TRELLEBORG MARINE AND INFRASTRUCTURE

SafePilot CAT MAX v2

SafePilot

MANUAL

Introduction

To fully utilize the CAT MAX v2 navigation system and all its features safely and easily, please read this manual carefully.

The CAT MAX is a flexible dual-band antenna navigation solution for pilot use. It can function completely independently of the vessel on which it is being used and provides all relevant information to the pilot without relying on the ship's instrumentation.

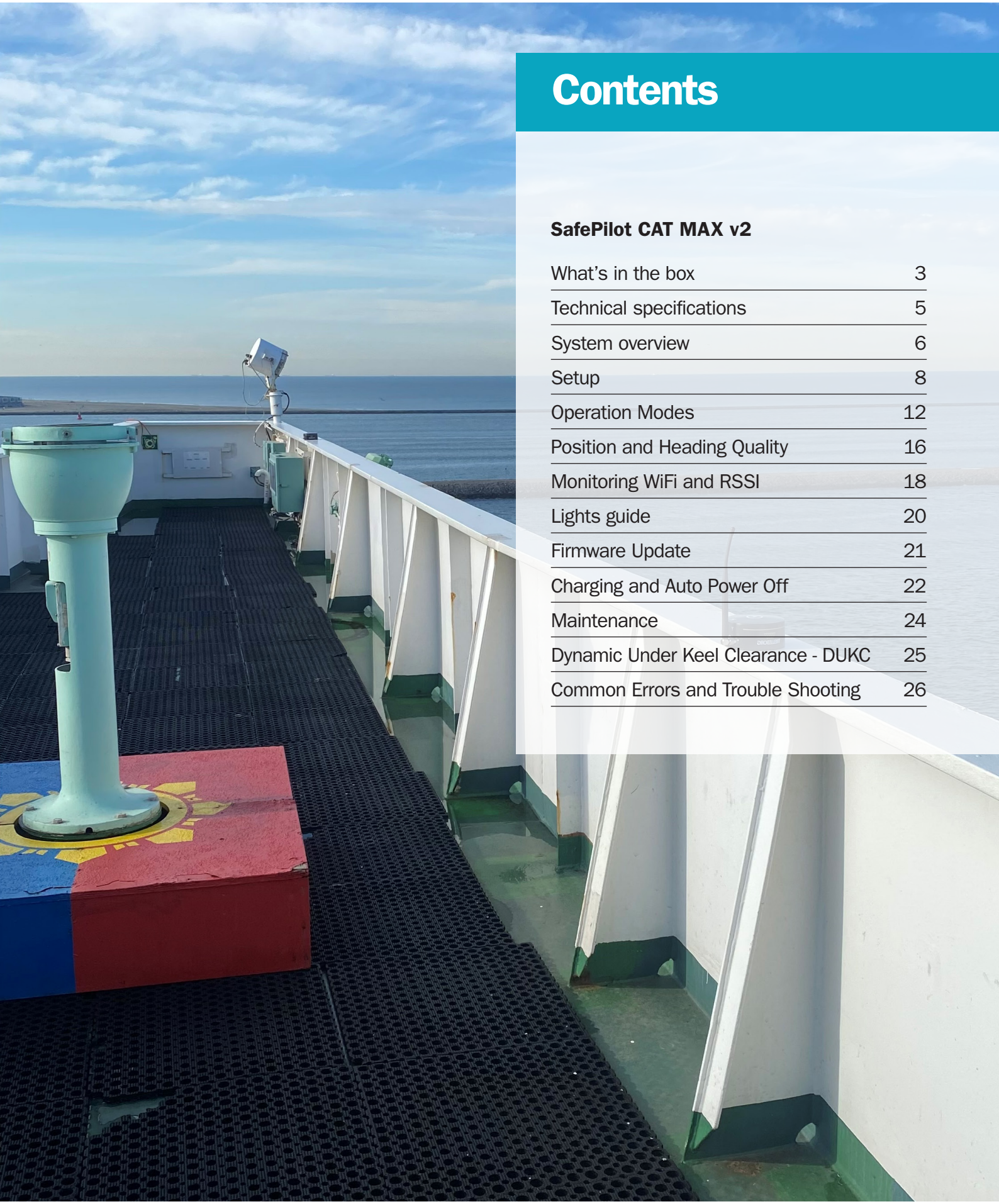
The system consists of heading and positioning units communicating with each other and the pilot's display through a Wi-Fi connection, ensuring a stable and long-range connection. It also comes with an extender unit to enhance Wi-Fi coverage.

The CAT MAX is equipped with a built-in six-axis inertial measurement unit (IMU) to ensure precise and independent measurements of roll, pitch, and rate of turn. This motion sensor allows for very accurate predictions when turning and navigating in confined waters. Moreover, the CAT MAX provides a feed through its integrated Automatic Identification System (AIS) receiver to monitor the movements of surrounding vessels.

In addition, the system allows for wireless charging as an alternative to traditional cable charging, providing full flexibility regarding keeping the units powered when working with the CAT MAX.

The TRELLEBORG MARINE SYSTEMS SafePilot systems are designed as a secondary navigational aid and do not relieve the user (pilot, captain, navigator, etc.) of their professional responsibility and navigational skills. Correct use, knowledge, and understanding of the performance and limitations of the SafePilot systems are the sole and only responsibility of the user.

It is important to note that the SafePilot systems and software do not override or substitute the navigation system (charts, ECDIS) installed on board as required by law.



Contents

SafePilot CAT MAX v2

What's in the box

THE CAT MAX V2 SYSTEM CONSIST OF:

1 pc. CAT MAX Position Unit . . . . . .A

1 pc. CAT MAX Heading Unit . . . . . B

1 pc. CAT Extender - AIS forwarder and network extender C

1 pc. AIS Antenna with adapter . . . . . D

1 pc. UHF Antenna with adapter. . . . . .E

1 pc. USB Multi Charger . . . . . .F

2 pcs. Charging cable . . . . . G

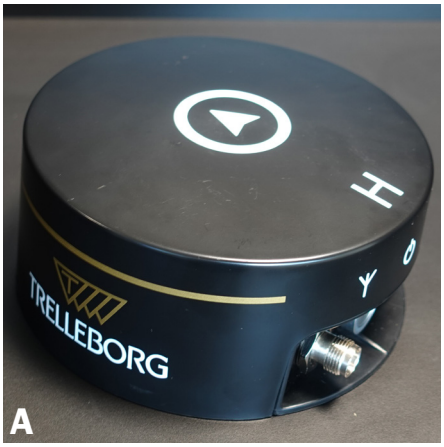
1 pc. Y-cable - Charging and AIS. . . . . H

1 pc. AIS cable I

2 pc. Lanyard . . . . . .J

2 pcs. Mounting brackets . . . . . K

2 pc. Quick Guide L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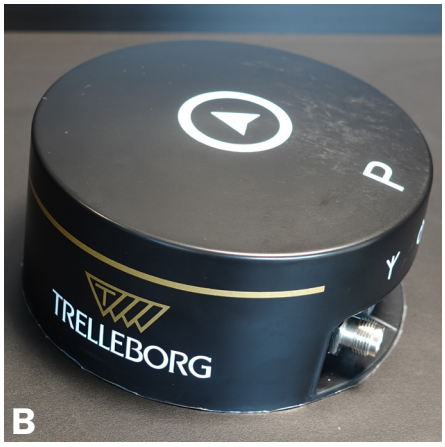
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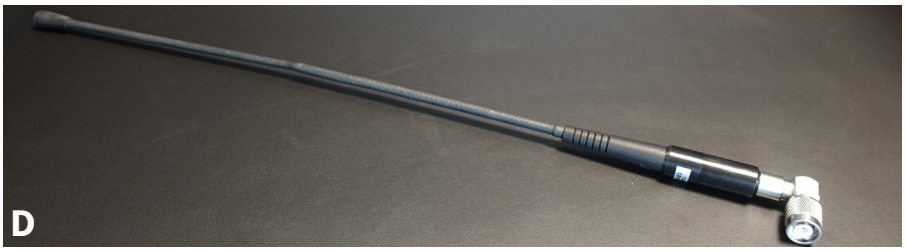
TRELLEBORG
CAT
EXTENDER
C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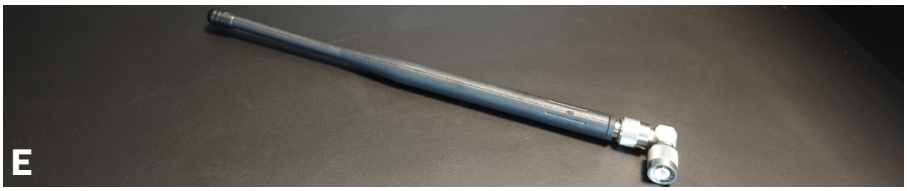
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Verbatim
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G


