Sailor

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INSTRUKTIONSBOG FOR
SAILOR RT 2048

INSTRUCTION BOOK FOR
SAILOR RT 2048

INSTRUKTIONSBUCH FÜR
SAILOR RT 2048

INSTRUCTIONS POUR
SAILOR RT 2048

INSTRUCCIONES PARA
SAILOR RT 2048

A/S S. P. RADIO · AALBORG · DENMARK

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RT2048 GRØN

1. INTRODUCTION

The SAILOR RT2048 VHF radiotelephone has been designed to comply with the increasing demands of a highly technological product, which means high quality, small size, etc.

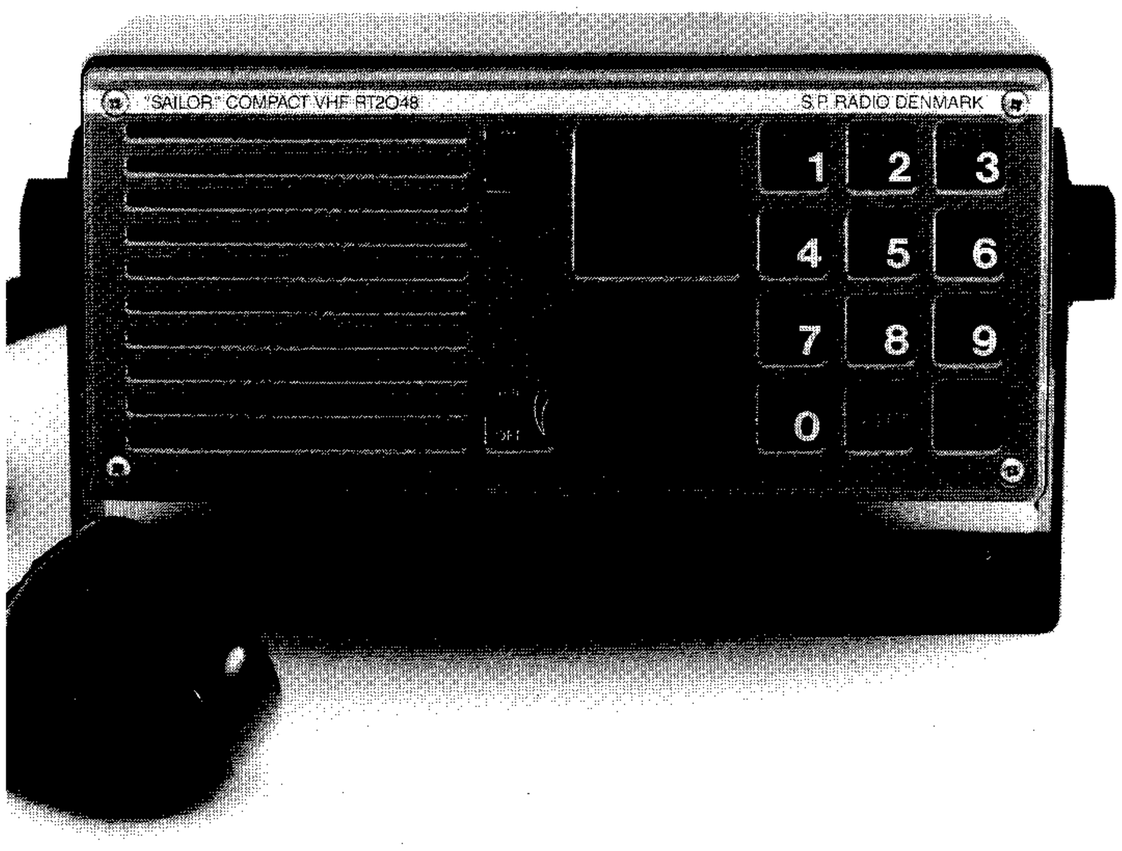
The SAILOR RT2048 is furthermore designed to fit into the SAILOR Compact 2000 module programme.

The SAILOR RT2048 can either be installed and operated as an independent unit, or in combination with other elements of the Compact 2000 programme. These include a Duplex VHF radiotelephone, a coast telephone station with a 400W PEP SSB transmitter and an SSB receiver with built-in FM and AM bands, and a scrambler which ensures complete communication secrecy.

The SAILOR VHF RT2048 has, by means of the latest technology in casting technique, been constructed to withstand the most extreme conditions experienced in small, semi-open boats. Inside, the printed circuits, which have made possible a combination of compactness and exceptional performance, are coated with a special moisture repellent lacquer.

In the design of this VHF radiotelephone, S. P. Radio have taken into account all the circumstances it will be exposed to in day-to-day operation. However, even a product of this high quality requires regular servicing and maintenance, and we recommend a close observance of the directions contained in the instruction book.

S. P. Radio is one of Europe's leading producers of maritime radio communication equipment - a position which has been maintained by means of constant and extensive product development. We have a world-wide network of dealers with general agencies in fifty countries. All our dealers are well-trained and able to service all SAILOR products.



1.1. GENERAL DESCRIPTION

SAILOR VHF RT2048 is an all solid state constructed microcomputer controlled VHF radiotelephone, intended for ship/ship and ship/shore communication.

SAILOR VHF RT2048 can operate in both simplex and semi-duplex mode.

SAILOR VHF RT2048 includes all 55 international and U.S. VHF marine channels, and is as standard prepared for up to 10 private channels, selected as simplex or semi-duplex channels in the frequency band 154.4 - 163.75 MHz.

SAILOR VHF RT2048 is equipped with flexible scanning facilities or additional 30 private channels in the above mentioned frequency band.

SAILOR VHF RT2048 has built-in dual watch facility, which enables the operator to listen out on two channels simultaneously (the selected channel and a programmable preference channel - normally channel 16).

SAILOR VHF RT2048 is provided with a quick select channel, normally channel 16.

SAILOR VHF RT2048 is provided with continuous turn-style operation of SQ and AF level for optimum resolution.

SAILOR VHF RT2048 is provided with a push-button keyboard offering an attractive tactile feeling and a safe finger-guide in the metal front. Besides, the keyboard is fitted with night-illumination of the lettering from behind.

SAILOR VHF RT2048 has a high efficient LED read-out of channel number and other indications for optimum reading under all conditions.

SAILOR VHF RT2048 is a modern transceiver with an all synthesized frequency generation based on a single crystal.

SAILOR VHF RT2048 has a built-in 12W AF power amplifier, which delivers 6W into the large built-in loudspeaker.

SAILOR VHF RT2048 is for 12V DC supply. Voltage change-over from 24V to 12V is easily done by the power supply N420.

SAILOR VHF RT2048 has an extremely low standby current consumption, typically below 100 mA.

SAILOR VHF RT2048 is housed in a corrosion resistant metal cabinet with a green nylon finish.

SAILOR VHF RT2048 can be delivered with a built-in selcall decoder, which will decode a selective call CA or all ships call CQ.

1.2. TECHNICAL DATA

Fulfils the international CEPT regulations.

GENERAL

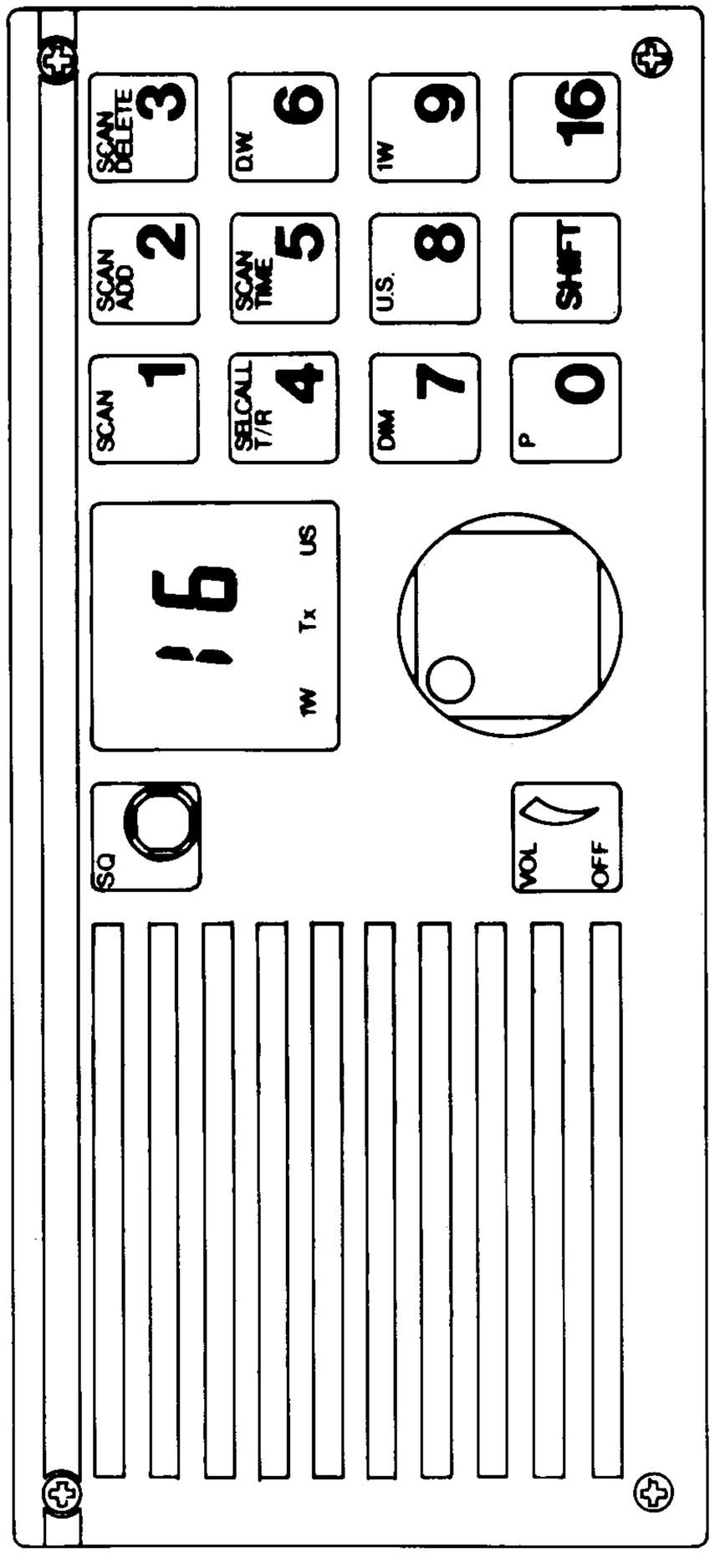
All international maritime VHF channels.	
Private channels:	10, may be extended to 40
Operation:	Simplex and semi-duplex
Modulation:	G3EJN (Phase)
Antenna impedance:	50 ohm
Frequency stability:	±10 ppm (Spec. vers. ±5 ppm)
Temperature range:	-20°C to +55°C
Nominal power supply:	13.2V DC
Power supply variation:	12V DC -10% to +30%
(with data according to international standards)	
Power consumption:	Standby = 0.1A
	Transmit = 5 A
Dimensions:	Height: 98 mm
	Width: 225 mm
	Depth: 160 mm
Weight:	3.1 kg

RECEIVER

Frequency range simplex:	154.40 - 159.15 MHz
Frequency semi-duplex:	159.00 - 163.75 MHz
Sensitivity:	0.25 uV PD at 12 dB SINAD
AF output power:	6 Watt/4 ohm
Telephone output:.....	0.5V RMS/200 ohm
Distortion:	Less than 5%
Scanning facilities:	Flexible scanning programme, with possibility for all international channels and 10 private channels.
Accessory:	Selcall decoder according to CCIR

TRANSMITTER

Frequency range normal:	154.40 - 159.15 MHz
Frequency range special:	159.00 - 163.75 MHz
RF output power:	25 Watt +0 to -0.5 dB
Reduced RF output:	0.5 to 1 Watt
Distortion:	Less than 5%


SCAN 1
SCAN ADD 2
SCAN DELETE 3
SELCALL T/R 4
SCAN TIME 5
D.W 6
DIM 7
U.S. 8
1W 9
P 0
SHIFT 16
16
US
Tx
1W
SQ
VOL
OFF

1.3. CONTROLS



Indication of ON/OFF/VOL turn-style knob operation.



Squelch sensitivity control knob with turn-style operation.



Quick selection of the call and distress channel 16.



Digits from 1 to 0



Activates the functions marked in orange on the keyboard. Whenever the keyboard is in "shift-mode" it will be indicated by "cornerbars" in the display ⌜ ⌜



Selects scanning programme.



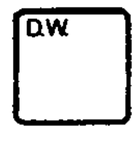
Adds a channel to the scanning table.



Deletes a channel from the scanning table.



Selects the scan time from 1 to 99 seconds. The time chosen is the listening time on one of the secondary channels receiving a signal.



Selects the dual watch facility.



Selects 1W reduced power output.

1.3. **CONTROLS** cont.:

U.S.

Selects the VHF channels used in the USA.

DIM

The intensity of the LED-indicators can be controlled in four steps. The keyboard illumination is switched on and off.

SELCALL T/R

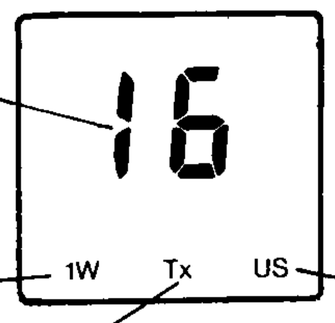
Tests the selcall decoder and resets the selcall decoder after a call.

P

Selects the standard private channels.

READ-OUT

Channel Read-Out All international maritime channels are shown by the two digits, when the channel has been keyed in. Selection of a standard private channel will be indicated with a **P-**.



Reduced Power

In harbour areas or in the close vicinity of another vessel, transmissions should be with reduced power. When the display shows 1W, the transmitter output power is reduced from 25W to 1W.
Where two stations are close together, this reduction can improve communication quality.

Transmitting

Whenever the handset switch is depressed, and the transmitter output power level has reached an appropriate level, the "TX" will appear.

US-Channels

In the USA a number of the international duplex channels are used as simplex channels. Ships sailing in American waters must therefore be able to select these channels as simplex channels. The appearance of "US" on the display indicates that this mode of operation is in use.

1.4. PRINCIPLE OF OPERATION

FREQUENCY GENERATION
All the internal frequencies are referenced to a crystal oscillator, running on 14.85 MHz.
The 14.85 MHz is divided by 4 in the REFERENCE DIVIDER, to generate a 3.7125 MHz signal, which is the input to the PLL-reference divider and clock-signal for the microcomputer.
The local oscillator signal for the first mixer in the receiver and the transmit signal are generated in a phase-locked loop (PLL). To generate the needed frequencies, which are specified as follows:

139.1 MHZ $\leq f_{LO1} \leq$ 148.45 MHz; 154.5 MHz $\leq f_{TX\ NORMAL} \leq$ 159.15 MHz

159.0 MHz $\leq f_{TX\ SPECIAL} \leq$ 163.75 MHz

a bandshift is performed in the VCO.
The loop reference frequency - and so the resolution - is 12.5 kHz, derived by dividing the reference divider output with 297.
The VCO output frequency is divided down to 12.5 kHz after the dual-modulus principle with a PRESCALER dividing with 32/33.
The phase detector output controls the CHARGE PUMPE feeding the loop filter integrator.
If there is a difference in phase/frequency between the inputs to the phase detector. An error current from the charge pumpe will be integrated in the loop filter, producing the needed voltage for the VCO.

RECEIVER
The antenna signal is fed to the RX AMPLIFIER through the RX/TX relay.
The bandpass filters around the RX amplifier are tuned by means of capacitor diodes, which are controlled by a DC-voltage derived from the VCO control voltage in the PLL.
The received signal is converted to the first intermediate frequency on 15.3 MHz in the FIRST MIXER, using the VCO signal from the RX BUFFER AMPLIFIER as local oscillator signal.
The signal is filtered and amplified before down-conversion to 450 kHz in the SECOND MIXER. The crystal oscillator signal is used as local oscillator signal.
After filtering in the SECOND IF FILTER, the signal is amplified and detected.
The AF signal is passed through a mute switch before undergoing appropriate amplification and filtering to get the right frequency response.
Besides, the detected output is filtered in the SQUELCH FILTER before it is amplified, detected, and compared with a reference level to get a logical level for the microcomputer, which controls the mute circuit.
The telephone amplifier and the AF power amplifier produce the wanted output levels for the earpiece and the loudspeaker.

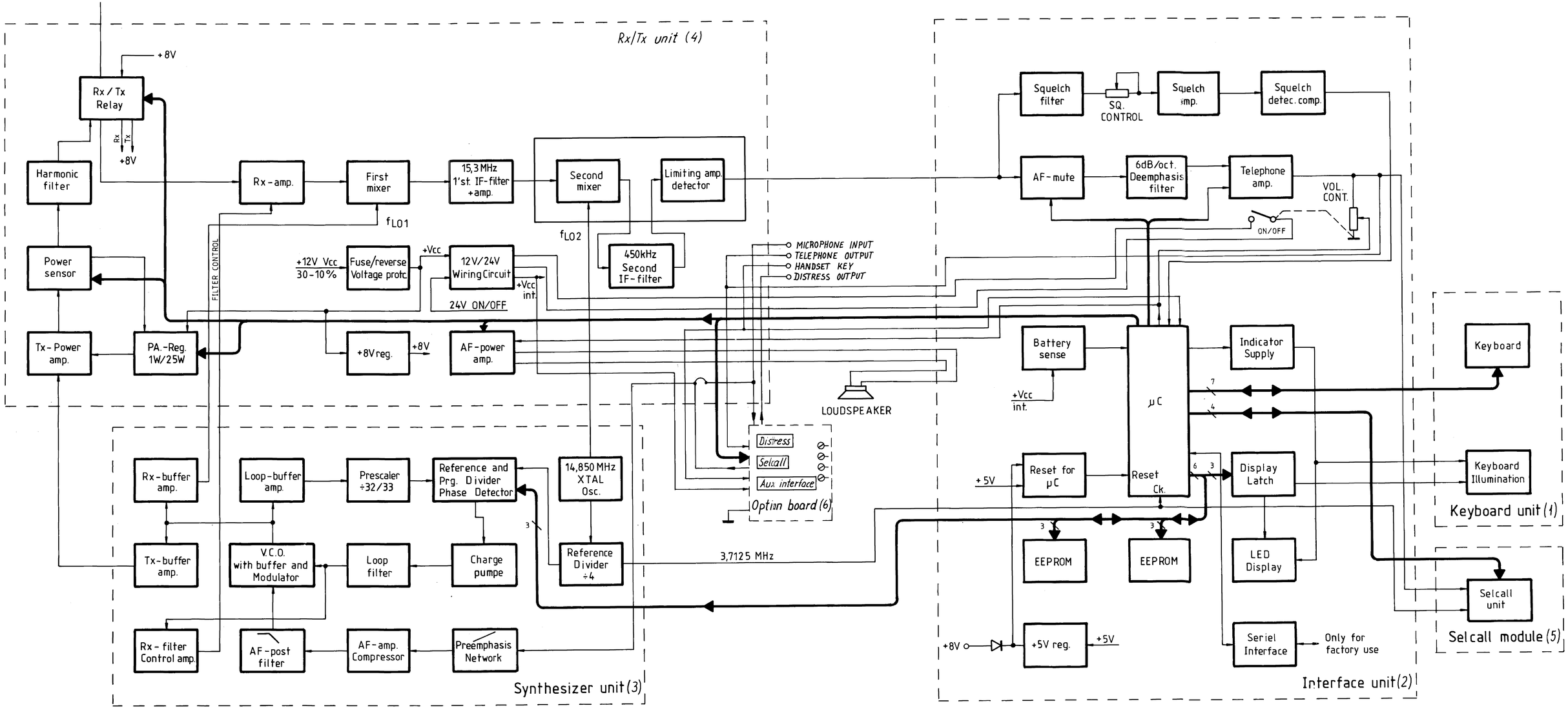
TRANSMITTER
The signal from the microphone is passed through a PRE-EMPHASIS network before appropriate amplification and compression in the AF AMPLIFIER COMPRESSOR.
This signal is filtered before it is fed to the VCO, where the modulation of the transmitter signal takes place.
As the VCO oscillates direct on the transmitting frequency in TX-mode, the signal only has to be amplified. This is done in the TX BUFFER AMPLIFIER and the TX POWER AMPLIFIER.

1.4. PRINCIPLE OF OPERATION cont.:

The power supply for the TX power amplifier is regulated by a feed-back loop via the POWER SENSE circuit to maintain constant output power level. Switching between full and reduced output power level is made by means of the PA-REGULATOR.
To reduce the level of harmonic components in the output signal it is passed through a HARMONIC FILTER before it is led to the antenna via the RX-TX-RELAY.

MICROCOMPUTER

The microcomputer on the interface unit is taking care of various functions, among these the user interface, which means reading of the keyboard and readout to the LED-display via the DISPLAY-LATCHES.
Moreover the computer calculates the appropriate division figures for the PLL, controls the transmitter power level, the AF mute circuits, and reads and writes to the EEPROM's.
When a selcall unit is installed, the microcomputer also controls the selcall switch capacitor filter.
The serial interface is only for factory production use.



RT2048B
4-0-25525B

BLOCK DIAGRAM RT 2048

RT2048B
4-0-25525B

+8V

Rx / Tx
Relay

Rx

Tx

+8V

Harmonic
filter

Rx - amp.

First
mixer

15,3 M
1'st. IF-
+amp

f_{LO1}

Power
sensor

FILTER CONTROL

+12V Vcc
30 - 10 %

Fuse/reverse
Voltage protc.

+Vcc

12V/2
Wiring C

24V ON/

Tx - Power
amp.

PA. - Reg.
1W/25W

+8V reg.

+8V

AF-po
amp

Rx - buffer
amp.

Loop - buffer
amp.

Prescaler
÷32/33

Reference
Prg. Divic
Phase Det

Tx - buffer
amp.

V.C.O.
with buffer and
Modulator

Loop
filter

Cha
pur

Rx - filter
Control amp.

AF - post
filter

AF - amp.
Compressor

Preemp
Netw

Rx/Tx unit (4)

First mixer

15,3 MHz 1'st. IF-filter +amp.

Second mixer

Limiting amp. detector

f_{LO1}

f_{LO2}

Fuse/reverse Voltage protc.

+Vcc

12V/24V Wiring Circuit

+Vcc int.

24V ON/OFF

450kHz Second IF-filter

MICROPHONE INPUT
TELEPHONE OUTPUT
HANDSET KEY
DISTRESS OUTPUT

+8V reg.

+8V

AF-power amp.

LOUDSPEAKER

Distress

Selcall

Aux. interface

Option board (6)

Prescaler ÷32/33

Reference and Prg. Divider Phase Detector

14,850 MHz XTAL Osc.

3

Loop filter

Charge pumpe

Reference Divider ÷4

3,7125 MHz

AF-amp. Compressor

Preemphasis Network

Synthesizer unit (3)

unit (4)

Squelch filter

SQ. CONTROL

Squelch amp.

Limiting amp. detector

AF-mute

6dB/oct. Deemphasis filter

MICROPHONE INPUT
TELEPHONE OUTPUT
HANDSET KEY
DISTRESS OUTPUT

Battery sense

+Vcc int.

LOUDSPEAKER

μC

7

4

Distress

Selcall

Aux. interface

Option board (6)

Reset for μC

+5V

Reset

Ck.

6

3

3

3

3,7125 MHz

EEPROM

EEPROM

+8V

+5V reg.

+5V

Squelch filter

SQ. CONTROL

Squelch amp.

Squelch detec. comp.

AF-mute

6dB/oct. Deemphasis filter

Telephone amp.

VOL. CONT.

ON/OFF

Battery sense

-Vcc

nt.

µC

7

4

Indicator Supply

Reset for µC

Reset

Ck.

6

3

Display Latch

3

3

EEPROM

EEPROM

LED Display

+5V reg.

+5V

Seriel Interface

Only for factory use

Interface unit (2)

Keyboard

Keyboard Illumination

Keyboard unit (1)

Selcall unit

Selcall module (5)

BLOCK DIAGRAM RT 2048

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2.6. ANTENNAS
2.7. SPECIAL OPTIONS
2.8. REAR VIEW OF VHF RT2048
2.9. STANDARD FREQUENCY TABLE

2. INSTALLATION

Before installation of a SAILOR VHF RT2048 the following points must be observed:

1. Which facilities have to be enabled?
   Selcall, private channels, US-mode, dual watch, scanning facilities, etc. The procedure how to enable the facilities is described in the manual: INSTRUCTIONS FOR IDENTITY AND SERVICE PROGRAMMING OF SAILOR VHF RT2048.
   This manual will only be delivered to dealers and general agents, where it must be at the disposal of trained service people in the service workshop.

2. In what way the VHF RT2048 has to be installed?
   In the section MOUNTING POSSIBILITIES, the installation of VHF RT2048 is described either as an independent unit or in combination with the other elements of the Compact 2000 programme.

3. Handset.
   Installation of handset, see the section HANDSET.

4. External loudspeaker.
   An external loudspeaker 4-8 ohm/6W can be connected to the power connector J1, pin 1 and 6, see the section POWER CONNECTOR + EXT. LOUDSPEAKER.

5. Special options:
   Remote alarm for selcall, AF to information decoder, AUX I and AUX II information, etc. are available, see the section SPECIAL OPTIONS.

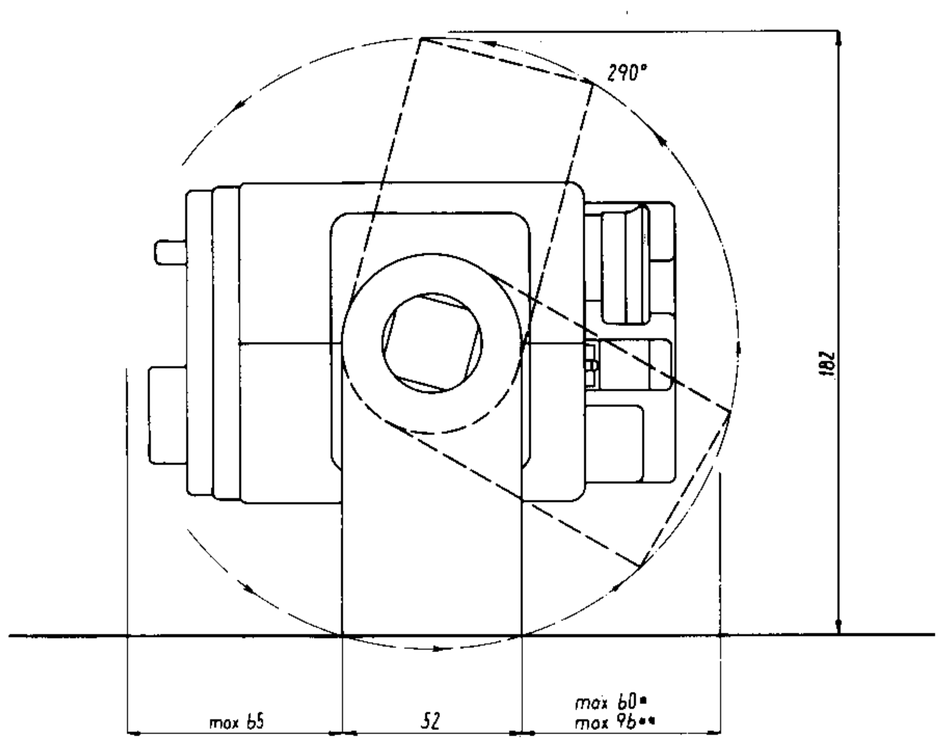
2.1. MOUNTING POSSIBILITIES

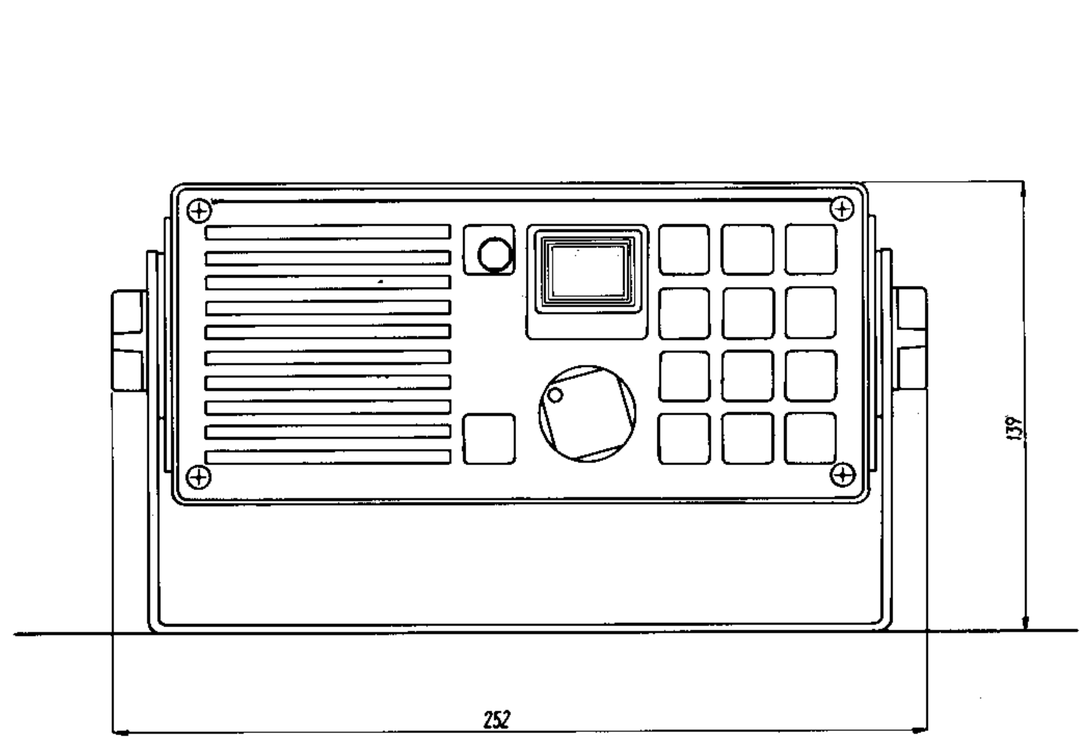
The VHF RT2048 cabinet is designed in a module called a mini 1/4 box. For this module we can supply a wide variety of installation brackets etc. which will be described below. We have made a drawing including dimensions and drilling plan for each type and we kindly ask you to look at the drawing for the type in question.

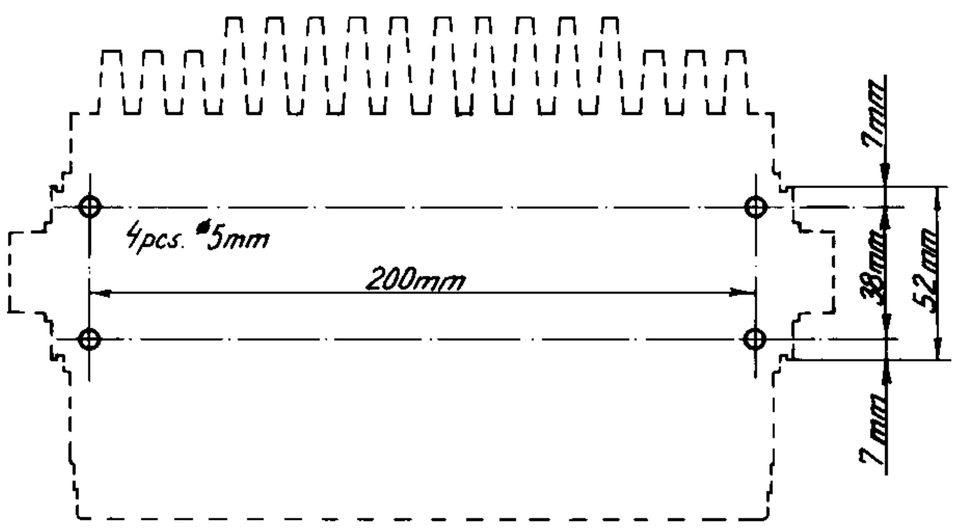
H2077 MULTI-PURPOSE MOUNTING BRACKET
This mounting bracket is as standard delivered together with RT2048. It permits a wide variety of installation possibilities such as tabletop, bulkhead or deckhead. It is easy to remove the set by unscrewing the two buttons of H2077.

H2077

RT2048 A 4-0-25572
4-0-25571
4-0-25668







Weight:

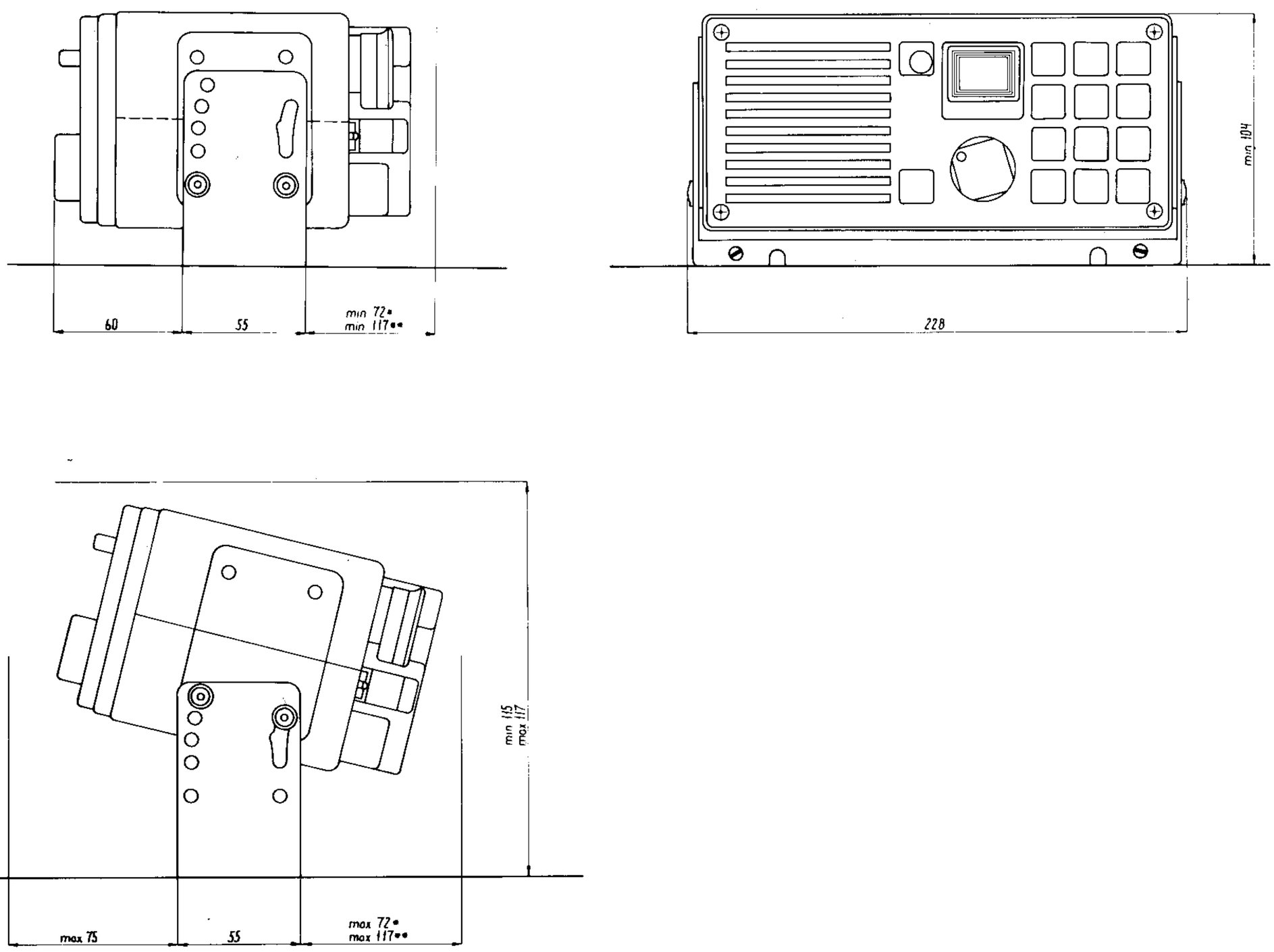
Mounting kit H2077:	0.4 kg
VHF RT2048:	3.2 kg

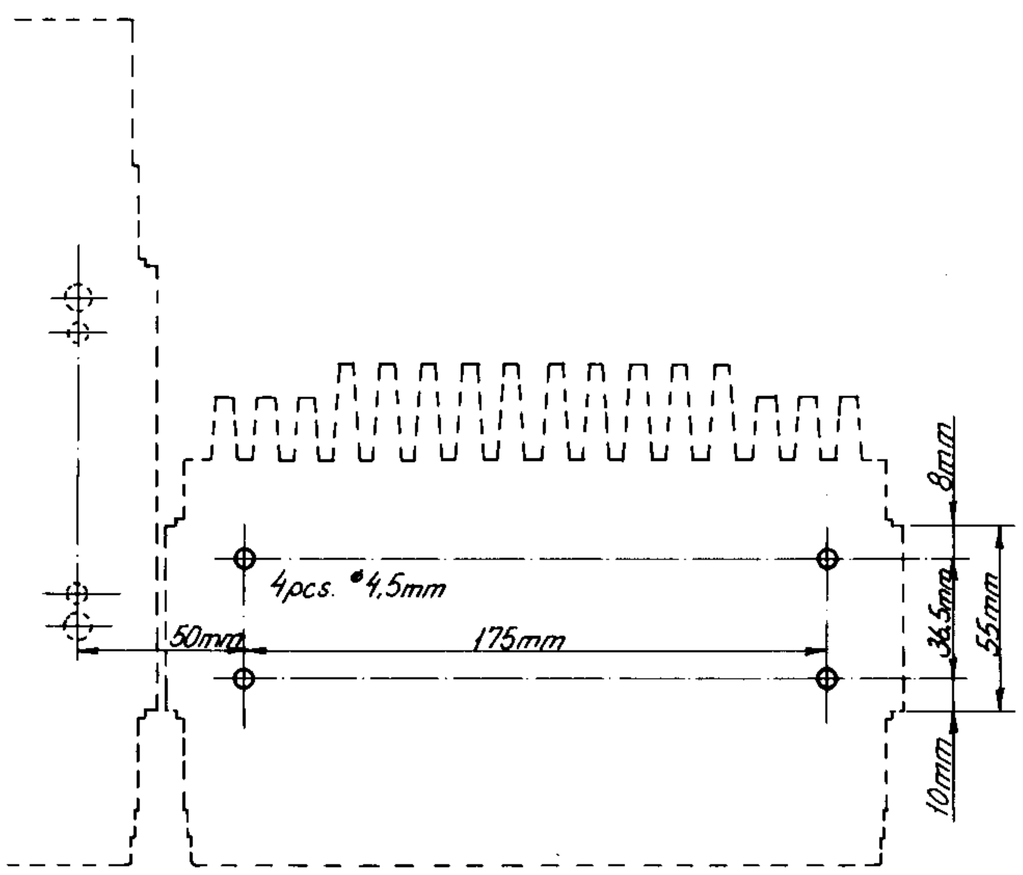
2.1. **MOUNTING POSSIBILITIES** cont.:

H2067 MOUNTING BRACKET FOR TABLETOP, BULKEHAD OR DECKHEAD MOUNTING FOR MINI 1/4 BOX

This mounting bracket is used when RT2048 is to be mounted next to other SAILOR units in the Compact 2000 programme mounted in H2055 mounting brackets. For example when installing the RT2048 next to the scrambler CRY2001 it is possible to tilt both units in the same angle.

H2067





Weight:

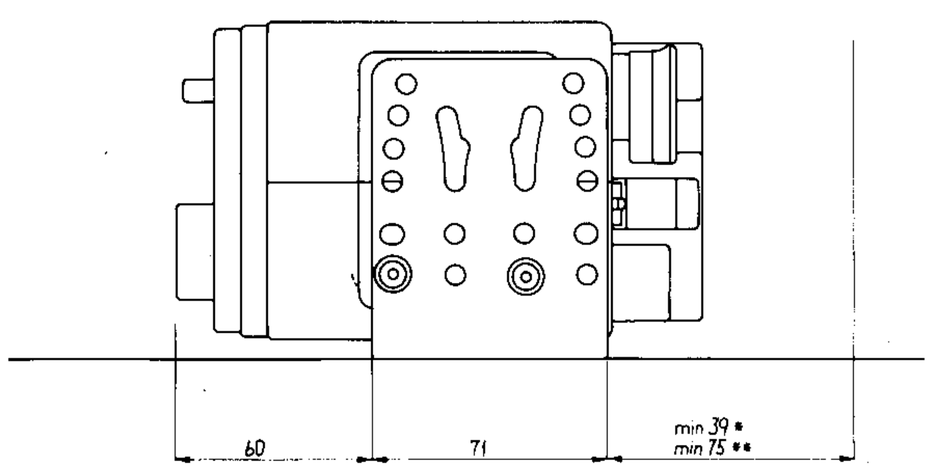
Mounting kit H2067:	0.5 kg
VHF RT2048:	3.2 kg

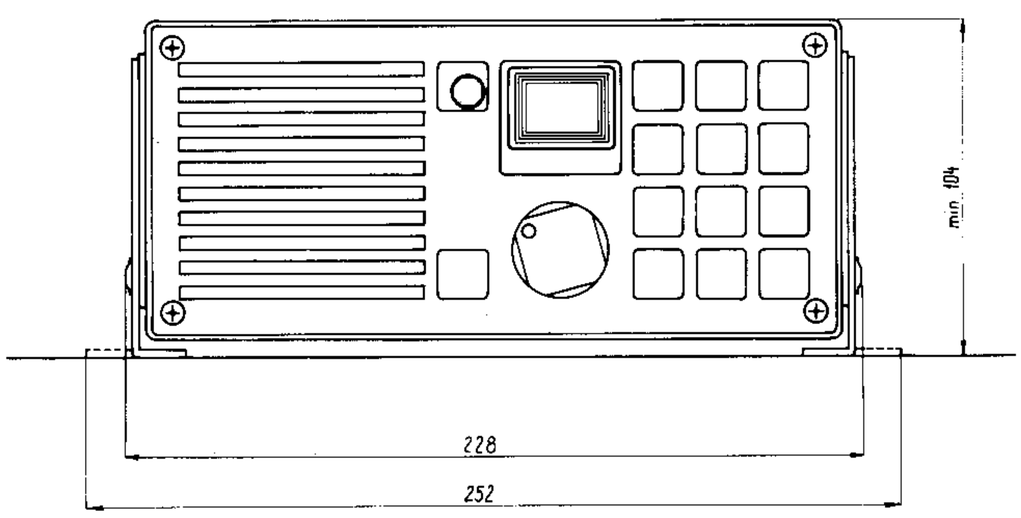
RT2048 A 4-0-25574 4-0-25573
4-0-25575 4-0-25659A

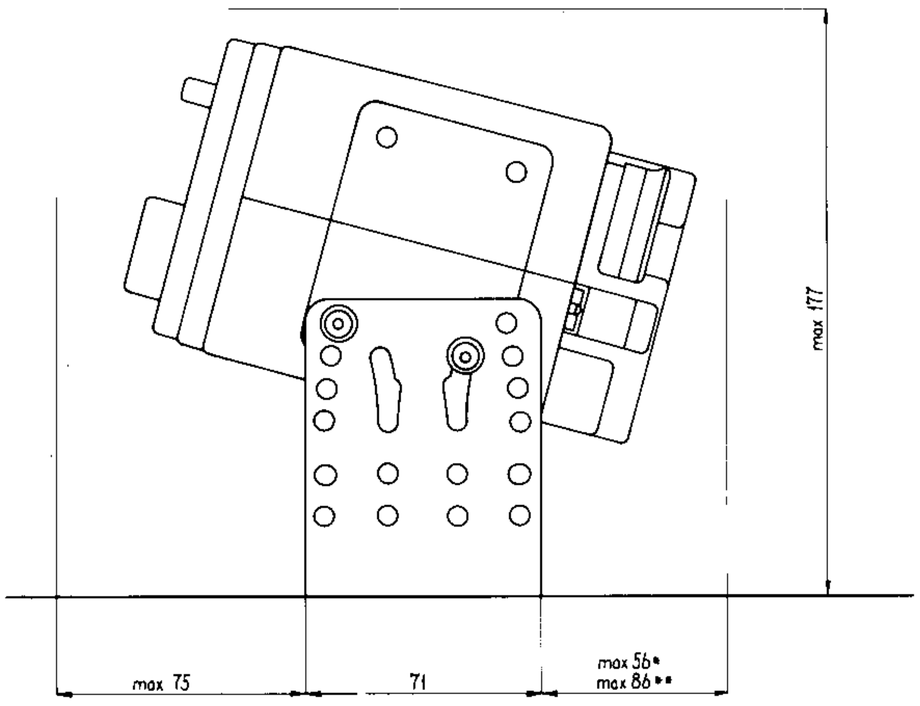
H2057 ANGLE HINGES FOR TABLETOP, BULKHEAD OR DECKHEAD MOUNTING FOR MINI 1/4 BOX

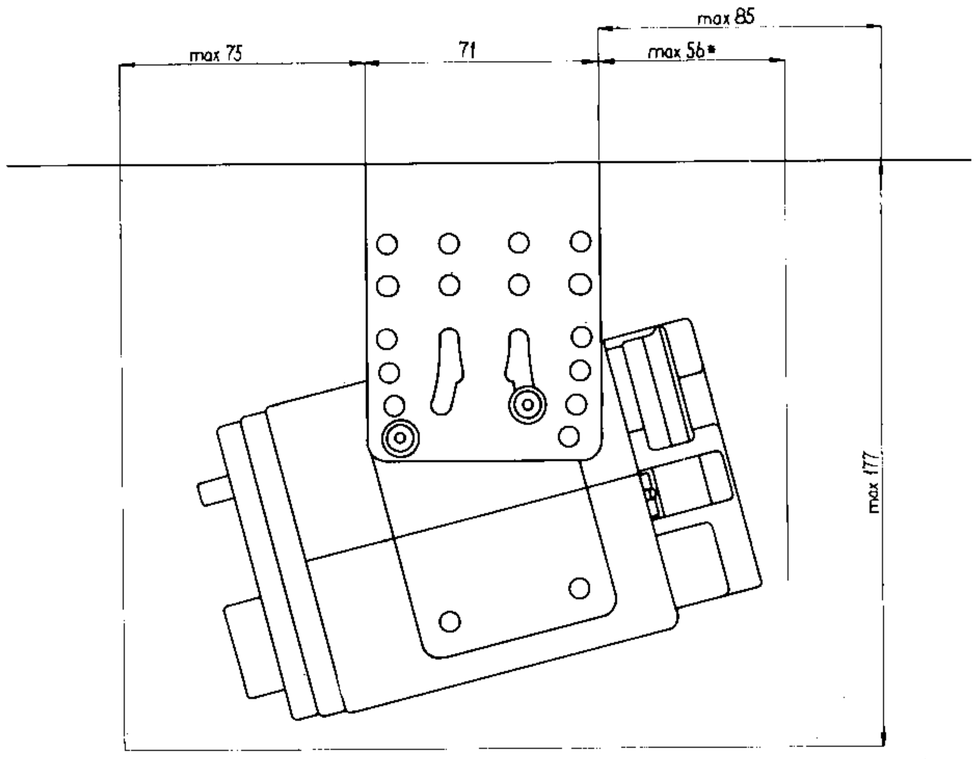
H2057 is designed for stationary installation. It offers a lot of mounting possibilities using the different holes in the angle hinges when tilting the VHF.

