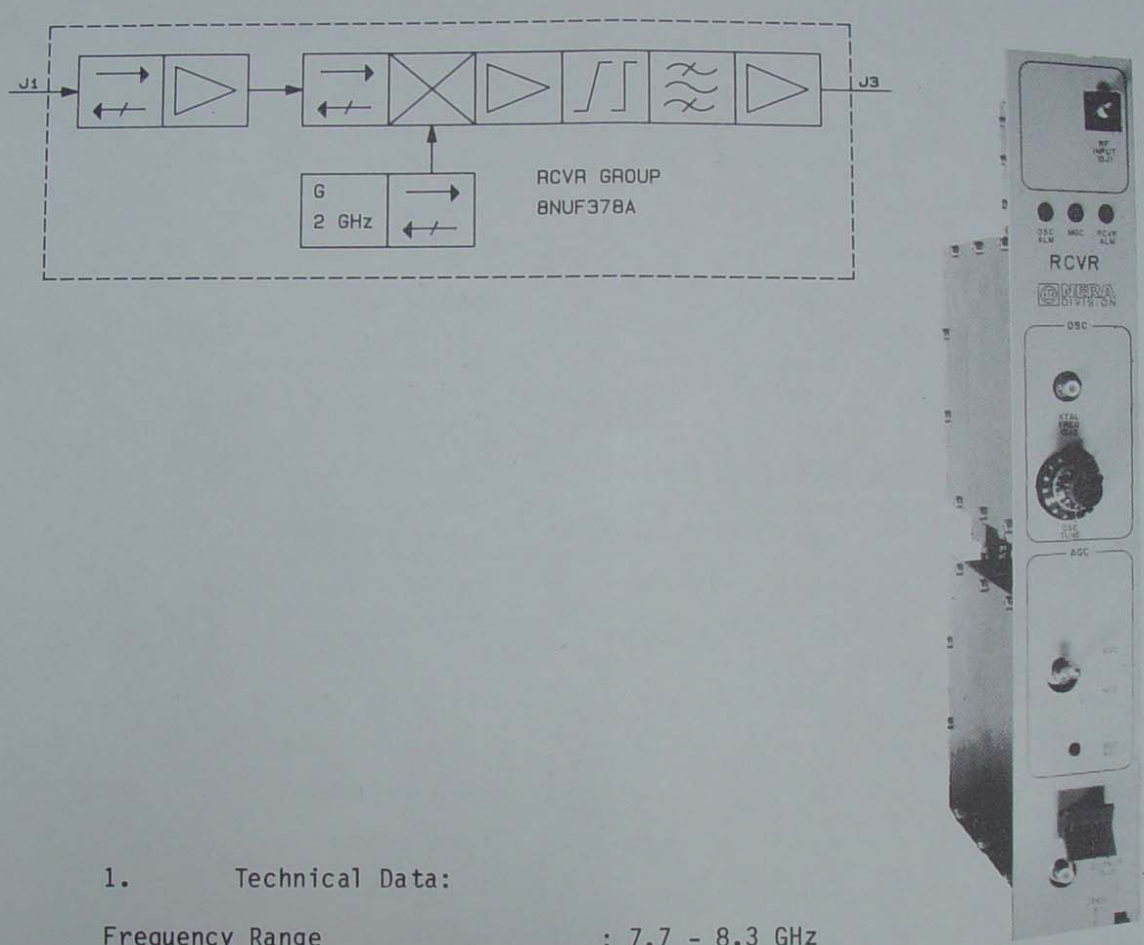


8 GHz surplus receiver group 8NUF378A from NERA

Rev 1.1

Hello,

recently a surplus 8 GHz down-converter unit was offered from Tom Babut in the deep-space yahoo group. I could get some information about the unit like schematic and also made some pictures of the unit. This is not a complete tear-down analysis but an interim report to help those who are interested in the unit.



1. Technical Data:

Frequency Range	: 7.7 - 8.3 GHz
Input Impedance	: 50 ohm
Output Impedance	: 75 ohm
Input Signal Range	: -30 to -85 dBm
Temperature Range	: 0 to 50 °C

2. General:

The Receiver Group 7.7 - 8.3 GHz is composed of the following units:

