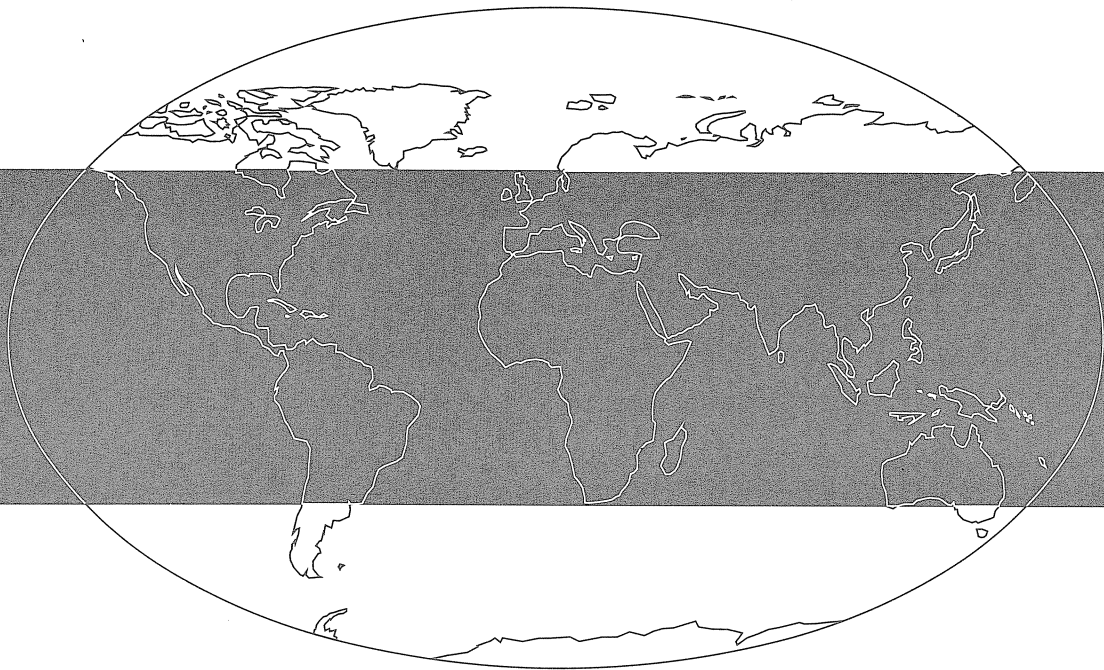
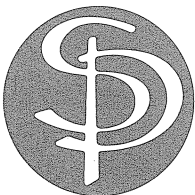


SAILOR



TECHNICAL MANUAL
FOR
COMPACT VHF RT2048



S.P. RADIO A/S · AALBORG · DENMARK



S.P. RADIO A/S

PORSVEJ 2 • DK-9200 AALBORG SV • DENMARK
TEL. INT. + 45-98180999 • TELEX 69 789 SPRAD DK • TELEFAX + 45-98186717

SAILOR

VHF RADIOTELEPHONE RT2048

QUICK SELECT CHART

Distress and Call Channel **16**

Channel Selection **1 3**

US-mode (Channels
Required in the USA) **SHIFT US**

Reduced Power **SHIFT 1W**

Dual Watch **SHIFT DW**

Start Scanning **SHIFT SCAN**

Add a Channel to
Scanning Programme **2 3 SHIFT SCAN
ADD**

Delete a Channel from
Scanning Programme **2 3 SHIFT SCAN
DELETE**

Set of »Scan Time« to
10 Seconds **SHIFT SCAN
TIME 1 0 SHIFT SCAN
TIME**



S. P. RADIO A/S

PORSVEJ 2

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INFO

SHIP'S NAME _____

CALL SIGN _____

SELCALL NO. _____

SPELLING

____ = _____

____ = _____

____ = _____

____ = _____

____ = _____

____ = _____

CHANNEL APPLICATION

	CHANNELS		INTER SHIP		PORT		PUBLIC	
	SIMPLEX	DUPLEX	SIMPLEX	DUPLEX	SIMPLEX	DUPLEX	SIMPLEX	DUPLEX
1				•		•		•
2				•		•		•
3				•		•		•
4				•		•		•
5				•		•		•
6	•							
7						•		•
8	•							
9	•			•				
10	•			•				
11				•				
12				•				
13	•			•				
14				•				
15	•			•				
16	Distress and Calling							
17	•			•				
18						•		
19						•		
20						•		
21						•		
22						•		
23								•
24								•
25								•
26								•
27								•
28								•
P								
P								
P								
P								
P								

	CHANNELS		INTER SHIP		PORT		PUBLIC	
	SIMPLEX	DUPLEX	SIMPLEX	DUPLEX	SIMPLEX	DUPLEX	SIMPLEX	DUPLEX
60						•		•
61						•		•
62						•		•
63						•		•
64						•		•
65						•		•
66						•		•
67	•			•				
68	•			•				
69	•			•				
70	DSC							
71				•				
72	•							
73	•							
74				•				
75	Guard Band							
76	Guard Band							
77	•							
78						•		•
79						•		•
80						•		•
81						•		•
82						•		•
83						•		•
84						•		•
85						•		•
86						•		•
87						•		•
88						•		•
P								
P								
P								
P								
P								

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 - 1.2. TECHNICAL DATA
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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.

RT2048



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.

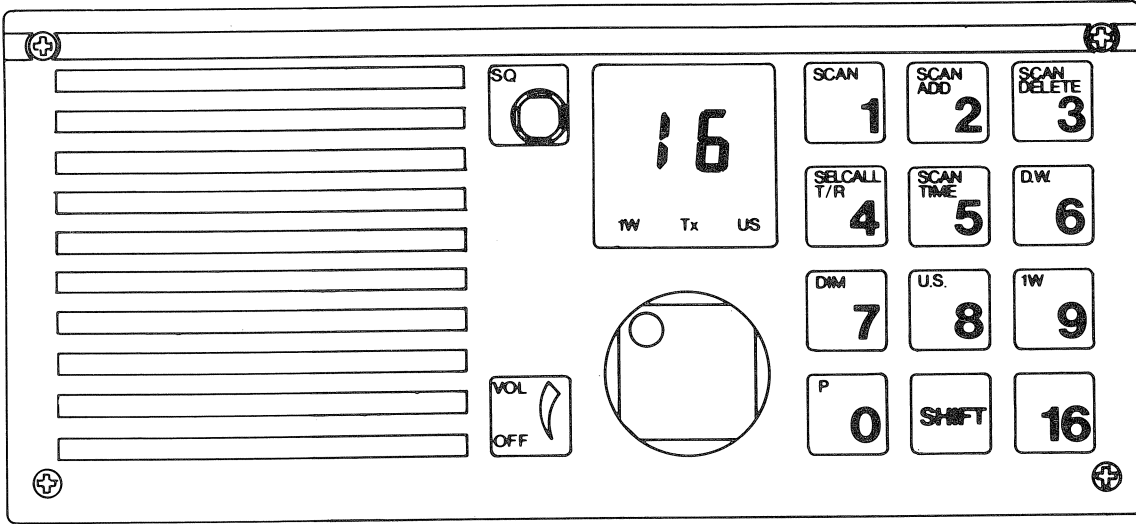
Private channels:	10, may be extended to 40
Operation:	Simplex and semi-duplex
Modulation:	G3EJN (Phase)
Antenna impedance:	50 ohm
Frequency stability:	± 10 ppm (Spec. vers. ± 5 ppm)
Temperature range:	-20°C to +55°C
Nominal power supply:	13.2V DC
Power supply variation:	12V DC -10% to +30%
(with data 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 μ V 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%



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.:



Selects the VHF channels used in the USA.



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



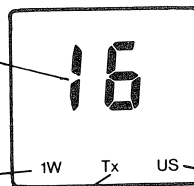
Tests the selcall decoder and resets the selcall decoder after a call.



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:

$$139.1 \text{ MHz} \leq f_{L01} \leq 148.45 \text{ MHz}; 154.5 \text{ MHz} \leq f_{TX \text{ NORMAL}} \leq 159.15 \text{ MHz}$$

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

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

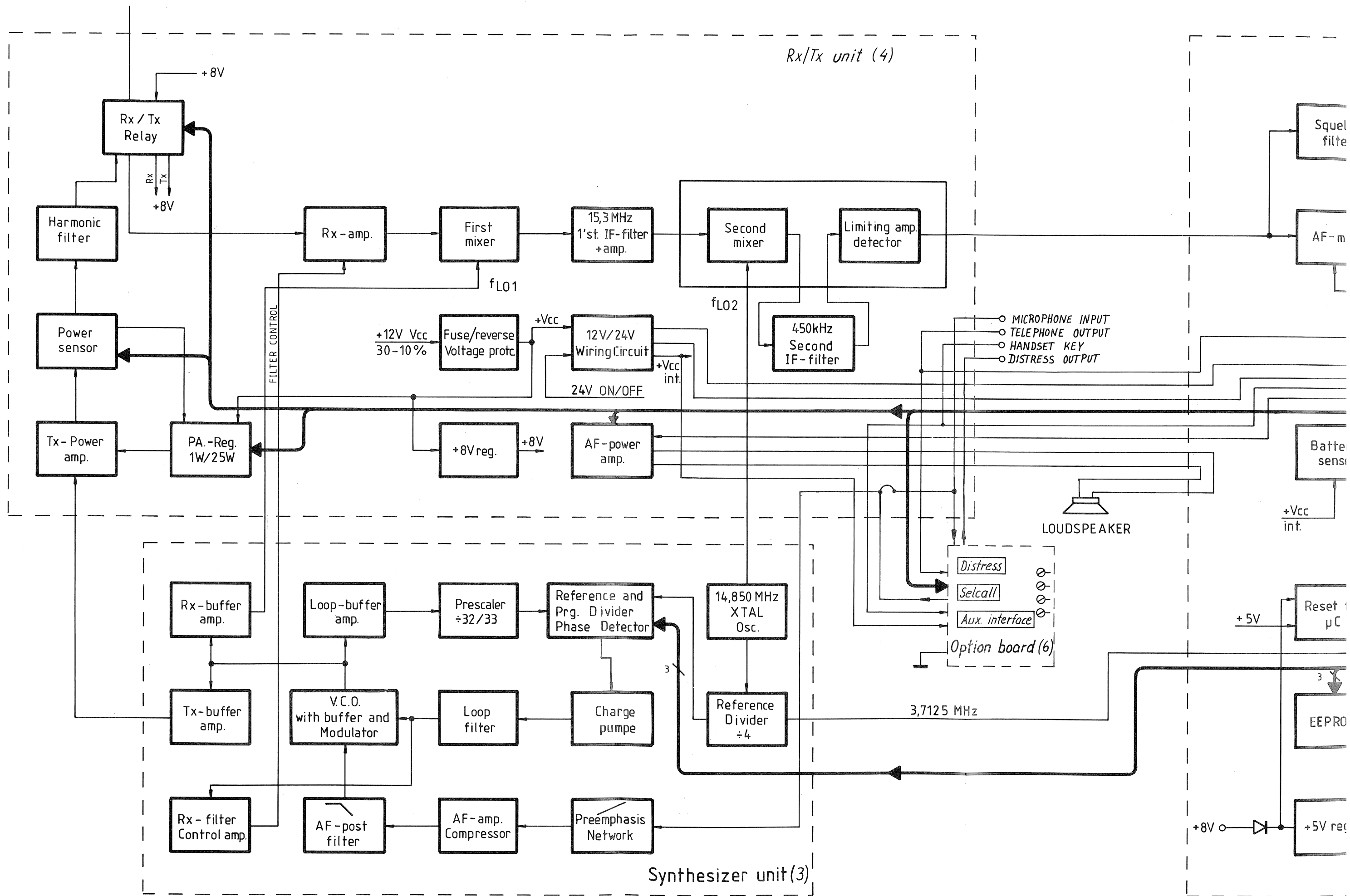
The microcomputer on the interface unit is taking care of various functions, among these the user interface, which means reading of the keyboard and readout to the LED-display via the DISPLAY-LATCHES.

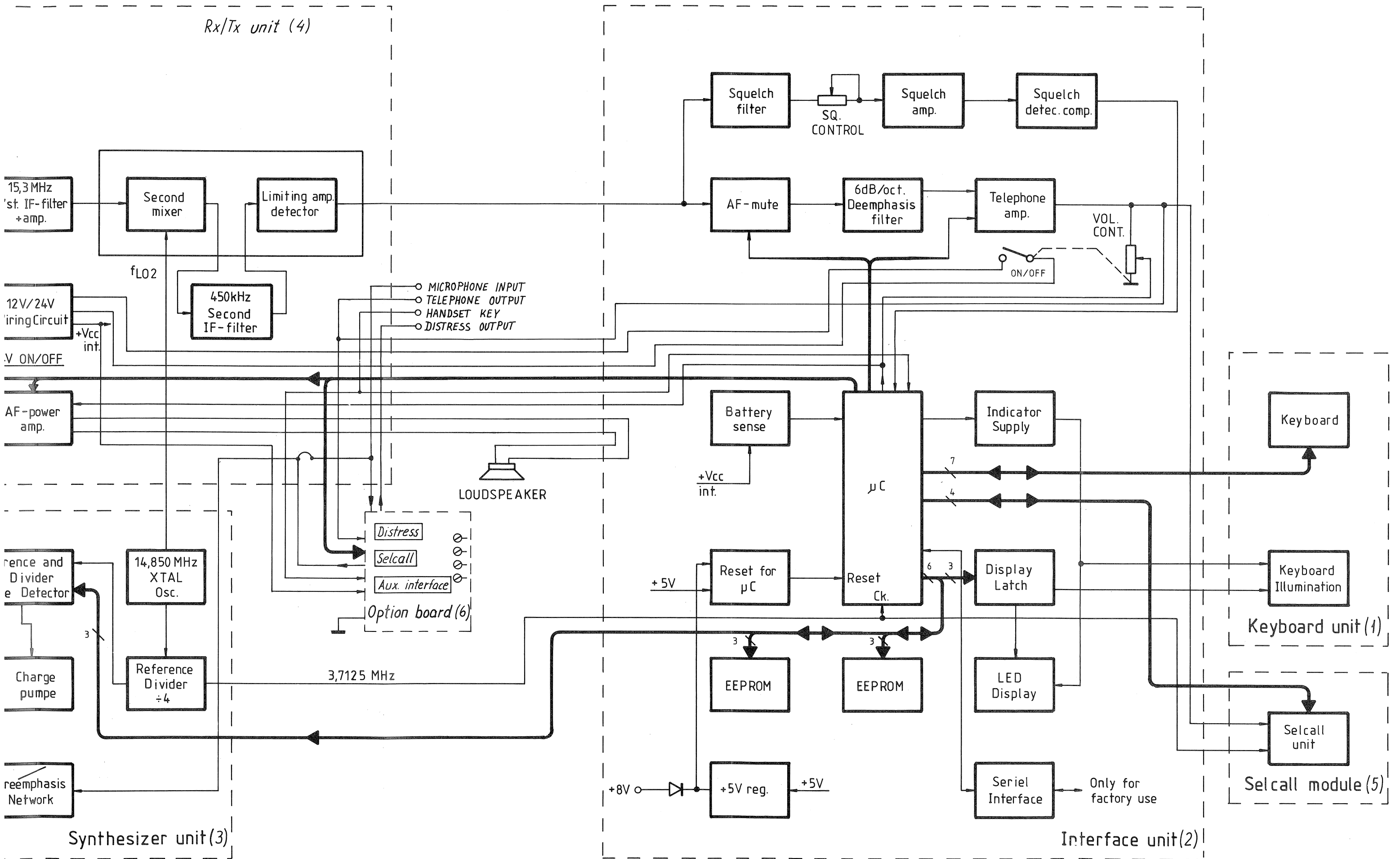
Moreover the computer calculates the appropriate division figures for the PLL, controls the transmitter power level, the AF mute circuits, and reads and writes to the EEPROM's.

When a selcall unit is installed, the microcomputer also controls the selcall switch capacitor filter.

The serial interface is only for factory production use.

KL2048 D
4-0-25525B





BLOCK DIAGRAM RT 2048

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- 2. INSTALLATION
 - 2.1. MOUNTING POSSIBILITIES, DIMENSIONS AND DRILLING PLANS
 - 2.2. HANDSET
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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

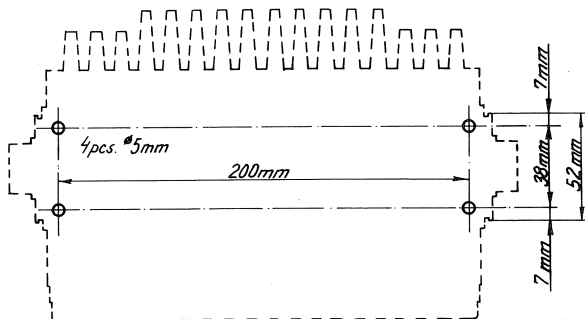
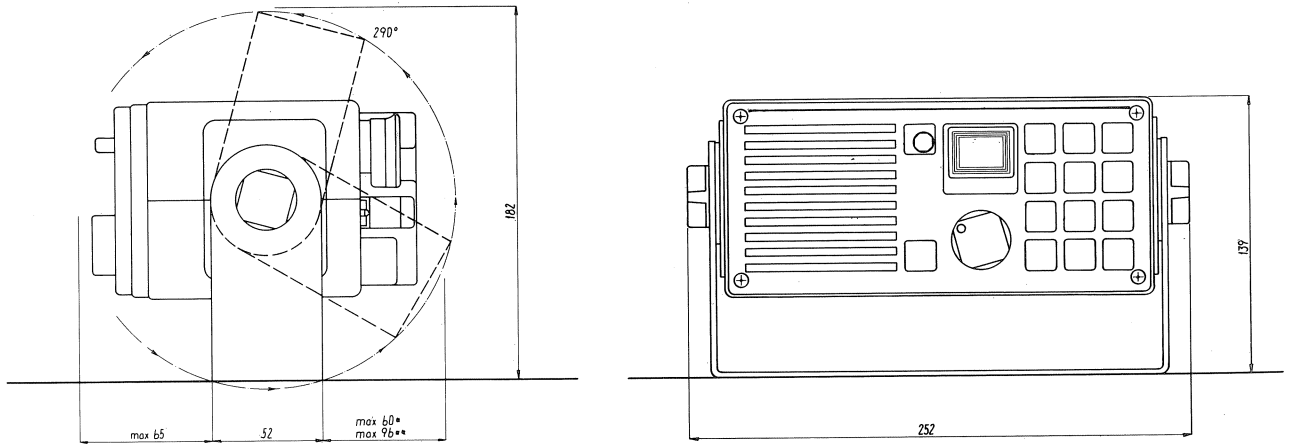
The VHF RT2048 cabinet is designed in a module called a mini 1/4 box. For this module we can supply a wide variety of installation brackets etc. which will be described below. We have made a drawing including dimensions and drilling plan for each type and we kindly ask you to look at the drawing for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



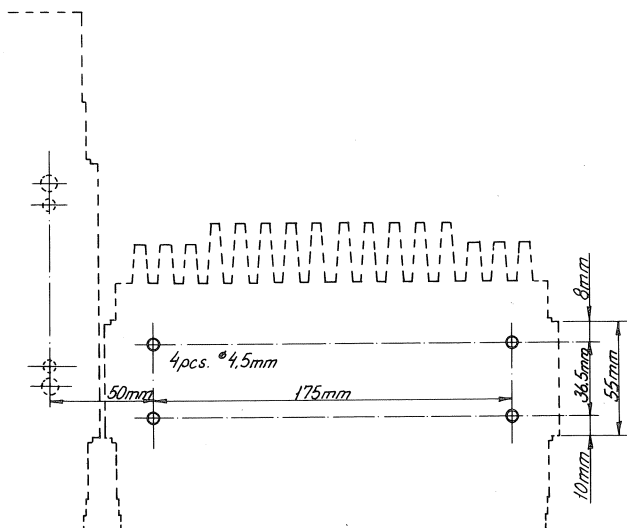
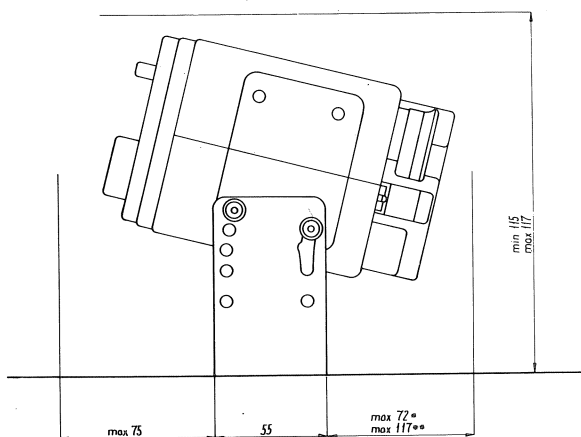
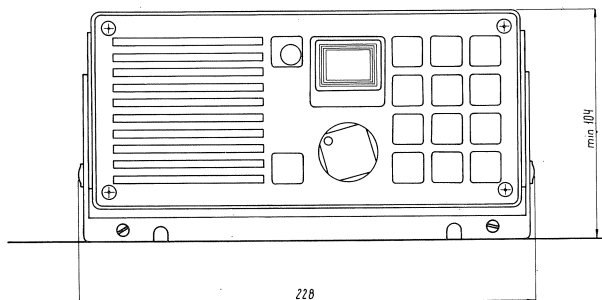
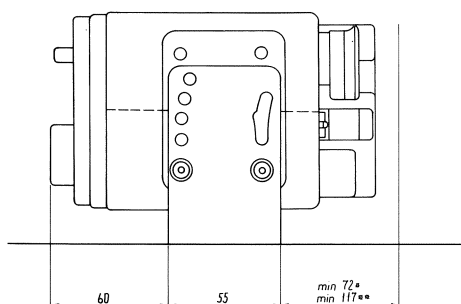
Weight:
 Mounting kit H2077: 0.4 kg
 VHF RT2048: 3.2 kg

