



skanti

INSTRUCTION MANUAL

**VHF RADIOTELEPHONE
TYPE TRP2500**

skanti

TRP2500 INSTRUCTION MANUAL

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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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6. SERVICE AND MAINTENANCE

6.1. Fault finding

6.2. Reassignment

7. COMPONENT LOCATION

7.1. Transceiver and VCO

7.2. Selcall

7.3. 24V to 12V converter unit

8. PARTS LIST



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

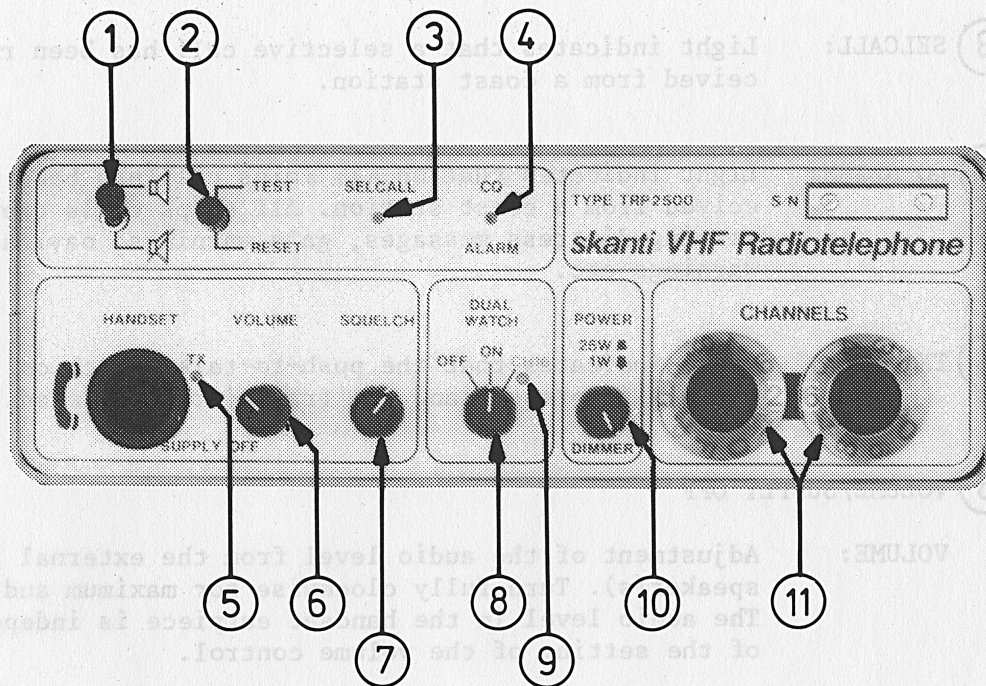


FIG. 2.1

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 loudspeaker(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 loudspeaker 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

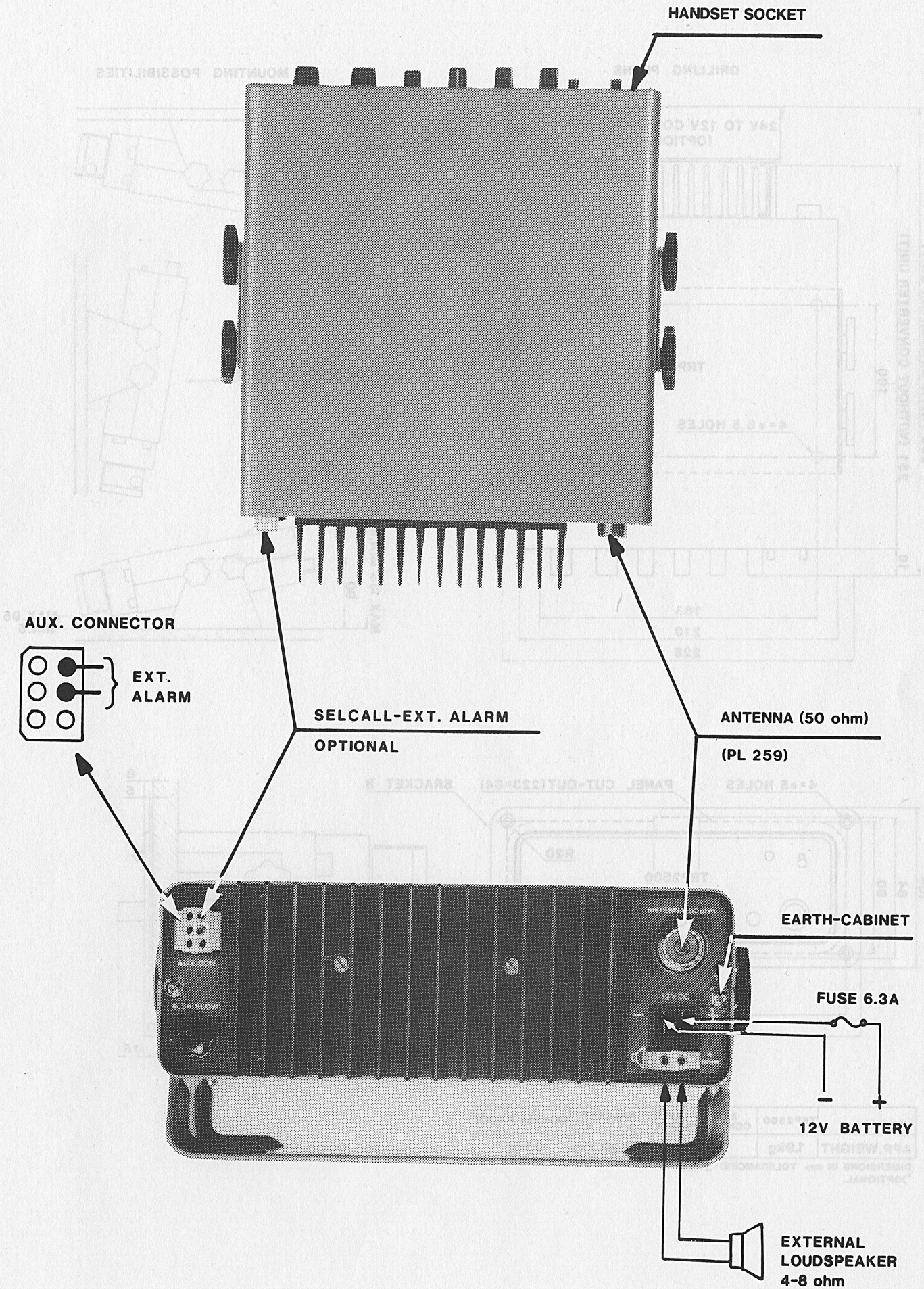
12 V battery

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

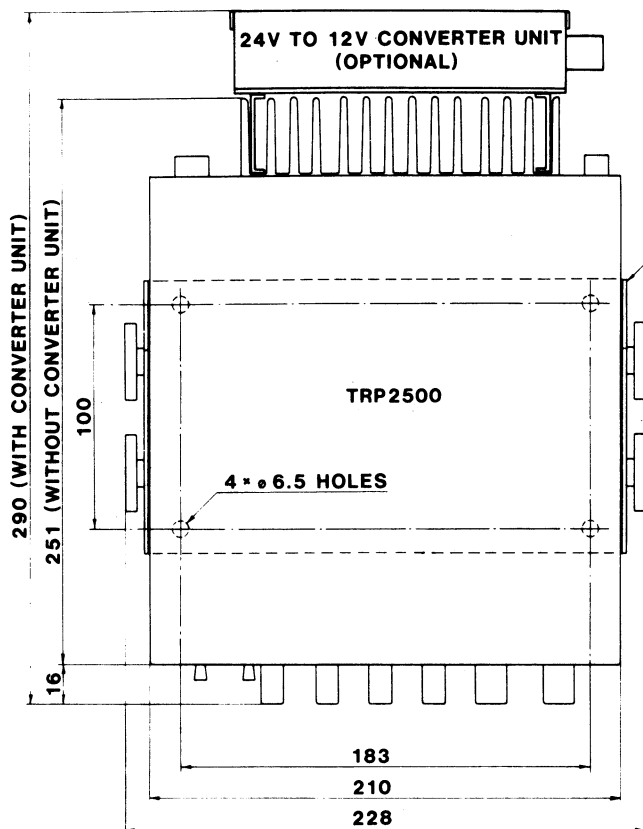
The set is designed with floating connections for antenna and power leads, and the set itself will not ground any side of a ground free ship's mains.

3.7 CABLE CONNECTIONS - EXTERNAL CABLES

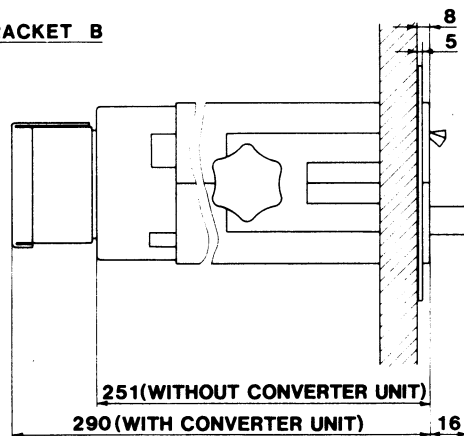
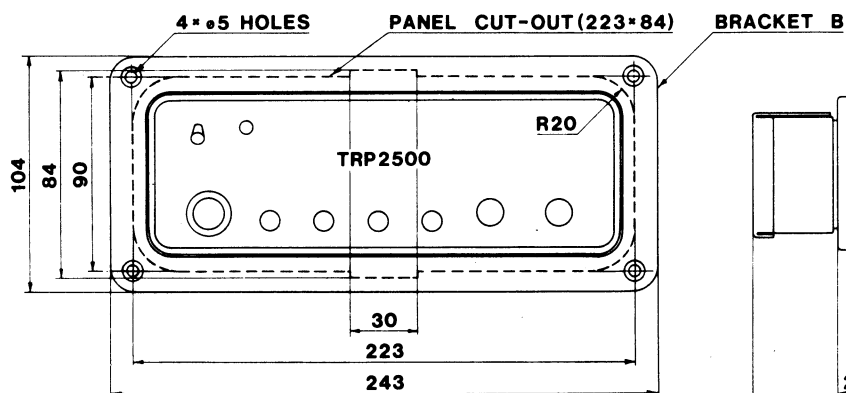
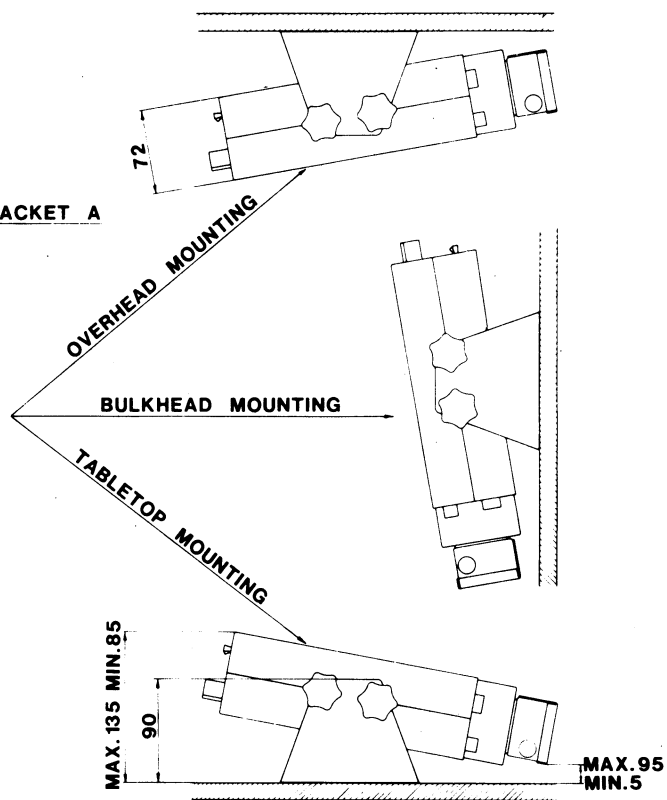


3.8 MOUNTING OF TRP2500

DRILLING PLANS



MOUNTING POSSIBILITIES



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

DIMENSIONS IN mm TOLERANCES: ± 1 mm

*)OPTIONAL.

