

LOWRANCE

HDS Carbon Installation Manual

ENGLISH



Preface

Disclaimer

As Navico is continuously improving this product, we retain the right to make changes to the product at any time which may not be reflected in this version of the manual. Please contact your nearest distributor if you require any further assistance.

It is the owner's sole responsibility to install and use the equipment in a manner that will not cause accidents, personal injury or property damage. The user of this product is solely responsible for observing safe boating practices.

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This manual represents the product as at the time of printing. Navico Holding AS and its subsidiaries, branches and affiliates reserve the right to make changes to specifications without notice.

Copyright

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Warranty

The warranty card is supplied as a separate document.

In case of any queries, refer to the brand website of your unit or system: www.lowrance.com.

Compliance statements

This equipment complies with:

- CE under 2014/53/EU Directive

- The requirements of level 2 devices of the Radio communications (Electromagnetic Compatibility) standard 2008
- Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The relevant Declaration of conformity is available in the product's section at the following website: www.lowrance.com.

Industry Canada

IC RSS-GEN, Sec 8.4 Warning Statement

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie

Canada applicables aux appareils radio exempts de licence.

L'exploitation est autorisée aux deux conditions suivantes: (1)

l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de

l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Warning

The user is cautioned that any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that the interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna

- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that of the receiver
- Consult the dealer or an experienced technician for help

Internet usage

Some features in this product use an internet connection to perform data downloads and uploads. Internet usage via a connected mobile/cell phone internet connection or a pay-per-MB type internet connection may require large data usage. Your service provider may charge you based on the amount of data you transfer. If you are unsure, contact your service provider to confirm rates and restrictions.

Countries of intended use in the EU

AT - Austria
BE - Belgium
BG - Bulgaria
CY - Cyprus
CZ - Czech Republic
DK - Denmark
EE - Estonia
FI - Finland
FR - France
DE - Germany
GR - Greece
HU - Hungary
IS - Iceland
IE - Ireland
IT - Italy
LV - Latvia
LI - Liechtenstein
LT - Lithuania
LU - Luxembourg
MT - Malta
NL - Netherlands

NO - Norway
PL - Poland
PT - Portugal
RO - Romania
SK - Slovak Republic
SI - Slovenia
ES - Spain
SE - Sweden
CH - Switzerland
TR - Turkey
UK - United Kingdom

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Navico product references

This manual refers to the following Navico products:

- Broadband Sounder™ (Broadband Sounder)
- DownScan Overlay™ (Overlay)
- GoFree™ (GoFree)
- INSIGHT GENESIS® (Insight Genesis)

About this manual

This manual is a reference guide for installing HDS Carbon units. Important text that requires special attention from the reader is emphasized as follows:

→ **Note:** Used to draw the reader's attention to a comment or some important information.

⚠ **Warning:** Used when it is necessary to warn personnel that they should proceed carefully to prevent risk of injury and/or damage to equipment/personnel.

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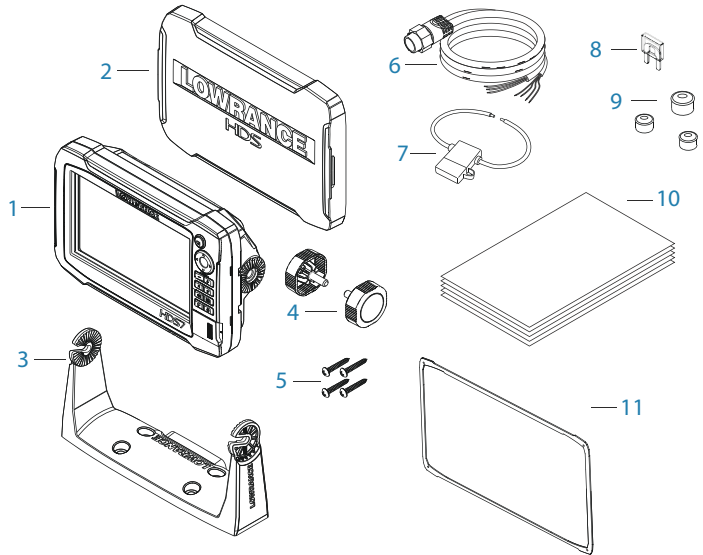
83	HDS Carbon technical specifications
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1

Check the contents

Check the contents of the box for your unit.