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

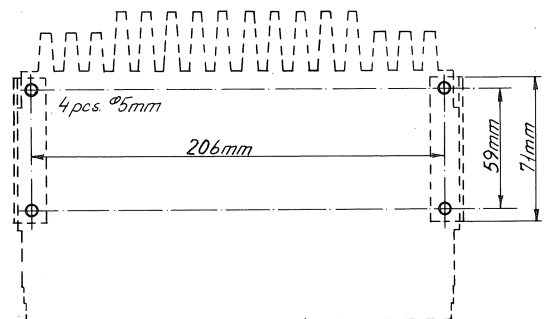
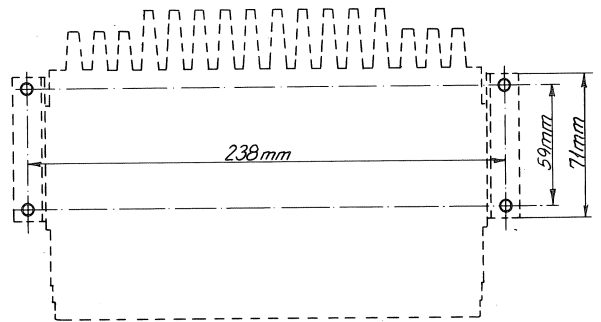
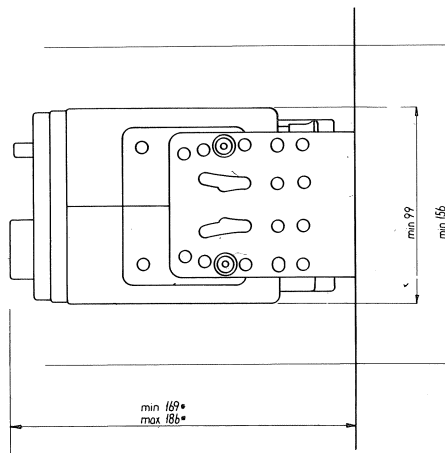
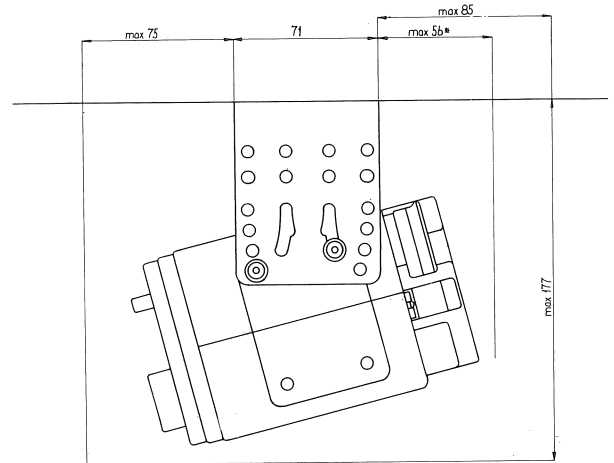
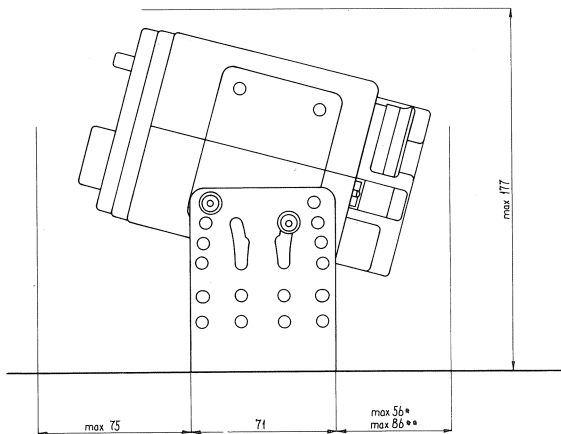
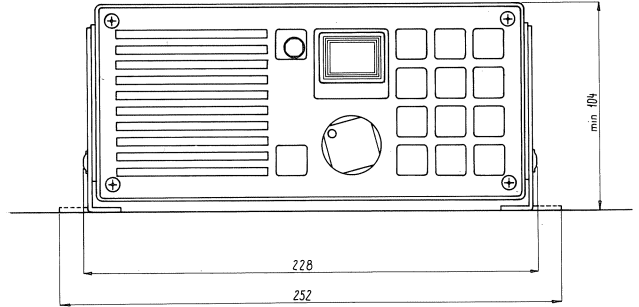
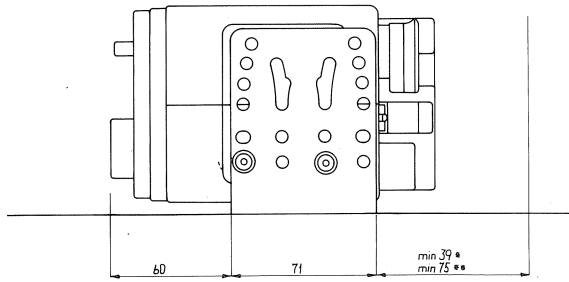
RT2048 A 4-0-25574 4-0-25573
 4-0-25575 4-0-25659A

2.1. MOUNTING POSSIBILITIES cont.:

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

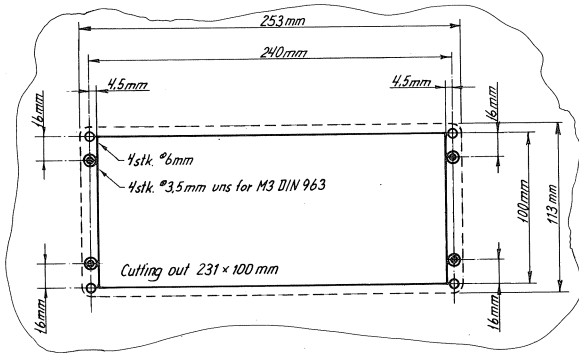
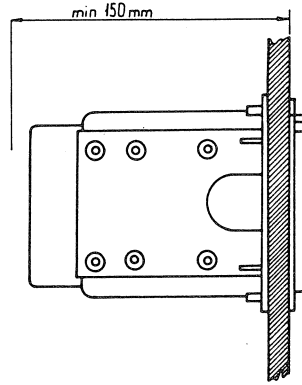
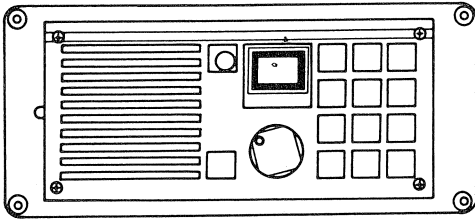
2.1. MOUNTING POSSIBILITIES cont.:

H2063 CONSOLE MOUNTING KIT FOR 1/4 BOX

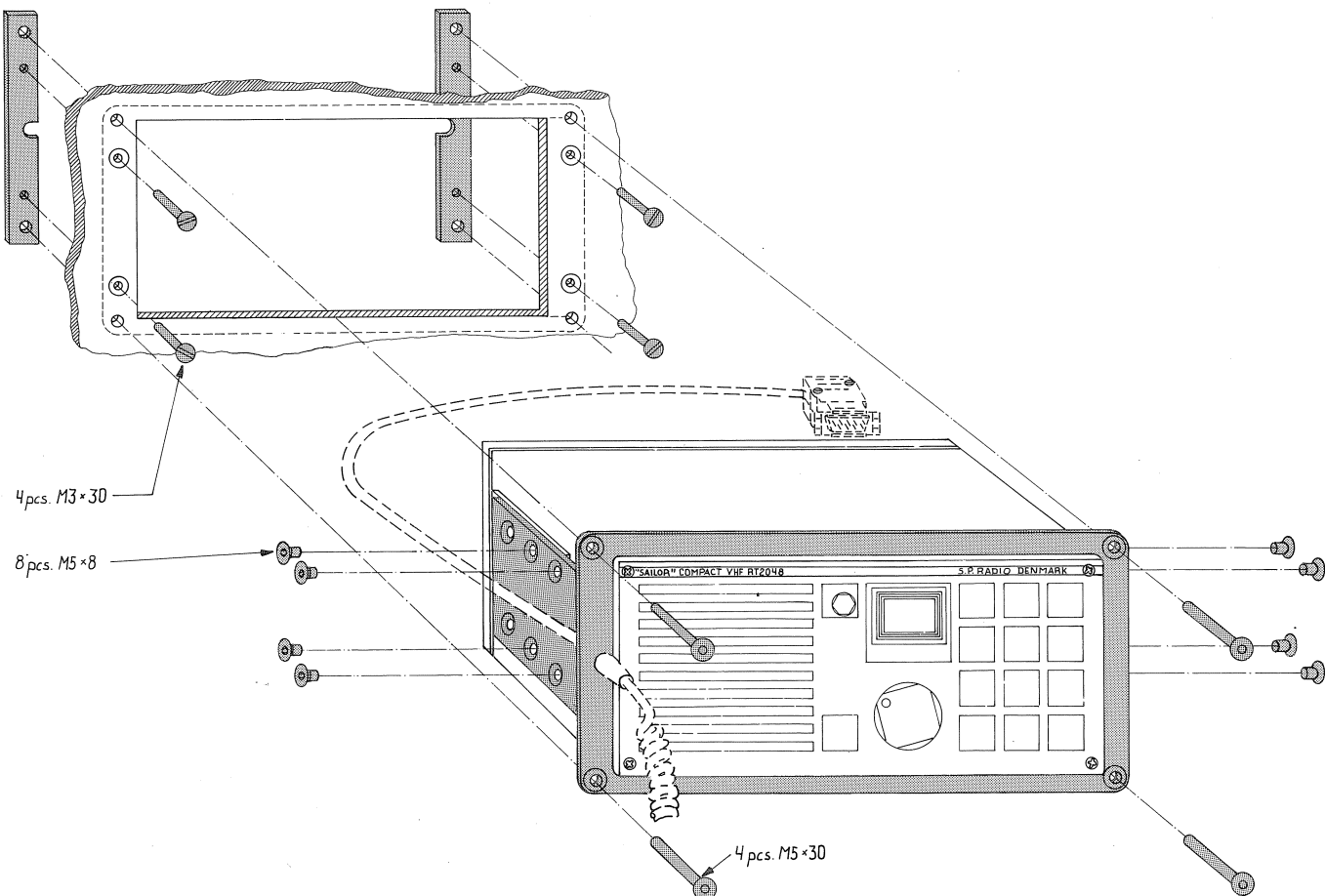
This mounting kit is used for console flush mounting of 1/4 box and mini 1/4 box.

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



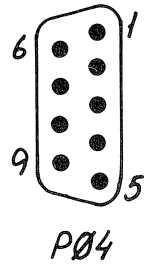
RT2048 A 4-0-25663
4-0-24703
4-0-25657

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

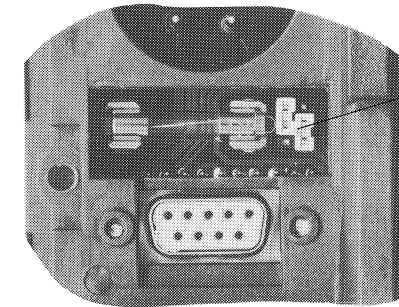
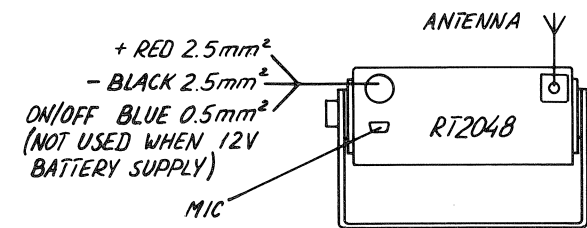
*only active when option board pcb is installed.

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.

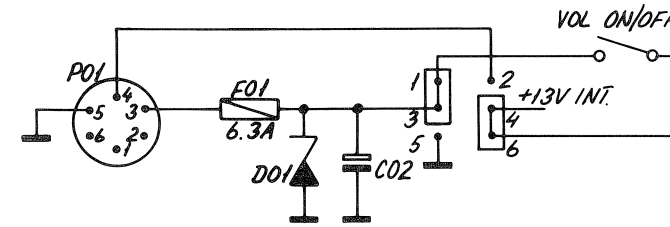
For 110V AC, 127V AC, 220V AC, or 237V AC operation an external power supply N163S must be used together with N420.

12V OPERATION

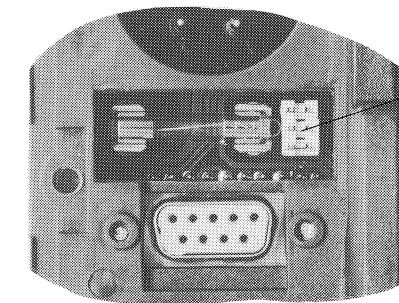
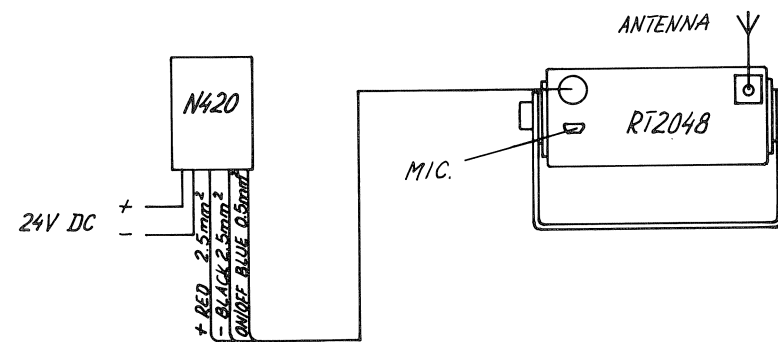


Strap for connection to external supply (12V)

BLOCK DIAGRAM OF STRAPPING FOR 12V DC

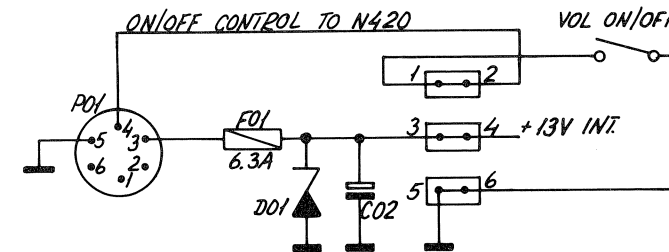


24V OPERATION



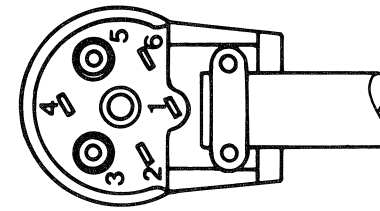
Strap for connection to N420 (24V)

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

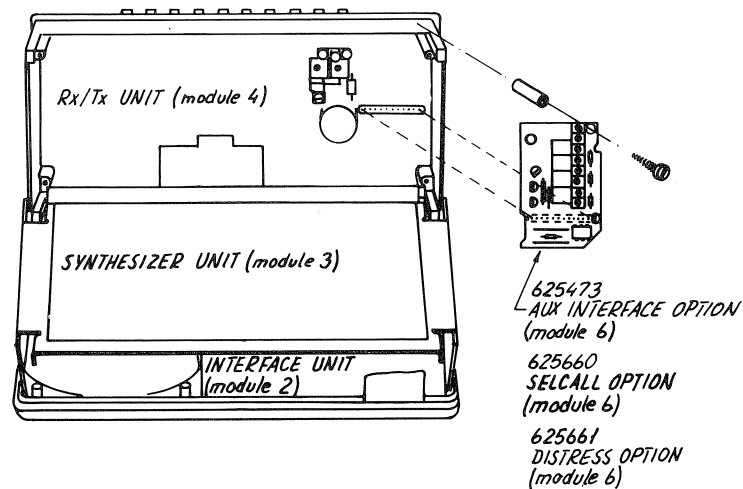
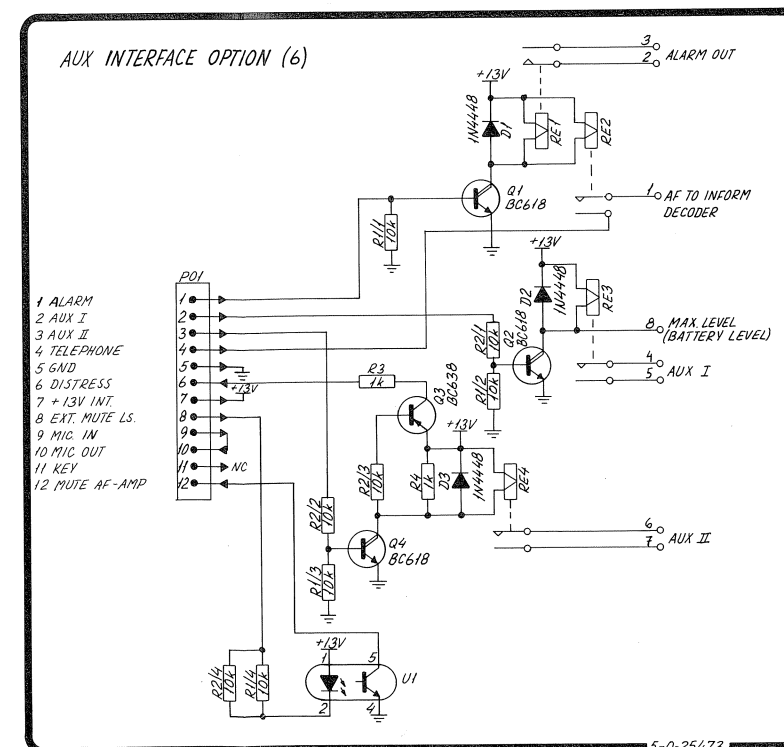
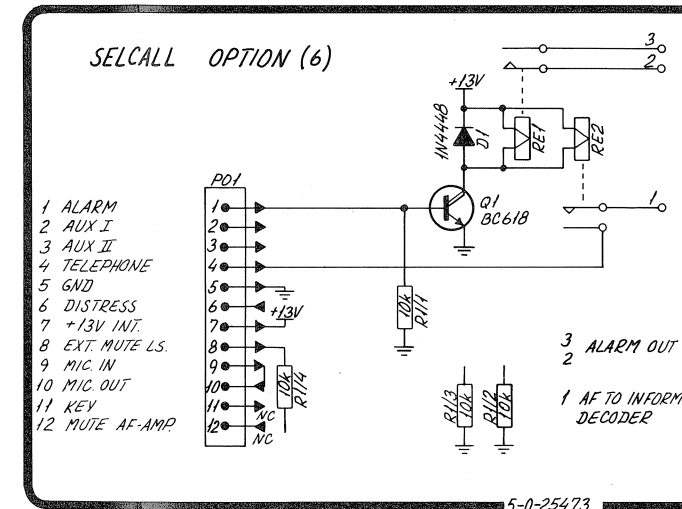
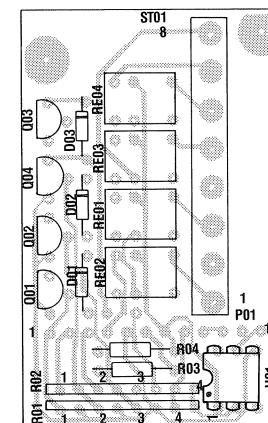
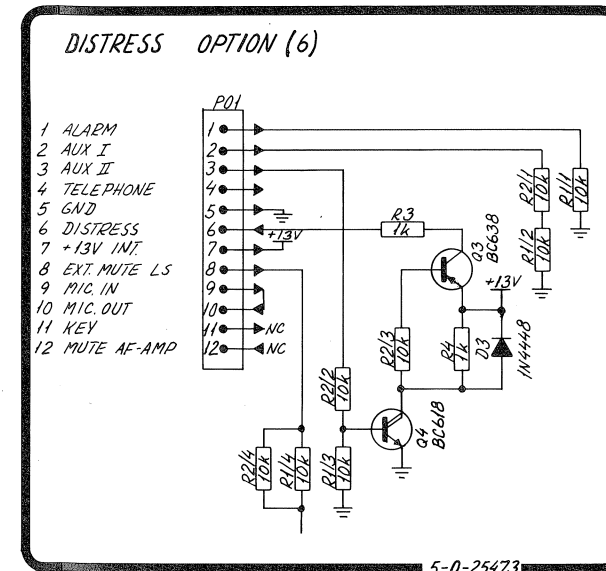
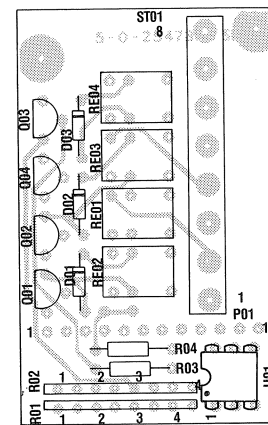
With a small modification in RT2048 the following options are available:

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 4-0-25661 A

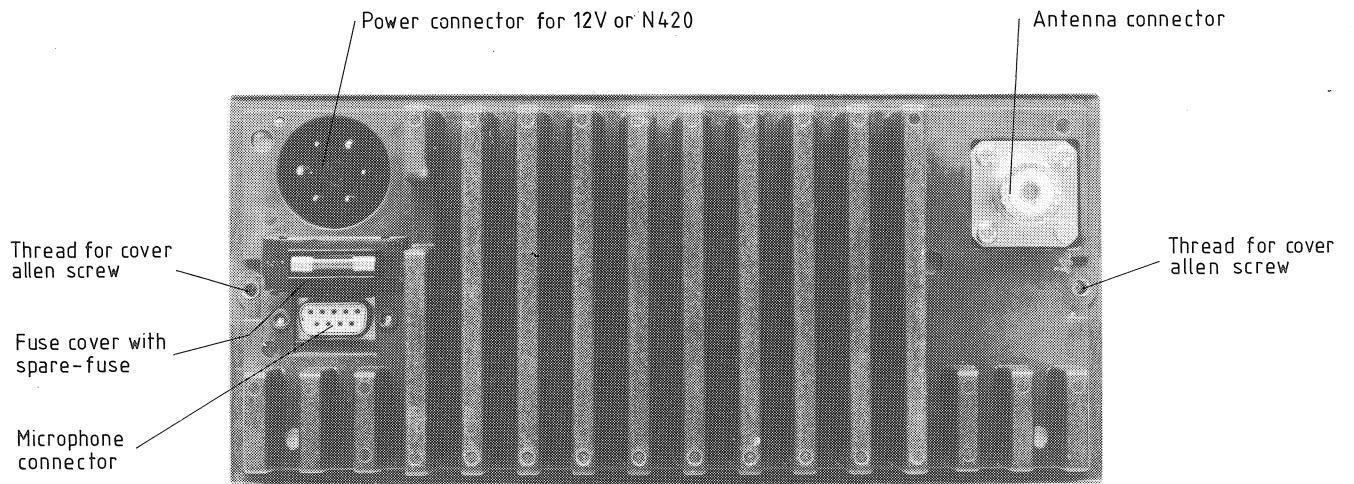
4-0-25660 A 4-0-25473 A

5-0-25473

5-0-25473

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 ADJUSTMENTS 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:

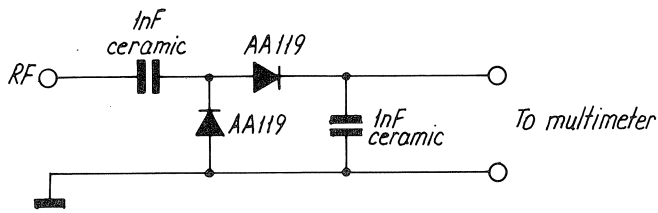
3.3. PROPOSAL FOR NECESSARY MEASURING INSTRUMENTS

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	>175 Mhz
Sensitivity	<100 mV
Impedance	>1 Mohm and 50 ohm
Accuracy	<1 · 10 ⁻⁶

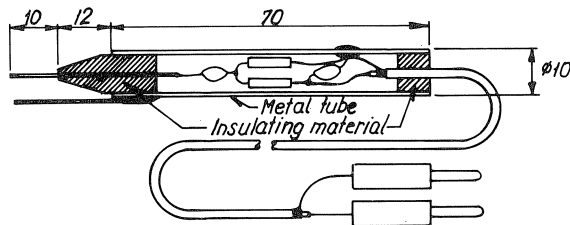
3.3. PROPOSAL FOR NECESSARY MEASURING INSTRUMENTS cont.:

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 measurements made by means of a test probe will be relative measurements. For quantitative measurements 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 \pm 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: $f = \pm 3$ 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: $f = \pm 4.8$ 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 \pm 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 \pm 100 Hz.

3.5.2. ADJUSTMENT OF RX/TX UNIT cont.:

6. Set modulation on signal generator to nominal modulation $f_m = 1$ kHz,
 $f = \pm 3$ 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 $250 \text{ mV}_{\text{RMS}} \pm 10 \text{ mV}_{\text{RMS}}$ 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

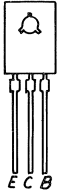
1. If a factory adjusted and tested module has to be inserted, just proceed with point 3.
2. Follow the procedure described in section 3.5.2. ADJUSTMENT OF RX/TX UNIT.
3. Follow the procedure Alignment of RX-filter control amplifier described in section 3.5.1. ADJUSTMENT OF SYNTHESIZER UNIT.

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



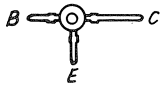
BD234



TIS88A



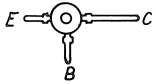
BF199



BFW92A



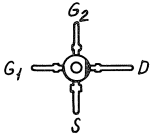
BC320-25
BC330-25
BC547A
BC547C
BC548B
BC549C
BC550B
BC557C



BF979



BC630



BF964



2N2369A



BF509



2N4427



J309

INTEGRATED CIRCUIT



LM317T



LM78L05AC

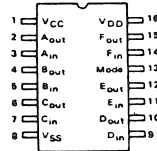


BF245A
BF256A

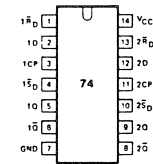


LM317LZ

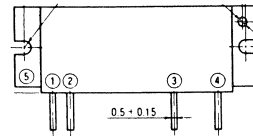
MC14504B



PC74HC74

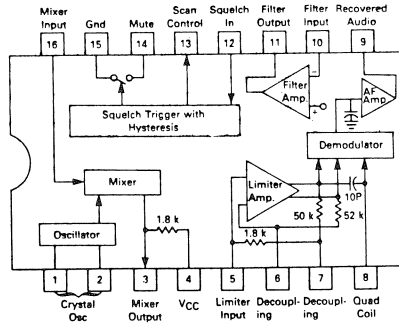
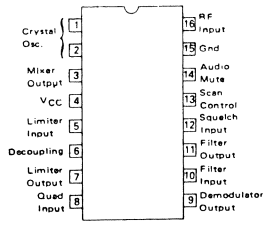


M57710A

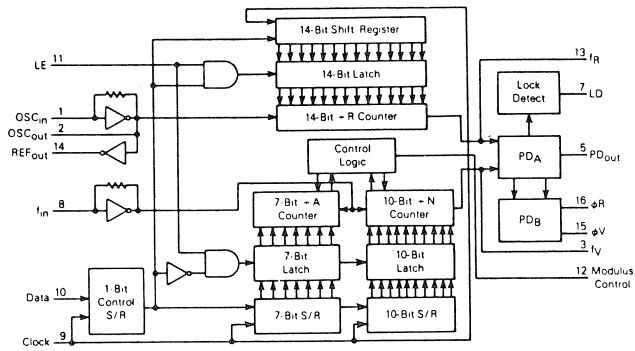
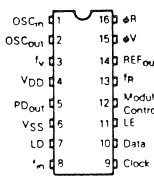


3.10. PIN CONFIGURATIONS cont.:

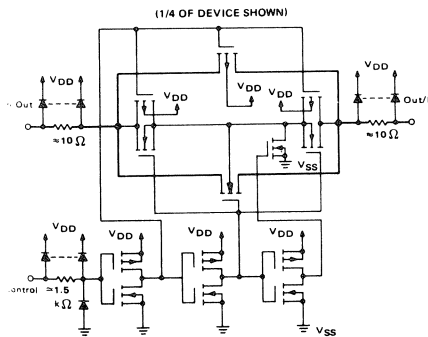
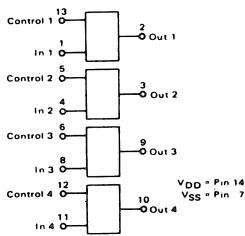
MC3361



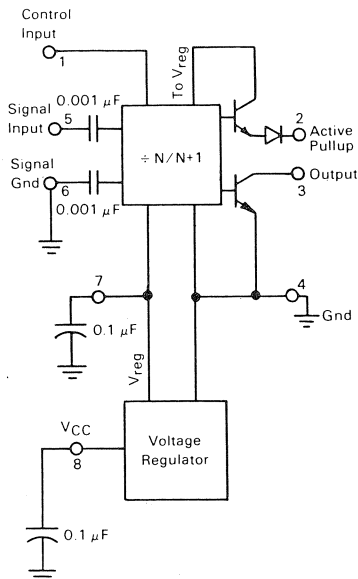
MC145158



MC14066B

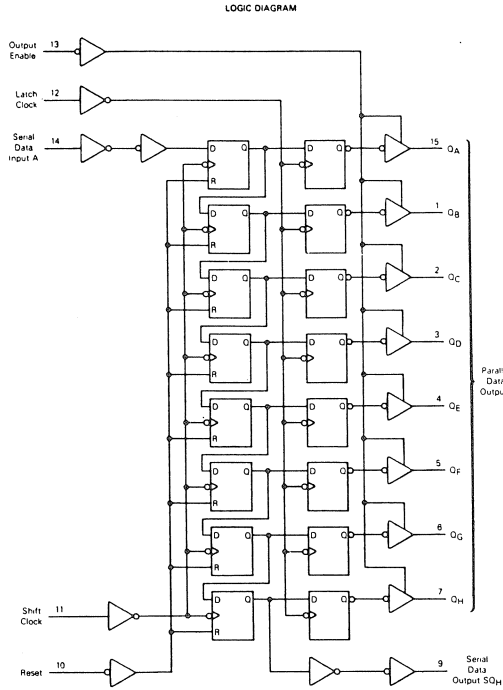
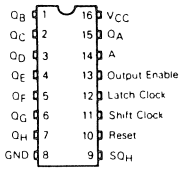


MC12015



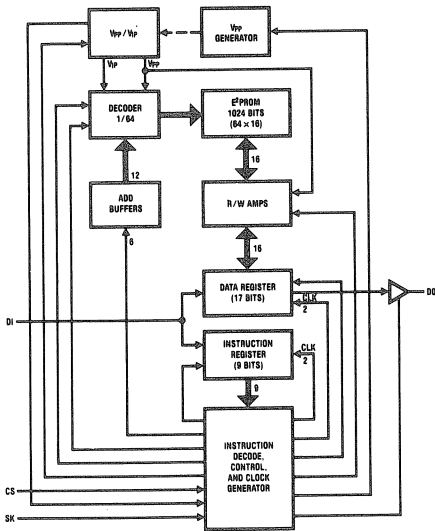
3.10. PIN CONFIGURATIONS cont.:

MC74HC595

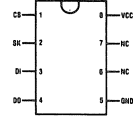


93C46 EEPROM

Block and Connection Diagrams

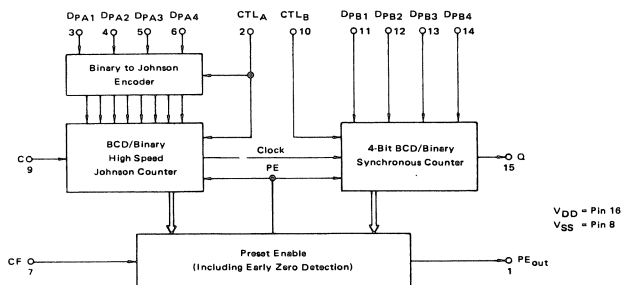
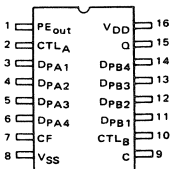


Dual-In-Line Package



- 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

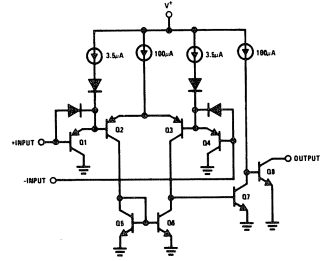
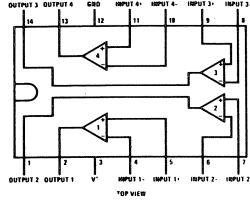
MC14569B



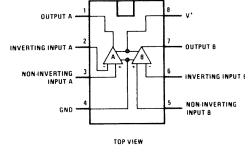
V_{DD} = Pin 16
 V_{SS} = Pin 8

3.10. PIN CONFIGURATIONS cont.:

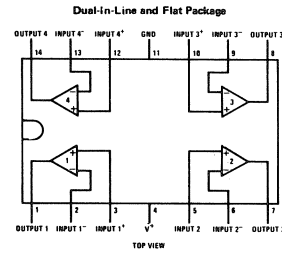
LM339



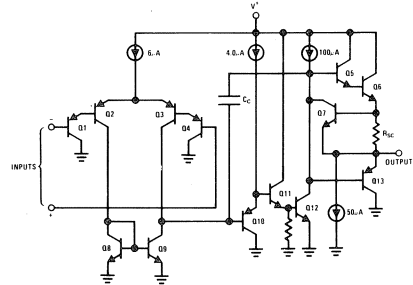
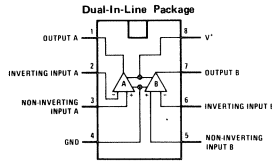
LM393



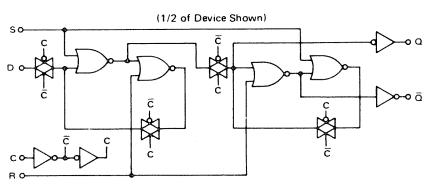
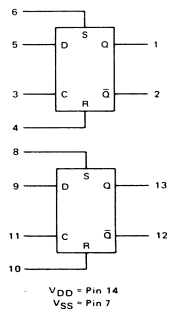
LM324



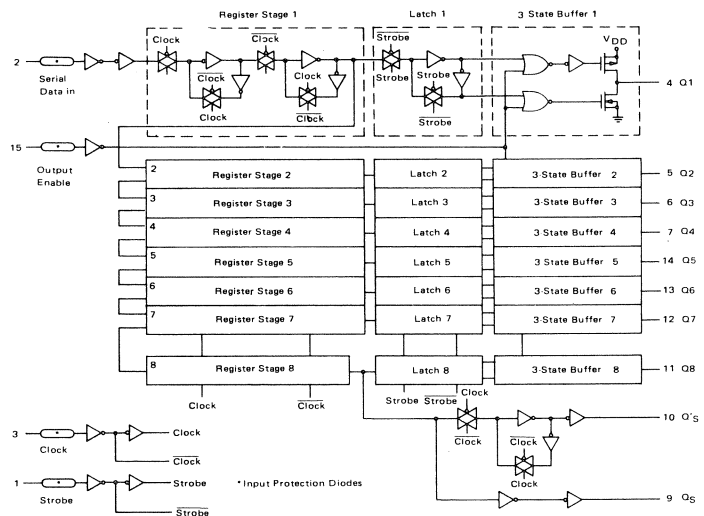
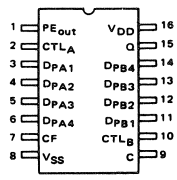
LM358



