The blue cool Radio BCR

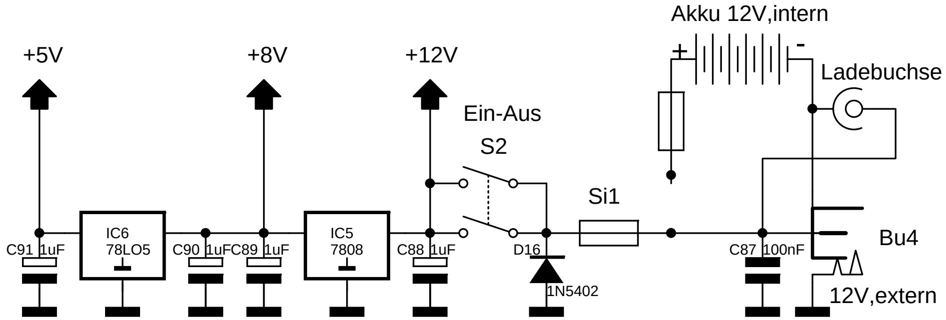
Rev:Nobember 20. 2006

© QRPproject Motzener Straße 36-38 12277 Berlin http://www.QRPproject.de Telefon: +49(30) 85 96 13 23 e-mail: support@QRPproject.de
Manual written by : FIservice Peter Zenker DL2FI email:dl2fi@qrpproject.de

Welcome to start assembling your BCR - Blue Cool Radio. We divided the complete kit into functional groups which can be tested individually after assembling. Please follow the manual while assembling because each group except the first one need the groups built before to be tested. The follow up inside a group also is not by chance but follows logical and safety rules. Besides this rules we tried to make it easier for you by using a graphical coordinate system. Behind all parts you find the coordinates of the part, in the placement plans you find the same system as a drawing. Following the coordinates will make it easy to find the correct place for any part.

The first group to be built ist the voltage regulator section

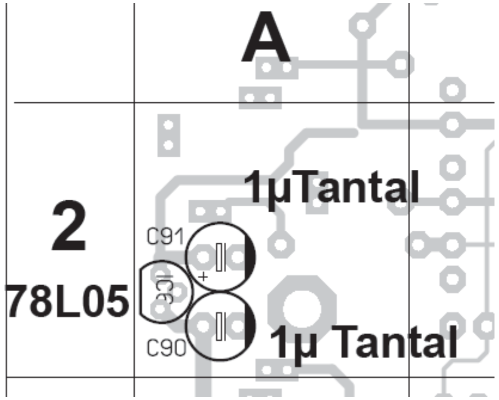
Group 1 Voltage Regulation

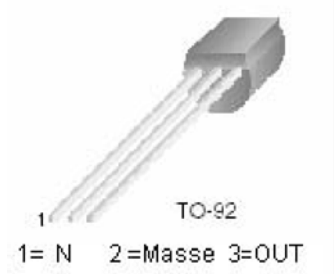


BCR should be powered by a 12 Volt power supply or a package of 10 AA NiMH cells which also give 12,0 V (Working range is 11 to 15 V). Most stages in BCR work at stabilzed 8 V. We desided to use 8V to protect a batterie package against low voltage which may destroy it. The choosen regulator IC 7808 needs 9,5 V to work properly, a NiMH pack with ten AA cells never should be used below 9,5 V.

The seperate 5V Regulator generates the supply for the central PIC Processor which controlls the BCR.

Start at the upper left corner at coordinates A/2
Find IC 6, an 78L05 Integrated Circuit in a TO92 housing. It´s flat side must be positioned as shown in the drawing. As allways good in RF





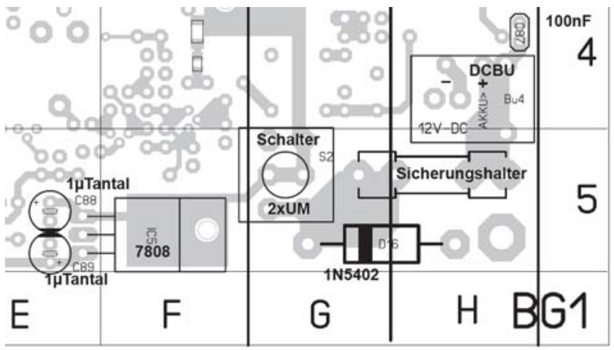
technique, do not solder it with „long legs“, the lower part of the IC should be not more the 2-3 mm above the PCB.

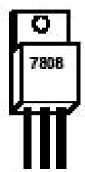
[ ] IC6 8L05 TO92 A-2, solder

Tantalum Caps are polarised The PLUS side is marked either with a plus sign (+) or a bar. Also the longer leg identifies the PLUS side. Most Tantalum caps look like a drop.

[ ] C90 1uF 35V Tantal A-2
[ ] C91 1uF 35V Tantal A-2
Go ahead at F/5 in the lower right corner. The blocking caps often have a right angle edge in their legs. Please take the time to rework this with a long nose plier to make it possible to place them very flat to the PCB. If they are placed to high above the PCB this will cause failures.

[ ] C87 100nF (104) H-4

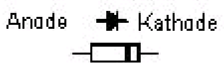




Rev: November 20 2006

[ ] C88	1uF 35V Tantalperle	E-5
[ ] C89	1uF 35V Tantalperle	E-5

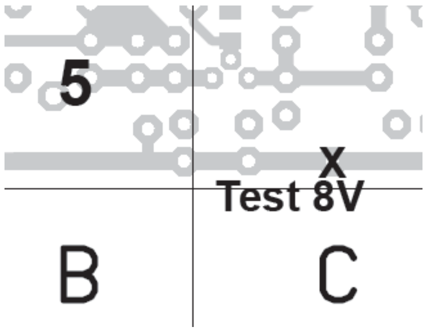
Attention: The following Diode must be placed the right way. The Kathode of a Diode is marked by a band. If the Tyoe of the Diode is completely

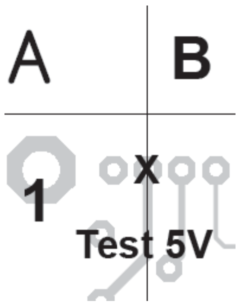


coded by bands, the thickest one markes the cathode. Place the band according to the placement plan.

[ ] D16 1N5402 G/H-5
IC5 is a voltage regulator in a TO220 Housing, which can handle about 1 Ampere at the desired Voltafe. It must be screwed directly to the PCB´s ground plane. Because the metall plate of the IC is Ground, we need no isolation. The printing of the IC looks to the upper side. Before installing bend the 3 legs 90 degrees down just behind its body. Use a small screwdriver to get a soft bent.
Screw the IC to its place before you solder it. However, it shoud lay flat on the PCB to enable the heat to flow away.

[ ] IC5	7808	TO220		F-5
[ ] S2	Toggle Switch	2xUmupright Typ MS500		G-5
[ ] Si1	Fuse Holder			G/H-5
[ ] Bu4	DCBU 2,1-PR DC Jack		2,1mm	H-4/5





[ ] Si1 Put a fuse into the holder.

Now recheck all your work to find eventually solder failures. Use an Ohmmeter to check the resistance between the switch and ground, it must be in the range of several Kilo Ohm.
Connect a power supply. Best choise is a Laboratory supply with adjustable current limit. Connect it to Jack BU4. Dont short the BCR Fuse with a wire, there have been others burning their project, you better should not do so.

If you didn´t see any smoke, you now can test your work.

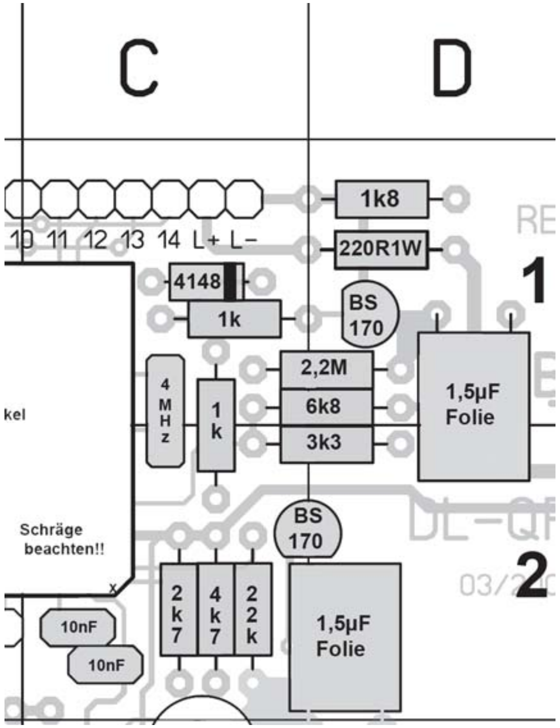
[ ] Test the 8 Volt stabilized line. A good access point is the solderlug at B/5 (see picture)

[ ] Now the 5V stabilized. You find a solderlug in B1 for good access.

If both Voltages are stable at 8V and 5V +/- some percent, go ahead to group 2, the controller section.

Group 2 Controller Section

This section we call the digital heart of our BCR. All functions of the radio are controlled by the Common PIC Controller. If the controller is in function, it gives you some internal tools as an advantage: The controler side tone enables testing the AF part, and the Controllers RF part gives us a complete signal Generator to test the IF section later on.



[ ] R63 not used with green display

[ ] R54 220R 1Watt D-1

[ ] D15 1N4148 C-1

[ ] R56 1K C-1

[ ] R55 2M2 C/D-1

[ ] R62 6,8K C/D-1

[ ] R61 3,3K C/D-2

[ ] R59 1K C-1/2

[ ] R57 2,7K C-2

[ ] R58 4,7K C-2

[ ] R60 22k C-2

[ ] C86 10nF (103) C-2

[ ] C77 10nF (103) C-2

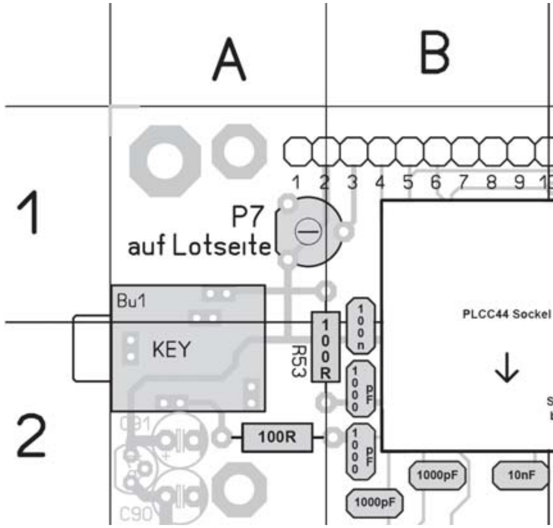
[ ] Q5 4,0MHz Resonator C-1/2

[ ] C84 1,5uF C/D-2

(This one must be installed lying, with legs bent down by 90 degrees, otherwise you will have trouble with the display later on.

[ ] C83 1,5uF 63V Folie **Also Lying** D-1/2

[ ] C85	10nF (103)	B-2
[ ] C80	1000pF(102)	B-2
[ ] C79	1000pF (102)	B-2
[ ] C78	1000pF (102)	B-2
[ ] R52	100R	A-2
[ ] C76	1000pF (102)	B-2
[ ] C81	100nF (104)	B-1/2
[ ] R53	100R	A/B-1/2
[X] C82	100nF SMD 0805	Bottom

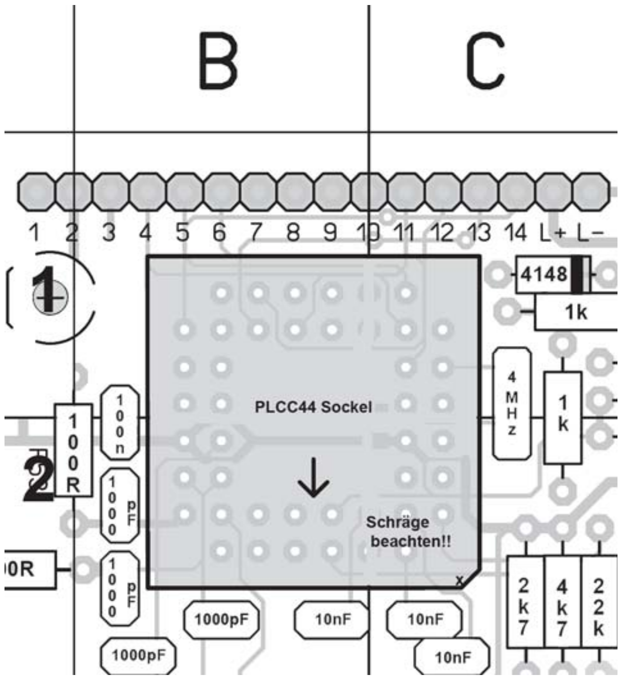


[ ] Bu1 3,5mmStereo Jack A-1/2

The following trimmer potentiometer must be placed at the bottom side of the PCB

[ ] P7 5K PIHER PT6 A/B-1

Now solder the socket for the PIC and the socket for the display. Carefully think what you are doing, before you solder them, especially the big PIC socket is the hell to desolder if it is wrong. Look at the PIC socket (PLCC socket). One of its 4 corners shows a 45 dgree angle. This corner must be placed into the lower left corner as can be seen in the picture below. Place the socket on the part side of the PCB. Again compare the 45 degree corner with the drawing. All pins must find there way into their holes easily without forcing the socket . If it is at its place, hold it with your fingers and control at the solder side if all pins found their way through the PCB. If this is ok, firmly press the socket against the PCB and solder two pins at diagonal corners. Recheck if the socket is placed absolutely flat on the PCB. If not, resolder the 2 pinst while pressing the socket down. If it is ok, solder carefully all remaining pins. Use bright light and a magnifier to controll if all pins are soldered properly.



[ ] IC4 Socket PLCC44 B/C-1/2

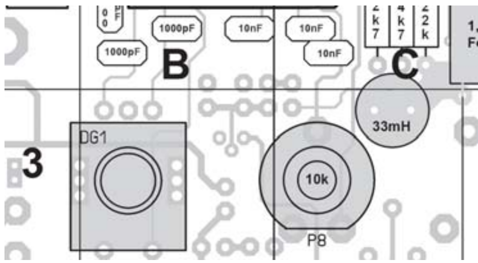
Now the socket for the display. It helps a lot, if you use the display itself as a justify tool. Take the display, a 16pin connector male and a 16PIN connector female plus 4 of the 12mm spacers and the small 2mm Screws. Do not solder yet.
Place the 16pin female connector into the mainboard.
Plug the 16pin male connector into the female connector
Place the display on the upper pins of the male connector. The ends of the pins look through the holes of the display. Now mount the 4 spacers at all 4 corners of the display between main board and display. Fasten all 4 screws while holding the display. 16pin connectors must be as exact as possible in a 90 degree angle on to the mainboard. If this is ok, solder the pins at the bottom of the mother board and the display board. The ends of the connector Pins will just flush with the PCB but this is ok because the boards are throughplated. Start with the outer pins, check again the right angle. If ok, solder the remaining pins.

[ ] Disp1	16 PIN male, straight	A/B/C-1
[ ] Disp2	16 PIN female straight	A/B/C-1
[ ] DiSP3	LCD-Display DEM 16216 SYH-LY	

[ ] Remove the Display and put the Display, screws and spacers to a safe place.

Now the C-Mos Transistors. Remember, they are extremly ESD sensitive. Use ESD tools or decharge yourself by touching a metal ground plate.
(Drawing = first picture section 2)

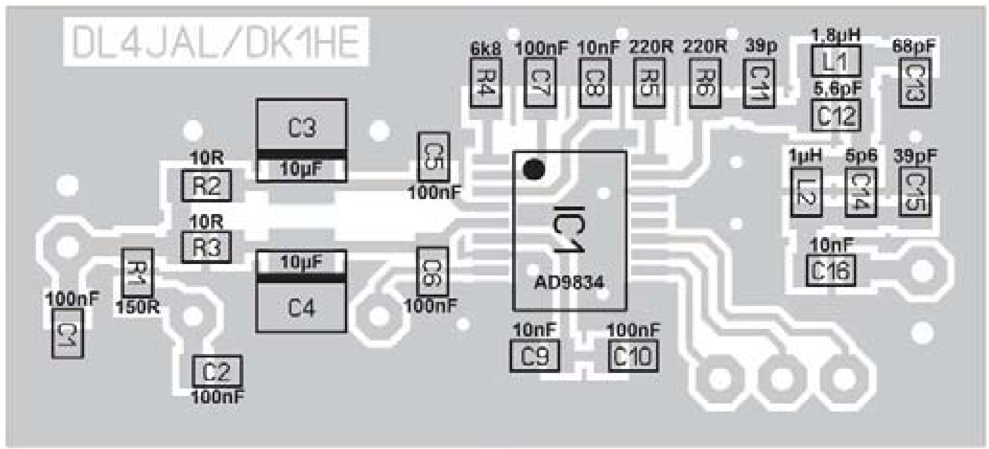
[ ] T16	BS170	C/D-2
[ ] T17	BS170	C/D-1



There ar e only a few parts left: :
[ ] L10 33mH radial Choke C-2/3
[ ] P8 10K Potentiometer SMC-10-V B/C-3
[ ] DG1 Shaft encoder ALPS A/B-3

To complete the controller section, you now need the DDS Modul. If you got it ready built and tested from QRPproject, go ahead to the next page where the connectors are installed. Otherwise assemble the DDS Module now.

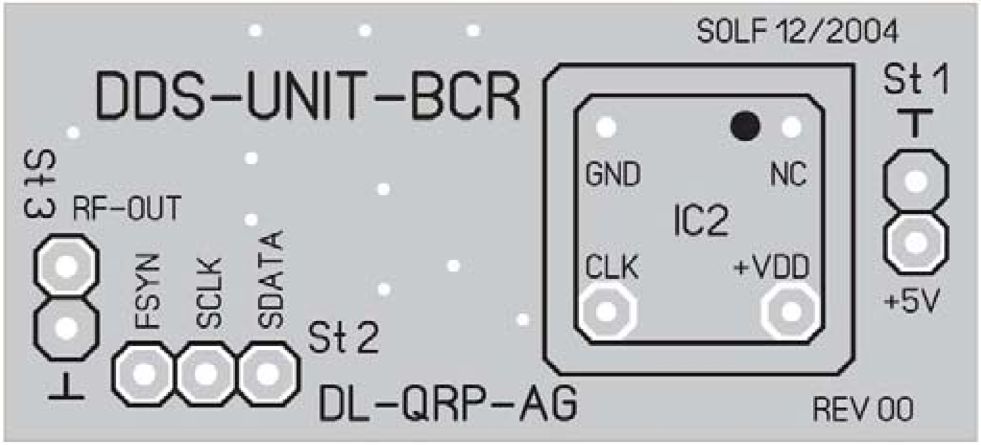
Assembling the DDS Modul:
If you have own expierience in soldering SMT parts, you may start immediate. If not, I recommend to read something about SMT soldering or to ask an OM with some expierience.
Start with IC1. Adjust it carefully above the Pads, the Dot mus show to the Callsign upper left corner. Solder to edge pins, controll the pposition again and solder the remaining pins.



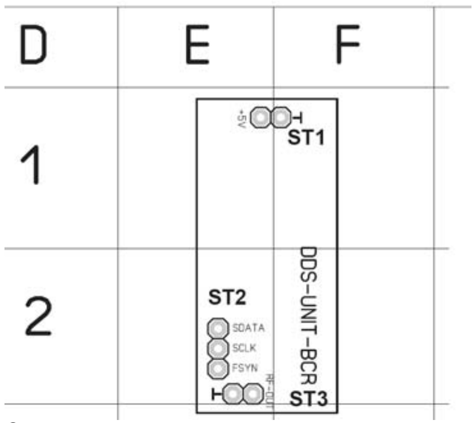
[ ] IC 1 AD9834
Now the other parts from left to rights:

[ ] C1	100nF 0805	[ ] R1	150R 0805
[ ] C2	100nF 0805	[ ] R3	10R 0805
[ ] R2	10R 0805	[ ] C4	10uF Tantal Gr. B
[ ] C3	10uF Tantal Gr. B	[ ] C6	100nF 0805
[ ] C5	100nF 0805	[ ] C9	10nF 0805
[ ] C10	100nF 0805	[ ] R4	6k8 0805
[ ] C7	100nF 0805	[ ] C8	10nF 0805
[ ] R5	220R 0805	[ ] R6	220R 0805
[ ] C11	39pF 0805	[ ] L1	1,8uF 0805
[ ] C12	5,6pF 0805	[ ] C13	68pF 0805
[ ] L2	1uH 0805	[ ] C14	5p6 0805
[ ] C15	39pF 0805	[ ] C16	10nF 0805

Now turn around the PCB. Here you will install the Clock Oscillator and the 3 connectors.



Solder first the integrated Clock. Take care to place the sharp edge to the upper right corner as shopwn in the picture.
[ ] Clock oscillator
Now mount the 2x2pin and 1x3 pin male connectors. They are placed at the side where the clock is and soldered at the side where the DDS is. Adjust them to a 90 degree angle before soldering.
[ ] ST1 connector 2 Pin male
[ ] ST2 connector 3 Pin male
[ ] ST3 connector 2 Pin male



Starting her,e same prodedure for both, ready made and self soldered DDS Modules:
Place the female connectors into their holes, place the modules into the connectors, adjust the modul on the connectors and solder.
[ ] ST1 2 PIN female, 90degrees angle on Mainboard, solder from solder side.
[ ] ST2 3 PIN same
[ ] ST3 2 PIN same

Now place the PIC processor itself into the socket. Find at first the 45 degree side of the PIC. This side must look to the inner part of the PCB. Dont force too much power while pressing the PIC into the socket, it must find its place very smooth.

