S. P. RADIO A/S - SAILOR MARINERADIO
110A
PORSVEJ 2 . DK-9200 AALBORG SV . DENMARK . TELEPHONE 98 18 09 99 . TELEX 69 789 . TELEFAX 98 18 67 17 . REG. NO. 61 531

Juni 1991

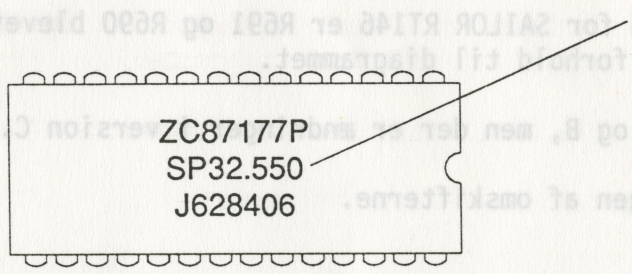
VEDR. SAILOR VHF RT146 PROCESSOR IC 604 og

SAILOR VHF RT2047 PROCESSORER IC 619 og IC 709

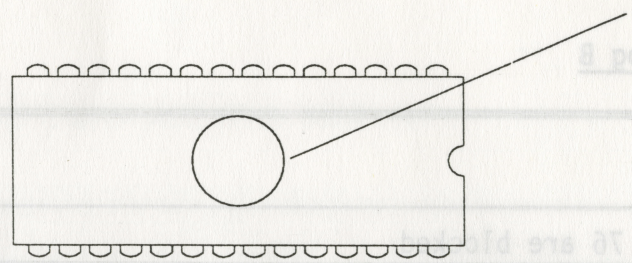
SAILOR VHF RT146 PROCESSOR

Vi har lavet 3 processorer, som passer til SAILOR VHF RT146.

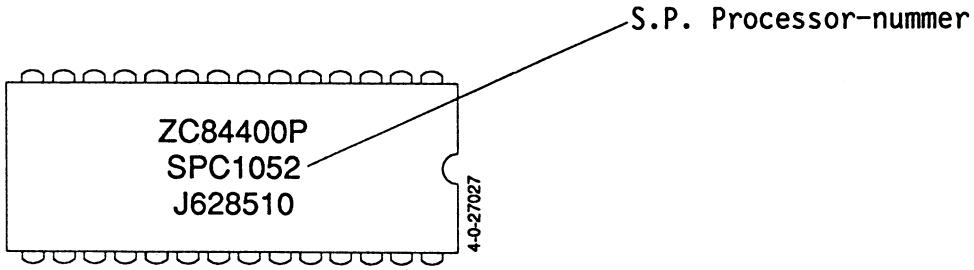
A. Den Gamle Maskeprocessor



B. UV-Prom Processor



C. Den Nye Maskeprocessor



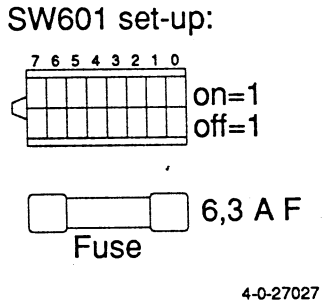
Når man bruger en maskeprocessor (A eller C), skal ben 6 (Num) jordes ved hjælp af modstanden R689 (220 ohm).

Med en UV-prom processor skal ben 6 (Num) forbindes til +5V gennem modstanden R689 (220 ohm). Forbindelserne er vist på de vedlagte diagrammer.

Bemærk venligst: I instruktionsbogen for SAILOR RT146 er R691 og R690 blevet ombyttet på komponent-placeringen i forhold til diagrammet.

Programmet er det samme i version A og B, men der er ændringer i version C.

Der er lavet ændringer i indstillingen af omskifterne.



Den Gamle Indstilling af Version A og B

	VAL 765	Function
	0XX	Channels 75 and 76 are blocked
	1XX	Channels 75 and 76 are open with reduced power
*	X00	Channels 15 and 17 are open with reduced power
*	X10	Channels 15 and 17 are open with full power
*	XX1	Channels 15 and 17 are blocked

* Steder hvor der er sket ændringer.

Den Nye Indstilling af Version C

	VAL 765	Function
	0XX	Channels 75 and 76 are blocked
	1XX	Channels 75 and 76 are open with reduced power
*	X0X	Channels 15 and 17 are open with reduced power
*	X1X	Channels 15 and 17 are open with full power
*	XX0	Channels 70 is open
*	XX1	Channel 70 is TX-blocked

* Steder hvor der er sket ændringer.

I version C er det ikke muligt at blokere kanalerne 15 og 17.

I stedet er det muligt at blokere kanal 70 i senderen.

