

# SAILOR SC4000 IRIDIUM



# Introduction

Your Iridium equipment is a modular system that consists of a transceiver unit, control handset unit, antenna unit and an optional analogue PSTN telephone/PABX.

You can make and receive voice calls on the control handset and the analogue PSTN telephone. You can connect up to four handsets **and** one analogue PSTN telephone or PBX switchboard to the system.

The system provides intercom for internal calls between any control handsets and between the analogue telephone and a control handset.

Via the data port on the transceiver, the unit can be used as a data modem for dial-up data calls, Internet access, SMS and E-mail messaging.

## **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.

Doc. no.: M4150GB0 Issue: H/0514

# Contents

<b>1</b>	<b>Technical Specifications .....</b>	<b>2</b>
<b>2</b>	<b>Installation .....</b>	<b>4</b>
2.1	Version Overview .....	4
2.2	Configuration of Single-Channel Unit .....	4
2.3	Cable Overview .....	5
2.3.1	Scanbus Termination .....	6
2.4	Where to Place the Satellite Transceiver Box .....	7
2.5	How to Mount the Satellite Transceiver Box .....	7
2.6	How to Put on the Finishing Cover .....	8
2.7	How to Insert the SIM Card .....	9
2.8	Optional SIM card Reader .....	9
2.9	How to Remove the Finishing Cover .....	10
2.10	Installation of the Antenna .....	11
2.11	Analogue telephone .....	13
2.12	Data Interface .....	14
2.13	External Ringer Interface .....	14
2.14	Reset Button .....	14
<b>Appendix A .....</b>	<b>.....</b>	<b>17</b>
	Spare Parts List .....	17

# 1 Technical Specifications

## Space Segment

Satellites	66 (Plus 6 in-Orbit backup satellites)
Orbital planes	6
Orbit height	780 kilometres
Inclination of the orbital planes	86.4 degrees
Orbital period	100 minutes, 28 seconds
Spot beams	48 per satellite

## Radio module

Frequency Range	1616 MHz to 1626.5 MHz (L-Band)
Duplexing Method	TDD (Time Domain Duplex)
Oscillator Stability	$\pm 1.5$ ppm
Input/Output Impedance	50 $\Omega$

## Multiplexing Method

Average Power during a transmit slot	(max) 7W
Average Power during a frame	(typical) 0.6W
Receiver Sensitivity at 50 Ohm	(typical) -118.5 dBm
Receiver Spurious Rejection at offsets > 1 MHz	(typical) 60 dB
Voice/Data Rate	2.4 kbit/s QPSK

## Antenna

	Helical, omni-directional 210° (3 dB beam width) Fibreglass radome $\varnothing$ 96 mm 16 dB
--	---

## Link Margin

## Antenna Tracking Capability

Turn	Omni-directional antenna
Roll/pitch	Up to $\pm 20$ from horizontal position
Yaw	Elevation > 8°

## Interface

Handset	600 $\Omega$ / 4 wire RS485
Telephone/PABX	270 $\Omega$ +750 $\Omega$ // 150nF / 2 wire
Data	RS232 with handshake
Position information	NMEA 0183

**Power supply**

DC	10 – 32V DC
AC (Optional)	110-230V AC (External adaptor)
Consumption	25 W during communication 8 W Stand by

**Environmental Conditions*****Transceiver***

Operating temperature	-10° C to +55° C
Storage temperature	-30° C to +70° C

***Antenna***

Temperature	EME -35° C to + 55° C
Rel. humidity	Up to 95% at 40° C
Icing (survival only)	Up to 25 mm of ice
Precipitation	Up to 100 mm/hour
Wind (velocity)	Up to 100 knots
Vibration	IME: 2 – 50 Hz @ 1 g EME: 4 – 33 Hz @ 1 g

**Weight**

Transceiver :	2.7 kg
Antenne:	220 g
Handset & cradle :	570 g

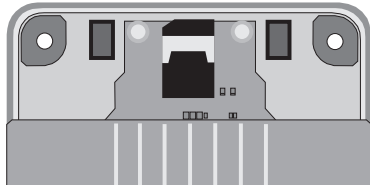
## 2 Installation

### 2.1 Version Overview

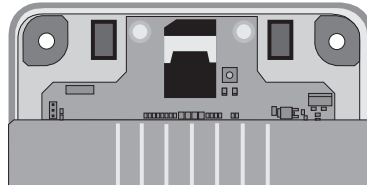
This manual covers the Transceiver Unit versions Mk2, Mk3 and Mk4.

