gps-clock-r4 Raspberry Pi Pico Development Board Bill of Material
Jed Margolin 12/6/2024, 3/11/2025

RefDes	Value	Description	Lead Spacing	
C1	100 uF	Capacitor, Electrolytic	0.1"	Omit for USB power
C2	0.1 uF	Capacitor, Monolythic Ceramic	0.1"	Omit for USB power
C3	0.1 uF	Capacitor, Monolythic Ceramic	0.1"	Omit for USB power
C4	10 uF	Capacitor, Electrolytic	0.1"	
C5	1000 pF	Capacitor, Monolythic Ceramic	0.1"	
C6	0.1 uF	Capacitor, Monolythic Ceramic	0.1"	
C7	10 uF	Capacitor, Electrolytic	0.1"	
C8	0.1 uF	Capacitor, Monolythic Ceramic	0.1"	
C9	0.1 uF	Capacitor, Monolythic Ceramic	0.1"	
C10	4700 pF	Capacitor, Mylar	0.1"	
C11	4700 pF	Capacitor, Mylar	0.1"	
C12	10 uF	Capacitor, Electrolytic	0.1"	
D1	1N5817	Schottky Diode	Omit for USB power	
D2	1N5817	Schottky Diode		
J1		Male Header 1x5, 0.1" spacing	HDR-1x5	Straight
J2		Male Header 1x6, 0.1" spacing	HDR-1x6	Right Angle
J3		Solder a wire jumper for USB Power, Leave Open for +8V to +12VDC Power		
J4		Male Header 1x2, 0.1" spacing	HDR-1x2	Right Angle, for NEO7M b

LCD1 LCD1602 16 x 2 (Parallel Only, 5V)
Even though the Raspberry Pi Pico operates at 3.3V the inputs of the 5V LCD recognize +3.3V as a logic ‘1’. It is for this reason that I write to the LCD but never read it. If I were to read it the LCD would send 5V to the Pico.

For the LCD
(4) M3x10 Nylon Standoffs
(4) M3 Washers, 1mm thick
(8) M3 x 6 Screws
Male Header, 1x16, 0,1" spacing (on the LCD)
Female Header, 1x16, 0,1" spacing (on the PCB)

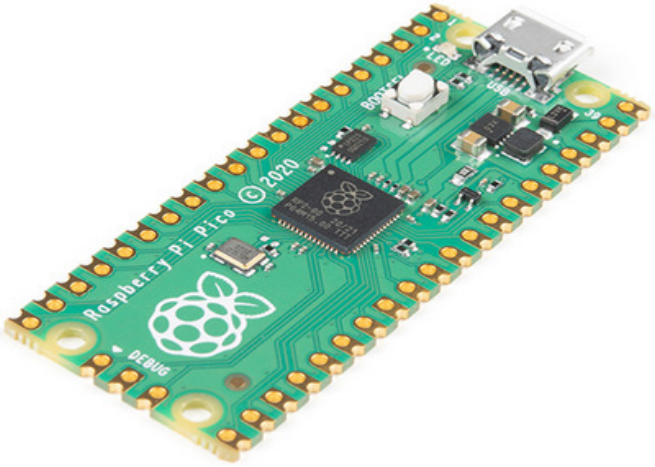
LED1	LED, 5 mm, Green	
LED2	LED, 5 mm, Green	
LED3	LED, 5 mm, Red	
PB1	Switch, Pushbutton, B3F-1070	6 x 6 x 4.3
PB2	Switch, Pushbutton, B3F-1070	6 x 6 x 4.3
PB3	Switch, Pushbutton, B3F-1070	6 x 6 x 4.3
PB4	Switch, Pushbutton, B3F-1070	6 x 6 x 4.3

R1	68K	Resistor, carbon film, 1/4W 5%
R2	10K	TrimPot: 3362P
R3	100	Resistor, carbon film, 1/4W 5%
R4	1K	Resistor, carbon film, 1/4W 5%
R5	4.7K	Resistor, carbon film, 1/4W 5%
R6	47K	Resistor, carbon film, 1/4W 5%
R7	10K 1%	Resistor, metal film, 1/4W 1%
R8	10K 1%	Resistor, metal film, 1/4W 1%
R9	10K	TrimPot: 3362P

SW1	SPDT	SS12D00G3 Slide Switch
SW2	SPDT	SS12D00G3 Slide Switch
SW3	SPDT	SS12D00G3 Slide Switch

The switch pins are on 0.1” centers. They are really inexpensive on eBay and AliExpress.
These switches are sensitive to heat. When soldering them allow at least a minute
between soldering the pins. Otherwise there is a plastic piece inside the switch
that can melt and a small piece of springy metal that can lose its temper (and thus its springy-ness).

