General Description

The receiver is designed to fit the standard 19" rack. It consists of the following three main units.

1. HF unit
2. Power supply
3. Control unit

1. HF Unit

The incoming HF signal from the antenna is converted via the mixer, filter and demodulator to an AF signal. This unit consists of the following sub-assemblies.

Protector or preselector (optional)
1st Mixer
2nd Mixer
Filter board
Demodulator
ISB Demodulator (optional)
or
IF/OUT
BFO
VCO A
VCO B

These sub-assemblies consists of single PCBs which are mounted each in a shielded cassette.

2. Power Supply

The power supply module contains a switching power supply unit using the flyback principle and consists of the following sub-assemblies:

Switching regulator
Overload sensor
Transformer
Automatic switch mains/battery

The sub-assemblies are enclosed in an aluminium case.

3. Control Unit

The control unit consists of nine functional boards:

1. Audio Board
2. Buffer D/A Converter
3. CPU Processor with EPROM
4. Time /Clock/Help board
5. Input/Output board
6. Display board
7. Motherboard (base of control unit)
8. Interconnection board (back of control unit)
9. REMOTE board (option)

Following block diagrams show the principles of the receiver operation.
The aerial input is fed to the protector cassette which consists of:

1. Low pass filter which attenuates all frequencies above 30 MHz.
2. 20 db switchable attenuator switched either manually or automatically when the input Rf signal is higher than the recommended tolerance.

Receiver fitted with a preselector have, in additon to the above named circuits, a low pass filter for the frequencies up to 1.6 MHz. The frequency ranges: 1.6 - 3.99; 4.0 - 7.99; 8.0 -16.99; 17.0 - 30.0 MHz have tunable band-pass filters.

The input signal is converted, in the 1st mixer, to an intermediate frequency of 63.078 MHz and in the 2nd mixer to 5 MHz. After further selection by the filter board the signal is then demodulated (dependant on the mode of operation). In the RX 1001 M (or optionally in the RX 5001) an IF Out module is fitted which generates an IF of 525 kHz and 10 kHz in addition to an IF of 30 kHz. The 30 kHz is generated on the filterboard for demodulation in externally connected demodulators.
Optionally the RX 5001 may be fitted with an ISB demodulator to allow ISB operaten. The BFO, VCO A, VCO B supply the frequencies required for the up- and down conversion.

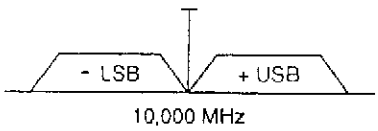
The power supply supplies the required voltages +18 V, +5 V and +12 V for the battery in the TIME-CLOCK-HELP-board. If the supply voltages fail the channel information and mode of operation are not lost. The power supply switches automatically from mains to battery when mains power fails and, upon return of mains, automatically switches back to mains.

The microprocessor in the CPU controls the different functions. The receiving frequency can be entered using either the keyboard or the variable frequency control knob whereas the operation modes can only be changed using the keyboard. When receiving on A1A the pitch of the received signal can be changed using the variable BFO control in 10 Hz steps from +5 kHz to -5 kHz. The selected modes are indicated using LEDs and the receiving frequency, number of the stored channel and the time are displayed with seven segment displays. If the receiver is to be remotely controlled (RS 232 C) an extra serial interface board is required. The receiver has an extensive selftest program which is divided into permanently monitored tests and those which are only monitored in connection with the BITE test.

The BITE causes a 1 MHz internally produced signal to be fed to the receiver input. The level of this signal is then monitored in the individual units and, if the measured signal is outside the parameters, indicates a fault condition. Using the RX 1001 RC remote control unit all major functions of up to ten receivers can be controlled with the exception of the ON/OFF switch, dimmer, AF level and monitor loudspeaker. Supplementary to the receiver is the telex/fax converter TG 1001 M (TC 5001) to enable the use of receivers/aerial diversity reception and the reception of telex and facsimile signals. The TG 1001 M (TC 5001) can also be used as a separate self contained unit.