The version can easily be determined by looking at the area around the SIM card reader.

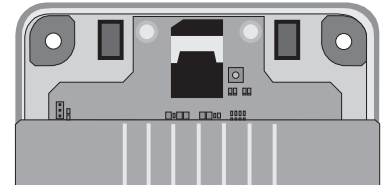
Mk2



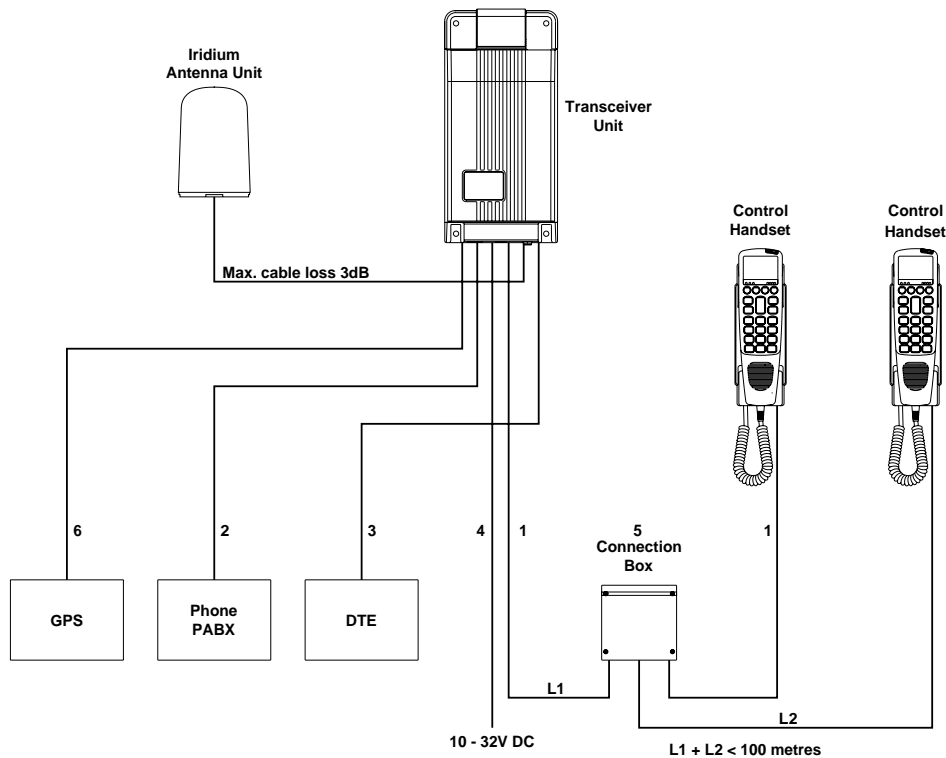
Mk3



Mk4



### 2.2 Configuration of Single-Channel Unit



35423E

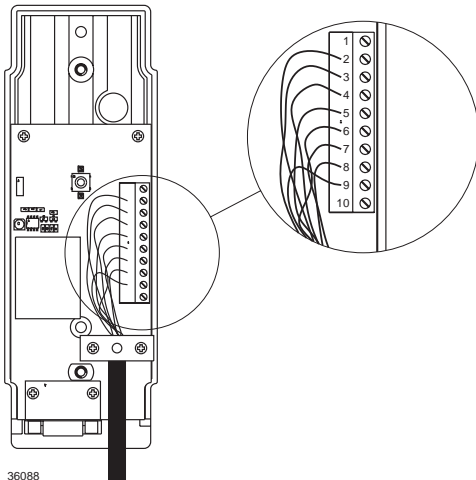
## 2.3 Cable Overview

### Cable 1 Scanbus

Cable: 9\*0.22 mm<sup>2</sup> shielded  
shield connected to ground

Cable connector type: 9 pole sub-d male

Transceiver	Description	Handset	Colour	
1	NC	1		
2	data+	2	white	Twisted pairs
3	data-	3	brown	
4	AF+	4	green	Twisted pairs
5	AF-	5	yellow	
6	GND	6	grey	Twisted pairs
7	+24V DC	7	pink	
8	RX_AF+	8	blue	Twisted pairs
9	RX_AF-	9	red	
shield	GND	shield		



### Cable 2 Phone

Cable connector type: RJ 11

Transceiver	Description
1	NC
2	phone1+
3	phone1-
4	NC

### Cable 3 Data

Cable: 9\*0.22 mm<sup>2</sup> shielded  
shield connected to ground

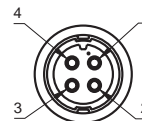
Cable connector type: 9 pole sub-d male

Transceiver	Description
1	DCD
2	received data
3	transmitted data
4	data terminal ready
5	serial GND
6	data set ready
7	request to send
8	clear to send
9	RI
shield	GND

