2 KW Low Pass Filter for 160-6 Meters

After 2 years or so making various adjustments to the original LPF filter configuration, and noting some of the changes which could be made to the board to make it easier to construct, tune, and re-configure (if necessary), I decided to modify the board layout itself. Here are all the changes made since the original generation 1 filter:

- All filter sections are now 7-pole Chebyshev, providing steep cut-off skirts and additional harmonic suppression.
- **The 15 meter section was moved** from the original 20-17 meter segment to the 12-10 meter segment. This made it easier to filter 20 and 17, so now these segments are 20-17, and 15-10
- Larger ferrite cores are used in the 20-17 and 15-10 meter segments
- the pc board markings have been revised
- The core material used in the 40-10 meter segments was changed to type 6
- The 6m filter section elements were changed to air-core inductors (ferrite is not necessary due to shorter wire lengths)
- all the chip capacitors are now mounted to the foil side of the PCB so one can make changes or correct installation errors without having to remove the inductors.
- extra space was allowed for mounting the capacitors; 160m uses a lot of them, and space was limited on generation 1 (they fit, but it was crowded).
- Provision was made for allowing either capacitive input or inductive input filters (first component), all 7-pole Chebyshev types. This would be important if one band was low in output due to interference from reflected harmonic energy, while the others were OK (keep in mind I'm attempting to make the filter universally useful with all the various RF deck designs out there)
- It is now even possible to have 5 of the 6 filter segments as 9-pole filters, though this is certainly overkill; harmonic suppression is more than enough with 7-pole filter segments for even the neediest RF decks.
- It is now possible to install segment-specific delay lines, should they be necessary, at the front of 5 of the 6 segments to minimize interference from reflected harmonic power coming back to the rf deck(s). This was useful in my own unit on 75m.

The configurations I'll be listing here are the ones I'm using in my own single and dual-deck amplifiers, but many more are possible…I stopped experimenting when I grew weary of trying to squeeze the last few watts out the amplifiers, but if you have the energy to continue experimenting, you may be able to discover even more efficient set-ups.

If using this filter for the W6PQL single amplifier pallet, 3rd harmonic levels returned to the rf deck by this type of filter can be 100 watts or more at 1kw output, and will interfere with proper operation. Optimum performance is achieved with a stand-off cable length of 34 inches; this is the recommended total coax length from the output of the rf deck to the input of the filter, and will minimize the interference caused by reflected power. For this RF deck, there was no need to individualize segment-specific delay lines, so jumper wires should be installed at the segment-lead-ins.

If using this filter for the W6PQL 2-pallet amplifier, the 80m and 40m filter sections are handled differently; and this is the configuration that produced the best results:

- 27" RG402 from output of each rf deck to inputs of combiner
- 30" RG402 from output of combiner to input of filter

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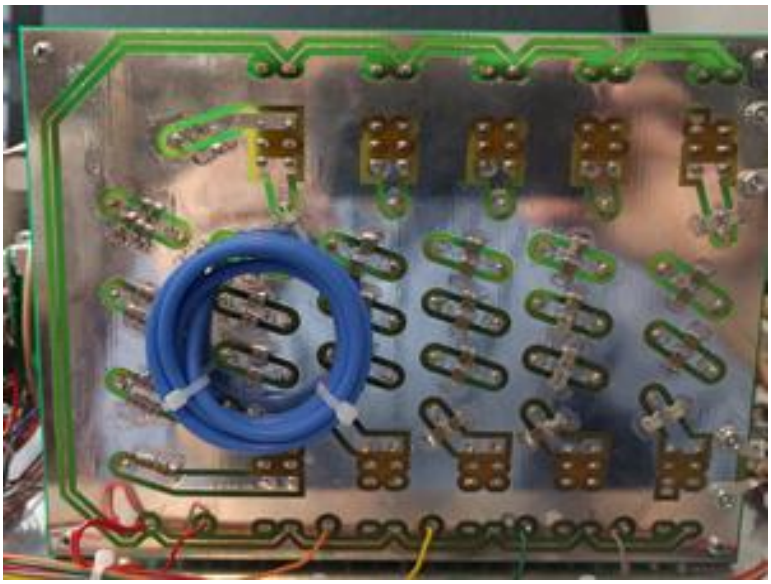
2 KW Low Pass Filter for 160-6 Meters

- 31” RG402 inserted ahead of the 80m filter bank on the LPF board (see photos below)
- LPF sections are all 7-pole Chebychev configured “c-l-c-l-c-l-c”; however, 40m is configured as “l-c-l-c-l-c-l”



The following table lists the 2-pallet amplifier performance using a power supply with a 60-amp limitation. All bands could achieve a minimum of 1500w.

band	Output power (60a max from 50v PSU)
160m	1600
80m	1600
40m	1800
20m	2000
17m	1800
15m	1800
12m	1750
10m	1600
6m	1700

The following are recommended configurations for each type of amplifier deck

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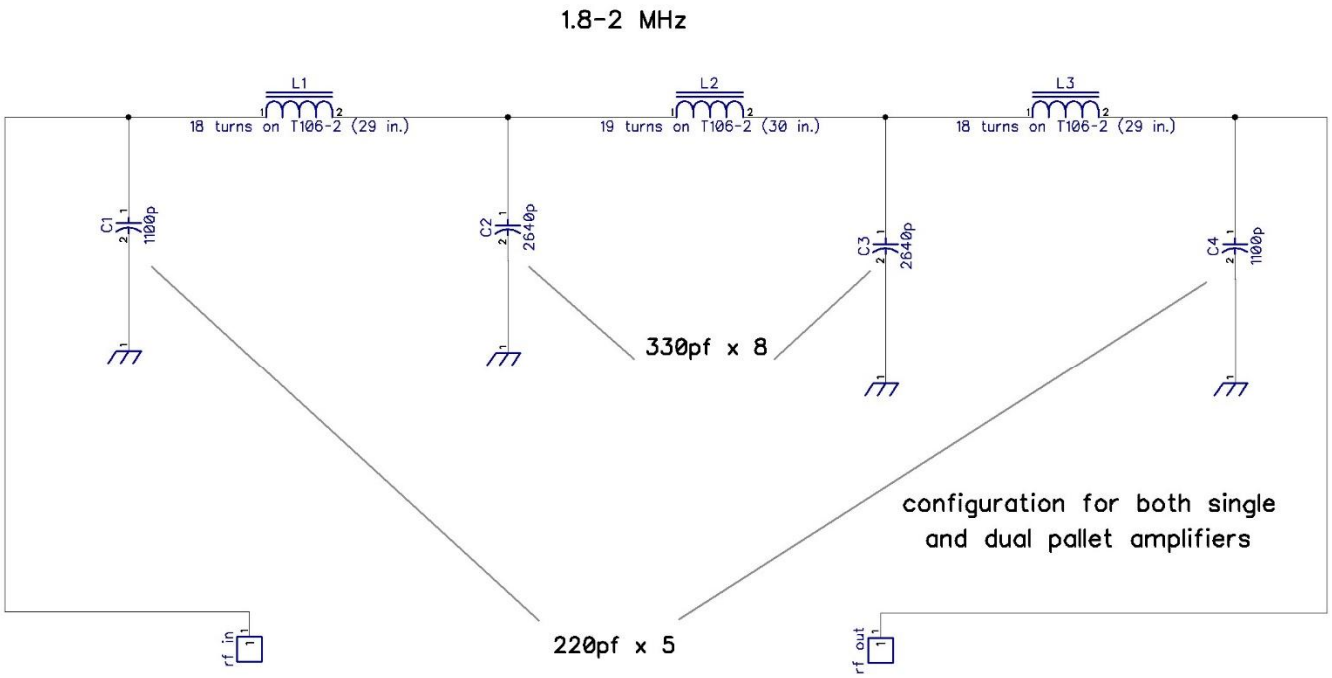

