
HS65™ GNSS compass

Installation manual

English



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Warranty

This product's warranty is supplied as a separate document.

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This product's safety, disclaimer and compliance statements are supplied as a separate document.

More information

Document version: 002

This document was prepared using software version 2.3.00.xx.

Features described and illustrated in this guide may vary from your system due to continuous development of the software.

For the latest version of this document in supported languages, and other related documentation, visit

www.simrad-yachting.com/downloads/compassesandgps.

Contact us

For product support and service information, visit www.simrad-yachting.com/contact-us.

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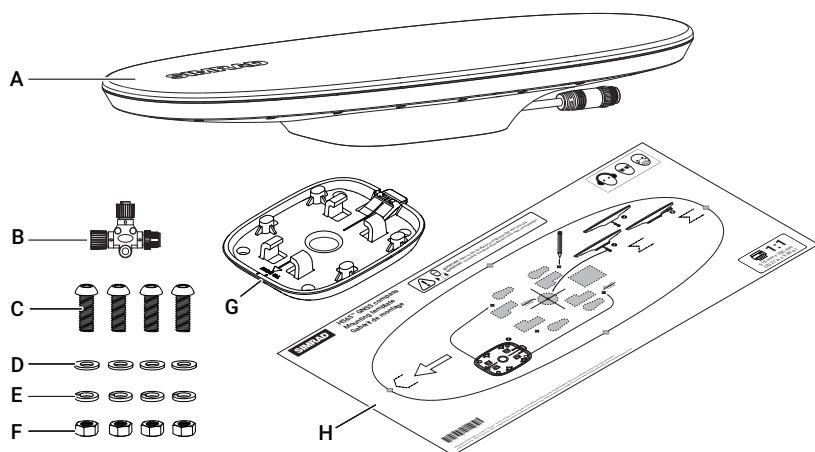
OVERVIEW

The HS65 GNSS compass outputs satellite heading, position, and attitude for sail and powerboats. It also outputs rate of turn, pitch, roll, and heave. The HS65's GNSS antennas are separated by approximately 30 cm (11.8") between phase centers, resulting in a heading performance error less than 2° RMS. The HS65 can provide heading and positioning updates at 10 Hz, making it suitable for autopilot steering and radar tracking.

It connects to the vessel's NMEA 2000® network, allowing you to set up and control it from compatible display units on the network.

The HS65 compass can be configured to output magnetic heading when a satellite fix is lost for more than three minutes, allowing you to proceed uninterrupted if GNSS data is not available.

In the box



- A HS65 GNSS compass
- B NMEA 2000® T-connector
- C 4x M8-1.25 x 30 machine screws
- D 4x flat washers
- E 4x spring washers
- F 4x nuts
- G Flat mount adapter plate (optional)
- H Mounting alignment card

INSTALLATION

Location

Consider the following when choosing the mounting location for the HS65:

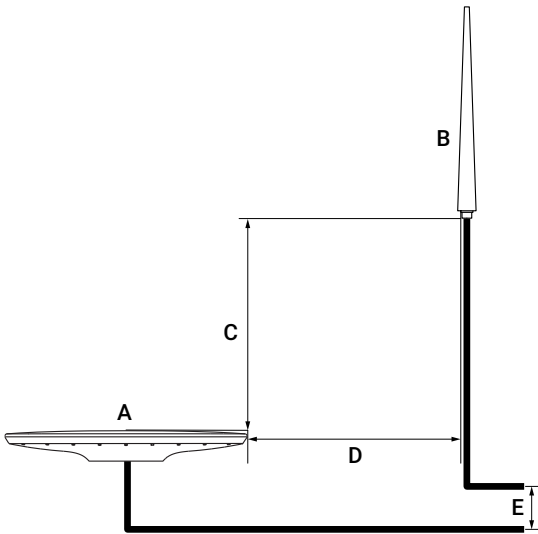
Optimize GNSS reception

Ensure that the HS65 has a clear view of the sky and horizon, and that the view is not blocked by obstructions that may reduce system performance. Metal, carbon, and wood could impact the GNSS signal in a negative way.

Minimize VHF interference

VHF interference from cellular phones and radio transmitters may interfere with GNSS operation. To ensure satellite-tracking performance of the HS65 is not compromised, install it at least 2 m (6.5 ft) away from transmitting antennas. Do not mount it in the path of a radar beam. Refer to the documentation supplied with the transmitting antenna for minimum safe distances.

Install the HS65 at least 0.5 m (1.6 ft) away from other GPS/GNSS receivers.



- A HS65
- B VHF antenna
- C Minimum vertical distance between the HS65 and VHF antenna: 2 m (6.5 ft)
- D Minimum horizontal distance between HS65 and VHF antenna: 2 m (6.5 ft)
- E Recommended cable separation: 0.3 m (1 ft) for the first 5 m (16.5 ft)

Minimize magnetic interference

The HS65 has the ability to report a magnetic heading when the satellite fix is lost for more than three minutes. If you intend to use this feature, you must install the HS65 as far as possible from magnetic influences. Possible sources of magnetic fields include engines, audio speakers, high-current cables, and objects containing ferrous metals, such as anchors or tool chests.

