Saab TransponderTech

C6 COM

OPERATION & INSTALLATION MANUAL

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i Copyright

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ii Disclaimer

While reasonable care has been exercised in the preparation of this manual, Saab TransponderTech shall incur no liability whatsoever based on the contents or lack of contents in the manual.

iii Firmware

This manual reflects the capabilities of the C6Com (optional component of R6 Navigation System) with C6Com F/W version 1.0.0.

The unit has the ability to be firmware updated after delivery. Therefore, the product label can specify a firmware different from the actual firmware in the product. Current firmware versions in the system can always be verified in the F/W information view as described in section 7.1

iv Manual Part Number and Revision

Part number 7000 125-305, revision A1.

v 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.

vi Contact Information

For installation, service, ordering info and technical support, 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.

www.saab.com/maritime

For the latest manual, firmware and certificates visit:
https://www.saab.com/transpondertechsupport

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1 SAFETY INSTRUCTIONS

1.1 General

Saab TransponderTech assumes no liability for customer not complying with requirements in this section or warnings and cautions elsewhere in this document.

This safety instruction section refers to all components of the C6 COM, referred to as “equipment” in this section.

1.2 Installation and Service

Only qualified technicians shall do installation and servicing of equipment. Electrical fuses must be replaced with correct types.

To prevent electrical shock hazard and damage to the equipment, the equipment shall be connected to electrical ground. A power supply corresponding to the voltage rating of the equipment shall be used. Failure to comply with this requirement may damage the equipment.

To ensure proper functioning of the equipment, only signal cables and antennas specified in this document may be used. Failure to comply with this requirement may cause unexpected behaviour of the equipment.

The equipment may not in any way be modified; doing so may cause fire, shock hazard or serious injury.

2 SYSTEM OVERVIEW

2.1 Product Description

The C6 COM is a router unit with redundant interfaces designed for receiving RTK (Real-Time Kinematic) corrections, either via Wi-Fi or UHF radio, and transmitting these corrections through its serial interface. The RTK data streams output through the RS-422 interface are primarily intended to provide correction data for the R6 NAV PRO Compass, ensuring highly accurate Position/Heading solutions.

Note: While the UHF data stream serves as the primary source of RTK reception, it will be automatically overridden by the Wi-Fi input whenever this feature is utilized.

In addition to RTK data, the C6 COM also forwards NMEA data received through its serial port to Wi-Fi, supplemented by context-specific information based on the unit's configuration and AIS targets received on the integrated VHF receiver.

The C6 COM includes a built-in web interface, enabling users to monitor its status, adjust configuration parameters, and perform maintenance tasks with ease

3 INSTALLATION

3.1 Equipment part numbers

The C6 COM's most common parts and accessories are listed below.

Name	Part number
C6 COM	7000 125-702
Power cable M12 to open 2m	7000-125-544
Ethernet cable M12 to RJ45 2m (Provided for Maintenance purposes only)	7000-125-550
Serial cable M12 to open 2m	7000-125-548

Table 1 - R6 Navigation System and accessories

3.2 Equipment Installation Environment

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

Name	Part number	IEC 60945 installation category
C6 COM	7000 125-702	Protected
Wi-Fi Antenna	7000 000-857 alt 7000 000 858	Protected
UHF/AIS Antenna	7000 000-855	Exposed

Table 2 - IEC 60945 equipment classification

3.3 Cables

3.3.1 Power cable M12 to open 2m

Marking: 7000-125-544
Type: PVC, Metal, Non-shielded
Length: 2 m
Diameter: 6 mm
Connectors: M12 (A-Coding) / Open
Function: Power input/output

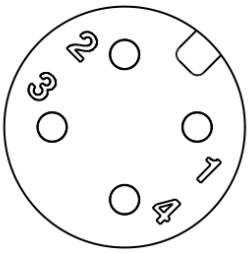

Figure 1 – Power Cable M12 Connectors 4 Pin, A-Coding

Function	Pin	Cable Colour
12 / 24 VDC	1	Brown
12 / 24 VDC	2	White
0 VDC	3	Blue
0 VDC	4	Black
N/C	5	-

Table 3 - Power cable M12 to open Interconnection

3.3.2 Serial cable M12 to open 2m

Marking: 7000-125-548
Type: PU, Metal, Shielded
Length: 2 m
Diameter: 6 mm
Connector: M12 / Open

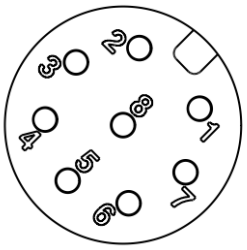

Figure 2 – Serial Cable M12 Connectors 4 Pin, A-Coding

Function	Pin	Cable Colour
Tx+	1	White
(Rx- Ext Term)	2	Brown
(Rx+ Ext Term)	3	Green
Rx+	4	Yellow
Rx-	5	Grey

-	6	Pink
Tx-	7	Blue
GND	8	Red

Table 4 - Serial cable M12 to open Interconnection

3.3.3 Ethernet cable M12 to RJ45 2m

Marking: 7000-125-550

Type: Cat 6A, LSZH, Metal, Shielded

Length: 2 m

Connector: M12 (X-Coded) / RJ45

Electrical: 1GBps Ethernet

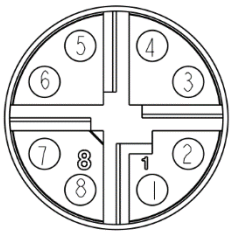

Figure 3 – Ethernet Cable M12 Connectors 8 Pin, X-Coding

Function	Pin	
MX1+	1	RJ45 - In/Out
MX1-	2	RJ45 - In/Out
MX1+	3	RJ45 - In/Out
MX1-	4	RJ45 - In/Out
MX1+	5	RJ45 - In/Out
MX1-	6	RJ45 - In/Out
MX1+	7	RJ45 - In/Out
MX1-	8	RJ45 - In/Out

Table 5 - ETH signals

3.3.4 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

3.3.5 AIS/UHF antenna cable specification

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.

Connector: BNC (Male).

See Table 6 - AIS/UHF antenna cables for the recommended cables. The cable attenuation shall be kept as low as possible; a 3 dB loss is the same as cutting the signal strength in half.

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

Type	∅ (mm)	Weight (kg/100m)	Attenuation @ 150 MHz (dB/100m)
RG 214	10,8	18,5	7
RG 217	13,8	30,1	5
RG 225	10,9	23,3	8