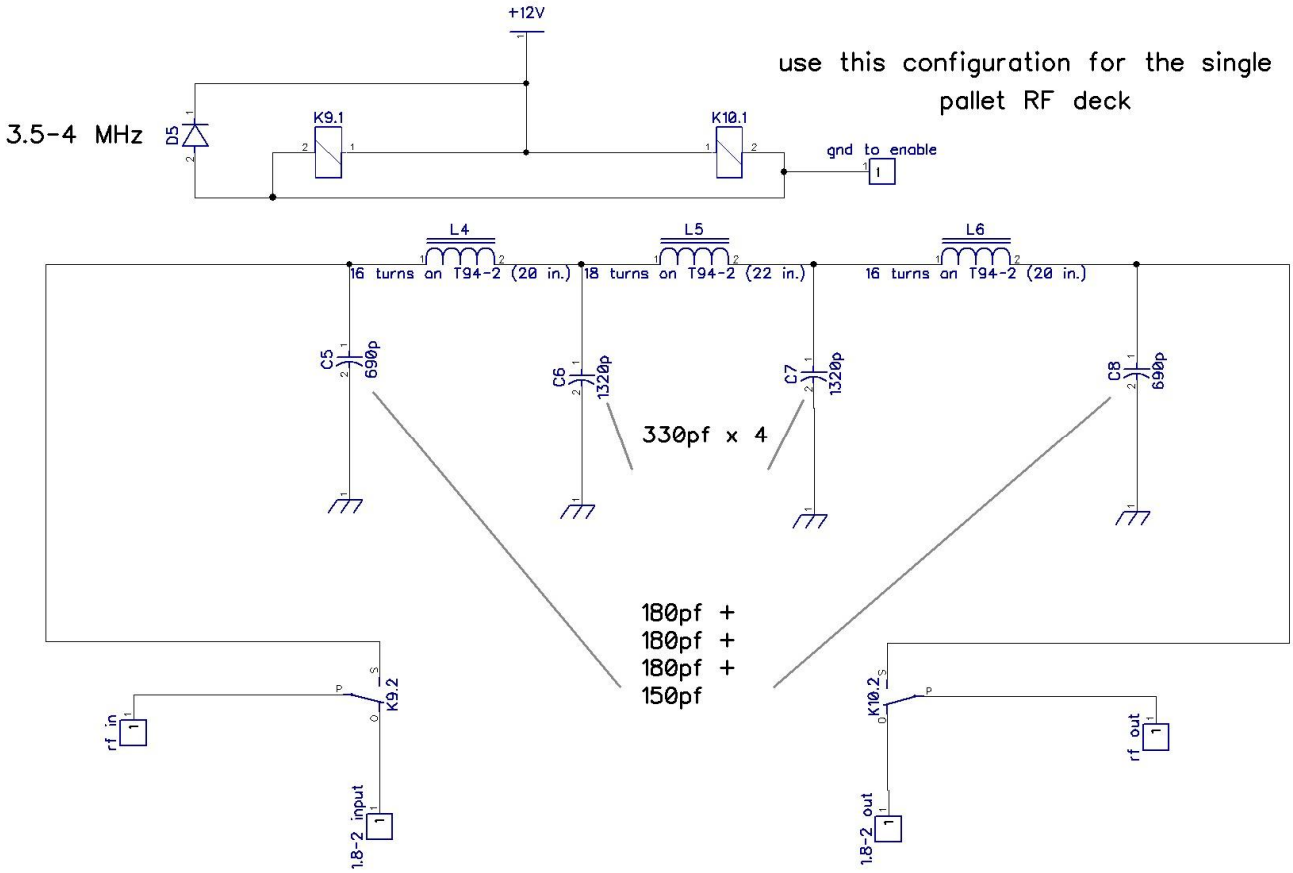

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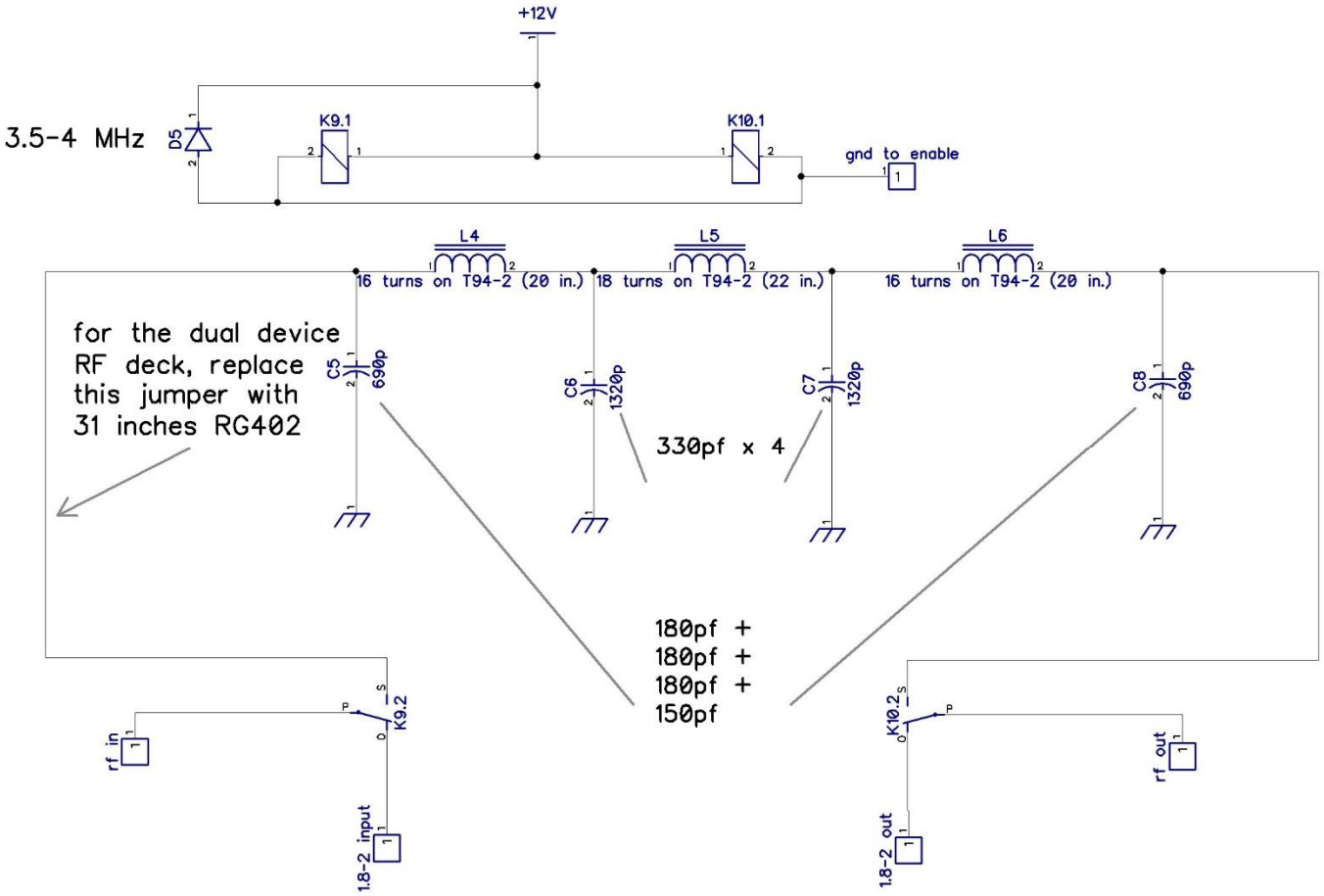

