OPERATORS AND INSTALLATION MANUAL

RA-2500

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Abbreviations and definitions

AIS -Automatic Identification System.
A shipborne broadcast transponder system in which ships continually transmit their position, course, speed and other data to other nearby ships and shoreline authorities on a common VHF radio channel.

ALARM
Message by which the navigator signals the occurrence of an event. The alarm is indicated by an audible tone and/or a message (or icon) on the display.

ALTITUDE
The height of the antenna over mean sea level.

AMBIENT
Surrounding or encompassing environment.

ANTENNA HEIGHT
The height (over the waterline) in which the antenna is installed.

ASM
AIS Service Management – Controlling entity for the whole AIS service

AUX
Auxiliary Port -A communication port on the AIS transponder, which can be used for NMEA or RTCM, input.

BAUD
Transmission rate unit of measurement for binary coded data (bit per second).

BIT
Short form of Binary Digit. The smallest element of data in a binary-coded value.

bps
Bits Per Second.

BSC
Base Station Controller

CHARACTER STRING
Continuous characters (other than spaces) in a message.

CHECKSUM
The value sent with a binary-coded message to be checked at the receiving end to verify the integrity of the message.

CLICK (KEYBOARD)

The audible tone generated when a key is activated

CLOCK
A precisely-spaced, stable train of pulses generated within an electronic system to synchronize the timing of digital operations within the system.

CLOCK OFFSET
The differences between the times at the CDU/processor tracking a satellite, the satellite itself, and GPS system time.

COG
See COURSE OVER GROUND

COURSE OVER GROUND
Course made good relative to the sea bed.

CURSOR
A flashing rectangle superimposed on a character position in the display window, indicating that a character may be entered in that position, or that the existing character may be changed via the keyboard.

DEFAULT
A condition that the navigator assumes automatically if no other condition is initiated by the operator.

DGPS
See DIFFERENTIAL GPS.

DIFFERENTIAL GPS (OOPS)
A method of refining GPS position solution accuracy by modifying
the locally computed position solution with correction signals from an external reference GPS CDU (monitor).

ECDIS
Electronic Chart Display and Information System

EPFS
Electronic Position Fixing System (GPS is mostly used)

ETA
Estimated Time of Arrival. Calculated on basis of the distance to the destination and the current (or estimated) speed.

FATDMA
Fixed Access Time Division Multiple Access -Data link access protocol used by base station transponders to allocate transmission slots on the data link. These slots are fixed and will thus not change until the base station transponder is re-configured.
FM
Frequency Modulation -The method by which a signal offsets the frequency in order to modulate it on a data link.
position (latitude, longitude, altitude, and time). See DILUTION OF PRECISION.

GFSK
Gaussian-Filtered-Shift-Keying -A standardised method of modulating digital data prior to transmission on a data link.

GMSK
Gaussian-Minimum-Shift-Keying -GFSK using BT -products and modulation index, which optimises the modulated signal.

GNSS
Global Navigation Satellite System -A common label for satellite navigation systems (such as GPS and GLONASS).

GLOBAL POSITIONING SYSTEM (GPS)The NAVSTAR Global Positioning System, which consists of or- biting satellites, a network of ground control stations, and user positioning and navigation equipment. The system has 24 satellites plus 3 active spare satellites in six orbital planes about 20,200 kilometres above the earth.

GLONASS
A satellite navigation system developed and operated by Russia.

GMT
Greenwich Mean Time. See also UNIVERSAL TIME COORDINATED.

GPS SYSTEM TIME
Time corrected to Universal Time Coordinated (UTC) and used as the time standard by the user segment of the GPS system.

HEADING
The direction in which the vessel is pointed, expressed as angular distance from north clockwise through 360 degrees. HEADING should not be confused with COURSE. The HEADING is constantly changing as the vessel yaws back and forth across the course due to the effects of sea, wind, and steering error.

IALA
International Association of Marine Aids to Navigation ans Lighthouse Authorities

IEC
International Electro-technical Commission.

IEC 61162-1 Maritime navigation and radiocommunication equipment and systems – Digital interfaces Single Talker-Multiple listeners: Closely related to NMEA0183 version 2.3, communication at 4800 baud. Definition of both electrical and protocol to be used.

IEC 61162-2 Maritime navigation and radiocommunication equipment and systems – Digital interfaces
Single Talker- Multiple listeners, High speed transmission: Closely related to NMEA0183HS version 2.3, communication at 34800 baud. Definition of both electrical and protocol to be used.

IEC 61993-2 Maritime navigation and radiocommunication equipment and systems – Automatic Information Systems (AIS)
Definitions of the sentences used for AIS in addition to those mentioned in IEC 61162-1 and IEC 61162-2.

IMO
International Maritime Organisation

INTERFACE
Electronic circuits that permit the passage of data between different types of devices; For example, the speed and heading interface circuit permits data from a speed log and compass to pass to the navigator processor.

IP
Internet Protocol (**IP**) is the central, unifying protocol in the TCP/IP suite. It provides the basic delivery mechanism for packets of data sent between all systems on an internet, regardless of whether the systems are in the same room or on opposite sides of the world. All other protocols in the TCP/IP suite depend on IP to carry out the fundamental function of moving packets across the internet.

ITDMA
Incremental Time Division Multiple Access -Access protocol for pre-announced transmissions of temporary or non-repeatable character. It is also used during data link network entry.

ITU
International Telecommunication Union.

LED
Light Emitting Diode.

LSS
Logical AIS Shore Station. A LSS is a software process, which transform the AIS data flow associated with one or more PSS into different AIS-related data flow. The SW process of a logical AIS station can run on any appropriate computer at any appropriate place.

MMI
Man Machine Interface

NMEA

National Marine Electronics Association. The NMEA electronics interface specifications have been developed under the auspices of the Association. The NMEA 0183 is an internationally recognized specification for interfacing marine electronics. NMEA 0183 version 2.3 is identical to lEC 61162-1.

POLLED MODE
A transponder is in a polled mode during a request-response session only. Distinguish this from a station, which is polled into certain slots. This station is first polled and then enters assigned mode.

POSITION UPDATE
The redefining of position by analysis of satellite orbital data as referenced to time.
PROCESSOR
The processor circuit card in the console that controls system operations and computes the positioning/navigation solutions.

PROMPT
A message on the display instructing the operator to make a keyboard entry.

PSS
Physical AIS Shore Station. The PSS is the most basic AIS-related entry, which can exist on its own in a real physical environment, as opposed to an AIS base station or AIS repeater station.

PULSE SPEED SENSOR
Speed log whose speed output signal is defined by a pulse mte output.

RATDMA
Random Access Time Division Multiple Access -Access protocol for transmissions which have not been pre-announced. This is used for the first transmission during data link network entry or for messages of non-repeatable character.

REFERENCE COMPASS
The compass against which the steering compass (see STEERING COMPASS) may be calibrated.

REFERENCE ELLIPSOID
A mathematical description of the Earth's ellipsoidal shape (see ELLIPSOID), which is the reference frame for positioning computation.

RESET

To return stored values to either the default value or zero in memory.

RMS
See ROOT MEAN SQUARED.

ROOT MEAN SQUARED (RMS)

A statistical measure of probability, stating that an expected event
will happen 68% of the time. In terms of position update accuracy, 68 position updates out of 100 will be accurate to within specified system accuracy.

SENSOR
A device that detects a change in a physical stimulus and turns it into a signal that can be measured.

SET AND DRIFT
The direction and the speed of the water over ground (current).

SIGNAL- TO-NOISE RATIO (SIN)
Quantitative relationship between the useful and non-useful part of the received satellite signal. A high SIN indicates a good receiving condition.

S/N See SIGNAL- TO-NOISE RATIO

SOFTWARE
Values programmed and preloaded into memory. The values represent a permanent set of instructions for running the automatic functions (computations) of the navigator.

SOG
See SPEED OVER GROUND

SOTMA
Self Organised Time Division Multiple Access -An access protocol, which allows autonomous operation on a data link while automatically resolving transmission conflicts.

SPEED OVER GROUND
Speed in relation to the seabed.

TCP
Transmission Control Protocol (**TCP**) provides a reliable byte-stream transfer service between two endpoints on an internet. TCP depends on IP to move packets around the network on its behalf.

TCP/IP
A name given to the collection (or *suite*) of networking protocols that have been used to construct the global Internet. The protocols are also referred to as the **DoD** (*dee-oh-dee*) or **Arpanet** protocol suite because their early development was funded by the Advanced Research Projects Agency (**ARPA**) of the US Department of Defense (**DoD**).

TDMA
Time Division Multiple Access. An access scheme for multiple access to the same data link.

UDP
User Datagram Protocol provides a packetized data transfer service between endpoints on an internet. UDP depends on IP to move packets around the network on its behalf.

UNIVERSAL TIME COORDINATED (UTC)
Greenwich mean time corrected for polar motion of the Earth and seasonal variation in the Earth's rotation.

UPDATE
See POSITION UPDATE.

UTC
See UNIVERSAL TIME COORDINATED.

VDL
VHF Data Link.

VHF
Very High Frequency -A set of frequencies in the MHz region.

VSWR
Voltage standing wave ratio

Amendment Record

AMENDMENT NO.	INCORP. BY	DATE	PAGE(S)	VERSION	REASON FOR CHANGE
1	ES	08.03.2005	52	A	
2	ES	08.11.2006	58	B	Kontroll med documenter.doc
3	ES	31.03.2007	Total: 59	C	New company name New logo
4	ES	04.01.2008	5-16	D	Talker identifier
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SAFETY INSTRUCTIONS

1. **Do not place liquid-filled containers on top of the equipment.**

2. **Immediately turn off the power if water or other liquid leaks into the equipment.** Continued use of the equipment can cause fire or electrical shock. Contact a Jotron AS agent for service.

3. **Immediately turn off the power if the equipment is emitting smoke or fire.**

4. **Do not operate the equipment with wet hands.**

5. **CAUTION!**
   This equipment contains CMOS integrated circuits. Observe handling precautions to avoid static discharges which may damage these devices.

LIST OF CONTENTS

1 GENERAL

1.1 Features

The RA-2500 is a ship borne AIS Receiver (Automatic Identification System) capable of receiving navigation data and ship data from other ships and costal stations.

The RA-2500 system consists of a receiver, a cable and connector to PC (RS-232), a AC adaptor and a combined VHF/GPS antenna.

1.1.1 The main features are:

Safety of navigation by automatically receiving navigational data from ships and coast stations.

● Static data:

- MMSI (Maritime Mobile Service Identity).
- IMO number (where available).
- Call sign and name.
- Length and beam.
- Type of ship.
- Location of position-fixing antenna on the ship.

● Dynamic data:

- Ships position with accuracy indication and integrity status.
- UTC.
- Course over ground (COG).
- Speed over ground (SOG).
- Heading.
- Navigation status (manual input).
- Rate of turn (where available).

● Voyage related data

- Ships draught.
- Hazardous cargo (type).
- Destination and ETA (at masters discretion).

● LCD panel.

● GPS and VHF antenna, separate or combined, for easy installation available.

● Built-in GPS receiver for UTC synchronization and backup position fixing.

1.2 Receiver module description

The receiver consist of:

1.2.1 Front board

The Front board consist of keyboard, LCD panel and four status lights for alarm, power and RX. The Front board communicates directly with the MMI micro controller at the Digital board. The LCD panel displays all required information about static data, dynamic data, voyage related data and short safety related messages. The information and messages are automatically updated according to the necessary international standards.

1.2.2 Digital board

The Digital board consist of Timer/MMI chapter, PC module and DGPS module.

Timer/MMI chapter

The Timer MMI chapter main task is to receive DGPS information.

PC module

The PC module is the communication centre for the RA-2500: analysing data, building and controlling data base, communication with external units and controlling RX messages into the right time slots.

DGPS module

The DGPS board receive GPS information from the GPS network. The internal GPS is a 12 channel all-in-view receiver with a differential capacity, and provides UTC reference for system synchronization to eliminate synchronisation problems among multiple users. It also gives COG and SOG when the external GPS fails.

1.2.3 RF board

The RF board consist of two TDMA receivers.

1.2.4 Power board

The Power board consist of a DC/DC converter giving the necessary internal voltages to operate the RA-2500.

1.2.5 Connector board

The connector board is the interface between the internal modules in RA-2500 and external units.

1.3 System overview

The system is based on the IMO regulation for Universal AIS.
The system is synchronized with GPS time to avoid conflict among multiple users.

The VHF channels 87B and 88B are commonly used in addition to local AIS frequencies.

The AIS receiver receives various data as specified by IMO and ITU on the frequency manually set up by the user.

