skanti

INSTRUCTION MANUAL

SSB RECEIVER
Type R6000

500 3-81
910 000 21
1. udgave

skanti

R 6000 INSTRUCTION MANUAL

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Due to the constant processing of the experience gained during production and operation of our equipment, minor modifications may occur relative to the information given in this manual. Whenever practicable corrections will be listed on a correction sheet inside the front cover of this manual.

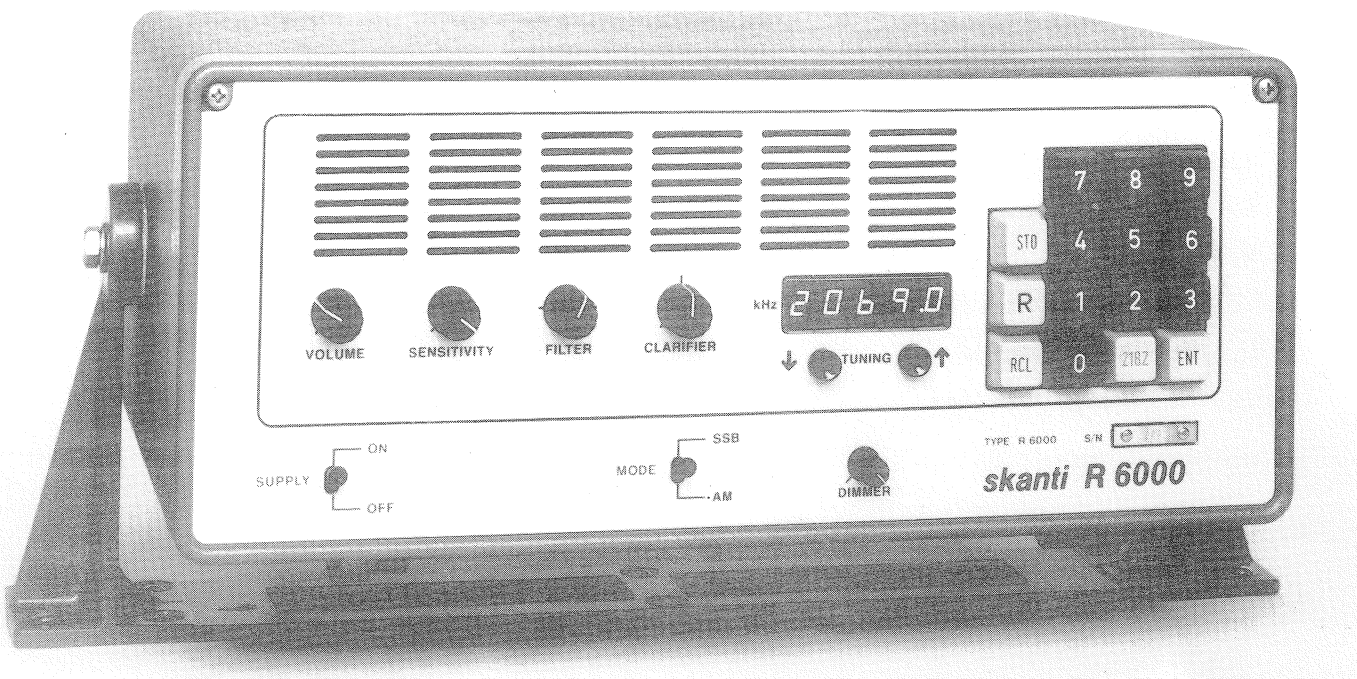

VOLUME
SENSITIVITY
FILTER
CLARIFIER
kHz
20690
TUNING
7 8 9
STO 4 5 6
R 1 2 3
RCL 0 2182 ENT
SUPPLY
ON
OFF
MODE
SSB
AM
DIMMER
TYPE R 6000
S/N
skanti R 6000

Fig. 1

1. INTRODUCTION TO R 6000

The R 6000 SSB marine receiver is designed for reception of type AM and SSB signals in the frequency range 100 kHz to 4500 kHz.

The receiver has an all solid state design with microprocessor control and fully synthesized operation in the complete frequency range.

The operator selects the frequencies via a keyboard. A single key operation instantly selects 2182 kHz.

The keyboard permits the operator to program up to 20 of the most often used receiving frequencies and to recall each channel with a few key operations. The R 6000 will store the programmed channels for several years, even when switched off.

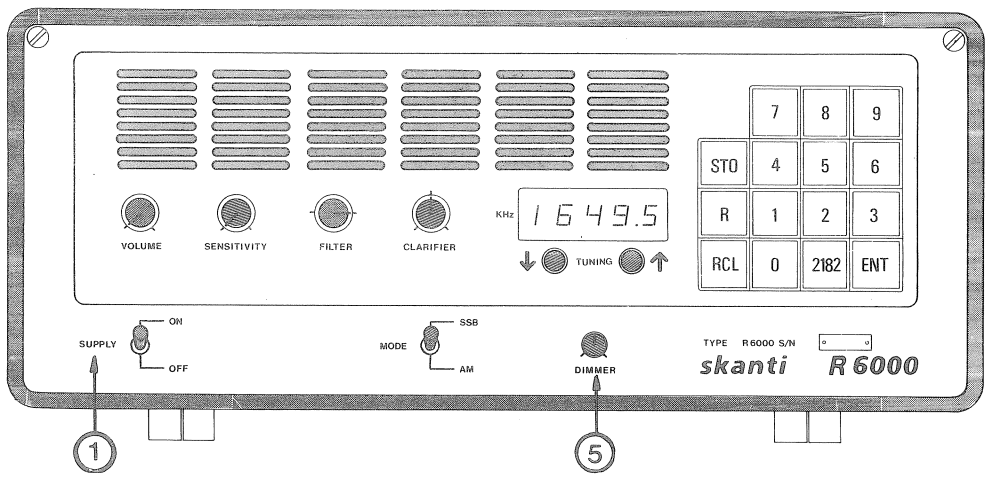
The built-in switched mode power supply secures stable internal voltages irrespective of large variations of the 24 V input voltage to the receiver.

As shown in Fig. 1 much thought has been put into the design of the R 6000, especially the front plate with its operating controls. The receiver consists of a non-metallic, non-magnetic housing, and 3 easily replacable electronic modules. This combined with the small dimensions of the cabinet ensures maximum installation and service flexibility.

2. OPERATION

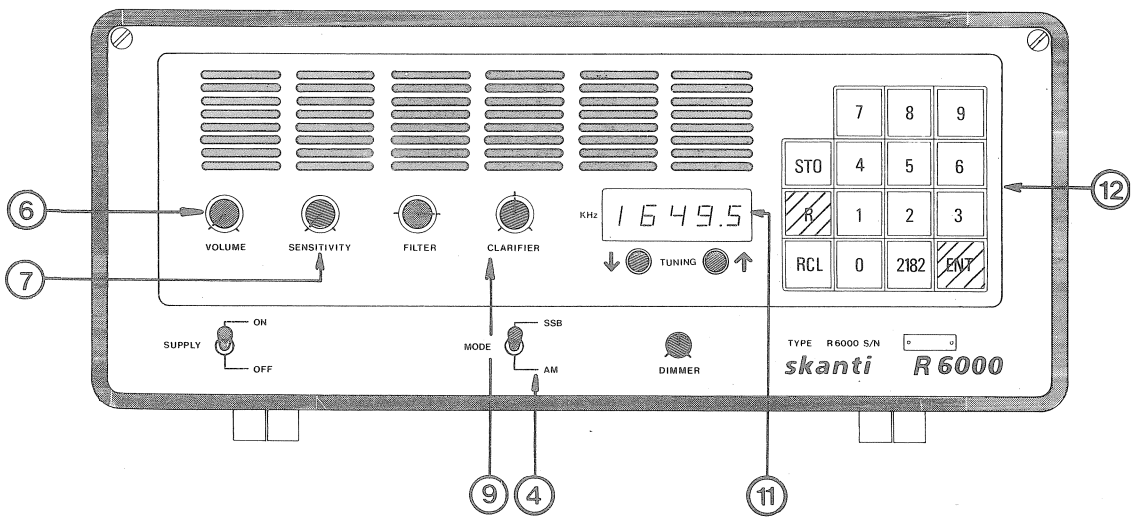
2.1. OPERATING INSTRUCTIONS - SHORT FORM

SWITCH ON



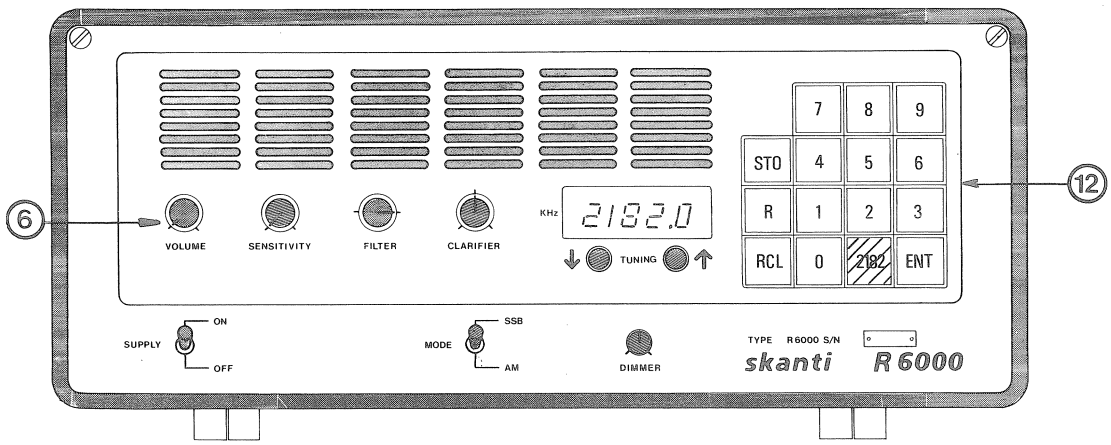
1. Switch SUPPLY (1) to "ON"
2. Turn DIMMER (5) fully clockwise

RECEIVE FREQUENCY SET-UP



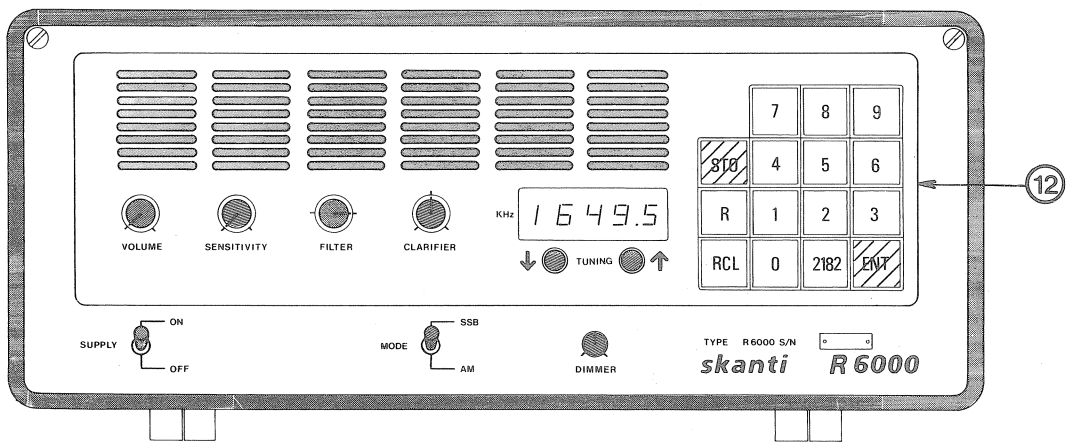
1. Press "R" key on keyboard (12).
2. Enter desired frequency in the frequency display (11) via keyboard (12) numeric keys.
3. Press "ENT" key on keyboard (12)
4. Turn SENSITIVITY (7) fully clockwise.
5. Adjust VOLUME (6) for a convenient sound level.
6. Set Mode-switch (4) to "SSB" or "AM" according to received signal.
7. Adjust CLARIFIER (9) for natural-sounding speech if mode is "SSB"

QUICK SET-UP FOR 2182 kHz



1. Press "2182" key on keyboard (12)
   This instantly changes receive frequency to 2182 kHz.
   AM mode is automatically selected (mode switch is de-activated).
   Receiver sensitivity is automatically switched to maximum.
   (The SENSITIVITY control is de-activated).
2. Adjust VOLUME (6) for a convenient sound level.

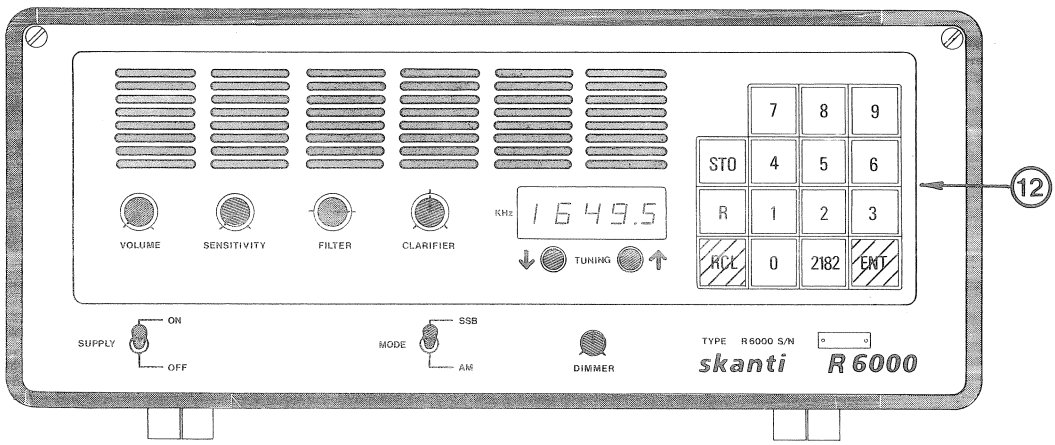
HOW TO STORE (STO) RECEIVE FREQUENCIES



To programme a "channel" into the built-in frequency memory proceed as follows:

1. Set up the actual frequencies on the displays.
2. Press the "STO" key on keyboard (12) and keep it pressed.
3. Enter your channel-number via the keyboard (12) numeric keys. You have 20 channels from 0-19.
4. Press and release "ENT" key, release "STO".

