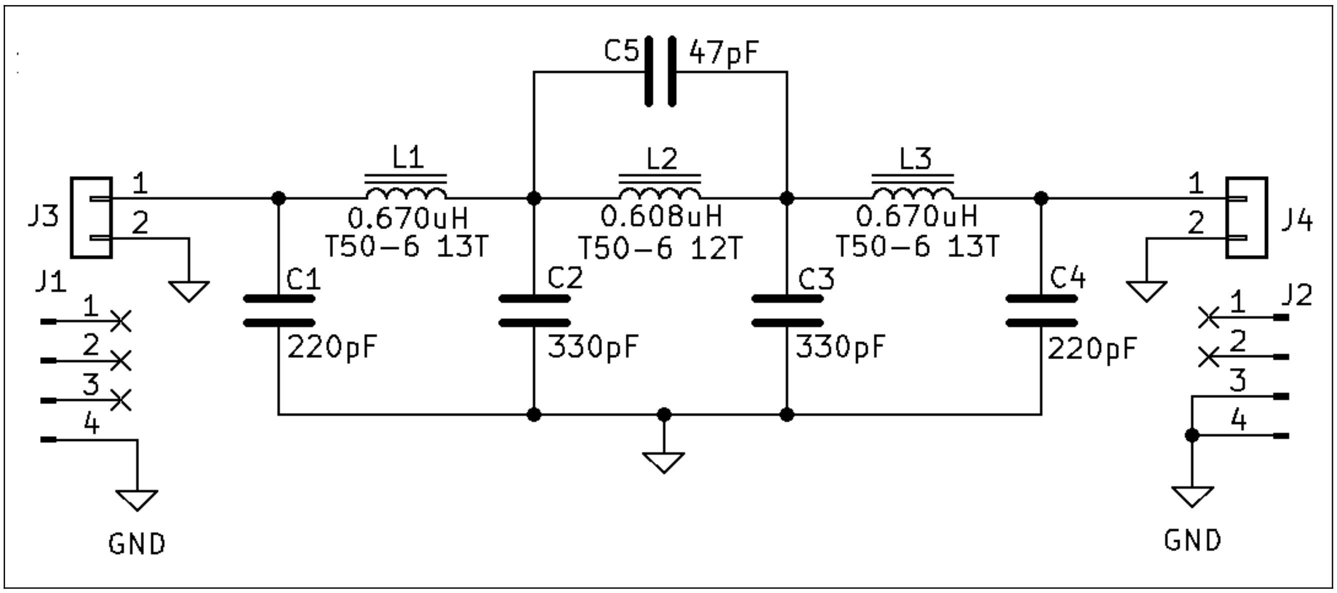
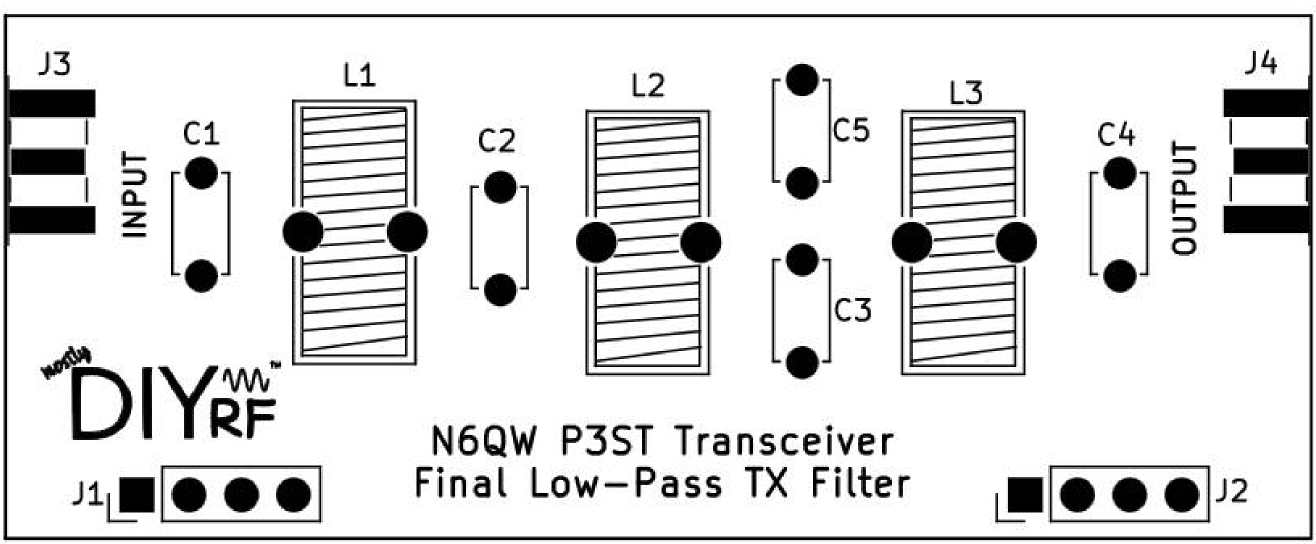
Mostly DIY RF / P3ST Transceiver
Final TX Low-Pass Filter

