Modification of NRD 515

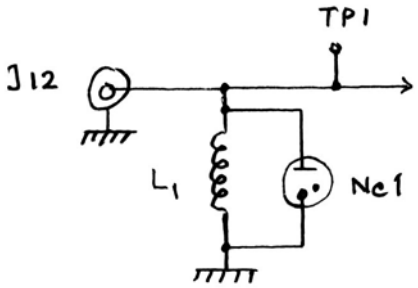
NRD 515 is one of the most popular medium wave receivers you can find. Unfortunately like it´s successor NRD 525, it has some minor shortcomings:

- preselector for MW with varicaps - reduced sensitivity
- always 5 dB attenuation on MW- reduced sensitivity
- arrester diodes in signal input chain causing intermodulation
- no IF-filter ahead of the detector – generating broadband noise

In the following notes you will find a few modifications which will change your NRD 515 to a top notch receiver.
These modifications are based on several years of experimentation together with a wellknown swedish MW-dxer, Stefan Wikander.

Removal of arrester diodes in the signal input chain.

The diodes CD83 - CD86 on the CMA105 board shall be removed and replaced by a 1 mH-choke parallelled by a neon bulb to earth. The arrester diodes generate a lot of strange intermodulation and crossmodulation all over the bands when the signal strength is too high.
Curcuit description:
(1.jpg)



L1 = Choke 1 mH
Ne1 = Neon bulb

Replace BC preselector with a bandpass filter 0,6-1,6 MHz.

The preselector for the MW-band is not too good. It has internal attenuation of the signal by at least 5 dB and must be peaked as soon as the frequency is changed. The varicap-diodes used can´t handle strong signals. If the preselector is replaced by a 50 ohm bandpass filter designed from the circuit digram below you get very good results. The bandpass filter is built on a circuit board exactly of the length so it can be mounted on the upper side between CD3 and CD4. It is attached to the chassis side with a small screw. Just lift up the inner part of the diodes CD3 and CD4 and attach to the input and output to the new bandpass filter. One small wire shall be attached to ground and one small wire shall be attached to R8 on the CMA105 board to activate the filter when MW is switched in.
With this filter there will be no difference in signal strength at the turnover frequencies when switching to the bandpass filters below 0,6 mHz or above 1,6 mHz.

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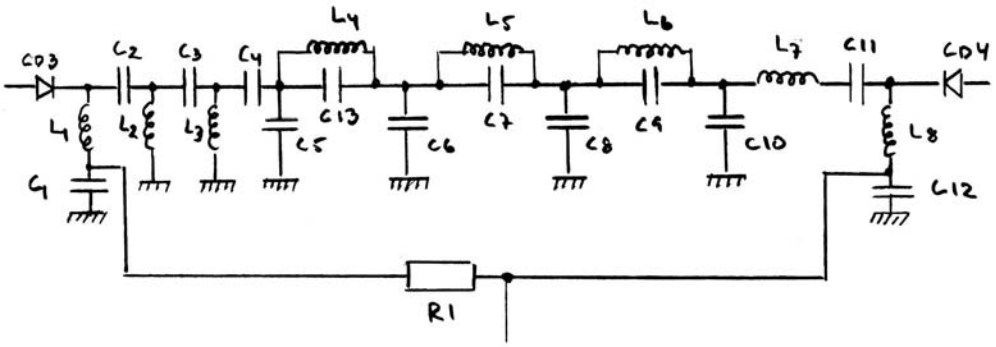


Component list:

C1, C11, C12 = 0,01 uF	C13 = 220 pF	C3 = 4700 pF
C2, C4 = 8200 pF	C5 = 2200 pF	C6 = 3300 pF
C7 = 820 pF	C8, C10 = 1800 pF	C9 = 680 pF
L1, L8 = 470 uH	L2 = 10 uH	L3, L5 = 4,7 uH
L4, L7 = 6,8 uH	L6 = 3,3 uH	
R1 = 100 ohm		

IF-filters.