Frequency conversion

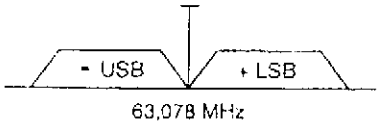
1.) $f_{RX} = 10{,}000 \begin{matrix} + \text{USB} \\ - \text{LSB} \end{matrix}$ MHz



2.) 1. Mixer

$10{,}000 \begin{matrix} + \text{USB} \\ - \text{LSB} \end{matrix}$ → 73,078 $- \left(10 \begin{matrix} + \text{USB} \\ - \text{LSB} \end{matrix} \right) = 63{,}078 \begin{matrix} + \text{LSB} \\ - \text{USB} \end{matrix}$

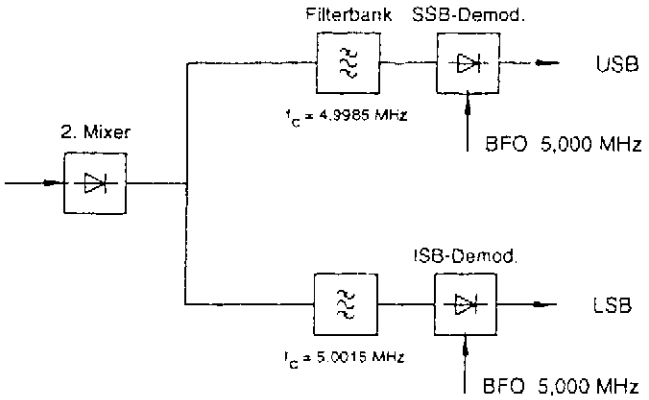
73,078

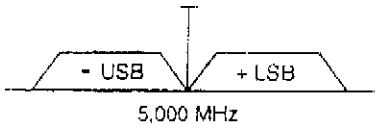


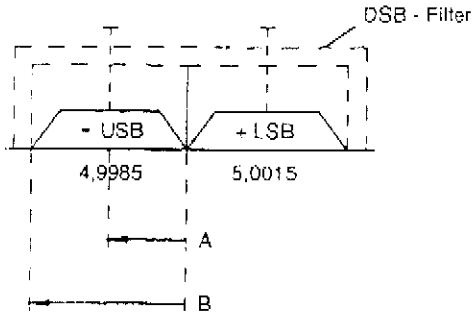
3.) 2. Mixer

$63{,}078 \begin{matrix} + \text{LSB} \\ - \text{USB} \end{matrix}$ → $63{,}078 \begin{matrix} + \text{LSB} \\ - \text{USB} \end{matrix} - 58{,}078 = 5 \begin{matrix} + \text{LSB} \\ - \text{USB} \end{matrix}$