Minimize vibration and motion of the unit

-  Vibration of the HS65 can reduce the quality of the attitude data. Install the HS65 in a location with minimal vibration.
-  Mounting the HS65 at the top of a mast may cause the attitude data to be degraded by the pitch and roll of the vessel. Installing the HS65 closer to the waterline will reduce the effects of pitch and roll on the compass outputs.
-  Installing the HS65 on a pole mount can reduce the accuracy of dead reckoning data, resulting in sub-optimal heading data.

 WARNING: Installing the HS65 on a pole mount is not recommended in high performance situations where control surfaces depend on pitch and roll data.
--

Orientation and position

Make sure there is room to mount the HS65 as close to horizontal as possible, and never mount it upside down.

The HS65 is intended to be mounted with its long axis parallel to the centerline of the vessel, and the Simrad® logo toward the bow. If this is not possible, use a compatible display to enter offsets.

Mount the HS65 in a location where you can connect its NMEA 2000® fly lead to your vessel's NMEA 2000® network. If you use an extension cable between the HS65 fly lead and the NMEA 2000® backbone (not supplied), the length of the extension cable should not exceed 4.5 m (14.75 ft).

Do not mount the HS65 in any location where it might be used as a hand hold.

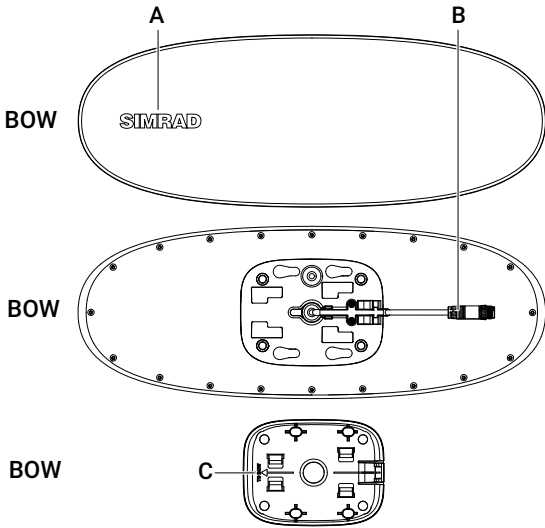
Mounting

Use non-magnetic hardware and where supplied, use the fittings included in the box. Tighten the screws by hand and not electric drill. Tighten them just enough to prevent movement under normal use.

When mounting the compass in a permanent position, always wear appropriate eye wear, ear protection and dust mask when drilling, cutting, or sanding. Remember to check the reverse side of all surfaces whenever drilling or cutting. Ensure that any cutting or drilling is done in a safe position and will not weaken the vessel's structure. If in doubt, consult a qualified boat builder, or marine electronics installer.

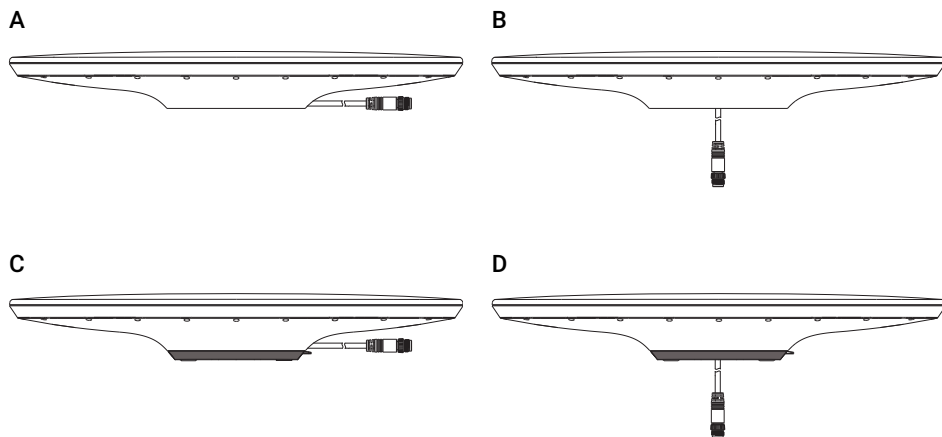
Orientation

- The front GNSS receiver is under the Simrad® logo (A).
- The NMEA 2000® fly lead exits at the rear of the HS65 (B).
- The front edges of mounting accessories are marked "TO BOW" (C).



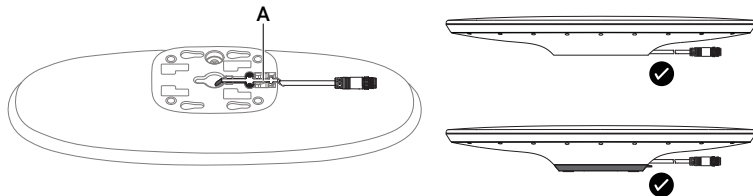
The HS65 GNSS compass can be mounted:

- directly to the mounting surface, with the cable exit horizontal (A) or vertical (B)
- using the supplied adapter plate, with the cable exit horizontal (C) or vertical (D)



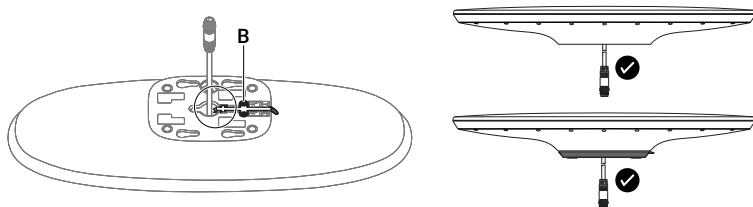
Reconfiguring the HS65 so the cable exits vertically

A cable retainer (A) is fitted into the base of the HS65. By default, the compass is configured with the cable exiting horizontally from the rear of the unit.