The AUX-filter FL5 can be fitted with a CFJ44K4, which is an excellent filter having a bandwidth of 3,2 kHz@ 6 dB and a good shape factor.
Alternatively a CLF-D2K from KIWA can be used, as the K4-filter is difficult to obtain.
For the other positions the standard filters can be used with good result.
More information about the KIWA filters can be found at:
http://wolfe.net/~kiwa/kiwa455.html

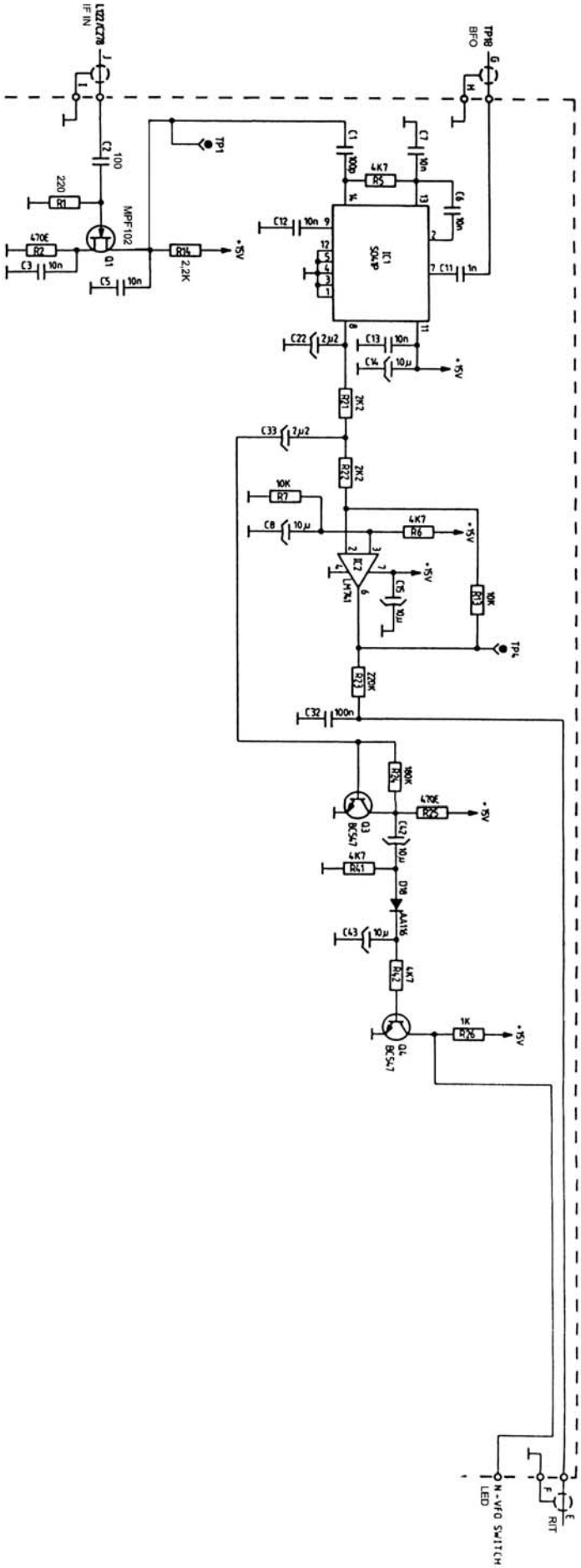
Fitting the NRD 515 with PLAM.

To get the best signal quality when using ECSS, it is best to fit a PLAM board. The ESKAB board is unfortunately no longer available. It is quite easy to build this unit on a small circuit board by following this drawing. The PLAM unit is always switched on.

J = junction between L122/C278/C280
E = pin 4 on IC38
G= TP18
N= Centre pin on VFO switch

C1, C2 = 100 pF	R1 = 220	D18 = AA116
C6, C7, C12	R5, R6, R41, R42 = 4,7K	SO41P
C3, C5, C13, = 10 nF	R14, R21, R22 = 2,2K	MPF102
C22, C33 = 12,2uF	R7, R13 = 10K	LM741
C11 = 1 nF	R23 = 220K	BC547
C8, C14, C15 = 10 uF	R24 = 180 K	
C32 = 100 nF	R2, R25 = 470	
C42, C43 = 10uF	R26 = 1K	

