OPERATORS AND INSTALLATION MANUAL

Tron UAIS TR-2500

JOTRON

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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 standardized 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 optimizes 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 kilometers 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 and Lighthouse Authorities

IEC
International Electro-technical Commission.

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

IMO
International Maritime Organization

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 transforms 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 Organized 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 end points on an internet. TCP depends on IP to move packets around the network on its behalf.

TCP/IP
TCP/IP is 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 end points 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	01.12.2006	78	A	Operators manual v.E Installation manual v.F Software update CN05326 New release
2	ES	11.02.07	79	B	New front and rear sides. Cleaned language
3	ES	03.01.08	1-1, 1-3 and 11-1	C	Class A and Class B info. ISGOTT info. New text in registration form.
4	ES	24.02.09	2-1	D	New GPS module
5	ES	08.09.09	5-4 to 5-25 8-1	E	New Service menu New software v. 01.02.04 Moved configuration menu
6	ES	22.03.10	5-2 to 5-25	F	Change of abbreviations. Removed “Service” menu.
7	ES	07.04.10	1-3. 5-23 to 5-25 , 8-2	G	Added Indication messages and corrected errors.
8	ML	26.10.10	5-1 and 5-3	H	Added procedure to restore display intensity and contrast and info about MMSI number
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to any products or modules described herein to improve reliability, function or design.
Jotron AS does not assume any liability arising
out of the application or use of the described product.

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.

TABLE OF CONTENTS

1 GENERAL

1.1 Features

The TR-2500 is a universal ship borne AIS Class A transponder (Automatic Identification System) capable of exchanging navigation and ship data between own ship, other ships and coastal stations. It complies with international standards: IMO MSC.74(69) Annex3, A.694, ITU-R M.1371-1, DSC ITU-R M.825, IEC 60945 and IEC 61993-2.

The TR-2500 system consists of a transponder, a junction box with connections for Input/Output of signals for associated units, a cable and connector to connect between the junction box and the transponder, a power cable for 24VDC input to the transponder from the junction box, VHF and GPS antenna or a combined VHF/GPS antenna and several associated units.

The main features are:

Safety of navigation by automatically exchanging navigational data between ships (Class A transponders), coast stations and Class B transponders (from SW version: AIS 01-01-02).

● **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).

- Short safety related messages and other short messages .
- LCD panel satisfying the IMO minimum requirements.
- Interfaces for radar, ECDIS, PC, LAN for future networking expansion.
- GPS and VHF antenna, separate or combined, for easy installation available.
- Built-in GPS receiver for UTC synchronization and backup position fixing.

1.2 TR-2500 description

The transponder consists of:

1.2.1 Front board

The Front board consists of keyboard, LCD panel and four status lights for alarm, power, RX and TX. 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 consists of DSP section, timer/MMI section, PC module and DGPS module.

DSP section

The DSP sections main task is to decode and code AIS.

Timer/MMI section

The main task of the Timer MMI section is to receive DGPS information and consider synchronization of the Tron AIS against the GPS system or against other transponders in the AIS system.

Embedded Controller(EC)

The EC module is the communication centre for the Tron TR-2500 Transponder: analyzing data, building and controlling data base, communication with external units and controlling RX and TX 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 synchronization problems among multiple users.

1.2.3 RF board

The RF board consists of three receiver units and one transmitter unit.
Two of the receiver units are TDMA receivers. One of the receiver units is dedicated to receive DSC messages. The transmitter unit is transmitting TDMA messages.

1.2.4 Power board

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

1.2.5 Connector board

The connector board is the interface between the internal modules in Tron AIS and external units.

1.3 System overview

The system is based on the IMO regulation for Universal AIS using Self Organized Time Division Multiple Access (SOTDMA) technology based on a VHF Data Link (VDL).
The system operates in three modes:

– Autonomous (continuous operation in all areas)
– Assigned (data transmission interval remotely controlled by authority in traffic monitoring service)
– Polled (in response to interrogation from a ship or authority)

The system is based on the IMO regulation for Universal AIS using Self Organized Time Division Multiple Access technology based on a VHF Data Link (VDL).

- 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.

- AIS transponders onboard ships exchange various data as specified by IMO and ITU on either frequency automatically set up by the frequency management telecommand. The DSC receiver in the transponder receives these frequencies.

- The VHF transmit power is set automatically at 2W or 12.5W.

1.3.1 1W transmission power during tanker loading

Implementation of ISGOTT demand stating 1W Transmission power during tanker loading.
This implementation is included in SW version: 01-01-00.
See paragraph 5.5.8.3 and 8.3 in this manual.

- Two new parameters describing power level associated with 1W output power. These parameters can be set with proprietary JOT nmea message which now accepts 22 parameters.

- When Type of ship = tanker, nav status = moored and SOG < 3kn (or SOG is default due to lack of sensor input), the AIS will substitute the 2.5W power parameters with the 1W power parameters and enter low power mode.

- When the criteria is not met, the AIS will revert to the 2.5W power parameters, and enter the power level associated with high sea area or the current region.

2 SPECIFICATIONS

2.1 TR-2500 environmental specifications and integrated GPS

TR-2500 ENVIRONMENTAL SPECIFICATIONS AND INTEGRATED GPS		
STANDARDS	**See Declaration of Conformity**	
Temperature range	-15°C to +55°C (operating) -40°C to +70°C (storage)	
Humidity	90% at +40°C (non condensing)	
Seal standard	IP20 (transponder)	
GENERAL	**TRANSPONDER**	**JUNCTION BOX**
Size	244 x 108 x 146mm	304 x 227.2 x 46.5mm
Weight	2.8kg	1.6kg
Color	Slate Grey (RAL7015) / Black (RAL9004)	Black (RAL9005)
Enclosure	Polycarbonate / Aluminum	Coated steel
Compass safety distance	Standard magnetic: 0.9m Steering magnetic: 0.65m	Standard magnetic: 2.30m Steering magnetic: 1.05m
Frequency range	156 – 162.025MHz	
Data ports	RS232, RS422 and LAN	
Supply voltage, DC	21.6 - 31.2VDC negative ground.	
Power consumption	<100W	
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	16 channels parallel	
Tracking	16 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 (CEP)	
Timing	< 100ns (absolute), < 40ns (1 sigma).	
Acquisition/Reacquisition	<4s with almanac, time and pos. <40s cold start	
DGPS interface	RTCM SC-104	

TR-2500 TRANSMITTER AND RECEIVER UNITS			
TDMA	**25 kHz**		**12.5 kHz**
Modulation spectrum	GMSK BT=0.4 and modulation index=0.5		GMSK BT=0.3 and modulation index=0.25
Adjacent channel power	< - 70dBc		< - 60dBc
Frequency range	156 – 162.025MHz		
Output power	1W (see chapter 1.3.1), 2W or 12.5W (selected automatically).		
Frequency error	< ±0.5kHz		
Channel switching time	< 25ms.		
Data transmission bit rate	9600bits/s ± 50ppm.		
Transmitter attack time	< 1ms.		
Transmitter release time	< 1ms.		
Spurious emission	<-36dBm (150kHz to 1 GHz), < -30dBm (1GHz to 2 GHz)		
Maximum transmission time	Maximum 5 slots (133ms.) In case of failure: Automatic shutdown after 1.4 sec.		
DSC Frequency B	2100Hz		
DSC Frequency Y	1300Hz		
Frequency error on B and Y	< ± 1%		
Mod. rate/Baud rate	1200 bits/s ± 30ppm		
RECEIVER	**TDMA**		**DSC**
	25kHz	**12.5kHz**	
Sensitivity	-107dBm (n.c.) -101dBm (e.c.)	-101dBm (n.c.) -98dBm (e.c.)	-107dBm (n.c.), -101dBm (e.c.)
Packet error rate	20% at sensitivity	20% at sensitivity	BER shall not exceed 10e-2 at high lev. input
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.)	70dBm (n.c.) 60dBm (e.c.)
Modulation	GMSK , 9600 bits/s ± 50ppm.		PSK, 1200 bits/s
Frequency range	156 - 162.025MHz		Ch. 70, 156.525MHz
Frequency error	± 3ppm.		± 2ppm.
Spurious response rejection	> 70dB two channels away from frequency		> 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.		> 65dB
Blocking /desensitization			> 84dB, except at spurious
Large signal PER	< 1% between -7dBm and -77dBm		
Transmit to receive sw. time	≈ 0.75ms.		
Spurious emission from RX	< -57dBm (150kHz to 1 GHz) < -47dBm (1GHz to 2 GHz)		

2.1.1 Transmission Intervals

See Technical Manual

2.1.2 Load requirements as listener

See Technical Manual

2.1.3 Data Transmission

See Technical Manual

3 TR-2500 UAIS CONFIGURATION

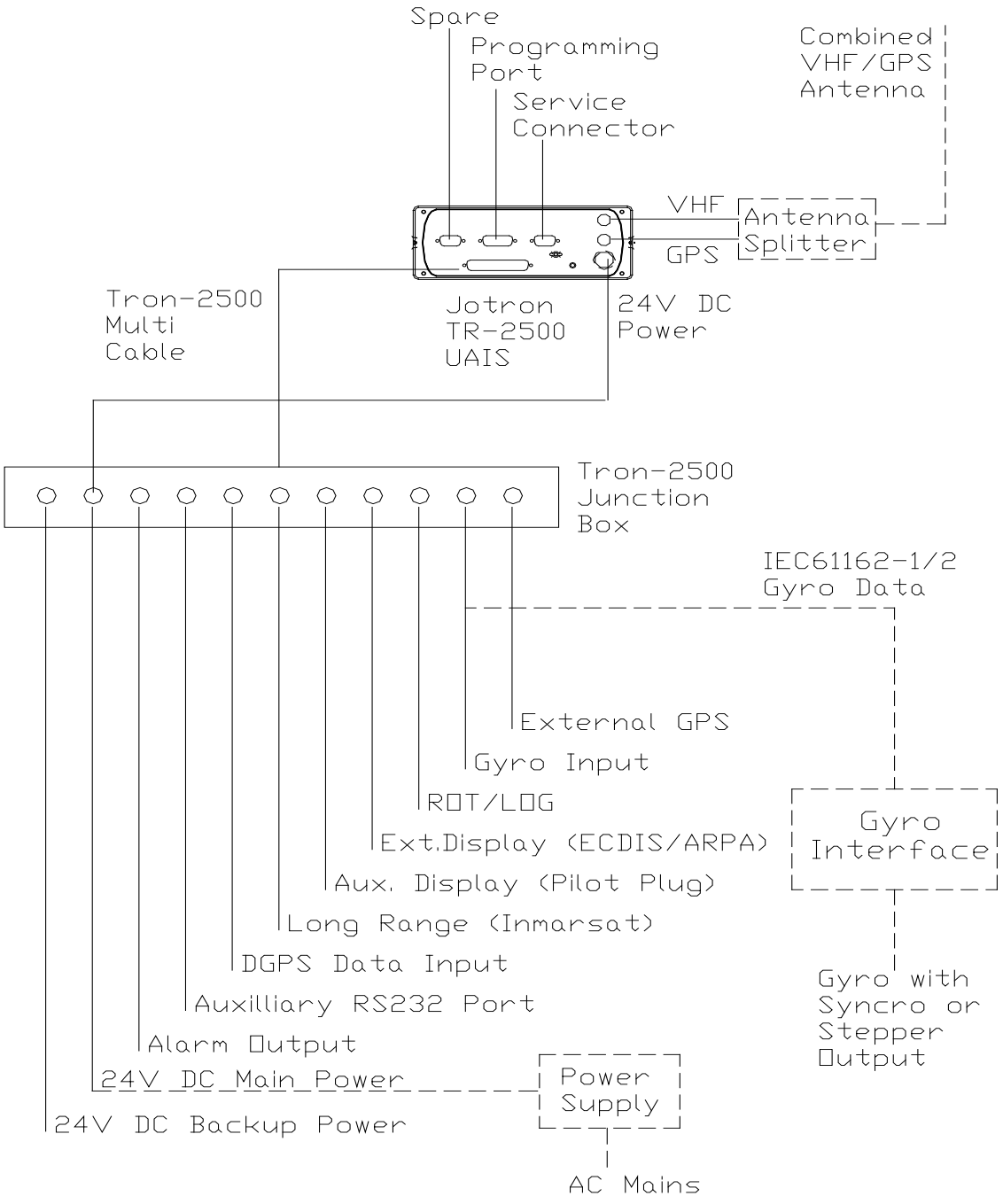


Figure 3.0, Complete Tron UAIS TR-2500 system.
(Dotted lines in the figure above, means options)

3.1 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 coastal shore stations including Vessel Traffic Service Centers.

3.2 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 always give the right picture of the traffic in your area separately.

3.3 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.

3.4 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.

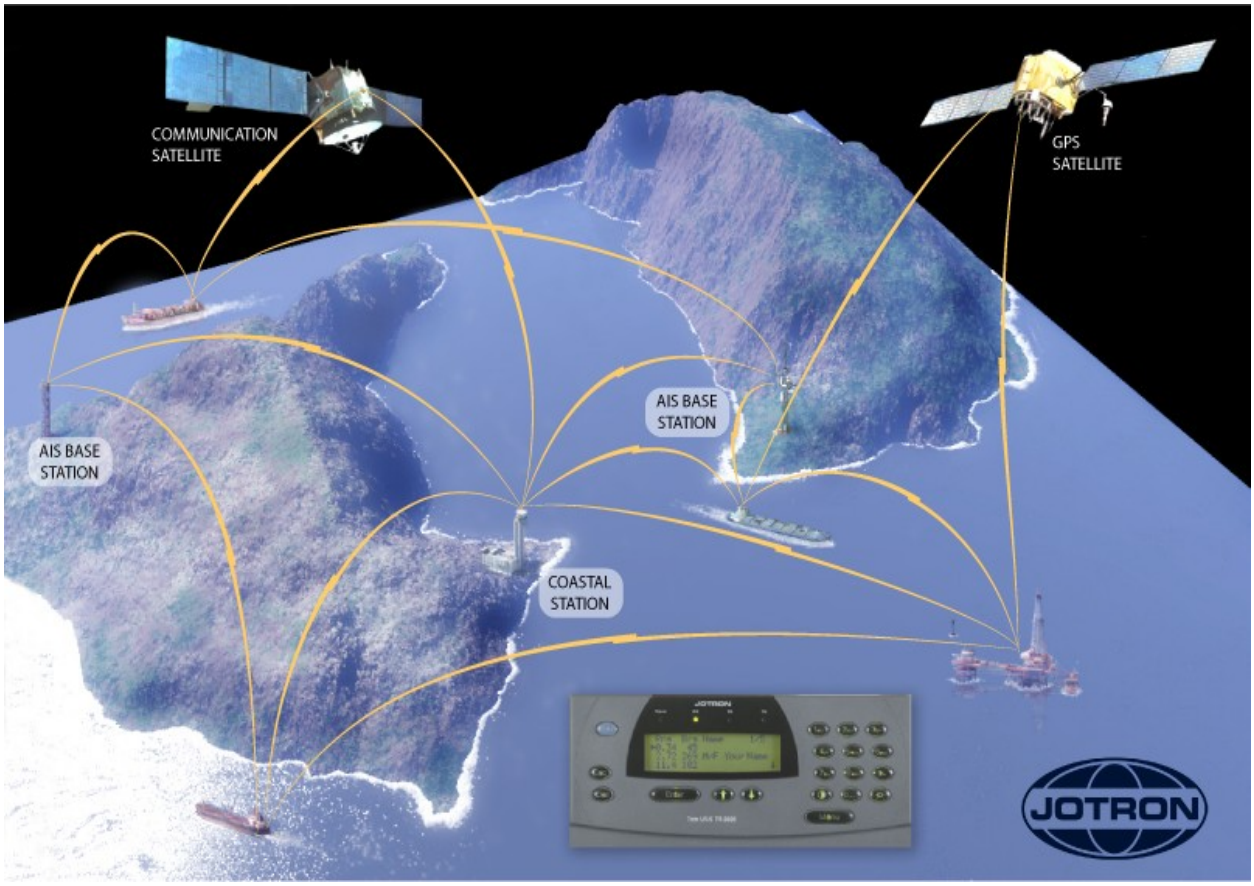


Figure 3.4, The total UAIS system.

4 INSTALLATION

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 the 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 if 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 TR-2500.

To minimize 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.

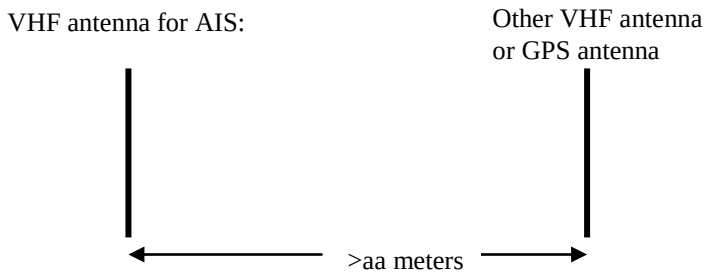
4.1.3 GPS/VHF combined antenna

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.