HOW TO RECALL (RCL) STORED RECEIVE FREQUENCIES



To recall a "channel" in the frequency memory proceed as follows:

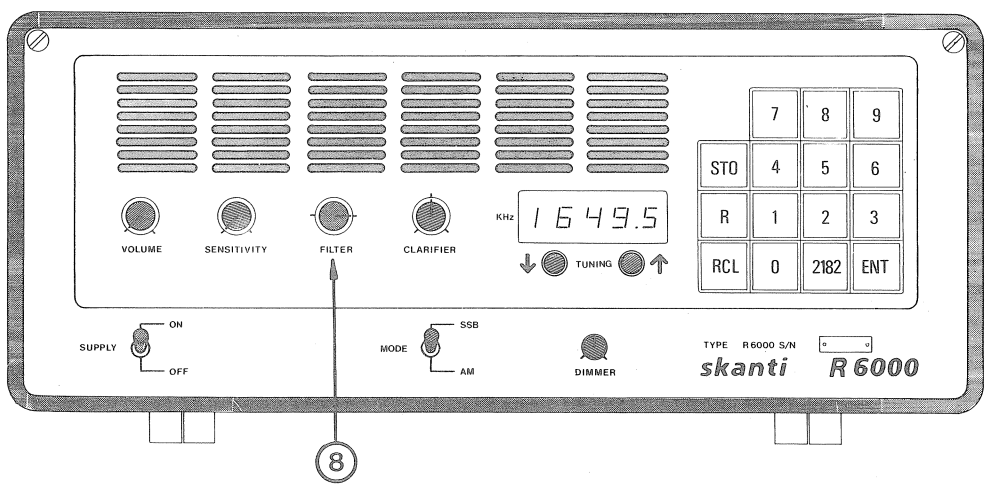
1. On keyboard (12) press

"RCL"

Channel no.

"ENT"

FILTER

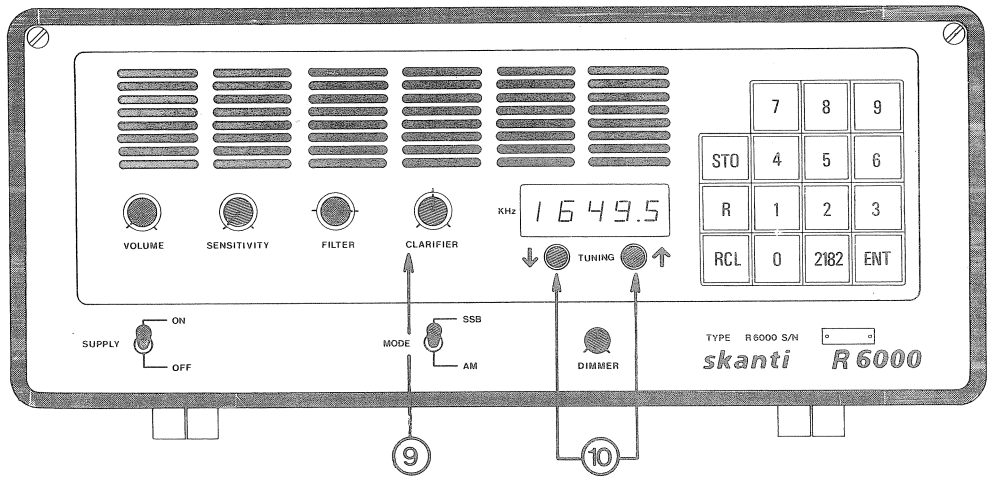


To minimize noise and interference at the receiving frequency, activate the FILTER (8) as follows:

1. Turn the FILTER (8) knob to its extreme left or right position (right or left markings); this will activate the filter.
2. Adjust FILTER (8) knob for max. receiver sensitivity or minimum transmitter noise/interference.

NOTE: The filter switches off automatically if the receiver frequency is changed either by TUNING or by a new keyboard entry of receiver frequency.

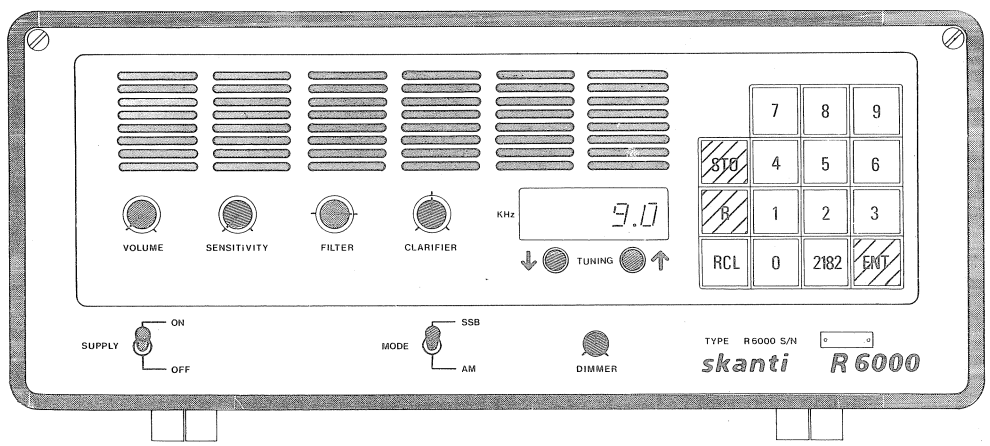
RECEIVER TUNING



1. TUNING pushbuttons (10) are used to change the receive frequency up/down. A short operation will change the frequency 1 kHz or 100 Hz in AM and SSB mode respectively. If a TUNING pushbutton is pressed and held pressed for more than 0.5 sec. the receiving frequency will change continuously with 10 kHz/sec. or 5 kHz/sec. in AM and SSB mode respectively. After 1 second the rate of change will be doubled.

2. For fine tuning to an SSB station use the CLARIFIER control (9) and adjust for natural-sounding speech.

9 KHz (10 KHz) SCANNING FACILITY IN THE BROADCAST BANDS:



This facility eliminates the need for fine-tuning to broadcast stations when using the TUNING pushbuttons. The broadcast bands 155 kHz to 281 kHz and 531 kHz to 1602 kHz are scanned in steps of 9 kHz, corresponding to the channel spacing of broadcast stations in regions 1 and 3. Alternatively the band 540 to 1600

may be scanned in steps of 10 kHz, corresponding to the channel spacing in Region 2.

To obtain 9 kHz (or 10 kHz) scanning proceed as follows:

Press in sequence 1:

"R"
"9" (or "10")
"ENT"

"9.0" or ("10.0") is now flashing in the display.

The information must now be stored in channel no. 19 as follows:

Press in sequence 2:

Press	"STO" and keep it pressed
Press	"1"
	"9"
	"ENT"
Release	"STO"

Only channel No. 19 can be used for storing information.

Any other content in channel 19 than 9.0 or 10.0 causes normal 1 kHz scanning.

Note that when the 9 kHz (or 10 kHz) scanning facility is desired channel 19 cannot be used for storing a receiver frequency.

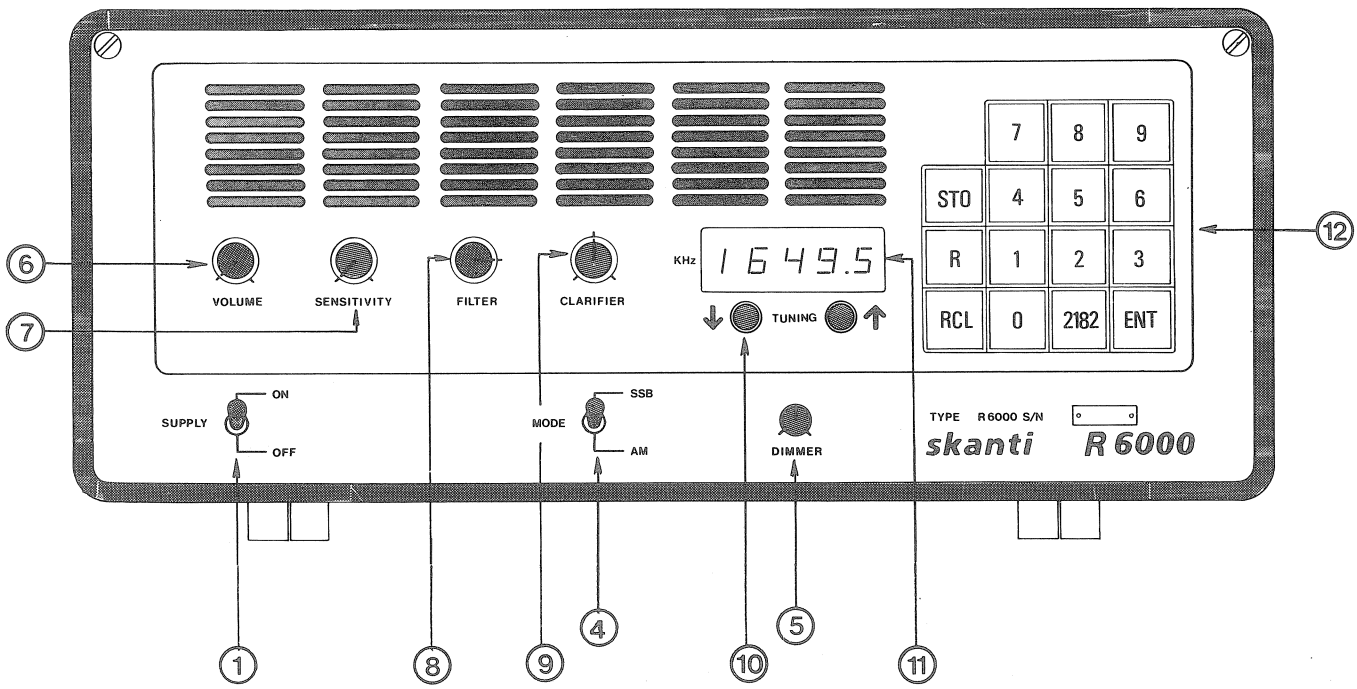

7
8
9
STO
4
5
6
R
1
2
3
RCL
0
2182
ENT
KHz
1649.5
TUNING
VOLUME
SENSITIVITY
FILTER
CLARIFIER
SUPPLY
ON
OFF
MODE
SSB
AM
DIMMER
TYPE R6000 S/N
skanti
R 6000
6
7
12
1
8
9
4
10
5
11

Fig. 2.2.1

2.2. DETAILED DESCRIPTION OF OPERATING CONTROLS

Refer to fig. 2.2.1.

(1) SUPPLY

ON : Switch-on of R 6000

OFF : Switch-off of R 6000.

(4) Mode switch

SSB : Reception of A3J and A3A

AM : Reception of A3H and A3
AM (A3H) is automatically selected in the receiver for frequencies below 1606.5 kHz.

(5) DIMMER : For adjustment of the light intensity in the frequency display.
Turn fully clockwise, for full maximum intensity.

(6) VOLUME : For adjustment of receiver AF gain.

(7) SENSITIVITY : Adjusts receiver IF amplifier gain. Turning the control anticlockwise gradually reduces the gain. This can be advantageous during SSB reception as it prevents noise from coming up in speech pauses.

NOTE: The AGC (Automatic Gain Control) is impeded when the gain is manually reduced by means of the SENSITIVITY control. Always turn the control fully clockwise when selecting a new frequency.

The SENSITIVITY control is disabled at frequencies below 1606.5 kHz (broadcast bands) and 2182 kHz (if selected by 2182 key) where AM (A3H), AGC ON is automatically selected.

(8) FILTER : For activation and adjustment of the narrow, tunable receiver input filter.
To activate the filter, turn the knob to its extreme left or right position (right or left horizontal markers).

Next, adjust the knob for maximum receiver sensitivity or minimum transmitter noise/interference.

NOTE: The filter is taken out of circuit automatically if the receiver frequency is changed, with either the TUNING pushbuttons (10) or with a new keyboard entry of receiver frequency.

(9) CLARIFIER : Receiver frequency fine tuning in SSB mode.

(10) TUNING

: Receiver frequency-decrease pushbutton

: Receiver frequency-increase pusbutton

NOTE: Rate of change is 10 kHz/second in AM mode and 5 kHz/second in SSB mode. However, the rate of frequency change will double if a TUNING pushbutton is kept pressed for more than one second. See also page 2-7. in SSB mode the frequency will step 100 Hz each time one of the pushbuttons is pressed.

