# 1 GENERAL DESCRIPTION

## 1.1 Technical Data

### 1.1.1 Receiver RX 1001 M / RX 5001

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|---|---|
| Frequency range | 10 kHz to 30 MHz |
| Frequency resolution | 10 Hz increments<br>Keyboard or single knob flywheel tuning at 500 Hz or 5 kHz per revolution |
| Frequency tuning | 10 Hz, 100 Hz selectable |
| Frequency synthesizer | Triple PLL lowest reference frequency 10kHz |
| Frequency change-over time | Within frequency decades: > 20 msec<br>between frequency decades: ≥ 100 msec<br>options: on request |
| Frequency stability<br>frequency standard internal<br>TCXO - 10 MHz | $5 \cdot 10^{-7}$ per day<br>$1 \cdot 10^{-6}$ per year |
| additional input<br>external standard 1 MHZ<br>or 10 MHz (BFO II) | Input level: 0 dBm ± 3 dB/50 ohms |
| BFO | ±5 kHz in 10 Hz steps, synthesized |
| Channel memory | 99 channels capable of being loaded with receiver parameters: frequency, mode of operation incl. bandwidth, RF-gain control, preselector and antenna-attenuator. |
| SCAN functions | 1. SCAN BY TIME<br>2. SCAN CHANNEL + CHANNEL<br>* 3. CHANEL SCAN<br>* 4. FREQUENCY SWEEP<br>increments 10 Hz to 10 kHz<br>lower and upper frequencies are to be programmed in up to 20 blocks |
| SCAN-STOP | Stop time programmable 0.1 - 0.9 sec<br>dwell time 1 - 9 sec and infinite<br>AGC threshold 5 - 95 dBµV |

* RX 5001 only

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| Modes of operation | DSB | (A2A, H2A, A3E, H3E) |
| | USB | (J3E, R3E, H3E) |
| | LSB | (J3E, R3E, H3E) |
| | CW | (A1A) |
| | * ISB | (B3E) (Option) |
| | TELEX/FAX | (F1B, F1C, F3C) |
| | (requires optional TTY/FAX converter) | |
| Antenna impedance | 50 ohms SWR < 2 : 1 and Ant. Att. = 0 dB | |
| Antenna input voltage | a.) 30 VEMF for 10 kHz to 1.5 MHz 10 minutes<br>b.) 100 VEMF for 1.5 MHz to 30 MHz 10 minutes<br>c.) 50 VEMF for 30 MHz to 400 MHz 10 minutes | |
| Input attenuator | 0 dB, 20 dB selectable; manual or automatic | |
| Spurious emission at antenna input | ≤ $1 \cdot 10^{-9}$ W | |
| Spurious radiations at antenna input | ≤ -97 dBm | |
| Image- and IF rejection | > 100 dB | |
| Intermediate frequencies | 1st IF 63.078 MHz<br>2nd IF 4.9985 MHz | |
| IF-Output 1 | 30 kHz; 600 ohms; 0 dBm | |
| IF-Output 2 | 4.9985 MHz; 50 ohms - 10 dBm | |
| AGC-characteristics | Output is maintained within 6 dB for a change in input of 120 dB for input levels between 0.5 µV and 500 mV.<br>Within frequency subrange 10 kHz to 80 kHz AGC characteristics apply to 90 dB | |

* RX 5001 only

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| AGC-time constants (SSB 30dB step): | Attack | Hold | Decay |
| long: | ≤ 10 ms | 1.5 - 3.5 s | 0.55 (± 25%) |
| short. | ≤ 10 ms | —— | 0.25 (± 25%) |

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| Sensitivity | A3E | B = 6 kHz, m = 0.5 |
| without | 20.....40 kHz | ≤ 7 µV EMF |
| HF preselection | 40.....200 kHz | ≤ 4 µV EMF |
| 10 dB SINAD | 0.2....30 kHz | ≤ 3 µV EMF |
| with CCITT-Filter | A1A | B=300 Hz |
| | 10.....40 kHz | ≤ 1 µV EMF |
| | 40.....200 kHz | ≤ 0.5 µV EMF |
| | 0.2....30 MHz | ≤ 0.5 µV EMF |
| | J3E | B=0.3..2.7 kHz |
| | 10...40 kHz | ≤ 3 µV EMF |
| | 0.04...1.6 | ≤ 1 µV EMF |
| | 1.6...30 MHz | ≤ 1 µV EMF |

