DSC 9000 SERIES

TECHNICAL MANUAL

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1. INTRODUCTION Table of Contents

GENERAL DESCRIPTION

The DSC 9000 is an MF/HF DSC Controller-Receiver which complies with the GMDSS requirements specified in SOLAS 88, chapter IV, when it is connected to a SKANTI TRP 7000 or TRP 8000 or another suitable HF transceiver.
It is designed in accordance with the recommendations and specifications of the IMO, ITU and CEPT for Class-A DSC equipment in the maritime mobile MF/HF service.
The Digital Selective Calling (DSC) system is a world-wide system for ship-to-shore, shore-to-ship, and ship-to-ship calling. It is an essential element in the Global Maritime Distress and Safety System (GMDSS) but is also used for public correspondence with land networks through coast stations providing this service.
Calls may be directed to single stations, to groups of stations or to all ships, and contain information about the category of the call (distress, urgency, safety, ship's business or routine), proposed frequency for subsequent communication, etc. In distress calls the distress position, nature of distress, etc. may be included.
Visual and audible signals advise the receiving party when calls are received. When contact has been established, frequencies are changed to the indicated working frequencies and the communication is carried out as usual.

DSC 9000 MF/HF Controller-Receiver is a compact equipment in modular design featuring the latest SMD technology. It consists of:
DCU 9000, DSC Control Unit, compact and easy to use, with large 160-character backlit LCD display with 4 lines. Splash-proof, backlit keyboard with tactile and audible feed-back. Up to 5 DCU 9000 sets may be connected to the DU 9000. The units are chain connected with a single cable.
DU 9000 DSC Unit, containing single channel or scanning receiver, power supply module, and the PCP module (Programmable Communication Processor) with DSC modulator, two DSC demodulators, and processor for control of the DSC unit and the communication with the DCU 9000, the HF transceiver and other connected equipment.
The unit is fully remote controlled from the DCU 9000 and may be installed in any convenient, suitable place. An additional DU 9006 DSC Unit configured as a DSC watch receiver may be connected where a second continuous watch receiver is needed.
The DSC 9000 MF/HF Controller-Receiver has complete control of the SKANTI TRP 7000 or TRP 8000 HF transceiver. This feature gives automatic transfer of the receiver and transmitter frequencies from the DSC 9000 to the HF transceiver. Furthermore, if an additional DU 9006 watch receiver is not connected, the receiver in the SKANTI TRP 7000 or TRP 8000 may be utilized for scanning of DSC calling channels while the receiver in the DSC 9000 simultaneously maintains distress and safety watch.
Interface (NMEA) to navigational equipment is included for automatic position updating. An external distress button may be connected for remote activation of distress calls, and external alarms may be connected for remote indication of received calls.
A serial interface for connection of a printer is included for selectable print-out of all calls, distress and safety calls only, transmitted and received calls, or received calls only as well as the possibility of printing out Short-dial list, DSC frequency list, MMSI list, Telephone list and configuration settings.
Received calls are stored until read-out. Up to 20 different distress calls and 20 other calls can be contained in the store.
The DSC 9000 remembers the last transmitted call in each format and category for easy repetition. Furthermore a short-dial register is included which may contain up to 99 user pre-programmed calls for easy recall.
When sending acknowledgements or calls in response to a received call, relevant information is automatically transferred from the received call for fast and easy response.
The DSC 9000 has direct-dial facilities in accordance with the operational procedures specified for ship stations in Recommendation ITU-R M.1080: INTERNATIONAL MARITIME MF/HF RADIOTELEPHONE SYSTEM WITH AUTOMATIC FACILITIES BASED ON DSC SIGNALLING FORMAT.
The DSC 9000 has built-in test facilities for easy routine testing and as an aid for trouble shooting and service.

BASIC VERSIONS

- **DSC 9001 - MF/HF DSC Controller-Receiver**
  Built-in DSC watch receiver for the MF distress DSC frequency 2187.5 kHz.
  The second demodulator may be used with the SKANTI TRP 7000 or TRP 8000 transceivers for scanning and DSC watch of 6 freely selectable MF/HF DSC channels.

- **DSC 9006 - MF/HF DSC Controller-Receiver**
  Built-in 6-channel scanning MF/HF DSC watch receiver.The second demodulator may be used with the SKANTI TRP 7000 or TRP 8000 transceivers for scanning and DSC watch of 6 freely selectable MF/HF DSC channels.

TECHNICAL DATA

GENERAL

Complies with the relevant IMO performance standards, the ITU Radio Regulations, the relevant ITU recommendations and meets the performance specifications of CEPT for MF/HF DSC equipment (T/R 34-01 E, Annex XIII).

Power Supply:
12/24/32 V battery.
Connection will not earth supply battery.

Supply Voltage Variation:
10.8 to 41.6 V DC

Power Consumption:
15 W to 50 W (50 W during the first min.) depending on backlight intensity and number of control units.
With additional DU add 15 W (50 W during the first min.)

Operating Temperature Range:
-20C to +55C

RECEIVER WITH DSC DECODER 1

Frequency Range:
DU 9001: 2187.5 kHz
DU 9006: 0.1 - 30 MHz

Frequency Selection:
DU 9001: Fixed
DU 9006: Scanning of up to six frequencies may be selected from pre-programmed or user-programmed frequencies.

Frequency accuracy:
Better than 10 Hz

Antenna Impedance:
50 ohms

Receiver Bandwidth:
Passband (6 dB) min. +/- 125 Hz
Attenuation at +/- 550 Hz min. 60 dB

Calling Sensitivity:
Antenna input (EMF) for symbol error rate below $1x10^{-2}$: 0 dBµV.

Adjacent Channel Selectivity:
With a wanted signal 20 dBµV, an unwanted signal 500 Hz off tune 60 dBµV does not deteriorate the symbol error rate below $1x10^{-2}$.

Co-Channel Rejection:
With a wanted signal 20 dBµV, an unwanted signal on the same frequency 14 dBµV does not deteriorate the symbol error rate below $1x10^{-2}$.

RF Intermodulation Response:
With a wanted signal 20 dBµV, two unwanted signals more than 30 kHz off tune 70 dBµV do not deteriorate the symbol error rate below $1x10^{-2}$.

Interference Rejection and Blocking Immunity:
With a wanted signal 20 dBµV, an unwanted signal in the frequency range 100 kHz to 2 GHz (except a +/- 3 kHz band around the tuned frequency) 90 dBµV does not deteriorate the symbol error rate below $1x10^{-2}$.

Dynamic Range:
With a wanted signal 80 dBµV the symbol error rate is below $1x10^{-2}$.

Conducted Spurious Emission:
Less than 1 nW measured at the antenna connector

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

DSC DECODER 2

Input Frequency:
1700 Hz +/-85 Hz.

Modulation rate:
100 baud.

Input Level:
Nominally 0 dBm.

Dynamic Range:
+10/-30 dB.

Input Impedance:
600 ohms, free of earth.

Scanning Interface:
Scanning of up to six frequencies may be selected from pre-programmed or user-programmed frequencies.
Scanning table and step commands are transferred via transceiver interface.
Stops on 100 baud dot pattern only.

DSC ENCODER

Modulation:
Phase continuous AFSK keying.

Output Frequency:
1700 Hz +/-85 Hz.

Frequency Accuracy:
Better than 0.5 Hz.

Modulation Rate:
100 baud, +/-30 ppm.

Output Level:
Adjustable, -10 to +10 dBm, 600 ohms.

Output Impedance:
600 ohms, free of earth.

Unwanted Spectral Components:
More than 60 dB below mean power output level.

TRANSCEIVER CONTROL

Control Data Interface:
Serial interface, compatible with RS-232.
Baud Rate: 2400 bps(T+Bus) /
4800 bps(NMEA).
Interface Protocol:
T+Bus(default) / T+Bus, one way / NMEA

TX Key Signal:
Open collector output, compatible with RS-410 type N.
Max current 50mA. Max voltage 32V. Low for keying TX.

Handset On-Hook Signal:
RS-410 type N input. Internally pulled up to 12V through 1.8 kohm.
Should be connected to GND when handset is off-hook or on-hook as determined by configuration.

RADIOTELEX INTERFACE

Control Data Interface:
Serial interface, compatible with RS-232. Opto-isolated (internally selected).
Baud rate: 2400 bits/sec.
Interface Protocol: T+Bus.

TX Key Signal:
RS-410 type N input.
Internally pulled up to 12V through 1kohm.
Should be connected to GND for keying TX.

OTHER INTERFACES

Navigator (DU or DCU):
Serial interface, opto-isolated, conforming with NMEA 0183. Baud rate: 4800 bits/sec.

Printer (DU or DCU):
Serial interface compatible with RS-232, opto-isolated (internally selected). Baud rate: 300 - 9600 bits/sec.

External Distress Alarm Button (DU or DCU):
RS-410 type N input.
Internally pulled up to 12V through 1.8kohm.
Should be connected to GND when distress button is activated.

Alarm Out (DCU):
Open collector output, compatible with RS-410 type N.
Max current 50mA. Max voltage 32V.
Low when Distress lamp is on.

Alarm 1 Out (DU):
Open collector output, compatible with RS-410 type N.
Max current 50mA. Max voltage 32V. Low as determined by configuration.

Alarm 2 Out (DU):
Open collector output, compatible with RS-410 type N.
Max current 50mA. Max voltage 32V. Low as determined by configuration.

Scan S/S (DU):
Open collector output, compatible with RS-410 type N.
Max current 50mA. Max voltage 32V. Not used at present.

OPERATIONAL FACILITIES

Display:
4 lines x 40 characters alpha-numeric dot matrix LCD module with black characters and yellow LED backlight.

Keyboard:
20 back-illuminated keys with tactile feedback.

Visual Indicators:
Green, red and yellow LEDs for indication of Supply On, reception/transmission of distress or urgency and other calls respectively.

Aural Alarm Signals:
Specific acoustic signals for distress/urgency calls and other calls.

Non-Volatile Memory:
Nine-digit self-ID is permanently stored and cannot be changed by the user.

Battery Backed-up Memory:
Capacity for storing
20 received distress calls
20 other received calls
10 Tx-calls
100 DSC frequency pairs
100 MMSI numbers
100 telephone numbers

BACK-UP BATTERY

Battery type:
$Li/SOCl_2$
Part number 107 811 60

Life Time:
6-12 years dependent on working conditions.

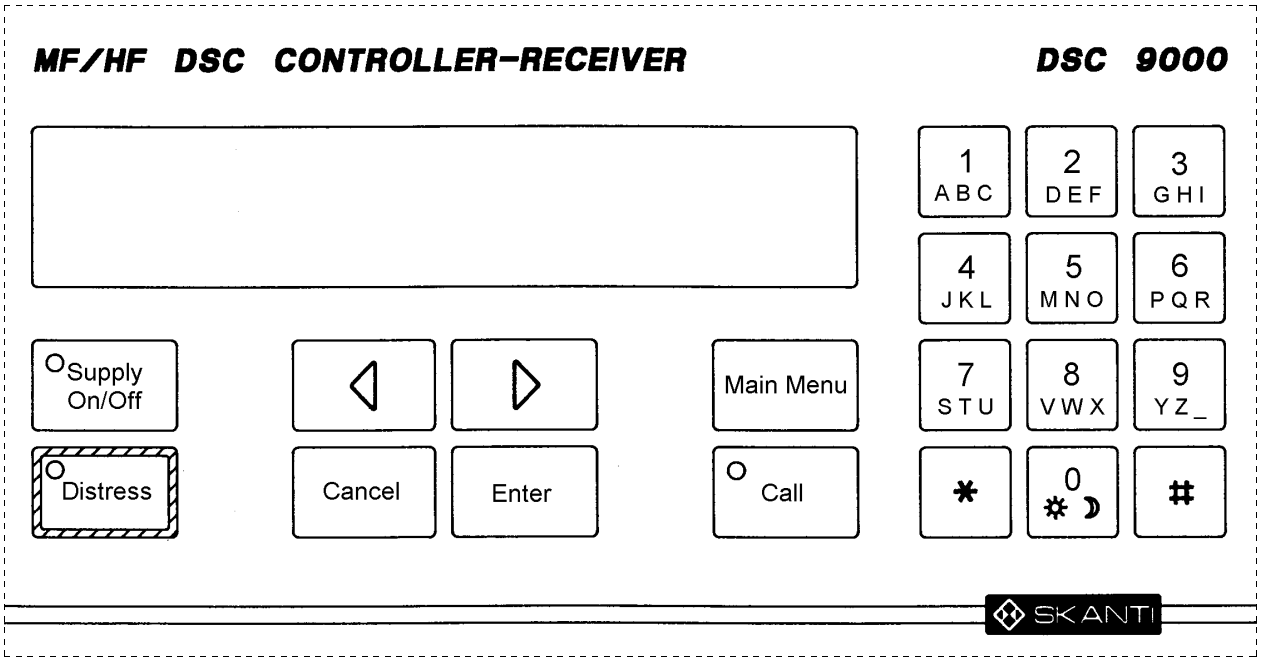
DIMENSIONS AND WEIGHTS

DCU 9000 Control Unit:
Width: 330 mm
Height: 132.5 mm
Depth: 43 mm
Weight: 1.4 Kg

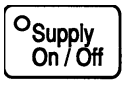
DU 9000 DSC Unit:
Width: 370 mm
Height: 132.5 mm
Depth: 291.5 mm
Weight: 7.4 Kg, DU 9001
7.5 Kg , DU 9006

2. OPERATION Table of Contents

DSC 9000 FRONT PANEL

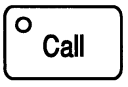


KEYS AND INDICATORS

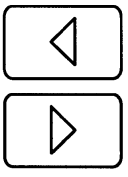


Switches DSC 9000 on.
Switches DSC 9000 off when pressed for 6 seconds.

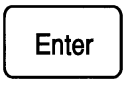
Selects DISTRESS mode.
Starts transmission of a distress alert if pressed for 6 seconds.



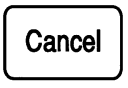
Selects TX-CALL menu.
Completes a composition of a TX-CALL using the information from the last call in the selected Format.
Starts transmission of a composed call if so is indicated.
Starts transmission of an acknowledgement if a call requiring acknowledgement is displayed.



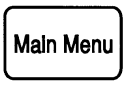
Change the content of a selection field.
Move between commands.
Change list numbers.
Change between numbers and letters in alpha-numeric fields.



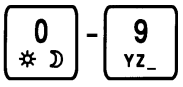
Enters the content of a selection or entry field and moves to the next step.
Executes a selected command.



Moves to the previous step.
Deletes the character at the cursor when keying in a value.
Interrupts transmission of a call in progress.
Stops an aural alarm signal.

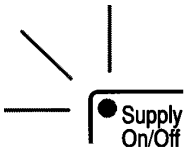


Selects the MAIN-MENU.



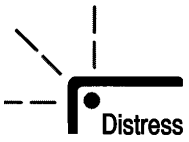
Enter numbers or letters in entry fields.

Switches illumination of display and keyboard backlight between "day" and "night" settings (unless a numeric entry is expected).



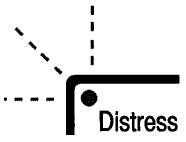
Steady green light

Indicates that the supply is on.



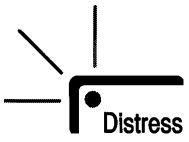
Slow flashing red light

A distress call (distress format or category) has been received . The lamp remains flashing until the call has been read out.



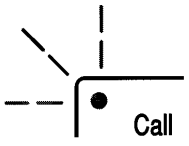
Quick flashing red light

A distress alert will be transmitted if the Distress key is kept pressed for 5 seconds.



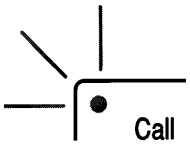
Steady red light

A distress alert transmission is in progress.
Distress alert will be automatically retransmitted.



Slow flashing yellow light

A call other than distress has been received. The lamp remains flashing until the call has been read out.



Steady yellow light

Transmission of a call (other than distress) is in progress.

AURAL ALARM SIGNALS

Distress Alarm: User-programmable sound indicating that a distress or urgency call has been received. Remain activated until a key is pressed

Call alarm: User-programmable sound indicating that a call (other than distress or urgency) has been received. Remain activated for 1/4 - 4 minutes (programmable) or until a key is pressed or, for Direct-dial and Selective telephony calls, the handset of the radiotelephone is lifted off-hook.

REMOTE ALARMS

External alarm devices may be connected to DSC 9000 and configurated to be active when

- the aural distress alarm sounds, or
- the aural call alarm sounds, or
- either alarm sounds *), or
- the distress lamp is illuminated and when the aural distress alarm sounds

*)Different on/off patterns so it is possible to distinguish between distress alarm and call alarm.

REMOTE ACTIVATION OF DISTRESS ALERT

An external push button may be connected to the equipment for remote initiation of a distress alert.

The external push button may be combined with a lamp configurated to follow the distress lamp.

The external push button is operated in the same way as the Distress key on DCU 9000. To initiate a distress alert press the push-button for 6 sec (until the distress lamp stops quick-flashing and shows steady light). Then release. If not released within 5 s transmission does not start.

MULTIPLE CONTROL UNITS

Up to 5 DCU 9000 control units may be connected simultaneously to a DU 9000. One of the control units may be given priority (by configuration).

Only one control unit can be *active* at a time while all others are *passive*. When switching on, the control unit on which the SUPPLY ON/OFF button was pressed becomes *active*. After an interruption in external power supply all control units will be *passive*.

If the active control unit is in the MAIN-MENU, STATUS or RX-CALL states or if all control units are passive, the display of a passive control unit shows:

```
STAND-BY

                    >STATUS<
```

If the active control unit is in any other state the display of a passive control unit shows:

```
BUSY
```

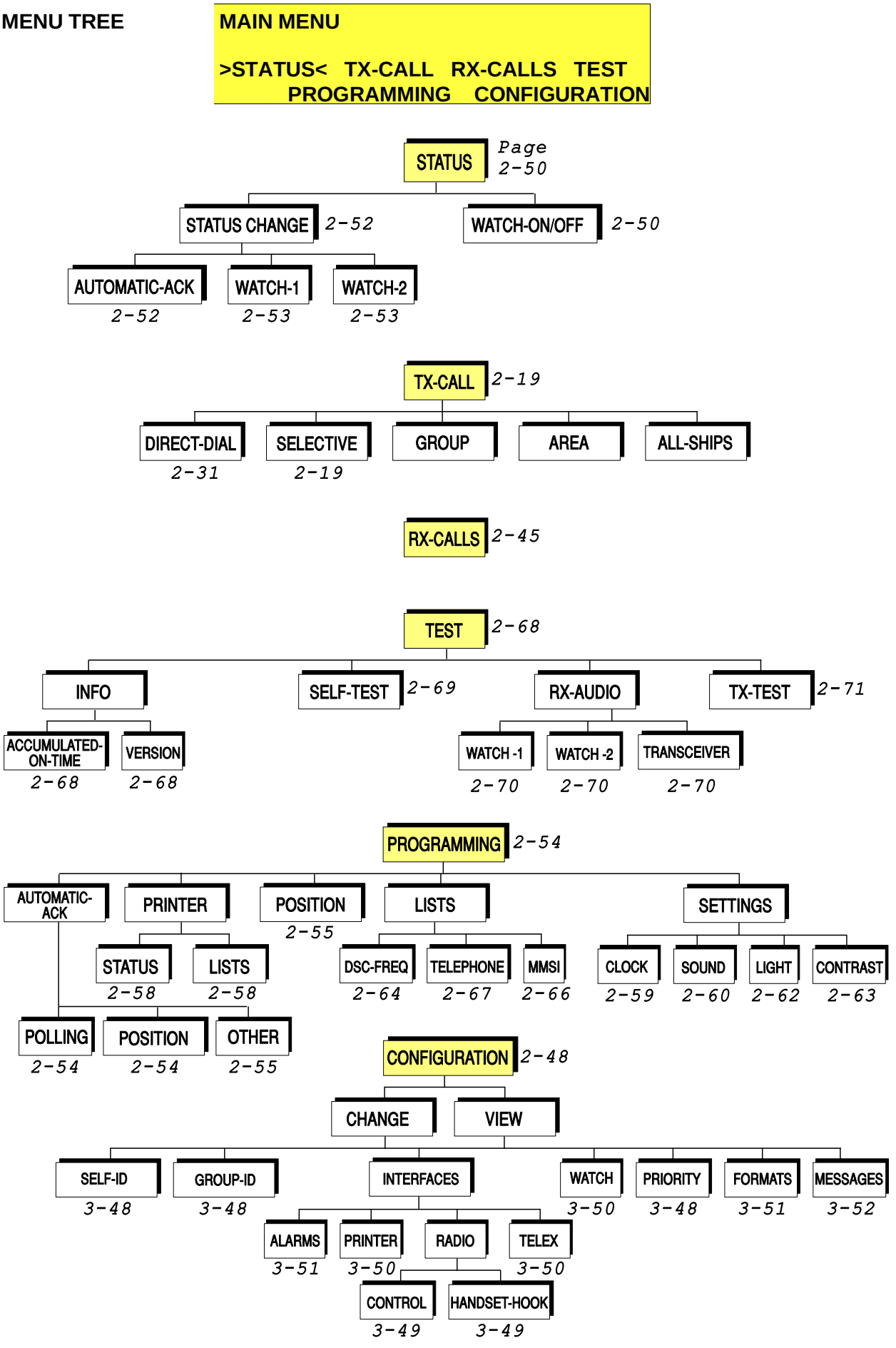
Only a passive control unit with higher priority can interrupt the active control unit in this case.

Only the keys Main Menu , Distress , Call , Enter and 0 ☼ ☽ are functioning on a passive control unit.

An incoming call activates the visual and audible indicators of all control units. Light and sound levels are induvidually adjustable.

The RX-CALL is displayed only on the active control unit.

MENU TREE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DISTRESS ALERT, *INFO*

To edit the Information, release 

immediately.

DISTRESS ALERT

1. Press Distress for 6 seconds.

   The displayed distress alert information will be transmitted when the key is released after the 6 seconds has elapsed.

Example:

DISTRESS
Position: 55˚59'N 133˚22'W at 1229 UTC
Undesignated distress USB telephony
- Keep pressing 5 sec to send message -

EDITING A DISTRESS ALERT, *INFO*

Position

The position is updated automatically by the ships navigational equipment or it may have been keyed in manually, see PROGRAMMING POSITION.
Automatic updated position information is 'frozen' at the moment the Distress button is pressed and may be corrected manually by selecting >EDIT<.

Nature of Distress

Selectable Options:
- Fire, explosion
- Flooding
- Collision
- Grounding
- Danger of capsizing
- Sinking
- Disabled and adrift
- Undesignated distress
- Abandoning ship

Type of Subsequent Distress Communication

Selectable Options:
- USB telephony
- AM telephony
- FEC telex

EDITING A DISTRESS ALERT

1. Press and release Distress.

2. Accept the **Position** if ok.

   Press Enter.

DISTRESS
Position: (55˚59'N 133˚22'W at 1229 UTC)

>POSITION OK< EDIT UNKNOWN

3. Select the **Nature of Distress** using the ◁ ▷ keys.

   Press Enter.

DISTRESS
Position: 55˚59'N 133˚22'W at 1229 UTC
<Undesignated distress> USB telephony
- - Change by [<] [>] or press [Enter] - -

4. Select the **Type of Subsequent Distress Communication** using the ◁ ▷ keys.

   Press Enter.

DISTRESS
Position: 55˚66'N 133˚22'W at 1229 UTC
Undesignated distress <USB telephony>
- - Change by [<] [>] or press [Enter] - -

5. To send on one DSC distress frequency select >SINGLE<.

   Press Enter.

DISTRESS
Position: 55˚59'N 133˚22'W at 1229 UTC
Undesignated distress USB telephony
DSC distress freq: ALL >SINGLE<

EDITING A DISTRESS ALERT, *INFO*

DSC Distress frequency

If >ALL< is selected, the distress alert will be sent on all six DSC Distress frequencies in turn.

Note:The Frequency is preset to 2187.5 kHz if watch receiver 1 is set to 'Distress watch MF' (DSC 9001).

If a single frequency is selected the Distress Alert will be sent on that frequency 5 times, in each transmission.

EDITING A DISTRESS ALERT Cont'd

6. Select a DSC Distress Frequency using the  keys.

   Press Enter.

DSC FREQUENCY SELECTION
<97 DISTRESS Tx: 8414.5 Rx: 8414.5 kHZ>

-- Change by [<] [>] or press [Enter] --

7. Press Distress for 6 seconds to transmit the Distress Alert immediately
   or
   press Main Menu to return to the Main Menu.

DISTRESS
Position: 55˚59'N 133˚22'W at 1229 UTC
Undesignated distress USB telephony
- Press [Distress] 6 sec to send message

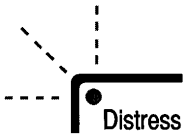
SENDING DISTRESS ALERT, *INFO*

If the transmitter is off the light in the distress lamp does not turn into steady light and the last line shows " -- Switch transmitter on --".

If the distress alert was transmitted on a single frequency, the transceiver is set automatically to telephony or telex mode as indicated in the call and to the appropriate distress frequency in the same band as the call.
After 3 minutes, if a single frequency was selected, the last line shows "-Press [Enter] to select DSC frequency-". Another DSC frequency may then be selected and the distress alert repeated on this frequency.
Automatic transmission if [Enter] is not pressed.

SENDING DISTRESS ALERT

1. Press Distress for 6 seconds.
   The Distress key lamp flashes quickly.
   The display shows the Distress Message.



DISTRESS
Position: 55˚59'N 133˚22'W at 1229 UTC
Undesignated distress USB telephony
- Keep pressing 5 sec to send message -

2. The display shows the remaining number of seconds

DISTRESS
Position: 55˚59'N 133˚22'W at 1229 UTC
Undesignated distress USB telephony
- Keep pressing 1 sec to send message -

DISTRESS
Position: 55˚59'N 133˚22'W at 1229 UTC
Undesignated distress USB telephony
---------- Release button ----------

When the time is out the Distress lamp will light steady.

3 Release Distress to start the transmission..

DISTRESS
Position: 55˚59'N 133˚22'W at 1229 UTC
Undesignated distress USB telephony
------- Tuning transmitter -------
---------- Transmitting ----------

4. The Distress Alert Transmission is automatically repeated at intervals of 3.5 - 4.5 minuttes.

DISTRESS
Position: 55˚59'N 133˚22'W at 1229 UTC
Undesignated distress USB telephony
- Awaiting acknowledgement -

5. The Distress Alert repetition continues until:
   the Distress Acknowledgement is received
   or Cancel is pressed.

RECEIVING DISTRESS ACKNOWLEDGEMENT, *INFO*

If SET UP is entered, the transceiver is set automatically to telephony or telex mode as indicated , and to the appropriate distress and safety frequency in the same band as the acknowledgement call.

END should be entered when communication is completed. The display returns to STATUS display or to RX-CALL if not all received calls have been read out and scanning is resumed on the transceiver if so selected.

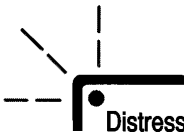
The Distress Acknowledgement is an All Ships Call and therefore received not only by the ship in distress.

RECEIVING DISTRESS ACKNOWLEDGEMENT

1. The Distress Acknowledgement is received. The Distress lamp flashes slowly.

   The display shows which station has acknowled the Distress Alert.

   Press Enter.



RX-CALL All ships from: 001234567
Category: Distress Distress ack

Received on 8414.5 kHz > MORE<

2. The display shows the Distress message acknowledged.

DISTRESS-ACKNOWLEDGEMENT TO:123456789
Position: 55˚66'N 133˚22'W at 1229 UTC
Undesignated distress USB telephony
>SET UP< QUIT

3. Enter SET UP and hook off the Transceiver handset to commence the Distress traffic by telephony.
   The Transceiver is automatically set to the Distress traffic frequency.

DISTRESS-ACKNOWLEDGEMENT TO:123456789
Position: 55˚66'N 133˚22'W at 1229 UTC
Undesignated distress USB telephony
>END<

4. When communication is completed, enter END.

SENDING DISTRESS RELAY CALL, INFO

To relay a received distress alert please refer to page 2-41

SENDING DISTRESS RELAY CALL

1. Press Call
   Select the format e.g. Selective call.
   Press Enter.

TX-CALL Saved call: Enter number 0-9

DIRECT-DIAL
>SELECTIVE< GROUP AREA ALL-SHIPS

2. Key in the Maritime Mobile Service Identity number of the coast station.
   Press Enter.

TX-CALL Selective to: (001234567)

- Enter maritime mobile service identity -

3. Select Distress Category.
   Press Enter.

TX-CALL Selective to: 001234567
Category: <Distress>

-- Change by [<] [>] or press [Enter] --

4. Select Distress Relay.
   Press Enter.

TX-CALL Selective to: 001234567
Category: Distress <Distress relay>

-- Change by [<] [>] or press [Enter] --

5. Key in the Maritime Mobile Service Identity of the ship in distress if known.
   Press Enter.

DISTRESS-RELAY Ship: (123456789)

- Enter maritime mobile service identity -

6. Key in the position.
   Press Enter.

DISTRESS-RELAY Ship:123456789
Position: 55˚59'N 133˚22'W at 1229 UTC

>POSITION-OK< EDIT

SENDING DISTRESS RELAY CALL, INFO

Nature of Distress

Selectable Options:
- Fire, explosion
- Flooding
- Collision
- Grounding
- Danger of capsizing
- Sinking
- Disabled and adrift
- Undesignated distress
- Abandoning ship

Type of Subsequent Distress Communication

Selectable Options:
- USB telephony
- AM telephony
- FEC telex

The distress relay call is automatically transmitted 5 times, total duration approx. 50 sec.

Following transmission of a selective call the receiver is set to the DSC RX frequency and awaits an acknowledgement within 5 minutes.

For All ships, Group or Area calls no acknowledgement is expected. In this case the transceiver is set automatically to telephony or telex mode as indicated in the call and to the appropriate distress and safety frequency in the same band as the call.

SENDING DISTRESS RELAY CALL Cont'd

7. Select the nature of distress.

   Press Enter.

```
DISTRESS-RELAY          Ship:123456789
Position:  55°59'N 133°22'W at 1229 UTC
<Undesignated distress>
  --  Change by [<]    [>] or press [Enter]  --
```

8. Select the type of subsequent distress communication.

   Press Enter.

```
DISTRESS-RELAY          Ship:123456789
Position:  55°59'N 133°22'W at 1229 UTC
Undesignated distress <USB telephony>
  --  Change by [<]    [>] or press [Enter]  --
```

9. Press Enter.

```
DISTRESS-RELAY          Ship:123456789
Position:  55°59'N 133°22'W at 1229 UTC
Undesignated distress   USB telephony
 - Press [Enter] to select DSC frequency -
```

10. Select one of the DSC Distress Frequencies (94-99).

    Press Enter.

```
DSC FREQUENCY SELECTION
<97 DISTRESS Tx:8414.5 Rx:8414.5 kHz>

 --  Change by [<]    [>] or press [Enter]  --
```

11. Press Call to transmit the message.

```
TX-CALL   Selective       to: 001234567
Category:  Distress       Distress relay

 -  Press [Call] to send on  8414.5 kHz  -
      -------    Tuning transmitter    -------
      -----    Checking for free channel    -----
      ----------    Transmitting    ----------
      ----  Awaiting ack on 8414.5 kHz  ----
```

If no acknowledgement has been received when the time expires, the display shows.

The call may be repeated on another frequency by selecting REPEAT.

```
No acknowledgement received

                    REPEAT  >QUIT<
```

RECEIVING DISTRESS RELAY ACKNOWLEDGEMENT, *INFO*

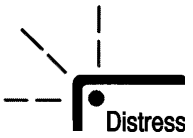
If SET UP is entered, the appropriate transmitter and receiver are set automatically to telephony or telex mode as indicated in the acknowledgement, and to the appropriate distress and safety frequency in the same band as the acknowledgement call. (If not configurated for automatic control of telex receiver and transmitter, the telephony receiver and transmitter are set to USB at the telephony distress frequency in the same band.)

If the handset is lifted off-hook while the acknowledgement is displayed, the telephony transmitter and receiver are set automatically to the telephony distress and safety frequency in the same band as the acknowledgement call.

END should be entered when communication is completed. The display returns to STATUS or to RX-CALL if not all received calls have been read out and scanning is resumed on the transceiver if so selected.

RECEIVING DISTRESS RELAY ACKNOWLEDGEMENT

1. The Distress Acknowledgement is received. The Distress lamp flashes slowly.



RX-ACKNOWLEDGEMENT from: 001234567
Category: Distress Distress relay

Received on 8414.5 kHz > MORE<

Press Enter.

2. The display shows the Distress relay message acknowledged.

DISTRESS-RELAY Ship:123456789
Position: 55˚59'N 133˚22'W at 1229 UTC
Undesignated distress USB telephony
>SET UP< QUIT

3. Enter SET UP or hook off the Transceiver handset to commence the Distress traffic by telephony.
The Transceiver is automatically set to the Distress traffic frequency.

DISTRESS-RELAY Ship:123456789
Position: 55˚59'N 133˚22'W at 1229 UTC
Undesignated distress USB telephony
>END<

4. When communication is completed, enter END.

SENDING A CALL, *INFO*

Note: Some formats may be disabled by configuration.

Categories
Selecable options:

All ships call	Area / Group / Selective
Distress	Distress
Urgency	Urgency
Safety	Safety
	Ship's business
	Routine

Type of subsequent communication / Telecommand.
Selecable options:

USB telephony
FEC telex
ARQ telex

For distresss category additionally:

Distress relay

Note: Telecommands may be added dependent on configuration.

SENDING A CALL

1. Press Call.

TX-CALL Saved call: 0-9

DIRECT-DIAL
>SELECTIVE< GROUP AREA ALL-SHIPS

2. Select the format. e.g. Selective call .

   Press Enter.

3. Key in the Maritime Mobile Service Identity of the station you want to call.

TX-CALL Selective to: (001234567)

- Enter maritime mobile service identity -

   Press Enter.

4. Select the Category.

TX-CALL Selective to: 001234567
Category: <Routine>

-- Change by [<] [>] or press [Enter] --

   Press Enter.

5. Select the type of subsequent communication/telecommand.

TX-CALL Selective to: 001234567
Category: Routine < USB telephony>

-- Change by [<] [>] or press [Enter] --

   Press Enter.

SENDING A CALL, *INFO*

Additional information
When calling a coast station select NONE.
When calling another ship select FERQUENCY and key-in the proposed working frequencies.

Note: Transmission is prevented until the channel is free. This feature may be overruled by pressing Call again.

