



**TECHNICAL MANUAL
TRP 8400 D SERIES ***

**** NOTE. The technical manual for the TRP 8400 series is based on the TRP 8250 D series manual, with all deviations described in the rear AMENDMENTS .***

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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 in the Amendments chapter of this Manual.

TRP 8000 Type Review

Facility or feature		Type number ¹⁾²⁾											
		TRP 8X50	TRP 8X51	TRP 8X52	TRP 8X53	TRP 8X54	TRP 8X55	TRP 8X56	TRP 8X57	TRP 8X58			
Simplex/Duplex ³⁾		S/D	S/D	S/D	S/D	S/D	S/D	S/D	S/D	S/D			
Output power	WATT PEP	²⁵⁰ / ₇₅₀	²⁵⁰ / ₇₅₀	²⁵⁰ / ₇₅₀	²⁵⁰ / ₇₅₀	²⁵⁰ / ₇₅₀	²⁵⁰ / ₇₅₀	250	²⁵⁰ / ₇₅₀	250			
	Reduced power	From 150 W to 150 W between 1.6 - 4 MHz	○	○	○	○	○	○	○	○	●		
		From 750 W to 400 W between 1.6 - 4 MHz	●	●	●	●	○	○		●			
		Overall reduction	○	○	○	○	○	○	○	○	○		
Frequency range	Receiver: 10 kHz - 30 MHz		●	●	●	●	●	●	●	●			
	Transmitter 1.2-30 MHz	Marine bands, channels or transmission frequencies ⁴⁾	●										
		Marine bands, free frequency ⁵⁾		●	●								
		Free frequency				●	●	●	●	●	●		
500 kHz facility				○					○ ⁶⁾				
Modes	SSB	USB, J3E & R3E		●	●	●	●	●	●	● ⁷⁾	●	●	
		LSB, J3E	Reception		●	●	●	●	●	●	●	●	●
			Transmission		○	○	○	○	●	●	●	○	●
			LSB-key disabled		○	○	○	○	○	○	○	○	○
			Transmission disabled		●	●	●	●	○	○	○	●	○
	AM	H3E	Reception		●	●	●	●	●	●	●	●	●
			Transmission	Full range	○	○	○	○	●	●	●	○	●
				2182 kHz only	●	●	●	●	○	○	○	●	○
	Disabled except 2182 kHz trans.		●	●	●	●	○	○	○	●	○		
	Telex/MCW	CW	A1A				●			●		●	
H2A					●			●		●			
F1B (incl. telex filters).			○	○	●	○	○	●	○	●	○		
Alarm 2182 kHz	Two-tone alarm generator		●	●	●	●				●	●		
	Alarmtest into dummy load ⁸⁾		○	○	○	○				○			
Scanning	Enabled		●	●	●	●	●	●	●	●	●		
	Disabled		○	○	○	○	○	○	○	○	○		

Legend:

- : Standard facility/feature
- : Optional facility/feature

Facility or feature		Type number ¹⁾ 2)								
		TRP 8X50	TRP 8X51	TRP 8X52	TRP 8X53	TRP 8X54	TRP 8X55	TRP 8X56	TRP 8X57	TRP 8X58
Memory	76 user-programmable frequency pairs	● ³⁾	●	●	●	●	●	●	●	●
	1017 pre-program. freq. pairs ⁴⁾ (incl. ITU chan. in marine vers.)	●	○	○	○	○	○	○	○	○
	ITU channels, pre-programmed	●	●	●	●				●	●
	Pre-programmed reception frequencies	○	○	○	○	○	○	○	○	○
Receiver gain control	Autom. Gain cont. (AGC)	On/off	●	●	●	●	●	●	●	
		Slow/fast			●			●		●
	RF amplifier (RF AMP)	●	●	●	●	●	●		●	
	Antenna attenuator (ANT ATT)	●	●	●	●	●	●		●	
Frequency stability	1.5 PPM	●	●	●	●	●	●	●	●	
	0.8 PPM	○	○	○	○	○	○	○	○	●
	0.4 PPM	○	○	○	○	○	○	○	○	○
Telex facilities	1500-2000 Hz telex offset ⁴⁾ (1700 Hz is standard)	○	○	○	○	○	○	○	○	○
	Display of carrier frequency (assigned freq. is standard)	○	○	○	○	○	○	○	○	○
	Unattended telex (AUTO-TELEX) ¹⁰⁾	○	○	○	○	○	○	○	○	○
	MARITEX ¹⁰⁾	○	○	○	○	○	○	○	○	○
Antenna Tuning unit (ATU)	ATU with built-in ant. switch ¹¹⁾ (built-in PCB 641).	○	○	○	○	○	○	○	○	○
	Antenna disconnected in tx-off ⁶⁾	○	○	○	○	○	○	○	○	
Morse Facilities	Selectable band widths			●			●		●	
	BFO			●			●		●	
Real time clock		●	●	●	●	●	●	●	●	●
Squelch		○	○	○	○	○	○	○	○	●
Line transformer		○	○	○	○	○	○	○	○	○
Automatic keying device (AKD) ¹²⁾ ¹³⁾				○					○ ⁶⁾	
REMOTE CONTROL ¹⁰⁾ ¹³⁾ ¹⁴⁾		○	○	○ ¹³⁾	○	○	○	○	○ ¹³⁾	○
Frequency displays disabled		○	○	○	○	○	○	○	○	○
Power Supply	12/24/32 volt or 24/32 volt battery ¹⁵⁾	●	●	●	●	●	●	●	●	●
	110/120/220/240 volt AC power supply ¹⁶⁾	○	○	○	○	○	○	○	○	○
	3x380/3x220/3x440 volt AC power supply ⁶⁾ ¹⁶⁾	○	○	○	○	○	○		○	

Legend:

- : Standard facility/feature
- : Optional facility/feature

2.1 BASIC VERSIONS

- In common : 250 Watt P.E.P. Power Amplifier.
Simplex/Semi-duplex operation 1.6-30 MHz.
- TRP 8250 S : Marine SSB Radiotelephone.
1017 preprogrammable frequencies in Marine Bands.
- TRP 8251 S : Marine SSB Radiotelephone.
Free frequency selection Marine Bands.
- TRP 8252 S : Marine SSB Radiotelephone.
Free frequency selection Marine Bands.
CW and MCW facilities.
- TRP 8253 S : Marine SSB Radiotelephone.
Free frequency selection all bands.
- TRP 8254 S : General Purpose SSB Radiotelephone.
Free frequency selection all bands.
- TRP 8255 S : General Purpose SSB Radiotelephone.
Free frequency selection all bands.
CW and MCW facilities.
- TRP 8256 S : General Purpose SSB Radiotelephone.
Free frequency selection all bands.
As type TRP 8254 S, but simplified keyboard.
- TRP 8257 S : Marine SSB Radiotelephone.
Free frequency selection all bands.
CW and MCW facilities.
- TRP 8258 S : Marine SSB Radiotelephone.
Free frequency selection all bands.
Automatic reduction of power below
4 MHz FCC version.

3. TECHNICAL DATA

Versions complying with the SOLAS 74 convention and the ITU Radio Regulations are available, meeting one or more of the specifications: CEPT, MPT, FCC, DOC and FTZ.

3.1 GENERAL

Frequency Generation: True digital frequency synthesis.

Frequency Selection: By common keyboard.
Single key selection of 2182 kHz
(TRP 8250 S/8251 S/8252 S/8253 S).
76 user-programmable frequency pairs.
Scanning facilities (may be disabled).
Remote control (optional).

Frequency Presentation: Separate LED displays for receive and transmit frequencies.

Frequency Stability: 1.5 ppm
0.8 ppm (optional)
0.4 ppm (optional)

Operating modes: Semiduplex and simplex.

USB: J3E upper sideband, suppressed carrier.
R3E: Upper sideband, reduced carrier.
AM: H3E upper sideband, full carrier.
LSB: J3E lower sideband, suppressed carrier
(optional).
CW: A1A morse telegraphy (TRP 8252 S/8255 S).
MCW: H2A modulated morse telegraphy
(TRP 8252 S/8255 S).
TELEX: F1B with center audio frequency selectable
between 1500 and 2500 Hz in 100 Hz steps
(optional).

Operating Temperature
Range: -20 deg. C to +55 deg. C

Full Performance
Temperature Range: 0 deg. C to +40 deg. C

3.2 RECEIVER CHARACTERISTICS

Frequency Range: 100 kHz to 30 MHz
(10 kHz to 100 kHz with reduced performance)

Frequency resolution: 100 Hz by numerical frequency keyboard entry. A search/fine tuning facility is provided with selectable increment steps of 10 Hz, 100 Hz or 1 kHz. In addition a user-programmed step size may be selected.

Antenna Impedance: Below 4 MHz: 10 ohm in series with 250 pF or 50 ohm (std.) internally selectable.
4 MHz to 30 MHz: 50 ohm

Input Protection: 30 V RMS (EMF) for up to 15 min.

IF Selectivity: SSB: 350 Hz to 2.7 kHz

AM: +/- 2.7 kHz or
+/- 4 kHz (optional)

CW/MCW
(TRP 8252 S/8255 S):

Wide: +/- 2.7 kHz or
+/- 4 kHz (optional)

Inter: +/- 1.2 kHz or
+/- 2.7 kHz (optional)

Narrow: +/- 250 Hz or
+/- 500 Hz (optional)

Very
Narrow: +/- 150 Hz (optional)

TELEX
(optional):

+/- 150 Hz or
+/- 250 Hz or
+/- 400 Hz

Sensitivity: Max. antenna input (EMF) for 10 dB SINAD

SSB
High impedance antenna:
1.6 - 4 MHz: 1.2 uV
50 ohm antenna:
1.6 - 30 MHz: 0.8 uV

AM

High impedance antenna:
100 kHz - 400 kHz: 60 uV
400 kHz - 1.6 MHz: 20 uV
1.6 MHz - 4 MHz: 7 uV

50 ohm antenna:
100 kHz - 400 kHz: 7 uV
400 kHz - 30 MHz: 5 uV

CW (+/- 500 Hz)
High impedance antenna:
100 kHz - 400 kHz: 6.5 uV
400 kHz - 4 MHz: 2 uV

50 ohm antenna:
100 kHz - 30 MHz: 0.6 uV

When RF-AMP is selected, the sensitivity is increased by 5 dB.

Intermodulation: (out-of-band)	94 dBuV per signal more than 30 kHz offset from receiver frequency produces less than equivalent input signal of 30 dBuV. (50 ohm antenna).
Cross modulation:	Unwanted signal of 105 dBuV/30% - 400 Hz more than 20 kHz offset from receiver frequency, produces cross modulation less than -30 dB relative to a wanted signal of 60 dBuV/SSB (50 ohm antenna).
Blocking:	More than 80 dB to cause a 3 dB change in output power when wanted signal gives 20 dB SINAD, and the unwanted signal is offset by more than 20 kHz from the receiver frequency.
Image Rejection:	Greater than 80 dB
IF Rejection:	Greater than 80 dB
Spurious Response Rejection:	Greater than 80 dB below 4 MHz Greater than 70 dB above 4 MHz
Internally generated spurious signals:	Less than 5 dB SINAD (SSB)
Spurious Emission:	Less than 20 pW/50 ohm at antenna connector.

RF-Amplifier: 0 dB or 10 dB

RF-Attenuator: 0 dB or 20 dB

Automatic Gain Control: Static:
 Less than 5 dB change in output for 100 dB input
 signal variation from 20 dB sensitivity level (SSB).

Dynamic:
 70 dB signal change:
 SSB, CW, MCW, TELEX (fast only):
 Attack time: 150 us
 Debounce time: 10 ms
 Hold time: Fast: 100 ms
 Slow: 2.5 s
 Decay time: Fast: 400 ms
 Slow: 1.5 s

AM:
 Attack time: 150 ms
 Decay time: 300 ms

BFO (optional): +/- 3 kHz synthesized in 100 Hz steps

Line output: Internally adjustable up to +10 dBm/600 ohm.

In-band
 Intermodulation: Less than -50 dB

Audio Output Power: 5 W in 8 ohm to internal and/or external loudspeaker.

3.3 TRANSMITTER CHARACTERISTICS

Output Power: 250 W PEP +0/-1.4 dB from Transceiver Unit into 50
 ohms.
 Power Reduction:
 Medium: approx. 60 W PEP
 Low: approx. 10 W PEP
 Single-tone max. Power:
 250 W PEP for keying duty-cycle less than 55% and
 modulation rates greater than 3 baud.
 3 dB power reduction when continuously keyed during 1
 min. Automatic power recovery when muted during 2
 min.

Transmitter
Frequencies:

TRP 8250 S:
Up to 1017 programmable channels, freely distributed
in the ranges:
1606.5 to 4800 kHz
6200 to 8950 kHz
12230 to 17650 kHz
18780 to 27100 kHz

TRP 8251 S/8252 S:
Free frequency selection in 100 Hz steps in above
ranges.

TRP 8253 S/8254 S/8255 S:
Free or programmable frequency selection in the
range:
1606.5 kHz to 30 MHz.

Spurious Emissions:

TRP 8250 S/8251 S/8252 S:
Less than -43 dB/PEP

TRP 8253 S/8254 S/8255 S:
Less than -62 dB/PEP

Alarm Generator:

A two-tone alarm generator is incorporated
(TRP 8250 S/8251 S/8252 S).

Audio Input Level:

Telex: 0 dBm +10/-16 dB
Input impedance: 600 ohm
Aux: 0 dBm +10/-16 dB
Input impedance: 600 ohm
Mic: 20 mV to 2.5 V internally adjustable.
Input impedance: 100 kohm//6.8 nF.
Recommended source impedance: Less than
2.5 kohm.

3.4 ANTENNA TUNING UNIT

Frequency Range: 1.6 - 30 MHz
Antenna Requirements: 7 - 18 m wire and/or whip.
Antenna Tuning: Fully automatic
Tuning time: 0.2 - 1.5 sec

Input Impedance after
tuning: 50 ohm. SWR \leq 1.4

Manual setting possible for 2182 kHz

Power Handling
Capability: 250 W PEP
125 W Average

3.5 POWER REQUIREMENTS

Supply Voltage: 12-24-32 V DC (-10/+30%)
(no presetting)
Connection will not earth Supply Battery.
110/120/220/240 V AC (optional external Power Supply
Unit, type P 8250)

Power Consumption
(approx.):

Receive only:	50 W
J3E unmodulated:	100 W
H3E unmodulated:	360 W
H3E alarm:	420 W
CW keyed:	640 W
MCW keyed:	420 W
ARQ-telex:	330 W

3.6 DIMENSIONS AND WEIGHTS

Control Unit:

Width:	372 mm
Height:	87 mm
Depth:	203 mm
Weight:	4 kg, approx.

Transceiver Unit:

Width:	422 mm (500 mm incl mounting brackets).
Height:	368 mm
Depth:	280 mm
Weight:	26 kg, approx.

Antenna Tuning Unit:

Width:	330 mm
Height:	440 mm (535 mm incl antenna horn).
Depth:	130 mm
Weight:	5.7 kg, approx.

