LPF-4B

Four band low pass filter module kit

Assembly manual

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Most recent updates and news at: www.ea3gcy.com

Thanks for constructing the **LPF-4B** low pass filter kit

Have fun assembling it and enjoy QRP! 73, Javier Solans, ea3gcy

PLEASE READ ALL OF THE ASSEMBLY INSTRUCTIONS COMPLETELY AT LEAST ONCE BEFORE BEGINNING.

SPECIFICATIONS

- Two "LPF" PI Low Pass Filters of 7-Cell
- Configurable Filters band : 80m, 40m, 20m, 15, 10m
- Useful Bands:
  - 80m Filter = **80m**
  - 40m Filter = **60m and 40m**
  - 20m Filter = **30m and 20m**
  - 15m FIlter = **17m and 15m**
  - 10m Filter = **12m and 10m**
- Switching: one relay for each filter.
- Minimum attenuation to the 3rd harmonic -45dB
- Input and Output Impedance: 50ohms.
- Maximum RF power: **50W**
- Power supply: 12 - 14V
- PCB size: 70 x 50mm.

THE LPF-4B

The **LPF-4B** kit is a module contains 2 low-pass filters switchable by relays. This is the necessary complement to the 3 to 30MHz broadband amplifier kit "QPA-1" (qrphamradiokits.com) or to any other HF broadband amplifier up to 30W that does not incorporate low pass filters. It can also be useful as a filters module to transceivers or transmitters home made.
The LPF-4B allows you to work in HF bands from 3 to 30MHz. Since all filters are useful for two bands except the 80m band filter.

PARTS LIST

Checked		Resistors			
		Reference	**Value**	**Type**	**Identified**
		R1 to R4	10K	10 K resistors	marrón-negro-naranja

Checked		Capacitors			
		Reference	**Value**	**Type**	**Identified**
		C1 y C4		See tabla	
		C2 y C3		See tabla	
		C5 y C8		See tabla	
		C6 y C7		See tabla	
		C9	100n	100n capacitor	104 o 0.1

Checked		Semiconductors and Relays			
		Reference	**Value**	**Type**	**Identified**
		D1 and D2	1N4148	1N4148 diodes	4148
		Q1 and Q2	BC547	BC547 transistors	BC547B
		RL1 and RL2	DC12V	12V Relays	DC12V

Checked		Toroids			
		Reference	**Value**	**Type**	**Identified**
		L1 to L6	T50-2 or T50-6	See table	

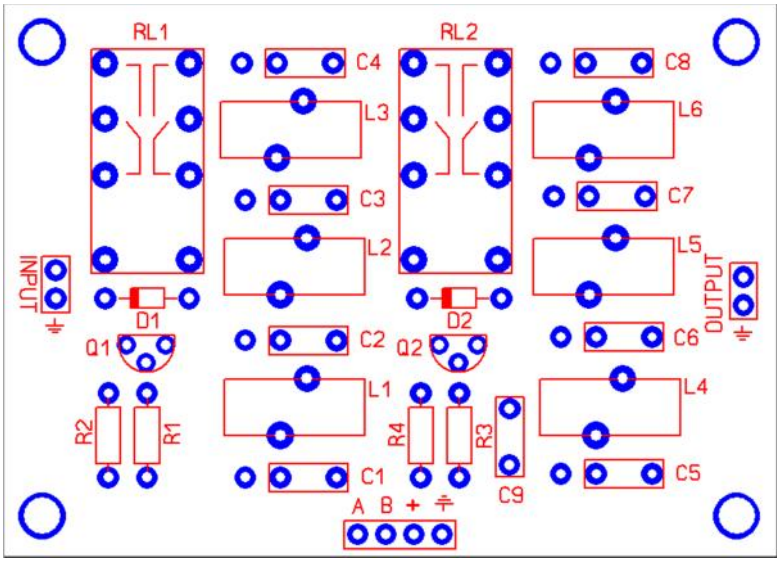
Checked		Divers			
		Reference	**Value**	**Type**	**Identified**
		Pins	---	8 pins strip (4+2+2)	---
		Spacers	---	4 Hexagonal spacers 4mm	---
		Screws	M3x4	M3 screws 4 mm length	---
		Nuts	M3	4 M3 Nuts	---
		Enamelled wire	220cms	120 cms 0,5mm enamelled wire	---
		PCB LPF-4B	---	Printed circuit board 71 x 50mm	---

TIPS FOR FIRST TIME BUILDERS

Tools required:
- A 30w soldering iron with fine tip, small wire cutters for cutting component leads, wire strippers, long-nose pliers, needle-nose pliers, X-Acto knife, screwdriver for M3 screws, alignment tool for adjusting IF transformers.
- You will need a good light and a magnifying glass to see the fine print on the components and other assembly details.