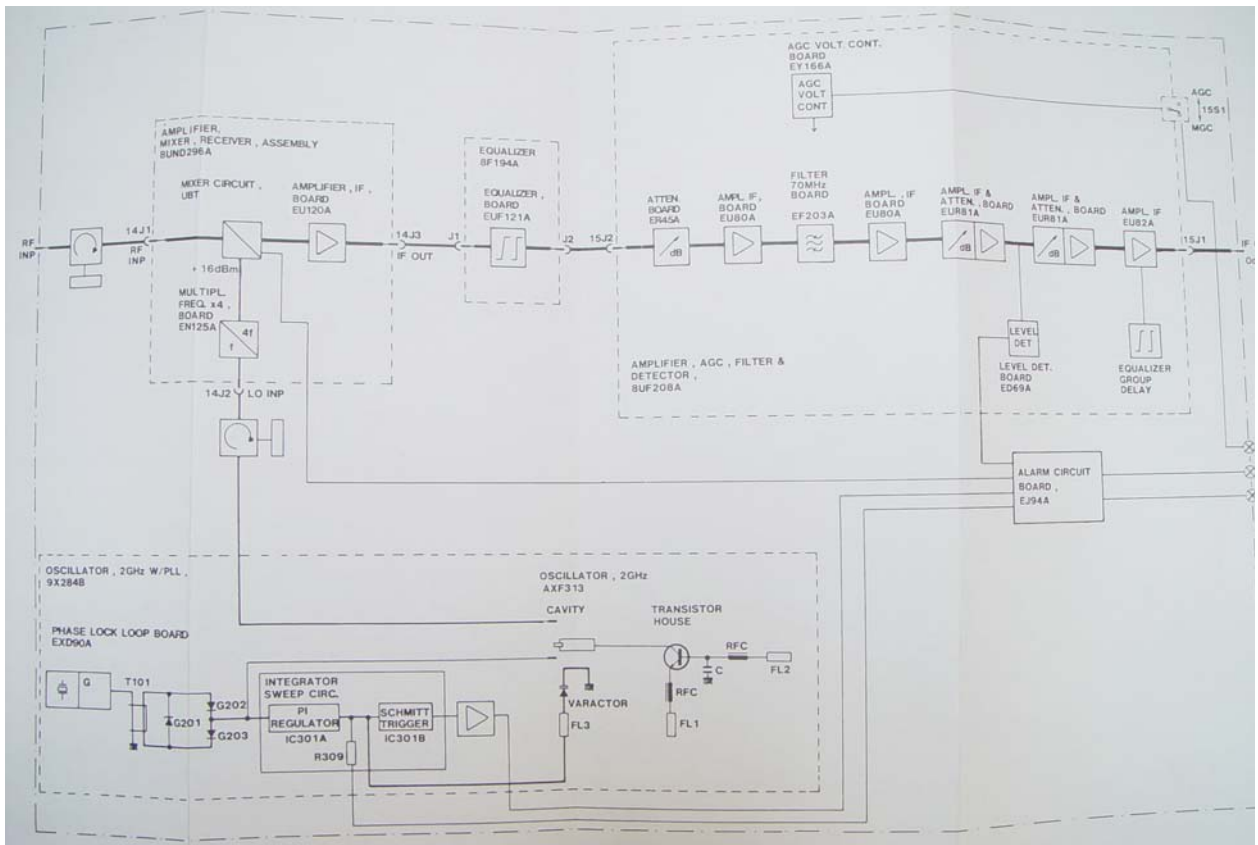
Oscillator 2 GHz w/PLL	9X284B
Amplifier AGC & Filter IF	8UF208A
Ampl. & Mixer, Receiver Assembly	8UND296A
Alarm Circuit Board	EJ94A
Equalizer	8F194A

For 9X284B, 8UF208A & 8F194A, see separate descriptions.

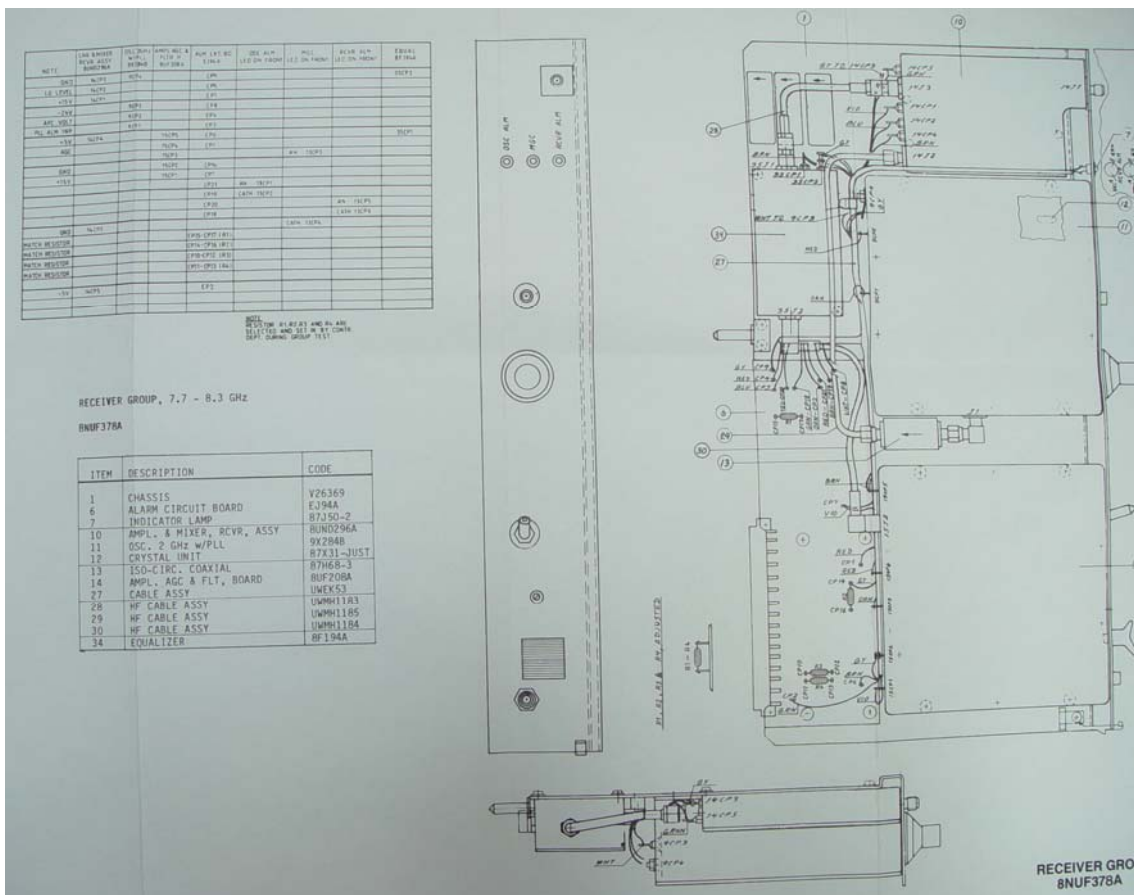
Here are some pictures of the RF unit, power supply unit and an additional 220/48V power supply unit:



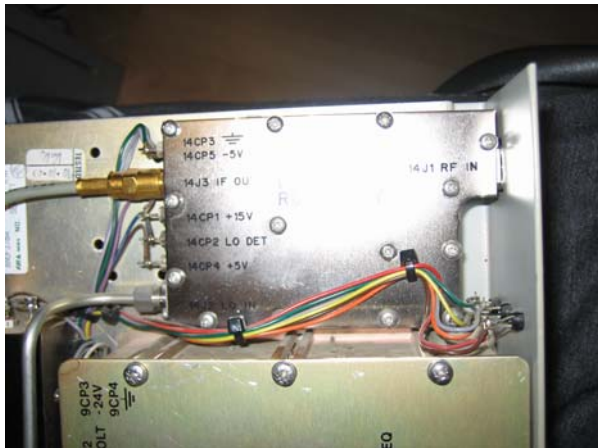
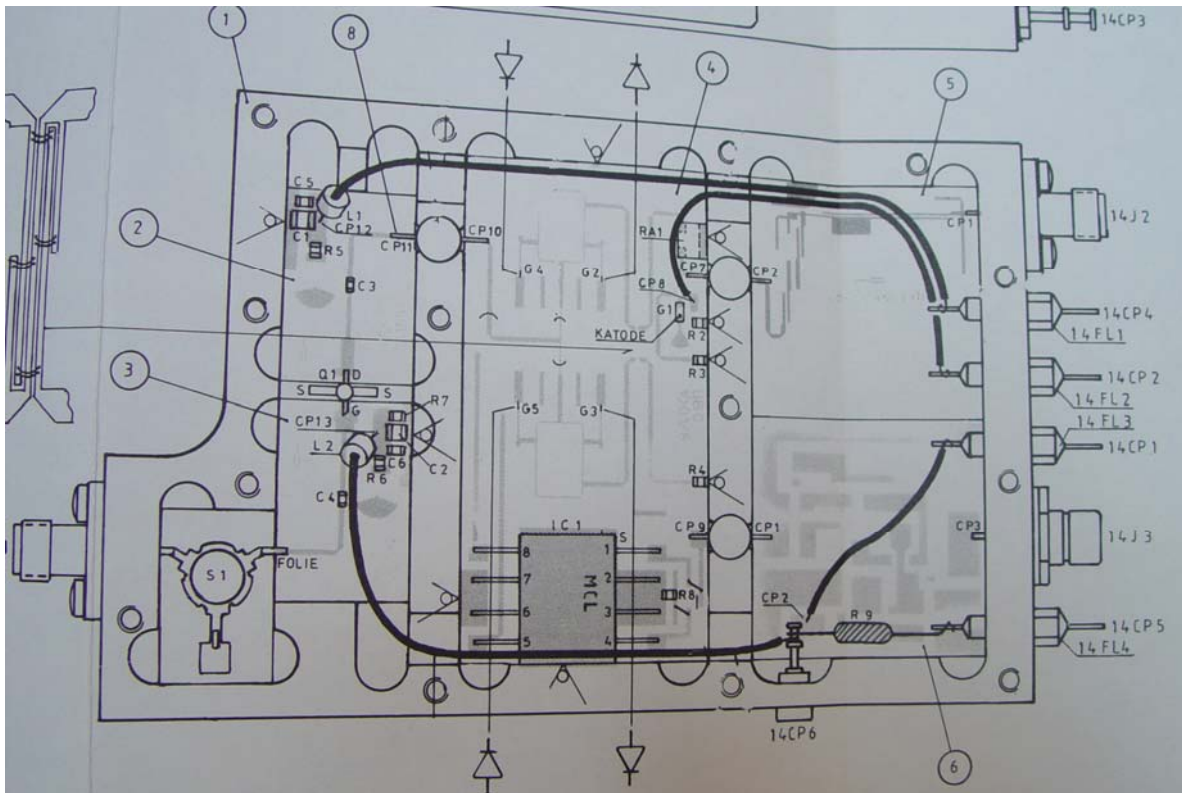
Main block diagram



RF unit drawing :



LNA mixer unit



LNA mixer unit

Oscillator unit:

OSCILLATOR, 2GHZ, W/PLL
9X284A/B

1. Technical Data:

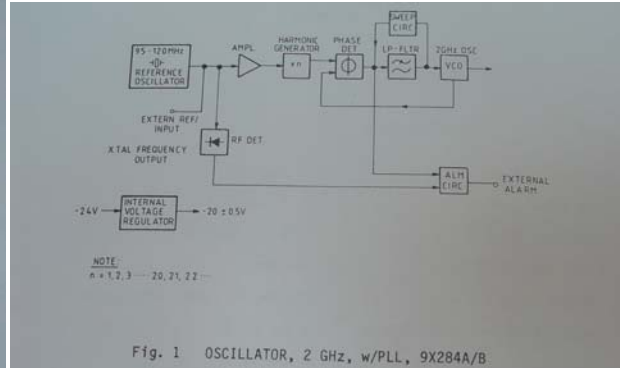
Control Voltage Range	: -4 V to -15 V
UHF output power	: 21.5 - 23.5 dBm
Frequency range	: 1.93 - 2.075 MHz
Frequency stability	: ± 20 ppm
Locking range	: ± 10 MHz at lowest frequencies
Testpoint reference oscillator	: 0 dBm ± 3 dB
Synthesizer input	: 0 dBm ± 5 dB
Input voltage	: -24 V/200 mA