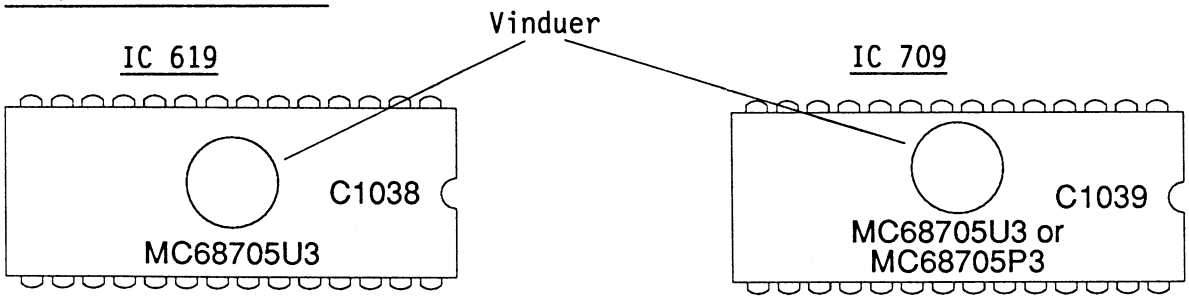
Vejrkanal WX4 = 161.650 MHz er blevet tilføjet.

I US-mode er kanal 01, 05 og 63 blevet ændret fra duplex til simplex.

SAILOR VHF RT2047 PROCESSORER

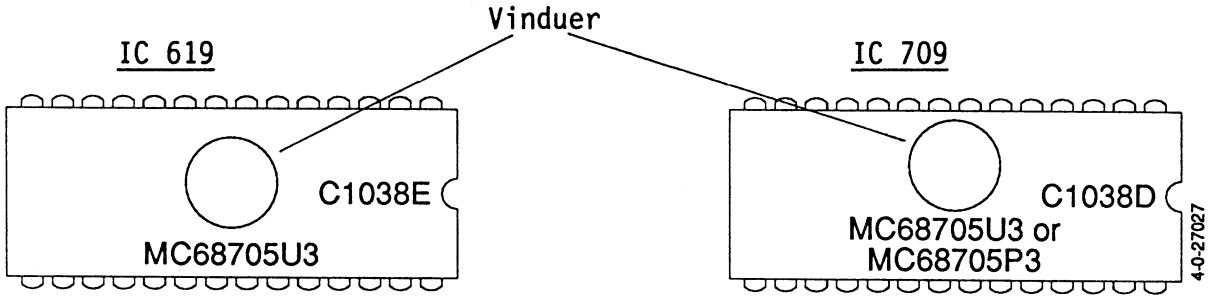
Vi har lavet 3 hold processorer til SAILOR VHF RT2047.

1. UV-Prom Processor



2. Maskeprocessor

3. UV-Prom Processor



Når man bruger UV-prom processor (MC68705-U3), skal ben 6 (Num) forbindes til V_{cc} (+5V).

Hvis tastaturets UV-prom processor er af typen MC68705P3, skal ben 7 (6) (Num) forbindes til V_{cc} (+5V).

Maskeprocessoren skal jordes på ben 7 (Num).

Der er ikke foretaget nogen ændringer i programmeringen mellem

1. UV-Prom Processor og 2. Maskeprocessor

Derfor kan disse blandes.

I det nye sæt 3. UV-Prom Processor, C1038E og C1039D, er der foretaget nogle ændringer. Derfor anbefaler vi ikke, at dette bruges sammen med 1 eller 2.

Programændringer

a. Nogle nye serviceprogrammer, hvor de 2 mest interessante er:

   P20 Programmer EEPROM nr. 0 med standard fabriksopsætning.

   P21 Programmer EEPROM nr. 1 med standard funktionskoder.

b. Privatkanaler kan blokeres i forbindelse med sending, uden at det får indflydelse på scanne fortegnelsen.

c. Separat blokering af kanal 70 i identitetskode nr. 0, bit 3 (1 = kanal 70 blokeret).

d. US-mode ændret til simplex operation i kanalerne 01, 05 og 63.

e. Separat programmering af 1 watt på kanalerne 13 og 67 med 25 watt tryk funktion.

Dette er blevet gjort i identitetskode nr. 1, bit 7 og 6.

Bit 7. 1 = 1 watt i INT- og US-mode.
Bit 6. 1 = 1 watt i US-mode.

f. Ændringer i programmerne for indland.

Belgien indland: Kanal 7 ⇒ 25 watt.
Kanaler 67, 68, 69, 71, 72, 74 ⇒ 1 watt.

Holland indland: Kanaler 7 - 78 ⇒ 25 watt.

g. Programmering af max. sendetid.

Dette gøres i serviceprogram P5, adr. 6F.