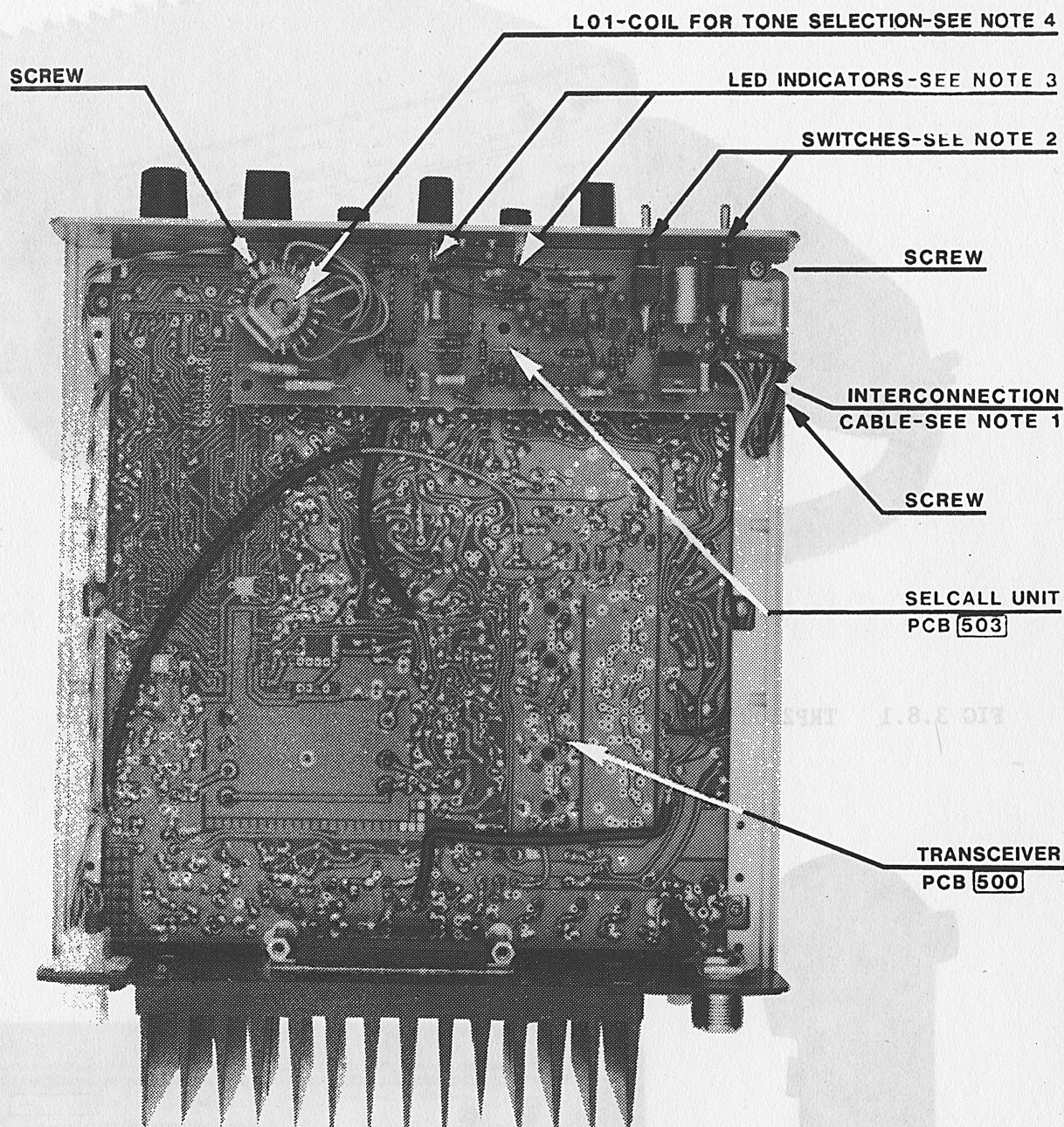


FIG 3.8.1 TRP2500 MOUNTED IN STANDARD BRACKET (TYPE A)



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.

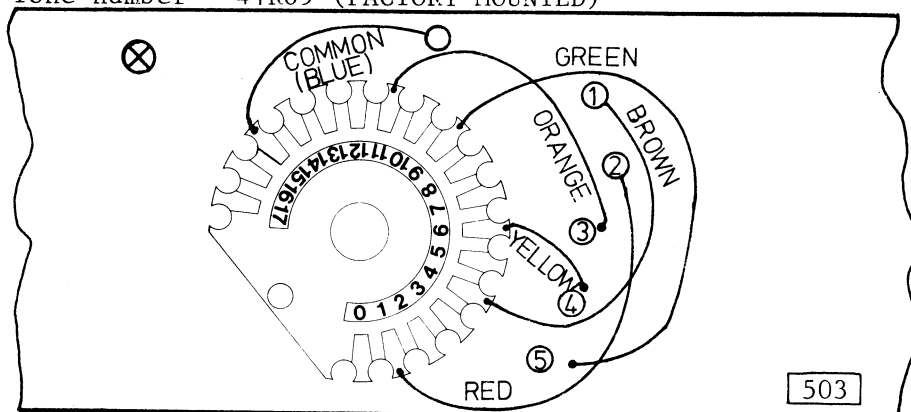
Note 2: After installation of the SELCALL Unit ensure that the rubber sealings on the shaft of the switches are pressing against the rear side of the front plate. Remember to mount the 2 neoprene caps on the shafts after installation of the SELCALL Unit.

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.

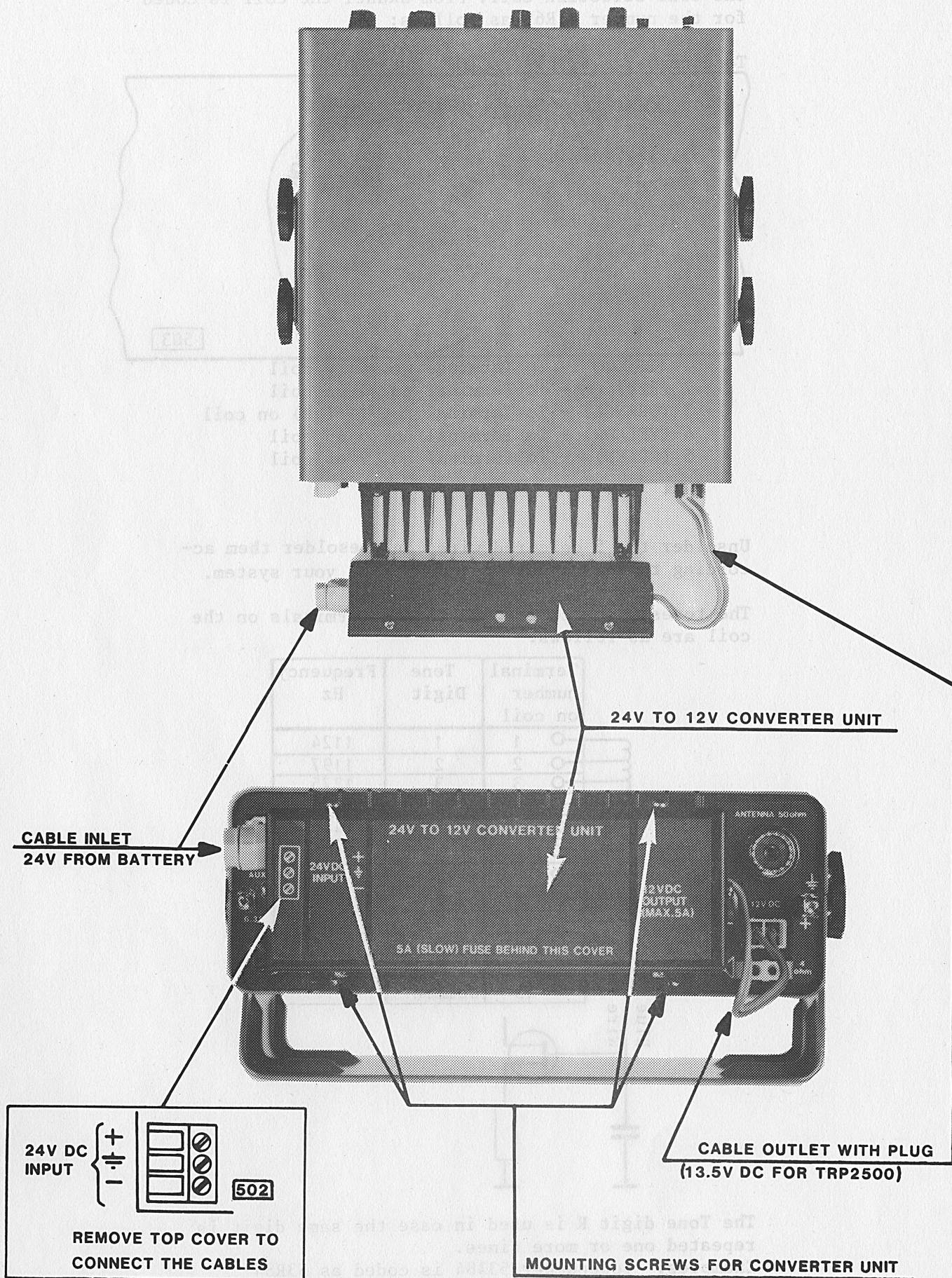
The tones which correspond to the terminals on the coil are as follows:

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° 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 μ V 20 dB SINAD (0.7 μ 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.

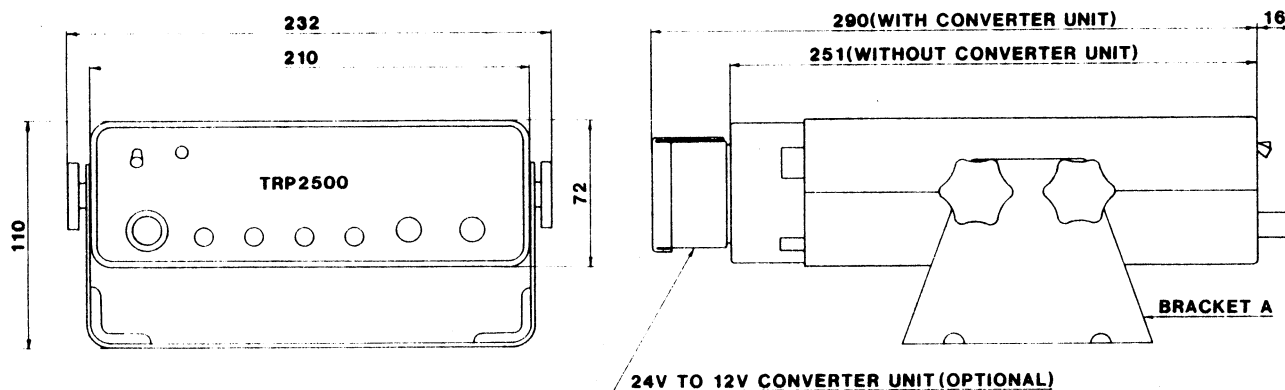
4.9. 24V to 12V CONVERTER UNIT

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 CONVERTER UNIT	BRACKET A	BRACKET B	SELCALL P.C.B.*
APP.WEIGHT	1.9kg	0.3kg	0.3kg	0.7kg	0.1kg

DIMENSIONS IN mm TOLERANCES: ± 1 mm
BRACKET B IS FOR PANEL MOUNTING
*OPTIONAL

4.11. INTERNATIONAL (EUROPEAN)
VIII MARINE MOBILE CHANNELS

Channel Designators	Frequencies MHz	
	Transmit	Receive
01	60 156.025	160.625
	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.
VIII MARINE MOBILE CHANNELS

Channel Designators	Frequencies MHz	
	Transmit	Receive
06	65S 156.275	156.275
	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 π 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

Input		Outout	
<u>Word</u>	<u>HEX</u>	<u>HEX</u>	<u>Ch.</u>
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 6309-1J
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	3e		
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 μ 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 ± 3 kHz and a max. deviation on high voice levels of ± 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 ≥ 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 ≥ 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 5×10^{-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 ± 4.2 kHz deviation. Check that deviation does not exceed ± 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 ± 3 kHz on potentiometer R121.
- 6.2.3.5. Check distortion is not exceeding 3%.