The duration of an MF/HF DSC call is approx. 10 sec.Following transmission of selective or direct-dial calls the receiver is set to the DSC RX frequency and awaits an acknowledgement within 5 minutes for selective calls and 25 seconds for direct-dial calls.

All ships, group and area calls require no acknowledgement. When the transmission is completed the transceiver is set to the mode and frequencies indicated in the call by pressing ENTER or, for telephony calls, lifting the handset off hook within 1 minute.

END should be entered when communication is completed. For telephony calls just place the handset on-hook. The display returns to STATUS or to RX-CALL if not all received calls have been read out and scanning is resumed on the transceiver if so selected.

SENDING A CALL Cont'd

6. Select the Additional information.
e.g. "NONE"

Press [Enter].

Press [Enter].

```
TX-CALL   Selective      to: 001234567
 Category:  Routine        USB telephony
Additional information:
>NONE< POSITION FREQUENCY CHANNEL
```

```
TX-CALL   Selective      to:  001234567
 Category:  Routine        USB telephony

 - Press [Enter] to select DSC frequency -
```

7. Select the DSC Frequency using the [◁] [▷] keys or by entering a List number.

Press [Enter].

```
DSC FREQUENCY SELECTION
<08  NATIONAL Tx:  2159.5  Rx  1624.5>

--  Change by [<]    [>] or press [Enter]  --
```

8. Select SEND.

Press [Enter].

```
TX-CALL   Selective      to:  001234567
 Category:  Routine        USB telephony

DSC Tx: 2159.5 kHz   EDIT   SAVE   >SEND<
```

9. Press [Call] to send the Selective call.

```
TX-CALL   Selective      to:  001234567
 Category:  Routine        USB telephony

 -  Press [Call] to send on 2159.5  kHz  -

       -------     Tuning transmitter     -------
       -----     Checking for free channel     -----
       ----------     Transmitting     ----------
       ----   Awaiting ack on 1624.5 kHz   ----
```

If no acknowledgement has been received when the time expires, the display shows.

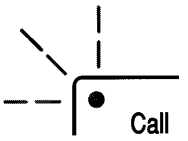
```
No acknowledgement received

                          REPEAT  >QUIT<
```

The call may be repeated on the same or another DSC frequency .Further call attempts to the same coast station should be delayed at least 15 minutes, if acknowledge is still not received.

RECEIVING ACKNOWLEDGEMENT, *INFO*

If SET UP is entered the mode and frequency of the transceiver is set as indicated in the call.
If the handset is lifted off-hook while an RX-call indicating telephony mode is displayed, the mode and frequency is set as indicated in the call.
END should be entered when communication is completed. For telephony calls just place the handset on hook. The display returns to STATUS or to RX-CALL if not all received calls have been read out and scanning is resumed on the transceiver if so selected.

RECEIVING ACKNOWLEDGEMENT



1. The Acknowledment is received.
   The Call lamp flashes.

RX-ACKNOWLEDGEMENT from: 001234567
Category: Routine USB telephony
Working freq. Tx: 2076.0 Rx: 1813.0 kHz
>SET UP< QUIT

2. Enter SET UP or hook off the Transceiver handset to commence the communication by telephony.
   The Transceiver is automatically set to the mode and frequencies indicated in the acknowledgement.

RX-ACKNOWLEDGEMENT from: 001234567
Category: Routine USB telephony
Working freq. Tx: 2076.0 Rx: 1813.0 kHz
>END<

3. When communication is completed, enter END.

SENDING A DIRECT-DIAL CALL, *INFO*

Direct-dial calls are used for direct telephone dialling of a land subscriber through an appropriate coast station providing automatic connection with the public switched telephone network.

Note: Not all coast stations provide this service.

To recall a saved call press the short-dial number (0-9).
To repeat a call press the call button.

Alternatively the MMSI list number (0-99) may be entered if the coast station has been programmed into the MMSI list. When Enter is pressed the programmed name of the coast station will be shown next to the 9-digit MMSI number.

Alternatively the telephone list number (0-99) may be entered if the number has been programmed into the telephone list. When Enter is pressed the programmed name of the coast station will be shown next to the telephone number.

The name of the coast station or the country may be used instead of NATIONAL, please refer to page 2-64 PROGRAMMING DSC-FREQUENCY LIST for further information.

SENDING A DIRECT-DIAL CALL

1. Press Call.

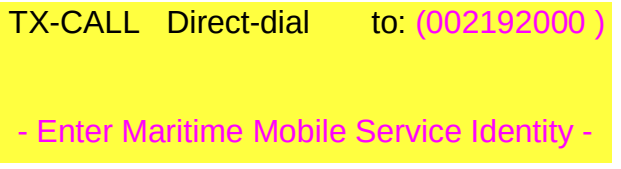
2. Select Direct-dial.

   To edit the call

   Press Enter.

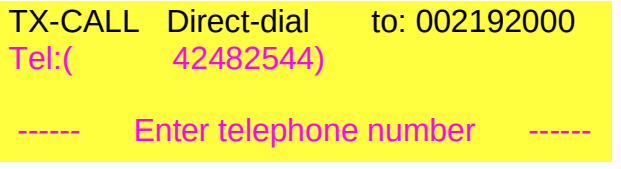
3. Key in the Maritime Mobile Service Identity of the coast station.

   Press Enter.

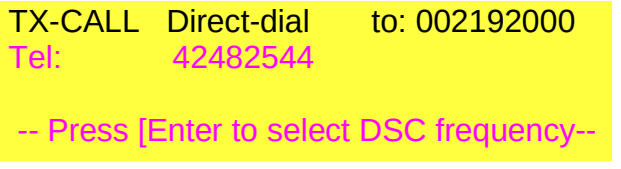


4. Key in the telephone no. of the land subscriber

   Press Enter.

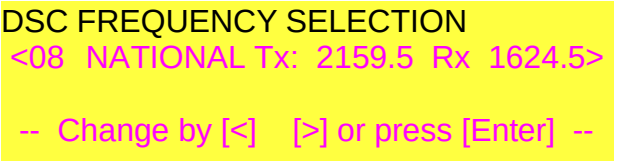


   Press Enter.



5. Select the DSC frequency of the coast station using the keys or by entering a List number.

   Press Enter.



SENDING A DIRECT-DIAL CALL, *INFO*

To save the call select SAVE and press the Enter button.

Acknowledgement from the coast station is normally received within 25 sec.

If the coast station cannot comply immediately with the call request due to the appropriate working frequencies being busy or for other reasons, this will be indicated in the acknowledgement.

The coast station evaluates the working channel quality during the DSC call. If quality is satisfactory the acknowledgement contains the same working frequencies. The coast station then starts dialling the subscriber.

If the working channel quality evaluation indicates that quality is not satisfactory the coast station may suggest other working frequencies. In this case the DSC calls are repeated on the new working frequencies.

If the working channel quality evaluation again indicates that quality is not satisfactory and no other channels are available the coast station sends an acknowledgement indicating -Cannot use Channel-.

SENDING A DIRECT-DIAL CALL Cont'd

5. Select SEND

Press Enter.

```
TX-CALL   Direct-dial      to: 002192000
Tel:          42482544

DSC tx: 2159.5 kHz     EDIT   SAVE   > SEND<
```

6. Press Call

```
TX-CALL   Direct-dial      to: 002192000
Tel:          42482544

--  Press [Call] to send on 2159.5  kHz  --
-----    Tuning transmitter    -----
-----    Checking for free channel    -----
----------    Transmitting    ----------
----  Awaiting ack on 1624.5 kHz  ----
```

When acknowledgement is received and the coast station can comply immediately the call is automatically repeated on the working frequency contained in the acknowledment.

```
TX-CALL   Direct-dial      to: 002192000
Tel:          42482544
Working freq.  Tx: 2076.0  Rx: 1813.0 kHz
-----    Setting-up transceiver    -----
---------    Tuning transmitter    ---------
----------    Transmitting    ----------
----  Awaiting ack on 1813.0 kHz  ----
```

```
RX-ACKNOWLEDGEMENT      from:  002192000
Tel:          42482544      USB telephony
Working freq.  Tx:  2076.0  Rx:  1813.0 kHz
Received on 1813.0 kHz                >END<
```

Lift the handset off hook and wait for the called subscriber to answer the telephone

When the call is completed or in case of no answer, place the handset on-hook. An 'End of call' DSC message is then sent to the coast station to stop call timing.

```
TX-CALL   Direct-dial      to: 002192000
Tel:          42482544      End of call

---------    Tuning transmitter    ---------
----------    Transmitting    ----------
----  Awaiting ack on 1813.0 kHz  ----
```

SENDING A DIRECT-DIAL CALL, *INFO*

SENDING A DIRECT-DIAL CALL Cont'd

The acknowledgement from the coast station may contain information on the chargeable duration of the call.

RX-ACKNOWLEDGEMENT from: 002192000
Tel: 42482544 End of call
Duration: 0 hours 6 min 35 sec
>QUIT<

RECEIVING DISTRESS ALERT, *INFO*

If SET UP is entered, the transceiver is set automatically to telephony or telex mode as indicated in the call, and to the appropriate distress and safety frequency in the same band as the call.

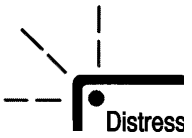
If received on an HF Distress frequency ACK is replaced by RELAY.
See page 2-39 for acknowledgeing a Distress Alert and page 2-41 for Relaying a Distress Alert.

END should be entered when communication is completed. The display returns to STATUS or to RX-CALL if not all received calls have been read out and scanning is resumed on the transceiver if so selected.

Note: A Distress Alert may be received on more frequencies.

RECEIVING DISTRESS ALERT

1. A Distress Alert is received.



RX-CALL Distress from: 123456789
Position: 55˚59'N 133˚22'W at 1229 UTC
Undesignated distress USB telephony
Received on 2187.5 kHz > SET UP< END

2. Enter SET UP. The transceiver is now automatically set to the Distress traffic frequency.

   Hook off the transceiver handset to acknowledge the receipt of the Distress alert by telephony.

RX-CALL Distress from: 123456789
Position: 55˚59'N 133˚22'W at 1229 UTC
Undesignated distress USB telephony
Received on 2187.5 kHz ACK > END <

3. When communication is completed, enter END.

ACKNOWLEDGING A DISTRESS ALERT, *INFO*

Ships receiving a DSC distress alert from another ship should defer the acknowledgement of the distress alert for a short interval, if the ship is within an area covered by one or more coast stations, in order to give the coast station time to acknowledge the DSC distress alert first.

Start of transmission is automatically delayed until 1 minute has passed since receipt of the Distress Alert. In this periode the displays shows ’ Call in progress ’.

END should be entered when communication is completed. The display returns to STATUS or to RX-CALL if not all received calls have been read out and scanning is resumed on the transceiver if so selected.

ACKNOWLEDGEING A DISTRESS ALERT

1. A distress alert is received on 2187.5 kHz and SET UP is selected

2. Select ACK.

   Press Enter

RX-CALL Distress from: 123456789
Position: 55˚59'N 133˚22'W at 1229 UTC
Undesignated distress USB telephony
Received on 2187.5 kHz >ACK< END

3. Select Continue.

   Press Enter

DSC distress acknowledgements are normally made by coast stations only.

>CONTINUE< RETURN

4. Press Call to transmit the Distress Acknowledgement.

DISTRESS-ACKNOWLEDGEMENT TO:987654321
Position: 55˚59'N 133˚22'W at 1229 UTC
Undesignated distress USB telephony
- Press [Call] to send on 2187.5 kHz -
------- Call in progress -------
------- Tuning transmitter -------
----- Checking for free channel -----
---------- Transmitting ----------

5. When communication is completed, enter END.

DISTRESS-ACKNOWLEDGEMENT TO:987654321
Position: 55˚59'N 133˚22'W at 1229 UTC
Undesignated distress USB telephony
> END <

RELAYING A RECEIVED DISTRESS ALERT, *INFO*

The distress relay call is automatically transmitted 5 times.

Regarding receiving distress relay acknowledgement, please refer to page 2-23

RELAYING A RECEIVED DISTRESS ALERT

1. A Distress Alert is received on an HF frequency and SET UP is selected. Select RELAY.

   Press Enter.

RX-CALL: Distress from:123456789
Position: 55˚59'N 133˚22'W at 1229 UTC
Undesignated distress USB telephony
Received on 8414.5 kHz RELAY >END<

2. Key in the Maritime Mobile Service Identity number of the coast station.

   Press Enter.

TX-CALL Selective to: (001234567)

- Enter maritime mobile service identity -

3. The Distress message is displayed.

   Press Enter.

DISTRESS-RELAY Ship:123456789
Position: 55˚59'N 133˚22'W at 1229 UTC
Undesignated distress USB telephony
- Press [Enter] to select DSC frequency -

4. Select the DSC distress frequency using the ◁ ▷ keys.

   Press Enter.

DSC FREQUENCY SELECTION
<97 DISTRESS Tx:8414.5 Rx:8414.5 kHz>

-- Change by [<] [>] or press [Enter] --

5. Press Call to transmit the message.

TX-CALL Selective to: 001234567
Category: Distress Distress relay

- Press [Call] to send on 8414.5 kHz -
------- Tuning transmitter -------
----- Checking for free channel -----
---------- Transmitting ----------
---- Awaiting ack on 8414.5 kHz ----

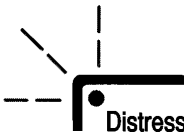
RECEIVING DISTRESS RELAY, *INFO*

If SET UP is entered, the transceiver is set automatically to telephony or telex mode as indicated in the call, and to the appropriate distress and safety frequency in the same band as the call.

END should be entered when communication is completed. The display returns to STATUS or to RX-CALL if not all received calls have been read out and scanning is resumed on the transceiver if so selected.

RECEIVING DISTRESS RELAY

1. A Distress Relay is received.



RX-CALL All ships from: 001234567
Category: Distress Distress relay

Received on 8414.5 kHz >MORE<

Press Enter

2. Enter SET UP. The transceiver is now automatically set to the Distress traffic frequency.

DISTRESS-RELAY Ship:123456789
Position: 55˚59'N 133˚22'W at 1229 UTC
Undesignated distress USB telephony
>SET UP< QUIT

Hook off the transceiver handset to acknowledge the receipt of the call by telephony.

DISTRESS-RELAY Ship:123456789
Position: 55˚59'N 133˚22'W at 1229 UTC
Undesignated distress USB telephony
> END<

3. When communication is completed, enter END.

RECEIVING A CALL, *INFO*

For calls requiring acknowledgement, please refer to page 2-47.

An incoming call will be displayed immediately if the equipment is in the MAIN-MENU or STATUS states. From other states the display returns to the last received RX-CALL instead of STATUS display if a call has been received.
The visual and audible indicators will signal that a call has been received. The visual indicator remains activated until the call has been read out.

If the call does not contain mode information ACCEPT is omitted.

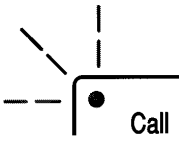
If SET UP is entered the mode and frequency of the transceiver is set as indicated in the call.

END should be entered when communication is completed. The display returns to STATUS or to RX-CALL if not all received calls have been read out and scanning is resumed on the transceiver if so selected.

All-ships, Group and Area calls, not having Distress or Urgency catagory, are considered obsolete when 5 minutes have passed since the reception of the call. The call is then treated as 'read-out'.

RECEIVING A CALL

1. A Call is received.



RX-CALL All ships to: 001234567
Category: Safety USB telephony
Working freq. TX: -----.- RX: 1734.0
Received on 2187.5 kHz >SET UP< QUIT

2. Enter SET UP.
   The transceiver in now automatically set to the mode and frequencies indicated in the call.

RX-CALL All ships to: 001234567
Category: Safety USB telephony
Working freq. TX: -----.- RX: 1734.0
Received on 2187.5 kHz > END<

3. When communication is completed, enter END.

All incomming calls are stored. The store has capacity for storing 20 different Distress calls and 20 different other calls. The oldest call in the group in question is deleted when the capacity is exceeded.

To see the content of the store,

RX-CALLS 1229 UTC 1 JUL 1992
Distress call from: 123456789
Received on 2187.5 kHz
- Change by [<] [>] or [Enter] to view --

press Main Menu **>RX-CALLS<** Enter


selects next or previous call,

Enter displays the complete call.

SENDING AN ACKNOWLEDGEMENT, *INFO*

Selective calls and Direct-dial calls require acknowledgement.

If the call contains Polling, Ship position, or legal mode and Frequency information, transmission of acknowledgement may be initiated by just pressing [Call]. Steps 2 to 5 are then automatically performed.
If the call is a telephony call the same is obtained by just lifting the handset off hook.

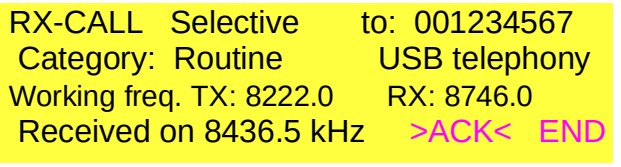
When transmission is completed and if the acknowledgement contains mode information, the transceiver is set to the mode and frequencies indicated in the acknowledgement call by pressing [Enter] or, for telephony calls, lifting the handset off-hook within one minute..

END should be entered when communication is completed. For telephony calls just place the handset on hook. The display returns to STATUS or to RX-CALL if not all received calls have been read out and scanning is resumed on the transceiver if so selected.

Note: If the call is not acknowledged within 4.5 minutes ACK is replaced by >TX-CALL<. If this is entered the information in the received call is transfered to a TX-CALL.

SENDING AN ACKNOWLEDGEMENT

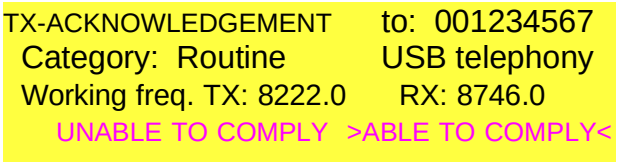
1. A CALL requiring acknowledgement is received.



2. Select ACK

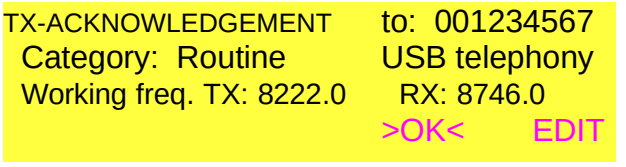
   Press Enter

3. Information is transferred from the received call.
   If able to answer the call, select ABLE TO COMPLY



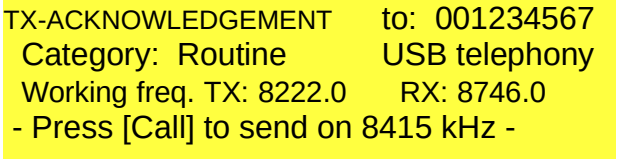
   Press Enter

4. If frequencies are ok, select OK



   Press Enter

5. Press Call to send the acknowledgement.



   or
   provided the call is a telephony call:
   Just hook off the Transceiver handset.
   Steps 2 to 5 are then automatically performed.

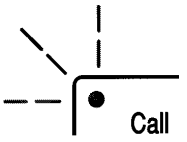
RECEIVING A DIRECT-DIAL CALL, *INFO*

Direct-dial calls are used for direct telephone dialling of the ship by a land subscriber through an appropriate coast station providing automatic connection with the public switched telephone network.

If incomming telephone calls cannot be answered for a period, the automatic acknowledgement status of the DSC 9000 should be changed to 'Unable to comply with telephony calls'. In this case the acknowledgement will contain the message 'Unable to comply', and the coast station will after receipt of that message transmit a busy signal to the calling subscriber.

The coast station evaluates the working channel quality during the DSC call. If quality is satisfactory the acknowledgement contains the same working frequencies. The coast station then starts dialling the subscriber.
If the working channel quality evaluation indicates that quality is not satisfactory the coast station may suggest other working frequencies. In this case the DSC calls are repeated on the new working frequencies.
If the working channel quality evaluation again indicates that quality is not satisfactory and no other channels are available the coast station sends an acknowledgement indicating -Cannot use Channel-.

RECEIVING A DIRECT-DIAL CALL



1. A call is received and an acknowledgement is initiated automatically.

```
TX-ACKNOWLEDGEMENT      to:  002192000
 Tel :  --                  USB telephony
 Working freq. TX: 2076.0    RX: 1813.0
     -------  Tuning transmitter  -------
    -----  Checking for free channel  -----
     -----------  Transmitting  -----------
                                > SET UP <
```

2. Lift handset off-hook
   or
   press Enter within one minute.
   A DSC call is then sent on the working frequency.

```
TX-CALL   Direct-dial    to:  002192000
 Tel :  --                  USB telephony
 Working freq. TX: 2076.0    RX: 1813.0
     -------  Setting-up transceiver  -------
     -------  Tuning transmitter  -------
     -----------  Transmitting  -----------
      ----- Awaiting ack on 1813.0 kHz  -----
```

The coast station evaluates channle quality. If satisfactory no acknowledgement is sent and communication with the land subscriber may begin. After 15 sec the bottom line changes to

```
                                > END <
```

When the call is completed place the handset on-hook. An 'End of call' DSC message is sent to the coast station to stop call timing.

```
TX-CALL   Direct-dial    to:  002192000
 Tel :  --                  USB telephony
 Working freq. TX: 2076.0    RX: 1813.0
     -------  Tuning transmitter  -------
    -----  Checking for free channel  -----
     -----------  Transmitting  -----------
      ----- Awaiting ack on 1813.0 kHz  -----
```

The acknowledgement from the coast station may contain information on the chargeable duration of the call.

```
RX-ACKNOWLEDGEMENT      to: 123456789
Tel: --                        End of call
Duration:  0 hours  6 min  35 sec
                                >QUIT<
```

STATUS DISPLAY

Main Menu **>STATUS<** Enter

The STATUS display comes up when power is switched on or when selected from the MAIN-MENU by selecting STATUS and pressing "Enter". The equipment automatically returns to STATUS display after 10 minutes unless an RX-CALL is displayed or if in Distress Transmit mode.

```
STATUS                          1107  UTC
 Distress watch:  2   4   6   8   12   16  MHz
 Calling watch:  08  09  11  17  20
          >WATCH ON/OFF< STATUS CHANGE
```

Status display example.

WATCH ON/OFF is omitted if DSC watch-reciver 2 is an additional DU 9006 configured as a DSC watch receiver.

The STATUS display shows the present status of:

- **Time**
- **Automatic acknowledgement**
- **DSC watch-receiver 1**
- **DSC watch-receiver 1's watch frequency or frequencies**
- **DSC watch-receiver 2**
- **DSC watch-receiver 2's watch frequency or frequencies**

Time (UTC) may be set in the programming menu.

Automatic acknowledgement status:

(Empty)
Aut ack: Unable

The Automatic ack display field is empty if automatic acknowledgement is set to able to comply. May be changed by selecting >STATUS CHANGE<.

DSC watch-receiver 1 status:

Distress watch
Calling watch
none

Watch-receiver 1 is the built-in receiver of DSC 9001/6. Its status is selelected in the configuration menu.

DSC watch-receiver 1 frequency status:

Distress watch MF	2187.5 kHz
Distress watch MF/HF	2, 4, 6, 8, 12, 16 MHz (DSC 9006 only,example)
Calling watch	08, 09, 10, 11, 17, 20 (DSC 9006 only,example)

Shows the frequency(ies) watched by watch-receiver 1.
Calling watch frequencies may be changed by selecting >STATUS CHANGE<.

DSC watch-receiver 2 status:

Distress watch
Calling watch
none

Watch-receiver 2 is either the receiver of the associated MF/HF transceiver (WATCH ON/OFF displayed) or an additional DU 9006 configured as a DSC watch receiver (continuously on). Its status is selelected in the configuration menu.

Note: The STATUS line is empty if 'None' is selected by configuration.

DSC watch-receiver 2 frequency status:

Distress watch MF	2187.5 kHz
Distress watch MF/HF	2, 4, 6, 8, 12, 16 MHz (example)
Calling watch	08, 09, 10, 11, 17, 20 (example)

Shows the frequency(ies) watched by watch-receiver 2.
Shows 'Off' if the receiver is switched off.
Calling watch frequencies may be changed by selecting >STATUS CHANGE<.
Watch on the associated MH/HF transceiver may be interrupted/restarted by selecting >WATCH ON/OFF<.

CHANGE STATUS

Main Menu **>STATUS<** Enter **>STATUS CHANGE<** Enter

The change status menu allows sellection of:

Automatic acknowledgement
DSC watch-receiver 1's watch frequencies
DSC watch-receiver 2's watch frequencies

Automatic acknowledgement may be set to
Able to comply
Unable to comply with telephony calls

For 'Unable to comply with telephony calls' the reason may be set to

- No reason given
- Congestion
- Station barred
- No operator
- Temporarily no operator
- Equipment disabled

When set to 'Unable to comply with telephony calls' automatic acknowledgement transmissions in response to calls containing a telephony telecommand will contain 'Unable to comply' and the additional message selected.

Automatic acknowledgement transmission takes place only if enabled by automatic ack programming. Automatic acknowledgement of direct-dial calls takes place if Direct-dial format is enabled by configuration. If Direct-dial format is enabled automatic ack of polling calls from coast stations is automatically enabled.

Automatic acknowledgement transmissions does not take place if the handset is off-hook or the equipment is not in STATUS, MAIN-MENU, or RX-CALL state.

Automatic acknowledgement transmissions does not take place if the call is received with error or has distress category.

DSC watch-receiver frequency may be changed as follows:

Distress watch	No change possible.
Calling watch	Frequencies may be selected from the DSC frequency list. The arrow keys will switch between the selected frequency numbers. The Enter key will display the frequencies selected and the arrow keys wil now move between the frequencies of the DSC frequency list or a list number may be entered. Pressing Enter will select the displayed frequency pair.

PROGRAMMING: AUTOMATIC ACKNOWLEDGEMENT

Main Menu **>PROGRAMMING<** Enter **>AUTOMATIC-ACK<** Enter

Polling calls

press Enter.

PROGRAMMING Automatic acknowledgement

>POLLING< POSITION OTHER

Select between: Off
All stations
Specific stations only

PROGRAMMING Aut ack of polling calls
< Specific stations only>

-- Change by [<] [>] or press [Enter] --

press Enter

If 'Specific stations only' is selected, enter the MMSI number of the stations.

PROGRAMMING Aut ack of polling calls
Specific stations only (002191000)
(_)
-- Enter MMSI; use # for any digit --

press Enter

Position calls

press Enter.

PROGRAMMING Automatic acknowledgement

POLLING >POSITION< OTHER

Select between: Off
All stations
Specific stations only

PROGRAMMING Aut ack of position calls
< Specific stations only>

-- Change by [<] [>] or press [Enter] --

press Enter

If 'Specific stations only' is selected, enter the MMSI number of the stations.

press Enter

PROGRAMMING Aut ack of position calls
Specific stations only (002191000)
(_)
-- Enter MMSI; use # for any digit --

Other calls

press Enter.

PROGRAMMING Automatic acknowledgement

POLLING POSITION > OTHER<

Select between: Off
All stations
Specific stations only

press Enter

PROGRAMMING Aut ack of other calls
< Specific stations only>

-- Change by [<] [>] or press [Enter] --

If 'Specific stations only' is selected, enter the MMSI number of the stations.

press Enter

PROGRAMMING Aut ack of other calls
Specific stations only (002191000)
(_)
-- Enter MMSI; use # for any digit --

PROGRAMMING: POSITION

Main Menu >PROGRAMMING< Enter >POSITION< Enter

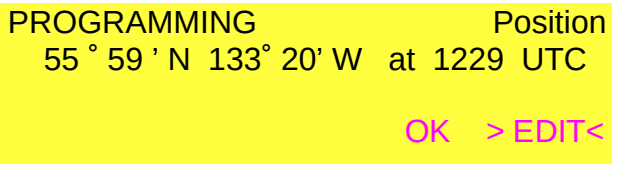
Automatic updating

If automatic updating from the NMEA input is used the actual position is displayed, Enter will return to the STATUS display
If not automatically updated, the DSC 9000 should be regularly updated manually in order to be able to receive Area calls correctly.

Manual updating

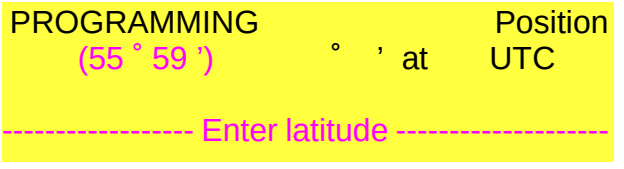
Select >EDIT< .

Press Enter.



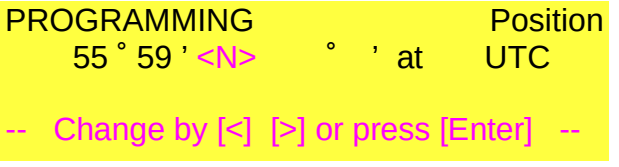
Enter the latitude.

Press Enter



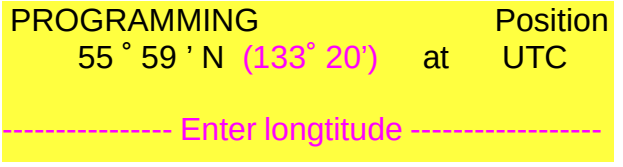
Select S or N using an arrow key.

Press Enter



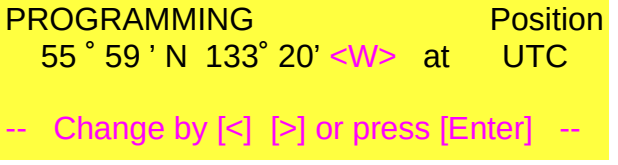
Enter the longtitude.

Press Enter



Select E or W using an arrow key.

Press Enter



Enter the time.

Press Enter

PROGRAMMING Position
55 ° 59 ' N 133° 20' W at (1229) UTC

--- Enter the time of the position ---

Press Enter to return to the STATUS display.

PROGRAMMING Position
55 ° 59 ' N 133° 20' W at 1229 UTC

>END<

If more than 12 hours have elapsed since the last updating, the time will be deleted.

PROGRAMMING: PRINTER

Printer Status

Main Menu **>PROGRAMMING<** Enter **>PRINTER<** Enter **>STATUS<** Enter

The **Printer Status** menu allows selection of:

Print all calls
Print all distress and safety calls
Print all RX calls
Print distress and safety RX calls
Print all RX calls with symbols
No print-out

The arrow key switches beween the above options and Enter selects the displayed option and returns to STATUS menu.

Print Lists

Main Menu **>PROGRAMMING<** Enter **>PRINTER<** Enter **>LISTS<** Enter

The **Print Lists** menu allows selection of:

Print short-dial list
Print DSC frequency list
Print Channel list
Print MMSI number list
Print telephone list
Print configuration settings

The arrow key switches beween the above options and Enter selects the displayed option, starts print-out and returns to STATUS menu.

PROGRAMMING: CLOCK SETTING

Main Menu >PROGRAMMING< Enter >SETTINGS< Enter >CLOCK< Enter

Enter the UTC time

Press Enter

PROGRAMMING Clock setting
(1229) UTC

---------- Enter UTC time ----------

Enter the day of month

Press Enter

PROGRAMMING Clock setting
1229 UTC (12)

---------- Enter day of month----------

Select the month using an arrow key

Press Enter

PROGRAMMING Clock setting
1229 UTC 12 <Jun>

-- Change by [<] [>] or press [Enter] --

Enter the year

Press Enter

PROGRAMMING Clock setting
1229 UTC 12 Jun (1992)

---------- Enter year ----------

Press Enter to return to the STATUS display.

PROGRAMMING Clock setting
1229 UTC 12 Jun 1992

>END<

PROGRAMMING: SOUND SETTING

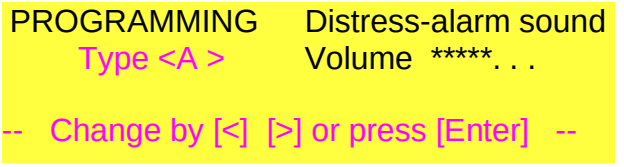
Main Menu >PROGRAMMING< Enter >SETTINGS< Enter >SOUND< Enter

Distress-alarm sound

>DISTRESS-ALARM< Enter

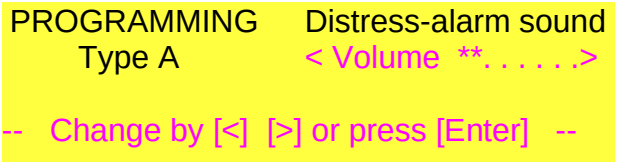
Select sound type A or B using an arrow key.

Press Enter

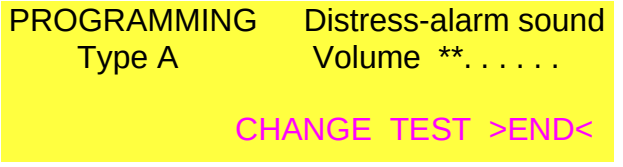


Select the volume level using the arrow keys.

Press Enter



Press Enter to return to the STATUS display.
>CHANGE< will return to the beginning of distress-alarm sound programming.
>TEST< will generate the selected sound in the loudspeaker.

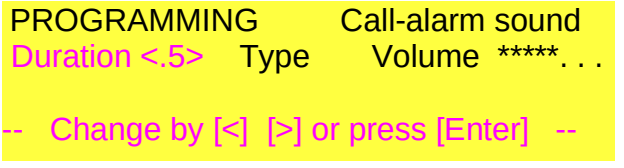


Call-alarm sound

>CALL-ALARM< Enter

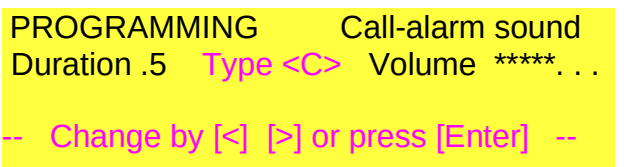
Select for how long the call-alarm shall last using the arrow keys.

Press Enter



Select sound type C or D using an arrow key.

Press Enter



Select the volume level using the arrow keys.

Press Enter

PROGRAMMING Call-alarm sound
Duration .5 Type C < Volume**. . . . . .>

Press Enter to return to the STATUS display.
>CHANGE< will return to the beginning of call-alarm sound programming.
>TEST< will generate the selected sound in the loudspeaker.

PROGRAMMING Call-alarm sound
Duration .5 Type C Volume **. . . . . .

CHANGE TEST >END<

Key-beep sound

>KEY-BEEP< Enter

Select the volume level using the arrow keys.

Press Enter to return to the STATUS display.