## IF-Bandwidth and Selection

| Filter Bandwidth (kHz) | | min. Bandwidth (kHz) | | max. Bandwidth (kHz) | |
|---|---|---|---|---|---|
| Standard | Special (Option) | Standard 6 dB | Special 6 dB | Standard 60 dB | Special 60 dB |
| 0.1 | 0.15 | 0.1 | 0.15 | 0.75 | 0.80 |
| 0.15 | 0.3 | 0.15 | 0.3 | 0.80 | 0.90 |
| 0.3 | 0.4 | 0.3 | 0.4 | 0.90 | 1.00 |
| 0.6 | 0.6 | 0.6 | 0.6 | 1.70 | 1.70 |
| 1.5 | 1.5 | 1.5 | 1.5 | 4.00 | 3.00 |
| 2.4 * | 2.7 | 2.4 | 2.7 | 3.80 | 4.20 |
| 3.0 ** | 3.0 | 3.0 | 3.0 | 4.60 | 4.60 |
| 6.0 | 6.0 | 6.0 | 6.0 | 15.60 | 15.60 |

* Special design for SSB- USB 0.3 to 2.7 LSB -0.3 to -2.7
Optional filters require replacement of any standard filter.

** Group delay ≤ 800 µsec at $f_o$ ± 1.2 kHz (for SSB audio 600 to 800 Hz)

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| Intercept point | 26 dBm (1 - 30 MHz) |
| Crossmodulation | For a wanted signal 60 $dB\mu V_{EMF}$ the interference produced by an unwanted signal 20 kHz off-tune and 90 $dB\mu V_{EMF}$ will be more than 30 dB below standard output. |
| Intermodulation | **Out of band:**<br>3rd order -60 dB or better, for two equal signals each of 100 $dB\mu V_{EMF}$ at $f_o$ +50 kHz and $f_o$ +100 kHz ($f_o$ > 200 kHz).<br><br>**In band:**<br>Unwanted signals -45 dB for two equal signals each of 100 $dB\mu V_{EMF}$ at $f_o$ +800 Hz and $f_o$ +1200 Hz ($f_o$ > 200 kHz) |
| Blocking | For a wanted signal 60 $dB\mu V_{EMF}$ an unwanted carrier 20 kHz off-tune must exceed 110 $dB\mu V_{EMF}$ to effect the output by 3 dB 3 or SINAD < 14 dB. |
| **Level indication** | |
| RF-LED-band | 0 to 110 dBµV, 10 dB steps |
| AF-LED-band | -15 to +6 dBm |
| **Audio outputs** | |
| Built-in loudspeaker | 1.5 W |
| Extern. loudspeaker | 3 W into 4 ohms |
| Earphones: | 10 mW into 600 ohms |
| Line: | 0 dBm ± 10 dB adjustable at the rearside of the receiver; 600 ohms balanced. |
| Audio distortion for 1000 Hz at standard output power: | < 5 % for SSB<br>< 5 % for DSB at 80 % modulation |
| AF 1 output | -7 dBm 600 Ohms line output for remote control |
| AF 2 output | -7 dBm 600 Ohms line output for remote control |
| IF-output | 30 kHz, 600 Ohms, typically 0 dBm |
| BCD frequency output | TTL-level |
| AGC output | 2 - 3.2 V |
| Antenna diversity | 2- 3.2 V |



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| **Power supplies** | |
| AC-operation | 110 - 120 V ± 10 % 45 to 400 Hz<br>220 - 240 V ± 10 % 45 to 400 Hz<br>power consumption: 65 VA ± 20% |
| DC-operation | 21 to 32 V, power consumption:<br>50 W ± 25%<br>floating |
| **Environmental conditions** | |
| Temperature | |
| Operating | -15 to +55 °C |
| Storage | -40 to +85 °C |
| Humidity | 95 % up to 40 °C |
| Vibration<br>without shockmounts | 0 to 12.5 Hz 3.2 mm amplitude<br>12.5 to 25 Hz 0.7 mm amplitude<br>25 to 50 Hz 0.4 mm amplitude<br><br>**Additional:**<br>0 - 50 Hz 0.3 mm peak to peak<br>50 - 500 Hz 2 g acceleration |
| Shock | 30 g., 11 msec. all sides |
| MIL spec. | Above tests according to respective section of VG 95332 |
| Weight | Approx. 15 kg (Standard without options) |
| Dimensions | 19" standard |
| Height | 132.5 mm (3 RU) |
| Depth | 450 mm (with handles) |
| Width | 483 mm |