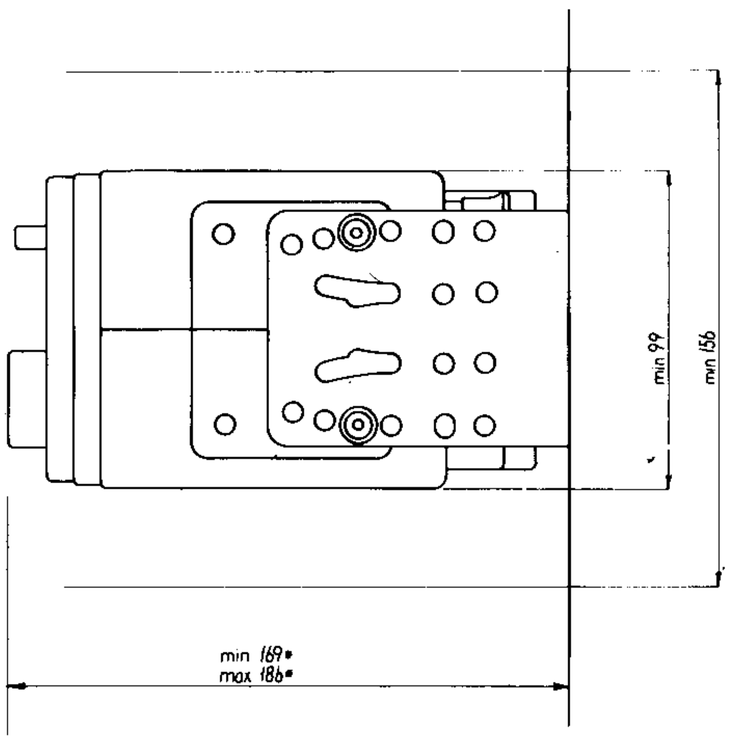
H2057

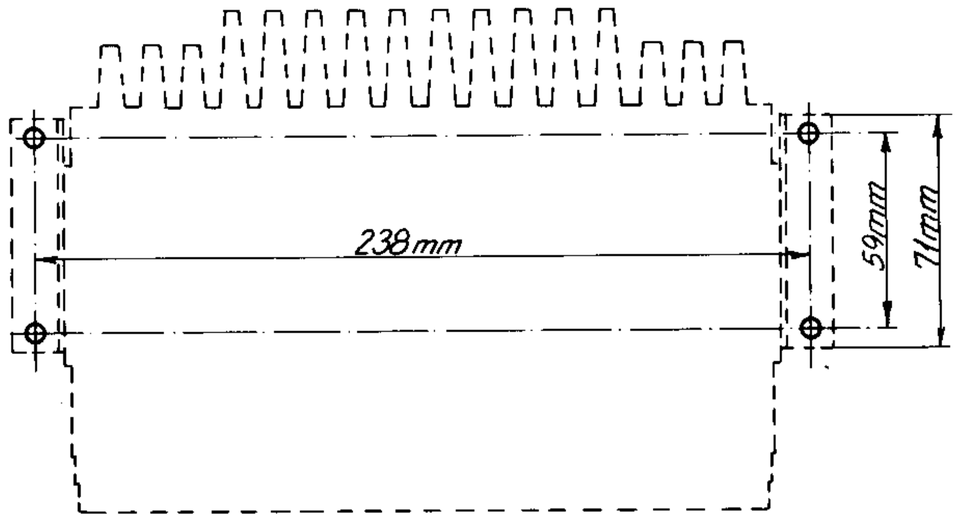


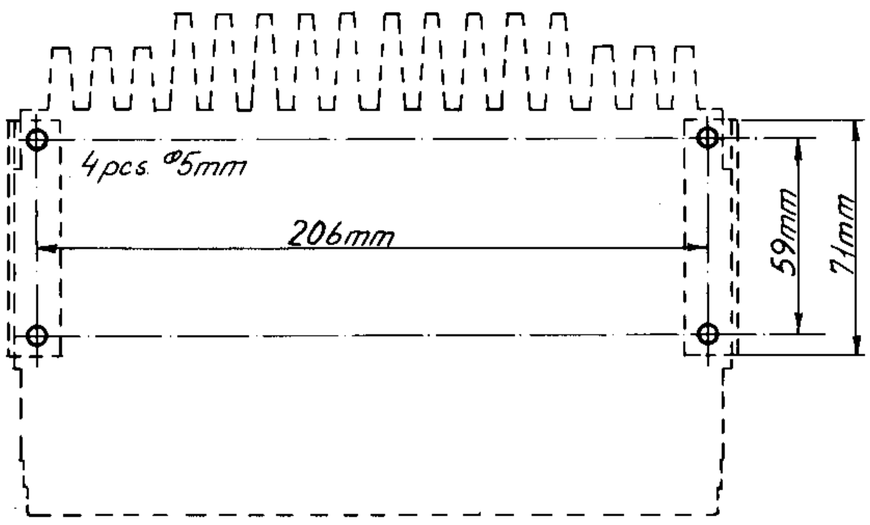












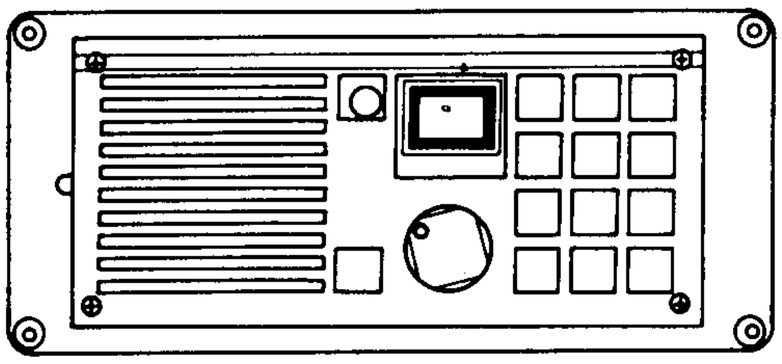
* Dimensions when using a right-angled VHF plug.
** Dimensions when using a standard VHF plug.

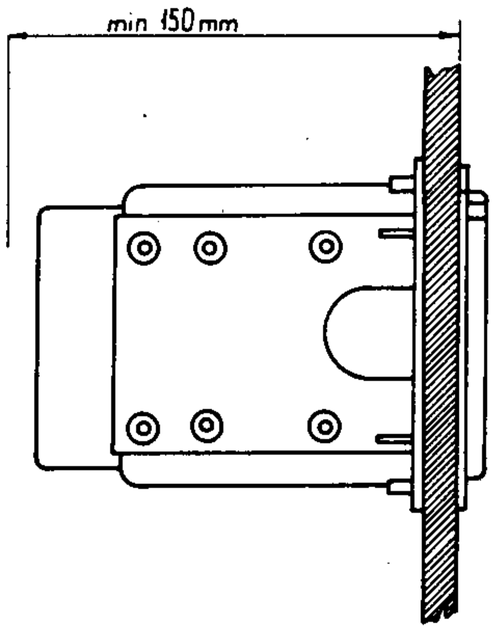
Weight: Mounting kit H2057: 0.4 kg
VHF RT2048: 3.2 kg

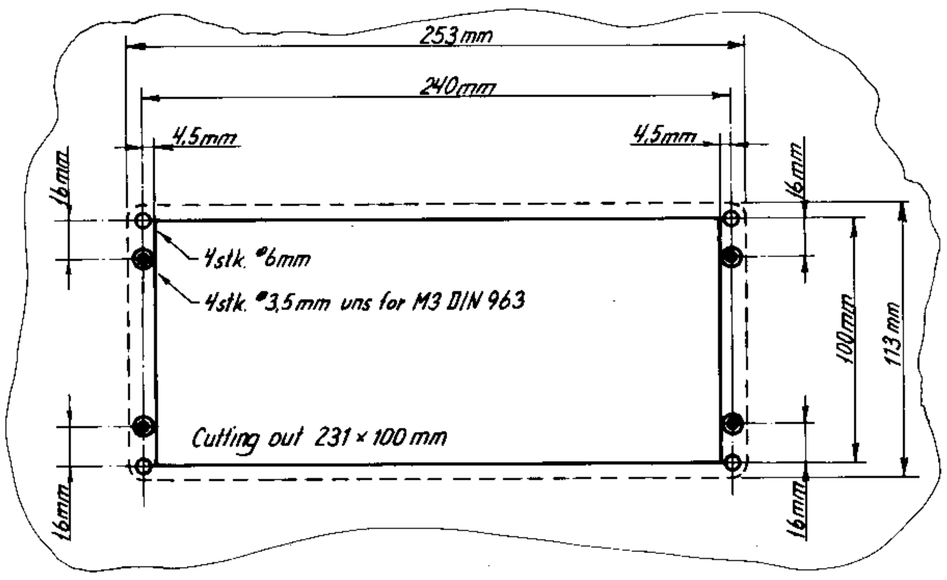
2.1. **MOUNTING POSSIBILITIES** cont.:

H2063 CONSOLE MOUNTING KIT FOR 1/4 BOX
This mounting kit is used for console flush mounting of 1/4 box and mini 1/4 box.
Free distance must be kept to allow free air circulation, ambient temperature max. 40°C.

H2063



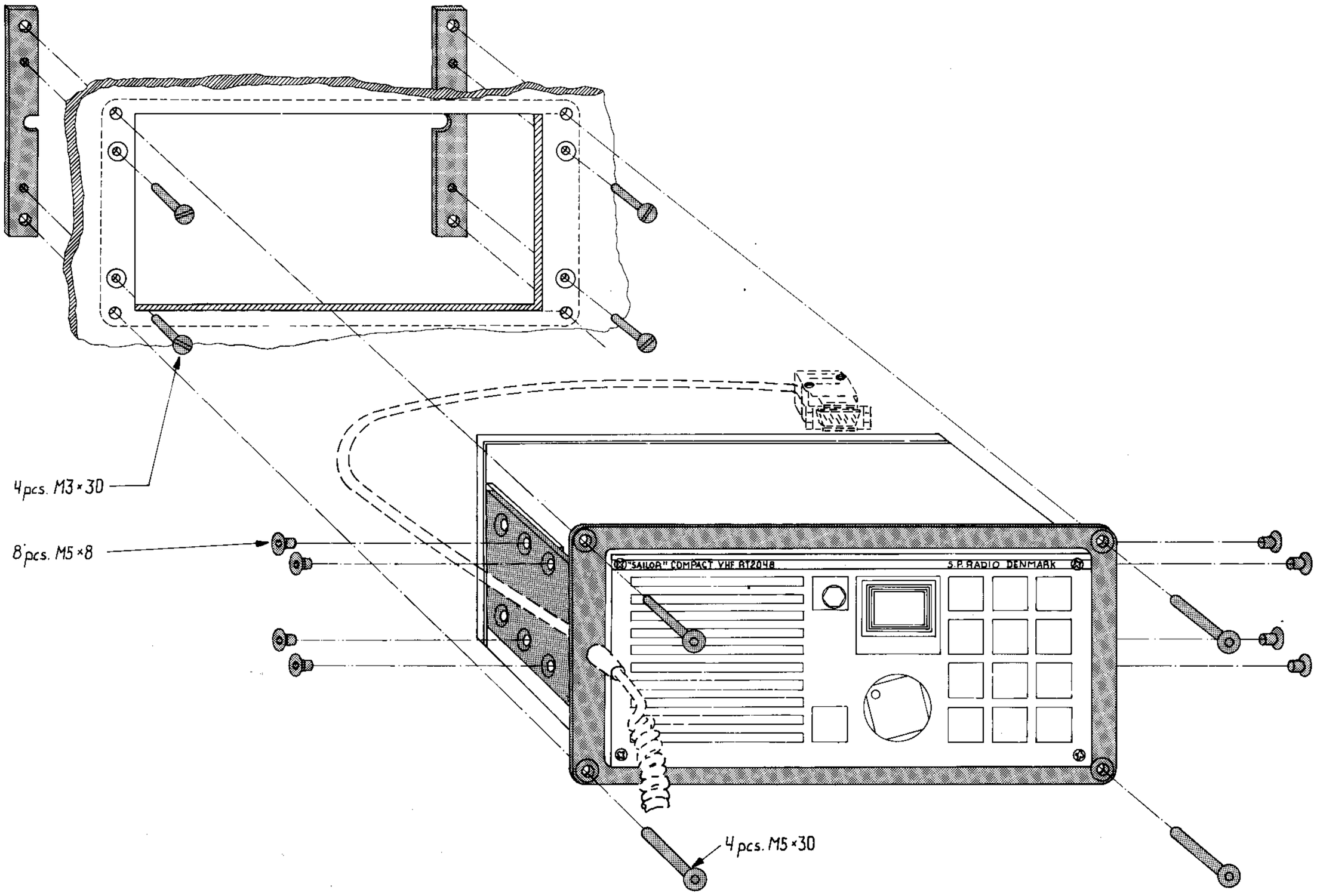




Weight:

Mounting kit H2063:	1.0 kg
VHF RT2048:	3.2 kg

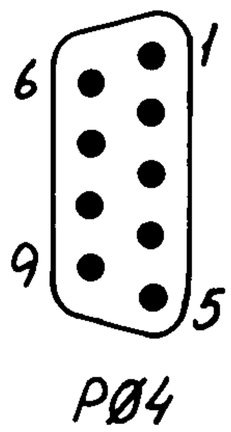
RT2048 A 4-0-25663
4-0-24703
4-0-25657



2.2. HANDSET

The handset can be placed anywhere near the VHF set. The cable is five-cored and connected to the rear of the VHF through a 9-pole Sub-D connector.
Installation of the cable, see the drawings of the mounting brackets. The cable grommet must be placed in the most convenient groove in the mounting bracket.
If more than one handset is needed, please see the section SPECIAL INSTALLATION WITH 2 OR 3 MICROTELEPHONES.

2.3. MICROTELEPHONE CONNECTOR



Pin No. 1 Telephone
Pin No. 2 GND
Pin No. 3 GND
Pin No. 4 Mic
Pin No. 5 Key
Pin No. 6 Spare
Pin No. 7 Distress CRY*
Pin No. 8 "Serial input"
Pin No. 9 +13V internal

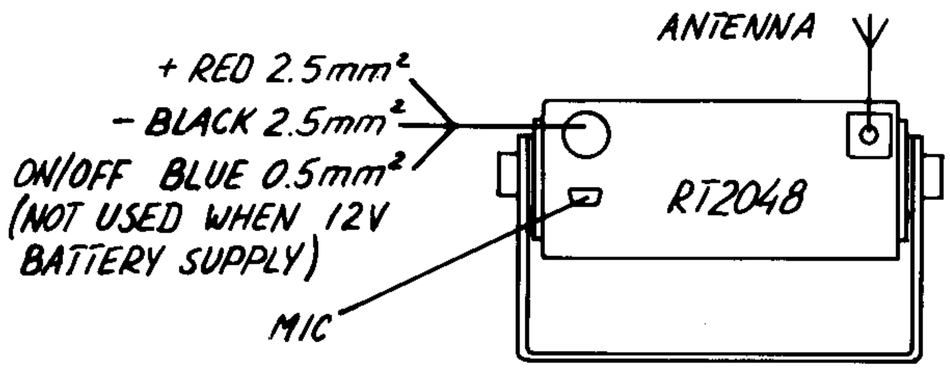
*only active when option board pcb is installed.

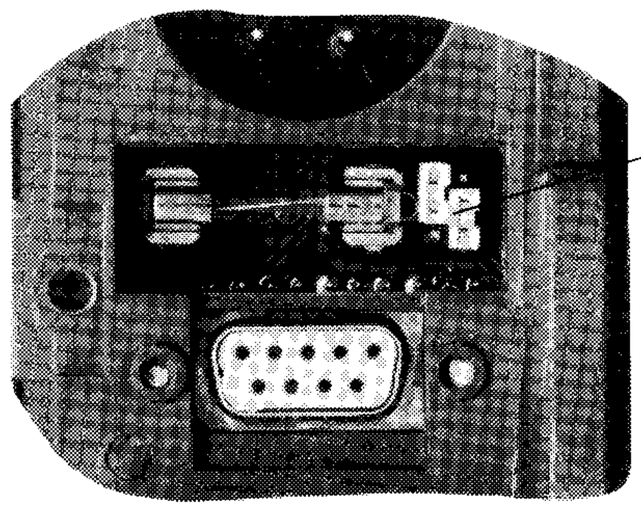
RT2048 A 4-0-25666
4-0-25664

2.4. POWER SUPPLY

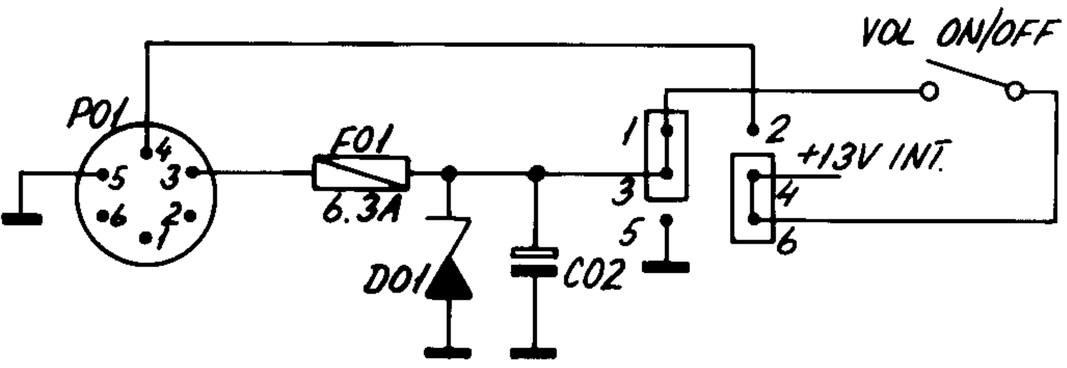
The standard power supply for RT2048 is 12V DC. For 24V DC supply an external power supply N420 (a 24V DC to 13.2V DC serial regulator) can be used.
For 110V AC, 127V AC, 220V AC, or 237V AC operation an external power supply N163S must be used together with N420.

12V OPERATION

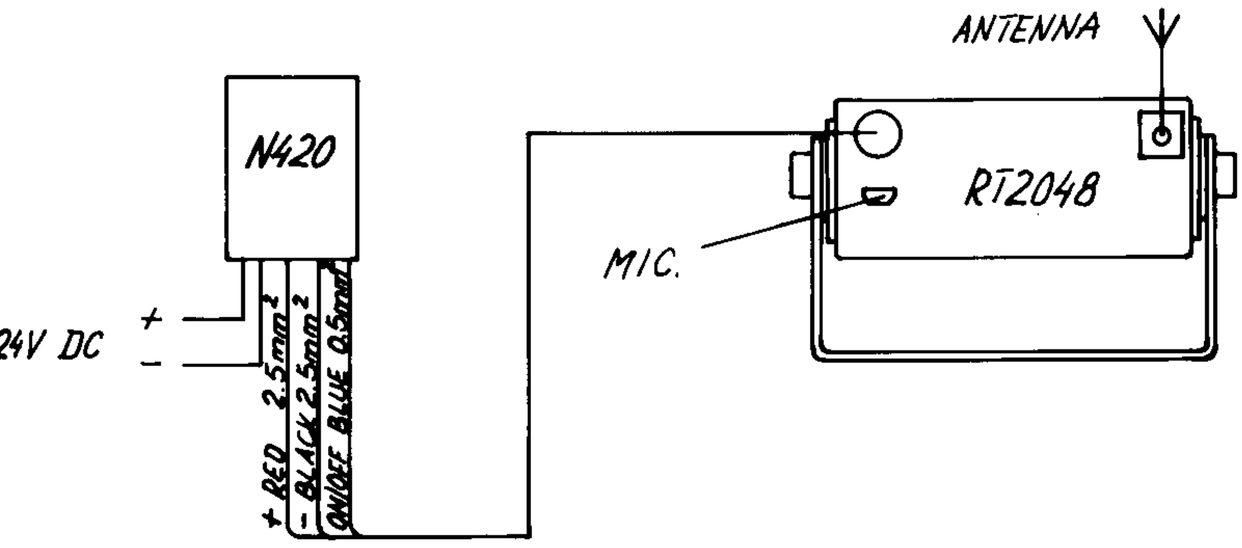


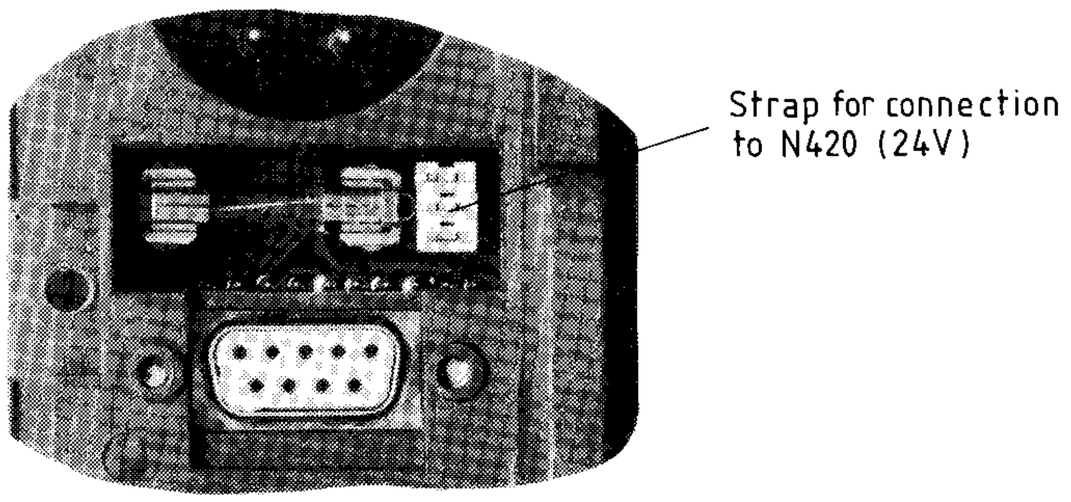


BLOCK DIAGRAM OF STRAPPING FOR 12V DC

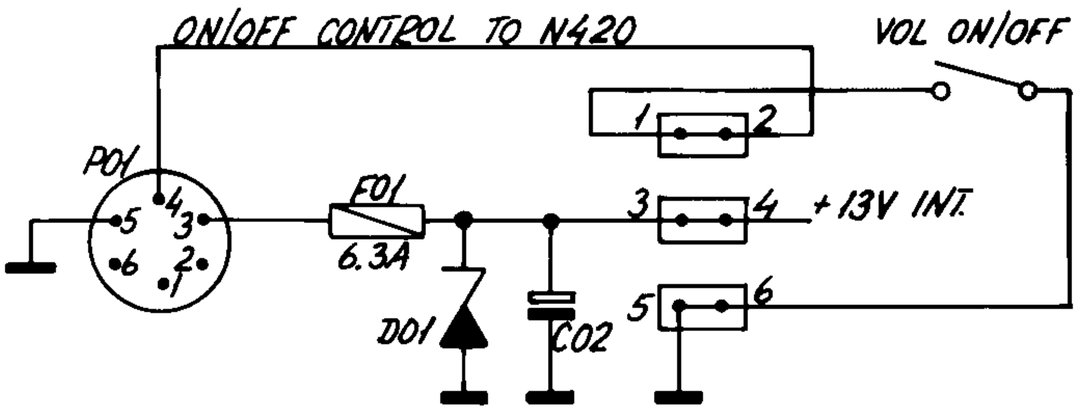


24V OPERATION



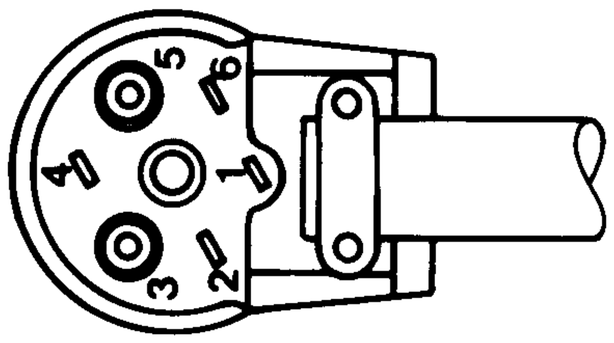


BLOCK DIAGRAM OF STRAPPING FOR 24V DC



2.5. POWER CONNECTOR + EXT. LOUDSPEAKER

VIEW FROM MOUNTING SIDE



J01

Pin No. 1 Ext. loudspeaker
Pin No. 2 Ext. mute*
Pin No. 3 +12V power supply
Pin No. 4 on/off for 24V supply
Pin No. 5 -12V power supply
Pin No. 6 Ext. loudspeaker

*only active when option board pcb is installed.

If necessary a 4-8 ohm/6W external loudspeaker can be connected to pin No. 1 and pin No. 6 in the power connector J 01 (observe that there is DC voltage on both wires).
External loudspeakers SAILOR H2054 and H2074 are available.

2.6. ANTENNAS

All common 50 ohm antennas, which cover the used frequency range with a reasonable standing wave ratio, maximum 1.5, are available.
The antenna is connected to the set by means of a 50 ohm coaxial cable with low loss, e.g. RG213U. At the cable end a PL259 plug is mounted.
The antenna must be placed as high and clear as possible. The horizontal distance to metal parts must be at least one metre.
S. P. Radio has an antenna of the necessary specifications available. The mentioned antenna is characterized by small external dimensions. For further particulars see special brochure VHF AERIALS.

2.7. SPECIAL OPTIONS

With a small modification in RT2048 the following options are available:

1. K-switch function (used on river boats in Germany). Can be enabled by means of the identity programming. US-button is changed to K-switch.

2. With DISTRESS OPTION installed
   S.P. No. 625661

   a. Distress output to CRY2001/2002.

2.7. SPECIAL OPTIONS cont.:

3. With SELCALL OPTION installed
   S.P. No. 625660

   a. SELCALL RELAY, when the selcall has accepted a CQ or an individual call signal, the selcall relay will turn on and short circuit two wires, which can be used for remote alarm. Max. contact load: 100V AC/24V DC - 2A.

   b. AF TO INFORMATION DECODER, the circuit giving AF signals to the information decoder is turned on when the set has accepted a CQ or an individual call signal. The circuit is turned on/off by the microprocessor.

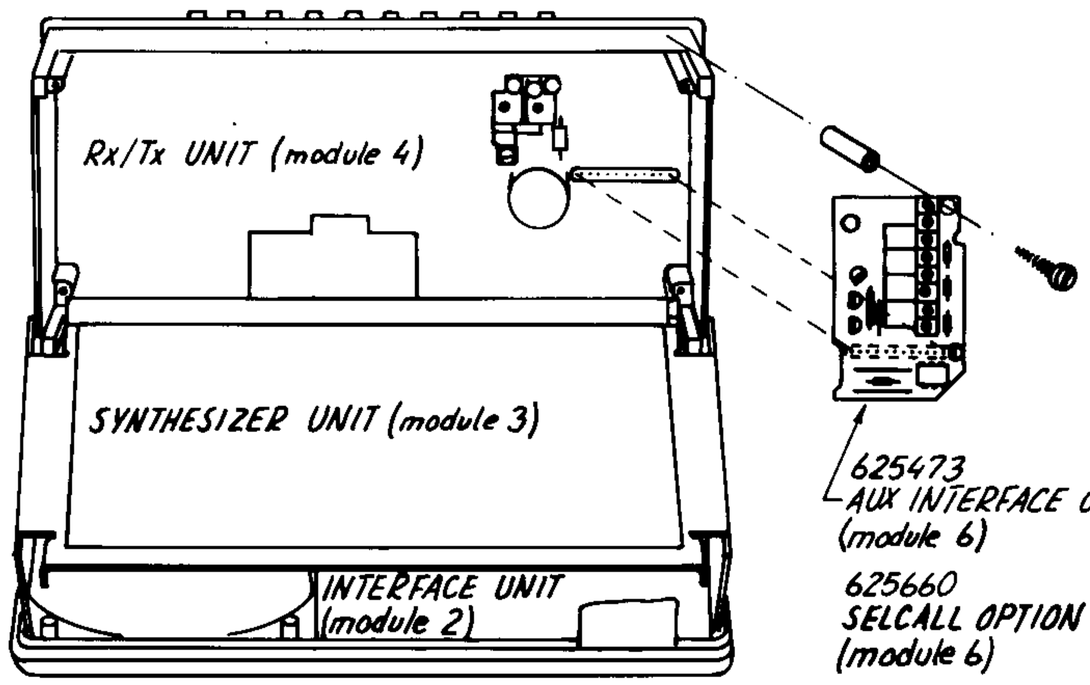
4. With AUX INTERFACE OPTION installed
   S.P. No. 625473
   (AUX1, AUX2 and MUTE functions) (Distress and Selcall functions are also mounted)

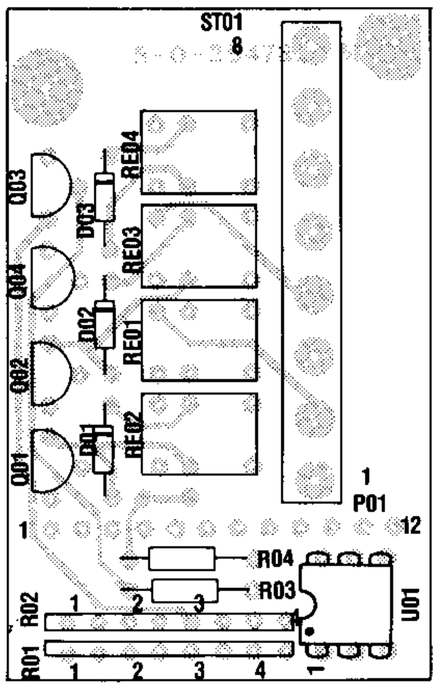
   a. AUX2, when information on certain channels is wanted, i.e. controlling a watch keeping receiver, the AUX2 information can be used, a relay is controlled from the microprocessor. Max. contact load: 100V AC/24V DC - 2A.

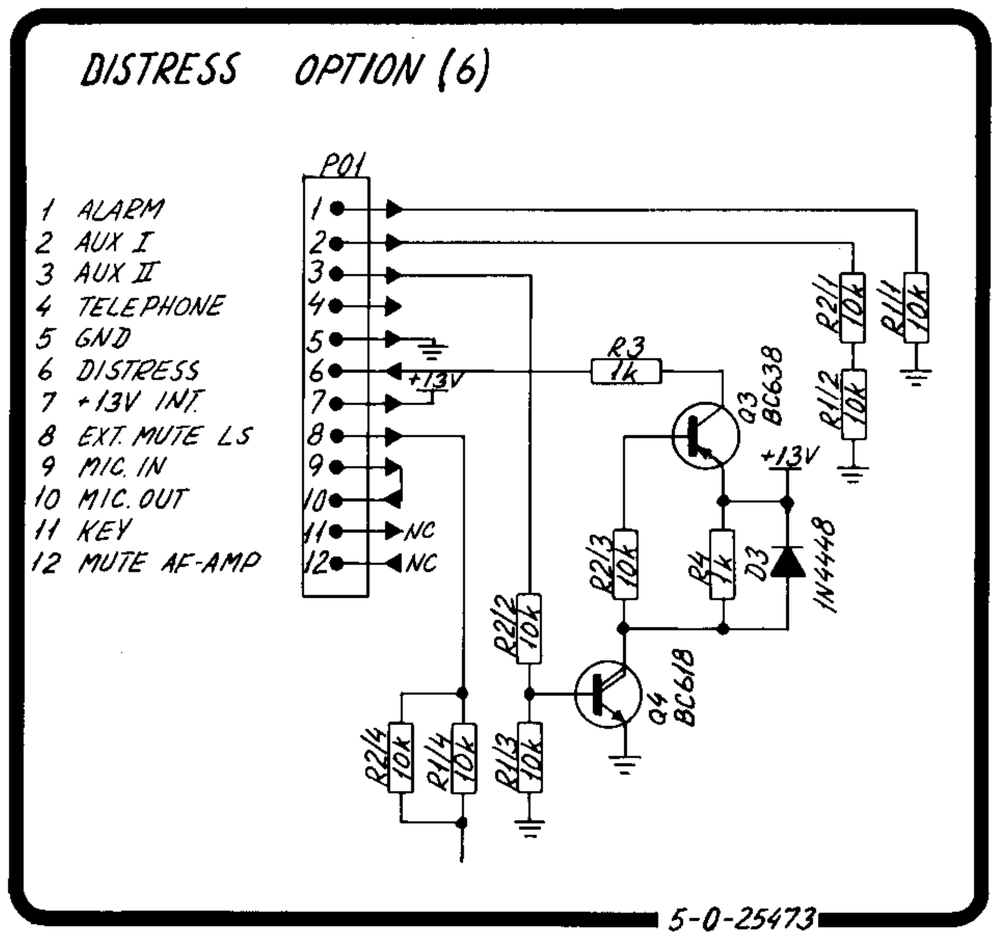
   b. AUX1, when function code in Prom 1 is enabled, AUX1 is free programmable on all international channels ("0" or "1").
   Standard programming on international channels is "0". Max. contact load: 100V AC/24V DC-2A.

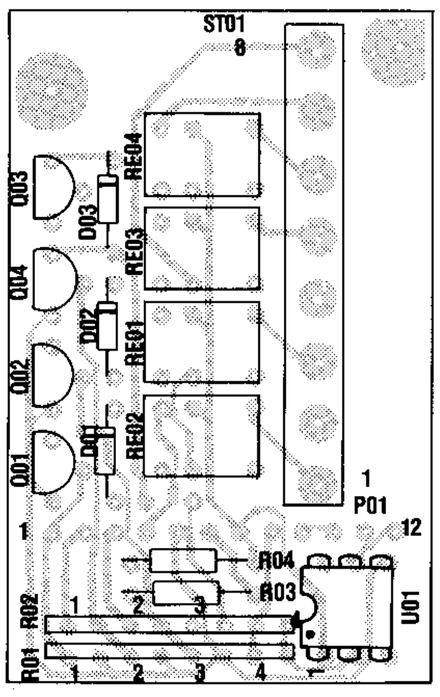
   c. MUTE, makes it possible to mute AF power amplifier from external equipment. Activated by a make function between pin 5 and pin 8 in P1 on option board.

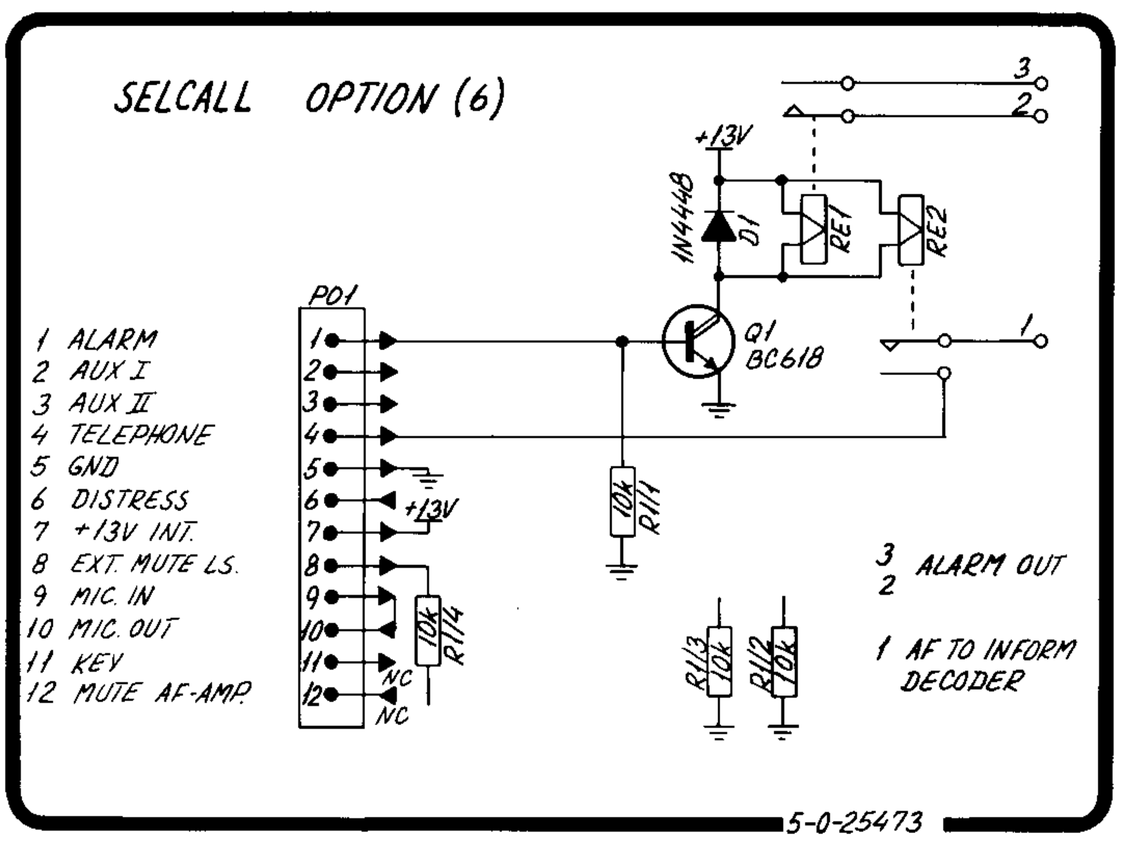
RT2048 B
4-0-25662 A
4-0-25660 A 4-0-25473 A

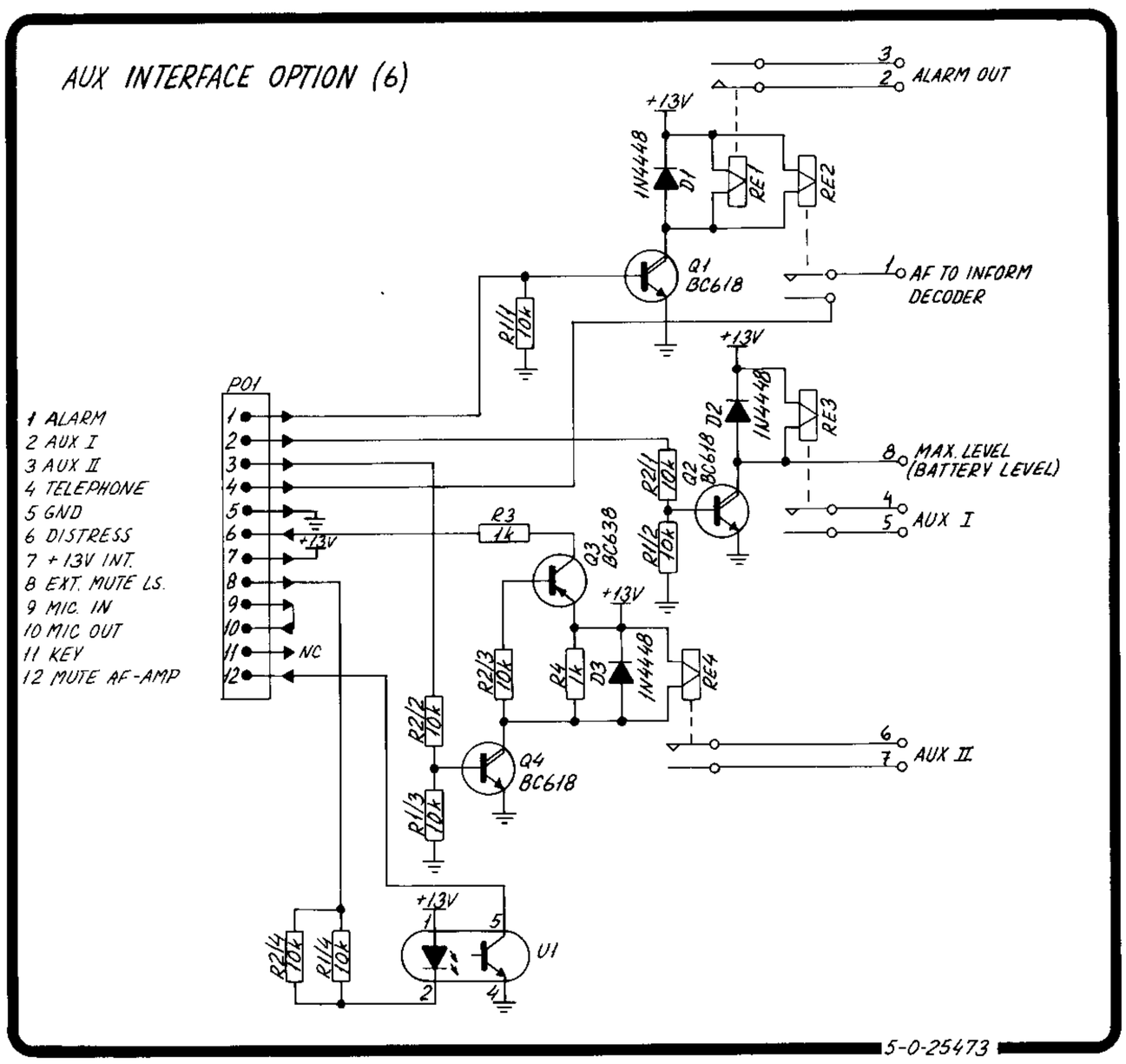



ST01
8
1
P01
12
1
RE04
RE03
RE01
RE02
D04
D03
D02
D01
Q04
Q03
Q02
Q01
R04
R03
R02
R01
U01

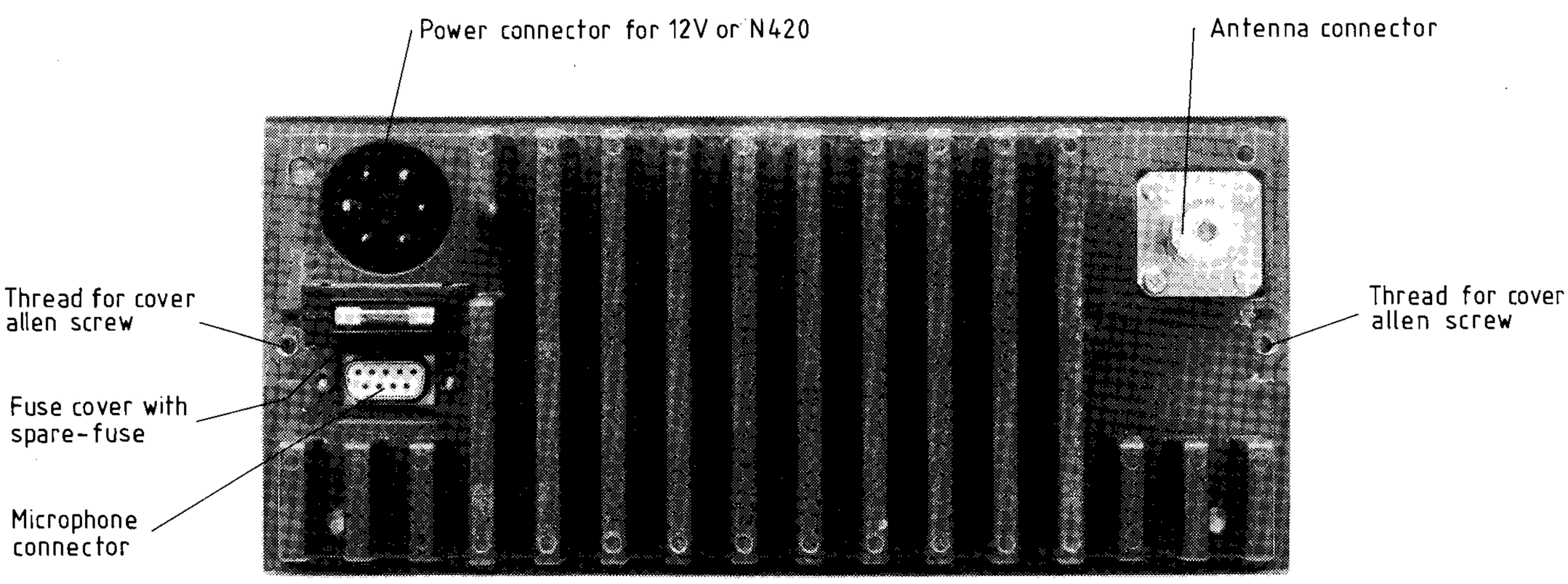

DISTRESS OPTION (6)
P01
1 ALARM
2 AUX I
3 AUX II
4 TELEPHONE
5 GND
6 DISTRESS
7 +13V INT.
8 EXT. MUTE LS
9 MIC. IN
10 MIC. OUT
11 KEY
12 MUTE AF-AMP
NC
NC
+13V
R3 1k
Q3 BC638
R2/1 10k
R1/1 10k
R1/2 10k
R2/3 10k
R4 1k
D3 1N4448
R2/2 10k
Q4 BC618
R2/4 10k
R1/4 10k
R1/3 10k
5-0-25473


ST01
8
1
P01
12
1
RE04
RE03
RE01
RE02
D04
D03
D02
D01
Q04
Q03
Q02
Q01
R04
R03
R02
R01
U01


SELCALL OPTION (6)
P01
1 ALARM
2 AUX I
3 AUX II
4 TELEPHONE
5 GND
6 DISTRESS
7 +13V INT.
8 EXT. MUTE LS.
9 MIC. IN
10 MIC. OUT
11 KEY
12 MUTE AF-AMP
NC
NC
+13V
1N4448 D1
RE1
RE2
Q1 BC618
10K R1/1
10K R1/4
R1/3 10K
R1/2 10K
3
2
ALARM OUT
1
AF TO INFORM DECODER
5-0-25473


AUX INTERFACE OPTION (6)
P01
1 ALARM
2 AUX I
3 AUX II
4 TELEPHONE
5 GND
6 DISTRESS
7 +13V INT.
8 EXT. MUTE LS.
9 MIC. IN
10 MIC OUT
11 KEY
12 MUTE AF-AMP
NC
+13V
3
2
ALARM OUT
1N4448 D1
RE1
RE2
Q1 BC618
R1/1 10K
1
AF TO INFORM DECODER
R3 1k
Q3 BC638
R2/1 10K
Q2 BC618
D2 1N4448
RE3
8
MAX. LEVEL (BATTERY LEVEL)
R1/2 10K
4
5
AUX I
R2/3 10K
R4 1k
D3 1N4448
RE4
6
7
AUX II
R2/2 10K
Q4 BC618
R1/3 10K
R2/4 10K
R1/4 10K
U1
5-0-25473

2.8. REAR VIEW OF VHF RT2048



2.9. STANDARD FREQUENCY TABLE

CHANNEL	TRANSMITTING FREQUENCY (MHz)	RECEIVING FREQUENCY (MHz)	
		US MODE (A.-CHANNELS)	INT'L MODE (INT.-CHANNELS)
01	156.050	156.050	160.650
02	156.100	160.700	
03	156.150	160.750	
04	156.200	160.800	
05	156.250	156.250	160.850
06	156.300	156.300	
07	156.350	156.350	160.950
08	156.400	156.400	
09	156.450	156.450	
10	156.500	156.500	
11	156.550	156.550	
12	156.600	156.600	
13	156.650	156.650	
14	156.700	156.700	
15	156.750	156.750	
16	156.800	156.800	
17	156.850	156.850	
18	156.900	156.900	161.500
19	156.950	156.950	161.550
20	157.000	161.600	
21	157.050	157.050	161.650
22	157.100	157.100	161.700
23	157.150	157.150	161.750
24	157.200	161.800	
25	157.250	161.850	
26	157.300	161.900	
27	157.350	161.950	
28	157.400	162.000	
60	156.025	160.625	
61	156.075	160.675	
62	156.125	160.725	
63	156.175	156.175	160.775
64	156.225	160.825	
65	156.275	156.275	160.875
66	156.325	156.325	160.925
67	156.375	156.375	
68	156.425	156.425	
69	156.475	156.475	
70	156.525	156.525	
71	156.575	156.575	
72	156.625	156.625	
73	156.675	156.675	
74	156.725	156.725	
77	156.875	156.875	
78	156.925	156.925	161.525
79	156.975	156.975	161.575
80	157.025	157.025	161.625
81	157.075	157.075	161.675
82	157.125	157.125	161.725
83	157.175	157.175	161.775
84	157.225	161.825	
85	157.275	161.875	
86	157.325	161.925	
87	157.375	161.975	
88	157.425	157.425	162.025
WX1	Inhibit	162.550	
WX2	Inhibit	162.400	
WX3	Inhibit	162.475	
WX4	Inhibit	161.650	

CONTENTS

3. SERVICE
3.1. MAINTENANCE
3.2. ALIGNMENT INSTRUCTIONS
3.3. PROPOSAL FOR NECESSARY MEASURING INSTRUMENTS
3.4. TEST PROBE
3.5. ADJUSTMENT PROCEDURE
3.5.1. ADJUSTMENT OF SYNTHESIZER UNIT
3.5.2. ADJUSTMENT OF RX/TX UNIT
3.6. TROUBLE SHOOTING
3.7. REPLACEMENT OF COMPONENTS
3.8. REPLACEMENT OF MODULES
3.9. NECESSARY ADJUSTMENT AFTER REPLACEMENT OF MODULE
3.9.1. REPLACEMENT OF RX/TX UNIT
3.9.2. REPLACEMENT OF SYNTHESIZER UNIT
3.10. PIN CONFIGURATIONS

3. SERVICE

3.1. MAINTENANCE

PREVENTIVE MAINTANANCE
If SAILOR RT2048 has been installed in a proper way the maintenance can be reduced to an overhaul at each visit of the service staff.
Then inspect the set, the antenna, cables, and plugs for mechanical damages, salt deposits, corrosion, and any foreign material.
Owing to its traditional structure, the SAILOR RT2048 has a long lifetime, but it must always be carefully checked at intervals not exceeding 12 months - dependent on the conditions under which the set is working. The set must be brought to the service workshop to be tested.