PROGRAMMING Key-beep sound
Illegal key volume < Volume**. . . . . .>

-- Change by [<] [>] or press [Enter] --

PROGRAMMING: LIGHT SETTING

Main Menu >PROGRAMMING< Enter >SETTINGS< Enter >LIGHT< Enter

Select the "Day" setting for the display backlight using the arrow keys.

Press Enter

Select the "Day" setting for the indicators using the arrow keys.

Press Enter

Select the "Night" setting for the display backlight using the arrow keys.

Press Enter

Select the "Night" setting for the indicators using the arrow keys.

Press Enter to return to the STATUS display.

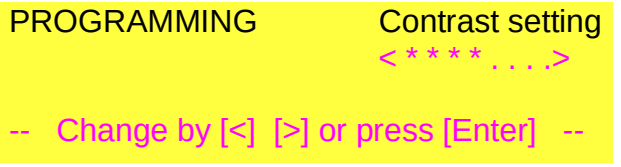
The light in the Distress and Call indicators cannot be reduced completely.

PROGRAMMING: CONTRAST SETTING

Main Menu >PROGRAMMING< Enter >SETTINGS< Enter >CONTRAST< Enter

Select the contrast setting using the arrow keys.

Press Enter to return to the STATUS display.



PROGRAMMING: DSC-FREQUENCY LIST

Main Menu **>PROGRAMMING<** Enter **>LISTS<** Enter **>DSC-FREQ<** Enter

The DSC-frequency list is pre-programmed but can be changed as described below.

Use the arrow key to change between the DSC-frequency numbers or enter the DSC-frequency number of the the frequency pair that you want to change and press Enter

PROGRAMMING DSC frequency list
<01 NATIONAL TX: 2156.0 RX: 1621.0 kHz>

-- Change by [<] [>] or press [Enter] --

Press Enter to edit the displayed frequency pair.

Enter a name for this frequency number.

Press Enter

PROGRAMMING DSC frequency list
01 (NATIONAL) TX: 2156.0 RX: 1621.0 kHz

---------- Enter name ----------

Enter the DSC transmit frequency.

Press Enter

PROGRAMMING DSC frequency list
01 NATIONAL (TX: 2156.0) RX: 1621.0 kHz

---- Enter own DSC transmit frequency ----

Enter the DSC receive frequency.

Press Enter

PROGRAMMING DSC frequency list
01 NATIONAL TX: 2156.0 (RX: 1621.0) kHz

---- Enter own DSC receive frequency ----

If all fields are empty or "0" the number is deleted from the list.
The distress and safety frequencies (94-99) cannot be edited.
The pre-programmed DSC frequency list is printed on the next page.

PRE-PROGRAMMED DSC FREQUENCIES

01	NATIONAL	Tx:	2156.0	Rx:	1621.0 kHz
02	NATIONAL		2156.5		1621.5
03	NATIONAL		2157.0		1622.0
04	NATIONAL		2157.5		1622.5
05	NATIONAL		2158.0		1623.0
06	NATIONAL		2158.5		1623.5
07	NATIONAL		2159.0		1624.0
08	NATIONAL		2159.5		1624.5
09	SHIP		2177.0		2177.0
10	INTER		2189.5		2177.0
11	INTER 1		4208.0		4219.5
12	INTER 2		4208.5		4220.0
13	INTER 3		4209.0		4220.5
14	INTER 1		6312.5		6331.0
15	INTER 2		6313.0		6331.5
16	INTER 3		6313.5		6332.0
17	INTER 1		8415.0		8436.5
18	INTER 2		8415.5		8437.0
19	INTER 3		8416.0		8437.5
20	INTER 1		12577.5		12657.0
21	INTER 2		12578.0		12657.5
22	INTER 3		12578.5		12658.0
23	INTER 1		16805.0		16903.0
24	INTER 2		16805.5		16903.5
25	INTER 3		16806.0		16904.0
26	INTER 1		18898.5		19703.5
27	INTER 2		18899.0		19704.0
28	INTER 3		18899.5		19704.5
29	INTER 1		22374.5		22444.0
30	INTER 2		22375.0		22444.5
31	INTER 3		22375.5		22445.0
32	INTER 1		25208.5		26121.0
33	INTER 2		25209.0		26121.5
34	INTER 3		25209.5		26122.0
35	INTER		458.5		455.5
94	DISTRESS		2187.5		2187.5
95	DISTRESS		4207.5		4207.5
96	DISTRESS		6312.0		6312.0
97	DISTRESS		8414.5		8414.5
98	DISTRESS		12577.0		12577.0
99	DISTRESS		16804.5		16804.5

PROGRAMMING: MMSI LIST

Main Menu >PROGRAMMING< Enter >LISTS< Enter >MMSI< Enter

Use the arrow key to change between the MMSI list numbers or enter the MMSI list number that you want to program and press Enter

```
PROGRAMMING                    MMSI list
<01   Name: LYNGBY    MMSI: 002191000>

--  Change by [<]  [>] or press [Enter]  --
```

Press Enter to edit the displayed MMSI list number.

Enter a name for the vessel or coast station.

Press Enter

```
PROGRAMMING                    MMSI list
01   Name: (LYNGBY)     MMSI: 002191000

----------------  Enter name  ----------------
```

Enter the MMSI number of the vessel or coast station.

Press Enter

```
PROGRAMMING                    MMSI list
01   Name: LYNGBY      MMSI: (002191000)

- Enter maritime mobile service identity -
```

If all fields are empty or "0" the number is deleted from the list.

Either the nine-digit MMSI number or the MMSI list number (0-99) may be entered when composing a TX-CALL.

When [Enter] is pressed the name and the nine-digit MMSI number is displayed.

When entering an unprogrammed list number the illegal-key sound is given and the number is deleted.

If, when receiving a call, the MMSI number of the calling station is found in the MMSI list, the name of the station will be displayed along with the nine-digit MMSI number.

PROGRAMMING: TELEPHONE LIST

Main Menu **>PROGRAMMING<** Enter **>LISTS<** Enter **>TELEPHONE<** Enter

Use the arrow key to change between the telephone list numbers or enter the telephone list number that you want to program and press Enter

```
PROGRAMMING          Telephone list
<01        4542482544          SKANTI>

--  Change by [<]  [>] or press [Enter]  --
```

Press Enter to edit the displayed telephone list number.

Enter the telephone number.

Press Enter

```
PROGRAMMING          Telephone list
01        (4542482544)          SKANTI

------  Enter telephone number  ------
```

Enter the name of the subscriber.

Press Enter

```
PROGRAMMING          Telephone list
01        4542482544          (     SKANTI)

----------------  Enter name  ----------------
```

If all fields are empty or "0" the number is deleted from the list.

Either the telephone number or the telephone list number (1-99) may be entered when composing a Direct-dial call.

When [Enter] is pressed the telephone number and the name is displayed.

When entering an unprogrammed list number the illegal-key sound is given and the number is deleted.

TEST: INFO

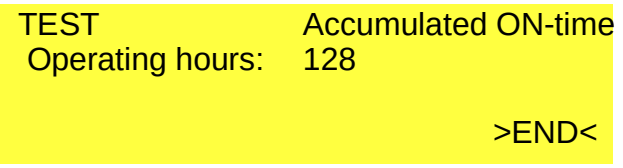
Main Menu **>TEST<** Enter **>INFO<** Enter

Accumulated ON-time

>ACCUMULATED-ON-TIME< Enter

The number of operating hours is displayed.

Press Enter to return to the STATUS display.



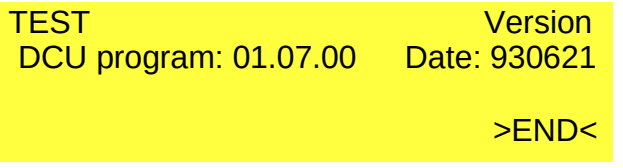
Version

>VERSION< Enter

> DCU < Enter

The program version and date for DCU is displayed.

Press Enter to return to the STATUS display.



The program version and date is displayed if selecting DU.
If an additional DU is connected the program version and date for both units are shown. DU 2 denotes the additional unit.

TEST: SELF-TEST

Main Menu >TEST< Enter >SELF-TEST< Enter

The test starts immediately and will continue until all test are completed and found ok.

Press Enter to end the test and return to status display.

```
TEST                    Automatic Self-test
Completed               19 steps ok
                        0 bypassed
                        0 failed        >END<
```

If a test fails the self-test will stop and display: test step no.
name of the failing test
error code

```
TEST                    Automatic Self-test
03  Synthesizer test:                Failed

Error code: 0301        >CONTINUE< END
```

Press Enter to continue.

If any the self test will stop on the next failure.

Press Enter to continue.

```
TEST                    Automatic Self-test
04  Synthesizer test:                Failed

Error code: 0411        >CONTINUE< END
```

When all test are completed a test status is displayed.

Press Enter to end the test and return to status display.

```
TEST                    Automatic Self-test
Completed               19 steps ok
                        0 bypassed
                        2 failed        >END<
```

The error code consists of step number (2 digits), indication of previous faults (1 digit: 0=no, 1=yes) and failure type (1 digit).

If an additional DU is connected a selftest on that is included in the sequence. The display will indicate that DU 2 is tested.

TEST: RX-AUDIO

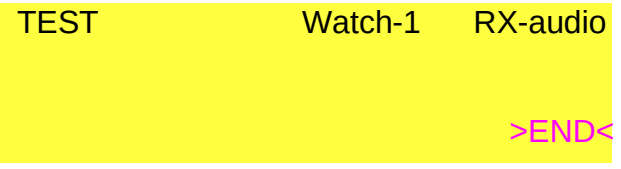
Main Menu **>TEST<** Enter **>RX-AUDIO<** Enter

Select which receiver to test using the arrow keys.

Press Enter to performe the audio test.

Adjust the volume level using the arrow keys.

Press Enter to end the test and return to the status display.



TEST: TX-TEST

[Main Menu] **>TEST<** [Enter] **>TX-TEST<** [Enter]

Action	Display
A message of warning is displayed. Press [Enter] to continue with the test.	TEST TX-test A test message is transmitted on a distress frequency in this test >CONTINUE< END
Enter the MMSI number of the coast station to receive the test call. Press [Enter] .	TX-CALL Selective to: (00123456) -Enter the maritime mobile service identity-
Press [Enter] to select the DSC frequency.	TX-CALL Selective to: (00123456) - Press [Enter] to select DSC frequency -
Select a DSC distress frequency using the arrow keys. Press [Enter].	DSC FREQUENCY SELECTION <94 DISTRESS Tx: 2187.5 Rx 2187.5> -- Change by [<] [>] or press [Enter] --
Press [Call] to transmit the test.	TX-CALL Selective to: 00123456 Category: Safety Test - Press [Call] to send on 2187.5 kHz - ------- Tuning transmitter ------- ----- Checking for free channel ----- ----------- Transmitting ----------- ---- Awaiting ack on 2187.5 kHz ----
Press [Enter] to return to status display.	RX-ACKNOLEDGEMENT from: 00123456 Category: Safety Test No additional information Received on 2187.5 kHz >END<

3. INSTALLATION Table of Contents

DESCRIPTION

General

Correct installation of the DSC 9000 is important for maximum performance and reliability. This chapter provides specific information about the installation of each unit, their interconnection and connection to other equipment.

Mounting the Units

DCU 9000 Control Unit

The DCU 9000 control unit is adaptable to a variety of mounting methods and should be placed with convenient operation in mind. It may be mounted directly on the front of the DU 9000 forming an integrated controller-receiver unit, or it may be installed separately with or without the mounting bracket.

DCU 9000 mounting on DU 9000

When mounted on the front of the DU 9000 (fig.1 at page 3-12), the two units must be interconnected by means of the ribbon cable included. Depending on wich way the DCU 9000 is turned relative to the DU 9000, the cable must be bent as shown in fig.3a at page 3-14 or fig.3b at page 3-14 respectively. To install the ribbon cable, remove the top cover of the DU 9000. Plug the cable into the corresponding socket on PCP 717 and place it between the two guiding tabs at the front top of the DU 9000. Refit the top cover. Plug the D-sub connector into the Net socket on the DCU 9000 as shown in fig.4 at page 3-15 and arrange the ribbon cable appropriately before fixing the DCU 9000 to the DU 9000.

All external connections to the DSC 9000 are made to the connectors at the rear of the DU 9000.

DCU 9000 with Mounting Bracket

The mounting bracket (fig. 5 at page 3-16) is used for table mounting of the DCU 9000, and may also be used for bulkhead and console mounting as shown in fig.6 at page 3-17 and fig.7 at page 3-18. Fig.7 shows how the mounting bracket may be installed behind a bulkhead or a console panel for low profile mounting. Fig.8a and 8b at page 3-19 and fig.9a and 9b at page 3-20 shows how flush mounting may be obtained and gives the dimensions for the necessary hardware.

External connections to the DCU 9000 are made to the terminal strips of the mounting bracket. For top side cable entry the Terminal Board may be dismantled and turned 180 degrees as illustrated in fig.10b at page 3-21.

DCU 9000 without Mounting Bracket

The DCU 9000 without mounting bracket may be bulkhead or console mounted as shown in fig.11 at page 3-22. Fig.12a and 12b at page 3-23 shows how flush mounting may be obtained and gives the dimensions for the necessary hardware.

External connections to the DCU 9000 are made to the connectors at the back of the unit as illustrated in fig.13 at page 3-24.

DU 9000

The DU 9000 DSC unit should be installed in a dry place near the associated radiotelephone and consideration should be given to accessibility for service. Airspace should be provided around the unit for adequate air circulation through the unit and the heat sink at the exterior of the unit. Fig 14 at page 3-25 shows the mounting possibilities and overall dimensions and shows the minimum distances to other objects ensuring good cooling.

External connections to the DU 9000 are made to the connectors at the back of the unit as illustrated in fig.15 at page 3-26.

Power Supply

The DSC 9000 operates at voltages between 10.8 and 41.6 VDC and may be powered from a 12V, 24V, or 32V battery or from an AC Power Supply Unit with a DC output voltage within the specified range.

When used with a Skanti TRP 7000 or TRP 8000 transceiver the AC Power Supply Unit of the transceiver is capable of supplying the additional power required by the DSC 9000.

The supply leads are connected to the supply terminal strip of the DU 9000. The supply terminal strip is adapted for screened power supply cable. Note that fuses must be provided in the supply leads to protect the cable. Table 2 at page 3-29 shows the necessary cable cross section and external fuse rating.

Earth connection of the equipment will not cause the battery to be earthed. Maximum permissible peak voltage between the battery terminals and the earth is 100V. The supply input is protected against polarity reversal.

Earth Connections

The earth terminal of each unit, where separated, should be connected to earth using 2.5mmSq wire, see fig.18 at page 3-30. The wire should be as short as possible and preferably be connected to a separate earth screw, which should not be shared by any other equipment. The earth lead should run as far away from the transmitter earth lead as possible.

Antenna

The antenna should be erected well in the clear and kept away as far as possible from electrical equipment in order to minimize noise. Length: 7-30m.

Electrical installation such as cable braiding 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 to 30 MHz.

The antenna feed-in should be coaxial cable, which should be as short as possible, especially in the case of short antennas. If a long cable is used an impedance matching transformer should be inserted in the antenna end of the feeder. For connector and cable specifications, see fig.19 at page 3-30.

Interconnection of Units

The units of the DSC 9000 are interconnected using a screened multiwire cable containing 5 twisted pairs of wire between the Net connectors of each unit.

Important: *Each unit contains a jumper which connects a 120 ohm resistor between terminals 2 and 3 of the net connectors, providing the necessary termination impedance for the serial data bus of the net. The jumper must be removed if the unit is not located at the end of the chain.*
*See fig. 20 at page 3-*31

The DU 9000-end of the cable is prepared by soldering a 9-pole D-Sub connector at the as described in fig.21 at page 3-32. Assure that the twisted wires are correctly paired.

Where the mounting bracket is used, the DCU 9000-end of the cable is connected to the terminal strip of the bracket, see fig.22 at page 3-33. Otherwise a 9-pole D-sub connector is used at this end as well.

Prepared 5x2x0.25mmSq screened cable with 9-pole D-sub connector at each end may be obtained from Skanti in 3m and 10m lengths:

3m: Part number 106 803 61

10m: Part number 106 803 51

Up to 5 control units may be connected to the DU 9000. The units must be chain connected.

Table 1 below shows the maximum permissible cable lengths for different numbers of control units, using the cable type specified in fig.21 at page 3-32.

Number of Control Units	Maximum cable length
1	180m
2	100m
3	75m
4	58m
5	47m

Table 1

Where control units are distributed along the line, their relative contribution to the cable load may be calculated by dividing each length of cable by the maximum length specified for the number of control units sharing that particular length of cable. The sum of all relative contributions must not exceed 1.

Example:

One control unit located 20m from the DU 9000

One control unit located 140m from the first DCU 9000

$$\frac{20}{100} + \frac{140}{180} = 0.2 + 0.78 = 0.98$$

which is less than 1 and thus acceptable.

One of the control units may be given priority, see the *Installation Configuration* section at page 3-48.

Connection of MF/HF Transceiver

The MF/HF transceiver is connected to the 25 pole D-sub connector marked **Com** on the DU 9000. See table 5 at page 3-37 for pin assignments and fig 24 at page 3-36 for connector and cable specifications.

The installation wiring diagram on page 3-45 details the connections for Skanti transceivers TRP 7000 and TRP 8000.

Note: *Telex filter is necessary in TRP 7000/8000*

The DSC 9000 is factory configurated for control of frequency and mode for automatic set-up of the radio equipment for DSC traffic and automatic change-over to working frequencies and mode as indicated in DSC calls. If not used for Radiotelex the receiver in the TRP 7000 or TRP 8000 may be utilized for scanning of up to 6 DSC calling channels while the built-in receiver of the DSC 9000 simultaneously maintains continuous watch.

Note: *For automatic mode set-up and external control of scanning receiver the program version of TRP 7000 or TRP 8000 must be compatible.*

To enhance the automatic control facilities a handset hook signal must be fed to the DSC 9000.

For TRP 7000 the handset hook-switch is built-in.

For TRP 8000 with old handset type, an optional hook-switch must be installed below the handset holder, see fig.26 at page 3-40.

For TRP 8000 with new handset type with built-in hook-switch, connection is made via a Din-connector, inserted in the extra socket of the handset holder. See fig.27 at page 3-42 for pin assignments.

The handset hook signal is used for stop and start of scanning on the transceiver scanning receiver, for inhibiting automatic acknowledgement transmission while the transceiver is used for telephony and for initiating automatic set-up of working frequencies, etc.

The AF output level from the DSC 9000 for transmitter modulation is factory preset to 0 dBm which matches Skanti transceivers TRP 7000 and TRP 8000. Adjustment, where required, is possible over the range -10 dBm to +10 dBm by trimpot R8, located on PCB 717, see fig. 31 at page 3-47.

The AF input level to the DSC 9000 from the external receiver should be in the range -30 to +10 dBm. The TRP 7000 and TRP 8000 are factory preset to 0 dBm. The input impedance is factory set to 600 ohms. High impedance is selectable by removing jumper J1 on PCB 717, see fig. 31 at page 3-47.

See the *Installation Configuration* section at page 3-48 for change of Radio Interface configuration.

Connection of an Additional DU

A DU 9006 DSC Unit may be connected to the DSC 9000 as an additional DU if a second continuous watch receiver is needed.

The built-in watch receiver of the DSC 9000 is typically used for the mandatory continuous DSC watch-keeping on the distress and safety frequency/-ies. Reception of DSC calls for public correspondance in the MF/HF bands demands an additional receiver, keeping watch on the appropriate calling frequencies. The DSC 9000 allows the receiver of the associated TRP 7000 or TRP 8000 to be used as this second watch receiver, but in cases where this is not desired, either because the transceiver is used for automatic telex or because continuous DSC calling watch is required, a DU 9006 configured as watch receiver may be used. When connected, this will automatically take over the watch-receiver 2 function otherwise assigned to the transceiver.

The DU 9006 is configured by inserting a coded 25-pole D-sub plug in the **AUX** socket. The plug is coded by connecting pin 18 to pin 23 and pin 10 to pin 25.

For interconnection with the DSC 9000 the Net connectors are used, please refer to page 3-5 *Interconnection of Units*. The antenna signal may conveniently be taken off at the antenna output of the DSC 9000. Power consumption of the DU 9006 is 15 W except for max. one minute following switch-on during which period it is 50 W. The installation wiring on page 3-45 shows the necessary connections. No other connections should be made to the additional DU.

First time the combination is switched on with a new ID the display will flicker for approx. one minute while self-ID and group-IDs are transferred to the additional DU and stored in the local EEPROM.

Connection of Radiotelex Equipment

External radiotelex equipment is connected to the 25 pole D-sub connector marked **Aux** on the DU 9000. See table 6 at page 3-39 for pin assignments and fig.25 at page 3-38 for connector and cable specifications.

The radiotelex equipment is automatically switched to the transceiver, when this is not in use by the DSC equipment. The simplified diagram in fig 30 at page 3-44 illustrates the interconnections.

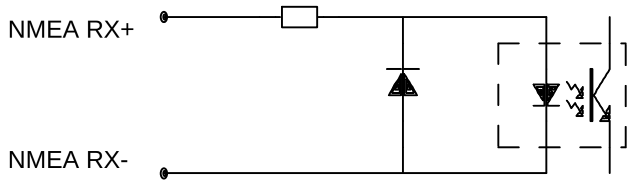
Connection of Navigation Equipment

Navigation equipment complying with the NMEA 0183 standard may be connected for automatic position updating. Connection is made either to the DU 9000 or to a DCU 9000 control unit but, only one navigation input can be used. The DSC 9000 automatically recognizes which input is used.

For connection to the DU 9000 use the 25 pole D-sub connector marked **Aux**. See table 6 at page 3-39 for pin assignments and fig.25 at page 3-38 for connector and cable specifications.

For connection to a DCU 9000 control unit, use the 15 pole D-sub connector marked **Aux**. See table 4 at page 3-35 for pin assignments and fig.23 at page 3-34 for connector and cable specifications. Where the mounting bracket is used, the cable is connected to the terminal strip of the bracket, see fig.22 at page 3-33.

The NMEA receive circuit consists of an optoisolator with a 3.3 kohms series resistor to insure current mode operation and a shunt diode to limit reverse bias as shown below. The circuit is isolated from earth.



The circuit operates with a minimum differential input voltage of 3 volts and takes less than 1 mA from the line at that voltage. The maximum voltage is 15 volts, compatible with RS-232 levels.

Interconnection between devices may be by means of two-conductor shielded twisted-pair wire. Multiple listeners may be connected to a single talker. The receivers are connected in parallel. The shield should be connected to the navigator chassis and should not be connected at any listener. However the shield should be continuous (unbroken) between all listeners.
Following sentences are recognized by the DSC 9000 for extraction of position information:

GGA:

```
                Differential reference station ID, 0000-1023
                            Age of Differential GPS data
                Units of geoidal separation, metres
                        Geoidal separation
        Units of antenna altitude, metres
Antenna altitude above/below mean sea-level
(geoid)
        Horizontal dilution of precision

$--GGA,hhmmss.ss,llll.ll,a,yyyyy.yy,a,x,xx,x.x,x.x,M,x.x,M,x.x,xxxx*hh
<CR><LF>
                                          Number of satellites in use
                                          GPS quality indicator
                                 Longitude,E/W
                         Latitude,N/S
                 UTC of position fix
```

```
GLL:
$--GLL,llll.ll,a,yyyyy.yy,a,hhmmss.ss,A*hh<CR><LF>
                                      └──── Status: A=Data valid
                                    └──── UTC of position fix
                           └──── Long itude, E/W
                └──── Latitude, N/S
GXP:
$--GXP,hhmmss.ss,llll.ll,a,yyyyy.yy,a,c--c,x*hh<CR><LF>
                                             └─ Satellite number
                                        └── Waypoint ID
                                    └──── Longitude,E/W
                           └──── Latitude,N/S
                └──── UTC of position fix
GDP:
$--GDP,hhmmss.ss,llll.ll,a,yyyyy.yy,a,c--c*hh<CR><LF>
                                        └── Waypoint ID
                                    └──── Longitude,E/W
                           └──── Latitude,N/S
                └──── UTC of position fix
GLP:
$--GLP,hhmmss.ss,llll.ll,a,yyyyy.yy,a,c--c*hh<CR><LF>
                                        └── Waypoint ID
                                    └──── Longitude,E/W
                           └──── Latitude,N/S
                └──── UTC of position fix
GOP:
$--GOP,hhmmss.ss,llll.ll,a,yyyyy.yy,a,c--c*hh<CR><LF>
                                        └── Waypoint ID
                                    └──── Longitude,E/W
                           └──── Latitude,N/S
                └──── UTC of position fix
*hh: Optional ckecksum delimiter and optional checksum field.
Not used by DSC 9000.
```

Connection of a Printer

A printer with serial interface may be connected to either the DU 9000 or a DCU 9000 control unit. Only one printer may be connected. The DSC 9000 must be configurated for the connection selected. See the *Installation Configuration* section at page 3-48.

The printer interface is opto-isolated with driver power delivered from the printer (most printers deliver a +5 to +15 V signal on one of the connector pins when operational).

For connection to the DU 9000 use the 25 pole D-sub connector marked **Com**. See table 5 at page 3-37 for pin assignments and fig.24 at page 3-36 for connector and cable specifications.

For connection to a DCU 9000 control unit, use the 15 pole D-sub connector marked **Aux**. See table 4 at page 3-35 for pin assignments and fig.23 at page 3-34 for connector and cable specifications. Where the mounting bracket is used, the cable is connected to the terminal strip of the bracket, see fig.22 at page 3-33.

Connection of a Distress Alarm Box

A distress alarm box consisting of a Distress button and an associated Distress lamp may be connected to the DCU 9000 control unit or to the DU 9000 DSC unit for remote initiation and indication of distress calls.

Fig.29 at page 3-43 shows the control box and a simplified diagram of the interconnections.

The Distress button is operated in exactly the same way as the Distress key on DCU 9000: To initiate a distress call press the push-button for 6 sec (until the distress lamp stops quick-flashing and shows steady light) and release.

The equipment will send the Distress call as previously prepared. If position is automatically updated the latest values at the time of activation is used including time information.

The Distress lamp flashes when a distress or urgency call has been received.

For connection to a DCU 9000 control unit use the 15 pole D-sub connector marked **Aux**. See table 4 at page 3-35 for pin assignments and fig.23 at page 3-34 for connector and cable specifications. Where the mounting bracket is used, the cable is connected to the terminal strip of the bracket, see fig.22 at page 3-33.

Alternatively, connection may be made to the DU 9000 using the 25 pole D-sub connector marked **Aux**. See table 6 at page 3-39 for pin assignments and fig.25 at page 3-38 for connector and cable specifications. Either *Alarm 1 Out* or *Alarm 2 Out* may be used, but the one selected must be configurated to follow the *'Distress Alarm + lamp'*. See the *Installation Configuration* section at page 3-48.

Connection of Remote Alarms

The *Alarm 1 Out* and *Alarm 2 Out* terminals of the DU 9000 Aux connector enables external lamps, buzzers, bells or other visual or audible indicators to be connected to the equipment. Each output may be configurated separately to be active when

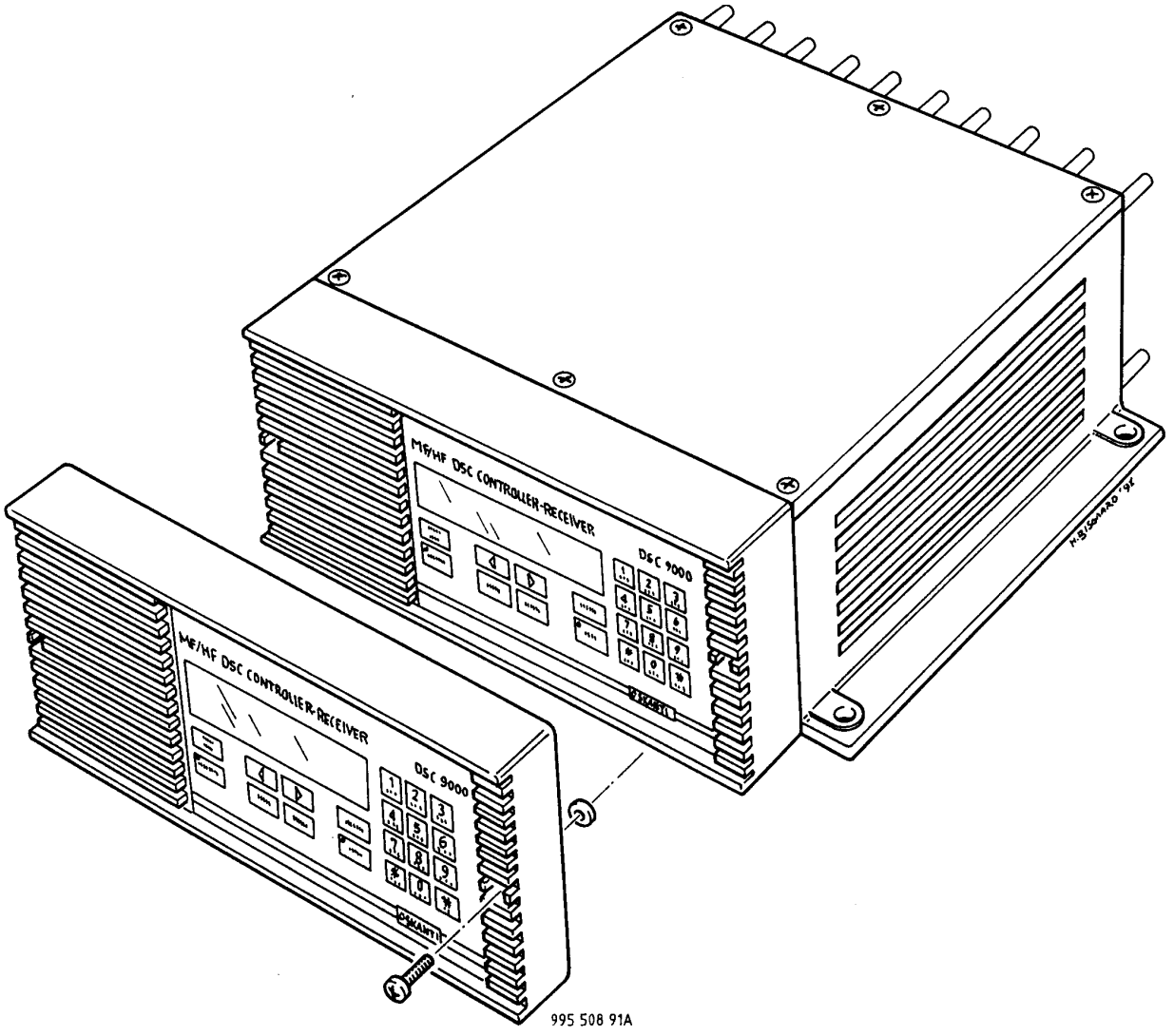
- the aural Distress alarm sounds, or
- the aural Call alarm sounds, or
- either alarm sounds *), or
- distress lamp is illuminated and distress alarm sounds

*) The on/off pattern resembles the alarm sound types, so it is possible to distinguish between distress alarm and call alarm.

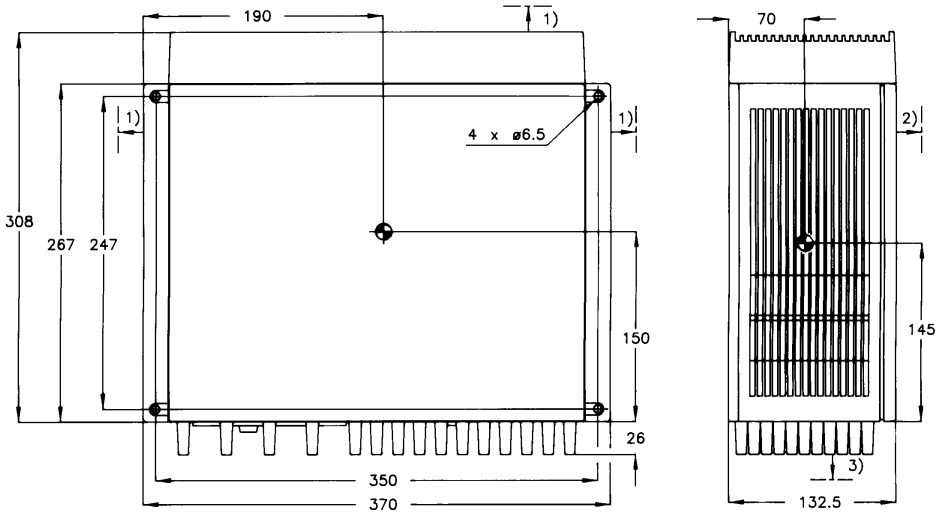
For connection to the DU 9000 use the 25 pole D-sub connector marked **Aux**. See table 6 at page 3-39 for pin assignments and fig.25 at page 3-38 for connector and cable specifications. See the *Installation Configuration* section at page 3-48 for setting-up the alarm outputs.

FIGURES AND TABLES

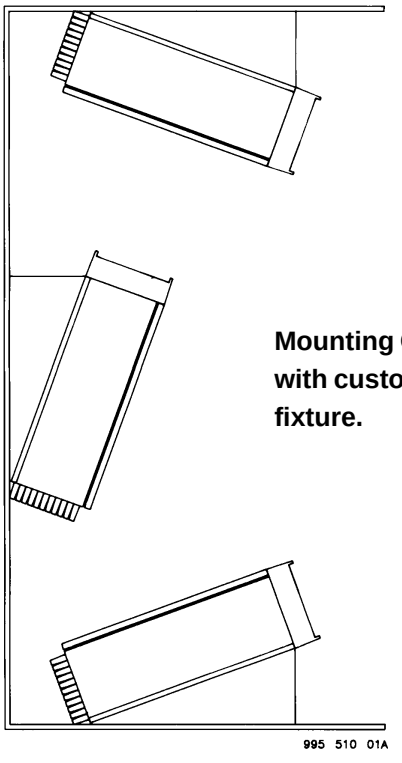
DCU 9000 MOUNTING ON DU 9000
Fig.1



DCU 9000 - DU 9000 OUTLINE
Fig.2



1) Space for air flow: min. 100
2) Space for service access: min. 500
3) Space for cable entry and air flow: min. 200

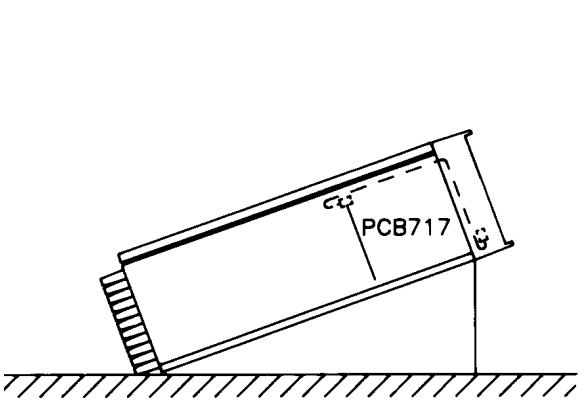


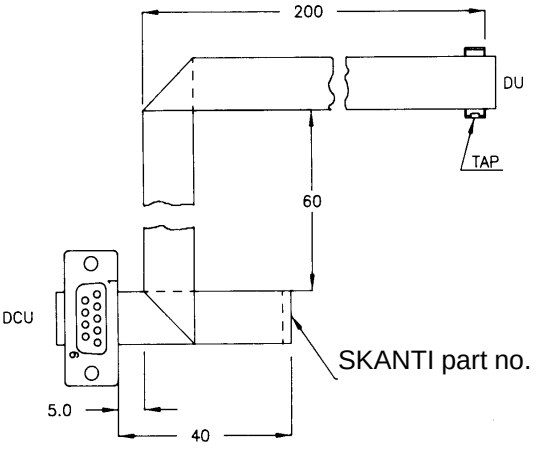
Mounting Options with customized fixture.