### Cable 4 Power supply

Pin no.	Description	Colour
1	10-32V DC	red
2	0V DC	black
3	NC	white
4	GND	green

Front view

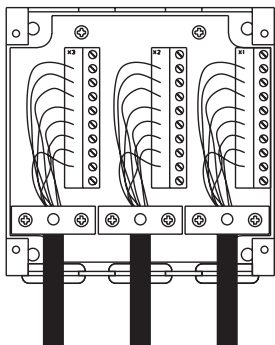


36662A

### Cable 5

#### Description of connections to T-connection H4196 (optional accessory)

The wire terminal blocks are connected in parallel.



36090

### Cable 6

#### GPS input

Cable: 9\*0.22 mm<sup>2</sup> shielded  
shield connected to ground

Cable connector type: 9 pole sub-d male

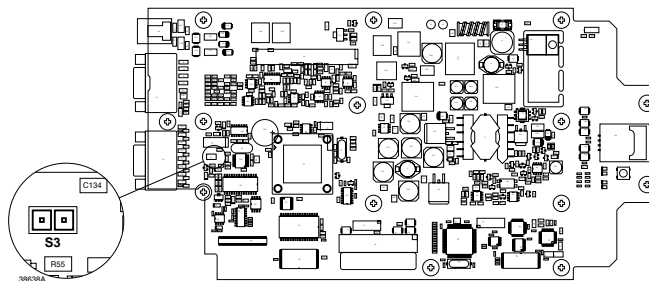
Transceiver	Description	
	Mk2 & Mk3	MK4
1	NC*	External Ringer
2	PC Rx (RS232)	PC Rx (RS232)
3	PC Tx (RS232)	PC Tx (RS232)
4	NC*	NC*
5	GND (RS232)	GND (RS232)
6	NC*	NC*
7	NMEA+	NMEA+
8	NMEA-	NMEA-
9	NC*	NC*
shield	GND	GND

\* Do only connect a standard RS232 terminal cable. If only NMEA needed, then do not connect to other pins than 7 and 8.

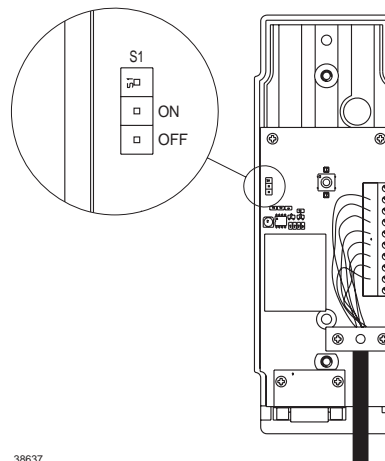
## 2.3.1 Scanbus Termination

The scanbus connecting the transceiver and the control units, has to be terminated. Only the first and last unit on the bus shall have the termination in ON position.

The termination in the transceiver unit is done by setting the jumper S3, located near the scanbus terminal on the PCB (see figure below). As default, the jumper S3 is set ON.



The termination in the control unit is located on the PCB in the cradle as jumper S1 (see figure below). As default the jumper S1 is set ON.



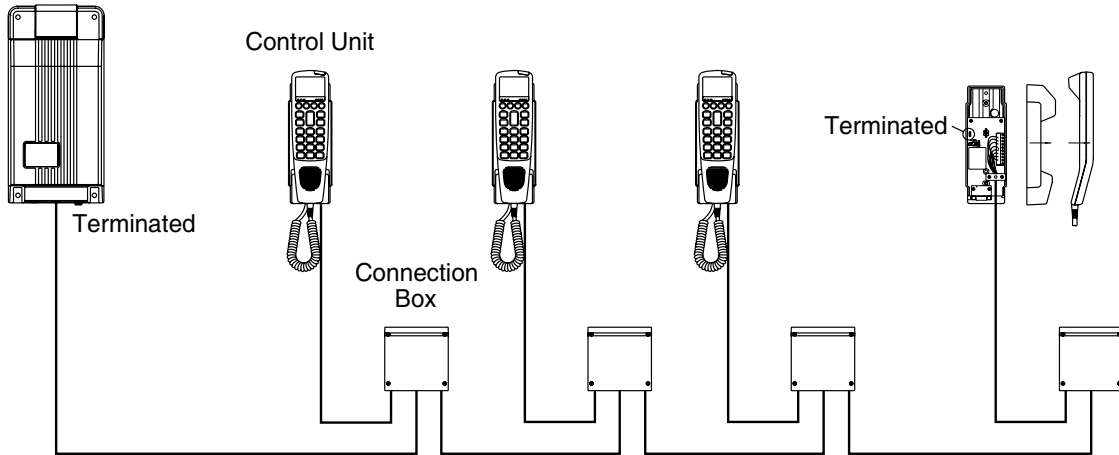
38637



When configuring a system only including a transceiver unit and one control unit, no changes in the default termination is needed. If the system includes more than