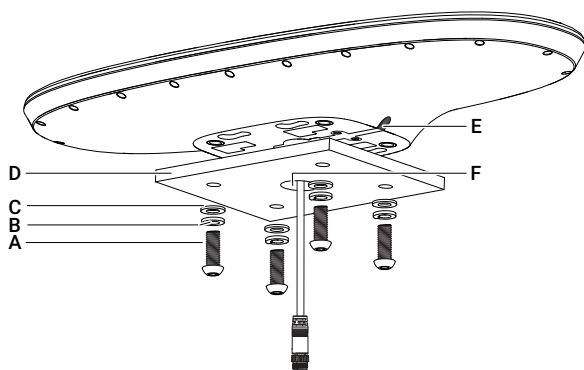
To install the HS65 with its cable exiting vertically from the center of the base:

- 1 Carefully turn the HS65 over to see its base.
- 2 Use a T8 Torx® screwdriver to remove the two cable retainer screws (B).
- 3 Remove the cable retainer, and ease the cable into a vertical position.
- 4 Turn the cable retainer 180°, then reinstall the cable retainer and its screws.



Mounting the HS65 directly onto a surface

- 1 Decide where on your vessel you will install the HS65.
- 2 Orientate the HS65 with the Simrad® logo towards the front of the vessel, and the long axis of the HS65 parallel to the centerline of the vessel.
- 3 Use the supplied alignment card to confirm correct alignment parallel to the vessel's centerline, and to mark the four mounting holes (refer to **Using the alignment card** on page 13).
- 4 Create four holes with diameter 9 mm (0.35 in).
 - **Note:** Create the center hole (**F**, below) only if you are installing the HS65 with its cable vertical instead of horizontal. The center hole should have diameter 20 mm (0.78 in).
- 5 Apply a light coating of Tef-Gel® or other suitable nickel or PTFE-based lubricant (not supplied) to the threads of the screws to prevent corrosion and galling.
- 6 Insert the mounting screws through a spring washer then a flat washer, then through the bottom of the mounting surface, and into the HS65.
- 7 Use a 5 mm Allen key to tighten the screws.
- **Note:** The screws should enter the HS65 to a depth of at least 8 mm (0.32 in), but not more than 20 mm (0.78 in).



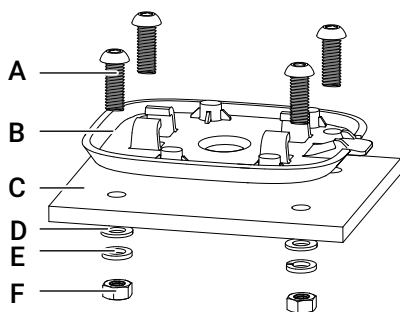
- A M8-1.25 x 30 machine screw (supplied)
- B Spring washer (supplied)
- C Flat washer (supplied)
- D Mounting surface
- E Cable retainer, refitted for vertical cable
- F Center hole in mounting surface (required only for vertical cable exit)

Mounting the HS65 using the adapter plate

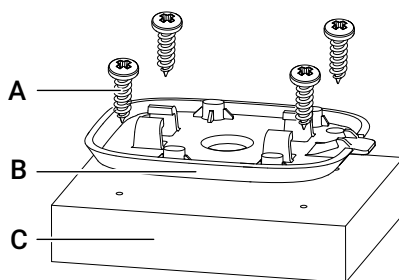
The supplied adapter plate can be used where you prefer to install fasteners from above, or if you are mounting the HS65 onto a thick substrate where you cannot access the underside to install washers and nuts.

→ **Note:** The HS65 only fits onto the adapter one way, so the alignment of the adapter plate determines the alignment of the compass. Refer to **Using the alignment card** on page 13.

- 1 Decide where on your vessel you will install the HS65.
- 2 Orientate the HS65 with the Simrad® logo towards the front of the vessel, and the long axis of the HS65 parallel to the centerline of the vessel.
- 3 Use the supplied alignment card to confirm correct alignment and to mark the four mounting holes.
- 4 If you are using the supplied M8 machine screws, create four holes with diameter 9 mm (0.35 in). If you are screwing the adapter plate onto a thick mounting surface, choose appropriate screws and create four pilot holes.
→ **Note:** Create the center hole only if you are installing the HS65 with its cable vertical instead of horizontal. The center hole should have diameter 20 mm (0.78 in).
- 5 Apply a light coating of Tef-Gel® or other suitable nickel or PTFE-based lubricant (not supplied) to the threads of the screws to prevent corrosion and galling.
- 6 Insert the mounting screws through the adapter plate as shown below. Use the supplied flat washers, spring washers, and nuts on the machine screws.