Dimensions are in mm
Tolerance: +/- 1 mm
Centre of Gravity
Weight: DSC 9001 8.6 Kg
Weight: DSC 9006 8.7 Kg

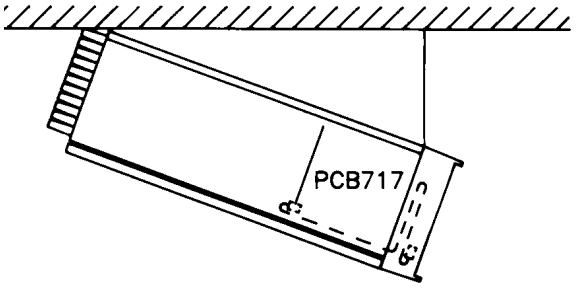
DCU 9000 - DU 9000 INTERCONNECTING RIBBON CABLE

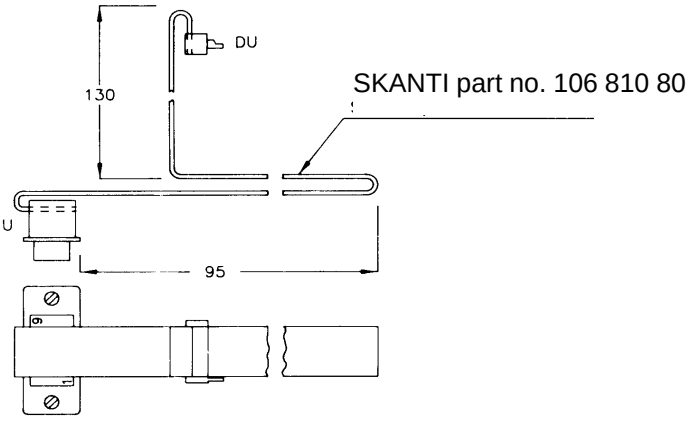
Folding the ribbon cable for table top mounting.
Fig.3a



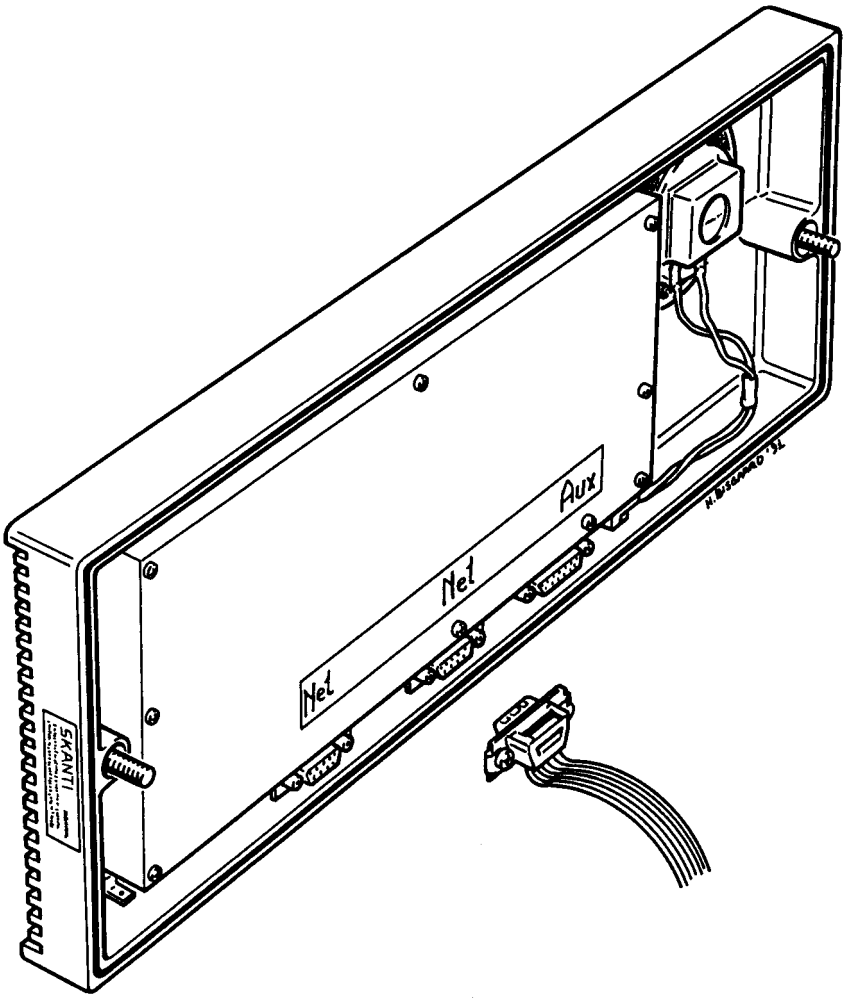


Folding the ribbon cable for bulkhead mounting.
Fig.3b



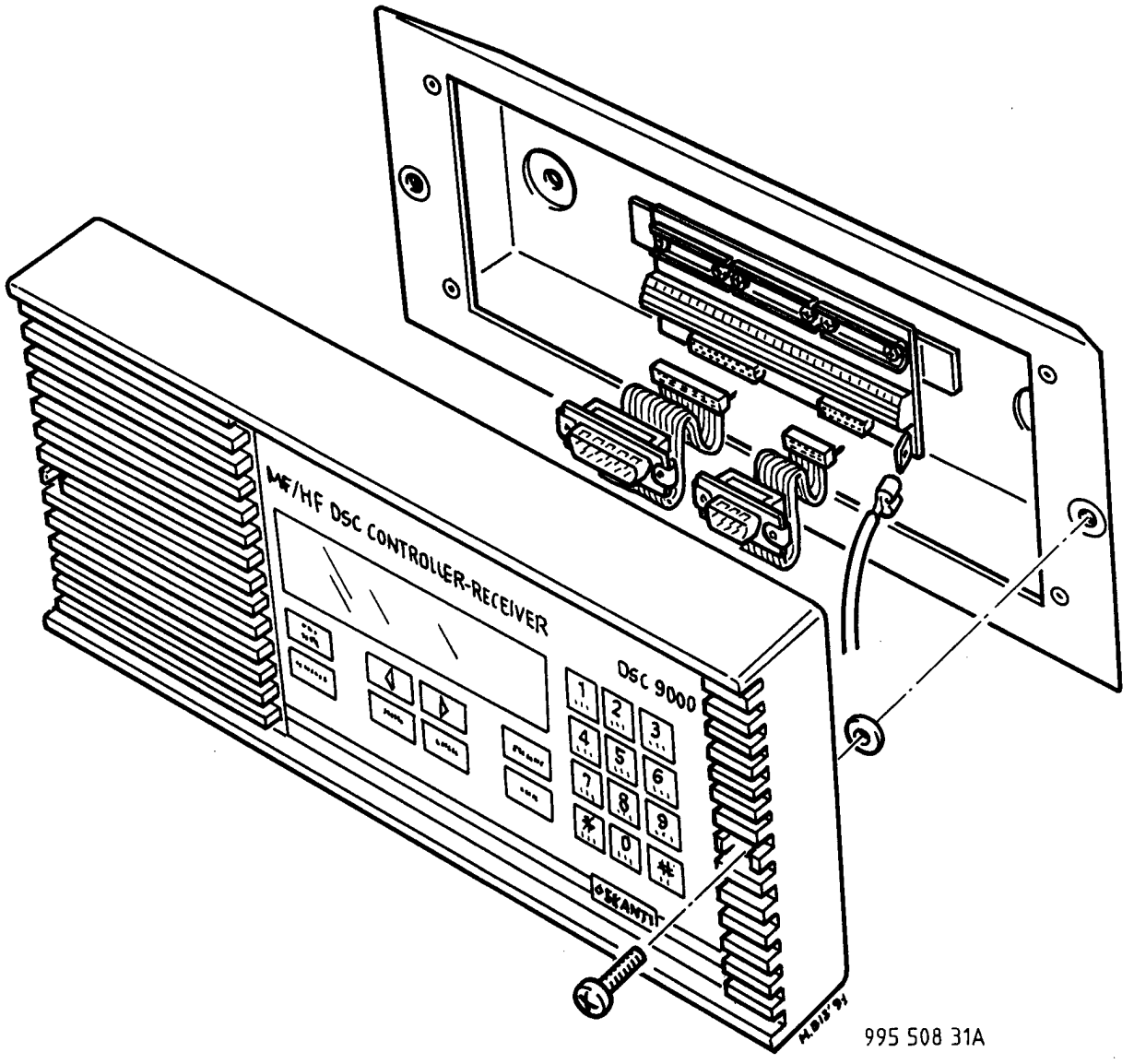


CABLE CONNECTION FOR DCU 9000 MOUNTING ON DU 9000
Fig.4

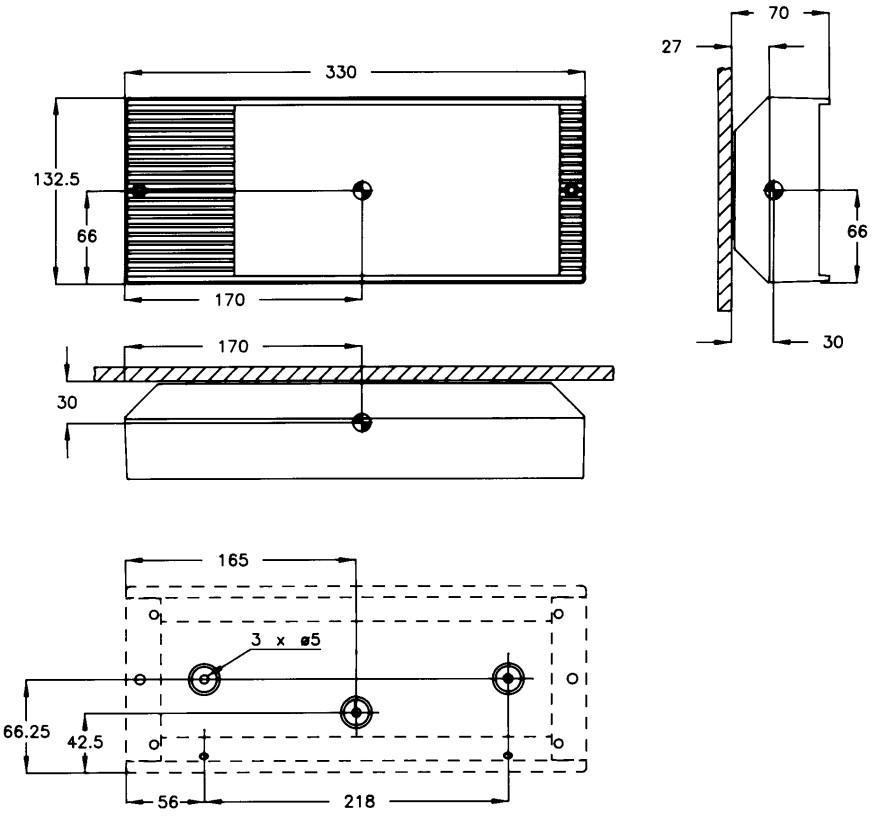


995 510 21

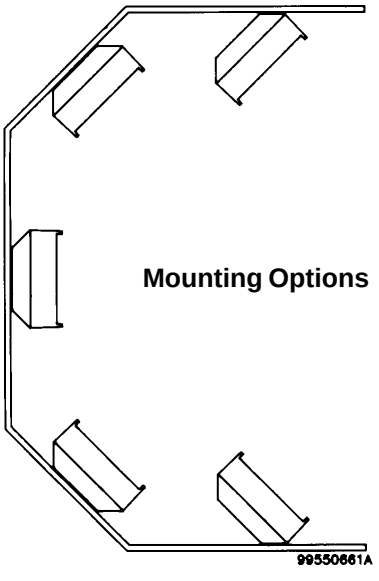
DCU 9000 WITH MOUNTING BRACKET
Fig.5



DCU 9000 INSTALLATION WITH MOUNTING BRACKET
Fig.6

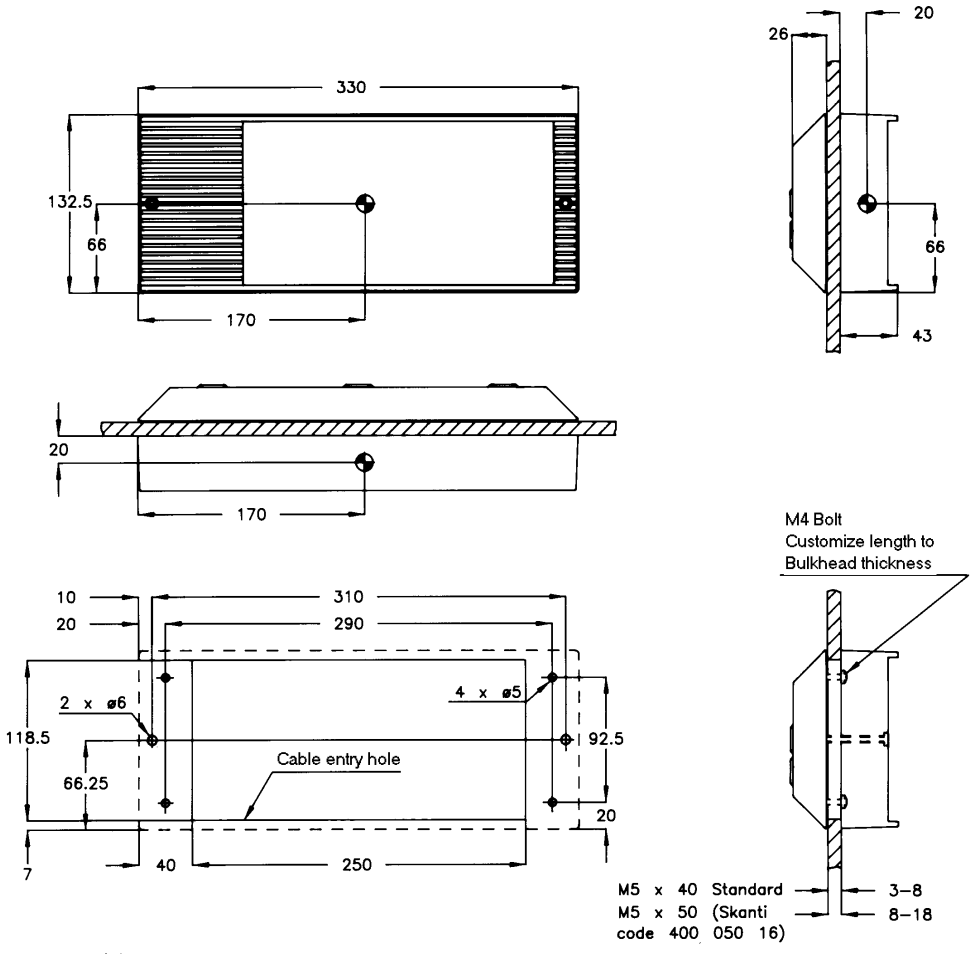


1) Space for cable entry min. 50

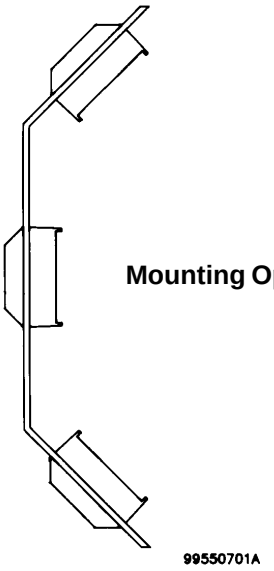


Dimensions are in mm
Tolerance: +/- 1 mm
Centre of Gravity
Weight: DCU 1.2 Kg
Weight: Mounting Bracket 0.7 Kg

DCU 9000 INSTALLATION WITH MOUNTING BRACKET
"LOW PROFILE MOUNTING" Fig.7



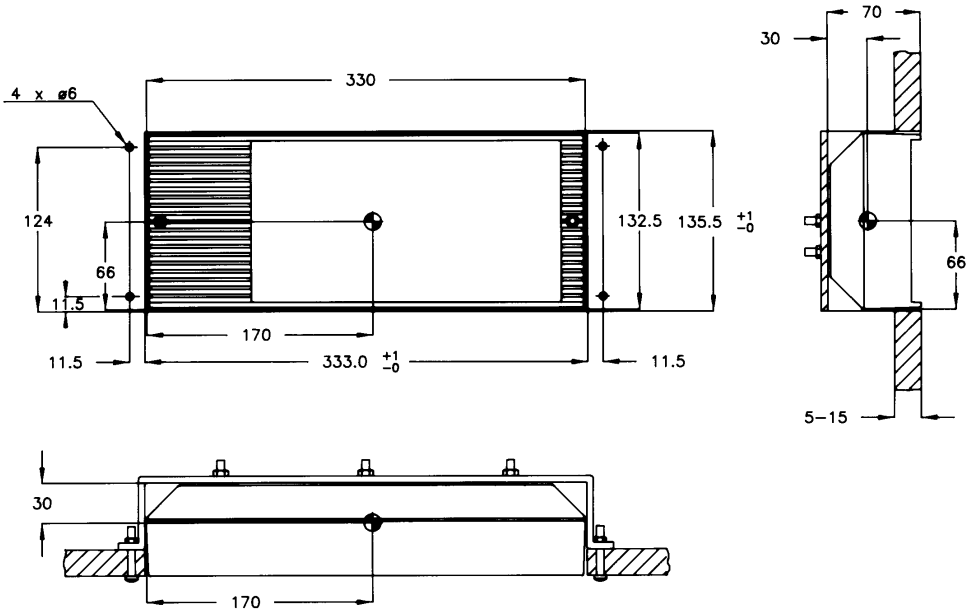
1) Space for cable entry min. 50



Mounting Options

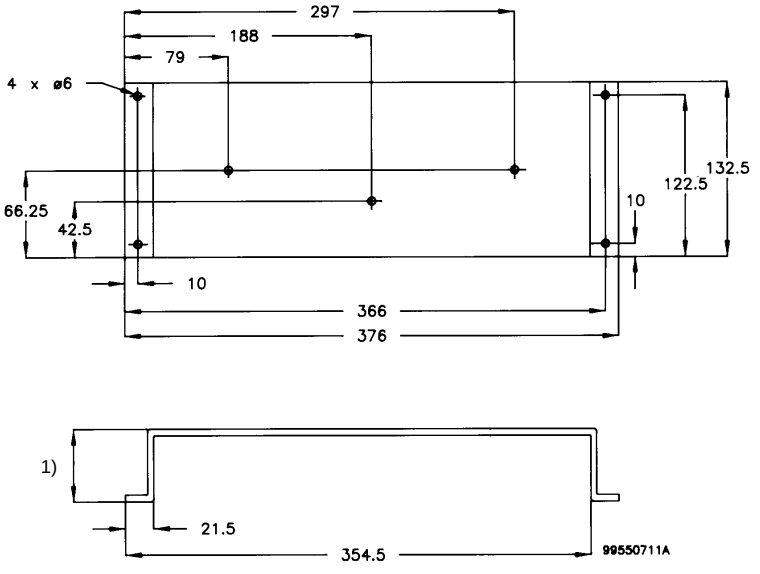
Dimensions are in mm
Tolerance: +/- 1 mm
Centre of Gravity
Weight: DCU 1.2 Kg
Weight: Mounting Bracket 0.7 Kg

DCU 9000 INSTALLATION WITH MOUNTING BRACKET
"FLUSH MOUNTING" Fig.8a



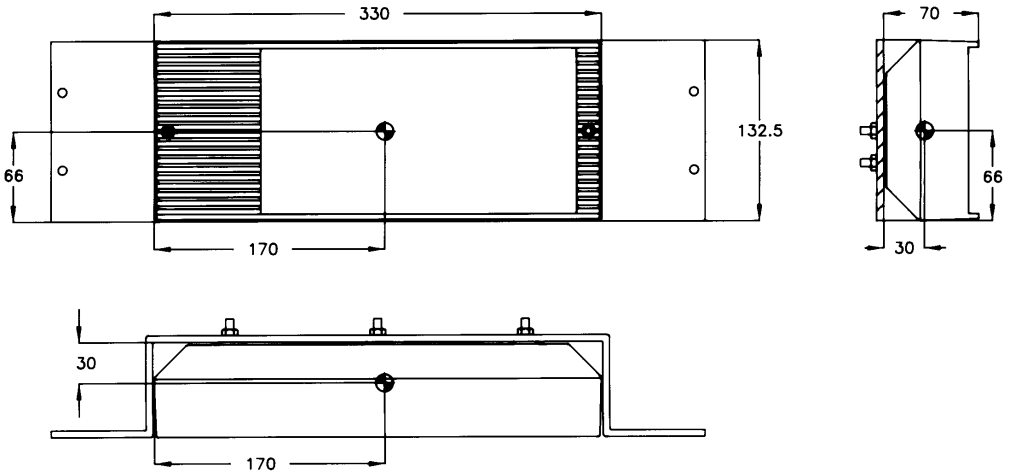
Dimensions are in mm Weight: DCU 1.2 Kg
Tolerance: +/- 1 mm Weight: Mounting Bracket 0.7 Kg
Centre of Gravity

Construction drawing for Fixture. Fig.8b



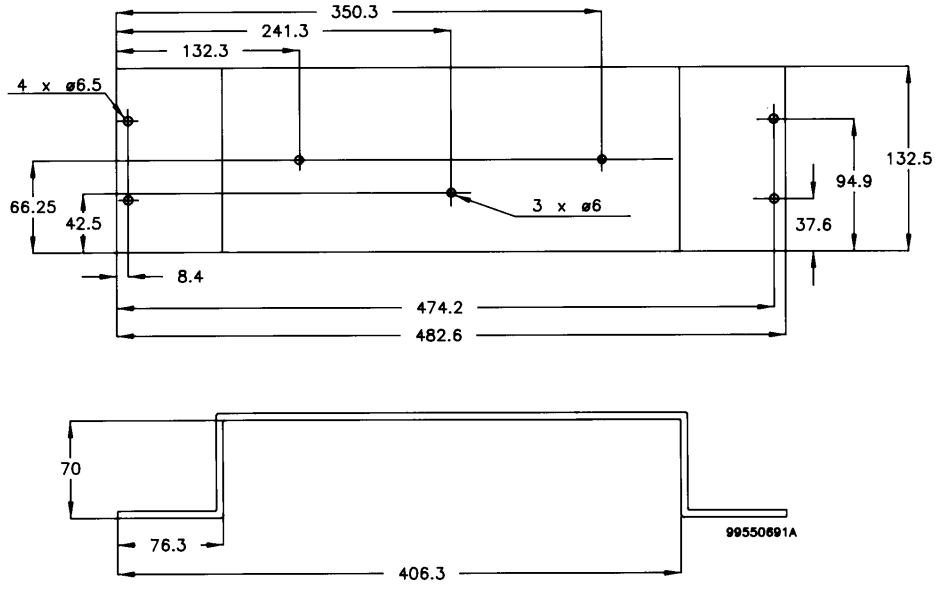
1) Customize to Bulkhead thickness.
Dimensions are in mm
Tolerance: +/- 0.2 mm

DCU 9000 INSTALLATION WITH MOUNTING BRACKET
19 INCH PANEL MOUNTING Fig.9a



Dimensions are in mm Weight: DCU 1.2 Kg
Tolerance: +/- 1 mm Weight: Mounting Bracket 0.7 Kg
Centre of Gravity

Construction drawing for Fixture. Fig.9b

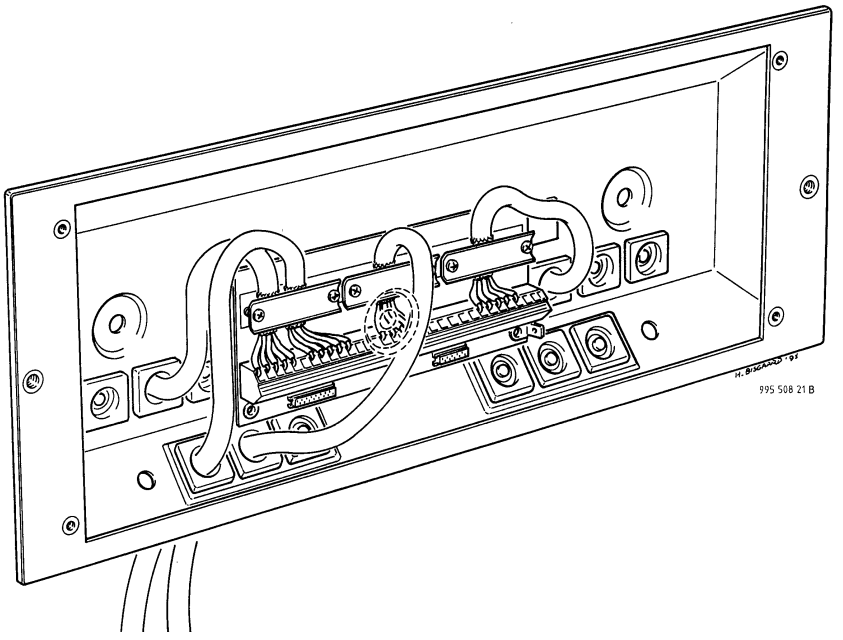


Dimensions are in mm
Tolerance: +/- 0.2 mm

TERMINAL BOARD MOUNTING OPTIONS

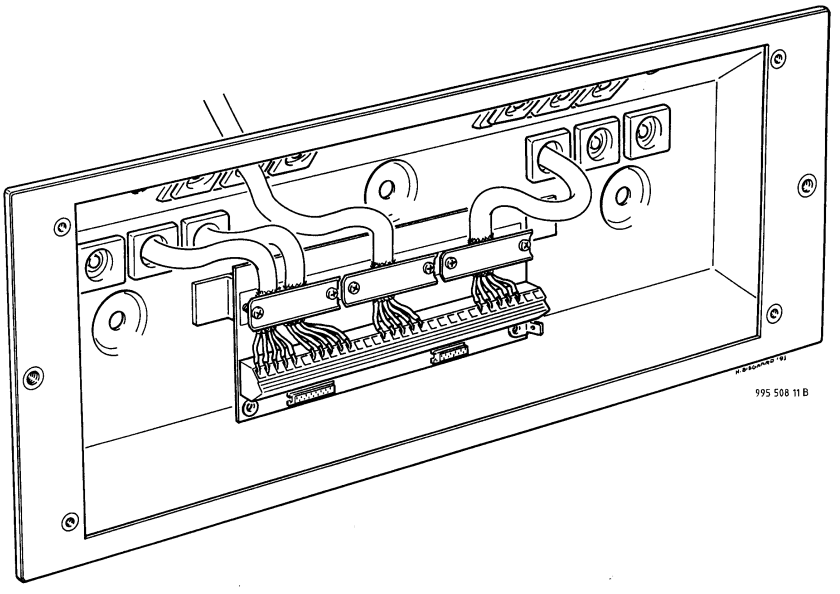
NORMAL MOUNTING OF TERMINAL BOARD

Fig.10a

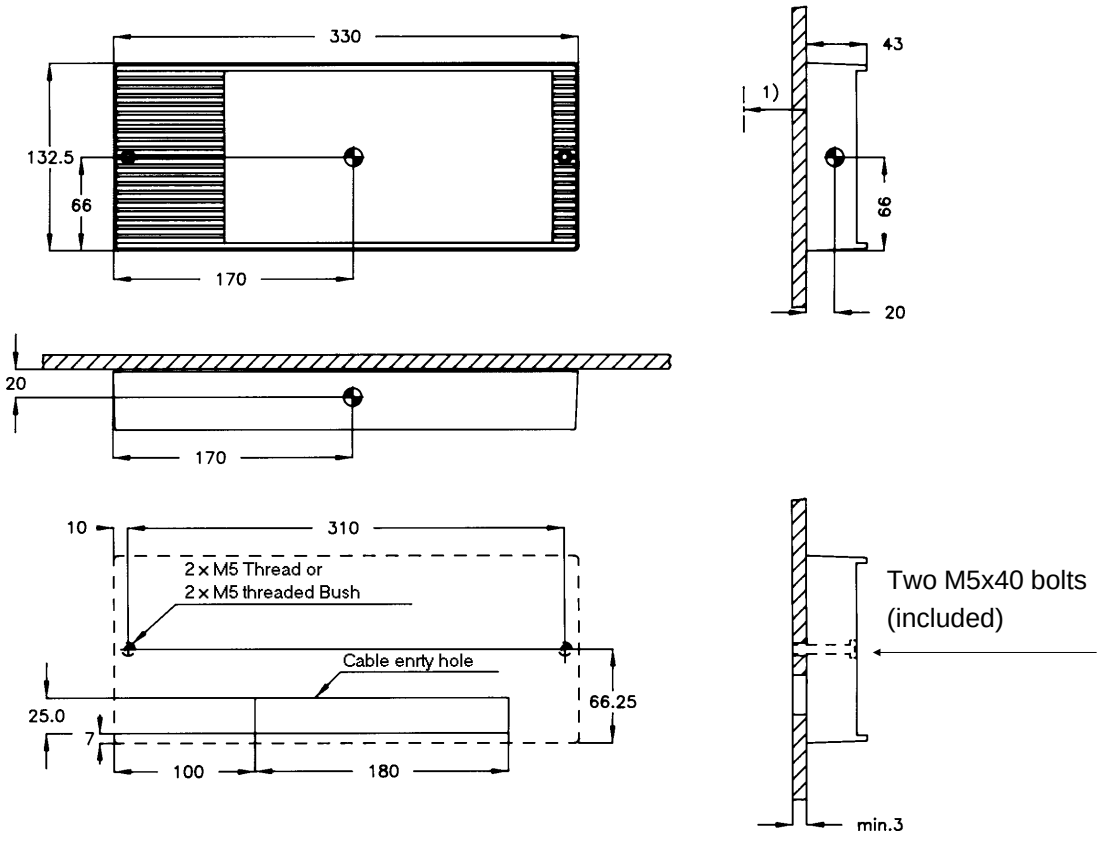


180 ˚ MOUNTING OF TERMINAL BOARD

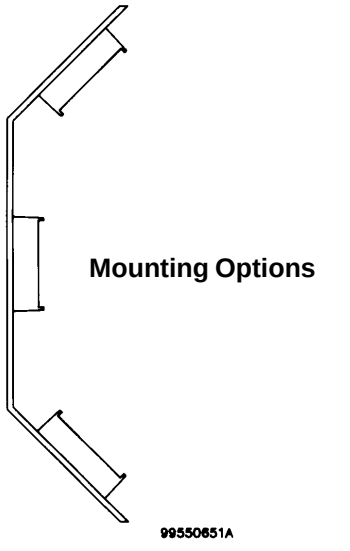
Fig.10b



DCU 9000 WITHOUT MOUNTING BRACKET
Fig.11

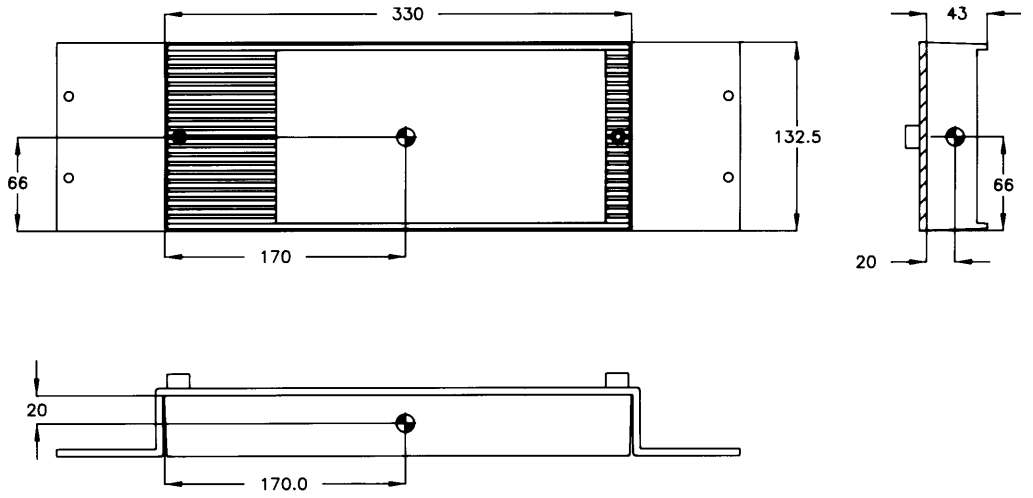


1) Space for cable entry min. 100



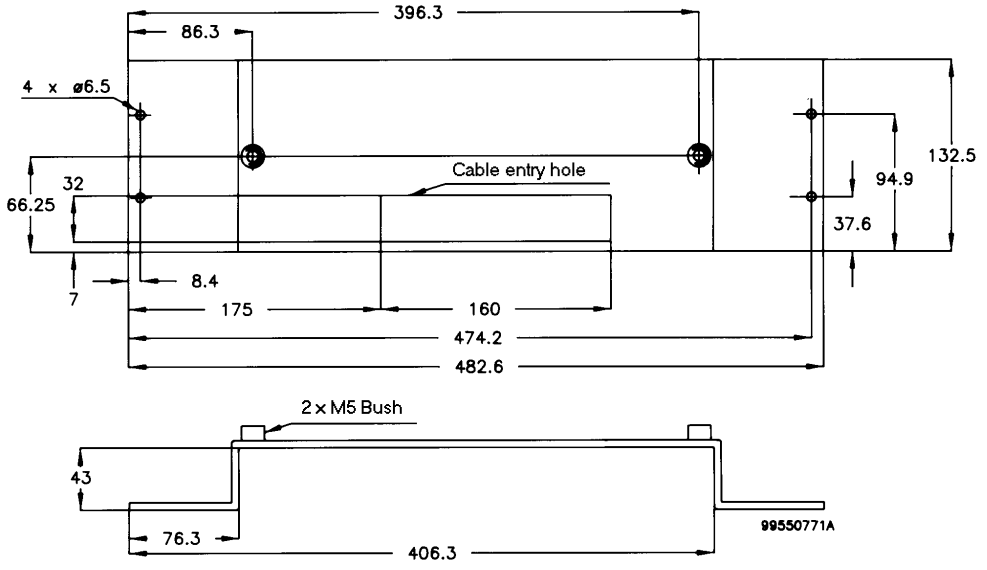
Dimensions are in mm
Tolerance: +/- 1 mm
Centre of Gravity
Weight: 1.2 Kg

