



# DL-QRP-AG



## Blue Cool Radio - 80m Option

We recommend to read the manual carefully. Manual Rev. 1.0

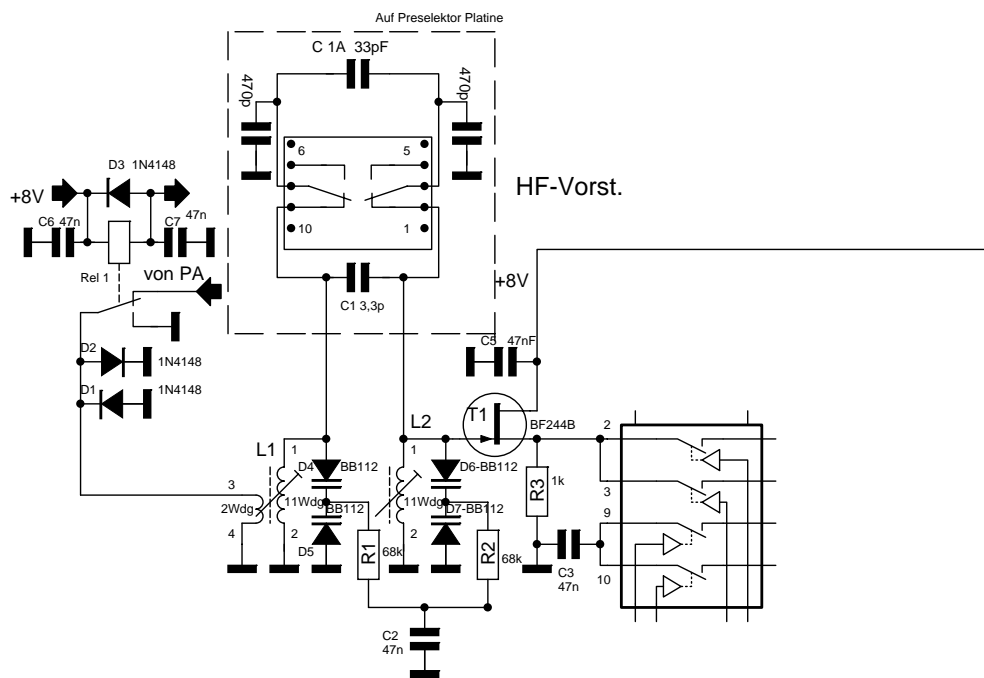
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Originally the BCR was designed as a 4 band transceiver for 40, 30, 20 and 17 meter. The more BCR have been in practical use, the more requests we got to design an optional 80m part. The designer of the BCR Digital section was the first one who tried an 80m addon and after some discussions in the BCR design group, we found a way to add a nearly perfect 80m band option to our BCR although the place is very restricted.

The addon consists of two little PCB and a firmware update.

PCB 1 switches the preselector to an additional range of 3,5 - 4 MHz

By a bistable Relais we parallel a 33pF capacitor to C1 and a 470pF to each bandpassfilter inductivities This shifts the tuning range to about 3,5-4 MHz



Preselektor Schaltung 80m Erweiterung BCR

PCB 2 contains an additional Low pass filter LPF with a cutoff at 4 MHz to stop the harmonics of 80m plus an 11 MHz-cutoff LPF. PCB 2 replaces the old 11MHz Cutoff LPF at the mainboard.

Because there is not enough room for additional Torroids, we use a little trick. Two LPF inductivities are wound on one Torroid. They are switched by

