

# LPF-9B

**Nine band low pass filter module kit  
(80-60-40-30-20-17-15-12-10 meters)**

## Assembly manual

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Thanks for constructing the **LPF-9B** 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**

- Five "LPF" Low Pass Filters of 7-Cell
- Filters band: 80m, 40m, 20m, 15, 10m
- Useful Bands (Nine):
  - 80m Filter = **80m**
  - 40m Filter = **60m y 40m**
  - 20m Filter = **30m y 20m**
  - 15m Filter = **17m y 15m**
  - 10m Filter = **12m y 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: 155 x 50mm.

## **THE LPF-9B**

The **LPF-9B** kit is a module contains 5 low-pass filters switchable by relays. This is the necessary complement to the 3 to 30MHz broadband amplifier kit "QPA-1" ([qrphamradiokits.com](http://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-9B allows you to work in all HF bands from 3 to 30MHz. Since all filters are useful for two bands except the 80m band filter.

**Note:** If you are not going to work in all HF bands, there is a 4-band version called **LPF-4B**.

# PARTS LIST

Checked		Resistors			
		Reference	Value	Type	Identified
		R1 a R10	10K	10 K resistors	marrón-negro-naranja

Checked		Capacitors			
		Reference	Value	Type	Identified
		C1 y C4	470p	470pF capacitors	470p 470J 471
		C2 y C3	1200p	1200pF capacitors	1200p 1200J 122
		C5 y C8	270p	270pF capacitors	270p 270J 271
		C6 y C7	680p	680pF capacitors	680p 680J 681
		C9 y C12	180p	180pF capacitors	180p 180J 181
		C10 y C11	390p	390pF capacitors	390p 390J 391
		C13 y C16	82p	82pF capacitors	82p 82 J
		C14 y C15	220p	220pF capacitors	220p 220J 221
		C17 y C20	56p	56pF capacitors	56p 56 J
		C18 y C19	150p	150pF capacitors	150p 150J 151

Checked		Semiconductors and Relays			
		Reference	Value	Type	Identified
		D1 a D5	1N4148	1N4148 diodes	4148
		Q1 a Q5	BC547	BC547 transistors	BC547B
		RL1 a RL5	DC12V	12V Relays	DC12V

Checked		Toroids			
		Reference	Value	Type	Identified
		L1, L2 y L3	T50-2	Red toroid 12.7mm	
		L4 a L15	T50-6	Yellow toroid 12.7mm	

Checked		Divers			
		Reference	Value	Type	Identified
		Pins	---	11 pins strip (7+2+2)	---
		Spacers	---	4 Hexagonal spacers 4mm	---
		Screws	M3x4	M3 screws 4 mm length	---
		Nuts	M3	4 M3 Nuts	---
		Enamelled wire	490cms	480 cms 0,5mm enamelled wire	---
		PCB LPF-9B	---	Printed circuit board 51 x 155mm	---

## TIPS FOR FIRST TIME BUILDERS

Tools required:

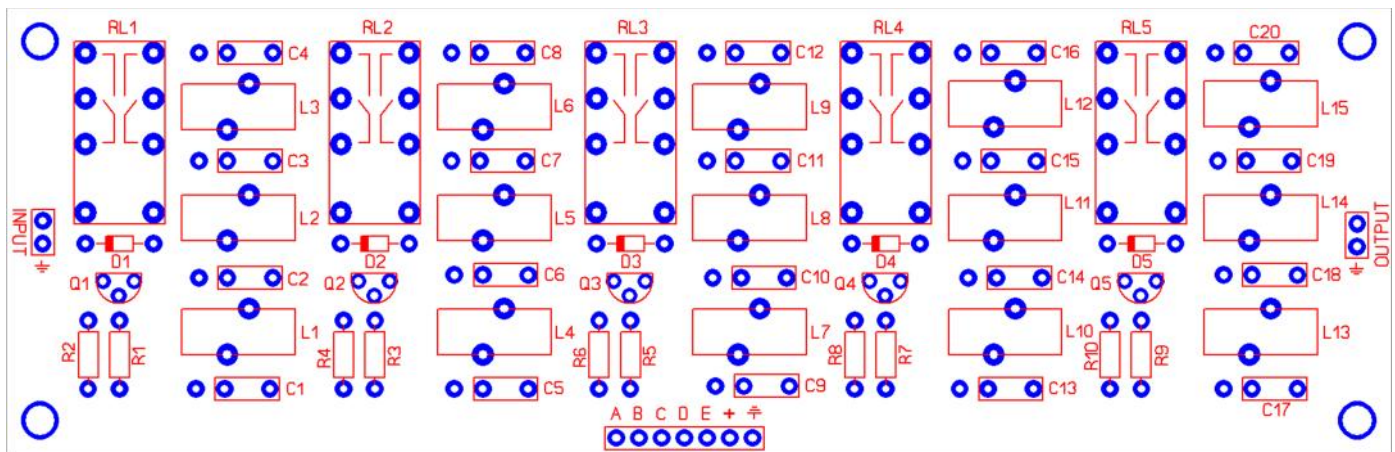
- A 30w soldering iron with fine tip, small wire cutters for cutting component leads, wire strippers, long-nose pliers, needle-nose pliers, X-Acto knife, screwdriver for M3 screws, alignment tool for adjusting IF transformers.
- You will need a good light and a magnifying glass to see the fine print 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 R10. Make sure they are properly placed on the board as shown in the pictures.
2. Next Install and solder C1 to C20 capacitors. Some capacitors are polystyrene type in axial format, these are placed in vertical position (see the images).