MC14013B



MC14094B

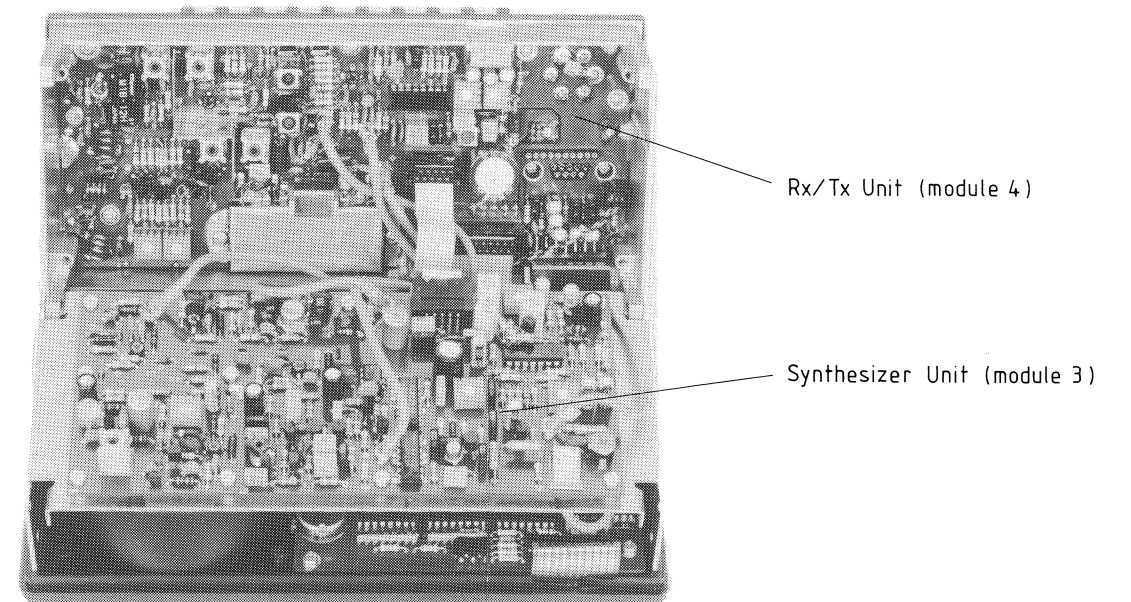
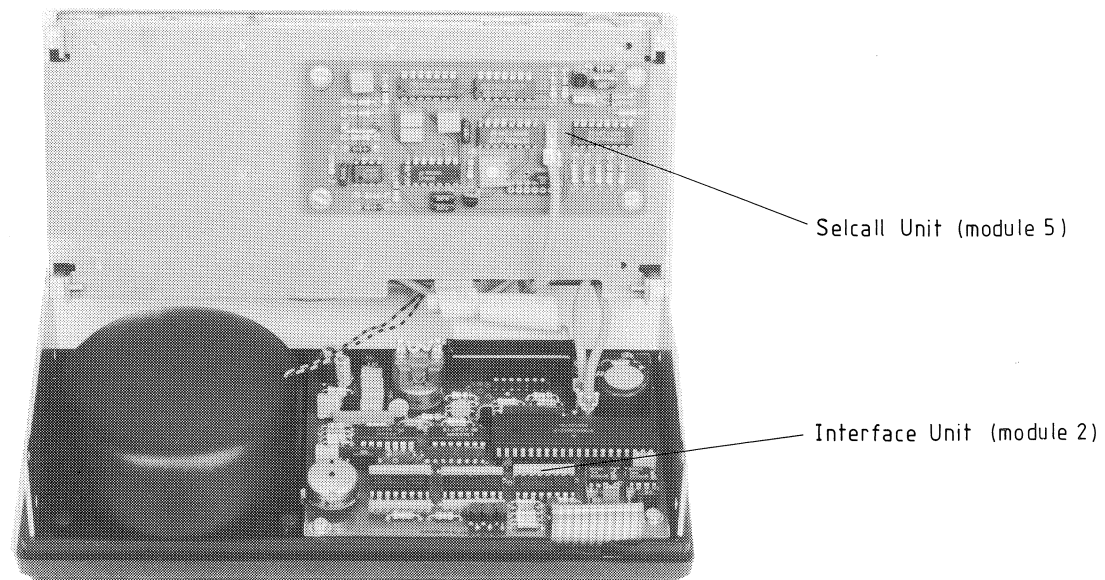
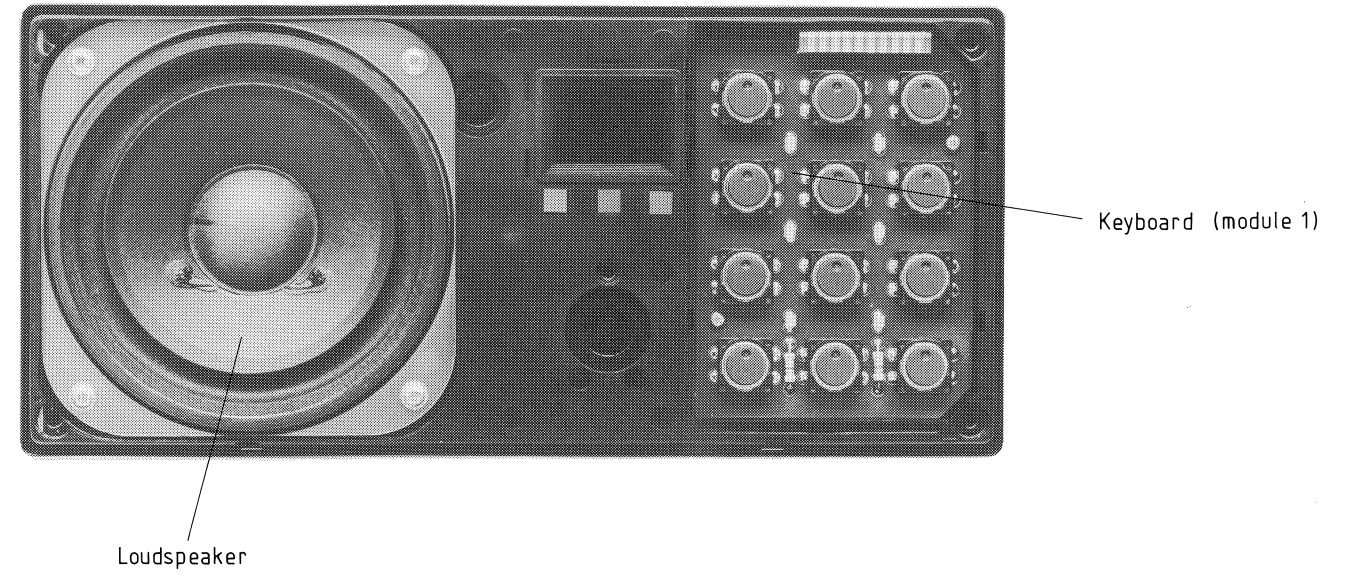
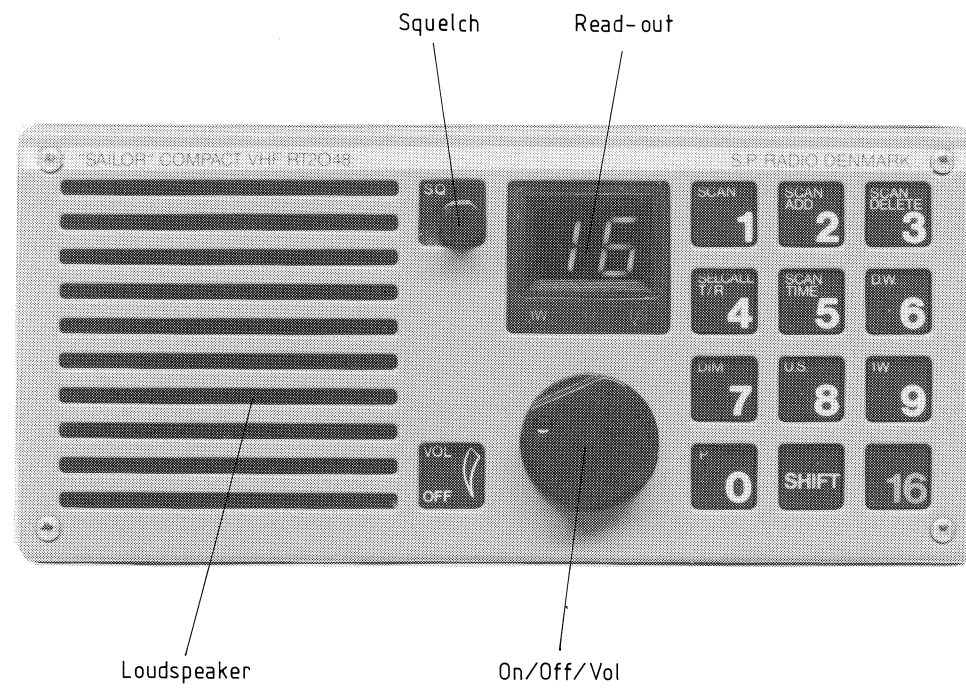


RT2048 A

CONTENTS

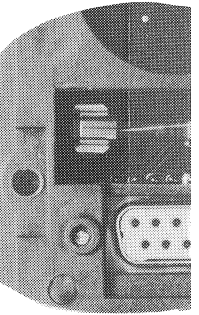
- 4. MODULE LOCATION
- 4.1. MECHANICAL DISASSEMBLING

4. MODULE LOCATION



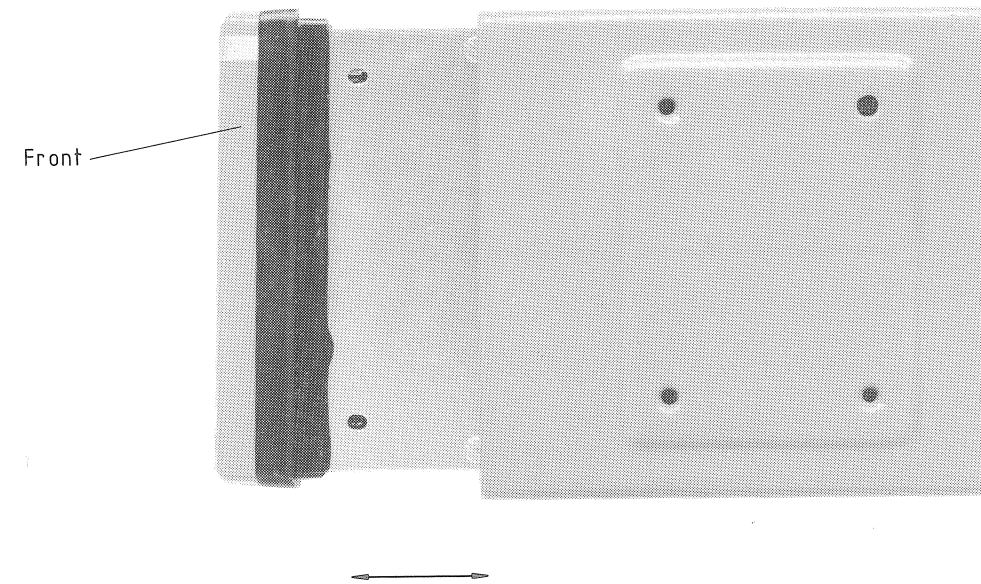
RT2048A4-6-25561,62,64,65,66,67.

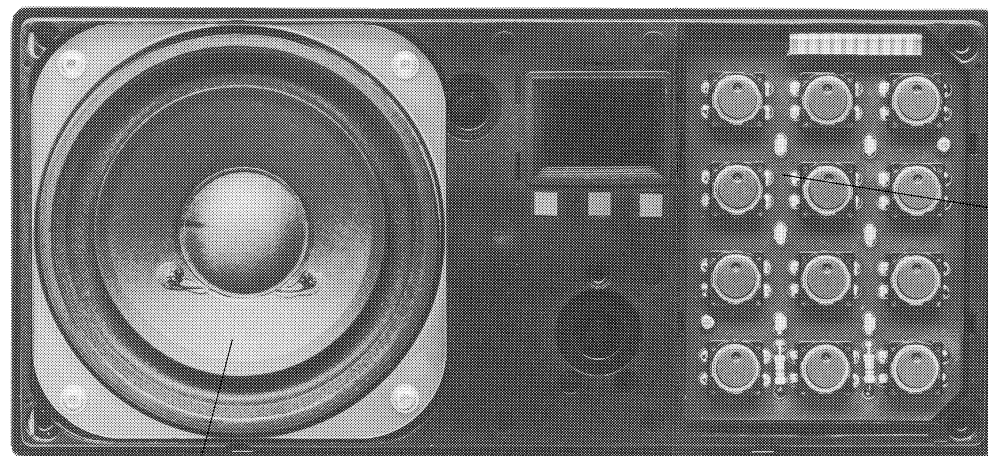
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4.1. MECHANICAL DISASSEMBLING RT2048

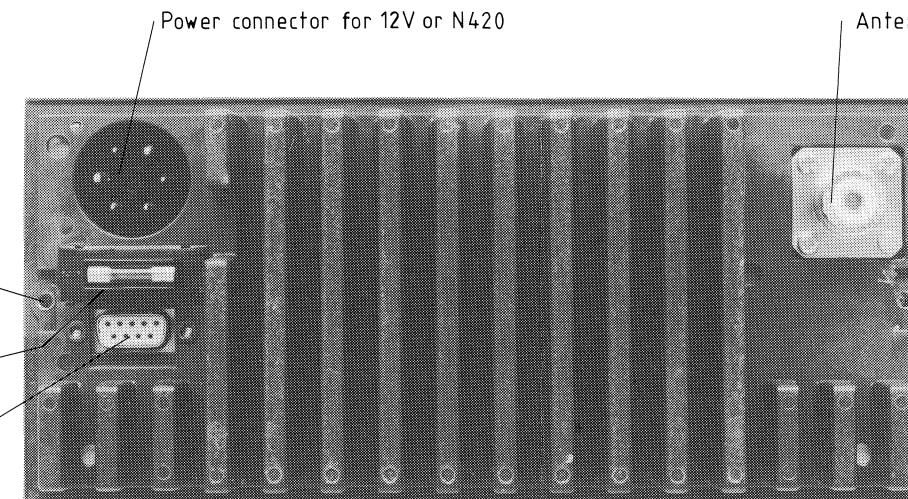
To disassemble the RT2048 remove the two allen screws with the black covers on the rear of the set and pull the frontplate and kabinet from each other.





Loudspeaker

Keyboard (module 1)



Power connector for 12V or N420

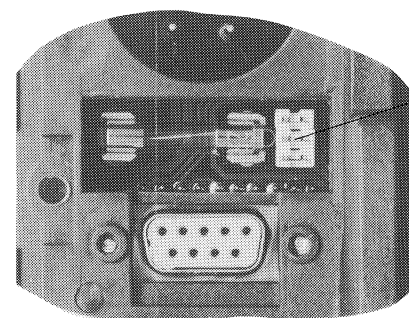
Antenna connector

Thread for cover allen screw

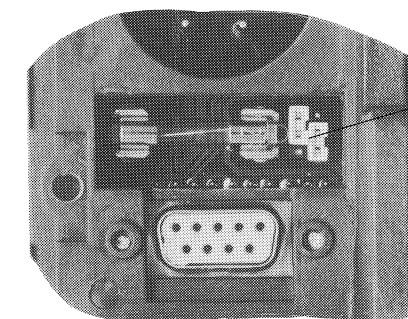
Thread for cover allen screw

Fuse cover with spare-fuse

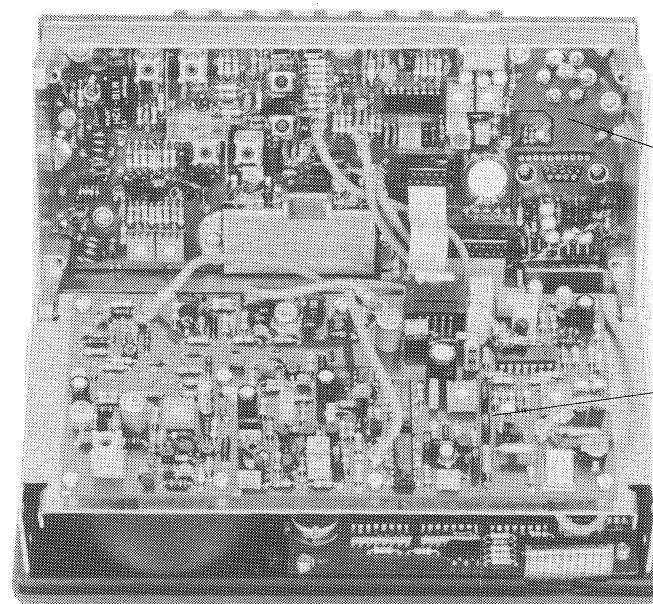
Microphone connector



Strap for connection to N420 (24V)



Strap for connection to external supply (12V)

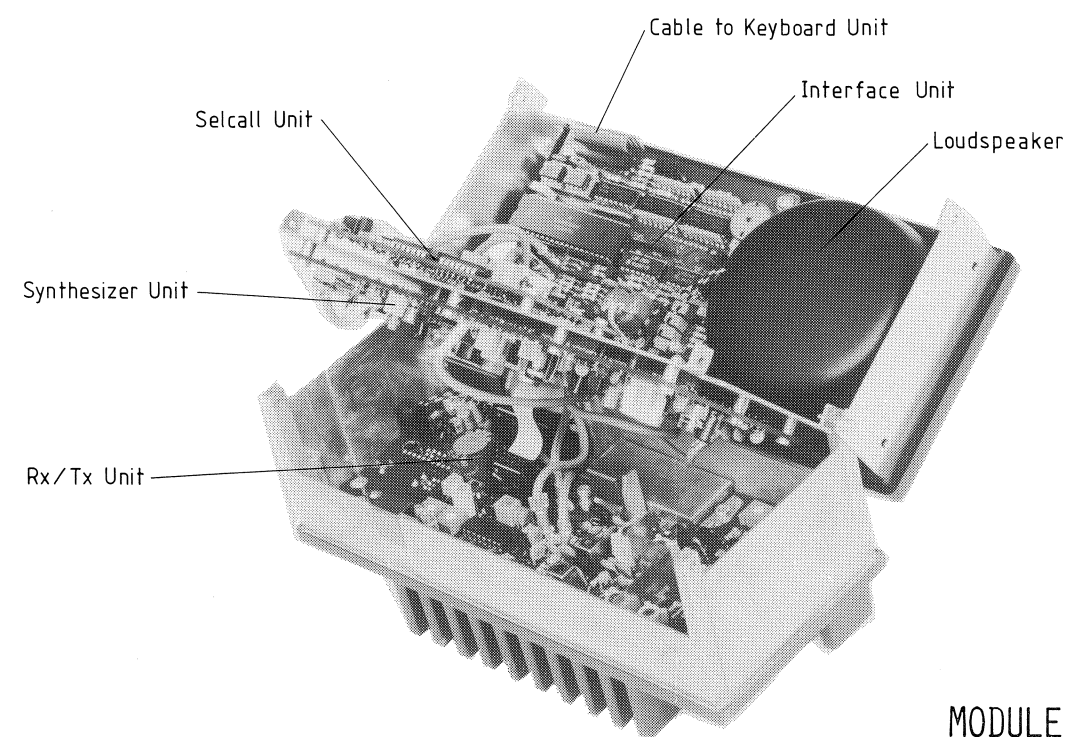


Rx/Tx Unit (module 4)

Synthesizer Unit (module 3)

module 5)

(module 2)



Cable to Keyboard Unit

Selcall Unit

Interface Unit

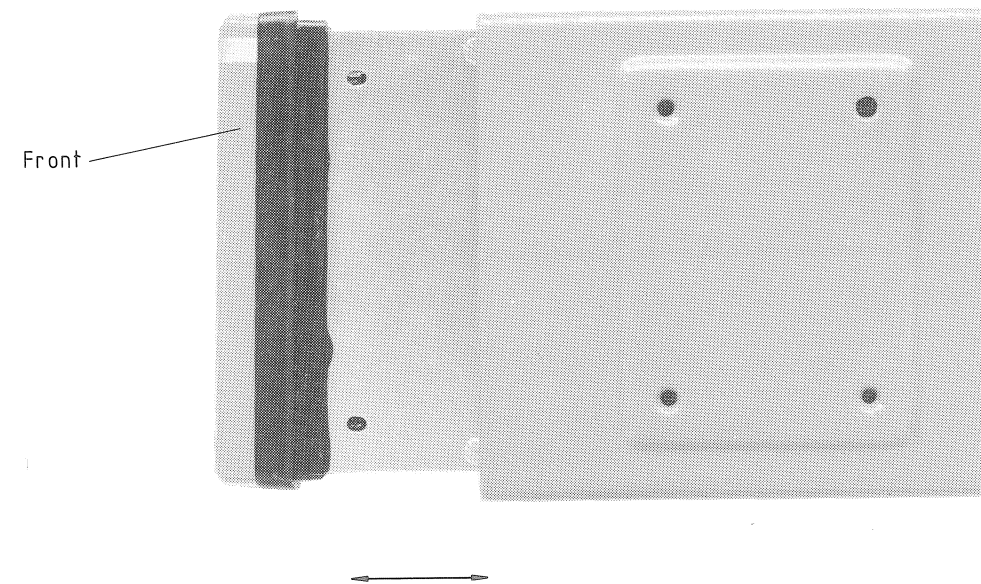
Loudspeaker

Synthesizer Unit

Rx/Tx Unit

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.



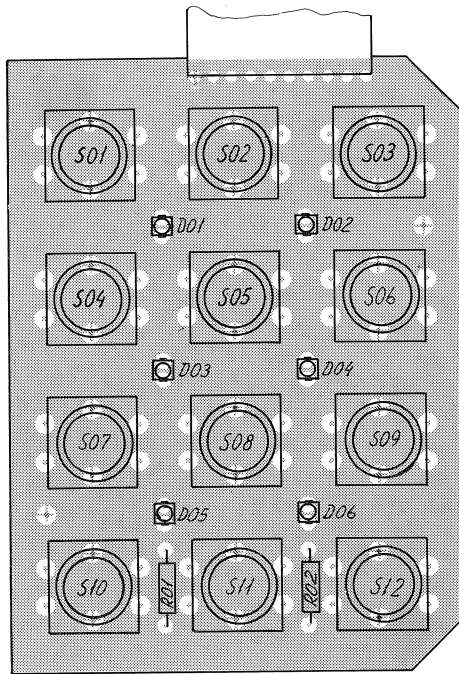
CONTENTS

- 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

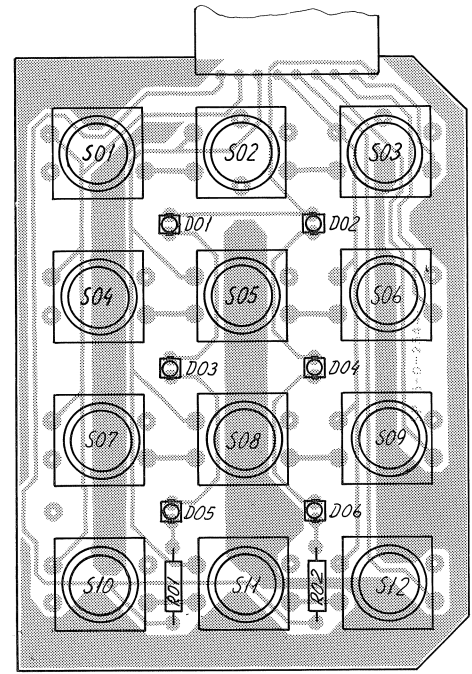
5. CIRCUIT DESCRIPTION

5.1. KEYBOARD UNIT (MODULE 1)

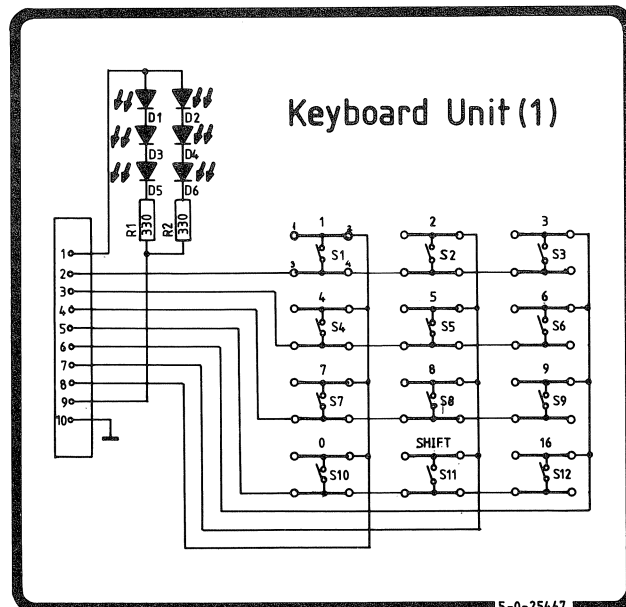
The keyboard unit comprises the 3 point 4 push button matrix, which is used for all the entries from the front panel e.g. channel selection, 1W etc. Besides the LED-diodes for keyboard illumination is placed on this board.