2 SPECIFICATIONS

2.1 RA-2500 environmental specifications and integrated GPS

RA-2500 ENVIRONMENTAL SPECIFICATIONS AND INTEGRATED GPS	
STANDARDS	IEC 60945 (2002), IEC 61993-2 (2001), IEC 61162-1 (2000) –2 (1998), IEC 61108-1 (1996)
Temperature range	-15°C to +55°C (operating) -40°C to +70°C (storage)
Humidity	90% at +40°C (non condensing)
Seal standard	IP64
GENERAL	**RECEIVER**
Size	244 x 108 x 146mm
Weight	2.8kg
Colour	Slate Grey (RAL7015) / Black (RAL9004)
Enclosure	Polycarbonate / Aluminium
Compass safety distance	Standard magnetic: 0.9m Steering magnetic: 0.65m
Frequency range	156 – 162.025MHz
Data ports	RS232 and RS422
Supply voltage, DC	21.6 - 31.2VDC negative ground.
Power consumption	<20W
DISPLAY / KEYBOARD	
Display	Monochrome STN-LCD, 24 characters x 4 lines. Adjustable backlight.
Keyboard	19 keys. Adjustable backlight.
LED	4 LED for identification of: Alarm, OK, RX and TX.
INTEGRATED GPS	
No. of channels	12 channels parallel
Tracking	12 channels simultaneously
Frequency	L1 – 1575.42MHz
RX code	C/A code
Velocity	>500m/s
Acceleration	Up to 5G
Accuracy	Horizontal: <3m (CEP), 5m (2dRMS). 3D:<5m (SEP). DGPS: <1m
Timing	< 100ns (absolute), < 40ns (1 sigma).
Acquisition/Reacquisition	<23s TTFF with time, pos. and ephemeris. <45s with almanac, time and pos. <120s cold start
DGPS interface	RTCM SC-104

TR-2500 RECEIVER UNITS		
RECEIVER	**TDMA**	
	25kHz	**12.5kHz**
Sensitivity	-107dBm (n.c.) -101dBm (e.c.)	-101dBm (n.c.) -98dBm (e.c.)
Packet error rate	20% at sensitivity	20% at sensitivity
Receive BT product	0.5.GMSK	0.3/0.5.GMSK
Co-channel rejection	> -10dB	> -16dB
Adjacent channel selectivity	70dBm (n.c.) 60dBm (e.c.)	50dBm (n.c.) 50dBm (e.c.)
Modulation	GMSK , 9600 bits/s ± 50ppm.	
Frequency range	156 - 162.025MHz	
Frequency error	± 3ppm.	
Spurious response rejection	> 70dB two channels away from frequency	
Intermodulation rejection	>=74dB at PER 20% for 1 tone – 15dBm at FO ±5.725MHz and 2 tones of -27dBm at +500kHz and FO +1MHz, when usable signal has a level of -101dBm.	
Blocking /desensitisation		
Large signal PER	< 1% between -7dBm and -77dBm	
Spurious emission from RX	< -57dBm (150kHz to 1 GHz) < -47dBm (1GHz to 2 GHz)	

3 RA-2500 CONFIGURATION

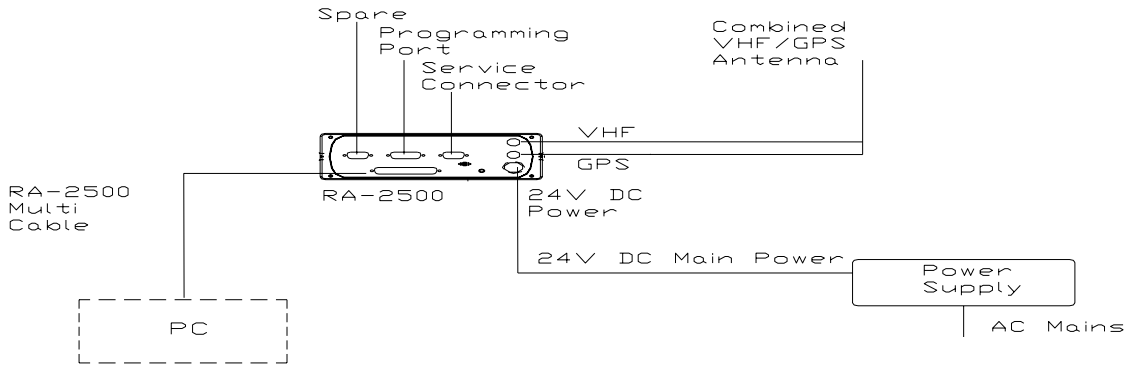


Figure 3.0, Complete Tron RA-2500 system.
(Dotted lines in the figure above, means options)

3.1 Using serial interface (through "External display" port)

When using this port, the RA-2500 needs a PC to connect and control the data flow.
For connection details, see chapter-------

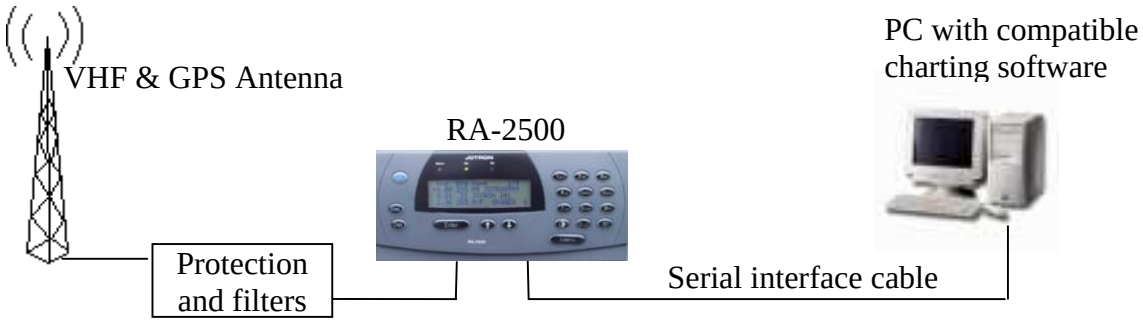


Figure 3.1, Communication between the RA-2500 and the PC is through the RS232 interface communicating on 38400 bits/second (baud).

3.2 Using Ethernet interface

Using this port, the RA-2500 is connected to the Ethernet port on a PC or a network node.
See chapter 7.3 for description of LAN connector.

3.3 Not all ships carry AIS

It is important to remember that not all ships carry AIS, in particular leisure crafts, fishing boats, warships and some costal shore stations including Vessel Traffic Service Centers.

3.4 Use of AIS in collision avoidance

As an anti-collision aid the AIS has some advantages over radar:

- Information provided in near real-time.
- Capable of instant presentation of target course alternations.
- Not subject to target swap.
- Not subject to target loss in clutter.
- Not subject to target loss due to fast maneuvers.
- Able to detect ships within VHF/FM coverage.
-

IMPORTANT

When using the AIS for anti-collision purposes it is important to remember that the AIS is an additional source of navigation information. It does not replace other navigational systems. The AIS may not separately always give the right picture of the traffic in your area.

3.5 Erroneous information

Erroneous information implies a risk to other ships as well as your own. Poorly configured or calibrated sensors might lead to transmission of incorrect information. It is the users responsibility to ensure that all information entered into the system is correct and up to date.

3.6 AIS in an Operational Environment

This illustration shows a typical AIS system where equipped ships, vessels and shore-based systems are automatically communicating with each other.

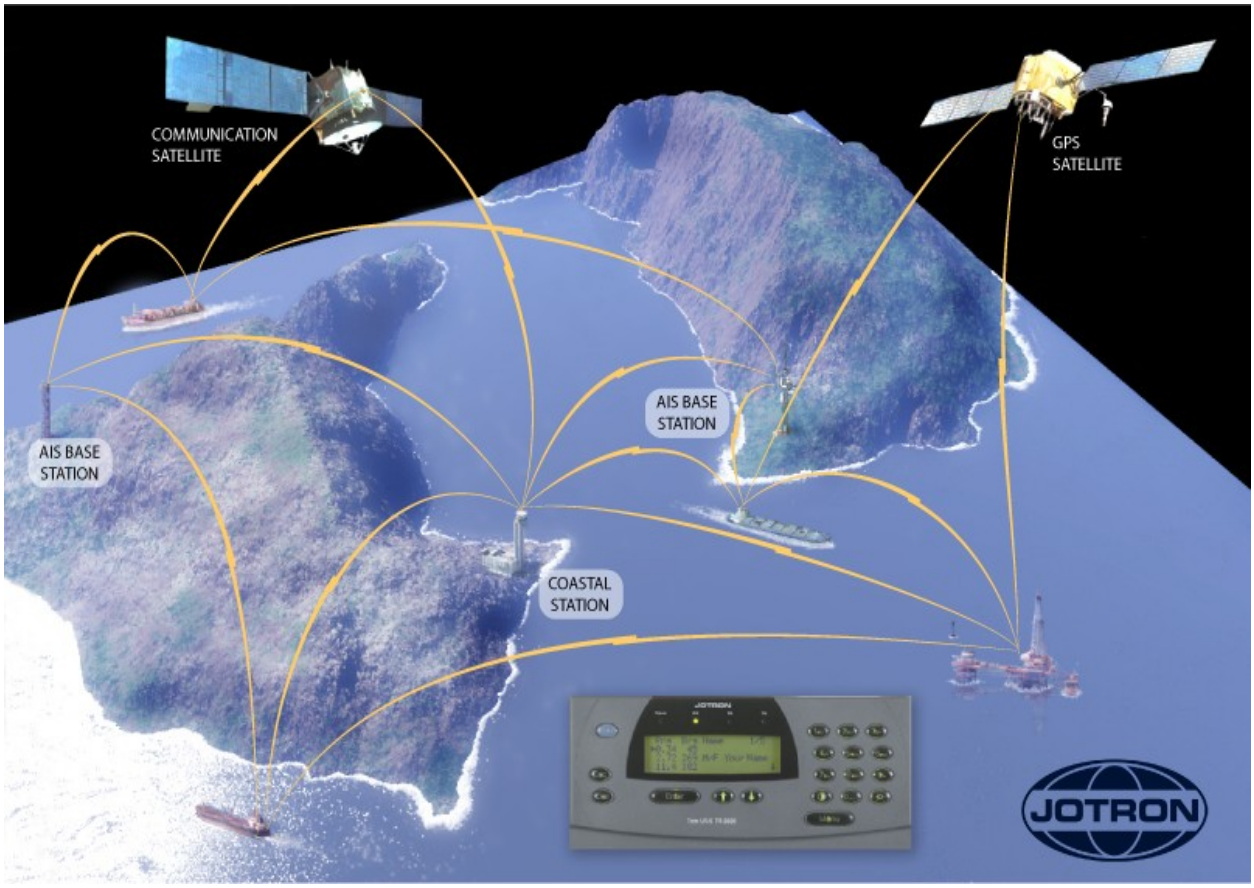


Figure 3.6, The total UAIS system.

4 INSTALLATION

Important notice

In a radio environment, depending of frequency and antenna separation, it may be necessary to use cavity filters to avoid transmitter noise and receiver blocking problems.

4.1 Antennas

4.1.1 GPS antenna location

Install the GPS antenna unit referring to figure 4.1.3. When selecting a mounting location for the antenna, keep in mind the following points.

1. Select a location out of the radar beam. The radar beam will obstruct or prevent reception of the GPS satellite signal.

2. There should be no interfering object within the line-of-sight to the satellites. Objects within line-of-sight to a satellite, for example a mast, may block reception or prolong acquisition time.

3. Mount the antenna unit as high as possible to keep it free of interfering objects and water spray, which can interrupt reception of GPS satellite signal it the water freezes.

4.1.2 VHF antenna location

Location of the mandatory AIS VHF-antenna should be carefully considered. Digital communication is more sensitive than analogue/voice communication to interference created by reflections in obstructions like masts and booms. It may be necessary to relocate the VHF radiotelephone antenna to minimize interference effects.
Install the VHF whip antenna referring to figure 4.1.3. Separate this antenna from other VHF radiotelephone antennas to prevent interference to the RA-2500.

To minimise interference effects, the following guidelines apply:

1. The AIS VHF antenna should be placed in an elevated position that is as free as possible with a minimum of 0.5 meters in the horizontal direction from constructions made of conductive materials. The antenna should not be installed close to any large vertical obstruction. The objective for the AIS VHF antenna is to see the horizon freely through 360 degrees.

2. The AIS VHF antenna should be installed safely away from interfering high-power energy sources like radar and other transmitting radio antennas, preferably at least 3 meters away from and out of the transmitting beam.

3. There should not be more than one antenna on the same plane. The AIS VHF antenna should be mounted directly above or below the ship's primary VHF radiotelephone antenna, with no horizontal separation and with a minimum of 2.8 meters vertical separation. If it is located on the same plane as other antennas, the distance apart should be at least 10 meters.

4.1.3 GPS/VHF combined antenna

See figure 4.1.3. Select a location out of the radar beam. The radar beam will obstruct or prevent reception of the GPS satellite signal.

There should be no interfering object within the line-of-sight to the satellites. Objects within line-of-sight to a satellite, for example, a mast, may block reception or prolong acquisition time.

Mount the antenna unit as high as possible. Mounting it this way keeps it free of interfering objects and water spray, which can interrupt reception of GPS satellite signal if the water freezes.