AC Power Supply
Unit (optional):

Width:	241 mm
Height:	367 mm (440 mm incl attachment rails).
Depth:	101 mm (121 mm incl attachment rails).
Weight:	17 kg, approx.

4.1.12.1 SECOND FUNCTION SYNTAX



- 1 Press "2".
The transmitter display is blanked and the decimal points start flashing. The receiver display shows "3" to identify a non-standard display and "2". If "2" was pressed by mistake "ENTER" will terminate second function mode.
- 2 Press a number.
The number is passed to the receiver display. This number identifies the second function page. If the number was pressed by mistake "ENTER" will terminate second function mode.
- 3 Press a number.
The number is passed to the receiver display. This number identifies the second function line. If the number was pressed by mistake "2" will restart the second function mode.
- 4 Press "ENTER".
If page and line numbers are not valid the receiver display starts flashing and the second function mode can be either restarted by pressing "2" or terminated by pressing "ENTER". If both page and line numbers are valid the respective second function is executed and if no further keys are required in the specific function the displays are restored to the state prior to second function execution.
- (5) Most second functions require additionally keys to be pressed. Typically "2" will restart second function mode and "ENTER" terminate it. Some second functions require confirmation via the "STO" key. This situation is indicated by a special warning display-flash shifting between "]]]]]]" and the entered number. Pressing "STO" will execute the function, "2" will restart the second function mode and any other key will terminate it.

Second functions requiring confirmation:

250: Clear RAM
251: Reset system
278: Clear "OPTION" register
280-287: Toggle "PRESET" register bit 0-7
298: Clear "GUARD" register

4.1.12.2 PAGE 0 (20#) Self test. For detailed information see self test description in chapter 8.

Executable lines:

- 200: Start automatic stepped self test.
- 201: Start manually stepped self test.
- 202: Start automatic stepped self test from an arbitrary test number.
- 203: Start manually stepped self test from an arbitrary test number.

4.1.12.3 PAGE 4 (24#)

Miscellaneous functions.

Executable lines:

- 241: Read accumulated on-time. The receiver display will show total operation time of the IRP 8250 S with 1 hour resolution. Pressing "2" or "ENTER" will restart or terminate second function.
- 242: Read and program receiver tune step. The receiver display shows the present programmable tune step. A new tune step may be entered via the numeric keys.
Tune steps between 100 Hz and 99 kHz are possible.
Pressing "ENTER" will terminate second function.
To use this additional tune step, OPTION bit 4 should be set to 1 (ref. second function 274).
In this case the "TUNE RATE" key will introduce a fourth state indicated by all tune rate annunciators switched off.
- 243: Read single frequency formats in configuration PROM. The reading address is initialized to PROM address 0. The receiver display shows the programmed frequency if the RX bit = 1. The transmitter display shows the programmed frequency if the TX bit = 1.
The mode annunciators show the programmed modulation(s). Pressing "DIMMER UP" will increase the reading address to the next higher located format if it is not the "LIMITER BYTE".
Pressing "DIMMER DOWN" will decrease the reading address to the next lower located format if the present reading address is higher than PROM address 0.
Keeping either "DIMMER" key pressed will advance the reading address automatically.
Pressing "2" or "ENTER" will restart or terminate second function.
For further PROM format information refer to section 4.10.
- 244: Control BFO frequency. The receiver display shows the present BFO frequency. The transmitter display shows the stored BFO frequency selected on power-up. Pressing "STO" will store the present frequency. Pressing "RCL" will recall the stored frequency. Pressing "2" or "ENTER" will restart or terminate second function.

245: Read special system parameters in configuration PROM. The receiver display shows the PROM address in decimal initialized to top of PROM = 4095. The transmitter display shows the PROM data in decimal. Pressing "RCL" will change the displayed data to hexadecimal, useful when reading BCD. Since the display decoder is not designed for letters the following symbols are displayed for hexadecimals greater than 9:

A : C
B : J
C : U
D : E
E : E
F : blank

Pressing "DIMMER DOWN" will show the next lower PROM address.
Pressing "DIMMER UP" will show the next higher PROM address.
Pressing "2" or "ENTER" will restart or terminate second function.

246: Read CU program release date and version. The receiver display shows release date (year/month/day). The transmitter display shows version number.
Pressing "2" or "ENTER" will restart or terminate second function.

247: Read TU program release date and version. The receiver display shows release date (year/month/day). The transmitter display shows version number.
Pressing "2" or "ENTER" will restart or terminate second function.

248: Adjust beeper sound level. A continuous control beeping is started. Pressing "VOLUME UP" will increase the sound level. Pressing "VOLUME DOWN" will decrease the sound level. Pressing "2" or "ENTER" will restart or terminate second function preserving the new beeper sound level.

249: Switch antenna OFF. The antenna and transmitter are switched OFF. The power annunciators are turned OFF to identify antenna OFF and transmitter display shows time of day to identify transmitter OFF. Finally second function is terminated. When "TX ON/OFF" is then pressed both antenna and transmitter are switched ON and power annunciators and transmitter display restored to normal.

4.1.12.4 PAGE 5 (25#) Miscellaneous functions. This page can not be entered when "GUARD" bit 7 is set (see second function page 9).

Executable lines:

250: Clear RAM. The function requires confirmation as described for the syntax key (5). All stored frequency pairs and modes, the "OPTION" register and "GUARD" register will be cleared (=0) and second function terminated.

251: Reset system. The function requires confirmation as described for the syntax key (5). 32 msec after releasing the "STO" key, both CU and TU processors are reset by running the power-up program.

4.1.12.5 PAGE 7 (27#)

Controls an 8-bit "OPTION" register.

Executable lines:

270: Toggle "OPTION" bit 0
271: - - - - 1
272: - - - - 2
273: - - - - 3
274: - - - - 4
275: - - - - 5
276: - - - - 6
277: - - - - 7
278: Clear "OPTION" register
279: Display "OPTION" register (bits 0-3 in transmitter display, bits 4-7 in receiver display).

All lines will display the resulting "OPTION" register. Pressing "2" or "ENTER" will restart or terminate second function.

"OPTION" bit functions:

BIT	LEVEL	FUNCTION
0	-	Reserved for future use
1	-	- - - -
2	-	- - - -
3	0	Normal
	1	Enable special squelched scanning in "phone mode"
4	0	Normal
	1	Enable programmable receiver tune rate
5	0	Normal
	1	Enable phone call interrupts in MARITEX mode
6	0	Normal
	1	Disable "ENTER" key during MARITEX mode
7	0	Normal
	1	No time-display "cursor"

4.1.12.6 PAGE 8 (28#) Controls an 8 bit "PRESET" register intended for use in installation only. Special system parameters which are difficult to specify before installation can be changed on location by toggling the respective bit in this non-volatile register. To protect the "PRESET" register against erroneous changes Page 8 can not be entered when "GUARD" bit 7 is set. Toggling any bit requires confirmation as described for the syntax key (5). Further more "PRESET" is excluded from the CLEAR RAM function (250).

Executable lines:

280: Toggle "PRESET" bit 0
281: - - - - 1
282: - - - - 2
283: - - - - 3
284: - - - - 4
285: - - - - 5
286: - - - - 6
287: - - - - 7
289: Display "PRESET" register (bits 0-3 in transmitter display, bit 4-7 in receiver display).

All lines will display the resulting "PRESET" register. Pressing "2" or "ENTER" will restart or terminate second function.

"PRESET" bit functions:

BIT	LEVEL	FUNCTION
0	-	Reserved for future use
1	-	- - - -
2	-	- - - -
3	-	- - - -
4	0	Normal
	1	Enable "Key inhibit"
5	0	Normal
	1	Disable power display (ampere only)
6	0	Normal
	1	Disable ampere display (power only)
7	0	Normal
	1	Complement external scan transitions

4.1.12.7 PAGE 9 (29#) Controls an 8-bit "GUARD" register. This page can not be entered when "GUARD" bit 7 is set (see following explanation).

Executable lines:

290: Toggle "GUARD" bit 0
291: - - - - 1
292: - - - - 2
293: - - - - 3
294: - - - - 4
295: - - - - 5
296: - - - - 6
297: - - - - 7
298: Clear "GUARD" register.
299: Display "GUARD" register (bits 0-3 in transmitter display, bit 4-7 in receiver display).

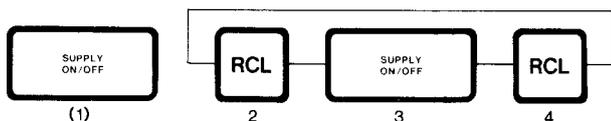
All lines will display the resulting "GUARD" register. Pressing "2" or "ENTER" will restart or terminate second function.

"GUARD" bit functions:

BIT	LEVEL	FUNCTION
0	0	Normal
	1	Inhibit direct entry of RX frequencies
1	0	Normal
	1	Inhibit "RX" key
2	0	Normal
	1	Inhibit direct entry of TX frequencies
3	0	Normal
	1	Inhibit "TX" key
4	0	Normal
	1	Inhibit store function
5	0	Normal
	1	Inhibit "STO" key
6	0	Normal
	1	Inhibit entry of scan parameters
7	0	Normal
	1	Inhibit certain second function pages

If programmed in the Configuration PROM (ref. section 5.12), either of the RX (bit 0 & 1) and TX (bit 2-3) GUARD bits set to 1 will cause the respective display to show channel numbers exclusively. If no channel number applies to the frequency then a "C" will be displayed (e.g. immediately after "SUPPLY ON").

Clear GUARD-bit 7 (PAGE GUARD)



- (1) Switch supply OFF.
- 2 Press "RCL" and keep it.
- 3 Switch supply ON.
- 4 Keep "RCL" pressed until the beeper sounds.
Guard-bit 7 is now cleared and all second function pages can be entered.

To prevent unauthorized use this syntax is not described in the User Manual.

4.1.12.8 SECOND FUNCTIONS SUMMARY

- 200: Start automatically stepped self test
- 201: Start manually stepped self test
- 202: Start automatic stepped self test from an arbitrary test number.
- 203: Start manually stepped self test from an arbitrary test number.

- 241: Read accumulated on-time
- 242: Read and program receiver tune step
- 243: Read single frequency formats
- 244: Control BFO frequency
- 245: Read special system parameters
- 246: Read CU release date and version
- 247: Read TU release date and version
- 248: Adjust beeper sound level
- 249: Turn OFF antenna

- 250: Clear RAM
- 251: Reset system

- 270-277: Toggle "OPTION" register bit 0-7
- 278: Clear "OPTION" register
- 279: Read "OPTION" register

- 280-287: Toggle "PRESET" register bit 0-7
- 289: Read "PRESET" register

- 290-296: Toggle "GUARD" register bit 0-6
- 297: Set "GUARD" register bit 7
- 298: Clear "GUARD" register
- 299: Read "GUARD" register

4.2 DESCRIPTION OF OPERATING CONTROLS



Switches ON/OFF the equipment power supply. When switched ON the equipment enters the state it was in just before being switched OFF.



Switches ON/OFF the transmitter functions. The transmitter display shows the transmitter frequency when switched ON, and the time of day when switched OFF.



Increases and decreases the light intensity in the displays, meters and annunciators.



Storing of receiver/transmitter frequency pairs and mode. When "STO" is pressed the receiver and transmitter displays are blanked and their decimal points start flashing, indicating that a channel number (0-75) must be entered in the receiver display via the numeric keys.



Setting/recalling scanning parameters and start/stop scanning of stored receiver/transmitter frequency pairs. The annunciator is flashing in automatic scanning mode and turned constantly ON in manual scanning mode. (for details see section 4.1)



Setting time of day, setting/recalling wake-up time, starting dormant state and setting dwell time in scanning. (for details see section 4.1)



Pressing "DUPLEX" causes no action in the TRP 8250 S



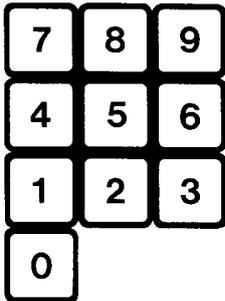
- a) Primary function: Change of receiver frequency. When "RX" is pressed the receiver display is blanked and its decimal point starts flashing, indicating that a new receiver frequency must be entered into the display via the numeric keys.
- b) Secondary function: Setting of wake-up time, when "RX" is pressed immediately after "SET TIME". Opening of the external scan port (see section 4.1)



- a) Primary function: Change of transmitter frequency. When "TX" is pressed the transmitter display is blanked and its decimal points starts flashing, indicating that a new transmitter frequency must be entered into the display via the numeric keys.
- b) Secondary function: Recalling of transmitter frequency from PROM. Closing of the external scan control port (see section 4.1)



- a) Primary function: Recalling stored receiver/ transmitter frequencies. When "RCL" is pressed the receiver and transmitter displays are blanked and their decimal points start flashing, indicating that a channel-number (0-75) must be entered into the receiver display via the numeric keys.
- b) Secondary function: Recalling wake-up time, when "RCL" is pressed immediately after "SET TIME" and recalling scanning parameters when "RCL" is pressed immediately after "SCAN" (see section 4.1)



Numeric keys

- a) Primary functions:
Entering of receiver/transmitter frequencies and channel numbers.
- b) Secondary functions:
Setting scanning parameters, time of day, wake up time and sound level of beeper. Refer to section 4.1 for further details.



Terminating keyboard operation. "ENTER" must be pressed to terminate all keyboard operations initiated by the "RX", "TX", "STO", "RCL", "SCAN", "SET TIME" or numeric keys. Generally the displays will then be reset to their initial states if the operating parameters are valid. An exception is the self test mode (see section 7.4)



Adjustment of receiver AF-amplifier gain. (Sound level of internal speaker, handset phone and headphone). Pressing one of the keys turns on the corresponding annunciator, which is turned off again when the key is released or when minimum or maximum sound level is reached.



Adjustment of receiver IF-amplifier gain when the AGC is switched OFF.



Switches ON/OFF the AGC (Automatic Gain Control). The annunciators indicate whether the AGC is ON or OFF. When the AGC is ON the receiver IF-amplifier gain is automatically adjusted and manual control disabled. When the AGC is switched OFF the receiver IF-amplifier gain is maintained on the level it had just before the AGC was switched OFF and manual control via the "SENSITIVITY" keys is enabled. When selecting a new receiver frequency the AGC should always be ON, to ensure that a suitable start level of IF-amplifier gain is set before the AGC is switched OFF for manual adjustment.



Selects AGC time constant, that is the rate at which gain is regulated. Annunciators indicate whether "AGC SLOW" or "AGC FAST" is selected. "AGC SLOW" is automatically selected when switching to the modes SSB, R3E or MCW. "AGC FAST" is automatically selected when switching to the modes AM, TELEX or CW. The settings selected by the system are assumed to give the best reception in the modes concerned but under special circumstances a better reception might be obtained by pressing "AGC FAST" if "AGC SLOW" were selected and vice versa. In the AM and the TELEX-mode only "AGC FAST" is possible.