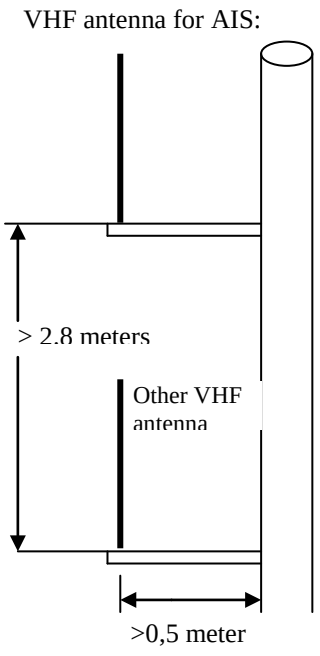
Mount the antenna unit as high as possible. Mounting it this way keeps it free of interfering objects and water spray, which can interrupt reception of GPS satellite signal if the water freezes.

Horizontal separation distance:

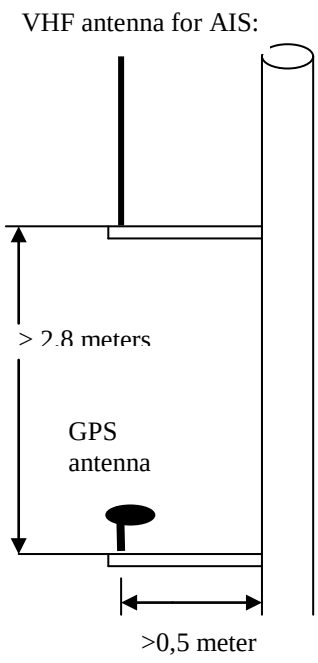


Vertical separation distance and distance from mast or other object of metal:

Vertical separation distance:



Vertical separation distance:



See article in chapter 4.1.2 explaining an example.

Figure 4.1.3, Examples of 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 losses mean only half the output power. If you have a transmitter delivering 12,5 W, and you have 3 dB losses 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.

4.2.2 Cable between Transponder and Junction Box

The cable is connected to a 37-pin D-sub male connector and is delivered in 10m length.

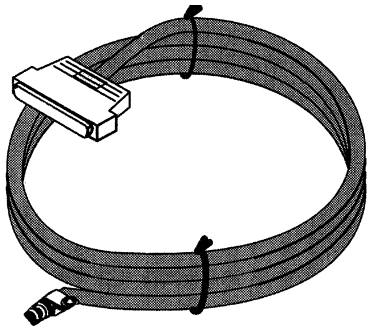


Figure 4.2.2, Connection cable

4.3 Mounting of transponder unit

The transponder unit can be installed as desktop mounted, roof mounted, flush mounted in a panel or mounted in a 19`` rack. Install it on the chart table or near the steering place. When selecting a mounting location for the transponder the following guidelines apply:

1. Keep the transponder out of direct sunlight.
2. The temperature and humidity should be moderate and stable.
3. Locate the unit away from exhaust pipes and vents.

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. Also leave slack in cables for the same reason.
7. A magnetic compass will be affected if the unit is placed too close to it. Observe the following compass safe distance to prevent disturbance to the compass:
   Standard Compass: 1.0 meters
   Magnetic Compass: 0.4 meters

4.3.1 Desktop Mounting

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

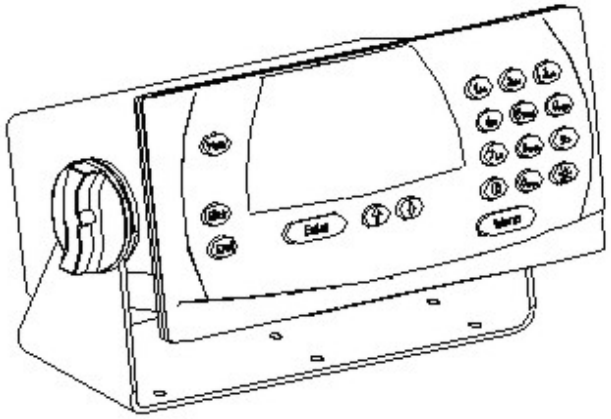


Figure 4.3.1, Desktop Mounting

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 sides and the bracket turned 180 degrees in order to get the bracket in place for roof mounting.
For mounting hole measurements see Figure 4.3.3.

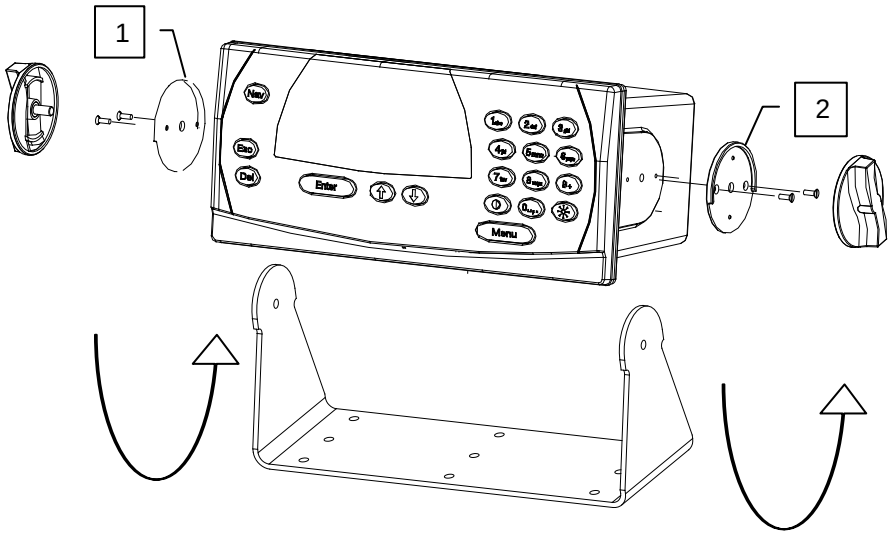


Figure 4.3.2.a, Roof Mounting

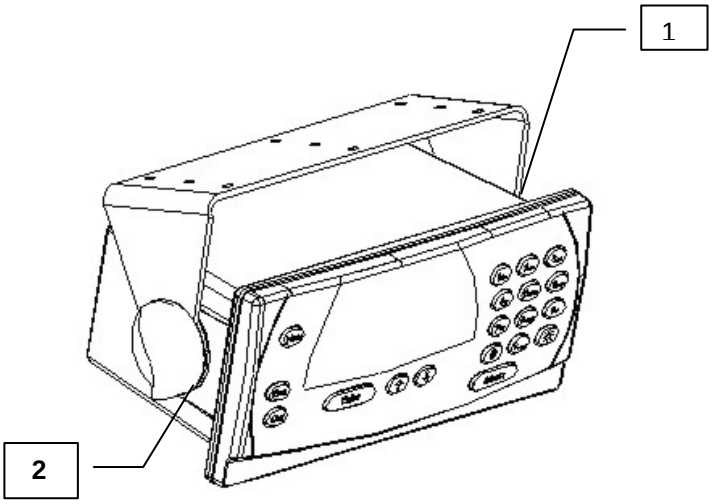


Figure 4.3.2.b, Roof Mounting

4.3.3 Bracket mounting hole measurements

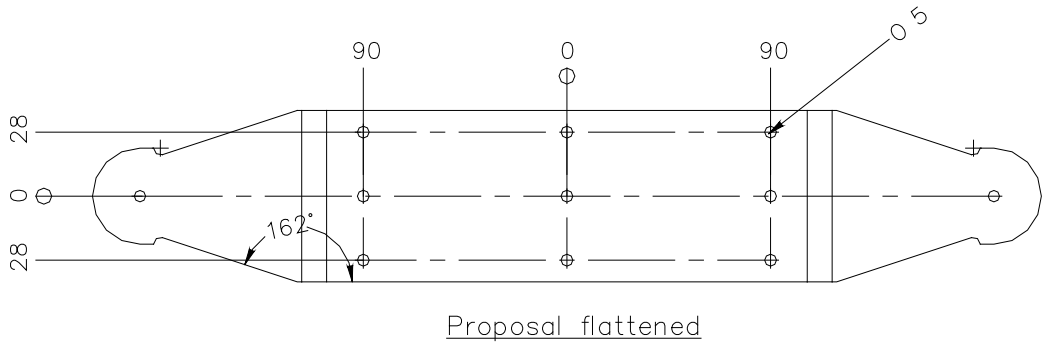


Figure 4.3.3, Bracket mounting hole measurements

4.3.4 Flush Mounting

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

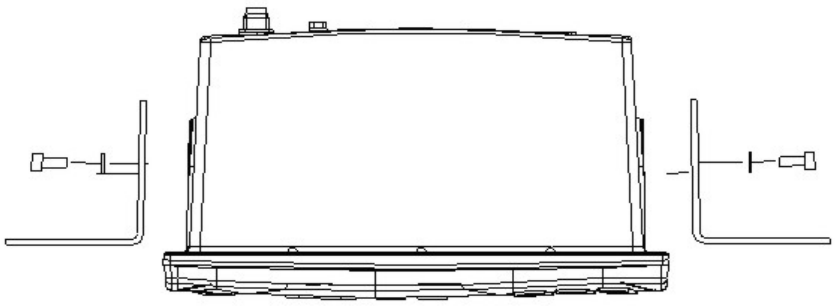


Figure 4.3.4.a, Flush Mounting

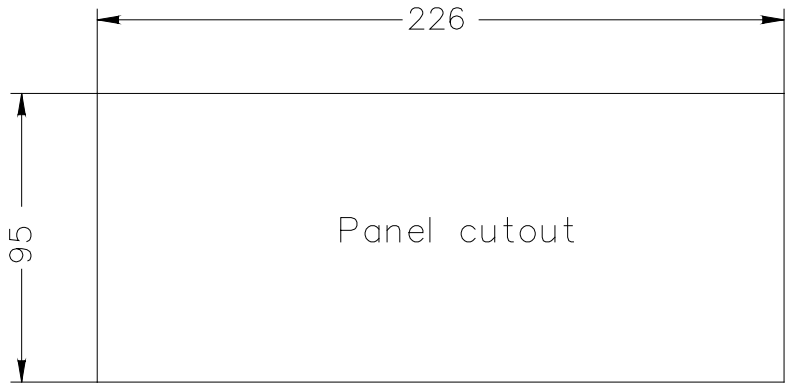


Figure 4.3.4.b, Flush Mounting Panel cutout

4.3.5 19``Rack Tray Mounting

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

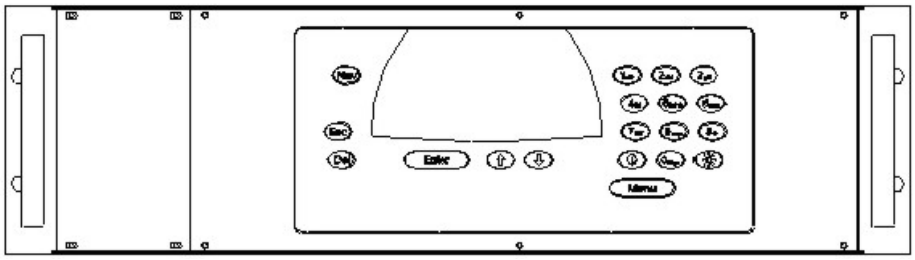


Figure 4.3.5.a, Rack Tray Mounting

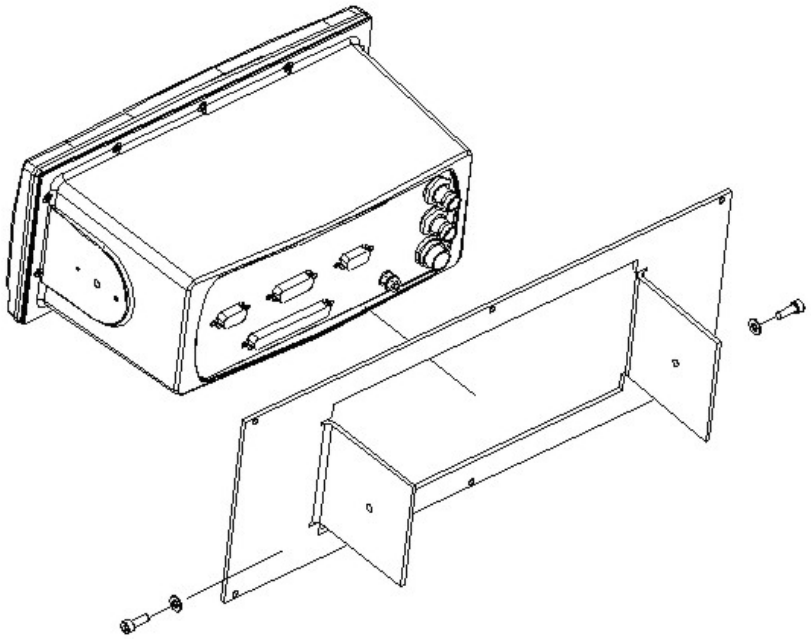


Figure 4.3.5.b, Rack Tray Mounting

4.4 Junction Box

Mount the junction box where it is protected from rain and water splash.
For mounting hole measurements see Figure 4.4.b

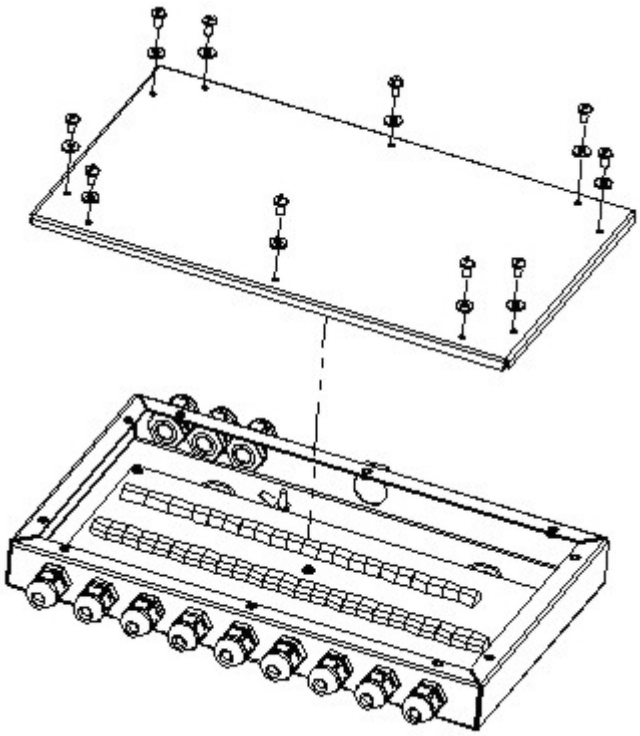


Figure 4.4.a, Junction Box with cover

Use the four 5mm mounting holes

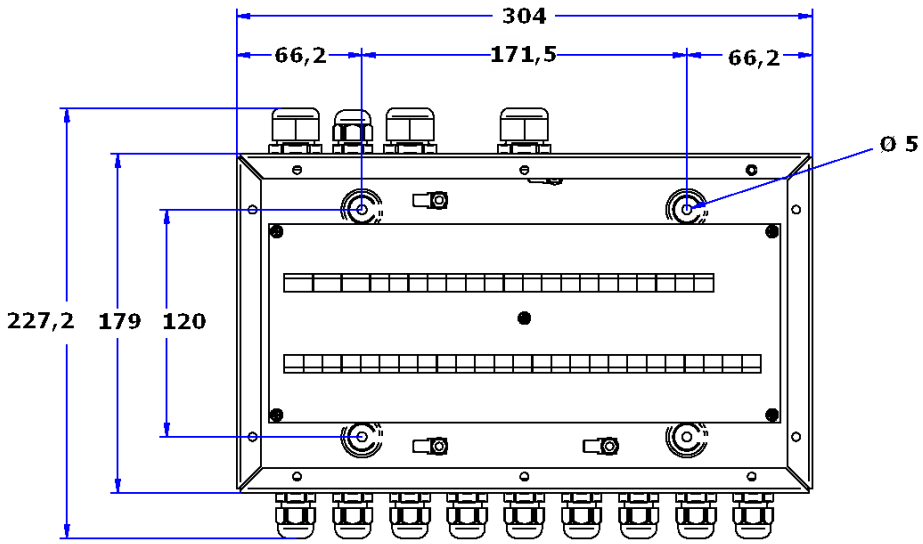


Figure 4.4.b, Junction Box mounting hole measurements

4.5 Wiring Tables

4.5.1 Connections to Junction Box

There are three input ports for sensor 1, 2 and 3 which are based on the IEC 61162-1/2.
The protocol is RS-422. Data transmission rate is selectable between 4,8Kb/s and 38,4Kb/s.