H


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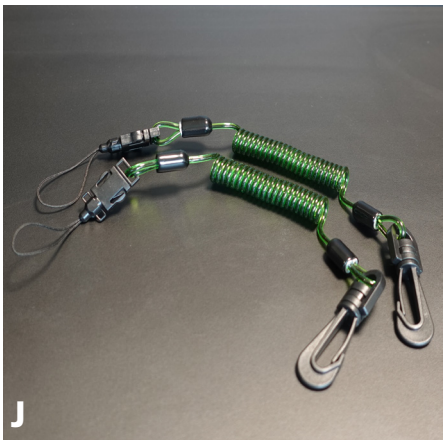
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K


SafePilot CAT MAX HDT
Quick Guide
SafePilot CAT MAX POS
Quick Guide
L

Technical Specifications

GNSS

- Tracked Systems: GPS / QZSS, Galileo, GLONASS, BeiDou
- Frequencies: L1C/A, L2C, L1OF, L2OF, E1B/C, E5b, B1I, B2I
- Interference Mitigation: Spoofing and Jamming detection
- Position Accuracy: RTK: 0.01m +/ – 1ppm, SBAS: 0.6m +/ – 1ppm
- Heading Accuracy@10m Antenna Separation: 0.02 degrees
- Speed Accuracy: 1 cm/sec
- Rate of Turn Accuracy: 0.1°/min

DGNSS CORRECTIONS

SafePilot CAT MAX can receive DGNSS Corrections from either UHF or over Wi-Fi using NTRIP. The specifications of the two are:

UHF

- Frequency: 403 – 473MHz
- Channel spacing: 25kHz
- DGNSS Corrections Protocol: RTCMv3

NETWORK DGNSS CORRECTIONS (NTRIP)

- Protocol: Networked Transport of RTCM via Internet Protocol (NTRIP)

AIS RECEIVER

- Dual Frequency: 161.975 & 162.025MHz (Class A & B receiver)
- Receiver Sensitivity: <-117dBm @ 20% packet error rate

INERTIAL MOTION UNIT (IMU)

- Gyro Bias Instability: ≤ 1.2°/hr
- Angular Random Walk: ≤ 0.08°/√hr
- 6 Degree OF Freedom: Triple Gyroscopes

Wi-Fi

- Access Point: IEEE 802.11 b/g/n with single band
- Number of clients: 8
- Security: WPA2

POWER

- Battery: > 18 hours of operation
- Quick charge (<3 hour)

MECHANICAL

- Weight: 2 x 600g

System overview

The CAT MAX system comprises three units: a CAT MAX POS (position), a CAT MAX HDG (heading), and a CAT EXTENDER.

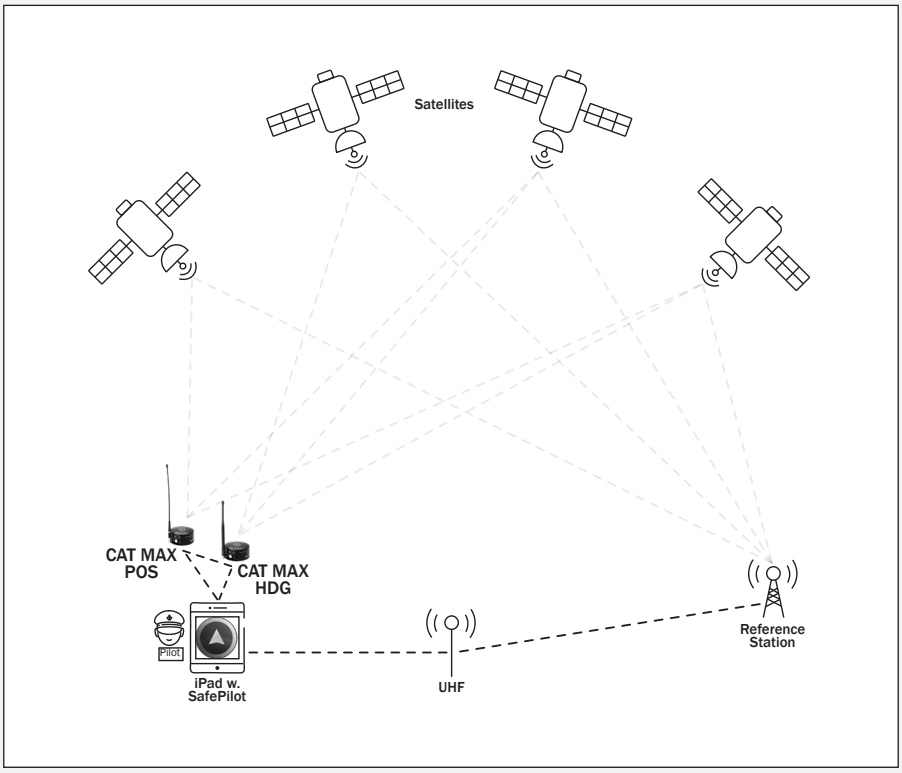
CAT MAX POS provides position, speed, and course information. It receives corrections from a global navigation satellite system (GNSS) and transmits them to the HDG unit to calculate the heading. The POS unit is also equipped with a built-in Ultra-High Frequency (UHF) radio modem to receive GNSS corrections, enabling it to achieve real-time kinematic (RTK) accuracy.

In addition, the system offers an alternative method to achieve RTK accuracy using internet-based corrections. The following section will outline the variances between the two options.

1. UHF Corrections

when using UHF corrections, a local reference station transmits the GNSS corrections on an approved or license-free frequency. This station is typically placed at a high location inside the port or in the vicinity. Trelleborg can provide the equipment for this kind of reference station, or an existing one can be used. If an already installed reference station is to be used, don't hesitate to contact Trelleborg to ensure the setup is correct.

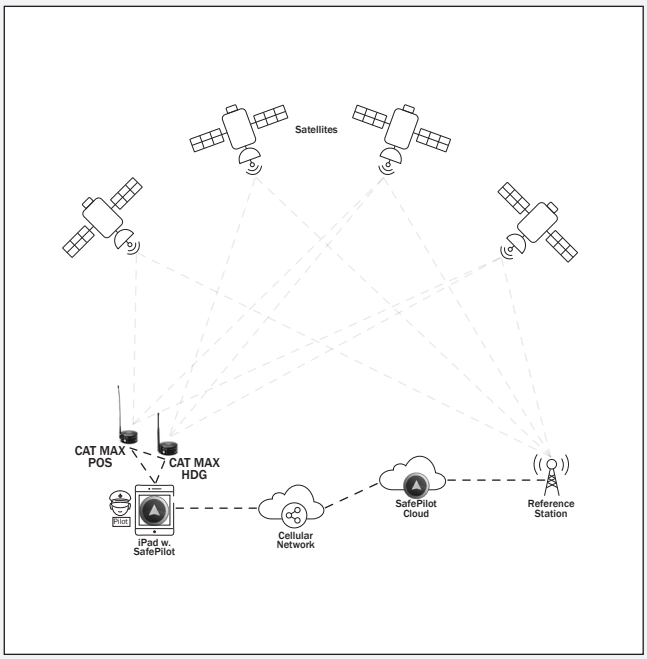
UHF communications are utilized in offshore systems as well, enabling various parties involved in the operation to communicate effectively. For example, a floating liquefied natural gas (FLNG) facility may send its position and RTK corrections to a CAT MAX on a tanker vessel, which in turn will send its position back to the FLNG.



CAT MAX UHF corrections

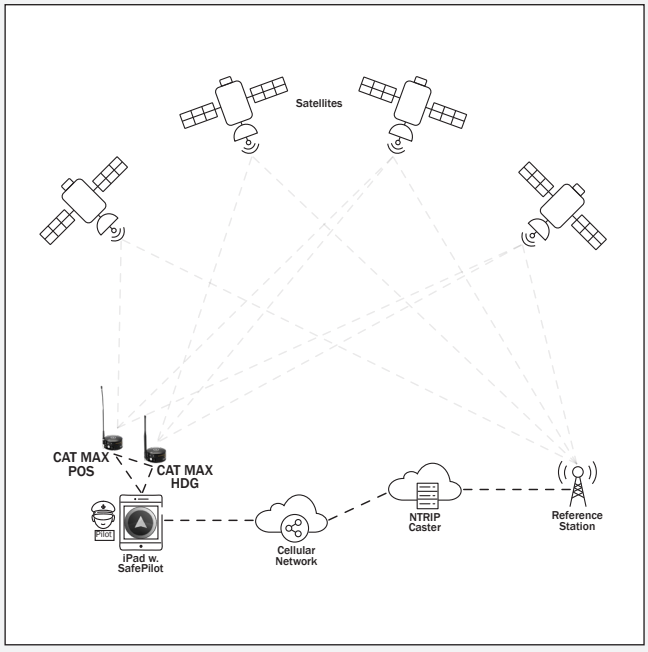
2. Internet corrections

If corrections are provided via the internet, a SafePilot server is typically used to access a local reference station installed within the port. Alternatively, the SafePilot server can be linked to an NTRIP server that will provide the corrections.



