Sailor

Sailor

INSTRUKTIONSBOG FOR
SAILOR VHF RT2047

INSTRUCTION BOOK FOR
SAILOR VHF RT2047

INSTRUKTIONSBUCH FÜR
SAILOR VHF RT2047

INSTRUCTIONS POUR
SAILOR VHF RT2047

INSTRUCCIONES PARA
SAILOR VHF RT2047

A/S S. P. RADIO · AALBORG · DENMARK

PART I: INSTALLATION AND SPECIAL OPTIONS FOR SAILOR VHF RT2047

SECTION

PART II: INSTRUCTION BOOK FOR SAILOR VHF RT2047

SECTION

1.1. INTRODUCTION

The SAILOR RT2047 VHF Radiotelephone has been designed to be used with the SAILOR Compact 2000 Module Programme.

SAILOR VHF RT2047 can either be installed and operated as an independent unit or in combination with the other elements of the Compact 2000 programme. These elements include a radiotelephone coast station with a 400 Watt SSB transmitter, an SSB receiver with built-in FM and AM bands and a scrambler which ensures complete communication secrecy.

SAILOR VHF RT2047 has been constructed to withstand the most extreme conditions experienced in small, semi-open boats. Its compact, weatherproof construction ensures a degree of resistance to sea spray. 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 operating. 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.

CONTENTS

PART I: INSTALLATION AND SPECIAL OPTIONS FOR SAILOR VHF RT2047

2. INSTALLATION

Before installation of a SAILOR VHF RT2047 the following points must be observed:

1. What 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 RT2047.
   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 RT2047 has to be installed?
   In section 2.1. MOUNTING POSSIBILITIES is described the installation of VHF RT2047 as an independent unit or in combination with the other elements of the Compact 2000 programme.

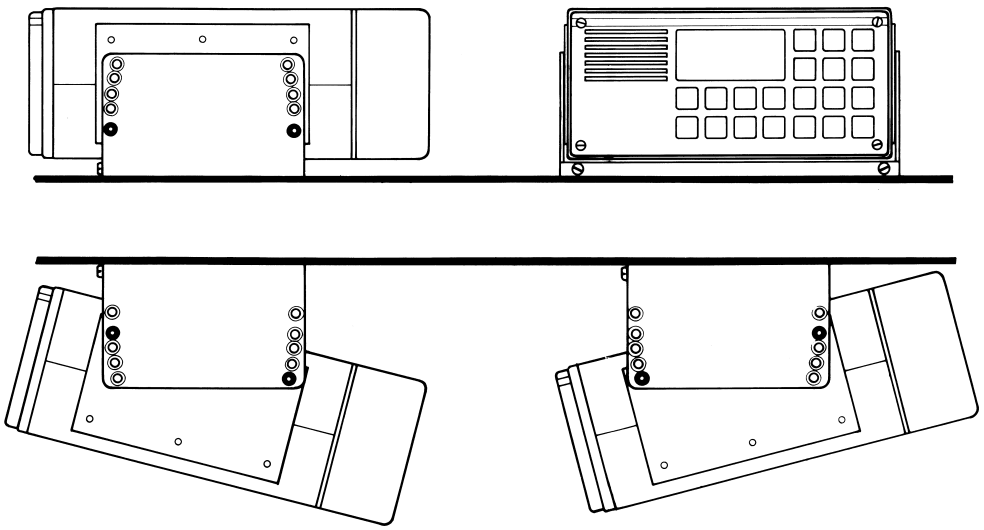
3. Handset.
   Installation of handset, see section 2.3. HANDSET.

4. External loudspeaker.
   An external loudspeaker 4 - 8 ohm/4 W can be connected to the power connector J802 pin 1 and 6, see section 2.6. POWER CONNECTOR + EXT. LOUDSPEAKER.

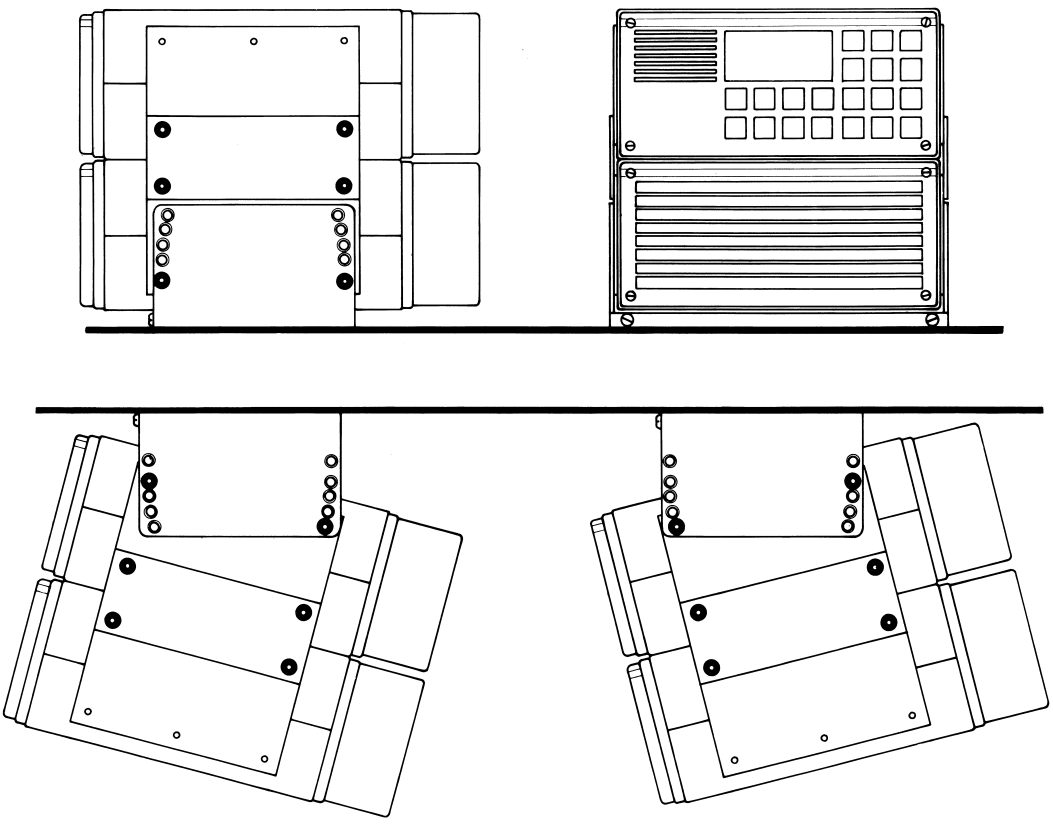
5. Special options:
   Remote alarm for selcall, AF to information decoder, AUX I and AUX II information, etc. are available, see section 2.7. SPECIAL OPTIONS.

2.1. MOUNTING POSSIBILITIES

TABLETOP AND DECKHEAD

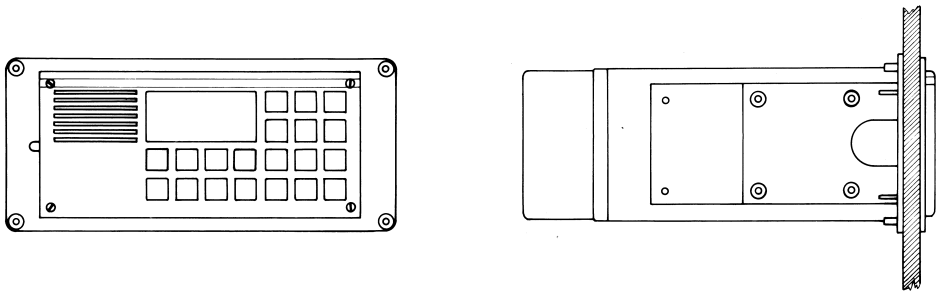


Mounting bracket H2055.

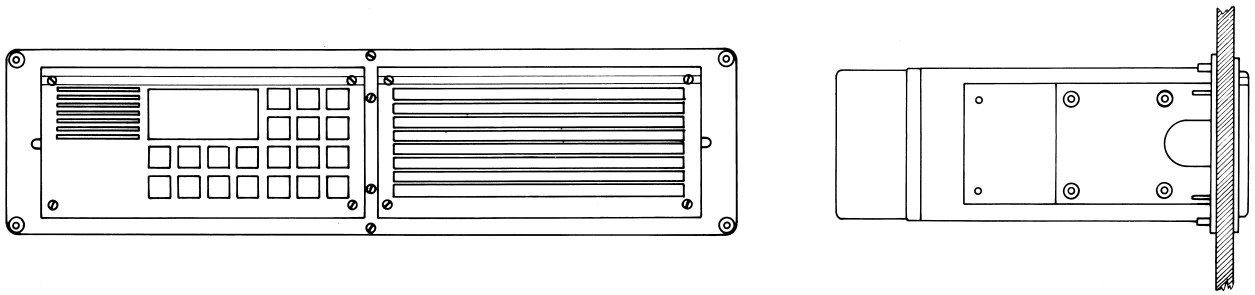


Mounting kit H2068 and H2055.

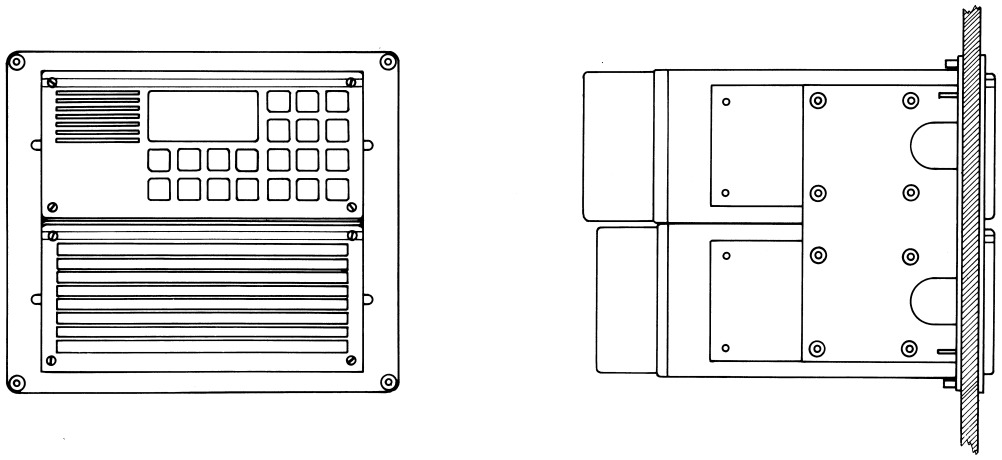
BULKHEAD AND CONSOLE



Mounting kit H2063.



Mounting kit H2062.



Mounting kit H2064.

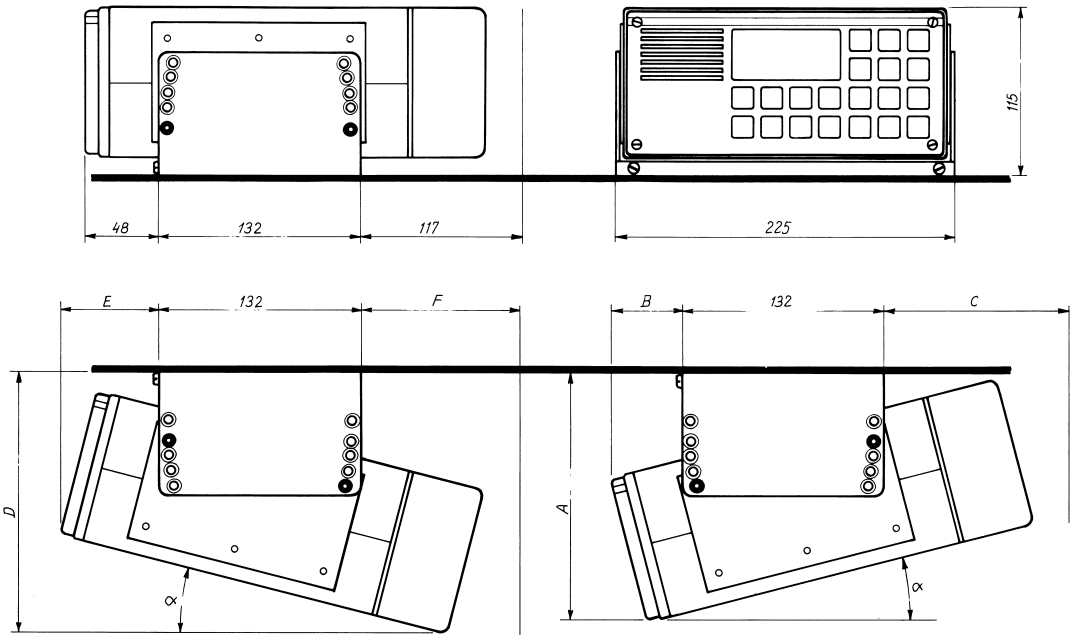
IN CONJUNCTION WITH OTHER "SAILOR" EQUIPMENT

Look up the INSTALLATION section for the SAILOR unit in question.

2.2 DIMENSIONS AND DRILLING PLAN

UNIVERSAL MOUNTING BRACKET H2055

Permits a wide variety of installation possibilities, such as on table top, bulkhead or deckhead. For other possibilities such as console installation, the SAILOR 19" rack or all units in the Compact programme assembled on the bulkhead, see special information concerning installation of the Compact programme.

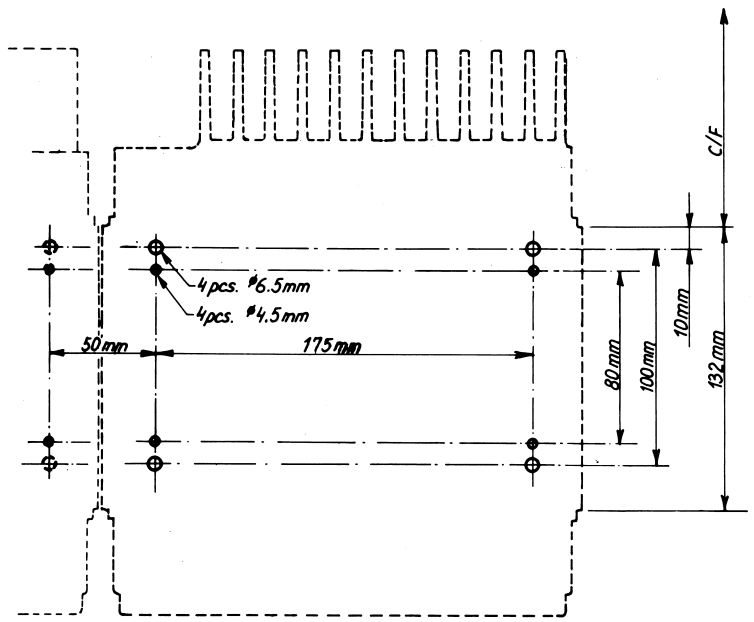


α	A	B	C	D	E	F
0°	130	48	117	130	48	117
4.8°	142	48	117	146	53	117
9.6°	155	48	118	163	59	116
14.4°	167	45	133	178	65	113

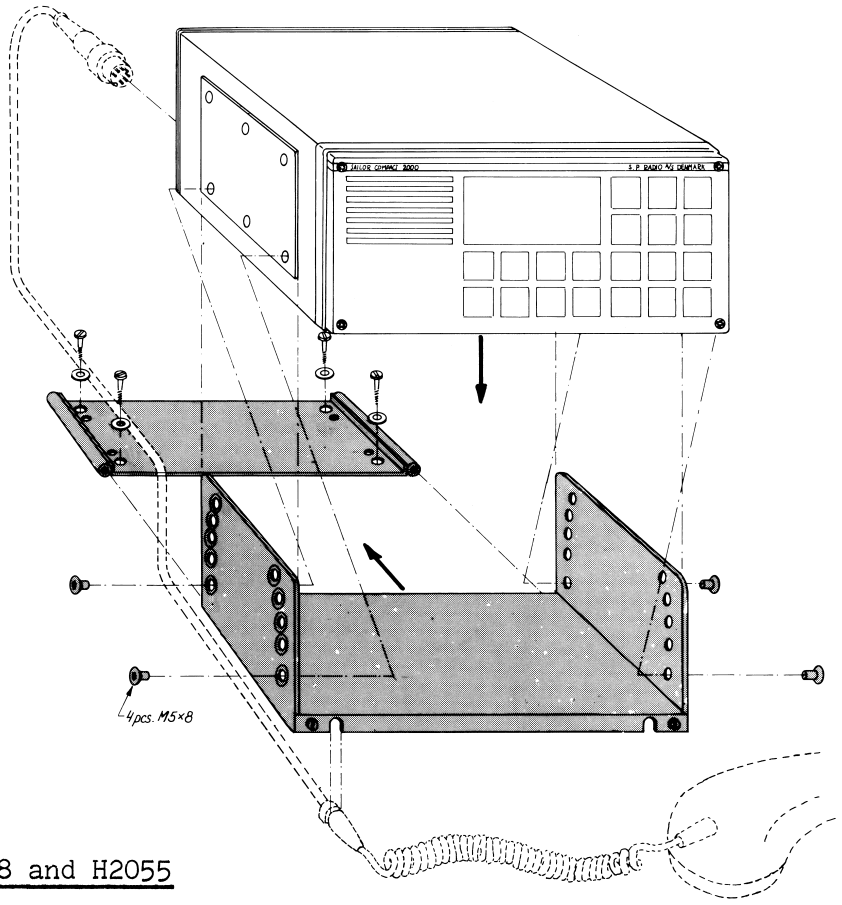
Dimensions in mm

WEIGHT

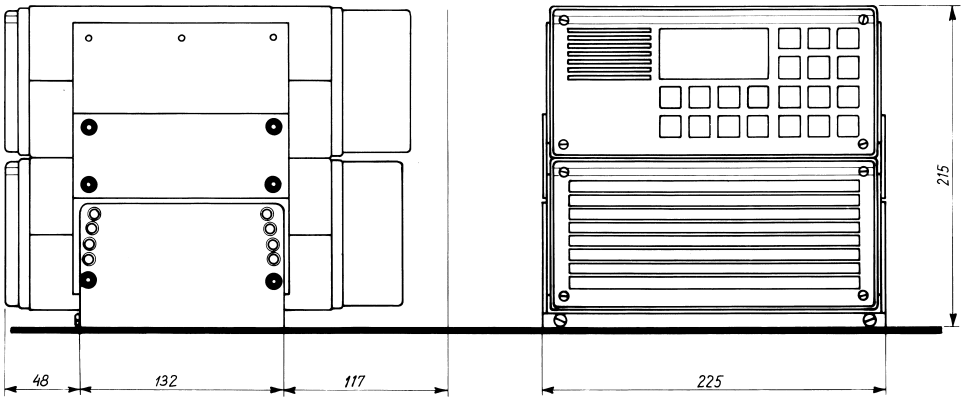
Mounting kit H2055:		1,5 kg
R2022	:	4,5 kg
H2054	:	5,5 kg
H2074	:	4,0 kg
CRY2001	:	3,2 kg
RT2047	:	5,2 kg

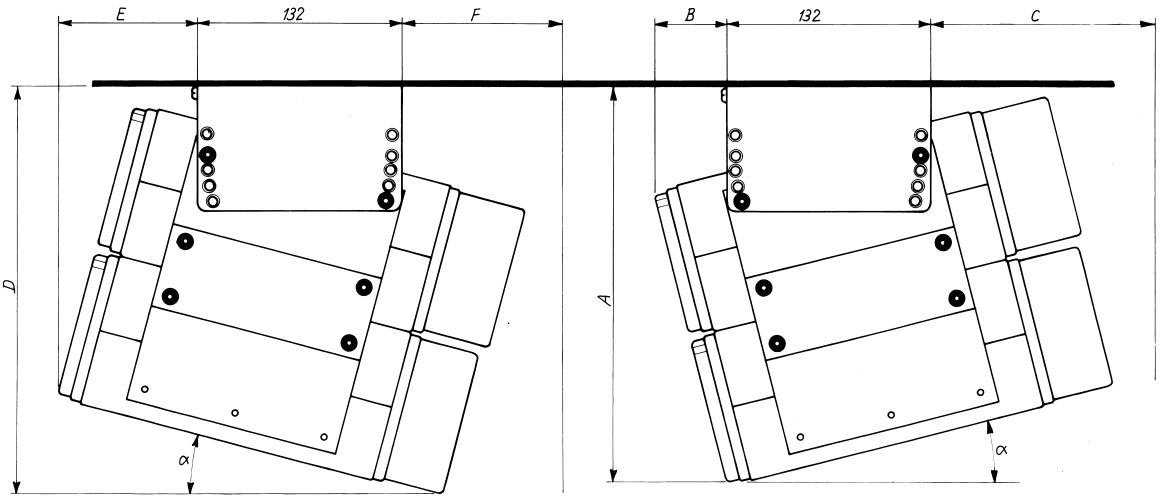


RT2047
4-0-24894, 4-0-24897.



Mounting kit H2068 and H2055





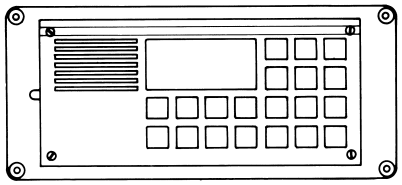
α	A	B	C	D	E	F
0°	230	67	117	230	67	117
4.8°	243	67	129	245	72	117
9.6°	255	65	142	262	78	115
14.4°	265	62	155	270	89	112

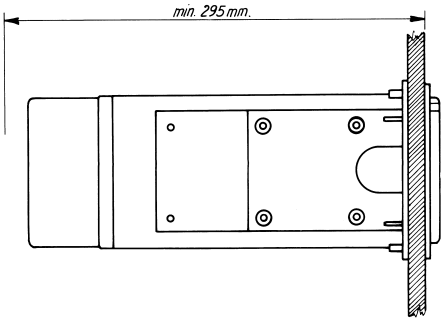
Dimensions in mm

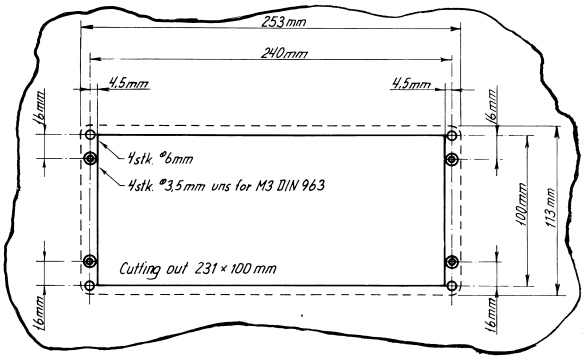
WEIGHT

Mounting kit H2068 and H2055:		1,5 kg
R2022	:	4,5 kg
H2054	:	5,5 kg
H2074	:	4,0 kg
CRY2001	:	3,2 kg
RT2047	:	5,2 kg

Mounting kit H2063



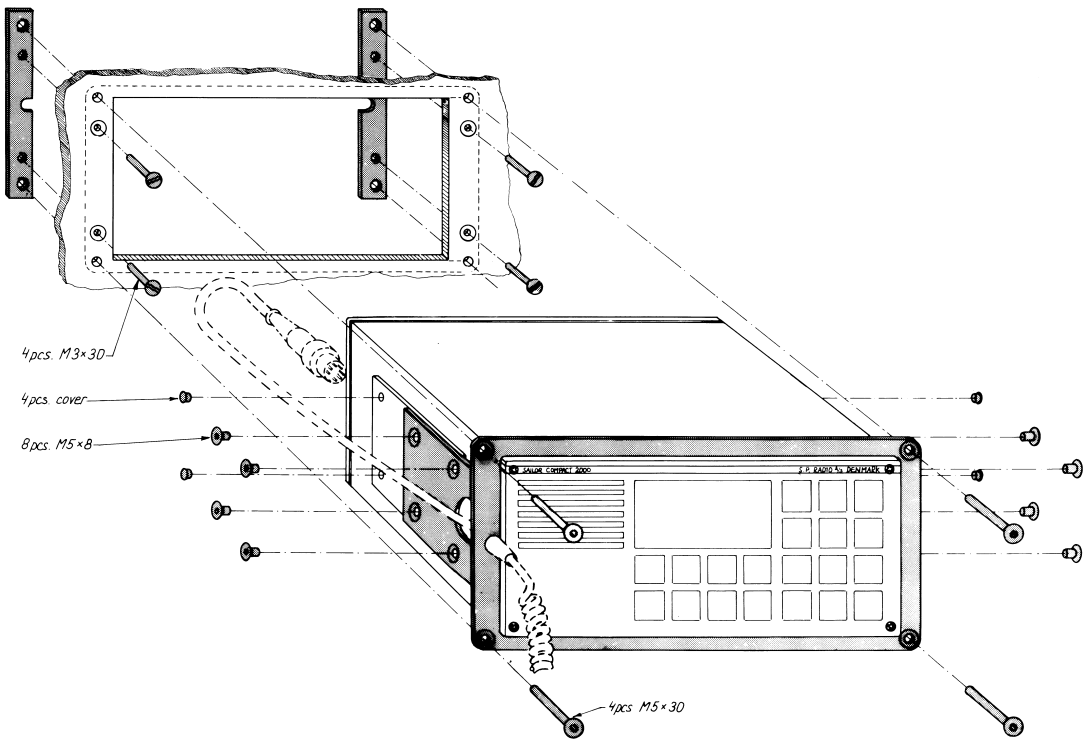




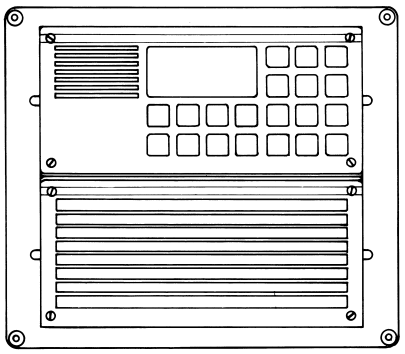
Free distance must be kept to allow free air circulation ambient temperature max. 40°C.

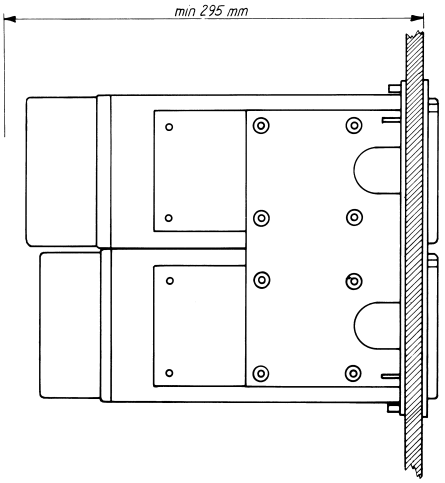
WEIGHT

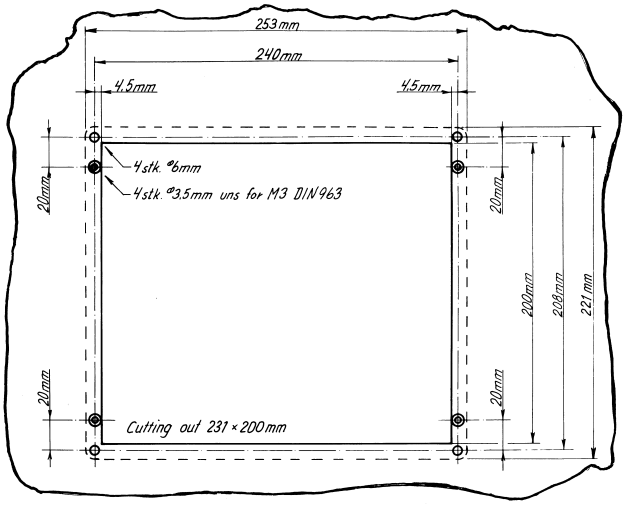
Mounting kit H2063:		1,0 kg
R2022	:	4,5 kg
H2054	:	5,5 kg
H2074	:	4,0 kg
CRY2001	:	3,2 kg
RT2047	:	5,2 kg



Mounting kit H2064





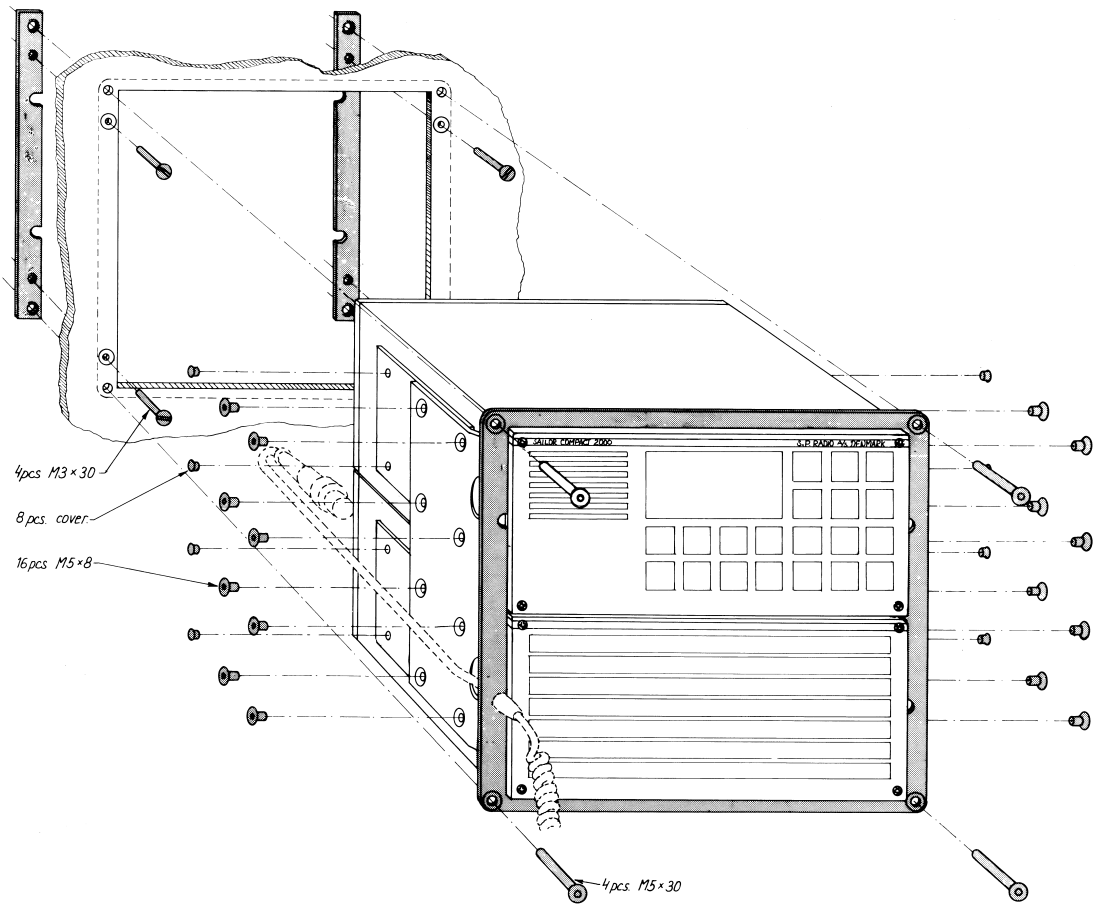


Free distance must be kept to allow free air circulation ambient temperature max. 40°C.

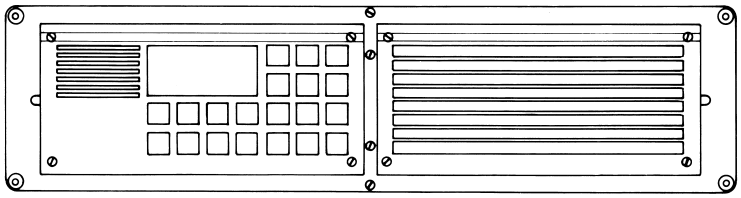
WEIGHT

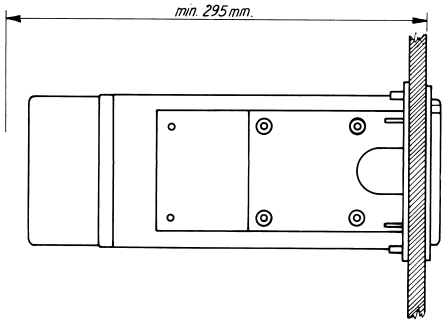
Mounting kit H2064:		1,5 kg
R2022	:	4,5 kg
H2054	:	5,5 kg
H2074	:	4,0 kg
CRY2001	:	3,2 kg
RT2047	:	5,2 kg

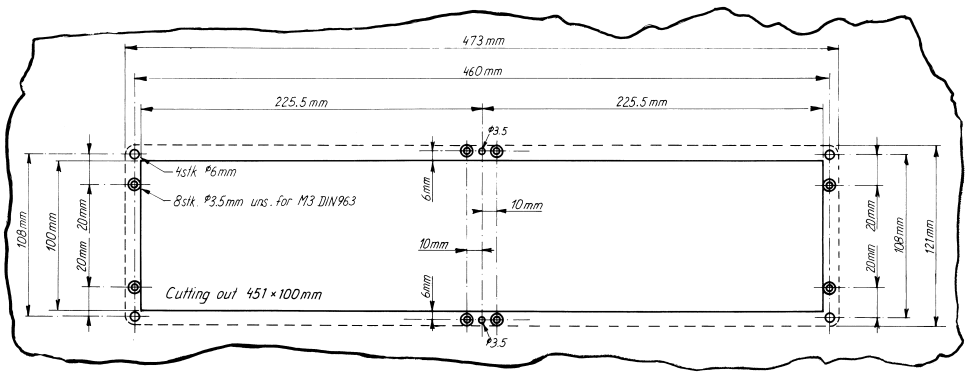
RT2047
4-0-24772/4-0-24704/4-0-24899



Mounting kit H2062



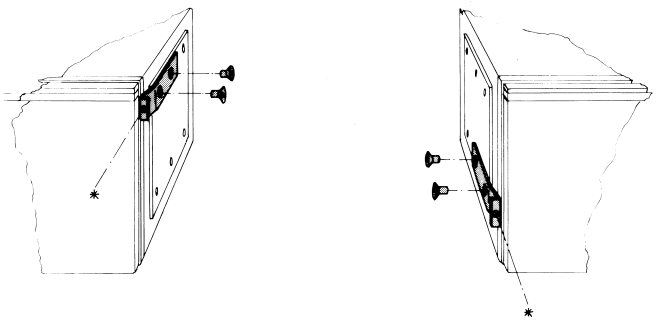


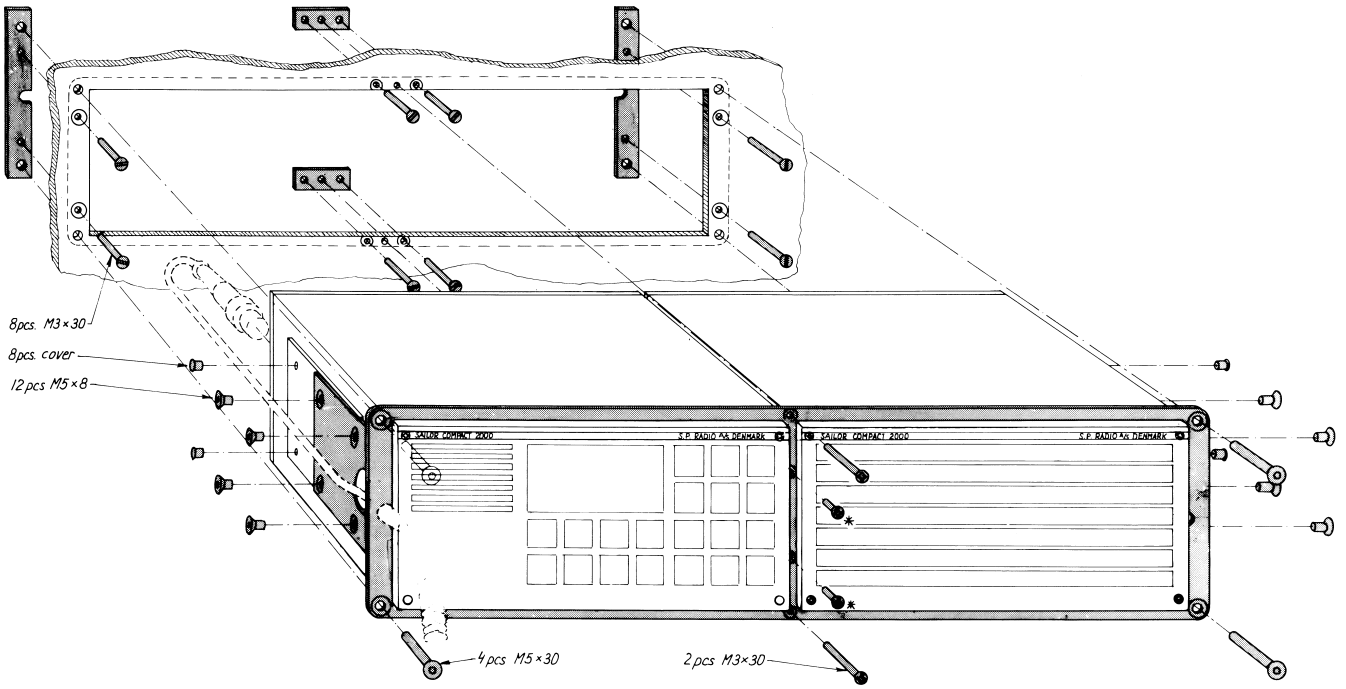


Free distance must be kept to allow free air circulation ambient temperature max. 40°C.

WEIGHT

Mounting kit H2062:		1,5 kg
R2022	:	4,5 kg
H2054	:	5,5 kg
H2074	:	4,0 kg
CRY2001	:	3,2 kg
RT2047	:	5,2 kg





RT2047
4-0-24898/4-0-24732/4-0-24773

T2031A/RT2047/CRY2001
4-0-24787A

MICROTELEPHONE for T2031

MIC. CONNECTOR

LOUDSPEAKER CONNECTOR

MICROTELEPHONE for VHF RT 2047

VHF POWER CONNECTOR

VHF MIC CONNECTOR

VHF AERIAL CONNECTOR

MICROTELEPHONE for CRY 2001

POWER CONNECTOR

"2"

"1"

CRY. POWER CONNECTOR

MIC

STN 2

STN 1

CONNECTION BOX H2091

VHF AERIAL

Rx AERIAL

+ 24V DC BATTERY −

50×0.5mm Cu. strip.

24V DC POWER SUPPLY N420 for VHF RT 2047.

T2031

H2054 / H2074

R2022

RT2047

CRY 2001

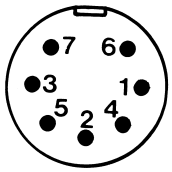
2.3. HANDSET

The handset can be placed anywhere near the VHF set. The cable is five-cored and connected to the rear plate through a 7 pins DIN connector with a lock nut.

Installation of the cable, see the drawings of the mounting brackets, section 2.2. DIMENSIONS AND DRILLING PLAN. The cable grommet must be placed in the most convenient groove in the mounting bracket.

If more than one handset is needed, see section 2.12. and 2.13. in part II, SPECIAL INSTALLATION WITH 2 OR 3 MICROTELEPHONES.

2.4. MICROTELEPHONE CONNECTOR



P803

VIEW FROM
MOUNTING SIDE

Pin No. 1	Telephone +
Pin No. 2	Telephone/mic. -
Pin No. 3	Microphone +
Pin No. 4	Distress CRY
Pin No. 5	Phone Patch
Pin No. 6	Key
Pin No. 7	No Connection

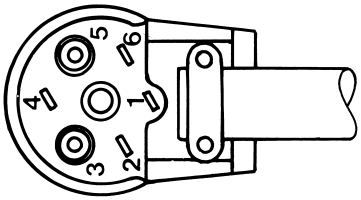
2.5. POWER SUPPLY

The standard power supply for RT2047 is 12V DC.

For 24V DC supply an external power supply N418 (switch mode) or the N420 a 24V DC to 13.2V DC serial regulator can be used, see part II, section 2.14. and 2.15.

For 110V AC , 127V AC, 220V AC or 237V AC an external power supply N163S must be used together with N418 or N420.

2.6. POWER CONNECTOR + EXT. LOUDSPEAKER



J802
VIEW FROM
MOUNTING SIDE

Pin No. 1 + EXT. LOUDSPEAKER
Pin No. 2 No Connection
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

If necessary a 4 - 8 ohm/4 W external loudspeaker can be connected to pin 1 and 6 of the power connector J802.

External loudspeakers H2054 and H2074 are available.

2.7. ANTENNAS

All common 50 ohm antennas, which cover the used frequency range with a reasonable standing wave ratio, maximum 1.5, are applicable.

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 as clear as possible. To metal parts the horizontal distance must be at least 1.0 metre.

S. P. Radio has an antenna of the necessary specifications avilable. The mentioned antenna is characterized by small external dimensions. For further particulars see special brochure, VHF AERIALS.

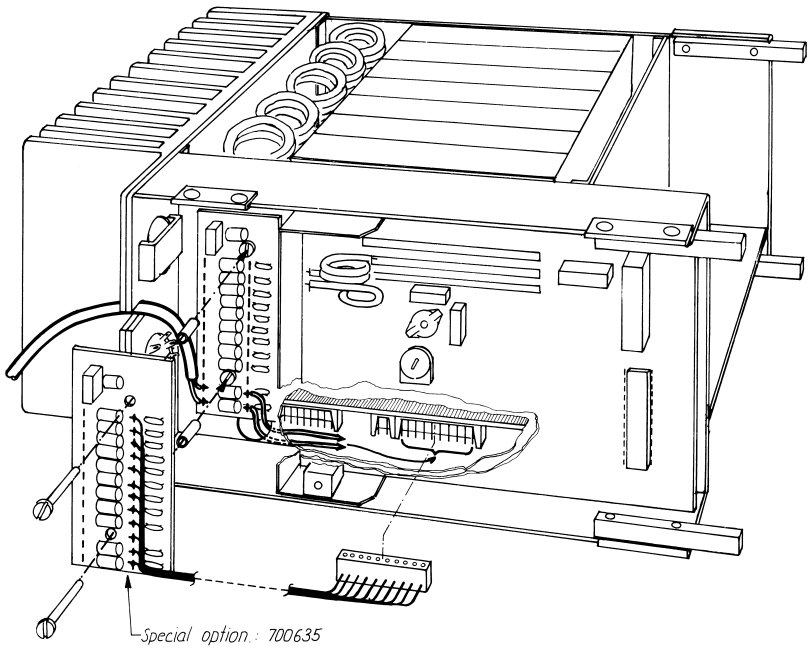
2.8. SPECIAL OPTIONS

With a small modification in RT2047 the following options are available:

1. K-Switch. With an external switch it is possible to change over to the functions used on river boats in Germany.
2. SELCALL RELAY. When the selcall has accepted a CQ or individual call signal, the selcall relay, RE602 will turn on and short-circuit two wires, which can be used for remote alarm. Max. contact load: 100V AC/24V DC - 2A.
3. AF TO INFORM. DECODER:
   The circuit giving AF signals to the information decoder is turned on when the set has accepted a CQ or individual call signal.

   The circuit is turned "ON" or "OFF" like the relay RE602 by the buffer/inverter IC611d.
4. AUX II.
   When an information on certain channels is wanted, i.e. controlling a watch keeping receiver, the AUX II information can be used.
   A relay RE601 is controlled through the buffer/inverter IC611e from the µC, IC619.
   Max. contact load: 100V AC/24V DC - 2A.
5. OUTPUT TO RECORDER.
   Through the connector P604 pin 1 and 2 on the INTERFACE UNIT (600) the AF signal to the telephone output can be led to a tape recorder.

PLACING OF FILTER UNIT FOR SPECIAL OPTIONS.



All the options mentioned are leading to the connector P604 on the INTERFACE UNIT (600).

From connector P604 it is necessary with a female plug with up to 10 positions and wires leading through a hole in the chassis to the place for the FILTER UNIT (900).

On the FILTER UNIT (900) two lines are free for special options.