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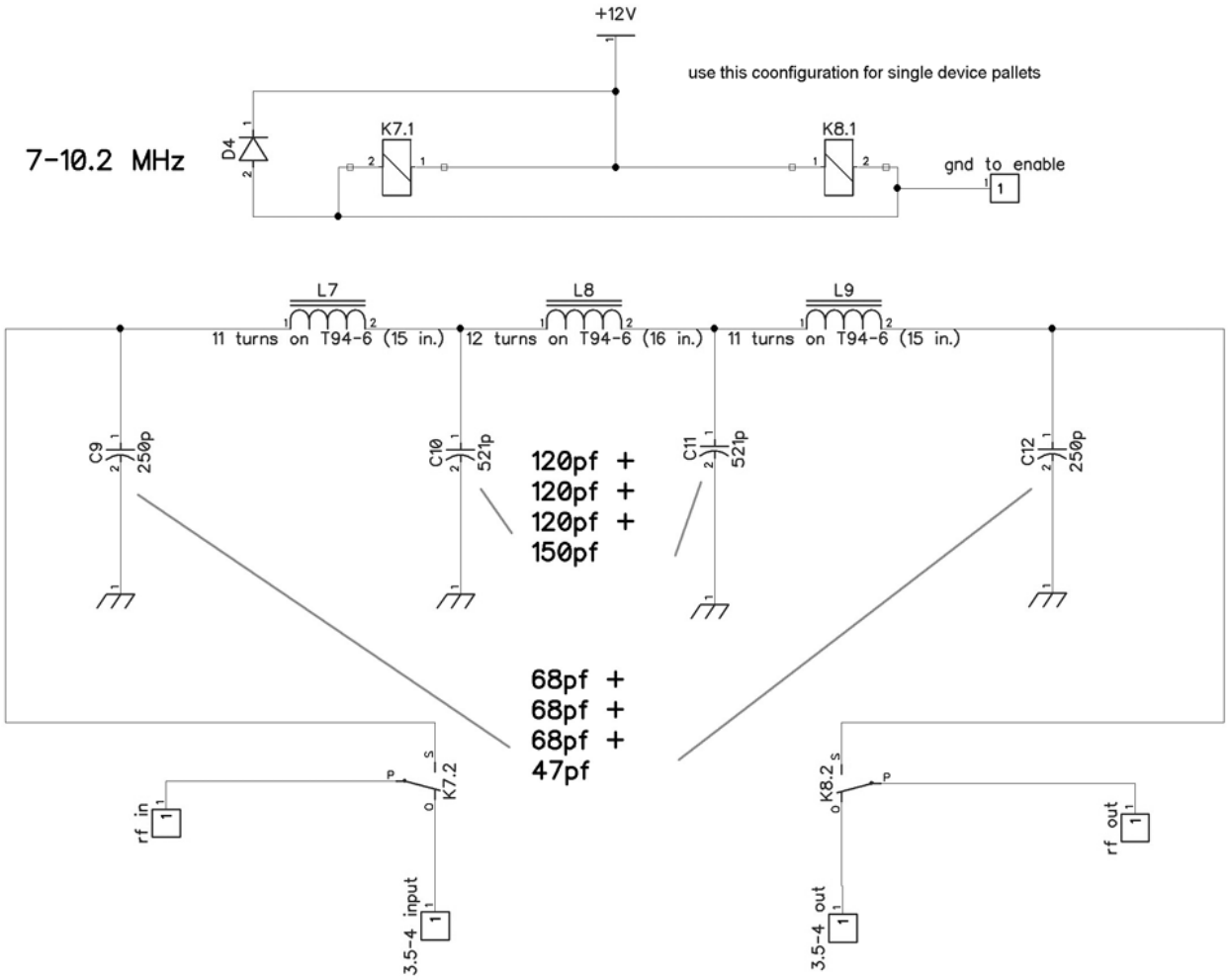

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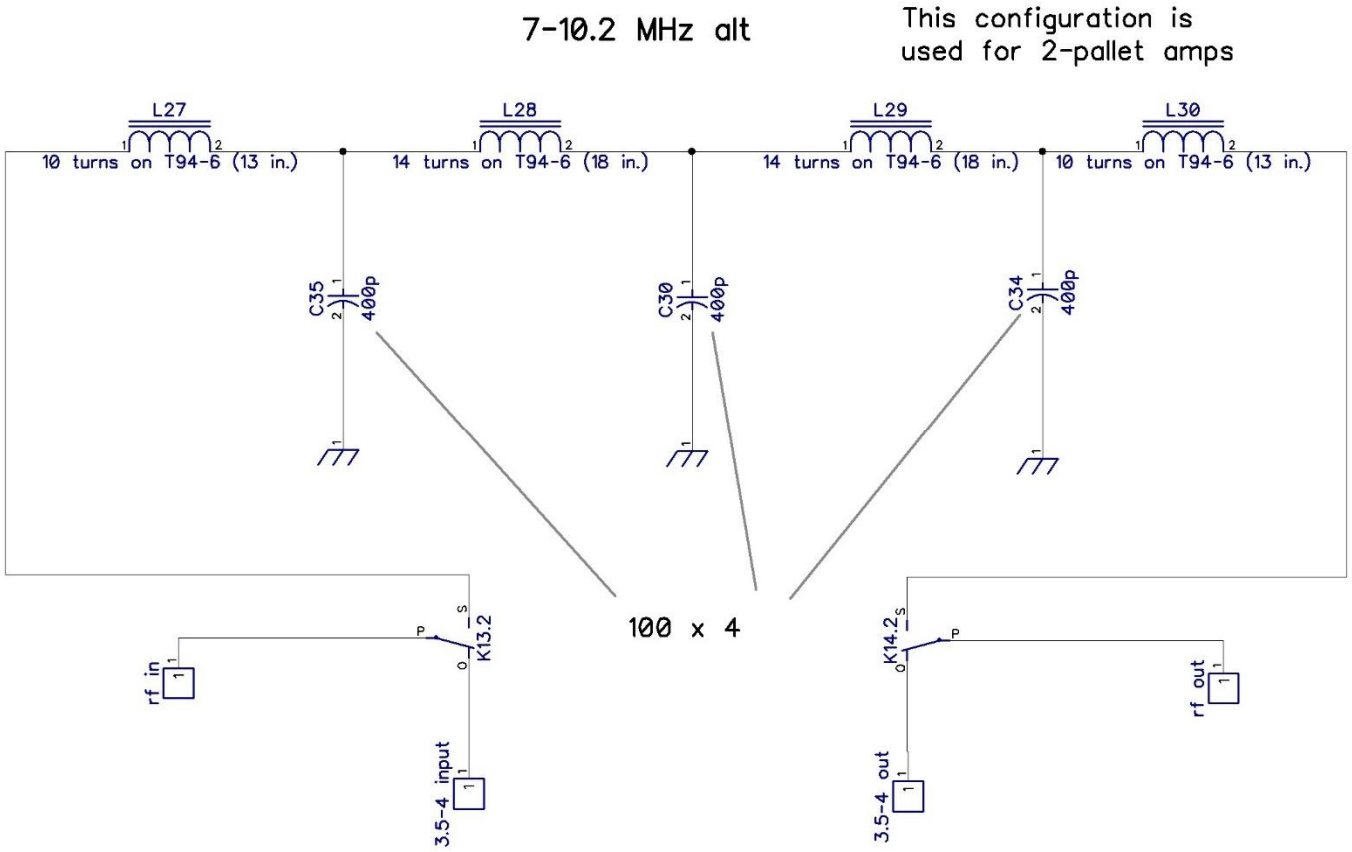

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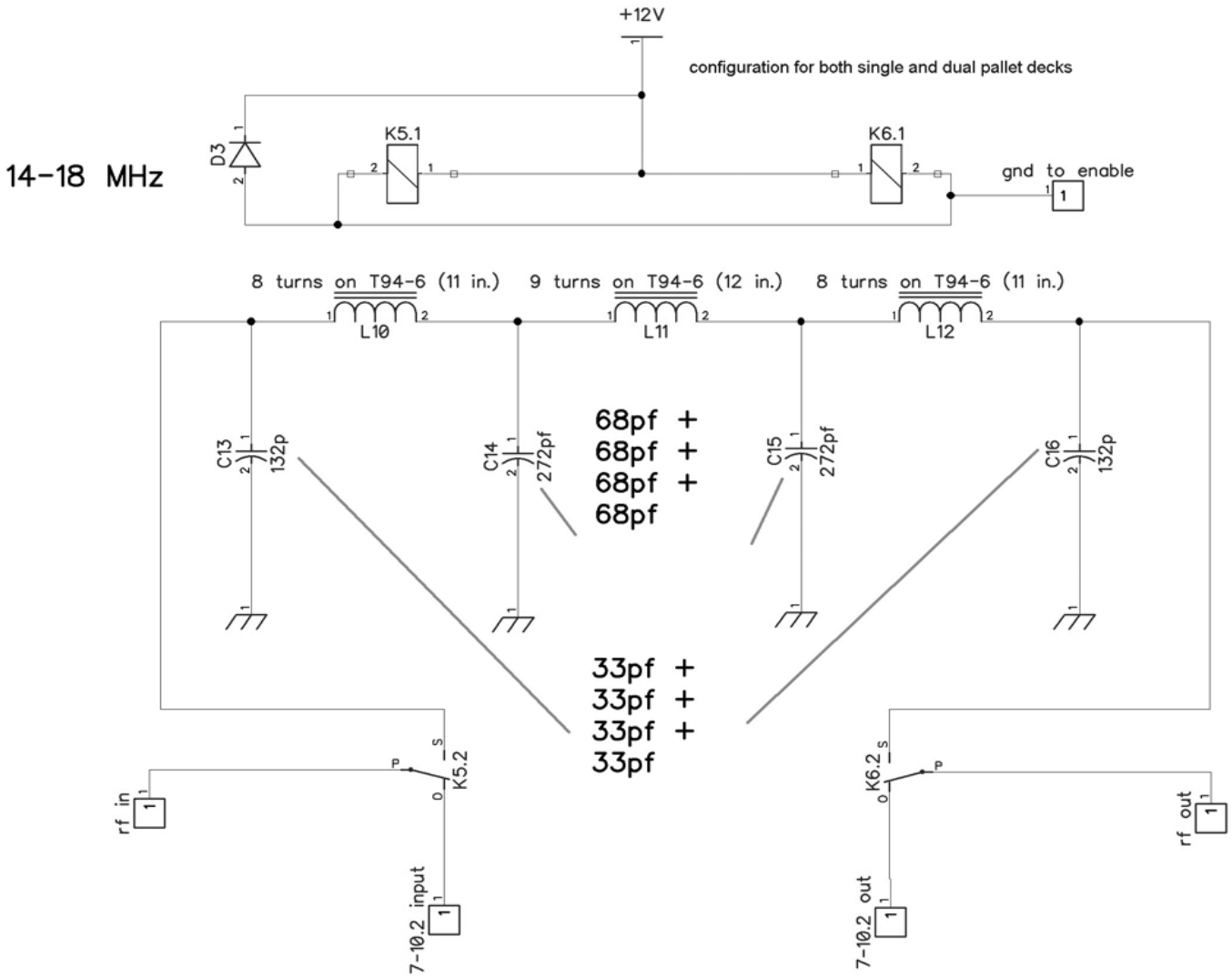

