TRP 7200

RADIO TRANSCEIVER

for MF/HF

TECHNICAL MANUAL

Skandinavisk Teleindustri SKANTI A/S

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INTRODUCTION Contents

GENERAL DESCRIPTION

The TRP7200 is a general purpose HF SSB transceiver covering the frequency range 1.6 to 30MHz designed for marine applications. The standard version offers simplex and semiduplex radiotelephone communication in the maritime mobile bands and is intended for installation in voluntarily as well as compulsorily fitted vessels.

The TRP7200 consists of a compact Control Unit, a fully remote controlled Transceiver Unit and an Antenna Tuning Unit. The Control Unit and the Transceiver Unit can be installed up to 50 m apart whereas the distance between the Transceiver Unit and the Antenna Tuning Unit may be as much as 100 m, all using standard screened cables.

Up to 5 Control units are easily connected to the same transceiver unit increasing the flexibility of the installation. The GMDSS requirements are from the outset designed into the TRP7200, and among a number of optional facilities a build-in radio telex modem is available.

The Control Unit contains all receiver and transmitter operating controls. It is fully push-button controlled by means of a rugged membrane keyboard, insensitive to dust and water. An LCD-display shows several information including both receive and transmit frequencies, the mode of operation and time of day. Back-light with dimmer function is included for both LCD-display and key-board to ease operation in any light condition. Mode, receive and transmit frequency set-ups can be stored and recalled directly from keyboard or used in conjunction with the 10 scan programs. Sweeping of a selected frequency range is also possible with the sweep function.

Where required by authorities transmitter frequencies can be preprogrammed into a PROM allowing transmission only on these frequencies. The compact Control Unit is easily installed horizontally as well as vertically and with the optional rotatable wedge tilted to fit into every environment.

The Transceiver Unit contains all receiver and transmitter circuitry and all connections for external equipment including an extra loudspeaker. The standard equipment has a built-in two-tone alarm generator and single key selection of 2182kHz. A squelch circuit, an low noise RF-amplifier and RF-attenuator are also included. The transceiver is fully synthesized and the receiver may be tuned in selectable steps of 1kHz, 100Hz and 10Hz.

The fully protected solid state 250W Power Amplifier, cooled by forced convection, matches a 50 ohms antenna system, but is normally used in connection with the Antenna Tuning Unit. A 12V, 24V and 32V version of the PA is available eliminating the need for any DC-DC converter.

In the standard version, the transmitter covers the marine bands between 1.6 to 30MHz, but optionally PA-filters are available which give continuous coverage of the frequency range 1.6 to 30MHz.

The microprocessor controlled Antenna Tuning Unit tunes to automatically all antennas between 5 and 18 meters and requires no presetting at the installation.The typical tune time is reduced to 0.3s.

The TRP 7200 is available as either a 12V, 24V or 32V version and mains operation is possible with the optional AC-power supply.

BASIC VERSIONS

TRP 7200   Marine HF-SSB Radio System

- 250 Watt P.E.P. Power Amplifier 24V version / 200 Watt P.E.P. Power Amplifier 12V version
- Simplex / Semi-duplex Operation.
- 896 Pre-Programmable Frequencies. Free RX Frequency.
- ITU Frequencies Pre-Programmed.
- Marine Bands: 1.6 - 30MHz.
  (1.60-4.80MHz, 6.20-8.95MHz, 12.23-17.65MHz,18.78-27.10MHz)
- Labelling: Control Unit 7200, Transceiver Unit 7200, Antenna Tuning Unit 7200 and
  AC Power Supply Unit 7200.

TRP 7201   Marine HF-SSB Radio System

- 250 Watt P.E.P. Power Amplifier 24V version / 200 Watt P.E.P. Power Amplifier 12V version
- Simplex / Semi-duplex Operation.
- Free TX frequency selection in marine bands. Free RX Frequency.
- ITU Frequencies Pre-Programmed.
- Marine Bands: 1.6 - 30MHz.
  (1.60-4.80MHz, 6.20-8.95MHz, 12.23-17.65MHz,18.78-27.10MHz)
- Labelling: Control Unit 7201, Transceiver Unit 7201, Antenna Tuning Unit 7200 and
  AC Power Supply Unit 7200.

TRP 7203   Marine HF-SSB Radio System

- 250 Watt P.E.P. Power Amplifier 24V version / 200 Watt P.E.P. Power Amplifier 12V version
- Simplex / Semi-duplex Operation.
- Free TX Frequency Selection 1.6 - 30MHz. Free RX Frequency.
- ITU Frequencies Pre-Programmed.
- Labelling: Control Unit 7203, Transceiver Unit 7203, Antenna Tuning Unit 7200 and
  AC Power Supply Unit 7200.

TRP 7204   General Purpose HF-SSB Radio System

- 250 Watt P.E.P. Power Amplifier 24V version / 200 Watt P.E.P. Power Amplifier 12V version
- Simplex / Semi-duplex Operation.
- Free TX Frequency Selection 1.6 - 30MHz. Free RX Frequency.
- Labelling: Control Unit 7204, Transceiver Unit 7204, Antenna Tuning Unit 7200 and
  AC Power Supply Unit 7200.

TRP 7205   General Purpose HF SSB-Radio System with CW facility

- 250 Watt P.E.P. Power Amplifier 24V version / 200 Watt P.E.P. Power Amplifier 12V version
- Simplex / Semi-duplex Operation.
- Free TX Frequency Selection 1.6 - 30MHz. Free RX Frequency.
- Labelling: Control Unit 7205, Transceiver Unit 7205, Antenna Tuning Unit 7200 and
  AC Power Supply Unit 7200.

TRP 7207   Marine HF-SSB Radio System with CW facility

- 250 Watt P.E.P. Power Amplifier 24V version / 200 Watt P.E.P. Power Amplifier 12V version
- Simplex / Semi-duplex Operation.
- Free TX Frequency Selection 1.6 - 30MHz. Free RX Frequency.
- ITU Frequencies Pre-Programmed.
- Labelling: Control Unit 7207, Transceiver Unit 7207, Antenna Tuning Unit 7200 and AC Power Supply Unit 7200.

TRP 7208   Marine HF-SSB Radio System

- 200 Watt P.E.P. Power Amplifier. Available as 12V, 24V or 32V version.
- Simplex / Semi-duplex Operation.
- Free TX Frequency Selection 1.6 - 30MHz. Free RX Frequency.
- ITU Frequencies Pre-Programmed.
- Automatic reduction of output power to 150 Watt P.E.P below 4MHz.
- FCC accepted version.
- Labelling: Control Unit 7208, Transceiver Unit 7208, Antenna Tuning Unit 7200 and AC Power Supply Unit 7200.

TECHNICAL DATA

GENERAL

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

Frequency Range:
1.6 - 30 MHz

Frequency Generation:
True digital frequency synthesis.

Frequency Selection:
Direct by the keyboard.
Up to 896 single frequencies.
All relevant ITU frequencies.
GMDSS Safety and Distress frequencies.
100 user-programmable channels.
(RX/TX frequency pair).
Single key selection of 2182 kHz
Scanning facilitiy
Sweep facility

Frequency Presentation:
LCD display with simultaneous presentation of receive and transmit frequencies.

Frequency Stability:
1.4 ppm
0.35 ppm (optional)
Aging: Less than 1 ppm/year

Operating Modes:
Simplex and semiduplex
SSB: Upper sideband suppressed carrier
    (J3E, USB).
USB: Upper sideband suppressed carrier
    (J3E, USB).
LSB: Lower sideband suppressed carrier
    (J3E, LSB).
R3E: Upper sideband reduced carrier (R3E).
AM: Reception/Transmission: Compatible AM
    single sideband full carrier (H3E).
    Reception: Double sideband full
    carrier (A3E).
TLX: Reception/Transmission: Single
    sideband suppressed carrier with
    modulating sub-carrier (J2B).

Sub-carrier user-programmable from 1500 Hz to 2950 Hz, default 1700 Hz. Reception: Frequency shift keyed carrier (F1B).
CW: Morse telegraphy keyed carrier(A1A)

Displayed Frequency:
Operating modes SSB, USB, LSB, R3E, AM: Carrier Frequency.
Operating mode TLX: Upconverted sub-carrier frequency
Operating mode CW: Carrier frequency

Other Facilities:
Two tone alarm generator
Backlight with dimmer function in display and keyboard
Real time clock
User-programmable Sleep Timer with up to 10 setups
Build-in selftest programme

Supply Voltage:
12, 24 and 32 Volt DC versions are available.

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

Compass Safe Distance:
See certificate on page 1-8 and 1-9.

RECEIVER CHARACTERISTICS

Frequency Range:
100 kHz to 30 MHz (10 kHz to 150 kHz with reduced performance).

Frequency Resolution:
100 Hz by keyboard entry. 10 Hz, 100 Hz or 1 kHz with the search/fine tuning facility.

BFO:
300 Hz to 3.0 kHz synthesized in 50 Hz step.

Antenna Impedance:
50 ohm. Automatically matched by the Antenna Tuning Unit.

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

IF Selectivity:
SSB: 350 Hz to 2.7 kHz
AM: +/- 3 kHz
TLX: +/- 150 Hz (optional)
CW: +/- 3.00 kHz
      +/- 1.20 kHz
      +/- 150 Hz

Sensitivity:
Antenna input (EMF) for 10 dB SINAD, 50 ohm antenna.
SSB: 0.6 μV
AM: 4 μV
TLX: 0.25μV
CW: 0.25 μV with +/- 150 Hz bandwidth
When HiSens is selected, the sensitivity is increased by approx. 5 dB.

Intermodulation:
Two 93 dBμV signals more than 30 kHz off tune (out-of-band) produces less output than an equivalent input signal of 30 dBμV.

In-band Intermodulation:
Less than -40 dB.

Cross Modulation:
Unwanted signal of 105 dBμV/30%-400Hz more than 20 kHz offset from receiver frequency, produces cross modulation less than -30dB relative to wanted signal of 60 dBμV/SSB.

Blocking:
With a wanted signal of 60 dBμV, an unwanted signal 20 kHz off tune 110 dBμV will affect the output level by less than 3 dB or cause a reduction in SINAD of less than 6 dB (SSB).

Reciprocal Mixing:
With a wanted signal giving 20 dB SINAD, an unwanted signal 20 kHz off tune and 80 dB above the wanted signal level will cause less than 6 dB reduction in SINAD (SSB).

Image Rejection:
Greater than 80 dB.

IF Rejection:
Greater than 80 dB.

Spurious Response Rejection:
Greater than 80 dB.

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 12 dB (HiSens).

RF-Attenuator:
0 dB or 20 dB.

Squelch:
Voice controlled squelch.

Audio Output Power:
Internal speaker:
1 W at less than 10% distortion.
External speaker:
5 W in 4 ohm at less than 10% distortion.

TRANSMITTER CHARACTERISTICS

Output Power: Load 50 ohm
200 W version: 200 W PEP +/-1.4 dB. 12, 24 and 32 VDC
250 W version: 250 W PEP +/-1.4 dB. 24 VDC
Output power dependent on supply voltage.

Power Reduction:
Medium: Approx. 60 W
User-programmable to approx.100, 60 or 20 W
Low: approx. 10 W

Frequency Range:
1605 kHz - 30 MHz

Frequency Resolution:
100 Hz step

Intermodulation:
Better than -31 dB PEP in standard two-tone test

Hum and Noise:
Less than -50 dB PEP (SSB)

Spurious Emissions:
Less than 43 dB/PEP, typical better than 60 dB/PEP

Supression of Unwanted Sideband:
Greater than 60 dB/PEP (1 kHz, SSB)

ANTENNA TUNING UNIT

Frequency Range:
1.6 - 30 MHz

Antenna Requirements:
5 - 18 m wire and whip antenna

Antenna Tuning:
Fully automatic with no presetting

Tuning Speed:
0.1 - 0.5 sec.

Input Impedance after Tuning:
50 ohm. SWR $\leq$ 1.6

Manual setting possible for 2182 kHz

Power Handling Capability:
250 W PEP, voice or ARQ radiotelex

REMOTE CONTROL
(with Interface-A 718 installed)

Line Input:

Input Impedance
600 ohm, balanced with center tap
Galvanic isolated

Input Level
-10 to +10 dBm

Line Output:

Output Impedance
600 ohm, balanced with center tap
Galvanic isolated

Output Level
0 dBm +/- 10 dB adjustable

Data Interface:

Interface Type
RS-232-C with optical isolation

Interface Protocol
See Technical Description

Total System Delay in TLX mode:

Ext key on to TX audio in: $\geq$ 5 ms

TX audio end to Ext key off: 0 ms

Ext key off to RX audio ready: typ. 9 ms

Scan Start/stop Input:

Scan Start
Programmable to negative or positive transition

Scan Stop
Programmable to negative or positive transition

Sweep Start/Stop Input
The scan start/stop input can alternatively be coupled to the sweep programme in the TRP 7200.

Sweep Start
Programmable to negative or positive transition

Sweep Stop
Programmable to negative or positive transition

POWER REQUIREMENTS

Supply Voltage:
12, 24 or 32 V DC (-10/+30%) versions.
Connection will not earth Supply Battery.

AC Power Supply 7200 (optional):
110, 120, 220/230 or 240 V AC (+/-10%)
For use with 24V version only.

Power Consumption (approx.):
Receive only: 40 W

200 W version:
J3E unmodulated: 70 W
FEC-telex: 410 W(270 W after 1 minute.)
J3E speach: 270 W
ARQ-telex: 240 W
CW keyed: 410 W.
H3E unmodulated: 200 W
H3E alarm 2182 kHz: 270 W

250 W version:
J3E unmodulated: 70 W
FEC-telex: 510 W(270 W after 1 minute.)
J3E speach: 350 W
ARQ-telex: 340 W
CW keyed: 510 W.
H3E unmodulated: 300 W
H3E alarm 2182 kHz: 370 W

Power Supply Unit (optional):
Width: 257 mm
Height: 308 mm
Depth: 112 mm
Weight: 15 kg, approx.

DIMENSIONS AND WEIGHTS

Control Unit:
Width: 213 mm
Height: 213 mm
Depth: 79 mm
Weight: 1.4 kg, approx.

Transceiver Unit:
Width: 370 mm
Height: 424.5 mm
Depth: 132.5 mm
Weight: 14 kg, approx.

Antenna Tuning Unit:
Width: 290 mm
Height: 352 mm (428.5 mm incl antenna horn).
Depth: 80 mm
Weight: 3.3 kg,approx.

Compass safe distance:

ADMIRALTY RESEARCH ESTABLISHMENT
Admiralty Compass Observatory
Procurement Executive, Ministry of Defence
Ditton Park, Slough SL3 7JE

Telex :   847181
Facsimile : Slough (0753) 42231 Ext : 440
Telephone : Slough (0753) 42231 Ext : 347

Reply to be addressed to : Mr N.H. Whiter

Mssrs E B Communications (UK) Ltd
20 Imperial Way
Croydon
Surrey
CRO 4RR

Attn: Mr A Blaydes

Our Ref : NAV/MCN31/361-1

Your Ref :

Date :   10 Dec 1990

Dear Sir,

COMPASS SAFE DISTANCE CERTIFICATE

1.   The results of the compass safe distance tests carried out in accordance with BS 3G 100 part 2 Section 2.4, and ISO recommendation R.694 on your equipment, are given below in metres:

DESCRIPTION	GRADE I $\frac{1}{4}°$	GRADE II & III 1°	GRADE IV 2°	REF ONLY	
				5.4°/H	18°/H
ANTENNA TUNING UNIT TRP 7200	0.5	0.3	0.3	0.4	0.3
CONTROL UNIT TRP 7200	1.2	0.7	0.6	1.1	0.8
TRANSCEIVER UNIT TRP 7200	0.5	0.3	0.3	0.4	0.3
AC POWER SUPPLY P 7200	1.2	0.7	0.6	1.1	0.7

2.   'H' denotes the mean flux density at testing station in Micro-Tesla. The minimum distance quoted with any item causing a magnetic deflection would be 0.3 metres.

3.   All distances have been rounded up to the nearest 0.1 metres in order to allow for the maximum deviation which might be caused by the most offensive sample of all units manufactured.

4.   The Admiralty Research Establishment (Admiralty Compass
Observatory) Slough, is the recognised Ministry of Defence
authority on all aspects of magnetic compasses, their uses and
installation. All results of Compass Safe Distance and Hazardous
Air Cargo tests are traceable to National Physical Laboratory
Standards through regular calibration of the ACO facility using
magnets calibrated at the NPL. ACO Slough is also accepted as an
authority by the Civilian Aviation Authority and the Dept of
Transport Marine Branch in their respective areas of
responsibility.

5.   Notice of your order will shortly be forwarded to our
accounts department who will communicate with you in due course.

                    Yours faithfully

                    N H Whiter
                    for DARE(S)

OPERATION Contents

SYMBOLS

Symbol   Description

Keying sequence
This symbol is printed on top of the decription of the keys used to perform
a given operation.

Display guidance
This symbol is printed on top of the pictures which will show you the
annunciators that a given keying sequence will activate and in this way
confirm to you that you have pressed the correct keys.

Info
This symbol is printed on top of the general information which are available
to a given operation.
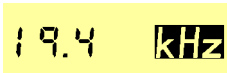
Flashing annunciator
When an annunciator (e.g. kHz) is printed in reverse it indicates
that the annunciator is flashing in the Control Unit display.

POWER ON

Turning on the TRP 7200

1. Press ⌷Supply On/Off⌷ to turn on the TRP 7200.
    The display will return the last set-up from when the transceiver was turned off.

2. Select the required illumination level for the Keyboard and Display.

    The illumination has 4 different levels:

    Press ⌷☼⌷ to toggle the illumination level.

    This example starts with no illumination.

    Press ⌷☼⌷ to switch to maximum illumination.

    Press ⌷☼⌷ to switch to medium illumination.

    Press ⌷☼⌷ to switch to minimum illumination.

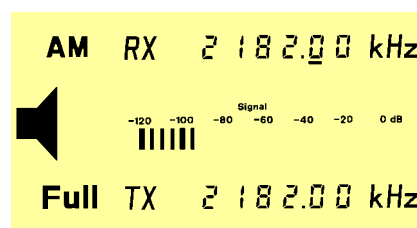   Press ⌷☼⌷ to switch to no illumination, and turn on the ⌷Supply On/Off⌷ light.

DISTRESS OPERATION

Using the 2182 kHz Distress mode.
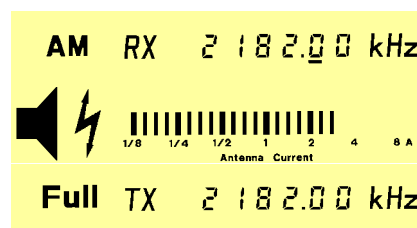
⊞ ☞   `8 8 ▷`

1.   Press [Supply On/Off] to turn on the TRP 7200.

2.   Press [2182] to select the pre-set Distress mode.

> AM RX   2182.00 kHz
>
> 🔊   Signal
>   -120 -100 -80 -60 -40 -20   0 dB
>   ‖‖‖‖‖
>
> Full TX   2182.00 kHz

3.   Press [Test Alarm] [Stop Alarm] simultaneously to transmit the Two-Tone Alarm Signal.

> AM RX   2182.00 kHz
>
> 🔊⚡ ‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖
>   1/8 1/4 1/2 1   2   4   8 A
>   Antenna Current
>
> Full TX   2182.00 kHz

The Alarm Signal will continue for 45 seconds or untill [Stop Alarm] is pressed.

4.   Press the handset key and transmit your distress message.

> AM RX   2182.00 kHz
>
> 🔊⚡ ‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖
>   1/8 1/4 1/2 1   2   4   8 A
>   Antenna Current
>
> Full TX   2182.00 kHz
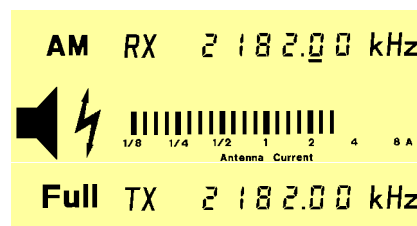
5.   Release the handset key and wait for a reply.

> AM RX   2182.00 kHz
>
> 🔊   Signal
>   -120 -100 -80 -60 -40 -20   0 dB
>   ‖‖‖‖‖
>
> Full TX   2182.00 kHz
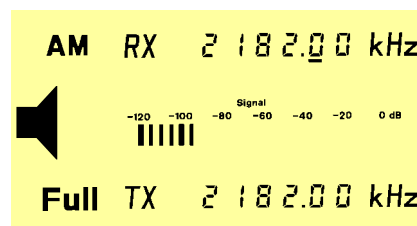
6.   Repeat your distress message untill a reply is received.

RECEIVER FREQUENCY

Entering a receiver frequency

⠿☞   `8 8 ▷`

1.   Press [RX] to clear the receiver display.   `RX          .    kHz`

2.   Enter the receiver frequency that you wish to use.   `RX    4419.4    kHz`
     e.g. **4419.4 kHz**.
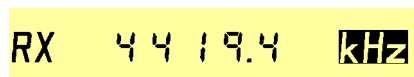
3.   Press [Enter] to complete your frequency   `RX    4419.40 kHz`
     choise

Receiver frequency range: 10 kHz to 30 MHz.
The receiver display will flash if an invalid frequency is entered .

AUDIO CONTROL

Operating Speaker, Volume and Squelch

1. Press ◁ to switch the internal Speaker on and off.
   The Speaker annunciator will be displayed when
   the Speaker is on.

   If an external speaker is connected to the Transceiver
   Unit, it can be switched on and off by pressing

   [Prog] [1] [Enter]

2. Press ◁ Volume or Volume ◁ to adjust the Speaker
   Level.
   The Speaker annunciator will flash when minimum or
   maximum speaker level is reached.

3.1. Press SQL to turn the Squelch on and off.
   The Squelch will switch on the audio in periods
   where a voice signal is received.
   The Squelch annunciator will be displayed when
   the Squelch is on.
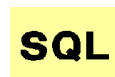
RECEIVER TUNING

Tuning the Receiver frequency.

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1. Press ◁ Rate or ▷ Rate to select the Tune Rate.   `RX   4143.62 kHz`
    The display bar will indicate the selected rate.
    e.g. **1 kHz** rate.

2. Press ▽ Tune or △ Tune to tune the receiver   `RX   4141.62 kHz`
    to the required frequency.
    e.g. Tuning down **2 kHz** from **4143.62** to **4141.62 kHz**.

AUTOMATIC GAIN CONTROL

Adjusting the receiver gain.

```
8 8  ▷
```
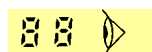
1.   For normal operation the AGC should be switced on.

2.   **AGC on**.

        The receiver sensitivity will automatically be adjusted to
         the received signal level.
        The Signal strength of the received signal is displayed.
        No further adjustment of the AGC is needed.
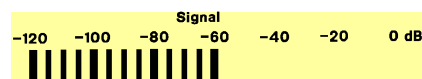
3.   **AGC on / Minimum Signal Threshold**.

        Press Sensitivity to adjust the Minimum Signal
        Threshold.
        Signals and noise below the selected Threshold
        will now be cut off.
        Is usefull when noise keeps comming up in
        signal pauses.
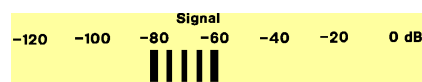
4.   **AGC on / Automatic Minimum Signal Threshold**.

        Press Prog and Sensitivity to adjust the
        Minimum Signal Threshold automatically.
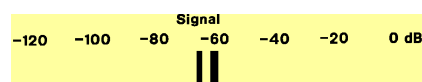
        Press Prog and Sensitivity to remove the
        Minimum Signal Threshold and return to normal
        AGC mode.
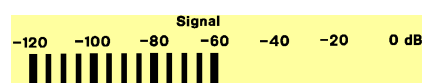
5.   **AGC off**

Press [AGC On/Off] to turn the AGC off.

The Sensitivity is now adjusted to the same Signal strength level as when the AGC was on.

```
AGC Off
                    Sensitivity
-120   -100   -80   -60   -40   -20   0 dB
```

Press [▷ Sensitivity] [◁ Sensitivity] to adjust the Sensitivity level.

```
                  Sensitivity
-120   -100   -80   -60   -40   -20   0 dB
```
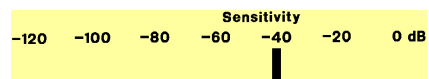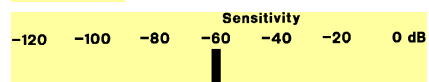
DIFFICULT RECEIVER CONDITIONS

Receiving signals under difficult conditions.

1. High Sensitivity

Press [HiSens] to increase the Sensitivity by approx. 5dB.
The HiSens annunciator is on when High Sensitivity is
selected.The HiSens should be used if very weak signals
are receiced.

High Sensitivity is switched off by pressing [HiSens] once more.

2. Antenna Attenuator

Press [Prog] [6] [Enter] to switch on and off
the receiver Antenna Attenuator. The Att annunciator
is on in the display when the Antenna Attenuator is
switched on.
The Antenna attenuator should be used when large
interferring signals are present at the receiver antenna
input.

TRANSMITTER ON/OFF

Turning the transmitter on or off.

`8 8` ▷

1. Press [TX On/Off] to turn the transmitter on.
   The TX display will display the selected
   transmitter frequency.

   `TX   6 2 1 8.6 0 kHz`

2. Press [TX On/Off] to turn the transmitter off.
   The TX display will be extinguished.

To save battery, turn the transmitteer off when only receiving is required.

TRANSMITTER FREQUENCY

Selecting a transmitter frequency

| | `88 ▷` |

1. Press **TX** to clear the transmitter display

`TX              .    kHz`

2. Enter the transmitter frequency that you wish to use. e.g. 4125 kHz.

`TX    4125.00 kHz`

3. Press **Enter** to complete your frequency choise.

`TX    4125.00 kHz`
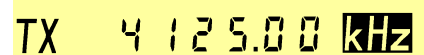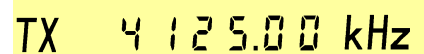
Transmitter frequency range: Dependent of Transceiver version (See below).
The transmitter display will flash if an invalid frequency is entered.

Transceiver Unit 7200: Frequencies pre-programmed in the Configuration Prom.

Transceiver Unit 7201: Frequencies in the Marine Bands (1.60 - 4.80 MHz, 6.20 - 8.95 MHz, 12.23 - 17.65 MHz, 18.78 - 27.10 MHz)

Transceiver Unit 7203, 7204, 7208: Frequencies from 1.6 MHz to 30 MHz.

POWER LEVEL

Changing The Transmitter Power Level

1.   Press [Power Level] to switch from Full to Medium power.

2.   Press [Power Level] to switch from Medium to Low power.

3.   Press [Power Level] to switch from Low back to Full power.

NEW MEDIUM POWER LEVEL

Selecting a new level for Medium power.

`88` ◢

1.   Press **Prog** **Power Level** and the first option for Medium power will be displayed: **60** W.

`Prog        6 0`

2.   Press **Power Level** and the second option for Medium power will be displayed: **100** W.

`Prog      1 0 0`

3.   Press **Power Level** and the third and last option for Medium power will be displayed: **20** W.

`Prog        2 0`

4.   When the required level for Medium power is displayed ,

press **STO** to Store the new Medium power level.

TUNE THE ATU

Tuning the Automatic Antenna Tuner .

1. The Automatic Antenna Tuner will tune the antenna to
   the best possible transmission condition the first time
   that the handset key is pressed after a new frequency
   has been selected.

   The conditions might change during a transmission and
   a new tune up will be needed.
   For example if ice is building up on the antenna or the
   vessel is heeling.

2. Press [TX Tune] to perform a new Tune procedure.
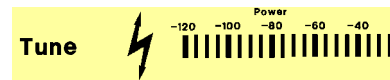
SIMPLEX FREQUENCY

Fast entry of the same frequency for both receiver and transmitter.

```
88 ▷
```

1. Press [RX] [TX] to clear both the receiver and
    the transmitter displays.

```
RX          .    kHz
TX          .    kHz
```

2. Enter the frequency that you wish to use for both
    receiving and transmitting. e.g.2049 kHz

```
RX   2049.0   kHz
TX   2049.0   kHz
```

3. Press [Enter] to complete your frequency
    choise.

```
RX   2049.00 kHz
TX   2049.00 kHz
```

COPY RX FREQUENCY

Copying the receiver frequency to the transmitter.

	`8 8 ▷`

1. You start with different frequencies in the RX and the TX displays.

	RX 4 1 4 3.6 0 kHz
	TX 6 2 1 8.6 0 kHz

2. Press `Prog` `RX` to copy the receiver frequency. Prog and the RX Bar will flash in the display.

	RX 4 1 4 3.6 0 kHz
Prog	

3. Press `TX` to transfer the RX frequency to the transmitter. The receiver frequency is now displayed in both the RX and the TX display.

	RX 4 1 4 3.6 0 kHz
	TX 4 1 4 3.6 0 kHz

COPY TX FREQUENCY

Copying the transmitter frequency to the receiver.


```
8 8  ▷
```

1. You start with different frequencies in the RX and the TX displays.

```
RX   4143.60 kHz

TX   6218.60 kHz
```

2. Press **Prog** **TX** to copy the transmitter frequency. Prog and the RX Bar will flash in the display.

```
                    ━

Prog TX   6218.60 kHz
```

3. Press **RX** to transfer the TX frequency to the receiver. The transmitter frequency is now displayed in both the RX and the TX display.

```
RX   6218.60 kHz

TX   6218.60 kHz
```

STORE A CHANNEL

Storing a channel in the User Programmable Memory

```
8 8  ▷
```

1.   Enter the required Receiver and Transmitter
     frequencies as well as the operating mode.
     e.g. **RX4143.6, TX6218.6 and mode SSB**.

```
SSB RX    4143.60 kHz

    TX    6218.60 kHz
```

2.   Press [**Prog**] [**STO**] to activate storage of the
     present set-up. The Prog and the RX bar will flash.

```
Prog                  ▬
```

3.   Enter the channel number that you wish to use as
     as storage for the set-up.
     e.g. User Programmable channel **76**.

```
Prog      C h    7 6
```

4.   Press [**Enter**] to enter your choise of User
     Programmable channel.

```
SSB RX    4143.60 kHz

    TX    6218.60 kHz
```

User Programmable Channels: 100 from channel no. 0 to 99.

RECALL A CHANNEL

Recalling an ITU channel or a channel stored in the User Programmable Memory.

              `88 ▷`

1.   Press **RCL** and the display will be cleared.

              `▬`

2.   Enter the required channel number.
        e.g. ITU channel 1221.

              `CH 1221`
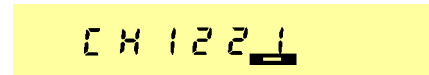
3.   Press **Enter**. The Receiver and the
Transmitter frequencies stored in channel 1221 is
now selected and will be displayed.

              `RX 13162.80 kHz`

              `TX 12392.00 kHz`
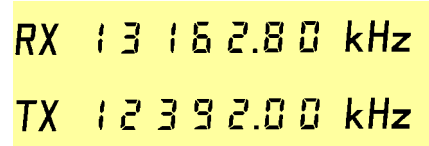
Recall Numbers:

0 - 99 :	User Programmable Channels.
100 - 129 :	GMDSS Distress and Safety Frequencies.
200 - 399 :	Direct Recall of the first 200 of up to 896 Pre-Programmed frequencies.
401 and up:	ITU Frequencies.

See also Installation page 3-45 to 3-55.

CHANGE MODE

Selecting another Operating Mode

⠿☞   `88 ▷`

1.   Press [AM] to switch to AM.   **AM**

2.   Press [SSB] to switch to SSB.   **SSB**

3 .   Press [TLX] to switch to TELEX.   **TLX**

4.   Press [Prog] [2] [Enter] to switch to LSB.   **LSB**

5.   Press [Prog] [3] [Enter] to switch to R3E.   **R3E**

📖

LSB is only enabled in the Basic versions TRP 7204 and TRP 7208.

CHANNEL SCANNING, SET UP

Setting up a Channel Scanning program

1. Press [Prog] [Scan] to start the programming.
    The currently selected Scan Program Number is
    displayed. e.g. **0**.

2. Enter the Scan Program Number that you wish to
    programme.
    e.g. **1**.
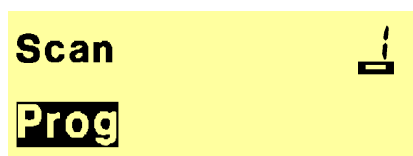
    Press [**Enter**] to select the Program Number.

    Start programming.

3. Enter the Number Of Channels that you wish to scan.
    e.g. **3**.

    Press [STO] to store the Number Of Channels.

4. Enter the number of the Trigger Source that you want
    to use : **0** = no trigger source, **1** = squelch,
    2 = signal strength, **3** = squelch or signal strength,
    4 = squelch and signal strength.
    e.g. **2**.
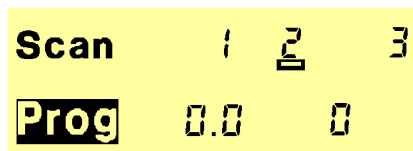
    Press [STO] to store the Trigger Source.

    Because signal strength is selected as Trigger Source
    in this example, you must set the corresponding sensitivity
    level now.

5.   Press [◁ Sensitivity] or [▷ Sensitivity] to adjust the
      sensitivity level.
      e.g. sensitivity **-80** dB
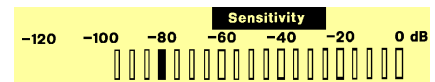
      Press [STO] to store the level.

6.   Enter the Dwell Time which is the period in which the
      receiver will "listen" for a signal on each frequency.
      e.g. **2.5** seconds.
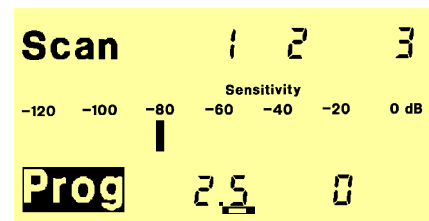
      Press [STO] to store the Dwell Time.

7.   Enter the Hold Time which is the period in which the
      receiver will stay on a frequency if the Trigger Source
      has detected a signal.
      e.g. **20** seconds.
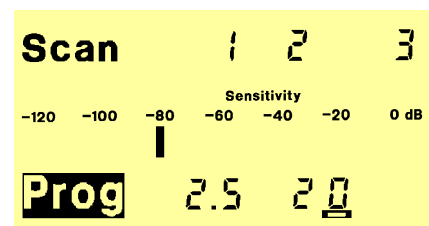
      Press [STO] to store the Hold Time.

      Now the channels that you wish to scan must be stored in the Scan Table.

8.   Enter the first Channel Number to be scanned.
      e.g. ITU ch. **403**
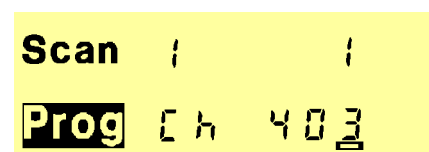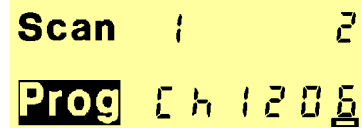
      Press [STO] to store the channel.

9. Enter the second Channel Number to be scanned.
    e.g. ITU ch. **1206**

    ```
    Scan  1      2
    Prog  Ch 1206
    ```
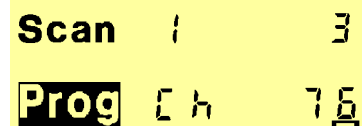
    Press [STO] to store the channel.
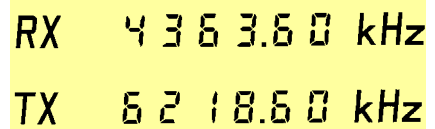
10. Enter the third Channel Number to be scanned.
    e.g. ch. **76** from the User Programmable Memory.

    ```
    Scan  1      3
    Prog  Ch    76
    ```

    Press [STO] to store the channel.

    When the last channel is stored, the transceiver
    will return to normal operation.

    ```
    RX  4363.60 kHz
    TX  6218.60 kHz
    ```

CHANNEL SCANNING, SET UP *INFO*

Scanning parameters:
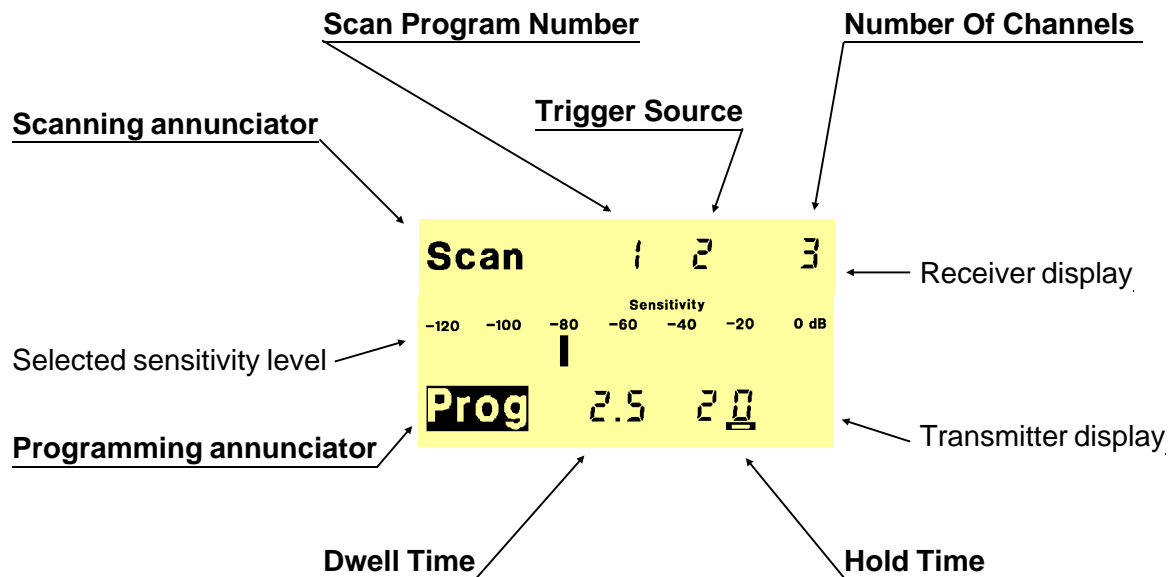
Scanning annunciator: Will be on during the programming.

Scan Program Number: **10** Scan Programs. Selectable from number **0** to number **9**.

Trigger Source: Selectable with number **0** to **4**. **0** = no trigger source, **1** = squelch,
2 = signal strength, **3** = squelch or signal strength, **4** = squelch and signal strength.
(**5** to **9** will be defaulted to **0**).

Number Of Channels to be scanned: The maximum number is depending on the currently
occupied scan memory, however not bigger than **99**. Enter the required number and TRP 7200
will inform you if the available memory is too small, by flashing the number.
If you store a bigger number of channels than required TRP 7200 will reduce the alocated
memory to the actual need, after the scan table has been stored and then update the Number Of
Channels to be scanned to the actual number.

Insert extra channels: Add the number of extra channels to the current number and store the
new number as the Number Of Channels to be scanned. You may now store the new channels
at the end of the Scan Table.

Delete a number of channels from the end of the scan table: Subtract the number of channels
that you wish to delete from the current number and store the new number as the Number Of
Channels to be scanned.

Delete a Scan Program: Store **00** as the Number Of Channels to be scanned.

Programming annunciator: Will flash during the programming.

Dwell Time: The period in which the receiver will "listen" for a signal on each frequency in the Scan Table. Selectable from **0.1** seconds to **9.9** seconds.

Hold time: The period in which the receiver will stay on a frequency in the Scan Table if the Trigger Source has detected a signal. Selectable from **1** second to **98** seconds.

No Hold Time: Store a Hold Time = **0** seconds.

Manual scanning: If you want to scan manually (press the Scan key to step to the next frequency in the Scan Table), store a Dwell Time = **0** seconds.

Automatic Stop: If you want to stop the scanning when the Trigger Source detects a signal , store a Hold Time = **99**.

