Sailor

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INSTRUKTIONSBOG FOR
SAILOR RT144

INSTRUCTION BOOK FOR
SAILOR RT144

INSTRUKTIONSBUCH FÜR
SAILOR RT144

INSTRUCTIONS POUR
SAILOR RT144

INSTRUCCIONES PARA
SAILOR RT144

A/S S. P. RADIO · AALBORG · DENMARK

GENERAL DESCRIPTION

Introduction

SAILOR RT144 is a telecommunication set comprising a transmitter and a receiver for simplex and semi-duplex VHF-radiocommunication on the international maritime VHF-channels.

SAILOR RT144 is a multi-channel set incorporating all international VHF-channels.

SAILOR RT144 is prepared for up to five private channels to be selected as simplex or semi-duplex channels in the frequency band 155,0 – 163,2 MHz.

SAILOR RT144 makes use of a digital synthesizer for frequency generation. The VHF-transceiver is provided with only one crystal to control all international maritime VHF-channels and the five optional private channels.

SAILOR RT144 is provided with a new and simple programming system which increases the reliability besides giving the station an unsurpassed flexibility as far as complying with all requirements from authorities and customers is concerned.

SAILOR RT144 is designed for installation in vessels of any type. The set is of all transistor design, and consequently the power consumption is very modest, and at the same time it has been possible to secure a very rugged construction.

SAILOR RT144 is built in an all-welded steel cabinet with antirust surfaces and Nylon finish in green colour. The control knobs are of deformation-resistant plastic material.

SAILOR RT144 is built up of modules and these are placed on swing chassis to facilitate service and repairs.

SAILOR RT144 can be delivered as 12 Volt or 24 Volt VHF-transceivers. The voltage changeover from 12 Volt to 24 Volt can be done by mounting a 24 Volt regulator on the back of the VHF-transceiver. This is a simple modification which can be made without dismounting the VHF-transceiver.

CONTENTS

TECHNICAL DATA RT144

General

All international maritime channels.	
Private channels	5 pcs.
Channel separation	25 kHz
Modulation	Phase
Operation	Simplex and semi-duplex
Temperature range	-20°C to +55°C
Frequency stability	±10 ppm (±1,5 kHz)
Antenna impedance	50 ohm
Power supply	12 Volt DC or 24 Volt DC
Power consumption	Stand-by = 0,5 Amp. Transmit = 5 Amp.
Voltage variation (with reduced data after international specs.)	-10 % +30 %
Dimensions	Height = 220 mm Width = 320 mm Depth = 165 mm
Weight	9 kg

Receiver

Frequency range simplex	155,000 - 158,600 MHz
Frequency range semi-duplex	159,600 - 163,200 MHz
Sensitivity	0,25 uV PD for 12 dB SINAD
AF-output power	2,5 Watt/4 ohm
Distortion	less than 5%

Transmitter

Frequency range normal	155,00 - 158,600 MHz
Frequency range special	159,600 - 163,200 MHz
RF-output power	25 Watt
Reduced RF-output power	1 Watt
Distortion	less than 5%

CONTROLS

❶ **FUNCTION SWITCH**

OFF: The set is switched off.

ON: The set is switched on and ready for use immediately.

1W: Transmitter output reduced to 1 Watt (for use in heavily used waters).

❷ **CHANNEL SELECTOR**

By means of the channel selector the required channel number is selected.

❸ **VOLUME**

Continuous volume control.

❹ **SQUELCH**

The squelch has to be adjusted by turning the knob clockwise, until the white noise in the loudspeaker just disappears. The adjustment must be done without receiving a signal.

❺ **DIMMER**

Brightness control in channel indicator.

❻ **HANDSET**

When the handset key is pressed, the transmitter is started.

When the handset key is not pressed, all calls will be heard in the loudspeaker.

❼ **LOUDSPEAKER**

All calls are heard like mentioned under handset. Auxiliary loudspeaker may be connected to the power supply plug.

❽ **CHANNEL APPLICATION**

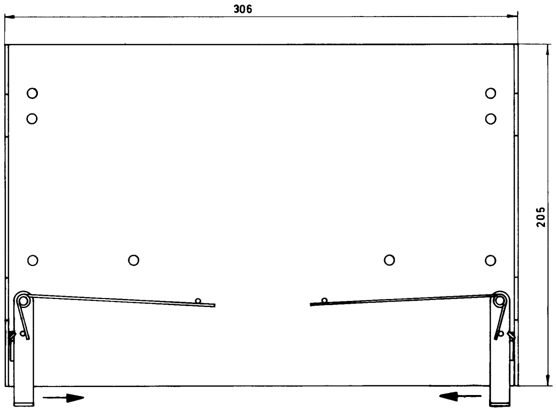
Showing the use of the selected channel.

INTER SHIP: Ship to ship correspondance.

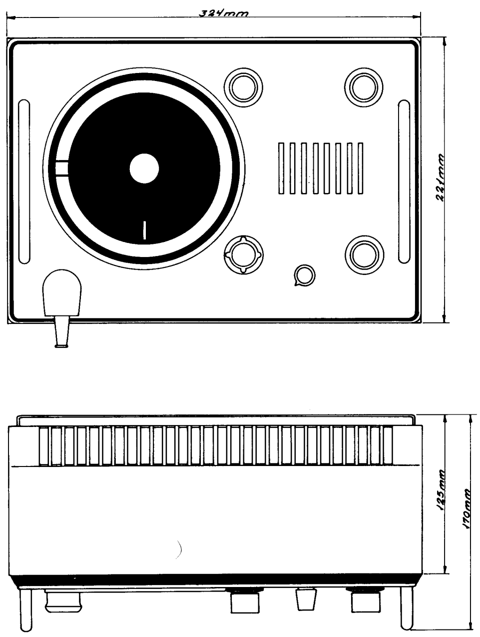
PORT: Port service.

PUBLIC: Public correspondance.

INSTALLATION



Mounting panel

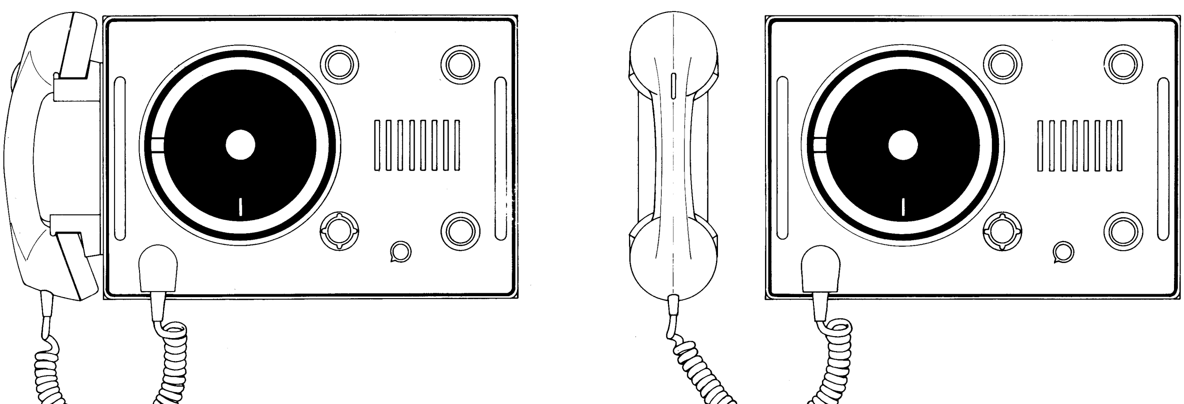


Mounting

It is a very easy matter to install the SAILOR RT 144 telecommunication set in the radio room, on the bridge or anywhere on board.
The mounting panel is fixed to the bulkhead by means of 4 screws. The set is hung up on this, there being 4 hooks on the mounting panel matching 4 slots at the back of the set. Two springloaded locks prevent the set from becoming loose from this mounting panel. If the set has to be taken down, the locks must be pushed in the direction of the arrows, lifting the set simultaneously.

Handset

The handset may be placed at the left side of the VHF set or if it is not suitable anywhere near the set. The cable is five-cored and may be extended. The cable is connected to the front of the VHF-set by means of a connector.



Possible position of handset

Power Supply

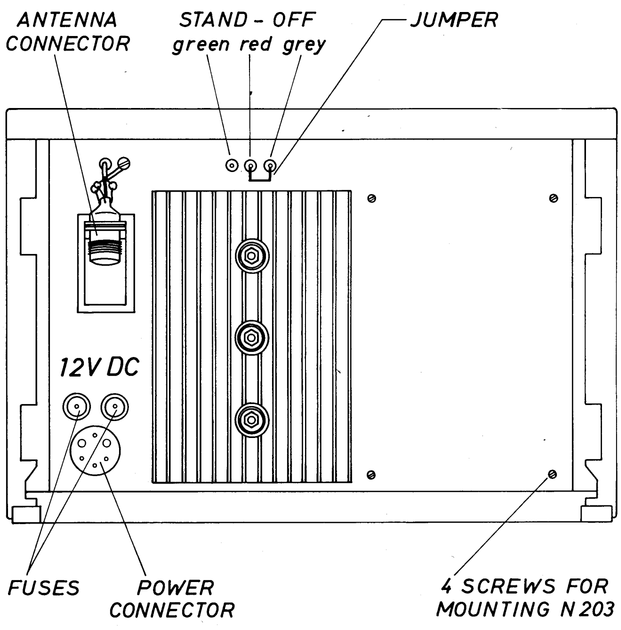
THE SAILOR RT144 can be delivered in two versions; for 12 V DC supply voltage and for 24 V DC supply voltage.

For 110 V AC - 127 V AC - 220 V AC or 237 V AC supply voltage an external power supply N163 must be used. In that case SAILOR RT144 then has to be the 24 V DC version.

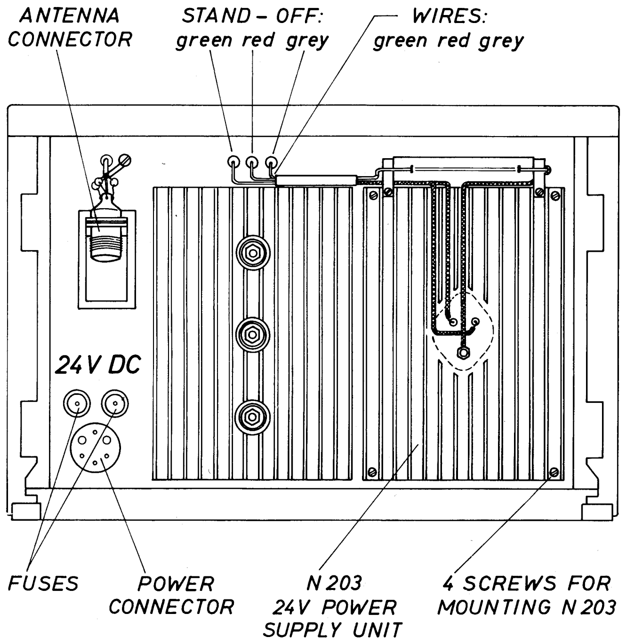
Please ascertain that the SAILOR RT144 is set to 12 V or 24 V corresponding to the voltage of the mains of the vessel.

SAILOR RT144 can easily be changed from 24 V power supply to 12 V power supply or vice versa.

SAILOR RT 144 VERSION FOR 12V POWER SUPPLY



SAILOR RT 144 VERSION FOR 24V POWER SUPPLY



Change from 12 V power supply to 24 V power supply:

Remove the jumper from the STAND OFF's.

Mount the power supply unit N203.

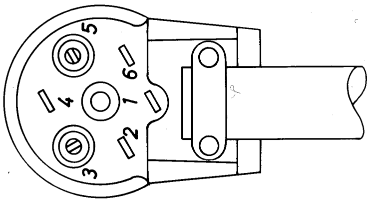
Solder the three WIRES green - red - grey to the corresponding STAND OFF's.

Change from 24 V power supply to 12 V power supply:

Remove the WIRES from the STAND-OFF's.

Remove the power supply unit N203.

Solder a jumper from STAND OFF marked red to STAND OFF marked grey.



Power connector

VIEW FROM MOUNTING SIDE

PIN 1 Aux. loudspeaker.

PIN 2 No connection.

PIN 3 +12/24V Power supply.

PIN 4 Aux. loudspeaker.

PIN 5 -12/24V Power supply.

PIN 6 No connection.

Auxiliary loudspeaker

The auxiliary 8 Ohm loudspeaker may be connected to pin 1 and pin 4 at the power connector.

Remember there is 12 V DC on the loudspeaker wires.

Auxiliary loudspeakers are available.

Antennas

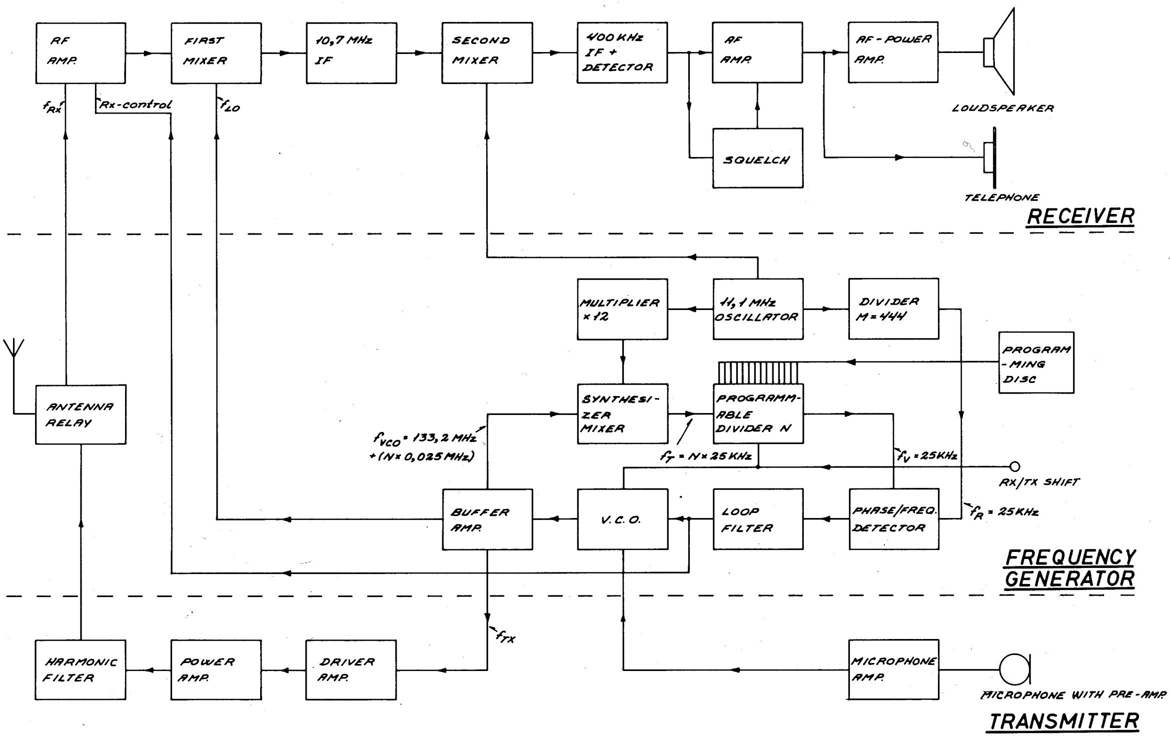
All common 50 ohm antennas, which cover the used frequency range with a reasonable standing wave ratio, maximum 1,5, are applicable.

The antenna is connected to the set by means of a 50 ohm coaxial cable with low loss, e.g. RG8U. At the cable end a PL 259 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 0,5 m.

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

PRINCIPLE OF OPERATION



Frequency generation

The necessary frequencies are generated by a frequency synthesizer according to the Phase-Locked-Loop principle.

A voltage-controlled oscillator (VCO) generates the output frequency f_{VCO} directly on the requested frequency.

The VCO-frequency can be varied by means of a DC-control-voltage from the PHASE DETECTOR.

The DC-control-voltage is filtered in the LOOP-FILTER.

The PHASE DETECTOR receives two signals, one variable frequency f_V and one reference frequency f_R.

The reference frequency f_R is a result of the crystal oscillator frequency 11,1 MHz being divided down to 25 kHz.

$f_R = 11100\ \text{kHz}/M = 11100\ \text{kHz}/444 = 25\ \text{kHz};\ M = 444$.

The variable frequency f_V is generated from the VCO-frequency in the following way:

In the SYNTHESIZER MIXER the counter frequency f_T is produced from the VCO-frequency and the multiplied crystal oscillator frequency.

$f_T = f_{VCO} - (12 \times 11{,}1\ \text{MHz}) = f_{VCO} - 133{,}2\ \text{MHz}$.

The counter frequency f_T is divided down by the dividing figure N in the PROGRAMMABLE DIVIDER to the variable frequency f_V.

$f_V = f_T/N = 25\ \text{kHz}$.

The working principle in a »Phase-Locked Loop« is the following: If there is a phase error between the variable frequency f_V and the reference frequency f_R, the regulation system has the characteristic that the DC-control-voltage will correct the VCO-frequency and consequently the variable frequency f_V, so that f_V will always follow the reference frequency f_R in phase.

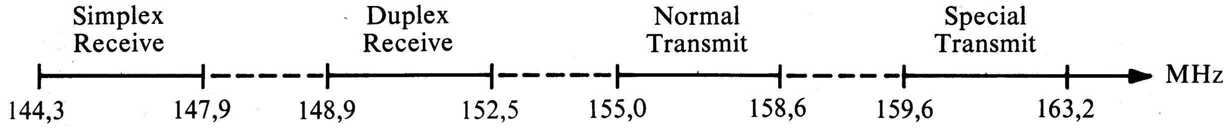
$f_R = f_V = (f_{VCO} - 133{,}2\ \text{MHz})/N = 25\ \text{kHz}$.

The VCO-frequency is now phase-locked on a fixed frequency to the reference frequency f_R and has therefore the same accuracy as this.

Changing of the VCO-frequency by e. g. 25 kHz (one channel) can be performed by changing the dividing figure N in the PROGRAMMABLE DIVIDER by one.

$f_{VCO} = 133{,}2\ \text{MHz} + (N \times 0{,}025\ \text{MHz})$.

The VCO-signal is used to feed both transmitter and receiver with the necessary frequencies respectively f_{TX} and f_{LO}. This means that the VCO must generate frequencies in the following four frequency bands.



The principle of programming is as follows:
The 145 potential frequencies in each band are controlled from the PROGRAMMING DISC, which encodes a start-figure P in the PROGRAMMABLE DIVIDER.
In the PROGRAMMABLE DIVIDER it is possible to encode a stop-figure S for each band. The frequency band is selected from Simplex/Duplex switch – RX/TX switch and Special Transmit switch.

The PROGRAMMABLE DIVIDER contains a counter circuit, which starts counting from the starting figure P and stops at the stop-figure S. Each time the counter reaches the stop-figure S, a pulse (f_V) is given to the PHASE DETECTOR, and the counter will start again counting from the start-figure P. A dividing down of f_T by N times has now been achieved.
$f_V = f_T/N$; $N = S - P$.

Receiver

When receiving simplex frequencies and duplex frequencies the same RF-AMPLIFIER is being used.
The band filters in the RF-AMPLIFIER are adjusted by means of capacity diodes, which get their control voltage RX-CONTROL from the LOOP-FILTER.
The aerial signal is fed to the RF-AMPLIFIER through the ANTENNA RELAY and on to the FIRST MIXER. Here it is mixed with the local oscillator frequency f_{LO} to an intermediate frequency signal of 10,7 MHz.
In the SECOND MIXER the 10,7 MHz signal is further mixed with the 11,1 MHz local oscillator signal to an intermediate frequency of 400 KHz, which will now be heavily amplified before detection.
After detection the signal is fed to the AF-AMPLIFIER and a SQUELCH stage, which cuts out the noise, when no signal is received.
From here the AF-signal is fed to TELEPHONE and AF-POWER AMPLIFIER.
The AF-POWER AMPLIFIER is able to give an output of 3,5 W into the loudspeaker.

Transmitter

The signal from the microphone is fed to the MICROPHONE AMPLIFIER, where the necessary amplification, amplitude limitation and filtering will take place. The amplitude limitation is performed by a compressor stage, which regulates the amplification, so that the amplitude will always be kept below a certain max. level.
The signal from the microphone is fed to the VCO, where the phase modulation of the transmitting signal f_{TX} will take place.
The BUFFER AMPLIFIER, the DRIVER AMPLIFIER and the POWER AMPLIFIER will amplify the transmitting signal f_{TX} up to an output of about 25 W.
The harmonics of the transmitting frequency f_{TX} are filtered away by the HARMONIC FILTER.

CIRCUIT DESCRIPTION

RX-AMPLIFIER-UNIT

The RX-Amplifier-Unit is comprising the following circuits.

RF-Amplifier and first mixer

The receiver works in the frequency band 155,0 MHz – 163,2 MHz. The receiver front end is variably tuned to the frequency selected on the channel selector.

From the aerial the signal is led through the aerial relay to the RF-Amplifier stage T101.

The input transistor T101 is a low noise transistor, which is capable of handling powerful signals.

A double tuned filter before the transistor T101 and a double tuned filter after provide the necessary selectivity towards spurious signals. These filters are variably tuned by the variocap. diodes D101, D103, D104 and D105. The DC-tuning voltages to the diodes (Rx-control) is delivered from the loop-filter in the phase-locked loop. From the double tuned filter the signal is led to the gate of the first mixer T102. The local oscillator injection signal passes the variably tuned filter and is coupled to the gate of the first mixer T102 via printed capacitor CP103.

The IF-signal of 10,7 MHz is fed from the matching network L105, C120 and C121 to the crystal-filter FL101, which alone is providing for the adjacent channel selectivity of the receiver.

Second mixer

By means of the circuit L107 and C126 the crystal filter is impedance-matched to the mixer transistor T103.

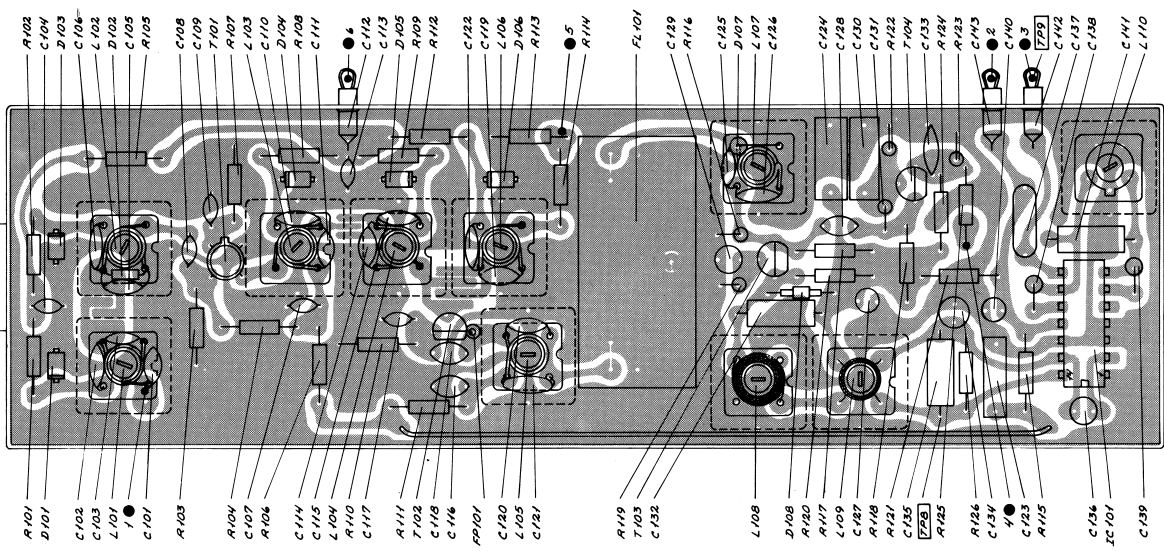
The 11,1 MHz injection signal is amplified in transistor T104 and fed via capacitor C128 to the base of the mixer transistor T103. The diodes D107 and D108 protect the circuit against high level aerial signals.

