RÁDIO
výrobní družstvo

TRANSCEIVER
R2 - CW
TECHNICKÁ DOKUMENTACE

PWR
80
60
40
20
S9
S5
S2
R
R2-CW
kHz
VFO A
VFO B
SSB
CW-L
CW-U
OFF
OFF
USB
SSB
OFF
CMP
CWF
LSB
CW
RIT
RANGE
144.0/.2
.2/.4
.8/145.0
VFO A
VFO B

Brief notes to schematic diagrams of the R2-CW transceiver

Introduction

RACOM a.s. (share union), is a young and dynamic Czechoslovak company designing and producing radiocommunication technology for the land mobile service and for ham radio. The R2-CW transceiver is a product of the RACOM's "anything worth doing is worth doing right" philosophy.

This 144 MHz CW/SSB transceiver was designed to meet the last years severe requirements of the electromagnetic compatibility, i.e. spectral purity of the transmitter output signal and immunity of the receiver againist strong rf input signals. These two improtant parameters, and other operational features of the R2-CW, are appreciated namely by contesters, serious DX'ers and meteor scatter operators.

The following text contains brief notes to the block diagram of the transceiver and to detail schematic diagrams of its nine PC-boards. Page references relate to the original booklet in czech language.

I. General diagram of the R2-CW

(page 2)

General schematic diagram of the R2-CW is showing that the fundamental technical concept follows a classical single conversion technique. The heterodyne signal, for both receiver and transmitter, is derrived by multiplying of the signal from the variable frequency crystal oscillator (VXO).

Very competing technical performance of the transceiver is done by keeping optimal signal and/or noice levels in the whole circuitry and by step-by-step checking of all important parameters in the course of production.

II. Variable frequency crystal oscillator board - VXO (page 4)

The Buttler type VXO uses two low - noise transistors T25 and T26. Operating point of these tranzistors is stabilized by D87, the Zener regulator. Special large surface crystals X5, X6, X7 were chosen in order to obtain maximum frequency shift without significant degradation of the signal quality. Series resonant frequencies of the above crystals are 16 897 kHz, 16922 kHz and 16 997 kHz. Each reactance circuit is connected to T25 emiter through respective switching diode. Reactance circuits are loaded by resistors R235, R238 and R241, 27 ohms each. This value of the load, much lower than the loading impedance performed by following circuit, contributes to the stability of oscillations in all three tuning ranges of the VXO. All three reactance circuits are fed from T26 emiter. Internal impedance of the feeding source is low due to R250 resistor. Thus, the diode switching does not influence nor frequency stability, nor the tunability of the VXO.

Parallel rf circuit in the T26 collector is tuned to the second harmonic VXO frequency (about 34 MHz) and dumped by R246. The 34 MHz signal is connected through C260 to the first diode frequency doubler, consisting of TR7 and D76, D77 Schotky diodes. Resistor R233 and the rf choke Tl23 are forming a matched load for the dc component of the doubler output. T27 is intended as linear amplifier, thus circuits L22-C272-C284-C258 and L23-C271 are tuned to 67,5 MHz. The second diode frequency doubler follows the T27 amplifier. Output signal is filtered in double bandpass filter and fed to the output connector. Typical level of the 135 MHz output signal is +10 dBm/50 ohms. Unwanted signals should be supressed more than 80 dB.

The basic frequency 17 MHz from the VXO is taken off through T28 buffer and fed to digital display board (CSL).

III. Mixers board - SMS (page 4)

On the SMS board are located main mixers in the receiving and transmitting path, 9 MHz i.f. crystal filter and circuits for RX/TX switching.

Receiving path is activated by a positive voltage at the +RX pin. Received signal at the RFRX pin is connected to JFET balanced mixer, formed by T20, T21. JFETs are working in a passive operating mode, without any supply voltage. A suitable gate - source bias is set by R205 potentiometer to reach the highest possible mixer dynamic range. The 135 MHz VXO output signal is amplified by T24. As the level greater than +20 dBm is required, T20 is operated in the AB class and its operating point is stabilized by D66 and D67 diodes. Mixer output circuit (C226, C230, C231, TR3) tunes on 9 MHz. It also transforms the input impedance of the T22 amplifier to optimum load for the mixer. T22 is an A-class amplifier, linearized by both the voltage and current negative feedbacks. The voltage

feedback also helps to minimise influence of great changes in load performed by crystal filter, especially on the edges of the pass band. Filter output, fed through the switching diode D65, is matched by the tuned circuit L14, C254, C237 to the input impedance of the i.f. amplifier, which is placed on the MFZ board.