DCU 9000 WITHOUT MOUNTING BRACKET
19 INCH PANEL MOUNTING Fig.12a



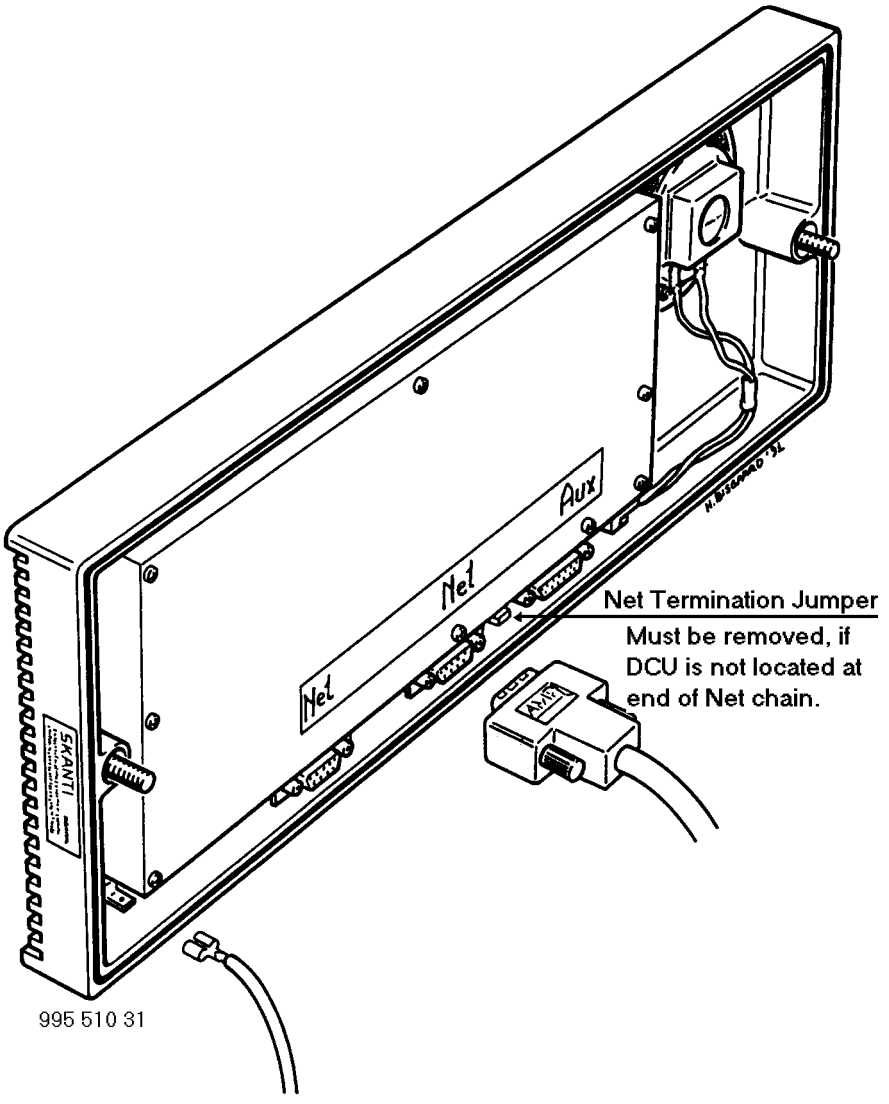
Dimensions are in mm Weight: DCU 1.2 Kg
Tolerance: +/- 1 mm
Centre of Gravity

Construction drawing for Fixture. Fig.12b

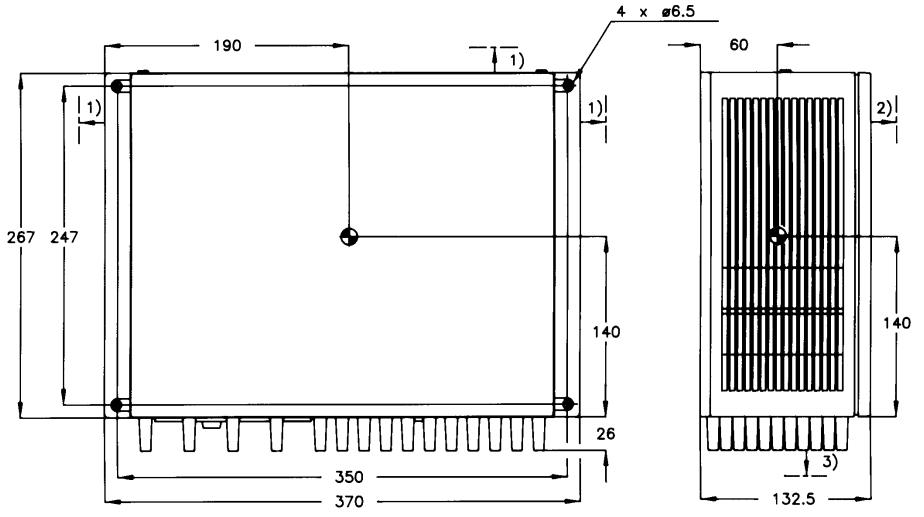


Dimensions are in mm
Tolerance: +/- 0.2 mm

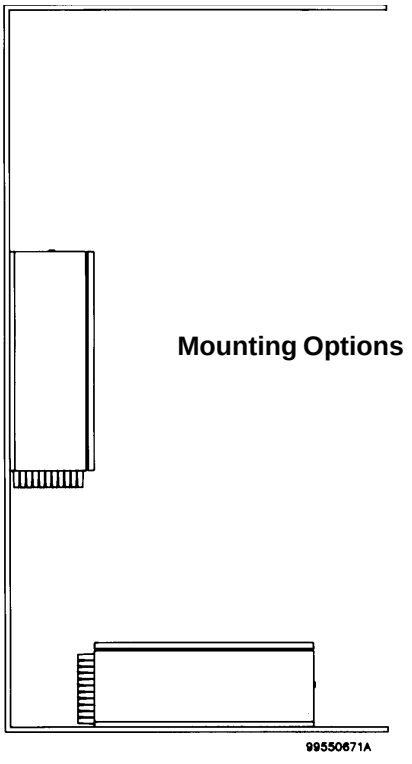
CABLE CONNECTIONS FOR DCU WITHOUT MOUNTING BRACKET
Fig.13



DU 9000 OUTLINE
Fig.14

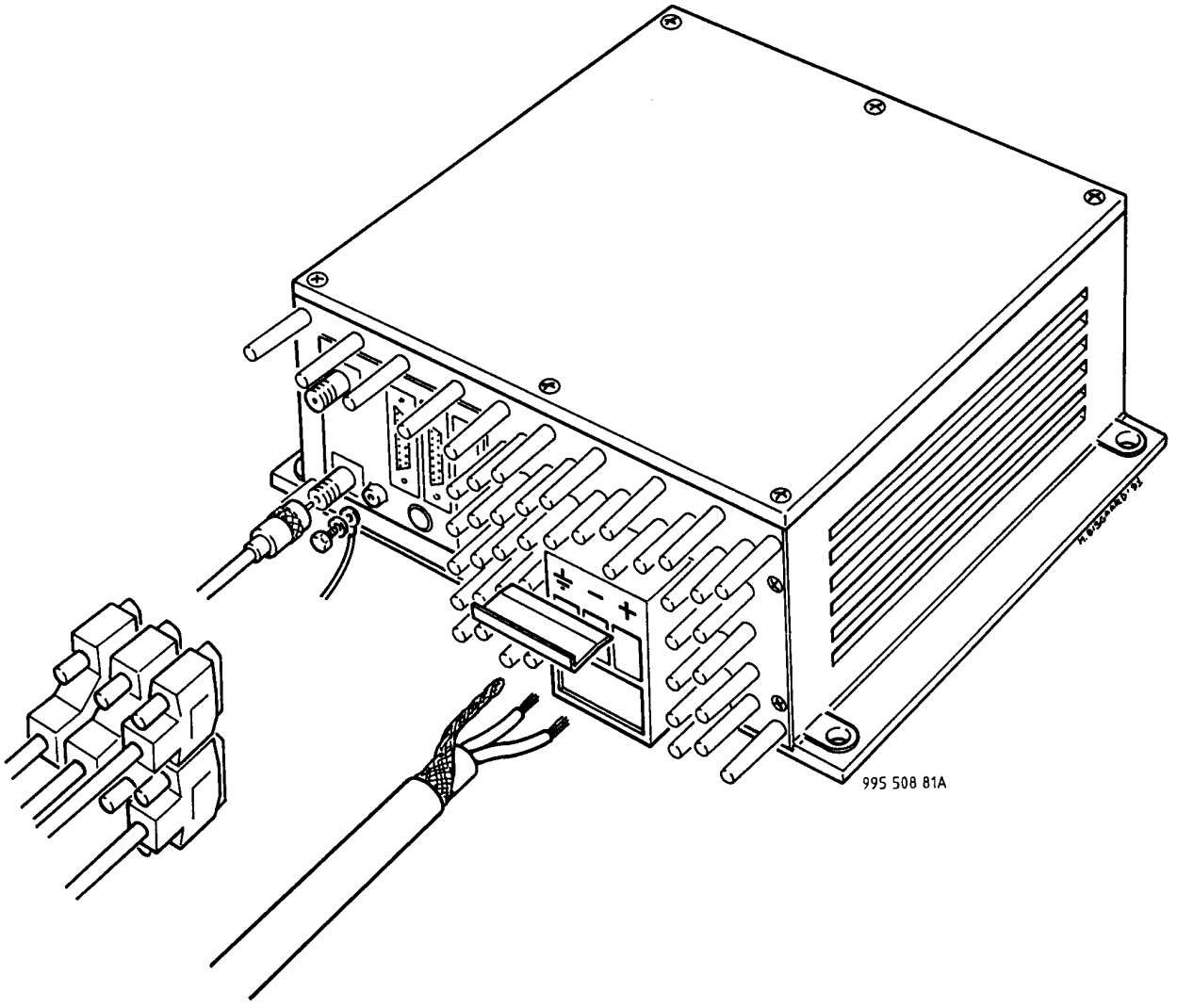


1) Space for air flow: min. 100
2) Space for service access: min. 500
3) Space for cable entry and air flow: min. 200



Dimensions are in mm
Tolerance: +/- 1 mm
Centre of Gravity
Weight: DU 9001 7.4 Kg
Weight: DU 9006 7.5 Kg

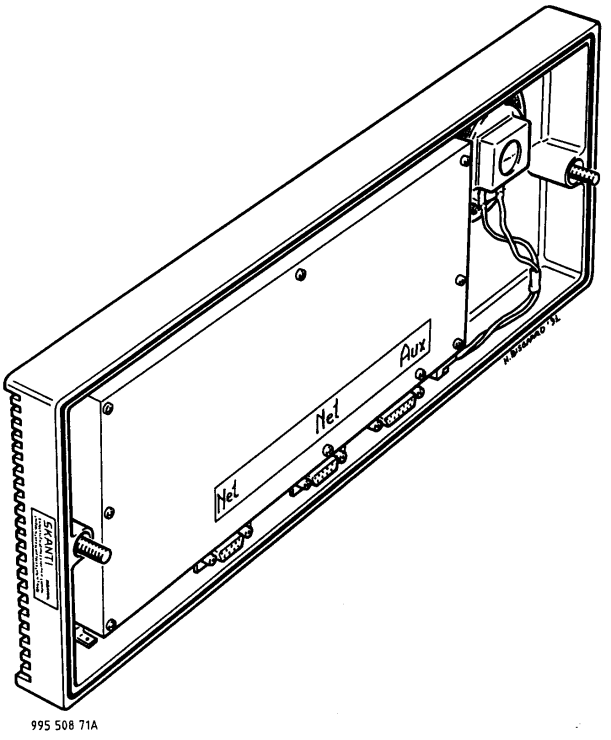
DU 9000 CABLE CONNECTIONS
Fig.15



CONNECTORS

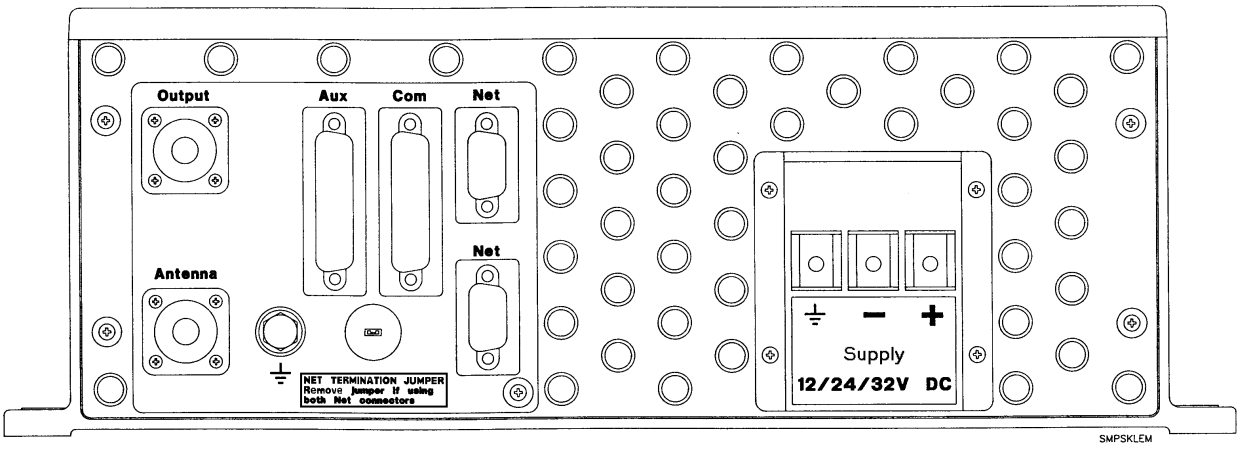
DCU 9000 CONNECTORS

Fig.16a

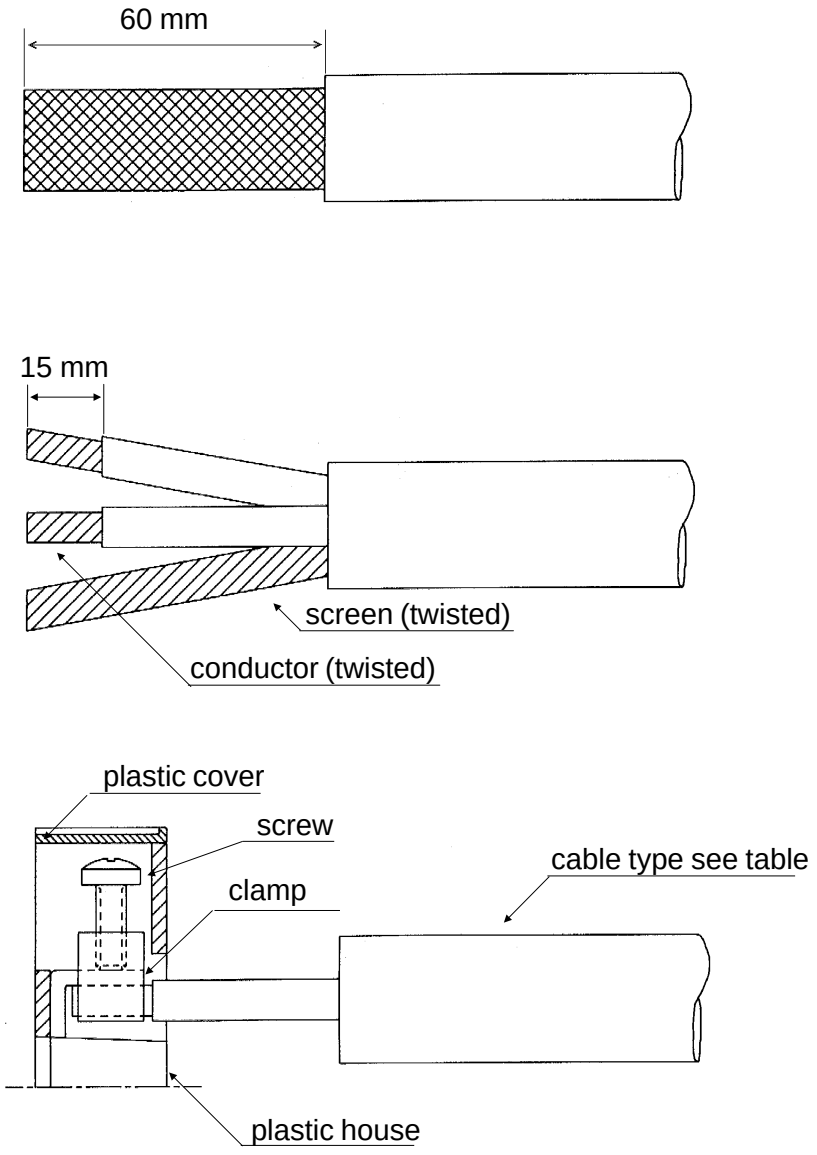


DU 9000 CONNECTORS

Fig.16b



SUPPLY TERMINAL STRIP, DU 9000
Fig.17



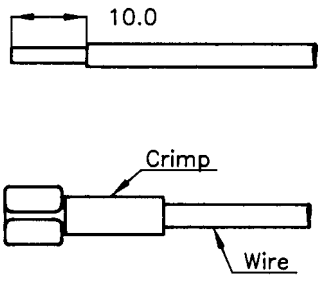
SUPPLY CABLE SPECIFICATIONS

Battery Voltage	Max. Cable Length to Battery	Recommended Cable	External fuses
12V	3.5m	Screened multiwire 2 X 2.5mmSq	20A
12V	8m	Screened multiwire 2 X 6mmSq	20A
24V	10m	Screened multiwire 2 X 1.5mmSq	10A
24V	16m	Screened multiwire 2 X 2.5mmSq	10A
24V	40m	Screened multiwire 2 X 6mmSq	10A
32V	15m	Screened multiwire 2 X 1.5mmSq	6.3A
32V	24m	Screened multiwire 2 X 2.5mmSq	6.3A
32V	60m	Screened multiwire 2 X 6mmSq	6.3A

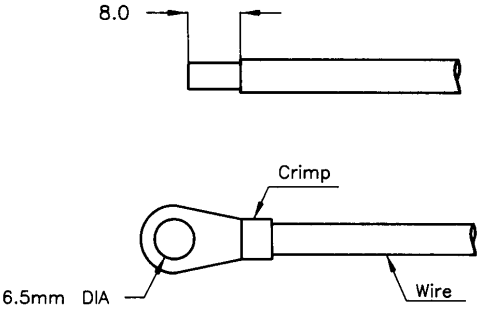
Table 2

EARTH CONNECTIONS
Fig.18

DCU 9000, EARTH CONNECTION
Skanti part no. 772 000 17

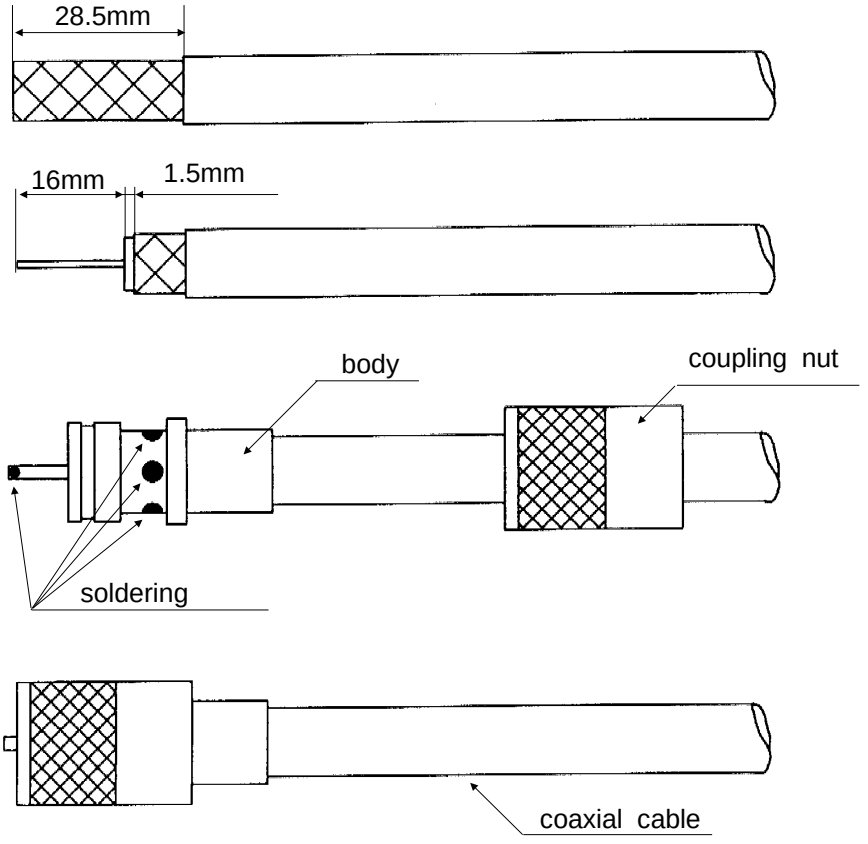


DU 9000, EARTH CONNECTION
Skanti part no. 772 000 14



Wire specification
Recommended wire dimension: min. 2.5 mm Sq .
Wire length as short as possible.

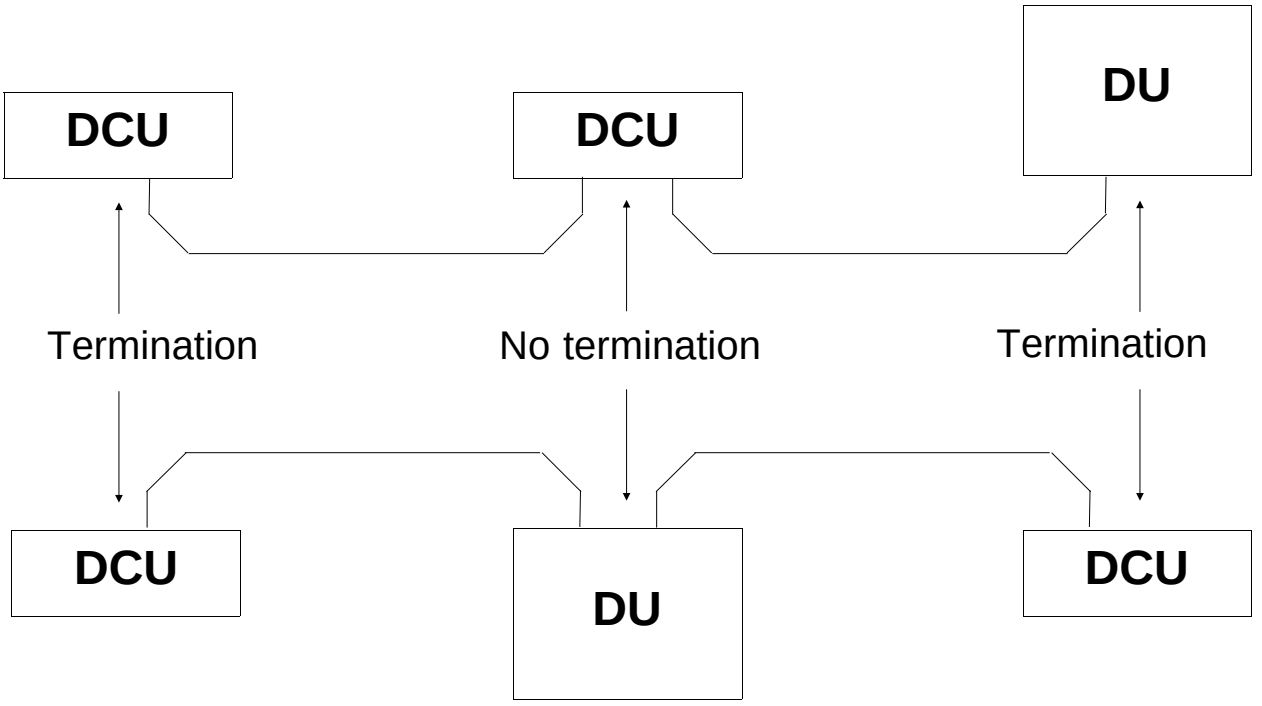
ANTENNA CONNECTOR
Fig.19



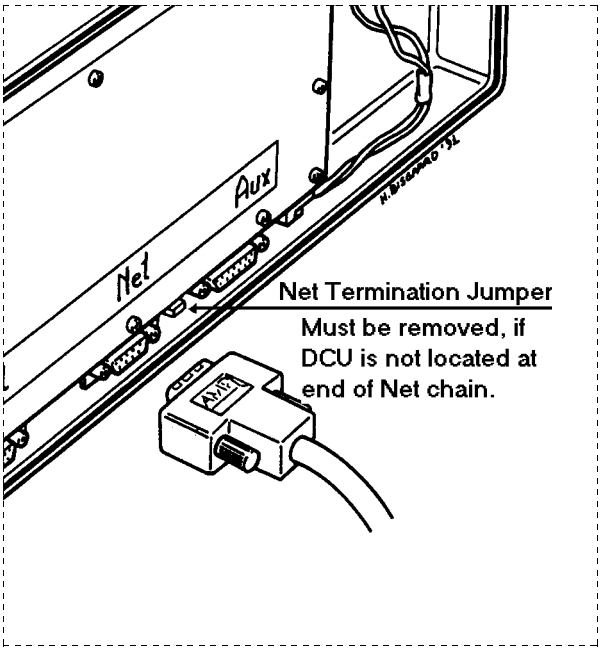
Connector type: PL 259, SKANTI part no. 751 000 54

Cable specification: Coaxial cable type RG-213/U or RG 8A/U

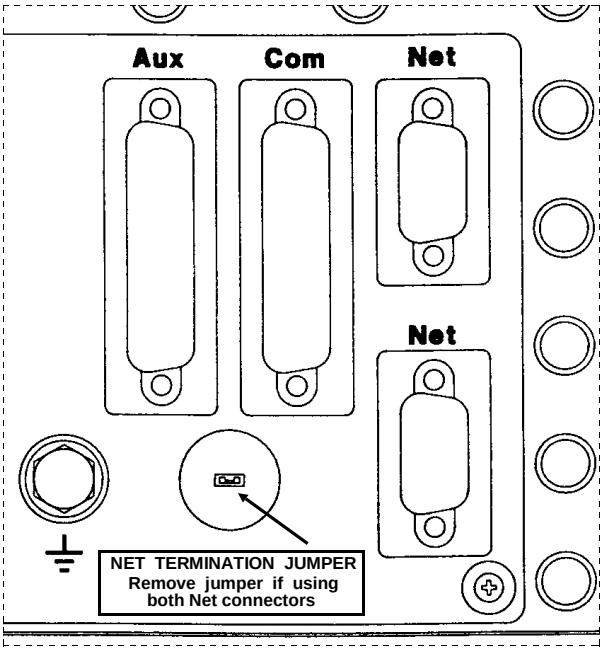
INTERCONNECTION OF UNITS
Fig.20a



NET TERMINATION JUMPER LOCATION

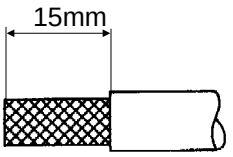


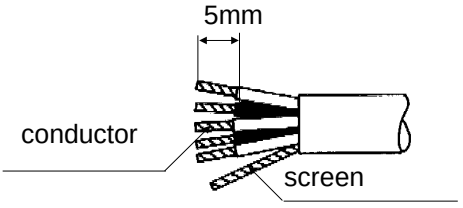
DCU
Fig.20b



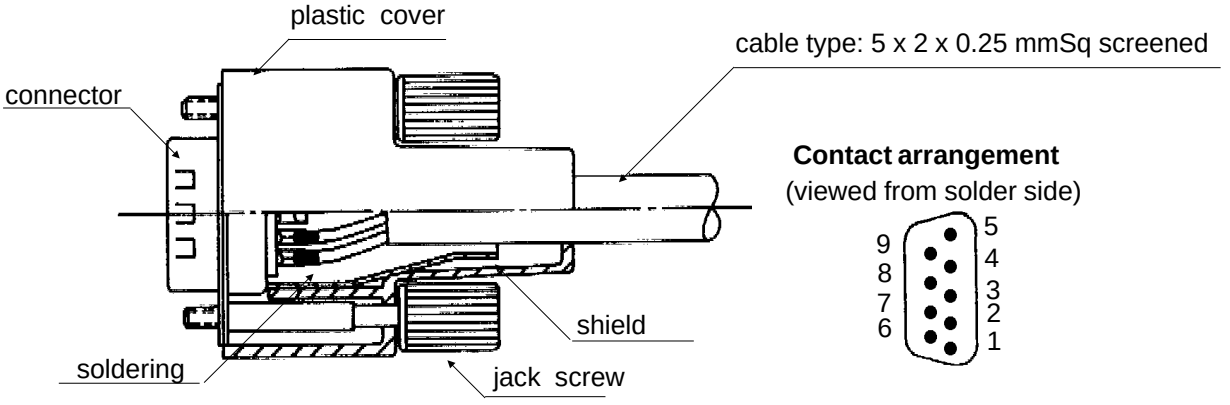
DU
Fig.20c

NET CONNECTOR, DCU 9000 AND DU 9000
Fig.21
SKANTI part no. 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 and fix the two jack screws into the plastic cover.



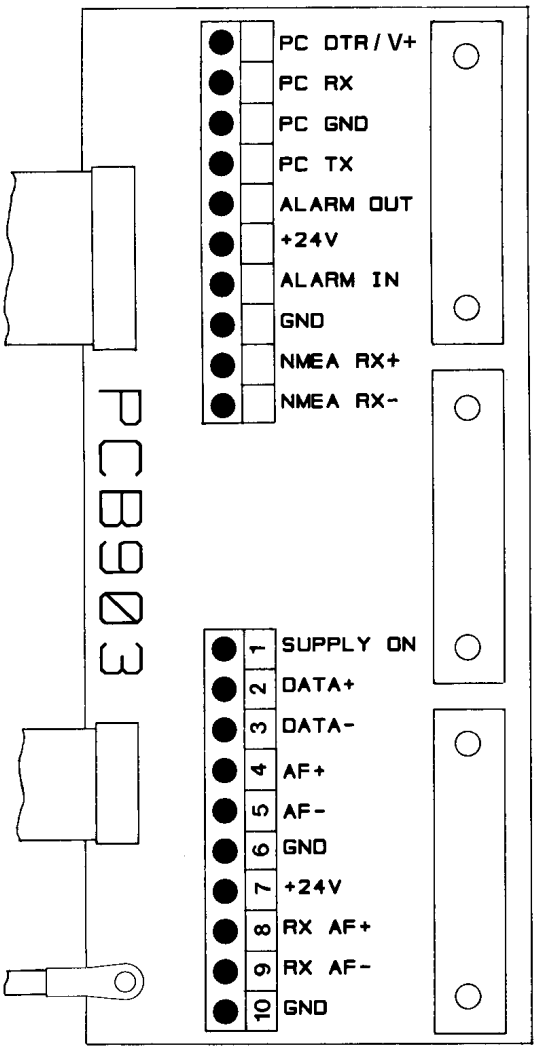
Contact arrangement
(viewed from solder side)

Pin no.	Designation	Remarks
1	Supply On	For switching-on power supply
2	Data+	For data communication between units
3	Data-	For data communication between units
4	AF+	Balanced audio signals
5	AF-	Balanced audio signals
6	GND	Ground reference
7	+24V	Supply voltage to control units
8	RXAF+	Not used in DSC 9000
9	RXAF-	Not used in DSC 9000
Shield	Cable screen	

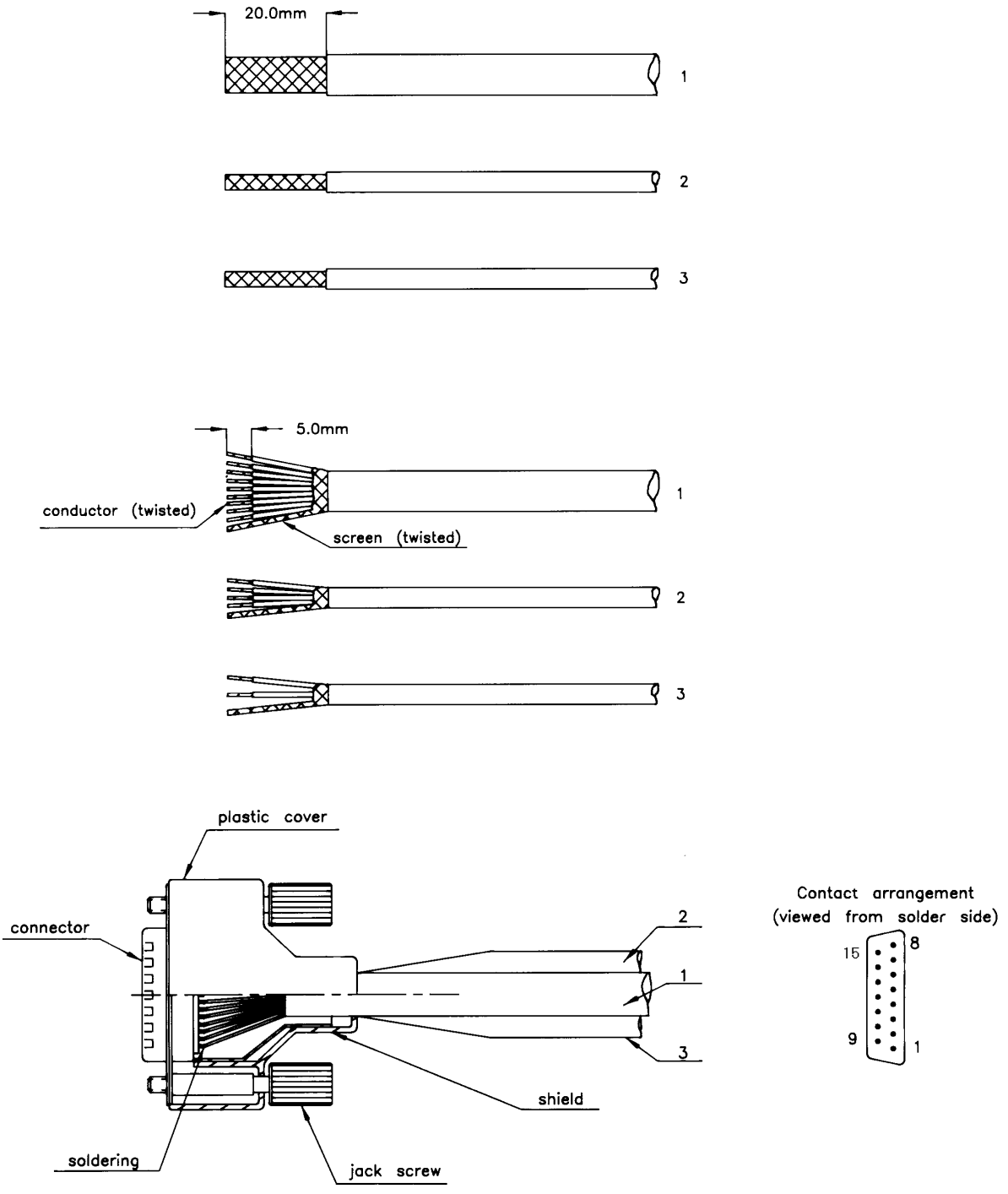
Table 3

Twisted pairs: 1 and 6
2 and 3
4 and 5
6 and 7
8 and 9

MOUNTING BRACKET TERMINAL BOARD
Fig.22



AUX CONNECTOR, DCU 9000
Fig.23
SKANTI part no. 751 000 65.