2. Description:

2.1 General:

Oscillator, 2 GHz, with Phase Lock Loop, 9X284A/B, consists of:

OSCILLATOR, 2 GHz	AXF312, 313
OSCILLATOR, phase lock board	EXD90A

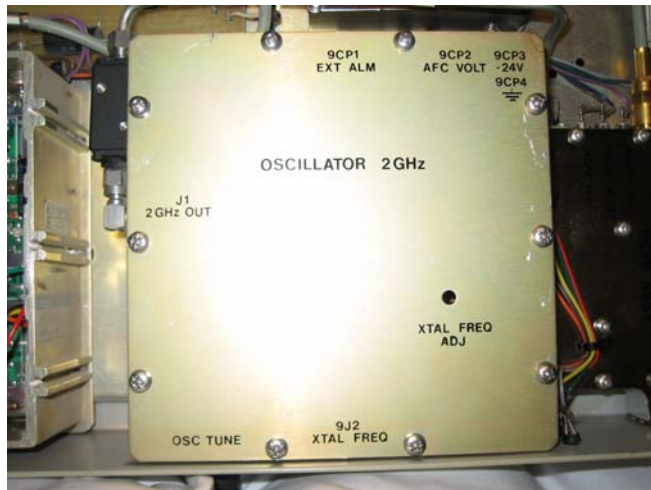
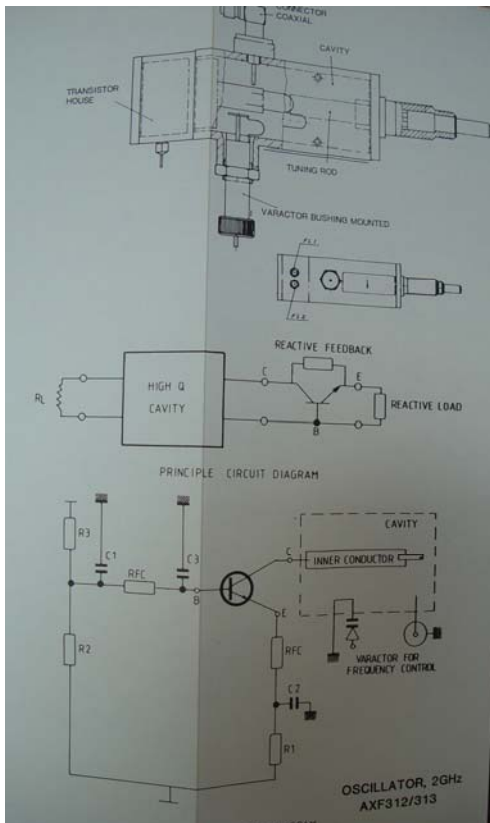


2.2 Functional:

Fig. 1 shows block schematic diagram for the 2 GHz oscillator. This is a simple phase lock loop.

The oscillator can be coarsly tuned by an external tuning screw several tens of MHz. The oscillator can be adjusted more than ± 10 MHz in frequency by the control voltage.

The crystal oscillator frequency is measured by a counter which is connected to the coaxial contact 9J2, which again is connected to CP102.



Amp & AGC & Filter unit 8UF210A/208A

1. Technical Data:

	8UF210A 8 Mb/s:	8UF208A 34 Mb/s:
IF level in	: -55 to 0 dBm	-55 to 0 dBm
IF level out	: 0 dBm +1 dB/ -1.5 dB	0 dBm +1 dB/ -1.5 dB
3 dB bandwidth	: < 70 ±4 MHz	< 70 ±13 MHz
25 dB bandwidth	: < 70 ±14 MHz	< 70 ±25 MHz
40 dB bandwidth	: < 70 ±28 MHz	< 70 +60, -40 MHz
Impedance	: 75 ohm	75 ohm
Reflection attenuation 70 MHz ±4 MHz		
Input	: > 10 dB	> 10 dB
Output	: > 24 dB	> 24 dB
Amplitude characteristic 70 MHz ±2 MHz	: < ±0.5 dB	< ±0.5 dB
Group delay variation 70 MHz ±2 MHz	: < 10 ns	< 10 ns
AGC voltage	: 0 V to +1.5 V 0 V at low level	0 V to +1.5 V 0 V at low level
Noise factor	: < 12 dB at -55 dBm, level in	< 12 dB at -55 dBm, level in
Power supply	: +5.3 V ±0.3 V/ 230 mA, +15 V ±0.5 V/50 mA	+5.3 V ±0.3 V/ 230 mA, +15 V ±0.5 V/50 mA

2. Description:

2.1 General:

Amplifier AGC & Filter, 8UF210A/208A consists of the following sub units:

	8UF210A	8UF208A
Amplifier, AGC, Filter & Detector, Board	EUD93A	EUD79A
Filter, 70 MHz, Board	EF203A	EF199A
Attenuator, Board	ER45A	ER45A
Amplifier, IF, Board	EU80A	EU80A
Amplifier, IF & Attenuator, Board	EUR81A	EUR81A
Level Detector, Board	ED69A	ED69A
AGC Voltage Control Board	EY166A	EY166A
Amplifier, IF, Board	EU82A	EU82A

2.2 Functional:

The main purpose of the unit is to amplify and filter the input signal. By the switch 15S1 in position MGC or AGC the gain is chosen to be constant or automatically regulated, respectively, to keep a fixed output level. The switch is situated on the front.