Soldering:
There are two important things which need to be done to insure successful operation of a kit. The first is to put the component into the proper place on the circuit board; the second is good soldering.
To solder properly, you must use a high-quality solder for electronics use and the correct type of iron. Use a small soldering iron with a fine, pointed tip. The soldering iron should be about 30 watts (if it is not thermostatically controlled). Use only high-quality electronic type solder. NEVER use any extra flux. You should hold the hot soldering iron in contact with both the circuit board and the component lead for about two seconds to heat them up. Then, keeping the soldering iron in place, touch the solder at the junction of the lead and trace and wait about two seconds or so until the solder flows between the terminal and the trace to form a good joint. Now remove the soldering iron. The soldering iron should have been in contact with the work piece for a total time of about 4-5 seconds. After soldering each joint, you should clean the soldering tip, removing any excess solder. This prevents mixing in old solder and residues from previous soldering operations.

RECOMMENDED ASSEMBLY SEQUENCE



It is advisable to carry out the assembly work in the following order:

1. Following the part list, place and solder all resistors R1 to R4. Make sure they are properly placed on the board as shown in the pictures.
2. Next Install and solder C1 to C9 capacitors. Some capacitors are polystyrene type in axial format, these are placed in vertical position (see the images).
3. Then place and solder D1 and D2 diodes, pay attention to place them with their correct orientation. There is a strip of color in one of the ends that has to match to board drawing.
4. Now place and solder the two relays, make sure they are flat by touching the board.
5. Place and solder the terminals "INPUT", "OUTPUT" and "A, B, + and GND"
6. Then wind and place the 6 toroids L1 to L6 following the instructions in the next section.

WINDING AND PLACEMENT TOROIDS

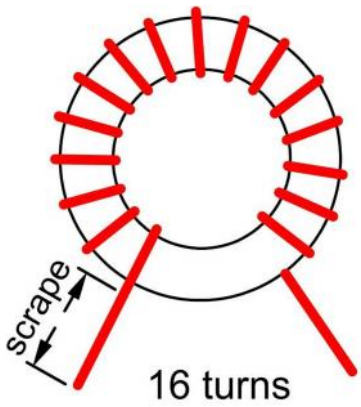
Toroid winding requires special attention. It is not a difficult job but you have to take the time to do it and build the toroids exactly as shown in the following instructions. This is a job that can be very fun if you take it in a relaxed way. Wind the turns with force and separate them around the entire toroid so that they follow the contour and stay as tight as possible. The turns should be evenly distributed throughout the toroid circumference.

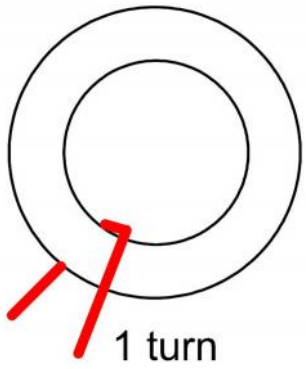
Counting the turns: **Count one turn for every time the wire passes through the center of the toroid.**
Important: **Wind the toroid exactly as shown in the pictures**.

All the toroids are wound in the same way, the only difference will be the type of toroid and the number of turns.

Although the coils look the same, they are NOT. Mark them in some way or store them separately (for example in small bags or envelopes) so as not to confuse them at the time of assembling.

Enamelled copper wire gauge is 0.5 mm for all coils.