58,078



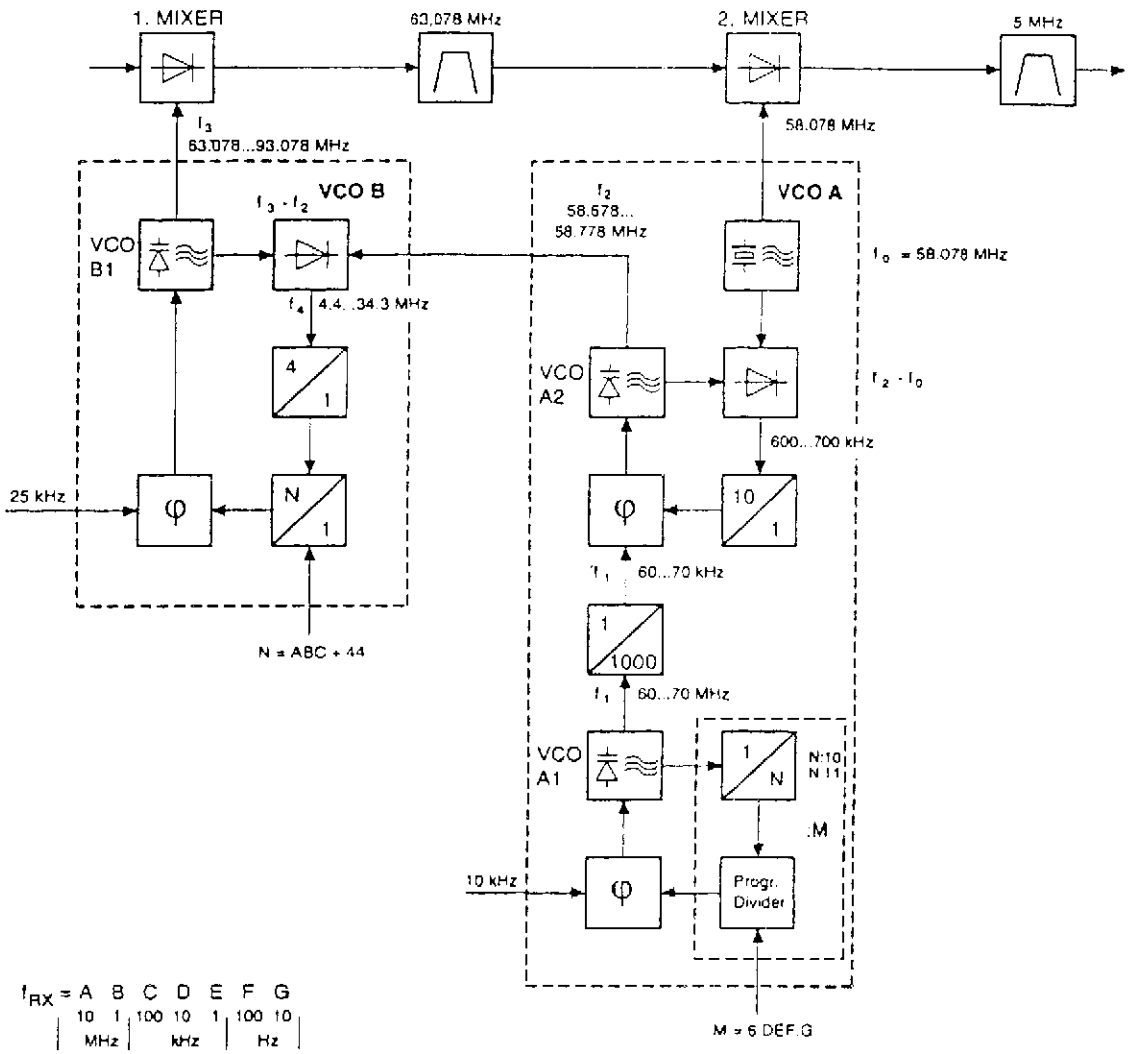




A^ VCO-Deviation for CW-Center	= -1.5 kHz	(all Filters)
B^ VCO-Deviation for LSB	= -3.0 kHz	(only Filters 0.1 ... 2.4 kHz)
No VCO-Deviation for USB		(only Filters 0.1 ... 2.4 kHz)
A^ VCO-Deviation for DSB	= -1.5 kHz	(all Filters except 6 kHz)