Horizontal separation distance:

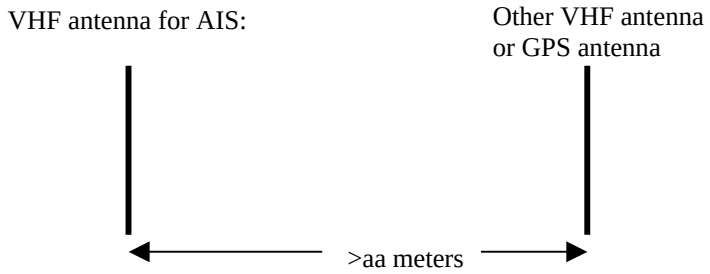
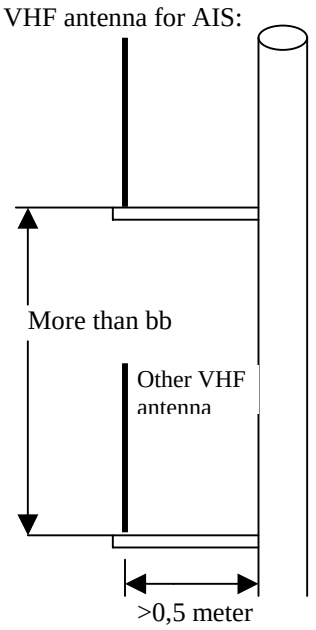


Figure 4.1.3a, Example of horizontal distance between antennas

Vertical separation distance and distance from mast or other object of metal:

Vertical separation distance:



Vertical separation distance:

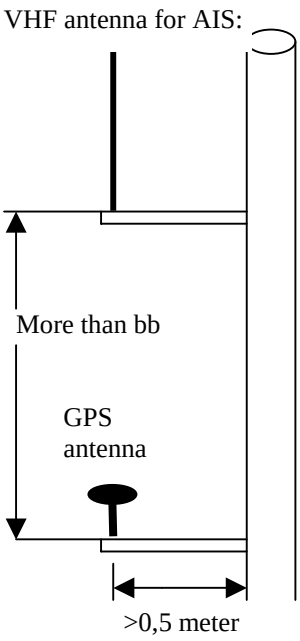


Figure 4.1.3b, Examples of vertical distance between antennas

4.2 Cabling

The cable should be kept as short as possible to minimize signal attenuation.

The table below gives recommendations on cables that can be used for the GPS antenna connections:

Type	**Attenuation @1.5 GHz (dB/100m)**	**Remark**
RG58	90	Default for use if length< 20 m and antenna = Procom GPS4
RG214	35	If combined GPS/VHF antenna from either Procom or Comrod is used, this or better can be used
RG225	30	Cable with lower loss

For optimum performance of the transponder approximately +10dB gain should be available when the cable attenuation has been subtracted from the GPS antenna preamplifier gain. Note that Procom AIS2/GPS and Comrod AC17-AIS are combined VHF/GPS antennas and additional attenuation from connectors/ diplexer must be taken in consideration. Some examples below:

Cable Type	Antenna	Preamplifier Gain (dB/100m)	Recommended cable length (m)
RG58	Procom GPS4	30	<20 meter
RG214	Procom AIS2/GPS	28	10-30 meter
	Comrod AC17-AIS	20	10-20 meter
RG225	Procom AIS2/GPS	28	10-40 meter
	Comrod AC17-AIS	20	10-30 meter

The table below is gives you the attenuation on the VHF frequencies with different cable types:

Cable Type	Attenuation @150 MHz (dB/100m)	Diameter (mm)	Weight (kg/100m)
RG214	7	10,8	18,5
RG225	8	10,9	23,3

Example : A RG 214 cable with length of 40 meters will have an attenuation of 2,8 dB.

Please keep the cables as short as possible, and be aware that 3 dB loss means only half the output power. If you have a transmitter delivering 12,5 W, and you have 3 dB loss in the cable, only 6,25 Watts will be at the antenna.

4.2.1 Cable installation

All outdoor installed connectors on coaxial cables should be fitted with preventive isolation such as vulcanizing tape to protect against water penetration into the antenna cable.

Coaxial cables should be installed in separate signal cable channels/tubes and at least 10 cm away from power supply cables. Crossing of cables should be done at right angles (90°). The minimum bend radius of the coaxial cable should be 5 times the cable's outer diameter.

4.3 Receiver unit

When selecting a mounting location for the receiver the following guidelines apply:

1. Keep the receiver out of direct sunlight.
2. The temperature and humidity should be moderate and stable.
3. The mounting location should be well ventilated.
4. Mount the unit where shock and vibration are minimal.
5. Keep the unit away from electromagnetic field generating equipment such as motor and generator.
6. Leave sufficient space at the sides and rear of the unit for maintenance and repair. Do also leave slack in cables for same reason.

4.3.1 Desktop Mounting

Use the standard Mounting Kit. For mounting hole measurements see Figure 4.3.3.

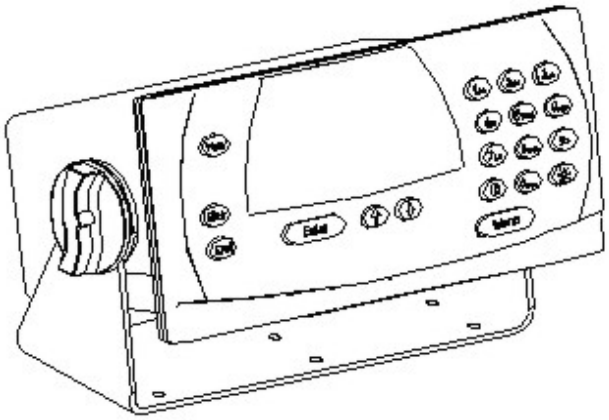


Figure 4.3.1, Desktop Mounting

4.3.2 Roof Mounting

Use the standard Mounting Kit for desktop mounting.
The bracket plates 1 and 2 must be switched over to opposite side and the bracket is turned 180 degrees in order to get the bracket in place for roof mounting.
For mounting hole measurements see Figure 4.3.3.

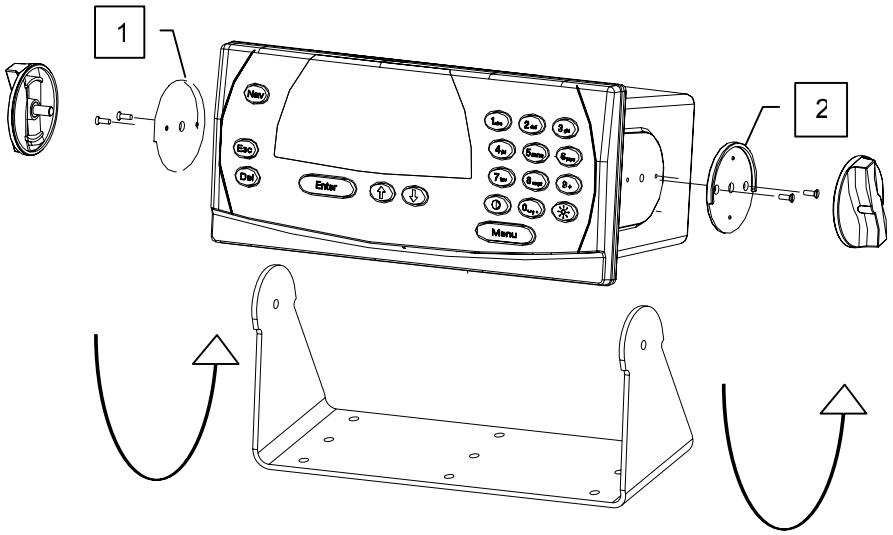


Figure 4.3.2a, Roof Mounting

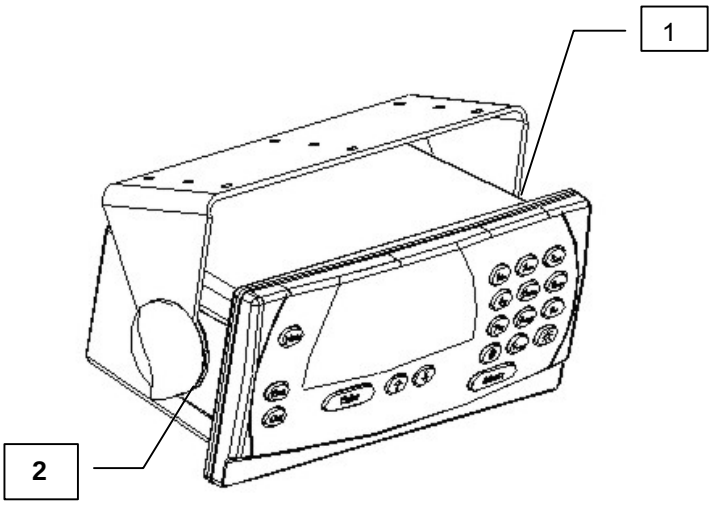


Figure 4.3.2b, Roof Mounting

4.3.3 Bracket mounting hole measurements

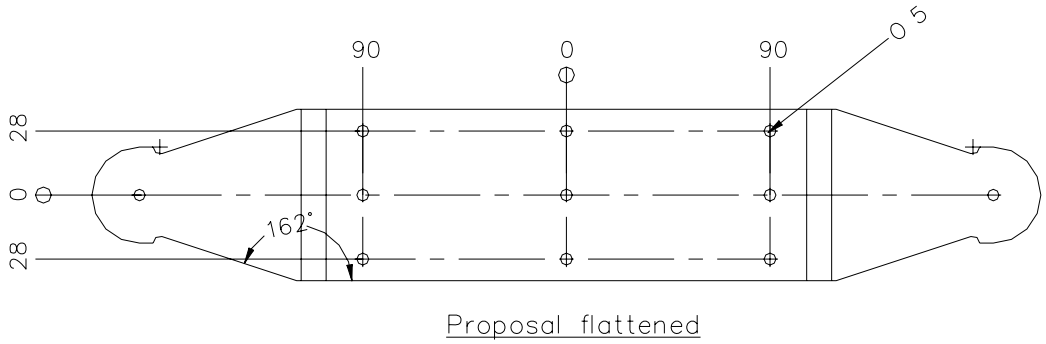


Figure 4.3.3, Bracket mounting hole measurements

4.3.4 Flush Mounting

Use the Flush Mounting Kit 80586. For mounting hole measurements see Figure 4.3.4b.

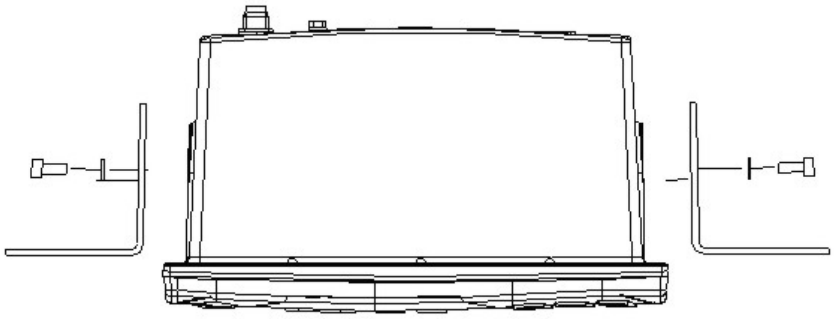


Figure 4.3.4a, Flush Mounting

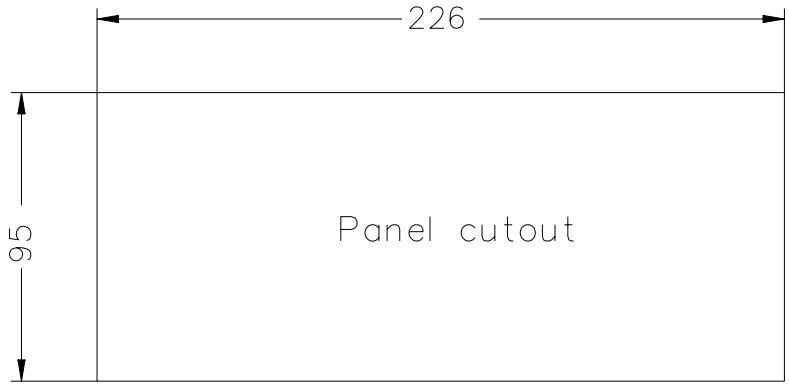


Figure 4.3.4b Flush Mounting Panel cutout

4.3.5 19``Rack Tray Mounting

Use the 19`` Rack Tray Mounting Kit 80587. For mounting see Figure 4.3.5b

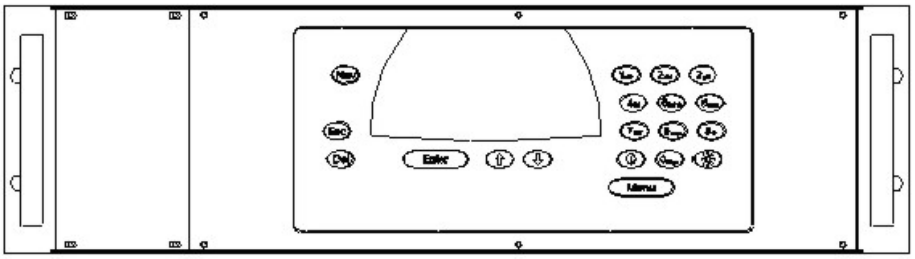


Figure 4.3.5a, Rack Tray Mounting

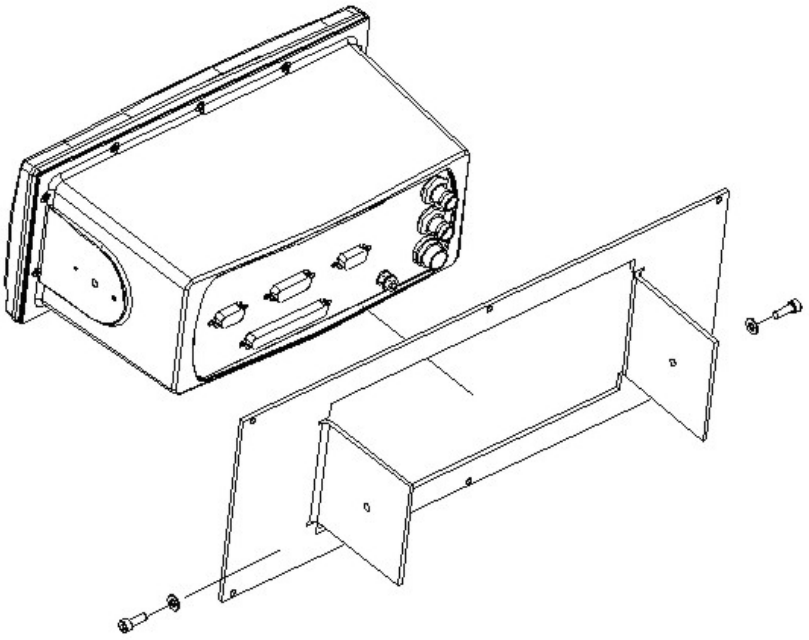


Figure 4.3.5b, Rack Tray Mounting

5 OPERATION

Figure 5.0, Front view RA-2500

5.1 Description of keys

Nav : Shortcut to insert navigational data

Menu : Show main menu

Enter : Accept current setting.
Takes you one menu level forward.
Enter sub-menu

Esc : Escape from current menu without saving.
Takes you one menu level back.