Table 6 - AIS/UHF antenna cables

3.4 System installation

3.4.1 Basic system interconnections

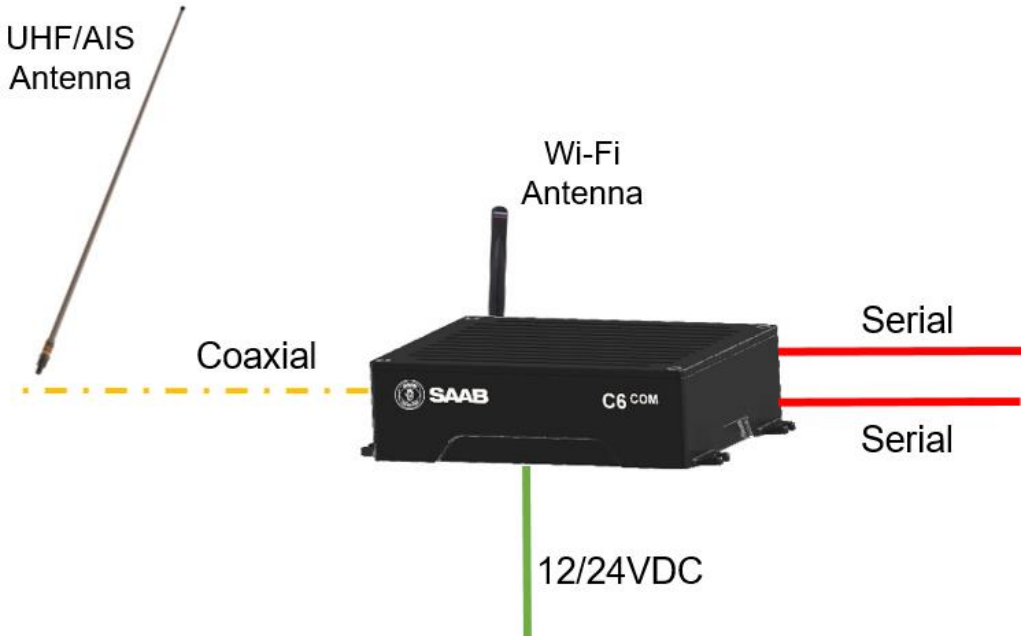

Figure 4 - Connection overview

3.4.2 Installation Procedure

When installing the C6 COM 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 C6 COM, centralized in the area of use
2. Mount/Connect a Wi-Fi antenna, choose gain depending on the vessel's size
   Note: If the vessel is smaller than 30 meters, start with the 4 dBi antenna. If needed for a stable connection depending on the bridge layout and the position of the units, use the 9 dBi antenna.
3. Connect external systems/sub-systems via the internal serial (RS-422) in- and output terminals
4. Mount the VHF/UHF Antenna
5. Draw coaxial cable from the VHF/UHF Antenna to the C6 COM and connect them to each other
6. Connect the C6 COM Power Input to an external 12/24 Volt power source or to the R6 NAV PRO Compass
7. Power up the unit
8. Perform system functional verification.
   - Check that the C6 COM does not report any alerts.
   - Verify that the NMEA data can be observed on C6 COMs Wi-Fi Network (at *least GGA, VTG, HDT, ROT, GSA, GSV on UDP port 17608 for NEO setups*).

3.4.3 Install the C6 COM

3.4.3.1 Sensor Location

When mounting the C6 COM, please consider the following:

- Mount the unit so that it is as centralized in the area of use as possible to get the best coverage.
- Mount the unit so that it is possible to observe the LEDs; which can be needed for troubleshooting purposes.
- 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 different cables can be connected without violating their maximum bending radius.

3.4.4 AIS/UHF Antenna Location

Location of the mandatory AIS/UHF 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 AIS/UHF antenna for AIS on a vessel is a compromise between the following items:

- Antenna type

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

3.4.4.1 AIS/UHF Antenna Type

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

3.4.4.2 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 C6 COM also uses UHF (403 - 473 MHz) for communication. The requirements for these frequencies are generally similar to those for AIS.

The AIS/UHF 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/UHF 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/UHF 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.

3.4.4.3 Clear View of the Horizon

The AIS/UHF 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/UHF antenna is to see the horizon freely through 360 degrees.

3.4.4.4 AIS/UHF Antenna Height

The C6 COM uses VHF and UHF radio frequencies for AIS and other communication. These frequencies propagate close to the line of sight. The higher the antenna location is, the longer the range will be.

3.4.5 **AIS/UHF 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 near the cable ends.

3.4.6 AIS/UHF Cable Grounding

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

4 WEB INTERFACE

The C6 COM has a web interface, just requiring an Ethernet connection, which gives the user a possibility to maintain and configure the sensor. The interface is accessible by the most common browsers through the default network address 172.16.0.6 or 172.17.0.6.

4.1.1 Status page

Status page displays information about how well the system preforms. See List of available alerts.

Note: For more detailed about the meaning of each alert see section 8.3

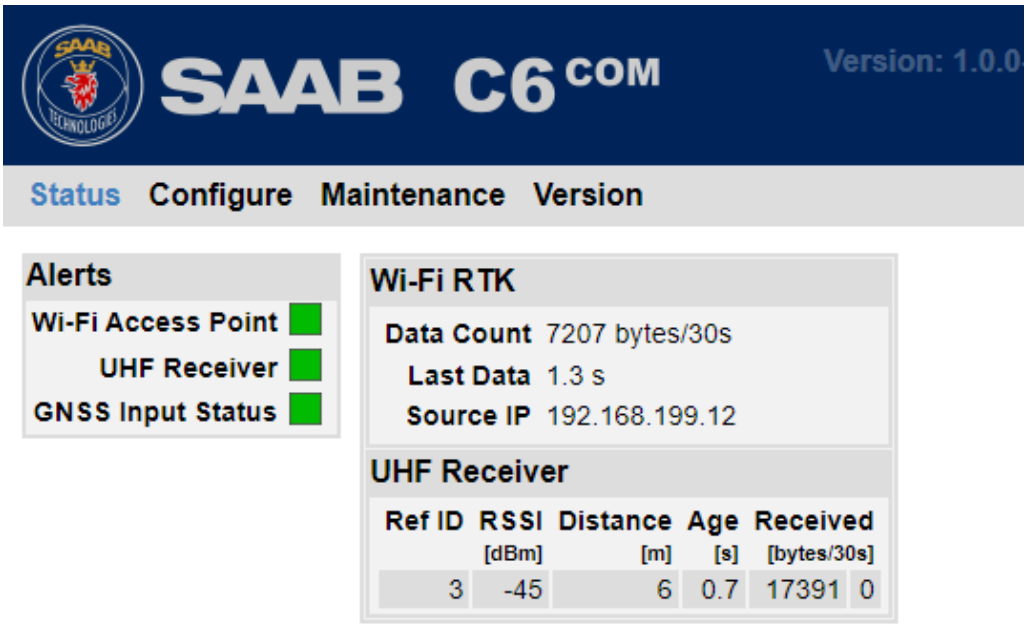

Figure 5 - Web Interface, Status page

4.2 Configuration Page

In the Configure page the C6 COM can be set to work as desired.