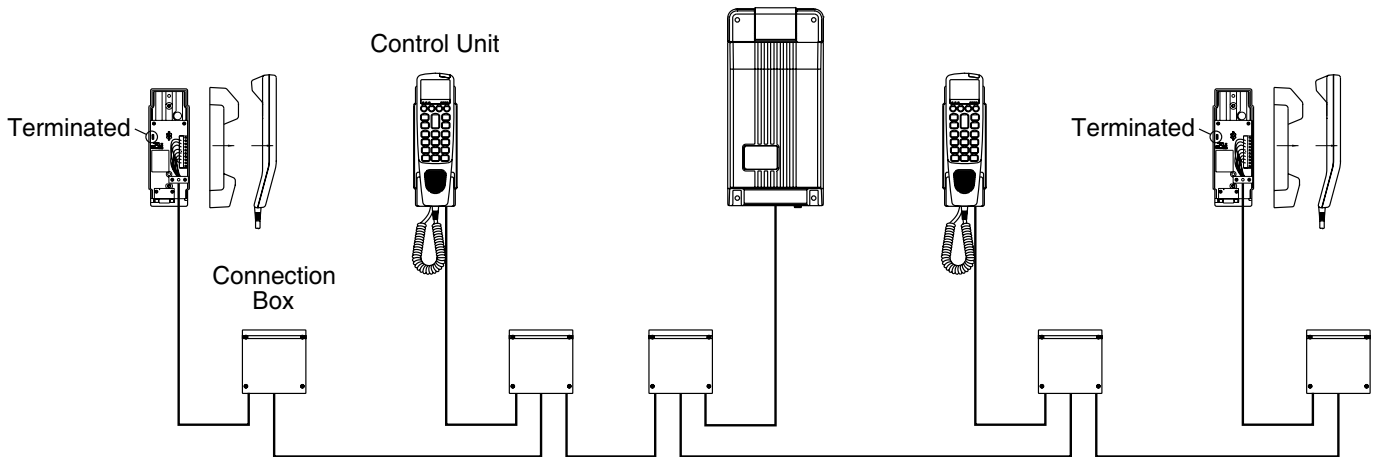
one control unit, it is needed to remove some of the default terminations. Below two examples of scanbus termination is given, when the system includes several control units.

Transceiver Unit



38635

Transceiver Unit



38636

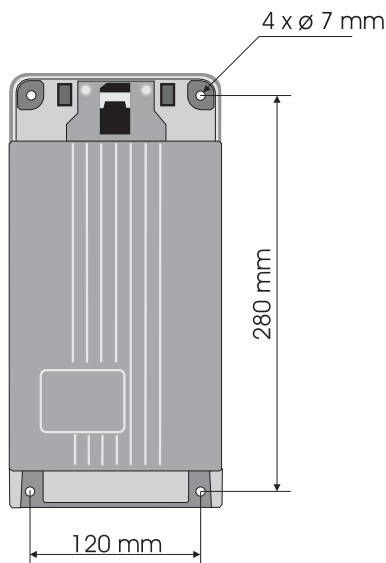
## 2.4 Where to Place the Satellite Transceiver Box

Mount the satellite transceiver box in a place where it is sheltered from the wind, protected from the salty and humid sea atmosphere. The temperature must not exceed 55° C.

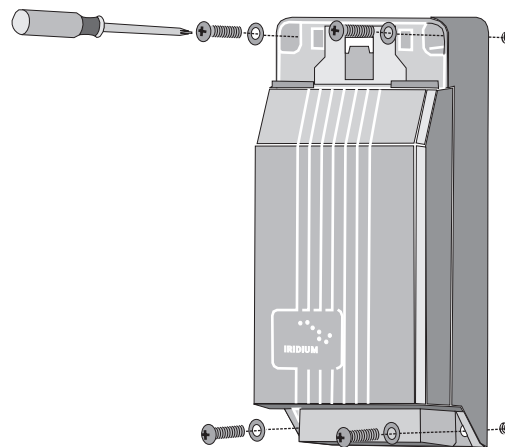
To ensure that the SIM card is easily accessible, do not place the satellite transceiver box higher than 1.5 m above the floor.