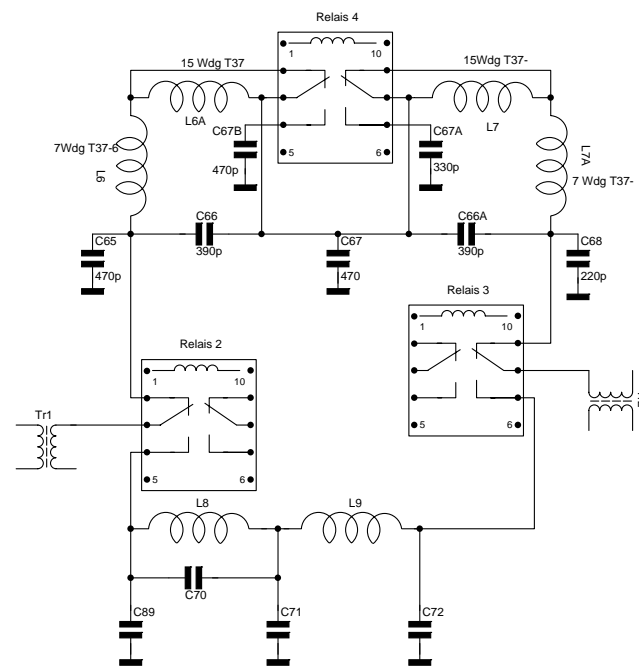
relais. At 4MHz Cutoff both inductivities are in series, at 11MHz one inductivity is shortened by the relais. During our tests we found that this works excellent, but it was not so easy to calculate because all known formulas assume the winding to be spread completely around to torroid. We found the best values by the traditional try and error method using a spectrum analyzer.

The control logic of BCR switches to the new PCBs if 80,40 or 30 m is selected. At 40 and 30m the relais shorts the 15 turn winding at both torroids. The remaining inductivity with their caps give us a cutoff at about 11 MHz. At 80m the complete number of turns is active and by additional capacitors the total capacitance is switched to 1270 pF. In this configuration the LPF has a cutoff at about 4 MHz

The BCR Low Pass Filters give us a harmonic suppression of better -50dBc (better 50 dB below carrier)

### Building the 80 m Option

Preparation: If the Option should be built into a complete assembled BCR,



BCR Tiefpasserweiterung Prototyp 23.3.06

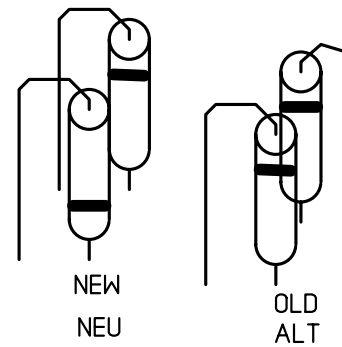
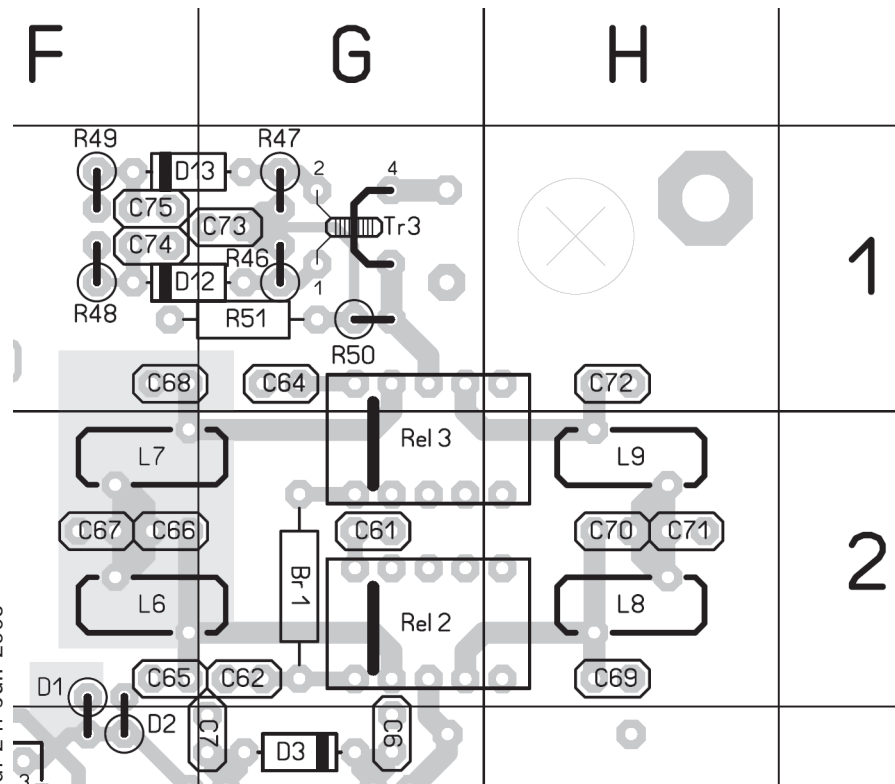
some parts from the mainboard must be disassembled before the 2 new PCB can be installed. Those of you who started with this manual during installing the standard BCR please go on at the next page.