400 kHz IF-amplifier and discriminator

The 400 kHz mixer product is via the filter, comprising the components L108, L109, C132 and C135, fed to the integrated amplifier IC101 in which the final amplification of the IF-signal takes place. This amplification is so high that the amplifier itself provides for a limitation of the signal, so that AM-modulation and noise will be eliminated.

The integrated amplifier IC101 also comprises the discriminator circuits.

The audio is taken from IC101 pin 8 to the AUDIO-AMPLIFIER-UNIT.



AC voltages outside frame of diagram.

▲: Measured with AF-voltmeter.

⊙: Measured with testprobe

●: Connections to module.

TP: Testpoint.

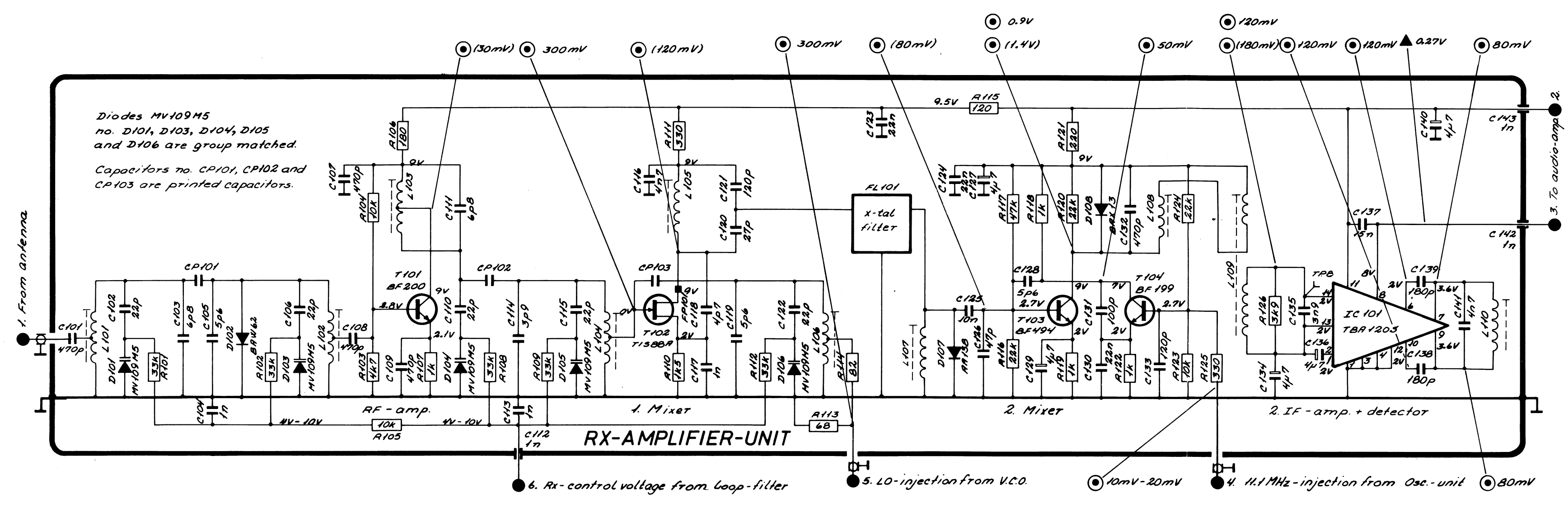
Testconditions:

Voltages without brackets:

Antenna signal 1 mV EMF: △ f = ± 3 kHz; fm = 1 kHz.

Voltages in brackets:

Antenna signal 10 mV EMF; △ f = ± 3 kHz; fm = 1 kHz.



AUDIO-AMPLIFIER-UNIT

The Audio-Amplifier-Unit comprises the following circuits.

AF-amplifier and filter

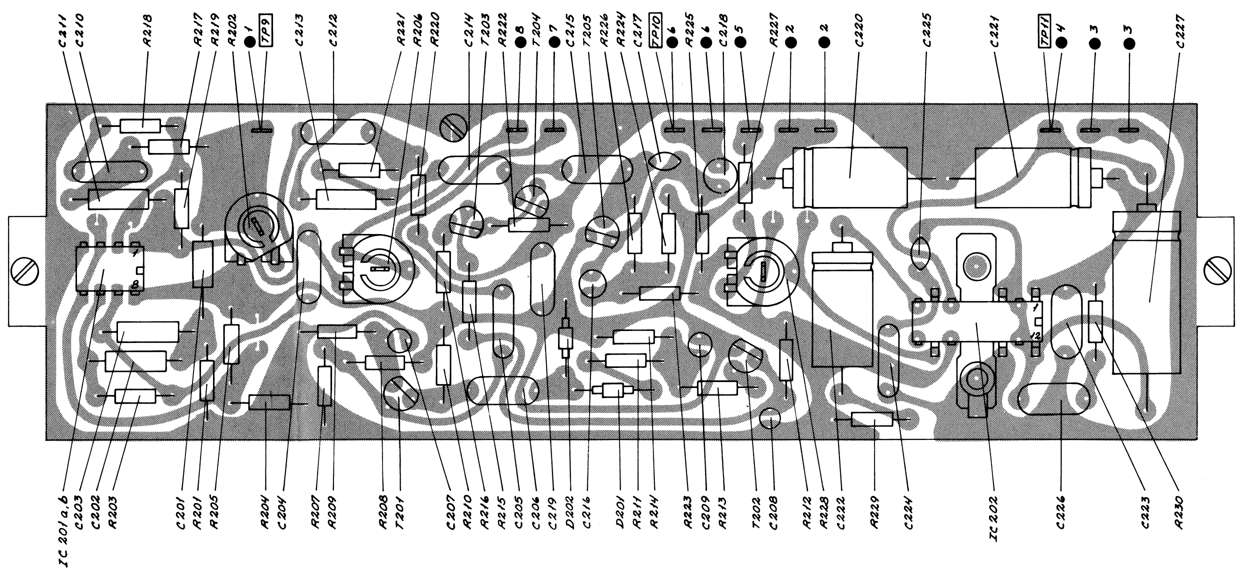
The AF-signal from the discriminator is fed to an active-filter comprising the operational amplifier IC201b. The active-filter provides for the necessary deem-phasis to give a frequency response of -6dB/oct. The active-filter is also taking care of limiting the AF-frequency-range to 300-3000 Hz.
Further the signal is fed to the telephone output transistor T205 passing the squelch-controlled transistor T204.

AF-power-amplifier

The signal for the integrated AF-power-amplifier is taken from the volume control R1004 and fed through the potentiometer R228 to the input terminal.
The integrated AF-power amplifier TBA 810 AS has terminal shut-down, which means the integrated amplifier cannot be overheated. IMPORTANT! The output terminal (loudspeaker wires) of the integrated power amplifier must not be shorted.

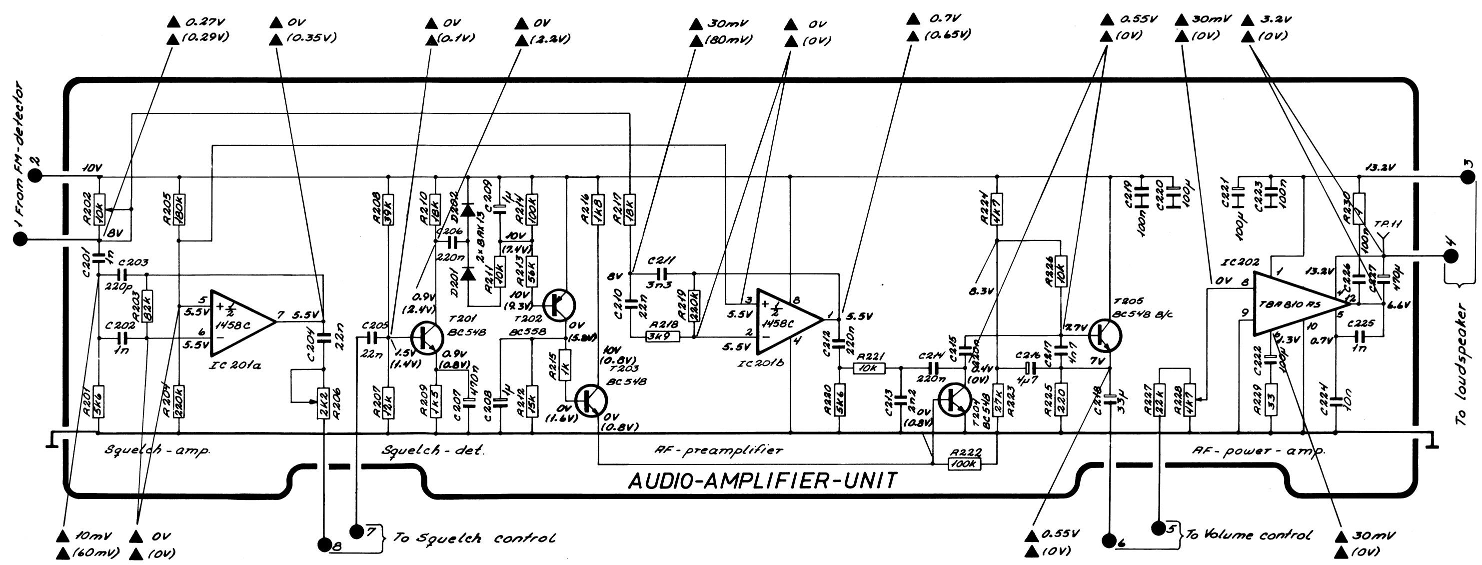
Squelch

The squelch serves the purpose of opening or shutting the audio signal to telephone- and power-amplifier depending on whether a signal is received or not.
The signal to the squelch is fed to the active high-pass filter comprising the operational amplifier IC201a.
The high-pass filter with a roll-off frequency of about 16 kHz selects a noise signal, which is amplified in the transistor T201 and fed to the diode peak-detector comprising the diodes D201 and D202. From the peak-detector the DC-signal is amplified in transistors T202 and T203 and fed to the base of T204 which will open and close for the audio-signal.
The principle of working is the following. When no signal is received, white noise is generated in the IF-amplifier. The noise over 16 kHz is detected and the DC-output signal is fed to the transistor T204 which will short the audio-signal.
When a signal is received, the white noise is suppressed in the IF-amplifier, which will result in a reduction of the DC-output signal from the squelch detector and the transistor T204 will open for the audio-signal to telephone- and power amplifier.



AC voltages outside frame of diagram.
▲: Measured with AF-voltmeter.
●: Connections to module.

Testconditions:
Voltages without brackets:
Antenna signal 1 mV EMF; △ f = ± 3 kHz; fm = 1 kHz.
Volume control at rated power 2.5 W/4 Ω.
Voltages in brackets:
No antenna signal.
External squelch max. closed.



SUPPLY-UNIT

The Supply-Unit comprises the following circuits.

13,2V regulator

With 24V supplied from mains of the ship the 13,2V regulator consists of the transistors T1001 and T401.

The transistor T1001 is placed on the heatsink at the back of the set. The heatsink with T1001 mounted is named 24V supply-unit N203.

The zenerdiode D401 forms a reference voltage of 9,1V for the regulator.

10V regulator

The 10V regulator uses the integrated regulator IC401 and with the series transistors T1002, the regulator is able to supply the necessary current.

In case of short-circuiting 10V the transistor T402 and diode D404 together with T1002 and R406 protect by limiting the current to about 1 amp.

5V regulator

The 5V regulator is a fixed integrated voltage regulator, and supplied from the above-mentioned 13,2V regulator.

Blocking of Tx and Tx/Rx

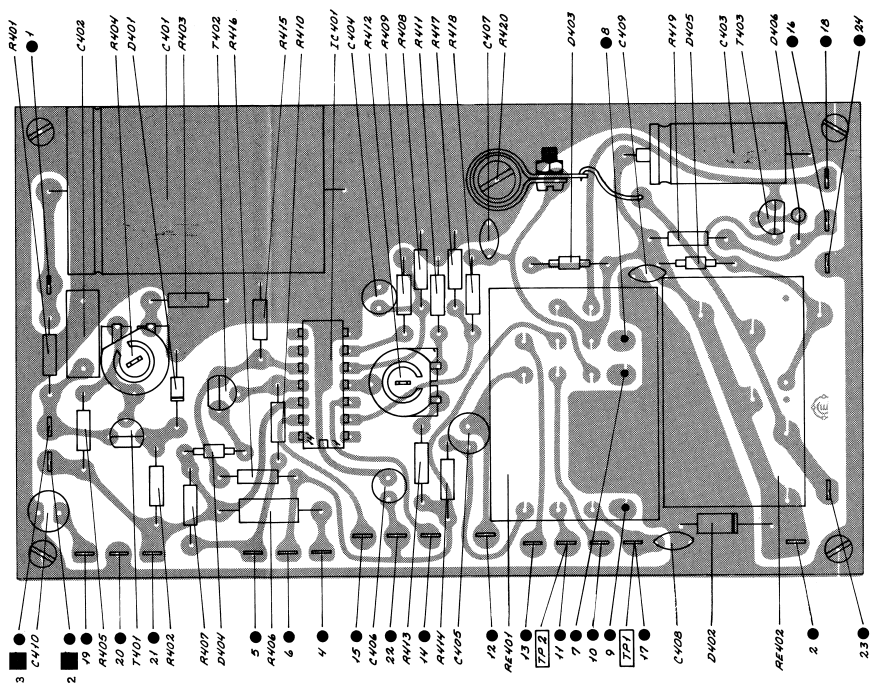
The integrated voltage regulator IC401 has the feature that with ground on pin 13, no 10V will be supplied. This is used to block the transmitter as well as the receiver. With ground on pin 3 of IC401 and 0,7V supplied at the same time to pin 2 of IC401, no 10V will be supplied. With pin 3 of IC401 still grounded and 0V to pin 2 of IC401, 10V will be supplied. This is used to block the transmitter, but not the receiver.

Relay

On the Supply-Unit the transmit/receive relay RE401 and the 1W reduced power relay RE402 are placed.

With transmitter keyed the relay RE401 will operate. The relay RE402 will also operate if base of transistor T403 is not grounded from IW-Red. control wire. The current to Tx-Power-Amplifier will now pass through relay RE402.

With transmitter keyed and ground from IW-Red. control wire to base of T403, only the relay RE401 will operate and the current to TX-POWER-AMPLIFIER will pass through relay RE401 and drop resistor R419.



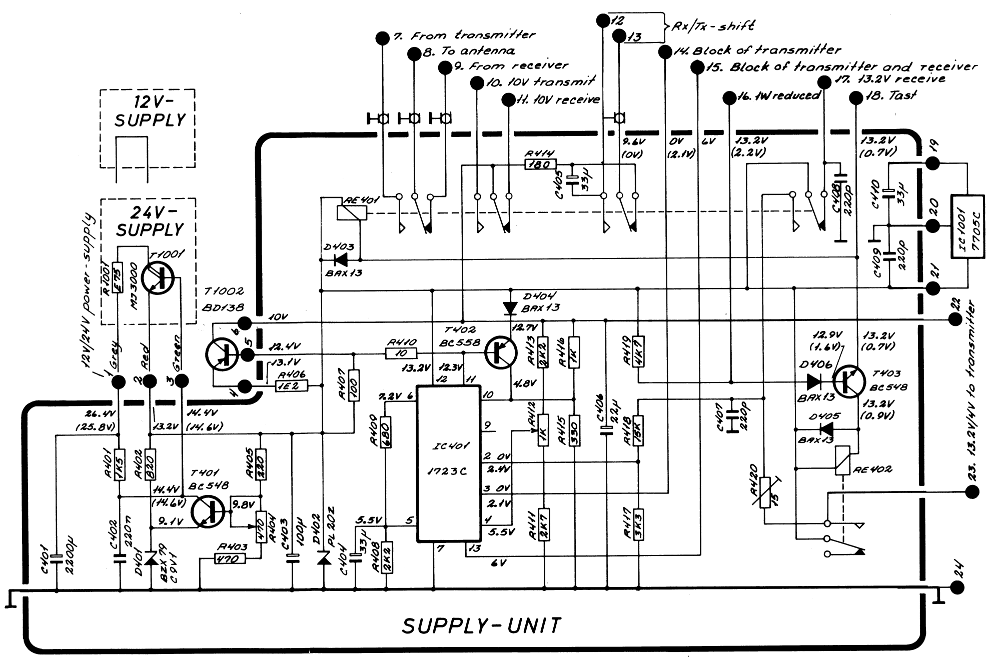
●: Connections to module.

TP: Testpoint.

Testconditions:

Voltages without brackets:
Operating in Rx-position (24 V supply).

Voltages in brackets:
Operating in Tx-position (24 V supply; full-power).



OSCILLATOR-UNIT

The Oscillator-Unit comprises the following circuits.

Oscillator

The transistor T501 is oscillating by means of a 11,1 MHz crystal. From the emitter of T501, 11,1 MHz – injection signal for second mixer is taken.
From the collector of T501, 11,1 MHz signal is fed via L501 to reference-driver.

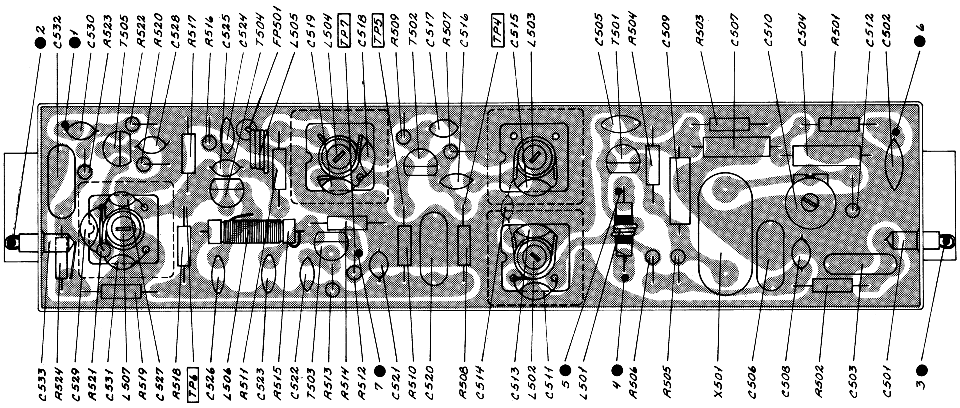
Signal for the multiplier is also taken from the collector of T501 and by means of the double tuned filter comprising the components L502, L503, C513, C514 and C515, only third overtone is by-passed to the transistor T502.

Multiplier

The transistor T502 is multiplying with four and the bandpass filter comprising the components L504, C518 and C519 is adjusted to 12x11,1 MHz.

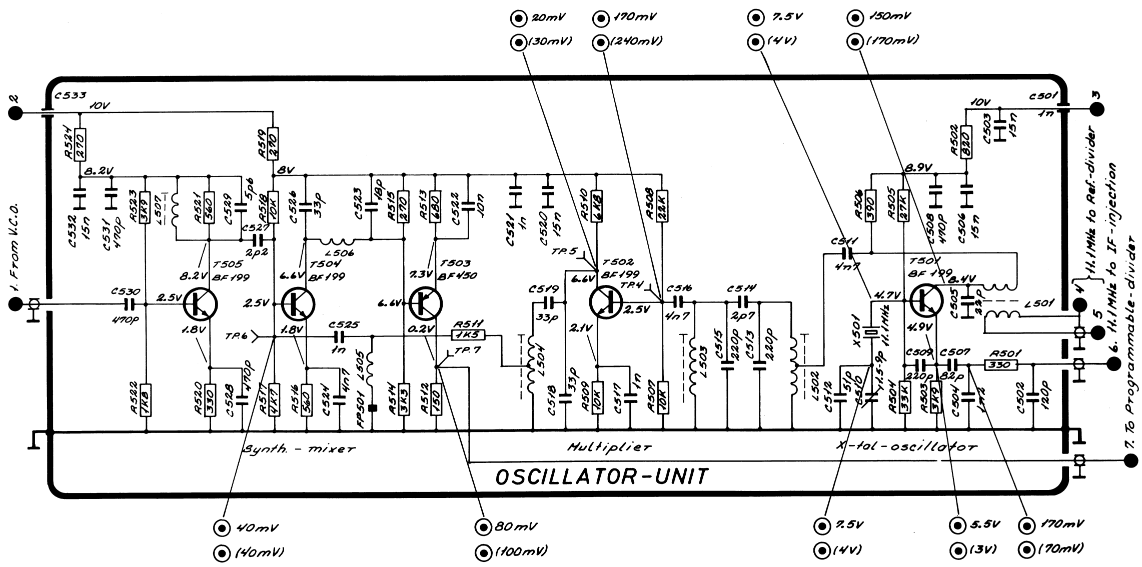
Mixer and amplifier

The feed-back signal from the V.C.O. is amplified in the transistor T505 and fed via capacitor C527 to the mixer transistor T504. The mixer product is led to amplifier T503 via filter comprising the components L506, C523 and C526. From amplifier T504 the variable frequency signal is taken to the pro-driver in DIVIDER-UNIT.



AC voltages outside frame of diagram.
▲: Measured with AF-voltmeter.
⊙: Measured with testprobe
●: Connections to module.
TP: Testpoint.

Testconditions:
Voltages without brackets:
X-tal with typical activity.
Voltages in brackets:
X-tal with minimum activity.



DIVIDER-UNIT

The Divider-Unit comprises the following circuits.

Programmable divider

The variable frequency feed-back signal (11 MHz – 30 MHz) from the OSCILLATOR-UNIT is amplified in transistors T604, T605 and T606 to TTL-level. The programmable divider is dividing the variable frequency by the dividing-figure N and the working principle is the following.

The 145 potential frequencies in each band are controlled from the PROGRAMMING DISC, which encodes a start-figure P in the binary counters IC605 and IC608 from the switches S301, S302, S303, S304, S305, S306 and S307.

In the programmable divider it is possible to encode four different stop-figures S for each band, simplex/duplex-receive and normal/special-transmit and these bands are controlled from S310, S314 and 10V-Rx. The gates IC601a, IC602b, IC602c, IC609a, IC607b, IC609b, IC610a and IC601b are decoding the stop-figure S, and when outputs from the counters reach the chosen stop-figure S the J-K flip-flop IC606b will load the counters IC605 and IC608 with the start-figure P. The counting will now start again from the start-figure P. The dividing-figure is now N = S – P.

Reference-divider

The fixed frequency signal 11,1 MHz from the OSCILLATOR-UNIT is amplified in the transistors T603 to TTL-level.

The reference-divider is dividing the reference-frequency by the dividing figure N = 444 to 25 kHz and working principle is the following.