If more lines are wanted, it is necessary with another FILTER UNIT. For placing the new FILTER UNIT it is necessary to loosen the original FILTER UNIT, remove the screws and insert new screws and distance pieces, see the drawing about placing an extra FILTER UNIT.

A MOUNTING KIT FOR SPECIAL OPTIONS, RT2047 ARE AVAILABLE, ORDERING NO. 700 635.

See diagram and component location for special options in Part II section 2.9.1.

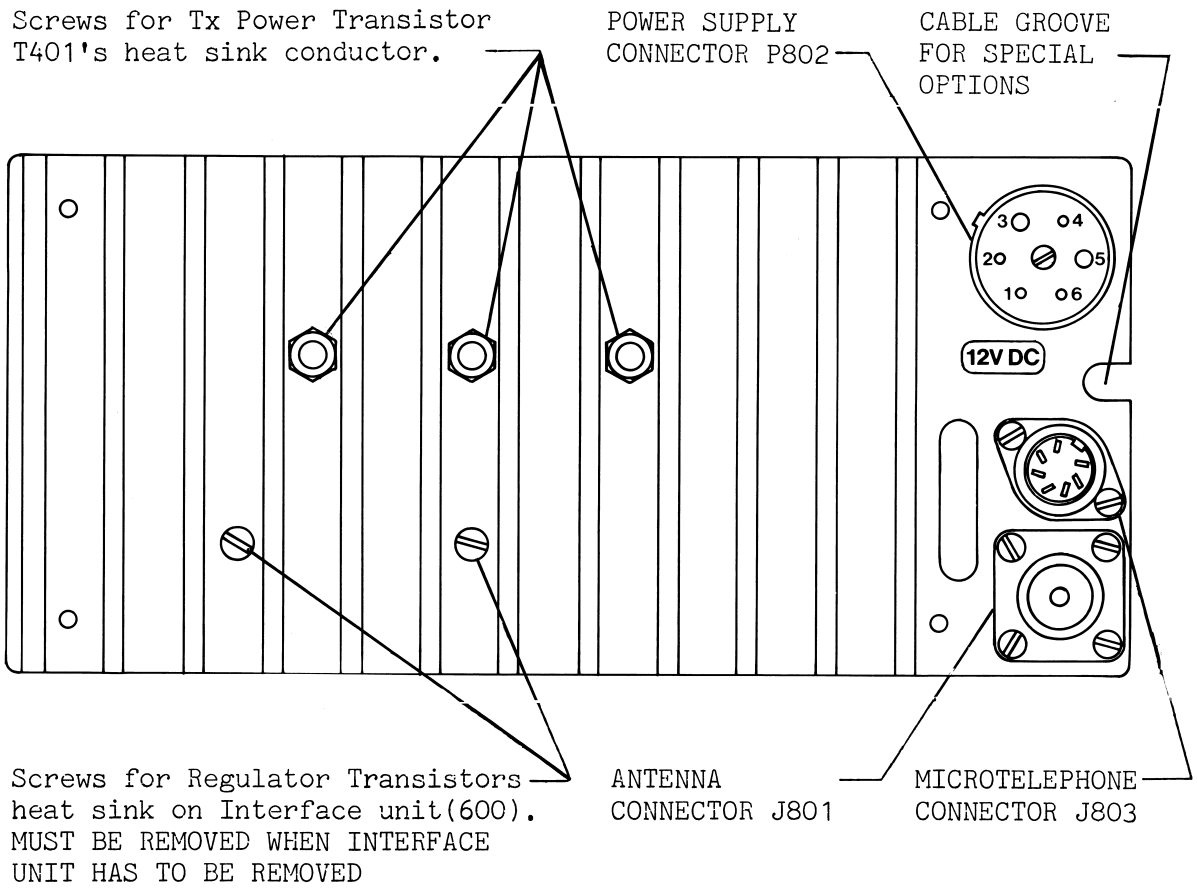
The kit contains: FILTER UNIT with screws, distance pieces and female plug with wires connected.

Further the cable leading outside the set used for special options has to lead through the groove in the rear plate, see the drawing section 2.9. VIEW OF REAR PLATE.

6. AUX I.
The option AUX I is for either internal or external use. It is placed in P603 pin 1 on the INTERFACE UNIT. Max. level on the output of the IC611f must not be more than the battery level, because a diode is connected to the supply pin in the IC.

How to enable the options, see the manual: INSTRUCTIONS FOR IDENTITY AND SERVICE PROGRAMMING OF SAILOR VHF RT2047.

2.9. REAR VIEW OF VHF RT2047



2.10. 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	162.875	
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

PART II: INSTRUCTION BOOK FOR SAILOR VHF RT2047

1. GENERAL DESCRIPTION FOR SAILOR VHF RT2047

SAILOR VHF RT2047 is an all solid state constructed marine VHF radiotelephone, intended for ship/ship and ship/shore communication.

SAILOR RT2047 can operate in duplex and simplex mode.

SAILOR RT2047 is provided with built in duplex-filter for duplex communication on one antenna. Er forsynet med et indbygget duplex-filter

SAILOR RT2047 includes all 55 international and U.S. VHF marine channels, and is prepared for up to 20 private channels to be selected as simplex or duplex channels. As option up to 67 private channels can be provided.

SAILOR RT2047 has six scanning programmes, one standard programme, and 5 individual programmed scanning programmes.

SAILOR RT2047 has built in dual watch facility, which enables the operator to listen out on two channels simultaneously (the selected channel and a preference channel - normally CH16.)

SAILOR RT2047 is provided with quick selection of channel 16.

SAILOR RT2047 is provided with selcall decoder. Selective call (CALL) or all ships call (CQ) from the coast station will be decoded.

SAILOR RT2047 receiver section is a double-conversion superheterodyne system, which makes use of a phase-locked digital frequency synthesizer for frequency generation based on a single crystal to provide all the standard channels and the private channels.

SAILOR RT2047 transmitter section is a phase-locked phase-modulated signal generator with a solid state RF power amplifier.

SAILOR RT2047 is provided with two microcomputers, one for controlling the frequency synthesizer, reading from and to EEPROMS, controlling the squelch and volume functions, and controlling the selcall filter. The other uC is controlling the display drivers, the dual watch, and scanning functions.

SAILOR RT2047 is for 12 Volt DC supply. Voltage change-over from 24V to 12V is done by the switch-mode power supply N418.

SAILOR RT2047 employs the most modern circuit technology, housed in a corrosion resistant aluminium cabinet with a green nylon finish.

SAILOR RT2047 is provided with membrane switches for controls, easy to use, reliable and hard-wearing. Cut-outs in the metal front serve as a safe finger-guide.

SAILOR RT2047 is fitted with night illumination. All lettering can be illuminated from behind.


"SAILOR" COMPACT VHF RT2047
S P RADIO DENMARK
Scan S
Duplex
Vol 12 SQ 4
26
1
2
3
4
5
6
7
8
9
VOL
VOL
SQ
SQ
ON
OFF
STOP
RUN
16
SHIFT
0
P
ENT

1.1. TECHNICAL DATA FOR SAILOR VHF RT2047

Fulfils the international CEPT regulations.

GENERAL

All international maritime VHF channels

Private Channels	20 as option up to 67
Operation	Duplex and Simplex
Modulation	G3EJN (Phase)
Antenna Impedance	50 ohm
Frequency Stability	±10 ppm
Temperature Range	-20°C to +55°C
Nominal Power Supply	13.2V DC
Power Supply Variation (with reduced data according to international standards)	12V DC -10% to +30%
Power Consumption	Standby = 0.5 Amp. Transmit = 6 Amp.
Dimensions	Height: 115 mm Width: 225 mm Depth: 262 mm
Weight	5.5 kg

RT2047

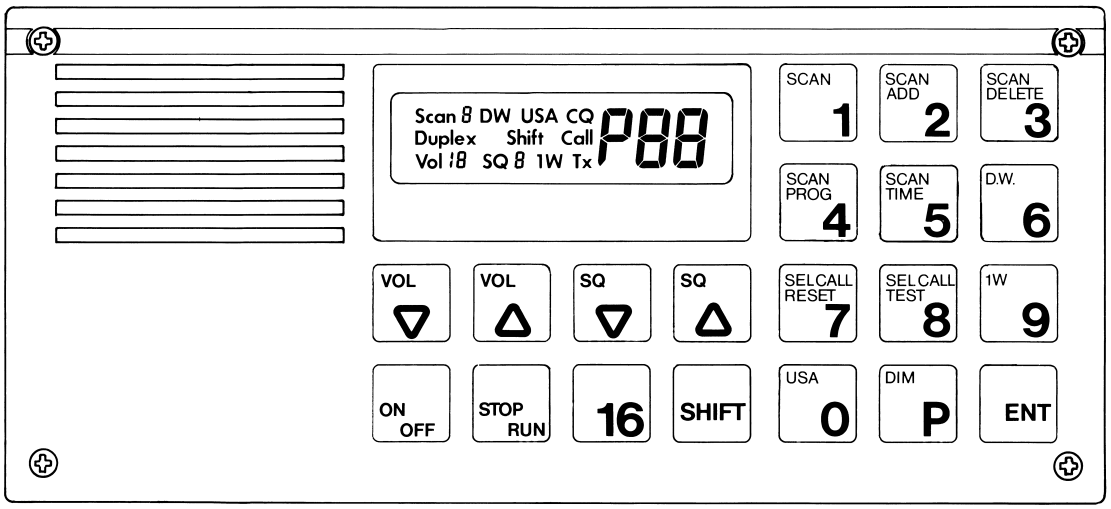
RECEIVER

Frequency Range Simplex	155.400 - 158.000 MHz
Frequency Range Duplex	160.000 - 162.600 MHz
Sensitivity	0.35 uV pd at 12 dB SINAD
Duplex desensitisation	Less than 2 dB
AF Output Power	3 Watt/4 ohm
Telephone Output	0.45V RMS/200 ohm
Distortion	Less than 5%
Scanning Facilities	5 scanning programmes with possibility for all your channels in each programme except the private channels from P20 to P67
Sensitivity Call Decoder	According to CCIR

TRANSMITTER

Frequency Range	155.400 - 158.000 MHz
RF Output Power	25 Watt, +0 to -1 dB
Reduced RF Output	0.5 to 1 Watt
Distortion	Less than 2%

1.2. CONTROLS



ON OFF — Turns the set on or off.

VOL △ — Increases volume progressively in 16 steps.

VOL ▽ — Reduces volume progressively in 16 steps.

SQ △ — Increases squelch sensitivity progressively in 8 steps, a gradual exclusion of weak signals with atmospherics.

SQ ▽ — Reduces squelch sensitivity progressively in 8 steps.

STOP RUN — Stops and starts scanning sequence. Listen out on several pre-determined channels.

16 — Quick select of the call and distress channel 16.

1 — Digits from 1 to 0.

P — Selects private channels.

ENT — Terminates the keying in of selected channels, scanning programmes, scan time etc.

SHIFT — Activates the functions marked in orange on the keyboard.

RT2047/4-0-23990

SHIFT FUNCTIONS

Selects scanning programmes.

Adds a channel to the scanning table.

Deletes a channel from the scanning table.

Stores the current scanning programme in the memory.

Selects the scan time from 1 to 99 seconds. The time chosen will be used to listen on one of the secondary channels receiving a signal.

Selects the dual watch facility.

Resets the selcall decoder after a call.

Tests the selcall decoder.

Selects 1 W reduced power output.

Selects the VHF channels used in USA.

Switches the panel illumination on or off.

Note: For operation see the green covered operating Manual for Sailor VHF RT2047.

1.3. PRINCIPLE OF OPERATION

1.3.1. FREQUENCY GENERATION

The frequencies are generated from a crystal oscillator on 21 MHz. The 21 MHz id divided in the REFERENCE DIVIDER to 2.1 MHz which is the input to the RX-REFERENCE DIVIDER and clock-signal for the micro-computer on the Interface Unit. In the RX-REFERENCE DIVIDER the 2.1 MHz is divided by 168 to 12.5 kHz which is reference for the PHASE DETECTOR. This makes it possible to change the frequency from the RX-VCO with 12.5 kHz spacing.
The signal from the RX-VCO is divided in a PRESCALER which divides by 33 until the A-COUNTER has reached zero and then it divides by 32. The N-COUNTER divides the output from the PRESCALER, and the output is led to the PHASE-DETECTOR, and here it is compared with the 12.5 kHz. If there is a difference an error voltage will be generated. This is integrated in the LOOP-FILTER and the output of this filter controls the RX-VCO. The frequency of the RX-VCO is the receiving frequency minus the intermediate frequency.

$$f_{LO1} = f_{RX} - f_{1IF} = f_{RX} - 21.4 \text{ MHz}$$

The output from the RX-VCO is mixed with the output from the TX-VCO which is in lock when it is 16.8 MHz above the Rx-VCO. This means that the receiver always is 4.6 MHz above the transmitter, namely 21.4 - 14.8 = 4.6; and this difference is equal to the duplex-distance.
The 16.8 MHz from the MIXER is divided by 32 to 525 kHz, which is compared with the 21 MHz divided by 40 in the REFERENCE DIVIDER. The error voltage is integrated in the LOOP-FILTER, the output of this filter controls the TX-VCO.

1.3.2. RECEIVER

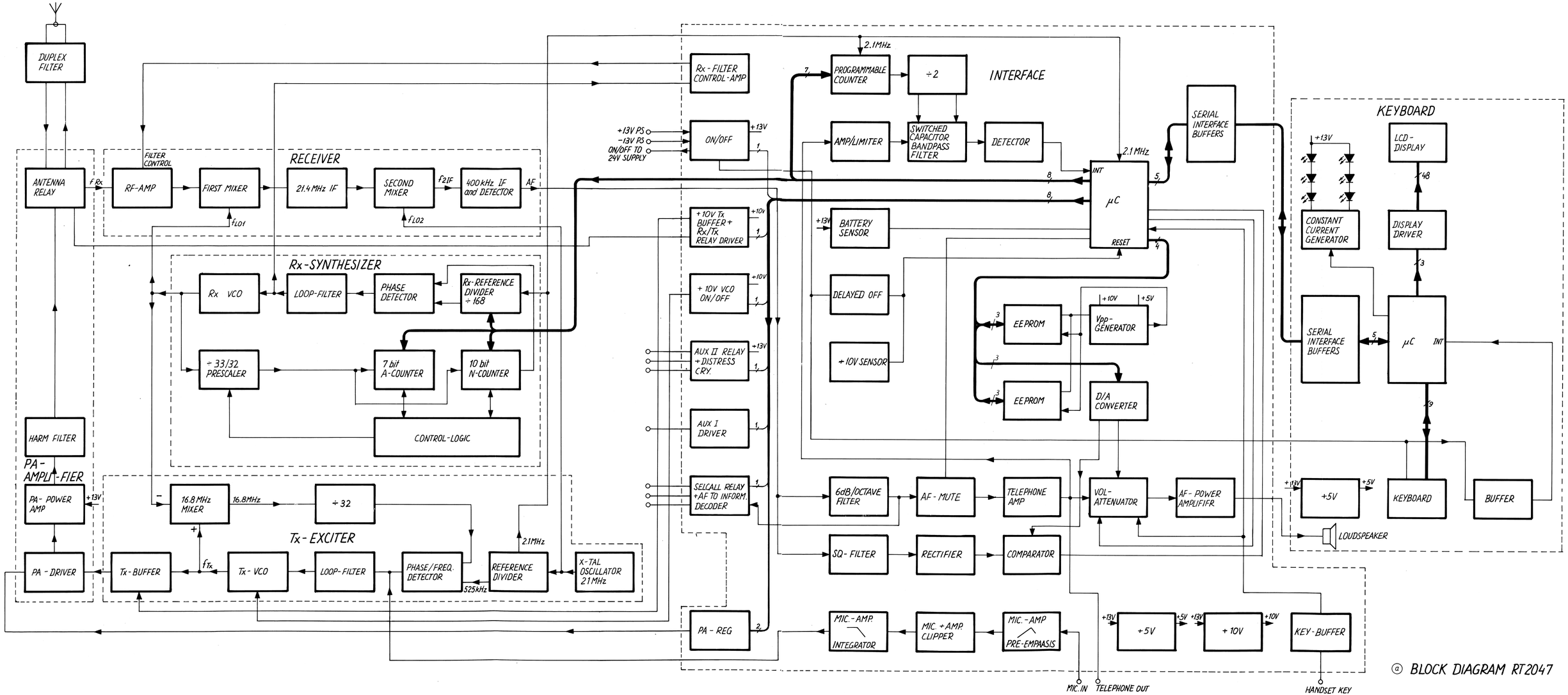
The antenna-signal is led through the duplex-filter and the antenna relay to the RF-AMPLIFIER. The bandpass filters are tuned by means of capacitor-diodes which are controlled by means of a DC-voltage which is derived from the control-voltage to the RX-VCO.
In the FIRST MIXER the antenna signal is mixed with the output from the RX-VCO to the intermediate frequency 21.4 MHz.
In the SECOND MIXER the 21.4 MHz is mixed with 21 MHz from the crystal-oscillator to 400 kHz which is amplified and detected.
The audio frequency signal is amplified and led through an active filter providing the frequency response further to the telephone amplifier and the AF power amplifier.

1.3.3. TRANSMITTER

The microphone signal is led through the MICROPHONE AMPLIFIER where the necessary amplification, limiting, and filtering take place. The limiting is done by a clipper. The signal from the MICROPHONE AMPLIFIER is led to the LOOP-FILTER, where the phase-modulation of the transmitter takes place.
As the TX-VCO oscillates directly on the transmitting frequency, the signal only has to be amplified. This is done in the TX-BUFFER, PA-DRIVER, and the PA-POWER AMPLIFIER. The power supply for the PA-driver is adjustable, and by means of this the output-power is adjusted. The harmonics of the output is filtered in HARM-FILTER, before it is led through the ANTENNA-RELAY and the DUPLEX-FILTER to the antenna.

1.3.4. THE MICROCOMPUTERS

The uC on the Interface Unit is taking care of calculating the dividing figure for the synthesizer, reading from and to the EEPROMs, controlling the squelch and volume functions, and controlling the selcall filter. The uC on the Keyboard Unit is taking care of the keyboard and controlling the display drivers. The Dual Watch and Scanning functions are also in this uC.
The communication between the two uCs is done on a RS232C - like serial connection.



RT2047/4-0-24312 A

ⓐ BLOCK DIAGRAM RT2047

CONTENTS

PART II: INSTRUCTION BOOK FOR SAILOR VHF RT2047

2.0. CIRCUIT DESCRIPTION

2.1. RECEIVER UNIT (100)

The receiver unit comprises the following circuits:

2.1.1. RF-Amplifier and First Mixer

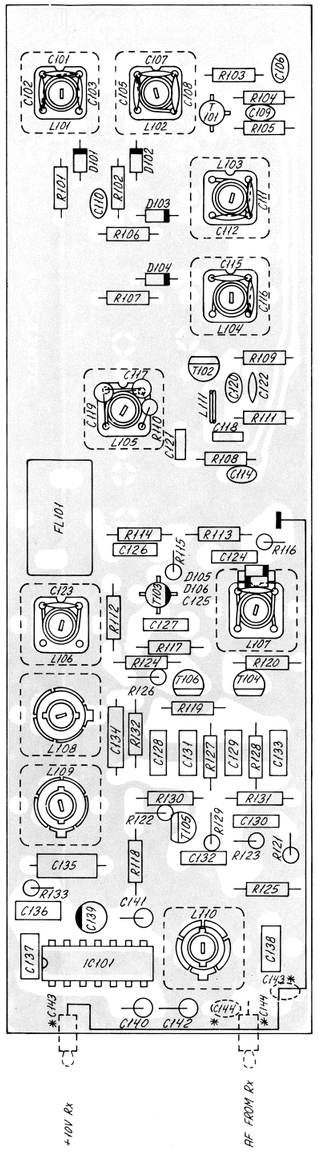
The RF-amplifier working in the frequency range 155.4 MHz to 162.4 MHz consists of the transistor T101 and the two double-tuned filters surrounding it.
From the aerial, the signal is led through the duplex-filter to the antenna switch from which the signal is fed to the receiver input-filter.
The input filter as well as the intermediate filter are variable capacitance tuned filters, controlled by a DC-voltage derived from the RX-VCO control voltage which secures an optimum filter response in the whole frequency range of the receiver.
In this way the two double-tuned filters create the necessary attenuation of signals far away from the wanted signal frequency in order to give the wanted spurious rejection of such unwanted signals.
The amplifying transistor T101 which is a large current, low noise transistor in a common-base configuration, secures by its gain the receiver overall noise figure; as well as good two-signal performance is obtained.
The RF-input to the first mixer is taken from the coil L104 in the intermediate filter.
Mixer transistor T102 is of the J-FET-type, where the first LO-signal is injecting into the source from a 50 ohm generator.
The wanted 21.4 MHz IF-output is selected by means of the tuned drain-circuit consisting of L105, C117, C119, and R110 which in the same time creates the necessary impedance matching to the IF-crystal filter.

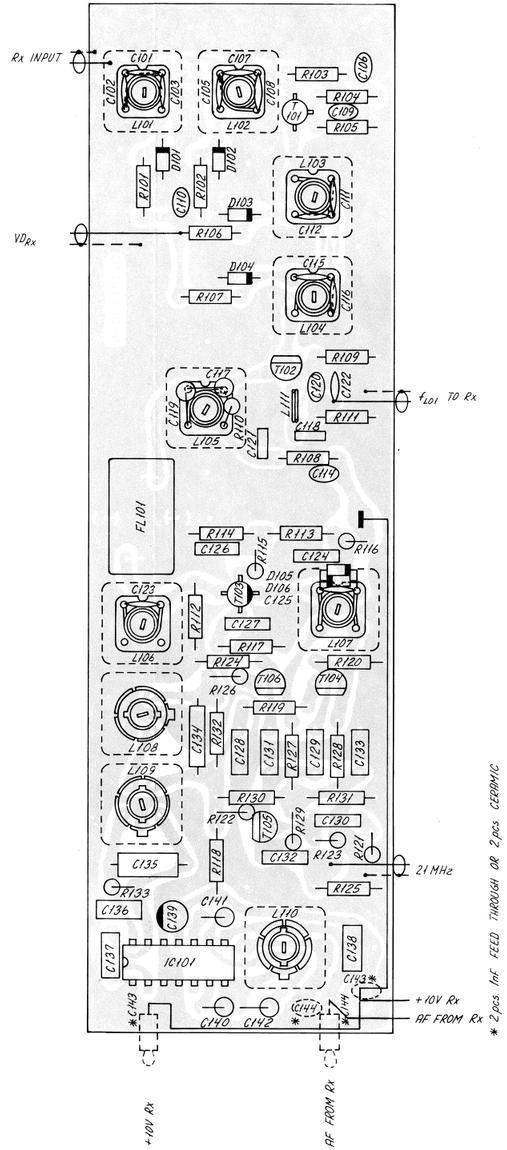
2.1.2. IF-Filter and Amplifier

The receiver adjacent channel selectivity is maintained by means of the crystal filter FL101. The output from this filter is led to the IF-amplifier with the transistor T103. L103, C123, and R112 give the appropriate impedance matching to the filter output.
The amplifier gives the needed power gain between crystal filter and second mixer and in the same time good large signal performance is obtained. Diodes D105, and D106 in the tuned drain-circuit limit the maximum IF-voltage swing delivered to the second mixer.

2.1.3. Second Mixer, 400 kHz IF-Amplifier and Discriminator

The second mixer consists of the IF-injection transistor T105 and the two mixing transistors T104 and T106 in a balanced configuration.
The second LO-signal of 21 MHz is taken from the reference crystal oscillator.
The 400 kHz IF-signal is taken out in an unbalanced way in the tuned collector circuit of T106 and led to the integrated amplifier IC101 via transformer L109 which is a part of the above mentioned collector circuit.
This integrated circuit comprises both a large gain IF-amplifier and the discriminator circuit.
The large gain secures a voltage-limited injection to the internal discriminator, providing a very good receiver AM-rejection.
The AF-output is taken from pin 8 on IC101.





AC voltages outside frame of diagram.

▲: Measured with oscilloscope or frq. counter.

⊙ ⊡: Measured with test probe.

●: Connections to module.

[ ]: Approx. measurement with test probe.

Test conditions: ⊙

Voltages without brackets:

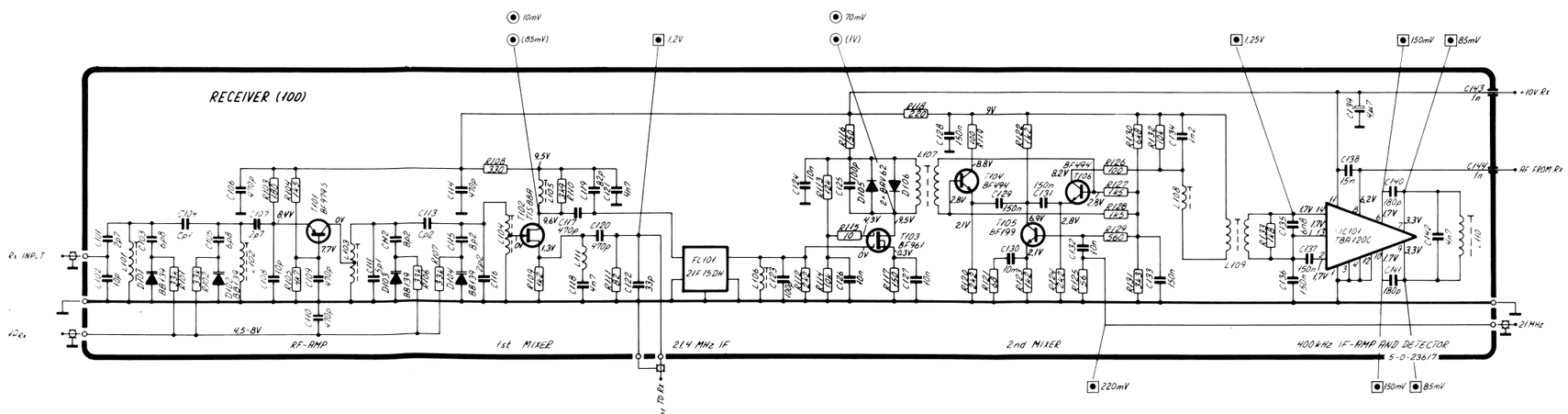
Antenna signal 1 mV pd: Δf=

±3 kHz; fm = 1 kHz

Voltages in brackets:

Antenna signal 10 mV pd; Δf =

±3 kHz; fm = 1 kHz



2.2. RX-SYNTHESIZER UNIT (200)

The RX-synthesizer unit comprises the following circuits:

2.2.1. RX-VCO and Buffer Amplifiers

The transistor T203 is producing 8.3 V supply voltage for the RX-VCO and bias for the buffer amplifiers consisting of the transistors T201 and T204.
The RX-VCO comprises a Field Effect Transistor T202 (the oscillator transistor), two coaxial coils L203, L204, two capacitors C212, C214, and a variable capacitance diode D201. The frequency is mainly determined by the components L203, L204, C214, and D201.
The RX-VCO is a voltage controlled oscillator where the control voltage from the loop filter determines the frequency by means of D201. A high control voltage to the variocap. diode D201 means a small capacitance in the diode which means a high frequency of the VCO. In the opposite way a low control voltage means a low VCO frequency.
The RX-VCO signal is passed to two buffer amplifiers via lowpass filter C209, C206, L201. The LO1 buffer transistor T201 is producing 5 mW for the 1st mixer in the receiver. The 5 mW is taken from the tuned filter L202, R202, C207, and C208. The prescaler buffer transistor T204 is producing 0.25 mW for the 16.8 MHz mixer in the TX-Exciter-Unit. It is also producing signal for 32/33 prescaler. The signal from transistor T204 is led through a lowpass filter C217, L206, and C222.
The gain in both buffers can be adjusted by the potentiometer R209.

2.2.2. 32/33 Prescaler

The integrated circuit IC201 is a two modulus prescaler based on the ECL technique.
From the control logic in the programmable divider IC202 pin 14, a high or low level is led to the prescaler IC201 pin 1. A high level at IC201 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 R232 and the diode D204 work as a speed-up circuit.

2.2.3. The Programmable Divider

The programmable divider IC202 comprises two phase detectors, a lock detector, a reference divider, an A-counter, an N-counter, control logic, and 8 latches. Only phase detector B of the detectors is in use.
When the VHF is switched on the microcomputer will load dividing figures into the reference divider and into the A and N-counters. The microcomputer loads only one latch at a time.
By setting up a code at the address inputs A_0 - A_2 the microcomputer selects a latch and at the same time a code for the dividing figure is set up at the data inputs D_0 - D_3. The microcomputer sends a strobe pulse to IC202 pin 12 and the selected latch is loaded. The procedure is then repeated until all the latches are loaded.
When the channel or the function of the VHF is changed it is only the latches for the A and N-counter which change data. The reference frequency is 2.1 MHz and it is constant. Therefore it is not necessary to change the dividing figure every time.
In the beginning of a counting period the prescaler IC201 starts dividing by 33 and the A and N-counters count down. First the A-counter reaches zero and stops counting and the control logic shifts the prescaler to divide by 32. Then the N-counter reaches zero and sends a pulse to the phase detector B, and the control logic shifts the prescaler to divide by 33. The control logic also reloads the A and N-counters with data from their latches and the whole thing starts all over again.
The pulse frequency from the reference divider is 12.5 kHz. If the RX-VCO frequency is correct the pulse frequency of the N-counter is also 12.5 kHz and in phase with the pulse from the reference divider. The phase detector B compares the phase of the two pulses. If they are not in phase the detector sends correction pulses to the phase-detector-pump for correcting the frequency/phase of the RX-VCO. However, the synthesizer circuit is born with a small phase error, therefore the phase detector is sending small correction pulses to transistor T210 with a frequency of 12.5 kHz.

f

y has decreased from its nominal fre-
ds negative correction pulses from
n. A current will then flow from C225
D. This current will discharge C225
e transistors T205 and T206 to increase
frequency.
n, the negative correction pulses from
ll turn transistor T209 off. The col-
increases and a current will flow
or R225 and into the capacitor C225
out voltage at the collector of the
rease until the VCO reaches its right

, both outputs of the phase-detector
of the transistors T205 and T206 will
corresponding to the VCO-frequency.
n a constant phase error and the phase
lses to transistor T210, even the

207, and T208 are working as an opera-
g input at base of transistor T208.
or T207 while the transistors T205

AC voltages outside frame of diagram.

▲: Measured with oscilloscope or frq. counter.

⊙⊡: Measured with test probe.

●: Connections to module.

[ ]: Approx. measurement with test probe.

Test conditions: ⊙

Voltages without brackets:

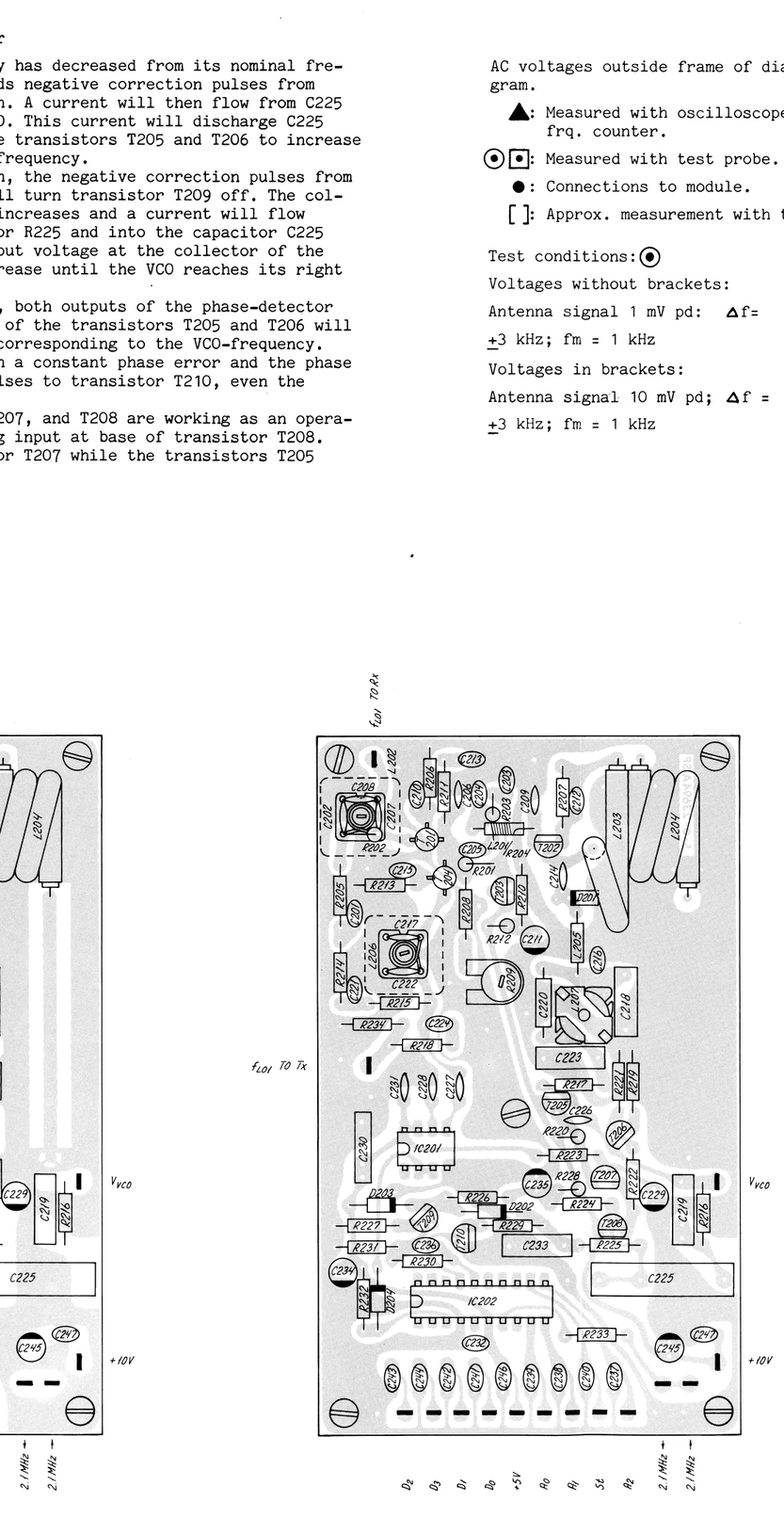
Antenna signal 1 mV pd: Δf=

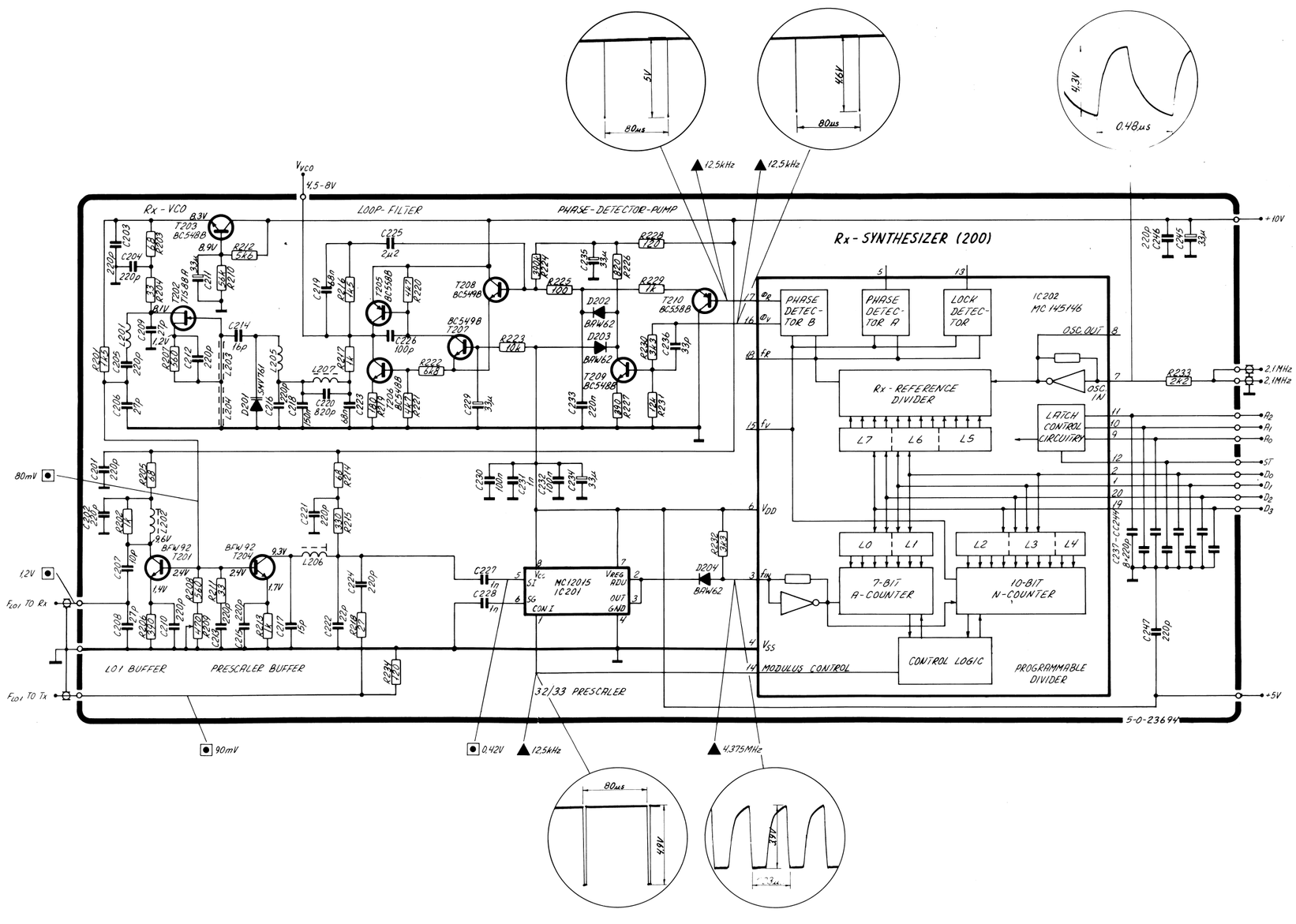
±3 kHz; fm = 1 kHz

Voltages in brackets:

Antenna signal 10 mV pd; Δf =

±3 kHz; fm = 1 kHz





2.2.4. Phase Detector Pump and Loop Filter

We assume that the RX-VCO frequency has decreased from its nominal frequency. The phase-detector now sends negative correction pulses from IC202 pin 17 to T210, which goes on. A current will then flow from C225 through R225 and R229 and into T210. This current will discharge C225 forcing the output voltage from the transistors T205 and T206 to increase until the VCO reaches the correct frequency.
If the RX-VCO frequency is too high, the negative correction pulses from the detector at pin 16 of IC202 will turn transistor T209 off. The collector voltage of transistor T209 increases and a current will flow through the diode D202, the resistor R225 and into the capacitor C225 and charge this capacitor. The output voltage at the collector of the transistors T205 and T206 will decrease until the VCO reaches its right frequency.
If the phase-locked-loop is locked, both outputs of the phase-detector will be 5 V and the output voltage of the transistors T205 and T206 will have a value between 2 V and 10 V corresponding to the VCO-frequency. However, the system is working with a constant phase error and the phase detector sends small correction pulses to transistor T210, even the phase-locked-loop is locked.
The four transistors T205, T206, T207, and T208 are working as an operational amplifier with the inverting input at base of transistor T208. Non-inverting input is at transistor T207 while the transistors T205 and T206 form the output stage.

AC voltages outside frame of diagram.

▲: Measured with oscilloscope or frq. counter.

⊙⊡: Measured with test probe.

●: Connections to module.

[ ]: Approx. measurement with test probe.

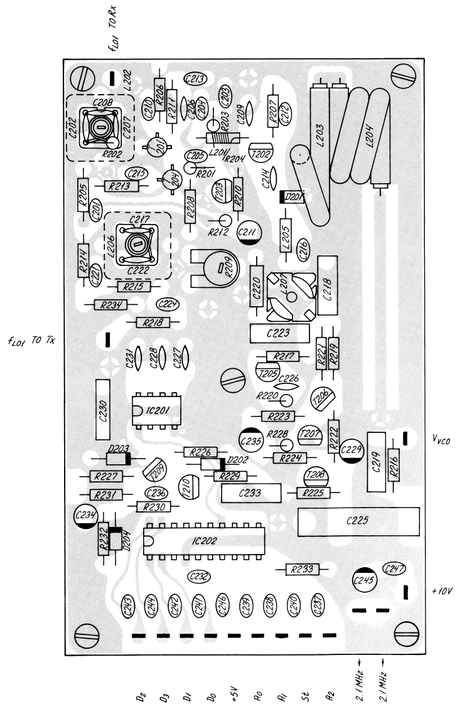
Test conditions: ⊙

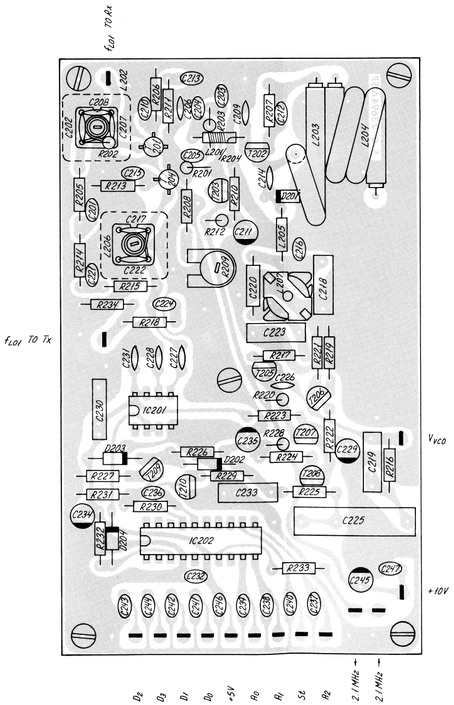
Voltages without brackets:

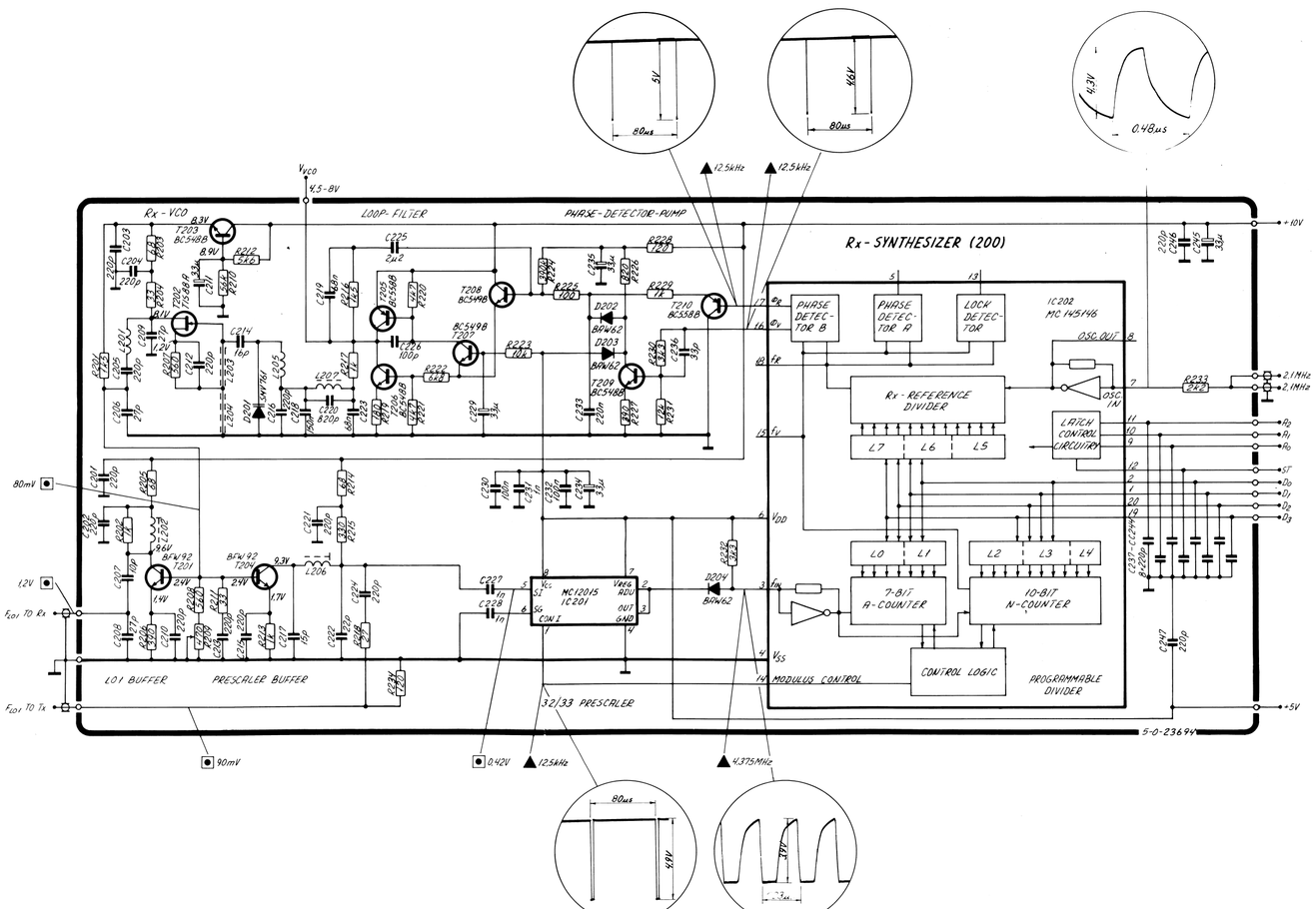
Antenna signal 1 mV pd: Δf= ±3 kHz; fm = 1 kHz

Voltages in brackets:

Antenna signal 10 mV pd; Δf = ±3 kHz; fm = 1 kHz







2.3. TX EXCITER UNIT (300)

The TX exciter unit comprises the following circuits:

2.3.1. Insulation Buffer and 16.8 MHz Mixer

From RX-VCO the signal is led to transistor T301 and from TX-VCO the signal is led to transistor T302. Both transistors which are not coupled in common base act as buffer amplifiers. The mixed signal over resistor T305 is led to the mixer amplifier T303 via capacitor C305. The differential signal which is the TX-VCO frequency minus the RX-VCO frequency is led to the amplifier transistor T304 through the low-pass filter consisting of C310, L301, and C311. In transistor T305 the signal is amplified to TTL level. The diode D301 works as a base clamp diode.