Del : Delete character at cursor

↑↓ : Scrolling menus

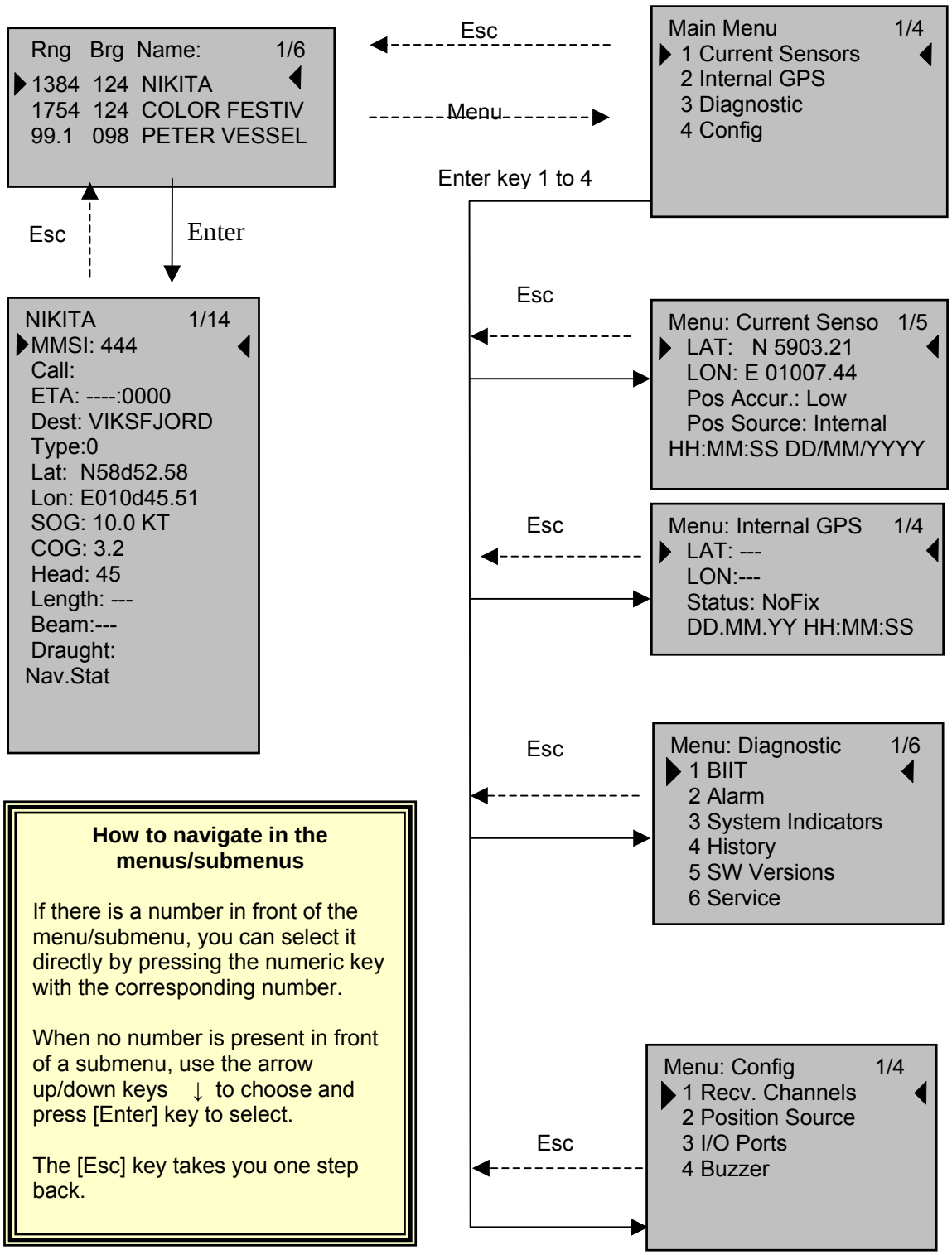
☼ : Adjust light intensity in display and keyboard buttons.

◑ : Adjust contrast in display.

0-9 : Digits 0-9.
Press keys with a short time interval to convert it to alphabetical character.

5.2 Menus

5.2.1 Menu Flowchart



How to navigate in the menus/submenus

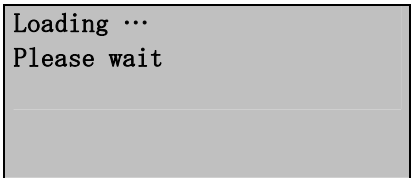
If there is a number in front of the menu/submenu, you can select it directly by pressing the numeric key with the corresponding number.

When no number is present in front of a submenu, use the arrow up/down keys ↓ to choose and press [Enter] key to select.

The [Esc] key takes you one step back.

5.3 Connecting power

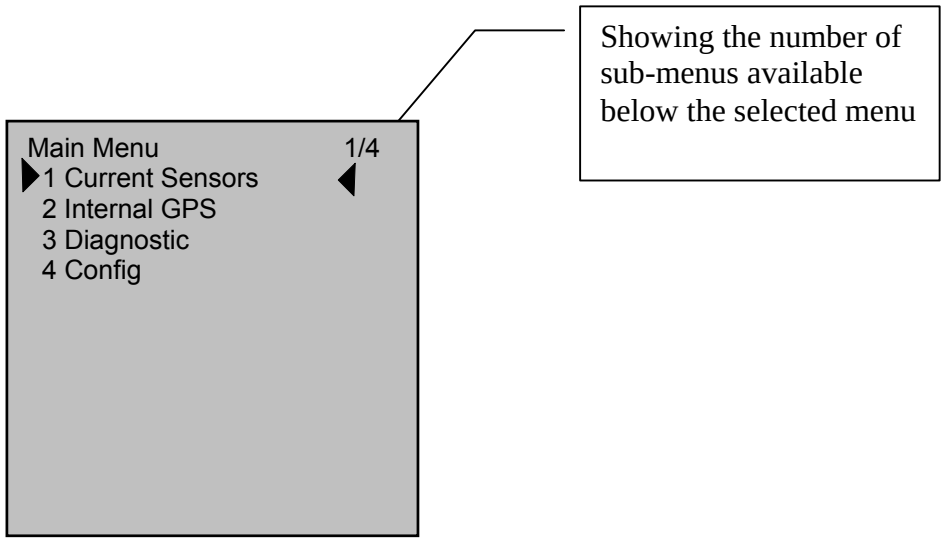
After connecting the antennas and Inputs/Outputs, the DC power can be connected to the RA-2500. The input voltage must be within 24VDC +30% / -10%. The power consumption is 17W. At start, the RA-2500 will look for connected sensors and equipment for 20 –30 seconds. The display will show:



After a while the alarm status will be indicated. Press [Del] key to reset the alarm settings.
If the RA-2500 has been previous configured, and the configuration is OK, there is no need to go further in this chapter. Otherwise continue with chapter 9.2.1.

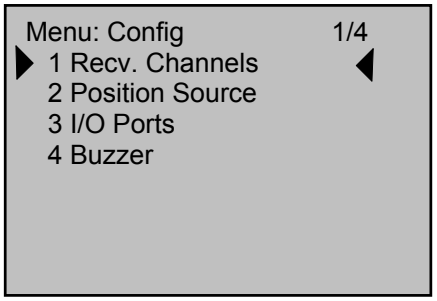
5.3.1 LAN configuration

Press [Menu] key to enter “Main menu”.



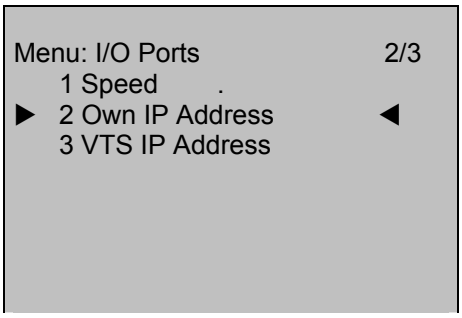
Select “Config” by [arrow down] key.

Press [Enter] key.

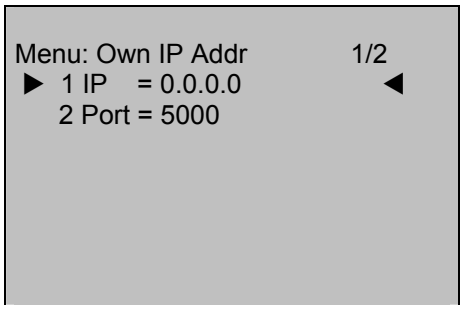


Select ‘ I/O Ports” followed by [Enter] key

5.3.1.1 Set Own IP address



Select “Own IP address” then [Enter] key
Now the IP address of the RA-2500 can be entered.



Enter an unique IP address on the network you are connected. See chapter 5.3.1.2.

The Port number is default to “5000”, but can be altered. This must of course be the same on the RA-2500 and the computer connected.

Press [Enter] when done. When you have saved the settings, you will press [ESC] to return to previous menu levels.

5.3.1.2 Selection of IP address

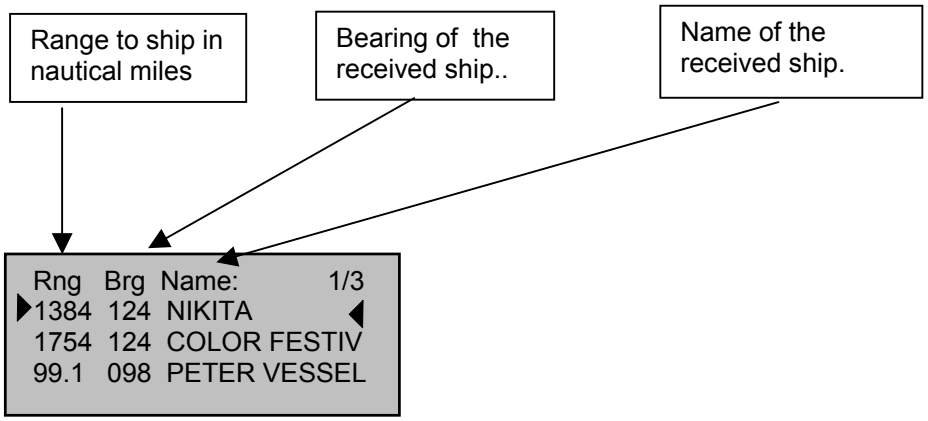
Be shure that Own IP and VTS IP is within the same subnet.
The configuration of Unicast, Multicast or Broadcast is dependent of the map system and the date network available. See this table for address limitations within the different groups and classes.

Class	Own IP address		VTS IP Unicast address		VTS IP Multicast address		VTS IP Broadcast address
	Min	Max	Min	Max	Min	Max	Fixed
A	10.0.0.0	10.255.255.254	10.0.0.0	10.255.255.254	224.0.0.0	239.255.255.255	10.255.255.255
B	172.16.0.0	172.31.255.254	172.16.0.0	172.31.255.254	172.16.0.0	172.31.255.254	172.31.255.255
C	192.168.0.0	192.168.0.254	192.168.0.0	192.168.0.254	192.168.0.0	192.168.0.254	192.168.0.255

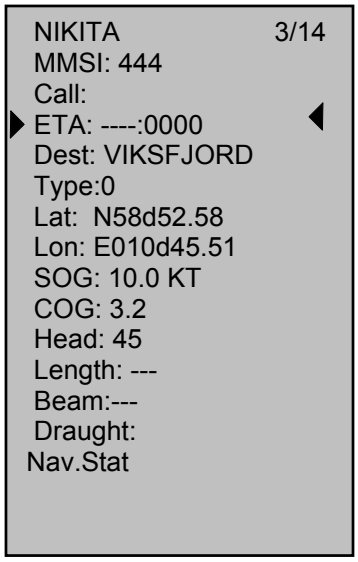
5.4 Normal use

5.4.1 Display received vessels

Normal use operational display



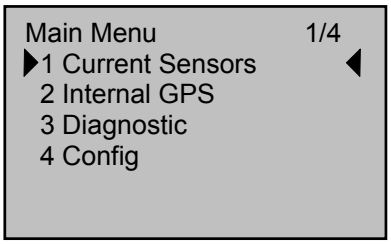
Select the name of the ship by pressing [arrow down] key and [Enter] key.