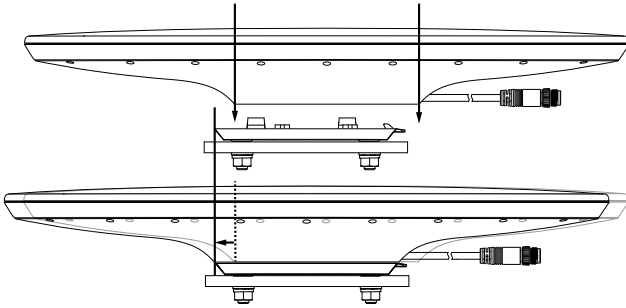


- A M8-1.25 x 30 machine screw
- B Adapter plate
- C Mounting surface
- D Flat washer in contact with surface
- E Spring washer in contact with nut
- F Nut



- A Screw (not supplied)
- B Adapter plate
- C Mounting surface

- 7 When the adapter plate is secured in the correct position, lower the HS65 over the clips in the adapter plate. Push the HS65 forwards to lock it in position.



Removing the HS65 from its adapter plate

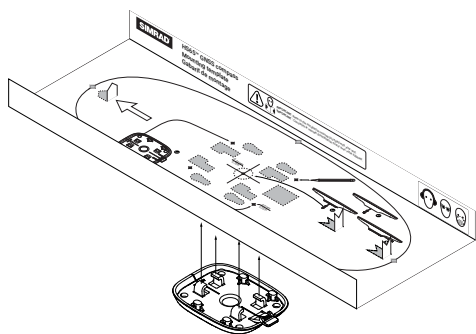
- 1 Disconnect the HS65's NMEA 2000® cable. Make sure the connector at the end of the cable is free to move through any holes or conduits without snagging.
- 2 Support the HS65 upper housing while inserting a large flat blade screwdriver into the clip at the rear of the adapter plate. Use the screwdriver blade to hold the clip down, and slide the HS65 horizontally backwards (towards the screwdriver) to disengage the HS65 from the tabs in the adapter plate.
- 3 Lift the HS65 vertically off the adapter plate.

Using the alignment card

The supplied alignment card is a life-size replica of the HS65. It fits onto any compatible mounting adapter, allowing you to align the adapter correctly before securing it and fitting the HS65.

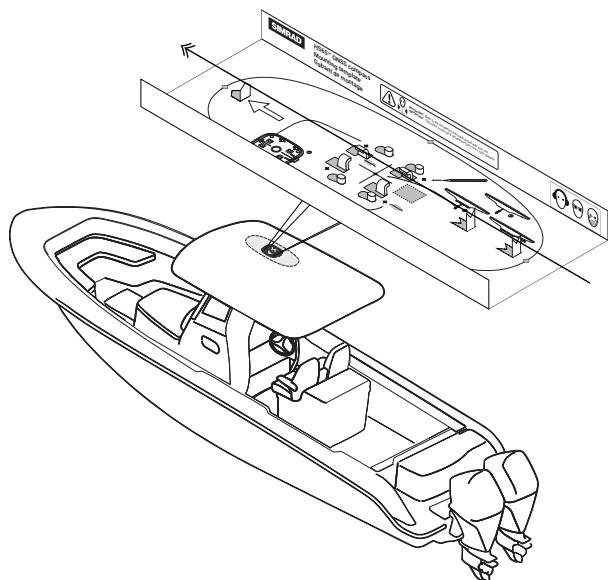
→ **Note:** If you downloaded a version of the alignment card from the Simrad® website, make sure its size is accurate before marking or drilling any holes in your vessel.

- 1 Fold up the long edges of the alignment card to prevent it from bowing.
- 2 Fold up the alignment sights on the long axis of the card.
- 3 If you are installing the HS65 using an adapter, fit the alignment card onto the adapter.



→ **Note:** When using an adapter, the adapter is installed first, then the HS65 is fitted onto the adapter. It is therefore very important to align the adapter correctly. The larger area of the alignment card should allow you to confirm alignment more easily than aligning the adapter by itself.

- 4 Use the sights to check the card is both parallel to the vessel's centerline, and level.



- 5 When you are satisfied with the alignment of the card (and adapter, if using), mark the required holes onto the mounting surface through the alignment card.

→ **Note:** If the alignment card is not level, you can use the card to estimate offsets that you enter later using your display.

Connecting the HS65

→ **Note:** For guidelines on constructing a NMEA 2000® network, refer to the documentation that came with your display.

⚠ Before you start the wiring, turn the electrical power off. If power is left on or turned on while wiring, fire, electrical shock or other serious injury may occur.

⚠ Do not make sharp bends in the cables.

⚠ Do not run cables so they interfere with mechanical systems.

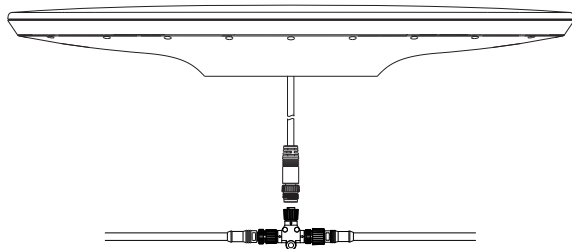
⚠ Do not run cables over sharp edges or burrs.

⚠ Use cable ties on all cables to keep cables secure.

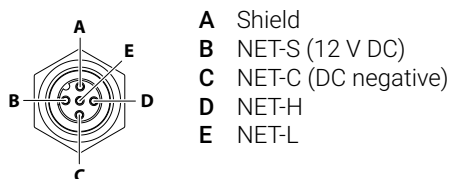
⚠ Do not overtighten cable ties, to avoid damaging the cables.

Use the supplied T-connector to connect the HS65 to a suitable NMEA 2000® network that is powered by a 12 V DC source and protected by a 3 A fuse.