RX 1001 M VCO and BFO frequency offsets

Operating mode	BFO-Freq.	VCO B VCO-Shift	AF Bandwidth	Selected Filter in 2. Mixer
DSB 0.1 kHz	BFO switched off	- 1.5 kHz	0.1 kHz	3 kHz
0.15 kHz	BFO switched off	- 1.5 kHz	0.15 kHz	3 kHz
0.3 kHz	BFO switched off	- 1.5 kHz	0.3 kHz	3 kHz
0.6 kHz	BFO switched off	- 1.5 kHz	0.6 kHz	3 kHz
1.5 kHz	BFO switched off	- 1.5 kHz	1.5 kHz	3 kHz
2.4 kHz	BFO switched off	- 1.5 kHz	2.4 kHz	3 kHz
3.0 kHz	BFO switched off	- 1.5 kHz	3.0 kHz	3 kHz
6.0 kHz	BFO switched off	NONE	6.0 kHz	6 kHz
USB 0.1 kHz	5.000 00 MHz	NONE	1.45 - 1.55 kHz	3 kHz
0.15 kHz	5.000 00 MHz	NONE	1.425- 1.575 kHz	3 kHz
0.3 kHz	5.000 00 MHz	NONE	1.35 - 1.65 kHz	3 kHz
0.6 kHz	5.000 00 MHz	NONE	1.2 - 1.8 kHz	3 kHz
1.5 kHz	5.000 00 MHz	NONE	0.75 - 2.25 kHz	3 kHz
2.4 kHz	5.000 00 MHz	NONE	0.3 - 2.7 kHz	3 kHz
3.0 kHz	5.000 30 MHz	+ 0,3 kHz	0.3 - 3.3 kHz	3 kHz
6.0 kHz	5.003 30 MHz	+ 3.3 kHz	0.3 - 6.3 kHz	6 kHz
LSB 0.1 kHz	4.997 00 MHz	- 3 kHz	1.45 - 1.55 kHz	3 kHz
0.15 kHz	4.997 00 MHz	- 3 kHz	1.425- 1.575 kHz	3 kHz
0.3 kHz	4.997 00 MHz	- 3 kHz	1.35 - 1.65 kHz	3 kHz
0.6 kHz	4.997 00 MHz	- 3 kHz	1.2 - 1.8 kHz	3 kHz
1.5 kHz	4.997 00 MHz	- 3 kHz	0.75 - 2.25 kHz	3 kHz
2.4 kHz	4.997 00 MHz	- 3 kHz	0.3 - 2.7 kHz	3 kHz
3.0 kHz	4.996 70 MHz	- 3.3 kHz	0.3 - 3.3 kHz	3 kHz
6.0 kHz	4.996 70 MHz	- 3.3 kHz	0.3 - 6.3 kHz	6 kHz
A1A 0.1 kHz	depends on	- 1.5 kHz	1.5 kHz ±50 Hz	3 kHz
0.15 kHz	BFO-knob setting	- 1.5 kHz	1.5 kHz ±75 Hz	3 kHz
0.3 kHz		- 1.5 kHz	1.5 kHz ±150 Hz	3 kHz
0.6 kHz	if AF = 1.5 kHz	- 1.5 kHz	1.5 kHz ±300 Hz	3 kHz
1.5 kHz	then 5.000 MHz or	- 1.5 kHz	1.5 kHz ±750 Hz	3 kHz
2.4 kHz	4.9970 MHz	- 1.5 kHz	1.5 kHz ±1.2 kHz	3 kHz
3.0 kHz		- 1.5 kHz	1.5 kHz ±1.5 kHz	3 kHz
6.0 kHz		- 1.5 kHz	1.5 kHz ±4.5 kHz	6 kHz
F1B 0.1 kHz	depends on	- 1.5 kHz	1.5 kHz ±50 Hz	3 kHz
0.15 kHz	Mini-DIP-switch	- 1.5 kHz	1.5 kHz ±75 Hz	3 kHz
0.3 kHz	on I/O board	- 1.5 kHz	1.5 kHz ±150 Hz	3 kHz
0.6 kHz		- 1.5 kHz	1.5 kHz ±300 Hz	3 kHz
1.5 kHz	Pos.1=4.9996 MHz	- 1.5 kHz	1.5 kHz ±750 Hz	3 kHz
2.4 kHz	Pos.5=5.000 00 "	- 1.5 kHz	1.5 kHz ±1.2 kHz	3 kHz
3.0 kHz		- 1.5 kHz	1.5 kHz ±1.5 kHz	3 kHz
6.0 kHz	Pos.0=5.000 50 "	- 1.5 kHz	1.5 kHz +4.5 kHz -1.5 kHz	6 kHz
ISB	5.000 00 MHz	NONE	USB 0.3 - 2.7 kHz other bandwidths are possible	6 kHz
			LSB 0.3 - 2.7 kHz only	6 kHz



Blockdiagram - VCO A and VCO B

VCO A/B Frequencysynthesis calcualting schedule

	A	B	C	D	E	F	G
f_{RX}							
	10 MHz	1 MHz	100 kHz	10 kHz	1 kHz	100 Hz	10 Hz

M = 6000.0 + DEF.G [6 | | | | |]

N = ABC + 44 [| | |]

	MHz 10	MHz 1	kHz 100	kHz 10	kHz 1	Hz 100	Hz 10	Hz 1
f_1 (VCO A) = 10 kHz x M								
$'f_1 = f_1 : 1000$								
f_2 (VCO A_2) = $'f_1$ x 10 + 58.078 MHz								
f_4 = 25 kHz x N x 4								
f_3 (VCO B) = $f_2 + f_4$								
1. IF = $f_3 - f_{RX}$								
2. IF = 1. IF - 58.078 MHz								