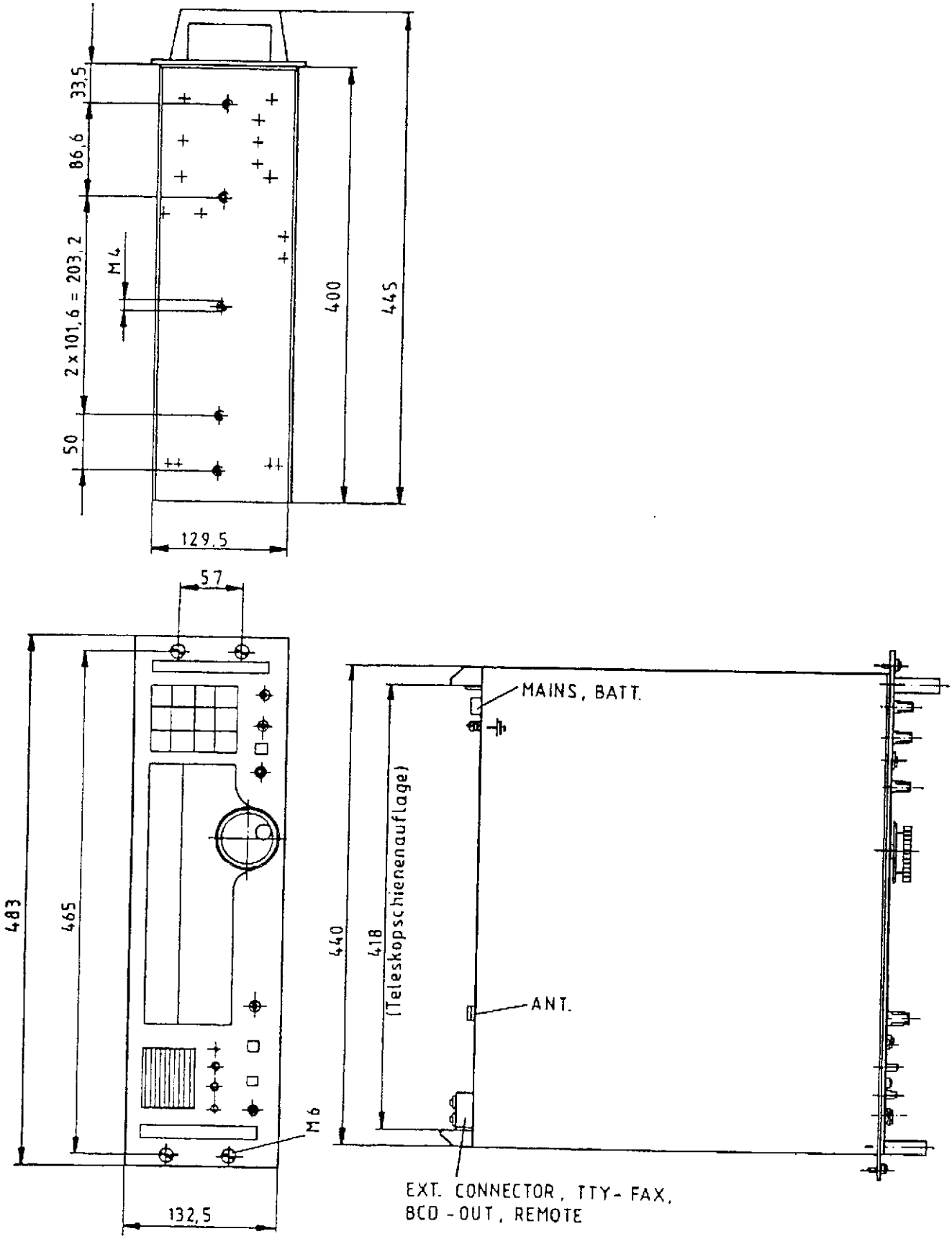



Fig. 1-1
Dimensional drawing RX 1001 M

## 1.2 Receiver Concept

The radio receiver RX 1001 M / RX 5001 has been developed for telegraphy, SSB-telephony and, with the additional-demodulator unit TC 1001, for teletype and facsimile reception. For the control of a narrow band active antenna, a BCD-Frequency output is provided.

