



# **SAILOR** RT4722 VHF-DSC DUPLEX Installation Manual

# Introduction

## S. P. Radio A/S

For more than half a century S. P. Radio A/S has been the market leader within maritime radio communication.

## SAILOR

The communication products and systems of S. P. Radio are recognized under the brand name SAILOR. The Sailor name has become a guarantee of reliable and technologically superior radio equipment, ranging from basic VHF units to satellite systems and complete compact GMDSS solutions.

## Products

The SAILOR COMPACT 2000 GMDSS is based on the well proven range of Sailor products specifically developed to meet the GMDSS requirements and supported by a world-wide Certified GMDSS service concept, giving several hundred reasons for shipping companies to choose equipment manufactured by S. P. Radio A/S. Today S. P. Radio A/S is recognized as the world's leading supplier of GMDSS solutions.

The SAILOR COMPACT 2000 GMDSS has already been and still is constantly supplied to a large number of the world's leading shipping companies and national naval fleets. It is a complete GMDSS solution which matches communication and safety needs exactly - regardless of whether you operate with A1, A2, A3 or A4.

The System 4000 GMDSS sets new standards. It is constructed on the basis of our comprehensive experience developing GMDSS equipment. It satisfies all the relevant requirements regarding safety and efficiency. The System 4000 presents a large number of attractive convenience and safety facilities, either as a complete solution or as a series of stand-alone products.

Sailor has a long history as a satellite communications supplier offering a full programme of satellite systems which includes Mini M, SAT-C and a number of stationary satellite systems. Our SAT-B is a breakthrough in maritime aerial technology and reliability. The SAT-B is the best possible choice when high quality speech transmission, top level security and the capacity to deal with large volumes of telex, fax, data and high-speed data (HSD) transmissions are required.

## Training certification

Training of deck officers to meet the requirements within the concept of GMDSS, as to operation of equipment and basic understanding of the systems, is an extremely important factor for the overall success-

ful implementation of GMDSS. As a unique initiative for GMDSS solutions, we can supply a complete software training programme for on-board training, to be used as preparation in order to fulfil the GMDSS requirements for obtaining the General Operation Certificate.

## Service

A world-wide Sailor GMDSS certified service concept has been established in order to provide the shipping industry with a highly professional and uniform level of service. The Sailor GMDSS Certified Service Centre concept, which is constantly monitored, ensures that replacement units and spare parts are available at all the Sailor Certified Service Centres around the world. Service centres which are in position along all the major shipping routes. Furthermore the Certified Service Centres ensure that technicians with an annually updated training are ready to provide service 24 hours a day, 365 days a year.

## Maintenance

Because of the fact that GMDSS equipment has been installed on board ships in order to meet the SOLAS (Safety of Life At Sea) convention, manufacturers and suppliers of GMDSS equipment have a certain responsibility to secure reliable supplies of equipment and spares in the years to come.

Therefore shipowners operating ships both locally and internationally should be fully aware of the importance of fitting GMDSS solutions which will be fully supported by the manufacturer.

It is a firm policy of S. P. Radio A/S, as the world's major manufacturer and supplier of GMDSS solutions, that for both the present GMDSS solutions and for future, alternative product solutions, all Sailor GMDSS systems will be entering the next century, in fully parallel production.

## Please note

Any responsibility or liability for loss or damage in connection with the use of this product and the accompanying documentation is disclaimed.

The information in this manual is furnished for informational use only, is subject to change without notice, may contain errors or inaccuracies, and represents no commitment whatsoever.

This agreement is governed by the laws of Denmark.

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# Contents

<b>1</b>	<b>Technical Specification .....</b>	<b>2</b>
<b>2</b>	<b>Installation .....</b>	<b>4</b>
2.1	Mounting Possibilities .....	4
2.2	Power Supply .....	7
2.3	Aerial .....	7
2.3.1	Placing the Aerials .....	8
2.4	Handset Connection .....	8
2.5	Loudspeaker Connection .....	9
2.6	Connectors .....	9
2.6.1	SPARC-Bus Cable .....	10
2.6.2	Options Connector H4992 .....	11
2.7	Cable Length .....	12
2.7.1	Power Cable .....	12
2.8	Electrical Connections .....	12
2.8.1	Power Connectors .....	12
2.8.2	Interconnection Cable Specification For VHF Printer Connection .....	13
2.9	Compass Safety Distance .....	13
2.10	Test Procedure TX/RX DSC Call .....	14

# 1 Technical Specification

Conforms to all relevant international requirements and resolutions as agreed by ETSI, IEC, ITU, and IMO as well as other national requirements. These specifications include ETS 300 162, ETS 300 338, IEC 945, IEC 1097-3 and IEC 1097-7.