Along with each set a TEST-SHEET is delivered in which all the measurements, made in the test department of the factory, are listed. If the control measurings made in the service workshop should not show the same values as those listed in the test-sheet, the set must be adjusted as specified in the ADJUSTMENT PROCEDURE.

3.2. ALIGNMENT INSTRUCTIONS

INTRODUCTION
The measuring values indicated in paragraph 2 of CIRCUIT DESCRIPTION AND SCHEMATIC DIAGRAMS are typical values and as indicated it will be necessary to use instruments in absolute conformity with the below list:

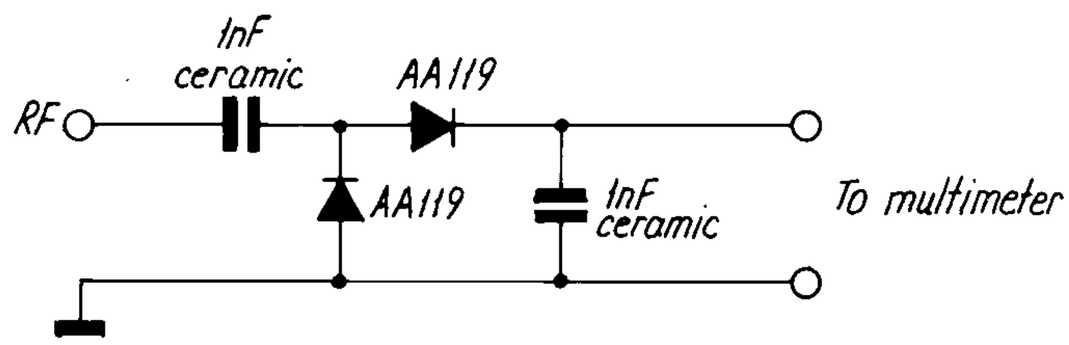
3.3. PROPOSAL FOR NECESSARY MEASURING INSTRUMENTS

VHF Signal Generator type TF2015	MARCONI
FM Modulation Meter type TF2303	MARCONI
Distortion Analyzer type TF2337A	MARCONI
AF Voltmeter type VT-121	TRIO
Tone Generator type PM5107	PHILIPS
Electronic Multimeter type PM2505	PHILIPS
RF Directional Wattmeter Model 43	BIRD
50W Load with 30 dB Attenuator type 8321	BIRD
Frequency Counter:	
Frequency range	$\geq$175 Mhz
Sensitivity	$\leq$100 mV
Impedance	$\geq$1 Mohm and 50 ohm
Accuracy	$\leq 1 \cdot 10^{-6}$

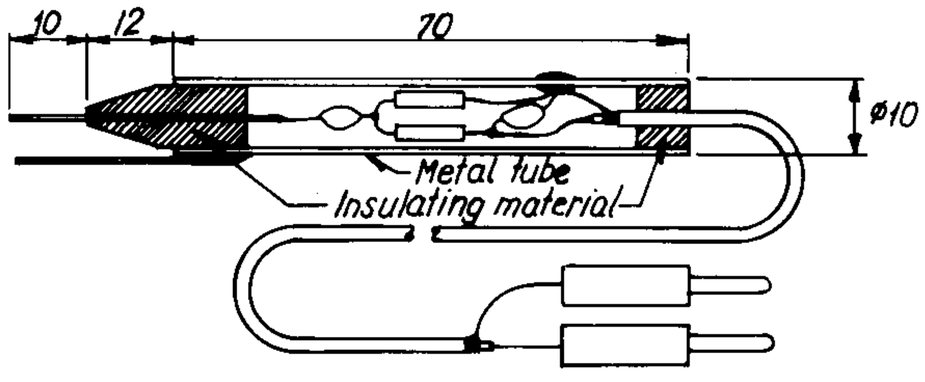
3.3. **PROPOSAL FOR NECESSARY MEASURING INSTRUMENTS** cont.:

We can also recommend one of the new communication test sets introduced by several instruments manufacturers.
From S. P. Radio this high quality product will be tested and adjusted by means of a CMT communication tester from Rohde and Schwarz.

3.4. TEST PROBE



LAYOUT OF THE PROBE



All measurings made by means of a test probe will be relative measurements. For quantitative measurings the diode probe should be calibrated by means of a signal generator at a certain impedance level (50 ohm) as a function of frequency.

3.5. ADJUSTMENT PROCEDURE

3.5.1. ADJUSTMENT OF SYNTHESIZER UNIT

Alignment of Frequency Generator and RF-Levels.

1. Connect a frequency counter to the TX-driver output of J4.

2. Select channel 6 and key the transmitter.

3. Connect a DC-voltmeter to the point between R50 and R95 and adjust L9 until the reading is 2.0V.

4. Adjust the frequency on C77 until the counter read-out is 156.300000 MHz ±150 Hz.

5. Connect a power meter to the TX-driver output at J4 and adjust the output level to minimum at R98.

6. Now the windings on coils L14, L13, and L12, L11, L10 are moved a little bit to obtain maximum output at J4.

7. If the output level is below 200 mW, the level is raised by means of R98 until the power meter reading is 200 mW.

8. Release the transmitter key; the set should still be on channel 6.

9. Connect a DC-voltmeter to the point between R50 and R95 and adjust C78 until the reading is 2.0V.

10. Check the RF-output level from the RX-buffer amplifier at J3. The level should be 5 mW -1 dB, +3 dB.

Alignment of Modulation Circuitry.

1. Connect a modulation meter to the TX-driver output at J4, and a distortion meter to the AF-output part on the modulation meter.

2. Connect tone generator and AF-voltmeter between pin 4 in the connector for handset and ground, pin 3.

3. Select channel number 6 and key the transmitter.

4. Turn potentiometer R97 fully clockwise.

5. Set the tone generator to a frequency of 1000 Hz and output level to 100 mV_{RMS}

6. Adjust R96 to nominal modulation: f = ±3 kHz and check that distortion is less than 5%

7. Raise tone generator output level to 1.0 V_{RMS}

8. Adjust R97 to maximum deviation: f = ±4.8 kHz.

3.5.1. **ADJUSTMENT OF SYNTHESIZER UNIT** cont.:

Alignment of RX-Filter Control Amplifier

1. The receiver must be tuned up according to the TUNE-UP PROCEDURE.
2. Select channel 28.
3. Connect signal generator to antenna connector J04.
4. Connect test probe to pin 16 at U03 on the RX/TX board.
5. Set signal generator frequency to 162.000 MHz and output level to -30 dBm.
6. Adjust R95 until maximum output level from the test probe is reached.

3.5.2. ADJUSTMENT OF RX/TX UNIT

Alignment of Internal Power Supply

1. Select channel 6.
2. Select 1W output level and key the transmitter.
3. Connect a DC-voltmeter to the test point at the output of U01.
4. Adjust the output voltage to 8V ±50 mV by means of potentiometer R04.

Alignment of RF and IF Amplifier

1. Select channel 6.
2. Connect signal generator to antenna connector J04.
3. Connect test probe to pin 16 on U03.
4. Set signal generator frequency to 156.300 MHz and the output level to -30 dBm.
5. Adjust transformers TR01, TR02, and coils L10, L11, L12, and L09 to maximum deflection on the TP-meter.

Alignment of Detector and AF-Output Level

1. Select channel 6.
2. Connect signal generator to antenna connector J04.
3. Connect frequency counter between pin 3 of U03 and frame through a 10 uF capacitor.
4. Set signal generator level to -30 dBm (no modulation).
5. Set signal generator frequency until frequency counter shows 450.0 kHz ±100 Hz.

3.5.2. **ADJUSTMENT OF RX/TX UNIT** cont.:

6. Set modulation on signal generator to nominal modulation fm = 1 kHz, f = ±3 kHz.
7. Connect AF-voltmeter to the AF output at pin 11 on U03.
8. Adjust coil L06 to maximum deflection on the AF-voltmeter.
9. Adjust potentiometer R20 to 250 mV_{RMS} ±10 mV_{RMS} on AF-voltmeter.
10. Connect distortion analyzer to the telephone output at pin 1 on P04.
11. Make sure that distortion is minimum by slightly tuning transformer TR01.
12. Check that distortion is below 5%.

Control of Receiver Sensitivity

1. Select channel 6.
2. Connect signal generator to antenna connector J04.
3. Connect distortion analyzer to the telephone output at pin 1 on P04.
4. Set signal generator to best sensitivity.
5. Check that the sensitivity is better than 0.5 uV EMF for 12 dB SINAD.
6. Repeat on channel 28.

Alignment of Transmitter Output Level

1. Connect RF-power meter and a 50 ohm 25 Watt load resistor to antenna connector J04.
2. Select channel 6 and key the transmitter.
3. Adjust potentiometer R21 until the reading is 25 Watt.
4. Set the output level to 1W.
5. Adjust potentiometer R19 until the reading is 0.8 Watt.

3.6. TROUBLE-SHOOTING

Trouble-shooting should only be performed by persons with sufficient technical knowledge, who have the necessary measuring instruments at their disposal, and who have carefully studied the operation principles and structure of SAILOR RT2048.

The first thing to check is whether the fault is somewhere in the antenna circuit, the power source, the handset, or in the transmitter - receiver unit.

In order to help you during trouble-shooting, the section 5. CIRCUIT DESCRIPTION contains diagrams, principal descriptions, and drawings showing the location of the individual components. Typical values for the DC and AC voltages are indicated in the diagrams, and also the test points are indicated in the diagrams.

SAILOR RT2048 has a number of trimming cores and trimmers, which must not be touched unless adjustments as specified in section 3.5. ADJUSTMENT PROCEDURE can be made.

When measuring in the units, short-circuits must be avoided as the transistors would then be spoiled.

3.7. REPLACEMENT OF COMPONENTS

When replacing transistors, diodes, resistors, capacitors and similar components you must use a small "pencil" soldering iron of 30 to 75 Watt rating. The soldering must be performed rapidly to avoid over-heating, and the use of a tin sucker is recommended, as otherwise there is a risk that both the components and the printed circuit will be spoiled.

3.8. REPLACEMENT OF MODULES

If a fault has been found in a module, it may often be worth-while to replace it and then repair it later on.

3.9. NECESSARY ADJUSTMENTS AFTER REPLACEMENT OF MODULE

3.9.1. REPLACEMENT OF RX/TX UNIT

1. If a factory adjusted and tested module has to be inserted,-just proceed with point 3.

2. Follow the procedure described in section 3.5.2. ADJUSTMENT OF RX/TX UNIT.

3. Follow the procedure Alignment of RX-filter control amplifier described in section 3.5.1. ADJUSTMENT OF SYNTHESIZER UNIT.

3.9.2. REPLACEMENT OF SYNTHESIZER UNIT

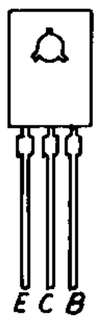
1. If a factory adjusted and tested module has to be inserted, just proceed with point 3.

2. Follow the procedure described in section 3.5.1. ADJUSTMENT OF SYNTHESIZER UNIT.

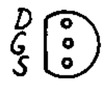
3. Follow the procedure Alignment of RX-filter control amplifier described in section 3.5.1.

3.10. PIN CONFIGURATIONS

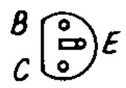
TRANSISTORS



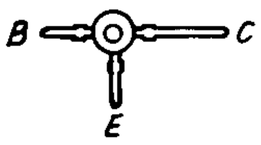
BD234



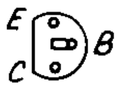
TIS88A



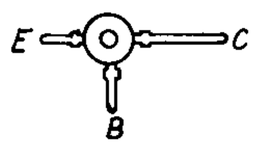
BF199



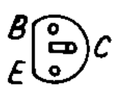
BFW92A



BC328-25
BC338-25
BC547A
BC547C
BC548B
BC549C
BC558B
BC557C



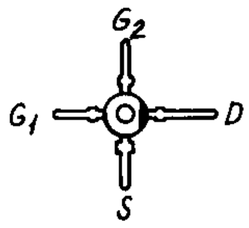
BF979



BC638



2N2369A



BF964



BF509

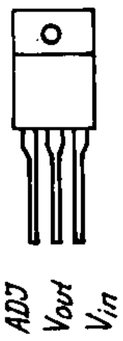


2N4427



J309

INTEGRATED CIRCUIT



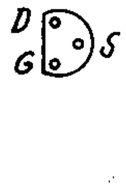
LM317T



LM78L05AC

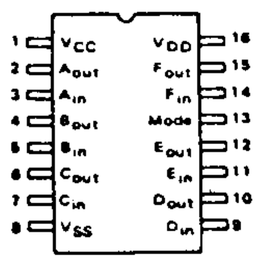


LM317LZ

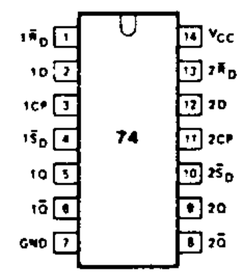


BF245A
BF256A

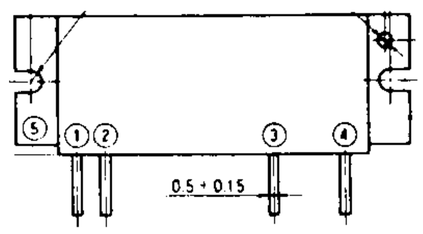
MC14504B



PC74HC74

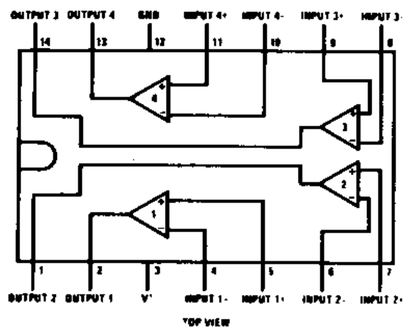


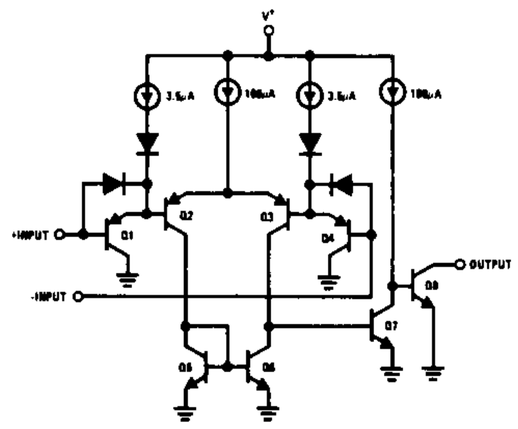
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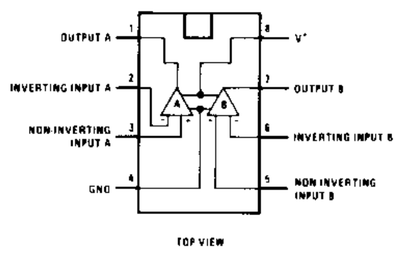
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LM339

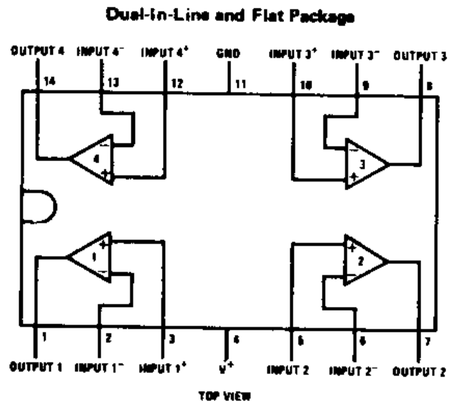




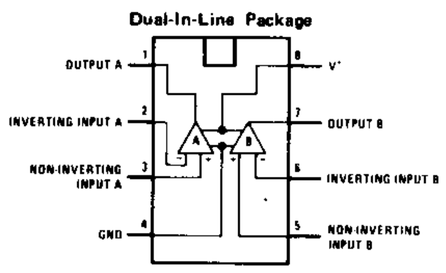
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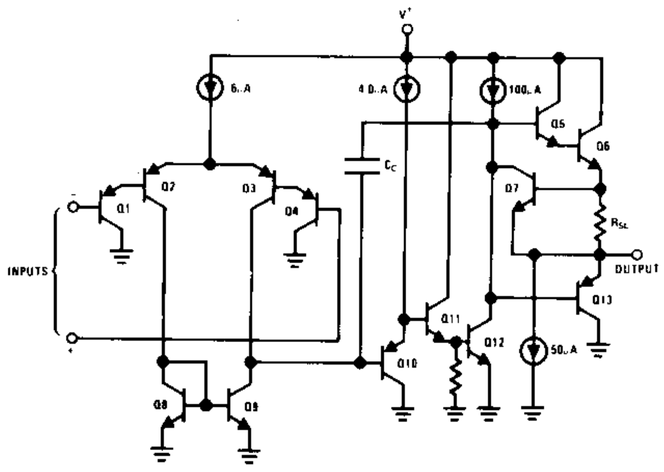


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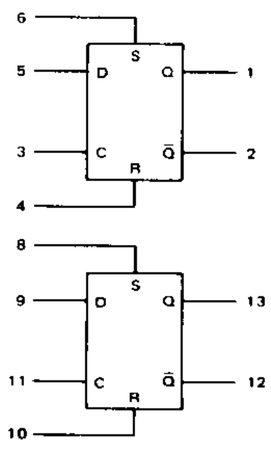


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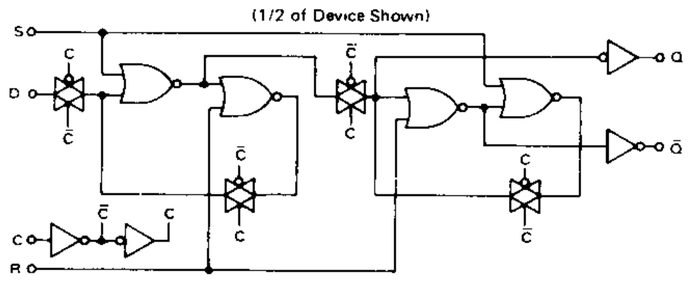




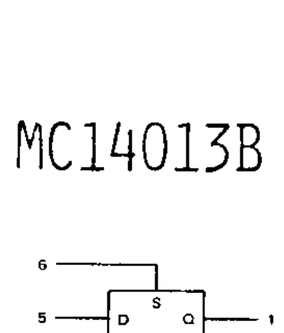
MC14013B



V_{DD} = Pin 14
V_{SS} = Pin 7

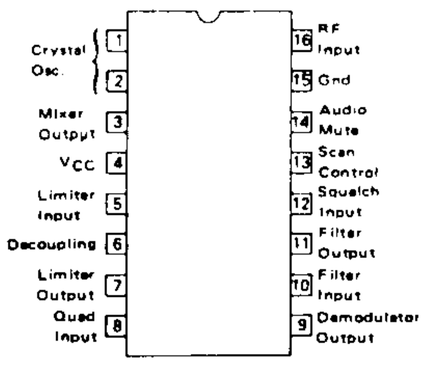


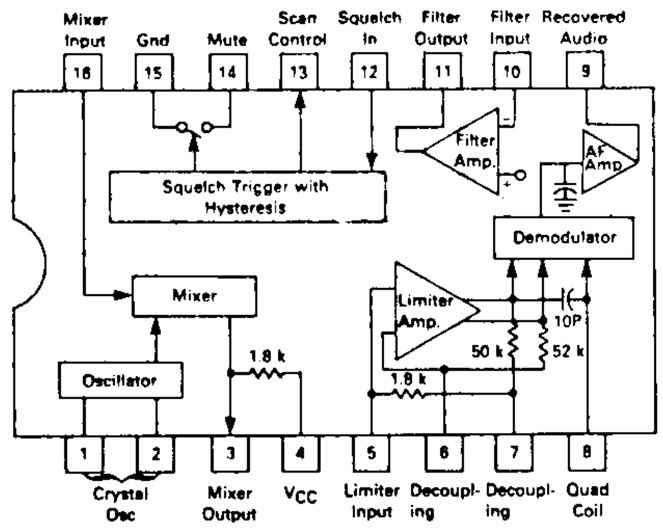
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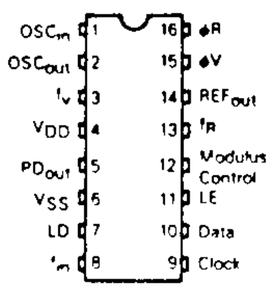
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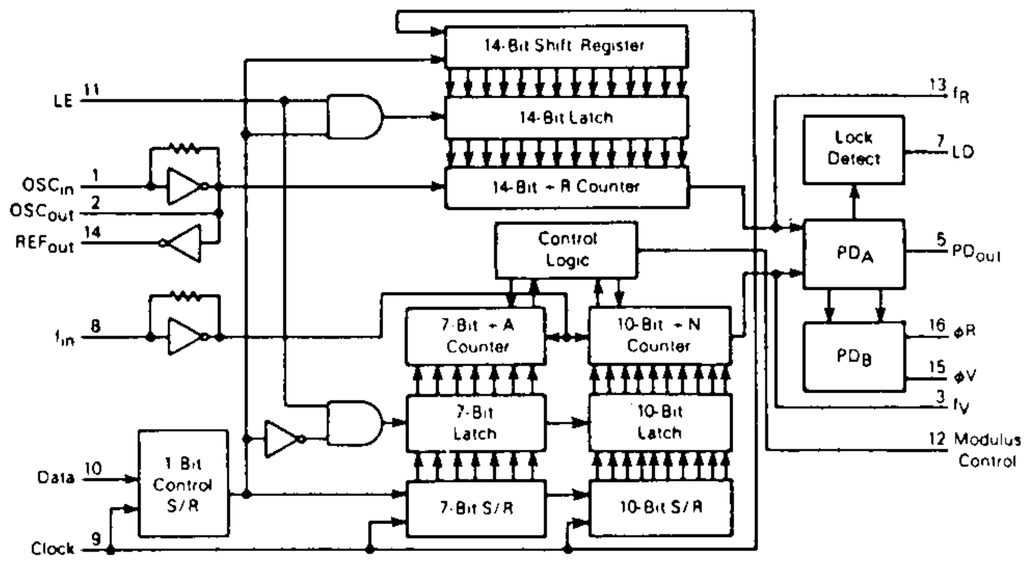
MC3361



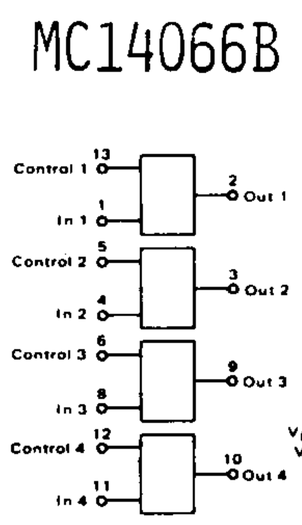


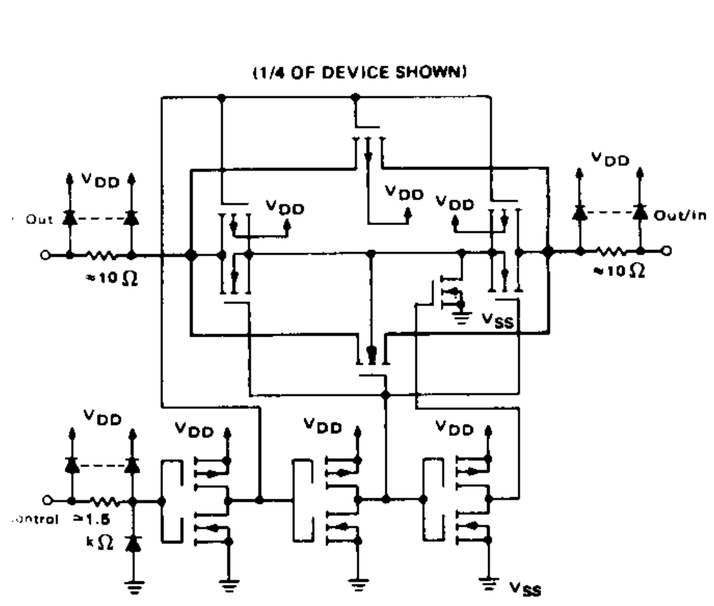
MC145158





MC14066B

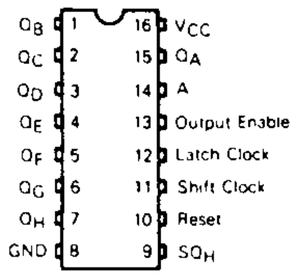


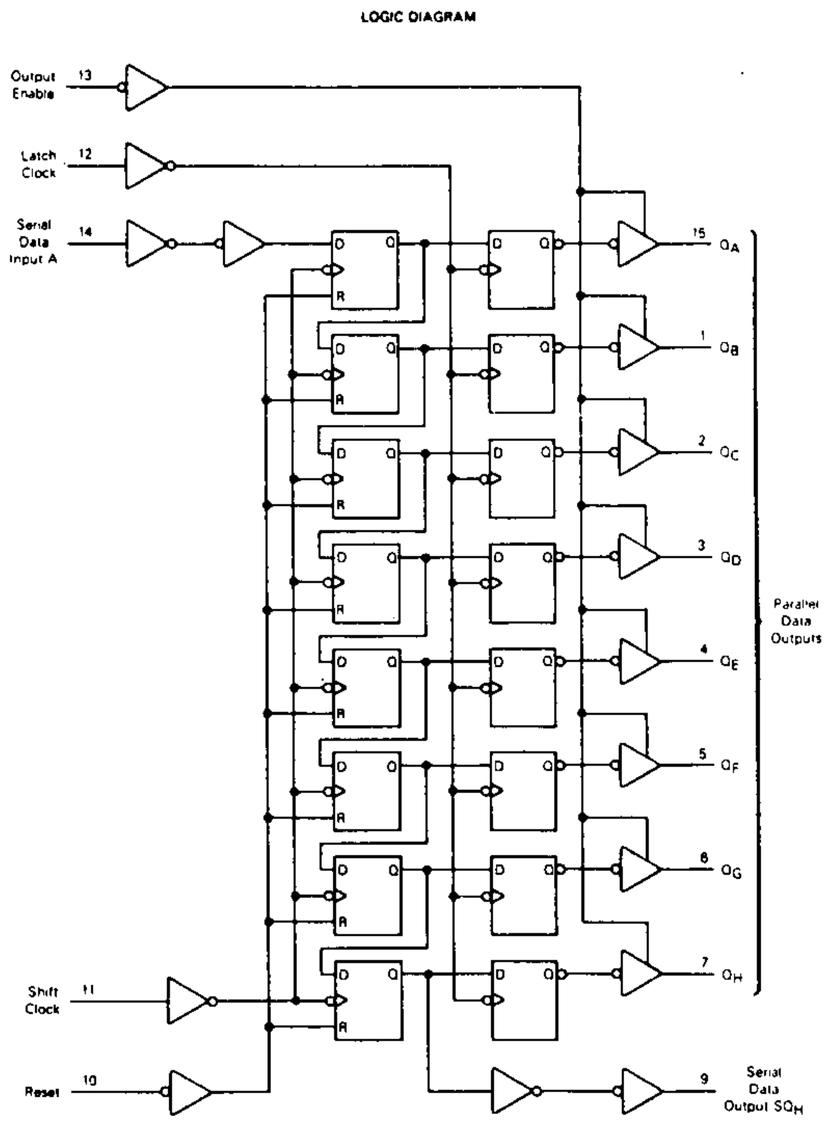


MC12015

3.10. **PIN CONFIGURATIONS** cont.:

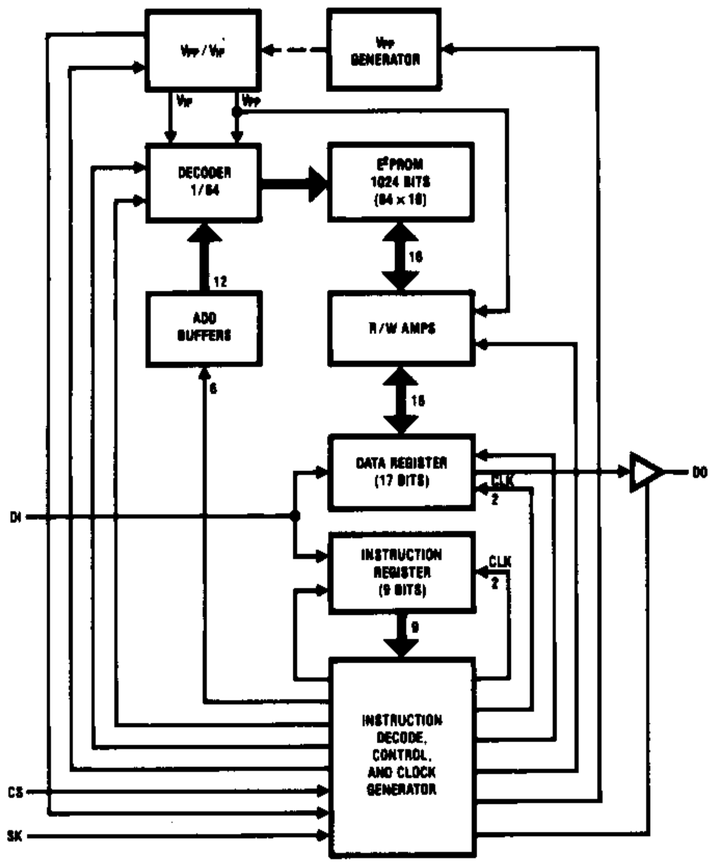
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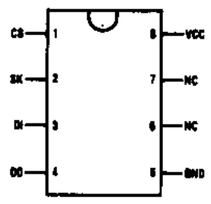


93C46 EEPROM

Block and Connection Diagrams



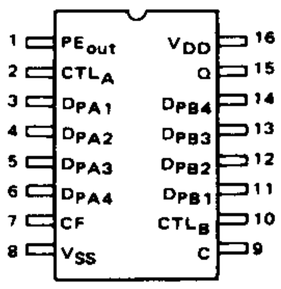
Dual-In-Line Package

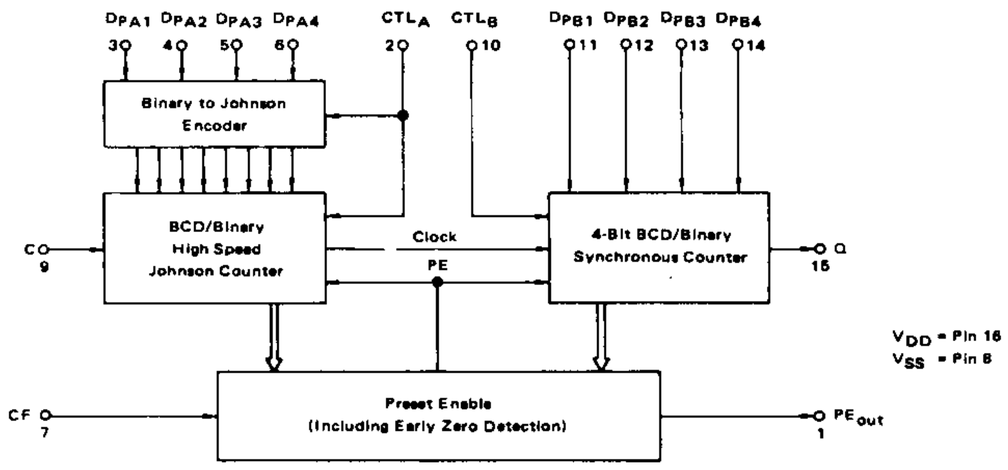


Pin Names

CS	Chip Select
SK	Serial Data Clock
DI	Serial Data Input
DO	Serial Data Output
V_{CC}	Power Supply
GND	Ground
NC	Not Connected