Toroid and capacitors Table

Band	**Toroid**	**L1-L3 (or L4-L6)** turns / wire lenght / uH	**L2 (or L5)**	**C1–C4 (C5-C8)**	**C2-C3 (C6-C7)**
80m	T50-2 (red)	21t / 42cms 16” / 2.45uH	24t / 47cms 18” / 3uH	470p	1200p
60-**40m**	T50-6 (yell.)	18t / 37cms 14” / 1.35uH	20t / 41cms 15” / 1.70uH	270p	680p
30-**20m**	T50-6 (yell.)	13t / 29cms 11” / 0.75uH	14t / 30cms 11” / 0.9uH	180p	390p
17-**15m**	T50-6 (yell.)	11t / 25cms 9” / 0.45uH	12t / 27cms 10” / 0.55uH	82p	220p
12-**10m**	T50-6 (yell.)	9t / 22cms 8” / 0.30uH	10t / 24cms 9” / 0.38uH	56p	150p

Choose one band you are interested in and write down the data for L1-L3 and L2 and C1-C4 and C2-C3 values.

Choose the second band you are interested and write down the data for L4-L6 and L5 and C1-C4 and C2-C3 values.

Next, wind the toroids according to the chosen band and install them in their corresponding places. Place and solder the capacitors in their corresponding places.

80m L1-L3 – L2 (L4-L6-L5) toroids

40m toroids

20m toroids

15m toroids

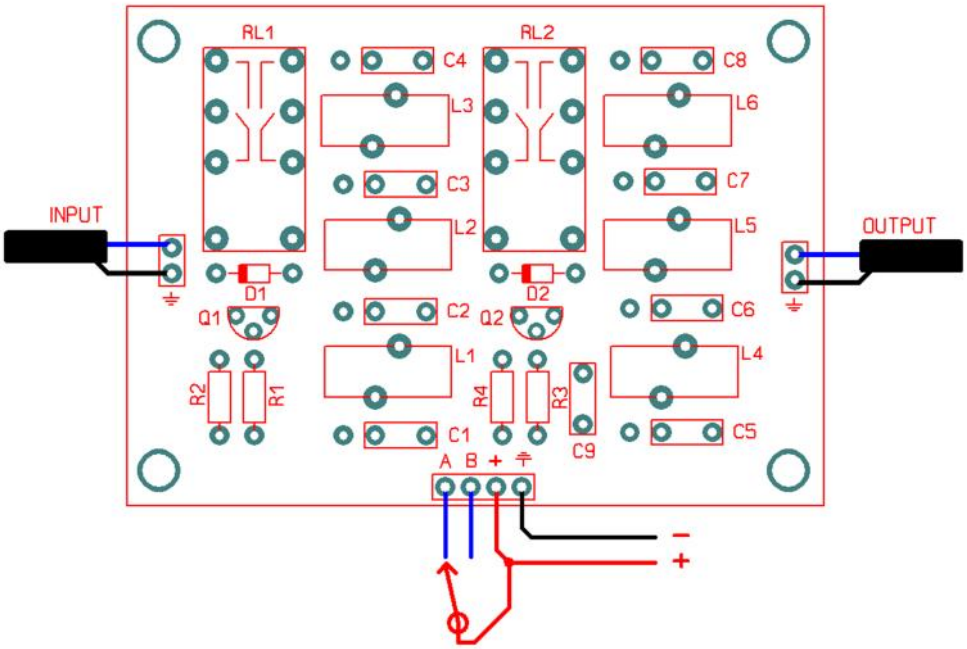
10m toroids

Scrape with a "cutter" or similar the piece of thread so you can weld it on the plate. You can also pre-tinned.

IMPORTANT NOTES:

- Each time the wire passes inside the center of the toroid, it counts as one turn.
- Wind all the toroids exactly in the direction shown by the images.

CONNECTIONS



The connections of the LPF-4B are very simple. You will need a 2-position switch for the switching of the 2 filters.