Bits 0 - 3. Max. sendetid 1 - 15 min.
Bits 4 - 7. Min. pausetid 1 - 15 sek.

Gjort ubrugbar med 00 i 6F.

Brugerændringer:

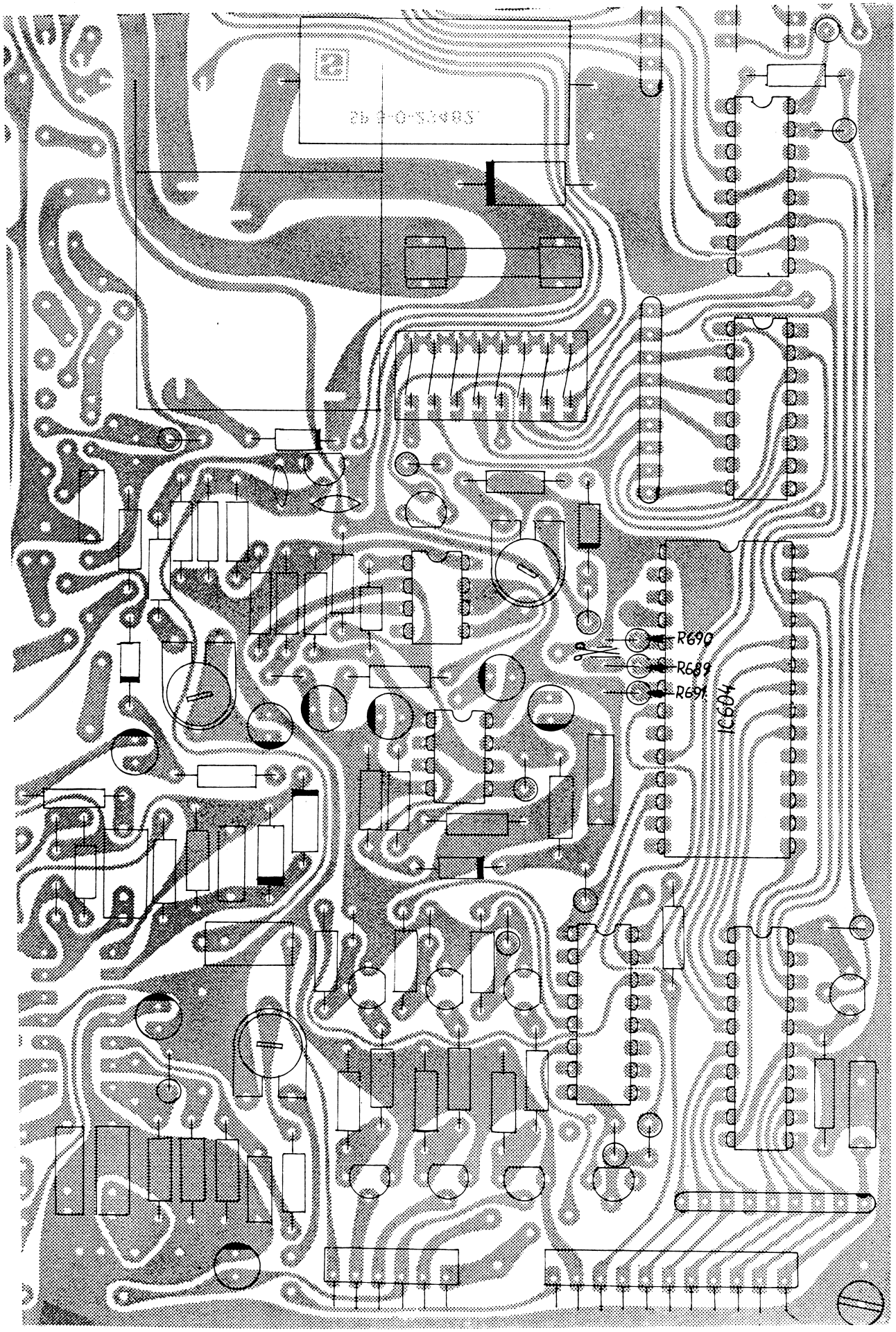
1. Squelch niveau ved duplex operation er 1.