Switches ON/OFF internal and external loudspeaker. Annunciator ON indicates loudspeaker(s) ON. If headphones are connected via the socket on the rear of the Control Unit, the internal loudspeaker is always switched OFF.



Increases receiver gain 10 dB by activating the RF-amplifier stage. Annunciator ON indicates RF-amplifier ON. The RF-amplifier may be used when the received signal is weak.



Decreases receiver gain 20 dB by inserting the antenna input attenuator. Annunciator ON indicates attenuator ON. The antenna attenuator may be used if the received signal is disturbed by strong out-of-band signals.



Switches ON/OFF Squelch function. Annunciator ON indicates Squelch ON. If the Squelch is ON a speech signal with a signal to noise ratio greater than a certain value is required to pass the signal through the receiver AF-amplifier. The Squelch is used to eliminate noise when there is no speech signal on the receiver frequency. The Squelch Board is optional. When not installed, pressing the key causes no action.



Selects frequency step in receiver tuning. An annunciator below one of the three right hand digits of the receiver display indicates the frequency step selected. 10 Hz, 100 Hz and 1000 Hz steps are possible.



Tuning of receiver frequency up or down in frequency steps selected by the "TUNE RATE" key (see section 4.1)



Adjustment of the BFO frequency down and up in CW mode. Receiver display shows BFO frequency when either of the keys are pressed.



Selects respective IF filters in CW and MCW mode. Annunciator ON indicates selected filter.



Selecting transmission of J3E and reception of J3E and R3E signals in USB (Upper Side Band). Annunciator ON indicates USB-mode selected.



Selecting transmission of J3E and reception of J3E and R3E signals in LSB (Lower Side Band). Annunciator ON indicates LSB-mode selected. If transmission of LSB is illegal and transmitter is ON, the transmitter display is flashing and transmitter function disabled.



Selecting transmission of H3E (Upper Side Band) and reception of H3E and A3E signals. Annunciator ON indicates AM mode selected. If transmission of H3E is illegal and transmitter is ON, the transmitter display is flashing and transmitter function disabled.



Selecting transmission of R3E and reception of R3E and J3E signals (Upper Side Band). Annunciator ON indicates R3E mode selected.



Selecting transmission and reception of Telex in F1B mode. Annunciator ON indicates Telex mode selected. The Telex function is optional.



Fast set up for 2182 kHz. Pressing this key will instantly change receiver and transmitter frequency to 2182 kHz, select AM (H3E) mode, select FULL POWER, and enable transmitter function (TX ON). The loudspeaker(s) and AGC are automatically switched ON and RF-AMP, ANT ATT and SQUELCH switched OFF. Antenna current is displayed when transmitting.



Fast set-up for 500 kHz. Pressing this key will instantly change receiver frequency to 500 kHz and select MCW (H2A) mode. The loudspeaker(s) and AGC are automatically switched ON and RFAMP, ANT ATT and SQUELCH switched OFF. IF FILTER keys are enabled and the intermediate type filter automatically selected.



Selecting transmission and reception of A1A morse telegraphy signals. Annunciator ON indicates CW-mode selected. If transmission of A1A is illegal and transmission is ON, the transmitter display is flashing and transmitter function disabled. IF FILTER keys are enabled and the intermediate type filter automatically selected. BFO is enabled and AGC is switched ON.



Selecting transmission and reception of H2A modulated morse telegraphy signals. Annunciator ON indicates MCW-mode selected. If transmission of H2A is illegal and transmission is ON, the transmitter display is flashing and transmitter disabled. IF FILTER keys are enabled and the intermediate type filter automatically selected. AGC is switched ON.



Activating Antenna Tuner. Pressing this key will start the automatic tuning procedure in the ATU (Antenna Tuning Unit). Tuning is performed in less than 1.5 sec. Pressing the handset key for the first time after changing transmitter frequency will also start the tuning procedure, and it is therefore not necessary to press "TX TUNE" in this case. "TX TUNE" is normally used when the frequency has been unchanged for some time and the antenna impedance has changed due to external circumstances (see section 4.1).



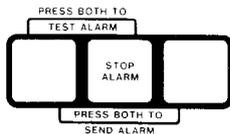
Selecting low transmitter output power (approx. 10 W PEP). Annunciator ON indicates LOW POWER selected.



Selecting medium transmitter output power (approx. 60 W PEP). Annunciator ON indicates MEDIUM POWER selected.



Selecting full transmitter output power (approx. 250 W PEP). Annunciator ON indicates FULL POWER selected.



Testing and transmitting the two-tone alarm signal. Press "STOP ALARM" and the left key simultaneously and keep pressed to test alarm. The alarm signal is heard in the loudspeaker, and transmitter keying is disabled. If the Dummy Load option is installed the alarm generator and the transmitter is tested on the built-in dummy load of the Antenna Tuning Unit. The Antenna Current Meter indicates current into the dummy load. The Output Power and Antenna Current annunciators are flashing to show that the transmitter is in the test mode. Test on dummy load cannot be performed on 2182 kHz.

Press the left and right keys simultaneously to send alarm. The alarm signal is heard in the loudspeaker and transmitted for 45 sec. on the selected frequency if the transmitter is ON. The alarm signal may be interrupted by pressing "STOP ALARM".

4.2.1 Transmitter Display In its initial state the transmitter display shows the transmitter frequency in kHz if TX is ON or the time of day in hours and minutes if TX is OFF. Time of day is indicated by a flashing time cursor (3rd digit). A steady time cursor indicates that entering or recalling of time has not yet been terminated. A flashing decimal point indicates that entering, storing or recalling of a transmitter frequency has not yet been terminated. Flashing digits indicate that the transmitter frequency and/or mode is unauthorized, i.e. the frequency is outside the specified range and/or not contained in the frequency PROM. The transmitter cannot be keyed if the transmitter display is flashing.

4.2.2 Receiver Display In its initial state the receiver display shows the receiver frequency in kHz. A flashing decimal point indicates that entering, storing or recalling of a receiver frequency or channel-number has not yet been terminated. Flashing digits indicate that the frequency or channel-number is outside the specified range.

4.2.3 Signal Strength meter Gives a relative indication of the signal strength in the received signal.

4.2.4 Output power/Antenna current meter Measures the antenna current during transmission on 2182 kHz and 500 kHz, as indicated by the antenna current annunciator. Gives a relative indication of the transmitter output power during transmission on other frequencies by measuring the output peak voltage/current, as indicated by the output power annunciator. A flashing meter indicates a fault in the Transceiver Unit - Antenna Tuning Unit communication.

4.2.5 Output power annunciator Also serves as a mismatch indicator on all frequencies. If the input SWR of the Antenna Tuning Unit exceeds 1:3 the output power annunciator starts flashing, indicating that tuning is required.

4.2.6 Reduced power annunciator If the temperature of the Power Amplifier heatsink and/or the Antenna Tuning Unit exceeds their maximum levels, the output power is reduced by 5 dB which is indicated by the reduced power annunciator. This may occur due to extreme environmental and/or working conditions.

5. INSTALLATION

Correct installation of the equipment is important for maximum performance and reliability. Antennas and earth connections must be installed with the greatest care using corrosion resistant materials. Cable routing shall be made so the cables are protected from physical damage. Cable bends especially on coaxial cables may not be sharp and a sufficient number of clips or straps should be used for securing the cables. Before installing the equipment make sure that the Configuration PROM is properly programmed, see section 5.12.

5.1 Mounting the Control Unit

The Control Unit can be tabletop or bulkhead mounted. Fig. 5.1 shows overall dimensions and a drilling plan for the necessary holes. The unit is bolted through two holes on the bottom part of the cabinet. The unit must be opened when bolting. Loosen the two front panel screws and lift off the front panel. The front panel is hinged to the bottom part by means of two flexible straps. To enable cable entry from either side of the unit, the bottom part of the cabinet may be turned 180 degrees relative to the front panel. To alter the position, open the unit and loosen the screws of the hinges in the bottom part of the cabinet and release the hinges. Turn the front panel and fix the hinges in the opposite side of the cabinet bottom. Be careful not to damage any components or to drop any conducting objects onto the printed circuit boards of the unit. The front panel can be tilted for convenient operation. To adjust the angle loosen the two front panel screws and open the unit. Move the two stop pins in each side of the unit to the appropriate holes and refit the front panel.

5.2 Mounting the Transceiver Unit

The Transceiver Unit may be mounted up to 100 metres from the Control Unit using a screened 16 x 0.5 mm sq. multiwire cable for interconnection. The unit should be installed in a dry place and consideration should be given to accessibility for servicing. The brackets supplied allow for bulkhead or bench mounting. Fig. 5.2 shows mounting details. It is important to provide plenty of airspace below and above the unit, for adequate air circulation through the heatsink at the back of the unit.

5.3 Mounting the Antenna Tuning Unit

The Antenna Tuning Unit may be mounted up to 100 metres from the Transceiver Unit using RG-213/U (RG-8A/U) coaxial cable and a screened 16 x 0.5 mm sq. multiwire cable for interconnection. The unit should be installed near the antenna feed point. Fig. 5.3 shows mounting details.

5.4 Power Supply

The TRP 8250 S operates at voltages between 10.6 and 41.6 VDC and is to be powered from a 12, 24 or 32 volt battery or from a separate AC Power Supply Unit. The supply leads are connected to the Transceiver Unit through the cable entry at the rear of the cabinet. The supply terminal strip is adapted for screened power supply cable as required by some administrations. The screen of the cable is connected to the center terminal. The terminal strip may be removed from the chassis for easier access. Attention should be paid to CCIR Rec. 218-1 which recommends that cables in the vicinity of the receiving antennas or the radio receiving room, and cables within the radio room, are screened by enclosing them in metal conduits, unless the cables themselves are effectively screened. The earth connection of the equipment will not cause the battery to be earthed. Maximum permissible peak voltage between the battery terminals and earth is 100 V. Note that fuses must be provided in the supply leads. Installation diagram fig. 5.3 shows the necessary cable cross sections and external fuse ratings.

5.5 Earth Connections

5.5.1 Antenna Tuning Unit As the earth connection of a transmitter is part of the total antenna system, it is of the utmost importance that the earth connection to the Antenna Tuning Unit is constructed to have the lowest possible RF-impedance. Losses in the earth connection will result in a decrease in radiated power which means that the range of the transmitter will be reduced. In steel ships a 50 x 0.5 mm copper strap as short as possible is connected between the earth terminal at the bottom of the Antenna Tuning Unit and two 1/2" or M12 bolts welded to the superstructure. Vessels constructed of non-conducting materials must be equipped with a copper earth plate having a minimum area of 1 square metre mounted below the water line. From a copper earth bolt hard soldered to the earth plate a 50 x 0.5 mm copper strap is run, preferably uninterrupted to the earth terminal at the bottom of the Antenna Tuning Unit. Should it be necessary to break the copper strap, for example to pass through a deck, two 1/2" or M12 bolts should be used for this feed through. The copper strap may not be passed through iron pipes and should be kept at minimum distance of 0.5 m from iron parts of some extent. If this minimum distance cannot be kept the copper strap must be effectively connected to these parts using a strap having the same dimensions. On wooden ships having a superstructure of metal, this superstructure should also be effectively connected to the copper strap by using stainless steel bolts and preferably pieces of stainless steel strips between the metal parts.

5.5.2 Other Units All other units must be grounded separately to the ships metal in the shortest possible way. The Control Unit is connected to ground from the ground frame at the cable entries using a 2.5 mm sq. wire. In the Transceiver Unit a ground strap is connected to the ground terminal at the cable entry. On vessels with no metallic superstructure the ground connection at the Control Unit and the Transceiver Unit may be omitted.

5.6 Antennas

The standard equipment is used with separate transmitting and receiving antennas. If, however, the Antenna Tuning Unit is fitted with the optional Antenna Relay Board [641] a common antenna may be used for transmission and reception. The antennas should be erected well in the clear, away from any objects whose influence on the antenna may vary, such as derricks etc. Insulators should be of the best type having low leakage even when wet. Stays, wires, steel masts etc. should be either effectively earthed or insulated. The receiving antenna should be kept as far as possible from electrical equipment in order to minimize noise. Electrical installation such as cable braiding (screens) and instruments in the vicinity of the receiving antenna should be earthed effectively, and the instruments in question should be fitted with noise-interference suppression devices, effective in the range 0.1 MHz to 30 MHz.

5.6.1 Transmitter Antenna The Antenna Tuning Unit will tune on any frequency in the range 1.6 to 30 MHz to wire and/or whip antennas of 7 to 18 metres total length. A long antenna is preferable with regard to radiated power.

The antenna is terminated at the insulator at the top of the Antenna Tuning Unit. The insulator must be relieved from mechanical stress by using max. 1 metre flexible wire between the insulator and a support.

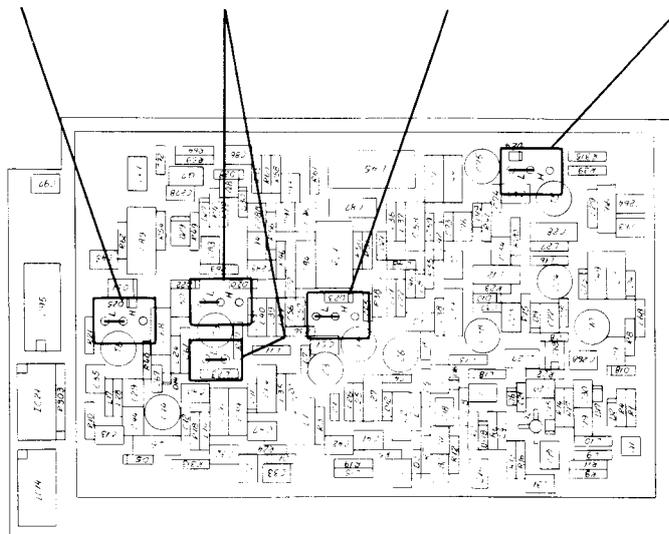
5.6.2 Receiver Antenna Length: 7-30 m. The antenna feed-in should be coaxial cable. The receiver antenna terminal is a UHF-connector (PL 259 type) located in the Transceiver Unit.

If a long cable is used an impedance matching transformer should be inserted at the antenna end of the feeder. In one antenna installations using the optional Antenna Relay Board [641] this transformer is built-in.

The receiver is normally delivered to 50 ohms input impedance. In the frequency range below 4 MHz it is possible to change the input to high impedance, which can be advantageous when using a short receiving antenna with no impedance matching transformer and a short feed-in.

Selection of high input impedance in the range below 4 MHz is carried out, by means of a soldering iron, by moving the strap from L to H in the desired frequency range. Below figure shows a section of PCB [610] with all straps set to low impedance (50 ohms).

<405 kHz 1.6-4 MHz 527-1600 kHz 405-527 kHz



5.7 Interconnection of Units

5.7.1 Control Unit-to-Transceiver Unit connections The units are interconnected by a length of 16 x 0.5 mm sq. screened multiwire cable (max. 100 metres).