2.3.2. 21 MHz Osc.

The oscillator is a Colpitt type and the oscillator transistor T308 is oscillating by means of a 21 MHz crystal X301.
The trimmer capacitor C331 is for fine adjustment of the oscillator frequency.
RF signal for second mixer in the receiver is taken from the low-pass filter C326, L305, and C328. RF signal for the reference divider is led to transistor T307 for amplifying. In transistor T306 the signal is amplified to TTL level.

2.3.3. Phase/Frequency Detector, 32 Counter and Reference Divider

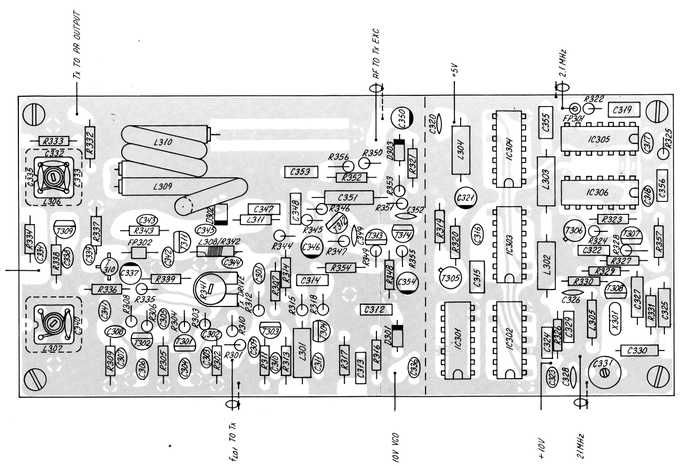
The crystal frequency is led to IC306 pin 10 which is a decade counter. From output pin 5 of this, the frequency is divided by 5. This frequency is led to flip-flop IC305a, where the frequency is divided by 2. From IC305a pin 5, the 2.1 MHz is taken and this is the clock frequency for the microcomputer and the RX synthesizer. The resistor R322 is for pull-up and the ferrit bead FP301 is blocking for higher harmonics of the clock frequency.
From IC306 pin 8, the 21 MHz is also divided by 10. The frequency is divided by 2 in flip-flop IC305b and divided by 2 in IC304a. At IC304b pin 13, the 21 MHz is then divided by 40 and the frequency is therefore 525 kHz at which the phase detector is working.
From the other side the mixed signal of 16.8 MHz is led to the binary divider IC301 pin 10 where it is divided by 16. In flip-flop IC302b the signal is divided by 2. From IC320b pin 8 the 16.8 MHz is then divided by 32 = 525 kHz.
The phase/frequency detector consists of IC302a, IC303, and IC304b. From IC304b pin 9 the detector is connected to the loop filter via the pull-up resistor R321 and the diode D303. The phase corrections pulse from the detector is active low and when the phase locked loop is in the lock the duty cycle of the correction pulse is about 30 per cent.
The correction pulses are made in this way:
After the count down of the 21 MHz the IC304b pin 9 goes low. Pin 8 goes high and this is connected to IC303 pin 2.
When the 16.8 MHz is divided by 32 the IC302a pin 6 and IC303 pin 1 go high. When IC303 pin 13 is always high the IC303 pin 8 will go low and preset IC302a and IC304b; the correction pulse will then go high and so on. The propagation delay in the two inverters IC303 determines the size of the preset pulse.

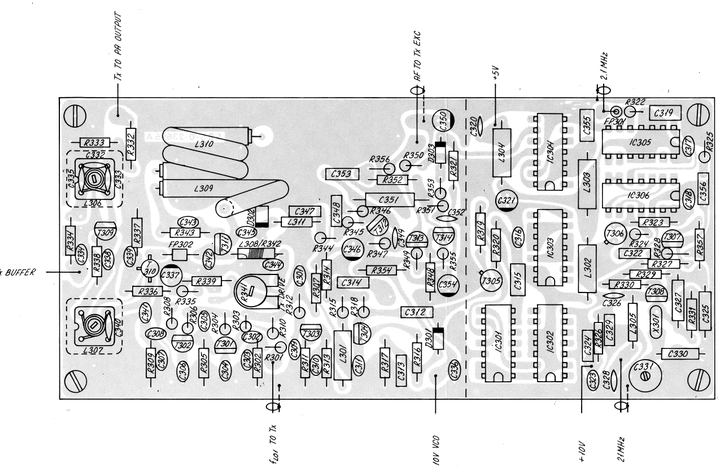
2,3,4. TX-VCO

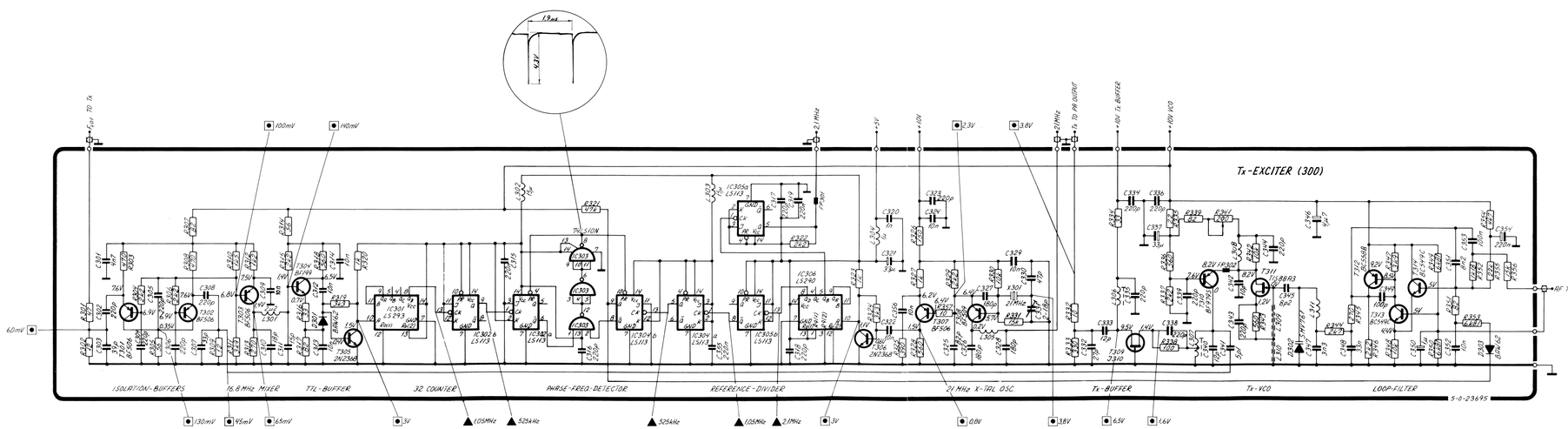
The TX-VCO comprises a Field Effect Transistor T311 (oscillator transistor), two coaxial coils L309 and L310, the capacitors C343 and C345, and a variocapacitor diode D302. The frequency is mainly determined by L309, L310, C345, and D302.
The TX-VCO is a Voltage Controlled Oscillator, where the control voltage from the loop filter determines the frequency by means of the variocapacitor diode D302. A high voltage to D302 means a smaller capacitor in D302 and again a higher VCO frequency. In the opposite way a small control voltage means a smaller frequency.
From drain of transistor T311 the signal is led to a buffer amplifier T310 via a tuned filter consisting of L308, R342, and C342. The ferrit bead is blocking for UHF oscillatings. In the collector of T310 there is a tuned filter consisting of L307 and C340. From here the signal for two circuits is taken.
From an outdraw on coil L307 signal to TX-buffer is taken through capacitor C338. Here the TX-VCO signal is amplified in transistor T309. In drain of T309 there is a tuned filter consisting of L306, C332, C333, R332, and R333, which gives a 50 ohm generator for Power Amplifier Unit. The output power from TX-buffer is 25 mW and is adjusted by trimmer potentiometer R341.
Stop and start of both TX-buffer and TX-VCO are controlled from the microcomputer by controlling the supply for the transistor. That secures that the frequency is correct before the transmitter is started.
From the collector of T310 signal for the 16.8 MHz Mixer is taken via capacitor C341.

2,3,5. Loop-filter

The Loop-filter amplifier is a differential amplifier (OP-Amp.) with the inverted input at the base of transistor T314, where also the phase detector is connected. The base of transistor T313, which is the non-inverted input, is connected to +5V by means of R349 and R350.
Transistor T312 is the output stage,and the control voltage for TX-VCO is taken over the resistor R346 and is filtered in the ripple-filter consisting of R345, C348, C347, and R344. At the input R351 and C352 are working as a filter against the higher harmonics in the phase detector pulse.
We assume that the system is in lock. While the detector pulse is low a current is flowing out of the capacitor C351 and the output voltage over R346 increases. The TX-VCO frequency is also increasing until the detector pulse goes high again. Because the diode D303 is blocking,a current flows into C351 through the resistors R354 and R355. The control voltage over R346 decreases and the frequency is also decreasing. The current which is flowing in and out of C351 is equal when the system is in lock. For principal understanding accept that C353 and R352 have no influence on the current to C351.
If the TX-VCO frequency is too high, the detector pulse gets smaller and that means that more current is flowing into C351 than there is flowing out. That means again that the control voltage and the frequency will decrease until the frequency is correct again.
The opposite process will happen if the frequency is too low. Even though the system is in lock there is always a little phase error.
The AF modulation signal is led into the Loop-filter via resistor R356. The control voltage is then modulated which again will modulate the phase in the TX-VCO.







AC voltages outside frame of diagram.

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⊙⊡: Measured with test probe.

●: Connections to module.

[ ]: Approx. measurement with test probe.

Test conditions:⊙

Voltages without brackets:

Antenna signal 1 mV pd: Δf=

±3 kHz; fm = 1 kHz

Voltages in brackets:

Antenna signal 10 mV pd; Δf =

±3 kHz; fm = 1 kHz

2.4. TX-POWER AMPLIFIER (400)

The TX-power-amplifier comprises the amplifier and a harmonic filter.

2.4.1. TX-Power-Amplifier

The amplifier consists of a single transistor output amplifier and a two-transistor power driver which are both tuned class-C amplifier circuits. The amplifier is made on double sided epoxy board, using microstrip technique in the tuning circuits.
The power driver is fed from a 50 ohm generator with a power level of 25 mW.
The final output power level is controlled by means of the supply voltage level fed to the power driver. In full power mode, the power driver will deliver about 4.5 - 5 W to the output transistor T401.
The output signal is fed to the harmonic filter through capacitors C405 and C406.

2.4.2. Harmonic Filter

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

2.5. ANTENNA RELAY (500)

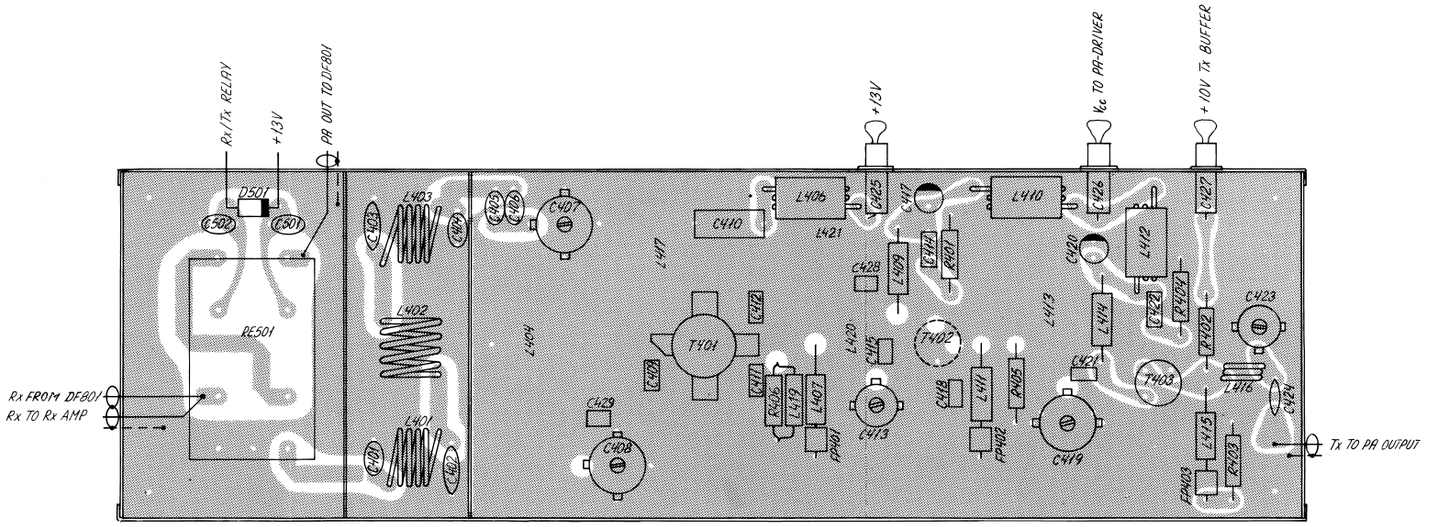
The antenna relay, RE501, is placed in the Tx-power amplifier module (400).

The relay is equipped with 2 change-over contacts and is activated when the transmitter is keyed.

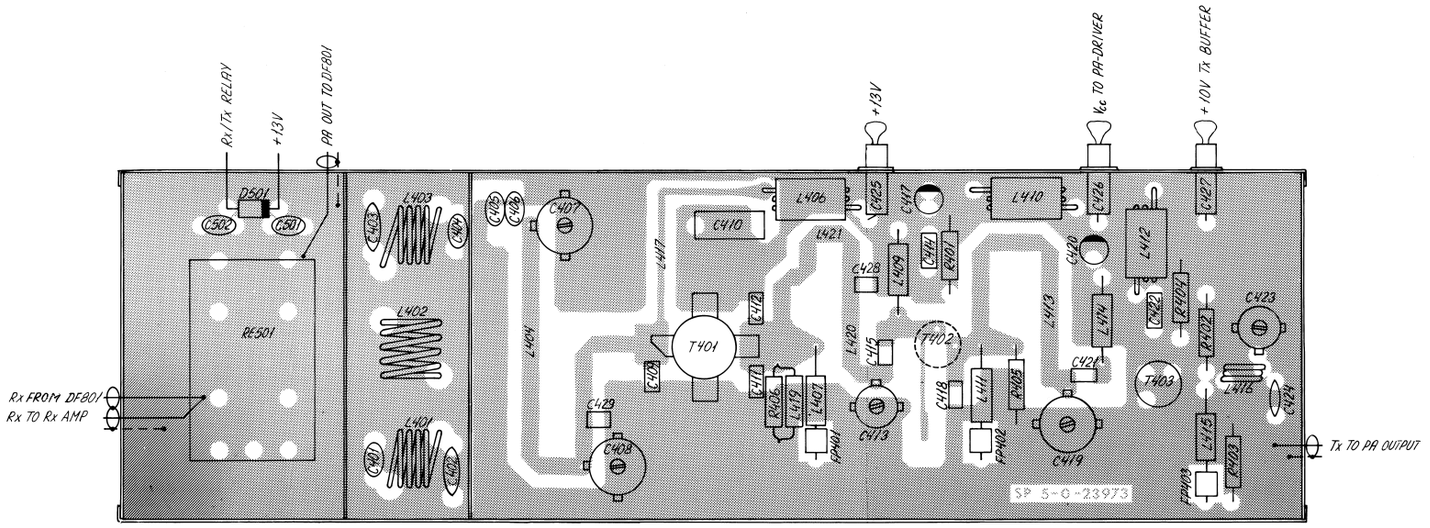
In simplex receiving mode the RF signal is led to the receiver (100) through both contacts from the Tx-section of the duplex filter.

In simplex or duplex transmitting mode the Tx-signal is led from the harmonic filter through one contact to the Tx-section of the duplex filter.

The other contact is grounded.



Tx-POWER AMPLIFIER WITH REAR SIDE TRACKS



Tx-POWER AMPLIFIER WITH UPPER SIDE TRACKS

AC voltages outside frame of diagram.

▲ : Measured with AF voltmeter. (RMS)

Test conditions.

Voltage without brackets:

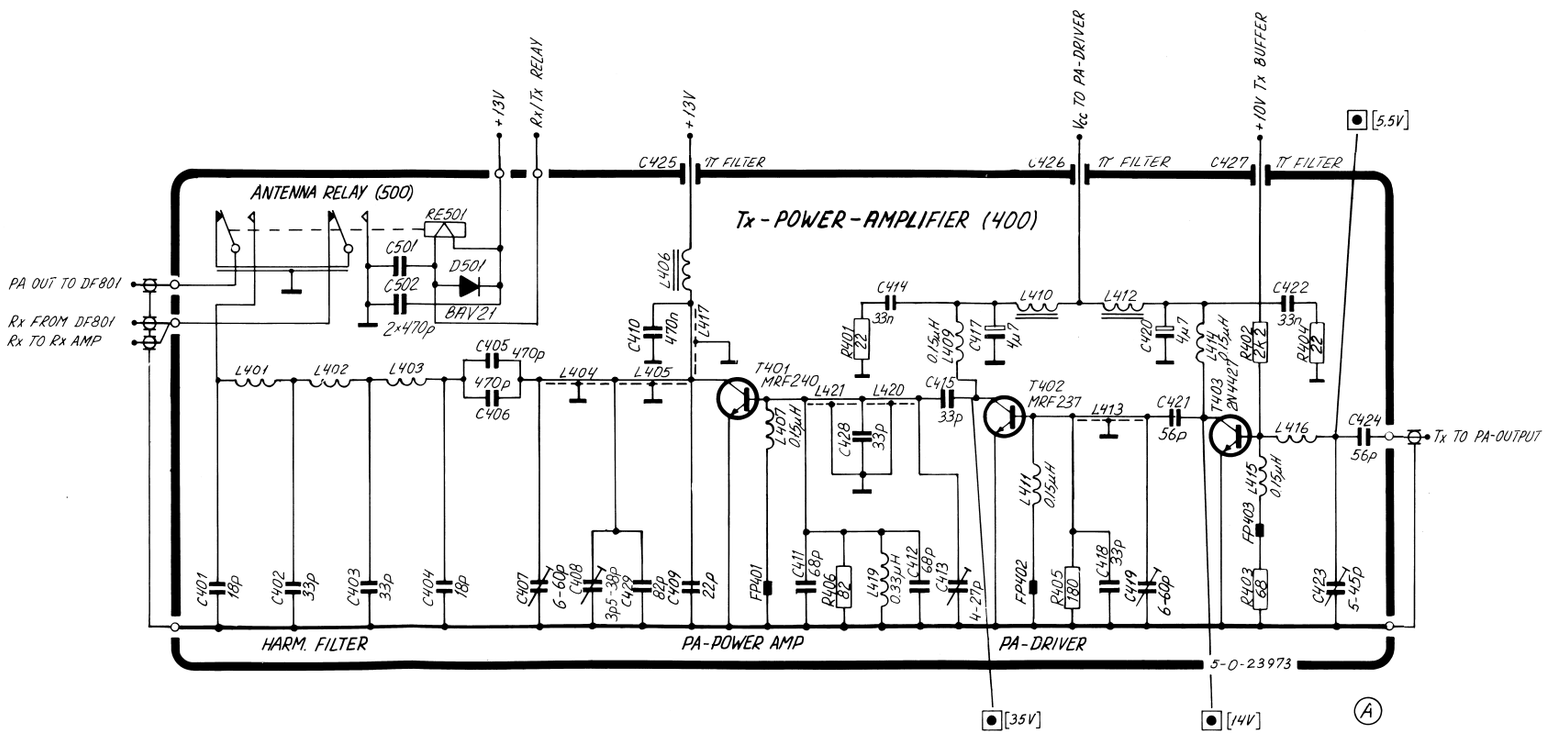
Operating in Rx position.

With antenna-signal 1 mV EMF

f = ±3 kHz; fm = 1 kHz

Voltage in brackets:

No antenna-signal, squelch max. closed.



2.6. INTERFACE UNIT (600)

2.6.1. ON/OFF Function

ON
When the ON/OFF push button is activated T604 is turned on and the relay RE603 is engaged. When the uC leaves reset condition PC5 is set to high level and T605 will be conducting, keeping T604 on.

OFF
When the ON/OFF push button is activated again IC619 receives a message on the serial interface. Then it stores the actual settings of the channel, volume, squelch, power level, INT/USA mode, and scan time. Afterwards PC5 is turned low, and T605, T604, and RE603 will switch off.

2.6.2. Battery Sensor

If the battery voltage drops below approx. 9.5V the output of IC607c goes high, and the uC will switch off the set.

2.6.3. Delayed OFF

If the ON/OFF push button is kept activated longer than approx. 3 secs, pin 12 on IC612b will go low forcing the uC into reset. This means that as soon as the button is released the set will switch off.

2.6.4. Temperature Sensor

Not mounted.

2.6.5. 5V Supply

The 5V power supply is an integrated, non adjustable regulator.

2.6.6. 10V Supply

The 10V supply is a serial regulator with current limiter. When it is switched on T610 gets base current through R632 and R641. Thus T610 draws collector current so that T609 turns on and the output voltage rises. When T613 begins to conduct the current in T610 is reduced. Thus the base current in T609 is also reduced and the output voltage stabilizes. The current limiting starts when the voltage across R640 is big enough to turn T606 on and makes the current flow through D608 to the emitter of T610, and therefore the current in T610 and also in T609 will decrease which results in a decrease of the output voltage.

2.6.7. PA Regulator

By means of the PA regulator it is possible to adjust the output power of the transmitter.
When the output from IC603b is changed from 0 to 5V, T607 is turned off. Thus T608 is turned on and then also T612 and T611 and the output voltage rises. When the voltage at the base of T608 is equal to the voltage on the base of T607 the current in T608 is reduced and then also in T612 and T611 and the output voltage stabilizes.
The output power from the TX POWER AMPLIFIER is adjusted by changing the output voltage of the PA REGULATOR with R668. When reduced output power is chosen (1W mode) the uC turns PB5 to 0V and the reference voltage to the regulator will be lowered. It can be adjusted at R629, and thus also the reduced output power.

2.6.8. Vpp Generator

This converter makes 24.5V for erasing and programming the EEPROMs.
The output is adjusted with R617a.
When one of the EEPROMs IC609 or IC610 receives a write or erase code from the uC they turn pin No. 1 to 0V. This enables the oscillator IC608. T617 is turned on when pin No. 10 on IC608 goes to a high level and the coil L601 will be charged. When pin No. 10 goes low T617 turns off and current will flow through D615 and charge the capacitor C655, and the output voltage will rise. When the output voltage is high enough the output transistor of the comparator IC607b turns on and stops the oscillator until C655 is discharged so much that the output of the comparator turns off again.

2.6.9. RX Filter Control Amplifier

The control voltage from the RX VCO is turned into a control voltage to the capacity diodes in the band pass filters in the receiver.

2.6.10. Microphone Amplifier

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

2.6.11. Squelch Circuit

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

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

2.6.12. AF Circuit

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

2.6.13. Selcall

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

Figure No.	f(nominal) (Hz)	IC618 input 6543210	f(clock) (Hz)	f(resonance) (Hz)
1	1124	1010001	12963	1127
2	1197	1001100	13816	1201
3	1275	1001000	14583	1268
4	1358	1000011	15672	1363
5	1446	0111111	16667	1449
6	1540	0111011	17797	1548
7	1640	0111000	18750	1630
8	1747	0110100	20192	1756
9	1860	0110001	21429	1863
0	1981	0101110	22826	1985
R	2110	0101011	24419	2123

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

2.6.14. EEPROMs

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

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

Read Operation

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

Store Operation

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

2.6.15. Serial Interface

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

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

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

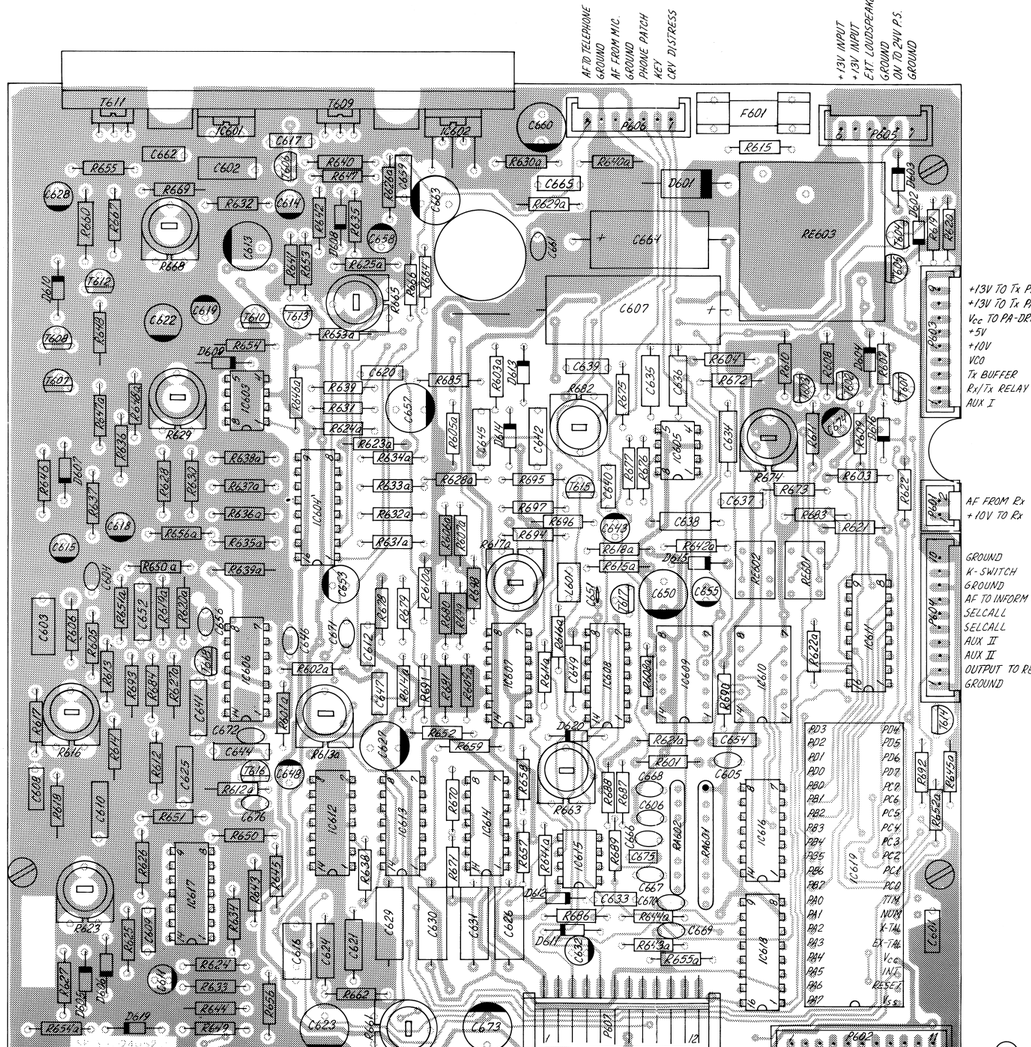
Transmission from IC709 to IC619
IC709 will set RTS (PD6 on IC619) to a high level at the same time as it sets DTR high. If IC619 has nothing to transmit it will answer by setting CTS (PC6) to a high level as soon as it is ready to receive. After IC709 has received the ready signal it will start transmission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

2.6.16. The Key-Function

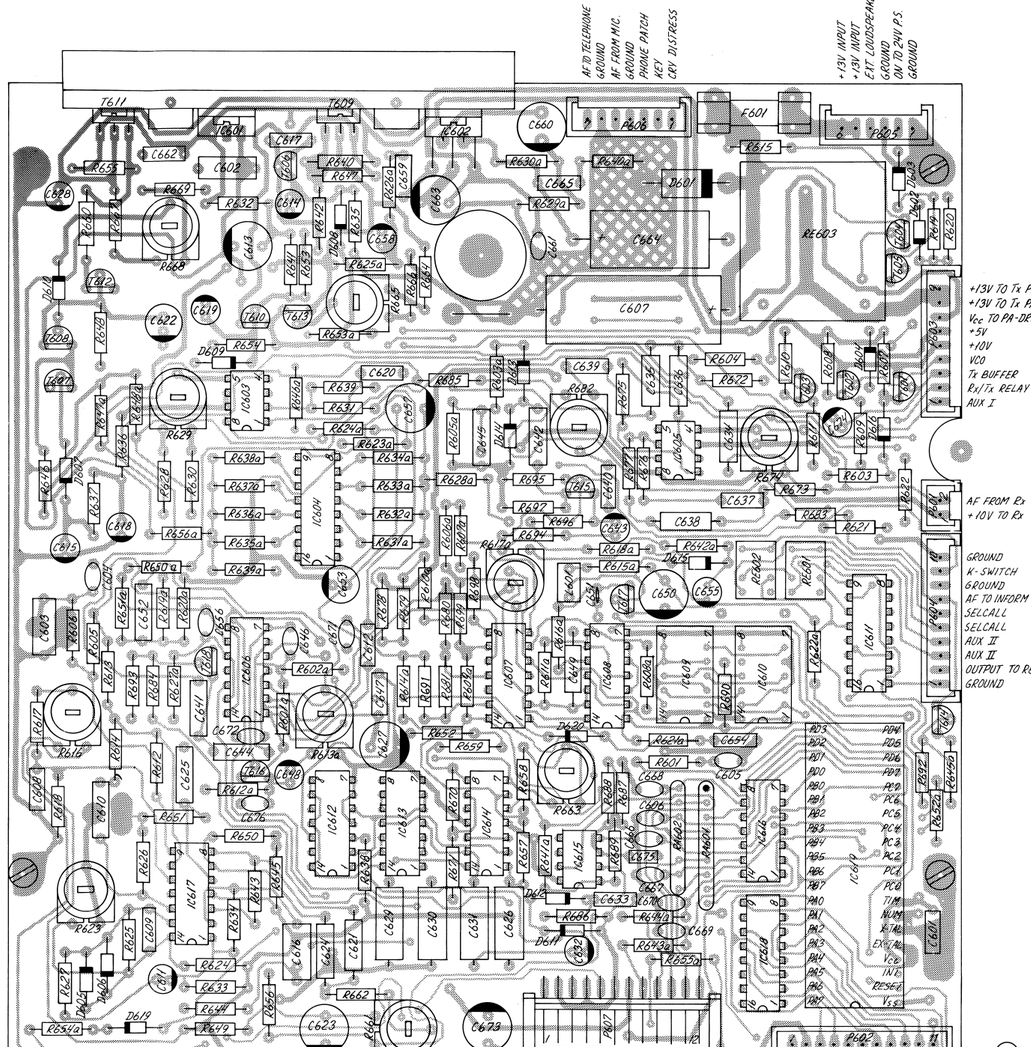
If the transmitter is keyed the input PD2 on the uC is put to a high level. If the radio is tuned on a simplex channel, the AF is muted by setting the output PB4 to a high level. Then the synthesizer is moved 4.6 MHz upwards. Then the TX-VCO is turned on by setting PB3 high and after approx. 15 msecs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

2.6.17. The Microcomputer

The uC is held in reset by a low voltage on the RESET input pin. As long as the uC is in reset it is doing nothing and all ports are configured as input pins.
The 10V-SENSOR secures that the capacitor C654 cannot be charged before the 10V supply is higher than approx. 8V. The 5V is checked internally. When the voltage on the reset pin is above the internal comparator level the uC starts. First all pins on PA, PB, and PC are configured as outputs. PB4, PB6, PC2, PC4, and PC5 to high level and the rest to low level.
Then the uC reads the address range from 64 to 7F in the EEPROM IC609. If there is an error in the range from 64 to 77 the uC will transmit an "E0" message to the display and go to test mode. If there is an error in the address range from 78 to 7F it will always initiate with channel 16, volume level at pos. 5 and the squelch level at 4.
If the first test is passed the uC will send information to the VOL/SQ latch (IC604) to the RX-synthesizer and initiate the selcall.
Then the uC supervises the KEY-input (PD2), the squelch detector (PD7), the selcall detector (INT pin), the RTS-input (PD6), and the battery sensor. (See the appropriate sections).



INTERFACE UNIT WITH UPPER SIDE TRACKS



INTERFACE UNIT WITH REAR SIDE TRACKS

RI2047B
4-6-24052F, 4-6-24052E I
4-6-24052E II

RT2047
4-0-24052F

* SETS MOUNTED WITH EEPROM PROCESSORS IC709 PIN6 AND IC619 PIN7 (NUM) ARE CONNECTED TO V_{CC}.

*** IC610 IS ONLY MOUNTED IN SPECIAL VERSIONS

AC voltages outside frame of diagram.

▲ : Measured with AF voltmeter. (RMS)

Test conditions.

Voltage without brackets:

Operating in Rx position.

With antenna-signal 1 mV EMF

f = ±3 kHz; fm = 1 kHz

Voltage in brackets:

No antenna-signal, squelch max. closed.

INTERFACE UNIT (600)

5-0-24052

2.7. KEYBOARD UNIT

2.7.1. Display

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

2.7.2. Keyboard

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

2.7.3. Panel Illumination

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

2.7.4. The Microcomputer

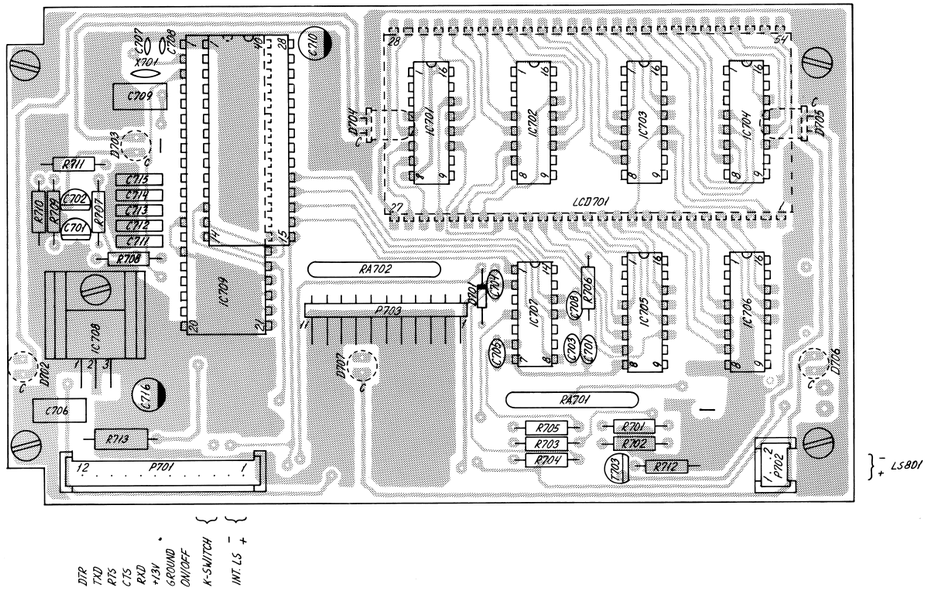
The uC uses the internal clock-generator and a ceramic resonator. The clock frequency is approx. 4 MHz.
The uC takes care of the dual watch and scanning functions and the keyboard and display. This means that when scanning, the uC requests a new channel every 100 msecs if it has not received a message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

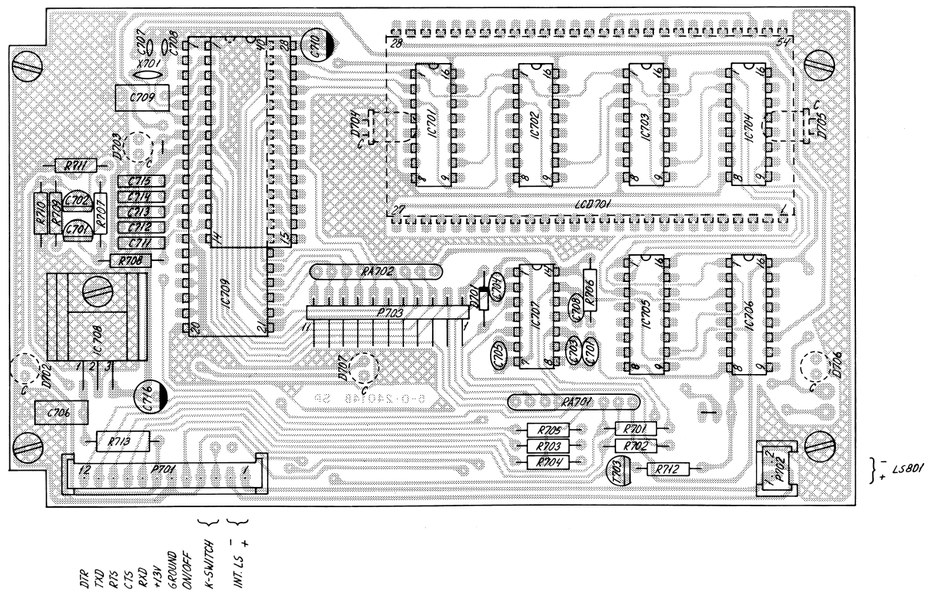
2.7.5. Dual Watch

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

2.7.6. Scanning

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





AC voltages outside frame of diagram.

▲ : Measured with AF voltmeter. (RMS)

Test conditions.

Voltage without brackets:

Operating in Rx position.

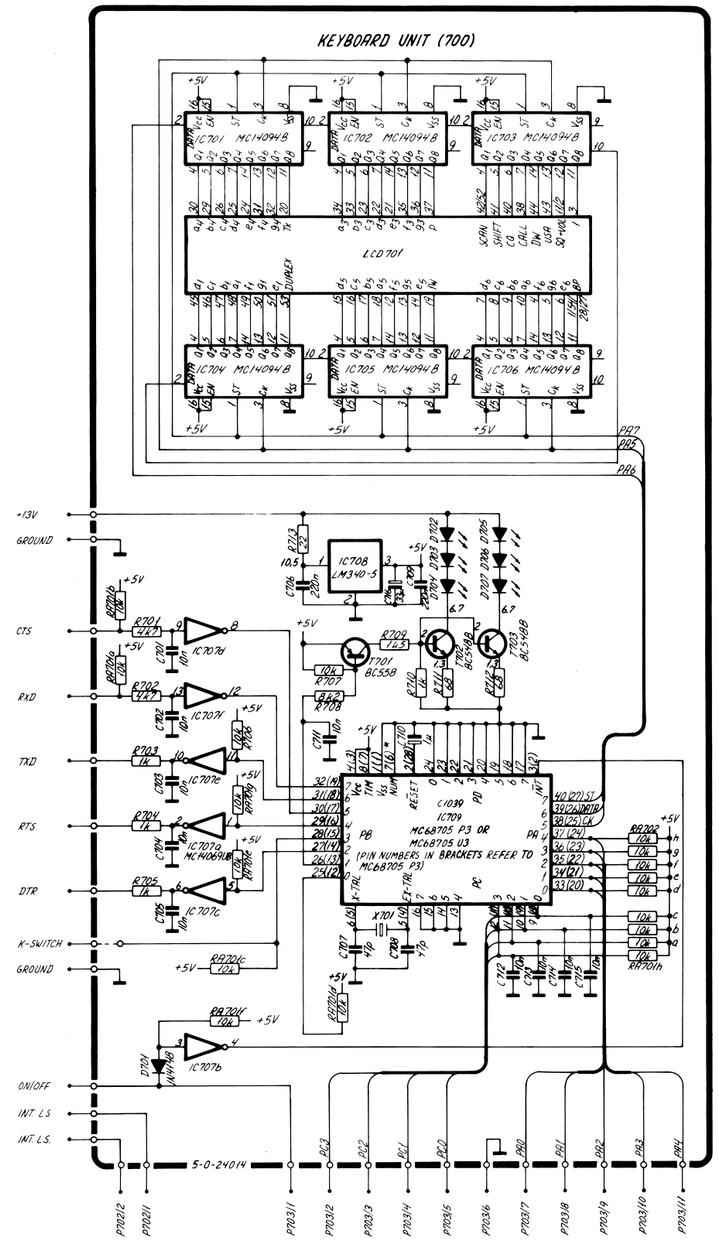
With antenna-signal 1 mV EMF

f = ±3 kHz; fm = 1 kHz

Voltage in brackets:

No antenna-signal, squelch max. closed.

* SETS MOUNTED WITH EEPROM PROCESSORS IC709 PIN 6 AND IC619 PIN 7 (NUM) ARE CONNECTED TO V_{cc}



2.8. DUPLEX FILTER (800)

With a duplex filter, DF801, placed in the station it is possible to operate in full duplex mode with only one antenna installed.

The duplex filter consists of 7 cavities, three in the Rx-section and four in the Tx-section.

The cavities in the Tx-section are stagger tuned. Two cavities (D-E) are suppressing the noise in the receiving band 160.625 MHz - 162.025 MHz with min. insertion loss in the transmitting band.

The function for the other two cavities (F-G) is to provide a band stop filter in the range of the image frequency band of the duplex distance, 4.6 MHz: 151.425 MHz - 152.825 MHz.

The cavities (A-B-C) in the Rx-section are stagger tuned. They are suppressing the transmitting frequencies with min. insertion loss in the receiving band.

See the picture of the frequency response of the duplex filter.

NB! The duplex filter is adjusted with special measuring equipment and must only be adjusted by S. P. Radio A/S.