Amplification takes place in 12 dB amplifier stages of the type EU80A and in 22 dB amplifier stages in module EUR81A. The unit has 2 modules of each type and total gain will then be 68 dB.

The gain from input to output of EUD93A/EUD79A is controlled by the supplied control voltage to attenuator module ER45A and corresponding attenuator which is placed on the input of module EUR81A.

EUD93A/EUD79A thus has 3 identical attenuators incorporated in the amplifier chain. The attenuation applied on EUD93A/EUD79A with these attenuators, can be regulated between 7 dB and 70 dB. With the switch in AGC-position, control voltage is delivered from EY166A.

Detector IF voltage from diode G1 is applied on one of the two inputs of an operational amplifier which is incorporated in EY166A. The other operational amplifier input can be set to a choice reference voltage by R4. Normally this voltage is set to ensure 0 dBm level on the IF-output in the dynamic working range of EUD93A/EUD79A.

ED69A delivers a voltage which is approximately linearly with logarithmic increase of IF input level, and the voltage in CP14 is used as an indication of RF level to the receiver group.

The return loss in CP1 is set by R1. Return loss is similarly adjusted on the output by L103, L104 and R103.

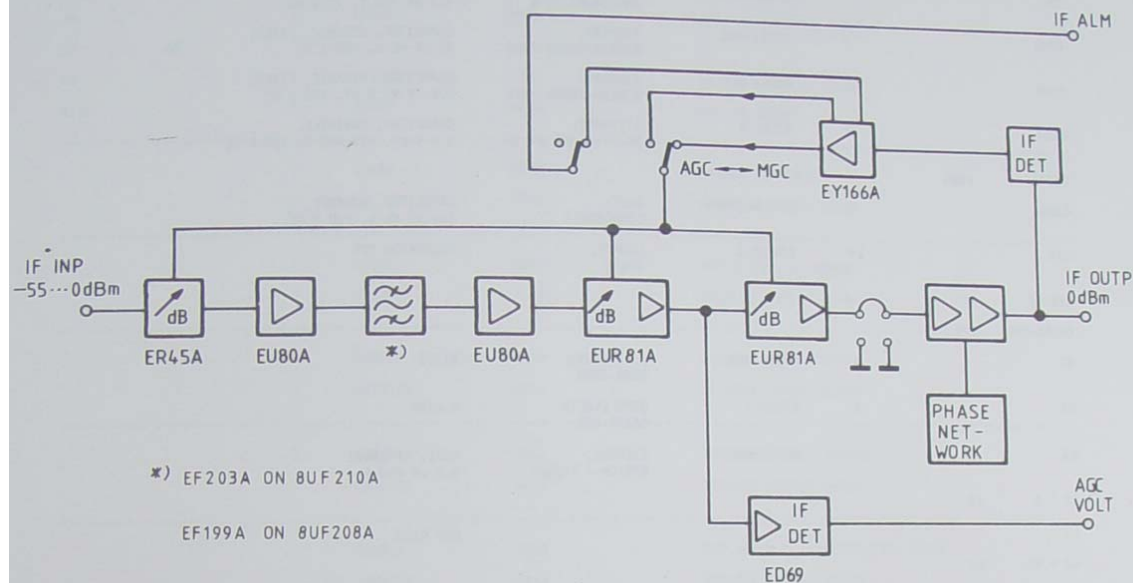
The group delay is set by L101, L102, C103 and C104. Flatness of band-pass curve is set by R101 and R102.