Above example only valid in USB mode (Filters 0.1 ... 2.4 kHz)
or DSB mode (Filter 6 kHz)

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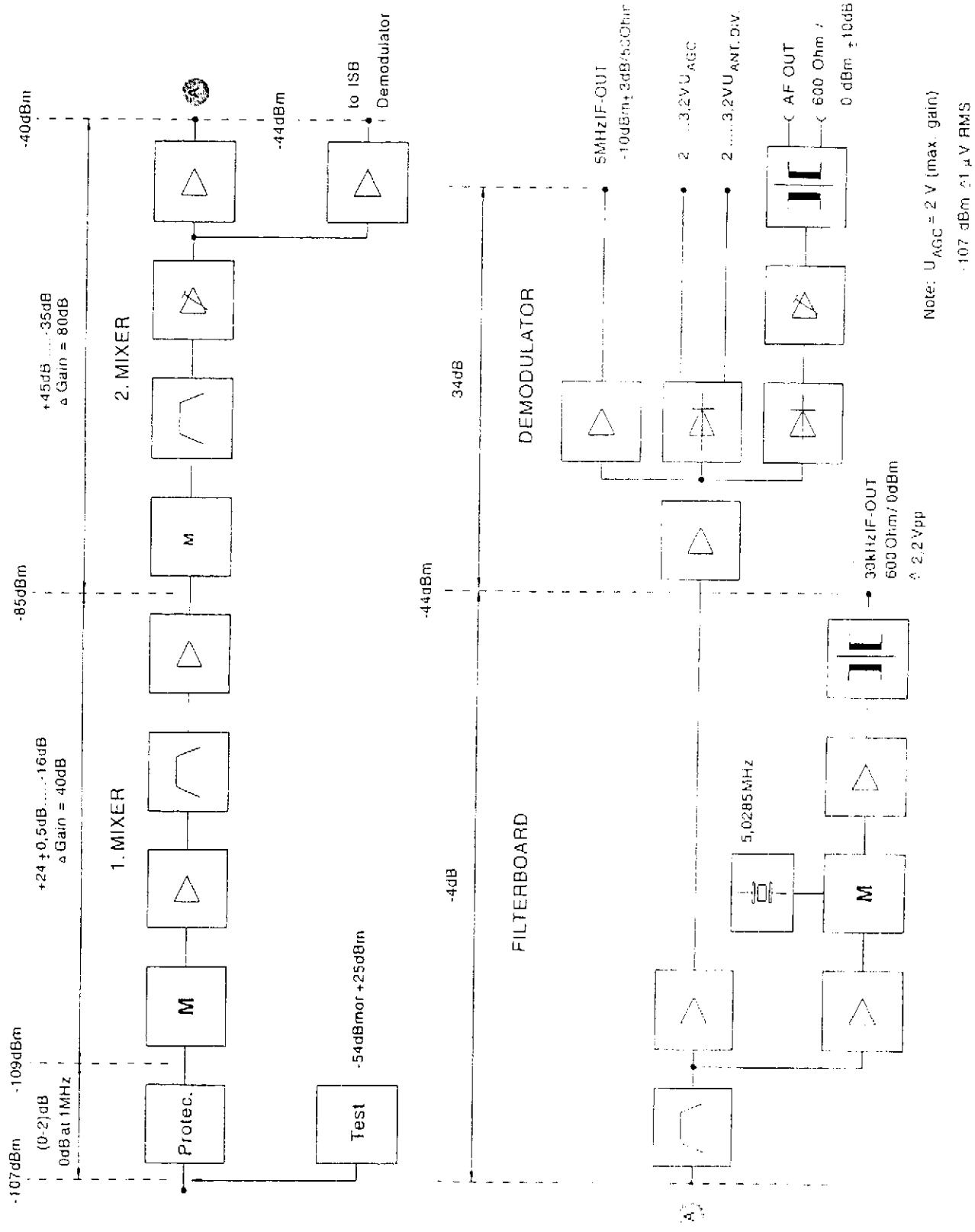

Signal level diagram