View from component side with upper side tracks.



View from component side with lower side tracks.



5-0-25447

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

5.2. INTERFACE UNIT (MODULE 2) cont.:

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.

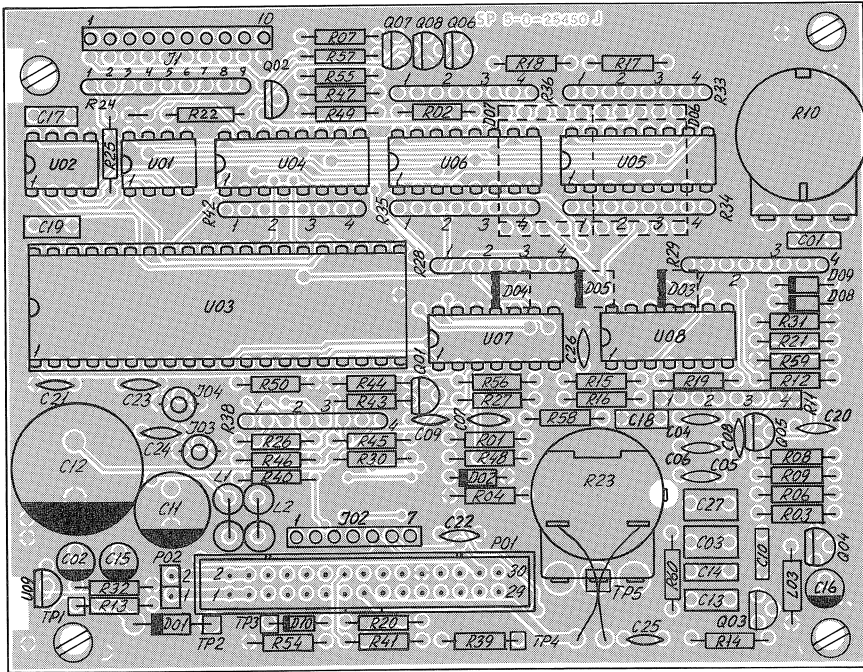
The microcomputer U03 detects the message and generates the appropriate mute signals for the AF amplifiers.

5.2.10. AF FILTER/AMPLIFIER

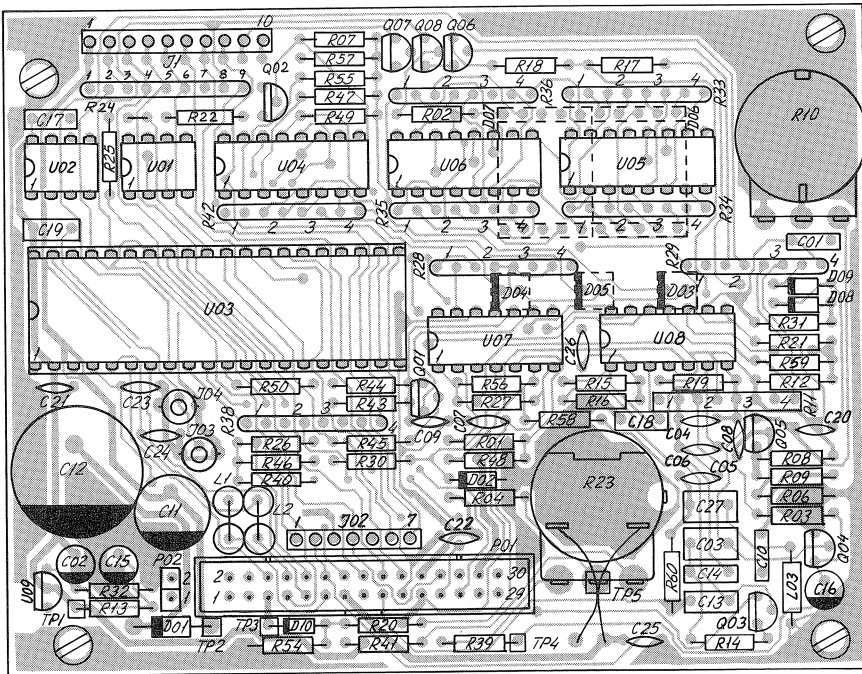
The AF signal is led to the active filter around U08/1. The filter provides a frequency response of -6 dB/oct. in the range of 0.3 to 3 kHz, and limits the signals outside this range.

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.

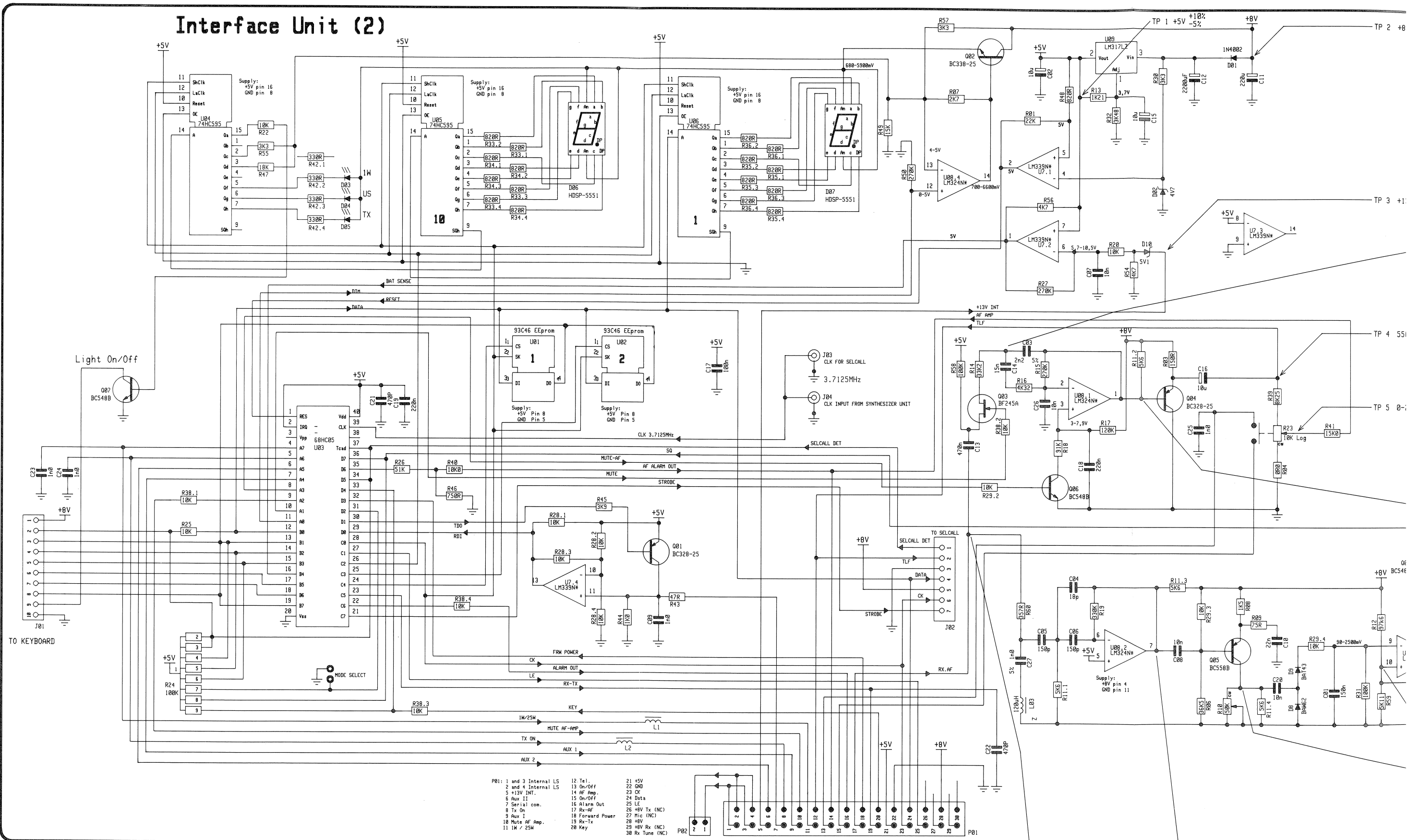


View from component side with lower side tracks.

INTERFACE UNIT (MODULE 2)

RT2048 B
4-6-25450D

Interface Unit (2)



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

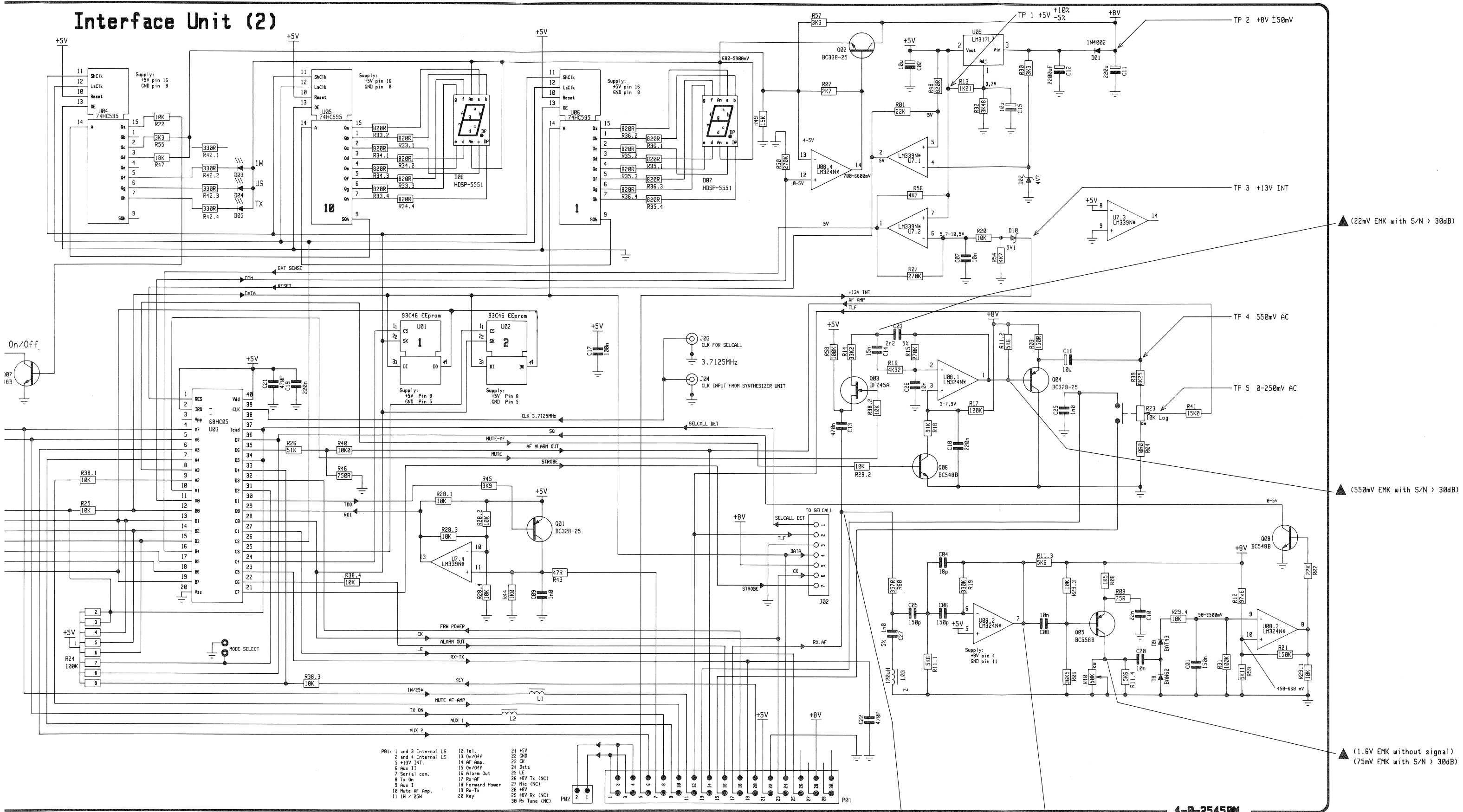
▲ APPROX MEASUREMENT WITH AC-VOLTMETER

▲ (250mV EMK with S/N > 30dB)

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

4-0-25450M

Interface Unit (2)



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

- ▲ (22mV EMK with S/N > 30dB)
- ▲ (550mV EMK with S/N > 30dB)
- ▲ (1.6V EMK without signal)
(75mV EMK with S/N > 30dB)

4-0-25450M

INT WITH AC-VOLTMETER

SCHEMATIC DIAGRAM INTERFACE UNIT (MODULE 2)

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.

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 Pump 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 circuit.

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

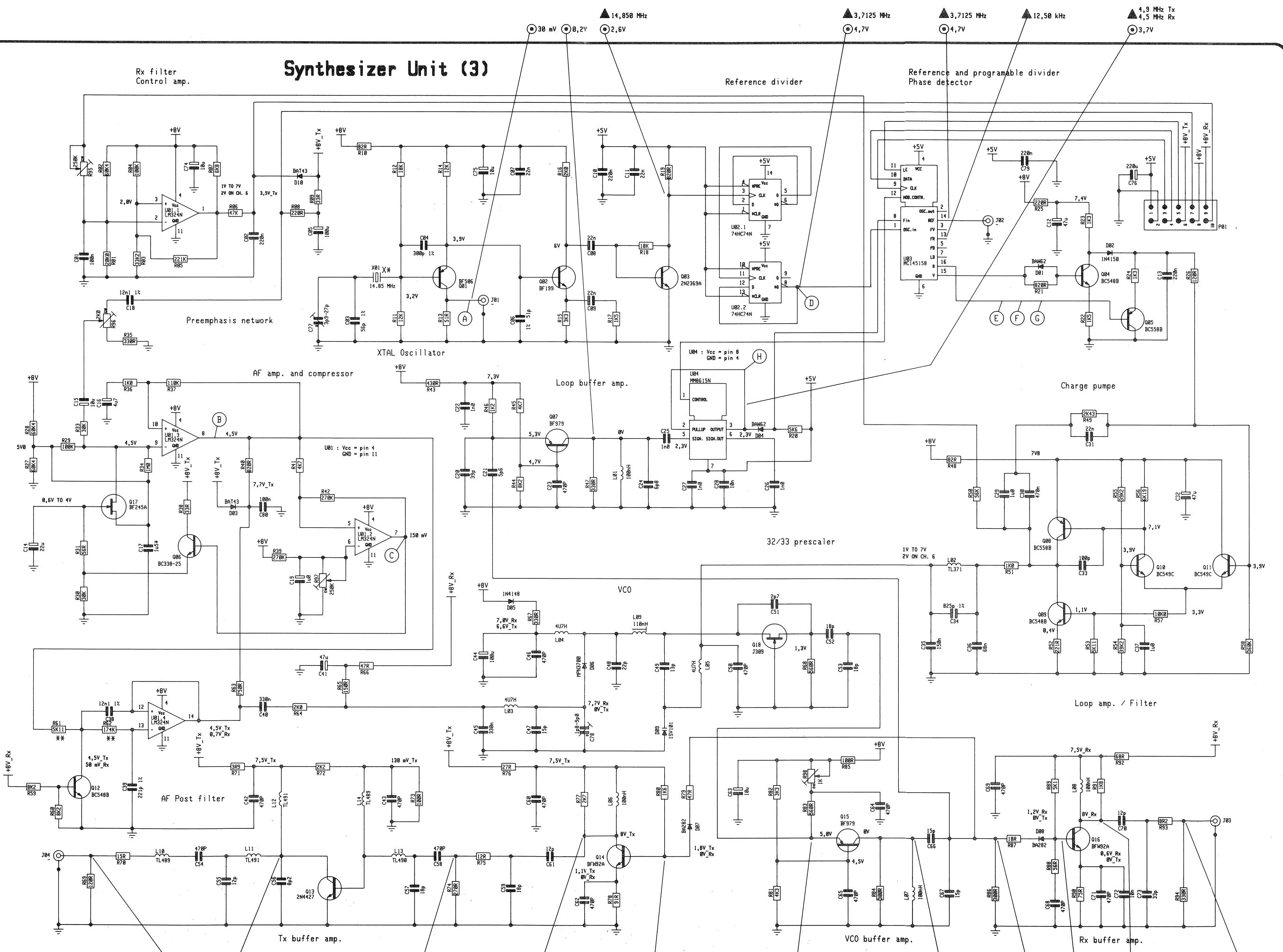
Capacitor C18 in conjunction with R35 and R96 introduces the needed 6 dB/oct. response of the AF input signal. The input sensitivity is adjusted by means of R96.

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.

Synthesizer Unit (3)