Transmitting path is activated by a positive voltage at the +TX pin. The input 9 MHz DSB signal at the DSB pin is then connected to the filter (by D70). In transmitting path, the filter is loaded by the emiter follower T23. The signal from the T23 emiter is fed to the diode ring mixer (D62, D63, D64, D71 Schottky diodes) excited by the 135 MHz signal from the VXO board. Mixer output is loaded by the input impedance of the T19 linear amplifier. Output signal from the T19 collector is matched to 50 ohms load by the transformer TR6.

IV. Intermediate frequency board - MFZ (page 5)

On the MFZ board are placed the i.f. amplifier, the product-detector, 9 MHz crystal oscillator switched on USB, LSB and CWTX frequencies, the regulated a.f. amplifier and AGC circuits. All these functions are fulfilled by the only IC IO21, supported by three aditional transistors.

The input i.f. 9 MHz signal from the SMS board is connected through the balun transformer TR1 to the symmetric rf preamplifier input of IO21. IO21 mixer part is used as the product-detector. BFO signal is generated by T7. Desired frequencies are obtained by switching crystals and suitable serial capacitors. BFO output signal is connected to the BFO pin (then the signal is fed to the DSB board) and through R137 to the IO21 product-detector. The dc level from IO21 sets the operating point of T7.

Af signal from the product-detector is picked up from R108 and fed to the CWF board. There it is filtered, ten times (20 dB) amplified and returned back to the MFZ board through REGAFIN pin. R128, R120 divider has to be used due to necessity of stepping-down the input impedance of the regulated amplifier. The af output signal is fed to the REGAFOUT pin and to the full-wave AGC detector (T5, T6, D39, D40, D43, D44).

The AGC time constant is done by R133, R135, C99 and C100. A simplified functional description of this dual time constant circuit is as follows. A short pulse of strong signal (a keying click for example) charges only C99, which is then quickly discharged into C100 by relatively small resistance of R135. If a strong signal is effecting for longer time period, both C99 and C100 are charged. So they have to discharge through much higher resistance of R133.

It is possible to lower the maximal MFZ gain (i.e. to increase the AGC treshold) by manual gain control. The RFGAIN pin is connected to ground through the RF gain potentiometer, which acts as a variable resistance of 5 kiloohms at maximum. It sets the voltage at the D38 anode and consequently at IO21/pin 9. Circuit connected to D33 cathode is intended to assure full receiver sensitivity at the moment just after switching from transmitting to reception. R138 and R110 set the optimal ratio of gain regulation in the i.f. and a.f. part of the amplifier. C107 causes slower response of the i.f. part. That is necessary to avoid unstability in the AGC loop caused by signal group delay in CW filter.

V. CW and SSB filters board - CWF

(page 5)

On the CWF board are placed two independent active filters. The first one works as an audio low pass for SSB and is using the only op-amp (1/2 IO20). Its cutoff frequency is about 2,8 kHz and frequencies around 2 kHz are intentionally slightly accentuated.

The second filter was designed to reach almost ultimate response for CW reception. As some RACOM members are experienced CW contest operators, we first tried to set the optimal response for a CW filter. Then we have developed a filter performing such response. To design a special computer program for a PC was the most important part of that work. Great care was taken to avoid limitation of receiver dynamic range. You can see the result, either by measuring or by listening to CW signals.

CW filter uses 7 op-amps. Five of them are wired as active band-passes, remaining two are forming a band-stop filter.

D32 keeps the +RX bus from residual voltage after switching to transmission, T4 accelerates discharging of C62, C64, C65 and C67 after this.

VI. Audio frequency amplifier board - NFZ (page 6)

Af power amplifier is using common IC for consumer electronic devices, IO22, and the circuit follows data sheet recommendation. R145 and R147 were added to mute the af amplifier when transmitting SSB. There is also the side-tone generator on the board, formed by T8 and T9. R151 controls the side-tone level.

