Saab TransponderTech

R5 SUPREME AIS Transponder System

OPERATION & INSTALLATION MANUAL

SAAB

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i Copyright

ii Disclaimer

iii Software

This manual reflects the capabilities of the R5 SUPREME AIS Transponder with Software version 1.1.16 and R5 SUPREME Control & Display Unit (CDU) with software version 1.1.16.

If the system since delivery has been updated from this version, such change should be reflected on a label on the unit. Current software versions in the system can always be verified in the S/W info dialog as described in section 5.22.

iv Manual Part Number and Revision

Part number 7000 118-300, revision F1.

v Safety Instructions

Note the following compass safe distances:

Equipment	Standard magnetic compass	Steering magnetic compass
R5 SUPREME Transponder	0,65 m	0,40 m
R5 SUPREME CDU	0,75 m	0,50 m

vi Disposal Instructions

Broken or unwanted electrical or electronic equipment parts shall be classified and handled as 'Electronic Waste'. Improper disposal may be harmful to the environment and human health. Please refer to your local waste authority for information on return and collection systems in your area.

THE AUTOMATIC IDENTIFICATION SYSTEM

vii   Contact Information

For installation, service, ordering info and technical support please contact your local Saab TransponderTech representative. A list with dealers, OEM partners and service stations can be found at our website, listed under the corresponding product page.

http://saab.com/security/maritime-traffic-management/traffic-management/

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1 THE AUTOMATIC IDENTIFICATION SYSTEM

The Automatic Identification System (AIS) is a safety information system that was proposed as a worldwide standard in 1997 and adopted by IMO in 1998. The AIS system is standardized by ITU, IEC, IALA and IMO and is subject to approval by a certification body. The first type approved AIS transponder in the world was Saab TransponderTech's R3 Class A Transponder in 2002.

AIS allows transceivers to automatically share static and dynamic data such as ship name, call sign, dimensions, position and sensor information on two dedicated data links in the upper marine VHF band. There are a number of different AIS devices that can send and receive information on the AIS data link:

- **Class A Transponder –** This type of transponder is used on open sea waters and is mandatory for ships of 300 gross tonnage or more on international voyages, all cargo ships of 500 gross tonnage or more and on passenger ships.

- **Class B Transponder –** Used on smaller vessels and pleasure crafts. It transmits with a lower power than the class A transponder and has lower priority on the data link.

- **Base Station –** Fixed shore station that is typically connected to an AIS network to collect information from all vessels at a certain port or shore line.

- **Repeater Stations –** Used to extend coverage range by repeating incoming messages. Can be implemented as a function in an AIS Base station or an AtoN station.

- **SAR (Search and Rescue) Transponder –** Used on airplanes and helicopters in search and rescue missions.

- **AtoN (Aids to Navigation) –** A transceiver that is fitted on buoys and lighthouses in order to send information about their positions.

- **Inland AIS –** A European standardized extension to Class A systems for use on inland water ways. An inland transponder has additional messages to communicate with bridges, ports and locks and can also send some additional information that are useful on water ways such as blue sign indication, specific hazardous cargo etc.

- **SART (Search and Rescue Transmitters) –** Distress beacons for life rafts. An active SART unit will always be sorted on top of the target list in the R5 SUPREME CDU to accentuate its presence.

2   SYSTEM OVERVIEW

2.1   Product Description

The basic R5 SUPREME AIS Transponder System consists of three parts

- The R5 SUPREME Transponder
- The R5 SUPREME Control and Display Unit (CDU)
- The R5 AIS Junction Box

The R5 SUPREME Transponder is a Class A unit consists of a transceiver radio unit, a 50 channel GPS receiver, and a controller unit. The radio has three receivers, two tuneable TDMA receivers and one DSC receiver. The transmitter alternates its transmissions between the two operating TDMA channels. The controller unit creates and schedules data packets (containing dynamic, static and voyage related data) for transmission based on the IMO performance standard for AIS.

The R5 SUPREME CDU is the AIS configuration and display unit. The colour LCD together with the resistive touch interface provides a graphical user-friendly interface to the system. The resistive touch panel allows functionality under all weather conditions. Under rough sea, the rubber keypads can be used instead of the touch interface. With the R5 SUPREME CDU it is possible to plot the location of other ships, aids to navigation and search and rescue vessels. The R5 SUPREME CDU can also be used to send and receive messages, perform configuration as well as supervise the R5 SUPREME transponder systems status. The front hatch of the CDU is covering an integrated AIS Pilot Plug connector, as well as USB port and MMC/SD card slot.

Note: The hatch has a screw lock mechanism. It is optional to use this lock. Recommended screwdriver for CDU hatch lock is flat tip 5.5-6.5mm.

The R5 AIS Junction Box allows for easy connection of external equipment to the transponder unit. The R5 SUPREME transponder shall be connected to the ship's sensors as required by the installation guidelines published by IALA. The R5 SUPREME can interface external navigation and presentation systems that support required IEC 61162-1 sentences. Refer to chapter 9 "Interpretation of Input Sentences" for more information. The R5 SUPREME is prepared for connection to Long Range systems like Inmarsat C.

3 INSTALLATION

3.1 Unpacking the Equipment

The R5 SUPREME AIS Transponder System consists of the R5 SUPREME transponder, the R5 SUPREME CDU and a number of optional accessories. The most common parts and accessories are listed below. *NOTE: This is not a list of supplied parts, as contents may vary for each order depending on user needs.*

Name	Part number
R5 SUPREME Transponder 7000 118-100 incl. AIS SW 1.1.X	7000 118-540
R5 SUPREME CDU 7000 118-100 incl. SW 1.1.X	7000 118-530
R5 Power Cable 2m	7000 118-077
R5 Signal Cable DSUB-DSUB 2m	7000 118-286
R5 SUPREME Documentation CD *Including* *R5 SUPREME AIS System Manual*	7000 118-361 *7000 118-300*
Printed document set *Including:* *AIS Installation Short Instruction* *AIS Operators Short Instruction* *AIS Certificate set*	7000 118-370 *7000 118-363* *7000 118-364* *7000 118-365*
R5 SUPREME Ethernet Cable 5m.	7000 000-525
R5 AIS Junction box	7000 118-120
GPS antenna options MA-700 AT575-68 Combined VHF/GPS Antenna AC Marine	 7000 000-485 7000 000-135 7000 000-435
Stainless Steel Antenna Mount 1" x 14	7000 000-472
AIS Alarm Relay Unit incl. socket	7000 100-132
VHF Antenna BA1012	7000 000-077
R5 SUPREME CDU Flush mount frame for R4 MKD upgrades	7000 118-367

Table 1 – R5 SUPREME AIS and accessories

INSTALLATION

3.2 Equipment Installation Environment

The table below lists the IEC 60945 equipment classification for the system.

Name	Part number	IEC 60945 installation category
R5 SUPREME Transponder	7000 118-540	Protected
R5 SUPREME CDU	7000 118-530	Protected
R5 AIS Junction box	7000 118-120	Protected
MA-700	7000 000-485	Exposed
AT575-68	7000 000-135	Exposed
VHF/GPS Antenna	7000 000-435	Exposed

Table 2 - IEC 60945 equipment classification

3.3 Installation Cables

The following cables are needed to install the R5 SUPREME AIS System.

2 x R5 Signal Cable DSUB-DSUB

Marking: 7000 118-286

Type: Shielded Twisted Pair x 0.33 mm^2

Length: 2 m

Diameter: 11 mm

Connector: 2 x 26-pole H.D.D-SUB (female to male)

Flame retardant: IEC60332-1

Interconnection: Straight connection on all pins.

DA-26P (Male Plug Front View)

DA-26S (Female Socket Front View)
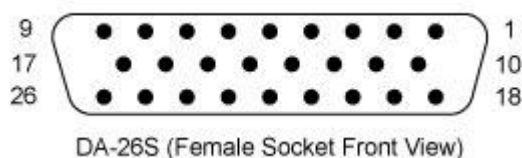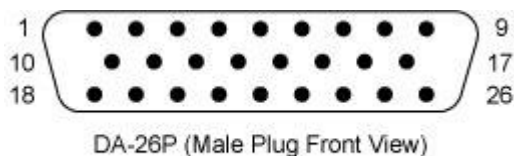
Note:Two signal cables are used from transponder to junction box, but one is installed in reverse direction (Cable 1: Male→ Female. Cable 2: Female → Male)

2 x R5 Power Cable

Type: Unshielded 4 wire cable x 1.3 mm^2

Length: 2 m

Diameter: 6 mm

INSTALLATION

Connector: ConXall Mini-Con-X 6382-4SG-311 (female)

Marking: 7000 118-077

Interconnection specification:
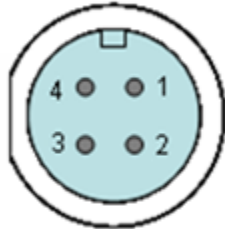
Function	Pin	Cable Color
PWR +	1	Red
PWR, GND	2	Black
Ext Switch R	*3*	*Brown*
Ext Switch F	*4*	*Orange*

R5 SUPREME VHF Antenna Cable

Type and length: See section 3.10.2 VHF Cabling

Connector: BNC (Male)

R5 SUPREME GPS Antenna Cable

Type and Length: See section 3.11.2 GPS Cabling

Connector: TNC (Male)

R5 SUPREME Ethernet Cable

Type: Cat-7, LSZH-FR, IEC 60332-1

Length: 5 m

Diameter: 6,5 mm

Connector: RJ-45

Part number: 7000 000-525

3.3.1 Minimum cable bending radius

When installing the cables the recommended minimum bending radiuses are as follows:

Signal and power cables: 10 times cable diameter

Coaxial cables: 5 times cable diameter

3.4 System interconnection overview

3.4.1 Standard system

Below is a general system setup with everything connected except external sensors and systems, which is connected to the R5 AIS Junction box. For alternate system setups, please see Section 11 "Alternate System Setups"
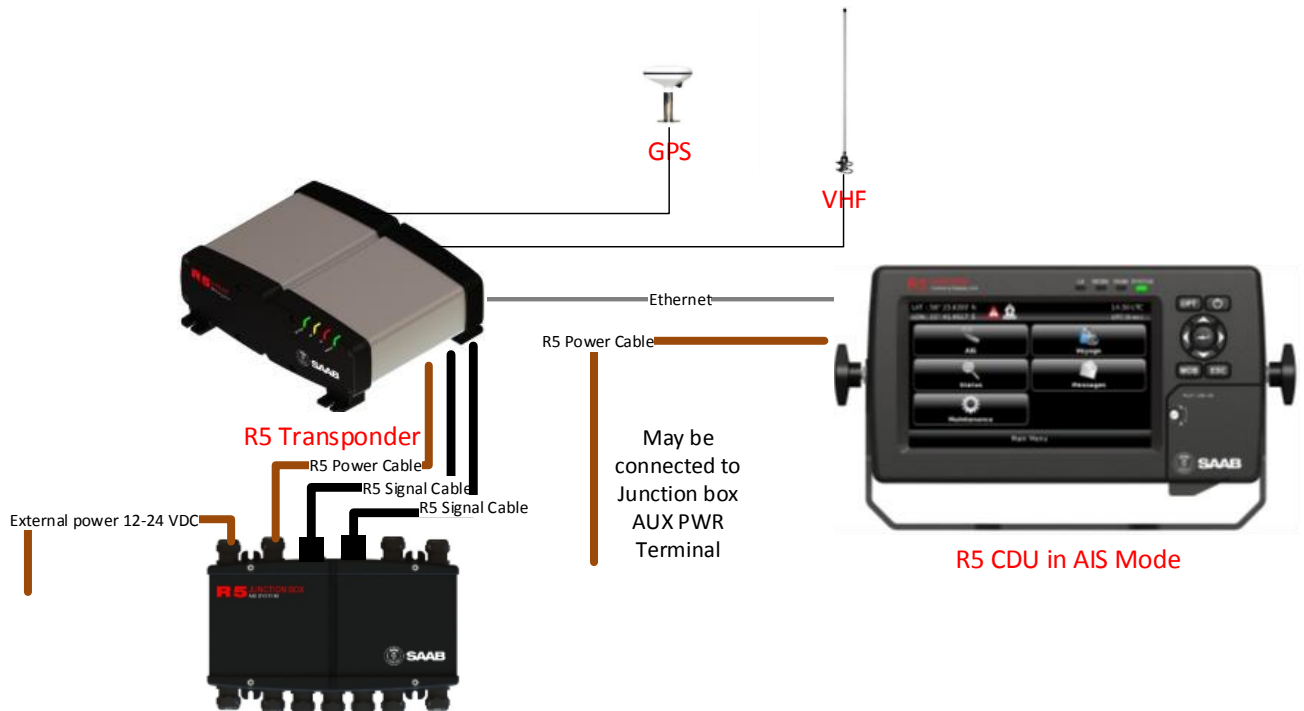
Figure 1- System overview

	R5 Supreme AIS Transponder 7000 118-540	R5 AIS Junction box 7000 118-120
R5 AIS Junction box 7000 118-120	2 x R5 Signal cable DSUB-DSUB 7000 118-286 R5 Power Cable 7000 118-077	-
R5 CDU 7000 118-530	R5 SUPREME Ethernet Cable, 7000 000-525	R5 Power Cable 7000 118-077

Table 3 – AIS System interconnect

INSTALLATION

3.5   Installation Procedure

When installing the R5 SUPREME AIS System it is recommended to follow the steps described in this installation manual. Details of the installation procedure can be found in the coming sections of the manual.

Recommended installation steps:

1. Mount the R5 SUPREME CDU at conning station
2. Mount the R5 SUPREME transponder
3. Mount the alarm relay unit (if applicable)
4. Connect all external systems and sensors to the R5 AIS Junction Box
5. Mount the R5 AIS Junction box
6. Connect the R5 SUPREME transponder and R5 SUPREME CDU directly or to Ethernet network
7. Mount the VHF antenna
8. Mount the GPS antenna
9. Power up the system
10. Configure IP and LWE-ID settings
11. Set additional configuration parameters
12. Perform system functional check

3.6   Installing the R5 SUPREME CDU

3.6.1   CDU Location

The R5 SUPREME CDU should be mounted close to the position from which the ship is normally operated, preferably on the bridge console close to the conning position.

When mounting the R5 SUPREME CDU, please consider the following:

- The temperature and humidity should be moderate and stable, +15ºC to +35ºC (Operating temperature: -15ºC to +55ºC.)
- Select a location away from excessive heat sources
- Avoid areas where there is a high flow of humid salt air
- Avoid places with high levels of vibrations and shocks
- Avoid mounting the R5 SUPREME CDU in direct sunlight. Prolonged exposure to direct sunlight may have adverse effects to the system.
- Ensure that there is enough airflow to avoid high ambient temperatures
- The units can affect magnetic compasses.
  - The minimum compass safe distance from the R5 SUPREME CDU is 0.75 meters to a standard magnetic compass and 0.50 meters to a steering magnetic compass.

3.6.2   R5 SUPREME CDU Mounting Options

The R5 SUPREME transponder and CDU are equipped with power and interface connectors designed to prevent water ingress.

INSTALLATION

However, the SD, USB and Pilot connectors under the CDU front hatch are protected by the hatch only; the connectors are NOT water proof.

It is therefore recommended to keep the CDU hatch closed when possible. The hatch has a locking mechanism designed to prevent unintentional opening. Depending on installation type it may be desired to keep this hatch locked.

It is recommended to install the system in an environment that is as protected from direct sunlight and water spray as possible. The R5 SUPREME CDU can be mounted in three different ways.

- Gimbal mount
- Panel mount
- Mounting frame panel mount – The CDU can be mounted in a frame that will cover a mounting hole from a previous R4 MKD flush mount installation.

3.6.2.1   CDU Gimbal Mount

The gimbal mount allows for a quick installation, and is suitable for panel as well as ceiling mounting. It will give the benefit of a tilt-able display and the possibility to mount and dismount CDU easily.

The gimbal mount is fastened with four screws in the mounting surface. The CDU is attached to the gimbal mount with two wing knobs.

3.6.2.2   Panel Mount

Panel mounting will reduce bridge clutter and reduce the space needed for installation.. A cutout fitting the CDU profile must be made. See Section 13.4 CDU Cutout Measurements for Panel Mount for dimensions.

The CDU is fastened in place using the bolt and knot from the included mounting kit 7000 118-315.
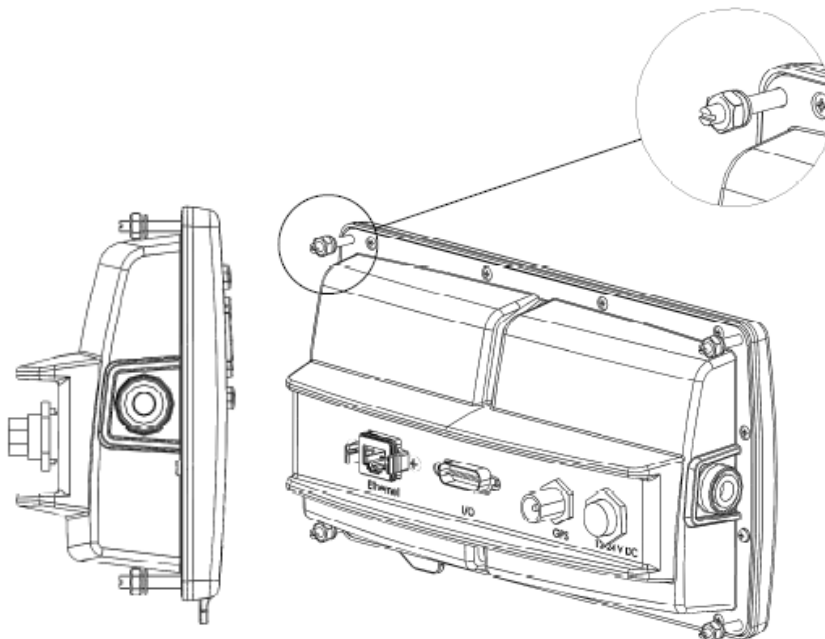
3.6.2.3 Mounting frame panel mount

The CDU can be attached to the panel mount frame using the mounting kit 7000 118-315 included with the R5 CDU.
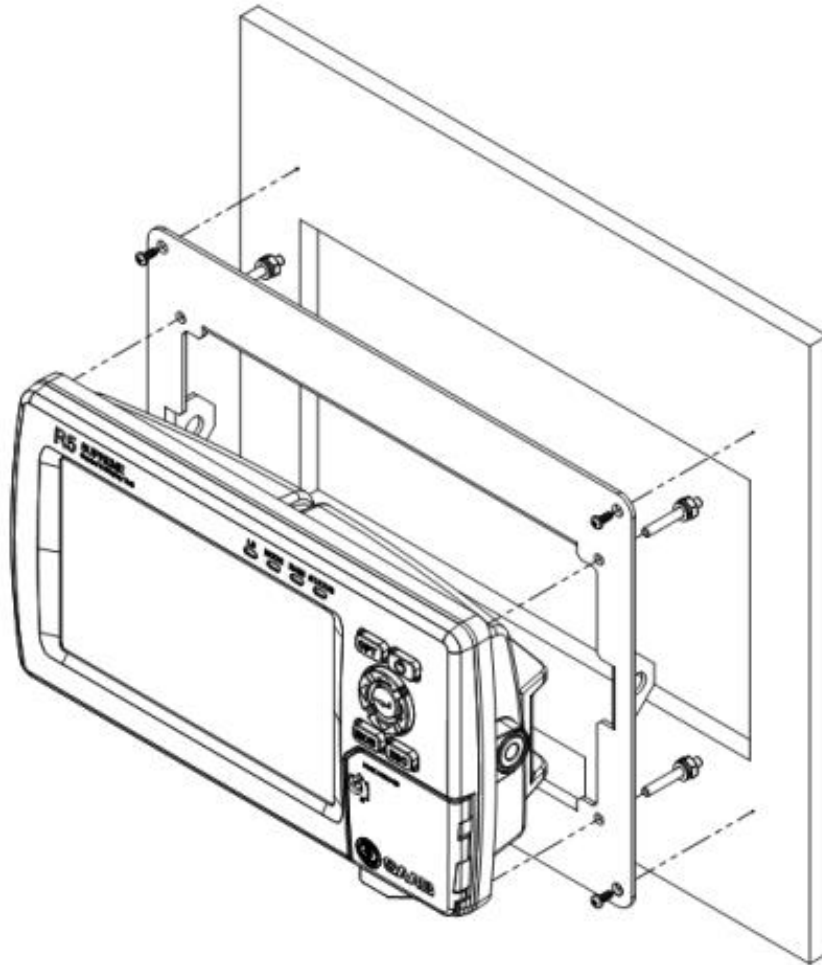
Figure 2 – R5 SUPREME CDU, Mounting frame panel mount

The cutout dimensions may need to be increased somewhat compared to the R4 MKD cutout, as the R5 CDU is slightly wider. See Section 13.5 CDU Mounting Frame cutout and dimensions.

3.8 Installing the R5 SUPREME Transponder

3.8.1 Transponder Location

When mounting the R5 SUPREME Transponder, please consider the following:

- Mount the unit on a wall or on top of a bench
- The temperature and humidity should be moderate and stable, +15ºC to +35ºC (Operating temperature: -15ºC to +55ºC.)
- Select a location away from excessive heat sources
- Avoid areas where there is a high flow of humid salt air
- Avoid places with high levels of vibrations and shocks
- Ensure that there is enough airflow to avoid high ambient temperatures
- Ensure that the cables can be connected without violating their minimum bending radius
- The unit can affect magnetic compasses. The minimum compass safe distance is 0.65 meters to a standard magnetic compass and 0.40 meters to a steering magnetic compass
- Install the R5 SUPREME transponder as close as possible to the transponder's VHF/GPS antennas to minimise cable loss

3.8.2 R5 SUPREME Transponder Mounting

The Transponder unit is secured in place using the screw holes in the four feet in the bottom corners.
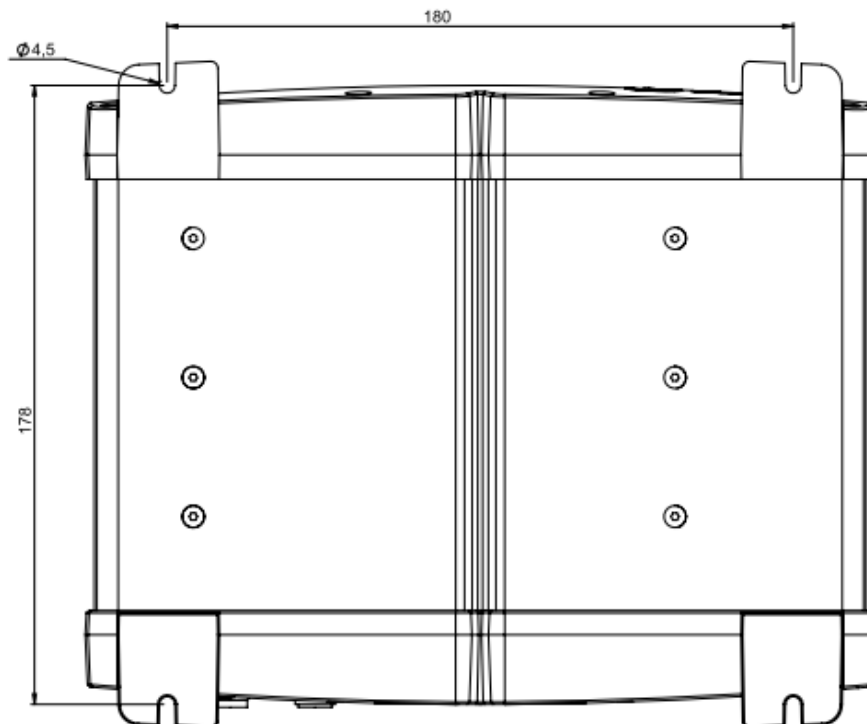
Figure 3- Transponder mounting holes.

3.9 Install the R5 AIS Junction Box

3.9.1 Junction Box Location

The R5 Signal Cables connecting the transponder to the Junction box are 2m long hence this is the maximum distance between the Junction Box and the Transponder unit.

The R5 AIS Junction Box is made from EMI shielded plastic.

Leave a clearance around the R5 AIS Junction Box to facilitate service and installation. See below figure for minimum recommended clearance area (measurements in mm).
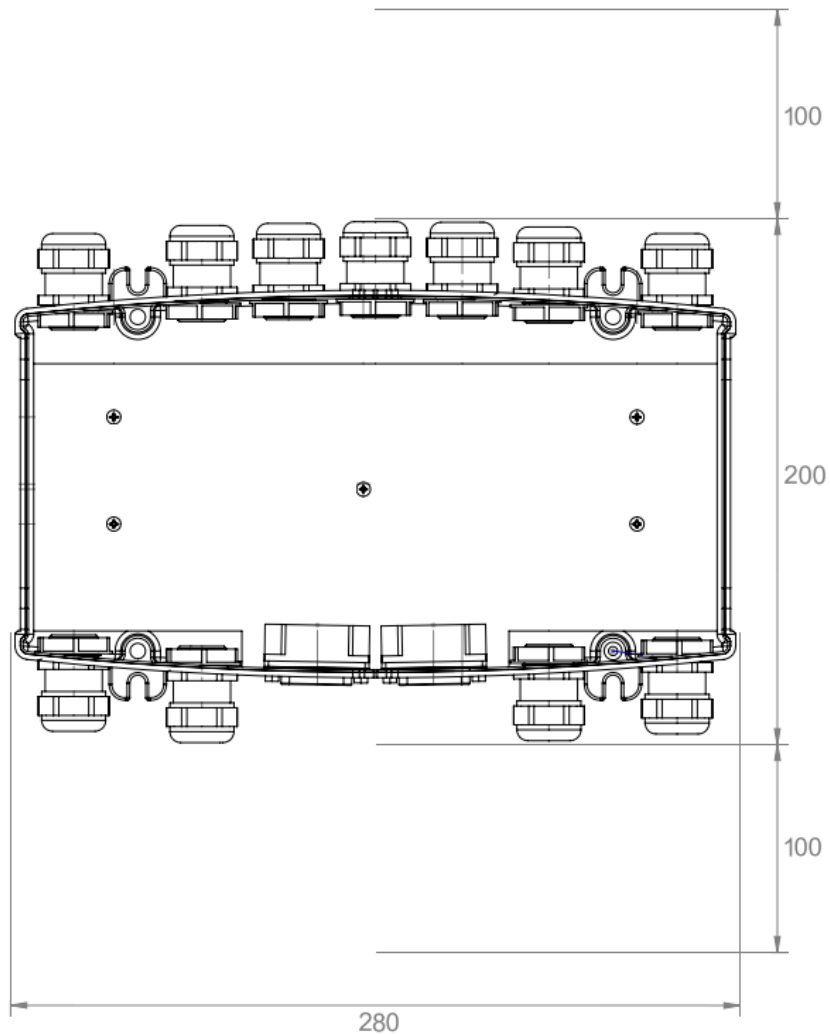
Figure 4 – Recommended Clearance Area (mm) for R5 AIS Junction Box

3.9.2   Junction Box Connections

The Junction box feature two 26-pin DSUB connectors, one male and one female.

All other connectors are internal of terminal block type.

Note: The R5 AIS Junction Box has two internal 5A fuses. The first fuse protects the connected transponder and the other one is an auxiliary fuse. The auxiliary fuse is meant to protect any device that is connected to the auxiliary power terminal block. The CDU is an example of such a device.
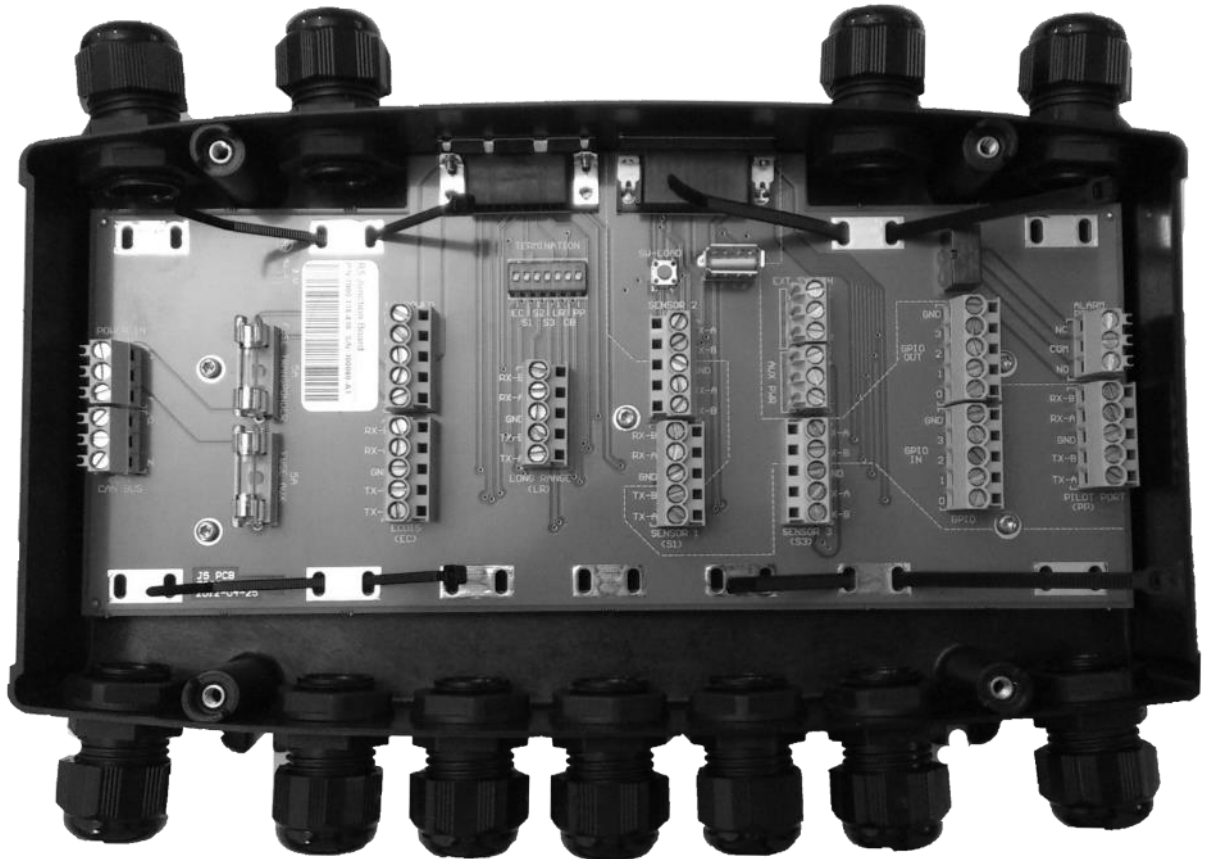
Interfaces:

Please see Section 12.2 "R5 AIS Junction box Interfaces" for details.