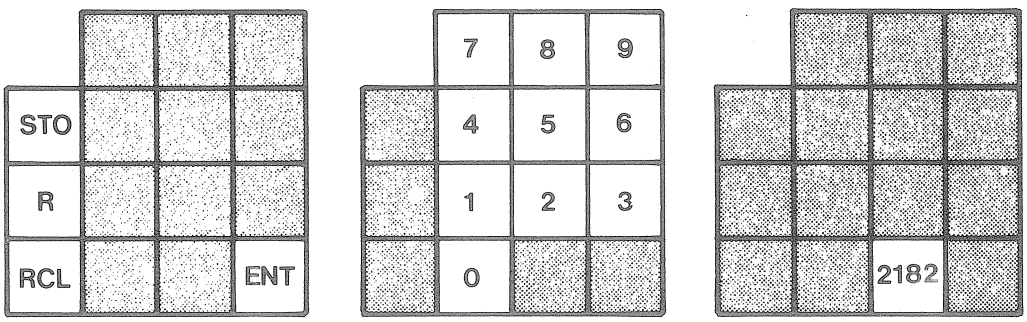
(11) R-display : Receive frequency display.

A flashing decimal point indicates that an enter or recall of a new receive frequency is not finalized.

Flashing digits indicate that the frequency is outside the specified receiver frequency range.

(12) Keyboard

The keyboard consists of five control keys and ten numeric keys.



FUNCTION CONTROL KEYS NUMERIC KEYS 2182 CONTROL KEY

All keyboard operations (except use of the "2182" key) must begin with one of the three extreme left column keys STO - R - RCL to define the type of function and must end with ENT to indicate that the keyboard operation is finalized.

For this reason keyboard operations generally have the following 3-step structure:

Step 1 Press one of the three function control keys:
STO for storing the frequency in display
R for updating the display
RCL for recalling stored frequency (channel)

Step 2 Use the numeric keys, either for entering new frequencies or a channel number.

Step 3 Press ENT

Details related to the five control keys are as follows:

STO — Store key.
To be used for storing the current contents of the display in the user-programmable memory.

Pressing STO will not change the content of the display.

STO must be pressed during the complete store sequence, see section 2.1.

R — Receiver frequency key.

Pressing this key will clear the display.
The decimal point flashes to indicate that a new receive frequency must be entered with the numeric keys.

RCL — Recall key.
To be used for recalling a channel from the user-programmable memory.

Pressing this key will clear the display.
The decimal point will flash, in both displays, to indicate the channel number must be entered with the numeric keys.

The entered channel number will now show in the display.
Refer to section 2.1 for complete recall procedure.

ENT — Enter key.
Must be operated to terminate all keyboard operations initiated by the STO-R or RCL keys.

2182 — Quick set-up key for 2182 kHz.

Pressing this key will instantly select 2182 kHz as receive frequency.

AM (A3H) mode and full receiver sensitivity is automatically selected independent of the actual positions of the mode-switch or sensitivity control knob.

3. PREVENTIVE MAINTENANCE

To ensure maximum performance and minimum repair trouble, we strongly recommend you to follow below stated headlines for preventive maintenance.

1. Always keep the battery fully charged.

2. Check antenna installation and the ground connection at regular intervals.

3. Keep antenna feed-through insulators clean and dry.

4. Keep your R 6000 clean and dry externally to ensure continued function of the front panel controls.

5. If R 6000 has not been used for a long period of time combined with exposure to extreme environmental conditions, open the unit and make a visual inspection. Remove salt, water or ice with a moist cloth before switching on the equipment.

6. For general maintenance and top performance, call an authorized service technician to give the equipment and the complete antenna/earth connection installation a general check every 12-18 months.

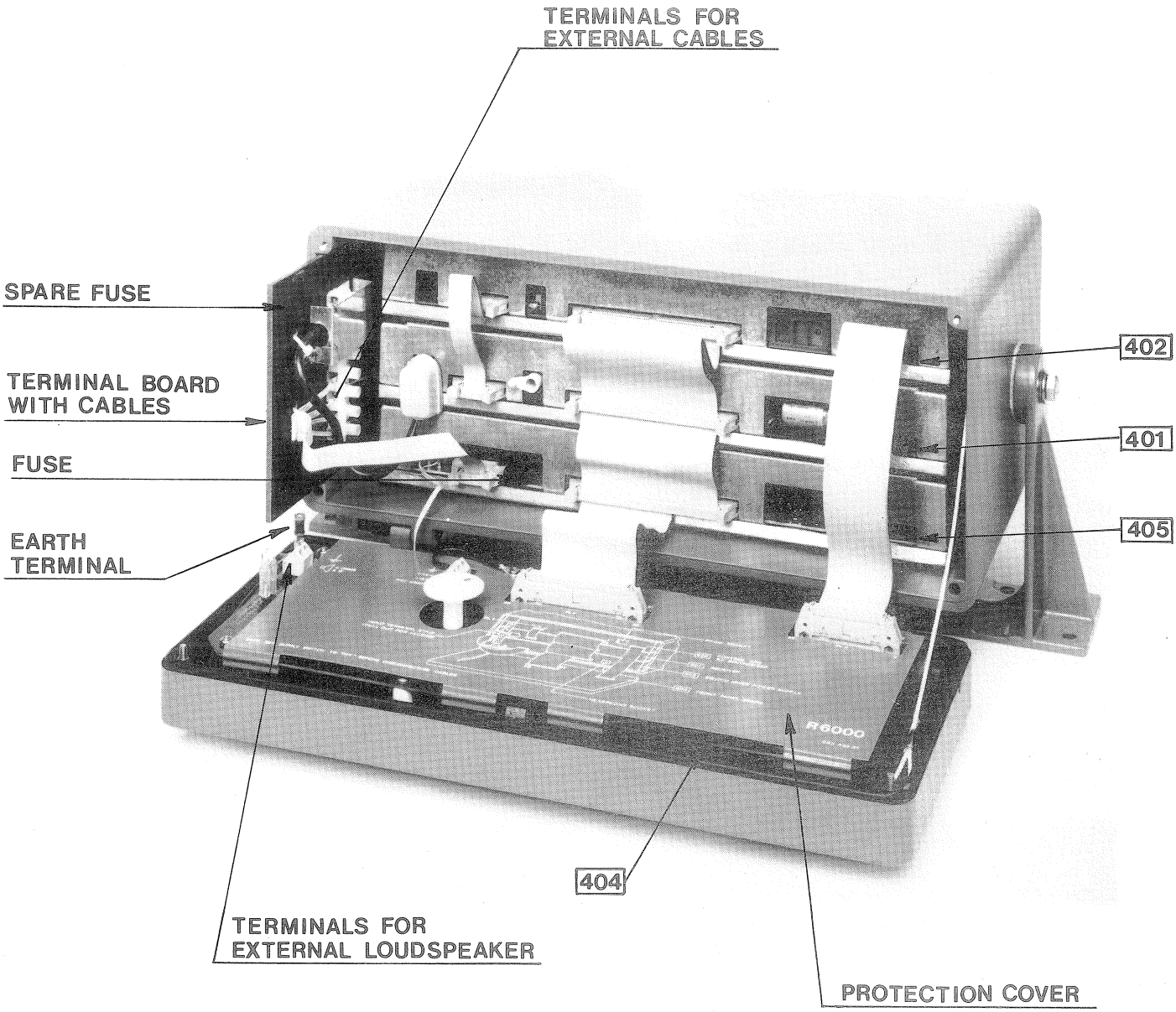


Fig. 4.1. R 6000 with front panel opened.

4. SIMPLE SERVICE

4.1. Malfunction:

If the equipment is not functioning correctly, a check should be made that it is being operated properly, see chapter 2.

4.2. Battery:

Check that the 24 V Battery voltage is present. The condition of the battery should be checked at frequent intervals. The battery must always be fully charged and should be topped up frequently with distilled water (liquid should be 5 to 10 mm above the plates).

4.3. Replacement of fuse:

If the R 6000 is totally dead: Replace fuse. The 24 V - Main Power fuse is positioned on the Switch Mode Power Supply [405] (see fig. 4.1)

The fuse becomes accessible when the hinged front panel is opened (2 screws on the front).

Fuse rating is 3.15 A slow.

NOTE: Set supply switch to OFF and open external supply voltage switch before opening the equipment and replacing fuses.

4.4. Replacement of Electronic Modules:

When a fault has been localized to one of the three electronic modules [401] [402] or [405] , the unit is very easily replaced.

Set supply switch to OFF, disconnect the coax- and flat-ribbon-cables to the module and pull out the faulty module, taking advantage of the pull-out grooves on each side of the metal box.

NOTE: Make sure to state the exact part number (refer to the spare parts lists in section 4.5) of the faulty module when ordering a replacement.

4.5 SPARE PARTS LIST

	Part No.
Standard Shipborne Spares	
2 fuse 3.15 A slow 6.3 x 32 mm	720 331 50
Depot Spares for R 6000	
404 Front Panel Board	107 440 41
401 Receiver	107 440 11
402 Control and Rx Synthesizer	107 440 21
405 Switch Mode Power Supply	107 440 51
60 Lead Flat Ribbon Cable	106 400 10
26 Lead Flat Ribbon Cable	106 400 30
10 lead Flat Ribbon Cable	106 400 20
Terminal board with cables	106 403 50

5. TECHNICAL DATA

The SKANTI R 6000 complies with the SOLAS 74 convention and the ITU Radio Regulations. It meets the CEPT specifications, the UK MPT specifications as well as the national requirements of most countries.

RECEIVER

Frequency Range:	Broadcast bands: 100 - 1606.5 kHz Communication bands: 1606.5 - 4500 kHz
Frequency Generation:	True digital frequency synthesis with 100 Hz resolution.
Frequency Presentation:	5-digit digital LED display.
Frequency Accuracy:	Better than 40 Hz.
Frequency Selection:	A search/scanning facility is provided with 1000 Hz resolution in AM mode. A 100 Hz step function is provided in SSB mode. AM mode is automatically selected below 1606.5 kHz. 2182 kHz is entered for the receiver by a single key also providing automatic selection of AM (A3H).
Operating modes:	AM (A3H) and SSB (A3A and A3J, upper side band)
Operating Temperature:	$-10^{o}C$ to $+55^{o}C$.
Sensitivity:	Antenna input for 10 dB SINAD: 0.15 - 1.6 MHz AM: 20 µV 1.6 - 4.5 MHz AM: 6.3 µV SSB: 1 µV measured with high antenna impedance. With 50 ohms input the figures are improved by approx. 6 dB.
Clarifier Control:	Variation $\pm$ 100 Hz.
Filter:	The built-in preselector is automatically disabled by any frequency change. The circuit is re-established (when required) by turning the control knob to one of its extreme positions.
Audio Output:	5 W in 4 ohms total impedance (internal and/or external loudspeaker (s)). Internal loudspeakers are 12.5 ohms/2 Watts total. (2 pcs. of 25 ohm in parallel.)

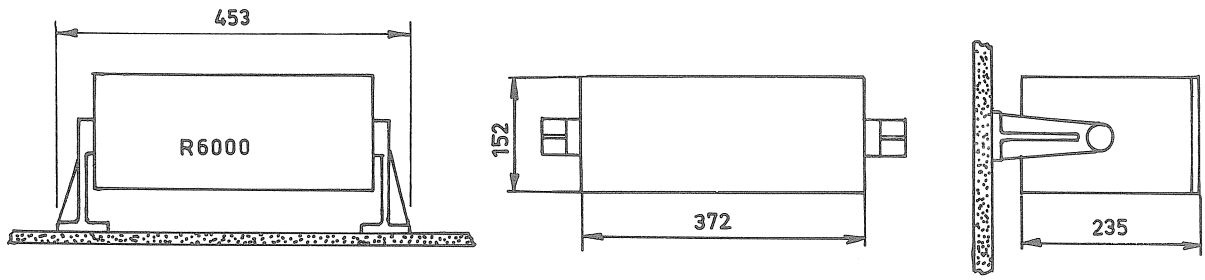
POWER REQUIREMENTS

Supply Voltage: 24V DC (+30%, -10%)
Connection will not earth supply battery.
AC mains by optional external unit.

Consumption: 0.5 A

DIMENSION AND WEIGHT

R 6000: 7.2 Kgs.



6. TECHNICAL DESCRIPTION

6.1. FRONT PANEL BOARD [404]

All manual controls on the front panel, with exception of the FILTER control, are connected to this p.c.b. All control signals branch out from this board to the different Control Unit p.c.b.'s, by way of two ribbon cables.

The Keyboard is continuously scanned by the Microprocessor Circuit, located on p.c.b. [402] . Activation of a particular key will load the number corresponding to that key, into the Microprocessor Circuit. This scanning process will also detect whether one of the two frequency tuning pushbuttons has been activated.

A multiplex technique is utilized to present the information, requested by the user, on the display.

For each display element, a BCD-code is sent from the Microprocessor Circuit to the BCD-to-7 Segment Decoder which in turn directly controls a Segment Driver. Concurrently a display element address is sent to the Scan Decoder where one of the five Digit Drivers is selected. The display element selected is now permitted to display the data for a length of time. Subsequently, the Microprocessor Circuit will send new data to a new display element, and so forth.

All display elements are updated every second millisecond. The maximum time-on duration for a single display is 200 microseconds. Continuously variable reduction of time-on duration - to the point where no light is visible on the displays - is available with the DIMMER control.

6.2. RECEIVER [401]

The antenna RF signal is led through 401-SK1 to a circuit designed to protect the receiver against excessive RF voltage and static electricity discharges, appearing on the antenna.

The RF signal from the protection circuit goes to one of the four input filters. Three of these filters are fixed-tuned and have respective passbands of 100 - 400 kHz, 400 - 1606.5 kHz and 1606.5 kHz - 4499.9 kHz. The fourth filter has a passband with a variable center frequency, controlled by the FILTER knob on the front panel. Center frequency range is 1606.5 - 4499.9 kHz.