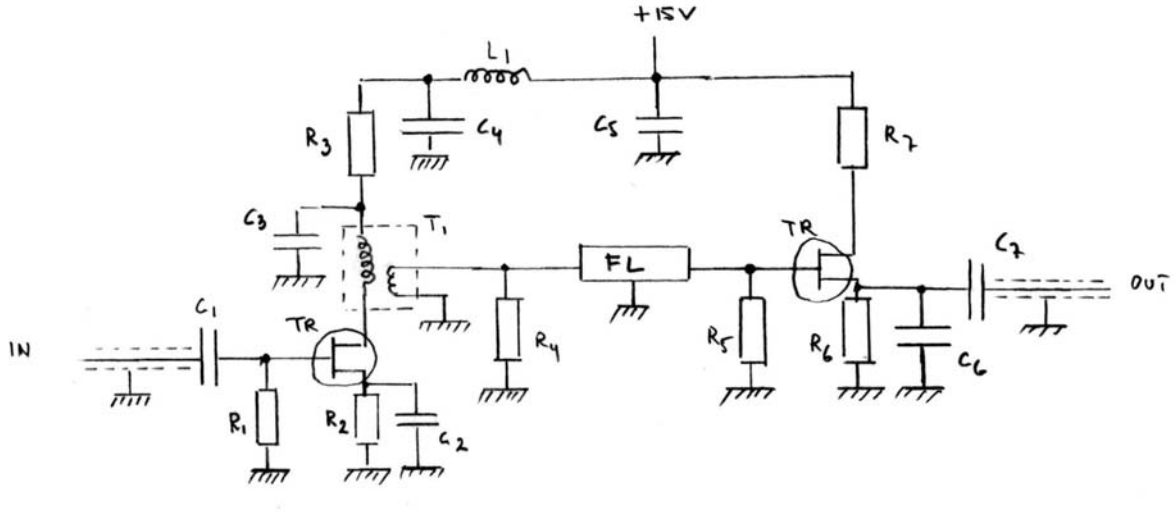
(8.jpg)


IF IN
BFO
TP1
TP2
TP3
TP4
MPF102
Q1
Q3 BC547
Q4 BC547
IC1 SO42P
IC2 LM741
+5V
LED
N-VFO SWITCH
RIT

Adding a cascading filter unit ahead of the detector.

To obtain substantially better ultimate-rejection and removal of the broadband noise noticed at narrow bandwidth, it is recommended to add this extra filter unit just ahead of the detector. Remove C284 and attach the IN and OUT wires instead. Please note which side is IN of C284. The filter used is depending of the bandwidth of the WIDE position. Normally the filter used in this extra unit shall be 0,2 - 0,3 kHz broader than the normal WIDE position. The filter shall be of the type CFK455H or CFK455I. For very narrow bandwidths a small amount of broadband noise can be noticed with these filters. Te remedy this, two separate filter units can be attached and switched by a relay. For *Wide* and *Aux* use a CFK455I and for *Inter* and *Narrow* a CFJ455K4. (I also have a complete drawing for a board with 2 separate filters & amplifers).

(3.jpg)