→ **Note:** The HS65 draws its power from the battery supplying the NMEA 2000® network. When the vessel is not in use, disconnect the power to the NMEA 2000® network to prevent the compass or other devices from draining the battery.



The pins in the HS65's fly lead connector are assigned as follows:



MAGNETIC BACKUP

The HS65 primarily uses signals from GNSS satellites to calculate position and heading. Appropriate signals from at least four satellites are required for the HS65 to report heading. If the satellite fix is lost temporarily, the HS65 will continue to report heading for up to three minutes using dead reckoning.

After three minutes, the HS65 will either:

- continue to report heading using data from its magnetometer (if this setting is enabled and the compass has a valid magnetic calibration),
- or
- report an invalid heading (if the compass does not have a valid magnetic calibration, or if the magnetic backup is not enabled).

Enable magnetic backup

To instruct the HS65 to use magnetic heading when satellite heading is lost for more than three minutes, on a compatible display, navigate to (depending on your multi-function display), either:

- **Settings > Boat network > Devices > HS65 GNSS Compass.** Select **Configure compass** and use the **Magnetic backup** toggle.
- or
- **Settings > Network > Device list > HS65 GNSS Compass > Configure** and select the **Backup Magnetic Compass** checkbox.

CALIBRATING THE COMPASS

If you enable magnetic backup, you must calibrate the HS65 compass to correct for the magnetic deviation on board the vessel. For optimal performance, you should recalibrate the compass if the vessel has traveled far from where it was previously calibrated. Recalibration may be required because the strength of the Earth's magnetic field varies in different geographic locations.

Auto calibration

There are three auto calibration modes. In all modes, the compass continuously collects and calculates new calibration parameters during normal use on the water. The difference is in how and when new parameters are applied.

The default mode is **On**, and for most users it's not necessary to change this. However, if you wish to make sure the compass doesn't change its calibration, you can set it to **Locked** once you're satisfied with the performance.

→ **Note:** *The HS65 needs to complete an auto calibration in **On** mode before **Locked** mode can be selected.*

Refer to the table below for more information about the compass auto calibration modes.

To change auto calibration modes, on a compatible display, navigate to (depending on your multi-function display), either:

- **Settings > Boat network > Devices > HS65 GNSS Compass.** Select **Configure compass**

or

- **Settings > Network > Device list > HS65 GNSS Compass > Configure**

and select a compass auto calibration mode from the dropdown list.

Mode	Behavior
On	In this mode, the first auto calibration will be completed, then the compass will phase in new parameters if they are deemed better than the parameters in use. It takes around 20 minutes to phase in the new settings.
Locked	In this mode, the compass won't change calibration parameters. If new parameters are deemed better than the current ones, the warning "Improved parameters are available" displays. In this situation, you can switch to On mode and phase in the new settings. Locked mode is suitable for vessels operating in a small geographical area with no big variation in the local magnetic field.
Off	In this mode the compass uses manual calibration.

Statuses and warnings

Magnetic calibration status and warning information display on the compass configuration screen of your multi-function display.

Status	Description
Calibrated	Calibration parameters are in use.
Calibrating	New calibration parameters have been found, and are being phased in.
Not calibrated (or - - -)	Not enough magnetic data collected to begin calibration.

Warning	Description
No warning	No current warning to display.
First calibration in progress	Data for first calibration is being collected.
Improved parameters are available	New calibration parameters have been found, but the current mode is Locked . Temporarily set the mode to On to update parameters.
Parameters in use are not valid	Current parameters are not valid. If this is seen when the mode is Locked , temporarily set the mode to On to update parameters.
Calibration required (or - - -)	No calibration present, and auto calibration mode is set to Off .

Manual calibration

To calibrate your HS65 compass manually, navigate to (depending on your multi-function display), either:

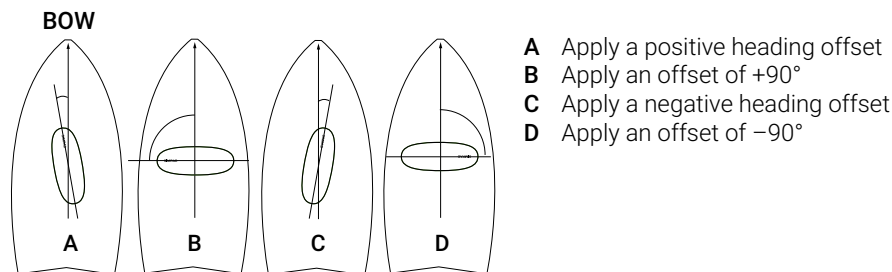
- **Settings > Boat network > Devices > HS65 GNSS Compass > Configure compass.** Select the **Recalibrate compass** button to start the calibration. Follow the on-screen instructions for the on-water calibration.
- or
- **Settings > Network > Device list > HS65 GNSS Compass > Calibrate.** Select the **Calibrate** button to start calibration. Follow the on-screen instructions for the sea trial. **Calibration OK** displays when the calibration is successful. Exit the calibration screen to save the calibration.
- **Note:** The auto calibration mode must be set to **Off** for manual calibration parameters to be used.
- **Note:** Some displays may invite you to carry out calibration as part of a device setup wizard.

OFFSETS

Apply offsets for the heading, pitch and roll outputs to compensate for any misalignment in mounting.