[ ] IC4 PIC16F877 PLCC + B/C-1/2

[ ] Reinstall the Display
[ ] Install the DDS Module

Check all your work with a magnifier for shorts and unsoldered Pins. If this is ok, apply 12 Volt and start testing of section 2.
After power on, adjust Contrast Pot P7 (on solder side of the PCB) to make the signs in the display readable. If so, swith power off an on again.
The display should show it´s initial sequence for a short time: Blue cool Radio and the Firmware revision e.g. 1.14. After the initial frequency it should show VFO A and B both at 7030 kHz.
At St3 RF- Out you will find the RF output of the DDS. Though the controller is in receive mode, the generated RF is calculated: Display frequency plus or minus RF depending on the band. You may control it with a receiver or a counter if you want so. Because most of you will play with the controller menue, we go on with the description of the Firmware now.

How to use the DDS_BCR
Press the Shaft encoder short: Change Rate sequential 10Hz, 50 Hz, 1kHz If you are in „Radio“ mode, 100kHz rate is added. Change of rate is signalized by a short beep (later on, if the AF is installed) Rate is displayed by decimal point /resolution of the shown frequency.

Press shaft encoder long (> 1s) The display will switch to MENUE.
By turning the shaft encoder, you scroll through the menue

Menue:
0 break Leave the menue without changing anything
1 VFO A/B Switch between VFO A/B
2 **Band 0 80m** (only available with built in 80m Option) Switch to 80m by pressing the shaft encoder. Actual frequency of actual band will be

stored.
2 **Band 1 40m** Switch to 40m by pressing the Shaft encoder. Actual frequency of actual band will be stored.
3 **Band 2 30m** Switch to 30m by pressing the Shaft encoder. Actual frequency of actual band will be stored.
4 **Band 3 20m** Switch to 20m by pressing the Shaft encoder. Actual frequency of actual band will be stored.
5 **Band 4 17m** Switch to 17m by pressing the Shaft encoder. Actual frequency of actual band will be stored.
6 **Band 5 Radio** Switch to Radio (Braoadcast) by pressing the Shaft encoder. Actual frequency of actual band will be stored. In Radio Mode TX is inhibited and 100kHz steps is added.
7 **light on/off** Backlight on / off. If you see ON in the display, pressing the shaft encoder will switch to ON. If you see OFF in the display, pressing the shaft encoder will switch to OFF
8 **light auto** Backlight automatic. If ON, any touch of the Dial will switch the backlight on. Backlight switches to off automatically after 2 s inactivity
9 **SETUP** start of the SETUP Menu
10 **keyer** Internal keyer electrinic ON /OFF
11 **memory read** Reads memory. The PIC stores up to 20 Frequencies (number 01 to 20, shown in the upper left corner of the display. Each Memory place stores Bandnumber plus Frequency for VFOA and VFOB. With the shaft encoder you can choose the memory number, the content of the memory is shown in the display. Cancel stops the operation. There are two ways to choose the memory contents:
1. Shortly pressing the shaft encoder (only 1 beep) overtakes the stored frequencies into VFO A/B and switches to the band.
2. Pressing the Shaft encoder long overtakes the frequencies into the VFO and starts the SCAN function. During Scan the Controller stops for any recognized signal for a short time. Touching the CW key or the Shaftencoder stops scanning at this frequency. Scan allways goes from A to B so Frequency A allways must be lower then frequency B. ATTENTION: Use only logical values, otherwise the controller will „hang up" . If you run in such a situation the only way to get out is the „Set Default" function.
12 **memory store** Write top Memoryr. Choose the Memory like in Menue 12. Store the actual VFO and Band information by pressing the Shaft encoder. Any content in the memory will be overwritten.

Rev:Nobember 20. 2006

13 **tune.** Switches the transmitter to TUNE. During TUNE power and SWR are displayed.
14 **split 1k** DDS switches VFO A to receive only and VFO B to transmit only. TX VFO starts exactly 1 kHz above the RX frequency. The Shaft encoder now changes only the TX frequency, RX stays stable
15 **split 2k** DDS switches VFO A to receive only and VFO B to transmitt only. TX VFO starts exactly 2 kHz above the RX frequency. The Shaft encoder now changes only the TX frequency, RX stays stable
16 **rit** Rit on /off. If ON, Row 1 in the display shows RX frequency, row 2 shows TX frequency, original frequency of row 1 was copied to row 2 while switching. Shaft encoder actuates only the RX, TX stays stable.

Paddle in combination with the Shaftencoder:

SPOT: Press shaft encoder end Dot Paddle at the same time. Sidetone is activated, rate switched to 10 Hz. With the shaft encoder you can adjust a received CW signal exactlxy to your sidetone which makes your BCR transceive.

TUNE Press shaftencoder and Dash paddle at the same time. Controller switches to „TUNE" mode

SETUP
Go to Menue, choose Setup.
0 **Setup break** Ends setup Menue, causes hard reset of the controller.
1 **DDS-Takt** Here you can adjust the clock oscillator. Valu is shown as Hex Number. ATTENTION: if you store a complete wrong value here, the DDS will not work any longer. Pressing the Shaft encoder will cause cursor to go from left to right. Left side are the coarse bits and right side the fine bits. Right of the lowest bit you will find left, save, cancel. At start the DDS generates 6075,000 Khz +/. some Hz depending on the Clock frequency. By variing the Hex Number, you can change the generated Frequency until it is exactly 6075,000 kHz. You do this by comparing it with a good counter or by zerobeating „Deutsche Welle" at 6075kHz in a shortwave Radio (establish a link between DDS Modul and a radio. Tune the radio to Deutsche Welle. You will hear the DDS as a tone if it is not exactly at the same frequency. Now tune the DDS until the tone is zero. If you got the DDS to the correct frequency, use SAVE at the right side to

store the calibration factor into memory. From now the DDS will generate very exactly th echoosen frequency

2 **ZF (Hz)** Here you can adjust the exact IF. The DDS at starting point generates the estimated IF of BCR which is a little bit lower the the Xtal frequency (that´s typical for ladder filters). The frequency is shown in the display in decimal values. The complete procedure is described in the IF section of the manual.

3 **S-Meter Eich** S-Meter calibration Menue

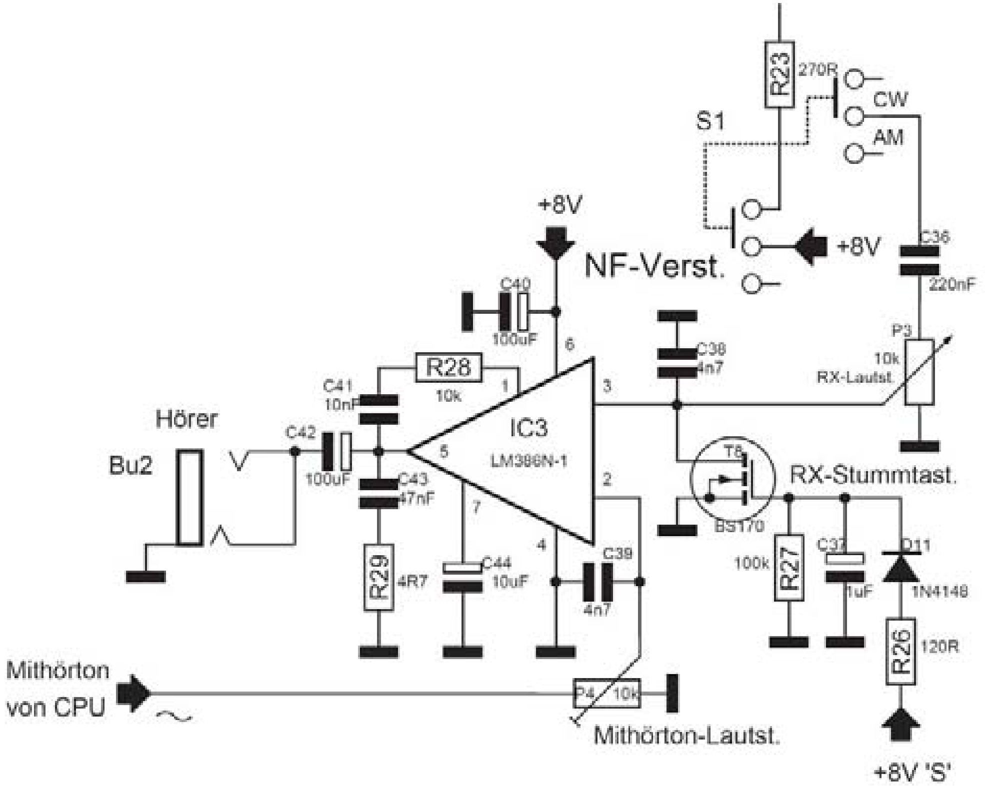
1. : No Antenna, Antenna jack open or Dummyload installed (S0). Hex-value is shown. Press shaft encoder, menue will jump to point 2

2: Apply 50uV ato the Antenna jack, measured Hexvalue is shown. Press Shaftencoder and leave th eMenbu by SAVE. The Pic will calculate the S-Meter curve now and store it into memory.

4 **pitch** Frequency of the sidetone can be choosen by the CW speed poty. Last stored value shown in the display. The choosen tone frequency must be aligned with the BFO Frequency during IF adjustment to be transceive.

6 **set default** This is the „SOS“ point, if all fails. Set default fills all memories with logicak values. All adjustments will be lost.

Coose „0 Setup break“ to leave the setup Menue

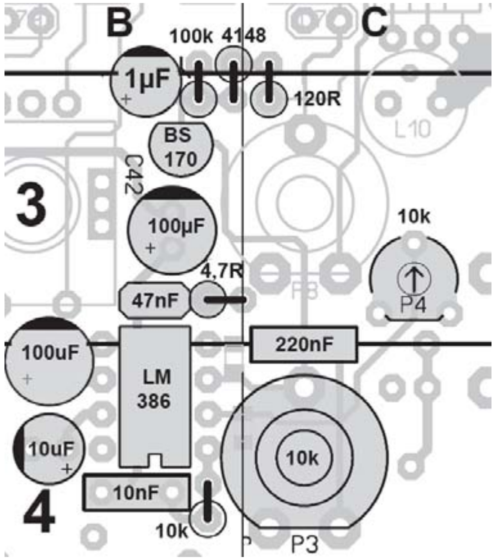


Group 3 AF Section

There are only a few parts in Section 3. It represents the AF Amplifier for both, the received Signals and the TX-sidetone. The AF Amplifier is designed to drive standard low impedance stereo headphones. Loudness of the sidetone can be adjusted independent from receiver loudness by trimmpot P4.

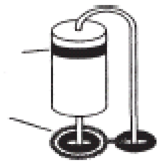
Start with installation of IC3 because it´s easier to be installed if space around is free of other parts.

[ ] IC3 LM386 B-3/4
[ ] C41 10nF Foile spaced 5mm B-4
[ ] R28 10K upright B-4
[ ] C44 10uF 35V rad. B-4
[ ] C40 100uF 16V rad. B-3/4
[ ] C43 47nF (473) B-3



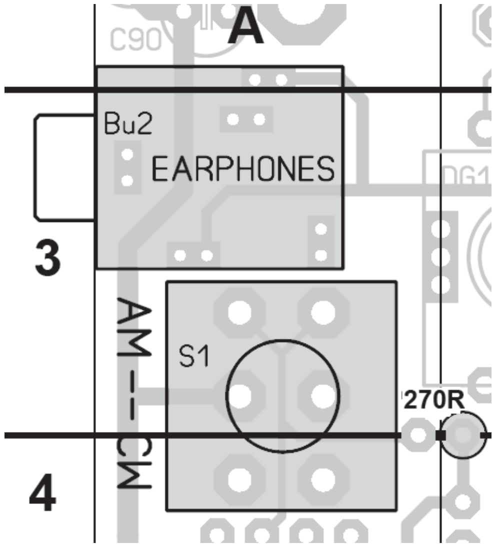
[ ] C36 220nF Foil spaced 5mm C-3/4
[ ] R29 4,7R upright B-3
[ ] C42 100uF rad. B-3
[ ] R26 120R upright C-3

Install fullowing diode also upright. There is a convention to place the cathode (banded side) to th eupper end.



The body is placed inside the printed circle in the placement plan.

[ ] D11 1N4148 B/C-2/3
[ ] R27 100K upright B-3
[ ] C37 1uF rad B-2/3
[X] C38 4,7nF SMD 0805 bottom of PCB
[X] C39 4,7nF SMD 0805 bottom of PCB
[ ] R23 270R upright A/B-3/4
[ ] Bu2 3,5mm Stereo Jack A-2/3

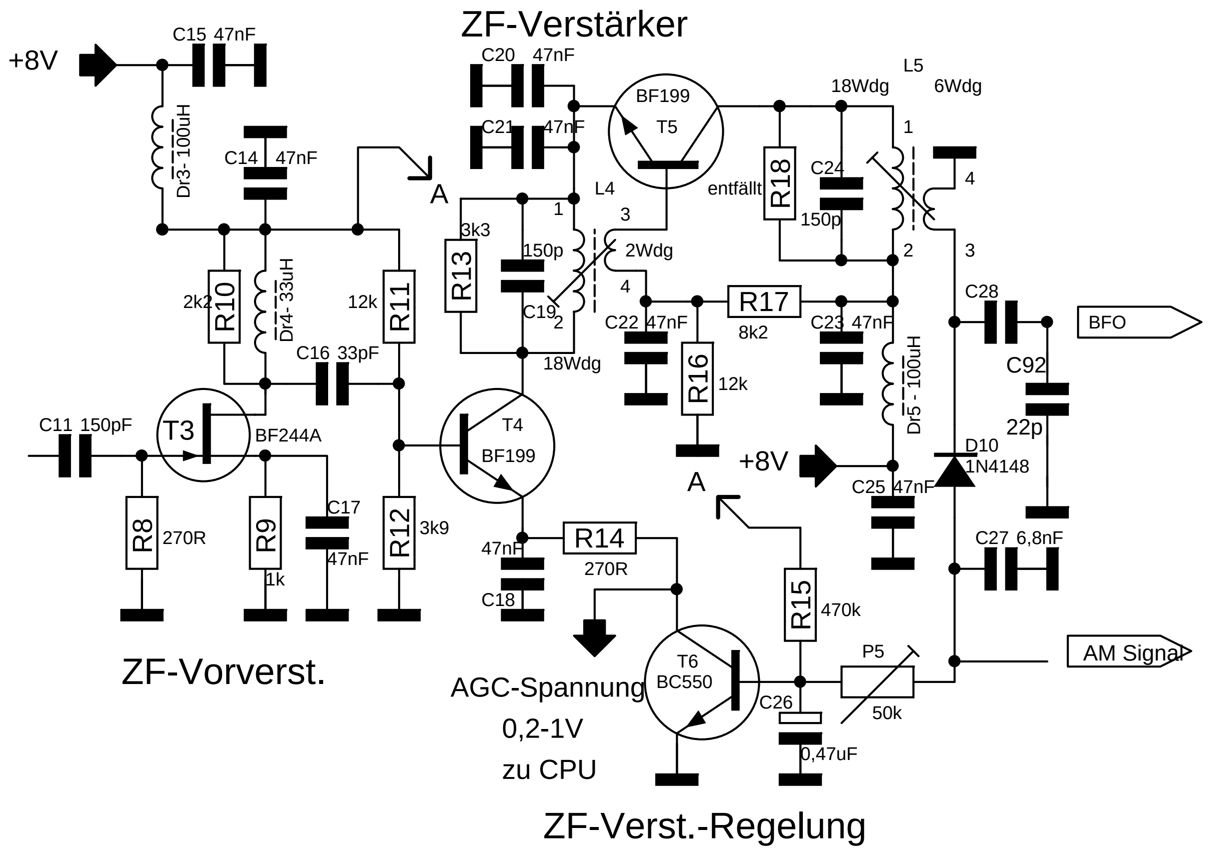


[ ] P3 10K Potentiometer SMC-10-V B/C-4
[ ] P4 10K PT6 Trimmpoti C-3

Remember ESD safety rules if you install th etransistor!!

[ ] T8 BS170 B-3
[ ] S1 Toggle Switch 2xUm A-3/4

If you again have checked your Work with a magnifier to find possible shorts and forgotten solder points, you need a headphone and a key to test this group. If you use a paddle, it must have a 3,5mm Stereo plug with following connections: Paddle: Tip = Dot, Ring = Dash, Back = Ground. Handkey (Pumpkey) : Tip and Ground,don´t connect the ring. Switch power



Baugruppe ZF-Verstärker / BFO

on and press the key or the dot paddle. You should here the sidetone. Adjust the level by P4. Go ahead with section 4.

Baugruppe 4 ZF Verstärker / BFO

The FET amplifier T3 together with the transformer Dr4/C16 acts as coupler to couple the impedance of the Ladderfilter to the selectiv amplifier T4/T5. As far as we know, the design of the following cascaded IF Amplifier by Peter, DK1HE is absolutely unique and new. You will enjoy it´s features after your BCR is ready built.

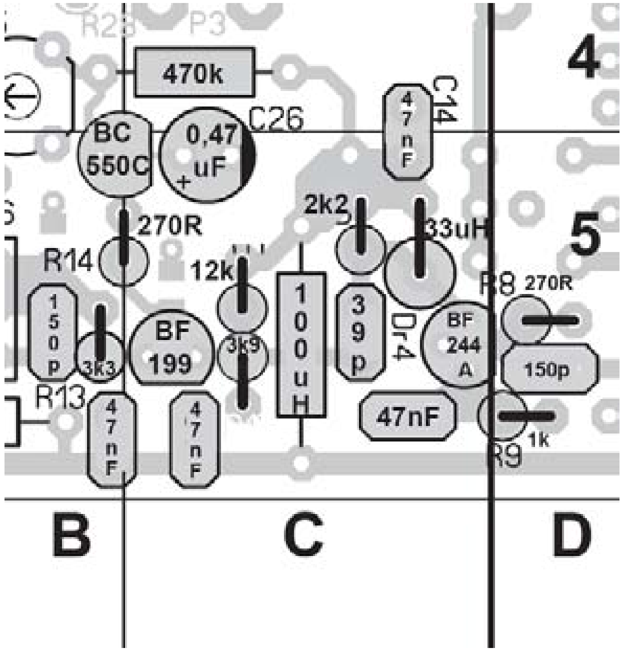
Transistors T4/T5 are in terms of DC serial cascaded and use half of the Voltage (4V) each. The commen collector current is adjusted by R14 to about 3,5mA which is significant low compared to two seperate driven singel Amplifier stages. By T6 easily the current through the complete chain can be varied and by this, the Gain factor of T4/T5 that means the gain of the IF amplifier can be regulated. In Terms of RF the amplifier works conventional. C20/C21 decouple both stages. T4 does not work with the low input impedance T5 but its working resitance is the resonate circuit L4/C9 which gives us much higher gain per stage.

Output of T5 is working with the resonate circuit L5/C24. By damping resistors R13/R18 the total unregulated gain is adjusted to about 70 dB.

The IF signal is inductiv coupled by L5 to the following product detector T7 and diode D10. D10 has to do 2 jobs: 1. it is used as AM Detector if BCR is used in AM with BFO switched off and 2. it generates the AGC Voltage directle from the IF without an extra amplifier. The AGC curve can be adjusted by P5.

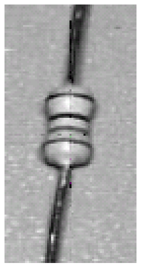
D10 generates a negative voltage which is proportional to to the IF Voltage. The neagtiv voltage reduces the base current of T6 in conjunction with the fieldstrength of the received signal, so the total collector currend and total gain decrease. 0dBm (220mV) at the antenna can be kept by the AGC without any distortions. Because D10 is used with a negativ Voltage, eben very small signals can start the AGC. By its negativ temperatur coefficient D10 compensates the tempereratur sensible base-emitter junction of T6. The AGC works stable over a wide temperature range.

CW and SSB denodulation is done by the MOS tetrode T7. To keep the number of parts low, it is designed as a self oscillating mixer. The BFO Quatz is oscillating with an offset of 500-900 Hz. Behind the Lowpas R24/C35 there is an AF signal, which can be handled by the AF amplifier.