VII. Double sideband signal generator board - DSB (page 6)

The 9 MHz DSB signal is generated at the DSB board, which contains an automatic gain controlled microphone amplifier, the balanced modulator with dynamic compression circuit, a keyed amplifier for CW transmission and a roger-beep tone generator.

The i.f. part of IO15 is used as the microphone amplifier. A simple feedback loop with the D26, D27 detector acts as an AGC circuit. Constant signal level at the modulator input is assured by this. The rf part of IO15 works as the balanced modulator. R58 is set to

maximum suppression of the carrier. The DSB signal envelope is detected by D29, C43 and R63. Detected envelope voltage acting on IO15/pin 3 causes immediate gain regulation and therefore a signal compression. As the gain regulation curve of IO15 is nonlinear, the degree of compression depends on the input signal level. When the AGC of the microphone amplifier is activated, i.e. a sufficient signal level at the MIC input is present, this rf signal compression reaches the 20 db level.

When the CMP button is not pressed, a dc voltage appears at IO15/pin 9. The gain of the microphone amplifier is then about 25 dB lower. At the medium speech loudness, using an ordinary dynamic microphone, the operation of the whole modulating chain is almost linear and only modulation peaks are compressed. Very sensitive microphone can cause signal compression even when CMP button is not pressed. On the other hand, when a low sensitive microphone is used, it is recommended to switch CMP on, otherwise the average rf output power is lower than it is possible.

In CW transmitting mode, IO15 is unsupplied and the 9000 kHz carrier is fed to the keyed stage T3. The diode D28 in T3 collector acts as a switching one and contributes to mark/space ratio. The leading edge of the CW signal is formed by R45 and C48, its decay by discharging of C48 by T3. The final CW signal shaping is done by its transition through the i.f. filter. The bandwidth, occupied by the transmitted CW signal, may be additionally reduced by increasing value of C48. Consequently, the maximum usable keying speed will be lower then.

The roger beep circuit uses IO16. It is activated by grounding of the BEEP pin.

VIII. Digital frequency display board - CSL (page 8)

The CSL board forms a front sub-panel of the transceiver. There are placed A and B tuning elements, indicating LED's, af gain, rf gain and RIT control potentiometers, S-meter and digital display. The board contains the complete circuitry for the digital display, the source of tuning voltage including RIT circuits and the S-meter.

Frequency digital display is derrived from the 17 MHz output signal from the VXO. The incoming signal is divided by four in the IO4 prescaler and then counted in IO13 and IO14. IO9 to 12 act as latches and decoders for the 4-digit LCD O1. Necessary gating, strobe and reset signals are generated in IO2 and IO3. The clock signal is derrived from 3276,8 kHz crystal oscillator, by IO1 and IO5 dividers. The 6,2 V dc voltage supplying the display circuitry is provided from IO8, D2 and D3.

Relatively complicated circuit of the tuning voltage supply has to meet following requirements:

1) immunity against temperature and supply voltage variations. It is done by the double regulation of the reference voltage (D9, D10) and by very high gain of the IO7 op-amp.

2) almost zero current through tuning helipots moving contacts. These contacts are connected just to the IO7 input, which is consumpting nanoamperes of dc current at maximum.

3) linear tuning characteristic needs a pertinent non-linear tuning voltage function of the helipot's rotation angle.

RIT circuit uses T1. The voltage drop on R27 is added to the reference voltage. Switching is done by appropriate voltage at +RIT or +NRIT pins.

S-meter uses twelve diodes strip to indicate either received or transmitted signal levels. LED's are controlled by IO6. S-meter inputs are at pins RFIND (from PAP) and SMETER (from MFZ).

IX. Rf power amplifier board - PAP

(page 9)

The PAP board is fixed to the rear panel of the transceiver. The rear panel also serves as a heat sink for power transistors. The board contains the input 144 MHz filter, followed by the three stage linear power amplifier and output low-pass filter, antenna relay, T/R switching circuits and protection circuits againist low supply voltage and antenna disconnection.

Rf output signal from the SMS board is fed through RFTX pin to the 3-stage band-pass filter. Another band-pass filter follows the T15 amplifier, providing impedance match between T15 and T16. Both T15 and T16 are A-class amplifiers. The final stage uses T17, operating in B-class. All these transistors have diode stabilized bias, final stage linearity is improved by negative feedback at emitter resistors. Transformation of the load impedance to T17 collector is provided by the L-network formed by reactances connected to L2. The following double pi-network (L4, L5) increases the suppression of unwanted harmonics.