In order to connect the cable to the Control Unit the front panel is removed. The cable is entered through the threaded cable entry and the wires are then connected to the terminal strip marked 601TS2 Transceiver Unit. NOTE: Wire ends should be fitted with cable end sleeves before mounting. The screen is connected to the ground frame at the cable entry. To connect the cable to the Transceiver Unit the front must be opened. The cable is entered through the cable entry at the back of the unit and the wires are connected to the terminal strip marked 620TS3 Control Unit. The screen must be connected to the chassis bracket. For connections see installation diagram fig. 5.3.

5.7.2 Transceiver Unit-to-Antenna Tuning Unit connections The units are interconnected by an RG-213/U (RG-8A/U) coaxial cable and a 16 x 0.5 mm sq. screened multiwire cable (max. 100 metres). In one-antenna installations using the optional Antenna Relay Board 641 an additional RG-213/U coaxial cable is used.

The coaxial cables are terminated in UHF-connectors (PL 259 type). The sockets in the Transceiver Unit may be removed from the chassis for easier access.

The multiwire cable is mounted in the same way in the Transceiver Unit as the cable from the Control Unit. The wires are connected to the terminal strip marked 620TS1 Antenna Tuning Unit, see fig. 5.3.

NOTE: If the TRP 8250 S is not operated with an ATU 8250 Antenna Tuning Unit a strap must be placed between terminal no. 6 (TUNE) and terminal no. 7 (TPR) of 620TS1. A missing strap will cause the Power Meter display to flash 11 sec. after a TUNE sequence has been initiated.

The cables enter the Antenna Tuning Unit through the threaded cable entries at the bottom of the unit. The wires must be connected as shown in fig. 5.3. The screen of the multiwire cable must be connected to the receptacle at the grounding tab next to the terminal strip.

NOTE: Wire ends of the multiwire cable should be fitted with cable end sleeves before mounting.

In installations with long earth straps to the Antenna Tuning Unit, high RF voltages may be present on the ATU ground terminal. To avoid this voltage being coupled to the Transceiver Unit the interconnection cables must be run from the Transceiver Unit to the point where the copper strap from the Antenna Tuning Unit is connected to earth. From this point the cables must follow the copper strap to the Antenna Tuning Unit. The cables should be placed upon the center of the copper strap to ensure good coupling. The part of the cable-run between earth and the Transceiver Unit must not be run in parallel with the earth strap within a distance of at least 1 metre.

5.8 Connection of External Equipment

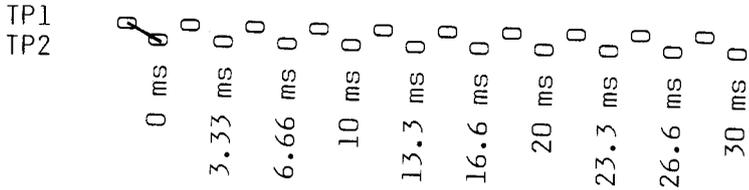
Auxiliary terminals in the Control Unit and the Transceiver Unit allows various external equipment to be connected to the TRP 8250 S. In tables 5.2 and 5.5 terminal assignments are listed for the Control Unit and the Transceiver Unit respectively. Screened cable should be used with the screen connected to ground frame or chassis.

5.8.1 Timing of TELEX KEY signal The transmitter pre-keying time should be approx. 7 ms. not less. Telex modems with programmable pre-keying time must be programmed to this value. In case of telex modems with a fixed pre-keying time longer than 7 ms. a time delay may be introduced by the TELEX KEY DELAY circuit on PCB 601 in the Control Unit.

The leading edge of the TELEX KEY signal may be delayed by up to 30 ms. in steps of 3.33 ms. by moving a strap to the appropriate position.



TELEX KEY DELAY SELECTION
(factory setting: 0 ms.)



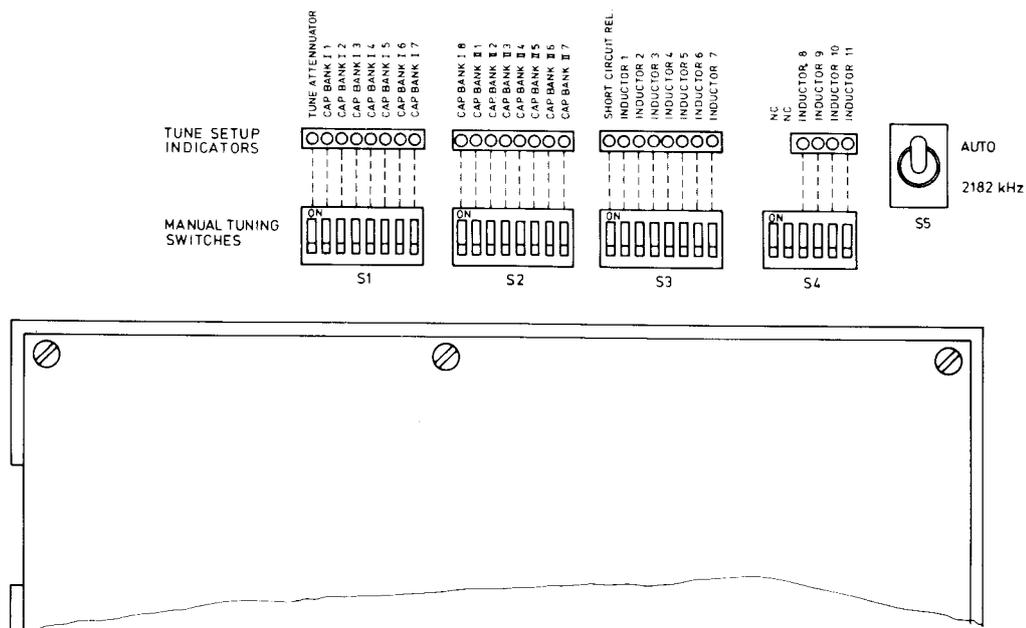
Telex modem pre-keying time minus selected telex key delay time must be equal to 7 ms. or more.

5.9 Final Installation Check

5.9.1 For operation of the equipment please refer to chapter 3. Note that an appropriate programmed Configuration PROM must be installed in the Control Unit, see section 5.12.

The Antenna Tuning Unit will tune automatically to the transmitter antenna when the equipment is keyed or the TUNE button is pressed. The standing wave ratio (SWR) at the input of the tuning unit is automatically measured after the tuning sequence. If the SWR exceeds approx. 3 the Power Annunciator on the Control Unit will flash, indicating that correct tuning has not been obtained. In this case, investigate the antenna installation and control that the antenna length is within the boundaries.

5.9.2 2182 kHz Manual Tune Set-up To enable manual tuning on 2182 kHz the Manual Tuning Switches in the Antenna Tuning Unit must be preset on the final antenna installation. Remove the cover of the Antenna Tuning Unit and follow below procedure.



Control that all Manual Switches are in position off.

With the switch AUTO/2182 kHz (S5) in position "AUTO", a normal tuning procedure is performed on 2182 kHz. The Manual Tuning Switches are then switched "ON", as indicated by light in the Tune Set-up Indicators.

Ensure that the transmitter is not keyed. Check correct setting of the Manual Tuning Switches by switching S5 to position 2182 kHz and simultaneously control that none of the Tune Set-up Indicators change. If any of the indicators change, repeat the procedure. When S5 is switched back to "AUTO" the Tune Set-up will be reset.

5.10 INSTALLATION OF OPTIONAL TELEX FILTER

To enable telex operation a receiver crystal filter must be installed in position X4 on PCB **610** RX/EX Signal Path in the Transceiver Unit. The center frequency of the filter must be 1398.5 kHz and the bandwidth must be in accordance with baud rate and frequency shift of the transmission. The center audio input/output frequency is adapted to the associated telex modem by programming of Telex Subcarrier in the Configuration PROM, see section 5.12 Configuration PROM programming.

To install the filter remove the front cover of the RX/EX Assembly and unplug the ribbon cable and the three coax cables. Open the door of the unit and disconnect the RX coax cable at the BNC connector and release the cable from the tube. Loosen the two screws of the P.A. Filter Assembly and swing it outwards. Disconnect the EX coax cable from the Power Amplifier and release the cable. Unscrew PCB **610** and remove it from the RX/EX Assembly.

Locate position X4 on the PCB. Mount the telex filter in that position and solder the terminations. Refit the PCB in the reverse order.

Fitting the filter on position X4 automatically enables the TELEX key on the Control Unit front panel and the function may now be checked.

5.11 REMOTE FREQUENCY CONTROL

TRP 8250 S is equipped with a serial interface for remote telex operation. That is, the receiver and/or transmitter frequencies may be remote controlled whereas telex mode will be automatically selected.

The remote control terminals are the 601TS1 Auxiliary Terminals no. 1 to 4, see Table 5.2. The interface, when used, has to be enabled by the appropriate Configuration PROM programming, see section 5.12. PROM addr. FEDh/4077d MARITEX.

The interface circuit conforms electrically to the EIA standard RS-232C using the following:

Baud rate	:	2400 bps
Parity	:	Odd
Word length	:	8 bits
Start bits	:	1
Stop bits	:	1

5.11.1 DATA FORMAT

Address word: This word, when transmitted to TRP 8250 S, initiates the command cycle. To identify the address word bits 6 and 7 shall both be set to 1. Thus, any other word types used will have to be less than C0h/192d.

Reserved addresses:
C2h/194d : Receiver
C3h/195d : Transmitter
FFh/255d : Broadcast

Command word: The word immediately following the address word contains the command.

Reserved commands:
00h/0d : Reset.
The TRP 8250 S will run the power-up sequence.
14h/20d : Frequency input.
The next 4 words will be interpreted as a frequency.

Frequency words: After a frequency command 4 words are used to specify the frequency in packed BCD:

1. 10 MHz 1 MHz
2. 100 kHz 10 kHz
3. 1 kHz 100 Hz
4. 10 Hz 0

Status word: After having received the frequency command and all four frequency words, the TRP 8250 S transmits a status word having the following format:

Bit

- 7 : Interface error. When set to 1 this bit identifies either a parity, framing, overrun or data format error. The command cycle must be repeated.
- 6 : Always 0.
- 5 : Busy. When set to 1 this bit identifies that the TRP 8250 S is not ready. The command cycle must be repeated.
- 0-4 : Address echo. This field contains the five LSB's of the received address word.

5.12 CONFIGURATION PROM PROGRAMMING

The Configuration Prom contains 4 kbytes in which legal frequencies, frequency bands and special system parameters can be programmed for customizing the equipment.

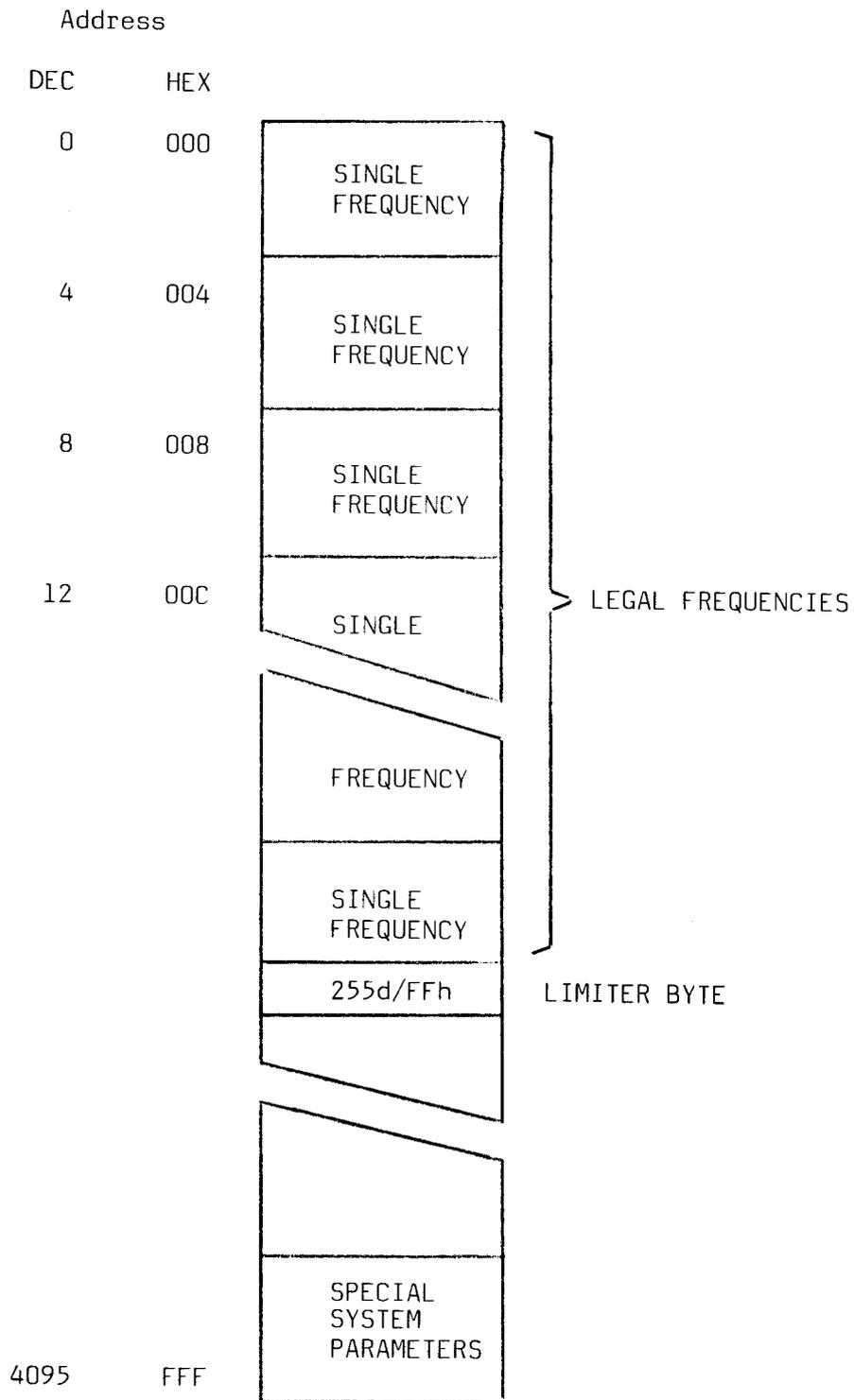
Legal frequencies and frequency bands are stacked in the lower part of the Prom together with legal modulation beginning at Prom address 0 and progressing upward in 4 byte steps until a limiter byte containing the data 255d/FFh are located.

Special system parameters are stacked in the higher part of the Prom beginning at Prom address 4095d/FFFh progressing downward.