For more information about configuration parameters related to:

- Network Interface, see section 5.1.4
- Serial Ports, see section 5.1.6
- Identifier, see section 5.1.7
- Antenna Offset, see section 5.1.2
- UHF Receiver, see section 5.1.3
- WIFI Access Point, see section 5.1.6

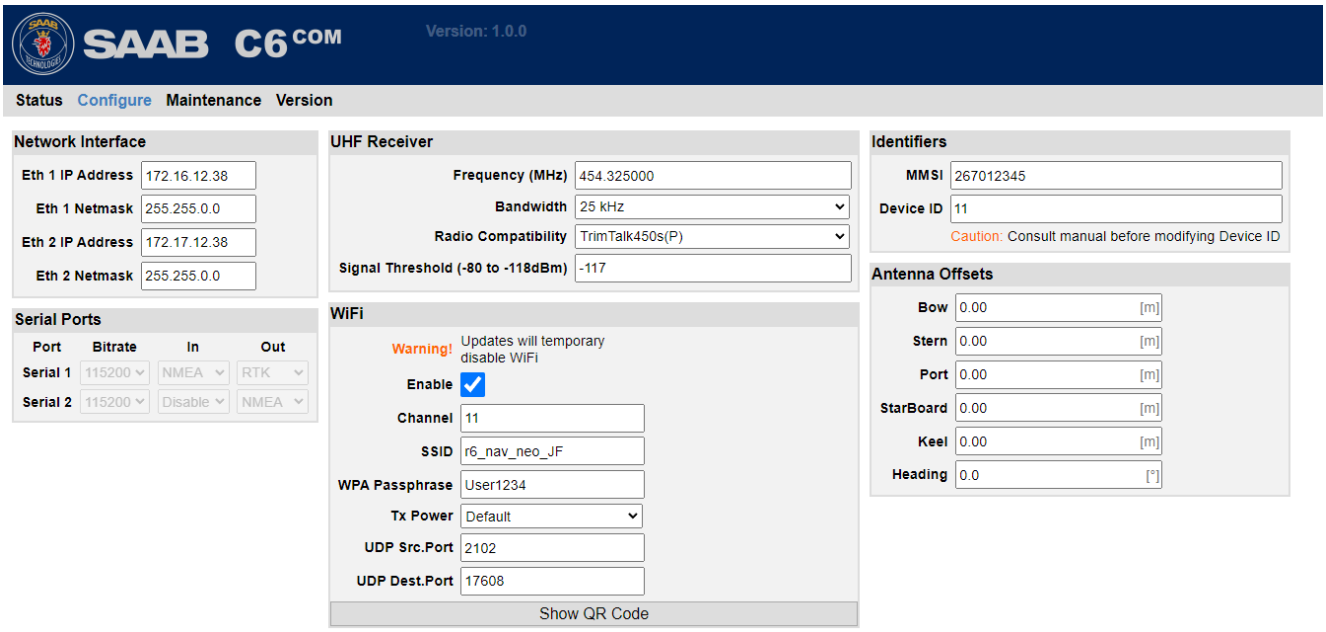

Figure 6 - Web Interface, Configure page

4.3 Maintenance Page

The “Maintenance” page functionality is for uploading of Firmware, saving/loading/restoring configuration settings.

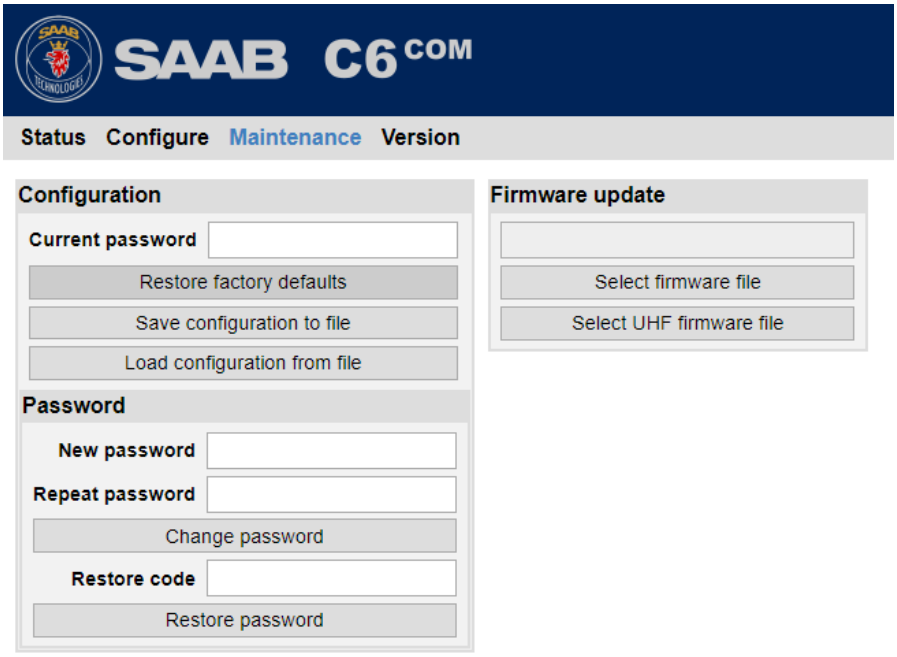

Figure 7 - Web Interface, Maintenance page

4.3.1 Configuration

This application makes it possible to save the current configuration settings as a .c6comcfg file or load configuration settings form an already saved .c6comcfg file. It also provides the possibility to reset the sensor to default settings.

4.3.2 Update

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, www.saab.com/maritime.

To perform a firmware update through the web interface:

- Connect the computer to the same network/subnet as the C6 COM
- Enter the web interface by a preferred browser and enter the current C6 COM IP address (Be sure that the computer has a valid/matching IP address)
- Enter the web interface’s maintenance page
- Click either on the button “Select firmware file” and select the .c6pkg, form the firmware package to start an upgrade process.

4.4 Version Page

The Version page displays information about the hardware and firmware of the unit. This information should always be provided when in contact with Saab TransponderTech support.

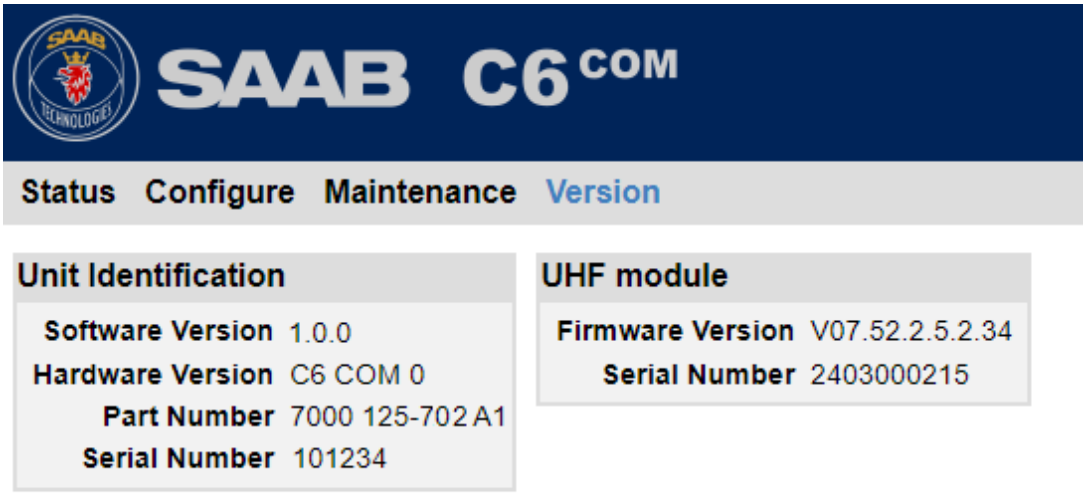

Figure 8 - Web Interface, Version page

5 CONFIGURATION

When the physical and electrical installation of the system is complete, the C6 COM needs to be configured. This section describes what the installer is required to do before the C6 COM is fully operational.

5.1.1 C6 COM Configuration Menu

This section describes the different configuration parameters that can be set in the C6 COM web interface.