Removing Parts from an allready installed BCR to add the 80m option:

Start in the LPF area:

- [ ] Remove L7, clean the solderpads FG/2
- [ ] Remove L6, clean the solderpads FG/2
- [ ] Remove C68, clean the solderpads FG/1
- [ ] Remove C67, clean the solderpads FG/2
- [ ] Remove C66, clean the solderpads FG/2

If D1 has been installed as shown in the mainboard manual, it mus be removed and replaced by a new Diode. The bodys of D1 must be placed parallel. To keep them working as before, the banded ends look opposite.



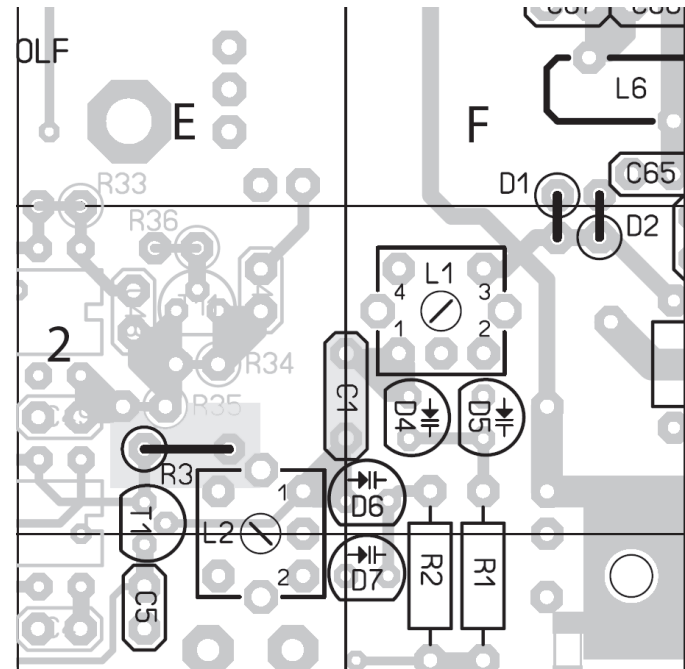
Look at the pictures before soldering to avoid mistakes!

[ ] D1 1N4148 F/2-3

Now preperate the Preselector area.  
You must remove two parts only:  
Resistor R3 and Capacitor C1

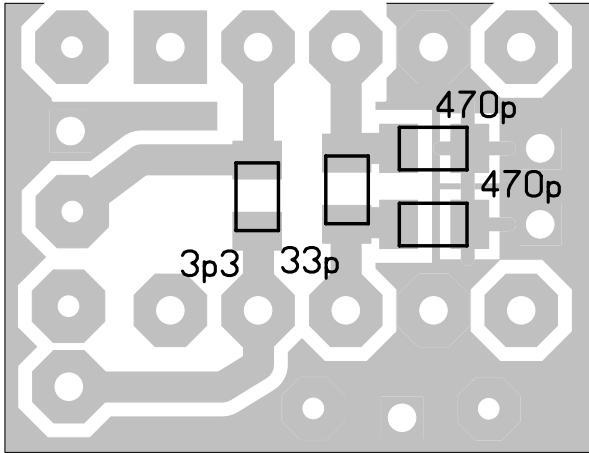
[ ] Remove R3, clean the solder Pads E/2

[ ] Remove C1, clean the solder Pads E,F/2



Assembling the AddOn PCB's Bandpassfilter first.

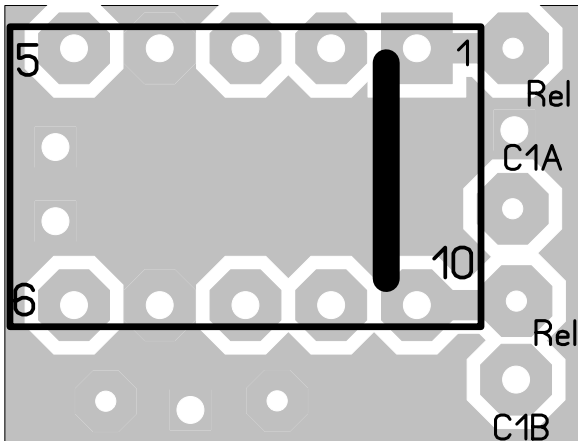
Solder the 4 SMD Caps first. If you did not before solder any SMT parts, please read some advice how to solder SMD. You will find some good instruction in the internet. A very usefull one is the course of VK3EM at:



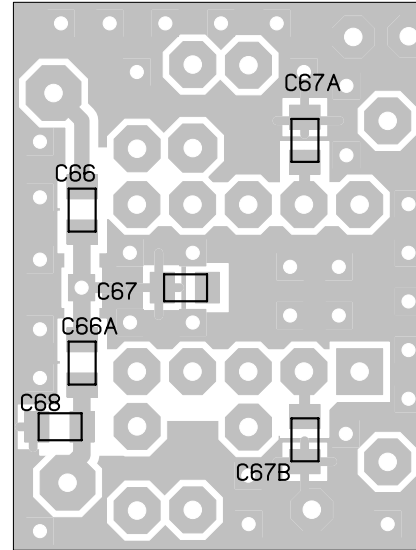
<http://www.geocities.com/vk3em/smtguide/websmt.html>

- [ ] 3p3 SMD 0805
- [ ] 33p SMD 0805
- [ ] 470p SMD 0805
- [ ] 470p SMD 0805

Now the relais . ATTENTION, the relais must be placed to the other side of the PCB. It's PIN's are soldered at the side where the SMT parts are. Pay attention not to reverse the relais, the banded side must be placed as shown in the picture left. Hold the relais down to the PCB and solder 2 corner pin's first. The relais must absolutely flat on the PCB, check it and solder the remaining pins if it is ok.



[ ] Preselector Relais all 10 Pins soldered



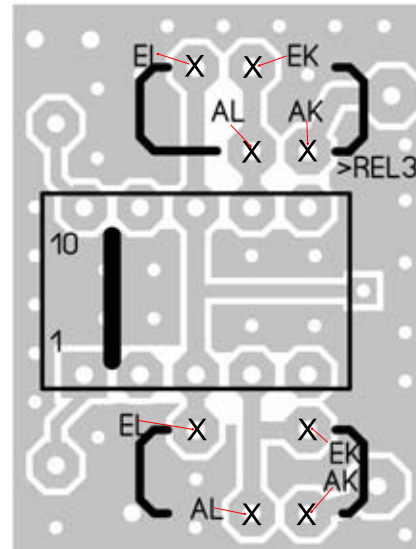
Go on with the LPF PCB. Again start with SMT parts:

- [ ] C66 390 pF
- [ ] C67A 330pF
- [ ] C67 470pF
- [ ] C66A 390pF
- [ ] C68 220pF
- [ ] C67B 470pF

Now the Relais. Again it must be placed on the other side of the PCB and soldered at the SMT side. Don't forget to check the

Band, it must be placed as shown in the picture.

[ ] LPF Relais, all ten pins soldered..



Now the „Double Inductivities“ The Shortcuts in the drawing mean:

- AK = Start of short winding
- EK = End of short winding
- AL = Start of long winding
- EL = End of long winding.

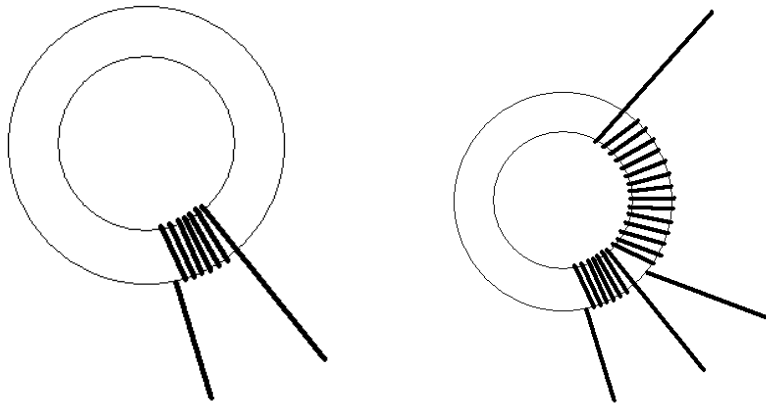
Both torroids are wound the same way, but take care to wind the correct direction to meet the solder pads . Use abt 30cm Of 0,4mm enameled wire. Wind as described following:

Start with the short winding. Pull the wire from the back to the front through the core. This is the first turn! The next turn again from back to front, it must lay RIGHT sight of the first turn, you wind counterclockwise. Do not spread this winding but wind it tight wire to

wire. Repeat until you count 7 turns INSIDE the core. The short winding is ready.