8UF210A/208A

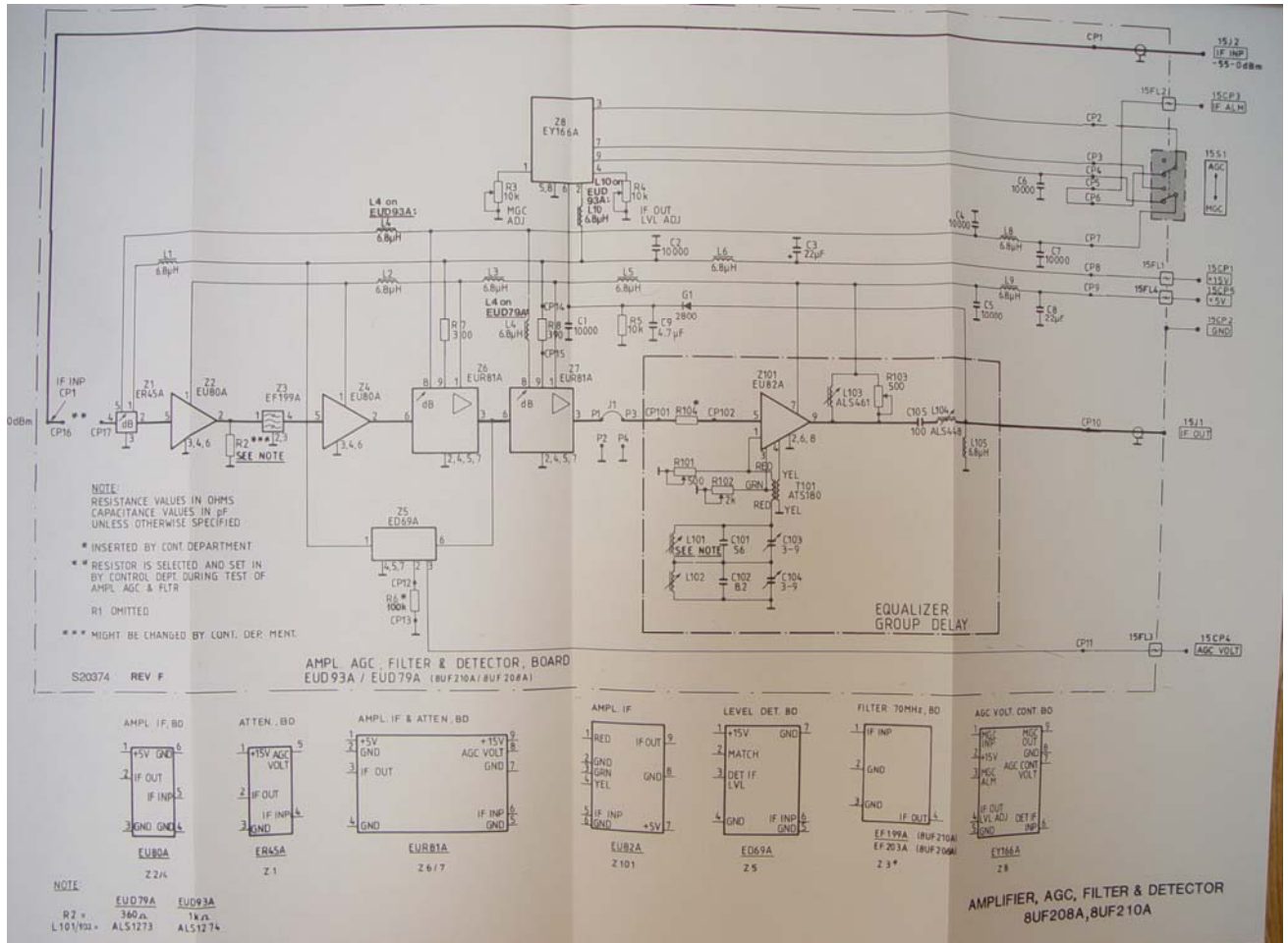
- 2 -

The gain is set by R3 with the switch 15S1 in position MGC. 15 V is then delivered via a 950 ohm resistor on EY166A to CP8.

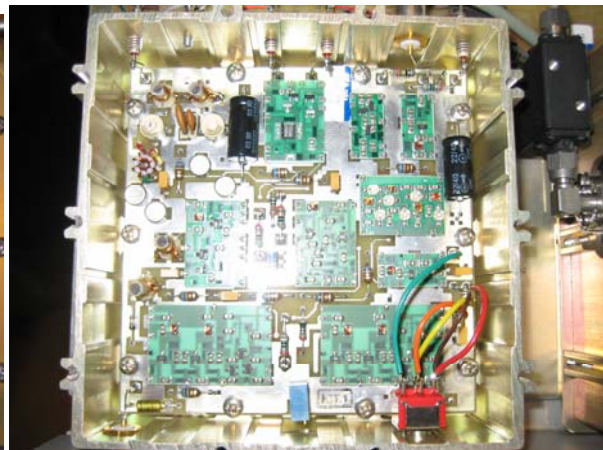
The IF level in CP12 is set by R4 with the switch 15S1 in position AGC when EUD79A/EUD93A works within its dynamic gain range.