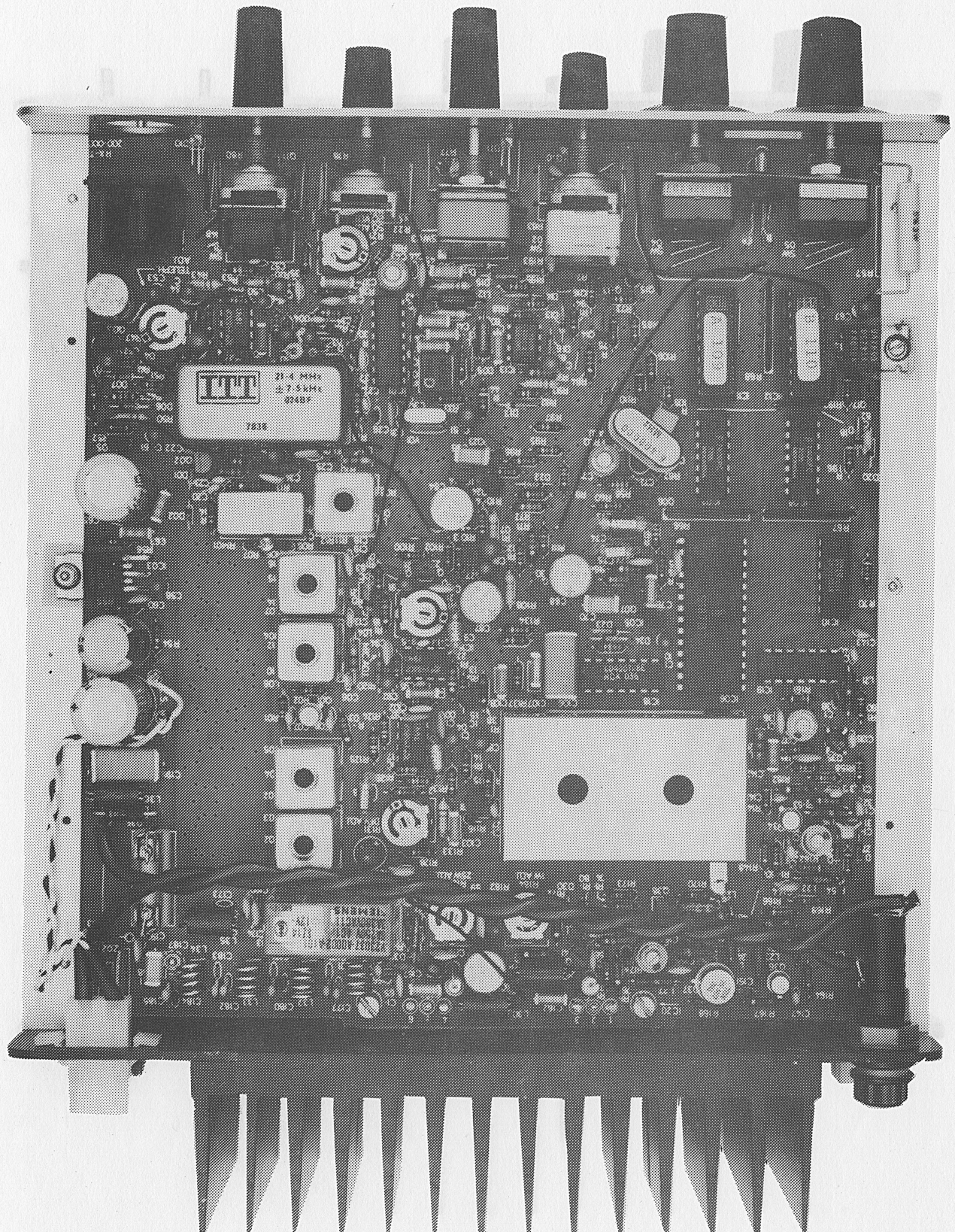
6.2.4. Receiver

- 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 μ V on channel 78 (156.97500 kHz) generator modulates with 1000 kHz and ± 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 μ 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 $0.7 \mu\text{V}$ 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 $8 \text{ V} \pm 0.4 \text{ V}$.
- 6.2.5.3. Connect tone generator to AF input terminal and adjust this to tone 6. ($1540 \text{ Hz} \pm 1 \text{ Hz}$).
- 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:
- That RE01 activates and closes the relay contact.
 - That a LF-shifting-tone with a peak-peak value of approx. 8V in unloaded condition appears on R37.
 - 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.