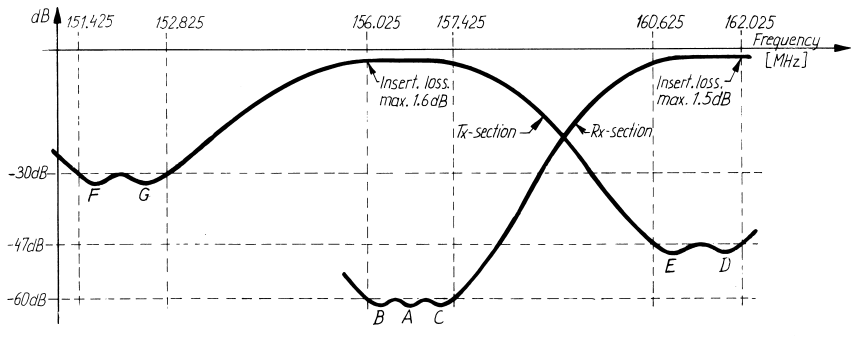
TECHNICAL DATA FOR DUPLEX FILTER FOR SAILOR VHF RT146 - RT2047.

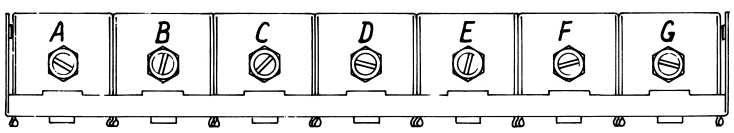
DATA:

Transmitter:		Frequency Range:
Band-stop attenuation:	-30 dB	151.425 - 152.825 MHz
Band-stop attenuation:	-47 dB	156.025 - 157.425 MHz
Insertion loss max.:	1.6 dB	
Return loss min.:	17 dB	

Receiver:		
Band-stop attenuation:	-60 dB	160.625 - 162.025 MHz
Insertion loss max.:	1.5 dB	

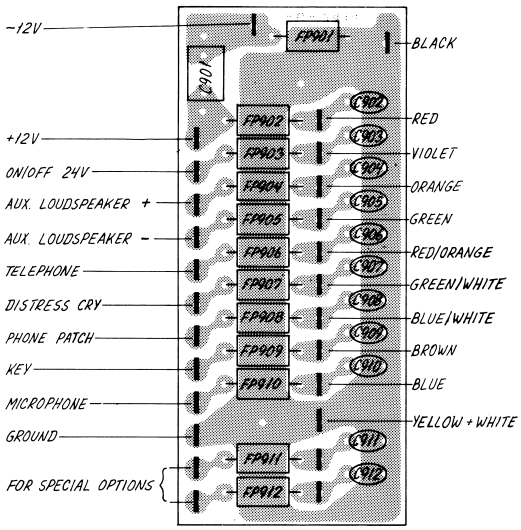
Picture of frequency response for duplex filter:

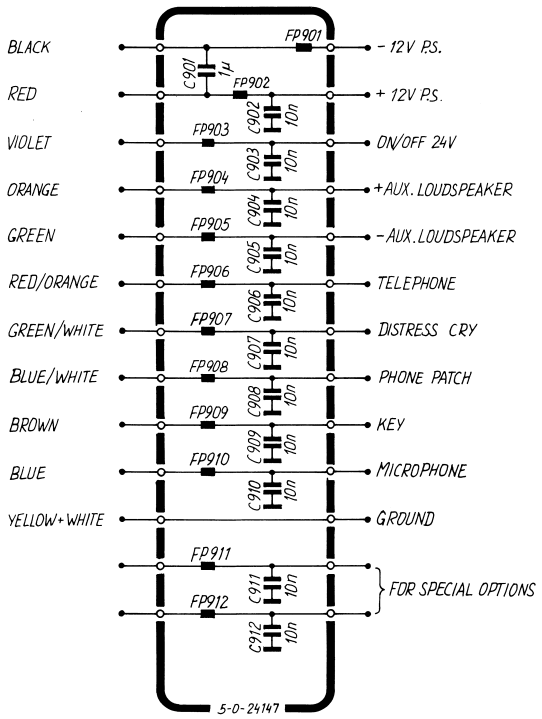




2.9. FILTER UNIT (900)

The function of the Filter unit is to protect the set against RF interference from equipment installed near the set.





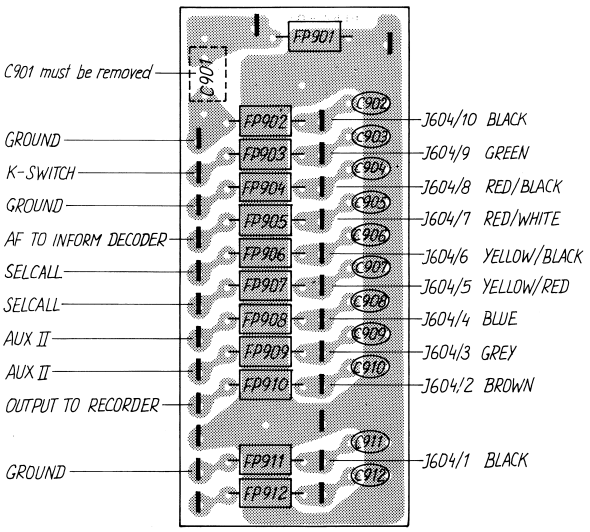
RT2047
4-0-24147I/4-6-24147I

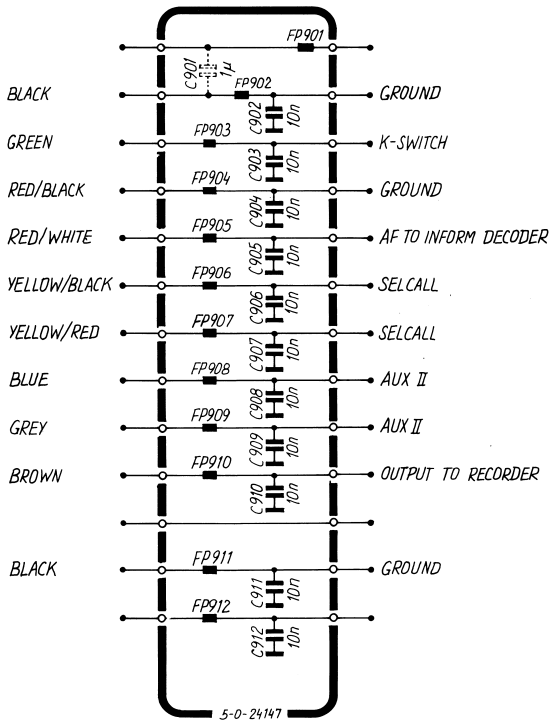
2.9.1. FILTER UNIT (900) FOR SPECIAL OPTIONS

The function of the FILTER UNIT is to protect the set against RF Interference from equipment installed near the set.

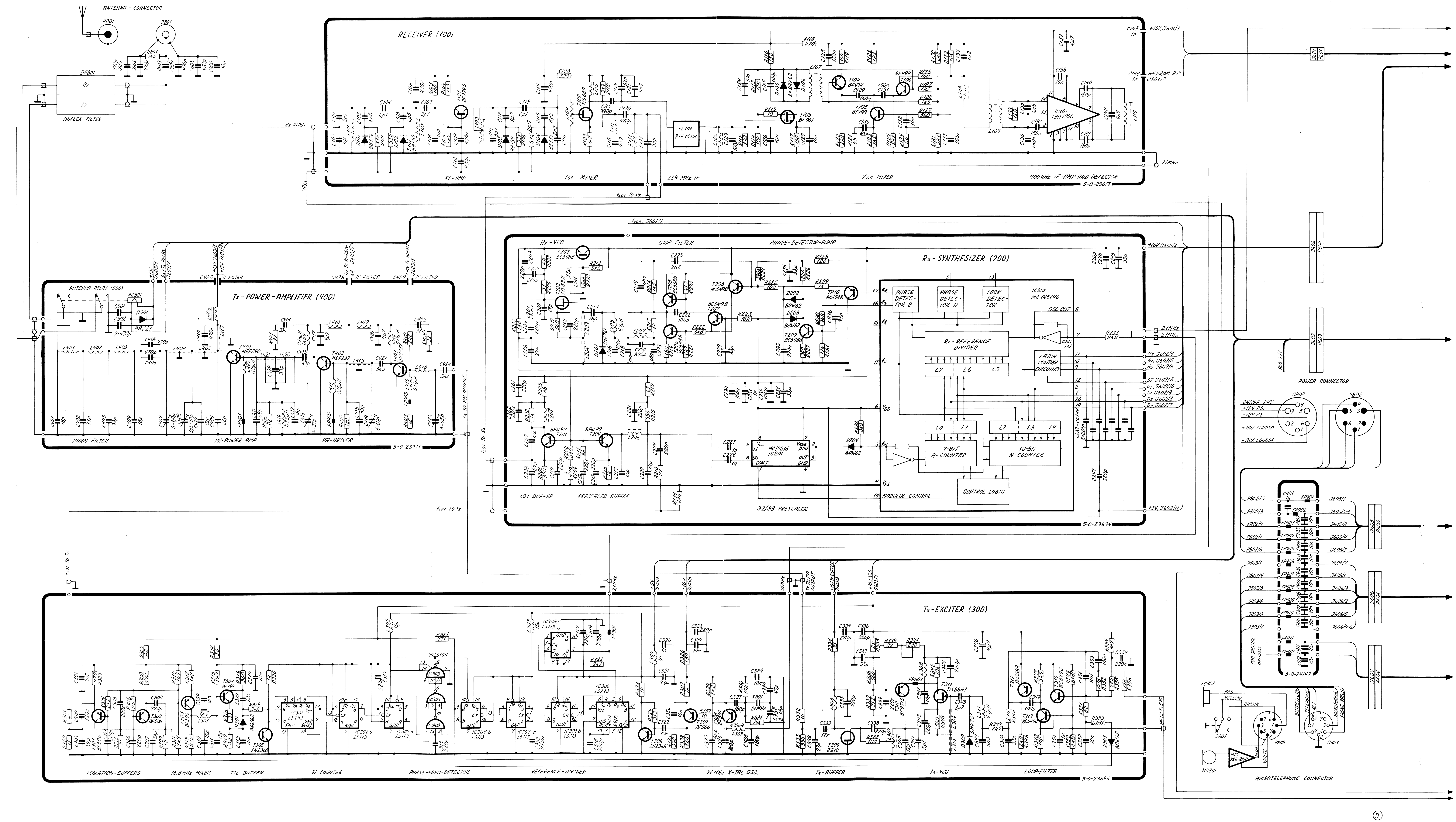
NOTE! Before placing the FILTER UNIT it is necessary to loosen the screws and nuts for the one plastic piece in the corner. The capacitor C901 must be removed, because there is no room for it.

After soldering of the wires on the FILTER UNIT for special options the ceramic capacitors C902-C912 must be bent down to give room for the cover.

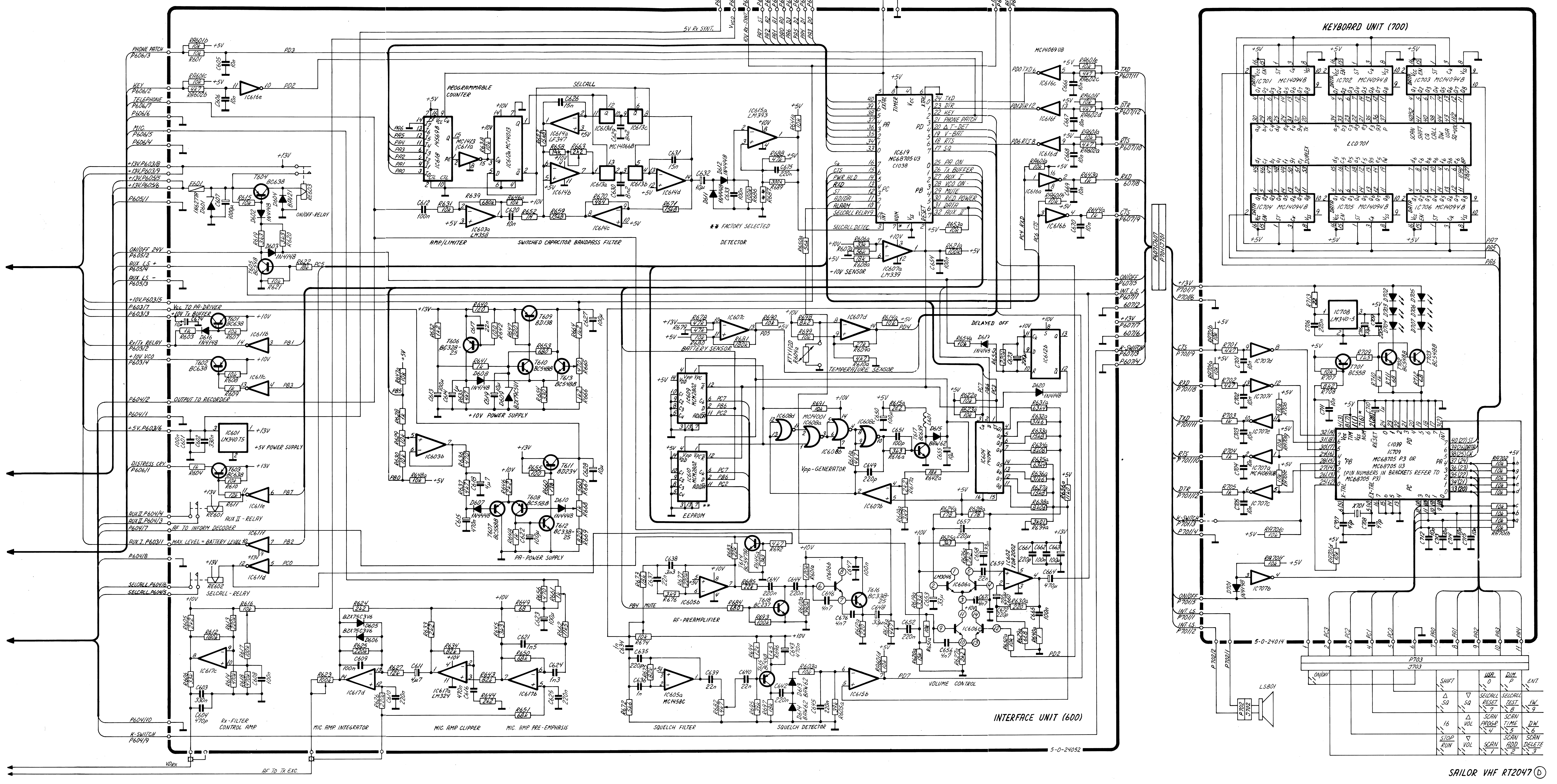




2.10. MAIN DIAGRAM

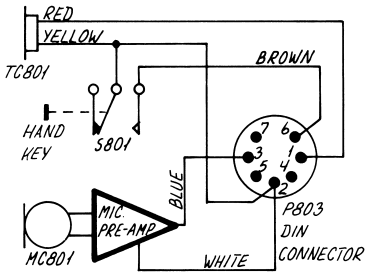

ANTENNA - CONNECTOR
P801
J801
DUPLEX FILTER
DF801
Rx
Tx
RECEIVER (100)
Rx INPUT
RF-AMP
1st MIXER
21,4 MHz IF
2nd MIXER
400 kHz IF-AMP AND DETECTOR
5-0-23617
FL101
21F15DH
IC101
TBA120C
+10V J601/1
RF FROM Rx
J601/2
21MHz
f_{LO1} TO Rx
V_{DRx}
V_{VCO} J602/1
Rx-VCO
LOOP-FILTER
PHASE-DETECTOR-PUMP
Rx-SYNTHESIZER (200)
IC202
MC 145146
PHASE DETECTOR B
PHASE DETECTOR A
LOCK DETECTOR
Rx-REFERENCE DIVIDER
LATCH CONTROL CIRCUITRY
OSC OUT
OSC IN
7-BIT A-COUNTER
10-BIT N-COUNTER
CONTROL LOGIC
MODULUS CONTROL
MC12015
IC201
32/33 PRESCALER
LO1 BUFFER
PRESCALER BUFFER
5-0-23694
+10V J602/2
+5V J602/11
ANTENNA RELAY (500)
RE501
Tx-POWER-AMPLIFIER (400)
HARM FILTER
PA-POWER AMP
PA-DRIVER
5-0-23973
Tx TO PA OUTPUT
f_{LO1} TO Tx
Tx-EXCITER (300)
ISOLATION-BUFFERS
16.8 MHz MIXER
TTL-BUFFER
32 COUNTER
PHASE-FREQ-DETECTOR
REFERENCE-DIVIDER
21 MHz X-TAL OSC.
Tx-BUFFER
Tx-VCO
LOOP-FILTER
5-0-23695
POWER CONNECTOR
ON/OFF 24V
+12V PS
-12V PS
+AUX LOUDSP
-AUX LOUDSP
J802
P802
5-0-24147
FOR SPECIAL OPTIONS
MICROTELEPHONE CONNECTOR
TC801
S801
MC801
MIC PRE AMP
P803
J803
RED
YELLOW
BROWN
BLUE
WHITE

* SETS MOUNTED WITH EEPROM PROCESSORS IC709 PIN 6 AND IC619 PIN 7 (NUM) ARE CONNECTED TO V_{cc}.

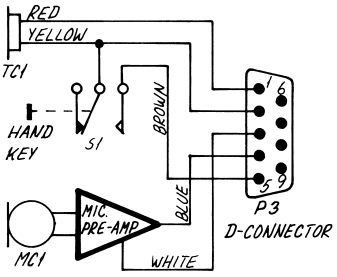


2.11. MICROTELEPHONE INSTALLATION.

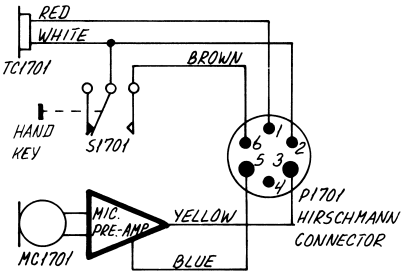
VHF RT2047 and T2031

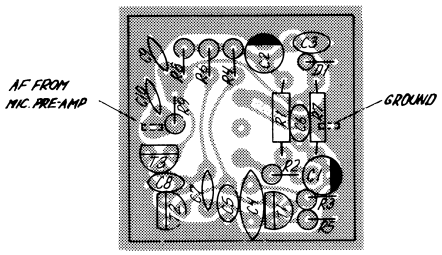


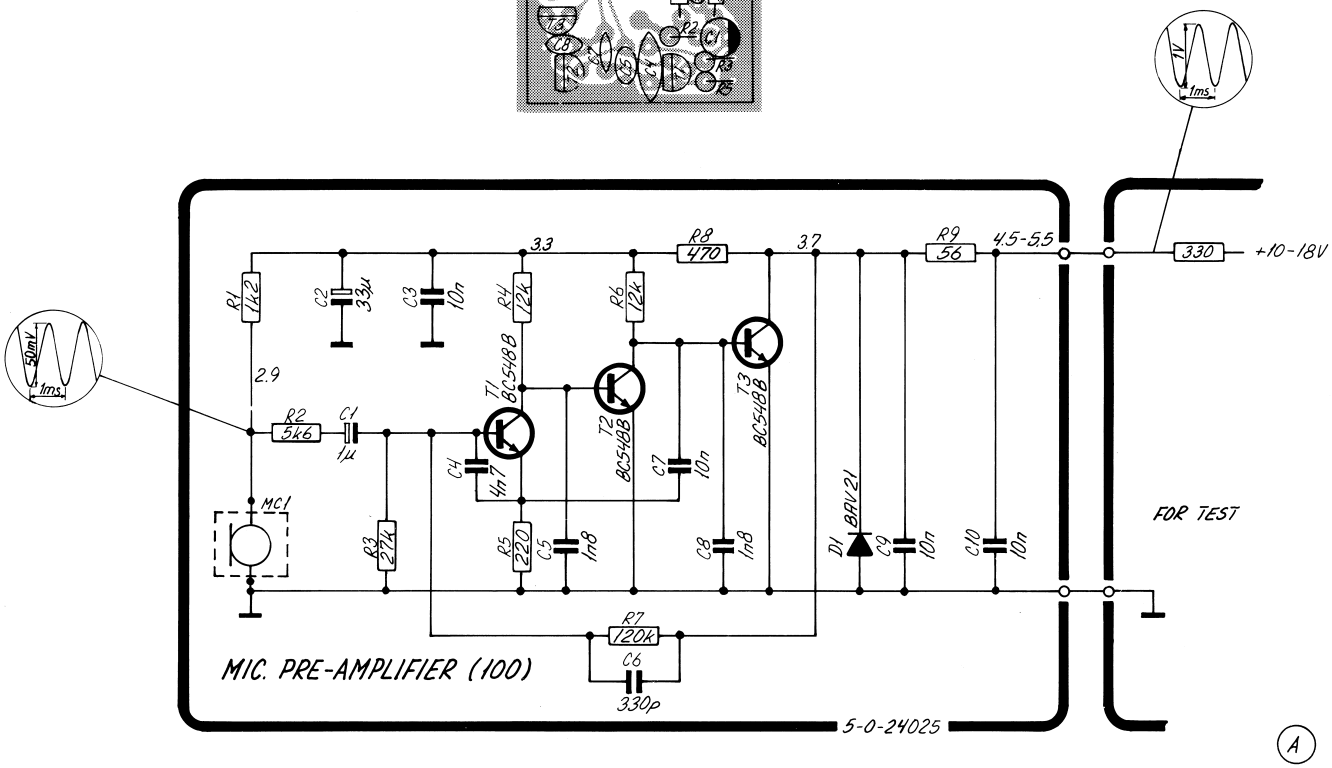
SCRAMBLER CRY2001



SHORTWAVE S130X







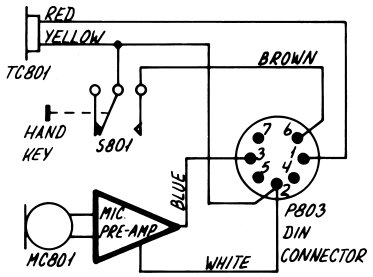
RT2047

			MANUFACTOR	TYPE	S.P.NUMBER
	MICROTELEPHONE	with ELEKTRET	ESPERA	PRINT NR.5-0-24025A	600108
C1	CAPACITOR ELECTROLYTIC	1uF 20% 50V	* ERO	EKI00AA110H	14.506
C2	CAPACITOR ELECTROLYTIC	33uF 20% 16V	* ERO	EKI00AA233D	14.518
C3	CAPACITOR CERAMIC	10nF -20/+80% 50V	KCK	HE70SJYF103Z	15.170
C4	CAPACITOR CERAMIC	4.7nF 20% 50V	KCK	HE80SJYD472M	15.165
C5	CAPACITOR CERAMIC	1.8nF -20/+80% 400V	FERROPERM	9/0141,9	15.735
C6	CAPACITOR CERAMIC	330pF 20% 400V	FERROPERM	9/0129,9	16.093
C7	CAPACITOR CERAMIC	10nF -20/+80% 50V	KCK	HE70SJYF103Z	15.170
C8	CAPACITOR CERAMIC	1.8nF -20/+80% 400V	FERROPERM	9/0141,9	15.735
C9	CAPACITOR CERAMIC	10nF -20/+80% 50V	KCK	HE70SJYF103Z	15.170
C10	CAPACITOR CERAMIC	10nF -20/+80% 50V	KCK	HE70SJYF103Z	15.170
D1	DIODE	BAV21	PHILIPS	BAV21	25.340
MC1	MICROPHONE ELEKTRET	EBM10	NIPRON	EBM10	46.012
R1	RESISTOR	1.2 KOHM 5% 0.33W	PHILIPS	2322 181 13122	01.202
R2	RESISTOR	5.6 KOHM 5% 0.33W	PHILIPS	2322 181 33562	01.718
R3	RESISTOR	27 KOHM 5% 0.33W	PHILIPS	2322 181 33273	01.735
R4	RESISTOR	12 KOHM 5% 0.33W	PHILIPS	2322 181 33123	01.727
R5	RESISTOR	220 OHM 5% 0.33W	PHILIPS	2322 181 33221	01.683
R6	RESISTOR	12 KOHM 5% 0.33W	PHILIPS	2322 181 33123	01.727
R7	RESISTOR	120 KOHM 5% 0.33W	PHILIPS	2322 181 13124	01.252
R8	RESISTOR	470 OHM 5% 0.33W	PHILIPS	2322 181 33471	01.691
R9	RESISTOR	56 OHM 5% 0.33W	PHILIPS	2322 181 33569	01.668
S1	MICROSWITCH	E62-10H PDT	CHERRY	E62-10H PDT	44.025
T1	TRANSISTOR	BC548B	* PHILIPS	BC548B	28.076
T2	TRANSISTOR	BC548B	* PHILIPS	BC548B	28.076
T3	TRANSISTOR	BC548B	* PHILIPS	BC548B	28.076
TC1	TELEPHONE CARTRIDGE	200 OHM	KIRK	01132518	46.010

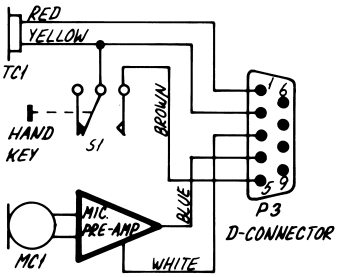
2.11.1 MICROTELEPHONE INSTALLATION.

RT2047 4-6-24025B
4-0-24025C 4-0-24293B

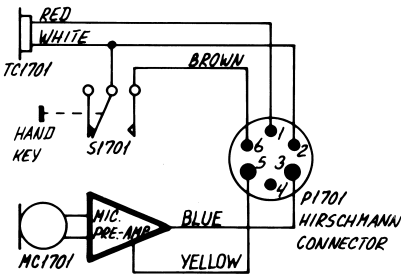
VHF RT2047 and T2031

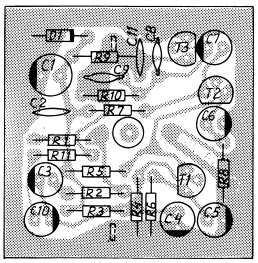


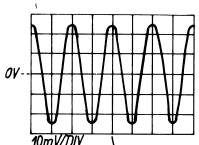
SCRAMBLER CRY2001 and RT2048

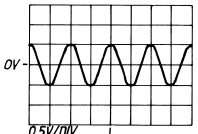


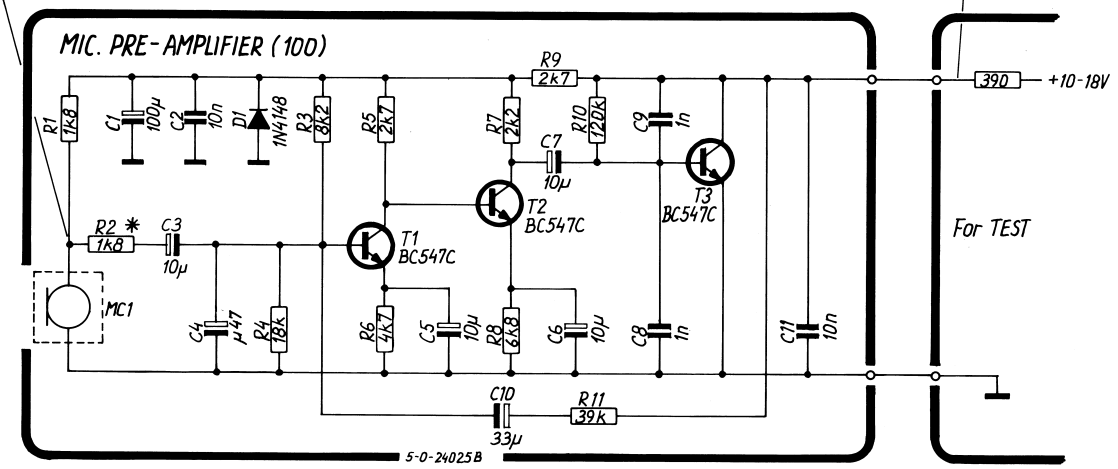
SHORTWAVE S130X











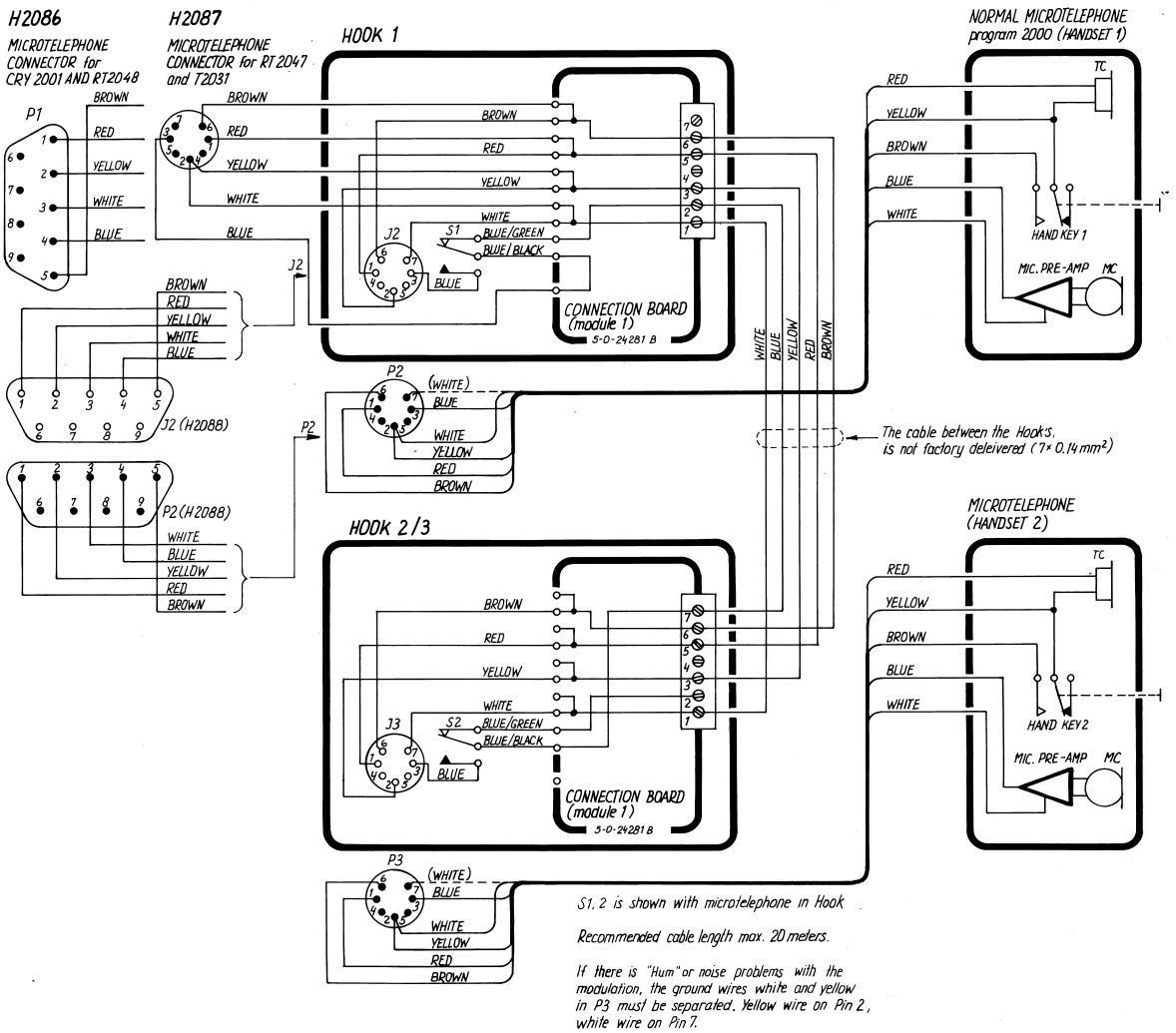
* In orange marked microtelephone cartridge R2 is changed from 1k8 to 5k6 ohm.

(C)

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

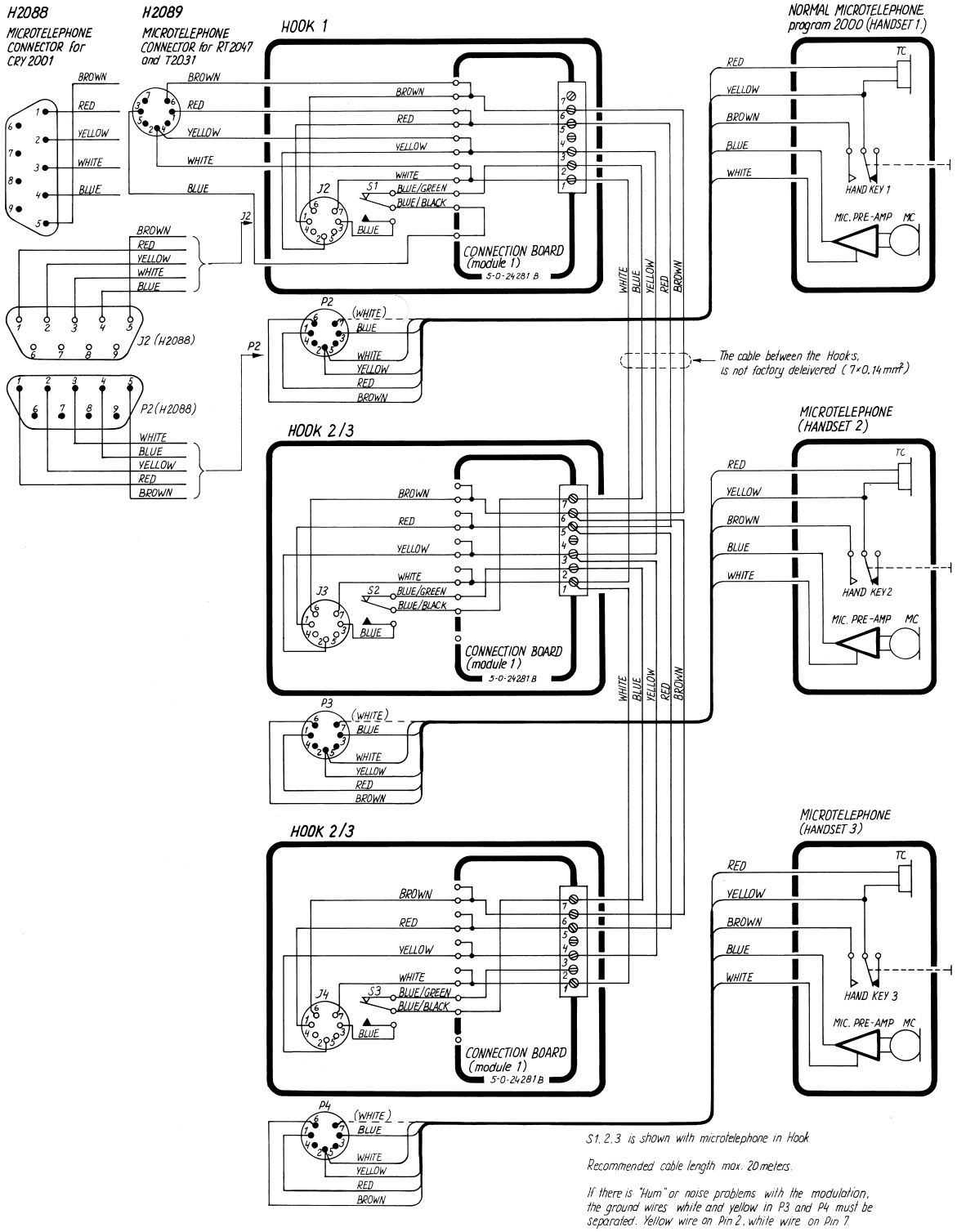
2.12. SPECIAL INSTALLATION WITH 2 MICROTELEPHONES: H2086 FOR SCRAMBLER CRY2001 H2087 FOR VHF RT2047 AND SSB T2031

MICROTELEPHONE ONE WITH PREFERENCE



2.13. SPECIAL INSTALLATION WITH 3 MICROTELEPHONES: H2088 FOR SCRAMBLER CRY2001 H2089 FOR VHF RT2047 AND SSB T2031

MICROTELEPHONE ONE WITH PREFERENCE



2.14. DC POWER SUPPLY N418

GENERAL DESCRIPTION
The power supply N418 is constructed for supply of a 13.2V VHF from a 24V DC system. In order to obtain high efficiency, the principle of regulation is the switch mode principle.

TECHNICAL DATA
The power supply N418 is on/off controlled from the connected VHF unit.

Input Voltage:	16 - 32V DC
Output Voltage:	13.2V DC
Output Current:	Max. 7A DC
Operation Temperature Range:	-15°C - +55°C
Switch Frequency:	Approx. 40 kHz

PRINCIPLE OF OPERATION
The on/off information from the connected VHF unit is controlling the N418 via pin 4 of P201.

The regulation takes place after the forward principle, which means that during the "on time" of the switching element T202, the coil L105 is connected direct from the input to the output.

When switching element T202 is turned off the stored energy in L105 maintains supply of current to the output via diode D201.

Regulation of the output voltage takes place via pulse width regulation, which means that the "on time" (duty cycle) of the switching element T202 is controlled. The regulation gives long "on time" when the input voltage is low, a further decrease of input voltage allows the T202 to be on, continuously. If the input voltage is increased the "on time" is shortened.

In order to limit the inrush current during the switching on of N418, soft start is built into N418, thus enabling a short "on time" for T202 immediately after the switching on, and afterwards the "on time" is slowly increased. Current limitation is established by sensing the voltage across the resistor R126. If the current is too high, the pulse width is shortened in order to reduce the output current.

CIRCUIT DESCRIPTION
When N418 is switched on the resistor R113 is connected to the negative terminal of the supply in the VHF and transistor T102 is on. The IC101 starts to function. The voltage level on pin 9 of IC101 controls the duty cycle and the voltage always starts from the low because C108 is discharged via transistor T101 every time the N418 is switched off.

Pin 16 of IC101 is a 5V reference voltage, which is divided down in R104, R105, and R106 and connected to pin 2 (the non-inverted input). Pin 1 of IC101 is connected to the output voltage via voltage divider R117 and R122,

the two levels are compared and the pulse width is controlled so that the output voltage stays stable. Pin 11 and 14 are outputs connected in parallel, the signal forms via T103 and T201 the drive signal for the switching element T202. The components L103, L104, R123, R124, R125, and C121 control the switching on and off of T202 and D201. D105 prevents inverse polarity across T202.

The IC102 senses the output current via the voltage across R126. If this voltage is too high - due to an overload - the pulse width and thus the output voltage is reduced.

With capacitors and coils in input and output, switching noise is suppressed so that the N418 fulfils the CISPR noise regulations.

ADJUSTMENT PROCEDURE

Adjustment of output voltage.

With a load equal to the consumption of a VHF unit in receive condition 0.5 - 0.8A measure the output voltage across C126, and if necessary adjust with R105 to 13.2V.

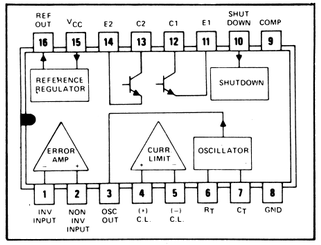
Adjustment of max. current.

With a load of 5.8A (2.3 ohm) across the output, check that the output voltage is still 13.2V.

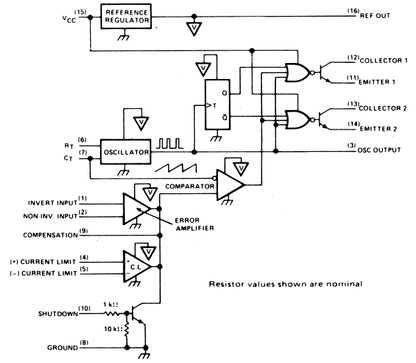
Change the load to 1,5 ohm by paralleling 4.3 ohm to the 2.3 ohm. The voltage will then be 10.5V and the output current is 7A. If necessary adjust to 10.5V with R111.