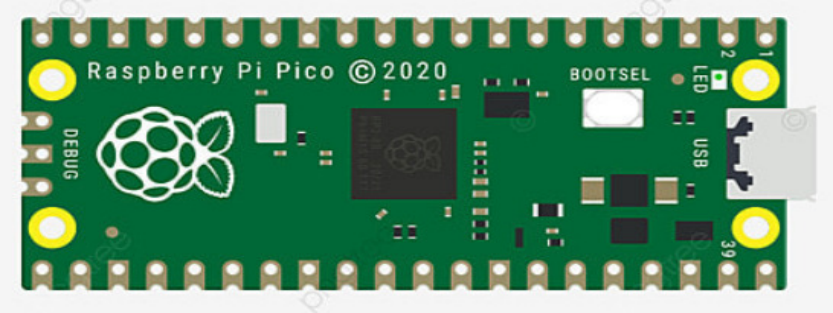
U1	Pico	Raspberry Pi Pico
		(2) Male Header 1x20, 0.1" spacing, straight (on Pico)
		(1) Male Header 1x3, 0.1" spacing, straight (debugger port, on Pico)
		(2) Female Header 1x20, 0.1" spacing, straight (on PCB)



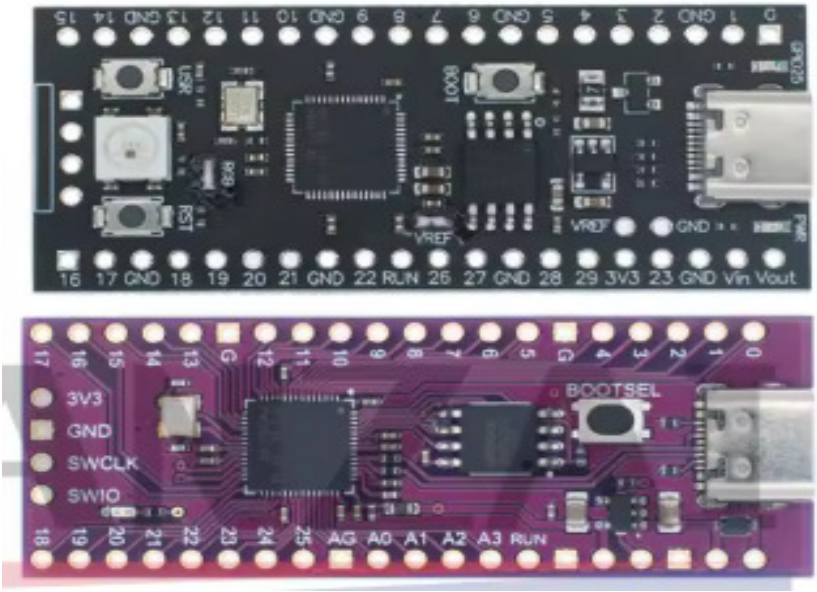
Plain Pico
Solder the headers yourself

While there is only 1 version of the standard Raspberry Pico Pico approved by the RaspBerry Pi Foundation there are several versions made by Chinese sources.

a. There is the Official RaspBerry Pi Pico which comes with the approved Raspberry Pi logo:



And then there is everything else such as these from AliExpress:



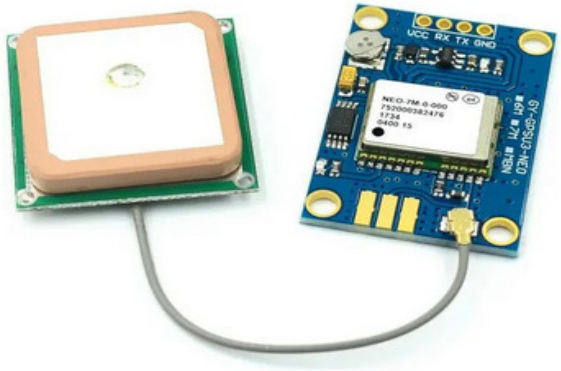
Some versions have a row spacing of 0.6”. My board is for a row spacing of 0.7” which is for standard Picos.

There is another important difference. The Official Pico uses a switching voltage regulator to bring the USB +5V down to +3.3V for the Pico.
The unofficial Pico (such as the black one) uses a linear regulator.
To reduce the dissipation in the linear regulator they put a resistor in series with the regulator. As a result the voltage at Pico pin 40 (VBUS) is about 4.6V.
With the Official Pico the VBUS voltage is about 5.0V . The LCD works best at 5.0V .