5.12.1 APPLICABLE PROMS:

TEXAS:	TMS2532JL
	TMS25L32JL
HITACHI:	HN462532
	HN462532G
	HN462532G-2

5.12.2 CONFIGURATION PROM MAP



5.12.3 SINGLE FREQUENCY FORMAT

ADDR	n	D7	D6	D5	D4	D3	D2	D1	D0
		TX	RX	ITU	ITU-BAND	BCD x 10 MHz			
	n + 1	BCD x 1 MHz				BCD x 100 kHz			
	n + 2	BCD x 10 kHz				BCD x 1 kHz			
	n + 3	BCD x 100 Hz				MODULATION			

5.12.3.1 MODULATION HEXADECIMAL

0 : J3E
 1 : R3E
 2 : H3E
 3 : A1A
 4 : H2A
 5 : F1B
 6 : LSB
 7 : J3E & R3E
 8 : reserved for future use
 9 : reserved for future use
 A : reserved for future use
 B : reserved for future use
 C : reserved for future use
 D : reserved for future use
 E : reserved for future use
 F : don't care

5.12.3.2 RX AND TX BITS: 0 : Frequency and modulation do not apply to RX or TX respectively. 1 : Frequency and modulation apply to RX or TX respectively. Both bits may be programmed in the same array.

5.12.3.3 ITU BIT: 0 : ITU channel apply to programmed frequency in accordance with selected channel-number. 1 : ITU channel do not apply to programmed frequency.

5.12.3.4 ITU BAND-BIT: 0 : The programmed frequency is within the band specified by the short-number. 1 : The programmed frequency is 1 MHz above the band specified by the short-number.

5.12.3.5 ITU CHANNELS When programming a "LEGAL FREQUENCY" table consisting of the ITU channel frequencies and/or other frequencies to be selected by the "RECALL ITU - - -" syntaxes, it is necessary to consider the search-algorithm used. This algorithm initiates the search at PROM addr. 0 and progresses until either the "LIMITER BYTE" (255d/FFh) or the desired "SINGLE FREQUENCY" is found. The "RECALL ITU FREQUENCY PAIRS FROM PROM" syntax utilizes 2 separate searches to obtain the pair. Having entered "RX"- "RCL"- "8"- "1"- "5"- "ENTER" the desired frequency is found as the 15th "SINGLE FREQUENCY" in the 8 MHz

band (if ITU BAND-BIT = 0) having the RX-BIT = 1, ITU-BIT = 0 and the modulation nibble validating the present receiver mode.

5.12.3.6 FREQUENCY BAND FORMAT The single frequency format may be used in pairs to form a frequency band format as shown below. This format is used to additionally limit the transmitter frequency range. When programmed, transmission outside this band is not possible. More than one band may be programmed. Please note that the bit- and modulation nibbles must be 0.

ADDR	n	D7	D6	D5	D4	D3	D2	D1	D0	
	n	always 0				BCD x 10 MHz				} lower frequency
	n + 1	BCD x 1 MHz				BCD x 100 kHz				
	n + 2	BCD x 10 kHz				BCD x 1 kHz				
	n + 3	BCD x 100 Hz				always 0				
	n + 4	always 0				BCD x 10 MHz				} upper frequency
	n + 5	BCD x 1 MHz				BCD x 100 kHz				
	n + 6	BCD x 10 kHz				BCD x 1 kHz				
	n + 7	BCD x 100 Hz				always 0				

5.12.4 SPECIAL SYSTEM PARAMETERS

ADDR	DATA	DESCRIPTION
4095d/FFFh		Telex audio center frequency
		Display of assigned frequency
	21d/15h :	1500 Hz
	22d/16h :	1600 Hz
	:	:
	:	:
	37d/25h :	2500 Hz
4095d/FFFh		Display of carrier frequency
	149d/95h :	1500 Hz
	150d/96h :	1600 Hz
	:	:
	:	:
	153d/99h :	1900 Hz
	160d/A0h :	2000 Hz
	:	:
	:	:
	165d/A5h :	2500 Hz
		When assigned frequency display is used, an input at the programmed audio center frequency will be transmitted at the displayed frequency.
		When carrier frequency display is used, an input at the programmed audio center frequency will be used as an USB signal at the displayed frequency + the audio center frequency.
		Any other data are defaulted to 23d/17h

4094d/FFEh Transmitter frequency status
165d/A5h : Free transmitter frequencies
255d/FFh : Only transmitter frequencies contained in lower part
of the Prom
Any other data are defaulted to 255d/FFh

4093d/FFDh Dummy load during alarm test
180d/B4h : Enable dummy load
255d/FFh : Disable dummy load
Any other data are defaulted to 255d/FFh

4092d/FFCh Morse
4d/04h : Enable 500, CW, MCW, FILTER and BFO keys.
Disable transmitter in MCW mode above 1605 kHz.
195d/C3h : Disable 500, CW, MCW, FILTER and BFO keys.
255d/FFh : Enable - - - - -
Any other data are defaulted to 255d/FFh

4091d/FFBh AGC and Sensitivity
195d/C3h : Disable AGC and Sensitivity keys
255d/FFh : Enable - - - - -
Any other data are defaulted to 255d/FFh

4090d/FFAh RF Amplifier and Antenna Attenuator
195d/C3h : Disable RF-AMP and ANT-ATT keys
255d/FFh : Enable - - - - -
Any other data are defaulted to 255d/FFh

4089d/FF9h Alarm
195d/C3h : Disable 500, 2182 and ALARM keys
255d/FFh : Enable - - - - -
Any other data are defaulted to 255d/FFh

4088d/FF8h R3E
195d/C3h : Disable R3E key
255d/FFh : Enable - -
Any other data are defaulted to 255d/FFh

4087d/FF7h LSB
195d/C3h : Disable LSB key
255d/FFh : Enable - -
Any other data are defaulted to 255d/FFh

4086d/FF6h SCAN
210d/D2h : Enable SCAN key
255d/FFh : Disable - -
Any other data are defaulted to 255d/FFh

4085d/FF5h Fast AGC & Slow AGC
210d/D2h : Enable AGC-SLOW and AGC-FAST keys
255d/FFh : Disable - - - - - -
Any other data are defaulted to 255d/FFh

4084d/FF4h LSB Transmitting
6d/O6h : Enable transmitter in LSB mode
255d/FFh : Disable - - - - - -
Any other data are defaulted to 255d/FFh

4083d/FF3h H3E Transmitting
2d/O2h : enable transmitter in H3E mode
255d/FFh : disable - - - - - -
Any other data are defaulted to 255d/FFh

4082d/FF2h VERY NARROW FILTER
195d/C3h : Disable VERY-NARROW key
255d/FFh : Enable - - - - - -
Any other data are defaulted to 255d/FFh

4081d/FF1h Antenna in TX-Off-State
180d/B4h : Antenna disconnected
255d/FFh : Antenna connected
Any other data are defaulted to 255d/FFh

4080d/FF0h Distress mode
0d/O0h : Select J3E when "2182" is pressed
255d/FFh : Select H3E when "2182" is pressed
Any other data are defaulted to 255d/FFh

4079d/FEFh Numeric keyboard type
32d/20h : CCITT. Top left key = "1"
255d/FFh : Standard. Top right key = "9"
Any other data are defaulted to 255d/FFh

4078d/FEeh Alarm Band
22d/16h : Disable alarm below 1605 kHz.
255d/FFh : Enable alarm in all bands.
Any other data are defaulted to 255d/FFh

4077d/FEDh Maritex
210d/D2h : Enable Maritex interface
255d/FFh : Disable - - - - - -
Any other data are defaulted to 255d/FFh

4076d/FECh Receiver frequency status
32d/20h : Only receiver frequencies contained in lower part of
the Prom
255d/FFh : Free receiver frequencies
Any other data are defaulted to 255d/FFh

4075d/FEBh Frequency Display

195d/C3h : Disable frequency display. Only channel numbers can
 be entered and displayed except using special pro-
 cedure.

255d/FFh : Enable frequency display
 Any other data are defaulted to 255d/FFh

4074d/FEAh Maximum output power

255d/FFh : Full output power range

BCD : Programming in packed BCD will limit the maximum
 output power to 10 times the programmed value

Ex: Data Output power

 16d/10h 100 W

 24d/18h 180 W

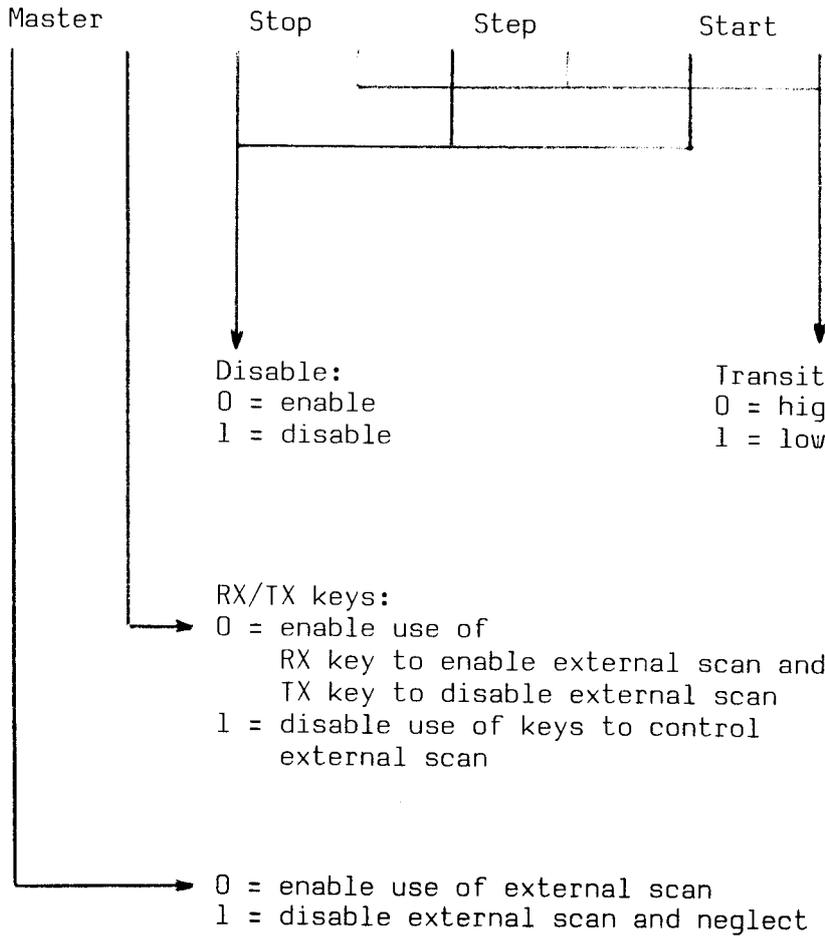
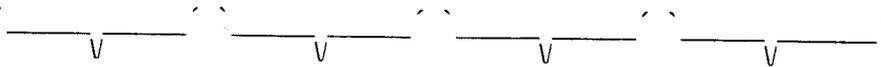
Any non-BCD-data or BCD-data exceeding the max.
power of the equipment are defaulted to 255d/FFh

4073d/FE9h Reduced output power between 1.6 and 4 MHz

21d/15h : Output power reduced to 150 W when the transmitter
 frequency is between 1.6 and 4 MHz

255d/FFh : No output power reduction
 Any other data are defaulted to 255d/FFh

D7	D6	D5	D4	D3	D2	D1	D0
dis-able	RX/TX keys	dis-able	tran-sition	dis-able	tran-sition	dis-able	tran-sition



5.12.5 STANDARD PROGRAMMING The following lists apply to SKANTI standard programming of special system parameters for each type unless otherwise agreed (ref. Factory programming of Configuration PROM). Only data different from 255d/FFh are listed.

	ADDR	DATA
TRP 8250S : -----	4092d/FFCh 4086d/FF6h 4072d/FE8h	195d/C3h 210d/D2h 16d/10h
TRP 8251S : -----	4094d/FFEh 4092d/FFCh 4086d/FF6h 4072d/FE8h	165d/A5h 195d/C3h 210d/D2h 16d/10h
TRP 8252S : -----	4094d/FFEh 4086d/FF6h 4085d/FF5h 4072d/FE8h	165d/A5h 210d/D2h 210d/D2h 16d/10h
TRP 8253S : -----	4094d/FFEh 4092d/FFCh 4086d/FF6h 4072d/FE8h	165d/A5h 195d/C3h 210d/D2h 16d/10h
TRP 8254S : -----	4094d/FFEh 4092d/FFCh 4089d/FF9h 4088d/FF8h 4086d/FF6h 4084d/FF4h 4083d/FF3h 4072d/FE8h	165d/A5h 195d/C3h 195d/C3h 195d/C3h 210d/D2h 6d/06h 2d/02h 16d/10h
TRP 8255S : -----	4094d/FFEh 4089d/FF9h 4086d/FF6h 4085d/FF5h 4084d/FF4h 4083d/FF3h 4072d/FE8h	165d/A5h 195d/C3h 210d/D2h 210d/D2h 6d/06h 2d/02h 16d/10h
TRP 8256S : -----	4094d/FFEh 4092d/FFCh 4091d/FFBh 4090d/FFAh 4089d/FF9h 4088d/FF8h 4086d/FF6h 4084d/FF4h 4083d/FF3h 4072d/FE8h	165d/A5h 195d/C3h 195d/C3h 195d/C3h 195d/C3h 195d/C3h 210d/D2h 6d/06h 2d/02h 16d/10h

TRP 8257S : 4094d/FFEh 165d/A5h
----- 4086d/FF6h 210d/D2h
4085d/FF5h 210d/D2h
4072d/FE8h 16d/10h

TRP 8258S : 4094d/FFEh 165d/A5h
----- 4092d/FFCh 195d/C3h
4091d/FFBh 195d/C3h
4090d/FFAh 195d/C3h
4089d/FF9h 195d/C3h
4086d/FF6h 210d/D2h
4084d/FF4h 6d/06h
4083d/FF3h 2d/02h
4072d/FE8h 16d/10h

Terminal No.	Designation	Direction	Signal level	Remarks
1	TX REM	Output	RS-232C	Remote Control Serial Data
2	GND	-		
3	RX REM	Input	RS-232C	Remote Control Serial Data
4	GND	-		
5	2182 SEL	Output	74LS00	High when 2182 is selected
6	GND	-		
7	SCAN S/S	Input	0/12 V	Start/Stop of scanning (user programmable)
8	GND	-		
9	TELEX KEY	Input	0/12 V	Keyes Tx in TELEX mode when LOW
10	GND	-		
11	AUX KEY	Input	0/12 V	Keyes Tx in USB, LSB, AM or R3E modes when LOW
12	GND	-		
13	TELEX IN	Input	-16 to +10 dBm	600 ohms audio input. Open in TELEX mode *
14	GND	-		
15	AUX IN	Input	-16 to 10 dBm	600 ohms audio input. Open in USB, LSB, AM or R3E modes when AUX KEY is LOW *
16	GND	-		
17	LINE OUT	Output	-10 to 10 dBm	600 ohms audio output. Internally adjustable *
18	GND	-		
19	SPEAKER -	Output	0 to 5 W	Load impedance 8 ohms
20	SPEAKER +			
21	KEY INHIBIT	Input	0/12 V	Inhibit keying when LOW **
22	GND	-		
23	OPTIONAL IN	Input	0/12 V	Reserved for future use
24	GND	-		

* An optional Line Transformer Board 603 is available providing balanced input/output.