BLOCK DIAGRAM AMPLIFIER, AGC & FILTER, 8UF208A/210A



Amp & AGC & Filter unit



Amp & AGC & Filter unit open

Equalizer unit 8F194A

1. Technical Data:

Impedance at 35J1 & 35J2 : 75 ohms unbalanced

Return loss at 35J1
for 70 MHz ± 13 MHz : >24 dB

Return loss at 35J2
for 70 MHz ± 13 MHz : >22 dB

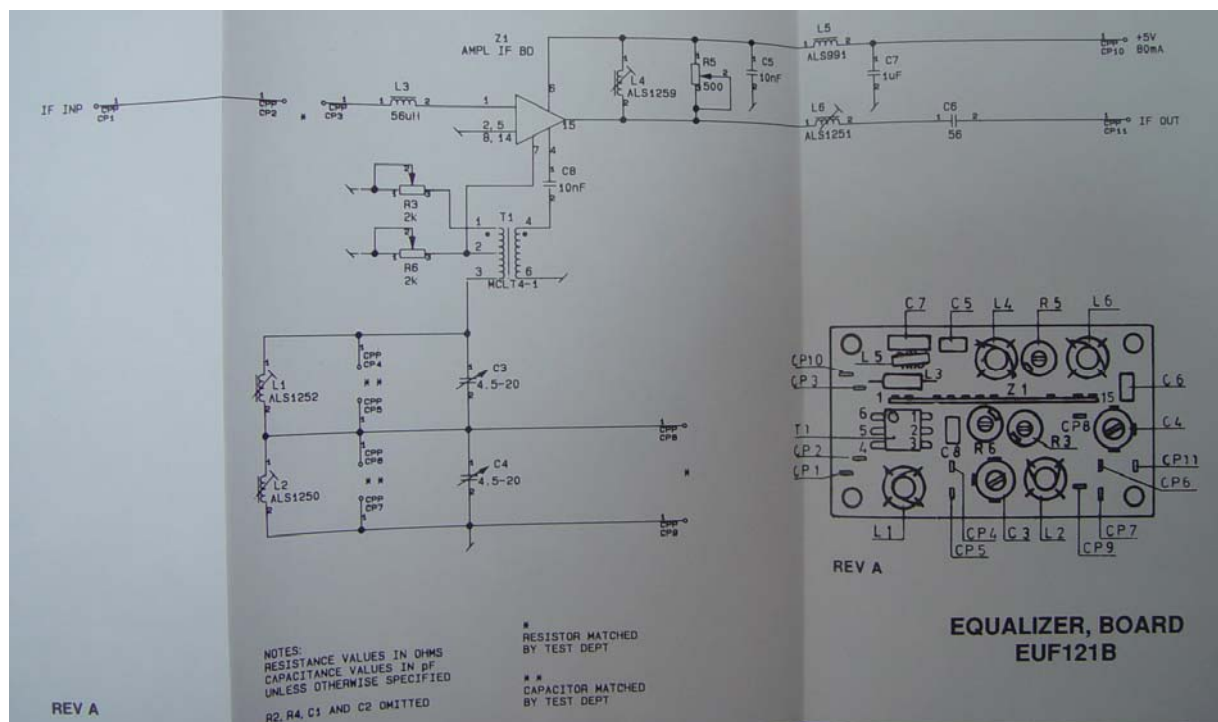
IF response var.
for 70 MHz ± 13 MHz : <0.3 dB

Delay approx. parabolic
for 70 MHz ± 13 MHz : 30 nS

Power Consumption : +5V/55 mA

2. General Description:

The equalizer contains the printed circuit board EUF121B. IF board, EU124B has two amplifier sections. The delay determining network is placed between these two amplifier sections.

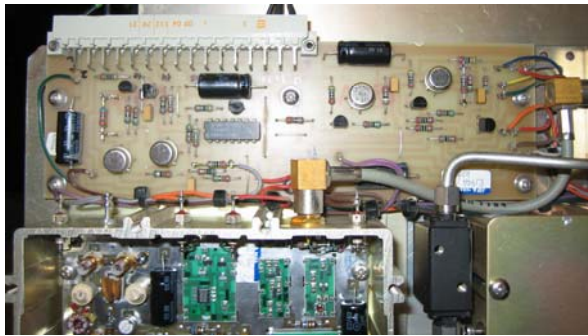


Equalizer unit closed

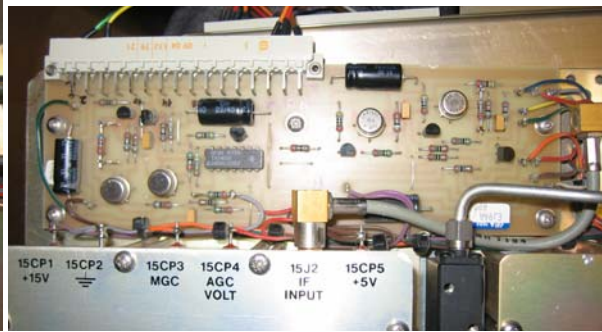


Equalizer unit open

Control unit



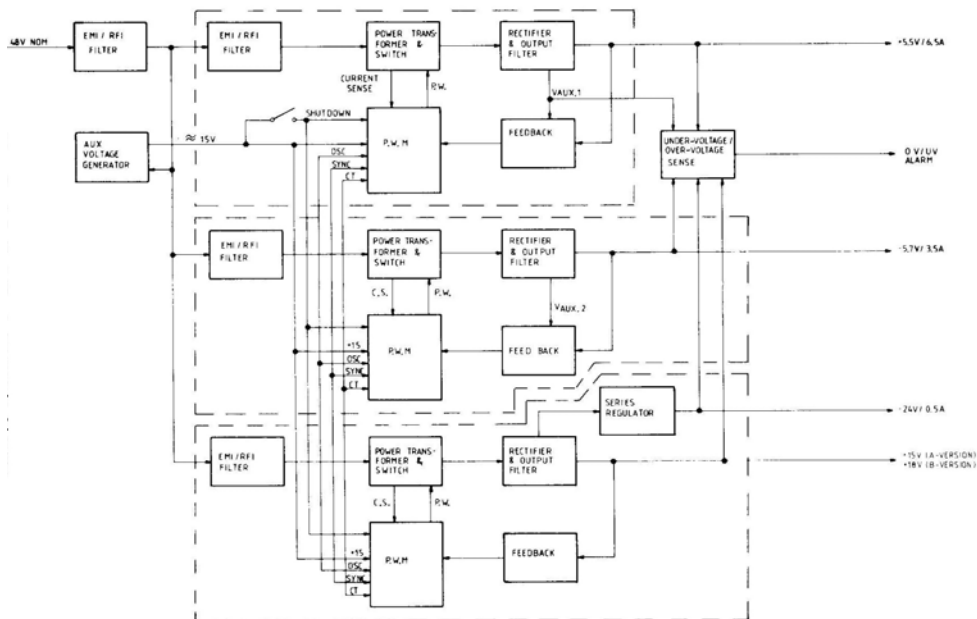
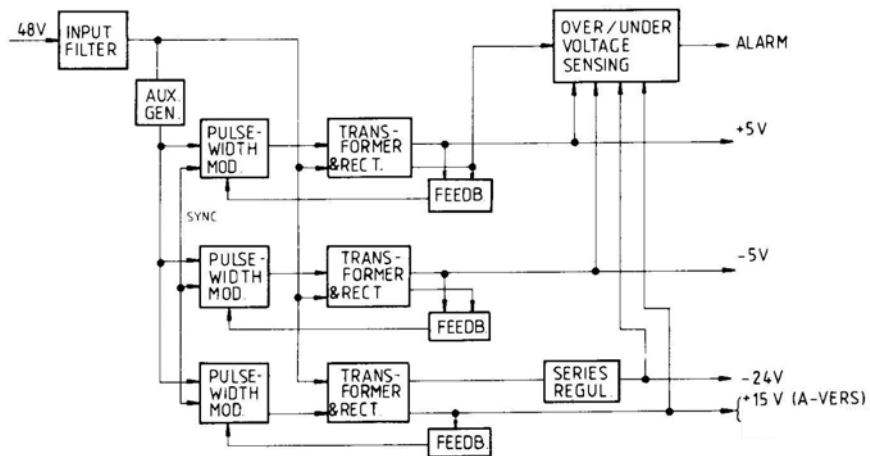
Control unit pic #1