Scan Table:

Scan Program Number   **Scan Table Counter**

```
Scan   1      2
Prog  Ch 1206
```
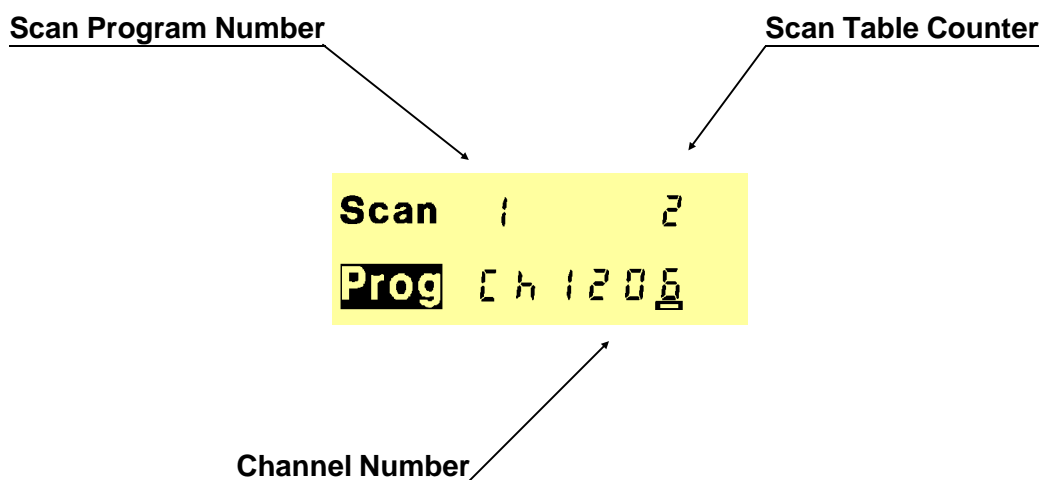
Channel Number

Scan Program Number: **10** Scan Programs. Selectable from number **0** to number **9**.

Scan Table Counter: Displays the current position in the Scan Table.
 e.g. ITU channel 1206 will be stored as the second channel in this Scan Table.

Channel Number: An ITU channel or a channel stored in the User Programmable Memory.

View parameters and channels of a Scan Program: Press Prog Scan STO STO . . .

Delete a channel: Store **9999** as Channel Number in the scan table position that you wish to delete.

Replace a channel: Store the new Channel Number in the position of the channel you want to replace.

Leave a Scan Program: You may leave the programming at any time by pressing ⌐Enter⌐

CHANNEL SCANNING, RECALL PROGRAM

Recalling a Scan Program

`88` ▷

1. Press [RCL] [Scan] to recall one of the 10 Scan Programs. The latest selected Scan Program will be displayed.
   e.g. Scan Program Number 0.
   Scan Programs are selected with numbers from o to 9.

Scan   `0`

2. Choose and enter the Scan Program Number
   e.g. Scan Program Number 1.

Scan   `1`

Press [**Enter**] to complete your choise.

3. The Scanning parameters for the selected Scan Program will now be displayed.
   e.g.
   Scan Program Number = 1
   Trigger Sourse = Signal Strength (2)
   Number of Channels to be scanned = 3
   Dwell time = 2.5 seconds
   Hold Time = 20 seconds

Scan   `1`   `2`   `3`
          `2.5`   `20`
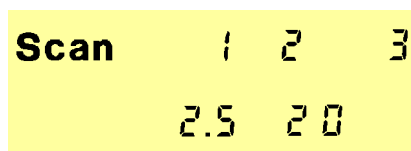
Press [**Enter**] to return.
The Transceiver will now return to normal operation.

`RX`   `4143.60 kHz`

`TX`   `6218.60 kHz`
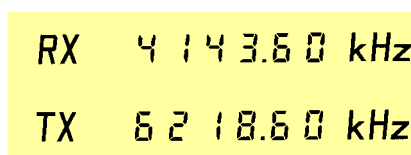
CHANNEL SCANNING, START/STOP

Operating the Channel Scanning.

⌗ ☜

`88 ▷`

1. Press [Scan] to start Channel Scanning.
    The Scan Program Number of the selected
    Scan Program will shortly be displayed.
    e.g.Scan Program Number 1.

`Scan      1`

2. Channel Scanning:

`Scan RX   4363.60 kHz`

`         Ch  403`

`Scan RX  13116.30 kHz`

`         Ch 1206`

`Scan RX   4143.60 kHz`

`         Ch   76`

3. Stop Channel Scanning:

3a. Press [Scan] to stop the Channel Scanning.
    Scanning will start on the next channel in the Scan

    Table when you press [Scan] again.

`RX   4143.60 kHz`

`TX   6218.60 kHz`

3b. Press [Enter] to stop the Channel Scanning.
    Scanning will start on the first channel in the Scan

    Table when you press [Scan] again.

    Receiver and Transmitter frequency of the channel
    which was displayed when you stopped the scanning
    will now be displayed.
    e.g. User Programmable channel 76: RX= 4143.6 kHz
    and TX= 6218.6 kHz.

FREQUENCY SWEEPING, SET UP

Setting up the Sweep Program.

⊞☞   `88 ▷`

1.   Press [Prog] [Sweep] to start the programming.
     The currently stored Sweep parameters is
     displayed.
      e.g. No parameters is stored..

     Sweep   0
     Prog 0.0   0

2.   Enter the number of the Trigger Source that you want
     to use: 0 = no trigger source, 1 = squelch
     2 = signal strength, 3 = squelch or signal strength,
     4 = squelch and signal strength.
   e.g. 2.

     Press [STO] to store the Trigger Source.

     Sweep   2
     Prog 0.0   0

     Because signal strength is selected as Trigger Source
     in this example, you must now set the sensitivity level.

3.   Press [◁ Sensitivity] or [▷ Sensitivity] to ad just the
     sensitivity level.
     e.g. Sensitivity -80 dB.
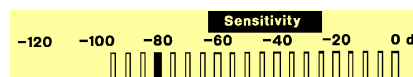
     Press [STO] to store the level.

     Sensitivity
     −120 −100 −80 −60 −40 −20 0 dB

4.   Enter the Dwell Time which is the period in which the
     receiver will "listen" for a signal on each frequency.
     e.g. 2.5 seconds.

     Press [STO] to store the Dwell Time.
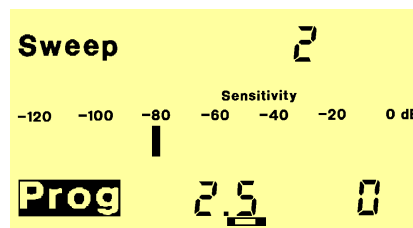
     Sweep   2
                  Sensitivity
   −120 −100 −80 −60 −40 −20 0 dB
     Prog 2.5   0

5. Enter the Hold Time which is the period in which the receiver will stay on a frequency when the Trigger Source has detected a signal.
    e.g. 20 seconds.

    Press **STO** to store the Hold Time.

```
Sweep        2
Prog    2.5  20
```

6. Enter the Step Frequency which is the frequency distance between all frequencies in the sweep.
    e.g. 3.1 kHz.

    Press **STO** to store the Step Frequency.

```
Sweep     3.10 kHz
Prog
```

7. Enter the Start Frequency .
    e.g. 8718.9 kHz.

    Press **STO** to store the Start Frequency.

```
Sweep 8718.9   kHz
Prog        0.0
```

8. Enter the Stop Frequency .
    e.g. 8811.9 kHz.

    Press **STO** to store the Stop Frequency.

```
Sweep 8718.9   kHz
Prog 8811.9    kHz
```

FREQUENCY SWEEPING, SET UP *INFO*

Sweep parameters:

Sweep annunciator   Trigger Source

Selected sensitivity level   Receiver display

Programming annunciator   Transmitter display

Dwell time   Hold time
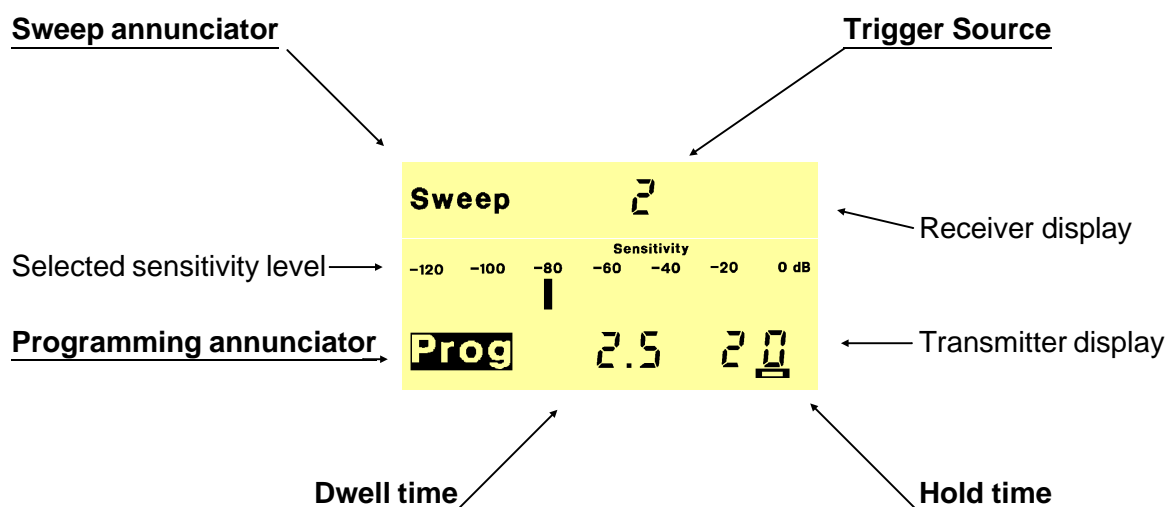
Sweep annunciator : Will be on during the programming and will flash during a frequency Sweep.

Trigger Source : Selectable with number 0 to 4. 0 = no trigger source, 1 = squelch, 2 = signal strength, 3 = squelch or signal strength, 4 = squelch and signal strength. (5 to 9 will be defaulted to 0).

Programming annunciator : Will flash during the programming.

Dwell time : The period in which the receiver will "listen" for a signal on each frequency in the Sweep Band. Selectable from 0.4 seconds to 9.9 seconds.

Hold time : The period in which the receiver will stay on a frequency in the Sweep Band if the Trigger Source has detected a signal. Selectable from 1 second to 98 seconds.

Step Frequency : The distance between the frequencies in the Sweep Band.

Start Frequency : The first frequency in the Sweep Band.

Stop Frequency : The last frequency in the Sweep Band.

FREQUENCY SWEEPING, START/STOP

Operating the frequency Sweeping

`88` ▷

1. Press **Sweep** to start frequency sweeping using the stored Sweep parameters.

    Sweep *RX*   *8718.90 kHz*

    Sweep *RX*   *8722.00 kHz*

    Sweep *RX*   *8725.10 kHz*

2a. Press **Sweep** to stop the frequency sweep. Sweeping will start on the next frequency

    in the band when you press **Sweep** again.

2b. Press **Enter** to stop the frequency sweep. Sweeping will start on the first frequency

    in the band when you press **Sweep** again.

    The Receiver frequency which was displayed when you stopped the Sweep will now be displayed.

    RX   *8725.10 kHz*

SLEEP TIMER, SET UP

Setting up a Sleep Program.

	`88 ▷`

1. Press **Prog** **Sleep** to start the programming.
    The currently selected Sleep Program is
    displayed. e.g. 0.

	0
Prog	
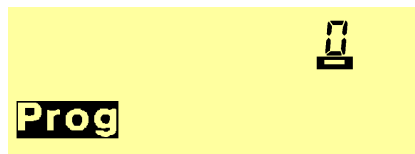
2. Enter the Sleep Program Number that you whish
    to programme.
    e.g. 9.

	9
Prog	

    Press **Enter** to select the program number.

3. Enable/Disable the Sleep Program:
    0 = Disable Sleep Program
    1 = Enable Sleep Program
    e.g. 1.

9	**1**
Prog	

    Press **STO** to store your choise.
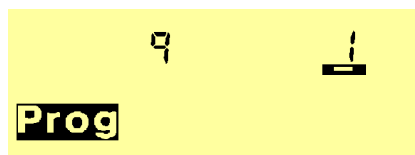
4. Enter the Channel Number that you whish to use
    when the Sleep Program turns on the transceiver.
    e.g. ITU channel 802.

9	1
Prog	Ch 80**2**

    Press **STO** to store the Channel Number .
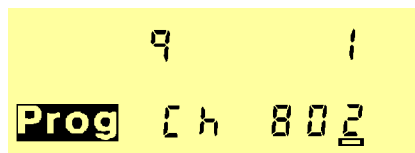
5.   Enter the Wake Up Time which is the time of day
that you wish this program shall turn on the transceiver.
e.g. 15.00 (3.00 PM).

Press ☐STO☐ to store the Wake Up Time.

6.   Enter the Fall Asleep Time which is the time of day
that you wish this program shall turn off the transceiver.
e.g. 15.30 (3.30 PM).

Press ☐STO☐ to store the Fall Asleep Time.

When the Fall Asleep Time is stored, the transceiver
will return to normal operation.

SLEEP TIMER *INFO*

Timer parameters:

Sleep Program Number   **Sleep Program Enable/Disable**

```
              9         1
Prog   Ch   802
```

Receiver display
Transmitter display

Wake Up Channel

Programming annunciator
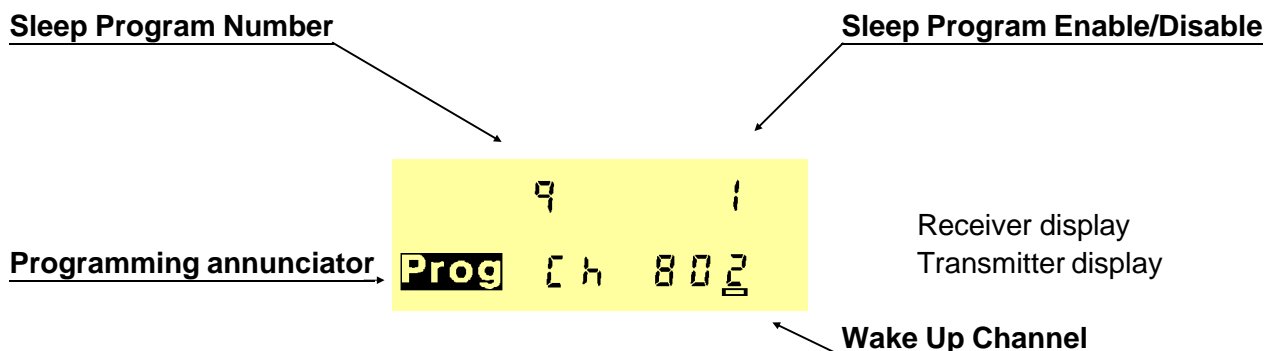
Sleep Program Number: 10 Sleep Programs. Selectable from **0** to **9**.

Sleep Program Enable/Disable: 0 = Disable Sleep Program, **1** = EnableSleep Program.

Programming annunciator: Will flash during the programming.

Wake Up Channel: The receiver and transmitter will be set to the frequencies of this channel when the Sleep Program turns on the transceiver.

Wake Up Time

```
         1500
         1530
```

Receiver display
Transmitter display
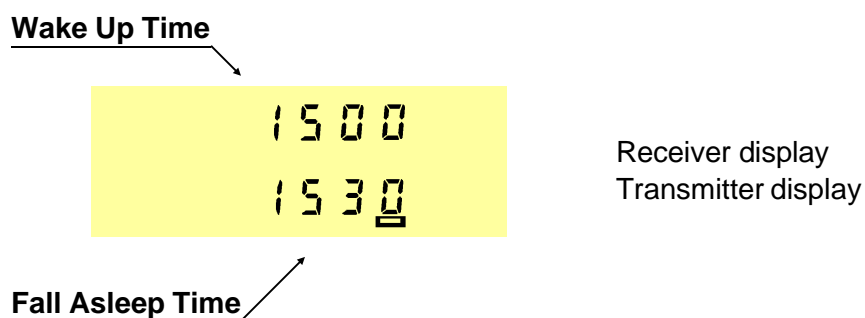
Fall Asleep Time

Wake Up Time: At this time the Sleep Program will switch on the transceiver.

Fall Asleep Time: At this time the Sleep Program will switch off the transceiver.

Wake Up and Stay On: If the the Fall Asleep time is set to the same time as the Wake Up time the Transceiver will switch on and stay on at this time.

SLEEP TIMER ON

Turning on the Sleep Timer.

⠿👉

`8 8 ▷`

1. Press $\boxed{\text{Sleep}}$ to switch off the transceiver and
   activate the Sleep Programs.
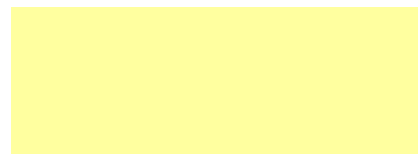
2. When the Wake Up Time of one of the enabled
   Sleep Programs is reached the transceiver
   will automatically switch on.
   e.g. 15:00.
   The receiver and the transmitter
   frequency will be set up to the channel which was
   stored in this program.
   e.g. ITU channel 802
   with RX frequency 8722 kHz
   and TX frequency 8198.1 KHz.

   `RX    8722.00 kHz`
   `15:00`
   `TX    8198.10 kHz`
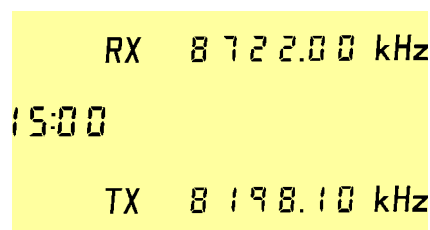
3. When the Fall Asleep Time of a Sleep Program
   is reached the transceiver will be turned off.

📖
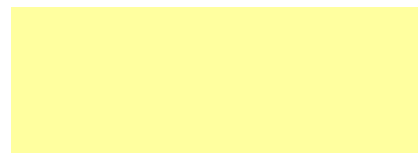
When the Sleep Timer is activated and has switched on the Transceiver, you may
operate the Volume Up, Volume Down and Speaker On/Off switch.
If you want to deactivate the Sleep Timer, just press any other key than the Volume
and Speaker keys.
If you want to activate the Sleep Timer again, it is necessary to press the Sleep key.

OPTIONAL AC POWER SUPPLY 7200

Operating the AC power supply, P7200.

1.   Press [Mains] to select the AC Mains for power source.

2.   Press [Battery] to select the Battery for power source.

3.   Press [Off] to turn off the power supply.

The P7200 must be pre-set for both No-Break operation and for Power-up state.
The No-Break and Power-up state jumpers are located on the AC Control Board
(see page 3-15).

No-Break operation
Jumper in Off position: If the AC fails, the DC supply for the transceiver will be cut off.
Jumper in ON position: If the AC fails , the P7200 will automatically switch to the connected bat-
tery and when the AC supply recovers, switch back to AC supply. All without interrupting your
transmission.

Power-up state
The Power-up state jumper decides if the P7200 will start up in Mains or Off when the supply
recovers after a fail on both Mains and Battery.

P7200 FAULT DIAGNOSIS

The indicator on each key along with the table below will help you to decide if the AC or the Battery supply is missing when you press a key and the expected switch is not performed.

Switching from:	**Pressing:**	**Indication:**	**Problem caused by:**

No-break Operation Off:

Off	Battery	Off	1. Battery not connected. 2. Output shortcircuited. 3. Temperature too high, P7200 is not mounted according to the instructions.
Off	Mains	Off	1. Mains not connected. 2. Output shortcircuited. 3. Temperature too high, P7200 is not mounted according to the instructions.
Mains	Battery	Off	1. Battery not connected.
Battery	Mains	Off	1. Mains not connected.

Switching from:	Pressing:	Indication:	Problem caused by:
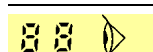
No-break Operation On:

Off	Battery	Off	1. Output shortcircuited. 2. Temperature too high, P7200 is not mounted according to the instructions.
Off	Mains	Off	1. Output shortcircuited. 2. Temperature too high, P7200 is not mounted according to the instructions.
Off	Mains	Battery	1. Mains not connected.
Battery	Mains	Battery	1. Mains not connected.
Mains	Battery	Off	1. Battery not connected.
Mains		Battery	1. Voltage drop-out on Mains supply. When Mains supply is recovered; automatic switch back to Mains operation.

The same features as described above along with a light
dimmer function are available with the AC Remote Control.

USER PROGRAMMABLE FUNCTIONS

By using the "Prog" key extra functions and features may be selected, and programming of the equipment is possible.

User Programmable Functions are selected by pressing:

Prog   **0-99**   Enter
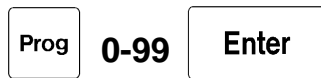
Some functions requires further key entries where as others requires storing of parameters with the "STO" key or stepping forward with the "Volume Up" key.

The following is a list of the Functions which are selected by their number:

0 - 9 : Select modes and features.

10 - 19 : Select special functions.

20 - 74 : Installation and service.

98 : Security Code.

99 : Select Configuration Mode.

No.	Function
0 :	Leave System to other User.
1 :	Switch External Speaker on/off.
2 :	Select LSB Mode.
3 :	Select R3E Mode.
6 :	Switch RF Attenuator On/Off.
7 :	Float Antenna.
8 :	Ground Antenna.
9 :	Switch "Boop" Sound On/Off.
10:	Select Intercom.
11:	Set Real Time Clock.
13:	Tilt Viewing Angle of Display.
14:	Toggle Bar-graph Reading, Power or Amperes.

20:	Automatic Stepped Self-test.
21:	Manually Stepped Self-test.
22:	Read Protection Code.
23:	View ATU Relay Setting.
24:	View ATU Relay Setting and Store Power Parameters.
25:	Read CU Priority / Intercom Number.
26:	View CU Software Version, Release and Release Date.
27:	View TU Software Version, Release and Release Date.
28:	View TU Configuration Customer ID, Version, Release and Release Date.
29:	View ATU Software Version, Release and Release Date.
30:	Read Accumulated On Time.
32:	View RX / EX Signal Path 715 Version.
33:	View Option Filter.
34:	View Power Amplifier Version.
35:	View PA Filter Version.
36:	View ATU Status.
37:	View Dummy Load.
38:	View ATU Fan.
39:	View Optional Interface Board.
40	Switch all Annunciators On in Display.
41	Switch Beep Sound On.
42	Switch Boop Sound On.
43	Switch High-beep Sound On.
45	Display Customer Secified Frequencies Pre-Programmed in Configuration PROM.
74	View Supply Voltage
98	View and Change Security Code.
99	Select Configuration Mode.

Description of User Programmable Functions

No.   Function

| 0 |

 Leave System to other User.

| 1 |

Switch External Speaker On/Off.

| 2 |

Select LSB Mode.
Both Receiver and Transmitter is set to LSB (J3E) mode. "LSB" annunciator is switched on.

| 3 |

Select R3E Mode.
Receiver is set to USB (J3E) mode, Transmitter to R3E (USB) mode and "R3E" annunciator is switched on.

| 6 |

Switch RF Attenuator On/Off.
When heavy interfering signals are present at the receiver input, reception quality can be improved by switching on the RF Attenuator.
"Att" annunciator is switched on when the RF Attenuator is on.

| 7 |

Float Antenna.
When the optional Dummy Load is installed in the ATU it is possible to disconnect (Float) the antenna.
When the antenna is floating the display shows:

Float

   ant

and the Transceiver can neither receive nor transmit.
Press "Enter" to connect the antenna again and return to normal operation.

| 8 |

Ground Antenna.
When the optional Dummy Load is installed in the ATU it is possible to connect the antenna to ground.
When the antenna is grounded the display shows:

gnd ant

and the Transceiver can neither receive nor transmit.
Press "Enter" to return to normal operation.

9

Switch "Boop" sound On/Off .
If an illegal key is pressed the CU will sound a "Boop". This feature may be
selected / inhibited to suit the individual operator.

1 **0**

Select Intercom.
When more than one Control Unit is connected the TRP 7200 can act as a normal
telephone with intercommunication between any two control units.
After "Prog" "10" "Enter" is pressed the display shows

Phone _

Enter "phone number" of the wanted Control Unit and press "Enter".

The wanted CU will start beeping until the handset is hooked-off.
Normal intercommunication in full duplex can now take place with all other
control units muted.
The Intercom facility is automatically disabled first time the handset of the calling
CU is hooked-on, and the Transceiver returns to normal operation.

1 **1**

Set Real Time Clock.
After "Prog" "11" "Enter" is pressed the Clock Display is cleared and the correct
time of day can be entered with the numeric keys.
Press "STO" and the Real Time Clock is started in the same moment.

1 **3**

Tilt Viewing Angle of Display.
To obtain the best possible legibility the viewing angle of the display may be
toggled between two positions by pressing "Prog" "13" "Enter".

1 **4**

Toggle Bar-graph Reading, Power or Amperes.
By pressing "Prog" "14" "Enter" it is possible to change the transmitter Bar-graph
display between either power or antenna current.

2 **0**

Automatic Stepped Self-test.
The Automatic Stepped Self-test is started and the step number together with
the error code is shown in the Display. The Self-test may be interrupted by
pressing the "Enter" key.
If an error is detected the Self-test is stopped with step number and error code
constantly displayed, until "Enter" is pressed which makes a return to normal
operation.
See description of the Self-test.

2 **1**

Manually Stepped Self-test.
The Manually Stepped Self-test is started from a user selectable step number.

Press: "Prog" "21" "Enter" "Step Number" "Enter"

The step number and error code is displayed as under Automatic Stepped Self-test.

To perform the same step number once more press: "Volume Down"
To perform the next step number press: "Volume Up"

Pressing "Enter" will make a return to normal operation.
See description of the Self-test.

2 **2**

Read Protection Code.
Pressing "Prog" "22" "Enter" the Protection Code will be shown in the Receiver Display. If more than one Protection Code is set, successively pressing "Enter" will show the rest and finally make a return to the normal operation.

If environmental or installational conditions, such as too high temperature or bad antenna installation is encountered, protection automatically takes place. The radiated power is maximized according to the worsened working conditions and the "Protec" annunciator is switched on in the Display, showing that protection has taken place and that the Transceiver has adjusted it self to the best possible performance.

If working conditions becomes too bad forcible protection takes place in order not to destroy the equipment. This condition is shown by flashing the "Protec" annunciator in the Display.
See description of the Protection Codes.

2 **3**

View ATU Relay Setting.
This function starts the ATU tuning the antenna on the displayed transmitter frequency. After tuning, the ATU relay setting is displayed as 0's and 1's. The first 12 relay settings are displayed and the remaining 12 settings are displayed by pressing "Enter".
Pressing "Enter" once more will make a return to normal operation.

2 **4**

View ATU Relay Setting and Store Power Parameters.
This function will display the 2 times 12 relay settings as "Prog 23" and additional power parameters are stored, which are used when the ATU is switched into manual mode with the "Manual Preset" pushbutton. The 24 displayed relay settings must be used as the manual switch setting in the ATU.
Pressing "Enter" will make a return to normal operation.
See Installation, 2182kHz Manual Tune Set-up page 3-7.

2	5

Read CU Priority / Intercom Number.
The Receiver Display will show the Priority / Intercom Number of the Control
Unit in use.
Pressing "Enter" will make a return to normal operation.

2	6

View CU Software version, release and release date.
Display CU Software version, release and release date.

Receiver Display: Version and Release number **VV.RR**.
Transmitter Display: Release date as **YY MM DD**.

Pressing "Enter" will make a return to normal operation.

2	7

View TU Software version, release and release date.
Display TU Software version, release and release date.

Receiver Display: Version and Release number **VV.RR**.
Transmitter Display: Release date as **YY MM DD**.

Pressing "Enter" will make a return to normal operation.

2	8

View TU Configuration version, release, customer ID and release date.
 Display TU Configuration version, release, customer ID and release date.

Receiver Display: Customer ID, Version and Release number **II   VV.RR**
Transmitter Display: Release date as **YY MM DD**.

Pressing "Enter" will make a return to normal operation.

2	9

View ATU Software version, release and release date.
Display ATU software version and release date. See "26"

Receiver Display: Version and Release number **VV.RR**.
Transmitter Display: Release date as **YY MM DD**.

Pressing "Enter" will make a return to normal operation.

3	0

Read Accumulated On Time.
The Accumulated On Time in hours is displayed in the Receiver Display.
Pressing "Enter" will make a return to normal state.
If the build-in back-up battery is removed while the supply is switched off, the
total user-programmable memory will be erased and the Accumulated On Time
will be set to "0".

3	2

View RX / EX Signal Path 715.
The Receiver Display shows version number.
 "7" is the standard version.
Pressing "Enter" will make a return to normal operation.

3	3

View Option Filter.
The Receiver Display shows if an optional filter is installed on RX / EX Signal Path 715:
 "0" if no Option Filter is installed.
 "1" if the Option Filter is installed.
Pressing "Enter" will make a return to normal operation.

3	4

View Power Amplifier Version.
The Receiver Display shows the PCB number of the installed Power Amplifier Assembly.

  12V Power Amplifier 720

  24V Power Amplifier 721

  12V FET Power Amplifier 722

  24V FET Power Amplifier 723

  32V FET Power Amplifier 724

Pressing "Enter" will make a return to normal operation.

3	5

View PA Filter Version.
The Receiver Display shows the PCB number of the installed PA Filter.

  Marine Filters 726

  Continuous Filters 727

Pressing "Enter" will make a return to normal operation.

3	6

View ATU Status.
The Receiver Display shows the status of the ATU:

 "0" if the ATU is not installed.
 "1" if the ATU is installed.
 "2" if the ATU is in manual mode.
 "3" if the TU - ATU data communication has failed.

Pressing "Enter" will make a return to normal operation.

3 **7**

View Dummy Load.
The Receiver Display shows if the Dummy Load 741 is installed in the ATU:

  "0" if no Dummy Load is installed.

  "1" if the Dummy Load is installed.

Pressing "Enter" will make a return to normal operation.

3 **8**

View ATU Fan.
The Receiver Display shows if the fan is installed in the ATU:

  "0" if no fan is installed.

  "1" if the fan is installed.

Pressing "Enter" will make a return to normal operation.

3 **9**

View Optional Interface Board
The PCB number will be displayed in the Receiver Display.

4 **0**

Switch All Annunciators On in display.
All annunciators in the display are switched on.
Pressing "Enter" will make a return to normal operation.

4 **1**

Switch Beep Sound On.
The Beep is sounded constantly.
Pressing "Enter" will make a return to normal operation.

4 **2**

Switch Boop Sound On.
The Boop is sounded constantly.
Pressing "Enter" will make a return to normal operation.

4 **3**

Switch High-beep Sound On.
The High-beep is sounded constantly.
Pressing "Enter" will make a return to normal operation.

4 **5**

**Display Customer Specified Frequencies Pre-Programmed
in Configuration PROM.**
By pressing "Volume Up" all the frequencies and their corresponding modes
are successively displayed.
If "RX" / "TX" is pressed the displayed frequency will be transferred to the
Receiver / Transmitter respectively.

7	4

View Supply Voltage
Displays the actual TU supply voltage at the moment the function is executed.
e.g. 24.7 Volt is displayed as "24.7" in the receiver display.

9	8

View or change Security Code.
Once encoded the Security Code provides the equipment with a psychological
barrier against burglary as the equipment is not operational before the correct
code is entered.
A "Security Code" sticker is supplied together with the transceiver. It must
preferably be placed on a visible spot near the equipment.
As the Security Code is assigned only to the currently used Control Unit, it is
necessary to store codes in all CU's in the installation that are exposed to burglary.
Installations where more than one Control Unit is connected, the codes need not
be the same, enabling the Security Code to be used as a security against
unauthorized use.
For Security Code, numbers between "1" and "9999999" may be used providing
a total of 9999999 different numbers.
From factory "0" is stored as general code and no entry of this number is required
in order to use the transceiver.
If the Security Code feature is desired, the following syntax must be used:

"Prog" "98" "Enter"

The Receiver Display shows the current Security Code. Key-in the wanted
Security Code and store it:

"Security Code" "STO"

The Security Code is now stored in the currently used CU and must be entered
every time the power supply is switched on:

"Security Code"

"Enter"

NOTE

- The Handset must be hooked on before the Supply is switched on and
  the Security Code is entered.

- If a wrong Security Code is used the equipment is not operational.

- Write down your Security Code and keep it in a non conspicuous place.

- If the Security Code is forgotten contact the local dealer.

- If the Security Code is used as a preventive measure against theft, it is
  recommended to enable the Security Code only when the ship is in port and
  disable the Security Code when the ship is at sea, giving quick radio-access
  to all on board in case of an emergency situation.

[9] [9]

Select Configuration Mode.
If no Password has been programmed (Password = 0) the transceiver is ready
for changing configurable parameters.
If a Password has been programmed (Password: 1 - 9999999) it is necessary
to enter the correct Password to get access to the Configuration Mode.

Press "Password" "Enter"

To make a re-configuration of a function enter the number of the function and
use the "STO" key and the numeric keys to store the wanted parameter value(s).
It is now possible to select another function by entering the corresponding number.
Pressing "Enter" will make a return to normal operation.
For further information see the description of the Configuration.

CONFIGURATION

TRP7200 has a pre-programmed Configuration PROM containing the necessary parameters to control the function of the equipment. Some of these parameters are also contained in the non-volatile memory and may therefore be changed by simple programming via the keyboard to suit the individual user.

As the non-volatile memory has battery back-up, all changes in the configuration together with other user-programmable functions and channels will be preserved with a good back-up battery. (Do not remove or replace battery with equipment switched off. See Preventive Maintenance).

To change the configuration of a function, select Configuration Mode and enter the number of the function in question. Some functions requires only to be selected by their number to execute the change, but most functions has several parameters with values which must be changed and stored with the "STO" key to store the change.

To prevent unauthorized programming of the configuration, the Configuration Mode may be protected with a Password. As default the Password is equal to 0 which requires no confirmation when selecting Configuration Mode. The Password may be changed by selecting Function Number 99 in the Configuration Mode. Next time Configuration Mode is selected the correct Password must be entered to get access to the mode. Passwords from 1 to 9999999 may be used.

Select Configuration Mode

Press | Prog | | 9 | | 9 | | Enter |

If no Password has been programmed (Password = 0) the transceiver is ready for changing configurable functions.

If a Password has been programmed (Password: 1 - 9999999) it is necessary to enter the correct Password to get access to the Configuration Mode.

Press *"Password"* | Enter |

Reconfiguration of a Function with Parameters

To make a reconfiguration of a Function with parameters enter the number of the Function in the Transmitter Display.

Press *"Function No."* | Enter |

The current corresponding parameters are displayed in the Receiver Display with a flashing bar below the first parameter to be changed.

Use [STO] to store the same value again if no change is wanted, or use the numeric keys to

change the value and [STO] to store a change. If the Function has more than one parameter the flashing bar will shift right to the next parameter. When the last parameter has been stored

another Function Number may be entered as described above. If [Enter] is pressed instead, the Transceiver will return to normal operation.

Some functions requires to be activated once, after a change has been made, in order to invoke the reconfiguration. For example if Power Level is "Full" and Full Power is disabled by configuration, the transmitter will stay on Full Power and next time Power Level is changed, only Medium and Low are available.

Directly Executable Functions

Some Functions are directly executable and requires no storing of parameters.

Press "Function No." [Enter]

The Function will be executed immediately and another Function Number may be entered.

If [Enter] is pressed instead, the Transceiver will return to normal operation.

Functions:

<u>**Disable / Enable of keys**</u>

When a key is disabled no change will take place when pressed.

If the key has a toggle function (TX On/Off, "Light", etc.) select the wanted state with the key before going to the Configuration Mode, disable the key by storing a "**0**" as the value of the

parameter. Press [Enter] to return to normal operation. The key is now disabled and the state is stable and not changeable.

Disabled keys can be enabled again by storing a "**1**" as a value of the parameter.

Keyboard keys: TRP7200, TRP7201, TRP7203 and TRP7208 all with standard Control Unit.

No. 1 to 28.   "**1**" will enable the key.

"**0**" will disable the key.

Double keys (Tune, Rate, Sensitivity, Volume) are displayed simultaneously with a position in the display corresponding to the keyboard layout.

Default values shown.

No.	Function	Parameter	Value	
1	RX key	Disable/Enable	1	
2	TX key	Disable/Enable	1	
3	RCL key	Disable/Enable	1	
4	STO key	Disable/Enable	1	
5	TX On/Off key	Disable/Enable	1	
6	Power Level key	Disable/Enable	1	
7	TX Tune key	Disable/Enable	1	
8	SSB key	Disable/Enable	1	
9	AM key	Disable/Enable	1	
10	TLX key	Disable/Enable	1	
11	2182 key	Disable/Enable	1	
12	Alarm Keys	Disable/Enable	1	
13	HiSens key	Disable/Enable	1	
14	SQL key	Disable/Enable	1	
15	Tune keys	Disable/Enable	1	1
16	Rate keys	Disable/Enable	1	1
17	AGC On/Off key	Disable/Enable	1	
18	Sensitivity keys	Disable/Enable	1	1
19	"Loudspeaker" key	Disable/Enable	1	
20	Volume keys	Disable/Enable	1	1
21	Scan key	Disable/Enable	1	
22	Sweep key	Disable/Enable	1	
23	Sleep key	Disable/Enable	1	
24	"Light" key	Disable/Enable	1	

"Hidden keys":

No.	Function	Parameter	Value
25	"Prog 1" (Ext. Speaker On/Off)	Disable/Enable	1
26	"Prog 2" (LSB)	Disable/Enable	1
27	"Prog 3" (R3E)	Disable/Enable	1
28	"Prog 6" (RF Attenuator)	Disable/Enable	1

Keyboard keys: TRP7204 with standard Control Unit.

No. 1 to 32.   "**1**" will enable the key.

"**0**" will disable the key.

Double keys (Tune, Rate, Sensitivity, Volume) are displayed simultaneously with a position in the display corresponding to the keyboard layout.

Default values shown.

No.	Function	Parameter	Value	
1	RX key	Disable/Enable	1	
2	TX key	Disable/Enable	1	
3	RCL key	Disable/Enable	1	
4	STO key	Disable/Enable	1	
5	TX On/Off key	Disable/Enable	1	
7	TX Tune key	Disable/Enable	1	
8	USB key	Disable/Enable	1	
9	AM key	Disable/Enable	1	
10	TLX key	Disable/Enable	1	
13	HiSens key	Disable/Enable	1	
14	SQL key	Disable/Enable	1	
15	Tune keys	Disable/Enable	1	1
16	Rate keys	Disable/Enable	1	1
17	AGC On/Off key	Disable/Enable	1	
18	Sensitivity keys	Disable/Enable	1	1
19	"Loudspeaker" key	Disable/Enable	1	
20	Volume keys	Disable/Enable	1	1
21	Scan key	Disable/Enable	1	
22	Sweep key	Disable/Enable	1	
23	Sleep key	Disable/Enable	1	
24	"Light" key	Disable/Enable	1	
26	LSB key	Disable/Enable	1	
30	Full key	Disable/Enable	1	
31	Med key	Disable/Enable	1	
32	Low key	Disable/Enable	1	

"Hidden keys":

No.	Function	Parameter	Value
25	"Prog 1" (Ext. Speaker On/Off)	Disable/Enable	1
27	"Prog 3" (R3E)	Disable/Enable	1
28	"Prog 6" (RF Attenuator)	Disable/Enable	1

Enable Power Levels

No. 50. Enable/Disable Power Level.
If all levels are disabled the transmitter will stay on the current power level.
"**1**" enables the Power Level.
"**0**" disables the Power Level.

Default values	Receiver Display		
	Power Level		
Parameter	Full	Med	Low
Enable/Disable	1	1	1

Input Selector versus TX Mode

No. 51. Select Transmitter AF Input Source versus transmitter mode.
External Line input is available when Interface-A 718 is installed.
"**0**": External Line input.
"**1**": Handset microphone input.
"**2**": Key-selected input. AF input follows active key input.

Default values	Receiver Display		
	TX Mode		
Parameter	SSB	R3E	AM
AF Input	1	1	1

Select Transmitter Key Input versus TX Mode

No. 52. Select Transmitter Key Input versus transmitter mode.
"**0**": External Key active.
"**1**": Handset Key active.
"**2**": Both key inputs active. The keying Key excludes the other.

Default values	Receiver Display		
	TX Mode		
Parameter	SSB	R3E	AM
Key Input	1	1	1

Compressor Time Constant versus TX Mode

No. 53. **Select Time Constant for the transmitter AF compressor versus transmitter mode.**
"**1**" corresponds to a normal time constant.
"**0**" corresponds to a long time constant.

