
U1	1	IC	LM2576T5.0	Not interchangeable with U8!
U2	1	Microcontroller	ESP32-PICO-KIT	Programmed with WordClock firmware
U3	1	IC	74HC14	
U4	1	IC	HT16K33	
U5, U6	2	IC	TBD62783	
U7	1	IC	ULN2803	
U8	1	IC	LM2576ADJ	Not interchangeable with U1!
U9	1	IC	74HC04D	
	1	Header		40 pins. Cut to 2x17 for microcontroller
	3 or 120	Pin Header		3 Headers with 40 pins each, or individual pins
	2	Bracket		Keystone 4326
	8	Standoff		Threaded 10mm
	10	Screw		M3 8mm
	2	Nut		M3

Reference	Qty	Part	Value	Note
	1	SD Card		Programmed with WordClock language database



# Schematic





## 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.

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