



***skanti***

**INSTRUCTION MANUAL**

**VHF RADIOTELEPHONE  
TYPE TRP2500**

200 3-83  
910 000 25  
Version 3A

***skanti***

## **TRP2500 INSTRUCTION MANUAL**

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## NOTICE

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Due to the constant processing of the experience gained during production and operation of our equipment, minor modifications may occur relative to the information given in this manual. Whenever practicable corrections will be listed on a correction sheet inside the front cover of this manual.



# TRP2500 INSTRUCTION MANUAL

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# INTRODUCTION TO TRP2500

The TRP 2500 is a VHF Radiotelephone for simplex and semi-duplex communications in the maritime VHF band.

The equipment is designed to comply with the CEPT performance specifications as well as the national regulations of most countries.

The TRP 2500 is fully synthesized and covers all the frequencies according to the international channel scheme. In addition to this, 20 private channels are also available for special purposes. Blocking of the transmitter or reduced output power can be programmed on any channel to meet individual requirements.

The TRP 2500 has a built-in two channel scanning function called Dual Watch. When the Dual Watch is in operation the receiver will alternately listen to the selected channel and to channel 16. Once every second it changes for a short period from the selected channel to channel 16. If a signal is received during this period the receiver will be locked to channel 16 as long as the signal is present.

The TRP 2500 may optionally be supplied with a built-in Selcall Decoder which makes it possible for coast stations to call your specific selcall number. When there is a call for you on channel 16, a tone signal will be heard in the loudspeaker and, if installed, in the External Alarm. The signal is on for about 4 seconds after which the lamp will indicate that you have been called. Due to this it is unnecessary to listen to the traffic lists of the coast stations.

All ships call from a coast station with distress messages, navigational or gale warnings will also be received and indicated acoustically and optically.

The TRP 2500 is designed for 12V battery operation. If the equipment is to be operated from a 24V battery supply, the 24V to 12V converter unit is used. The converter unit is mounted on the rear of the cabinet. It gives a stable 13.5V DC voltage independent of possible fluctuations of the battery voltage, and therefore a more constant output power.



## 2. OPERATION

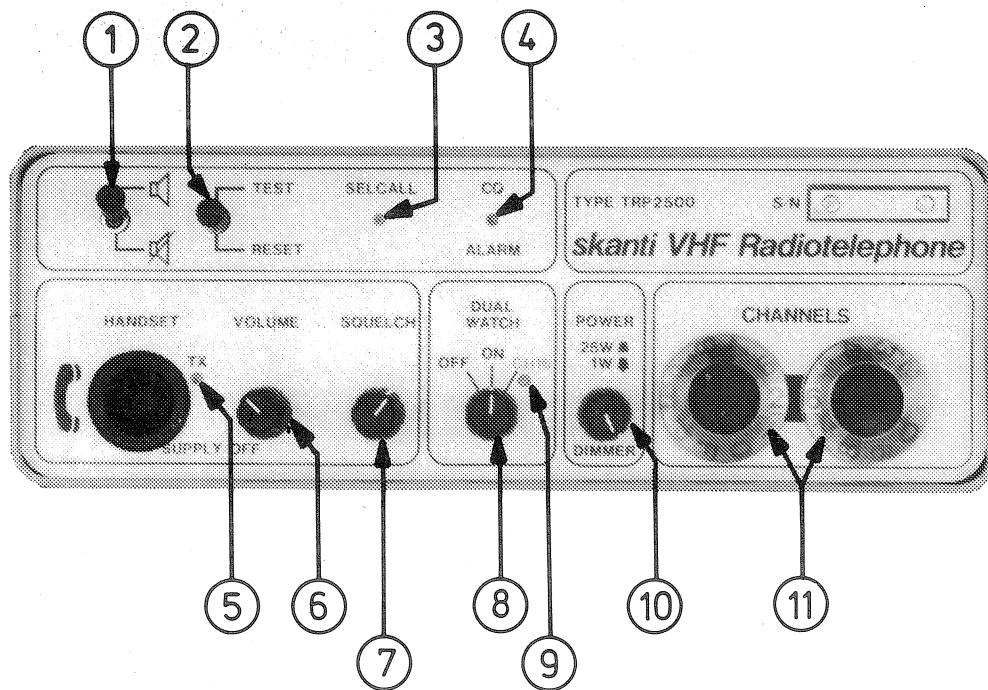




FIG. 2.1

### 2.1. OPERATING CONTROLS

① to ② are part of the optional Selcall Unit

① Speaker on/off.

 : Speaker(s) on  
 : Speaker(s) off

② TEST/RESET

The switch is a spring loaded 3-position switch normally in the center position.

**TEST:** In this position the selcall unit is tested for correct functioning. The indicators "SELCALL" and "CQ" will flash and the tone signal will be heard in the loudspeaker and the Ext. Alarm output will be activated.

RESET: The indicators "SELCALL" and "CQ" are extinguished, the tone signal stopped and the Ext. Alarm output deactivated.

③ SELCALL: Light indicates that a selective call has been received from a coast station.

④ CQ-ALARM: Light indicates that an All Ships call has been received from a coast station. All ships calls are concerning distress messages, gale warnings, navigational warnings etc.

⑤ TX: Light indicates that the push-to-talk switch on the handset is pressed and the transmitter is keyed.

⑥ VOLUME/SUPPLY OFF

VOLUME: Adjustment of the audio level from the external loud-speaker(s). Turn fully clockwise for maximum audio level. The audio level in the handset earpiece is independent of the setting of the volume control.

SUPPLY OFF: Complete switch-off of the TRP 2500 when control knob is turned fully counter-clockwise.

⑦ SQUELCH: Silencing of receiver in the periods where no signal is received. Adjust the knob clockwise until the point where the white noise heard in the earpiece or loud-speaker has just disappeared.

NB: If turned fully clockwise the receiver sensitivity will be reduced.

⑧ DUAL WATCH SWITCH

OFF: In this position the Dual Watch is switched OFF, and the equipment locked to the selected channel.

ONN: In this position the Dual Watch is switched ON. The receiver is listening to the selected channel and at the same time watching channel 16 (preference channel).

The indicator "CH 16" ⑩ is flashing when the Dual Watch is on.

If a signal is received on channel 16, the light will be constant, and the receiver will stay on this channel until the signal disappears. When the transmitter is keyed the Dual Watch is switched off during the keying period, and the equipment is locked to the selected channel.



CH 16: This position enables rapid switch over to channel 16 irrespective of the Channel Selector setting.

The lamp "CH 16" will continuously light and the light in the channel selector will distinguish.

⑨ CH-16 INDICATOR:

Flashing light indicates that the Dual Watch is on. Constant light indicates that the Dual Watch switch is in position "CH 16" or that a signal is received on channel 16 in the Dual Watch position.

⑩ POWER/DIMMER CONTROL

POWER:

▲ The RF output power is 25 W when the knob is pushed in.

▲ The RF output power is 1 W when the knob is pulled out.

DIMMER: For adjustment of light intensity of all the control panel lights.

Turn fully clockwise for maximum intensity.

⑪ CHANNEL SELECTOR:

The left selector switch selects the first digit of the channel number (ten's) and the right selector switch selects the second digit of the channel number (one's). Up to 20 private channels are selected between F0 to F9 and P0 to P9 (optional programming required if these channels are to be used).

## 2.2. THE VHF CHANNEL SYSTEM

The marine VHF radio telephony system has been built around internationally agreed parameters and offers compatibility in all countries. In other words, the channel system is the same all around the world.

The frequencies used are located in the high frequency (VHF) range, between 156 MHz and 163 MHz, and with 25 kHz spacing between the channels.

When the system was started in 1957, the channel spacing was 50 kHz, and the available international channels were numbered 01 through 28. It was soon realized that the growing popularity of the system induced a requirement for more channels. The spacing was reduced to 25 kHz, roughly doubling the number of available channels. The channels are located in between the old ones, and are numbered 60-88. Operationally, this is no problem because the channel selectors on VHF radiotelephones will show the number in logical sequence.

Channel 16 is the calling and safety channel, and shall not be used for other types of communication. To safeguard this channel, the neighbour channels 75 and 76 are not permitted for operation, and the next two channels 15 and 17 shall be used with reduced power only.

The other channels have been divided into groups for use in public correspondence, port operations and ship-to-ship services.

On the last page of chapter 4 the complete international channelling system is listed. In addition to the international channels, there are a number of "private" channels of local use. These channels can often be incorporated in the VHF radiotelephones, but the manufacturer or dealer should be consulted in each case.

Although the international system is adopted worldwide, there are national regulations issued to ensure that the manufacturers meet quality requirements, for the protection of the users.

### 2.3. MAKING DISTRESS CALLS

Use channel 16:

MAYDAY MAYDAY MAYDAY - THIS IS (name of vessel), CALL SIGNAL (three times) (followed by) MAYDAY - NAME OF VESSEL - POSITION - WHAT KIND OF ASSISTANCE REQUIRED, PLUS OTHER INFORMATION THAT MIGHT HELP RESCUE OPERATION.

Example:

MAYDAY MAYDAY MAYDAY this is Martha Martha Martha, xyz xyz xyz MAYDAY, Martha position six miles west of Nordre Rønner lighthouse collision with unknown vessel foreship full of water.

DISTRESS CALLS are made in the language considered most likely to be understood. The following phonetic alphabet is used for spelling out words:

A - ALfa	I - INdia	Q - QueBEC
B - BRAvo	J - JULiETT	R - ROMEo
C - CHARlie	K - KIlo	S - SiERRA
D - DELta	L - LIma	T - TANGo
E - Echo	M - Mike	U - Uniform
F - FOXtrot	N - NoVEMber	V - VICTor
G - Golf	O - OSkar	W - WHISkey
H - HoTEL	P - PaPA	X - X-ray
		Z - ZULu

Pronounce words stressing syllables in CAPITAL type.

PLEASE NOTE: If no answer is received on channel 16 the call can be repeated on any other available channel.

### 3. INSTALLATION

The TRP 2500 is easily installed on bulkhead, table top, deckhead or in instrument panels.

#### 3.1. Battery Charging

Although the equipment will stand a certain amount of overvoltage, care should be taken to avoid installations which could cause the very high idling voltage of some chargers to appear at the VHF battery terminals. This could happen if the battery is disconnected or allowed to run dry.

Always connect the charger direct to the battery with separate cables, not to cable systems. and do not use the ship's hull as return for battery or charging currents.

#### 3.2. Reversed Voltage

The VHF is protected against reversed polarity, but to avoid blown fuses, the battery and charger polarities should be checked carefully before connecting the VHF.

#### 3.3. Siting

The equipment should be located on the bridge, in the chartroom or another suitable place where it is readily accessible and reasonably protected from splash water. The antenna should be located as high as practicable and in an area which is free from obstructions.

For a typical marine installation, the following suggestions will help in making an efficient installation.

3.3.1. Mount the set with mounting bracket horizontally on top of a table or a bench, vertically on the side of a bulkhead.

3.3.2. Utilize the external speaker for watch-keeping. For outdoor use a watertight model should be installed.

3.3.3. The antenna should preferably be located on top of the mast, but other alternatives could be considered. When the antenna site has been decided upon, make the coaxial cable run as short as possible.

#### 3.4. Mounting

When the siting of the radiotelephone has been fixed, secure the set with 4 screws.

#### 3.5. Coaxial Cable

The type of coaxial cable between the radiotelephone and the antenna should be RG-213/U or similar 50 ohm cable. Keep length as short as possible - on these frequencies the attenuation is 0.1 dB per metre. A loss of 0.1 dB is equal to 2% of the available power output.

Fit the coaxial cable with a UHF plug PL-259 or similar type at the equipment end and also at the antenna end where appropriate. Refer to mounting instructions for coaxial connector. To protect the coaxial cable from mechanical damage in exposed surroundings, it is recommended that the cable is placed inside a steel pipe. Alternatively an armoured cable such as RF-215/U could be used.

### 3.6. Supply Voltage Input

The TRP 2500 is to be powered direct from a 12 V battery or from a 24 V to 12 V converter unit. The converter unit may optionally be supplied with the TRP 2500. It is mounted at the rear of the cabinet with 4 screws.

#### Battery Supply Cables

Connect the supply cables direct to the battery terminals to avoid damaging transients from ignition switch etc.