## 2.5 How to Mount the Satellite Transceiver Box

Fix the satellite transceiver box to the wall using the four screws included in the package. The screws are positioned as shown below:



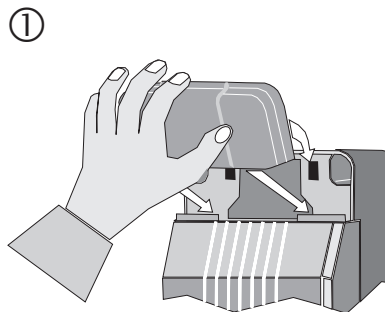
First tighten three of the screws. The wall surface should be plane. If there is a discrepancy in planeness exceeding 1 mm, level the discrepancy up by shims or washers under the fourth screw before this is tightened.



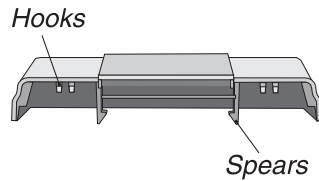
## 2.6 How to Put on the Finishing Cover

When the satellite transceiver box has been mounted on the wall, put on the finishing cover.

The small lid in the finishing cover should be shut. Press the hooks inside the finishing cover down on the two thin edges of the satellite transceiver box. While pressing, let the two plastic spears inside the finishing cover into the two square holes of the satellite transceiver box.

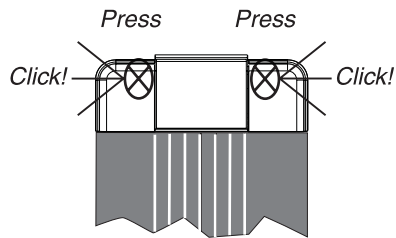


②



Press hard on the spots shown in the picture below until a loud click is heard.

③



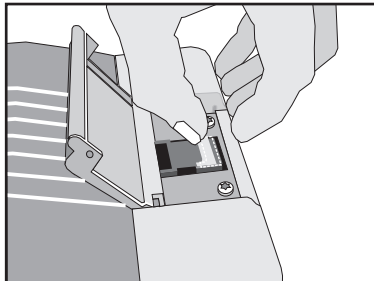
When putting on the finishing cover, do not use any tools – only your hands.

## 2.7 How to Insert the SIM Card

First, open the small lid in the finishing cover protecting the SIM card reader. Then go through each of the following steps:

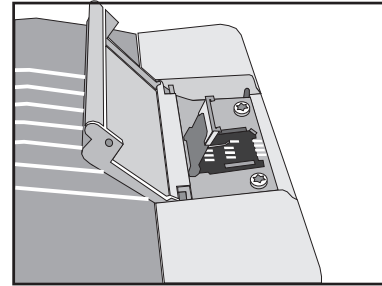
Unlock the SIM card holder by pushing the lock with your finger nail.

①



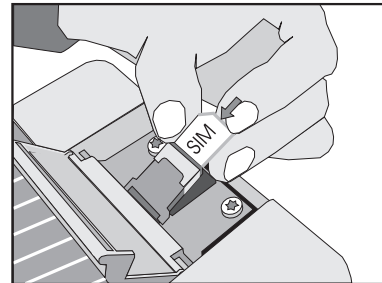
Lift the SIM card holder so that the slot points upwards.

②



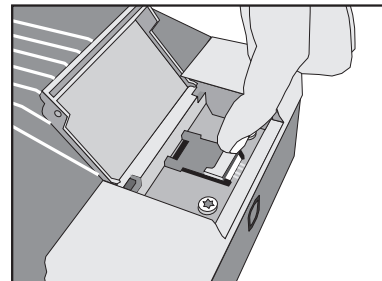
Insert the SIM card in the slot. Make sure that the cut-off corner of the card is placed as shown in the picture.

③



Push the SIM card holder back down, and lock it by pushing the lock with a finger nail.

④



Finally, shut the lid again.

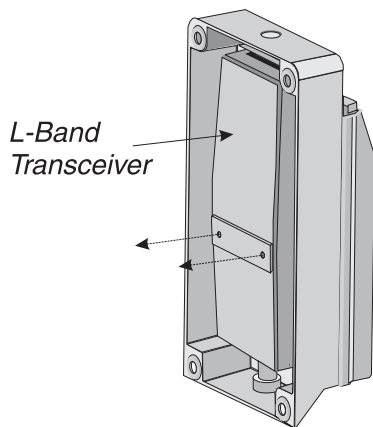
## 2.8 Optional SIM card Reader

Only direct accessible on Mk3 units produced from August 16, 2003. On older units the L-Band transceiver must be dismantled in order to install the SIM card.