3. Then place and solder D1 to D5 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 five relays, make sure they are flat by touching the board.
5. Place and solder the terminals "INPUT", "OUTPUT" and "A, B, C, D, E, + and GND"
6. Then wind and place the 15 toroids L1 to L15 following the instructions in the next section.

## WINDING AND PLACEMENT TOROIDS

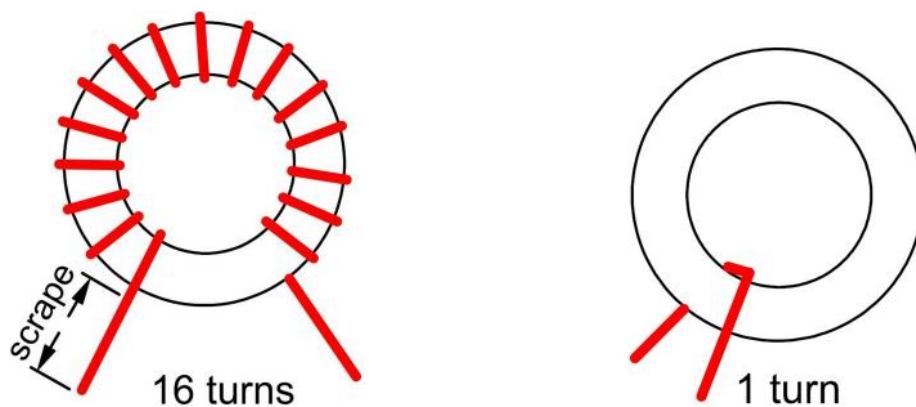
Toroid winding requires special attention. It is not a difficult job but you have to take the time to do it and build the toroids exactly as shown in the following instructions. This is a job that can be very fun if you take it in a relaxed way. Wind the turns with force and separate them around the 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 Table

Band	Toroid	Turns / wire length / uH	
80m	T50-2	L1-L3 = 21t / 42cms 16" / 2.45uH	L2 = 24t / 47cms 18" / 3uH
60-40m	T50-6	L4-L6 = 18t / 37cms 14" / 1,35uH	L5 = 20t / 41cms 15" / 1.70uH
30-20m	T50-6	L7-L9 = 13t / 29cms 11" / 0.75uH	L8 = 14t / 30cms 11" / 0.9uH
17-15m	T50-6	L10-L12 = 11t / 25cms 9" / 0.45uH	L11 = 12t / 27cms 10" / 0.55uH
12-10m	T50-6	L13-L15 = 9t / 22cms 8" / 0.30uH	L14 = 10t / 24cms 9" / 0.38uH

### L1 and L3

L1 and L3 are equal. T50-2 toroids (red) are used. Cut about 42 cm of enamelled wire and wind twenty one (21) turns in each toroid as seen in the images.

### L2

L2. T50-2 toroid (red) are used. Cut about 47 cm of enamelled wire and wind twenty-four (24) turns as show the images.



80m L1-L3 and L4 toroids 80m

### L4 and L6

L4 and L6 are equal. Toroids T50-6 (yellow) are used. Cut about 37 cm of enamelled wire and wind eighteen (18) turns in each toroid as seen in the images.