The conductor size of the battery leads is to be calculated from the table below

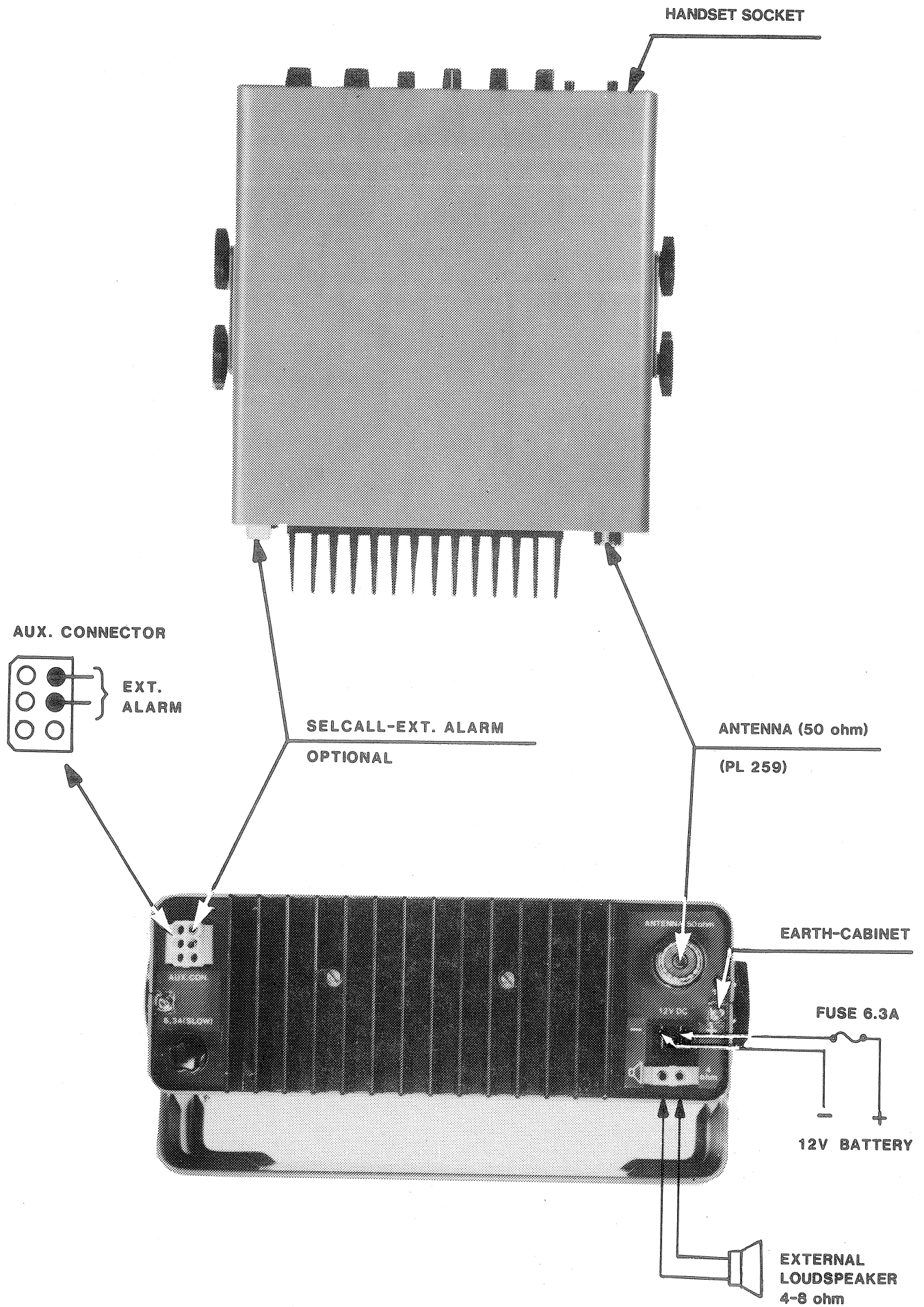
#### 12 V battery

Cable Area Sq.mm	Distance in m. Metre
1.0	2.5
1.5.	4.0
2.5	6.0
4.0	10.0
6.0	16.0

#### Ungrounded (Floating) Mains

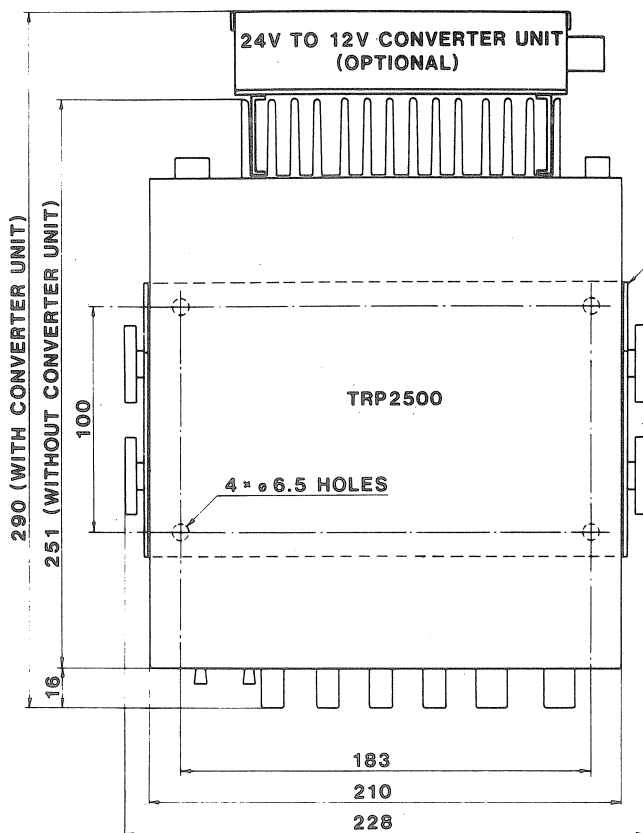
The set is designed with floating connections for antenna and power leads, and the set itself will not ground any side of a ground free ship's mains.

### 3.7 CABLE CONNECTIONS - EXTERNAL CABLES

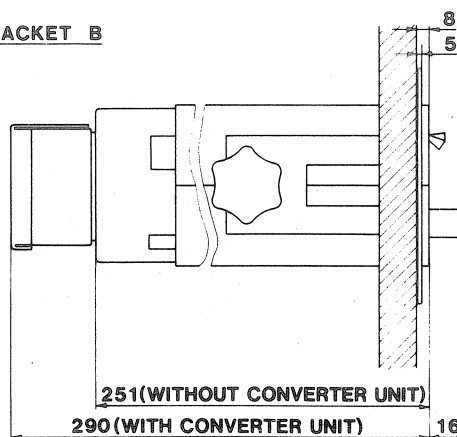
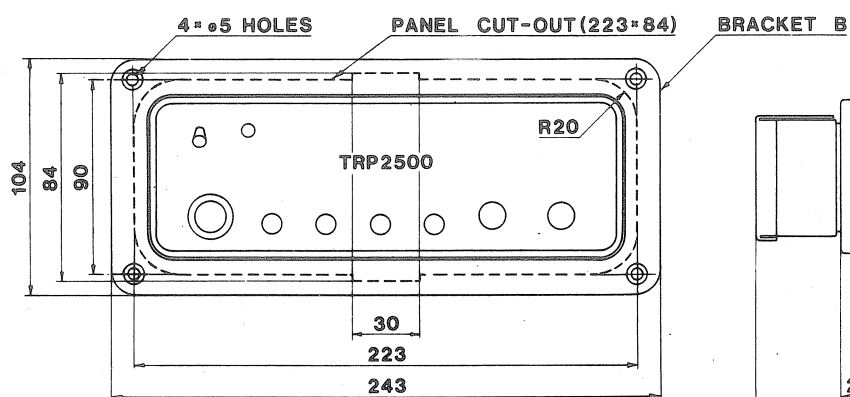
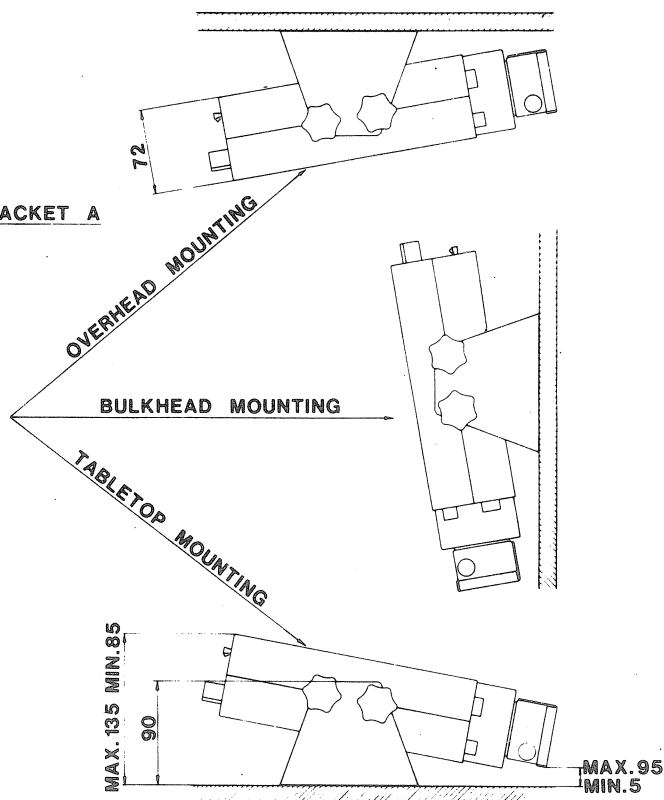


### 3.8 MOUNTING OF TRP2500

#### DRILLING PLANS



#### MOUNTING POSSIBILITIES



UNIT	TRP2500	24V TO 12V <sup>*)</sup> CONVERTER UNIT	BRACKET A	BRACKET B <sup>*)</sup>	SELCALL P.C.B. <sup>*)</sup>
APP.WEIGHT	1.9kg	0.3kg	0.3kg	0.7kg	0.1kg

DIMENSIONS IN mm TOLERANCES:  $\pm 1$ mm  
<sup>\*)</sup>OPTIONAL.

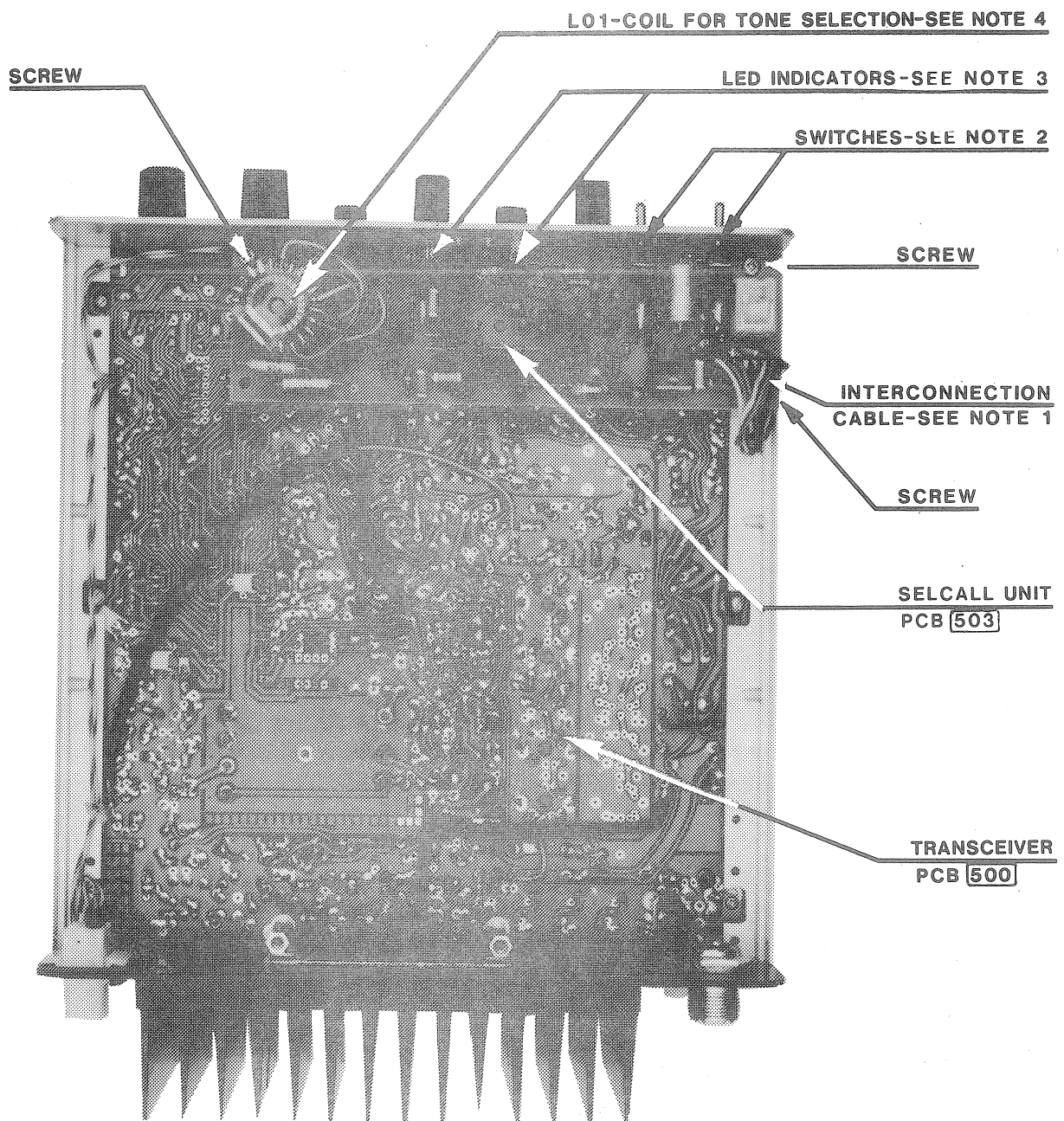


FIG 3.8.1 TRP2500 MOUNTED IN STANDARD BRACKET (TYPE A)



FIG 3.8.2 TRP2500 MOUNTED IN PANEL BRACKET (TYPE B)

### 3.9. MOUNTING OF SELCALL UNIT **503** (OPTIONAL)



Note 1: The Interconnection cable is temporarily fixed to the inside at the TRP 2500 in the standard version where the SELCALL Unit is not mounted. Release the cable and the plug from the cabinet. Remove the tape and the strap (piece of wire) from the plug. The strap shortcircuits pin 2 and pin 7 when the SELCALL Unit is not installed in the TRP 2500. Otherwise the loudspeaker will be disconnected. Connect the plug to the socket on the SELCALL Unit.