Apart from local control it can be operated in remote control (Plug-in PCB Serial Interface). By using this PCB, the receiver may be remote-controlled either by a computer (for example a PC) with a RS-232-C interface or via a remote control unit (HAGENUK RX 1001 RC).

By means of an optional PRESELECTOR an RF-input selection improvement can be achieved which could be of advantage in close proximity to powerful transmitters.

Apart from the AF-outputs 30 kHz, 625 kHz, 10 kHz and a 5 MHz IF-output are provided. The mode "antenna diversity" makes it necessary to feed-back level information about the HF-signals being filtered in the receiver to the diversity switching facility in the TC 1001. For this, the RX 1001 M is equipped with a quick-action demodulator with a suitable output.

The RX 1001 M is equipped with extensive auto test arrangements (BITE). Tests being performed continuously during operation and the individual test can be distingushed by pressing the TEST key. When these individual tests are being done, a 1 MHz Test-signal is given to the receiver-input. The level of this signal is then checked in individual modules. A failure indication takes place, when values are exceeding the fixed limits.

The block diagrams shows the receiver concept of the RX 1001 M and RX 5001.

The antenna signal is either connected via the protector module or, if optionally fitted, via the preselector module to the 1. Mixer. The preselector consists of three circuit passive tracking bandpass filters.

In the 1. Mixer, the received RF signal is being mixed with the local oscillator frequency of 63.088...93.078 MHz to the first IF of 63.078 MHz. The mixer is a 17 dBm high level diode ring mixer.

In the 2. Mixer Module the 1. IF is converted down to the 2. IF of 5 MHz by mixing the insertion frequency of 58.078 MHz from the VCO A with the 1. IF. The 6 kHz DSB Filter and the 3 kHz SSB Filter is located in the 2. Mixer module as well. At strong antenna input signals the gain of the 1.Mixer-module can be reduced up to 40 dB and the gain of the 2. Mixer Module can be reduced up to 80 dB, both depending on the voltage U AGC/MGC.

For further selection, 6 filters are provided in the filter cassette. Downmixing of the 2. IF to the 30 kHz IF output is done in the filter cassette as well.

The demodulator cassette contains an IF amplifier, the SSB/CW demodulator (product detector), the AM demodulator and an AGC and diversity rectifier. The time response of the AGC-generator can be changed by the receiver frontpanel (AGC short/long).
Upper and lower sideband are selected by changing the BFO insertion frequency. For CW demodulation, the BFO frequency is variable ± 5 kHz by front panel control.

The frequency synthesis of the receiver is done in the BFO-, VCO A- and VCO B-cassette.

The BFO Cassette generates the BFO frequency and PLL reference frequencies for VCO A (10 kHz) and VCO B (25 kHz) and also a test frequency spectrum starting at 1 MHz. This signal is used for BITE testing and it is a 1 MHz square wave signal of +25 dBm which can be attenuated to -54 dBm.

A 10 MHz TCXO in the BFO cassette is the source for all generated frequencies in the receiver. An external 10 MHz or 1 MHz frequency standard can be connected as well. The internally generated frequency is available on a receptacle on the back of the BFO cassette.

The VCO-A generates the frequency steps 10 Hz, 100 Hz, 1 kHz and 10 kHz, and also the second LO-frequency of 58.078 MHz.

By means of the VCO-B, the steps 100 kHz, 1 MHz and 10 MHz are determined and, together with the mixture of the VCO-A, a local oscillator-signal of 63.088 - 93.078 MHz is generated.

The receiver is equipped with a switch mode power supply. The power supply provides +18 V and +5 V and also +12 V for charging the built-in accumulator. A break-down of the AC power supply makes that the power supply automatically switches over to the battery supply.

The operational unit is indicated in the block diagram by "CONTROL PART". It contains the microprocessor for the control of individual settings such as frequencies, bandwidth etc. being entered via the operational elements. The DISPLAY indicates the set operational modes.
For the indication of frequency, time and channel-no., 7-segment LED displays are provided. Single LEDs are provided to indicate the operational modes, input voltages and also the AF-level.