RT146-RT2047 A
4-6-23818A I II

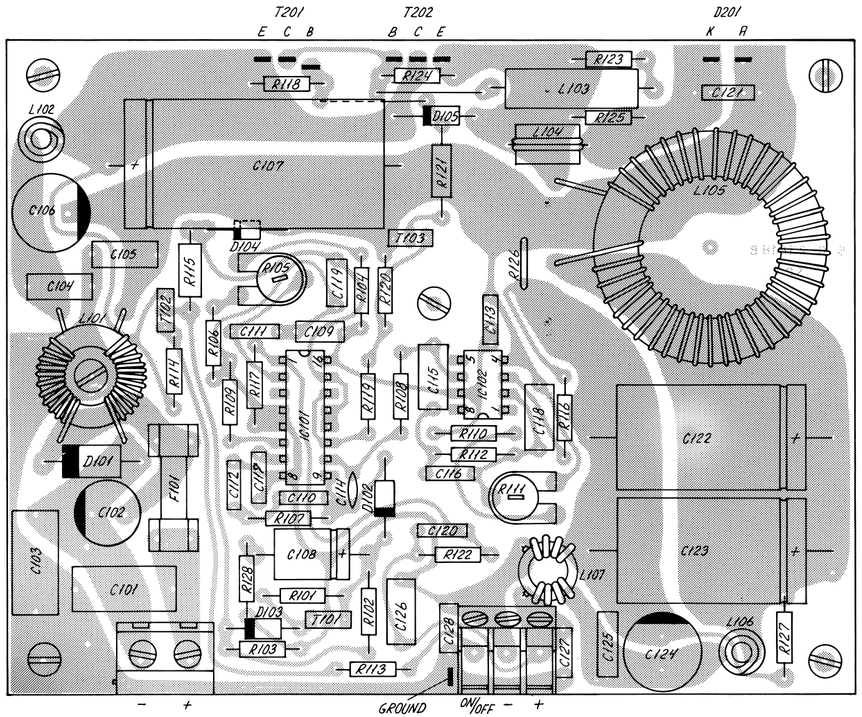
J OR N
DUAL-IN-LINE PACKAGE
(TOP VIEW)

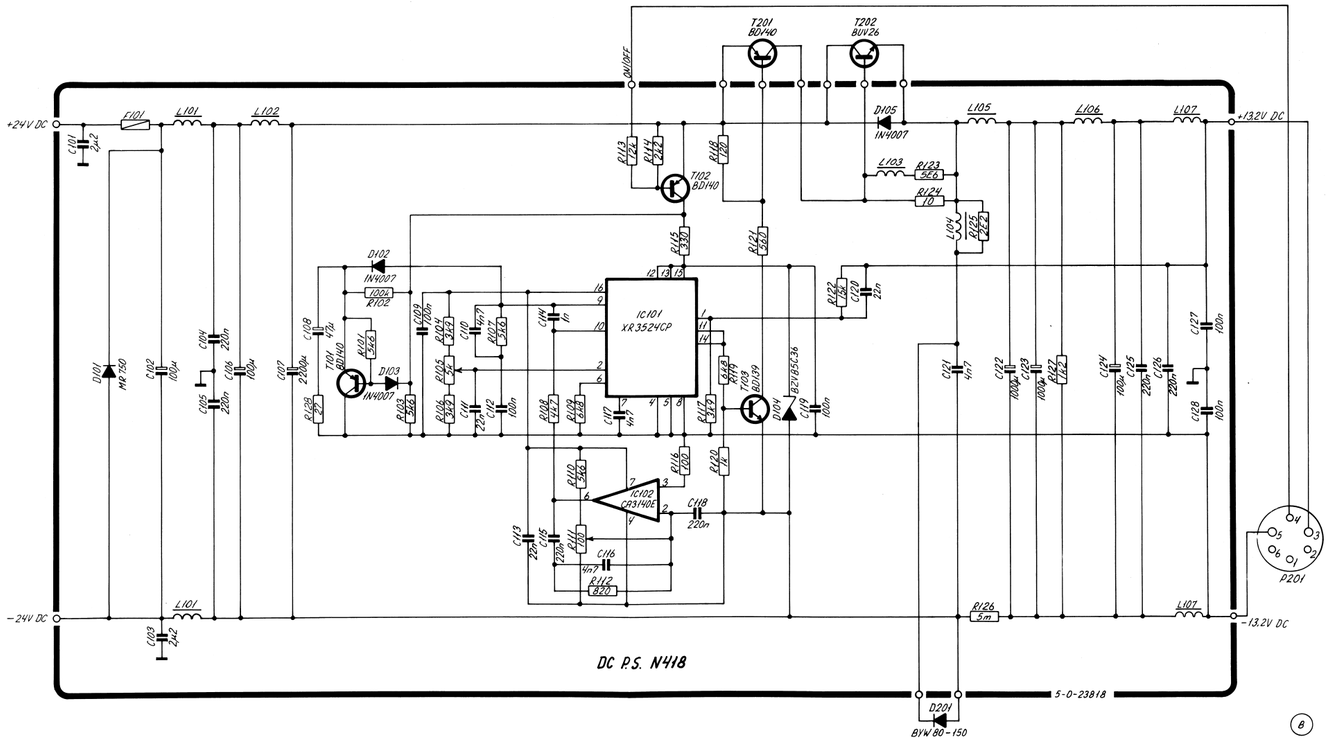


functional block diagram



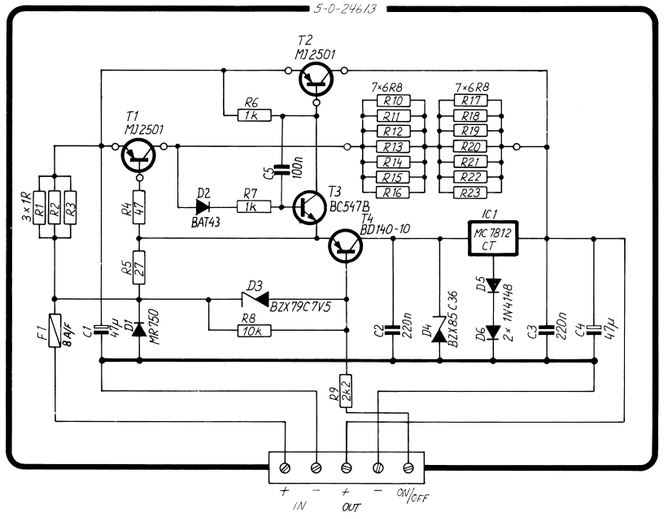
Resistor values shown are nominal

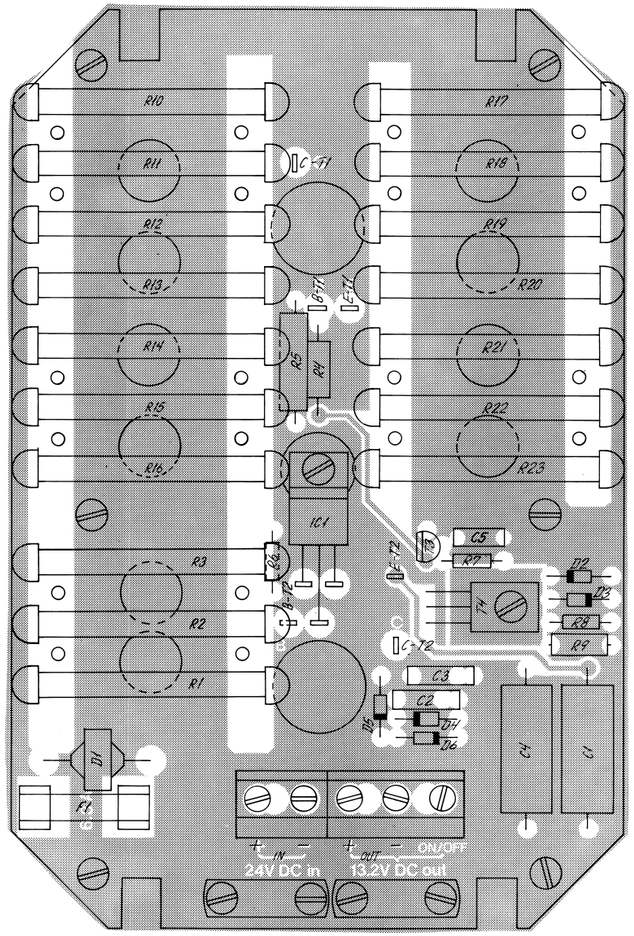


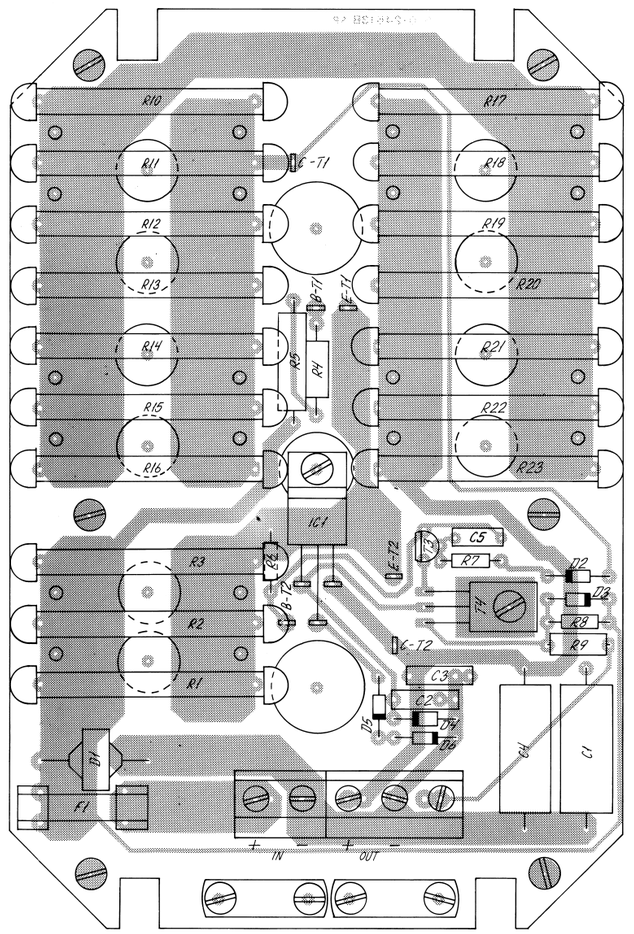


N420A

4-6-24613A 4-0-24613B

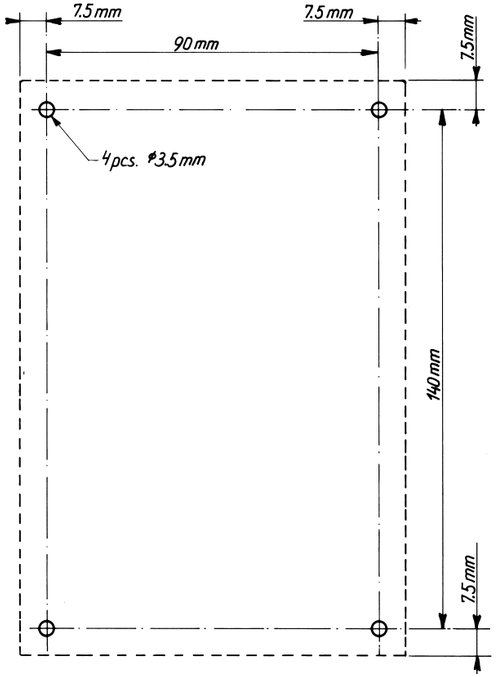


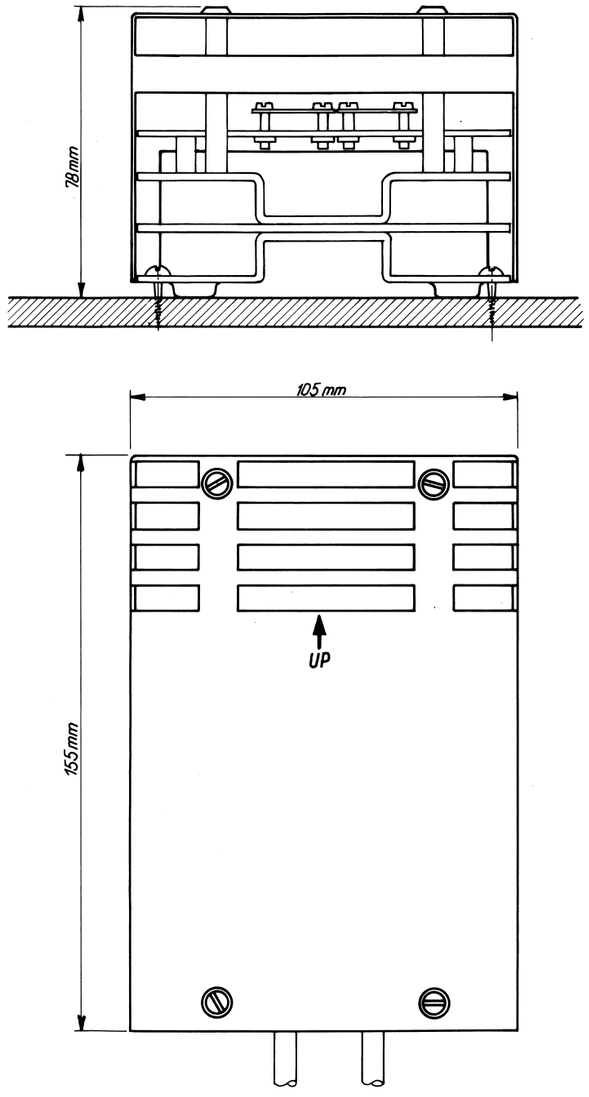




24V/12V REGULATOR N420

DIMENSIONS AND DRILLING PLAN N420





N420 must only be mounted vertically.

Free distance must be kept to allow circulation.

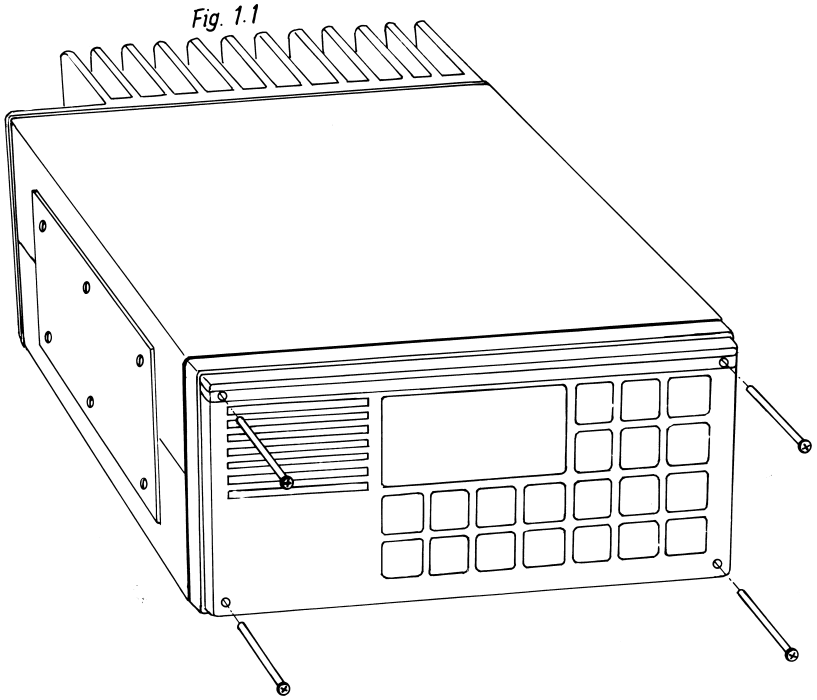
PARTS LIST N420

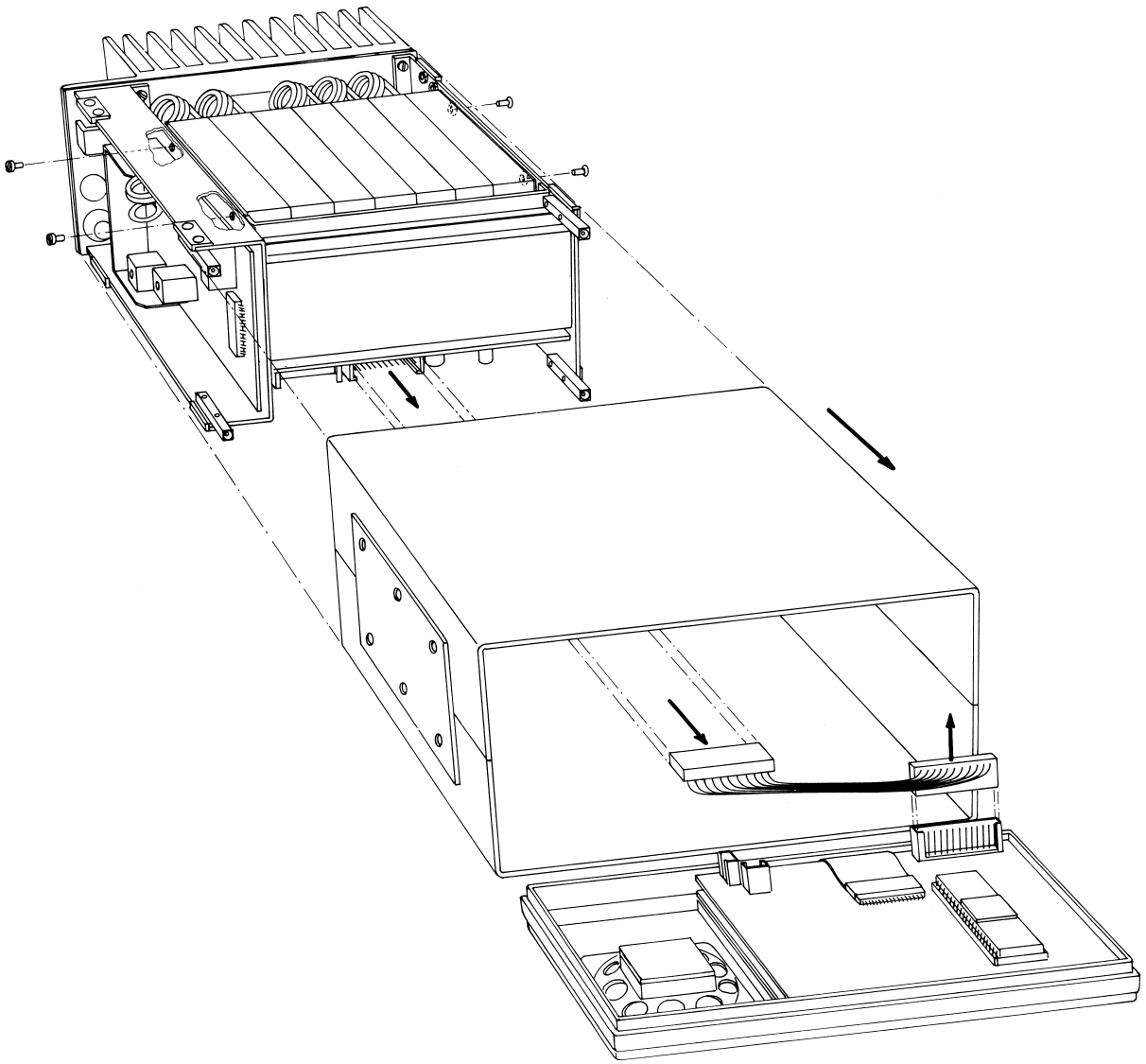
POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMB
	VOLTAGE REGULATOR	N420	ESPERA	PRINT NR.5-0-24613B	600416
C1	CAPACITOR ELECTROLYTIC	47uF -10/+50% 63V	*ERO	EB 00 FC 247 J	14.552
C2	CAPACITOR MKT	220nF 10% 100V	SIEMENS	B32511-D1224-K000	11.227
C3	CAPACITOR MKT	220nF 10% 100V	SIEMENS	B32511-D1224-K000	11.227
C4	CAPACITOR ELECTROLYTIC	47uF -10/+50% 63V	*ERO	EB 00 FC 247 J	14.552
C5	CAPACITOR MKT	100nF 10% 100V	*SIEMENS	B32510-D1104-K000	11.219
D1	DIODE	MR750	MOTOROLA	MR750	25.219
D2	DIODE SCHOTTKY	BAT 43	THOMSON-CSF	BAT43	27.600
D3	DIODE ZENER	7.5V 5% 0.4W BZX79C7V5	*MOTOROLA	BZX79C7V5	26.539
D4	DIODE ZENER	36V	PHILIPS	BZV85C36	26.780
D5	DIODE	1N4148	* ITT	1N4148	25.131
D6	DIODE	1N4148	* ITT	1N4148	25.131
F1	FUSE	8A.F. Ø5x20mm	*ELU	171 100 8A.F. DIN 41571	45.561
IC1	VOLTAGE REGULATOR	+12V	* MOTOROLA	MC7812CT	31.260
R1	RESISTOR	1 OHM 10% 6.5W	VITROHM	1R0 10% TYPE 296-0	05.725
R2	RESISTOR	1 OHM 10% 6.5W	VITROHM	1R0 10% TYPE 296-0	05.725
R3	RESISTOR	1 OHM 10% 6.5W	VITROHM	1R0 10% TYPE 296-0	05.725
R4	RESISTOR	47 OHM 5% 0.6W	BEYSCHLAG	MBB0207-100BX	03.167
R5	RESISTOR	27 OHM 5% 2.5W	PHILIPS	2322 192 32709	04.660
R6	RESISTOR	1 KOHM 5% 0.33W	PHILIPS	2322 181 53102	01.200
R7	RESISTOR	1 KOHM 5% 0.33W	PHILIPS	2322 181 53102	01.200
R8	RESISTOR	10 KOHM 5% 0.33W	PHILIPS	2322 181 53103	01.225
R9	RESISTOR	2.2 KOHM 5% 0.6W	BEYSCHLAG	MBB0207	03.208
R10	RESISTOR	6.8 ohms 10% 6.5W	VITROHM	6R8 10% TYPE 296-0	05.730
R11	RESISTOR	6.8 ohms 10% 6.5W	VITROHM	6R8 10% TYPE 296-0	05.730
R12	RESISTOR	6.8 ohms 10% 6.5W	VITROHM	6R8 10% TYPE 296-0	05.730
R13	RESISTOR	6.8 ohms 10% 6.5W	VITROHM	6R8 10% TYPE 296-0	05.730
R14	RESISTOR	6.8 ohms 10% 6.5W	VITROHM	6R8 10% TYPE 296-0	05.730
R15	RESISTOR	6.8 ohms 10% 6.5W	VITROHM	6R8 10% TYPE 296-0	05.730
R16	RESISTOR	6.8 ohms 10% 6.5W	VITROHM	6R8 10% TYPE 296-0	05.730
R17	RESISTOR	6.8 ohms 10% 6.5W	VITROHM	6R8 10% TYPE 296-0	05.730
R18	RESISTOR	6.8 ohms 10% 6.5W	VITROHM	6R8 10% TYPE 296-0	05.730
R19	RESISTOR	6.8 ohms 10% 6.5W	VITROHM	6R8 10% TYPE 296-0	05.730
R20	RESISTOR	6.8 ohms 10% 6.5W	VITROHM	6R8 10% TYPE 296-0	05.730
R21	RESISTOR	6.8 ohms 10% 6.5W	VITROHM	6R8 10% TYPE 296-0	05.730
R22	RESISTOR	6.8 ohms 10% 6.5W	VITROHM	6R8 10% TYPE 296-0	05.730
R23	RESISTOR	6.8 ohms 10% 6.5W	VITROHM	6R8 10% TYPE 296-0	05.730
T1	TRANSISTOR DARLINGTON	MJ2501	*MOTOROLA	MJ2501	29.235
T2	TRANSISTOR DARLINGTON	MJ2501	*MOTOROLA	MJ2501	29.235
T3	TRANSISTOR	BC547B	* ITT	BC547B	28.067
T4	TRANSISTOR	BD140-10	* PHILIPS	BD140-10	29.066

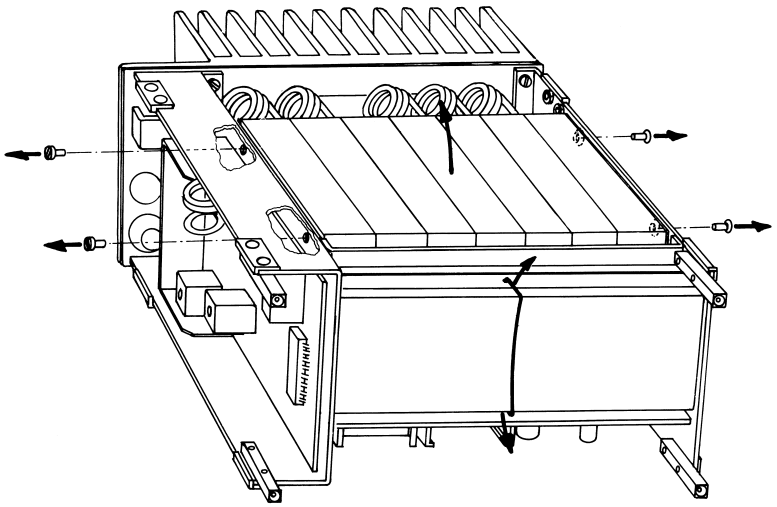
N420 B/2-87
4-6-25332

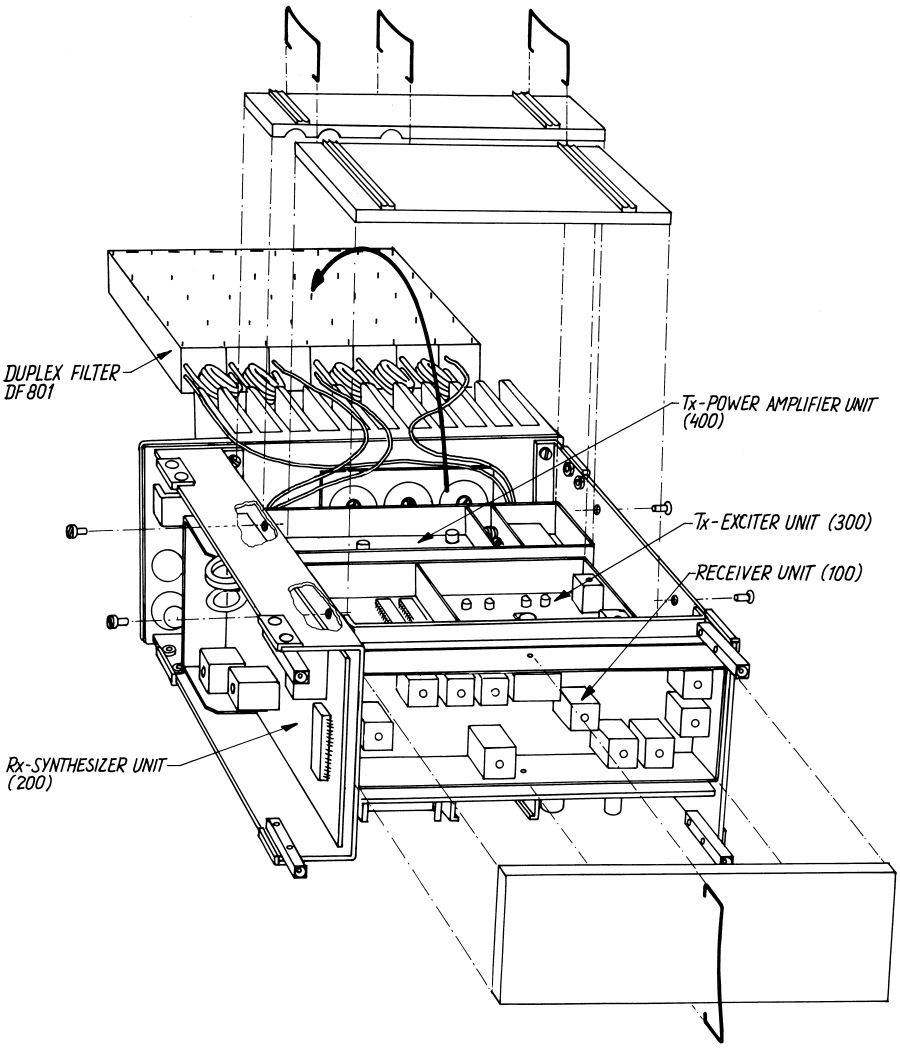
3.0. MECHANICAL DISASSEMBLING RT2047

Fig. 1.1








DUPLEX FILTER
DF 801
Tx-POWER AMPLIFIER UNIT
(400)
Tx-EXCITER UNIT (300)
RECEIVER UNIT (100)
Rx-SYNTHESIZER UNIT
(200)

CONTENTS

PART II: INSTRUCTION BOOK FOR SAILOR VHF RT2047

2.15. N420 24V/12V REGULATOR

GENERAL DESCRIPTION
The regulator N420 is a general purpose 24V DC to 13.2V DC regulator, e.g. to be used for supply of SAILOR VHF radiotelephones.

The regulator N420 is a serial regulator with excellent noise performance.

TECHNICAL DATA
The regulator N420 is on/off controlled from the connected VHF unit.

Input Voltage:	21.6 to 31.2V DC
Output Voltage:	13.4V DC
Output Current:	Max. 8A DC
Operation Temperature Range:	-15°C to +55°C
Fuse:	8 Amp. 5 x 20 mm
Current from on/off Terminal:	Less than 15 mA DC

PRINCIPLE OF OPERATION
A linear serial regulator where most of the loss is dissipated in resistors.
It is provided with a terminal for remote shut-down.
If the on/off terminal is connected to the -terminal, the regulator is on.
If the on/off terminal is disconnected, the regulator is off.

CIRCUIT DESCRIPTION

The output voltage is regulated by the integrated voltage regulator IC1. The output voltage is 12V DC plus the forward voltage of the diodes D5 and D6 approx. 13.4V DC, if T4 is turned on. If the output voltage falls the current through IC1 and R5 increases. An increase in voltage across R5 will result in an increase in current in T1 and R10 - R23 and the output current. T1 delivers most of the output current and FC1 only a small driver current.

If the input voltage is low and the output current is high, the voltage across R10 - R23 results in T1 goes into saturation. The voltage across R4 increases and when the voltage across R4 and V_{BE} of T1 is greater than approx. 1 Volt, T3 starts to conduct base current to T1. This transistor starts to shunt the remaining current to the output, bypassing R10 - R23.

When the input voltage and the output current are high, T1 is nearly saturated. When the input voltage is low and the output current is high, the resistors R1 - R3 will result in saturation of both T1 and T2. The combination of T1 in saturation and T2 delivering the remaining output current divides the total loss, so that the most is lost in resistors and gives us lower loss in the semi-conductors and lower junction temperature, which ends up in a higher reliability for the whole regulator.

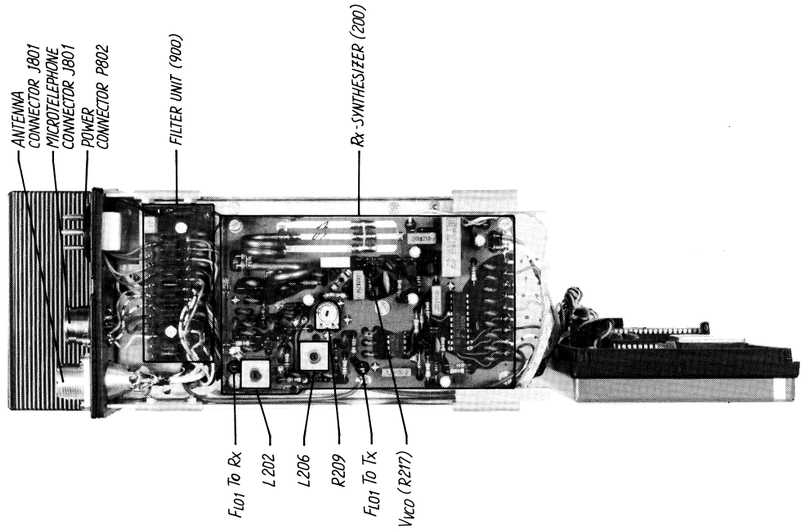
T4 is used to switch the regulator ON/OFF. If the ON/OFF input is disconnected, then T4 is OFF and the base currents to T1 and T2 are zero and the current through IC1 is zero too. The stand-by current consumption is then less than 10 microamp.
If the ON/OFF input is connected to - input, T4 goes into saturation and the regulator starts.

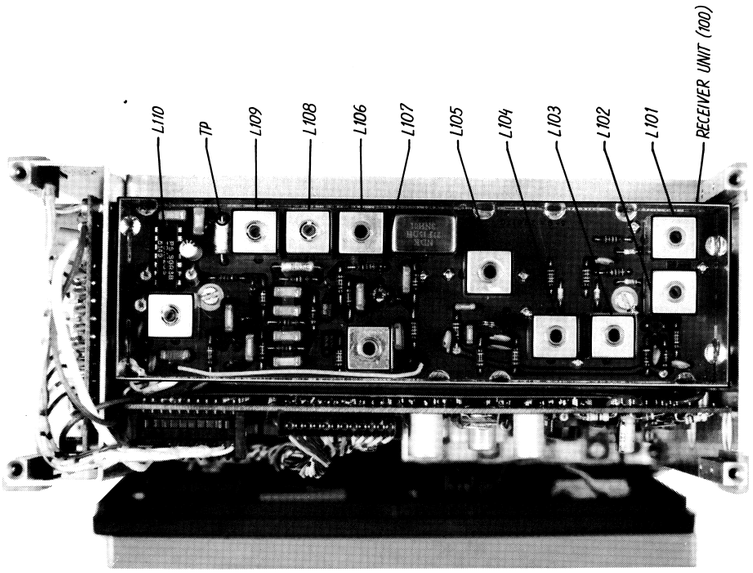
In case of short-circuit of the output, R5 and D3 limit the current through IC1 and T4 to approx. 250 mA and R1 - R3 and D3 limit the current through T1 and T2 to approx. 15 Amp.
The temperature on the heatsink will increase and activate the thermal protection circuit inside IC1 and lower the output voltage, even though a short-circuit of the output should be avoided.

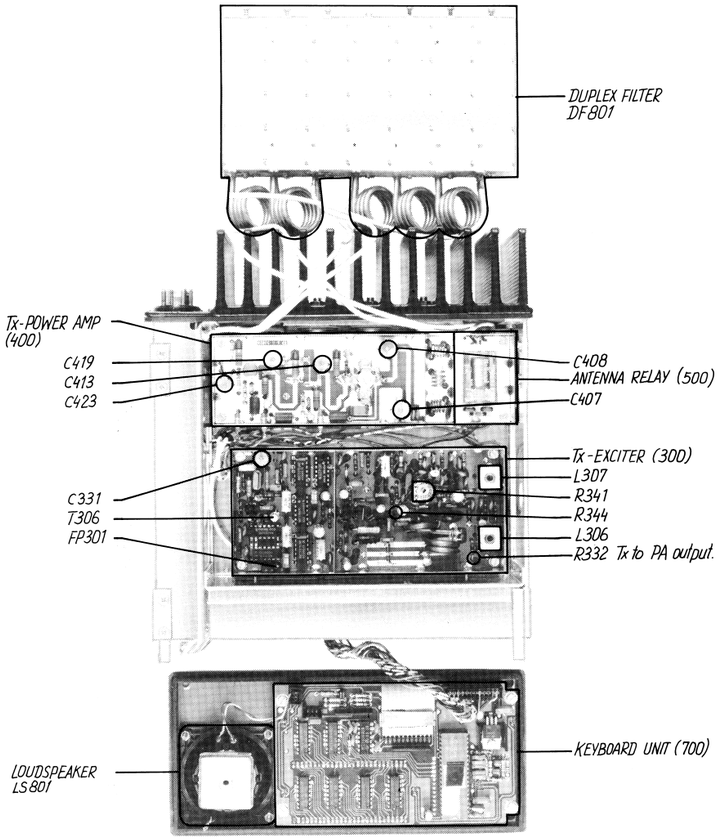
The diode D1 protects against reverse input voltage. It blows the fuse in case of a wrong input connection.

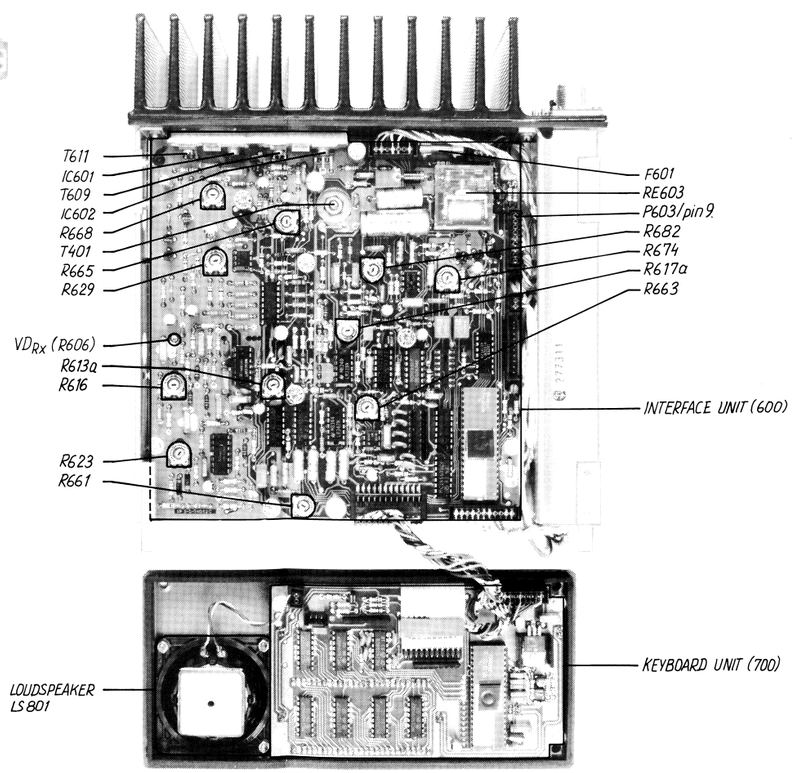
The zener diode D4 acts as an input voltage transient protection.

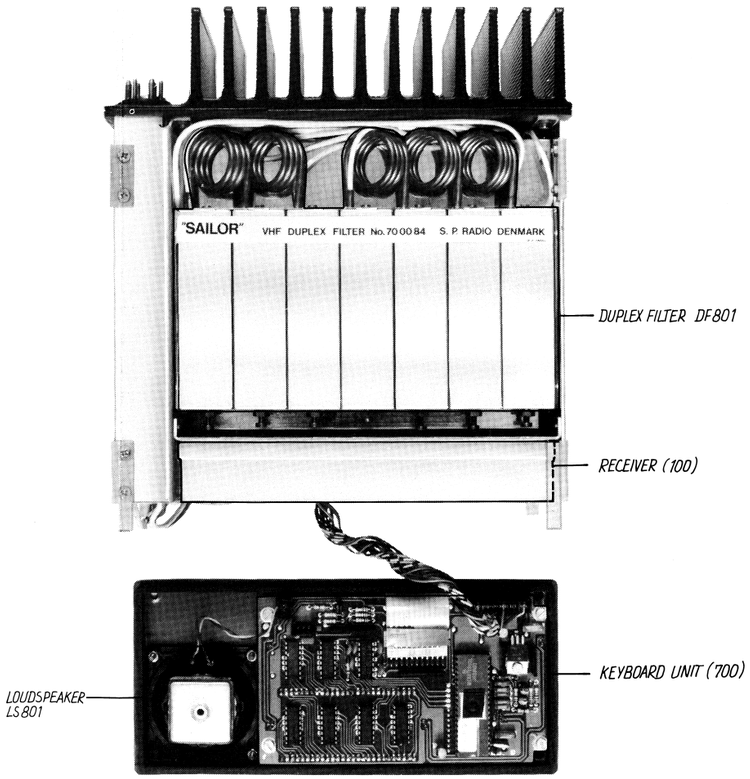
3.1. MODULE LOCATION











RT2047 4-6-24905/4-6-24906
4-6-24907/4-6-24908/4-6-24909

CONTENTS

4. SERVICE

4.1. MAINTENANCE

Preventive Maintenance

If SAILOR RT2047 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 RT2047 has a long lifetime, but - always depending upon the circumstances under which the set is working - it should be carefully controlled at intervals of no more than 12 months. The set must be taken to the service workshop to be tested.
Along with each set a "Test-sheet" is delivered in which all the measurings 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 under Adjustment Procedure.

4.2. ALIGNMENT INSTRUCTIONS

Introduction

The measuring values indicated in paragraph 2 about 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:

4.3. PROPOSAL FOR NECESSARY MEASURING INSTRUMENTS

VHF Signal Generator type TF2015..... MARCONI

FM Modulation Meter type TF2303 ..... MARCONI

Distortion Analyzer type TF2337A ..... MARCONI

AF Voltmeter type VT-121 ..... TRIO

Tone Generator type PM5107 ..... PHILIPS

Electronic Multimeter type PM2505 ..... PHILIPS

RF Directional Wattmeter Model 43 ..... BIRD

50W Load with 30 dB Attenuator type 8321 .... BIRD

Frequency Counter:

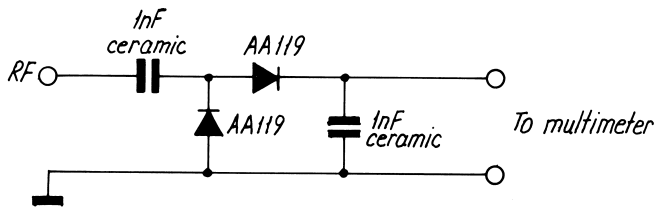
Frequency range	$\geq$ 175 MHz
Sensitivity	$\leq$ 100 mV
Impedance	$\geq$ 1 Mohm and 50 ohm
Accuracy	$\leq 1 \cdot 10^{-6}$

We can also recommend the portable universal VHF test set from Radio-Holland:

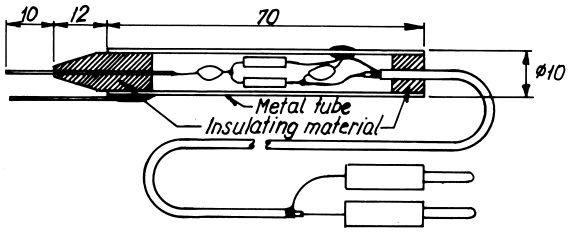
Omnitester type RH-4316

This test set is designed especially for a fast and accurate service of VHF transceivers.

TEST PROBE



LAYOUT OF THE PROBE



4.4. CALIBRATION OF TEST PROBE

For some test probe measurements it is necessary to use a test probe calibrated together with a specified multimeter.

Necessary equipment:

1. Diagram with space for the measuring results
2. Test probe
3. Multimeter
4. New factory adjusted RT2047

4.4.1. Procedure for Calibration

1. Switch on the set.
2. Select channel 28.
3. Remove coax cable from soldering point for F_{LO1} to RX on RX-Synthesizer and replace it with a 50 ohm resistor.
4. Connect test probe to the above mentioned point and write down the measured result on the diagram.
5. Remove the resistor and solder back the coax cable.
6. Follow the above mentioned procedure by measuring the levels from F_{LO1} to TX on RX-Synthesizer and TX drive level from TX-Exciter.

All other test probe measurements are relative and ought to be measured with the same test probe and taken down on the diagram.

4.5. ADJUSTMENT PROCEDURE

4.5.1. Adjustment of INTERFACE UNIT (600)

Alignment and control of voltage regulators.

1. Switch on the set.
2. Select channel 28.
3. Check 13.2V with multimeter on fuse F601 and P603 pin 9.
4. Check 5V ±0.2V with multimeter on IC601 pin 3.
5. Connect multimeter to collector of T609 and adjust 10V regulator with R665 to 10V ±0.2V.
6. Connect multimeter to collector of T611 and key the transmitter.
7. Adjust PA-regulator with R668 to 8.4V ±0.2V.
8. Connect multimeter to R606.
9. Adjust RX-control voltage (VD_{RX}) to 8V ±0.2V with R616.

Alignment of V_{pp}-Voltage for EEPROMS, IC609 and IC610.

1. Remove the EEPROMS, but remember their position.
2. Short-circuit from IC609, pin 1 to ground.
3. Adjust the V_{pp}-Voltage, measured on IC609, pin 4 to 24.5V ±0.5V with potentiometer R617a (2.2 kohm).

Alignment of SELCALL TEST TONE:

The procedure is described in the manual, INSTRUCTIONS FOR IDENTITY AND SERVICE PROGRAMMING OF SAILOR VHF RT2047, section 3.8.: SELCALL TEST TONE.

4.5.2. Adjustment of RX-SYNTHESIZER (200)

1. Select channel 28.
2. Check the DC-control voltage on R217 with a multimeter to be 8V ±0.4V. If components have been changed in the VCO-circuit, it is possible that the jump wire used for adjusting the VCO frequency range has to be moved until the 8V ±0.4V is achieved.
3. Control of frequency on F_{LO1} to RX with a frequency counter to be 140.600 MHz.

Alignment of F_{LO1} to TX and F_{LO1} to RX.

1. Connect "calibrated" test probe to soldering point for F_{LO1} to TX.
2. Adjust L202 until the core is 0.5 mm over the coil form and potentiometer R209 CCW to 1/3 of the range (experience).
3. Adjust L206 to max. deflection on the Tp meter.
4. Select channel 6.
5. Check the deflection on the Tp meter to be nearly the same as ch.28. Otherwise obtain the level on ch.6 and ch.28 to be nearly the same by adjusting L206.
6. Connect test probe to soldering point for F_{LO1} to RX.
7. Adjust L202 to max. deflection on Tp meter and obtain that deflection on ch.6 and ch.28 are nearly the same.

The levels measured with power meter (mW) and 50 ohm impedance must be:

F_{LO1} to TX: 0.25 mW

F_{LO1} to RX: 5 mW ±1.5 dB.

4.5.3. Adjustment of TX-EXCITER (300)

1. Select channel 28.
2. Connect frequency counter to the top of T306.
3. Adjust trimming capacitor C331 until the frequency counter shows 21000000 Hz ±20 Hz.

Note! With the transmitter keyed you can measure on R332 and adjust C331 until the frequency counter shows 157400000 Hz ±150 Hz.

4. Check on FP301 the clock frequency to microprocessor to be 2.1 MHz.
5. Check the DC-control voltage on R344 to be 8V ±0.4V.
   If components have been changed in the VCO-circuit it is possible that the jump wire used for adjusting the VCO frequency range has to be moved until the 8V ±0.4V is achieved. (With Transmitter Keyed)

Alignment of TX-drive level.

1. Remove coax cable from TX-PA and solder a 50 ohm resistor from TX to PA output to ground.
2. Connect test probe to TX to PA output.
3. Adjust coils L306 and L307 to max. deflection on the Tp meter and obtain that the levels on ch.6 and ch.28 are nearly the same.
4. Adjust R341 to the correct output about 3.8V on Tp meter.
5. Remove the 50 ohm resistor and solder the coax cable back to the output point.

4.5.4. Adjustment of TX-POWER AMPLIFIER

Alignment of output power.

1. Select channel 20.
2. Connect RF-power meter and a 50 ohm 25 Watt load resistor to antenna connector J801.
3. Adjust trimming capacitors C423, C419, C413, C408, C407 to max. deflection on the power meter.
4. Repeat the adjustment under point 3 several times to get max. output power.
5. Adjust R668 on interface unit till the power meter shows 25 Watt. Max PA regulator Vcc = 10.5V.
6. Set output power to 1W.
7. Adjust R629 on interface unit till the power meter shows 0.8 Watt.

4.5.5. Alignment of Modulation on Interface Unit (600)

1. Select channel 28.
2. Disconnect the blue wire on the Filter Unit coming from J803 pin 3.
3. Connect tone generator and AF Voltmeter between the solder terminal for the disconnected blue wire and ground (the white wire beside it).
4. Set power output level to 1W.