CAT MAX using internet corrections through SafePilot Cloud

Networked Transport of RTCM via Internet Protocol (NTRIP) is a protocol for transmitting real-time GNSS correction data over the internet, enhancing position accuracy for autonomous navigation



CAT MAX using internet corrections through NTRIP

CAT MAX HDG provides heading and rate of turn. The heading is computed based on the GNSS corrections transmitted from the CAT MAX POS, and the rate of turn is based on the change in heading and measurements made by the IMU. If the optional Dynamic Under Keel Clearance (DUKC) function has been purchased, the HDG unit will also provide roll and pitch.

To function properly, both the POS and the HDG units should be placed on horizontal surfaces. The CAT MAX units have GNSS antennas at the top of the cabinet, which must face upwards. In addition, the HDG unit carries an IMU that measures rate of turn, roll, and pitch. Placing it on a surface that is not horizontal will degrade or compromise the measurements. A built-in AIS receiver will receive AIS targets at a range of up to 30NM.

CAT EXTENDER is used to extend the Wi-Fi range. Although the CAT MAX units can maintain stable and long-range Wi-Fi on their own, placing the units on different vessels without obstructing the signal can be challenging. Obstacles on the vessel can obstruct the signal from the units, causing a blockage. By placing the CAT EXTENDER in the center of the bridge, better Wi-Fi coverage across the entire bridge will be ensured.

Setup

When paired, the two CAT MAX units should be placed outside with a clear sky view. Obstructions could cause the CAT MAX to be less accurate or even wrong because the measurements would be based on fewer satellite trackings. To make sure to get the best measurements, the following conditions must be taken into consideration:

- The recommended baseline between the two CAT MAX units is 4 meters (13 feet). If it is impossible to get a 4-meter baseline without any obstructions nearby, it would be preferred to accept a bit less accuracy and then place the units closer together. Be aware that the baseline should always be a minimum of one meter.
- If the above is impossible, the CAT MAX POS and HDG can also be placed with a longer baseline or on opposite bridge wings. In the latter case, it is important to know that only the signal from shared satellites can be used to compute the heading.
- Make sure the standard deviation does not exceed 0.5 degrees; otherwise, the CAT MAX HDG will be unable to compute a heading. The standard deviation is shown under the quality indicator in the iPad's upper left corner of the SafePilot software - this feature will be described in more detail below.
- Make sure the CAT MAX has at least a 3m clearance from obstructions such as the wheelhouse, rain covers or railings.
- Maintain a distance of at least 0.5 meters between the CAT MAX and obstacles such as antennas. (If the antenna transmits at high power, it may disrupt CAT MAX satellite tracking!)
- For vessels with enclosed bridge wings, it is recommended to place the CAT MAX on monkey island with the HDG unit at the front center and the POS unit on the port or starboard side from this. Placing the CAT EXTENDER inside and at the center will provide the best Wi-Fi coverage within the bridge.

The following images illustrate suitable and unsuitable locations for the CAT MAX units and provide directions on how to mount them and connect them to the pilot plug.

Very good location, as the area around the CAT MAX unit is clear and free of obstacles.

Even though it may seem like a good spot for the CAT MAX, it's actually not ideal because the antennas block a large portion of the sky and may cause interference by emitting high power.

This is a great location for the CAT MAX because the only obstruction to the view of the sky from the two units is the Panama Roof, which is made of plastic and is at a sufficient distance.

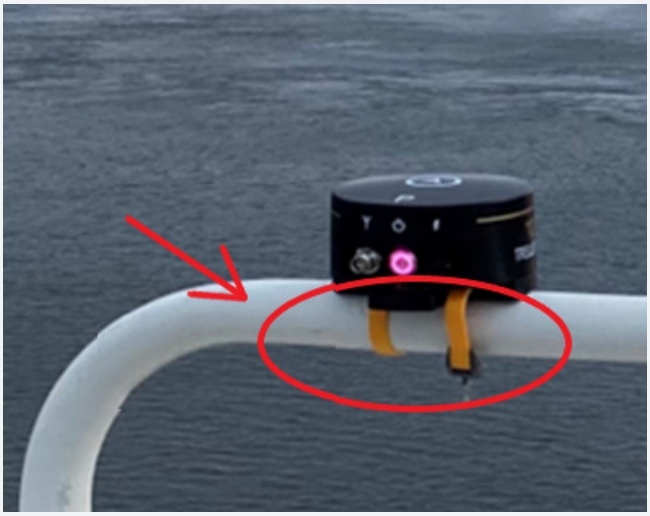
Due to the proximity of numerous metal pipes, this location is not suitable for the CAT MAX.

Since there are more than 3 meters (10 feet) to the wheelhouse from this location, it would also be suitable for the placement of the CAT MAX, even though it seems like it may be blocking the view.

Here, the wheelhouse is too close to the CAT MAX unit, blocking almost half of the sky view, making it less suitable for placement.

Mounting

The CAT MAX has very strong magnets on the bottom, securely attaching it to any metal surface. If no suitable flat horizontal surface is found where the units can be placed, the CAT MAX includes a set of mounting brackets, which makes it very easy to fit one or both units onto a railing or pipe. The bracket is also equipped with magnets and straps to make sure it can be properly attached to the railing.



CAT MAX unit mounted on a pipe railing using the included bracket.

If using brackets, ensure the strap is only wrapped around the railing or pipes once to allow the magnets on the CAT MAX units to stick.

When the CAT MAX is fitted to the brackets, the combined magnetic field makes the magnets stick even more. Because of this, it is recommended that the brackets be used even though the units are mounted on a flat surface.

The CAT MAX features a bottom mounting hole for attaching the provided safety lanyard, as illustrated in the image below.

Safety lanyard attached to CAT MAX unit.

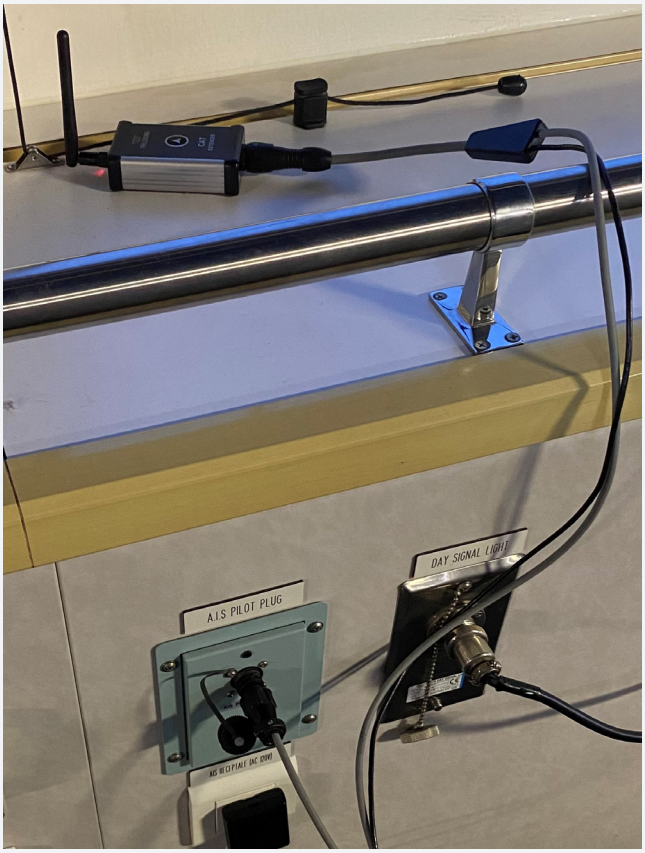
Connect to pilot Plug

The CAT MAX HDG unit can be connected to the pilot plug, if a suitable location for neither the Cat Max POS nor the HDG unit can be found. This way, the SafePilot will receive the heading from the ship's AIS transponder, as well as the AIS targets (As in Mode 1, referenced in the next section).

When using this option, it is very important to install the unit horizontally to ensure an accurate rate of turn. If the CAT MAX HDG is used as a pilot plug repeater, it is recommended that the CAT MAX POS unit also be used to ensure the reliability of position, speed, and course.

CAT MAX HDG connected to the Pilot Plot

The CAT EXTENDER as well can be connected to the Pilot Plug. If using the CAT EXTENDER this way, connect it to the Pilot Plug to receive AIS targets. This setup positions the EXTENDER centrally, ensuring excellent Wi-Fi coverage across the entire bridge (As in Mode 4, described below).



