FREQUENCY CENTRAL

Build documentation for:

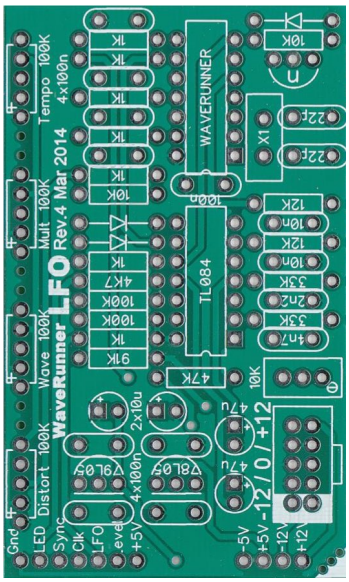
ULTRA WAVE

Powered by Electric Druid code exclusive to Frequency Central

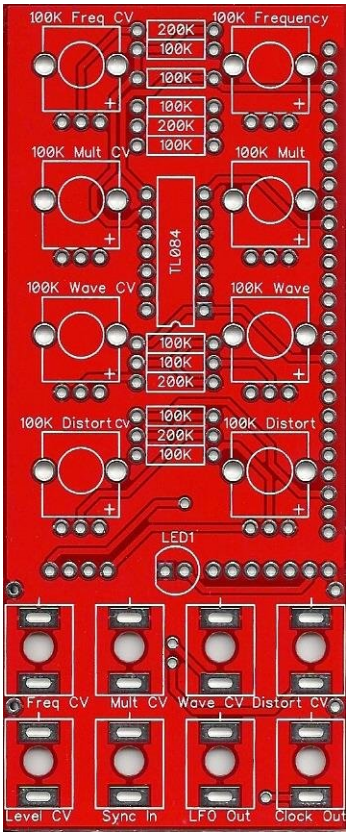
Ultra Wave is a fully expanded version of the Wave Runner LFO. It's a multi-waveform sync-able LFO based on the Electric Druid TAPLFO2D family of code, but with some significant additions and improvements. The WAVERUNNER 1 PIC and code is exclusive to Frequency Central and was developed specifically for the Wave Runner/Ultra Wave, and is not compatible with similar modules.

Main PCB

(top)