This additional SIM card reader can be used as a master SIM card, thus allowing the crew to place individual cards in the primary SIM card reader on the front.

The primary SIM card reader on the front has highest priority and will thus disable the card in the optional card reader when a card is inserted.

The optional card reader is ideal for Ship Security and Alert installations, where a permanent SIM card is required.



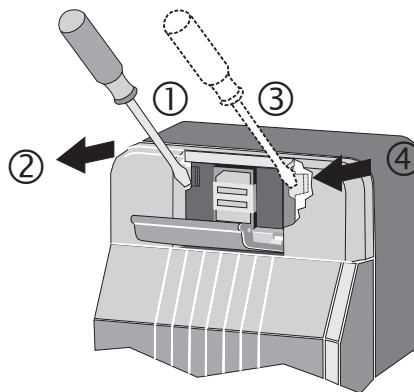
Remove the lid by removing the 2 umbraco screws. After inserting the card put the lid back on.

## 2.9 How to Remove the Finishing Cover

You may need to dismount the satellite transceiver box from the wall, e.g. in connection with service.

For access to the mounting screws, the finishing cover can be removed from the satellite transceiver box as follows:

- ① Put a screwdriver into the slot in the printed circuit board beside the SIM card reader, and press gently to unhook the plastic spear.
- ② While pressing with the screwdriver, lift up the same side of the finishing cover slightly to loosen it.
- ③ Repeat this procedure on the other side of the finishing cover.
- ④ You can now detach the finishing cover from the satellite transceiver box by pulling it gently upwards.



## 2.10 Installation of the Antenna

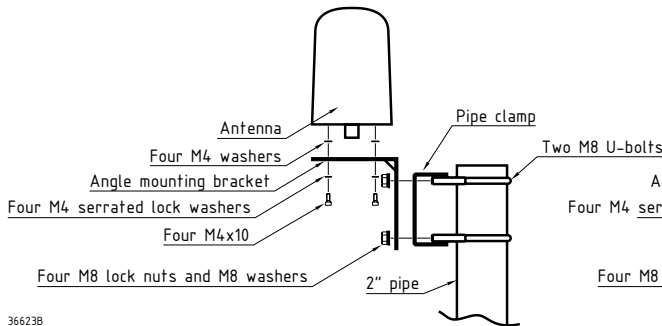
One of the advantages of this equipment is the easy-to-handle, lightweight and rugged antenna. Because the IRIDIUM® system is characterised by a good link margin, the antenna is a passive quadrifilar helix type, requiring no external power supply and consisting of only nonmoving parts.

The following figures show the antenna and the two different mounting accessories available:  
The mounting bracket in fig. 1 can be used in two different ways - mounted on either a rail or a pole.

The fitting in fig. 2 can be used at the top of a tube. **Please note** that it is necessary to mount the cable, and seal this connection securely before the antenna and fitting are mounted on the tube.

### **Important!**

To comply with FCC RF exposure regulations, the antenna must be installed in a location providing a minimum RF Radiation Safety Distance of 0.61m (2 feet).



36623B

Fig. 1

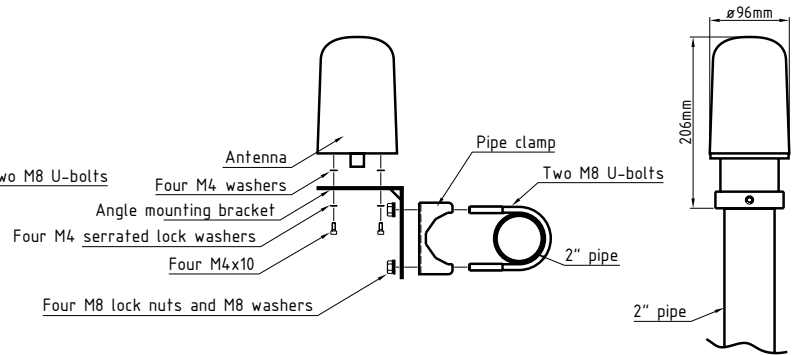


Fig. 2

### Antenna cable

Below, please find a table of cables that can be provided by your dealer:

CABLE					CONNECTOR	
Cable type	Part no.	Maximum length/ 3 dB loss	Outer diameter	Minimum bending radius	Conn. type	Part no.
RG 214/U	E62.415	8 m	10.8 mm	54 mm	N	MALE E62.147
SUCOFEEED 1/2" HF	77.518	19 m	13.4 mm	35 mm	N	MALE 79.002
SUCOFEEED 1/2"	77.519	30 m	16.0 mm	125 mm	N	MALE 79.001
SUCOFEEED 7/8"	77.520	50 m	27.8 mm	220 mm	N	MALE 79.003 & FEMALE 79.004

### **Important!**

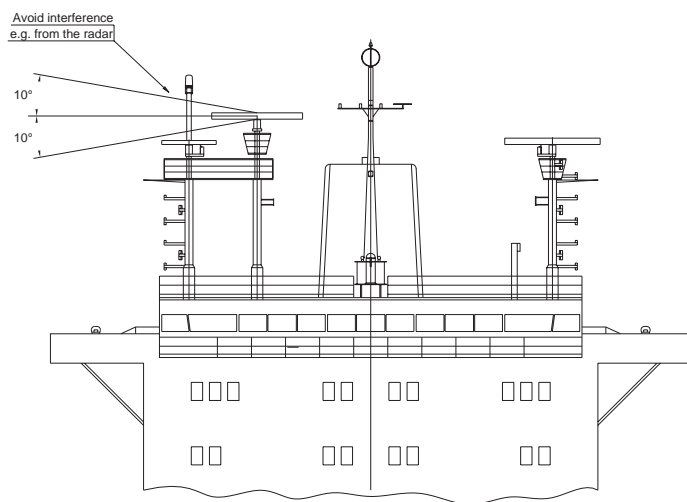
It is important that the antenna cable used has a maximum loss of 3dB @ 1.6GHz between antenna and transceiver. This antenna cable must be in one piece. Neglecting this will reduce the overall receiving/transmitting performance at sea. If installation is not carried out in accordance with these guidelines, it will void the warranty of the product.

## Precautions

In order to avoid interference or any other kind of disturbances from other systems on board, there are a few precautions to take note of:

### Radars

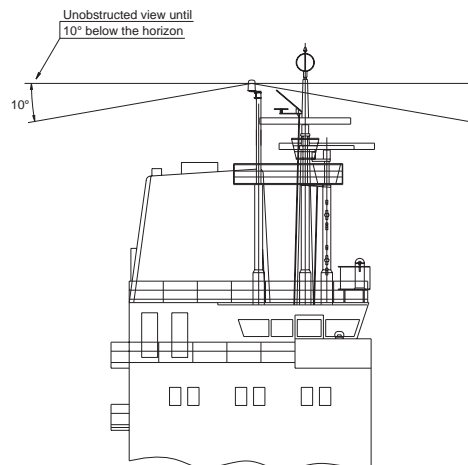
According to any installation guide for radars it is of vital importance that any other units are kept outside the radiation beam of the radar. Please consult the illustration down below, showing what area to avoid:



36622A

### Inmarsat equipment

The operating frequency bands of the Iridium and Inmarsat systems are neighbours, and it is not in any way by any technical solution possible to completely separate these bands. This means that interference from Inmarsat can be expected, especially if the antennas are placed near each other. The distance between the antennas should be as far as possible.



### GPS

Tests have shown that only in case very old GPS equipment is used, a user may expect a minor influence on the GPS originated from the Iridium equipment. This can be avoided by ensuring a distance of at least 1 m between the two antennas.

If in any way the user experiences trouble using Iridium because of Inmarsat, a filter can be provided as an option. This filter is placed in a suitable place between the antenna and the transceiver. The filter is a passive type not requiring external power. Please contact your dealer for further information.

The table below shows the distance to other Inmarsat equipment, with and without use of filter.

9505 ISU Protection Distance	Main Lobe (Metres)	Side Lobe (Metres)	Back-Lobe (Metres)	
No Filter	14	4	4	Inmarsat (Mini-M)
No Filter	25	4	4	Inmarsat (Std-M)
No Filter	84	20	20	Inmarsat A
No Filter	70	16	16	Inmarsat B
No Filter	14	14	14	Inmarsat C
With Filter	1	1	1	Inmarsat (Mini-M)
With Filter	1	1	1	Inmarsat (Std-M)
With Filter	4	1	1	Inmarsat A
With Filter	4	1	1	Inmarsat B
With Filter	1	1	1	Inmarsat C

## 2.11 Analogue telephone

The PSTN interface on the transceiver unit converts the wireless Iridium network into an ordinary telephone line. You can connect a standard analogue PSTN telephone directly to this interface for crew calling or as an office phone.