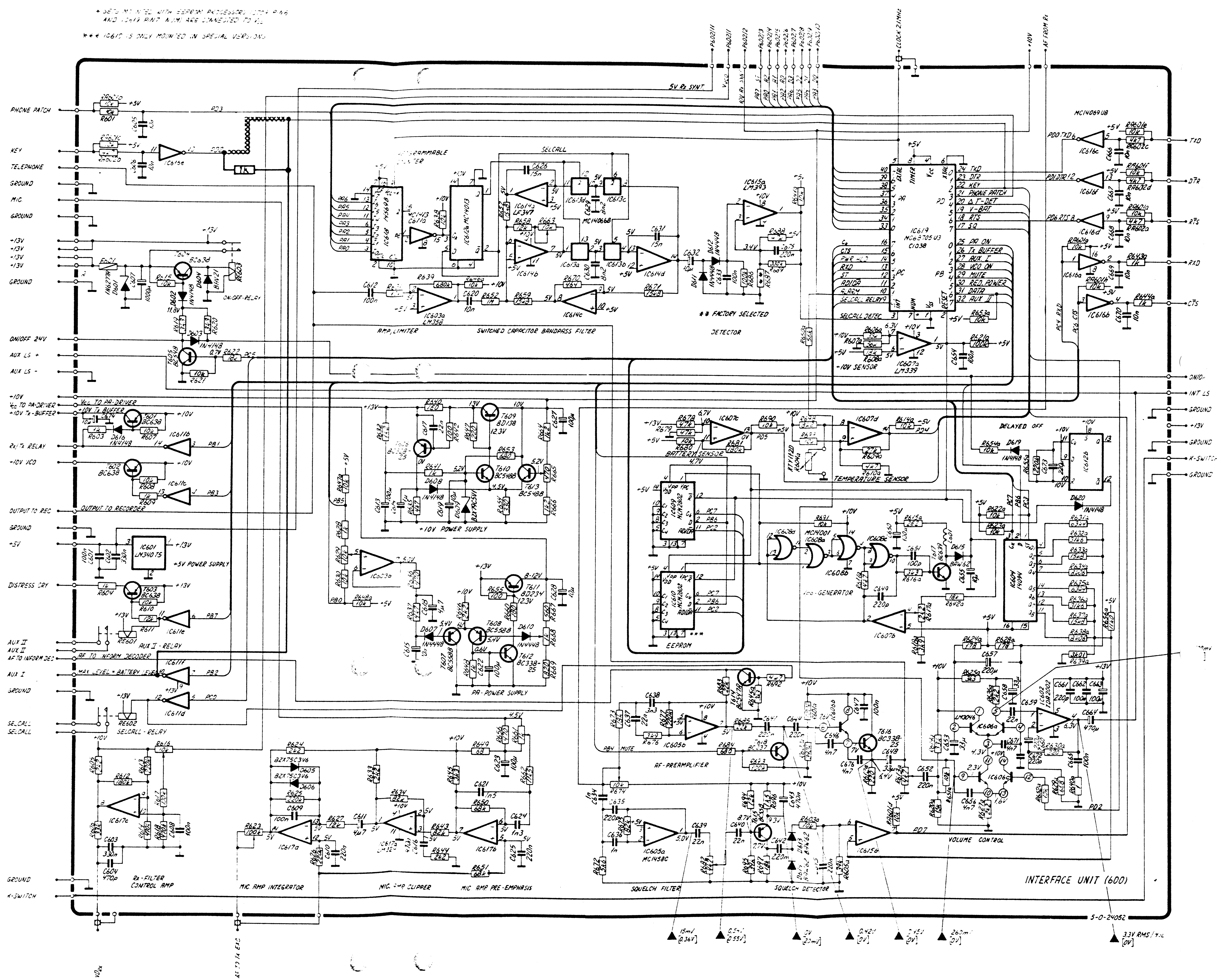
2. TX-indikation altid gyldig.

3. Phone patch kun aktiv på duplex kanaler.

4. Selcall følsomhed 3 dB bedre med ændringerne R670 ⇒ 392 ohm, C632 ⇒ 100 nF og R687 ⇒ 47 kohm.

Komponentplacering SAILOR RT146 Interface





AC voltages outside frame of diagram.

▲ : Measured with AF voltmeter. (RMS)

Test conditions.

Voltage without brackets:

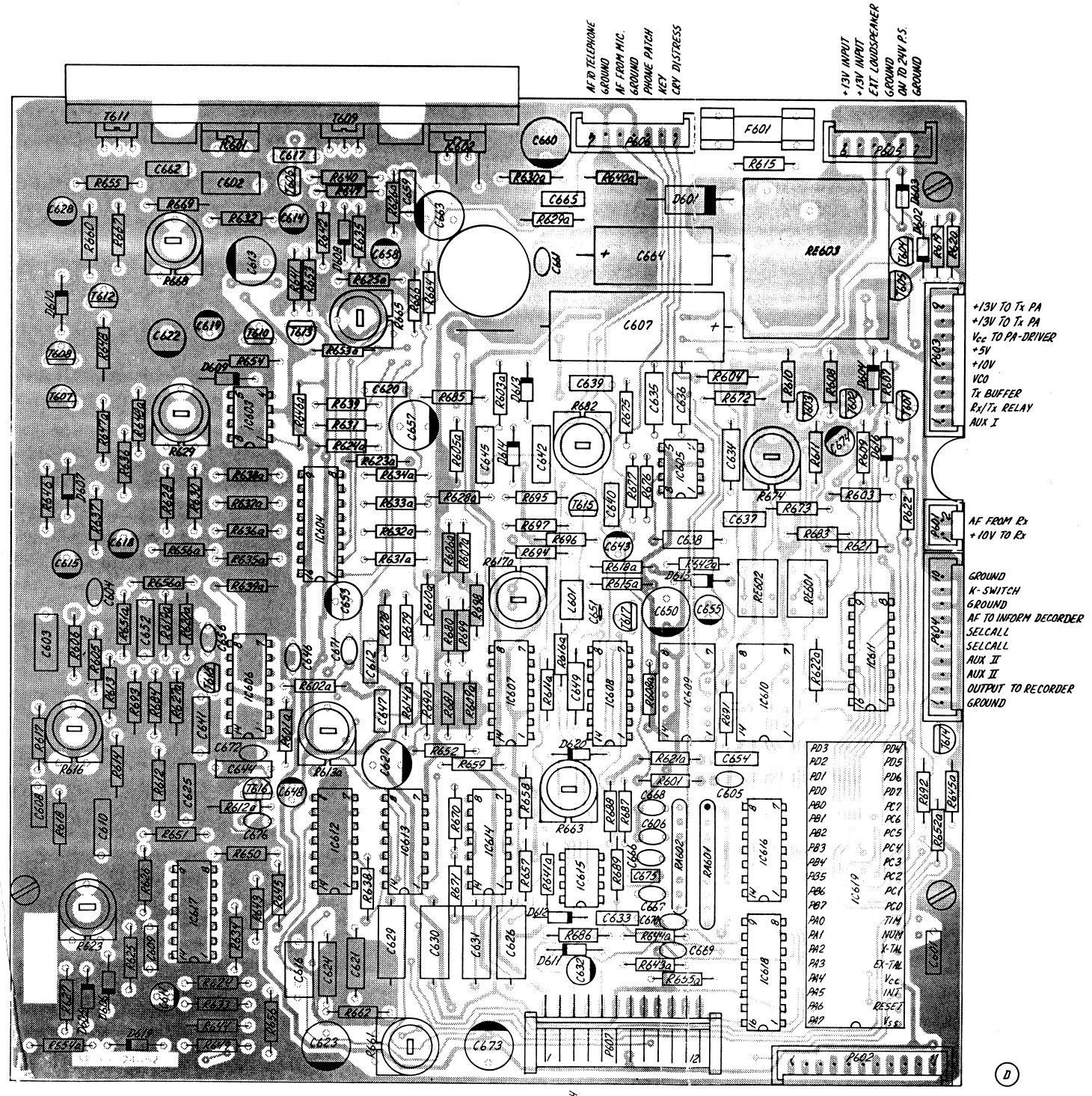
Operating in Rx position.