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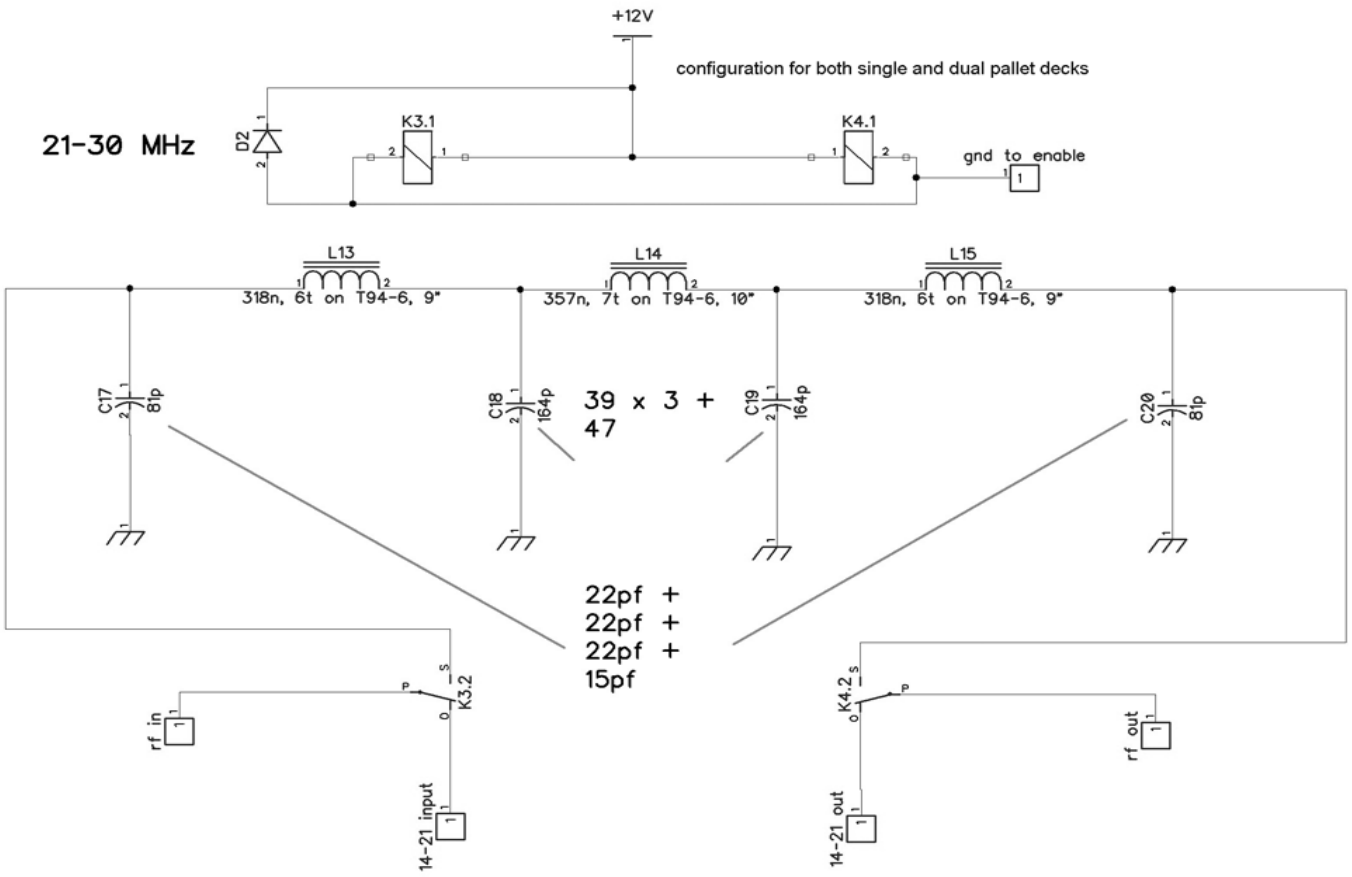

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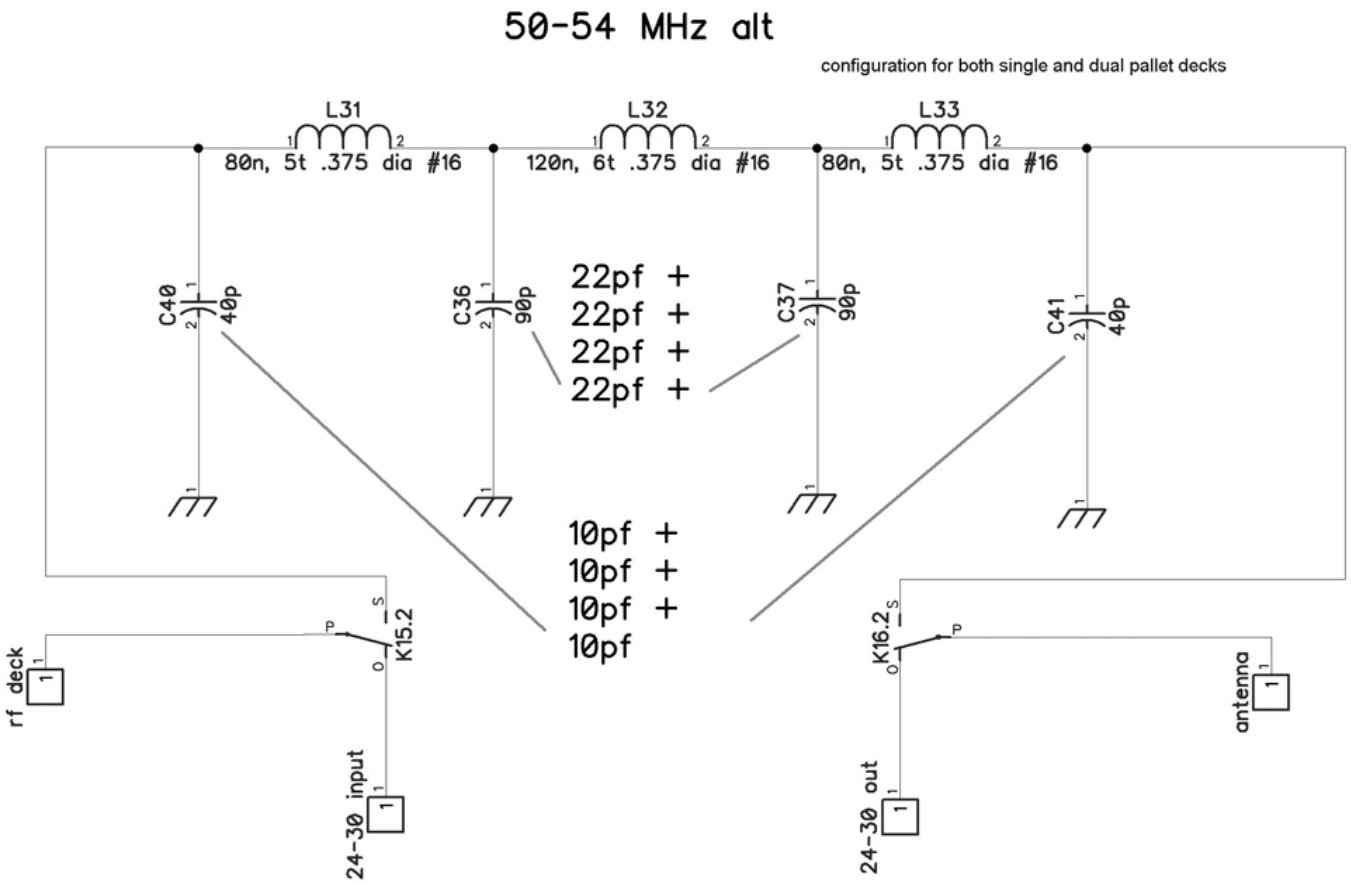