Cut the ends about 2-3 cm outside of the core.

Now the long winding. Start just behind the short one, same direction



again back to front, again counterclockwise. This time you must count 15 turns inside the core.

Do the second core exactly the same way.

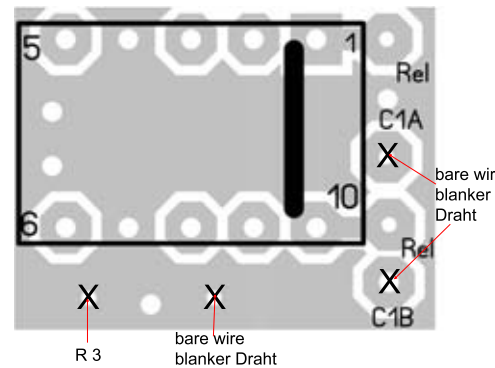
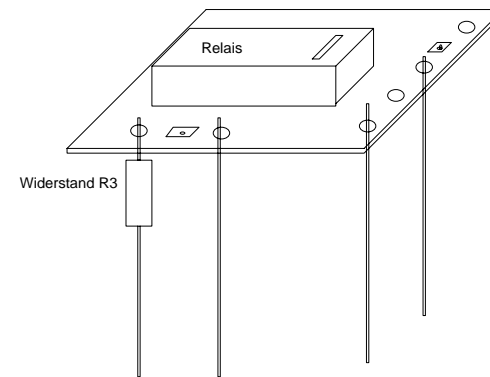
Remove the enamel very short next to the ring and tin it at about 1cm. Repeat this for all wire ends.

Sort the ends as shown in the picture. Pull the ends through the corresponding holes in the PCB. Check if the wire is completely tinned inside the PCB holes. If not, rework them. If ok, pull the core tight to the PCB and solder all wires.

- [ ] Inductivity 1 LPF
- [ ] Inductivity 2 LPF

Now both PCB are ready soldered, you may install them on the mainboard now.

Start with the smaller BPF PCB



At make the stand offs. Solder the 1k resistor and two resistor cut-offs to the little PCB as shown in the picture. Solder at the relais side but be careful not to touch the relais with the iron. Solder the resistor tight to the PCB. Actually it's body must touch the PCB. Do not use the rectangular hole, it is only a ground feed through, use the round solder pad.

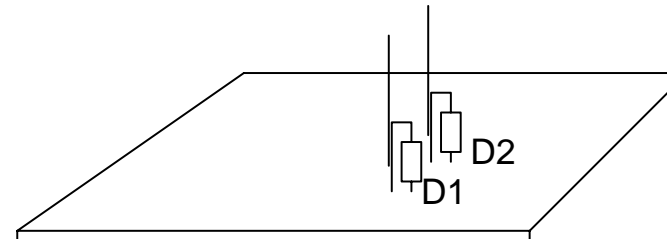
- [ ] R3 1k
- The pad right of R3 stays free
- [ ] Resistor Cutoff of at least 15mm into the next round solder pad
- [ ] Resistor Cutoff of at least 15mm into the round solder pad right lower corner
- [ ] Resistor Cutoff of at least 15mm into the round solder pad, 3rd solder pad from right lower corner

Now mount the PCB with its 3 bare wires and the resistor into the corresponding holes of the main PCB below. This will be a little bit tricky, but if you did clean the holes carefully before it works. If all 4 standoffs are in their holes, press the PCB down until the PCB flushes with the upper side of L1.