So far the theory of this new IF Amplifier design, let´s start to asemble it now.
Start in the lower right corner in D5

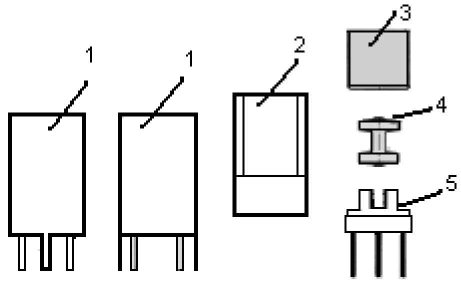
[ ] C11 150pF (151) D-5
[ ] R8 270R upright D-5
[ ] R9 1K upright C/D-5
[ ] C16 39pF (390 or 39) C-5
[ ] C17 47nF (473) C-5
[ ] C14 47nF (473) C-4/5
[ ] Dr4 33uH SMCC C-5 see picture right!!
[ ] R10 2k2K upright C-5
[ ] Dr3 100uH SMCC C-5
[ ] R11 12K upright C-5
[ ] R12 3,9K upright C-5
[ ] C15 47nF (473) C-5
[ ] C25 47nF (473) B/C-5
[ ] C19 150pF (151) B-5
[ ] R13 3k3 B-5
[ ] R14 270 R upright B/C-5
[ ] C26 0,47uF 35V Tantalum C-4/5
[ ] R15 470K B/C-4



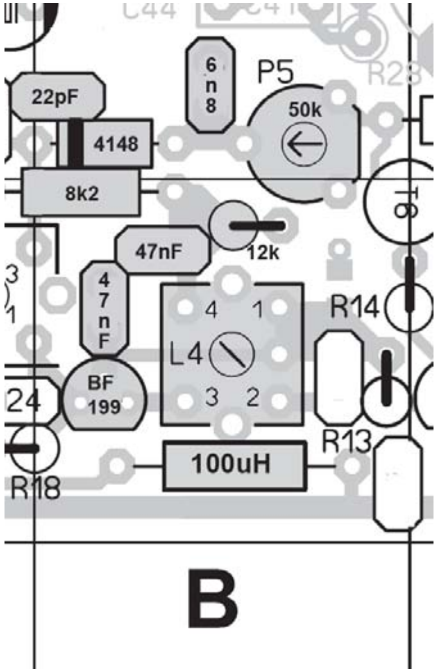
Remember ESD rules while installing the following transistors, they are very sensitive against electrostatic discharge.
Attention: The suffix in a type is essential, it makes the difference. Never interchange BF244**B** and BF244**A,** they are really different. This rule is true for all European BF, BC, BD type transistors.

[ ]	T4	BF199	C-5
[ ]	T3	BF244A	C-5
[ ]	T6	BC550C	B/C-4/5

In the next step you will find the first coil. Because all over the world Radio Amateurs are telling sad stories how difficult it is to make such coils, i will describe the „how to make coils „ a little bit broader to show you, that there is nothing secret nor complicated.
In american kits torroids are preferred. In Germany for long times only cylindrical and shielded cylindrical coils have been used. Both types have advantages and disadvantages and that´s the reason that in our designs we use both types. The main advantage of a Coil you will use in this section is

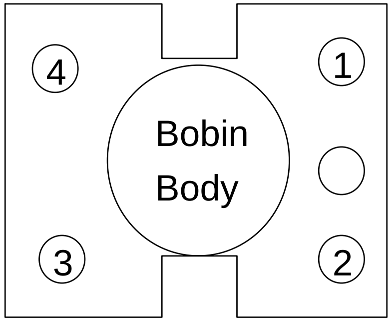


its low footprint. Compared to a torroid it is allmost a halfe place you need because it must be tuneable and Torroids can only be tuned if you use an extra variable cap. In our BCR we use a special type of encapsuled variable Coils. They are named „Bobin“ coil. The body to put the wire on is made out of ferrite, you see it in the picture at number 4. We wind the wire on this form not as a single layer but just „as it comes“ The only essential is, that the number of turns must be correct. The complete Bobin consists of:
1. Shield cap 2. Holder for the ferrite cap made from plastic,
3. Ferrit cap with an outside thread 4. Bobin Body,
5 socket with 5 Pins.



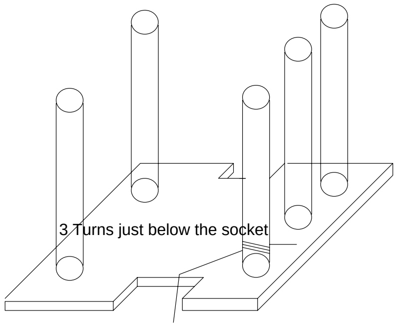
To prepare the Bobin take the Body, give a drop of superglue between the snap in part middle of the socket and snap the body to the holder. Give the glue a chance to dry before you go on with the coil. In the mean you may install some further parts of section 4.

[ ] DR5 100uH SMCC B-5
[ ] C20 47nF (473) B-5
[ ] C22 47nF (473) B-5
[ ] R16 12K upright B-5
[ ] R17 8,2K A/B-4/5
[ ] D10 1N4148 A/B-4
[ ] C92 22pF (22j) A/B-4
[ ] C27 6,8nF (682) B-4
[ ] P5 50K PT6 Trimmpot B-4/5
[ ] T5 BF199 B-5

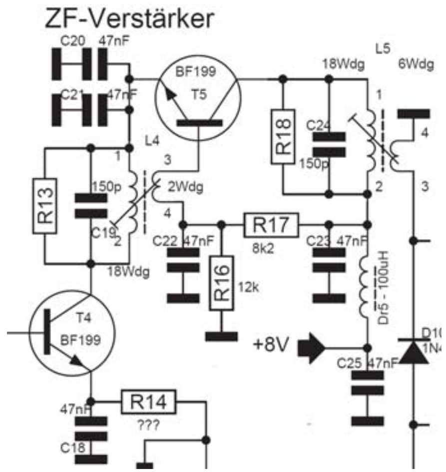


So, the glue should be dry, let´s start with the coil.
Look at the Coil from the upper side and hold it above the left picture. 2 Pins at the left side, 3 pins at the right side.

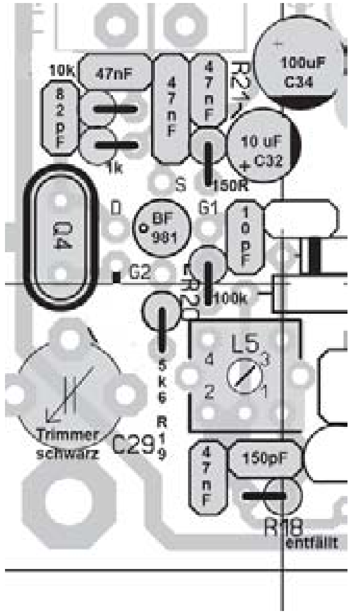
At both the upper and lower side of the socket, you will see a notch. This notch is the way the wire has to go if it crosses from the Socket Pins to the Bobin Body.
Lets´s start:



Sling one end of the wire as it is (no solder) 3 times around PIN 1. This 3 turns around the pins schould be directly below the socket, about 1-2cm Look at the picture left, it shows the Bobin socket from the bottom side to make clear, how the wire is fastened to the pin. The Pins are very rough so the wire will hold in place.
Now up through the notch to the Bobin Body and clockwise 18 turns around the body. You will end with turn number 18 just behind PIN 2, go down through the notch and wind 3 turns around PIn 2 the same way you did it at PIN 1. Cut the wire leaving a little tail of abt 1-2 cm again.
Thats all, the Resonate winding is finshed. L4 needs a coupling winding This consists of 2 turns. Start at PIN 3 again with 3 turns around the pin very next to the body, go up throuh the gap and wind clockwise 2 times around the body. You will end at Pin 4. Go down through the notch, 3 times around PIN 4 and cut the wire you dont need for this coil 1-2 cm behind the pin. This coil is ready, except it has to be soldered now. The easiest way to do is to hold it with the PINs upside in a vice to have both hands free. Clean the tip of your solder iron carefully. Now touch the 3 turns around a Pin with the solder tip and at the same time with thin solder. Temperature of the solder iron should be between 350 and 400 dreges Celsius. Wait 1-3 second until the solder flows and remove the iron. The laquer on the wire normaly momentary is cracked and she copper is tinned to the Pin. After soldering the 4 pins cut of the wire tails and check your work with an ohmmeter. Result must be: about zero ohm betwen 1/2 and 3/4.
If this is ok, you can prepare the rest of the coil. Take the blue plastic holder and the ferrite cap and screw the cap into the blue plastic holder. Do the first turns without a tool, use your finger. Try to do it without too much power. The ferrite and the plastic must be in one axis. Try two turns forward, one backwart several times. Doing it this way, you will get a nice threat into to plastik making later adjustment of the coil easier. Now place the coil on its place with the 5 Pins through the holes in the PCB. Adjust the coil to stand exact upright and solder the Pins, do not use to much solder. Carefully check that no extra solder is to see at the upper side at the pins which could cause a short to the shield.



Rev: November 20 2006

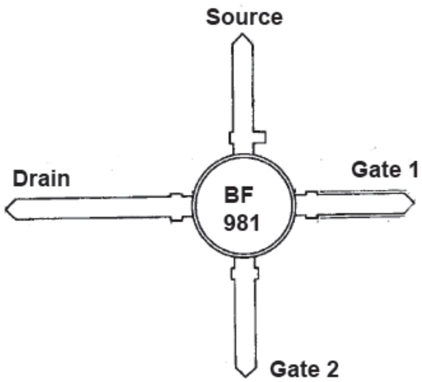


Place the prepared blue plastic with its ferrite cap on the the coil. Place the shield can over the plasitk, The two noses of the shield should go through their corresponding holes in the PCB, but do not solder the shield now.

[ ] L4 Neosid 7.1 F10b B-5
Reson. Winding: 18 turns 0,1 mm laquered wire
Coupl. winding: 2 turns 0,1mm laquered wire

Now finish group 4:

[ ] C35 47nF (473) A-4
[ ] C30 82pF (82p or820) A-4
[ ] R24 10K upright A-4
[ ] R22 1K upright A-4
[ ] C31 47nF spaceing 5mm (473) A-4
[ ] C33 47nF (473) A-4
[ ] C28 10pF (10p or100) A/B-4
[ ] R21 150R upright A-4
[ ] R20 100K upright A-4/5
[ ] R19 5,6K upright A-5
[ ] DR10 47uH SMD **bottom** A-5
[ ] C23 47nF (473) A-5
[ ] C24 150pF (151) A/B-5
[ ] C29 2,5-60pF Foil variabke cap 7,5mm black A-5
[X] R18 not used A/B-5
[ ] C32 10uF 35V rad. A/B-4
[ ] C34 100uF 16V rad. A/B-4



The Dual Gate MOS T7, BF981 is very sensitve against ESD remember the ESD rules. The picture left shows the pinning as you you see it from the upper side, orinting readable. It will be installed exactly as you see it here. The little Dot in the drawing remarks the long drain pin. Bent all 4 pins carefulle downwards 90 degrees, and place the transistor into it´s holes. If all is ok, you still can see the type-print, otherwise you have bent the pins the wrong direction. Solder all 4 pins from the solder side (bottom of PCB)

[ ] T7 BF981 Attention, ESD rules!!! A-4

The Quartz must be soldered a little above the PCB to prevent it against getting shortened by solder at its bottom. Easiest way to to is to use a cut of from a resistor temporary between the PCB and the quartz. Dont forget the to remove the cutof after soldering the quartz
.

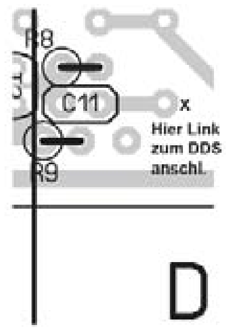
[ ] Q4 4,915MHz HC49U A-4/5

Next to the Quarz you will see a little rectangular soldered pad. This is to ground the housing of the quartz. Solder a resistor cutoff to this pad and solder the other end to the quartz housing at about half the height of the housing. Soldering at the quartz housing is easier, if you clean the solder place with a glass hair brush or similar tool.

[X] C18 47nF SMD0805 bottom C-5
[X] C21 47nF SMD 0805 bottom B-5

Last thing in this section is coil L5.
Wind 18 turns between pin 1 and 2 as you learned it for L4. The coupling this time has 6 turns instead of 2. Wind 6 turns between Pin 3 and 4

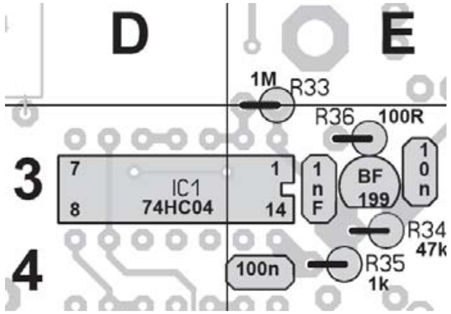
[ ] L5 Neosid 7.1 F10b A/B-5
Resonate winding: 18 turns 0,1 mm laquered wire
Coupling winding: 6 turns 0,1mm laquered wires



Thats all. The IF Amplifier is ready built and rady to be tested. Before testing, again check your work with the help of a magnifier and a bright lamp. All ok?
Connect a Headphone. Connect a piece of wire to point X as shown in the drawing below. Dont solder, just plug it into the hole. The other end lay without electrically contact on the DDS Modul. This will grab some RF from the DDS output to the IF amplifier. The upper end of the

Ferrit caps of L4 and L5 should be about 1-2 mm below the copper shield. Now switch on your BCR. Go to Menu, Setup and into the ZF section. The default frequency stored by us is 1kHz below the Xtal frequency, that is the normal value for this type of ladder filters. Because there is no Xtal filter built in, the absolute frequency is not very important in this moment. In the headphones you should hear a signal now. The frequency depends on the trimmer C29. You may have a look at the AGC Voltage: connect a Voltmeter to the upper end of R14 and ground. Range 0-2 V. Switch off the DDS in the Menue. Adjust Trimpot P5 to abt 0,2V. Now again switch on the DDS: Menue, Setup, ZF. The voltage at R14 should increase. You may adjust L4/ L5 now for maximum reading, but the final adjustment will be done later on after the Ladder filter has been installed.

Switch off your BCR and remove the link wire. Go ahead with section 5

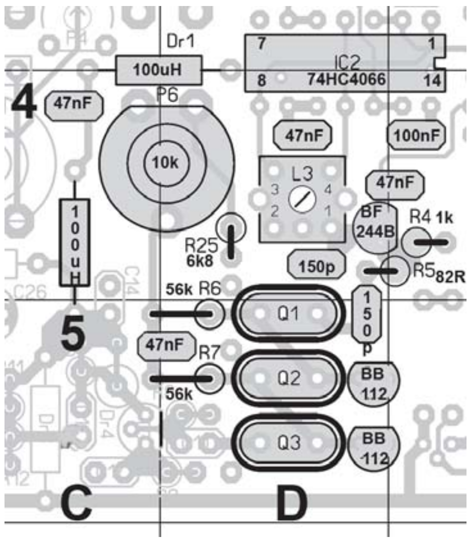


Group 5 DDS Signal preparation, Mixer, IF buffer and Ladder Filter

[ ] C48 1000pF (102) E-3
[ ] C47 10nF (103) E-3
[ ] R33 1M upright E-2/3
[ ] R36 100R upright E-3
[ ] R34 47k upright E-3
[ ] R35 1K upright E-3
[ ] C49 100nF (104) E-3

Attention, place the notch of the socket to the right side as shown in the picture .
[ ] DIL 14 socket D/E-3

Dont install the IC now, this will be done if the sectrion has been completed!



[ ] Dr1 100uH SMCC C/D-2/4
[ ] C13 47nF (473) C-4
[ ] Dr2 100uH SMCC C-4
[ ] C3 47nF (473) D-4
[ ] C4 100nF (104) E-4
Take care for the notch!
[ ] DIL 14 socket D/E-3/4, do not install the IC itself!
[ ] C9 47nF (473) D/E-4
[ ] R4 1K uppright E- 4
[ ] R5 82R upright D/E-4

Remember: The Quartz must be installed a little bit above the PCB!

[ ] Q1 4,915MHz HC49U D-4/5
[ ] Q2 4,915MHz HC49U D-5
[ ] Q3 4,915MHz HC49U D-5
[ ] Remove the help wires you used to install the Xtals!
Left and right next to the Quatzfilter there are holes to connect the enclosures of the Xtals to ground. Use a piece of wire and solder it between ground connection points and quartz housings. Solder at half the height of

every quartz, cleaning with a glass brush or similar tool makes soldering at the Quartz housing easier.

[ ] Quarzhousings to ground.

[ ] R25 6,8K supright D-4
[ ] C8 150pF COG (150p or 151) D-4
[ ] R6 56K upright D-5
[ ] C12 47nF (473) C/D-5
[ ] R7 56K upright D-5
[ ] C10 150pF (150p or 151) D-4/5
[ ] P6 10K Potentiometer SMC-10-V C/D-4

The following diodes do not have the standard glas or plastic housing but are built into a TP92 Transistor housing. They look exactly like a little transistor with only 2 legs plus a very short 3rd leg in the middle. If you install it, take care to leave a little distance between the PCB and the short 3rd leg to avoit shortening the two solder pads.

[ ] D8 BB112 D/E-5
[ ] D9 BB112 D/E-5
Attention, Transistors are ESD sensitive.
[ ] T11 BF199 E-3
[ ] T2 BF244B D/E-4

Now another coil. L3 which is very similar to the others:

Resonate winding: 18 turns 0,1mm laquered wire between PIN 2 and PIN 1
Coupling winding 4 turns 0,1mm laquered wire between PIN 4 and PIN 3
[ ] L3 Neosid 7.1 F10b D-4

You now may install the IC into their sockets. Don´t interchange them, apply the notch to the correct side (according to the placement plans, both nothes look to the right side. **ATTENTION: remeber ESD rules!!**
[ ] IC1 74HC04 D/E-3
[ ] IC2 74HC4066 D/E-3/4

All ok? Dont forget to recheck your work with a magnifier. Please do not let out this step. OK, I know you are doing a good job here, but > 90 % of kits I get for support fail due to soldering failures!

The BCR Receiver now is nearly complete. AF and IF are ready installed, the mixer is on board, only stage missing to be ready to receive signals is the „Frontend“ with Preselector and Low Pass filter. However, you can test the complete IF part now. The link we used in the section before this time is not needed because the Mixer does a direct connection between IF and DDS Generator.
As you know, the BCR RX and TX frequency are generated in a different way: in TX mode the DDS VFO is working directly on the end frequency, in RX mode the DDS is shifted by the IF frequency. To make the RX listening on the correct frequency, the IF frequency mut be known exactly to the PIC to calculate the shift. The middle frequency of Ladderfilters in principle is somewhat lower the the frequency of a single Quartz. With the help of the integrated IF generator, we now must find the individual middle frequency of your BCR.
Attach the headphones and powersupply.
Attach a Voltmeter at the upper end of R14. (If you own an needle instriment, use it. A Digital Voltmeters will do the job also, but with a needle Voltmeter it´s more comfortable because you better see tendencies while adjusting).

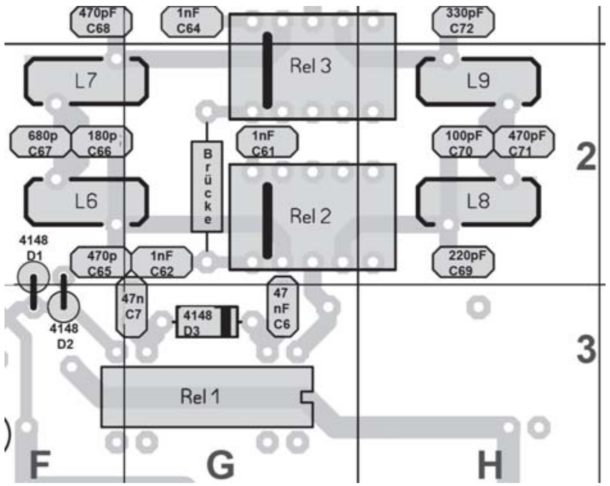
- Adjust the ferrite caps of L3, L4, L5. The upper end of the cap should be abt 1-2 mm below the copper can.
- Switch S1 to **SSB (** toward Display = AM**)**
- Adjust C29 to it´s half capacity position (you can see the plates through the foil)
- Switch on your BCR.
- Adjust P6 counterclockwise to its end, then back abt 10 degrees clockwise.
- Adjust P5 to about 200mV at R14. Switch to AM. You will see a different, lower reading. The difference should not exceed 100mV. Leave the switch in AM position.
- Go to Menu, Setup, ZF. The display shows the actual generated IF frequency. Your Voltmeter should read more or less increased Voltage now.

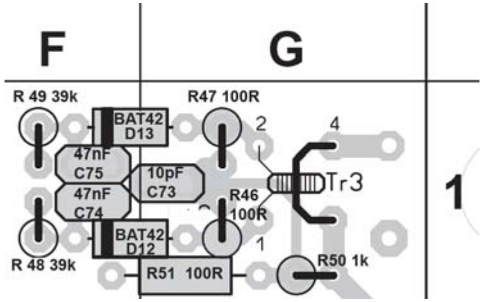
Change the Generator frequency to lower frequency in small steps and watch the Voltmeter carefully to find the maximum voltage. The maximum represents the midpoint of the filter curve. Leave the Generator at this frequency.

Now adjust L3, L4 and L5 also to Maximum. If all 3 coil are adjusted, readjust the generator frequency. Repeat the procedure 3-4 times until all adjustments get stable

Switch S1 to SSB. You should hear two tones in the headphone. One of them has a stable frequency, it is the sidetone generated by the pic. The other tone can be varied in it´s frequency by C29. This tone is the result of mixing the IF signal with the BFO in the product detector. The frequency represents the shift between IF Frequency and BFO frequency. (if you dont hear the sidetone, you probably didn´t adjust it´s loudness in the AF section, do it now)

If you hear both tones, adjust the BFO Tone. While turning C29 around you will find zerobeat, that´s the point where IF and BFO are at the same frequency, resulting in a zero Hertz tone. At both sides of zerobeat you will find the same audible tone, this are the two sidebands. Adjust C29 to the side of greater capacity until it has exact the same frequency as the sidetone. If it is adjusted correctly, both tones will be heard as 1 tone with a little jamming on it. Leave the menue by choosing „save“ at the right side of the display.