• It is recommended to connect external cables to the Junction box before mounting the box to a surface.

• Open the lid of the R5 AIS Junction Box.

• Fix the box on an appropriate surface/place with using the screw holes on the four feet of the junction box.

• Pull the cables through suitable cable glands. These glands are located on the front and back of the junction box. Please note that the glands can be removed if the cables are too thick. With the glands mounted, the maximum supported cable diameter is 12mm. Without the glands mounted, the maximum supported cable diameter is 19.5mm.

• Shielded cables should be stripped down to the shielding and fastened with cable ties (not included). There are eleven cable tie fastening points on the circuit board, one for every anti-vibration gland on the junction box. Make sure that the cable shielding touches the tin plated area at the fastening point. The maximum supported cable tie width is 4.5mm.

INSTALLATION

- Tighten the anti-vibration glands so that the cables are secured.
- Connect the cables to the terminal blocks.
- Fix the lid to the box casing.

3.10 **Mount the VHF Antenna**

The R5 SUPREME Transponder, like any other ship borne transceiver operating in the VHF maritime band, may cause interference to a ship's VHF radiotelephone. Because AIS is a digital system, this interference may occur as a periodic (e.g. every 10 second) soft clicking sound on a ship's radiotelephone. This effect may become more noticeable when the VHF radiotelephone antenna is located close to the AIS VHF antenna and when the radiotelephone is operating on channels near the AIS operating channels (e.g. channels 27, 28 and 86).

Attention should be paid to the location and installation of different antennas in order to obtain the best possible efficiency. Special attention should be paid to the installation of mandatory antennas like the AIS antennas.

So, installing the AIS VHF antenna is also a crucial part of the system installation. How and where you install your AIS VHF antenna and cable will affect its efficiency.

3.10.1 **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 the interference effects. Installing the VHF antenna for AIS on a vessel is a compromise between the following items:

- Antenna type
- Antenna separation
- Clear view of the horizon
- Antenna height

3.10.1.1 Antenna Type

The AIS VHF antenna should have Omni directional vertical polarization providing unity gain.

3.10.1.2 Antenna Separation

AIS transponders use simplex channels at frequencies on the high side of the marine mobile band (AIS channel A = 2087, 161.975 MHz, and AIS channel B = 2088, 162.025 MHz). These channels are close to the duplex channels used for shore to ship marine communication. The AIS VHF antenna should be separated as much as possible from the voice VHF installations used for main communication to avoid unnecessary interference.

There should not be more than one antenna on the same level. 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 meters vertical separation. If it is located on the same level as other antennas, the distance apart should be at least 10 meters.

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

3.10.1.3   Clear View of the Horizon

The AIS VHF antenna should be placed in an elevated position that is as free as possible with a minimum distance of 2 meters in 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.

3.10.1.4   VHF Antenna Height

The AIS is using VHF radio frequencies, which propagation characteristics are close to line of sight. The higher the antenna location is, the longer the range will be.

3.10.2   VHF Cabling

The cable should be kept as short as possible to minimize attenuation of the signal. Double shielded coaxial cable equal or better than RG214 is recommended to minimize the effects from electromagnetic interference from high power lines, radar or other radio transmitter cables.

The table below gives recommendation on cables that can be used for the VHF-antenna connections. The cable attenuation shall be kept as low as possible; a 3 dB loss is the same as cutting the signal strength in half.

Type	Attenuation @ 150 MHz (dB/100m)	$\varnothing$ (mm)	Weight (kg/100m)
RG 214	7	10.8	18.5
RG 217	5	13.8	30.1
RG 225	8	10.9	23.3

Table 4 – VHF Antenna Cables

Ex: A cable of 40 meter RG 214 has a cable attenuation of 2.8 dB.

3.10.3   VHF Cable Mounting

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°).

Coaxial cables should not be exposed to sharp bends, which may lead to a change of the characteristic impedance of the cable. The minimum bending radius should be 5 times the cable's diameter.

All outdoor installed connectors should be weather proofed, e.g. with shrink tubing, watertight seal tape or butyl rubber tape and plastic tape sealing, to protect against water penetration into the antenna cable.

Secure the cable properly close to the cable ends.

3.10.4   VHF Cable Grounding

Coaxial down-leads must be grounded. The coaxial shielding screen should be connected to ground.

3.11 Mount the GPS Antenna

The R5 SUPREME shall be connected to a GPS antenna type MA-700, AT575-68 or a combined AC Marine GPS/VHF antenna. 5V DC is supplied through the antenna lead for the antenna preamplifier.

If the combined AC Marine GPS/VHF antenna is used the diplexer unit shall be installed in an indoors environment.

Attention should be paid to the location and installation of the different antennas on the ship in order to obtain the best possible efficiency. Special attention should be paid to the installation of mandatory antennas like the AIS antennas.

So, installation of the GPS antenna is a crucial part of the system installation. How and where you install your GPS antenna and cable will greatly affect its sensing efficiency.

3.11.1 GPS Antenna Location

The GPS antenna must be installed where it has a clear view of the sky. The objective is to see the horizon freely through 360 degrees with a vertical observation of 5 to 90 degrees above the horizon. Small diameter obstructions, such as masts and booms do not seriously degrade signal reception, but such objects should not eclipse more than a few degrees of any given bearing. Do not mount the antenna in the top of a mast or tower, as this may degrade the COG and SOG readings.

Locate the GPS antenna at least 3 meters away from and out of the transmitting beam of high-power transmitters such as S-Band Radar (typically $\pm15°$ vertically from the array's centre point) and/or Inmarsat systems (A, B, C, or M; typically $\pm10º$ from the array's centre point in any of the possible transmitting directions).

Locate the GPS antenna at least 3 meters away from HF or VHF radios or their antennas. This includes the ship's own AIS VHF antenna if it is designed and installed separately.

3.11.2 GPS Cabling

The gain of the GPS antenna built-in pre-amplifier shall match the cable attenuation. The resulting installation gain (pre-amplifier gain minus cable attenuation) shall be within 0 to 26 dB. A minimum value of 10 dB is recommended for optimum performance.

Double shielded coaxial cable is recommended. The coaxial cable should be routed directly between the GPS antenna and the R5 SUPREME Transponder's GPS connector in order to reduce electromagnetic interference effects. The cable should not be installed close to high-power lines, such as radar or radio-transmitter lines or the AIS VHF antenna cable. A separation of 1 meter or more is recommended to avoid interference due to RF-coupling. Crossing of antenna cables should be done at 90 degrees to minimise magnetic field coupling.

The table below gives recommendation on cables that can be used for the Transponder GPS-antenna connections. Due to the high frequency it's important that the attenuation in the cable is low for the specific frequency (1.5 GHz).

Type	Attenuation @ 1.5 GHz (dB/m)	∅ (mm)	Weight (kg/100m)
RG 58	0.9	5	3.7
RG 400	0.6	4.95	6.3
RG 223	0.6	5.40	5.5
RG 214	0.35	10.8	18.5
RG 225	0.3	10.9	23.3

Table 5 – GPS Antenna Cables

For optimum performance approximately +10dB gain should be available when the cable attenuation has been subtracted from the GPS-antenna preamplifier gain. The net gain shall not exceed +26dB.

Example:

Cable type	Preamplifier gain (dB)	Required min. cable length (m)	Recommended max. cable length (m)
RG 58	12	0	2
RG 58	26	0	18
RG 58	30	4.5	22
RG 223	12	0	3.5
RG 223	26	0	26.5
RG 223	30	6.5	33.5
RG 214	12	0	6
RG 214	26	0	46
RG 214	30	11.5	57

Table 6 – GPS Antenna Cable Examples

Min length = (Preamp. Gain – 26 dB)/Cable attenuation per meter

Max length = (Preamp. Gain – 10 dB)/Cable attenuation per meter

3.11.3   GPS Cable Mounting

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°).

INSTALLATION

Coaxial cables should not be exposed to sharp bends, which may lead to a change of the characteristic impedance of the cable. The minimum bending radius should be 5 times the cable's diameter.

All outdoor installed connectors should be weather proofed, e.g. with shrink tubing, watertight seal tape or butyl rubber tape and plastic tape sealing, to protect against water penetration into the antenna cable.

Secure the cable properly near the cable ends.

3.11.4 GPS Cable Grounding

Coaxial down-leads must be used. The coaxial shielding screen should be connected to ground.

3.12 Electrical Installation details

For complete specification of signal interface details see Section 12 "Electrical Interfaces"

3.12.1 Input port priority

The protocol of the serial port interfaces is compliant to IEC 61162-1Ed.4 (2010-11).

All serial ports in the R5 SUPREME Transponder have the same capabilities with one exception, any Long Range equipment must be connected to the Long Range port. Apart from that, all ports are bidirectional ports and can be connected to any external equipment such as ECDIS and external sensors. The primary external position sensor should be connected to the Sensor 1 port since this port has the highest priority. The serial ports in the R5 SUPREME Transponder can also receive differential corrections in RTCM format for the internal GPS receiver. The ports in the R5 SUPREME Transponder have different default baud rates but they can all be configured to any baud rate of 4800, 9600, 38400, 57600 or 115200 bps. The priority levels for input of sensor data on the different ports are listed below:

Priority	Identification	Default Baud Rate
1 (Highest priority)	Sensor 1	4800 bps
2	Sensor 2	4800 bps
3	Sensor 3	4800 bps
4	ECDIS	38400 bps
5	Long Range	9600 bps
6	Transponder Pilot	38400 bps
7 (Lowest priority)	CDU Pilot	38400 bps

Table 7 – Port Priorities and Default Baud Rates

If valid position data from external position sources are input on both Sensor 1 and ECDIS port, the position data from Sensor 1 will be used.

If the same data is provided using different NMEA sentences on the same port, the priority depends on the sentence in accordance with Table 8.

INSTALLATION

Priority	Position	COG/SOG	HDG	ROT
1 (Highest)	RMC	RMC	THS	ROT
2	GNS	VTG	HDT	-
3	GGA	VBW	OSD	-
4	GLL	OSD	-	-

Table 8 – Sentence priority

3.12.2   Output Drive Capacity for Serial Ports

Each serial port transmitter can have a maximum of 25 listeners drawing 2.0 mA each.

3.12.3   Input Load

Input impedance for each listener input is 6.4 kΩ.

3.12.4   Schematics of Serial Transceivers

Each of the RS422 serial interfaces fulfils the requirements of IEC 61162-2 and IEC 61993-2. A detailed schematic of one of the serial ports is shown below.
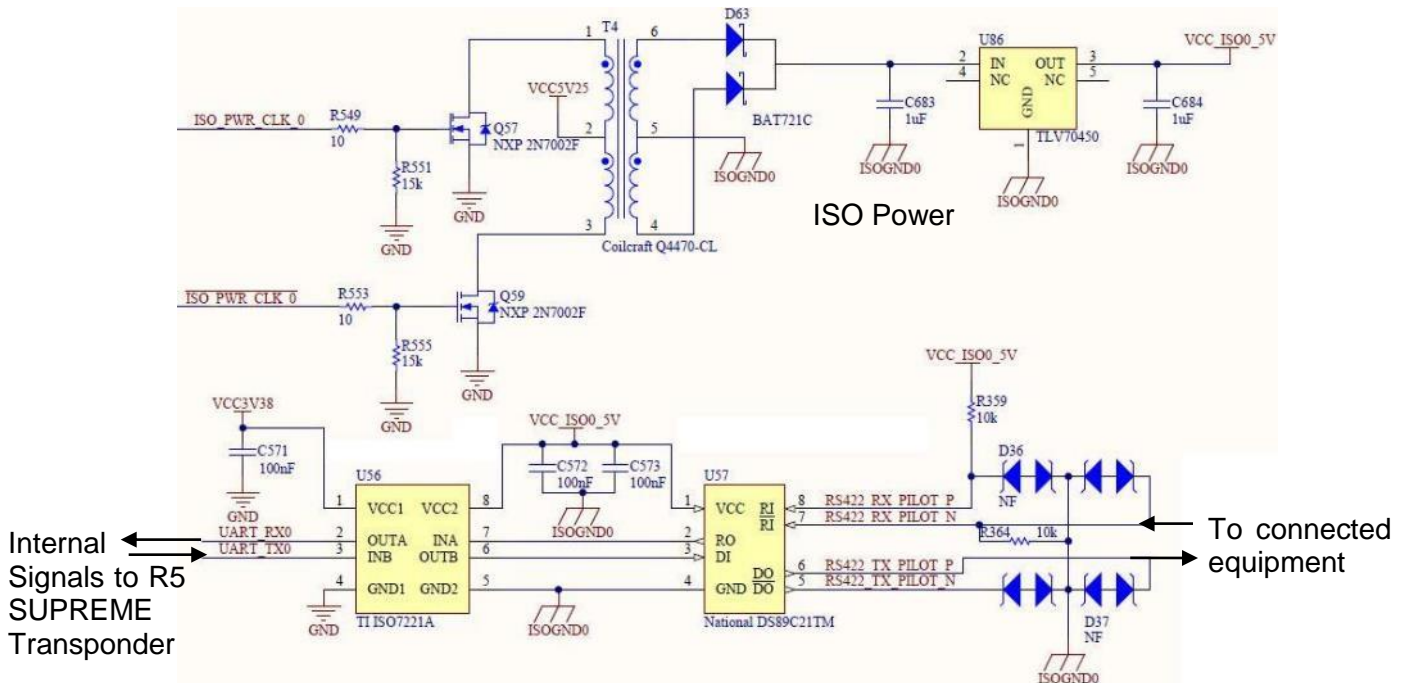
Figure 5 – Serial Port Schematics

3.12.5   Discrete Input/Output Signals (GPIO)

The R5 SUPREME Transponder has four discrete input signals and four discrete output signals which are used in e.g. R5 SUPREME W-AIS installations. These GPIO signals have the following capacities:

High-level input voltage (will be interpreted as logical "1" if above)	2.1 V
Low-level input voltage (will be interpreted as logical "0" if below)	0.9 V

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High-level output voltage	Min 2.48 V
(shall be interpreted as logical "1")	Max 3.38 V
Low-level output voltage	Max 0.5 V
(shall be interpreted as logical "0")	
Maximum Output Current	4 mA

3.12.5.1   Discrete Alarm Acknowledgement

The R5 SUPREME Transponder has support for a discrete alarm acknowledgement signal which will acknowledge all currently active alarms when it is activated.

The signal must be configured for alarm acknowledgement operation which is done with the parameter "AIS Alarm ACK Binary Port" listed in chapter 4.3.16. It can be configured for activation on either rising edge or falling edge.

The alarm acknowledgement input shall be connected to GPIO IN 1. It has an internal pull down resistor so by connecting it to a switch with an appropriate voltage on the other side the rising and falling edges can be generated.

A suitable voltage (3.3V) is available on GPIO OUT 1 when configured for alarm acknowledgement operation.

Recommended installation

Connect a switch between GPIO OUT 2 and GPIO IN 2. When the switch is closed a rising edge will be generated and when the switch is opened a falling edge will be generated.

3.12.6   Transponder Connections

- Connect Ethernet cable to network or directly to R5 SUPREME CDU Ethernet port.

- Connect R5 Power Cable to R5 AIS Junction box.

- Connect CDU and Transponder Ground terminals to ship ground.

- Connect one R5 Signal Cable to Transponder **RS422** port and R5 AIS Junction box.

- Connect one R5 Signal Cable in opposite direction to Transponder **I/O** port and R5 AIS Junction box.

- Connect GPS antenna to GPS port and VHF antenna to VHF port

*Note: The **I/O** port gender is opposite from the **RS422** port, and the R5 Signal cable is Male to Female. This will ensure that the wrong transponder port is not connected to the wrong junction box DSUB port.*

3.12.7   CDU Electrical Connections

- Connect Ethernet cable to network or directly to R5 SUPREME Transponder Ethernet port.

- Connect R5 Power Cable to Junction box or other External power with 5A Fuse.

- Connect Ground terminal to ship ground.

3.12.8   R5 AIS Junction box connections

Figure 1 show a general overview how the R5 SUPREME AIS System can be connected to the R5 AIS Junction Box. For a more detailed description of the cable connections, see section 3.3 Installation Cables.

3.12.8.1   R5 System general connections

- Connect External power to the POWER IN.

- Connect R5 Power cable from R5 Transponder to R5 POWER terminal

- Connect R5 Power cable from R5 CDU to AUX PWR terminal (optional)

Note: R5 CDU can be mounted in a remote location and use another power source.

- Connect R5 Signal Cables from R5 Transponder **I/O** and **RS422** ports to Junction box DSUB connectors.

*Note: Both the R5 SUPREME Transponder's 26-pin interface ports (marked **RS-422** and **I/O**) should be connected to the R5 AIS Junction Box by using two R5 Signal Cables, DSUB-DSUB.*

3.12.8.2   External connections

- Connect external sensor providing GPS Position (mandatory)

- Connect external sensor providing True Heading, and Rate of Turn if available.

- Connect: DGPS Beacon receiver providing RTCM-104 format data to any of the RS-422 input screw terminals

3.12.9 External Switch

It is possible to connect an external switch to the R5 SUPREME Transponder.

The switch may be used to quickly turn off transmissions (TX OFF), or it may also be used to force the radio transmit power to 1W only.

Note: Manually set 1W mode operation, or Silent Mode, is outside of type approved operational mode.

To use the External Switch functions, it must be configured accordingly in Misc. Interface view accessed from *Main Menu → Maintenance → Configuration → Interface → Misc. Interfaces*.

The status of the switch can be controlled by input on the brown and orange wires of the R5 Power Cable (See section 3.3 for cable details), or by connecting to the R5 AIS Junction Box (R) and (F) signals in the Ext Switch terminal block.

Connect the external switch as in the figure below. When the switch is open, all VHF transmissions will be disabled or only transmit in low power mode depending on configuration. When the switch is closed, the R5 SUPREME Transponder will transmit normally or transmit at normal power level.
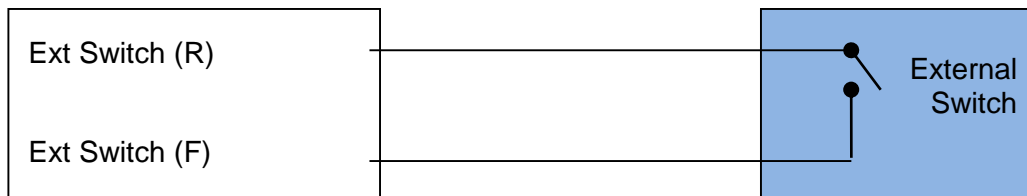
3.12.10 Alarm Relay

It is required that the AIS alarm output (relay) is connected to an audible alarm device or the ship's alarm system, if available. The R5 AIS Junction Box has a built in alarm relay that can be connected to the ship's alarm system. If the installation is done without the junction box, an external alarm relay should be connected.

Alternatively, the ship's BIIT alarm system may use the alarm messages output on the AIS Presentation Interface (PI) provided the alarm system is AIS compatible. The AIS Alarm Relay is either mounted on a DIN mounting rail or direct on the wall.

The alarm relay wires have the following colour codes in the 26-pole R5 signal cable:

RELAY VCC	Brown / Red
RELAY GND	White / Pink
RELAY OUT	Pink / Brown

Table 9 – Alarm Relay Wires
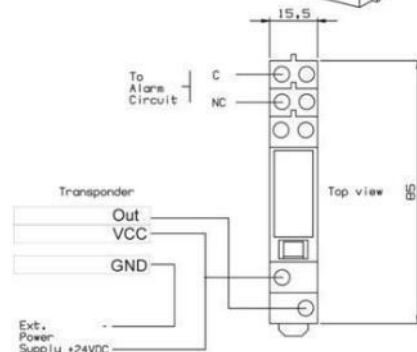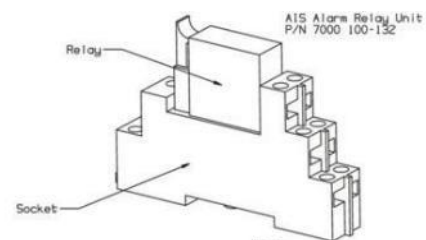
Figure 6 – Alarm Relay

3.14 **Hot Standby Installation**

The R5 SUPREME AIS Transponder system can be installed in a "Hot Standby" configuration where two complete R5 SUPREME AIS systems are used to get full redundancy. Each transponder system has its own R5 SUPREME CDU, R5 SUPREME AIS Transponder, GPS antenna and VHF antenna.

The only interconnection required between the two systems in the hot standby pair is a RS422 serial cable between the two R5 SUPREME AIS transponders.
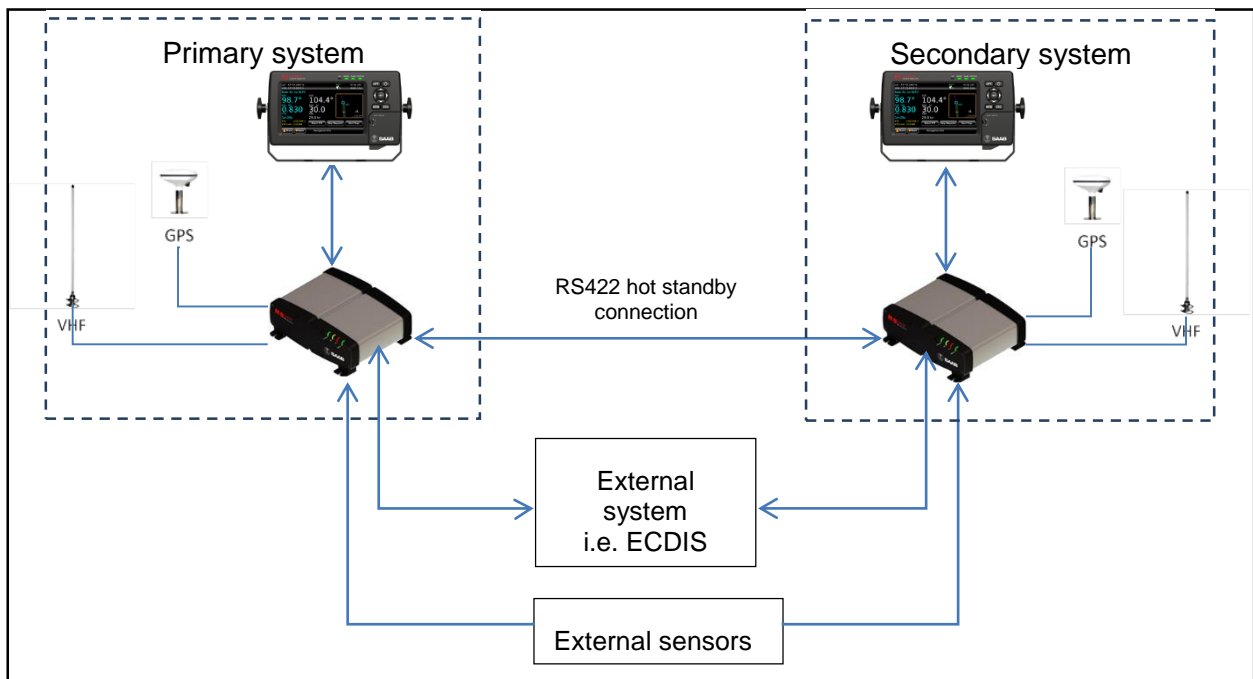
One transponder will be in standby mode and be silent while the other transponder is active and operates as a normal Class A transponder. If the active transponder stops working the standby transponder will wake up and take over the transmissions. The transponders will continuously synchronize static and voyage data so that the same information is sent out on the VHF link regardless of which transponder is active.

Since the systems shall be able to function as normal stand-alone systems, all external sensors need to be connected to both systems independently. With RS422 this is easily done since sensor data is one-way and both transponders can be connected to each sensor in a multiple listener fashion.

For external systems requiring redundant AIS operation each such system must be connected to both the primary and secondary systems.

The systems will monitor each other and the system with the best current status will be used as the active system while the other is in standby mode. If both transponder systems have exactly the same status, the system configured as "Primary" will be chosen as the active system. Important criteria will be considered when selecting the transponder with the best status. These criteria are listed below in decreasing severity:

1. "*General Failure*" alarm
2. "*Tx Malfunction*" alarm
3. "*Rx Ch A Malfunction*" or "*Rx Ch B Malfunction*" alarm
4. "*Rx Ch C Malfunction*" alarm.

5. "*Antenna VSWR Exceeds Limit*" alarm

6. "*UTC Sync Invalid*" alarm

7. "*No Sensor Position In Use*" alarm

8. "*No Valid SOG Information*" alarm

9. "*No Valid COG Information*" alarm

10. "*Heading Lost/Invalid*" alarm

11. "*No Valid ROT Information*" alarm

12. Position Quality

13. Heading Quality

14. Rate of Turn Quality

15. "*Heading Sensor Offset*" alarm

16. "*MKD Connection Lost*" alarm

17. Primary/Secondary Configuration

3.14.1   Configure use of Hot Standby functionality

Both units in the hot-standby pair need to be configured for hot-standby operation. There are only two configurations needed for this:

- **Hot Standby Function**: *Disabled, Primary, Secondary*

- **Hot Standby Port**: *ECIDS, Long Range, Pilot (transponder), Sensor 1, Sensor 2, Sensor 3*

In the Hot Standby pair one unit must be configured as "*Primary*" and the other as "*Secondary*", also the baudrate of the Hot Standby port on the two units needs to match.

Hot Standby Function and Hot Standby Port parameters can be configured from the *Misc Interface Configuration* view described in section 4.3.16. The baudrate of the selected Hot Standby port can be configured in the *Port Rates* view described in section 4.3.15.

3.14.2   Hot Standby Status Icons

The current Hot Standby status is indicated with an icon in the status bar of the R5 SUPREME CDU. The following Hot Standby icons can be shown:

 No communication with the other unit.

 Operating as the active (transmitting) transponder in the hot standby pair.

 Operating as the standby (silent) transponder in the hot standby pair.

More information about the current Hot Standby operation is also shown in the *Hot Standby Status* view described in section 5.24.

4   CONFIGURATION

When the physical and electrical installation of the system is complete, the R5 SUPREME AIS System needs to be configured. This chapter describes what the installer is required to do before the R5 SUPREME AIS System is fully functional.

4.1   Configuration Wizard

The first time the R5 SUPREME CDU is started, a configuration wizard will be shown. This wizard is a helpful guide to configure the basic functionality of the R5 SUPREME System. The following sections describe the different steps in the configuration wizard.

4.1.1   Calibration Screen
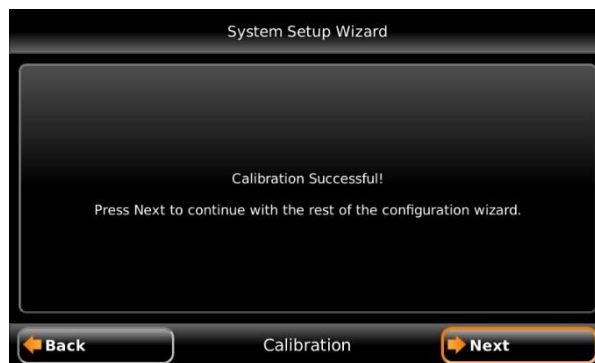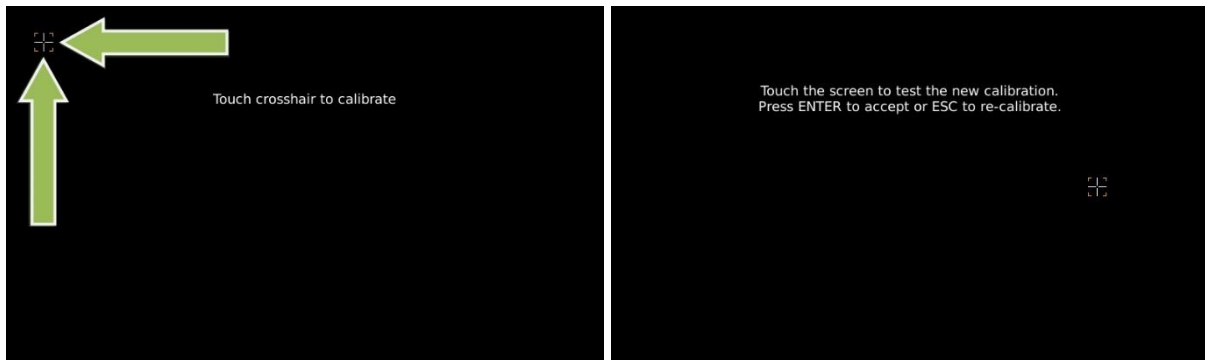
The first time the R5 SUPREME CDU is used, the touch screen needs to be calibrated. A crosshair will be shown on the screen at five different locations. Press on the crosshair each time it appears to calibrate the touch screen. Try to hit the centre of the cross as accurate as possible for the best possible calibration. When the calibration is done, a test screen will appear where the new touch settings can be tested. Press anywhere on the screen to move the crosshair. Accept the new calibration by pressing ENTER on the keypad or press ESC to re-calibrate.

4.1.2 System Setup
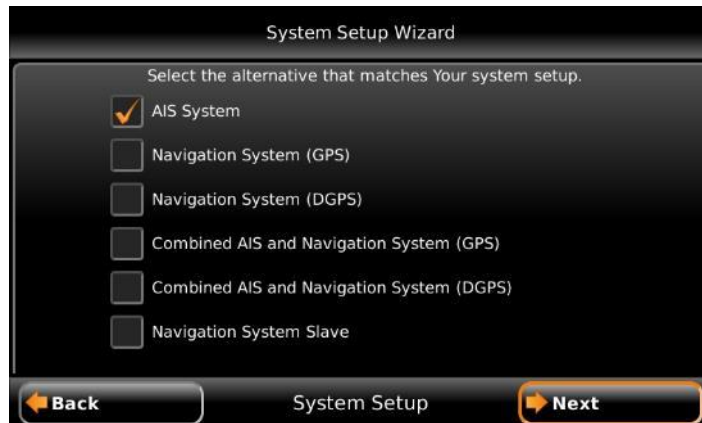
The R5 SUPREME CDU can be used in a standalone AIS system, standalone Navigation system, Combined AIS and Navigation system or be used as a slave display to an existing R5 Navigation System. The Navigation system can also be in two different configurations with either an R4 GPS sensor or an R4 DGPS sensor. It is up to the user to specify which equipment is connected to the R5 SUPREME CDU.