Antenna relay is placed near by the antenna connector in order to minimise output power losses and to reach the best possible receiver noise figure. T10 receiver front-end amplifier uses a high quality air coil at the input, wound by the silver plated wire of 1 mm diameter. R186 in T10 collector and ferrite beads TI3, TI4 are preventing self-oscillations of the amplifier. In order to reach the maximum strong signal immunity, the collector current of T10 is set to about 15 mA.

Undervoltage protection circuit (T13, D52) prevents to switch the transceiver to transmission when the supply voltage falls under 11 V limit.

Antenna disconnection is detected by D49 and T18. When the outer dc short connection is not present on the antenna connector, T18 switch off the inner +TX bus. So, zero rf power can be generated then. Some additional informations concerning this protective measure can be seen on the last page of this paper, in the point 5. (Antenna).

X. Interconnection board - PRD

(page 10)

On the PRD board are placed connectors of all boards. This board provides necessary interconnection of pertinent pins. More over, on the PRD board are placed all button switches, all connectors accesible through the rear panel and protection circuits againist supply overvoltage and reverse polarity. Diodes D59 and D60 are preventing from undesired influence of residual voltages from RIT circuit. D61 Zener diode acts as the voltage regulator for VXO range switching circuit.

Operating the transceiver

1. Power supply

The nominal operating voltage of the R2-CW is 12,6 V dc. The admissible range of the supply voltage is from 11 to 14 V dc.

Undervoltage protection (see PAP board) starts below 11 V. Overvoltage protection (by a fuse and thyristor - see PRD board) is to act at about 15 V.

Current consumption of the whole transceiver is max. 2 A (transmitting), 0,33 A when receiving. It is recommended to use a properly dimensioned supply cord for the transceiver, to avoid undesired supply voltage changes (see your operating manual).

2. Microphone

Due to automatic gain control of the microphone amplifier and to the modulation compressor (see DSB board), it is possible to use almost all common microphone types. Overloading of the microphone input cannot result in splatters or any other way of interference caused by transmitted signal. But, the quality of modulation can only be as good as your microphone is.

The input impedance of the microphone amplifier is about 600 ohms.

3. Keying

The outer keying device has to be able to switch the voltage of about 12 v dc at the current of 1 mA. The minimum rated keying speed is 2000 letters per minute (LPM), but typically you can use keying speed as high as 4000 LPM.