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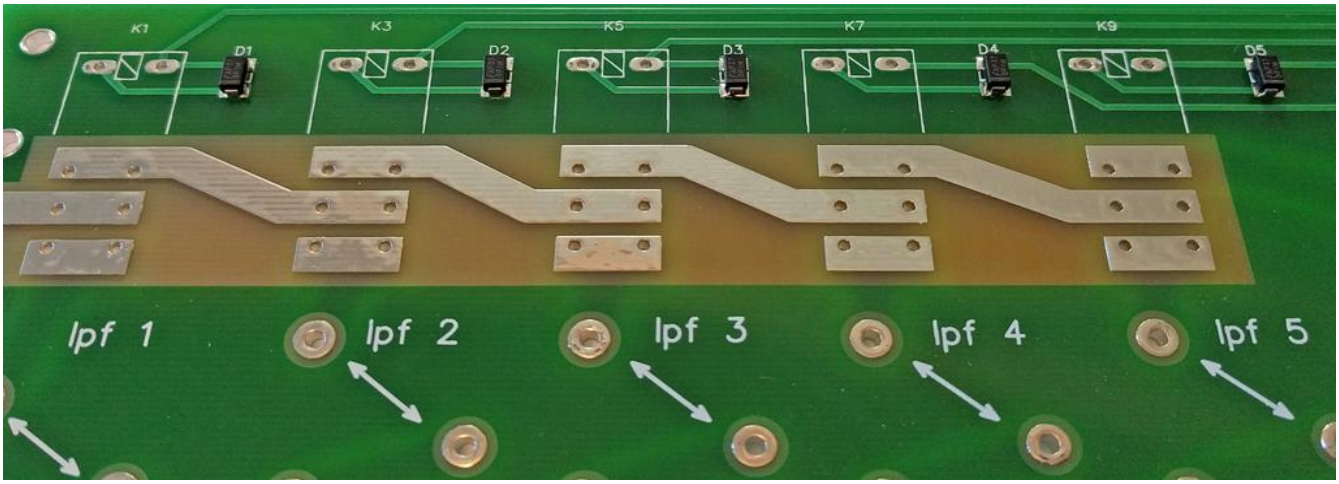
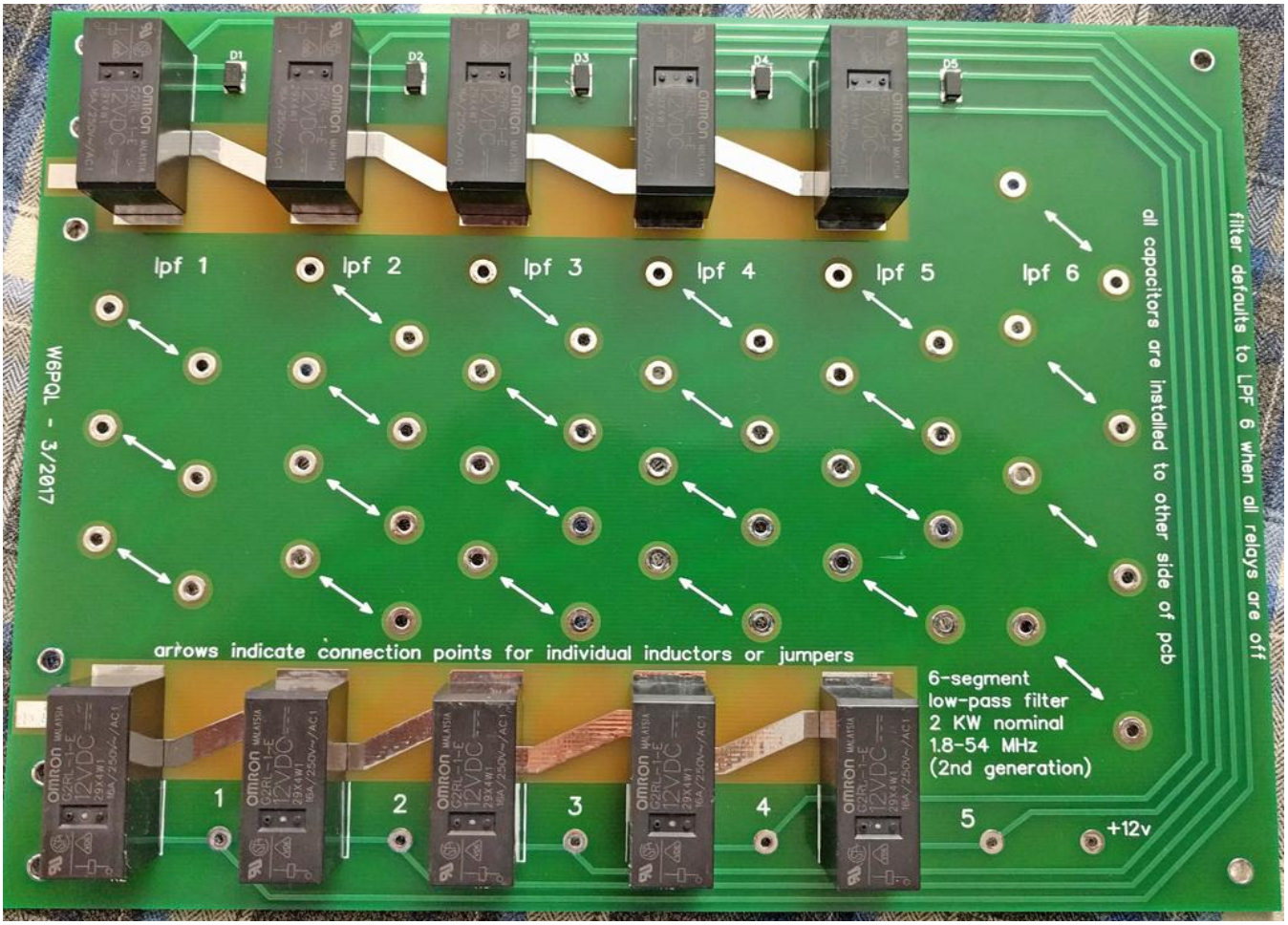
2 KW Low Pass Filter for 160-6 Meters

Begin construction of your filter by installing the diodes first. This will prevent soldering iron damage to the plastic relay cases (which can get in the way of diode installation if done later).



Now it's safe to install the relays.