In a standard AIS installation, the alternative "AIS System" should be selected.

4.1.3 Network Configuration

The R5 SUPREME CDU uses UDP Multicast as defined by IEC 61162-450 Light Weight Ethernet (LWE), to communicate with the R5 SUPREME Transponder as well as other R5 SUPREME CDU units. It is therefore necessary to configure an IP number and a Light Weight Ethernet network ID for the R5 SUPREME CDU. The LWE ID consists of two letters (always "GP" for the R5 SUPREME CDU) and four digits.

The IP and LWE ID must be unique for all equipment connected to the LWE network.

4.1.4 Select Transponder

When the R5 SUPREME CDU is configured to be used in an AIS system, an R5 Transponder must be located and selected on the LWE network. Make sure that the R5 Transponder has power and is connected to the same network as the R5 SUPREME CDU. In the "Select Transponder" view on the R5 SUPREME CDU, press the button "Refresh List" to search for R5 Transponders on the network. Select the R5 Transponder that the R5 SUPREME CDU should communicate with and press "Next" to go to the Transponder Network Configuration view.

4.1.5   Transponder Network Configuration
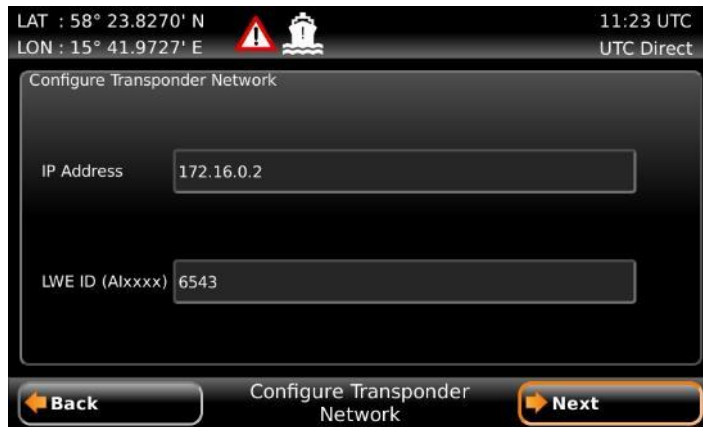
When a transponder has been selected by the R5 SUPREME CDU it is possible to configure the transponder IP address and LWE ID. The R5 SUPREME Transponder must have a unique LWE ID that consists of two letters (always "AI" for an R5 Transponder) and four digits. Press "Next" to save changes and finish the configuration wizard.

The R5 Transponder IP address and LWE ID configuration is password protected. The default AIS user password is "user" and the password is case sensitive.

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4.1.6 Connection Screen
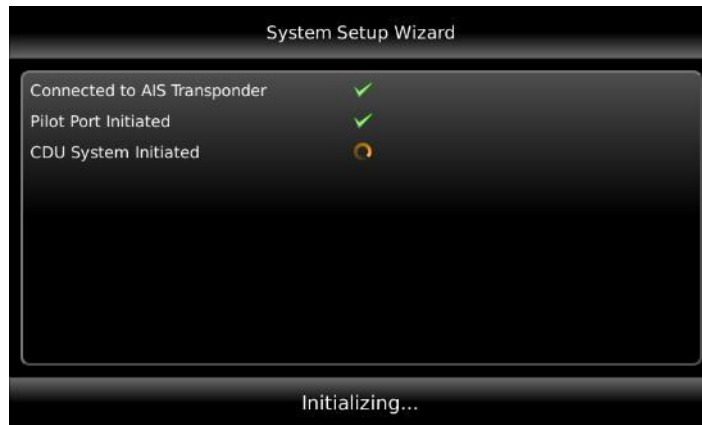
This screen is shown while the R5 SUPREME CDU connects to external equipment and initializes the system. When the initialization is complete the R5 SUPREME CDU will automatically switch to the Target List view when configured as an AIS system.

4.2 System Functional Check

When the R5 SUPREME has been installed according to the procedures described in previous chapters, it is recommended to make a first functional check of the system. Check the following things to ensure that the R5 SUPREME AIS System is fully functional.

- Check the Own Ship Data view to make sure that the configured data is sent on the VHF link, refer to chapter 5.11 "View Transmitted Own Ship Information" for more information.

- Make sure that there are no unexpected active alarms in the alarm list, see chapter 5.17 "Alarms".

- Perform a communication test to ensure that the R5 SUPREME transponder can send and receive messages from other AIS transponders. Refer to chapter 5.24 "Hot Standby Status" for information on how to perform a communication test.

4.3 Configuration Parameters

This section describes the different configuration parameters that can be set in the R5 SUPREME AIS System.

4.3.1 AIS Voyage

This view is accessed by pressing **Main → Voyage → AIS Voyage.**

The parameters in AIS Voyage view are used for input of voyage specific information that is sent over the AIS link. These parameters should typically be configured before each voyage.

Parameter Name	Description
Navigational Status	Changes the navigational status reported by own ship.
	It is also possible to quickly change navigational status by pressing Nav. Status Icon in the status bar.

CONFIGURATION

Estimated Time of Arrival (ETA)	The estimated time of arrival to destination of current voyage
Destination	The destination for the current voyage
Draught (Class A)	The vertical distance measured from the lowest point of a ship's hull to the water surface, in meters (one decimal precision)
Hazardous Cargo (X,Y,Z,OS)	Classification of current cargo according to X,Y,Z,OS
Persons on Board	Total number of persons on board

4.3.2   Ship Static

This view is accessed by pressing **Main → Maintenance → Configuration → AIS → Ship Static**

Parameter Name	Description
MMSI	Maritime Mobile Service Identity reported by own ship
IMO	International Maritime Organization number reported by own ship
Ship Name	Ship name reported by own ship
Call Sign	Call sign reported by own ship
Height over Keel	Height over keel in meters (one decimal precision). Height over Keel information is sent as a response to an "Extended Ship Static and Voyage Related Data" request message.
Ship Type (IMO)	Type of Ship according to ITU 1371-4. Both numerical input and selection from list is possible.

4.3.3   Ship Dimensions

This view is accessed by pressing **Main → Maintenance → Configuration → AIS → Ship Dimensions**

The parameters in the Ship Dimensions view depends on the configuration parameter "Ship Size Mode" in the Misc. Interfaces view. The Ship Size Mode parameter can be set to either Standard or Simplified (default). The Ship Size Mode affects how the user should input ship size and antenna position information and how it is interpreted.

Standard Mode

In this mode the user must input:

- *A, B, C, D* for internal antenna [m]
- *A, B, C, D* for external antenna [m]

Simplified Mode (default)

In this mode there is no way for the user to input mismatching data, all parameters uses the same precision and each measurement is entered only once (in standard mode it is for example possible to enter three different length of ship: *Convoy/ship length, internal A+B* and *external A+B*). In simplified mode the transponder will automatically calculate and correctly round the A, B, C and D values reported on the VHF link.

In this mode the user inputs:

- *Ship length* [m] (one decimal precision)
- *Ship beam* [m] (one decimal precision)
- *X, Y* for internal antenna relative to ship [m] (one decimal precision)
- *X, Y* for external antenna relative to ship [m] (one decimal precision)

4.3.4   Regional Areas

This view is accessed by pressing **Main → Maintenance → Configuration → AIS → VHF Radio → Regional Areas**

The view shows the regional areas set in the transponder. These are normally transmitted by an AIS base station to change AIS VHF nominal power level and/or frequencies in a specific area. When editing an area or creating a new area the following parameters can be configured:

Parameter Name	Description

CONFIGURATION

Channel A	The channel number for AIS channel A (2087 = default) that should be used in the regional area
Channel B	The channel number for AIS channel B (2088 = default) that should be used in the regional area
Zone Size	The transitional zone size of the regional area in nautical miles (NM)
Tx Mode	Decides on which channels the transponder will use when transmitting in the regional area. When set to "Silent", the transponder will stop automatic transmissions on AIS channels A and B.
Power	Output power for the transponder in the regional area. High = 12.5 W, Low = 1 W.
LAT NE	The latitude for the North East corner of the regional area
LON NE	The longitude for the North East corner of the regional area
LAT SW	The latitude for the South West corner of the regional area
LON SW	The longitude for the South West corner of the regional area

4.3.5 Long Range Broadcast Configuration

This view is accessed by pressing **Main → Maintenance → Configuration → AIS → VHF Radio → Long Range Broadcast**

Long range messages (Message 27) are position messages designed to aid Satellite reception of AIS position messages. AIS Satellites have a huge antenna footprint, and can have problems with receiving too many targets at the same time. Therefore Message 27 is a slightly shortened position messages, transmitted less frequently than normal position messages, and on frequencies different from normal AIS VHF data.

Parameter Name	Description
LR Broadcast Ch. 1	The first channel number for broadcasting long range message 27. The message is sent every 6 minutes on each channel so if both channels are configured a message 27 will be broadcast every 3 minutes. If this parameter is set to zero no long range broadcast transmissions will be sent on this channel.
LR Broadcast Ch. 2	The second channel number for broadcasting long range message 27. The message is sent every 6 minutes on each channel so if both channels are configured a message 27 will be broadcast every 3

CONFIGURATION

	minutes. If this parameter is set to zero no long range broadcast transmissions will be sent on this channel.

4.3.6 Long Range (Reply Mode and Filter Settings)

This view is accessed by pressing **Main → Maintenance → Configuration → AIS → Long Range**

Parameter Name	Description
Reply Mode	When set to "Auto" the R5 SUPREME Transponder will automatically respond to any Long Range interrogation messages. When set to "Manual" the operator is responsible for sending a response or refusal to any Long Range interrogation message. This can be done from the *Long Range* view that is accessed from **Main Menu → Messages → Long Range**. For more information see section 5.15 Long Range Interrogations. The information that is sent in a response is automatically filled in by the R5 SUPREME Transponder depending on the Long Range filter settings (the parameters below).
Ship ID (A)	Filter setting that defines if a Long Range response message should include ship name, call sign and IMO number.
Message Date/Time (B)	Filter setting that defines if a Long Range response message should include information about date and time of message composition.
Latitude / Longitude (C)	Filter setting that defines if a Long Range response message should include position.
Course Over Ground (E)	Filter setting that defines if a Long Range response message should include COG.
Speed Over Ground (F)	Filter setting that defines if a Long Range response message should include SOG.
Destination And ETA (I)	Filter setting that defines if a Long Range response message should include destination and ETA.
Draught (O)	Filter setting that defines if a Long Range response message should include draught.
Ship Type And Cargo (P)	Filter setting that defines if a Long Range response message should include ship type and cargo information.

CONFIGURATION

Ship Size And Type (U)	Filter setting that defines if a Long Range response message should include ship's length, beam and type.
Persons On Board (W)	Filter setting that defines if a Long Range response message should include number of persons on board.

4.3.7 Password

This view is accessed by pressing **Main → Maintenance → Configuration → AIS → Password**

Parameter Name	Description
New User Password	Changes the user level password for the R5 SUPREME AIS System. **The default user level password is "user"**
New Admin Password	Changes the admin level password for the R5 SUPREME AIS System. **The default admin level password is "admin"**
Restore Password Key	It is possible to restore both user password and admin password to the default values above with a secret restore key. To obtain the restore key, contact TransponderTech Support and be prepared to provide the serial number of the transponder unit.

4.3.8 Display Parameters

This view is accessed by pressing **Main → Maintenance → Configuration → Display → Display Parameters**

Parameter Name	Description
Plot Compass	This parameter determines how the plot of AIS targets should be oriented. If set to "North Always Up", the plot will always have north up and own ship will rotate according to heading input. If set to "Own Ship Bow Always Up", the plot will always have own ship pointing up and rotate the rest of the plot according to heading input.
Require Text Msg ACK	This parameter determines if an ACK msg is required as a response when sending addressed binary text messages to another target.

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4.3.9 Visual Settings

Press the OPT button for 5 seconds to reset the visual settings to default values.

To quickly turn off all backlight on the R5 SUPREME CDU, press once on the **PWR** button on the front of the CDU. This will completely turn off all backlight for the LCD; LED's and buttons on the R5 SUPREME CDU. However, if there is an active, unacknowledged alarm in the system, the STATUS LED will still be visible and blink with a red light. To return to previous light settings, press the **PWR** button again.

It is also possible to quickly change between day/night modes by pressing and holding down the **PWR** button for 2 seconds. This will enable the **PWR** button options menu, press "Night Mode" or "Day Mode" button to switch mode.
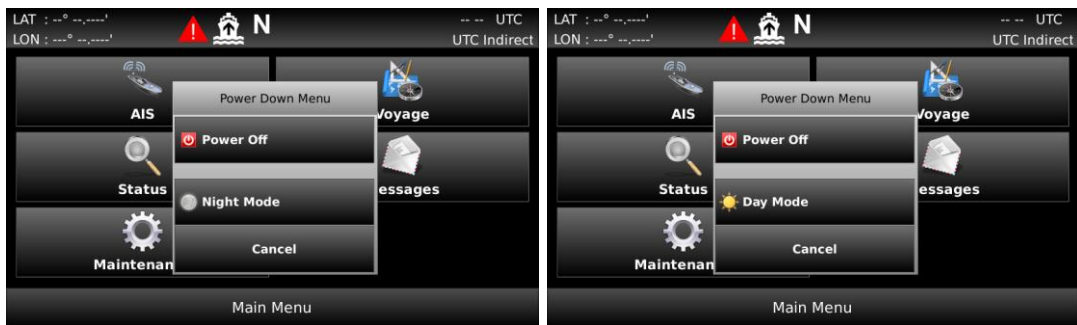
Figure 7 – Power Down Menu

To switch between day/night mode and to tune backlight for buttons, LCD and LEDs, enter the *Visual Settings* view which is accessed from **Main Menu → Maintenance → Configuration → Display → Visual Settings**

Parameter Name	Description
Mode	There are two available display backlight modes; Day/Night. If set to "Day Mode" display parameters related to day mode as described below are used. If set to "Night Mode" display parameters related to night mode as described below are used.
Master Level	The master level controls the overall brightness level in percent of the selected maximum level for LCD Default: 80%
Day Mode LCD Backlight	Controls the maximum LCD backlight level in percent. Default: 80%
Day Mode LED Intensity	Controls the maximum LED intensity level in percent. Default: 80%
Day Mode Button Illumination	Controls the maximum button illumination level in percent. Default: 80%

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Night Mode LCD Backlight	Controls the maximum LCD backlight level in percent. Default: 40%
Night Mode LED Intensity	Controls the maximum LED intensity level in percent. Default: 40%
Night Mode Button Illumination	Controls the maximum button illumination level in percent. Default: 40%

4.3.10   Sound

This view is accessed by pressing **Main → Maintenance → Configuration → Display → Sound**

Parameter Name	Description
Alarm Volume	Sets the volume of the R5 SUPREME CDU internal speaker.
Alarm Waiting For ACK	Determines how the R5 SUPREME CDU speaker should behave when an alarm is active and waiting for acknowledgement. **This setting does NOT affect the behaviour of the alarm relay or any external alarm system.**
Long Range Message	Controls the behaviour of the R5 SUPREME CDU speaker when an LR interrogation message is received.
AIS Message	Controls the behaviour of the R5 SUPREME CDU speaker when a SRM or binary text message is received.

4.3.11   Time

This view is accessed by pressing **Main → Maintenance → Configuration → Display → Time**

Parameter Name	Description
Time Zone	This parameter defines if the times that are displayed in the R5 SUPREME CDU should be in UTC or LOC (local) time. If local time is chosen, the offset from UTC must be specified with the three parameters listed below.
Offset sign	The sign of the local time offset from UTC.
Hours	The local time hour offset from UTC.
Minutes	The local time minute offset from UTC.

CONFIGURATION

4.3.12 Units

This view is accessed by pressing **Main → Maintenance → Configuration → Display → Units**

Parameter Name	Description
Range Unit	This parameter determines the unit for the range value of targets in the Target List, Extended Info view and Plot view. Range values can be calculated in nautical miles (NM), kilometres (km) or statute miles (Sm).
Speed Unit	This parameter determines the unit for the SOG value of targets in Extended Info view and Plot view. The SOG values can be calculated in knots (kn), kilometres per hour (km/h) or miles per hour (mph).

4.3.13 CDU Password

This view is accessed by pressing **Main → Maintenance → Configuration → Display → CDU Password**

Parameter Name	Description
New CDU Password	Changes the password for the R5 SUPREME CDU. **The default CDU password is "cdupwd"**
Restore Password Key	It is possible to restore the CDU password to the default value above with a secret restore key. To obtain the restore key, contact TransponderTech Support and be prepared to provide the serial number of the R5 SUPREME CDU unit.

4.3.14 Alarm Config

This view is accessed by pressing **Main → Maintenance → Configuration → Alarms**

In this view all alarms can be configured to either "Enabled" or "Disabled". When the alarm is enabled, an active alarm will affect the external alarm relay as well as the speaker in the R5 SUPREME CDU. It will also be shown as a popup alarm in the CDU. When the alarm is set to disabled it will not affect anything when the alarm becomes active.

For more information about the alarm view, refer to chapter 5.17 "Alarms". For a list of all the alarms that can occur, refer to chapter 8.3 "Troubleshooting with Alarm Messages."

4.3.15 Port Rates

In the Port Rates view it is possible to configure the baud rate for all the serial ports of the R5 SUPREME Transponder and the Pilot Port on the R5 SUPREME CDU. It is also possible to specify if checksum is required for data sent to the specific port.

This view is accessed by pressing **Main → Maintenance → Configuration → Interface → Port Rates**

Parameter Name	Description

Baud Rate	Changes the baud rate (bits per second) for the corresponding serial port.
Checksum	When set to "Required", all messages that are input on the corresponding serial port to the R5 SUPREME Transponder must have a valid checksum. When set to "Disabled", messages both with and without checksum are accepted on the corresponding serial port.

4.3.16 Misc Interfaces

This view is accessed by pressing **Main Menu → Configuration →Interface → Misc Interfaces**

Parameter Name	Description
SSD Password	Changes the value of the SSD password level. When set to "None", no password is required when configuring the transponder with an SSD sentence from e.g. an ECDIS via the serial port interface. When set to "User", an SPW sentence with the correct user level password must be sent before the SSD on the serial port interface.
Ship Size Mode	This affects how the user should input the ship size, convoy size and antenna positions. See section 4.3.3 for more details.
AIS GPS Output Port	Defines on which serial port the R5 SUPREME should output data from the internal GPS. When set to "None" no internal GPS data will be output.
External Switch	This parameter specifies if there is an external switch connected to the system and the desired system use of the switch. If no switch is used, set the parameter to "No Function". See section 3.12.9 "External Switch" for more information.
AIS Alarm ACK Binary Port	The R5 SUPREME transponder has the possibility to connect a binary signal that can acknowledge all alarms at the same time. This can be done by activating the "AIS Alarm ACK Binary Port". The acknowledgement signal can be triggered on either rising or falling edge. See section 3.12.5.1 "Discrete Alarm Acknowledgement" for installation details of the ACK binary port. Alarms can also be acknowledged from the R5 CDU or from NMEA input on one of the serial ports. If no binary

CONFIGURATION

	signal is to be used for acknowledgement, this parameter should be set to "Disabled".
Hot Standby Function	Enables/Disables the Hot Standby functionality described in section 3.14. It is important that one transponder is configured as "Primary" and the other transponder in hot standby pair is configured as "Secondary" for the hot standby function to work properly.
Hot Standby Port	The port designated for hot standby functionality described in section 3.14. If hot standby functionality is enabled, this port cannot be used for anything else than synchronization with the other transponder in the hot standby pair.

4.3.17   Own CDU Settings (Network)

This view is accessed by pressing **Main Menu → Configuration →Interface → Network → Own CDU Settings**

Parameter Name	Description
CDU IP Address	The Internet Protocol (IP) address of the R5 SUPREME CDU.
CDU LWE ID	The unique ID that is used on the Light Weight Ethernet network. For example if this parameter is set to "3141" the R5 SUPREME CDU will transmit messages on the LWE network with the LWE ID "GP3141".
	This ID must be unique for all equipment connected to the same LWE network.

4.3.18   Transponder Settings (Network)

This view is accessed by pressing **Main Menu → Configuration →Interface → Network → Transponder Settings**

Parameter Name	Description
IP Address	The Internet Protocol (IP) address of the R5 SUPREME Transponder.
LWE ID	The unique ID that is used on the Light Weight Ethernet network. For example if this parameter is set to "3142" the R5 Transponder will transmit messages on the LWE network with the LWE ID "AI3142".
	This ID must be unique for all equipment connected to the same LWE network.

4.3.19 Transponder LWE Input (Network sensors)

This view is accessed by pressing **Main Menu → Configuration →Interface → Input → Transponder LWE Input**

Configuration in this view allows for connection of GNSS, heading and ROT equipment to the R5 Supreme transponder using the LWE interface.

For each data type, enter the LWE ID for each external system that the Transponder shall connect to. For example if Primary position source is set to "GP3210" the R5 SUPREME Transponder will accept position data on the LWE network from systems with the LWE ID "GP3210".

Parameter Name	Description
Position Primary Source	Set to LWE ID of primary position source
Position Secondary Source	Set to LWE ID of secondary position source
COG + SOG Primary Source	Set to LWE ID of primary COG + SOG source
COG + SOG Secondary Source	Set to LWE ID of secondary COG + SOG source
Rate of Turn Primary Source	Set to LWE ID of primary Rate of Turn source
Rate of Turn Secondary Source	Set to LWE ID of secondary Rate of Turn source
Heading Primary Source	Set to LWE ID of primary Heading source
Heading Secondary Source	Set to LWE ID of secondary Heading source

4.3.20 Installation Test

This view is accessed by clicking **Main Menu → Maintenance → Installation Test**

Parameter Name	Description
Sensor Data Source	This parameter specifies which port the R5 SUPREME Transponder should currently use as its external position source. The default value of this parameter is "Automatic" which means that the R5 SUPREME Transponder will accept position information on any port and use the information on the port with highest priority. If Position Source is set to anything other than "Automatic", the R5 SUPREME Transponder will only accept position information if it comes from the port specified by this parameter. This parameter can be used to test incoming data on a specific sensor port. The R5 SUPREME Transponder will automatically revert to "Automatic" on reboot.

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SART Test Mode	This parameter determines if SART Test targets should be displayed in Target List and Plot views of the R5 SUPREME CDU.
	It also controls if connected systems, for example ECDIS, will receive SART Test targets.

5   OPERATION

5.1   General usage

The system can be fully operated using the R5 SUPREME CDU. The CDU is operated using the touch sensitive screen, or the backlit keypad. Some ECDIS systems may also allow for normal AIS usage.

Apart from observing received AIS targets, normal interfacing with the system involves:

- Updating voyage related parameters
- Updating navigational status
- Verifying alarms
- Sending/receiving text messages.

The CDU Front hatch covers an integrated AIS Pilot Plug connector. This hatch can be locked shut if needed. We recommend a flat tip 5.5-6.5mm screwdriver for locking/unlocking the hatch.

5.2   LED's on R5 SUPREME Transponder

1 - STATUS LED (multi-colour)

- Constant green when the transponder is operating and no alarms are active.
- Constant red if there is an active alarm.
- Flashing red if there is an unacknowledged alarm.

2 - RX LED (yellow)

- Flashes yellow when the transponder receives a message on the VHF link.

3 - TX LED (red)

- Flashes red when the transponder transmits a message on the VHF link.

4 - Ethernet LED (green)

- Constant green when an Ethernet cable is connected
- Flashes green when data is transferred.

5.3 LED's and Controls on R5 SUPREME CDU

This section describes the controls and status LED's on the front of the R5 SUPREME CDU.

1 - STATUS LED (multi-colour)

- Constant green when the transponder is operating and no alarms are active
- Constant red if there is an active alarm
- Flashing red if there is an unacknowledged alarm

2 - RAIM LED (multi-colour)

Not used in standard R5 SUPREME AIS System. Only used in Navigation System enabled installations.

3 - MODE LED (multi-colour)

Not used in standard R5 SUPREME AIS System. May be used in other product variants, see product variant specific documentation.

4 - LIGHT SENSOR

Can be used to automatically dim the backlight of the display, see section 0

Visual Settings.

5 - ARROW KEYPAD and ENTER

The easiest way to navigate in menus, lists and edit fields in the R5 SUPREME CDU is by using the touch interface. However, the arrow keypad and ENTER button can also be used to control the R5 SUPREME CDU in e.g. rough seas. The arrow keypad (**< >** and **∧ ∨**) is used to navigate in menus, lists and edit fields. The centre button of the keypad is an ENTER button which is used to select the highlighted choice in a menu, list or edit control.

6 - PWR

The power button on the R5 SUPREME CDU is used to turn off the display and can also be used to quickly change the settings for backlight of LCD, buttons and LEDs.

- A <u>quick press</u> of the **PWR** button will turn off all backlight but the R5 SUPREME CDU will still be running. If there is an active, unacknowledged alarm in the system, the STATUS LED will still be blinking red. Otherwise all LED's will be turned off.

- If the PWR button is pressed for more than <u>two seconds</u>, a "Power Down Menu" will appear. Here it is possible to power off the R5 SUPREME CDU completely or to quickly change the backlight percentage for the LCD, LEDs and buttons if Dimming Mode is set to "Manual" (see section 0 for information about Dimming Mode parameter).

Figure 8 – Power Down Menu

- If the PWR button is pressed for <u>more than fifteen seconds</u>, the CDU will perform a hard reboot.

7 - OPT

This button is an "Option key" which is only active in some of the views. When pressed, it gives the user a list of options that can be performed on the highlighted item.

In screens with parameters, the **OPT** button can be used to set the parameter to default value.

8 - MOB

Not used in the plain R5 SUPREME AIS System. Only available in Navigation System enabled installation.

9 - ESC

Used to return to previous screen or to cancel an edit change of a data field.

5.3.1   Change Settings of a Parameter

Several of the views in the R5 SUPREME CDU contain parameters that can be edited. To edit a parameter, click on it using the touch interface. A virtual keyboard will appear where it is possible to enter data. Click on the enter button of the virtual keyboard when the data input is

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done. To save all the changes made in the current view, press the Save button in the lower right corner of the screen.
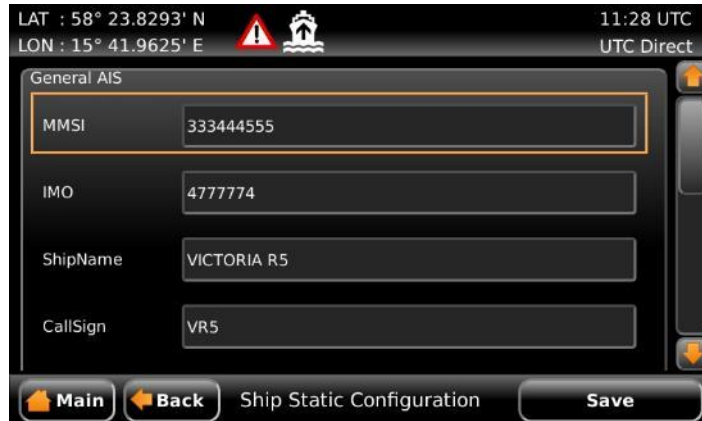
Figure 9 – Example of a parameter view

It is also possible to use buttons on the front of the R5 SUPREME CDU to select and change a parameter. Use the **ARROW KEYPAD** to select a parameter, the currently selected parameter will be marked with an orange rectangle (see figure above). Press **ENTER** to popup the virtual keyboard. Use the **ARROW KEYPAD** to highlight the desired character and press **ENTER** to select it. Navigate to enter button of the virtual keyboard and press **ENTER** when done.

Figure 10 – Example of virtual keyboards

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5.4 Menu Structure – Tree view

```
                                    Main menu
        ┌───────────┬──────────┬──────────┬──────────┬──────────┐
   Maintenance    Voyage       AIS       Status     Messages

   Installation Test   Ais Voyage   Operational Mode   Status List      Long Range Msg

   Communication Test               Plot               View Raw Data    Persons on Board

   Factory Reset                    Target List        SW/HW Info       AIS Messages

   System Update                                       Alarm List

                                                       AIS Status
```

```
   System Update
   ┌──────────────┬──────────────┬──────────────────┬──────────────┐
   Load /Save Config   Update CDU SW   Update Transponder SW   Update Licenses

   Save Transponder Config   Load CDU Config   Save CDU Config   Load Transponder Config
```

```
   AIS Status
   ├── AIS Internal GPS Status
   ├── VHF Status
   ├── Non Functional Time
   └── Transmitted Own ship data
```

```
   Configuration
   ┌──────────┐
   Interface
   ┌───────────┬───────────┬───────────┬───────────┬───────────┐
   Misc Interfaces   Port Rates   System Setup   Network   Input

   Alarm                          Transponder Settings   Select Transponder   Own CDU Settings   Transponder LWE Input
```

```
   Display
   ┌──────────────┬──────────────┬────────┬────────┬────────┬──────────────┐
   Visual Settings   Calibrate Display   Time   Units   Sound   CDU Password
```

```
   AIS
   ┌──────────┬───────────────┬─────────────┬──────────────────┬──────────┬──────────┐
   Long Range   Ship Dimensions   Ship Static   Display Parameters   Password   VHF Radio

                                                                    Regional Areas
                                                          ┌──────────┬──────────┬──────────┐
                                                        Edit Area   View Area   New Area

                                                                                Long Range Broadcast
```

5.4.1 Navigating in Menus

To navigate in the R5 SUPREME CDU menus, simply press the menu button corresponding to the desired view using the touch interface, or use the **ARROW KEYPAD** buttons **< >** and ∧ ∨ to navigate between the view buttons. The currently selected button will be marked with an orange outline and orange text. Press the **ENTER** button to enter the currently selected view. In the lower left corner of a view there is also a Back button to quickly go back to previous view and a Main button to go directly to the Main Menu view.

Figure 11 – Main Menu   Figure 12 – AIS Menu

5.5 Alarm and Alert Pop-ups

The R5 SUPREME AIS System features alarm and alert pop-ups that can appear any time during operation. To acknowledge an alarm or alert message, click the ACK button using the touch screen or press **ENTER.** An example of an alarm message is shown below.

Figure 13 – Alarm Popup

5.6 Status Bar

The top of the screen of the R5 SUPREME CDU always displays a summary of the system's status. See illustration below.