Grroup 6 LPF, RX Frontend, Preselector

In this section you will complete the receiver. After finishing, you will be able to use it as an RF Receiver.
Attention: If you plan to install the 80m Option, pay attention to special advise at some places.

[ ] C73 10pF (10p)	F/G-1	[ ] C74 47nF (473)	F-1
[ ] C75 47nF (473)	F-1	[ ] D12 BAT42 o.ä.	F/G-1
[ ] D13 BAT42 o.ä.	F/G-1	[ ] R48 39K upright	F-1
[ ] R49 39K upright	F-1	[ ] R51 100R	F/G-1
[ ] R46 100R upright	G-1	[ ] R47 100R upright	G-1
[ ] R50 1K supright	G-1	[ ] C64 1nF (102)	G-1
[ ] C72 330pF COG (331)	H-1	[ ] C61 1nF (102)	G-2
[ ] C70 100p COG (101 o.100p)	H-2	[ ] C71 470pF COG (471)	H-2
[ ] C69 220pF COG (331)	H-2	[ ] C6 47nF (473)	G-2/3
[ ] D3 1N4148	G-3	[ ] C62 1nF (102)	G-2
[ ] C7 47nF (473)	F/G-2/3	[ ] C65 470pF COG (471)	F/G-2
[ ] BR1 0 Ohm bridge	G-2	[ ] Rel1 DIP-Relais 1xUm 12V	F/G-3
[ ] Rel2 Relais bistabil 5V NAIS TQ2-L-5V	G/H-2		
[ ] Rel3 Relais bistabil 5V NAIS TQ2-L-5V	G/H-1/2		

Do NOT install the following parts if you plan to install the 80m Option. If so, go ahead next page to build the Current transformer which is used by BCR to measure SWR and power later on.

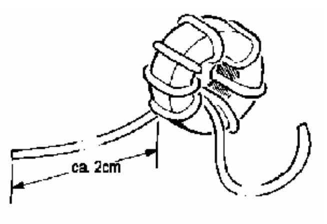
[ ] C68 470pF COG (471)	F/G-1
[ ] C67 680pF COG (681)	F-2
[ ] C66 180pF COG or Styroflex) (180p /181)	F/G-2
[ ] D1 1N4148	F-2/3
[ ] D2 1N4148	F-2/3

Rev: November 20 2006

Building the current transformer and the SWR/Power measuring unit.
You now will handle the first torroid in this kit. It is the smallest one you have to deal with, it is only 4,5x1,9x2mm and it is made from N30 material, that´s a ferrite. Wind exactly 22 turns trough the ring. I know, there ares some mistery tales about torroids to hear in the field, but it is absolutey easy. Just count INSIDE the ring, thats the hole secret. Spread the 22 turns over the whole ring. This is the secondary winding. The primary winding consists of only 1 turn. Actually 1 turn does not look like a turn because it is only a piece of wire through the ring, but that is the trick with torroids: because all the magnetic field is concentrated inside the ring, it doesn´t matter what happenes at the outer side of the ring. You may use a cut of from a resistor to form the primary, because it is easier to solder then the laquered wire. However, solder the 1 turn primary firs and the thin secondary after it because you may damage the thin wire if you do it opposite.

[ ] Tr3 Ringkern N30 4,5x1,9x2 G-1 prim.1 turn 0,5mm wire / sec.22 turns 0,1mm laquered wire.

Ok, that was for training purpose ;-)
If you have done the small transformer with success, you will not have any problems with the Low Pass Filter Torroids.
ATTENTION: Do not wind or Install L6 and L7 if you plan to install the 80m Option. use the description of L6 only as reference for L9
L6 is a simple Torroid coil wound with 0,4mm laquered wire. If you look at the holes on the pcb for L6, you will see, that you must take care to wind these Torroids in the correct direction to meet the layout. How? If you feed the wire from back to front through the ring, wind the next turns clockwise. If you feed the wire front to back through the ring, wind the next turns counterclockwise. The picture shows such a torroid with 8 turns.
OK, lets start. Wind L6 on a yellow Torroid. Count inside the ring, wind 13 turns 0,4mm laquered wire. All turns should be tautly (tight?) on the ring, if all 13 turns are made spread them over 2/3 of the ring.



The enamel wire supplied with the kit can be heat-stripped. A good method to do this is to place a small amount of solder (a „blob“) on the end of your soldering iron, then insert the wire into the hot solder for a few seconds. Avoid scraping insulation off with a razor blade, as this may nick the wire. Strip and tin the leads of the toroid before you mount it to the board. You should remove the enamel from the leads up to about 3 mm from the core. You should see only bare wire (no insulation) on the side to be soldered. Now install the torroid. While soldering hold it tigh against the board to give it a stable position. Do NOT glue the Torroid to the board.

[ ] L6 Amidon T37-6 13Wdng 0,4mm CuL F/G-2

Now L9, it is wound the same way as L6. Use the same direction for the winding, use the **0.5mm wire**.

[ ] L9 Amidon T37-6 (yellow) 11 turns 0,5mm CuL H-2

The next 2 Torroids must be wound the opposite direction due to the geometrie of the board. We didn´t do this to annoy you, the geometrie is the result of some RF rules which claim the wire length of coils to be as short as possible.

Do not wind L7 if you plan to install the 80m option, use text as reference forr L8.

Make L7: L7 gets 17 turns of **0,4mm** laquered wire on a yellow ring**.** Attention, take care the geometrical aspect. If you wind from back to front, this time wind counterclockwise. If you wind front to back, this time wind clockwise.

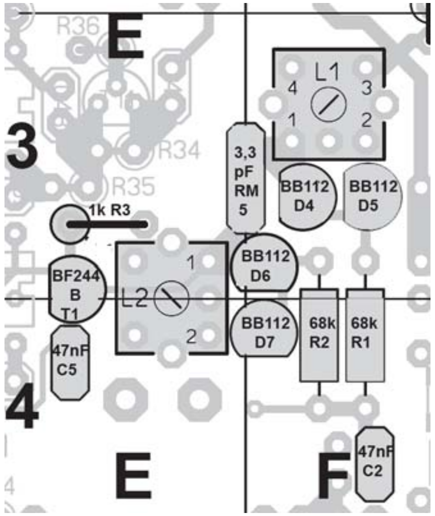
[ ] L7 Amidon T37-6 yellow 17 turns 0,4mm wire F/G-2

To make L8 use the same technik as for L7, but use 0,5mm wire.
[ ] L8 Amidon T37-6 yellow 10turns 0,5mm wire H-2

Ok, now some remaining parts and this section is complete. Remember how to handle BB12 diodes, avoid shorts by placing them too close down to the board.

[ ] D4 BB112 F-3
[ ] D5 BB112 F-3
[ ] D6 BB112 E/F-3
[ ] D7 BB112 E/F-4

Attention: Do NOT install C1 and R3 if you plan to install the 80m Option!



[ ] C1 3,3pF RM 5mm!! (3p3) E/F-3
[ ] R3 1K upright E-3
[ ] C5 47nF (473) E-5
[ ] R1 68K F-3/4
[ ] R2 68K F-3/4
[ ] C2 47nF (473) F-4
[ ] T1 BF244B E-3/4

The potentiomer P1 must be installed at C/D 3, there is no extra placement drawing for this.
[ ] P1 10K Pot SMC-10-V C/D-3

Now again two Bobin coils. You remember them, do you? L2 is easy, it has only a resonate winding, no coupling winding.

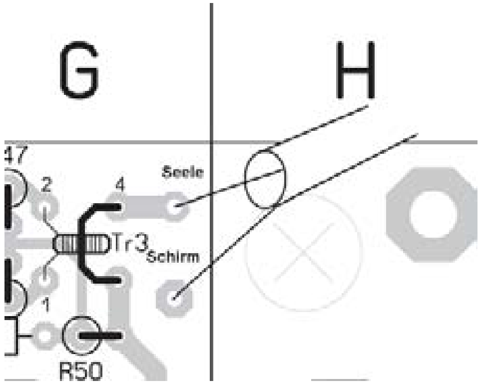
[ ] L2 Neosid 7.1 F10b 11 turns between 1 and 2 0,1 CuL E-3/4

L1 again with two windings. 11 turns between Pin 2 and PIN 1 und 2 turns between PIN 4 and PIN 3

[ ] L1 Neosid 7.1 F10b F-3
Res. Winding 11 turns 0,1 mm
Coupl. Winding 2turns 0,1 mm
Install the coils plus Ferrit Caps plus shield, do not solder the shield yet.

IF you install the 80m Option, put away this manual now and switch to the 80m Options manual. You will come back if you have installed the 80m option.

If you have allready built the 80m Option or if you dont want to use 80m, go on here:



Take a piece of RG174 50 Ohm coax abt 4-7 cm long. Remove about 1cm of the insulation at both ends . Solder one side to a BNC jack and the other end to the points shown in the drawing.

As usual, check your work to find shorts or missing solder points. I understand, that you are hot to hear the first signals now, but DO THE CHECK FIRST. Use a Magnifier and bright light.

Done the check??
OK. Connect your headphones and the power supply.
Preselector Pot to left end, Filter Pot right end, Mode switch to AM switch your BCR on.
Goto Menu
Choose Radio.
If not changed by yourselfe, the DDS by default is set to 6075 kHz, the Frequency of „Deutsche Welle“ which should be heard all over Europe very loud. Outside Europe or if you dont like Deutsche Welle, set the DDS to another frequency of your choice where a strong BC AM station is working.
You should hear this station now in the headphone.
Attach you Voltmeter to R14 and ground and adjust L1 and L2 „coarse „ to maximum AGC Voltage. Fine tuning will be done later. The peaks will not be very sharp.
Now switch to CW/SSB and choose 40m by the menue.   Use a dipmeter or a Signal Generator to produce a 40m signal, couple the signal to the BNC Jack
If you dont have a Signal Generator or a dipper, you may do the following at a real Antenna with a signal of another HAM.

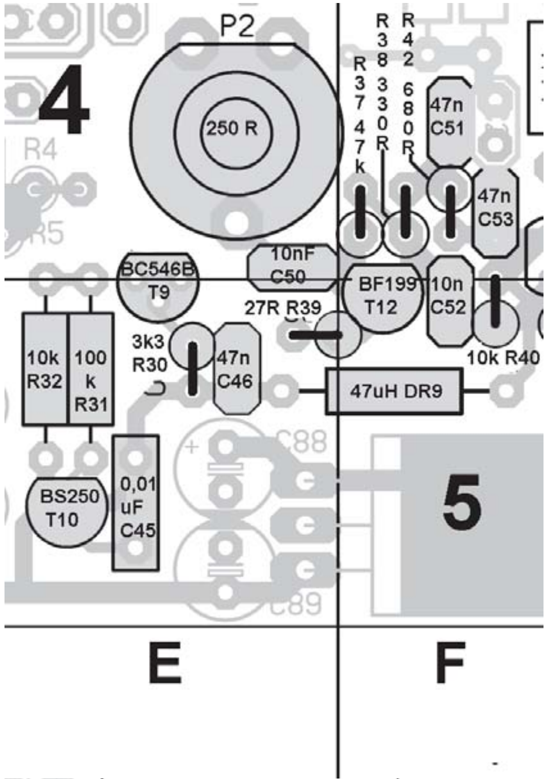
Adjust the Preselector Pot to noise maximum. This is extrem sharp, only a mm with the knob. Adjusting the Preselector needs some training because it is so extrem sharp. If the preselector is adjusted, find the Signal with the VFO. If you do not find it, increase the signal a little bit for the first time. Now disconnect the generator because this lowers the actual Q of L1 which makes it harder to adjust. Use some 10cm wire attached to the inner conductor of the BNC jack as a very short antenna and couple the signal to this antenna. It must not be loud, it must just be audible.
Adjust L1 and L2 using a nonconductive tool to maximum of AGC Voltage. Redo adjustment several times using the smallest possible signal. During adjustment do NOT change the Preselector Pot.

All ok?

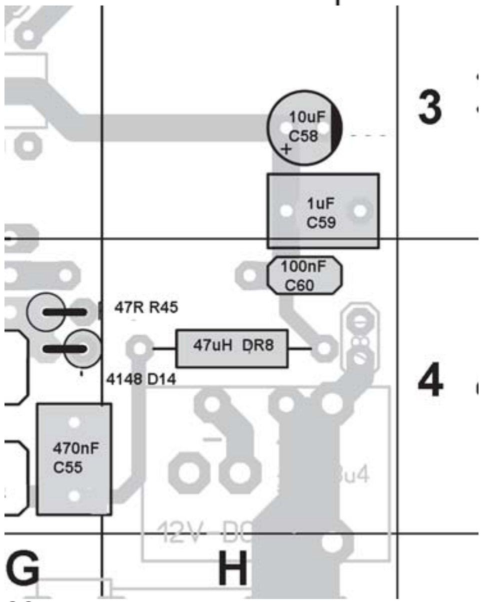
Its on your own, what you will do next: listening into the bands or build the TX parts. I heard from some QRPers that stey stopped soldering for severals days, while they were playing with their new BCR receiver

However, the TX part does not leave too much work because some groups are used in the RX as well so they are still built.

Group 7 Transmitter



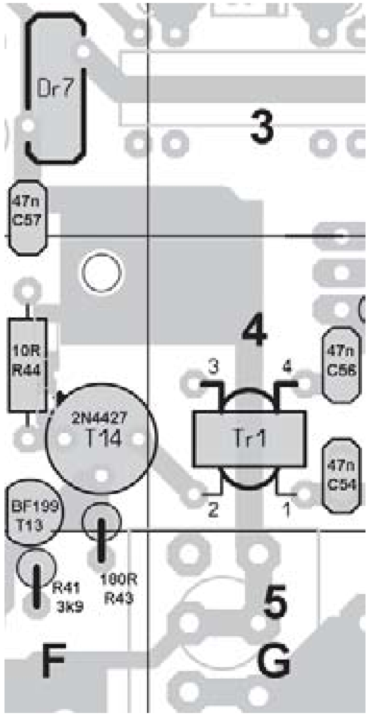
[ ] R32 10K E-5
[ ] R31 100K E-5
[ ] C45 0,010uF E-5
[ ] R30 3,3K upright E-5
[ ] C46 47nF (473) E-5
[ ] C50 10nF (103) E-4/5
[ ] R39 27R upright E/F-5
[ ] C94=820pF at PCB solder side parallel to R39 (MODification)
[ ] Dr9 47uH SMCC E/F-5
[ ] C52 10nF (103) F-4/5
[ ] R37 47K upright E/F-4
[ ] R38 330R upright F-4
[ ] R42 680R upright F-4
[ ] C51 47nF (473) F-4
[ ] C53 47nF (473) F-4
[ ] R40 10K upright F-4/5
[ ] C55 470nF Foil spc 5 G-4
[ ] D14 1N4148 G-4
[ ] R45 47R upright G-4
[ ] Dr8 47uH SMCC H-4
[ ] C60 100nF (104) H-4
[ ] C59 1uF Foil space 5 H-3
[ ] C58 10uF 35V rad. H-3
[ ] R41 3,9K upright F-5
[ ] R43 180R upright F-4/5
[ ] R4410R F-4



Attention: ESD rules !!

[ ] T12 BF199 E/F-4/5
[ ] T13 BF199 F-4/5
[ ] T9 BC546B E-4/5
[ ] T10 BS250 E-5

The driver Transistor must be mounted on the little plastic socket you find in the kit.



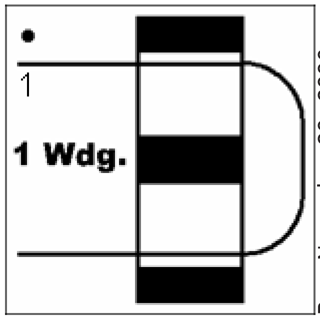
[ ] T14 2N4427 +plastic socket F-4
[ ] C57 47nF (473) F-3/4

The choke for the TX will be wound on a ferrite because the TX current would be too high for a standard SMCC choke.
We use an FT37-43 ferrite for the Choke. Again take care to meet the geometrical requirements, remember to count the turns inside the ring.

[ ] Dr7 Amidon FT37-43 10turns 0,5mm laquered wire F-3
Prepare Dr7 by using the „blob „ method as you did it in the LPF section.

[ ] C54 47nF (473) G-4
[ ] C56 47nF (473) G-4

Now a new thing, a transformer wound on a double hole core, a so called PigNose. Because this is new and bacause I know that often mistakes where made with pignoses, I will give a detailed description how to do. It is easy, but you must know some facts.
The transforme is used to transform the high output impedance of the drivers collector to the low input impedance of the PA Base. So we need a step down transformer. Because it must work between 3,5 and 18 MHz, it must be a broadband transformer. Such broadband transformers usually are wound on Ferrite materials which give us high inductivity with minimum number of turns which results in low capacity between the turns.
Lay the pignose flat in the table, the holes looking left to right as you see in the drawing right.

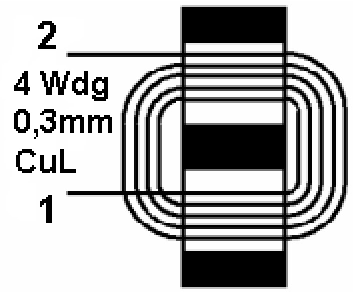


See how a complete turn in a pignose is formed:
Upper left to upper right
and back

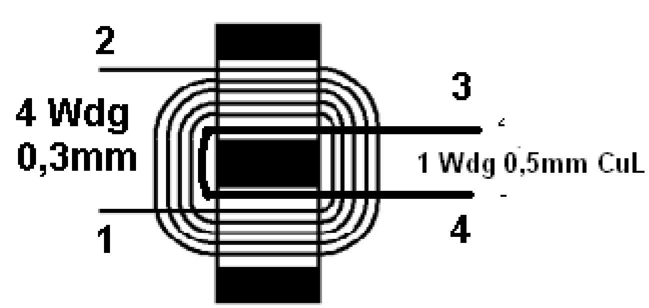
Rev: November 20 2006

lower right to lower left.
That completes 1 turn.

Transfor,er TR 1 must have 4 primary and 1 secondary turns.



Use 20cm of the 0,3 mm wire. Feed the wire from upper left to upper right. Leave about 3 cm wire at the left side. Now back through the lower hole. Pay attention not to scrap the wire to much at the pignoses corners. If the laquer gets damaged, this could short the transformer.
Now the second turn: Feed the longer end again upper left to upper right and back lower right to lower left - second turn is ready.



Add the remaining two turns the same way and the primary is ready.

Now the secondary . The secondary is made by 1 turn 0.5mm wire. Start just at the opposite end of the pignose: Upper right to upper left and back lower left to lower right.

Thats it.

Tin the 4 ends the same way you did it with the Torroids. Place the ready made pignose to the PCB, The primary (thin wire) goes to solder point 1 and 2, the secondary (thick wire) goes to solder point 3 and 4

[ ] Tr1 BN43-2402 Double Hole Core G-4
prim.4 turns 0,3mm enamel wire
sec.1 turn 0,5mm enamel wire.

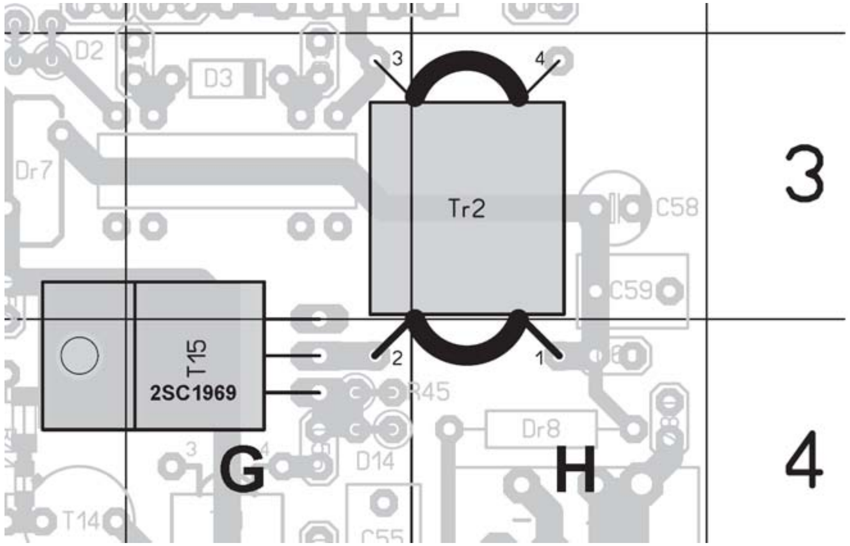
Install the power regulation Potentiomer P2

[ ] P2 250R PIHER SMC-10-V E-4

and the TX is ready except the PA.
After you have controlled your work, you can test the TX section withot any problem because the driver can work against R45 without any problem.

Connect power
connect a key
switch power on
choose KEYER OFF in the Menu

Use an RF probe to measure the RF at the collector of the driver transistor, that is the housing of the transistor. The power can be regulated by the power potentiometer.