With antenna-signal 1 mV EMF

f = ±3 kHz; fm = 1 kHz

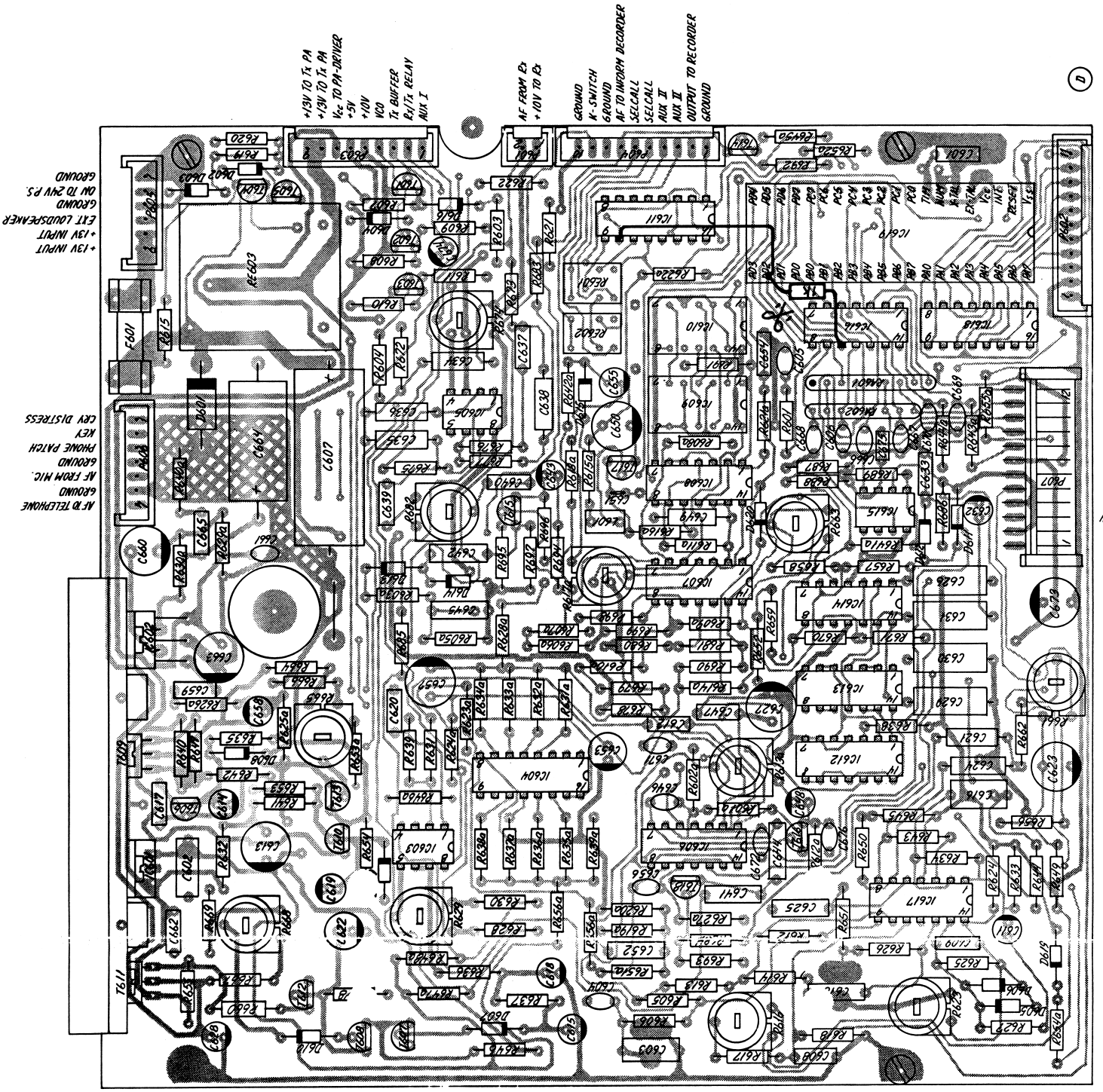
Voltage in brackets:

No antenna-signal, squelch max. closed.



INTERFACE UNIT WITH UPPER SIDE TRACKS

RT2047A
4-6-24052E, 4-6-24052E I
4-6-24052E II



2.7. KEYBOARD UNIT

2.7.1. Display

The LCD-display is static driven with an 50 Hz AC signal measured with reference to the back plane input (BP pin numbers 1, 27, 28, 54). A segment which is off has always the same voltage as BP.
The latches (IC701 - IC706) is loaded serially from the uC. Every 10 msecs a strobe puls is sent to the latches, and the content of the internal shift register in the latches is loaded into the output latches. Afterwards new information is shifted into the shift registers so the content is ready when the next 10 msecs have passed.

2.7.2. Keyboard

The keyboard is scanned once every 10 msecs. First PA4 is turned low, and PA0- PA3 are turned into inputs. Afterwards PC0-PC3 are read, and if there is a low level on one of these pins a push button is activated. If they are all high PA3 is turned low and the others to input pins, and PC0-PC3 are read once more and so on. When finished PA0 is left at low level.

2.7.3. Panel Illumination

The LEDs are driven with a constant current generator. With PB1 at 0V the current generators are on and with PB1 at 5V they are switched off.

2.7.4. The Microcomputer

The uC uses the internal clock-generator and a ceramic resonator. The clock frequency is approx. 4 MHz.
The uC takes care of the dual watch and scanning functions and the keyboard and display. This means that when scanning, the uC requests a new channel every 100 msecs if it has not received a message telling that there is a carrier.
Concerning the serial interface see section 2.6.15. SERIAL INTERFACE.
When the radio is on and the ON/OFF switch is activated and released again the uC will be interrupted. The uC will then transmit a message to IC619 to tell it to switch off.

2.7.5. Dual Watch

When the radio is dual-watching the receiver is watching CH16 for 100 msecs once every 1.5 sec. If there is a carrier on CH16 the receiver will stay there until the carrier disappears.
When there is not a carrier on CH16 only the number of the primary channel is shown in the display along with the DW-sign.
The uC on the keyboard is taking care of the timing and requesting every change of channel.