▲ APPROX. MEASUREMENTS WITH TEST PROBE
 ○ APPROX. MEASUREMENTS WITH VOLTMETER

CH1
5
2
CH1
CH2
1
2
CH1
1
5
CH1
1
1

RT2048 4-0-25451M

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

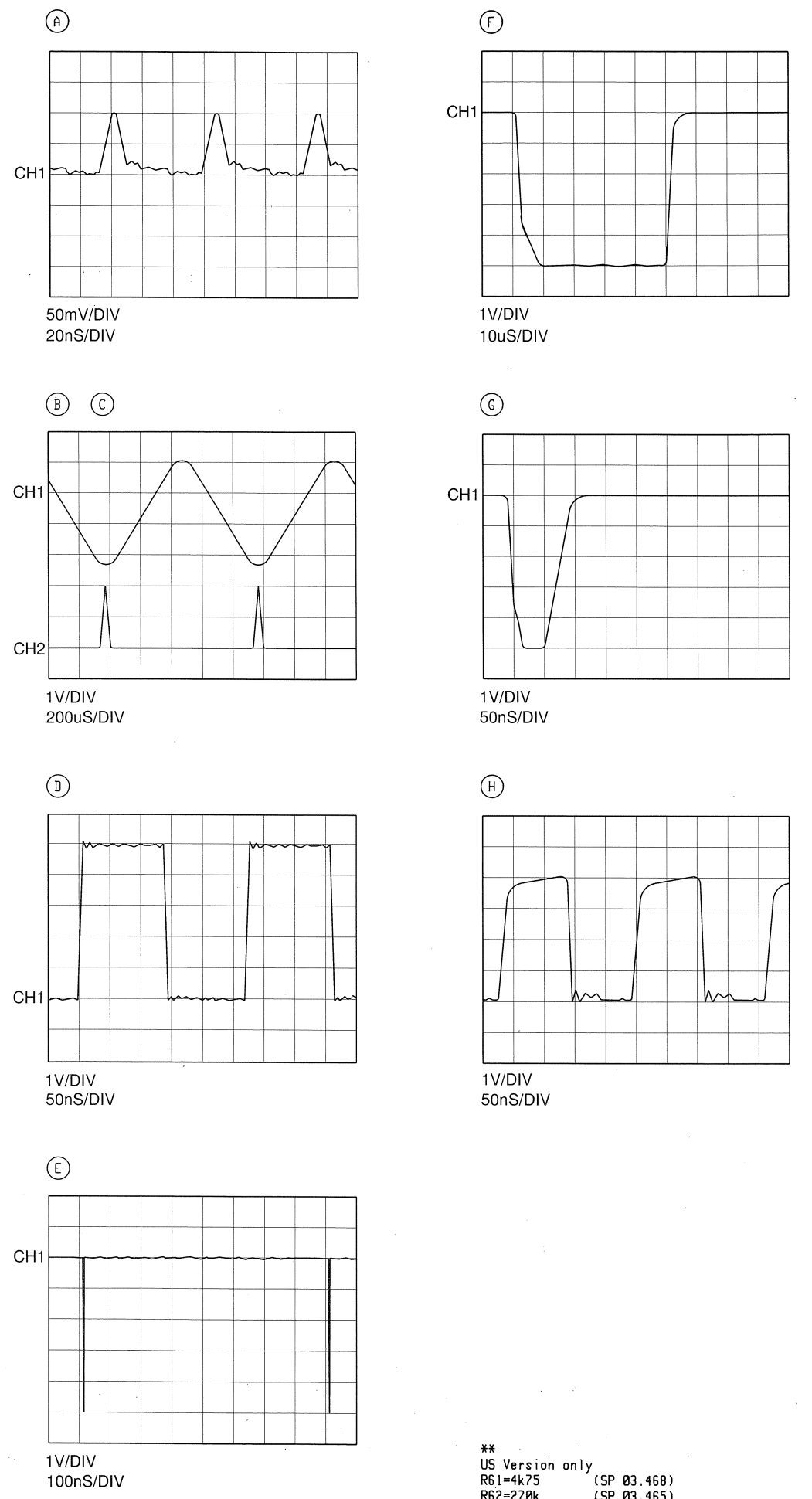
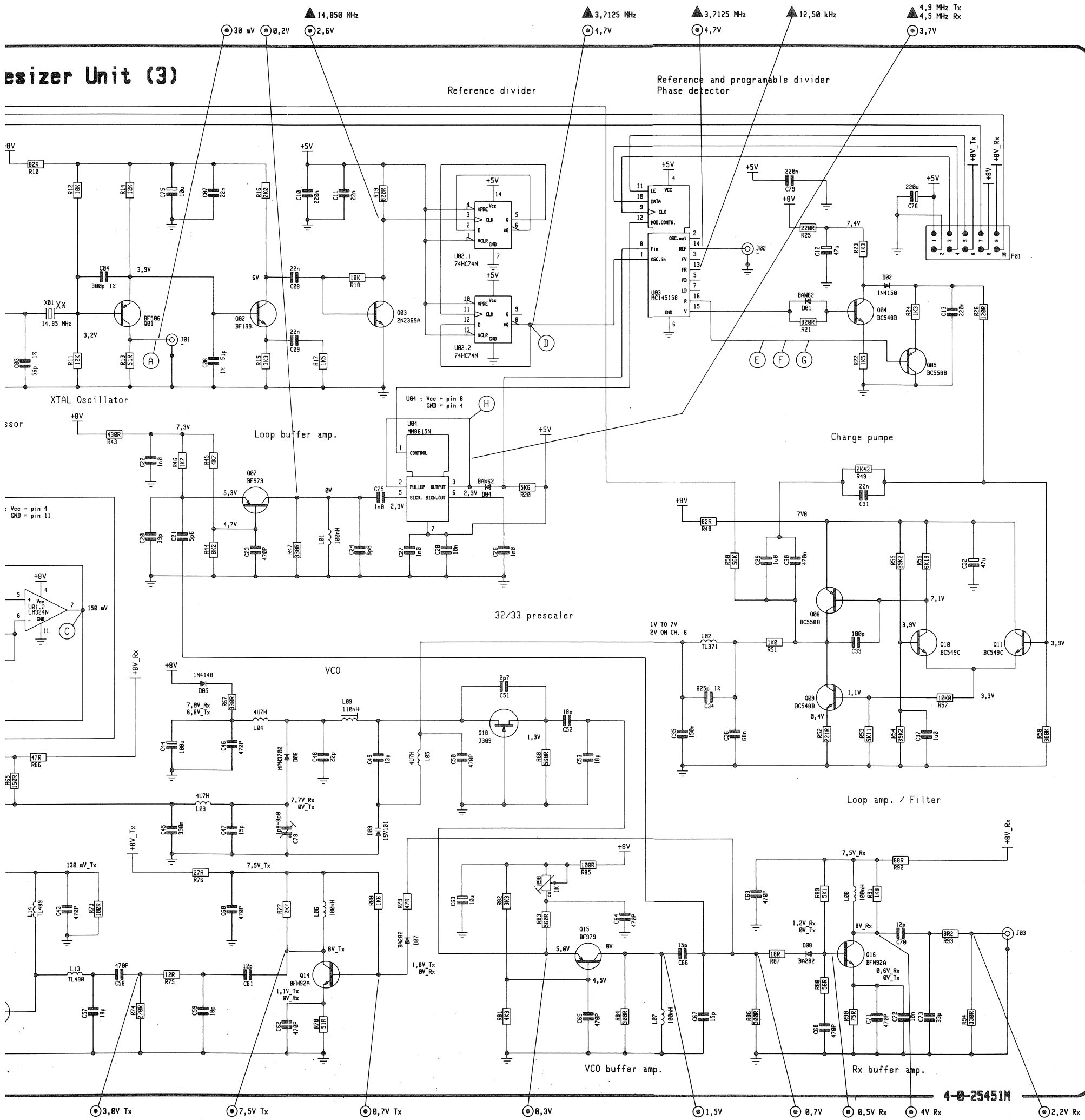
The transistor Q10 amplifies the signal to the 2nd mixer, which has a tuned drain circuit consisting of L04 and C32.

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.

Synthesizer Unit (3)



**
US Version only
R61=4k75 (SP 03.468)
R62=270k (SP 03.465)
X81=5ppm C1075 (SP 39.841)

4-0-25451M

SCHEMATIC DIAGRAM SYNTHESIZER (MODULE 3)

5.4. RX/TX UNIT (MODULE 4)

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- RF power amplifier
- Harmonic filter
- RF power control
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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.

5.4. RX/TX UNIT cont.:

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.

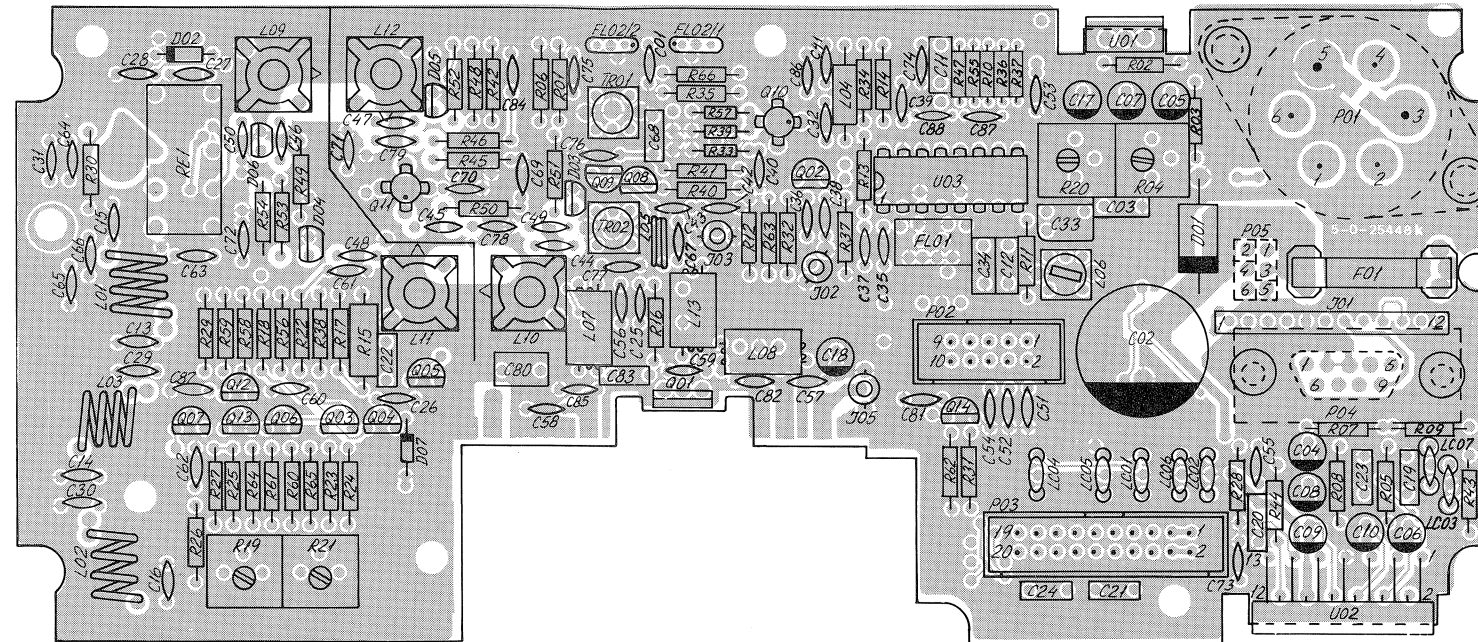
If the power is lower than about 15 Watt in the 25 Watt position the power indicator transistor Q06 will make a smooth change-over to 1 Watt position through resistor R61.

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.

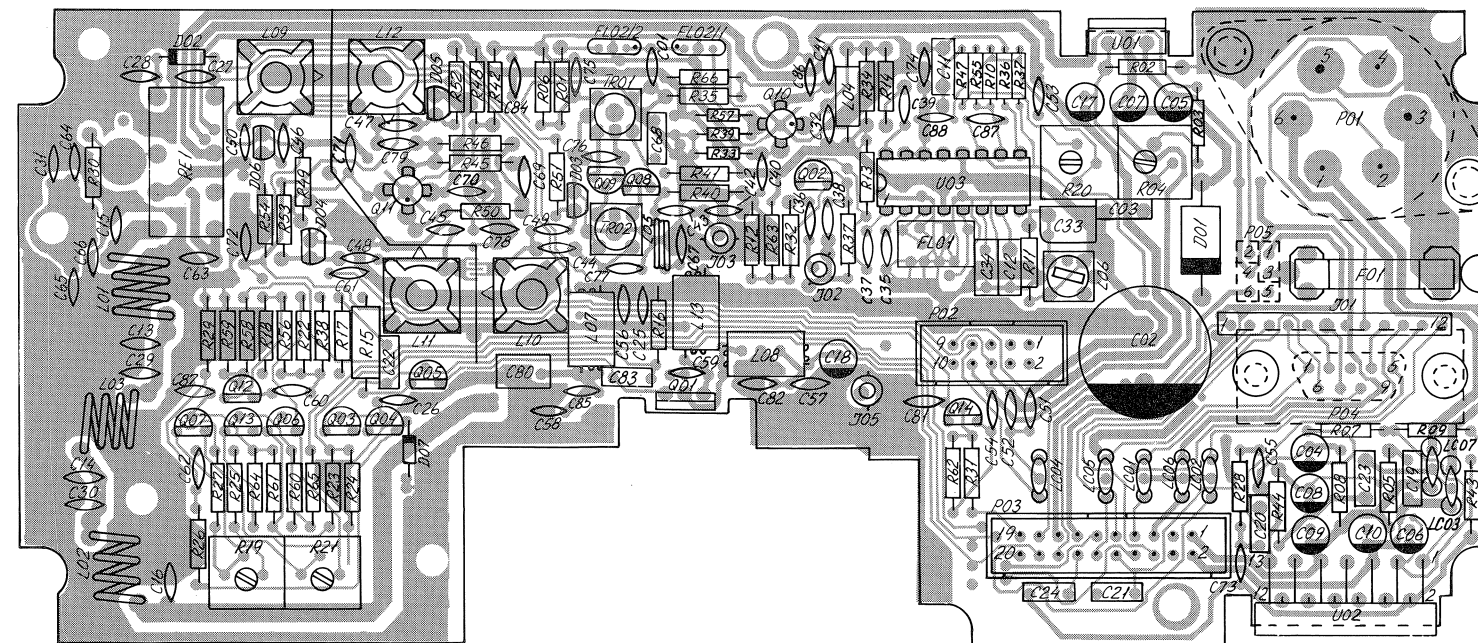
5.4. RX/TX UNIT cont.:

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.

5.5. SELCALL UNIT (MODULE 5)

The input to the selcall is taken from the telephone output. The signal is first amplified and limited in U04/2 and then it passes the bandpass filter. Finally the signal is rectified and compared with a reference level in the comparator U04/1.

3.7125 MHz is divided in the programmable counter U06. The output of this is divided by 2 and turned into a square wave in the flip-flop U03/2. The outputs of the flip-flop is connected to the switches U02. The frequency, at which the switches around the capacitors C03 and C04 are working, determines the resonance frequency of the filter. Thus by changing the dividing figure to U06, it is possible to change the resonance frequency of the filter.

With R01 it is possible to fine adjust the resonance frequency of the filter (see the adjustment procedure).

Figure No.	f(nominal) (Hz)	U06 input								U03 output (Hz)
		14	13	12	11	6	5	4	3	
1	1124	0	1	1	0	0	1	1	1	18022
2	1197	0	1	1	0	0	0	0	0	19336
3	1275	0	1	0	1	1	0	1	0	20625
4	1358	0	1	0	1	0	1	0	1	21838
5	1446	0	1	0	1	0	0	0	0	23203
6	1540	0	1	0	0	1	0	1	1	24750
7	1640	0	1	0	0	0	1	1	0	26518
8	1747	0	1	0	0	0	0	1	0	28125
9	1860	0	0	1	1	1	1	1	0	29940
0	1982	0	0	1	1	1	0	1	0	32004
R	2110	0	0	1	1	0	1	1	1	33750

When the radio is switched on the dividing figure, corresponding to the first figure in the selcall number, is shifted out on port B0 on the uC at the interface unit which is connected to the input of U07.

U07 is a serial to parallel shift register which converts the signal to the dividing figure U06. If the correct tone is received the output of the comparator U4/1 goes low. This output is connected to the uC's SEL-DET. pin. When the tone disappears again the uC will put out the dividing figure corresponding to the next figure in the selcall number.

If all five tones are received correctly, the port C06 (EXT. ALARM) on the uC goes high. This port is connected to pin 1 on the connector to the option board at the RX/TX unit. At the same time the uC will send out an alarm tone from D06 via the volume control and power amplifier to the loudspeaker. The alarm tone lasts for 10 secs after an individual call, and after an all call it lasts until the selcall has been reset.

If the SELCALL T/R button is activated the alarm circuits and indicators are tested.

5.5. SELCALL UNIT (MODULE 5)

The input to the selcall is taken from the telephone output. The signal is first amplified and limited in U04/2 and then it passes the bandpass filter. Finally the signal is rectified and compared with a reference level in the comparator U04/1.

3.7125 MHz is divided in the programmable counter U06. The output of this is divided by 2 and turned into a square wave in the flip-flop U03/2. The outputs of the flip-flop is connected to the switches U02. The frequency, at which the switches around the capacitors C03 and C04 are working, determines the resonance frequency of the filter. Thus by changing the dividing figure to U06, it is possible to change the resonance frequency of the filter.

With R01 it is possible to fine adjust the resonance frequency of the filter (see the adjustment procedure).

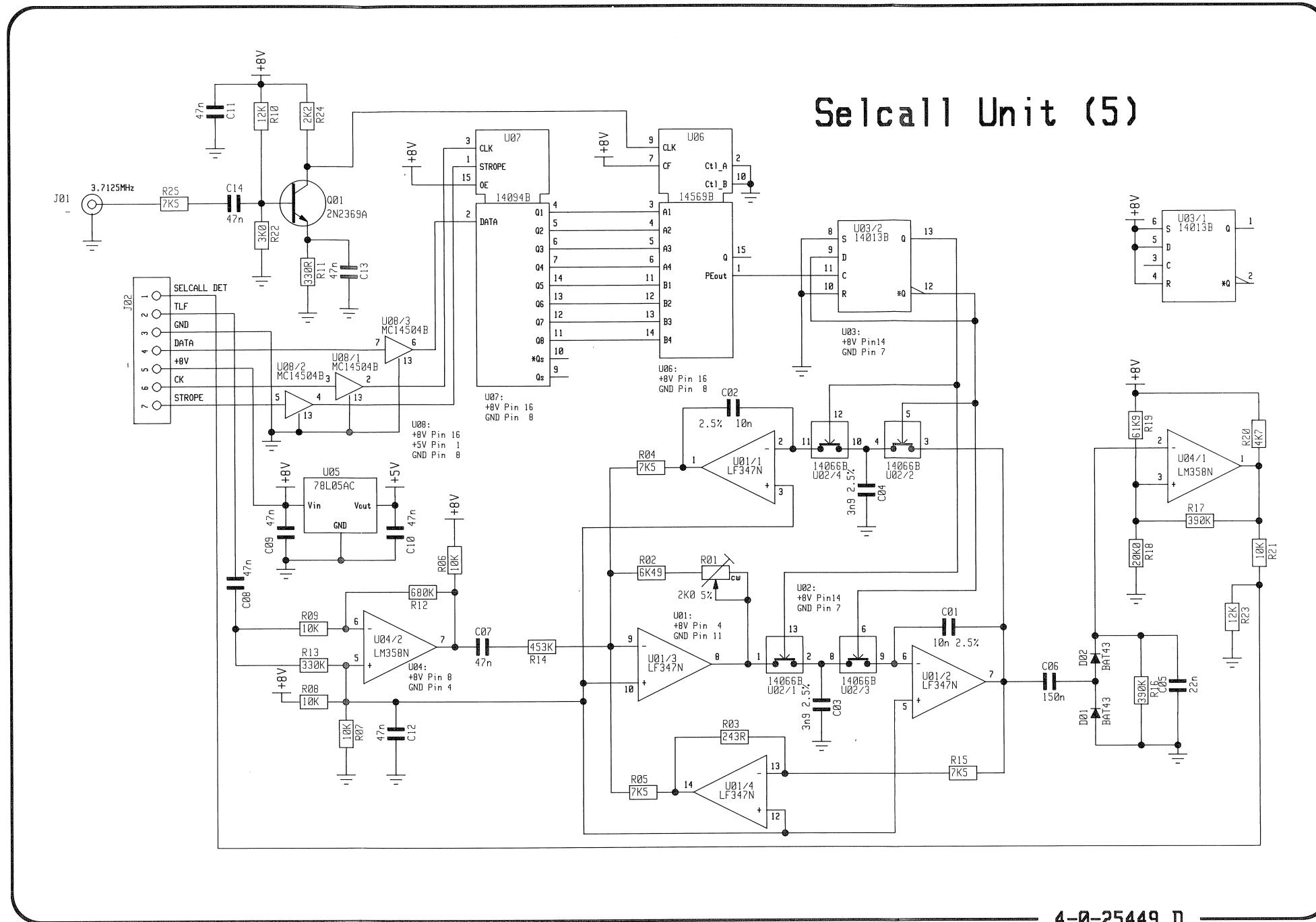
Figure No.	f(nominal) (Hz)	U06 input								U03 output (Hz)
		14	13	12	11	6	5	4	3	
1	1124	0	1	1	0	0	1	1	1	18022
2	1197	0	1	1	0	0	0	0	0	19336
3	1275	0	1	0	1	1	0	1	0	20625
4	1358	0	1	0	1	0	1	0	1	21838
5	1446	0	1	0	1	0	0	0	0	23203
6	1540	0	1	0	0	1	0	1	1	24750
7	1640	0	1	0	0	0	1	1	0	26518
8	1747	0	1	0	0	0	0	1	0	28125
9	1860	0	0	1	1	1	1	1	0	29940
0	1982	0	0	1	1	1	0	1	0	32004
R	2110	0	0	1	1	0	1	1	1	33750

When the radio is switched on the dividing figure, corresponding to the first figure in the selcall number, is shifted out on port B0 on the uC at the interface unit which is connected to the input of U07.

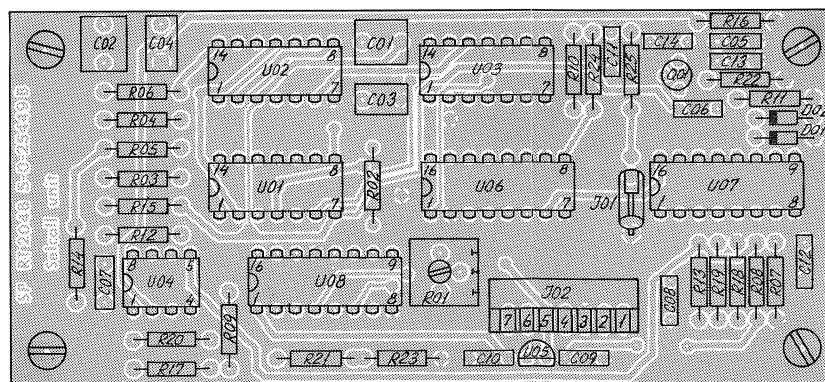
U07 is a serial to parallel shift register which converts the signal to the dividing figure U06. If the correct tone is received the output of the comparator U4/1 goes low. This output is connected to the uC's SEL-DET. pin. When the tone disappears again the uC will put out the dividing figure corresponding to the next figure in the selcall number.

If all five tones are received correctly, the port C06 (EXT. ALARM) on the uC goes high. This port is connected to pin 1 on the connector to the option board at the RX/TX unit. At the same time the uC will send out an alarm tone from D06 via the volume control and power amplifier to the loudspeaker. The alarm tone lasts for 10 secs after an individual call, and after an all call it lasts until the selcall has been reset.