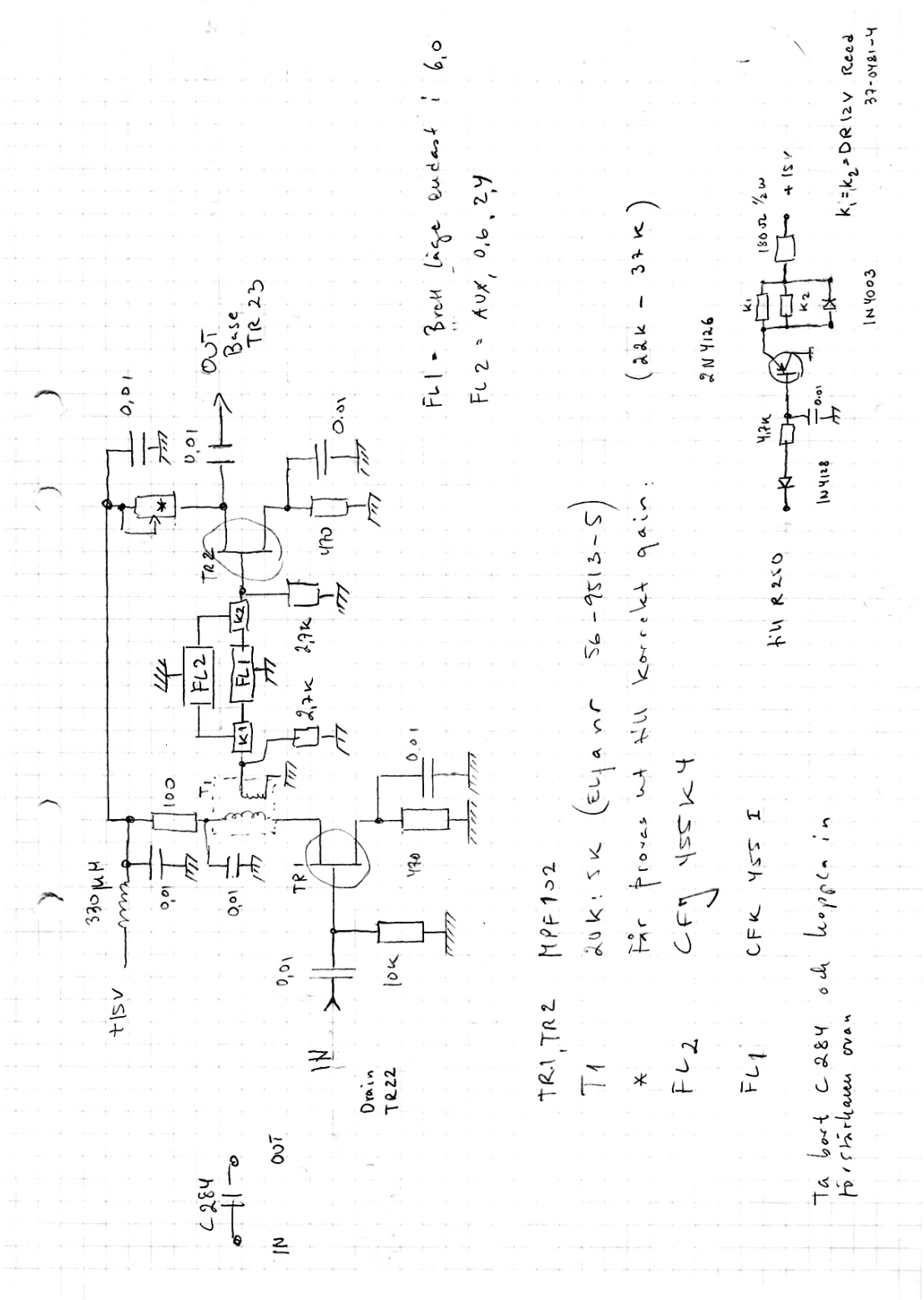


Components:
C1, C2, C3, C4, C5, C6, C7 = 0,01 uF
R1 = 10K
R2, R6 = 470
R4, R5 = 2,2K
R3 = 100
R7 = c:a 19K (try out the value to get the same gain as without the new filter unit)
L1 = 0,33 mH
T1 = 455 kHz 20K:5K transformer (TOKO or similar)
TR = MPF102 or similar
FL = CFK455H or CFK455I

Using a 2-filter board with relays

The schematic below shows the initial layout for using 2 filters in the cascading unit. The initial plan was to change filters within one amplifier stage. In reality it ended with a board using 2 separate amplifier stages, one for each filter.