5. Connect modulation meter loosely to the RF-load resistor.
6. Connect distortion analyzer to the modulation meter.
7. Turn potentiometer R661 to the middle of the adjusting range.
8. Set the tone generator to a frequency of 1000 Hz and output level to 5 V_{RMS} (nominal level 500 mV_{RMS} + 20 dB). Read level on AF-voltmeter.
9. Key the transmitter.
10. Adjust R623 to max. deviation: Δ F = $\pm$5.0 kHz.
11. Set level of tone generator to nominal level: 500 mV_{RMS}.
12. Adjust R661 to nominal modulation: Δ F = $\pm$3.0 kHz.
13. Check that distortion is less than 5%.

4.5.6. Adjustment of RX-Amplifier Unit

Alignment of RF and IF amplifier:

1. Select channel 28.
2. Connect signal generator to antenna connector J801.
3. Connect test probe to pin 14 of IC101.
4. Set signal generator frequency to 162.000 MHz and increase signal level until the deflection on Tp meter reaches 30% of maximum deflection.
5. Readjust signal generator level under the alignment if necessary to keep the same deflection on the Tp meter. You must be sure that the signal is out of compression.
6. Adjust coils L101, L102, L103, L104, L105, L106, L107, L108, and L109 to max. deflection on the Tp meter.
7. Select channel 6.
8. Set signal generator to 156.300 MHz.
9. Adjust potentiometer R616 (interface unit) to max. deflection on Tp meter.
10. Select channel 28.
11. Set signal generator to 162.000 MHz.
12. Adjust coils L101, L102, L103, and L104 to max. deflection on the Tp meter.

Alignment of Detector, Telephone-Amplifier and LF-Power-Amplifier.

1. Select channel 6.
2. Connect signal generator to antenna connector J801.
3. Connect frequency counter between pin 14 of IC101 and frame through 10 uF capacitor.
4. Set signal generator level to 1 mV EMF (no modulation).
5. Set signal generator frequency till frequency counter shows 400.0 kHz $\pm$0.1 kHz.
6. Set modulation on signal generator to nominal modulation:

   fm = 1 kHz, ΔF = $\pm$3 kHz.

7. Connect AF Voltmeter to the telephone output, pin 1 of J803 or the solder terminal on the Filter-Unit for the red/orange wire. (The telephone output must be loaded with 200 ohm or a telephone).
8. Adjust coil L110 to max. deflection on the AF voltmeter.
9. Adjust potentiometer R674 to 0.45V_{RMS} on AF voltmeter.
10. Connect distortion analyzer between the orange and green wire (ground) on Filter-Unit.
11. Set volume control to max. level (pos. 15).
12. Adjust potentiometer R613a to 3.3V_{RMS} over 4 ohm.
13. Check that the distortion is less than 5%.

Alignment and control of receiver sensitivity:

1. Select channel 6.
2. Connect signal generator to antenna connector J801.
3. Connect distortion analyzer between the orange and green wire (ground) on Filter-Unit.
4. Set signal generator to best sensitivity (12 dB SINAD).
5. Adjust potentiometer R616 (Interface Unit) to best sensitivity.
6. Adjust coils L101, L102, and L103 to max. signal to noise ratio (best sensitivity).
7. Check that the sensitivity is better than 0.8 uV EMF for 12 dB SINAD.

Alignment of Squelch:

1. Select channel 28.
2. Connect signal generator to antenna connector J801.
3. Set squelch control to pos. 0.
4. Adjust signal generator to give -18 dB signal to noise ratio.
5. Set squelch control to max. position (pos. 8).
6. Adjust potentiometer R682 till the squelch just starts to cut the noise.

4.6. TROUBLE-SHOOTING

Trouble-shooting should only be performed by persons with a sufficient technical knowledge, who have the necessary measuring instruments at their disposal, and who have carefully studied the operation principles and structure of SAILOR RT2047.

Commence by ascertaining whether the fault is somewhere in the antenna circuit, the power source, the handset or in the transmitter - receiver unit.

For help with trouble-shooting in the SAILOR RT2047, the section 2.0. CIRCUIT DESCRIPTION, contains diagrams, principal descriptions and drawings showing the location of the individual components. In the diagrams typical values are indicated for the DC and AC voltages, just as the test points are indicated in the diagrams.

SAILOR RT2047 has a number of trimming cores and trimmers, which must not be touched, unless adjustments like specified under section 4.5. ADJUSTMENT PROCEDURE can be made.

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

A great help for trouble-shooting is the TEST PROGRAMMES FOR RT2047 mentioned in section 3. of the manual: INSTRUCTIONS FOR IDENTITY AND SERVICE PROGRAMMING OF SAILOR VHF RT2047.

Therefore we recommend service people to read section 3., 4., and 5. and see the possibilities by using the test programmes for fault finding.

4.7. REPLACEMENT OF COMPONENTS

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

4.8. REPLACEMENT OF MODULES

If a fault has been ascertained in a module, it may often, to save time, be worth-while to change it and then repair it later.

4.9. NECESSARY ADJUSTMENTS AFTER REPLACEMENT OF MODULE

4.9.1. Replacement of RECEIVER UNIT (100):

Follow the procedure in section 4.5.6. Adjustment of Rx-Amplifier Unit:

1. Alignment of RF and IF amplifier, points 1 - 12.
2. Alignment of Detector, Telephone-amplifier, and LF-power-amplifier, points 1 - 13.
3. Alignment and control of receiver sensitivity, points 1 - 7.
4. Alignment of Squelch, points 1 - 6.

4.9.2. Replacement of RX-SYNTHESIZER (200):

Normally the module is adjusted from the factory. Just control the frequency on the soldering point for F_{LO1} to Rx on a simplex channel, e.g. ch. 6 to be in Rx-mode: 156.300 MHz - 21.4 MHz = 134.900 MHz and in Tx-mode: 156.300 MHz - 16.8 MHz = 139.500 Mhz.

4.9.3. Replacement of TX-EXCITER (300).

Follow the procedure in section 4.5.3. Adjustment of Tx-Exciter:

1. Control of frequencies and DC-control voltage to VCO, points 1 - 5.
2. Alignment of Tx-drive level, points 1 - 5.

4.9.4. Replacement of TX-POWER AMPLIFIER (400).

Follow the procedure in section 4.5.4. Adjustment of Tx-Power Amplifier about alignment of output power, points 1 - 7.

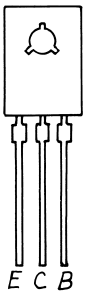
4.9.5. Replacement of INTERFACE UNIT (600)

1. Follow the procedure in section 4.5.1. Adjustment of Interface Unit about alignment and control of voltage regulators, points 1 - 9. Alignment of V_{pp}-Voltage for EEPROMS, IC609 and IC610, points 1 - 3 and alignment of SELCALL TEST TONE.
2. Section 4.5.5. Alignment of Modulation on Interface Unit, points 1-13.
3. Section 4.5.6. Adjustment of RX-Amplifier Unit about alignment of Telephone-Amplifier and LF-Power-Amplifier, points 1-13, leaving out points 3, 5 and 8 and about alignment of squelch, points 1 - 6.
4. Section 4.5.4. Adjustment of TX-Power Amplifier, points 5 - 6 - 7.

4.10. PIN CONFIGURATION

TOP VIEW

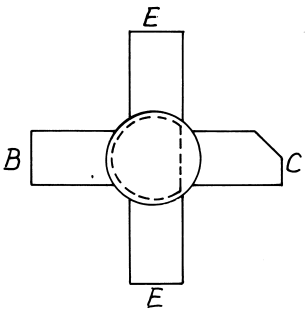
BOTTOM VIEW



BD138
BD234

TIS88A

BF199
BF494



MRF240

BC237B
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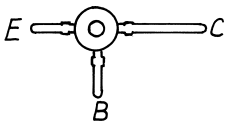

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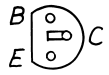
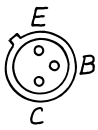


BC638
BC639



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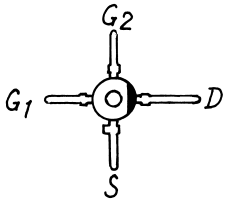

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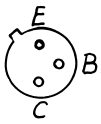
BF509



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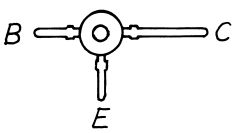

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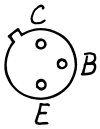

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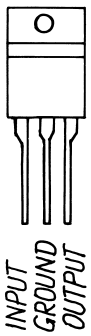


MC7805C

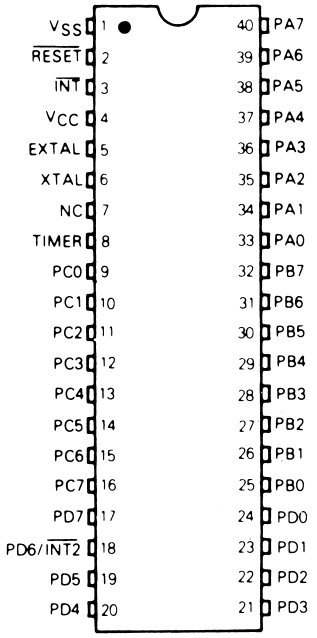
J310

RT2047

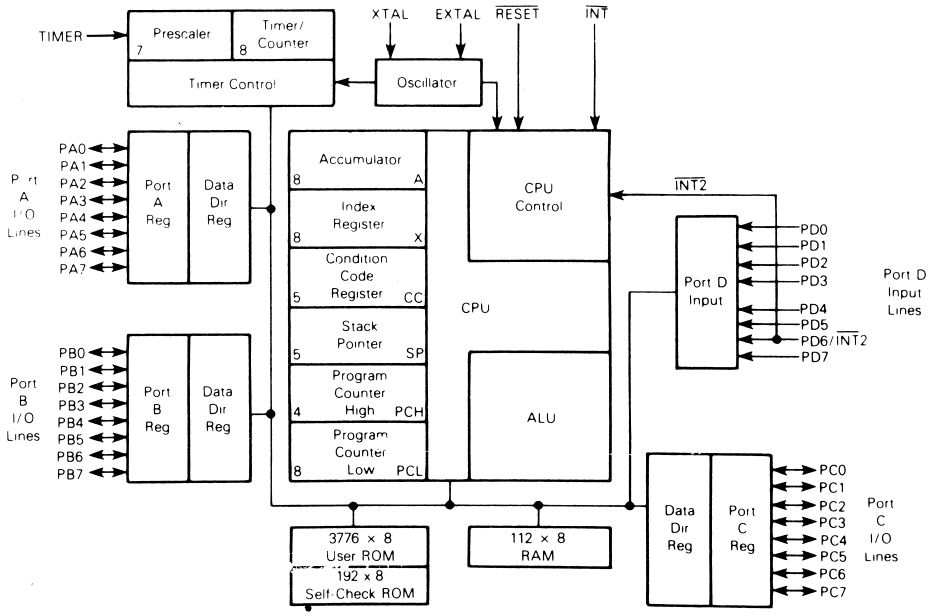
4.11 PIN CONFIGURATONS, BLOCK-AND SCHEMATIC DIAGRAM FOR IC.'s

MC6805U3 8-BIT MICROCOMPUTER

PIN ARRANGEMENT

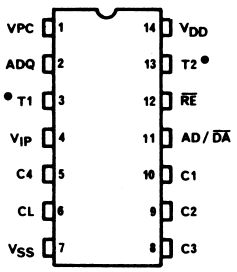


BLOCK DIAGRAM



MCM2802 32 x 32 BIT SERIAL ELECTRICALLY ERASABLE PROM

PIN ASSIGNMENT

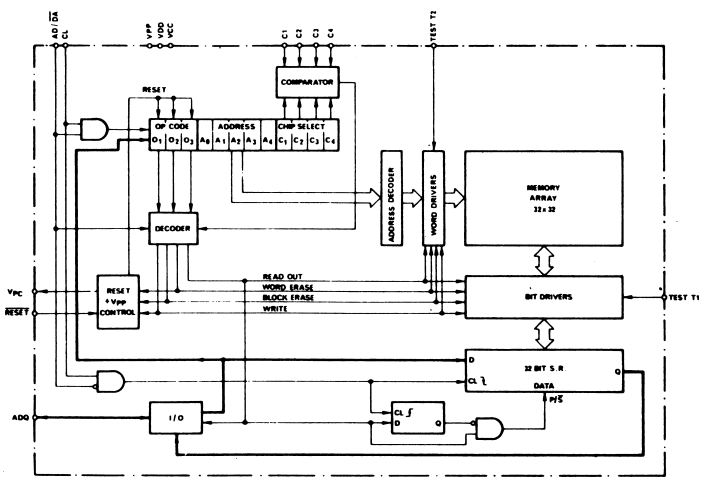


* For normal operation, hardwired to V_{SS}.

PIN NAMES

VPC. . . . . Program Voltage Control
ADQ . Address Input + Data Input/Output
T1, T2 . . . . . Margin Testing
C1, C2, C3, C4 . . . . . Chip Address 1 to 4
CL . . . . . Clock
$\overline{RE}$ . . . . . Reset
AD/$\overline{DA}$. . . . . Shift Register Select

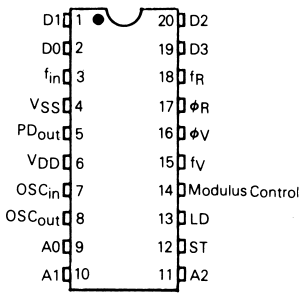
BLOCK DIAGRAM



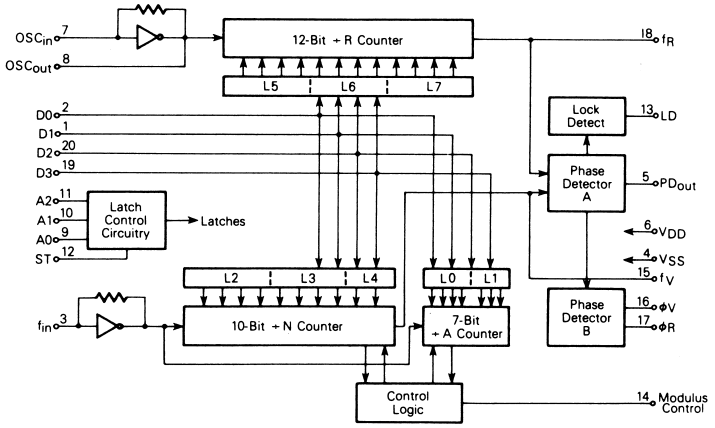
RT2047

MC145146 4-BIT DATA BUS INPUT PLL FREQUENCY SYNTHESIZER

PIN ASSIGNMENT

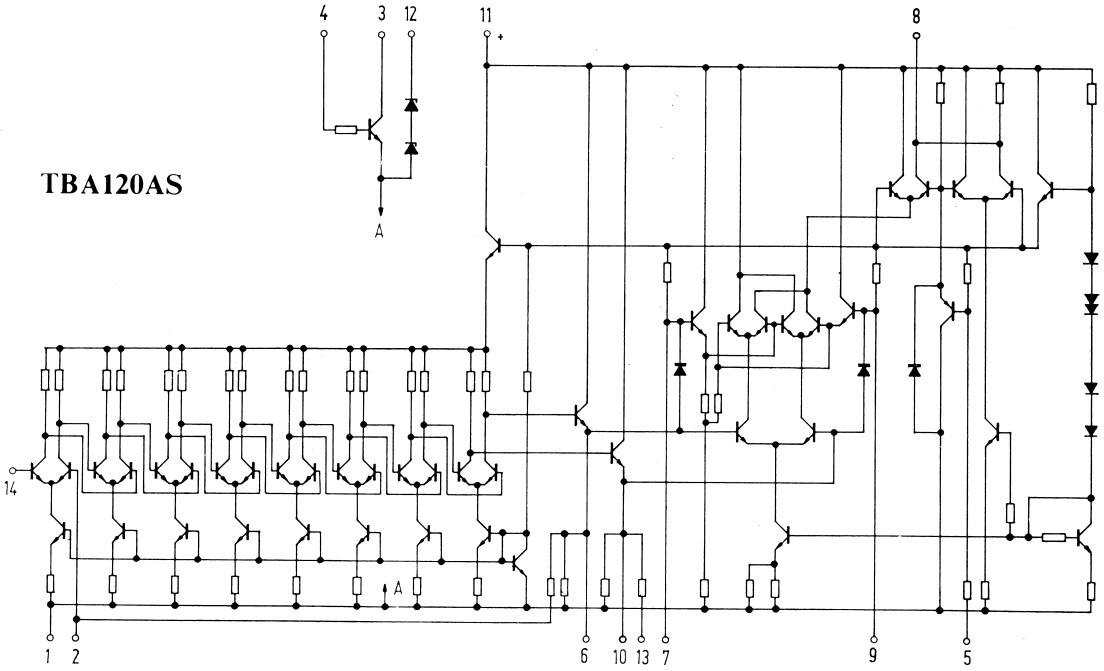


BLOCK DIAGRAM



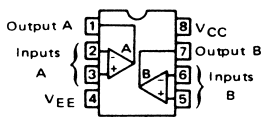
TBA120AS FM IF AMPLIFIER, LIMITER AND DETECTOR

SCHEMATIC DIAGRAM

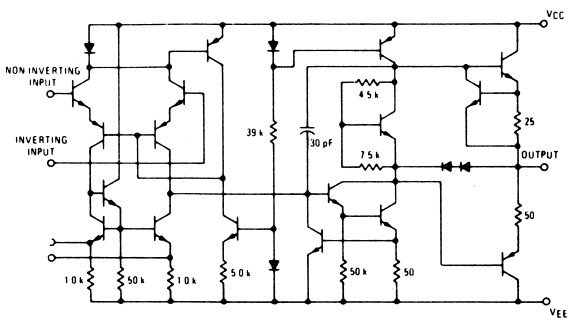


MC1458CP DUAL OPERATIONAL AMPLIFIER

CONNECTION DIAGRAM



EQUIVALENT CIRCUIT SCHEMATIC

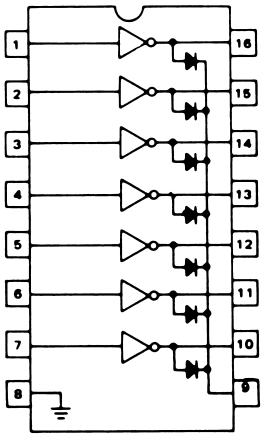


RT2047

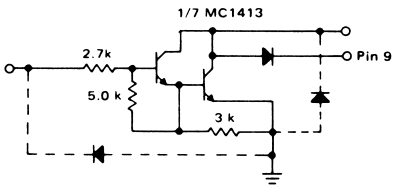
PIN CONFIGURATIONS CONT.

MC1413 HIGH-VOLTAGE, HIGH-CURRENT DARLINGTON TRANSISTOR ARRAYS

PIN CONNECTIONS

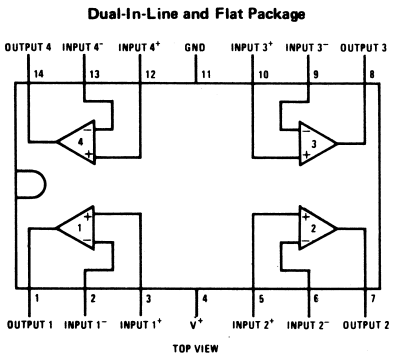


SCHEMATIC DIAGRAM

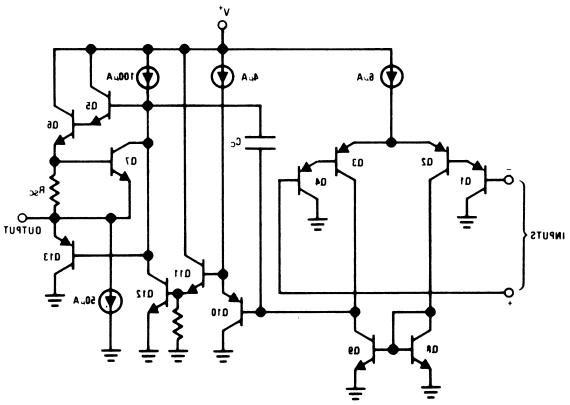


LM324 LOW POWER QUAD OPERATIONAL AMPLIFIERS

CONNECTION DIAGRAM

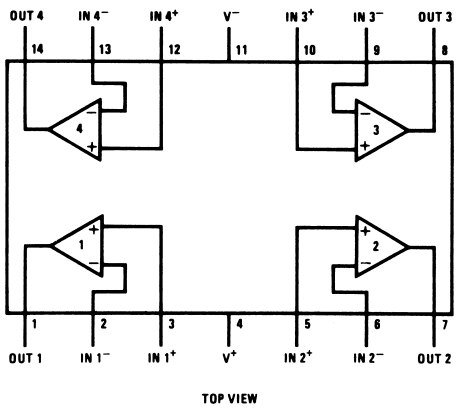


SCHEMATIC DIAGRAM (EACH AMPLIFIER)

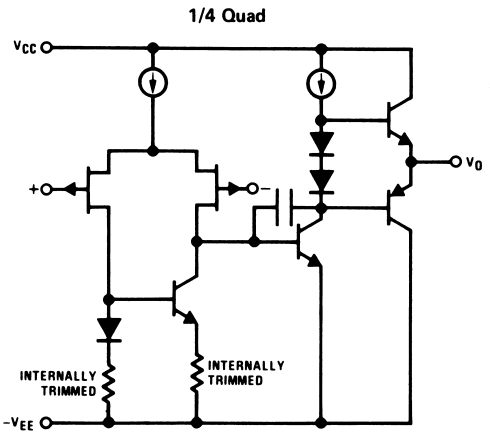


LF 347 4 x JFET INPUT OP. AMP.

CONNECTION DIAGRAM



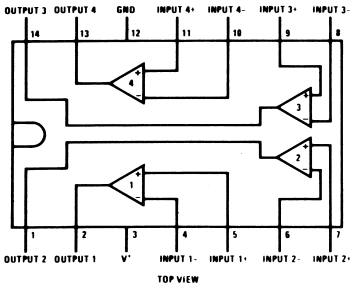
SIMPLIFIED SCHEMATIC



RT2047

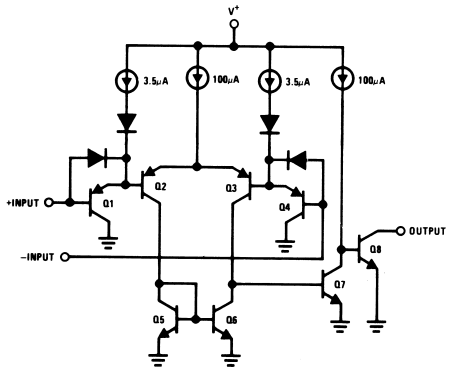
LM339, LM393 LOW POWER LOW OFFSET VOLTAGE COMPARATORS

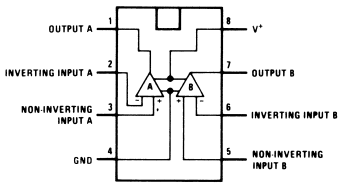
LM339 CONNECTION DIAGRAM



TOP VIEW

SCHEMATIC DIAGRAM

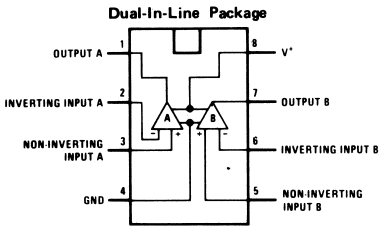




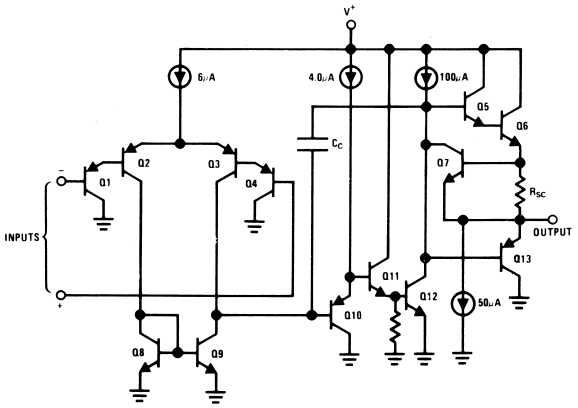
TOP VIEW

LM358 LOW POWER DUAL OPERATIONAL AMPLIFIERS

CONNECTION DIAGRAM (TOP VIEW)

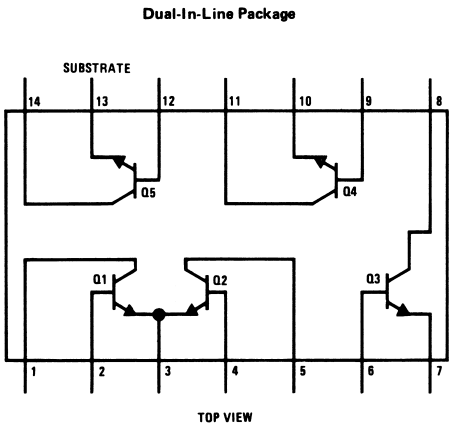


SCHEMATIC DIAGRAM (EACH AMPLIFIER)



LM 3046 TRANSISTOR ARRAYS

SCHEMATIC AND CONNECTION DIAGRAM

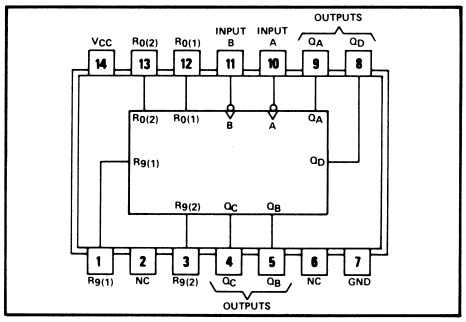


TOP VIEW

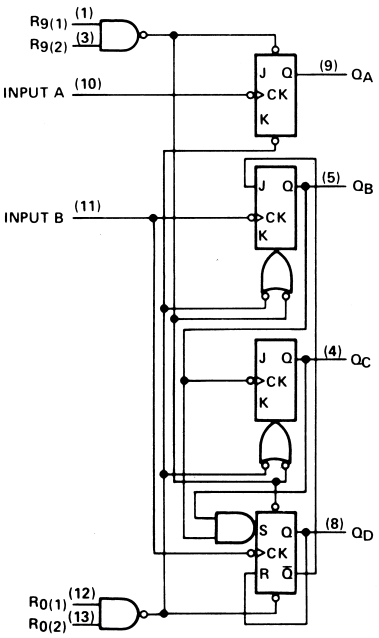
SN74LS290

DECADE COUNTER

(TOP VIEW)



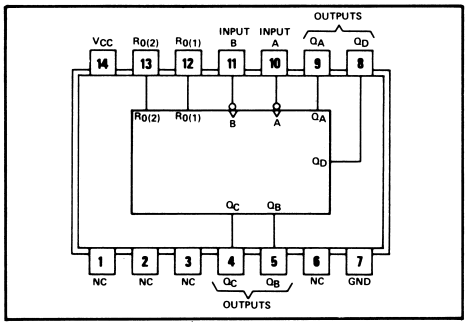
FUNCTIONAL BLOCK DIAGRAM LS290



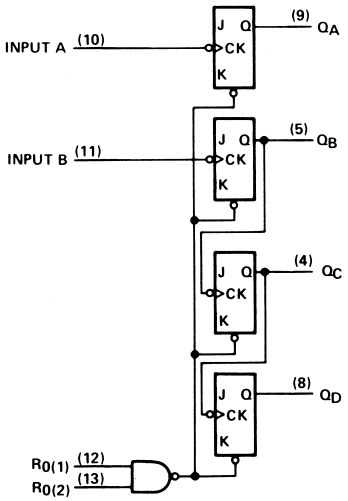
SN74LS293

BINARY COUNTER

(TOP VIEW)

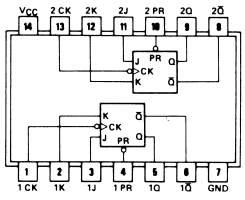


FUNCTIONAL BLOCK DIAGRAM LS293



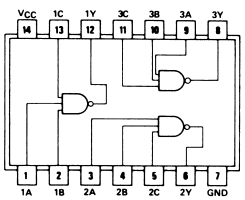
SN74LS113AN

DUAL J-K FLIP-FLOP



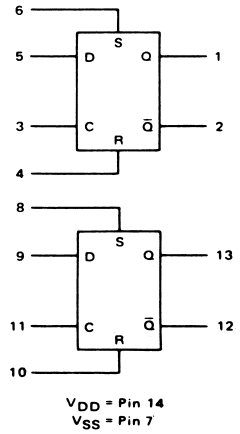
SN74LS10N

TRIPLE 3-INPUT NAND GATES



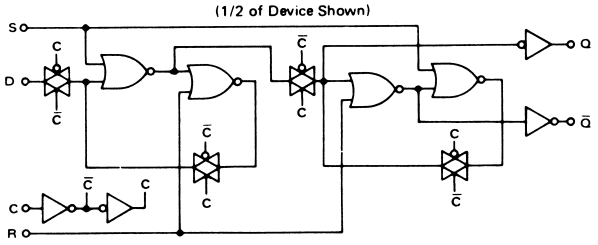
MC14013B DUAL TYPE D FLIP-FLOP

BLOCK DIAGRAM



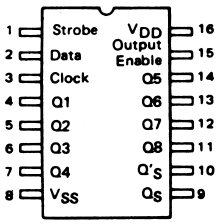
V_{DD} = Pin 14
V_{SS} = Pin 7

LOGIC DIAGRAM

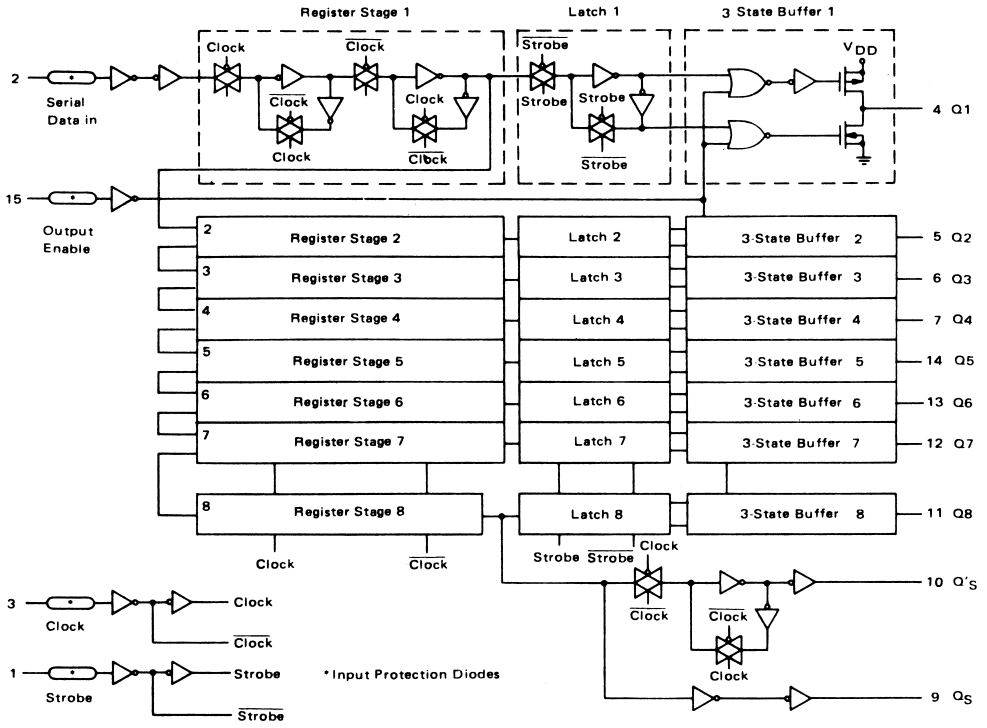


MC14094B 8-STAGE SHIFT/STORE REGISTER

PIN ASSIGNMENT



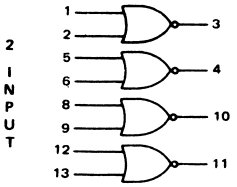
BLOCK DIAGRAM



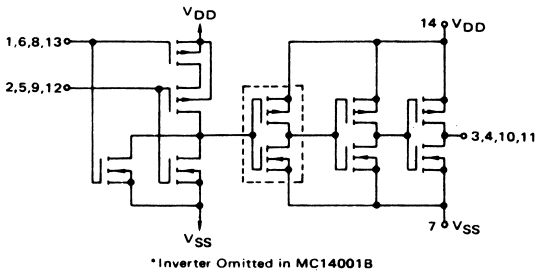
PIN CONFIGURATIONS CONT.

MC14001B QUAD 2-INPUT NOR GATE

LOGIC DIAGRAM



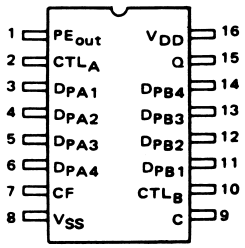
SCHEMATIC DIAGRAM



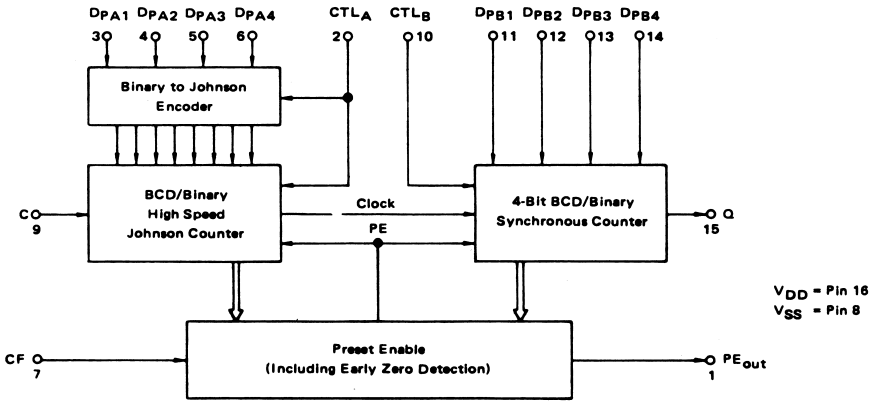
*Inverter Omitted in MC14001B

MC14569B HIGH SPEED PROGRAMMABLE DIVIDE-BY-N DUAL 4 BIT BCD/BINARY COUNTER

PIN ASSIGNMENT

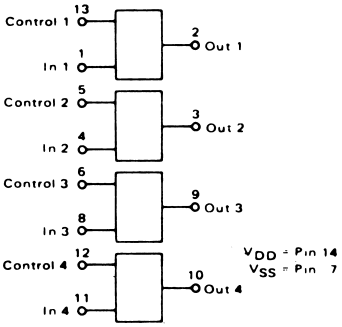


BLOCK DIAGRAM

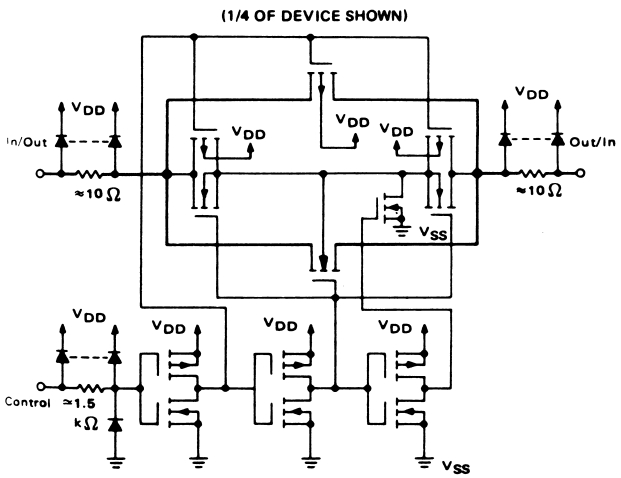


MC14066B QUAD ANALOG SWITCH QUAD MULTIPLEXER

BLOCK DIAGRAM



CIRCUIT SCHEMATIC

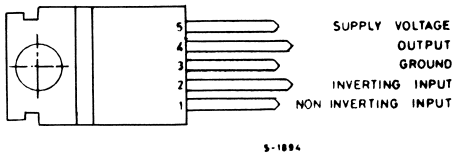


RT2047

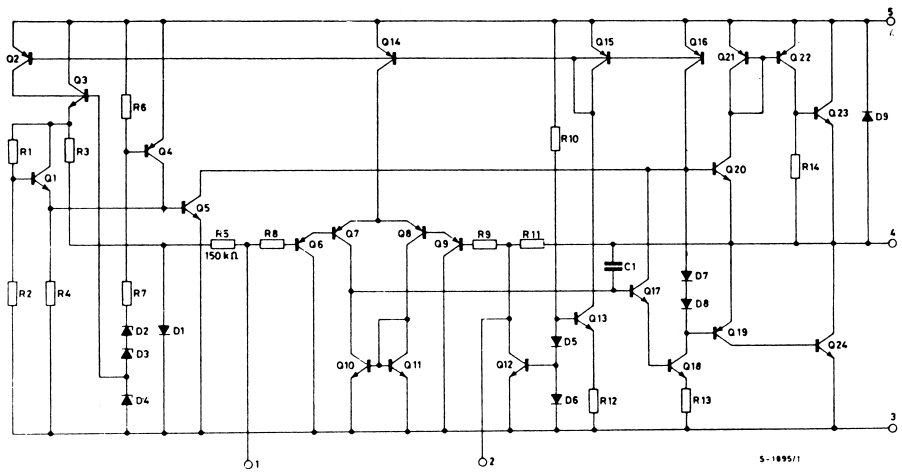
PIN CONFIGURATIONS CONT.

TDA2002 AF POWER AMP.

CONNECTION DIAGRAM

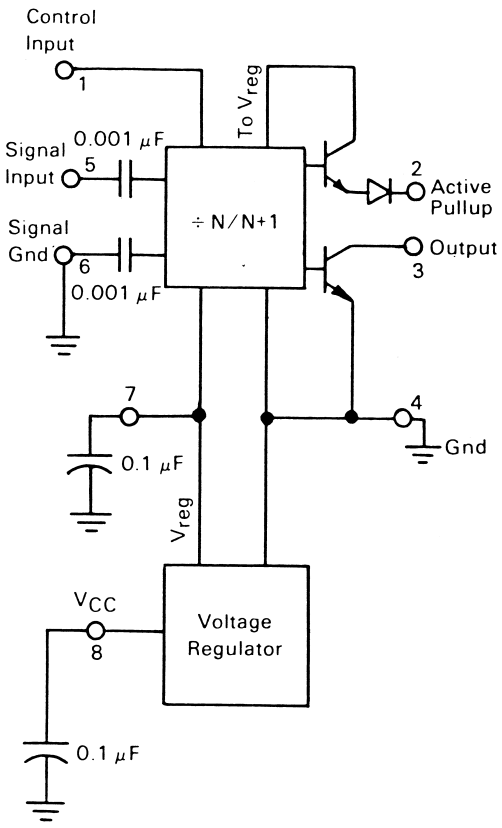


SCHEMATIC DIAGRAM



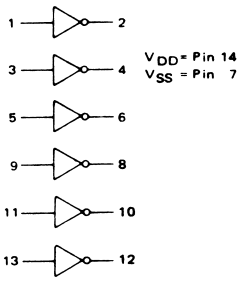
MC12015 TWO-MODULUS PRESCALER

PRESCALER BLOCK DIAGRAM

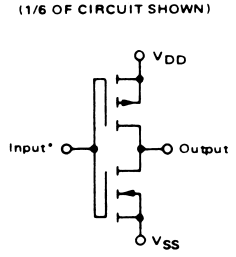


MC14069UB HEX INVERTER

LOGIC DIAGRAM



CIRCUIT SCHEMATIC



*Double diode protection on all inputs not shown.

RT2047

CONTENTS

PART II: INSTRUCTION BOOK FOR SAILOR VHF RT2047

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
	MAIN CHASSIS RT2047	MODULE 800	ESPERA	VHF RADIOTELEFON DUPLEX	802047
C801	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C802	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C803	CAPACITOR CERAMIC	1nF -20/+80% 400V	FERROPERM	9/0138,9 U/LAK+TRAD	16.152
C804	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C805	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C806	CAPACITOR MKT	10nF 10% 400V	ERO*	MKT1822-310/405	12.212
DF801	DUPLEX FILTER	DF 801	ESPERA	DF 801	700084
J801	ANTENNA JACK (FEMALE)	SO239	KAJ V HANSEN	SO239	78.504
J802	SUPPLY JACK (FEMALE)	MEK 60 BZ	HIRSCHMANN	973025-100 6 pole Female for Cable	78.309
J803	SOCKET CHASSIS MOUNT	7 POLES	R.S.*	110-549	78.385
LS801	LOUDSPEAKER	8 OHM	VIFA	S 6 FB 8ohm M.PAKN	46.040
P801	AERIAL PLUG	PL259	* RODAN	PL259/LODDE/BAKELIT INDL.	78.502
P802	SUPPLY JACK (MALE)	MESEI 60	HIRSCHMANN	973020-100 6 pole Male Chassis Ø25MM	78.320
P803	MULTIPLUG	7 POLES	R.S.*	110-559	78.386
R801	RESISTOR MF	15k OHM 5% 0.4W	* PHILIPS	2322 181 53153	01.229

RT2047 32/88.