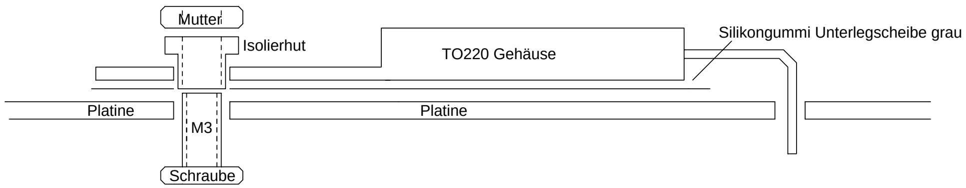


If this is ok, you can do the last step, instlling the PA

Group 8 PA

There are only two part in this section to be installed, but this should be done very carefully.

Start with the PA Transistor. It must seated absolutely flat on the PCB Ground plane. Because BCR is working in C-Mode with a very high efficiency it does not produce too much heat, but it is better to keep it as cool as possible. The metall plate of the PA Transistor must be insulatet from the groundplane, so we use a modern silicone insulator. **DO NOT USE any type of grease** as it was done in older times. We have found the grease in combination with RF Power Transistors often cause self oscillating in the 200 MHz range.



Bend the legs of the transistor with the help of a small screwdriver round downwards as shpwn in the picture. Place it together with the insulator on the board and adjust the legs until the transistor is lying really flat on the board. Now screw it to the bord. If this has been done, solder the legs from the bottom side.

[ ] T15 2SC1969 + Silicone insulator.   F/G-3/4

Last thing to install: the output transformer. Again it is a pignose, only a little bigger than the other one. This time it is an step up transformer. Both windings are made from 0.5mm enameled wire.
Because it is not possible to identify primary and secondary by the thickness of the wire, you should mark the primary side of the pignose. Very usefull to do this is nail laquer.
The primary gets 2 turns (Solder point 1 and 2) the secondary gets 4 turns (solderpoints 3 and 4)
Build the transformer, tin the wires and install it at its place.

[ ] Tr2 BN43-202 pignose   G/H-3/4

primary 2 turns 0,5mm enameled wire
secondary 4 turns 0,5mm enameled wire

That´s all.
before you start testing the PA, again check your work. Dont put your BCR in the enclosure now but do the last test without enclosure.

Connect a dummy load to your BCR
connect a power supply which can handle 2 A
If you have worked with a low current fuse inside the BCR, change it against a 1,25A or 2A fuse.
connect a morse key
Switch the BCR to on.
Choose Keyer off in the menue
Hit the morse key
Measure the power. It must be adjustable with the power potentiometer between 0 Watt and 5 Watt. On the lower bands you will get some more

power and you may use higher power in practice if you want, but you must be aware of one rule: Increasing the drive by the power-pot will increase the output. Depending on the band and some individual specific parameters of your BCR you will find a point beyond the 5 Watt mark, where the power not longer increases if you increase the drive, but the current will increase exorbitant.
Pleaseallways use your BCR below this point. My personal BCR for example at 80m has this point at 11,0 Watt. Up to 11 Watt, current and power out increase parallel. Above 11 Watt powers stays at 11 Watt while current nearly doubles.

Find out this points for all bands and mark the points on the enclosure later on as „maximum usable power“ per Band.

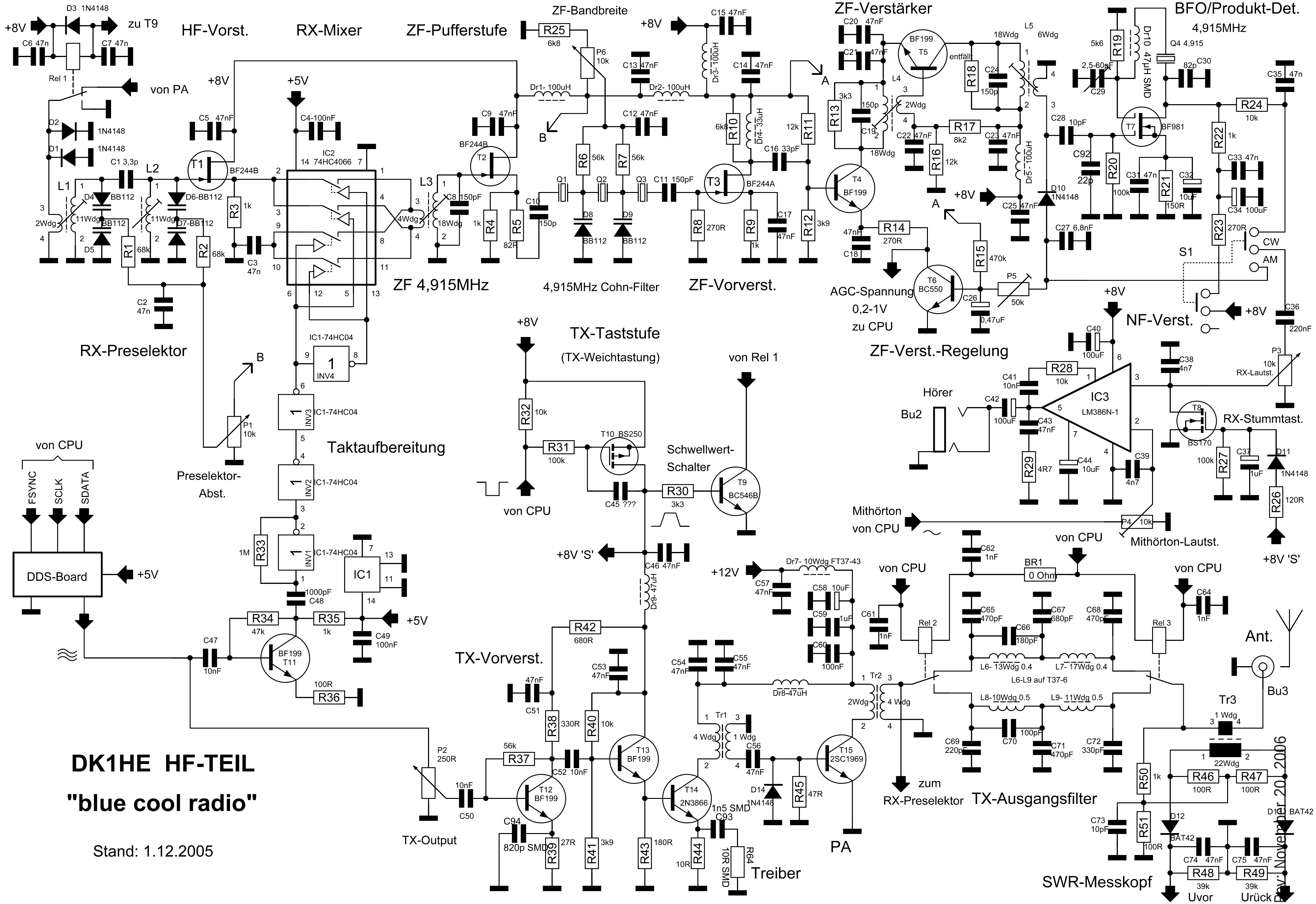
You may build your BCR into the enclosure now.
There are 8 long spacers in the kit. Be aware, that this actually are 2 diffent types. The 4 longer ones must be screwed to the upper side of the PCB (part side) the 4 shorter belong to the buttom side of the PCB.

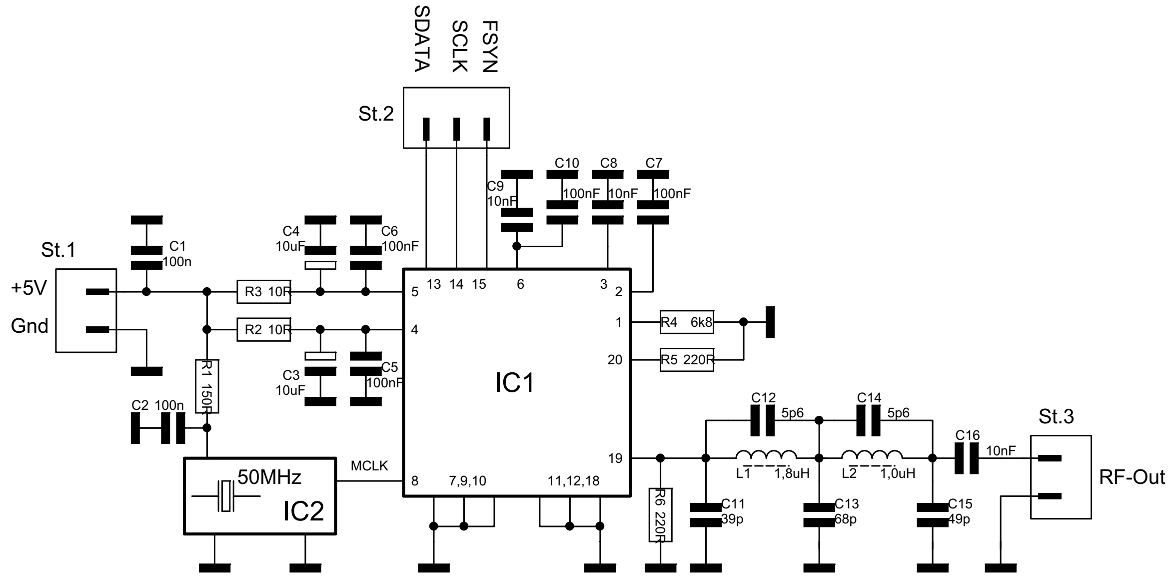
Install the BNC jack into the enclosure, solder the Coax tail to the BNC Jack but not jet to the PCB.
Place the pcb into the enclosure. It fits very tight, it´s not an easy job to get it in and out.
Feed the coax through the big hole in the pcb
if the PCB ist inside the enclosure, solder the Coax to the PCB

screw the 4 upper screws
screw the bottom plate
connect an antenna, keyer, power supply, headphone
work your first BCR QSO

You will have fun

Peter, DL2FI


HF-Vorst.
RX-Mixer
ZF-Pufferstufe
ZF-Bandbreite
ZF-Verstärker
BFO/Produkt-Det.
4,915MHz
RX-Preselektor
ZF 4,915MHz
4,915MHz Cohn-Filter
ZF-Vorverst.
AGC-Spannung
0,2-1V
zu CPU
ZF-Verst.-Regelung
NF-Verst.
Hörer
RX-Lautst.
RX-Stummtast.
Taktaufbereitung
Preselektor-Abst.
TX-Taststufe
(TX-Weichtastung)
von Rel 1
Schwellwert-Schalter
von CPU
DDS-Board
Mithörton von CPU
Mithörton-Lautst.
TX-Vorverst.
TX-Output
Treiber
PA
zum RX-Preselektor
TX-Ausgangsfilter
Ant.
SWR-Messkopf
Uvor
Urück
DK1HE HF-TEIL
"blue cool radio"
Stand: 1.12.2005
Rev. November 20, 2006

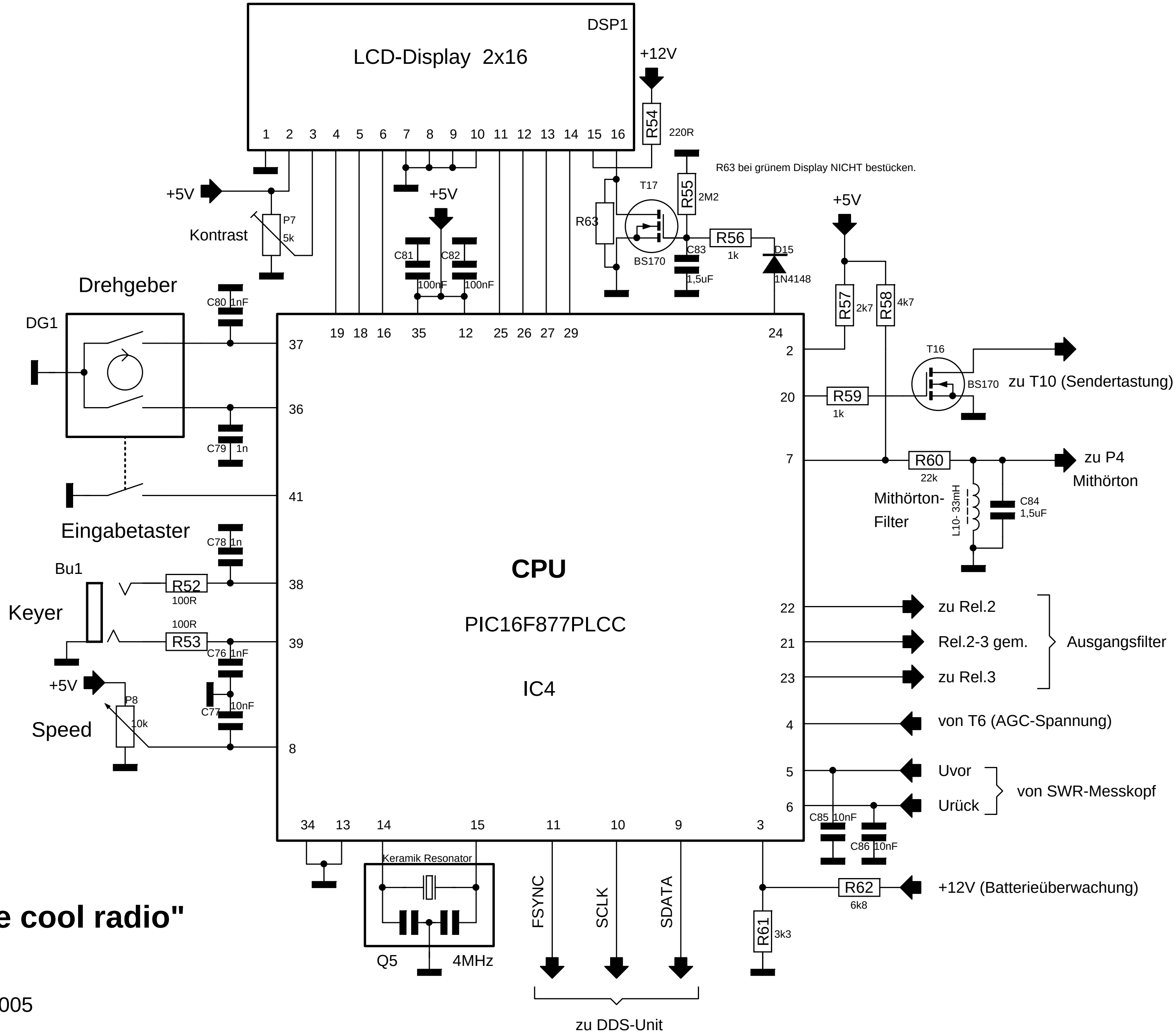


DDS-Unit "blue cool radio"

DL4JAL / DK1HE

Stand: 1.12.2005

Rev:Nobember 20. 2006

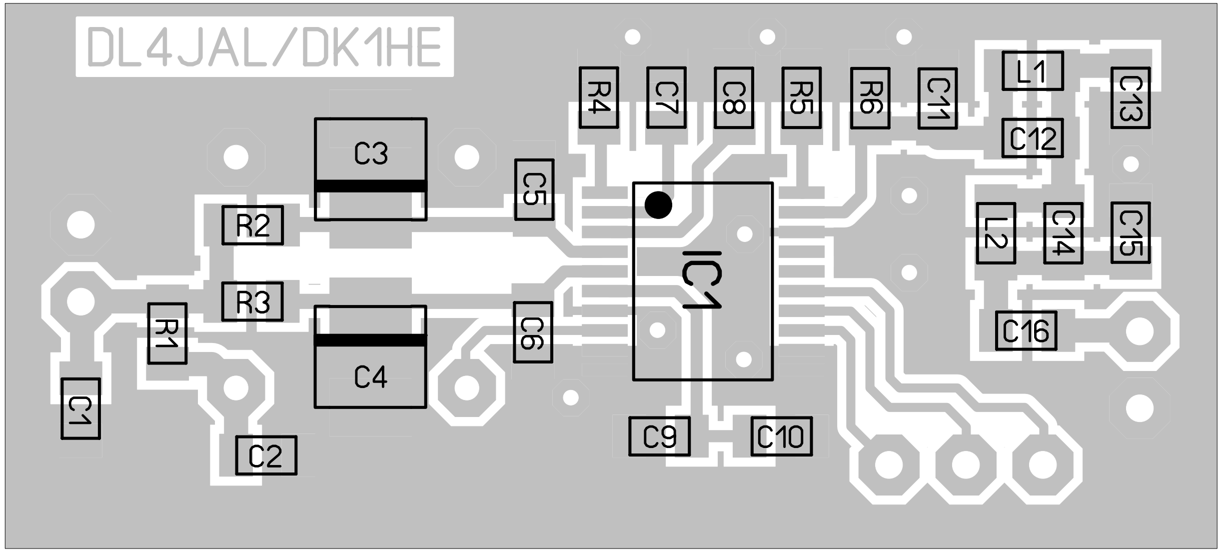


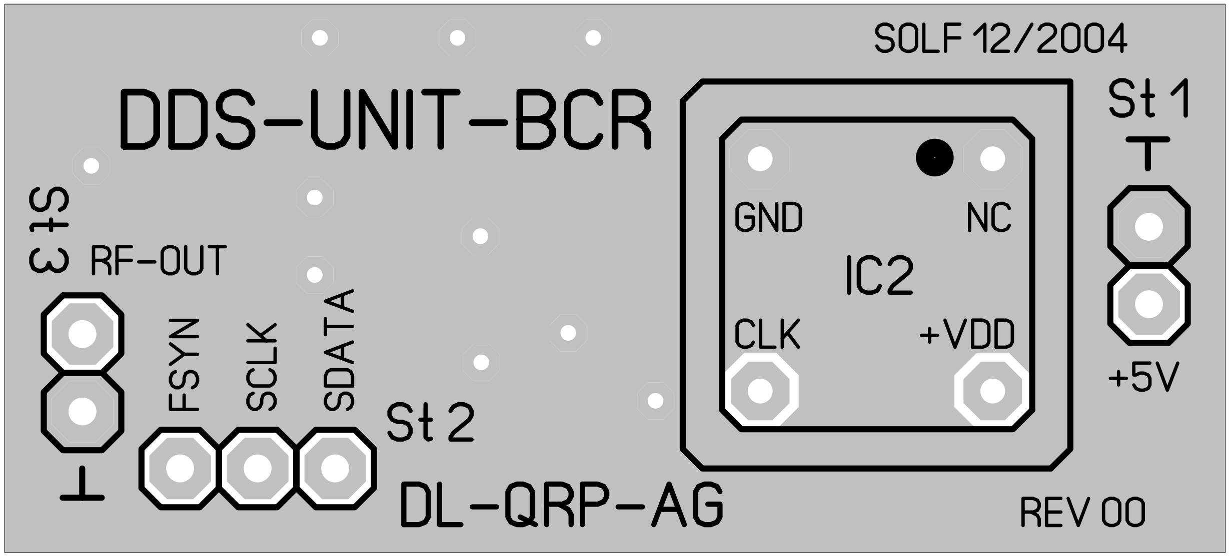
Steuerteil "blue cool radio"