A change in receiving frequency will be followed by automatic selection from among the three fixed-tuned filters. The automatic selection is controlled from the Microprocessor via the Gate Circuit. If the Filter is to be used the FILTER knob must be turned to one of its extreme positions, where a switch is activated and sets a latch in the Gate Circuit which in turn selects the Filter.

The RF signal from the input filters is mixed, in the 1st mixer, with a 10.8 - 15.2 MHz signal from the RX synthesizer, located on p.c.b. [402] . Mixer output is filtered in a 10.7 MHz double sideband crystal filter, where overall AM selectivity is determined.

The 10.7 MHz IF signal passes a PIN diode attenuator, controlled from the AGC circuit, before being fed to the 2nd Mixer. The other input signal to this mixer is a 9.3 MHz + 100/- 500 Hz signal from the Clarifier Circuit on p.c.b. [402] .

The 2nd IF filtering is selected from the Gate Circuit. In the SSB-mode the output from the 2nd Mixer is fed to a lower sideband crystal filter which determines overall SSB selectivity. In the AM-mode the output is fed to a 1.4 MHz LC-filter.

The filters are followed by the IF Amplifier, the gain of which is controlled by the AGC voltage.

A 1.4 MHz Band-Pass Filter connects the IF Amplifier to the Signal Detector. The integrated circuit of the Signal Detector contains a balanced mixer and a high-gain limiting amplifier. The IF signal is applied balanced to the one input part of the mixer.

In the AM mode, the IF signal is also fed to the amplifier input. This signal is amplified and clipped to constant amplitude and internally connected to the other input part of the mixer where it is mixed with the modulated signal. The difference frequency contains the wanted AF signal.

In the SSB-mode a 1.4 MHz signal, derived from the Reference Divider on p.c.b. [402] , is applied to the amplifier input.

The AF signal is via the VOLUME potentiometer on p.c.b. [404] fed to the AF amplifier which contains a 3 kHz active low-pass filter. AF output excits p.c.b. [401] to enter the handset earpiece and the loudspeaker(s).

The Signal Detector output also contains the sum frequency of the two input signals. This signal is used for the Automatic Gain Control and is taken off across a 2.8 MHz tuned circuit. The signal is amplified before being brought to the AGC Detector. The AGC Detector output controls the overall IF gain of the receiver.

IF gain may also be manually controlled with the SENSITIVITY control on the front panel. However, at frequencies below 1606.5 kHz and when 2182 kHz is selected by means of the 2182 key, the SENSITIVITY control is disabled so as to allow maximum IF gain irrespective of the actual setting of the control knob.

6.3. CONTROL AND RX SYNTHESIZER [402]

6.3.1 Microprocessor Circuit

The Microprocessing Unit (MPU) is the central unit of the Microprocessor Circuit. It responds to inputs and produces outputs in a manner determined wholly by a sequency of instructions referred to as its program. The sequential operation of the MPU is clocked by a 2.8 MHz signal derived from the Reference Divider of the RX Synthesizer.

The program is held in the Read-Only Memory (ROM). The instructions are fetched into the MPU one at a time to be decoded and actioned. The program contains mainly instructions for reading input from the Keyboard, how to display receiving frequencies, and for synthesizer control.

The Input/Output (I/O) circuits are utilized by the MPU to communicate with the keyboard, the Displays, the synthesizer as well as the RAM. The I/O Circuits also delivers a two-tone alarm signal to the Exciter.

The Non Volatile Random Access Memory (RAM) is the user-programmable frequency memory. Memory content will not be lost when power is switched off, because a lithium battery will then supply current to the RAM.

MPU start-up procedure is controlled by the Restart Generator, when power is turned on.

The Power Down Detector detects if the 7.5 V supply voltage is decreasing below a certain limit - a warning sign that power will most likely disappear very soon. At this point an order is communicated to the MPU to conclude all current tasks and to await return of power.

6.3.2. RX Synthesizer

The reference oscillator of the synthesizer is a 12.6 MHz crystal controlled oscillator. The amplitude stabilized output signal is fed to the Clarifier Mixer and to the Reference Divider.

In the Reference Divider a 2.8 MHz source for the MPU is produced, a 1.4 MHz source for the Receiver, 5 kHz and 500 Hz sources for the I/O circuits as well as a 500 Hz reference frequency for the synthesizer loop.

The 500 Hz reference frequency and the Loop Divider output frequency are compared in the Phase/Frequency Comparator circuit. To obtain lock two conditions must be met: First, the frequency of the two output signals must be the same, i.e. 500 Hz. Second, a very small, but definite, phase difference must exist between the two signals. If this minute phase difference changes, the Phase/Frequency Comparator will immediately produce a correction voltage that will correct the VCO frequency until the original phase difference is reestablished.

The Loop Filter is designed to stop unwanted noise from modulating the VCO, and to give the loop a proper dynamic response.

The Voltage Controlled Oscillator (VCO) covers a frequency range of 10.8 - 15.2 MHz. The amplitude stabilized output signal is split between two Buffer Amplifiers, one for the injection signal to the Receiver's 1st Mixer, the other for the Loop Divider.

The division ratio of the Loop Divider is controlled by the contents of the Serial-to Parallel Shift Registers. Information to these registers is received from the Microprocessor Circuit in serial format. Loop Divider output frequency is 500 Hz, when the loop is locked.

The frequency of the 3.3 MHz Voltage Controlled Crystal Oscillator (VCXO) is determined both by the 100 Hz information, stored in the Shift Registers, and the Clarifier Control Voltage. The control voltages are added in a summing amplifier. VCXO frequency may be varied approximately $\pm$ 100 Hz with the CLARIFIER control whereas frequency may be varied 0, 100, 200, 300 or 400 Hz by the 100 Hz information-controlled voltage. The total frequency variation range is thus -100 Hz to + 500 Hz.

The 3.3 MHz signal is mixed with the 12.6 MHz XO frequency in the Clarifier Mixer. The output signal is filtered in a 9.3 MHz band-pass filter and applied to a Buffer Amplifier. The output is amplitude stabilized by means of a detector controlling the 3.3 MHz oscillator gain. The resulting 9.3 MHz + 100/- 500 Hz signal is led to the Receiver's 2nd Mixer.

6.4. SWITCH MODE POWER SUPPLY [405]

The 24 V from the Battery is fed through a relay switch, controlled by the Overvoltage and Reverse Polarity Protection circuit, and through a noise filter before it is allowed to flow to the Converter itself.

It is a fly-back converter where a part of the 9V rectified secondary output is compared to a reference voltage and the result is transferred to the primary side via an optocoupler and is used to control the duty cycle of the converter. This is done by regulating the duty cycles of the pulses from the 20 kHz oscillator, before they are used as a driving signal for the Converter Driver. This means that we have a regulating loop, where the output voltage from the converter is fairly stable independent of the battery voltage variations and different loading conditions on the DC-outputs.

By means of optocouplers, in both the voltage and current control feedback path, the secondary side of the converter is galvanically isolated from the primary side and thereby from the battery.

The converter is designed so that the 17 V output voltage is tracking correctly when the 9 V output is well stabilized. Each rectified output is equipped with a Current Sensor and Overvoltage Protector. The two sensors and the Overvoltage Protector, attached to the 9V-line, disables the regulating loop and forces the converter into a low-power mode if an abnormal loading condition exists on the outputs.

24 volt can be fed to the mute input from an external transmitter during keying. The input signal is galvanically separated from the receiver by an optocoupler.

AF-output from the receiver can be fed to an earpiece through this module.

7. INSTALLATION

Correct installation of the equipment is important for maximum performance and reliability. Antennas and earth connections must be installed with the greatest care.

7.1. Mounting of Receiver

The Receiver Unit is suspended in a pair of brackets supplied. The drawing on page 7-3 shows possible mounting positions, overall dimensions and a drilling plan for the necessary holes. The unit can be tilted in the brackets to a convenient angle and fixed in that position by tightening the bolts at the sides.

A frame for flush mounting is optionally available.

7.2. Connection to the Permanent Installation

The R 6000 is to be powered from a 24V battery or a separate AC-to-24V DC converter unit. The supply leads are connected to the Terminal Board in the left side of the Receiver, seen from the front with open Front Panel Board. (See Fig. 4.1 on page 4-0). The connections of the external cables to the Terminal board are shown on page 7-4.
Before entering the Receiver Cabinet the cables must be installed with an adequate loop to allow the Terminal Board to be pulled 3-4 cm out of the Receiver Cabinet. Fuses must be provided in the supply leads. Maximum voltage drop in the supply leads should be 0.5 Volts. Table 7.1. shows the necessary cable cross sections and external fuse rating.

Max. cable length to battery	Conductor area	External fuses
6 m	2 x 0.75 mm^2	6A
12 m	2 x 1.0 mm^2	

Table 7.1

7.3. Earth Terminal

The receiver earth terminal is connected to the terminal at the rear of the front panel. (See Fig. 4.1 on page 4-0).

7.3.1 Steel Ships:

A flexible 2.5 sq. mm earth wire is run to a separate $\frac{1}{2}$" earth bolt welded to the hull as close to the Control Unit as possible.

7.3.2. Wooden Ships:

A flexible 2.5 sq. mm earth wire is run directly to the transmitter earth bolt on the earth plate. The wire should be run at a minimum distance of 0.5 m from the transmitter earth wire.

7.4. Other Cables:

Other cables should be placed as far away as possible from the earth leads and under no circumstances parallel with any transmitter copper strap closer than 0.7 m and, for the receiver earth leads, closer than 0.2 m.

7.5. Earthing the Battery:

RF earth connections will cause neither battery nor mains leads to be connected to the hull. If it is desired to connect the battery to the hull, it is important to make the connection right at the battery, never in the Receiver. Max. permissible peak voltage between the battery terminals and earth is 250 V.

7.6. Antenna

The antenna should be suspended well in the clear, away from objects whose influence on the antennas may vary, such as derricks etc. Insulators should be of the best type having low leakage even when wet.

The receiver antenna terminal is located on the Terminal Board.

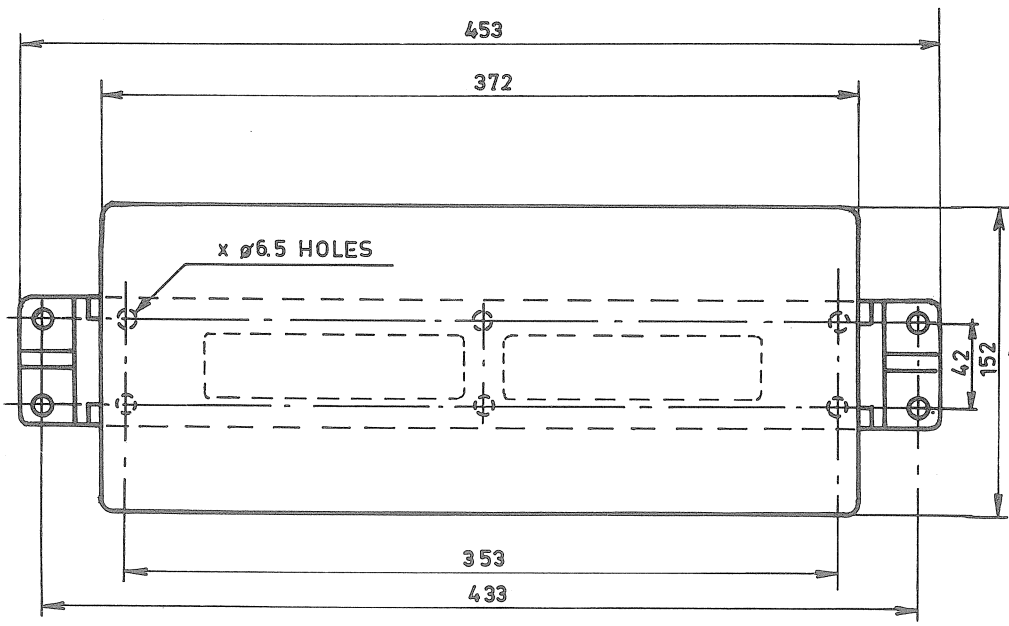
Length: 7 - 30 m. The receiving antenna should be brought in with a length of coaxial cable, which should be as short as possible, especially in the case of a short antenna.

If a long coaxial cable is used in order to separate receiver and transmitter antennas it will often be advantageous to insert an impedance matching transformer at the antenna end of the coaxial cable.

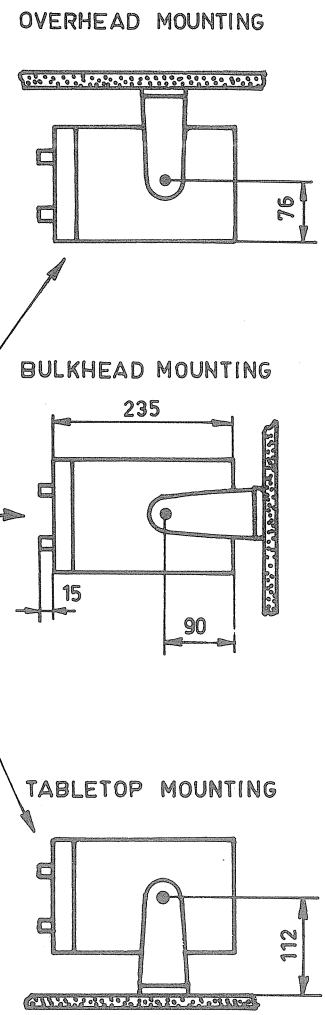
7.7. Extension Speaker

If an extension speaker is to be installed it should be connected to terminals for external loudspeaker (See Fig. 4.1 on page 4.0)

An audio power of 5 watts is available into a 4 ohms load. This power can be shared between several loudspeakers if so desired. The built-in speakers in the R6000 Receiver have an impedance of 12.5 ohms total (2 pcs of 25 ohm in parallel). When connecting the extension speaker(s) the minimum value of the total impedance should be 4 ohms including the built-in speakers. If 5 watts is required in the extension speaker(s), the built-in speakers must be disconnected.