## General information

Normal channels	All int. ch's for 25 kHz operation. Up to 40 private channels.
Opt. channels	All int. ch's for 12.5 kHz operation. Up to 224 ch's with up to 54 private ch's.
Channel spacing	25 kHz / opt. 12.5 kHz
Frequency range	Rx/Tx: 150.800 MHz - 157.425 MHz. Rx: 160.625 MHz - 163.6 MHz.
Operating modes	Simplex/Semi-duplex/duplex.
Modulation	G3EJN for telephony receiver G2B for DSC signaling
Frequency stability	±10 ppm/ opt. ± 5 ppm
Aerial connectors	Standard 50 ohm female, SO239
Temperature range	-15° C to +55° C
Supply voltage	13.2V DC Nominal
Supply range	10.8V DC to 15.6V DC
Supply current	Stand-by 0.14A Transmitter on 1.5A (Low power) Transmitter on 6.5A (High power)
Transceiver dimen.	H*W*D 100*200*259mm.
Transceiver weight	3.9 kg

## Receiver

Sensitivity for:	
12 dB SINAD	-118 dBm or 0.28 µV p.d.
AF rated power	
Output 1	4W/ 4 Ω
Output 2	6W/ 4 Ω
Distortion THD	Below 5%
Signal/noise ratio	Better than 40 dB
AF response	- 6 dB/octave
Spurious emission	Below 2 nW
Spurious resp. att.	More than 70 dB

Duplex spurious resp. att.	More than 70 dB
Duplex desensitiation	Below 3 dB
Intermodulation att.	More than 68 dB
Co-channel rejection	Better than -10 dB
Adj. ch. selectivity	More than 70 dB
Blocking	More than 90 dB $\mu$ V

**Transmitter**

RF output power *	High 25W + 0 dB to -0.5 dB Low 0.9W +0.5 dB to - 1 dB
Adj. ch. power	Below -70 dBc
Spurious radiation	Below 0.25 $\mu$ W
Cabinet radiation	Below 0.25 $\mu$ W
AF response	+ 6 dB/octave
Distortion	Below 5%
Signal/noise ratio	Better than 40 dB

**DSC Facilities:**

DSC operation	According to Rec. ITU-R M.541-6 and Rec. ITU-R M.689-2
DSC protocol	According to Rec. ITU-R M.493-7 class A
Navigator interface	NMEA 0183, GGA, GLL, ZDA NMEA input current 8mA type
Symbol error rate below $1 \cdot 10^{-2}$ at Modulation	-119 dBm or 0.25 $\mu$ V p.d. 1700 Hz $\pm$ 400 Hz 1200 baud $\pm$ 30 ppm
Frequency error	Below $\pm$ 1 Hz
Residual DSC-mod.	Below - 26 dB

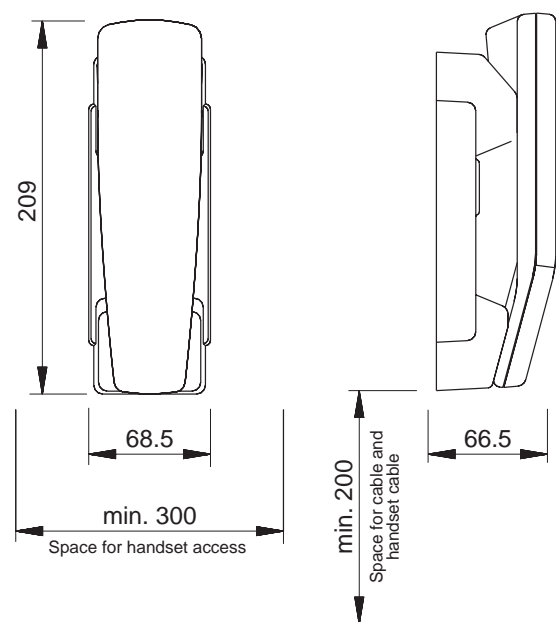
\* Note: The transmitter has a built in temperature sense function that will reduce the output power from 25W to 1W if the radio is getting too hot. This may happen if there is no free air circulation around the radio.