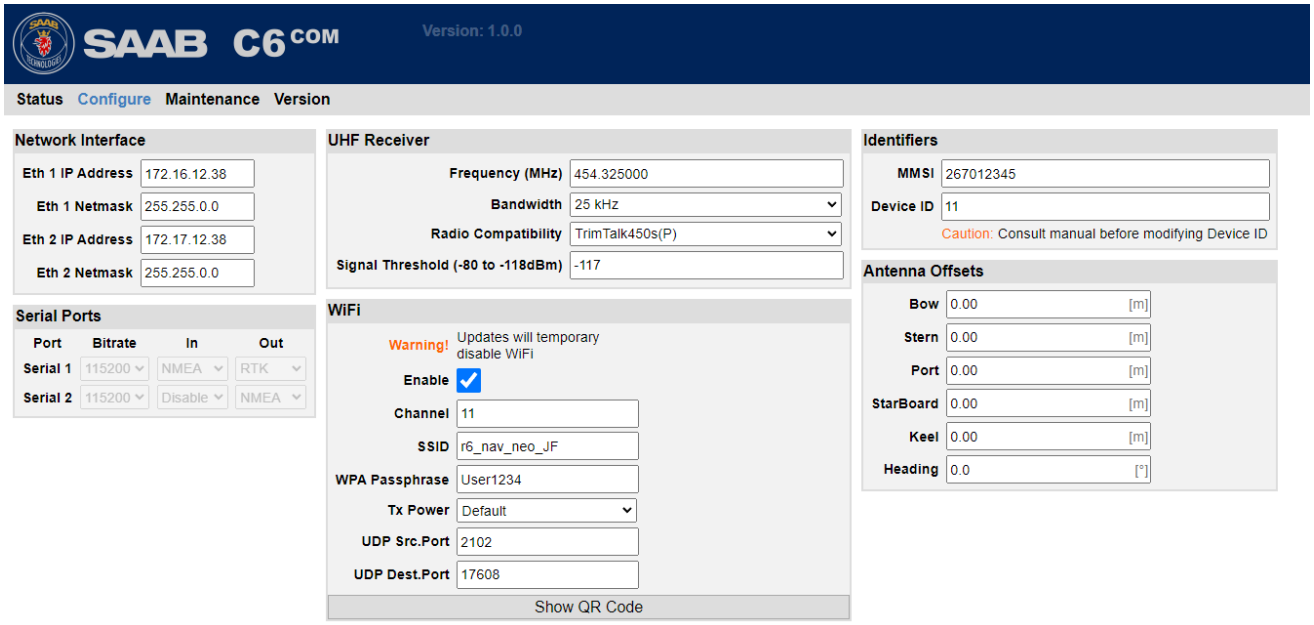

Figure 9 - Configuration Tab

5.1.2 Antenna Offset / Identifier

This section describes antenna offset configuration, see table below for clarification. The configuration settings will be output on the Wi-Fi interface in form of the PACP,NOSR sentence (see section 10.2.4).

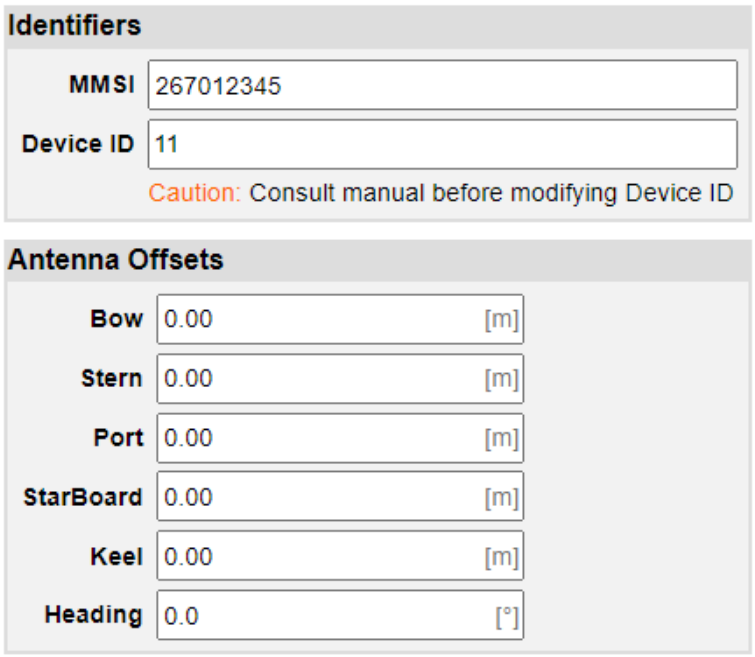

Figure 10 - Antenna Offset Settings

Parameter Name	Description
MMSI	Vessel's MMSI
Device ID	Neo Systems Unique Device ID, reported in PTMSX messages. For identification of the vessel and its antenna configurations. Default: Same as the last for numbers in the C6 COM units serial number (S/N 601234 = Dev.ID 1234) Note: This parameter should not be changed if the unit isn't used as a replacement for an old (due to reparation or other failure)
Bow	The distance from the position (GNSS) antenna to the bow in meters (two decimals accuracy)
Stern	The distance from the position (GNSS) antenna to the stern in meters (two decimals accuracy)

Port	The distance from the position (GNSS) antenna to the starboard side of the vessel in meters (two decimals accuracy)
StarBoard	The distance from the position (GNSS) antenna to the port side of the vessel in meters (two decimals accuracy)
Keel	The vertical distance from the vessel's keel to the position (GNSS) antenna in meters (two decimals accuracy)
Heading	The heading offset. The relative bearing from the position (GNSS) antenna to the heading antenna relative to the vessel's heading in tenth of degree

Table 5-7 - Antenna Offset Parameters

5.1.3 UHF Receiver

This section describes the configurable alternatives of the UHF receiver.

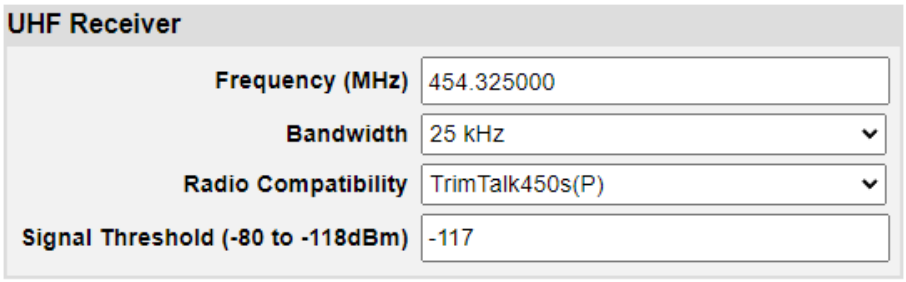

Figure 11 - UHF Receiver Settings

Parameter Name	Description
Frequency	This parameter sets the UHF Receiver frequency configurable in MHz. The range configurable frequencies is 403 - 473 MHz with the default set to 454.325 Mhz.
Bandwidth	This parameter sets the UHF Receiver bandwidth with options: • 12.5 kHz • 20 kHz • 25 kHz
Radio Compatibility	This parameter sets the UHF Receiver modulation and protocol defined in an amount of compatibility mode with following options:

	• SATELLINE-3AS • PacCrest-4FSK • PacCrest-GMSK • **TrimTalk450s(P) (Rx fits PacCrest modems)** • Trimtalk450s(T) (Rx fits Trimble modems) • PacCrest-GMSK FEC Off • PacCrest-FST • PacCrest-FST (FEC OFF) • SATEL-8FSK-2 (FEC ON) • SATEL-8FSK-2 (FEC ON) • PacCrest-GMSK FEC Off Scrambler Off • PacCrest-4FSK FEC On Scrambler Off • PacCrest-GMSK FEC On Scrambler Off
Signal Threshold	This parameter sets the UHF Receiver's carrier sense threshold signal level. Default: -107 dB Note: Recommended to not change this trimmed setting if not necessary due to setup issues.