DRILLING PLAN



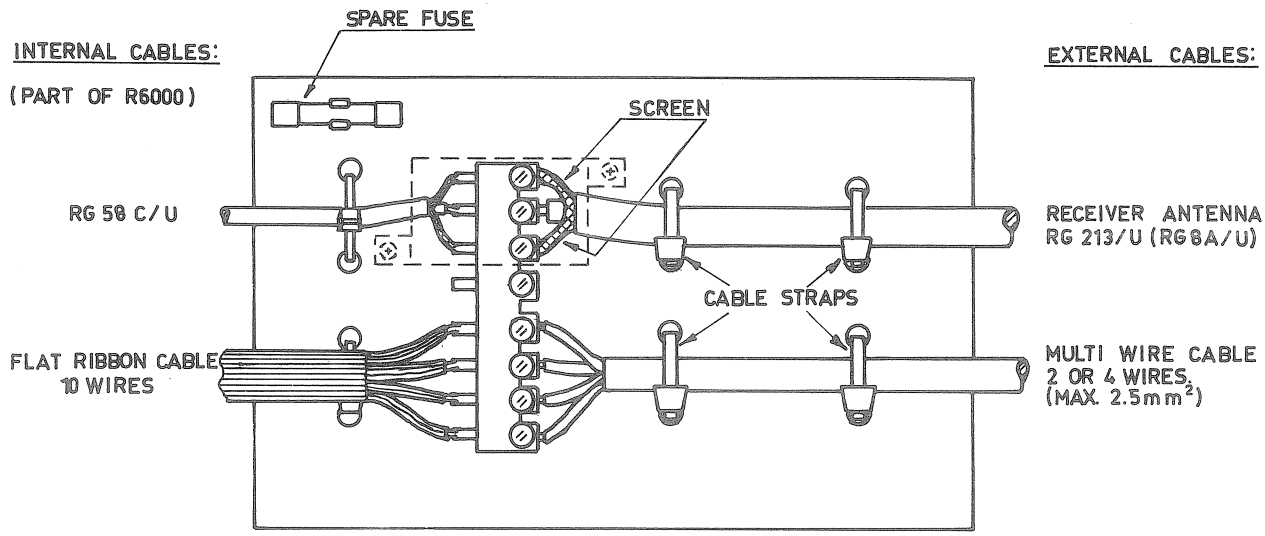
MOUNTING POSSIBILITIES

UNIT:	APPR. WEIGHT:
R6000	7.2 kgs

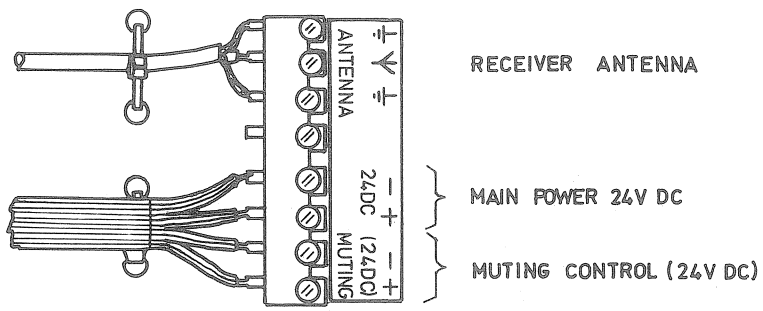
TOLERANCES : ± 1 mm
DIMENSIONS IN mm

MOUNTING OF R6000

343 451 91



INTERNAL / EXTERNAL CABLES



CABLE CONNECTIONS

TERMINAL BOARD — CABLE CONNECTIONS.

8. CIRCUIT DIAGRAMS

8.1. Symbol Explanation

8.1.1. Arrows:

A black arrow on a line indicates in which direction an AC-signal flows.

A white arrow on a line indicates in which direction the information of a DC signal flows. An exception from this rule is the supply lines and their connections, which are always indicated by a supply voltage level or its associated label.

8.1.2. Logic circuits:

A small circle at an external input means that the specific input is active LOW, i.e. it produces the desired function, in conjunction with other inputs if its voltage is the lower of the two logic levels in the system, otherwise the specific input is HIGH.

A clock input is indicated by an open triangle. A small circle at a clock input means that the outputs change on the HIGH to LOW clock transition.

A small circle at an output indicates that when the function designated is true, the output is LOW.

Inputs and outputs are labelled with labels as described in table 8.1. table 8.1.

8.1.3. Logic Functions:

Logic functions are labelled with labels in brackets. an active LOW function is given a bar over the label.

8.1.4. Voltages:

Typical DC voltages are indicated on the circuit diagrams next to the points to which they refer and are marked with a "V".

Typical logic levels are indicated in brackets (LOW/HIGH) on the circuit diagrams next to the point to which they refer and are marked with a "V".

Typical AC voltages are likewise indicated on the circuit diagrams. They are marked with "Vpp" or "mVpp".

ABBREVIATIONS

A	= ampere, amperes
B	= battery, motor
C	= capacitor
Car.	= carbon
Cer.	= ceramic
D	= diode
F	= farad, fan
FS	= fuse
H	= henry
k	= kilo or 10^{3}
L	= inductor
LS	= loudspeaker
lin.	= linear
log.	= logarithmic
m	= milli or 10^{-3}
M	= mega or 10^{6}
ME	= instrument
MF	= metal film
Mi	= mica
MP	= metallized paper
u	= micro or 10^{-6}
n	= nano or 10^{-9}
NPO	= temp. coefficient 0
N150	= temp. coefficient -150
NTC	= neg. temp. coefficient
P	= pico or 10^{-12}
PL	= connector (plug)
Polyes.	= polyester
Polyst.	= polystyrene
PTC	= pos. temp. coefficient
Q	= transistor
R	= resistor
RL	= relay
S	= switch
SK	= connector (socket)
SL	= lamp
T	= transformer
Tan	= tantalum electrolytic capacitor
U	= integrated circuit
V	= working voltage DC or volts
Vl	= valve
Vac.	= working voltage AC
Var.	= variable
Vpp	= peak to peak voltage
Varicap	= variable capacitance diode
ww	= wire wound
W	= watt, watts
W.alum	= wet aluminium electrolytic
X	= crystal, crystal osc. or crystal filter

Table 8-1

Label	Short for	Meaning
A	Trig Input	triggers one-shot on falling edge
A_x	Address	selects a memory location (data word) or a multiplexer input.
B	Trig Input	triggers one-shot on rising edge
B/D	Binary/Decimal	selects counting mode (modulus 16 or 10)
BI	Blank Input	deactivates BCD-to-7 segment decoder (blanks connected display)
C_xY	Control Signal	programmable bidirectional hand-shake signal to/from peripheral
CEP, CET	Clock Enable	enables clock signal to counter
CP	Clock Pulse	edge activated input for updating synchronous circuit
CS_x	Chip Select	selects a memory or peripheral circuit (bus slave)
D_x	Data	input to D flip-flop and register or bidirectional information path for bus connected device
E	Enable Input	enables clock signal
EO	Enable Output	activates output(s) from combinatorical circuit.
EQ	Enable Output	activates output(s) from sequential circuit.
HLT	Halt	suspends MPU activity and releases busses.
I_xY	Input Data	input for combinatorical circuit
IRO_y	Interrupt Request	wired-OR flag from peripheral to MPU indicating interrupt detected.

Table 8.1 (continued)

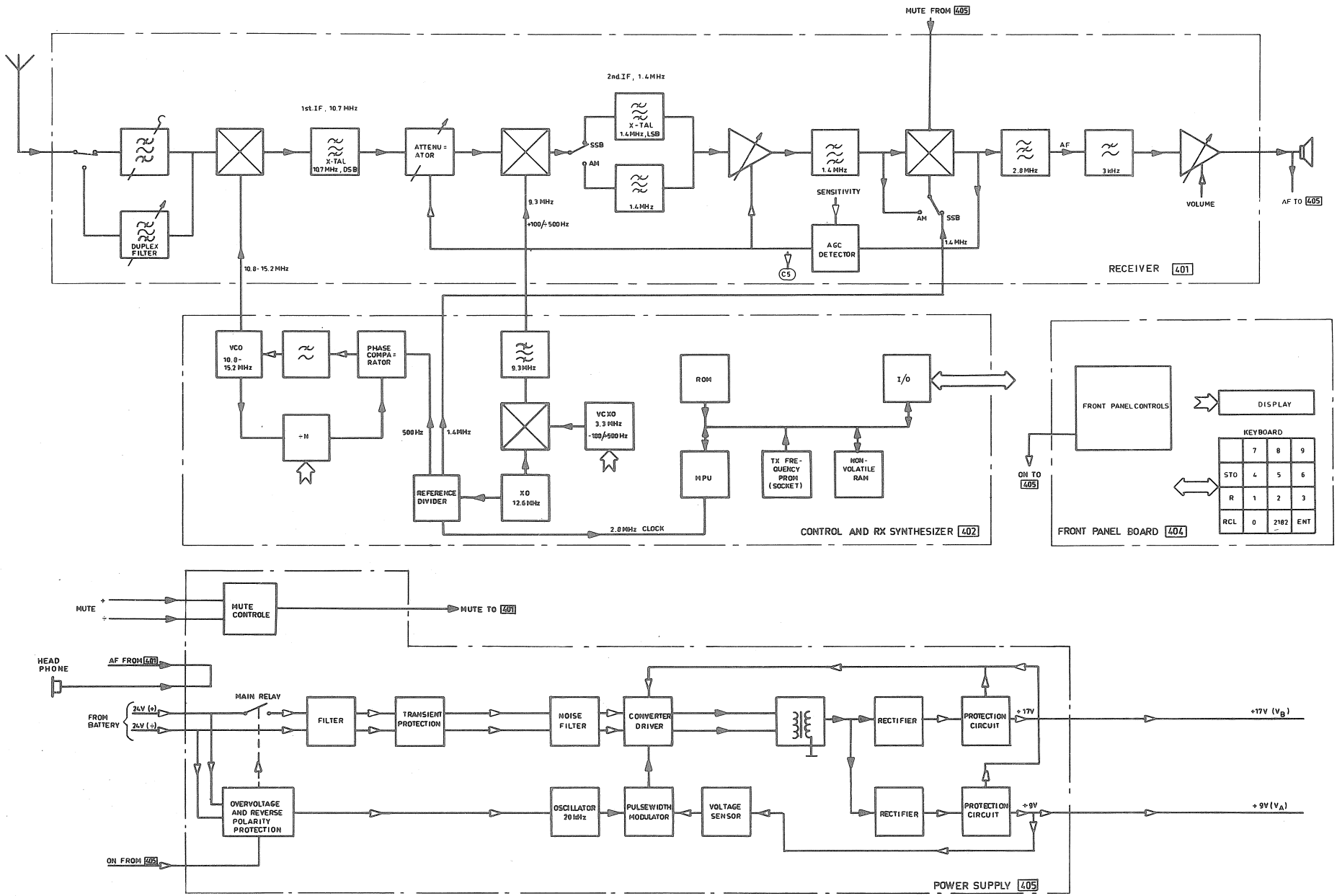
Label	Short for	Meaning
J, K	Data	input to J-K flip-flop
K_x	Mode Select	selects counting mode for programmable counter
LE	Latch Enable	updates latching register
LT	Lamp Test	Activates all outputs on BCD-to-7 segment decoder
MR	Master Reset	input for initializing MPU or clearing programmable registers in peripheral circuit
MRDY	Memory Ready	hand-shake flag to MPU indicating new bus cycle may be started
NMI	Non-maskable Interrupt	flag to MPU, which cannot be masked softwarewise indicating interrupt detected
O_x	Output	output from combinatorical circuit
P_xY	Data (bidirectional)	input to programmable counter or programmable bidirectional signal to/from peripheral
PE	Parallel Enable	loads P_x data into programmable counter
Q_x	Output	output from sequential circuit
R	Reset	forces flip-flop(s) to LOW state
$\overline{RBI}$	Ripple Blank Input	deactivates BCD-to-7 segment decoder (blanks connected display) if data correspond to leading zero, when decoders are cascaded.
RS_x	Register Select	addresses programmable registers in peripheral circuit
S	Set	forces flip-flop(s) to HIGH state
S_y	Select Data	selects data path through multiplexer

Table 8.1 (continued)

Label	Short for	Meaning
SYNC	Synchronize	issued from bus master (MPU) to synchronize data transfer
TC	Terminate Count	output from counter indicating new cycle started (corresponds to carry or borrow depending on counting direction)
U/D	UP/Down	selects counting direction
VMA	Valid Memory Address	issued from bus master (MPU) to indicate stable address bus
WI	Write Input	input to bus slave to make it accept data from master
WQ	Write Output	output from bus master (MPU) when it is a data source.