** KEY INHIBIT input is applicable only when Preset bit 4 = "1", see second function 284.

601-TS1 AUXILIARY TERMINALS, CONTROL UNIT

Table 5.2

HANDSET SOCKET:

Terminal No.	Designation	Direction	Signal level	Remarks
1	MIC	Input	50 mV - 1 V	Internally adjustable +/-8 dB
2	GND	-		
3	EARPIECE	Output	0 - 10 mW	500 ohms. Controlled by VOLUME
4	+ 12 V	Output	+ 12 V	Supply for MIC. Amplifier Keyes Tx in USB, LSB, AM or R3E when LOW
5	HANDSET KEY	Input	0/12 V	

HEADPHONE SOCKET:

Terminal No.	Designation	Direction	Signal level	Remarks
1	-	Output	0 TO 10-160 mW	Mono or stereo headphones may be used. 8 ohm - 5 kohm Built-in speaker is discon- nected when jack is inser- ted
2	-			
3	- LS			

MORSE KEY SOCKET:

Terminal No.	Designation	Direction	Signal level	Remarks
1	MORSE KEY	Input	0/12 V	Keyes Tx in CW or MCW when LOW
2	GND	-		

EXTERNAL CONNECTIONS, CONTROL UNIT

Table 5.3

Terminal No.	Designation	Direction	Remarks
1	+	Input	Supply from 12/24/32 V battery or P 8250 Screen Supply from 12/24/32 V battery or P 8250
2	GND	-	
3	-	Input	

TS 1 SUPPLY TERMINALS, TRANSCEIVER UNIT

Table 5.4

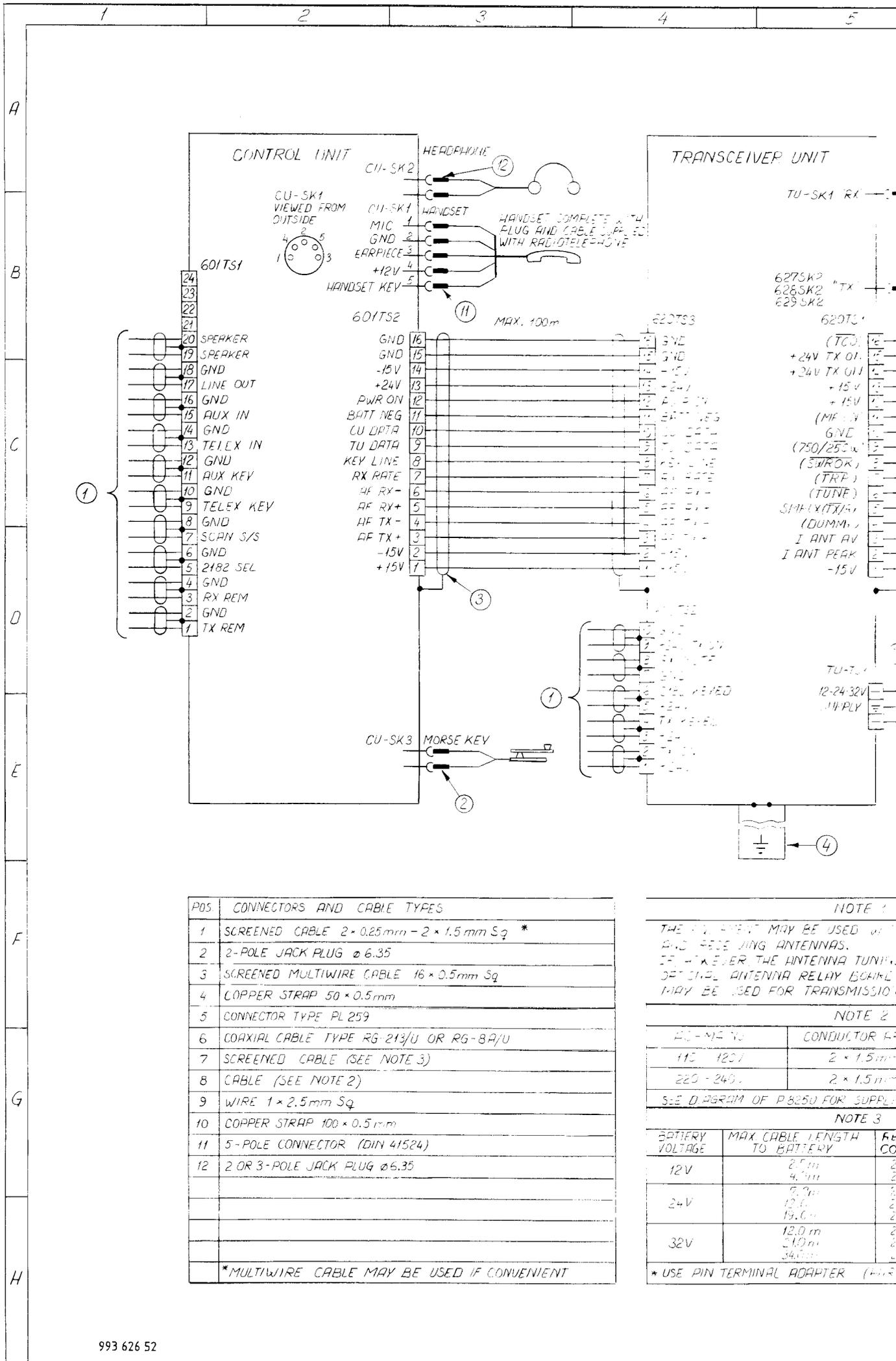
Terminal No.	Designation	Direction	Max. Current	Remarks
1	+ 24 V	Output	Note 1	+ 24 V available when equipment is ON Open collector. Low when TX on + 24 V available when equipment is ON Open collector. Low when TX KEYED + 24 V available when equipment is ON Open collector. Low when TX KEYED on 2182 kHz
2	TX ON	Output	250 mA	
3	+ 24 V	Output	Note 1	
4	TX KEYED	Output	250 mA	
5	+ 24 V	Output	Note 1	
6	2182 KEYED	Output	250 mA	
7	GND	-		0/12 V. Rx is muted when connected to GND + 24 V available when TX is ON
8	RX MUTE	Input		
9	+ 24 V TX ON	Output	Note 1	
10	GND	-		

Note 1: Max. total current 1000 mA

620 TS 2 AUXILIARY TERMINALS, TRANSCEIVER UNIT

Table 5.5





POS	CONNECTORS AND CABLE TYPES
1	SCREENED CABLE 2 × 0.25mm - 2 × 1.5mm Sq *
2	2-POLE JACK PLUG ø 6.35
3	SCREENED MULTIWIRE CABLE 16 × 0.5mm Sq
4	COPPER STRAP 50 × 0.5mm
5	CONNECTOR TYPE PL 259
6	COAXIAL CABLE TYPE RG-213/U OR RG-8A/U
7	SCREENED CABLE (SEE NOTE 3)
8	CABLE (SEE NOTE 2)
9	WIRE 1 × 2.5mm Sq
10	COPPER STRAP 100 × 0.5mm
11	5-POLE CONNECTOR (DIN 41524)
12	2 OR 3-POLE JACK PLUG ø 6.35
	*MULTIWIRE CABLE MAY BE USED IF CONVENIENT

NOTE 1
THE FOLLOWING MAY BE USED WITH THE ANTENNAS.
IF HOWEVER THE ANTENNA TUNING IS NOT OPTIMAL AN ANTENNA RELAY BOARD MAY BE USED FOR TRANSMISSION.

NOTE 2

FREQUENCY	CONDUCTOR SIZE
115 - 120 MHz	2 × 1.5mm
220 - 240 MHz	2 × 1.5mm

SEE DIAGRAM OF P 8250 FOR SUPPLY

NOTE 3

BATTERY VOLTAGE	MAX CABLE LENGTH TO BATTERY	RECOMMENDED CABLE TYPE
12V	2.0m	2
	4.0m	2
	9.0m	2
24V	13.0m	2
	19.0m	2
	24.0m	2
32V	12.0m	2
	21.0m	2
	34.0m	2

* USE PIN TERMINAL ADAPTER (P 8250)

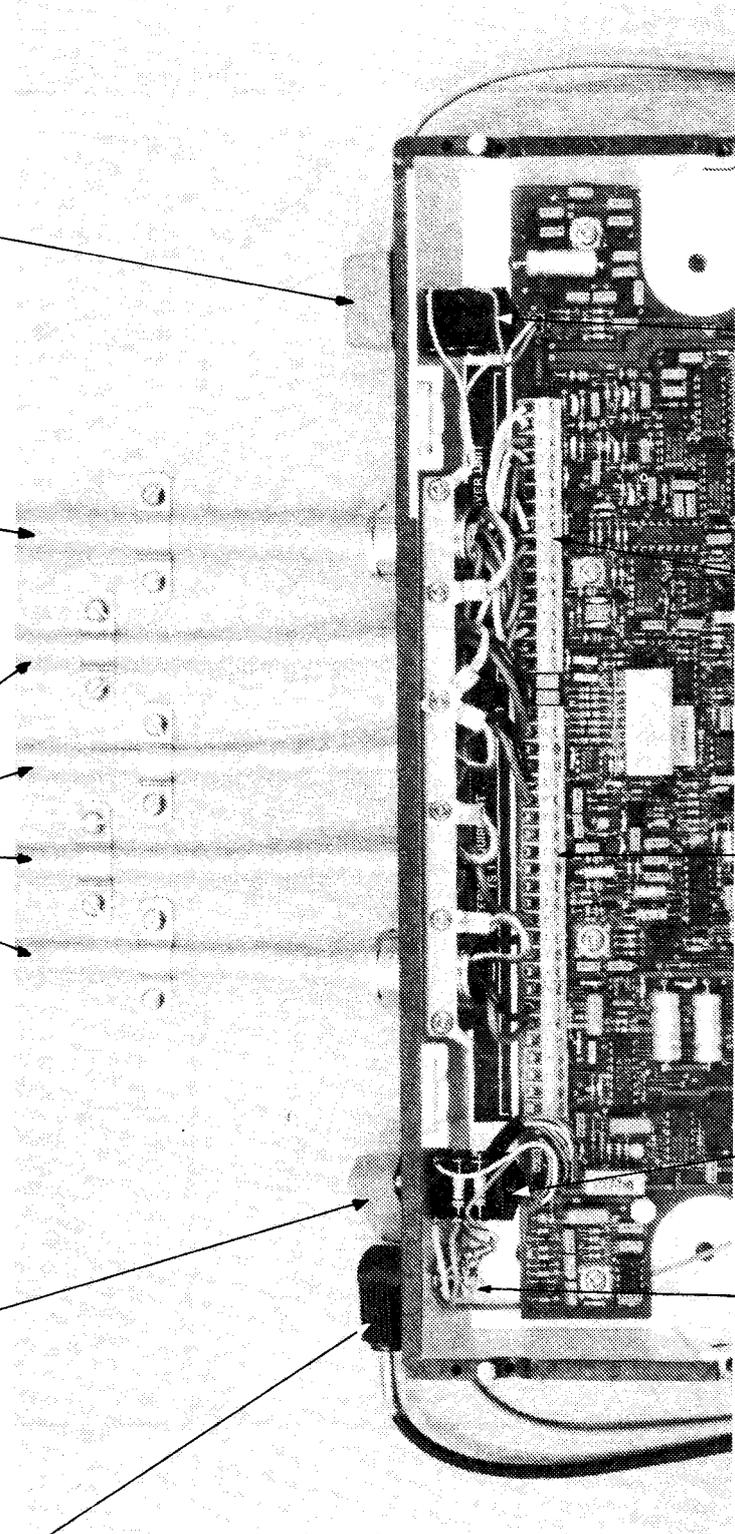
"HANDSET"
5-POLE CONNECTOR

"HEADPHONE"
2 OR 3 POLE JACK PLUG

SCREENED CABLES
2 x 0.25 - 2 x 1.5mm Sq

SCREENED MULTIWIRE
CABLE 16 x 0.5mm Sq

"MORSE KEY"
2-POLE JACK PLUG



CU-SK1

CU-SK2

601TS1

601TS2

CU-SK3

INSTALLATION WIRING OF CONTROL UNIT 8000

SCREENED MULTIWIRE CABLES
16 x 0.5mm Sq.