DL4JAL

Stand: 1.12.2005

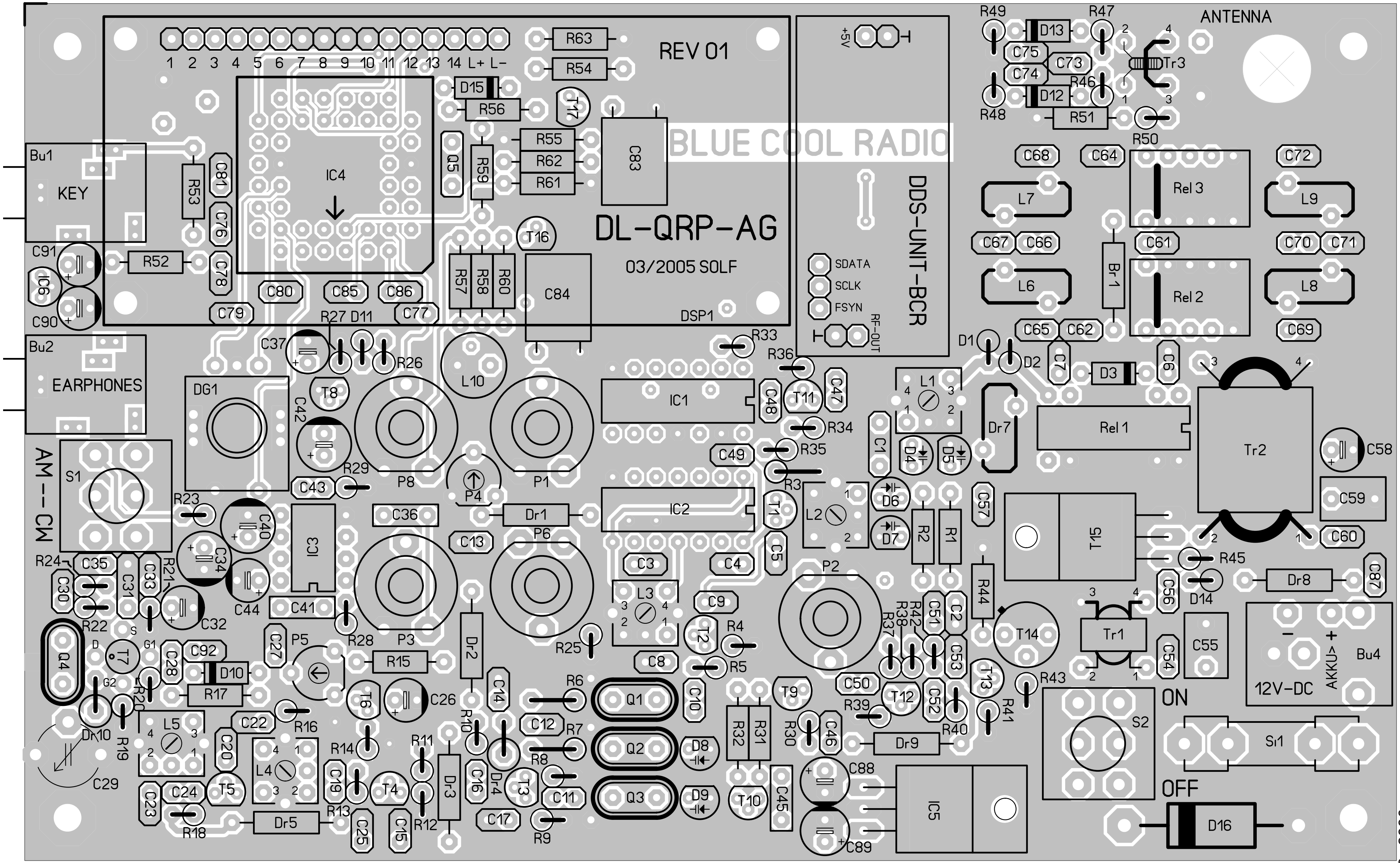
Rev: November 20 2006





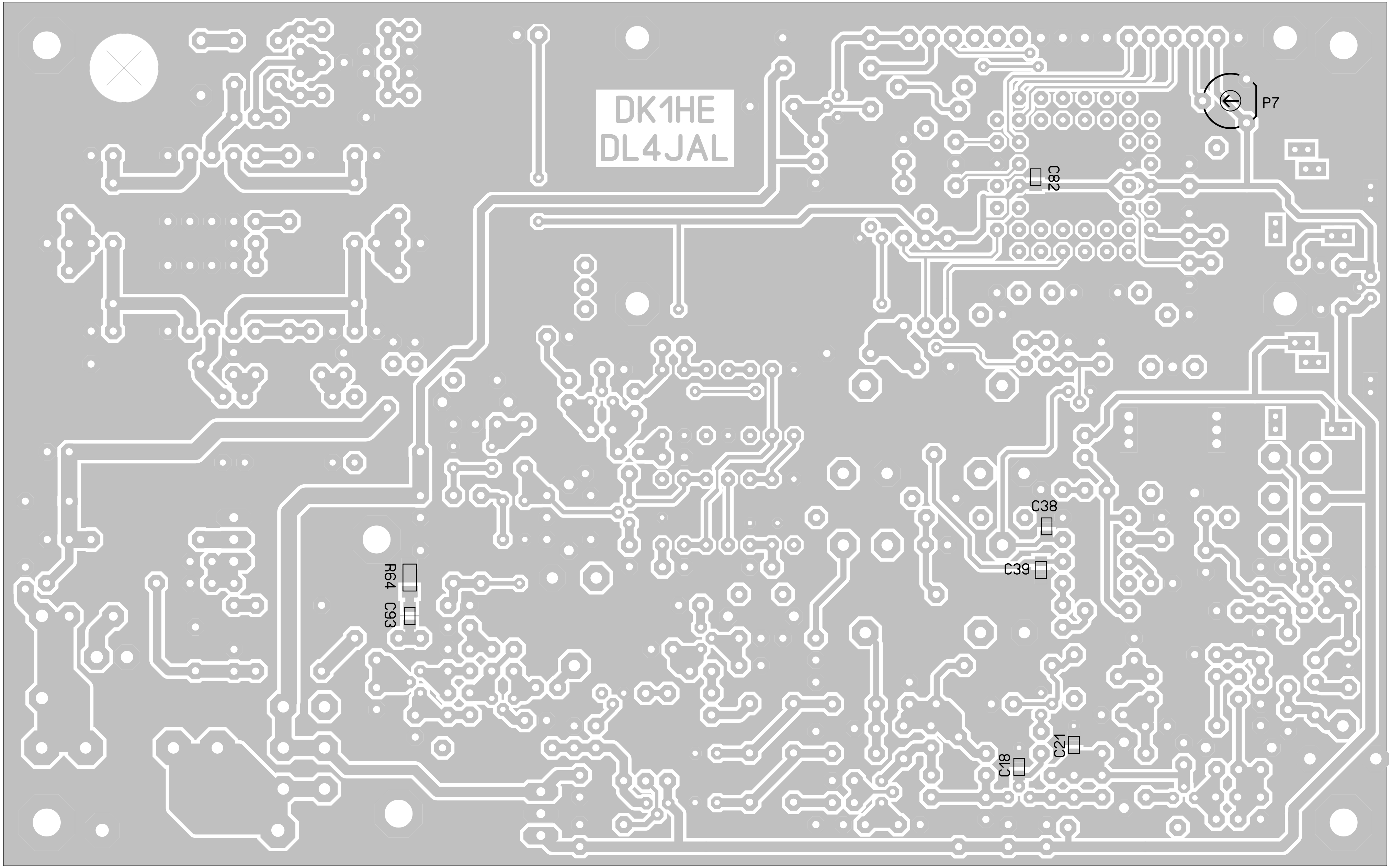
DDS Unit

Rev:Nobember 20. 2006



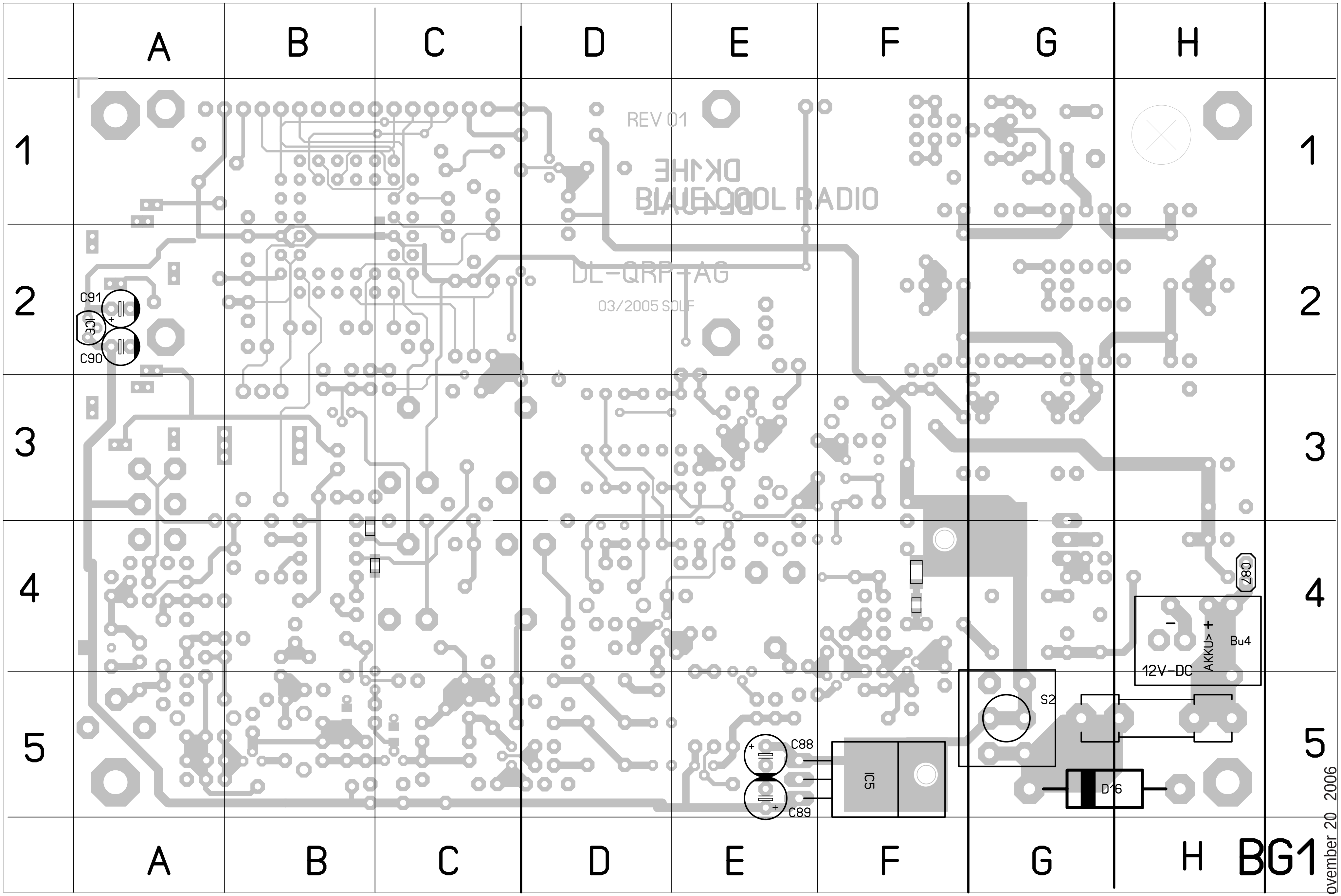
Rev: November 20 2006

BCR Mainboard Part side complete

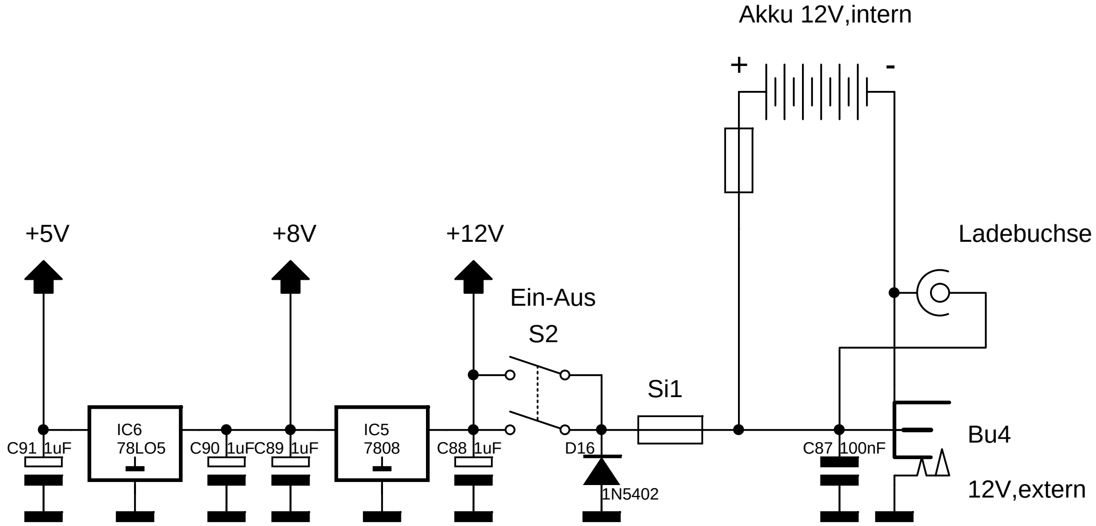


BCR mainboard Solderside SMT Parts

Rev:Nobember 20. 2006



Rev: November 20 2006

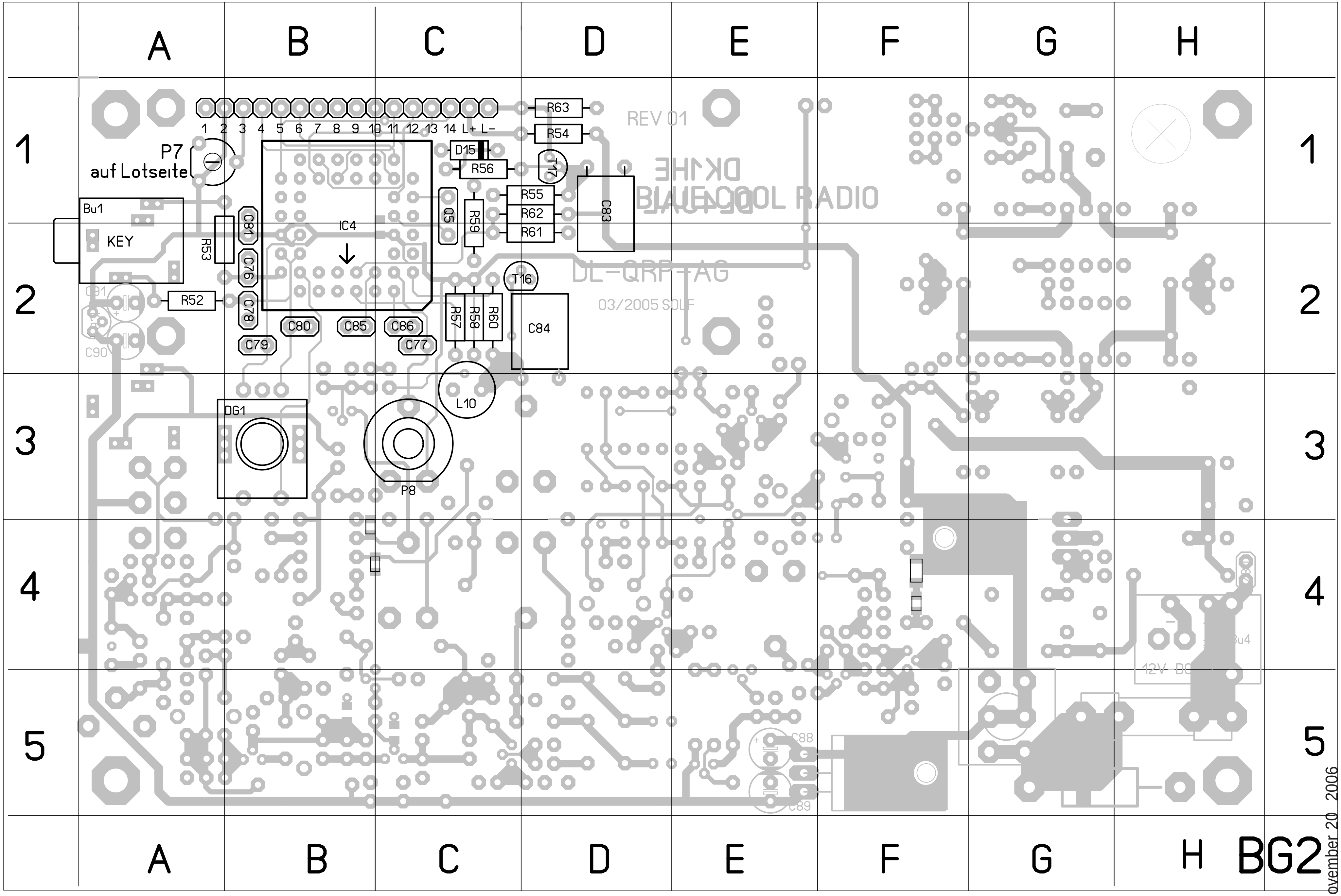


Stromversorgung "blue cool radio"