Applying a heading offset

To correct for the HS65 not being parallel to the centerline of the vessel, use your multi-function display to enter a heading offset.



→ **Note:** Initial heading data is invalidated until the HS65 achieves a satellite fix. To enable you to set the heading offset for the first time, your vessel needs to be outdoors with an unobstructed view of the sky so the HS65 can get a satellite fix.

To change whether the heading displays relative to magnetic north ($^\circ\text{M}$) or true north ($^\circ\text{T}$), navigate to (depending on your multi-function display) either

- **Settings > Preferences > Heading**, and select $^\circ\text{M}$ or $^\circ\text{T}$.

or

- **Settings > Units > Heading**, and select $^\circ\text{M}$ or $^\circ\text{T}$.

1 Make a note of the current value for the heading.

On some displays, you may have to access the compass data page to see current values. To do this, navigate to (depending on your multi-function display), either:

- **Settings > Boat network > Devices > HS65 GNSS compass > Show details**

or

- **Settings > Network > Device list > HS65 GNSS compass > Data.**

2 Use a chart or chartplotter to find the bearing from the vessel position to a visible object, and steer the vessel so its center line aligns with the bearing line pointing towards the object.

3 To open the compass configuration screen navigate to (depending on your multi-function display) either

- **Settings > Boat network > Devices > HS65 GNSS Compass > Configure compass**

or

- **Settings > Network > Device list > HS65 GNSS Compass > Configure.**

4 Adjust the heading offset so the compass heading output is the same as the known bearing you are steering on.

→ **Note:** The compass heading and bearing values may be damped. Allow time for the heading and bearing values to settle before applying offset.

Applying offsets for pitch and roll

1 Ensure the vessel is stationary at the dock, loaded in normal trim.

On some displays, you may have to access the compass data page to see current values. To do this, navigate to (depending on your multi-function display), either:

- **Settings > Boat network > Devices > HS65 GNSS compass > Show details**

or

- **Settings > Network > Device list > HS65 GNSS compass > Data.**

2 To open the compass configuration screen navigate to (depending on your multi-function display) either

- **Settings > Boat network > Devices > HS65 GNSS Compass > Configure compass**

or

- **Settings > Network > Device list > HS65 GNSS Compass > Configure.**

3 Adjust the pitch and roll offsets so the compass outputs are zero.

→ *Note: If you need to access the data page to see current values, navigate to (depending on your multi-function display), either:*

- **Settings > Boat network > Devices > HS65 GNSS compass > Show details**

or

- **Settings > Network > Device list > HS65 GNSS compass > Data.**

Applying a position offset

→ *Note: Position offset is available only on selected B&G® and Simrad® displays.*

Entering a position offset allows the vessel's position to be reported at the bow instead of being reported from the position where the HS65 is mounted.

To enter a position offset navigate to **Settings > Boat network > Sources**. Under the **Position** group, select **Set GPS Offset**.

CONFIGURATION AND OPERATION

Device information

To check the model, serial number, and software version for your HS65 GNSS compass, navigate to (depending on your multi-function display) either:

- **Settings > Boat network > Devices > HS65 GNSS compass > Show details**
- or
- **Settings > Network > Device list > HS65 GNSS compass.**

Renaming your compass

Renaming your HS65, particularly if you have two or more external GNSS antennas, allows you to identify it by name on your display screen.

To rename your compass, navigate to (depending on your multi-function display), either:

- **Settings > Boat network > Devices > HS65 GNSS compass.** Select the edit icon (pencil) to enter a new name.
- or
- **Settings > Network > Device list > HS65 GNSS Compass.**

Instance

To change the instance of your HS65 on the NMEA 2000® network, navigate to (depending on your multi-function display), either:

- **Settings > Boat network > Devices > HS65 GNSS compass > Show details.** Select the more icon (three dots) then **Expert settings**.
- or
- **Settings > Network > Device list > HS65 GNSS Compass > Configure.**

Source selection

Before starting source selection, make sure all devices and networks are connected and turned on.

When more than one source is available for a data type, the system uses an internal priority list.

Automatic source selection

To have your multi-function display assign a source for each type of data, navigate to (depending on your multi-function display), either:

- **Settings > Boat network > Sources** and select **Auto select all sources**
- or
- **Settings > Network > Auto configure.**

→ **Note:** *Running an automatic source selection updates the data sources for all peripherals on your NMEA 2000® network, not just those that use HS65 data.*

Manual source selection

If there is more than one source for the same data, and the source selected by the system is not the one you want to use, you can manually select individual data sources by navigating to (depending on your multi-function display), either:

- **Settings > Boat network > Sources**

or

- **Settings > Network > Data sources**

and open the data type whose source you want to change.

Viewing data

To see values for all the data your compass is reporting, navigate to (depending on your multi-function display), either:

- **Settings > Boat network > Devices > HS65 GNSS compass > Show details**

or

- **Settings > Network > Device list > HS65 GNSS compass > Data.**

Displaying HS65 data on screen

Applications (apps) on your multi-function display relevant data types on screen. For example, a chart app might show the vessel's course over ground.

You can also use your display's **Instruments** app to customize dashboards to show your favorite data types. For instructions about how to use the Instruments app to display data, refer to the documentation that came with your multi-function display.

Selecting satellite constellation

The usability of satellite constellations depends on your location.

In European regions, GPS, Galileo + SBAS may give optimal performance.