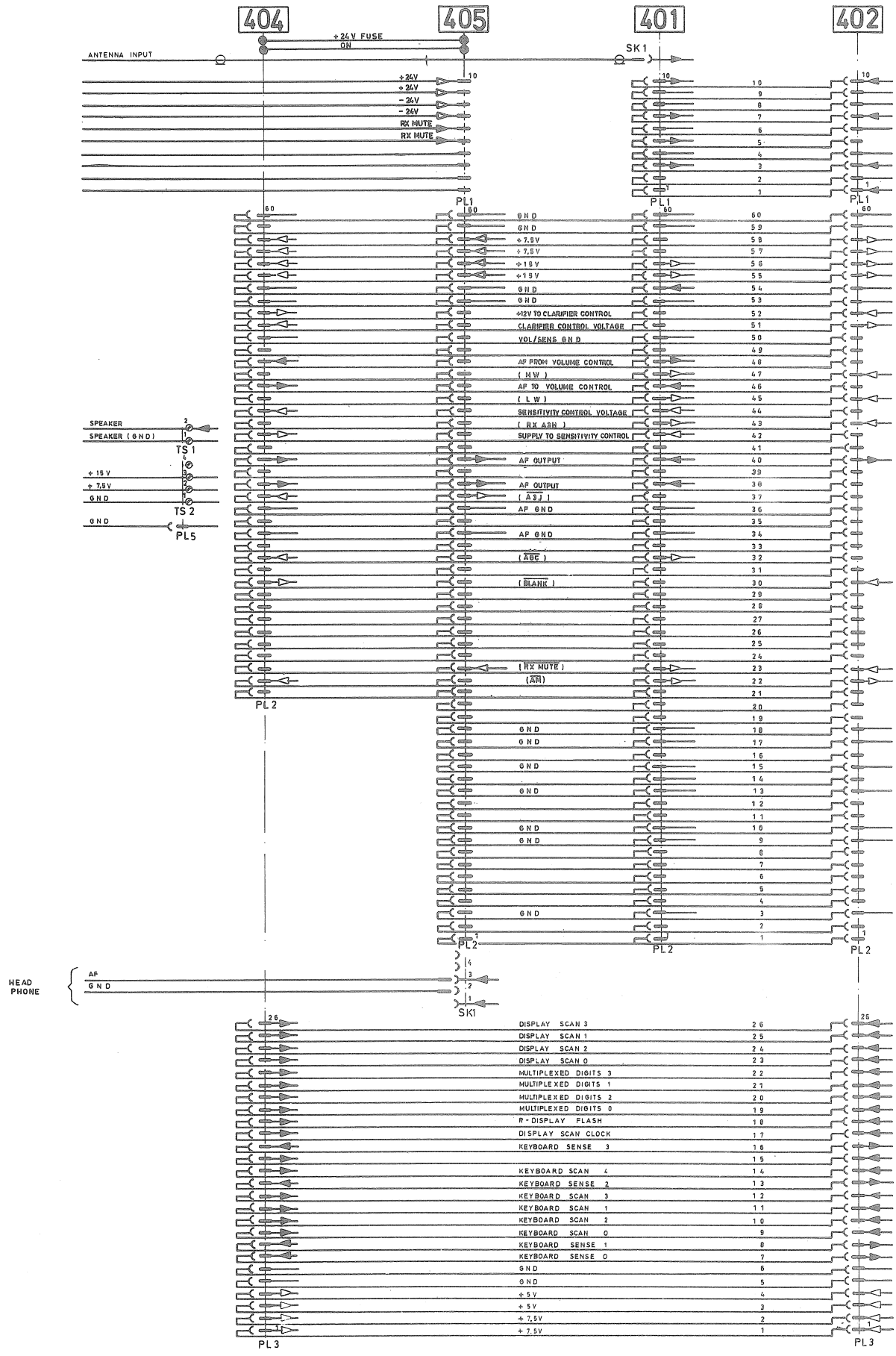
(1) "x" is a numerical index (zero origin indexing) corresponding to bit position

(2) "y" is an alphabetical index used for multiple ports.