Control PCB

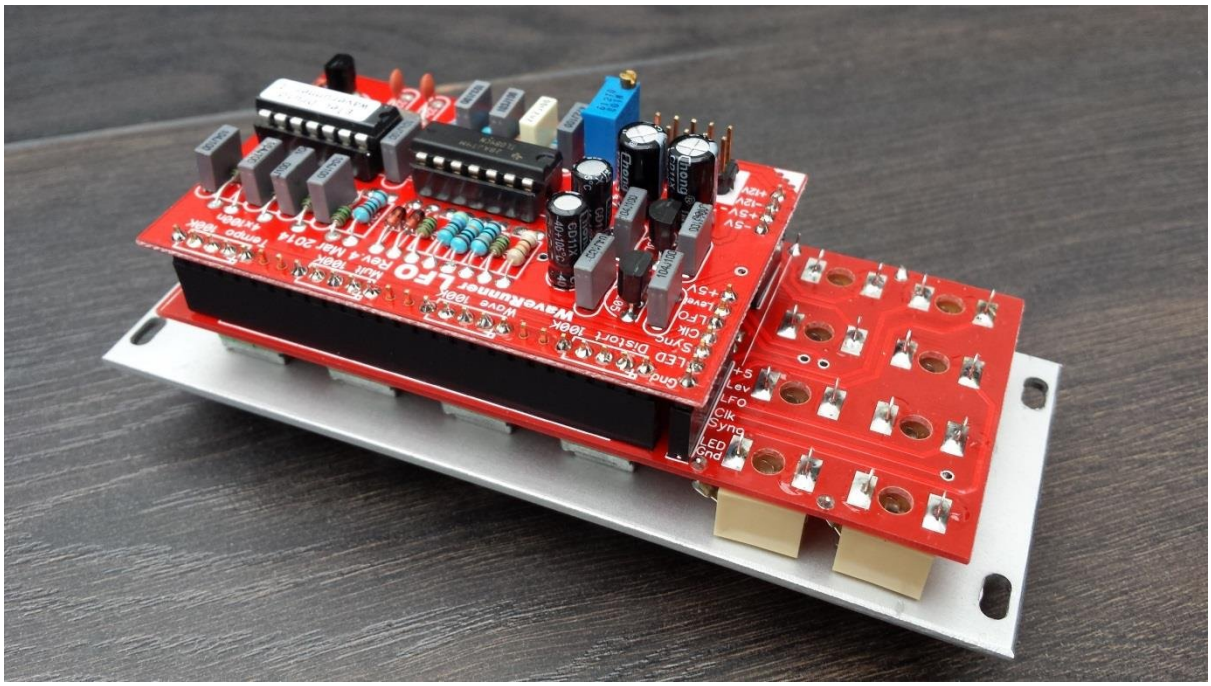


(bottom)

Note that PCB colours may vary.

Bill of Materials			
1k x 7 4k7 x 1 10k x 2 12k x 2 33k x 2 47k x 1 91k x 1 100k x 10 200k x 4 All resistors ¼ watt metal film.	22pF x 2 2.2nF x 1 4.7nF x 1 10nF x 2 100nF x 9 10uF electrolytic x 2 47uF electrolytic x 2	WAVERUNNER PIC TL084 x 2 BC547 x 1 78L05 x 1 79L05 x 1 1N4148 x 3 3mm red LED x1 20MHz crystal x 1 14 pin socket x 3	B100K x 8 Knob x 8 10k trimmer x1 3.5mm socket x 8 Male 40 pin header Female 40 pin header 10 pin box header

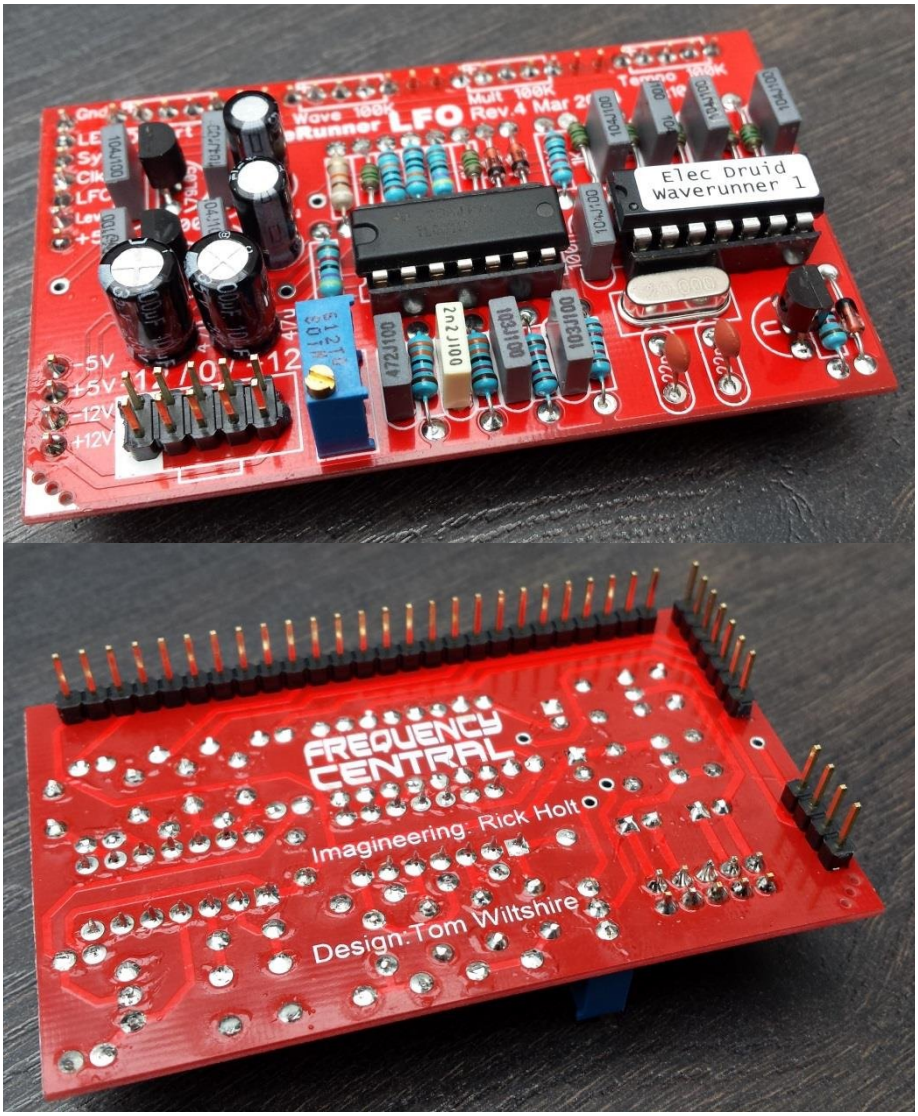
Please observe the correct polarity of the electrolytic capacitors and diodes.