OPERATION
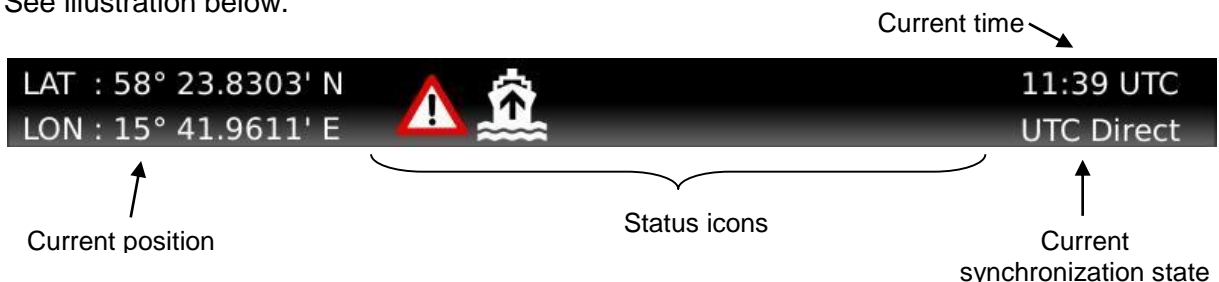
If a valid navigation position is available, it is displayed to the left. The status icons are displayed in the middle and the current time is shown to the right. Time is either UTC or local (LOC). Beneath the current time there is also information about the transponder's synchronization state. The synchronization state can be:

- **UTC Direct** – This is the normal state where the R5 SUPREME Transponder gets the UTC time from its own internal GPS receiver.

- **Indirect Synchronization** – The R5 SUPREME Transponder is synchronizing based on receipt of data from other AIS transmitters.

  NOTE: It is possible to be in Indirect Synchronization but still have a valid position in the upper left corner of the status bar. The position information may be from an external GPS sensor, but UTC Direct synchronization can only be taken from the internal GPS receiver.

5.7 Status Icons

The status icons that can be displayed are:

Unread message (safety related message, text message or RTA)

Unread Long Range message (automatic reply)

Unread Long Range message (manual reply)

Active acknowledged alarms – Press for quick access to alarm list

Active unacknowledged alarms – Press for quick access to alarm list

1W mode (Indicates 1 Watt TX mode for Tankers is enabled.) See NOTE below for details.

Silent Mode activated, either with Tx Mode parameter or silent switch.

Navigational status, being one of:

Navigational status is undefined

At anchor or moored

Under way using engine

Navigational status is one of: Not under command, Restricted manoeuvrability, Constrained by her draught, Aground, Engaged in fishing, Under way sailing, Reserved for future use.

Press the Navigational Status icon for quick access to the NavStatus selection view.

NOTE: The transponder will automatically engage 1W mode when the following conditions are met: Ship type = Tanker, Nav Status = Moored and SOG <= 3 knots, otherwise 1W mode will be automatically disengaged. The Tanker 1W mode is fully automatic and cannot be disengaged by other external control.

5.8 View Remote Ship Information

The R5 SUPREME AIS System will power up in *Target List* view. This view is accessed from **Main Menu → AIS → Target List**.

The *Target List* view displays a list of all AIS targets received on the VHF link. The list includes MMSI or ship's name (Ship ID), range (RNG), bearing (BRG) and time since last report was received (Age) for each AIS target received by the system.

Figure 14 – Target List

To send an SRM or TXT message to a vessel, select the desired target in the list and press the **OPT** button.

For extended information about a target in the list, select the desired target in the list and then press the "Extended Info" button. When using the **ARROW KEYPAD**, use the ∧ ∨ buttons to select the target list (marked with an orange frame) and press **ENTER**. It is now possible to use the ∧ ∨ buttons to select the desired target in list. The press **ESC** and use the **ARROW KEYPAD** to navigate to the "Extended Info" button. Press **ENTER** to entemailbr the *Extended Information* view.

The *Extended Information* view includes static, dynamic and voyage related data for the selected target. Press the button "Next Page" to switch between the pages of extended information.

Figure 15 – Extended Info

It also is possible to press **OPT** button in Extended Info view to query for Static And Voyage Data and Persons on Board information.

Press *"*Back*"* button in the lower left corner to return to *Target List* view.

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5.9 **View Plot of Targets**

The location of targets relative to your own ship is visualized in the *Plot* view. The view is accessed from the **Main Menu → AIS → Plot**.

Figure 16 – Target Plot

To send an SRM or TXT message to a vessel, select the desired target in the plot and press the **OPT** button.

For extended information about a target select it in the plot and press the "Extended Info" button in the lower right corner.

It also is possible to press **OPT** button in Extended Info view to query for Static And Voyage Data and Persons on Board information.

The own ship target is displayed as a 'T' shaped symbol. Class B targets are indicated by a 'B' appended to the target icon and Inland targets are indicated by either an 'I' or by a blue sign symbol appended to the target.

5.10 **Target Classification**

Received AIS targets can be assigned a classification to which will be displayed in a different colour in target list and target plot view.

OPERATION
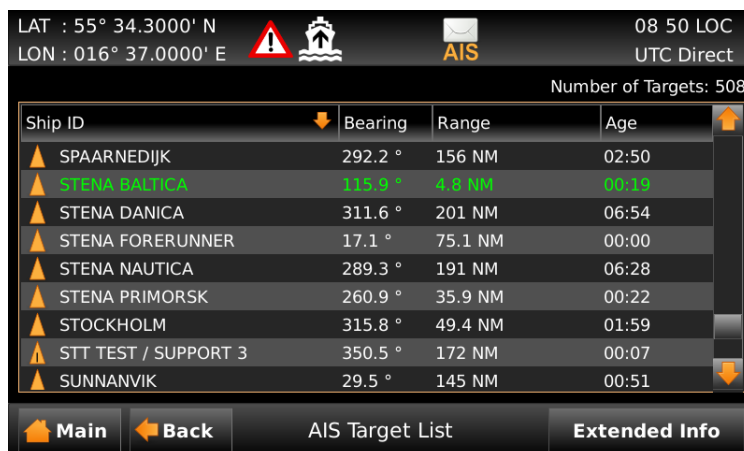
The Extended Info view shows the target classification in the classification colour in the Target Identification group.

Target classification configuration is accessed from **Main Menu → AIS → Target Classification.**
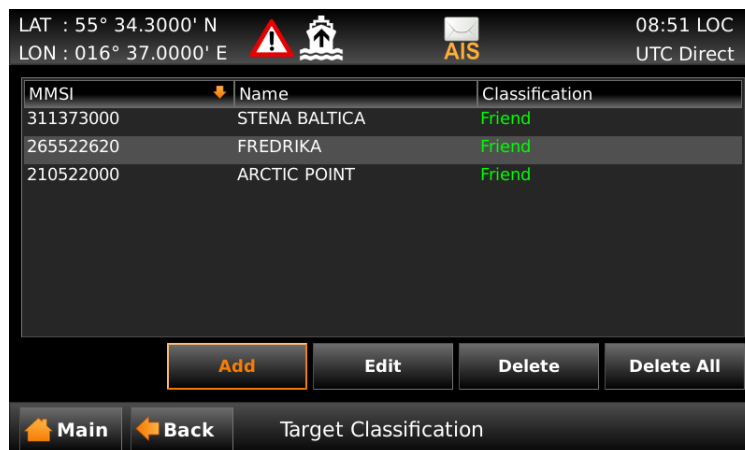
Press Add button to add a new target classification. Select a target from the drop down list. If a target name is received, the name field is automatically filled in with the target name. The name field is editable to allow for a custom target label. Select a classification from the classification drop down list.

Target classifications can also be added by selecting a target in the target list view or target plot view and pressing the OPT button. From the popup menu, select Target Classification.

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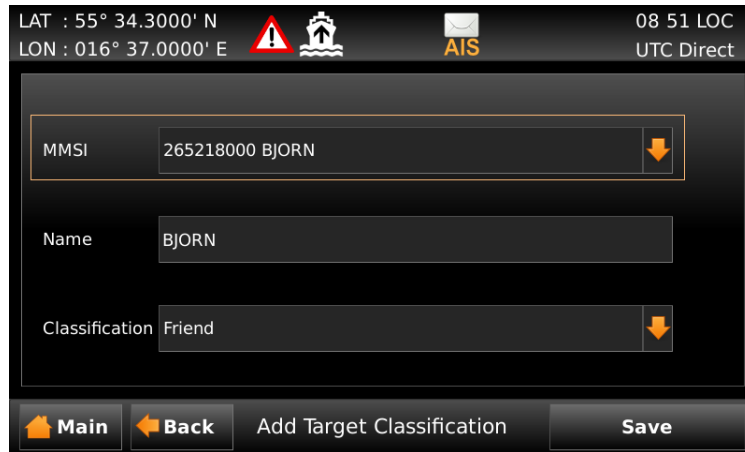
To edit or delete a target classification, select a target from the list view and press either edit or delete.

5.11 View Transmitted Own Ship Information

The information transmitted by the R5 SUPREME Transponder on the VHF link is viewed in the *Own Ship Data* view. This view is accessed from **Main Menu→ AIS → Own Ship Data** and includes the static, dynamic and voyage related data actually sent by the R5 SUPREME Transponder. The view reflects the contents of the last transmitted AIS messages, thus there may be some delay from the time the parameters are changed until they are displayed in the *Own Ship Data* view.

Figure 17 – Transmitted Own Ship Data

5.12 Enter and Read Voyage Related Information

Voyage related information (for transmit via AIS) is displayed in the *AIS Voyage* view. The view is accessed from **Main Menu→ AIS → Voyage→AIS Voyage**. Voyage related data includes destination, estimated time of arrival (ETA) and number of people aboard.

Figure 18 – AIS Voyage

5.13 **Handling Safety Related Messages (SRM) and Text Messages**

Safety related messages (SRMs) and text messages can be sent to specific targets (addressed messages) or broadcast to all targets. The *Inbox*, *Outbox* and *Send* views for SRMs and text messages can be accessed from **Main Menu→Messages→AIS Messages**.
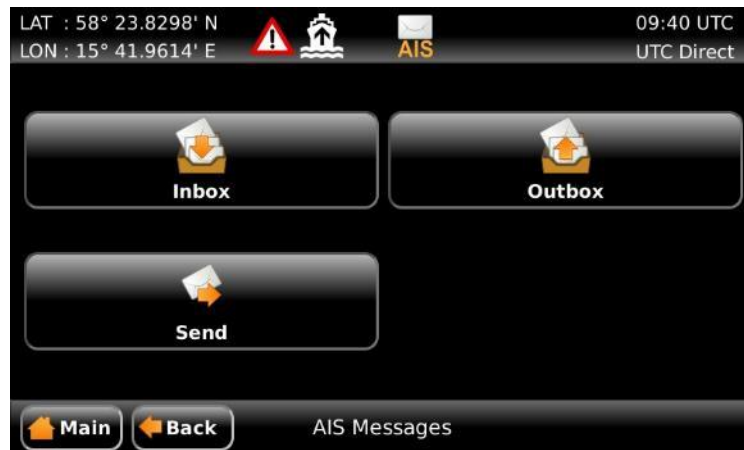
Figure 19 - AIS Messages

5.13.1 **Read Received Messages**

Received messages can be accessed in the *Inbox* view. Unread SRMs and text messages are indicated with an envelope icon in the status bar. In the *Inbox* view unread messages are marked with a closed envelope while read messages are marked with an open envelope.
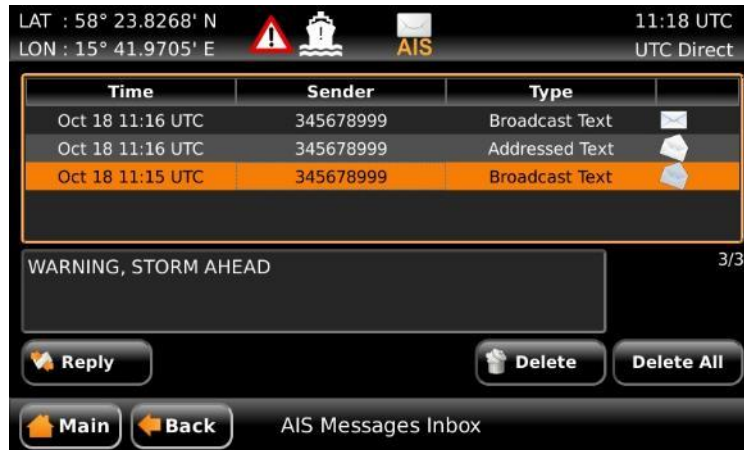
Figure 20 – AIS Message Inbox

5.13.2 Send SRMs and Text Messages

SRMs are composed and sent in the *Send* view accessed from **Main Menu → Messages → AIS Messages → Send**. It is also possible to select a target in the Target List view or the Plot view and press the **OPT** key to address a message to a specific unit.

To write a message, click in the text edit area to the left or use the **ARROW KEYPAD** to mark the text area and press **ENTER.** This will show the virtual keyboard where the message can be entered. Click on the ENTER button of the virtual keyboard when done.
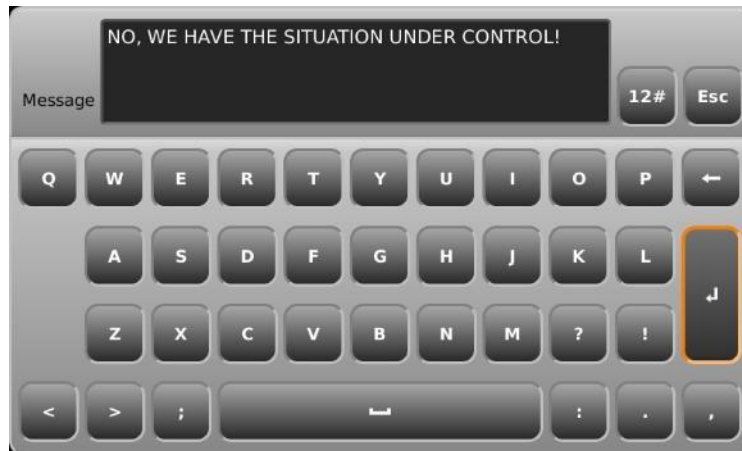
Figure 21 – Virtual Keyboard

Figure 22 – AIS Message Send view

Sent messages can be viewed in the *Outbox* view accessed from **Main Menu → Messages → AIS Messages → Outbox**.

Figure 23 – AIS Message Outbox

5.14 Send Persons On Board

In the *Persons On Board* view it is possible to send information about number of persons on board (PoB) to another vessel. The PoB message can be sent as either addressed or broadcast.

The information sent in the messages is automatically filled in by the R5 SUPREME AIS System depending on the voyage configuration made in **Main Menu→Voyage→AIS Voyage**.
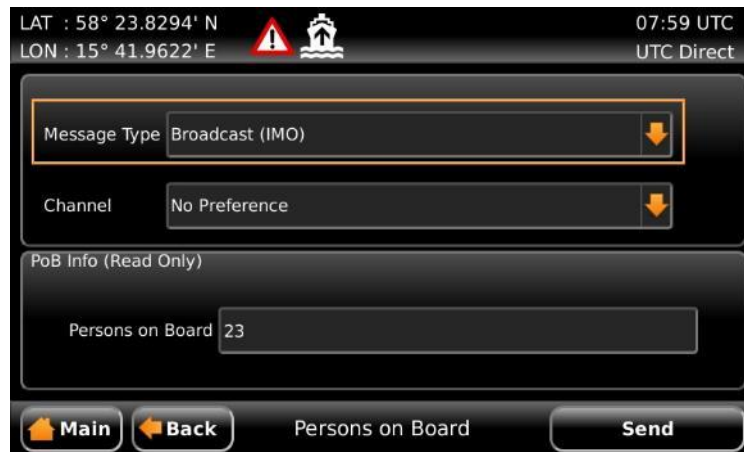
Figure 24 – Persons On Board

5.15 Long Range Interrogations

An AIS transponder can receive long range interrogation messages to poll for certain information. A received interrogation message is indicated by a LR icon in the status bar. If the "Long Range Reply Mode" parameter has been configured to "Auto", the R5 SUPREME Transponder will automatically send a response to the interrogation. If the "Long Range Reply Mode" parameter is set to "Manual", the operator must send a response or refusal from the *Long Range Message* view accessed from **Main Menu → Messages → Long Range**. For more information about the "Reply Mode" parameter and Long Range filter settings, see section 4.3.6.

Figure 25 – Long Range

To send a reply or refusal to the interrogation or to delete an interrogation from the message list, click on the message in the list view to mark it and then click on one of the buttons "Send Reply", "Refuse Reply" or "Delete". When using the **ARROW KEYPAD**, use the buttons ∧ ∨ to navigate to the message list and press **ENTER**. Mark the desired interrogation by again using ∧ ∨ and then press **ESC** button to be able to navigate to the desired button using the **ARROW KEYPAD** (∧ ∨, < >). Press **ENTER** when the desired button is marked with orange frame and orange text (see "Send Reply" button in picture above).

The *Long Range* view uses the following symbols to indicate the status of a request or reply message:

> **?** – The information is requested by the sender

> **X** – The information is available and provided

! – The information requested is refused

5.16 Regional Areas

Regional Area messages are transmitted from shore based AIS Base Stations by local authorities to control AIS VHF settings of AIS transponders within a defined area. The transponder will store up to eight different areas. An area will timeout and be deleted 24 hours after it was last received, or if the distance to the area becomes greater than 120 NM.

All regional areas that are stored in the R5 SUPREME Transponder can be viewed in the *Regional Areas* view which is accessed from **Main Menu → Maintenance → Configuration → AIS → VHF Radio → Regional Areas**. The list shows the north east and south west corners of the areas. The area is marked with green colour if it is in use by the R5 SUPREME Transponder. To view the settings of an area or to edit an existing area, mark the area in the list and click on the "View Area" or "Edit Area" button. When using the **ARROW KEYPAD**, mark the area list and then press **ENTER** to be able to select the desired area with ∧ ∨. When the correct area is selected, press **ESC** and use the **ARROW KEYPAD** to navigate to the desired button.

It is possible to manually create and edit regional areas in the system. It is not recommended to modify anything in this view unless instructed to do so by the authorities or for testing in a controlled environment.

Figure 26 – Regional Areas

5.17 Alarms

All currently active and enabled alarms are shown in the *Alarm List* view that can be accessed from **Main Menu→ Status → Alarm List** or by clicking on the alarm indication in the status bar. As default, only alarms that are configured as "Enabled" will be shown in the list. It is possible to also show disabled active alarms by pressing the button "Show All Alarms". For a list of all alarms, see chapter 8.3.
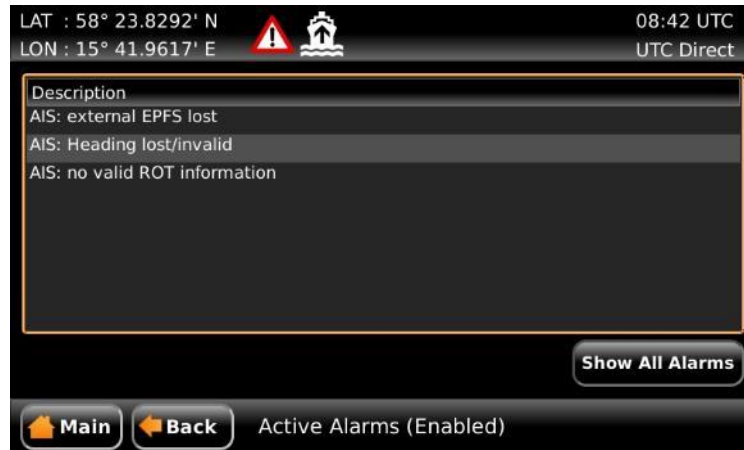
Figure 27 - Alarms

5.18 Status List

Current status indications are listed in the *Status List* view that can be accessed from **Main Menu → Status → Status List**. The different status indications that can occur are listed in chapter 8.8.
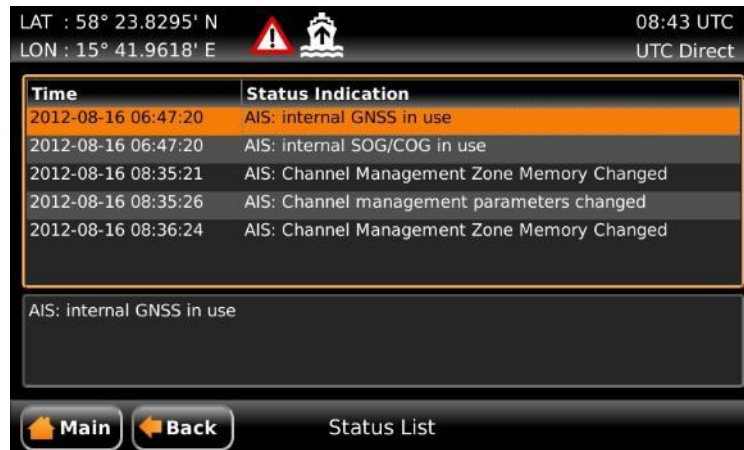
Figure 28 - Status List

5.19 Non Functional Time

This view displays information about times when the R5 SUPREME Transponder has been turned off or for some other reason has not been transmitting for more than 15 minutes. The view is accessed from **Main Menu → Status → AIS → Non Functional Time**.
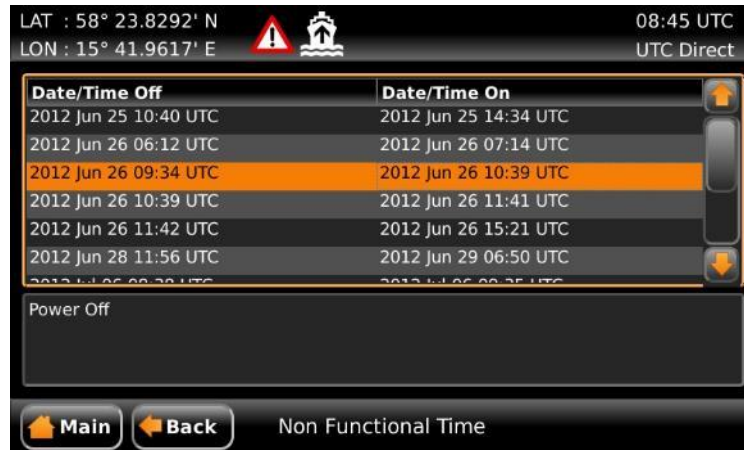
Figure 29 - Non Functional Time

5.20 **AIS Internal GPS Status**

This view displays the satellites received by the R5 SUPREME Transponder internal GPS receiver. The list is sorted by the satellites ID (PRN number) and shows elevation, azimuth and signal to noise ratio (SNR) for each satellite. The view also displays the total number of satellites in view, total number of satellites used in the position calculation reported by GGA sentence, current operating mode and dilution of precision (DOP) values.
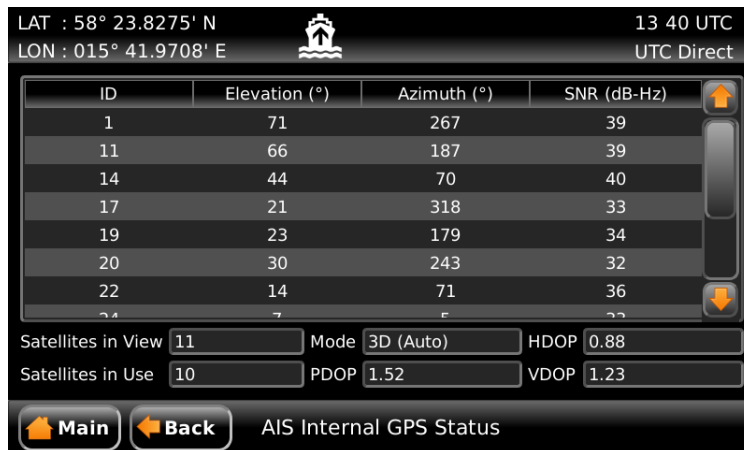
Figure 30 – AIS Internal GPS Status

5.21 **View Raw Data**

This view displays the incoming data on the selected serial port. It is also possible to pause the data on the screen by pressing the "Freeze" button. The *View Raw Data* view can be a helpful tool when trouble shooting the system to see what sensor input is actually received on each port. The view can be accessed from **Main Menu → Status → View Raw Data**.

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Figure 31 - View Raw Data

5.22 **SW/HW Info**

This view displays the software and hardware revisions for the R5 SUPREME AIS System and is accessed from **Main Menu → Status → SW/HW Info**. This information should always be provided when in contact with Saab TransponderTech support.

Figure 32 - SW/HW Info

5.23 **VHF Status**

The *VHF Status* view shows the currently used settings. Channel number, frequency, power and operation mode are displayed for each VHF transceiver in the R5 SUPREME Transponder. This information is useful when troubleshooting to make sure that the R5 SUPREME Transponder uses the expected VHF radio settings. If e.g. a regional area is set and in use, this will affect the information shown in the VHF Status view.

Figure 33 - VHF Status

5.24 **Hot Standby Status**

This view shows current status of the hot standby operation described in section 3.14.
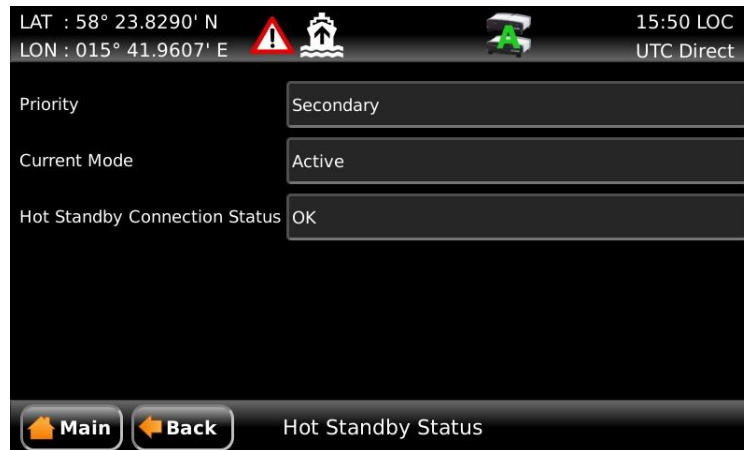
Figure 34 – Hot Standby Status

The view shows if the transponder is configured as Primary or Secondary unit in the hot standby pair, current mode ("Active" or "Standby") and also status of the hot standby operation. The status can be one of the following:

- **OK** – Hot Standby is working properly.

- **Lost connection to other unit** – Serial connection between the two transponders is not working.

- **One way communication** – Status from this unit does not reach the other unit.

- **Configuration mismatch** – Primary/Secondary configuration wrong. One unit must be set to "Primary and the other to "Secondary" for the Hot Standby pair to work.

  Hot standby version mismatch – The transponders in the Hot Standby pair have different software versions.

If the hot standby connection status is anything else the "OK" an alarm will also be generated. The hot standby alarm is configurable as described in section 4.3.14.

5.25 **Communication Test**

When installing the R5 SUPREME AIS System, or when performing annual testing, a communication test shall be done to ensure that other transponder systems can receive the R5 SUPREME Transponder's transmissions. This can be done from the *Communication Test* view accessed from **Main Menu → Maintenance → Communication Test**.

When entering the *Communication Test* view a suggested target with a suitable range (between 15 NM and 25 NM) will be selected in the MMSI parameter field if such a target has been received by the R5 SUPREME AIS System. It is however possible to select a different target for the communication test. To start the test, click on the "Send" button in lower right corner. A popup with the result of the communication test will appear if a reply is received or if no reply has been received within 15 seconds.

Figure 35 - Communication Test

5.26 **Update Software**

The software of the R5 SUPREME CDU is easy upgradable via the USB Host interface located behind the front hatch of the R5 SUPREME CDU. To perform a software update, follow the instructions in the *Update Software* view which can be accessed from **Main Menu → Maintenance → System Update → Update CDU SW**. For more information about the upgrade procedure, refer to chapter 6, "Software Upgrade."

Figure 36 - Update Software

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5.27 **Factory reset**

All config parameters described in section 4.3 "Configuration Parameters" can be set to default values from the *Factory Reset* view which can be accessed from **Main Menu → Maintenance → Factory reset**.

NOTE 1: All SRM, Long Range and text messages will be deleted from the system!

NOTE 2: The MMSI parameter will also be reset to zero and therefore the transponder will stop transmitting and the alarm "Tx Malfunction" will become active.

Figure 37 – Factory Reset

5.28 **Save/Load Config to/from USB memory**
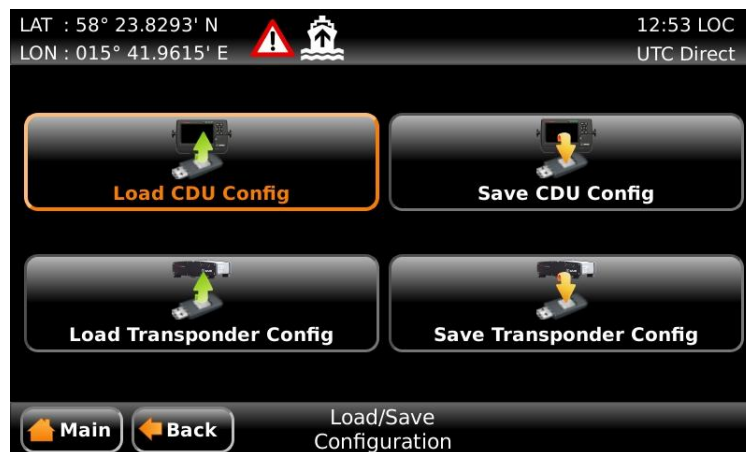
Figure 38 – Load/Save Configuration Menu

The R5 SUPREME AIS Transponder System has the capability to save configuration of both CDU and transponder to a USB memory. The configuration files can be used as backup so that the SUPREME system can be restored to a previous configuration; however during normal software upgrade of the SUPREME AIS system the configuration parameters will NOT be changed so a backup is usually not needed.

The saved configuration files can also be used to load several R5 SUPREME systems with the same settings.

The CDU configuration file includes all settings that can be found under the *Display Configuration* view (**Main Menu → Maintenance → Configuration → Display**) as well as CDU interface settings such as IP address, LWE ID and System Setup. The transponder configuration file includes all

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other settings such as Alarm configuration, Interface settings, Ship Static, Ship Dimensions, Voyage settings etc.

The following sections describe how to save/load CDU and transponder configuration to/from USB memory. The load/save configuration views can be accessed from **Main Menu → Maintenance → System Update → Load/Save Configuration**.

5.28.1 Save CDU configuration to USB memory

Do the following to save the CDU configuration to a file on a USB memory.