4. Headphones and loudspeaker

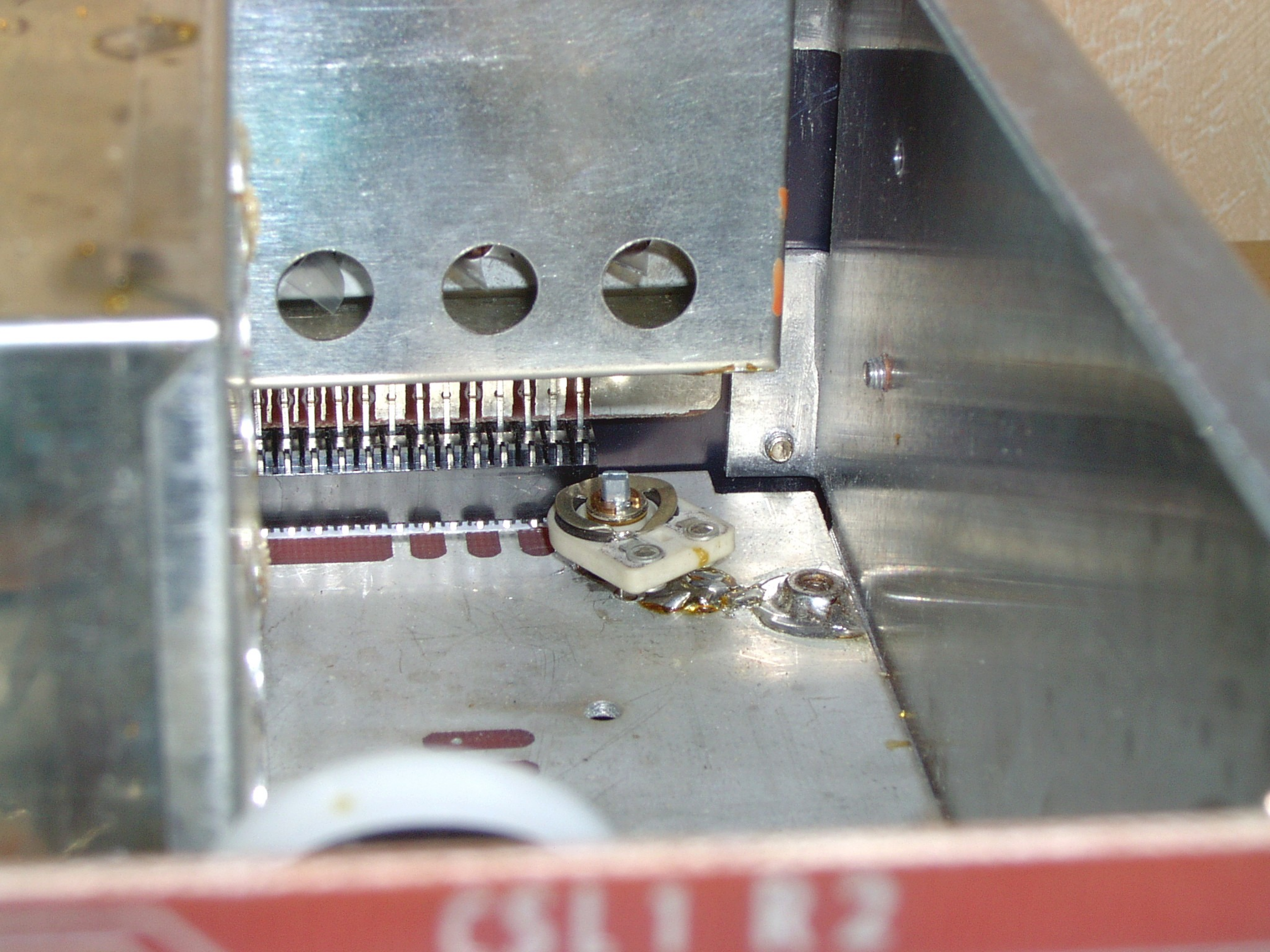
It is possible to use any current type of headphones. The optimum impedance of external loudspeaker is 4 to 8 ohms.

5. Antenna

Nominal rf load impedance at the antenna connector is 50 ohms, but the transmitter accepts also 70 ohms load (VSWR 1,4).

It is worth to remember, that the central (hot) conductor of the antenna cable must have a dc short connection (100 ohms of resistance at maximum) to the ground - see the protection circuit with T18 and D49 on the PAP board. Without this dc connection the transceiver will not transmit any power. This protective measure is considered usefull especially when external accessories are in use. For example, this circuit can assure reliable protection of an remote rf preamplifier from being destroyed by transmitted power. If your antenna doesn't perform dc shortcut, simply add a rf choke to the antenna end of the cable.

R RACOM a.s.
NOVÉ MĚSTO NA MORAVĚ
TRANSCEIVER R2-CW
v.č. 197 rok výroby : 1992



RACOM a.s.
radio communication

Dear customer,

as we are continuously trying to meet your demands, we are continuously making improvements in our products. Thus it becomes sometimes that operating manual is not quite up-to-date.

Your transceiver is now equipped with control of output RF power. Before this transceiver left us for our dealer, it had been adjusted for maximum available RF power (the value can be found in enclosed list of measured parameters of your transceiver). Now, if you turn the transceiver upside down, you will find small hole through bottom cover, near one of rear foots (the right one if transceiver is in normal operating position). With suitable screwer you can reach variable resistor, which controls the output power. Turning clockwise you are decreasing the output power, so you can adjust your desired level. As that variable resistor is placed directly in RF signal path, it is better to use an insulated instrument. When using metal screwer, it is recommended not to operate transmitter during adjustment. But don't worry to try - there's NO danger of electrical damage of your transceiver, just the level of output power will be affected by touching the variable resistor's body with metal.

This way of RF power reduction does not influence the quality of transmitted RF signal. More over, with lowering the RF power level, the 3-rd order IMD products are suppressed better. Only under approximately 100mW level the noise performance of transmitter is slightly affected, but it still remains excellent.

We hope that this improvement enlarges operational capabilities of R2-CW and you will enjoy your 2-meter band activity with it.