MC14569B



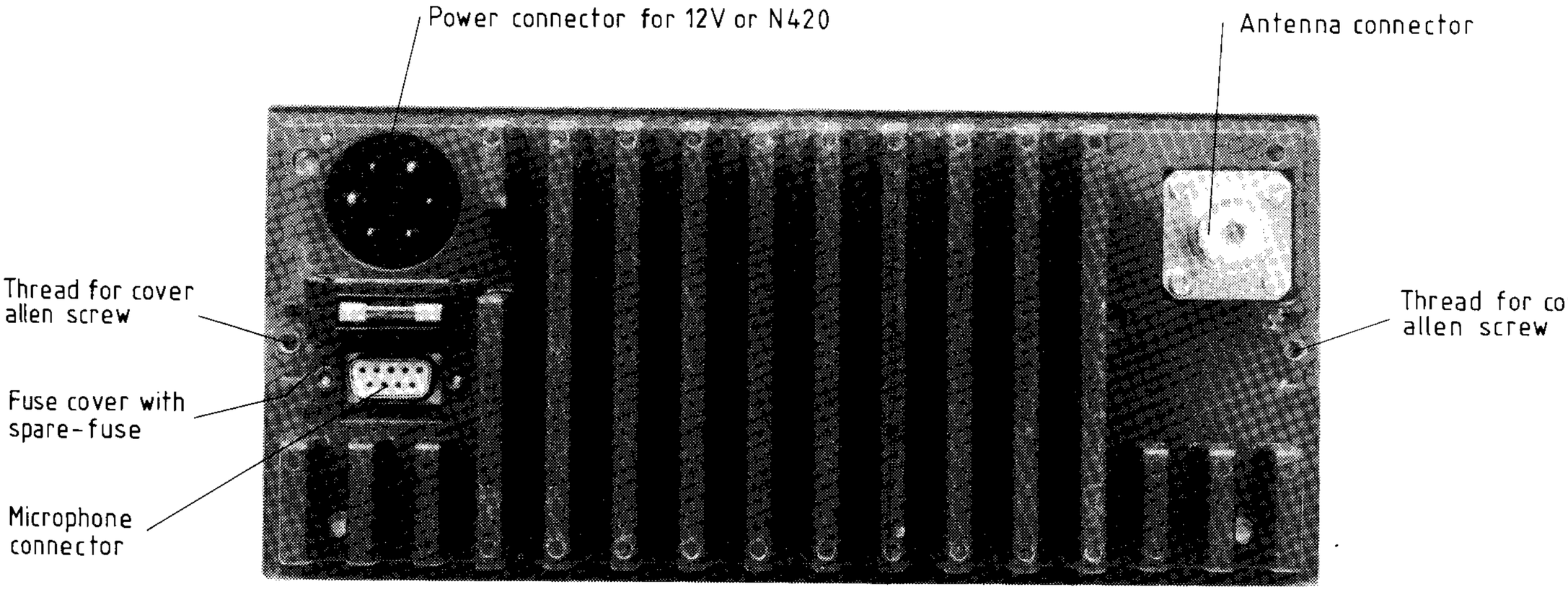


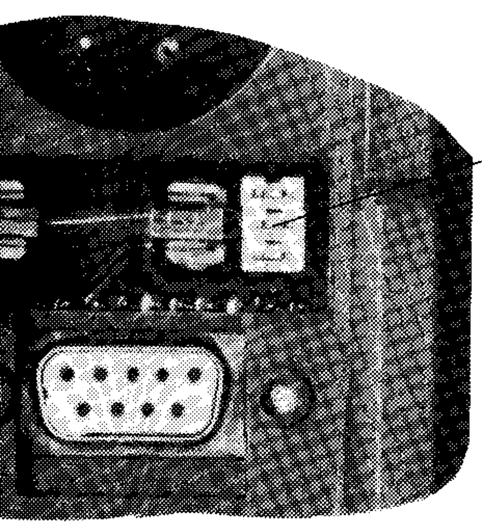
RT2048 A

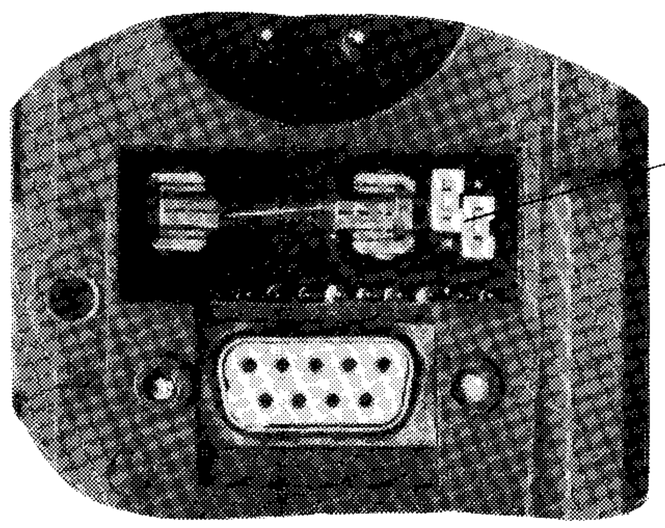
CONTENTS

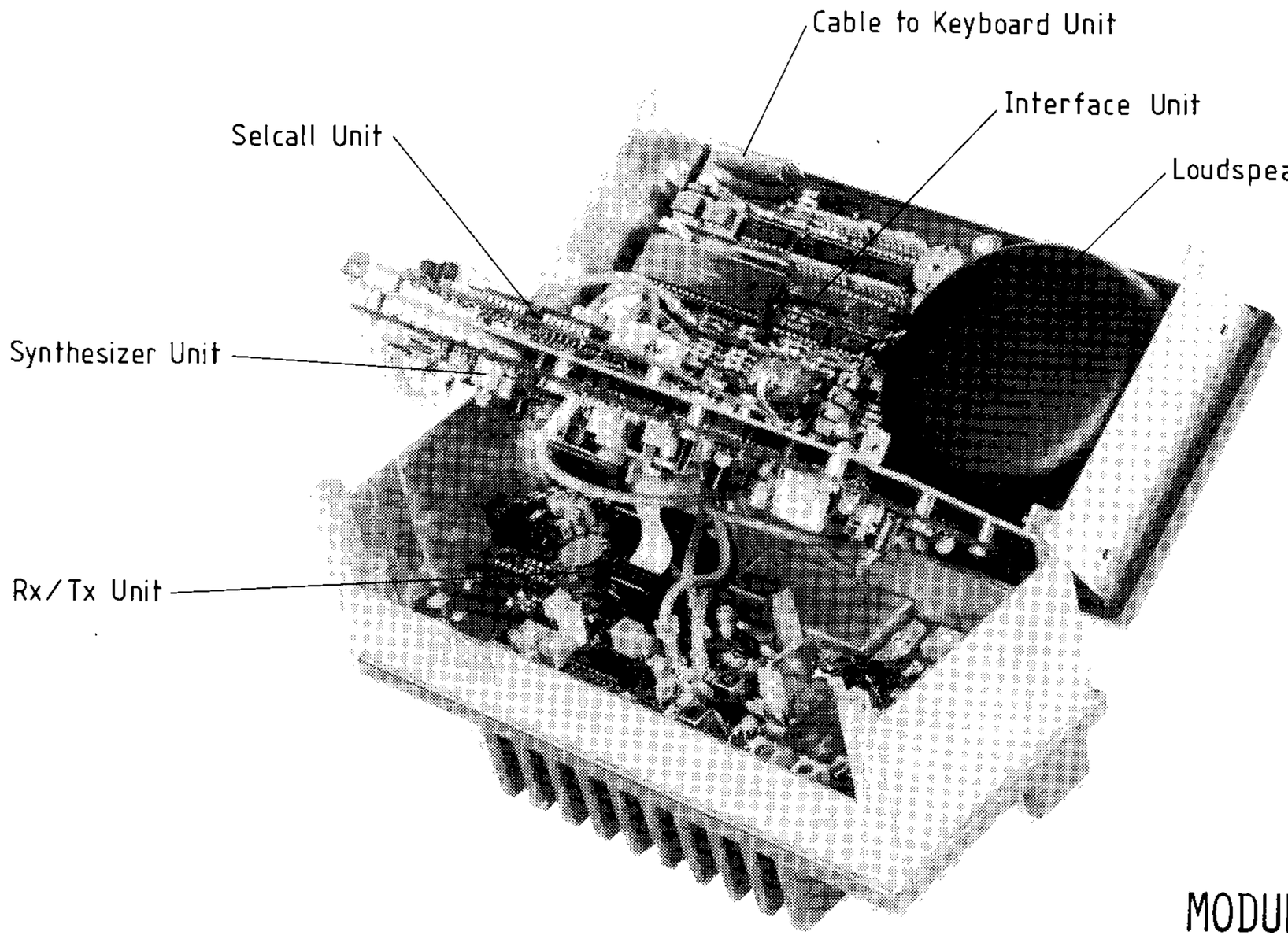
4. MODULE LOCATION
4.1. MECHANICAL DISASSEMBLING

RT2048 GRØN

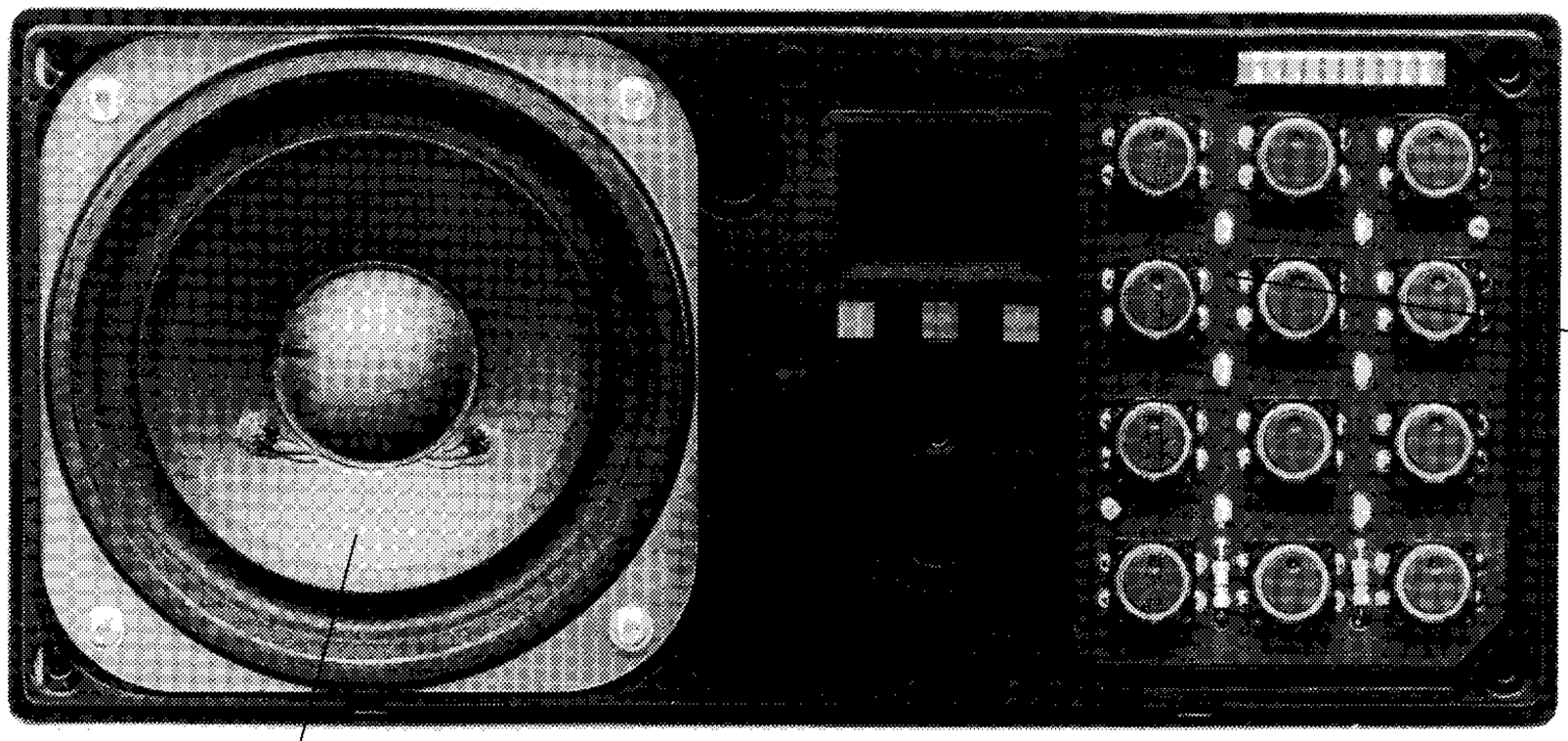






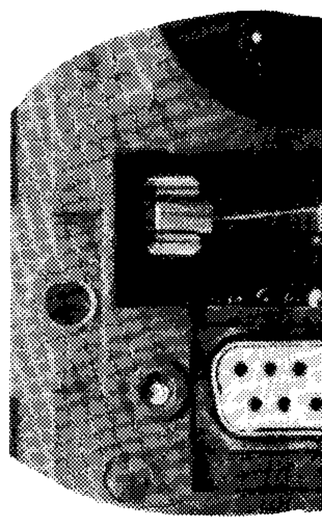


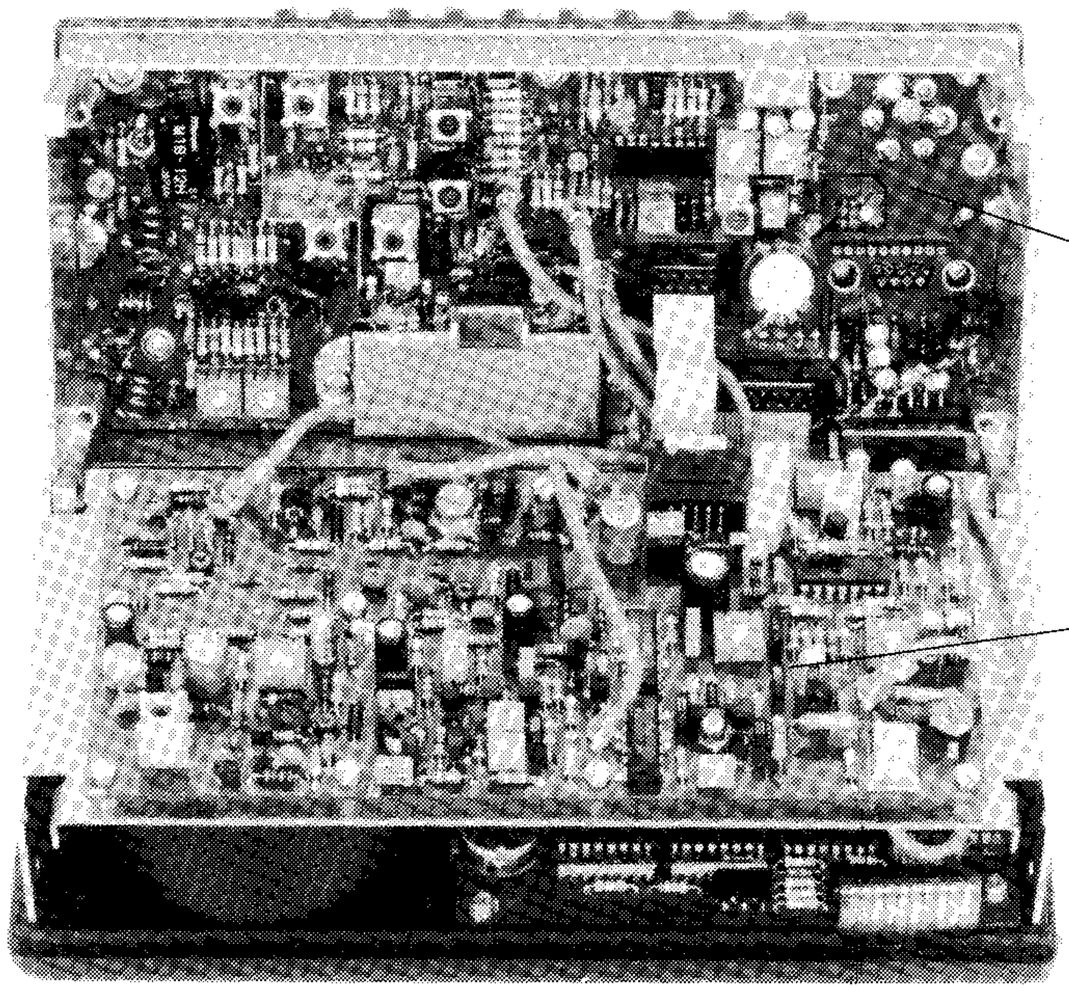
MODULE LOCATION RT2048



Keyboard (module 1)

Loudspeaker

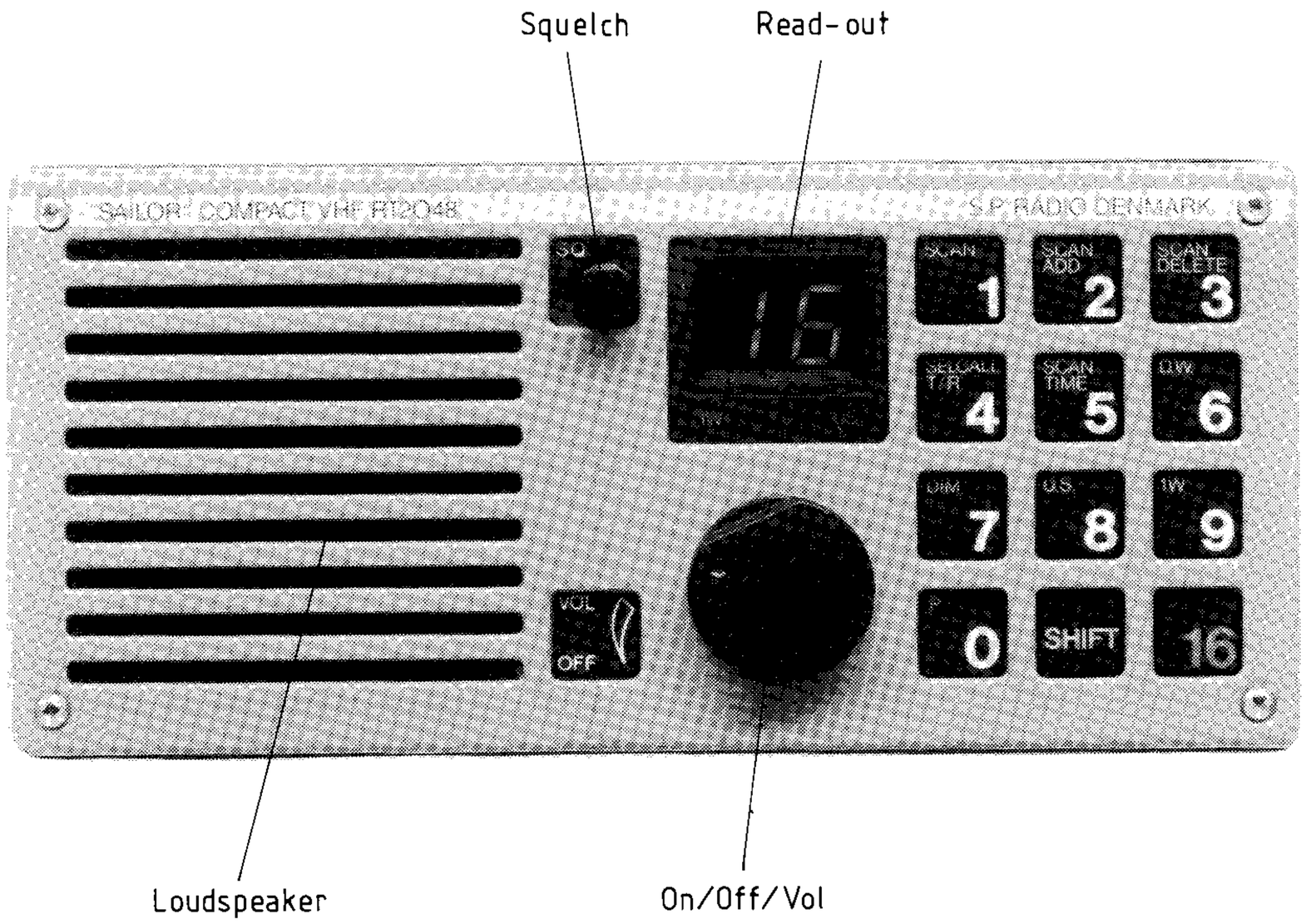


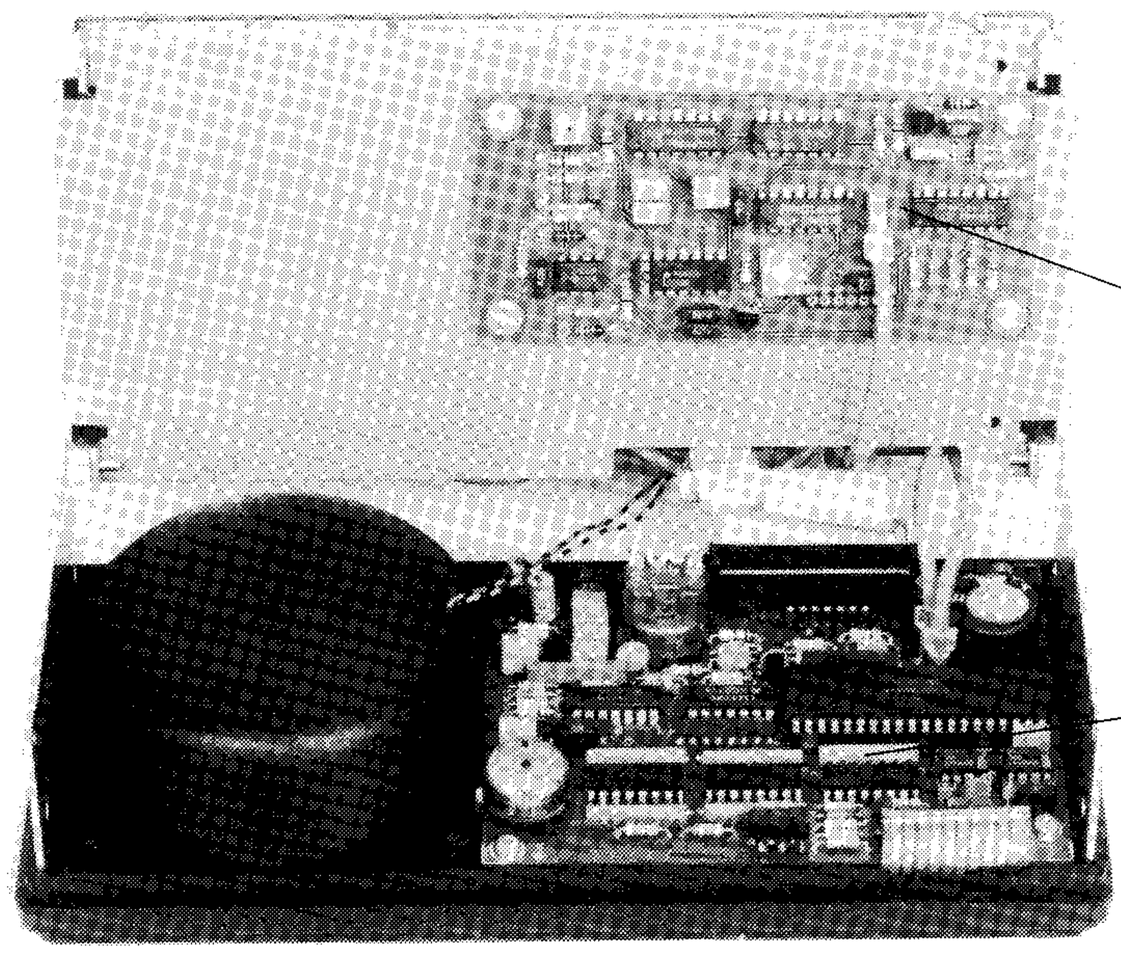


Rx/Tx Unit (module 4)

Synthesizer Unit (module 3)

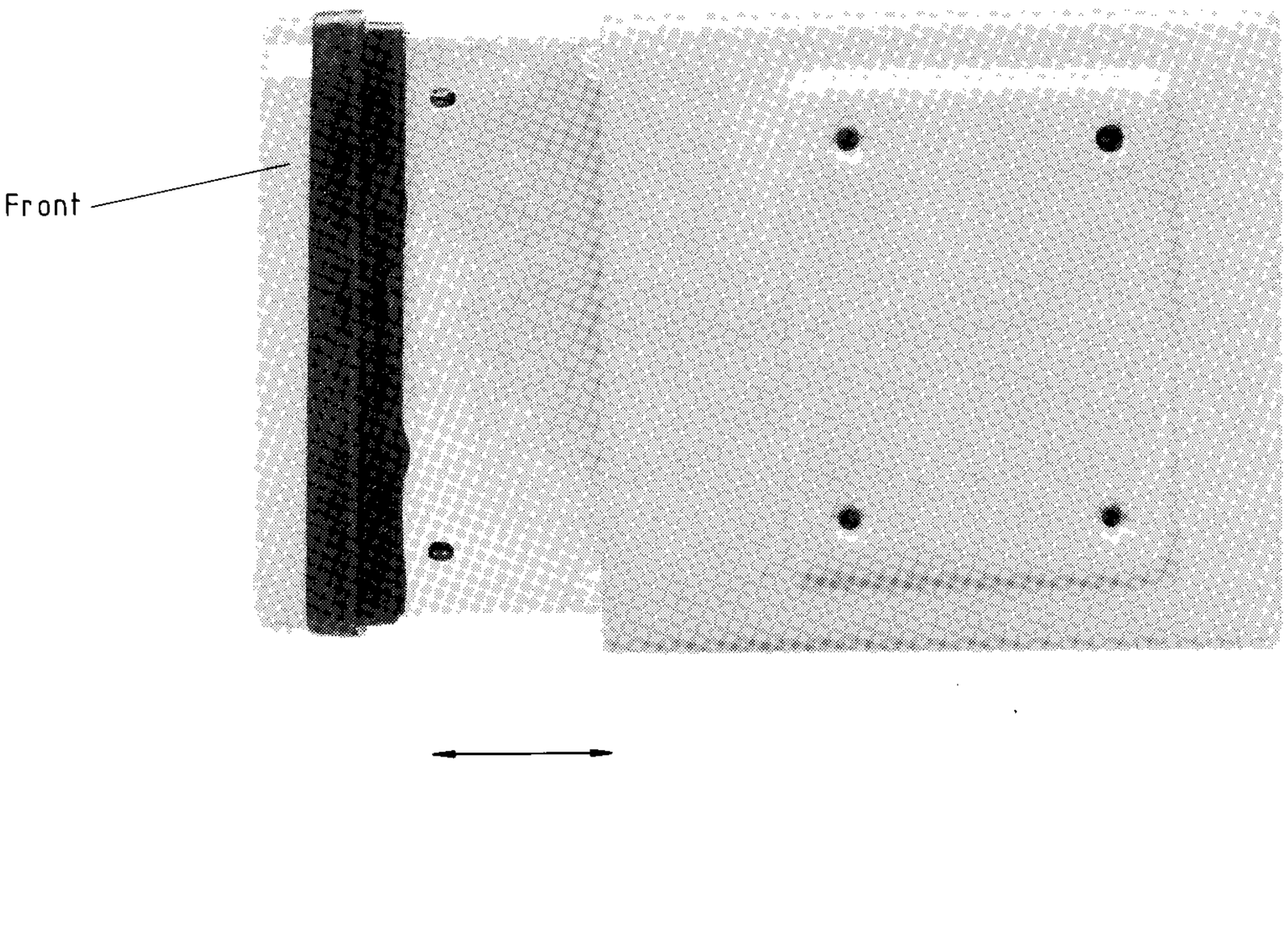
4. MODULE LOCATION





4.1. MECHANICAL DISASSEMBLING RT2048

To disassemble the RT2048 remove the two allen screws with the black covers on the rear of the set and pull the frontplate and kabinet from each other.



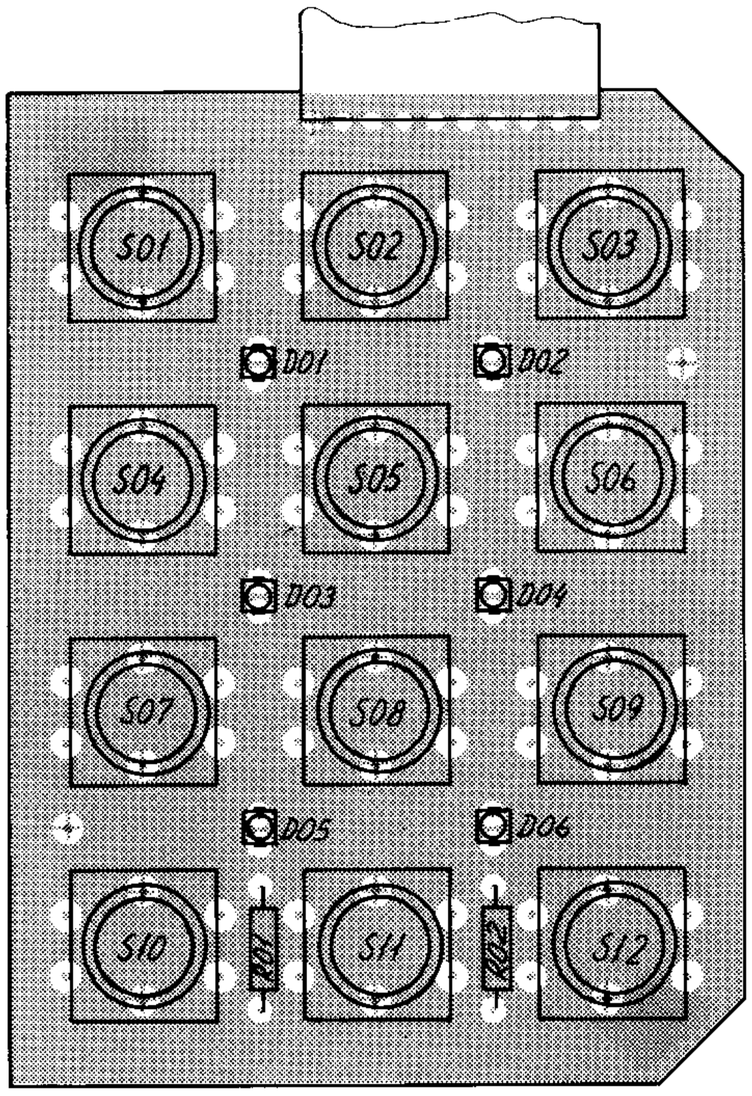
CONTENTS

5. CIRCUIT DESCRIPTION AND SCHEMATIC DIAGRAMS
5.1. KEYBOARD UNIT (MODULE 1)
5.2. INTERFACE UNIT (MODULE 2)
5.3. SYNTHESIZER UNIT (MODULE 3)
5.4. RX/TX UNIT (MODULE 4)
5.5. SELCALL UNIT (MODULE 5) OPTIONAL
5.6. INTERCONNECTION CABLE DIAGRAM

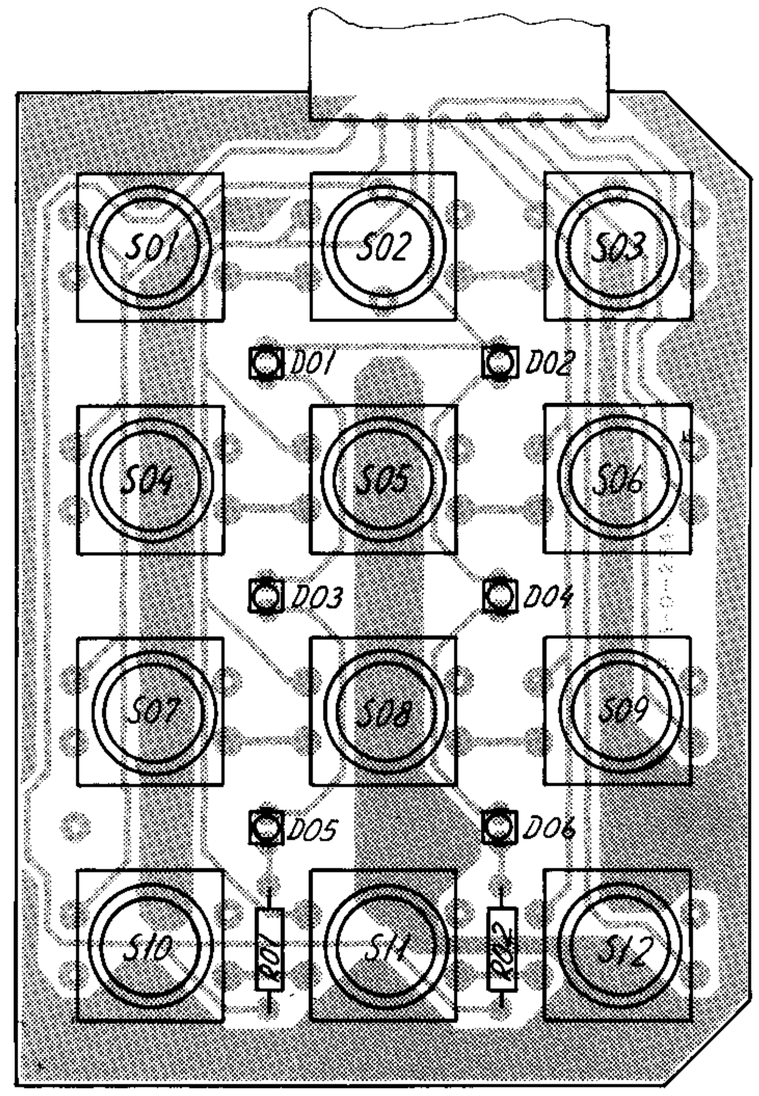
5. CIRCUIT DESCRIPTION

5.1. KEYBOARD UNIT (MODULE 1)

The keyboard unit comprises the 3 point 4 push button matrix, which is used for all the entries from the front panel e.g. channel selection, 1W etc. Besides the LED-diodes for keyboard illumination is placed on this board.

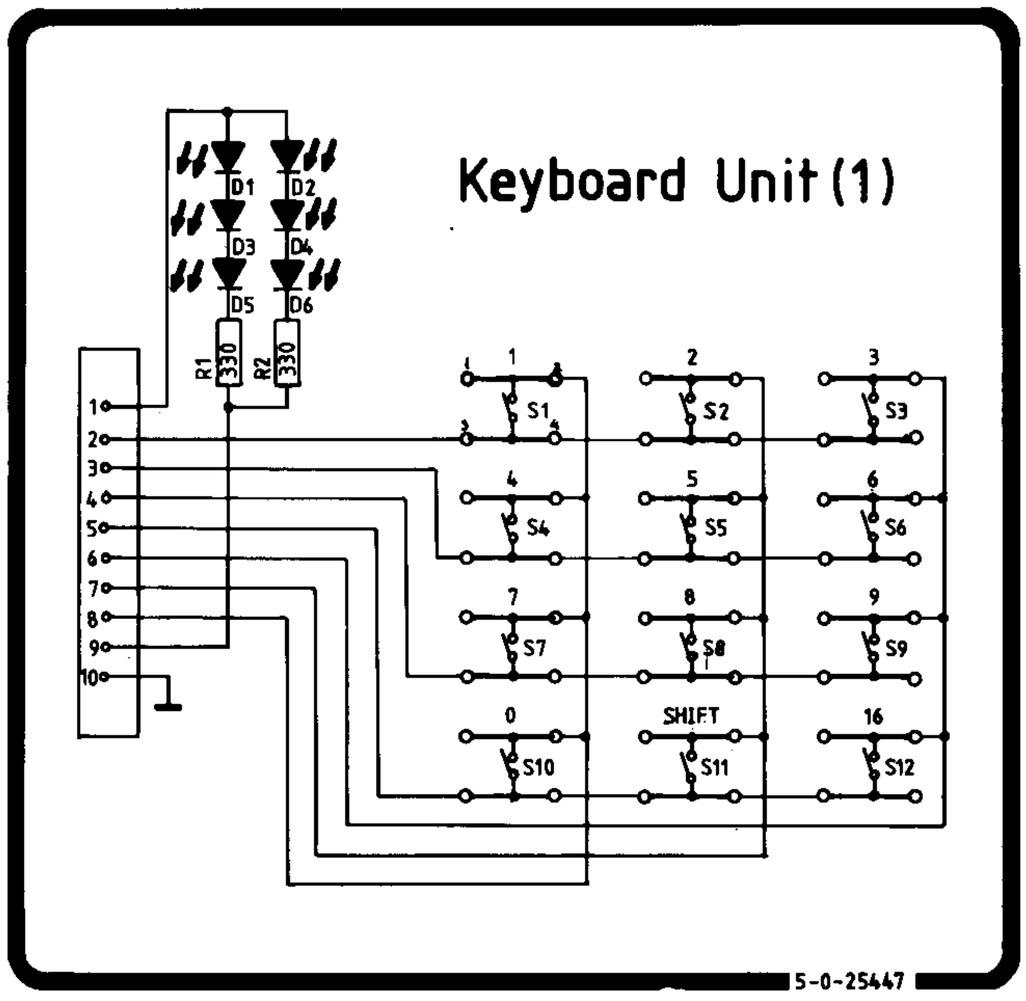


View from component side
with upper side tracks.



View from component side
with lower side tracks.

RT2048 A
4-6-25447A 4-0-25447



KEYBOARD (MODULE 1)

5.2. INTERFACE UNIT (MODULE 2)

5.2.1. **+5V POWER SUPPLY**

The internal power supply for the logic circuitries is generated from the internal +8V power supply, by means of the integrated voltage regulator U09. The input voltage for U09 is fed to pin 3 via D01, which secures an appropriate voltage decay on C12 when the set is switched off.

5.2.2. **BATTERY SENSE/RESET CIRCUIT**

When the set is switched on, U07/1 which is coupled as a comparator will generate an appropriate reset signal for the microcomputer U03.
U07/2 is configured as a comparator circuit sensing the level of the internal +13V supply voltage. When this voltage drops below a certain level determined by R27, R20, R54, and D11 a "voltage low" signal is generated on pin 1. This action is detected by the microcomputer U3 which in turn will block the key function.

5.2.3. **INDICATOR SUPPLY**

The LED read-out intensity is controlled by means of a four-step voltage supply. Transistor Q02 acts as the emitter follower buffer transistor. The base voltage level of this transistor, and so the output voltage, is controlled by means of U08/4 and the programming resistors R07, R49, R47, and R55.

5.2.4. **DISPLAY LATCHES**

The display segments and the display power supply control inputs are buffered by means of three serial to parallel registers included in the integrated circuits U04, U05 and U06. The information is latched-in by means of the internal serial data bus controlled by the microcomputer.

5.2.5. **READ-OUT**

The information read-out is made by means of two seven-segment LED-displays D06, D07 and three individual diodes for 1W, TX and US-mode D03, D10, and D12.

5.2.6. **EEPROM-MEMORIES**

The two IC's U01 and U02 constitute the internal programmable memory. These circuits are controlled by the microcomputer via the internal serial bus. The memories are used for set identification codes, private channel programming etc.

5.2.7. **MICROCOMPUTER**

All the internal control signals are supplied by the microcomputer U03, either by means of the internal serial bus or by individual control signals

like the key function, power level etc. Besides the microcomputer reads the keyboard information via the connector J01.
When a selcall unit is installed via J02, the control functions for this module and the alarm generation are created by the microcomputer. The audible alarm is coupled to the loudspeaker by means of resistors R26, R40, and R46.

5.2.8. **SERIAL INTERFACE**

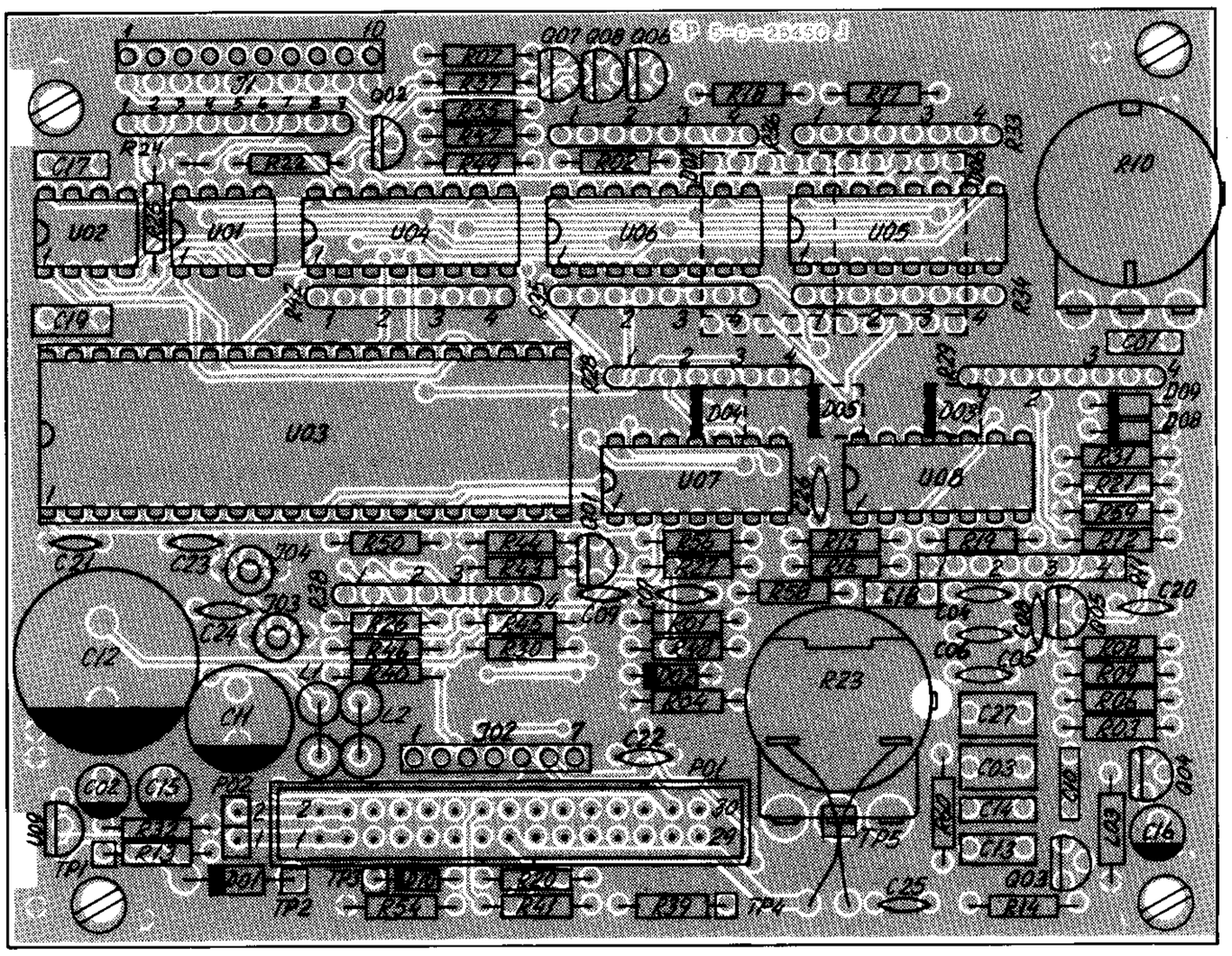
For use in the factory production, a serial interface to the microcomputer is implemented by means of U07/4 and transistor Q01.

5.2.9. **SQUELCH**

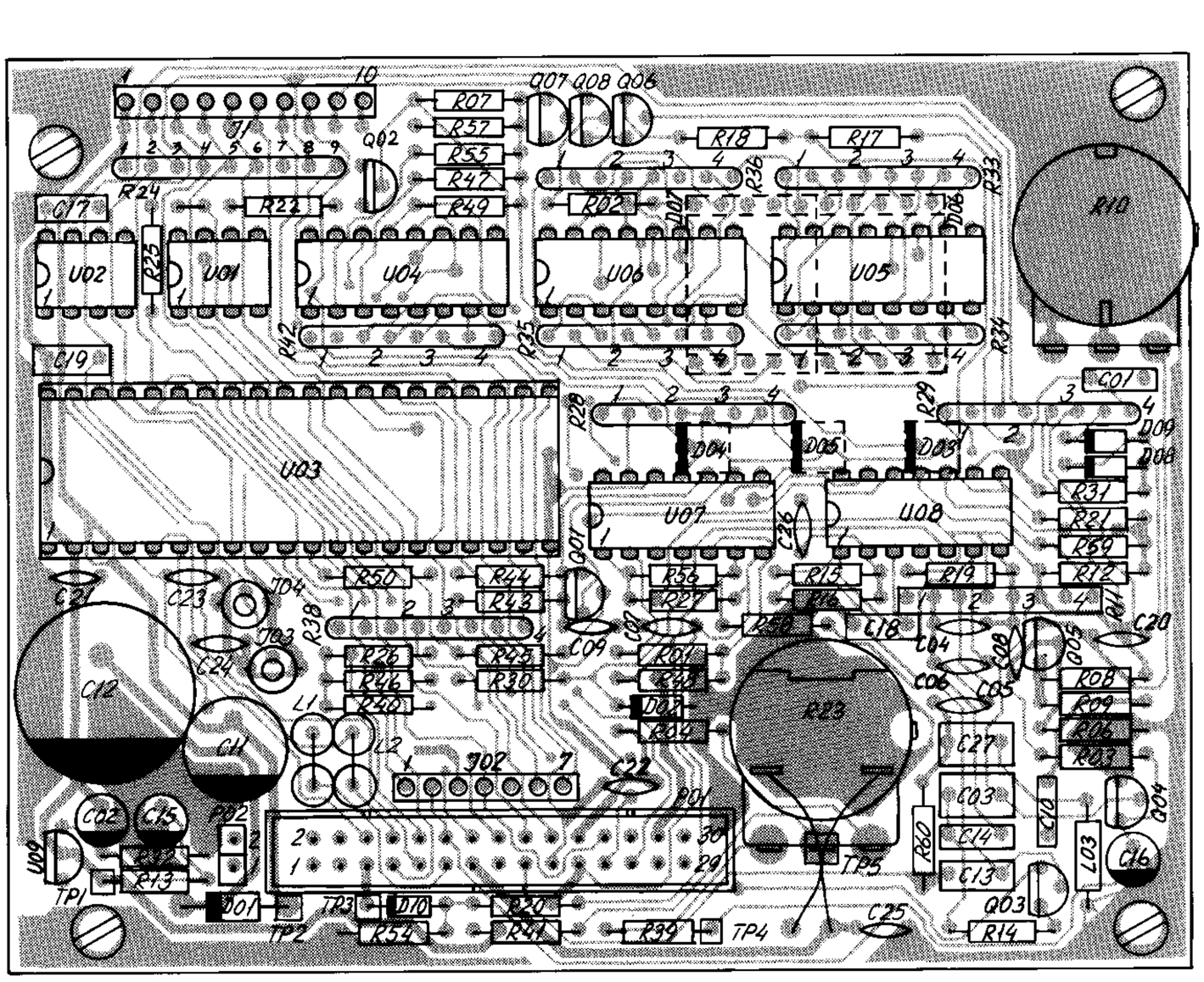
The AF signal from the discriminator amplifier on RX/TX board is fed to the active squelch filter around U08/2, which is a highpass filter with a roll-off frequency of 45 kHz. The signal is amplified about 6-8 dB.
The amplitude of the noise signal is adjustable from the front panel by means of the squelch potentiometer R10.
Q05 amplifies the signal to the squelch detector. If there is a noise signal (without carrier at the receiver), the detector generates a DC voltage at pin 9 on U08/3. When this voltage increases to 0.6V, which is the same as the voltage at pin 10 on U08/3, the comparator output goes low and the squelch mute message is generated via Q08.
The microcomputer U03 detects the message and generates the appropriate mute signals for the AF amplifiers.

5.2.10. **AF FILTER/AMPLIFIER**

The AF signal is led to the active filter around U08/1. The filter provides a frequency response of -6 dB/oct. in the range of 0.3 to 3 kHz, and limits the signals outside this range.
Q04 is an emitter follower buffer amplifier, which supplies the earphone and the AF power amplifier. The uC controls the mute function via Q06 and Q03. When Q06 is off the DC voltage at pin 3 and 1 is 8V and therefore Q04 is off.
The loudspeaker level is adjustable by means of the volume control R23.



View from component side with upper side tracks.



View from component side with lower side tracks.

INTERFACE UNIT (MODULE 2)

Interface Unit (2)

TP 1 +5V +10% -5%

TP 2 +8V ±50mV

TP 3 +13V INT

TP 4 550mV AC

TP 5 0-250mV AC

▲ (22mV EMK with S/N > 30dB)

▲ (550mV EMK with S/N > 30dB)

▲ (1.6V EMK without signal)
(75mV EMK with S/N > 30dB)

▲ (250mV EMK with S/N > 30dB)

▲ (275mV EMK without signal)
(4mV EMK with S/N > 30dB)

▲ APPROX MEASUREMENT WITH AC-VOLTMETER

4-0-25450 L

Rettet den 25.10.91 MAJ

SCHEMATIC DIAGRAM INTERFACE UNIT (MODULE 2)

TP 1 +5V +10% -5%

TP 2 +8V ±50mV

TP 3 +13V INT

TP 4 550mV AC

TP 5 0-250mV AC

▲ (22mV EMK with S/N › 30dB)

▲ (550mV EMK with S/N › 30dB)

▲ (1.6V EMK without signal)
(75mV EMK with S/N › 30dB)

▲ (250mV EMK with S/N › 30dB)

▲ (275mV EMK without signal)
(4mV EMK with S/N › 30dB)

4-0-25450 L

Rettet den 25.10.91 MAJ

SCHEMATIC DIAGRAM INTERFACE UNIT (MODULE 2)

2)

+5V

U05 74HC595 — ShClk, LaClk, Reset, OE; A; Qa–Qh; SQh

Supply:
+5V pin 16
GND pin 8

820R R33.2, R33.1, R34.1, R34.2, R34.3, R33.3, R33.4, R34.4

D06 HDSP-5551 (g f An a b / e d An c DP)

U06 74HC595 — ShClk, LaClk, Reset, OE; A; Qa–Qh; SQh

Supply:
+5V pin 16
GND pin 8

820R R36.2, R36.1, R35.2, R35.1, R35.3, R36.3, R36.4, R35.4

D07 HDSP-5551 (g f An a b / e d An c DP)

R49 15K

600-5900mV

R57 3K3

Q02 BC328-25

R07 2K7

+5V

C02 10u

R40 820R

U09 LM317LZ (Vout, Adj, Vin)

R13 1K21

0,7V

R32 3K48

R01 22K

5V

4-5V

R50 270K

U08.4 LM324N# (13, 12, 14)

700-6600mV

U7.1 LM339N# (2, 5V, 4, 5)

R56 4K7

U7.2 LM339N# (1, 6, 7)

5V

5,7-10,5V

R20 10K

C07 10n

R27 270K

1W

US

TX

BAT SENSE

RESET

U01 93C46 EEprom (CS, SK, DI, DO)

Supply:
+5V Pin 8
GND Pin 5

U02 93C46 EEprom (CS, SK, DI, DO)

Supply:
+5V Pin 8
GND Pin 5

+5V

C17 100n

C21 470P, C19 220n

J03 CLK FOR SELCALL

3.7125MHz

J04 CLK INPUT FROM SYNTHESIZER UNIT

CLK 3.7125MHz

SELCALL DET

SO

MUTE-AF

AF ALARM OUT

MUTE

STROBE

R26 51K

R40 10K0

R46 750R

R45 3K9

R28.1 10K

R28.2 10K

R28.3 10K

U7.4 LM339N# (13, 10, 11)

Q01 BC328-25

47R R43

R28.4 10K

R41 1K0

C09 1n0

R38.4 10K

TDO

RDI

FRM POWER

CK

ALARM OUT

LE

RX-TX

R38.3 10K

KEY

1W/25W

MUTE AF-AMP

TX ON

AUX 1

AUX 2

L1

L2

+13V INT
AF AMP
TLF

+8V

R58 100K

R14 33K2

C03

C14 15n, 2n2 5%

R15 270K

R16 4K32

Q03 BF245B

R29.1 10K

C13 470n

C26 10n

U08.1 LM324N# (2, 3, 1)

3-7,9V

R17 120K

91K R18

C18 220n

Q06 BC548B

10K R29.2

TO SELCALL

J02 (SELCALL DET, TLF, DATA, CK, STROBE)

C04 10p

R60 357R

R19 330K

C05 150p

C06 150p

C27 1n0 5%

U08.2 LM324N# (6, 5, 7)

Supply:
+8V pin 4
GND pin 11

L03 120uH

R11.1 5K6

RX.AF

+5V

+8V

C22 470P

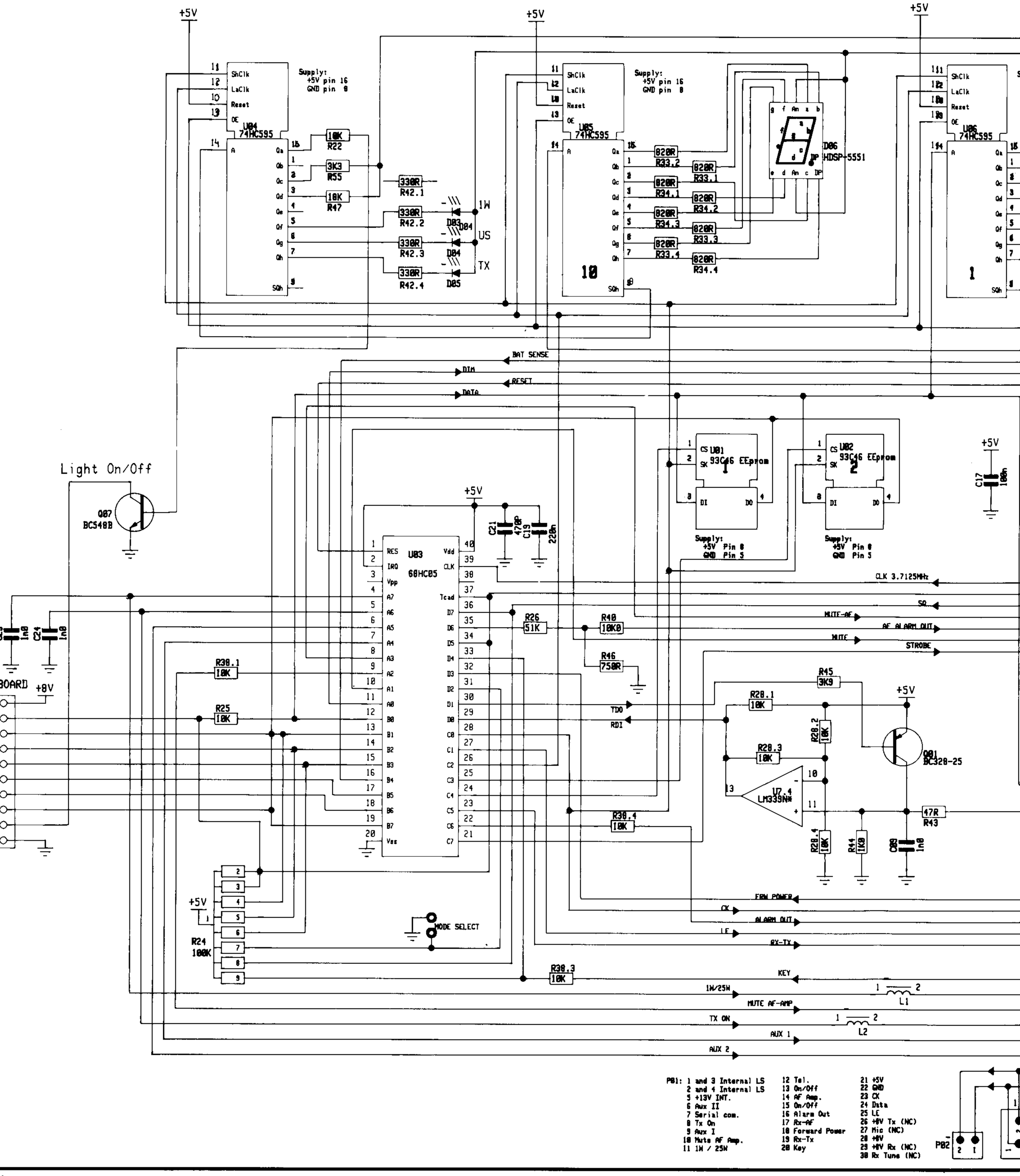
P01:
1 and 3 Internal LS
2 and 4 Internal LS
5 +13V INT.
6 Aux II
7 Serial com.
8 Tx On
9 Aux I
10 Mute AF Amp.
11 1W / 25W
12 Tel.
13 On/Off
14 AF Amp.
15 On/Off
16 Alarm Out
17 Rx-AF
18 Forward Power
19 Rx-Tx
20 Key
21 +5V
22 GND
23 CK
24 Data
25 LE
26 +8V Tx (NC)
27 Mic (NC)
28 +8V
29 +8V Rx (NC)
30 Rx Tune (NC)

P02

P01

▲ (250mV EMK with S/N

Interface Unit (2)



▲ APPROX MEASUREMENT WITH AC-VOLTMETER

5.3. SYNTHESIZER UNIT (MODULE 3)

5.3.1. **VCO with Buffer**

The voltage controlled oscillator, built around the Field Effect Transistor Q18, is oscillating either on the transmitting frequency or on the first receiver local oscillator frequency, which means the receiving frequency less 15.3 MHz. To reach this function, the oscillator is implemented with a bandshift by means of the bandswitch diode D6 and the two capacitors C47 and C78.
In transmit mode, where the diode D6 is reverse biased, the oscillating frequency is mainly determined by C48, L9, C49, C51, and D9.
In receiving mode the oscillator resonance frequency is lowered 15.3 MHz by switching D6 on and thus putting C47 and C78 in parallel with C48.
The oscillating frequency is varied by means of the control voltage fed to the capacitor diode D9.
The output voltage from the VCO is taken via a capacitive tap C52, C53 on the source of Q18 and fed to the common buffer amplifier, built around Q15. The power gain of this stage is adjusted by means of potentiometer R98. The gain is adjusted so that the output level from the TX buffer amplifier is 200 mW measured at the output connector J4.