1. Insert a FAT32 formatted USB memory in the USB host interface port in the R5 CDU.

2. Enter the *Save CDU Config to USB* view.
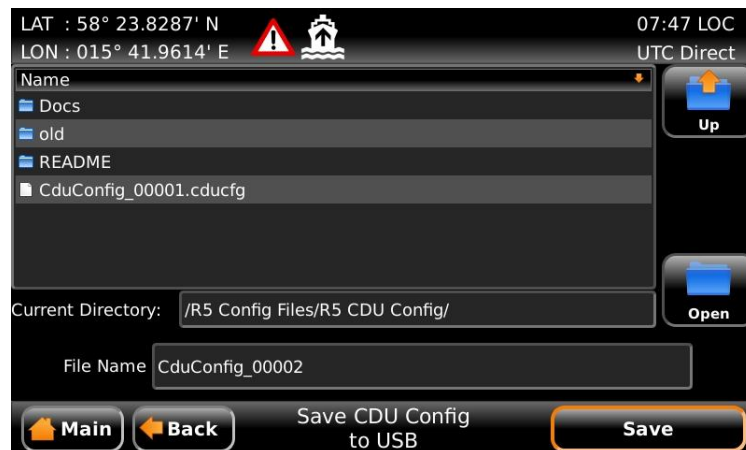
Figure 39 – Save CDU Config to USB

1. Open the folder on the USB memory where the CDU configuration file should be saved. The file will be saved in the folder shown in the "Current Directory" field.

    Use the touch interface or the arrow keypad to navigate between folders and files on the USB memory. Only folders and CDU configuration files will be listed in the view. To view the contents of a sub folder, mark the folder in the list and press the button "Open" using the touch interface, or use the arrow keypad and press ENTER. To go back to the previous folder, use the touch interface or the arrow keypad to press the "Up" button in upper right corner of the view.

2. Select an existing CDU configuration file to overwrite it or enter a new file name by pressing the "File Name" edit field.

3. Press "Save" to save the CDU configuration to the specified file and directory.

4. A popup will appear stating how many parameters that have been saved in the file on the USB memory.

Figure 40 – CDU Config successfully saved

5.28.2 Load CDU configuration from USB memory

Do the following to load the CDU configuration from an existing config file on a USB memory:

1. Insert the USB memory in the USB host interface port in the R5 CDU.

2. Enter the *Load CDU Config from USB* view.
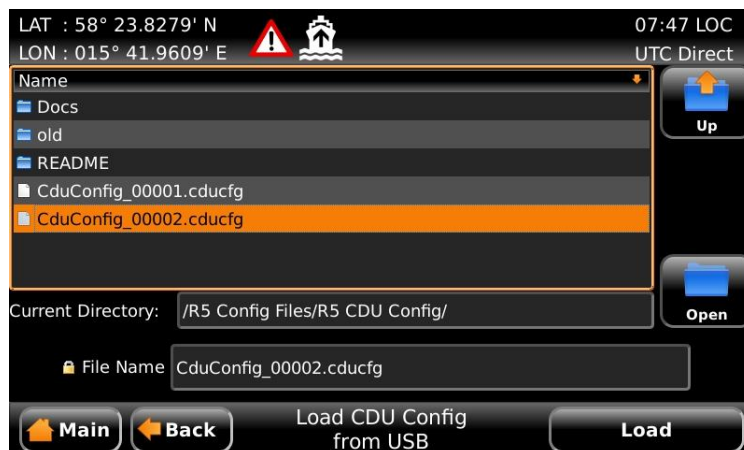
Figure 41 – Load CDU Config from USB

3. Select the desired configuration file.

   Use the touch interface or the arrow keypad to navigate between folders and files on the USB memory. Only folders and CDU configuration files will be listed in the view. To view the contents of a sub folder, mark the folder in the list and press the button "Open" using the touch interface, or use the arrow keypad and press ENTER. To go back to the previous folder, use the touch interface or the arrow keypad to press the "Up" button in upper right corner of the view.

4. Press "Load" to load configuration from the selected file. A virtual keyboard prompting for the CDU password will appear. Enter the password (default = "cdupwd") and press ENTER on the virtual keyboard.

5. A popup will appear stating how many parameters that have been loaded. If the System Type parameter has been changed the CDU will reboot.

Figure 42 – CDU Config successfully loaded

5.29 Save Transponder configuration to USB memory

Do the following to save the transponder configuration to a file on a USB memory.

1. Insert a FAT32 formatted USB memory in the USB host interface port in the R5 CDU.

2. Enter the *Save CDU Config to USB* view.
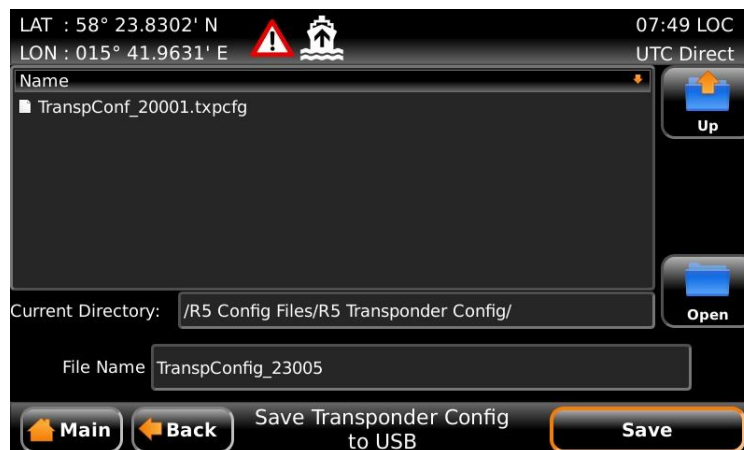
Figure 43 – Save Transponder Config to USB

3. Open the folder on the USB memory where the transponder configuration file should be saved. The file will be saved in the folder shown in the "Current Directory" field.

   Use the touch interface or the arrow keypad to navigate between folders and files on the USB memory. Only folders and transponder configuration files will be listed in the view. To view the contents of a sub folder, mark the folder in the list and press the button "Open" using the touch interface, or use the arrow keypad and press ENTER. To go back to the previous folder, use the touch interface or the arrow keypad to press the "Up" button in upper right corner of the view.

4. Select an existing transponder configuration file to overwrite it or enter a new file name by pressing the "File Name" edit field.

5. Press "Save" to save the transponder configuration to the specified file and directory.

6. A popup will appear when the configuration has been read from the transponder and written to the USB memory.

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Figure 44 – Transponder Config successfully saved

5.29.1 Load Transponder configuration from USB memory

Do the following to load the transponder configuration from an existing config file on a USB memory:

1. Insert the USB memory in the USB host interface port in the R5 CDU.

2. Enter the *Load Transponder Config from USB* view.
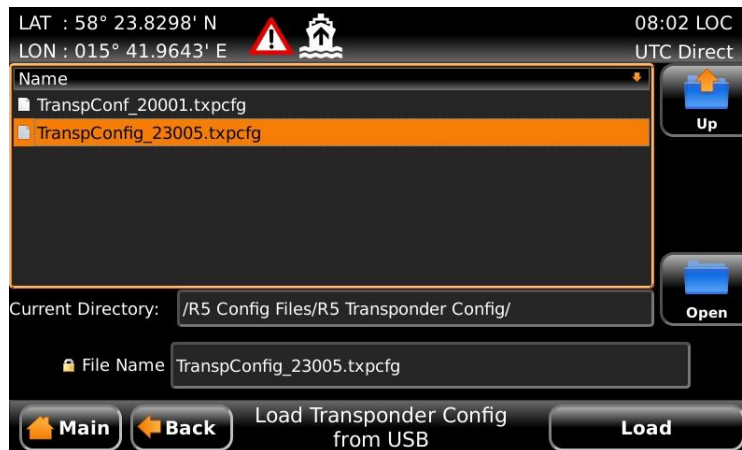
Figure 45 – Load Transponder Config from USB

3. Select the desired configuration file.

   Use the touch interface or the arrow keypad to navigate between folders and files on the USB memory. Only folders and transponder configuration files will be listed in the view. To view the contents of a sub folder, mark the folder in the list and press the button "Open" using the touch interface, or use the arrow keypad and press ENTER. To go back to the previous folder, use the touch interface or the arrow keypad to press the "Up" button in upper right corner of the view.

4. Press "Load" to load configuration from the selected file. A virtual keyboard prompting for the admin password will appear. Enter the password (default = "admin") and press ENTER on the virtual keyboard.

5. A popup will appear stating how many parameters that have been successfully loaded in the transponder.

Figure 46 – Transponder Config successfully loaded.

6 SOFTWARE UPGRADE

Note: After updating the software add a sticker stating the new software version close to the product label.

After replacing the CDU or Transponder unit with a new unit, it may be necessary to make a software upgrade to make sure there are no software compatibility issues.

It is possible to upgrade the software in the Transponder unit and the CDU unit. Make sure to carefully read the release notes for the software upgrade package first.

The Transponder can be upgraded over Ethernet via the R5 CDU USB port or from the R5 AIS Junction box USB port.

6.1 Upgrade Software in R5 SUPREME Transponder via Junction Box.

The R5 SUPREME Transponder can be upgraded through the USB host interface located in the R5 AIS Junction Box. To upgrade the software in the R5 SUPREME Transponder, perform the following steps:

- Unzip the R5 SUPREME Transponder upgrade package in the root folder of an USB memory stick (must be FAT32 formatted). There should now be a folder called swload in the USB root folder.

- Insert the USB memory stick in the USB host interface in the R5 AIS Junction Box.

- Make sure that the R5 SUPREME Transponder's 26-pin **I/O** port is connected to the R5 Junction Box.

- Hold down the 'SW-LOAD'-button in the R5 AIS Junction Box. The R5 SUPREME Transponder will reboot and start the software upgrade. The 'SW-LOAD'-button must be held down until the transponder **STATUS LED** is lit green and the transponder **Rx LED** is lit yellow.

The software upgrade is complete when the **STATUS LED** is lit green, this normally takes a couple of minutes. The R5 SUPREME Transponder will automatically reboot after 3 seconds.

*NOTE: If the upgrade process fails, The **STATUS LED** will be lit red and one of the **Rx LED** or **Tx LED** starts blinking; see **Error! Reference source not found.** for reason of failure. Should this happen, trouble shoot according to error code. Hold down the 'SW-LOAD'-button and reboot the R5 SUPREME to try again.*

	STATUS	Rx	Tx
Upgrade mode started	GREEN	YELLOW	
Upgrade in progress		Blinking YELLOW	
Upgrade complete (automatic reboot after 3 sec)	GREEN		
Error: USB Not Found	RED	Blinking YELLOW 0.5Hz	

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Error: No SW found on USB	RED	Blinking YELLOW 4Hz	
Error: Flash erase failed	RED		Blinking RED 0.5 Hz
Error: Flash write failed	RED		Blinking RED 4 Hz

Table 10 – LED Indicators during Software Upgrade

Troubleshooting:

Error: No USB Found – Try a different make or model of USB memory. Format as FAT32.

Error: No SW found on USB – Verify SW folder structure on USB memory.

6.2 **Upgrade Software in R5 SUPREME Transponder via CDU**

It is also possible to upgrade the R5 SUPREME Transponder via Ethernet interface by using the R5 SUPREME CDU. Perform the following steps to initiate the transponder software upgrade from the R5 SUPREME CDU:

- Unzip the R5 SUPREME Transponder upgrade package in the root folder of an USB memory stick (must be FAT32 formatted). There should now be a folder called swload in the USB root folder.

- Insert the USB memory stick in the USB host interface in the USB port located behind the front hatch of the R5 SUPREME CDU.

- Make sure that the R5 SUPREME CDU and R5 SUPREME Transponder communicates with each other via Ethernet. Several R5 Transponders may be available on the network. The currently selected transponder is marked with green colour in the *Select Transponder* view which can be accessed from **Main Menu → Maintenance → Configuration → Interface → Network → Select Transponder.**

Figure 47 – Select Transponder

- Start the upgrade procedure by following the on screen instructions in the *Update Transponder SW* view which can be accessed from **Main Menu → Maintenance → Update Transponder SW.**

Figure 48 –Update Transponder SW

- The R5 SUPREME Transponder will reboot when the new software has been loaded so the connection will temporarily be lost. When the transponder has rebooted with the new software and connection is established again, the following view will be shown, indicating that the upgrade is complete:
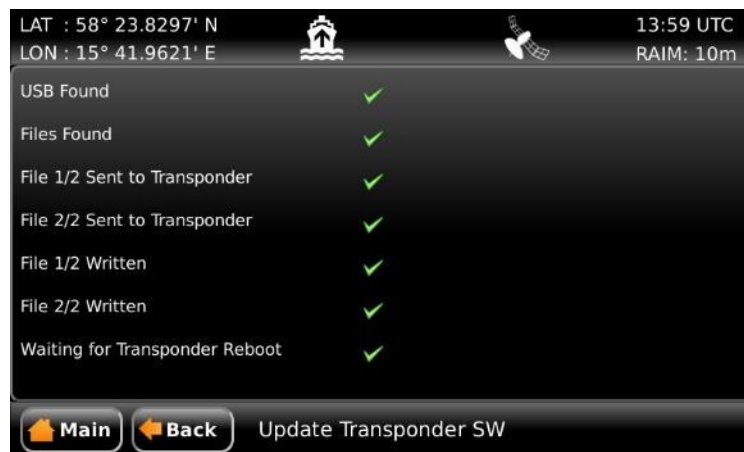
Figure 49 –Update Transponder SW, Complete

6.3 License Upgrade

Some features in the R5 SUPREME AIS System are license controlled and needs to be unlocked by a special license file. A license file is unique for each single R5 SUPREME Transponder. The license file name has the following structure;

200001 - 7000 118-611 [Secure W-AIS].lic

In this example:

200001 – The serial number of the R5 SUPREME Transponder unit this key works with.

7000 118-611 – The part number of this license key.

To upgrade the license in the R5 SUPREME AIS System, perform the following:

- Place the license file in the root of a FAT32 formatted USB memory. It is possible to put many license files on the same USB memory if upgrading several units.

- Make sure that the R5 SUPREME CDU and R5 SUPREME Transponder communicates with each other via Ethernet. Several R5 Transponders may be available on the network. The currently selected transponder is marked with green colour in the *Select Transponder*

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view which can be accessed from **Main Menu → Maintenance → Configuration → Interface → Network → Select Transponder.**

- Insert the USB memory in the USB host interface located behind the front hatch of the R5 SUPREME CDU.

- Enter the view **Main Menu → Maintenance → System Update → License** and press the button "Update License".

- If the license is successfully set, a number of unlocked modules will appear:

Figure 50 –License Upgrade Successful

- If a correct license file cannot be found on the USB memory, the following will appear:

Figure 51 – No License File Found

6.4 **Upgrade Software in R5 SUPREME CDU**

The R5 SUPREME CDU is easy upgradable through the USB host interface located behind the front hatch. To upgrade the software in the R5 SUPREME CDU, perform the following steps:

- Unzip the R5 SUPREME CDU upgrade package in the root folder of an USB memory stick (must be FAT32 formatted). There should now be a folder called cduswload in the USB root folder.

- Insert the USB memory stick in the USB host interface located behind the front hatch.

- Hold down the 'Down Arrow'-button on the front of the R5 SUPREME CDU   and reboot the system. The 'Down Arrow'-button must be held down until the **STATUS LED** is lit green and the **RAIM LED** is lit yellow.

The software upgrade is complete when the **STATUS LED** is lit green. The R5 SUPREME CDU will automatically reboot after 3 seconds. Check that correct SW has been loaded in the SW/HW Info view which can be accessed through **Main Menu → Status →SW/HW Info**.

If the upgrade process fails, The **STATUS LED** will be lit red and one of the **RAIM LED** or **MODE LED** starts blinking. Should this happen, hold down the 'Down Arrow'-button and reboot the R5 SUPREME CDU to try again.

The software upgrade can also be initiated from the *Update Software* view in the R5 SUPREME CDU. Refer to chapter 5.26 "Update Software" for more information.

	MODE LED	RAIM LED	STATUS
Upgrade mode started		YELLOW	GREEN
Upgrade in progress		Blinking YELLOW	
Upgrade complete (automatic reboot after 3 sec)			GREEN
Error: USB Not Found		Blinking YELLOW 0.5Hz	RED
Error: No SW found on USB		Blinking YELLOW 4Hz	RED
Error: Flash erase failed	Blinking RED 0.5 Hz		RED
Error: Flash write failed	Blinking RED 4 Hz		RED

Table 11 – CDU LED Indicators during Software Upgrade

7 TECHNINCAL SPECIFICATIONS

7.1 R5 SUPREME Transponder

7.1.1 Physical

Dimensions:	Height: 77 mm Width: 227 mm Depth: 192 mm
Weight:	2.05 kg

7.1.2 Electrical

Input Voltage:	12-24 VDC
Power Consumption:	20 W (60 W peak)

7.1.3 Environmental

Temperature:	-15˚C to +55˚C (Operational) -30˚C to +80˚C (Storage)
Vibrations:	IEC 60945 ed. 4
EMC:	IEC 60945 ed. 4
Radio Type Approval:	IEC 61993-2 ed. 2
Compass Safe Distance:	65 cm (for standard magnetic compass) 40 cm (for steering magnetic compass)

7.1.4 VHF Transceiver

Receivers:	156 – 163 MHz (TDMA) 156.525 MHz fixed (DSC, Channel 70)	
Transmitter:	156 – 163 MHz	
Channel bandwidth:	25 kHz	
Output Power:	High: Low: "Tanker 1W Mode":	12,5 W 1W 1W
VHF antenna connector:	BNC-Female	
Antenna Input Impedance:	50 ohm	

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7.1.5   Internal GPS Receiver

Type:	GPS L1, C/A Code, 50 Channels
Update rate:	2 Hz
Accuracy:	< 2.5 m (GPS, CEP, 50%, 24 hours static) < 2.0 m (SBAS, CEP, 50% 24 hours static)
Antenna feeding:	5 VDC
GPS Antenna connector:	TNC-Female
Antenna Input Impedance:	50 ohm

7.1.6   AIS Alarm Relay

Max switching current:	0,1 – 5 A
Max switching voltage:	30 VDC
Max switching power:	150 W

7.2   R5 SUPREME CDU

7.2.1   Physical

Dimensions:	Height: 140 mm Width: 255 mm Depth: 84 mm
Weight:	1.6 kg
Dimensions (incl. gimbal mount)	Height: 170 mm Width: 295 mm Depth: 84 mm
Weight (incl. gimbal mount):	1.8 kg

7.2.2   Electrical

Input Voltage:	12-24 VDC
Power Consumption:	13 W

7.2.3   Environmental

Temperature:	-15˚C to +55˚C (Operational)

	-30˚C to +80˚C (Storage)
Vibrations and EMC:	IEC 60945 ed. 4
Compass Safe Distance:	75 cm (for standard magnetic compass)
	50 cm (for steering magnetic compass)

7.1 R5 AIS Junction Box

7.1.1 Physical

Dimensions:	Height: 72 mm
	Width: 272 mm
	Depth: 195 mm
Weight:	0.75 kg

7.1.2 R5 AIS Junction Box Alarm Relay

Max switching current:	2 A
Max switching voltage s:	220 VDC or 250 VAC
Max switching power:	60W (DC) or 62.5 VA (AC) resistive load

8 TROUBLESHOOTING

One of the basic ideas with troubleshooting is to solve a supposed problem on site instead of immediately sending the suspected part for a costly repair. Solving a supposed problem would in this aspect mean both to rectify the real problem, but it could also mean that the suspected part is confirmed to be working or not-working.

Historically, many of the parts sent to Saab TransponderTech for repair have in fact been confirmed working instead. Another common scenario is that the equipment has faulty I/O settings or other erroneous configurations, easy to fix on site. A proper troubleshooting would ideally prevent those unnecessary returns of fully functional equipment.

There are numerous ways to troubleshoot a transponder installation, much dependant on the skill and experience level of the troubleshooter. The preferred approach may probably also differ between different individuals, and there is no such thing as right or wrong.

This chapter is not intended to be a step by step troubleshooting instruction, but instead offer a toolbox with some different techniques on how to troubleshoot the R5 SUPREME AIS System.

8.1 Troubleshooting Prerequisites

A transponders operating environment may naturally differ widely, ranging from small high-speed RIB's to very large SOLAS tankers, military aircraft carriers and even submarines. The diversity of installation environments will of course have impact on the complexity of the troubleshooting, but it is always advisable to start with minimizing all possible interference sources in order to simplify the troubleshooting.

- Disconnect other NMEA equipment from the R5 (ECDIS, RADAR, NAV, etc.)
- Switch off other emission sources (RADAR, SATCOM, VHF, etc.)

We strongly encourage to always use the latest software available for the R5 SUPREME System. It may contain bug-fixes and other improvements solving already known issues. Always check existing release notes to see if your problem is to be found.

8.2 Troubleshooting with the Front Panel LED's of the Transponder

It is very fast and effective to use the LED's to verify the status of the R5 SUPREME Transponder. This should always be the first step in the troubleshooting.

8.2.1 STATUS LED (multi-colored)

- The STATUS LED is <u>constantly lit green</u> when the transponder is operating and no alarms are active.
- The STATUS LED is <u>constantly lit red</u> if there are one or more acknowledged active alarms in the transponder, but no unacknowledged alarms. Refer to chapter 8.3 for interpretation of the alarms.
- The STATUS LED is <u>flashing red</u> if there are one or more unacknowledged alarms in the transponder. Refer to chapter 8.3 for interpretation of the alarms.

If neither color are lit, nor flashing, then check the power supply and make sure that:

- The voltage is correct and stable
- The polarity is correct and not switched
- The available current is sufficient for start up and transmission
- The external fuse is functional

- The power cable is undamaged

- The power connector is properly connected and secured

8.2.2 RX LED (yellow)

The RX LED is <u>flashing yellow</u> when the transponder is receiving a message from the VDL. This can be intermittently.

If there is verified traffic on the VDL and the RX LED still is dark, then check the alarm list for any active alarms. Refer to chapter 8.3 for interpretation of the alarms.

Lack of reception may be an indication of a VHF antenna problem or connectivity issues. Check the installation for problems.

8.2.3 TX LED (red)

The TX LED is <u>flashing red</u> when the transponder is transmitting a message to the VDL. The transmission interval is between 2 – 360 seconds. Refer to chapter 8.5.

If the TX LED is completely dark, then check so that the transmission is not switched off either through an active regional area or by the Tx Mode parameter. It is possible to check the status on each transceiver in the VHF Status view described in section 5.23.

If the transmission is activated and there still is no red flashing, then check the alarm list for any active alarms. Refer to chapter 8.3 for interpretation of the alarms.

8.3 Troubleshooting with Alarm Messages

The R5 SUPREME AIS System constantly monitors itself for failures, abnormal conditions and other important parameters. Some of the monitoring trigger alarms and those alarms are excellent aids in the troubleshooting process.

An active alarm can have two states, unacknowledged or acknowledged. The state of an alarm will affect the STATUS LED on both the R5 SUPREME Transponder and the R5 SUPREME CDU. Refer to chapter 8.2.1.

A new alarm (unacknowledged) will raise a pop-up window that needs to be acknowledged by the user. The active alarms can be found in the alarm view. Refer to chapter 5.17.

All active alarms are outputted on all the serial interface ports of the R5 SUPREME Transponder every 30 seconds. The alarm status can for example be used in interfacing ECDIS systems or centralized alarm systems. The alarms can also be monitored or recorded for troubleshooting purposes by for example a terminal application.

The status of an alarm can be identified by two letters in the alarm sentence, "**A**" and "**V**". The alarm sentence is constructed as: *$AIALR,hhmmss.ss,xxx,A,A,c-c, where:*
hhmmss.ss = Time (UTC) of alarm condition change
xxx = Unique alarm identifier
A = Alarm condition (A = Active, V = Inactive)
A = Alarm's acknowledge state, A = acknowledged, V = unacknowledged
c-c = Alarm's description text

$AIALR,hhmmss.ss,xxx,<u>V</u>,A,c-c: Tx malfunction: Alarm is **Inactive**

$AIALR,hhmmss.ss,xxx,<u>V</u>,V,c-c: Tx malfunction: Alarm is **Inactive**

$AIALR,hhmmss.ss,xxx,<u>A</u>,<u>A</u>,c-c: Tx malfunction: Alarm is **Active** and **Acknowledged**

$AIALR,hhmmss.ss,xxx,<u>A</u>,<u>V</u>,c-c: Tx malfunction: Alarm is **Active** and **Unacknowledged**

The alarms that can occur in the R5 SUPREME AIS System are listed below:

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8.3.1   AIS: Tx Malfunction (ID 001)

A Tx Malfunction alarm is generated if there is a malfunction in the radio transmitter hardware or if the antenna VSWR exceeds an allowed ratio. If the radio transmitter returns to normal operation or if VSWR returns to a value below the allowed threshold, the alarm is cleared. The Tx Malfunction alarm is also generated when the MMSI is configured to "0", in which case the R5 SUPREME Transponder will not transmit.

8.3.2   AIS: Antenna VSWR Exceeds limit (ID 002)

The VSWR (Voltage Standing Wave Ratio) of the antenna is checked for every transmission and if it exceeds a given ratio then a VSWR alarm is generated. If the VSWR goes below the allowed threshold, the alarm is cleared.

8.3.3   AIS: Rx Ch A Malfunction (ID 003)

8.3.4   AIS: Rx Ch B Malfunction (ID 004)

8.3.5   AIS: Rx Ch C Malfunction (ID 005)

The radio receivers are continuously monitored and if any part of the receivers' hardware should malfunction, an Rx Malfunction alarm is generated for that receiver. If the radio receiver returns to normal operation, the alarm is cleared.

8.3.6   AIS: General Failure (ID 006)

This alarm is generated if the R5 SUPREME Transponder fails to initiate the radio or if a severe hardware failure has occurred. If this alarm occurs, contact your retailer.

8.3.7   AIS: UTC Sync Invalid (ID 007)

This alarm is generated when the R5 SUPREME Transponder loses UTC direct synchronization (cannot synchronize from internal GPS receiver).

8.3.8   AIS: MKD connection lost (ID 008)

This alarm is active if the R5 SUPREME Transponder has lost connection with the R5 SUPREME CDU. If this alarm occurs, check the Ethernet connection and the network settings.

8.3.9   AIS: Internal/External GNSS position mismatch (ID 009)

This alarm is generated if the difference between the internal and external GNSS position is more than 100 m for more than 15 minutes.

8.3.10   AIS: NavStatus incorrect (ID 010)

This alarm is generated if the navigational status is incorrect. If e.g. the navigational status is set to "At Anchor" but the ship is moving faster than 3 knots, the NavStatus incorrect alarm will become active.

A popup will appear when the "Incorrect NavStatus" alarm is acknowledged to prompt user to change the NavStatus

8.3.11   AIS: Heading sensor offset (ID 011)

This alarm is active when SOG (Speed Over Ground) is greater than 5 kn and the difference between COG (Course Over Ground) and HDT (True Heading) is greater than 45˚ for 5 min.

8.3.12   AIS: Active AIS SART (ID 014)

This alarm is generated when the R5 SUPREME Transponder has received an active AIS SART position report.

8.3.13 AIS: External EPFS Lost (ID 025)

This alarm is generated if the position from the external Electronic Position Fixing System is invalid (i.e. no external GNSS). Due to the fallback arrangement for the positioning sensor this alarm can be inactive up to 30 seconds (during which the internal GNSS is used) before the alarm is activated.

8.3.14 AIS: No Sensor Position In Use (ID 026)

This alarm is active if the R5 SUPREME Transponder does not have a valid position (latitude/longitude) from any sensor.

8.3.15 AIS: No Valid SOG Information (ID 029) / No Valid COG Information (ID 030)

These alarms are active if the R5 SUPREME Transponder does not have a valid SOG (Speed Over Ground) or a valid COG (Course Over Ground) from any sensor. The SOG and COG is based on the speed log (if external GNSS is used and a valid heading is available) or the GNSS currently in use.

8.3.16 AIS: Heading Lost/Invalid (ID 032)

This alarm is generated if either the heading information is lost/invalid (from external sensors) or if the heading is undefined.

8.3.17 AIS: No Valid ROT Information (ID 035)

This alarm is active if ROT (Rate Of Turn) is undefined or if no valid ROT information is available from external sensor or internal calculations.

8.3.18 AIS: Hot standby connection failure (ID 065)

This alarm is active if hot standby functionality is enabled and there is a problem with the connection to the other transponder unit in the hot standby pair. More details about the connection problem can be viewed in the *Hot Standby Status* view. See sections 3.14 and 5.24 for more information about the hot standby functionality in the R5 SUPREME transponder system.

8.3.19 AIS: CDU Lost Connection To Transponder

This alarm is active if the R5 SUPREME CDU has lost connection with the R5 SUPREME Transponder. If this alarm occurs, check the Ethernet connection and the network settings.

8.4 Troubleshooting via the CDU

There is a lot of information and data accessible via the CDU that can be useful for troubleshooting, and that can help finding a presumed problem. The following items are just a few examples of what to look at.

8.4.1 Transmitted Own Ship Data View

When the transponder transmits data on the VDL, it also simultaneously outputs this data on all the serial ports. This information is displayed in the *Own Ship Data* view.

Figure 52 – Transmitted Own Ship Data

8.4.2 Target List

The target list is primarily useful when analyzing the receiving functionality. The propagation characteristics of VHF radio frequencies are close to line of sight. A harsh radio environment, reflections in cables, connectors or the antenna will shorten the effective range.

Figure 53 – Target List

8.4.3 Time in Status Bar

The time (UTC or LOC) in the upper right corner of the display is provided by the transponder. If the time is not correct, the transponders internal GPS does not have a position fix. This will also be indicated by the alarm "UTC sync invalid". This problem is normally caused by a GPS-antenna failure or damaged antenna cables. This problem may also be caused by interference from radio equipment on-board.

8.4.4 View Raw Data

The *View Raw Data* view can be used to see received data on the ports of the R5 SUPREME AIS System. It is useful for troubleshooting to make sure that connected sensors provide correct data to the system. The "View Port" parameter determines from which port the data displayed in the view are taken. It is possible to pause the view by pressing the "Freeze" button. All data that is received while the view is paused will not be displayed in the view.

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Figure 54 – View Raw Data

8.4.5 Status List

The status list view is used to display status indications that are stored in the transponder. The indications are created when an important event has occurred in the transponder. Time of occurrence and status indication text are shown in the view. A list of all possible indications can be found in section 8.8 "Indication Messages".