Frequency entry is done either via key-board or the tuning knob.

In CW (mode A1A), the BFO-frequency may be set via a separate knob.
The Receiver RX 1001 M offers a memory capacity of 99 channels and features two basic different scan programs, 1 and 2.
The receiver RX 5001 in contrast offers three basic Scan programs 1,3 and 4. (Refer to the list below).

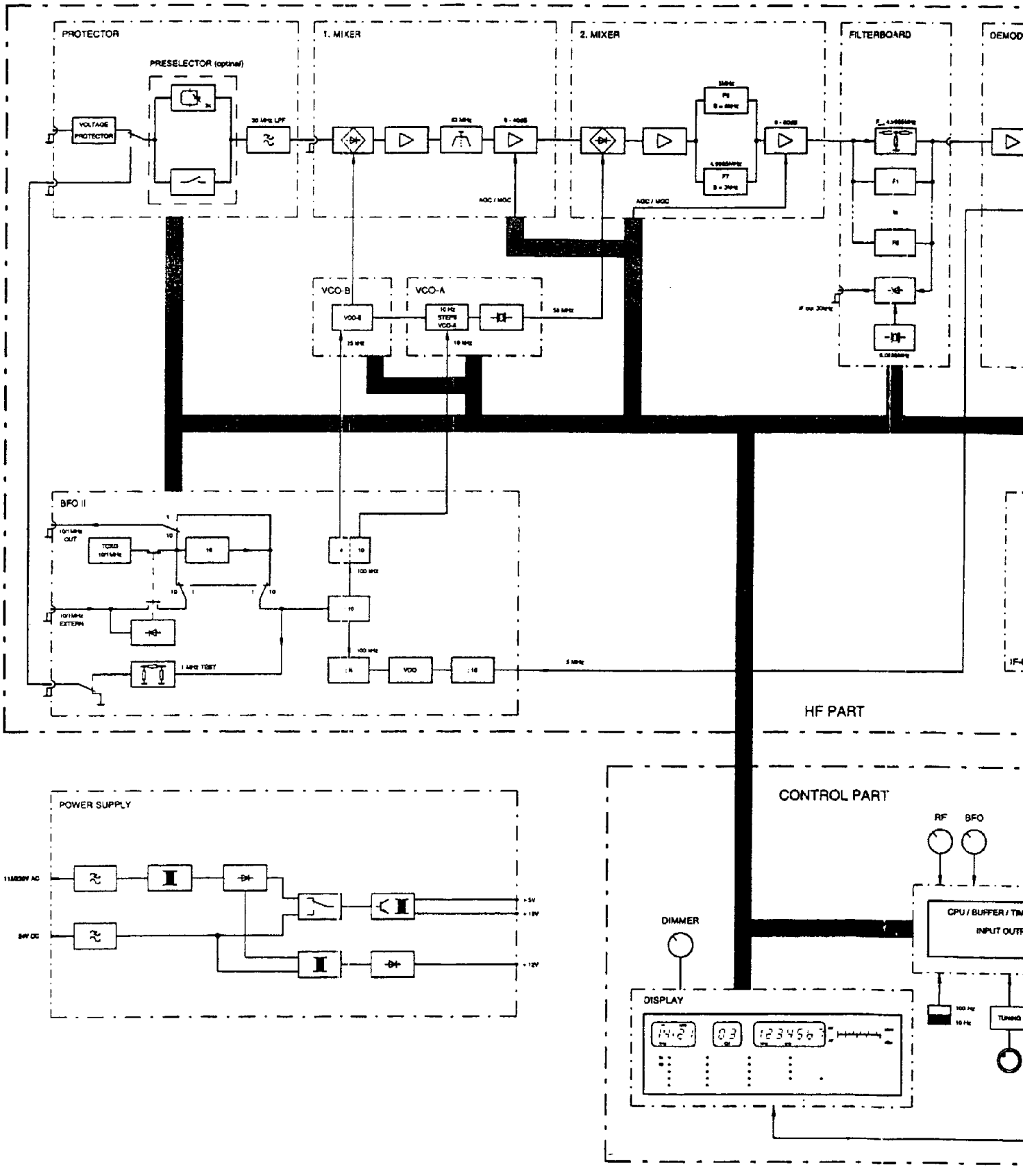
1. SCAN BY TIME
   This program operates on channel scanning with priority to those channels which are designated to preset times. At these given times the programmed channel is activated and stays active during a preset time interval.