Default Values	Receiver Display			
	TX Mode			
Parameter	SSB	R3E	AM	TLX
Time Constant	1	1	1	0

AGC Parameters versus RX Mode

Select receiver AGC Parameters versus receiver mode.

No. 54. **"Hang" the AGC during transmit.**
"**1**": The AGC action is disabled during transmit.
"**0**": The AGC action continues during transmit.

Default Values	Receiver Display				
	RX Mode				
Parameter	SSB	R3E	AM	CW	TLX
Hang	1	1	1	0	0

No. 55. **Select Hang AGC function versus receiver mode.**
"**1**": The AGC operates with disabled Hang function.
"**0**": The AGC operates with enabled Hang function.

Default Values	Receiver Display				
	RX Mode				
Parameter	SSB	R3E	AM	CW	TLX
Hang AGC	0	0	1	0	1

No. 56. Select AGC Decay Time versus receiver mode.
"**1**" corresponds to Slow Decay Time.
"**0**" corresponds to Fast Decay Time.

Default Values	Receiver Display				
Parameter	SSB	R3E	RX Mode AM	CW	TLX
Decay Time	1	1	1	0	0

No. 57. Select AGC Hang Time versus receiver mode.
"**1**" corresponds to Long Hang Time.
"**0**" corresponds to Short Hang Time.

If Hang AGC (see No. 55) is disabled the AGC Hang Time has no influence.

Default Values	Receiver Display				
Parameter	SSB	R3E	RX Mode AM	CW	TLX
Hang Time	1	1	1	0	0

No. 58. Select AGC Suppressor function versus receiver mode.
"**1**": Activate the AGC Suppressor.
"**0**": Disable the AGC Suppressor.

Default Values	Receiver Display				
Parameter	SSB	R3E	RX Mode AM	CW	TLX
Suppressor	0	0	0	0	1

No. 59. Select additional AGC Filter.
"**1**": Disable the additional AGC Filter.
"**0**": Enable the additional AGC Filter.

Default Values	Receiver Display				
Parameter	SSB	R3E	RX Mode AM	CW	TLX
AGC Filter	1	1	0	1	1

AF Bypass in telex mode

No. 60. Select AF Bandwidth in telex mode.
"**1**" corresponds to a large AF bandwidth.
"**0**" corresponds to the normal AF bandwidth.
Default value is "0".

Split Mode Disable/Enable tables

Disable/Enable receiver transmitter Split Mode.
"**1**": Enable Split Mode.
"**0**": Disable Split Mode.

No. 61. RX mode = USB versus TX modes.

Default Values	Receiver Display		
Parameter	LSB	TX Mode AM	CW
RX Mode USB	1	1	1

No. 62. RX mode = LSB versus TX modes.

Default Values	Receiver Display		
Parameter	USB	TX Mode AM	CW
RX Mode LSB	1	1	1

No. 63. RX mode = AM versus TX modes.

Default Values	Receiver Display		
	TX Mode		
Parameter	USB	LSB	CW
RX Mode AM	1	1	1

No. 64. RX mode = CW versus TX modes.

Default Values	Receiver Display		
	TX Mode		
Parameter	USB	LSB	AM
RX Mode CW	1	1	1

<u>**Disable / Enable "Prog" functions**</u>

"**1**" enables the "Prog" function.
"**0**" disables the "Prog" function.
Default value shown below.

<u>No</u>.	<u>Function</u>	<u>Parameter</u>	<u>Value</u>
65	Prog Scan	Disable/Enable	1
66	Prog Sweep	Disable/Enable	1
67	Prog Sleep	Disable/Enable	1
68	Prog Power Level	Disable/Enable	1
69	Prog STO	Disable/Enable	1

<u>**Disable / Enable "Prog" "98" function**</u>

No. 70. Disable/Enable view and change of the Security Code.

"**1**" makes it possible to view and change Security Code.
"**0**" makes it impossible to view or change Security Code.
Default value is "1".

View / change set-up of DSC and Telex Option, Interface-A 718

Interface-A 718 is for use in combination with an external modem. When the optional Interface-A 718 is installed in the Transceiver Unit it might be necessary to select another configuration of the board to obtain the wanted function in the actual installation. Please reefer to the Interface-A 718 Technical Manual for detailed explanation of the different parameters involved.

No. 75. View / change set-up of DSC and Telex Option,Interface-A 718.

Store the wanted value to select one out of seven possible configurations.Default value is "6".

Parameter	Value
TELEX with local frequency control	0
REMOTE FREQUENCY CONTROL	1
AUTOTELEX	2
AUTOTELEX with telephony option	3
MARITEX	4
MARITEX with telephony option	5
DSC	6

View / change Telex Audio Centre Frequency

No. 76. View / change Telex Audio Centre Frequency.

Centre Freq. = $1500Hz + N2 \times 500Hz + N1 \times 50Hz$

N1 values: 0 to 9
N2 values: 0 to 2

Default Audio Centre Frequency = 1700Hz

Default Values	Receiver Display	
	Multipliers	
Parameter	N2	N1
Centre Freq.	0	4

View / change External Scan S/S input

With the optional board, Interface-A 718, installed the available Scan S/S (Scan Start/Stop)
input can be used to control the scanning of the 10 build-in user-programmable scan programs
or the user-programmable sweep program. The Scan S/S input transition must be enabled to
one out of four possibilities, and the input coupled to either Scan or Sweep.

No. 77. View / change External Scan S/S input

Scan S/S Input Transition:

Parameter	Value
Disable	0
Start/Stop on positive/negative transition	1
Start/Stop on negative/positive transition	2
Start/Stop on positive/positive transition	3
Start/Stop on negative/negative transition	4

If a step function is wanted select value = 1 or 2 and store a Dwell Time = 0
during the programming of the scan or sweep program. See "Channel Scanning,
Set Up" or "Frequency Sweeping, Set Up".

Scan S/S Coupling:

Parameter	Value
Coupled to Scan	0
Coupled to Sweep	1

Store the wanted values to select the required transition and coupling.

Default Values	Receiver Display	
Parameter	Transition	Coupling
Scan S/S	0	0

Reset Scan, Sweep and Sleep

No. 95   When function number 95 is selected all parameters and frequency tables of
                    Scan, Sweep and Sleep programmes are deleted and reset to factory setting.

Reset currently used Control Unit

No. 96   When function number 96 is selected on a Control Unit connected to the EZ-net, the contents of it's EEPROM is reset to factory setting. The EEPROM contains information about EZ-net parameters, Keyboard parameters, Security Code and Priority/Intercom number. If this function is selected, especially in installations where more than one Control Unit is connected, the set-up made by the user may be changed.

Reset System Parameters to default values

No. 97   When function number 97 is selected, all System Parameters are reset to default values. The System Parameters are those listed under function number 1 to 94.

Reset total memory and system parameters to default values

No. 98   Function number 98 deletes the total user-programmable channel memory, executes function number 95 and 97, and resets the Password for the Configuration Mode.

View / change Password

No. 99   To prevent unauthorized programming of the configuration, the Configuration Mode may be protected with a Password. As default the Password is 0 which requires no confirmation when selecting Configuration Mode. The Password may be viewed or changed by selecting Function Number 99. Next time Configuration Mode is selected the correct Password must be entered to get access to the mode. Passwords from 1 to 9 999 999 may be used.
When function number 99 is selected the current Password is displayed. To change the

Password key-in the new Password and press   `STO`   to store it.

If no change is wanted press   `Enter` .

Press   `Enter`   to get back to normal operation.

PROPAGATION OF HF AND MF RADIO WAVES

Introduction

The TRP 7200 is able to operate on frequencies from 1.605 MHz to 30 MHz. This frequency span covers the upper part of the MF range (0.3 - 3 MHz) and the whole HF range (3 - 30 MHz). In this wide frequency area the propagation properties of radio waves differs markedly from one edge to the other.

The propagation in the MF and HF frequency bands takes place in two different ways, namely one in which the radio waves follows the surface of the Earth ("Groundwaves") and one in which the radio waves are reflected from the Ionosphere ("Skywaves"). Both propagation modes are influenced by many factors, the major being the Sun, the position of the vessel on Earth and the time of day.
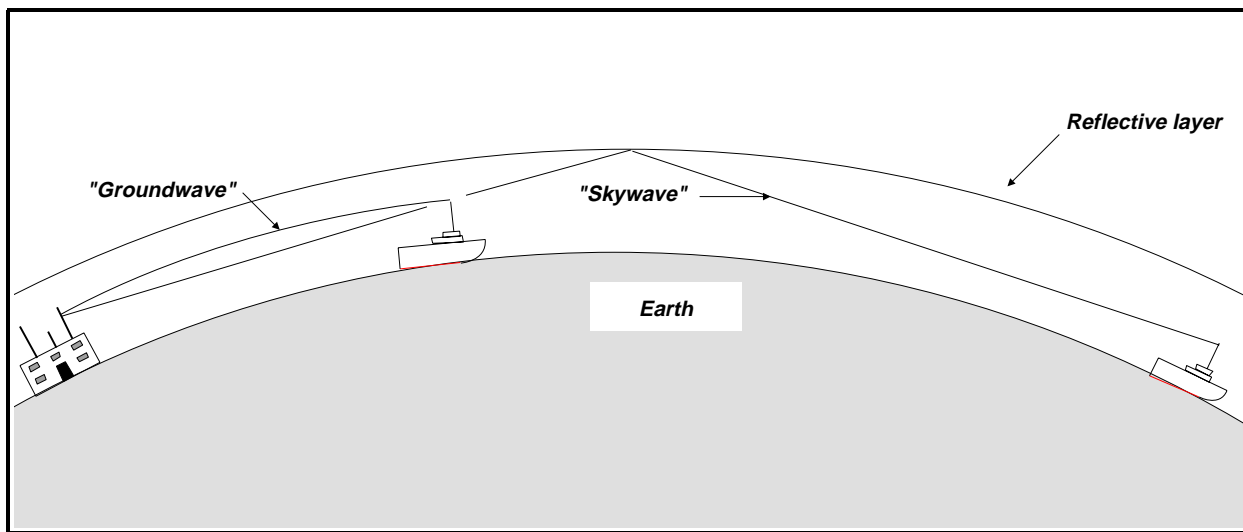
Groundwave propagation

In the MF band and the lower part of the HF band, at frequencies up to 5 MHz the predominant propagation mode is groundwave propagation.

In this mode the waves originating from the transmitter antenna will follow the Earths curvature to the receiver antenna. It is not necessary to have direct line of sight between the antennas as it is in the case of VHF radiotelephones. Under normal conditions the range of communication can be expected to be up to 800 Km at 1.6 MHz decreasing to about 500 Km at 5 MHz. The reason for the shorter range on the higher frequencies is that the attenuation in the atmosphere increases with the frequency and at the same time the radio waves' ability to follow the curvature of the Earth decreases.

The time of day will also influence on the propagation. During the day, the atmosphere, due to the radiation from the Sun, will be more absorptive than during the night when a range of up to 1000 Km can be expected.

Vertical polarized radio waves, which are signals radiated from vertical antennas such as whip antennas, have a larger range in the MF and lower HF band than for instance a horizontal wire antenna.

At frequencies above 5 MHz the radio waves ability to follow the Earth's curvature decreases and at 30 MHz the propagation is almost along a straight line. Therefore if ground wave propagation is to be used on 30 MHz the range is confined to distances at which there will be optical sight between the antennas in question.

Skywave propagation

At frequencies between 5 MHz and 30 MHz long distance propagation is achieved by skywave propagation. Certain layers of the Earth's upper atmosphere, in the Ionosphere, called the E-layer and the F1- and the F2-layers are able to act as a sort of mirror to the radio waves in the above mentioned frequency range. A signal of the appropriate frequency will therefore be reflected by the mirror and will return to the Earth beyond the horizon of the transmitter antenna.

The reflection properties of the Ionosphere are strongly dependent of the state of the Ionosphere. During the day the Sun's radiation will increase the reflection, while the reflection during the night will be lower. At the same time the radiation will however, increase the attenuation of the radio waves.

The highest frequency that can be used to communication on a certain distance is called the Maximum Usable Frequency (MUF). This frequency is, however, subject to great variation in propagation. The best frequency to use is about 15 pct. lower than the MUF. This frequency is called the FOT, Frequence Optimal du Travail.

Besides the diurnal variations due to the Sun's radiation, the propagation is also dependent of the solar activity in general. During periods of high solar activity the MUF will be higher, but at the same time disturbances in the Ionosphere, due to the high activity, will be more frequent.

Tables of MUFs covering various radio paths are published monthly by many telecom administrations.

INSTALLATION Contents

DESCRIPTION

General

Correct installation of the TRP 7200 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. Sharp cable bends especially on coaxial cables must be avoided and a sufficient number of clips or straps should be used to secure the cables.

Mounting the Control Unit

Up to 5 Control Units can be connected to the Transceiver Unit using the build-in local area network (EZ-Net). The Control Units must be chain connected and the maximum distance from the Transceiver Unit to the last Control Unit is 50m. The screened multiwire cable needed depends on the actual installation. Several examples are shown on page 3-28.
The Control Unit can be tabletop or bulkhead mounted. Page 3-9,3-10 shows the different possibilities including the use of the optional wedges providing the best possible viewing and operation position. Overall dimensions and a drilling plan for the necessary holes is shown on page 3-9. Make sure that the mounting surface is reasonable plane.
Before mounting the Control Unit select the best way for the cable entry. There are several alternatives which are shown on page 3-17,3-18. In all cases one of the marked entry plates on the bottom part of the Control Unit must be removed to enable the cable entry. Use a saw for the small vertical entry plates using the 2 grooves on the inside as guidelines. Break off the plate with a pair of pliers. Use a sharp knife for the large plate as shown on page 3-16. If the cable entry is made in the side of the Control Unit use the plastic gasket to seal the entry.
To open the Control Unit loosen the two front panel screws and swing open the cabinet. At an angle of about 80 degrees the front panel can be completely removed.
Solder the D-sub connector as described on page 3-27 and make sure that the cable length will fit when the Control Unit is closed again.
If the Control Unit is to be mounted directly on a surface bolt the bottom part of the unit through the four holes using the necessary screws. If the optional mounting wedge is used bolt the wedge through the four holes, observing the cable entry, and then bolt the bottom part of the Control Unit to the wedge using the four 4mm screws.
Connect the cable to one of the D-sub sockets on the front panel PCB and assemble the unit. If more than one Control Unit is installed, the other D-sub socket is used to run the cable to the next Control Unit. Be careful not to damage any components or to drop any conducting objects onto the printed circuit board of the unit.
The viewing angle of the LCD display can be optimized for best performance by using the "Prog" "13" function, see description of the User Programmable Functions page 2-43.

Mounting the Transceiver Unit

The Transceiver Unit should be installed in a dry place and consideration should be given to accessibility for servicing. It is important to provide plenty of airspace on the sides and below the unit, for adequate fan driven air circulation through the unit and for the heatsink at the end of the unit.Page 3-11 shows the mounting possibilities as well as the minimum distances to other object ensuring good cooling, as well as a drilling plan.

Mounting the Antenna Tuning Unit

The Antenna Tuning Unit may be mounted up to 100 metres from the Transceiver Unit using RG-213/U coaxial cable and a 5 wire screened multi cable for interconnection. For cable details see 3-32,3-34. The unit should be installed near the antenna feed point. Page 3-12 shows mounting details.

Power Supply

The TRP720X is available in different versions for operation on the standard battery voltages (12V, 24V, or 32V) or from a separate optional AC Power Supply 7200. The supply leads are connected to the supply terminal strip of Transceiver Unit at the end 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 left terminal. 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.Table on page 3-31 shows the necessary cable cross sections and external fuse ratings.

Earth Connections

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 100 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 or three 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 100 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 or three 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.
On fibre glass boats, such as yachts and sailing boats, it may be difficult to install a sufficiently good earth. Short copper straps are bolted to conducting parts on the engine, the keel and other conducting objects. Many copper straps can be glued to the inner surface of the hull below the water line to produce a large capacitance to the water. It is important that the total area of copper is large and that the distance between the copper surface and the water is as little as possible. The copper straps are connected directly to the ATU.

Transceiver Unit

The Transceiver Unit is preferably grounded separately to the ships metal in the shortest possible way. A 10 to 16mm sq. ground wire is connected to the ground terminal at the end of the unit. See 3-33. On vessels with no metallic superstructure the ground connection may be omitted.

Antennas

The standard equipment is used with common transmitting and receiving antenna. The antenna 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 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.
The Antenna Tuning Unit will tune on any frequency in the range 1.6 to 30 MHz to wire and/or whip antennas of 5 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.

Interconnection of Units

Control Unit-to-Transceiver Unit connections

The cable is prepared by soldering D-sub connectors at both ends as described on page 3-27. If the cable entry is in the side of the Control Unit, fit the cable with the plastic gasket to seal the entry.
In order to connect the cable to the Control Unit the front panel is removed. The cable is entered through the wanted entry (see 3-17) and the cable is connected to one of the D-sub sockets on the front panel PCB. If more than one Control Unit is installed, use the other D-sub socket to run the cable to the next Control Unit.
To connect the cable to the Transceiver Unit simply use the D-sub socket marked "EZ-Net" on the end of unit.

Transceiver Unit-to-Antenna Tuning Unit connections

The units are interconnected by an RG-213/U coaxial cable and a five wire screened multiwire cable (See 3-32,3-35 for cable information) with a maximum length of 100 meters. The coaxial cable are terminated in UHF-connectors (PL 259 type) and connected at both ends to the sockets marked "TX/RX".
The multiwire cable is soldered to a D-sub connector as described on 3-34 and inserted into the "ATU Com" socket at the end of the Transceiver Unit. At the ATU end, the multiwire cable is soldered to the five-pin multi socket as described on page 3-34, and connected to the corresponding plug marked "ATU Com" at the end of the ATU.
Remember to fit the double rubber gasket on both the coaxial and multiwire cable before soldering. See 3-20.

NOTE:

TRP720X can be operated without the ATU7200. Just connect the 50ohms antenna system to the coaxial socket marked "TX/RX" at the end of the Transceiver Unit.

Important:

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 centre 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.

Connection of External Equipment

External equipment is connected to the D-sub socket marked "Com" at the end of the Transceiver Unit. By installing different optional boards inside the Transceiver Unit TRP720X is adaptable to a variety of applications, such as Telex and DSC. Please refer to the enclosed manual regarding the option for correct installation, set-up and connection of external equipment. Some control signals are already available at the "Com" socket as standard. See table page 3-35 for information. Screened cables should always be used.

Final Installation Check

For operation of the equipment please refer to chapter 2. Note that an appropriate programmed Configuration PROM must be installed in the Transceiver Unit, see section on page 3-47.

NOTE:

For normal communication between the Transceiver Unit and the Antenna Tuning Unit make sure that the "Manual Preset" push bottom, located between the two cable entries in the double rubber gasket in the end of the ATU, is released (no red light). If a red light is seen the ATU is switched to manual mode and no communication can take place. Push "Manual Preset" to switch off the light, and then push "Supply On/Off" twice on the Control Unit to initiate correct communication. See also 2182kHz Manual Tune Set-up below.

The Antenna Tuning Unit will tune automatically to the antenna first time the equipment is keyed on a new frequency or when the "TX Tune" button is pressed. During the tune sequence and normal transmission all transmitter circuits are monitored to ensure safe operating conditions. If transmission conditions are bad (bad antenna installation, high temperatures, etc.) the transmitted power will be reduced to a safe limit. When such a condition occurs, the "Protec" annunciator in the display will be switched on to indicate that protection has taken place, and that the output power is reduced to the highest possible safe limit to maximize the radiated power. If the transmission condition is improved automatic recovery to full power takes place.

The reason for the necessary protection can be investigated by pressing "Prog" "22" "Enter" (Read Protection Code). The displayed protection code(s) is described on page 5-3 of this manual.

If transmission conditions becomes too severe (a broken antenna, too high temperature, etc.) or a fault occurs in the equipment the "Protec" annunciator will flash in the display, indicating that radiated power no longer can be maximized. The output power will be reduced or totally switched off. When such a condition occurs, read the Protection Code as described above to investigate the nature of the fault.

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.

   Make sure that the antenna installation is working satisfactory.

   Press "2182" for fast selection of the emergency frequency.

   Press "Prog" "24" "Enter" (View ATU relay setting and store power parameters) to store the relevant parameters and to display the actual ATU relay setting on the frequency.

   Write down the first 12 relay settings displayed as 1's and 0's starting in the receiver frequency display, continuing in the transmitter frequency display, all in one long row. Press "Enter" to display the last 12 relay settings and write down as described above, ending up with 24 relay settings in one long row.

   Press "Enter" to return to normal operation.

   Remove the front cover of the ATU and preset the 24 relay switches according to the result obtained above. Presetting is now finished. Refit the front cover.

If a call on 2182kHz is made and at the same time a malfunction of the automatic tuning system occurs, push the "Manual Preset" bottom located between the two cable entries in the double rubber gasket in the end of the ATU. A red light in the push bottom is switched on, indicating that the ATU is in manual mode and that the 24 preset relay settings are used. Communication on 2182kHz can now take place.

NOTE:

If the "Manual Preset" has been pressed, it is necessary to release the bottom (no red light) and switch off and on the power supply with the "Supply On/Off" key to initiate normal TU - ATU communication.

Installation of optional Telex Filter

To enable telex operation a receiver crystal filter must be installed in position Option X on PCB RX/EX Signal Path 715 in the Transceiver Unit. The centre frequency of the filter must be 455kHz and the bandwidth must be in accordance with baud rate and frequency shift of the transmission. The centre audio input/output frequency is adapted to the associated telex modem by programming of Telex Subcarrier. See 2-62 Configuration.

To install the filter remove the front cover of the Transceiver Unit and unplug the ribbon cables and the coax cables on the Module Assembly. Loosen the four screws of Module Assembly and remove it. Open the Module Assembly by loosening the two screws, take out RX/EX Signal Path 715 and remove the metal shield.

Locate position Option Z3 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 Option Z3 automatically enables the "TLX" key on the Control Unit front panel and the function may now be checked.

Installation of Master Oscillator

To install another Master Oscillator remove the front cover of the Transceiver Unit and unplug the ribbon cables and the coax cables on the Module Assembly. Loosen the four screws of Module Assembly and remove it. Open the Module Assembly by loosening the two screws, take out Synthesizer Board 711 and remove the metal shield. Locate the shielding box on the PCB containing the Master Oscillator. Remove the box lid and change Master Oscillators. Refit the metal shields and PCB in the reverse order.

Installation of AC Power Supply

Setting of No-break and Power-up State.
No-break operation: The position of the No-break jumper located at the AC Control Board 750 (see page 3-15) decides if No-break operation is enabled.
With No-break operation enabled the power supply automatically switch to the connected battery in case of AC power fail, and switches back without interrupting your transmission when the AC supply recovers. See page 2-40.
Power-up State: The Power-up State is set by the Power-up State jumper located at the AC Control Board 750 (see page 3-15).
The position decides if the Power Supply has to start up in Off or Mains operation after fail or disconnection of *both* Mains and Battery supply.
The No-break operation and the Power-up State settings are working independently.
Factory settings are: No-break disabled (jumper in OFF position) and Power-up State is set to Mains.

CONTROL UNIT OUTLINE
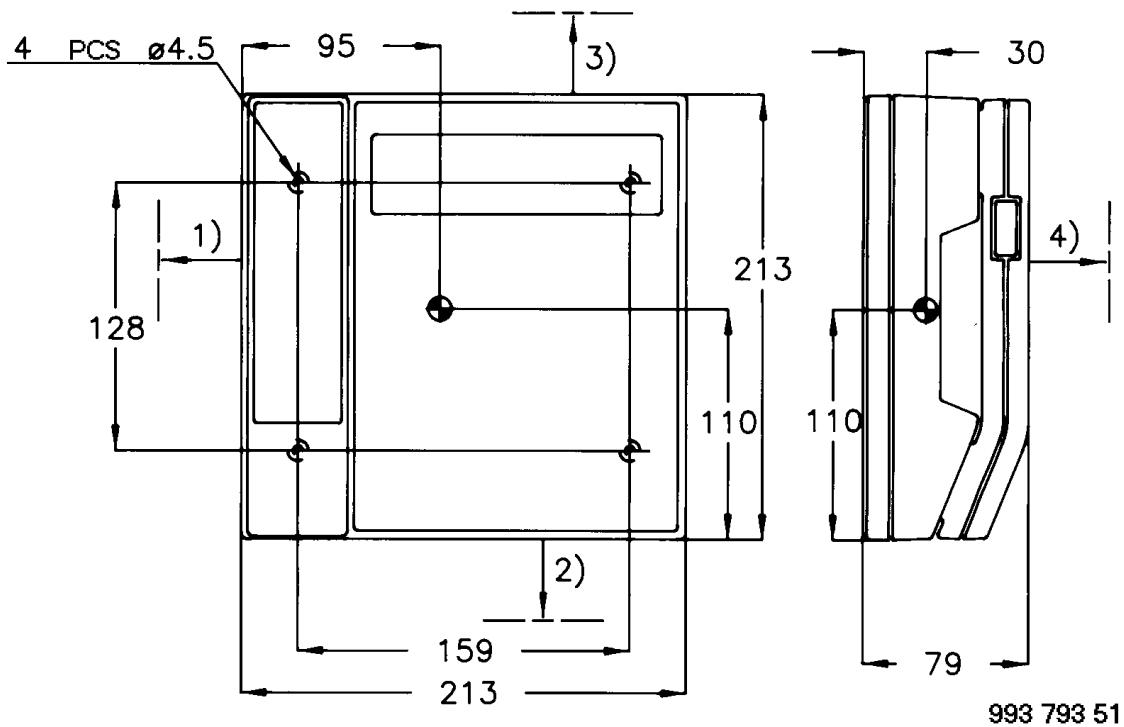
993 793 51

1) Space for cable entry and handset: min.100

2) Space for cable entry and handset cable: min. 270

3) Space for cable entry: min 50

4) Space for service access: min 500

Control Unit

Mounting

Options

Dimensions are in mm

Tolerance: +/- 1 mm

⊕ Centre of Gravity

Weight: 1.4 Kg
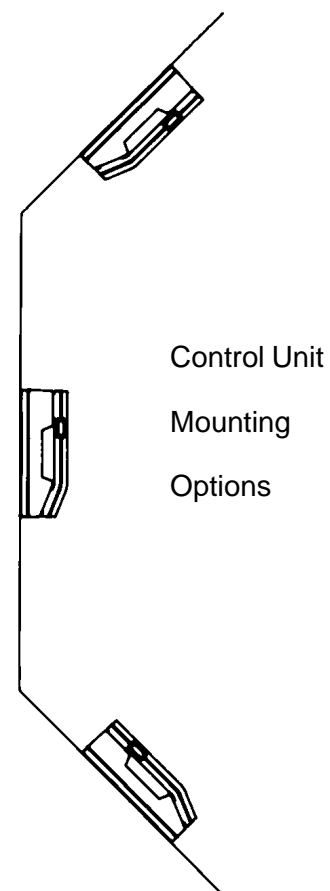
CONTROL UNIT OUTLINE, Incl TILTING WEDGE
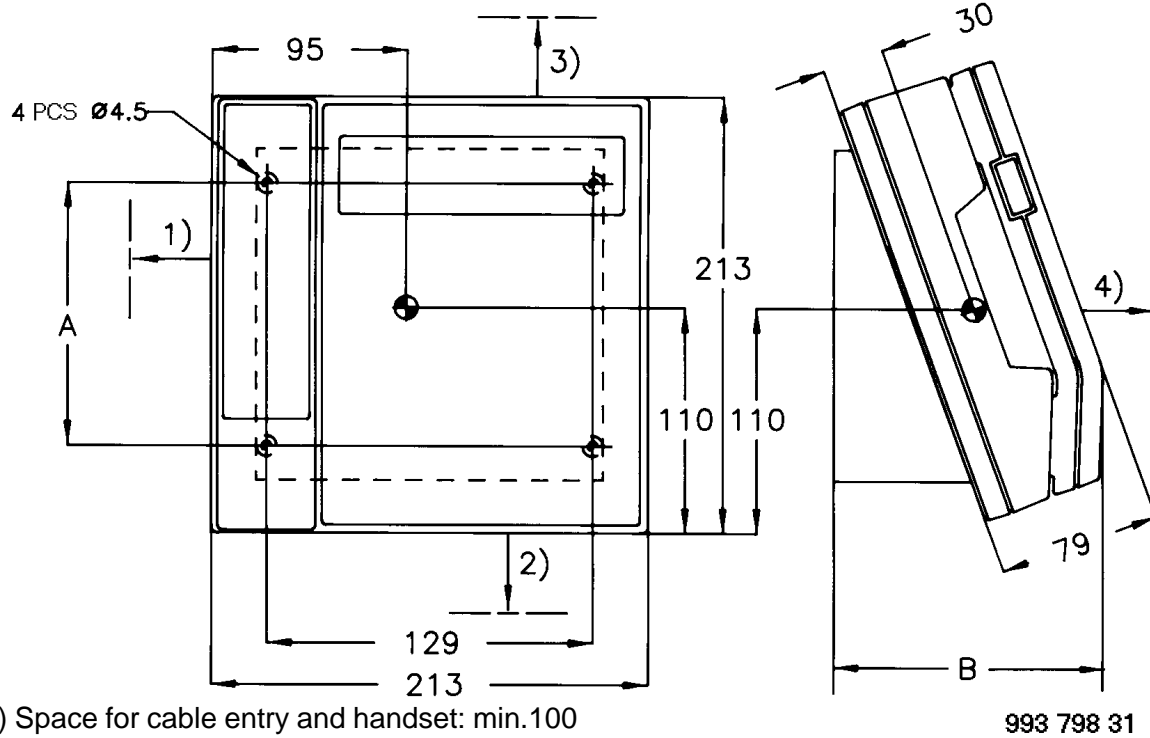
993 798 31

1) Space for cable entry and handset: min.100

2) Space for cable entry and handset cable: min. 270

3) Space for cable entry: min 50

4)Space for service access: min 500

NOTE
When Tilting Wedge is mounted on a surface which is not
sufficiently plane, apply washers between the Tilting Wedge
and the surface before the Control Unit is attached
to the Tilting Wedge.

Control Unit

Mounting

Options

including

Tilting Wedge

Dimensions are in mm

Tolerance: +/- 1 mm

🜨 Centre of Gravity

Weight: 2.0 Kg incl. Tilting Wedge
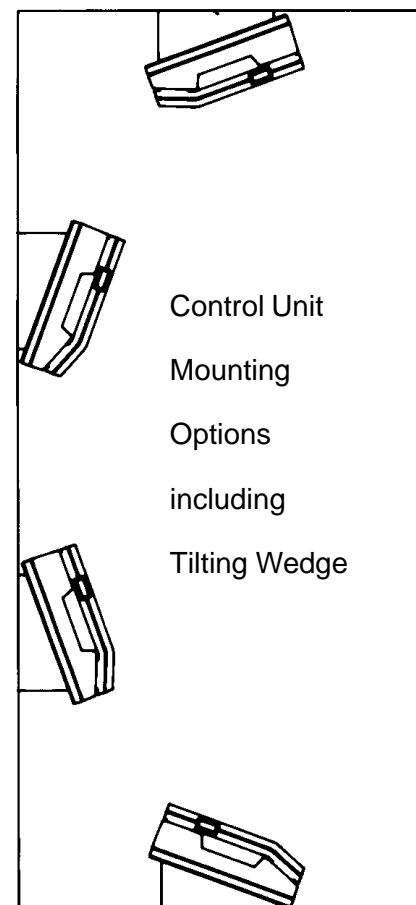
TRANSCEIVER UNIT OUTLINE

1) Space for air flow: min.100

2) Space for service access: min 500

3) Space for cable entry and air flow: min 200

Transceiver Unit

Mounting

Options

Dimensions are in mm

Tolerance: +/- 1 mm

⊕ Centre of Gravity

Weight: 14.0 Kg

ANTENNA TUNING UNIT OUTLINE

993 793 71
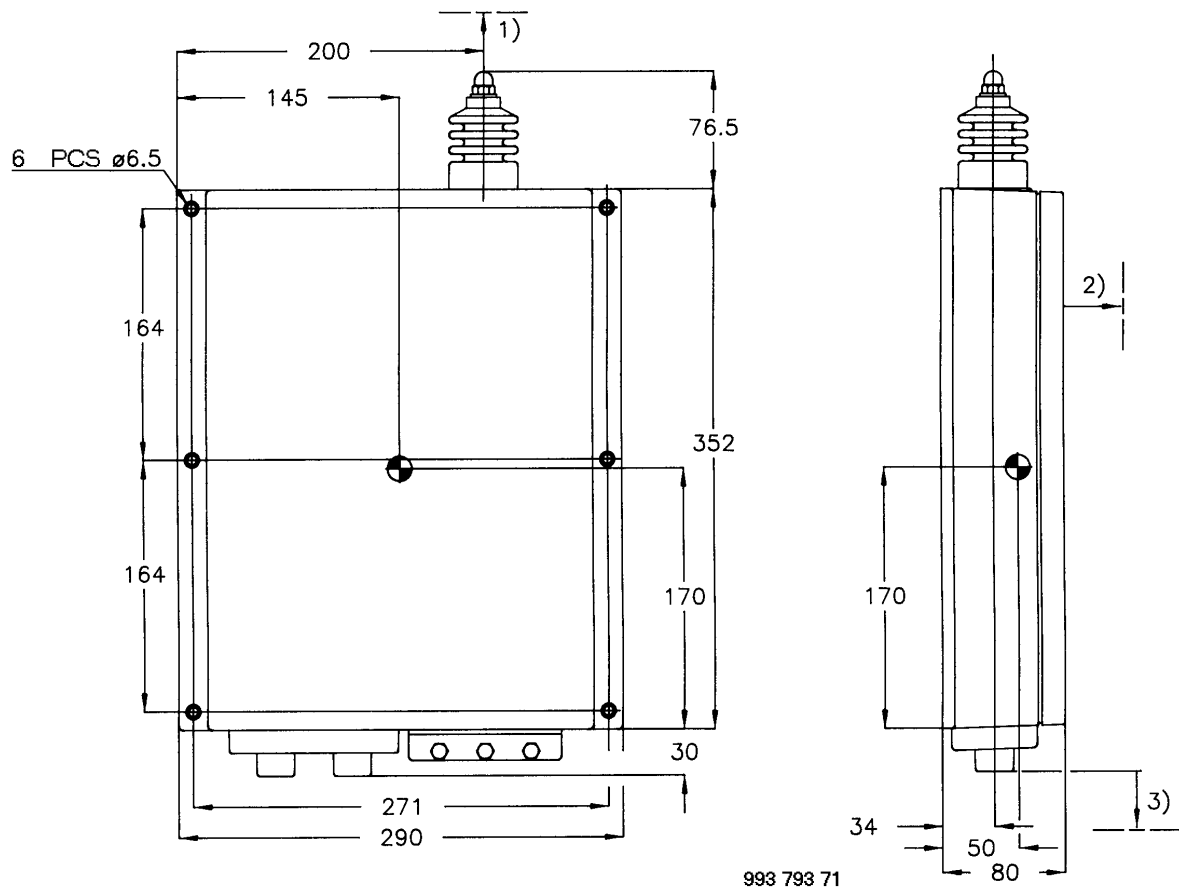
1) Space to nearest overhang: min.50

2) Space for service access: min 500

3) Space for cable entry and service access: min 200

Antenna Tuning Unit

Mounting

Options

Dimensions are in mm

Tolerance: +/- 1 mm

⊕ Centre of Gravity

Weight: 3.3 Kg

AC POWER SUPPLY OUTLINE

1) Space for air flow: min.100

2) Space for service access: min 500

3) Space for cable entry and air flow: min 200
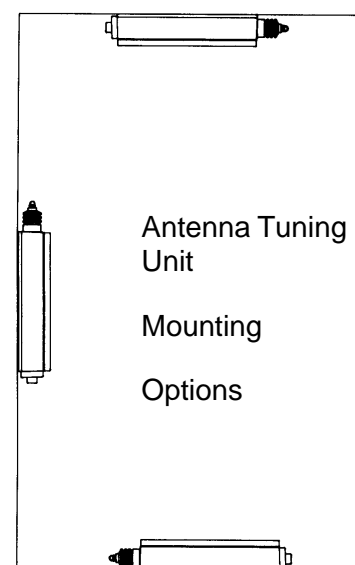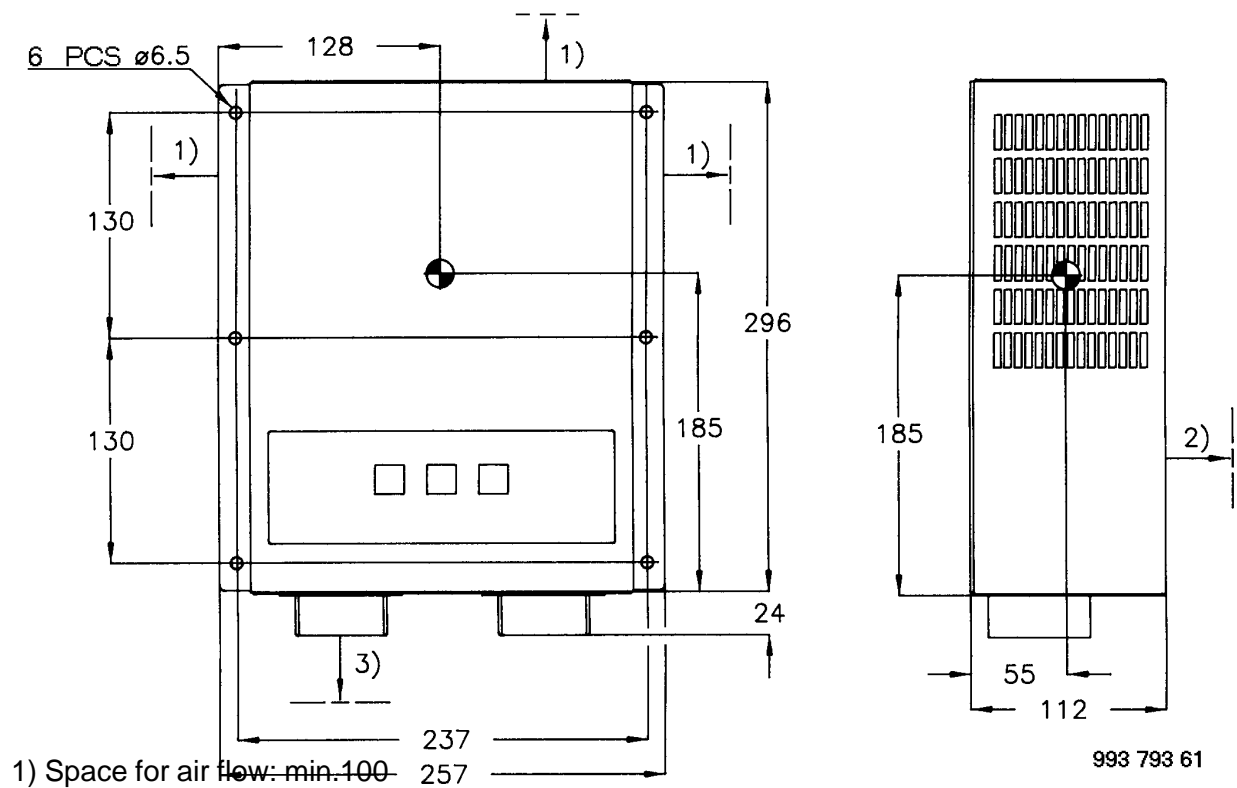
Dimensions are in mm

Tolerance: +/- 1 mm

⊕ Centre of Gravity

Weight: 15.0 Kg

Power Supply

Vertical

Mounting

Only

AC REMOTE CONTROL OUTLINE

232

77

38.5

116

116

11.5

23

1)