Figure 55 – Status List

8.5 Reporting Intervals for Class A Transponders

The different information types sent by the R5 SUPREME AIS System are valid for different time periods and therefore they need different update intervals. These update intervals are defined in the AIS standard (ITU-R M 1371-4) and should be applied by all transponders. There are however some exceptions from this, which can be found in the standard. Class B transponders have for example different intervals than the Class A transponder.

All this needs to be taken in consideration while troubleshooting thus it affects the anticipated behaviour of a transponder.

Information type / Condition	Nominal reporting interval
Static Information	6 min, on amendment, on request
Voyage related information	6 min, on amendment, on request
Dynamic information (See conditions below)	
- Ship at anchor or moored and not moving faster than 3 knots	3 minutes
- Ship at anchor or moored and moving faster than 3 knots	10 seconds
- Ship 0-14 knots	10 seconds
- Ship 0-14 knots and changing course	3 1/3 seconds
- Ship 14-23 knots	6 seconds
- Ship 14-23 knots and changing course	2 seconds
- Ship > 23 knots	2 seconds
- Ship > 23 knots and changing course	2 seconds

Table 12 – Reporting Intervals

8.6 **F.A.Q**

8.6.1 **I cannot see the vessel on the Internet AIS service**

Websites providing AIS services like e.g. www.marinetraffic.com does not cover all the seas of the world, but only specific coastal areas where AIS receivers have been installed and that upload the data to the websites. The vessel must be in reception range of these AIS receivers to show up on the Internet AIS service.

8.6.2 **I can "see" the other vessel, but they do not "see" my vessel**

There are several reasons why this might happen. The first thing to check is if the R5 SUPREME Transponder is transmitting at all or if is transmitting in low power mode. In *VHF Status* view described in section 5.23 it is possible to check the status on all R5 SUPREME Transponder's VHF transceivers. Make sure that correct channels and power mode are used. There might be a regional area set in the transponder that changes the operating mode of the R5 SUPREME Transponder. Regional areas are listed in the *Regional Area* view (see section 5.16).

The MMSI must also be configured in order for the R5 SURPEME Transponder to transmit. If the MMSI is zero, the R5 SUPREME Transponder will be silent.

Another possibility is that the other vessels' transponder requires a shorter reception range in order to receive the R5 SUPREME Transponder's transmissions. In the *Target List* view and the *Plot* view it is possible to see the range and bearing to other vessels.

8.6.3 **The VHF range seems to be short**

As a rule of thumb, the VHF range is equal to line of sight from the antenna position, which means that the higher the antenna is installed, the longer the range will be. It is also important

to follow the guide lines for an antenna installation as thoroughly as possible. Section 3.10 "Mount the VHF Antenna" describes how to best install the VHF antenna.

8.6.4   I can only receive a few GPS satellites

The position of the GPS antenna is of high importance to optimize the GPS reception. Follow the guide lines of GPS antenna installation described in chapter 3.11 "Mount the GPS Antenna" as thoroughly as possible.

If the ship is close to a harbour or shore with high structures or travelling in an area with high terrain, the GPS reception might be worse. The GPS antenna must be installed where it has a clear view of the sky. The objective is to see the horizon freely through 360 degrees with a vertical observation of 5 to 90 degrees above the horizon.

The GPS antenna cable should also be as short as possible and with 50 Ω impedance. A very long antenna cable or faulty impedance can heavily reduce the GPS reception.

8.7   Contacting Support

The primary source for support and RMA issues should for end customers be the local dealer where the equipment was purchased in the first place. Another option is to contact one of our OEM partners or affiliate service stations and request help. An updated list with our dealers, OEM partners and service stations can be found at our website, http://saab.com/, listed under the corresponding product.

Currently: http://saab.com/security/maritime-traffic-management/traffic-management/

It is also possible to contact Saab TransponderTech's technical support if this is preferred.

We recommend contacting us via email at support.transpondertech@saabgroup.com for most accurate and detailed help. If the situation is very urgent then it is of course also possible to call us at normal Swedish workdays and working hours. Telephone **+46-13-189420**.

Before contacting support, always check the following information and include it in the first email, or have it ready at the phone call:

-   All the information provided by the SW/HW Info view which can be accessed from **Main Menu→Status→SW/HW Info**.

-   Detailed fault description

8.8   Indication Messages

The indication messages, with identity and type information, are listed below:

ID	Type	Message text
021	Status	External DGNSS in use
022	Status	External GNSS in use
023	Status	Internal DGNSS in use (beacon)
024	Status	Internal DGNSS in use (msg 17)
025	Status	Internal GNSS in use
027	Status	External SOG/COG in use
028	Status	Internal SOG/COG in use
031	Status	Heading valid
033	Status	Rate of Turn Indicator in use

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034	Status	Other ROT source in use
036	Event	Channel management parameters changed
056	Event	Channel management zone memory changed
061	Status	Enter semaphore mode
062	Event	Leave semaphore mode
063	Event	NVM Checksum errors
064	Event	RATDMA overflow
066	Status	Tanker Low VHF Power Mode
067	Status	Beacon correction received
068	Status	VDL correction received
069	Status	No correction received

8.9 Long Range Definitions

A = Ship's name, call sign, and IMO number

B = Date and time of message composition

C = Position

E = Course over ground (COG)

F = Speed over ground (SOG)

I = Destination and Estimated Time of Arrival (ETA)

O = Draught

P = Ship/Cargo

U = Ship's length, breadth, type

W= Persons on board

9 INTERPRETATION OF INPUT SENTENCES

All interface ports accepts the full set of input listed below sentences, except the sentences listed in section 9.4.1 that are unique to the Long Range interface port.

The protocol of the serial input sentences shall be compliant to IEC 61162-1Ed.4 (2010-11) for maximum interoperability.

9.1 GPS and Sensor Input Sentences

9.1.1 DTM - Datum Reference

If local code is other than WGS84, then the positions report from that port is discarded.

$--DTM,ccc,a,x.x,a,x.x,a,x.x,ccc

Field	Format	Name	Comment
1	--DTM	Sentence Id	Used
2	ccc	Local Datum Code	Interpret if it's WGS84 or not
3	A	Local Datum Subdivision Code	Ignored
4	x.x	Lat Offset (2 fields)	Ignored
5	a		Ignored
6	x.x	Long Offset (2 fields)	Ignored
7	a		Ignored
8	x.x	Altitude Offset	Ignored
9	ccc	Reference Datum Code	Ignored

9.1.2 GBS - GNSS Satellite Fault Detection

If this sentence is received once a second from the position source in use, the RAIM flag will be set to TRUE.

$--GBS,hhmmss.ss,x.x,x.x,x.x,xx,x.x,x.x,x.x

Field	Format	Name	Comment
1	--GBS	Sentence Id	Used
2	hhmmss.ss	UTC Time of GGA or GNS	Ignored
3	x.x	Expected Error in latitude	Used
4	x.x	Expected Error in longitude	Used
5	x.x	Expected error in altitude	Ignored
6	xx	ID number of most likely failed satellite	Ignored
7	x.x	Probability of missed detection	Ignored
8	x.x	Estimate of bias in meters	Ignored
9	x.x	Standard Deviation of bias estimate	Ignored

9.1.3 GGA - Global Positioning System Fix Data

$--GGA,hhmmss.ss,llll.ll,a,yyyy.yy,a,x,xx,x.x,x.x,M,x.x,M,x.x,xxxx

Field	Format	Name	Comment
1	--GGA	Sentence Id	Used
2	hhmmss.ss	UTC of position	UTC Second is used to indicate Time Stamp
3	llll.ll	Latitude	Used
4	a		
5	yyyy.yy	Longitude	Used
6	a		
7	x	GPS quality indicator	Used, 1 -> Position with Low Accuracy 2 -> Position with High Accuracy 3 -> Position with Low Accuracy

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			6 -> Dead Reckoning with Low Accuracy 7 -> Manual mode with low accuracy OTHER -> No Position Used when the GPS is the internal GPS (Used in proprietary sentences)
8	xx	Satellites in use	Ignored
9	x.x	Horizontal dilution of precision	Ignored
10	x.x	Antenna altitude	Ignored
11	M	Units of antenna altitude, meter	Ignored
12	x.x	Geodial separation	Ignored
13	M	Units of geodial sep.	Ignored
14	x.x	Age of differential GPS data	Ignored
15	xxxx	Differential reference station ID	Ignored

9.1.4 GLL – Geographic position, latitude/longitude

$--GLL,llll.ll,a,yyyy.yy,a,hhmmss.ss,A,a

Field	Format	Name	Comment
1	--GLL	Sentence Id	Used
2	llll.ll	Latitude	Used
3	a		
4	yyyy.yy	Longitude	Used
5	a		
6	hhmmss.ss	UTC of position	UTC Second is used to indicate Time Stamp
7	A	Status	Used
8	a	Mode indicator	NULL -> Message is ignored A -> Position with Low Accuracy D -> Position with High Accuracy E -> Dead Reckoning Mode with Low Accuracy M-> Manual Mode with Low Accuracy OTHER -> No Position

9.1.5 GNS – GNSS fix data

If the Mode Indicator is a NULL field, the sentence is ignored.

$--GNS,hhmmss.ss,llll.ll,a,yyyy.yy,a,c--c,xx,x.x,x.x,x.x,x.x,x.x

Field	Format	Name	Comment
1	--GLL	Sentence Id	Used
2	hhmmss.ss	UTC of position	UTC Second is used to indicate Time Stamp
3	llll.ll	Latitude	Used
4	a		
5	yyyy.yy	Longitude	Used
6	a		
7	c--c	Mode indicator	A, P -> Position with low accuracy D, R, F -> Position with high Accuracy E -> Dead Reckoning Mode with Low accuracy M -> Manual Mode with low accuracy OTHER -> No Position
8	xx	Total number of satellites	Used when the GPS source is the internal GPS (used in proprietary sentences)
9	x.x	HDOP	Ignored
10	x.x	Antenna altitude, meter	Ignored

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11	x.x	Geodial separation	Ignored
12	x.x	Age of differential corrections	Ignored
13	x.x	Differential reference station ID	Ignored

9.1.6 HDT - Heading, True

The use of this sentence is talker identifier dependent.

$--HDT,x.x,T

Field	Format	Name	Comment
1	--HDT	Sentence Id	Used
2	x.x	Heading, degrees true	Used
3	T		

NOTE: HDT input must be recieved at least every 3 seconds for the R5 SUPREME to calculate ROT from the HDT input.

9.1.7 OSD – Own ship data

$--OSD,x.x,A,x.x,a,x.x,a,x.x,x.x,a

Field	Format	Name	Comment
1	--OSD	Sentence Id	Used
2	x.x	Heading, degrees true	Used if heading status is 'A'
3	A	Heading status	Used
4	x.x	Vessel course, degrees true	Used as COG
5	a	Course reference	Used[1]
6	x.x	Vessel speed	Used as SOG
7	a	Speed reference	Used[1]
8	x.x	Vessel set	Ignored
9	x.x	Vessel drift	Ignored
10	a	Speed units	Used to convert SOG to knots

9.1.8 RMC – Recommended minimum specific GNSS data

$--RMC,hhmmss.ss,A,llll.ll,a,yyyy.yy,a,x.x,x.x,xxxxxx,x.x,a,a

Field	Format	Name	Comment
1	--RMC	Sentence Id	Used
2	hhmmss.ss	UTC of position	UTC Second is used to indicate Time Stamp
3	A	Status	Used
4	llll.ll	Latitude	Used
5	a		
6	yyyy.yy	Longitude	Used
7	a		
8	x.x	Speed over ground, knots	Used
9	x.x	Course over ground, degrees true	Used
10	xxxxxx	Date	Ignored
11	x.x	Magnetic variation	Ignored
12	a		
13	a	Mode indicator	NULL -> Message is ignored A -> Position with low accuracy D -> Position with high accuracy E -> Dead Reckoning Mode with Low accuracy M -> Manual Mode with low accuracy OTHER -> No Position

---

[1] SOG and COG are used if both COG reference and SOG reference are set to either: B, P, R

INTERPRETATION OF INPUT SENTENCES

9.1.9   ROT – Rate of turn

The rate of turn value is only used if the talker identifier is TI. Otherwise the value will only be used to determine the direction, i.e. "Moving Right" or "Moving Left".

$--ROT,x.x,A

Field	Format	Name	Comment
1	--ROT	Sentence Id	Used
2	x.x	Rate of turn	Used if Status is set to 'A'
3	A	Status	Used

9.1.10   THS – True Heading and Status

$--THS,x.x,a

Field	Format	Name	Comment
1	--THS	Sentence Id	Used
2	x.x	Heading, degrees true	Used if Status is set to 'A'
3	a	Status	Used

NOTE: THS input must be recieved at least every 3 seconds for the R5 SUPREME to calculate ROT from the THS input.

9.1.11   VBW - Dual Ground / Water Speed

The current position source must be external GPS, and heading must be available for the transponder to accept this sentence.

$--VBW,x.x,x.x,A,x.x,x.x,A,x.x,A,x.x,A

Field	Format	Name	Comment
1	--ROT	Sentence Id	Used
2	x.x	Longitudinal water speed	Ignored
3	x.x	Transverse water speed	Ignored
4	A	Status: water speed	Ignored
5	x.x	Longitudinal ground speed	Used if Status is set to A
6	x.x	Transverse ground speed	Used if Status is set to A
7	A	Status: ground speed	Used
8	x.x	Stern transverse water speed	Ignored
9	A	Status stern water speed	Ignored
10	x.x	Stern transverse ground speed	Ignored
11	A	Status stern ground speed	Ignored

9.1.12   VTG – Course over ground and ground speed

$--VTG,x.x,T,x.x,M,x.x,N,x.x,K,a

Field	Format	Name	Comment
1	--VTG	Sentence Id	Used
2	x.x	Course over ground, degrees true	Used
3	T		
4	x.x	Course over ground, degrees magnetic	Ignored
5	M		
6	x.x	Speed over ground, knots	Used
7	N		
8	x.x	Speed over ground, km/h	Ignored
9	K		
10	a	Mode indicator	Used

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9.1.13 ZDA – Time and date

This message is only interpreted if it's received from the internal GPS (the time synchronisation source).

$--ZDA,hhmmss.ss,xx,xx,xxxx,xx,xx

Field	Format	Name	Comment
1	--ZDA	Sentence Id	Used
2	hhmmss.ss	UTC	Used
3	xx	Day (UTC)	Used
4	xx	Month (UTC)	Used
5	xxxx	Year (UTC)	Used
6	xx	Local zone hours	Ignored
7	xx	Local zone minutes	Ignored

9.2   **General Input Sentences**

9.2.1   ACK – Acknowledge Alarm

$--ACK,xxx

Field	Format	Name	Comment
1	--ACK	Sentence Id	Used
2	xxx	ID of the alarm source	Used

9.2.2   EPV – Command or report equipment property value

$--EPV,a,c--c,c--c,x.x,c--c,

Field	Format	Name	Comment
1	--EPV	Sentence Id	Used
2	a	Sentence status flag	Used
3	c--c	Destination equipment type	Used, AI or STT
4	c--c	Unique Identifier	Used, may be null
5	x.x	Property identifier	Used
6	c--c	Value of property to be set	Used

9.2.3   SPW – Security Password Sentence

$--SPW,ccc,c--c,x,c--c

Field	Format	Name	Comment
1	--SPW	Sentence Id	Used
2	ccc	Password protected sentece	Used
3	c--c	Unique Identifier	Used, may be NULL
4	x	Password level	Used
5	c--c	Password	Used

9.2.4   HBT – Heartbeat Supervision Sentence

$--HBT,x.x,A,x

Field	Format	Name	Comment
1	--SPW	Sentence Id	Used
2	x.x	Configured repeat interval	Used (Limited to 60 sec)
3	A	Equipment status	Used
4	x	Sequential sentence identifier	Ignored

9.3   **AIS Specific Input Sentences**

9.3.1   ABM – Addressed Binary and Safety-Related Message

!--ABM,x,x,x,xxxxxxxxx,x,x.x,s--s,x

Field	Format	Name	Comment
1	--ABM	Sentence Id	Used
2	x	Total nr of sentences	Used if in interval 1..9, otherwise the sentence is ignored
3	x	Sentence number	Used if in interval 1..total sentences, otherwise the sentence is ignored
4	x	Sequential message identifier	Used if in interval 0..3, otherwise the sentence is ignored
5	xxxxxxx xxx	MMSI of Destination	Used
6	X	AIS Channel	Used
7	x.x	Message Id	Used if 6 or 12, otherwise the sentence is ignored
8	s--s	Encapsulated Data	Used
9	x	Number of filled bits	Used

INTERPRETATION OF INPUT SENTENCES

9.3.2 ACA – AIS Regional Channel Assignment Message

The zone created of this sentence must be accepted by the channel management rules (size of zone, distance to own position, valid channel number etc). If the zone isn't accepted, the zone will be ignored.

$--ACA,x,llll.ll,a,yyyy.yy,a,llll.ll,a,yyyy.yy,a,x,xxxx,x,xxxx,x,x,x,a,x, hhmmss.ss

Field	Format	Name	Comment
1	--ACA	Sentence Id	Used
2	x	Sequence number	Ignored
3	llll.ll	NE latitude (2 fields)	Used
4	a		
5	yyyy.yy	NE longitude (2 fields)	Used
6	a		
7	llll.ll	SW latitude (2 fields)	Used
8	a		
9	yyyy.yy	SW longitude (2 fields)	Used
10	a		
11	x	Transitional zone size	Used
12	xxxx	Channel A	Used
13	x	Channel A bandwidth	Used
14	xxxx	Channel B	Used
15	x	Channel B bandwidth	Used
16	x	Tx/Rx mode	Used
17	x	Power level	Used
18	a	Information source	Ignored
19	x	In use flag	Ignored
20	hhmmss.ss	Time of In use change	Ignored

9.3.3 AIQ – Query Sentence

$--AIQ,ccc

Field	Format	Name	Comment
1	--	Talker ID of requester	Used
2	AIQ	Talker ID for device	Used
3	ccc	Approved sentence formatter of data being requested	It's possible to query the following sentences: ACA, ALR, EPV, LRI, SSD, TRL, TXT and VSD

9.3.4 AIR – AIS Interrogation Request

This sentence can also be used to do a "UTC Request".

$--AIR,xxxxxxxxx,x.x,x,x.x,x,xxxxxxxxx,x.x,x

Field	Format	Name	Comment
1	--AIR	Sentence Id	Used
2	xxxxxxxxx	MMSI 1	Used
3	x.x	Message ID 1.1	Used
4	x	Message sub section	Ignored
5	x.x	Message ID 1.2	Used, may be NULL
6	x	Message sub section	Ignored
7	xxxxxxxxx	MMSI 2	Used, may be NULL
8	x.x	Message ID 2.1	Used, may be NULL
9	x	Message sub section	Ignored
10	x	Channel	Used, may be NULL

INTERPRETATION OF INPUT SENTENCES

9.3.5 BBM – Broadcast Binary Message

$--BBM,x,x,x,x,x.x,s--s,x

Field	Format	Name	Comment
1	--BBM	Sentence Id	Used
2	X	Total number of sentences	Used if in interval 1..9, otherwise rejected
3	X	Sentence number	Used if in interval 1..total number of sentences, otherwise rejected.
4	X	Sequential message identifier	Used if in interval 0..9, otherwise rejected
5	X	AIS channel	Used
6	x.x	Message Id	Used if 8 or 14
7	s—s	Encapsulated data	Used
8	X	Number of filled bits	Used

9.3.6 SSD – Ship Static Data

$--SSD,c--c,c--c,xxx,xxx,xx,xx,c,aa

Field	Format	Name	Comment
1	--SSD	Sentence Id	Used
2	c--c	Call sign	Used, may be NULL
3	c--c	Name	Used, may be NULL
4	xxx	Pos ref A	Used to change position reference for the position source in use. May be NULL.
5	xxx	Pos ref B	Used to change position reference for the position source in use. May be NULL.
6	xx	Pos ref C	Used to change position reference for the position source in use. May be NULL.
7	xx	Pos ref D	Used to change position reference for the position source in use. May be NULL.
8	c	DTE	Ignored
9	aa	Source identifier	Used

9.3.7 VSD – Voyage Static Data

$--VSD,x.x,x.x,x.x,c--c,hhmmss.ss,xx,xx,x.x,x.x

Field	Format	Name	Comment
1	--VSD	Sentence Id	Used
2	x.x	Type of ship and cargo	Used
3	x.x	Maximum present draught	Used
4	x.x	Persons on-board	Used
5	c--c	Destination	Used
6	hhmmss.ss	Est. UTC of arrival	Used
7	Xx	Est. day of arrival	Used
8	Xx	Est. month of arrival	Used
9	x.x	Navigational status	Used
10	x.x	Regional application flags	Used

9.4 Long Range Input Sentences

9.4.1 On Long Range Port

The LR sentences can only be used with the Long Range interface port.

INTERPRETATION OF INPUT SENTENCES

9.4.1.1   LRF – AIS long-range function

$--LRF,x,xxxxxxxxx,c—c,c—c,c—c

Field	Format	Name	Comment
1	--LRF	Sentence Id	Used
2	x	Sequence number	Used
3	xxxxxxx xx	MMSI of requestor	Used
4	c--c	Name of requestor	Used
5	c--c	Function request	Used
6	c--c	Function reply status	Used

9.4.1.2   LRI – AIS long-range interrogation

$--LRI,x,a,xxxxxxxxx,xxxxxxxxx,llll.ll,a,yyyyy.yy,a,llll.ll,a,yyyyy.yy,a

Field	Format	Name	Comment
1	--LRI	Sentence Id	Used
2	x	Sequence number	Used
3	xxxxxxx xx	MMSI of requestor	Used
4	xxxxxxx x	MMSI of destination	Used
5	llll.ll	Latitude	Used
6	a	N / S	Used
7	yyyyy.y y	Longitude	Used
8	a	E / W	Used

9.4.2   On Other Input Ports

9.4.2.1   LRF – AIS long-range function

$--LRF,x,xxxxxxxxx,c—c,c—c,c—c

Field	Format	Name	Comment
1	--LRF	Sentence Id	Used
2	x	Sequence number	Used
3	xxxxxxx xx	MMSI of requestor	Used
4	c--c	Name of requestor	Used
5	c--c	Function request	Used
6	c--c	Function reply status	Used

9.5   Proprietary Input Sentences

All Saab TransponderTech Proprietary Sentences will have talker ID PSTT.

9.5.1   Proprietary Query message PSTT,101

$PSTT,101,c--c,

Field	Format	Name	Comment
1	PSTT	Proprietary SAAB TranspondeTech Sentence	Used
2	101	Sentence Query	Used
3	c--c	Proprietary sentence to query	Used

INTERPRETATION OF INPUT SENTENCES

10 INTERPRETATION OF OUTPUT SENTENCES

10.1 Proprietary Output Sentences (PSTT)

In addition to the standardized IEC sentences, the R5 SUPREME System is able to output the proprietary sentences listed below. All Saab TransponderTech Proprietary Sentences have talker ID "PSTT".

10.1.1 $PSTT,10A – UTC Date and Time

This sentence provides UTC Date and Time, i.e. R5 SUPREME system time (based on internal GNSS time). It is output approximately once every 10 seconds (± 1 s).

$PSTT,10A,YYYYMMDD,HHMMSS

Field	Format	Name	Comment
1	10A	Sentence Id	10A always
2	YYYYMMDD	Date	Year, month and day in decimal notation. (00000000 = Not available)
3	HHMMSS	Time	Hour, minute and second in decimal notation. (999999 = Not available)

Example: $PSTT,10A,20121028,135230*<FCS><CR><LF>

= Date   October 28, 2012

= Time   13:52:30 UTC

10.1.2 $PSTT,10C – Data Link Status

This sentence provides information about the traffic on the VHF data link. It is output approximately once every 60 seconds. Traffic load is calculated over the last frame (i.e. 60 seconds). Number of units is derived from the internal user list and is generally the number of received units within the last few minutes.

$PSTT,10C,C,LLL,NNNN

Field	Format	Name	Comment
1	10C	Sentence Id	10C always
2	C	Channel	A = VDL Channel A B = VDL Channel B
3	LLL	Traffic Load	Data link traffic load in precent, 0-100.
4	NNNN	Number of Units	Number of units occupying the data link

10.1.3 $PSTT,146 – System Operational Mode Status

This sentence reports the system operational mode. This sentence is output on change, periodically every minute and on request using PSTT,101.

$PSTT,146,x,x,x*hh<CR><LF>

Field	Format	Name	Comment
1	146	Sentence Id	146 always
2	X	1 W Mode	0 = Default 1 = 1 Watt
3	X	System Mode	0 = Class A 1 = Inland
4	X	Transmit mode	0 = Normal 1 = Silent

INTERPRETATION OF OUTPUT SENTENCES

10.1.4 $PSTT,1F3 – Transponder Restart

This sentence will be output when the transponder has restarted.

$PSTT,1F3,R

Field	Format	Name	Comment
1	1F3	Sentence Id	1F3 always
2	R	Restart Reason	0 = Unknown 1 = Cold Start 2 = General Protection Fault 3 = Power Fail 4 = Warm Start

10.2 Long Range Output Sentences

10.2.1 On Long Range Port

10.2.1.1 LR1 – AIS long-range reply sentence 1

$--LR1,x,xxxxxxxxx,xxxxxxxxx,c—c,c—c,xxxxxxxxx

Field	Format	Name	Comment
1	--LR1	Sentence Id	Used
2	x	Sequence number	Used
3	xxxxxxxxx	MMSI of responder	Used
4	xxxxxxxxx	MMSI of requestor (reply destination	Used
5	c--c	Ship's name	Used
6	c--c	Call sign	Used
7	xxxxxxxxx	IMO Number	Used

10.2.1.2 LR2 – AIS long-range reply sentence 2

$--LR2,x,xxxxxxxxx,xxxxxxxx,hhmmss.ss,llll.ll,a,yyyyy.yy,a,x.x,T,x.x,N

Field	Format	Name	Comment
1	--LR2	Sentence Id	Used
2	x	Sequence number	Used
3	xxxxxxxxx	MMSI of responder	Used
4	xxxxxxxx	Date	Used
5	hhmmss.ss	UTC time of position	Used
6	llll.ll	Latitude	Used
7	a	N / S	Used
8	yyyyy.yy	Longitude	Used
9	a	E / W	Used
10	x.x	Course over ground	Used
11	T	Validity of COG	Used
12	x.x	Speed over ground	Used
13	N	Validity of SOG	Used

10.2.1.3 LR3 – AIS long-range reply sentence 3

$--LR3,x,xxxxxxxxx,c—c,xxxxxx,hhmmss.ss,x.x,x.x,x.x,x.x,x.x,x.x

Output rate: On event

Field	Format	Name	Comment
1	--LR3	Sentence Id	Used
2	x	Sequence number	Used

INTERPRETATION OF OUTPUT SENTENCES

3	xxxxxxx xx	MMSI of responder	Used
4	c--c	Voyage destination	Used
5	xxxxxxx x	ETA Date	Used
6	hhmmss. ss	ETA time	Used
7	x.x	Draught	Used
8	x.x	Ship / Cargo	Used
9	x.x	Ship length	Used
10	x.x	Ship width	Used
11	x.x	Ship type	Used
12	x.x	Persons	Used

10.2.1.4   LRF – AIS long-range function

$--LRF,x,xxxxxxxxx,c—c,c—c,c—c

Output rate: On event

Field	Format	Name	Comment
1	--LRF	Sentence Id	Used
2	x	Sequence number	Used
3	xxxxxxx xx	MMSI of requestor	Used
4	c--c	Name of requestor	Used
5	c--c	Function request	Used
6	c--c	Function reply status	Used

10.2.2   On All Other Output Ports

10.2.2.1   LRF – AIS long-range function

$--LRF,x,xxxxxxxxx,c—c,c—c,c—c

Output rate: On event

Field	Format	Name	Comment
1	--LRF	Sentence Id	Used
2	x	Sequence number	Used
3	xxxxxxx xx	MMSI of requestor	Used
4	c--c	Name of requestor	Used
5	c--c	Function request	Used
6	c--c	Function reply status	Used

10.2.2.2   LRI – AIS long-range interrogation

$--LRI,x,a,xxxxxxxxx,xxxxxxxxx,llll.ll,a,yyyyy.yy,a,llll.ll,a,yyyyy.yy,a

Output rate: On event

Field	Format	Name	Comment
1	--LRI	Sentence Id	Used
2	x	Sequence number	Used
3	xxxxxxx xx	MMSI of requestor	Used
4	xxxxxxx x	MMSI of destination	Used
5	llll.ll	Latitude	Used
6	a	N / S	Used
7	yyyyy.y y	Longitude	Used
8	a	E / W	Used

INTERPRETATION OF OUTPUT SENTENCES

10.3 AIS Output Sentences

10.3.1 ABK – AIS Addressed and binary broadcast acknowledgement

$ -- ABK,xxxxxxxxx,x,x.x,x,x

Output rate: On event.

Field	Format	Name	Comment
1	--ABK	Sentence Id	Used
2	xxxxxxxxx	MMSI of the addressed AIS unit	Used
3	x	AIS channel of reception	Used
4	x.x	ITU - R M.1371 Message ID	Used
5	x	Message sequence number	Used
6	x	Type of acknowledgement	Used

10.3.2 ACA – AIS Regional Channel Assignment Message

$--ACA,x,llll.ll,a,yyyy.yy,a,llll.ll,a,yyyy.yy,a,x,xxxx,x,xxxx,x,x,x,a,x,
hhmmss.ss

Output rate: On event. On request.

Field	Format	Name	Comment
1	--ACA	Sentence Id	Used
2	x	Sequence number	Ignored
3	llll.ll	NE latitude (2 fields)	Used
4	a		
5	yyyy.yy	NE longitude (2 fields)	Used
6	a		
7	llll.ll	SW latitude (2 fields)	Used
8	a		
9	yyyy.yy	SW longitude (2 fields)	Used
10	a		
11	x	Transitional zone size	Used
12	xxxx	Channel A	Used
13	x	Channel A bandwidth	Used
14	xxxx	Channel B	Used
15	x	Channel B bandwidth	Used
16	x	Tx/Rx mode	Used
17	x	Power level	Used
18	a	Information source	Ignored
19	x	In use flag	Ignored
20	hhmmss.ss	Time of In use change	Ignored

10.3.3 ALR – Set alarm state

$--ALR,hhmmss.ss,xxx,A, A,c--c

Output rate: On event, on request, and automatically. Output every 30s for active alarms and every 60s when no active alarms.