In Asia-Pacific regions, GPS, GLONASS, QZSS + SBAS may give optimal performance.

GPS, GLONASS, Galileo, QZSS, and BeiDou constellations are available, but not every constellation can be enabled at the same time. Typically, three constellations can be enabled together, for example, GPS + GLONASS + Galileo.

To change the GNSS constellations the HS65 uses, navigate to (depending on your multi-function display) either:

- **Settings > Boat network > Devices > HS65 GNSS compass > Show details.** Select the more icon (three dots) then **Expert settings**

or

- **Settings > Network > Device list > HS65 GNSS Compass > GNSS**

and select the constellations you want to use.

Monitoring the signal strength

To monitor the signal from satellites in view, navigate to (depending on your multi-function display) either:

- **Settings > Boat network > Devices > HS65 GNSS compass.** Select the more icon (three dots) then **Diagnostics**

or

- **Settings > System > Satellites.**

Enabling SBAS

To enable a Satellite-Based Augmentation System (SBAS), navigate to (depending on your multi-function display) either:

- **Settings > Boat network > Devices > HS65 GNSS compass.** Select the more icon (three dots) then **Expert settings.** Select the name of the SBAS system you want to enable.

or

- **Settings > Network > Device list > HS65 GNSS Compass > Configure.** Select **Enable WAAS/MSAS/EGNOS.**

Software updates

The HS65 runs on software that may be updated from time to time.

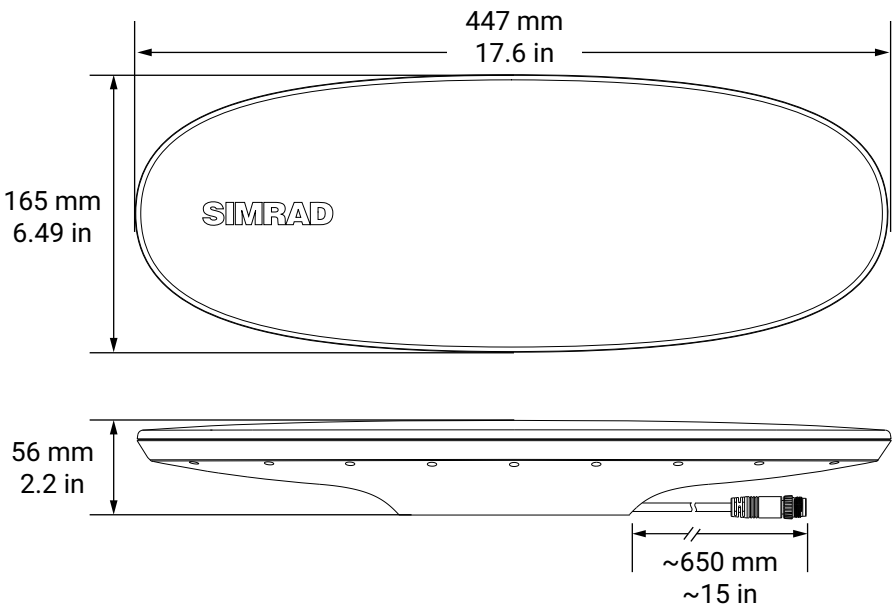
Check for relevant software updates at

www.simrad-yachting.com/downloads/compassesandgps.

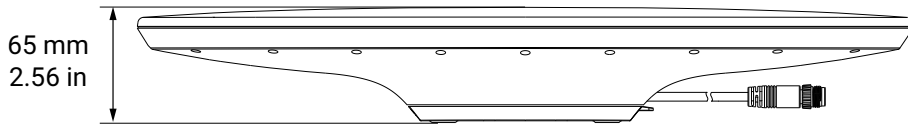
Refer to the documentation that came with your multi-function display for instructions about how to install software updates onto devices connected to the NMEA 2000® network.

→ **Note:** *Compatible multi-function displays with Wi-Fi® enabled have the ability to notify you when software updates for devices on your NMEA 2000® network are available.*

DIMENSIONS



With flat mount adapter fitted:



TROUBLESHOOTING

Issue	Troubleshooting
No data from the HS65	• Use your display to verify the NMEA 2000® network is powered and your HS65 is visible in the list of devices. • Verify the fuse for the NMEA 2000® backbone is intact. Check integrity and connectivity of cable connections. • Check your multi-function display, and peripherals such as radar that use data from the HS65, are running the most up-to-date versions of their software. • Verify that the NMEA 2000® backbone is correctly terminated. • Verify the voltage measured at the HS65 connection is between 9–16 V DC.
No GNSS lock	• Verify the HS65 has a clear view of the sky.
No SBAS lock	• Verify the HS65 has a clear view of the sky. • SBAS lock is only possible if you are in an appropriate SBAS regions. Currently, there is limited SBAS availability in the southern hemisphere.
No heading	➔ Note: <i>Heading from GNSS is not available if the HS65's view of the sky is blocked (including when the HS65 is indoors).</i> • Use your display to monitor the satellites in use. To establish a heading solution, at least four satellites should have a strong signal-to-noise ratio (SNR). • To use magnetic data when satellite data is lost for longer than three minutes: use a compatible display to enable magnetic heading, and make sure the magnetic calibration is valid.
Incorrect heading value	• Confirm the HS65 is installed with its long axis parallel to the centerline of the vessel, and with the Simrad® logo on the housing at the bow end of the vessel. If either condition is not met, use your display to apply an appropriate heading offset.