Cable specification
Acommodate cable outer diameter from 4.4 to 11.0 mm

Pin no.	Designation	Direction	Remarks
1	PC DTR / V+	Input	+5V/+15V supply for opto-isolated serial data interface for printer (RS-232) *)
2	PC GND		Power supply reference for serial data interface for printer (RS-232) *)
3	Alarm Out	Output	Open collector (RS-410N) for external alarm. Max 50mA, 32V. Active Low
4	Alarm In	Input	For external distress alarm button. Internal pull-up to 15V through 2.5kohm.
5	NMEA Rx+	Input	Opto-isolated serial interface for navigation equipment (NMEA 0183)
6	n.c.		
7	n.c.		
8	n.c.		
9	PC Rx	Input	Serial data input or busy input for printer (RS-232) *)
10	PC Tx	Output	Serial data output for printer (RS-232) *)
11	+24 V	Output	+24V for use with 'Alarm Out'. Max 100 mA. Internally protected.
12	GND		
13	NMEA Rx-	Input	Opto-isolated serial interface for navigation equipment (NMEA 0183)
14	n.c.		
15	n.c.		

Table 4

*) The printer interface is opto-isolated with driver power delivered from the printer. Most printers deliver a High (+5V to +15V) signal on one of the connector pins when the printer is operational. Opto-isolation may be disabled by connecting the terminals PC GND and GND and connecting a 2.2 kohm resistor between the terminals +24V and PC DTR/V+.

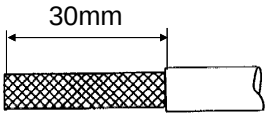
The terminal 'PC RX' is used for handshake signal input:

If Xon/Xoff handshake is used, the terminal must be connected to the outgoing serial data pin of the printer.

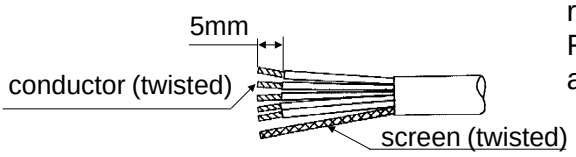
If Busy (High/Low) handshake is used, the terminal must be connected to the printer Ready/Busy signal output.

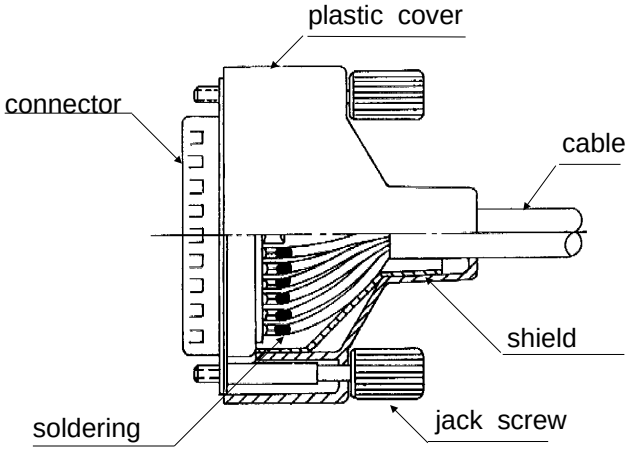
See page 3-50 for configuration of printer interface.

COM CONNECTOR, DU 9000
Fig.24
SKANTI part no 751 000 66.

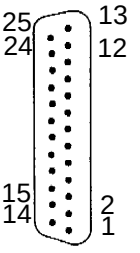


Before contacts of plug are soldered: slide the plastic cover over the cable .
After the contacts are soldered: latch the inner and outer shields into the connectors from the rear and snap in.
Finally slide the plastic cover over the shield and fix the two jack screws into the plastic cover.





Contact arrangement
(viewed from solder side)



Cable specification
Acommodate cable outer diameter from 4.4 to 11.0 mm

Pin no.	Designation	Direction	Remarks
1	GND		
2	Print RX	Input	Serial interface for printer (RS-232) *)
3	Print Tx	Output	Serial interface for printer (RS-232) *)
4	On-Hook	Input	Internal pull-up to 12V through 1.8kohm (RS-410N). Low for handset off-hook = normal. (Configurable)
5	n.c.		
6	PCP Tx	Output	Serial interface for transceiver control (RS-232)
7	Print GND		Serial interface for printer (RS-232) *)
8	Rx Line-	Input	For external receiver AF 0 dBm -30/+10 dB 600 ohm, free of earth **)
9	+15V	Output	+15V, R_i=470 ohm
10	n.c.		
11	GND		
12	Key Out	Output	Open collector (RS-410N). Max 50mA, 32V Low for keying TX
13	GND		
14	S/S Out	Output	Open collector (RS-410N). Max 50mA, 32V Not used
15	Tx Line-	Output	AF for transmitter modulation Adjustable -10/+10 dBm 600 ohm, free of earth
16	Tx Line+	Output	AF for transmitter modulation Adjustable -10/+10 dBm 600 ohm, free of earth
17	GND		
18	n.c.		
19	PCP Rx	Input	Serial interface for transceiver control (RS-232)
20	Print V+	Input	+5V/+15V supply for opto-isolated serial interface for printer *)
21	Rx Line+	Input	For external receiver AFInput 0 dBm -30/+10 dB 600 ohm, free of earth **)
22	n.c.		
23	n.c.		
24	GND		
25	+24V	Output	+24V. Max 100 mA. Internal fuse. Not used
Shield	Cable screen		

Table 5

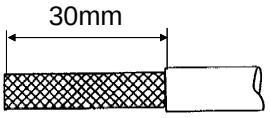
The printer interface is opto-isolated with power delivered from the printer. Most printers deliver a High (+5V to +15V) signal on one of the connector pins when the printer is operational.

Opto-isolation may be disabled by inserting jumpers J10,J11 and J12 on PCB 717. See fig.31 on page 3-47.

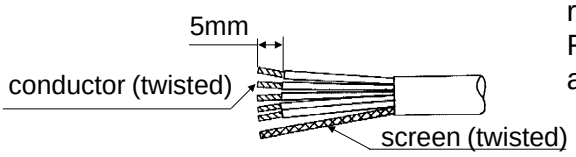
The termminal 'Print RX' is used for handshake signal input:

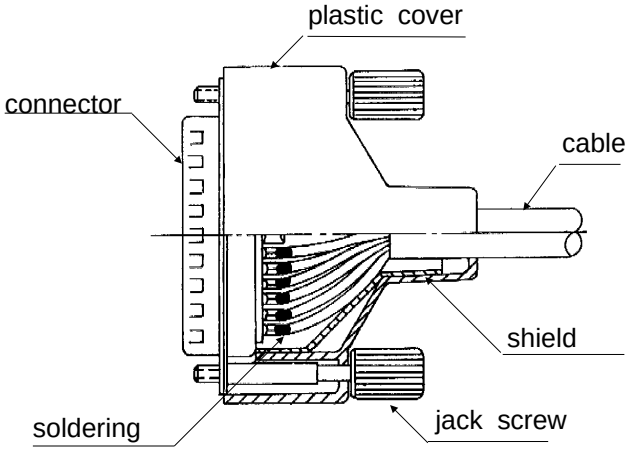
> If Xon/Xoff handshake is used, this terminal must be connected to the outgoing serial data pin of the printer. If Busy (High/Low) handshake is used, the terminal must be connected to the printer Ready/Busy signal output. See page 3-50 for configuration of printer interface

AUX CONNECTOR, DU 9000
Fig.25
SKANTI part no 751 000 66.

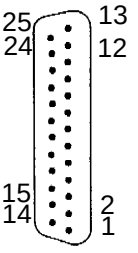


Before contacts of plug are soldered: slide the plastic cover over the cable .
After the contacts are soldered: latch the inner and outer shields into the connectors from the rear and snap in.
Finally slide the plastic cover over the shield and fix the two jack screws into the plastic cover.





Contact arrangement
(viewed from solder side)



Cable specification
Acommodate cable outer diameter from 4.4 to 11.0 mm

Pin no.	Designation	Direction	Remarks
1	GND		
2	PC Rx	Input	Serial interface for PC or radiotelex equipment (RS-232) *)
3	PC Tx	Output	Serial interface for PC or radiotelex equipment (RS-232) *)
4	Alarm 1 out	Output	Open collector (RS-410N) for external alarm. Max 50mA, 32V. Active Low
5	NMEA Rx+	Input	Opto isolated serial interface for navigation equipment (NMEA 0183)
6	On-Hook	-	Connected to Com pin 4.
7	PC GND		Serial interface for PC or radiotelex equipment (RS-232) *)
8	Rx Line-	Output	AF for radiotelex equipment. Connected to Rx Line- input (Com connector)
9	n.c.		
10	Disable	Input	Disables +24V output to Net when connected to pin 24
11	GND		
12	Key In	Input	Internal pull-up to 12V through 1kohm (RS-410N). Low for keying TX from radiotelex equipment
13	GND		
14	n.c.		
15	Tx Line In-	Input	AF from radiotelex equipment. Connected to Tx Line- (Com connector)
16	Tx Line In+	Input	AF from radiotelex equipment. Connected to Tx Line+ (Com connector) when DSC is not transmitting
17	NMEA Rx-	Input	Opto isolated serial interface for navigation equipment (NMEA 0183)
18	Alarm In	Input	For external distress alarm button. Internal pull-up to 12V through 1.8kohm.
19	n.c.		
20	PC DTR	Input	+5V/+15V supply for opto-isolated serial interface for PC or radiotelex equipment (RS-232) *)
21	Rx Line+	Output	AF for radiotelex equipment. Connected to Rx Line- input (Com connector)
22	n.c.		
23	Alarm 2 Out	Output	Open collector (RS-410N) for external alarm. Max 50mA, 32V. Active Low
24	GND		
25	+24V	Output	+24V for use with 'Alarm 1 Out' and 'Alarm 2 Out'. Max 100 mA. Internal fuse.
Shield	Cable screen		

Table 6

*) Opto-isolated with driver power delivered from PC (DTR).
(Non-isolated: Set Jumpers J8, J9, and J13 on PCB 717 ON)
Note. If non-isolated. Pin 20 PC DTR must not be connected.

OPTIONAL HANDSET HOOK-SWITCH FOR TRP 8000
Fig.26a

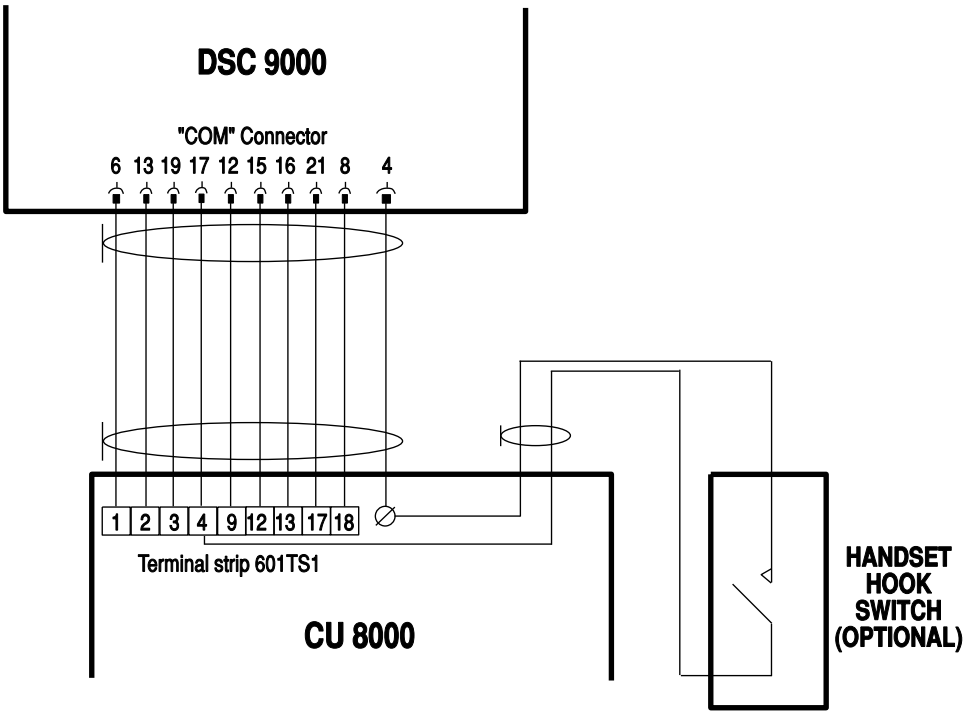
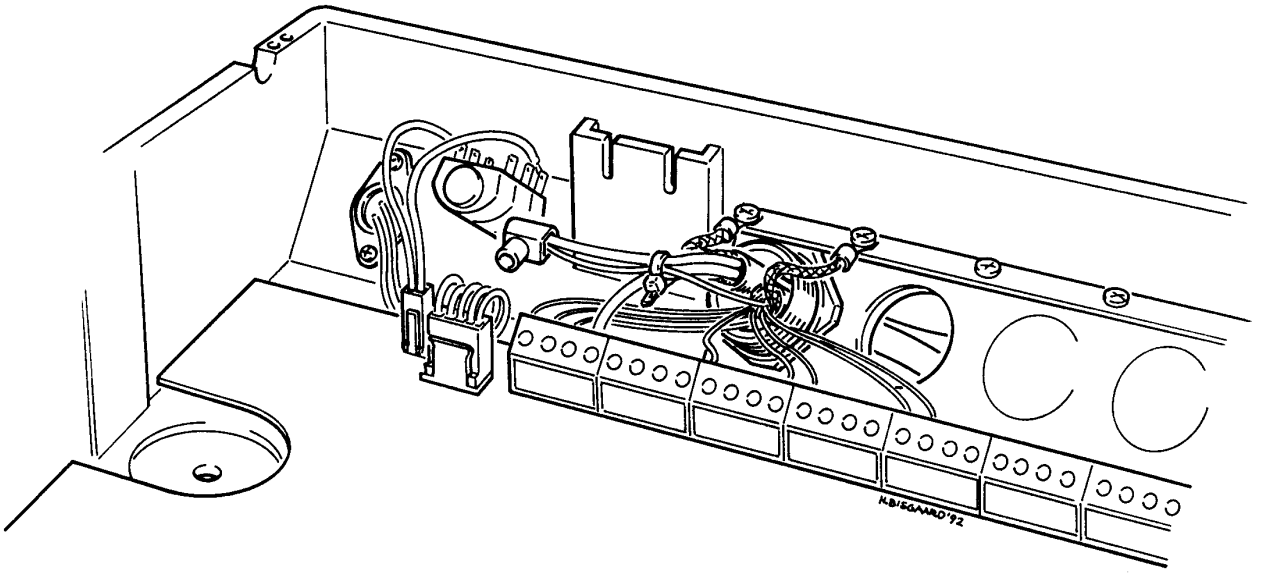
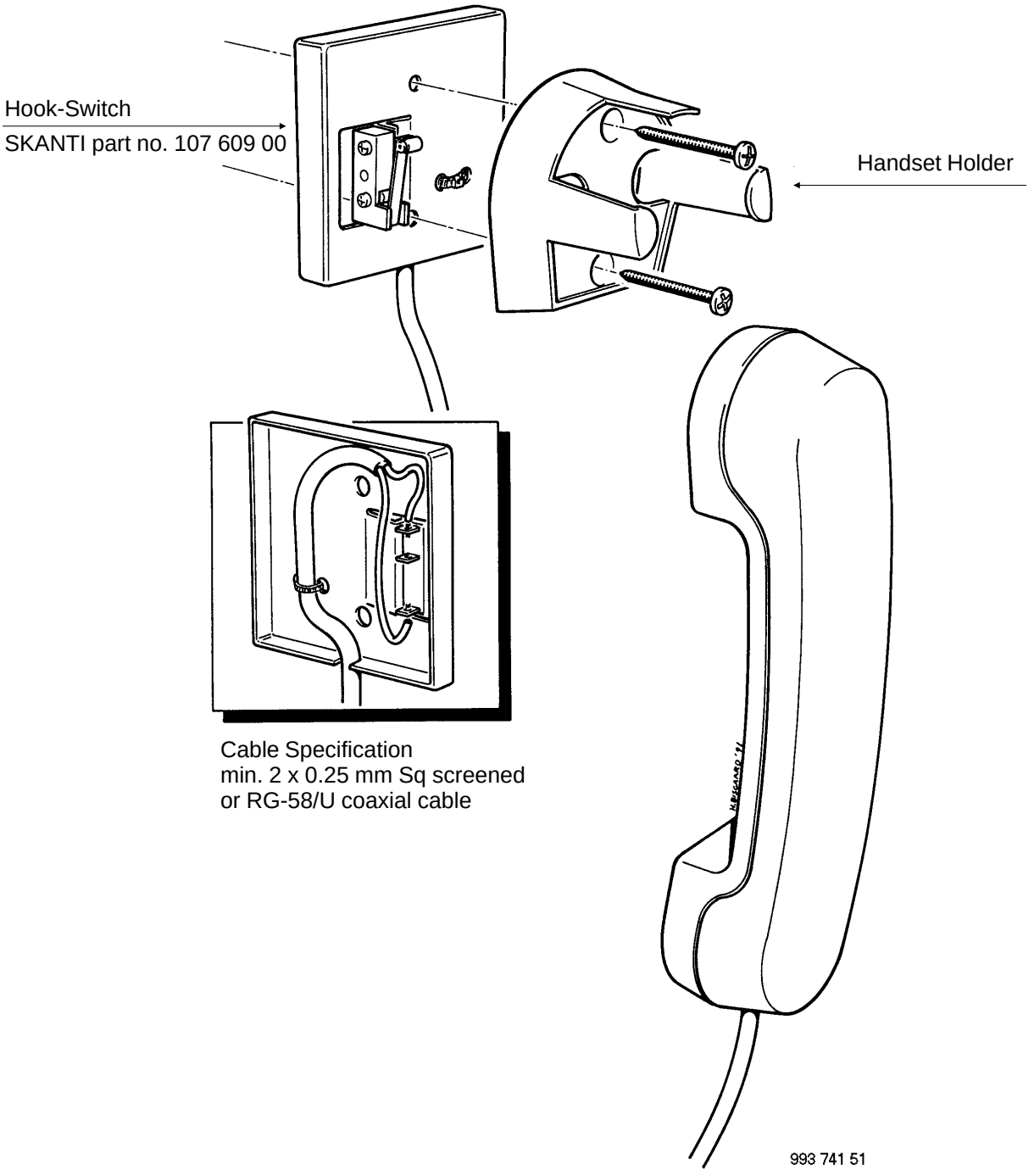


Fig.26b

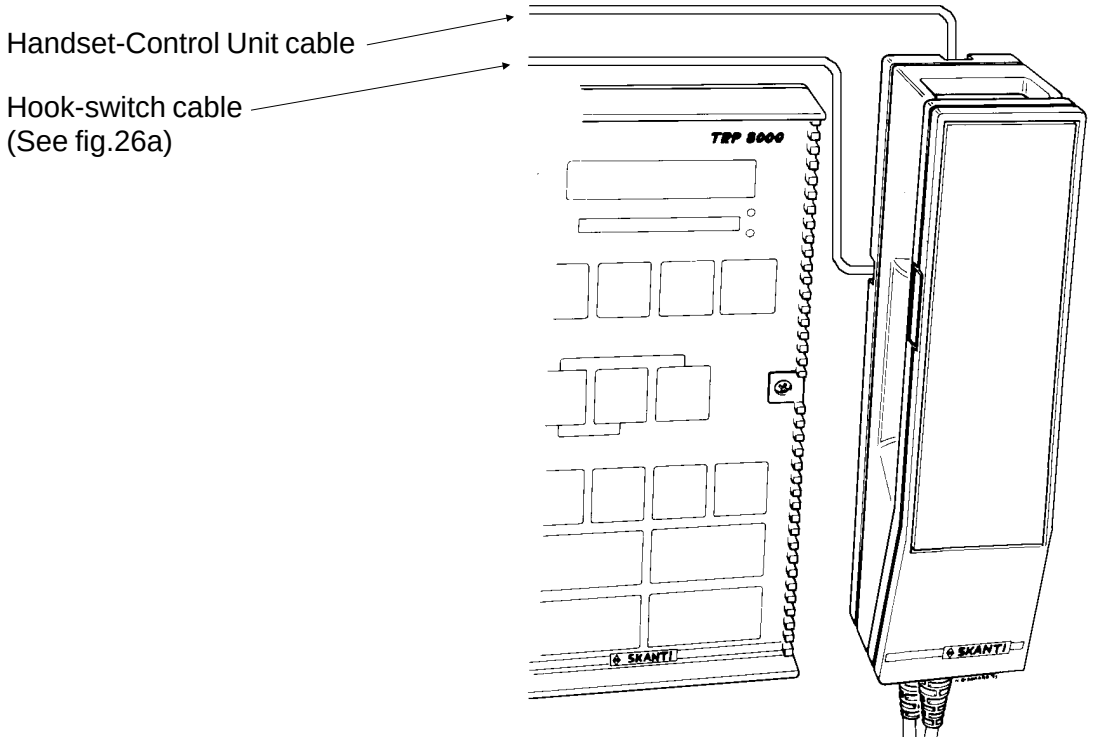


993 741 71 A

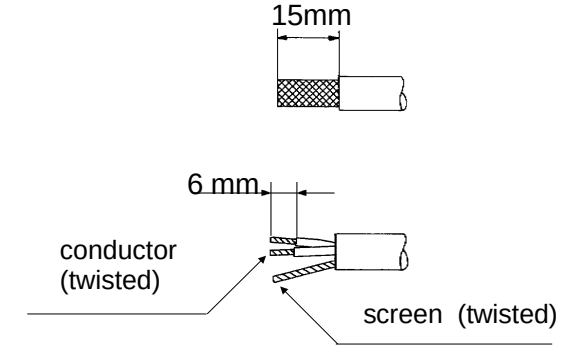
Fig.26c


Hook-Switch
SKANTI part no. 107 609 00
Handset Holder
Cable Specification
min. 2 x 0.25 mm Sq screened
or RG-58/U coaxial cable
993 741 51

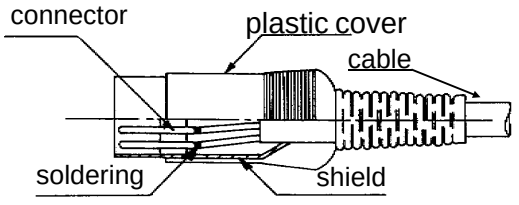
HANDSET WITH BUILT-IN HOOK SWITCH
Fig.27

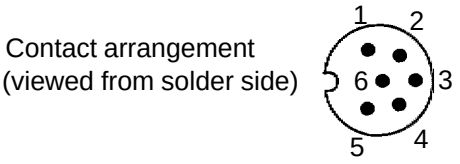


CONNECTOR FOR BUILT-IN HANDSET HOOK-SWITCH
Fig.28
SKANTI part no 751 001 72.



Before contacts of the 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.

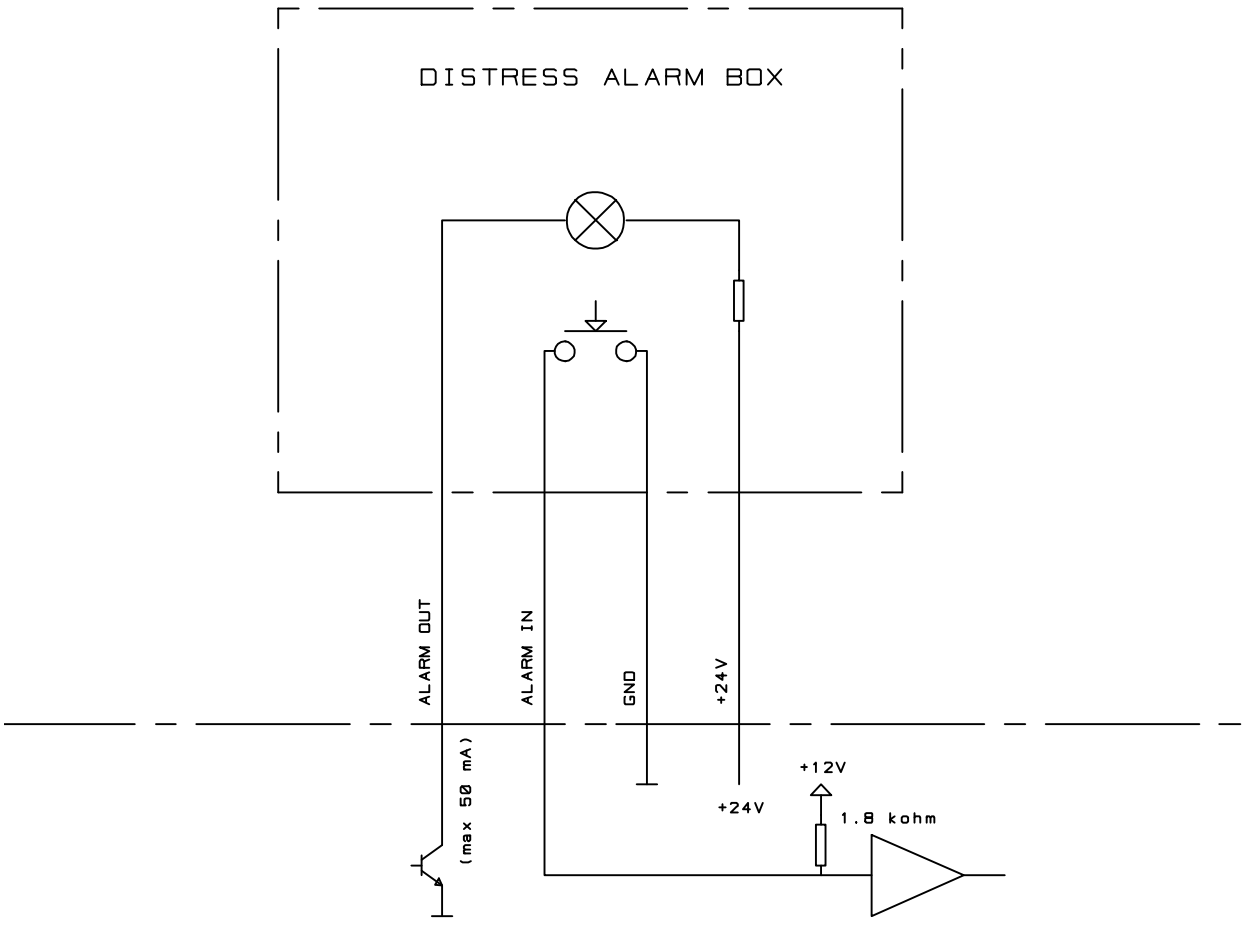




Pin No.	Designation	Remarks
1	$\overline{\text{HOOK-ON}}$	Low when the handset is placed in the holder
2	NC	
3	NC	
4	NC	
5	NC	
6	GND	

Table 7

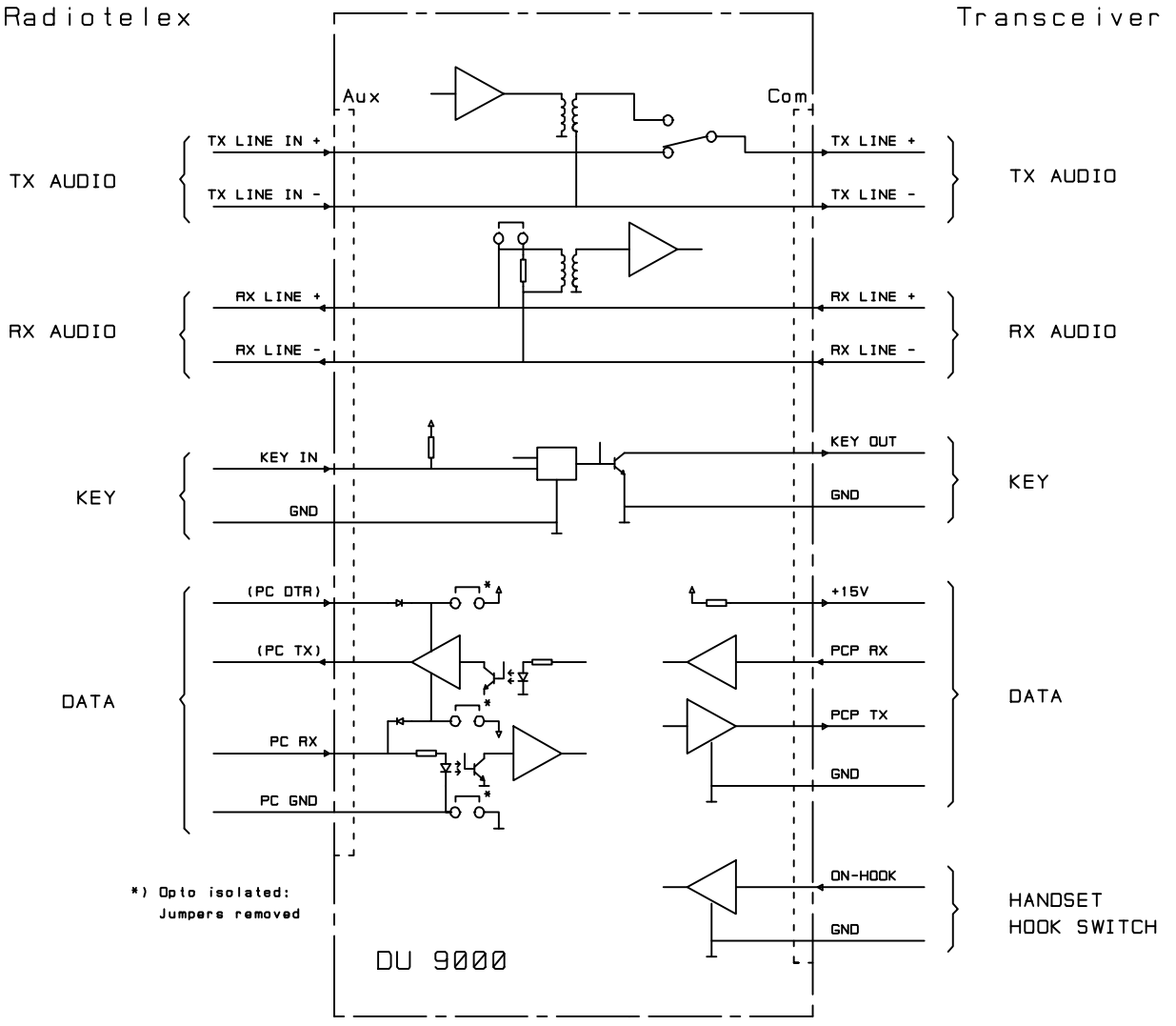
DISTRESS ALARM BOX
Fig.29
Diagram.



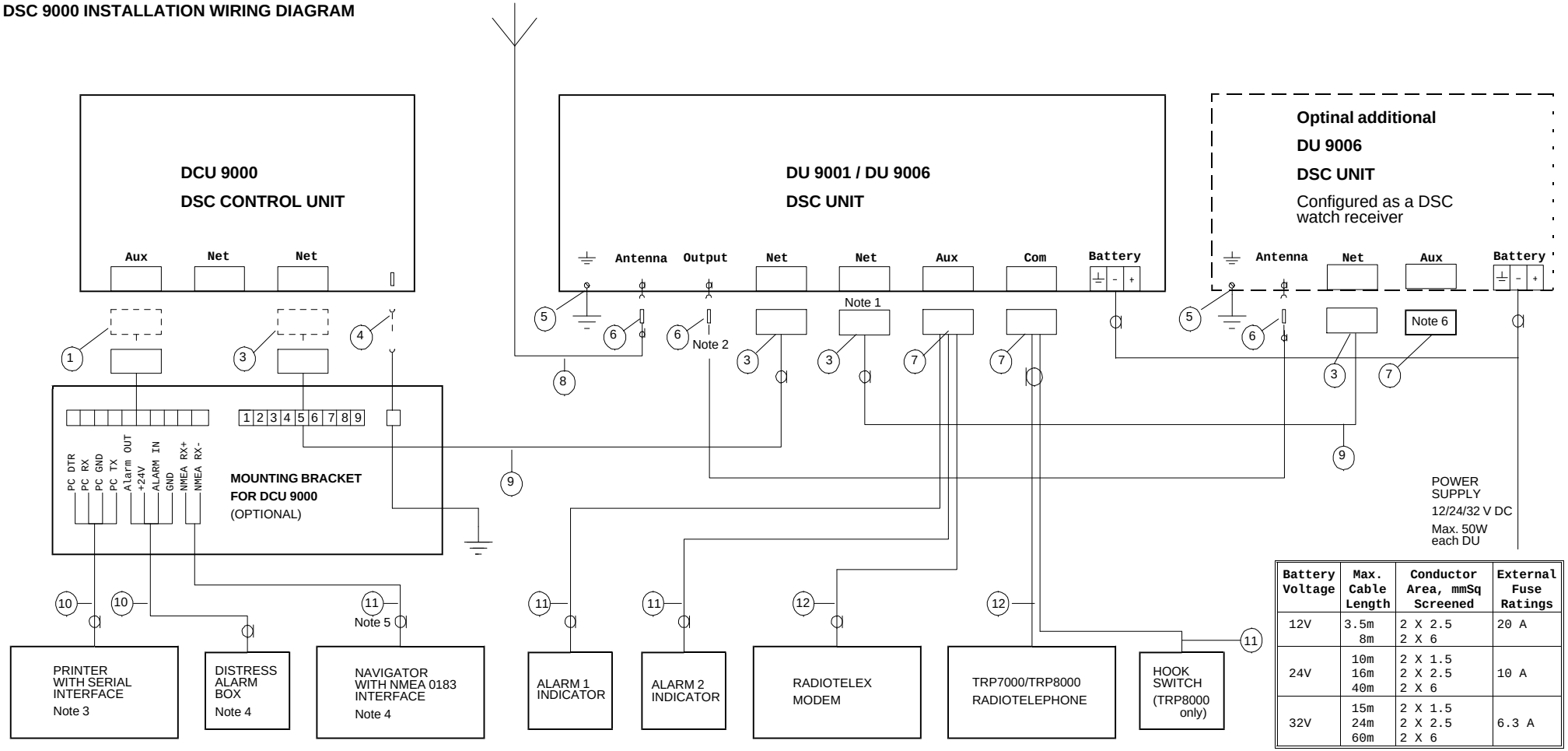
DISTRESS BUTTON: Press and hold in for 6 seconds.