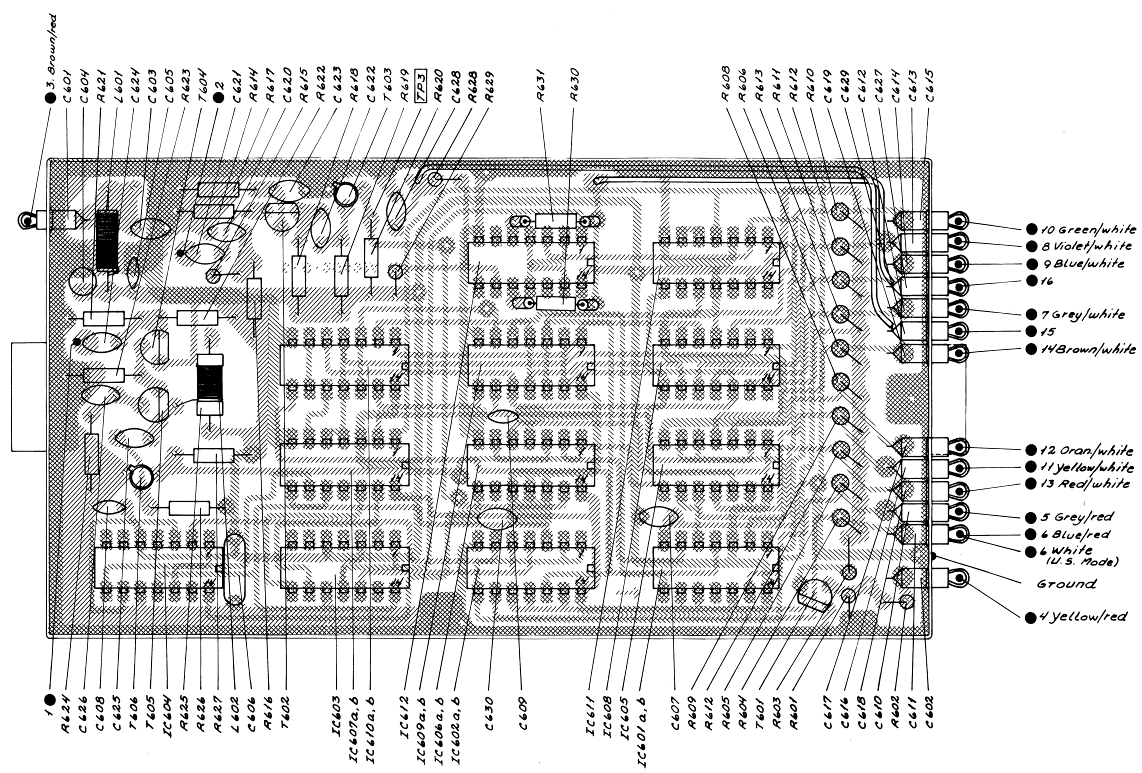
The reference signal is first divided by 2 in the J-K flip-flop IC 606a.

The two binary counters IC603 and IC604 have the possibility of counting to 256.

The gates IC607a and IC602a will decode the outputs from the counters IC603 and IC604 and when the counters reach 222 the gates will reset the counters and they will start counting again.

Phase/frequency-detector

The fixed frequency signal 25 kHz and the variable frequency signal are passed to the phase/frequency-detector IC612. Proportional to frequency or phase difference between the two signals the phase/frequency-detector IC612 will generate an error voltage, which is passed to the loop-filter in TX-EXCITER-UNIT.



AC voltages outside frame of diagram.

⊙: Measured with testprobe

●: Connections to module.

TP: Testpoint.

Testconditions:

Voltages without brackets:
Operating in Rx-position.

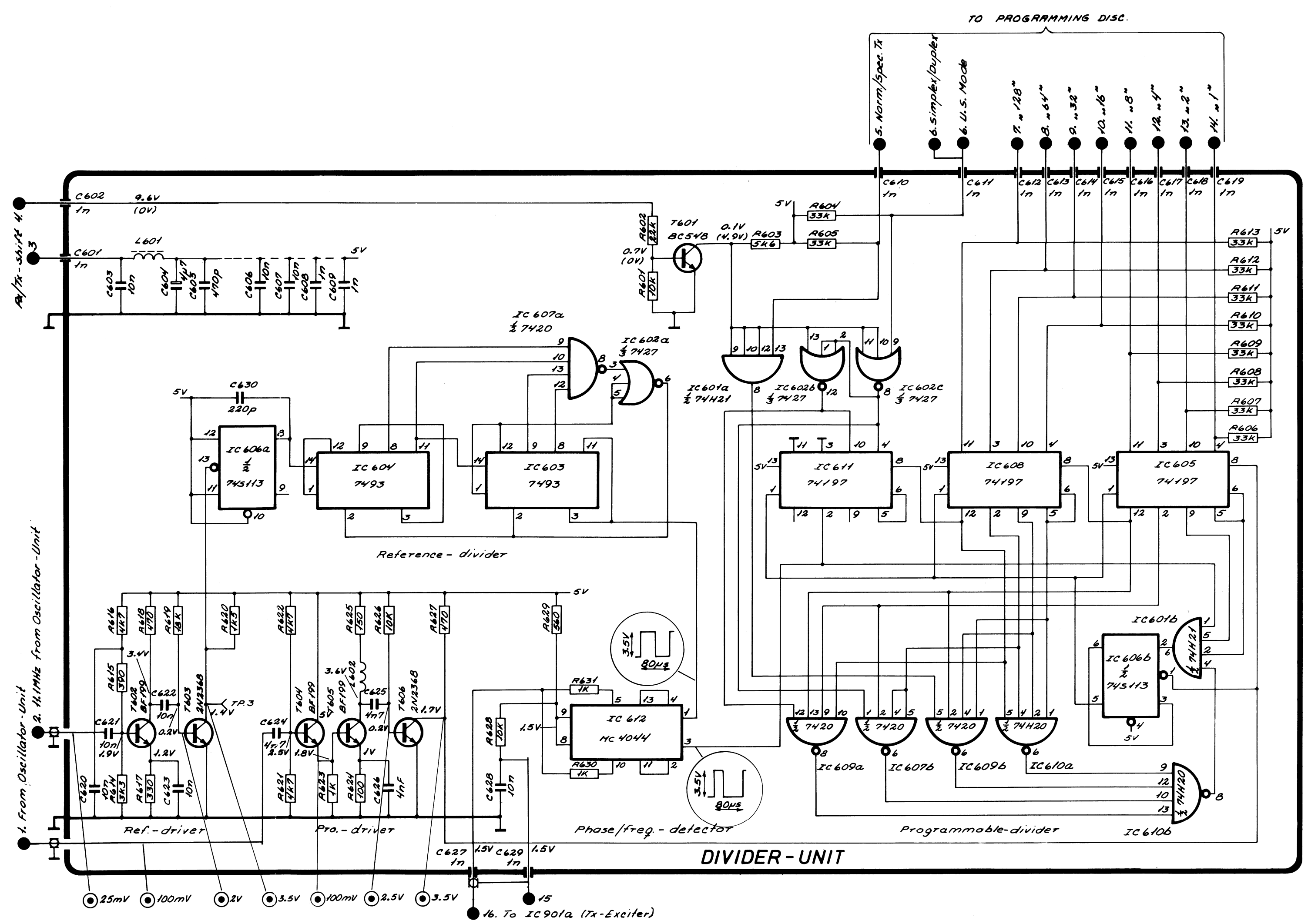
Voltages in brackets:
Operating in Tx-position.

Measurements on connection points ● 5 to ● 14:

Connections ● 5 to ● 14 is programmed from the programming disc. The code to the connection points is described in the section Programming of Private Channels.

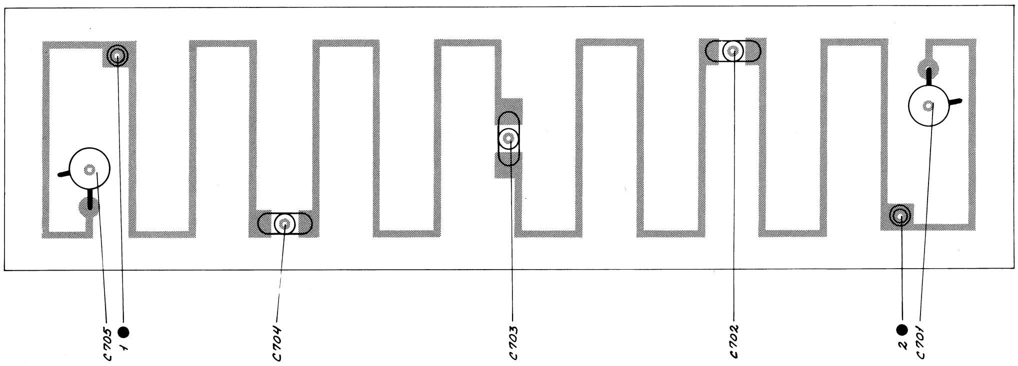
A screw inserted gives a logical »0« (0V).

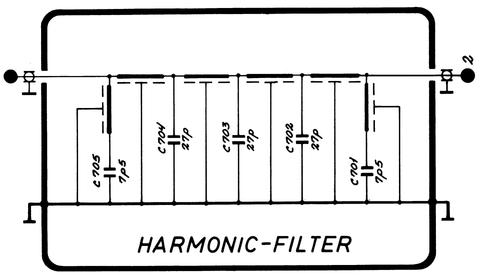
No screw gives a logical »1« (5V).



HARMONIC FILTER

The transistors in the TX-POWER-AMPLIFIER are working in class C and will result in heavy distortion of the signal and therefore, in order to prevent disturbances on other services, it will be necessary to reduce the harmonic frequencies. For this purpose a filter is inserted between the TX-POWER-AMPLIFIER and the aerial. The harmonic filter consists of 3 M derived T-sections.



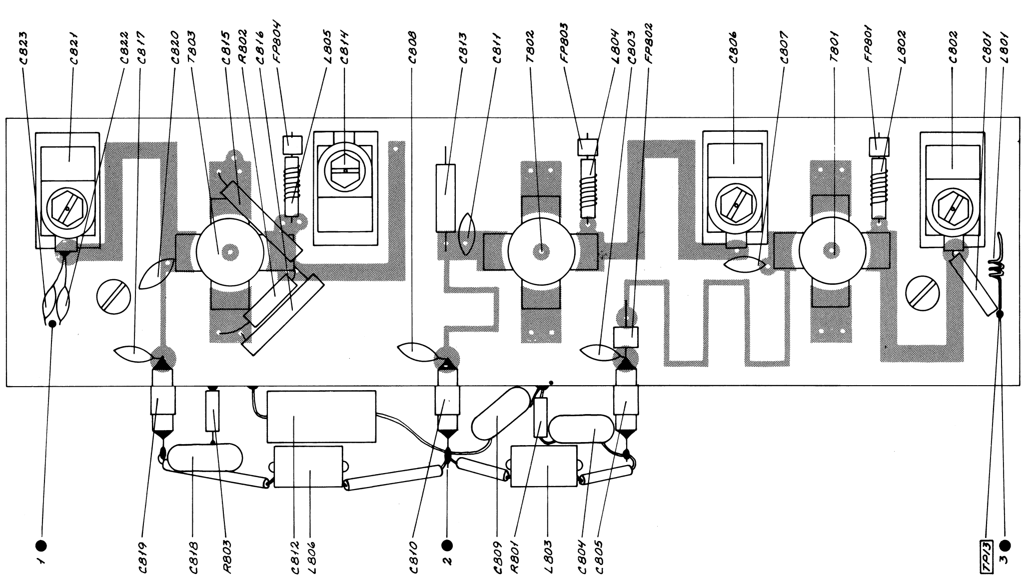


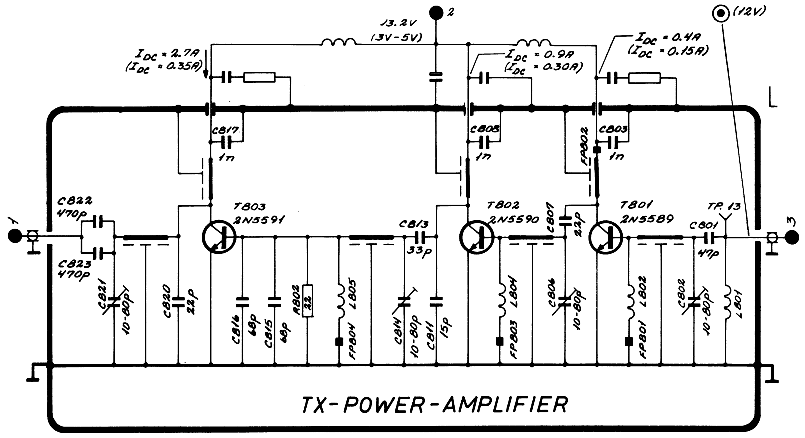
●: Connections to module.

TX-POWER-AMPLIFIER

The TX-POWER-AMPLIFIER is built up on a double-sided print board in stripline. The three transistors T801, T802 and T803 are all working as class C amplifiers.

The 220 mW supplied to the transistor T801 are amplified to about 2,5W. The transistor T902 will amplify this to about 9W and the output transistor T803 will deliver an output of about 25W, this output being fed through C822 and C823 to the HARMONIC FILTER.





⊙: Measured with testprobe

●: Connections to module.

TP: Testpoint.

Testconditions:

Voltages and current without brackets:

Tx-full-power.

Voltages and current in brackets:

Tx-reduced-power.

TX-EXCITER-UNIT

The Tx-Exciter-Unit comprises the following circuits.

Loop-filter

The operational amplifier IC901d in the loop-filter is summarizing the error voltage from the phase/frequency-detector in the following way.

If the phase-locked loop is locked, the voltage on both input terminals of IC901d pin 2 and pin 3 will be 1,5V and the voltage on the output terminal pin 1 will have a value between 2V and 10V corresponding to the V.C.O.-frequency. If the V.C.O.-frequency is too high, the error voltage from phase/frequency-detector IC612 will result in a current flowing from IC612 pin 10. This current will charge capacitor C919, so that the voltage on output terminal of IC901d pin 1 will decrease until the V.C.O.-frequency reaches the right value. (For principal understanding accept that C918 and R935 have no influence on the current, and also that no current is flowing into pin 2 of IC901d).

If the V.C.O.-frequency is too low an error voltage will result in a current flowing into pin 5 of IC612, and the voltage on pin 1 of IC901d will increase until the V.C.O.-frequency has reached the right value. The low-pass filter comprising the components L901, C920, C921 and C925 will attenuate the unwanted component on adjacent channels.

V.C.O.

The V.C.O. is a voltage controlled oscillator where the control voltage from the loop-filter can determine the frequency of the oscillator.

The field effect transistor T904 is the oscillator transistor, oscillating at a frequency mainly determined by the components L903, C929 and the variable capacitance diode D907.

Field effect transistor T905 is a buffer transistor.

From transmit to receive position the V.C.O.-frequency is shifting abruptly 10,7 MHz. In receive position, 10V from Rx/Tx-shift will open the diode D906 and the capacitor C927 is coupled parallel to the main determine frequency component of the V.C.O. In transmit position, 0V from Rx/Tx-shift is reversing the diode D906 and the capacitor C927 has no influence on the frequency of the V.C.O. In transmit position the reversed diode D906 is used as a variocap. diode for modulating the V.C.O.

Buffer- and driver-amplifier

From the V.C.O. the signal is passed to the parallel coupled buffer transistors T906, T907 and T908. The transistor T906 works as buffer for phase-locked loop feedback signal to OSCILLATOR-UNIT. The transistor T907 works as buffer for injection signal to the first mixer in RX-AMPLIFIER-UNIT. The transistors T908, T909 work as buffer and amplifier for the transmitter signal.

The transistor T910 is the driver for the TX-POWER-AMPLIFIER. The potentiometer R963 can regulate the power output from driver transistor T910 from about 200 mW to 300 mW in 50 Ohm.

Microphone amplifier

The microphone signal from preamplifier A1001 is differentiated via capacitor C903 and the parallel combination of resistors R902 and and R903.

Transistor T901 works as amplifier. The microphone sensitivity can be adjusted by potentiometer R906.

Microphone compressor

The compressor is a circuit which will work as a normal amplifier for small input signals and keep a certain output level when the signal level has passed the threshold value. In fact the compressor is very much like an ordinary clipper circuit. One important difference is that the compressor will not make any distortion when a constant high input level is applied.

The signal from microphone amplifier is passed to the variable attenuator R911 and field effect transistor T902. In this configuration T902 works as a variable resistor. Variation of the DC-voltage on the gate of T902 will change the drain-source resistance of T902.

From the attenuator the signal is amplified in the operational amplifier IC901a, and inserted in the operational amplifier IC901b with gain -1. The two signals from IC901a and IC901b are now 180° out of phase. The full wave peak rectifier with diodes D903 and D904 will now start to rectify when the signal is higher than the threshold value. The transistor T903 will deliver current to charge the capacitor C911. The DC-voltage on C911 is now used to regulate the drain-source resistance of T902.

If the microphone has an amplitude higher than the threshold value, the DC-voltage on the capacitor C911 will regulate the resistance of T902 and attenuate the microphone signal to the level determinated by the threshold value.

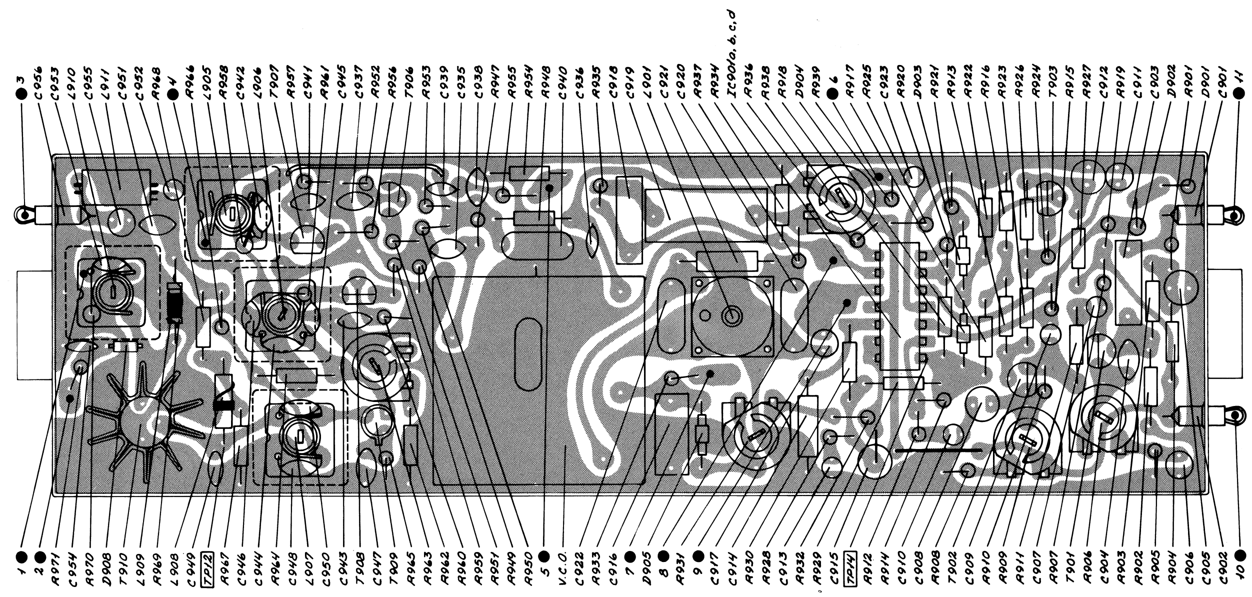
The potentiometer R909 adjusts the threshold value for the compressor. The diodes D901 and D902 are stabilizing the DC-working point for the operational amplifier.

Microphone low-pass filter

From the compressor the signal is fed to a low-pass filter which heavily attenuates all signals above 3 kHz. The low-pass filter is an active filter comprising the operational amplifier IC901c.

In transmit position the signal from the low-pass filter is passed to the modulation diode D906 in the V.C.O.

The potentiometer R931 is adjusted for maximum allowed frequency deviation.

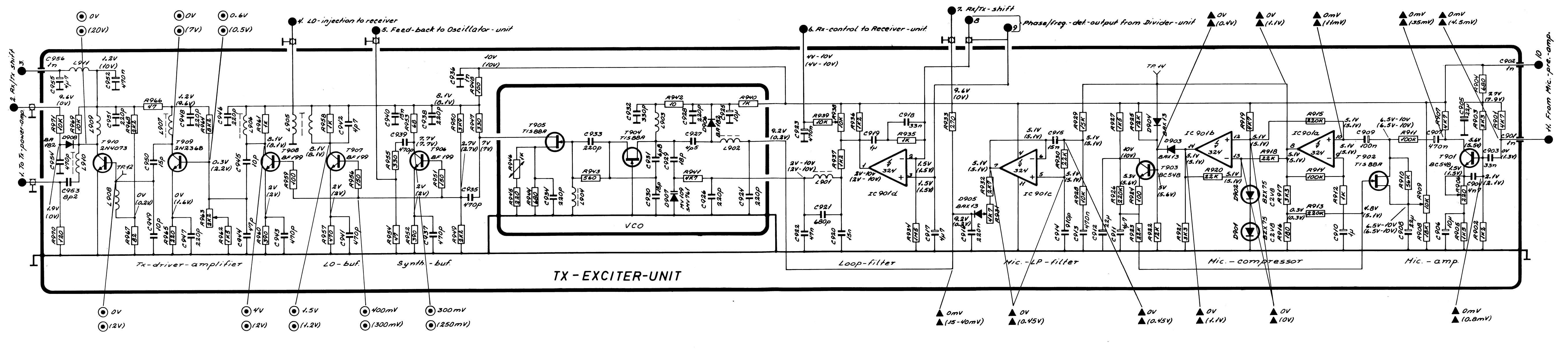


AC voltages outside frame of diagram.

▲: Measured with AF-voltmeter.
⊙: Measured with testprobe
●: Connections to module.
TP: Testpoint.

Testconditions:
Voltages without brackets:
Operating in Rx-position.
Squelch closed.
Voltages in brackets:
Operating in Tx-position.

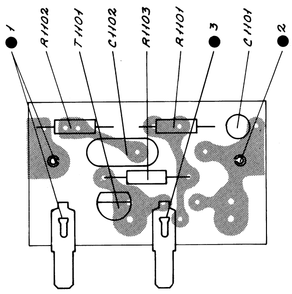
Modulation of transmitter: $\Delta f = \pm$ 3 kHz; fm = 1 kHz.
R906 adjusted to normal sensitivity.
AF-generator connected to microphone pre-amp. in the hook.

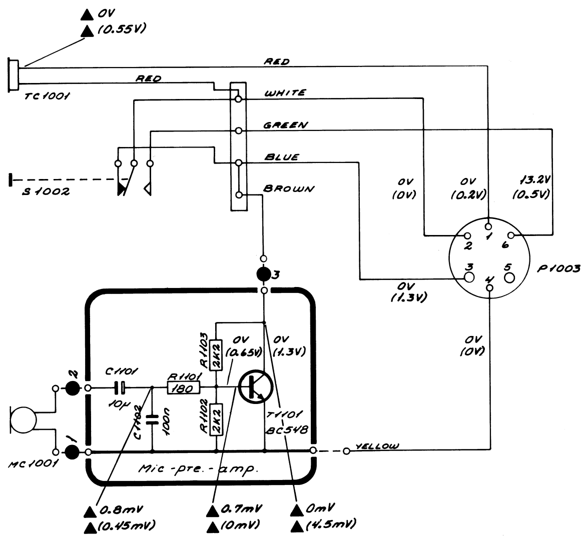


MICROPHONE PRE-AMPLIFIER

The Microphone Pre-Amplifier is built into the microtelephone hand-set.