Assembly and Test Instructions

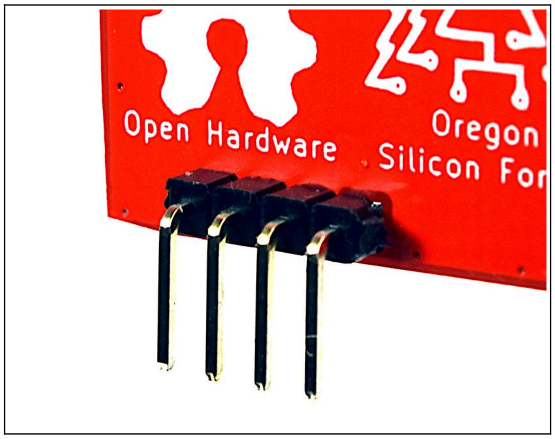
As the final module the transmit signal encounters on its way to the antenna, the low-pass filter does the important work of removing the harmonics that are the inevitable product of frequency generation and modulation. This one is based on a well-proved design by W3NQN. Its center bypass capacitor, C5, gives the filter better suppression of second-harmonic energy than other designs. Its easily-wound inductors and fixed capacitors make it a simple build. For component values to use for the 15 or 17 meter bands, see **https://bit.ly/w3nqn-lpf**.



Assembly



1. As with the 4-pin headers on all the modules, install them with the right-angle pins extending out the back side of the PCB. Also as with all the modules, the input and output pads may be used either to attach board-edge-style SMA connectors or, with the help of the thru-holes in the middle of the pads, directly-soldered connections may be made.



Four-pin right-angle header orientation

2. Install the ceramic capacitors as indicated in the schematic and assembly diagrams. They are not polarized, and it's a good idea to solder them in place such that their values can be read later.

3. Using the T50-6 toroid cores, wind L1 and L3 using the 26AWG enameled wire provided. Each will require 13 turns (about 10" of wire). Remember that a turn is counted as every time the wire passes through the toroid. Wind L2 (also with a T50-6 core) with 12 turns. If this is your first time winding toriods, see W2AEW's video: **https://bit.ly/w2aew-toroids** and N2CQR's **https://bit.ly/n2cqr-toroids**.

Do not apply coil dope or any other coating to the windings at this time. This will allow you to adjust the windings by moving them closer together (increasing inductance) or further apart (decreasing inductance). The magnet wire included has a "solderable" enamel coating. Theoretically, you can solder right through it. Do not trust this claim. Instead, you should tin the leads on the wound toroids by running a soldering iron charged with solder along the leads, perhaps back and forth several times. Once tinned, the leads can be reliably soldered to the PCB. If you wish, you can apply a small drop of multi-purpose glue where the wound toroid touches the PCB to stabilize it. Avoid getting the glue on more than a few turns.

Static Test Procedure

1. Using magnification, visually inspect both sides of the PCB to look for solder bridging or other conductive debris. It's usually best to clean off flux residue first.

2. As you can see from the schematic, there should be DC continuity between the input and output pads on the PCB (unlike the BPF). Also clear is that there should be ***no*** DC continuity between the input and output pads and GND.

3. Ensure that pins 1-3 on J1 are isolated from GND (they should have no connection at all), and that pin 4 of J1 and pins 3 & 4 of J2 have good continuity to GND.

Dynamic Test Procedure

The surest way of dynamically testing a filter is to examine it with a vector network analyzer. If you have one (including a nanoVNA), look at this LPF to have a flat passband to a little over 15MHz and a sharp roll-off thereafter. The purpose of the low-pass filter is to remove (or greatly attenuate) the harmonic frequencies of the fundamental 20 Meter signal on transmit. Since the second harmonic (the fundamental is considered the "first" harmonic) is in the 28MHz range, if the roll-off occurs significantly below that, it should work fine to meet FCC requirements.

To see this sort of dynamic testing being done, watch the video by W2AEW at **https://bit.ly/w2aew-lpf**. For examples of how to do this with a signal generator and oscilloscope, see videos by N2CQR at **https://bit.ly/n2cqr-bpf** and by VE6WV at **https://bit.ly/ve6wz-bpf**. These two show the process applied to band-pass filters, but the method is the same for LPFs.