5.3.2. **Loop Buffer Amplifier**

The output from the common VCO buffer is fed to the divider chain via the stage around Q7, which secures the needed amplification and the reverse isolation between the digital parts and the VCO.
The amplifier is a fixed tuned broad band amplifier with L1, C24, and R47 forming a low Q tuned circuit.

RT 2048 A

5.3.3. **32/33 Prescaler**

The integrated circuit U4 is a two modulus prescaler based on the ECL technique.
From the control logic in the programmable divider U3 pin 12, a high or low level is led to the prescaler U4 pin 1. A high level at U4 pin 1 causes the prescaler to divide by 33 and in turn a low level at pin 1 sets it up for dividing by 32.
The resistor R20 and the diode D4 work as a speed-up and overdrive protection circuit.

5.3.4. **Reference/Programmable Divider and Phase Detector**

The integrated circuit U3 comprises both a programmable divider for the reference input and a programmable divider with control logic for use in conjunction with a dual modulus prescaler. Besides, the IC includes two phase detectors and a lock detector of which only one of the phase detectors is in use, the output pins located at pin 15 and pin 16.
Both dividers are programmed via the serial bus from the microcomputer. The coding structure of the serial data stream includes the needed information for the on-chip decoder to detect the kind of the reached division figures.
The reference division ratio is constant as the input of 3.7125 MHz is derived from the X-tal oscillator.

5.3. **SYNTHESIZER UNIT** cont.:

In the beginning of a counting period the prescaler U4 starts dividing by 33. After a few counts the modulus control pin changes level and the prescaler will finish the dividing cycles with a division ratio of 32, ending up with the correct total division ratio.
The pulse frequency out of the reference divider is 12.5 kHz. If the VCO frequency is correct the pulse frequency from the variable divider is also 12.5 kHz and in phase with the pulse from the reference divider. The on-chip phase detector compares the phase of the two pulses. If they are out of phase the detector creates correction pulses to the Charge Pumpe for correction of the VCO frequency/phase.
However, the synthesizer circuit is made with a small constant phase error, forced by the current drawn through R58, to avoid phase detector non linearities to degrade the loop performance. So the phase detector is sending small correction pulses to transistor Q4 with a frequency of 12.5 kHz.

5.3.5. **Charge Pumpe**

The charge pumpe, mainly consisting of Q4, Q5, and D2, converts the pulse with modulated phase detector outputs of U3 pin 15 and 16 to a DC current flowing into or out of the loop amplifier.
Assume that the VCO frequency has decreased from its nominal value. The phase detector will produce a negative correction pulse on pin 16, turning Q5 on, resulting in current being drawn out of the loop amplifier.
This action will cause the output voltage to increase, thus increasing the VCO frequency to the nominal value.
An increase in VCO frequency from its nominal value will in turn cause a correction pulse on pin 15, turning Q4 off, resulting in current flowing into the loop amplifier through the diode D2. This means the output voltage will decrease, forcing the VCO frequency to decrease.
Because of the current drawn through R58, a small correction pulse of about 500 nsec will always be present at pin 15 on U3 with a frequency of 12.5 kHz.

5.3.6. **Loop Amplifier/Filter**

The loop amplifier is realized as a discrete operational amplifier with transistors Q10 and Q11 forming the input differential pair and Q8, Q9 the output stage.
The loop dynamic performance is mainly controlled via the feed-back components in the loop amplifier, this means capacitors C29, C30, C31 and R49. The output from the loop amplifier is further filtered in a low pass filter formed by C36, L2, C34, and C35, to reduce the level of the reference frequency sidebands on the VCO output.

5.3.7. **RX Buffer Amplifier**

When receiving, the bandswitch diode D8 is turned on, and the output from the VCO buffer amplifier is further amplified in a single tuned amplifier formed around Q16 with L8, C70, and C73 forming the tuned circuit. The output is attenuated and impedance matched by means of resistors R93 and R94. The typical output level at connector J3 will be 5 mW.

5.3. **SYNTHESIZER UNIT** cont.:

5.3.8. **TX Buffer Amplifier**

When the set changes to transmit mode, the band switch diode D7 will be turned on and the output from the VCO buffer amplifier will be fed to the two stage amplifier cicuit.
The level is amplified to about 30 mW in Q14 and the final stage with Q13 boosts the level to about 200 mW measured at connector J4.
The first stage is working as a class A amplifier with the base on Q14 biased through R80, D7, R79, and R86. The output stage is working as a class C amplifier with a small base bias through resistors R72 and R73.

5.3.9. **X-Tal Oscillator**

The oscillator is of a Colpitt type and the oscillator transistor Q1 is oscillating by means of a 14.850 MHz crystal X1.
The trimmer capacitor C77 is for fine adjustment of the oscillator frequency.
RF signal for the second mixer in the receiver is taken from the collector of transistor Q1, connector J1.
The oscillator signal is buffered and amplified in transistors Q2 and Q3 before it is fed to the reference divider.

5.3.10. **Reference Divider**

The fixed divide by four reference divider U2 divides the X-tal oscillator frequency down to 3.7125 MHz before it is fed to the microcomputer via connector J2 and the phase locked loop reference divider included in U3.

5.3.11. **RX Filter Control Amplifier**

This variable slope DC amplifier made by means of an operational amplifier U1 converts the VCO control voltage to an appropriate control voltage for the variocap. diode tuned filters in the receiver front-end.
The maximum output voltage is adjusted by means of potentiometer R95.

5.3.12. **Preemphasis Network**

Capacitor C18 in conjunction with R35 and R96 introduces the needed 6 dB/oct. response of the AF input signal. The input sensitivity is adjusted by means of R96.

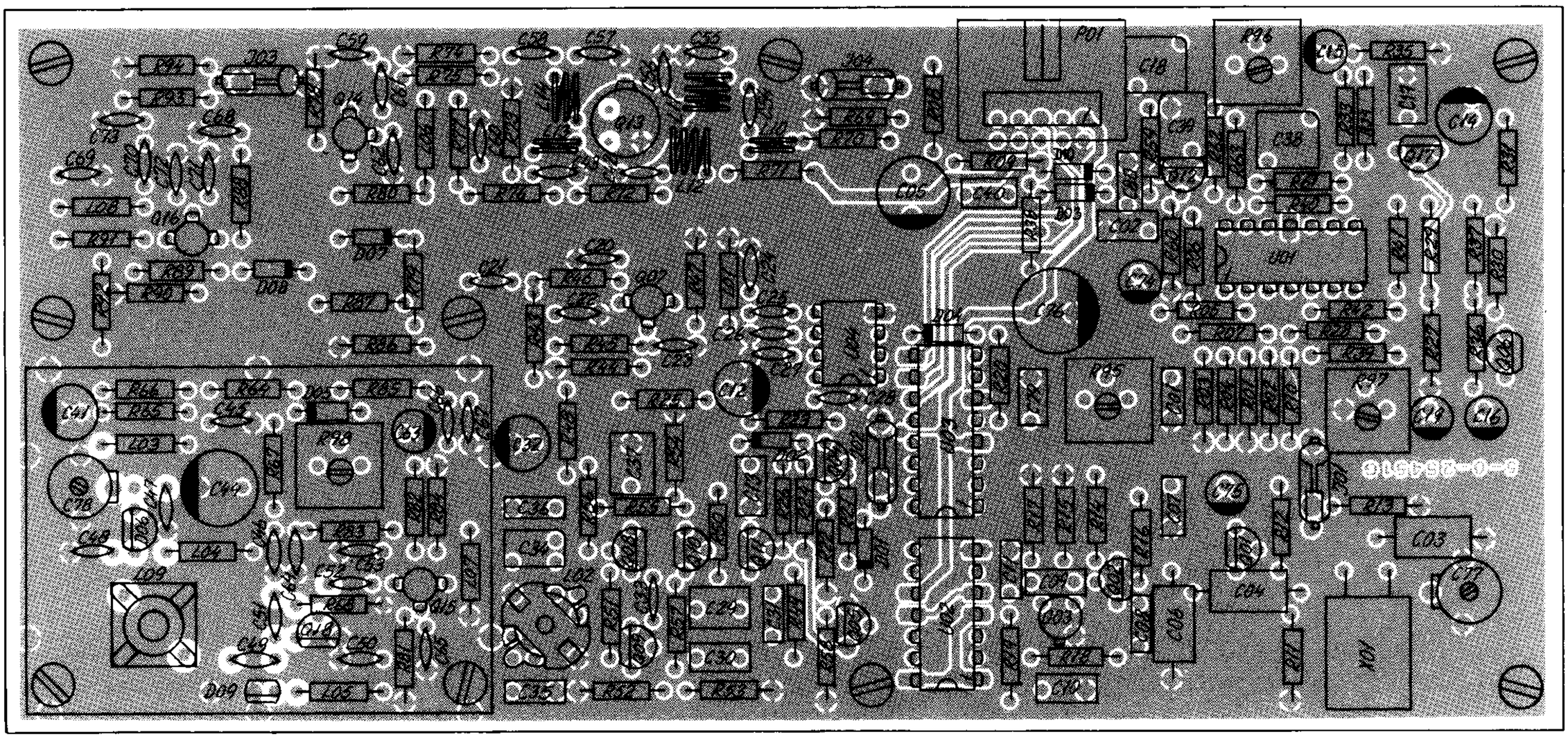
5.3.13. **AF Amplifier/Compressor**

This circuit, formed around two operational amplifiers in U1, comprises both an amplifying and voltage limiting function. Amplifier No. 3 is a fixed voltage amplifier, the output of which is sensed by means of the comparator made by amplifier No. 2. When the peak output voltage exceeds a certain level, adjusted by means of potentiometer R97, the comparator will turn on transistor Q6, which in turn will charge capacitor C14. So the gate-source voltage on transistor Q17, acting as a variable resistor, will decrease and also the AC resistance between pin 10 on U1 and ground, which in turn will reduce the input level to the amplifier.
The rise-time of the compressor is mainly determined by resistors R38, R31, and capacitor C14. The decay-time by C14 and R30.

5.3. **SYNTHESIZER UNIT** cont.:

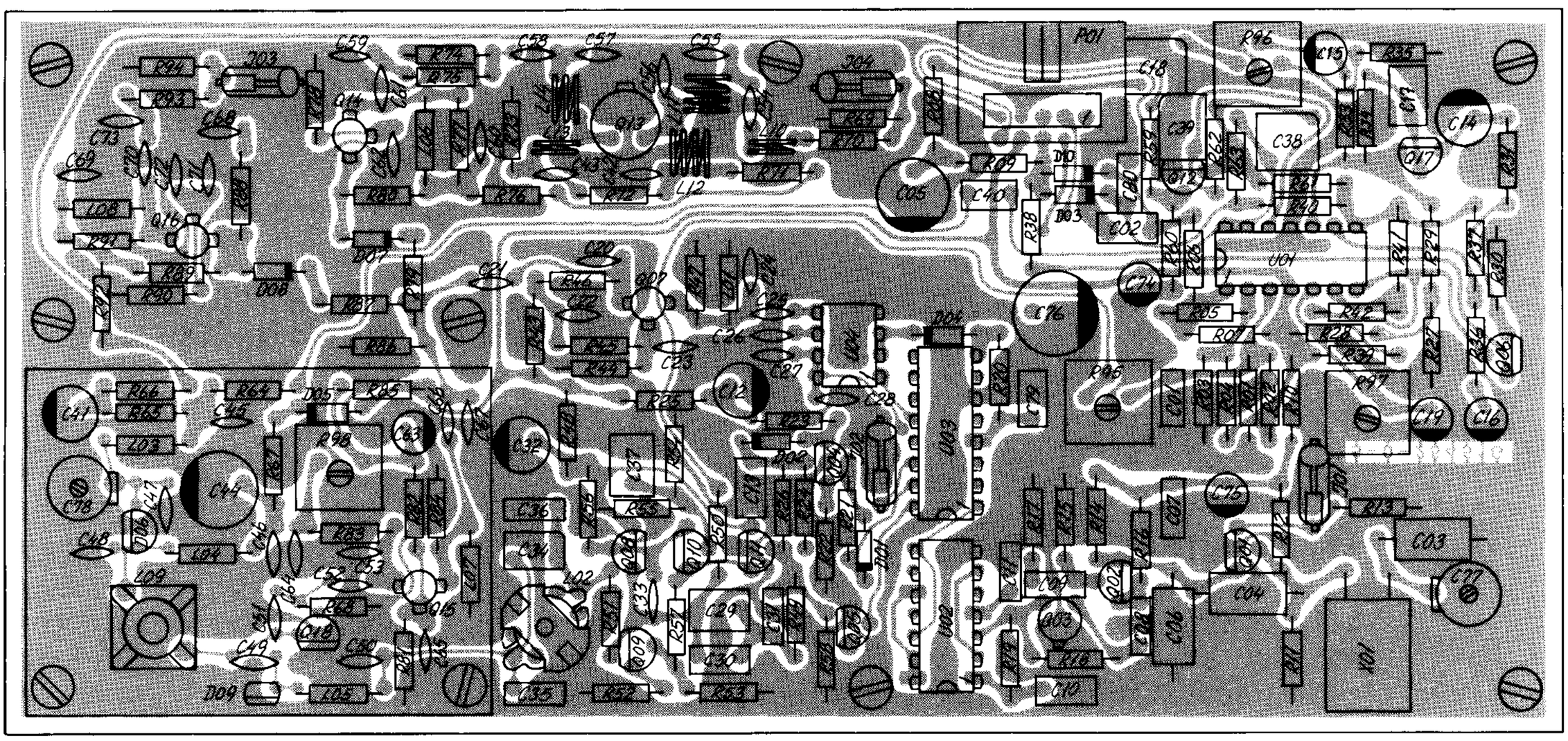
5.3.14. **AF Post Filter**

This second order active filter, built around operational amplifier No. 4 in U1, secures an appropriate high frequency roll-off of the AF signal. Resistors R64 and R65 give an appropriate attenuation of the AF signal before it is fed to the modulating diode D6 in the VCO.



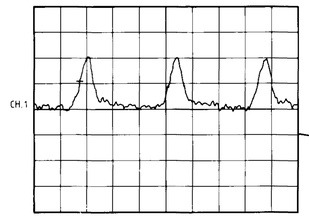
RT2048
4-6-254 D
51 G

View from component side with upper side tracks.

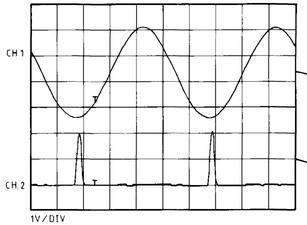


View from component side with lower side tracks.

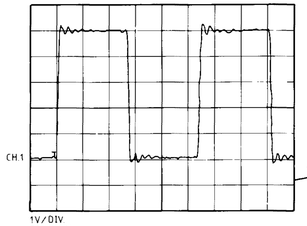
RT2048 4-0-25451L



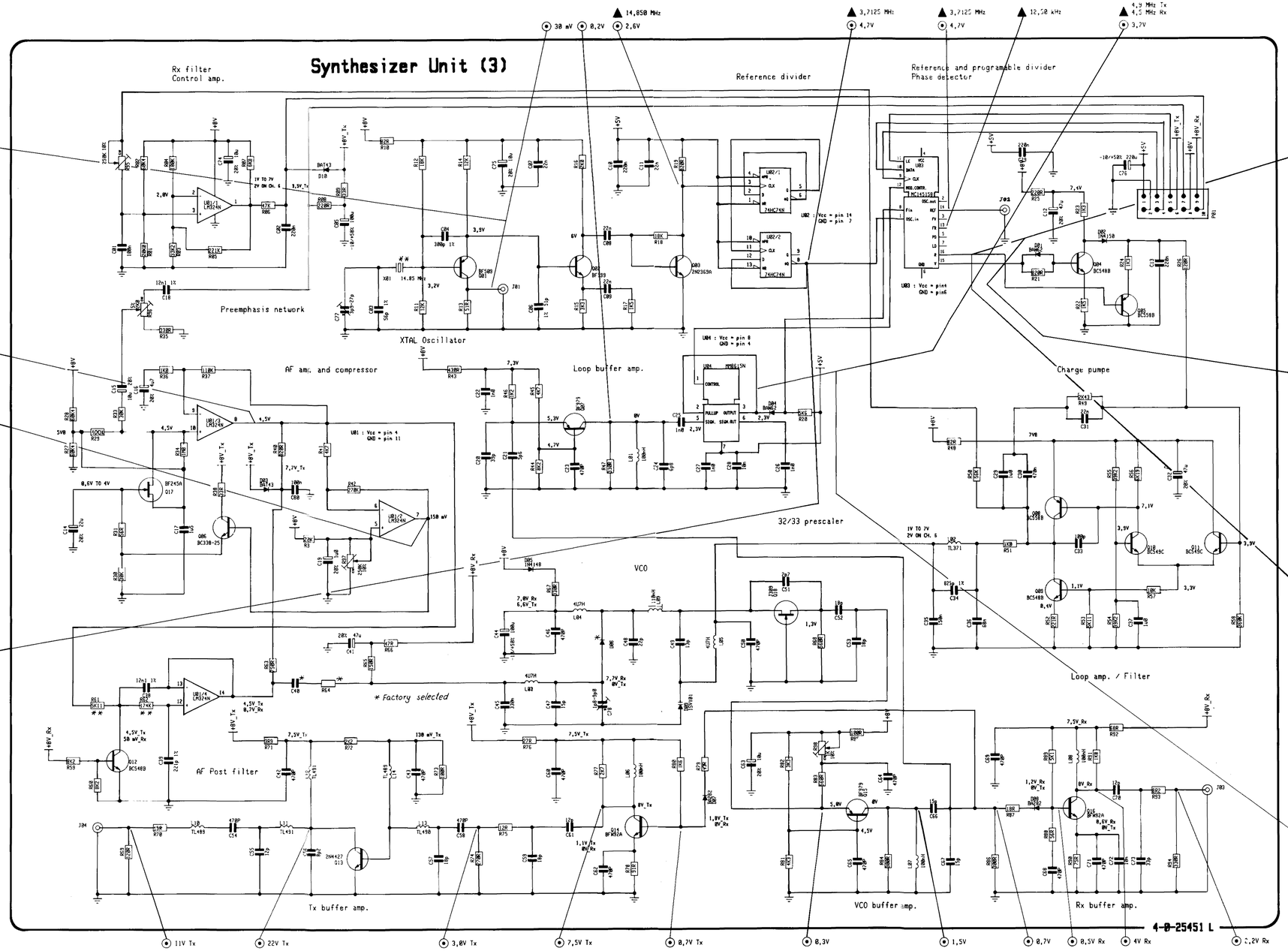
50mV/DIV
20nS/DIV

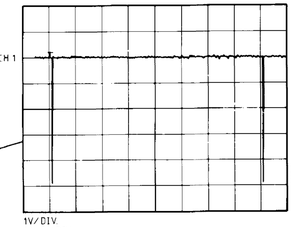


1V/DIV
200 µS/DIV

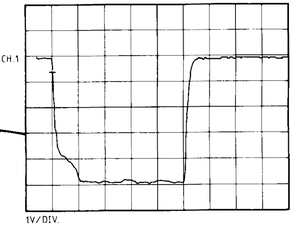


1V/DIV
50 nS/DIV

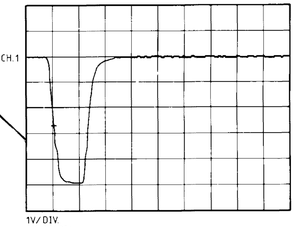




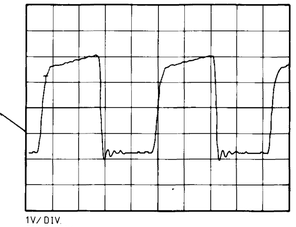
1V/DIV
10 µS/DIV



1V/DIV
100 nS/DIV



1V/DIV
50 nS/DIV



1V/DIV
50 nS/DIV

⊙ APPROX. MEASUREMENTS WITH TEST PROBE.

△ APPROX. MEASUREMENTS WITH VOLTMETER.

SCHEMATIC DIAGRAM SYNTHESIZER (MODULE 3)

3,7125 MHz
4,7V

3,7125 MHz
4,7V

12,50 kHz

4,9 MHz Tx
4,5 MHz Rx
3,7V

Reference and programable divider
Phase detector

U03 : Vcc = pin4
GND = pin6

= pin 14
= pin 7

Charge pumpe

1V TO 7V
2V ON CH. 6

Loop amp. / Filter

VCO buffer amp.

Rx buffer amp.

1,5V

0,7V

0,5V Rx

4V Rx

2,2V Rx

4-0-25451 L

CH.1
1V/DIV.
10µS/DIV.

CH.1
1V/DIV.
100 nS/DIV.

CH.1
1V/DIV.
50 nS/DIV.

1V/DIV.
50 nS/DIV.

SCHEMATIC DIAGRAM SYNTHESIZER (MODULE 3)

Synthesizer Unit (3)

30 mV · 0,2V · 14,850 MHz · 2,6V · 3,7125 MHz · 4,7V · 3,7125 MHz · 4,7V

Reference divider

Reference and program
Phase detector

XTAL Oscillator

AF amp. and compressor

Loop buffer amp.

32/33 prescaler

VCO

Tx buffer amp.

VCO buffer amp.

U01 : Vcc = pin 4
GND = pin 11

U02 : Vcc = pin 14
GND = pin 7

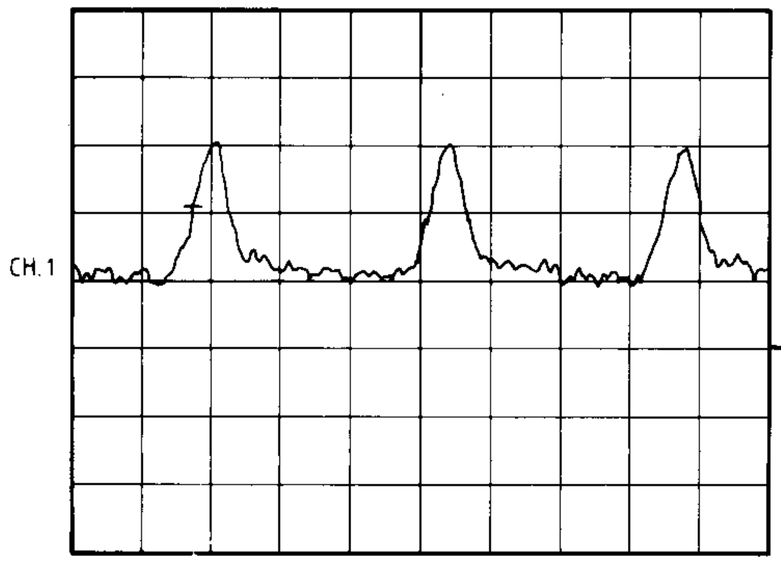
U03 : Vcc = pin4
GND = pin6

U04 : Vcc = pin 8
GND = pin 4

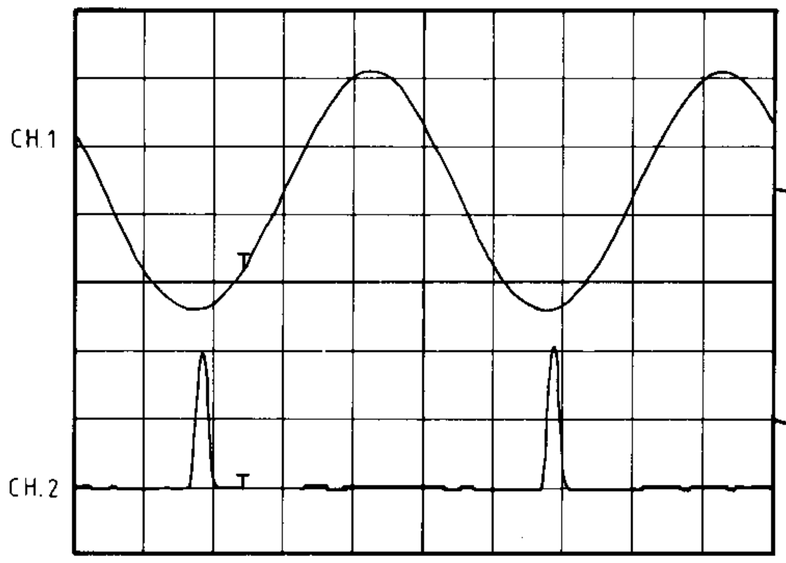
* Factory selected

1V TO 7V
2V ON CH. 6

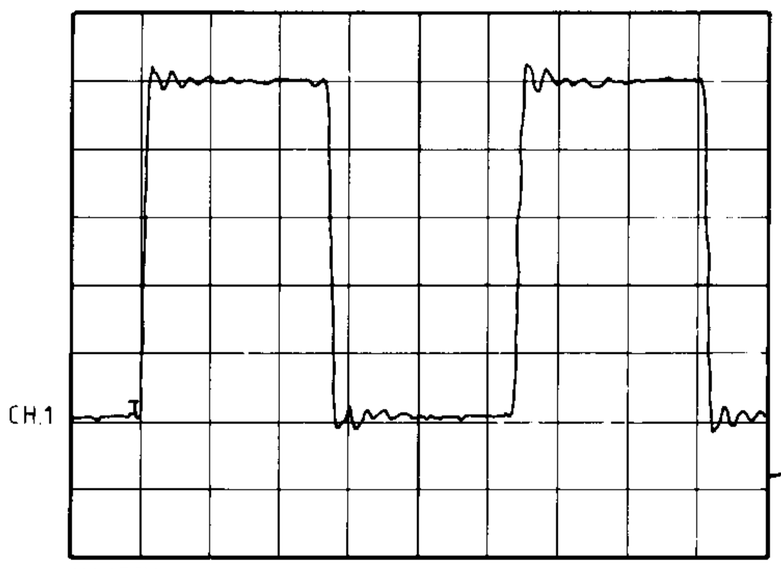
3,0V Tx · 7,5V Tx · 0,7V Tx · 0,3V · 1,5V



50 mV / DIV.
20 nS / DIV.



1V / DIV.
200 µS / DIV.



1V / DIV.
50 nS / DIV.

**US VERSION ONLY
R61 = 4K75 (SP 03.468)
R62 = 270K (SP 03.465)
XOi = 5PPM C1075 (SP 39.841)

⊙ APPROX. MEASUREMENTS WITH TEST PROBE.

△ APPROX. MEASUREMENTS WITH VOLTMETER.

Rx filter
Control amp.

Synt

250K 10% R95 CW
R02 68K4
R04 100K
C74 10u 20%
R07 6K8
+8V
1V TO 7V
2V ON CH. 6
3,5V_Tx
2,0V
U01/1 LM324N
47K R06
C02 220n
C01 100n
20K0 R01
33K2 R03
221K R05
+8V_Tx
BAT43 D10
R09 33R
R08 220R
C05

12n1 1% C18
5% 2K0 CW R96
330R R35
Preemphasis network
C77 3n9-27p

AF amp. and compu
+8V
1K0 R36
110K R37
C15 10u 20%
C16 4u7 20%
R28 68K4
R33 30K
5V0
100K R29
R27 68K4
U01/3 LM324N
4,5V
R34 1M0
R40 820R
R41 4K7
7,7V_Tx
0,6V TO 4V
BF245A Q17
R38 33R
D03 BAT43
100n C00
C14 22u 20%
R31 56R
C17 1u5
Q06 BC338-25
270K R39
C19 1u0 20%
R97
R30 30K

20% C41
R63 750R
12n1 1% C38
R61 5K11 **
R62 174K **
U01/4 LM324N
4,5V_Tx
0,7V_Rx
C40 *
R64 *
+8V_Rx
4,5V_Tx
50 mV_Rx
7,5V_Tx
3R9 R71
2K2 R72
8K2 R59
Q12 BC548B
C39 22p 1%
AF Post filter
C42 470p
L12 TL491
R60 8K2

J04
15R R70
L10 TL489
470P C54
L11 TL491
R69 120R
C55 12p
C56 8p2
2N4427 Q13
Tx buffer a

11V Tx
22V Tx

5.4. RX/TX UNIT (MODULE 4)

The RX/TX unit comprises the following circuits:

The receiver including detector
AF power amplifier
RF power amplifier
Harmonic filter
RF power control
8V power supply

5.4.1. RECEIVER FRONT-END

The RF amplifier covers the frequency range 154.400 MHz to 163.600 MHz and consists of the low noise Dual Gate Si-Mos-FET Q11 surrounded by two high Q double-tuned bandpass filters.

From the aerial the signal is led through the aerial relay to the receiver input bandpass filter. The input bandpass filter as well as the intermediate bandpass filter are controlled by a DC voltage on the tuning diodes. This DC voltage derives from the RX VCO control voltage and secures an optimum filter response in the whole frequency range of the receiver.
The two bandpass filters create the necessary attenuation of unwanted signals.

5.4.2. FIRST MIXER

The balanced mixer has good large signal properties, securing good intermodulation characteristic.
The mixer transistors Q08 and Q09 are of the J-FET type.
The signal is led to the balanced input transformer TR2 and then to the gates of the J-FETs, which are switched by injecting the first LO signal into the sources. The mixed signals are fed to the balanced output transformer TR1 where the wanted signal on 15.3 MHz is selected by the tune circuit consisting of TR1 and C75.
R06 and R01 create the necessary impedance matching the IF crystal filter.

5.4.3. CRYSTAL FILTER

The receiver adjacent channel selectivity is maintained by means of the crystal filter FL2 in co-operation with the ceramic filter FL1.
R57 and R39 give the impedance matching the crystal filter output.

5.4.4. IF AMPLIFIER

The transistor Q10 amplifies the signal to the 2nd mixer, which has a tuned drain circuit consisting of L04 and C32.
R34 creates the impedance matching the 2nd mixer.

5.4.5. SECOND MIXER, CERAMIC FILTER, DETECTOR AND AF AMPLIFIER

The second LO signal 14.850 MHz is amplified in Q02 before it is delivered to the mixer.

The signal out of the mixer (450 kHz) is fed through the ceramic filter to the limiter amplifier and discriminator in U03.
The phase shift network to the quadrangular discriminator consisting of R11, L06, C33, and a 10 pF capacitor inside the IC.
AF output is led through a lowpass filter consisting of R36 and C74, which removes the high frequencies (450 kHz).
An internal operational amplifier amplifies the AF signal to 250 mV, which is adjusted by R20.

5.4.6. **AF POWER AMPLIFIER**

The AF power amplifier is capable of delivering 6 Watt in the internal loudspeaker (4 ohm) and 6 Watt in an external loudspeaker 4 ohm.
The gain of 34 dB is fixed by the resistors R07, R08 and R09.
The AF power amplifier is muted (pin 11, 0 = off, 1 = on) about 1.25 sec. after the squelch is closed.

5.4.7. **RF POWER AMPLIFIER**

The power amplifier covering the frequency range 154.4 MHz to 163.6 MHz consists of a module with 50 ohm terminations and 2 amplifiers. The first amplifier is the driver which has a gain of up to 12 dB, depending on the driver voltage from Q01. The input is about 200 mW.
The second amplifier has a gain of 10 dB.

5.4.8. **HARMONIC FILTER**

The harmonic filter is realized as a seventh order Chebyscher filter, which at the same time will provide the necessary attenuation of the harmonic generated by the power amplifier and a low insertion loss at the carrier frequency.
The output is fed to the antenna relay.

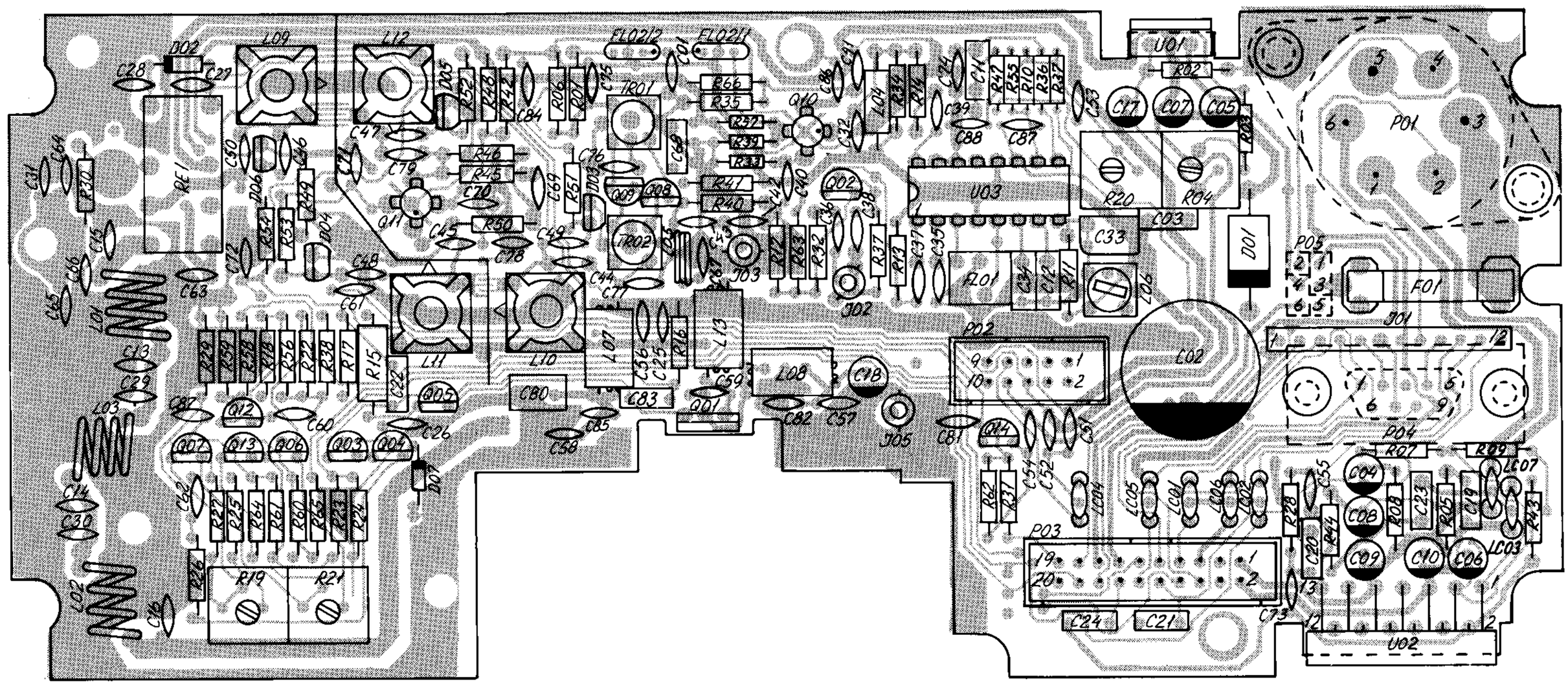
5.4.9. **RF POWER CONTROL**

The power adjustment loop consists of Q04, Q03, Q05 and Q01.
Q04 is the power detector which together with Q03 forms a differential circuit.
The differential circuit controls Q05 and Q01 which are made as a Darlington transistor.
C22, R17, and R15 make a feed-back in order to slow down the loop.
Q12 controls the on/off function through the differential resistor R18.
Q06 is the power indicator transistor which gives the microcomputer information about power on the output from the RF power amplifier.
This information is active about 0.3 Watt.
Q13 controls the 1 Watt/25 Watt change-over transistor Q07.
If the power is lower than about 15 Watt in the 25 Watt position the power indicator transistor Q06 will make a smooth change-over to 1 Watt position through resistor R61.
The 25 Watt adjustment is done on R21 and the 1 Watt adjustment is done on R19. The 25 Watt has to be adjusted first because it has influence on the adjustment of 1 Watt.

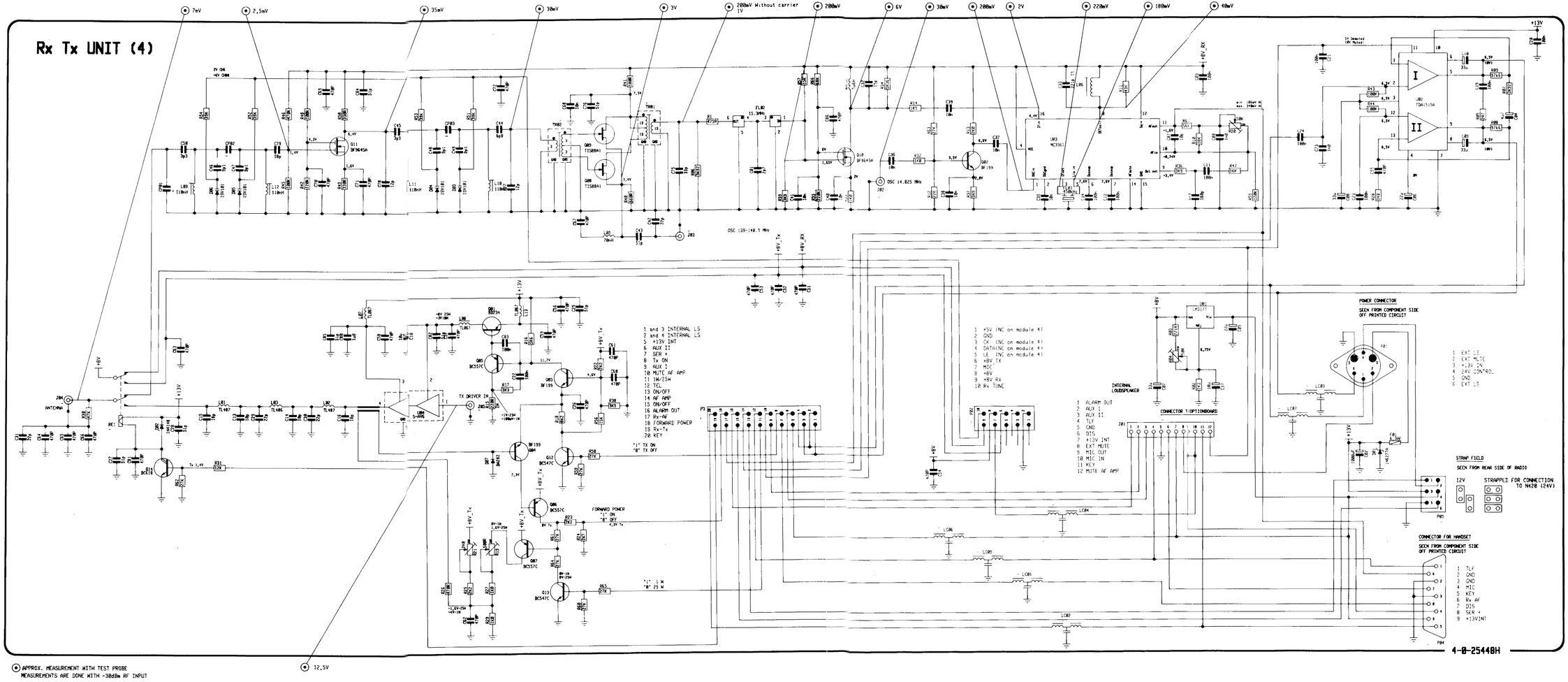
5.4.10. **8V POWER SUPPLY**

The regulator U01 is supplied from the internal 13V supply.
The adjustment of the voltage is done on resistor R04.
The 8V supply is divided into 2 more supplies in the antenna relay, the 8V TX supply and the 8V RX supply.

View from component side with upper side tracks.



View from component side with lower side tracks.