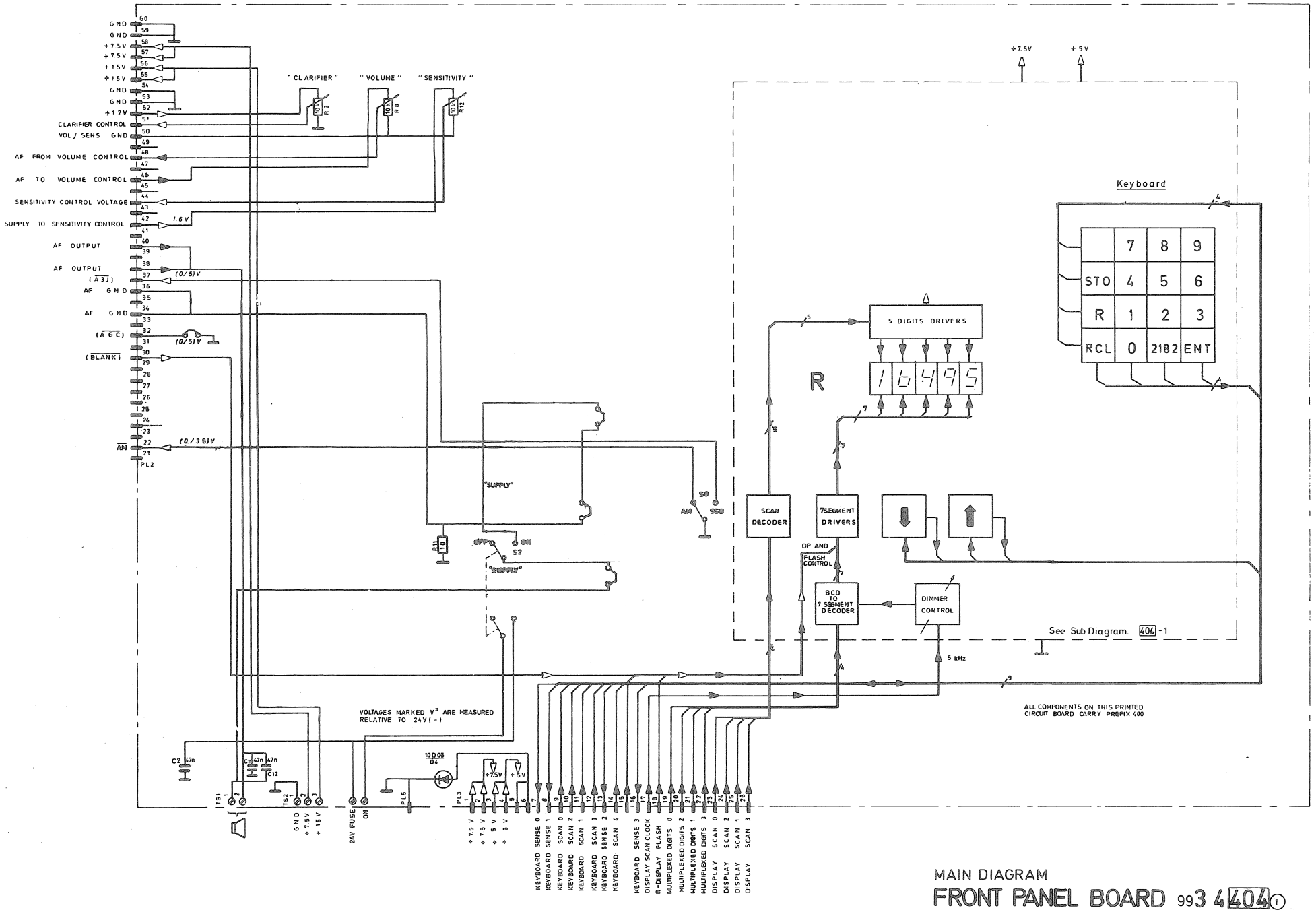
BLOCK DIAGRAM, R 6000

993 451 41



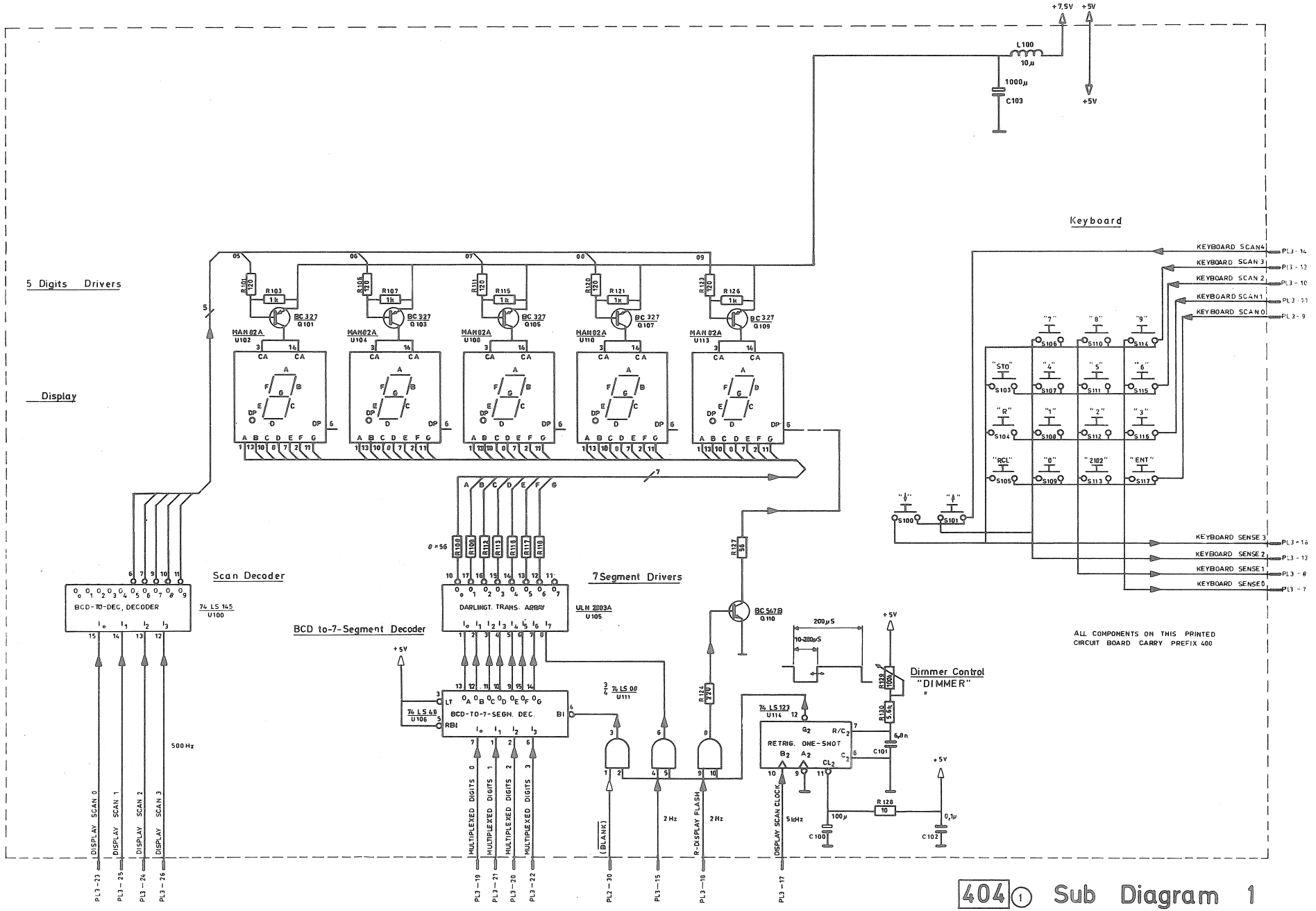
WIRING DIAGRAM, R6000

9939451 51

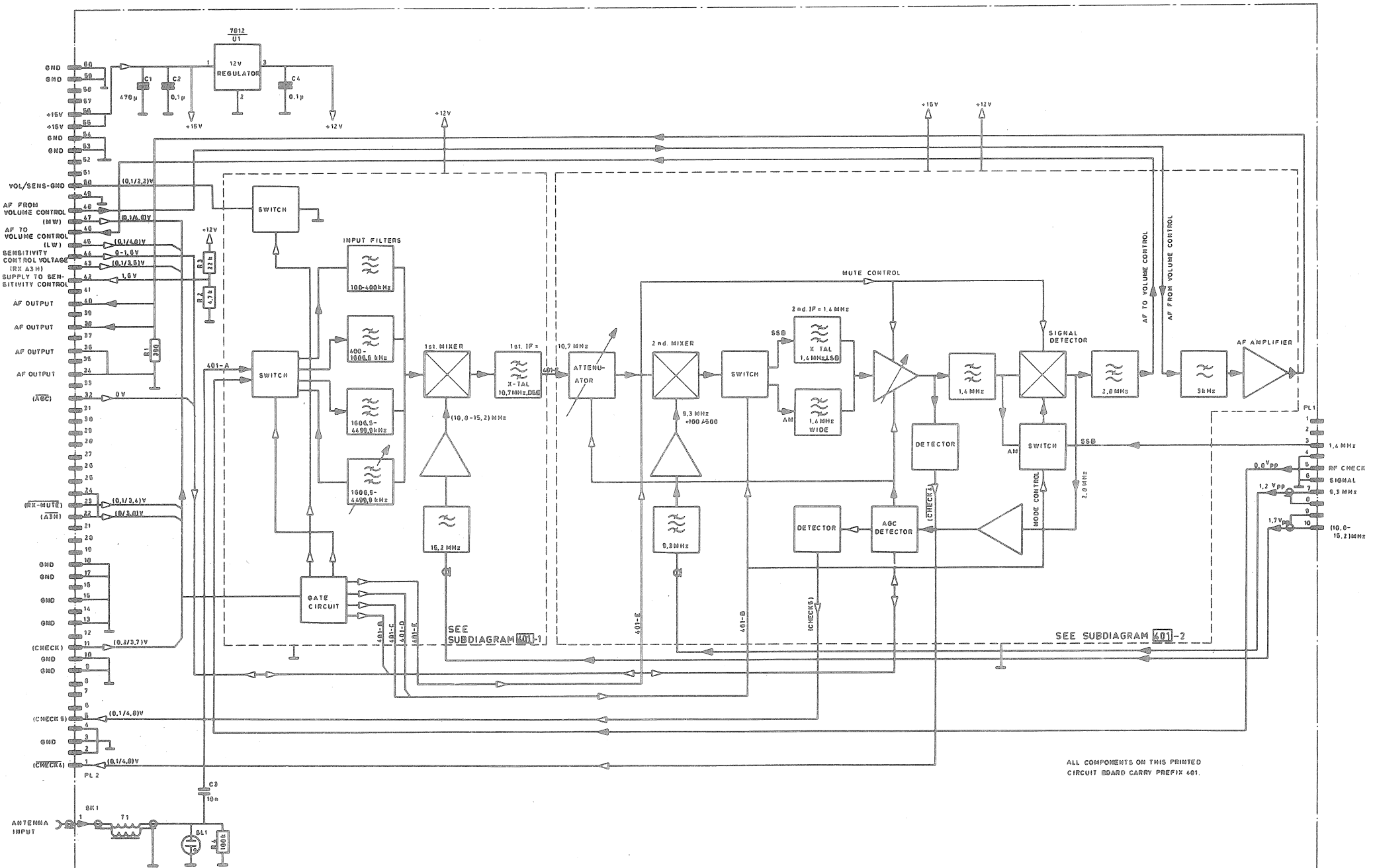


MAIN DIAGRAM

FRONT PANEL BOARD 993 4404①

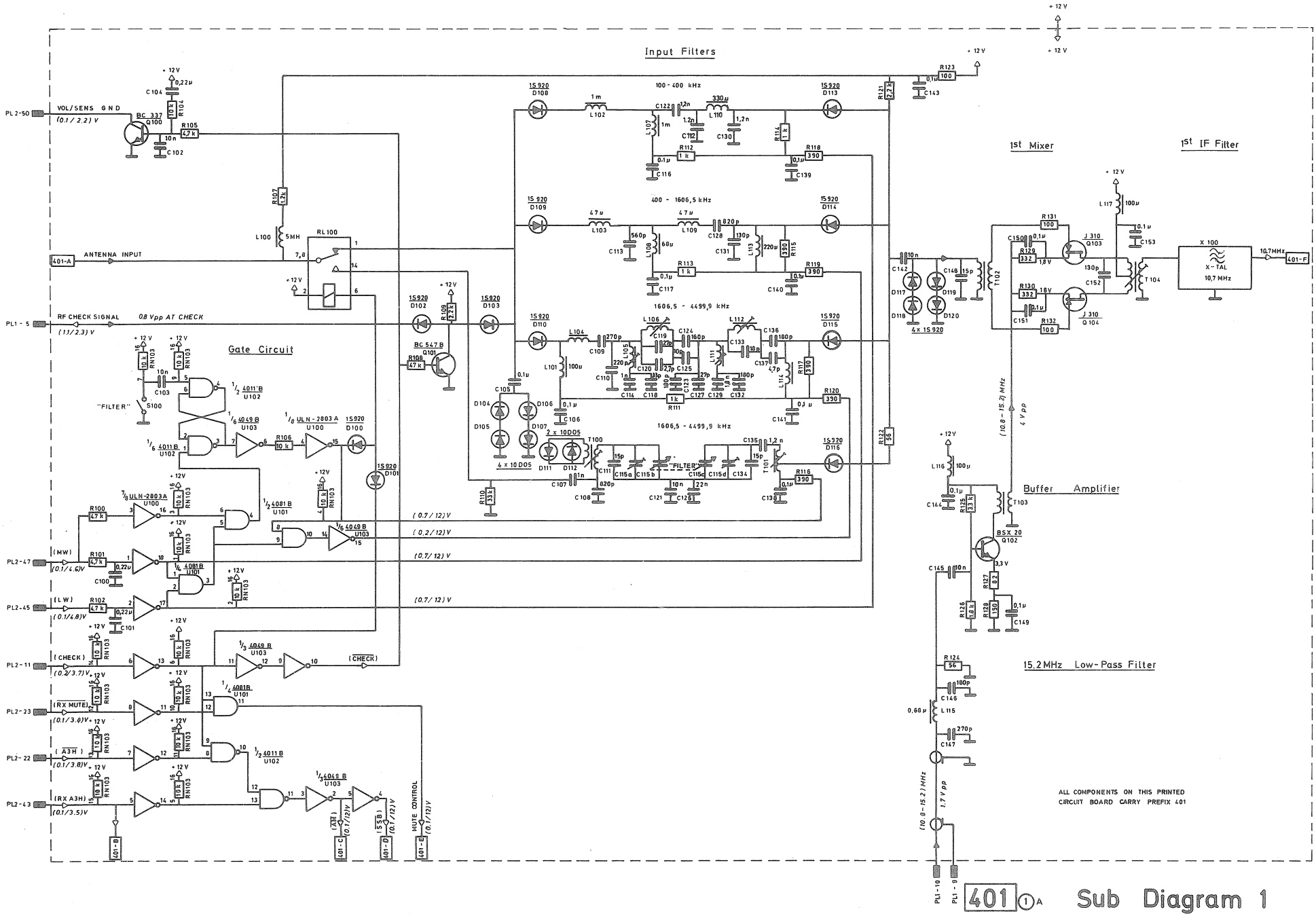


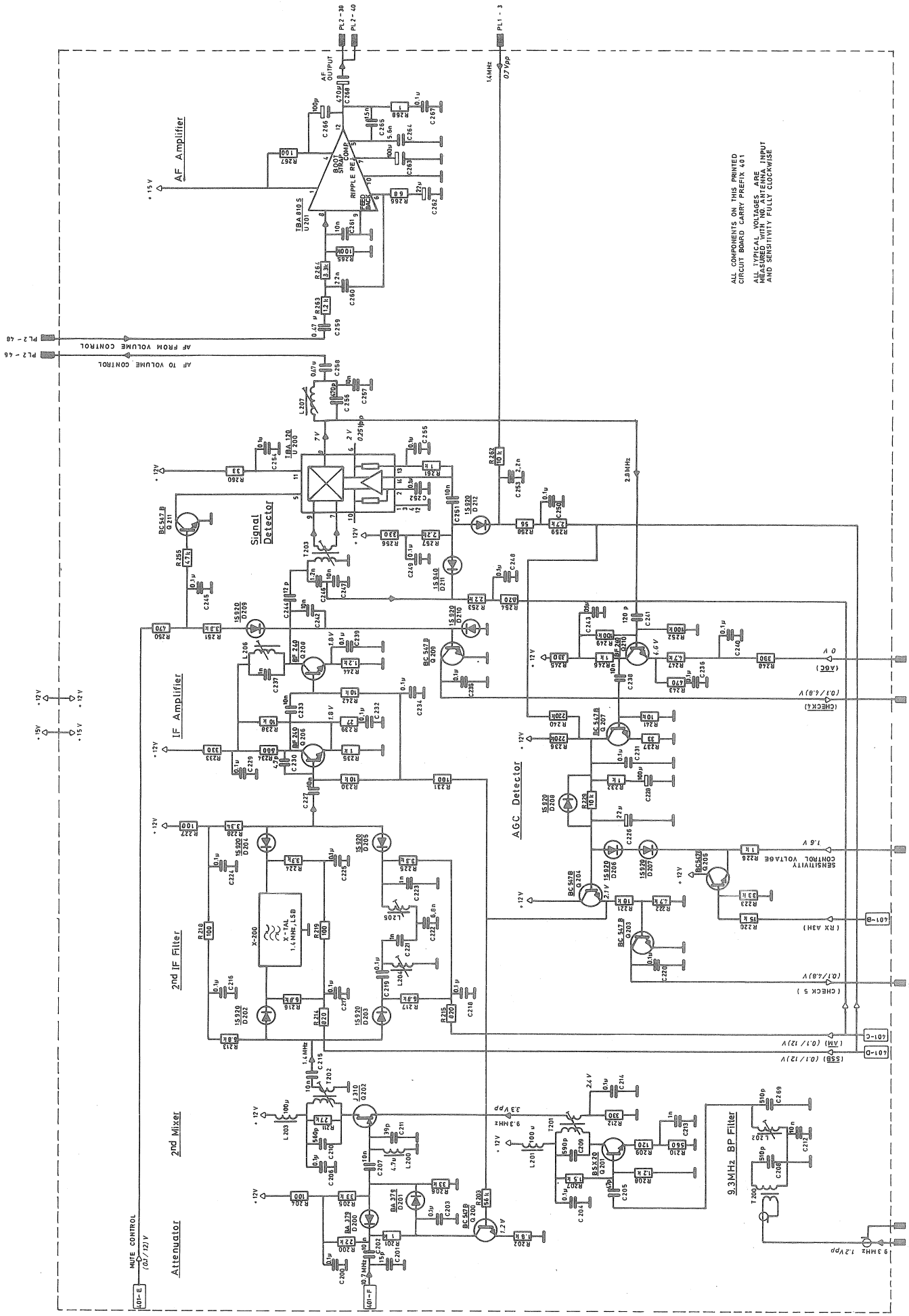
404 ① Sub Diagram 1

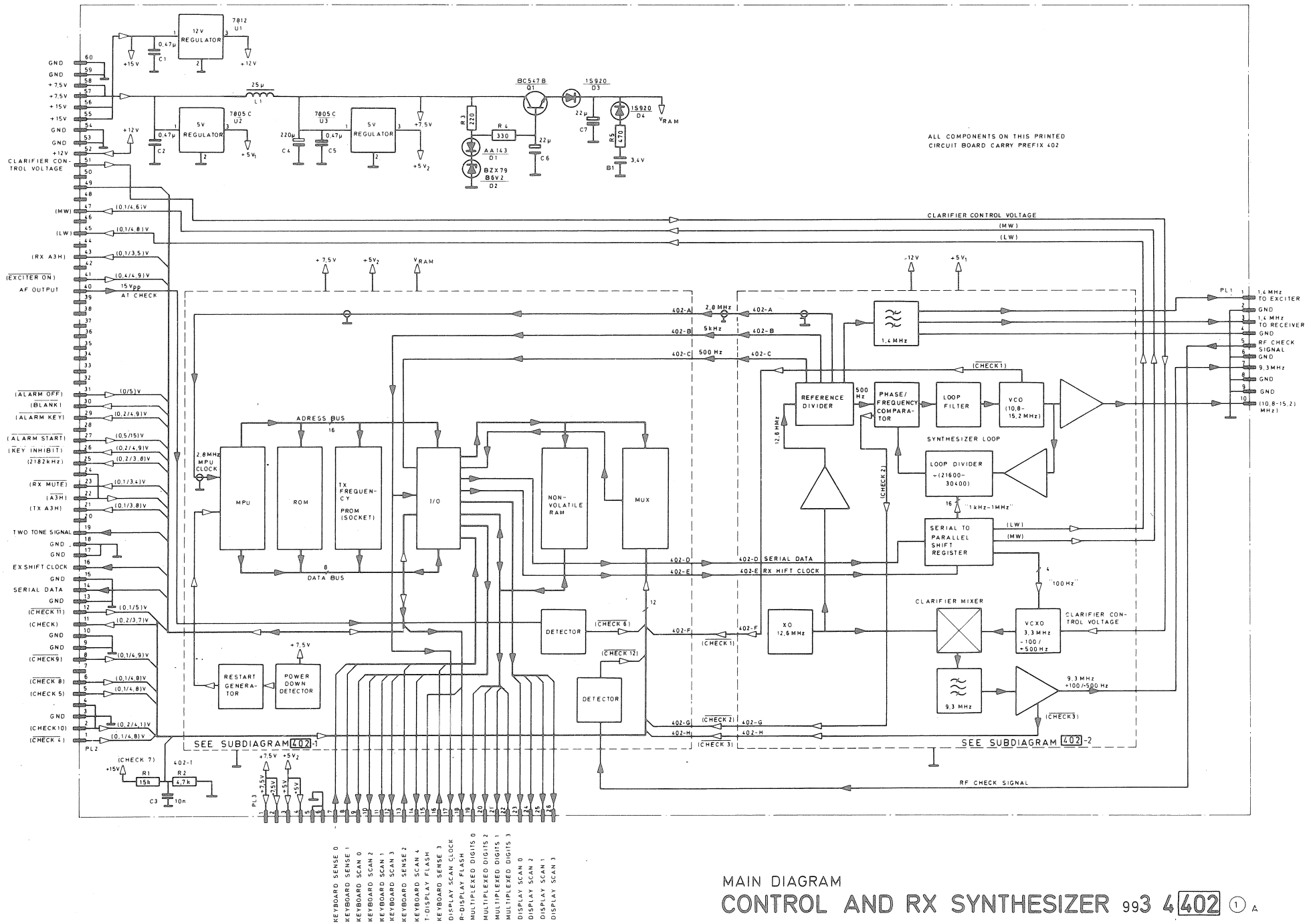


MAIN DIAGRAM

RECEIVER 993 4 401 ①

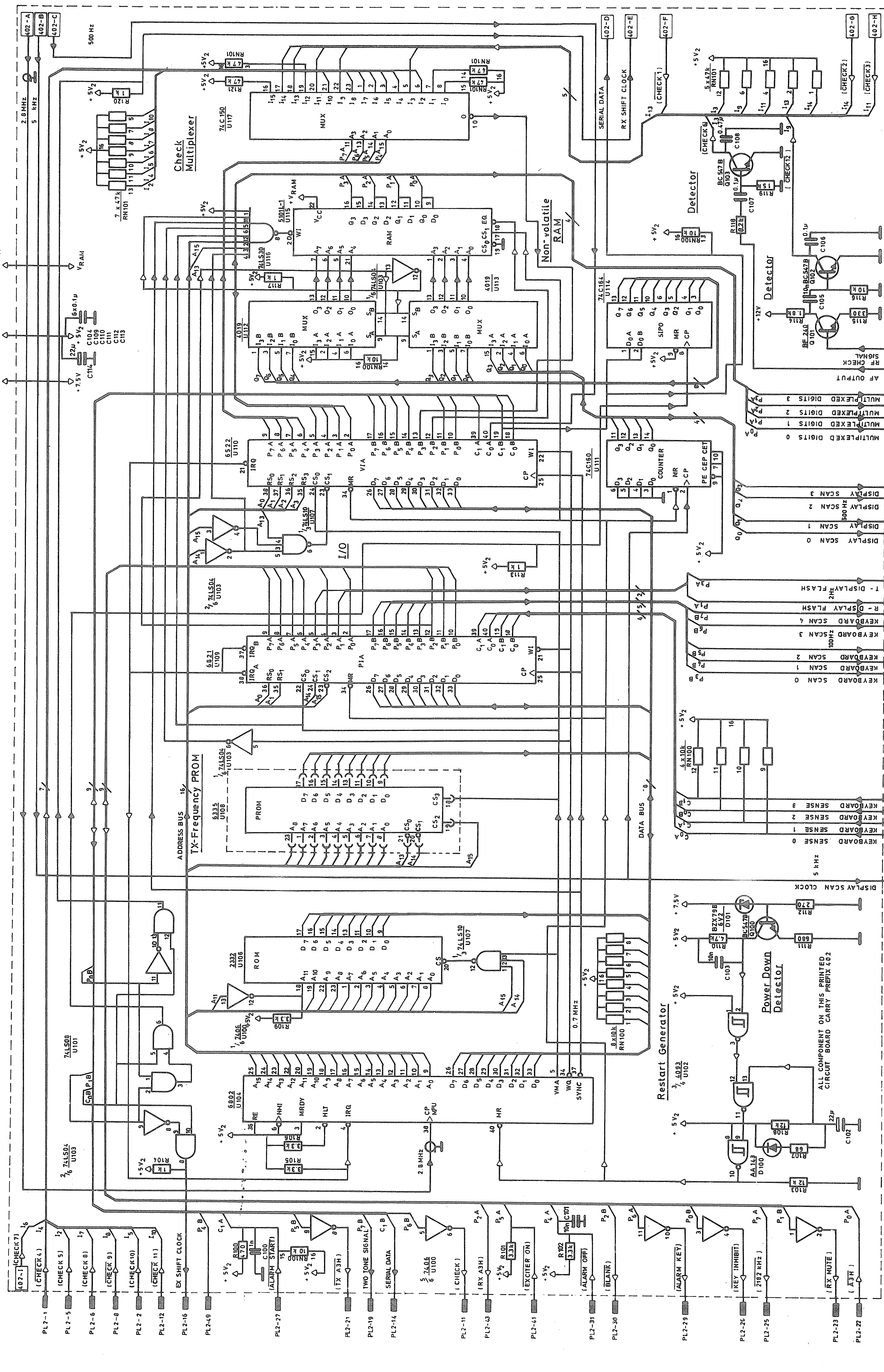

Input Filters
Gate Circuit
1st Mixer
1st IF Filter
Buffer Amplifier
15,2 MHz Low-Pass Filter
100 - 400 kHz
400 - 1606,5 kHz
1606,5 - 4499,9 kHz
1606,5 - 4499,9 kHz
VOL/SENS GND
(0.1 / 2.2) V
ANTENNA INPUT
RF CHECK SIGNAL
0.8 Vpp AT CHECK
(11/2.3) V
"FILTER"
(MW)
(0.1/4.6)V
(LW)
(0.1/4.8)V
(CHECK)
(0.2/3.7)V
(RX MUTE)
(0.1/3.6)V
(A3H)
(0.1/3.8)V
(RX A3H)
(0.1/3.5)V
(CHECK)
MUTE CONTROL
(0.1/12)V
(0.7/12) V
(0.2/12) V
(0.7/12) V
(0.7/12) V
+ 12 V
X-TAL 10,7 MHz