Junction Box Inputs/Outputs	Functions
1	
2	
3	Isolated GND
4	AIS port 1 (B) Sensor 1
5	AIS port 1 (A) IEC61162-1/2
6	Isolated GND
7	
8	
9	Isolated GND
10	AIS port 2 (B) Sensor 2
11	AIS port 2 (A) IEC61162-1/2
12	Isolated GND
13	
14	
15	Isolated GND
16	AIS port 3 (B) Sensor 3
17	AIS port 3 (A) IEC61162-1/2
18	Isolated GND
19	AIS port 4 (B) External Display
20	AIS port 4 (A) IEC61162-1/2
21	Isolated GND
22	AIS port 4 (B)
23	AIS port 4 (A)
24	Isolated GND

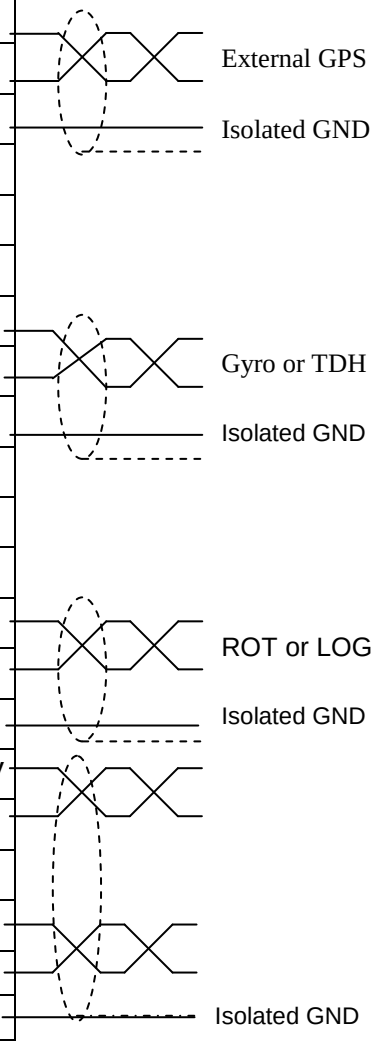
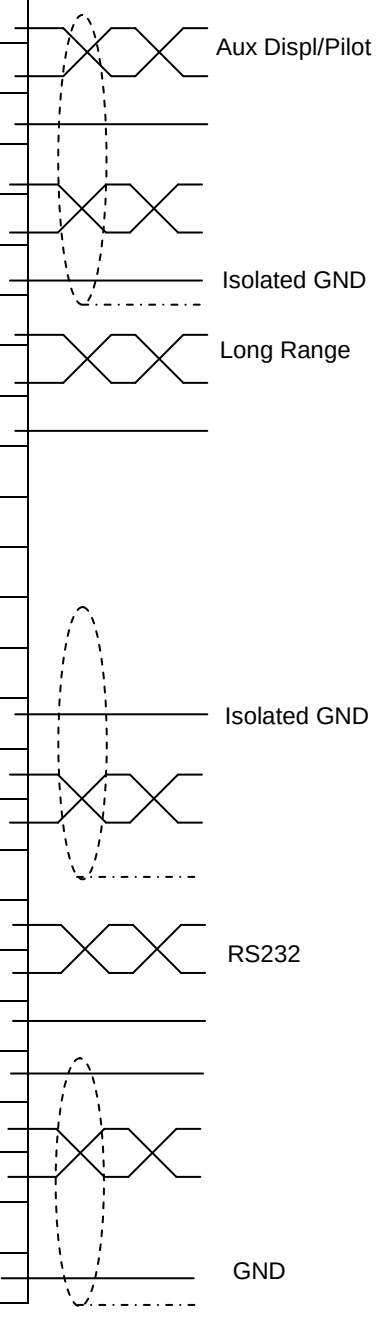


Table 4.5.1.a, Junction Box connections 1 - 24

Junction Box Inputs/Outputs	Functions
25	AIS port 5 (B) Aux Displ/Pilot
26	AIS port 5 (A) IEC61162-1/2
27	Isolated GND
28	AIS port 5 (B)
29	AIS port 5 (A)
30	Isolated GND
31	AIS port 6 (B) Long Range
32	AIS port 6 (A) IEC61162-1/2
33	Isolated GND
34	AIS port 6 (B)
35	AIS port 6 (A)
36	Isolated GND
37	
38	
39	Isolated GND
40	AIS port 7 (B) DGPS data
41	AIS port 7 (A) ITU-R M.823-2
42	Isolated GND
43	AIS port 8, TD, RS232
44	AIS port 8, RD, RS232
45	Signal GND, RS232
46	Dry relay contact, Referred to pin 48
47	Dry relay contact, Referred to pin 48
48	Dry relay contact, Referred to pin 46 & 47
49	Spare
50	GND



The RS-232 can be used as an ECDIS port, else it will function as a sensor port.

Table 4.5.1.b, Junction Box connections 25 - 50

4.5.2 Interconnection Diagram

37 Pin D-sub TR-2500	Connection Cable Wire Colors	Junction Box Terminal Block	Junction Box Inputs/Outputs	Functions	Input / Output
1	white	1	1	AIS TD1-B	Reserved
2	brown	2	2	AIS TD1-A	Reserved
			3	Isolated GND	
3	green	3	4	AIS RD1-B (External GPS)	In
4	yellow	4	5	AIS RD1-A (External GPS)	In
			6	Isolated GND	
5	Grey	5	7	AIS TD2-B	Reserved
6	Pink	6	8	AIS TD2-A	Reserved
			9	Isolated GND	
7	Blue	7	10	AIS RD2-B (Gyro or TDH)	In
8	Red	8	11	AIS RD2-A (Gyro or TDH)	In
			12	Isolated GND	
9	black	9	13	AIS TD3-B	Reserved
10	violet	10	14	AIS TD3-A	Reserved
			15	Isolated GND	
11	grey/pink	11	16	AIS RD3-B	In
12	red/blue	12	17	AIS RD3-A	In
			18	Isolated GND	
13	white/green	13	19	AIS TD4-B (External Display)	Out
14	brown/green	14	20	AIS TD4-A (External Display)	Out
			21	Isolated GND	
15	white/yellow	15	22	AIS RD4-B	In
16	yellow/brown	16	23	AIS RD4-A	In
			24	Isolated GND	
17	white/grey	17	25	AIS TD5-B (Aux Displ/Pilot)	Out
18	grey/brown	18	26	AIS TD5-A (Aux Displ/Pilot)	Out
			27	Isolated GND	
19	white/pink	19	28	AIS RD5-B	In
20	pink/brown	20	29	AIS RD5-A	In
			30	Isolated GND	
21	white/blue	21	31	AIS TD6-B (Long Range)	Out
22	brown/blue	22	32	AIS TD6-A (Long Range)	Out
			33	Isolated GND	
23	white/red	23	34	AIS RD6-B	In
24	brown/red	24	35	AIS RD6-A	In
			36	Isolated GND	
25	White/black	25	37	AIS TD7-B	Reserved
26	brown/black	26	38	AIS TD7-A	Reserved
			39	Isolated GND	
27	Grey/green	27	40	AIS RD7-B (DGNSS data)	In
28	yellow/grey	28	41	AIS RD7-A (DGNSS data)	In
			42	Isolated GND	
29	Pink/green	29	43	RS-232 TX	Out
30	yellow/pink	30	44	RS-232 RX	In
			45	RS-232 GND	
31	green/blue	31	46	Dry relay contact, Referred to pin 48	Alarm Out (NC)
32	yellow/blue	32	47	Dry relay contact, Referred to pin 48	Alarm Out (NO)
33	green/red	33	48	Dry relay contact, Referred to #46 & 47	Common
34	yellow/red	34	49	I/O Spare	
35	green/black	35		Future warning for Backup Power	
36	Yellow/black	36	50	GND	

Table 4.5.2, Interconnection Diagram

For definition of signal state, see chapter 4.5.2.1.

4.5.2.1 Signal state definitions

Junction Box interfaces Port 1 to 7 are RS422 with A and B lines.
The idle, marking, logical 1, OFF or stop bit states are defined by a negative voltage on line A with respect to line B.
The active, spacing, logical 0, ON or start bit states are defined by a positive voltage on line A with respect to line B.
It should be noted that the above A with respect to B levels are inverted from the voltage input/output requirements of standard UARTs and that many line drivers and receivers provide a logic inversion.

4.5.3 DC Power Input/output of Junction Box

Junction Box Terminal Block	Function	Input/Output
51	GND	
52	0VDC	In
53	+24VDC MAIN	In
54	GND	
55	0VDC FUSED	Out
56	+24VDC FUSED	Out
57	GND	
58	0VDC	In
59	+24VDC BACKUP	In

Table 4.5.3, DC Power Input/output of Junction Box

4.5.4 Description of 24VDC connection to transponder

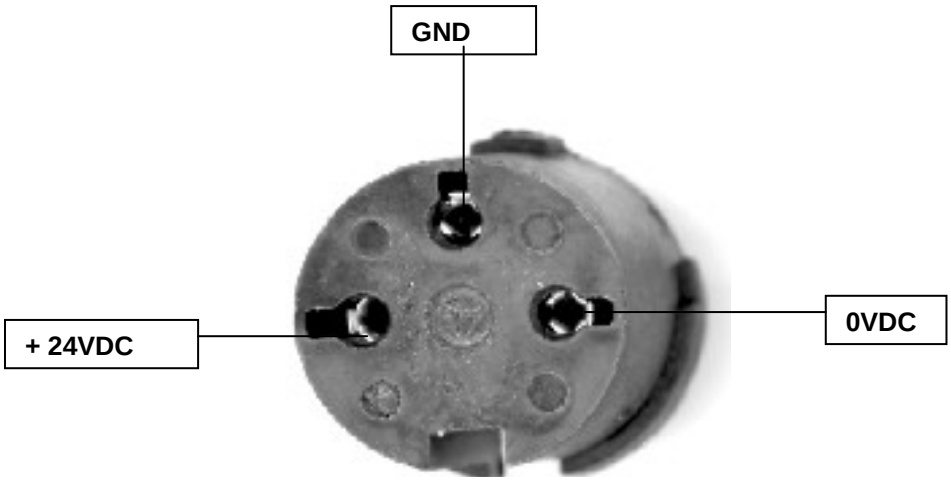


Figure 4.5.4, 24VDC Connector for cable, front side

4.5.5 Description of Pilot Plug connection to Junction Box

Pin No.	Name	Connected to Junction Box at	In/Out
1	Pilot Plug	AIS port 26	TDA Out
4	Pilot Plug	AIS port 25	TDB Out
5	Pilot Plug	AIS port 29	RDA In
6	Pilot Plug	AIS port 28	RDB in
9	Pilot Plug	AIS port 30	Floating Ground

Table 4.5.5, Description of Pilot Plug connection to Junction Box

4.5.6 Description of Junction Box Connector at TR-2500

Pin No.	Name	Function	In/Out
1		AIS TD1-B	Reserved
2		AIS TD1-A	Reserved
3	AIS 1 in (B)	AIS RD1-B (External GPS)	In
4	AIS 1 in (A)	AIS RD1-A (External GPS)	In
5		AIS TD2-B	Reserved
6		AIS TD2-A	Reserved
7	AIS 2 in (B)	AIS RD2-B (Gyro or TDH)	In
8	AIS 2 in (A)	AIS RD2-A (Gyro or TDH)	In
9		AIS TD3-B	Reserved
10		AIS TD3-A	Reserved
11	AIS 3 in (B)	AIS RD3-B	In
12	AIS 3 in (A)	AIS RD3-A	In
13	AIS 4 out (B)	AIS TD4-B (External Display)	Out
14	AIS 4 out (A)	AIS TD4-A (External Display)	Out
15	AIS 4 in (B)	AIS RD4-B	In
16	AIS 4 in (A)	AIS RD4-A	In
17	AIS 5 out (B)	AIS TD5-B (Aux Displ/Pilot)	Out
18	AIS 5 out (A)	AIS TD5-A (Aux Displ/Pilot)	Out
19	AIS 5 in (B)	AIS RD5-B	In
20	AIS 5 in (A)	AIS RD5-A	In
21	AIS 6 out (B)	AIS TD6-B (Long Range)	Out
22	AIS 6 out (A)	AIS TD6-A (Long Range)	Out
23	AIS 6 in (B)	AIS RD6-B	In
24	AIS 6 in (A)	AIS RD6-A	In
25	AIS 7 out (B)	AIS TD7-B	Reserved
26	AIS 7 out (A)	AIS TD7-A	Reserved
27	AIS 7 in (B)	AIS RD7-B (DGNSS data)	In
28	AIS 7 in (A)	AIS RD7-A (DGNSS data)	In
29		RS-232 TX	Out
30		RS-232 RX	In
31		ALARM Out NC to #33	
32		ALARM Out NO to #33	
33		ALARM CO switch between #31 and #32	
34		I/O Spare	
35		Future warning for Backup Power	-
36	GND	Ground	-
	Cable screen	Chassis GND	-

Table 4.5.6, Description of Junction Box Connector at TR-2500

5 OPERATING INSTRUCTIONS TR-2500

Figure 5, Front view TR-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

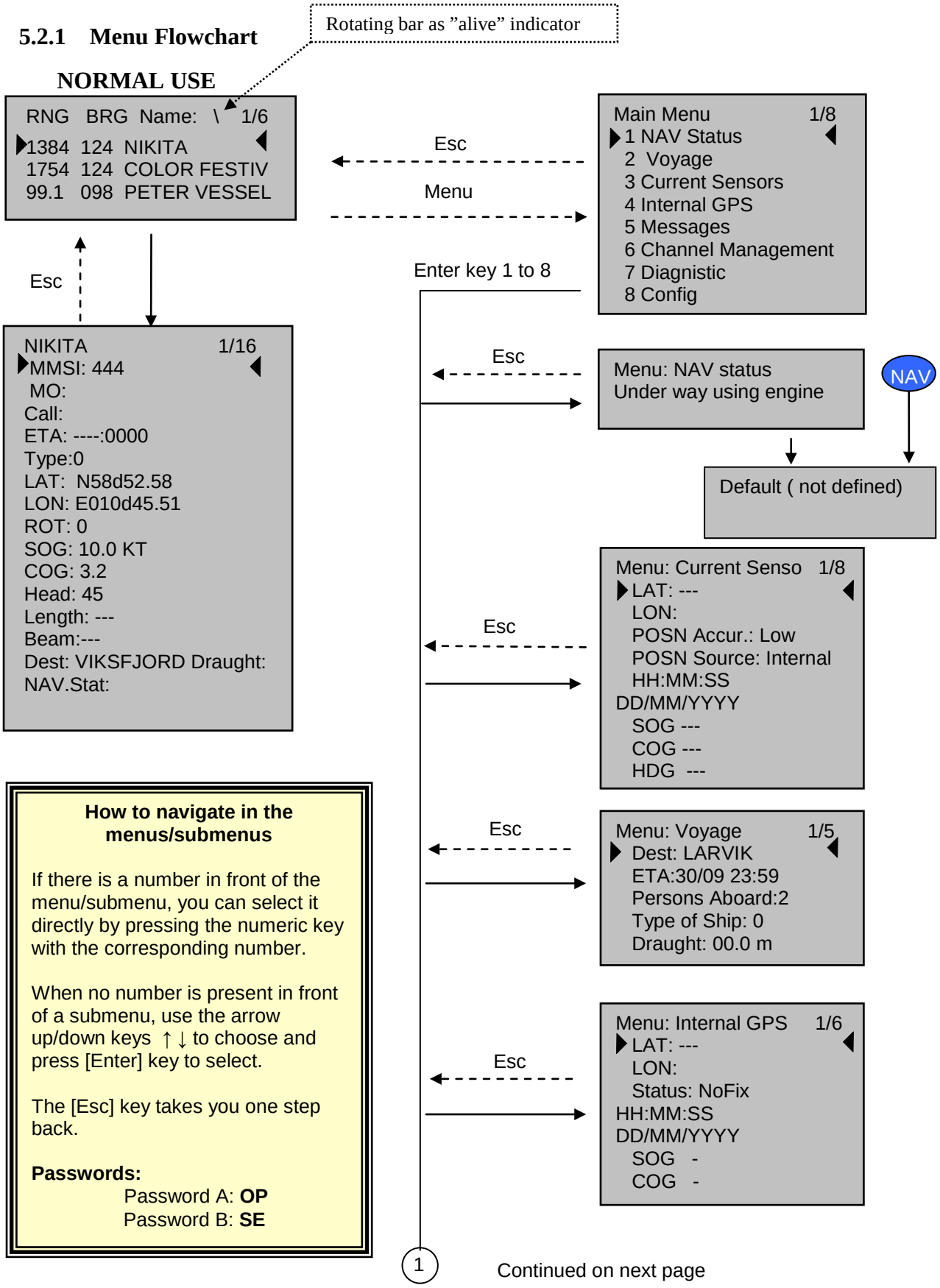
☼ : Adjust light intensity in display and keyboard buttons.
Press Del button to restore default value.

◑ : Adjust contrast in display. Press Del button to restore default value.

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

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.