HDS Carbon box contents



- 1 HDS Carbon display
- 2 Suncover
- 3 Bracket
- 4 Knobs
- 5 Fasteners (4x 6G x 1.5 panhead PH1)
- 6 Power/NMEA 0183 cable
- 7 Fuse holder (ATC blade)
- 8 Fuse (5 A)
- 9 Caps (3x for HDS-7, 4x for HDS-9/12/16 - for ethernet, NMEA 2000, StructureScan)
- 10 Documentation pack
- 11 Dash gasket (HDS-16 only)

2

Overview

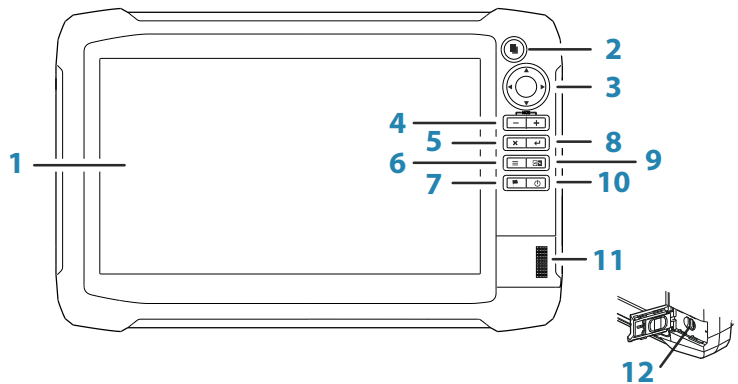
The unit has a built-in CHIRP/Broadband and StructureScan Sonar. The unit can network over NMEA 2000, and Ethernet allows access to data as well as control of numerous optional devices that can provide Sonar, radar, audio entertainment, weather and digital switching.

The unit has a built-in high speed GPS receiver (10Hz) and supports Insight charts from Navico including Insight Genesis. The system also supports charts from Navionics and C-MAP as well as content created by a variety of third party mapping providers in the AT5 format. For a full selection of available charts, visit www.gofreemarine.com, www.c-map.com or www.navionics.com.

The unit may be mounted to the vessel with the supplied mounting bracket, or panel mounted.

The unit is intended for 12 V DC operation and will accept the moderate fluctuations commonly seen in DC systems.

The front panel and keys

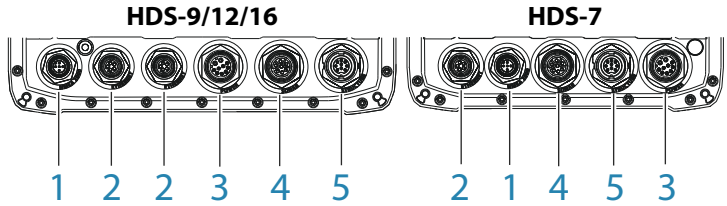


1 Touchscreen

- 2 Pages key**
Press once to activate the **Home** page. Repeat short presses to cycle the favorite buttons. Press and hold from an active page to go to the last used page.
- 3 Cursor keys**
Press arrows to move through menu items, to adjust a value, and to move the cursor on a panel.
- 4 Zoom Out / Zoom In keys and MOB key**
Zoom keys for panels and images. Simultaneous pressing both keys saves a Man Overboard (MOB) waypoint at the current vessel position.
- 5 Exit (X) key**
Press to exit a dialog, to return to previous menu level, and to remove the cursor from the panel.
- 6 Menu key**
A single press displays the menu for the active panel/overlay. Press and hold to hide or show the menu. A quick double-press displays the settings menu.
- 7 Waypoint key**
Press to display the dialog for saving new waypoints. Press twice to quick save a waypoint. Press and hold to access the Find menu.
- 8 Enter key**
Press to select or save your settings.
- 9 Panel key**
Used on multiple-panel pages. A short press switches between the panels, a long press expands active panel to a full page panel and back again.
- 10 Power key**
Press once to display the **System Controls** dialog. Repeat short presses to cycle the backlight brightness. Press and hold to turn the unit ON/OFF.
- 11 Card reader door**
- 12 microSD Card readers**