10,7MHz
4 x 1S 920
4 x 10 D05
2 x 10D05
(10.8 - 15.2) MHz
1.7 V pp
4 V pp
ALL COMPONENTS ON THIS PRINTED CIRCUIT BOARD CARRY PREFIX 401
401 1 A
Sub Diagram 1


401 (1)A Sub Diagram 2
ALL COMPONENTS ON THIS PRINTED CIRCUIT BOARD CARRY PREFIX 401
ALL TYPICAL VOLTAGES ARE MEASURED WITH NO ANTENNA INPUT AND SENSITIVITY FULLY CLOCKWISE
AF Amplifier
Signal Detector
IF Amplifier
AGC Detector
2nd IF Filter
2nd Mixer
Attenuator
9.3MHz BP Filter
SENSITIVITY CONTROL VOLTAGE
AF OUTPUT
AF FROM VOLUME CONTROL
AF TO VOLUME CONTROL
MUTE CONTROL
PL2 - 38
PL2 - 40
PL1 - 3
PL2 - 48
PL2 - 46
PL2 - 32
PL2 - 1
PL2 - 44
PL2 - 5
PL1 - 8
PL1 - 7
401-B
401-C
401-D
401-E
401-F
TBA 810 S U201
TBA 120 U 200
X-200
X-TAL 1.4MHz,LSB

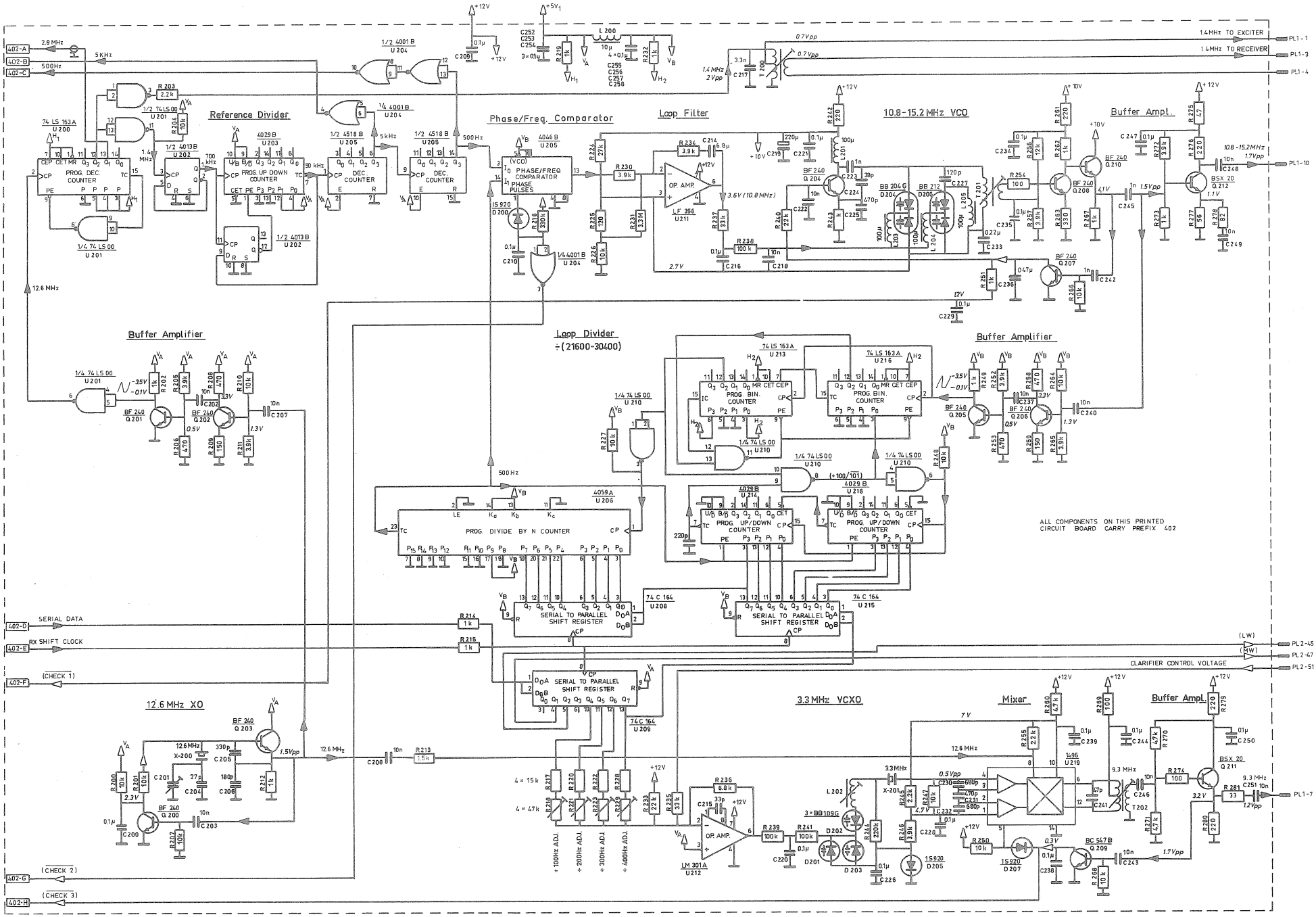


MAIN DIAGRAM

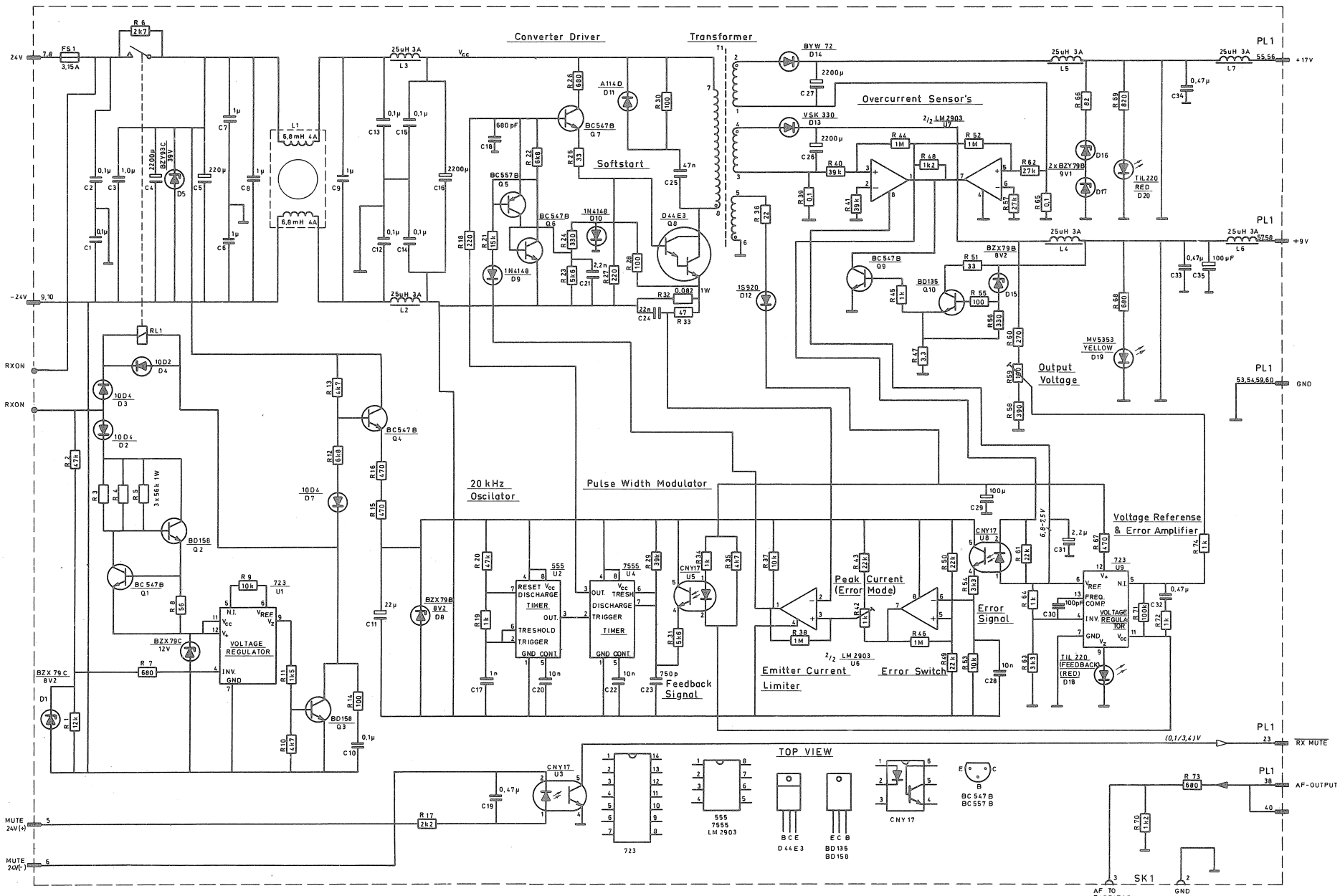
CONTROL AND RX SYNTHESIZER 993 4402 ① A



402 ①B Sub Diagram 1



402 (1) A Sub Diagram 2



POWER SUPPLY 993 4405 (1)