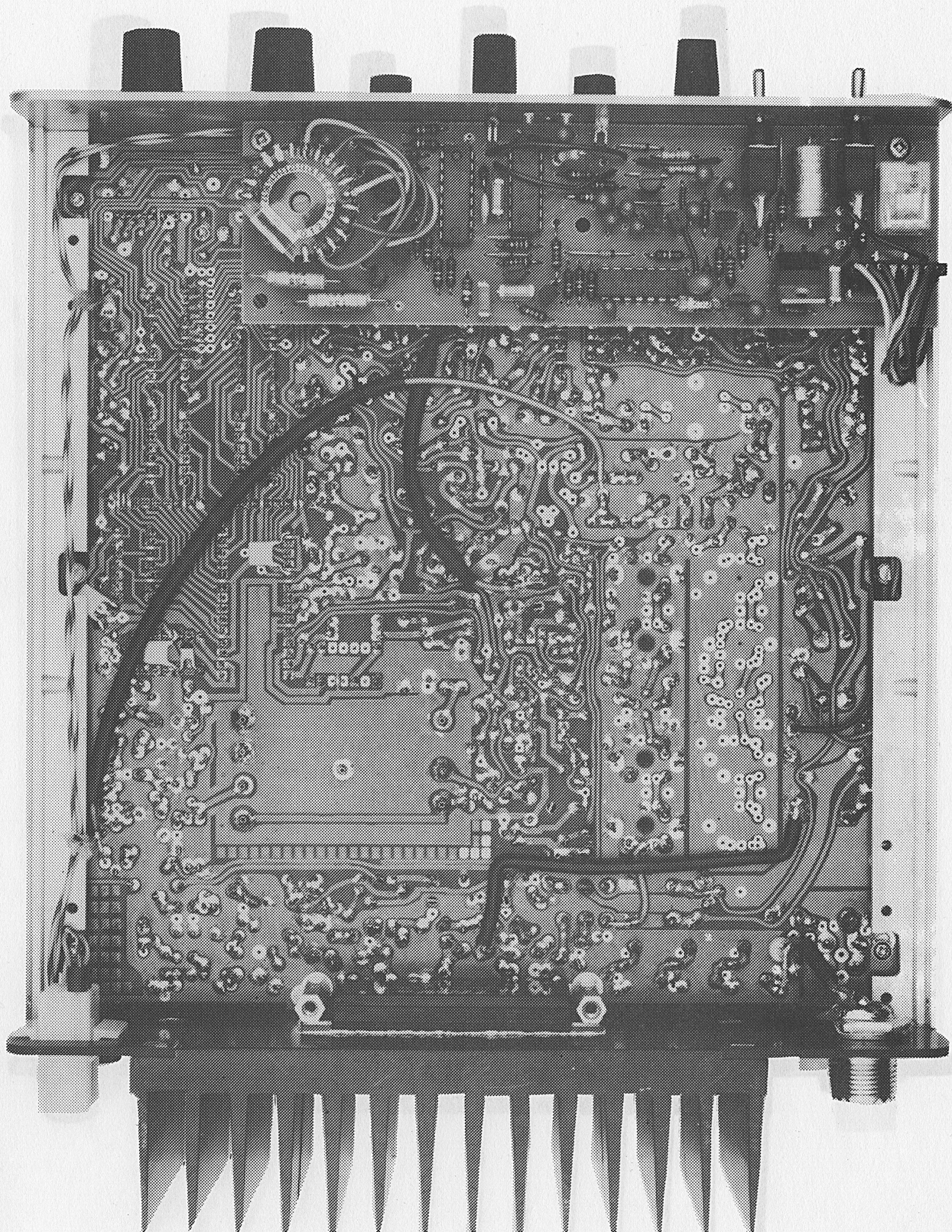
7. COMPONENT LOCATION

7.1. Transceiver and VCO [500] / [501]

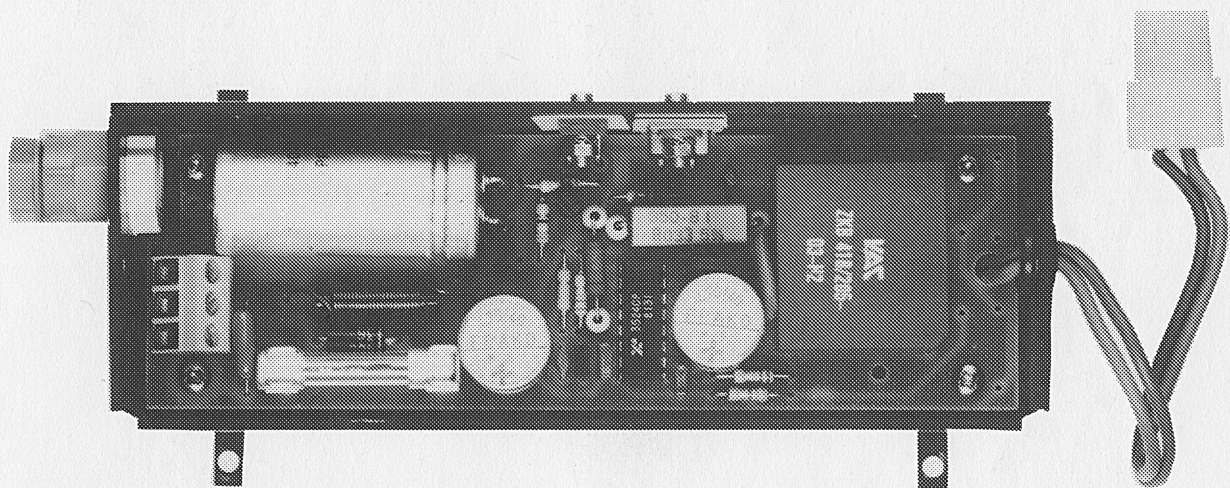


7.2. Selcall 503

7.1. Transceiver and VCO 500 \ 501



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	" " 632 09398	"	1
C03, 14	"	5,6pf	" " 638 33568	"	2
C175, 185	"	6,8pf	" " 638 33688	"	2
C25, 176, 184	"	8,2pf	" " 09828	"	3
C17	"	10pf \pm 2%	" " 632 10109	"	1
C42, 151	"	"	" " 638	"	2
C05	"	"	" " 34109	"	1
C171	"	" \pm 5%	9/0123,9-400V	Ferroperm	1
C02, 15, 129	"	12pf \pm 2%	2222 638 34129	Philips	1
C10, 22, 95	"	"	" 632	"	3
C177, 178, 181, 182, 183	"	"	" 638 34159	"	5
C180	"	15pf	" " 632 10189	"	1
C72, 138	"	18pf	" " 10339	"	2
C01, 16	"	33pf	" " 638 34479	"	2
C30	"	47pf	" " 10479	"	1
C74	"	"	" " 10689	"	1
C45	"	68pf	" " 34101	"	1
C31	"	100pf	" " 34121	"	1
C97, 100	"	120pf	" " 58181	"	2
C07, 08, 128, 131, 132	"	180pf	"	"	5
C132	"	220pf \pm 10%	2222 630 03221	"	1
C06, 11, 13, 18, 20, 27, 34, 83, 127, 135, 140, 141, 143, 145, 147, 168, C23, 57	"	"	" " 03221	"	1
C187	"	1nf	" " 02102	"	16
	"	"	" " 03102	"	2
	"	1nf \pm 80% -20%	SBFK-8 1000pf 400V	Stettner	1
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,	"	2,2nf \pm 10%	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 ±10%	100V	2222 630 02472	Philips	3
C43, 71, 130, 137, 154	" " var.	3,5-13pf N470	160V	7S-Triko 300 427411	Stettner	5
C75	Cap. polystyr.	680pf ±1% 1nf	250V	2222 426 46801	Philips	1
C73	" "	" "	"	" " 41002	"	1
C98, 101	" polyester	1,5nf ±10%	100V	EM15-1	Toptronic	2
C93	" "	1,8nf "	"	EM18-1	"	1
C48	" "	5,6nf "	"	EM56-1	"	1
C47, 80, 96, 103, 108	" "	10nf ±5%	400V	B32560-D6103-J000	Siemens	5
C107	" "	33nf "	250V	B32560-D3333-J000	"	1
C37, 38, 40, 41, 46, 63, 64, 78, 142, 162, 163	" "	0,1uf "	100V	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 ±20%	35V	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
C:67, 88, 148	" "	6,8uf "	16V	" 6R8M16 ST	"	5
153, 156	" "	10uf "	"	" 10M16 ST	"	4
C51, 52, 89, 105	" "	22uf "	10V	" 22M10 ST	"	2
C81, 55	" ellyt	10uf +50-10%	25V	SKE 10/25 GFP	Frako	2
C161, 164	" "	100uf "	16V	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 ±20%	"	TAG4R7M16 ST	ITT	1
C28	" "					

DIAGRAM NO.	DESCRIPTION	SPECIFICATION	MFG. NO.	MFG.	QTY
R56	Resistor cabon	1 ohm $\pm 5\%$ 0,33W	SBB 0207	Beyschlag	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	"	020 " " "	"	"	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
R14	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	SBB 0207	Beyschlag	1
R122	"	820 " " " "	"	"	1
R66, 67, 68	Resistor Network	7x4,7 Kohm $\pm 5\%$	RN 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 (squellch)	"	5 " 1in. 0,2W	0502-300 5 k lin	"	1
R43 (Vol+ON/OFF SW01)	"	5 " log. 0,1W	0503-311 5 k log	"	1
R83 (Dim+1W/25W SW02)	"	5 " lin. 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)		Drg.300-0003	Augat	2
	Rubber Grommet	(LA01) 9,5x5,6 mm	HV3098(RS170-140)	INTELL	1
	Hex spacer	L=25 mm	Drg.300-0001	Rudolph S.	1
	Can		B15	Jaeger	2
				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
Lo8, 22, 25	"	0,22uH "	" 0,22uH	"	3
Lo4, o5, 11, 2o	"	1,ouH "	B781oo-S11o2K	Siemens	4
L26	"	3,3uH "	" S1332K	"	1
L1o	"	1ouH "	" S11o3K	"	1
L13	"	22uH "	" S1223K	"	1
L12	"	1mH "	" S11o5J	"	1
L28, 3o, 35, 36	"	o,85kohm $\pm 20\%$	4312 o2o 367oo	Philips	4
Lo1, o2, o6, o7	Coil		Drg. 1oo ooo1	Intell	4
L31, 34	"		" 1oo ooo3	"	2
L32, 33	"		" 1oo ooo3	"	2
	Form		K316Pc	Neosid	4
	Slug		3x8F1oob/SK	"	4
	Can		71oo(RS146-156)	Anglosid	4
	Ferrit Bead	(Qo1 G2) 3,5x1x3 mm	RS146-51o	Rudolph S.	1

DIAGRAM NO.	DESCRIPTION	SPECIFICATION	MFG. NO.	MFG.	QTY
(Z01)	LS. plug		1625-3P	Molex	1
	Contact male		1560-1L	"	2
(Z02)	Batt. plug		180923	AMP	1
	Contact female		42238-2	"	2
(Z03)	Antenna plug		PL259 (UHF)		1
(Z04)	Aux plug		1261-6P	Molex	1
	Contact male		1190-1L	"	2
	Microtelephone		HS-6000BL	Nikkelsen	1
	"	holder	1901	"	1
	"	clips	12791	"	1
	"	mount. pl.	12793	"	1
(Z05)	"	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
Zo3	Ant. conn.	UHF	SU239SH	Rudolph S.	1
Zo4	Aux. conn.		1261-6R	Molex	1
	Contact female		1169-FL	"	2
	Knob			SIFAM	2
	Knob			"	2
	Knob			"	2

DIAGRAM NO.	DESCRIPTION	SPECIFICATION	MFG. NO.	MFG	QTY
Do1, o2, o3, o4, o6, o7, o8, o9, 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
Do5	" zener	ZPD6V8		"	1
D35	" "	BZV 40 C18		Siemens	1
D21, 31	" germani.	AA143		ITT	2
D10, 11	" LED	CQY54 (XR209R)		Philips	2
Qo1	Trans. silicon	3N206		Texas	1
Qo2	" "	BF414		Telefunk.	1
Qo3, o4, o5, o8, 11, 14, 15, 17, 25, 27, 28, 30, 40, 41	" "	BC237B		Siemens	14
Q12, 16, 23, 24, 26, 31	" "	BC327-25		"	6
Qo6, o7	" "	PN2369 (3N2369A)		National S.	2
Q10, 13	" "	BC337		Siemens	2
Q34	" "	BF173		Telefunk.	1
Q35	" "	MPF132 (MEN632, 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	"	S1873		Siemens	1
IC07, 08	"	DM7406N		National S.	2
IC10	"	DM74LS26N		"	1
IC11	"	MM1 6309-1J	Code "A"	MMI	1
IC12	"	" " "	" "B"	"	1
IC13	"	CA555PC		Fairchild	1
IC18	"	CD4007UBE		RCA	1
IC19	"	S89		Siemens	1
IC20	"	NV30 (MHW603, MHW613A)		TRW	1

DIAGRAM NO.	DESCRIPTION	SPECIFICATION	MFG. NO.	MFG.	QTY
RM01	Balanced mixer	SBL-1		Mini circ.	1
FL01	Crystal filter	21,4 MHz	024BF(NDK21A15DB)	IIT	1
FL02	Ceramic filter	455 kHz (RP577872)	CFU 455D	Murata	1
Y01	Crystal	20,945 MHz	Al80DFF	Croven	1
Y02	"	6,4 MHz	Al87DDf	"	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	WECO	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	" tantalium	1 uf $\pm 20\%$ 35V	TAG 1ROM35 ST	ITT	1
C123	"	6,8uf " 16V	" 6R8M16 ST	"	1
C112	"	100uf " 10V	" 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		Texas	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	INTELL	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

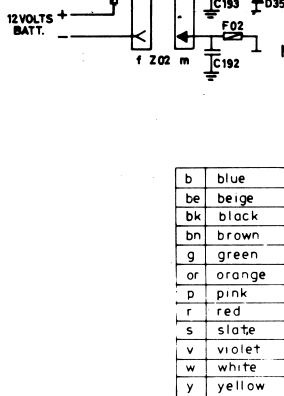
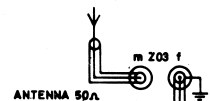
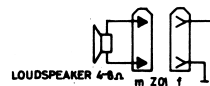
Version 1A

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
Qo?	"	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

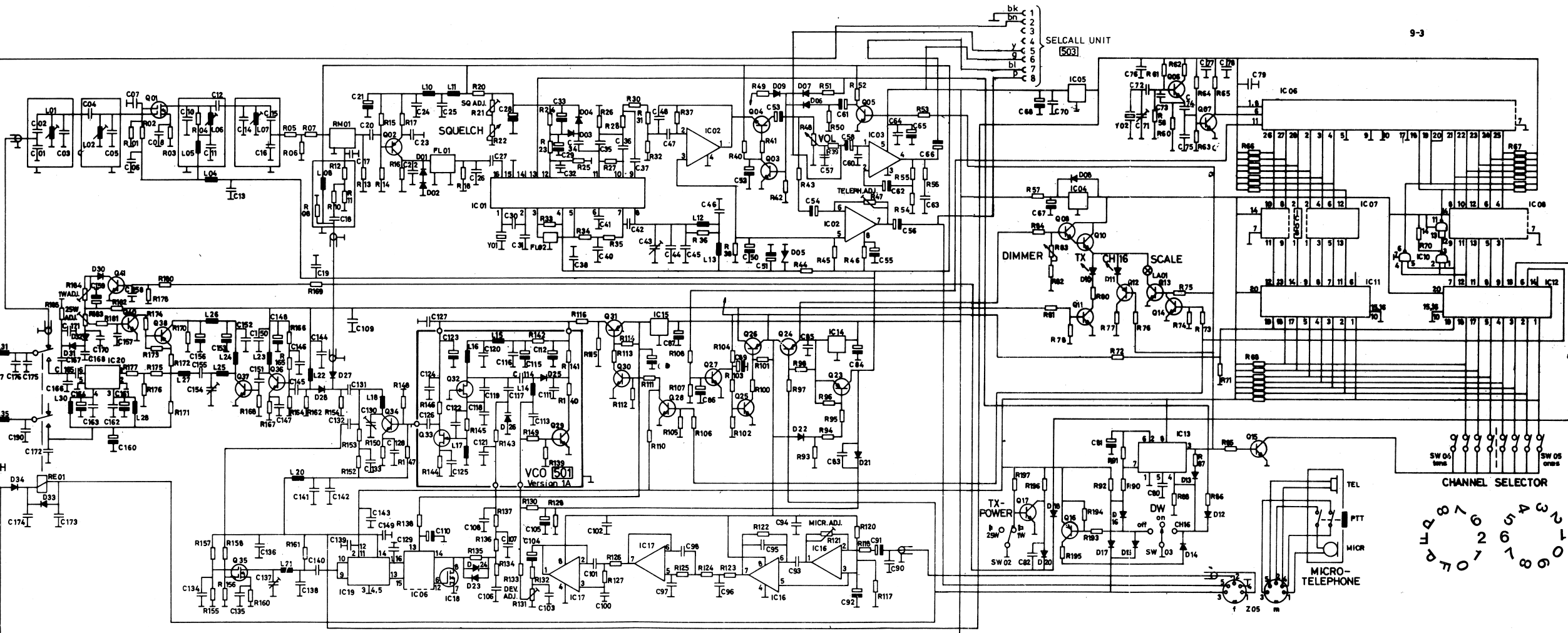
4-11-83 4-68

DIAGRAM NO.	DESCRIPTION	SPECIFICATION	MFG. NO.	MFG.	QTY
Co9	Cap. ceramic	4,7nf $\pm 10\%$	2222 63o 03472	Philips	1
Co4	" polystyr.	47opf $\pm 1\%$	" 426 447o1	"	1
Co3	" "	24 nf " 63V	" 424 424o3	"	1
Co3a	" "	1,5 " " "	" " 415o2	"	1
C23	" polyester	1o nf $\pm 5\%$ 4ooV	B3256o-D61o3-Jooo	Siemens	1
Co1, o2, o5, o6, 18	" "	o,1uf " 1ooV	" D11o4	"	5
C22	" "	o,22uf " "	" D1224	"	1
C12, 15	" tantalium	o,22uf $\pm 20\%$ 35V	TAG OR22M35 S1	ITT	2
C13, 14	" "	o,47 " " "	" OR47M35 SP	"	2
C2o	" "	1,0 " " "	" 1ROM35 SF	"	1
Co7, o8, 1o, 11, 16,	" "	4,7 " " 16V	" 4R7M1o SP	"	6
17	" "	22 " " 1oV	" 22M1o SP	"	1
C19	" "	1oouf $\pm 5o-1o\%$ 16V	EK1oo/16 GPF	Frako	1
C21	" ellyt				