TECHNICAL SPECIFICATIONS

Sensor and positioning accuracy	
Receiver type	Multi-band GNSS Compass
Signals received	GPS, GLONASS, BeiDou, Galileo, QZSS1
Channels	368
GPS sensitivity	-167 dBm
SBAS tracking	2-channel, parallel tracking (WAAS, EGNOS, L1 Sb, MSAS, GAGAN)
Update rates (position and heading)	10 Hz default
Positioning accuracy	1.5 m RMS (no SBAS) <1.0 m RMS (with SBAS)
Heading accuracy	<2° RMS
(Backup) magnetic heading accuracy	<3° RMS
Heave accuracy (GNSS)	0.3 m (11.8 in)
Pitch/Roll accuracy	<2° RMS
Rate of turn	500°/s maximum
Cold start	25 s typical
GNSS heading fix	10 s typical (after you have valid position)
Magnetic heading fix	2 s if magnetic backup is enabled and calibrated
Maximum speed	>150 kn (278 km/h)
Compass safe distance	0.5 m (20 in)
Gyroscope and accelerometer	Provides smooth heading under normal operation. Maximum error rate 2° per minute (for periods up to 3 minutes) when a loss of GNSS heading fix has occurred.

Power	
Input voltage	9–16 V DC
Power consumption	1.6 W (multi-GNSS, typical continuous draw at 12 V)
Load equivalency number (LEN)	3
Power isolation	Isolated to enclosure
Reverse polarity protection	Yes
Communication	
Connector	NMEA 2000® Micro-C
Mechanical	
Weight (no mount)	0.85 kg (1.87 lb)
Dimensions (no mount)	L 44.7 cm (17.6") W 16.5 cm (6.49") H 5.6 cm (2.2")
Environmental	
Operating temperature	–25°C to +70°C (–13°F to +158°F)
Storage temperature	–40°C to +85°C (–40°F to +185°F)
Humidity	95% non-condensing
Enclosure	IPX6 and IPX7
EMC	IEC60945:2002 EN 301 489-1 V2.2.3 (2019-11) EN 301 489-19 V2.2.1 (2022-09) EN 303 413 V1.2.1 (2021-04)

SUPPORTED DATA

NMEA 2000® messages received based on a request

PGN	Description	Default update rate (ms)	Frequency (Hz)
059392	ISO acknowledgment Acknowledges the status of certain requests addressed to a specific electronic control unit (ECU).	On request	On request
059904	ISO request Requests the transmission of a specific PGN, addressed or broadcast.	On request	On request
060928	ISO address claim Identifies the address claimed by an ECU to other ECUs.	On request	On request
126996	Product information Product-specific information including NMEA 2000® database version supported, manufacturer's product code, NMEA 2000® certification level, and load equivalency number.	On request	On request
126464	Receive/transmit PGNs group function List of received and transmitted PGNs supported by a node.	On request	On request

NMEA 2000® transmitted messages

PGN	Description	Default update rate (ms)	Frequency (Hz)
126992	System Time Provides a regular transmission of UTC time and date, and synchronism for measurement data.	1000	1
126993	Heartbeat Confirms a device is still present on the network.	60000	1/60

PGN	Description	Default update rate (ms)	Frequency (Hz)
127250	Vessel heading Provides heading sensor value with a flag for true or magnetic. If the sensor value is magnetic, the deviation field can be used to produce a magnetic heading, and the variation field can be used to correct the magnetic heading to produce a true heading.	100	10
127251	Rate of turn Rate of change of heading.	100	10
127257	Attitude Provides a single transmission that describes the position of a vessel relative to both horizontal and vertical planes. Attitude can be used for vessel stabilization, vessel control and onboard platform stabilization.	100	10
127258	Magnetic variation Contains a sequence number to synchronize other messages such as heading or course over ground. The quality of service and age of service are provided to determine appropriate level of service if multiple transmissions exist.	1000	1
128001	Vessel acceleration Provides acceleration of the vessel in all three axes (ahead/astern; port/starboard; and up/down), measured using the ground as a reference.	100	10
129025	Position, rapid update Provides latitude and longitude referenced to WGS84. A single frame message suited to frequent transmission.	100	10
129026	COG & SOG, rapid update Single frame PGN that provides course over ground (COG) and speed over ground (SOG).	250	4
129027	Position delta, high precision rapid update Provides delta position changes down to 1 mm with a delta time period accurate to 5 ms.	100	10

PGN	Description	Default update rate (ms)	Frequency (Hz)
127252	Heave The vertical distance from the mean sea level. Positive values correspond to distances below the mean sea level (for example the vessel dropping into a trough), in accordance with the North-East-Down (NED) coordinate system.	100	10
129029	GNSS position data Conveys a comprehensive set of global navigation satellite system (GNSS) parameters, including position information.	1000	1
129539	GNSS DOPs Provides a single transmission containing GNSS status and dilution of precision components (DOP) that indicate the contribution of satellite geometry to the overall positioning error. Three DOP parameters are reported: horizontal (HDOP), vertical (VDOP), and time (TDOP).	1000	1
129540	GNSS sats in view GNSS information on current satellites in view, tagged by sequence ID. Information includes PRN, elevation, azimuth, SNR.	1000	1