## 2 Installation

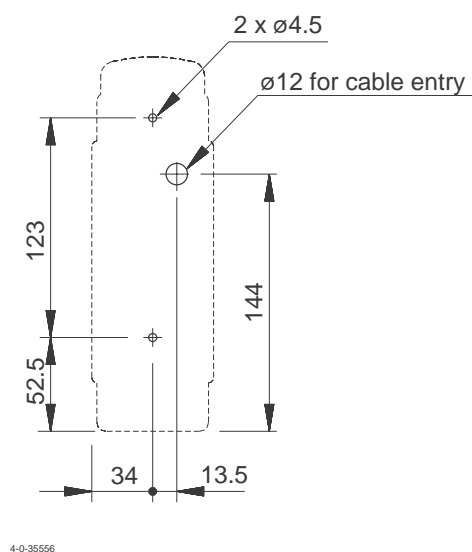
### 2.1 Mounting Possibilities

Mounting possibilities, dimensions and drilling plan

#### Handset



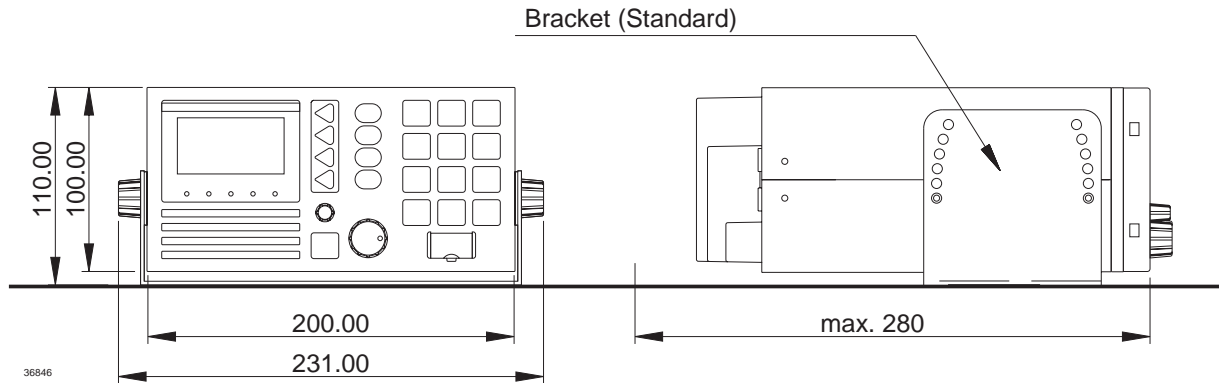
#### Drilling Plan



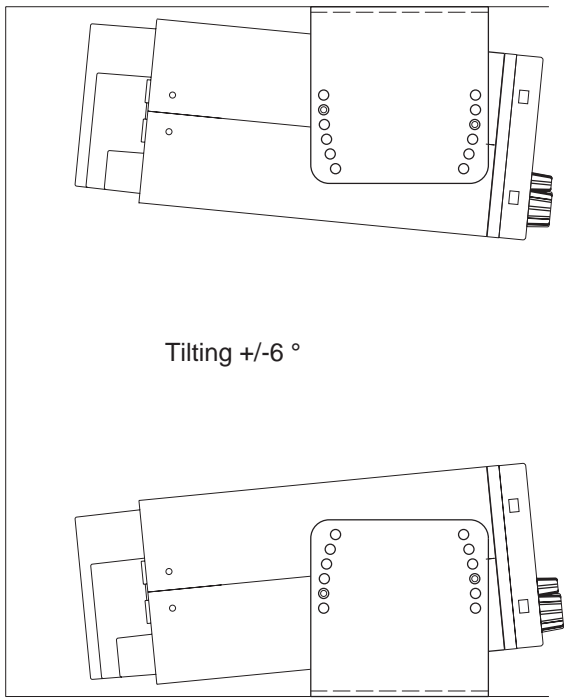
**Weight:**  
Handset

0.4 kg

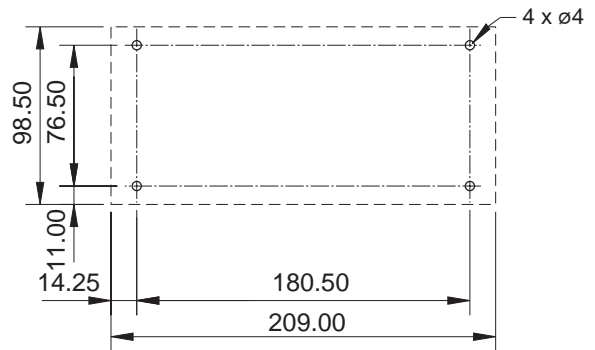
### VHF-DSC DUPLEX With Mounting Bracket