38.5

11.5

max. 5

204

4 x ø4.5

69.0

45

220
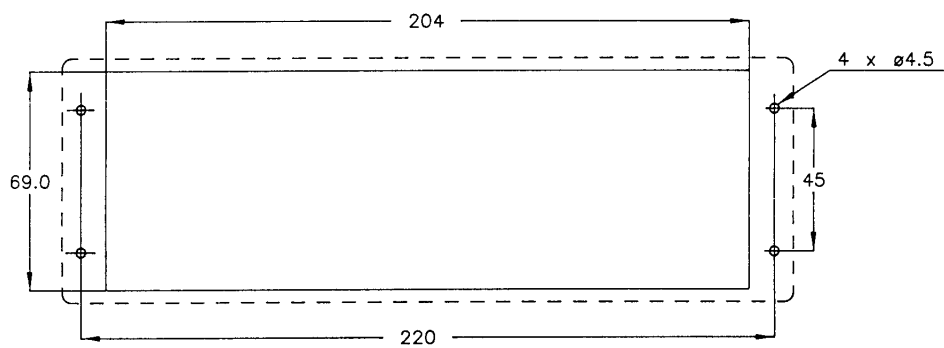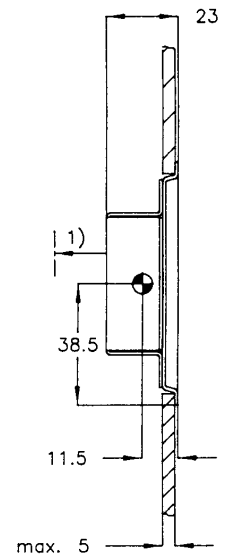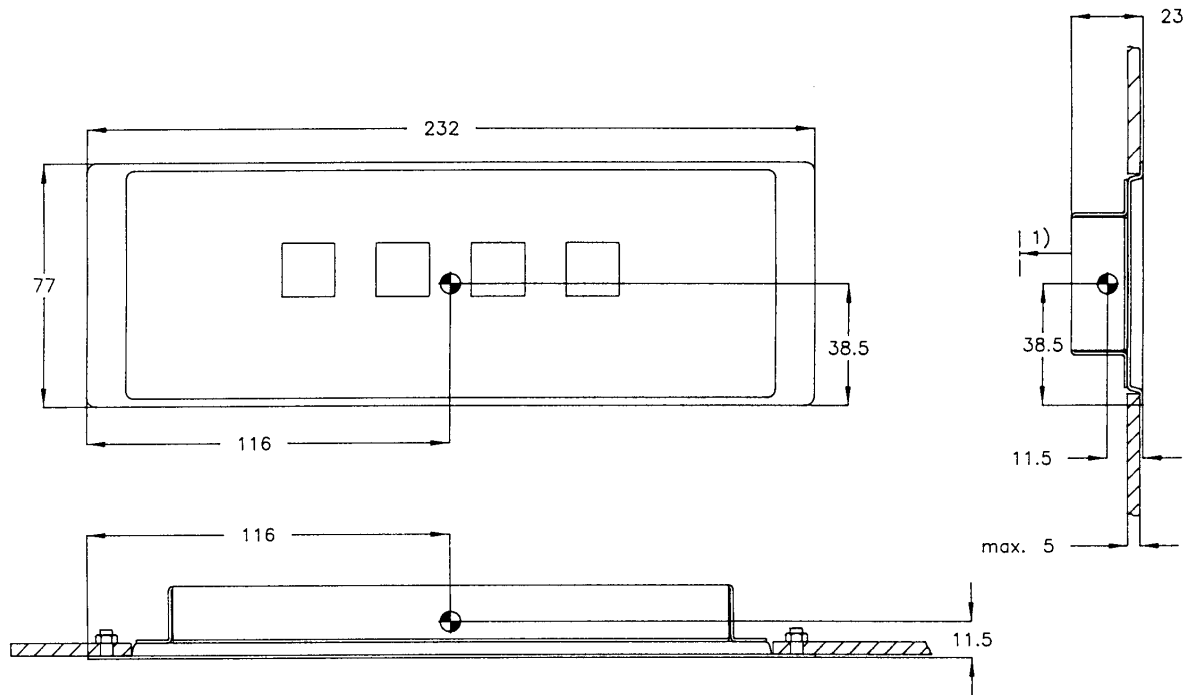
Dimensions are in mm

Tolerance: +/- 1 mm

⊕ Centre of Gravity

Weight: 0.4 Kg

AC Remote
Control

Mounting

Options

M550761A
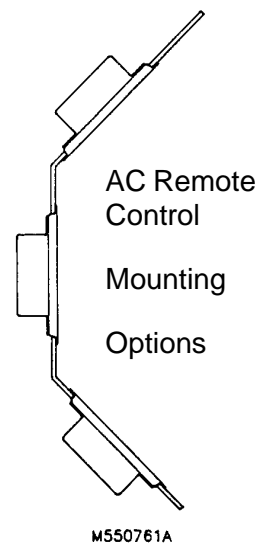
AC POWER SUPPLY SET-UP

TRANSFORMER PRIMARY CONNECTIONS

110V FUSE 8A S

220V/230V FUSE 4A S

120V FUSE 8A S

240V FUSE 4A S
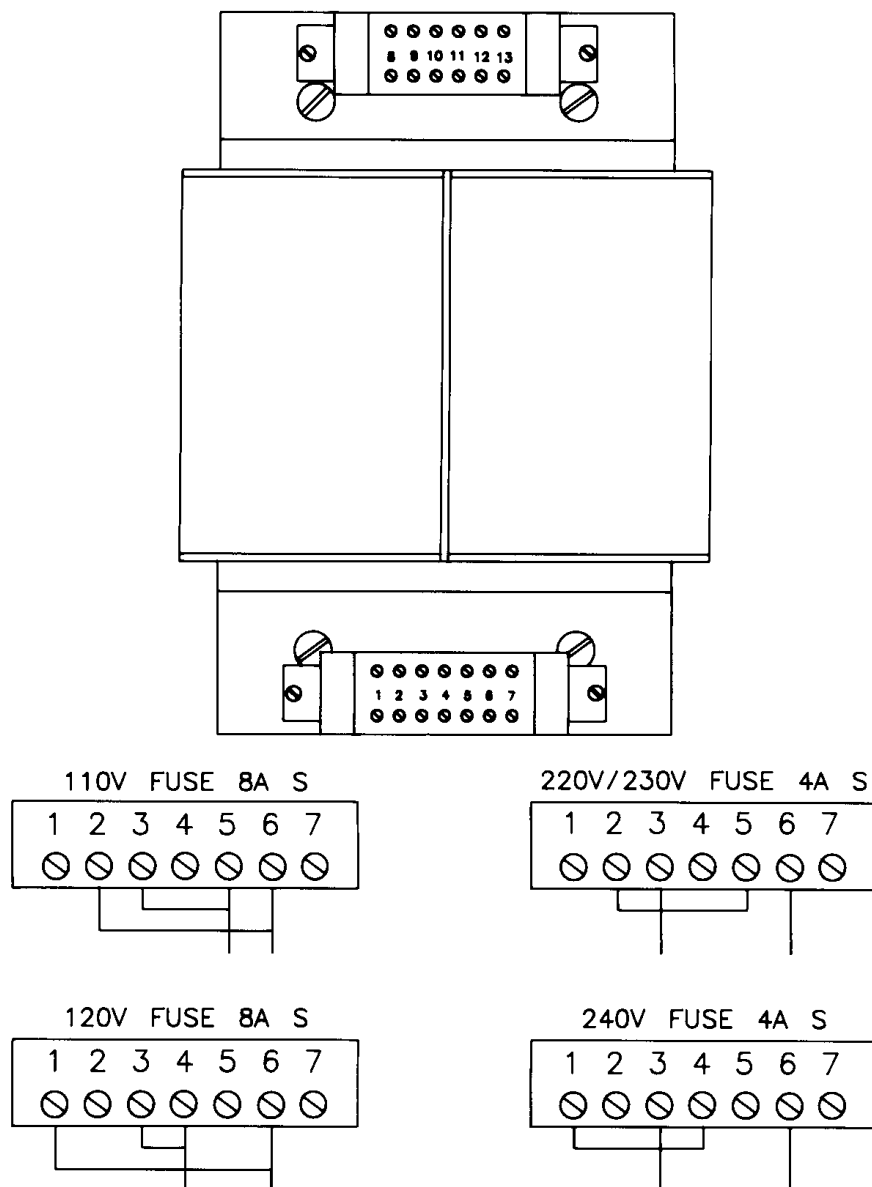
POWERUP STATE AND NO—BREAK INSTALLATION (see page 2-40)

POWERUP STATE

NO—BREAK

PCB750
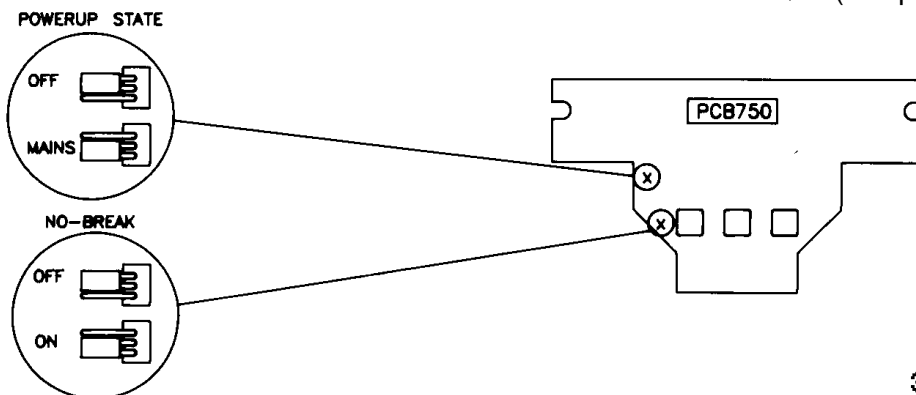
343 790 41

CONTROL UNIT CABLE ENTRY
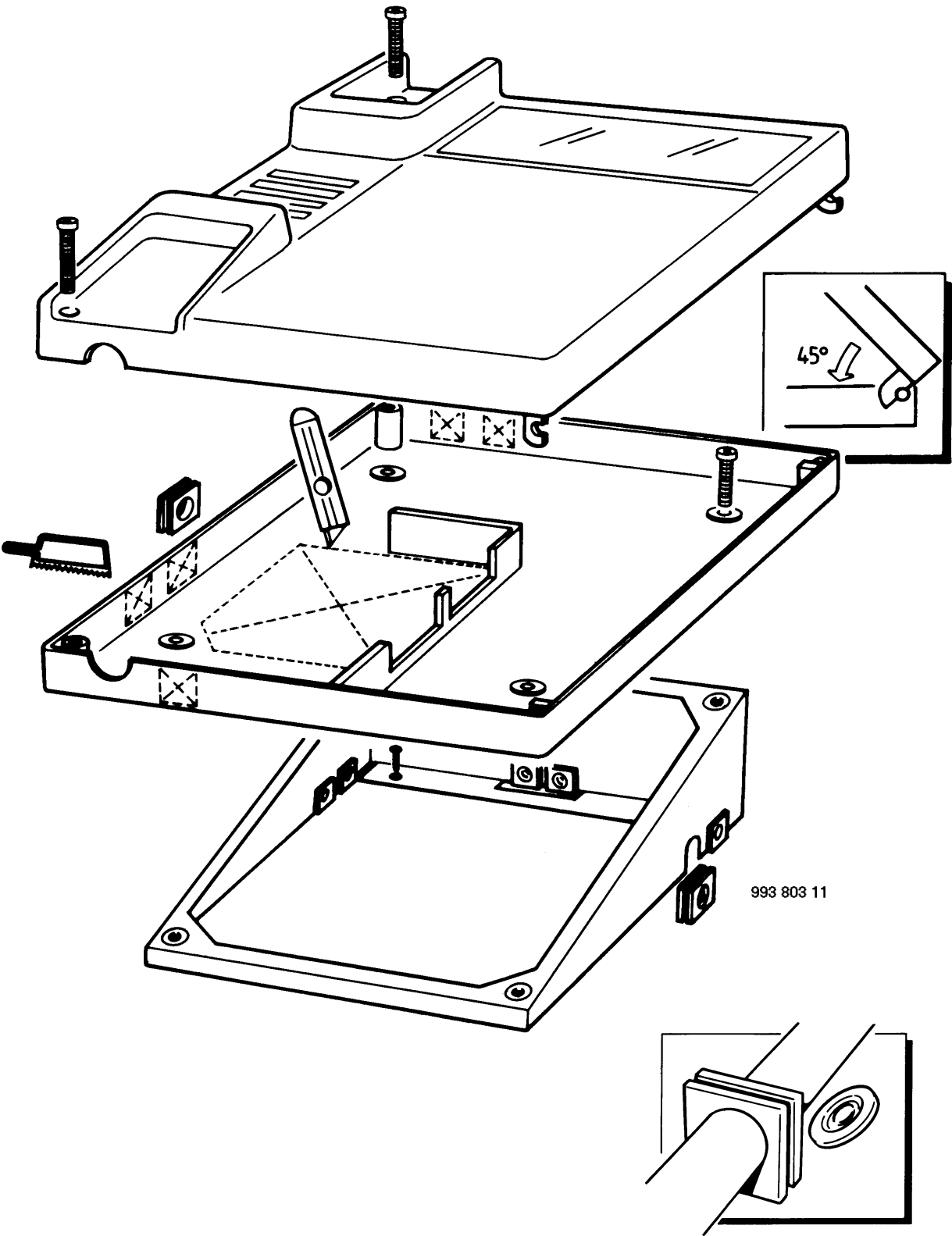
993 803 11

CONTROL UNIT CABLE ENTRY OPTIONS

Option 1
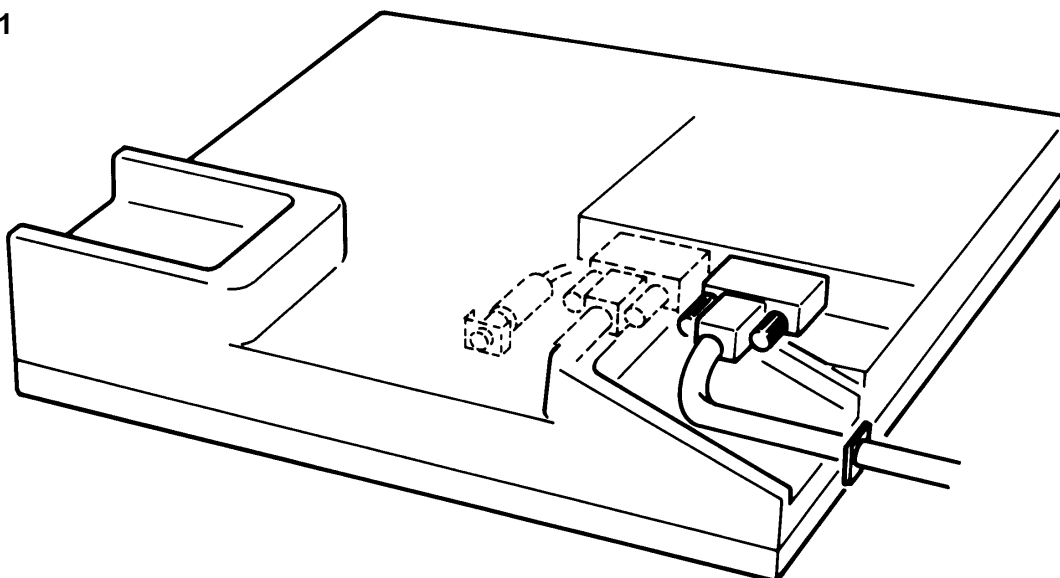
Option 2
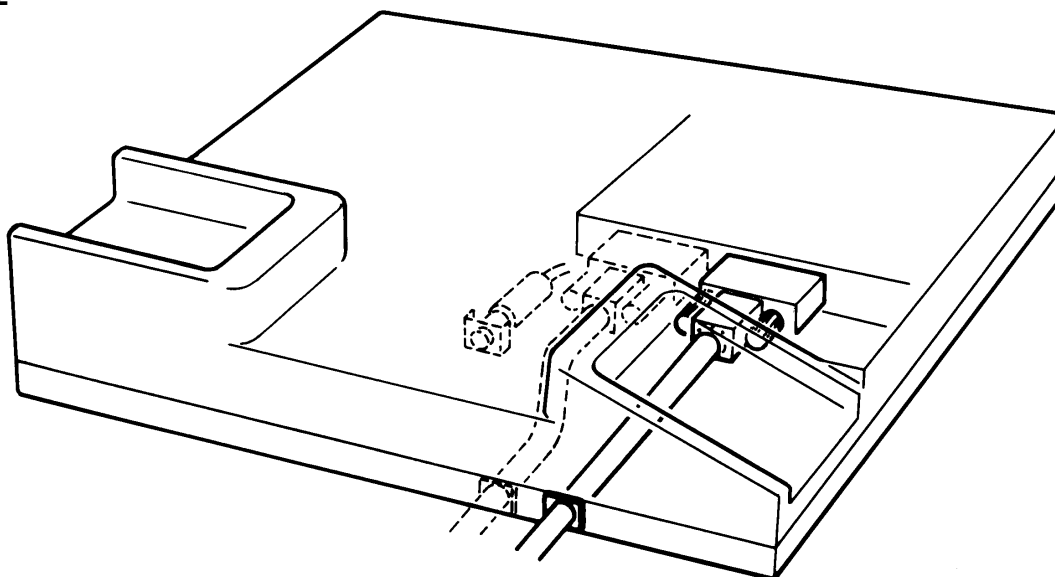
Option 3
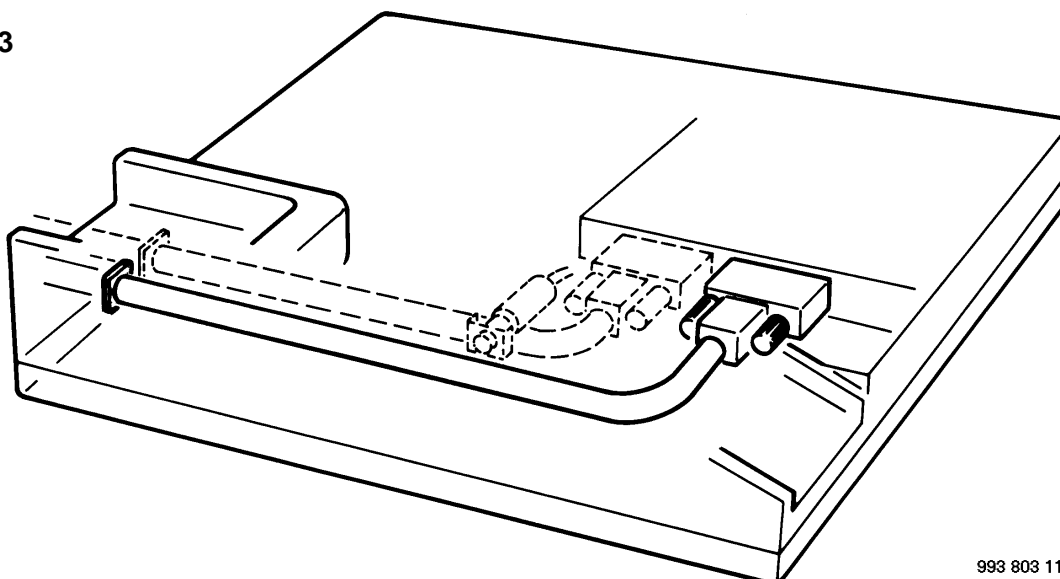
993 803 11

Option 4
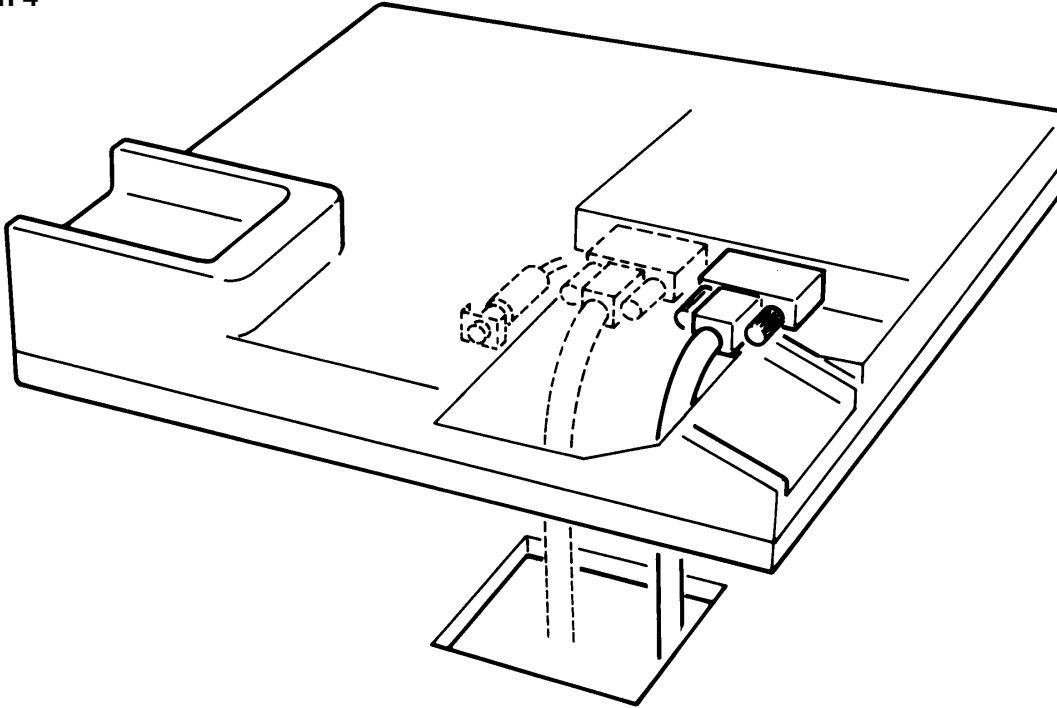
**Options using
Tilting Wedge**
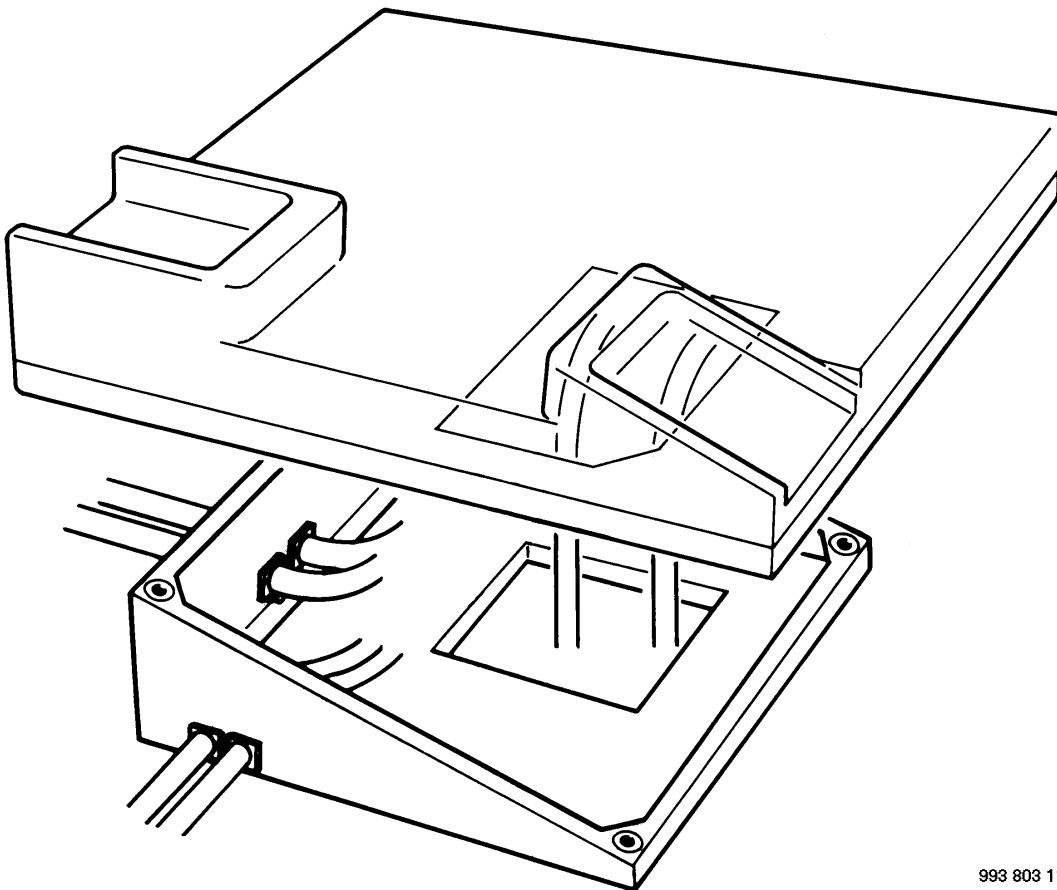
993 803 11

TRANSCEIVER UNIT CABLE CONNECTIONS
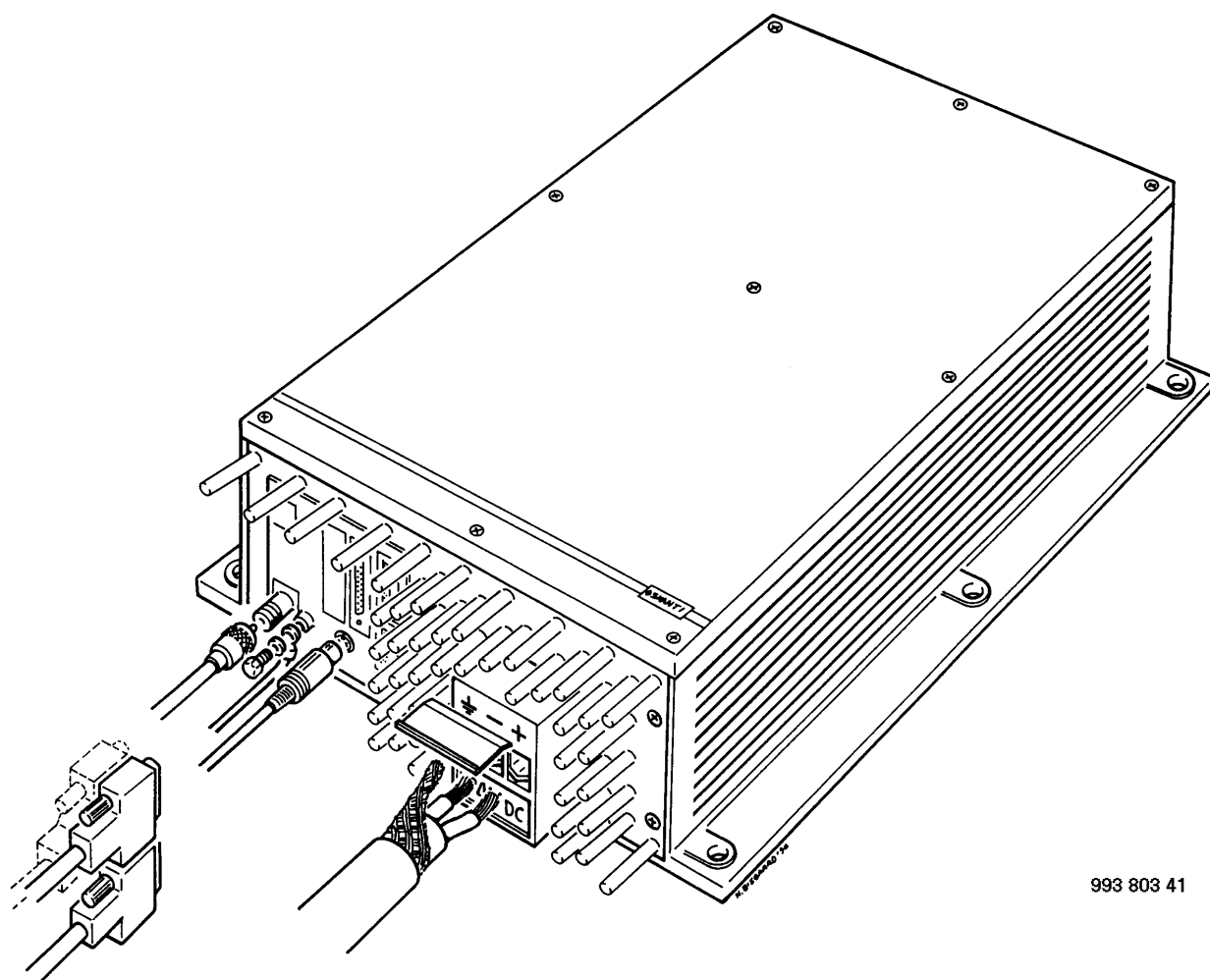
993 803 41

ANTENNA TUNING UNIT CABLE CONNECTIONS
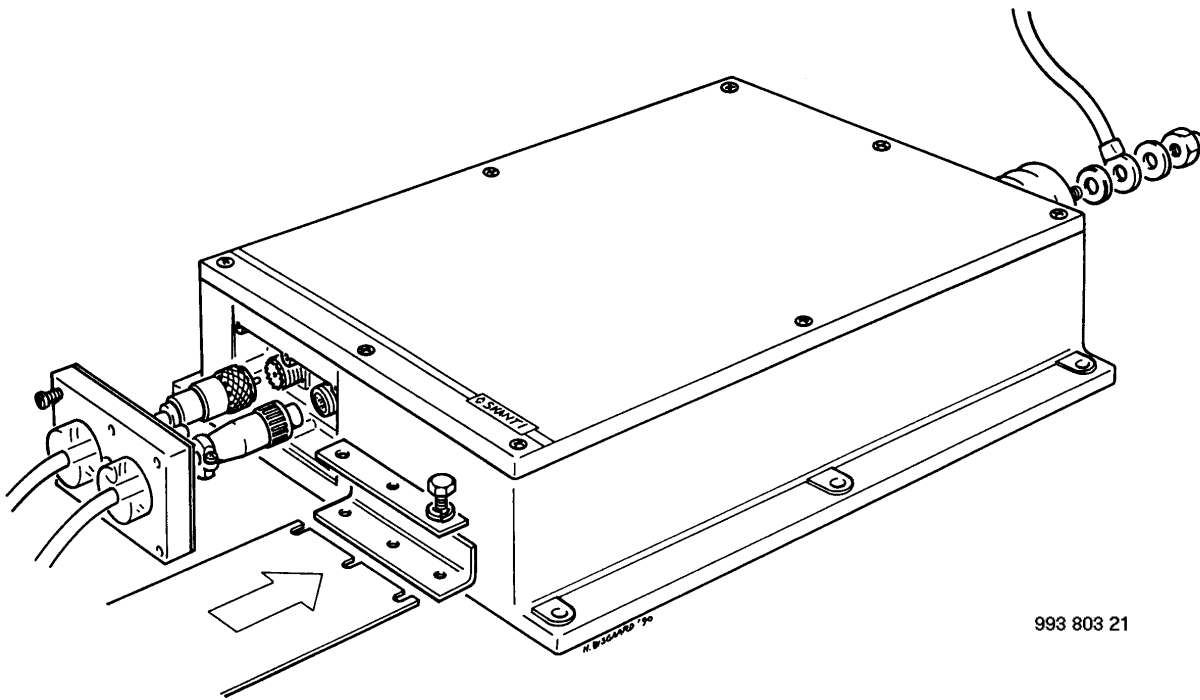
993 803 21

AC POWER SUPPLY CABLE CONNECTIONS
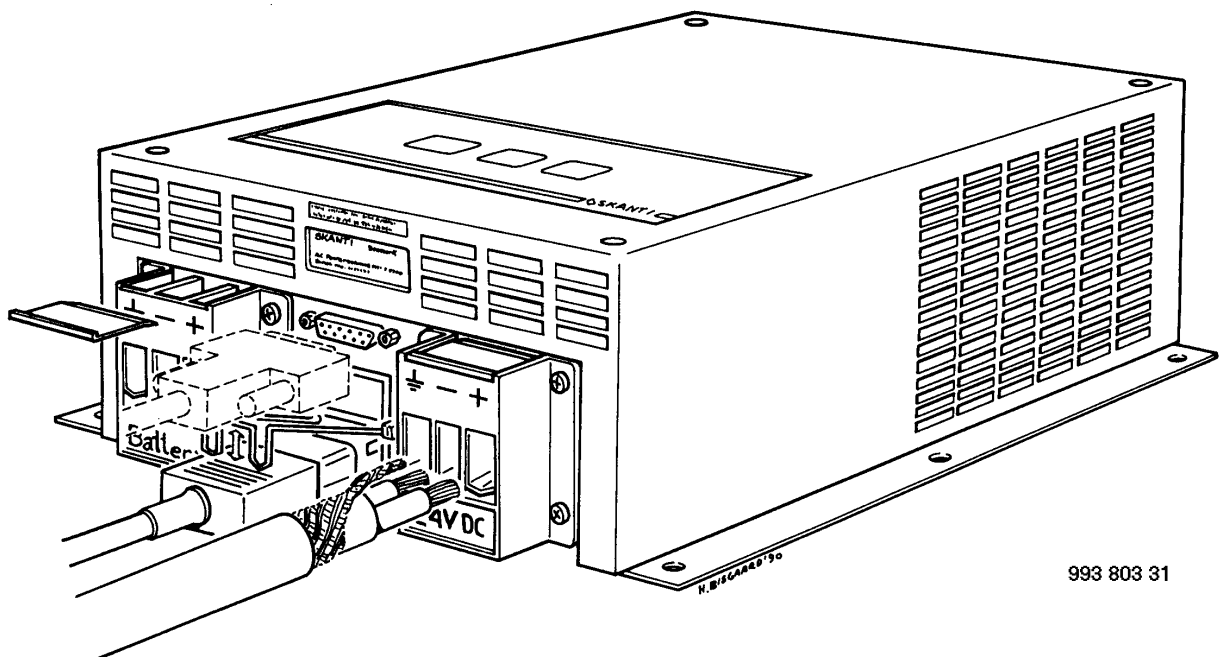
993 803 31

AC REMOTE CONTROL CABLE CONNECTION

993 788 91A
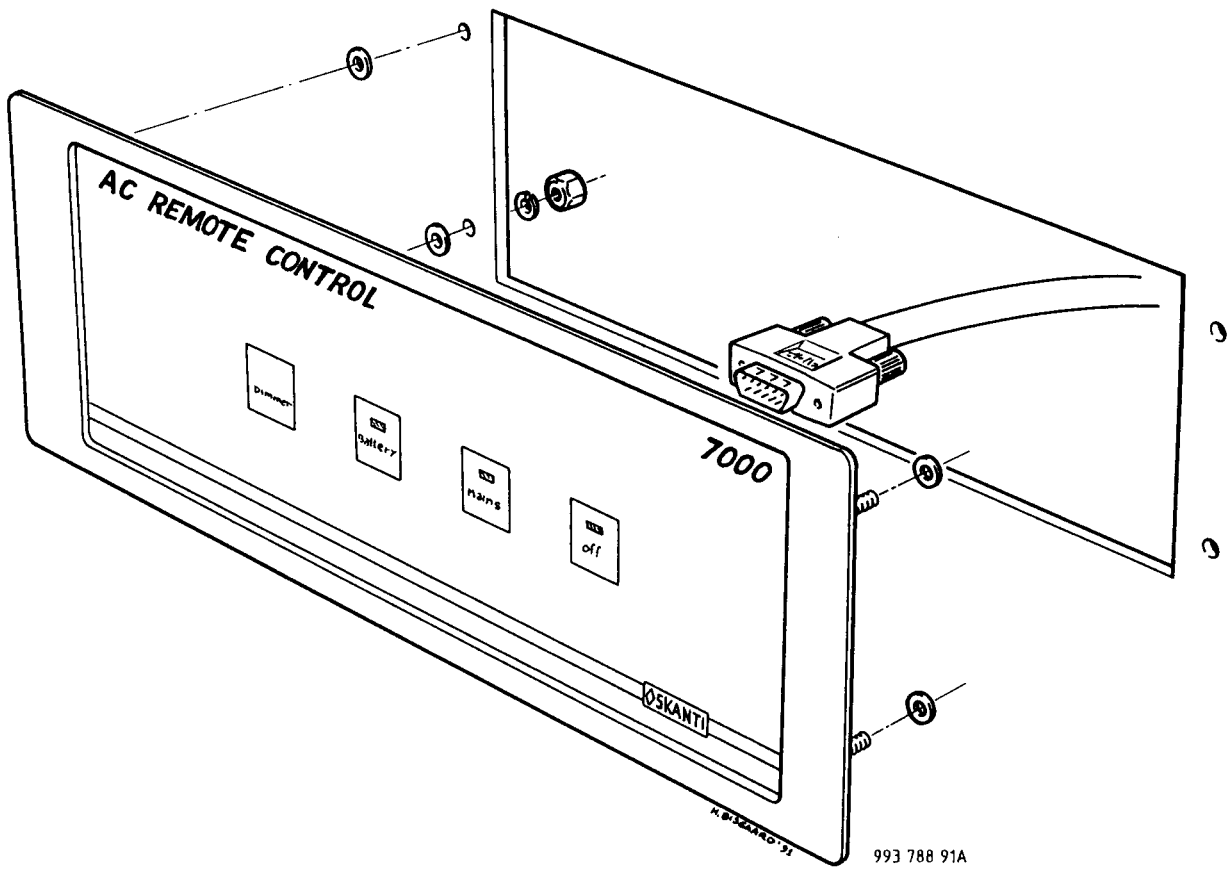
TRP 7200 INSTALLATION WIRING DIAGRAM

993 796 71 B

to antenna

X42

EZnet

ATU Com

X6A

X6A

X23A

X23B

**CONTROL
UNIT**

X34

TX / RX

**TRANCEIVER
UNIT**

X19

X19

**ANTENNA
TUNING
UNIT**

HANDSET

X18

X40

to battery

GND

to antenna

X42

X6A X6A X6A X6A X6A

CONTROL UNIT

EZnet

CONTROL UNIT

EZnet

X23A X23B

X51 X51

X34 X34

ATU Com

X19 X19

TX / RX

ANTENNA TUNING UNIT

TRANCEIVER UNIT

X21

HANDSET HANDSET

X26 X18 X40

GND GND

X18 X103A X107 X108

Remote Battery Mains

Ext SPK

AC POWER SUPPLY *

CU SPEAKER UNIT

to DC 12/24/32V

TU SPEAKER UNIT

REMOTE CONTROL UNIT

X103B

to battery

to AC 110/220V

* For 24V operation only

CONNECTOR X6 A - EZnet
SKANTI code 751 000 64

Identify twisted pairs.
Before contacts of plug are soldered: slide the
plastic cover over the cable .
After the contacts are soldered: latch the inner
and outer shields into the connectors from the
rear and snap in.
Finally slide the plastic cover over the shield
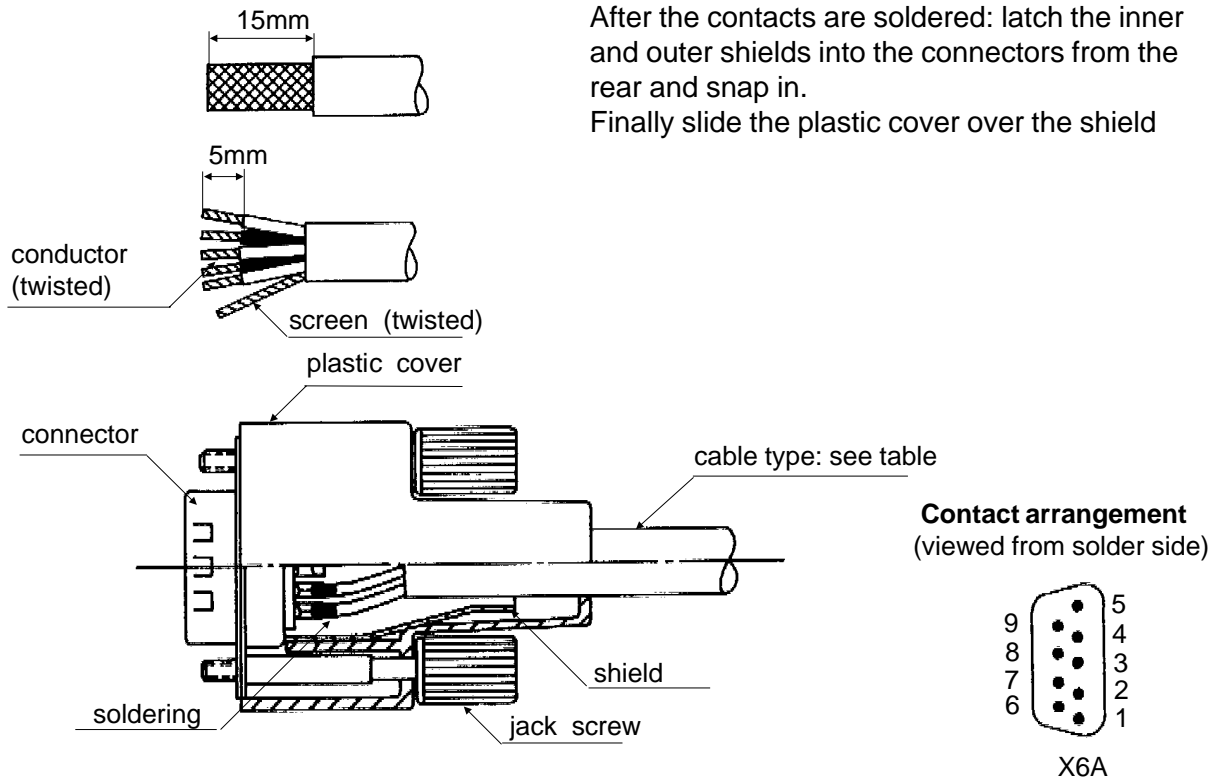
Connector X6 A- EZnet Terminal no.	Designaltion	Remarks
1	SUPPLY ON	0V when Supply On/Off key is pressed.
2	TU-CU DATA	0 / 12V
3	+7.5V	+7.5V
4	AF+	Balanced audio signal
5	AF-	Balanced audio signal
6	GND	GND
7	-15V	-15V
8	+15V	+15V
9	NC	NC
Shield	Cable screen	

CU installation example no. 1:

TRANSCEIVER UNIT — Up to 50 m — CONTROL UNIT

CU installation example no. 2:

TRANSCEIVER UNIT — Up to 5m — CONTROL UNIT — Up to 45 m — CONTROL UNIT

CU installation example no. 3:

TRANSCEIVER UNIT — Up to 5m — CONTROL UNIT — Up to 23 m — CONTROL UNIT — Up to 23 m — CONTROL UNIT

CU installation example no. 4:

Up to 50 m

TRANSCEIVER UNIT — Up to 5m — CONTROL UNIT — Up to 15m — CONTROL UNIT — Up to 15m — CONTROL UNIT — Up to 15m — CONTROL UNIT

CU installation example no. 5:

TRANSCEIVER UNIT — Up to 5m — CONTROL UNIT — Up to 11m — CONTROL UNIT — Up to 11m — CONTROL UNIT — Up to 11m — CONTROL UNIT — Up to 11m — CONTROL UNIT
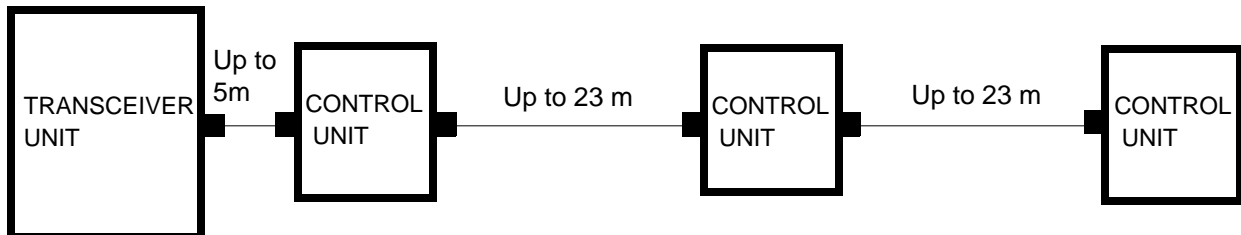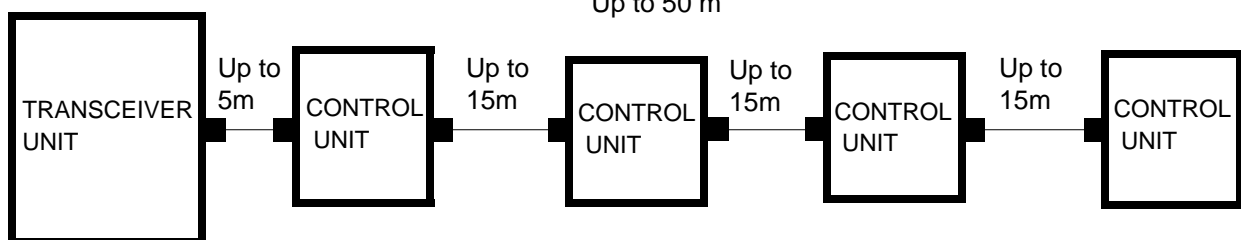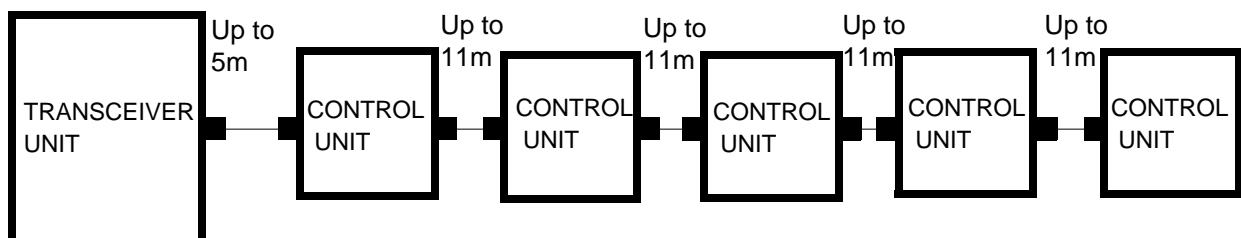
X6A cable specification.