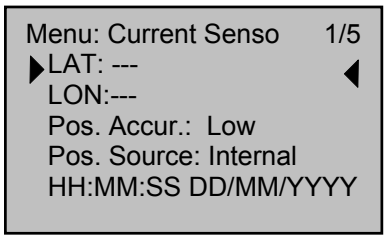
Select specific information by pressing [arrow down] key and [Enter] key.

Press [Esc] key twice to go to “Main Menu”.

5.4.2 Current Sensors / Dynamic Data menu



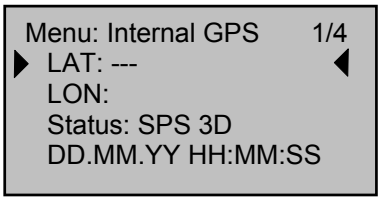
Select “Current Sensor” with numeric key [1] or [arrow down] key and [Enter] key.



This menu shows the data from the selected sensors onboard that the RA-2500 is receiving.
Press [Esc] key twice to return to “Main Menu”.

5.4.3 Internal GPS Menu

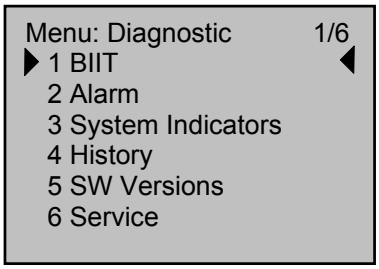
From the “Main Menu” select “Internal GPS” by pressing numeric key [4] or [arrow down] key and [Enter] key.



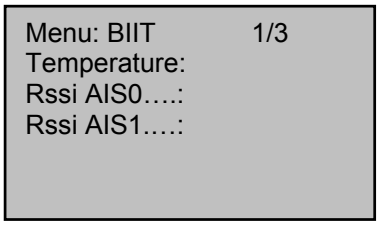
This menu shows the data from the internal GPS module.
Press [Esc] key twice to return to “Main Menu”.

5.4.4 Diagnostic Menu

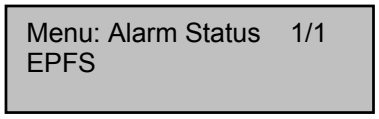
From the “Main Menu” select “Diagnostic” by pressing numeric key [3] or [arrow down] key and [Enter] key.



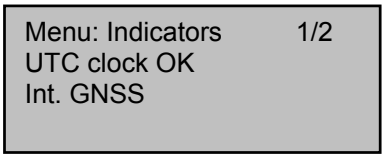
This menu gives access to different submenus for readout of parameters.
The only submenu who can give access to changes is the “Service” menu which is password protected.
Select “BITE” menu by pressing [Enter] key or numeric key [1].



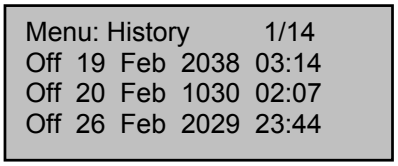
This menu gives BIIT readout values from the receiver.
Press [Esc] key to go one step back. Select “Alarm Status” menu by pressing numeric key [2] or [arrow down] key and press [Enter] key.



This menu shows the log over momentarily status alarms that have been visualized in the AIS display and signed for by pressing [Del] key, but are still valid.
Press [Esc] key to go one step back. Select “System Indicators” menu by pressing numeric key [3] or [arrow down] key and press [Enter] key.

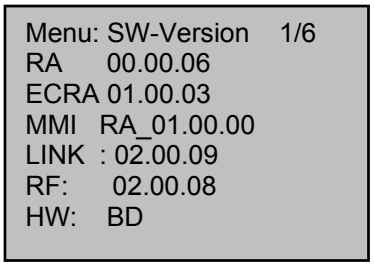


This menu shows the momentarily status if sensor is connected.
Press [Esc] key to go one step back. Select “History” menu by pressing numeric key [4] or [arrow down] key and press [Enter] key.

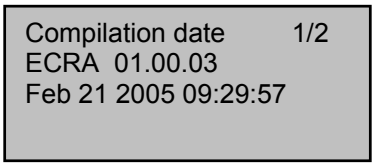


This menu shows the log over when the receiver have been turned off for more than 15 min. Press [Esc] key to go one step back.

Select “SW Version” menu by pressing numeric key [5] or [arrow down] key and press [Enter] key.



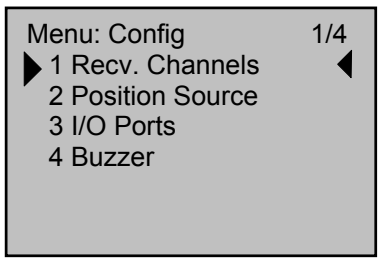
This menu shows the different software versions installed in the receiver.
To get the Compilation date for each software version, select the software by [arrow up/down] keys and press [Enter] key.



This shows the Compilation date and time for this specific software.
Press [Esc] key to go one step back. Repeat the procedure for the other software versions. Press [Esc] key twice to go back to “Main” menu.

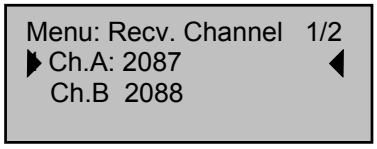
5.4.5 Config Menu

From “Main” menu select “Config” menu by pressing numeric key [4] or [arrow down] key and press [Enter] key.

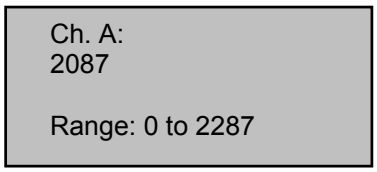


5.4.5.1 Receiver channels

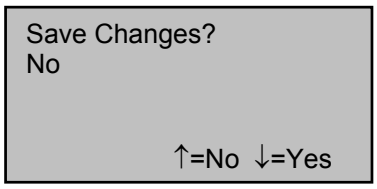
Select “Recv. Channels.” menu by pressing numeric key [1] or [arrow up/down] keys and press [Enter] key.



From this menu it is possible to set the frequencies of the two receiving channels.

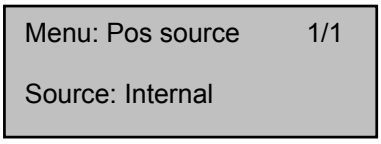


Set value for selected channel. Repeat for Ch. B.

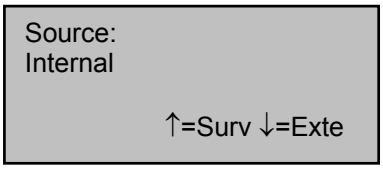


5.4.5.2 Positioning Source

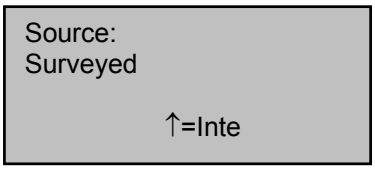
From “Config” menu select “Positioning Source” menu by pressing numeric key [2] or [arrow up/down] keys and press [Enter] key.



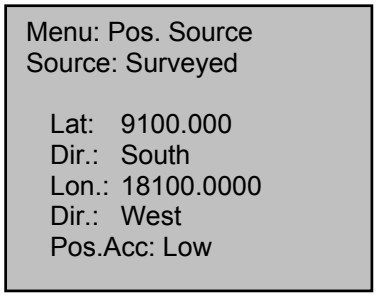
Select between Internal, External or Surveyed source.



Select by using the arrow keys.



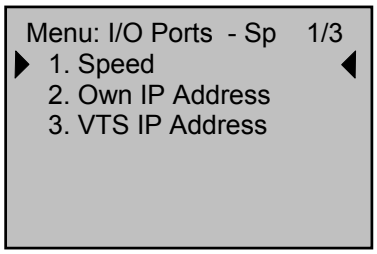
The Surveyed source is a static precise position to be entered manually for a RA-2500.



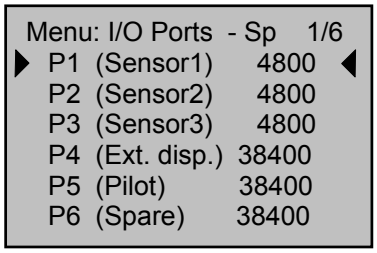
Press [Esc] key to go back to “Config” menu.

5.4.5.3 I/O Ports

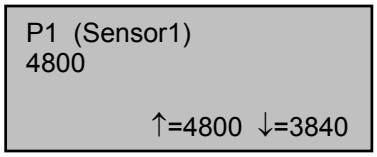
From “Config” menu select “I/O Ports” menu by pressing numeric key [3] or [arrow up/down] keys and press [Enter] key.



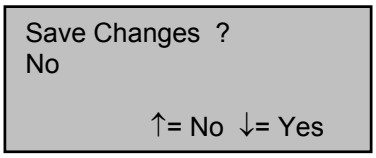
Press [Enter] key or numeric key [1] to select data speed .



This menu allows the setting of data speed at port1 to port 6 of 4800 b/s or 38400 b/s.
Press [Enter] key to select “P1”.



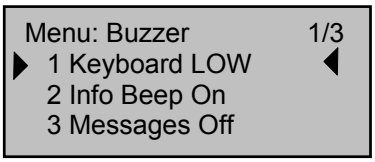
Select speed using [arrow up/down] keys and press [Enter] key
Repeat the prosedure for all ports.
Press [Esc] key to return



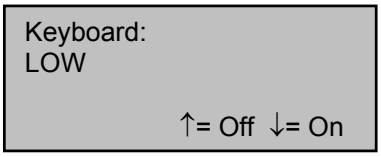
Confirm changes by [arrow up/down] keys and press [Enter] key

5.4.5.4 Buzzer

From “Config” menu select “Buzzer” menu by pressing numeric key [5] or [arrow down] key and [Enter] key.



Select “Keyboard” menu by pressing numeric key [1] or [Enter] key.



Select keyboard status with [arrow up/down] keys and [Enter] key.
Repeat procedure for “Info Beep” and “Messages”.
Press [Esc] key twice to return to “Config” menu.

5.5 Description of sentence format

The following provides a summary explanation of the approved sentence structure:

$aaccc, c---c*hh<CR><LF>

ASCII	HEX	Description
"$"	24	Start of sentence: starting delimiter
aaccc		Address field: alphanumeric characters identifying type of talker, and sentence formatter. The first two characters identify the talker. The last three are the sentence formatter mnemonic code identifying the data type and the string format of the successive fields. Mnemonics will be used as far as possible to facilitate read-outs by users.
","	2C	Field delimiter: starts each field except address and checksum fields. If it is followed by a null field, it is all that remains to indicate no data in a field.
c---c		Data sentence block: follows address field and is a series of data fields containing all of the data to be transmitted. Data field sequence is fixed and identified by the third and subsequent characters of the address field (the sentence formatter). Data fields may be of variable length and are preceded by delimiters ",".
"*"	2A	checksum delimiter: follows last data field of the sentence. It indicates that the following two alpha-numeric characters show the HEX value of the checksum.
hh		Checksum field: the absolute value calculated by exclusive-OR'ing the eight data bits (no start bits or stop bits) of each character in the sentence between, but excluding, "$" and "*". The hexadecimal value of the most significant and least significant four bits of the result are converted to two ASCII characters (0-9, A-F) for transmission. The most significant character is transmitted first. The checksum field is required in all cases.
<CR><LF>	0D 0A	End of sentence: sentence terminating delimiter.

5.6 Input

5.6.1 Definitions

1. BCFQ = Query BCF message from RA-2500
   When the RA-2500 receives a Query, it responds with a BCF message.

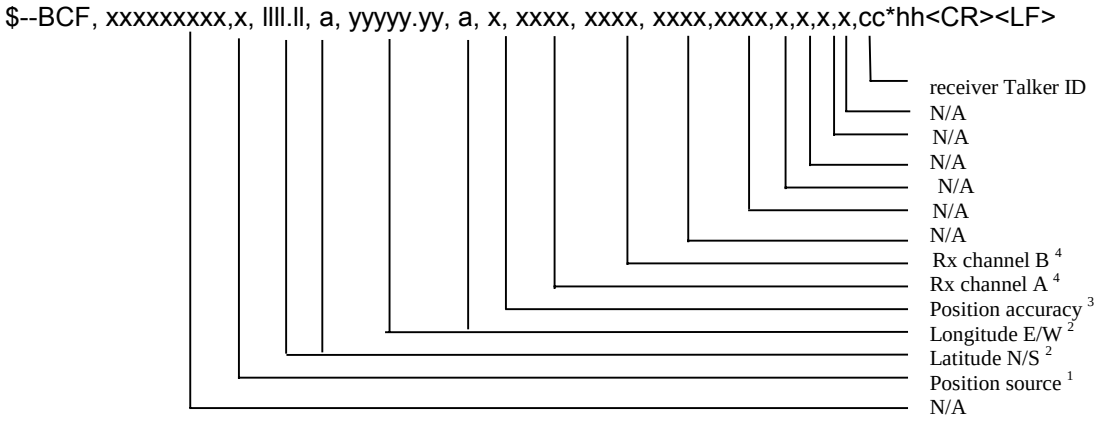
2. BCF = Configure Rx channels, Position source and Talker ID at RA-2500

5.6.2 Receiving actions

VDL Input	Resulting PI Output	Resulting VDL Output
Message 1	VDM	Nil
Message 2	VDM	Nil
Message 3	VDM	Nil
Message 4	VDM	Nil
Message 5	VDM	Nil
Message 8	VDM	Nil
Message 9	VDM	Nil
Message 11	VDM	Nil
Message 12	VDM	Nil
Message 14	VDM	Nil
Message 16	VDM	Nil
Message 17	VDM	Nil
Message 18	VDM	Nil
Message 19	VDM	Nil
Message 20	VDM	Nil
Message 21	VDM	Nil
Message 22	VDM	Nil

5.6.3 Format BCF:

Configure RA-2500 parameters. See paragraph 10.2.1 section 2.