### Mounting Option



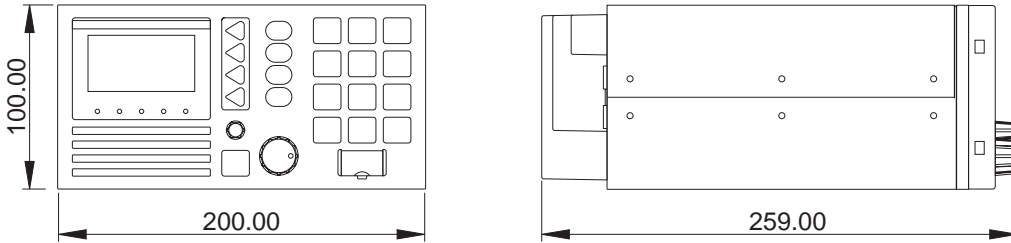
### Drilling plan



**Weight:**  
VHF-DSC DUPLEX  
Mounting Bracket

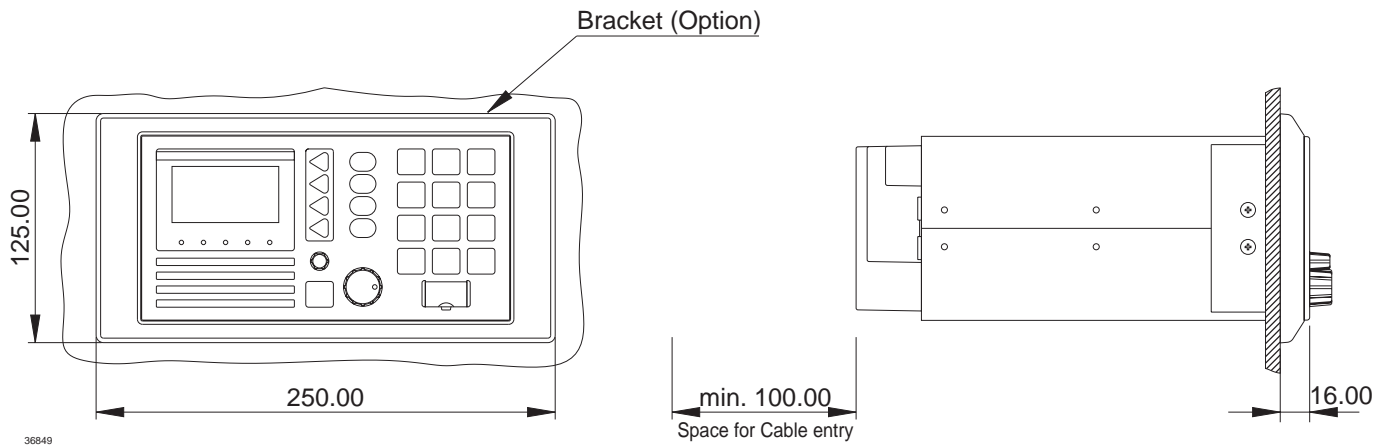
3.9 kg  
0.7 kg

**VHF-DSC DUPLEX**



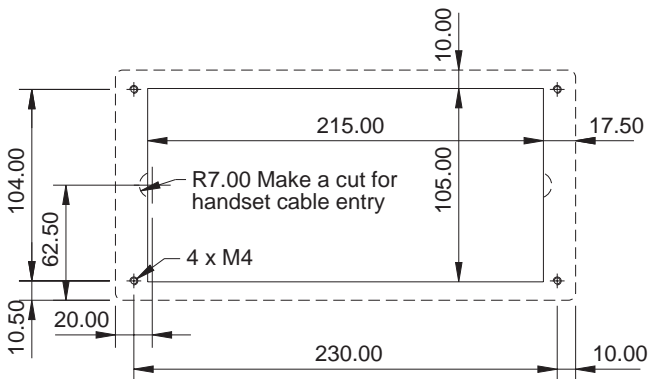
36848

**VHF-DSC DUPLEX With Mounting Bracket MB4994 (Flush mounting)**



36849

**Drilling Plan**



4-0-36006

**Weight:**  
 Mounting Bracket MB4994  
 (Part no. 80499410) 0.2 kg

**WARNING:**  
 Only use original screws; otherwise you risk short-circuiting the battery ground to the ship ground.

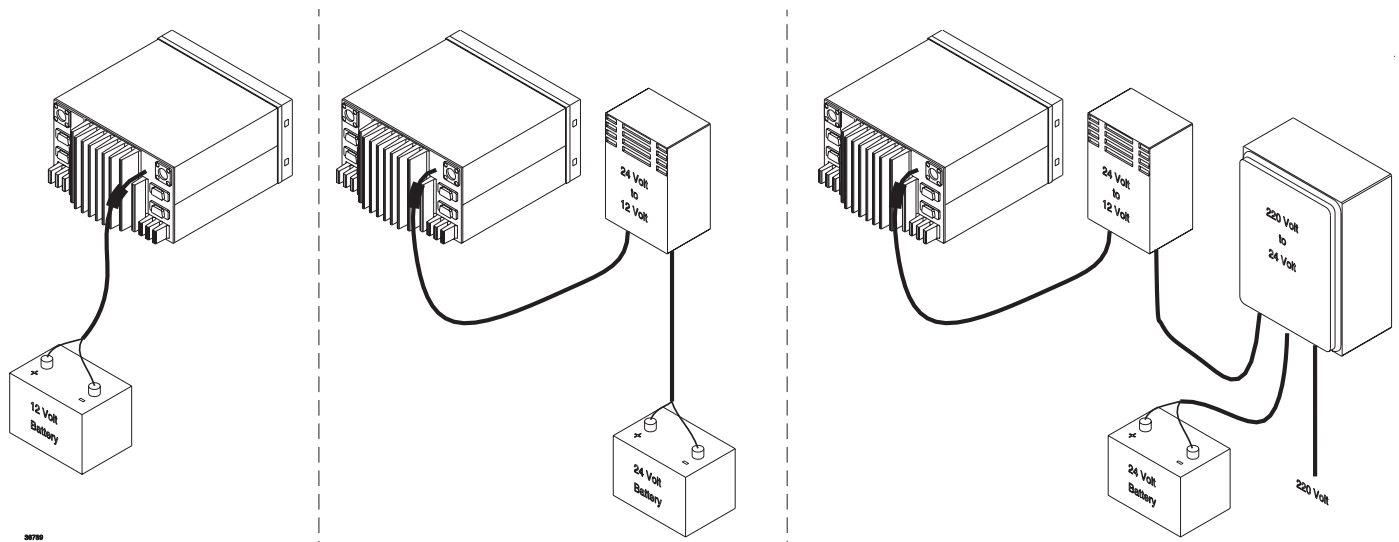


## 2.2 Power Supply

The standard power supply for the VHF unit is 12V DC.