CAT EXTENDER connected to the Pilot Plot

Operation Modes

The CAT MAX system has four different modes, which can be used depending on conditions and situations requiring its function. The different ways of usage will be rewiewed in the following:

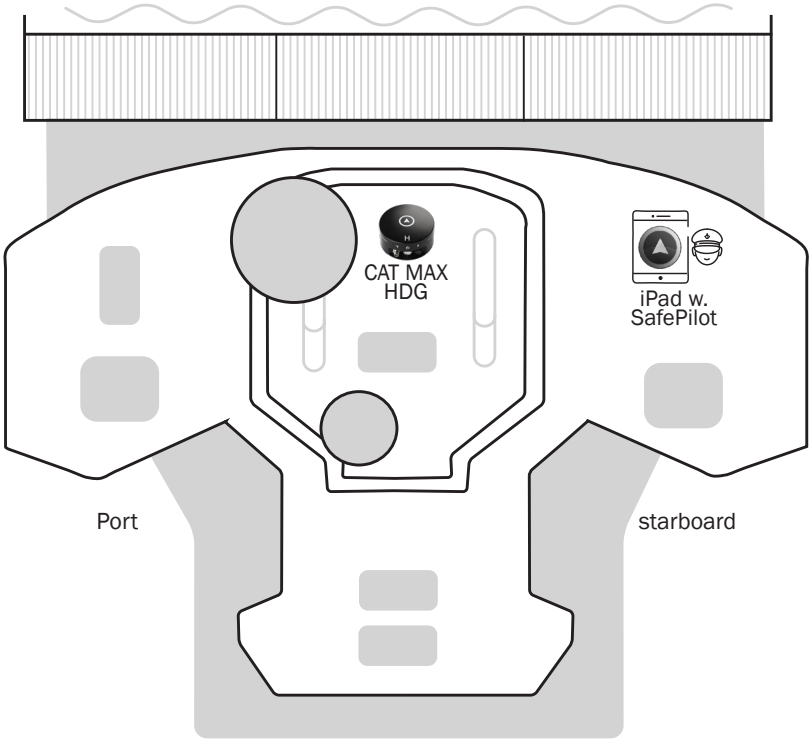
1. Using CAT MAX as Pilot Plug Repeater

In the simplest use case, the CAT MAX can act as a Pilot Plug Repeater. Its primary function is to address the limitations of the AIS pilot plug data format. This is achieved by generating an accurate real-time rate of turn and providing the missing decimal readings to the heading data through an integrated IMU, intelligent processing, and the advanced Kalman filter algorithm integrated into the unit's software.

Please note that relying solely on the ship's own instrumentation may lead to inaccuracies in reading the ship's position and speed due to frequent instrument inaccuracies. This is why it is recommended to utilize CAT MAX in either mode 2, 3, or 4 for most operations. Then, an independent position, speed, course, heading, and rate of turn is provided.

To use the device in mode 1, please follow the steps below:

- Press the button to turn on the CAT MAX
- Connect the CAT MAX to the pilot plug using the supplied cable
- Make sure the unit is placed on a horizontal surface to achieve a reliable rate of turn
- Connect the iPad to the "CAT MAX (xxxxxxxx)" network using password "86912255" and launch the SafePilot software
- For optimal Wi-Fi performance and reliability, position the CAT MAX as shown in the instructions below, with the arrow pointing towards the bow

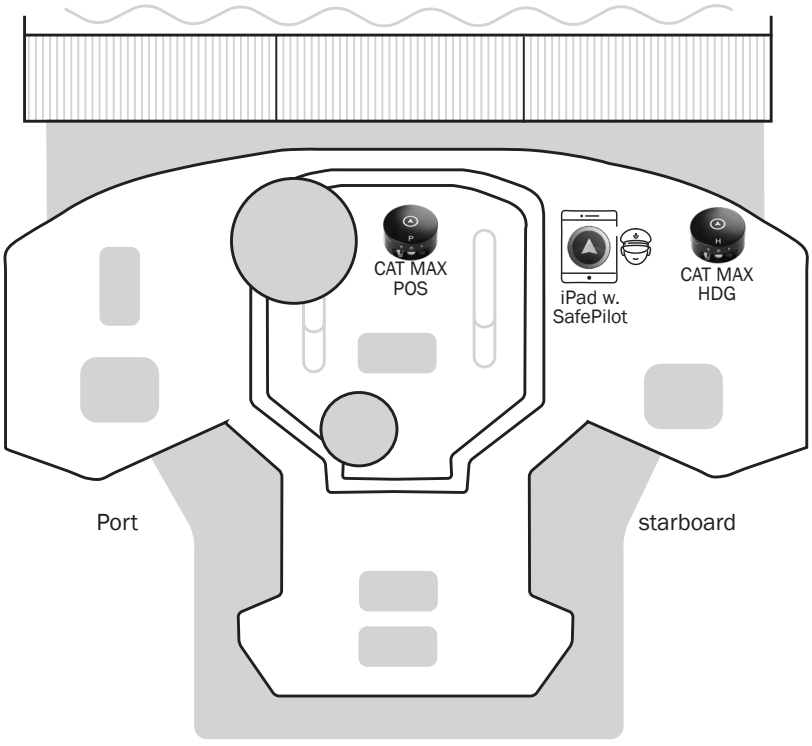


2. Using CAT MAX as Pilot Plug Repeater with external GNSS Receiver

The CAT MAX units will, in this mode, function as a pair. One will operate as the heading unit (HDG), while the other will handle position (POS). In Mode 2, the system provides an accurate rate of turn as well as independent position, course over ground, and speed information, enhancing the reliability of the positioning data.

To use the device in mode 2, please follow the steps below:

- Turn on both CAT MAX units one by one by pressing the button on the side
- After a few moments, the buttons flash green simultaneously to indicate that they have paired
- Connect the HDG unit to the pilot plug using the supplied cable. Make sure the unit is placed on a horizontal surface to achieve a reliable rate of turn
- Connect the iPad to the “CAT MAX (xxxxxxxx)” network using password “86912255” and launch the SafePilot software.
- For optimal Wi-Fi performance and reliability, position the CAT MAX as shown in the instructions below, with the arrow pointing towards the bow.



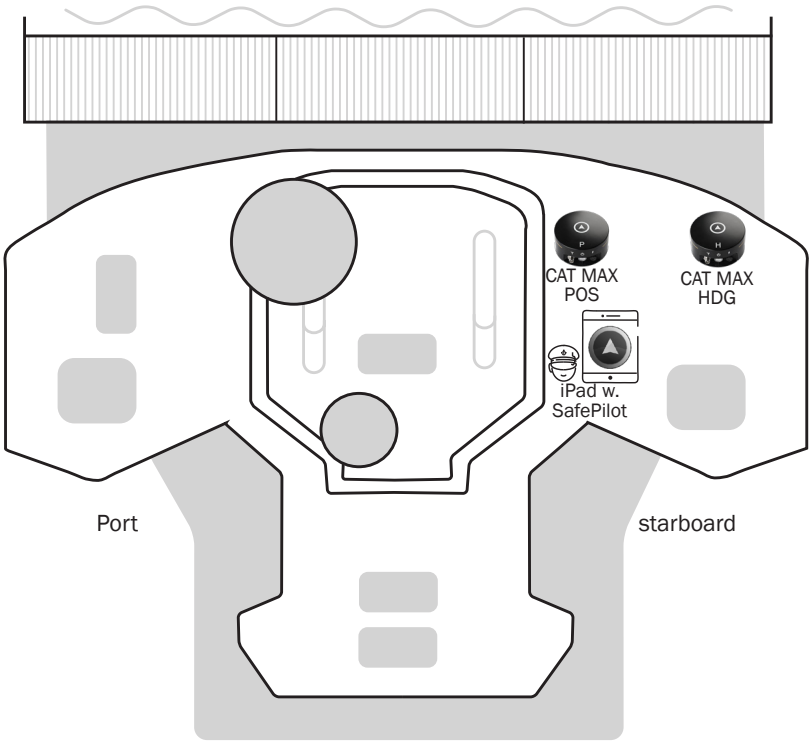
3. Using CAT MAX as a stand-alone system

In the 3rd mode, the CAT MAX functions as a fully independent system, not dependent on the ship's instrumentation.

When used in this way, both CAT MAX units are placed on the bridge wing. One unit is configured as a CAT MAX HDG, which computes very accurate real-time heading, rate of turn, and roll/pitch via the built-in IMU and intelligent filtering. The other unit is configured as a CAT MAX POS, computing a position/speed and course.