Accommodate cable outer diameter from 4.4 to 11.0mm

CU installation example no.	Cable type	Skanti code
1	Screened multiwire 8 x $0.25mm^2$	702 000 29
2	Screened multiwire 8 x $0.25mm^2$	702 000 29
3	Screened multiwire 8 x $0.34mm^2$	702 000 30
4	Screened multiwire 8 x $0.34mm^2$	702 000 30
5	Screened multiwire 8 x $0.50mm^2$	702 000 31

CONNECTOR X18 - BATTERY

60mm

15mm

screen (twisted)

conductor (twisted)

plastic cover

screw

clamp

cable type see table

plastic house
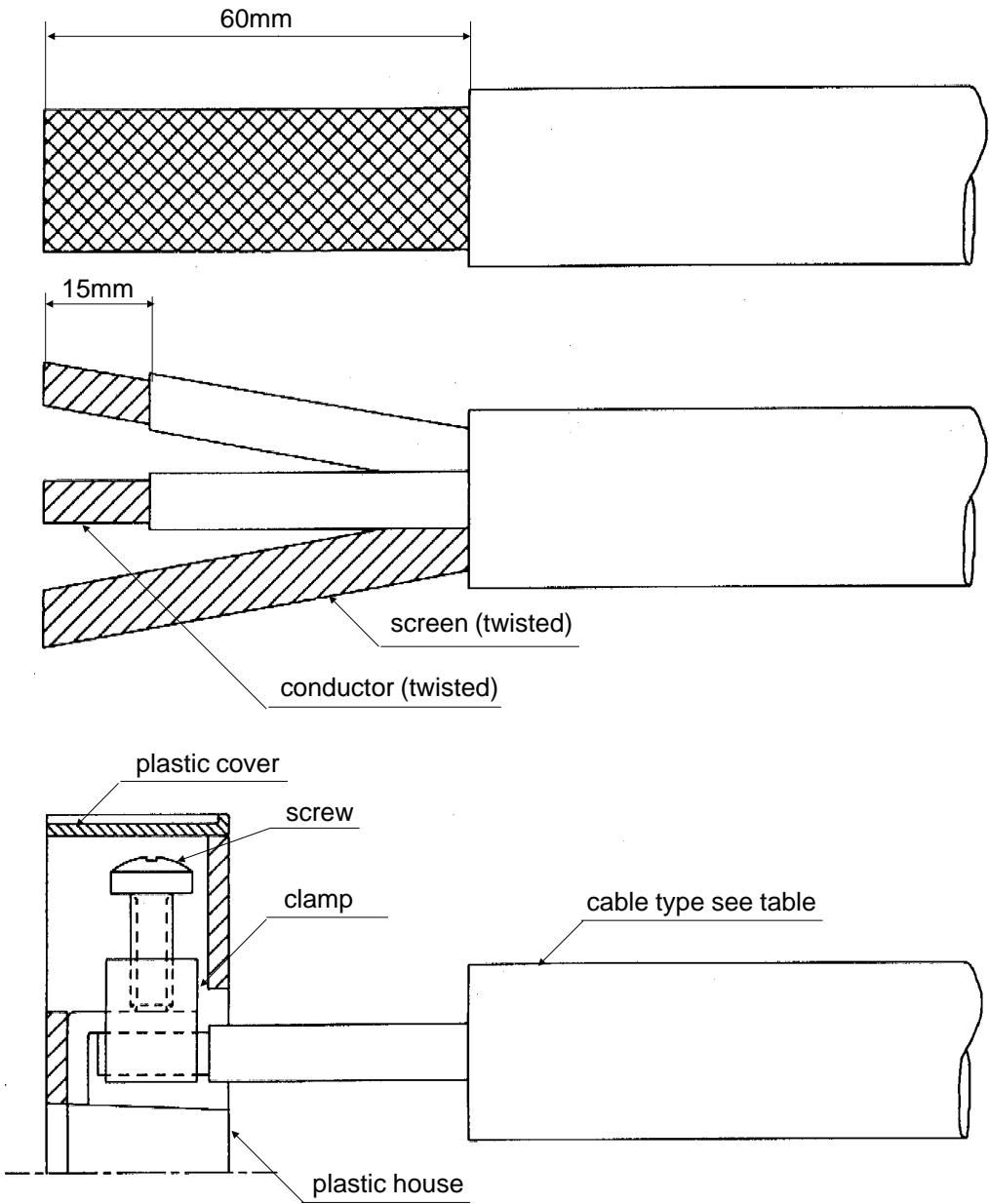
Contact arrangements
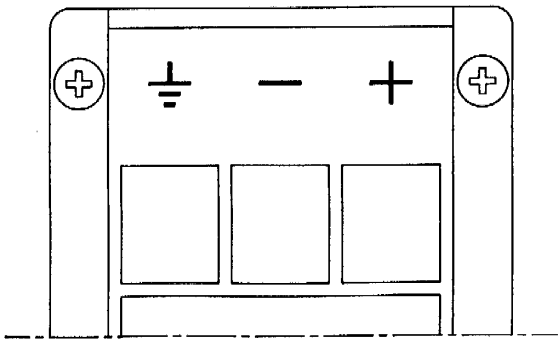
X18 Cable specification

Battery voltage	Max. cable length to battery *	Recommended cable	External fuses
12V	2.5m	Screened multiwire 2 x 16mm^2	50 A
12V	4.0m	Screened multiwire 2 x 25mm^2	50 A
24V	2.5m	Screened multiwire 2 x 10mm^2	40 A
24V	4.5m	Screened multiwire 2 x 16mm^2	40 A
24V	7.0m	Screened multiwire 2 x 25mm^2	40 A
32V	4.0m	Screened multiwire 2 x 10mm^2	40 A
32V	6.5m	Screened multiwire 2 x 16mm^2	40 A
32V	10.0m	Screened multiwire 2 x 25mm^2	40 A

* The maximum cable lengths are specified for continuos two tone operation.
For ARQ or speech operation only, the maximum cable length figures are doubled.

See connector X107 for installation with power supply unit.

CONNECTOR X19 - TX/RX

28.5mm

16mm   1.5mm

body   coupling nut

soldering
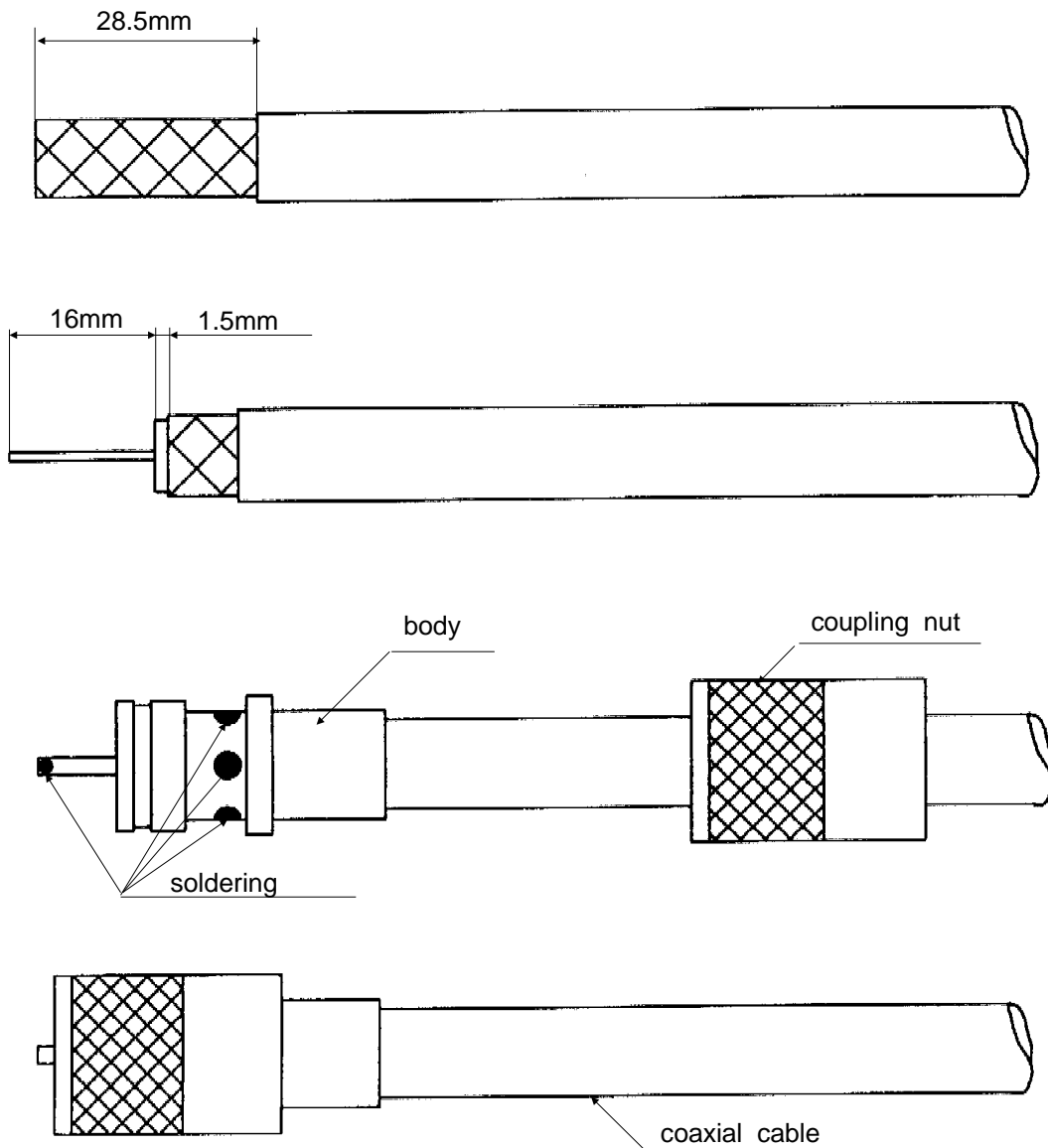
coaxial cable

X19 cable specification

Coaxial cable type RG-213/U or RG 8A/U

CONNECTOR X21 - GND

11mm

crimp

6.4 mm DIA
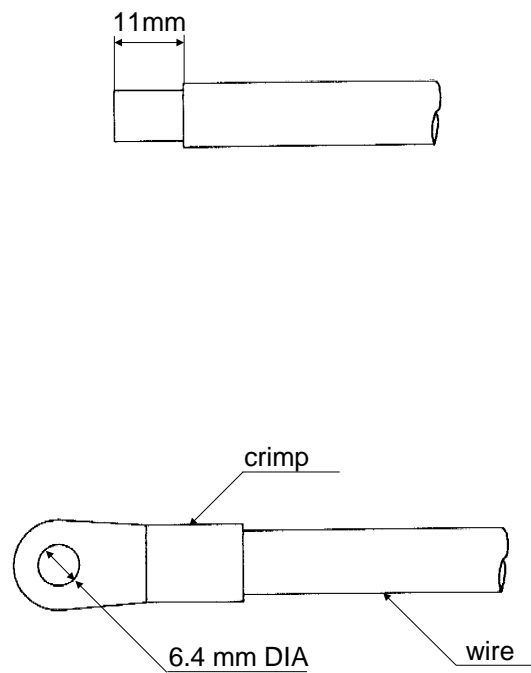
wire

X21 Wire specification
Recommended wire dimension: $16mm^2$.
Wire length as short as possibly.

CONNECTORS X23A / X23B - ATU Com

Connector X23A - ATU Com
Skanti code 751 000 64
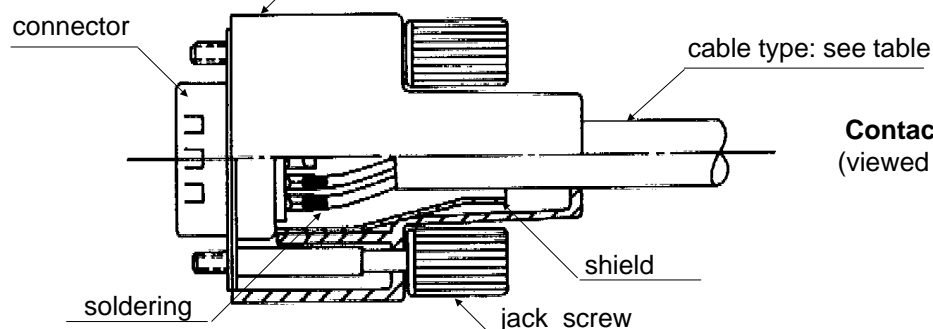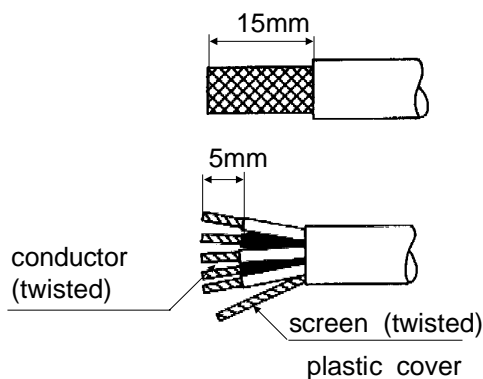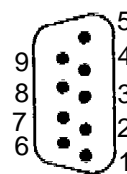
Identify twisted pairs.
Before contacts of plug are soldered: slide the plastic cover over the cable .
After the contacts are soldered: latch the inner and outer shields into the connectors from the rear and snap in.
Finally slide the plastic cover over the shield

15mm

5mm

conductor
(twisted)

screen (twisted)

plastic cover

connector

cable type: see table

Contact arrangement
(viewed from solder side)

shield

soldering

jack screw

X23A

Connector X23B - ATU Com
Skanti code 751 001 69
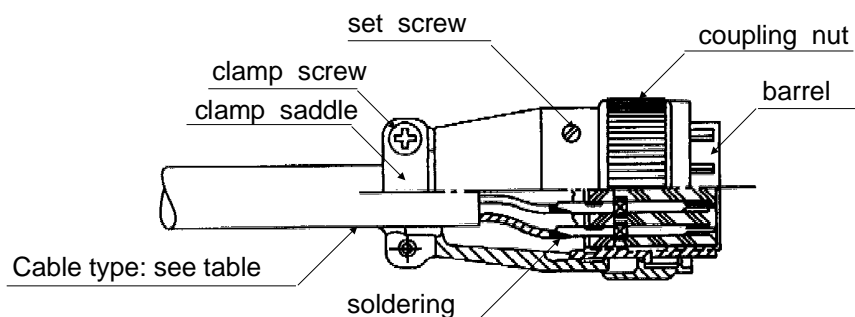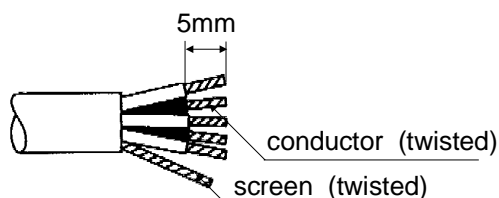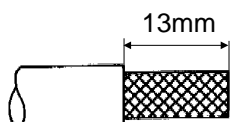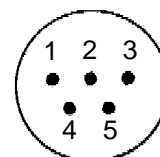
Before contacts of plug are soldered: slide endbell over the cable . Loosen the set screw on the endbell to separate endbell from the barrel, and slide endbell over the cable. After soldering: screw endbell into barrel and fix with the set screw.

13mm

5mm

conductor (twisted)

screen (twisted)

set screw

clamp screw

clamp saddle

coupling nut

barrel

Contact arrangement
(viewed from solder side)

Cable type: see table

soldering

X23B

Connector X23A - ATU Com Terminal no.	Connector X23B - ATU Com Terminal no.	Designation	Remarks
1	5	GND	Cable screen
2 and 3	3	TU-ATU DATA	0/24V
4 and 5	2	TX/$\overline{RX}$,$\overline{PROTEC}$	0/24V
6 and 7	4	GND	
8 and 9	1	TX24V / RX15V	+24V when TX on and +15V when TX off

Cable length	Cable type	Skanti code
Up to 40 m	Screened multiwire 5 x 0.25mm^2	702 000 26
Up to 75 m	Screened multiwire 5 x 0.50mm^2	702 000 27
Up to 100m	Screened multiwire 5 x 0.75mm^2	702 000 28

CONNECTOR X25 - Com
SKANTI code 751 000 66
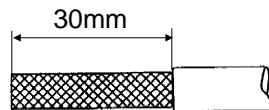
Identify twisted pairs.
Before contacts of plug are soldered: slide the
plastic cover over the cable .
After the contacts are soldered: latch the inner
and outer shields into the connectors from the
rear and snap in.
Finally slide the plastic cover over the shield
and fix the two jack screws into the plastic cover.
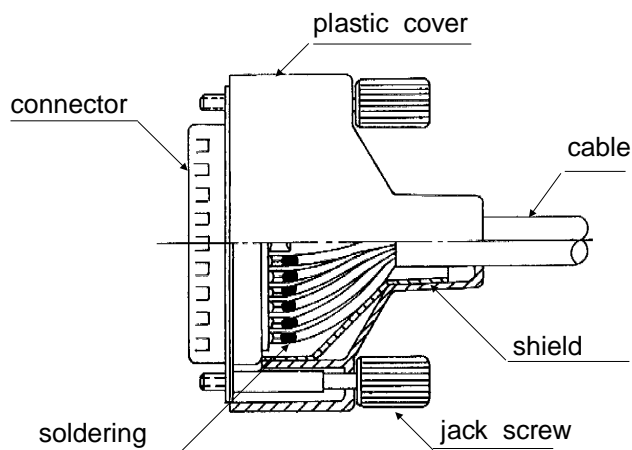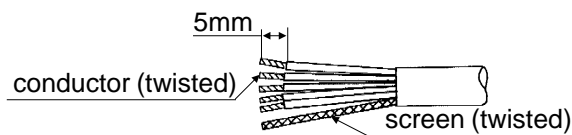
Contact arrangement
(viewed from solder side)
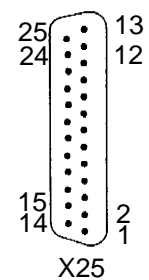
X25 Cable specification
Acommodate cable outer diameter from 4.4 to 11.0 mm

Connector X25 - com Terminal no.	Designaltion	Direction	Remarks
1	REM17	I/O	Optional
2	REM2	I/O	Optional
3	REM4	I/O	Optional
4	REM6	I/O	Optional
5	REM8	I/O	Optional
6	REM10	I/O	Optional
7	REM12	I/O	Optional
8	REM14	I/O	Optional
9	2182 KEYED	Output	Open collector Max. current 250mA Max. voltage 40V. Is low when TX is keyed on 2182 kHz.
10	TX INHIBIT	Input	TX inhibited when connected to GND. Internally pulled up to 15V through 2.2kohm.
11	RX MUTE	Input	RX muted when connected to GND. Internally pulled up to 15V through 2.2kohm.
12	EXT KEY	Input	TX is keyed in telex and other datatransmission modes, when EXT KEY is low. Internally pulled up to 15V through 2.2kohm
13	GND		
14	REM1	I/O	Optional
15	REM3	I/O	Optional
16	REM5	I/O	Optional
17	REM7	I/O	Optional
18	REM9	I/O	Optional
19	REM11	I/O	Optional
20	REM13	I/O	Optional
21	REM15	I/O	Optional
22	REM16	I/O	Optional
23	TX KEYED	Output	Open collector. Max. i current 250mA Max. voltage 40V. Is low when TX is keyed.
24	2182 SEL	Output	Open collector. Max. i current 250mA. Max. voltage 40V. Is low when 2182 kHz is selected.
25	+24V	Output	+24V available when equipment is on. Max. current 200mA Internally fused.
Shield	Cable screen		

CONNECTOR X26 - Ext SPK
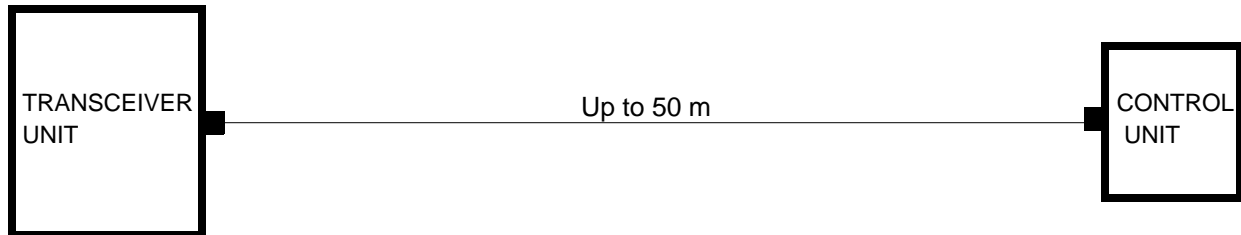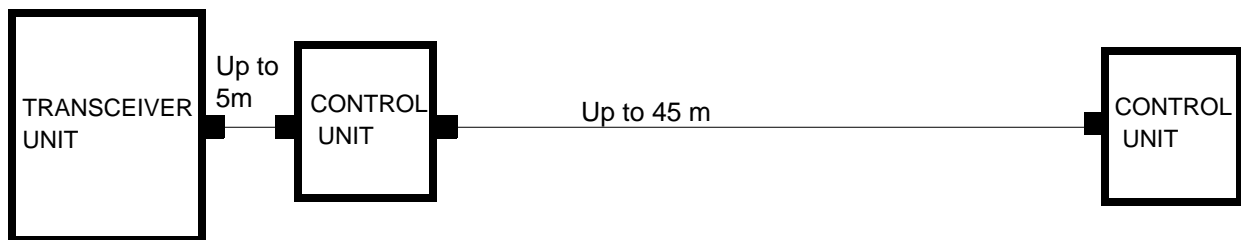SKANTI code 751 001 71

Before contacts of plug are soldered:
slide plastic cover over the cable.
After the contacts are soldered: the two
shields are latched into the connector
and snapped in.
Finally slide the plastic cover over the
shield.
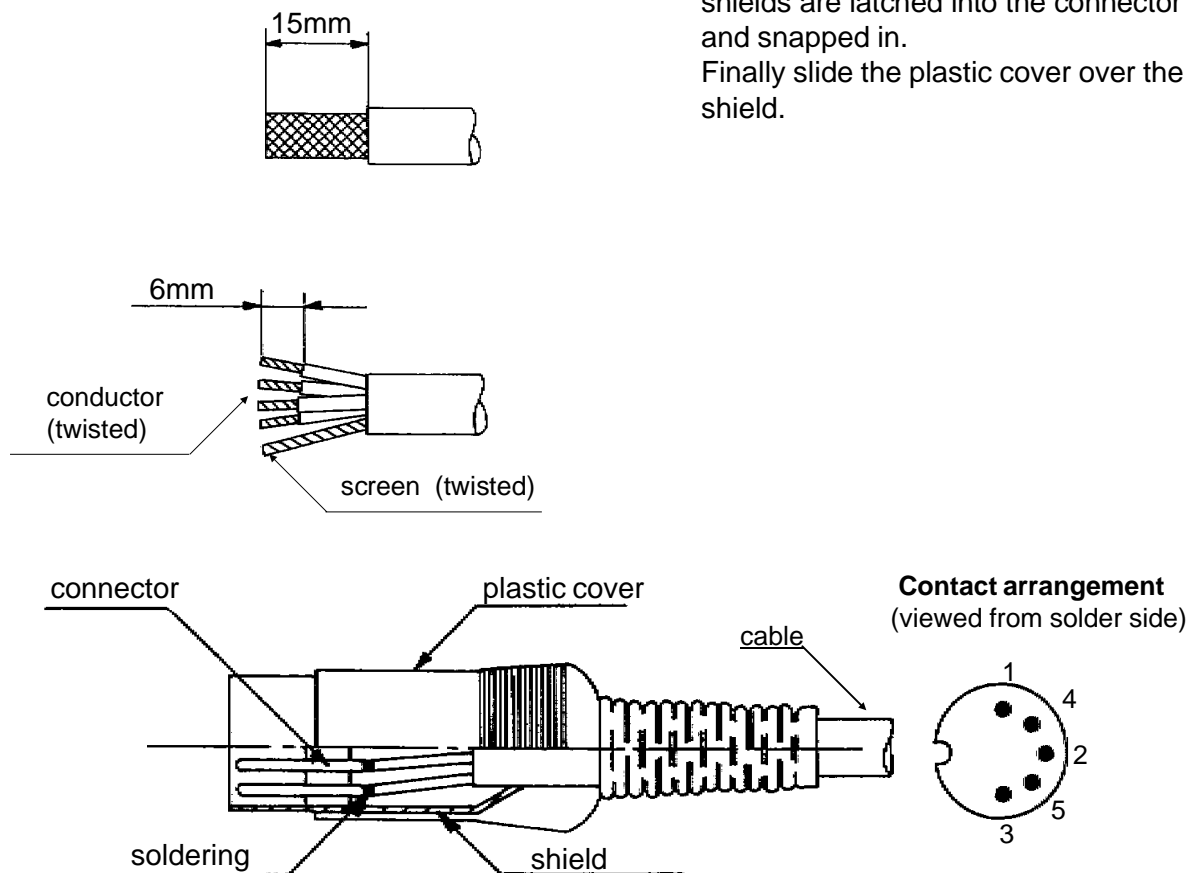
Connector X26 - Ext SPK Terminal no.	Designation	Remarks
1	NC	
2	GND	
3	NC	
4	NC	
5	AF	Output power 0-5 W in 4 ohm. Minimum load impedance 2 ohm.

X26 cable specification
Recommended cable outer diameter 5.5mm

CONNECTOR X34 - HANDSET CON
SKANTI code 751 001 72

Before contacts of plug are soldered:
slide plastic cover over the cable.
After the contacts are soldered: the two
shields are latched into the connector
and snapped in.
Finally slide the plastic cover over the
shield.
Before contacts of plug are soldered:

Contact arrangement
(viewed from solder side)
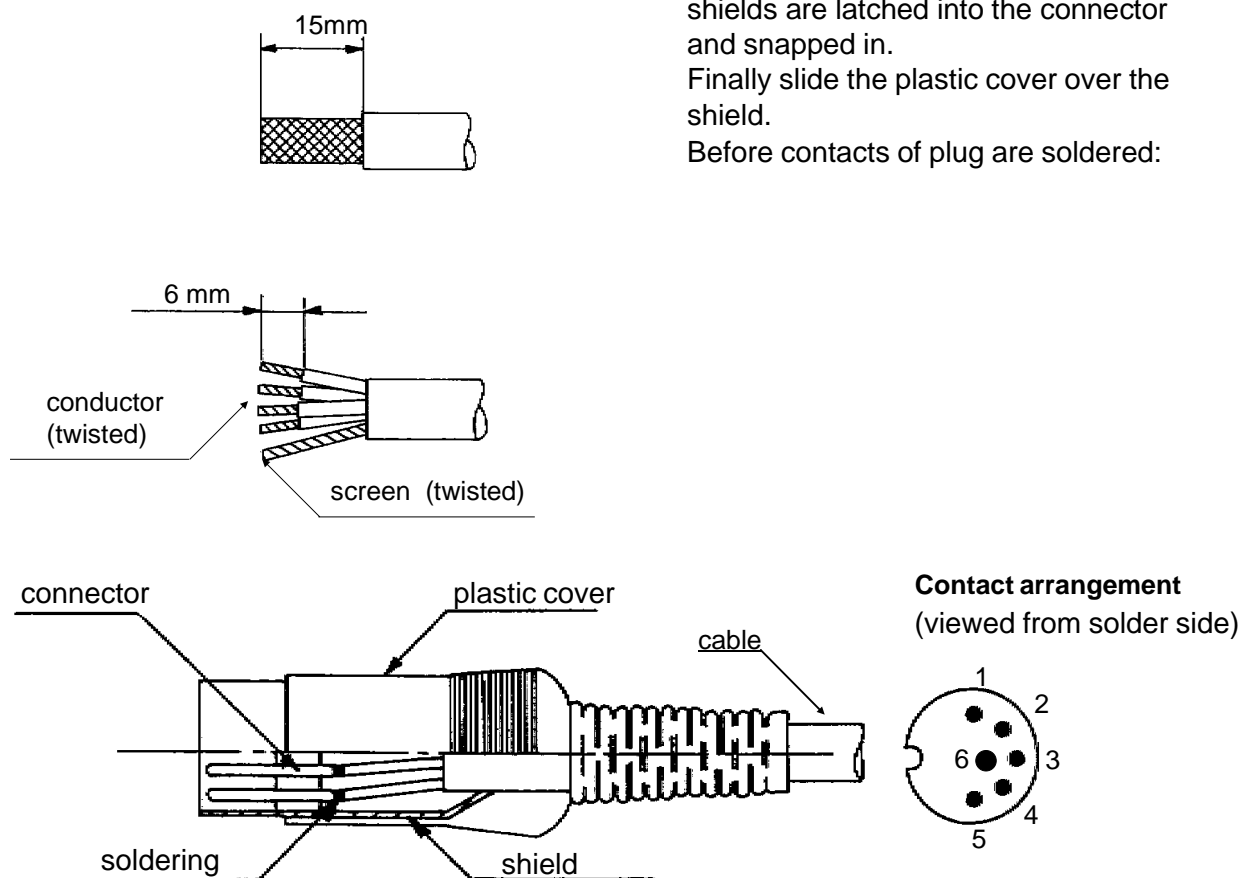
Connector X34 - HANDSET CON Terminal no.	Designation	Remarks
1	HOOK ON	Low when handset is placed in the holder
2	HANDSET KEY	Low when handset key is pressed
3	+12V	
4	MIC	0-1.6Vpp Adjustable +/-8dB.
5	EARPIECE	Max. 2.1Vpp
6	GND	

X34 cable specification

Recommended cable outer diameter 5.5mm

CONNECTOR X40 - GND
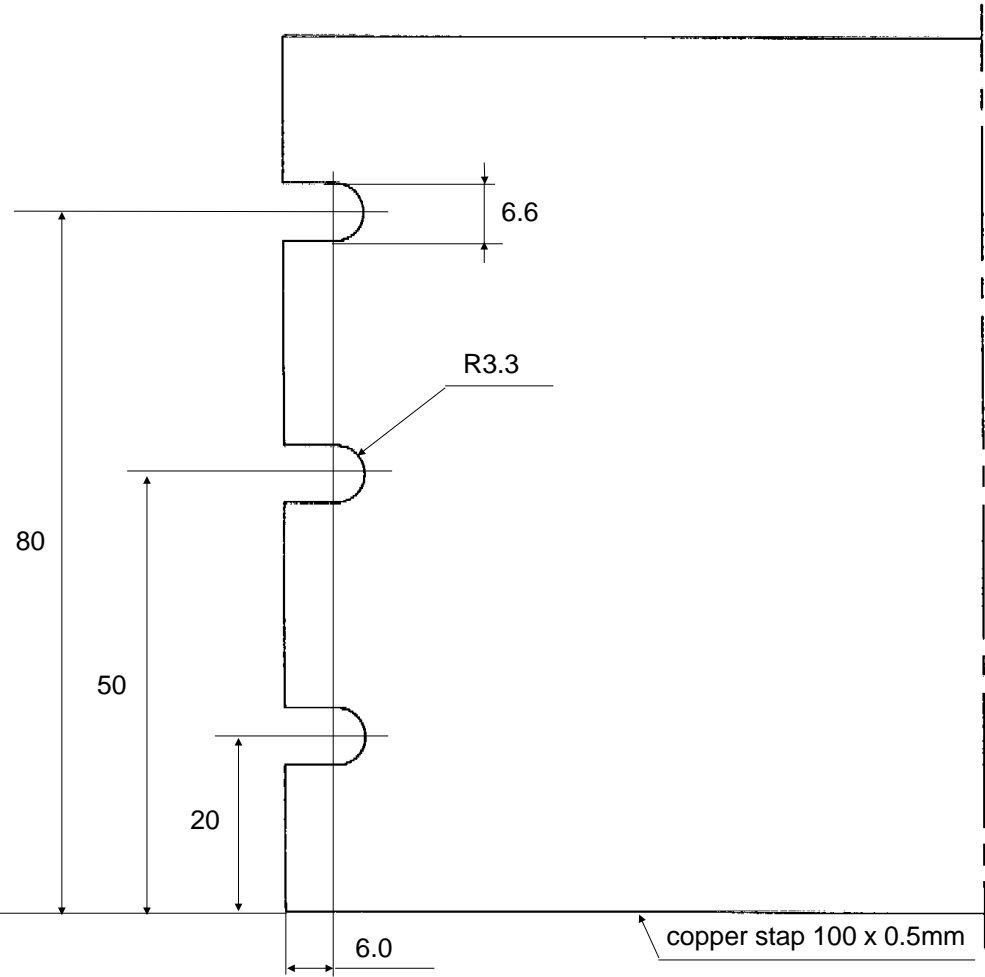
Dimension in mm

CONNECTOR X51 - Ext AF

10mm

conductor (twisted

5mm

screen (twisted)

plastic cover

cable

connector

soldering

crimpes
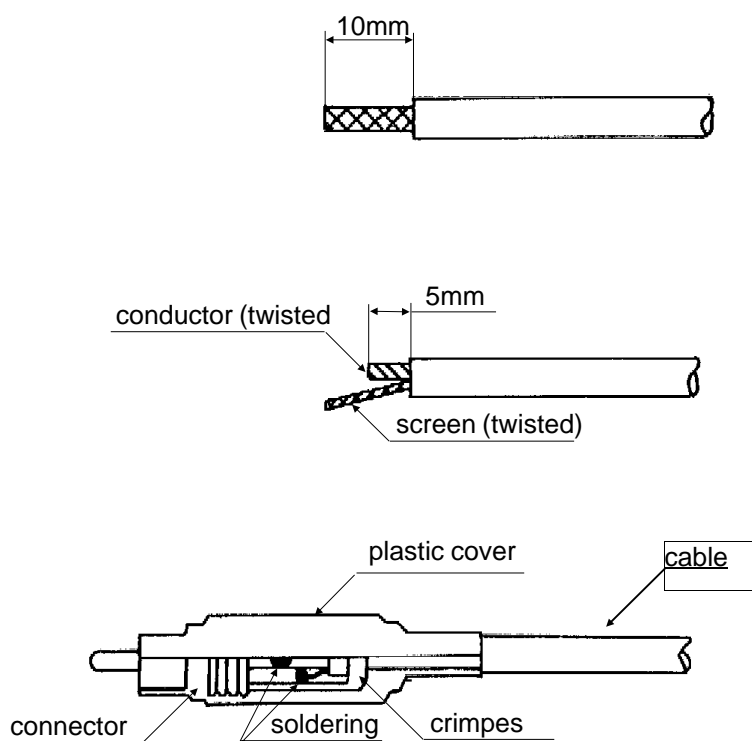
Connector X51 - Ext AF	Designation	Remarks
inner terminal	Ext AF	600 ohm ~ 0 dB Level:Volume-dependent
shield	Cable screen	

CONNECTOR X103A - Remote
SKANTI code 751 000 64

Identify twisted pairs.
Before contacts of plug are soldered: slide the plastic cover over the cable .
After the contacts are soldered: latch the inner and outer shields into the connectors from the rear and snap in.
Finally slide the plastic cover over the shield

15mm

5mm

conductor (twisted)

screen (twisted)

plastic cover

connector

cable type: see table

Contact arrangement
(viewed from solder side)

9 8 7 6

5 4 3 2 1

X103A

shield

soldering

jack screw
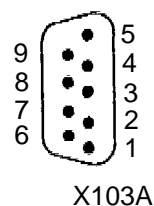
Connector X103A- Remote Terminal no.	Designation	Signal level	Remarks
1	NC		NC
2	MAINS LED		Indicating operating mode
3	BAT LED		Indicating operating mode
4	OFF LED		Indicating operating mode
5	GND		
6	LED SUPPLY	-12V	Measured relative to +24V level
7	MAINS	0/5V	Controlled by the MAINS key
8	BAT	0/5V	Controlled by the BATTERY key
9	OFF	0/5V	Controlled by the OFF key
Shield	Cable screen		

X103 cable specification.
Accommodate cable outer diameter from 4.4 - 11.0mm.