For 24V DC supply an external power supply with the type number N420 can be used. The N420 is in principle a 24V DC to 13.2V DC serial regulator.

For 110V AC, 127V AC, 220V AC or 237V AC operation, an external power supply with the type number N163S must be used together with N420.



### Fuse

The fuse is a standard 10A mini car fuse. There is a spare fuse in the power cable connector.

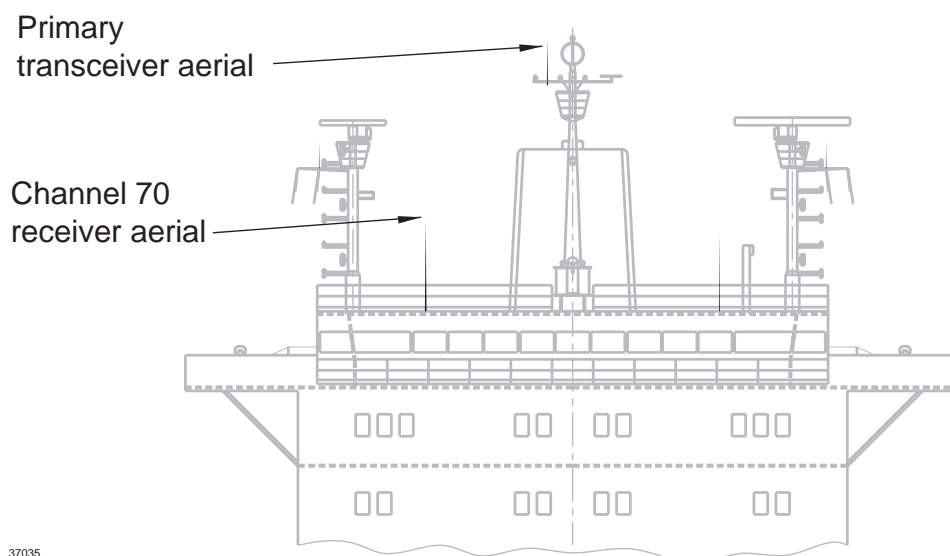
## 2.3 Aerial

All common 50 ohm aerials which cover the used frequency range with a reasonable standing wave ratio, maximum 1.5, can be used.

The aerial is connected to the set by means of a 50 ohm coaxial cable with low loss, e.g. RG213U. At the cable end a PL259 plug is mounted.