2.7.6. Scanning

When the radio is scanning the radio is listening to the channels in the scanning table for 100 msecs each. CH16 is being watched for 100 msecs in between every channel. If there is a carrier the receiver will start dual watching on this channel as long as the SCAN TIME is set. There is built in a hold time of 1.5 secs so that the receiver will stay there for 1.5 sec after the carrier has disappeared.

2.6.10. Microphone Amplifier

The amplifier consists of three stages. In the first stage the signal is preemphasized. In the next stage the signal is clipped when the input signal is big enough, and in the last stage the signal is deemphasize before it is led to the modulator in the TX EXCITER. The deemphasizing is necessary because it is a phase modulator.

2.6.11. Squelch Circuit

The signal from the receiver is fed to the active high pass filter IC605a. The filter attenuates signals below 10 kHz which means that talk will not be detected.
The output of the filter is fed to the clipper T615 and the detector comprising the capacitor C645, the diodes D613, D614, and the resistors R603a and R605a.
The rectified noise level is compared with a reference level in the voltage comparator IC615b. When the noise level is higher than the reference level, the output will be low. This output is connected to PD7 on the uC, which will turn off the AF by means of T618, except if the squelch setting is 0 (in the display). The correspondence between the number in the display and the latch IC604:

SQ:	Without carrier: Q8 Q7 Q6 Q5	With carrier: Q8 Q7 Q6 Q5
0	1 1 1 1	1 1 1 1
1	1 1 1 0	1 1 1 1
2	1 1 0 1	1 1 1 0
3	1 1 0 0	1 1 0 1
4	1 0 1 0	1 1 0 0
5	1 0 0 0	1 0 1 0
6	0 1 1 0	1 0 0 0
7	0 1 0 0	0 1 1 0
8	0 0 1 0	0 1 0 0

2.6.12. AF Circuit

The AF signal from the receiver is fed to the active filter IC605b. The filter provides a frequency response of -6 dB/Oct. in the range 0.3 to 3 kHz and limits the signals outside this range. Further the signal is fed to the telephone output amplifier IC606b and T616.
From the telephone output the signal is fed through the VOLUME CONTROL circuit IC606 and the AF POWER AMP.
The DC current in the differential amplifier in the VOLUME CONTROL is controlled by the transistor between pins 9, 10 and 11. The attenuation will be minimum when the current through the transistor between pins 3, 4 and 5 is maximum, and this is the condition when the outputs Q1 - Q4 on the latch IC604 is high (display reading will be 15). In that case the voltage on pin 4 of the differential amplifier will be the same as on pin 2.
The D/A converter R631a - R634a is together with the resistor R628a functioning as a voltage divider. With all the outputs Q1 - Q4 at 0V the voltage between pin 4 and pin 2 will be approx. 200 mV. This means that the current through the transistor between pins 3, 4 and 5 will be minimum and the signal will be attenuated about 60 dB.
Resistor R625a and capacitor C658 prevent cross talk from the supply voltage to the output of the attenuator.

2.6.13. Selcall

The input to the selcall is taken from the telephone output. The signal is first amplified and limited in IC603a. Then it passes the bandpass filter and after this it is rectified and compared with a reference level in the comparator IC615a.
2.1 MHz is divided in the programmable counter IC618. The output of this is divided by 2 and turned into a square wave in the flip-flop IC612a. The outputs of the flip-flop are connected to the switches IC613. The frequency at which the switches around the capacitors C629 and C630 are working determines the resonance frequency of the filter. Thus by changing the dividing figure to IC618 it is possible to change the resonance frequency of the filter.
With R663 it is possible to adjust the resonance frequency of the filter (see the adjustment procedure).

Figure No.	f(nominal) (Hz)	IC618 input 6543210	f(clock) (Hz)	f(resonance) (Hz)
1	1124	1010001	12963	1127
	1	1001100	13816	1201
3	1215	1001000	14583	1268
4	1358	1000011	15672	1363
5	1446	0111111	16667	1449
6	1540	0111011	17797	1548
7	1640	0111000	18750	1630
8	1747	0110100	20192	1756
9	1860	0110001	21429	1863
0	1981	0101110	22826	1985
R	2110	0101011	24419	2123

When the radio is switched on the dividing figure corresponding to the first figure in the selcall number is put on port A on the uC which is connected to the input of IC618. If the correct tone is received the output of the comparator IC615a goes low. This output is connected to the uC INT pin. When the tone disappears again the uC will put out the dividing figure corresponding to the next figure in the selcall number. If all five tones are received correctly then the uC will send a message on the serial interface to the keyboard unit, turn on the selcall relay RE602, and send out an alarm tone from PC1 via the volume control and power amp. to the loudspeaker. The alarm tone lasts for 10 secs after an individual call and after an all call it lasts until the selcall is reset.
If the SELCAL TEST button is activated the alarm circuits and indicators are tested.