Passwords:

Password A: **OP**
Password B: **SE**

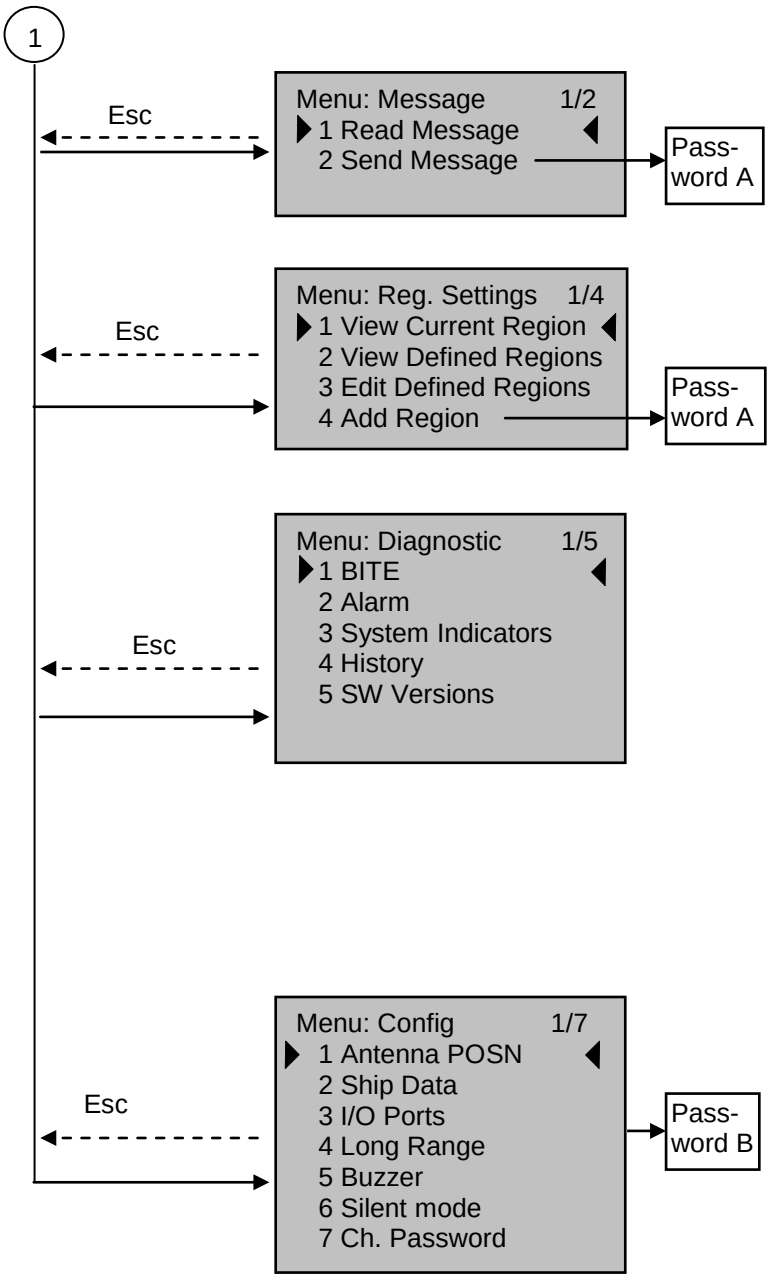


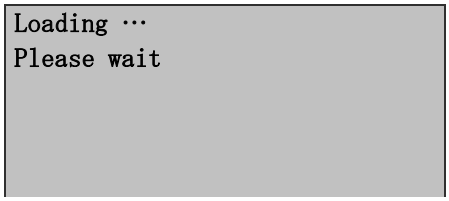
Figure 5.2.1, Menu Flowchart.

5.2.2 Select menu/submenu:

The different menus/sub-menus can be selected directly by the numeric keys (1-9) or the arrow keys and ”Enter”. The [Nav] key gives direct access to change Navigational Status.

5.3 The first start up

After connecting the antennas and Inputs/Outputs, the DC power can be connected to the TR-2500 from the junction box. The input voltage must be within the specifications for supply voltage in chapter 2.1. At start, the TR-2500 will look for connected sensors and equipment for approx. 40 seconds. The display will show:



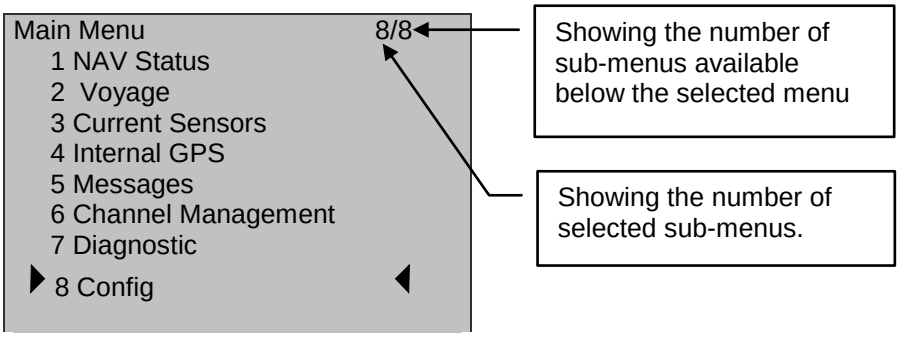
The TR-2500 will not start to transmit own ship static data, or receive other stations before the MMSI number is entered and the unit is rebooted. See chapter 5.3.1.2 for entering the MMSI number. After a reboot it will then start to transmit within 2 minutes. Static data includes MMSI number, IMO number, call sign, ship name, ship length and width, ship type and GPS antenna position. The ships dynamic data like the ships position with accuracy, SOG, COG, rate of turn, heading, etc. is also transmitted in intervals between two seconds and 3 minutes depending of the ships speed and course change.
See chapter 8.1 for list of "Ships navigation status and reporting interval".

After a while the alarm status will be indicated. See chapter 8.2 for Alarm messages.

Press [Del] key to reset the alarm settings.

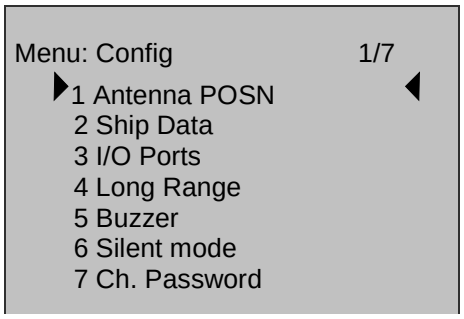
Press [Menu] key to enter "Main menu".

Select "8 Config" by numeric key [8] or [arrow down] key and press [Enter] key.



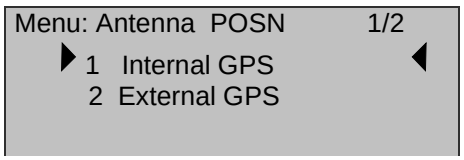
5.3.1 Configuration Menu

This menu is for configuration of your own AIS system.
When entering a submenu in the "Config menu" you have to enter password B. When the password is accepted you have access to all parameters in the "Config menu". If you escape from the "Config menu" you have to re-enter the password to change the parameters.

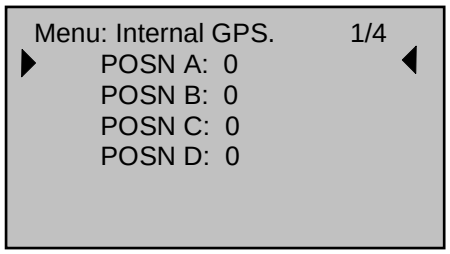


5.3.1.1 Antenna position

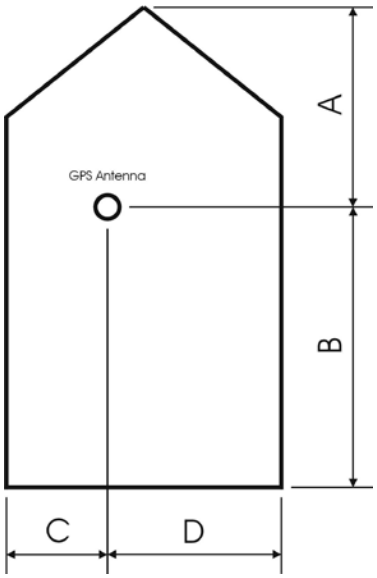
Select "Antenna POSN." menu by pressing numeric key [1] or [arrow up/down] keys and press [Enter] key.



Select "1 Internal GPS" by [Enter] key or numeric key [1].



Press [Enter] key to continue.
Enter Password B and press [Enter] key.
Fill in the different ranges according to Figure 5.3.1.1
Press [Enter] key and type in the value for A. Then press [Enter] key again.
Select next POSN with [arrow down] key.
Repeat the procedure for the B, C and D positions.
Press [Esc] key to return to "Antenna POSN" menu.
Select "External GPS" with numeric key [2] or [arrow down] key and press [Enter] key.
Repeat the procedure as described for Internal GPS.
Press [Esc] key twice for return to "Config" menu.



A: Distance from bow to GPS antenna position (000 m)

B: Distance from stern to GPS antenna position (000 m)

C: Distance from port to GPS antenna position (00 m)

D: Distance from starboard to GPS antenna position (00 m)

Figure 5.3.1.1 GPS Antenna position.

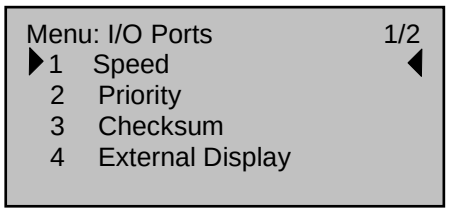
5.3.1.2 Ship data

Select “Ship Data” menu by pressing numeric key [2] or [arrow up/down] keys and press [Enter] key.

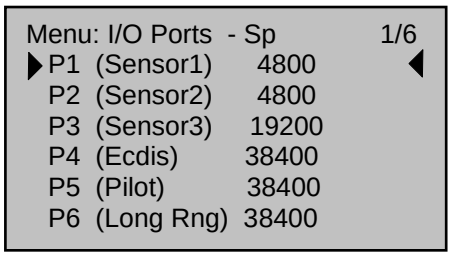
Enter the necessary data line by line by selecting the line with [arrow up/down] keys and press [Enter] key, enter data and [Enter] key. Select [Esc] key and repeat the procedure for next line. Press [Esc] key twice for return to “Config” menu.

5.3.1.3 I/O ports

Select “I/O Port” menu by pressing numeric key [3] or [arrow up/down] keys and press [Enter] key.

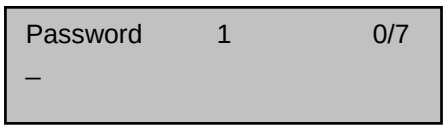


Press [Enter] key or numeric key [1] to select data speed.

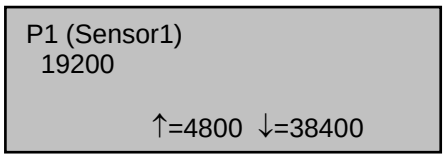


5.3.1.3.1 Speed

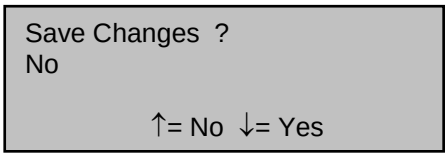
This menu allows the setting of data speed at port1 to port 6 of 4800 b/s, 19200b/s or 38400 b/s.
Press [Enter] key to select “P1”.



Type password A and press [Enter] key.



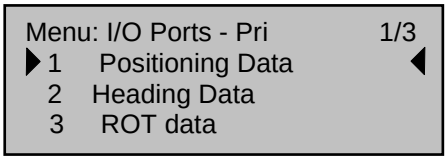
Select speed using [arrow up/down] keys and press [Enter] key
Repeat the procedure for all ports.
Press [Esc] key to return



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

5.3.1.3.2 Priority

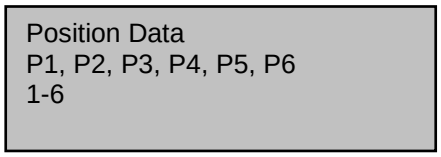
From “I/O Ports” menu select numeric key [2] to select “Priority” menu.



From this menu the priority for each port can be set individually.

Position Data

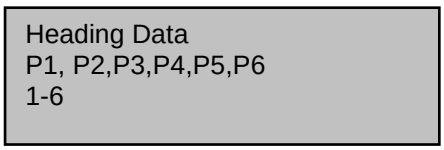
Select “Position Data” by pressing [Enter] key.



Use [arrow up/down” keys to manoeuvre between the different ports (P1 to P6)
and the numeric keys [1 – 6] to select the priority for each port.
Press [Esc] key to return to “I/O Ports” menu.

Heading Data

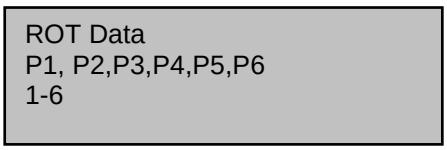
Select “Heading Data” by pressing numeric key [2] or [arrow down] key and [Enter] key.



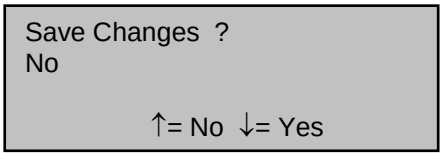
Repeat the procedure as for “Positioning Data”.
Press [Esc] key to return to “I/O Ports” menu.

Rot Data

Select “Rot Data” by pressing numeric key [3] or [arrow down] key and [Enter] key.

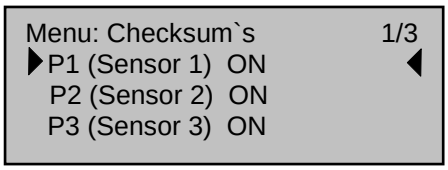


Repeat the procedure as for “Positioning Data”.
Confirm changes by [arrow up/down] keys and press [Enter] key

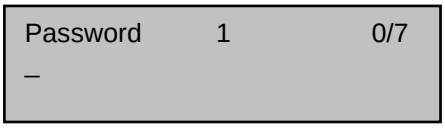


5.3.1.3.3 Checksum

From “I/O Ports” menu select numeric key [3] to select “Checksum” menu.



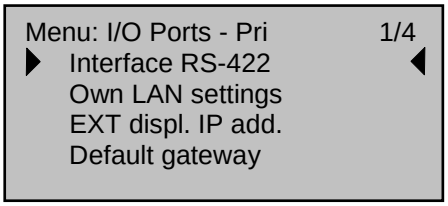
Press [Enter] key to select “P1”.



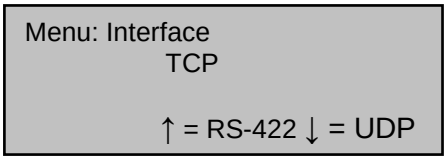
Type password A and press [Enter] key.
Select the checksum for P1, P2 or P3 to be “ON” or “OFF”.
Press [Esc] key to return to “I/O Ports” menu.

5.3.1.3.4 External Display

From “I/O Ports” menu select numeric key [4] to select “External Display” menu.

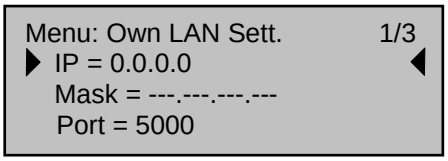


Press [Enter] key to select “Interface RS-422”.

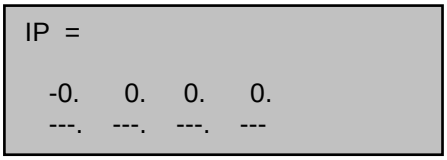


Select between RS-232, RS-422, UDP or TCP
Press [Esc] key to return to “I/O Ports-Pri” menu.

Select “ Own LAN settings”

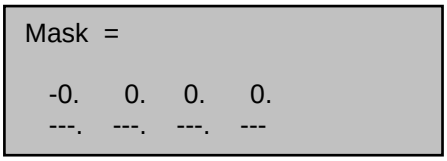


Press [Enter] key to select “IP”.



Insert IP address for External display.
Press [Esc] key to return to “Own LAN Sett.” menu.

Select “Mask”.

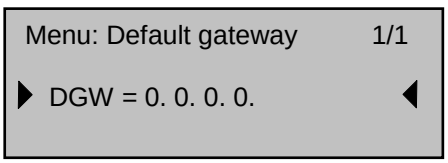


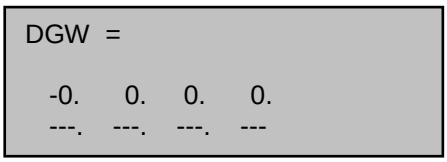
Insert Mask address for External display.
Press [Esc] key to return to “Own LAN Sett.” menu.

Select “ Port”.

Do not change Port address without asking the IT responsible person.
Press [Esc] key twice to return to “I/O Ports-Pri” menu.

Select “Default gateway”.

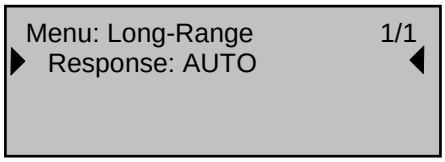




Press [Esc] key repeatly to return to “Config” menu.