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
	MICROTELEPHONE	with ELEKTRET MIC.AMP.	ESPERA	5-0-24025C	600108
C1	CAPACITOR ELECTROLYTIC	1uF 20% 50VDC	ERO	EKI 00 AA 110 H M9	14.506
C2	CAPACITOR ELECTROLYTIC	33uF 20% 16VDC	ERO*	EKI 00 AA 233 D M9	14.518
C3	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
C4	CAPACITOR CERAMIC	4n7F 20% CL2 50VDC	NKE	DT 380 758L D 472 M 50V FLAT PACK	15.165
C5	CAPACITOR CERAMIC	1.8nF -20/+80% 400V	FERROPERM	9/0141,9	15.735
C6	CAPACITOR CERAMIC	330pF 20% 400V	FERROPERM	9/0129,9	16.093
C7	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
C8	CAPACITOR CERAMIC	1.8nF -20/+80% 400V	FERROPERM	9/0141,9	15.735
C9	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
C10	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
D1	DIODE	BAV21	PHILIPS	BAV21	25.340
MC1	MICROPHONE ELECTRET	ø9.7 x 6.7mm	# MATSUSHITA	WM-034BY	46.012
R1	RESISTOR MF	1.2k OHM 5% 0.4W	* PHILIPS	2322 181 53122	01.202
R2	RESISTOR	5.6 KOHM 5% 0.33W	PHILIPS	2322 181 33562	01.718
R3	RESISTOR	27 KOHM 5% 0.33W	PHILIPS	2322 181 33273	01.735
R4	RESISTOR	12 KOHM 5% 0.33W	PHILIPS	2322 181 33123	01.727
R5	RESISTOR	220 OHM 5% 0.33W	PHILIPS	2322 181 33221	01.683
R6	RESISTOR	12 KOHM 5% 0.33W	PHILIPS	2322 181 33123	01.727
R7	RESISTOR MF	120k OHM 5% 0.4W	* PHILIPS	2322 181 53124	01.252
R8	RESISTOR	470 OHM 5% 0.33W	PHILIPS	2322 181 33471	01.691
R9	RESISTOR	56 OHM 5% 0.33W	PHILIPS	2322 181 33569	01.668
S1	MICROSWITCH	E62-10H PDT	CHERRY	E62-10H PDT	44.025
T1	TRANSISTOR AF	BC548B NPN TO-92	ITT	BC548B	28.076
T2	TRANSISTOR AF	BC548B NPN TO-92	ITT	BC548B	28.076
T3	TRANSISTOR AF	BC548B NPN TO-92	ITT	BC548B	28.076
TC1	TELEPHONE CARTRIDGE	200 OHM	S.E.K. (KIRK)	0113.2513	46.010

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
	MICROTELEPHONE	WITH ELECTRET MIC. AMP.	ESPERA	5-0-24025D	600875
C1	CAPACITOR ELECTROLYTIC	100uF 20% 10VDC	ERO	EKI 00 BB 310 C M9	14.607
C2	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
C3	CAPACITOR ELECTROLYTIC	10uF 20% 35VDC	ERO	EKI 00 AA 210 F M9	14.512
C4	CAPACITOR ELECTROLYTIC	0.47uF 20% 50VDC	ERO	EKI 00 AA 047 H M9	14.504
C5	CAPACITOR ELECTROLYTIC	2.2uF 20% 50VDC	ERO	EKI 00 AA 122 H M9	14.503
C6	CAPACITOR ELECTROLYTIC	2.2uF 20% 50VDC	ERO	EKI 00 AA 122 H M9	14.503
C7	CAPACITOR ELECTROLYTIC	10uF 20% 35VDC	ERO	EKI 00 AA 210 F M9	14.512
C8	CAPACITOR CERAMIC	1nF 10% 100V	*PHILIPS	2222 630 19102	16.149
C9	CAPACITOR CERAMIC	1nF 10% 100V	*PHILIPS	2222 630 19102	16.149
C10	CAPACITOR ELECTROLYTIC	33uF 20% 16VDC	ERO*	EKI 00 AA 233 D M9	14.518
C11	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
D1	DIODE	1N4148 HIGH SPEED	ITT	1N4148 CARTON	25.131
MC1	MICROPHONE ELECTRET	ø9.7 x 6.7mm	* MATSUSHITA	WM-034BY	46.012
R1	RESISTOR	1.8 KOHM 5% 0.33W	PHILIPS	2322 180 73182	01.707
R2	RESISTOR	1.8 KOHM 5% 0.33W	PHILIPS	2322 180 73182	01.707
R3	RESISTOR	8.2 KOHM 5% 0.33W	PHILIPS	2322 180 73822	01.723
R4	RESISTOR	18 KOHM 5% 0.33W	PHILIPS	2322 180 73183	01.732
R5	RESISTOR	2.7 KOHM 5% 0.33W	PHILIPS	2322 180 73272	01.711
R6	RESISTOR	4.7 KOHM 5% 0.33W	PHILIPS	2322 180 73472	01.717
R7	RESISTOR	2.2 kOHM 5% 0.33W	PHILIPS	2322 180 73222	01.709
R8	RESISTOR	6.8 kOHM 5% 0.33W	PHILIPS	2322 180 73682	01.721
R9	RESISTOR	2.7 KOHM 5% 0.33W	PHILIPS	2322 180 73272	01.711
R10	RESISTOR	120 kOHM 5% 0.33W	PHILIPS	2322 180 73124	01.753
R11	RESISTOR	39 KOHM 5% 0.33W	PHILIPS	2322 180 73393	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)	0113.2513	46.010

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
	RECEIVER	MODULE 100	ESPERA	5-0-23617F	600009
C101	CAPACITOR CERAMIC	2.7pF +-.1pF NPO 250V	FERROPERM	9/0112,9	15.516
C102	CAPACITOR CERAMIC	10pF 5% NPO 500VDC	NKE	DT 350 758L CH 100 J 500V FLAT PACK	15.565
C103	CAPACITOR CERAMIC	6p8F +-0.25pF NPO 500VDC	NKE	DT 350 758L CH 6R8 C 500V FLAT PACK	15.023
C104	CAPACITOR PRINTED			5-0-23617F UDSTANSES AF S.P. RADIO	51.781
C105	CAPACITOR CERAMIC	6p8F +-0.25pF NPO 500VDC	NKE	DT 350 758L CH 6R8 C 500V FLAT PACK	15.023
C106	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C107	CAPACITOR CERAMIC	2.7pF +-.1pF NPO 250V	FERROPERM	9/0112,9	15.516
C108	CAPACITOR CERAMIC	10pF 5% NPO 500VDC	NKE	DT 350 758L CH 100 J 500V FLAT PACK	15.565
C109	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C110	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C111	CAPACITOR CERAMIC	5.1pF +-.25pF NPO 400V	FERROPERM	9/0112,9	15.539
C112	CAPACITOR CERAMIC	8p2F +-0.25pF NPO 500VDC	NKE	DT 350 758L CH 8R2 C 500V FLAT PACK	15.030
C113	CAPACITOR PRINTED			5-0-23617F UDSTANSES AF S.P. RADIO	51.781
C114	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C115	CAPACITOR CERAMIC	8p2F +-0.25pF NPO 500VDC	NKE	DT 350 758L CH 8R2 C 500V FLAT PACK	15.030
C116	CAPACITOR CERAMIC	2.2pF +-.1pF NPO 400V	FERROPERM	9/0112,9	15.513
C117			FERROPERM	9/0216,8	15.800
C118	CAPACITOR MKT	4n7F 10% 63VDC	SIEMENS	B32529-A472-K-289	11.374
C119			FERROPERM	9/0216,8	15.778
C120	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C121	CAPACITOR MKT	4n7F 10% 63VDC	SIEMENS	B32529-A472-K-289	11.374
C122	CAPACITOR CERAMIC	33pF 5% N150 63V	#FERROPERM	9/0116,8	15.816
C123	CAPACITOR CERAMIC	100pF 5% N33 25V	#FERROPERM	9/0213,8	15.781
C124	CAPACITOR MKT	10nF 10% 400V	SIEMENS	B32510-D6103-K000	11.381
C125	CAPACITOR CERAMIC	100pF 5% N33 25V	#FERROPERM	9/0213,8	15.781
C126	CAPACITOR MKT	10nF 10% 400V	SIEMENS	B32510-D6103-K000	11.381
C127	CAPACITOR MKT	10nF 10% 400V	SIEMENS	B32510-D6103-K000	11.381
C128	CAPACITOR MKT	150nF 10% 100V	SIEMENS	B32510-D1154-K000	11.222

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
C129	CAPACITOR MKT	150nF 10% 100V	SIEMENS	B32510-D1154-K000	11.222
C130	CAPACITOR MKT	10nF 10% 400V	SIEMENS	B32510-D6103-K000	11.381
C131	CAPACITOR MKT	150nF 10% 100V	SIEMENS	B32510-D1154-K000	11.222
C132	CAPACITOR MKT	10nF 10% 400V	SIEMENS	B32510-D6103-K000	11.381
C133	CAPACITOR MKT	150nF 10% 100V	SIEMENS	B32510-D1154-K000	11.222
C134	CAPACITOR POLYSTYRENE	1.2nF 1% 160V	#PHILIPS	2222 429 81202	10.278
C135	CAPACITOR POLYSTYRENE	6.8nF 1% 63V	#PHILIPS	2222 428 86802	10.221
C136	CAPACITOR MKT	150nF 10% 100V	SIEMENS	B32510-D1154-K000	11.222
C137	CAPACITOR MKT	150nF 10% 100V	SIEMENS	B32510-D1154-K000	11.222
C138	CAPACITOR MKT	15nF 10% 400V	SIEMENS	B32510-D6153-K000	11.364
C139	CAPACITOR ELECTROLYTIC	4.7uF 20% 50VDC	ERO	EKI 00 AA 147 H M9	14.510
C140	CAPACITOR POLYSTYRENE	180pF 1% 630V	#PHILIPS	2222 431 81801	10.407
C141	CAPACITOR POLYSTYRENE	180pF 1% 630V	#PHILIPS	2222 431 81801	10.407
C142	CAPACITOR POLYSTYRENE	4.7nF 1% 160V	#PHILIPS	2222 429 84702	10.292
C143	CAPACITOR CERAMIC	1nF 10% 50VDC CL2	NKE	DT 340 758L B 102 K 50V FLAT PACK	16.160
C144	CAPACITOR CERAMIC	1nF 10% 50VDC CL2	NKE	DT 340 758L B 102 K 50V FLAT PACK	16.160
D101	DIODE	BB139 QUINT	ITT	BB139 QUINTET	26.140
D102	DIODE	BB139 QUINT	ITT	BB139 QUINTET	26.140
D103	DIODE	BB139 QUINT	ITT	BB139 QUINTET	26.140
D104	DIODE	BB139 QUINT	ITT	BB139 QUINTET	26.140
D105	DIODE	BAW62 HIGH SPEED	PHILIPS	BAW62-143	25.350
D106	DIODE	BAW62 HIGH SPEED	PHILIPS	BAW62-143	25.350
FL101	CRYSTAL FILTER	21.4 MHz	NDK	21F15DH	40.022
IC101	INTEGRATED CIRCUIT	TBA120C	MOTOROLA	TBA120C NOT PREFERED	31.350
L101	COIL	TL355	S.P.RADIO	6-0-23627	400355
L102	COIL	TL356	S.P.RADIO	6-0-23628	400356
L103	COIL	TL357	S.P.RADIO	6-0-23629	400357
L104	COIL	TL358	S.P.RADIO	6-0-23630	400358
L105	COIL	TL360	S.P.RADIO	6-0-23632A	400360
L106	COIL	TL361	S.P.RADIO	6-0-23633	400361
L107	COIL	TL362	S.P.RADIO	6-0-23634 A	400362
L108	COIL	TL363	S.P.RADIO	6-0-23635	400363
L109	COIL	TL364	S.P.RADIO	6-0-23636	400364
L110	COIL	TL365	S.P.RADIO	6-0-23637	400365
L111	COIL	TL359	S.P.RADIO	6-0-23631	400359
R101	RESISTOR MF	33k OHM 5% 0.4W	* PHILIPS	2322 181 53333	01.237
R102	RESISTOR MF	33k OHM 5% 0.4W	* PHILIPS	2322 181 53333	01.237
R103	RESISTOR MF	180 OHM 5% 0.4W	PHILIPS	2322 181 53181	01.181
R104	RESISTOR MF	1k5 OHM 5% 0.4W	* PHILIPS	2322 181 53152	01.204
R105	RESISTOR MF	4.7k OHM 5% 0.4W	* PHILIPS	2322 181 53472	01.216
R106	RESISTOR MF	33k OHM 5% 0.4W	* PHILIPS	2322 181 53333	01.237

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
R107	RESISTOR MF	33k OHM 5% 0.4W	* PHILIPS	2322 181 53333	01.237
R108	RESISTOR MF	330 OHM 5% 0.4W	PHILIPS	2322 181 53331	01.187
R109	RESISTOR MF	1.2k OHM 5% 0.4W	* PHILIPS	2322 181 53122	01.202
R110	RESISTOR	3.9 KOHM 5% 0.33W	PHILIPS	2322 181 33392	01.714
R111	RESISTOR MF	82 OHM 5% 0.4W	* PHILIPS	2322 181 53829	01.172
R112	RESISTOR MF	2.2k OHM 5% 0.4W	* PHILIPS	2322 181 53222	01.208
R113	RESISTOR MF	12k OHM 5% 0.4W	* PHILIPS	2322 181 53123	01.227
R114	RESISTOR MF	10k OHM 5% 0.4W	* PHILIPS	2322 181 53103	01.225
R115	RESISTOR	10 OHM 5% 0.33W	PHILIPS	2322 181 33109	01.650
R116	RESISTOR	150 OHM 5% 0.33W	PHILIPS	2322 181 33151	01.679
R117	RESISTOR MF	150 OHM 5% 0.4W	* PHILIPS	2322 181 53151	01.179
R118	RESISTOR MF	220 OHM 5% 0.4W	PHILIPS	2322 181 53221	01.183
R119	RESISTOR MF	100 OHM 5% 0.4W	* PHILIPS	2322 181 53101	01.175
R120	RESISTOR MF	2.2k OHM 5% 0.4W	* PHILIPS	2322 181 53222	01.208
R121	RESISTOR	68 OHM 5% 0.33W	PHILIPS	2322 181 33689	01.670
R122	RESISTOR	1.2 KOHM 5% 0.33W	PHILIPS	2322 181 33122	01.702
R123	RESISTOR	1.2 KOHM 5% 0.33W	PHILIPS	2322 181 33122	01.702
R124	RESISTOR MF	2.2k OHM 5% 0.4W	* PHILIPS	2322 181 53222	01.208
R125	RESISTOR MF	56 OHM 5% 0.4W	* PHILIPS	2322 181 53569	01.168
R126	RESISTOR	100 OHM 5% 0.33W	PHILIPS	2322 181 33101	01.675
R127	RESISTOR MF	1k5 OHM 5% 0.4W	* PHILIPS	2322 181 53152	01.204
R128	RESISTOR MF	1k5 OHM 5% 0.4W	* PHILIPS	2322 181 53152	01.204
R129	RESISTOR	560 OHM 5% 0.33W	PHILIPS	2322 181 33561	01.693
R130	RESISTOR MF	6.8k OHM 5% 0.4W	* PHILIPS	2322 181 53682	01.220
R131	RESISTOR MF	3.3k OHM 5% 0.4W	* PHILIPS	2322 181 53332	01.212
R132	RESISTOR MF	10k OHM 5% 0.4W	* PHILIPS	2322 181 53103	01.225
R133	RESISTOR	1.8 KOHM 5% 0.33W	PHILIPS	2322 181 33182	01.706
T101	TRANSISTOR	BF979S	SIEMENS	BF979S	28.250
T102	TRANSISTOR	FET TIS88A2	MOTOROLA*	TM00 044-2	29.736
T103	TRANSISTOR MOSFET	BF961	SIEMENS*	BF961	29.755
T104	TRANSISTOR RF	BF494 PNP TO-92	PHILIPS	BF494	28.201
T105	TRANSISTOR	BF199	PHILIPS	BF199	28.179
T106	TRANSISTOR RF	BF494 PNP TO-92	PHILIPS	BF494	28.201

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
	RX-SYNTHESISER	MODULE 200	ESPERA	5-0-23694D	600012
C201	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758L B 221K500V FLAT PACK	16.090
C202	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758L B 221K500V FLAT PACK	16.090
C203	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758L B 221K500V FLAT PACK	16.090
C204	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758L B 221K500V FLAT PACK	16.090
C205	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758L B 221K500V FLAT PACK	16.090
C206	CAPACITOR CERAMIC	27pF 5% N150 50VDC	NKE	DT 350 758L PH 270 J 50V FLAT PACK	15.812
C207	CAPACITOR CERAMIC	10pF 5% NPO 500VDC	NKE	DT 350 758L CH 100 J 500V FLAT PACK	15.565
C208	CAPACITOR CERAMIC	27pF 5% N150 50VDC	NKE	DT 350 758L PH 270 J 50V FLAT PACK	15.812
C209	CAPACITOR CERAMIC	27pF 5% N150 50VDC	NKE	DT 350 758L PH 270 J 50V FLAT PACK	15.812
C210	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758L B 221K500V FLAT PACK	16.090
C211	CAPACITOR ELECTROLYTIC	33uF 20% 16VDC	ERO*	EKI 00 AA 233 D M9	14.518
C212	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758L B 221K500V FLAT PACK	16.090
C213	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758L B 221K500V FLAT PACK	16.090
C214	CAPACITOR CERAMIC	16pF 5% N150	*KCK	HE40SJPH160J	15.057
C215	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758L B 221K500V FLAT PACK	16.090
C216	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758L B 221K500V FLAT PACK	16.090
C217	CAPACITOR CERAMIC	15pF 5% NPO 500VDC	NKE	DT 360 758L CH 150 J 500V FLAT PACK	15.590
C218	CAPACITOR POLYESTER	0.15uF 10% 100V	ERO*	MKT1822	11.074
C219	CAPACITOR POLYESTER	68nF 10% 250V	ERO	MKT1822	11.102
C220	CAPACITOR POLYSTYRENE	820pF 1% 250V	*PHILIPS	2222 430 88201	10.348
C221	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758L B 221K500V FLAT PACK	16.090
C222	CAPACITOR CERAMIC	22pF 5% NPO 400V	FERROPERM	9/0116/9	16.120
C223	CAPACITOR POLYESTER	68nF 10% 250V	ERO	MKT1822	11.102
C224	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758L B 221K500V FLAT PACK	16.090

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
C225	CAPACITOR POLYESTER	2.2uF 10% 100V	ERO*	MKT1822	11.142
C226	CAPACITOR CERAMIC	100pF 5% N150 500V	*KCK	HM11SJPH101J	15.132
C227	CAPACITOR CERAMIC	1nF 10% 50VDC CL2	NKE	DT 340 758L B 102 K 50V FLAT PACK	16.160
C228	CAPACITOR CERAMIC	1nF 10% 50VDC CL2	NKE	DT 340 758L B 102 K 50V FLAT PACK	16.160
C229	CAPACITOR ELECTROLYTIC	33uF 20% 16VDC	ERO*	EKI 00 AA 233 D M9	14.518
C230	CAPACITOR POLYESTER	0.1uF 10% 100V	ERO*	MKT1822	11.073
C231	CAPACITOR CERAMIC	1nF 10% 50VDC CL2	NKE	DT 340 758L B 102 K 50V FLAT PACK	16.160
C232	CAPACITOR CERAMIC	100nF 10% 50V	SIEMENS	B37987-F5104-K000	16.305
C233	CAPACITOR POLYESTER	0.22uF 10% 100V	ERO*	MKT1822	11.075
C234	CAPACITOR ELECTROLYTIC	33uF 20% 16VDC	ERO*	EKI 00 AA 233 D M9	14.518
C235	CAPACITOR ELECTROLYTIC	33uF 20% 16VDC	ERO*	EKI 00 AA 233 D M9	14.518
C236	CAPACITOR CERAMIC	33pF 5% N150 400V	*KCK	HM74SJPH330J	15.083
C237	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758L B 221K500V FLAT PACK	16.090
C238	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758L B 221K500V FLAT PACK	16.090
C239	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758L B 221K500V FLAT PACK	16.090
C240	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758L B 221K500V FLAT PACK	16.090
C241	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758L B 221K500V FLAT PACK	16.090
C242	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758L B 221K500V FLAT PACK	16.090
C243	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758L B 221K500V FLAT PACK	16.090
C244	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758L B 221K500V FLAT PACK	16.090
C245	CAPACITOR ELECTROLYTIC	33uF 20% 16VDC	ERO*	EKI 00 AA 233 D M9	14.518
C246	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758L B 221K500V FLAT PACK	16.090
C247	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758L B 221K500V FLAT PACK	16.090
D201	DIODE CAPACITANCE	S P RADIO C1037	ITT	BB139AT-19321 SP C1037	26.110
D202	DIODE	BAW62 HIGH SPEED	PHILIPS	BAW62-143	25.350
D203	DIODE	BAW62 HIGH SPEED	PHILIPS	BAW62-143	25.350
D204	DIODE	BAW62 HIGH SPEED	PHILIPS	BAW62-143	25.350
IC201	INTEGRATED CIRCUIT	MC12015P	NATIONAL*	DS8615N-4	32.850
IC202	INTEGRATED CIRCUIT	4BIT SER.INP.PLL SYNTHES	MOTOROLA	MC145146P	33.490
L201	COIL	TL370	S.P.RADIO	6-0-23686	400370

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
L202	COIL	TL368	S.P.RADIO	6-0-23592	400368
L203	COIL	TL375	S.P.RADIO	TL375	400375
L204	COIL	TL376	S.P.RADIO	TL376	400376
L205	CHOKE	4u7H 10%	SIEMENS *	B78108-T1472-K	20.137
L206	COIL	TL369	S.P.RADIO	6-0-23662	400369
L207	COIL	TL371	S.P.RADIO	6-0-23687	400371
R201	RESISTOR	1.5 KOHM 5% 0.33W	PHILIPS	2322 181 33152	01.704
R202	RESISTOR	1 KOHM 5% 0.33W	PHILIPS	2322 181 33102	01.700
R203	RESISTOR	68 OHM 5% 0.33W	PHILIPS	2322 181 33689	01.670
R204	RESISTOR MF	33 OHM 5% 0.4W	* PHILIPS	2322 181 53339	01.162
R205	RESISTOR MF	68 OHM 5% 0.4W	* PHILIPS	2322 181 53689	01.170
R206	RESISTOR MF	390 OHM 5% 0.4W	* PHILIPS	2322 181 53391	01.189
R207	RESISTOR MF	560 OHM 5% 0.4W	* PHILIPS	2322 181 53561	01.193
R208	RESISTOR MF	560 OHM 5% 0.4W	* PHILIPS	2322 181 53561	01.193
R209	POTENTIOMETER TRIMMING	470 OHM 10% 0.5W	PHILIPS*	2322 482 22471	07.651
R210	RESISTOR MF	56k OHM 5% 0.4W	* PHILIPS	2322 181 53563	01.243
R211	RESISTOR MF	33 OHM 5% 0.4W	* PHILIPS	2322 181 53339	01.162
R212	RESISTOR	5.6 KOHM 5% 0.33W	PHILIPS	2322 181 33562	01.718
R213	RESISTOR MF	1k OHM 5% 0.4W	* PHILIPS	2322 181 53102	01.200
R214	RESISTOR MF	68 OHM 5% 0.4W	* PHILIPS	2322 181 53689	01.170
R215	RESISTOR MF	330 OHM 5% 0.4W	PHILIPS	2322 181 53331	01.187
R216	RESISTOR MF	1k5 OHM 5% 0.4W	* PHILIPS	2322 181 53152	01.204
R217	RESISTOR MF	1k OHM 5% 0.4W	* PHILIPS	2322 181 53102	01.200
R218	RESISTOR MF	27 OHM 5% 0.4W	* PHILIPS	2322 181 53279	01.160
R219	RESISTOR MF	180 OHM 5% 0.4W	PHILIPS	2322 181 53181	01.181
R220	RESISTOR	4.7 KOHM 5% 0.33W	PHILIPS	2322 181 33472	01.716
R221	RESISTOR MF	4.7k OHM 5% 0.4W	* PHILIPS	2322 181 53472	01.216
R222	RESISTOR MF	6.8k OHM 5% 0.4W	* PHILIPS	2322 181 53682	01.220
R223	RESISTOR MF	10k OHM 5% 0.4W	* PHILIPS	2322 181 53103	01.225
R224	RESISTOR MF	390k OHM 5% 0.4W	* PHILIPS	2322 181 53394	01.264
R225	RESISTOR MF	100 OHM 5% 0.4W	* PHILIPS	2322 181 53101	01.175
R226	RESISTOR MF	820 OHM 5% 0.4W	PHILIPS	2322 181 53821	01.197
R227	RESISTOR MF	390 OHM 5% 0.4W	* PHILIPS	2322 181 53391	01.189
R228	RESISTOR	120 OHM 5% 0.33W	PHILIPS	2322 181 33121	01.677
R229	RESISTOR MF	1k OHM 5% 0.4W	* PHILIPS	2322 181 53102	01.200
R230	RESISTOR MF	3.3k OHM 5% 0.4W	* PHILIPS	2322 181 53332	01.212
R231	RESISTOR MF	12k OHM 5% 0.4W	* PHILIPS	2322 181 53123	01.227
R232	RESISTOR MF	3.3k OHM 5% 0.4W	* PHILIPS	2322 181 53332	01.212
R233	RESISTOR MF	2.2k OHM 5% 0.4W	* PHILIPS	2322 181 53222	01.208
R234	RESISTOR MF	120 OHM 5% 0.4W	* PHILIPS	2322 181 53121	01.177
T201	TRANSISTOR RF	BFW92A	TFK	BFW92A	29.160
T202	TRANSISTOR JFET	TIS88A3 TO-92	MOTORPLA	TM 00 044-3	29.737
T203	TRANSISTOR AF	BC548B NPN TO-92	ITT	BC548B	28.076
T204	TRANSISTOR RF	BFW92A	TFK	BFW92A	29.160

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
T205	TRANSISTOR	BC558B	ITT*	BC558B	28.100
T206	TRANSISTOR AF	BC548B NPN TO-92	ITT	BC548B	28.076
T207	TRANSISTOR	BC549B	ITT/NAT.*	BC549B	28.080
T208	TRANSISTOR	BC549B	ITT/NAT.*	BC549B	28.080
T209	TRANSISTOR AF	BC548B NPN TO-92	ITT	BC548B	28.076
T210	TRANSISTOR	BC558B	ITT*	BC558B	28.100

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
	TX-EXCITER	MODULE 300	ESPERA	5-0-23695D	600100
C301	CAPACITOR CERAMIC	4n7F 20% CL2 50VDC	NKE	DT 380 758S D 472 M 50V FLAT PACK	15.165
C302	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758S B 221K500V FLAT PACK	16.090
C303	CAPACITOR CERAMIC	39pF 5% N150 500V	#KCK	HM74SJPH390J	15.095
C304	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758S B 221K500V FLAT PACK	16.090
C305	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758S B 221K500V FLAT PACK	16.090
C306	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758S B 221K500V FLAT PACK	16.090
C307	CAPACITOR CERAMIC	33pF 5% N150 400V	#KCK	HM74SJPH330J	15.083
C308	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758S B 221K500V FLAT PACK	16.090
C309	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
C310	CAPACITOR CERAMIC	18pF 5% NPO 500VDC	NKE	DT 360 758S CH 180 J 500V FLAT PACK	15.060
C311	CAPACITOR CERAMIC	15pF 5% NPO 500VDC	NKE	DT 360 758L CH 150 J 500V FLAT PACK	15.590
C312	CAPACITOR MKT	10nF 10% 400V	SIEMENS	B32510-D6103-K000	11.381
C313	CAPACITOR MKT	10nF 10% 400V	SIEMENS	B32510-D6103-K000	11.381
C314	CAPACITOR MKT	10nF 10% 400V	SIEMENS	B32510-D6103-K000	11.381
C315	CAPACITOR MKT	220nF 10% 100V	SIEMENS	B32510-D1224-K000	11.225
C316	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758S B 221K500V FLAT PACK	16.090
C317	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758S B 221K500V FLAT PACK	16.090
C318	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758S B 221K500V FLAT PACK	16.090
C319	CAPACITOR MKT	220nF 10% 100V	SIEMENS	B32510-D1224-K000	11.225
C320	CAPACITOR CERAMIC	1nF 10% 50VDC CL2	NKE	DT 340 758L B 102 K 50V FLAT PACK	16.160
C321	CAPACITOR ELECTROLYTIC	33uF 20% 16VDC	ERO	EKI 00 AA 233 D M9	14.518
C322	CAPACITOR MKT	10nF 10% 400V	SIEMENS	B32510-D6103-K000	11.381
C323	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758S B 221K500V FLAT PACK	16.090
C324	CAPACITOR MKT	10nF 10% 400V	SIEMENS	B32510-D6103-K000	11.381
C325	CAPACITOR POLYSTYRENE	82pF 1% 630V	#PHILIPS	2222 431 88209	10.398
C326	CAPACITOR CERAMIC	180pF 5% N33 25V	#FERROPERM	9/0213/8	15.788
C327	CAPACITOR POLYSTYRENE	180pF 1% 630VDC	PHILIPS	2222 431 81801	10.407

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
C328	CAPACITOR CERAMIC	180pF 5% N33 25V	#FERROPERM	9/0213/8	15.788
C329	CAPACITOR MKT	10nF 10% 400V	SIEMENS	B32510-D6103-K000	11.381
C330	CAPACITOR STYROFLEX	47pF 2/5% 160V	SIEMENS	B31063-B1470-H000	10.168
C331	CAPACITOR TRIMMING	2-18pF PTFE	DAU	107.2901.018	17.100
C332	CAPACITOR CERAMIC	27pF 5% N150 50VDC	NKE	DT 350 758L PH 270 J 50V FLAT PACK	15.812
C333	CAPACITOR CERAMIC	12pF 5% NPO 500VDC	NKE	DT 350 758L CH 120 J 500V FLAT PACK	15.575
C334	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758S B 221K500V FLAT PACK	16.090
C335	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758S B 221K500V FLAT PACK	16.090
C336	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758S B 221K500V FLAT PACK	16.090
C337	CAPACITOR ELECTROLYTIC	33uF 20% 16VDC	ERO	EKI 00 AA 233 D M9	14.518
C338	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758S B 221K500V FLAT PACK	16.090
C339	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758S B 221K500V FLAT PACK	16.090
C340	CAPACITOR CERAMIC	12pF 5% NPO 500VDC	NKE	DT 350 758L CH 120 J 500V FLAT PACK	15.575
C341	CAPACITOR CERAMIC	5.1pF +-.25pF N150 400V	FERROPERM	9/0116/9	16.107
C342	CAPACITOR CERAMIC	10pF 5% N150 400V	FERROPERM	9/0116/9	16.113
C343	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758S B 221K500V FLAT PACK	16.090
C344	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758S B 221K500V FLAT PACK	16.090
C345	CAPACITOR CERAMIC	8.2pF +-.25pF N150 400V	FERROPERM	9/0116/9	16.112
C346	CAPACITOR ELECTROLYTIC	4.7uF 20% 50VDC	SANOY	50-MV-4.7-HA+TS	14.510
C347	CAPACITOR MKT	3.3nF 5% 400V	ERO*	MKT1818-233/634	11.371
C348	CAPACITOR MKT	33nF 5% 250V	SIEMENS	B32510-D3333-J000	11.497
C349	CAPACITOR CERAMIC	100pF 5% N150 500V	#KCK	HM11SJPH101J	15.132
C350	CAPACITOR ELECTROLYTIC	1uF 20% 50VDC	SANOY	50-MV-1-HA+TS	14.506
C351	CAPACITOR POLYSTYRENE	8/2nF 1% 160V	#PHILIPS	2222 429 88202	10.298
C352	CAPACITOR CERAMIC	10nF -20/+80% 40V	FERROPERM	9/0141/8	15.740
C353	CAPACITOR MKT	100nF 10% 100V	SIEMENS*	B32510-D1104-K000	11.219
C354	CAPACITOR ELECTROLYTIC	0.22uF 20% 50VDC	ERO	EKI 00 AA 022 H M9	14.502
C355	CAPACITOR MKT	220nF 10% 100V	SIEMENS	B32510-D1224-K000	11.225
C356	CAPACITOR MKT	10nF 10% 400V	SIEMENS	B32510-D6103-K000	11.381
L309	COIL	TL375	S.P.RADIO	TL375	400375
L310	COIL	TL376	S.P.RADIO	TL376	400376
D301	DIODE	BAW62 HIGH SPEED	PHILIPS	BAW62-143	25.350
D302	DIODE CAPACITANCE	S P RADIO C1037	ITT	BB139AT-19321 SP C1037	26.110

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
D303	DIODE	BAW62 HIGH SPEED	PHILIPS	BAW62-143	25.350
FP301	FERRITE BEAD	Ø3,7xØ1.2x3.5mm GRADE 3B	PHILIPS	4322 020 34400	35.180
FP302	FERRITE BEAD	Ø3.7xØ1.2x3.5mm GRADE 4B1	PHILIPS	4322 020 34420	35.181
IC301	INTEGRATED CIRCUIT	SN74LS293N	TEXAS*	74LS293N	34.260
IC302	INTEGRATED CIRCUIT	SN74LS113AN	TEXAS*	SN74LS113AN	33.841
IC303	INTEGRATED CIRCUIT	SN74LS10N	TEXAS*	74LS10N	33.534
IC304	INTEGRATED CIRCUIT	SN74LS113AN	TEXAS*	SN74LS113AN	33.841
IC305	INTEGRATED CIRCUIT	SN74LS113AN	TEXAS*	SN74LS113AN	33.841
IC306	INTEGRATED CIRCUIT	SN74LS290N	TEXAS*	SN74LS290N	34.251
L301	CHOKE	2.2uH 10%	FERROPERM	1582	20.131
L302	CHOKE	15uH 10%	FERROPERM	1582	20.152
L303	CHOKE	15uH 10%	FERROPERM	1582	20.152
L304	CHOKE	1uH 10%	FERROPERM	1582	20.115
L305	CHOKE	0.47uH 10%	SIEMENS *	T78108-T3471-K	20.075
L311	CHOKE	4u7H 10%	FASTRON	MICC-4R7K-02	20.137
R301	RESISTOR	47 OHM 5% 0.33W	PHILIPS	2322 181 33479	01.666
R302	RESISTOR MF	12 OHM 5% 0.4W	PHILIPS	2322 181 53129	01.152
R303	RESISTOR	470 OHM 5% 0.33W	PHILIPS	2322 181 33471	01.691
R304	RESISTOR	2.2 KOHM 5% 0.33W	PHILIPS	2322 181 33222	01.708
R305	RESISTOR MF	56 OHM 5% 0.4W	* PHILIPS	2322 181 53569	01.168
R306	RESISTOR	2.2 KOHM 5% 0.33W	PHILIPS	2322 181 33222	01.708
R307	RESISTOR MF	82 OHM 5% 0.4W	* PHILIPS	2322 181 53829	01.172
R308	RESISTOR	470 OHM 5% 0.33W	PHILIPS	2322 181 33471	01.691
R309	RESISTOR MF	12 OHM 5% 0.4W	PHILIPS	2322 181 53129	01.152
R310	RESISTOR	1.5 KOHM 5% 0.33W	PHILIPS	2322 181 33152	01.704
R311	RESISTOR MF	3.9k OHM 5% 0.4W	* PHILIPS	2322 181 53392	01.214
R312	RESISTOR	1.2 KOHM 5% 0.33W	PHILIPS	2322 181 33122	01.702
R313	RESISTOR MF	270 OHM 5% 0.4W	PHILIPS	2322 181 53271	01.185
R314	RESISTOR MF	56 OHM 5% 0.4W	* PHILIPS	2322 181 53569	01.168
R315	RESISTOR	2.2 KOHM 5% 0.33W	PHILIPS	2322 181 33222	01.708
R316	RESISTOR MF	33 OHM 5% 0.4W	PHILIPS	2322 181 53339	01.162
R317	RESISTOR MF	82 OHM 5% 0.4W	* PHILIPS	2322 181 53829	01.172
R318	RESISTOR	560 OHM 5% 0.33W	PHILIPS	2322 181 33561	01.693
R319	RESISTOR MF	3k3 OHM 5% 0.4W	PHILIPS	2322 181 53332	01.212
R320	RESISTOR MF	1k0 OHM 5% 0.4W	PHILIPS	2322 181 53102	01.200
R321	RESISTOR MF	47k OHM 5% 0.4W	* PHILIPS	2322 181 53473	01.241
R322	RESISTOR	2.2 KOHM 5% 0.33W	PHILIPS	2322 181 33222	01.708
R323	RESISTOR MF	1k0 OHM 5% 0.4W	PHILIPS	2322 181 53102	01.200
R324	RESISTOR	3.3 KOHM 5% 0.33W	PHILIPS	2322 181 33332	01.712
R325	RESISTOR	390 OHM 5% 0.33W	PHILIPS	2322 181 33391	01.689
R326	RESISTOR MF	150 OHM 5% 0.4W	* PHILIPS	2322 181 53151	01.179
R327	RESISTOR MF	1k0 OHM 5% 0.4W	PHILIPS	2322 181 53102	01.200
R328	RESISTOR	560 OHM 5% 0.33W	PHILIPS	2322 181 33561	01.693
R329	RESISTOR MF	2k2 OHM 5% 0.4W	PHILIPS	2322 181 53222	01.208

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
R330	RESISTOR MF	10k OHM 5% 0.4W	PHILIPS	2322 181 53103	01.225
R331	RESISTOR MF	15k OHM 5% 0.4W	* PHILIPS	2322 181 53153	01.229
R332	RESISTOR MF	10 OHM 5% 0.4W	PHILIPS	2322 181 53109	01.150
R333	RESISTOR MF	330 OHM 5% 0.4W	PHILIPS	2322 181 53331	01.187
R334	RESISTOR MF	33 OHM 5% 0.4W	PHILIPS	2322 181 53339	01.162
R335	RESISTOR	22 OHM 5% 0.33W	PHILIPS	2322 181 33229	01.658
R336	RESISTOR MF	560 OHM 5% 0.4W	* PHILIPS	2322 181 53561	01.193
R337	RESISTOR MF	2k2 OHM 5% 0.4W	PHILIPS	2322 181 53222	01.208
R338	RESISTOR MF	100 OHM 5% 0.4W	PHILIPS	2322 181 53101	01.175
R339	RESISTOR MF	82 OHM 5% 0.4W	* PHILIPS	2322 181 53829	01.172
R341	PRESET CERMET	200 OHM 10% 0.5W	BOURNS	3386P-1-201	07.884
R342	RESISTOR MF	10k OHM 5% 0.4W	PHILIPS	2322 181 53103	01.225
R343	RESISTOR MF	560 OHM 5% 0.4W	* PHILIPS	2322 181 53561	01.193
R344	RESISTOR	2.7 KOHM 5% 0.33W	PHILIPS	2322 181 33272	01.710
R345	RESISTOR	270 OHM 5% 0.33W	PHILIPS	2322 181 33271	01.685
R346	RESISTOR	2.2 KOHM 5% 0.33W	PHILIPS	2322 181 33222	01.708
R347	RESISTOR	3.9 KOHM 5% 0.33W	PHILIPS	2322 181 33392	01.714
R348	RESISTOR MF	10k OHM 5% 0.4W	PHILIPS	2322 181 53103	01.225
R349	RESISTOR	6.81 KOHM 1% 0.4W	*PHILIPS	2322 156 16812	03.419
R350	RESISTOR	6.81 KOHM 1% 0.4W	*PHILIPS	2322 156 16812	03.419
R351	RESISTOR	82 OHM 5% 0.33W	PHILIPS	2322 181 33829	01.672
R352	RESISTOR	1.18 KOHM 1% 0.4W	*PHILIPS	2322 156 11182	03.226
R353	RESISTOR	6.81 KOHM 1% 0.4W	*PHILIPS	2322 156 16812	03.419
R354	RESISTOR MF	4k7 OHM 5% 0.4W	PHILIPS	2322 181 53472	01.216
R355	RESISTOR	22 KOHM 5% 0.33W	PHILIPS	2322 181 33223	01.733
R356	RESISTOR	15 KOHM 5% 0.33W	PHILIPS	2322 181 33153	01.729
R357	RESISTOR MF	10 OHM 5% 0.4W	PHILIPS	2322 181 53109	01.150
T301	TRANSISTOR	BF 506	SIEMENS	BF506	28.202
T302	TRANSISTOR	BF 506	SIEMENS	BF506	28.202
T303	TRANSISTOR	BF 506	SIEMENS	BF506	28.202
T304	TRANSISTOR RF	BF199	PHILIPS	BF199	28.178
T305	TRANSISTOR RF SWITCH	2N2369A	PHILIPS	2N2369A	28.315
T306	TRANSISTOR RF SWITCH	2N2369A	PHILIPS	2N2369A	28.315
T307	TRANSISTOR	BF 506	SIEMENS	BF506	28.202
T308	TRANSISTOR	BF509	AEG*	BF509	28.203
T309	TRANSISTOR	J310	SILICONIX	J310	29.725
T310	TRANSISTOR	BF979S	SIEMENS	BF979S	28.250
T311	TRANSISTOR JFET	TIS88A3 TO-92	MOTORPLA	TM 00 044-3	29.737
T312	TRANSISTOR AF	BC558B	PHILIPS	BC558B	28.100
T313	TRANSISTOR	BC549C	PHILIPS*	BC549C	28.082
T314	TRANSISTOR	BC549C	PHILIPS*	BC549C	28.082
X301	CRYSTAL	21.0 MHz NC-25B	DANTRONIC*	21MHz NC25B SP.SPEC.C1035	39.838
L306	COIL	TL374	S.P.RADIO	6-0-23690	400374

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
L307	COIL	TL373	S.P.RADIO	6-0-23689	400373
L308	COIL	TL372	S.P.RADIO	6-0-23688	400372

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
	TX-POWER AMPLIFIER	MODULE 400 & 500	ESPERA	5-0-23973A	600013
C401	CAPACITOR CERAMIC	18pF 5% NPO 500VDC	NKE	DT 360 758S CH 180 J 500V FLAT PACK	15.060
C402	CAPACITOR CERAMIC	33pF 5% NPO 400V	FERROPERM	9/0112,9	15.608
C403	CAPACITOR CERAMIC	33pF 5% NPO 400V	FERROPERM	9/0112,9	15.608
C404	CAPACITOR CERAMIC	18pF 5% NPO 500VDC	NKE	DT 360 758S CH 180 J 500V FLAT PACK	15.060
C405	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C406	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C407	CAPACITOR TRIMMING	6-60pF PTFE	DAU	109.4901.060	17.210
C408	CAPACITOR TRIMMING	3.5-38pF PTFE	DAU	109.3901.038	17.120
C409	CAPACITOR MULTI LAYER	22pF 10% HQ 200V	TEKELEC	101S41L220JP M/FORT. TERMINALER	16.271
C410	CAPACITOR MKT	470nF 10% 100V	SIEMENS	B32511-D1474-K000	11.388
C411	CAPACITOR MULTI LAYER	68pF 10% HQ 200V	TEKELEC	101S41L680JP M/FORT. TERMINALER	16.273
C412	CAPACITOR MULTI LAYER	68pF 10% HQ 200V	TEKELEC	101S41L680JP M/FORT. TERMINALER	16.273
C413	CAPACITOR TRIMMING	3.9-27pF PTFE	DAU	107.3901.027	17.110
C414	CAPACITOR MKT	33nF 20% 63V	SIEMENS	B32529-B333-K-289	11.298
C415	CAPACITOR MULTI LAYER	33pF 10% HQ 200V	TEKELEC	101S41L330KP M/FORT. TERMINALER	16.272
C417	CAPACITOR ELECTROLYTIC	4.7uF 20% 50VDC	SANOY	50-MV-4.7-HA+TS	14.510
C418	CAPACITOR MULTI LAYER	33pF 10% HQ 200V	TEKELEC	101S41L330KP M/FORT. TERMINALER	16.272
C419	CAPACITOR TRIMMING	6-60pF PTFE	DAU	109.4901.060	17.210
C420	CAPACITOR ELECTROLYTIC	4.7uF 20% 50VDC	SANOY	50-MV-4.7-HA+TS	14.510
C421	CAPACITOR MULTI LAYER	56pF 10% NPO 100V	KCK*	C1C31 P2ACG 560K	16.285
C422	CAPACITOR MKT	33nF 20% 63V	SIEMENS	B32529-B333-K-289	11.298
C423	CAPACITOR TRIMMING	5-45pF PTFE	DAU	107.5901.045	17.130
C424	CAPACITOR CERAMIC	56pF 5% NPO	#KCK	HE60SJCH560J	15.111
C425	VHF PI-FILTER		FERROPERM	9/0168,50 PI-FILTER	16.515
C426	VHF PI-FILTER		FERROPERM	9/0168,50 PI-FILTER	16.515
C427	VHF PI-FILTER		FERROPERM	9/0168,50 PI-FILTER	16.515
C428	CAPACITOR MULTI LAYER	33pF 10% HQ 200V	TEKELEC	101S41L330KP M/FORT. TERMINALER	16.272
C429	CAPACITOR MULTI LAYER	82pF 10% HQ 200V	TEKELEC	101S41L820JP M/FORT. TERMINALER	16.274
FP401	FERRITE BEAD	Ø3,7xØ1.2x3.5mm GRADE 3B	PHILIPS	4322 020 34400	35.180
FP402	FERRITE BEAD	Ø3,7xØ1.2x3.5mm GRADE 3B	PHILIPS	4322 020 34400	35.180