Cable length	Cable type	Skanti code
up to 50 m	Screened multiwire 8 x 0.5mm^2	702 000 31

CONNECTOR X107 - Battery

60mm

15mm

screen (twisted)

conductor (twisted)

plastic cover

screw

clamp

cable type: see table

plastic house
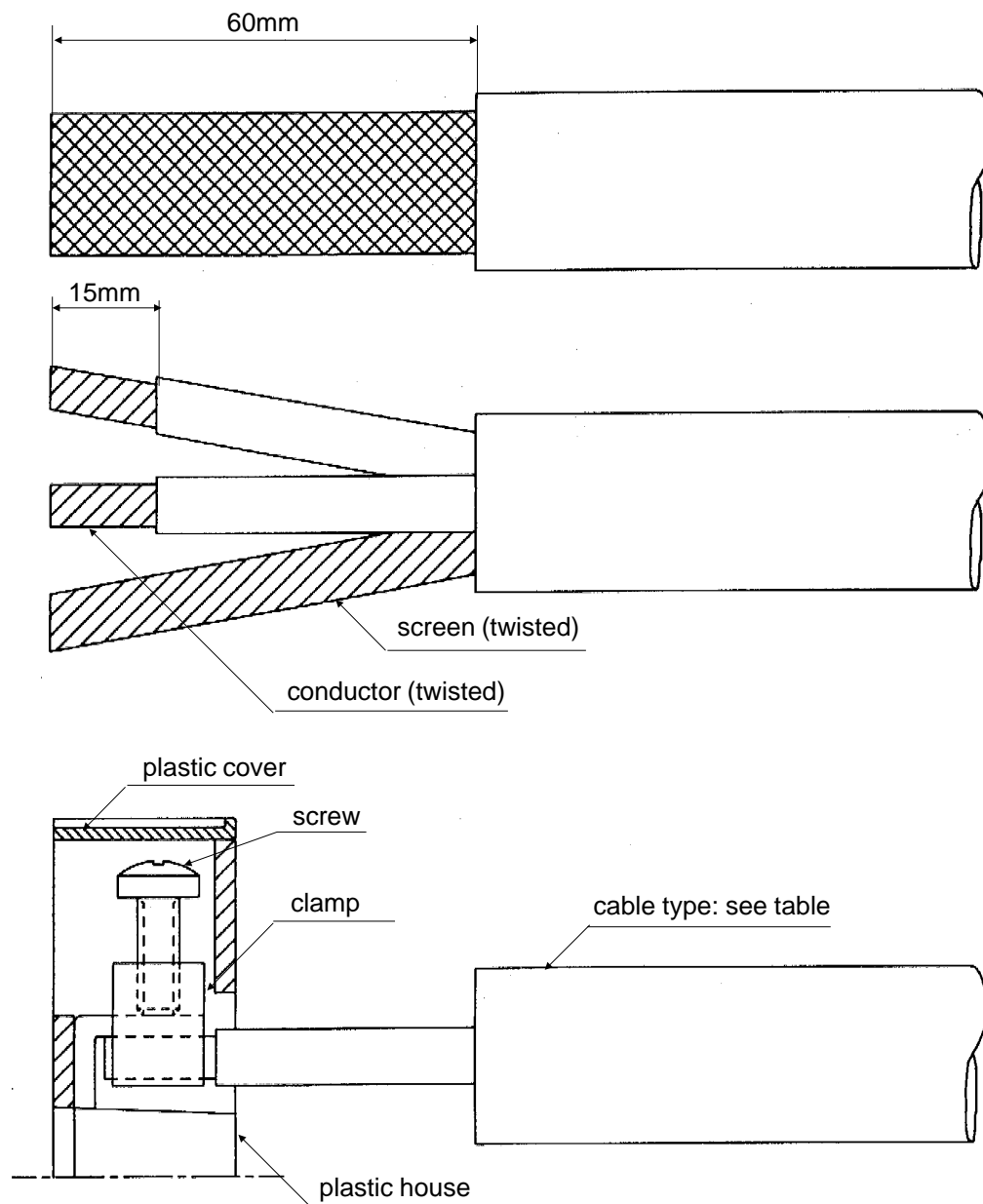
Contact arrangements
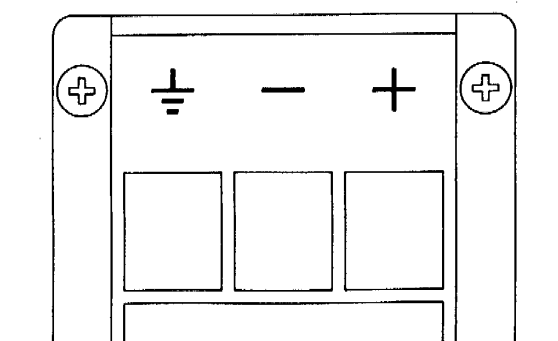
X107 Cable specification

Battery voltage	Max. cable length X107 *	Recommended cable	External fuses
24V	2.5m	Screened multiwire 2 x 10mm^2	40 A
24V	4.5m	Screened multiwire 2 x 16mm^2	40 A
24V	7.0m	Screened multiwire 2 x 25mm^2	40 A

* The maximum cable lengths are specified for continuos two tone operation. For ARQ or speech operation only, the maximum cable length figures are doubled.

CONNECTOR X108 - Mains
SKANTI code 750 000 61

25mm

earth

15mm

10mm

conductor (twisted)

plastic cover

cable type: see table

clamp saddle
clamp screw
earth screw terminal
screw terminal
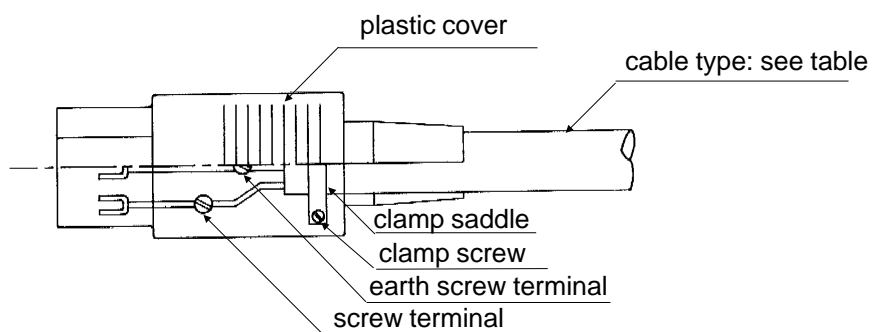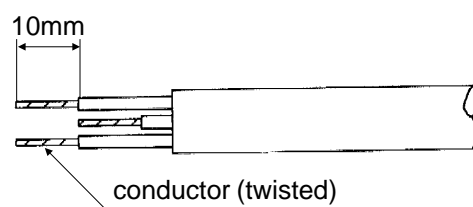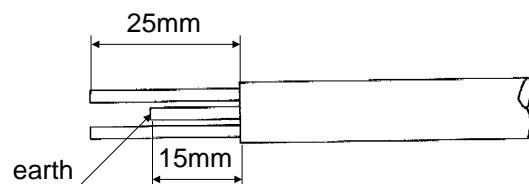
Contact arrangement

~   ~
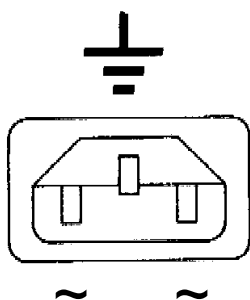
Connector X108 - Mains Terminal no.	Designation	Remarks
~	MAINS 1	Phase or zero
~	MAINS 2	Phase or zero
	EARTH	

X108   cable specification

Recommended cable outer diameter 7.0mm.

AC - Mains	Recommended cable	Internal fuse rating
110 - 120V	Multiwire 3 x 1.5mm^2	8A Slow 5 x 20mm
220 - 240V	Multiwire 3 x 1.5mm^2	4A Slow 5 x 20mm

CONFIGURATION PROM

The TRP7200 series Configuration PROM contains frequencies, frequency bands and system configuration parameters for customizing the equipment.

Legal frequencies with corresponding legal mode and frequency bands are programmed in the PROM address area from 512d/0200h to 7167d/1BFFh excluding the 'Not usable' area from 4096d/1000h to 4607d/11FFh. The PROM area is divided into tree sub-areas, each with a specific frequency information and representation.

512d/0200h to 4095d/0FFFh:
PROM area reserved for customer specified frequencies. Up to 896 single or simplex frequencies or up to 448 duplex frequencies may be programmed in the 4-byte **Frequency Record Format**. The first 200 single, simplex or duplex frequencies including their corresponding mode can be recalled directly via the keyboard as successively short-numbers (200 to 399) are
assigned.
If a limited transmitter frequency range is wanted one or more frequency bands may be programmed in this PROM area, using the 8-byte **Frequency Band Format**.
If the whole PROM area is not filled, a **Limiter Byte** containing 255d/FFh must be programmed to indicate the end of frequency information.

4608d/1200h to 5119d/13FFh:
PROM area reserved for GMDSS Distress and Safety Frequencies and other safety frequencies. The frequencies and their corresponding mode can be recalled with short-numbers from 100 to 199, which are successively assigned. The PROM area will contain up to 128 single or simplex frequencies or 64 duplex frequencies represented in the 4-byte **Frequency Record Format**.
If the whole PROM area is not filled, a **Limiter Byte** containing 255d/FFh must be programmed to indicate the end of frequency information.

5120d/1400h to 7167d/1BFFh:
This PROM area contains all ITU SSB channels and DSC and Telex TX frequencies. All ITU SSB channels can be recalled directly with the mode automatically set to SSB by using the ITU channel number as short-number. SSB ITU channels without number can also be recalled as successively higher numbers are assigned. The frequencies are represented in the 11-byte **Fixed Step Frequencies Format**.
A **Limiter Byte** containing 255d/FFh must always be programmed to indicate the end of frequency information.

7168d/1C00h to 8191d/1FFFh:
System configuration parameters are programmed in the higher part of the PROM from 8191d/1FFFh and downwards.

PROM Type: **27C64, 200nS, 8K x 8**

PROM Location: **Transceiver Unit, TU Control Board 710**

Configuration PROM Map:

Address		Contents
dec	hex	

Address dec	hex	Contents
0	0000	**Not usable**
511	01FF	
512	0200	**Customer Specified Frequencies** **TX Band Limits**
xxxx	xxxx	**Limiter Byte 255d / FFh**
4095	0FFF	
4096	1000	**Not usable**
4607	11FF	
4608	1200	**GMDSS Distress and Safety Frequencies**
xxxx	xxxx	**Limiter Byte 255d / FFh**
5119	13FF	
5120	1400	**ITU Channels (SSB)** **ITU DSC and Telex TX Frequencies**
xxxx	xxxx	**Limiter Byte 255d / FFh**
7167	1BFF	
7168	1C00	**System Configuration Parameters**
8191	1FFF	

Frequency Record Format

		D7	D6	D5	D4	D3	D2	D1	D0
Addr	n	RX	TX	S-F	0	Modulation			
	n+1	BCD X 10MHz				BCD X 1MHz			
	n+2	BCD X 100kHz				BCD X 10kHz			
	n+3	BCD X 1kHz				BCD X 100Hz			

Single-, Simplex- and Duplex-frequencies can be mixed and recalled with the short-numbers 100 to 199 and 200 to 399 if their relative position in the tables do not exceed 100 and 200 respectively.

RX, TX and S-F bits:

RX and Tx bits indicates receiver and transmitter frequency respectively.

S-F bit indicates a Single Frequency (RX or TX) which may be recalled with a short-number.

Examples:

D7	D6	D5	
RX	TX	S-F	
1	0	0	Receiver part of duplex frequency
0	1	0	Transmitter part of duplex frequency
1	1	0	Simplex frequency
1	0	1	Single receiver frequency which can be recalled with a short-number
0	1	1	Single transmitter frequency which can be recalled with a short-number
0	0	1	Empty channel which occupy a short-number

D4:

Always set to 0.

Modulation nibble:

0:	SSB (USB)
1:	LSB
2:	R3E
3:	AM
4:	CW
5:	TLX (Telex, DSC)
6:	Reserved for future use
7:	SSB + 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

Fixed Step Frequencies Format

Addr		D7	D6	D5	D4	D3	D2	D1	D0
	n	RX	TX	ITU	0	Modulation			
		Start Channel							
	n+1	BCD X 1000				BCD X 100			
	n+2	BCD X 10				BCD X 1			
		Number Of Channels							
	n+3	BCD X 1000				BCD X 100			
	n+4	BCD X 10				BCD X 1			
		Start Frequency							
	n+5	BCD X 10MHz				BCD X 1MHz			
	n+6	BCD X 100kHz				BCD X 10kHz			
	n+7	BCD X 1kHz				BCD X 100Hz			
	n+8	BCD X 10Hz							
		Step Frequency							
	n+9	BCD X 10kHz				BCD X 1kHz			
	n+10	BCD X 100Hz				BCD X 10Hz			

A large group of frequencies with uniform channel spacing are easily represented by programming the 11-byte Fixed Step Frequencies Format.

RX and TX bits:

0:	Frequencies do not apply to RX or TX respectively.
1:	Frequencies apply to RX or TX respectively.

Both bits are set to "1" for simplex frequencies.

ITU bit:

0:	The programmed frequencies are not ITU channels.
1:	The programmed frequencies are ITU channels and if the mode is SSB (Modulation nibble: 0 or 7) they can be recalled with the ITU short-number.

D4:

Always set to 0.

Modulation nibble:

0:	SSB (USB)
1:	LSB
2:	R3E
3:	AM
4:	CW
5:	TLX (Telex, DSC)
6:	Reserved for future use
7:	SSB + 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

Start Channel:
The start channel number for the group.
E.g. 401 for the ITU channel 401.

Number Of Channels:
The total number of frequencies or channels in the group. Legal numbers: 1 to 9998.

Start Frequency:
The first frequency in the group.

Step Frequency:
The fixed frequency- or channel-spacing for the group.

Frequency Band format

		D7	D6	D5	D4	D3	D2	D1	D0
Addr	n	Always 0				Always 0			
	n+1	BCD X 10MHz				BCD X 1MHz			
	n+2	BCD X 100kHz				BCD X 10kHz			
	n+3	BCD X 1kHz				BCD X 100Hz			
	n+4	Always 0				Always 0			
	n+5	BCD X 10MHz				BCD X 1MHz			
	n+6	BCD X 100kHz				BCD X 10kHz			
	n+7	BCD X 1kHz				BCD X 100Hz			

By programming a Frequency Band the transmitter frequency range may be limited to the specified band and transmission outside the band is inhibited. The first 4 bytes specifies the lower legal frequency limit and the next 4 bytes specifies the upper legal frequency limit. Several bands may be programmed.

Limiter byte
If the programmed Frequencies and possible Frequency Bands do not use all the available bytes in the relevant PROM areas a Limiter Byte must be programmed to indicate the end of frequency information.
The Limiter Byte contains the value 255d / FFh.

Pre-programmed ITU frequencies

GMDSS Distress and Safety Frequencies

Freq. kHz	Designation	Mode	Type	RCL
2182.0	J3E Distress Safety	SSB	Simplex	100
2174.5	NBDP Distress Safety	TLX	Simplex	101
2187.5	DSC Distress Safety	TLX	Simplex	102
4125.0	J3E Distress Safety	SSB	Simplex	103
4177.5	NBDP Distress Safety	TLX	Simplex	104
4207.5	DSC Distress Safety	TLX	Simplex	105
6215.0	J3E Distress Safety	SSB	Simplex	106
6268.0	NBDP Distress Safety	TLX	Simplex	107
6312.0	DSC Distress Safety	TLX	Simplex	108
8291.0	J3E Distress Safety	SSB	Simplex	109
8376.5	NBDP Distress Safety	TLX	Simplex	110
8414.5	DSC Distress Safety	TLX	Simplex	111
12290.0	J3E Distress Safety	SSB	Simplex	112
12520.0	NBDP Distress Safety	TLX	Simplex	113
12577.0	DSC Distress Safety	TLX	Simplex	114
16420.0	J3E Distress Safety	SSB	Simplex	115
16695.0	NBDP Distress Safety	TLX	Simplex	116
16804.5	DSC Distress Safety	TLX	Simplex	117
5680.0	J3E Coordinated SAR	SSB	RX freq	118
490.0	NBDP Meteorology Nav	TLX	RX freq	119
518.0	NBDP Navtex	TLX	RX freq	120
4209.5	NBDP Navtex	TLX	RX freq	121
4210.0	NBDP Safety	TLX	RX freq	122
6314.0	NBDP FC Safety Info	TLX	RX freq	123
8416.5	NBDP FC Safety Info	TLX	RX freq	124
12579.0	NBDP FC Safety Info	TLX	RX freq	125
16806.5	NBDP FC Safety Info	TLX	RX freq	126
19680.5	NBDP FC Safety Info	TLX	RX freq	127
22376.0	NBDP FC Safety Info	TLX	RX freq	128
26100.5	NBDP FC Safety Info	TLX	RX freq	129

May be recalled directly by entering the relevant number from 100 to 129.
Mode will automatically be set according to the table.

TRP7200: Subsequent selection of other modes will disable the transmitter except when the
mode is SSB and R3E is selected.

Ship station RX and TX frequencies for SSB duplex operation in the Maritime Mobile Bands between 4 and 27.5MHz.
ITU Radio Regulations Appendix 16, Section A.

HF Duplex Telephony Channels:

Ch.	401 - 427	Ch.	428 - 429
Ch.	601 - 608		
Ch.	801 - 833	Ch.	834 - 837
Ch.	1201 - 1241		
Ch.	1601 - 1656		
Ch.	1801 - 1815		
Ch.	2201 - 2253		
Ch.	2501 - 2510		

243 RX/TX frequency pairs   6 RX frequencies

May be recalled directly by entering ITU channel number.
Mode will automatically be set to SSB.

TRP7200: Subsequent selection of other modes except R3E will disable the transmitter.

Inter-ship SSB Simplex frequencies in the Maritime Mobile Bands between 4 and 27.5MHz.
Successive channel numbers are assigned.
ITU Radio Regulations Apendix 16, Section B.

HF Simplex Telephony Frequencies.

Ch.	430 - 431
Ch.	609 - 611
Ch.	838 - 839
Ch.	1242 - 1246
Ch.	1657 - 1663
Ch.	1816 - 1822
Ch.	2254 - 2260
Ch.	2511 - 2517

40 Simplex frequencies

May be recalled directly by entering channel number.
Mode will automatically be set to SSB.

TRP7200: Subsequent selection of other modes except R3E will disable the transmitter.

Ship station SSB TX frequencies in the 4000 - 4063kHz band.
Successive channel numbers are assigned.
ITU Radio Regulations Appendix 16, Section C-1.

HF TX Telephony Frequencies

      Ch.   432 - 452

      21 TX frequencies

May be recalled directly by entering channel number.
Mode will automatically be set to SSB.

TRP7200: Subsequent selection of other modes except R3E will disable the transmitter.

Ship station SSB TX frequencies in the 8100 - 8195kHz band.
Successive channel numbers are assigned.
ITU Radio Regulations Appendix 16, Section C-2.

HF TX Telephony Frequencies

      Ch.   840 - 870

      31 TX frequencies

May be recalled directly by entering channel number.
Mode will automatically be set to SSB.

TRP7200: Subsequent selection of other modes except R3E will disable the transmitter.

Extra frequencies for TRP7200:

International ship station DSC TX frequencies for purposes other than distress and safety.

2177.0	2189.5	kHz
4208.0	4208.5	4209.0 kHz
6312.5	6313.0	6313.5 kHz
8415.0	8415.5	8416.0 kHz
12577.5	12578.0	12578.5 kHz
16805.0	16805.5	16806.0 kHz
18898.5	18899.0	18899.5 kHz
22374.5	22375.0	22375.5 kHz
25208.5	25209.0	25209.5 kHz

      26 TX frequencies

For verification of TX frequency only.
TX frequencies are only selectable in Telex mode.
Subsequent selection of other modes will disable the transmitter.

Extra frequencies for TRP7200:

National ship station MF DSC TX frequencies for purposes other than distress and safety.

2156.0	2156.5 kHz
2157.0	2157.5 kHz
2158.0	2158.5 kHz
2159.0	2159.5 kHz

8 TX frequencies

For verification of TX frequency only.
TX frequencies are only selectable in Telex mode.
Subsequent selection of other modes will disable the transmitter.

Extra frequencies for TRP7200:

Ship station paired NBDP frequencies (TX frequencies only) in the Maritime Mobile Bands
between 4 and 27.5MHz.
ITU Radio Regulations Apendix 32.

Paired Telex Frequencies. TX part only.

4	MHz	Band	Ch.	1 -	19
6	MHz	Band	Ch.	1 -	34
8	MHz	Band	Ch.	1 -	40
12	MHz	Band	Ch.	1 -	156
16	MHz	Band	Ch.	1 -	193
18/19	MHz	Band	Ch.	1 -	45
22	MHz	Band	Ch.	1 -	135
25/26	MHz	Band	Ch.	1 -	40

662 TX frequencies

For verification of TX frequency only.
TX frequencies are only selectable in Telex mode.
Subsequent selection of other modes will disable the transmitter.

Extra frequencies for TRP7200:

Ship station non-paired NBDP frequencies in the Maritime Mobile Bands between 4 and 27.5MHz. ITU Radio Regulations Apendix 33.

Non-paired Telex Frequencies.

4MHz Band	Ch.	1 - 10
6MHz Band	Ch.	1 - 23
8MHz Band	Ch.	1 - 36
12MHz Band	Ch.	1 - 34
16MHz Band	Ch.	1 - 39
18/19MHz Band	Ch.	1 - 11
22MHz Band	Ch.	1 - 45
25/26MHz Band	Ch.	1 - 31

229 TX frequencies

For verification of TX frequency only. TX frequencies are only selectable in Telex mode. Subsequent selection of other modes will disable the transmitter.

Total number of frequencies: 1539

System Configuration Parameters

The System Configuration Parameters programmed in the higher part of the prom (reserved area 5120d/1400h to 8191d/1FFFh) determines the function of the equipment. The most important parameters for customizing the equipment are listed below. The parameters are global and cannot be changed by programming via the keyboard.

Designation

Cold Boot Frequency
+ Mode Set-up

Address	D7 D6 D5 D4	D3 D2 D1 D0	Description
7593d/1DA9h	Always 0	RX Modulation	
7594d/1DAAh	BCD X 10MHz	BCD X 1MHz	**RX frequency**
7595d/1DABh	BCD X 100kHz	BCD X 10kHz	
7596d/1DACh	BCD X 1kHz	BCD X 100Hz	
7597d/1DADh	Always 0	TX Modulation	
7598d/1DAEh	BCD X 10MHz	BCD X 1MHz	**TX frequency**
7599d/1DAFh	BCD X 100kHz	BCD X 10kHz	
7600d/1DB0h	BCD X 1kHz	BCD X 100Hz	

Data for the Modulation nibble
see description of the Single
Frequency Format

Designation	Address (**d**ecimal / **h**exadecimal)	Data	Description
Max TX Power	7601d/1DB1h	Pm:	Maximum TX power = 10 x Pm Watt Pm values from 1d/01h to 25d/19h corresponds to 10Watt to 250Watt
Security Code Enable	7602d/1DB2h	0d/00h: 1d/01h:	Disable Security Code Enable Security Code All other data are defaulted to 1d/01h

Designation	Address	Data	Description
	(**d**ecimal / **h**exadecimal)		
Customer ID	7603d/1DB3h		
		ID:	Customer identification number
			ID: 0d/00h to 99d/63h
Enable SSB mode	7606d/1DB6h		
		0d/00h:	Disable SSB mode
		1d/01h:	Enable SSB mode
			All other data are defaulted to 1d/01h
Enable LSB mode	7607d/1DB7h		
		0d/00h:	Disable LSB mode
		1d/01h:	Enable LSB mode
		All other data are defaulted to 1d/01h	
Enable R3E mode	7608d/1DB8h		
		0d/00h:	Disable R3E mode
		1d/01h:	Enable R3E mode
			All other data are defaulted to 1d/01h
Enable CW mode	7609d/1DB9h		
		0d/00h:	Disable CW mode
		1d/01h:	Enable CW mode
			All other data are defaulted to 1d/01h
Enable TLX mode	7610d/1DBAh		
		0d/00h:	Disable TLX mode
		1d/01h:	Enable TLX mode
			All other data are defaulted to 1d/01h
Reduce to 150W below 4MHz	7611d/1DDBh		
		0d/00h:	Disable reduction
		1d/01h:	Enable reduction
			All other data are defaulted to 0d/00h

Designation	Address (**d**ecimal / **h**exadecimal)	Data	Description
Alarm test in Dummy Load	7612d/1DBCh		
		0d/00h:	Disable test in Dummy Load
		1d/01h:	Enable test in Dummy Load
			All other data are defaulted to 0d/00h
Enable RX in AM mode	7613d/1DBDh		
		0d/00h:	Disable RX in AM mode
		1d/01h:	Enable RX in AM mode
			All other data are defaulted to 1d/01h
Enable TX in AM mode	7614d/1DBEh		
		0d/00h:	Disable TX in AM mode
		1d/01h:	Enable TX on 2182kHz only
		2d/02h:	Enable TX on 2182 + 2200kHz only
		255d/FFh:	Free TX in AM mode
			All other data are defaulted to 255d/FFh
Distress mode	7615d/1DBFh		
		0d/00h:	SSB mode when 2182 is pressed
		3d/03h:	AM mode when 2182 is pressed
			All other data are defaulted to 3d/03h
Receiver frequency status	7616d/1DC0h		
		0d/00h:	RX on PROM frequencies only
		1d/01h:	Free RX frequency
			All other data are defaulted to 1d/01h
Transmitter frequency status	7617d/1DC1h		
		0d/00h:	TX on PROM frequencies only
		1d/01h:	Free TX frequency
			All other data are defaulted to 1d/01h
Single sideband mode display	7618d/1DC2h		
		0d/00h:	Display upper-sideband as USB
		1d/01h:	Display upper-sideband as SSB
			All other data are defaulted to 1d/01h

Standard Programming

The Standard Programming shows how the different standard types are programmed unless otherwise agreed. Only the above described parameters are shown. A total PROM listing and Master PROM's are available on request.

Addr	TRP7200	TRP7201	TRP7203	TRP7204	TRP7208
7593d/1DA9h	0d/00h	0d/00h	0d/00h	0d/00h	0d/00h
7594d/1DAAh	2d/02h	2d/02h	2d/02h	17d/11h	2d/02h
7595d/1DABh	24d/18h	24d/18h	24d/18h	80d/50h	24d/18h
7596d/1DACh	32d/20h	32d/20h	32d/20h	0d/00h	32d/20h
7597d/1DADh	0d/00h	0d/00h	0d/00h	0d/00h	0d/00h
7598d/1DAEh	2d/02h	2d/02h	2d/02h	17d/11h	2d/02h
7599d/1DAFh	24d/18h	24d/18h	24d/18h	80d/50h	24d/18h
7600d/1DB0h	32d/20h	32d/20h	32d/20h	0d/00h	32d/20h
7601d/1DB1h	20d/14h	20d/14h	20d/14h	20d/14h	20d/14h
7602d/1DB2h	1d/01h	1d/01h	1d/01h	1d/01h	1d/01h
7603d/1DB3h	0d/00h	1d/01h	3d/03h	4d/04h	8d/08h
7606d/1DB6h	1d/01h	1d/01h	1d/01h	1d/01h	1d/01h
7607d/1DB7h	0d/00h	0d/00h	0d/00h	1d/01h	1d/01h
7608d/1DB8h	1d/01h	1d/01h	1d/01h	1d/01h	1d/01h
7609d/1DB9h	0d/00h	0d/00h	0d/00h	0d/00h	0d/00h
7610d/1DBAh	1d/01h	1d/01h	1d/01h	1d/01h	1d/01h
7611d/1DDBh	0d/00h	0d/00h	0d/00h	0d/00h	1d/01h
7612d/1DBCh	1d/01h	1d/01h	1d/01h	0d/00h	1d/01h
7613d/1DBDh	1d/01h	1d/01h	1d/01h	1d/01h	1d/01h
7614d/1DBEh	1d/01h	1d/01h	1d/01h	255d/FFh	255d/FFh
7615d/1DBFh	3d/03h	3d/03h	3d/03h	3d/03h	3d/03h
7616d/1DC0h	1d/01h	1d/01h	1d/01h	1d/01h	1d/01h
7617d/1DC1h	0d/00h	1d/01h	1d/01h	1d/01h	1d/01h
7618d/1DC2h	1d/01h	1d/01h	1d/01h	0d/00h	1d/01h

OPTIONS

DESIGNATION	SKANTI CODE
Control Unit:	
Loudspeaker	107 801 30
Tilting wedge, 20˚	107 801 90
Tilting wedge, 30˚	107 802 70
Transceiver Unit:	
Programmable Communication Processor 717	107 871 71
Interface-A 718	107 871 81
Antenna Tuning Unit:	
Dummy Load 741	107 874 11

ACCESSORIES

<u>DESIGNATION</u>   <u>SKANTI CODE</u>

Control Unit:

Screened multicore cable, 5 x 0.25 mm^2 x 100 m   702 000 26

Screened multicore cable, 5 x 0.50 mm^2 x 100 m   702 000 27

Screened multicore cable, 5 x 0.75 mm^2 x 100 m   702 000 28

Screened multicore cable, 8 x 0.25 mm^2 x 100 m   702 000 29

Screened multicore cable, 8 x 0.34 mm^2 x 100 m   702 000 30

Screened multicore cable, 8 x 0.50 mm^2 x 100 m   702 000 31

Transceiver Unit:

D-sub connector, 9 pole   751 000 64

D-sub connector, 25 pole   751 000 66

DIN connector, 6 pole   751 001 72

ACCESSORIES INCLUDED

DESIGNATION	QUANTITY	SKANTI CODE
Control Unit:		
Cable gland	2	343 782 61
Rubber foot	4	429 000 03
D-sub connector, 9 pole	2	751 000 64
User manual	1	910 000 55
Transceiver Unit:		
Coaxial connector , UHF PL 259	1	751 000 54
D-sub connector, 9 pole	1	751 000 64
Technical manual	1	910 000 56
Antenna Tuning Unit:		
Coaxial connector , UHF PL 259	1	751 000 54
SRCN connector, 5 pole	1	751 001 69
Power Supply Unit (option):		
Fuse 8A slow, 5 x 20 mm	2	720 380 03
Power Connector, 3 pole	1	750 000 61

TECHNICAL DESCRIPTION Contents

CONTROL UNIT 7200

The Control Unit CU 7200 consists of a handset and a control box and operates like a terminal connected to a computer meaning that all operations which are entered on the Control Unit will be performed by the Transceiver Unit.
The Control Unit contains the following PCBs including the listed circuits:

HANDSET

Microphone Board 708:   Microphone and HOOK ON detector

AF Amplifier Board 707:   OP AMPs to amplify the earpiece signal and to add gain to the microphone signal which can be adjusted here.

CONTROL BOX

CU-1 Control Board 701:   The digital part includes the microprocessor and performs the keyboard scanning, display driving, data communication with the Transceiver Unit as well as driving the Backlight 785 which is also included in the control box.
The analog part includes AF receiver/driver, AF amplifier and Beep generator. It performs the handling of the bidirectional AF lines, amplifying AF signals for the earpiece, the internal speaker and the line output.

TRANSCEIVER UNIT 7200

The Transceiver Unit 7200 contains most of the PCBs in the TRP 7200 which are listed below and the circuits they include.

TU Control Board 710   The digital part includes the MCU, address decoder, Program PROMS, Configuration PROM, Non volatile RAM, Real Time Clock, EZ-net driver, ATU interface, digital TU-bus driver, Remote interface and drivers for the analog circuits.
The analog part includes voltage regulators, analog interface circuits and analog output drivers.
The TU Control Board is the main control board of the TRP 7200. It controls the digital and analog operations required when the Control Unit 7200 is operated.

Synthesizer Board 711   The synthesizer board includes synthesizers, dividing/ multiplication circuits and check detectors. The 1st, 2nd and 3rd local oscillator receive their reference signal from the master oscillator PCB 712 or 713.The 1. local oscillator covers the frequency range from 45 MHz to 75 MHz and generates the injection signal for the 1. mixer on RX/EX signal path 715.
The 2. local oscillator generates by division and multiplication a 44.544 MHz signal for the 2. mixer. The 3. local oscillator generates a 456.5 kHz signal for the modulation/demodulation process.

Master Oscillator 712/713   The master oscillator includes a highly stable Oven
                                  Controlled Crystal Oscillator (OCXO). The master oscillator
                                  generates the accurate 17.8176 MHz reference signal for the
                                  Synthesizer Board 711 and is available in 2
                                  versions: PCB 712 giving 40 Hz and PCB 713 giving 10 Hz
                                  transmitter frequency stability.

RX / EX Signal Path 715.   The RX signal path includes protection, antenna attenuator,
                                  RF- and IF amplifiers, mixers, filter bank, demodulator, squelch
                                  and audio line drivers. The RX signal path performs the
                                  handling of the received antenna signal and delivers a balanced
                                  AF signal to the Control Unit and to the SMPS/Interconnection
                                  730 for the external speaker.
                                  The EX signal path includes the AF compressor, modulator,
                                  filter bank, mixers and EX amplifier. The EX signal path
                                  generates the modulated RF signal for the power amplifier.
                                  The RX / EX signal path is controlled by the TU Control Board
                                  710 and receives its injection signal from the Synthesizer
                                  Board 711.

Power Amplifier 720 / 721.   The Power Amplifier includes input attenuator, PA
                                  drivers, PA-stage, fan circuit, protection, key circuit and SWR
                                  detector.
                                  The Power Amplifier receives the modulated RF input
                                  signal from the RX/EX Signal Path 715 and delivers the amplified
                                  output signal to the low-pass filters, PCB 726 or 727. The SWR
                                  detector output is a monitor signal for the TU Control Board 710.
                                  The fan circuit drives the fan in accordance with the temperature
                                  signal monitored on the Power Amplifier and the SMPS. The
                                  Power Amplifier is available in 2 versions: PCB 720 for 12 Volt
                                  and PCB 721 for 24 Volt operation.

FET Power Amplifier,   The FET power amplifier is the FCC version of the Power
722 / 723 / 724.   Amplifier PCB 720 / 721 and includes Power Field Effect
                                  Transistors (MOSFETs). The FET Power Amplifier is available
                                  in 3 versions: PCB 722 for 12 Volt, PCB 723 for 24 Volt and
                                  PCB 724 for 32 Volt operation.

Marine Filters 726   The PA filters includes low-pass filters, relay drivers and
Continuous Filters 727   peak detector.
                                  The PA Filters removes the unwanted harmonic frequencies
                                  from the PA signal received from the Power Amplifier. The
                                  output of the PA Filters is connected to the input of the ATU
                                  via RX/TX Relay on SMPS/Interconnection 730.
                                  The selection of low-pass filter is controlled by the
                                  TU Control Board 710. The Peak Detector output monitors the
                                  output power and is used for power level adjustments and to
                                  dispaly the power level in the Control Unit.
                                  The PA filters is available in 2 versions: PCB 726 for
                                  transmission in the Marine Bands and PCB 727 for transmission
                                  with continuous coverage from 1.6 MHz to 30 MHz.

SMPS / Interconnection 730.   The Switched Mode Power Supply part of the SMPS / Interconnection includes control and protection circuit.
The SMPS generates all the voltages needed in the TRP 7200 galvanicly insulated from the battery, only the Power Amplifier is supplied directly from the battery.
The SMPS is protected against wrong input voltage level and polarity.
The Interconnection part of the SMPS / Interconnection includes RX/TX relay and AF power amplifier.
The Interconnection acts as a cross field for the signals in the Transceiver Unit and performs the RX/TX relay shift as well as amplifying of the AF signal from the RX/EX Signal Path 715 for the external speaker.

ANTENNA TUNING UNIT 7200

The Antenna Tuning Unit 7200 contains the ATU Board 740 and the optional Dummy Load 741.

ATU Board 740.   The ATU board includes tuning network, measuring system, micro controlling circuits and manual tune switches.
The ATU board matches the impedance of the antenna to 50 ohm in order to gain the best possible SWR. The ATU board communicates tuning process- and frequency information with the Transceiver Unit.

Dummy Load 741(optional).   The Dummy Load includes relays and load resistors.
The Dummy Load permits Alarm test into Dummy Load as well as grounding or floating the antenna.

AC Power Supply 7200 (optional)

The P 7200 is a AC power supply providing manual or automatic switch over to a reserve battery. It can be operated from the build in keyboard or from the optional Remote Control panel.
P 7200 can be used with 24 Volt versions only.

AC Control Board 750   The AC Control Board includes rectifier, ripple rejector, AC/DC switch with selectable no-break function and control circuits.