5.3.1.4 Long Range

Select “Long Range” menu by pressing numeric key [4] or [arrow down] key and [Enter] key.

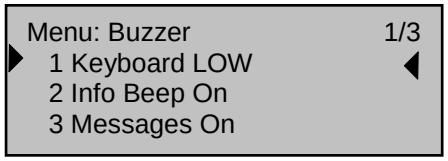


This menu allows the user to decide whether the request for information from an outside source will obtain this information automatically or manually. Press [Enter] key to set.

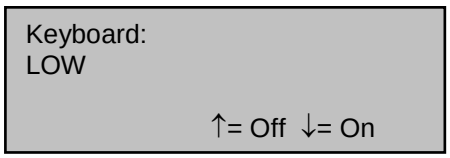
Select by [arrow up/down] keys and press [Enter] key
Press [Esc] key to return to “Config” menu.

5.3.1.5 Buzzer

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



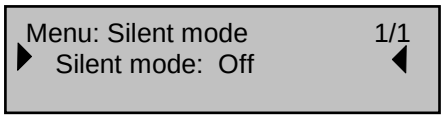
Select “Keyboard” menu by pressing numeric key [1] or [Enter] key.



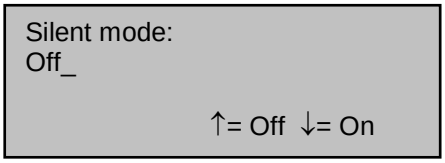
Select keyboard status with [arrow up/down] keys and [Enter] key.
Repeat procedure for “Info Beep” and “Messages”.
Press [Esc] key twice to return to “Config” menu.

5.3.1.6 Silent mode

Select “Silent mode” menu by pressing numeric key [6] or [arrow down] key and [Enter] key



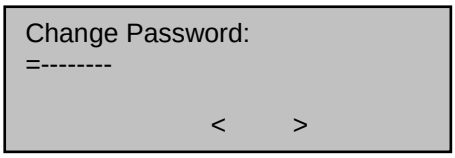
Select Silent mode status with [arrow up/down] keys and [Enter] key.



Press [Esc] key twice to return to “Config” menu.

5.3.1.7 Change Password

Select “Ch. Password” menu by pressing numeric key [7] or [arrow down] key and [Enter] key.



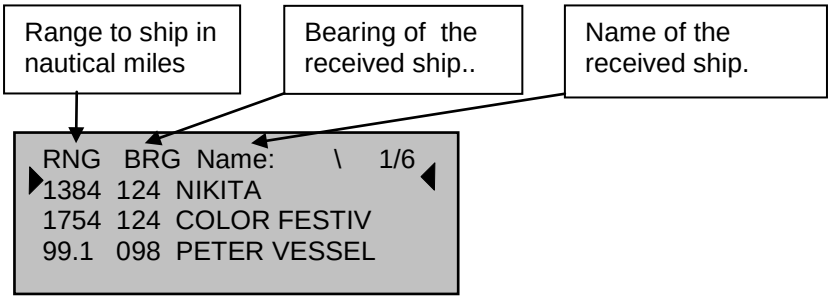
Press [Enter] key
Follow instructions Press [Esc] key twice to return to operational display

5.4 Normal use

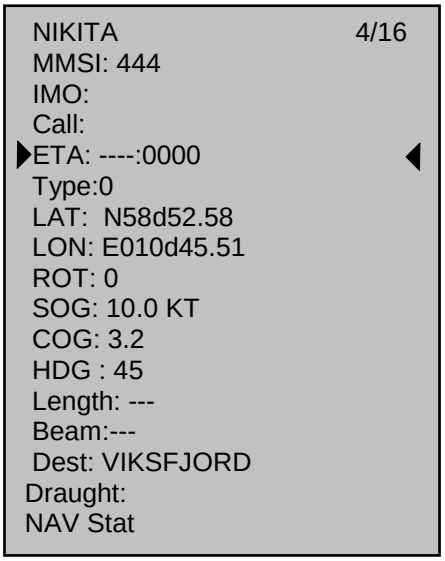
Follow the instruction for Menu navigation in chapter 5.2.1

5.4.1 Display received vessels

Normal use operational display



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

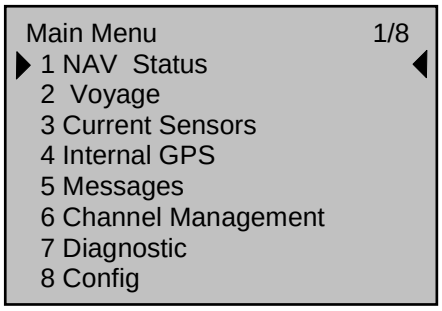


Select specific information by pressing [arrow down] key and [Enter] key.

Press [Esc] key to go back one step.

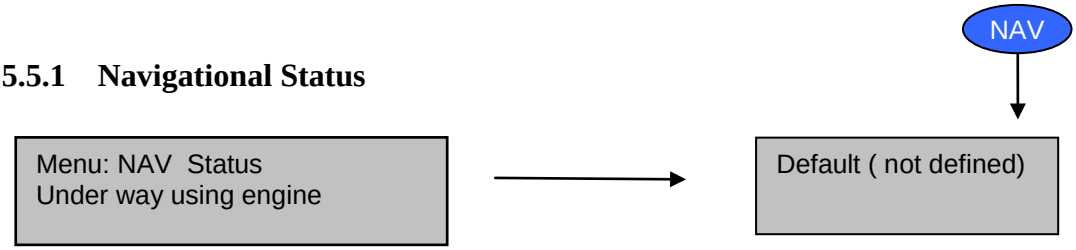
5.5 Main menu

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



To select “Navigational Status” press numeric key [1] or [Enter] key.

5.5.1 Navigational Status

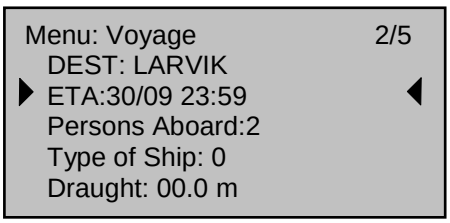


This shows the Navigational Status of your own ship. To change status, press [Enter] key or [Nav] key. The [Nav] key takes you directly to menu.
Press [Esc] key twice to return to “Main Menu”
For changing of Navigational Status use [Arrow up/down] keys and [Enter] key.
Select from table 5.5.2

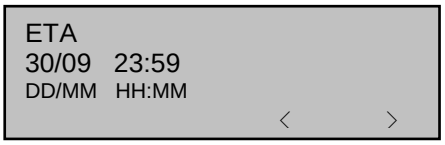
5.5.2 Entering Voyage data

Select ”Voyage” from ”Main Menu” with numeric key [2] or using [arrow down] key and [Enter] key.

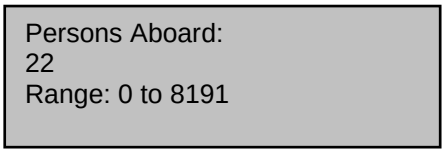
Type in correct data and press [Enter] key.
Press [Esc] key to return to “Voyage Menu”.



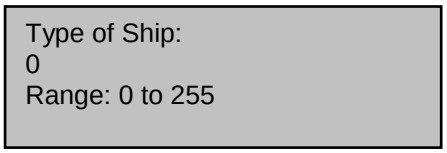
Select ETA with [arrow down] key and [Enter] key.



Type in correct data and press [Enter] key.
Press [Esc] key to return to “Voyage Menu”.
Select “Persons Aboard” with [arrow down] key and [Enter] key.



Type in correct data and press [Enter] key.
Press [Esc] key to return to “Voyage Menu”.
Select “Type of Ship” with [arrow down] key and [Enter] key.



Type in correct data and press [Enter] key. See table 5.5.2
Press [Esc] key to return to “Voyage Menu”.
Select “Draught” with [arrow down] key and [Enter] key.

Type in correct data and press [Enter] key.
Press [Esc] key twice to return to “Main Menu”.

Identifiers Used by ships to Report Their Type		
First Digit		**Second Digit**
0 – Not used		0 – All ships of this type
1 – Reserved for future use		1 – Carrying DG, HS, or MP IMO hazard or pollutant category A
2 – WIG (Wing In Ground)		2 – Carrying DG, HS, or MP IMO hazard or pollutant category B
3 – see table A below		3 – Carrying DG, HS, or MP IMO hazard or pollutant category C
4 – HSC (High Speed Craft)		4 – Carrying DG, HS, or MP IMO hazard or pollutant category D
5 – see table B below		5 – Reserved for future use
6 – Passenger Ships		6 – Reserved for future use
7 – Cargo Ships		7 – Reserved for future use
8 – Tankers		8 – Reserved for future use
9 – Other types of Ship		9 – No additional information

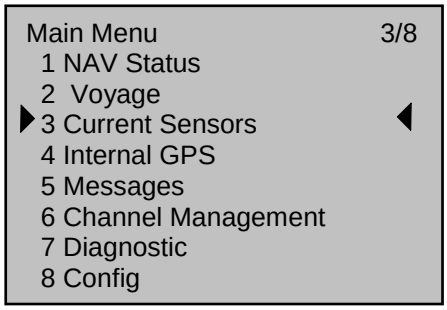
Identifier Number		**Table A: Identifiers Used by Other Ships to Report Their Type**
First Digit	**Second Digit**	
3	0	Fishing
3	1	Towing
3	2	Towing and length of the tow exceeds 200mtrs (ft) or breadth exceeds 25 mtrs (ft)
3	3	Engaged in dredging or underwater operations
3	4	Engaged in diving operations
3	5	Engaged in military operations
3	6	Sailing
3	7	Pleasure craft
3	8	Reserved for future use
3	9	Reserved for future use

Identifier Number		**Table B: Identifiers Used by Special Craft to Report Their Type**
First Digit	**Second Digit**	
5	0	Pilot vessel
5	1	Search and rescue vessel
5	2	Tugs
5	3	Port tenders
5	4	Vessels with anti-pollution facilities or equipment
5	5	Law enforcement vessels
5	6	Spare – for assignments to local vessels
5	7	Spare – for assignments to local vessels
5	8	Medical transports (as defined in the 1949 Geneva Conventions and Additional Protocols)
5	9	Ships according to Resolution No. 18 (Mob-83)

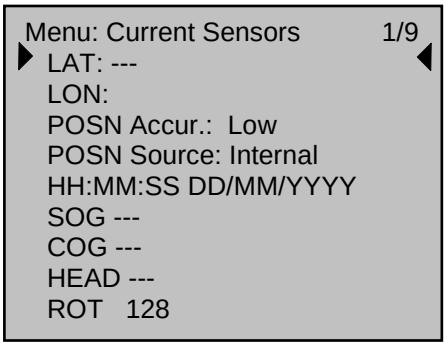
DG = Dangerous Goods HS = Hazardous Substances MP = Marine Pollutants

Table 5.5.2 Type of ship identifiers.

5.5.3 Current Sensors / Dynamic Data menu



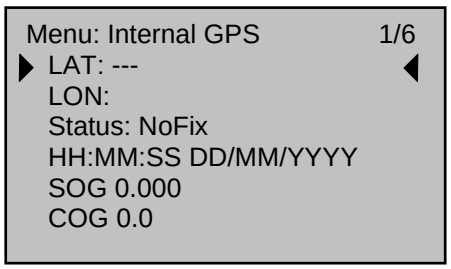
Select “Current Sensors” with numeric key [3] or [arrow down] key and [Enter] key.



This menu shows the data from the selected sensors onboard that the transponder is transmitting to the AIS system.
Press [Esc] key twice to return to “Main Menu”.

5.5.4 Internal GPS Menu

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

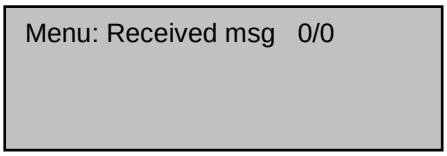


This menu shows the data from the internal GPS module.
Press [Esc] key twice to return to “Main Menu”.

5.5.5 Messages Menu

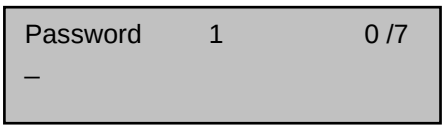
From the “Main Menu” select “Message” by pressing numeric key [5] or [arrow down] key and [Enter] key.

Select “Read Messages” by pressing [Enter] key or numeric key [1].



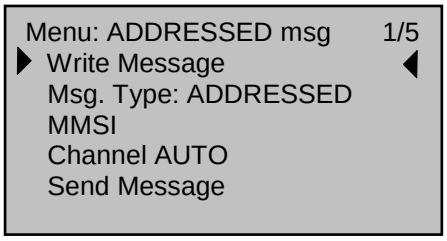
The number of received messages will show in upper right corner.
The transponder will show up to 100 messages. The latest received message will always be on top of the list. Select a message by [arrow up/down] key and [Enter] key to read the message.
Press [Esc] key to return to “Message Menu”.

From the “Messages Menu” select “Send Messages” by pressing numeric key [2] or [arrow down] key and [Enter] key. When you try to “Send Message”, you must enter password A. (see chapter 5.2.1)



Type password A and press [Enter] key.

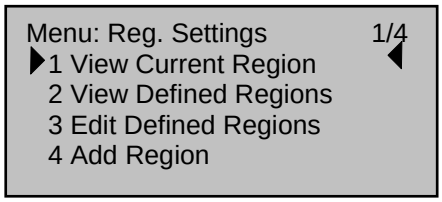
Then you will be able to write a message as shown below



Select “Write Message” by pressing [Enter] key. Write message, select ADDRESSED, select MMSI and type in MMSI number to the receiving part. Select “Send Message” and [Enter] to send.

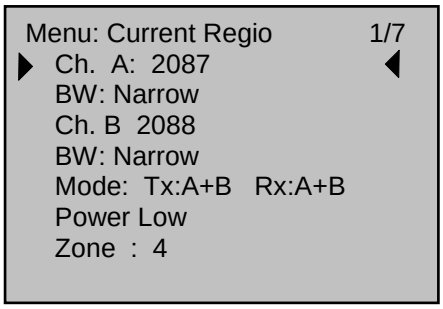
5.5.6 Regional Settings

The “Channel Management” is to define areas around the world that use specific frequencies and power output for that area only.
From the “Main Menu” select “Channel Management” by pressing numeric key [6] or [arrow down] key and [Enter] key.



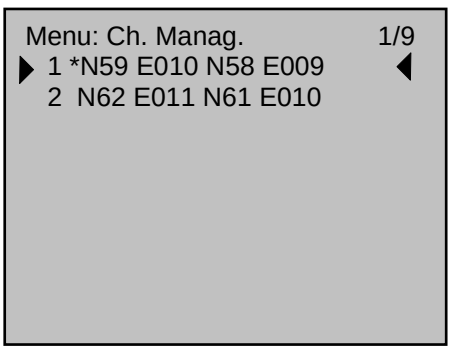
Select “View Current Region” by pressing the numeric key [1], or press [arrow down] key and [enter] key.

5.5.6.1 View Current Region



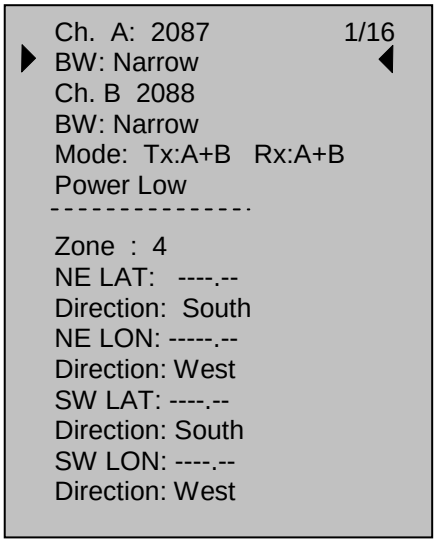
This menu shows the settings for the current region.
Press [Esc] to go one step back.
Select “View Defined Regions” by pressing the numeric key [2], or press [arrow down] key and [enter] key.

5.5.6.2 View Defined Regions

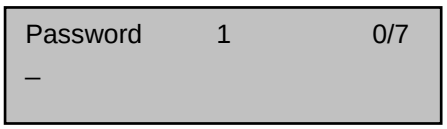


This menu shows defined regional settings for various regions.
For more specific information, press [Enter] key.

This menu shows the specific information for one region.



Press [Esc] twice to return to “Reg. Settings” menu
Select “Add Regions” by pressing the numeric key [4], or press [arrow down] key and [Enter] key.
When you try to “Add Regions”, you must enter password A. (see chapter 5.2.1)



Type password A and press [Enter] key.