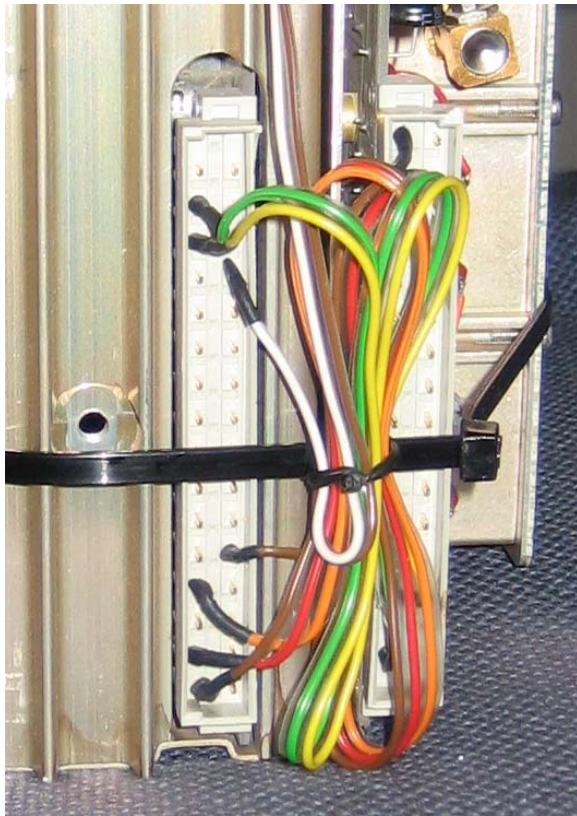
Control unit pic #2

Power supply unit 0PR117A

Input voltage	:	<u>A-VERSION:</u> 40 - 60 V
Output voltage and maximum output current, tolerance ± 0.2 V	:	+5.5 V/6.5 A -5.7 V/3.5 A +15 V/1 A -24 V/0.5 A
Ripple	:	<60 mV p-p
Max Power	:	40 W

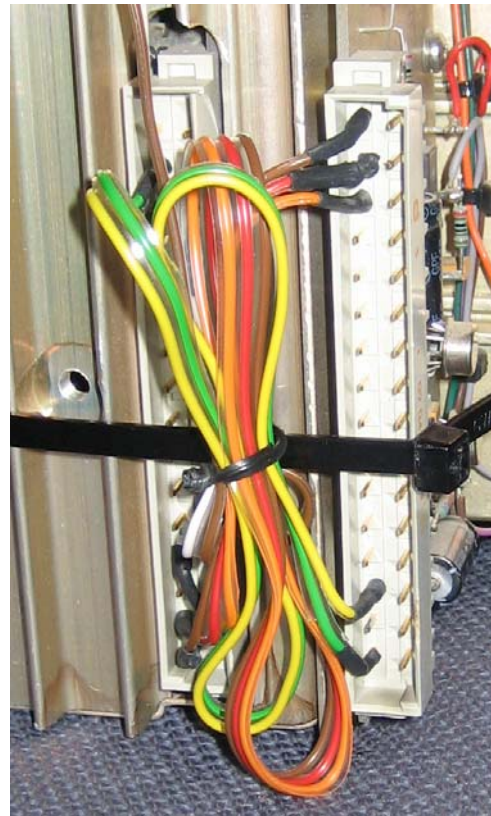


Power supply connection to RF unit



Connector of power supply unit

Pin	Colour	Signal	Level
3	Green	A	-5 V out
5	Yellow	B	-24 V out
8	White	X	0V in (from 48Vsupply)
24	Brown	Y	48V in (from 48V supply)
25	Orange	C	+15V out
29	Red	D	+5V out
31	Brown	E	0V out



Connector of RF unit

Pin	Colour	Signal	Level
1	Brown	E	0V in
3	Red	D	+5V in
5	Orange	C	+15V in
27	Yellow	B	-24V in
31	Green	A	-5V in

Feedback is always very welcome. Please send it to the Email address below. I am especially interested in the experience of other users of such a unit. If someone knows how to modify the error unit such that the RCVR ALM LED stays off I appreciate any hints.

Best regards

Matthias DD1US

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Homepage: <http://www.dd1us.de>