Table 5-8 - UHF Parameters

5.1.4 Network Interface

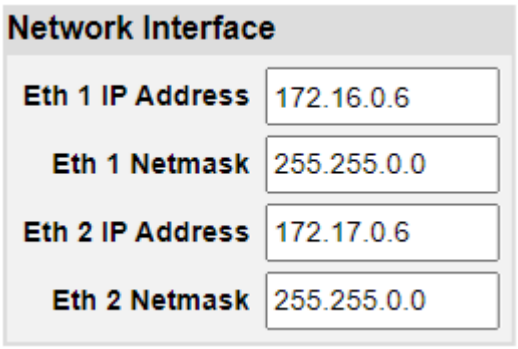

Figure 12 - Network Settings

Parameter Name	Description
Eth 1 IP Address	The IP Address and network mask used for the C6 COM port ETH1.

	Example: 172.16.0.6 (default setting)
Eth 1 Netmask	IP-address Subnet mask used for port ETH1 of the C6 COM
Eth 2 IP Address	The IP Address and network mask used for the C6 COM port ETH2. *Example: 172.17.0.6 (default setting)*
Eth 2 Netmask	IP-address Subnet mask used for port ETH2 of the C6 COM

Table 5-9 - NAV Network Parameters

5.1.5 Serial Ports

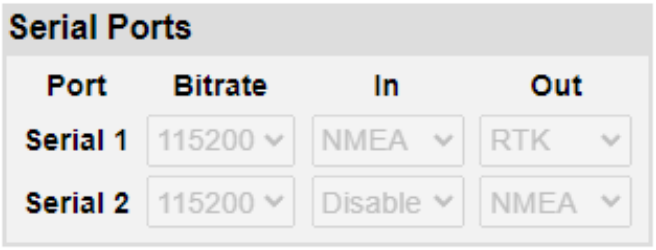

Figure 13 - Serial Ports

The *Serial Ports* is used to show which serial ports that receive or transmits NMEA sentences and output RTCM stream.

Read more about received NMEA messages in section 11.

Note: In software 1.0.0 the Serial port isn't configurable.

Parameter Name	Description
Serial x - In	Specifies the input functionality of serial port x.
Serial x - Out	Specifies the output functionality of serial port x.

Table 5-10 - Sensor Output Parameters

5.1.6 Wi-Fi Settings

This section describes the configurable Wi-Fi credentials also including functionality of generating QR code for easier connection.

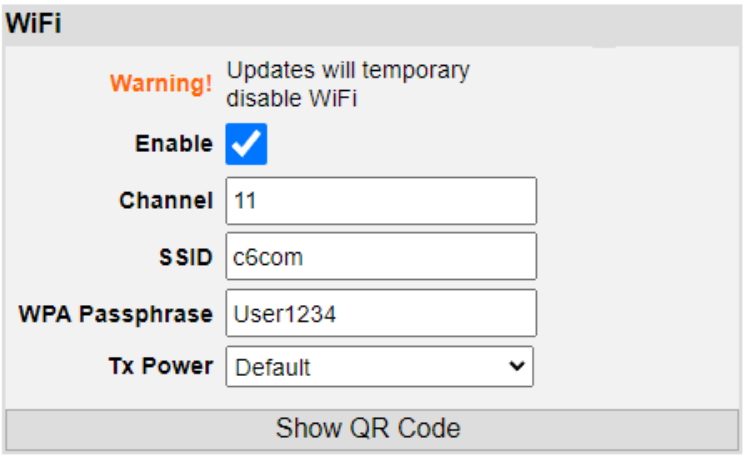

Figure 14 - Wi-Fi Settings

Parameter Name	Description
Enable	This parameter is used for enabling or disabling the Wi-Fi Access Point. *Default: Enabled*
Channel	This parameters is setting which channel the Wi-Fi Access Point should use. Range configurable: Channel 1 - 11 *Default: 11*
SSID	This parameter describes the C6 COM's Wi-Fi identification name. *Default: r6_nav_neo* *Note: SSID stands for "Service Set Identifier." It's basically the name of a Wi-Fi network that you see when you're looking for available networks to connect to. It's the name you click on to join a Wi-Fi network.*
WPA Passphrase	This parameter sets the C6 COM's WPA passphrase which are the password that you need to enter to connect to a Wi-Fi network that uses WPA (Wi-Fi Protected Access) security. It's the key to access the network securely *Default: User1234*

Tx Power	This parameter is used to adjust the Wi-Fi's output power. *Default: 18 dBm* *Note:* Adjusting the Wi-Fi output power could potentially violate different standards, especially if increased. Consequently the unit's certification may not apply in this state.
UDP Source Port	This parameter sets the UDP Source Port which is the identity used when sending out data on the Wi-Fi network. *Default UDP Port 2102*
UDP Destination Port	This parameter sets the UDP Destination Port which is the number used to identify the receiving program or application on the Wi-Fi network *Default UDP Port: 17608*

Table 5-11 - Wi-Fi Parameters

5.1.6.1 Show QR Code

A default QR-Code is delivered with the C6 COM with the units default settings pre-configured. If more printed QR codes are needed or other settings I desired, new can be generated using the "Show QR Code" button. This button produces a QR code that allows direct connection to the unit's network with the current settings.

5.1.7 LEDs on C6 COM

Figure 15 - LEDs on C6 COM

1. **Status LED (Multi-colour)**

   The "*Status"* LED is multi-coloured; it will either be red or green. When this LED is continuously lit green the system receives correct the expected data and no internal alerts is active. If the LED is continuously lit red the system has active alerts.

2. **Power LED (12-24 VDC)**

   The green "*12-24 VDC"* LED indicates when the unit is provided with correct power input by getting continuously lit.

3. **Ethernet 1/2 LEDs**

   The green "*Ethernet"* LED indicates when the data are received or transmit by flashing.

6 FIRMWARE UPGRADE

Using the C6 COM in combination with a different/other unit, it may be necessary to make a Firmware upgrade to make sure that the units FW versions are fully aligned.

The C6 COM can be upgraded over Ethernet web interface.

Make sure to carefully read the release notes for the Firmware upgrade package first.

For the latest manual, firmware and certificates please visit:

https://www.saab.com/transpondertechsupport

6.1 Upgrade Firmware in C6 COM via Web

To update the C6 COM firmware, simply use the file upload tool on the Web servers "Maintenance" category page.

To perform a Firmware upgrade, perform following steps:

- Click the **Select Firmware file** button.
- Browse the file structure to find and select the .c6compkg-file for upload. Click on the **Upload** button (or similar in your language). The upgrade process will start.
- The file is uploaded to the C6 COM. A progress bar displays the data transfer.
- Once the file is uploaded it will be written to the device. A progress bar is shown.
- When written the device will reboot, and the Web page will reload. The upgrade process is thereafter finished.