Then you will be able to add a new region, as shown in next sub chapter:

5.5.7 Add Regions

```
Ch.  A:  2087
BW: Narrow
Ch. B  2088
BW: Narrow
Mode:  TX:A+B   RX:A+B
Power Low

Zone  :  4
NE LAT:   ----.--
Direction:  South
NE LON: -----.--
Direction: West
SW LAT: ----.--
Direction: South
SW LON: ----.--
Direction: West
```

In this menu all data can be edited by selecting the actual line, by [arrow up/down] key and [Enter] key.
Press [Esc] key to go one step back, and repeat procedure for all lines.
Press [Esc] key twice to return to “Main Menu”.

Regions should be as large as possible. The minimum limit is 20 nautical miles and maximum limit is 200 nautical miles.

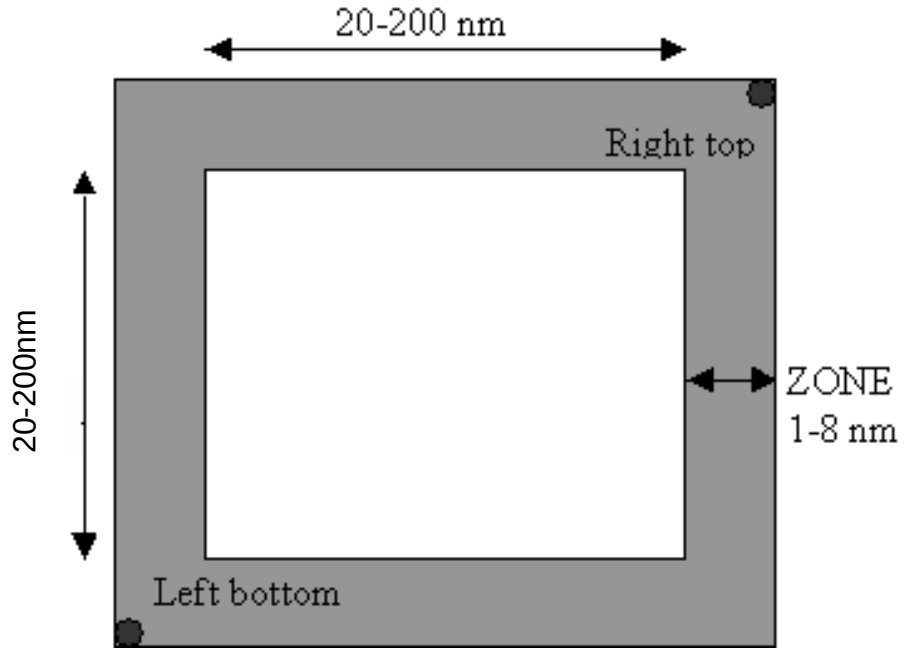


Figure 5.5.7.a, Region definition

In addition to the limits of the region, a transition zone must be defined between 1 and 8 nautical miles.

This is done in the menu line marked “ZONE”

This zone is used for frequency transition so only one frequency is changed at a time. There are defined rules for how the AIS will behave through this zone.

The AIS will continuously monitor for its own position and range to the regional areas defined.

When entering transition zone for Region 1, frequency is changed on the primary channel. The AIS is now sending the primary frequency defined for each of the regions.

When the boundary for the Region 1 is crossed, the second frequency shall be changed. Then the primary frequency for the old region (or default setting) is switched with the secondary frequency for the new region. Then both frequencies have changed.

When entering another region, frequency transition is performed as described above with the frequencies (settings) of the new region.
When leaving a region, frequency transition is performed back to default values.

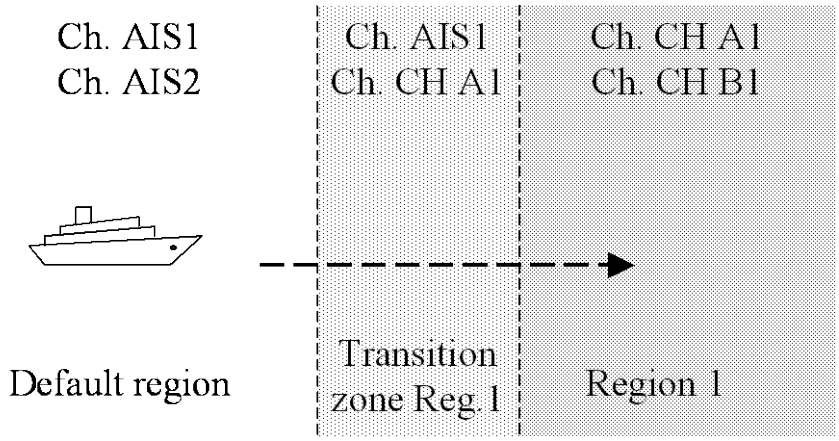
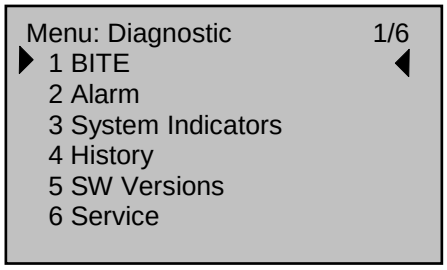


Figure 5.5.7.b, Frequencies used when entering a new region

5.5.8 Diagnostic Menu

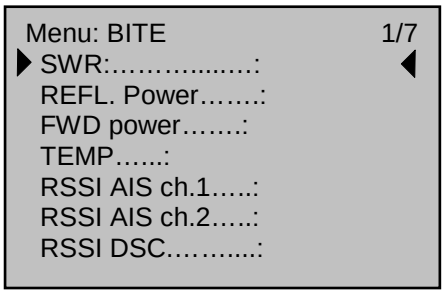
From the “Main Menu” select “Diagnostic” by pressing numeric key [7] or [arrow down] key and [Enter] key.



This menu gives access to different submenus for readout of parameters.
The only submenu which can give access to changes is the “Service” menu which is only for factory use.

5.5.8.1 BITE

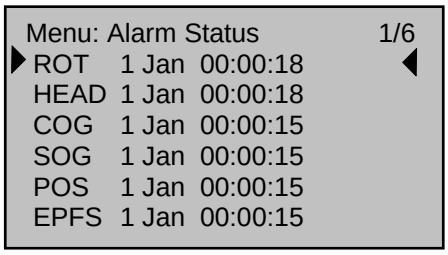
Select “BITE” menu by pressing [Enter] key or numeric key [1].



This menu gives BITE readout values from the transponder. The SWR readout will show 10 times the real value that is calculated like this: SWR=(FWD power+ REFL Power / FWD power- REFL Power)
Press [Esc] key to go back to “Diagnostic menu”.

5.5.8.2 Alarm Status

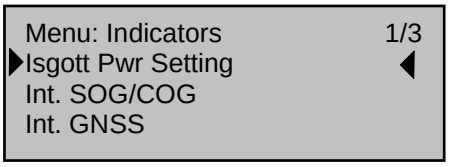
Select “Alarm” menu by pressing numeric key [2] or [arrow down] key and press [Enter] key.



This menu shows the log over momentarily status alarms that have been visualized in the AIS display and acknowledged by pressing [Del] key, but are still valid.
These alarm messages are also sent to “External display/ pilot port”.
See paragraph 3.2.3 in the Technical Manual.
Press [Esc] key to go back to “Diagnostic menu”.

5.5.8.3 System Indicators

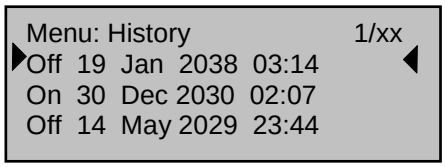
Select “System Indicators” menu
by pressing numeric key [3] or [arrow down] key and press [Enter] key.



This menu shows the momentary status of all sensors connected.
These messages are also sent as TXT messages to “External display/ pilot port”.
See paragraph 3.2.8 in the Technical Manual.
Press [Esc] key to go back to “Diagnostic menu”.

5.5.8.4 History

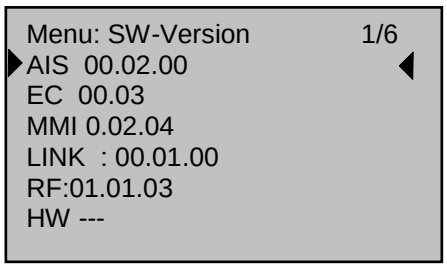
Select “History” menu by pressing numeric key [4] or [arrow down] key and press [Enter] key.



This menu shows when the transponder have been turned on or off.
Press [Esc] key to go back to “Diagnostic menu”.

5.5.8.5 SW version

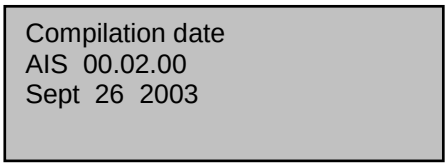
Select “SW Version” menu
by pressing numeric key [5] or [arrow down] key and press [Enter] key.



This menu shows the different software versions installed in the transponder.

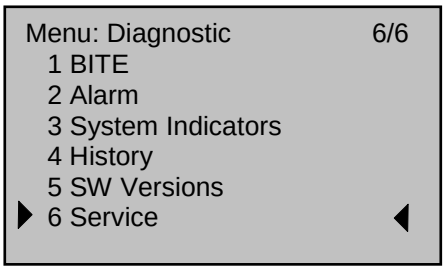
5.5.8.6 Compilation date

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 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 “Diagnostic” menu.

5.5.8.7 Service menu



The “Service” menu is only for factory use.
Press [Esc] key twice to go back to “Main Menu”.

6 EQUIPMENT LIST

6.1 Standard supply 80400

No.	Name	Type	Stock No.	Qty.	Remarks
1	Transponder unit	TR-2500	80401	1	
2	Standard Bracket Kit	For Desktop or Roof mounting of TR-2500	81540	1	
3	Junction Box		80560	1	
4	**Plug Kit consisting of:**		**81533**		
-	AIS Distribution Cable	10m with 37 pin D-sub	80579	1	
-	TNC connector	TNC for RG-58	80578	1	
-	BNC connector	BNC for RG-214	80577	1	
-	Power connector	For 24VDC	81509	1	
-	Pilot Port Connector including cover		81541	1	
-	9 pin D-sub cover		80593	2	
-	15 pin D-sub cover		80594	1	
5	AIS Viewer	Windows software	81650	1	

6.2 Optional supply

No.	Name	Type	Stock No.	Remarks
1	GPS/VHF combined antenna	Procom AIS 2/GPS	80748	
2	Plug Kit for 80748		81535	
3	Signal splitter to 80748	Procom	81649	
4	VHF antenna	Procom CXL 2-1 LW/1	92598	
5	Plug Kit for 92598		81534	
6	GPS antenna with mounting bracket	Procom GPS4 with FLG bracket	80611	
7	Plug Kit for 80611		81534	
8	GPS/VHF combined antenna	Comrod AC17-AIS	80747	
9	Plug Kit for 80747		81536	
10	VHF antenna with mounting bracket	Transvoice type 206-147 with 200-240 bracket	80617	
11	Plug Kit for 80617		80597	
12	GPS antenna with mounting bracket	Transvoice type 202-968 with 200-456/200-233 bracket	80618	
13	Plug Kit for 80618		81534	
14	Flush Mounting Kit		80586	
15	19`` Rack Tray Mounting Kit		80587	

7 WIRING AND CONNECTIONS

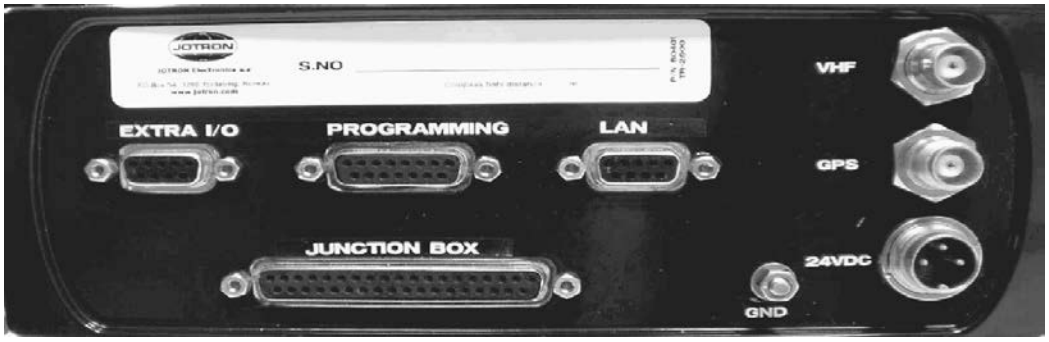


Figure 7 TR-2500 rear connections and plugs

7.1 Description of Connectors

VHF Antenna Connector	BNC type antenna connector to be connected directly to an external VHF antenna or antenna splitter to receive and transmit VHF frequencies.
GPS Antenna Connector	TNC type antenna connector to be connected directly to an external GPS antenna or antenna splitter to receive GPS information.
24VDC Connector	Connector to connect 24VDV power to the transponder.
Ground Tag (GND)	Ground Tag is to be connected directly to the ships metal.
Extra I/O Connector	9 pin D-sub connector
Programming Connector	15 pin D-sub connector is for programming of the Transponder by Program Engineers only
Junction Box Connector	This 37 pin D-sub female connector gives connections between the transponder and the Junction Box
LAN Connector	9 pin D-sub connector

7.2

7.2.1 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 10.5 and 10.7.

7.2.2 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 10.8.

7.2.3 24VDC Connector

This is a connector to connect 24VDV power to the transponder.

7.2.4 Ground Tag (GND)

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

7.2.5 Extra I/O Connector

Factory use only.

7.2.6 Programming Connector

Factory use only

7.2.7 Junction Box Connector

This 37 pin D-sub female connector is described in chapter 4.5.6.

7.2.8 LAN Connector

This 9-pin D-sub connector is described in chapter 7.2.

7.2.9 Description of 24VDC connection to transponder

This is described in chapter 4.5.4.

7.3 Description of LAN connector (UDP)

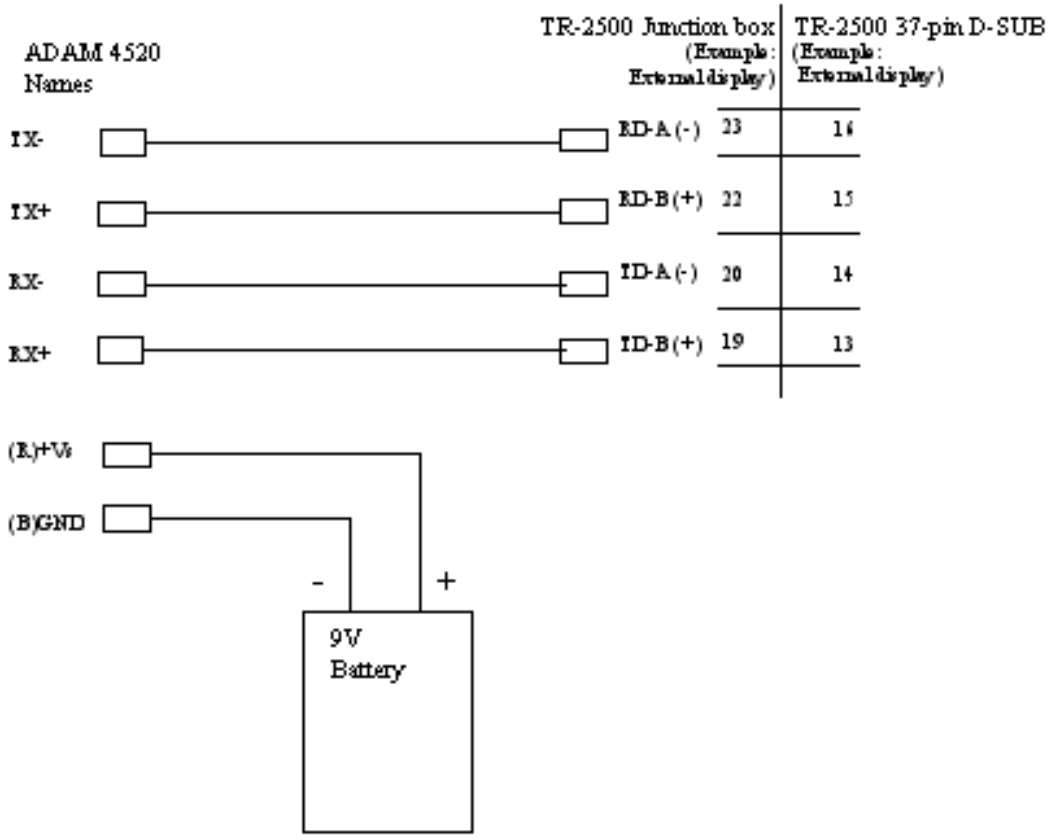
Contains Ethernet 10Mbit Twisted pair interface.

Service connector, 9 pins Dsub:

Nr.	Name	Function		In/Out
1	Ether TX+	Ethernet Transmit Data+		Out
2	Ether TX-	Ethernet Transmit Data-		Out
3	Ether_RX+	Ethernet Receive Data+		In
4	Ether_RX-	Ethernet Receive Data-		In
5	GND	Ground		-
6		For service only		
7		For service only		
8	+14V	+14 V, max 300mA.		-
9	NC	Not Connected		-

7.4 Connection between JOTRON UAIS TR-2500 and PC through RS422 to RS232 converter

Here is ADAM 4520 used as RS422 to RS232 converter, but the connection is similar if other type of converers is used.