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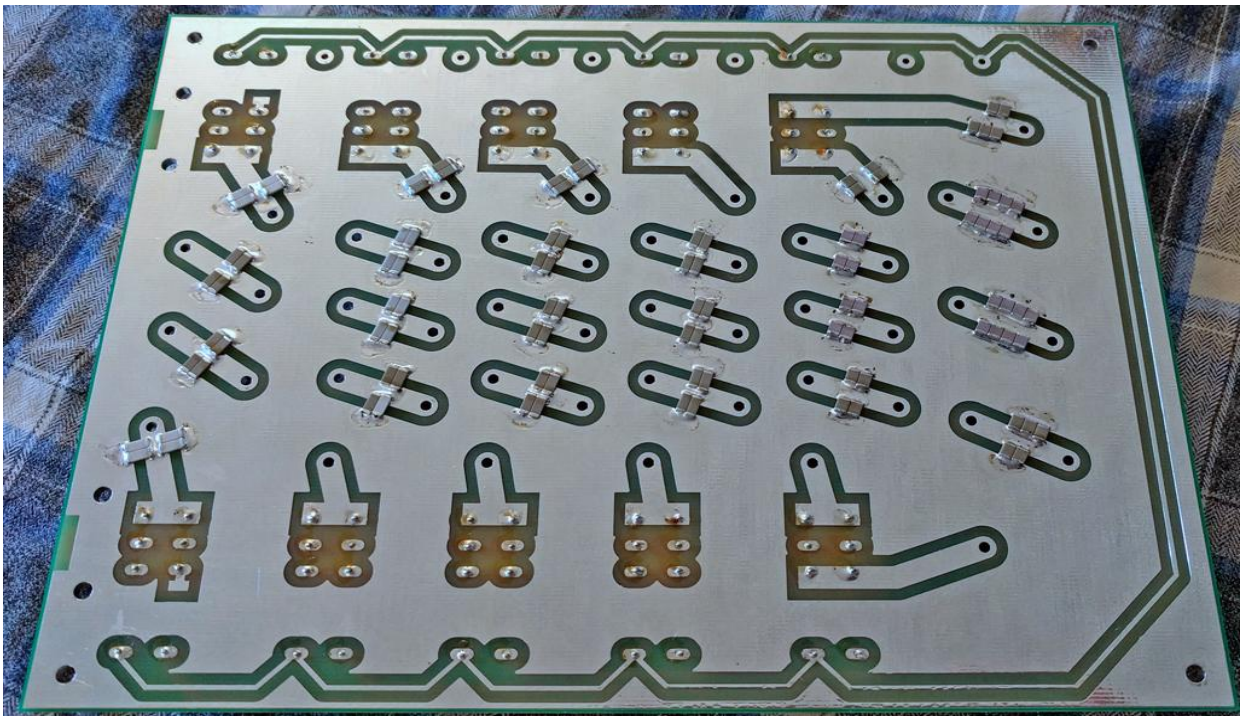
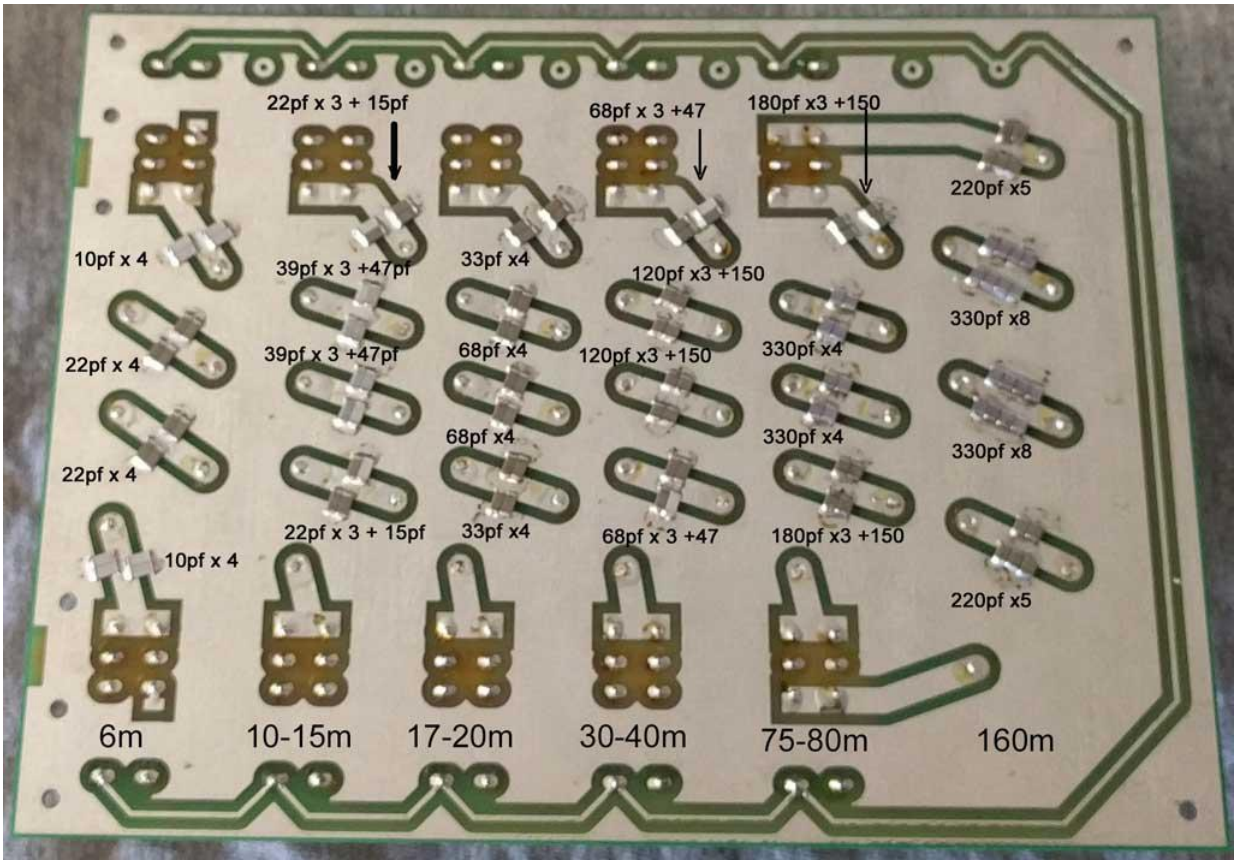
2 KW Low Pass Filter for 160-6 Meters

Turn the board over and install the chip capacitors. The 6m segment is on the left, 160m on the right. The first photo is for the dual-pallet configuration; filter segment 4 will have a different pattern installed for the single-pallet set-up, which is shown in the second photo.





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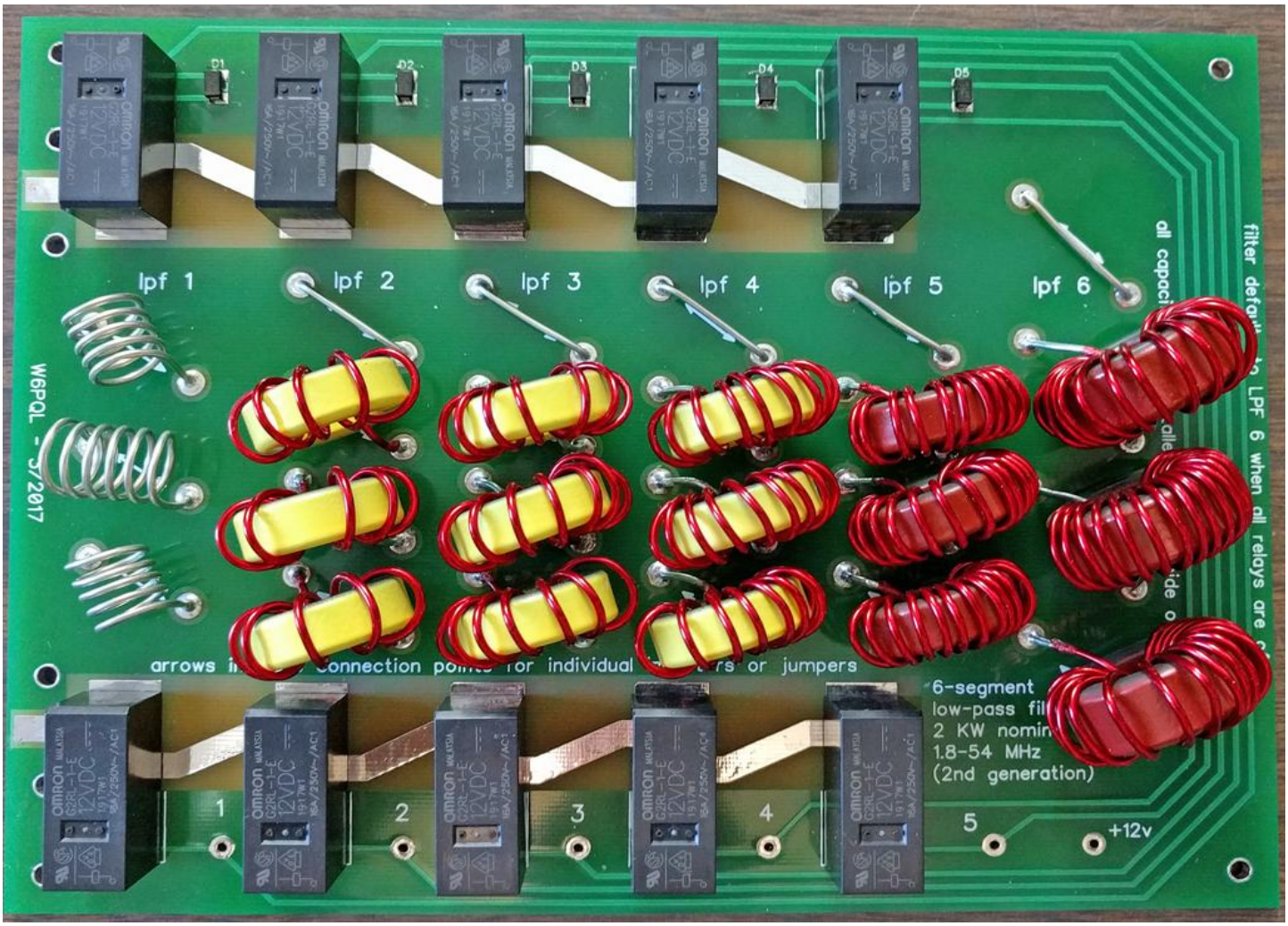
2 KW Low Pass Filter for 160-6 Meters