Rear connections

HDS Carbon rear connections



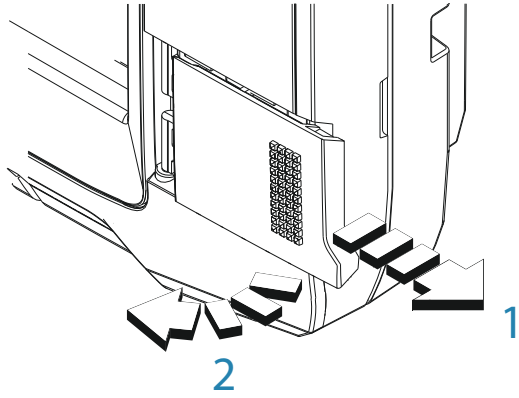
- 1 **NMEA 2000** - data input / output
- 2 **ETHERNET** - high bandwidth data (radar, sonar, chart)
- 3 **POWER** - 12V input & NMEA 0183. Optional video-in via adaptor
- 4 **SONAR** - CHIRP and Broadband Sonar
- 5 **STRUCTURE** - StructureScan HD Sonar

Card reader

Used for inserting a microSD memory card. The memory card can be used for detailed chart data, software updates, transfer of user data, and system backup.

→ **Note:** Do not download, transfer or copy files to a chart card. Doing so can damage chart information on the chart card.

The card reader door should always be securely shut immediately after inserting or removing a card, in order to prevent possible water ingress.



All size displays have two card reader slots. The card reader door is opened by sliding the door to the right (1) using your fingernail, then hinging forward (2) from the right hand side.

3

Installation

Mounting location

Choose the mounting locations carefully before you drill or cut.

For overall width and height requirements, refer to "*Dimensional drawings*" on page 73.

Do not mount any part where it can be used as a hand hold, where it might be submerged, or where it will interfere with the operation, launching, or retrieving of the boat.

The unit should be mounted so that the operator can easily use the controls and clearly see the screen.

The unit has a high-contrast screen and is viewable in direct sunlight, but for best results install the unit out of direct sunlight. The chosen location should have minimal glare from windows or bright objects.

The mounting location may affect the internal GPS receiver. Test the unit in its intended location to ensure satisfactory reception. An external GPS source can be added to overcome poor reception areas.

Check that it is possible to route cables to the intended mounting location.

Leave sufficient clearance to connect all relevant cables.

Before cutting a hole in a panel, make sure that there are no hidden electrical wires or other parts behind the panel.

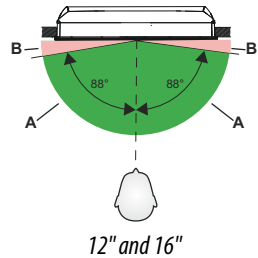
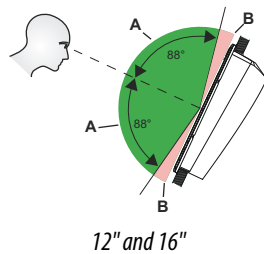
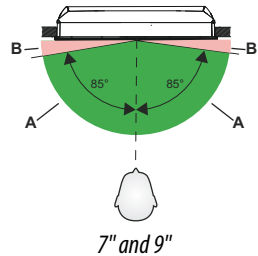
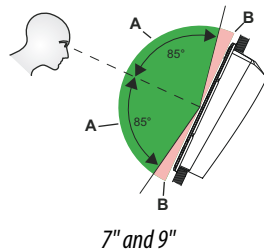
Ensure that any holes cut are in a safe position and will not weaken the boat's structure. If in doubt, consult a qualified boat builder, or marine electronics installer.

→ **Note:** Where flush mounted, the enclosure should be dry and well ventilated. In small enclosures, it may be required to fit forced cooling.

⚠ Warning: Inadequate ventilation and subsequent overheating of the unit may cause unreliable operation and reduced service life. Exposing the unit to conditions that exceeds the specifications could invalidate your warranty. – refer to "Technical specifications" on page 83.

Viewing angle

The viewing angle influences the viewability of the monitor. The recommended viewing angles relative to perpendicular are shown in the illustrations below.