2. SCAN CHANNEL + CHANNEL
   Up to 99 channels in any sequence can be linked together and scanned in 2 second intervals.

3. CHANNEL SCAN
   For CHANNEL SCAN set lower channel and upper channel of a group to be scanned, followed by the stop time and dwell time and AGC-threshold. Up to twenty groups of channels can be selected following the same input procedure before the Scan-program is started. Scanning can be stopped from the keyboard or externally by grounding a connector pin.

4. FREQUENCY SWEEP
   For this scan program select lower frequency and upper frequency of band required followed by input for stop time, dwell time frequency increments and AGC-threshold. This programming procedure can be repeated for up to twenty groups of frequency bands to be scanned in sequence until a go-command starts scanning. Scanning can be stopped from the keyboard or externally by grounding a connector pin.

RX 1001 M / RX 5001
Part 1



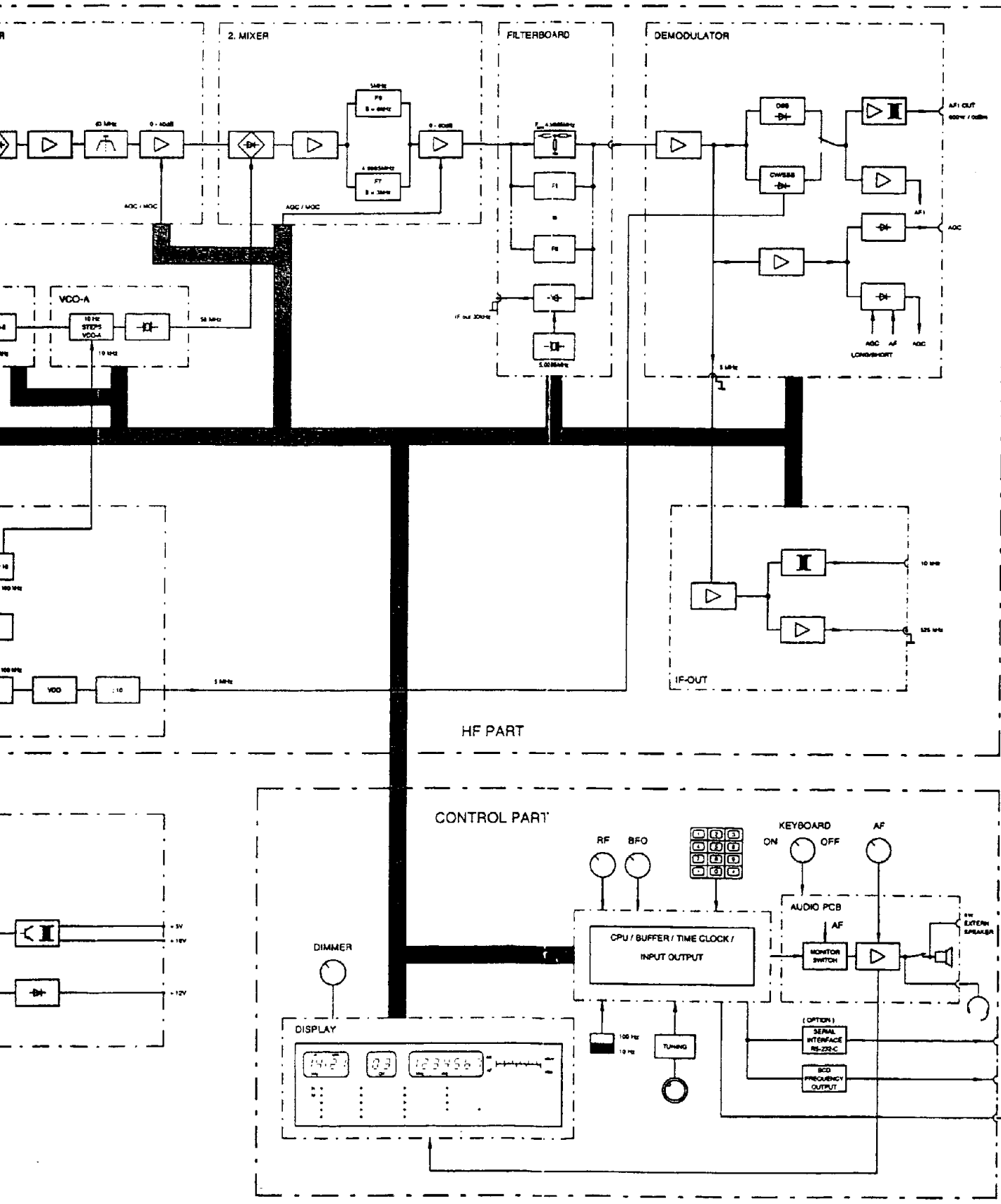
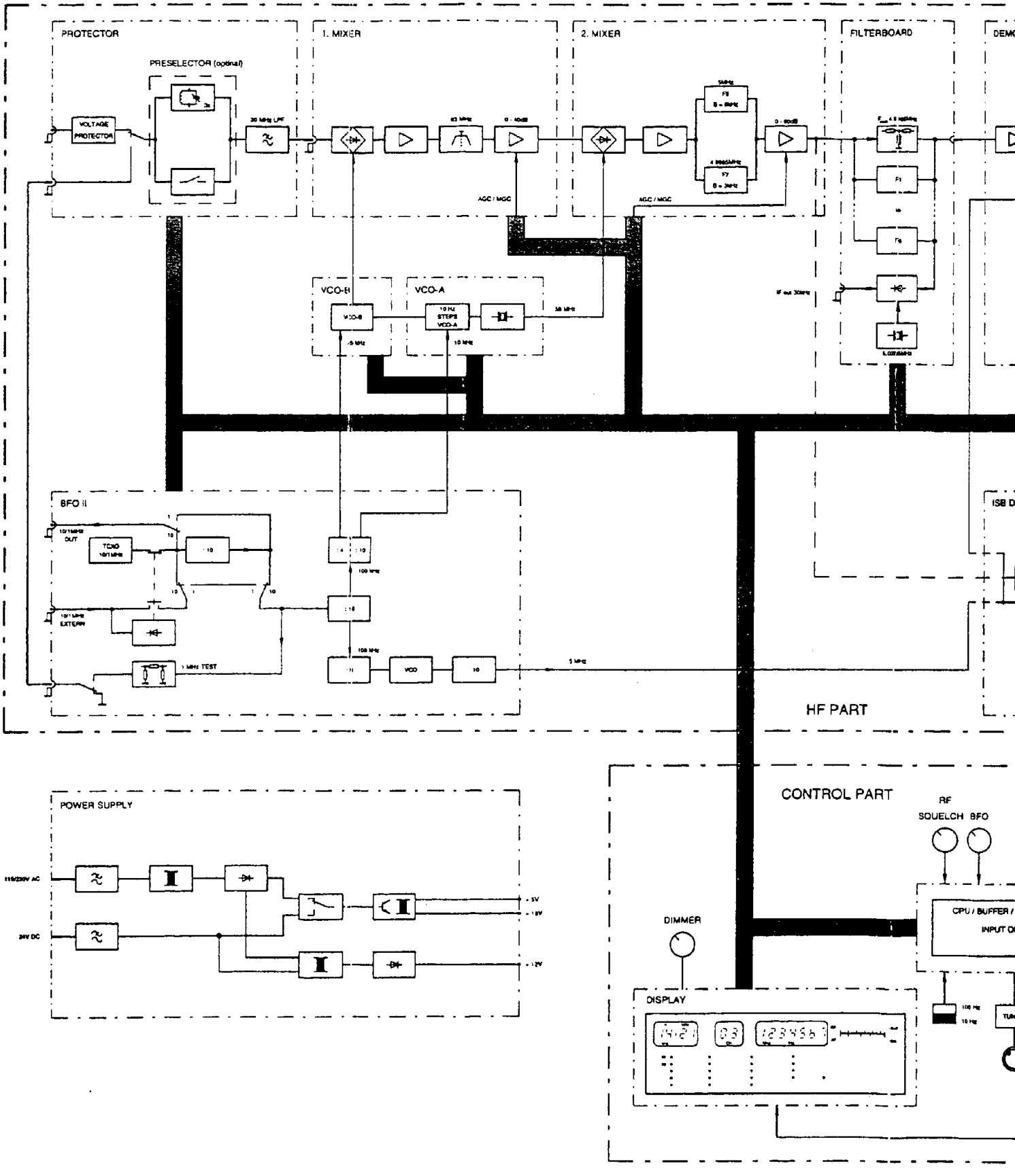