Notes:

1. Identifies the source of the position.
   Value 0 = surveyed position
   Value 1 = internal source
   Value 2 = external source

2. Surveyed position of the base station. The position is only applicable to fixed base stations. Within the base station, the "electronic position fixing device" parameter is set to a value of 7 indicating a surveyed position. Mobile or non-fixed base stations receive their position information by another means.

3. 0 = low > 10m.
   1 = high < 10m ; differential mode of DGNSS.

4. VHF channel number, see paragraph 9

5.7 Output

All sentences starts with a delimiter that can be “$” or “!” followed by the talker identifier indicated by “- -“. The talker identifier is AI for AIS.

5.7.1 Definitions

1. VDM = All received VDL messages (except addressed Binary and Safety messages) are forwarded in a VDM message to the Management System.

2. BCF = Configure Rx channels, Position source and Talker ID at RA-2500.

3. GGA = Forward internal GPS data if position source internal.

4. VTG = Forward internal GPS data if position source internal.

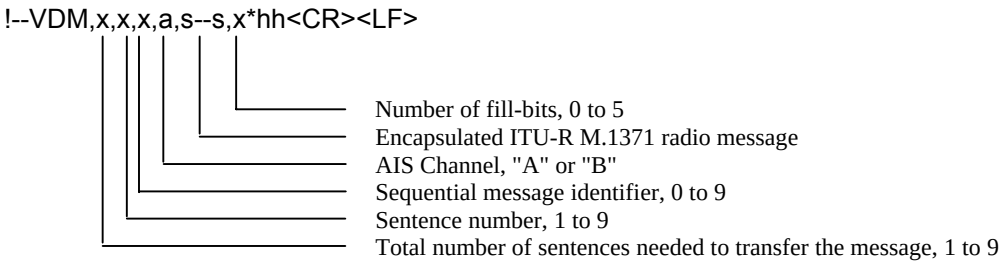
5. GLL = Forward internal GPS data if position source internal.

6. ALR = Position alarm.

7. TXT = UTC status, Position source status.

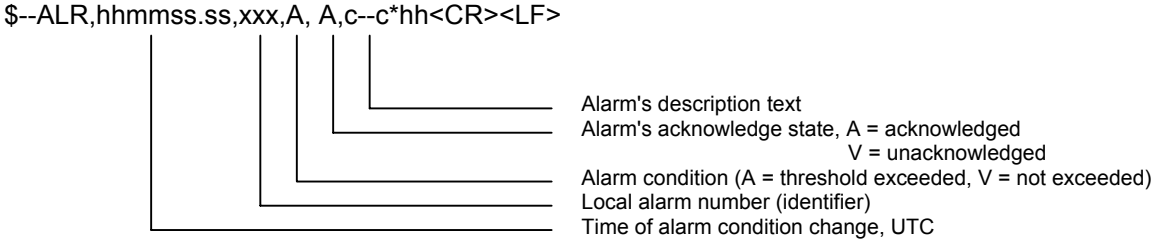
5.7.2 VDM VHF Data-link Message

This sentence is used to transfer the entire contents of a received AIS message packet, as defined in ITU-R M.1371 and as received on the VHF Data Link (VDL), using the "6-bit" field type.



5.7.3 ALR - Set alarm state.

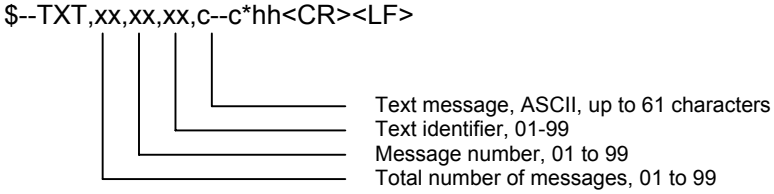
Local alarm condition and status. This sentence is used to report an alarm condition on a device and its current state of acknowledgement.



alarms description text	Alarm condition threshold exceeded	Alarm condition not exceeded	alarm ID or text identifier	reaction of the system to the alarm condition threshold exceeded
AIS: Rx channel 1 malfunction	A	V	003	
AIS: Rx channel 2 malfunction	A	V	004	
AIS: general failure	A	V	006	
AIS: No sensor position in use	A	V	026	Continue operation

5.7.4 TXT Text transmission

For the transmission of short text messages. Longer text messages may be transmitted by using multiple sentences.

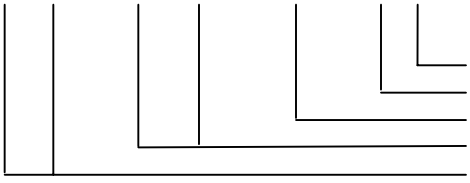


Text message	Text identifier	reaction of the system
AIS: UTC clock lost	007	Continue operation using indirect or semaphore synchronisation
AIS: external DGNSS in use	021	Continue operation
AIS: external GNSS in use	022	Continue operation
AIS: internal DGNSS in use (beacon)	023	Continue operation
AIS: internal DGNSS in use (msg 17)	024	Continue operation
AIS: internal GNSS in use	025	Continue operation
AIS: surveyed position in use	041	Continue operation
AIS: UTC clock OK	042	Continue operation
AIS: System Started	051	Continue operation

5.7.5 GLL Geographic position latitude/longitude

Latitude and longitude of vessel position, time of position fix and status.

$--GLL, llll.ll, a, yyyyy.yy, a, hhmmss.ss, A, a *hh<CR><LF>



Mode indicator
Status: A = data valid V = data invalid
Time of position (UTC)
Longitude , E/W
Latitude, N/S

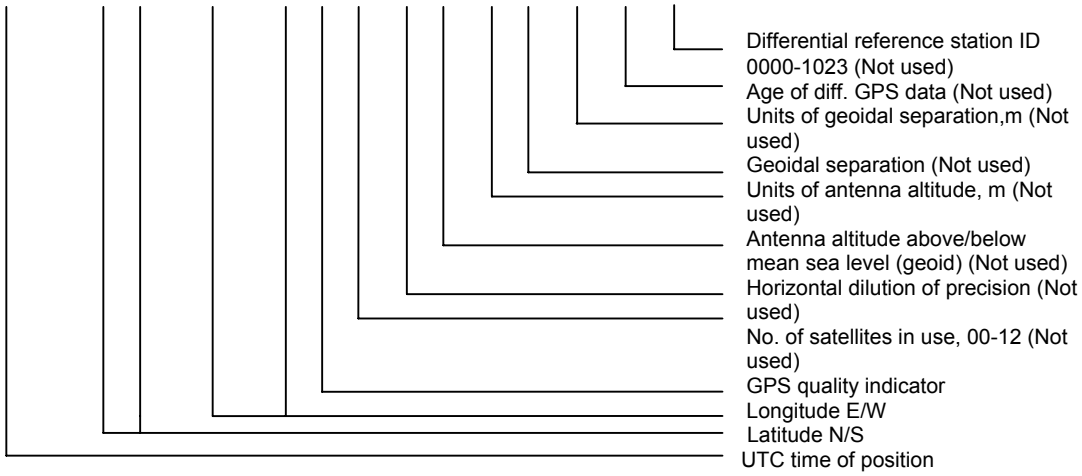
NOTE: Positioning system Mode indicator:

A = Autonomous
D = Differential
E = Estimated (dead reckoning)
M = Manual input
S = Simulator
N = Data not valid

5.7.6 GGA Global positioning system (GPS) fix data

Time, position and fix-related data for a GPS receiver.

$--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>



6 EQUIPMENT LIST

6.1 Standard supply 80500

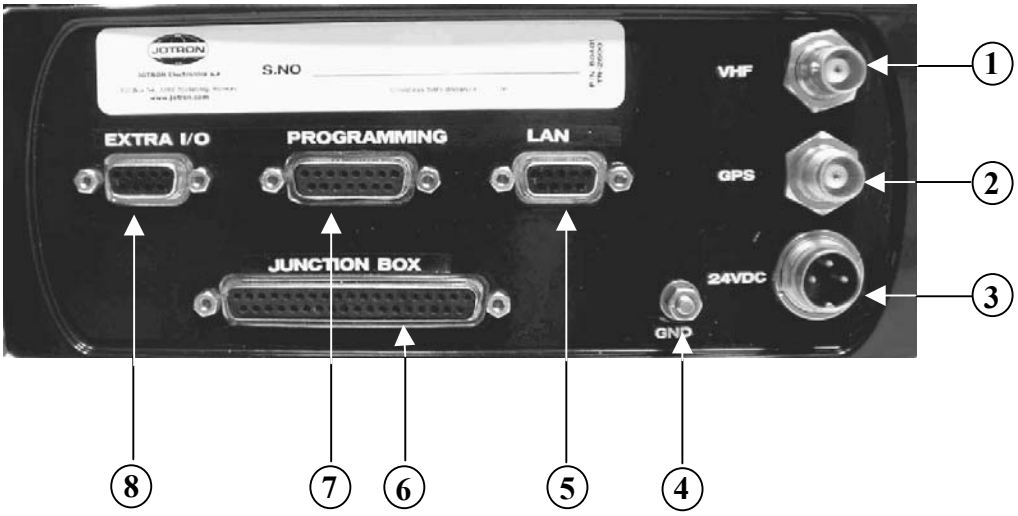
No.	Name	Type	Stock No.	Qty.
1	Receiver unit	RA-2500	**80500**	1
2	Operators & Installation Manual		**81984**	1
3	Standard Bracket Kit	For Desktop or Roof mounting of RA-2500	81540	1
4	AC/DC External power supply	230VAC to 24VDC	81830	1
5	Power connector	For 24CDC to RA-2500	81509	1
6	Combined GPS and VHF antenna		81903	1
7	RS232 Cable 37pin to 9pin	2.5m	**82092**	1
8	AIS Graphical Viewer v.1.2.2.or higher w/manual	CD-R	**81650**	1

6.2 Optional supply

Name	Type	Stock No.
RS422 to RS232 converter	Allows 30m connection cable	81905
LAN cable	5m 9pin D-sub to RJ45	**82159**
GPS antenna with mounting bracket	Transvoice type 202-968 with 200-456/200-233 bracket	80618
Plug Kit for 80618		81534
GPS/VHF combined antenna	Comrod AC17-AIS	80747
Plug Kit for 80747		81536
Signal splitter 80747		81768
VHF antenna w/mounting bracket	Transvoice	80617
Plug Kit 80617		80597
Flush Mounting Kit		80586
19`` Rack Tray Mounting Kit		80587

7 WIRING AND CONNECTIONS

7.1 RA-2500 Rear Connections



1. VHF Antenna Connector

This is a BNC type antenna connector to be connected directly to an external VHF antenna or antenna splitter to receive and transmit VHF frequencies.
For further information see chapter 8.9.

2. GPS Antenna Connector

This is a TNC type antenna connector to be connected directly to an external GPS antenna or antenna splitter to receive GPS information.
For further information see chapter 8.10.

3. 24VDC Connector

This is a connector to connect 24VDV power to the receiver.
For further information see chapter 6.7 and 8.13.

4. Ground Tag (GND)

This Ground Tag is to be connected directly to the ships metal.

5. LAN Connector

See chapter 7.4

6. Junction Box Connector

See chapter 7.2

7. Programming Connector

This 15 pin D-sub connector is for programming of the Receiver by Program Engineers only.

8. Extra I/O Connector

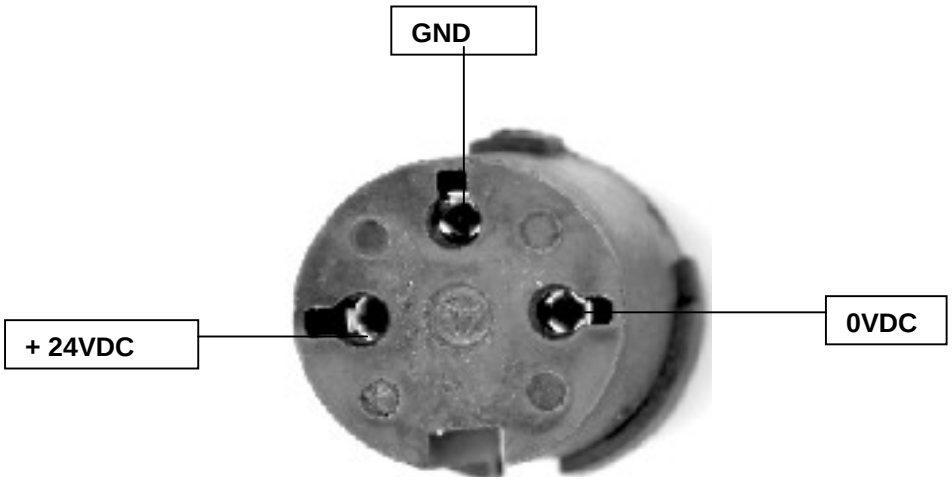
This 9 pin D-sub connector is not described. Factory use only.