Note 2: After installation of the SELCALL Unit ensure that the rubber sealings on the shaft of the switches are pressing against the rear side of the front plate. Remember to mount the 2 neoprene caps on the shafts after installation of the SELCALL Unit.

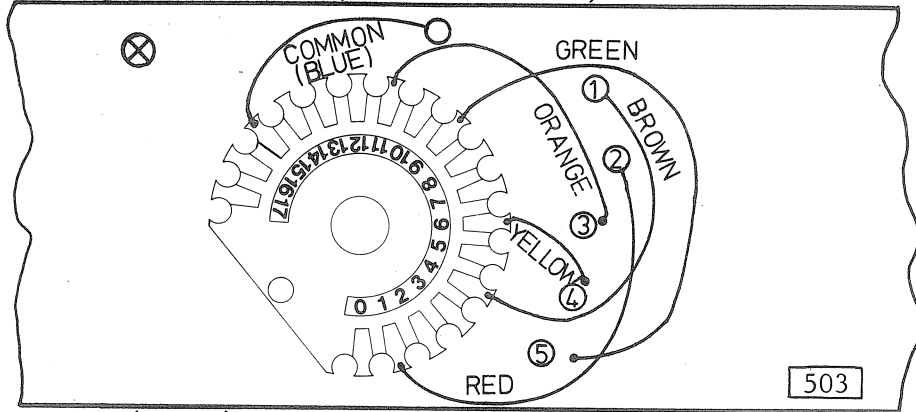
Note 3: Ensure that the LEDs are pressed properly into 2 holes in the front plate.



Note 4 :

The selective call sign consists of 5 individual tones. To program the SELCALL Unit to a given number it is necessary to rearrange the 5 connections to the taps on the tone selection coil. From Skanti the coil is coded for the number 41R69 as follows:

Tone number = 41R69 (FACTORY MOUNTED)



- 1 (BROWN) - To Terminal no. 4 on coil
- 2 (RED) - To Terminal no. 1 on coil
- 3 (ORANGE) - To Terminal no. 11 (=R) on coil
- 4 (YELLOW) - To Terminal no. 6 on coil
- 5 (GREEN) - To Terminal no. 9 on coil

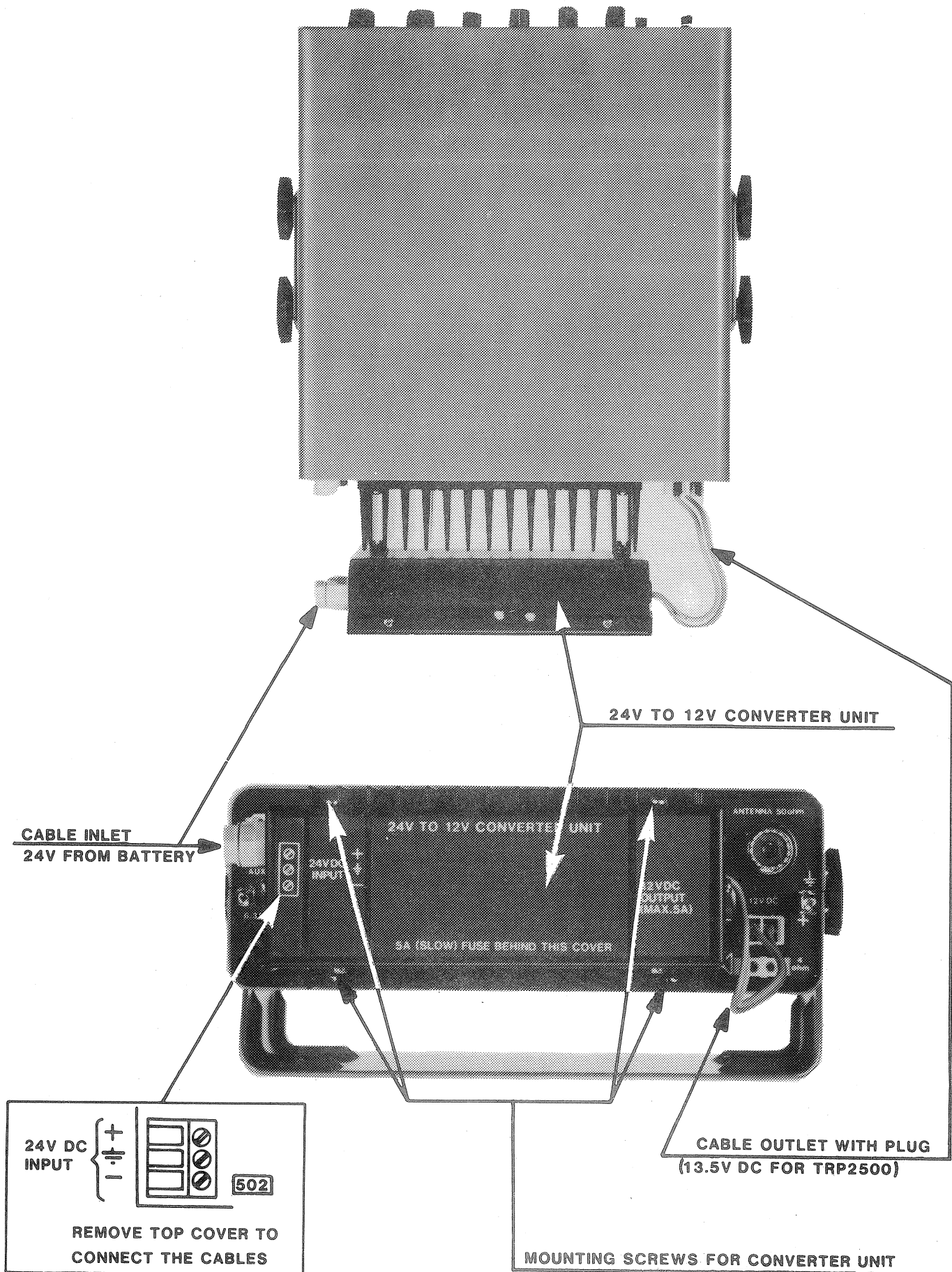
Unsolder the 5 coloured wires and resolder them according to the actual code number of your system.

The tones which correspond to the terminals on the coil are as follows:

Terminal number on coil	Tone Digit	Frequency Hz
1	1	1124
2	2	1197
3	3	1275
4	4	1358
5	5	1446
6	6	1540
7	7	1640
8	8	1747
9	9	1860
10	0	1981
11	R	2110
15	Common	-

The Tone digit R is used in case the same digit is repeated one or more times.

Examples: Tonenumber 53384 is coded as 53R84  
Tonenumber 53334 is coded as 53R34



## 4. TECHNICAL DATA

### 4.1. GENERAL

The TRP 2500 is a fully synthesized VHF Radiotelephone which can be programmed to cover the VHF MARINE band frequencies according to the international channel scheme. In addition 20 private channels are available for special purposes. Blocking of transmitter or reduced power can be programmed on any channel to meet special requirements. Channel programming can be done by use of a standard PROM programmer.

### 4.2. POWER OUTPUT

The TRP 2500 is capable of producing a power output of 25 watts when loaded into a 50 ohm load.

### 4.3. INPUT POWER REQUIREMENTS

Supply voltage: 12 Volt (+30%, - 10%)  
Nominal voltage: 13.2 Volt  
Consumption: RX only : < 0.6A  
TX - 1W: < 1.5A  
TX - 25W: < 5.0A

### 4.4. POWER SUPPLY PROTECTION

The TRP 2500 is protected against over-voltage transients and reverse polarity.

### 4.5. CONTROLS AND DISPLAYS

The TRP 2500 provides the following operator controls and displays:

#### 4.5.1. Controls

Volume control - with on/off switch  
Channel selector - two rotating switches select operating channel number. On private channels the indications will be P0-P9 and F0-F9  
Power and dimmer control - is a two function button with a pull function for 1 watt and a rotating function for dimmer  
Dual watch - is operated by a rotating switch which also gives direct access to channel 16  
Squelch - is adjustable from front panel

#### 4.5.2. Displays

RF transmit light - a LED indicates RF output power  
Channel 16 light - a LED indicates use of "direct access to channel 16 ON"  
Channel selector display - illuminated display will indicate what operating channel has been selected.

#### 4.6. TRANSMITTER SPECIFICATIONS

(Typical, measured at 13.2V supply voltage)  
Frequency range 155.0-159.0 MHz  
Modes of operation Simplex and semiduplex  
Frequency control Synthesizer  
Frequency stability (+/- 1.5 kHz)  
(-15°C to 55°C)  
Power output 25 watts, 1 watt low power (+0 dB - 0.8 dB)  
Type of emission 16F3  
Hum and noise < -40 dB  
Number of channels 55 + 20 private

#### 4.7. RECEIVER SPECIFICATIONS

(Typical, measured at 13.2V supply voltage)  
Frequency range 155.0-159.0, 159.6-163.6 MHz  
Frequency stability (+/- 1.5 kHz)  
(-15°C to 55°C)  
Audio output rating 4 watts in external 4 ohm speaker  
Audio distortion < 5%  
Sensitivity 0.35  $\mu$ V 20 dB SINAD (0.7  $\mu$ V EMF)  
Selectivity 70 dB  
Intermodulation 70 dB  
Limiter < 1 dB (input up to 100 dB above sensitivity)  
Noise < -50 dB  
RF impedance 50 ohm

#### 4.8. SELCALL

The TRP 2500 may optionally be supplied with a built-in selcall decoder.

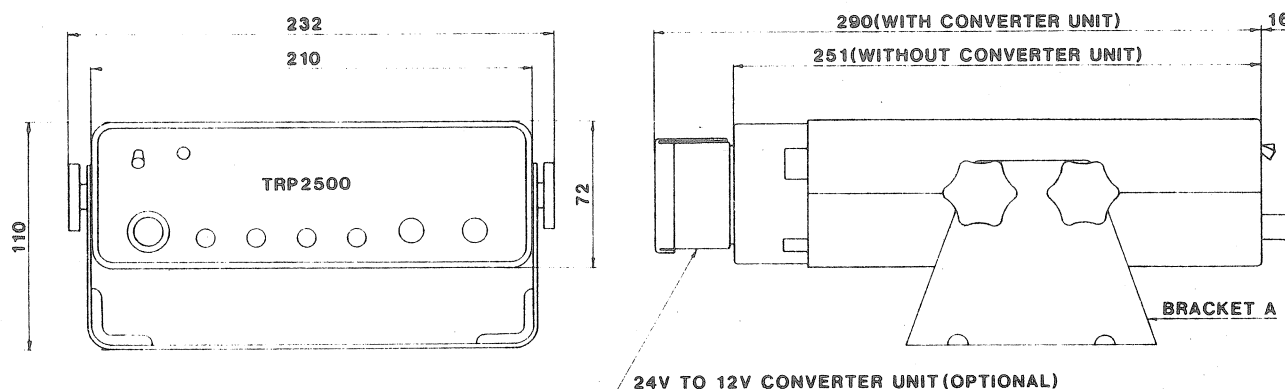
#### 4.9. 24V to 12V CONVERTER UNIT

The TRP 2500 may optionally be supplied with a 24V to 12V converter unit designed for mounting on the rear of the TRP 2500.

##### 4.9.1. Input Power Requirements

Supply Voltage: 24V (+30% - 10%)  
Nominal Voltage: 26.4 Volt  
Consumption: RX only : < 0.5A  
TX - 1W: < 1.0A  
TX - 25W: < 3.0A

#### 4.10. DIMENSIONS AND WEIGHT



UNIT	TRP2500	24V TO 12V <sup>*)</sup> CONVERTER UNIT	BRACKET A	BRACKET B <sup>*)</sup>	SELCALL P.C.B. <sup>*)</sup>
APP.WEIGHT	1.9kg	0.3kg	0.3kg	0.7kg	0.1kg

DIMENSIONS IN mm TOLERANCES:  $\pm$ 1mm  
BRACKET B IS FOR PANEL MOUNTING  
<sup>\*)</sup>OPTIONAL

4.11. INTERNATIONAL (EUROPEAN)  
VHF MARINE MOBILE CHANNELS

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

U.S.  
VHF MARINE MOBILE CHANNELS

Channel Designators	Frequencies MHz	
	Transmit	Receive
65S	156.275	156.275
06	156.300	156.300
66S	156.325	156.325
07S	156.350	156.350
67	156.375	156.375
08	156.400	156.400
68	156.425	156.425
09	156.450	156.450
69	156.475	156.475
10	156.500	156.500
70	156.525	156.525
11	156.550	156.550
71	156.575	156.575
12	156.600	156.600
72	156.625	156.625
13	156.650	156.650
73	156.675	156.675
14	156.700	156.700
74	156.725	156.725
15	156.750	156.750
75	Guard-band	
16	156.800	156.800
76	Guard-band	
17	156.850	156.850
77	156.875	156.875
18S	156.900	156.900
78S	156.925	156.925
19S	156.950	156.950
79S	156.975	156.975
20	157.000	161.600
80S	157.025	157.025
24	157.200	161.800
84	157.225	161.825
25	157.250	161.850
85	157.275	161.875
26	157.300	161.900
86	157.325	161.925
27	157.350	161.950
87	157.375	161.975
28	157.400	162.000
88S	157.425	157.425
WX 1	-	162.550
WX 2	-	162.400



## 5. FUNCTIONAL DESCRIPTION

### 5.1 TRP 2500

The SKANTI TRP 2500 is built around synthesizer circuit IC06, with related divider IC19, receiver circuit IC01 and transmitter power ampl. module IC20.