NOTE: This is the procedure to follow regardless of type of update. The contents of the .c6compkg-file controls what is updated.

7 TECHNICAL SPECIFICATIONS

7.1 C6 COM

7.1.1 Physical

Dimensions:	Height: 53 mm Width: 205 mm Depth: 150 mm
Weight:	1.1 kg

7.1.2 Electrical

Input Voltage:	24V DC (12 to 24 VDC)
Nominal Power:	6 W
Nominal Current:	0.25A @ 24 VDC input
Antenna input impedance:	50Ω

7.1.3 Environmental

Temperature:	-15˚C to +55˚C (Operational) -30˚C to +80˚C (Storage)
EMC:	IEC 60945 ed. 4

7.1.4 UHF Receiver

Frequency	403 to 473 MHz (default 454.325 MHz)
Bandwidth	12,5/20/25 KHz
Modulation	GMSK/4FSK/8FSK/16FSK
Protocol	TrimTalk 450S (configurable)
Sensitivity	< -115dBm

7.1.1 AIS Receiver

Frequency	161.975 / 162.025 MHz
Sensitivity	< -116dBm at 20% packet error rate

7.1.1 Wi-Fi

Access Point	IEEE 802.11 a/b/g/n, 2.4 GHz

Number of Clients	4
Security	WPA2
Output Power	18 dBm
Sensitivity	< -82 dBm

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 an installation, much dependant on the skill and experience level of the trouble-shooter. The preferred approach may probably also differ between different individuals, and there is no such thing as right or wrong.

This section 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 C6 COM unit and the whole R6 Navigation System.

8.1 Troubleshooting Prerequisites

A C6 unit's operating environment may naturally differ widely, ranging from small high-speed vessels 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 all other equipment able to communicate with the unit
- Switch off other emission sources (RADAR, SATCOM, VHF, etc.)

We strongly encourage to always use the latest Firmware available for the C6 COM. 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 Sensor LEDs

If the sensor's status LED is flashes red, the sensor has failed to enter the primary firmware application and instead start up in backup mode. In backup mode will all system settings been returned to default and locked down.

8.3 Troubleshooting with Internal Indications

The R6 Navigation System constantly monitors itself for failures, abnormal conditions and other important parameters. The monitoring trigger internal alerts and those are excellent aids in the troubleshooting process.

No alerts are output by the C6 COM, but the HBT Sentence which are output will state if there is an issue in the unit.

NOTE: The R6 NAV PRO Compass will observe the HBT sentence and indicate for the user if the connected C6 COM has any issues.

8.3.1 Wi-Fi Access Point

If this indication is activated there is an issue with the internal communication with the Wi-Fi Access Point.

8.3.2 UHF Receiver

If this indication is activated there is an issue with the internal communication with the UHF Receiver.

8.3.3 NMEA Input

This indication is activated when the C6 COM isn't provided with the required NMEA data by serial port.

8.4 Contacting Support

The primary source for support and RMA issues for end customers should 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, www.saab.com/maritime, listed under the corresponding product.

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 "FW/HW Information" views (Unit).
- Detailed fault description.

For the latest manual, firmware and certificates please visit https://www.saab.com/transpondertechsupport

9 COMMUNICATION INTERFACES

This section describes the characteristics of the communication interfaces in the C6 COM system.

The unit is equipped with two Ethernet network interfaces, two RS-422 serial ports, UHF/AIS receivers as well as a Wi-Fi interface.

9.1 Serial Ports

The C6 COM has two serial ports RS422 mainly used for communication with the “R6 NAV PRO Compass”

- Serial 1 is pre-set to output RTCM 3 streams received from either the UHF Receiver or the Wi-Fi as well as receiving NMEA data from the “R6 NAV PRO Compass”
- Serial 2 is pre-set to output NMEA data for monitoring purposes handled in the “R6 NAV PRO Compass”

Note: The intention is to install the Serial 1 port to the IN1/OUT1 and the Serial 2 port to the IN2/OUT2 on the “R6 NAV PRO Compass”.

9.2 Ethernet Ports

The “C6 COM’s” Ethernet interface is exclusively designated for maintenance purposes, aligning with the current design and usage of the system. Consequently, the Ethernet interface will not have support for the IEC 61162-450 protocol.

9.3 Wi-Fi Communication

The Wi-Fi Interface is the main communication of a NPPU systems. Here NMEA sentences received from the whole R6 NAV NEO system is output by UDP-packages. The system also has the capability getting input of RTCM 3 data streams from external sources (such as a NPPU Applications on an IPad).

9.4 UHF Receiver

The “C6 COM” is capable getting correction data received over UHF radio, which is most commonly transferred with the Trim Talk or Pacific Crest protocol. These data streams are internally interpretation and translated to RTCM 3 that are output a RTCM 3 data stream by RS-422.

9.5 AIS Receiver

The “C6 COM” is equipped with an internal AIS receiver, able to receive AIS messages by the standard AIS channels (87B - 161.975 MHz and 88B - 162.025 MHz). All received targets are reported on Wi-Fi in the forms of NMEA - VDM sentences.

9.6 Input/Output Sentences

NMEA data is input through the serial ports from the "R6 NAV Compass" and it is output to the observer/pilot via Wi-Fi. Additionally, the transmission includes internally generated sentences with complimentary information.

Note: RTK data in form of RTCM 3, received from either UHF or Wi-Fi is also forwarded down to the "R6 NAV Compass".

Sentence	Description
VTG	Track Made Good and Ground Speed (Input-Serial/Output-WiFi)
GSV	GNSS satellites in view
GSA	Active Satellites (Input-Serial/Output-WiFi)
GGA/GNS	Global Positioning System Fix Data (Input-Serial/Output-WiFi)
VDM	Received AIS Information (Output-WiFi)
PTMSG	Spoofing/Jamming status (Input-Serial/Output-WiFi)
PTMSX	Vender Identification and Configuration (Output-WiF)
HDT	Heading, True (Input-Serial/Output-WiFi)
ROT	Rate-Of-Turn (Input-Serial/Output-WiFi)
NOSW	NPU Offset Write (Input-WiFi)
NOSR	NPU Offset Read (Output-WiFi)

Table 9 -12 - Supported Output Sentences

10 INTERPRETATIONS OF SENTENCES

10.1 Talker Identifier

All GNSS output sentences use the talker identifiers that can be seen in the table below. All of them starting a message with a '$'-character.