Field	Format	Name	Comment
1	--ALR	Sentence Id	Used
2	hhmmss.ss	Time of alarm condition change, UTC	Used
3	Xxx	Unique alarm number (identifier) at alarm source	Used

INTERPRETATION OF OUTPUT SENTENCES

4	A	Alarm condition A = threshold exceeded V = not exceeded	Used
5	A	Alarm's acknowledge state A = acknowledged V = unacknowledged	Used
6	c--c	Alarm's description text	Used

10.3.4   EPV – Command or report equipment property value

$--EPV,a,c--c,c--c,x.x,c—c

Output rate: On request.

Field	Format	Name	Comment
1	--EPV	Sentence Id	Used
2	a	Sentence status flag	Used
3	c--c	Destination equipment type	Used
4	c--c	Unique Identifier	Used
5	x.x	Property identifier	Used
6	c--c	Value of property	Used

10.3.5   NAK – Negative acknowledgement

$--NAK,cc,ccc,c--c,x.x,c—c

Output rate: On event

Field	Format	Name	Comment
1	--NAK	Sentence Id	Used
2	cc	Talker identifier	Used
3	ccc	Affected sentence formatter	Used
4	c--c	Unique Identifier	Used
5	x.x	Reason code for negative acknowledgement	Used
6	c--c	Negative acknowledgement's descriptive text	Used

10.3.6   SSD – Ship Static Data

$--SSD,c--c,c--c,xxx,xxx,xx,xx,c,aa

Output rate: On request.

Field	Format	Name	Comment
1	--SSD	Sentence Id	Used
2	c--c	Call sign	Used, may be NULL
3	c--c	Name	Used, may be NULL
4	xxx	Pos ref A	Used to change position reference for the position source in use. May be NULL.
5	xxx	Pos ref B	Used to change position reference for the position source in use. May be NULL.
6	xx	Pos ref C	Used to change position reference for the position source in use. May be NULL.
7	xx	Pos ref D	Used to change position reference for the position source in use. May be NULL.
8	c	DTE	Ignored
9	aa	Source identifier	Ignored

10.3.7   TRL – AIS transmitter non functioning log

$--TRL,x.x,x.x,x,xxxxxxxx,hhmmss.ss,xxxxxxxx,hhmmss.ss,x

INTERPRETATION OF OUTPUT SENTENCES

Output rate: On request. Up to 10 sentences in a burst.

Field	Format	Name	Comment
1	--TRL	Sentence Id	Used
2	x.x	Total number of log entries	Used
3	x.x	Log entry number	Used
4	x	Sequential message identifier	Used
5	xxxxxxxx	Switch off date	Used
6	hhmmss.ss	Switch off UTC time	Used
7	xxxxxxxx	Switch on date	Used
8	hhmmss.ss	Switch on UTC time	Used
9	X	Reason code1	Used

10.3.8 TXT – Text transmission

$--TXT,xx,xx,xx,c--c

Output rate: On request, on event.

Field	Format	Name	Comment
1	--TXT	Sentence Id	Used
2	xx	Total number of sentences	Used
3	xx	Sentence number	Used
4	xx	Text identifier	Used
5	c--c	Text message	Used

10.3.9 VDM – AIS VHF data-link message

!--VDM,x,x,x,a,s—s,x

Only output on serial port when baudrate is 38400 bps or higher.

Output rate: On VHF message receive event.

Field	Format	Name	Comment
1	--VDM	Sentence Id	Used
2	X	Total number of sentences needed to transfer the message	Used
3	X	Sentence number	Used
4	X	Sequential message identifier	Used
5	A	AIS channel	Used
6	s—s	Encapsulated ITU-R M.1371 radio message	Used
7	X	Number of fill bits	Used

10.3.10 VDO – AIS VHF data-link own-vessel report

!--VDO,x,x,x,a,s—s,x

Only output on serial port when baudrate is 38400 bps or higher.

Output rate: On VHF transmission event. "Dummy" messages once per second.

Field	Format	Name	Comment
1	--VDO	Sentence Id	Used
2	X	Total number of sentences needed to transfer the message	Used
3	X	Sentence number	Used
4	X	Sequential message identifier	Used
5	A	AIS channel	Used for transmission event. Not used for "dummy" position messages.

INTERPRETATION OF OUTPUT SENTENCES

6	s—s	Encapsulated ITU-R M.1371 radio message	Used
7	X	Number of fill bits	Used

10.3.11 VER – Version

$--VER,x,x,aa,c--c,c--c,c--c,c--c,c--c,c--c,x

Output rate: On request.

Field	Format	Name	Comment
1	--VER	Sentence Id	Used
2	x	Total number of sentences	Always 1
3	x	Sentence number	Always 1
4	aa	Device Type	Used
5	c--c	Vendor ID	Used
6	c--c	Unique Identifier	Used
7	c--c	Manufacturer serial number	Used
8	c--c	Model code	Used
9	c--c	Software revision	Used
10	c--c	Hardware revision	Used
11	x	Sequential message identifier	Always NULL

10.3.12 VSD – Voyage Static Data

$--VSD,x.x,x.x,x.x,c--c,hhmmss.ss,xx,xx,x.x,x.x

Output rate: On request.

| Field	Format	Name	Comment
1	--VSD	Sentence Id	Used
2	x.x	Type of ship and cargo	Used
3	x.x	Maximum present draught	Used
4	x.x	Persons on-board	Used
5	c--c	Destination	Used
6	hhmmss.ss	Est. UTC of arrival	Used
7	Xx	Est. day of arrival	Used
8	Xx	Est. month of arrival	Used
9	x.x	Navigational status	Used
10	x.x	Regional application flags	Used

11 ALTERNATE SYSTEM SETUPS

11.1 Dual CDU

Additional R5 CDU units can be connected to the same R5 SUPREME transponder, if connected to the same network.

NOTE: If using two or more CDU units connected to the same transponder, it is important to only do AIS configuration from one unit at a time. Failure to do so may result in unexpected results.
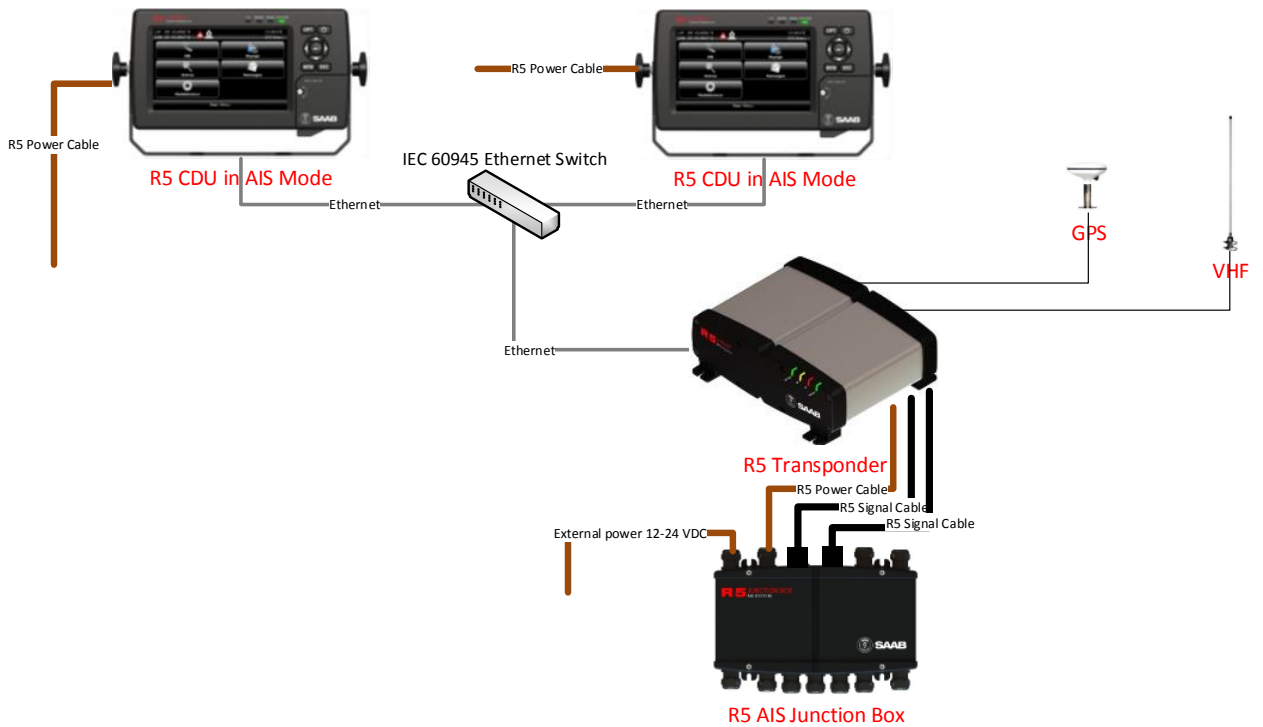
HW Parts in addition to a standard R5 SUPREME AIS kit:

R5 CDU - 7000 118-530

R5 Power Cable, 2m - 7000 118-077

2 x R5 SUPREME Ethernet Cable, 5m - 7000 000-525

Ethernet switch

11.2 Combined AIS and Navigation system setup

Below details how to install a combined AIS MKD and Navigation system, using one CDU.

The CDU can act as both AIS MKD and Navigation system at the same time. The initial system setup wizard will activate the correct dialogs and menus.

Running the CDU in this mode will activate many more functions and views in the system, not detailed in this manual. For information about navigation functions and setup, please see the navigation system manual: 7000 118-301, R5 SUPREME Navigation System manual.
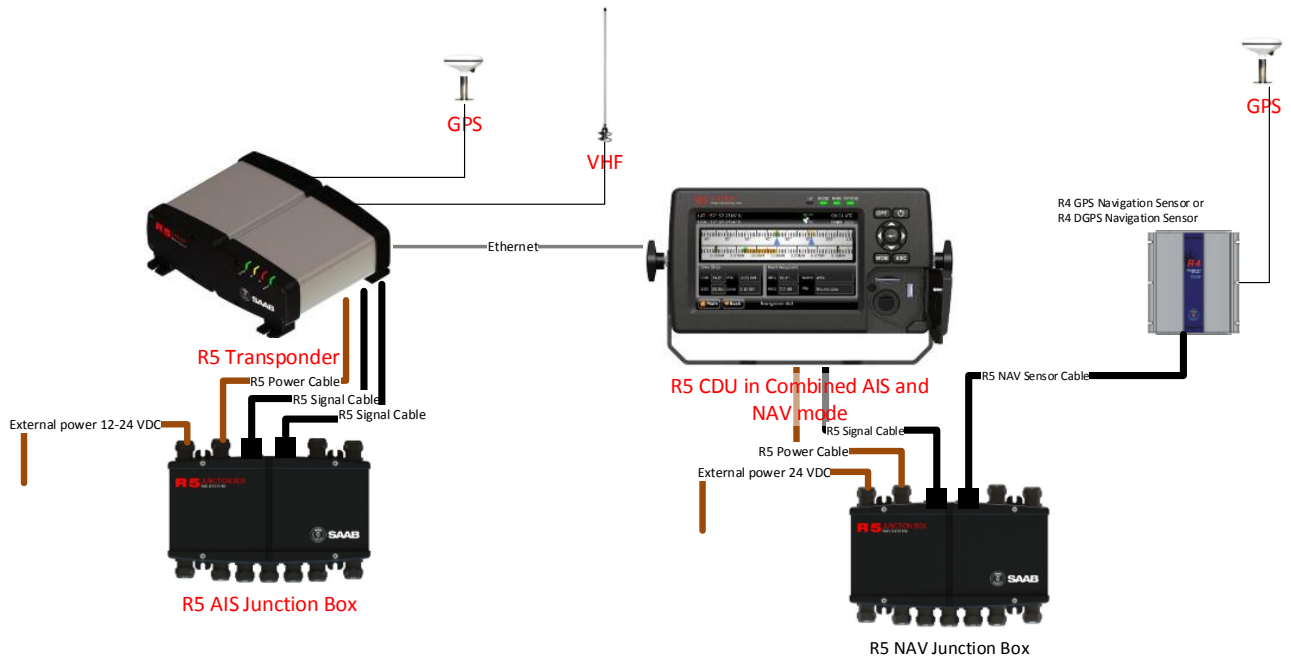

Figure 56- Combined AIS and Navigation system

HW Parts in addition to a standard R5 SUPREME AIS kit:

R4 Navigation sensor. 7000 109-141(GPS) or 7000 109-140 (DGPS)s

R4 Navigation sensor antenna 7000 000-263 (GPS) or 7000 000-359 (DGPS)

R5 NAV Junction box - 7000 118-121 (Optional)

With R5 Nav Junction Box only:

R5 Navigation Sensor Power and Signal Cable, 2m - 7000 118-122

R5 Signal cable DSUB-DSUB, 2m - 7000 118-286

Without R5 Nav Junction Box only:

R4 Navigation Sensor Power and Signal Cable, 2m - 7000 109-011
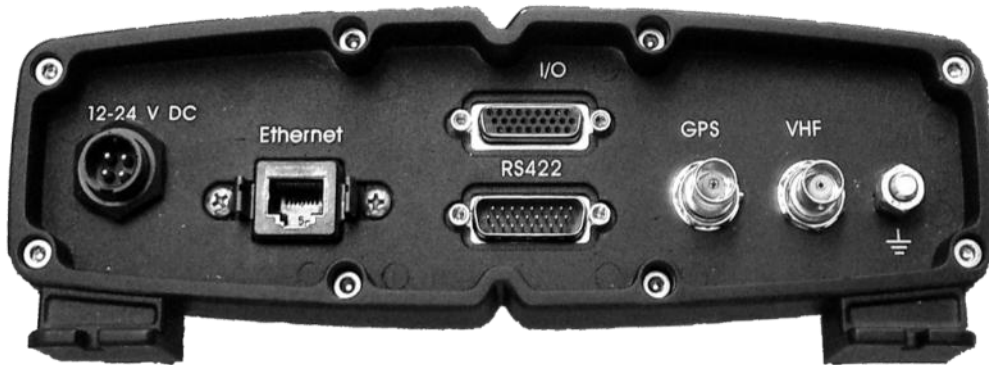
R5 Signal cable DSUB-OPEN, 2m - 7000 118-078

12 ELECTRICAL INTERFACES

For details in RS-422 Baud rates and Sensor input priority please see section 3.12.1 "Input port priority"

12.1 Transponder interface details

12.1.1 RS422 port - 26-pole H.D.D-SUB Male

Pin	In/Out	Signal Name	Signal Type
1	Out	ECDIS - TxB (+)	RS422
2	Out	ECDIS - TxA (-)	RS422
3	In	Sensor1 - RxB (+)	RS422
4	In	Sensor1 - RxA (-)	RS422
5	In	Sensor2 - RxB (+)	RS422
6	In	Sensor2 - RxA (-)	RS422
7	In	Long Range - RxB (+)	RS422
8	In	Long Range - RxA (-)	RS422
9	-	Long Range - GND	RS422
10	-	ECDIS - GND	RS422
11	In	ECDIS – RxB (+)	RS422
12	In	ECDIS – RxA (-)	RS422
13	-	Sensor1 – GND	RS422
14	-	Sensor2 – GND	RS422
15	In	Sensor3 – RxB (+)	RS422
16	In	Sensor3 – RxA (-)	RS422
17	Out	Long Range – TxB (+)	RS422
18	Out	Long Range – TxA (-)	RS422
19	-	Alarm Relay – GND	-
20	Out	Alarm Relay – Out	-
21	-	GND	-
22	-	-	-
23	-	Sensor3 – GND	RS422
24	-	Alarm Relay - VCC	-
25	-	-	-
26	-	-	-

Table 13 – Transponder RS422 Port

12.1.2   I/O port - 26-pole H.D.D-SUB Female

Pin	In/Out	Signal Name	Signal Type
1	Out	Sensor 1 – TxB (+)	RS422
2	Out	Sensor 1 – TxA (-)	RS422
3	-	GND	-
4	-	GND	-
5	Out	Sensor 2 – TxA (-)	RS422
6	Out	Sensor 2 – TxB (+)	RS422
7	Out	Sensor 3 – TxA (-)	RS422
8	Out	Sensor 3 – TxB (+)	RS422
9	In	SW LOAD	Binary
10	-	GND	-
11	In/Out	USB Host (-)	Differential USB
12	In/Out	USB Host (+)	Differential USB
13	-	USB Host VCC	-
14	-	GND	-
15	In	Pilot Port – RxA (-)	RS422
16	In	Pilot Port – RxB (+)	RS422
17	Out	Pilot Port – TxA (-)	RS422
18	Out	Pilot Port – TxB (+)	RS422
19	In	General I/O 3 – In	Binary
20	Out	General I/O 0 – Out	Binary
21	In	General I/O 2 – In	Binary
22	Out	General I/O 1 – Out	Binary
23	In	General I/O 1 – In	Binary
24	Out	General I/O 2 – Out	Binary
25	Out	General I/O 3 – Out	Binary
26	In	General I/O 0 – In	Binary

Table 14 – I/O Transponder Port

12.1.3   Power port

Pin	In/Out	Signal Name	Signal Type
1	In	PWR +	24 VDC
2	In	PWG GND	0 VDC
3	In	Ext Switch R	See instr.
4	In	Ext Switch F	See instr.

12.1.4   Ethernet port – RJ-45 100 MBit – IEC 61162-450

12.1.5   GPS port - TNC (Female) - 5 VDC

12.1.6   VHF port - BNC (Female)

12.1.7   GND Screw – M6

ELECTRICAL INTERFACES
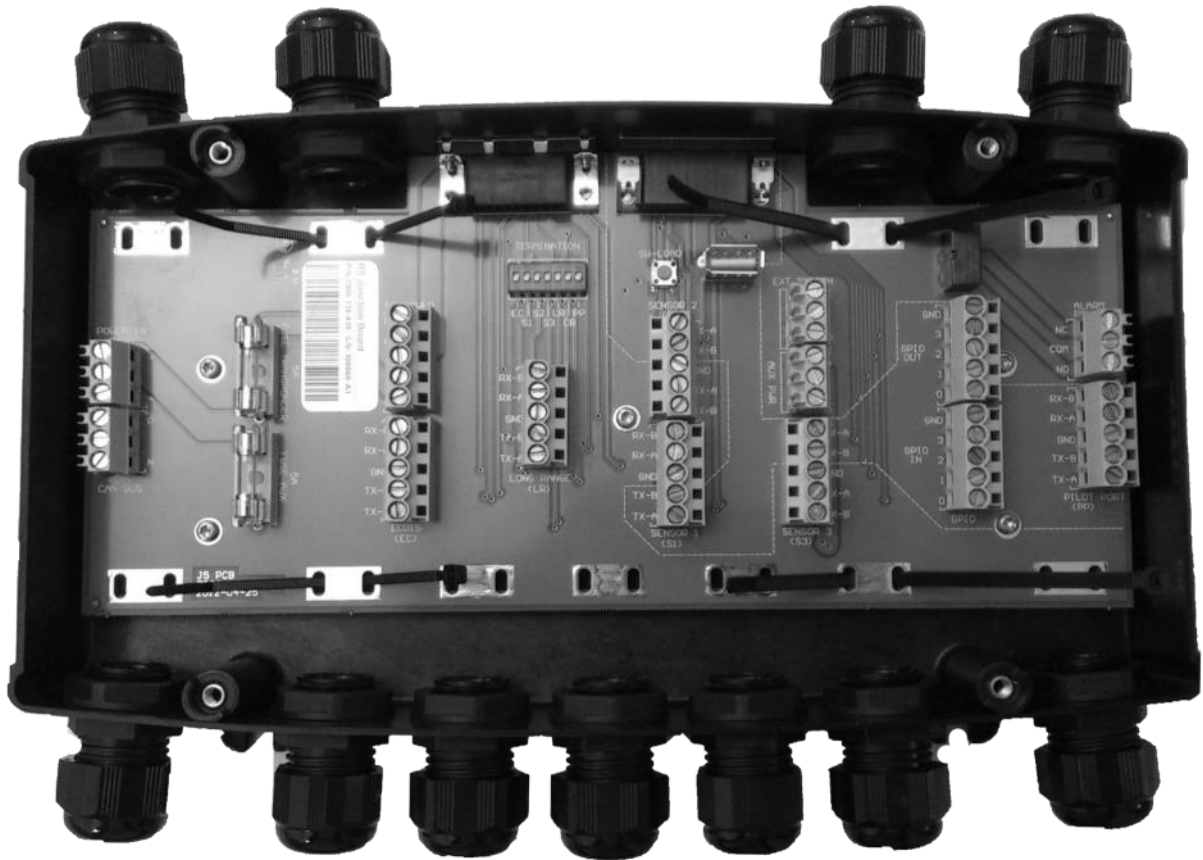
12.2 **R5 AIS Junction box Interfaces**

Figure 57 – R5 AIS Junction box

12.2.1 **External ports:**

12.2.1.1.1 26 pin DSUB Female port:

Connects R5 Signal Cable DSUB-DSUB to Transponder "RS422"

12.2.1.1.2 26 pin DSUB Male port:

Connects reversed R5 Signal Cable DSUB-DSUB to Transponder "I/O"

12.2.1.1.3 Cable gland ports:

 M20: Will fit 6-12 mm cables. For larger cables please unscrew the cable gland. See description of internal connectors below.

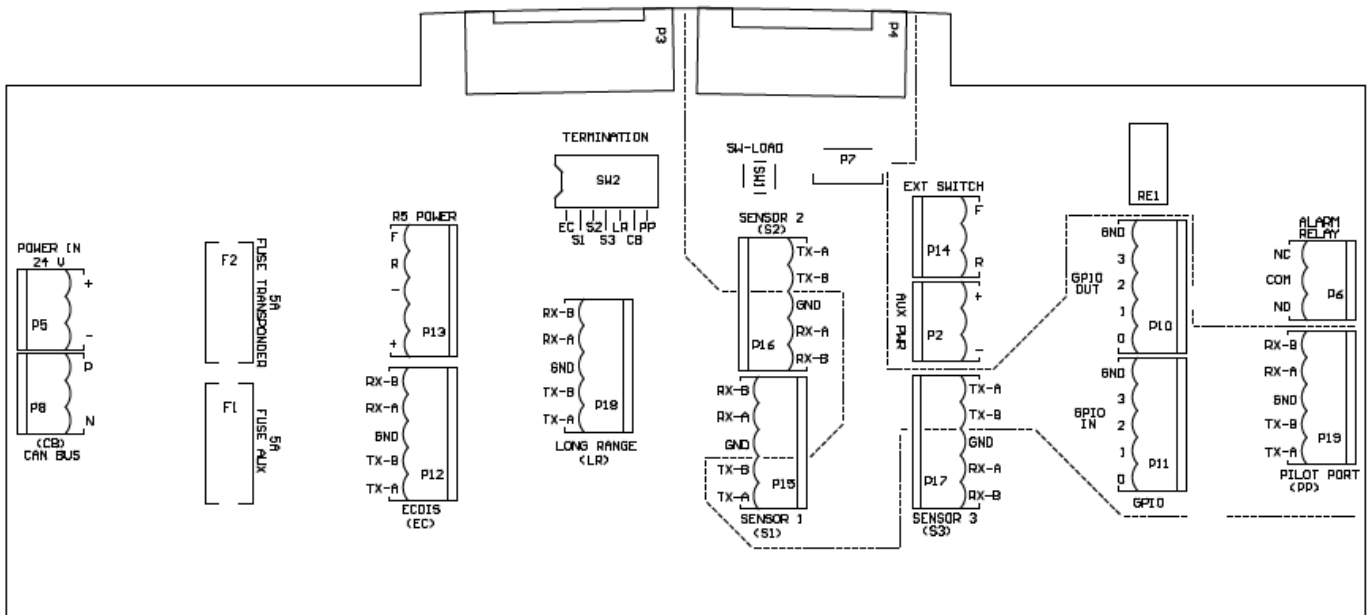### 12.2.2 Internal Screw terminals and components

Figure 58 – Circuit Board Layout and markings

The table below details all the screw terminal connections when connected with two R5 Signal Cables to an R5 SUPREME Transponder

Item[1]	Terminal Marking	Pin Marking	Signal	Connects to
P2	AUX PWR	+	Ext Power In by AUX PWR FUSE	CDU R5 Power Cable Red
		-	Power In -	CDU R5 Power Cable Black
P5	POWER IN	+	Ext Power In +	External power
		-	Ext Power In -	External power
P6	ALARM RELAY	NC	Alarm Relay NC	Junction box Alarm relay
		COM	Alarm Relay COM	Junction box Alarm relay
		NO	Alarm Relay NO	Junction box Alarm relay
P8	CAN BUS	P	CAN Bus P	R5 **RS422 Pin 25**
		N	CAN Bus N	R5 **RS422 Pin 26**
P10	GPIO OUT	0	GPIO OUT 0	R5 **I/O Pin 20**
		1	GPIO OUT 1	R5 **I/O Pin 22**
		2	GPIO OUT 2	R5 **I/O Pin 24**
		3	GPIO OUT 3	R5 **I/O Pin 25**
		GND	GPIO OUT GND	R5 **I/O Pin 3**
P11	GPIO IN	0	GPIO IN 0	R5 **I/O Pin 26**
		1	GPIO IN 1	R5 **I/O Pin 23**
		2	GPIO IN 2	R5 **I/O Pin 21**
		3	GPIO IN 3	R5 **I/O Pin 19**
		GND	GPIO IN GND	R5 **I/O Pin 3**
P12	ECDIS	TX-A	ECDIS TX-A	R5 **RS422 Pin 2**

ELECTRICAL INTERFACES

Item[1]	Terminal Marking	Pin Marking	Signal	Connects to
		TX-B	ECDIS TX-B	R5 **RS422 Pin 1**
		GND	ECDIS GND	R5 **RS422 Pin 10**
		RX-A	ECDIS RX-A	R5 **RS422 Pin 12**
		RX-B	ECDIS RX-B	R5 **RS422 Pin 11**
P13	R5 POWER	+	R5 Power +	Transponder R5 Power Cable Red
		-	R5 Power -	Transponder R5 Power Cable Black
		R	R5 Power R	Transponder R5 Power Cable Brown
		F	R5 Power F	Transponder R5 Power Cable Orange
P14	EXT SWITCH	F	Ext Switch F	Terminal R5 power **F**
		R	Ext Switch R	Terminal R5 power **R**
P15	SENSOR 1	TX-A	Sensor 1 TX-A	R5 **I/O pin 2**
		TX-B	Sensor 1 TX-B	R5 **I/O pin 1**
		GND	Sensor 1 GND	R5 **RS422 Pin 13**
		RX-A	Sensor 1 RX-A	R5 **RS422 Pin 4**
		RX-B	Sensor 1 RX-B	R5 **RS422 Pin 3**
P16	SENSOR 2	TX-A	Sensor 2 TX-A	R5 **I/O pin 5**
		TX-B	Sensor 2 TX-B	R5 **I/O pin 6**
		GND	Sensor 2 GND	R5 **RS422 Pin 14**
		RX-A	Sensor 2 RX-A	R5 **RS422 Pin 6**
		RX-B	Sensor 2 RX-B	R5 **RS422 Pin 5**
P17	SENSOR 3	TX-A	Sensor 3 TX-A	R5 **I/O pin 7**
		TX-B	Sensor 3 TX-B	R5 **I/O pin 8**
		GND	Sensor 3 GND	R5 **RS422 Pin 23**
		RX-A	Sensor 3 RX-A	R5 **RS422 Pin 16**
		RX-B	Sensor 3 RX-B	R5 **RS422 Pin 15**
P18	LONG RANGE	TX-A	Long Range TX-A	R5 **RS422 Pin 18**
		TX-B	Long Range TX-B	R5 **RS422 Pin 17**
		GND	Long Range GND	R5 **RS422 Pin 9**
		RX-A	Long Range RX-A	R5 **RS422 Pin 8**
		RX-B	Long Range RX-B	R5 **RS422 Pin 7**
P19	PILOT PORT	TX-A	Pilot Port TX-A	R5 **I/O pin 17**
		TX-B	Pilot Port TX-B	R5 **I/O pin 18**
		GND	Pilot Port GND	R5 **I/O pin 4**
		RX-A	Pilot Port RX-A	R5 **I/O pin 15**
		RX-B	Pilot Port RX-B	R5 **I/O pin 16**

Table 15 - Screw terminals

Below table details additional components in the Junctionbox

Item	Description
SW2	Termination Switches for ECDIS, Sensor 1, Sensor 2, Sensor 3, Long Range, CAN Bus and Pilot Port
SW1	Push-button for Software Load
P3	D-SUB Connector for R5 Signal Cable connected to transponder port **RS422**
P4	D-SUB Connector for R5 Signal Cable connected to transponder port **I/O**
P7	USB connector for Software Upgrade of Transponder
F1	5A fuse for AUX PWR
F2	5A fuse for R5 POWER

Table 16 - Additional Junction box components

12.3 CDU Interfaces:

12.3.1   CDU Back:

12.3.1.1   Ethernet port – RJ-45 100 MBit – IEC 61162-450

12.3.1.2   I/O port - 26-pole H.D.D-SUB Female

Only used in Combination with R4 Navigation Sensor installations.

12.3.1.3   GND Screw – M6

12.3.1.4   Power port

Pin	In/Out	Signal Name	Signal Type
1	In	PWR +	24 VDC
2	In	PWG GND	0 VDC

12.3.2   CDU Front hatch:

Figure 59- CDU Front ports

12.3.2.1   USB Host Type A

USB 2.0.