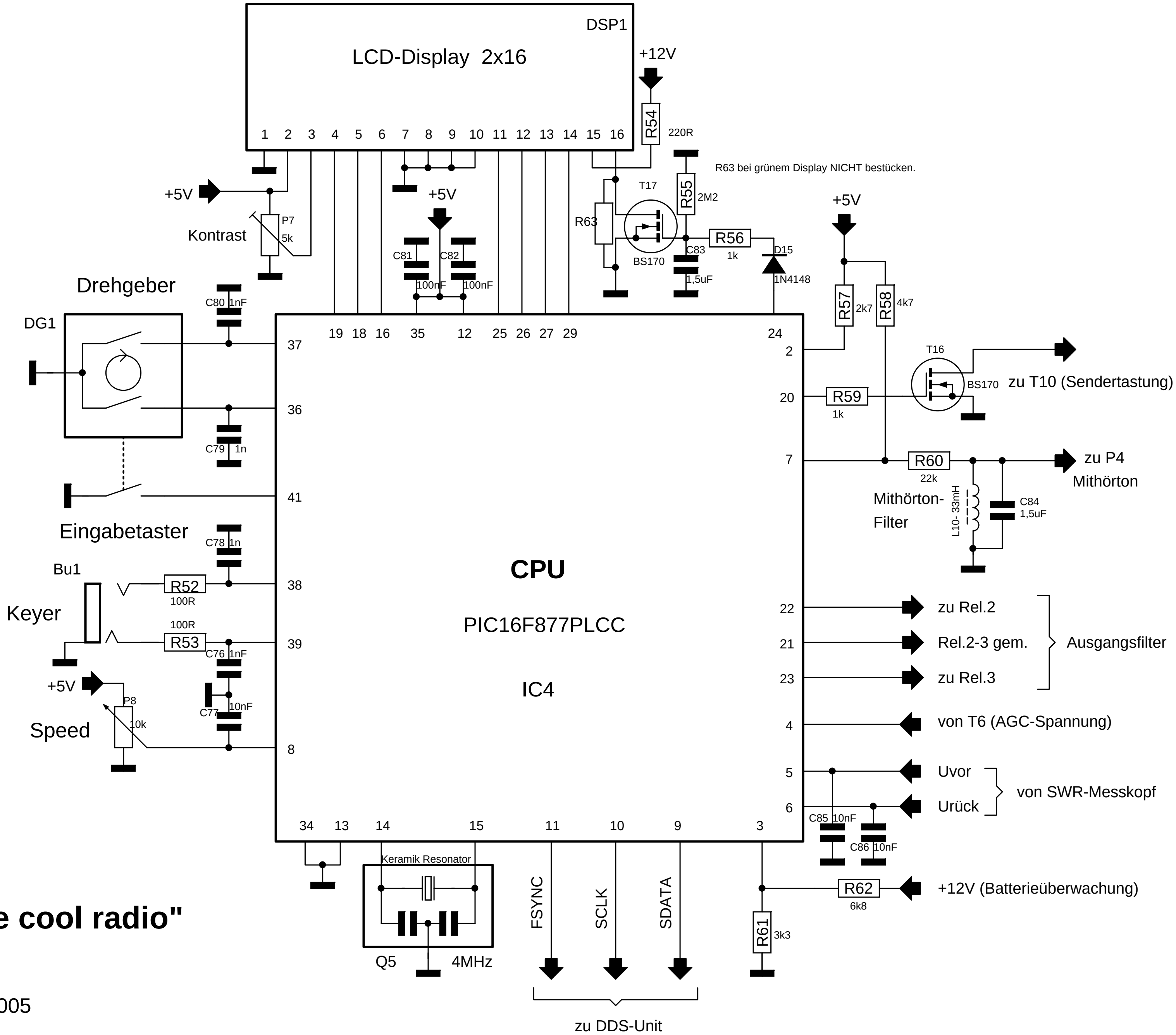
DK1HE

Stand: 6.01.2005

Rev:Nobember 20. 2006



Rev: November 20 2006

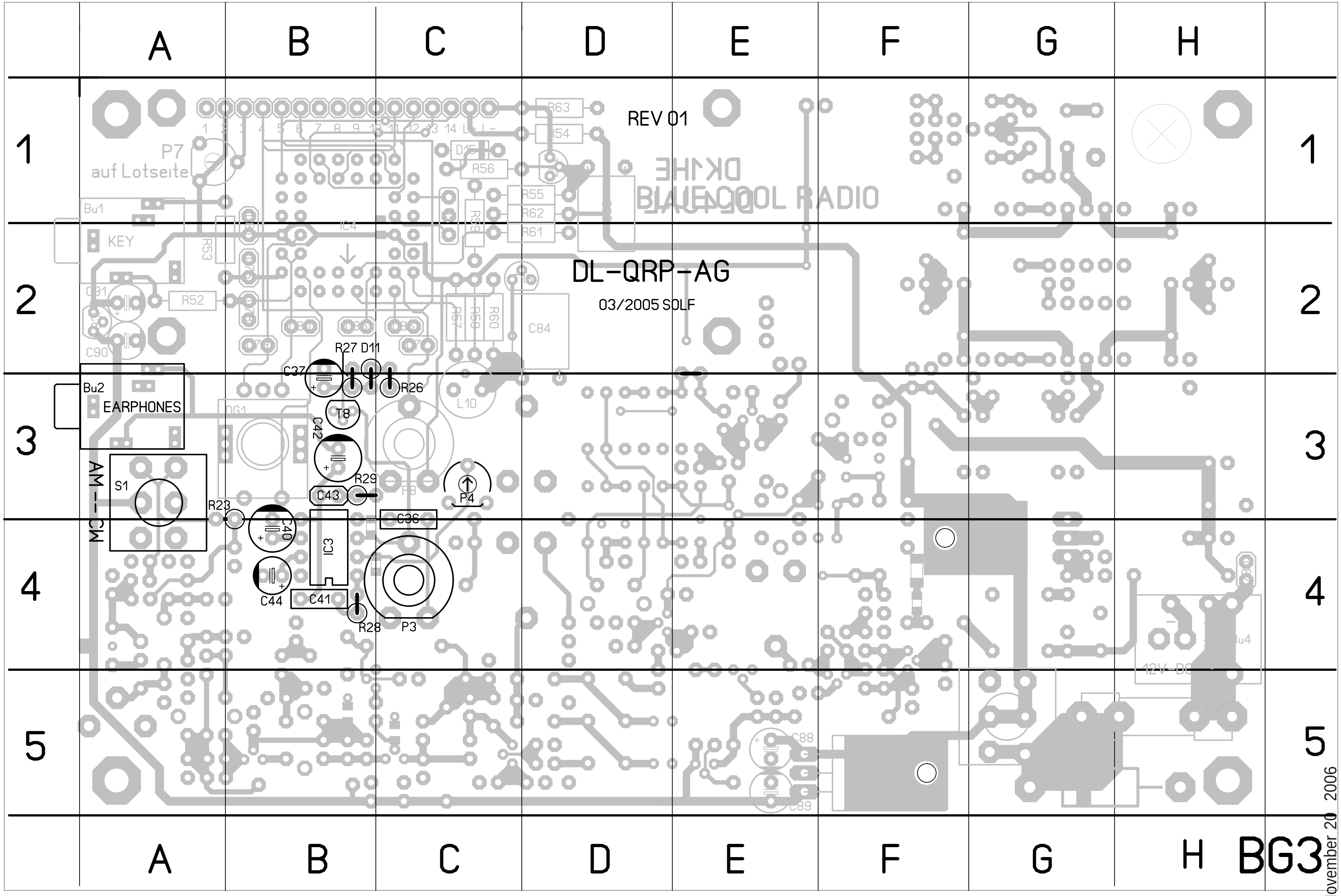


Rev:Nobember 20. 2006

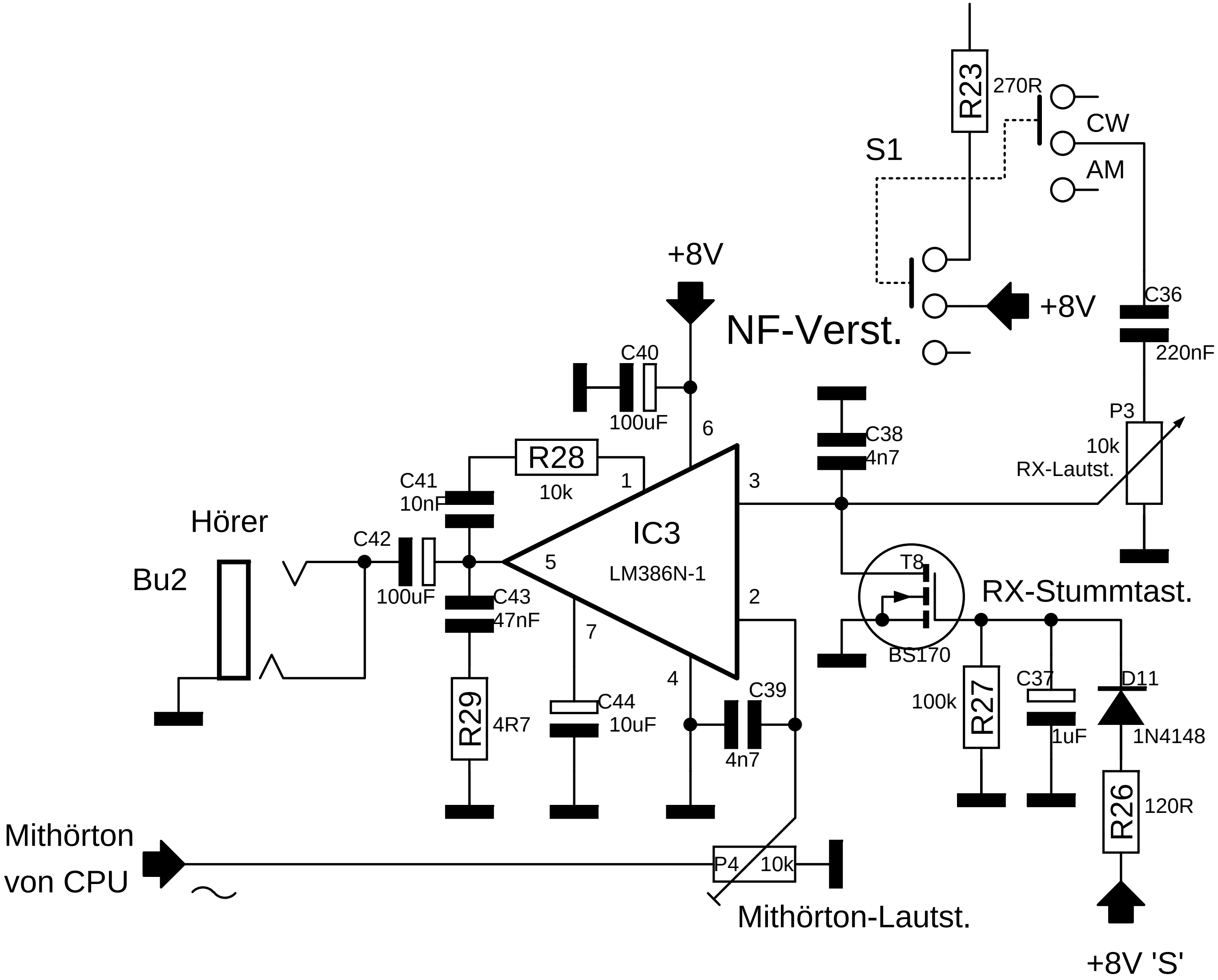
Steuerteil "blue cool radio"

DL4JAL

Stand: 1.12.2005

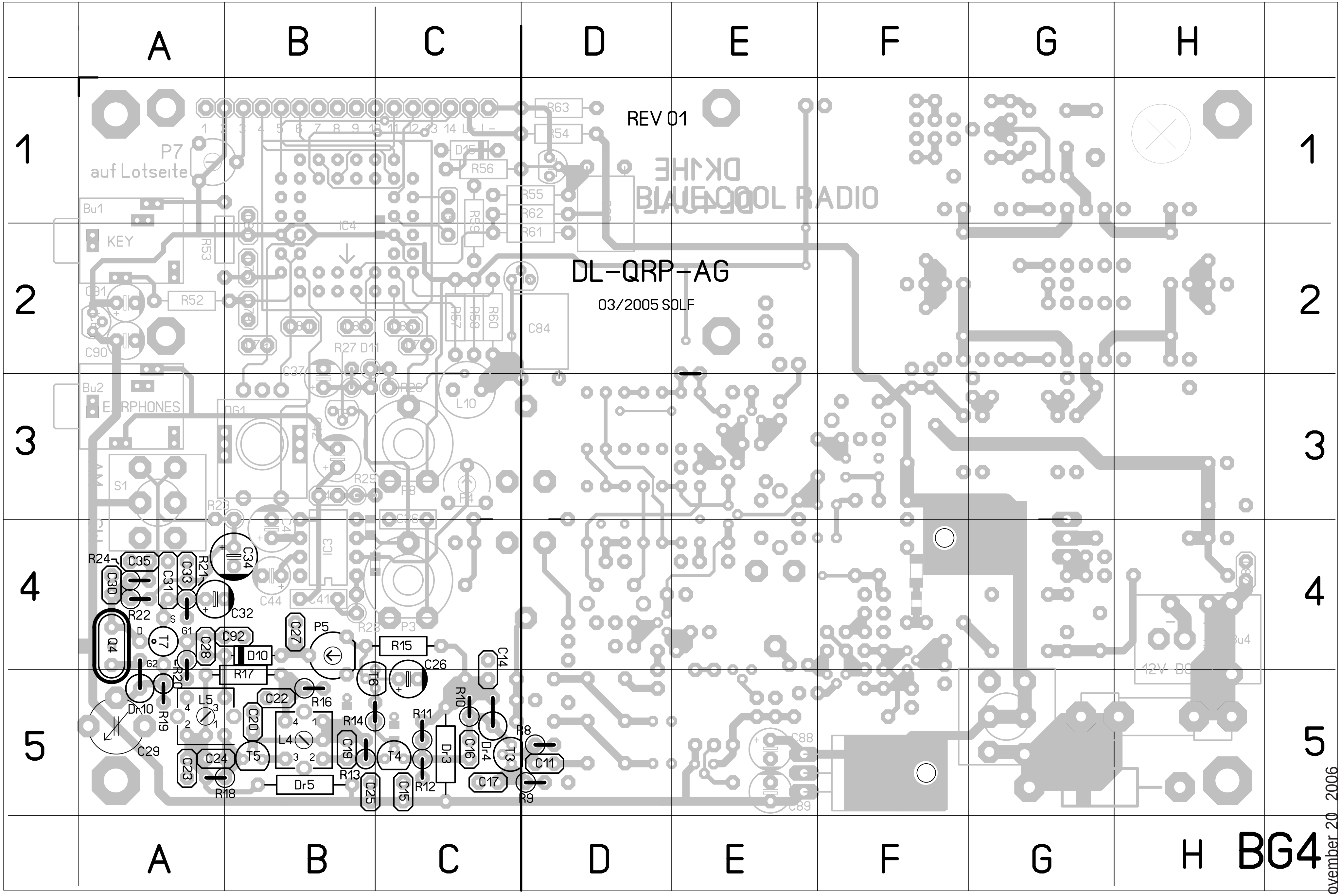


A B C D E F G H
1 2 3 4 5
REV 01
DL-QRP-AG
03/2005 SOLF
BLUE COOL RADIO
P7
auf Lotseite
Bu1
KEY
Bu2
EARPHONES
AM -- CW
S1
C37 R27 D11 R26
T8
C42
C43 R29
P4
R23
C40
C36
C3
C44 C41
R28 P3
R52 R53
R63 R54 R56 R55 R62 R61
C84
L10
C88 C89
Bu4
BG3
Rev: November 20 2006