The synthesizer supplies an injection signal to the first mixer in the receiver.

For control of the transmitter, direct synthesizer frequency is used, which in this case is frequency modulated with the microphone signal.

Channel information (RX freq. TX freq. RX blocking and TX power output), is in the coding of the two PROM's - IC11 and IC12.

The receiver signal, which from the antenna, via a low-pass-filter, antenna relay, broad-band-tuned pre-circuit, is amplified by Q01, is conducted over another band-pass-filter to the ring mixer RM01, where it is converted to 21.4 MHz, which is then amplified in the first intermediate-freq. ampl. Q02.

The crystal filter FL01 is responsible for the major part of the receiver's selectivity, is followed by IC01 which contains the second mixer, crystal-controlled oscillator of 20.945 MHz, secondary interm-freq. 455 kHz discriminator, squelch amplifier and driver circuit for the multi-vibrator IC13, used for two channel listening.

The IF signal from IC01 which is amplified and de-emphasized in IC02 passes the squelch transistor Q04 to the phone-pre-amplifier IC02, which yealds 1 mW by standard modulation.

From the squelch transistor Q04, the signal is also taken to the volume control R48 where the output amplifier IC03 is connected.

The VCO consisting of the oscillator-transistor Q32, the amplifier-transistor Q33, the capacitor-diode D26, and the switch-diode D25, supplies the drive to Q34 with broad-band-tuned  $\pi$  circuit in the collector, from here the signal passes the conductive diode D28 in RF change-over switch D27, D28: as also transistor Q36 with constant tuning and Q37 with variable collector from where the drive via a 3 dB attenuator reaches the TX-PA module, whose output power is 25 W with a drive of about 200 mW.

For control of the power output, the diode detector D31 with following amplifier Q40 and Q38 is incorporated. With an increasing level on the TX-PA output, the collector-voltage will automatically be lowered in the drive transistor Q37, followed by a fall in the RF level to the TX-PA module.

Q41 serves as switch transistor for the 1 W adjustment on R185. The TX-PA is connected in such a way that the RF level is constant in the 1 W position, and only is reduced by lower battery voltage in the 25 W position.

The modulation from the mic. amplified in IC16 and IC17, which is connected as pre-amplifier with mic. adjust. R121, is followed by a de-emphasizing amplifier, a limiter, a low-pass-filter, and then via deviation adjust. R131 lead to switch-diode D25 acting as freq. modulator in pos. transmit.

The freq. variation occurs as the diode capacity is changed in rhythm with the AF signal supplied.

Drive for the variocap. D26 comes via the integration circuit from the phase-detector in IC06. This circuit also contains a freq. divider for the 6.4 MHz reference crystal.

The divider is tuned so that the phase-detector carries a 12.5 kHz reference signal.

The detector's 2nd signal is generated in the VCO (Q32, Q33) from where it via Q35 and the 100/101 divider in IC19 is conducted to the IC06 circuit's two variable dividers A and B.

The detector is connected here and receives the 12.5 kHz when the loop is phase-locked.

The divider A and B with 7 and 9 bits respectively is controlled by the programmed circuits IC11 and IC12.

Programming of divider A and B is done by a binary code which for example for ch. 16 can be calculated the following way:

Receiver freq. on ch. 16 is ..... 156.800 MHz  
 from here is drawn first IF of ..... 21.400 MHz  
 which gives a VCO freq. of ..... 135.400 MHz

As the ref. freq. is 12.5 kHz it gives a downward division of:

$$\frac{135.400}{12.5} = 10832 \text{ times}$$

Is the A divider set to 32 and B to 108 the result is:

$$\begin{array}{rcl} (108-32) \times 100 & = & 76 \times 100 = 7600 \\ \text{and} & & 32 \times 101 = 3232 \\ \text{which together gives the desired} & & \underline{10832} \end{array}$$

In a corresponding manner, the code to the transmitter freq. 156.800 MHz to ch. 16 is calculated:

$$\frac{156.800}{12.5} = 12544$$

Set A divider for 44 and B for 125, which gives:

$$\begin{array}{rcl} (125-44) \times 100 & = & 81 \times 100 = 8100 \\ \text{and} & & 44 \times 101 = 4444 \\ \text{which together is} & & \underline{12544} \end{array}$$



The binary code for A and B is thus:

Terminals IC06 :   26 27 28 02 03 04 05       17 18 19 20 21 22 23 24 25

RX channel 16 :   0 1 0 0 0 0 0       0 0 1 1 0 1 1 0 0

TX channel 16 :   0 1 0 1 1 0 0       0 0 1 1 1 1 1 0 1

In order to prevent the synthesizer, in un-locked condition, generating freq. it is not programmed for, a control signal comes from the detector part in IC06 to the power supply (8 V stabilized) so that this is switched off when the synthesizer is not locked.

TTL MEMORY 6309-1J

2049 BIT READ ONLY MEMORY

Input		Output		Input		Output	
Word	HEX	HEX	Ch.	Word	HEX	HEX	Ch.
0	00		p0	57	39	f3	19
1	01		p1	58	3a		
2	02		p2	59	3b		
3	03		p3	60	3c		
4	04		p4	61	3d		
5	05		p5	62	3e		
6	06		p6	63	3f		
7	07		p7	64	40	7f	20
8	08		p8	65	41	7b	21
9	09		p9	66	42	77	22
10	0a			67	43	73	23
11	0b			68	44	bf	24
12	0c			69	45	bb	25
13	0d			70	46	b7	26
14	0e			71	47	b3	27
15	0f			72	48	3f	28
16	10		f0	73	49	3b	29
17	11		f1	74	4a		
18	12		f2	75	4b		
19	13		f3	76	4c		
20	14		f4	77	4d		
21	15		f5	78	4e		
22	16		f6	79	4f		
23	17		f7	80	50	b9	60
24	18		f8	81	51	b5	61
25	19		f9	82	52	b1	62
26	1a			83	53	3d	63
27	1b			84	54	39	64
28	1c			85	55	35	65
29	1d			86	56	31	66
30	1e			87	57	9d	67
31	1f			88	58	fd	68
32	20	db	00	89	59	f9	69
33	21	b7	01	90	5a		
34	22	b3	02	91	5b		
35	23	3f	03	92	5c		
36	24	3b	04	93	5d		
37	25	37	05	94	5e		
38	26	53	06	95	5f		
39	27	df	07	96	60	f5	70
40	28	9b	08	97	61	f1	71
41	29	fb	09	98	62	7d	72
42	2a			99	63	79	73
43	2b			100	64	75	74
44	2c			101	65	71	75
45	2d			102	66	bd	76
46	2e			103	67	b9	77
47	2f			104	68	f5	78
48	30	f7	10	105	69	f1	79
49	31	f3	11	106	6a		
50	32	7f	12	107	6b		
51	33	7b	13	108	6c		
52	34	77	14	109	6d		
53	35	73	15	110	6e		
54	36	bf	16	111	6f		
55	37	bb	17	112	70	7d	80
56	38	f7	18	113	71	79	81

Input		Output	
Word	HEX	HEX	Ch.
114	72	75	82
115	73	71	83
116	74	bd	84
117	75	b9	85
118	76	b5	86
119	77	b1	87
120	78	3d	88
121	79	59	89
122	7a		
123	7b		
124	7c		
125	7d		
126	7e		
127	7f	bf	16
128	80		p0
129	81		p1
130	82		p2
131	83		p3
132	84		p4
133	85		p5
134	86		p6
135	87		p7
136	88		p8
137	89		p9
138	8a		
139	8b		
140	8c		
141	8d		
142	8e		
143	8f		
144	90		f0
145	91		f1
146	92		f2
147	93		f3
148	94		f4
149	95		f5
150	96		f6
151	97		f7
152	98		f8
153	99		f9
154	9a		
155	9b		
156	9c		
157	9d		
158	9e		
159	9f		
160	ao	5f	00
161	a1	5b	01
162	a2	57	02
163	a3	53	03
164	a4	9f	04
165	a5	9b	05
166	a6	fb	06
167	a7	f7	07
168	a8	f3	08
169	a9	7f	09
170	aa		
171	ab		

Input		Output	
Word	HEX	HEX	Ch.
172	ac		
173	ad		
174	ae		
175	af		
176	bo	7b	10
177	b1	77	11
178	b2	73	12
179	b3	bf	13
180	b4	bb	14
181	b5	b7	15
182	b6	b3	16
183	b7	3f	17
184	b8	3b	18
185	b9	37	19
186	ba		
187	bb		
188	bc		
189	bd		
190	be		
191	bf		
192	co	33	20
193	c1	df	21
194	c2	db	22
195	c3	d7	23
196	c4	d3	24
197	c5	5f	25
198	c6	5b	26
199	c7	57	27
200	c8	53	28
201	c9	9f	29
202	ca		
203	cb		
204	cc		
205	cd		
206	ce		
207	cf		
208	do	5d	60
209	d1	59	61
210	d2	55	62
211	d3	51	63
212	d4	9d	64
213	d5	fd	65
214	d6	f9	66
215	d7	f5	67
216	d8	f1	68
217	d9	7d	69
218	da		
219	db		
220	dc		
221	dd		
222	de		
223	df		
224	eo	79	70
225	e1	75	71
226	e2	71	72
227	e3	bd	73
228	e4	b9	74
229	e5	b5	75

PROM "A"

Input		Output	
Word	HEX	HEX	Ch.
230	e6	b1	76
231	e7	3d	77
232	e8	39	78
233	e9	35	79
234	ea		
235	eb		
236	ec		
237	ed		
238	ee		
239	ef		
240	fo	31	80
241	f1	dd	81
242	f2	a9	82
243	f3	d5	83
244	f4	d1	84
245	f5	5d	85
246	f6	59	86
247	f7	55	87
248	f8	51	88
249	f9	9d	89
250	fa		
251	fb		
252	fc		
253	fd		
254	fe		
255	ff	b3	16

TTL MEMORY 6309-17  
2049 BIT READ ONLY MEMORY

PROM "B"

Input		Output		Input		Output	
Word	HEX	HEX	Ch.	Word	HEX	HEX	Ch.
0	00		p0	54	36	4e	16
1	01		p1	55	37	4e	17
2	02		p2	56	38	fc	18
3	03		p3	57	39	fc	19
4	04		p4	58	3a		
5	05		p5	59	3b		
6	06		p6	60	3c		
7	07		p7	61	3d		
8	08		p8	62	3c		
9	09		p9	63	3f		
10	0a			64	40	fc	20
11	0b			65	41	fc	21
12	0c			66	42	fc	22
13	0d			67	43	fc	23
14	0e			68	44	fc	24
15	0f			69	45	fc	25
16	10		f0	70	46	fc	26
17	11		f1	71	47	fc	27
18	12		f2	72	48	fc	28
19	13		f3	73	49	fd	29
20	14		f4	74	4a		
21	15		f5	75	4b		
22	16		f6	76	4c		
23	17		f7	77	4d		
24	18		f8	78	4e		
25	19		f9	79	4f		
26	1a			80	50	c2	60
27	1b			81	51	c2	61
28	1c			82	52	c2	62
29	1d			83	53	c2	63
30	1e			84	54	c2	64
31	1f			85	55	c2	65
32	20	53	00	86	56	c2	66
33	21	c2	01	87	57	52	67
34	22	c2	02	88	58	4e	68
35	23	c2	03	89	59	4e	69
36	24	c2	04	90	5a		
37	25	c2	05	91	5b		
38	26	52	06	92	5c		
39	27	c2	07	93	5d		
40	28	52	08	94	5e		
41	29	4e	09	95	5f		
42	2a			96	60	4e	70
43	2b			97	61	4e	71
44	2c			98	62	4e	72
45	2d			99	63	4e	73
46	2e			100	64	4e	74
47	2f			101	65	4f	75
48	30	4e	10	102	66	4f	76
49	31	4e	11	103	67	4e	77
50	32	4e	12	104	68	fc	78
51	33	4e	13	105	69	fc	79
52	34	4e	14	106	6a		
53	35	4e	15	107	6b		

Input		Output	
Word	HEX	HEX	Ch.
108	6c		
109	6d		
110	6e		
111	6f		
112	70	fc	
113	71	fc	
114	72	fc	
115	73	fc	
116	74	fc	
117	75	fc	
118	76	fc	
119	77	fc	
120	78	fc	
121	79	4f	
122	7a		
123	7b		
124	7c		
125	7d		
126	7e		
127	7f	4e	16
128	80		p0
129	81		p1
130	82		p2
131	83		p3
132	84		p4
133	85		p5
134	86		p6
135	87		p7
136	88		p8
137	89		p9
138	8a		
139	8b		
140	8c		
141	8d		
142	8e		
143	8f		
144	90		f0
145	91		f1
146	92		f2
147	93		f3
148	94		f4
149	95		f5
150	96		f6
151	97		f7
152	98		f8
153	99		f9
154	9a		
155	9b		
156	9c		
157	9d		
158	9e		
159	9f		