DISTRESS LAMP:	*Flashing:*	Distress or Urgency call received
	Quick flashing:	Distress button activated
	Steady light:	Distress alert in progress

RADIOTELEX INTERCONNECTIONS
Fig.30.
Simplified diagram



DSC 9000 INSTALLATION WIRING DIAGRAM



Battery Voltage	Max. Cable Length	Conductor Area, mmSq Screened	External Fuse Ratings
12V	3.5m 8m	2 X 2.5 2 X 6	20 A
24V	10m 16m 40m	2 X 1.5 2 X 2.5 2 X 6	10 A
32V	15m 24m 60m	2 X 1.5 2 X 2.5 2 X 6	6.3 A

Pos	Connector Types	
1	15-pole D-Sub male	751 000 65
3	9-pole D-Sub male	751 000 64
4	Tab Connector	772 000 17
5	Cable Lug	772 000 14
6	UHF Plug Type PL 259	751 000 54
7	25-pole D-Sub male	751 000 66

Pos	Cable Types
8	Coaxial, RG-213/U or RG-8A/U
9	5 x 2 x 0.25mmSq Screened
10	4 x 0.25mmSq Screened
11	2 x 0.25mmSq Screened
12	5 x 2 x 0.25mmSq Screened

DCU 9000 Aux Connector Pin No.	
9	PC RX
10	PC TX
1	PC DTR
2	PC GND
3	Alarm Out
11	+24V
4	Alarm In
12	GND
5	NMEA RX+
13	NMEA RX -

DU 9000 AUX Pin no.	Radiotelex Modem
8	RX Audio
21	RX Audio
15	TX Audio
16	TX Audio
12	Key
13	GND
2	Data Out
3	(Data In)
20	(DTR)
7	Data GND

DU 9000 Com Pin No.	TRP 7000 w.PCB717 Com Pin No.	TRP 7000 w.PCB718 Com Pin No.	TRP 8000 601 TS1 Term.No.	TRP 8000 Hook Switch	Remarks
8	8	8	18		RX Audio
21	21	21	17		RX Audio
15	15	15	12		TX Audio
16	16	16	13		TX Audio
12	12	12	9		Key
13	13	13+7	2		GND
6	6	2	1		Data
19	19	3	3		Data
9		20			+15V
4	4	4		1	Hook
17				x	GND

Note 1: Where more units are chain connected the termination jumper is removed from units not located at the end of the chain.

Note 2: One additional receiver may be connected to the antenna output.

Note 3: May alternatively be connected to DU 9000 Com connector.

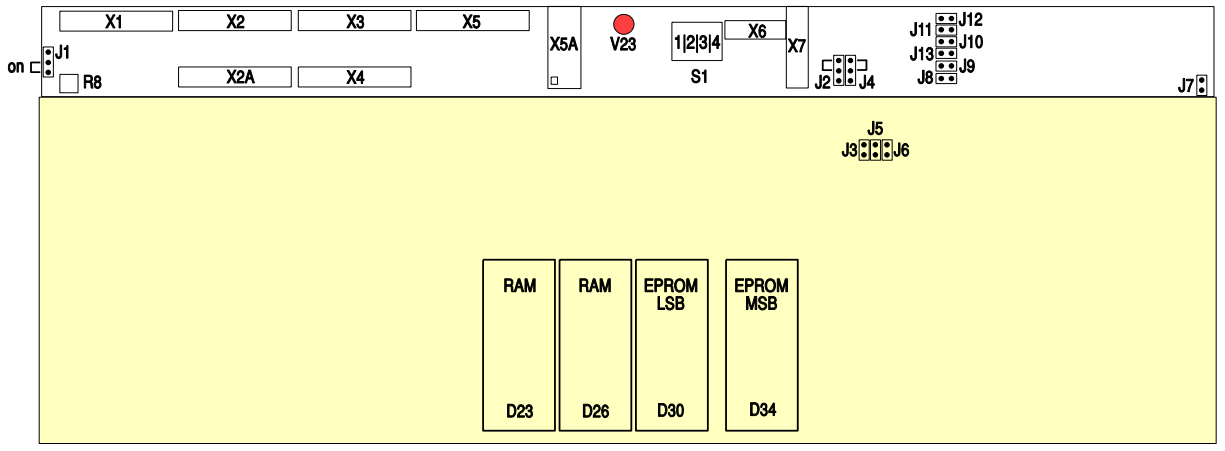
Note 4: May alternatively be connected to DU 9000 Aux connector.

Note 5: Screen connected at navigator only.

Note 6: Configuration plug. Connect pin 18 to pin 23 and pin 10 to pin 25.

PCB 717 JUMPER AND ADJUSTMENT LOCATIONS

Fig.31



Trimpot R8

AF output level.
For adjustment of signal level on Tx Line.
Factory setting: 0 dBm.

Jumper J1

Input impedance.
When On the input impedance of Rx Line is 600 ohms.
When Off the input impedance is high.
Factory setting: On.

Jumpers J2 and J4

Not used.

Jumper J3

Test mode.
Enables Special Test mode when On.
Factory setting: Off.

Jumper J5, J6 and J7

Not used. Left open.

Jumpers J8, J9 and J13

PC interface (DU 9000).
When all three jumpers are On the opto-isolation is suspended.
Factory setting: Off.

Jumpers J10, J11 and J12

Printer interface (DU 9000) .
When all three jumpers are On the opto-isolation is suspended.
Factory setting: Off.

Red LED V23

Program activity.
Normal operation is indicated by regular flashing.

Factory resetting

With the equipment on, disconnect Supply Voltage.
Insert 'Factory Resetting Plug' in the COM connector on the DU 9000.
Switch supply on for 30 seconds.
Disconnect supply voltage.
Remove 'Factory Resetting Plug.
Reconnect Supply Voltage.

Note: Factory Resetting must be made after exchange of software (EPROMs).

INSTALLATION CONFIGURATION

The DSC 9000 is factory configured to standard settings, stored in a non-volatile EEPROM. Change of these settings is possible from the front panel of the DCU 9000.

To view or change configuration settings, switch the equipment on, press [Main Menu], select CONFIGURATION and press [Enter]. Select VIEW or CHANGE and press [Enter].

To protect against unintensional changes a password must be entered if CHANGE is selected. The figures are not displayed while keyed-in.

Note: Following any change in configuration setting the supply must be switched off-on to implement the changes.

Configuration of Self-ID

The Maritime Mobile Service Identity assigned to the station must be stored in the DSC 9000 before it can be used.

Select SELF-ID in the CONFIGURATION menu and press [Enter]. Key-in the MMSI and press [Enter].

To prevent the operator from changing the self-ID, it must be protected by entering PROTECT. *Please note that once PROTECT has been entered, change of self-ID is not possible* (only after a factory resetting. See page 3-47). Therefore, check the numbers carefully for correctness before pressing [Enter].

Configuration of Group-ID

One or more group call identities may be assigned to the station. Group call identity numbers always contains a leading zero. The group call identities assigned to the station must be stored in the DSC 9000 before it is able to respond to group calls. Up to six group call identity numbers may be stored.

Select GROUP-ID in the CONFIGURATION menu and press [Enter]. Key-in the group call identities and press [Enter]. Check that the self-ID is correct after having switched the equipment off and on.

Configuration of Control Unit Priority

Where more control units are connected to a DU 9000 each control unit may be given a priority.

Only a control unit with higher priority can interrupt a control unit which is in any other state than MAIN-MENU or STATUS states.

To change the priority level select PRIORITY in the CONFIGURATION menu and press [Enter]. Select the desired priority level (1. priority is the highest level) and press [Enter].

Note: If an external distress alarm button is connected to a control unit, this control unit should be given priority

Configuration of Radio Interface

The DSC 9000 may be configured for different protocols for control of the associated radio equipment:

T+Bus (default)
T+Bus, one way
NMEA

Baudrate 2400 bps for T+Bus and 4800 bps for NMEA is implicitly selected.

Following NMEA sentences are used to set frequency, mode of operation and transmitter power level of the radio equipment.

```
RX frequency:

$CDFSI,,xxxxxx,c,*hh<CR><LF>
           │     └─ Mode of operation[1]
           └─ Receiving frequency[2]

TX frequency:

$CDFSI,xxxxxx,,c,9*hh<CR><LF>
           │     │  └─ Power level (9=highest)
           │     └─ Mode of operation[1]
           └─ Transmitting frequency[2]

Notes:

1) Mode of operation:

    m = J3E, telephone
    o = H3E, telephone
    w = F1B/J2B, teleprinter/DSC
    { = A1A Morse, morse key/headset

2) Frequency in 100 Hz increments.
```

To change configuration select INTERFACES in the CONFIGURATION menu and press [Enter]. Select RADIO in the Interfaces menu and press [Enter]. Select CONTROL in the Radio interface menu and press [Enter]. Select the desired option and press [Enter].

Configuration of Handset Hook-Switch Interface

The handset hook interface may be configured for either polarity of the input signal or for ignoring the input, i.e. if no hook-switch is connected.

To change configuration select INTERFACES in the CONFIGURATION menu and press [Enter] . Select RADIO in the Interfaces menu and press [Enter] . Select HANDSET-HOOK in the Radio interface menu and press [Enter]. Select the correct option Normal, Reverse or Ignore. 'Normal' corresponds to off-hook = low input signal. Press [Enter] .
TRP 7000: Normal
TRP 8000 handset with built-in hook switch: Reverse

The handset hook signal is utilized as follows:

When the receiver of the radiotelephone is used for scanning controlled from the DSC 9000 or radiotelex equipment, scanning is interrupted while the handset is off-hook. At the same time automatic DSC acknowledgement transmissions are disabled. Scanning is automatically resumed when the handset is placed on-hook.

When a Selective or Direct-dial telephony call is received, lifting the handset off-hook will stop the acoustic alarm, start transmission of an acknowledgement, and set the radiotelephone to the appropriate working frequencies.

Configuration of DSC-watch

The DSC 9000 enables two DSC watch receivers to be used simultaneously. The status display contains a line for each receiver/demodulator, indicating the DSC watch frequencies.

It is possible by configuration to select between different DSC watch lay-outs in the status display:

Distress watch MF

Distress watch MF/HF

Calling watch

None

One of the lay-outs may be selected for each watch receiver.

To change the configuration, select WATCH in the CONFIGURATION menu and press [Enter]. Select the desired configuration for each watch receiver and press [Enter].

Note: When the TRP 7000 or TRP 8000 is intended to be used for automated radiotelex and no additional DU configured as a DSC watch receiver is connected (see page 3-7 'Connection of an additional DU'), 'None' should be selected for 'watch receiver 2'.

Configuration of Telex Interface

Select INTERFACES in the CONFIGURATION menu and press [Enter]. Select TELEX in the Interfaces menu and press [Enter]. Select 'External modem' if an external radiotelex modem is used and press [Enter].

Configuration of Printer Interface

Select INTERFACES in the CONFIGURATION menu and press [Enter]. Select PRINTER in the Interfaces menu and press [Enter]. Select between connection to

This DCU, None/other DCU, or DU*

and press [Enter]. Select between Baud rates of

300, 600, 1200, 2400, 4800*, or 9600

and press [Enter]. Select between Parity/data bits

None/7, None/8*, Even/7, Even/8, Odd/7, or Odd/8

and press [Enter]. Select between handshake types

Xon/xoff, Busy High, Busy Low, None*

and press [Enter]. Select between paper feed

Up* or Down

and press [Enter].

*) Default

Configuration of External Alarms

Select INTERFACES in the CONFIGURATION menu and press [Enter]. Select ALARMS in the Interfaces menu and press [Enter]. Select for each output in turn the desired activation conditions:

Distress alarm only

Call alarm only

Distress + Call alarm

Distress alarm + lamp

Configuration of Formats

Certain call formats may be omitted. This enables the DSC 9000 to be adapted to specific applications where it is desirable to avoid unintended use of these formats.

The formats that can be disabled are:

Distress

Group + Area

Direct-dial

To change the configuration, select FORMAT in the CONFIGURATION menu and press [Enter]. Select 'Yes' to include a format, or 'No' to disable a format, and press [Enter].

All formats can be received and displayed in RX-calls irrespective of the configuration settings.

Configuration of Messages

It is possible to select between the full set of telecommands or a reduced set. The reduced set may be selected where it is desirable to avoid unintended use of the telecommands.

Full set of telecommands:

Polling
Unable to comply
-Congestion
-Busy
-Queue
-Station barred
-No operator
-Temporarily no opr
-Equipment disabled
-Cannot use channel
-Cannot use mode
Data V.21
Data V.22
Data V.22 bis
Data V.23
Data V.26 bis
Data V.26 ter
Data V.27 ter
Data V.32
USB telephony
AM telephony
Distress relay
FEC telex
ARQ telex
RTTY receive
RTTY
A1A/CW tape
Ship position
A1A/CW Morse
Facsimile
No information

Reduced set of telecommands:

USB telephony
Distress relay
FEC telex
ARQ telex

Only messages enabled by configuration are selectable in TX-calls. All messages may be displayed in RX-calls and TX-acknowledgements, irrespective of the configuration.

ACCESSORIES INCLUDED

DCU 9000:

DESIGNATION	QUANTITY	SKANTI PART NUMBER
Mounting bracket for DCU 9000	1	107 810 40
D-sub connector, 9 pole, male	2	751 000 64
D-sub connector, 15 pole, male	1	751 000 65
Tab connector, female	1	772 000 17

DU 9000:

DESIGNATION	QUANTITY	SKANTI PART NUMBER
Technical manual	1	910 000 63
D-sub connector, 25 pole, male	2	751 000 66
Set of labels for 25 pole connectors	1	345 507 91
UHF plug, type PL 259	1	751 000 54
Cable lug	1	772 000 14
Ribbon cable assembly, DCU-DU	1	106 810 80
Fuse 5x20mm, 200 mA Slow	1	720 220 02

OPTIONAL ACCESSORIES

DESIGNATION		SKANTI PART NUMBER
Hook-switch assembly for TRP 8000 old handset		107 609 00
DIN connector, 6 pole, for TRP 8000 new handset		751 001 72
Cable 2x0.25mmSq screened, length: 100 metres		702 000 33
Cable 4x0.25mmSq screened, length: 100 metres		702 000 34
Cable 5x2x0.25mmSq screened, length: 100 metres		702 000 35
Cable assembly 5x2x0.25mmSq screened with 9 pole D-sub connectors, length:	3 metres	106 803 61
	10 metres	106 803 51

4. TECHNICAL DESCRIPTION Table of Contents

DSC CONTROL UNIT, DCU 9000

Block diagram: page 4-9.
Interconnection diagram: page 4-10.

The primary function of the control unit is to support the man/machine interface via keyboard, display, and visual and audible indicators. It contains following PCB's:

Control Board 901:

Contains a micro-controller unit which performs keyboard scanning, display and indicator LED driving, control of display contrast, control of display and keyboard backlight, control of loudspeaker volume, sensing of Alarm Button, and control of Alarm Out interface.

Via an asynchronous communication interface adaptor and an opto-isolated RS-232 receiver/driver a serial interface printer may be controlled if connected to the PC terminals. The opto-isolated driver is supplied from the printer. Input from navigational equipment with NMEA 183 interface are received via another opto-isolated receiver and asynchronous communication interface adaptor.

The micro-controller communicates with the microprocessor of the DU 9000 via a serial bus using the CAN (Controller Area Network) communication protocol. The baud rate on the bus is 76.8 kbits/sec and the interface to the micro-controller is made by a dedicated CAN controller chip.

A temperature sensor monitors the internal air temperature of the control unit near the LCD display to automatically adjust for the temperature dependent contrast setting variation of the display and at the same time adjust the maximum level of the display backlight intensity to highest permissible at the given temperature.

The audio amplifier feeding the built-in loudspeaker of the control unit amplifies audible alarm signals and illegal key beep signals generated by the micro-controller or may be switched to monitor RX Audio signals on the Net AF lines.

A switched mode voltage converter transforms the DCU supply voltage (nominally 24V) to the 5V needed by the digital circuitry and the LCD display and its LED backlight. The audio amplifier and keyboard backlight are supplied directly by the input voltage which may vary between 19V and 28V dependent on interconnecting cable length. A current controlled backlight driver insures that the backlight intensity is independent of the input voltage.

Front Panel Board 902:

Carries keyboard switches, LCD display and backlight, 14 keyboard backlight LEDs connected in two chains, and a relay connecting the Supply On/Off key switch to the Supply On wire to DU 9000 in the off condition and to the micro-controller of the control unit in the on condition.

Also carries a 15-pole D-sub connector for connecting auxiliary equipment and two 9-pole D-sub Net connectors for connecting the DU 9000 and possibly one or more additional units. A jumper connects a 120 ohm resistor between terminals 2 and 3 of the Net connectors, providing the necessary termination impedance of the serial data bus of the net. The jumper must be removed if the unit is not located at the end of a chain.

The optional Mounting Bracket for DCU 9000 contains following PCB:

Terminal Board 903:

Contains terminal blocks for connecting auxiliary equipment and for the Net cable to the DU 9000. Ribbon cable connectors provides for connection to the control unit.

DSC UNIT, DU 9001

Block diagram: page 4-11.
Interconnection diagram: page 4-12.

The primary functions of the DU 9001 are the DSC controller function with two independent demodulators and single channel watch reception on the MF distress and safety DSC frequency 2187.5 kHz. It contains following PCB's:

Programmable Communication Processor 717:

Contains a 80C186 16 bit microprocessor with its peripherals, a real time clock, interface circuits for alarm, handset hook, and key input signals, interface circuits for alarm and key output signals, four asynchronous communication interface adaptors for serial communication with radiotelex equipment (PC), radio equipment (PCP), printer, and navigational equipment (NMEA). The driver/receivers for PC, printer and NMEA are opto-isolated with driver power delivered from the equipment connected. Opto isolation may be disabled by inserting appropriate jumpers.

The microprocessor communicates with the micro-controller of the DCU 9000 control unit via a serial bus using the CAN (Controller Area Network) communication protocol. The baud rate on the bus is 76.8 kbits/sec and the interface to the microprocessor is made by a dedicated CAN controller chip.

Timer circuits for the modulator generates the continuous phase frequency shift keyed signal as a square wave at eight times the modulation frequency. Subsequent filtering in a transversal filter followed by a low pass analog filter leaves an FSK modulated sine wave at the desired frequency. The signal is routed through audio switches to an adjustable output amplifier. The modulator signal may also be routed to each of the demodulators for test purposes.

The input signals for the two demodulators coming from the built-in receiver via RSP AF and from an external receiver via LINE IN and connected to Demodulator 1 and 2 respectively are each filtered in an analog band-pass filter before being applied to the demodulators. The demodulators controls two timers, which forms the interface to the microprocessor.

Master Oscillator 913:

The master oscillator includes a stable oven controlled crystal oscillator (OCXO) which generates an accurate 17.325 MHz for the first mixer of the Single Channel Receiver 914.

Single Channel Receiver 914:

The single channel receiver is fixed tuned to 2187.5 kHz. It the includes antenna input protection, pre-selector, 1. mixer where the input signal is mixed with a 1.7325 MHz signal originating from the master oscillator signal divided by 10, followed by a narrow-band crystal filter with a centre frequency of 455 kHz, IF amplifier, and 2. mixer. The local oscillator signal for this is generated by a 7.2528 MHz crystal oscillator the output of which is divided by 16 to produce a frequency of 453.3 kHz. The output from the mixer is low-pass filtered and the AF signal centred around 1.7 kHz is finally amplified in an AF amplifier. A self-test facility is included comprising injection of a test signal at the input of the receiver and signal check at the AF output.

SMPS/Interconnection 930:

The Switched Mode Power Supply part includes control and protection circuit. The SMPS generates all the voltages needed in the DSC 9000 galvanically isolated from the battery. The SMPS is protected against wrong input voltage level and polarity.

The interconnection part includes a splitter for the antenna signal allowing an additional receiver to be connected to the same antenna, and a relay which in standby directs modulation output from an external modem to the transmitter.

DSC UNIT, DU 9006

Block diagram: page 4-13.
Interconnection diagram: page 4-14.

The primary functions of the DU 9006 are the DSC controller function with two independent demodulators and scanning watch reception on up to six MF/HF DSC frequencies. It contains following PCB's:

Programmable Communication Processor 717:

See description above.

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 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 Receiver Signal Path 915. 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 713:

The master oscillator includes a highly stable oven controlled crystal oscillator (OCXO) which generates an accurate 17.8176 MHz reference signal for Synthesizer Board 711.

Receiver Signal Path 915:

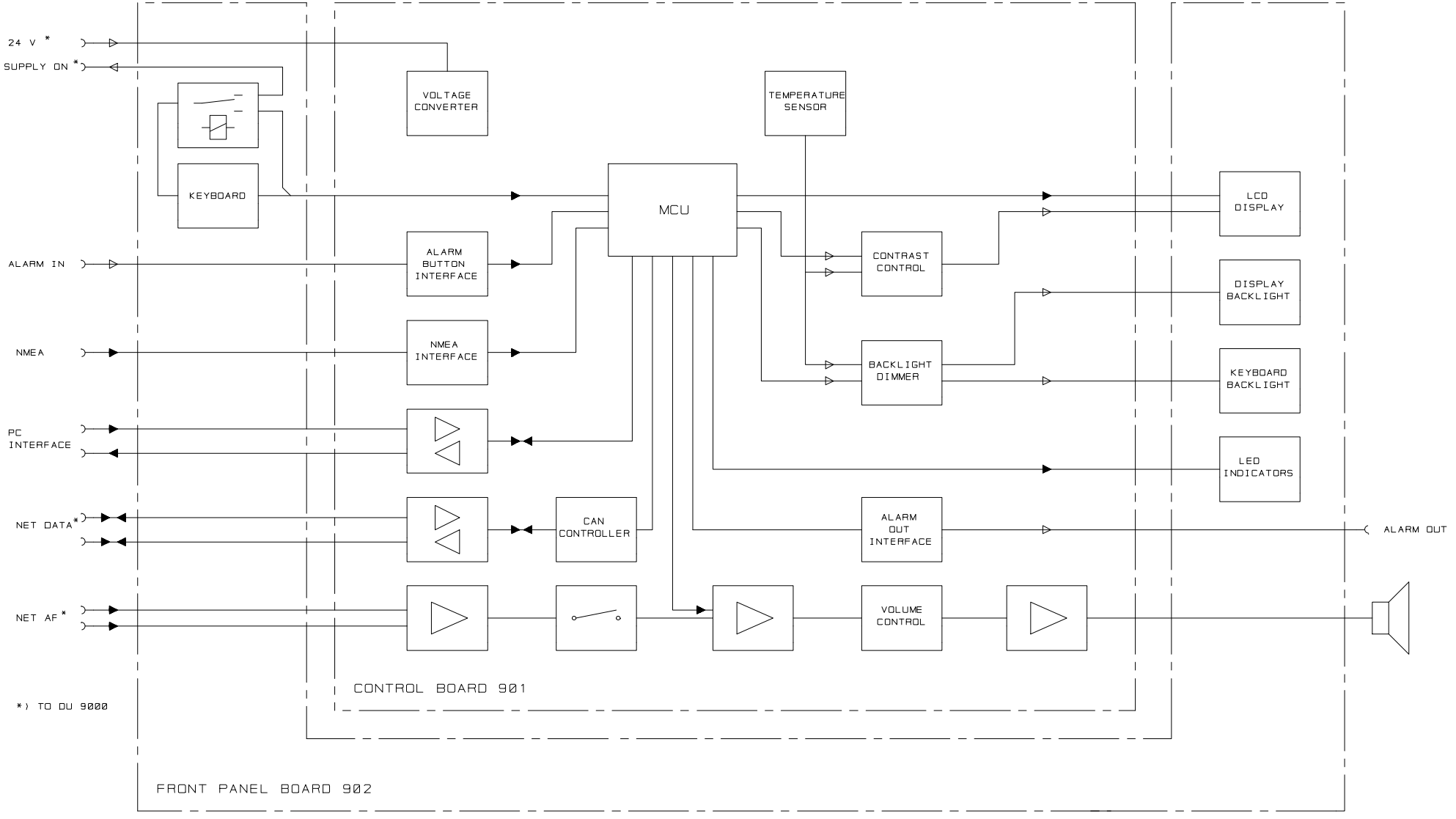
The receiver signal path includes antenna input protection, pre-selector, 1. mixer where the input signal is mixed with the 1. local oscillator of the synthesizer, followed by a 45 MHz crystal filter, 1. IF amplifier, and 2. mixer. The local oscillator frequency for this is 44.544 MHz corresponding to a 2. IF frequency of 455 kHz. The 2. IF filter is a narrow-band crystal filter. In the 3. mixer the IF signal is mixed with 456.7 kHz producing an AF signal centred around 1.7 kHz. A self-test facility is included comprising injection of test signals at the 1. mixer from the synthesizer and signal check at the AF output.

SMPS/Interconnection 930:

See description above.