Hinweis:

Der R2-CW Transceiver ist mit zahlreichen Schutzschaltungen ausgestattet. U.a. wird das Antennenspeisekabel auch Unterbrechung überwacht. Der Transceiver muß zu diesem Zweck einen ohmschen Widerstand > 100 Ohm 'sehen', was bei üblichen Antennenspeisungen (Faltdipol, Gammamatch usw.) gewährleistet ist. Bei Verwendung von HB 9 CV-Antennen oder Vertikalstrahlern ist eine handelsübliche HF-Drossel (z.B. VK 200) zwischen Innenleiter und Außenleiter des Speisekoaxkabels zu schalten. Dies gilt im übrigen auch bei Verwendung von Endstufen, die nicht galvanisch angekoppelt werden.

5.Technical description

The R2CW features modular construction. It consists of 9 etched circuit boards which - except PRD and CSL boards - are placed in individual screening boxes.

Transmitting path

The double sideband 9 MHz signal is generated at the DSB board. The DSB signal is either modulated by the microphone audio signal (SSB mode) or unmodulated (CW mode). The DSB signal is then fed to the SMS board where the CW, USB or LSB signal is separated by a 9 MHz crystal filter and mixed with the control oscillator 135 MHz (VXO) signal. This later one is generated at the VXO board. The 144 MHz signal from the mixer output is fed to the internal linear amplifier to reach the rated output power.

Receiving path

The input signal from the antenna flows to the preamplifier at the PAP board. The preamplifier signal is then fed to the SMS board where is it mixed with the 135 MHz control oscillator (VXO) signal. The resulting mixer product is filtered out in the 9 MHz crystal filter and then fed to the MFZ board. This board contains i.f. amplifier, product detector, a.f. preamplifier and pertinent AVC circuits. Between the product detector output and the a.f. preamplifier input is the a.f. signal branched to feed it for filtering at the CWF board. Either the preamplifier a.f. signal, or the output signal from the filter is connected to the NFZ board containing the a.f. power amplifier and the switchable speaker.

6.Construction

The R2CW is built on double sided etched circuit boards with plated holes. Boards are placed into individual screening boxes and connected through connecting board. The complete of 9 boards is built in the aluminium cabinet.

7.Operation and maintenance

The R2CW may only be operated by the authorised person, i.e. a person owning the pertinent and valid amateur radio operation licence.

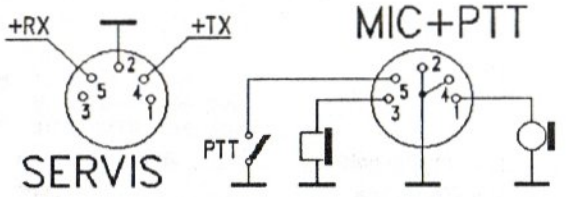
From the point of view of the user, the equipment does not require any special maintenance, but it is necessary to keep operating requirements to avoid presence of moisture, rain, hard shocks and to keep the R2CW clean.

8.Connection of accessory

The R2CW is not equipped with the power supply. The transceiver can be powered either from a 12 Volts accumulator or a 12 V net power supply. Regarding to the significiant difference between the current consumption in receiving and transmitting mode, it is necessary to use an appropriately rated and well regulated net power supply. More over, it is necessary to provide good a.c. filtering and to take measures to eliminate possible unwanted influence on the power supply functions caused by strong r.f. electromagnetic field, especially when you are using an external r.f. power amplifier. The d.c. power cord should be made of insulated copper conductors with the cross-section area of 1 mm min. at the lenght of 1 m max. When longer cord, use conductors with proportionally larger cross-section area. The voltage drop on the conductors at the current of 2 A is not neglectable.

Rear panel connector labeled MIC+PTT contains microphone input pins, PTT switch pins and headphones output pins. It is possible to use any type of dynamic microphone, but types with 200 to 600 impedance are most suitable ones and recommended. Higher signal level at the microphone input results in higher degree of output signal compression.

The R2CW does not produce signal splatter even when extremely strong modulation signal is present at the microphone input. In this case the quality of modulation is not too high. We recommend using the R-M microphone produced by Racom a.s.