- [ ] Solder all 4 pins at the bottom of the main PCB

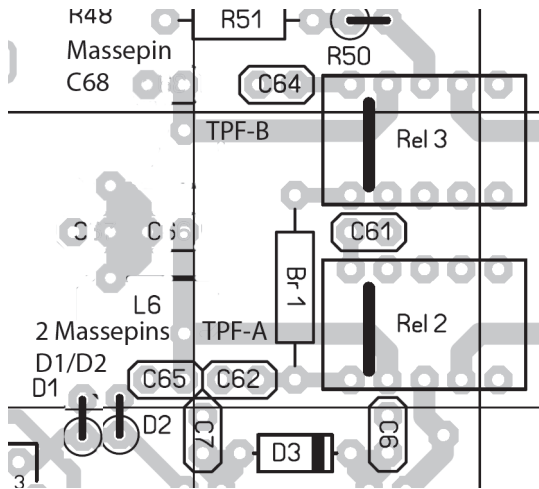
Now the LPF-PCB. It must be placed upside down, the relais and the cores hang towards the main PCB. To prepare the installation, solder the stand off Pins first.

### Drahtstücke anlöten



- [ ] Solder 2 Resistor CutOffs to D1 and D2 as shown in the picture. The PCB will be

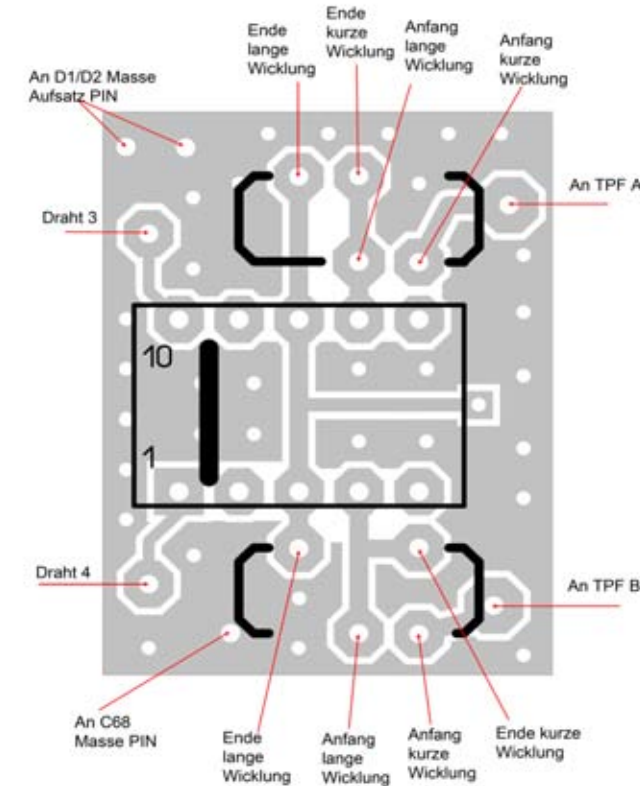
soldered on this pins later on. This can only be done, if the Diodes have been mounted the correct way as described in the desolder part.



[ ] Solder a resistor CutOff to the ground side off the former C68 location.

[ ] Solder 2 pieces of abt 2,5cm flexible wire to the pads marked as TPF A and TPF B in the drawing of the main board.

[ ] feed the other end of the flexible wires through the holes in the little PCB. Solder them from the solder side of the PCB. Remember: the PCB will be mounted upside down.



Now the PCB must be seated on the 3 Ground PINs at D1/D2/C68

[ ] Solder 3 ground Pins at the small PCB.

Only thing remaining now is the wiring between the Optio PCBs and the processor.

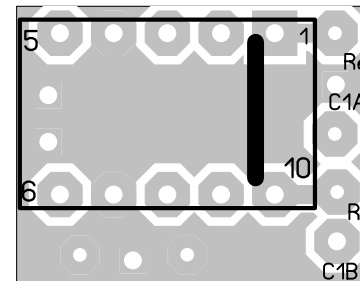
Each relais has it's own driver port but they all have a common line. Therefore we need 3 wires between the two PCBs and the processor. Because the proc is

extreme ESD sensitive, dont forget to follow the ESD rules. Use the ESD tool.

Start with the Bandpass Filter. Remove abt 3mm of the isolation of a 20cm long piece of wire. Feed the this side from the upper side into the first open solder pad counted from L1 side. Leave abt 1mm unisolated wire to be seen from the upper side and solder it. Go on with the other 2 wires the same way.