### L5

L5. T50-6 toroid (yellow) are used. Cut about 41 cm of enamelled wire and wind twenty (20) turns as show the images.



40m L4, L6 and L5 toroids

## L7 and L9

L7 and L9 are equal. Toroids T50-6 (yellow) are used. Cut about 29 cm of enamelled wire and wind thirteen (13) turns in each toroid as seen in the images.

## L8

L8. T50-6 toroid (yellow) are used. Cut about 30 cm of enamelled wire and wind fourteen (14) turns as show the images.



Toroides L7, L9 y L8 para 20m

## L10 and L12

L10 and L12 are equal. Toroids T50-6 (yellow) are used. Cut about 25 cm of enamelled wire and wind eleven (11) turns in each toroid as seen in the images.

## L11

L11. T50-6 toroid (yellow) are used. Cut about 27 cm of enamelled wire and wind twelve (12) turns as show the images.



Toroides L10, L12 y L11 para 15.

## L13 and L15

L13 and L15 are equal. Toroids T50-6 (yellow) are used. Cut about 22 cm of enamelled wire and wind nine (9) turns in each toroid as seen in the images.

## L14

L14. T50-6 toroid (yellow) are used. Cut about 24 cm of enamelled wire and wind ten (10) turns as show the images.



Toroides L13, L15 y L14 para 10m

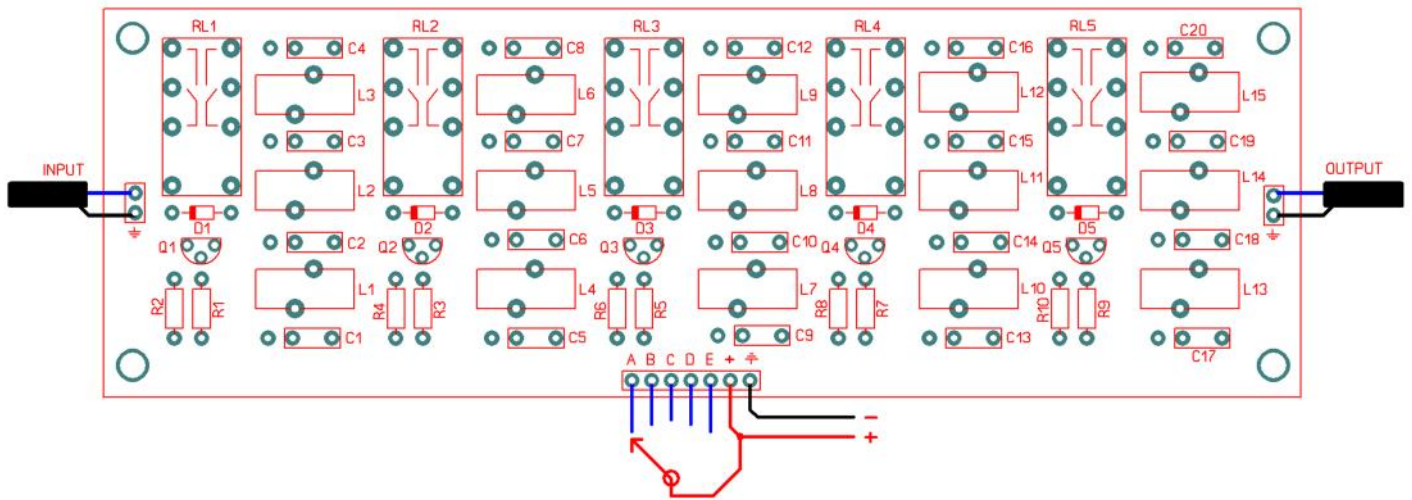
Scrape with a "cutter" or similar the piece of thread so you can weld it on the plate. You can also pre-tinned.

### 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-9B are very simple. You will need a 5-position switch for the switching of the 5 filters.