Rear panel connector labeled SERVIS may be used to control the external r.f. power amplifier. A positive approximately equal to operating (power supply) voltage is alternatively present at pin +RX and +TX according to the actual operating state of the R2CW. Maximum current consumption from both above pins is 70 mA.

Function of other rear panel connectors is evident from their labels.

The rear panel screw labeled DELAY is used for adjusting of the transition time delay (from transmitting to receiving state of the R2CW) when operating CW.

Function of the front panel push-button switches is evident from their labels. The push-button labeled CMP switches the modulation compressor on or off.

Take into account that proper transmitting/receiving switching functions of the R2CW are fulfiled only in the case when a galvanic (low resistance, R < 100 ohm) connection is assured between the inner pin of antenna connector and the connector body. It is therefore necessary to assure this condition when connecting an external r.f. power amplifier, as well as when connecting antenna. Do not forget, that the purity and modulation quality of the output signal can be significantly degradeg by a low quality or by not properly adjusted external r.f. power amplifier. It is therefore recomended to choose a suitable type of it or to design and construct your own external r.f. power amplifier with maximal possible care.

RACOM s.r.o.
radio communication

R2-CW

CW/SSB 144 MHz transceiver

Bělisko 1349, 592 31 Nové Město na Moravě
Czechoslovakia

The

R2CW transceiver

is designed and manufactured by a young and dynamic Czechoslovak private share union RACOM. The company expresses its thanks for your confidence in its product and draws your atention to folowing paragraphs.

1. General

The R2CW is a modern transceiver for CW and SSB operation in the radio amateur 2 meters (144 MHz) band. The r.f. design and construction of the equipment meet actual high demands of the amateur contest operation and emphasize modulation quality and spectral purity of the output transmitted signal, as well as excellent receiver parameters, such as front-end desensitiation, noise figure, sensitivity and selectivity.

The actual situation on congested radio amateur bands is often very hard and troublesome with respect to mutual interference. Technical properties of the R2CW should eliminate strong signal desensing of the receiver and allow to operate your station even in the case when your neighbouring radio ham operator is separated only by several hundreds meters from your operating site.

Receiving part of the R2CW transceiver offers top values of selectivity and of the front-end overloading. Its transmitting part is producing extremely clean and quality signal. If your nearest neighbouring ham is operating equipment of the same top quality as the R2CW, you both can take part in a contest without any mutual interference.

The R2CW is a top performer also in the meteor scatter operation. CW keying circuits are able to handle keying speed to 4000 letters per minute.

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2. Accessories and spare parts

The folowing parts and accessories are supplied with each R2CW:

1 fuse 2 A,

1 connector WK48298 (cable type PL259),

2 connectors WK45903 (cable type stereo jack 3,5 mm),

2 connectors 6AF89777 (5 pin audio cable type),

1 connector 6AF98541 (cable type power supply cinch).

Please check if all above parts are packed with and placed in the R2CW carton box.

3. Technical parameters

Frequency ranges: ..... 144,0 - 144,2 MHz
..... 144,2 - 144,4 MHz
..... 144,8 - 145,0 MHz

Tuning: ..... continuous, 20 kHz per revolution,
..... two independent tunings

Frequency scale: ..... 4 digit LCD display
.....resolution 100 Hz

RIT range: ..... +/- 2,5 kHz

Temperature stability: ..... better than 150 Hz / 1 °C

Noise figure: .....3 dB

Front-end IP3: .....0 dBm

Receiver sensitivity: ..... better than -126 dBm
..... (0,112 uV/50 ohm for S/N = 10 dB

Receiver bandwidth: .....SSB 2,2 kHz, CW 300 Hz

Two-signal selectivity
(SSB/CW): ..... +/-1 kHz - / 70 dB
..... +/-5 kHz 80dB / 88 dB
..... +/-20 kHz 100dB / 108 dB

Reciprocal mixing noise: .....-143 dBc/Hz/20 kHz

AVC regulation range: ..... 110 dB

Manual r.f. sensitivity control:.....min. 120 dB

S-meter:..... 12 LED's, S3 to S9 +80 dB

Switchable CW filtr: ..... 300 Hz/-3 dB
..... 900 Hz/-60 dB

Transmitter output power (CW): .....7 W/50 ohm

Suppression of unwanted emissions: .....min. 60 dB

Noise spectral purity of the
output signal: .....better then -141 dBc/Hz/20 kHz

Operating d.c. voltage: ..... external 12,6 V (11 to 14 V)

Current consumption:..... receiving 300 mA approx.
..... transmitting 2 A approx.