Wind the inductors and Install them. Jumpers will be used at lpf 2,3,4,5 and 6 when filtering for a single pallet rf deck.



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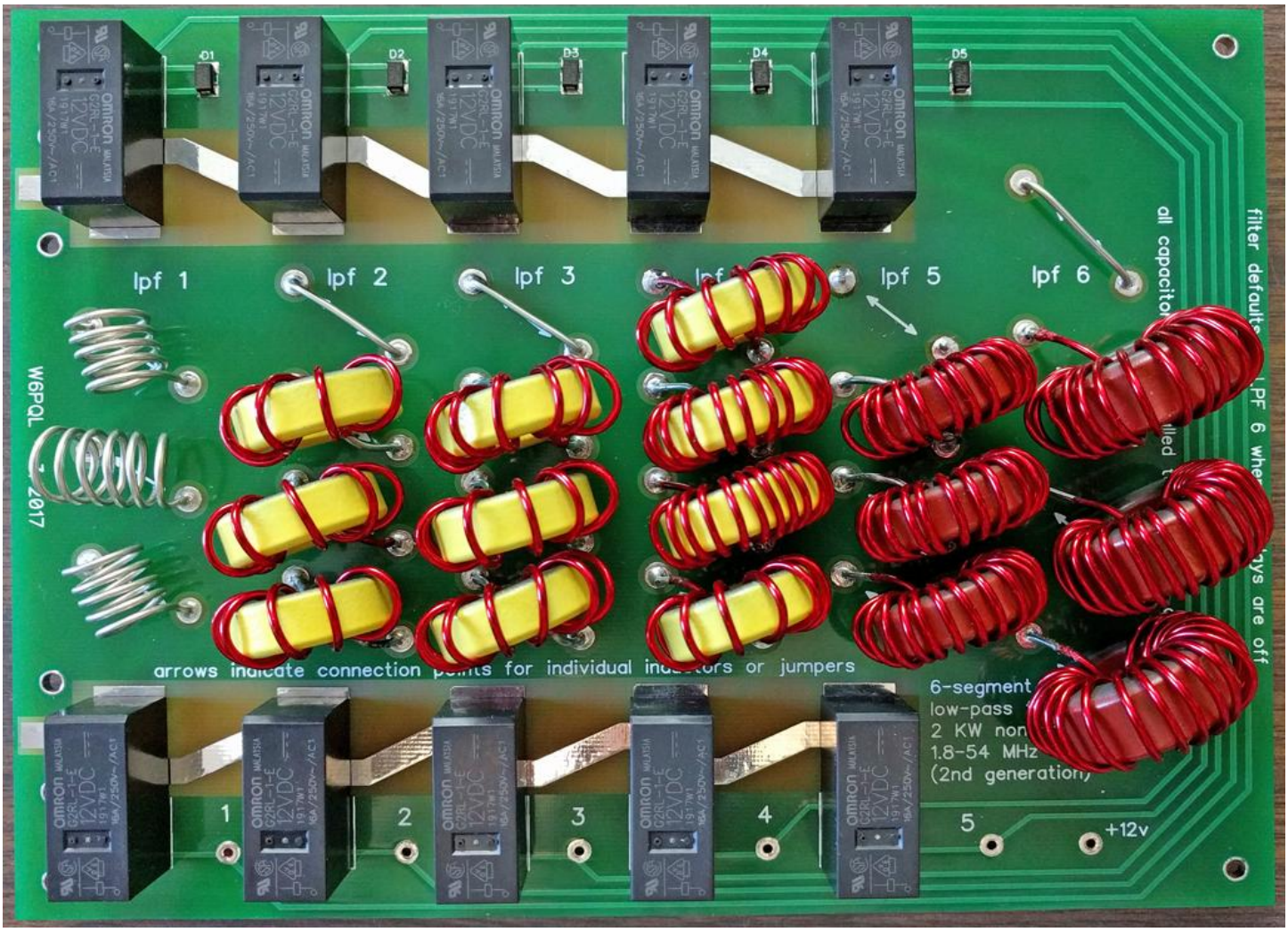
2 KW Low Pass Filter for 160-6 Meters

When filtering for the 2-pallet rf deck, lpf 2,3 and 6 will have the jumpers, lpf 4 will have an inductor installed at the jumper location, and lpf 5 will have a delay line installed on the foil side of the board (see next photo).



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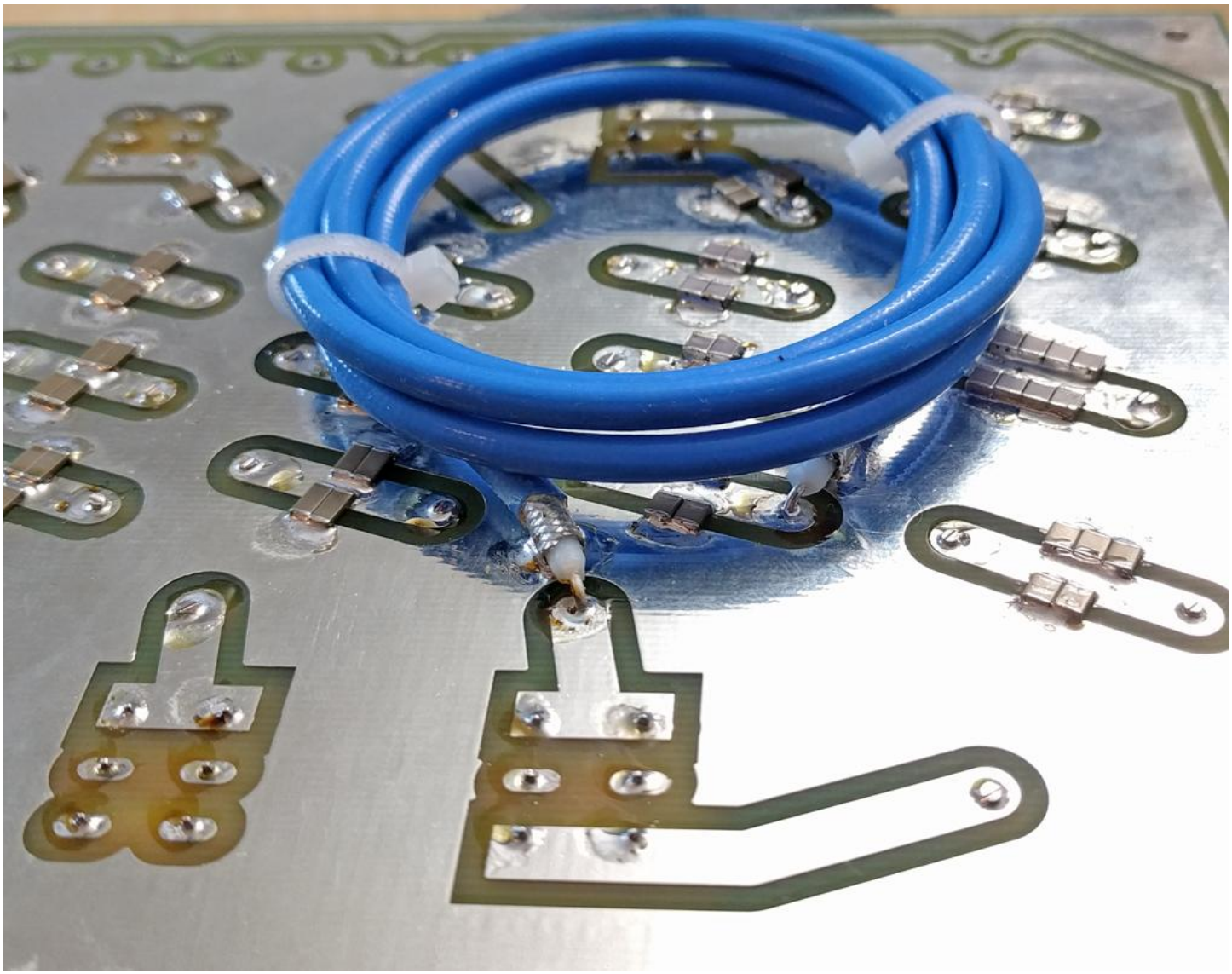
2 KW Low Pass Filter for 160-6 Meters