SCHEMATIC DIAGRAM RX/TX UNIT (MODULE 4)

220mV 180mV 40mV

+8V_RX

+13V

5V Demuted
(0V Muted)

U02
TDA1515A

min. 186mV AC
max. 340mV AC

U01
LM317T

POWER CONNECTOR

SEEN FROM COMPONENT SIDE
OFF PRINTED CIRCUIT

1 EXT LS
2 EXT MUTE
3 +13V IN
4 24V CONTROL
5 GND
6 EXT LS

INTERNAL
LOUDSPEAKER

CONNECTOR TO OPTIONBOARD

1 ALARM OUT
2 AUX I
3 AUX II
4 TLF
5 GND
6 DIS
7 +13V INT
8 EXT MUTE
9 MIC OUT
10 MIC IN
11 KEY
12 MUTE AF AMP

STRAP FIELD

SEEN FROM REAR SIDE OF RADIO

12V

STRAPPED FOR CONNECTION
TO N420 (24V)

CONNECTOR FOR HANDSET

SEEN FROM COMPONENT SIDE
OFF PRINTED CIRCUIT

1 TLF
2 GND
3 GND
4 MIC
5 KEY
6 Rx AF
7 DIS
8 SER +
9 +13VINT

4-0-25448H

SCHEMATIC DIAGRAM RX/TX UNIT (MODULE 4)

200mV Without carrier
1V

200mV 6V 30mV 200mV 2V 220mV 180mV 40mV

+8V_RX

FL02 15.3MHz

Q10 BF964SA

OSC 14.825 MHz
J02

U03 MC3361

FL01 450kHz

min. 186mV AC
max. 348mV AC

139~148.5 MHz

+8V_Tx +8V_RX

1 +5V (NC on module 4)
2 GND
3 CK (NC on module 4)
4 DATA(NC on module 4)
5 LE (NC on module 4)
6 +8V_TX
7 MIC
8 +8V
9 +8V_RX
10 Rx TUNE

P02

U01 LM317T

INTERNAL LOUDSPEAKER

CONNECTOR TO OPTIONBOARD
J01

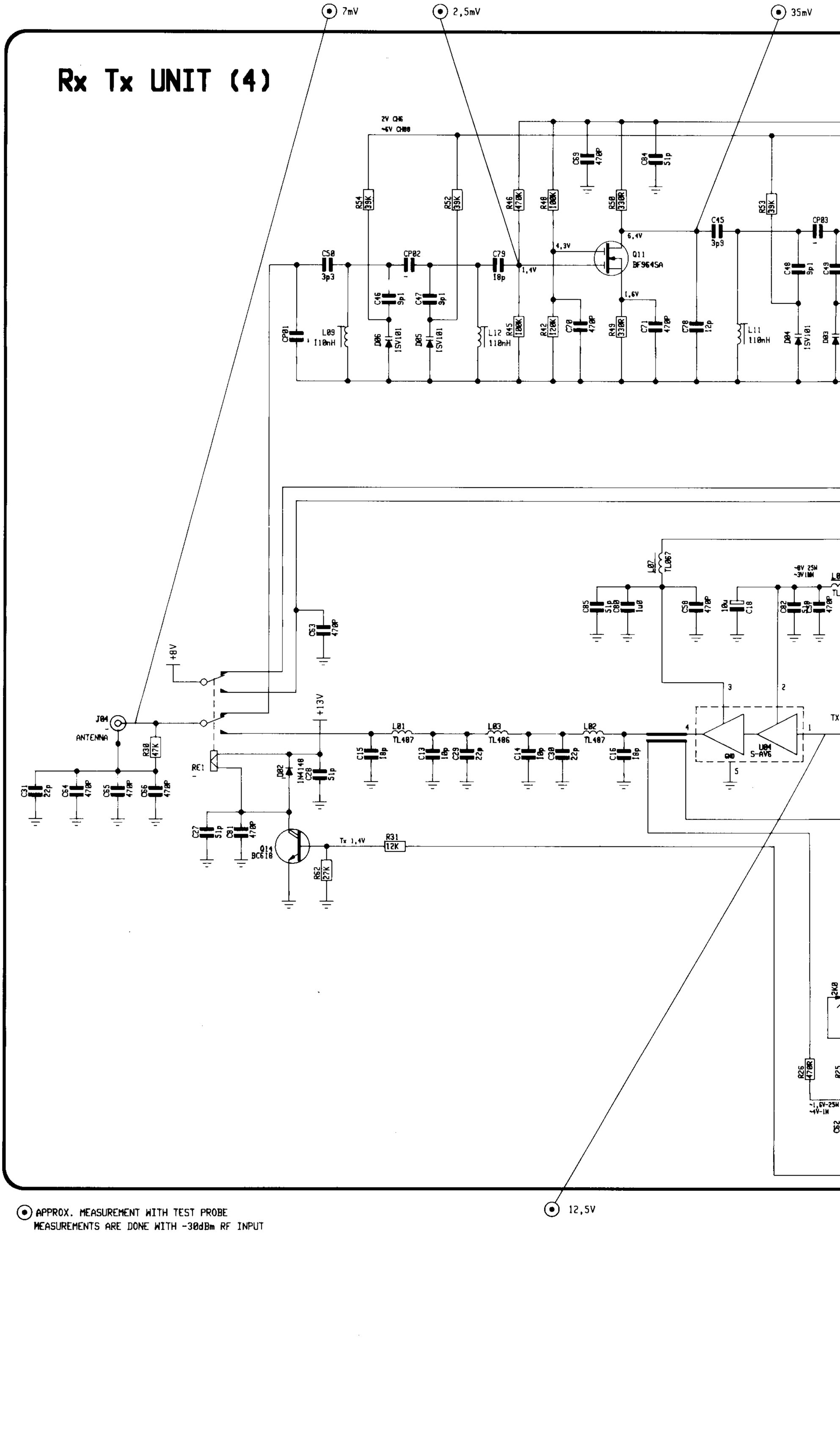
1 ALARM OUT
2 AUX I
3 AUX II
4 TLF
5 GND
6 DIS
7 +13V INT
8 EXT MUTE
9 MIC OUT
10 MIC IN
11 KEY
12 MUTE AF AMP

LC04 LC06 LC05 LC01 LC02 LC03 LC07

35mV
30mV
3V
200mV Without carrier
1V
200mV
6V
30m
C84 51p
R53 39K
R51 39K
C72 470P
C45 3p9
CP03
C44 6p8
C48 3p1
C49 3p1
C71 470P
C78 12p
L11 110nH
D04 1SV101
D03 1SV101
L10 110nH
12p
R41 180R
7,5V
C60 10n
C76 51p
TR02
TR01
Q09 TIS88A1
Q08 TIS88A1
1,4V
R40 560R
C57 470P
L05 70nH
C43 51p
C42 22p
J03
C75 33p
R06 3K92
R1 475R
FL02 15.3MHz
C81 2p7
R57 15K
R66 68K
C86 470P
L1 5u6H
C32 15p
R34 5K36
R14 1K5
R63 27K
Q10 BF964SA
6V
1,65V
2V
C36 10n
R32 1K0
OSC 14.825 MHz
J02
R39 3K9
C41 10n
R35 220K
C40 10n
R33 1K0
R12 22K
OSC 139-148.5 MHz
+8V_Tx
+8V_RX
C53 470P
C52 470P
C51 470P
+13V
L07 TL067
C58 470P
10u
C18
~8V 25W
~3V 1W
L08 TL067
C82 51p
C83 470P
Q01 BD234
TL067 L13
C56 470P
C25 51p
C83 100n
R16 5K6
C59 470P
Q05 BC557C
11,7V
C22 100n
R17 3K3
Q03 BF199
4,6V
R22 2K2
C61 470P
C60 470P
R30 3K9
C26 470P
R18 6K2
R56 15K
TX DRIVER IN
J05
R15 22R 2W
~1V-25W
~100mV-1W
U04 S-AV6
BF199 Q04
D07 BA282
7,3V
Q12 BC547C
R58 27K
R59 27K
"1" TX ON
"0" TX OFF
Q06 BC557C
FORWARD POWER
"1" ON
"0" OFF
4,3V Tx
0V Tx
R23 2K2
R61 27K
R24 2K7
R64 27K
8V-1W
1,6V-25W
2K0 R21
500R R19
Q07 BC557C
8V-1W
8V-25W
R26 470R
R25 2K2
R27 1K0
~1,6V-25W
~1V-1W
C62 470P
R29 1K0
Q13 BC547C
R65 27K
R60 27K
"1" 1 W
"0" 25 W
P3
1 and 3 INTERNAL LS
2 and 4 INTERNAL LS
5 +13V INT
6 AUX II
7 SER +
8 Tx ON
9 AUX I
10 MUTE AF AMP
11 1W/25W
12 TEL
13 ON/OFF
14 AF AMP
15 ON/OFF
16 ALARM OUT
17 Rx-AF
18 FORWARD POWER
19 Rx-Tx
20 KEY
+8V
C54 470P

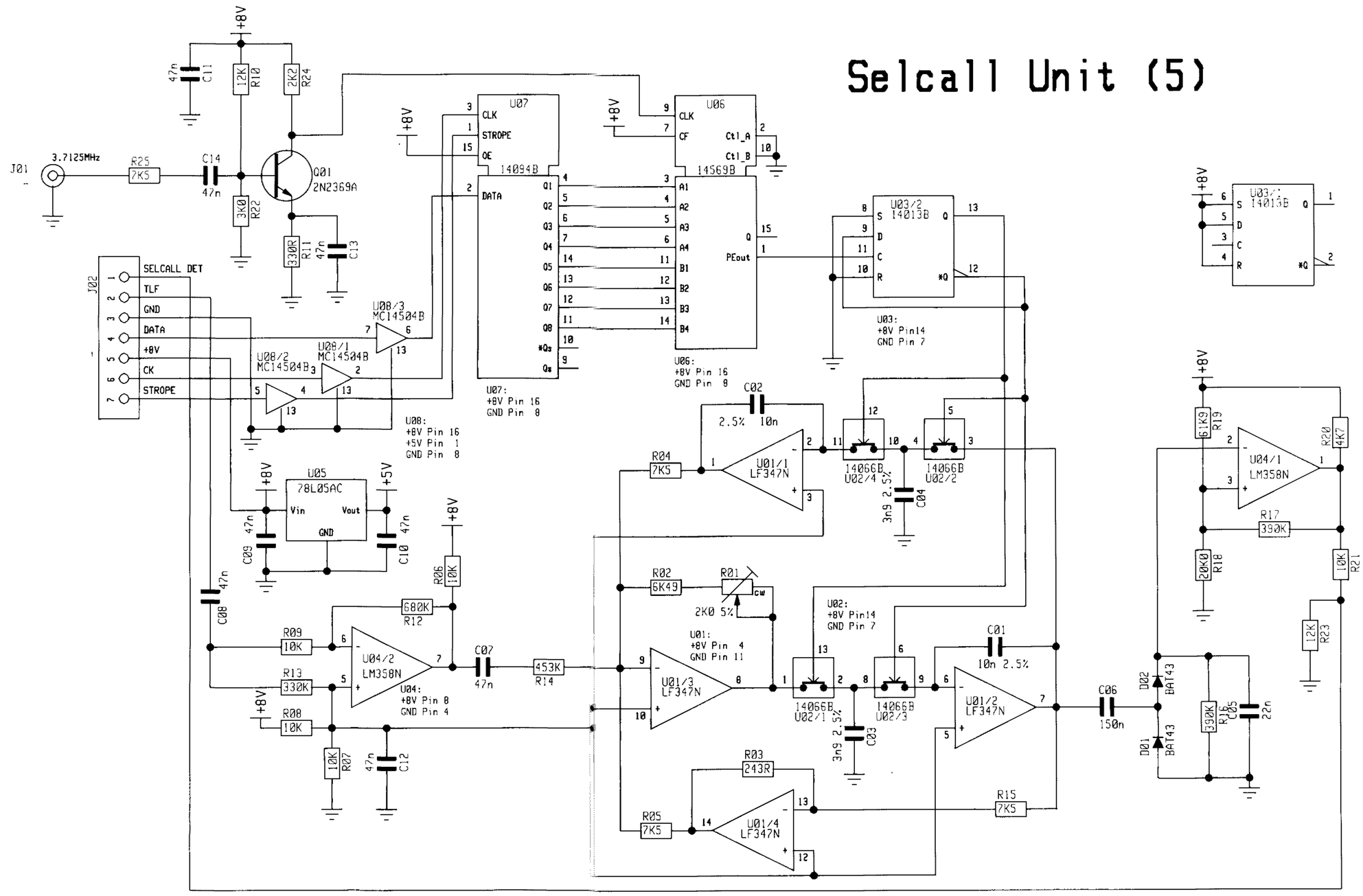
Rx Tx UNIT (4)

RT2048 E 4-0-25448H

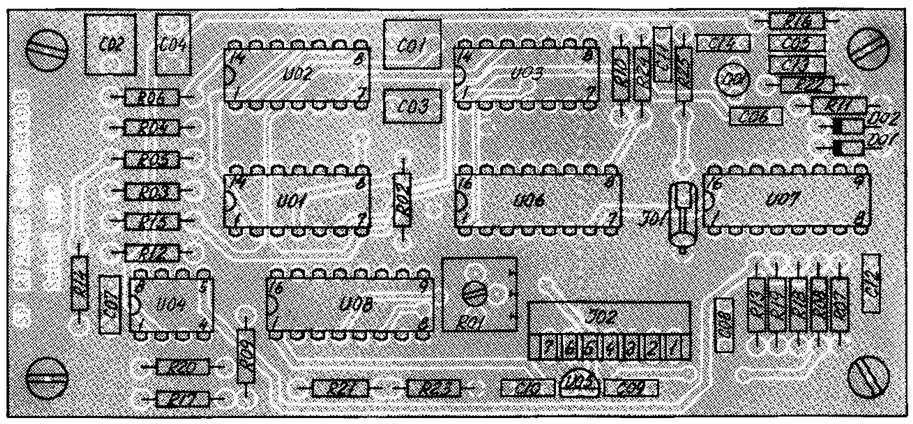


⊙ APPROX. MEASUREMENT WITH TEST PROBE
MEASUREMENTS ARE DONE WITH -30dBm RF INPUT

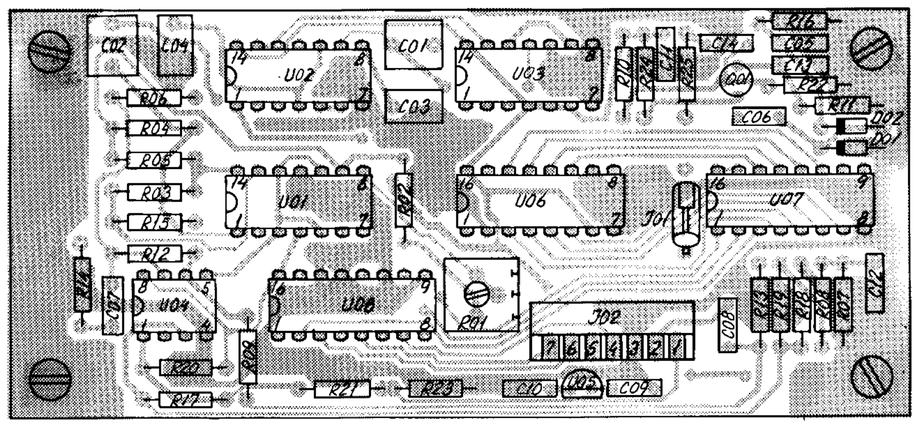
Selcall Unit (5)



4-0-25449 D

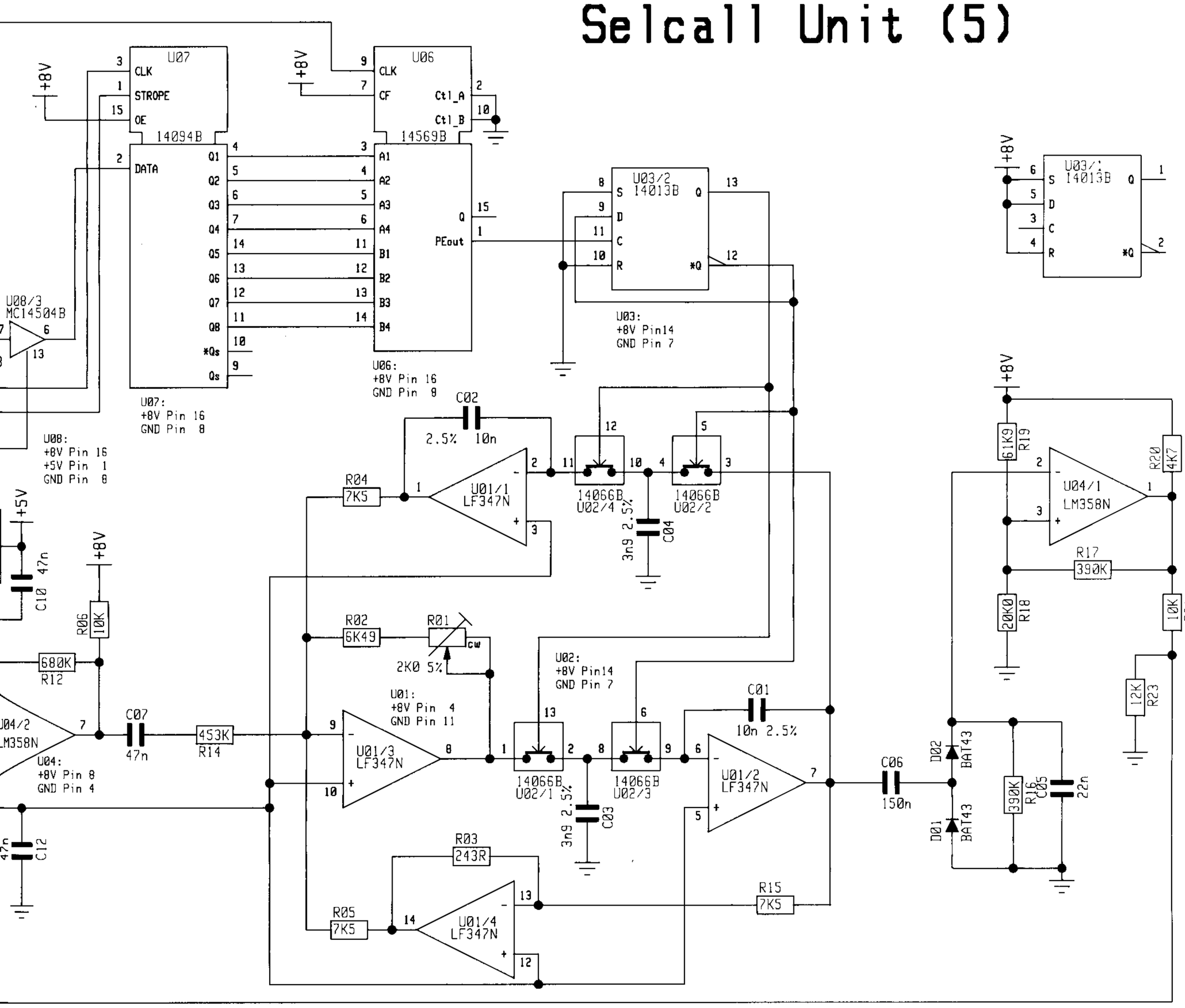


View from component side with upper side tracks.

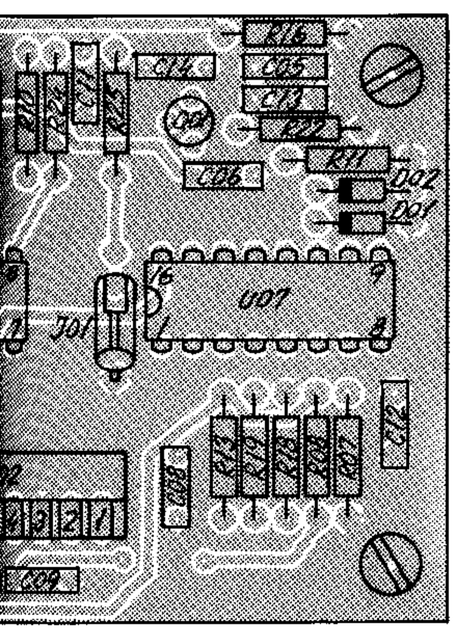


View from component side with lower side tracks.

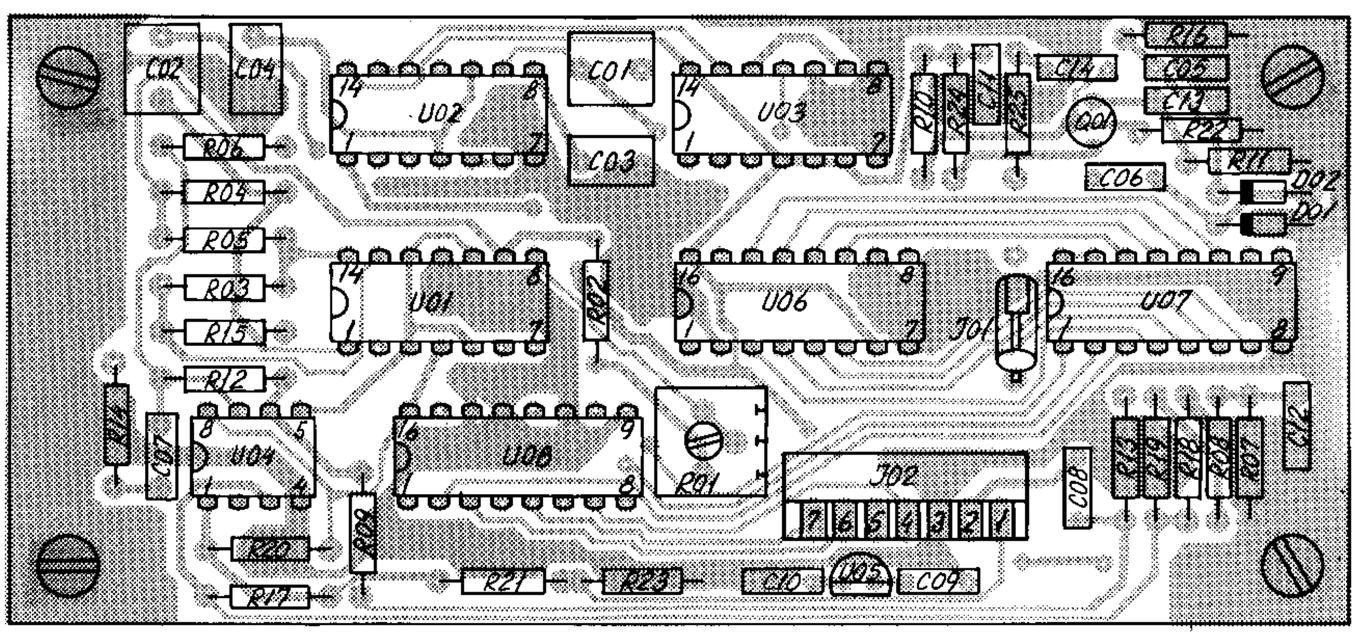
Selcall Unit (5)



4-0-25449 D

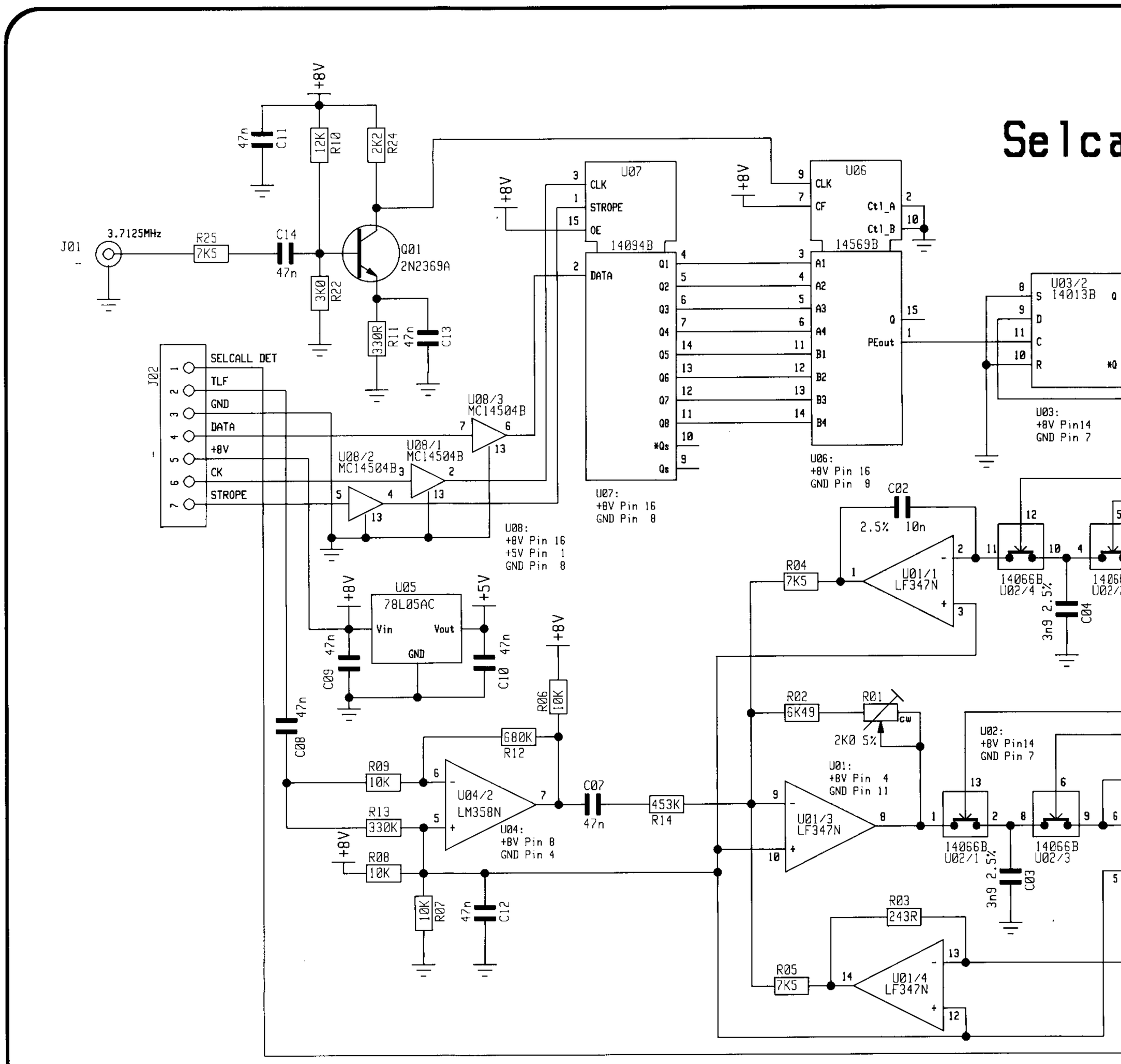


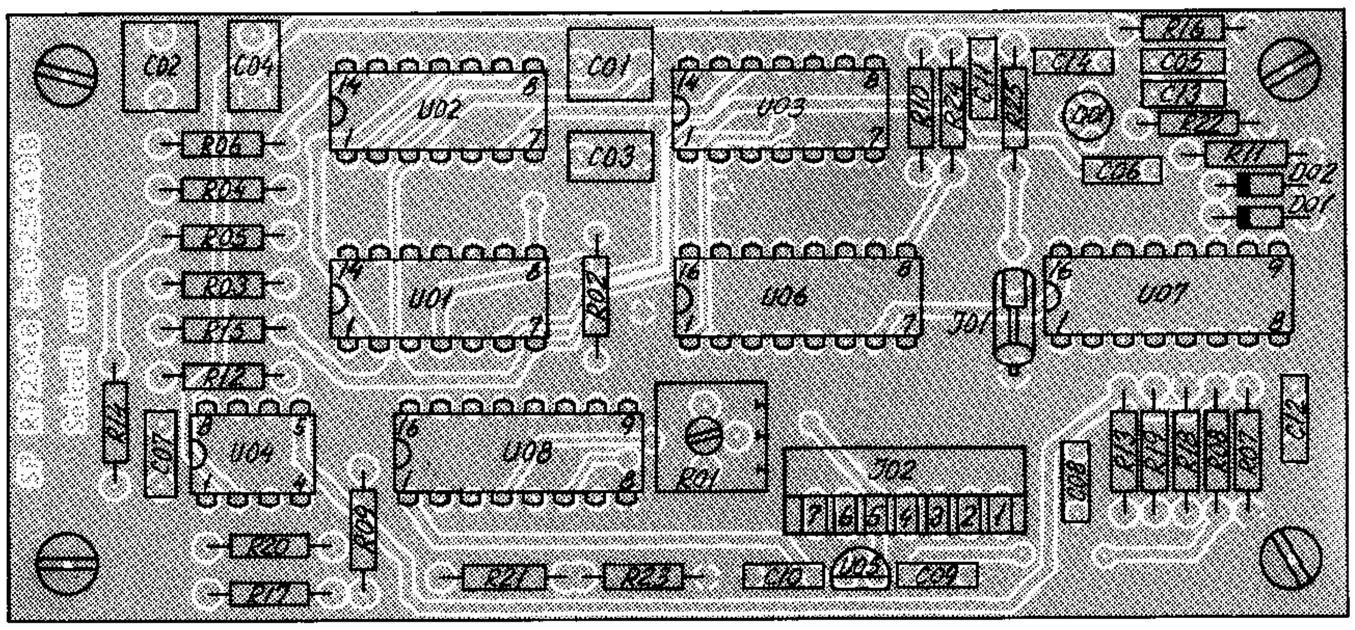
r side tracks.



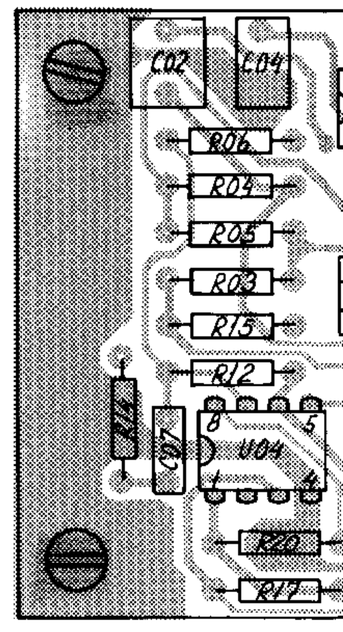
View from component side with lower side tracks.

SELCALL UNIT (MODULE 5)



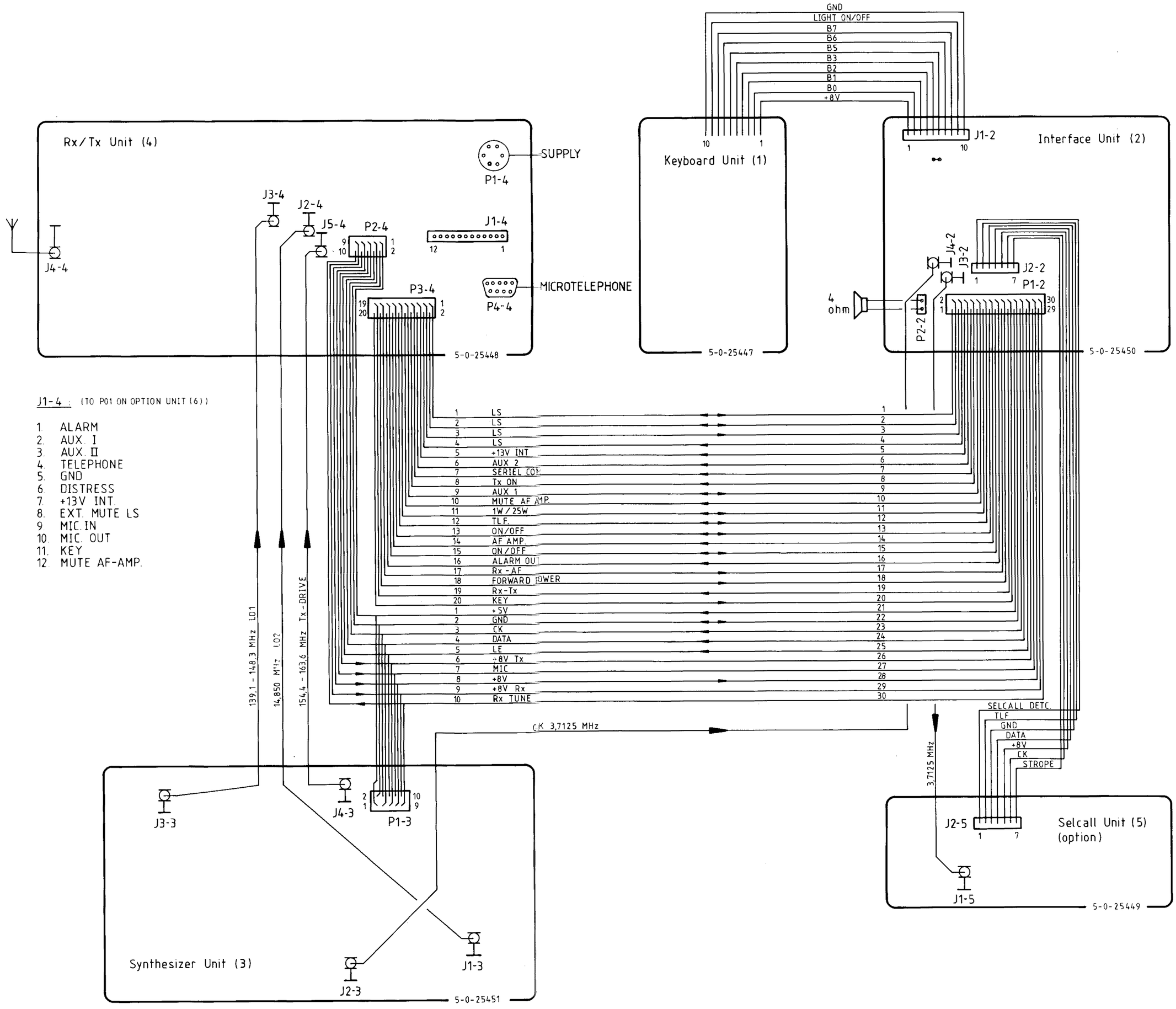


View from component side with upper side tracks.



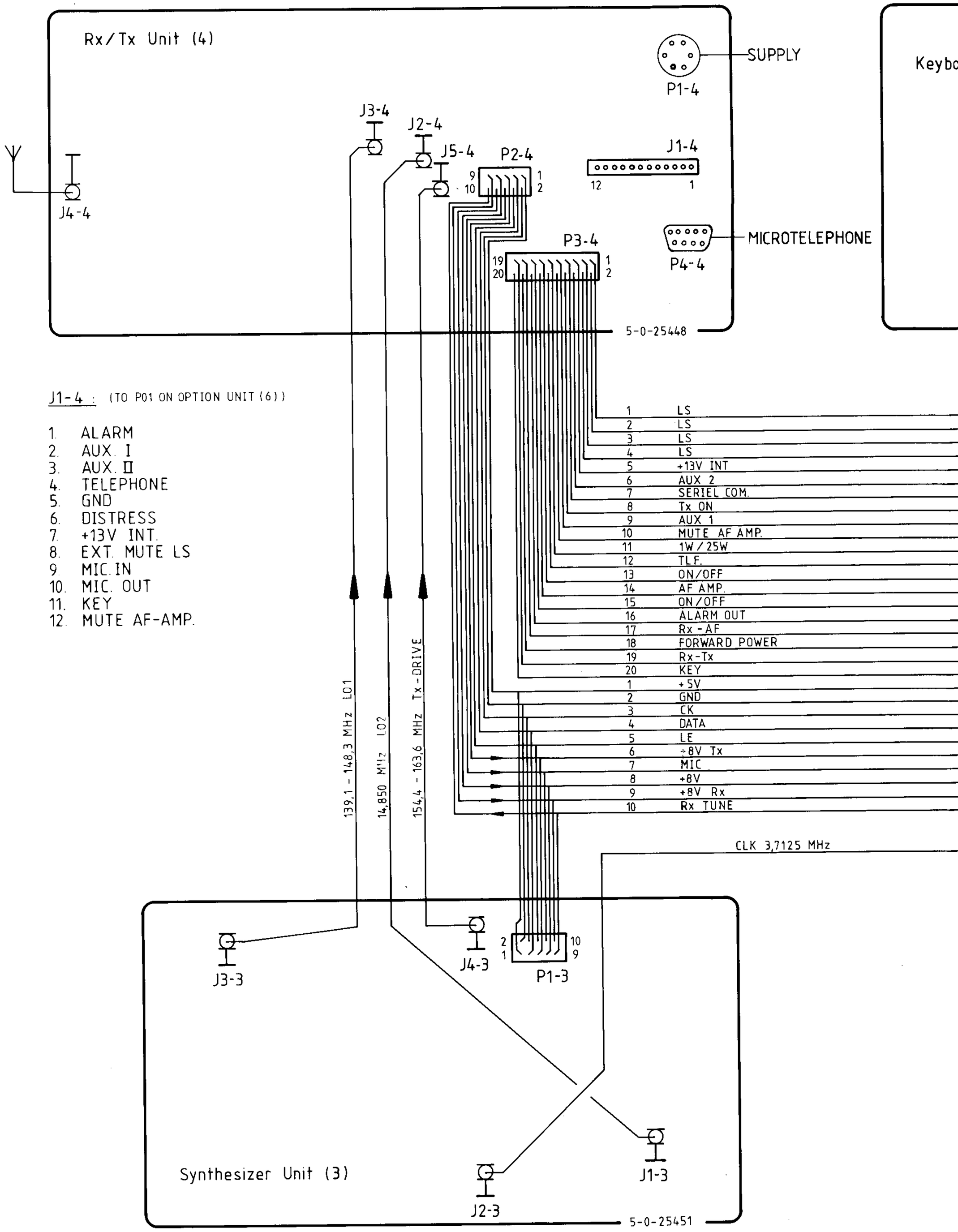
View from com

5.6. INTERCONNECTION CABLE DIAGRAM



INTERCONNECTION CABLE DIAGRAM RT2048

5.6. INTERCONNECTION CABLE DIAGRAM



INTERCONNECTION CABLE DIAGRAM RT2048

GND
LIGHT ON/OFF
B7
B6
B5
B3
B2
B1
B0
+8V

10 1

Keyboard Unit (1)

5-0-25447

1 10

J1-2

Interface Unit (2)

SUPPLY

P1-4

J1-4

1

MICROTELEPHONE

P4-4

-0-25448

J4-2
J3-2

J2-2
1 7
P1-2

4
ohm

P2-2

2 30
1 29

5-0-25450

LS 1
LS 2
LS 3
LS 4
+13V INT 5
AUX 2 6
SERIEL COM. 7
Tx ON 8
AUX 1 9
MUTE AF AMP. 10
1W / 25W 11
TLF. 12
ON/OFF 13
AF AMP. 14
ON/OFF 15
ALARM OUT 16
Rx - AF 17
FORWARD POWER 18
Rx-Tx 19
KEY 20
+5V 21
GND 22
CK 23
DATA 24
LE 25
+8V Tx 26
MIC 27
+8V 28
+8V Rx 29
Rx TUNE 30

CLK 3,7125 MHz

3,7125 MHz

SELCALL DETC.
TLF
GND
DATA
+8V
CK
STROPE

J2-5
1 7

Selcall Unit (5)
(option)

J1-5

5-0-25449

J1-3

-0-25451

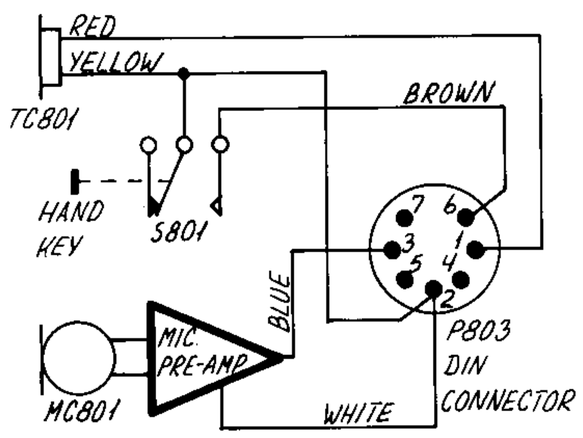
CONTENTS

6. MICROTELEPHONE INSTALLATION
6.1. SPECIAL INSTALLATION WITH 2 MICROTELEPHONES
6.2. SPECIAL INSTALLATION WITH 3 MICROTELEPHONES

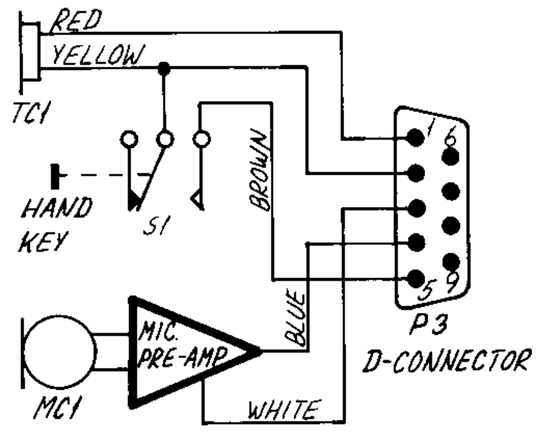
GRØN
RT2048

6. MICROTELEPHONE INSTALLATION

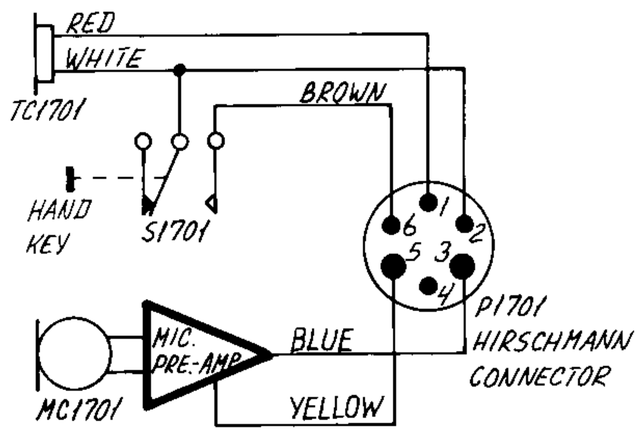
VHF RT2047 and T2031

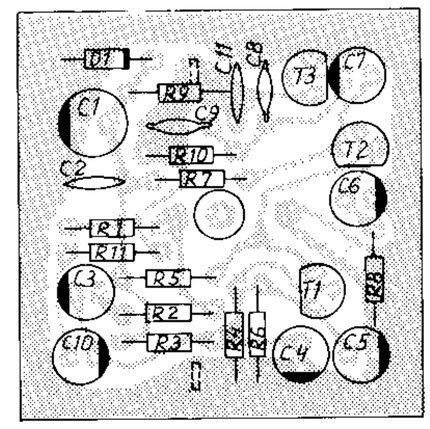


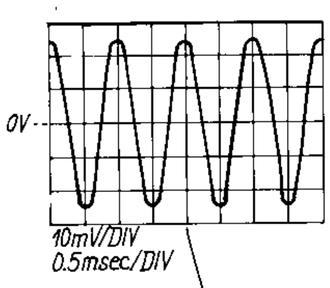
SCRAMBLER CRY2001, RT2048 and RE2100

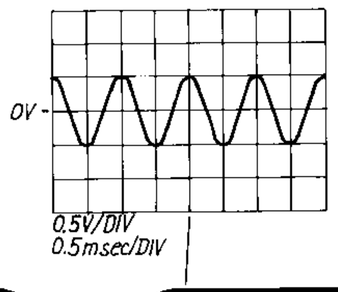


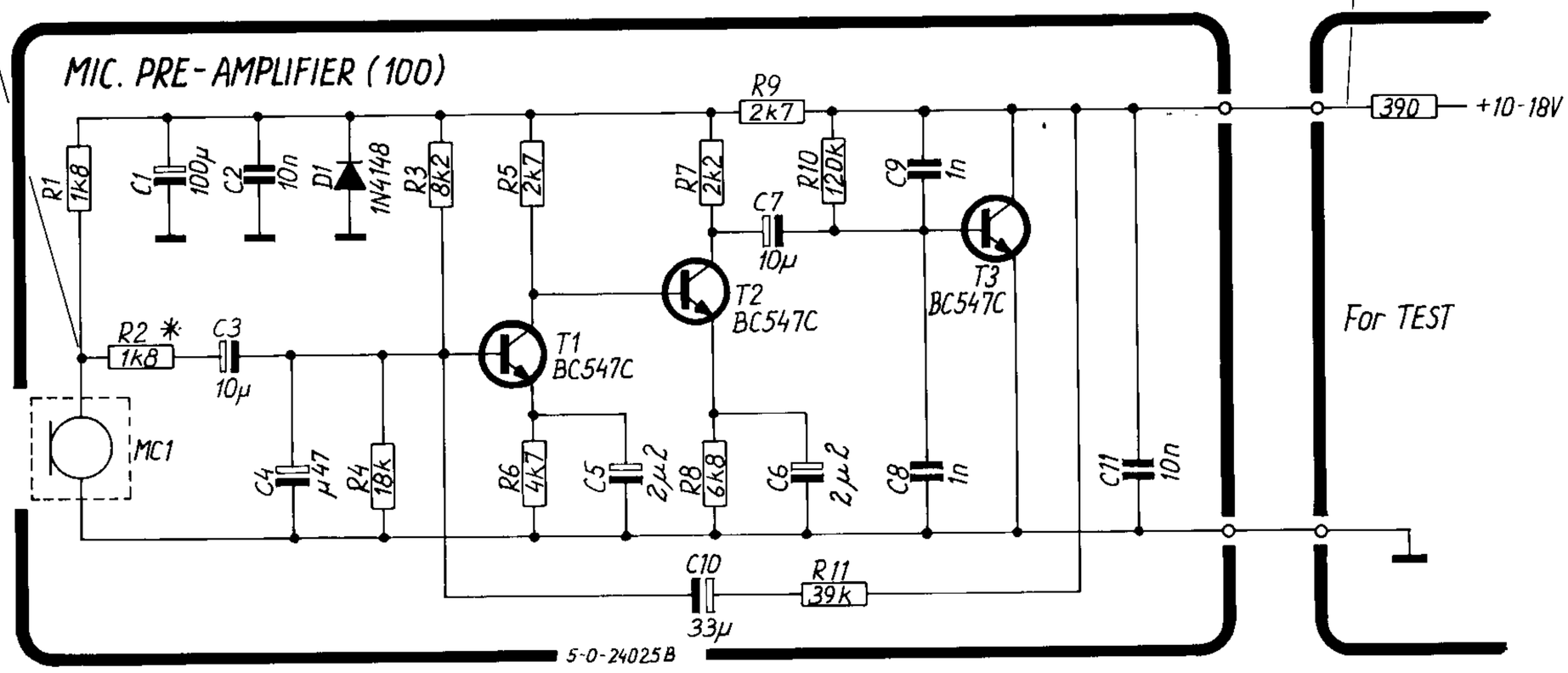
SHORTWAVE S130X











* In orange marked microtelephone cartridge R2 is changed from 1k8 to 5k6 ohm.