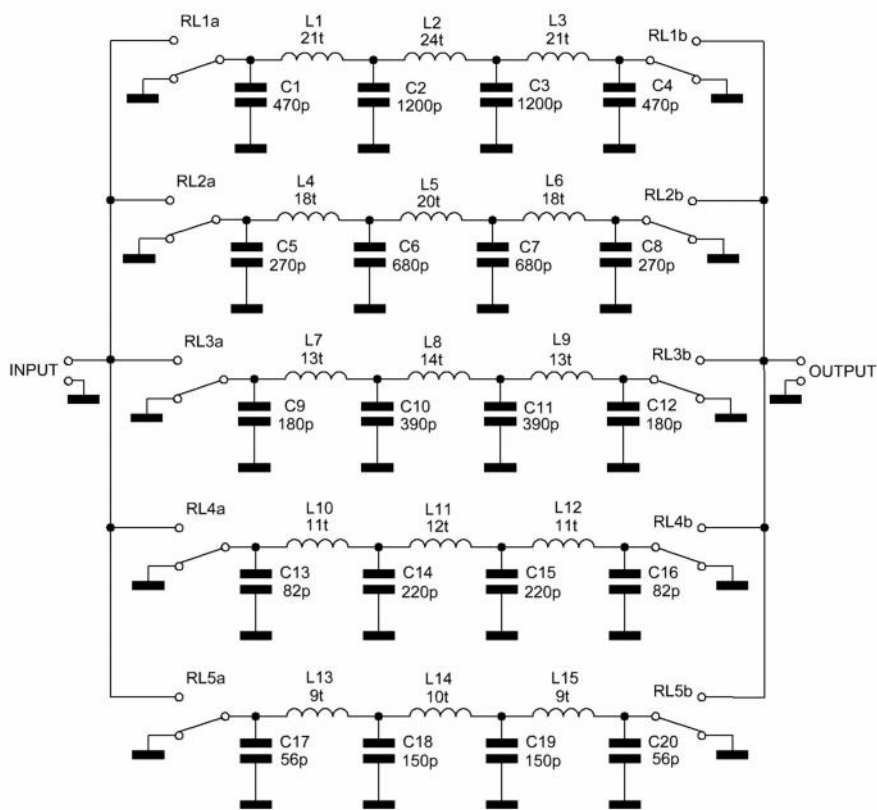
When voltage is sent to "A" terminal, the **80m** filter is activated (relay 1). Terminal "B" activates the filter for **60m and 40m** (relay 2). Terminal "C" activates the filter for **30m and 20m** (relay 3). Terminal "D" activates the filter for **17 and 15m** (relay4). Terminal "E" activates the filter for **12m and 10m** (relay5).

*Only one filter can be activated at the same time.*

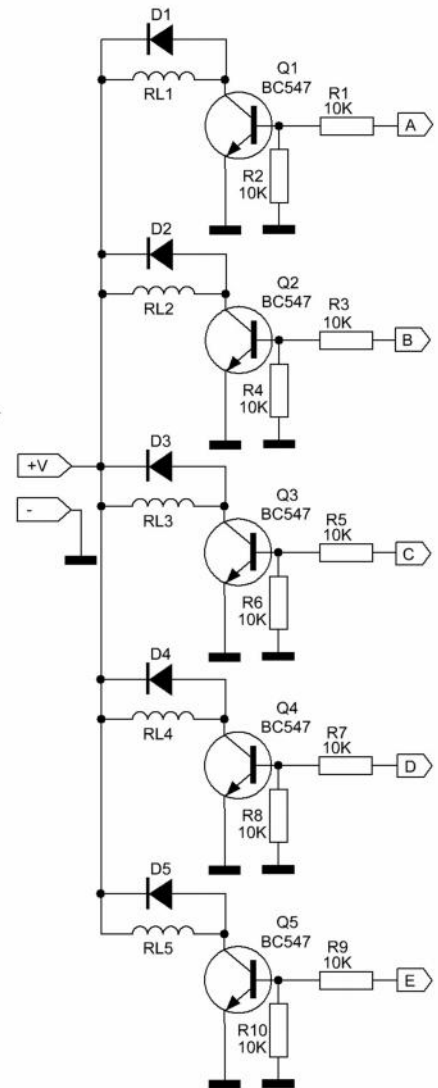
*The module does not incorporate by-pass, therefore there must be a filter activated to circulate RF from input to output.*

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

# SCHEMATIC



LPF-9B



# 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](mailto:ea3gcy@gmail.com)

Javier Solans, EA3GCV, 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, it 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 accidentally.

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](mailto:ea3gcy@gmail.com)

THANK YOU for building the **LPF-9B** kit.

Enjoy QRP!

73 Javier Solans, EA3GCV