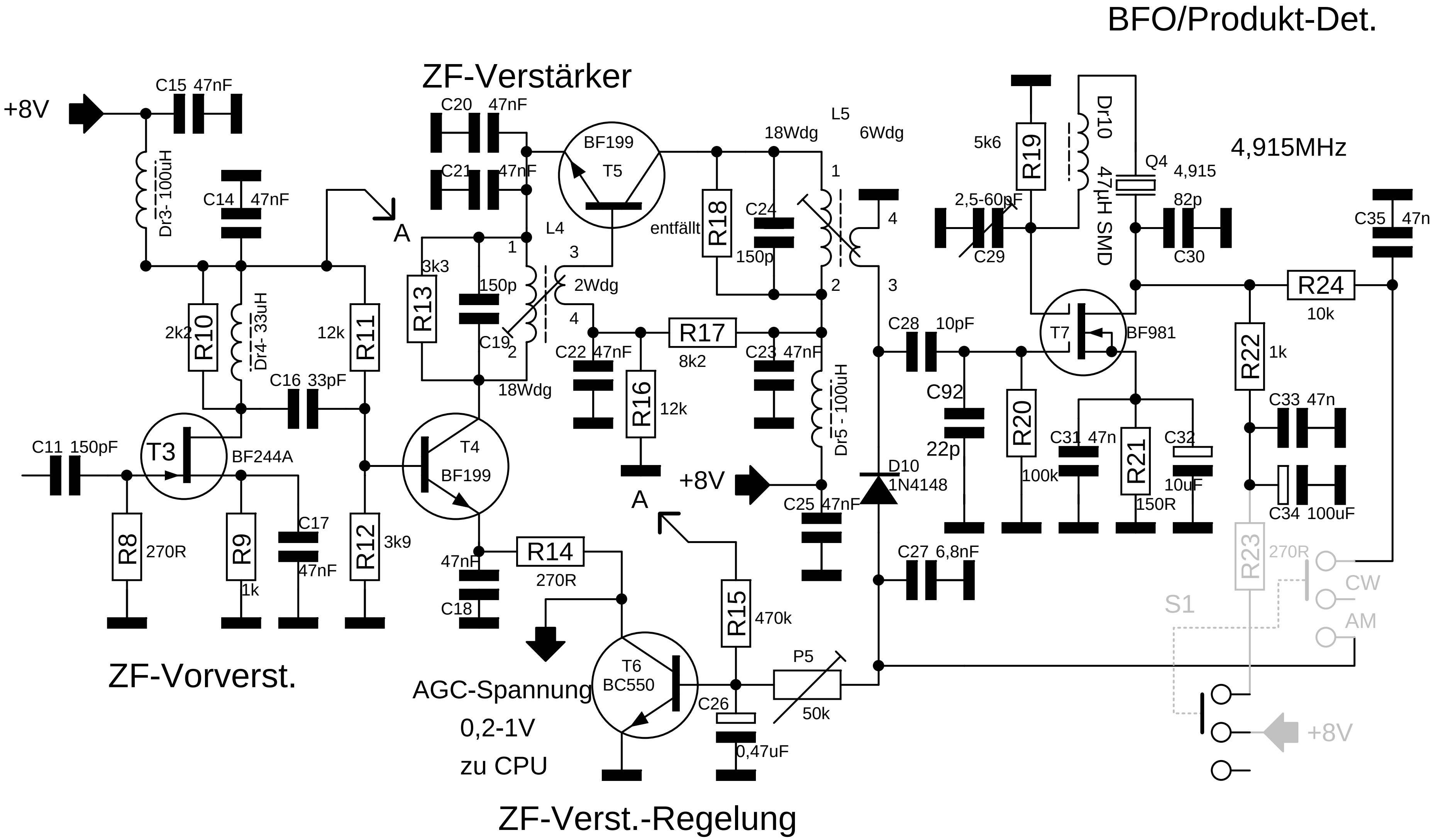


Rev:Nobember 20. 2006

Baugruppe NF Teil

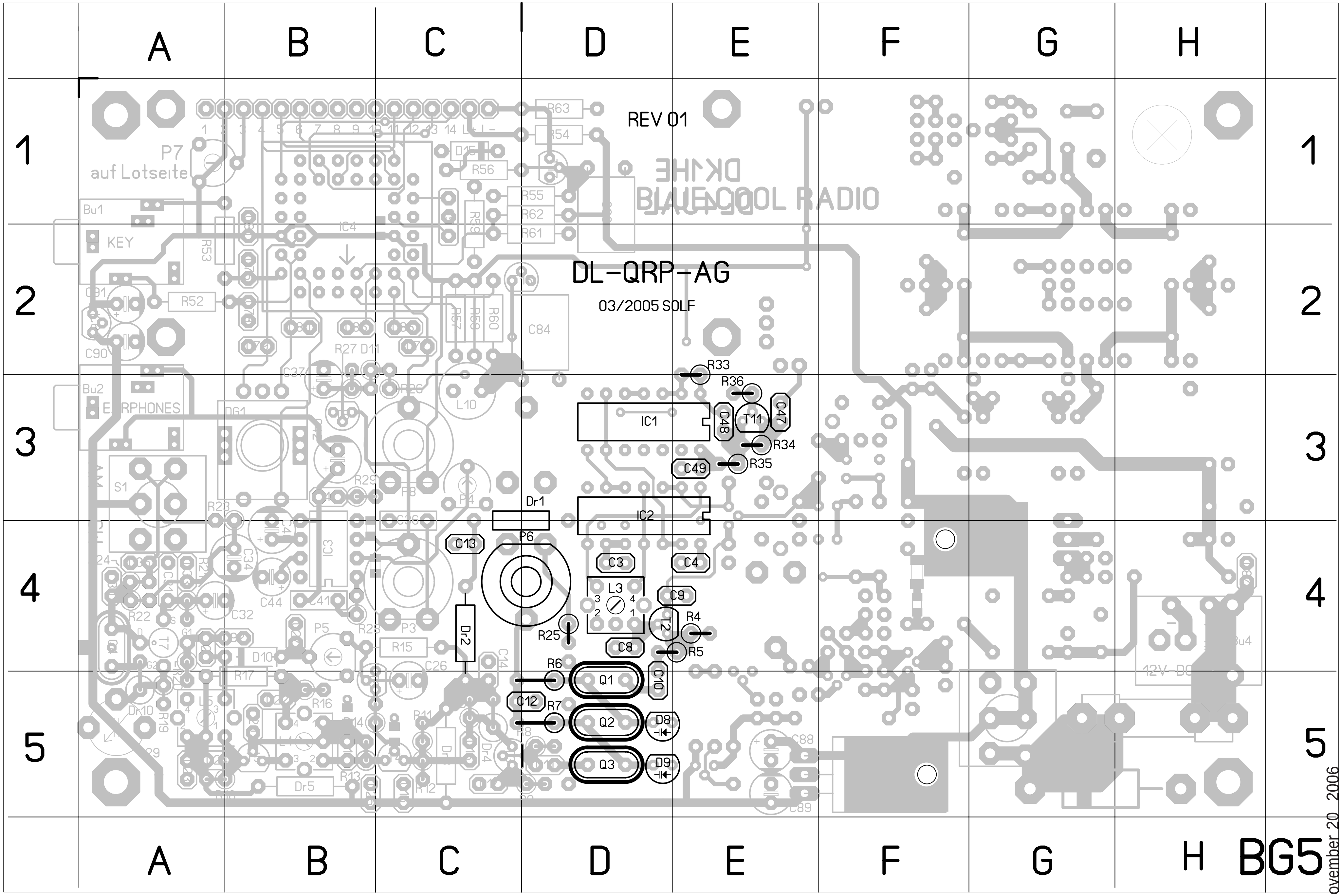


Rev: November 20 2006

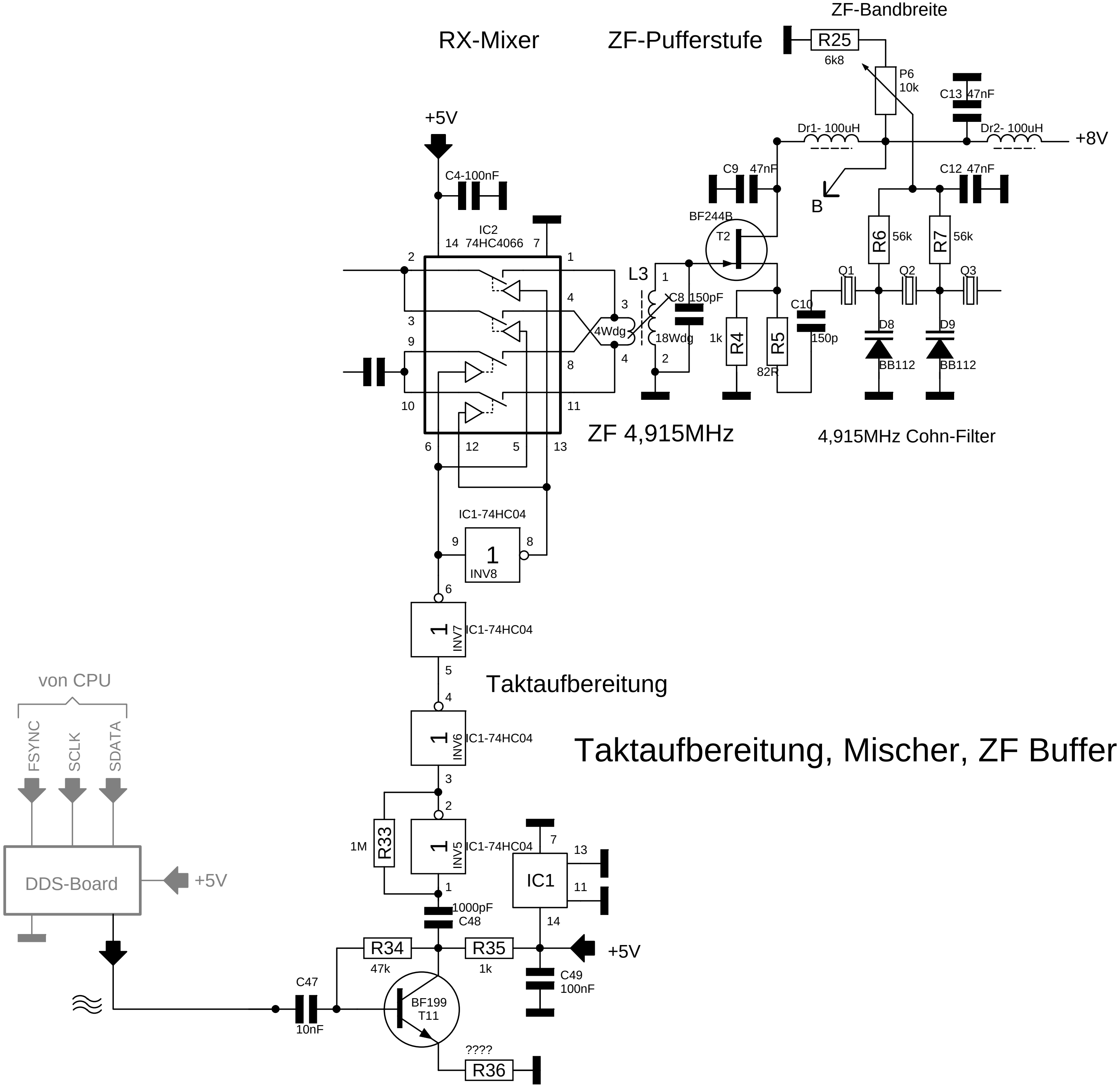


Baugruppe ZF-Verstärker / BFO

Rev:Nobember 20. 2006

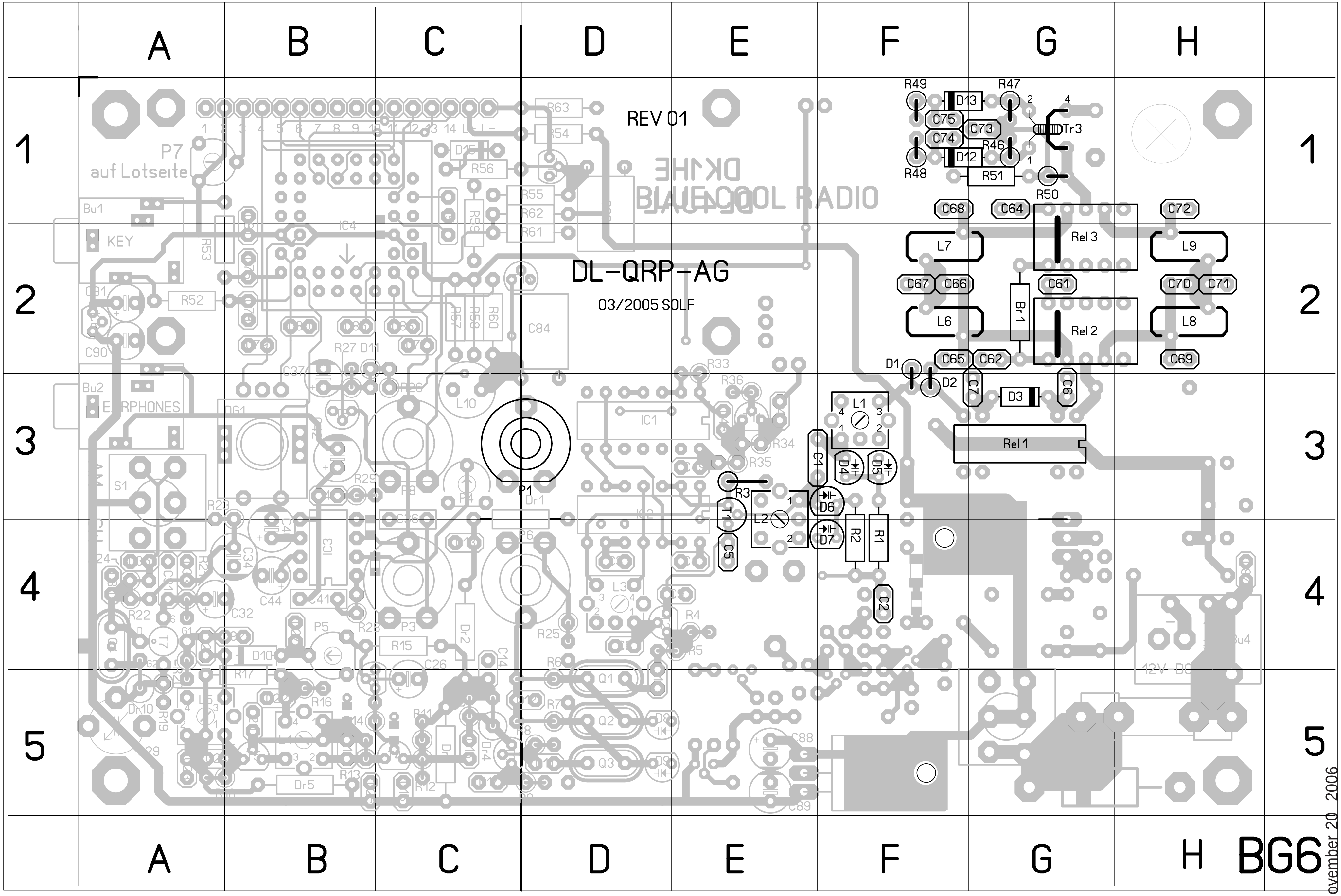


A B C D E F G H
1 2 3 4 5
REV 01
DK1HE
BLUE COOL RADIO
DL-QRP-AG
03/2005 SOLF
P7
auf Lotseite
KEY
EARPHONES
IC1
IC2
IC4
Dr1
Dr2
P6
L3
Q1
Q2
Q3
D8
D9
R33
R36
R34
R35
C47
C48
C49
T11
C13
C3
C4
C9
R4
R5
T2
C8
C10
R25
R6
R7
C12
H BG5



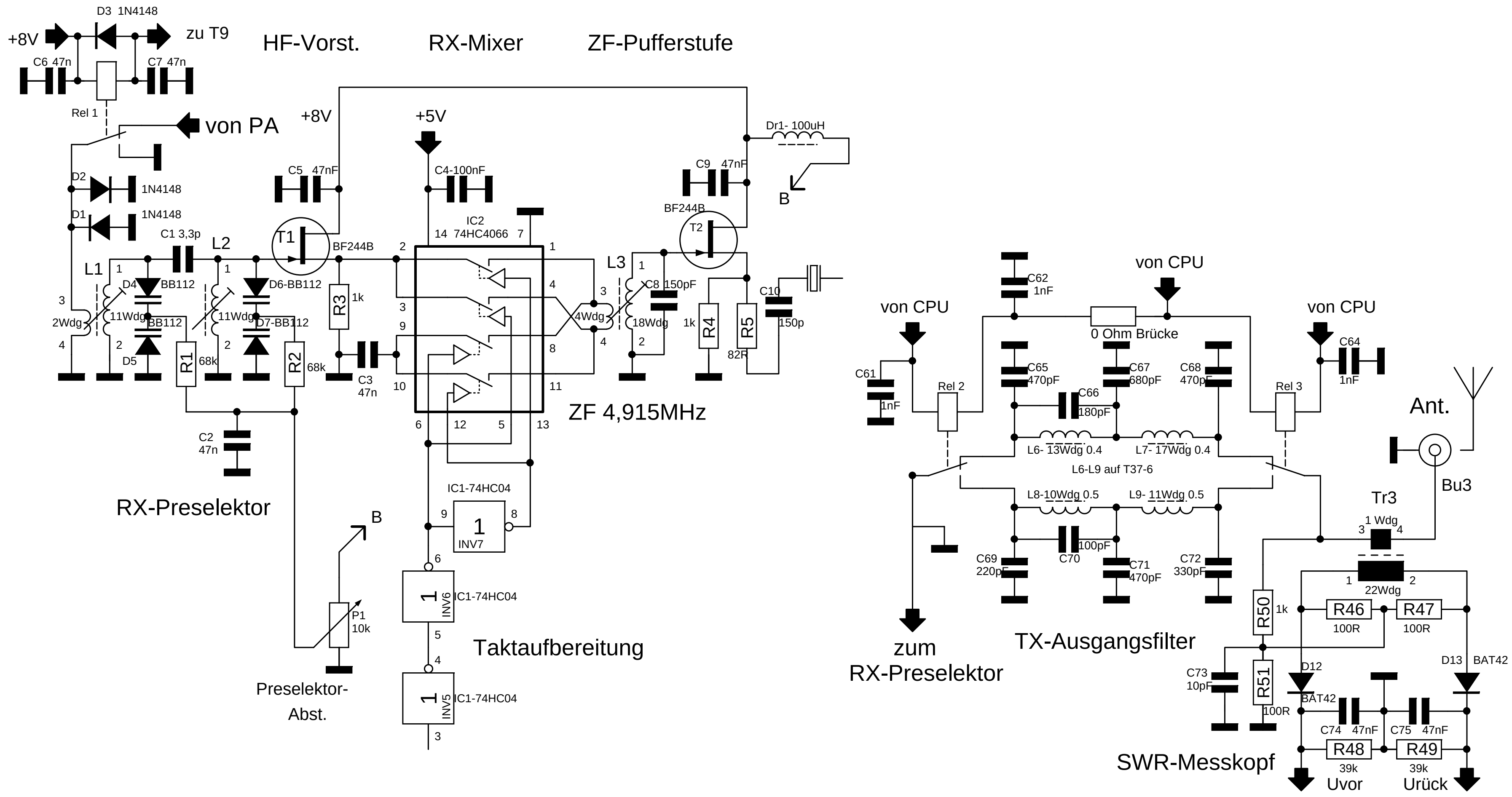
Taktaufbereitung, Mischer, ZF Buffer und Quarzfilter

Rev:Nobember 20. 2006



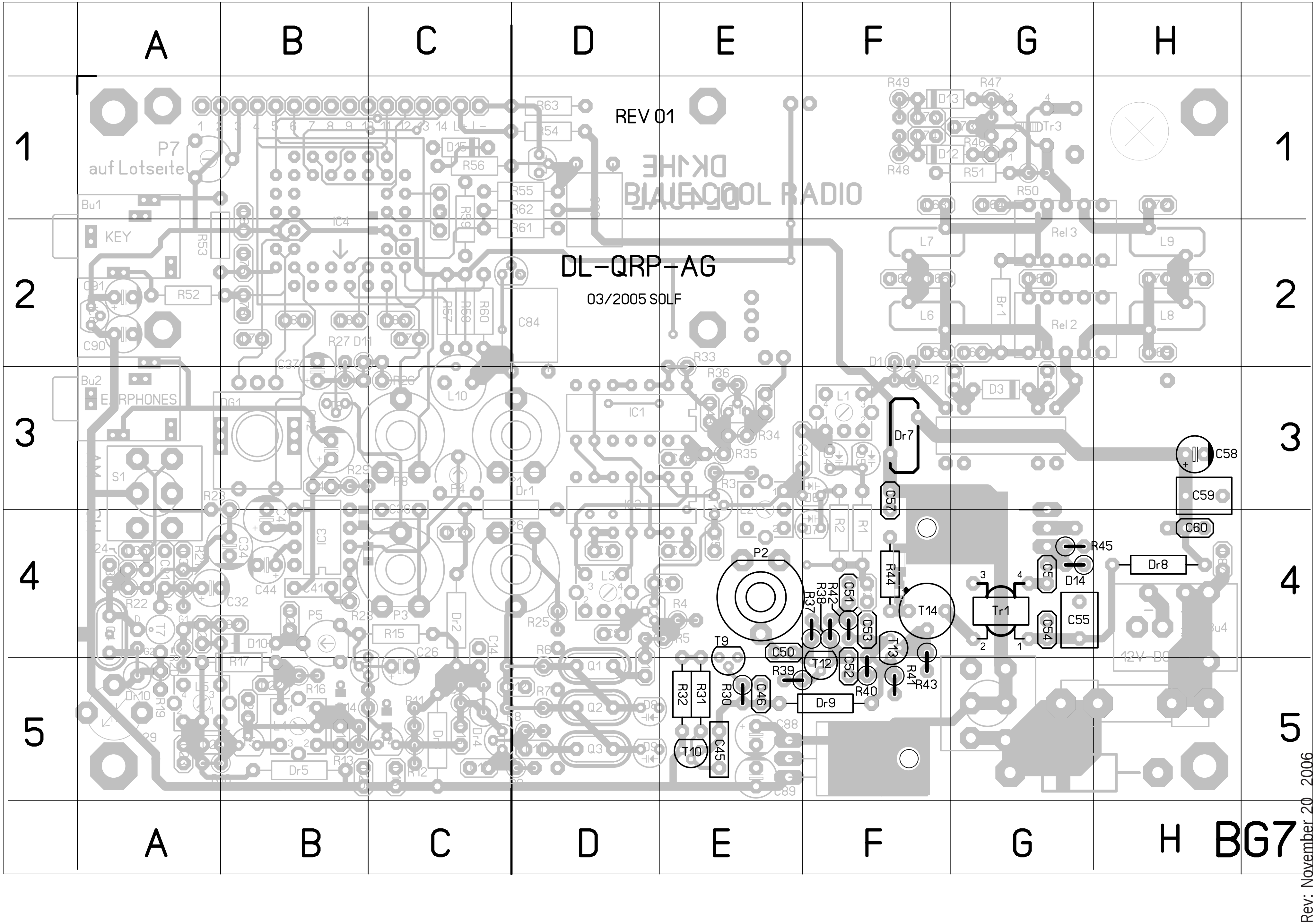
BG6

Rev: November 20 2006

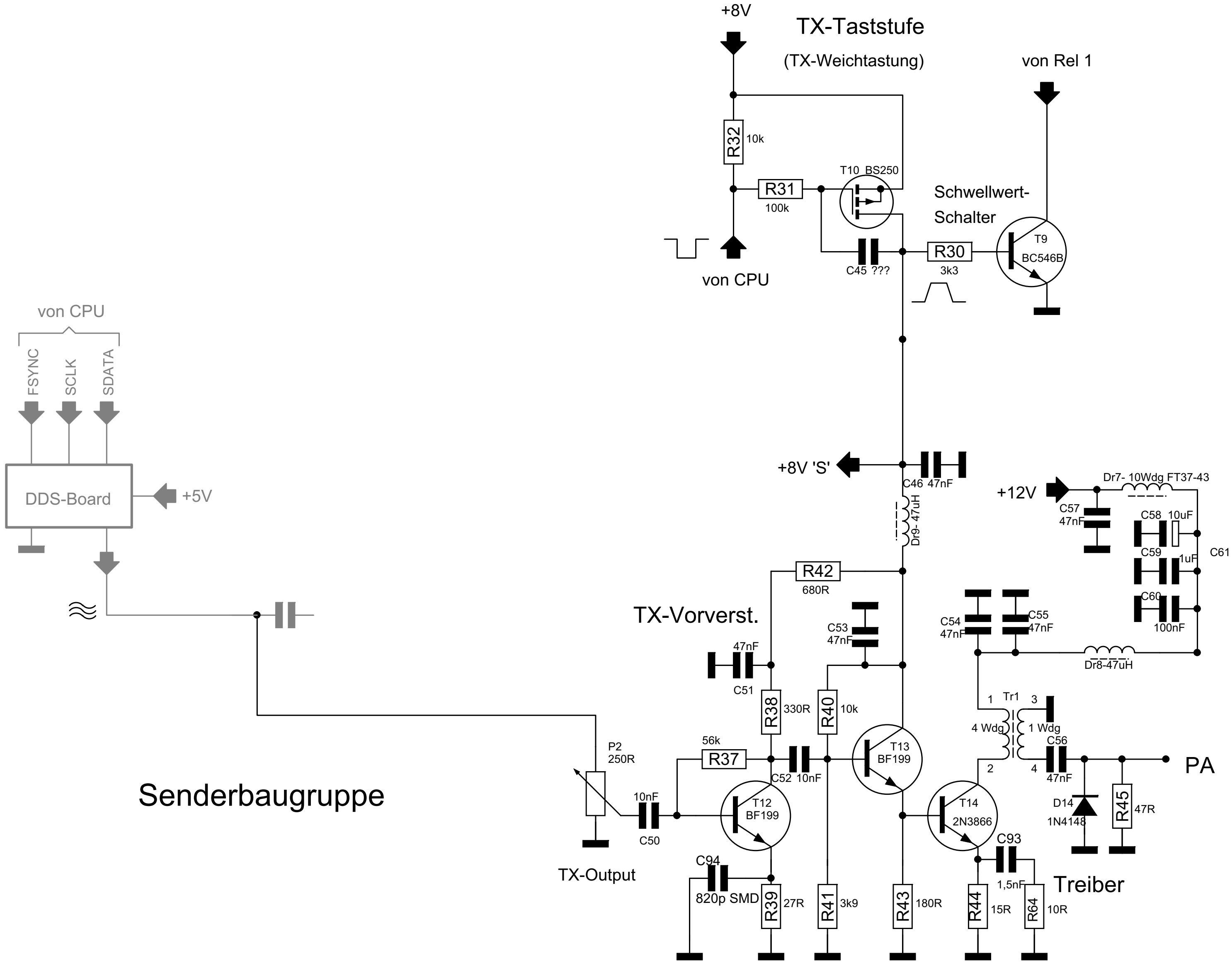


Tiefpassfilter, RX Eingang, Preselektor

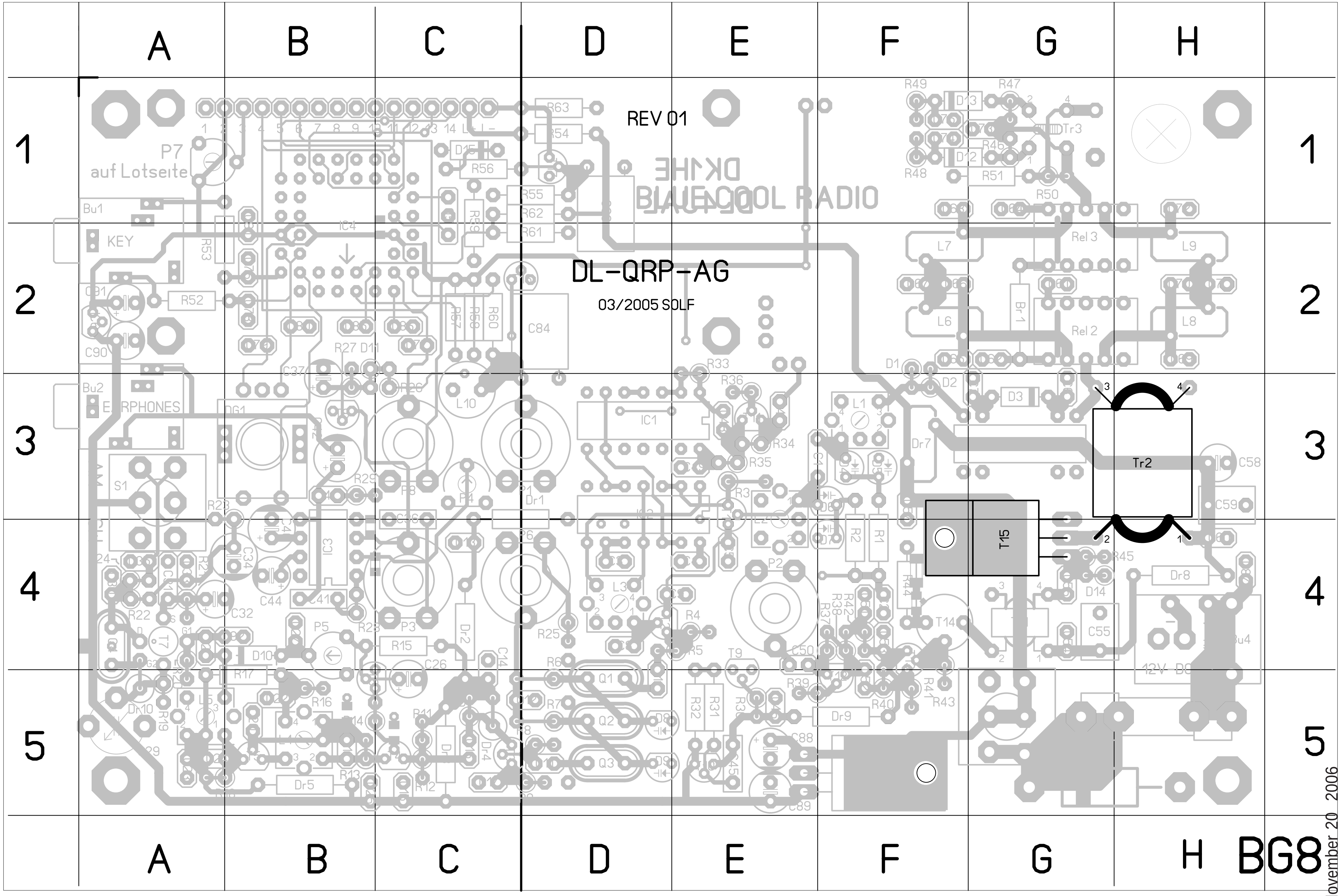
Rev:Nobember 20. 2006



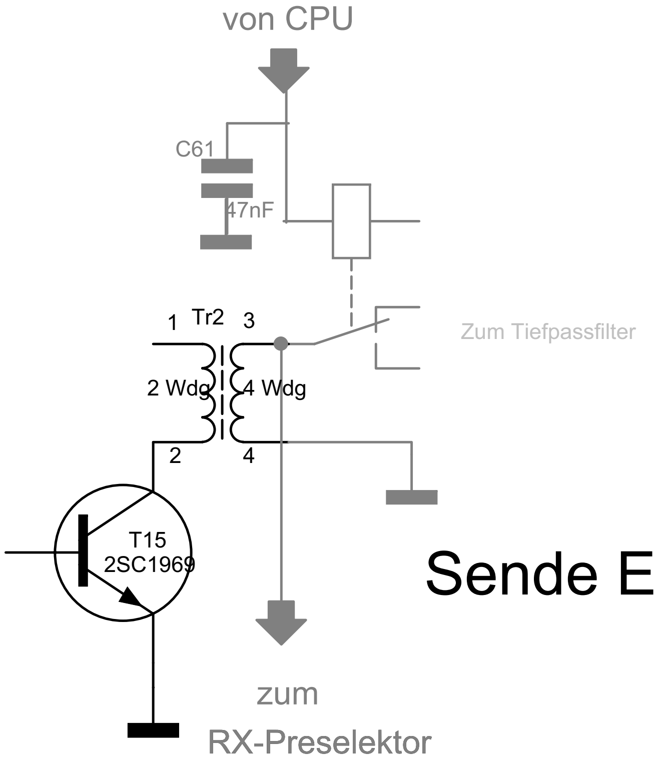
REV 01
DK1HE
BLAUE COOL RADIO
DL-QRP-AG
03/2005 SOLF
auf Lotseite
KEY
EARPHONES
12V DC
BG7
Rev: November 20 2006



Rev:Nobember 20. 2006



Rev: November 20 2006



Sende Endstufe

Rev:Nobember 20. 2006