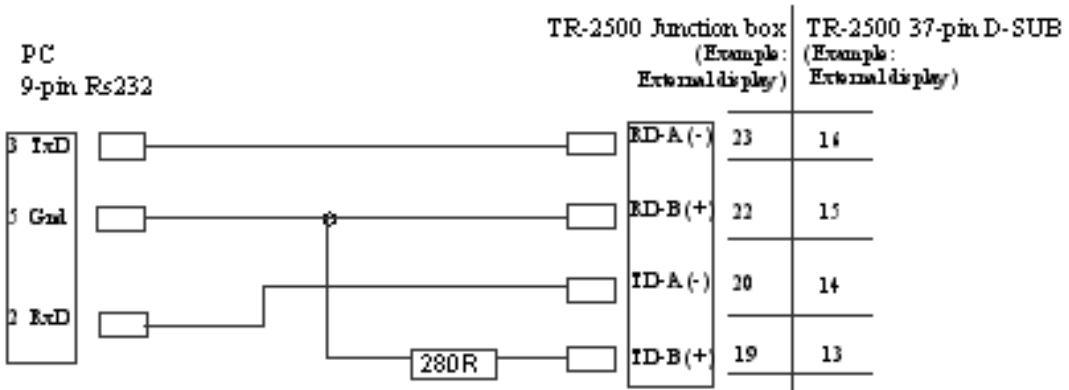


On the RS232 side the converter, a standard RS232 extender cable must be used to connect to the personal computer. Jotron's 97824 may be used here.

7.5 Connection between JOTRON UAIS TR-2500 and serial port (9-Pin)

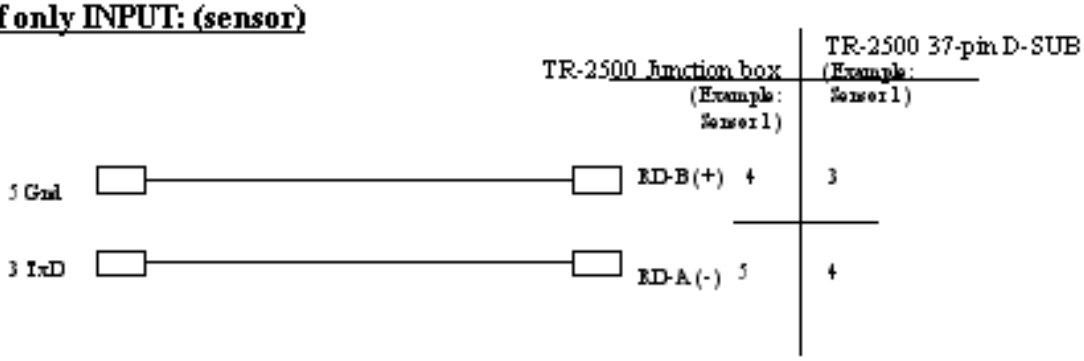
1. **If two-way communication:**

Note that sensor inputs 1-3 are standard 4800 baud, Aux. Display and External Display are 38400 baud. (This connection must be used if connected to Jotron AIS Viewer)



2. **If only OUTPUT:**

3. **If only INPUT: (sensor)**



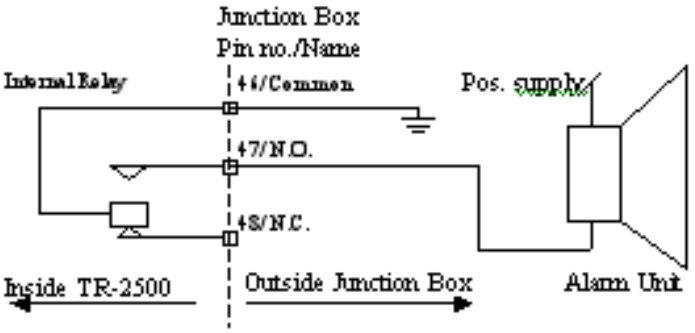
7.6 Connection of "External Alarm" to JOTRON UAIS TR-2500

Alternative 1: Alarm using internal relay

If the Alarm to be connected consumes within these limits:

< 2A/30VDC
< 0.5A/125VAC
< 0.3A/110VDC

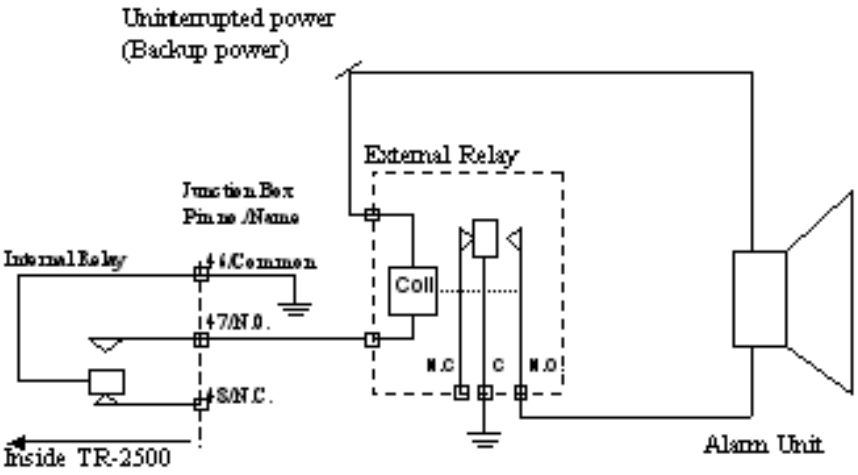
this alternative may be used.



Please Note that pin 47/N.O (Normally Open) will be connected to pin 46 through the internal relay on both ALARM conditions and power failure, (if Tron UAIS TR-2500 looses 24V power)

Alternative 2: Alarm using external relay'

Alarm with high current consumption can be connected like this:



In this configuration, both the external relay and the alarm unit are powered from external power source, and the alarm unit is grounded through the external relay if an alarm occurs or the main power to the AIS is removed/defective.
Other configurations may be used, but remember that the Alarm must be functioning both on AIS Alarm conditions, and power failure to the AIS.

7.7 Interfacing External GPS to Jotron UAIS T

There are many different GPS manufacturers and models on the market and therefore these guidelines may be necessary. There are different electrical interfaces available as RS232 and RS422, and RS422 is the only which can directly connect to TR-2500. But even thought if a GPS has RS422, it may have different names for the signals, than the standardized on the AIS, A and B. Below is a table comparing different signal names that are compatible:

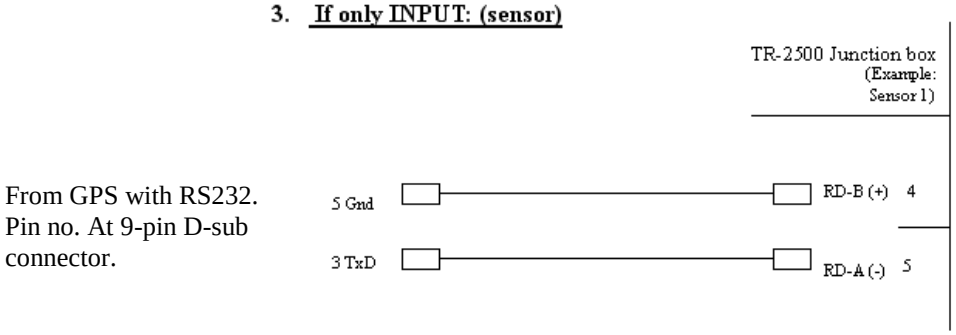
Standard	IEC61162	NMEA	Simrad	Jotron TR-2500
Negative signal	A	-	Return (Common)	RD-A (pin 5)[1]
Positive signal	B	+	Data Out	RD-B (pin 4)[1]

1) Indicates connection to TR-2500, sensor input #1

There are also other configuration possibilities but in common most equipment will not be damaged if connected wrongly.

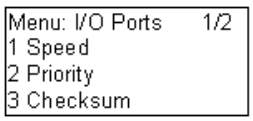
If the GPS has RS232 output it needs some special connection to work with the TR-2500. Either you can use a converter from RS232 to RS422 or connect according to picture below:

3. If only INPUT: (sensor)

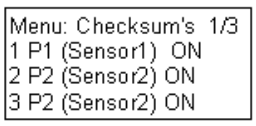


The TR-2500 requires checksum on all it sensor input data, but since some sensors, like older GPS's does not have checksum, it is possible to turn this off in the TR-2500. This must be done according to this procedure:

1. Select «Menu» -> «Config» -> «I/O Ports»



2. Select "Checksum" -> "Enter"



3. Select correct sensor (If GPS, normally "Sensor1") and turn OFF Checksum.
4. Press "Enter" -> "ESC" and when question if you want to save, answer YES.
5. Power OFF the TR-2500, and power ON again to get the new configuration to be used.①
6. Check in the "Menu" -> "Current Sensor" that you have data available from "external", otherwise you don't have correct connection or configuration

① Not necessary if software version newer than AIS: 01.01.01 (all versions with 01.00.xx need restart)

8 ALARM AND INDICATIONS

8.1 Ship navigation status and reporting interval

Reporting interval:

The different information types are valid for a different time period and thus need a different update rate.

Static information:	Every 6 min or, when data has been amended, on request.
Dynamic information:	Dependent on speed and course alteration according to "5.2 Alarm messages".
Voyage related information:	Every 6 min or, when data has been amended, on request.
Safety related message:	As required.

Ship navigation status	Reporting interval
Moored	3 min
0 – 14 kt speed	10 s
0 – 14 kt speed with course change	3 + 1/3 s
14 – 23 kt speed	6 s
14 – 23 kt speed with course change	2 s
Speed higher than 23 kt	2 s
Speed higher than 23 kt with course change	2 s

8.2 Alarms

Alarm messages (Sent to external display/pilot port as ALR messages)	**Description** (Shown at TR-2500 MKD)	**System action**
TX	TX malfunction	Stop transmission
VSWR	Antenna VSWR exceeds limit	Continue operation
RX1	RX channel 1 malfunction	Stop transmission on affected channel
RX2	RX channel 2 malfunction	Stop transmission on affected channel
RX70	RX channel 70 malfunction	Stop transmission on affected channel
GENF	General failure (Can be missing MMSI)	Stop transmission
EPFS	External EPFS lost (GPS)	Continue operation, will use table below for priority of POSN data
POSN	No sensor position in use	Continue operation with (Manual, Dead reckoning or No position.)
SOG	No valid SOG (Speed Over Ground) information	Continue operation using default data
COG	No valid COG (Course Over Ground) information	Continue operation using default data
HDG	Heading lost / invalid	Continue operation using default data
ROT	No valid ROT (Rate of Turn) information	Continue operation using default data

8.2.1 Receiver malfunction

If the error messages “RX1”, “RX2” or “RX70” appears on the LCD Display, this indicates that the test of the TDMA receivers 1 or 2 or Digital Selcall receiver has failed.

The test for these receivers is as follows:

8.2.2 Receiver tests

Every time a transmission is made and the receiver is on the same channel as the transmitter, the receiver measures the signal level (RSSI) and will give an alarm if the signal level is too low. This means that this test will include the complete receiver chain.

The alarm messages are as follows:

	Display indication	Alarm ID in ALR sentence on IEC61162-1/2 ports
TDMA receiver 1 error	RX1	ID 003
TDMA receiver 2 error	RX2	ID 004
DSC (Digital selcall) receiver error	RX70	ID 005

8.3 System indicators

Text messages (Sent to external display/pilot port as TXT messages)	**Description** (Shown at TR-2500 MKD in “System Indicators” menu)
UTC clock lost	UTC clock lost
External DGNSS in use	Ext. DGNSS in use
External GNSS in use	Ext. GNSS in use
Internal DGNSS in use beacon	Int. DGNSS beacon
Internal DGNSS in use msg 17	Int. DGNSS msg 17
Internal GNSS in use	Int. GNSS
External SOG/COG in use	Ext. SOG/COG
Internal SOG/COG in use	Int. SOG/COG
Heading valid	Heading valid
Rate of turn indicator in use	ROT in use
Other ROT source in use	Other ROT in use
Channel mngmnt params changed	Ch. mng param chng
Entering ISGOTT power setting	Isgott Pwr Setting
Leaving ISGOTT power setting	Isgott Removed
MMSI not defined	MMSI not defined

8.4 Position Sensor fallback conditions

Position sensor priority:	
1	External DGNSS
2	Internal DGNSS
3	External EPFS, uncorrected
4	Internal GNSS, uncorrected
5	No sensor position

8.5 List of navigation status

0 = under way using engine		7 = engaged in fishing
1 = at anchor		8 = under way sailing
2 = not under command		9 = reserved for High Speed Craft
3 = restricted maneuverability		10 = reserved for Wing in Ground
4 = constrained by draught		11 – 13 = reserved for future use
5 = moored		14 = reserved for AIS-SART
6 = aground		15 = not defined (default)

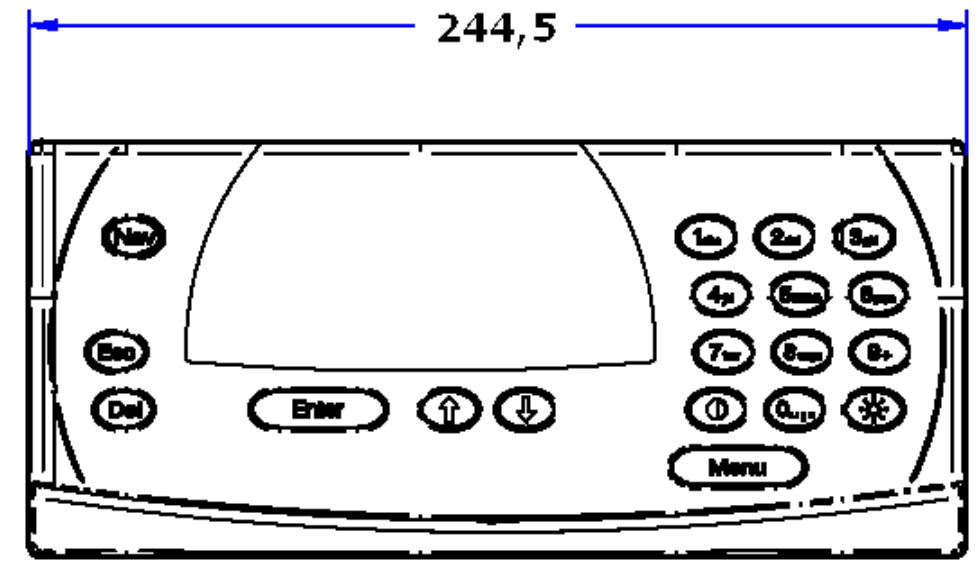
9 LIST OF VHF CHANNELS

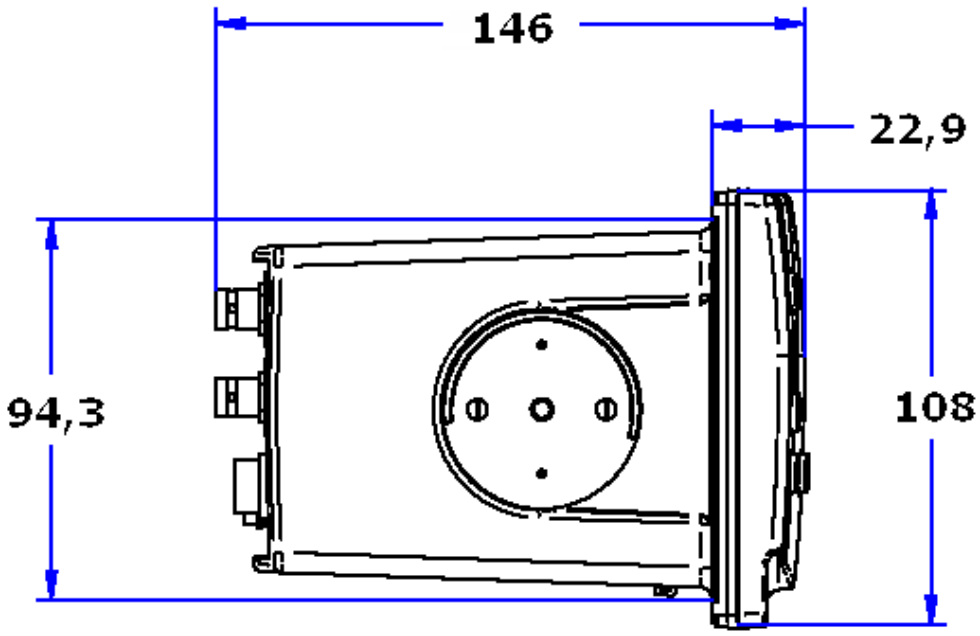
Channel no.	Frequency	Channel no.	Frequency	Channel no.	Frequency	Channel no.	Frequency
6	156.3000	1021	157.0500	1279	156.9775	2219	161.5625
8	156.4000	1022	157.1000	1280	157.0375	2220	161.6125
9	156.4500	1023	157.1500	1281	157.0875	2221	161.6625
10	156.5000	1024	157.2000	1282	157.1375	2222	161.7125
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