Main PCB assembly

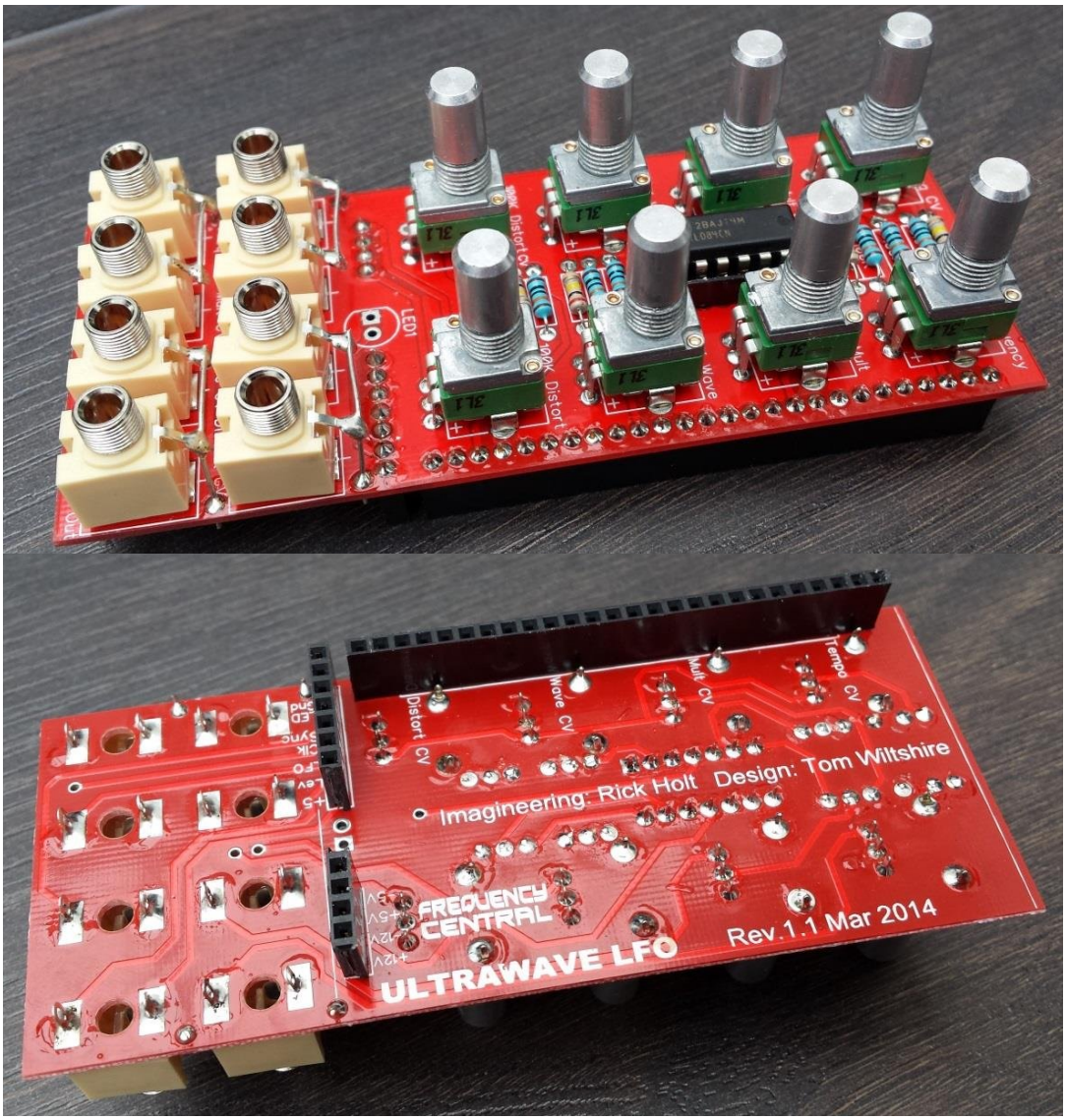
Solder the components from the lowest profile to the highest profile:

1. Solder all diodes and all resistors.
2. Solder 20Mhz crystal
3. Solder 22pF capacitors
4. Solder 14 pin IC sockets
5. Solder 2.2nF, 4.7nF, 10nF and 100nF capacitors
6. Solder 78L05, 79L05 and BC547
7. Solder the power header – if you're using box type (as listed in bill of materials), observe correct polarity1
8. Solder 10uF and 47uF electrolytic capacitors, and the 10k trimmer
9. Mount TL084 and WAVERUNNER PIC into their sockets
10. Cut male headers to size (1x 4 way, 1x 7 way, 1x 26 way) and solder them into place. Make sure that they stick out of the bottom of the PCB. Just one thing to note: the 26 way header has 6 holes for which there are no solder pads. This is perfectly normal.



Control PCB assembly

1. Solder all resistors.
2. Solder IC socket. Insert TL084.
3. Place all pots on the PCB, and fold over their mounting tabs at the rear of the PCB, then place the panel over them. This will assure that they are correctly positioned. Flip the whole lot over and solder the pots into place.
4. Place all sockets on the PCB, making sure the ground tabs are in line with the PCB's 4 ground pads, then place the panel over them. This will assure that the sockets are correctly positioned. Flip the whole lot over and solder the sockets into place.
5. Ground the sockets to the PCB. There are 4 ground pads, one for each pair of sockets (see photo below. Use a resistor leg to connect them.)
6. Cut female headers to size (1x 4 way, 1x 7 way, 1x 26 way) and solder them into place. Make sure that they stick out of the bottom of the PCB.
7. Put the LED through its pads (short leg to square hole). Present the panel to the PCB, flip the whole lot over, make sure the LED sticks though the hole in the panel, solder in place.
8. You can now plug the **Main PCB** into the **Control PCB** and proceed to calibration.



Calibration

The 10K trimmer right by the power header is for Level CV zero offset. Correct set calibration ensures that the output from the LFO socket is spot-on at 0V when the Level CV input sees 0V. This is particularly important when using Ultra Wave as a pitch vibrato source into a VCO with a mod wheel controlling LFO depth via the Level CV.

1. Power on your Ultra Wave
2. Plug a patch cable into Ultra Wave's LFO output
3. Using a digital multimeter (DMM), connect the black probe to the sleeve of the patch cable (ie ground), connect the red probe to the tip of the patch cable (I find a couple of crocodiles can help here)
4. Ground the Level CV input
5. Adjust the 10k trimmer until your DMM reads exactly 0V

Troubleshooting

Not all DIY builds work first time. The vast majority of build issues are down to soldering inconsistencies. This is far more likely than a bad IC, for example. The first step of successful troubleshooting should always be to reflow all soldering to eliminate any dry joints (bad connections) or solder bridges (short circuits). This is also an opportunity to closely inspect your work – you might find some unsoldered pads, or an IC not inserted into its socket, for example. Next steps are to double check all resistor values are correct, and to check polarities of all diodes, transistors, ICs and electrolytic capacitors. This is not an exhaustive troubleshooting guide, but should address 95% of build issues.

RDH 05/04/14
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