Talker identifier	System/Systems
GP	Global Position System (GPS)
GN	Multiple Position Systems
GA	Galileo Position System
GB	BeiDou Position System
GL	GLONASS

10.2 Sentences

10.2.1 HDT - True heading of the vessel

$--HDT,x.x,T

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

10.2.2 ROT - Rate of turn

$--ROT,x.x,a

Field	Format	Name	Comment
1	--ROT	Sentence Id	Used
2	x.x	Rate of turn, °/min, "-" = bow turns to port	Used
3	a	Status: A = data valid V = data invalid	Used

10.2.3 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	
2	hhmmss.ss	UTC of position	
3	llll.ll	Latitude	

4	A		
5	yyyy.yy	Longitude	
6	a		
7	x	GPS quality indicator	
8	xx	Satellites in use	
9	x.x	Horizontal dilution of precision	
10	x.x	Antenna altitude	
11	M	Units of antenna altitude, meter	
12	x.x	Geodial separation	
13	M	Units of geodial sep.	
14	x.x	Age of differential GPS data	
15	xxxx	Differential reference station ID	

10.2.4 GSA - GNSS DOP and active satellites

$--GSA,a,x,x.x,x.x,…,x.x,x.x,x.x,x.x

Field	Format	Name	Comment
1	--GSA	Sentence Id	
2	A	Mode	
3	X	Mode	
4	x.x	Satellite ID (1)	
5	x.x	Satellite ID (2)	
…	…	…	
15	x.x	Satellite ID (12)	
16	x.x	PDOP	
17	x.x	HDOP	
18	x.x	VDOP	
19	h	GNSS System ID	

10.2.5 GSV - GNSS satellites in view

$--GSV,x,x,xx,xx,xx,xxx,xx.....,xx,xx,xxx,xx,h

Field	Format	Name	Comment
1	--GSV	Sentence Id	
2	x	Total number of messages	
3	x	Message number	
4	x	Total number of satellites in view	
5	xx	Satellite ID number (Satellite 1)	
6	xx	Elevation, degrees (Satellite 1)	
7	xxx	Azimuth, degrees true (Satellite 1)	
8	xx	SNR (Satellite 1)	
…	…	…	Fields for all satellites are used
21	h	Signal ID	Always one (1)

10.2.1 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	
2	x.x	Course over ground, degrees true	
3	T		
4	x.x	Course over ground, degrees magnetic	
5	M		
6	x.x	Speed over ground, knots	
7	N		
8	x.x	Speed over ground, km/h	
9	K		
10	a	Mode indicator	

10.2.2 PTMSG - Spoofing/Jamming Status

$PTMSG,x,,,,x,x,,

Field	Format	Name	Comment
1	PTMSG	Sentence Id	
2	X	Message Version	
3	Null	-	Not Used
4	Null	-	Not Used
5	Null	-	Not Used
6	X	Jamming Status: 0 Not monitoring 1 No jamming detected 2 Jamming detected but fix OK 3 Jamming detected fix invalid 4 Unknown	
7	x	Spoofing Status: 0 Unknown or deactivated 1 No spoofing indicated 2 Spoofing indicated 3 Multiple spoofing indications	
8	Null	-	Not Used
9	Null	-	Not Used

10.2.3 PTMSX - GNSS/Heading Antenna Installation and Status

$PTMSX,x,x,x,x,x,x,x,x,x,x

Field	Format	Name	Comment
1	PTMSX	Sentence Id	
2	x	Message Version	
3	x	Unique Device ID	
4	x	Vender ID	
5	x	Model ID	

6	x	GNSS Antenna satellite counter	
7	x	HDG Antenna satellite counter	
8	x	GNSS/HDG antenna baseline in cm	
9	x	UHF frequency	
10	x	Powered by battery	Not Used

10.2.4 NOSR/NOSW - NPU Antenna Offsets

$PACP,NOSR(W), x,x,x,x,x,x,x,x,x

Field	Format	Name	Comment
1	PACP	Sentence Id	
2	NOS(W/R)	Message	
3	x	Message Version	
4	x	Vessel MMSI	
5	x	Bow	Distance from GNSS Antenna and vessel bow in centimeters
6	x	Stern	Distance from GNSS Antenna and vessel stern in centimeters
7	x	Port	Distance from GNSS Antenna and vessel port side in centimeters
8	x	Starboard	Distance from GNSS Antenna and vessel starboard side in centimeters
9	x	Heading	Angel of the relative bearing from the GNSS Antenna to the HDG Antenna relative to the heading of the vessel in tenths of degrees
10	x	Baseline	Distance from GNSS Antenna to HDG Antenna
11	x	Keel	Vertical distance from GNSS antenna to the keel of the vessel in centimeters

11 ELECTRICAL INTERFACES

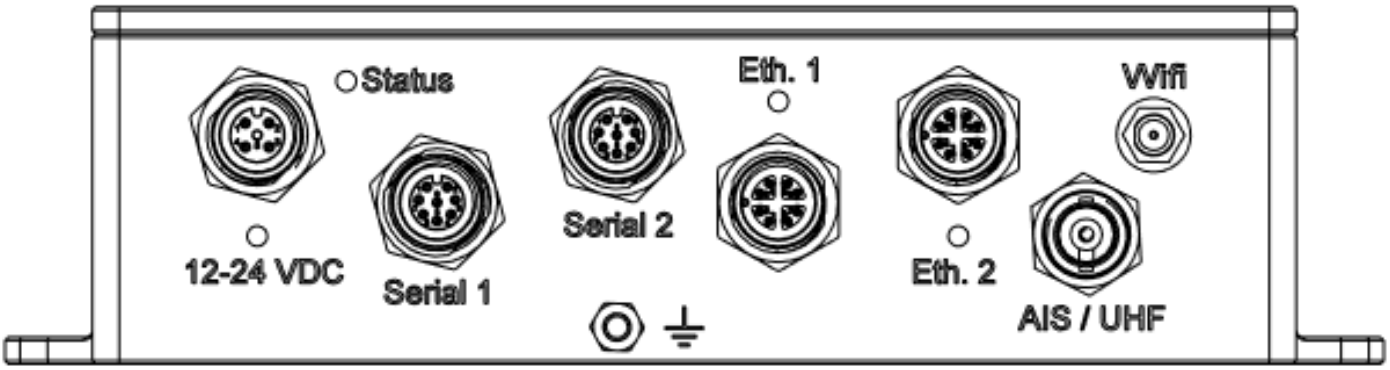

Figure 12-1 - C6 COM connectors (rear view)

11.1.1 12-24 VDC interface

Connector Type: M12 - A Coded

Function: Power input

Note: For pinout and more information see section 3

11.1.2 RS-422 Serial interfaces

Connector Type: M12 - A Coded

Function: Serial output/input

Note: For pinout and more information see section 3

11.1.3 Ethernet interfaces

Connector Type: M 12 - X Coded

Function: Web-interface access

Note: For pinout and more information see section 3

Note: This ports is only for maintenance and initial configurations by Web-interface.

11.1.4 Wi-Fi Antenna RF

Connector Type: SMA (Female)

Electrical: Coaxial

11.1.5 AIS/UHF Antenna RF

Connector Type: TNC (Female)

Electrical: Coaxial

11.1.6 GND symbol interface

Type: M6 hex nuts and threaded rod

Function: Connection to ground

11.1.6.1 Schematics

Each of the RS-422 serial interfaces on the C6 COM fulfils the requirements as specified in IEC 61162.