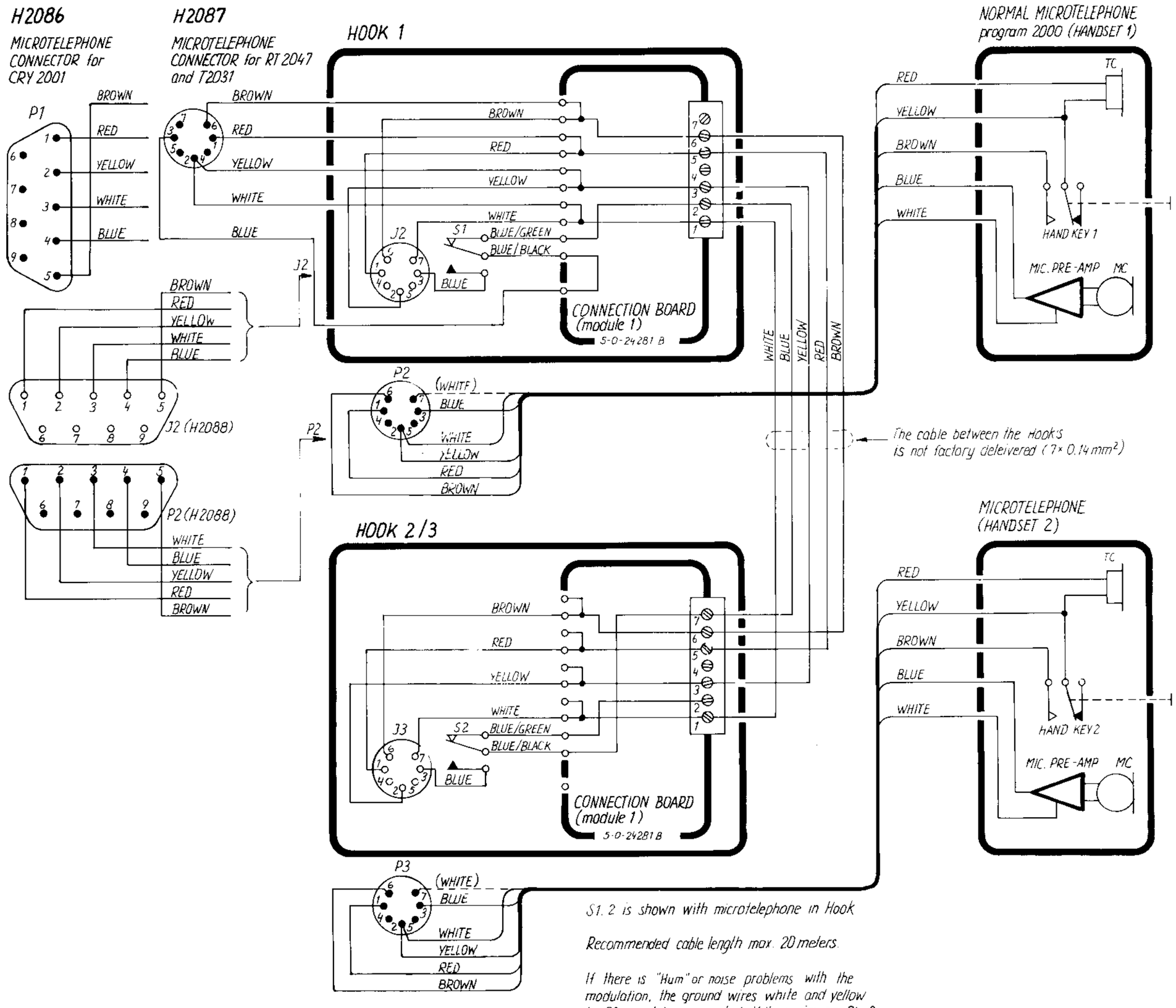
(D)

RT2047; RT2048, RE2100,
T2031, CRY2001 4-6-24025B
4-0-24293D 4-0-24025D

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMB
	MICROTELEPHONE	WITH ELECTRET MIC. AMP.	ESPERA	PRINT NR.5-0-24025B	600875
C1	CAPACITOR ELECTROLYTIC	100uF 20% 10V	*ERO	EKI 00 BB 310 C	14.607
C2	CAPACITOR CERAMIC	10nF -20/+80% 50V	#KCK	HE70SJYF103Z	15.170
C3	CAPACITOR ELECTROLYTIC	10uF 20% 35V	* ERO	EKI 00 AA 210 F	14.512
C4	CAPACITOR ELECTROLYTIC	0.47uF 20% 50V	ERO	EKI 00 AA 047 H	14.504
C5	CAPACITOR ELECTROLYTIC	10uF 20% 35V	* ERO	EKI 00 AA 210 F	14.512
C6	CAPACITOR ELECTROLYTIC	10uF 20% 35V	* ERO	EKI 00 AA 210 F	14.512
C7	CAPACITOR ELECTROLYTIC	10uF 20% 35V	* ERO	EKI 00 AA 210 F	14.512
C8	CAPACITOR CERAMIC	1nF 10% 100V	*PHILIPS	2222 630 03102	16.149
C9	CAPACITOR CERAMIC	1nF 10% 100V	*PHILIPS	2222 630 03102	16.149
C10	CAPACITOR ELECTROLYTIC	33uF 20% 16V	* ERO	EKI 00 AA 233 D	14.518
C11	CAPACITOR CERAMIC	10nF -20/+80% 50V	#KCK	HE70SJYF103Z	15.170
D1	DIODE	1N4148	* ITT	1N4148	25.131
MC1	MICROPHONE ELECTRET	WM-034BY	MATSUSHITA	WM-034BY	46.012
R1	RESISTOR	1.8 KOHM 5% 0.33W	BEYSCHLAG	MBA 0204-00-BX-5%	01.707
R2	RESISTOR	1.8 KOHM 5% 0.33W	BEYSCHLAG	MBA 0204-00-BX-5%	01.707
R3	RESISTOR	8.2 KOHM 5% 0.33W	BEYSCHLAG	MBA 0204-00-BX-5%	01.723
R4	RESISTOR	18 KOHM 5% 0.33W	BEYSCHLAG	MBA 0204-00-BX-5%	01.732
R5	RESISTOR	2.7 KOHM 5% 0.33W	BEYSCHLAG	MBA 0204-00-BX-5%	01.711
R6	RESISTOR	4.7 KOHM 5% 0.33W	BEYSCHLAG	MBA 0204-00-BX-5%	01.717
R7	RESISTOR	2.2 kOHM 5% 0.33W	BEYSCHLAG	MBA 0204-00-BX-5%	01.709
R8	RESISTOR	6.8 kOHM 5% 0.33W	BEYSCHLAG	MBA 0204-00-BX-5%	01.721
R9	RESISTOR	2.7 KOHM 5% 0.33W	BEYSCHLAG	MBA 0204-00-BX-5%	01.711
R10	RESISTOR	120 kOHM 5% 0.33W	BEYSCHLAG	MBA 0204-00-BX-5%	01.753
R11	RESISTOR	39 KOHM 5% 0.33W	BEYSCHLAG	MBA 0204-00-BX-5%	01.740
S1	MICROSWITCH	E62-10H PDT	CHERRY	E62-10H PDT	44.025
T1	TRANSISTOR	BC547C	SGS	BC547C	28.068
T2	TRANSISTOR	BC547C	SGS	BC547C	28.068
T3	TRANSISTOR	BC547C	SGS	BC547C	28.068
TC1	TELEPHONE CARTRIDGE	200 OHM	S.E.K. (KIRK)	0113.2518 (0113.2510)	46.010

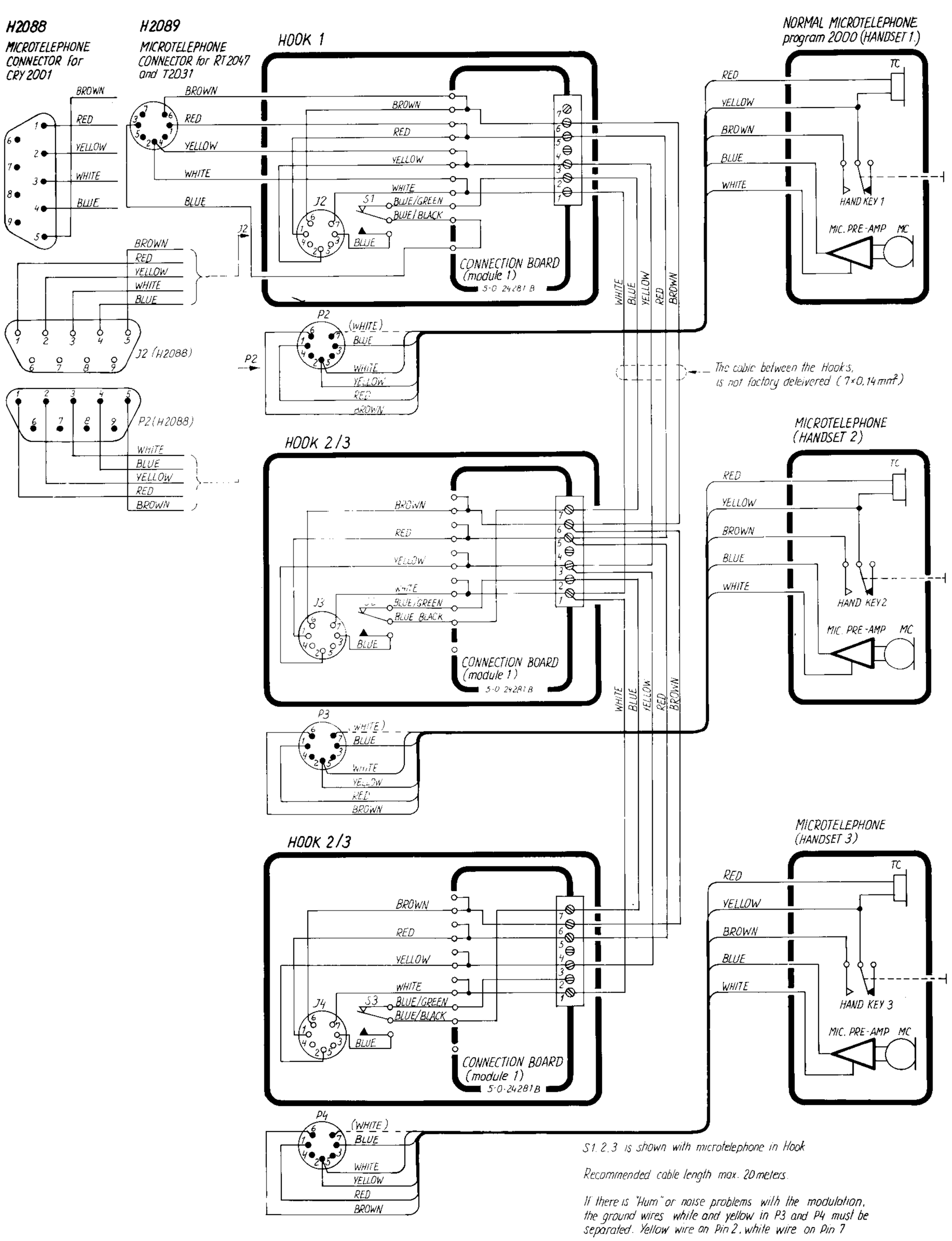
6.1. SPECIAL INSTALLATION WITH 2 MICROTELEPHONES: H2086 FOR SCRAMBLER CRY2001, RT2048 AND RE2100 H2087 FOR VHF RT2047 AND SSB T2031

MICROTELEPHONE ONE WITH PREFERENCE



6.2. SPECIAL INSTALLATION WITH 3 MICROTELEPHONES: H2088 FOR SCRAMBLER CRY2001, RT2048 AND RE2100 H2089 FOR VHF RT2047 AND SSB T2031

MICROTELEPHONE ONE WITH PREFERENCE



CRY2001, RT2047, T2031, RT2048, RE2100
4-0-24804A

CONTENTS

7. PARTS LIST

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
	SIMPLEX / SEMIDUPLEX VHF	**RT2048 STANDARD**	**ESPERA**	**VHF RT2048 (STANDARD) SAILOR GREEN**	**802048**
VARIOUS	**MINI 1/4 BOX CABINET**	**SAILOR GREEN**		**225435 GR\N RILSAN ALUMINIUM**	**141.751**
VARIOUS	KEYBOARD FOIL RT2048		ESPERA	1-0-25434C	225434
VARIOUS	POWER CABLE WITH PLUG		ESPERA	503758 POWERKABEL	503758
VARIOUS	MICROTELEPHONE WITH	CRADLE RT2048	ESPERA	3-0-25773	725773
VARIOUS	AERIAL PLUG	PL259	* RODAN	PL259/LODDE/BAKELIT INDL.	78.502
VARIOUS	**OPERATION INSTRUCTIONS**	**RT2048**	**S.P.RADIO A/S**		**B2048**
VARIOUS	SERVICE AND SALES AGENTS	ADRESSES WORLD WIDE	S.P.RADIO A/S		F1000GB
VARIOUS	MANUAL RT2048 ENGLISH		S.P.RADIO A/S		M2048GB

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
	KEYBOARD MODULE	**RT2048**	**ESPERA**	**5-0-25447**	**625447**
D1-1	**DIODE LIGHT EMITTING**	**SUB MINIATURE YELLOW**	**H.P.**	**HLMP-7019**	**25.649**
D2-1	DIODE LIGHT EMITTING	SUB MINIATURE YELLOW	H.P.	HLMP-7019	25.649
D3-1	DIODE LIGHT EMITTING	SUB MINIATURE YELLOW	H.P.	HLMP-7019	25.649
D4-1	DIODE LIGHT EMITTING	SUB MINIATURE YELLOW	H.P.	HLMP-7019	25.649
D5-1	DIODE LIGHT EMITTING	SUB MINIATURE YELLOW	H.P.	HLMP-7019	25.649
D6-1	**DIODE LIGHT EMITTING**	**SUB MINIATURE YELLOW**	**H.P.**	**HLMP-7019**	**25.649**
J1-1	INTERCONNECTION CABLE	10 POLES L=60mm	MOLEX	3-0-25465B	56.003
R1-1	RESISTOR MF	330 OHM 5% 0.4W	PHILIPS	2322 181 53331	01.187
R2-1	RESISTOR MF	330 OHM 5% 0.4W	PHILIPS	2322 181 53331	01.187
S1-1	SWITCH KEYBOARD	12x12mm	ALPS	SKHCAD (KHC 10904)	43.601
S2-1	**SWITCH KEYBOARD**	**12x12mm**	**ALPS**	**SKHCAD (KHC 10904)**	**43.601**
S3-1	SWITCH KEYBOARD	12x12mm	ALPS	SKHCAD (KHC 10904)	43.601
S4-1	SWITCH KEYBOARD	12x12mm	ALPS	SKHCAD (KHC 10904)	43.601
S5-1	SWITCH KEYBOARD	12x12mm	ALPS	SKHCAD (KHC 10904)	43.601
S6-1	SWITCH KEYBOARD	12x12mm	ALPS	SKHCAD (KHC 10904)	43.601
S7-1	**SWITCH KEYBOARD**	**12x12mm**	**ALPS**	**SKHCAD (KHC 10904)**	**43.601**
S8-1	SWITCH KEYBOARD	12x12mm	ALPS	SKHCAD (KHC 10904)	43.601
S9-1	SWITCH KEYBOARD	12x12mm	ALPS	SKHCAD (KHC 10904)	43.601
S10-1	SWITCH KEYBOARD	12x12mm	ALPS	SKHCAD (KHC 10904)	43.601
S11-1	SWITCH KEYBOARD	12x12mm	ALPS	SKHCAD (KHC 10904)	43.601
S12-1	**SWITCH KEYBOARD**	**12x12mm**	**ALPS**	**SKHCAD (KHC 10904)**	**43.601**

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
	INTERFACE MODULE	**RT2048**	**ESPERA**	**5-0-25450J**	**625450**
VARIOUS	**INTEGRATED CIRCUIT**	**CPU PROGRAMMED (C1078)**	**MOTOROLA**	**SP.SPEC: C1078B** ZC No: <99679>	**32.563**
VARIOUS	CONNECTION CABLE FOR	VOLUME CONTROL RT2048	AFD.32	3-0-25466	525466
VARIOUS	SOCKET	1/10" SIL 10 POLES	PRECI-DIP *	311-91-110	78.803
C1-2	CAPACITOR MKT	150nF 5% 50VDC	ERO	MKT 1826-415/06 4-G	11.181
C2-2	CAPACITOR ELECTROLYTIC	10uF 20% 35VDC	ERO	EKI 00 AA 210 F M9	14.512
C3-2	**CAPACITOR POLYPROPYLENE**	**2n2F 5% 100VDC**	*** ERO**	**KP 1830-222/01-4-GW**	**13.400**
C4-2	CAPACITOR CERAMIC	18pF 5% NPO 500VDC	NKE	DT 360 758S CH 180 J 500V FLAT PACK	15.060
C5-2	CAPACITOR CERAMIC	150pF 2% N150 100VDC	PHILIPS	2222 683 34151	15.148
C6-2	CAPACITOR CERAMIC	150pF 2% N150 100VDC	PHILIPS	2222 683 34151	15.148
C7-2	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
C8-2	**CAPACITOR CERAMIC**	**10nF -20/+80% CL2 50VDC**	**NKE**	**DT 350 758L F 103 Z 50V** FLAT PACK	**15.170**
C9-2	CAPACITOR CERAMIC	1nOF 10% CL2 500VDC	NKE	DT 360 758L B 102 K 500V FLAT PACK	15.160
C10-2	CAPACITOR MKT	22nF 5% 100VDC	PHILIPS	2222 370 89223	11.169
C11-2	CAPACITOR ELECTROLYTIC	220uF -20/+50% 16VDC	ERO	EKM 00 CC 322 D G5	14.640
C12-2	CAPACITOR ELECTROLYTIC	2200uF 20% 16VDC	* SAMHWA ELEC.	SV-2200uF-16WV	14.713
C13-2	**CAPACITOR MKT**	**470nF 5% 63VDC**	**PHILIPS**	**2222 370 79474**	**11.187**
C14-2	CAPACITOR MKT	15nF 5% 63VDC	PHILIPS*	2222 370 89153	11.173
C15-2	CAPACITOR ELECTROLYTIC	10uF 20% 35VDC	ERO	EKI 00 AA 210 F M9	14.512
C16-2	CAPACITOR ELECTROLYTIC	10uF 20% 35VDC	ERO	EKI 00 AA 210 F M9	14.512
C17-2	CAPACITOR MKT	0.1uF 10% 63VDC	PHILIPS	2222 370 78104	11.136
C18-2	**CAPACITOR MKT**	**220nF 5% 63VDC**	**PHILIPS***	**2222 370 79224**	**11.182**
C19-2	CAPACITOR MKT	220nF 20% 63VDC	ERO	MKT 1826-422/06 6-G	11.183
C20-2	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
C21-2	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C22-2	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C23-2	**CAPACITOR CERAMIC**	**1nOF 10% CL2 500VDC**	**NKE**	**DT 360 758L B 102 K 500V** FLAT PACK	**15.160**
C24-2	CAPACITOR CERAMIC	1nOF 10% CL2 500VDC	NKE	DT 360 758L B 102 K 500V FLAT PACK	15.160
C25-2	CAPACITOR CERAMIC	1nOF 10% CL2 500VDC	NKE	DT 360 758L B 102 K 500V FLAT PACK	15.160
C27-2	CAPACITOR POLYPROPYLENE	1nF 5% 10VDC	ERO	KP 1830-210/01-4-GW	13.398
C26-2	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V	15.170

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
				FLAT PACK	
D1-2	**DIODE RECTIFIER**	**1N4002 100V/1A**	**THOMSON**	**1N4002 (03/04/05/06/07)**	**25.100**
D2-2	DIODE ZENER	4V7 2% 0.4W	PHILIPS	BZX79B4V7	26.496
D3-2	DIODE LIGHT EMITTING	REDSQUARE 5x5mm	TFK	TLSH 5301	25.538
D4-2	DIODE LIGHT EMITTING	YELLOW SQUARE 5x5mm	# TFK	TLSY 5301	25.539
D5-2	DIODE LIGHT EMITTING	REDSQUARE 5x5mm	TFK	TLSH 5301	25.538
D6-2	**DISPLAY 7SEGMENT LED**	**HDSP-5551 RED**	**HP**	**HDSP-5551**	**25.725**
D7-2	DISPLAY 7SEGMENT LED	HDSP-5551 RED	HP	HDSP-5551	25.725
D8-2	DIODE SCHOTTKY	BAT 43	THOMSON-CSF	BAT43	27.600
D9-2	DIODE SCHOTTKY	BAT 43	THOMSON-CSF	BAT43	27.600
D10-2	DIODE ZENER	5.1V 2% 0.4W	* PHILIPS	BZX79B5V1	26.497
J1-2	**SOCKET**	**10 POLES F.RIBBON CABLE**	**MOLEX**	**52011-1010**	**78.283**
J2-2	SOCKET	7 POLES F.RIBBON CABLE	MOLEX	52011-0710	78.280
J3-2	SOCKET COAX	VERTICAL FOR PCB MOUNT.	TAIKO	TMP-J01X-V6	78.518
J4-2	SOCKET COAX	VERTICAL FOR PCB MOUNT.	TAIKO	TMP-J01X-V6	78.518
L1-2	FERRITE BEAD INDUCTOR	DOUBLE BEAD CORE	MURATA	BL02RN2-R62T2	35.300
L2-2	**FERRITE BEAD INDUCTOR**	**DOUBLE BEAD CORE**	**MURATA**	**BL02RN2-R62T2**	**35.300**
L3-2	CHOKE FIXED	120uH 10%	FASTRON	MICC-121K-02	20.372
P1-2	MULTIPLUG	2x15 POLES PCB VERSION	3M	3531-6002 / 7630-6002 JL	78.253
P2-2	PLUG	1/10" SIL SQ.PINS 2 POLES	AMP	0-826629-2 (0-826647-2)	78.322
P3-2	PLUG	1/10" SIL SQ.PINS 2 POLES	AMP	0-826629-2 (0-826647-2)	78.322
Q1-2	**TRANSISTOR AF**	**BC328-25 PNP TO-92**	**PHILIPS**	**BC328-25**	**28.052**
Q2-2	TRANSISTOR AF	BC338-25 NPN TO-92	PHILIPS	BC338-25	28.058
Q3-2	TRANSISTOR J FET	N CHANNEL BF245A	* PHILIPS	BF245A	29.714
Q4-2	TRANSISTOR AF	BC328-25 PNP TO-92	PHILIPS	BC328-25	28.052
Q5-2	TRANSISTOR AF	BC558B	PHILIPS	BC558B	28.100
Q6-2	**TRANSISTOR AF**	**BC548B NPN TO-92**	**PHILIPS**	**BC548B**	**28.076**
Q7-2	TRANSISTOR AF	BC548B NPN TO-92	PHILIPS	BC548B	28.076
Q8-2	TRANSISTOR AF	BC548B NPN TO-92	PHILIPS	BC548B	28.076
R1-2	RESISTOR MF	22k OHM 5% 0.4W	PHILIPS	2322 181 53223	01.233
R2-2	RESISTOR MF	22k OHM 5% 0.4W	PHILIPS	2322 181 53223	01.233
R3-2	**RESISTOR MF**	**150 OHM 5% 0.4W**	**PHILIPS**	**2322 181 53151**	**01.179**
R4-2	RESISTOR	0 OHM	* PHILIPS	2322 181 90018	01.110
R6-2	RESISTOR MF	36k5 OHM 1% 0.6W	PHILIPS	2322 156 13653	03.438
R7-2	RESISTOR MF	2k7 OHM 5% 0.4W	PHILIPS	2322 181 53272	01.210
R8-2	RESISTOR MF	1k5 OHM 5% 0.4W	PHILIPS	2322 181 53152	01.204
R9-2	**RESISTOR MF**	**75 OHM 5% 0.4W**	**PHILIPS**	**2322 181 53759**	**01.171**
R10-2	POTENTIOMETER	50k OHM 20% 50mW LOG	NOBLE	779-9013	08.286
R11-2	RESISTOR ARRAY	4x5k6 OHM 5% 1/4W	MURATA	RG SD Y 562J	08.626
R12-2	RESISTOR MF	97k6 OHM 1% 0.6W	* PHILIPS	2322 156 19763	03.471
R13-2	RESISTOR MF	1k21 OHM 1% 0.6W	PHILIPS	2322 156 11212	03.227
R14-2	**RESISTOR MF**	**33k2 OHM 1% 0.6W**	*** PHILIPS**	**2322 156 13323**	**03.232**

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
R15-2	**RESISTOR MF**	**270k OHM 1% 0.6W**	*** PHILIPS**	**2322 156 12704**	**03.465**
R16-2	RESISTOR MF	4k32 OHM 1% 0.6W	* PHILIPS	2322 156 14322	03.415
R17-2	RESISTOR MF	120k OHM 5% 0.4W	PHILIPS	2322 181 53124	01.252
R18-2	RESISTOR MF	91k OHM 5% 0.4W	PHILIPS	2322 181 53913	01.248
R19-2	RESISTOR MF	330k OHM 1% 0.6W	PHILIPS	2322 156 13304	03.270
R20-2	**RESISTOR MF**	**10k OHM 5% 0.4W**	**PHILIPS**	**2322 181 53103**	**01.225**
R21-2	RESISTOR MF	150k OHM 5% 0.4W	PHILIPS	2322 181 53154	01.254
R22-2	RESISTOR MF	10k OHM 5% 0.4W	PHILIPS	2322 181 53103	01.225
R23-2	POTENTIOMETER	10k OHM 10% 0.1W LOG	NOBLE	V90-10155-D	08.257
R24-2	RESISTOR ARRAY	8x100k OHM 5% 1/8W	MURATA	RG LD 8 X 104 J	08.655
R25-2	**RESISTOR MF**	**10k OHM 5% 0.4W**	**PHILIPS**	**2322 181 53103**	**01.225**
R26-2	RESISTOR MF	51k0 OHM 1% 0.6W	* PHILIPS	2322 156 15103	03.462
R27-2	RESISTOR MF	270k OHM 1% 0.6W	* PHILIPS	2322 156 12704	03.465
R28-2	RESISTOR ARRAY	4x10k OHM 5% 1/8W	PANASONIC	EXBF8V103G (4X10K)	08.615
R29-2	RESISTOR ARRAY	4x10k OHM 5% 1/8W	PANASONIC	EXBF8V103G (4X10K)	08.615
R30-2	**RESISTOR MF**	**3k3 OHM 5% 0.4W**	**PHILIPS**	**2322 181 53332**	**01.212**
R31-2	RESISTOR MF	100k OHM 5% 0.4W	PHILIPS	2322 181 53104	01.250
R32-2	RESISTOR MF	3k48 OHM 1% 0.6W	PHILIPS	2322 156 13482	03.400
R33-2	RESISTOR ARRAY	4x820 OHM 5% 0.25W	PANASONIC	EXBF8V821G (4X820R)	08.601
R34-2	RESISTOR ARRAY	4x820 OHM 5% 0.25W	PANASONIC	EXBF8V821G (4X820R)	08.601
R35-2	**RESISTOR ARRAY**	**4x820 OHM 5% 0.25W**	**PANASONIC**	**EXBF8V821G (4X820R)**	**08.601**
R36-2	RESISTOR ARRAY	4x820 OHM 5% 0.25W	PANASONIC	EXBF8V821G (4X820R)	08.601
R38-2	RESISTOR ARRAY	4x10k OHM 5% 1/8W	PANASONIC	EXBF8V103G (4X10K)	08.615
R39-2	RESISTOR MF	8k25 OHM 1% 0.6W	* PHILIPS	2322 156 18252	03.423
R40-2	RESISTOR MF	10k0 OHM 1% 0.6W	* PHILIPS	2322 156 11003	03.427
R41-2	**RESISTOR MF**	**15k0 OHM 1% 0.6W**	**PHILIPS**	**2322 156 11503**	**03.429**
R42-3	RESISTOR ARRAY	4x330 OHM 5% 1/4W	MURATA	RG SD 4 Y 331J	08.608
R43-2	RESISTOR MF	47 OHM 5% 0.4W	PHILIPS	2322 181 53479	01.166
R44-2	RESISTOR MF	1k0 OHM 5% 0.4W	PHILIPS	2322 181 53102	01.200
R45-2	RESISTOR MF	3k9 OHM 5% 0.4W	PHILIPS	2322 181 53392	01.214
R46-2	**RESISTOR MF**	**750 OHM 5% 0.4W**	**PHILIPS**	**2322 181 53751**	**01.196**
R47-2	RESISTOR MF	18k OHM 5% 0.4W	PHILIPS	2322 181 53183	01.231
R48-2	RESISTOR MF	820 OHM 5% 0.4W	PHILIPS	2322 181 53821	01.197
R49-2	RESISTOR MF	15k OHM 5% 0.4W	PHILIPS	2322 181 53153	01.229
R50-2	RESISTOR MF	270k OHM 1% 0.6W	* PHILIPS	2322 156 12704	03.465
R54-2	**RESISTOR MF**	**4k7 OHM 5% 0.4W**	**PHILIPS**	**2322 181 53472**	**01.216**
R55-2	RESISTOR MF	3k3 OHM 5% 0.4W	PHILIPS	2322 181 53332	01.212
R56-2	RESISTOR MF	4k7 OHM 5% 0.4W	PHILIPS	2322 181 53472	01.216
R57-2	RESISTOR MF	3k3 OHM 5% 0.4W	PHILIPS	2322 181 53332	01.212
R58-2	RESISTOR MF	100k OHM 5% 0.4W	PHILIPS	2322 181 53104	01.250
R59-2	**RESISTOR MF**	**5k11 OHM 1% 0.6W**	*** PHILIPS**	**2322 156 15112**	**03.414**
R60-2	RESISTOR MF	357 OHM 1% 0.6W	* PHILIPS	2322 156 13571	02.204
U1-2	EEPROM	1k BIT SERIAL	OKI	MSM16811RS	32.708
U2-2	EEPROM	1k BIT SERIAL	OKI	MSM16811RS	32.708

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
U3-2	**SOCKET**	**DIL 2x20 POLES**	*** AMP**	**641606-3**	**30.935**
U4-2	INTEGRATED CIRCUIT	8 BIT SHIFT REG.SERIAL IO	NATIONAL	MM74HC595N	34.502
U5-2	INTEGRATED CIRCUIT	8 BIT SHIFT REG.SERIAL IO	NATIONAL	MM74HC595N	34.502
U6-2	INTEGRATED CIRCUIT	8 BIT SHIFT REG.SERIAL IO	NATIONAL	MM74HC595N	34.502
U7-2	INTEGRATED CIRCUIT	QUAD VOLTAGE COMPERATOR	TEXAS*	LM339N	31.075
U8-2	**QUAD OP.AMP.**	**324**	**TEXAS**	**LM324N**	**31.065**
U9-2	VOLTAGE REGULATOR	ADJUSTABLE Io=100mA	TEXAS	TL317CLP	31.145

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
	SYNTESE MODULE	**RT2048**	**ESPERA**	**5-0-25451G**	**625451**
			DAFA	23-20 V1200	51.108
C1-3	**CAPACITOR MKT**	**0.1uF 10% 63VDC**	**PHILIPS**	**2222 370 78104**	**11.136**
C2-3	CAPACITOR MKT	220nF 10% 63VDC	PHILIPS	2222 370 78224	11.095
C3-3	CAPACITOR POLYSTYRENE	56pF 1% 630V	#PHILIPS	2222 431 85609	10.394
C4-3	CAPACITOR POLYSTYRENE	300pF 1% 630VDC	PHILIPS	2222 431 83001	10.414
C5-3	CAPACITOR ELECTROLYTIC	100uF -10/+50% 25VDC	ERO	EKM 00 CC 310 E G5	14.610
C6-3	**CAPACITOR POLYSTYRENE**	**51pF 1% 630V**	**#PHILIPS**	**2222 431 85109**	**10.393**
C7-3	CAPACITOR MKT	22nF 10% 100VDC	PHILIPS	2222 370 88223	11.175
C8-3	CAPACITOR MKT	22nF 10% 100VDC	PHILIPS	2222 370 88223	11.175
C9-3	CAPACITOR MKT	22nF 10% 100VDC	PHILIPS	2222 370 88223	11.175
C10-3	CAPACITOR MKT	220nF 10% 63VDC	PHILIPS	2222 370 78224	11.095
C11-3	**CAPACITOR MKT**	**22nF 10% 100VDC**	**PHILIPS**	**2222 370 88223**	**11.175**
C12-3	CAPACITOR ELECTROLYTIC	47uF 20% 25VDC	ERO	EKI 00 BB 247 E M9	14.524
C13-3	CAPACITOR MKT	220nF 5% 63VDC	PHILIPS*	2222 370 79224	11.182
C14-3	CAPACITOR ELECTROLYTIC	22uF 20% 35VDC	ERO	EKI 00 BB 222 F M9	14.516
C15-3	CAPACITOR ELECTROLYTIC	10uF 20% 35VDC	ERO	EKI 00 AA 210 F M9	14.512
C16-3	**CAPACITOR ELECTROLYTIC**	**4.7uF 20% 50VDC**	**ERO**	**EKI 00 AA 147 H M9**	**14.510**
C17-3	CAPACITOR MKT	1u5F 10% 50VDC	ERO	MKT 1826 515/05 5-G	11.191
C18-3	CAPACITOR POLYSTYRENE	12n1F 1% 63VDC	* PHILIPS	2222 443 41213	10.796
C19-3	CAPACITOR ELECTROLYTIC	1uF 20% 50VDC	ERO	EKI 00 AA 110 H M9	14.506
C20-3	CAPACITOR CERAMIC	39pF 5% NPO 50VDC	NKE	DT 350 758L CH 390 J 50V FLAT PACK	15.085
C21-3	**CAPACITOR CERAMIC**	**5p6F +/-0.25pF NPO 500VDC**	**NKE**	**DT35-0465 758S CH 5R6 C** 500V FLAT PACK	**15.015**
C22-3	CAPACITOR CERAMIC	1nOF 10% CL2 500VDC	NKE	DT 360 758L B 102 K 500V FLAT PACK	15.160
C23-3	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C24-3	CAPACITOR CERAMIC	6p8F +/-0.25pF NPO 100VDC	PHILIPS	2222 683 09688	15.325
C25-3	CAPACITOR CERAMIC	1nOF 10% CL2 500VDC	NKE	DT 360 758L B 102 K 500V FLAT PACK	15.160
C26-3	**CAPACITOR CERAMIC**	**1nOF 10% CL2 500VDC**	**NKE**	**DT 360 758L B 102 K 500V** FLAT PACK	**15.160**
C27-3	CAPACITOR CERAMIC	1nOF 10% CL2 500VDC	NKE	DT 360 758L B 102 K 500V FLAT PACK	15.160
C28-3	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
C29-3	CAPACITOR MKT	1uF 5% 63VDC	PHILIPS	2222 370 79105	11.190
C30-3	CAPACITOR MKT	470nF 5% 63VDC	PHILIPS	2222 370 79474	11.187
C31-3	**CAPACITOR MKT**	**22nF 5% 100VDC**	**PHILIPS**	**2222 370 89223**	**11.169**
C32-3	CAPACITOR ELECTROLYTIC	47uF 20% 25VDC	ERO	EKI 00 BB 247 E M9	14.524

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
C33-3	**CAPACITOR CERAMIC**	**100pF 5% NPO 50VDC**	**NKE**	**DT 380 758L CH 101 J 50V** FLAT PACK	**15.136**
C34-3	CAPACITOR POLYSTYRENE	825pF 1% 63VDC	PHILIPS	2222 443 48251	10.755
C35-3	CAPACITOR MKT	150nF 5% 50VDC	ERO	MKT 1826-415/06 4-G	11.181
C36-3	CAPACITOR MKT	68nF 5% 63VDC	PHILIPS	2222 370 79683	11.178
C37-3	CAPACITOR MKT	1uF 10% 63VDC	PHILIPS	2222 370 78105	11.137
C38-3	**CAPACITOR POLYSTYRENE**	**12n1F 1% 63VDC**	*** PHILIPS**	**2222 443 41213**	**10.796**
C39-3	CAPACITOR POLYSTYRENE	221pF 1% 63VDC	PHILIPS	2222 443 42211	10.727
C41-3	CAPACITOR ELECTROLYTIC	47uF 20% 25VDC	ERO	EKI 00 BB 247 E M9	14.524
C42-3	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C43-3	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C44-3	**CAPACITOR ELECTROLYTIC**	**100uF -10/+50% 25VDC**	**ERO**	**EKM 00 CC 310 E G5**	**14.610**
C45-3	CAPACITOR MKT	330nF 5% 63VDC	PHILIPS*	2222 370 79334	11.184
C46-3	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C47-3	CAPACITOR CERAMIC	15pF 5% N150 500VDC	NKE	DT 350 758L PH 150 J 500V FLAT PACK	16.115
C48-3	CAPACITOR CERAMIC	22pF 5% N150 500VDC	KCK	RT-HM SK PH 220 J AMMO PACK	15.062
C49-3	**CAPACITOR CERAMIC**	**13pF 5% N150 50VDC**	**NKE**	**DT 340 758S PH 130 J 50V** FLAT PACK	**15.051**
C50-3	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C51-3	CAPACITOR CERAMIC	2p7F +/-0.25pF N150 50VDC	NKE	DT 330 758S PJ 2R7 C 50V FLAT PACK	15.001
C52-3	CAPACITOR CERAMIC	18pF 5% NPO 500VDC	NKE	DT 360 758S CH 180 J 500V FLAT PACK	15.060
C53-3	CAPACITOR CERAMIC	18pF 5% NPO 500VDC	NKE	DT 360 758S CH 180 J 500V FLAT PACK	15.060
C54-3	**CAPACITOR CERAMIC**	**470pF 10% 500VDC**	**NKE**	**DT35-0465 758L 471BK 500V** FLAT PACK	**16.095**
C55-3	CAPACITOR CERAMIC	12pF 5% NPO 500VDC	NKE	DT350465 758S CH 120J 500 FLAT PACK	15.575
C56-3	CAPACITOR CERAMIC	8p2F +-0.25pF NPO 500VDC	NKE	DT 350 758L CH 8R2 C 500V FLAT PACK	15.030
C57-3	CAPACITOR CERAMIC	18pF 5% NPO 500VDC	NKE	DT 360 758S CH 180 J 500V FLAT PACK	15.060
C58-3	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C59-3	**CAPACITOR CERAMIC**	**18pF 2% NPO 100VDC**	**PHILIPS**	**2222 683 10189**	**15.330**
C60-3	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
C61-3	**CAPACITOR CERAMIC**	**12pF 2% NPO 100VDC**	**PHILIPS**	**2222 683 10129**	**15.328**
C62-3	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C63-3	CAPACITOR ELECTROLYTIC	10uF 20% 35VDC	ERO	EKI 00 AA 210 F M9	14.512
C64-3	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C65-3	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C66-3	**CAPACITOR CERAMIC**	**15pF 2% NPO 100VDC**	**PHILIPS**	**2222 683 10159**	**15.329**
C67-3	CAPACITOR CERAMIC	15pF 2% NPO 100VDC	PHILIPS	2222 683 10159	15.329
C68-3	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C69-3	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C70-3	CAPACITOR CERAMIC	12pF 2% NPO 100VDC	PHILIPS	2222 683 10129	15.328
C71-3	**CAPACITOR CERAMIC**	**470pF 10% 500VDC**	**NKE**	**DT35-0465 758L 471BK 500V FLAT PACK**	**16.095**
C72-3	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
C73-3	CAPACITOR CERAMIC	33pF 2% NPO 100VDC	PHILIPS	2222 683 10339	15.333
C74-3	CAPACITOR ELECTROLYTIC	10uF 20% 35VDC	ERO	EKI 00 AA 210 F M9	14.512
C75-3	CAPACITOR ELECTROLYTIC	10uF 20% 35VDC	ERO	EKI 00 AA 210 F M9	14.512
C76-3	**CAPACITOR ELECTROLYTIC**	**220uF -20/+50% 16VDC**	**ERO**	**EKM 00 CC 322 D G5**	**14.640**
C77-3	CAPACITOR TRIMMING	3.9-27pF PTFE	DAU	107.3901.027	17.110
C78-3	CAPACITOR TRIMMING	1.8-9pF PTFE	DAU	117 1991 009 B021	17.090
C79-3	CAPACITOR MKT	220nF 10% 63VDC	PHILIPS	2222 370 78224	11.095
C80-3	CAPACITOR MKT	0.1uF 10% 63VDC	PHILIPS	2222 370 78104	11.136
D1-3	**DIODE**	**BAW62 HIGH SPEED**	**PHILIPS**	**BAW62-143**	**25.350**
D2-3	DIODE	1N4150	PHILIPS	1N4150	25.140
D3-3	DIODE SCHOTTKY	BAT 43	THOMSON-CSF	BAT43	27.600
D4-3	DIODE	BAW62 HIGH SPEED	PHILIPS	BAW62-143	25.350
D5-3	DIODE	1N4148 HIGH SPEED	PHILIPS	1N4148-143	25.131
D6-3	**DIODE SWITCH**	**FACTORY SELECTED MPN 3700**	**ESPERA**	**C1082A / 0-0-25550**	**725550**
D7-3	DIODE SWITCH	BA282	ITT	BA282	25.390
D8-3	DIODE SWITCH	BA282	ITT	BA282	25.390
D9-3	DIODE CAPASITANCE	13pF/9VDC	TOSHIBA	1SV101 in matched group	26.135
D10-3	DIODE SCHOTTKY	BAT 43	THOMSON-CSF	BAT43	27.600
J1-3	SOCKET COAX	HORISONTAL FOR PCB MOUNT.	TAIKO	TMP-J01X-A2	78.517
J2-3	**SOCKET COAX**	**HORISONTAL FOR PCB MOUNT.**	**TAIKO**	**TMP-J01X-A2**	**78.517**
J3-3	SOCKET COAX	HORISONTAL FOR PCB MOUNT.	TAIKO	TMP-J01X-A2	78.517
J4-3	SOCKET COAX	HORISONTAL FOR PCB MOUNT.	TAIKO	TMP-J01X-A2	78.517
L1-3	CHOKE	0.10uH 5%	WEST CAP	1A1003M-5% / TAPED	20.099
L3-3	CHOKE	4u7H 10%	FASTRON	MICC-4R7K-02	20.137
L4-3	**CHOKE**	**4u7H 10%**	**FASTRON**	**MICC-4R7K-02**	**20.137**

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
L5-3	**CHOKE**	**4u7H 10%**	**FASTRON**	**MICC-4R7K-02**	**20.137**
L6-3	CHOKE	0.10uH 5%	WEST CAP	1A1003M-5% / TAPED	20.099
L7-3	CHOKE	0.10uH 5%	WEST CAP	1A1003M-5% / TAPED	20.099
L8-3	CHOKE	0.10uH 5%	WEST CAP	1A1003M-5% / TAPED	20.099
L9-3	COIL RF	0.11uH ADJUSTABLE	TOKO	E526HN-100117	38.409
P1-3	**PLUG PCB**	**2x5 POLES RIGHT ANGLE**	**3M**	**7610-5002-JL**	**78.252**
Q1-3	TRANSISTOR	BF509	AEG*	BF509	28.203
Q2-3	TRANSISTOR RF	BF199	PHILIPS	BF199	28.178
Q3-3	TRANSISTOR RF SWITCH	2N2369A	MOTOROLA	2N2369A	28.315
Q4-3	TRANSISTOR AF	BC548B NPN TO-92	PHILIPS	BC548B	28.076
Q5-3	**TRANSISTOR AF**	**BC558B**	**PHILIPS**	**BC558B**	**28.100**
Q6-3	TRANSISTOR AF	BC338-25 NPN TO-92	PHILIPS	BC338-25	28.058
Q7-3	TRANSISTOR RF	LOW POWER PNP BF979	TELEFUNKEN AG	BF979	28.251
Q8-3	TRANSISTOR AF	BC558B	PHILIPS	BC558B	28.100
Q9-3	TRANSISTOR AF	BC548B NPN TO-92	PHILIPS	BC548B	28.076
Q10-3	**TRANSISTOR**	**BC549C**	**PHILIPS***	**BC549C**	**28.082**
Q11-3	TRANSISTOR	BC549C	PHILIPS*	BC549C	28.082
Q12-3	TRANSISTOR AF	BC548B NPN TO-92	PHILIPS	BC548B	28.076
Q13-3	TRANSISTOR	2N4427	MOTOROLA*	2N4427	28.330
Q14-3	TRANSISTOR RF	BFW92A	TFK	BFW92A	29.160
Q15-3	**TRANSISTOR RF**	**LOW POWER PNP BF979**	**TELEFUNKEN AG**	**BF979**	**28.251**
Q16-3	TRANSISTOR RF	BFW92A	TFK	BFW92A	29.160
Q17-3	TRANSISTOR J FET	N CHANNEL BF245A	* PHILIPS	BF245A	29.714
Q18-3	TRANSISTOR JFET	N-CHAN. J309	* SILICONIX	J309	29.724
R1-3	RESISTOR MF	20k0 OHM 1% 0.6W	* PHILIPS	2322 156 12003	03.452
R2-3	**RESISTOR MF**	**60k4 OHM 1% 0.6W**	*** PHILIPS**	**2322 156 16043**	**03.238**
R3-3	RESISTOR MF	33k2 OHM 1% 0.6W	* PHILIPS	2322 156 13323	03.232
R4-3	RESISTOR MF	100k OHM 1% 0.6W	* PHILIPS	2322 156 11004	03.477
R5-3	RESISTOR MF	221k OHM 1% 0.6W	* PHILIPS	2322 156 12214	03.483
R6-3	RESISTOR MF	47k OHM 5% 0.4W	PHILIPS	2322 181 53473	01.241
R7-3	**RESISTOR MF**	**6k8 OHM 5% 0.4W**	**PHILIPS**	**2322 181 53682**	**01.220**
R8-3	RESISTOR MF	220 OHM 5% 0.4W	PHILIPS	2322 181 53221	01.183
R9-3	RESISTOR MF	33 OHM 5% 0.4W	PHILIPS	2322 181 53339	01.162
R10-3	RESISTOR MF	82 OHM 5% 0.4W	PHILIPS	2322 181 53829	01.172
R11-3	RESISTOR MF	12k OHM 5% 0.4W	PHILIPS	2322 181 53123	01.227
R12-3	**RESISTOR MF**	**18k OHM 5% 0.4W**	**PHILIPS**	**2322 181 53183**	**01.231**
R13-3	RESISTOR MF	51 OHM 5% 0.4W	PHILIPS	2322 181 53519	01.167
R14-3	RESISTOR MF	12k OHM 5% 0.4W	PHILIPS	2322 181 53123	01.227
R15-3	RESISTOR MF	3k3 OHM 5% 0.4W	PHILIPS	2322 181 53332	01.212
R16-3	RESISTOR MF	2k0 OHM 5% 0.4W	PHILIPS	2322 181 53202	01.207
R17-3	**RESISTOR MF**	**1k5 OHM 5% 0.4W**	**PHILIPS**	**2322 181 53152**	**01.204**
R18-3	RESISTOR MF	18k OHM 5% 0.4W	PHILIPS	2322 181 53183	01.231
R19-3	RESISTOR MF	820 OHM 5% 0.4W	PHILIPS	2322 181 53821	01.197
R20-3	RESISTOR MF	5k6 OHM 5% 0.4W	PHILIPS	2322 181 53562	01.218