12.3.2.2   CDU Pilot Plug RS-422

This bi-directional port is routed over Ethernet to the Transponder.
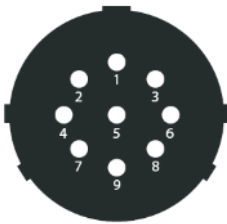
Figure 60 - CDU Pilot plug pin numbering

Pilot plug	Signal Type
PIN 9	RS-422 GND
PIN 1	RS-422 TX-A
PIN 5	RS-422 RX-A
PIN 4	RS-422 TX-B
PIN 6	RS-422 RX-B

Table 17 – CDU Pilot port signals

12.3.3   Secure Digital Card Reader

13 MECHANICAL DRAWINGS

13.1 Transponder Physical Size and Mechanical Drawing
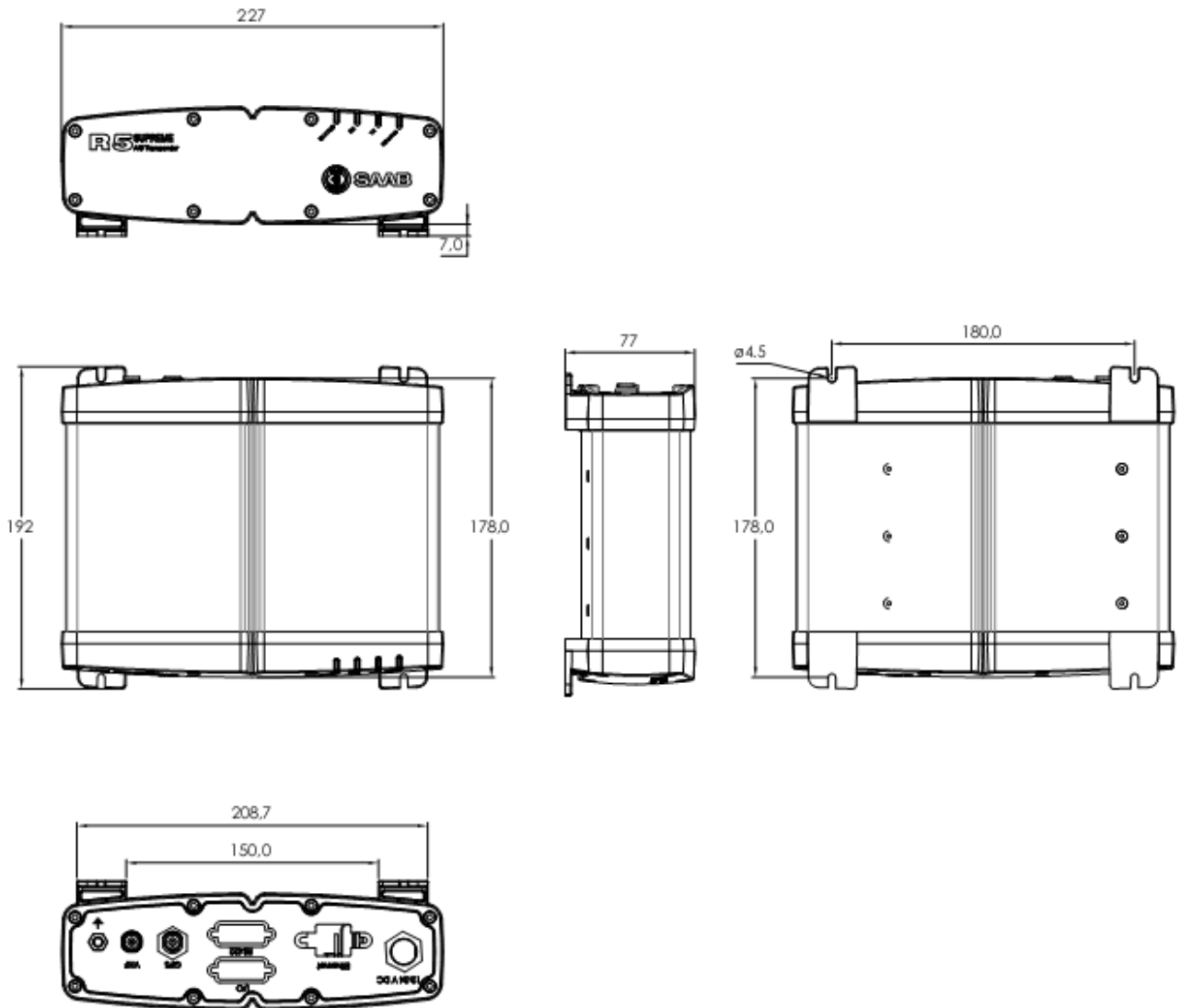
Figure 61 – R5 SUPREME Transponder, Dimensions

13.2 CDU Physical Size and Mechanical Drawing
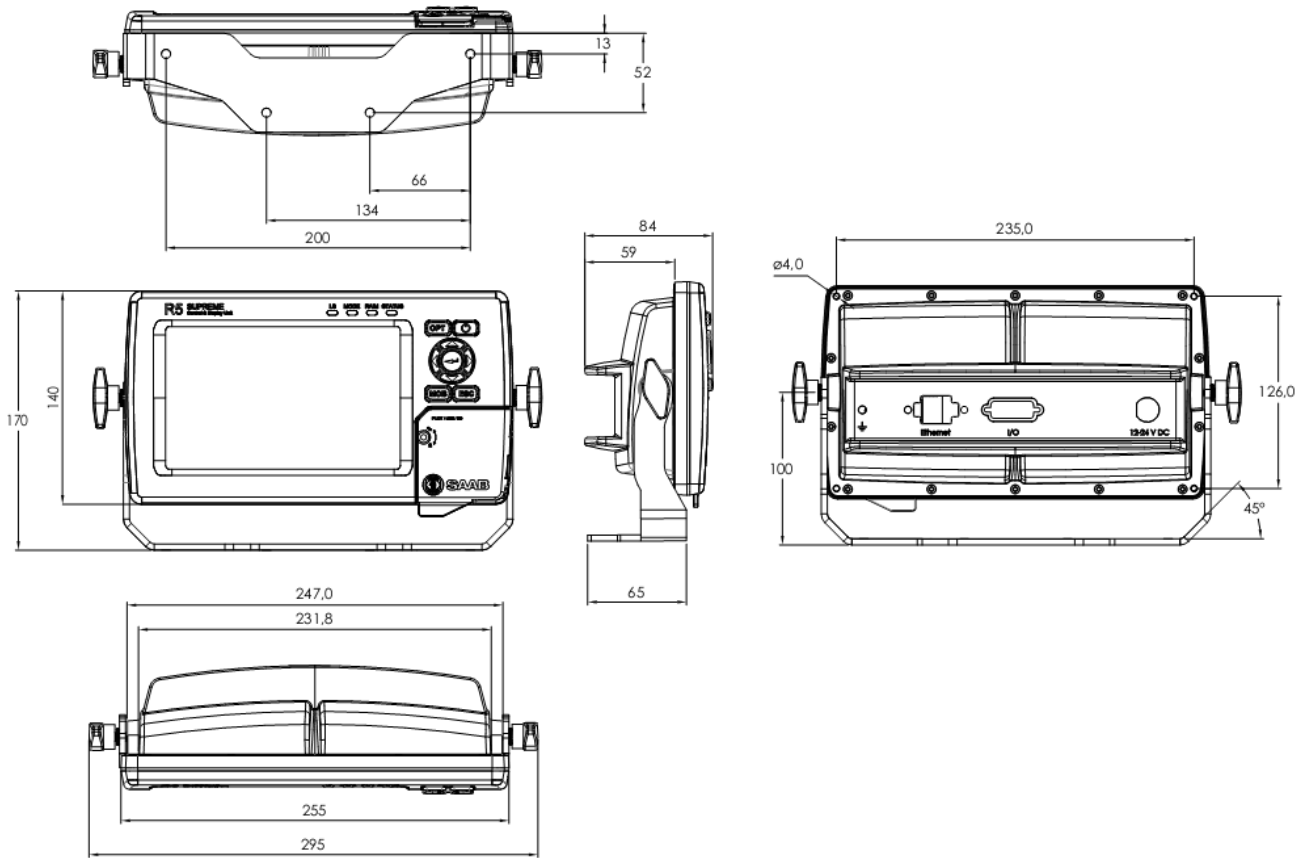
Figure 62 – R5 SUPREME CDU Mechanical Drawing (mm)

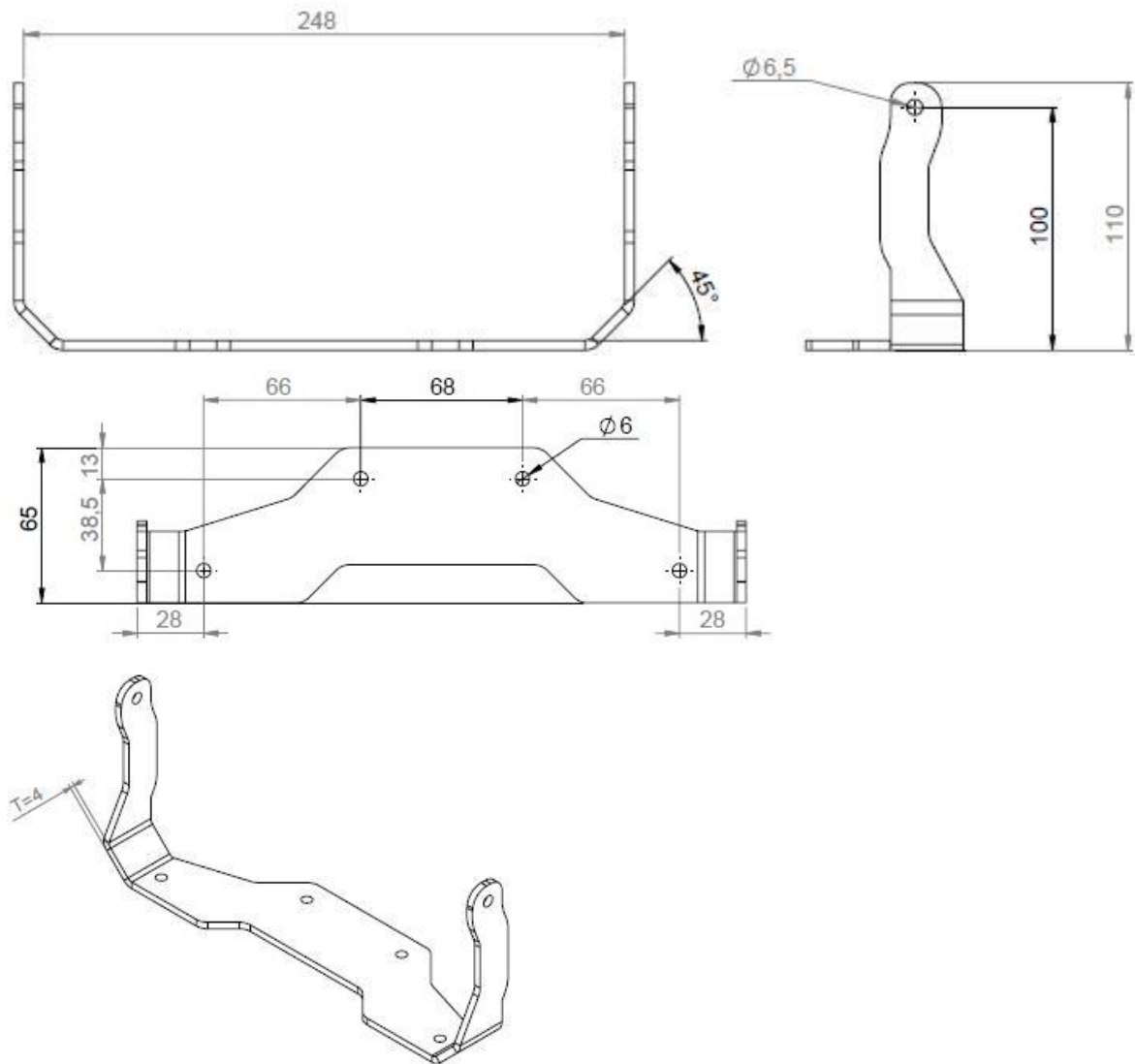## 13.3 CDU Gimbal Mount Physical Size and Mechanical Drawing

Figure 63 – R5 SUPREME CDU, Gimbal Mount

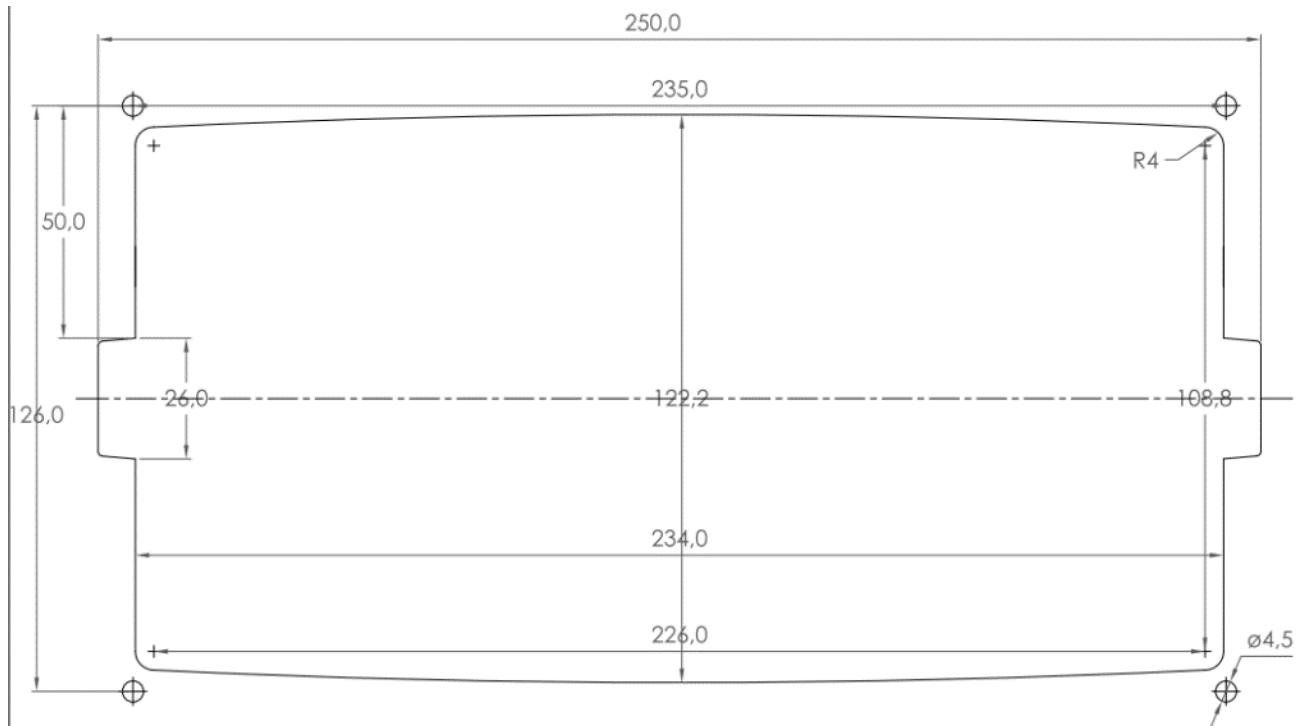### 13.4 CDU Cutout Measurements for Panel Mount

Figure 64 – R5 SUPREME CDU, Cutout Measurements for Panel Mount [mm]
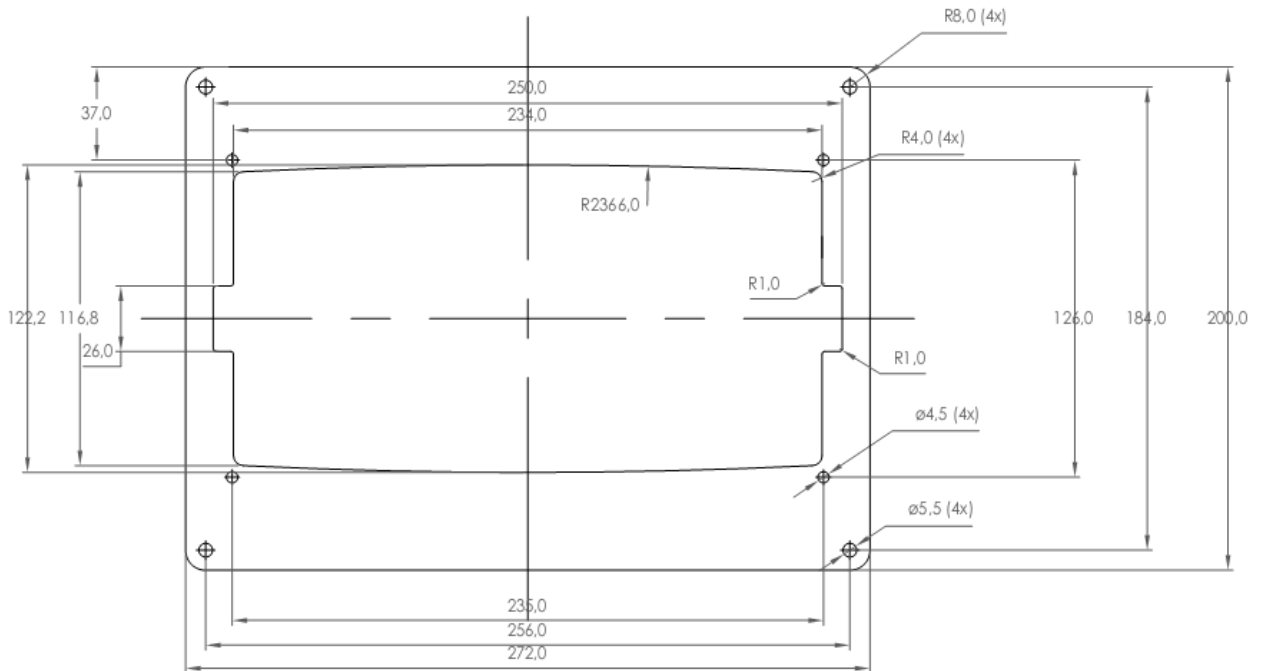
13.5 CDU Mounting Frame cutout and dimensions
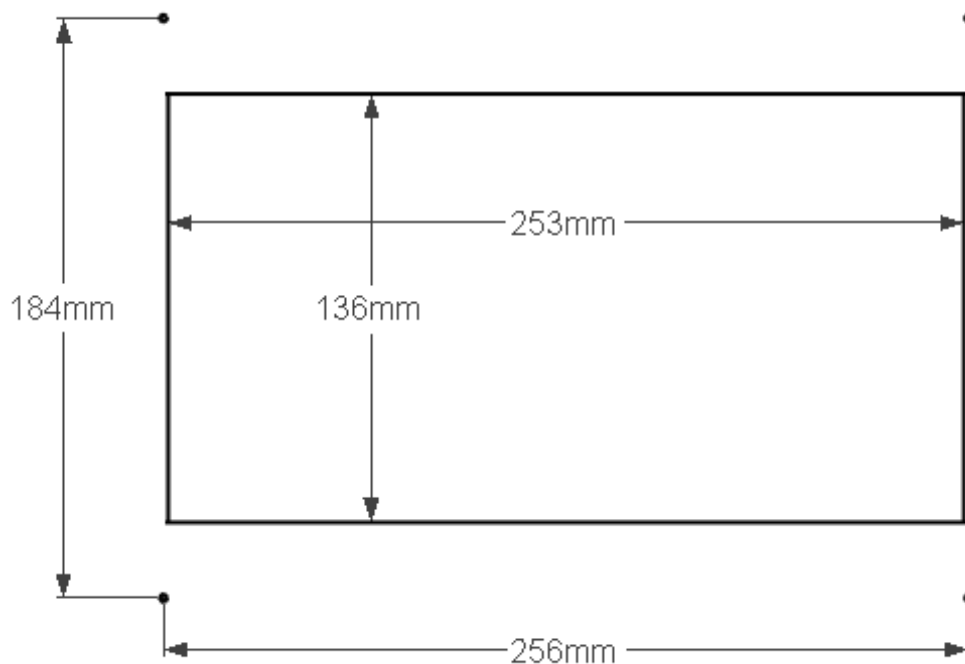

Figure 65 – R5 SUPREME CDU, Mounting frame dimensions

Figure 66 – R5 SUPREME CDU, Cutout Measurements for Panel Flush Mount (mm)

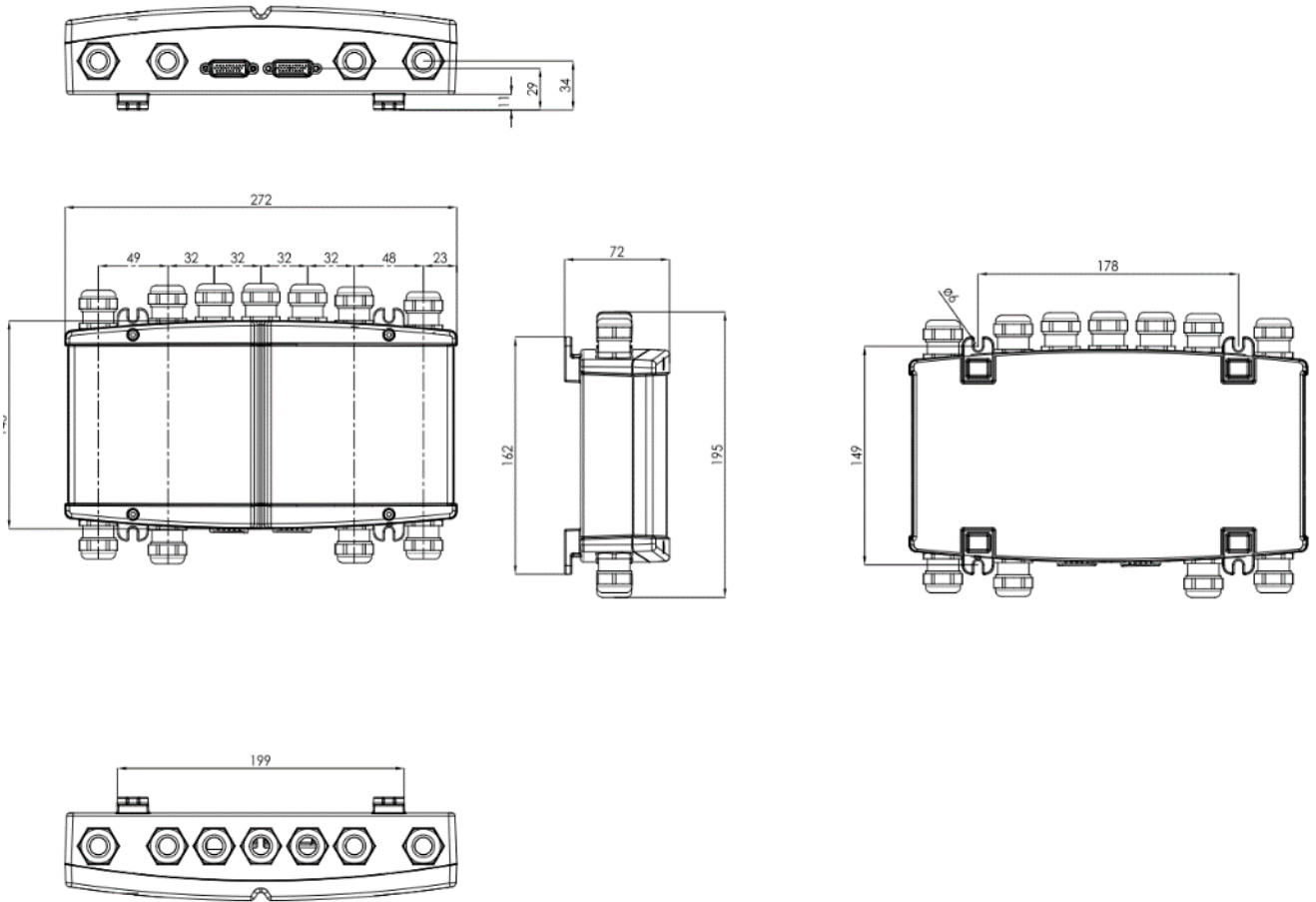### 13.6 **R5 AIS Junction Box Physical Size and Mechanical Drawing**

Figure 67 – R5 AIS Junction Box, Dimensions (mm)

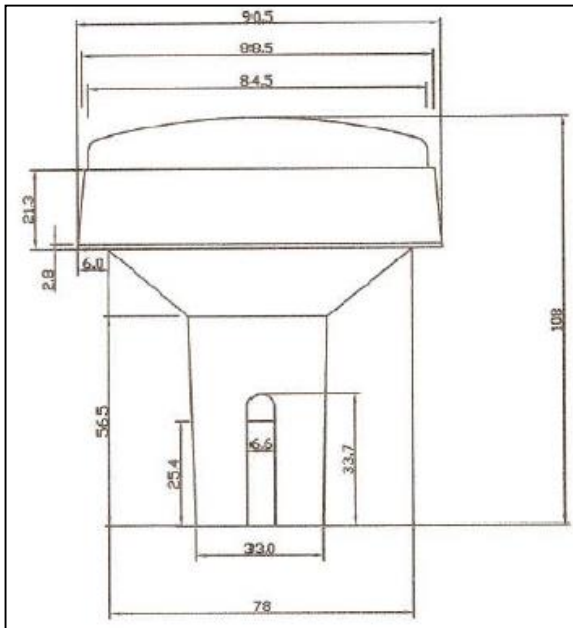## 13.7 **GPS Antenna – Physical Size and Mechanical Drawing**
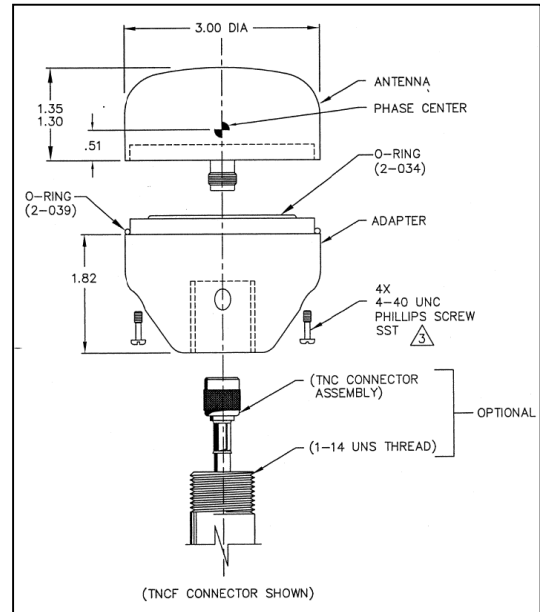

Figure 68 – GPS Antenna – MA700
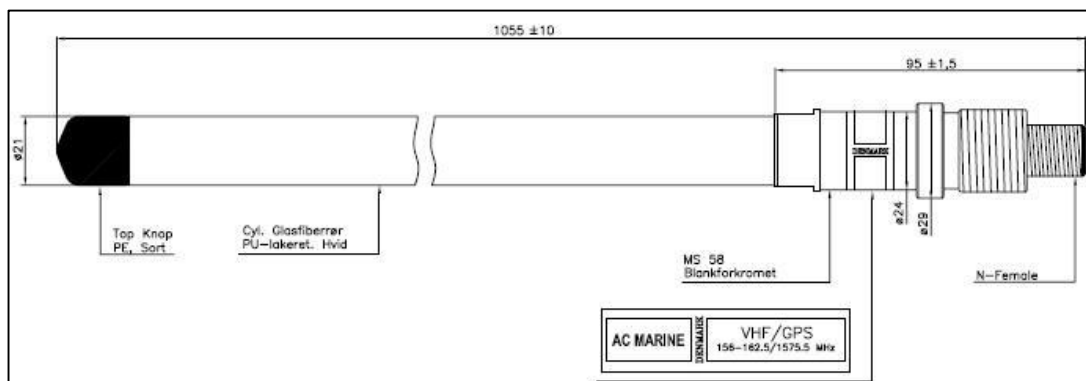

Figure 69 – GPS Antenna – AT575-68

Figure 70 – Combined VHF / GPS Antenna – AC Marine

14 GLOSSARY

ACK	Acknowledgement
AFSK	Audio Frequency Shift Keying
AIS	Automatic Identification System
Ant	Antenna
App	Application
ARPA	Automatic Radar Plotting Aid
BRG	Bearing
BS	Base Station
CDU	Control and Display Unit
Ch	Channel
COG	Course Over Ground
Comm	Communication
DGNSS	Differential Global Navigational Satellite System
Disp	Display
DTE	Data Terminal Equipment
DSC	Digital Selective Calling
ECDIS	Electronic Chart Display and Information System
EGNOS	European Geostationary Navigation Overlay Service
EPFS	Electronic Position Fixing System
ETA	Estimated Time of Arrival
Ext	External
GALILEO	European GNSS
GLONASS	Russian GNSS
GMSK	Gaussian Minimum Shift Keying
GNSS	Global Navigational Satellite System
GPS	Global Positioning System
HDG	Heading
HDOP	Horizontal Dilution Of Precision
H/W	Hardware
IALA	International Association of Lighthouse Authorities
ID	Identifier
IEC	International Electrotechnical Commission
IMO	International Maritime Organization
Int	Internal
IP	Internet Protocol (adress)
ITU	International Telecommunications Union
LAT	Latitude

LED	Light Emitting Diode
LOC	Local
LON	Longitude
LR	Long Range
LWE	Light Weight Ethernet
Msg	Message
MKD	Minimum Keyboard and Display
MSAS	MTSAT Satellite Augmentation System (Japan)
NMEA	National Marine Electronics Association
MMSI	Maritime Mobile Service Identity
N/A	Not available
NE	North East
No	Number
NVM	Non-Volatile Memory
PoB	Persons on board
Pos	Position
RAIM	Receiver Autonomous Integrity Monitoring
RNG	Range
RATDMA	Random Access Time Division Multiple Access
ROT	Rate Of Turn
RTA	Recommended Time of Arrival
Rx	Receive
SAR	Search And Rescue
SART	Search And Rescue Transmitter
SBAS	Satellite Based Augmentation System
SNR	Signal to Noise Ratio
SOG	Speed Over Ground
SRM	Safety Related Message
Sync	Synchronization
SW	South West
S/W	Software
TDMA	Time Division Multiple Access
Transp	Transponder
Tx	Transmit
UN	United Nations
UTC	Universal Time Coordinated
VHF	Very High Frequency
VSWR	Voltage Standing Wave Ratio. (A low value indicates a problem with the antenna or connections/cables to the antenna.)

GLOSSARY

| WAAS | Wide Area Augmentation System (United States) |

14.1 Units

bps	Bits per second
W	Watt
m	Meter
kHz	Kilo Hertz
dB-Hz	Decibel-Hertz
NM	Nautical Mile
km	Kilometer
Sm	Statute Mile
kn	Knots
km/h	Kilometer per Hour
mph	Miles per Hour
mm-dd hh:mm	month-day hour:minute
h:m:s	hours:minutes:seconds

GLOSSARY

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The R5 SUPREME AIS Transponder System runs on a Linux operating system which is licensed with GNU General Public License. The source code of the linux kernel can be obtained by contacting Saab TransponderTech AB:

Saab TransponderTech
Låsblecksgatan 3
589 31 Linköping
Sweden

Email: support.transpondertech@saabgroup.com

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Version 2, June 1991

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