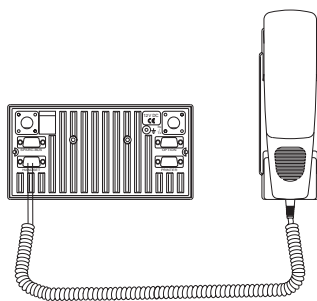
## 2.3.1 Placing the Aerials

In a GMDSS CLASS A installation, there are always two aerials. These should be mounted in a place that is as high and clear as possible - as illustrated below. Note that the primary transceiver aerial must be placed at a higher level than the channel 70 receiver aerial.



## 2.4 Handset Connection

The handset is connected directly to the HANDSET plug at the back of the VHF set.



## 2.5 Loudspeaker Connection

When one or more control units are connected to the VHF system, two of them can be set up to use the transceiver's two loudspeaker outputs to drive external speakers.

To link a loudspeaker to a control unit, enter the function menu and select external speaker:

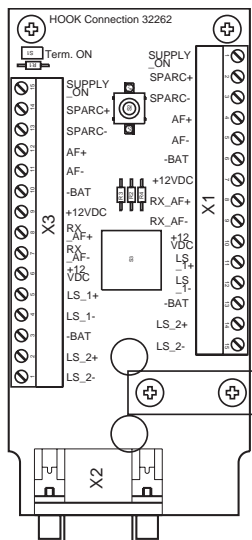
Path: Func\general\sound\loudspeak\norm\alarm\extspk, and set external speaker to be 1 or 2 as desired.

The loudspeaker signals are available in the SPARC-bus cabling, and a loudspeaker can be connected to the system in the handset hook parts or in the connection box.

Connect the loudspeaker cables to SPARC-bus signals (LS\_1+ and LS\_1-) or (LS\_2+ and LS\_2-) depending on which speaker selection is made by the control unit(s).

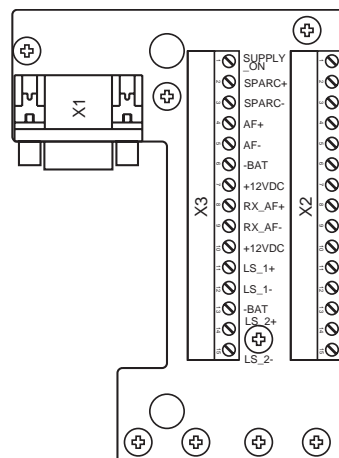
## 2.6 Connectors

### Handset Hook



35348

### SPARC-Bus Connection Box H4991



35349A

In the handset hook the shield of the SPARC-bus cable is connected to the cable relief.

### WARNING:

Be carefull not to cover the distress switch with installation wires.

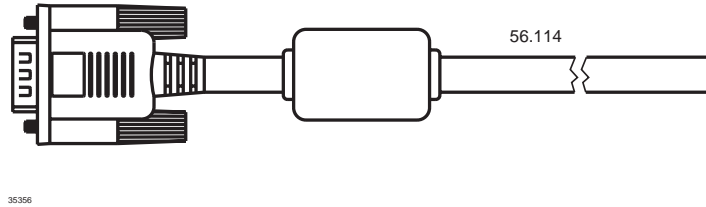
## 2.6.1 SPARC-Bus Cable

The table below describes the max. length of the SPARC-bus cable for the power supply for **one** handset unit. The length of the cable depends on the number of supply wires and the wire thickness. The table shows the cable lengths for systems with a supply voltage of +12V. If the system supply voltage is 24V, i.e. the supply voltage is provided through N420, the max. cable length listed in the table may be doubled.

Number	System supply	Number of wires in cable	From	To	Wire mm2	Number of wires - BATT OVDC	Number of wires +12VDC	Max. length
56.114	+12 Volt	2x8	BOX	HOOK	0.25	2	2	30 metres
	+12 Volt	2x8	BOX	HOOK	0.50	2	2	60 metres
	+12 Volt	2x8	BOX	HOOK	0.75	2	2	100 metres
	+12 Volt	2x8	Transceiver	HOOK	0.14	3	2	5 metres

The SPARC-bus cable length is limited by the level of output power delivered to a connected external speaker on the LS\_2 terminals. The speaker output power depends on cable length and cable thickness as described in the table below.