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
R21-3	**RESISTOR MF**	**820 OHM 5% 0.4W**	**PHILIPS**	**2322 181 53821**	**01.197**
R22-3	RESISTOR MF	1k5 OHM 5% 0.4W	PHILIPS	2322 181 53152	01.204
R23-3	RESISTOR MF	1k3 OHM 1% 0.6W	* PHILIPS	2322 156 11302	03.402
R24-3	RESISTOR MF	1k3 OHM 1% 0.6W	* PHILIPS	2322 156 11302	03.402
R25-3	RESISTOR MF	220 OHM 5% 0.4W	PHILIPS	2322 181 53221	01.183
R26-3	**RESISTOR MF**	**120 OHM 5% 0.4W**	**PHILIPS**	**2322 181 53121**	**01.177**
R27-3	RESISTOR MF	60k4 OHM 1% 0.6W	* PHILIPS	2322 156 16043	03.238
R28-3	RESISTOR MF	60k4 OHM 1% 0.6W	* PHILIPS	2322 156 16043	03.238
R29-3	RESISTOR MF	100k OHM 5% 0.4W	PHILIPS	2322 181 53104	01.250
R30-3	RESISTOR MF	30k OHM 5% 0.4W	PHILIPS	2322 181 53303	01.236
R31-3	**RESISTOR MF**	**56 OHM 5% 0.4W**	**PHILIPS**	**2322 181 53569**	**01.168**
R33-3	RESISTOR MF	30k OHM 5% 0.4W	PHILIPS	2322 181 53303	01.236
R34-3	RESISTOR MF	1M0 OHM 5% 0.4W	PHILIPS	2322 181 53105	01.275
R35-3	RESISTOR MF	330 OHM 5% 0.4W	PHILIPS	2322 181 53331	01.187
R36-3	RESISTOR MF	1k0 OHM 5% 0.4W	PHILIPS	2322 181 53102	01.200
R37-3	**RESISTOR MF**	**110k OHM 5% 0.4W**	**PHILIPS**	**2322 181 53114**	**01.251**
R38-3	RESISTOR MF	33 OHM 5% 0.4W	PHILIPS	2322 181 53339	01.162
R39-3	RESISTOR MF	270k OHM 5% 0.4W	PHILIPS	2322 181 53274	01.260
R40-3	RESISTOR MF	820 OHM 5% 0.4W	PHILIPS	2322 181 53821	01.197
R41-3	RESISTOR MF	4k7 OHM 5% 0.4W	PHILIPS	2322 181 53472	01.216
R42-3	**RESISTOR MF**	**270k OHM 5% 0.4W**	**PHILIPS**	**2322 181 53274**	**01.260**
R43-3	RESISTOR MF	430 OHM 5% 0.4W	* PHILIPS	2322 181 53431	01.190
R44-3	RESISTOR MF	8k2 OHM 5% 0.4W	PHILIPS	2322 181 53822	01.222
R45-3	RESISTOR MF	4k7 OHM 5% 0.4W	PHILIPS	2322 181 53472	01.216
R46-3	RESISTOR MF	1k2 OHM 5% 0.4W	PHILIPS	2322 181 53122	01.202
R47-3	**RESISTOR MF**	**330 OHM 5% 0.4W**	**PHILIPS**	**2322 181 53331**	**01.187**
R48-3	RESISTOR MF	82 OHM 5% 0.4W	PHILIPS	2322 181 53829	01.172
R49-3	RESISTOR MF	2k43 OHM 1% 0.6W	* PHILIPS	2322 156 12432	03.396
R50-3	RESISTOR MF	56k OHM 5% 0.4W	PHILIPS	2322 181 53563	01.243
R51-3	RESISTOR MF	1k0 OHM 5% 0.4W	PHILIPS	2322 181 53102	01.200
R52-3	**RESISTOR MF**	**221 OHM 1% 0.6W**	*** PHILIPS**	**2322 156 12211**	**03.384**
R53-3	RESISTOR MF	5k11 OHM 1% 0.6W	* PHILIPS	2322 156 15112	03.414
R54-3	RESISTOR MF	39k2 OHM 1% 0.6W	PHILIPS	2322 156 13923	03.439
R55-3	RESISTOR MF	39k2 OHM 1% 0.6W	PHILIPS	2322 156 13923	03.439
R56-3	RESISTOR MF	6k19 OHM 1% 0.6W	* PHILIPS	2322 156 16192	03.399
R57-3	**RESISTOR MF**	**10k0 OHM 1% 0.6W**	*** PHILIPS**	**2322 156 11003**	**03.427**
R58-3	RESISTOR MF	360k OHM 5% 0.4W	PHILIPS	2322 181 53364	01.263
R59-3	RESISTOR MF	8k2 OHM 5% 0.4W	PHILIPS	2322 181 53822	01.222
R60-3	RESISTOR MF	8k2 OHM 5% 0.4W	PHILIPS	2322 181 53822	01.222
R61-3	RESISTOR MF	5k11 OHM 1% 0.6W	* PHILIPS	2322 156 15112	03.414
R62-3	**RESISTOR MF**	**174k OHM 1% 0.6W**	**PHILIPS**	**2322 156 11744**	**03.255**
R63-3	RESISTOR MF	750 OHM 5% 0.4W	PHILIPS	2322 181 53751	01.196
R65-3	RESISTOR MF	150 OHM 5% 0.4W	PHILIPS	2322 181 53151	01.179
R66-3	RESISTOR MF	47 OHM 5% 0.4W	PHILIPS	2322 181 53479	01.166

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
R67-3	**RESISTOR MF**	**330 OHM 5% 0.4W**	**PHILIPS**	**2322 181 53331**	**01.187**
R68-3	RESISTOR MF	560 OHM 5% 0.4W	PHILIPS	2322 181 53561	01.193
R69-3	RESISTOR MF	120 OHM 5% 0.4W	PHILIPS	2322 181 53121	01.177
R70-3	RESISTOR MF	15 OHM 5% 0.4W	PHILIPS	2322 181 53159	01.154
R71-3	RESISTOR MF	3R9 OHM 5% 0.4W	PHILIPS	2322 181 53398	01.139
R72-3	**RESISTOR MF**	**2k2 OHM 5% 0.4W**	**PHILIPS**	**2322 181 53222**	**01.208**
R73-3	RESISTOR MF	100 OHM 5% 0.4W	PHILIPS	2322 181 53101	01.175
R74-3	RESISTOR MF	270 OHM 5% 0.4W	PHILIPS	2322 181 53271	01.185
R75-3	RESISTOR MF	12 OHM 5% 0.4W	PHILIPS	2322 181 53129	01.152
R76-3	RESISTOR MF	27 OHM 5% 0.4W	PHILIPS	2322 181 53279	01.160
R77-3	**RESISTOR MF**	**2k7 OHM 5% 0.4W**	**PHILIPS**	**2322 181 53272**	**01.210**
R78-3	RESISTOR MF	91 OHM 5% 0.4W	PHILIPS	2322 181 53919	01.174
R79-3	RESISTOR MF	47 OHM 5% 0.4W	PHILIPS	2322 181 53479	01.166
R80-3	RESISTOR MF	1k6 OHM 5% 0.4W	PHILIPS	2322 181 53162	01.205
R81-3	RESISTOR MF	4.3k OHM 5% 0.4W	* PHILIPS	2322 181 53432	01.215
R82-3	**RESISTOR MF**	**3k3 OHM 5% 0.4W**	**PHILIPS**	**2322 181 53332**	**01.212**
R83-3	RESISTOR MF	560 OHM 5% 0.4W	PHILIPS	2322 181 53561	01.193
R84-3	RESISTOR MF	300 OHM 5% 0.4W	PHILIPS	2322 181 53301	01.186
R85-3	RESISTOR MF	100 OHM 5% 0.4W	PHILIPS	2322 181 53101	01.175
R86-3	RESISTOR MF	300 OHM 5% 0.4W	PHILIPS	2322 181 53301	01.186
R87-3	**RESISTOR MF**	**18 OHM 5% 0.4W**	**PHILIPS**	**2322 181 53189**	**01.156**
R88-3	RESISTOR MF	56 OHM 5% 0.4W	PHILIPS	2322 181 53569	01.168
R89-3	RESISTOR MF	5k1 OHM 5% 0.4W	PHILIPS	2322 181 53512	01.217
R90-3	RESISTOR MF	75 OHM 5% 0.4W	PHILIPS	2322 181 53759	01.171
R91-3	RESISTOR MF	1k8 OHM 5% 0.4W	PHILIPS	2322 181 53182	01.206
R92-3	**RESISTOR MF**	**68 OHM 5% 0.4W**	**PHILIPS**	**2322 181 53689**	**01.170**
R93-3	RESISTOR MF	8R2 OHM 5% 0.4W	PHILIPS	2322 181 53828	01.147
R94-3	RESISTOR MF	330 OHM 5% 0.4W	PHILIPS	2322 181 53331	01.187
R95-3	PRESET CERMET	250k OHM 10% 0.5W	* BOURNS	3386P-1-254	07.895
R96-3	PRESET CERMET	2k0 OHM 5% 0.5W	BOURNS	3386P-1-202-11	07.887
R97-3	**PRESET CERMET**	**250k OHM 10% 0.5W**	*** BOURNS**	**3386P-1-254**	**07.895**
R98-3	PRESET CERMET	1k0 OHM 10% 0.5W	BOURNS	3386P-1-102	07.886
U1-3	QUAD OP.AMP.	324	TEXAS	LM324N	31.065
U2-3	INTEGRATED CIRCUIT	DUAL D-FF POS.TRIG.	TEXAS	SN74HC74N	34.501
U3-3	INTEGRATED CIRCUIT	SERIAL INPUT PLL SYNTHES.	MOTOROLA	MC145158P2	33.492
U4-3	**INTEGRATED CIRCUIT**	**MC12015P**	**MOTOROLA***	**MC12015P**	**32.850**
X1-3	CRYSTAL C1074	14.850MHz 10ppm NC18C	NDK	SP.SPEC: C1074	39.839
L2-3	COIL	TL371	S.P.RADIO	6-0-23687	400371
L10-3	CHOKE TL489		ESPERA	6-0-25459	400489
L11-3	CHOKE TL491		ESPERA	6-0-25461	400491
L12-3	**CHOKE TL491**		**ESPERA**	**6-0-25461**	**400491**
L13-3	CHOKE TL489		ESPERA	6-0-25459	400489
L14-3	CHOKE TL490		ESPERA	6-0-25460	400490

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
	RX/TX MODULE	**RT2048**	**ESPERA**	**5-0-25448J**	**625448**
	JUMPER	**2 POLE**	**SAMTEC***	**MSL-260-G**	**78.325**
	FUSECLIP	FOR 20x5mm FUSELINK	# LITTEL FUSE	111501	78.396
C1-4	CAPACITOR CERAMIC	2p7F +/-0.25pF NPO 100VDC	PHILIPS	2222 683 09278	15.320
C2-4	CAPACITOR ELECTROLYTIC	1000uF 20% 35VDC	SAMHWA ELEC.	SV-1000uF-35WV	14.655
C3-4	**CAPACITOR MKT**	**0.1uF 10% 63VDC**	**PHILIPS**	**2222 370 78104**	**11.136**
C4-4	CAPACITOR ELECTROLYTIC	4.7uF 20% 50VDC	ERO	EKI 00 AA 147 H M9	14.510
C5-4	CAPACITOR ELECTROLYTIC	22uF 20% 25VDC	ERO	EKI 00 AA 222 E M9	14.514
C6-4	CAPACITOR ELECTROLYTIC	22uF 20% 25VDC	ERO	EKI 00 AA 222 E M9	14.514
C7-4	CAPACITOR ELECTROLYTIC	33uF 20% 16VDC	ERO	EKI 00 AA 233 D M9	14.518
C8-4	**CAPACITOR ELECTROLYTIC**	**33uF 20% 16VDC**	**ERO**	**EKI 00 AA 233 D M9**	**14.518**
C9-4	CAPACITOR ELECTROLYTIC	33uF 20% 16VDC	ERO	EKI 00 AA 233 D M9	14.518
C10-4	CAPACITOR ELECTROLYTIC	33uF 20% 16VDC	ERO	EKI 00 AA 233 D M9	14.518
C11-4	CAPACITOR MKT	0.1uF 10% 63VDC	PHILIPS	2222 370 78104	11.136
R12-4	CAPACITOR MKT	0.1uF 10% 63VDC	PHILIPS	2222 370 78104	11.136
C13-4	**CAPACITOR CERAMIC**	**10pF +-0.5pF NPO 500VDC**	**NKE**	**DT 350 758L CH 100 D 500V FLAT PACK**	**15.040**
C14-4	CAPACITOR CERAMIC	10pF +-0.5pF NPO 500VDC	NKE	DT 350 758L CH 100 D 500V FLAT PACK	15.040
C15-4	CAPACITOR CERAMIC	18pF 5% NPO 500VDC	NKE	DT 360 758S CH 180 J 500V FLAT PACK	15.060
C16-4	CAPACITOR CERAMIC	18pF 5% NPO 500VDC	NKE	DT 360 758S CH 180 J 500V FLAT PACK	15.060
C17-4	CAPACITOR ELECTROLYTIC	10uF 20% 35VDC	ERO	EKI 00 AA 210 F M9	14.512
C18-4	**CAPACITOR ELECTROLYTIC**	**10uF 20% 35VDC**	**ERO**	**EKI 00 AA 210 F M9**	**14.512**
C19-4	CAPACITOR MKT	0.1uF 10% 63VDC	PHILIPS	2222 370 78104	11.136
C20-4	CAPACITOR MKT	0.1uF 10% 63VDC	PHILIPS	2222 370 78104	11.136
C21-4	CAPACITOR MKT	0.1uF 10% 63VDC	PHILIPS	2222 370 78104	11.136
C22-4	CAPACITOR MKT	0.1uF 10% 63VDC	PHILIPS	2222 370 78104	11.136
C23-4	**CAPACITOR MKT**	**0.1uF 10% 63VDC**	**PHILIPS**	**2222 370 78104**	**11.136**
C24-4	CAPACITOR MKT	0.1uF 10% 63VDC	PHILIPS	2222 370 78104	11.136
C25-4	CAPACITOR CERAMIC	51pF 5% NPO 50VDC	NKE	DT 360 758S CH 510 J 50V FLAT PACK	15.110
C26-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C27-4	CAPACITOR CERAMIC	51pF 5% NPO 50VDC	NKE	DT 360 758S CH 510 J 50V FLAT PACK	15.110
C28-4	**CAPACITOR CERAMIC**	**51pF 5% NPO 50VDC**	**NKE**	**DT 360 758S CH 510 J 50V FLAT PACK**	**15.110**
C29-4	CAPACITOR CERAMIC	22pF 5% NPO 500VDC	KCK	RT-HM60 SK CH 220 J AMMO PACK	15.080
C30-1	CAPACITOR CERAMIC	22pF 5% NPO 500VDC	KCK	RT-HM60 SK CH 220 J	15.080

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
C31-4	**CAPACITOR CERAMIC**	**22pF 5% NPO 500VDC**	**KCK**	AMMO PACK **RT-HM60 SK CH 220 J** AMMO PACK	**15.080**
C32-4	CAPACITOR CERAMIC	15pF 5% NPO 500VDC	NKE	DT 360 758L CH 150 J 500V FLAT PACK	15.590
C33-4	CAPACITOR POLYSTYRENE	221pF 1% 63VDC	PHILIPS	2222 443 42211	10.727
C34-4	CAPACITOR MKT	0.1uF 10% 63VDC	PHILIPS	2222 370 78104	11.136
C35-4	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
C36-4	**CAPACITOR CERAMIC**	**10nF -20/+80% CL2 50VDC**	**NKE**	**DT 350 758L F 103 Z 50V FLAT PACK**	**15.170**
C37-4	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
C38-4	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
C39-4	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
C40-4	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
C41-4	**CAPACITOR CERAMIC**	**10nF -20/+80% CL2 50VDC**	**NKE**	**DT 350 758L F 103 Z 50V FLAT PACK**	**15.170**
C42-4	CAPACITOR CERAMIC	22pF 5% N150 500VDC	KCK	RT-HM SK PH 220 J AMMO PACK	15.062
C43-4	CAPACITOR CERAMIC	51pF 5% NPO 50VDC	NKE	DT 360 758S CH 510 J 50V FLAT PACK	15.110
C44-4	CAPACITOR CERAMIC	6p8F +-0.5pF N150 50VDC	NKE	DT 330 758S PH 6R8 D 50V FLAT PACK	15.020
C45-4	CAPACITOR CERAMIC	3p9F +/-0.25pF N150 50VDC	NKE	DT 330 758S PJ 3R9 C 50V FLAT PACK	15.003
C46-4	**CAPACITOR CERAMIC**	**9p1F +/-0.5pF N150 50VDC**	**NKE**	**DT 340 758L PH 9R1 D 50V FLAT PACK**	**15.033**
C47-4	CAPACITOR CERAMIC	9p1F +/-0.5pF N150 50VDC	NKE	DT 340 758L PH 9R1 D 50V FLAT PACK	15.033
C48-4	CAPACITOR CERAMIC	9p1F +/-0.5pF N150 50VDC	NKE	DT 340 758L PH 9R1 D 50V FLAT PACK	15.033
C49-4	CAPACITOR CERAMIC	9p1F +/-0.5pF N150 50VDC	NKE	DT 340 758L PH 9R1 D 50V FLAT PACK	15.033
C50-4	CAPACITOR CERAMIC	3p3F +/-0.25pF N150 500V	NKE	DT 350 758L PJ 3R3 C 500V FLAT PACK	16.103
C51-4	**CAPACITOR CERAMIC**	**470pF 10% 500VDC**	**NKE**	**DT35-0465 758L 471BK 500V FLAT PACK**	**16.095**
C52-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C53-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V	16.095

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
C54-4	**CAPACITOR CERAMIC**	**470pF 10% 500VDC**	**NKE**	**FLAT PACK DT35-0465 758L 471BK 500V**	**16.095**
C55-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	FLAT PACK DT35-0465 758L 471BK 500V	16.095
C56-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	FLAT PACK DT35-0465 758L 471BK 500V	16.095
C57-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	FLAT PACK DT35-0465 758L 471BK 500V	16.095
C58-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	FLAT PACK DT35-0465 758L 471BK 500V	16.095
C59-4	**CAPACITOR CERAMIC**	**470pF 10% 500VDC**	**NKE**	FLAT PACK **DT35-0465 758L 471BK 500V**	**16.095**
C60-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	FLAT PACK DT35-0465 758L 471BK 500V	16.095
C61-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	FLAT PACK DT35-0465 758L 471BK 500V	16.095
C62-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	FLAT PACK DT35-0465 758L 471BK 500V	16.095
C63-4	**CAPACITOR CERAMIC**	**470pF 10% 500VDC**	**NKE**	FLAT PACK **DT35-0465 758L 471BK 500V**	**16.095**
C64-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	FLAT PACK DT35-0465 758L 471BK 500V	16.095
C65-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	FLAT PACK DT35-0465 758L 471BK 500V	16.095
C66-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	FLAT PACK DT35-0465 758L 471BK 500V	16.095
C67-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	FLAT PACK DT35-0465 758L 471BK 500V	16.095
C68-4	**CAPACITOR MKT**	**10nF 20% 100VDC**	**PHILIPS**	FLAT PACK **2222 370 38103**	**11.168**
C69-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V	16.095
C70-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	FLAT PACK DT35-0465 758L 471BK 500V	16.095
C71-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	FLAT PACK DT35-0465 758L 471BK 500V	16.095
C72-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	FLAT PACK DT35-0465 758L 471BK 500V	16.095
C73-4	**CAPACITOR CERAMIC**	**1nOF 10% CL2 500VDC**	**NKE**	FLAT PACK **DT 360 758L B 102 K 500V**	**15.160**
C74-4	CAPACITOR CERAMIC	180pF 5% N150 50VDC	KCK	FLAT PACK RT-HE95-SK PH 181 J	15.149
C75-4	CAPACITOR CERAMIC	33pF 5% N750 500VDC	NKE	AMMO PACK DT350465 758L UJ 330J 500	16.064
				FLAT PACK	

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
C76-4	**CAPACITOR CERAMIC**	**51pF 5% NPO 50VDC**	**NKE**	**DT 360 758S CH 510 J 50V**	**15.110**
C77-4	CAPACITOR CERAMIC	12pF 5% N150 500VDC	NKE	FLAT PACK DT 350 758L PH 120 J 500V	16.114
C78-4	CAPACITOR CERAMIC	12pF 5% N150 500VDC	NKE	FLAT PACK DT 350 758L PH 120 J 500V	16.114
C79-4	CAPACITOR CERAMIC	18pF 5% N150 50VDC	NKE	FLAT PACK DT 340 758S PH 180 J 50V	15.061
C80-4	**CAPACITOR MKT**	**1uF 10% 63VDC**	**PHILIPS**	FLAT PACK **2222 370 78105**	**11.137**
C81-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V	16.095
C82-4	CAPACITOR CERAMIC	51pF 5% NPO 50VDC	NKE	FLAT PACK DT 360 758S CH 510 J 50V	15.110
C83-4	CAPACITOR MKT	0.1uF 10% 63VDC	PHILIPS	FLAT PACK 2222 370 78104	11.136
C84-4	CAPACITOR CERAMIC	51pF 5% NPO 50VDC	NKE	DT 360 758S CH 510 J 50V	15.110
C85-4	**CAPACITOR CERAMIC**	**51pF 5% NPO 50VDC**	**NKE**	FLAT PACK **DT 360 758S CH 510 J 50V**	**15.110**
C86-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	FLAT PACK DT35-0465 758L 471BK 500V	16.095
C87-4	CAPACITOR CERAMIC	10pF 5% NPO 500VDC	NKE	FLAT PACK DT 350 758L CH 100 J 500V	15.565
C88-4	CAPACITOR CERAMIC	1nF 10% 50VDC CL2	NKE	FLAT PACK DT 340 758L B 102 K 50V	16.160
D1-4	DIODE TRANSIENT ABSORBER	18V	MOTOROLA*	FLAT PACK 1N6277A	26.765
D2-4	**DIODE**	**1N4148 HIGH SPEED**	**PHILIPS**	**1N4148-143**	**25.131**
D3-4	DIODE CAPASITANCE	13pF/9VDC	TOSHIBA	1SV101 in matched group	26.135
D4-4	DIODE CAPASITANCE	13pF/9VDC	TOSHIBA	1SV101 in matched group	26.135
D5-4	DIODE CAPASITANCE	13pF/9VDC	TOSHIBA	1SV101 in matched group	26.135
D6-4	DIODE CAPASITANCE	13pF/9VDC	TOSHIBA	1SV101 in matched group	26.135
D7-4	**DIODE SWITCH**	**BA282**	**ITT**	**BA282**	**25.390**
F1-4	FUSE	6.3AF 250V 5x20mm	ELU	179 020 6.3AF	45.571
FL1-4	CERAMIC FILTER	Fc=450kHz BW=20kHz	MURATA	SFP 450DR	41.512
FL2-4	CRYSTAL FILTER	Fc=15.3MHz	* NDK	SP.SPEC: C1076 (15N15B)	40.029
J1-4	SOCKET	1/10" SIL 12 POLES	EURO DIP	BL 12 O Z	78.805
J2-4	**SOCKET COAX**	**VERTICAL FOR PCB MOUNT.**	**TAIKO**	**TMP-J01X-V6**	**78.518**
J3-4	SOCKET COAX	VERTICAL FOR PCB MOUNT.	TAIKO	TMP-J01X-V6	78.518
J4-4	ANTENNA JACK (FEMALE)	SO239	KAJ V HANSEN	SO239	78.504
J5-4	SOCKET COAX	VERTICAL FOR PCB MOUNT.	TAIKO	TMP-J01X-V6	78.518
L1-4	CHOKE TL 487		ESPERA	6-0-25457	400487
L2-4	**CHOKE TL 487**		**ESPERA**	**6-0-25457**	**400487**
L3-4	CHOKE TL486		ESPERA	6-0-25456A	400486
L4-4	CHOKE	5u6H 10%	* FASTRON	SMCC-5R6K-02	20.139
L5-4	CHOKE TL488	70nH	ESPERA	6-0-25458	400488

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
L6-4	**COIL**	**568uH ADJUSTABLE**	**SUMIDA ELEC.CO.**	**P-75B / 2175-2239-1025**	**38.432**
L7-4	COIL	TL067	S.P.RADIO	6-0-20854A 400067=20.053	400067
L8-4	COIL	TL067	S.P.RADIO	6-0-20854A 400067=20.053	400067
L9-4	COIL RF	0.11uH ADJUSTABLE	TOKO	E526HN-100117	38.409
L10-4	COIL RF	0.11uH ADJUSTABLE	TOKO	E526HN-100117	38.409
L11-4	**COIL RF**	**0.11uH ADJUSTABLE**	**TOKO**	**E526HN-100117**	**38.409**
L12-4	COIL RF	0.11uH ADJUSTABLE	TOKO	E526HN-100117	38.409
L13-4	COIL	TL067	S.P.RADIO	6-0-20854A 400067=20.053	400067
LC1-4	EMI SUPPRESSION FILTER	Fo=70MHz	MURATA	DST 310 91 Y5S 222 M	18.550
LC2-4	EMI SUPPRESSION FILTER	Fo=70MHz	MURATA	DST 310 91 Y5S 222 M	18.550
LC3-4	**EMI SUPPRESSION FILTER**	**Fo=70MHz**	**MURATA**	**DST 310 91 Y5S 222 M**	**18.550**
LC4-4	EMI SUPPRESSION FILTER	Fo=70MHz	MURATA	DST 310 91 Y5S 222 M	18.550
LC5-4	EMI SUPPRESSION FILTER	Fo=70MHz	MURATA	DST 310 91 Y5S 222 M	18.550
LC6-4	EMI SUPPRESSION FILTER	Fo=70MHz	MURATA	DST 310 91 Y5S 222 M	18.550
LC7-4	EMI SUPPRESSION FILTER	Fo=70MHz	MURATA	DST 310 91 Y5S 222 M	18.550
P1-4	**PLUG**	**6 POLES**	**HIRSCHMANN**	**973 887-100** UDEN FR[SNING I BEN	**78.315**
P2-4	PLUG	2x5 POLES	3M	3654-6002 / 7610-6002 JL	78.251
P3-4	PLUG	2x10 POLES	3M	3592-6002 / 7620-6002 JL	78.250
P4-4	SOCKET	SUB D 9 POLES	IB OBEL PEDERS.	NS-DMS-09SBTS-S1	78.144
P5-4	PLUG	1/10" DIL SQ.PINS 6 POLES	AMP	826656-3	78.340
Q1-4	**TRANSISTOR**	**BD234**	**PHILIPS**	**BD234**	**29.070**
Q2-4	TRANSISTOR RF	BF199	PHILIPS	BF199	28.178
Q3-4	TRANSISTOR RF	BF199	PHILIPS	BF199	28.178
Q4-4	TRANSISTOR RF	BF199	PHILIPS	BF199	28.178
Q5-4	TRANSISTOR	BC557C	* PHILIPS	BC557C	28.092
Q6-4	**TRANSISTOR**	**BC557C**	*** PHILIPS**	**BC557C**	**28.092**
Q7-4	TRANSISTOR	BC557C	* PHILIPS	BC557C	28.092
Q8-4	TRANSISTOR N-CHAN. JFET	TIS88A1	MOTOROLA	TM 00 044 -1	29.735
Q9-4	TRANSISTOR N-CHAN. JFET	TIS88A1	MOTOROLA	TM 00 044 -1	29.735
Q10-4	TRANSISTOR MOSFET	DUAL GATE N-CHAN.BF964SA	TFK	BF964SA	28.240
Q11-4	TRANSISTOR MOSFET	DUAL GATE N-CHAN.BF964SA	TFK	BF964SA	28.240
Q12-4	**TRANSISTOR AF**	**NPN BC547C TO-92**	**PHILIPS**	**BC547C**	**28.068**
Q13-4	TRANSISTOR AF	NPN BC547C TO-92	PHILIPS	BC547C	28.068
Q14-4	TRANSISTOR DARLINGTON	NPN BC618	MOTOROLA	BC618	28.107
R1-4	RESISTOR MF	475 OHM 1% 0.6W	* PHILIPS	2322 156 14751	03.393
R2-4	RESISTOR MF	1k3 OHM 1% 0.6W	* PHILIPS	2322 156 11302	03.402
R3-4	RESISTOR MF	221 OHM 1% 0.6W	* PHILIPS	2322 156 12211	03.384
R4-4	**PRESET CERMET**	**50 OHM 10% 0.5W**	*** BOURNS**	**3386P-1-500**	**07.882**
R5-4	RESISTOR MF	2R7 OHM 5% 0.4W	PHILIPS	2322 181 53278	01.135
R6-4	RESISTOR MF	3k92 OHM 1% 0.6W	PHILIPS	2322 156 13922	03.409

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
R7-4	**RESISTOR MF**	**3k92 OHM 1% 0.6W**	**PHILIPS**	**2322 156 13922**	**03.409**
R8-4	RESISTOR MF	97k6 OHM 1% 0.6W	* PHILIPS	2322 156 19763	03.471
R9-4	RESISTOR MF	97k6 OHM 1% 0.6W	* PHILIPS	2322 156 19763	03.471
R10-4	RESISTOR MF	18k OHM 5% 0.33W	PHILIPS	2322 180 73183	02.502
R11-4	RESISTOR MF	43k OHM 5% 0.4W	PHILIPS	2322 181 53433	01.240
R12-4	**RESISTOR MF**	**22k OHM 5% 0.4W**	**PHILIPS**	**2322 181 53223**	**01.233**
R13-4	RESISTOR MF	2k0 OHM 5% 0.4W	PHILIPS	2322 181 53202	01.207
R14-4	RESISTOR MF	1k5 OHM 5% 0.4W	PHILIPS	2322 181 53152	01.204
R15-4	RESISTOR PMF	220 OHM 5% 2W	PHILIPS	2322 194 13221	04.183
R16-4	RESISTOR MF	5k6 OHM 5% 0.4W	PHILIPS	2322 181 53562	01.218
R17-4	**RESISTOR MF**	**3k3 OHM 5% 0.4W**	**PHILIPS**	**2322 181 53332**	**01.212**
R18-4	RESISTOR MF	8k2 OHM 5% 0.4W	PHILIPS	2322 181 53822	01.222
R19-4	PRESET CERMET	500 OHM 10% 0.5W	* BOURNS	3386P-1-501	07.885
R20-4	PRESET CERMET	50k 10% 0.5W	* BOURNS	3386P-1-503	07.892
R21-4	PRESET CERMET	2k0 OHM 5% 0.5W	BOURNS	3386P-1-202-11	07.887
R22-4	**RESISTOR MF**	**2k2 OHM 5% 0.4W**	**PHILIPS**	**2322 181 53222**	**01.208**
R23-4	RESISTOR MF	2k2 OHM 5% 0.4W	PHILIPS	2322 181 53222	01.208
R24-4	RESISTOR MF	2k7 OHM 5% 0.4W	PHILIPS	2322 181 53272	01.210
R25-4	RESISTOR MF	2k2 OHM 5% 0.4W	PHILIPS	2322 181 53222	01.208
R26-4	RESISTOR MF	470 OHM 5% 0.4W	PHILIPS	2322 181 53471	01.191
R27-4	**RESISTOR MF**	**1k0 OHM 5% 0.4W**	**PHILIPS**	**2322 181 53102**	**01.200**
R28-4	RESISTOR MF	1k8 OHM 5% 0.4W	PHILIPS	2322 181 53182	01.206
R29-4	RESISTOR MF	1k0 OHM 5% 0.4W	PHILIPS	2322 181 53102	01.200
R30-4	RESISTOR MF	47k OHM 5% 0.4W	PHILIPS	2322 181 53473	01.241
R31-4	RESISTOR MF	12k OHM 5% 0.4W	PHILIPS	2322 181 53123	01.227
R32-4	**RESISTOR MF**	**1k0 OHM 5% 0.4W**	**PHILIPS**	**2322 181 53102**	**01.200**
R33-4	RESISTOR MF	1k0 OHM 5% 0.4W	PHILIPS	2322 181 53102	01.200
R34-4	RESISTOR MF	5k36 OHM 1% 0.6W	PHILIPS	2322 156 15362	03.418
R35-4	RESISTOR MF	220k OHM 5% 0.4W	PHILIPS	2322 181 53224	01.258
R36-4	RESISTOR MF	3k9 OHM 5% 0.33W	PHILIPS	2322 180 73392	02.486
R37-4	**RESISTOR MF**	**3k9 OHM 5% 0.4W**	**PHILIPS**	**2322 181 53392**	**01.214**
R38-4	RESISTOR MF	3k9 OHM 5% 0.4W	PHILIPS	2322 181 53392	01.214
R39-4	RESISTOR MF	3k9 OHM 5% 0.33W	PHILIPS	2322 180 73392	02.486
R40-4	RESISTOR MF	560 OHM 5% 0.4W	PHILIPS	2322 181 53561	01.193
R41-4	RESISTOR MF	180 OHM 5% 0.4W	PHILIPS	2322 181 53181	01.181
R42-4	**RESISTOR MF**	**120k OHM 5% 0.4W**	**PHILIPS**	**2322 181 53124**	**01.252**
R43-4	RESISTOR MF	100k OHM 5% 0.4W	PHILIPS	2322 181 53104	01.250
R44-4	RESISTOR MF	100k OHM 5% 0.4W	PHILIPS	2322 181 53104	01.250
R45-4	RESISTOR MF	100k OHM 5% 0.4W	PHILIPS	2322 181 53104	01.250
R46-4	RESISTOR MF	470k OHM 5% 0.4W	PHILIPS	2322 181 53474	01.266
R47-4	**RESISTOR MF**	**56k OHM 5% 0.33W**	**PHILIPS**	**2322 180 73563**	**02.514**
R48-4	RESISTOR MF	100k OHM 5% 0.4W	PHILIPS	2322 181 53104	01.250
R49-4	RESISTOR MF	330 OHM 5% 0.4W	PHILIPS	2322 181 53331	01.187
R50-4	RESISTOR MF	330 OHM 5% 0.4W	PHILIPS	2322 181 53331	01.187

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
R51-4	**RESISTOR MF**	**39k OHM 5% 0.4W**	**PHILIPS**	**2322 181 53393**	**01.239**
R52-4	RESISTOR MF	39k OHM 5% 0.4W	PHILIPS	2322 181 53393	01.239
R53-4	RESISTOR MF	39k OHM 5% 0.4W	PHILIPS	2322 181 53393	01.239
R54-4	RESISTOR MF	39k OHM 5% 0.4W	PHILIPS	2322 181 53393	01.239
R55-4	RESISTOR MF	120k OHM 5% 0.33W	PHILIPS	2322 180 73124	02.522
R56-4	**RESISTOR MF**	**15k OHM 5% 0.4W**	**PHILIPS**	**2322 181 53153**	**01.229**
R57-4	RESISTOR MF	15k OHM 5% 0.33W	PHILIPS	2322 180 73153	02.500
R58-4	RESISTOR MF	27k OHM 5% 0.4W	PHILIPS	2322 181 53273	01.235
R59-4	RESISTOR MF	27k OHM 5% 0.4W	PHILIPS	2322 181 53273	01.235
R60-4	RESISTOR MF	27k OHM 5% 0.4W	PHILIPS	2322 181 53273	01.235
R61-4	**RESISTOR MF**	**27k OHM 5% 0.4W**	**PHILIPS**	**2322 181 53273**	**01.235**
R62-4	RESISTOR MF	27k OHM 5% 0.4W	PHILIPS	2322 181 53273	01.235
R63-4	RESISTOR MF	27k OHM 5% 0.4W	PHILIPS	2322 181 53273	01.235
R64-4	RESISTOR MF	27k OHM 5% 0.4W	PHILIPS	2322 181 53273	01.235
R65-4	RESISTOR MF	27k OHM 5% 0.4W	PHILIPS	2322 181 53273	01.235
R66-4	**RESISTOR MF**	**68k OHM 5% 0.4W**	**PHILIPS**	**2322 181 53683**	**01.245**
R67-4	RESISTOR MF	56k OHM 5% 0.33W	PHILIPS	2322 180 73563	02.514
RE1-4	RELAY	12VDC 2SH 1.25A	ZETLER	AZ 830-2C-12DSEA	21.030
TR1-4	TRANSFORMER	2u7H ADJUSTABLE	TOKO	F292MNS-3342BQE	38.431
TR2-4	TRANSFORMER	Fr=157MHz ADJUSTABLE	SUMIDA ELEC.CO.	S-7GD / 0237-1756	38.430
U1-4	**VOLTAGE REGULATOR**	**POSITIVE ADJUSTABLE 1.5A**	**MOTOROLA**	**LM317T**	**31.055**
U2-4	INTEGRATED CIRCUIT	AF POWER AMPLIFIER	PHILIPS	TDA1515A	31.489
U3-4	INTEGRATED CIRCUIT	NBFM IF SYSTEM	PHILIPS	MC 3361 N	31.325
U4-4	INTEGRATED CIRCUIT	VHF POWER AMPL.25W	* TOSHIBA	S-AV6	32.450

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
	SELCALL MODULE (OPTIONAL) RT2048		**ESPERA**	**5-0-25449B**	**625449**
C1-5	**CAPACITOR KP**	**10nF 2.5% 63VDC**	**EVOX***	**PFR 103H TA18**	**13.407**
C2-5	CAPACITOR KP	10nF 2.5% 63VDC	EVOX*	PFR 103H TA18	13.407
C3-5	CAPACITOR KP	3.9nF 2.5% 63VDC	EVOX*	PFR 392H TA18	13.402
C4-5	CAPACITOR KP	3.9nF 2.5% 63VDC	EVOX*	PFR 392H TA18	13.402
C5-5	CAPACITOR MKT	22nF 10% 100VDC	PHILIPS	2222 370 88223	11.175
C6-5	**CAPACITOR MKT**	**150nF 5% 50VDC**	**ERO**	**MKT 1826-415/06 4-G**	**11.181**
C7-5	CAPACITOR MKT	47nF 10% 63VDC	EVOX*	MMK5 473K63 TA18	11.644
C8-5	CAPACITOR MKT	47nF 10% 63VDC	EVOX*	MMK5 473K63 TA18	11.644
C9-5	CAPACITOR MKT	47nF 10% 63VDC	EVOX*	MMK5 473K63 TA18	11.644
C10-5	CAPACITOR MKT	47nF 10% 63VDC	EVOX*	MMK5 473K63 TA18	11.644
C11-5	**CAPACITOR MKT**	**47nF 10% 63VDC**	**EVOX***	**MMK5 473K63 TA18**	**11.644**
C12-5	CAPACITOR MKT	47nF 10% 63VDC	EVOX*	MMK5 473K63 TA18	11.644
C13-5	CAPACITOR MKT	47nF 10% 63VDC	EVOX*	MMK5 473K63 TA18	11.644
C14-5	CAPACITOR MKT	47nF 10% 63VDC	EVOX*	MMK5 473K63 TA18	11.644
D1-5	DIODE SCHOTTKY	BAT 43	THOMSON-CSF	BAT43	27.600
D2-5	**DIODE SCHOTTKY**	**BAT 43**	**THOMSON-CSF**	**BAT43**	**27.600**
J1-5	SOCKET COAX	HORISONTAL FOR PCB MOUNT.	TAIKO	TMP-J01X-A2	78.517
J2-5	SOCKET	7 POLES F.RIBBON CABLE	MOLEX	52011-0710	78.280
Q1-5	TRANSISTOR RF SWITCH	2N2369A	MOTOROLA	2N2369A	28.315
R1-5	PRESET CERMET	2k0 OHM 5% 0.5W	BOURNS	3386P-1-202-11	07.887
R2-5	**RESISTOR MF**	**6k49 OHM 1% 0.6W**	*** PHILIPS**	**2322 156 16492**	**03.412**
R3-5	RESISTOR MF	243 OHM 1% 0.6W	* PHILIPS	2322 156 12431	03.385
R4-5	RESISTOR MF	7k50 OHM 1% 0.6W	* PHILIPS	2322 156 17502	03.448
R5-5	RESISTOR MF	7k50 OHM 1% 0.6W	* PHILIPS	2322 156 17502	03.448
R6-5	RESISTOR MF	10k OHM 5% 0.4W	PHILIPS	2322 181 53103	01.225
R7-5	**RESISTOR MF**	**10k OHM 5% 0.4W**	**PHILIPS**	**2322 181 53103**	**01.225**
R8-5	RESISTOR MF	10k OHM 5% 0.4W	PHILIPS	2322 181 53103	01.225
R9-5	RESISTOR MF	10k OHM 5% 0.4W	PHILIPS	2322 181 53103	01.225
R10-5	RESISTOR MF	12k OHM 5% 0.4W	PHILIPS	2322 181 53123	01.227
R11-5	RESISTOR MF	330 OHM 5% 0.4W	PHILIPS	2322 181 53331	01.187
R12-5	**RESISTOR MF**	**680k OHM 5% 0.4W**	**PHILIPS**	**2322 181 53684**	**01.270**
R13-5	RESISTOR MF	330k OHM 5% 0.4W	PHILIPS	2322 181 53334	01.262
R14-5	RESISTOR MF	453k OHM 1% 0.6W	* PHILIPS	2322 156 14534	03.516
R15-5	RESISTOR MF	7k50 OHM 1% 0.6W	* PHILIPS	2322 156 17502	03.448
R16-5	RESISTOR MF	390k OHM 5% 0.4W	PHILIPS	2322 181 53394	01.264
R17-5	**RESISTOR MF**	**390k OHM 5% 0.4W**	**PHILIPS**	**2322 181 53394**	**01.264**
R18-5	RESISTOR MF	20k0 OHM 1% 0.6W	* PHILIPS	2322 156 12003	03.452
R19-5	RESISTOR MF	61k9 OHM 1% 0.6W	* PHILIPS	2322 156 16193	03.239
R20-5	RESISTOR MF	4k7 OHM 5% 0.4W	PHILIPS	2322 181 53472	01.216
R21-5	RESISTOR MF	10k OHM 5% 0.4W	PHILIPS	2322 181 53103	01.225
R22-5	**RESISTOR MF**	**3k0 OHM 5% 0.4W**	**PHILIPS**	*** 2322 181 53302**	**01.211**

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
R23-5	**RESISTOR MF**	**12k OHM 5% 0.4W**	**PHILIPS**	**2322 181 53123**	**01.227**
R24-5	RESISTOR MF	2k2 OHM 5% 0.4W	PHILIPS	2322 181 53222	01.208
R25-5	RESISTOR MF	7k50 OHM 1% 0.6W	* PHILIPS	2322 156 17502	03.448
U1-5	INTEGRATED CIRCUIT	LF347N	#NATIOPNAL	LF347N	31.530
U2-5	INTEGRATED CIRCUIT	QUAD ANALOG SWITCH	MOTOROLA	MC14066BCP	33.232
U3-5	**DUAL TYPE D FLIP-FLOP**	**MC14013BCP**	**SIGNETICS***	**HEF4013BP**	**33.056**
U4-5	DUAL OP AMP	LM358N	TEXAS	LM358P	31.100
U5-5	VOLTAGE REGULATOR	5V 5% 0.1A	MOTOROLA*	MC78L05ACP	31.135
U6-5	INTEGRATED CIRCUIT	MC14569BCP	* MOTOROLA	MC14569BCP	33.449
U7-5	INTEGRATED CIRCUIT	MC14094BCP	NAT.*	CD4094BCN	33.305
U8-5	**IC CMOS**	**HEX LEVEL SHIFTER**	**MOTOROLA**	**MC 14504 BCP**	**33.282**

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
	SELCALL ALARM (MODULE 6)	**SPECIAL OPTION FOR RT2048**	**ESPERA**	**4-0-25660/5-0-25473**	**625660**
D1	**DIODE HIGH SPEED**	**1N4448**	**PHILIPS**	**1N4448**	**25.147**
P1	PLUG	1/10" SIL 12 POLES	* SAMTEC	TS-112-T-AA	78.328
Q1	TRANSISTOR DARLINGTON	NPN BC618	MOTOROLA	BC618	28.107
R1/4	RESISTOR ARRAY	4x10k OHM 5% 1/8W	PANASONIC	EXBF8V103G (4X10K)	08.615
RE1	RELAY	12VDC 1SH. 2A.	MILTRONIC AB	OUC-S-112D	21.300
RE2	**RELAY**	**12VDC 1SH. 2A.**	**MILTRONIC AB**	**OUC-S-112D**	**21.300**

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
	DISTRESS OUTPUT (MODULE 6)	**SPECIAL OPTION FOR RT2048**	**ESPERA**	**4-0-25661/5-0-25473**	**625661**
D3	**DIODE HIGH SPEED**	**1N4448**	**PHILIPS**	**1N4448**	**25.147**
P1	PLUG	1/10" SIL 12 POLES	* SAMTEC	TS-112-T-AA	78.328
Q3	TRANSISTOR	BC638	AEG*	BC638	28.117
Q4	TRANSISTOR DARLINGTON	NPN BC618	MOTOROLA	BC618	28.107
R1/4	RESISTOR ARRAY	4x10k OHM 5% 1/8W	PANASONIC	EXBF8V103G (4X10K)	08.615
R2/4	**RESISTOR ARRAY**	**4x10k OHM 5% 1/8W**	**PANASONIC**	**EXBF8V103G (4X10K)**	**08.615**
R2/2	RESISTOR ARRAY	4x10k OHM 5% 1/8W	PANASONIC	EXBF8V103G (4X10K)	08.615
R2/3	RESISTOR ARRAY	4x10k OHM 5% 1/8W	PANASONIC	EXBF8V103G (4X10K)	08.615
R3	RESISTOR MF	1k0 OHM 5% 0.4W	PHILIPS	2322 181 53102	01.200
R4	RESISTOR MF	1k0 OHM 5% 0.4W	PHILIPS	2322 181 53102	01.200

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
	AUX INTERFACE (MODULE 6)	**SPECIAL OPTION FOR RT2048**	**ESPERA**	**5-0-25473**	**625473**
D1	**DIODE HIGH SPEED**	**1N4448**	**PHILIPS**	**1N4448**	**25.147**
D2	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
D3	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
P1	PLUG	1/10" SIL 12 POLES	* SAMTEC	TS-112-T-AA	78.328
Q1	TRANSISTOR DARLINGTON	NPN BC618	MOTOROLA	BC618	28.107
Q2	**TRANSISTOR DARLINGTON**	**NPN BC618**	**MOTOROLA**	**BC618**	**28.107**
Q3	TRANSISTOR	BC638	AEG*	BC638	28.117
Q4	TRANSISTOR DARLINGTON	NPN BC618	MOTOROLA	BC618	28.107
R1/4	RESISTOR ARRAY	4x10k OHM 5% 1/8W	PANASONIC	EXBF8V103G (4X10K)	08.615
R2/4	RESISTOR ARRAY	4x10k OHM 5% 1/8W	PANASONIC	EXBF8V103G (4X10K)	08.615
R3	**RESISTOR MF**	**1k0 OHM 5% 0.4W**	**PHILIPS**	**2322 181 53102**	**01.200**
R4	RESISTOR MF	1k0 OHM 5% 0.4W	PHILIPS	2322 181 53102	01.200
RE1	RELAY	12VDC 1SH. 2A.	MILTRONIC AB	OUC-S-112D	21.300
RE2	RELAY	12VDC 1SH. 2A.	MILTRONIC AB	OUC-S-112D	21.300
RE3	RELAY	12VDC 1SH. 2A.	MILTRONIC AB	OUC-S-112D	21.300
RE4	**RELAY**	**12VDC 1SH. 2A.**	**MILTRONIC AB**	**OUC-S-112D**	**21.300**
U1	OPTO COUPLER	CNY17-2	TOSHIBA	CNY 17-2	32.530