AC Remote Control (optional)

This optional panel provides remote control as well as status indication of the P 7200. Maximum distance between Remote Control and P 7200 is 50 meters.
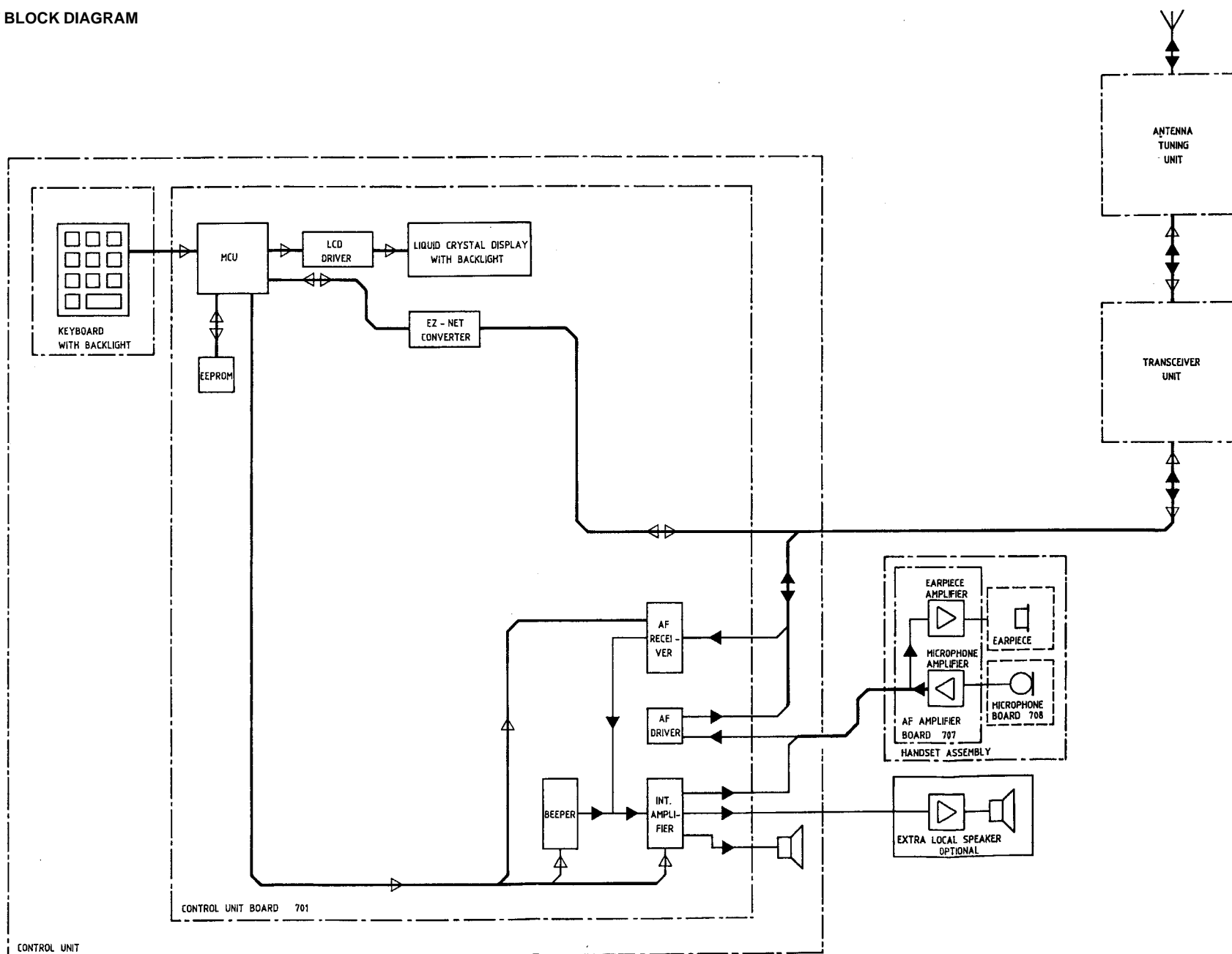
Remote Control 751   This board contains control switches and a Dimmer function for the back-lit panel.
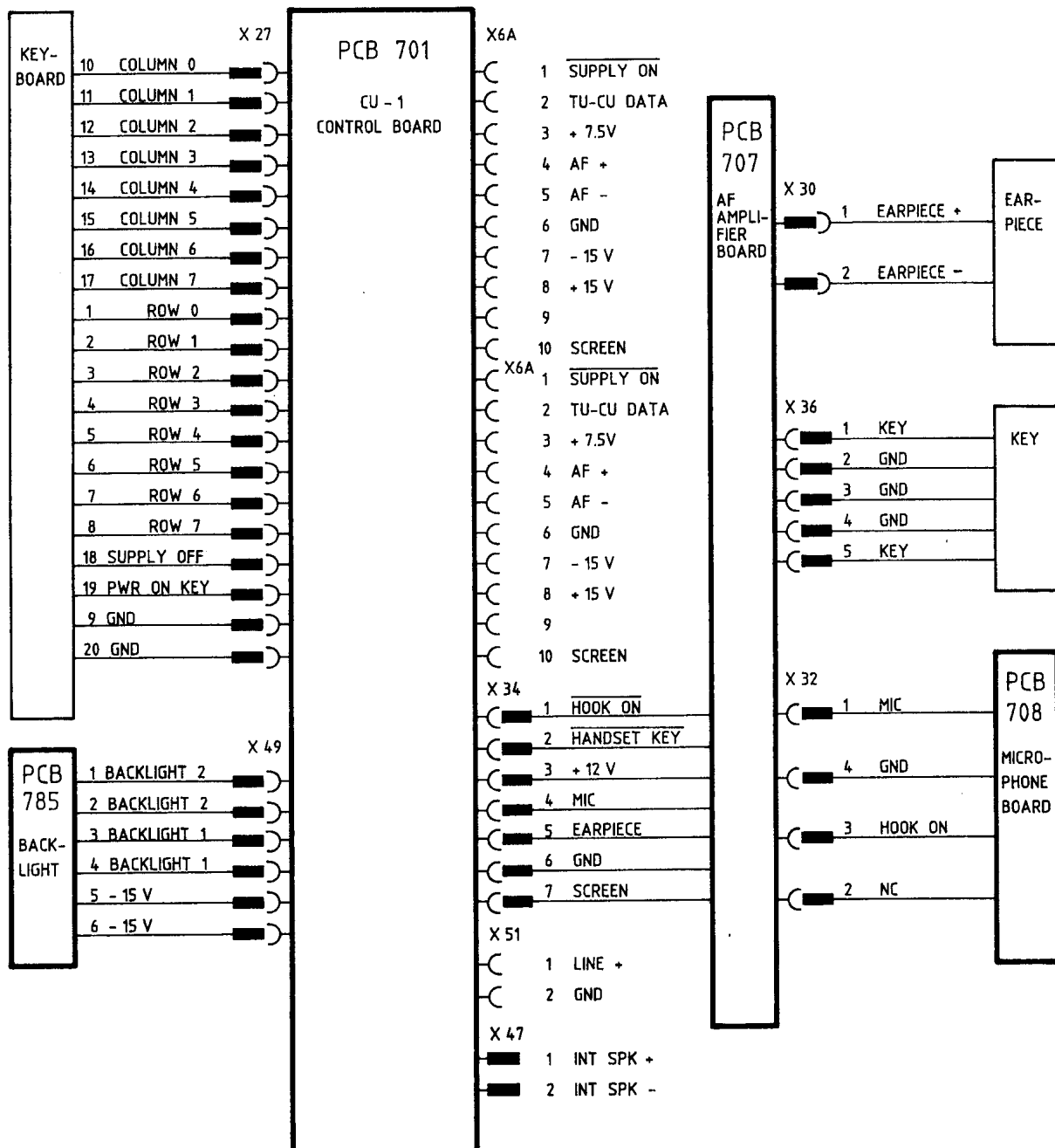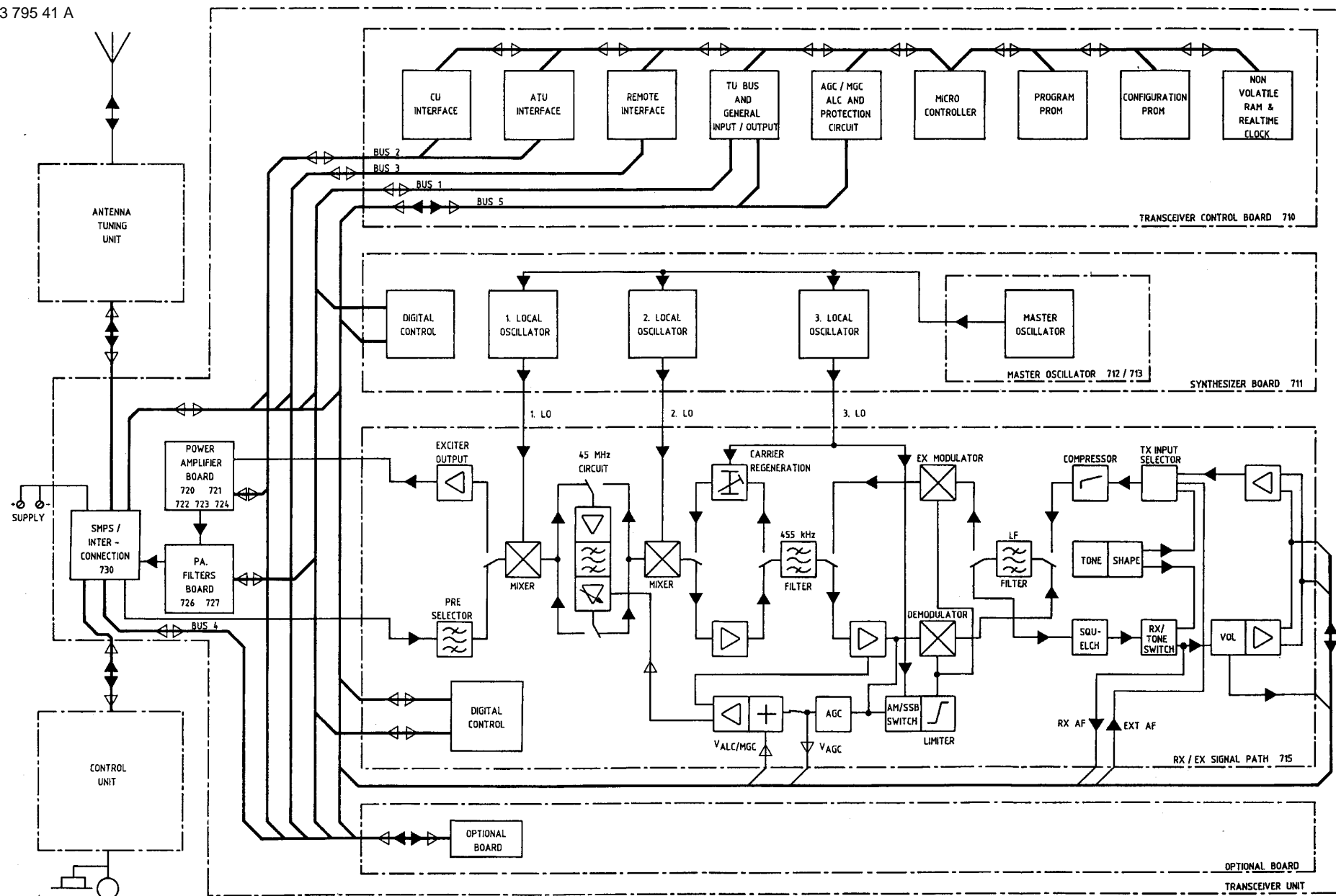
CONTROL UNIT BLOCK DIAGRAM

993 797 41 A

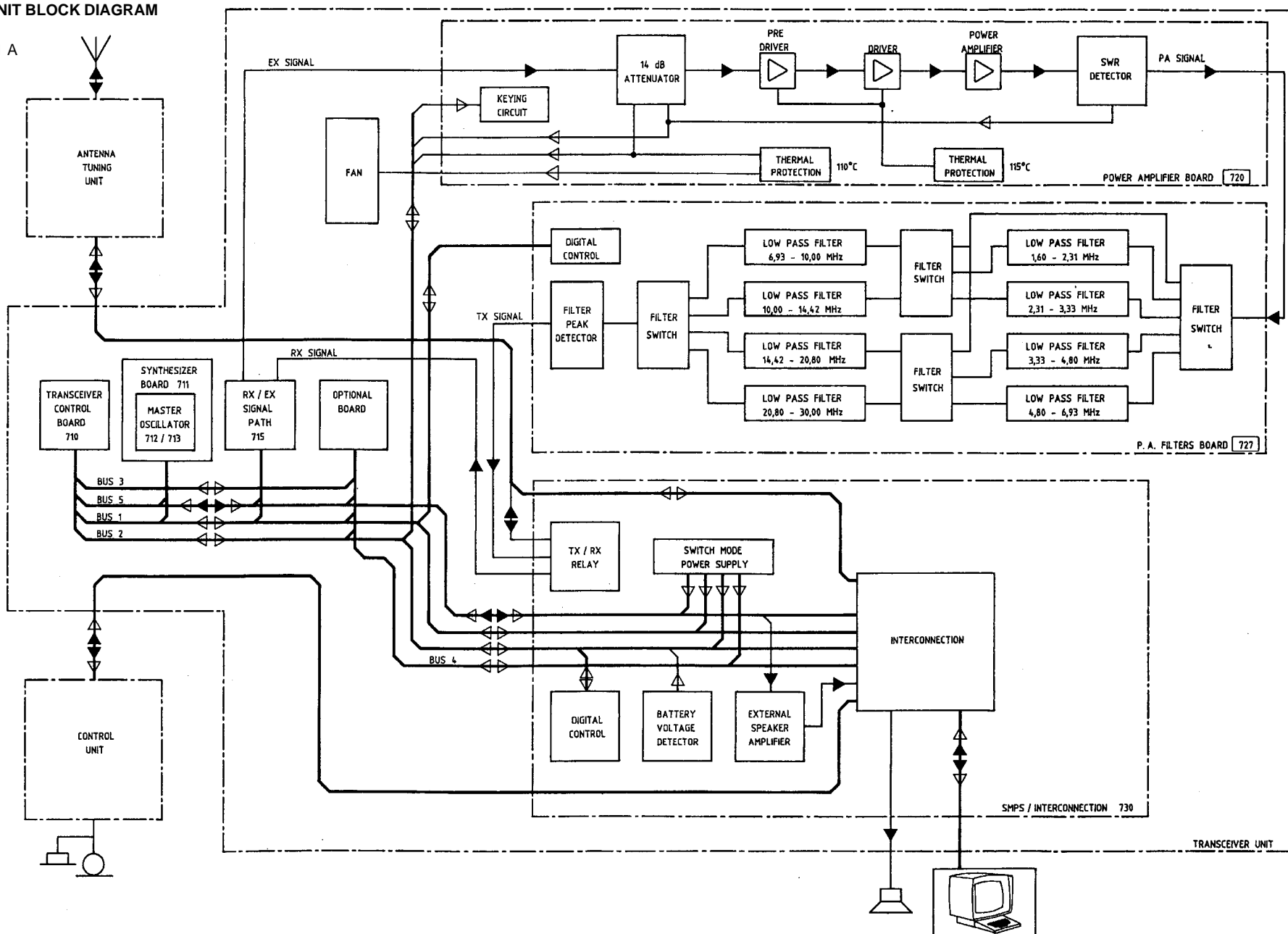## CONTROL UNIT INTERCONNECTION

993 796 01 A

TRANSCEIVER UNIT BLOCK DIAGRAM

1 OF 2 993 795 41 A

TRANSCEIVER UNIT BLOCK DIAGRAM

2 OF 2 993 795 41 A
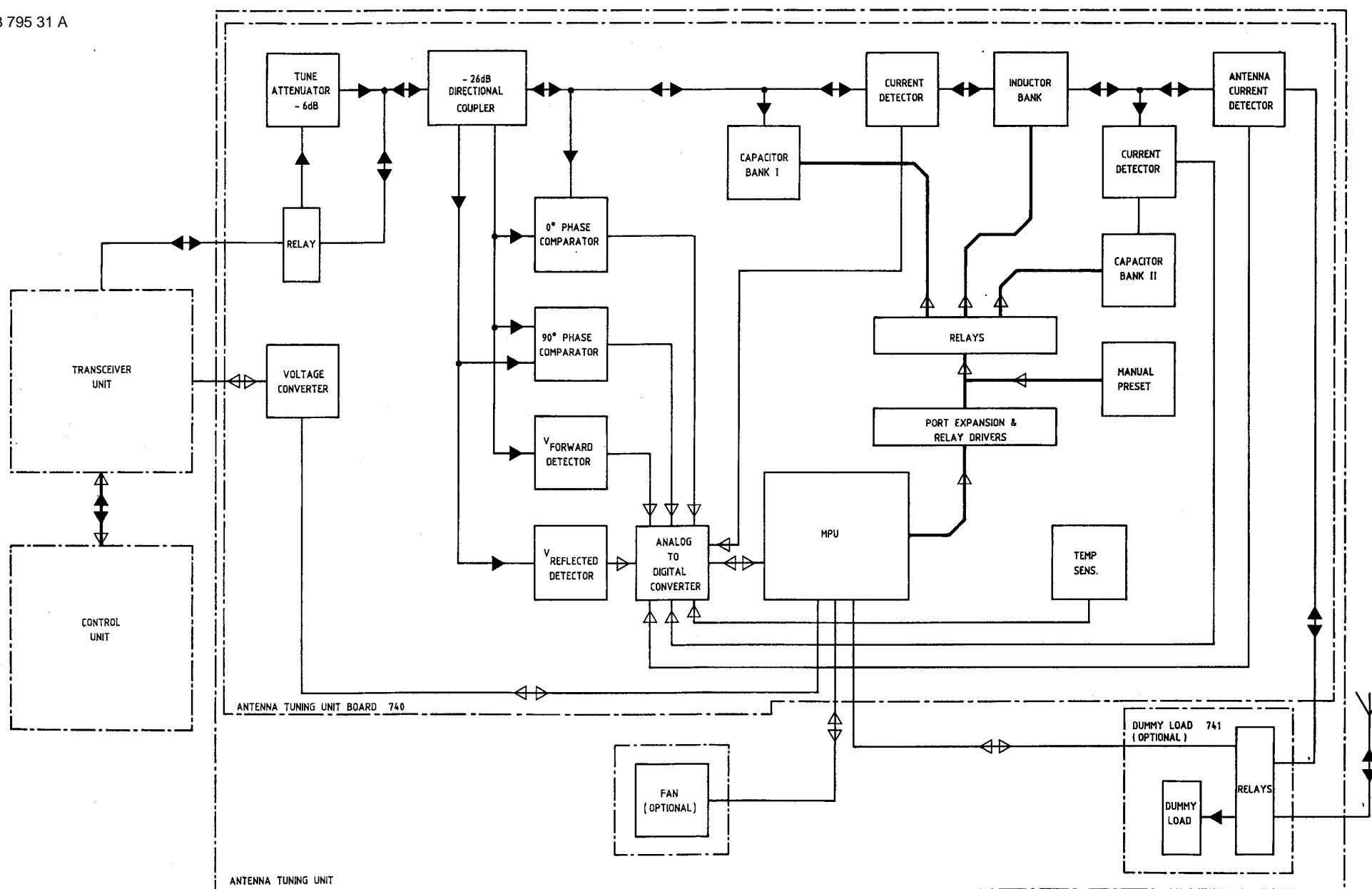
TRANSCEIVER UNIT INTERCONNECTION
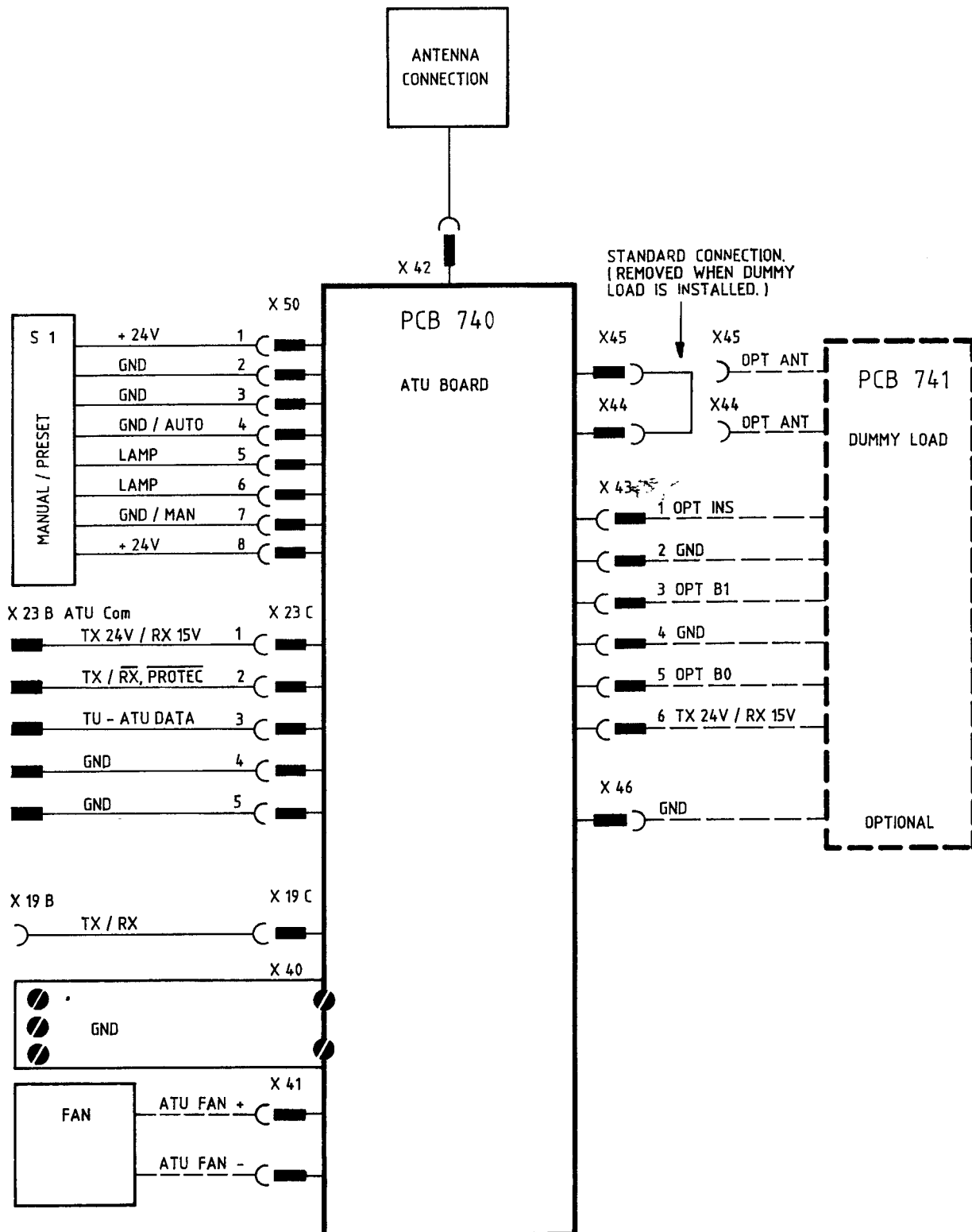
993 796 11 A
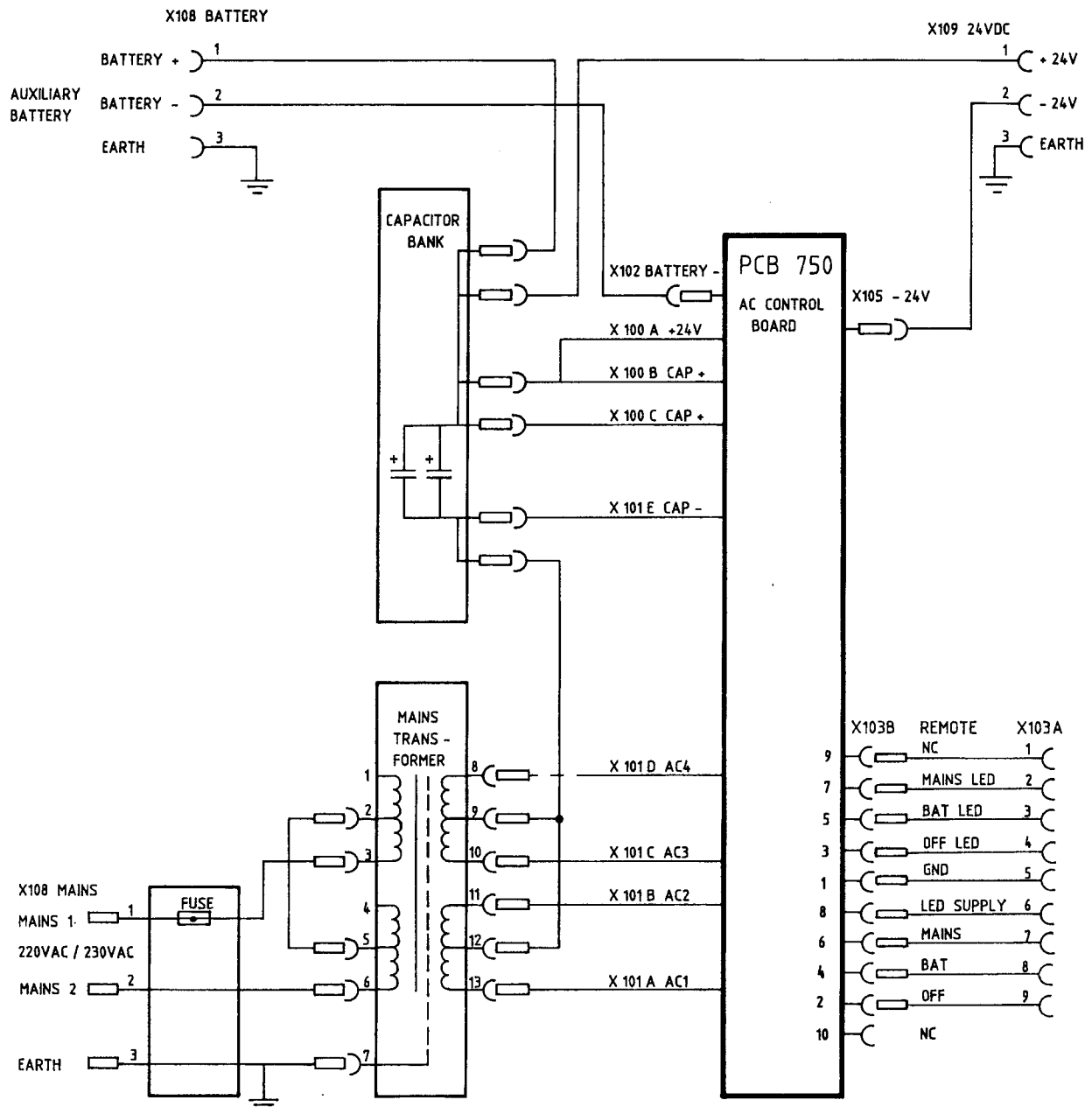
ANTENNA TUNING UNIT BLOCK DIAGRAM

993 795 31 A

ANTENNA TUNING UNIT INTERCONNECTION

993 795 91 B

AC POWER SUPPLY INTERCONNECTION

993 796 81 A

ALC AND PROTECTION SYSTEM

993 795 21 A
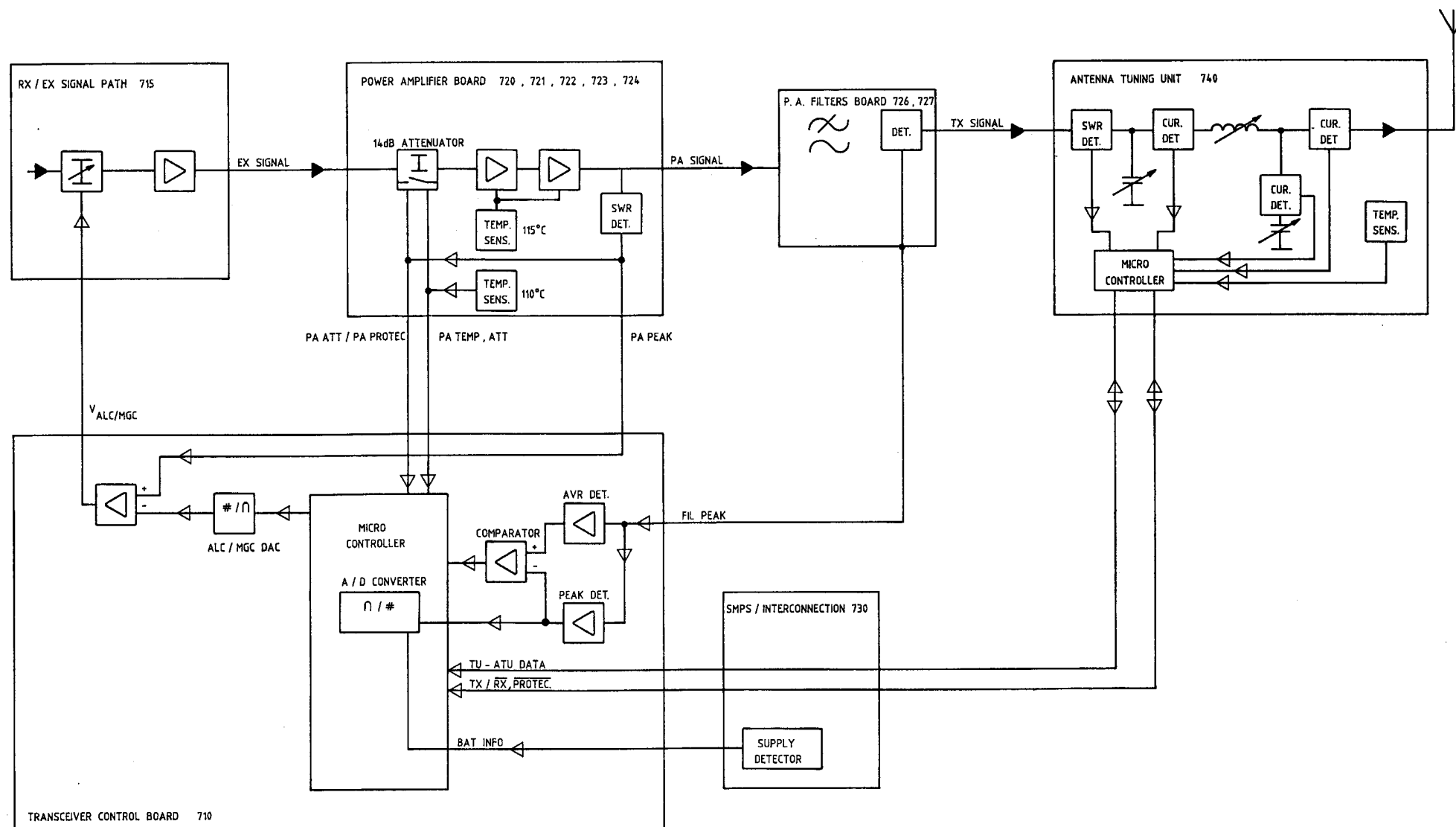
SERVICE Contents

PROTECTION CODES

The TRP 7200 Protection Codes are generated during Tune and ALC procedures and during normal transmit conditions. When protection takes place it is shown by an either static or flashing "Protec" annunciator in the display. When "Protec" is static it indicates that protection occurs to prevent overload, and that the TU is capable of changing parameters in order to maximize radiated power. Transmission can be continued normally without any precautions. If "Protec" is flashing it indicates that protection has taken place to prevent damage of the equipment, and that the TU can not maximize the radiated power. This condition may occur for example on a broken antenna.

The protection codes may be read by entering: [Prog] [2] [2] [Enter]

The Receiver Display will show the Protection Code. If more than one Protection Code is set, successively pressing "Enter" will show the rest and finally make a return to normal operation. All Protection Codes are reset when the power supply is switched on.

Protection Code Groups:

No.	Group
00	No protection
01 - 19	TU software protection codes
20 - 39	TU hardware protection codes
40 - 59	ATU protection codes

Protection Codes, Description:

No.	Designation	Description
10	*Tune Power Low*	TU Control Board measures too low power output. Tune power < 30W. ATU selects feed through setting after "TU Failure" command. Coax cable TU - ATU open. Power regulation inhibit. Flash "Protec".

11

Tune Power High   TU Control Board measures too high power output.
                          Tune power > 40W.
                          ATU selects feed through setting after "TU Failure"
                          command.
                          Power regulation inhibit.
                          Flash "Protec".

12

ALC Power High   TU Control Board measures too high power output.
                          ALC power was too high.
                          Exciter level to ~+12dBm.
                          Power regulation inhibit.
                          Flash "Protec".

13

ALC Power Low   TU Control Board measures too low power output.
                          ALC power was too low.
                          Exciter level to ~+12dBm.
                          Power regulation inhibit.
                          Supply voltage high.
                          Flash "Protec".

14

ALC Power Low   TU Control Board measures too low power output.
                          ALC power was too low.
                          Exciter level to ~+12dBm.
                          Power regulation inhibit.
                          Flash "Protec".

15

TU-ATU Failure   TU Control Board measures too high power output.
                          TX power was too high.
                          Power regulation inhibit.
                          Flash "Protec".

16

Med/Low High   TU Control Board measures too high power output.
                          Medium or Low Power was too high.
                          Flash "Protec".

17

Full High   TU Control Board measures too high power output.
                          Full Power was too high.
                          Powerbregulation inhibit.
                          Flash " Protec".

20	*PA Temp*	PA temperature too high. PA Temp / Att = 1 and PA Att / PA Protect = 1. Power regulation inhibit. Flash "Protec".
21	*PA SWR*	PA SWR was too high. It is necessary to switch off the equipment to reset protection. Analog ALC failure. PA Temp / Att = 0 and PA Att / PA Protect = 1. Power regulation inhibit. Flash "Protec".
22	*High Average*	Average power reduced to 100W. Power regulation modified. Switch on "Protec".
23	*PA Hot*	PA temperature too high. Fan failure. PA Temp / Att = 1 and PA Att / PA Protect = 1 in more than 5 min. Key inhibit in next 5 min. Flash "Protec".
40	*Not Tuned*	ATU failed tuning the antenna. ATU selects feed through setting. Power regulation inhibit. Flash "Protec".
41	*No Tune Power*	ATU measured no tune power. ATU selects feed through setting. Coax cable TU - ATU shorted. Power regulation inhibit. Flash "Protec".
42	*Bad SWR*	ATU measured SWR>8 during Tune Procedure. ATU selects feed through setting. Power regulation inhibit. Flash "Protec".
43	*High SWR*	ATU measured 3<SWR<8 during Tune Procedure. Power regulation inhibit.

44	*V or I*	ATU requests for lower max. power during ALC Adjust. Power regulation modified.
45	*Temp*	ATU requests for lower power during TX. Power regulation modified. Switch on "Protec".
46	*Bad SWR TX*	ATU measured SWR>8 during TX. Power regulation inhibit. Flash "Protec".
47	*High SWR TX*	ATU measured 3<SWR<8 during TX. Power regulation inhibit.
48	*V or I high TX*	ATU requests for lower power during TX. Power regulation modified.
49	*ATU Manual*	Manual Preset on ATU is activated. Switch on "Protec".
50	*V or I high*	ATU requests for lower max. power during ALC Adjust and expected power reduced to less than 45W. Bad antenna.. Power regulation modified. Switch on "Protec".
51	*TU-ATU bad com*	TU - ATU communication is out of order. Key inhibit. Flash "Protec". It is necessary to switch off the equipment to reset the protection.

PREVENTIVE MAINTENANCE

Due to the modern design of the TRP 720X preventive maintenance can be reduced to a minimum provided the equipment is correctly installed. To ensure maximum performance and minimum repair trouble we recommend you to follow the below stated headlines for preventive maintenance.

1. The condition of the battery should be checked at frequent intervals. The battery must always be fully charged and should be topped up frequently with distilled water (liquid should be 5 to 10 mm above the plates).

2. Check the condition of antenna installation, groundconnection and cables at regular intervals.

3. Keep antenna feed-through insulators clean and dry.

4. Ensure that no objects are obstructing the free airflow through the cooling channels of the Transceiver Unit and keep the units free of dust accumulation to prevent overheating.

5. For cleaning use a damp cloth. Sticky dirt may be removed using a cloth with a weak soap solution. Wipe off with a clean cloth.

Realignment of Master Oscillator 712 713

The Master Oscillator frequency should be checked at least once a year. The Master Oscillator determines the exact transmit and receive frequencies of the equipment. The oscillator tends to age very slowly with time, typically with the highest drift rate the first year. The check should be performed by a qualified technician with the necessary test equipment at his disposal.

1. Measuring Equipment:

     1.1   Frequency Counter: Frequency range 100 MHz

                                            Input impedance = 50 ohm

                                            Sensitivity at least 0.2 Vrms

                                            Accuracy better than 0.01ppm

2. Preparations:

     2.1   Switch on the power at least 30 minutes before adjustment.

     2.2   Remove the front cover of the Transceiver Unit.

     2.3   Locate and disconnect X10 carrying the 2. Local Oscillator signal from the Synthesizer Board 711 to RX/EX Signal Path 715. Connect the frequency counter to the X10 socket on the synthesizer.

     2.4   The ambient temperature should be within 10 to 30 deg. Celsius. Do not adjust the Master Oscillator shortly after long keying sequences of the transmitter. Be sure that thermal equilibrium has taken place before adjustment.

3. Realignment of Master Oscillator:

    3.1   Locate the Master Oscillator adjustment hole in the metal shield of Synthesizer Board 711. Use a small screwdriver to gently adjust the frequency.

    3.2   Adjust the frequency as close as possible to 44.544 000 MHz.
                  Adjustment tolerance +/-1Hz.

    3.3   Connect X10 and refit the front cover.

Replacement of Backup Battery

TRP 7000 uses standard 1.5 V alkaline batteries to back-up the memory when the power supply is switched off. Use only the best quality for replacement to avoid leakage.

Skanti recommends:

> DURACELL
> Alkaline
> 1.5 V
> MN1500 / LR6 / Size AA
> 3 pieces

The battery life time depends especially on temperature and working conditions, but is estimated to 3 to 4 years.

Every time the power supply is switched on the capacity of the back-up batteries is checked. When the capacity is becoming low the "Bat" annunciator in the display is switched on, showing that it is time to replace batteries. If the capacity becomes critically low the "Bat" annunciator will flash, indicating that memory contents may be lost when the power supply is switched off.

Note that only last set-up, user-programmable memory, Scan, Sweep and Sleep programs and user-configurable parameters are lost with a low voltage back-up battery, and that TRP 7000 is fully operational even without a back-up battery.

Replacement:

Switch on the power supply to ensure no loss of memory contents when the battery pack is removed. Remove the front cover of the Transceiver Unit. The back-up battery pack is located in the Transceiver Unit opposite to the heatsink. Disconnect the battery supply socket X7 on Transceiver Control Board 710 and remove the battery pack by pulling the nylon string. Change all three batteries and be sure to replace with correct polarity. Refit battery pack, socket and front cover. The power supply may now switched off.

Cleaning the Air Filter

TRP 7000 uses a fan to cool all circuitry inside the Transceiver Unit. To keep the cooling air clean an Air Filter is placed in front of the fan. This Air Filter should be cleaned frequently, especially under dusty working conditions. A dusty Air Filter will block efficient cooling and the transmitter output power is hence reduced to avoid over heating.
Remove the front cover of the Transceiver Unit and gently pull out the Air Filter located in front of the fan. Clean the Air Filter refit and assemble the unit.

TROUBLE SHOOTING

If a malfunction should occur in the TRP 7200, the following steps should be taken, in order to locate and repair the malfunction :

1. Execute built in selftest if possible, and check out what caused the erroneous behaviour, by reading the according error description to the error message in the display.

2. If an execution of the selftest failed, check that all cables and plugs are correctly connected, and that the supply voltage is sufficient. At this point the fuses should be checked. If the TRP 7200 is supplied from an AC Power Supply, the fuse located on the Power Supply Unit must be checked.

3. If the Control Unit display is flashing all annunciators, it indicates missing data communication between the Control Unit and the Transceiver Unit. This could be caused by a bad cable connection on the data wire between these units.

4. The next step is to open the Transceiver Unit and :

    a. Check cables and plugs.

    b. Check that the LED (Light Emitting Diode) on the SMPS/Interconnection Board 730 is constantly on; indicating that the Switch Mode Power Supply is on and able to produce 7.5 V.

    c. Check that the LED on TU Control Board 710 is flashing twice a second, indicating that the microcomputer is operating properly.

5. If the above steps did not help, please contact your local SKANTI Service Agent. A list of SKANTI Service Agents is enclosed on page 5-40.

SELF TEST INTRODUCTION

The SELF TEST program of the TRP 7200 can be used as a fault diagnosing tool for the service technician. It may also be used as a tool from which the user can obtain additional information to pass on to the service agent when ordering service.
The SELF TEST is a build in automatic program which tests the vital functions of the TRP 7200 by performing and monitoring a sequence of operations. The program controls the analog and digital set ups which are necessary to perform each test step in the line of tests executed during the SELF TEST. These set ups will result in a digital feed back from the CHECK DETECTORS which are located on most of the PCBs in the TRP 7200. The test-result from each test step will be displayed on the RX display of the Control Unit

SELF TEST DESCRIPTION

The self test can be performed in two different modes : automatic mode and step mode. Automatic mode is intended for verification of all functions, except the ones where PA power is applied. All these will automatically be stepped through, until the last is reached, or an error condition has occurred.
The step mode can be used to test the transmitter or for service purposes. In this mode tests can manually be stepped through and be repeated several times, giving an expert the opportunity to make measurements.
The execution of the self test is displayed in the Control Unit as shown beneath, where the RX part of the Liquid Crystal Display shows the test being carried out at the time. The bar under the least significant number of the test number is flashing during entering the start test number in step mode. The TX part shows the error code indicating if the test was OK. OK status is obtained if the error code is "PASSED" or "BYPASS" ("BYPASS" meaning : "the test can't be executed due to missing option"). Other error codes are explained in the individual description of each test step.
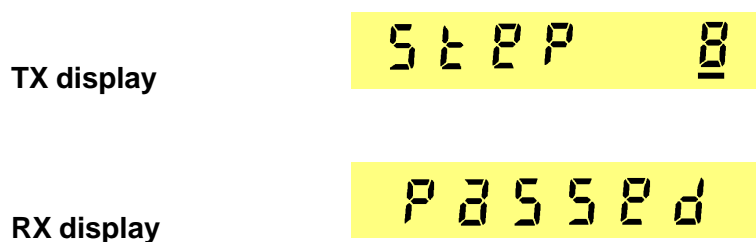
TX display   `StEP    8`

RX display   `PassEd`

EXECUTION OF THE AUTOMATIC STEPPED SELFTEST

This test is carried out by entering :

| Prog | **2** | **0** | Enter |
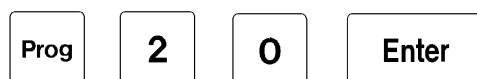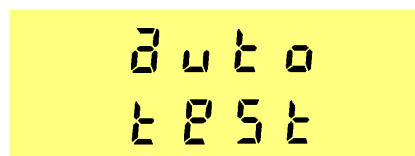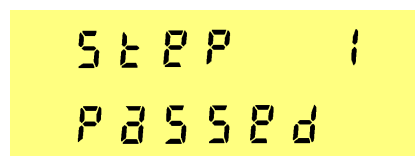
Test numbers **1 to 33** will be performed.