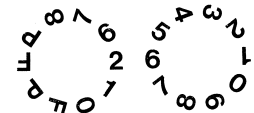
DIAGRAM NO.	DESCRIPTION	SPECIFICATION	MFG. TYPE NO.	MFG.	QTY
R38	Resistor carbon	6,8 ohm $\pm 5\%$ 0,33W	SB3 0207	Beyschlag	1
R32	"	22 " " "	"	"	1
R39, 40	"	470 " " "	"	"	2
R14	"	1 kohm " " "	"	"	1
R03 (factory selected)	"	(1,5 ") " "	"	"	1
R05, 35	"	2,2 " " "	"	"	2
R25	"	4,7 " " "	"	"	1
R10	"	5,6 "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



MAIN SWITCH
off on
SW 01 part of R46



b	blue
be	beige
bk	black
bn	brown
g	green
or	orange
p	pink
r	red
s	slate
v	violet
w	white
y	yellow



MICRO-TELEPHONE

TEL

PTT

DW

TX-POWER

SCALE

TX

DIMMER

SELCALL UNIT

IC05

IC06

IC07

IC08

IC09

IC10

IC11

IC12

IC13

IC14

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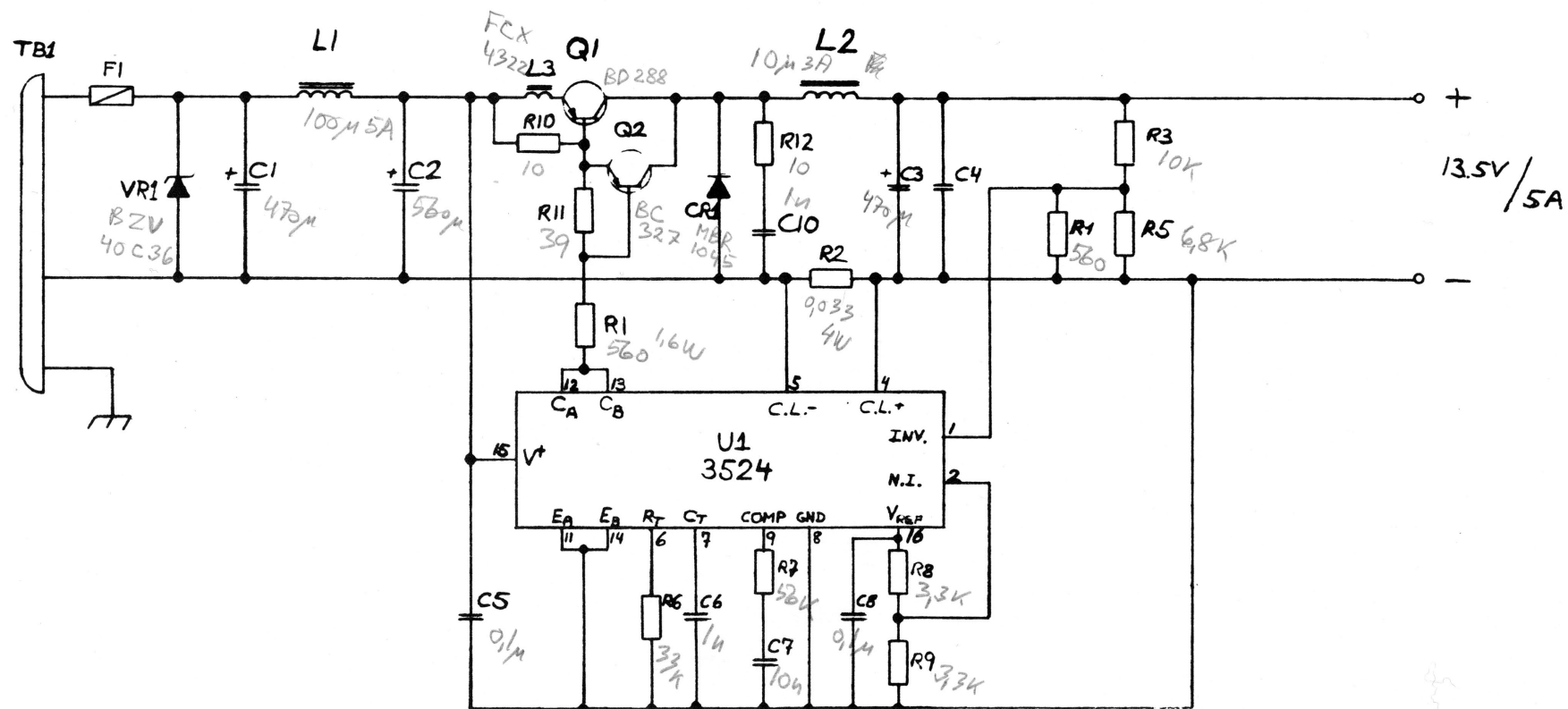
IC300

IC301

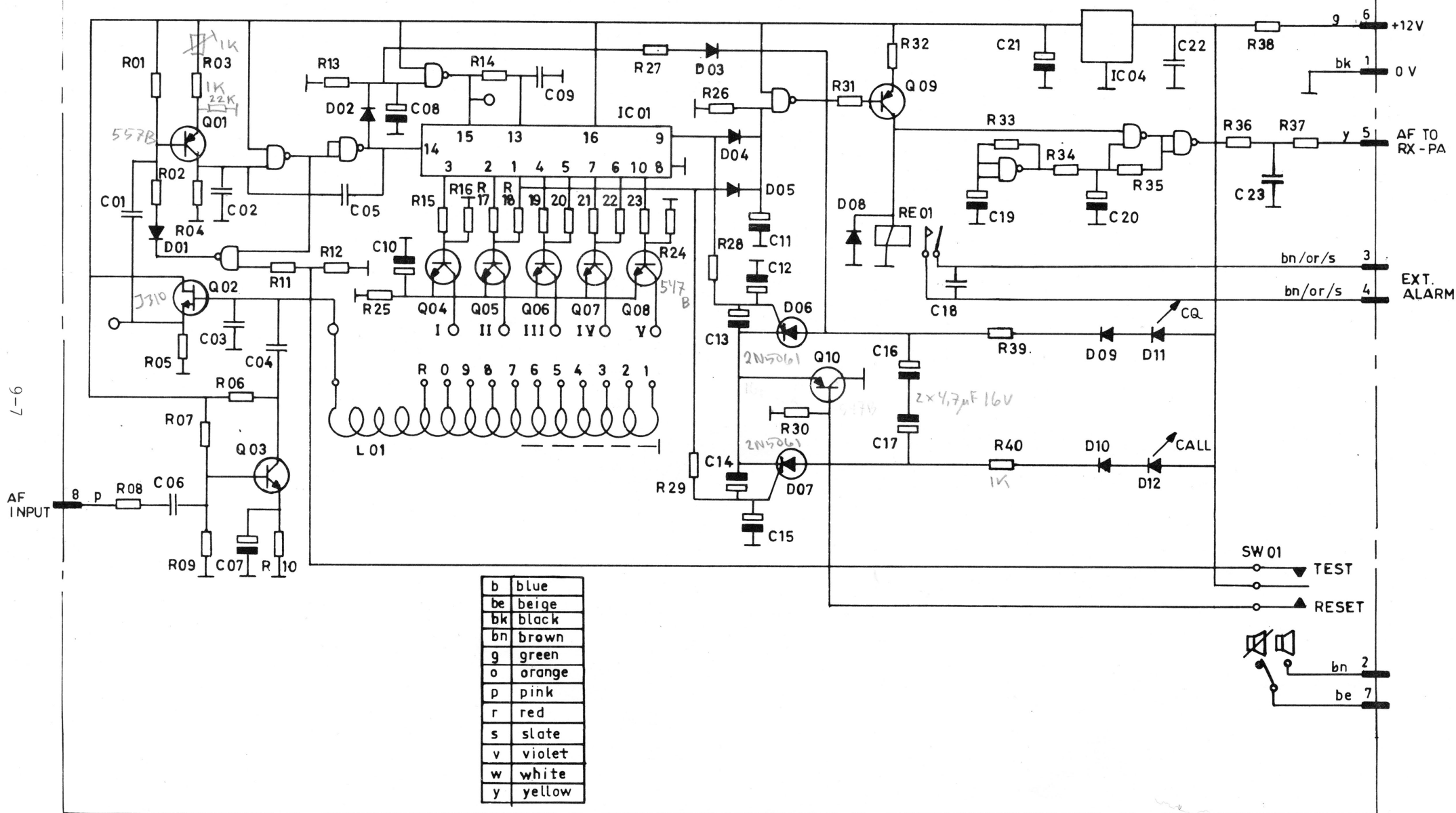
IC302

IC303

IC304

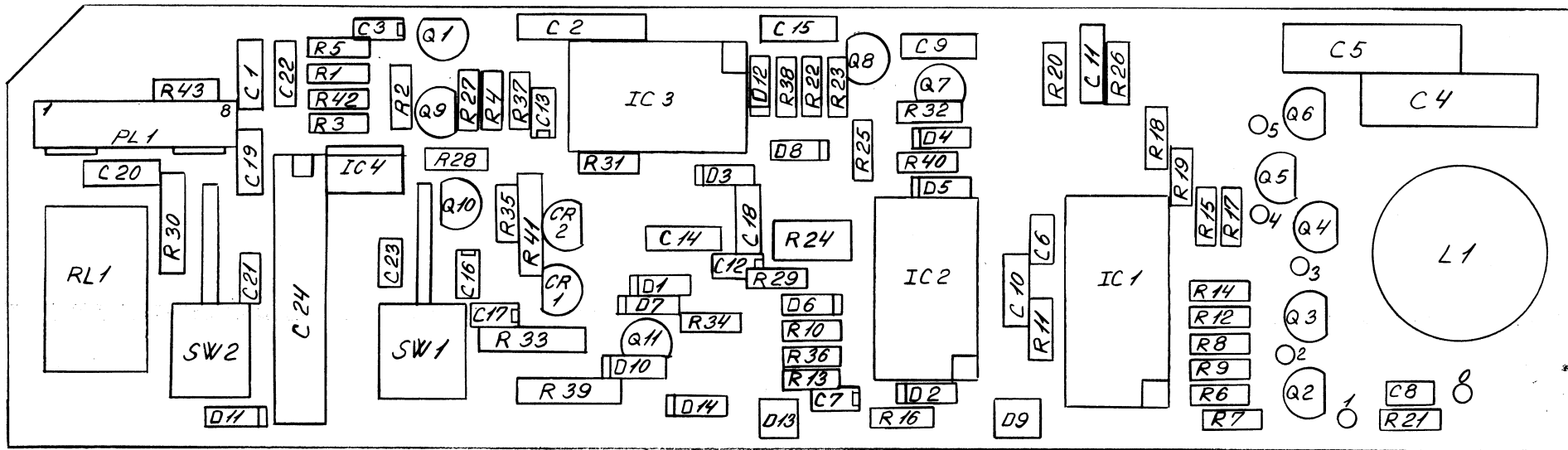


24V TO 12V CONVERTER UNIT **502** VERSION 2A
(OPTIONAL)