To use the device in mode 3, please follow the steps below:

- Turn on both CAT MAX units one by one by pressing the button on the side
- After a few moments, the buttons flash green simultaneously to indicate that they have paired. Connect the iPad to the "CAT MAX (xxxxxxxx)" network using password "86912255" and launch the SafePilot software.
- Make sure the units are placed on a horizontal surface to achieve the highest reliability in rate of turn.
- To achieve the best Wi-Fi performance, reliability, and coverage, both the POS and HDG units should be placed on the bridge wing with a clear view of the sky. Furthermore, the HDG unit should be closest to the wheelhouse to ensure the best Wi-Fi coverage.
- The CAT MAX units should be placed as shown in the instructions below, with the arrow pointing toward the bow.

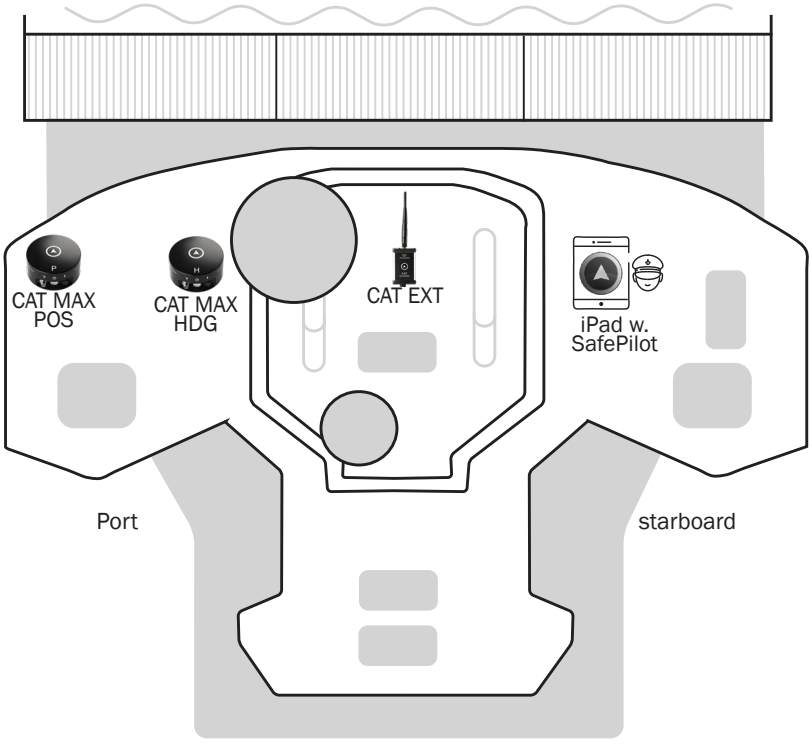


4. Using CAT MAX as a stand-alone system with HDG and extended Wi-Fi Range

In Mode 4, the CAT EXTENDER will be used alongside the CAT MAX HDG and POS units. The CAT EXTENDER will act as the Wi-Fi access point. If placed in the center of the ship, the EXTENDER will provide strong and reliable Wi-Fi coverage throughout the entire bridge wing - even on large vessels such as ULCVs. The CAT MAX HDG will compute the heading and rate of turn, and the CAT MAX POS will compute the position/speed and course.

To use the device in mode 4, follow the steps below:

- Turn on the CAT EXTENDER and wait until it lights up in a solid white (about 5 seconds)
- Turn on the HDG and POS units one by one by pressing the button on the side
- After a few moments, all three devices should flash green simultaneously, indicating they are paired.
- Connect the CAT EXTENDER to the Pilot Plug using the supplied cable.
- Connect the iPad to the network “CAT MAX (xxxxxxxx)” with password “86912255” and launch the SafePilot software.
- Place the CAT MAX HDG and CAT MAX POS on the bridge wing with a clear view of the sky. Placing one unit on the port side and one on the starboard side, will provide a long baseline, resulting in very accurate computing of the heading.
- To achieve the best Wi-Fi performance and reliability, it is important to place the CAT MAX with the arrow pointing towards the bow.
- The CAT EXTENDER should be positioned to have a clear view of the bridge wings and the two CAT MAX units. The antenna of the CAT EXTENDER must be oriented vertically, pointing upwards.



Position and heading quality

The Device Status window in the SafePilot software provides valuable information about the quality of position, speed, and heading computations. To access it, tap the quality indicator RTK on the left side of the top bar.

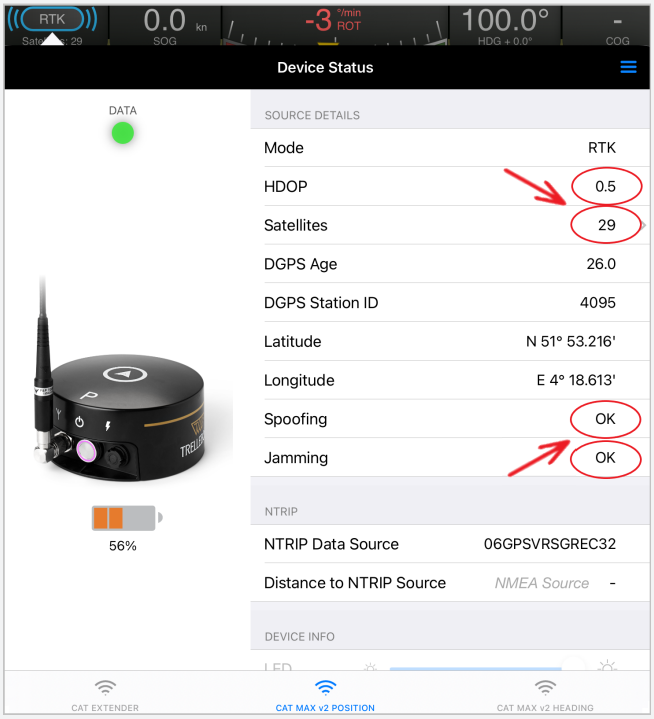
The information from the different units is shown in separate windows. To switch between these, tap either CAT MAX POSITION CAT MAX HEADING or CAT EXTENDER in the bottom bar of the Device Status window

The values displayed in these windows indicate whether the units are placed appropriately or should be moved to a better location if possible and whether they are in contact with one another.

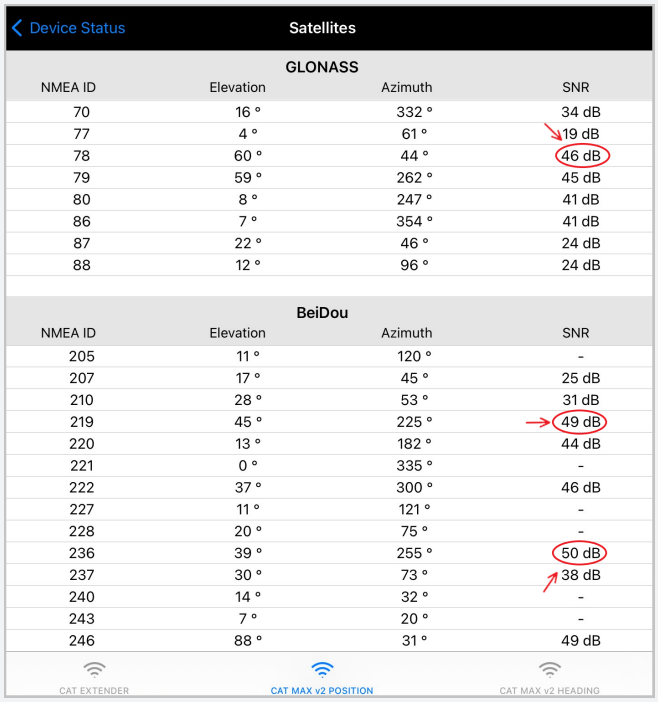
When evaluating the placement of each unit, it's important to consider the general guidelines listed above in the "Setup" section.