Input		Output	
Word	HEX	HEX	Ch.
160	a0	4d	00
161	a1	8c	01
162	a2	8c	02
163	a3	8c	03
164	a4	8c	04
165	a5	8c	05
166	a6	04	06
167	a7	84	07
168	a8	04	08
169		04	09
170	aa		
171	ab		
172	ac		
173	ad		
174	ae		
175	af		
176	bo	04	10

Input		Output	
Word	HEX	HEX	Ch.
177	b1	04	11
178	b2	04	12
179	b3	04	13
180	b4	04	14
181	b5	44	15
182	b6	04	16
183	b7	44	17
184	b8	84	18
185	b9	84	19
186	ba		
187	bb		
188	bc		
189	bd		
190	be		
191	bf		
192	co	84	20
193	c1	84	21
194	c2	84	22
195	c3	84	23
196	c4	84	24
197	c5	84	25
198	c6	84	26
199	c7	84	27
200	c8	84	28
201	c9	c5	29
202	ca		
203	cb		
204	cc		
205	cd		
206	ce		
207	cf		
208	do	8c	60
209	d1	8c	61
210	d2	8c	62
211	d3	8c	63
212	d4	8c	64
213	d5	84	65
214	d6	84	66
215	d7	04	67
216	d8	04	68
217	d9	04	69
218	da		
219	db		
220	dc		
221	dd		
222	de		
223	df		
224	eo	04	70
225	e1	04	71
226	e2	04	72
227	e3	04	73
228	e4	04	74
229	e5	45	75
230	e6	45	76
231	e7	04	77
232	e8	84	78

Input		Output	
Word	HEX	HEX	Ch.
233	e9	84	79
234	ea		
235	eb		
236	ec		
237	ed		
238	ee		
239	ef		
240	fo	84	80
241	f1	84	81
242	f2	84	82
243	f3	84	83
244	f4	84	84
245	f5	84	85
246	f6	84	86
247	f7	84	87
248	f8	84	88
249	f9	45	89
250	fa		
251	fb		
252	fc		
253	fd		
254	fe		
255	ff	04	16

## 5.2. SELCALL (OPTIONAL)

The audio signal from the TRP 2500 telephone ampl. IC02, via the selcall multiconnector, is ampl. and limited by transistor Q03.

The tuned circuit C03 and the multi-tapped coil L01 is responsible for the selectivity necessary for the sequence selection of a 5 tone code.

Q02 is a high input imp. ampl. which is followed by the detector Q01. The accepted output from Q01 is shaped by IC02 and applied to the clock input at decade counter TC01.

Q04 to Q08 serve as switch transistors for coil taps.

Depending on the received code, All Ships Call or Selective Call, one of the two thyristors D06 and D07 will be triggered and the corresponding LED marked CQ or CALL will illuminate.

At the same time a tone can be heard in the loudspeaker, delivered by the alarm generator formed by IC03, C19, R33, C20, and R35.

The input coming from either D04 or D05 via IC02 sets the relay driver transistor Q09.

In TEST pos. the gate IC03, switch on the feedback to the detector transistor Q01, generating clock pulses from IC01, starting alternating flashing of the indicators, and starting the audio alarm.

In pos. RESET the transistor Q10 switches off the thyristors D06 and D07.

For tone freq. and coding see Selcall realignment section.



## 6. SERVICE AND MAINTENANCE

### 6.1. Fault Finding

#### 6.1.1. Test Equipment

Test instruments required for fault finding, realignment and performance checking of the TRP 2500 are as follows:

FM signal generator (130 to 170 MHz and 21.4 MHz)

Freq. counter (165 MHz)

Wattmeter 50 ohm with e.g. 2W and 25W fs.

Dummyload 50 ohm (with 20 to 40 dB att. output)

Oscilloscope

Multimeter

FM deviation meter

Distortion and AF meter

AF generator

Power supply 10-16V, 6A

#### 6.1.2. General

Before assuming the TRP 2500 has any malfunctions, the "obvious" should be checked.

1. Improper DC power supply voltages or blown fuse due to reversal of supply connection
2. Microphone connections broken or improperly inserted plug
3. Defective antenna system.
4. Incorrect control settings (blocked Ch.) or lack of any activity on the Ch.
5. Improper installation - the receiver and transmitter may be checked for proper operation by a signal generator, RF meter and freq. counter.

If performance is not within specifications after all the obvious above mentioned checks have been made, it may then be assumed a malfunction in the set.

The service is to find out the specific nature of the problem, such as no receiver audio, no RF output, low sensitivity etc., and then use standard signal tracing technique to find the defective stage, and the defective component.

#### 6.1.3. Transmitter and Receiver Inoperative

No dial light: Check channel-setting and fuse.

Check coax cable from antenna connector to PCB and antenna relay.

Check output voltage of stabilizers IC04 8.2V, IC05 5V, IC14 8.2V, IC15 8.2V and VCO supply voltage on R116 approx. 8V.

If VCO voltage is not available, check the collector of Q30 is low and that output from pin 6 on IC12 (Prom) is high, in low pos. the VCO is switched off (Ch. blocking). Check the Ch. selectors and the collector low level on Q15 with DW switch in pos. "off" (coll. high in pos. DW "on").

Replace IC12 if pin 6 output is constant low with different channel settings.

RF check of VCO output, if DC supply is measured on R116, can be checked on the base of Q34 approx. 120 mV.

Check that the freq. corresponds with the Ch. setting.

Check RF input to pre-scaler IC19 on pin 9 or 10 is approx. 130 mV.

If the freq. synthesizer is out of lock the collector on Q27 will go low and the supply voltages 8 and 12 V to the TX driver transistors Q36 and Q37 will be switched off by Q26 via Q25.

#### 6.1.4. Receiver Inoperative only.

Check for any mechanical defects (broken wires etc.).

Check supply voltage on AF amplifier IC03 and 8V on RX switch transistor Q23.

NOTE! - Do not attempt to "tweak" receiver front end on weak signals. Signal to noise ratio will not improve and freq. response will be ruined as well as out of band rejection, image rejection, intermodulation and dynamic range of the receiver. The front end must be sweep aligned for proper performance.

Check operation by connecting a signal generator with a relatively high level (eg. 1mV) to the antenna connector or better through a load with eg. 20dB attenuated output to the ant. conn.

If no audio appears in the speaker or mic., then check injection level (approx. 250 mV) and freq. (receiving freq. 21.4 MHz) to the first mixer RM01, if correct then inject a 10uV 21.4 MHz signal to IF IC01 by connecting the signal generator across the filter resistor R18. If audio still not appears then check crystal Y01, and AF output from IC01 (pin 9).

Check audio from IC02 pin 1 to switch transistor Q04 (squelch).

Check squelch system by seeing if the trigger circuit output pin 13 on IC01 goes low, when the squelch potentiometer is turned fully counter clockwise.

Audio system can be checked by injecting a 175 mV 1 kHz signal across the volume control.

Adjustment of ca. C43 to max. audio output should be done with a signal generator tuned to the exact Ch. freq. (modulation: 1 kHz  $\pm$  3 kHz deviation. RF level: 100  $\mu$ V).

#### 6.1.5. Transmitter Inoperative

If there is no RF output, check the DC current drain by inserting an A-meter in series with the +lead from the +12V battery or power supply.

Place power switch in 1 W pos. and press the PTT switch.

If current is less than 1 A, check 12 V on pin 3 and 4 on IC20.

Check TX 8 V from the switch transistors Q24 and 26.

Check VCO 8 V supply from Q31 and the regulated 12 V from Q38 to RF driver transistor Q37.

RF input level to base on Q36 approx. 500 mV.

RF input level to TX-PA module pin 1 approx. 1 V in pos. 1 W and 2.5 V in pos. 25 W.

Current consumption is respectively approx. 1.4 and 4.6 A when TX-PA module is in order.

Check AF voltage across the deviation adj. pot. to be approx. 2.5 V with loud voice level applied to the mic.

A simplified modulation test when an FM deviation meter is available, is to talk into the mic., reveals the modulation performance: A "mean" deviation of  $\pm 3$  kHz and a max. deviation on high voice levels of  $\pm 5$  kHz.

#### 6.2. REALIGNMENT

6.2.1. Connect 13.2 V to the battery terminals.

6.2.2. Switch on the set by turning the volume knob.

6.2.3. The channel selectors are to channel 88.

6.2.4. Dual watch switch in position off.

6.2.5. Dimmer control is turned full anti-clockwise.

##### 6.2.1. Frequency Synthesizer

6.2.1.1. RF mV test meter is connected to L0 input terminal on mixer RM01 (next to R12), align C130 to maximum response  $\geq 250$  mV.

6.2.1.2. RF mV test meter is then connected to input terminal 9 or 10 on IC19. Align C137 to maximum response  $\geq 150$  mV.

##### 6.2.2. Transmitter

6.2.2.1. Connect Watt-meter and 50 ohm load resistor to antenna terminal and select channel 78 on channel selectors.

6.2.2.2. Align potentiometer (R183) for 25 watts output.

- 6.2.2.3. Set Dimmer/Power switch in pos. 25 watts. Key the transmitter and align C154 to maximum output power  $\geq 25$  Watts.
- 6.2.2.4. Turn R183 anti-clockwise until output power has fallen to 23 Watts.
- 6.2.2.5. The voltage supply is increased to 15.6 V, but output power is not to exceed 25 Watts.
- 6.2.2.6. Set Dimmer/Power switch in pos. 1 Watt, and align potentiometer R184 to 0.75 Watt with transmitter keyed. Reduce power supply voltage to 13.2 V and release key.
- 6.2.2.7. A frequency counter with an accuracy of  $5 \times 10^{-7}$ , is connected to the HF attenuator (20-40 dB), transmitter is keyed on channel 78 and C71 (cap. for 6.4 MHz crystal) is aligned to counter display a frequency of 156.97500 MHz.

#### 6.2.3. Modulation

- 6.2.3.1. Disconnect the microphone and connect an AF generator with an inner resistance of 500 ohm to the microphone wires. Tune to 1000 Hz and a level of 24 mV emf.
- 6.2.3.2. Turn potentiometer R121 full anti-clockwise.
- 6.2.3.3. With deviation meter connected to RF load the transmitter is keyed on channel 78. Align potentiometer R131 to  $\pm 4.2$  kHz deviation. Check that deviation does not exceed  $\pm 4.8$  kHz when AF generator varies between 300 Hz and 3 kHz.
- 6.2.3.4. Tune AF generator to 1000 Hz and reduce output level to 2.4 mV EMK. Align deviation to  $\pm 3$  kHz on potentiometer R121.
- 6.2.3.5. Check distortion is not exceeding 3%.

#### 6.2.4. Receiver

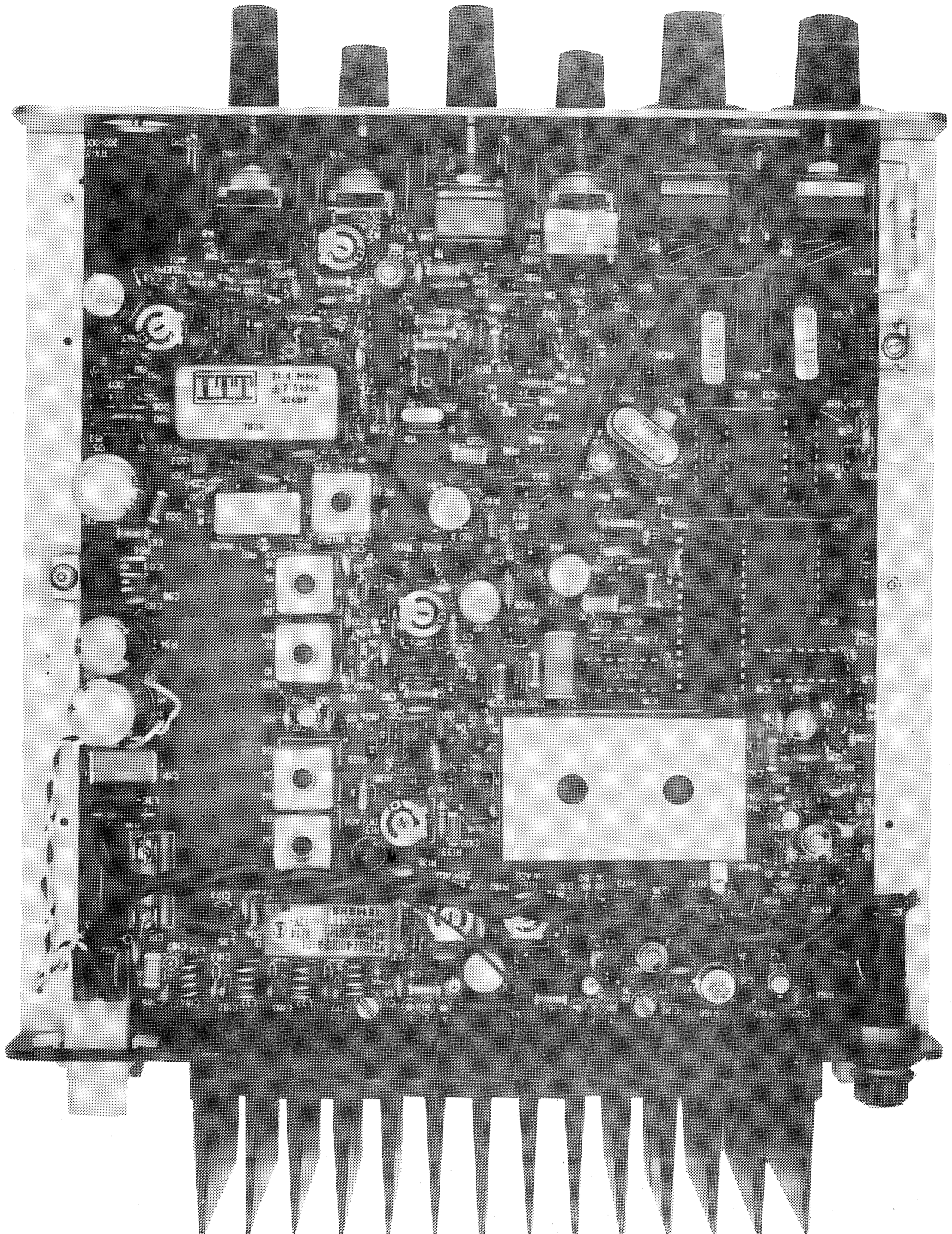
- 6.2.4.1. Tune sweep generator to 160 MHz and connect to antenna terminal, with detector connected to RF terminal on RM01 (next to R07). Align L01, L02, L06, L07 until symmetry around the centre frequency 159.5 MHz.
- 6.2.4.2. With RF generator connected to antenna terminal and adjusted to 100  $\mu$ V on channel 78 (156.97500 kHz) generator modulates with 1000 kHz and  $\pm 3$  kHz deviation. The telephone capsule is replaced with a 200 ohm resistor to which the LF voltmeter is connected. Align C43 to maximum.
- 6.2.4.3. Telephone level is adjusted to 1 mW in 200 ohm (0.45 V, RMS) on potentiometer R47.
- 6.2.4.4. Tune RF generator level to 1.4  $\mu$ V emf and turn squelch knob clockwise to stop. Adjust squelch potentiometer to the point where the squelch is just open, so that at 1000 Hz the tone can be heard in loudspeaker or telephone.