Fig. 1-2
Blockdiagram RX 1001 M

RX 1001 M / RX 5001
Part 1



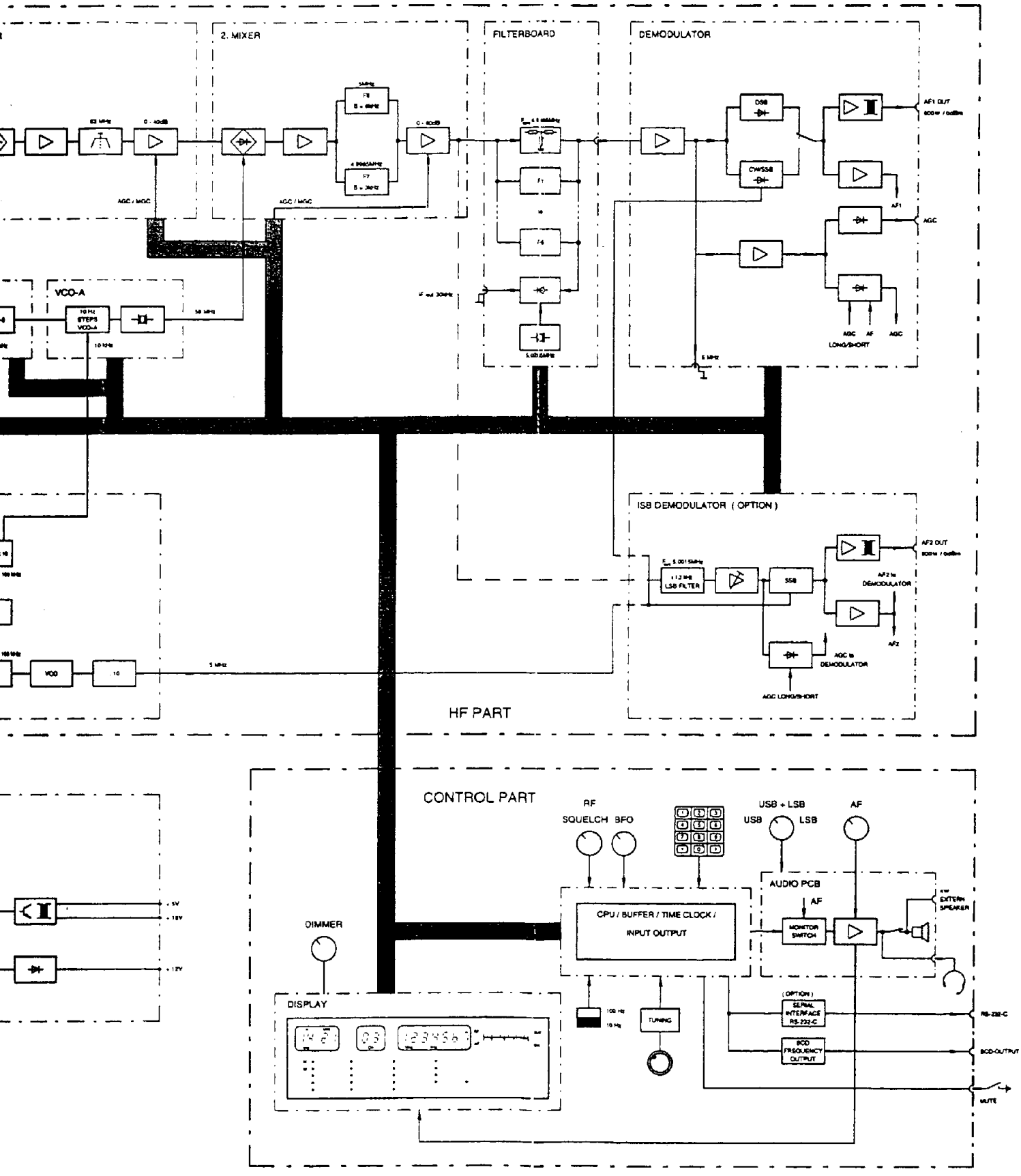



Fig. 1-3
Blockdiagram RX 5001