The amplifier has got an input impedance of 200 ohm, equal to the microphone impedance. The amplifier consists of the transistor T1101, the current of which is supplied through the collector transistor R401 placed in the TX-EXCITER-UNIT.





AC voltages outside frame of diagram.

▲: Measured with AF-voltmeter.

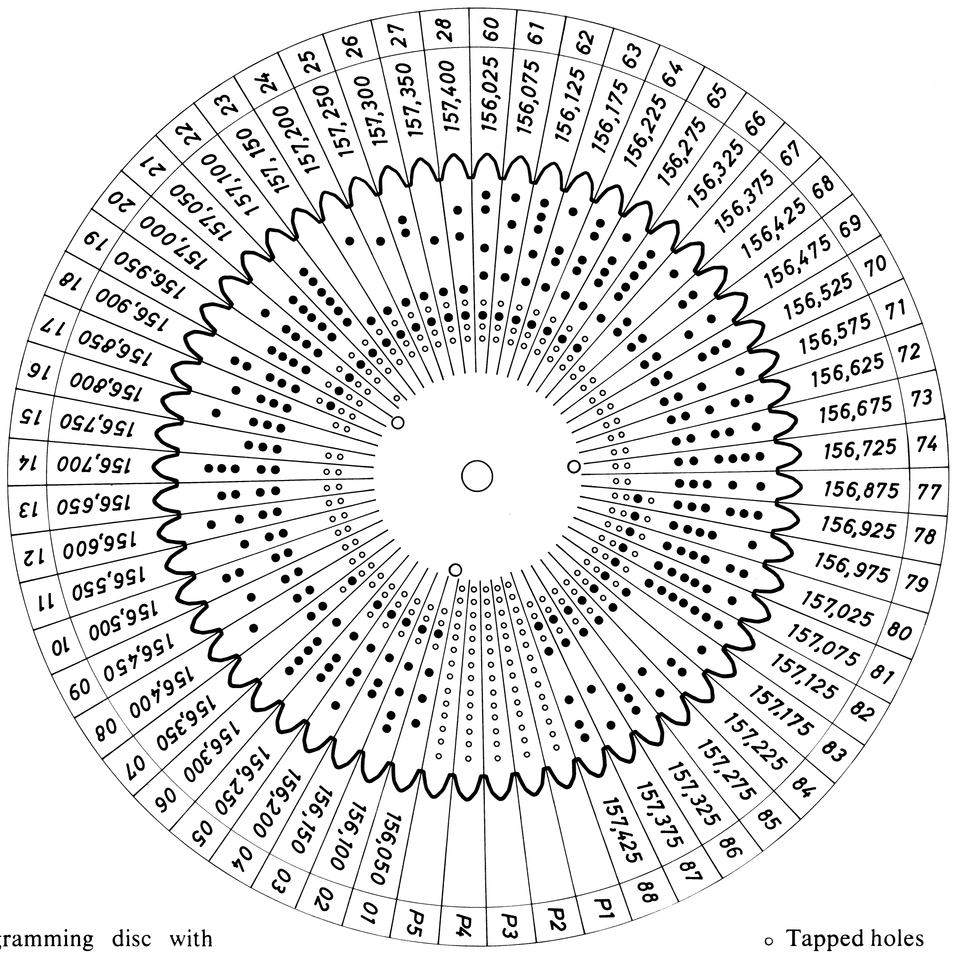
●: Connections to module.

Testconditions:

Voltages without brackets:
Operating in Rx-position.
Antenna signal 1 mV EMF: $\Delta f = \pm 3$ kHz; fm = 1 kHz.
Squelch max. closed.
Voltages in brackets:
Operating in Tx-position.
AF-generator connected to point ● 1 and ● 2.
V_{AF} = 0.9 mV EMF.

PROGRAMMING OF PRIVATE CHANNELS

The programming of a SAILOR VHF RT144 is made by means of a programming disc as far as frequencies and special requirements in connection with transmitter and receiver are concerned. A standard programming disc has all the international maritime channels permanently coded and is prepared for coding of 5 private channels.

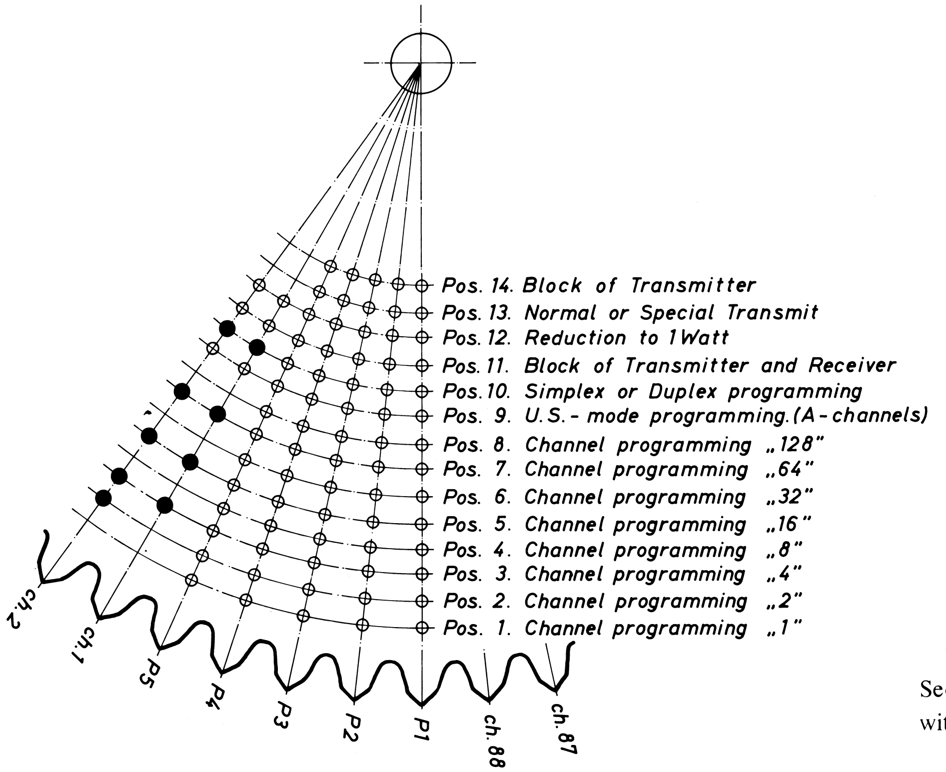


Standard programming disc with frequency indication.

o Tapped holes
• Contact points (logical »o«)

Procedure of programming:

1. Dismount control knobs on the front panel.
2. Remove front panel by unscrewing the four screws at the corners.
3. Remove dial plate.
4. The programming disc is now ready for programming.
5. The programming is carried out by inserting programming screws in accordance with the instructions given in the below paragraph »Programming Alternatives«.



Section of the programming disc with Pos.-explanation.

Programming Alternatives:

Programming of frequencies (Pos. 1 – Pos. 8, Pos. 10 and Pos. 13)

The set is prepared for programming of 5 private channels in the frequency band 155,0 MHz – 158,6 MHz. The channels can be selected as simplex or semi-duplex channels respectively, which means that at semi-duplex operation 4,6 MHz above the transmitting frequency is received. On the private channel positions it will also be possible to code the transmitter in the frequency band 159,6 MHz – 163,2 MHz (SPECIAL – TRANSMIT). Reduced datas on the output of the transmitter are here to be expected.

In the frequency table on page the frequencies wanted for transmitting respectively reception are found. Then the programming to be used in Pos. 1 – Pos. 8 and the programming of Pos. 10 and Pos. 13 are read and the programming screws are inserted in a private channel position.

NOTE! Remove the screw in Pos. 11 for every private channel which is taken into use.

Blocking of transmitter and receiver (Pos. 11)

One or more of the international maritime channels can be blocked in order to comply with national claims. In the channel positions, where blocking is wanted, a programming screw is to be inserted in Pos. 11.

NOTE! Channel 16 excepted.

Reduced output (Pos. 12)

On all international maritime channels and private channels an automatic reduction of the output to below 1 Watt is possible. In the channel positions, where reduction is wanted, a programming screw is to be inserted in Pos. 12.

Blocking of transmitter (Pos. 14)

Can be used in the countries, in which they have channels only used for reception, e. g. channels for weather reports. In the channel positions, in which blocking of the transmitter is wanted, a programming screw is to be inserted in Pos. 14.

Submitting of an external information (Pos. 9)

From one or more optional channel positions it will be possible to submit an external information. This information is a contact connection to negative battery pole, which can be used for activating of a relay or a transistor.

Example of use is a supplementary Watch Receiver, blocking of which is desired, when RT144 is set on certain channels.

A wire is mounted from the contact-panel Pos. 9 to pin 2 of the power-connector J1002.

In the channel positions, in which an information (connection to battery pole) is wanted, a programming screw is to be inserted in Pos. 9.

U.S.-mode programming (A-channels) (Pos. 9)

In U.S.A. and Canada more of the international maritime duplex-channels are used as simplex-channels. Therefore the set is prepared for individual coding of the duplex-channels needed.

The wire, which is mounted on the contact panel Pos. 10, is to be moved to Pos. 9 on the contact panel.

In the channel positions, which are wanted to be duplex-channels, a programming screw is to be inserted in Pos. 9.

The channel positions without a screw in Pos. 9 are simplex-channels (international channels and A-channels).

FREQUENCY TABLE

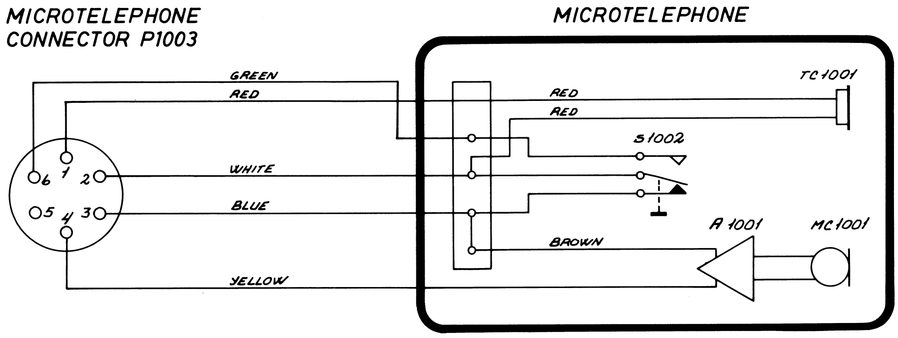
Insert a screw in the Pos number marked ⊖ No screw in the Pos number without marking								RECEIVE		TRANSMIT	
Pos 8	Pos 7	Pos 6	Pos 5	Pos 4	Pos 3	Pos 2	Pos 1	No screw in Pos 9	Insert a screw in Pos 9	No screw in Pos 13	Insert a screw in Pos 13
128	64	32	16	8	4	2	1	Frequency MHz	Frequency MHz	Frequency MHz	Frequency MHz
		⊖		⊖		⊖		155,000	159,600	155,000	159,600
		⊖		⊖		⊖	⊖	155,025	159,625	155,025	159,625
		⊖		⊖	⊖			155,050	159,650	155,050	159,650
		⊖		⊖	⊖		⊖	155,075	159,675	155,075	159,675
		⊖		⊖	⊖	⊖		155,100	159,700	155,100	159,700
		⊖		⊖	⊖	⊖	⊖	155,125	159,725	155,125	159,725
		⊖	⊖					155,150	159,750	155,150	159,750
		⊖	⊖				⊖	155,175	159,775	155,175	159,775
		⊖	⊖			⊖		155,200	159,800	155,200	159,800
		⊖	⊖			⊖	⊖	155,225	159,825	155,225	159,825
		⊖	⊖		⊖			155,250	159,850	155,250	159,850
		⊖	⊖		⊖		⊖	155,275	159,875	155,275	159,875
		⊖	⊖		⊖	⊖		155,300	159,900	155,300	159,900
		⊖	⊖		⊖	⊖	⊖	155,325	159,925	155,325	159,925
		⊖	⊖	⊖				155,350	159,950	155,350	159,950
		⊖	⊖	⊖			⊖	155,375	159,975	155,375	159,975
		⊖	⊖	⊖		⊖		155,400	160,000	155,400	160,000
		⊖	⊖	⊖		⊖	⊖	155,425	160,025	155,425	160,025
		⊖	⊖	⊖	⊖			155,450	160,050	155,450	160,050
		⊖	⊖	⊖	⊖		⊖	155,475	160,075	155,475	160,075
		⊖	⊖	⊖	⊖	⊖		155,500	160,100	155,500	160,100
		⊖	⊖	⊖	⊖	⊖	⊖	155,525	160,125	155,525	160,125
	⊖							155,550	160,150	155,550	160,150
	⊖						⊖	155,575	160,175	155,575	160,175
	⊖					⊖		155,600	160,200	155,600	160,200
	⊖					⊖	⊖	155,625	160,225	155,625	160,225
	⊖				⊖			155,650	160,250	155,650	160,250
	⊖				⊖		⊖	155,675	160,275	155,675	160,275
	⊖				⊖	⊖		155,700	160,300	155,700	160,300
	⊖				⊖	⊖	⊖	155,725	160,325	155,725	160,325
	⊖			⊖				155,750	160,350	155,750	160,350
	⊖			⊖			⊖	155,775	160,375	155,775	160,375
	⊖			⊖		⊖		155,800	160,400	155,800	160,400
	⊖			⊖		⊖	⊖	155,825	160,425	155,825	160,425
	⊖			⊖	⊖			155,850	160,450	155,850	160,450
	⊖			⊖	⊖		⊖	155,875	160,475	155,875	160,475
	⊖			⊖	⊖	⊖		155,900	160,500	155,900	160,500
	⊖			⊖	⊖	⊖	⊖	155,925	160,525	155,925	160,525
	⊖		⊖					155,950	160,550	155,950	160,550
	⊖		⊖				⊖	155,975	160,575	155,975	160,575
	⊖		⊖			⊖		156,000	160,600	156,000	160,600
	⊖		⊖			⊖	⊖	156,025	160,625	156,025	160,625
	⊖		⊖		⊖			156,050	160,650	156,050	160,650

Insert a screw in the Pos number marked ⊖ No screw in the Pos number without marking								RECEIVE		TRANSMIT	
Pos 8	Pos 7	Pos 6	Pos 5	Pos 4	Pos 3	Pos 2	Pos 1	No screw in Pos 9	Insert a screw in Pos 9	No screw in Pos 13	Insert a screw in Pos 13
128	64	32	16	8	4	2	1	Frequency MHz	Frequency MHz	Frequency MHz	Frequency MHz
	⊖		⊖		⊖		⊖	156,075	160,675	156,075	160,675
	⊖		⊖		⊖	⊖		156,100	160,700	156,100	160,700
	⊖		⊖		⊖	⊖	⊖	156,125	160,725	156,125	160,725
	⊖		⊖	⊖				156,150	160,750	156,150	160,750
	⊖		⊖	⊖			⊖	156,175	160,775	156,175	160,775
	⊖		⊖	⊖		⊖		156,200	160,800	156,200	160,800
	⊖		⊖	⊖		⊖	⊖	156,225	160,825	156,225	160,825
	⊖		⊖	⊖	⊖			156,250	160,850	156,250	160,850
	⊖		⊖	⊖	⊖		⊖	156,275	160,875	156,275	160,875
	⊖		⊖	⊖	⊖	⊖		156,300	160,900	156,300	160,900
	⊖		⊖	⊖	⊖	⊖	⊖	156,325	160,925	156,325	160,925
	⊖	⊖						156,350	160,950	156,350	160,950
	⊖	⊖					⊖	156,375	160,975	156,375	160,975
	⊖	⊖				⊖		156,400	161,000	156,400	161,000
	⊖	⊖				⊖	⊖	156,425	161,025	156,425	161,025
	⊖	⊖			⊖			156,450	161,050	156,450	161,050
	⊖	⊖			⊖		⊖	156,475	161,075	156,475	161,075
	⊖	⊖			⊖	⊖		156,500	161,100	156,500	161,100
	⊖	⊖			⊖	⊖	⊖	156,525	161,125	156,525	161,125
	⊖	⊖		⊖				156,550	161,150	156,550	161,150
	⊖	⊖		⊖			⊖	156,575	161,175	156,575	161,175
	⊖	⊖		⊖		⊖		156,600	161,200	156,600	161,200
	⊖	⊖		⊖		⊖	⊖	156,625	161,225	156,625	161,225
	⊖	⊖		⊖	⊖			156,650	161,250	156,650	161,250
	⊖	⊖		⊖	⊖		⊖	156,675	161,275	156,675	161,275
	⊖	⊖		⊖	⊖	⊖		156,700	161,300	156,700	161,300
	⊖	⊖		⊖	⊖	⊖	⊖	156,725	161,325	156,725	161,325
	⊖	⊖	⊖					156,750	161,350	156,750	161,350
	⊖	⊖	⊖				⊖	156,775	161,375	156,775	161,375
	⊖	⊖	⊖			⊖		156,800	161,400	156,800	161,400
	⊖	⊖	⊖			⊖	⊖	156,825	161,425	156,825	161,425
	⊖	⊖	⊖		⊖			156,850	161,450	156,850	161,450
	⊖	⊖	⊖		⊖		⊖	156,875	161,475	156,875	161,475
	⊖	⊖	⊖		⊖	⊖		156,900	161,500	156,900	161,500
	⊖	⊖	⊖		⊖	⊖	⊖	156,925	161,525	156,925	161,525
	⊖	⊖	⊖	⊖				156,950	161,550	156,950	161,550
	⊖	⊖	⊖	⊖			⊖	156,975	161,575	156,975	161,575
	⊖	⊖	⊖	⊖		⊖		157,000	161,600	157,000	161,600
	⊖	⊖	⊖	⊖		⊖	⊖	157,025	161,625	157,025	161,625
	⊖	⊖	⊖	⊖	⊖			157,050	161,650	157,050	161,650
	⊖	⊖	⊖	⊖	⊖		⊖	157,075	161,675	157,075	161,675
	⊖	⊖	⊖	⊖	⊖	⊖		157,100	161,700	157,100	161,700
	⊖	⊖	⊖	⊖	⊖	⊖	⊖	157,125	161,725	157,125	161,725

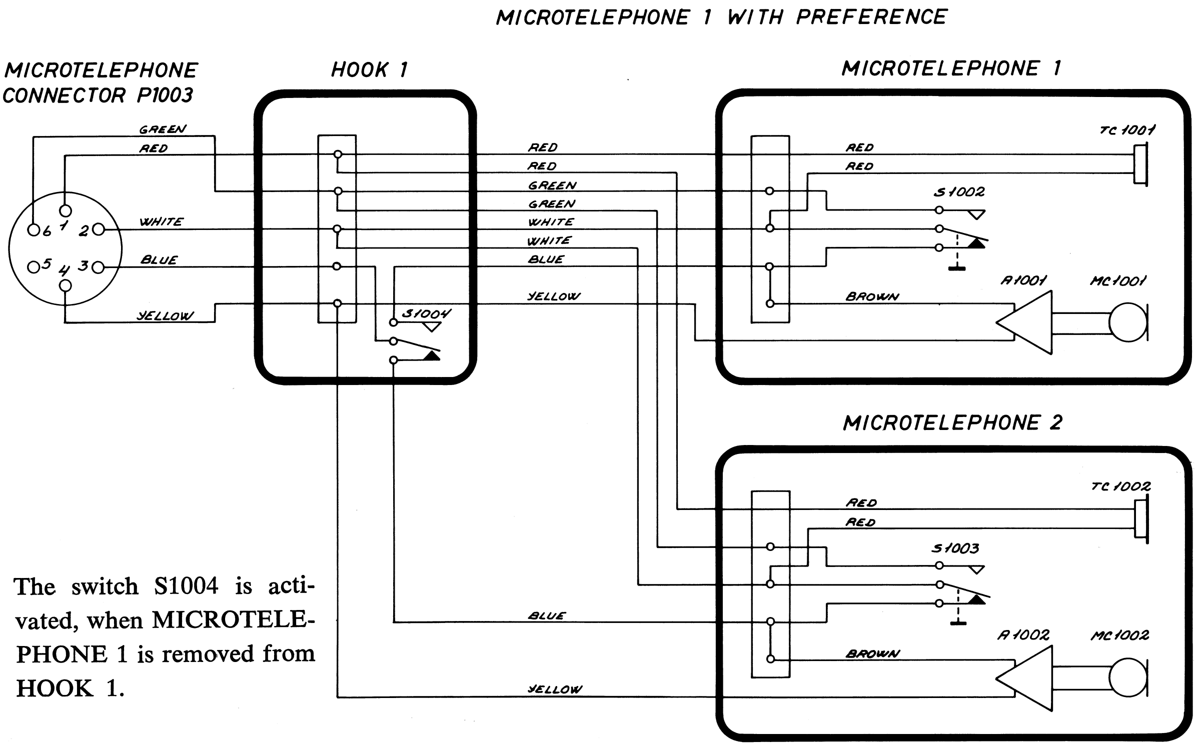
Insert a screw in the Pos number marked ⊖ No screw in the Pos number without marking								RECEIVE		TRANSMIT	
Pos 8	Pos 7	Pos 6	Pos 5	Pos 4	Pos 3	Pos 2	Pos 1	No screw in Pos 9	Insert a screw in Pos 9	No screw in Pos 13	Insert a screw in Pos 13
128	64	32	16	8	4	2	1	Frequency MHz	Frequency MHz	Frequency MHz	Frequency MHz
⊖								157,150	161,750	157,150	161,750
⊖							⊖	157,175	161,775	157,175	161,775
⊖						⊖		157,200	161,800	157,200	161,800
⊖						⊖	⊖	157,225	161,825	157,225	161,825
⊖					⊖			157,250	161,850	157,250	161,850
⊖					⊖		⊖	157,275	161,875	157,275	161,875
⊖					⊖	⊖		157,300	161,900	157,300	161,900
⊖					⊖	⊖	⊖	157,325	161,925	157,325	161,925
⊖				⊖				157,350	161,950	157,350	161,950
⊖				⊖			⊖	157,375	161,975	157,375	161,975
⊖				⊖		⊖		157,400	162,000	157,400	162,000
⊖				⊖		⊖	⊖	157,425	162,025	157,425	162,025
⊖				⊖	⊖			157,450	162,050	157,450	162,050
⊖				⊖	⊖		⊖	157,475	162,075	157,475	162,075
⊖				⊖	⊖	⊖		157,500	162,100	157,500	162,100
⊖				⊖	⊖	⊖	⊖	157,525	162,125	157,525	162,125
⊖			⊖					157,550	162,150	157,550	162,150
⊖			⊖				⊖	157,575	162,175	157,575	162,175
⊖			⊖			⊖		157,600	162,200	157,600	162,200
⊖			⊖			⊖	⊖	157,625	162,225	157,625	162,225
⊖			⊖		⊖			157,650	162,250	157,650	162,250
⊖			⊖		⊖		⊖	157,675	162,275	157,675	162,275
⊖			⊖		⊖	⊖		157,700	162,300	157,700	162,300
⊖			⊖		⊖	⊖	⊖	157,725	162,325	157,725	162,325
⊖			⊖	⊖				157,750	162,350	157,750	162,350
⊖			⊖	⊖			⊖	157,775	162,375	157,775	162,375
⊖			⊖	⊖		⊖		157,800	162,400	157,800	162,400
⊖			⊖	⊖		⊖	⊖	157,825	162,425	157,825	162,425
⊖			⊖	⊖	⊖			157,850	162,450	157,850	162,450
⊖			⊖	⊖	⊖		⊖	157,875	162,475	157,875	162,475
⊖			⊖	⊖	⊖	⊖		157,900	162,500	157,900	162,500
⊖			⊖	⊖	⊖	⊖	⊖	157,925	162,525	157,925	162,525
⊖		⊖						157,950	162,550	157,950	162,550
⊖		⊖					⊖	157,975	162,575	157,975	162,575
⊖		⊖				⊖		158,000	162,600	158,000	162,600
⊖		⊖				⊖	⊖	158,025	162,625	158,025	162,625
⊖		⊖			⊖			158,050	162,650	158,050	162,650
⊖		⊖			⊖		⊖	158,075	162,675	158,075	162,675
⊖		⊖			⊖	⊖		158,100	162,700	158,100	162,700
⊖		⊖			⊖	⊖	⊖	158,125	162,725	158,125	162,725
⊖		⊖		⊖				158,150	162,750	158,150	162,750
⊖		⊖		⊖			⊖	158,175	162,775	158,175	162,775
⊖		⊖		⊖		⊖		158,200	162,800	158,200	162,800