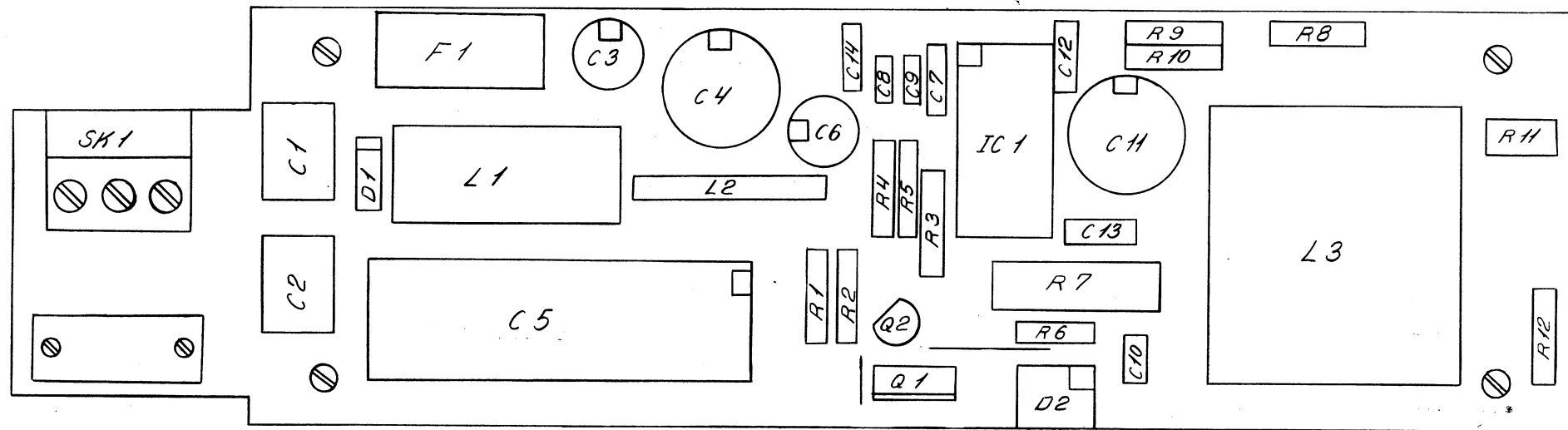


SELCALL **503**
(OPTIONAL)

VERSION 1A



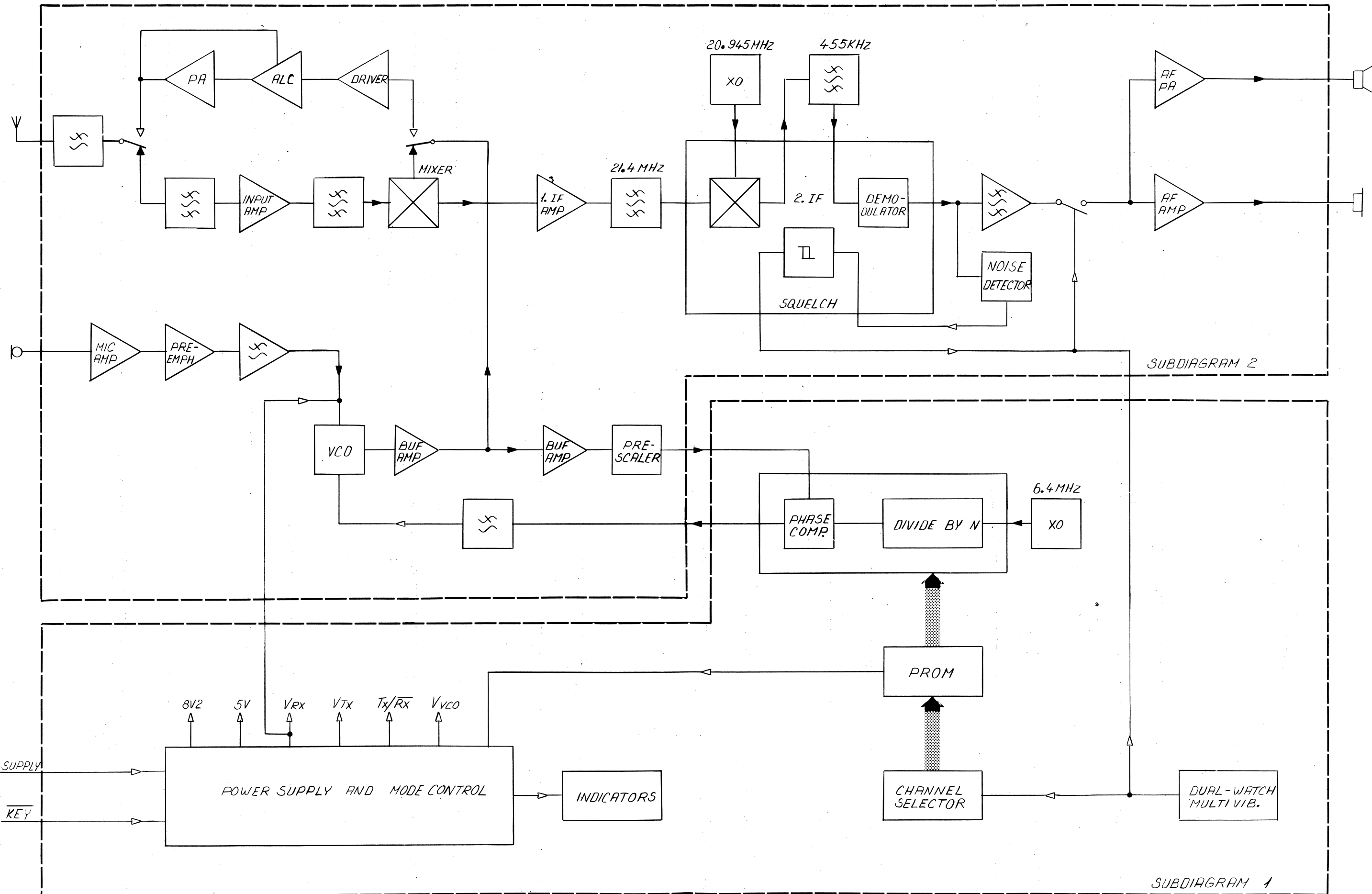
PCB ASSEMBLY DRAWING
 503 VERSION 4A
 SELCALL UNIT