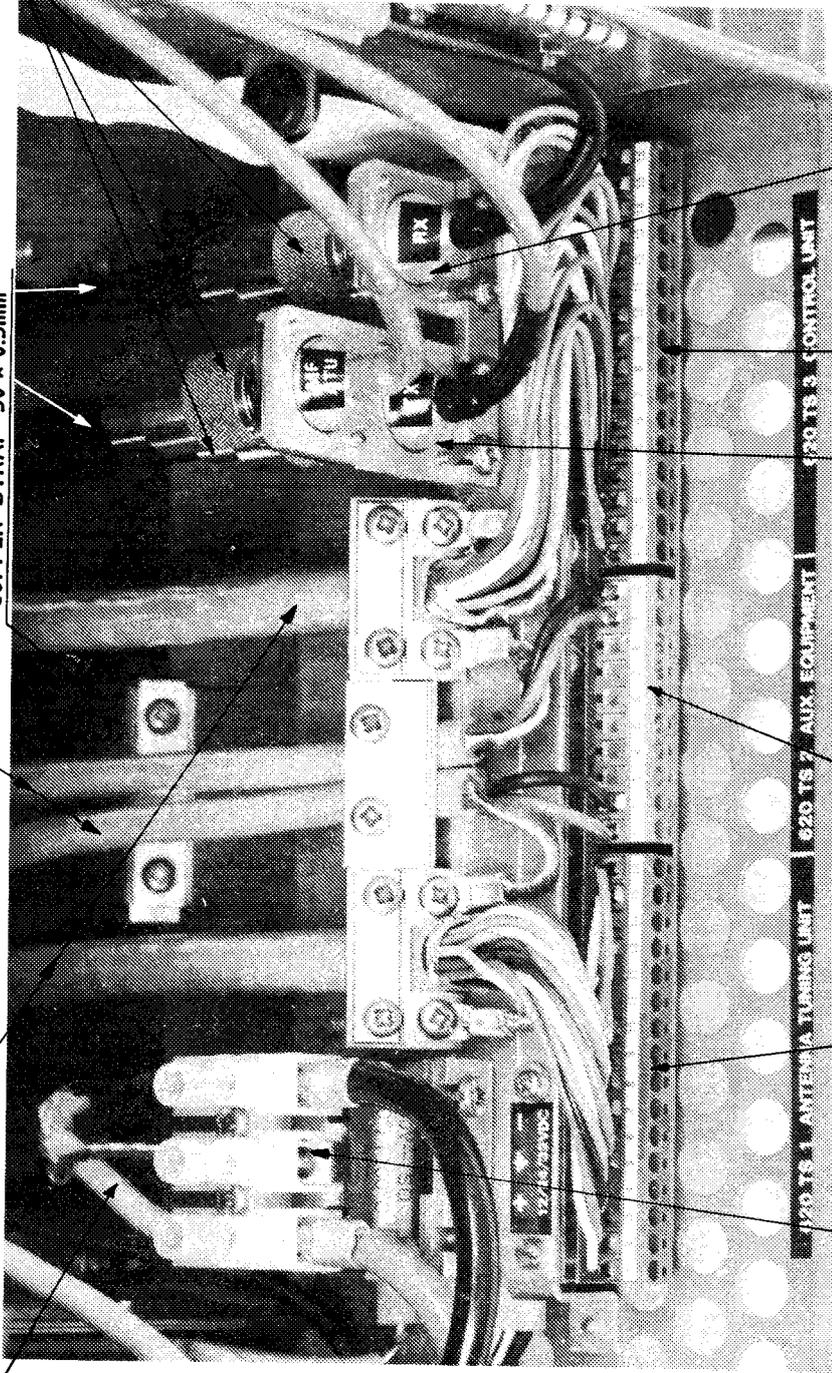
SCREENED CABLES
2 x 0.25 - 2 x 1.5mm Sq

SCREENED CABLE

COAXIAL CABLE RG - 213/U

COPPER STRAP 50 x 0.5mm

CONNECTOR PL 259



TU-TS1

620TS1

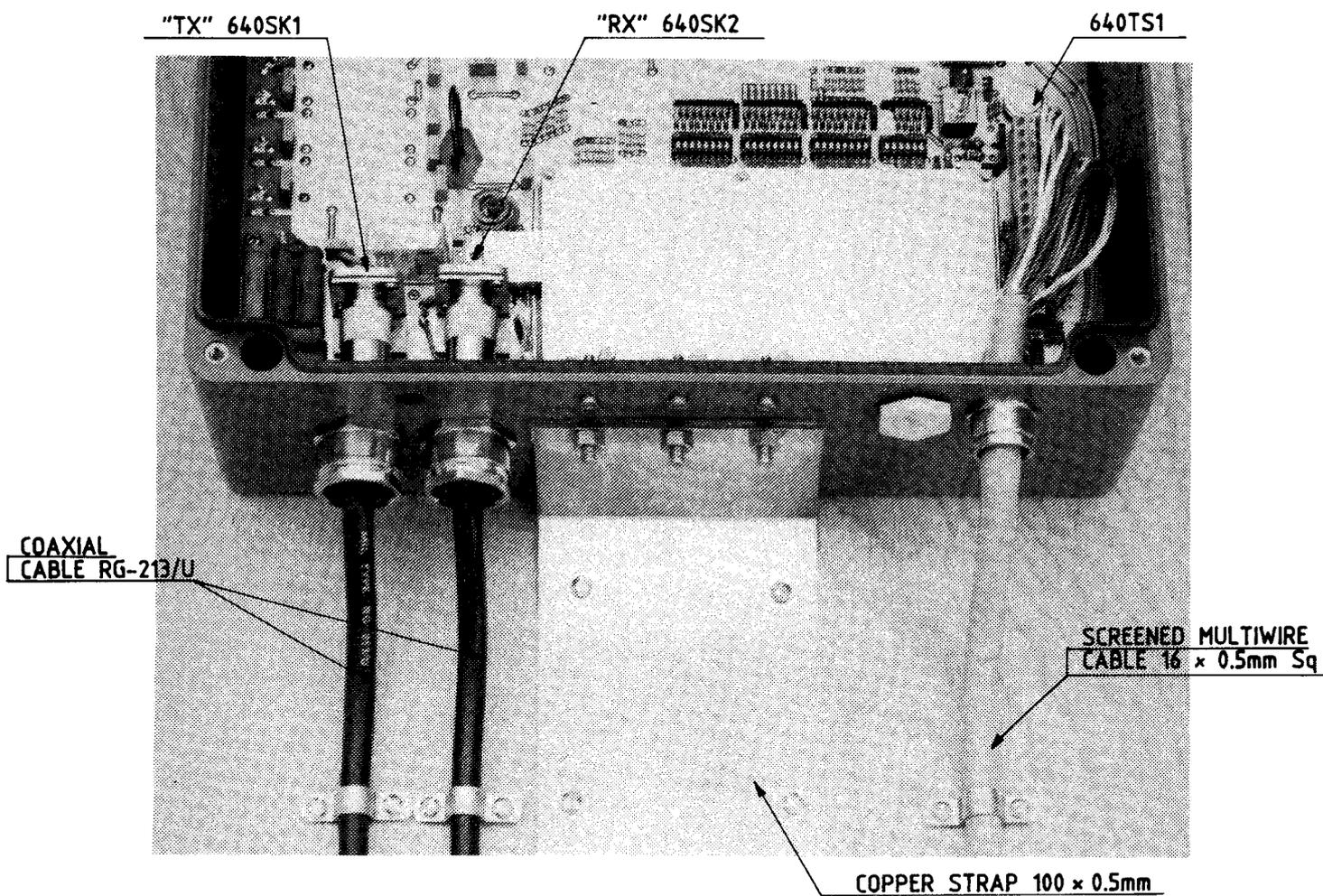
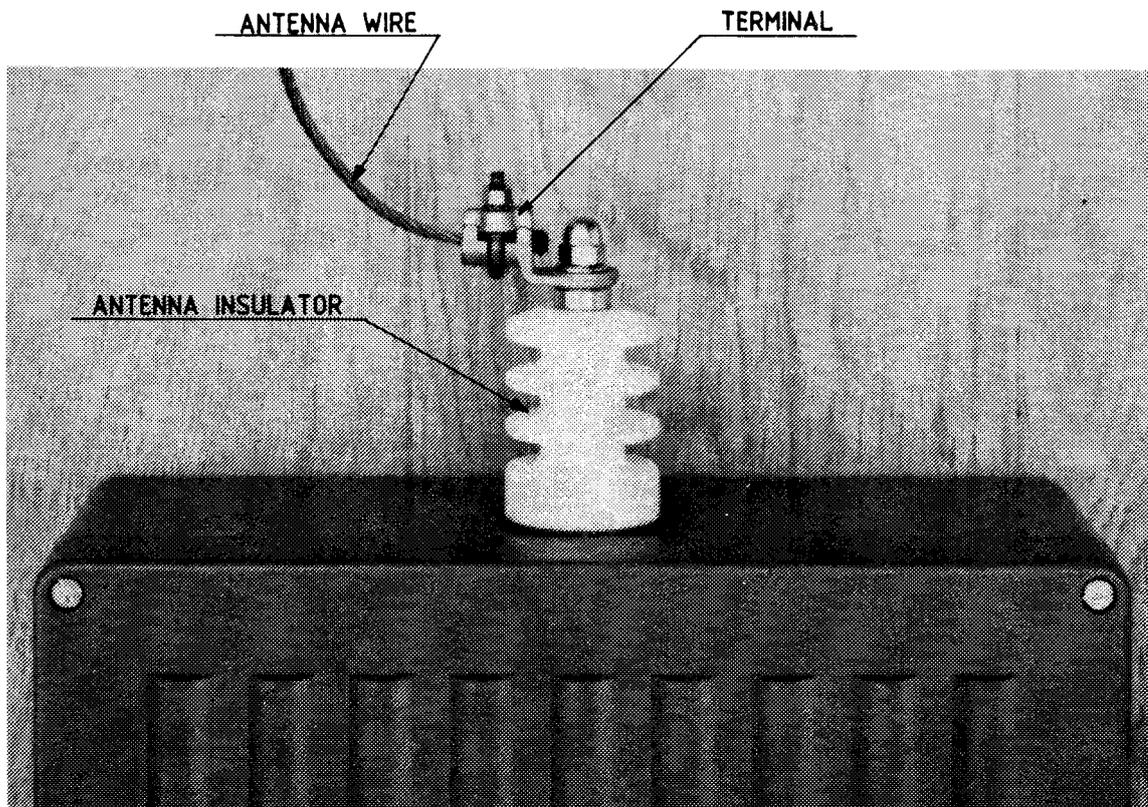
620TS2

627/628/629SK2

620TS3

TU-SK1

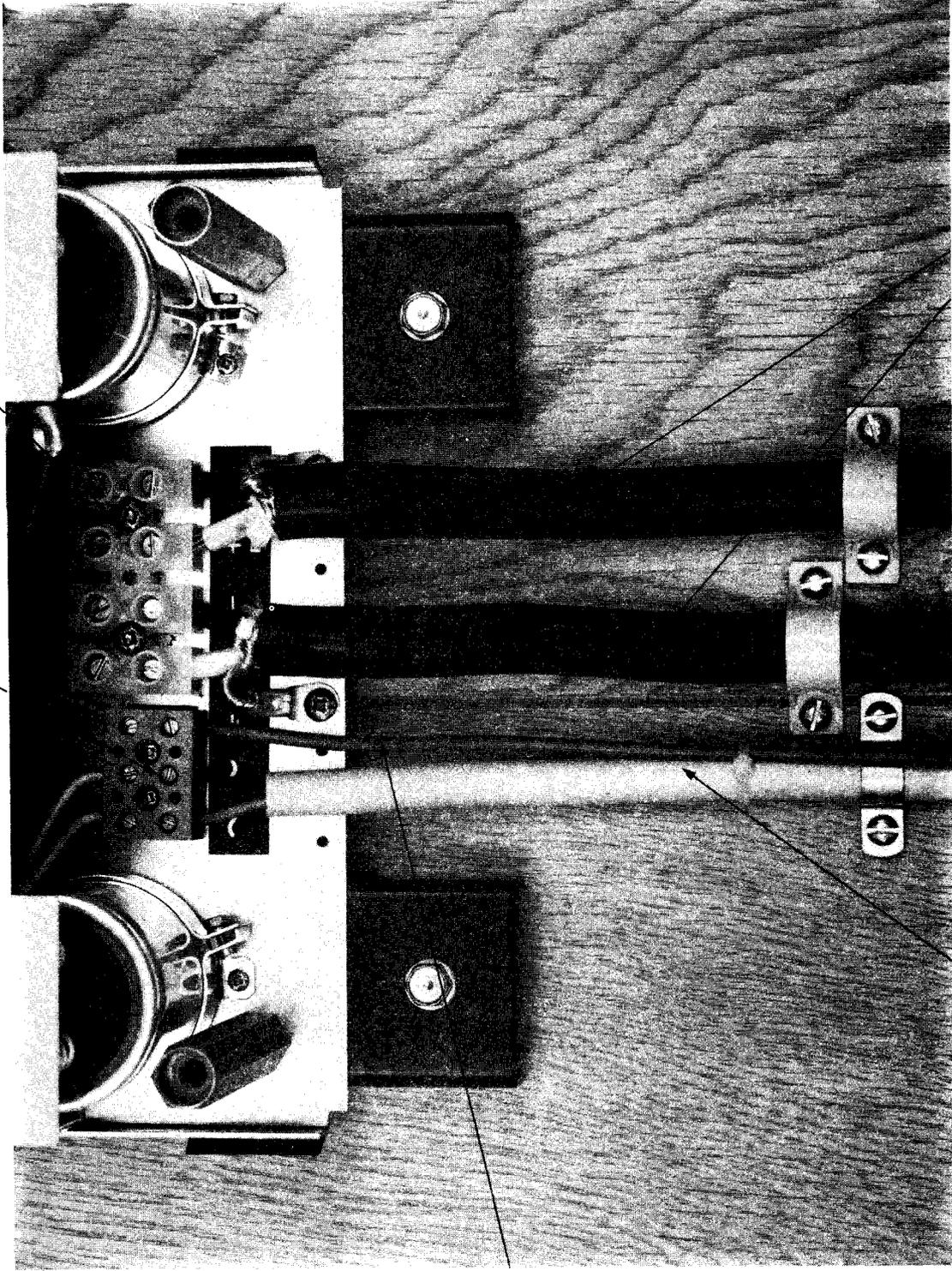
INSTALLATION WIRING OF TRANSCIVER UNIT 8250 S



INSTALLATION WIRING OF ANTENNA TUNING UNIT 8250

PSU-TS2

PSU-TS1



WIRE 1 x 2.5mm Sq

CABLE

SCREENED CABLES

INSTALLATION WIRING OF AC POWER SUPPLY UNIT 8250

6. TECHNICAL DESCRIPTION

6.1 CONTROL UNIT

The Control Unit contains a loudspeaker, two printed circuit boards, Control Board [600] and Audio Processing [601] and a membrane keyboard. In addition an optional Squelch Board [602] and an optional Line Transformer Board [603] may be installed. It furthermore contains connections for handset, headphones, extension speaker, morse-key and telex-equipment. The Block Diagram of the Control Unit illustrates the functions of each circuit board while the Interconnection Diagram shows the interconnections between the boards (see chapter 9 for diagrams). The Control Unit is housed in a Noryl (PPO) cabinet suitable for tabletop or bulkhead mounting. The front panel can be tilted for convenient operation when the unit is mounted vertically as well as horizontally.

6.2 TRANSCEIVER UNIT

The Rx/Tx Assembly of the Transceiver Unit contains the Rx/Ex Signal Path [610], a Synthesizer Board [611] and a Master Oscillator [612] (or [613], [614]). These boards are located in the door of the unit. The cabinet itself contains a Switched Mode Power Supply which converts the battery voltage to a stabilized 48 V voltage supplying the Power Amplifier and the Voltage Converter Board [621]. The Voltage Converter produces various supply voltages necessary in the equipment and provides galvanic isolation from the battery. Supply voltages, signal and control voltages are distributed via the Interconnection Board [620] to external units and to the Transceiver Control Board [624] which performs the central control of the Transceiver Unit. The exciter output signal from the Rx/Tx Assembly is routed to the Power Amplifier Board [626] the output from which is filtered by the harmonic filters on P.A. Filters [627] (or [628], [629]).

6.3 ANTENNA TUNING UNIT

The ATU consists of a Tuning Network, a Measuring System and a Microprocessor Part. During the tune sequence a 6 dB Attenuator is switched in to keep the load of the Power Amplifier at approx. 50 ohms. The MPU will set up the Tuning Network to give the best obtainable SWR, on basis of the measuring system.

The Tuning Network comprises Capacitor Bank I, Capacitor Bank II and an Inductor Bank. With these it is possible to form either an L or a pi matching network. The capacitor Banks and the Inductor Bank are built up by binary related capacitors respectively binary related coils. The setting of the Capacitors and Coils is accomplished by relays.

6.4 AC POWER SUPPLY UNIT

The P 8250 is a combined AC/DC Power Supply especially developed for powering the TRP 8250 Series. The input power for P 8250 is AC, and the output is an unregulated 32 V DC voltage.

Where a battery is required as a reserve source of electrical energy to the radiotelephone equipment, it can be connected via the P 8250 power supply. By means of the switch on the front panel it is possible to select between AC or Battery operation.

6.5 ALC AND PROTECTION SYSTEM

6.5.1 Automatic Level Control (ALC) The Transceiver Unit has an advanced microprocessor controlled automatic level system, which ensures that the optimum power is delivered to the Antenna Tuning Unit.

The Tune Sequence, which is initiated either by pressing TUNE on the Control Unit front panel or by keying the transmitter after a frequency change has been carried out, is terminated by a CW pulse of full power with a duration of 70 ms.