Protections: ..... at undervoltage transceiver does not
..... switch on the transmitting mode,
..... at overvoltage and/or uncorrect
..... polarity the fuse burns out,
.....at antena disconnection transceiver
..... switches on the transmitting mode,
.....but it does not transmitt.

Admissible ambient temperature:.....- 5 to + 35 °C

Dimensions: ..... 280 x 220 x 90 mm

Weight: ..... 3 kg

4. Warranty and servicing

This product is warranted against defects in materials and workmanship for a period of one year from the date of purchase.

Warranty and after warranty service is provided by the manufacturer or by authorized firm in the Federal Republic Germany.

Any questions with respect to the warranty should be taken up either with authorised firm or with the manufacturer.

Address of the manufacturer:

RACOM s.r.o.
Bělisko 1349
592 31 Nové Město na Moravě
Czechoslovakia
tel./fax (42 616) 916 578

Address of authorised firm in the FRG:

Date of purchase: 4. listop. 1992

R2CW serial Nr.: 197/92

Dealer's certification:

RACOM s.r.o.
RADIO COMMUNICATION
Bělisko 1349
592 31 Nové Město na Moravě
Czechoslovak R.

Dipl.Ing. HELMUT OELLER
Beratender Ingenieur

Lange Zeile 7 A
90419 Nürnberg
Tel./Fax 0911-379603

Rechnung

Nummer 93/3

7.Sept.1993

Ihr Auftrag Tel 06.09.1993 Postpaket

Wir liefern für Ihre Rechnung und Gefahr

1 Stück VHF-Transceiver R2-CW	DM 1099.--
Verpackung und Versand	DM 25.--
Rechnungsbetrag	DM 1124.--

In diesem Betrag sind DM 146.61 gesetzliche Mehrwertsteuer enthalten.

Der Rechnungsbetrag wurde per Vorkasse erhoben

Siegmar Kleine
A. Dürer Str. 3/78
D-99610 SÖMMERDA
Tel.u.FAX 03634-600814

Sömmerda, den 21.08.1997

Lieber OM!

Anbei der gewünschte Quarz.
Ich bedanke mich für die Überweisung der Unkosten.

Vielleicht ein paar Hinweise zur Umrüstung des R2-CW.
Beide Gehäuseteile abschrauben.
Die Baugruppe VXO (in Normallage des Gerätes 4.Baugruppe von links) von unten mit 2 Stück M3 Schrauben lösen und nach oben vom Steckverbinder abziehen.
Obere und untere Weissblechabdeckung der Baugruppe ablöten.
Jetzt den Quarz X7 , es ist der vordere am Steckverbinder, auslöten.
Den neuen Quarz einlöten.
Der Abschirmbecher der Spule L17 muss entfernt werden (eine Lötstelle direkt am Steckverbinder).
Der Abgleichkern musste bei mir etwas herausgedreht werden.
Die niedrigste Frequenz muss mit dem Kern auf ca. (144) 398.0 abgeglichen werden.
Die obere Frequenz liegt dann bei etwa (144) 550.0
Das bedeutet, es werden nur ca. 150 KHz überstrichen, was aber völlig reicht.
Wer gerne die 200 KHz wieder haben möchte, muss auf die Spule L17 etwa 12 Windungen CuL 0,1mm zusätzlich aufbringen und C264 (82pF) in 180pF ändern. Danach wieder abgleichen s.o.
Ein anderer Kern schafft auch nicht die 200 KHz.

Ich habe es sein lassen, da mir 150 KHz reichen !!!

Jetzt die beiden Blechteile wieder anlöten, Baugruppe einstecken und von unten wieder anschrauben. Funktionsprobe!!!!!

Gerät wieder zuschrauben und alles ist erledigt.

Herzliche 73 de Sigi
DL 3 AMA

73 Sigi

DELAY

50-70 Ω/144 MHz

R RACOM a.s.
NOVÉ MĚSTO NA MORAVĚ
TRANSCEIVER R2-CW
v.č. 197 rok výroby : 1992

KEY PHONES SPEAKER LIGHT F 2,5 A =12,6 V/1,8 A SERVICE MIC·PTT