[ ] Wire 1, (25cm) to solderPad Relais PIN 10

[ ] Wire 2 (3cm) to solder Pad Relais PIN 1



Now the Low Pass Filter board. See picture total left at this side but **remember, the PCB ist mounted upside down! Pin 10 of the Relais is the round solder pad looking to the PA transistor!!!**

[ ] Wire 3 (25cm) to solderpad RELAIS PIN 10

[ ] Wire 4 (25 cm) to solderpad RELAIS Pin 1

Feed wire 1, 3 and 4 through the main board hole for the coax cable. At the bottom side too the Microprocessor. Use the drawing to find the 3 Pins you need to solder the 3 wires. Lengthen the 3 wires so they can be soldered without being stressed. Remove the isolation at abt 2mm and solder the wires to the pins:

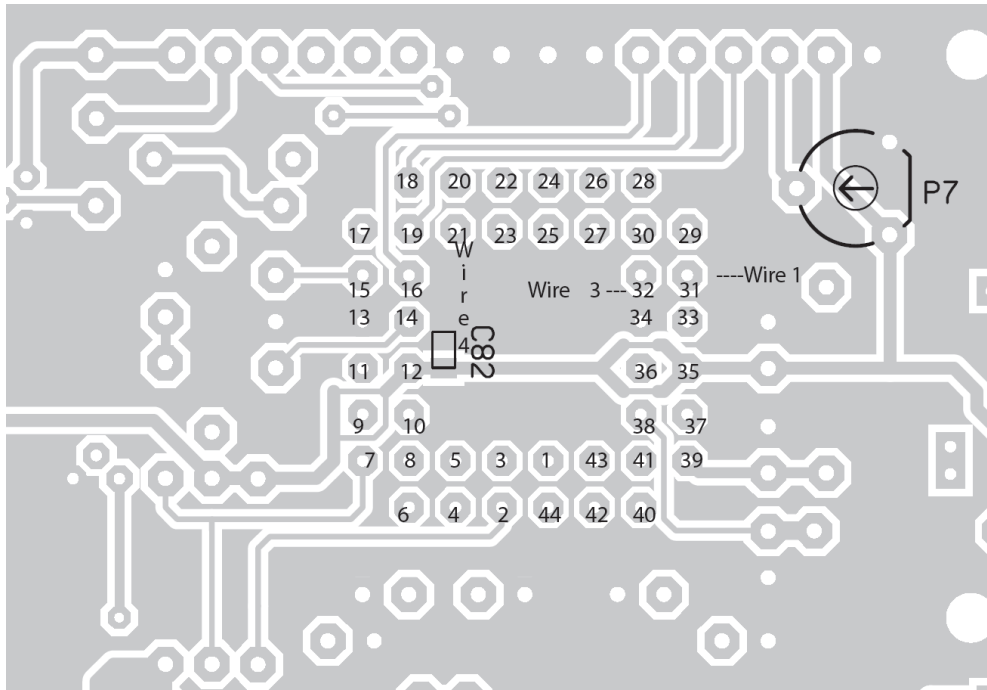
[ ] Wire 1 to Socket Pin 31

[ ] Wire 3 to Socket Pin 32

[ ] Wire 4 to Socket Pin 21

Now connect the short wire number 2 to the junction of wire 4 at the LPF pcb and you are ready with soldering.

[ ] Wire 2 a to junction of wire 4 at LPF



If your firmware version is less than 1.14, you must change the processor

Both inductivities of the Preselector must be adjusted now regarding to the procedure described in the main manual.

That makes the assembling complete, your BCR has been converted into a 5 Band radio.

The QRPproject Team wishes lots of fun on 80m.

Partlist 80m option:

PCB	LPF	TPF	
1	220pF	SMD 0805	
1	330pF	SMD 0805	
2	390pF	SMD 0805	
2	470pF	SMD 0805	
1	Exchange Diode 1N4148		
1	Bistabiles Relais		
2	Amidon Torroid T37-6		
2m	enameled wire 0,4mm		

PCB	Bandpassfilter
1	3p3 SMD 0805
1	33p SMD 0805
1	470p SMD 0805
2	470p SMD 0805
1	Exchange resistor R3 1kOhm
1	Bistabiles Relais

Wire 4 colours ( 4x50cm )

Wire flexible 10cm