- 6.2.4.5. The receivers' sensitivity is controlled to be 0.7  $\mu$ V emf, at 20 dB SINAD, with psophometric filter connected between telephone output and meter.
- 6.2.4.6. Check all channel frequencies and sensitivity in receive mode.
- 6.2.4.7. Check output power on transmitter, and frequencies on all channels with key down. Channel 15 and 17 are checked for automatic reduction of power to maximum 1 Watt. (Ref. 0.75 Watt adjustment).
- 6.2.5. Selcall (optional)
- 6.2.5.1. Connect 13.2 V to + terminal (code = 61139).
- 6.2.5.2. Check IC04's output voltage to be 8 V  $\pm$  0.4 V.
- 6.2.5.3. Connect tone generator to AF input terminal and adjust this to tone 6. (1540 Hz  $\pm$  1 Hz).
- 6.2.5.4. Connect the oscilloscope or LF voltmeter to R05 and connect pin 15 (IC01) to the + 8 V voltage, adjust the core in coil L01 carefully to max. which is approx. 3.5 V pp.
- 6.2.5.5. With the oscilloscope connected to pin 15 on IC01 the LF input level is increased to approx. 200 mV, after which the pulse lengths are checked to be between 12 and 15 ms and the distance between the pulses to be between 270 and 350 ms. If this is not the case the resistance values of R03 and R13, respectively, are changed until the requirement has been met.
- 6.2.5.6. SW01 is switched to position "TEST", and the following are checked:
- a. That RE01 activates and closes the relay contact.
  - b. That a LF-shifting-tone with a peak-peak value of approx. 8V in unloaded condition appears on R37.
  - c. That CQ and CALL indicators are flashing alternately.
- 6.2.5.7. When SW01 is released the flashes are to stop immediately.
- 6.2.5.8. SW01 is hereafter switched into position "RESET" by which the indicator which flashed when the test was over is put out.
- 6.2.5.9. If CALL/CQ generator available:
- Connect this instead of the tone generator and adjust it to above mentioned code 61139 with a level of approx. 200 mV and check that the CALL indicator is switched on when the code has been sent (decoder hereafter to be reset).
- 6.2.5.10. Adjust generator to All Ships Call (CQ) and check that the CQ indicator is lighted within 5 seconds from the beginning of the call.



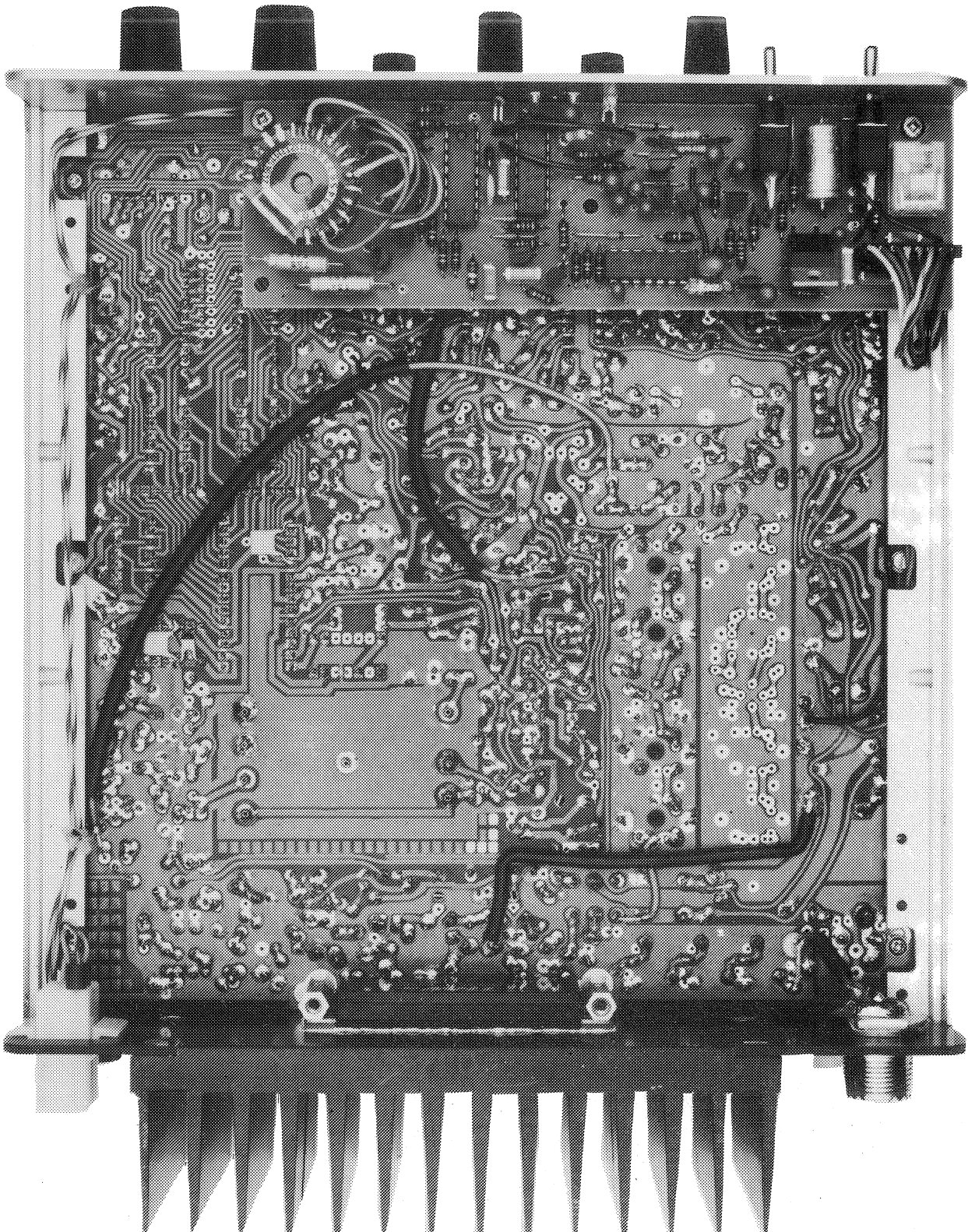
## 7. COMPONENT LOCATION

### 7.1. Transceiver and VCO 500 / 501



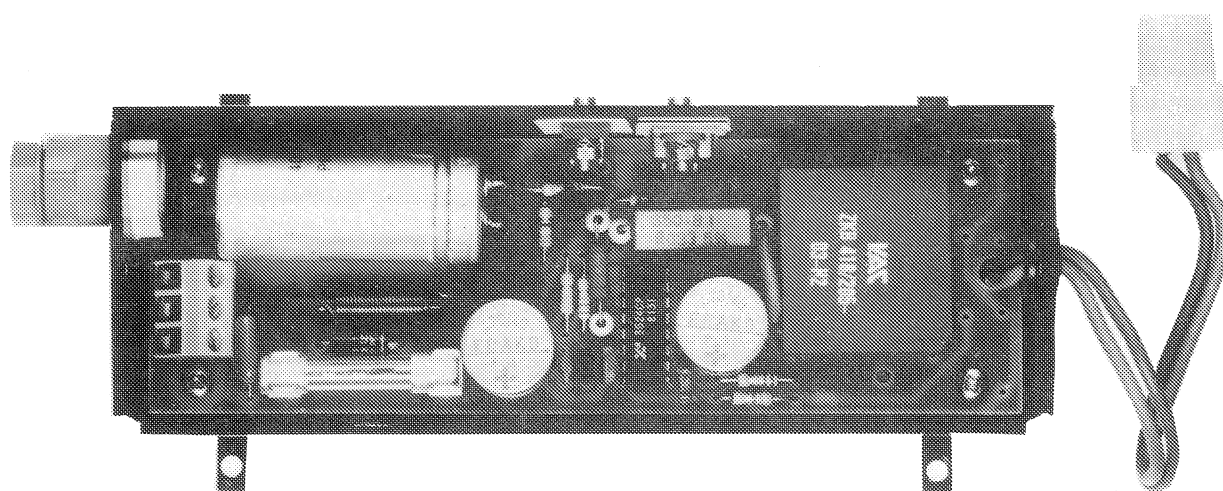


7.2. Selcall 503





7.3. 24V to 12V Converter Unit 502





# 8. PARTS LIST

8.1. TRANSCEIVER 500 Version 1A

DIAGRAM NO.	DESCRIPTION	SPECIFICATION	MFG. TYPE NO.	MFG.	QTY
C12	Cap. ceramic	1pf $\pm$ 0, 25pf P100 100V	2222 638 03108	Philips	1
C04, 167	"	1,5pf " " " " " "	" " " 03158	"	2
C166	"	3,9pf " " NPO	" " " 632 09398	"	1
C03, 14	"	5,6pf " " N150	" " " 638 33568	"	2
C175, 185	"	6,8pf " " " " " "	" " " 638 33688	"	2
C26, 176, 184	"	8,2pf " " NPO	" " " 09828	"	3
C17	"	10pf $\pm$ 2% " " " "	" " " 632 10109	"	1
C42, 151	"	" " " " " " " "	" " " 638 " " "	"	2
C05	"	" " " " N150	" " " 34109	"	1
C171	"	" $\pm$ 5% N2200 400V	9/0123, 9-400V	Ferroprem	1
C02, 15, 129	"	12pf $\pm$ 2% N150 100V	2222 638 34129	Philips	1
C10, 22, 95	"	" " " " " "	" " " 632	"	3
C177, 178, 181, 182, 193	"	15pf " " " " " "	" " " 638 34159	"	5
C180	"	18pf " " NPO	" " " 632 10189	"	1
C72, 138	"	33pf " " " " " "	" " " 10339	"	2
C01, 16	"	47pf " " N150	" " " 638 34479	"	2
C30	"	" " " " NPO	" " " 10479	"	1
C74	"	68pf " " " " " "	" " " 10689	"	1
C45	"	100pf " " N150	" " " 34101	"	1
C31	"	120pf " " " " " "	" " " 34121	"	1
C97, 100	"	180pf " " N750	" " " 58181	"	2
C07, 08, 128, 131, 133	"	220pf $\pm$ 10% 100V	2222 630 03221	"	5
C132	"	" " " " " "	" " " 02221	"	1
C06, 11, 13, 18, 20, 27, 34, 83, 127, 135, 140, 141, 143, 145, 147, 168, C23, 57	"	1nf " " " " " "	" " " 02102	"	16
C187	"	" " " " " "	" " " 03102	"	2
C35, 36, 82, 109, 144, 190, C19, 24, 25, 32, 76, 77, 79, 90, 134, 136, 139, 146, 149, 150, 152, 155, 157, 158, 165, 170, 172, 174, 192, 193, 194,	"	1nf $\pm$ 80% -20% 400V	SBFK - 8 1000pf 400V	Stettner	1
	"	2,2nf $\pm$ 10% 100V	2222 630 02222	Philips	6
	"	4,7nf " " " " " "	" " " 03470	"	25