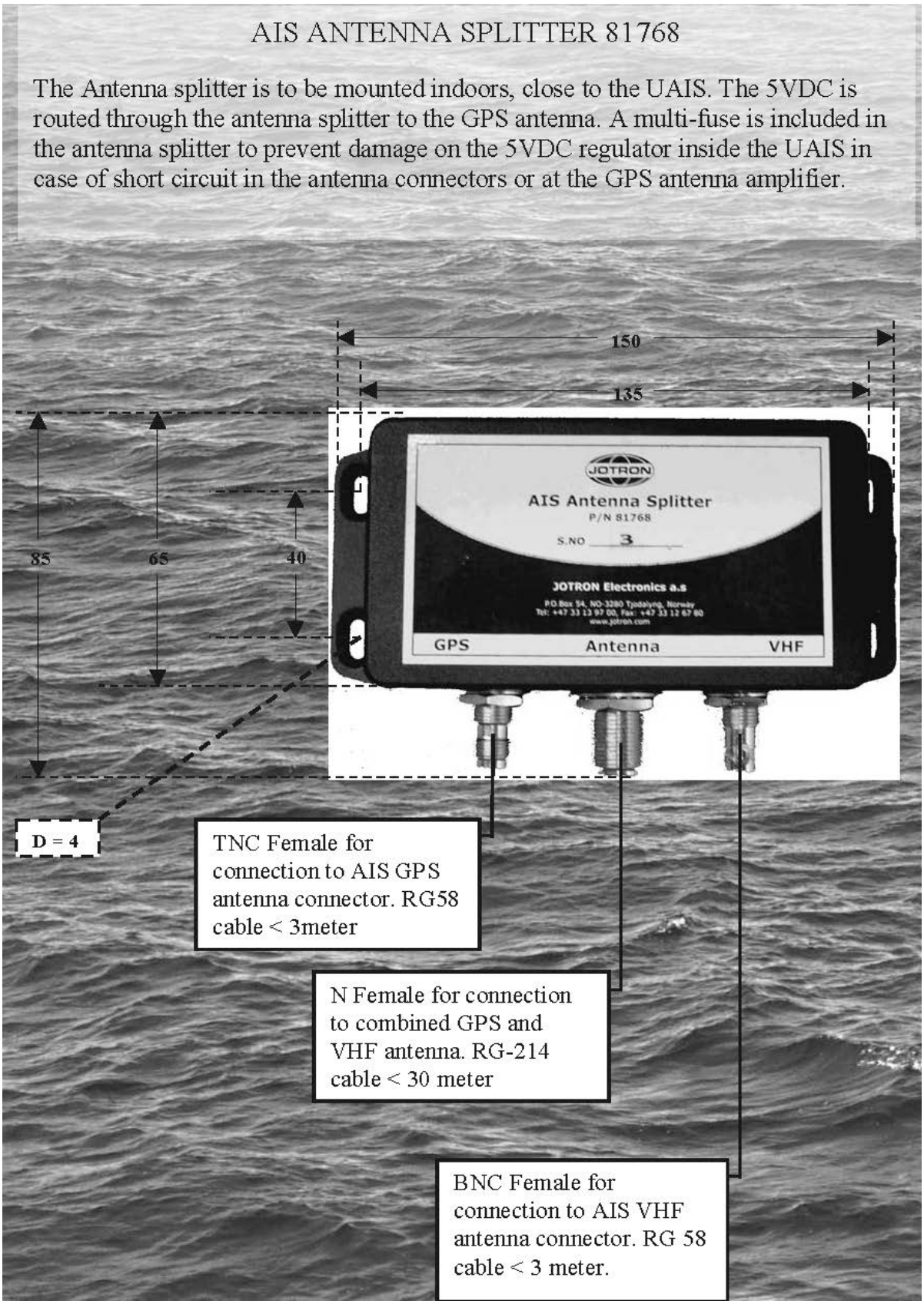
10 OUTLINE DRAWINGS

10.1 TR-2500 AIS Transponder





10.2 AIS Antenna Splitter



10.3 Procom CXL 2-1/h Maritime VHF Antenna

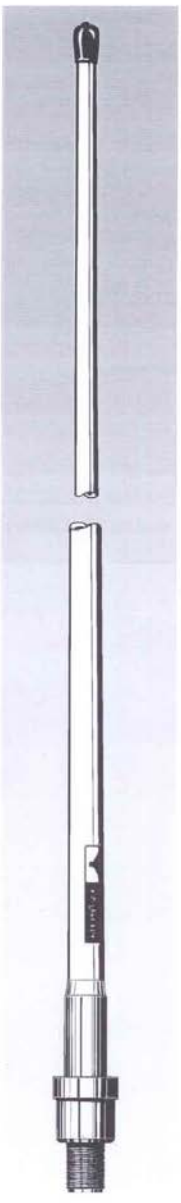
CXL 2-1/...

Base Station and Marine VHF Antenna

PROCOM

DESCRIPTION:

- ★ This base station and maritime VHF antenna is developed for use on board ships as well as on masts 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/... 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/... 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 assure long dependable service in all climates.



SPECIFICATIONS:

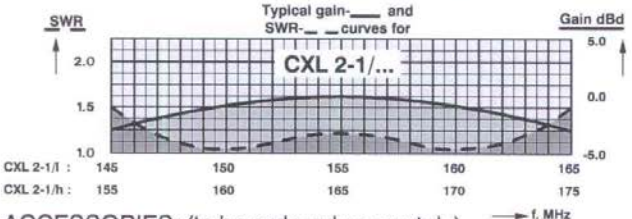
ELECTRICAL	
MODEL	CXL 2-1/...
ANTENNA TYPE	1/2 λ coaxial, broad-band
FREQUENCY	CXL 2-1/l: 144-165 MHz CXL 2-1/h: 155-175 MHz
IMPEDANCE	Nom. 50 Ω
POLARISATION	Vertical
GAIN	2 dBi 0 dBd
BANDWIDTH	21 MHz
SWR	< 1.5
MAX. POWER	150 watt
MECHANICAL	
TEMP. RANGE	-30° C ÷ +70° C
CONNECTOR	UHF-female (standard)
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

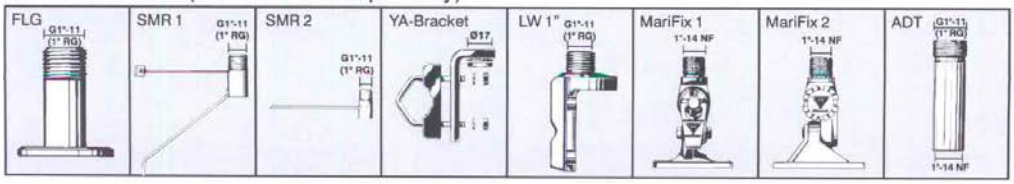
TYPE NO.	FREQUENCY
CXL 2-1/l	144-165 MHz
CXL 2-1/h	155-175 MHz

ORDERING DESIGNATIONS

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



ACCESSORIES: (to be ordered separately)



06.2003

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

10.4 Procom GPS 4 Antenna

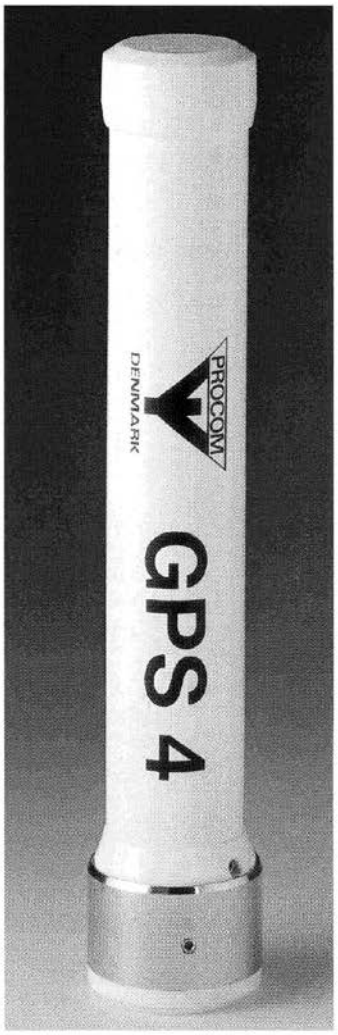
GPS 4/...

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.



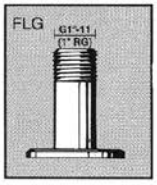
SPECIFICATIONS:

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. 9.6 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)

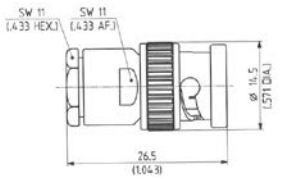
ACCESSORIES:



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

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

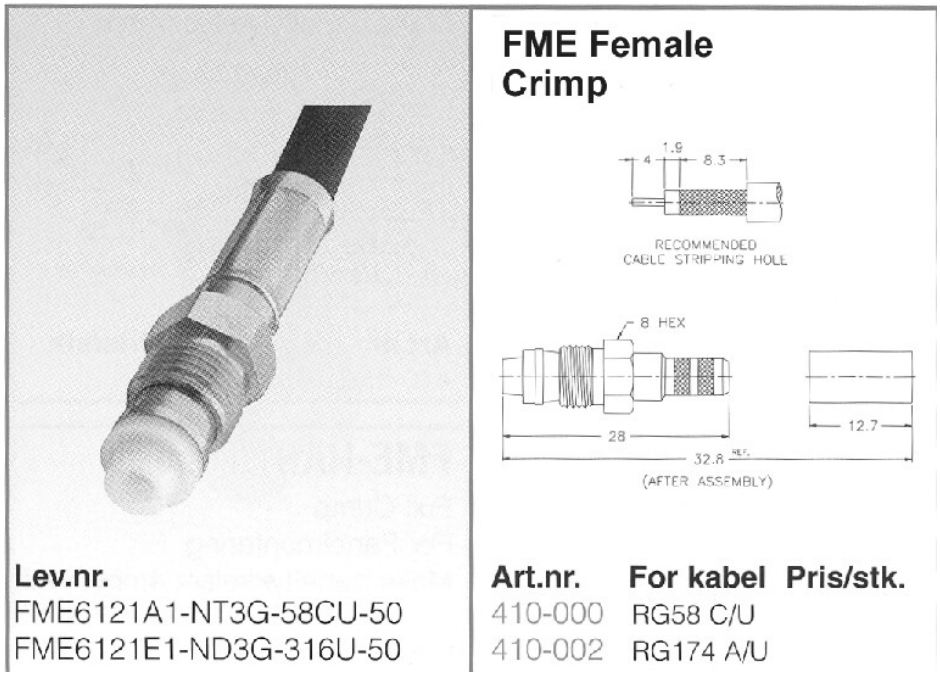
> for flexible cables
> cable entry clamp
> centre contact soldered



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	

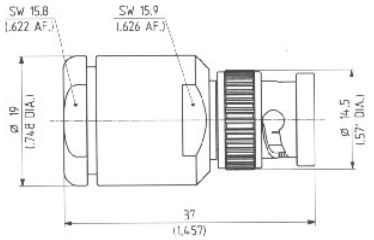
⊞ centre contact NOT captivated

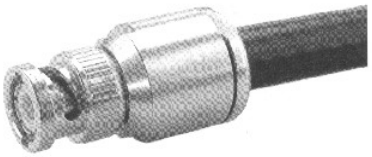
10.6 FME Connector Female 80588, Holund 40100



10.7 BNC Connector Male 80577, Suhner 11BNC-50-2 / 133NE

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

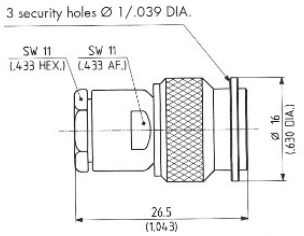




SUHNER TYPE	Article No.	Cable Group (example)	Packaging	Assembly Instruction	Notes
11 BNC-50-7-1 / 133 NE	22540145	U28 (RG 213/U)	single	3008	
11 BNC-50-7-2 / 133 NE	22540149	U33 (RG 214/U)	single	3008	

10.8 TNC Connector Male 80578 Suhner 11TNC-3-6 / 133NE

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

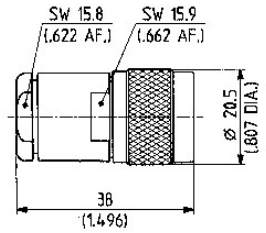


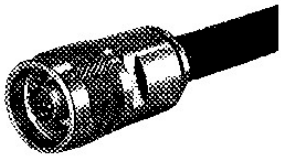
SUHNER TYPE	Article No.	Cable Group (example)	Packaging	Assembly Instruction	Notes
11 TNC-50-2-1 / 133 NE	22640783	U2 (RG 316/U)	single	3005	
11 TNC-50-3-5 / 133 NE	22640798	U7,10 (RG 58C/U)	single	3005	
11 TNC-50-3-6 / 133 NE ⊞	22543475	U7,10 (RG 58C/U)	single	3004	

⊞ centre contact NOT captivated

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

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

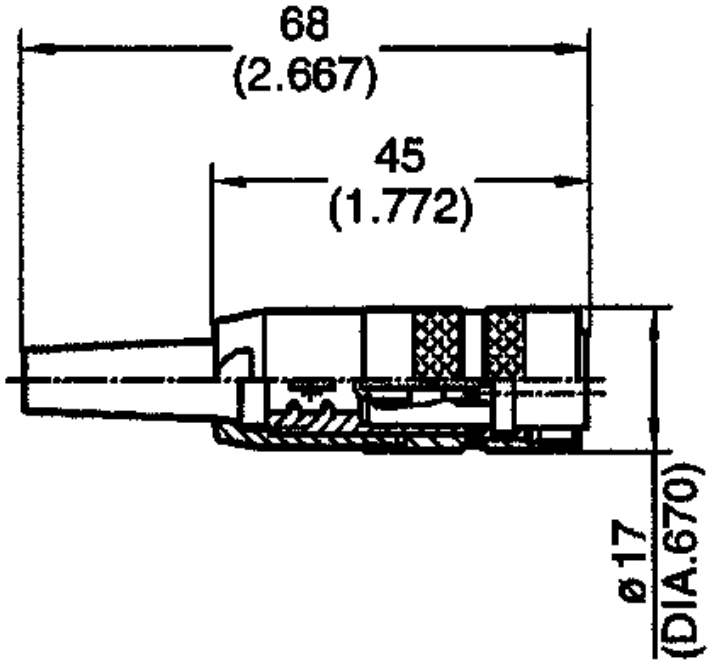




SUHNER TYPE		Article No.	Cable Group (example)	Packaging	Assembly Instruction	Weight
11 N-50-7-5 / 133 NE	⊞	22542117	U33,28 (RG 214/U)	single	3007	51.0 g/ *1.79 oz.*
11 N-50-7-6 / 133 NE		22542120	U33,28 (RG 214/U)	single	3008	51.0 g/ *1.79 oz.*

⊞ centre contact NOT captivated

10.10 24VDC Power Connector 81509, AMP C091AT3261001



11 REGISTRATION FORM

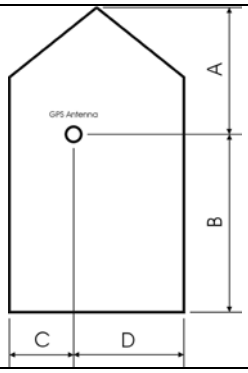
Please tear off this page, fill in the form and return to Jotron AS in order to have a valid 24 months product warranty.

Fax.: + 47 33 12 67 80 - Attention Service Department.

Tron UAIS Installation – registration form

Vessel Data			
Vessel name:		**IMO Number:**	
Flag State:		**MMSI Number:**	
Owner / Company:		**Radio Call Sign:**	
On-Board Contact Name		**Telephone Number(s):**	Office:
			GSM:
Superintendents Name:		**Telephone Number(s):**	Office:
			GSM:
Type of Vessel:		**Gross Registered Tonnage:**	Tonnes
L.O.A.:	mtrs	**Beam:**	mtrs
Comments:			
Tron UAIS serial number:			
Junction Box serial number:			

GPS ant. location



Antenna Location	**External Position Source, Option A or B GNSS Antenna**	**Tron UAIS Internal Position Sourse GNSS Antenna**
A= Distance to Bow:	mtrs	mtrs
B= Distance to Stern:	mtrs	mtrs
C= Distance to Port Side:	mtrs	mtrs
D= Distance to Starboard:	mtrs	mtrs

All necessary information is logged in paragraph 5.3.1

Installation completed and successfully commissioned by:

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

Please fill in with capital letters

Jotron AS
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www.jotron.com