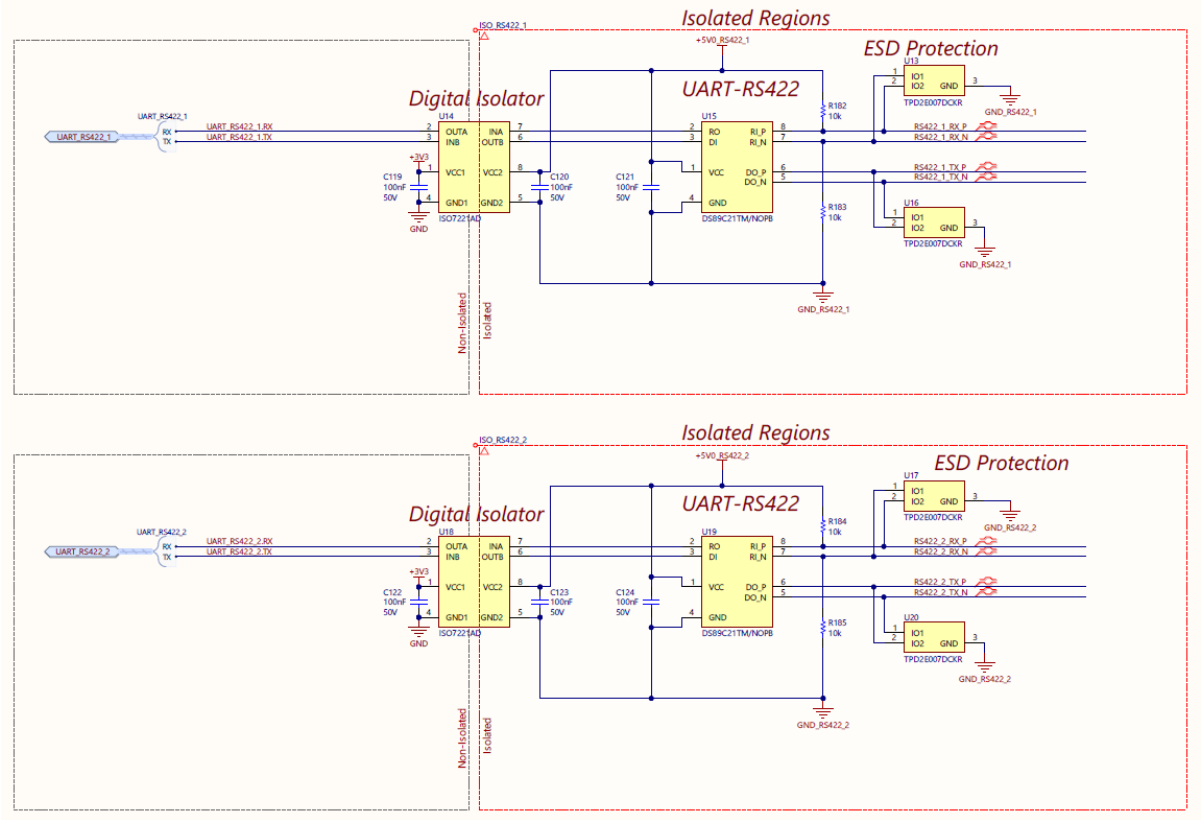

Figure 16 - C6 COM Serial Interface Input Schematics

12 MECHANICAL DRAWINGS

17. C6 COM Size and Mechanical Drawing

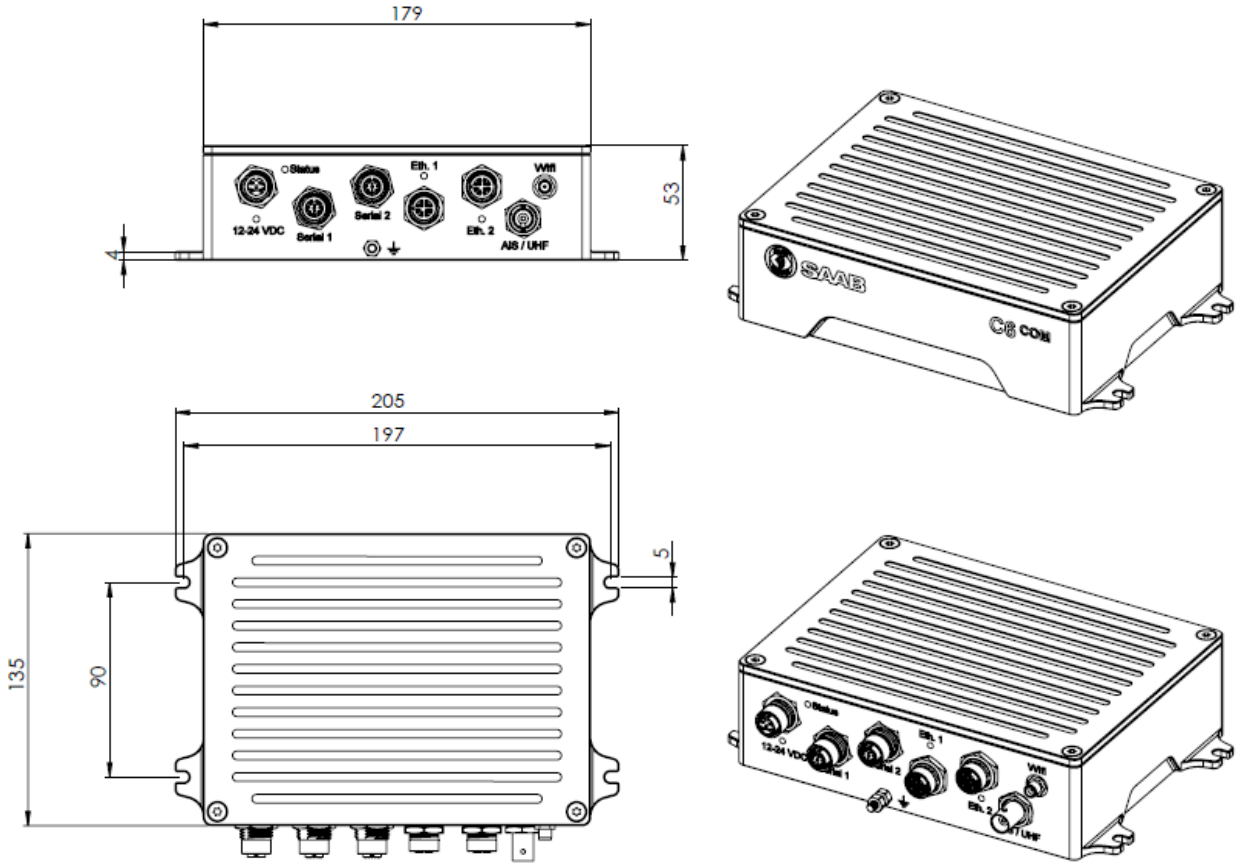

Figure 17 - C6 COM Measuements [mm]

13 GLOSSARY

Term	Description
AIS	Automatic Identification System
Ant	Antenna
Ch	Channel
Comm	Communication
Ext	External
F/W	Firmware
GMSK	Gaussian Minimum Shift Keying
GNSS	Global Navigational Satellite System
GPS	Global Positioning System
HDG	Heading
H/W	Hardware
ID	Identifier
IEC	International Electrotechnical Commission
IMO	International Maritime Organization
Int	Internal
IP	Internet Protocol (address)
ITU	International Telecommunications Union
LED	Light Emitting Diode
LWE	Light Weight Ethernet
MSG	Message
NMEA	National Marine Electronics Association
N/A	Not available
NVM	Non-Volatile Memory
RTCM	Radio Technical Commission for Maritime Services
RTK	Real Time Kinetics
SNR	Signal to Noise Ratio
UHF	Ultra High Frequency
UTC	Universal Time Coordinated
VHF	Very High Frequency

Table 13 - Abbreviation List

13.1 Units

bps	Bits per second
W	Watt
kHz	Kilo Hertz

Table 14 - Units List