Insert a screw in the Pos number marked No screw in the Pos number without marking								RECEIVE		TRANSMIT	
Pos 8	Pos 7	Pos 6	Pos 5	Pos 4	Pos 3	Pos 2	Pos 1	No screw in Pos 9	Insert a screw in Pos 9	No screw in Pos 13	Insert a screw in Pos 13
128	64	32	16	8	4	2	1	Frequency MHz	Frequency MHz	Frequency MHz	Frequency MHz
⊖		⊖		⊖		⊖	⊖	158,225	162,825	158,225	162,825
⊖		⊖		⊖	⊖			158,250	162,850	158,250	162,850
⊖		⊖		⊖	⊖		⊖	158,275	162,875	158,275	162,875
⊖		⊖		⊖	⊖	⊖		158,300	162,900	158,300	162,900
⊖		⊖		⊖	⊖	⊖	⊖	158,325	162,925	158,325	162,925
⊖		⊖	⊖					158,350	162,950	158,350	162,950
⊖		⊖	⊖				⊖	158,375	162,975	158,375	162,975
⊖		⊖	⊖			⊖		158,400	163,000	158,400	163,000
⊖		⊖	⊖			⊖	⊖	158,425	163,025	158,425	163,025
⊖		⊖	⊖		⊖			158,450	163,050	158,450	163,050
⊖		⊖	⊖		⊖		⊖	158,475	163,075	158,475	163,075
⊖		⊖	⊖		⊖	⊖		158,500	163,100	158,500	163,100
⊖		⊖	⊖		⊖	⊖	⊖	158,525	163,125	158,525	163,125
⊖		⊖	⊖	⊖				158,550	163,150	158,550	163,150
⊖		⊖	⊖	⊖			⊖	158,575	163,175	158,575	163,175
⊖		⊖	⊖	⊖		⊖		158,600	163,200	158,600	163,200

Normal Installation with 1 Microtelephone

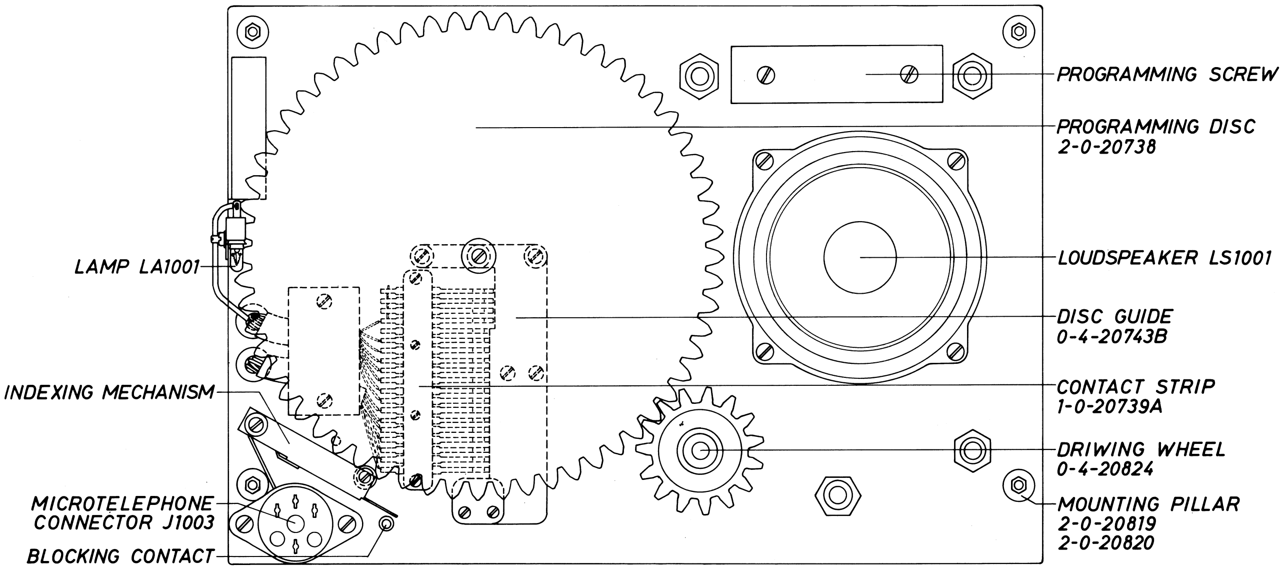


Special Installation with 2 Microtelephones

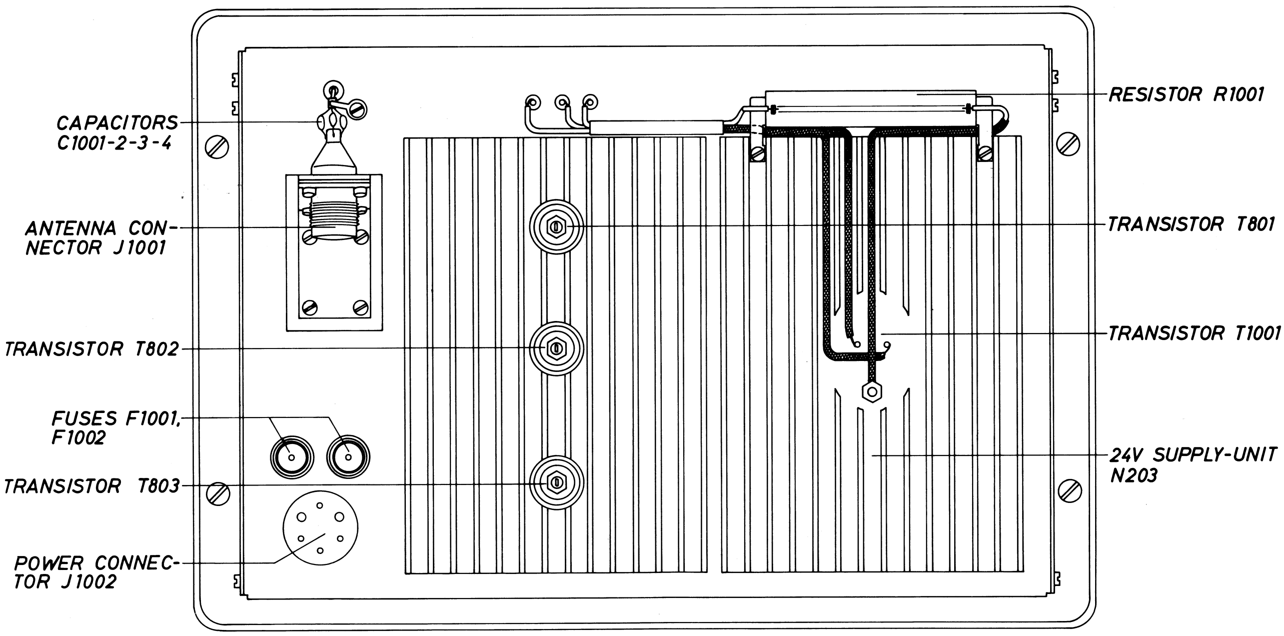


Note: The switch S1004 is activated, when MICROTELEPHONE 1 is removed from HOOK 1.

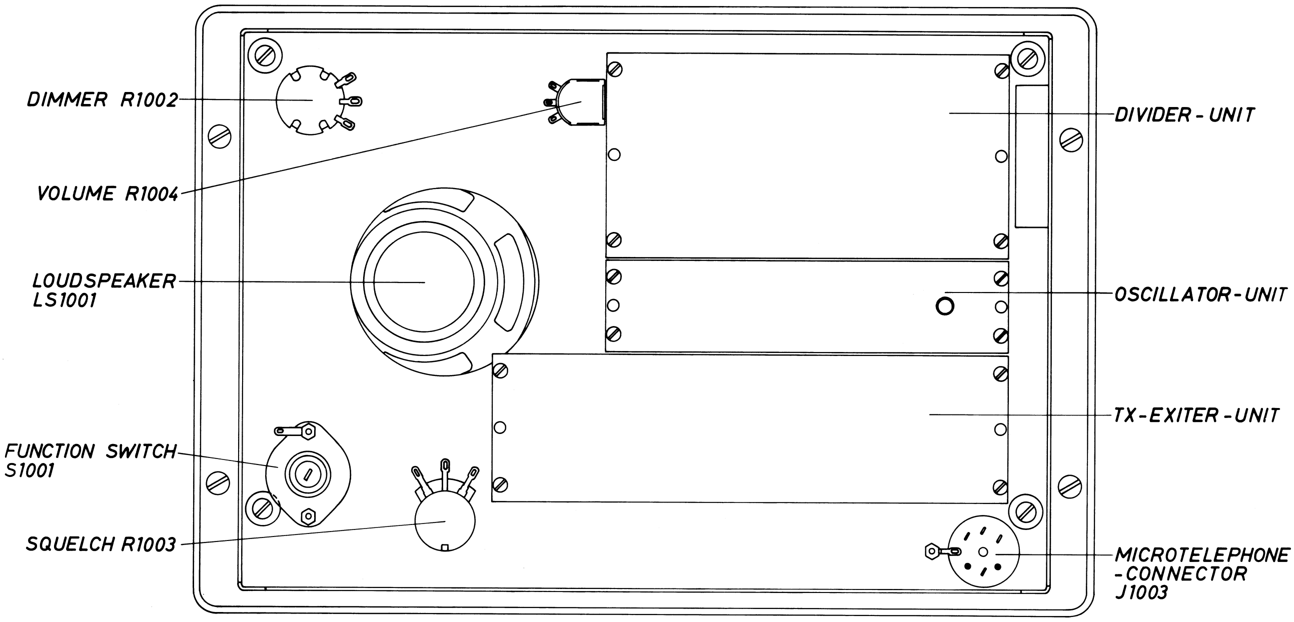
MECHANICAL LAYOUT



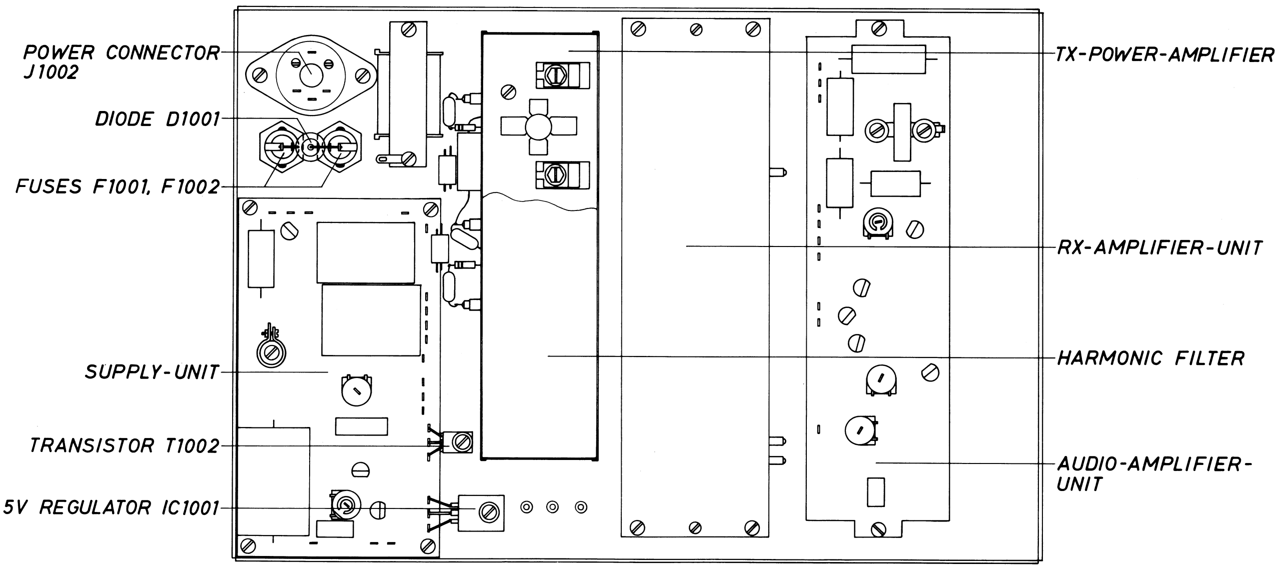
FRONT CHASSIS VIEW



REAR CHASSIS VIEW



INNER CHASSIS VIEW



INNER CHASSIS VIEW

SERVICE

Maintenance

Preventive Maintenance

If SAILOR RT144 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 bodies. Control the function of switches, volume control and of handset with holder.

Owing to its traditional structure the SAILOR RT144 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 month. The set must be taken to the service workshop to be tested. Along with each set a »Testsheet« 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 »Testsheet«, the set must be adjusted like specified under Adjustment Procedure.

Alignment Instructions

Introduction

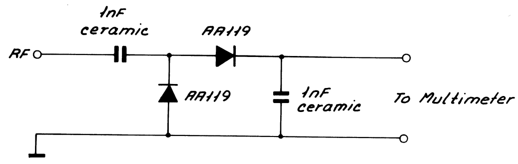
The measuring values indicated in the following paragraphs are typical values and are normative. Where exact values are indicated it will be necessary to use instruments in absolute conformity with the below list.

Necessary measuring instruments

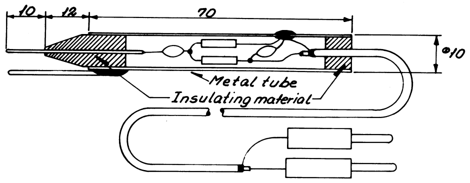
VHF Signal Generator type TF2015 .... MARCONI
FM Modulation Meter type TF2303............ MARCONI
AF Voltmeter type IM21 .... HEATKIT
Distortion Analyser type IM58................... HEATHKIT
Tone Generator type PM5105.................... PHILIPS
Electronic Multimeter type PM2503 .... PHILIPS
RF Directional 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 M Ohm and 50 Ohm
Accuracy:	$\leq 1 \cdot 10^{-6}$

Test probe



Layout of the probe



ADJUSTMENT PROCEDURE

Adjustment of VOLTAGE REGULATORS

Alignment of 13,2V and 10V Voltage Regulators

1. Connect voltmeter to TP. 1.
2. If it is a 24V station adjust R404 to 13,2V on the voltmeter.
3. Connect voltmeter to TP. 2.
4. Adjust potentiometer R412 to 10V ± 0,2V.

Adjustment of OSCILLATOR-UNIT

Alignment of Frequency

1. Connect frequency counter between TP. 3 and frame through 1uF.
2. Adjust trimmer capacitor C509, until the frequency counter shows 11100000 Hz ± 10 Hz.

Note: You can also count directly on the transmitting frequency, and fore adjustment of C509 you can use an arbitrary channel ex. ch. 16. f = 156800000 Hz ± 150 Hz.

Alignment of Multiplier and Mixer

1. Set CHANNEL SELECTOR on ch. 28.
2. Connect testprobe to TP. 4.
3. Adjust coils L502 and L503 for maximum deflection on the Tp.-meter.
4. Connect testprobe to TP. 5.
5. Adjust coils L503 and L504 for maximum deflection on the Tp.-meter.
6. Connect the testprobe to TP. 6.
7. Adjust coil L507 for maximum deflection on the Tp.-meter.
8. Connect the testprobe to TP. 7.
9. Fine adjustment of coils L502, L503 and L504.

Adjustment of RX-AMPLIFIER-UNIT and AUDIO-AMPLIFIER-UNIT

Alignment of RF- and IF-Amplifier

1. Set CHANNEL SELECTOR on ch. 28.
2. Connect signal generator to antenna connector J1001.
3. Connect testprobe to TP. 8.
4. Set signal generator frequency to 162,000 MHz and increase signal level, until the deflection on the Tp.-meter reaches 30% of maximum deflection.
5. Readjust signal generator level under the following alignment always keeping the same deflection on the Tp.-meter.
6. Adjust coils L109 and L108 to maximum deflection on the Tp.-meter.
7. Repeat adjustment under point 6.
8. Adjust coils L107, L105, L106, L104, L103, L102 and L101 to maximum deflection on the Tp.-meter.
9. Set CHANNEL SELECTOR on ch. 6.
10. Set signal generator frequency to 156,300 MHz.
11. Adjust coil L905 and L906 to maximum deflection on the Tp.-meter.
12. Adjust potentiometer R938 to maximum deflection on the Tp.-meter.
13. Set CHANNEL SELECTOR on ch. 28.
14. Set signal generator frequency to 162,000 MHz.
15. Adjust coils L106, L104, L103, L102 and L101 to maximum deflection on the Tp.-meter.
16. Set CHANNEL SELECTOR on ch. 6.
17. Set signal generator frequency on 156,300 MHz.
18. Adjust potentiometer R938 to maximum deflection on the Tp.-meter.

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

1. Set CHANNEL SELECTOR on ch. 6.
2. Connect signal generator to antenna connector J1001.
3. Connect frequency counter between TP. 8 and frame through 10µF.
4. Set signal generator level to 1mV (no modulation).
5. Set signal generator frequency till frequency counter shows 400,0 kHz ± 0,1 kHz.
6. Connect voltmeter between TP. 9 and +10V.
7. Check that potentiometer R202 is in center position.
8. Rotate iron screw in coil L110 and take readings of Vmin. and Vmax. from the voltmeter (mean voltage).
9. Adjust coil L110 to (Vmin. + Vmax.) ½ on the voltmeter.
10. Connect AF-amplifier voltmeter to TP. 10.
11. Load TP. 10 with telephone or a 200 ohm resistor.
12. Set signal generator to modulation frequency 1000 Hz and deviation ± 3 kHz.
13. Adjust potentiometer R202 to 0,55 V (RMS) on AF-amplifier-voltmeter.
14. Connect distortion analyzer between TP. 11 and frame (IMPORTANT remember that there is 12V DC on TP. 12).
15. Set VOLUME control R1004 in max. position.
16. Adjust potentiometer R228 for an output, which gives 15% distortion.
17. Adjust volume control R1004 to 3,7 (RMS) over 4 ohm (3,5W).
18. Check that the distortion is less than 5%.

Alignment and Control of Receiver Sensitivity

1. Set CHANNEL SELECTOR on ch. 6.
2. Connect signal generator to antenna connector J1001.
3. Connect distortion analyzer between TP. 11 and frame (IMPORTANT remember that there is 12V DC on TP. 11).
4. Set signal generator to best sensitivity.
5. Adjustment L101 and L102 to best signal to noise ratio (best sensitivity).
6. Turn adjustment screw in L107 two turns C.W. and notice at the same time that the sensitivity is rising.
7. Check that the sensitivity on all channels is better than 0,6 uV EMK for 12 dB SINAD.

Alignment of Squelch

1. Set CHANNEL SELECTOR on ch. 6.
2. Connect signal generator to antenna connector J1001.
3. Turn Squelch potentiometer R1003 full C.W.
4. Set signal generator to best sensitivity and signal level 6 dB higher than the sensitivity point.
5. Adjust inside squelch potentiometer R206 till the squelch just starts to cut the noise.

Adjustment of TX-EXCITER-UNIT and TX-POWER-AMPLIFIER

Alignment of Output-Power

1. Set CHANNEL SELECTOR to ch. 14.
2. Set FUNCTION SWITCH in position 1W.
3. Connect RF-output power meter and a 50 ohm, 25W load resistor to antenna connector J1001.
4. Connect testprobe to TP. 12.
5. Turn potentiometer R963 fully C.C.W.
6. Key the transmitter.
7. Adjust coils L906, L907 and again L906 to maximum deflection on the Tp.-meter.
8. Connect testprobe to TP. 13.
9. Adjust coils L910, L907 to maximum deflection on the Tp.-meter.
10. Set FUNCTION SWITCH in position ON.
11. Adjust capacitor C802, C806, C814 and C821 to maximum deflection on RF-output power meter.
12. Repeat adjustment under point 11.
13. Adjust potentiometer R963 to about 20W.
14. Connect testprobe to TP. 13.
15. Adjust coil L907 and L910 to maximum deflection on Tp.-meter.
16. Adjust capacitors C802, C806, C814 and C821 to maximum deflection on RF-output power meter.
17. Repeat adjustment under point 16.
18. Adjust potentiometer R963 to 20–25 W on RF-output power meter.

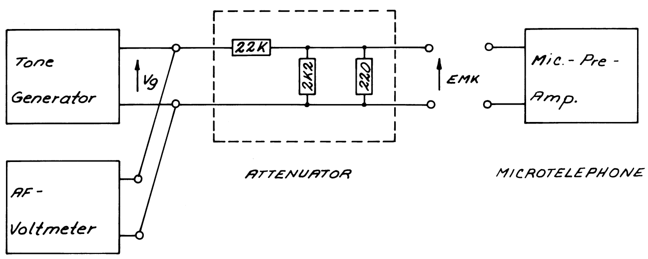
Alignment of reduced Transmitter Output

1. Set FUNCTION SWITCH to position 1W.
2. Connect RF-output power meter and a 50 ohm, 25W load resistor to the antenna connector J1001.
3. Key the transmitter.
4. Adjust resistor R419 until the RF-output power meter shows from 0,5W to 1W.