DIAGRAM NO.	DESCRIPTION	SPECIFICATION	MFG. TYPE NO.	MFG.	QTY
C94, 102, 60	Cap. ceramic	4,7nf $\pm 10\%$	2222 630 02472	Philips	3
C43, 71, 130, 137, 154	" " var.	3,5-13pf N470	7S-Triko 300 427411	Stettner	5
C75	Cap. polystyr.	680pf $\pm 1\%$	2222 426 46801	Philips	1
C73	" "	1nf "	" " 41002	"	1
C98, 101	" polyester	1,5nf $\pm 10\%$	EM15-1	Toptronic	2
C93	" "	1,8nf "	EM18-1	"	1
C48	" "	5,6nf "	EM56-1	"	1
C47, 80, 96, 103, 108	" "	10nf $\pm 5\%$	B32560-D6103-J000	Siemens	5
C107	" "	33nf "	B32560-D3333-J000	"	1
C37, 38, 40, 41, 46, 63, 64, 78, 142, 162, 163	" "	0,1uf "	B32560-D1104-J000	"	11
C70, 85, 188	" "	0,22uf "	B32560-D1224-J000	"	3
C106, 191	" "	2,2uf "	B32562-C1225-J000	"	2
C29, 92, 104, 50	Cap. tantalum	0,1uf $\pm 20\%$	TAG OR1M35 ST	ITT	4
C33, 61, 86	" "	0,47 uf "	" OR47M35 ST	"	4
C21, 53, 54, 58, 91, 110, 159	" "	1,0uf "	" 1ROM35 ST	"	7
C67, 88, 148	" "	6,8uf "	" 6R8M16 ST	"	5
153, 156	" "	10uf "	" 10M16 ST	"	4
C51, 52, 89, 105	" "	22uf "	" 22M10 ST	"	2
C81, 55	" ellyt	10uf +50-10%	SKE 10/25 GFP	Frako	2
C161, 164	" "	100uf "	EP 100/16 GFP	"	5
C56, 68, 84, 87, 160	" "	470uf "	EP 470/16 GFP	"	1
C62	" "	1000uf "	EP 1000/16 GFP	"	2
C65, 66	" "	4,7uf $\pm 20\%$	TAG4R7M16 ST	ITT	1
C28	" "				

DIAGRAM NO.	DESCRIPTION	SPECIFICATION	MFG. NO.	MFG.	QTY
R36	Resistor cabon	1 ohm $\pm 5\%$ 0,33W	SBB 0207	Heyschlag	1
R54	"	2,2	"	"	1
R175, 177	"	8,2	"	"	2
R138, 167, 171, 172	"	10	"	"	4
R10, 12, 152	"	15	"	"	3
R07	"	18	"	"	1
R05, 116	"	22	"	"	2
R160, 161	"	47	"	"	2
R06, 13	"	56	"	"	2
R11	"	68	"	"	1
R46, 164, 168	"	100	"	"	3
R153, 166, 176	"	150	"	"	3
R55, 150, 174, 181	"	220	"	"	4
R03, 118	"	270	"	"	2
R17	"	330	"	"	1
R44	"	390	"	"	1
R77, 80, 115, 158	"	470	"	"	4
R26	"	560	"	"	1
R165	"	620	"	"	1
R16	"	910	"	"	1
R62, 82, 101, 128					
156, 169, 170, 185,					
194	"	k	"	"	9
R18	"	1,2	"	"	1
R33, 34, 65, 130,					
148	"	1,5	"	"	5
R93, 96, 98, 134	"	2,2	"	"	4

DIAGRAM NO.	DESCRIPTION	SPECIFICATION	MFG. NO.	MFG.	QTY
R54	Resistor carbon	2,7 kohm $\pm 5\%$ 0.33W	SBB 0207	Beyschlag	1
R50, 94	"	3,3 " " "	"	"	2
R08, 52, 70, 75, 78,					
100, 102, 103, 110,					
147, 154, 162, 193,					
196, 197, 49	"	4,7 " " "	"	"	16
R41, 39, 182	"	5,6 " " "	"	"	3
R40, 85, 95, 105, 106,					
111, 112, 113, 132	"	6,8 " " "	"	"	9
R04, 14, 15, 28, 88,					
92, 97, 114, 123,					
136, 137, 173	"	10 " " "	"	"	12
R53, 91	"	12 " " "	"	"	2
R20	"	15 " " "	"	"	1
R30, 73, 74, 76, 81,					
85, 87, 104, 135, 195	"	22 " " "	"	"	10
R71, 72, 178, 180	"	27 " " "	"	"	4
R42, 58, 61	"	33 " " "	"	"	3
R35, 107, 108	"	47 " " "	"	"	3
R32, 36, 50, 90, 133, 43	"	56 " " "	"	"	6
R54	"	68 " " "	"	"	1
R01, 31, 38, 45, 124,					
125, 126, 127, 155	"	82 " " "	"	"	9
R02, 23, 24, 51, 117,					
157	"	100 " " "	"	"	6
R120	"	75 " " "	"	"	1
R37	"	150 " " "	"	"	1
R25, 27	"	220 " " "	"	"	2

DIAGRAM NO.	DESCRIPTION	SPECIFICATION	MFG. NO.	MFG.	QTY
R53	Resistor carbon	270 kohm $\pm$ 5% 0,33W	SBJ 0207	Beyschlag	1
R122	"	820 " " " "	"	"	1
R66, 67, 68	Resistor Network	7x4,7 kohm $\pm$ 5%	RA 7-472J	K-ohm	3
R57	" wirew.	10 ohm $\pm$ 5% 3W	211A 10 ohm	Diplohm.	1
R184	" carbon var.	500 " " 0,1W	0052-620 500 ohm Ruwido		1
R21, 183	"	10 kohm " "	" 10 k"	"	2
R121, 131	"	47 " " " "	" 47 ""	"	2
R47	"	250 kohm " "	" 250 ""	"	1
R22 (squelch)	"	5 " " 1in. 0,2W	0502-300 5 k lin	"	1
R43 (Vol+ON/OFF SW01)	"	5 " " 1og. 0,1W	0503-311 5 k log	"	1
R83 (Dim+1W/25W SW02)	"	5 " " 1in. 0,2W	0514-300 5 k lin mit bügel	"	1
SW04, 05 (Ch.sel)	Rotary code switch	10 pos. BCD complm.	SC17 48435 26107 ITT		2
SW03 (DW)	Bügel (DW-SW)	3 pos.	1740-301	Ruwido	1
	IC	20 p. DIP socket	"	"	1
	Holder (SW04, 05)		Augat		2
	Rubber Grommet	(LA01) 9,5x5,6 mm	Drg.300-0003 INTELL		1
	Hex spacer	L=25 mm	HV3098(RS170-140)Rudolph S.		1
	Can		Drg.300-0001 Jaeger		2
			B15 Neosid		1

DIAGRAM NO.	DESCRIPTION	SPECIFICATION	MFG. TYPE NO.	MFG.	QTY
L23, 24	Choke	0,1uH $\pm 10\%$	1R-2 0,1uH	Dale	2
L18, 21, 27	"	0,15uH "	" 0,15uH	"	3
L08, 22, 25	"	0,22uH "	" 0,22uH	"	3
L04, 05, 11, 20	"	1,0uH "	B78100-S1102K	Siemens	4
L26	"	3,3uH "	" S1332K	"	1
L10	"	10uH "	" S1103K	"	1
L13	"	22uH "	" S1223K	"	1
L12	"	1mH "	" S1105J	"	1
L28, 30, 35, 36	"	0,85kohm $\pm 20\%$	4312 020 36700	Philips	4
L01, 02, 06, 07	Coil		Drg. 100 0001	Intell	4
L31, 34	"		" 100 0003	"	2
L32, 33	"		" 100 0003	"	2
	Form		K316PC	Neosid	4
	Slug		3x8F100b/SK	"	4
	Can		7100(RS146-156)	Anglosid	4
	Ferrit Bead	(Q01 G2) 3,5x1x3 mm	RS146-510	Rudolph S.	1



DIAGRAM NO.	DESCRIPTION	SPECIFICATION	MFG. NO.	MFG.	QTY
(Z01)	LS. plug Contact male		1625-3P 1560-1L	Molex "	1 2
(Z02)	Batt. plug Contact female		180923 42238-2	AMP "	1 2
(Z03)	Antenna plug		PL259 (UHF)		1
(Z04)	Aux plug Contact male		1261-6P 1190-1L	Molex "	1 2
(Z05)	Microtelephone		MS-6000BL	Nikkelsen	1
	"	holder	1901	"	1
	"	clips	12791	"	1
	"	mount. pl.	12793	"	1
	"	plug	RP.351605	Radio P.	1
	Fuseholder (F01)		RP.498510	"	1
F01	Fuse	6,3A 6,3x32 mm			
	Bracket		Drg.300-0007	INTELL	1
	Cabinet		9514.2S	Jaeger	1
	Front plate		Drg.300-0004	INTELL	1
	Rear plate		" 300-0005	"	1
	Heat sink		" 300-0006	"	1
	Bush (front plate)		"		6
	Film insulator		(FO-220)		2
	Rubber Grommet	(Micr. conn.)TP63	HV4163A (RS170-430)	Rudolph S.	1
	Shoulder Bush		105.359	Assmann	6
	Ferrit bead	3,55x14,3x2,5 Grade 3B	4313 020 15840	Philips	3
Z01	LS. conn.		1625-3K	Molex	1
	Contact female		1561-TL	"	2

DIAGRAM NO.	DESCRIPTION	SPECIFICATION	MFG. NO.	MFG.	QTY
Z03	Ant. conn.	UHF	SU239SH	Rudolph S.	1
Z04	Aux. conn.		1261-6R	Nolex	1
	Contact female		1189-FL	"	2
	Knob			SIFAM	2
	Knob			"	2
	Knob			"	2

DIAGRAM NO.	DESCRIPTION	SPECIFICATION	MFG. NO.	MFG	QTY
D01, 02, 03, 04, 06, 07, 08, 09, 12, 13, 14, 15, 16, 17, 18, 20, 22, 23, 24, 30, 32, 33	Diode silicon	1N4148		ITT	22
D34	" "	1N4002		"	1
D27, 28	" "	BA243		"	2
D05	" zener	4PD6V8		"	1
D35	" "	B4V 40 C18		Siemens	1
D21, 31	" germani.	AA143		ITT	2
D10, 11	" LED	CQY54 (XR209R)		Philips	2
Q01	Trans. silicon	3N206		Texas	1
Q02	" "	BF414		Telefunk.	1
Q03, 04, 05, 08, 11, 14, 15, 17, 25, 27, 28, 30, 40, 41	" "	BC237B		Siemens	14
Q12, 16, 23, 24, 26, 31	" "	BC327-25		"	6
Q06, 07	" "	PN2369 (3N2369A)		National S.	2
Q10, 13	" "	BC337		Siemens	2
Q34	" "	BF173		Telefunk.	1
Q35	" "	MPF132 (MEM632, 2N206)		Motorola	1
Q36	" "	BFY90		Philips	1
Q37	" "	2N4427		TRW	1
Q38	" "	BD234		Philips	1

DIAGRAM NO.	DESCRIPTION	SPECIFICATION	MFG. NO.	MFG.	QTY
IC01	Integr. circ.	MC3357P		Motorola	1
IC02, 16, 17	"	1458N		Texas	3
IC03	"	TDA2003H		SGS-ATES	1
IC04	"	UA7805UC		Fairchild	1
IC05, 14, 15	"	UA78L82AWC		"	3
IC06	"	S187B		Siemens	1
IC07, 08	"	DM7406N		National S.	2
IC10	"	DM74LS26N		"	1
IC11	"	MM1 6309-1J	Code "A"	MMI	1
IC12	"	" " "	" "B"	"	1
IC13	"	CA555TC		Fairchild	1
IC18	"	CD4007UBE		RCA	1
IC19	"	S89		Siemens	1
IC20	"	MV30 (MHW603, NHW613A)		TRW	1

DIAGRAM NO.	DESCRIPTION	SPECIFICATION	MFG. NO.	MFG.	QTY
RM01	Balanced mixer	SBL-1		Mini circ.	1
FL01	Crystal filter	21,4 MHz	O24BF(NDK21A15DB)	IIT	1
FL02	Ceramic filter	455 kHz (RP577872)	CFU 455D	Murata	1
YO1	Crystal	20,945 MHz	AL80DFF	Croven	1
YO2	"	6,4 MHz	A187DDf	"	1
RE01	Ant. relay	12V 270 ohm	V23037-A0002-A101	Siemens	1
LA01	Dail lamp	5V 0,06A	GL583(RS152-503)	USHING	1
FO2	Fuse	15A 5x20			1
Z02	Tap. conn.		GST BG 12.351.104	NECO	2
Z05	Micr. "	5 pol. DIN (stereo)	D-5	Cliff	1
	VCO unit		Drg.000-0002	Intell	1
	PCB (Rx-Tx)		200-0001		1
	Eyelets			F.Rikard P. 13	1
	Cable coax.		RG178/U		1
	"		"		1
	"		"		1
	"		"		1

DIAGRAM NO.	DESCRIPTION	SPECIFICATION	MFG. NO.	MFG.	QTY
R142	Resistor carbon	22 ohm $\pm 5\%$ 0,33W	SBB 0207	deyschlag	1
R144, 145	"	470	"	"	2
R146	"	1 kohm	"	"	1
R140	"	2,7	"	"	1
R143	"	4,7	"	"	1
R139, 149	"	22	"	"	2
R141	"	27	"	"	1
C119	Cap. ceramic	4,7pf $\pm 0,25$ pf N150 100V	2222 638 33478	Philips	1
C114	"	6,8pf	" " 33688	"	1
C118	"	10 pf $\pm 2\%$	" " 34109	"	1
C117	"	15 pf	" " 34159	"	1
C113, 122, 125, 126	"	220pf $\pm 10\%$ 100V	" 630 03221	"	4
C111, 116, 121, 124	"	4,7nf	" " 03472	"	4
C120	" polystyrene.	1 uf $\pm 1\%$ 250V	" 426 41002	"	1
C115	" tantalum	1 uf $\pm 20\%$ 35V	TAG 1ROM35 ST	ITT	1
C123	"	6,8uf	" 6R8N16 ST	"	1
C112	"	100uf	" 100M10 ST	"	1
L14, 15, 17	Choke	1,0 uH $\pm 10\%$	IR-2 1,0uH	Dale	3
L16	Coil		Drg. 100 0002	Intell	1
D25	Diode silicon	BA243		ITT	1
D26	" cap. var.	BB109G		Siemens	1
Q32, 33	Trans. silicon	BF256LA		Texes	2
Q29	"	BC237B		Siemens	1