With a PABX you can add more telephone lines for multiple phones ie. office network.

The interface handles the following tasks:

- generates DC current to the phone/PABX in both idle and active mode
- generates ringing voltage
- detects call requests from a phone/PABX
- detects DTMF tones from a phone/PABX
- outputs 12 or 16kHz billing tone for a PABX

Important: Do not connect the transceiver to a PSTN telephone line on land.

Specification of the Iridium system PSTN connection:

RJ11 connection:

1. NC
2. TIP
3. RING
4. NC

Line Voltage: 48V DC  
 Line current (source): 24 mA  
 Line impedance: 270  $\Omega$  + 750  $\Omega$  // 150 nF (this impedance also covers 600  $\Omega$ )

Ringing voltage: 60V RMS, 90 Vpp (square wave)

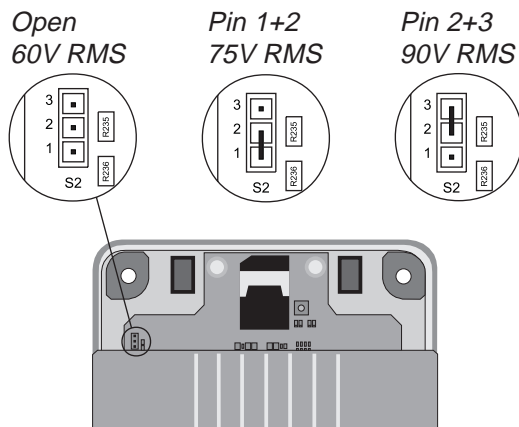
Ringing sequence: 0.6 sec On, 4 sec Off

Ringing frequency: 30 Hz

Ringing drive capability: 1400  $\Omega$  @ 30 Hz (= 5 normal ring units)

**Note:** Some analogue phone line impedance may differ from the commonly used standards. If the ringing volume is too low, the ringing voltage can be changed to gain higher output.

The selector switch is located under the finishing cover.



## 2.12 Data Interface

The Iridium transceiver unit can be used as a 2.4kbps data modem.

Connect a PC via a serial COM port to the 9 pole data connector using a standard serial data cable. The data interface is a full RS232 interface with hardware flowcontrol.

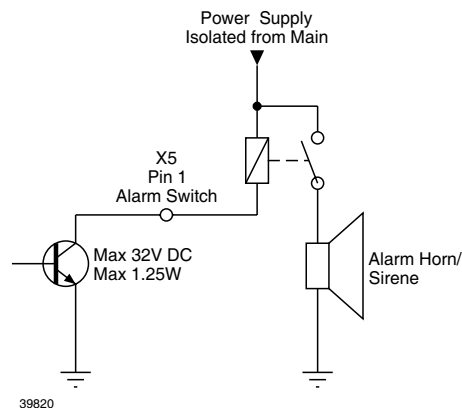
With the SMS/Email client installed on a PC you can receive and send Iridium SMS and short emails from the PC. The SMS/Email client is included in the transceiver package.

To use the transceiver as a data modem a dedicated modem software driver is needed. Please contact your Iridium Service Provider, who can supply you with the Iridium Data Interface software.

## 2.13 External Ringer Interface

The external ringer output pin in the Service/NMEA port can control an optional ringer or a lamp. This is very useful in noisy environments or when there is a need for ringing indication at more locations.

The output is an open collector output and can pull down a signal of max 32V DC and a power dissipation of max 1.25W. The output is pulsing at 0.5 Hz whenever there is an incoming call. When the call is answered the output will stop pulsing.



## 2.14 Reset Button

The reset button is placed next to the SIM card reader. Pushing this button will halt the power supply and remove power from the transceiver unit. When releasing the button, the power will come back and thereby make a power reset of the transceiver unit.







# Appendix A

## Spare Parts List

Item	Mk2 81412000	Mk3 82412000	Mk4 83412000
	Itemnumber	Itemnumber	Itemnumber
Power cable	56.140		
TNC/N adaptor	79.005	79.005	N.A.
Coax cable with TNC male - N female	N.A.	56.181*	56.181
ID kit	49.310		
Fuse	45.669		
Scanbus male 9p Sub-D	78.758		
Scanbus female 9p Sub-D	78.765		
Housing 9p Sub-D	78.745		
Handset spiral cable	56.102		
Connection box H4196	80419610		

\*) 56.181 introduced in production August 16, 2004. Replacing TNC/N adaptor 79.005.