Wire [mm2]	Length [m]	Max. Power [W]
0.14	5	3.4
0.25	10	3.2
0.25	20	2.0
0.50	20	3.2
0.50	40	2.0
0.75	30	3.2
0.75	60	2.0



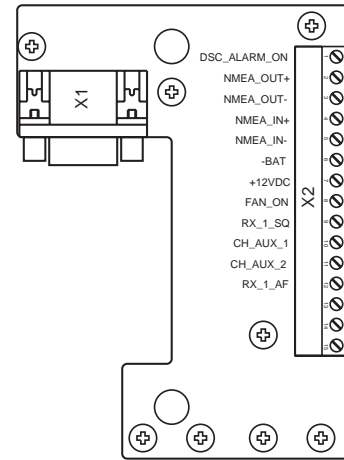
### SPARC-bus/Option cable 5 metres 56.114

Pin no.	Name	Colour	Twisted pair
pin 1	SUPPLY_ON	Red/White	7
pin 2	SPARC+	Yellow	1
pin 3	SPARC-	Yellow/Black	1
pin 4	AF+	Blue/White	2
pin 5	AF-	Blue	2
pin 6	-BAT_0VDC	Red and Orange	7/8
pin 7	+12VDC	Orange/White	8
pin 8	RX_AF+	Green/White	3
pin 9	RX_AF-	Green	3
pin 10	+12VDC	Black/White	6
pin 11	LS_1+	Brown	4
pin 12	LS_1-	Brown/White	4
pin 13	-BAT_0VDC	Black	6
pin 14	LS_2+	Purple	5
pin 15	LS_2-	Purple/White	5
Shield		Shield	

## 2.6.2 Options Connector H4992

### Options connectors

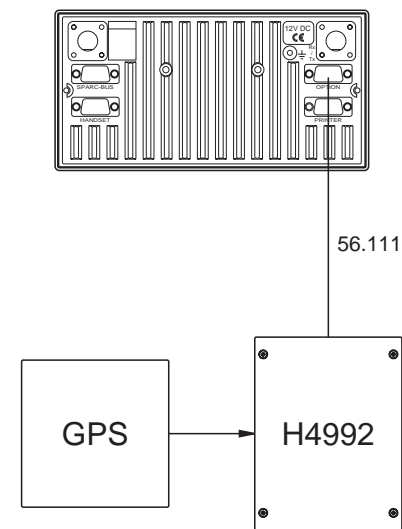
Transceiver unit X2	Twisted Name	Option box pair	X1,X2
pin 1	DSC_ALARM_ON		1
pin 2	NMEA_OUT+1	1	Optional
pin 3	NMEA_OUT-1	1	Optional
pin 4	NMEA_IN+	2	4
pin 5	NMEA_IN-	2	5
pin 6	-BAT_0VDC	3	6
pin 7	+12VDC	3	7
pin 8	FAN_ON		8
pin 9	RX_1_SQ		9
pin 10	CH_AUX_1		10
pin 11	CH_AUX_1		11
pin 12	RX_1_AF		12
pin 13	N.C.		13
pin 14	N.C.		14
pin 15	N.C.		15



35350

To connect a GPS to the VHF transceiver, connect the GPS signal lines to the options connector pin\_4 (NMEA\_IN+) and pin\_5 (NMEA\_IN-).

Alternatively the GPS can be connected directly to the transceiver by means of a 15-pole high density D-sub which is supplied with the radio, in the same pins as those mentioned above. (NMEA\_IN+ and NMEA\_IN-) To fasten the D-sub on the transceiver, use the special 15 to 15-pole adaptor, also supplied with the radio.



35407A

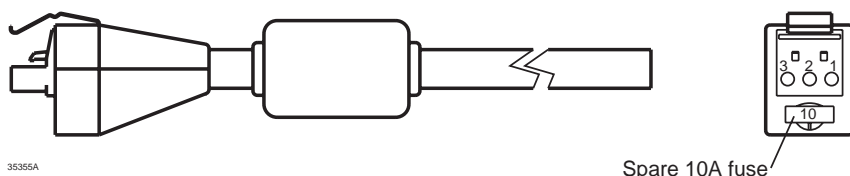
## 2.7 Cable Length

The cable length specified below is the absolute maximum length.

### 2.7.1 Power Cable

Number	Supply	From	To	Wire mm2	Max. length
56.112	+12 volt	BATTERY	RT4722	2.5	1.5 metres
	+12 volt	BATTERY	RT4722	5.0	3 metres

Note: The cable length from battery to N420 depends on the wire thickness, but the voltage at the cable end at N420 should not be less than 18 volt.