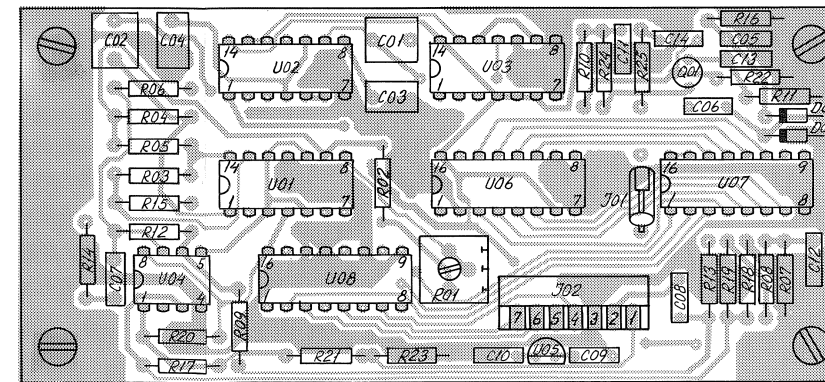
If the SELCALL T/R button is activated the alarm circuits and indicators are tested.



4-0-25449 D

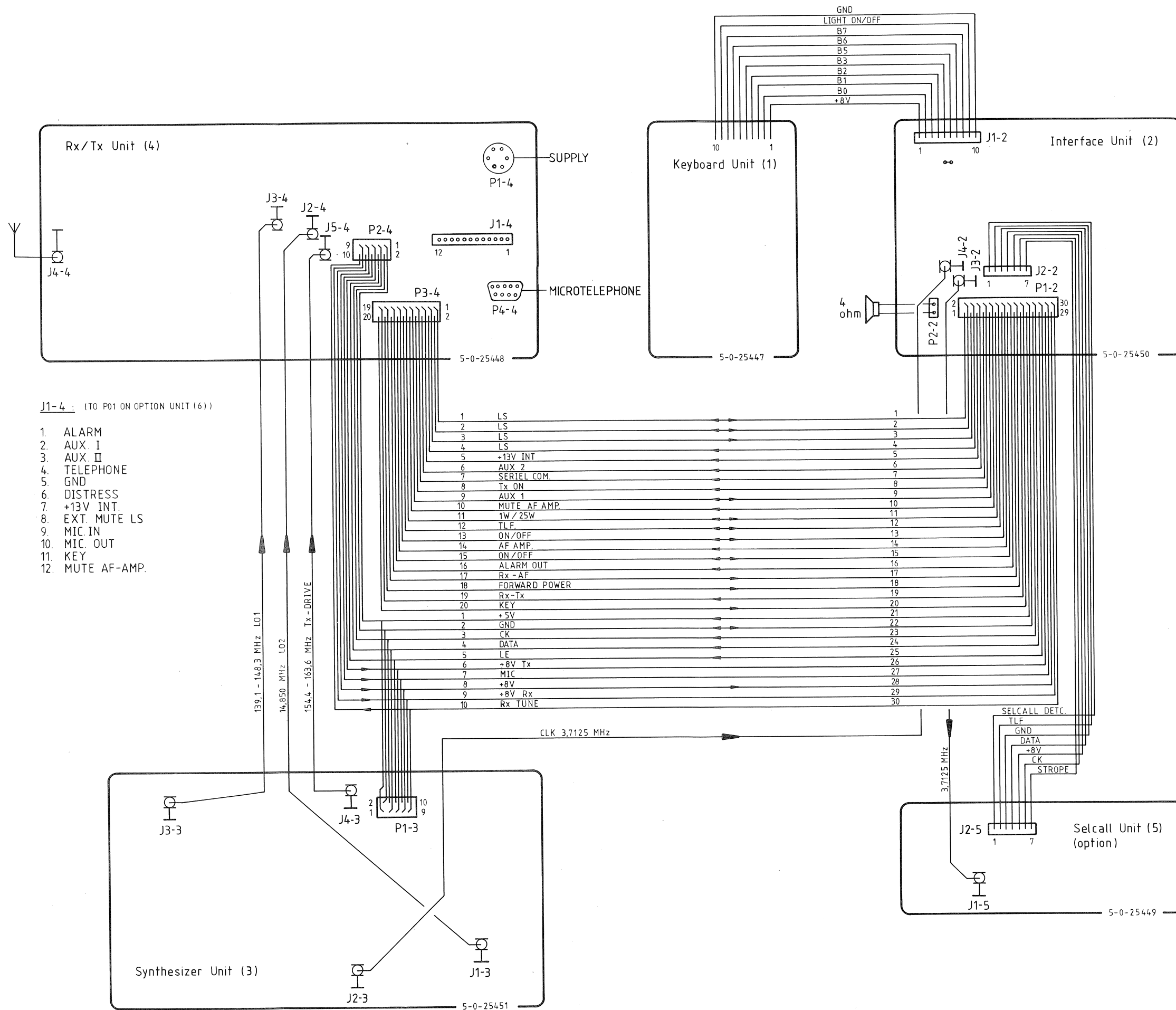


View from component side with upper side tracks.



View from component side with lower side tracks.

5.6. INTERCONNECTION CABLE DIAGRAM



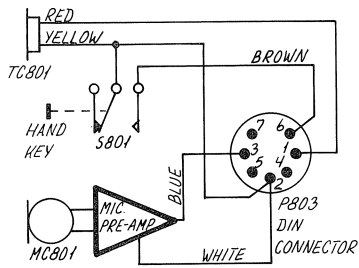
RT2048 B 4-0-25568C

CONTENTS

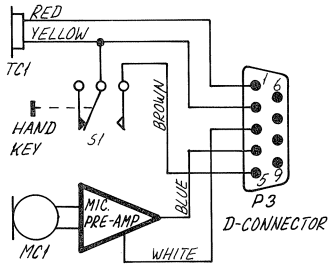
- 6. MICROTELEPHONE INSTALLATION
 - 6.1. SPECIAL INSTALLATION WITH 2 MICROTELEPHONES
 - 6.2. SPECIAL INSTALLATION WITH 3 MICROTELEPHONES
 - 6.3. MECHANICAL DIMENSIONS FOR HANDSET

6. MICROTELEPHONE INSTALLATION

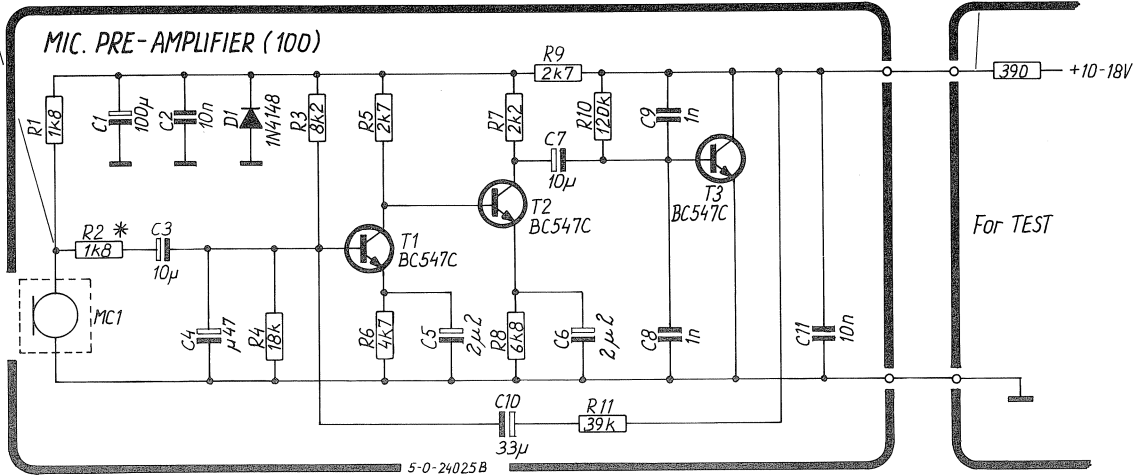
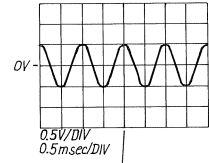
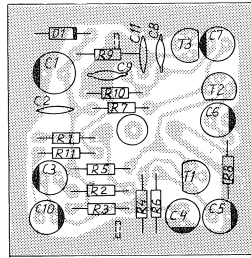
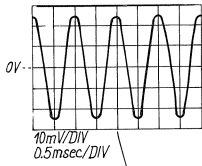
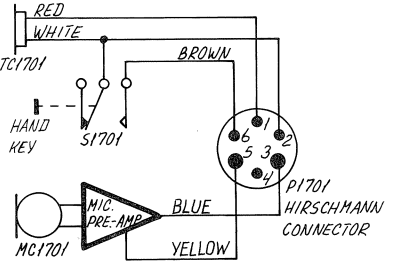
VHF RT2047 and T2031



SCRAMBLER CRY2001, RT2048 and RE2100



SHORTWAVE S130X



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

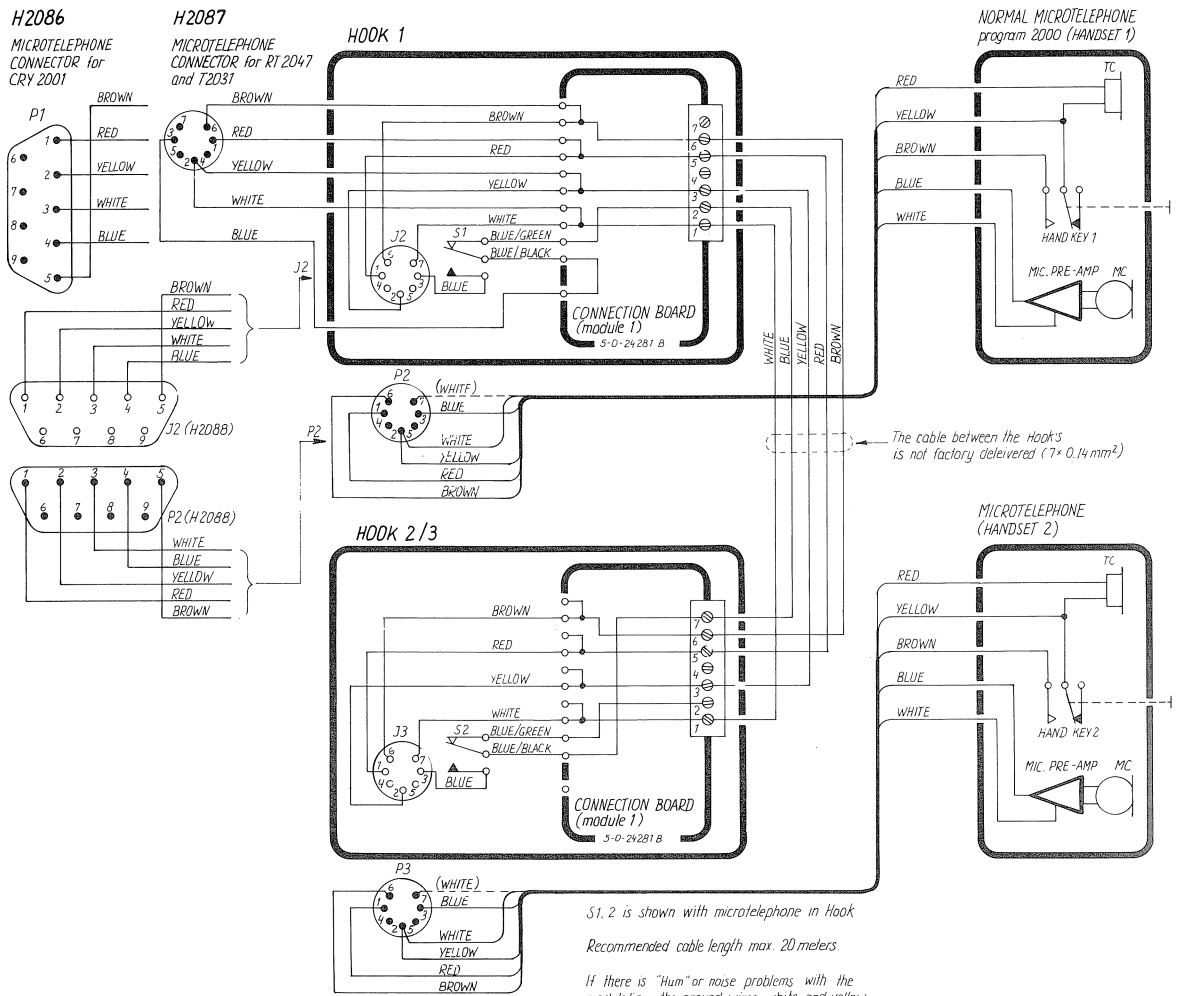
(D)

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

POSITION	DESCRIPTION	MANUFACTURER	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

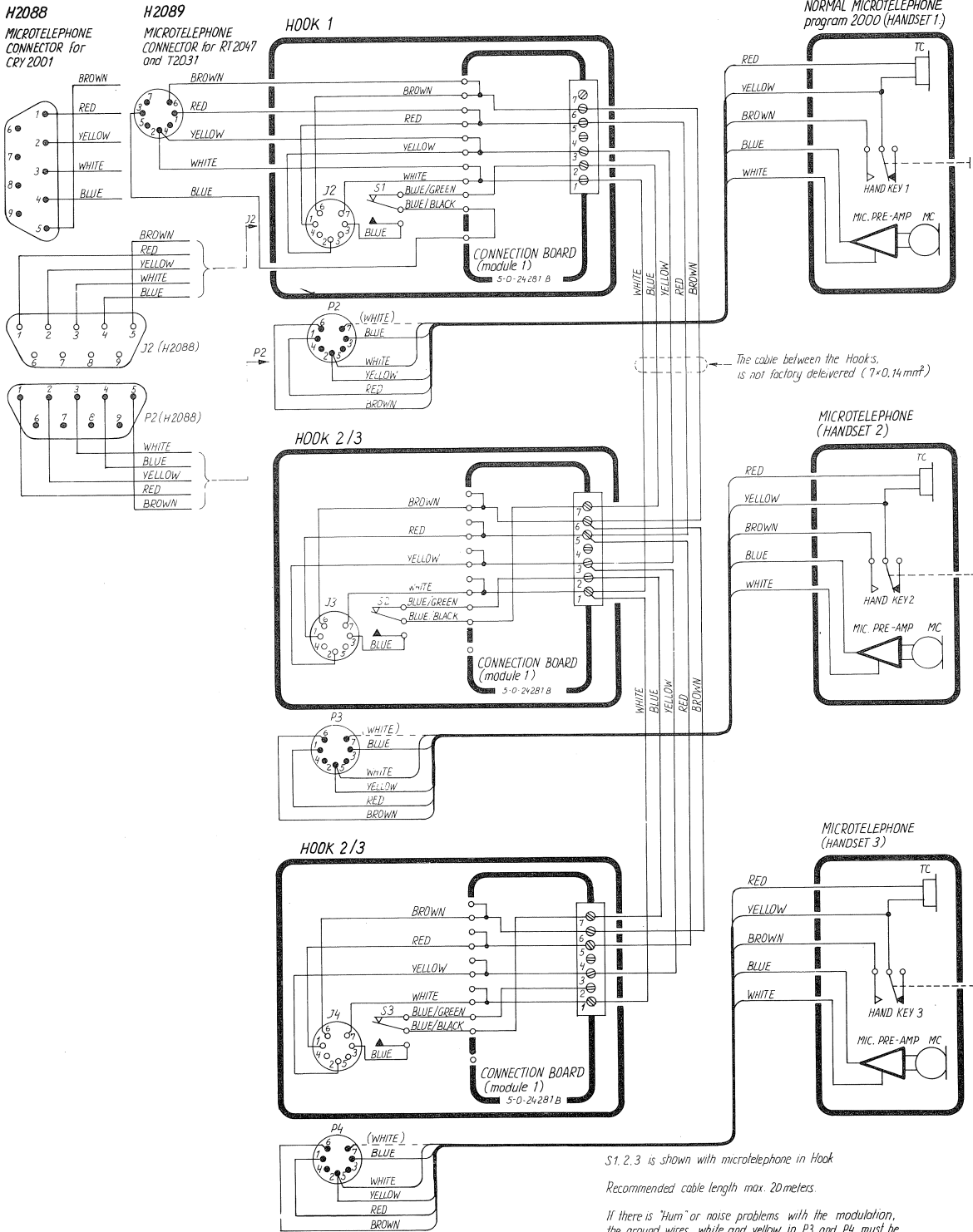
MICROTELEPHONE ONE WITH PREFERENCE



CRY2001, RT2047, T2031, RT2048, RE2100
4-0-24803B

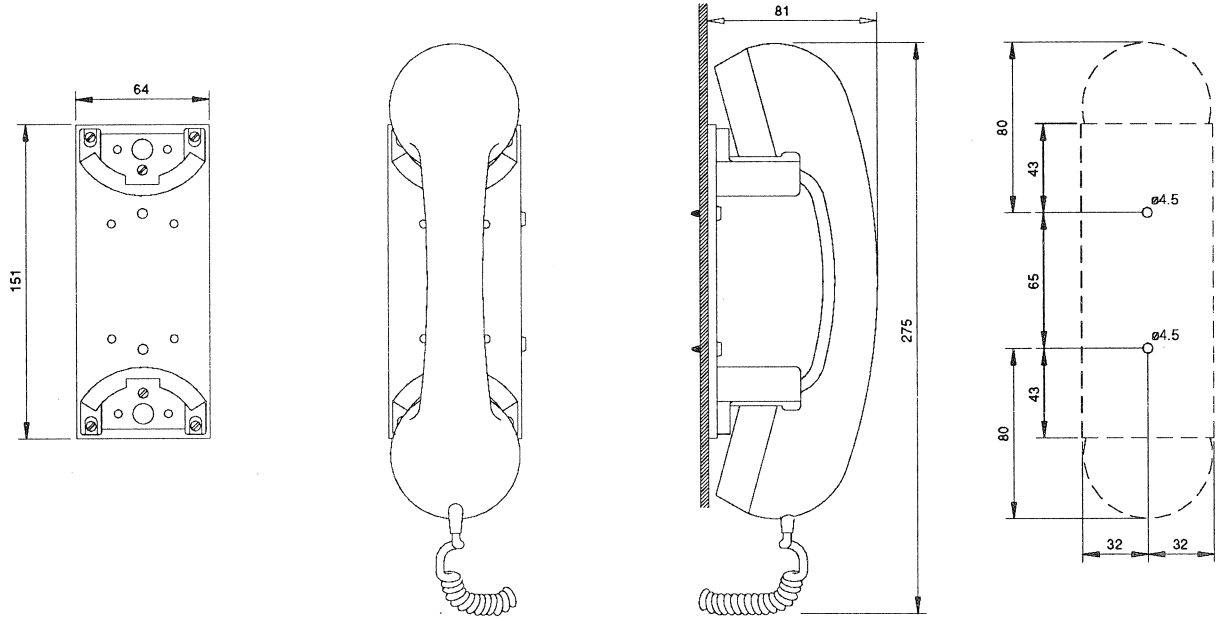
6.2. SPECIAL INSTALLATION WITH 3 MICROTELEPHONES: H2088 FOR SCRAMBLER CRY2001, RT2048 AND RE2100 H2089 FOR VHF RT2047 AND SSB T2031

MICROTELEPHONE ONE WITH PREFERENCE



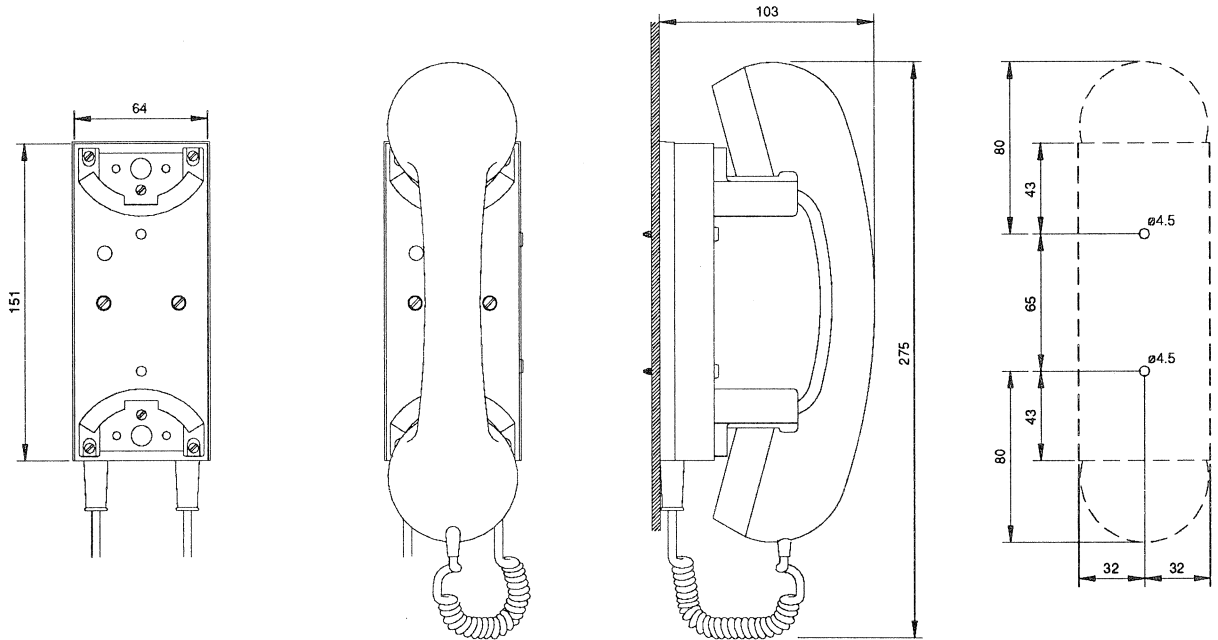
CRY 2001, RT2047, T2031, RT2048, RE2100
4-O-24804A