General Guidelines for the CAT MAX POSITION Unit

- The unit should be able to connect to more than 20 satellites
- HDOP (horizontal dilution of precision) value must not exceed 1.5
- Both the spoofing and jamming status should be OK



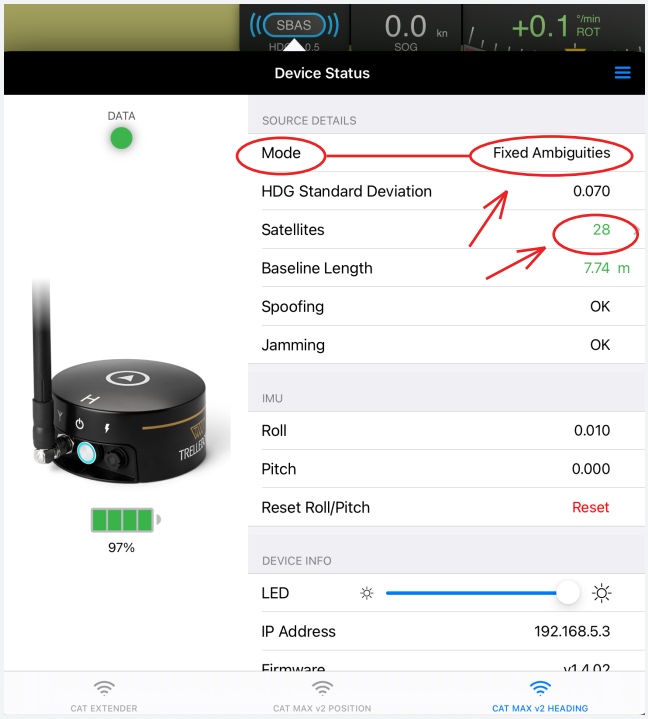
- At least three satellites should have an SNR (signal-to-noise ratio) beyond 45 dB



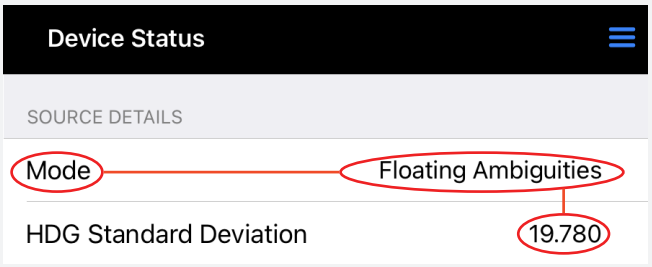
General Guidelines for the CAT MAX HEADING Unit

- For the HDG unit to function optimally, it should have access to more than 15 satellites. The number indicates how many satellites the two CAT MAX units commonly connect to. If there are not enough shared satellites, the HDG unit should be placed in a location with a clear view of the sky and/or covering the same part of the sky as the Pos unit.
- The Mode indicator can show one of the following three statuses:

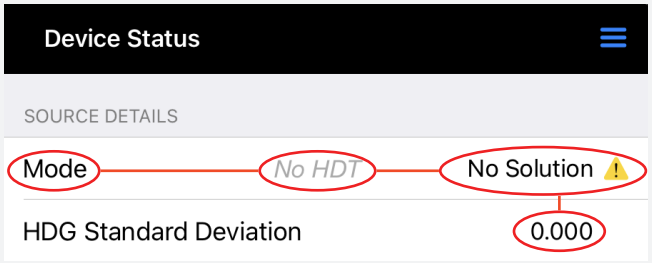
  Fixed Ambiguities: The heading is displayed and is of high precision.



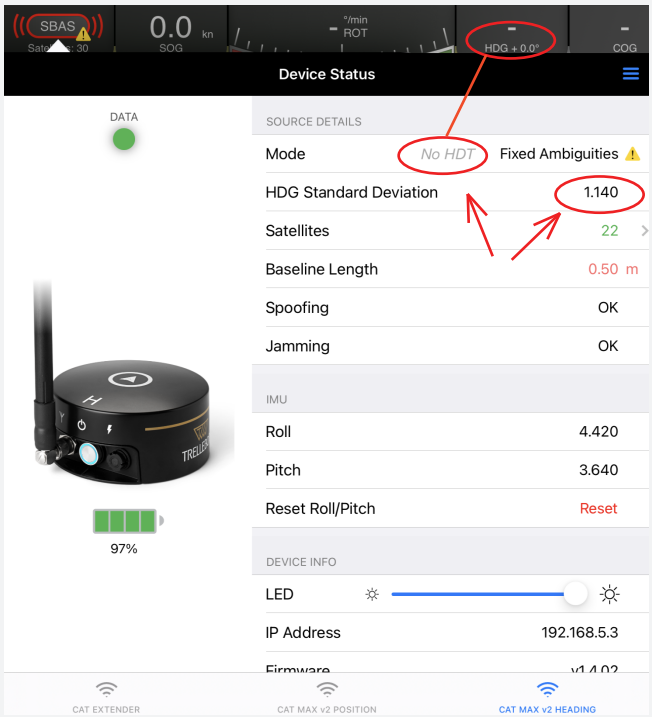
  Floating Ambiguities: A heading is computed, but the quality is not very good (The HDG standard deviation is above 0.5° – see the bullet below)



  No Solution: No heading is computed. Most likely because the HDG unit does not receive any corrections from the position unit



- The HDG standard deviation indicates the minimum heading accuracy. The indication must be lower than 0.5° for a heading to be displayed
- In case the HDG standard deviation value exceeds 0.5 for 5 minutes or more, the IMU will stop computing the heading. This means no heading will be provided, as seen below.



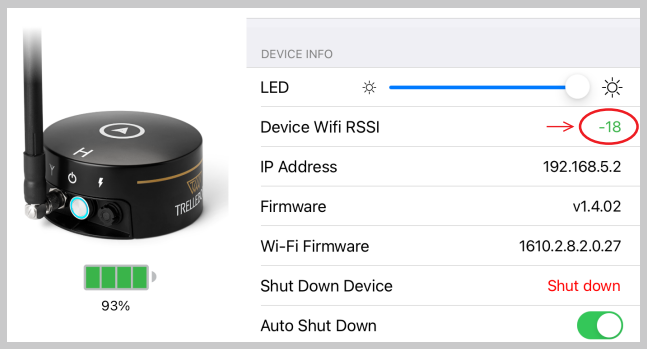
Monitoring WiFi and RSSI

Maintaining a stable WiFi connection between the different units is essential for ensuring high-quality data reception and reliable connectivity. The strength of the signal can be monitored in the Device Status window under the "Device WiFi RSSI" point. This reference point will indicate whether the connection is strong or if there are any issues.

The signal quality is categorized into three levels:

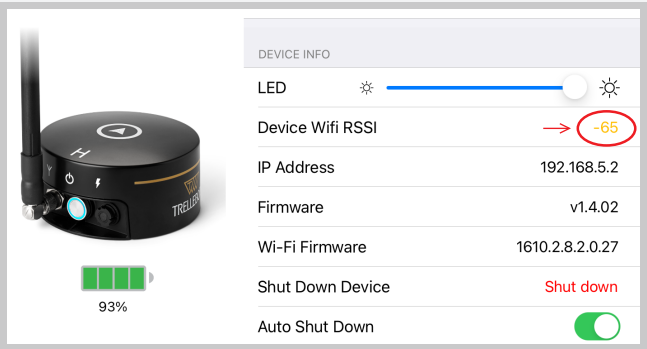
- **Green** (Signal Strength: -60 or better):

  A green indicator signifies a stable connection; no further action is needed



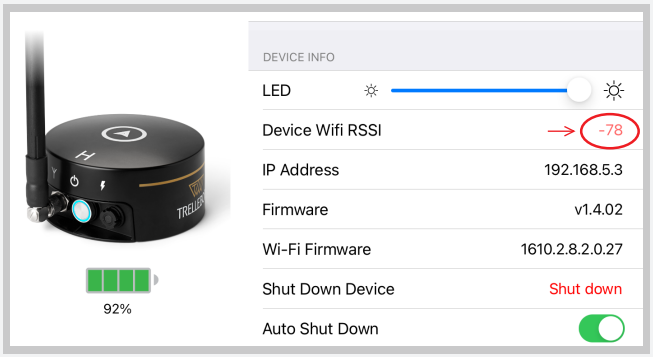
- **Yellow** (Signal Strength: Between -60 and -75):

  A yellow indicator means the connection is weaker than preferred. In such cases, relocating the CAT MAX units to a better position for improved WiFi signal strength is advisable.



- **Red** (Signal Strength: Below -75):

  A red indicator means the WiFi connection is too weak. For reliable connectivity, the units must be relocated to an area with a stronger signal (preferably above -60).

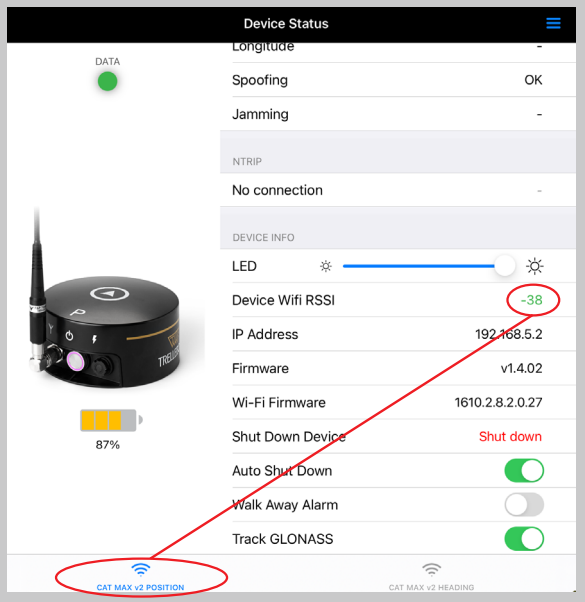


The location of the information to check the signal strength may vary depending on the mode in which the system is being used. However, the key takeaway is that it is essential to monitor the client unit or units closely.