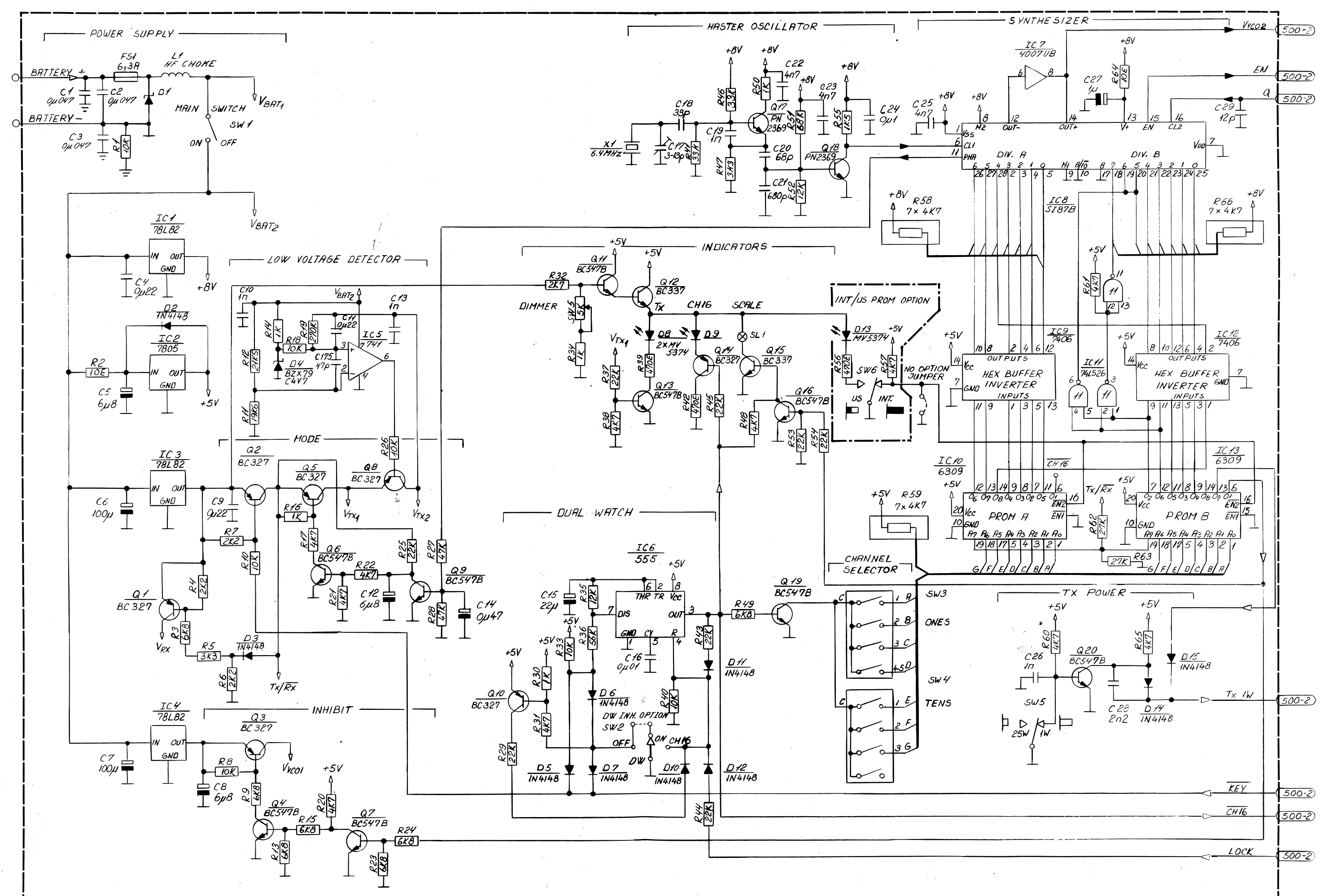


PCB ASSEMBLY DRAWING

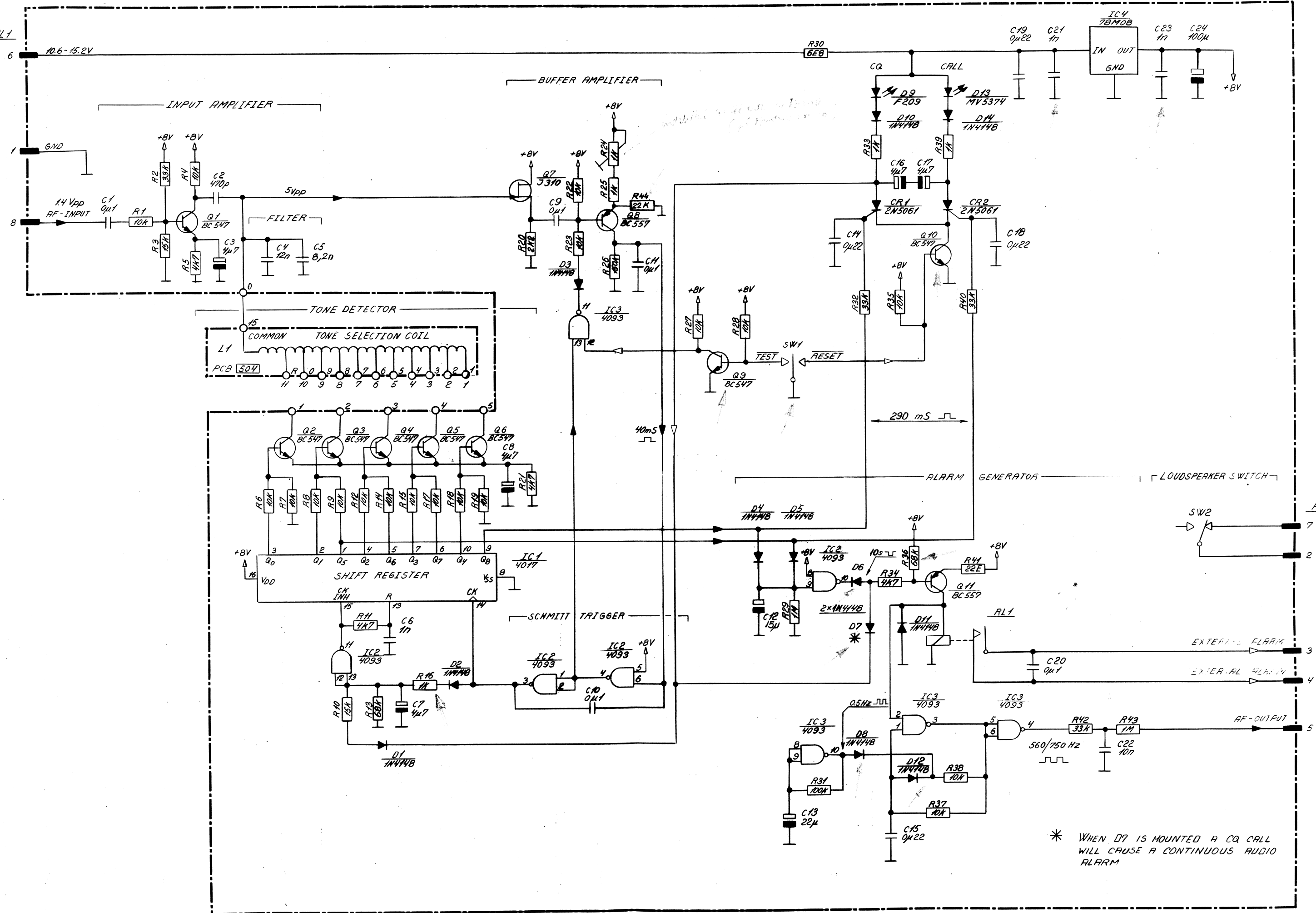
508 VERSION 2A

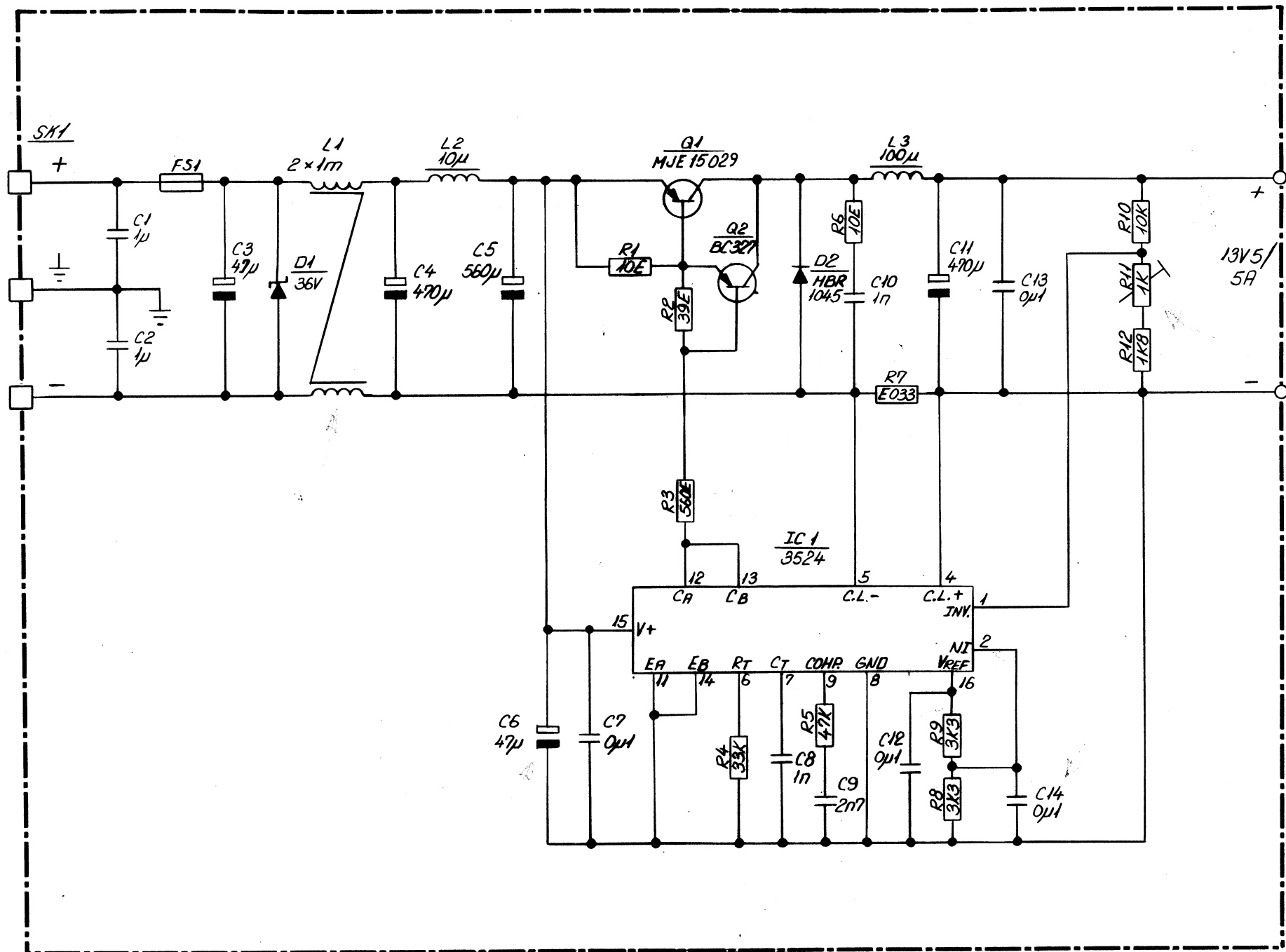
24V TO 12V CONVERTER UNIT





PL1





24V TO 12V CONVERTER UNIT

508 VERSION 2A

PARTS LIST FOR 500 VERSION 5A

Printed Circuit Board Complete 500			107 550 01
IC1,3,4	78L82		850 788 20
IC2	7805		850 780 50
IC5	741		850 074 10
IC6	555		850 055 50
IC7	4007UB		850 400 70
IC8	S187B		850 018 70
IC9,12	7406		850 740 60
IC10	6309	PROM-A	383 505 93
IC11	74LS26		850 742 61
IC13	6309	PROM-B	383 506 03
IC14	S-AV6		850 003 00
IC15 — MIXER	HPF505		850 000 11
IC16	MC3357		850 335 70
IC17-19	1458		850 145 80
IC20	TDA2002		850 200 20
IC21	S89		850 008 90
Q1-3,5,8,10,14	BC327		840 032 70
Q4,6,7,9,11,13,16, 19,20,22,23,29,31, 32	BC547B		840 054 70
Q12,15	BC337		840 033 70
Q17,18	PN2369A		840 236 90
Q21,30	3N204	Q21-30 206	843 020 40
Q24	BD234		842 023 40
Q25	2N4427		841 442 70
Q26	BF173		840 017 30
Q27	BFY90		840 009 00
Q28	BF414		840 041 40
D1	BZV40C18		832 401 80
D2,3,5-7,10-12,14 15,17-19,23-26, 29-33	1N4148		830 414 80
D4	BZV79C4V7		832 794 70
D8,9	MV5374		823 000 04
D16,27	AA143		830 014 30
D20	1N4002		831 400 20
D21,22	BA243		830 024 30
D28	BZX79C6V8		832 796 80
X1	6,4 MHz		383 501 31
X2	21,4 MHz		383 502 81
X3	20,945MHz		383 501 21
X4	455 KHz		810 045 51

PARTS LIST FOR 500 VERSION 5A

RL1	12V		RELAY		730 000 30
R1,8,10,26,33, 40,70,103,104, 131,153,154,158	10 kohm		Pot.		503 410 01
R2	10 ohm 5%	3W	vw		526 110 00
R3,9,13,15,23,24, 49,122	6.8 kohm 5%	1/4W	Car.		501 368 00
R4,6,7,161	2.2 kohm 5%	1/4W	Car.		501 322 00
R5,47	3.3 kohm 5%	1/4W	Car.		501 333 00
R11	19.6kohm 1%		MF		511 419 60
R12	21.5kohm 1%		MF		511 421 50
R14,16,30,34, 68,124,144	1 kohm 5%	1/4W	Car.		501 310 00
R17,20-22,31,38,48, 60,61,65,87,91,99, 100,143,155	4.7 kohm 5%	1/4W	Car.		501 347 00
R18	10 kohm 5%	1/8W	Car.		500 410 00
R19,138	270 kohm 5%	1/4W	Car.		501 527 00
R25,29,37,43-45, 53,54,165	22 kohm 5%	1/4W	Car.		501 422 00
R27,28,129	47 kohm 5%	1/4W	Car.		501 447 00
R32	2.7 kohm 5%	1/4W	Car.		501 327 00
R35,52	12 kohm 5%	1/4W	Car.		501 412 00
R36,134,136, 141,160	56 kohm 5%	1/4W	Car.		501 456 00
R39,42,142	470 ohm 5%	1/4W	Car.		501 247 00
R41,46,156	33 kohm 5%	1/4W	Car.		501 433 00
R50	1 kohm 5%	1/8W	Car.		500 310 00
R51	68 kohm 5%	1/8W	Car.		500 468 00
R55,102,119,120, 127	1.5 kohm 5%	1/4W	Car.		501 315 00
R58,59,66	4.7 kohm		SIL.		530 000 01
R62,63,76,77	27 kohm 5%	1/4W	Car.		501 427 00
R64,100	10 ohm 5%	1/4W	Car.		501 110 00
R67,151,168	5.6 kohm 5%	1/4W	Car.		501 356 00