Alignment of Modulation

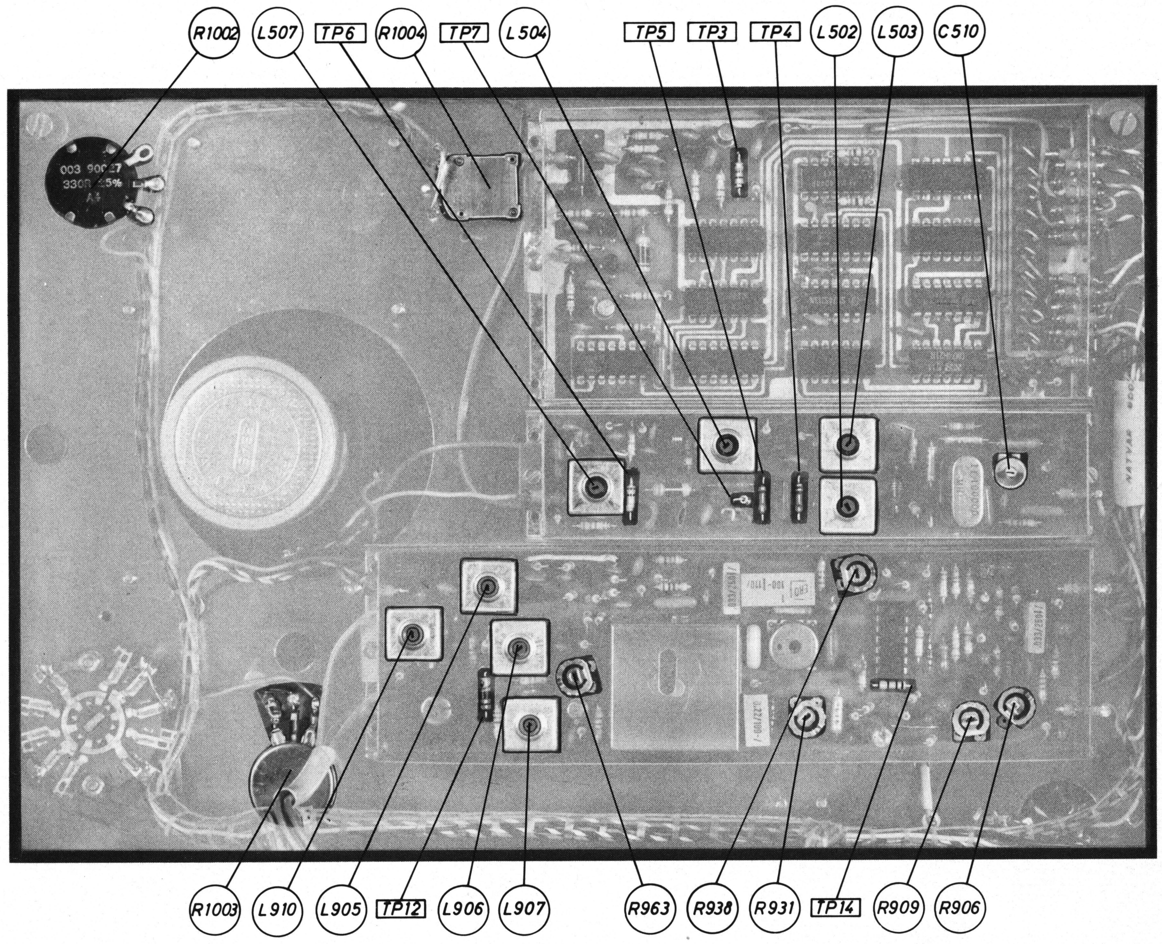
1. Set CHANNEL SELECTOR on ch. 28.
2. Connect tone generator, AF-voltmeter and Input Attenuator to MICROPHONE-PRE-AMPLIFIER input (Remove the microphone). See diagram.
3. Set FUNCTION SWITCH to position 1W.
4. Connect modulation meter loosely to the RF load resistor.
5. Connect distortion analyzer to the modulation meter.
6. Turn potentiometer R909 full C.W.
7. Set tone generator to a frequency of 1000 Hz and the level to »Standard test signal«.
8. Connect AF-voltmeter to TP. 14.
9. Key the transmitter.
10. Adjust potentiometer R906 to 1,1 V RMS on testpoint TP. 14.
11. Set tone generator to a frequency of 1000 Hz and the level to »Standard test signal +20 dB«.
12. Connect AF-voltmeter to TP. 14.
13. Adjust potentiometer R909 to 1,7 V RMS on testpoint TP. 14.
14. Set tone generator level to »Standard test signal + 20 dB« and the frequency, which gives the largest + or – deviation, abt. 3 kHz.
15. Adjust potentiometer R931 for ± 5 kHz deviation.
16. Set tone generator to a frequency of 1000 Hz and the level to »Standard test signal«.
17. Fine adjust potentiometer R906 to ± 3 kHz deviation.
18. Check that distortion is less than 5%.

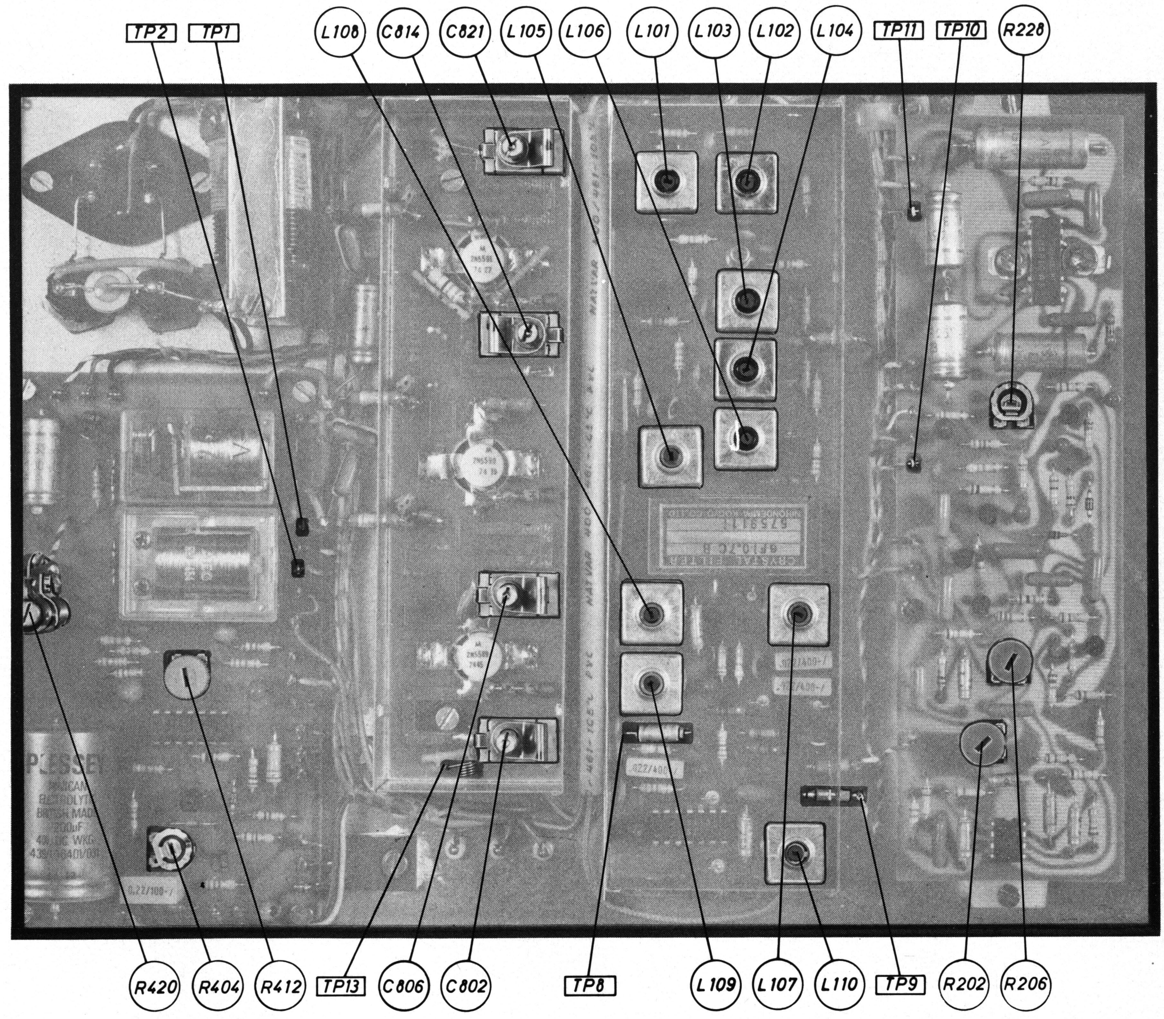
Input Attenuator for MICROPHONE PRE-AMPLIFIER.



»Standard test signal«: Vg = 0,1 V, (EMK = 0,9 mV).

»Standard test signal + 20 dB«: Vg = 1 V; (EMK = 9 mV).


R1002
L507
TP6
R1004
TP7
L504
TP5
TP3
TP4
L502
L503
C510
R1003
L910
L905
TP12
L906
L907
R963
R938
R931
TP14
R909
R906


TP2
TP1
L108
C814
C821
L105
L106
L101
L103
L102
L104
TP11
TP10
R228
R420
R404
R412
TP13
C806
C802
TP8
L109
L107
L110
TP9
R202
R206

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 RT 144.
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 RT144 the section 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 both diagrams and location drawings.
SAILOR RT144 has a number of trimming cores and trimmers, which must not be touched, unless adjustments like specified under Adjustment Procedure can be made. When measuring in the units, shortcircuitings must be avoided as the transistors would then be spoiled.

Trouble-shooting in the frequency generating circuit

Below a couple of measuring methods to be made use of at the fault-finding in the frequency generating circuit will be described. Assumed is a thorough knowledge of the mode of operation of the frequency generating circuit, otherwise the sections Principle of Operation and Circuit Description should be carefully read.
At trouble-shooting the phase-locked loop can be opened, and if the system is o.k. it has the following mode of operation:
A counter capable of measuring frequencies in the 150 MHz range is connected to the coaxial cable supplying »LO-injection« to the RX-AMPLIFIER-UNIT.

The resistor lead to R937 is cut, and an external variable DC-control-voltage (1-10 V DC) is supplied to the resistor R937.
In position »receive« the »LO-injection« frequency will vary from abt. 140 MHz to abt. 154 MHz at a DC-control-voltage variation from 2V to 10V.
In position »transmit« the »LO-injection« frequency will vary from abt. 152 MHz to 166 MHz at a DC-control-voltage variation from 2V to 10V.
The input signals to pin 1 and pin 3 of MC4044 IC612 can be checked by means of an oscilloscope. The graphs are shown in section Circuit Description under DIVIDER-UNIT. If the DC-control-voltage to R937 is varied, it will be seen that signal on pin 3 of IC612 is varying in frequency above respectively below 25 kHz, and that the signal on pin 1 has a fixed frequency of 25 kHz.
The output voltage from MC4044 IC612 can be checked by means of a multi-meter on pin 5 and pin 10 respectively. If the DC-control-voltage is so adjusted that the frequency on pin 3 of IC612 is below 25 kHz, abt. 0,1V DC will be measured on pin 5 and abt. 0,1V DC on pin 10 of IC612 by means of a multi-meter. If the DC-control-voltage is so adjusted that the frequency on pin 3 of IC612 is above 25 kHz, abt. 2,3V DC on pin 10 and abt. 2,3V DC on pin 5 of IC612 will be measured by means of a multi-meter.
The output voltage on pin 1 of IC901d can be checked by means of a multi-meter. If the DC-control-voltage to R937 is varied, the DC-voltage measured on pin 1 of IC901d will change from 1V to 10V, when the frequency, for which the channel selector has been set, is surpassed.

Check on DIVIDER-UNIT coding:

The coding of DIVIDER-UNIT can be checked by means of the frequency table and description in section Programming of Private Channels.
One screw inserted into the programming disc will give a logical »0« (0V).
No screw in the programming disc will give a logical »1« (5V).
The 5V and 0V can be checked by means of a multi-meter on the terminals of the DIVIDER-UNIT. (The use of the terminals is described in the section Circuit Description under DIVIDER-UNIT).

Check on the phase-locked loop:
Check as to whether the phase-locked loop is locked (i. e. the V.C.O. generates the required frequency, for which the channel selector has been set). By means of a multi-meter the DC-control-voltage on the resistor lead to R937 is measured. If the DC-control-voltage is abt. 4-7V and changes its value from channel to channel, the phase-locked loop is locked.
If the DC-control-voltage is abt. 1V or 10V, the phase-locked loop is not locked, and there is a fault in the system.

Symptoms of fault on the phase-locked loop:
When the set is incapable of transmitting and receiving in all channel positions!
If all the DC-supply-voltages to the modules are o. k., the fault is to be found in the modules OSCILLATOR-UNIT, DIVIDER-UNIT or TX-EXCITER-UNIT.
When the frequency is incorrect in one or more of the channel positions, then the source of fault will be limited to the PROGRAMMING DISC or the DIVIDER-UNIT.

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.

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.

Necessary Adjustment after replacement of Module

Replacement of RX-AMPLIFIER-UNIT:
Alignment of RF- and IF-Amplifier points 1 to 18.
Alignment of Detector, Telephone-Amplifier and LF-Power-Amplifier points 1 to 13.
Alignment and Control of Receiver Sensitivity points 1 to 7.
Alignment of Squelch points 1 to 5.

Replacement of AUDIO-AMPLIFIER-UNIT:
Alignment of Detector, Telephone-Amplifier and LF-Power-Amplifier points 10 to 18.
Alignment of Squelch points 1 to 5.

Replacement of SUPPLY-UNIT:
Alignment of 13,2 V and 10 V Voltage Regulators points 1 to 4.

Replacement of OSCILLATOR-UNIT:
Alignment of Frequency points 1 and 2.
Alignment of Multiplifier and Mixer points 1 to 9.

Replacement of DIVIDER-UNIT:
No alignments.

Replacement of TX-POWER-AMPLIFIER:
Alignment of Output-Power points 1 to 18.
Alignment of Reduced Transmitter Output points 1 to 4.

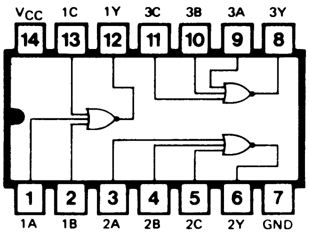
Replacement of TX-EXCITER-UNIT:
Alignment of Output-Power points 1 to 18.
Alignment of Modulation points 1 to 18.
Alignment of RF- and IF-Amplifier points 1 to 18.
Alignment and Control of Receiver Sensitivity points 1 to 5.

Replacement of V.C.O.:
Alignment of Modulation points 14 to 18.
Alignment of RF- and IF-Amplifier points 1 to 18.
Alignment and Control of Receiver Sensitivity points 1 to 5.

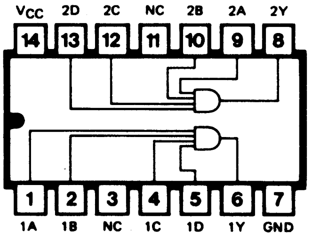
Functional block diagrams for the

INTEGRATED CIRCUITS

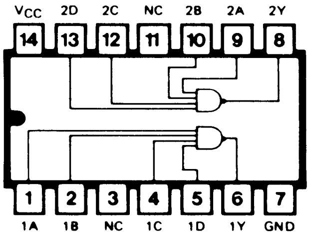
SN7427N
Triple 3-input NOR gate



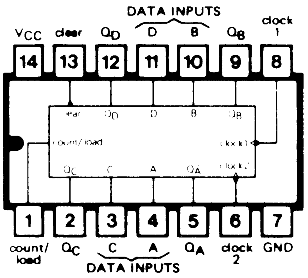
SN74H21N
Dual 4-input AND gate



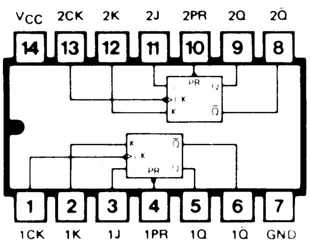
SN7420N
Dual 4-input NAND gate



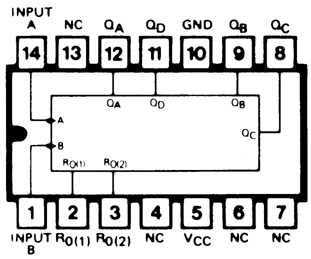
SN74197N
50 MHz Binary Counter



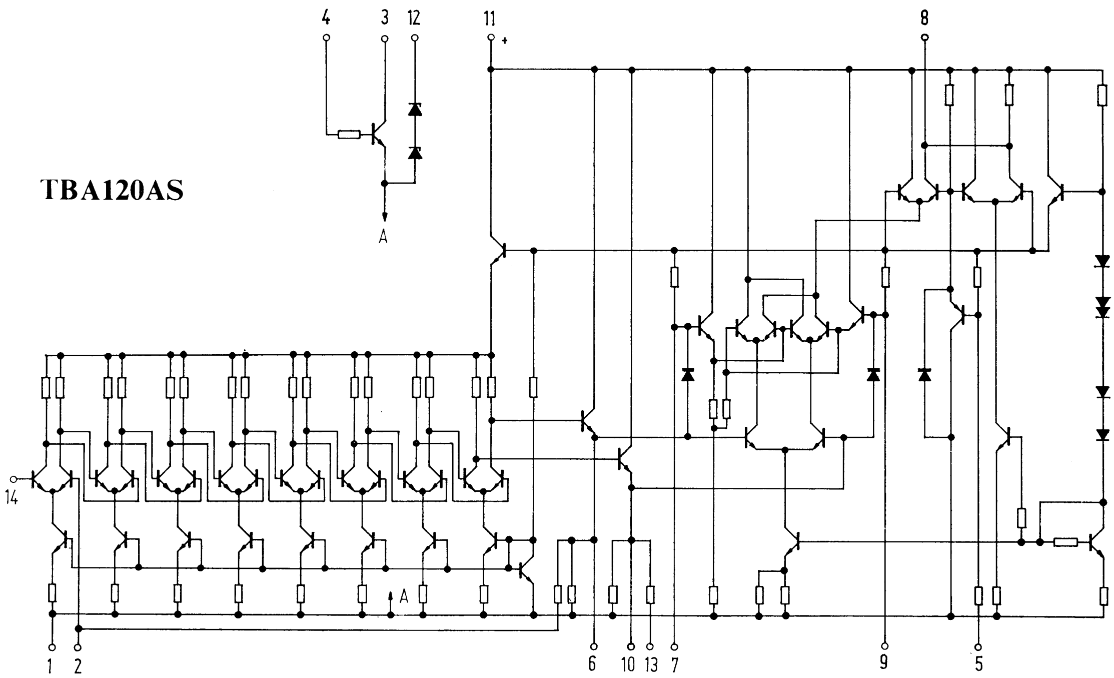
SN74S113N
Dual J-K master-slave flip-flop



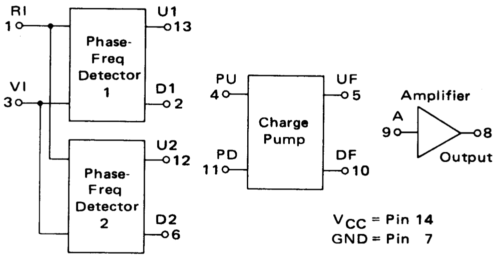
SN7493N
4-bit binary counter



TBA120AS



MC4044



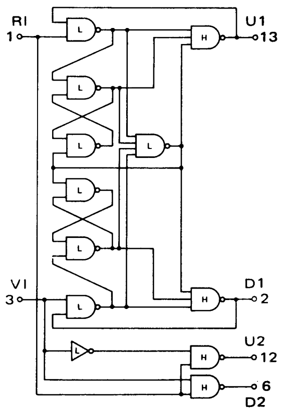
Input Loading Factor: RI, VI = 3

Output Loading Factor (Pin 8) = 10

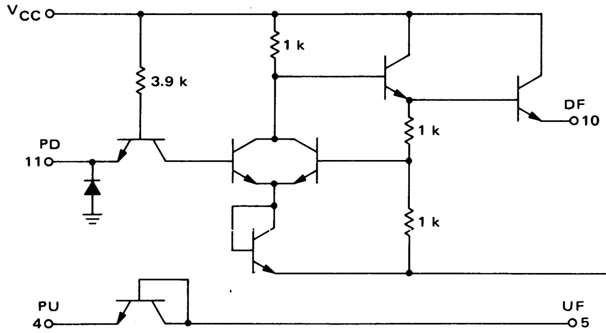
Total Power Dissipation = 85 mW typ/pkg

Propagation Delay Time = 9.0 ns typ (thru phase detector)

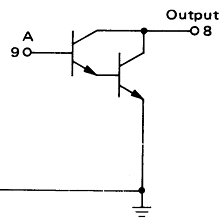
PHASE DETECTOR



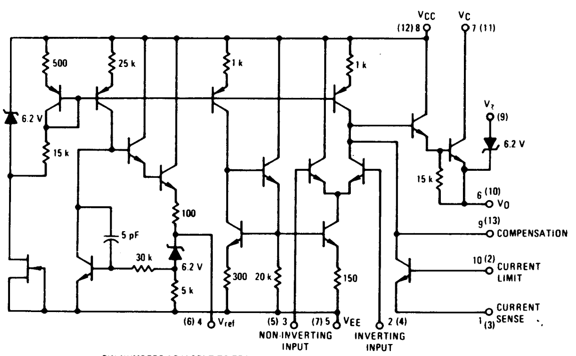
CHARGE PUMP



AMPLIFIER

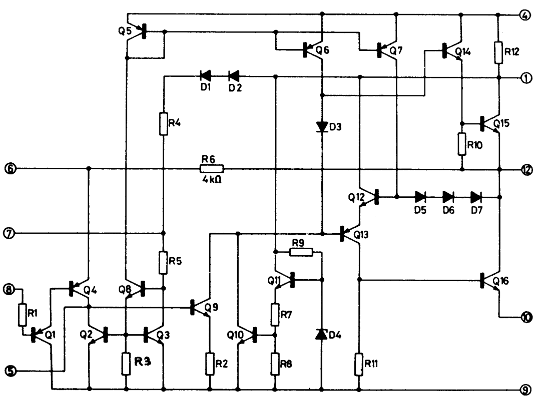


1723C



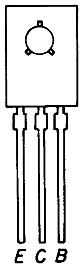
PIN NUMBERS ADJACENT TO TERMINALS ARE FOR THE METAL AND CERAMIC FLAT PACKAGE;
PIN NUMBERS IN PARENTHESIS ARE FOR THE CERAMIC DUAL IN-LINE PACKAGE.

TBA810AS

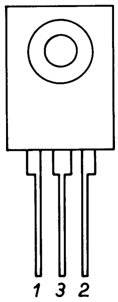


PIN. CONFIGURATION

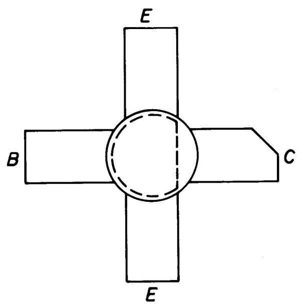
TOP VIEW



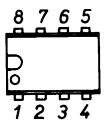
BD138



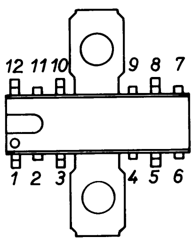
7705C



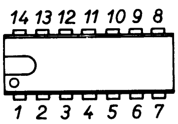
2N5589
2N5590
2N5591



1458C

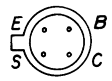


TBA 810AS

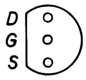


TBA 120S; 1723C; 324; MC 4044; 7420; 74H20; 74H21; 7427; 7493; 74S113; 74197.