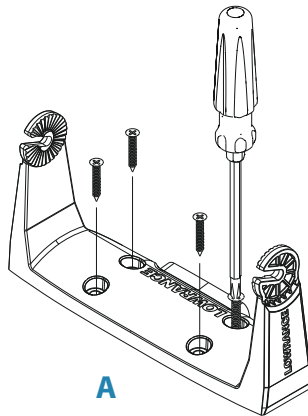


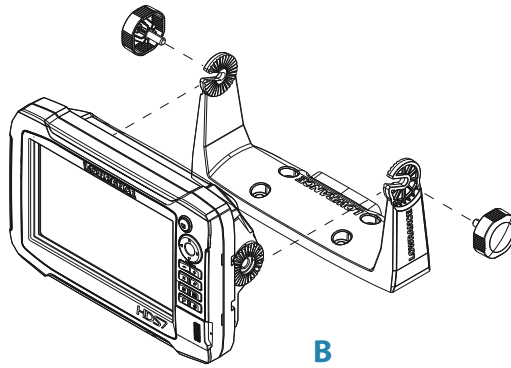
- A** Optimum viewing angle
- B** Poor viewing angle or obstructed view

Bracket mounting

U-bracket mounting

1. Place the bracket in the desired mounting location. Ensure that the chosen location has enough height to accommodate the unit fitted in the bracket, and allows tilting of the unit. Also adequate space is required on both sides to allow tightening and loosening of the knobs.
2. Mark the screw locations using the bracket as a template, and drill pilot holes. Use fasteners suited to the mounting surface material. If the material is too thin for self-tappers, reinforce it, or mount the bracket with machine screws and large washers. Use only 304 or 316 stainless steel fasteners.
3. Screw down the bracket (**A**).
4. Mount the unit to the bracket using the knobs. Hand tighten only. The ratchet teeth in the bracket and unit case ensure a positive grip and prevent the unit from changing from the desired angle (**B**).





Panel mounting

The screws for panel mounting are included in the box.
For mounting instructions, refer to the mounting template.

4

Mounting the transducer

Transducer location selection and installation are two of the most critical steps in Sonar installation. To function properly the transducer must be in the water at all times, and in a location that has a smooth flow of water while the boat is moving.

⚠ Warning: Read all the mounting instructions before drilling or cutting holes in your vessel.

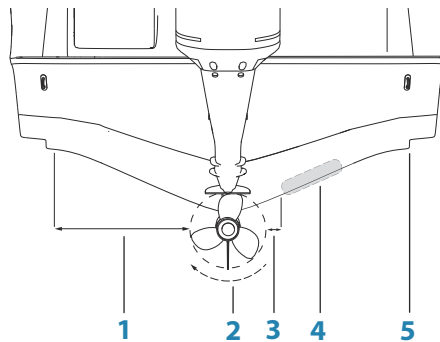
Research

Before starting the installation of the transducer, check the following:

- Find out if the boat builder has a recommended installation location
- Establish the direction of rotation of the propeller(s)
- With the boat traveling at cruising speed, watch the water flow behind the boat to find the area with the smoothest flow (least bubbles)

Select a transducer location

The primary aim is to stay clear of propeller and hull generated turbulence, while mounting the transducer as close to the center of the vessel as possible.

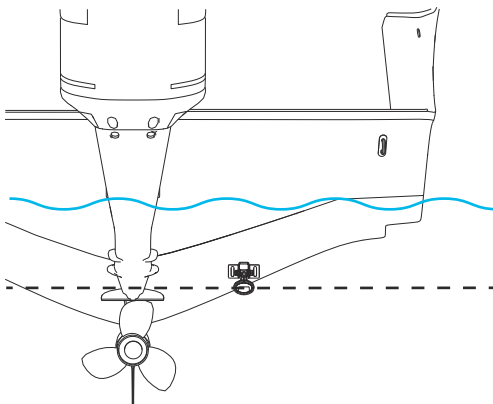


- 1 Avoid mounting within 1 m (3.3') to port (left) of propeller**
- 2 Conventional clockwise propeller rotation**
- 3 Avoid mounting within 7.5 cm (3") to starboard of propeller**
- 4 Best mounting location - undisturbed water flow**
- 5 Planing strake - avoid mounting behind here**