6.3. MECHANICAL DIMENSIONS FOR HANDSET



RT2048, RE2100, C2140
4-0-26999 4-0-27946

MECHANICAL DIMENSIONS FOR HANDSET HOLDER WITH MICROSWITCH



CONTENTS

7. PARTS LIST

7 PARTS LIST

SIMPLEX / SEMIDUPLEX VHF		RT2048 STANDARD	ESPERA	VHF RT2048 (STANDARD)	802048
				SAILOR GREEN	
POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
VARIOUS	KEYBOARD FOIL RT2048		ESPERA	1-0-25434C	225434
VARIOUS	MINI 1/4 BOX CABINET	SAILOR GREEN		225435 GRØN RILSAN ALUMINIUM	22543500
VARIOUS	POWER CABLE WITH PLUG		ESPERA	503758 POWERKABEL	503758
VARIOUS	MICROTELEPHONE WITH	CRADLE CRY2001/RT2048	ESPERA	3-0-25772	725772
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

BASE UNIT RT2048 STD.			ESPERA		702048
POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
VARIOUS	SILICONE SEAL	FOR CABINET	NORD.ELEKTR.	0-4-25397A 632-2456-00-X	48.585
VARIOUS	KNOB Ø10mm		SANDER PLAST	0-3-25432A	48.693
VARIOUS	FUSE COVER		SANDER PLAST	Tg.Nr: 0-3-25362B	48.696
VARIOUS	COVER FOR ALLEN SCREW		SANDER PLAST	0-3-25350A	48.699
VARIOUS	CONNECTION CABLE FOR MAIN INTERCONNECTION	LOUDSPEAKER CABLE RT2048	AFD.32 3M	3-0-25463 3-0-25462A	525463 56.004
VARIOUS	ANTENNA JACK (FEMALE)	SO239	KAJ V HANSEN	SO239	78.504
VARIOUS	SCREW PT Ø2.9 x 16MM A2		FASTENERS A/S	KB30x16 WN-1442/A2	88.103
VARIOUS	COAX CABLE Ø3x23cm		ESPERA	3-0-25471	525471
VARIOUS	COAX CABLE Ø3x23cm		ESPERA	3-0-25471	525471
-1	KEYBOARD MODULE	RT2048	ESPERA	5-0-25447	625447
-2	INTERFACE MODULE	RT2048	ESPERA	5-0-25450J / 4-0-25450M	625450
-3	SYNTHESE MODULE	RT2048	ESPERA	5-0-25451G / 4-0-25451M	625451
-4	RX/TX MODULE	RT2048	ESPERA	5-0-25448K / 4-0-25448J	625448
-5	SELCALL MODULE (OPTIONAL)	RT2048	ESPERA	5-0-25449B	625449
-SPEC	BUS-INTERRUPT OPTION (6)	RM2042	ESPERA	5-0-26945A	626945
VARIOUS	MICROTELEPHONE FOR	CRY2001, RT2048 & RE2100	ESPERA	700118 MICROTELEPHONE	700118
LS1	LOUDSPEAKER	4 OHMS 15W 88x88mm	RIGHT ELEC.	CORPS-881252-035P TERMINALER BAGUDRETTEDE	46.052

KEYBOARD MODULE		RT2048	ESPERA	5-0-25447	625447
POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
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 / 4-0-25450M	625450
POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
VARIOUS	SOCKET	DIL 2x20 POLES	* AMP	641606-3	30.935
VARIOUS	CONNECTION CABLE FOR	VOLUME CONTROL RT2048	AFD.32	3-0-25466	525466
VARIOUS	SOCKET	1/10" SIL 10 POLES	PREC-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	ELNA	RJ2-35-V-100-M-T34	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	ELNA	RJ2-16-V-221-M-T2	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	ELNA	RJ2-35-V-100-M-T34	14.512
C16-2	CAPACITOR ELECTROLYTIC	10uF 20% 35VDC	ELNA	RJ2-35-V-100-M-T34	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 FLAT PACK	15.170
D1-2	DIODE RECTIFIER	1N4002 100V/1A	THOMSON	1N4002 (03/04/05/06/07)	25.100
D2-2	DIODE ZENER	4V7 2% 0.4W BZX79B4V7	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	BAW62 HIGH SPEED	PHILIPS	BAW62-143	25.350
D9-2	DIODE SCHOTTKY	BAT 43	THOMSON-CSF	BAT43	27.600
D10-2	DIODE ZENER	5.1V 2% 0.4W BZX79B5V1	* 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

POSITION	DESCRIPTION		MANUFACTURER	TYPE	S.P.NUMBER
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% 0.33W	PHILIPS	2322 180 73223	02.504
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
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
U3-2	INTEGRATED CIRCUIT	CPU PROGRAMMED (C1106)	MOTOROLA	SP.SPEC: C1106 ZC No: <409231P>	32.563
U4-2	8 BIT SHIFT REG.SERIAL IO	74HC595	NATIONAL	MM74HC595N	34.502
U5-2	8 BIT SHIFT REG.SERIAL IO	74HC595	NATIONAL	MM74HC595N	34.502
U6-2	8 BIT SHIFT REG.SERIAL IO	74HC595	NATIONAL	MM74HC595N	34.502
U7-2	QUAD VOLTAGE COMPERATOR	LM339	TEXAS*	LM339N	31.075
U8-2	QUAD OP.AMP.	324	TEXAS	LM324N	31.065
U9-2	VOLTAGE REG. ADJUSTABLE	Io=0.1A LM317L	TEXAS	TL317CLP	31.145

POSITION	DESCRIPTION	MANUFACTOR	TYPE	S.P.NUMBER
SYNTSESE MODULE		RT2048	ESPERA	5-0-25451G / 4-0-25451M 625451
POSITION	DESCRIPTION	MANUFACTOR	TYPE	S.P.NUMBER
C1-3	CAPACITOR MKT	0.1uF 10% 63VDC	NORTON	NORMOUNT V1300 0.8x12mm 95.512
C2-3	CAPACITOR MKT	220nF 10% 63VDC	PHILIPS	2222 370 78104 11.136
C3-3	CAPACITOR POLYSTYRENE	56pF 1% 630V	PHILIPS	2222 370 78224 11.095
C4-3	CAPACITOR POLYSTYRENE	300pF 1% 630VDC	#PHILIPS	2222 431 85609 10.394
C5-3	CAPACITOR ELECTROLYTIC	100uF -10/+50% 25VDC	PHILIPS	2222 431 83001 10.414
C6-3	CAPACITOR POLYSTYRENE	51pF 1% 630V	ERO	EKM 00 CC 310 E G5 14.610
C7-3	CAPACITOR MKT	22nF 10% 100VDC	#PHILIPS	2222 431 85109 10.393
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	ELNA	RJ2-25-V-470-M-F1 14.524
C13-3	CAPACITOR MKT	220nF 5% 63VDC	PHILIPS*	2222 370 79224 11.182
C14-3	CAPACITOR ELECTROLYTIC	22uF 20% 35VDC	ELNA	RJ2-35-V-220-M-F1 14.516
C15-3	CAPACITOR ELECTROLYTIC	10uF 20% 35VDC	ELNA	RJ2-35-V-100-M-T34 14.512
C16-3	CAPACITOR ELECTROLYTIC	4.7uF 20% 50VDC	ELNA	RJ2-50-V-4R7-M-T34 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	ELNA	RJ2-50-V-010-M-T34 14.506
C20-3	CAPACITOR CERAMIC	39pF 5% NPO 50VDC	NKE	DT 350 758L CH 390 J 50V 15.085
C21-3	CAPACITOR CERAMIC	5p6F +/-0.25pF NPO 500VDC	NKE	FLAT PACK DT35-0465 758S CH 5R6 C 15.015
C22-3	CAPACITOR CERAMIC	1nOF 10% CL2 500VDC	NKE	500V FLAT PACK DT 360 758L B 102 K 500V 15.160
C23-3	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	FLAT PACK DT35-0465 758L 471BK 500V 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 15.160
C26-3	CAPACITOR CERAMIC	1nOF 10% CL2 500VDC	NKE	FLAT PACK DT 360 758L B 102 K 500V 15.160
C27-3	CAPACITOR CERAMIC	1nOF 10% CL2 500VDC	NKE	FLAT PACK DT 360 758L B 102 K 500V 15.160
C28-3	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V 15.170
C29-3	CAPACITOR MKT	1uF 5% 63VDC	PHILIPS	FLAT PACK 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	ELNA	RJ2-25-V-470-M-F1 14.524
C33-3	CAPACITOR CERAMIC	100pF 5% NPO 50VDC	NKE	DT 380 758L CH 101 J 50V 15.136
C34-3	CAPACITOR POLYSTYRENE	825pF 1% 63VDC	PHILIPS	FLAT PACK 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	ELNA	RJ2-25-V-470-M-F1 14.524
C42-3	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V 16.095
C43-3	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	FLAT PACK DT35-0465 758L 471BK 500V 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 16.095
C47-3	CAPACITOR CERAMIC	15pF 5% N150 500VDC	NKE	FLAT PACK DT 350 758L PH 150 J 500V 16.115
C48-3	CAPACITOR CERAMIC	22pF 5% N150 500VDC	KCK	FLAT PACK RT-HM SK PH 220 J 15.062
C49-3	CAPACITOR CERAMIC	13pF 5% N150 50VDC	NKE	AMMO PACK DT 340 758S PH 130 J 50V 15.051
C50-3	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	FLAT PACK DT35-0465 758L 471BK 500V 16.095

POSITION	DESCRIPTION		MANUFACTURER	TYPE	S.P. NUMBER
C51-3	CAPACITOR CERAMIC	2p7F +/-0.25pF N150 50VDC	NKE	FLAT PACK DT 330 758S PJ 2R7 C 50V	15.001
C52-3	CAPACITOR CERAMIC	18pF 5% NPO 500VDC	NKE	FLAT PACK DT 360 758S CH 180 J 500V	15.060
C53-3	CAPACITOR CERAMIC	18pF 5% NPO 500VDC	NKE	FLAT PACK DT 360 758S CH 180 J 500V	15.060
C54-3	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	FLAT PACK DT35-0465 758L 471BK 500V	16.095
C55-3	CAPACITOR CERAMIC	12pF 5% NPO 500VDC	NKE	FLAT PACK DT350465 758S CH 120J 500	15.575
C56-3	CAPACITOR CERAMIC	8p2F +/-0.25pF NPO 500VDC	NKE	FLAT PACK DT 350 758L CH 8R2 C 500V	15.030
C57-3	CAPACITOR CERAMIC	18pF 5% NPO 500VDC	NKE	FLAT PACK DT 360 758S CH 180 J 500V	15.060
C58-3	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	FLAT PACK DT35-0465 758L 471BK 500V	16.095
C59-3	CAPACITOR CERAMIC	18pF 2% NPO 100VDC	PHILIPS	2222 683 10189	15.330
C60-3	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	FLAT PACK DT35-0465 758L 471BK 500V	16.095
C61-3	CAPACITOR CERAMIC	12pF 2% NPO 100VDC	PHILIPS	2222 683 10129	15.328
C62-3	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	FLAT PACK DT35-0465 758L 471BK 500V	16.095
C63-3	CAPACITOR ELECTROLYTIC	10uF 20% 35VDC	ELNA	RJ2-35-V-100-M-T34	14.512
C64-3	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	FLAT PACK DT35-0465 758L 471BK 500V	16.095
C65-3	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	FLAT PACK DT35-0465 758L 471BK 500V	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	FLAT PACK DT35-0465 758L 471BK 500V	16.095
C69-3	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	FLAT PACK DT35-0465 758L 471BK 500V	16.095
C70-3	CAPACITOR CERAMIC	12pF 2% NPO 100VDC	PHILIPS	2222 683 10129	15.328
C71-3	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	FLAT PACK DT35-0465 758L 471BK 500V	16.095
C72-3	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	FLAT PACK DT 350 758L F 103 Z 50V	15.170
C73-3	CAPACITOR CERAMIC	33pF 2% NPO 100VDC	PHILIPS	2222 683 10339	15.333
C74-3	CAPACITOR ELECTROLYTIC	10uF 20% 35VDC	ELNA	RJ2-35-V-100-M-T34	14.512
C75-3	CAPACITOR ELECTROLYTIC	10uF 20% 35VDC	ELNA	RJ2-35-V-100-M-T34	14.512
C76-3	CAPACITOR ELECTROLYTIC	220uF -20/+50% 16VDC	ELNA	RJ2-16-V-221-M-T2	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
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	BF 506	SIEMENS	BF506	28.202

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
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
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

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
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
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	DUAL D-FF POS TRIG.	74HC74	TEXAS	SN74HC74N	34.501
U3-3	SERIAL INPUT PLL SYNTHES.	MC145158P2	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

RX/TX MODULE RT2048 ESPERA 5-0-25448K / 4-0-25448J 625448

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
VARIOUS	SHUNT CONNECTOR	FEMALE 2 POLES	SAMTEC	SNT-100-BK-G	78.325
VARIOUS	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	ELNA	RJ2-50-V-4R7-M-T34	14.510
C5-4	CAPACITOR ELECTROLYTIC	22uF 20% 25VDC	ELNA	RJ2-25-V-220-M-T34	14.514
C6-4	CAPACITOR ELECTROLYTIC	22uF 20% 25VDC	ELNA	RJ2-25-V-220-M-T34	14.514
C7-4	CAPACITOR ELECTROLYTIC	33uF 20% 16VDC	ELNA	RJ2-16-V-330-M-T34	14.518
C8-4	CAPACITOR ELECTROLYTIC	33uF 20% 16VDC	ELNA	RJ2-16-V-330-M-T34	14.518
C9-4	CAPACITOR ELECTROLYTIC	33uF 20% 16VDC	ELNA	RJ2-16-V-330-M-T34	14.518

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POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
C10-4	CAPACITOR ELECTROLYTIC	33uF 20% 16VDC	ELNA	RJ2-16-V-330-M-T34	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 5% NPO 500VDC	NKE	DT 350 758L CH 100 J 500V FLAT PACK	15.565
C14-4	CAPACITOR CERAMIC	10pF 5% NPO 500VDC	NKE	DT 350 758L CH 100 J 500V FLAT PACK	15.565
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	ELNA	RJ2-35-V-100-M-T34	14.512
C18-4	CAPACITOR ELECTROLYTIC	10uF 20% 35VDC	ELNA	RJ2-35-V-100-M-T34	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 AMMO PACK	15.080
C31-4	CAPACITOR CERAMIC	22pF 5% NPO 500VDC	KCK	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

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
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 FLAT PACK	16.095
C54-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C55-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C56-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C57-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C58-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C59-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C60-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C61-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C62-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C63-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C64-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C65-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C66-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C67-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C68-4	CAPACITOR MKT	10nF 20% 100VDC	PHILIPS	2222 370 38103	11.168
C69-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C70-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C71-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C72-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C73-4	CAPACITOR CERAMIC	1nOF 10% CL2 500VDC	NKE	DT 360 758L B 102 K 500V FLAT PACK	15.160
C74-4	CAPACITOR CERAMIC	180pF 5% N150 50VDC	KCK	RT-HE95-SK PH 181 J AMMO PACK	15.149
C75-4	CAPACITOR CERAMIC	33pF 5% N750 500VDC	NKE	DT350465 758L UJ 330J 500 FLAT PACK	16.064
C76-4	CAPACITOR CERAMIC	51pF 5% NPO 50VDC	NKE	DT 360 758S CH 510 J 50V FLAT PACK	15.110
C77-4	CAPACITOR CERAMIC	12pF 5% N150 500VDC	NKE	DT 350 758L PH 120 J 500V FLAT PACK	16.114
C78-4	CAPACITOR CERAMIC	12pF 5% N150 500VDC	NKE	DT 350 758L PH 120 J 500V FLAT PACK	16.114
C79-4	CAPACITOR CERAMIC	18pF 5% N150 50VDC	NKE	DT 340 758S PH 180 J 50V FLAT PACK	15.061
C80-4	CAPACITOR MKT	1uF 10% 63VDC	PHILIPS	2222 370 78105	11.137
C81-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C82-4	CAPACITOR CERAMIC	51pF 5% NPO 50VDC	NKE	DT 360 758S CH 510 J 50V FLAT PACK	15.110
C83-4	CAPACITOR MKT	0.1uF 10% 63VDC	PHILIPS	2222 370 78104	11.136
C84-4	CAPACITOR CERAMIC	51pF 5% NPO 50VDC	NKE	DT 360 758S CH 510 J 50V FLAT PACK	15.110
C85-4	CAPACITOR CERAMIC	51pF 5% NPO 50VDC	NKE	DT 360 758S CH 510 J 50V FLAT PACK	15.110
C86-4	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C87-4	CAPACITOR CERAMIC	10pF 5% NPO 500VDC	NKE	DT 350 758L CH 100 J 500V FLAT PACK	15.565
C88-4	CAPACITOR CERAMIC	1nF 10% 50VDC CL2	NKE	DT 340 758L B 102 K 50V FLAT PACK	16.160

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
C89-4	CAPACITOR CERAMIC	51pF 5% NPO 50VDC	NKE	DT 360 758S CH 510 J 50V FLAT PACK	15.110
D1-4	DIODE TRANSIENT ABSORBER	18V 1N6277/PFZ18	MOTOROLA*	1N6277A	26.765
D2-4	DIODE	1N4148 HIGH SPEED	PHILIPS	1N4148-143	25.131
D3-4	DIODE	BB139 QUINT	ITT	BB139 QUINTET	26.140
D4-4	DIODE	BB139 QUINT	ITT	BB139 QUINTET	26.140
D5-4	DIODE	BB139 QUINT	ITT	BB139 QUINTET	26.140
D6-4	DIODE	BB139 QUINT	ITT	BB139 QUINTET	26.140
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%	* FSTRON	SMCC-5R6K-02	20.139
L5-4	CHOKE TL488	70nH	ESPERA	6-0-25458	400488
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	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	PCB VERSION 2x 4-40 NUT	NS TECH	DMS-9SBTS-"E"	78.164
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
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

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
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
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	MEISEI	M1B-12-H	21.030
TR1-4	TRANSFORMER	2u7H ADJUSTABLE	TOKO	F292MNS-3342BQE	38.431
TR2-4	TRANSFORMER	Fr=157MHz ADJUSTABLE	SUMIDA ELEC.	S-7GD / 0237-1756	38.430
U1-4	POS. VOLTAGE REG. ADJUST.	Io=1.5A LM317T	MOTOROLA	LM317T	31.055
U2-4	AF POWER AMPLIFIER	TDA1515A	PHILIPS	TDA1515A	31.489
U3-4	NBFM IF SYSTEM	MC3361	PHILIPS	MC 3361 N	31.325
U4-4	VHF POWER AMP. 25W	S-AV6/M57710A/MC5233	* TOSHIBA	S-AV6	32.450

POSITION DESCRIPTION MANUFACTOR TYPE S.P.NUMBER

SELCALL MODULE (OPTIONAL) RT2048 ESPERA 5-0-25449B / 4-0-25449D 625449

POSITION DESCRIPTION MANUFACTOR TYPE S.P.NUMBER

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
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	QUAD ANALOG SWITCH	MC14066B/CD4066B	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	POS. VOLTAGE REG. FIXED	5V 5% 0.1A 78L05AC	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

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SELCALL ALARM (MODULE 6) SPECIAL OPTION FOR RT2048 ESPERA 4-0-25660/5-0-25473 625660

POSITION DESCRIPTION MANUFACTOR TYPE S.P.NUMBER

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.	ORIGINAL ELECT	OUC-SS-112D (-S/-SH-)	21.300
RE2	RELAY	12VDC 1SH. 2A.	ORIGINAL ELECT	OUC-SS-112D (-S/-SH-)	21.300