EXECUTION OF THE AUTOMATIC STEPPED SELFTEST (cont')

When this test mode is chosen, the display will show
"auto test" a few seconds.

> auto
> test

Then all tests except transmitter test, will be carried out,
until an error condition occurs, or all tests are finished.

> Step 1
> passed

If an error is detected, please refer to descriptions of
single tests, where a possible error source is mentioned.
After the automatic stepped selftest has stopped, the test
result will displayed for a few seconds, whereupon the
transceiver returns to normal operation.

> Err 1

It is possible to interrupt the automatic test, by pressing [Enter]
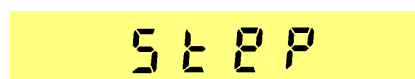
EXECUTION OF THE MANUAL STEPPED SELFTEST

This test is carried out by entering :
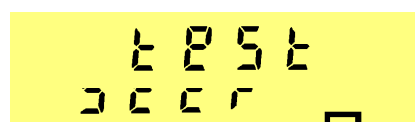
[Prog] [2] [1] [Enter]

Test numbers **1 to 35** can be performed.

The display will now show "step test" a few seconds.

> Step

> test
> occr

The required test number x, from where the step test
will start its execution must be entered now:

> test

[Enter]

x   (test number)

With this mode chosen, the first test will be executed after entering this number.

There are three options to proceed , either press

⌷ **Volume** (increasing) to perform the next test or press

⌷ **Volume** (decreasing) to perform the same test again.

If

⌷ **Enter** is pressed, the transceiver will return to normal operation.

 This will happen too, if

⌷ **Volume** (increasing) is pressed after the last test has been performed.

DESCRIPTION OF TEST STEPS

TEST 1

Test 1 will test AF path on PCB 715, PCB 701/702/703 and PCB 730. The test is carried out, by turning off the microprocessor controlled tone generator and turning both internal and external loudspeakers on.
AF check, internal loudspeaker check and external loudspeaker check are all checked for silence.

Error code	Possible error source	PCB
`Passed`	OK	
`Err   1`	AF line, tone shape, volume Cabling 710 - 715	715
`Err   2`	External speaker amplifier Cabling 710 - 730	730
`Err   3`	Internal speaker amplifier Cabling 710 - 701/703	701

TEST 2

Test 2 will test AF path on PCB 715, PCB 701/702/703 and PCB 730. The test is carried out, by turning on the microprocessor controlled tone generator and turning both internal and external loudspeakers on. A clear 1 kHz tone will be heard during this test.
AF check, internal loudspeaker check and external loudspeaker check are all checked for tone.

Error code	Possible error source	PCB
`Passed`	OK	
`Err  1`	AF line, tone shape, volume, tone generator Cabling 710 - 715	715
`Err  2`	External speaker amplifier, speaker shortcircuit Cabling 710 - 730	730
`Err  3`	Internal speaker amplifier, speaker shortcircuit Cabling 710 - 701/703	701

TEST 3

Test 3 tests volume control on RX/EX Signal Path PCB 715.
The test is carried out, by turning on the microprocessor controlled tone generator, and verifying that AF check toggles condition, and keeps it with increasing volume level. Mute is checked in a similar way.

Error code	Possible error source	PCB
`Passed`	OK	
`Err  1`	Volume control Cabling 710 - 715	715
`Err  2`	AF mute Cabling 710 - 715	715

TEST 4

Test 4 checks the beeper on Control Unit PCB 701/702/703.
Test if beeper generates right condition on internal speaker check detector.

Error code	Possible error source	PCB
Passed	OK	
Err 1	Internal speaker amplifier, beeper Cabling 710 - 701/703	701

TEST 5

Test 5 is a display test on Control Unit PCB 701/702/703.
Turns on all enunciators in display. Visual control must be carried out.

Error code	Possible error source	PCB
Passed	OK	

TEST 6

Test 6 tests Master Oscillator PCB 712/713
Test if MO is oscillating, using MO check.

Error code	Possible error source	PCB
Passed	OK	
Err 1	Master oscillator Cabling 710 - 711 or 711 - 712/713	712

TEST 7

Test 7 tests Synthesizer PCB 711 all local oscillators.
Test that synthesizer is able to lock in midrange
Band : 45 - 52.5 MHz
1.LO : 50.00000 MHz
3.LO : 456.50 kHz
The test is OK if SYNCHECK = 1.
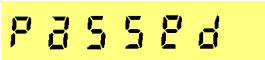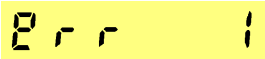
Error code	Possible error source	PCB
`PASSEd`	OK	
`Err 1`	Synthesizer Cabling 710 - 711	711

TEST 8

Test 8 tests Synthesizer PCB 711 1. LO
Test if 1.LO is able to get out of lock to check that microprocessor can control synthesizer.
Band : 45 - 52.5 MHz
1.LO : 75.00000 MHz
3.LO : 456.50 kHz
The test is OK if SYNCHECK = 0.
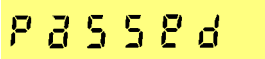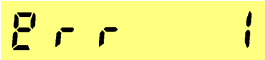
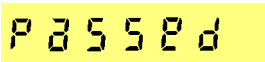| Error code	Possible error source	PCB
`PASSEd`	OK	
`Err 1`	Synthesizer Cabling 710 - 711	711
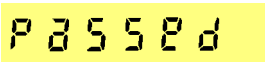
TEST 9

Test 9 tests Synthesizer PCB 711 1. LO
Test if 1. LO is able to lock in band 0 low border
Band : 45 - 52.5 MHz
1.LO : 45.00000 MHz
3.LO : 456.50 kHz
The test is OK if SYNCHECK = 1.

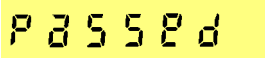| Error code	Possible error source	PCB
`Passed`	OK	
`Err 1`	Synthesizer Cabling 710 - 711	711
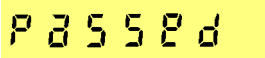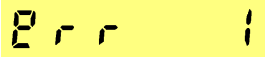
TEST 10

Test 10 tests Synthesizer PCB 711 1. LO
Test if 1. LO is able to lock in band 0 high border
Band : 45 - 52.5 MHz
1.LO : 52.50000 MHz
3.LO : 456.50 kHz
The test is OK if SYNCHECK = 1.

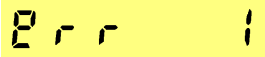| Error code	Possible error source	PCB
`Passed`	OK	
`Err 1`	Synthesizer Cabling 710 - 711	711
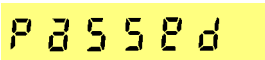
TEST 11

Test 11 tests Synthesizer PCB 711 1. LO
Test if 1. LO is able to lock in band 1 low border
Band : 52.5 - 60 MHz
1.LO : 52.50000 MHz
3.LO : 456.50 kHz
The test is OK if SYNCHECK = 1.

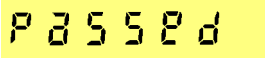| Error code	Possible error source	PCB
Passed	OK	
Err 1	Synthesizer Cabling 710 - 711	711

TEST 12

Test 12 tests Synthesizer PCB 711 1. LO
Test if 1. LO is able to lock in band 1 high border
Band : 52.5 - 60 MHz
1.LO : 60.00000 MHz
3.LO : 456.50 kHz
The test is OK if SYNCHECK = 1.

Error code	Possible error source	PCB
Passed	OK	
Err 1	Synthesizer Cabling 710 - 711	711

TEST 13

Test 13 tests Synthesizer PCB 711 1. LO
Test if 1. LO is able to lock in band 2 low border
Band : 60 - 67.5 MHz
1.LO : 60.00000 MHz
3.LO : 456.50 kHz
The test is OK if SYNCHECK = 1.

Error code	Possible error source	PCB
`Passed`	OK	
`Err  1`	Synthesizer Cabling 710 - 711	711

TEST 14

Test 14 tests Synthesizer PCB 711 1. LO
Test if 1. LO is able to lock in band 2 high border
Band : 60 - 67.5 MHz
1.LO : 67.50000 MHz
3.LO : 456.50 kHz
The test is OK if SYNCHECK = 1.

Error code	Possible error source	PCB
`Passed`	OK	
`Err  1`	Synthesizer Cabling 710 - 711	711

TEST 15

Test 15 tests Synthesizer PCB 711 1. LO
Test if 1. LO is able to lock in band 3 low border
Band : 67.5 - 75 MHz
1.LO : 67.50000 MHz
3.LO : 456.50 kHz
The test is OK if SYNCHECK = 1.

Error code	Possible error source	PCB
`Passed`	OK	
`Err    1`	Synthesizer Cabling 710 - 711	711

TEST 16

Test 16 tests Synthesizer PCB 711 1. LO
Test if 1. LO is able to lock in band 3 high border
Band : 67.5 - 75 MHz
1.LO : 75.00000 MHz
3.LO : 456.50 kHz
The test is OK if SYNCHECK = 1.

Error code	Possible error source	PCB
`Passed`	OK	
`Err    1`	Synthesizer Cabling 710 - 711	711

TEST 17

Test 17 tests Synthesizer PCB 711 3. LO
Test if 3.LO is able to get out of lock to check that the microprocessor can control the synthesizer.
Band : 67.5 - 75 MHz
1.LO : 75.00000 MHz
3.LO : 400.00 kHz
The test is OK if SYNCHECK = 0.
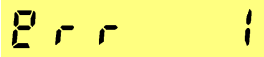
Error code	Possible error source	PCB
Passed	OK	
Err 1	Synthesizer Cabling 710 - 711	711

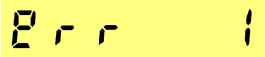**TEST 18**

Test 18 tests Synthesizer PCB 711 3. LO
Test if synthesizer is able to lock 3. LO low border
Band : 67.5 - 75 MHz
1.LO : 70.00000 MHz
3.LO : 452.50 kHz
The test is OK if SYNCHECK = 1.

Error code	Possible error source	PCB
Passed	OK	
Err 1	Synthesizer Cabling 710 - 711	711

TEST 19

Test 19 tests Synthesizer PCB 711 3. LO
Test if synthesizer is able to lock 3. LO high border
Band : 67.5 - 75 MHz
1.LO : 70.00000 MHz
3.LO : 460.50 kHz
 The test is OK if SYNCHECK = 1.

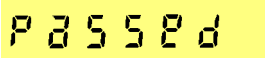| Error code	Possible error source	PCB
`Passed`	OK	
`Err 1`	Synthesizer Cabling 710 - 711	711

TEST 20

Test 20 performs receiver test on RX/EX Signal Path PCB 715 in SSB mode and with SSB filter.
By choosing the right synthesizer frequency the signal passes the 45 MHz filter and is mixed to
a 1 kHz tone in the audio part. This makes the Automatic Gain Control lower the sensitivity and
the AF check indicating AF. RX mute is also checked.
Band : 45 - 52.5 MHz
1.LO : 44.99900 MHz
3.LO : 456.00 kHz

Error code	Possible error source	PCB
`Passed`	OK	
`Err 1`	Receiving signal path Cabling 710 - 715 or 711 - 715	715
`Err 2`	AGC Cabling 710 - 715 or 711 - 715	715
`Err 3`	RX mute	715

TEST 21

Test 21 performs receiver test on RX/EX Signal Path PCB 715 in AM mode and with AM filter.
By choosing the right synthesizer frequency the signal passes the 45 MHz filter and is mixed to
generate an unmodulated carrier . This makes the Automatic Gain Control lower the sensitivity
and the AF check indicating no AF.
Band : 45 - 52.5 MHz
1.LO : 44.99900 MHz
3.LO : 456.00 kHz

Error code	Possible error source	PCB
`PaSSEd`	OK	
`Err 1`	Receiving signal path, AM detector Cabling 710 - 715 or 711 - 715	715
`Err 2`	AGC Cabling 710 - 715 or 711 - 715	715

TEST 22

Test 22 performs receiver test on RX/EX Signal Path PCB 715 in Telex mode and with Telex
filter, if a such is mounted.
By choosing the right synthesizer frequency the signal passes the 45 MHz filter and is mixed to
a 1 kHz tone in the audio part. This makes the Automatic Gain Control lower the sensitivity and
the AF check indicating AF.
Band : 45 - 52.5 MHz
1.LO : 44.99900 MHz
3.LO : 456.00 kHz

Error code	Possible error source	PCB
`PaSSEd`	OK	
`Err 1`	Receiving signal path, option filter Cabling 710 - 715 or 711 - 715	715
`Err 2`	AGC Cabling 710 - 715 or 711 - 715	715
`bYPaSS`	No optional filter installed	715

TEST 23

Test 23 tests squelch on RX/EX Signal Path PCB 715
By choosing the right synthesizer frequency the signal passes the 45 MHz filter and is mixed to
a 1 kHz tone in the audio part. This makes the squelch open. Then a 2 kHz is generated making
the squelch close. Squelch hold time is also checked.
Band : 45 - 52.5 MHz
1.LO : 44.99900 MHz
3.LO : 456.00 kHz

3.LO : 457.00 kHz

Error code	Possible error source	PCB
`Passed`	OK	
`Err 1`	Squelch circuit not able to open Cabling 710 - 715 or 711 - 715	715
`Err 2`	Squelch circuit not able to close Cabling 710 - 715 or 711 - 715	715
`Err 3`	Squelch hold time	715

TEST 24

Test 24 tests manual Gain Control on RX/EX Signal Path PCB 715. By choosing the right
synthesizer frequency the signal passes the 45 MHz filter and is mixed to a 1 kHz tone in the
audio part. By controlling the Manual Gain Control to low sensitivity the AF check indicates no
AF. High sensitivity shows AF present.
Band : 45 - 52.5 MHz
1.LO : 44.99900 MHz
3.LO : 456.00 kHz

Error code	Possible error source	PCB
`Passed`	OK	
`Err 1`	Not able to lower MGC Cabling 710 - 715 or 711 - 715	715
`Err 2`	Not able to rise MGC Cabling 710 - 715 or 711 - 715	715

TEST 25

Test 25 tests Automatic Gain Control Hang facility on RX/EX Signal Path PCB 715.
Examine hang function in three steps :
1) Check normally AGC (with 1 kHz tone)
2) Check that AGC hangs (without signal)
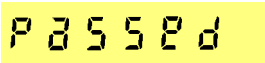3) Check that AGC hang has ended (without signal)

Band : 45 - 52.5 MHz
1.LO : 44.99900 MHz
3.LO : 456.00 kHz

Band : 67.5 - 75 MHz
1.LO : 80.00000 MHz
3.LO : 456.00 kHz

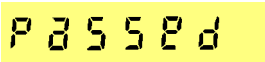| Error code	Possible error source	PCB
`Passed`	OK	
`Err 1`	AGC Cabling 710 - 715 or 711 - 715	715
`Err 2`	AGC hang facility	715

TEST 26

Test 26 performs exciter test on RX/EX Signal Path PCB 715 in SSB mode and with SSB filter and no input.
The exciter is set up to produce 15 MHz SSB signal. With input grounded; no RF is detected at RF check.
Band : 60 - 67.5 MHz
1.LO : 60.00000 MHz
3.LO : 455.00 kHz

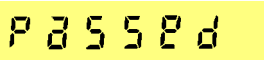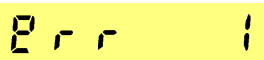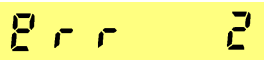| Error code	Possible error source	PCB
`Passed`	OK	
`Err 1`	Exciter signal path Cabling 710 - 715 or 711 - 715	715

TEST 27

Test 27 performs exciter test on RX/EX Signal Path PCB 715 in SSB with SSB filter and tone input.
The exciter is set up to produce 15 MHz SSB signal. With tone input; RF is detected at RF check. Shape key is also checked.
Band : 60 - 67.5 MHz
1.LO : 60.00000 MHz
3.LO : 456.00 kHz

Error code	Possible error source	PCB
`Passed`	OK	
`Err    1`	Exciter signal path Cabling 710 - 715 or 711 - 715	715
`Err    2`	Shape key	715

TEST 28

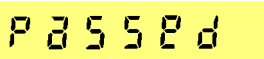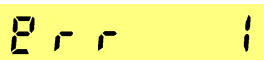Test 28 performs exciter test on RX/EX Signal Path PCB 715 in R3E with SSB filter and tone input.
The exciter is set up to produce 15 MHz R3E signal. With tone input; RF is detected at RF check.
Band : 60 - 67.5 MHz
1.LO : 60.00000 MHz
3.LO : 455.00 kHz

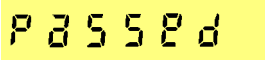| Error code	Possible error source	PCB
`Passed`	OK	
`Err    1`	Exciter signal path Cabling 710 - 715 or 711 - 715	715

TEST 29

Test 29 performs exciter test on RX/EX Signal Path PCB 715 in AM with SSB filter and no input.
The exciter is set up to produce 15 MHz AM carrier. With input grounded; RF is detected at RF check.
Band : 60 - 67.5 MHz
1.LO : 60.00000 MHz
3.LO : 455.00 kHz

Error code	Possible error source	PCB
`Passed`	OK	
`Err    1`	Exciter signal path Cabling 710 - 715 or 711 - 715	715

TEST 30

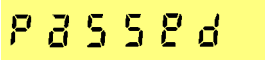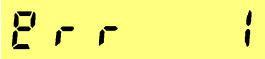Test 30 performs exciter test on RX/EX Signal Path PCB 715 in CW mode with SSB filter and no input.
The exciter is set up to produce 15 MHz carrier. With input grounded; RF is detected at RF check.
Band : 60 - 67.5 MHz
1.LO : 60.00000 MHz
3.LO : 455.00 kHz

Error code	Possible error source	PCB
`Passed`	OK	
`Err    1`	Exciter signal path Cabling 710 - 715 or 711 - 715	715

TEST 31

Test 31tests Automatic Level Control on RX/EX Signal Path PCB 715. The exciter is set up to produce 15 MHz CW carrier. With input grounded and low ALC level; no RF is detected at RF check. With high ALC level RF is present.
Band : 60 - 67.5 MHz
1.LO : 60.00000 MHz
3.LO : 455.00 kHz

Error code	Possible error source	PCB
`Passed`	OK	
`Err 1`	Not able to lower ALC Cabling 710 - 715 or 711 - 715	715
`Err 2`	Not able to rise ALC Cabling 710 - 715 or 711 - 715	715

TEST 32

Test 32tests Antenna Tuning Unit PCB 740 without power.
The TU checks that an ATU is connected and if, if it is in manual mode and able to communicate with the TU.
The ATU tests : RAM, Vforward-, Vreflected-, 0 degrees-, 90 degrees- and temperature- detector.

Error code	Possible error source	PCB
`Passed`	OK	
`Err 1`	ATU in manual mode Cabling 730 - 710 or 730 - 740	740
`Err 2`	ATU - TU communication failure Cabling 730 - 710 or 730 - 740	740,710
`Err 3`	ATU ram error	740
`Err 4`	Vforward detector	740

TEST 32 (continued)

`Err 5`	Vreflected detector	740
`Err 6`	0˚ detector	740
`Err 7`	90˚ detector	740
`Err 8`	Temperature sensor	740
`bYPass`	No ATU connected	

TEST 33

Test 33 tests correspondence between battery voltage and power amplifier module.
Supply voltage is read from PCB 730 and compared with PA module id. PA id is performed by a voltage divider and read by the A/D converter.

Error code	Possible error source	PCB
`Passed`	OK	
`Err 1`	Supply voltage too low or voltage measuring circuit Cabling 710 - 730	730
`Err 2`	Supply voltage too high on 12 V PA module	
`Err 3`	Supply voltage too low on 24 V PA module	
`Err 4`	Supply voltage too high on 24 V PA module	
`Err 5`	Supply voltage too low on 32 V PA module	
`Err 6`	Supply voltage too high on 32 V PA module	
`Err 7`	Unidentified PA module Cabling 710 - 720/721/722/723/724	720

TEST 34

Test 34 is a listening test to ensure that the frequency is vacant, before the transmitter test is carried out.

Error code	Possible error source	PCB
`Passed`	OK	

TEST 35

Test 35 tests PA - module PCB 720/721/722/723/724, PA - filters PCB 726/727 and ATU PCB 740.
A full tune and alc procedure is performed on a frequency chosen by the user. Then a transmission with full power is carried out for 10 seconds, followed by a transmission in low power mode also lasting 10 seconds.

Error code	Possible error source	PCB
`Passed`	OK	
`Err 1`	PA Attenuator Relay Cabling 710 - 720*	720
`Err 10`	Tune Power Low Coax 715 - 720* or 720* - 726/727 Coax cables 720* - 726/727 - 730, TU - ATU open. Cabling 710 - 715 or 710 - 726/727	
`Err 11`	Tune Power High Cabling 710 - 715 or 710 - 726/727	
`Err 12`	ALC Power High Cabling 710 - 715 or 710 - 726/727	
`Err 13`	ALC Power Low while supply voltage high Cabling 710 - 715 or 710 - 726/727	
`Err 14`	ALC Power Low Cabling 710 - 715 or 710 - 726/727	

* 720/721/722/723/724

TEST 35 (continued)

`Err 15`

TU - ATU Failure
Cabling 710 - 730 or 730 - 740
Antenna installation or ATU

`Err 16`

Med/Low High
Cabling 710 - 720* or 710 - 726/727

`Err 17`

Full High
Cabling 710 - 720* or 710 - 726/727

`Err 20`

PA Temp   720
Check Blower & Blower Filter

`Err 21`

PA SWR   720
Coax 720* - 726/727
Antenna installation

`Err 40`

Not Tuned   740
Antenna installation or ATU

`Err 41`

No Tune Power   740
RX/TX relay PCB 730 or coax connectors
Coax cables 726/727 - 730, TU - ATU shorted.
ATU

`Err 42`

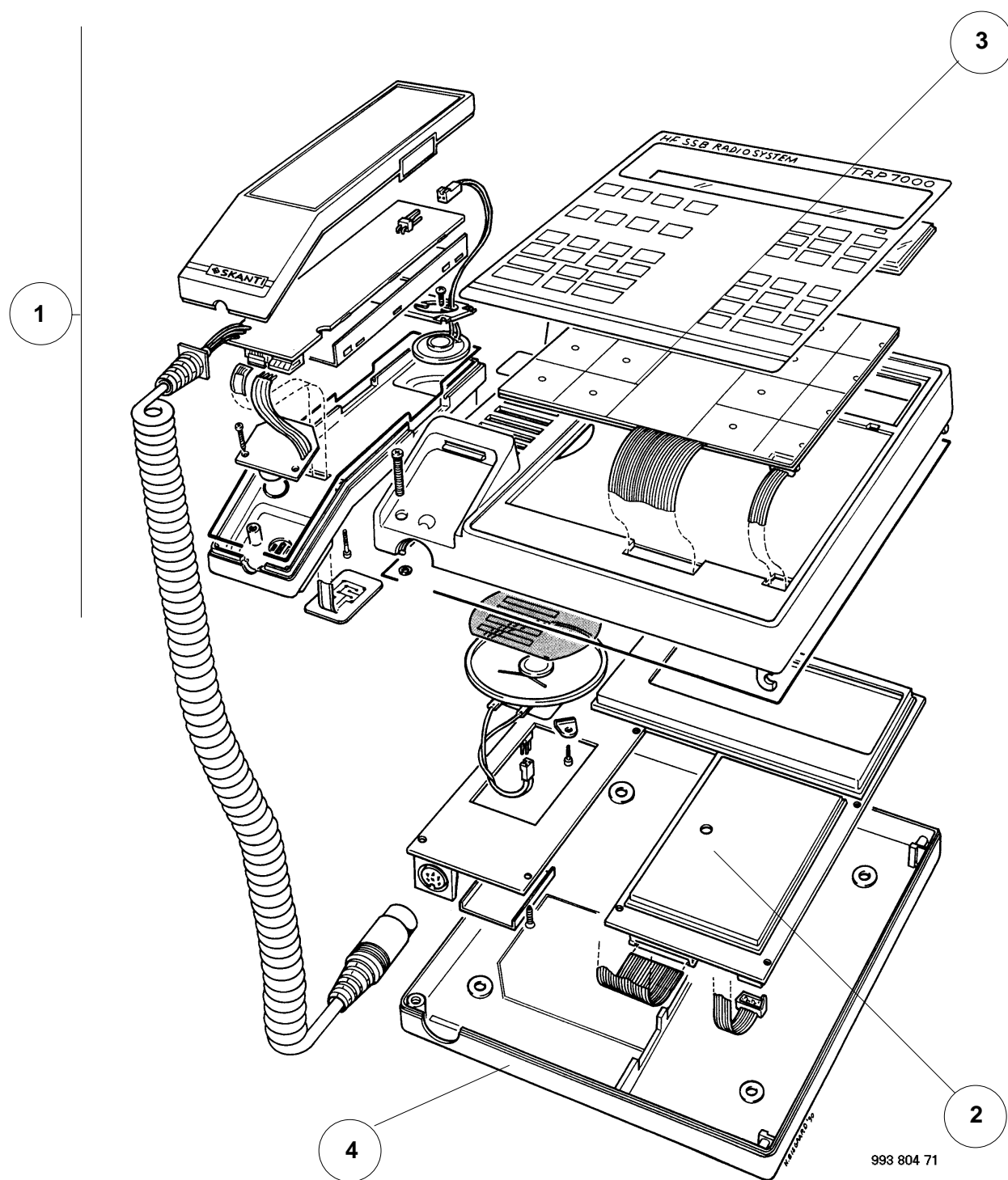Bad SWR   740
Antenna installation or ATU

`Err 46`

Bad SWR TX   740
Antenna installation or ATU

* 720/721/722/723/724

CONTROL UNIT SPARE-PARTS

POS.	DESIGNATION	SKANTI CODE
1	Handset Complete	107 800 00
2	CU-1 Control Board 701 incl. screen covers	107 805 00
3	Keyboard incl. Back-Light	107 805 10
4	Bottom Box	343 781 41

993 804 71

TRANSCEIVER UNIT SPARE-PARTS

POS.	DESIGNATION	SKANTI CODE
1	TU Control Board 710 incl. screen covers	107 805 30
2	Synthesizer Board 711 incl. Master Oscillator 712 / 713 and screen covers.	107 805 40
3	Master Oscillator 712	107 871 21
	Master Oscillator 713	107 871 31
4	RX / EX Signal Path 715 incl. screen covers	107 805 50
5	PCP 717 incl. screen covers (option)	107 805 60
	Interface A 718 incl. screen covers (option)	107 805 70
6	12V Power Amplifier Assembly	107 803 00
	24V Power Amplifier Assembly	107 803 10
	12V FET Power Amplifier Assembly	107 803 20
	24V FET Power Amplifier Assembly	107 803 30
	32V FET Power Amplifier Assembly	107 803 40
7	Marine filters 726	107 872 61
	Continuous Filters	107 872 71
8	SMPS / Interconnection Assembly	107 800 80
9	X1 Ribboncable	373 787 41
10	X2 Ribboncable	373 787 51
11	X5 Ribboncable	373 787 61
12	X3 Ribboncable (option)	373 801 51
13	X4 Ribboncable (option)	373 801 41
14	Batteries: 3 pcs. Alkaline 1.5V MN1500	890 000 03
15	Battery Container incl. Connector	107 801 70
16	Blower filter	107 802 60
17	Standard Blower incl. Connector	107 801 80
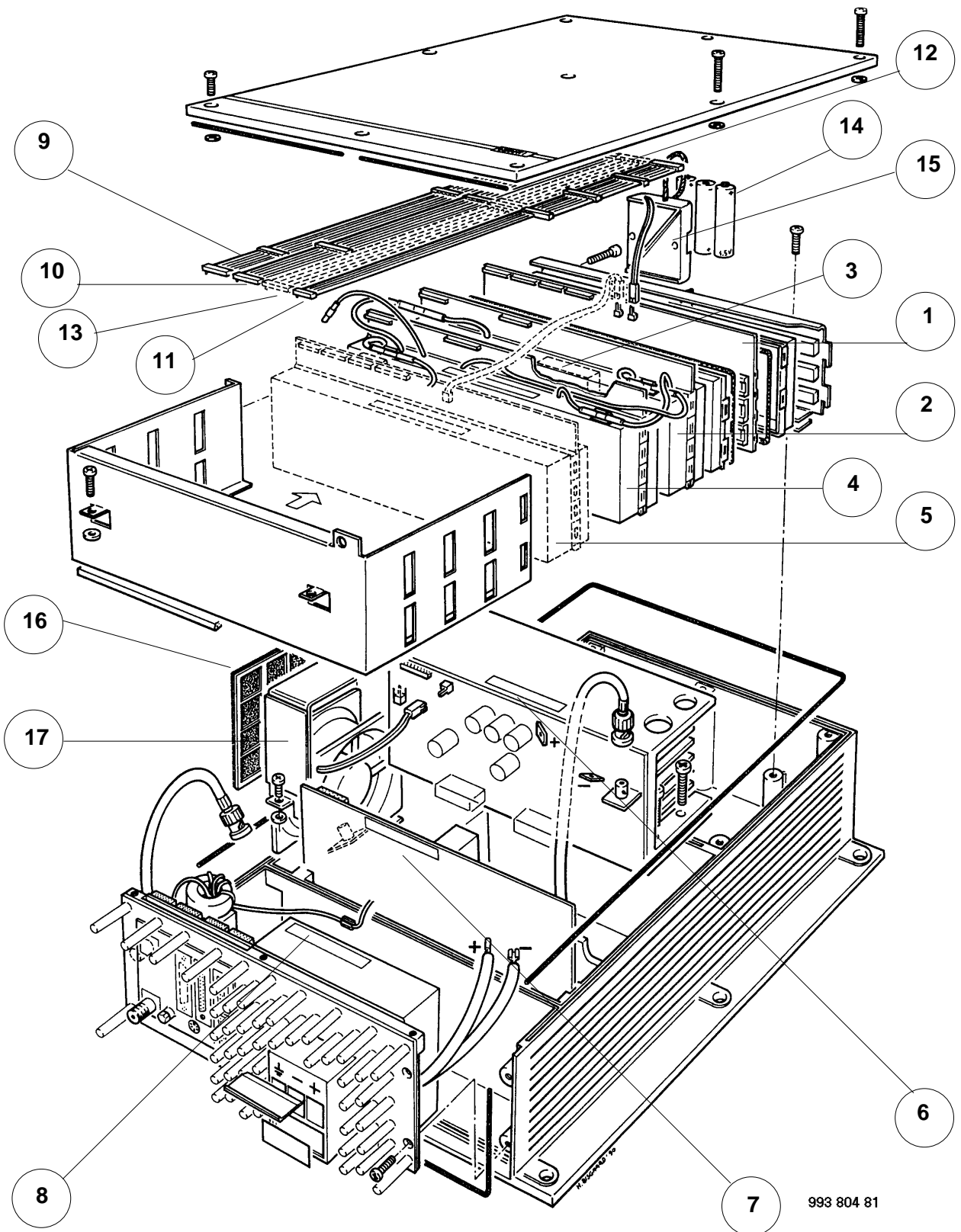
993 804 81

ANTENNA TUNING UNIT SPARE-PARTS

POS.	DESIGNATION	SKANTI CODE
1	ATU Board 740 incl. screen covers	107 805 20
2	Dummy Load 741	107 874 11
3	Blower	107 800 30
4	Twin Cable-Gasket	343 784 11
5	Twin Cap	343 784 21
6	Rail Clip	343 591 83
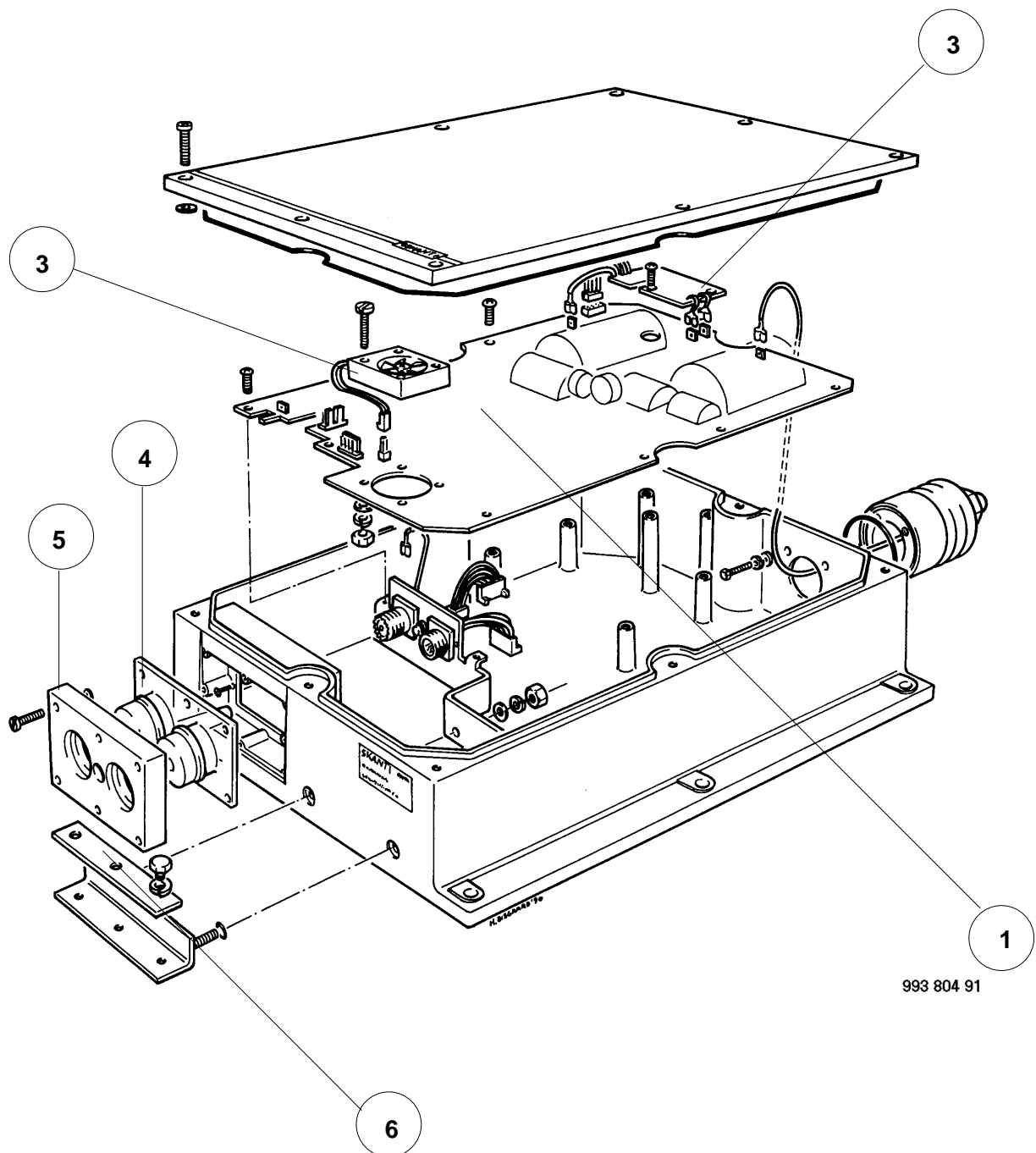
993 804 91

AC POWER SUPPLY SPARE-PARTS

POS.	DESIGNATION	SKANTI CODE
1	AC Control Board Assembly	107 800 50
2	Terminal Strip	107 803 80
3	Fuse: 2 pcs. 220V 4A 5x20 mm	720 340 02
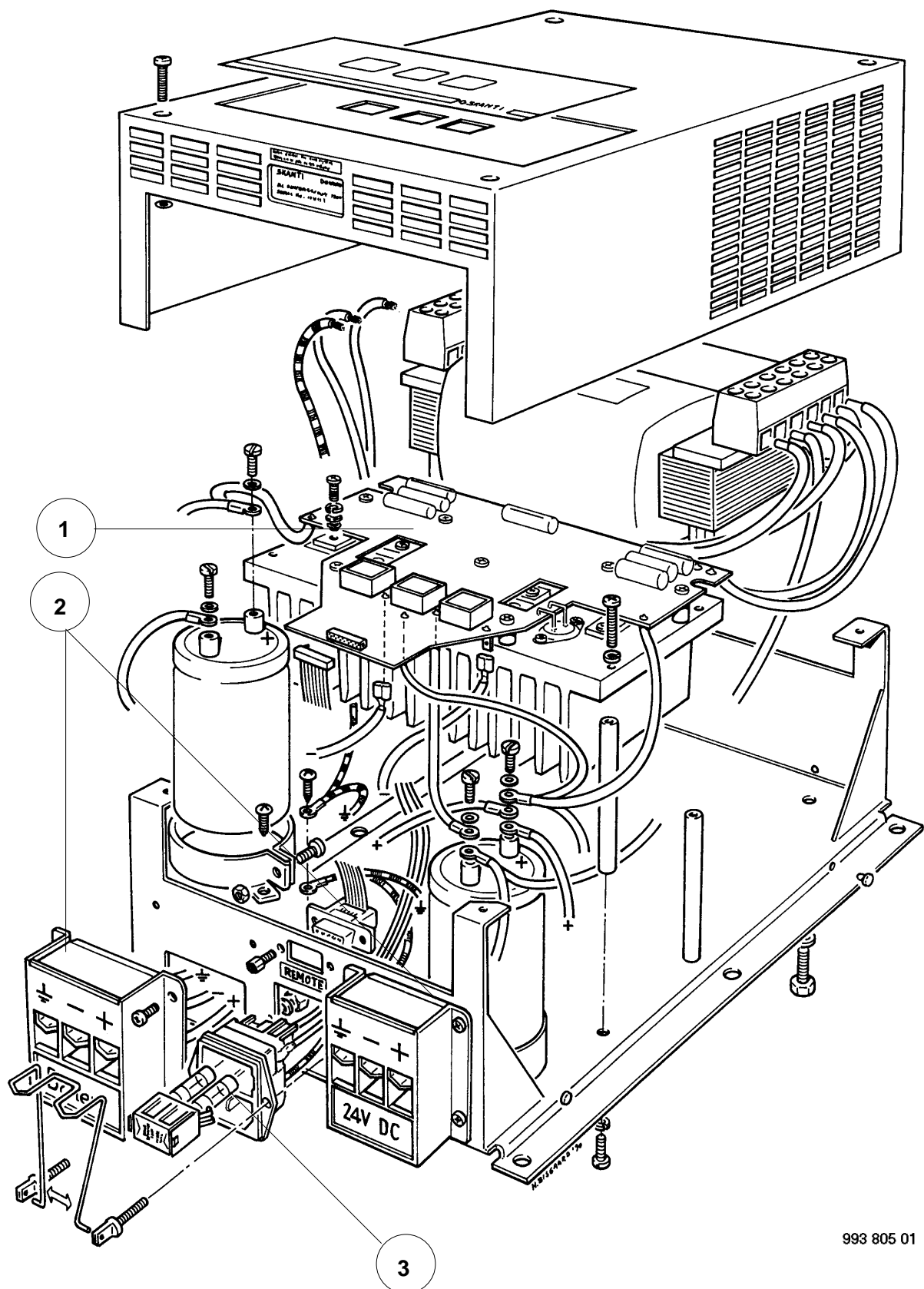
993 805 01

SKANTI SERVICE AGENTS

Please refer to the list of agents at the SKANTI homepage on this Internet address:

http://www.skanti.dk