For the W6PQL dual-pallet deck, install a 31” rg402 delay line in place of the jumper at lpf5 on the foil side of the board. It can be neatly coiled and secured with cable ties as shown. Note the shield of the cable at both ends is soldered to the ground foil.



The RG402 is not supplied in the kit. RG142 may also be used, but is more difficult to work with than RG402.

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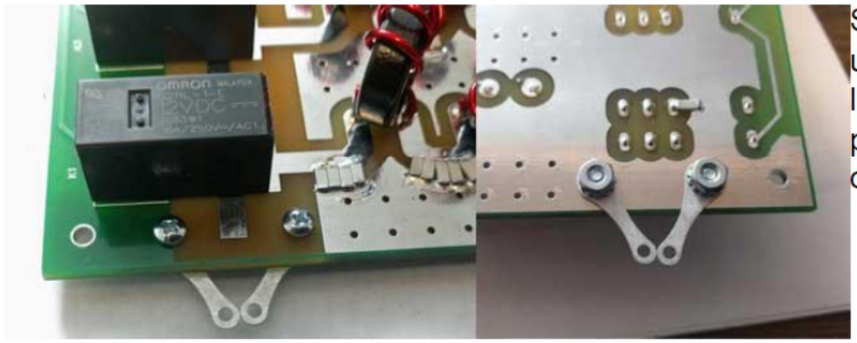
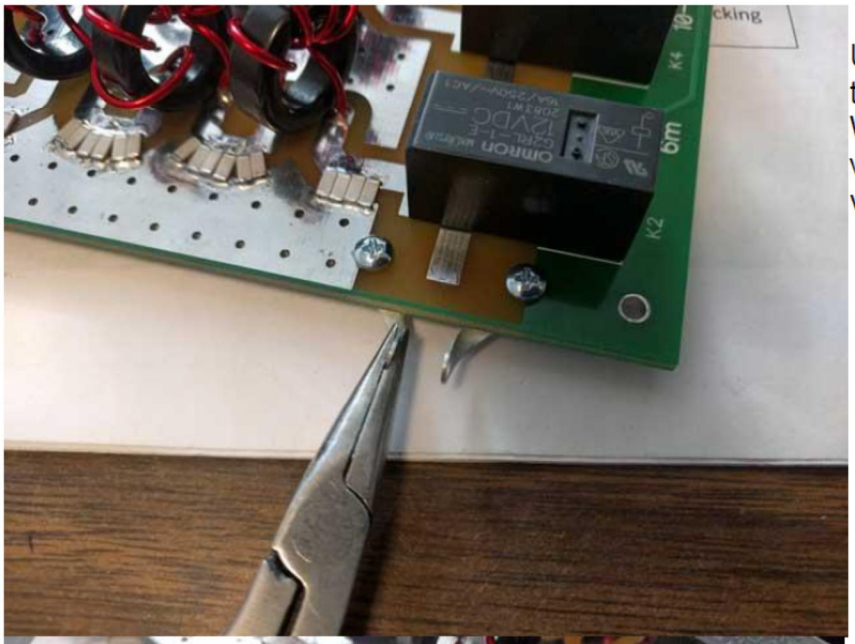
2 KW Low Pass Filter for 160-6 Meters

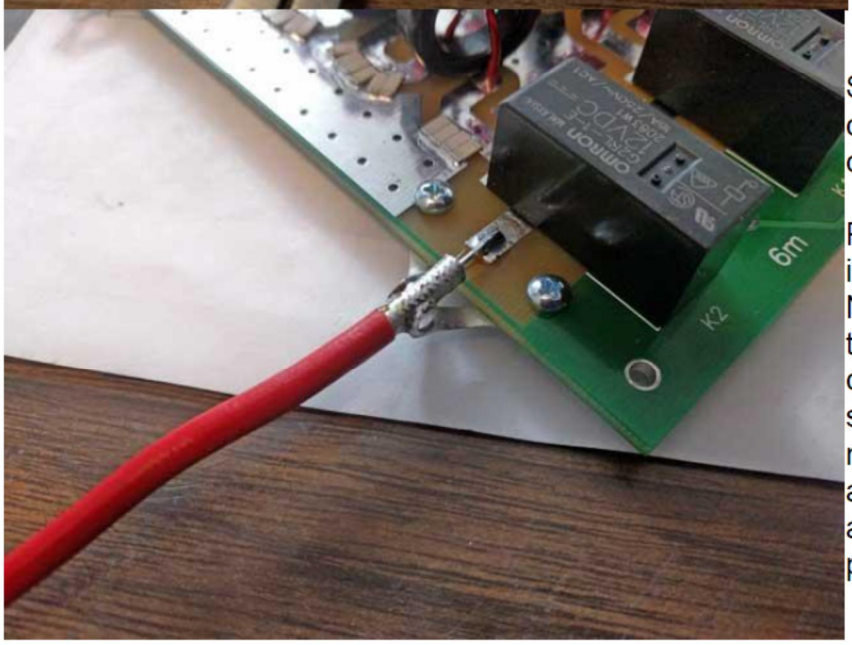
Coax fastener installation instructions



Secure two solder lugs as shown here using the 4-40 machine screws provided; leftmost photo is top side, rightmost photo shows the two locking nuts on the other side securing the lugs.



Using a pair of needle-nose pliers, bend the ends of the lugs vertical as shown. With the lugs formed in this way, there will be considerable strength in both the vertical and horizontal planes.



Shown here is RG402 coax, though you can use any coax (such as RG142) capable of handling the power.

Prepare your coax by removing 20mm insulation covering the outer conductor. Next, remove 10mm insulation covering the center conductor. With the center conductor laying on top of the board and soldered to the board trace, taking care not to move the coax, position the lugs against the sides of the outer conductor and solder them to the outer. Repeat this procedure for the other RF connection.

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2 KW Low Pass Filter for 160-6 Meters

Bill of Materials

# 16 tinned wire, bare 5 turns	2	.375 ID
# 16 tinned wire, bare 6 turns	1	.375 ID
#16 magnet wire, 200C, 9"	**2**	6 turns
#16 magnet wire, 200C, 10"	**1**	7 turns
#16 magnet wire, 200C, 11"	**2**	8 turns
#16 magnet wire, 200C, 12"	**1**	9 turns
#16 magnet wire, 200C, 13"	**2**	10 turns
#16 magnet wire, 200C, 15"	**2**	11 turns
#16 magnet wire, 200C, 16"	**1**	12 turns
#16 magnet wire, 200C, 18"	**2**	14 turns
#16 magnet wire, 200C, 20"	**2**	16 turns
#16 magnet wire, 200C, 22"	**1**	18 turns
#16 magnet wire, 200C, 29"	**2**	18 turns
#16 magnet wire, 200C, 30"	**1**	19 turns
2kv ceramic		
330pf	24	
220pf	10	
180pf	6	
150pf	4	
120pf	6	
100pf	12	
3kv ceramic		
68pf	14	
47pf	4	
39pf	6	
33pf	8	
22pf	14	
15pf	2	
10pf	8	
G2RL-1-E-12V Relay	10	
GF1M Rectifier General Purpose	5	
#6 long solder lug	4	
4-40 k/l	4	
4-40 x .25	4	
PC Board	1	
T106-2 toroid core	3	
T94-2 toroid core	**3**	
T94-6 toroid core	**10**	

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