DIAGRAM NO.	DESCRIPTION	SPECIFICATION	MFG. NO.	MFG.	QTY
	PCB (VCO)		200-0002		1
	Pin	Ø1,3x10	4772/2/7	F.Rikard P. 8	
	Box		Drg. 300-0002	IMELL	1

8.3 PARTS LIST  
FOR  
**502** VERSION 2A  
24V to 12V Converter Unit

Printed Circuit Board Complete 502				107 550 21
502IC1	3524			850 352 40
502Q1	BD288			842 028 80
Q2	BC327			840 032 70
502D1	MBR 1045			
D2	BZV40C36			832 403 60
502L1	100uH 5A			740 210 04
L2	10uH 3A	20%		740 110 02
L3,4	FCX 4322			739 000 00
502R2	0.033ohm		4W	526 003 30
R10,12	10ohm	5%		501 110 00
R11	39ohm	5%		501 139 00
R1	560ohm		1,6W	514 256 00
R4,8,9	3,3kohm	5%		501 333 00
R5	6,8kohm	5%		601 368 00
R3	10kohm	5%		501 410 00
R6	33kohm	5%		501 433 00
R7	56kohm	5%		501 456 00
502C6,10	1nF		63V	602 310 01
C7	10nF		63V	602 410 00
C5,8	100nF		63V	622 510 01
C1,3	470uF		40V	652 847 01
C2	560uF		40V	652 856 00



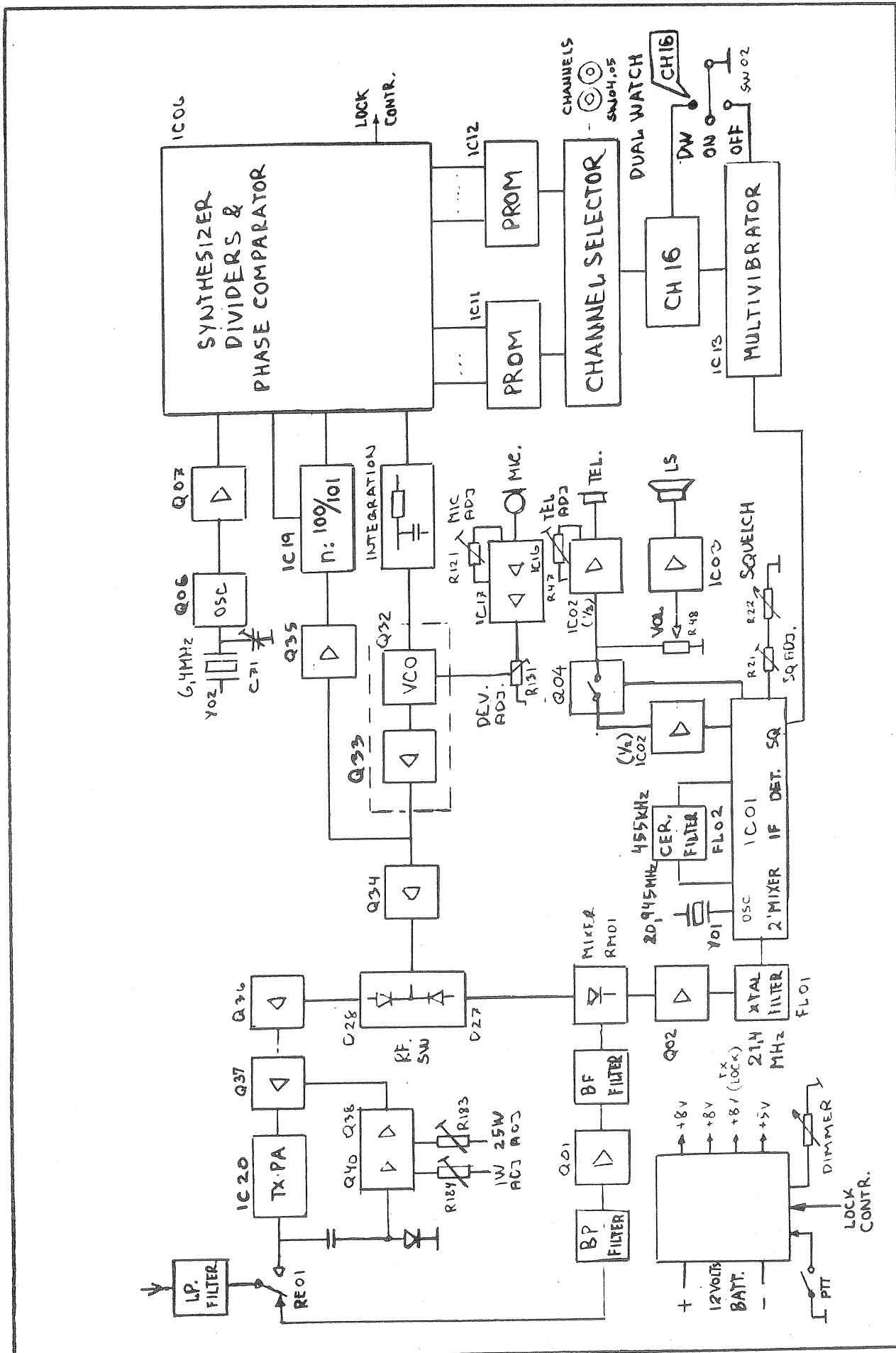
8.4. SELCALL 503 Version 1A

DIAGRAM NO.	DESCRIPTION	SPECIFICATION	MFG. NO.	MFG.	QTY
Do1, o2, o3, o4, o5, o8, o9, 1o	Diode silicon	1N4148		ITT	8
Do6, o7	Thyristor silicon	2N5o61		Motorola	2
D11, 12	Diode LED	CQY54(XR2o9R)		Philips	2
Qo3, o4, o5, o6, o7, o8	Trans. silicon	BC237B		Siemens	6
Qo1, o9, 1o	"	BC3o7B		"	3
Qo2	"	J31o		National S.	1
ICo2, o3	Integr. circuit	CD4o93BE		RCA	2
ICo1	"	CD4o17BE		"	1
ICo4	"	UA78Mo8UC		Fairchild	1
REo1	Relay	6V 8o ohm	MZ 6HG (Blue)	ITT	1
SWo1	Switch	SPDT (ON-OFF-ON)	To8-127 (o,1")	JBT	1
Zo1	Connector			Molex	1
Lo1	Coil		Drg.1oo-ooo5	INTELL	1
	PCB		" 2oo-ooo5	"	1
	Pin	ø1,3x6	4768/2,5/3,5	F.Rikard P.	16

DIAGRAM NO.	DESCRIPTION	SPECIFICATION	MFG. NO.	MFG.	QTY
Co9	Cap. ceramic	4,7nf $\pm 10\%$	2222 630 03472	Philips	1
Co4	" polystyr.	470pf $\pm 1\%$	" 426 44701	"	1
Co3	"	24 nf " 63V	" 424 42403	"	1
Co3a	"	1,5 " " "	" " 41502	"	1
C23	" polyester	10 nf $\pm 5\%$ 400V	B32560-D6103-J000	Siemens	1
Co1, 02, 05, 06, 18	"	0,1uf " 100V	" D1104 "	"	5
C22	"	0,22uf " "	" D1224 "	"	1
C12, 15	" tantalium	0,22uf $\pm 20\%$ 35V	TAG OR22M35 S1	ITT	2
C13, 14	"	0,47 " " "	" OR47M35 SP	"	2
C20	"	1,0 " " "	" 1ROM35 SI	"	1
Co7, 08, 10, 11, 16, 17	"	4,7 " " 16V	" 4R7M10 SP	"	6
C19	"	22 " " 10V	" 22M10 SP	"	1
C21	" electrolyt	100uf $\pm 50-10\%$ 16V	EK100/16 GPF	Frako	1

DIAGRAM NO.	DESCRIPTION	SPECIFICATION	MFG. TYPE NO.	MFG.	QTY
R38	Resistor carbon	6,8 ohm $\pm 5\%$ 0,33W	SB3 0207	Beyschlag	1
R32	"	22 " " "	"	"	1
R39, 40	"	470 " " "	"	"	2
R14	"	1 kohm " " "	"	"	1
R03 (factory selected)	"	(1,5 " " " )	"	"	1
R05, 35	"	2,2 " " "	"	"	2
R25	"	4,7 " " "	"	"	1
R10	"	5,6 " " "	"	"	1
R01, 02, 06, 08, 11, 12, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 30, 31, 34 R09, 27 R07, 28, 29, 36 R13 (factory selected) R33 R04, R26 (factory selected) R37	"	10 " " " "	"	"	19
	"	15 " " " "	"	"	2
	"	33 " " " "	"	"	4
	"	(56 " " " )	"	"	1
	"	100 " " " "	"	"	1
	"	150 " " " "	"	"	1
	"	(820 " " " )	"	"	1
	"	1 Mohm " " "	"	"	1





BLOCK DIAGRAM TRP 2500 VERSION 2A



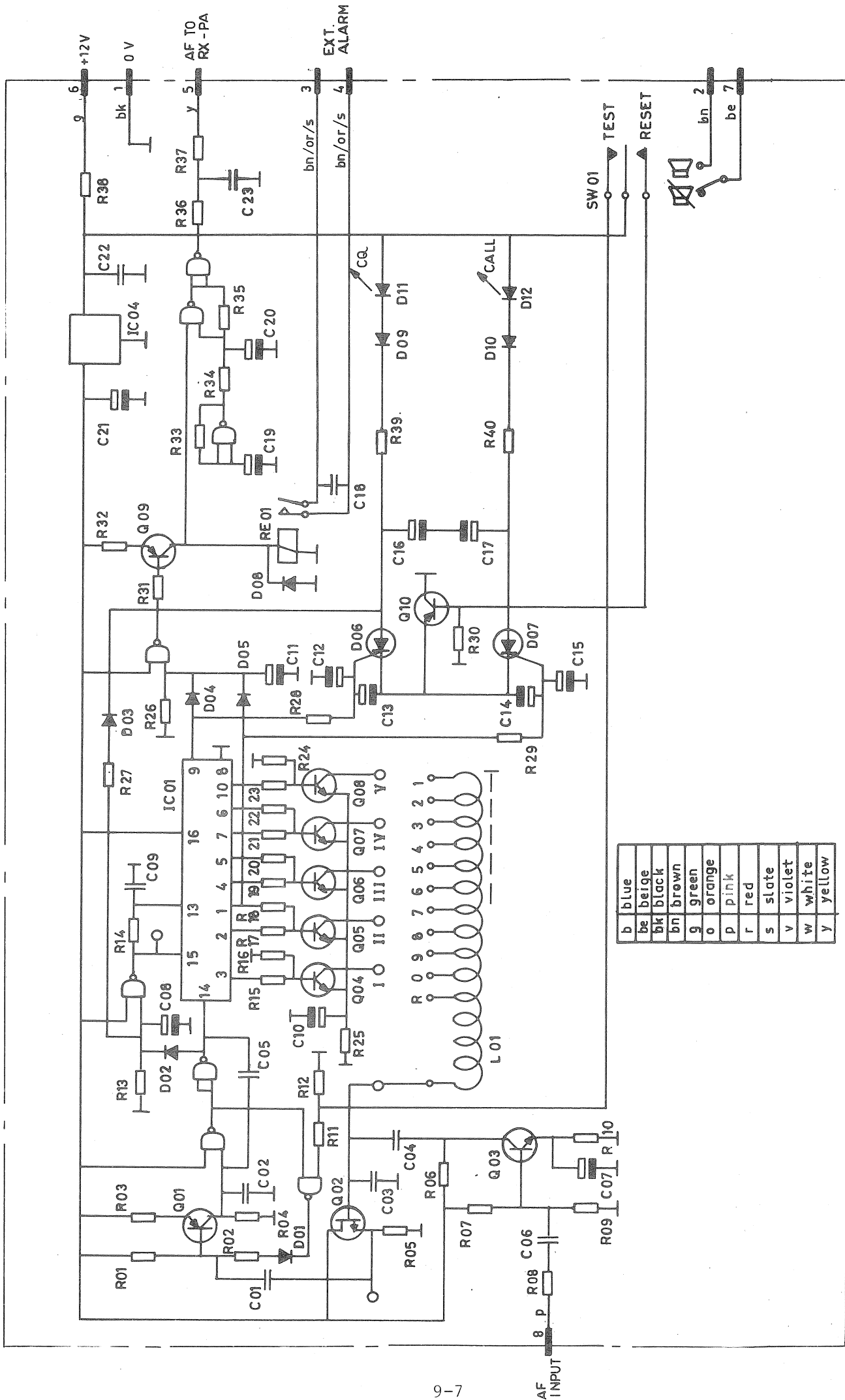












SELCALL **503** VERSION 1A  
(OPTIONAL)