Therefore, if you do the USB-Powered version of my board you should use the Official Pico.

There is another difference between Official and unofficial Picos. The Official Picos use a USB Micro connector. The unofficial Picos generally use a USB-C connector.

U2	MCP6002	OpAmp, 8-pin DIP IC Socket with Machine Tooled Pins
U3	NEO7M	GPS Module with antenna



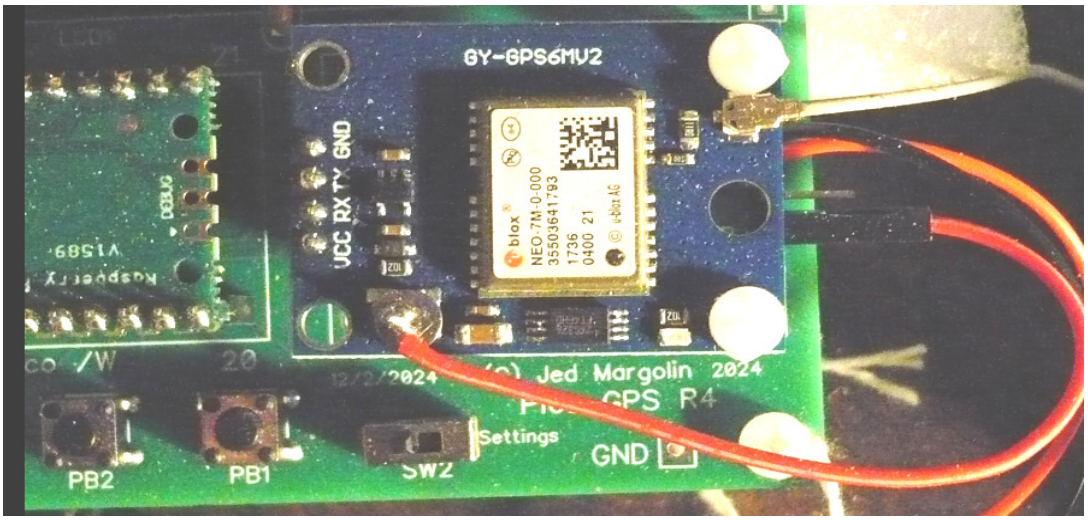
(1) Male Header 1x4, 0.1" spacing, straight (on module)
(1) Female Header 1x4, 0.1" spacing, straight (on PCB)
(2) M3x10 Nylon Standoffs
(2) M3 Washers, 1mm thick
(4) M3 x 6 Screws

The module might not have the three pads next to the antenna connector.

All of the NEO7M modules I have bought have come with an EEPROM and a Super Capacitor to backup the satellite data so it does not do a cold start every time it is powered up. From a cold start it can take several minutes to acquire the satellites. Then it can take up to 12.5 minutes to get the current Leap Seconds so the time will be correct.

The NEO7M does not use the EEPROM (the NEO6M did) and the Super Capacitor is crap so it is necessary to use your own backup battery. Here I am using a CR2032. You could instead use two AAA batteries or two LR44 batteries in series.

Solder a cut ribbon cable wire to the top bracket of the capacitor on the NEO7M module.
The other end goes into one of the pins of Header J4



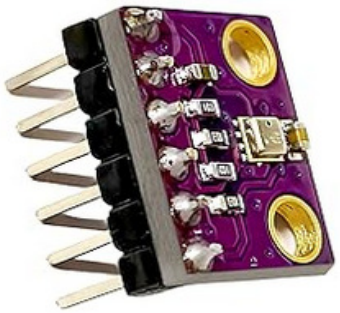
(1) CR2032 Battery Holder

(1) CR2032 Lithium Ion Coin Cell Battery

U4 7805 Voltage Regulator, TO-220, 5V Omit for USB power

For the Board
- (4) M3x18 Nylon Standoffs
- (4) M3 x 6 Screws

The GPS Altimeter requires an additional part, the BME280, along with the ribbon cable wire leads to connect it to the I2C port on my board. The schematic shows how to connect it.



Note that there is an older part, the BM**P**280. While the BM**E**280 does temperature, air pressure, and humidity the BM**P**280 does only temperature and air pressure. This is how you can tell the difference:
www.jmargolin.com/pico-projects/difference_bme-280_bmp280.htm

Meilleures salutations,

Jed Margolin