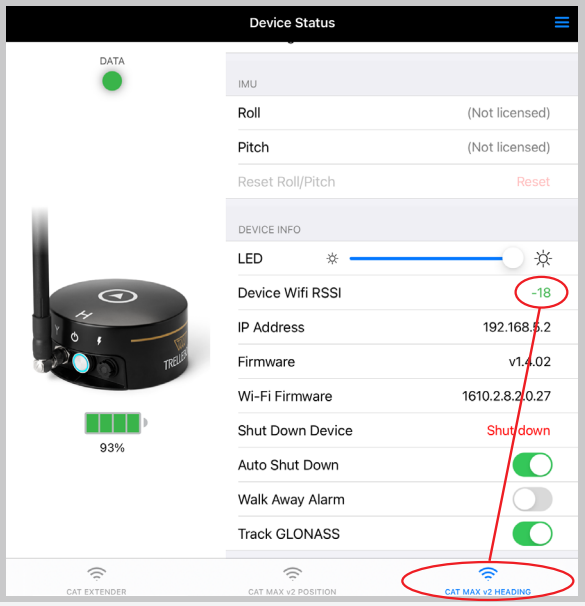
The following provides a brief overview of which unit or units to monitor when used in different modes:

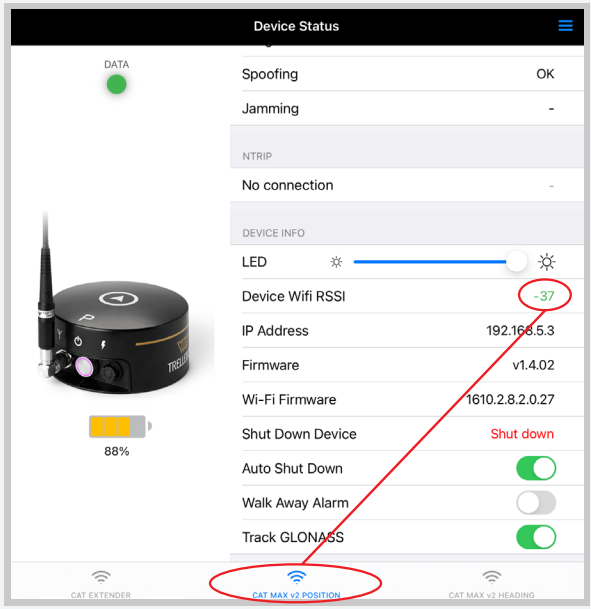
- **Mode 1:** The CAT MAX HDG unit is, in this mode, connected directly to the pilot plug. This eliminates the need for WiFi and monitoring the connection

- **Mode 2:** In the second mode, the CAT MAX POS unit is the client to the HDG unit which is connected to the pilot plug and provides the signal. In this case, the signal strength can be monitored in the Device Status window when it displays the status for the POS unit, as shown in the screen capture below:



- **Mode 3 and 4:** When used in this mode, both units will be clients of the ship's WiFi (in mode four through the EXTENDER). It is, therefore, important to monitor the signal for both devices.





If the signal gets lost, it may be necessary to turn the unit with the lost signal off and on again to regain the connection.

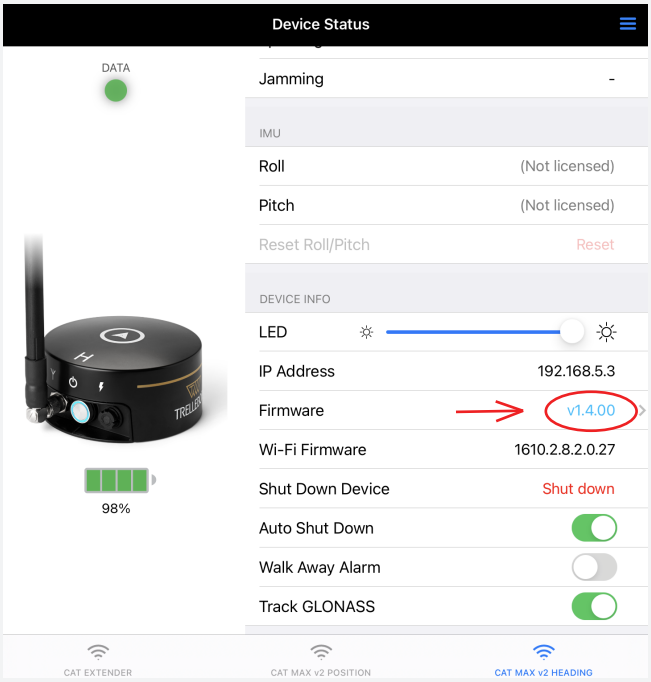
Lights Guide

CAT MAX HEADING UNIT (HDG):		
	Steady Blue	HDG/AIS position OK
	Slow Flashing Blue	No HDG/AIS position
	Steady Red	Fully Charged
	Fast Flashing Red	Low Battery
	Slow Flashing Red	Charging
	Simultaneous Flashing Green	CAT MAX HDG - CAT MAX POS Paired
CAT MAX POSITION UNIT (POS):		
	Steady Purple	WiFi Connected, position OK
	Fast Flashing Purple	Not Connected to CAT MAX HDG
	Slow Flashing Purple	No GPS position
	Steady Red	Fully Charged
	Fast Flashing Red	Low Battery
	Slow Flashing Red	Charging
	Simultaneous Flashing Green	CAT MAX POS - CAT MAX HDG Paired
CAT EXTENDER (EXT):		
	Steady White	WiFi Connected
	Slow Flashing White	Booting
	Simultaneous Flashing Green	EXTENDER paired with CAT MAX POS - CAT MAX HDG

Light overview of the different units

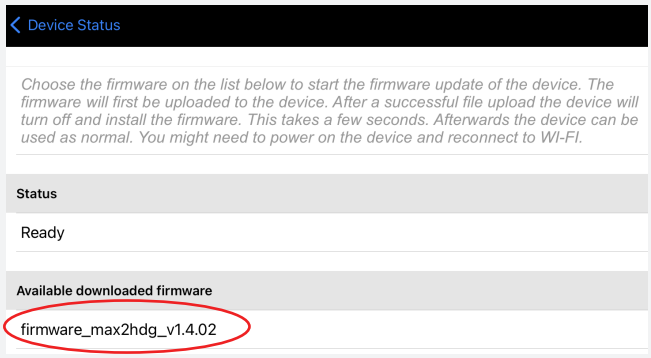
Firmware Update

It is recommended that your CAT MAX units always be updated with the latest firmware. When an update is available, it will be displayed in the GPS Status view window, and the version currently installed will be marked with blue

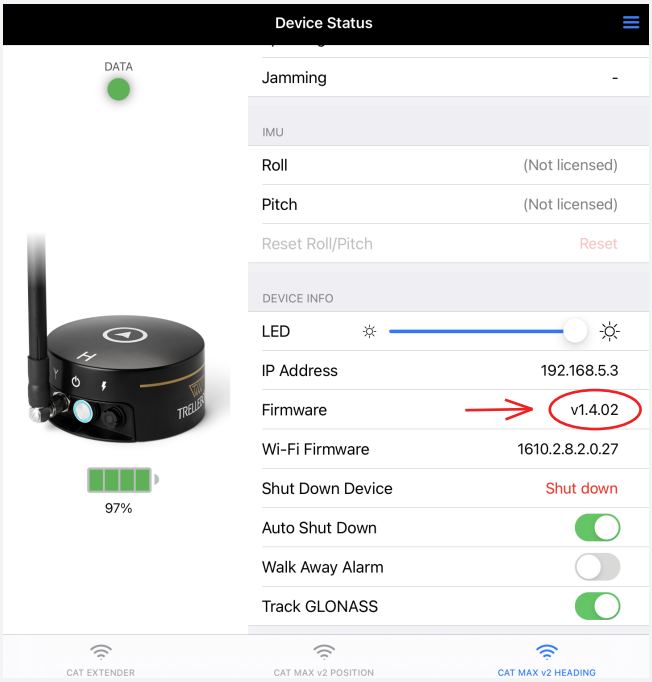


The update can be performed over the air (OTA) using the SafePilot Software by following the steps below:

- Turn on your CAT MAX, connect to its WI-FI, and open the SafePilot software
- To update the firmware, tap on the firmware field in the GPS Status view window. A new window will appear showing the available firmware.
- Tap on the new firmware version, and the device will start updating



- After the update is completed, the new firmware version will be marked in black in the GPS Status view window

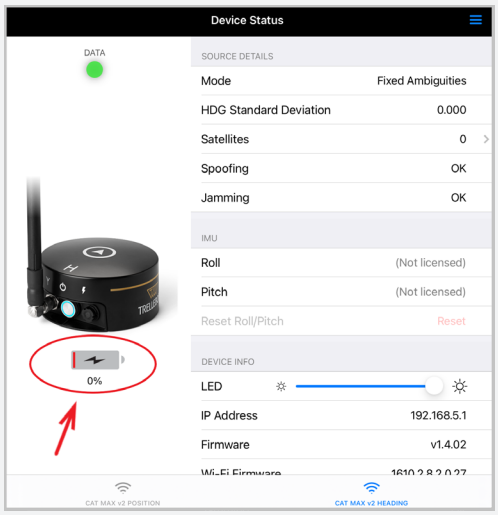


Charging and Auto Power off

To offer high flexibility, the SafePilot CAT MAX features two charging options: via cable or with a wireless charge pad. The EXTENDER unit can only be charged using a cable.