7.2 Description of Junction Box Connector

37 Pin D-sub RA-2500	Functions	Input / Output
13	AIS TD4-B (External Display)	Out
14	AIS TD4-A (External Display)	Out
	Isolated GND	
15	AIS RD4-B	In
16	AIS RD4-A	In
	Isolated GND	
17	AIS TD5-B	
18	AIS TD5-A	
	Isolated GND	
19	AIS RD5-B	
20	AIS RD5-A	
	Isolated GND	
21	AIS TD6-B	Out
22	AIS TD6-A	Out
	Isolated GND	
23	AIS RD6-B	In
24	AIS RD6-A	In
	Isolated GND	
25	AIS TD7-B	Reserved
26	AIS TD7-A	Reserved
	Isolated GND	
27	AIS RD7-B	
28	AIS RD7-A	
	Isolated GND	
29	RS-232 TX	Out
30	RS-232 RX	In
31	Dry relay contact, Referred to pin 48	Alarm Out (NC)
32	Dry relay contact, Referred to pin 48	Alarm Out (NO)
33	Dry relay contact, Referred to #46 & 47	Common
34	I/O Spare	
35	Future warning for Backup Power	
36	GND	

7.3 Description of 24VDC connection to receiver

24VDC Connector for cable, front side



7.4 Description of LAN connector

Contains Ethernet 10Mbit Twisted pair interface and RS232 serial port with Tx and Rx.

Service connector, 9 pins Dsub:

Nr.	Name	Function		In/Out
1	Ether_Tx+	Ethernet Transceive Data+		Out
2	Ether_Tx-	Ethernet Transceive Data-		Out
3	Ether_Rx+	Ethernet Receive Data+		In
4	Ether_Rx-	Ethernet Receive Data-		In
5	GND	Ground		-
6				
7				
8	+14V	+14 V, max 300mA.		-
9	NC	Not Connected		-

8 ALARM MESSAGES

8.1 Receiver malfunction

If the error messages “Rx1”or “Rx2” appears on the LCD Display, this indicate that the test of the TDMA receivers 1 or 2 has failed.

The alarm messages are as follows:

Alarm ID or text identifier	Alarm description text
ID 003	AIS RX channel 1 malfunction
ID 004	AIS RX channel 2 malfunction
ID 006	AIS RX general failure

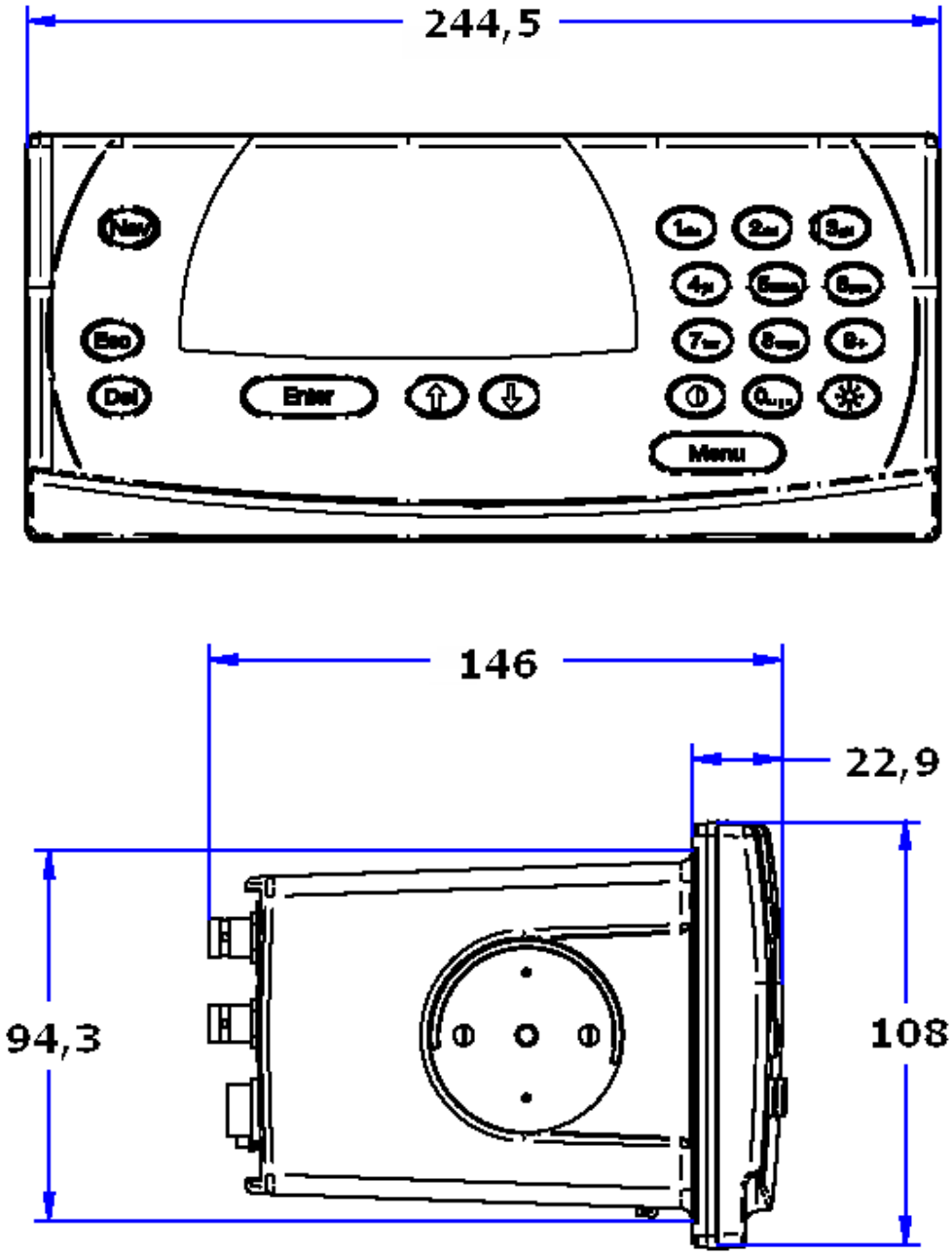
9 LIST OF VHF CHANNELS

Channel no.	Frequency	Channel no.	Frequency	Channel no.	Frequency	Channel no.	Frequency
6	156.3000	1021	157.0500	1279	156.9775	2219	161.5625
8	156.4000	1022	157.1000	1280	157.0375	2220	161.6125
9	156.4500	1023	157.1500	1281	157.0875	2221	161.6625
10	156.5000	1024	157.2000	1282	157.1375	2222	161.7125
11	156.5500	1025	157.2500	1283	157.1875	2223	161.7625
12	156.6000	1026	157.3000	1284	157.2375	2224	161.8125
13	156.6500	1027	157.3500	1285	157.2875	2225	161.8625
14	156.7000	1028	157.4000	1286	157.3375	2226	161.9125
15	156.7500	1060	156.0250	1287	158.3875	2227	161.9625
16	156.8000	1061	156.0750	2001	160.6500	2228	162.0125
17	156.8500	1062	156.1250	2002	160.7000	2260	160.6375
67	156.3750	1063	156.1750	2003	160.7500	2261	160.6875
68	156.4250	1064	156.2250	2004	160.8000	2262	160.7375
69	156.4750	1065	156.2750	2005	160.8500	2263	160.7875
70	156.5250	1066	156.3250	2007	160.9500	2264	160.8375
71	156.5750	1078	156.9250	2018	161.5000	2265	160.8875
72	156.6250	1079	156.9750	2019	161.5500	2266	160.9375
73	156.6750	1080	157.0250	2020	161.6000	2278	161.5375
74	156.7250	1081	157.0750	2021	161.6500	2279	161.5775
75	156.7750	1082	157.1250	2022	161.7000	2280	161.6375
76	156.8250	1083	157.1750	2023	161.7500	2281	161.6875
77	156.8750	1084	157.2250	2024	161.8000	2282	161.7375
208	156.4125	1085	157.2750	2025	161.8500	2283	161.7875
209	156.4625	1086	157.3250	2026	161.9000	2284	161.8375
210	156.5125	1087	157.3750	2027	161.9500	2285	161.8875
211	156.5625	1088	157.4250	2028	162.0000	2286	161.9375
212	156.6125	1201	156.0625	2060	160.6250	2287	161.9875
213	156.6625	1202	156.1125	2061	160.6750		
214	156.7125	1203	156.1625	2062	160.7250		
215	156.7625	1204	156.2125	2063	160.7750		
216	156.8125	1205	156.2625	2064	160.8250		
217	156.8625	1206	156.3125	2065	160.8750		
267	156.3875	1207	156.3625	2066	160.9250		
268	156.4375	1218	156.9125	2078	161.5250		
269	156.4875	1219	156.9625	2079	161.5750		
270	156.5375	1220	157.0125	2080	161.6250		
271	156.5875	1221	157.0625	2081	161.6750		
272	156.6375	1222	157.1125	2082	161.7250		
273	156.6875	1223	157.1625	2083	161.7750		
274	156.7375	1224	157.2125	2084	161.8250		
275	156.7875	1225	157.2625	2085	161.8750		
276	156.8375	1226	157.3125	2086	161.9250		
277	156.8875	1227	157.3625	2087	161.9750		
1001	156.0500	1228	157.4125	2088	162.0250		
1002	156.1000	1260	156.0375	2201	160.6625		
1003	156.1500	1261	156.0875	2202	160.7125		
1004	156.2000	1262	156.1375	2203	160.7625		
1005	156.2500	1263	156.1875	2204	160.8125		
1007	156.3500	1264	156.2375	2205	160.8625		
1018	156.9000	1265	156.2875	2206	160.9125		
1019	156.9500	1266	156.3375	2207	160.9625		
1020	157.0000	1278	156.9375	2218	161.5125		

Channel 2087 = Channel 87B Channel 2088 = Channel 88B

10 OUTLINE DRAWINGS

10.1 TR-2500 AIS Transponder



10.2 Procom CXL 2-1/l

Maritime VHF Antenna with FLG Bracket

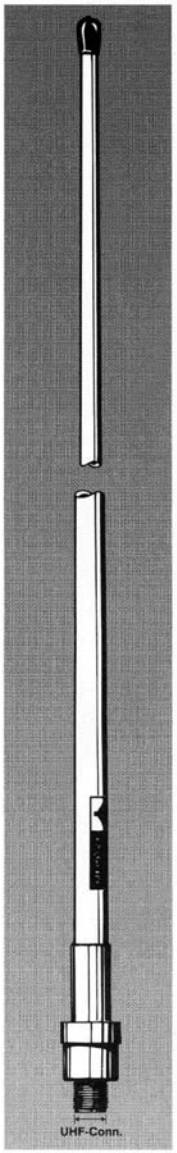
CXL 2-1/l

Marine VHF Antenna

PROCOM

DESCRIPTION:

- ★ This maritime VHF antenna is developed for use on board ships and thanks to the 1" revolving nut mounting system it can be mounted in the mast, in the auxilliary mast as well as on the cross-beam. By means of PROCOM's flange mount it can also be mounted on deck or rooftop.
- ★ Bear in mind that the higher the antenna is mounted the better coverage.
- ★ Avoid mounting the antenna parallel with and in the neighbourhood of other metal parts, such as mast, supporting wires etc. Free mounting and as high as possible is most preferable, otherwise the SWR and the radiation diagram will be influenced.
- ★ The antenna is a 1/2 λ design and this means that it needs neither loading coils, ground-plane, radials nor other auxiliary arrangements.
- ★ CXL 2-1/l can, without problems, operate with duplex radioes and on the semi-duplex channels, owing to the fact that it is broad-banded (see SWR diagram). In other words, CXL 2-1/l has a shipshape SWR on the RX-frequencies, which is just as important as it is for the TX-frequencies.
- ★ Furthermore, the antenna is a grounded radiator antenna and therefore it shows a DC-short across the coaxial cable.
- ★ A conical glassfiber tube completely encloses the carefully designed radiating element to ensure long dependable service in all climates.