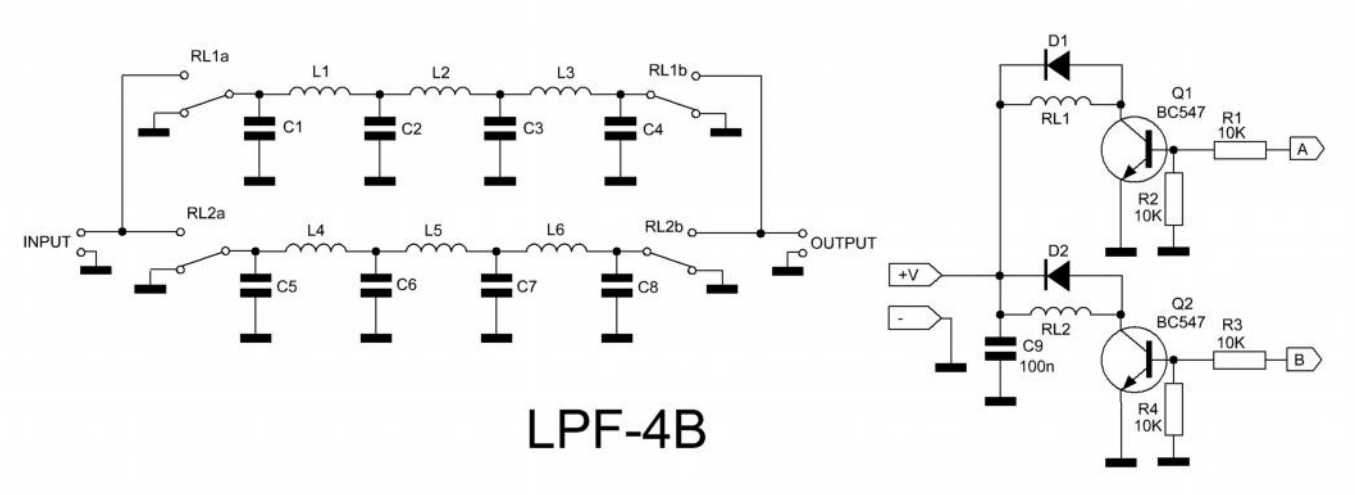
When voltage is sent to **"A"** terminal, the L1-L2-L3 and C1-C2-C3-C4 is activated (relay 1).

When voltage is sent to **"B"** terminal, the L4-L5-L6 and C5-C6-C7-C8 is activated (relay 2).

Only one filter can be activated at the same time.
The module does not incorporate by-pass, therefore there must be a filter activated to circulate RF from input to output.

Use 50ohms RF coaxial cable for input and output (types RG174 or RG58).

SCHEMATIC


RL1a
L1
L2
L3
RL1b
C1
C2
C3
C4
INPUT
RL2a
L4
L5
L6
RL2b
OUTPUT
C5
C6
C7
C8
LPF-4B
D1
RL1
Q1
BC547
R1
10K
A
R2
10K
D2
+V
-
RL2
C9
100n
Q2
BC547
R3
10K
B
R4
10K

LIMITED WARRANTY

Please read carefully BEFORE building your kit

All electronic components and hardware supplied with the kit are under warranty in case of any manufacturing defect for the period of one year after purchase. The warranty does not include the transmitter final amplifier transistor.

The original purchaser has the option of examining the kit and manual for 10 days. If, within this period, the buyer decides not to build the kit, he/she may return the entire unassembled kit at their own expense for the shipping expenses. The shipping expenses and sales commissions (i.e. bank, Ebay, and Paypal commissions) included in the purchase price will not be returned.
Please, BEFORE returning a product, request instructions by email at: ea3gcy@gmail.com

Javier Solans, EA3GCY, warrants this device to function according to the specifications, provided that it is assembled and adjusted as described in this documentation, and used correctly according to all provided instructions.
It is your responsibility to follow all the instructions in the manual, to identify all the components correctly, and to use good workmanship and proper tools and instruments in the construction and adjustment of this kit.
REMEMBER: This kit will not work as a commercially manufactured product; however, if can often give similar results. Do not expect great performance, BUT YOU ARE SURE TO HAVE LOTS OF FUN!

If you believe that there is a missing component for the kit, please do a thorough inventory of all parts using the parts list in the manual. Check all bags, envelopes and boxes carefully. If needed, you may email me and I will replace any component that you are missing. Even if you can find the exact part locally, please let me know so that we are aware of the problem to help other customers.
I can also supply any part that you have lost, damaged or broken accidently.
If you find any errors in this manual or would like to make a comment, please do not hesitate to contact me at: ea3gcy@gmail.com

THANK YOU for building the **LPF-4B** kit.

Enjoy QRP!
73 Javier Solans, EA3GCY