Wireless Charging

When using wireless charging, the CAT MAX unit should be placed in the center of a wireless charging pad that supports Qi charging. It will start flashing red, indicating that it is charging. When the unit is fully charged, the light switches from flashing to lighting up in solid red.
The unit is fully functional while charging, and the progress can be followed in the SafePilot software. The battery load percentage is shown along with a lightning symbol indicating that the charging is ongoing.



Depending on the charger, the battery can charge from 0 to 100% in approximately 8 hours.

When receiving the CAT MAX, the battery will only hold very little power due to restrictions on shipping lithium batteries via airfreight.

Cable Charging

When the charging cable is connected, the CAT MAX flashes red, indicating that charging is in progress. When the unit is fully charged, the light switches from flashing to lighting up in solid red. The SafePilot software displays the current battery level and whether the unit is charging, just like with wireless charging.

The CAT MAX is fully functional while charging. It supports charging versions up to USB PD 3.0, USB HVDCP, and QuickCharge 3.0. When fast-charging is used, the CAT MAX battery charges from 0 to 100% in approximately 4 hours, while the CAT EXTENDER will take approximately 1.5 hours to fully charge from empty.

Please be aware not to twist the charging cable when connecting or disconnecting.

Auto power off

It is possible to enable/disable the feature, as required, through SafePilot software.

Either of the CAT MAX Units will turn off automatically under certain conditions.

If the following conditions are met, the unit will turn off. This will also occur when the devices are connected to a Pilot Plug or charger.

Heading Unit (HDG)

- If no heading has been achieved for 30 minutes.
- If no clients are registered, on the CAT MAX Wi-Fi Network for 30 minutes

Position Unit (POS)

- If not connected to the HDG Unit for 5 minutes
- If no valid position is achieved for 30 minutes

Maintenance

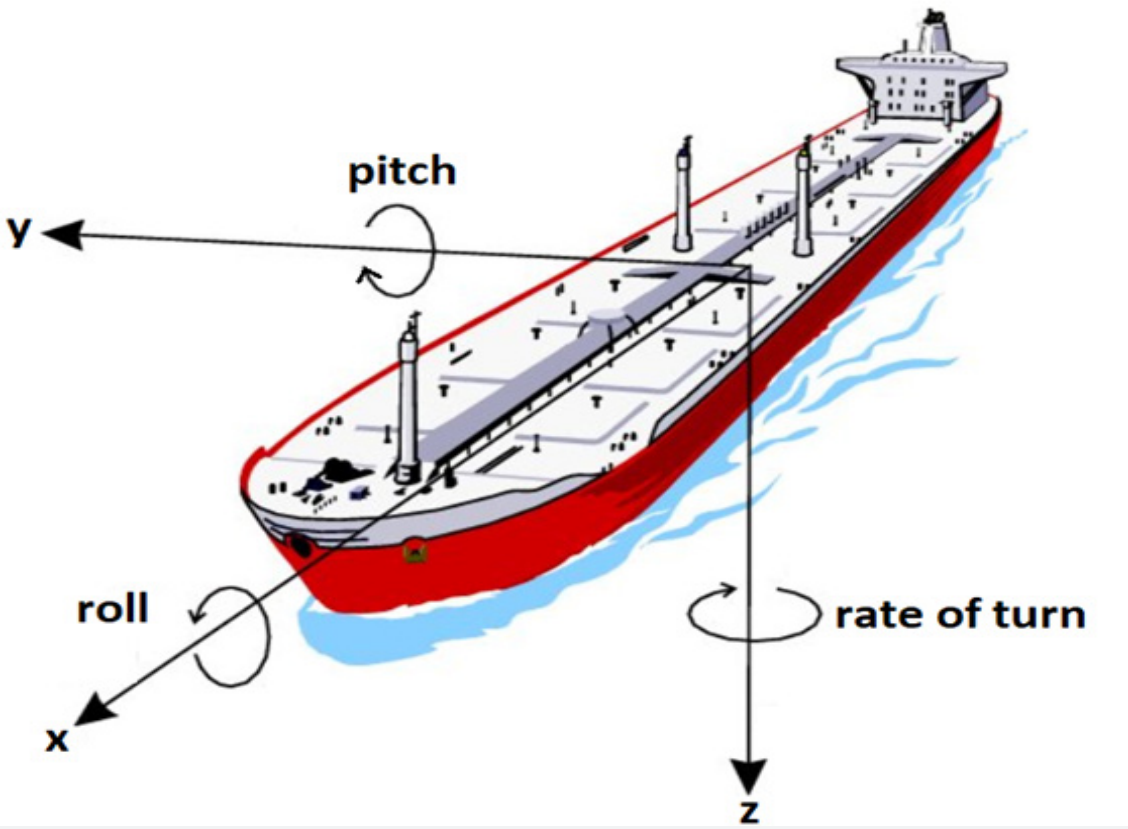
To ensure the CAT MAX remains in great condition, please keep the following in mind:

- Keep the CAT MAX clean and dry while stored.
- The battery level should be maintained at 50-60% if the device is not used for an extended period of time
- All cables need regular inspection, and the connectors must be checked to ensure they are clean
- Ensure the safety strap is intact and not damaged. It should be replaced if it shows any signs of wear and tear. Always use the safety strap when fitting the CAT MAX on the mounting bracket
- Inspect the straps on the mounting bracket and make sure they are in good condition. Replace if any of the straps show signs of wear and tear
- Always remove the CAT MAX from the bracket before taking it off the railing

Dynamic Under-Keel Clearance - DUKC

If needed, the CAT MAX system can provide measurements for calculating the under-keel clearance. The DUCK option in the SafePilot software must then be procured; furthermore, contact with an RTK reference station is necessary to provide the data about height.
The system will then provide position, height (Requires RTK), heading, roll, and pitch - all data needed to calculate the vessel's least under-keel clearance.

The IMU inside the CAT MAX HDG unit measures roll and pitch, while the CAT MAX POS unit provides height information.
It is important that the CAT MAX HDG is installed correctly to ensure that the roll and pitch figures are exact and not compromised. The arrow on the CAT MAX HDG must point toward the vessel's bow to get the correct measurements. Since the unit is round, it might be difficult to place correctly; therefore, using the mounting bracket, even on a flat surface, may be advantageous.



COMMON ERRORS & TROUBLESHOOTING

No Heading:

- The CAT MAX HDG unit should be positioned closest to the wheelhouse. Please verify this
- Make sure that the baseline between the POS and HDG exceeds one meter
- Move the CAT MAX to another location

If none of the above actions resolves the issue and the heading is still impossible to compute, use the CAT MAX HDG to receive the heading from the vessel's AIS transponder by connecting it to the pilot plug. (To learn how to do this, please refer to the previous section "Connect to pilot Plug")

No Wi-Fi connection::

- Make sure that the CAT MAX HDG unit is the one closest to the wheelhouse
- Avoid placing the iPad on a metal surface, as it can reduce Wi-Fi connectivity
- Make sure the CAT MAX HDG unit is oriented correctly to obtain the best range. (To learn more about placing the units, please refer to the previous sections "Setup")
- Try moving the CAT MAX to another location - possibly closer to the wheelhouse
- If there are any wireless printers on/ inside the bridge/pilothouse these should be turned off
- If support is required, please include pictures of the location of each of the CAT MAX units in the recording. This is valuable information that will ensure that proper support is given

GET IN TOUCH

Technical support | support@safepilot.eu

Website | trelleborg.com/marineandinfrastructure

Sales | toc.aar.sales@trelleborg.com

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Trelleborg Marine and Infrastructure
Email: support@safepilot.eu