2.6.14. EEPROMs

The EEPROMs contains an address/opcode register, a data register, a memory array and some decoding logic.
With the AD/DA line (PC2) at a high level the uC sends out the chip enable address, but as the uC always transmits in blocks of 8 bits, the first 4 bits will be ignored. The EEPROMs compare the last 4 bits with the chip select pins C1 - C4, and only the EEPROM where the levels on the select pins are equal to the chip enable address send from the uC executes the instruction. Next the uC sends out a 5 bit address for the memory matrix and a 3 bit opcode to select the function:

Opcode	03	02	01
Read	0	0	0
Word Erase	0	1	0
Write	0	0	1
Standby	1	0	0

Read Operation

After the read opcode the uC will turn the data pin (PB6) to an input pin set the AD/DA line (PC2) to low level (data mode) and read 32 bits (four 8 bit words). This is because the memory matrix is organized as 32 words containing each 32 bits. When the uC has finished it will set AD/DA to a high level (address mode) and turn the data pin to an output again and send out the chip address and the standby code.

Store Operation

The uC will then after the memory address information send the word erase code. Then the Vpc (pin No. 1) will go low as soon as the AD/DA line goes low, thus enabling the Vpp-GENERATOR. This will be kept on for approx. 120 msecs. While the old byte is being erased the new one is read into the data register (4 bytes with each 8 bits).
Then the chip enable address and the memory address is sent out with the write code. The AD/DA is kept low for 10 msecs and the new word is stored. Again the Vpc pin will go low and enable the Vpp-GENERATOR. If several words are to be stored the whole procedure will be repeated as many times as necessary. At last the chip enable address and the standby code is sent out.

2.6.15. Serial Interface

The transmission of information between the 2 uCs takes place on a serial bus similar to a RS232C serial interface. Each byte consists of 8 bits of information, a start-, a stop-, and a parity bit. Odd parity is being used and the transmission speed is 2400 Baud. Only one byte will be transferred each period of 10 msecs.

Transmission can only take place when the DTR (PD1) is high. The uC on the KEYBOARD UNIT will take this line high once every 10 msecs.

Transmission from IC619 to IC709
Transmission is allowed on the RXD line (PC4) as soon as DTR is high independent of the level of RTS. IC709 will keep DTR high as long as it is receiving a byte.

Transmission from IC709 to IC619
IC709 will set RTS (PD6 on IC619) to a high level at the same time as it sets DTR high. If IC619 has nothing to transmit it will answer by setting CTS (PC6) to a high level as soon as it is ready to receive. After IC709 has received the ready signal it will start transmission on the TXD line (PD0 on IC619). The DTR, RTS and CTS will be kept high as long as the transmission takes place.

2.6.16. The Key-Function

If the transmitter is keyed the input PD2 on the uC is put to a high level. If the radio is tuned on a simplex channel, the AF is muted by setting the output PB4 to a high level. Then the synthesizer is moved 4.6 MHz upwards. Then the TX-VCO is turned on by setting PB3 high and after approx. 15 msecs also the TX-BUFFER on (PB1 high) and after further 60 msecs the PA-REGULATOR is turned on by setting PB0 and PB5 high.
If reduced power is selected PB5 will be low.
When the key is released the PA-REGULATOR is turned off first. After approx. 15 msecs the TX-BUFFER is turned off, and after further 45 msecs the TX-VCO is turned off. If the set is in a simplex channel the synthesizer is moved 4.6 MHz back again, and the AF is turned on.

2.6.17. The Microcomputer

The uC is held in reset by a low voltage on the RESET input pin. As long as the uC is in reset it is doing nothing and all ports are configured as input pins.
The 10V-SENSOR secures that the capacitor C654 cannot be charged before the 10V supply is higher than approx. 8V. The 5V is checked internally. When the voltage on the reset pin is above the internal comparator level the uC starts. First all pins on PA, PB, and PC are configured as outputs. PB4, PB6, PC2, PC4, and PC5 to high level and the rest to low level. Then the uC reads the address range from 64 to 7F in the EEPROM IC609. If there is an error in the range from 64 to 77 the uC will transmit an "EO" message to the display and go to test mode. If there is an error in the address range from 78 to 7F it will always initiate with channel 16, volume level at pos. 5 and the squelch level at 4.
If the first test is passed the uC will send information to the VOL/SQ latch (IC604) to the RX-synthesizer and initiate the selcall.
Then the uC supervises the KEY-input (PD2), the squelch detector (PD7), the selcall detector (INT pin), the RTS-input (PD6), and the battery sensor. (See the appropriate sections).