Pin no.	Name	Colour
Pin 1	SUPPLY_ON	Blue
Pin 2	+BAT	Red
Pin 3	-BAT	Black

## 2.8 Electrical Connections

### 2.8.1 Power Connectors

#### Power Connectors

Transceiver unit	Name	Battery	N420
pin 1	SUPPLY_ON	NC	SUPPLY_ON *
pin 2	+Battery, +12VDC	+	+12V
pin 3	-Battery, 0VDC	-	0V

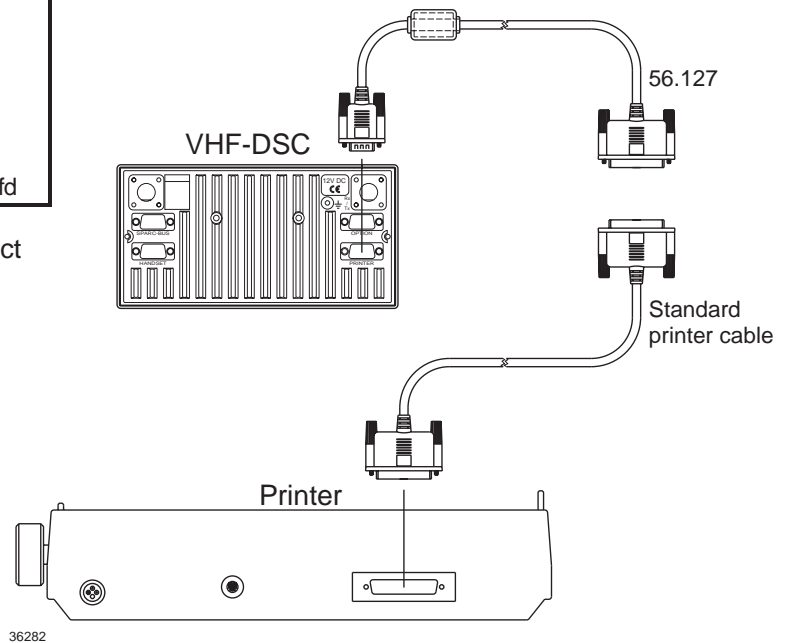
\* NB! The blue wire is **only** to be used in connection with N420

## 2.8.2 Interconnection Cable Specification For VHF Printer Connection

### Printer Cable 56.127

15-pole SUB-D male		25-pole SUB-D female	
pin 1	LPT_Error	pin 15	-Error
pin 2	LPT_Init	pin 16	-Init
pin 3	LPT_D1	pin 3	D1
pin 4	LPT_D4	pin 6	D4
pin 5	LPT_D7	pin 9	D7
pin 6	-BAT_0VDC	pin 14	-Slct in
pin 6	-BAT_0VDC	pins 18,19,..(to)..24,25	-Gnd
pin 7	LPT_Str	pin 1	-Strobe
pin 8	LPT_D0	pin 2	D0
pin 9	LPT_D3	pin 5	D3
pin 10	LPT_D6	pin 8	D6
pin 11	LPT_Busy	pin 11	Busy
pin 12	LPT_Select	pin 13	Slct
pin 13	LPT_D2	pin 4	D2
pin 14	LPT_D5	pin 7	D5
pin 15	LPT_Auto_Feed	pin 14	-Auto fd

For the connection to the printer you have to connect the 15-pole SUB-D male to the VHF units printer connection and the 25-pole SUB-D to a standard printer cable (25-pole SUB-D - Centronic)



## 2.9 Compass Safety Distance

Unit	Standard	Steering
VHF-DSC DUPLEX	1.3 m	0.8 m
N420	0.6 m	0.3 m
N163S	1.2 m	0.7 m

## 2.10 Test Procedure TX/RX DSC Call

To test the system's DSC functionality, enter the function menu and perform two test calls: (INTernal test) and (EXTernal test).

**Internal** test call: (The call is looped back internally, no activation of transmitter or receiver)

This test controls the DSC modem in the transceiver RX and TX internally.

1. Hook off handset.
2. Enter function menu: Func\dsc\testcalls\int path. Select call by "arrow right" key.
3. "Transmit" the call by keying "Send call".
4. The display will show in sequence: TX-CALL, TX-OK.
5. The call is announced by the DSC modem. Read the call info in RX-LOG.

**External** test call: (The call is transmitted and received using the aerials).

This test also controls the hardware of transmitter and receiver boards.

1. Hook off handset.
2. Enter function menu: Func\dsc\testcalls\ext path. Select call by "arrow right" key.
3. "Transmit" the call by keying "Send call".
4. The display will show in sequence: TX-CALL, TX-OK.
5. The call is announced by the DSC modem. Read the call info in RX-LOG.







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