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
FP403	FERRITE BEAD	Ø3,7xØ1.2x3.5mm GRADE 3B	PHILIPS	4322 020 34400	35.180
L401	COIL	TL367	S.P.RADIO	6-0-23639	400367
L402	COIL	TL367	S.P.RADIO	6-0-23639	400367
L403	COIL	TL367	S.P.RADIO	6-0-23639	400367
L404	COIL PRINTED			5-0-23973A	51.784
L405	COIL PRINTED			5-0-23973A	51.784
L406	COIL	TL067	S.P.RADIO	6-0-20854A 400067=20.053	400067
L407	CHOKE	0.15uH 10%	SIEMENS *	T78108-T3151-K	20.101
L409	CHOKE	0.15uH 10%	SIEMENS *	T78108-T3151-K	20.101
L410	COIL	TL067	S.P.RADIO	6-0-20854A 400067=20.053	400067
L411	CHOKE	0.15uH 10%	SIEMENS *	T78108-T3151-K	20.101
L412	COIL	TL067	S.P.RADIO	6-0-20854A 400067=20.053	400067
L413	COIL PRINTED			5-0-23973A	51.784
L414	CHOKE	0.15uH 10%	SIEMENS *	T78108-T3151-K	20.101
L415	CHOKE	0.15uH 10%	SIEMENS *	T78108-T3151-K	20.101
L416	COIL	TL366	S.P.RADIO	6-0-23638	400366
L417	COIL PRINTED			5-0-23973A	51.784
L419	CHOKE	0.33uH 10%	SIEMENS *	T78108-T3331-K	20.107
L420	COIL PRINTED			5-0-23973A	51.784
L421	COIL PRINTED			5-0-23973A	51.784
R401	RESISTOR MF	22 OHM 5% 0.4W	PHILIPS	2322 181 53229	01.158
R402	RESISTOR MF	2k2 OHM 5% 0.4W	PHILIPS	2322 181 53222	01.208
R403	RESISTOR MF	68 OHM 5% 0.4W	* PHILIPS	2322 181 53689	01.170
R404	RESISTOR MF	22 OHM 5% 0.4W	PHILIPS	2322 181 53229	01.158
R405	RESISTOR MF	180 OHM 5% 0.4W	PHILIPS	2322 181 53181	01.181
R406	RESISTOR MF	82 OHM 5% 0.4W	* PHILIPS	2322 181 53829	01.172
T401	TRANSISTOR	MRF240	MOTOROLA	MRF 240	29.252
T402	TRANSISTOR	MRF237	MOTOROLA	MRF237	29.249
T403	TRANSISTOR	2N4427	MOTOROLA*	2N4427	28.330
C501	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
C502	CAPACITOR CERAMIC	470pF 10% 500VDC	NKE	DT35-0465 758L 471BK 500V FLAT PACK	16.095
D501	DIODE GENERAL PURPOSE	BAV21 200V/0.25A	PHILIPS	BAV21	25.340
RE501	RELAY	12VDC 2A 2SHIFT	ERNI	REL35-A1-2W1.0P-12VDC	21.193

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
	INTERFACE UNIT	MODULE 600	ESPERA	5-0-24052F	600015
C601	CAPACITOR MKT	100nF 10% 100V	SIEMENS*	B32510-D1104-K000	11.219
C602	CAPACITOR MKT	330nF 10% 100V	SIEMENS	B32511-D1334-K000	11.229
C603	CAPACITOR MKT	330nF 10% 100V	SIEMENS	B32511-D1334-K000	11.229
C604	CAPACITOR CERAMIC	470pF 10% CL2 50VDC	NKE	DT 330 758L B 471 K 50V FLAT PACK	16.158
C605	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
C606	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
C607	CAPACITOR ELECTROLYTIC	1000uF -10/+50% 25V	RUBYCON*	25TTMS1000M	14.580
C608	CAPACITOR MKT	100nF 10% 100V	SIEMENS*	B32510-D1104-K000	11.219
C609	CAPACITOR MKT	100nF 10% 100V	SIEMENS*	B32510-D1104-K000	11.219
C610	CAPACITOR MKT	220nF 10% 100V	SIEMENS	B32511-D1224-K000	11.227
C611	CAPACITOR ELECTROLYTIC	4.7uF 20% 50VDC	SANOY	50-MV-4.7-HA+TS	14.510
C612	CAPACITOR MKT	100nF 10% 100V	SIEMENS*	B32510-D1104-K000	11.219
C613	CAPACITOR ELECTROLYTIC	100uF -10/+50% 25VDC	ERO	EKM 00 CC 310 E G5	14.610
C614	CAPACITOR ELECTROLYTIC	1uF 20% 50VDC	SANOY	50-MV-1-HA+TS	14.506
C615	CAPACITOR ELECTROLYTIC	0.47uF 20% 50VDC	ERO	EKI 00 AA 047 H M9	14.504
C616	CAPACITOR MKT	470nF 10% 100V	SIEMENS	B32511-D1474-K000	11.388
C617	CAPACITOR MKT	22nF 10% 250V	SIEMENS	B32510-D3223-K000	11.297
C618	CAPACITOR ELECTROLYTIC	4.7uF 20% 50VDC	SANOY	50-MV-4.7-HA+TS	14.510
C619	CAPACITOR ELECTROLYTIC	10uF 20% 35VDC	SANOY	35-MV-10-HA+TS	14.512
C620	CAPACITOR MKT	10nF 10% 400V	SIEMENS	B32510-D6103-K000	11.381
C621	CAPACITOR POLYSTYRENE	1.5nF 1% 160V	#PHILIPS	2222 429 81502	10.280
C622	CAPACITOR ELECTROLYTIC	100uF 20% 10VDC	SANYO	10 MV 100 HA +TS	14.607
C623	CAPACITOR ELECTROLYTIC	100uF -10/+50% 25VDC	ERO	EKM 00 CC 310 E G5	14.610
C624	CAPACITOR POLYSTYRENE	1.3nF 1% 160V	#PHILIPS	2222 429 81302	10.279
C625	CAPACITOR MKT	220nF 10% 100V	SIEMENS	B32511-D1224-K000	11.227
C626	CAPACITOR POLYSTYRENE	15nF 1% 160V	#PHILIPS	2222 429 81503	10.304
C627	CAPACITOR ELECTROLYTIC	100uF -10/+50% 25VDC	ERO	EKM 00 CC 310 E G5	14.610
C628	CAPACITOR ELECTROLYTIC	10uF 20% 35VDC	SANOY	35-MV-10-HA+TS	14.512
C629	CAPACITOR POLYSTYRENE	8,2nF 1% 160V	#PHILIPS	2222 429 88202	10.298
C630	CAPACITOR POLYSTYRENE	8,2nF 1% 160V	#PHILIPS	2222 429 88202	10.298
C631	CAPACITOR POLYSTYRENE	15nF 1% 160V	#PHILIPS	2222 429 81503	10.304
C632	CAPACITOR ELECTROLYTIC	10uF 20% 35VDC	SANOY	35-MV-10-HA+TS	14.512
C633	CAPACITOR MKT	100nF 10% 100V	SIEMENS*	B32510-D1104-K000	11.219
C634	CAPACITOR POLYSTYRENE	1n00F 1% 250VDC	PHILIPS	2222 430 81002	10.350
C635	CAPACITOR POLYSTYRENE	220pF 1% 630VDC	PHILIPS	2222 431 82201	10.409
C636	CAPACITOR POLYSTYRENE	1n00F 1% 250VDC	PHILIPS	2222 430 81002	10.350
C637	CAPACITOR MKT	22nF 10% 250V	SIEMENS	B32510-D3223-K000	11.297
C638	CAPACITOR POLYSTYRENE	3.3nF 1% 160V	#PHILIPS	2222 429 83302	10.288

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
C639	CAPACITOR MKT	22nF 10% 250V	SIEMENS	B32510-D3223-K000	11.297
C640	CAPACITOR MKT	22nF 10% 250V	SIEMENS	B32510-D3223-K000	11.297
C641	CAPACITOR MKT	220nF 10% 100V	SIEMENS	B32511-D1224-K000	11.227
C642	CAPACITOR MKT	220nF 10% 100V	SIEMENS	B32511-D1224-K000	11.227
C643	CAPACITOR ELECTROLYTIC	0.47uF 20% 50VDC	ERO	EKI 00 AA 047 H M9	14.504
C644	CAPACITOR MKT	220nF 10% 100V	SIEMENS	B32511-D1224-K000	11.227
C645	CAPACITOR MKT	220nF 10% 100V	SIEMENS	B32511-D1224-K000	11.227
C646	CAPACITOR CERAMIC	4n7F 20% CL2 50VDC	NKE	DT 380 758S D 472 M 50V FLAT PACK	15.165
C647	CAPACITOR MKT	100nF 10% 100V	SIEMENS*	B32510-D1104-K000	11.219
C648	CAPACITOR ELECTROLYTIC	33uF 20% 16VDC	ERO	EKI 00 AA 233 D M9	14.518
C649	CAPACITOR POLYSTYRENE	220pF 1% 630VDC	PHILIPS	2222 431 82201	10.409
C650	CAPACITOR ELECTROLYTIC	100uF -10/+50% 25VDC	ERO	EKM 00 CC 310 E G5	14.610
C651	CAPACITOR CERAMIC	100pF 20% 25V	FERROPERM	9/0212,8	16.182
C652	CAPACITOR MKT	220nF 10% 100V	SIEMENS	B32511-D1224-K000	11.227
C653	CAPACITOR ELECTROLYTIC	33uF 20% 35VDC	ERO	EKI 00 BB 233 F M9	14.520
C654	CAPACITOR MKT	100nF 10% 100V	SIEMENS*	B32510-D1104-K000	11.219
C655	CAPACITOR ELECTROLYTIC	10uF 20% 35VDC	SANOY	35-MV-10-HA+TS	14.512
C656	CAPACITOR CERAMIC	4n7F 20% CL2 50VDC	NKE	DT 380 758S D 472 M 50V FLAT PACK	15.165
C657	CAPACITOR ELECTROLYTIC	220uF -10/+50% 10VDC	ERO	EKM 00 CC 322 C G5	14.630
C658	CAPACITOR ELECTROLYTIC	33uF 20% 16VDC	ERO	EKI 00 AA 233 D M9	14.518
C659	CAPACITOR MKT	22nF 10% 250V	SIEMENS	B32510-D3223-K000	11.297
C660	CAPACITOR ELECTROLYTIC	220uF -10/+50% 10VDC	ERO	EKM 00 CC 322 C G5	14.630
C661	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758S B 221K500V FLAT PACK	16.090
C662	CAPACITOR MKT	100nF 10% 100V	SIEMENS*	B32510-D1104-K000	11.219
C663	CAPACITOR ELECTROLYTIC	100uF -10/+50% 25VDC	ERO	EKM 00 CC 310 E G5	14.610
C664	CAPACITOR ELECTROLYTIC	470uF -10/+50% 16V	ERO	EB 00 GC 347 D	14.572
C665	CAPACITOR MKT	100nF 10% 100V	SIEMENS*	B32510-D1104-K000	11.219
C666	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
C667	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
C668	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
C669	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
C670	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
C671	CAPACITOR CERAMIC	4n7F 20% CL2 50VDC	NKE	DT 380 758S D 472 M 50V FLAT PACK	15.165
C672	CAPACITOR CERAMIC	220pF 10% 500VDC CL2	NKE	DT35-0465 758S B 221K500V FLAT PACK	16.090

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
C673	CAPACITOR ELECTROLYTIC	220uF -10/+50% 16VDC	ERO	EKM 00 DC 322 D G5	14.640
C674	CAPACITOR ELECTROLYTIC	10uF 20% 35VDC	SANOY	35-MV-10-HA+TS	14.512
C675	CAPACITOR MKT	220nF 10% 63VDC	PHILIPS	2222 370 78224	11.095
C676	CAPACITOR CERAMIC	4n7F 20% CL2 50VDC	NKE	DT 380 758S D 472 M 50V FLAT PACK	15.165
D601	DIODE TRANSIENT ABSORBER	18V	MOTOROLA*	1N6277A	26.765
D602	DIODE	1N4148 HIGH SPEED	PHILIPS	1N4148-143	25.131
D603	DIODE	1N4148 HIGH SPEED	PHILIPS	1N4148-143	25.131
D604	DIODE GENERAL PURPOSE	BAV21 200V/0.25A	PHILIPS	BAV21	25.340
D605	DIODE ZENER	3.6V	PHILIPS	BZX75C3V6	26.911
D606	DIODE ZENER	3.6V	PHILIPS	BZX75C3V6	26.911
D607	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
D608	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
D609	DIODE ZENER	5.1V 5% 0.4W	PHILIPS	BZX79C5V1	26.527
D610	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
D611	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
D612	DIODE HIGH SPEED	1N4448	PHILIPS	1N4448	25.147
D613	DIODE	BAW62 HIGH SPEED	PHILIPS	BAW62-143	25.350
D614	DIODE	BAW62 HIGH SPEED	PHILIPS	BAW62-143	25.350
D615	DIODE	BAW62 HIGH SPEED	PHILIPS	BAW62-143	25.350
D616	DIODE	1N4148 HIGH SPEED	PHILIPS	1N4148-143	25.131
D619	DIODE	1N4148 HIGH SPEED	PHILIPS	1N4148-143	25.131
D620	DIODE	1N4148 HIGH SPEED	PHILIPS	1N4148-143	25.131
F601	FUSE	8A.F. Ø5x20mm	ELU *	171 100 8A.F. DIN 41571	45.561
IC601	VOLTAGE REGULATOR	FIXED 5V/1A	MOTOROLA	MC7805CT	31.250
IC602	INTEGRATED CIRCUIT	TDA2002V	SGS*	TDA2002V	31.480
IC603	DUAL OP AMP	LM358N	TEXAS	LM358P	31.100
IC604	INTEGRATED CIRCUIT	MC14094BCP	RCA*	CD4094	33.305
IC605	INTEGRATED CIRCUIT	DUAL OPERATIONAL AMP.	TEXAS	MC1458P	31.215
IC606	TRANSISTOR ARRAY	3046	RCA	CA3046E	31.025
IC607	INTEGRATED CIRCUIT	QUAD VOLTAGE COMPERATOR	TEXAS*	LM339N	31.075
IC608	INTEGRATED CIRCUIT	MC14001BCP	MOTOROLA	MC14001BCP	33.010
IC609	INTEGRATED CIRCUIT	MCM2802P	MOTOROLA	MCM2802P	33.495
IC610	INTEGRATED CIRCUIT	MCM2802P	MOTOROLA	MCM2802P	33.495
IC611	INTEGRATED CIRCUIT	MC1413P	TEXAS*	ULN2003A	31.077
IC612	DUAL TYPE D FLIP-FLOP	MC14013BCP	SIGNETICS*	HEF4013BP	33.056
IC613	INTEGRATED CIRCUIT	QUAD ANALOG SWITCH	RCA	CD4066BE	33.232
IC614	INTEGRATED CIRCUIT	LF347N	#NATIOPNAL	LF347N	31.530
IC615	INTEGRATED CIRCUIT	DUAL DIFF.COMPARATOR	TEXAS	LM393P	31.105
IC616	INTEGRATED CIRCUIT	MC14069UBCP	MOTOROLA	MC14069UBCP	33.235
IC617	QUAD OP.AMP.	324	TEXAS	LM324N	31.065
IC618	INTEGRATED CIRCUIT	MC14569BCP	* MOTOROLA	MC14569BCP	33.449
IC619	INTEGRATED CIRCUIT	MAIN PROCESSOR	MOTOROLA	SP C1038	32.555

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
L601	CHOKE	100uH 5% SD75	NEOSID	MOTOROLA NO.SC93819P 006122 12	20.169
P601	PLUG	2 POLES	AMP	0-826375-2	78.102
P602	PLUG (MALE)	11 POLE	AMP	1-826375-1	78.111
P603	PLUG (MALE)	9 POLE	AMP	0-826375-9	78.109
P604	PLUG (MALE)	10 POLE	AMP	1-826375-0	78.110
P605	PLUG	6 POLE	AMP	0-826375-6	78.106
P606	PLUG (MALE)	7 POLE	AMP	0-826375-7	78.107
P607	PLUG	12 POLE	AMP	1-826383-2	78.030
R601	RESISTOR MF	10k OHM 5% 0.4W	PHILIPS	2322 181 53103	01.225
R603	RESISTOR MF	1k0 OHM 5% 0.4W	PHILIPS	2322 181 53102	01.200
R604	RESISTOR MF	1k0 OHM 5% 0.4W	PHILIPS	2322 181 53102	01.200
R605	RESISTOR MF	2k2 OHM 5% 0.4W	PHILIPS	2322 181 53222	01.208
R606	RESISTOR MF	33k OHM 5% 0.4W	PHILIPS	2322 181 53333	01.237
R607	RESISTOR MF	10k OHM 5% 0.4W	PHILIPS	2322 181 53103	01.225
R608	RESISTOR MF	10k OHM 5% 0.4W	PHILIPS	2322 181 53103	01.225
R609	RESISTOR MF	1k0 OHM 5% 0.4W	PHILIPS	2322 181 53102	01.200
R610	RESISTOR MF	10k OHM 5% 0.4W	PHILIPS	2322 181 53103	01.225
R611	RESISTOR MF	12k OHM 5% 0.4W	PHILIPS	2322 181 53123	01.227
R612	RESISTOR MF	180k OHM 5% 0.4W	* PHILIPS	2322 181 53184	01.256
R613	RESISTOR MF	220k OHM 5% 0.4W	PHILIPS	2322 181 53224	01.258
R614	RESISTOR MF	470k OHM 5% 0.4W	PHILIPS	2322 181 53474	01.266
R615	RESISTOR MF	10k OHM 5% 0.4W	PHILIPS	2322 181 53103	01.225
R616	POTENTIOMETER TRIMMING	10 KOHM 20% 0.05W	PHILIPS	2322 410 03357	07.578
R617	RESISTOR MF	100k OHM 5% 0.4W	PHILIPS	2322 181 53104	01.250
R618	RESISTOR MF	470k OHM 5% 0.4W	PHILIPS	2322 181 53474	01.266
R619	RESISTOR MF	3k3 OHM 5% 0.4W	PHILIPS	2322 181 53332	01.212
R620	RESISTOR MF	3k3 OHM 5% 0.4W	PHILIPS	2322 181 53332	01.212
R621	RESISTOR MF	10k OHM 5% 0.4W	PHILIPS	2322 181 53103	01.225
R622	RESISTOR MF	18k OHM 5% 0.4W	* PHILIPS	2322 181 53183	01.231
R623	POTENTIOMETER TRIMMING	100 KOHM 20% 0.05W	PHILIPS	2322 410 03361	07.588
R624	RESISTOR MF	2k2 OHM 5% 0.4W	PHILIPS	2322 181 53222	01.208
R625	RESISTOR MF	220k OHM 5% 0.4W	PHILIPS	2322 181 53224	01.258
R626	RESISTOR MF	220k OHM 5% 0.4W	PHILIPS	2322 181 53224	01.258
R627	RESISTOR MF	12k OHM 5% 0.4W	PHILIPS	2322 181 53123	01.227
R628	RESISTOR MF	1k0 OHM 5% 0.4W	PHILIPS	2322 181 53102	01.200
R629	POTENTIOMETER TRIMMING	10 KOHM 20% 0.05W	PHILIPS	2322 410 03357	07.578
R630	RESISTOR MF	10k OHM 5% 0.4W	PHILIPS	2322 181 53103	01.225
R631	RESISTOR MF	10k OHM 5% 0.4W	PHILIPS	2322 181 53103	01.225
R632	RESISTOR MF	1k2 OHM 5% 0.4W	PHILIPS	2322 181 53122	01.202
R633	RESISTOR MF	2k2 OHM 5% 0.4W	PHILIPS	2322 181 53222	01.208
R634	RESISTOR MF	82k OHM 5% 0.4W	* PHILIPS	2322 181 53823	01.247
R635	RESISTOR MF	4k7 OHM 5% 0.4W	PHILIPS	2322 181 53472	01.216
R636	RESISTOR MF	470 OHM 5% 0.4W	PHILIPS	2322 181 53471	01.191

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
R637	RESISTOR MF	4k7 OHM 5% 0.4W	PHILIPS	2322 181 53472	01.216
R638	RESISTOR MF	10k OHM 5% 0.4W	PHILIPS	2322 181 53103	01.225
R639	RESISTOR MF	680k OHM 5% 0.4W	* PHILIPS	2322 181 53684	01.270
R640	RESISTOR MF	1 OHM 5% 0.5W	PHILIPS	2322 156 11008	03.125
R641	RESISTOR MF	1k0 OHM 5% 0.4W	PHILIPS	2322 181 53102	01.200
R642	RESISTOR MF	100 OHM 5% 0.4W	PHILIPS	2322 181 53101	01.175
R643	RESISTOR MF	82k OHM 5% 0.4W	* PHILIPS	2322 181 53823	01.247
R644	RESISTOR MF	2k2 OHM 5% 0.4W	PHILIPS	2322 181 53222	01.208
R645	RESISTOR MF	3k3 OHM 5% 0.4W	PHILIPS	2322 181 53332	01.212
R646	RESISTOR MF	2k2 OHM 5% 0.4W	PHILIPS	2322 181 53222	01.208
R647	RESISTOR MF	220 OHM 5% 0.4W	PHILIPS	2322 181 53221	01.183
R648	RESISTOR MF	1k0 OHM 5% 0.4W	PHILIPS	2322 181 53102	01.200
R649	RESISTOR MF	68 OHM 5% 0.4W	* PHILIPS	2322 181 53689	01.170
R650	RESISTOR MF	68k OHM 5% 0.4W	* PHILIPS	2322 181 53683	01.245
R651	RESISTOR MF	68k OHM 5% 0.4W	* PHILIPS	2322 181 53683	01.245
R652	RESISTOR	1 MOHM 1% 0.4W	*PHILIPS	2322 156 11005	03.604
R653	RESISTOR MF	680 OHM 5% 0.4W	PHILIPS	2322 181 53681	01.195
R654	RESISTOR MF	330 OHM 5% 0.4W	PHILIPS	2322 181 53331	01.187
R655	RESISTOR MF	100 OHM 5% 0.4W	PHILIPS	2322 181 53101	01.175
R656	RESISTOR MF	470 OHM 5% 0.4W	PHILIPS	2322 181 53471	01.191
R657	RESISTOR	15.8 KOHM 1% 0.4W	*PHILIPS	2322 156 11583	03.430
R658	RESISTOR	14 KOHM 1% 0.4W	*PHILIPS	2322 156 11403	03.432
R659	RESISTOR	15.8 KOHM 1% 0.4W	*PHILIPS	2322 156 11583	03.430
R660	RESISTOR	178 OHM 1% 0.4W	*PHILIPS	2322 156 11781	03.380
R661	POTENTIOMETER TRIMMING	1 KOHM 20% 0.05W	PHILIPS	2322 410 03354	07.570
R662	RESISTOR	11.5 KOHM 1% 0.4W	*PHILIPS	2322 156 11153	03.428
R663	POTENTIOMETER TRIMMING	2.2 KOHM 20% 0.05W	PHILIPS	2322 410 03355	07.572
R664	RESISTOR MF	1k2 OHM 5% 0.4W	PHILIPS	2322 181 53122	01.202
R665	POTENTIOMETER TRIMMING	470 OHM 20% 0.05W	PHILIPS	2322 410 03353	07.568
R666	RESISTOR MF	1k2 OHM 5% 0.4W	PHILIPS	2322 181 53122	01.202
R667	RESISTOR MF	560 OHM 5% 0.4W	* PHILIPS	2322 181 53561	01.193
R668	POTENTIOMETER TRIMMING	1 KOHM 20% 0.05W	PHILIPS	2322 410 03354	07.570
R669	RESISTOR MF	820 OHM 5% 0.4W	PHILIPS	2322 181 53821	01.197
R670	RESISTOR	464 OHM 1% 0.4W	*PHILIPS	2322 156 14641	03.392
R671	RESISTOR	15.8 KOHM 1% 0.4W	*PHILIPS	2322 156 11583	03.430
R672	RESISTOR MF	5k6 OHM 5% 0.4W	PHILIPS	2322 181 53562	01.218
R673	RESISTOR MF	18k OHM 5% 0.4W	* PHILIPS	2322 181 53183	01.231
R674	POTENTIOMETER TRIMMING	10 KOHM 20% 0.05W	PHILIPS	2322 410 03357	07.578
R675	RESISTOR MF	82k OHM 5% 0.4W	* PHILIPS	2322 181 53823	01.247
R676	RESISTOR MF	3.9k OHM 5% 0.4W	* PHILIPS	2322 181 53392	01.214
R677	RESISTOR MF	220k OHM 5% 0.4W	PHILIPS	2322 181 53224	01.258
R678	RESISTOR MF	47k OHM 5% 0.4W	* PHILIPS	2322 181 53473	01.241
R679	RESISTOR MF	47k OHM 5% 0.4W	* PHILIPS	2322 181 53473	01.241
R680	RESISTOR MF	10k OHM 5% 0.4W	PHILIPS	2322 181 53103	01.225

RT2047-1.89

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
R681	RESISTOR MF	180k OHM 5% 0.4W	* PHILIPS	2322 181 53184	01.256
R682	POTENTIOMETER TRIMMING	4.7 KOHM 20% 0.05W	PHILIPS	2322 410 03356	07.575
R683	RESISTOR MF	22k OHM 5% 0.4W	PHILIPS	2322 181 53223	01.233
R684	RESISTOR MF	680 OHM 5% 0.4W	PHILIPS	2322 181 53681	01.195
R685	RESISTOR MF	22k OHM 5% 0.4W	PHILIPS	2322 181 53223	01.233
R686	RESISTOR MF	100k OHM 5% 0.4W	PHILIPS	2322 181 53104	01.250
R687	RESISTOR MF	82k OHM 5% 0.4W	* PHILIPS	2322 181 53823	01.247
R688	RESISTOR MF	47k OHM 5% 0.4W	* PHILIPS	2322 181 53473	01.241
R689	RESISTOR MF	330k OHM 5% 0.4W	* PHILIPS	2322 181 53334	01.262
R690	RESISTOR MF	10k OHM 5% 0.4W	PHILIPS	2322 181 53103	01.225
R691	RESISTOR MF	10k OHM 5% 0.4W	PHILIPS	2322 181 53103	01.225
R692	RESISTOR MF	4k7 OHM 5% 0.4W	PHILIPS	2322 181 53472	01.216
R693	RESISTOR MF	100k OHM 5% 0.4W	PHILIPS	2322 181 53104	01.250
R694	RESISTOR MF	12k OHM 5% 0.4W	PHILIPS	2322 181 53123	01.227
R695	RESISTOR MF	39k OHM 5% 0.4W	* PHILIPS	2322 181 53393	01.239
R696	RESISTOR MF	1k5 OHM 5% 0.4W	* PHILIPS	2322 181 53152	01.204
R697	RESISTOR MF	18k OHM 5% 0.4W	* PHILIPS	2322 181 53183	01.231
R698	RESISTOR MF	8k2 OHM 5% 0.4W	PHILIPS	2322 181 53822	01.222
R699	RESISTOR MF	10k OHM 5% 0.4W	PHILIPS	2322 181 53103	01.225
R601a	RESISTOR MF	120k OHM 5% 0.4W	PHILIPS	2322 181 53124	01.252
R602a	RESISTOR MF	390k OHM 5% 0.4W	* PHILIPS	2322 181 53394	01.264
R603a	RESISTOR MF	10k OHM 5% 0.4W	PHILIPS	2322 181 53103	01.225
R604a	RESISTOR TEMP.SENSOR	2k0 10% AT 25 CENTIGRADE	SIEMENS	Q62705-K56 (KTY11-2D)	07.150
R605a	RESISTOR MF	39k OHM 5% 0.4W	* PHILIPS	2322 181 53393	01.239
R606a	RESISTOR MF	33k OHM 5% 0.4W	PHILIPS	2322 181 53333	01.237
R607a	RESISTOR MF	56k OHM 5% 0.4W	* PHILIPS	2322 181 53563	01.243
R608a	RESISTOR MF	18k OHM 5% 0.4W	* PHILIPS	2322 181 53183	01.231
R609a	RESISTOR MF	27k OHM 5% 0.4W	* PHILIPS	2322 181 53273	01.235
R610a	RESISTOR MF	4k7 OHM 5% 0.4W	PHILIPS	2322 181 53472	01.216
R611a	RESISTOR MF	4k7 OHM 5% 0.4W	PHILIPS	2322 181 53472	01.216
R612a	RESISTOR MF	220 OHM 5% 0.4W	PHILIPS	2322 181 53221	01.183
R613a	POTENTIOMETER TRIMMING	4.7 KOHM 20% 0.05W	PHILIPS	2322 410 03356	07.575
R614a	RESISTOR MF	10k OHM 5% 0.4W	PHILIPS	2322 181 53103	01.225
R615a	RESISTOR MF	2R2 OHM 5% 0.4W	PHILIPS	2322 181 53228	01.133
R616a	RESISTOR MF	3k3 OHM 5% 0.4W	PHILIPS	2322 181 53332	01.212
R617a	POTENTIOMETER TRIMMING	2.2 KOHM 20% 0.05W	PHILIPS	2322 410 03355	07.572
R618a	RESISTOR MF	3.9k OHM 5% 0.4W	* PHILIPS	2322 181 53392	01.214
R619a	RESISTOR MF	33k OHM 5% 0.4W	PHILIPS	2322 181 53333	01.237
R620a	RESISTOR MF	15k OHM 5% 0.4W	* PHILIPS	2322 181 53153	01.229
R621a	RESISTOR MF	100k OHM 5% 0.4W	PHILIPS	2322 181 53104	01.250
R622a	RESISTOR MF	10k OHM 5% 0.4W	PHILIPS	2322 181 53103	01.225
R623a	RESISTOR MF	10k OHM 5% 0.4W	PHILIPS	2322 181 53103	01.225
R624a	RESISTOR	178 OHM 1% 0.4W	*PHILIPS	2322 156 11781	03.380
R625a	RESISTOR MF	3k3 OHM 5% 0.4W	PHILIPS	2322 181 53332	01.212

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
R626a	RESISTOR MF	2k2 OHM 5% 0.4W	PHILIPS	2322 181 53222	01.208
R627a	RESISTOR MF	2k2 OHM 5% 0.4W	PHILIPS	2322 181 53222	01.208
R628a	RESISTOR	178 OHM 1% 0.4W	*PHILIPS	2322 156 11781	03.380
R629a	RESISTOR MF	6.8 OHM 5% 0.4W	* PHILIPS	2322 181 53688	01.145
R630a	RESISTOR MF	220 OHM 5% 0.4W	PHILIPS	2322 181 53221	01.183
R631a	RESISTOR	63.4 KOHM 1% 0.4W	*PHILIPS	2322 156 16343	03.444
R632a	RESISTOR	31.6 KOHM 1% 0.4W	*PHILIPS	2322 156 13163	03.436
R633a	RESISTOR	15.8 KOHM 1% 0.4W	*PHILIPS	2322 156 11583	03.430
R634a	RESISTOR	8.06 KOHM 1% 0.4W	*PHILIPS	2322 156 18062	03.422
R635a	RESISTOR	63.4 KOHM 1% 0.4W	*PHILIPS	2322 156 16343	03.444
R636a	RESISTOR	31.6 KOHM 1% 0.4W	*PHILIPS	2322 156 13163	03.436
R637a	RESISTOR	15.8 KOHM 1% 0.4W	*PHILIPS	2322 156 11583	03.430
R638a	RESISTOR	8.06 KOHM 1% 0.4W	*PHILIPS	2322 156 18062	03.422
R639a	RESISTOR MF	3k01 OHM 1% 0.6W	PHILIPS	2322 156 13012	03.411
R640a	RESISTOR MF	1 OHM 5% 0.4W	PHILIPS	2322 181 53108	01.125
R641a	RESISTOR MF	10k OHM 5% 0.4W	PHILIPS	2322 181 53103	01.225
R642a	RESISTOR MF	18k OHM 5% 0.4W	* PHILIPS	2322 181 53183	01.231
R643a	RESISTOR MF	1k0 OHM 5% 0.4W	PHILIPS	2322 181 53102	01.200
R644a	RESISTOR MF	1k0 OHM 5% 0.4W	PHILIPS	2322 181 53102	01.200
R645a	RESISTOR MF	3k3 OHM 5% 0.4W	PHILIPS	2322 181 53332	01.212
R646a	RESISTOR MF	10k OHM 5% 0.4W	PHILIPS	2322 181 53103	01.225
R647a	RESISTOR MF	10k OHM 5% 0.4W	PHILIPS	2322 181 53103	01.225
R648a	RESISTOR MF	10k OHM 5% 0.4W	PHILIPS	2322 181 53103	01.225
R650a	RESISTOR MF	56k OHM 5% 0.4W	* PHILIPS	2322 181 53563	01.243
R651a	RESISTOR MF	10k OHM 5% 0.4W	PHILIPS	2322 181 53103	01.225
R652a	RESISTOR MF	10k OHM 5% 0.4W	PHILIPS	2322 181 53103	01.225
R653a	RESISTOR MF	10k OHM 5% 0.4W	PHILIPS	2322 181 53103	01.225
R654a	RESISTOR MF	10k OHM 5% 0.4W	PHILIPS	2322 181 53103	01.225
R655a	RESISTOR MF	220k OHM 5% 0.4W	PHILIPS	2322 181 53224	01.258
R656a	RESISTOR	11 KOHM 1% 0.4W	*PHILIPS	2322 156 11103	03.458
RA601	RESISTOR ARRAY	8x10k OHM 5% 1/8W	MURATA	RG LD 8 X 103 J	08.630
RA602	RESISTOR ARRAY	4x4k7 OHM 5% 1/8W	MURATA	RG LD 4 Y 472 J	08.625
RE601	RELAY	12VDC 1SH. 2A.	MILTRONIC AB	OUC-S-112D	21.300
RE602	RELAY	12VDC 1SH. 2A.	MILTRONIC AB	OUC-S-112D	21.300
RE603	RELAY	E3206H	EICHHOFF	BV-55-280R	21.026
T601	TRANSISTOR	BC638	AEG*	BC638	28.117
T602	TRANSISTOR	BC638	AEG*	BC638	28.117
T603	TRANSISTOR	BC638	AEG*	BC638	28.117
T604	TRANSISTOR	BC638	AEG*	BC638	28.117
T605	TRANSISTOR AF	BC548 NPN TO-92	PHILIPS	BC548 (-A/-B/-C)	28.070
T606	TRANSISTOR AF	BC328-25 PNP TO-92	PHILIPS	BC328-25	28.052
T607	TRANSISTOR AF	BC558B	PHILIPS	BC558B	28.100
T608	TRANSISTOR AF	BC558B	PHILIPS	BC558B	28.100
T609	TRANSISTOR	BD138	PHILIPS*	BD138	29.057

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
T610	TRANSISTOR AF	BC548B NPN TO-92	PHILIPS	BC548B	28.076
T611	TRANSISTOR	BD234	PHILIPS	BD234	29.070
T612	TRANSISTOR AF	BC338-25 NPN TO-92	PHILIPS	BC338-25	28.058
T613	TRANSISTOR AF	BC548B NPN TO-92	PHILIPS	BC548B	28.076
T614	TRANSISTOR	BC547A	MOTOROLA*	BC547A	28.065
T615	TRANSISTOR	BC558	PHILIPS	BC558	28.097
T616	TRANSISTOR AF	BC338-25 NPN TO-92	PHILIPS	BC338-25	28.058
T617	TRANSISTOR	BC639	PHILIPS*	BC639	28.120
T618	TRANSISTOR	BC237B	ITT*	BC237B	28.034

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
	KEYBOARD UNIT	MODULE 700	ESPERA	5-0-24014C	600016
C701	CAPACITOR CERAMIC	10nF -20/+80% 32V	FERROPERM	9/0145,9	15.900
C702	CAPACITOR CERAMIC	10nF -20/+80% 32V	FERROPERM	9/0145,9	15.900
C703	CAPACITOR CERAMIC	10nF -20/+80% 32V	FERROPERM	9/0145,9	15.900
C704	CAPACITOR CERAMIC	10nF -20/+80% 32V	FERROPERM	9/0145,9	15.900
C705	CAPACITOR CERAMIC	10nF -20/+80% 32V	FERROPERM	9/0145,9	15.900
C706	CAPACITOR MKT	220nF 10% 100V	SIEMENS	B32511-D1224-K000	11.227
C707	CAPACITOR CERAMIC	47pF 10% N33 25V	FERROPERM	9/0213,8	15.770
C708	CAPACITOR CERAMIC	47pF 10% N33 25V	FERROPERM	9/0213,8	15.770
C709	CAPACITOR MKT	220nF 10% 100V	SIEMENS	B32511-D1224-K000	11.227
C710	CAPACITOR ELECTROLYTIC	1uF 20% 50VDC	ERO	EKI 00 AA 110 H M9	14.506
C711	CAPACITOR MKT	10nF 10% 400V	SIEMENS	B32510-D6103-K000	11.381
C712	CAPACITOR MKT	10nF 10% 400V	SIEMENS	B32510-D6103-K000	11.381
C713	CAPACITOR MKT	10nF 10% 400V	SIEMENS	B32510-D6103-K000	11.381
C714	CAPACITOR MKT	10nF 10% 400V	SIEMENS	B32510-D6103-K000	11.381
C715	CAPACITOR MKT	10nF 10% 400V	SIEMENS	B32510-D6103-K000	11.381
C716	CAPACITOR ELECTROLYTIC	33uF 20% 16VDC	ERO*	EKI 00 AA 233 D M9	14.518
D701	DIODE	1N4148 HIGH SPEED	ITT	1N4148 CARTON	25.131
D702	DIODE LIGHT EMITTING	ORANGE 5mm	SANKEN	SEL 1913K	25.631
D703	DIODE LIGHT EMITTING	ORANGE 5mm	SANKEN	SEL 1913K	25.631
D704	DIODE LIGHT EMITTING	YELLOW 5mm	SANKEN	SEL1910D	25.630
D705	DIODE LIGHT EMITTING	YELLOW 5mm	SANKEN	SEL1910D	25.630
D706	DIODE LIGHT EMITTING	ORANGE 5mm	SANKEN	SEL 1913K	25.631
D707	DIODE LIGHT EMITTING	ORANGE 5mm	SANKEN	SEL 1913K	25.631
IC701	INTEGRATED CIRCUIT	MC14094BCP	NATIONAL*	CD4094BCN	33.305
IC702	INTEGRATED CIRCUIT	MC14094BCP	NATIONAL*	CD4094BCN	33.305
IC703	INTEGRATED CIRCUIT	MC14094BCP	NATIONAL*	CD4094BCN	33.305
IC704	INTEGRATED CIRCUIT	MC14094BCP	NATIONAL*	CD4094BCN	33.305
IC705	INTEGRATED CIRCUIT	MC14094BCP	NATIONAL*	CD4094BCN	33.305
IC706	INTEGRATED CIRCUIT	MC14094BCP	NATIONAL*	CD4094BCN	33.305
IC707	INTEGRATED CIRCUIT	MC14069UBCP	MOTOROLA	MC14069UBCP	33.235
IC708	VOLTAGE REGULATOR	MC7805CT	NATIONAL*	LM340-T5	31.250
IC709	INTEGRATED CIRCUIT	REMOTE PROCESSOR	MOTOROLA	SP C1039 MOTOROLA NO.SC93820P	32.558
J701	RECEPTACLE (FEMALE)	12 POLE	AMP	1-826371-2	78.132
J702	RECEPTACLE (FEMALE)	2 POLE	AMP	0-826371-2	78.122
J703	MEMBRANESWITCH 5+6	11 POLE CONNECTOR	MEKOPRINT *	LEVERES EFTER GODKENDT PRØVE	44.500
LCD701	LIQUID CRYSTAL DISPLAY	LCD-3509-365-923/RT2047	HAMLIN	SP TG.0-3-23886A HAMLIN TG.3509-365-923	25.705
P701	PLUG (MALE)	12 POLE	AMP	1-826375-2	78.112

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
P702	PLUG (MALE)	2 POLE	AMP	0-826375-2	78.102
P703	PLUG (MALE)		BERG	75168-301-36	78.380
R701	RESISTOR MF	4.7k OHM 5% 0.4W	* PHILIPS	2322 181 53472	01.216
R702	RESISTOR MF	4.7k OHM 5% 0.4W	* PHILIPS	2322 181 53472	01.216
R703	RESISTOR MF	1k OHM 5% 0.4W	* PHILIPS	2322 181 53102	01.200
R704	RESISTOR MF	1k OHM 5% 0.4W	* PHILIPS	2322 181 53102	01.200
R705	RESISTOR MF	1k OHM 5% 0.4W	* PHILIPS	2322 181 53102	01.200
R706	RESISTOR MF	10k OHM 5% 0.4W	* PHILIPS	2322 181 53103	01.225
R707	RESISTOR MF	10k OHM 5% 0.4W	* PHILIPS	2322 181 53103	01.225
R708	RESISTOR MF	8.2k OHM 5% 0.4W	* PHILIPS	2322 181 53822	01.222
R709	RESISTOR MF	1k5 OHM 5% 0.4W	* PHILIPS	2322 181 53152	01.204
R710	RESISTOR MF	1k OHM 5% 0.4W	* PHILIPS	2322 181 53102	01.200
R711	RESISTOR MF	68 OHM 5% 0.4W	* PHILIPS	2322 181 53689	01.170
R712	RESISTOR MF	68 OHM 5% 0.4W	* PHILIPS	2322 181 53689	01.170
R713	RESISTOR	22 OHM 5% 0.5W	PHILIPS	2322 156 12209	03.159
RA701	RESISTOR ARRAY	8x10k OHM 5% 0.125W	PANASONIC	EXB-F9E-103-J	08.630
RA702	RESISTOR ARRAY	8x10k OHM 5% 0.125W	PANASONIC	EXB-F9E-103-J	08.630
T701	TRANSISTOR	BC558	PHILIPS	BC558	28.097
T702	TRANSISTOR AF	BC548B NPN TO-92	ITT	BC548B	28.076
T703	TRANSISTOR AF	BC548B NPN TO-92	ITT	BC548B	28.076
X701	RESONATOR CERAMIC	4MHz	TDK	FCR-4	41.510

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
	FILTER UNIT	MODULE 900	ESPERA	5-0-24147	600122
C901	CAPACITOR MKT	1000nF 10% 100V	SIEMENS	B32511-D1105-K000	11.233
C902	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
C903	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
C904	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
C905	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
C906	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
C907	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
C908	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
C909	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
C910	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
C911	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
C912	CAPACITOR CERAMIC	10nF -20/+80% CL2 50VDC	NKE	DT 350 758L F 103 Z 50V FLAT PACK	15.170
FP901	FERRITE BEAD	HZ 4.2/2.1/7 G K1201	KASCHKE	HZ 4,2/2,1/7 G K1201 405 442 075 021	35.011
FP902	FERRITE BEAD	HZ 4.2/2.1/7 G K1201	KASCHKE	HZ 4,2/2,1/7 G K1201 405 442 075 021	35.011
FP903	FERRITE BEAD	HZ 4.2/2.1/7 G K1201	KASCHKE	HZ 4,2/2,1/7 G K1201 405 442 075 021	35.011
C904	FERRITE BEAD	HZ 4.2/2.1/7 G K1201	KASCHKE	HZ 4,2/2,1/7 G K1201 405 442 075 021	35.011
FP905	FERRITE BEAD	HZ 4.2/2.1/7 G K1201	KASCHKE	HZ 4,2/2,1/7 G K1201 405 442 075 021	35.011
FP906	FERRITE BEAD	HZ 4.2/2.1/7 G K1201	KASCHKE	HZ 4,2/2,1/7 G K1201 405 442 075 021	35.011
FP907	FERRITE BEAD	HZ 4.2/2.1/7 G K1201	KASCHKE	HZ 4,2/2,1/7 G K1201 405 442 075 021	35.011
FP908	FERRITE BEAD	HZ 4.2/2.1/7 G K1201	KASCHKE	HZ 4,2/2,1/7 G K1201 405 442 075 021	35.011
FP909	FERRITE BEAD	HZ 4.2/2.1/7 G K1201	KASCHKE	HZ 4,2/2,1/7 G K1201 405 442 075 021	35.011

POSITION	DESCRIPTION		MANUFACTOR	TYPE	S.P.NUMBER
FP910	FERRITE BEAD	HZ 4.2/2.1/7 G K1201	KASCHKE	HZ 4,2/2,1/7 G K1201 405 442 075 021	35.011
FP911	FERRITE BEAD	HZ 4.2/2.1/7 G K1201	KASCHKE	HZ 4,2/2,1/7 G K1201 405 442 075 021	35.011
FP912	FERRITE BEAD	HZ 4.2/2.1/7 G K1201	KASCHKE	HZ 4,2/2,1/7 G K1201 405 442 075 021	35.011