The signal level at the output of the Transceiver Unit is measured by means of a voltage and current peak-detector placed at the output of the P.A. Filter Assembly [627][628] or [629]. The detector voltage (9.0 V at 250 W output power) is applied to the Transceiver Control Board [624], PL3-9 (FILPEAK), and compared with the output voltage (8.62 V) of the "SETPOINT REGISTER" in IC42-3,2. The error signal ALC is fed to the RX/EX Signal Path [610], PL1-12 driving a voltage controlled attenuator placed in the exciter signal path.

Finally the ALC voltage is compared in IC42-5,6 with a ramp voltage generated by the "ALCHOLD REGISTER" and the corresponding DAC (IC24). When the two voltages equals, the ramp is stopped and switch IC44-10,11 is closed. The ALC voltage is now constant generated by the "ALCHOLD REGISTER" and thereby the gain of the Transmitter Signal Path is independent of the modulating signal.

When MEDIUM POWER is selected, the ALC voltage generated by the "ALCHOLD REGISTER" is increased by 0.93 V. In LOW POWER a 14 dB attenuator placed on the Power Amplifier Assembly [626] controlled by PAATT is activated and the ALC voltage is equal to the Full Power preset value.

6.5.2 Protection Circuits

6.5.2.1 Power Amplifier Protection The Power Amplifier Protection can be divided into two main groups, SWR protection and thermal protection.

The SWR protection contains a reflected power and output voltage detector placed at the output of the Power Amplifier Assembly [626]. The output of the detector (PAPEAK) is connected to the Transceiver Control Board [624], PL2-7 and is OR'ed together with the FILPEAK voltage from the P.A. Filter Assembly [627][628] or [629]. Now, if the SWR at the output of the Power Amplifier Assembly

[626] increases during a transmission an error voltage is generated at IC42-1 exceeding the voltage generated by the "ALCHOLD REGISTER" thereby increasing the ALC voltage and reducing the output power within 1 ms to a permissible level.

The output of the reflected power and output voltage detector is also used to make an independent local protection of the Power Amplifier by activating the 14 dB attenuator if the detector voltage exceeds 10 V. This ensures fully protection of the Power Amplifier if the ALC-loop should be faulty or disconnected. To reset the attenuator it is necessary to turn off the main power of the transceiver in a few seconds.

The thermal protection consists of two thermostiches mounted on the heatsink of the Power Amplifier Assembly and an average/peak power detector.

One thermostich is activated if the heatsink temperature exceeds 100 deg. C. Thereby logical signal TCl fed to the Transceiver Control Board [624], PL2-5 goes low and the output power is reduced by 5 dB. This is carried out by changing the reference voltage from the "SETPOINT REGISTER" to 4.36 V and increasing the voltage from the "ALCHOLD REGISTER" by 0.82 V relative to the Full Power preset value.

The other thermostich is activated if the temperature of the heatsink exceeds 110 deg. C. In this case the supply voltage to the preamplifier is cut off.

The average power and the peak power are compared in IC41-3,2. If, in a Full Power transmission, the average power exceeds the peak power minus 3 dB, the logical signal at IC41-1 goes high. If this condition has been present during one minute, e.g. by transmitting CW with continuous key-down or broadcast mode telex, the output power will be reduced by 3 dB (SETPOINT voltage 5.71 V, ALCHOLD voltage increased by 0.54 V relative to Full Power preset value). The power will recover to Full Power level when the transmitter has been muted during two minutes.

To enable Full Power ARQ Telex Transmission the system accepts keying duty-cycles less than 50 % and modulation rates greater than 3 baud without power reduction.

6.5.2.2 ATU Protection To protect the Antenna Tuning Unit against excess current, for instance if the antenna is shortcircuited, an average current detector is provided. The output of the detector IANTAVR is connected to the Transceiver Control Board [624], PL4-14 and is OR'ed together with the FILPEAK voltage from the P.A. Filter Assembly [627] [628] or [629]. Now, if the average current exceeds 6 A during a transmission an error voltage is generated at IC42-1 exceeding the voltage generated by the "ALCHOLD REGISTER" thereby increasing the ALC voltage and reducing the output power and thereby the average current.

If the SWR at the input of the Antenna Tuning Unit exceeds 1:3 logical signal SWROK goes high and Power Display Annunciator on Control Unit front panel starts flashing informing the operator that a better antenna match might be

obtained by carrying out a new Tune Sequence.

To prevent overheating of the Antenna Tuning Unit a temperature sensor is incorporated. If the internal temperature of the Antenna Tuning Unit exceeds 85 deg. C, logical signal TCO goes low and the output power is reduced by 5 dB. (SETPOINT voltage 4.36 V, ALCHOLD voltage increased by 0.82 V relative to Full Power preset value).

6.5.2.3 Reduced Power-Indication In case of 5 dB reduced power condition due to thermal protection the annunciator "Reduced Power" on the Control Unit front panel is lit. The annunciator "Reduced Power" will also turn on if the average power, in a full power transmission, exceeds the peak power minus 3 dB during one minute. In this condition the power is reduced by 3 dB.

2.4 Note if the TCXO is marked with a frequency offset.

2.5 Connect all sockets again.

2.6 Measure the temperature close to the Master Oscillator and take the necessary arrangements to keep it between 20 and 30 deg. Celsius. Be sure that thermal equilibrium has taken place before adjustment.

3. Realignment of Master Oscillator:

3.1 Disconnect the socket from PL2 on the RX/EX Signal Path **610** carrying the injection signal to the 1st. mixer. Connect the frequency counter to the socket.

3.2 Key-in USB mode and a receiver frequency of 26.68000 MHz on the Control Unit.

3.3 Adjust R1 until the counter reads $f = 71.680000 \text{ MHz} \pm 1 \text{ Hz}$. If the TCXO is marked with a frequency offset, multiply the offset by 7 and add to the frequency stated above. For example:

Frequency offset +2 Hz
Add $7 * 2 = 14 \text{ Hz}$
Adjust to $f = 71.680014 \text{ MHz} \pm 1 \text{ Hz}$

3.4 Replace all covers and sockets again.

7.2 Replacement of backup battery

The lithium backup battery should be changed within four years after its installation in the equipment. The expiration date is marked on the battery.

If the time is exceeded the battery voltage may become too low which causes the real-time clock to default to 00:00 and the contents of the user-programmable memory to get lost when the equipment is switched OFF.

The battery is located in the Control Unit on Control Board **600** and should be changed by a qualified technician.

8. TROUBLE SHOOTING AND SERVICE

8.1 Malfunction

If the equipment is not functioning correctly a check should be made that it is being operated properly, see chapter 4.

8.2 Replacement of FUSES

The Transceiver Unit contains two replaceable fuses located at the front of the Switched Mode Power Supply. The fuses become accessible when the front door is opened. Spare fuses are placed on the Switched Mode Power Supply.

The AC Power Supply Unit contains a fuse located at the front of the unit. Spare fuses are located behind the cover.

Fuse ratings are given in table 8.1 below. Fuses with marked ratings within 5 percent of the ratings must be used. Note that fast or slow blowing fuses must be used as specified.

Location	Fuse Rating	Function	Symptom if fuse is blown
Transceiver Unit	4 A fast	+48 V to Voltage Converter	Equipment dead, but Main Relay operates when Supply switch is activated. Voltage-indicator lamp in Switched Mode Power Supply is lit when power is on.
	15 A fast	48 V to Power Amplifier	No RF output power
AC Power Supply Unit	110/120 V: 12.5 A slow 220/240 V: 6.3 A slow	Mains input	No light in DC OUTPUT LAMP with mains switch position MAINS ON

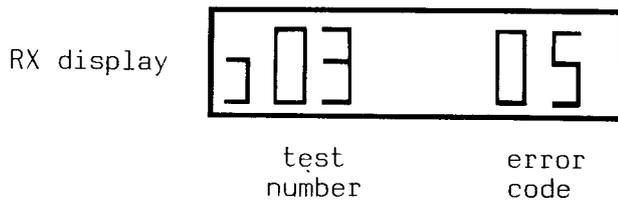
Table 8.1

8.3 HOW TO MANUALLY TUNE THE ANTENNA TUNING UNIT TO 2182 kHz IN CASE OF FAILURE IN THE AUTOMATIC TUNING SYSTEM"

1. Switch SUPPLY OFF on Control Unit.
2. Remove cover from Antenna Tuning Unit.
3. Locate AUTO/2182 kHz toggle switch and switch it to 2182 kHz (downwards).
4. Refit the cover.
5. The radiotelephone is now ready for operation on 2182 kHz only.

8.4 DESCRIPTION OF SELF TEST FUNCTIONS

Self test can be done in two different modes, auto mode and step mode. Auto mode is intended for a quick verification of all functions, it will execute all tests in sequence and stop if a malfunction is detected. Step mode is intended for service purposes, it allows step by step testing and gives the operator the possibility to make measurements during the tests and to repeat tests. Thus it can be used as a built-in signal generator for many purposes. The results of the tests are displayed on the RX display at the Control Unit. The result consists of a test number, indicating which test has been performed, and an error code indicating if the test was OK. Please note that the transmitter must be turned ON before executing the self test, otherwise the synthesizer, exciter and transmitter tests will fail.



The error codes are to be interpreted as follows:

Error code	Meaning
00	The test has passed.
01	A malfunction has been detected, refer to specific test description for precise information.
02	
-	
-	
97	
98	Communication error The test failed due to communication error between CU and TU.
99	The test can not be executed due to missing options (special IF filters etc.)

8.4.1 EXECUTION OF SELF TEST IN AUTO MODE

The self test is executed by pressing:



The test will take several seconds, during which various sounds may be heard. The test will stop when all tests have been executed, or the first time an error is detected. When the test stops, a test number and an error-code will be displayed. If the error-code is 00 no faults has been detected. If the error-code is different from 00, an error has been detected, refer to description of specific tests for information on the fault and for appropriate actions. The test result will be displayed for 10 seconds, thereafter the Transceiver will return to normal operation.

8.4.2 EXECUTION OF SELF TEST FROM AN ARBITRARY TEST NUMBER (AUTO MODE)

The self test is executed by pressing:



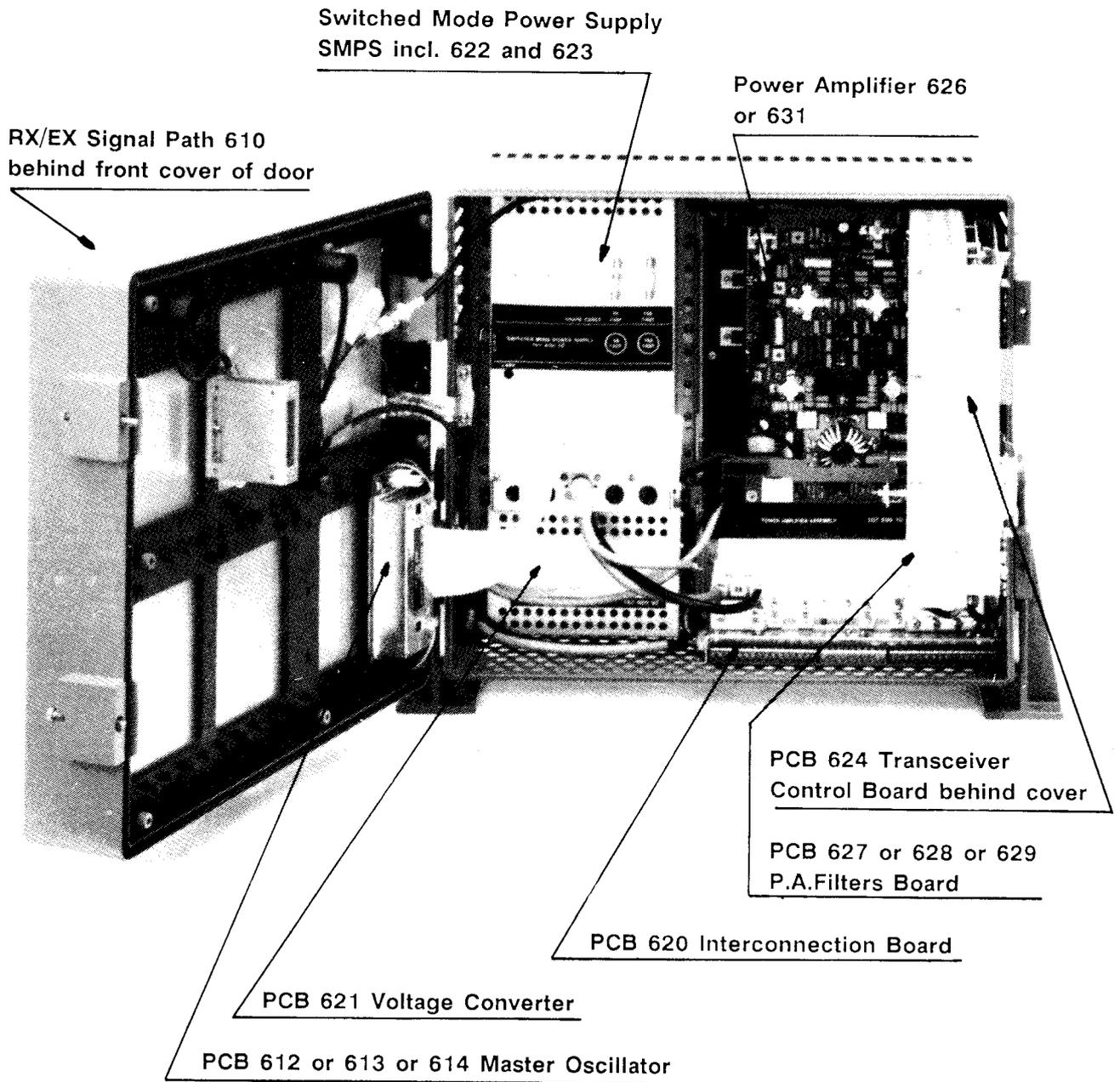
The test number is entered via the numeric keys into the receiver display. Pressing "ENTER" will start self test from the specified test number if possible. Pressing other keys than "ENTER" or numerics will resume normal operation as will pressing an invalid test number. Execution of the self test will progress as described in above passage.

8.4.3 EXECUTION OF SELF TEST IN STEP MODE

The self test is executed by pressing:



The test will start by executing test number 1 and displaying the test number and the error code. The test setup will remain until the operator presses "DIMMER UP", then it will proceed to the next test. The last test can be repeated by pressing "DIMMER DOWN". If the operator presses any key but "DIMMER UP" or "DIMMER DOWN", the Transceiver will return to normal operation. The Transceiver will return to normal operation when the last test has been executed.



Switched Mode Power Supply
SMPS incl. 622 and 623

Power Amplifier 626
or 631

RX/EX Signal Path 610
behind front cover of door

PCB 624 Transceiver
Control Board behind cover

PCB 627 or 628 or 629
P.A.Filters Board

PCB 620 Interconnection Board

PCB 621 Voltage Converter

PCB 612 or 613 or 614 Master Oscillator