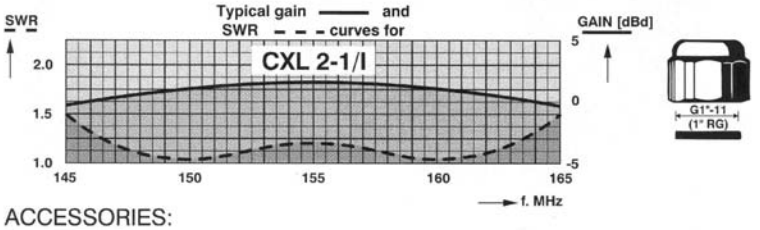


SPECIFICATIONS:

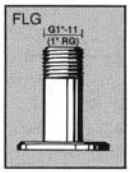
ELECTRICAL	
MODEL	CXL 2-1/l
ANTENNA TYPE	1/2 λ coaxial, broad-band
FREQUENCY	144–165 MHz
IMPEDANCE	Nom. 50 Ω
POLARISATION	Vertical
GAIN	0 dBd (2 dBi)
BANDWIDTH	21 MHz
SWR	< 1.5
MAX. POWER	150 watt
MECHANICAL	
TEMP. RANGE	-30° C → +70° C
CONNECTOR	UHF-female (standard)
ANTENNA COLOUR	Marine white
DIA. IN TOP END	8 mm
DIA. IN BOTTOM END	16 mm
TOTAL HEIGHT	Approx. 1.15 m
WEIGHT	Approx. 300 g
MOUNTING	On 1" RG (G1"-11) threaded water pipe or on optional mounting brackets (see below)

ORDERING DESIGNATIONS

TYPE NO.	CONNECTOR
CXL 2-1/l	UHF-female
CXL 2-1/l-N	N-female
CXL 2-1/l-TNC	TNC-female



ACCESSORIES:



PROCOM A/S reserve the right to amend specifications without prior notice.

10.3 Procom GPS 4 Antenna

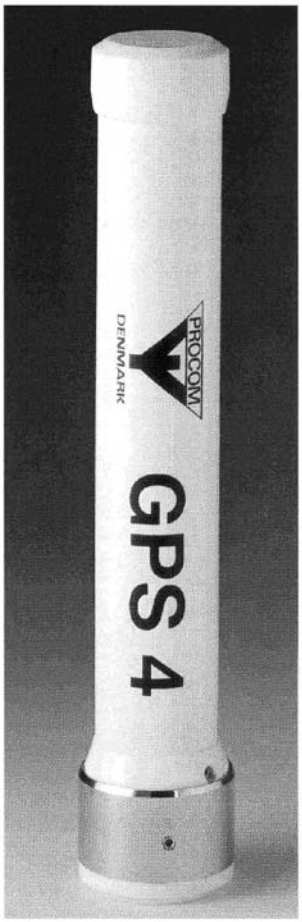
GPS 4/...

Active Receiving Antenna for the 1575 MHz NAVSTAR GPS Satellite Navigational System

PROCOM

DESCRIPTION:

- ★ Full hemispherical coverage due to quadrifilar helix antenna element.
- ★ Built-in high gain, low noise amplifier.
- ★ Input filter for thorough RF-overload protection.
- ★ Right-hand circular polarisation (RHCP).
- ★ High rejection of cross-polarised reflections prevents fading caused by multipath propagation.
- ★ Choice between 5 V or 12 V supply voltage.
- ★ DC supply via RF-connector.
- ★ EMC tested to IEC 801 and IEC 255.
- ★ Total design carried out to make the antenna withstand tough environments.
- ★ Comprehensive range of accessory mounting brackets available.



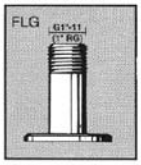
SPECIFICATIONS:

ELECTRICAL General specifications	
ANTENNA TYPE	Quadrifilar helix active antenna
FREQUENCY	1575 MHz
IMPEDANCE	Nom. 50 Ω
POLARISATION	Circular right-hand
COVERAGE	Hemispherical
GAIN (in axial direction)	> 32 dBi
CROSS-POLARISATION ATT.	> 10 dB
Built-in amplifier	
GAIN	> 30 dB
NOISE FIGURE	< 3 dB (incl. input filter). Typ. approx. 2.5 dB
1 dB COMPRESSION POINT	> 10 dBm
SELECTIVITY	> 20 dB down at ± 100 MHz
OUT OF BAND ATTENUATION	0.03– 1 GHz : > 40 dB down 2 –10 GHz : > 40 dB down
SWR (output)	< 2.0
SUPPLY VOLTAGE	GPS 4: 5±0.5 VDC GPS 4/12V: 9–15 VDC
CURRENT CONSUMPTION	Approx. 44 mA
EMC	Full protection (IEC 801, IEC 255)
MECHANICAL	
MATERIALS	Antenna dome: Weather-resistant low-loss plastic
ANTENNA COLOUR	Marine white
INSULATION	Connector ground terminal is galvanically insulated from the mounting hardware
WIND SURFACE	Approx. 0.0072 m²
MAX. WIND SPEED	200 km/h
WIND LOAD	Approx. 9.8 N (at 150 km/h)
TEMP. RANGE	-30° C ⇢ + 70° C
CONNECTOR	FME-male (pin)
SUGGESTED DOWNLEAD CABLE	< 10 m : RG 58 > 10 m : RG 213
TOTAL HEIGHT	Approx. 23 cm
WEIGHT	Approx. 150 g
MOUNTING	On 1" water pipe or on PROCOM 1" mounting brackets (see accessories below)

MODEL SURVEY:

TYPE NO.	SUPPLY VOLTAGE
GPS 4	5 V DC (4.5–5.5 V)
GPS 4/12 V	12 V DC (9–15 V)

ACCESSORIES:

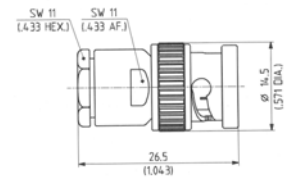


PROCOM A/S reserve the right to amend specifications without prior notice.

10.4 BNC connector

95299, Suhner 24BNC-50-2-13/133NE

> for flexible cables
> cable entry clamp
> centre contact soldered

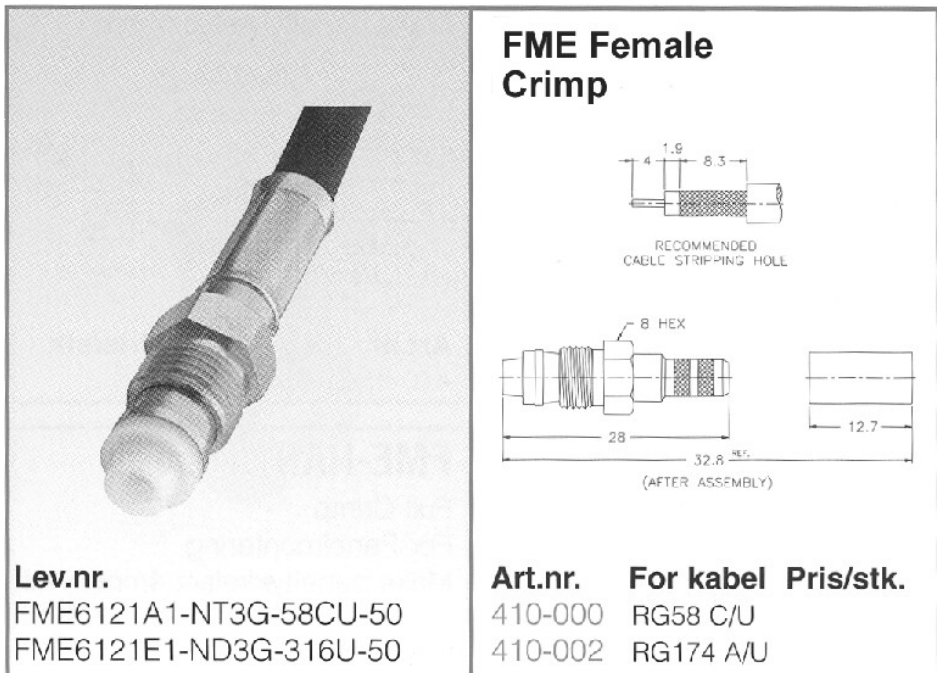


SUHNER TYPE	Article No.	Cable Group (example)	Packaging	Assembly Instruction	Notes
11 BNC-50-1-1 / 133 NE	22540021	U1 (RG 178 B/U)	single	3005	
11 BNC-50-2-1 / 133 NE	22540029	U2 (RG 316/U)	single	3005	
11 BNC-50-3-1 / 133 NE ⊞	22540045	U7,10 (RG 58C/U)	single	3004	
11 BNC-50-3-5 / 133 NE	22540054	U7,10 (RG 58C/U)	single	3005	

⊞ centre contact NOT captivated

10.5 FME Connector Female

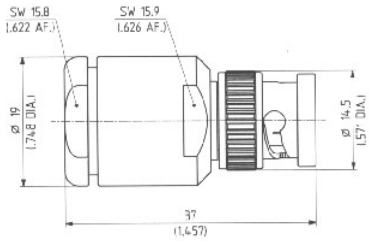
80588, Holund 40100

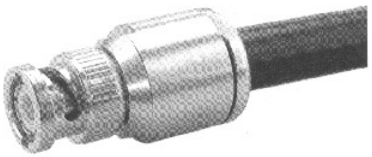


10.6 BNC Connector Male

80577, Suhner 11BNC-50-2 / 133NE

> for flexible cables
> cable entry clamp
> centre contact soldered



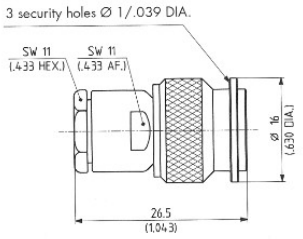


SUHNER TYPE	Article No.	Cable Group (example)	Packaging	Assembly Instruction	Notes
11 BNC-50-7-1 / 133 NE	22540145	U28 (RG 213/U)	single	3008	
11 BNC-50-7-2 / 133 NE	22540149	U33 (RG 214/U)	single	3008	

10.7 TNC Connector Male

80578 Suhner 11TNC-3-6 / 133NE

> for flexible cables
> cable entry clamp
> centre contact soldered



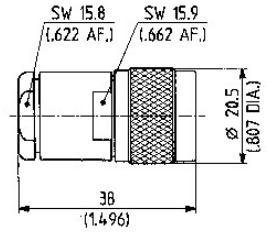
SUHNER TYPE	Article No.	Cable Group (example)	Packaging	Assembly Instruction	Notes
11 TNC-50-2-1 / 133 NE	22640783	U2 (RG 316/U)	single	3005	
11 TNC-50-3-5 / 133 NE	22640798	U7,10 (RG 58C/U)	single	3005	
11 TNC-50-3-6 / 133 NE ⊞	22543475	U7,10 (RG 58C/U)	single	3004	

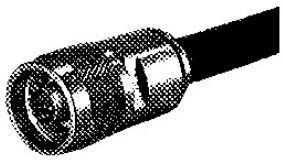
⊞ centre contact NOT captivated

10.8 N Connector Male

80581, Suhner 11N-50-7-5 / 133NE

> for flexible cables
> cable entry clamp
> centre contact soldered



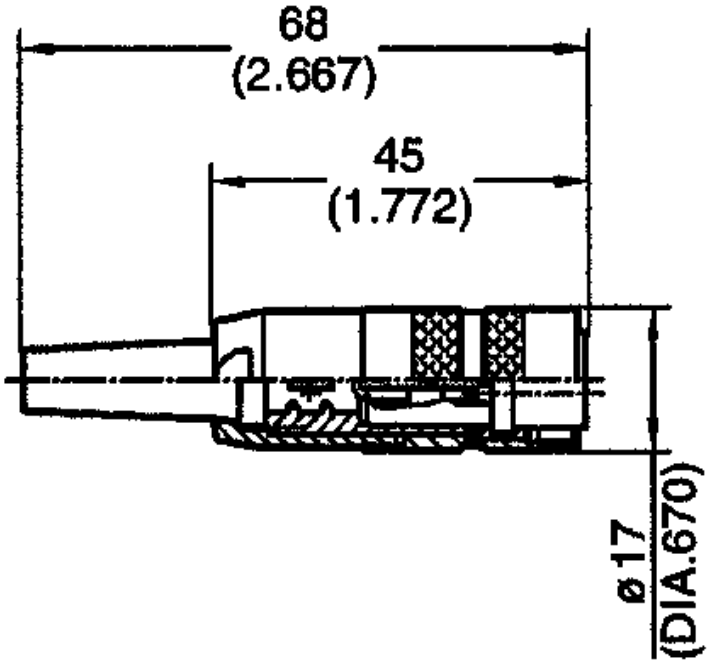


SUHNER TYPE		Article No.	Cable Group (example)	Packaging	Assembly Instruction	Weight
11 N-50-7-5 / 133 NE	⊞	22542117	U33,28 (RG 214/U)	single	3007	51.0 g/ *1.79 oz.*
11 N-50-7-6 / 133 NE		22542120	U33,28 (RG 214/U)	single	3008	51.0 g/ *1.79 oz.*

⊞ centre contact NOT captivated

10.9 24VDC Power Connector

81509, AMP C091AT3261001



11 REGISTRATION FORM

✂---------- Cut here and return this page to JOTRON ----------

RA-2500 Installation form

Data			
Station name			
Country		**MMSI Number**	
Owner / Company			
Contact Name #1		**Telephone Number(s)**	Office:
			GSM:
Contact Name #2		**Telephone Number(s)**	Office:
			GSM:
Comments:			

RA-2500 AIS Receiver serial number:	

Installation completed and successfully commissioned by:

Technician, (type name)		
Service provider / company		
Place	**Date**	**Signature**

Please fill in with capital letters

This form must be returned to Jotron AS, Fax.: + 47 33 12 67 80
(attention service department) in order to have a valid 24 months product warranty.

Jotron AS
P.O. Box 54, NO-3280 Tjodalyng, Norway
Tel: +47 33 13 97 00 | Fax: +47 33 12 67 80

www.jotron.com