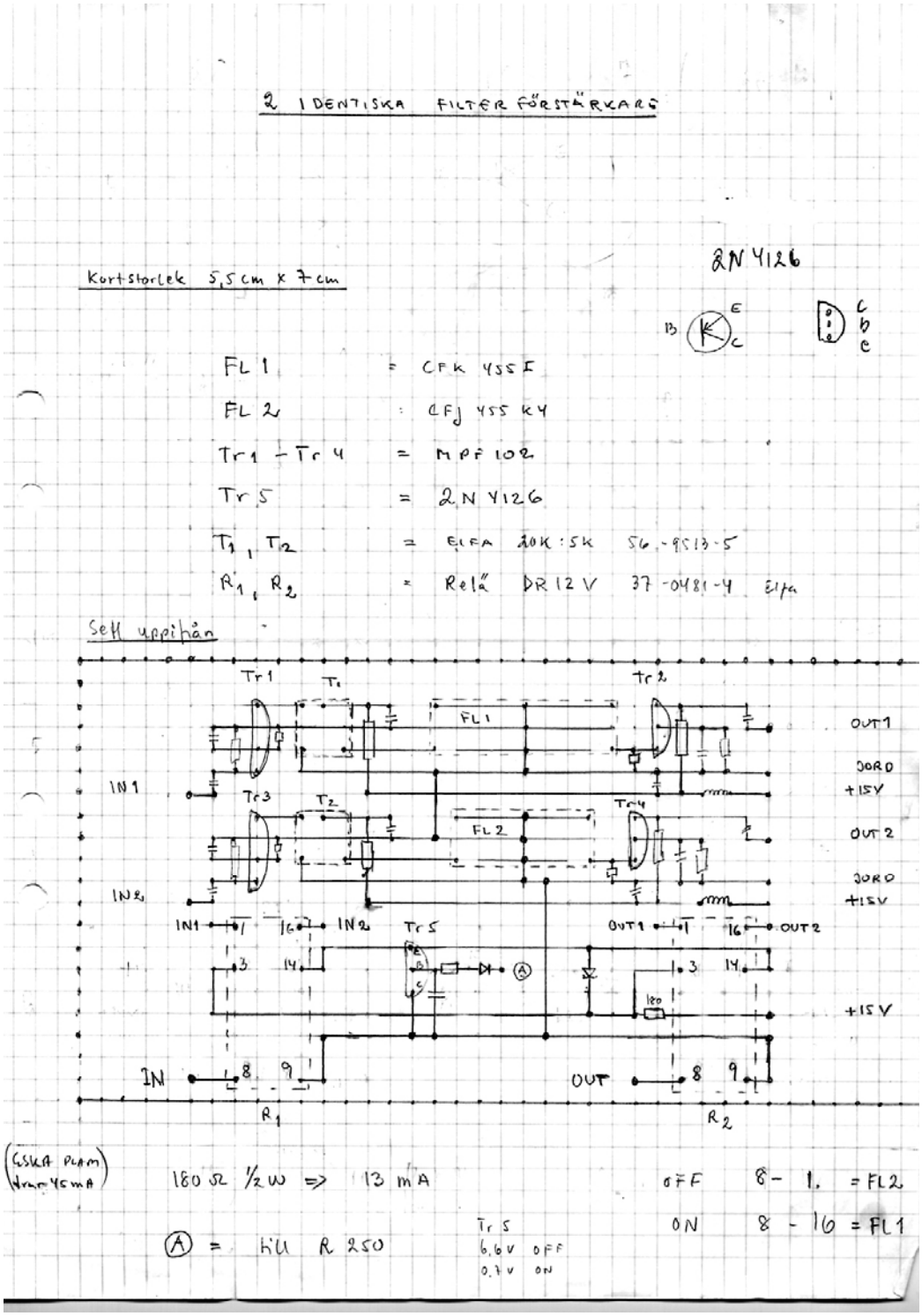
FL1 is used for WIDE and FL2 is used for AUX, INTER and NARROW.



The final layout for 2 identical filter amplifiers.
Below is the layout seen from top of the experimental board (final size 5,5 x 7 cm)

The experimental board is Elfa part no 48-202-70 with parallel copper bands, 1,2 mm holes and 2,54 mm raster.

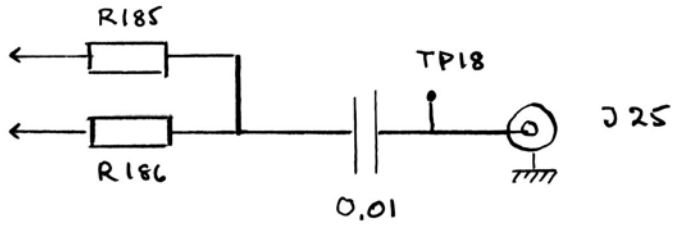
T1 & T2 20K:5K 455 kHz transformer (Elfa part no 56-951-35)
R1 & R2 is 12V relay (former Elfa part no 37-048-14, no more in stock). The relay used was a SDS relais type DR-12V http://images.mercateo.com/pdf/Schuricht/DR.pdf



Inserting a 0,01 uF condenser in the BFO-chain.

To get a better ratio between BFO/IF-signals, insert a 0,01 uF condenser according to this drawing:

(4.jpg)



Removing R256 in the Noise blanker.

To get much better effect from the noise blanker, short out R256. Change R113 to 4,7K. Adjust RV2 to c:a ¾ of maximum gain.

More hints.
Due to signal leakage from the first mixer to the second mixer there will be some image frequencies 910 kHz below the wanted signal.
These image frequencies will be eliminated if an antenna tuner type Yaesu FTR 7700 or similar is used. It is also possible to use some extensive shielding but more difficult to obtain good results.

Elfa is a Swedish supplier of parts, www.elfa.se

If anybody needs additional information, feel free to contact me via E-mail.

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