PARTS LIST FOR 500 VERSION 5A

R69,132,135,140, 145-147,157	82 kohm	5%	1/4W	Car.	501 482 00
R71,116,117,133, 148,150,163	100 kohm	5%	1/4W	Car.	501 510 00
R72	1 kohm			Pot.	582 310 00
R73	10 kohm			Pot.	582 410 00
R74,78,95,171	220 ohm	5%	1/4W	Car.	501 222 00
R79,80,121	10 kohm	5%	1/4W	Car.	501 410 00
R81	33 ohm	5%	1/2W	Car.	502 133 00
R83	10 ohm	5%	1/8W	Car.	500 110 01
R85	39 ohm	5%	1/4W	Car.	501 139 03
R86	8.2 ohm	5%	1/4W	Car.	501 082 00
R88,92,105	150 ohm	5%	1/4W	Car.	501 215 00
R89,94,97	15 ohm	5%	1/4W	Car.	501 115 00
R90,125	22 ohm	5%	1/4W	Car.	501 122 00
R96,109,167	100 ohm	5%	1/4W	Car.	501 210 00
R98	68 ohm	5%	1/4W	Car.	501 168 00
R101	56 ohm	5%	1/4W	Car.	501 156 00
R106	820 ohm	5%	1/4W	Car.	501 282 00
R107	390 ohm	5%	1/4W	Car.	501 239 00
R108	560 ohm	5%	1/8W	Car.	500 256 00
R111	330 ohm	5%	1/8W	Car.	500 233 00
R112	15 kohm	5%	1/4W	Car.	501 415 00
R113	1.2 kohm	5%	1/8W	Car.	500 312 00
R115	5 kohm			Pot.	353 500 51
R118,126	220 kohm	5%	1/8W	Car.	500 522 00
R123	47 kohm			Pot.	582 447 00
R128	560 ohm	5%	1/4W	Car.	501 256 00
R130	470 ohm	5%	1/8W	Car.	500 247 00
R137	150 kohm	5%	1/4W	Car.	501 515 00
R139	390 ohm	5%	1/4W	Car.	501 239 00
R149	6.8 kohm	5%	1/8W	Car.	500 368 00
R152,162	47 ohm	5%	1/4W	Car.	501 147 00
R159	820 kohm	5%	1/4W	Car.	501 582 00
R164	470 kohm			Pot.	582 547 00
R166	220 kohm			Pot.	582 522 00
R169	270 ohm	5%	1/4W	Car.	501 227 00
R170	75 kohm	5%	1/4W	Car.	501 475 00
R172	2.2 ohm	5%	1/4W	Car.	501 022 00
R173	1 ohm	5%	1/4W	Car.	501 010 00
C1-3	0.047uF	10%	63V	Polyes.	622 447 00
C4,9,11,35	0.22uF	10%	100V	Polyes.	623 522 01
C5,8,85,100,12	6.8uF	+50-20%	16V	Tan.	651 668 00
C6,7,72,163	100uF	+50-10%	16V	W.alum.	651 810 02

PARTS LIST FOR 500 VERSION 5A

C10,13,26,45,56,71, 75,91,94,98,99,102, 104,108,113,118,121, 140,158,159,161,172	1 nF	1%	250V	Cer.	603 310 01
C14,114,139	0.47uF	+50-20%	35V	Tan.	652 547 00
C15,157	22uF	+50-20%	16V	Tan.	651 722 01
C16,123,134,141, 142	0.01uF	10%	400V	Polyes.	625 410 01
C17,89,131,146	3.5-13pF			Var.	683 113 00
C18,155	33pF	2%	63V	Cer.	603 133 02
C19	1 nF	1%	250V	Polyst.	614 310 00
C20	68pF	2%	63V	Cer.	603 168 00
C21	680pF	1%	250V	Polyst.	614 268 00
C22,23,25,40,41,57, 63,64,67,74,78,86, 95,101,103,106,112, 122,144,151,164, 165,166,168	4.7nF	10%	63V	Cer.	602 347 03
C27,38,97,147,150 163,167	1 uF	+50-20%	35V	Tan.	652 610 01
C28,33,62,120,124	2.2nF	10%	63V	Cer.	603 322 01
C29,30,69,80,105, 149	12pF	2%	63V	Cer.	603 112 00
C31,81,175	47pF	2%	63V	Cer.	603 147 00
C32,76,87	5.6pF	0.25p	63V	Cer.	603 056 01
C34,42	1.5pF	0.25p	63V	Cer.	603 015 00
C36	10pF	2%	63V	Cer.	602 110 00
C37	1 nF	+80-20%	400V	DISK	605 310 00
C39	10pF	5%	400V	Cer.	605 110 00
C43	3.9pF	0.25p	100V	Cer.	603 039 01
C44,70	10 nF	+50-20%	100V	Cer.	603 410 01
C46,55	6.8pF	0.25p	63V	Cer.	603 068 00
C47,54,107	8.2pF	0.25p	63V	Cer.	603 082 00
C48,49,51-53,79	15pF	2%	63V	Cer.	603 115 00
C50	18pF	2%	63V	Cer.	603 118 01
C58,68	10uF	+50-10%	25V	W.alum.	652 710 00
C59,66,82,83,90,93	220pF	10%	100V	Cer.	603 222 00
C61,152	2.2uF	10%	100V	Polyes.	623 622 01
C73	1 pF	0.25p	63V	Cer.	603 010 00

PARTS LIST FOR 500 VERSION 5A

C84,116,119, 125,126,130,137, 156,171,173,24	0.1uF	10%	100V	Polyes.	623 510 02
C88,92,96,129	10pF	2%	63V	Cer.	602 110 02
C109	27pF	2%	63V	Cer.	603 127 00
C110	56pF	2%	63V	Cer.	603 156 00
C111	4.7uF	+50-20%	16V	Tan.	651 647 00
C115,145,153	0.1uF	+50-20%	35V	Tan.	652 510 00
C117,135,143	10uF	+50-20%	16V	Tan.	651 710 00
C127,136	180pF	2%	100V	Cer.	603 218 00
C128,154	1,8nF	10%	100V	Polyes.	623 318 00
C132	100pF	2%	63V	Cer.	603 210 00
C133	5.6nF	10%	100V	Polyes.	623 356 00
C138	1,5nF	10%	100V	Polyes.	623 315 00
C148	0.033uF	10%	250V	Polyes.	624 433 00
C160	4.7nF	10%	63V	Cer.	602 347 01
C169,174	470uF	+50-10%	16V	W.alum.	651 847 02
C170	1000uF	+50-10%	16V	W.alum.	651 910 02
L1,4,9,11					740 000 01
L2,3,12,14					103 501 61
L5,8					103 501 41
L6,7					103 501 51
L10,13,16,25	1uH				740 010 01
L17,19,21	0.1uH				740 001 00
L18,23	0.22uH				740 002 20
L20,28	0.15uH				740 001 50
L22	47uH				740 147 03
L24	10uH				740 110 01
L26	1mH				740 310 03
L27	22uH				740 122 03
SL1	60mA		5V	LAMP	821 000 10
SW1	SWITCH - Pot.				353 500 41
SW2	3 WAY SWITCH				373 500 61
SW3,4	SWITCH - EXCESS 3 GRAY				373 500 72
SW5	PUSH/PULL SWITCH				353 500 32
SK3	5 POL.FEMALE				751 000 84
VC01	PCB 501				107 550 11

PARTS LIST FOR 501 VERSION 2A

Printed Circuit Board Complete 501					107 550 11
Q3	BC547B				840 054 70
Q1,2	BF256				840 025 60
D1	BB109				833 010 90
D2	BA243				830 024 30
R5	22 ohm	5%	1/4W	Car.	501 122 00
R2,3	470 ohm	5%	1/4W	Car.	501 247 00
R1	1kohm	5%	1/4W	Car.	501 310 00
R9	2.7kohm	5%	1/4W	Car.	501 327 00
R4	4.7kohm	5%	1/4W	Car.	501 347 00
R6,8	22kohm	5%	1/4W	Car.	501 422 00
R7	27kohm	5%	1/4W	Car.	501 427 00
C7	4.7pF	0.25p	63V	Cer.	602 047 00
C11	5.6pF	0.25p	63V	Cer.	602 056 00
C8	10pF	2%	63V	Cer.	602 110 04
C9	15pF	2%	63V	Cer.	602 115 01
C2,3,5,14	220pF	10%	63V	Cer.	603 222 00
C6	1nF	10%	63V	Cer.	603 310 02
C1,10,12,15	4.7nF	10%	63V	Cer.	602 347 02
C13	1uF	+50-20%	35V	Tan.	652 610 01
C4	6.8uF	+50-20%	16V	Tan.	652 668 00
C16	100uF	+50-20%	10V	Tan.	651 810 01
L1					103 501 71
L4	0.68uH				740 006 81
L2,3	1uH				740 010 02

PARTS LIST FOR 503 VERSION 3A

Printed Curcuit Board Complete 503					107 550 31
IC1	4017B				850 401 70
IC2,3	4093B				850 409 30
IC4	78M08				850 780 80
Q1-6,9,10	BC547B				840 054 70
Q7	J310				840 031 03
Q8,11	BC557B				840 055 70
D1-6,8,10-12,7	1N4148				830 414 80
D9	F209	LED RED			823 000 00
D13	MV5374	LED YELLOW			823 000 04
RL1	MZ 6HG	RELAY			780 000 28
R1,4,6-9,12,14,15, 17,-19,22,23,27,28, 34,35,37,38	10kohm	5%	1/5W	Car.	500 410 00
R2,32,40,42	33kohm	5%	1/5W	Car.	500 433 00
R3,10	15kohm	5%	1/5W	Car.	500 415 00
R5,11,21	4.7kohm	5%	1/5W	Car.	500 347 00
R13,36	68kohm	5%	1/5W	Car.	500 468 00
R20	2.2kohm	5%	1/5W	Car.	500 322 00
R24	1kohm			Pot.	582 310 01
R26	150kohm	5%	1/5W	Car.	500 515 00
R29,43	1Mohm	5%	1/5W	Car.	500 610 00
R30	6.8 ohm	5%	1/3W	Car.	501 068 00
R31	100kohm	5%	1/5W	Car.	500 510 00
R33,39	1 kohm	5%	1/5W	Car.	500 310 00
R41	22 ohm	5%	1/3W	Car.	501 122 00
R44	22 kohm	5%	1/4W	Car.	500 422 00
C1,9,10,11,20	0.1uF	10%	63V	Polyes.	622 510 00
C2	470pF	1%	630W	Polyst.	616 247 00
C3,7,8,12,16,17	4.7uF	20%	16V	Tan.	651 647 00
C4	12nF	1%	63V	Polyst.	612 412 00
C5	8.2nF	1%	63V	Polyst.	612 382 00
C6,21,23	1nF	10%	100W	Cer.	603 310 01
C13	22uF	20%	16V	Tan.	651 722 01
C14,15,18,19	0.22uF	10%	63V	Polyes.	622 522 01
C22	10nF +50-20%		100V	Cer.	603 410 01
C24	100uF +50-10%		16V	W.alum.	651 810 00
CR1,2	2N5061				833 506 10
L1	PCB 504				103 501 81
SW1					762 000 22
SW2					762 000 21

PARTS LIST FOR 503 VERSION 3A

PL1

8 POL MOLEX

751 000 98

PARTS LIST FOR 508 VERSION 2A

Printed Curcuit Board Complete 508					107 550 81
IC1	3524				850 352 40
Q1	BD288				842 028 80
Q2	BC327				840 032 70
D1	BZV40C36				832 403 60
D2	MBR1045				830 104 50
R1,6	10 ohm	5%	1/3W	Car.	501 110 00
R2	39 ohm	5%	1/3W	Car.	501 139 00
R3	560ohm		1.6W	ww	514 256 00
R4	33kohm	5%	1/3W	Car.	501 433 00
R5	47kohm	5%	1/3W	Car.	501 447 00
R7	0.033ohm		4W	ww	526 003 30
R8,9	3.3kohm	5%	1/3W	Car.	501 333 00
R10	10kohm	5%	1/3W	Car.	501 410 00
R11	1kohm			Pot.	582 310 01
R12	1.8kohm	5%	1/3W	Car.	501 318 00
C1,2	1 uF	10%	100V	Polyes.	623 610 01
C3,6	47uF		25V	W.alum.	652 747 01
C4,11	470uF		40V	W.alum.	652 847 01
C5	560uF		40V	W.alum.	652 856 00
C7,12-14	0.1uF	20%	63V	Polyes.	622 510 01
C8	1nF		63V	Polyes.	602 310 01
C9	2.7nF		63V	Polyes	602 327 00
L1					103 512 62
L2	10uH				740 110 02
L3	100uH				740 210 04
FS1	5A				720 350 02
SK1	3POL.				770 000 33