

## WWVB Generator pc board/kit Assembly Notes. Ver 1.2 10/24/11

Please read before assembling your kit.

Make sure you have the polarity correct before applying voltage to your board. Incorrect polarity can damage the voltage regulator, the WWVBG chip, and the LCD module. PCB eyelet W5 is the positive voltage input.

You may want to install the lower components (resistors) first and install the higher ones last. That gives the most time for the board to lie flat while you are trying to solder it. You will need to bend the larger resistor leads fairly close to the body of the resistors to fit the hole spacing used. The larger and smaller resistors are both 1/4W.

The 4.7 uF capacitor is polarized, and must be installed correctly. The square pad is the **positive** end, and is also marked with a + sign nearby. The negative side of the capacitor is marked with a – sign.

Make sure that the notch on the chip is next to the square pad (pin 1) before soldering.

The voltage regulator must be installed as shown on the parts placement diagram.

Several optional components are implemented on the pc board. R5 and R6 could be used as a voltage-divider to reduce the output signal level (In most cases, this is not what you want to do). Be careful not to load down the modulation circuit by using a low value for R6, if you do decide to use it. C6 could be used to implement a low-pass output filter, again being careful not to load down the modulation circuit excessively. Install a shorting jumper at R5 if the R5-R6 voltage divider is not used.

Header J1 is only used for programming U1, and would normally not be populated.

The software was written to drive a 1 line by 16 character LCD module that uses the industry-standard Hitachi 44780 (or equivalent) controller chip. This type of LCD is common and inexpensive. The interface to the module uses 4-bit mode. The signal names on J2 map directly to signals on the LCD module connector, but are not in the same order. **Note that in 4-bit mode, the data bus connections to the module are D4-D7, not D0-D3, so the four data bus signals on J2 must connect to D4-D7 of the LCD module. LCDD0 connects to module D4.** If you use a backlit module, the current for the backlight must be supplied separately to the module, as the 78L05 will not be able to supply it. R9 may be increased from 0 ohms to reduce the LCD contrast, or a potentiometer may be used. Something like 1K or 5K might be a good choice, depending on the design of the module. If a non-zero R9 is used, a small electrolytic capacitor of maybe 1 uF should be placed across it, with the negative end tied to gnd.

Pin one of the J2 header has a square pad on the pc board. Pin two is across from it. The odd-numbered pins are down the outside of the connector, and the even-numbered ones are down the inside.

To attach the connector to the ribbon cable, slide one end of the cable into the interior of connector, and allow about one half inch of it to stick out the other side. The ribbon cable should fit nicely into the ribbed lower side of the top part of the connector. Check the centering of the cable to insure that there is a wire above each of the contacts in the lower section. The connector should lie across the ribbon cable, perpendicular to it. You may want to place a small piece of scotch tape from the ribbon cable, across the top part of the connector, and to the ribbon cable on the other side, to hold the connector in the correct position. Once you have it placed properly, place the connector in a vise and squeeze the two halves of the connector together slowly until the top half locking pieces snap into place on both sides. This will force the cable onto the contacts in the lower part of the connector, which will cut through the insulation and make contact to the wires. (If you are not pleased with the way it looks after the two halves are pressed together, you can gently pry out the locking pieces at either end of the connector and slide the top part up, then carefully remove the cable from the contacts and try again. Don't try taking the connector apart after squeezing it unless you are pretty sure you need to. An ohmmeter can be used to check for shorts or open contacts. You can use a resistor lead to probe the connector contacts.) The outer wire of the cable, near the pin one side of the header, connects to pin one of the header. The next wire connects to pin 2, etc..

### Voltage and current:

The 78L05 regulator supplied with the kit requires approx 6.7V minimum to provide 5V. It can tolerate a maximum input voltage of 35 volts. This regulator is rated for 100 mA maximum continuous output current, but is capable of peak currents of around 250 mA at 25 degrees C. With no heatsink, the regulator can dissipate approx 0.7 watts. (Exceeding this value will cause it to shut down.)

### Resistor color bands:

|               |                                |
|---------------|--------------------------------|
| 0 ohm         | single black band              |
| 470 Ohms      | yellow violet brown gold       |
| 499 Ohms 1%   | yellow white white black brown |
| 1.18K Ohms 1% | brown brown gray brown brown   |
| 10K Ohms      | brown black orange gold        |
| 47K Ohms      | yellow violet orange gold      |

### Capacitor Marking:

27 pF caps may also be marked 27J (J means 5% tolerance)  
0.1 uF caps may also be marked "104"

### And finally, to quote Heathkit:

Always use rosin core, radio type solder (60:40 or 50-50 tin lead content) for all of the soldering in this kit. The warranty will be void for any kit in which acid core solder or paste has been used.