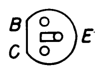
BOTTOM VIEW



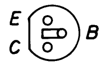
BF 200



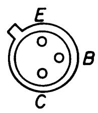
TIS88A



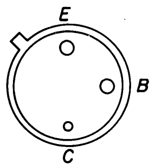
BF494
BF199
BF450



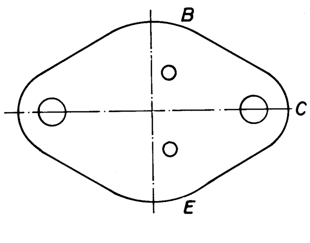
BC548
BC548B/C
BC558



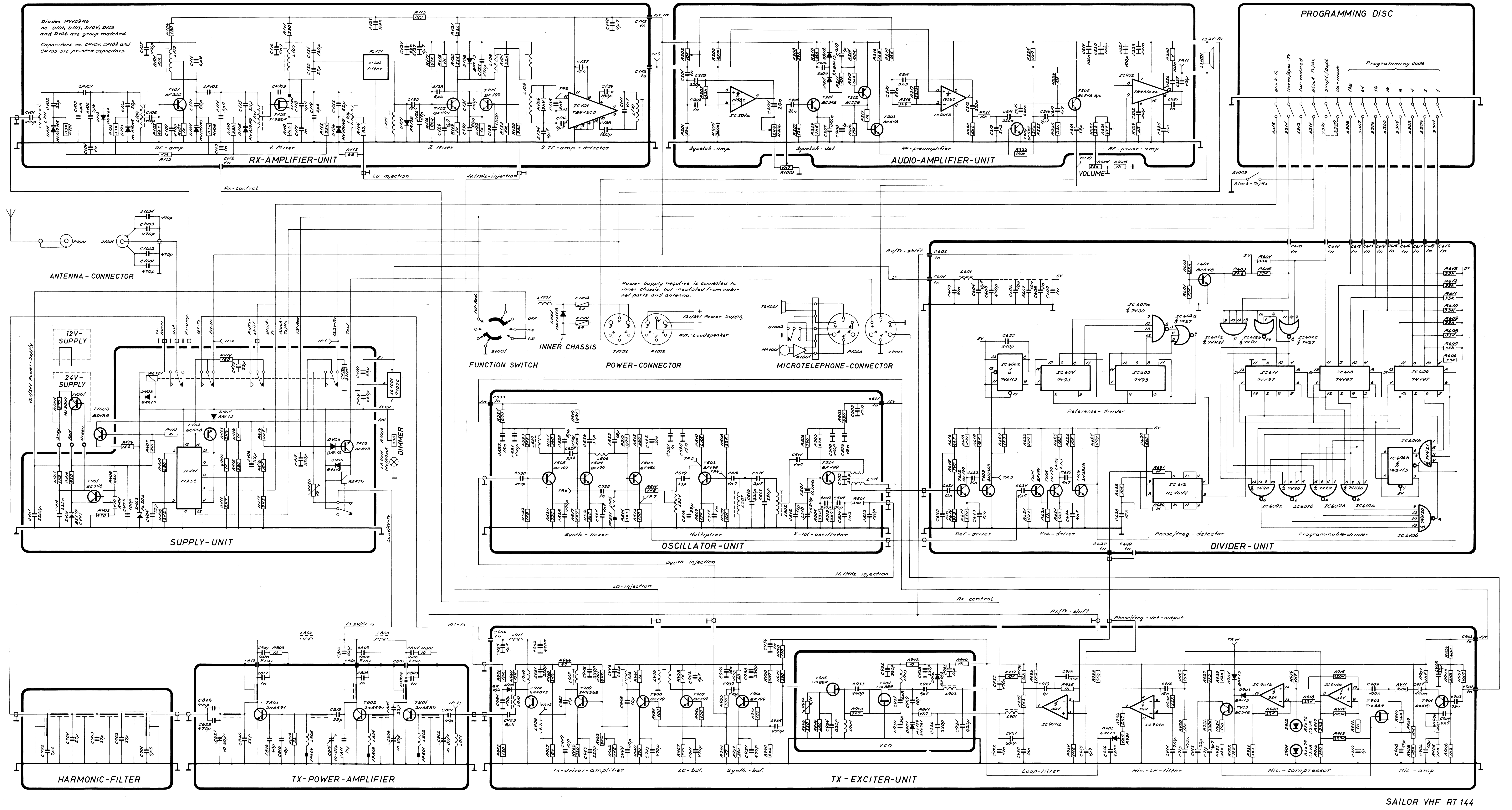
2N2368



2N4073



MJ3000


RX-AMPLIFIER-UNIT
AUDIO-AMPLIFIER-UNIT
PROGRAMMING DISC
ANTENNA-CONNECTOR
FUNCTION SWITCH
INNER CHASSIS
POWER-CONNECTOR
MICROTELEPHONE-CONNECTOR
SUPPLY-UNIT
OSCILLATOR-UNIT
DIVIDER-UNIT
HARMONIC-FILTER
TX-POWER-AMPLIFIER
TX-EXCITER-UNIT
12V-SUPPLY
24V-SUPPLY
DIMMER
VOLUME
VCO
Diodes MV109MS no. D101, D103, D104, D105 and D106 are group matched.
Capacitors no. CP101, CP102 and CP103 are printed capacitors.
Power Supply negative is connected to inner chassis, but insulated from cabinet parts and antenna.
SAILOR VHF RT 144

RX-AMPLIFIER-UNIT RT144

Symbol	Description		Manufact.	
R101	Resistor	33 Kohm	Philips	2322 101 33333
R102	Resistor	33 Kohm	Philips	2322 101 33333
R103	Resistor	4,7 Kohm	Philips	2322 101 33472
R104	Resistor	10 Kohm	Philips	2322 101 33103
R105	Resistor	10 Kohm	Philips	2322 101 33103
R106	Resistor	180 ohm	Philips	2322 101 33181
R107	Resistor	1 Kohm	Philips	2322 101 33102
R108	Resistor	33 Kohm	Philips	2322 101 33333
R109	Resistor	33 Kohm	Philips	2322 101 33333
R110	Resistor	1,5 Kohm	Philips	2322 101 33152
R111	Resistor	330 ohm	Philips	2322 101 33331
R112	Resistor	33 Kohm	Philips	2322 101 33333
R113	Resistor	68 ohm	Philips	2322 101 33689
R114	Resistor	82 ohm	Philips	2322 101 33829
R115	Resistor	120 ohm	Philips	2322 101 33121
R116	Resistor	22 Kohm	Philips	2322 106 33223
R117	Resistor	47 Kohm	Philips	2322 101 33473
R118	Resistor	1 Kohm	Philips	2322 101 33102
R119	Resistor	1 Kohm	Philips	2322 106 33102
R120	Resistor	22 Kohm	Philips	2322 101 33223
R121	Resistor	220 ohm	Philips	2322 101 33221
R122	Resistor	1 Kohm	Philips	2322 106 33102
R123	Resistor	10 Kohm	Philips	2322 106 33103
R124	Resistor	22 Kohm	Philips	2322 101 33223
R125	Resistor	330 ohm	Philips	2322 101 33332
R126	Resistor	3,9 Kohm	Philips	2322 101 33392
C101	Capacitor ceramic	470pF/400V	Ferroperm	9/0129,9 ± 20%
C102	Capacitor ceramic	22pF/400V	Ferroperm	9/0116,9 ± 5%
C103	Capacitor ceramic	6,8pF/400V	Ferroperm	9/0112,9 ± 0,25pF
C104	Capacitor ceramic	1nF/40V	Ferroperm	9/0129,8 - 20 + 80
C105	Capacitor ceramic	5,6pF/400V	Ferroperm	9/0112,9 ± 0,25pF
C106	Capacitor ceramic	22pF/400V	Ferroperm	9/0116,9 ± 5%
C107	Capacitor ceramic	470pF/40V	Ferroperm	9/0129,8 - 20 + 80
C108	Capacitor ceramic	470pF/40V	Ferroperm	9/0129,8 - 20 + 80
C109	Capacitor ceramic	470pF/40V	Ferroperm	9/0129,8 - 20 + 80

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RX-AMPLIFIER-UNIT RT144

Symbol	Description		Manufact.	
C110	Capacitor ceramic	22pF/400V	Ferroperm	9/0116,9 ±5%
C111	Capacitor ceramic	6,8pF/400V	Ferroperm	9/0112,9 ±0,25pF
C112	Capacitor feed-through	1nF/250V	Ferroperm	9/0138,58 ÷20 +80
C113	Capacitor ceramic	1nF/40V	Ferroperm	9/0129,8 ÷20 +80
C114	Capacitor ceramic	3,9pF/400V	Ferroperm	9/0112,9 ±0,25pF
C115	Capacitor ceramic	22pF/400V	Ferroperm	9/0116,9 ±5%
C116	Capacitor ceramic	4,7nF/30V	Ferroperm	9/0145,9 ÷20 +80
C117	Capacitor ceramic	1nF/40V	Ferroperm	9/0129,8 ÷20 +80
C118	Capacitor ceramic	4,7pF/400V	Ferroperm	9/0112,9 ±10%
C119	Capacitor ceramic	5,6pF/400V	Ferroperm	9/0112,9 ± 0,25pF
C120	Capacitor ceramic	27pF/ 400V	Ferroperm	9/0119,9 ±10%
C121	Capacitor ceramic	120pF/63V	Ferroperm	9/0121,8 ±10%
C122	Capacitor ceramic	22pF/400V	Ferroperm	9/0116,9 ±5%
C123	Capacitor polyester	22nF/250V	Philips	2222 342 44223
C124	Capacitor polyester	22nF/250V	Philips	2222 342 44223
C125	Capacitor ceramic	10nF/30V	Ferroperm	9/0145,9 ÷20 +80
C126	Capacitor ceramic	47pF/400V	Ferroperm	9/0121,9 ±10%
C127	Capacitor tantal	4,7uF/16V	ERO	ETP 2C
C128	Capacitor ceramic	5,6pF/400V	Ferroperm	9/0112,9 ± 0,5pF
C129	Capacitor tantal	4,7uF/16V	ERO	ETP 2C
C130	Capacitor polyester	22nF/250V	Philips	2222 342 44223
C131	Capacitor polystyrene	100pF/500V	Philips	2222 427 61001
C132	Capacitor polystyrene	470pF/250V	Philips	2222 426 24701
C133	Capacitor ceramic	120pF/63V	Ferroperm	9/0121,8 ±10%
C134	Capacitor tantal	4,7uF/16V	ERO	ETP 2C
C135	Capacitor polystyrene	3,9nF/63V	Philips	2222 424 23902
C136	Capacitor tantal	4,7uF/16V	ERO	ETP 2C
C137	Capacitor polyester	15nF/250V	Philips	2222 342 45153
C138	Capacitor polystyrene	180pF/500V	Philips	2222 427 61801
C139	Capacitor polystyrene	180pF/500V	Philips	2222 427 61801
C140	Capacitor tantal	4,7uF/16V	ERO	ETP 2C
C141	Capacitor polystyrene	4,7nF/63V	Philips	2222 424 24702
C142	Capacitor feed-through	1nF/250V	Ferroperm	9/0138,58 ÷20 +80
C143	Capacitor feed-through	1nF/250V	Ferroperm	9/0138,58 ÷20 +80

RX-AMPLIFIER-UNIT RT144

Symbol	Description		Manufact.	
CP101-				
CP103	Capacitor printed		S.P.	
L101	Coil	TL152	S.P.	6-0-20827
L102	Coil	TL153	S.P.	6-0-20828
L103	Coil	TL154	S.P.	6-0-20829
L104	Coil	TL155	S.P.	6-0-20830
L105	Coil	TL156	S.P.	6-0-20831
L106	Coil	TL157	S.P.	6-0-20832
L107	Coil	TL158	S.P.	6-0-20833
L108	Coil	TL159	S.P.	6-0-20834
L109	Coil	TL160	S.P.	6-0-20835
L110	Coil	TL161	S.P.	6-0-20836
T101	Transistor		Philips	BF200
T102	Transistor		TEXAS	TIS88A
T103	Transistor		Philips	BF494
T104	Transistor		Philips	BF199
D101	Diode variocap.	group matched diodes	Motorola	MV109 M5
D103	Diode variocap.		Motorola	MV109 M5
D104	Diode variocap.		Motorola	MV109 M5
D105	Diode variocap.		Motorola	MV109 M5
D106	Diode variocap.		Motorola	MV109 M5
D102	Diode		Philips	BAW62
D107	Diode		A.E.G.	AA138
D108	Diode		Philips	BAX13

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RX-AMPLIFIER-UNIT RT144

Symbol	Description	Manufact.	
IC101	Integrated circuit	Siemens	TBA 120S
FP101	Ferrit bead. Grade 4B	Philips	4322 020 34420
FL101	Crystal filter 10,7 MHz	K.V.G.	XFM-107 B

AUDIO-AMPLIFIER-UNIT RT144

Symbol	Description		Manufact.	
R201	Resistor	5,6 Kohm	Philips	2322 101 33562
R202	Trimming potentiometer	10 Kohm	Philips	2322 410 03307
R203	Resistor	82 Kohm	Philips	2322 101 33823
R204	Resistor	220 Kohm	Philips	2322 101 33224
R205	Resistor	180 Kohm	Philips	2322 101 33184
R206	Trimming potentiometer	2,2 Kohm	Philips	2322 410 03305
R207	Resistor	12 Kohm	Philips	2322 101 33123
R208	Resistor	39 Kohm	Philips	2322 101 33393
R209	Resistor	1,5 Kohm	Philips	2322 101 33152
R210	Resistor	18 Kohm	Philips	2322 101 33183
R211	Resistor	10 Kohm	Philips	2322 101 33103
R212	Resistor	15 Kohm	Philips	2322 101 33153
R213	Resistor	56 Kohm	Philips	2322 101 33563
R214	Resistor	100 Kohm	Philips	2322 101 33104
R215	Resistor	1 Kohm	Philips	2322 101 33102
R216	Resistor	1,8 Kohm	Philips	2322 101 33182
R217	Resistor	18 Kohm	Philips	2322 101 33183
R218	Resistor	3,9 Kohm	Philips	2322 101 33392
R219	Resistor	220 Kohm	Philips	2322 101 33224
R220	Resistor	5,6 Kohm	Philips	2322 101 33562
R221	Resistor	10 Kohm	Philips	2322 101 33103
R222	Resistor	100 Kohm	Philips	2322 101 33104
R223	Resistor	27 Kohm	Philips	2322 101 33273
R224	Resistor	4,7 Kohm	Philips	2322 101 33472
R225	Resistor	220 ohm	Philips	2322 101 33221
R226	Resistor	10 Kohm	Philips	2322 101 33103
R227	Resistor	22 Kohm	Philips	2322 101 33223
R228	Trimming potentiometer	4,7 Kohm	Philips	2322 410 03306
R229	Resistor	33 ohm	Philips	2322 101 33339
R230	Resistor	1 ohm	Philips	2322 101 33108
C201	Capacitor polystyrene	1nF/125V	Philips	2222 425 21002
C202	Capacitor polystyrene	1nF/125V	Philips	2222 425 21002
C203	Capacitor polystyrene	220pF/500V	Philips	2222 427 22201
C204	Capacitor polyester	22nF/250V	Philips	2222 342 44223
C205	Capacitor polyester	22nF/250V	Philips	2222 342 44223
C206	Capacitor polyester	0,22uF/100V	Philips	2222 342 24224

AUDIO-AMPLIFIER-UNIT RT144

Symbol	Description		Manufact.	
C207	Capacitor tantal	0,47uF/35V	ERO	ETP 1A
C208	Capacitor tantal	1uF/35V	ERO	ETP 1A
C209	Capacitor tantal	1uF/35V	ERO	ETP 1A
C210	Capacitor polyester	22nF/250V	Philips	2222 342 45223
C211	Capacitor polystyrene	3,3nF/63V	Philips	2222 424 23302
C212	Capacitor polyester	0,22uF/100V	Philips	2222 342 24224
C213	Capacitor polystyrene	2,2nF/63V	Philips	2222 424 22202
C214	Capacitor polyester	0,22uF/100V	Philips	2222 342 24224
C215	Capacitor polyester	0,22uF/100V	Philips	2222 342 24224
C216	Capacitor tantal	4,7uF/16V	ERO	ETP 2C
C217	Capacitor ceramic	4,7nF/30V	Ferroperm	9/0145,9 ÷20 +80
C218	Capacitor tantal	33uF/10V	ERO	ETP 3G
C219	Capacitor polyester	0,1uF/100V	Philips	2222 342 24104
C220	Capacitor electrolytic	100uF/25V	Siemens	B41283-B5107-T
C221	Capacitor electrolytic	100uF/25V	Siemens	B41283-B5107-T
C222	Capacitor electrolytic	100uF/25V	Siemens	B41283-B5107-T
C223	Capacitor polyester	0,1uF/100V	Philips	2222 342 24104
C224	Capacitor polyester	10uF/250V	Philips	2222 342 44103
C225	Capacitor ceramic	1nF/40V	Ferroperm	9/0129,8 ÷20 +80
C226	Capacitor polyester	0,1uF/100V	Philips	2222 342 24104
C227	Capacitor electrolytic	470uF/16V	Siemens	B41283-A4477-T
T201	Transistor		Philips	BC548
T202	Transistor		Philips	BC558
T203	Transistor		Philips	BC548
T204	Transistor		Philips	BC548
T205	Transistor		Philips	BC548 B/C
D201	Diode		Philips	BAX13
D202	Diode		Philips	BAX13
IC201	Integrated circuit		Motorola	MC1458C
IC202	Integrated circuit		S.G.S.	TBA810AS

SUPPLY UNIT RT144

Symbol	Description		Manufact.	
R401	Resistor	1,5 Kohm	Philips	2322 101 33152
R402	Resistor	820 ohm	Philips	2322 101 33821
R403	Resistor	470 ohm	Philips	2322 101 33471
R404	Trimming potentiometer	470 ohm	Philips	2322 410 03303
R405	Resistor	220 ohm	Philips	2322 101 33221
R406	Resistor	1,2 ohm	Philips	2322 212 13128
R407	Resistor	100 ohm	Philips	2322 101 33101
R408	Resistor	2,2 Kohm	Philips	2322 101 33222
R409	Resistor	680 ohm	Philips	2322 101 33681
R410	Resistor	10 ohm	Philips	2322 101 33109
R411	Resistor	2,7 Kohm	Philips	2322 101 33272
R412	Trimming potentiometer	1 Kohm	Philips	2322 410 03304
R413	Resistor	2,2 Kohm	Philips	2322 101 33222
R414	Resistor	180 ohm	Philips	2322 101 33181
R415	Resistor	330 ohm	Philips	2322 101 33331
R416	Resistor	1 Kohm	Philips	2322 101 33102
R417	Resistor	3,3 Kohm	Philips	2322 101 33332
R418	Resistor	15 Kohm	Philips	2322 101 33153
R419	Resistor	4,7 Kohm	Philips	2322 101 33472
R420	Resistor	0-15 ohm 10W	Danotherm	GRV 10L 15 ohm
C401	Capacitor electrolytic	2200uF/40V	Siemens	B41010-A7228-T
C402	Capacitor polyester	0,22uF/100V	Philips	2222 342 24224
C403	Capacitor electrolytic	100uF/25V	Siemens	B41283-B5107-T
C404	Capacitor tantal	33uF/10V	ERO	ETP-3G
C405	Capacitor tantal	33uF/10V	ERO	ETP-3G
C406	Capacitor tantal	22uF/16V	ERO	ETP-3G
C407	Capacitor ceramic	220pF/400V	Ferroperm	9/0129,9 ± 20%
C408	Capacitor ceramic	220pF/400V	Ferroperm	9/0129,9 ± 20%
C409	Capacitor ceramic	220pF/400V	Ferroperm	9/0129,9 ± 20%
C410	Capacitor tantal	33uF/10V	ERO	ETP-3G
T401	Transistor		Philips	BC548
T402	Transistor		Philips	BC558

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SUPPLY UNIT RT144

Symbol	Description	Manufact.	
T403	Transistor	Philips	BC548
D401	Zenerdiode	Philips	BZX79 C9V1
D402	Zenerdiode	Silec	PL20Z
D403	Diode	Philips	BAX13
D404	Diode	Philips	BAX13
D405	Diode	Philips	BAX13
D406	Diode	Philips	BAX13
IC401	Integrated circuit	Motorola	MC1723C
RE401	Relay	A.E.G.	RHL454 86111-0-32 12V
RE402	Relay	B.T.R.	320 12V Spec.

OSCILLATOR-UNIT RT144

Symbol	Description		Manufact.	
R501	Resistor	330 ohm	Philips	2322 101 33331
R502	Resistor	820 ohm	Philips	2322 101 33821
R503	Resistor	3,9 Kohm	Philips	2322 101 33392
R504	Resistor	33 Kohm	Philips	2322 101 33333
R505	Resistor	27 Kohm	Philips	2322 106 33273
R506	Resistor	390 ohm	Philips	2322 106 33391
R507	Resistor	10 Kohm	Philips	2322 106 33103
R508	Resistor	22 Kohm	Philips	2322 101 33223
R509	Resistor	10 Kohm	Philips	2322 106 33103
R510	Resistor	6,8 Kohm	Philips	2322 101 33682
R511	Resistor	1,5 Kohm	Philips	2322 101 33152
R512	Resistor	150 ohm	Philips	2322 106 33151
R513	Resistor	680 ohm	Philips	2322 106 33681
R514	Resistor	3,3 Kohm	Philips	2322 101 33332
R515	Resistor	270 ohm	Philips	2322 212 13271
R516	Resistor	560 ohm	Philips	2322 106 33561
R517	Resistor	4,7 Kohm	Philips	2322 101 33472
R518	Resistor	10 Kohm	Philips	2322 101 33103
R519	Resistor	270 ohm	Philips	2322 101 33271
R520	Resistor	330 ohm	Philips	2322 106 33331
R521	Resistor	560 ohm	Philips	2322 106 33561
R522	Resistor	1,8 Kohm	Philips	2322 106 33182
R523	Resistor	3,9 Kohm	Philips	2322 106 33392
R524	Resistor	270 ohm	Philips	2322 101 33271
C501	Capacitor feed-through	1nF/250V	Ferroperm	9/0138,58 ÷20 +80
C502	Capacitor ceramic	120pF/63V	Ferroperm	9/0121,8 ± 10%
C503	Capacitor polyester	15nF/250V	Philips	2222 342 44153
C504	Capacitor polystyrene	1,2nF/63V	Philips	2222 424 21202
C505	Capacitor ceramic	22pF/400V	Ferroperm	9/0116,9 ±10%
C506	Capacitor polyester	15nF/250V	Philips	2222 342 44153
C507	Capacitor polystyrene	82pF/500V	Philips	2222 427 48209
C508	Capacitor ceramic	470pF/40V	Ferroperm	9/0129,8 ÷20 +80
C509	Capacitor polystyrene	220pF/500V	Philips	2222 427 42201
C510	Trimming capacitor	1,5-9pF	D.A.U.	107.1901.009
C511	Capacitor ceramic	4,7nF/30V	Ferroperm	9/0145,9 ÷20 +80

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OSCILLATOR-UNIT RT144

Symbol	Description		Manufact.	
C512	Capacitor polystyrene	51pF/500V	Philips	2222 427 85109
C513	Capacitor ceramic	220pF/25V	Ferroperm	9/0213,8 ±10%
C514	Capacitor ceramic	2,7pF/250V	Ferroperm	9/0112,9 ±0,25pF
C515	Capacitor ceramic	220pF/25V	Ferroperm	9/0213,8 ±10%
C516	Capacitor ceramic	4,7nF/30V	Ferroperm	9/0145,9 ÷20 +80
C517	Capacitor ceramic	1nF/40V	Ferroperm	9/0129,8 ÷20 +80
C518	Capacitor ceramic	33pF/63V	Ferroperm	9/0116,8 ±10%
C519	Capacitor ceramic	33pF/63V	Ferroperm	9/0116,8 ±10%
C520	Capacitor polyester	15nF/250V	Philips	2222 342 44153
C521	Capacitor ceramic	1nF/40V	Ferroperm	9/0129,8 ÷20 +80
C522	Capacitor ceramic	10nF/30V	Ferroperm	9/0145,9 ÷20 +80
C523	Capacitor ceramic	18pF/400V	Ferroperm	9/0112,9 ±10%
C524	Capacitor ceramic	4,7nF/30V	Ferroperm	9/0145,9 ÷20 +80
C525	Capacitor ceramic	1nF/40V	Ferroperm	9/0129,8 ÷20 +80
C526	Capacitor ceramic	33pF/400V	Ferroperm	9/0119,9 ±10%
C527	Capacitor ceramic	2,2pF/250V	Ferroperm	9/0112,9 ±0,25pF
C528	Capacitor ceramic	470pF/40V	Ferroperm	9/0129,8 ÷20 +80
C529	Capacitor ceramic	5,6pF/400V	Ferroperm	9/0112,9 ±0,5pF
C530	Capacitor ceramic	470pF/40V	Ferroperm	9/0129,8 ÷20 +80
C531	Capacitor ceramic	470pF/40V	Ferroperm	9/0129,8 ÷20 +80
C532	Capacitor polyester	15nF/250V	Philips	2222 342 44153
C533	Capacitor feed-through	1nF/250V	Ferroperm	9/0138,58 ÷20 +80
L501	Coil	TL162	S.P.	6-0-20837
L502	Coil	TL163	S.P.	6-0-20838
L503	Coil	TL164	S.P.	6-0-20839
L504	Coil	TL165	S.P.	6-0-20840
L505	Coil	TL166	S.P.	6-0-20841
L506	Coil	TL167	S.P.	6-0-20842
L507	Coil	TL168	S.P.	6-0-20843
FP501	Ferrit bead. Grade 4B		Philips	4322 020 34420