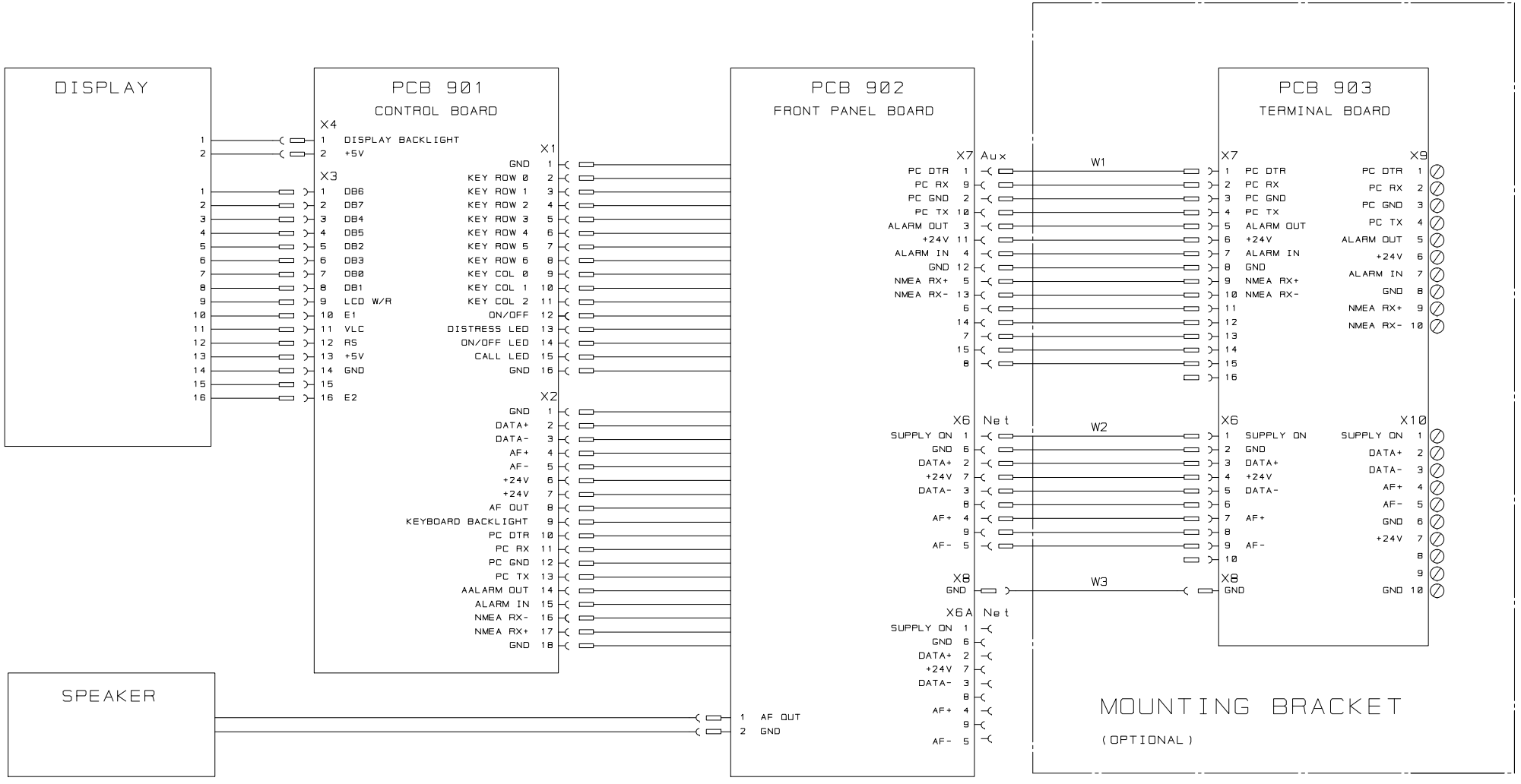
BLOCK DIAGRAM DCU 9000

DSC CONTROL UNIT



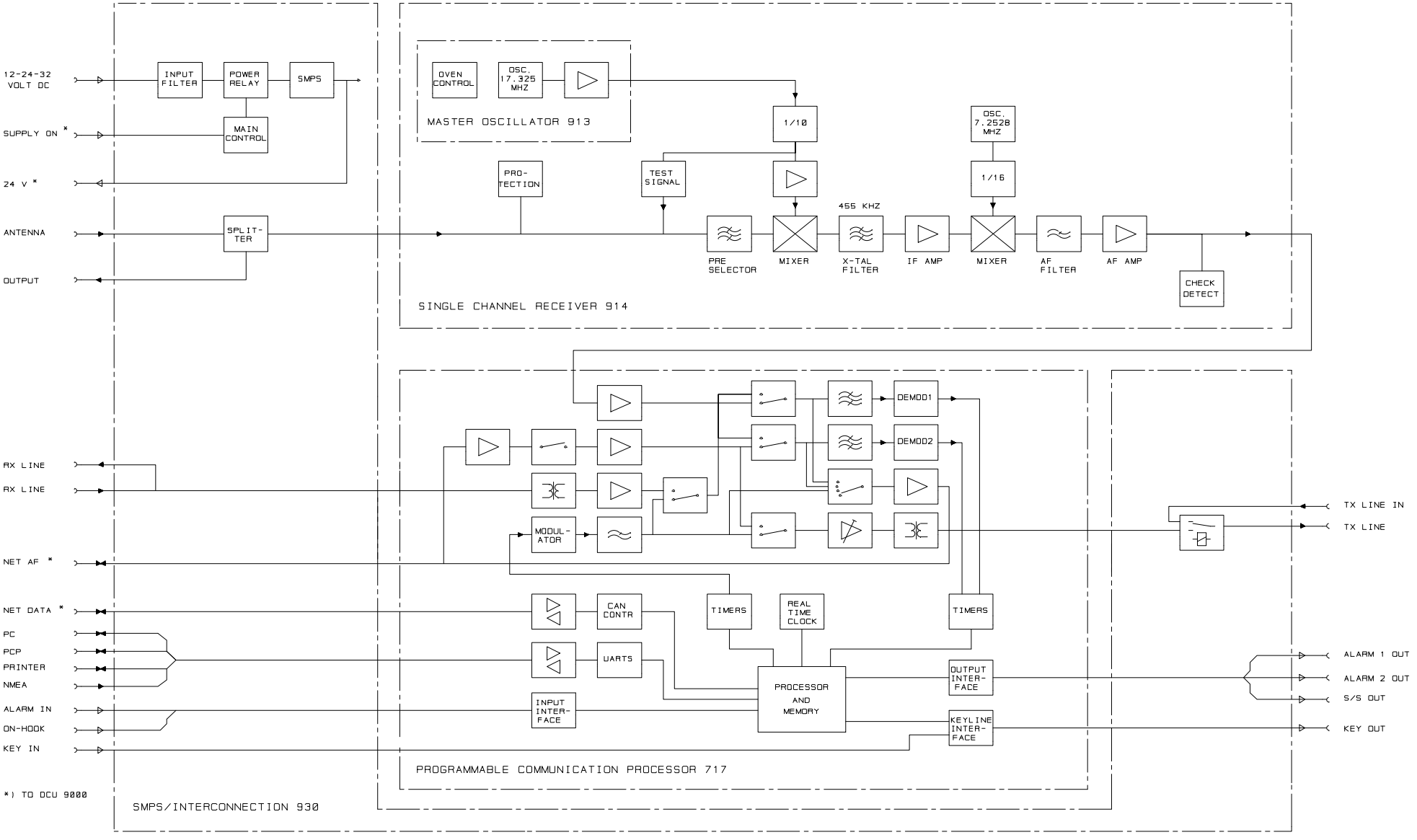
INTERCONNECTION DIAGRAM DCU 9000

DSC CONTROL UNIT



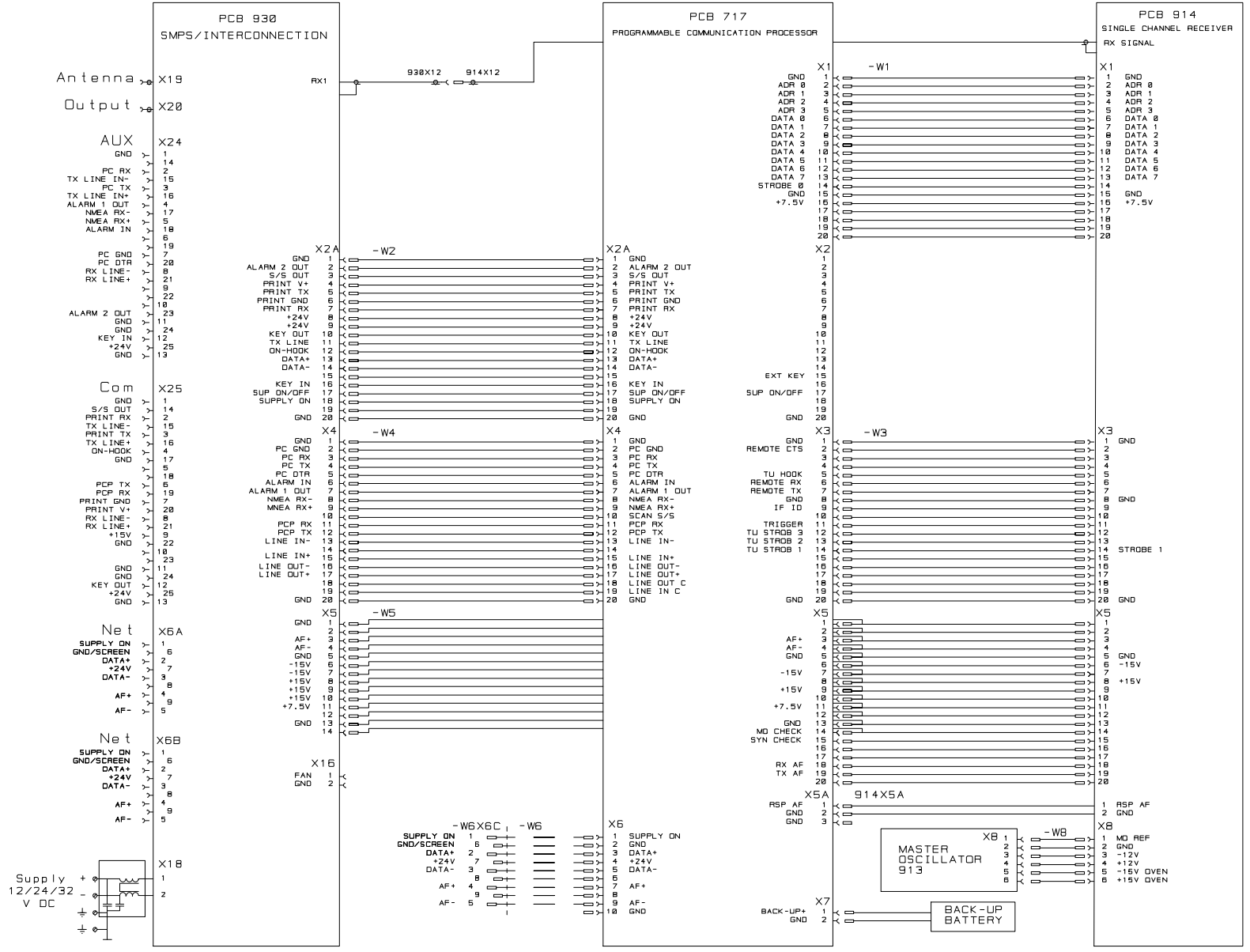
BLOCK DIAGRAM DU 9001

DSC UNIT



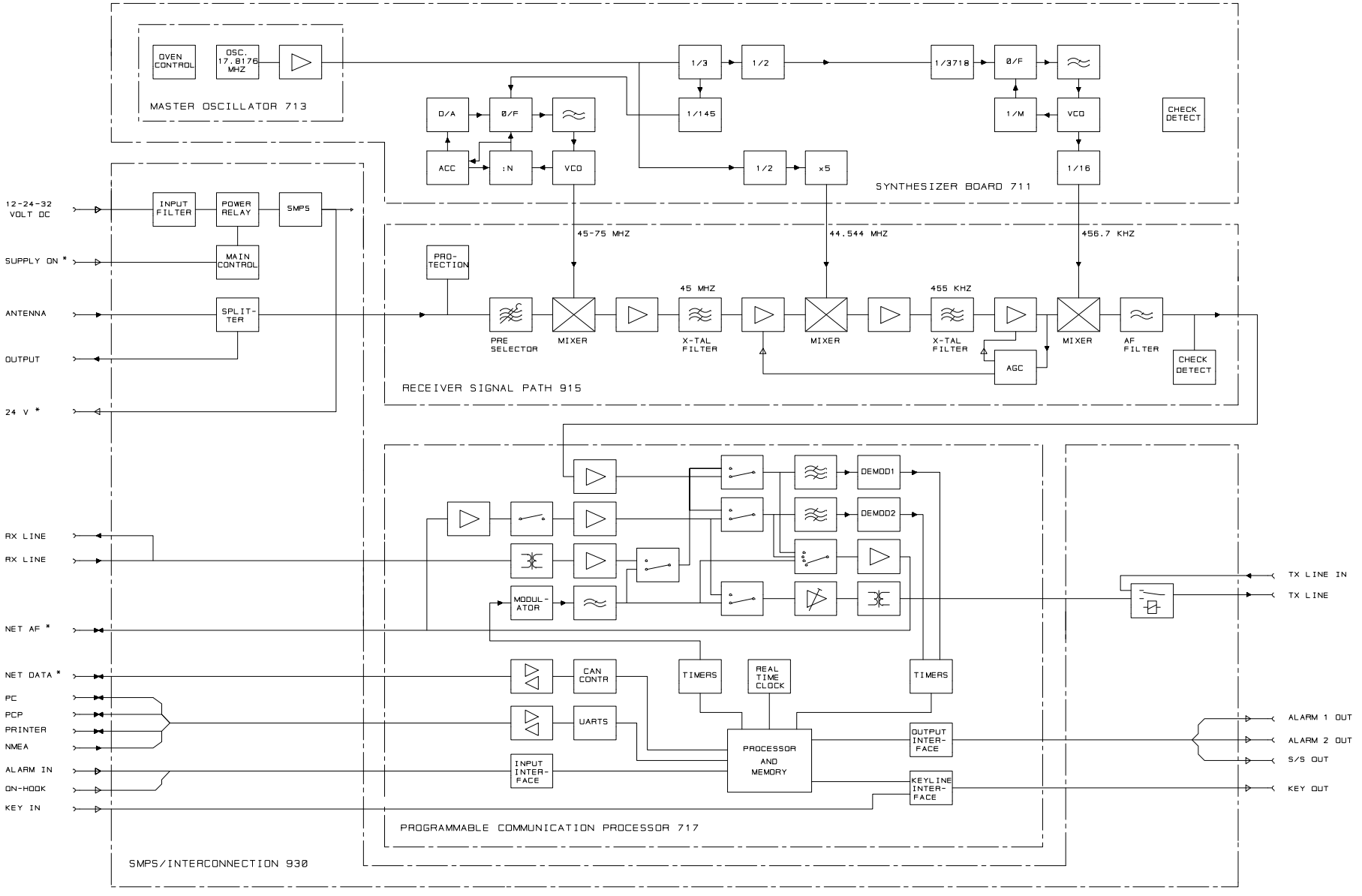
INTERCONNECTION DIAGRAM DU 9001

DSC UNIT



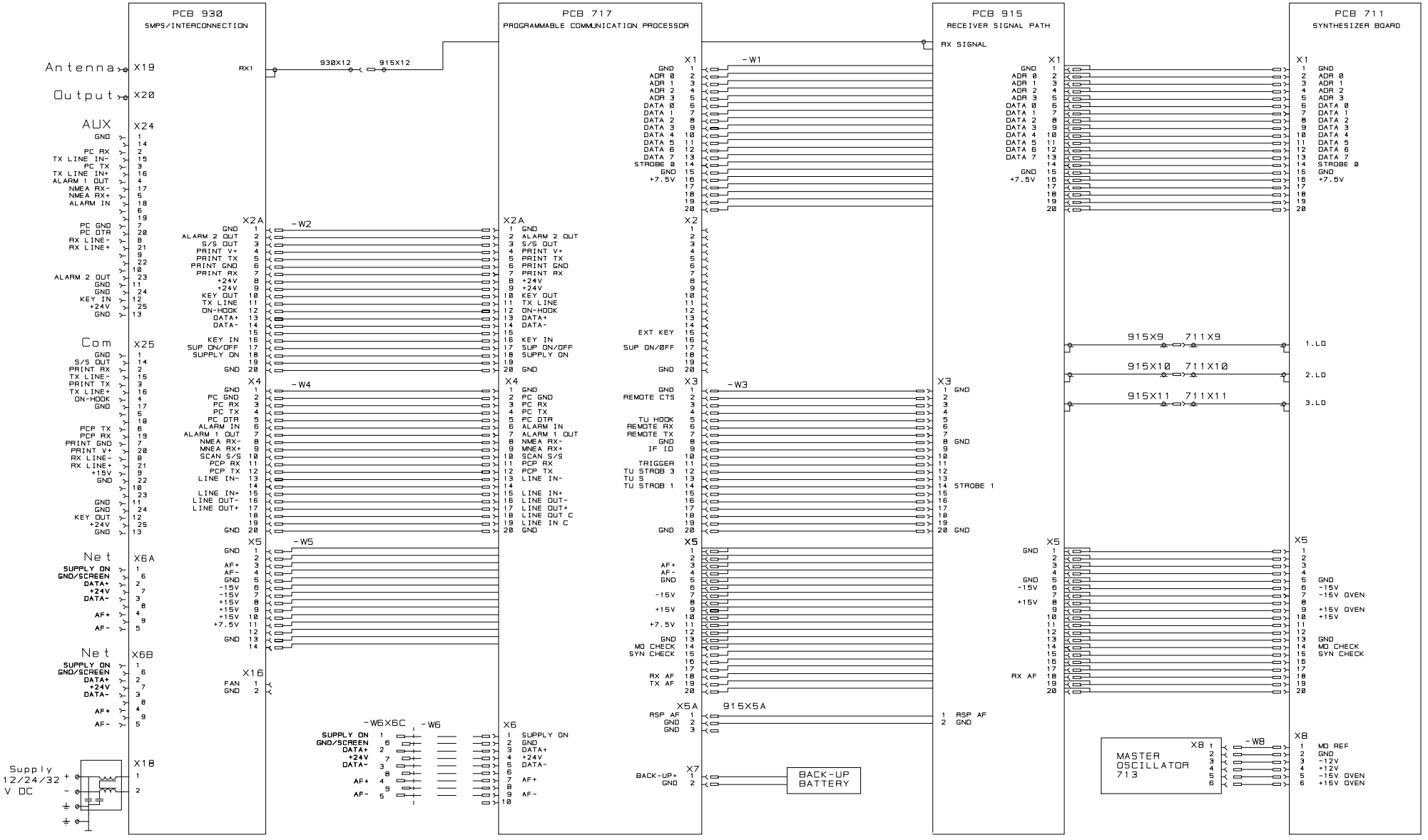
BLOCK DIAGRAM DU 9006

DSC UNIT



INTERCONNECTION DIAGRAM DU 9006

DSC UNIT



5. SERVICE Table of Contents

PREVENTIVE MAINTENANCE

Realignment of Master Oscillator 713 (DSC 9006 only)

The Master Oscillator frequency should be checked at least once a year. The Master Oscillator determines the exact receive frequency 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:

   Frequency counter: Frequency range 100 MHz
   Input impedance 50 ohms
   Sensitivity at least 0.2 V_{RMS}
   Accuracy better than 0.01 ppm

2. Preparations:

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

   2.2 Remove the front cover of the DU 9006.

   2.3 Locate and disconnect 711X10 carrying the 2. Local Oscillator signal from the Synthesizer Board 711 to Receiver Signal Path 915. Connect the frequency counter to the X10 socket on the synthesizer.

   2.4 The ambient temperature should be between 10 and 30 deg. Celsius. 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 the 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 +/- 1 Hz.

   3.3 Re-connect X10 and refit the front cover.

Replacement of back-up battery

The DSC 9000 uses a lithium battery to back-up the memory when power supply is switched off.
The expected battery life time is minimum 6 years.
The manufacturing date is marked on the battery.
When servicing the equipment, always check the date on the battery and replace if the minimum battery life time has expired or expires in the near future.

1. Turn on the DSC 9000. This will prevent loss of memory content.

2. Remove the front cover of the DU 9001/6.

3. Disconnect the battery plug.

4. Remove the battery container from its compartment by pulling the nylon string.

5. Read the manufacturing date on the battery. If life time is due to expire, replace the complete battery container.
   Skanti part number 107 811 60.

6. Push the battery container back into its compartment and connect the battery plug.

7. The DSC 9000 may now be turned off without loosing memory content.

Warning:
The battery contains lithium. Do not recharge, disassemble, heat above 100 deg.C, incinerate, or expose contents to water.

SELF-TEST

The Self-test menu is selected by pressing:

Main Menu **>TEST<** Enter **>SELF-TEST<** Enter

Automatic self-test is performed to check all test-steps in the self-test. It will stop if a test-step fails or all tests are completed. If a test-step fails the test will stop and display the failing test-step number, the failing part of the DSC, the possible cause of failure and an error code. A description of each test-step along with the error code explanation is listed in this chapter.

Self-test example:
completed without fail.

```
TEST      Automatic Self-test
Completed          19 steps ok
                    0 bypassed
                    0 failed                >END<
```

Fig. 1

Self-test example:
completed with 2 fails.

```
TEST      Automatic Self-test
03  Synthesizer test:                    Failed

Error code: 0301          >CONTINUE< END
```

Fig. 2

```
TEST      Automatic Self-test
04  Synthesizer test:                    Failed

Error code: 0411          >CONTINUE< END
```

Fig. 3

```
TEST      Automatic Self-test
Completed          19 steps ok
                    0 bypassed
                    2 failed          >END<
```

Fig. 4

The error code consists of step number (2 digits), indication of previus faults (1 digit: 0=no, 1=yes) and failure type (1 digit).

If an additional DU is connected a Self-test on that is included in the sequence. The display will indicate that DU 2 is tested.

Test-step description and error code explanation

DSC 9001:

Step no. 01 Receiver test.

Tests Single Channel Receiver PCB 914.
The receiver is muted. The AF Detector at the output checks that no signal is present.

The test is OK if $\overline{\text{AF CHECK}}$=1

Error code	Possible error source
0101	PCB 914 or cable
0102	RSP AF cable or PCB 717

Step no. 02 Receiver test.

Tests Single Channel Receiver PCB 914.
A 2187.5 kHz test signal is generated locally and injected at the pre-selector input of the receiver. The signal passes the receiver where it is mixed to a 1.7 kHz tone. The AF Detector at the output checks that signal is present.

The test is OK if $\overline{\text{AF CHECK}}$=0

Error code	Possible error source
0201	PCB 914 or cable
0202	RSP AF cable or PCB 717

Step no. 03 EEPROM test

Tests Programmable Communication Processor PCB 717.
Checks and re-writes the EEPROM.

The test is OK if the checksum is correct.

Error code	Possible error source
1801	PCB 717

Step no. 04 DCU test

Tests the DCU 9000.

Error code	Test	Possible error source
1901	Audio/Speaker	PCB 901, cable, PCB 902, speaker
1902	Display backlight	Display, PCB 901
1903	Keyboard backlight	PCB 902, cable, PCB 901
1904	Contrast circuit	PCB 901, display
1905	Distress LED	PCB 902, cable, PCB 901
1906	Call LED	PCB 902, cable, PCB 901
1907	Supply LED	PCB 902, cable, PCB 901

DSC 9006:

Step no. 01 Master Osc. test.

Tests if Master Oscillator is oscillating, using MO check.

Error code	Possible error source
0101	PCB 713, PCB 711, cable

Step no. 02 Synthesizer test.

Tests Synthesizer PCB 711 all local oscillators.
Tests that synthesizer is able to lock in mid-range.

Band: 45 - 52.5 MHz
1. LO: 50.00000 Hz
3. LO: 456.7 kHz

The test is OK if SYNCHECK=1

Error code	Possible error source
0201	PCB 711 or cable

Step no. 03 Synthesizer test.

Tests Synthesizer PCB 711 1. LO.
Tests 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: 456.7 kHz

The test is OK if SYNCHECK=0

Error code	Possible error source
0301	PCB 711 or cable

Step no. 04 Synthesizer test.

Tests Synthesizer PCB 711 1. LO.
Tests if 1. LO is able to lock in band 0 low border.

Band: 45 - 52.5 MHz
1. LO: 45.00000 MHz
3. LO: 456.7 kHz

The test is OK if SYNCHECK=1

Error code	Possible error source
0401	PCB 711 or cable

Step no. 05 Synthesizer test.

Tests Synthesizer PCB 711 1. LO.
Tests if 1. LO is able to lock in band 0 high border.

Band: 45 - 52.5 MHz
1. LO: 52.50000 MHz
3. LO: 456.7 kHz

The test is OK if SYNCHECK=1

Error code	Possible error source
0501	PCB 711 or cable

Step no. 06 Synthesizer test.

Tests Synthesizer PCB 711 1. LO.
Tests if 1. LO is able to lock in band 1 low border.

Band: 52.5 - 60 MHz
1. LO: 52.50000 MHz
3. LO: 456.7 kHz

The test is OK if SYNCHECK=1

Error code	Possible error source
0601	PCB 711 or cable

Step no. 07 Synthesizer test.

Tests Synthesizer PCB 711 1. LO.
Tests if 1. LO is able to lock in band 1 high border.

Band: 52.5 - 60 MHz
1. LO: 60.00000 MHz
3. LO: 456.7 kHz

The test is OK if SYNCHECK=1

Error code	Possible error source
0701	PCB 711 or cable

Step no. 08 Synthesizer test.

Tests Synthesizer PCB 711 1. LO.
Tests if 1. LO is able to lock in band 2 low border.

Band: 60 - 67.5 MHz
1. LO: 60.00000 MHz
3. LO: 456.7 kHz

The test is OK if SYNCHECK=1

Error code	Possible error source
0801	PCB 711 or cable

Step no. 09 Synthesizer test.

Tests Synthesizer PCB 711 1. LO.
Tests if 1. LO is able to lock in band 2 high border.

Band: 60 - 67.5 MHz
1. LO: 67.50000 MHz
3. LO: 456.7 kHz

The test is OK if SYNCHECK=1

Error code	Possible error source
0901	PCB 711 or cable

Step no. 10 Synthesizer test.

Tests Synthesizer PCB 711 1. LO.
Tests if 1. LO is able to lock in band 3 low border.

Band: 67.5 - 75 MHz
1. LO: 67.50000 MHz
3. LO: 456.7 kHz

The test is OK if SYNCHECK=1

Error code	Possible error source
1001	PCB 711 or cable

Step no. 11 Synthesizer test.

Tests Synthesizer PCB 711 1. LO.
Tests if 1. LO is able to lock in band 3 high border.

Band: 67.5 - 75 MHz
1. LO: 75.00000 MHz
3. LO: 456.7 kHz

The test is OK if SYNCHECK=1

Error code	Possible error source
1101	PCB 711 or cable

Step no. 12 Synthesizer test.

Tests Synthesizer PCB 711 3. LO.
Tests if 3. LO is able to get out of lock to check that microprocessor can control 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
1201	PCB 711 or cable

Step no. 13 Synthesizer test.

Tests Synthesizer PCB 711 3. LO.
Tests if 3. LO is able to lock at low border.

Band: 67.5 - 75 MHz
1. LO: 70.0000 MHz
3. LO: 452.57 kHz

The test is OK if SYNCHECK=1

Error code	Possible error source
1301	PCB 711 or cable

Step no. 14 Synthesizer test.

Tests Synthesizer PCB 711 3. LO.
Tests if 3. LO is able to lock at high border.

Band: 67.5 - 75 MHz
1. LO: 70.0000 MHz
3. LO: 460.50 kHz

The test is OK if SYNCHECK=1

Error code	Possible error source
1401	PCB 711 or cable

Step no. 15 Rx signal path test.

Tests Rx Signal Path PCB 915 I/O register addressing.
Reads the OPTION INST signal.

The test is OK if VERSION-0=1

Error code	Possible error source
1501	PCB 915 jumper or cable

Step no. 16 Rx signal path test.

Tests Rx Signal Path PCB 915.

The pre-selector and the synthesizer is set-up so no signal passes the receiver. The AF Detector at the output checks that no signal is present.

Pre-selector: PRE 0
Band: 67.5 - 75 MHz
1. LO: 75.0000 MHz
3. LO: 456.7 kHz

The test is OK if $\overline{\text{AF CHECK}}$=1

Error code	Possible error source
1601	PCB 915 or cable
1602	RSP AF cable or PCB 717

Step no. 17 Rx signal path test.

Tests Rx Signal Path PCB 915.
By choosing the right synthesizer frequency the signal passes the 45 MHz filter and is mixed to a 1.7 kHz tone in the audio part of the receiver. The AF Detector at the output checks that signal is present.

Band: 45 - 52.5 MHz
1. LO: 44.99900 MHz
3. LO: 456.7 kHz

The test is OK if $\overline{\text{AF CHECK}}$=0

Error code	Possible error source
1701	PCB 915 or cable
1702	RSP AF cable or PCB 717

Step no. 18 EEPROM test

Tests Programmable Communication Processor PCB 717.
Checks and re-writes the EEPROM.

The test is OK if the checksum is correct.

Error code	Possible error source
1801	PCB 717

Step no. 19 DCU test

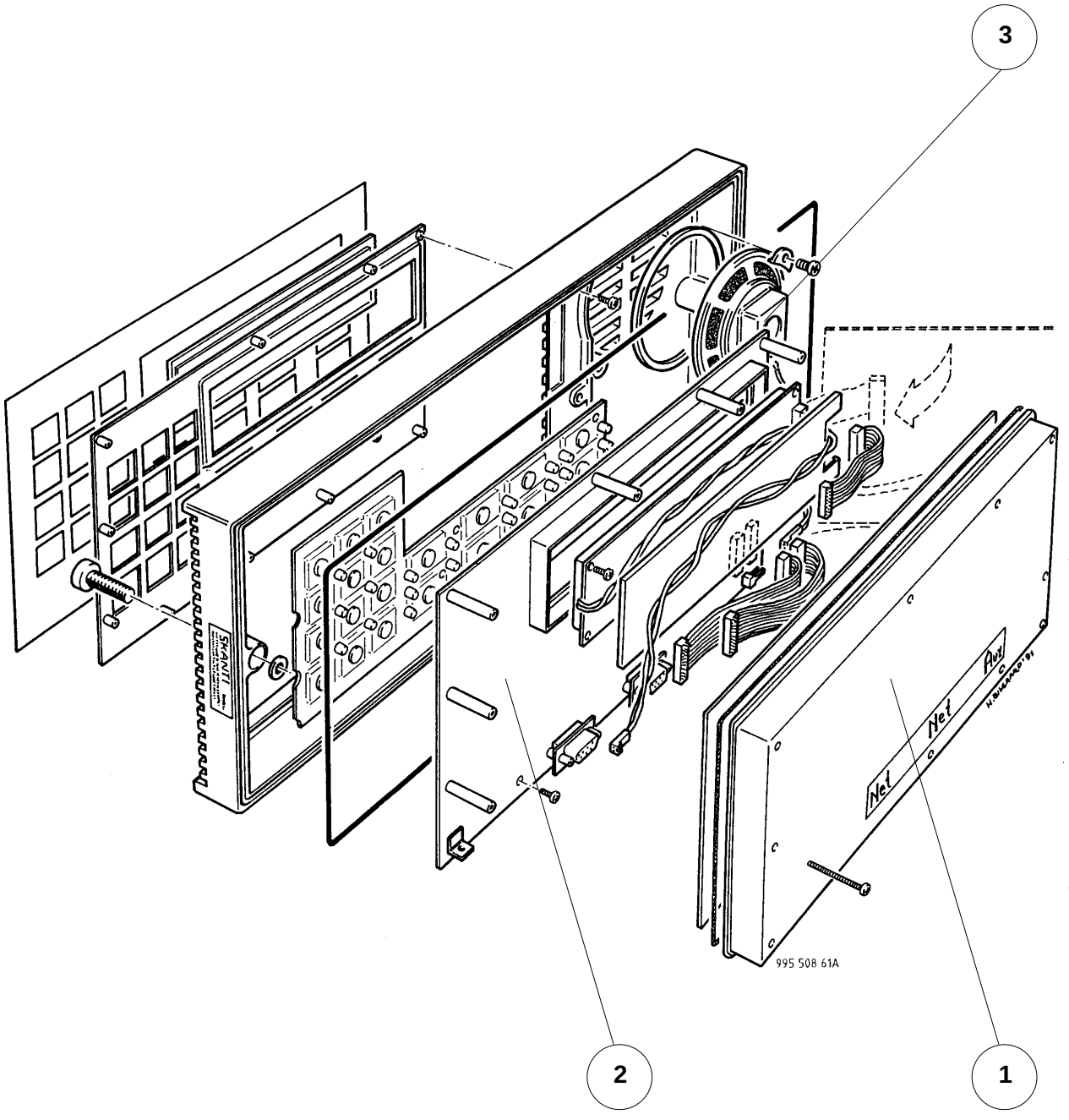
Tests the DCU 9000.

Error code	Test	Possible error source
1901	Audio/Speaker	PCB 901, cable, PCB 902, speaker
1902	Display backlight	Display, PCB 901
1903	Keyboard backlight	PCB 902, cable, PCB 901
1904	Contrast circuit	PCB 901, display
1905	Distress LED	PCB 902, cable, PCB 901
1906	Call LED	PCB 902, cable, PCB 901
1907	Supply LED	PCB 902, cable, PCB 901

DSC 9000 SPARE-PARTS

DSC CONTROL UNIT SPARE-PARTS

Position	Designation	SKANTI part no.
1	Control Board 901	107 890 11
2	Front Panel Board 902	107 890 21
3	Loudspeaker 50 ohms 1W	860 000 10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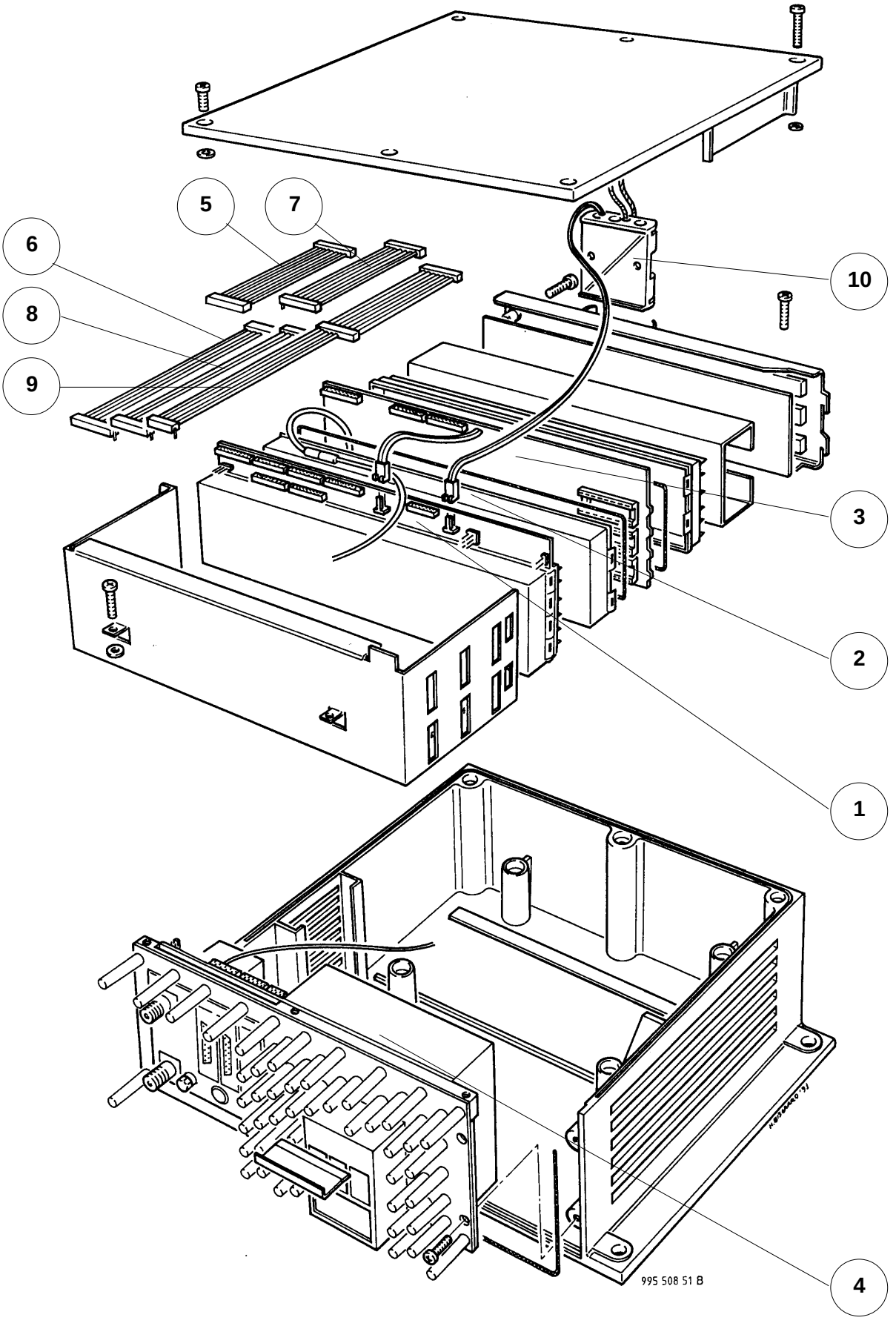
DSC UNIT 9001 SPARE-PARTS

Position	Designation	SKANTI part no.
1	Programmable Communication Processor 717 incl. screen covers.	107 805 60
2	Master Oscillator 913 (located on Single Ch. Receiver 914)	107 891 31
3	Single Channel Receiver 914 incl. Master Oscillator 913 and screen covers.	107 812 10
4	SMPS / Interconnection Assembly 930	107 809 80
5	W1 Ribboncable	106 811 10
6	W2 Ribboncable	106 811 00
7	W3 Ribboncable	106 811 10
8	W4 Ribboncable	106 811 00
9	W5 Ribboncable	106 811 50
10	Battery Container incl. batteries	107 811 60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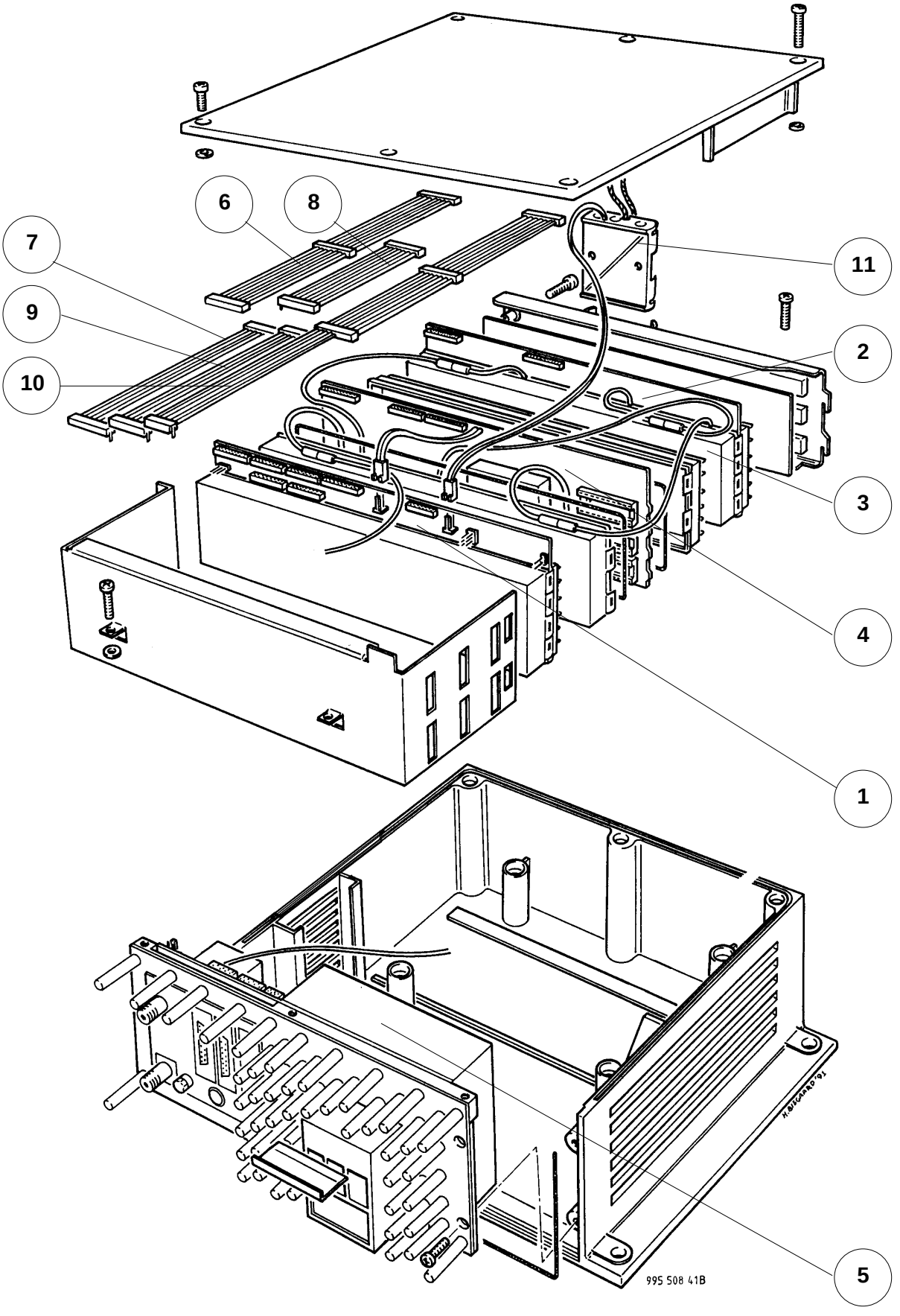
DSC UNIT 9006 SPARE-PARTS

Position	Designation	SKANTI part no.
1	Programmable Communication Processor 717 incl. screen covers.	107 805 60
2	Synthesizer Board 711 incl Master Oscillator 713 and screen covers.	107 805 90
3	Master Oscillator 713 (located on Synthesizer Board 711)	107 871 31
4	Receiver Signal Path 915 incl. screen covers	107 812 00
5	SMPS / Interconnection Assembly 930	107 809 80
6	W1 Ribboncable	106 811 30
7	W2 Ribboncable	106 811 00
8	W3 Ribboncable	106 811 10
9	W4 Ribboncable	106 811 00
10	W5 Ribboncable	106 811 20
11	Battery Container incl. batteries	107 811 60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HM 11.06.96