OSCILLATOR-UNIT RT144

Symbol	Description	Manufact.	
X501	Crystal 11100.000 KHz	K.V.G.	
T501	Transistor	Philips	BF199
T502	Transistor	Philips	BF199
T503	Transistor	Philips	BF450
T504	Transistor	Philips	BF199
T505	Transistor	Philips	BF199

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DIVIDER-UNIT RT144

Symbol	*Description*		*Manufact.*	
R601	Resistor	10 Kohm	Philips	2322 106 33103
R602	Resistor	22 Kohm	Philips	2322 106 33223
R603	Resistor	5,6 Kohm	Philips	2322 106 33562
R604-				
R613	Resistor	33 Kohm	Philips	2322 106 33333
R614	Resistor	3,3 Kohm	Philips	2322 101 33332
R615	Resistor	390 ohm	Philips	2322 106 33391
R616	Resistor	4,7 Kohm	Philips	2322 101 33472
R617	Resistor	330 ohm	Philips	2322 101 33331
R618	Resistor	470 ohm	Philips	2322 101 33471
R619	Resistor	18 Kohm	Philips	2322 101 33183
R620	Resistor	1,5 Kohm	Philips	2322 101 33152
R621	Resistor	4,7 Kohm	Philips	2322 101 33472
R622	Resistor	4,7 Kohm	Philips	2322 101 33472
R623	Resistor	1 Kohm	Philips	2322 101 33102
R624	Resistor	100 ohm	Philips	2322 101 33101
R625	Resistor	150 ohm $\frac{1}{2}$W	Philips	2322 212 13151
R626	Resistor	10 Kohm	Philips	2322 101 33103
R627	Resistor	470 ohm	Philips	2322 101 33471
R628	Resistor	10 Kohm	Philips	2322 106 33103
R629	Resistor	560 ohm	Philips	2322 106 33561
R630	Resistor	1 Kohm	Philips	2322 101 33102
R631	Resistor	1 Kohm	Philips	2322 101 33102
C601	Capacitor feed-through	1nF/250V	Ferroperm	9/0138,58 ÷20 +80
C602	Capacitor feed-through	1nF/250V	Ferroperm	9/0138,58 ÷20 +80
C603	Capacitor ceramic	10nF/30V	Ferroperm	9/0145,9 ÷20 +80
C604	Capacitor tantal	4,7uF/16V	ERO	ETP 2C
C605	Capacitor ceramic	470pF/40V	Ferroperm	9/0129,8 ÷20 +80
C606	Capacitor polyester	10nF/250V	Philips	2222 342 44103
C607	Capacitor ceramic	10nF/30V	Ferroperm	9/0145,9 ÷20 +80
C608	Capacitor ceramic	1nF/40V	Ferroperm	9/0129,8 ÷20 +80
C609	Capacitor ceramic	1nF/40V	Ferroperm	9/0129,8 ÷20 +80
C610-				
C619	Capacitor feed-through	1nF/250V	Ferroperm	9/0138,58 ÷20 +80

DIVIDER-UNIT RT144

Symbol	Description		Manufact.	
C620- C623	Capacitor ceramic	10nF/30V	Ferroperm	9/0145,9 ÷20 +80
C624- C626	Capacitor ceramic	4,7nF/30V	Ferroperm	9/0145,9 ÷20 +80
C627	Capacitor feed-through	1nF/250V	Ferroperm	9/0138,58 ÷20 +80
C628	Capacitor ceramic	10nF/30V	Ferroperm	9/0145,9 ÷20 +80
C629	Capacitor feed-through	1nF/250V	Ferroperm	9/0138,58 ÷20 +80
C630	Capacitor ceramic	220pF/400V	Ferroperm	9/0129,9 ± 20%
L601	Coil	TL169	S.P.	6-0-20844
L602	Coil	TL170	S.P.	6-0-20845
T601	Transistor		Philips	BC548
T602	Transistor		Philips	BF199
T603	Transistor		Philips	2N2368
T604	Transistor		Philips	BF199
T605	Transistor		Philips	BF199
T606	Transistor		Philips	2N2368
IC601	Integrated circuit		TEXAS	SN74H21
IC602	Integrated circuit		TEXAS	SN7427
IC603	Integrated circuit		TEXAS	SN7493A
IC604	Integrated circuit		TEXAS	SN7493A
IC605	Integrated circuit		TEXAS	SN74197
IC606	Integrated circuit		TEXAS	SN74S113
IC607	Integrated circuit		TEXAS	SN7420
IC608	Integrated circuit		TEXAS	SN74197
IC609	Integrated circuit		TEXAS	SN7420
IC610	Integrated circuit		TEXAS	SN74H20
IC611	Integrated circuit		TEXAS	SN74197
IC612	Integrated circuit		Motorola	MC4044

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HARMONIC FILTER RT144

Symbol	Description		Manufact.	
C701	Capacitor ceramic	7,5 pF/400V	Ferroperm	9/0112,9 ±5%
C702-				
C704	Capacitor feed-through	27 pF	Ferroperm	9/0112,5 ±5%
C705	Capacitor ceramic	7,5 pF/400V	Ferroperm	9/0112,9 ±5%

TX-POWER-AMPLIFIER RT144

Symbol	Description		Manufact.	
R801	Resistor	10 ohm	Philips	2322 101 33109
R802	Resistor	22 ohm ½W	Philips	2322 212 13229
R803	Resistor	10 ohm	Philips	2322 101 33109
C801	Capacitor ceramic	47pF/250V	Ferroperm	9/0116,3 ±10%
C802	Trimming capacitor	10-80pF	Radioparts	S14
C803	Capacitor ceramic	1nF/40V	Ferroperm	9/0129,8 ÷20 +80
C804	Capacitor polyester	0,1uF/100V	Philips	2222 342 24104
C805	VHF-π-Filter		Ferroperm	9/0168,5
C806	Trimming capacitor	10-80pF	Radioparts	S14
C807	Capacitor ceramic	22pF/400V	Ferroperm	9/0116,9 ±10%
C808	Capacitor ceramic	1nF/40V	Ferroperm	9/0129,8 ÷20 +80
C809	Capacitor polyester	0,1uF/100V	Philips	2222 342 24104
C810	VHF-π-Filter		Ferroperm	9/0168,5
C811	Capacitor ceramic	15pF/400V	Ferroperm	9/0112,9 ±10%
C812	Capacitor electrolytic	100uF/25V	Siemens	B41283-B5107-T
C813	Capacitor ceramic	33pF/400V	Ferroperm	9/0116,3 ±10%
C814	Trimming capacitor	10-80pF	Radioparts	S14
C815	Capacitor ceramic	68pF/250V	Ferroperm	9/0116,3 ±10%
C816	Capacitor ceramic	68pF/250V	Ferroperm	9/0116,3 ±10%
C817	Capacitor ceramic	1nF/40V	Ferroperm	9/0129,8 ÷20 +80
C818	Capacitor polyester	0,1uF/100V	Philips	2222 342 24104
C819	VHF-π-Filter		Ferroperm	9/0168,5
C820	Capacitor ceramic	22pF/400V	Ferroperm	9/0116,9 ±10%
C821	Trimming capacitor	10-80pF	Radioparts	S14
C822	Capacitor ceramic	470pF/400V	Ferroperm	9/0129,9 ± 20%
C823	Capacitor ceramic	470pF/400V	Ferroperm	9/0129,9 ± 20%
L801	Coil	TL066	S.P.	6-0-20846
L802	Coil	0,15uHy	Jahre	71,1
L803	Coil	TL067	S.P.	6-0-20854
L804	Coil	0,15uHy	Ferroperm	1587
L805	Coil	0,15uHy	Ferroperm	1587

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TX-POWER-AMPLIFIER RT144

Symbol	Description	Manufact.	
L806	Coil TL067	S.P.	6-0-20854
FP801	Ferrit bead. Grade 3B	Philips	4322 020 34400
FP802	Ferrit bead. Grade 3B	Philips	4322 020 34400
FP803	Ferrit bead. Grade 3B	Philips	4322 020 34400
FP804	Ferrit bead. Grade 3B	Philips	4322 020 34400
T801	Transistor	Motorola	2N5589
T802	Transistor	Motorola	2N5590
T803	Transistor	Motorola	2N5591

TX-EXCITER-UNIT RT144

Symbol	Description		Manufact.	
R901	Resistor	4,7 Kohm	Philips	2322 106 33472
R902	Resistor	1,2 Kohm	Philips	2322 101 33122
R903	Resistor	3,3 Kohm	Philips	2322 101 33332
R904	Resistor	680 ohm	Philips	2322 101 33681
R905	Resistor	1,5 Kohm	Philips	2322 101 33152
R906	Trimming potentiometer	220 ohm	Philips	2322 410 03302
R907	Resistor	4,7 Kohm	Philips	2322 106 33472
R908	Resistor	18 Kohm	Philips	2322 106 33183
R909	Trimming potentiometer	10 Kohm	Philips	2322 410 03307
R910	Resistor	56 Kohm	Philips	2322 106 33563
R911	Resistor	100 Kohm	Philips	2322 101 33104
R912	Resistor	1 Kohm	Philips	2322 106 33102
R913	Resistor	220 Kohm	Philips	2322 101 33224
R914	Resistor	100 Kohm	Philips	2322 106 33104
R915	Resistor	220 Kohm	Philips	2322 106 33224
R916	Resistor	180 ohm	Philips	2322 101 33181
R917	Resistor	3,3 Kohm	Philips	2322 101 33332
R918	Resistor	22 Kohm	Philips	2322 101 33223
R919	Resistor	4,7 Kohm	Philips	2322 106 33472
R920	Resistor	22 Kohm	Philips	2322 106 33223
R921	Resistor	3,3 Kohm	Philips	2322 106 33332
R922	Resistor	12 Kohm	Philips	2322 101 33123
R923	Resistor	22 Kohm	Philips	2322 101 33223
R924	Resistor	100 ohm	Philips	2322 106 33101
R925	Resistor	12 Kohm	Philips	2322 106 33123
R926	Resistor	220 Kohm	Philips	2322 106 33224
R927	Resistor	1,5 Kohm	Philips	2322 106 33152
R928	Resistor	10 Kohm	Philips	2322 106 33103
R929	Resistor	15 Kohm	Philips	2322 101 33153
R930	Resistor	22 Kohm	Philips	2322 101 33223
R931	Trimming potentiometer	4,7 Kohm	Philips	2322 410 03306
R932	Resistor	2,7 Kohm	Philips	2322 106 33272
R933	Resistor	270 ohm	Philips	2322 106 33271
R934	Resistor	1,5 Mohm	Philips	2322 101 33155
R935	Resistor	1 Kohm	Philips	2322 106 33102
R936	Resistor	1,2 Kohm	Philips	2322 101 33122
R937	Resistor	1,2 Kohm	Philips	2322 106 33122
R938	Trimming potentiometer	10 Kohm	Philips	2322 410 03307
R939	Resistor	10 Kohm	Philips	2322 106 33103

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TX-EXCITER-UNIT RT144

Symbol	Description		Manufact.	
R940	Resistor	1 Kohm	Philips	2322 106 33102
R941	Resistor	4,7 Kohm	Philips	2322 106 33472
R942	Resistor	10 ohm	Philips	2322 101 33109
R943	Resistor	560 ohm	Philips	2322 106 33561
R944	Resistor	680 ohm	Philips	2322 106 33681
R945	Resistor	220 ohm	Philips	2322 106 33221
R946	Resistor NTC	1 Kohm	Philips	2322 642 11102
R947	Resistor	330 ohm	Philips	2322 106 33331
R948	Resistor	100 ohm	Philips	2322 101 33101
R949	Resistor	2,2 Kohm	Philips	2322 106 33222
R950	Resistor	3,9 Kohm	Philips	2322 106 33392
R951	Resistor	150 ohm	Philips	2322 106 33151
R952	Resistor	390 ohm	Philips	2322 106 33391
R953	Resistor	68 ohm	Philips	2322 106 33689
R954	Resistor	47 ohm	Philips	2322 101 33479
R955	Resistor	330 ohm	Philips	2322 106 33331
R956	Resistor	150 ohm	Philips	2322 106 33151
R957	Resistor	470 ohm	Philips	2322 106 33471
R958	Resistor	1 Kohm	Philips	2322 106 33102
R959	Resistor	100 ohm	Philips	2322 106 33101
R960	Resistor	390 ohm	Philips	2322 106 33391
R961	Resistor	1 Kohm	Philips	2322 106 33102
R962	Resistor	1,5 Kohm	Philips	2322 101 33152
R963	Trimming potentiometer	2,2 Kohm	Philips	2322 410 03305
R964	Resistor	8,2 Kohm	Philips	2322 101 33822
R965	Resistor	220 ohm	Philips	2322 106 33220
R966	Resistor	47 ohm	Philips	2322 106 33479
R967	Resistor	82 ohm	Philips	2322 101 33829
R968	Resistor	2,2 Kohm	Philips	2322 101 33222
R969	Resistor	10 Kohm	Philips	2322 106 33103
R970	Resistor	120 ohm	Philips	2322 106 33121
R971	Resistor	10 Kohm	Philips	2322 101 33103
C901	Capacitor feed-through	1nF/250V	Ferroperm	9/0138,58 ÷20 +80
C902	Capacitor feed-through	1nF/250V	Ferroperm	9/0138,58 ÷20 +80
C903	Capacitor polyester	33nF/250V	Philips	2222 342 45333
C904	Capacitor ceramic	4,7nF/30V	Ferroperm	9/0145,9 -20 +80
C905	Capacitor tantal	22uF/16V	ERO	ETP 3G

TX-EXCITER-UNIT RT144

Symbol	Description		Manufact.	
C906	Capacitor tantal	10uF/16V	ERO	ETP 2E
C907	Capacitor tantal	0,47uF/35V	ERO	ETP 1A
C908	Capacitor tantal	22uF/16V	ERO	ETP 3G
C909	Capacitor tantal	0,1uF/35V	ERO	ETP 1A
C910	Capacitor tantal	1uF/16V	ERO	ETP 1A
C911	Capacitor tantal	4,7uF/16V	ERO	ETP 2C
C912	Capacitor tantal	22uF/16V	ERO	ETP 3G
C913	Capacitor tantal	0,47uF/35V	ERO	ETP 1A
C914	Capacitor polystyrene	910pF/125V	Philips	2222 425 29101
C915	Capacitor polystyrene	15nF/63V	Philips	2222 424 61503
C916	Capacitor polyester	0,22uF/100V	Philips	2222 342 25224
C917	Capacitor tantal	4,7uF/16V	ERO	ETP 2C
C918	Capacitor polyester	33nF/250V	Philips	2222 342 45333
C919	Capacitor polyester	1uF/100V	Philips	2222 344 25105
C920	Capacitor polyester	15nF/250V	Philips	2222 342 45153
C921	Capacitor polystyrene	680pF/125V	Philips	2222 425 46801
C922	Capacitor polyester	47nF/250V	Philips	2222 342 45473
C923	Capacitor tantal	0,47uF/35V	ERO	ETP 1A
C924	Capacitor ceramic	220pF/400V	Ferroperm	9/0129,9 ± 20%
C925	Capacitor tantal	10uF/16V	ERO	ETP 2E
C926	Capacitor ceramic	220pF/400V	Ferroperm	9/0129,9 ± 20%
C927	Capacitor ceramic	4,5pF/400V	Ferroperm	9/0112,9 ± 0,1pF
C928	Capacitor ceramic	220pF/400V	Ferroperm	9/0129,9 ± 20%
C929	Capacitor ceramic	18pF/400V	Ferroperm	9/0112,9 ± 5%
C930	Capacitor ceramic	15pF/400V	Ferroperm	9/0112,9 ± 5%
C931	Capacitor ceramic	6,8pF/400V	Ferroperm	9/0116,9 ± 0,25%
C932	Capacitor ceramic	330pF/25V	Ferroperm	9/0213,8 ± 10%
C933	Capacitor ceramic	220pF/400V	Ferroperm	9/0129,9 ± 20%
C934	Capacitor ceramic	220pF/400V	Ferroperm	9/0129,9 ± 20%
C935	Capacitor ceramic	470pF/40V	Ferroperm	9/0129,8 -20 +80%
C936	Capacitor ceramic	1nF/40V	Ferroperm	9/0129,8 -20 +80%
C937	Capacitor ceramic	470pF/40V	Ferroperm	9/0129,8 -20 +80%
C938	Capacitor ceramic	220pF/400V	Ferroperm	9/0129,9 ± 20%
C939	Capacitor ceramic	470pF/40V	Ferroperm	9/0129,8 -20 +80%
C940	Capacitor polyester	15nF/250V	Philips	2222 342 44153
C941	Capacitor ceramic	470pF/40V	Ferroperm	9/0129,8 -20 +80%
C942	Capacitor ceramic	4,7pF/400V	Ferroperm	9/0112,9 ± 10%
C943	Capacitor ceramic	470pF/40V	Ferroperm	9/0129,8 -20 +80%
C944	Capacitor ceramic	47pF/63V	Ferroperm	9/0116,8 ± 10%
C945	Capacitor ceramic	10pF/400V	Ferroperm	9/0112,9 ± 10%

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TX-EXCITER-UNIT RT144

Symbol	Description		Manufact.	
C946	Capacitor ceramic	220pF/400V	Ferroperm	9/0129,9 ± 20%
C947	Capacitor ceramic	220pF/400V	Ferroperm	9/0129,9 ± 20%
C948	Capacitor ceramic	220pF/400V	Ferroperm	9/0129,9 ± 20%
C949	Capacitor ceramic	10pF/400V	Ferroperm	9/0121,9 ± 10%
C950	Capacitor ceramic	15pF/400V	Ferroperm	9/0121,9 ± 10%
C951	Capacitor ceramic	220pF/400V	Ferroperm	9/0129,9 ± 20%
C952	Capacitor tantal	0,47uF/35V	ERO	ETP 1A
C953	Capacitor ceramic	8,2pF/400V	Ferroperm	9/0121,9 ± 10%
C954	Capacitor ceramic	470pF/40V	Ferroperm	9/0129,8 -20 +80%
C955	Capacitor tantal	4,7uF/16V	ERO	ETP 2C
C956	Capacitor feed-through	1nF/250V	Ferroperm	9/0138,58 -20 +80%
L901	Coil	TL172	S.P.	6-0-20847
L902	Coil	TL059	S.P.	6-0-20844
L903	Coil	TL173	S.P.	6-0-20848
L904	Coil	TL059	S.P.	6-0-20844
L905	Coil	TL174	S.P.	6-0-20849
L906	Coil	TL175	S.P.	6-0-20850
L907	Coil	TL176	S.P.	6-0-20851
L908	Coil	0,15uHy	Ferroperm	1587
L909	Coil	TL177	S.P.	6-0-20852
L910	Coil	TL178	S.P.	6-0-20853
L911	Coil	TL067	S.P.	6-0-20854
T901	Transistor		Philips	BC548
T902	Transistor		Texas	TIS 88A
T903	Transistor		Philips	BC548
T904	Transistor		Texas	TIS 88A
T905	Transistor		Texas	TIS 88A
T906	Transistor		Philips	BF199
T907	Transistor		Philips	BF199
T908	Transistor		Philips	BF199
T909	Transistor		Philips	2N2368
T910	Transistor		Motorola	2N4073

TX-EXCITER-UNIT RT144

Symbol	Description	Manufact.	
D901	Diode	Philips	BZX75 C2V8
D902	Diode	Philips	BZX75 C2V8
D903	Diode	Philips	BAX13
D904	Diode	Philips	BAX13
D905	Diode	Philips	BAX13
D906	Diode	Philips	BA182
D907	Diode	Motorola	SMV761
D908	Diode	Philips	BA182
IC901	Integrated circuit	National	LM324

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MAIN CHASSIS RT144

Symbol	Description			Manufact.	
R1001	Resistor	0,75 ohm		Vitrohm	222-0,R75, 10%
R1002	Potentiometer	330 ohm	0-3-20856	Philips	2322 003
R1003	Potentiometer	4,7 Kohm	0-3-20858	Piher	21E6 s/i Curve A
R1004	Potentiometer	22 Kohm	0-3-20857	Ruwido	0502-050 22Kohm+log.
R1005	Resistor	1 Kohm.		Philips	2322 101 33102
C1001 -C1004	Capacitor ceramic		470pF/400V	Ferroperm	9/0129,9 ± 20%
L1001	Coil			Tradania	
F1001	Fuse	5 x 20 mm	F 6,3A	E.L.U.	171100
F1002	Fuse	5 x 20 mm	F 6,3A	E.L.U.	171100
S1001	Switch			M.E.C.	
S1002	Microtelephone handset switch			KIRK	
MC1001	Microphone cartridge			KIRK	DTK 740
TC1001	Telephone cartridge			KIRK	DTK 740
A1001	Microphone pre. amp.			S.P.	
J1001	Antenna jack (female)			K.W.Hansen	S0239
J1002	Supply jack (male)			Hirschmann	Mesei 60F
J1003	Microtelephone jack (female)			Hirschmann	Meb 60H

MAIN CHASSIS RT144

Symbol	Description	Manufact.	
P1001	Antenna plug (male)	K.W.Hansen	PL259
P1002	Supply plug (female)	Hirschmann	Mek 60Bz
P1003	Microtelephone plug (male)	Hirschmann	Mes 60Bz
LA1001	Lamp 14V, 80mA	Okaya "Rodan"	RM5 - 14V80E
LS1001	Loudspeaker	SEAS	9TV LG
T1001	Transistor	Motorola	MJ3000
T1002	Transistor	Philips	BD138
D1001	Diode	Motorola	MR1031B
IC1001	Integrated circuit	Motorola	MC7705 C

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Microphone pre. amp.

Symbol	Description		Manufact.	
R1101	Resistor	180 ohm	Philips	2322 101 33181
R1102	Resistor	2,2 Kohm	Philips	2322 101 33222
R1103	Resistor	2,2 Kohm	Philips	2322 101 33222
C1101	Capacitor tantal	10 uF/16V	ERO	ETP 2C
C1102	Capacitor polyester	0,1uF/100V	Philips	2222 342 24104
T1101	Transistor		Philips	BC 548