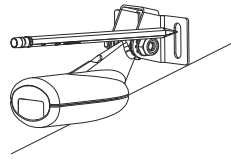
- **Note:** Reverse the distance guides (1 & 3) from propeller where engine is of counterclockwise configuration.
- **Note:** Vessels with strakes or ribs on the hull can create large amounts of turbulence at higher speeds. A good transducer location on these types of boats is between the ribs closest to the engine.
- **Note:** If the transducer is not placed in a smooth flow of water, interference caused by bubbles and turbulence may show onscreen in the form of random lines or dots. The unit could also lose bottom signal when the boat is on plane.
- **Note:** Trim tabs vary in the amount of turbulence they create as they are adjusted, stay clear of these.

Attaching the transducer

The transducer should be installed parallel with the transom's waterline, not the bottom of the boat (deadrise).



→ **Note:** Ensure the entire bottom surface of the transducer hangs at least 3 mm (1/8th of an inch) lower than the bottom of the hull.



Hold the transducer with bracket up to the transom of the boat and trace the slotted screw hole locations (two on the 83/200 KHz transducer, and four on the 50/200 KHz transducer). Mark drilling points in the middle of each outline, to allow for transducer height adjustment. Drill pilot holes to suit fasteners.

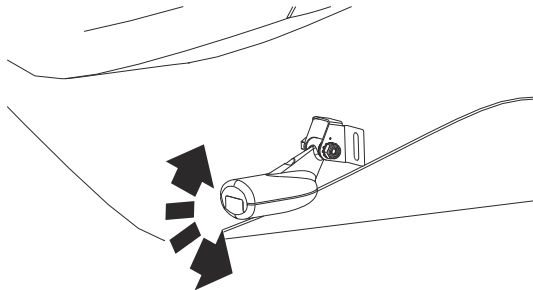
→ **Note:** Check that there is nothing on the other side of the mounting surface that may be damaged by drilling.

Attach transducer to transom, using supplied stainless steel fasteners. Drill a 25 mm (1") hole above the waterline, large enough to pass the plug through.

Secure the cable to the hull at regular intervals using cable P clips or saddles and ensure that moving parts such as an outboard motor or boarding ladder cannot snag the cable.

Adjusting the transducer

If the sonar image shows interference lines on the screen when moving, which worsen with speed, it may be possible to eliminate these by adjusting the angle of the transducer.



→ **Note:** A transducer that is tilted too far in either direction does not perform well; missing targets, or losing the bottom at speed.

If performance does not improve with tilting, try adjusting the height of the transducer relative to the transom of the boat. If the transducer is too high it may be seeing cavitation caused by the trailing edge of the transom.

5

Wiring

Guidelines

Don't:

- make sharp bends in the cables
- run cables in a way that allows water to flow down into the connectors
- run the data cables adjacent to radar, transmitter, or large/high current carrying cables or high frequency signal cables.
- run cables so they interfere with mechanical systems
- run cables over sharp edges or burrs

Do this:

- make drip and service loops
- use cable-tie on all cables to keep them secure
- solder/crimp and insulate all wiring connections if extending or shortening the cables. Extending cables should be done with suitable crimp connectors or solder and heat shrink. Keep joins as high as possible to minimize possibility of water immersion.
- leave room adjacent to connectors to ease plugging and unplugging of cables

⚠ Warning: Before starting the installation, be sure to turn electrical power off. If power is left on or turned on during the installation, fire, electrical shock, or other serious injury may occur. Be sure that the voltage of the power supply is compatible with the unit.

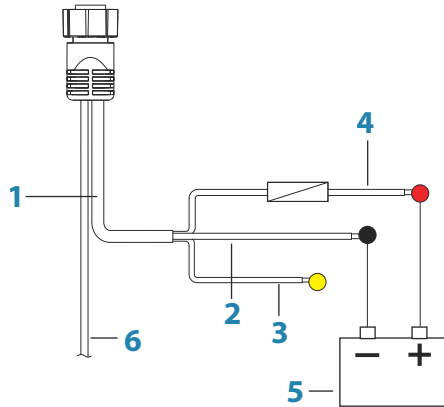
⚠ Warning: The unit has a voltage rating of 12 V DC, it is not suited for use with 24 V DC systems.

⚠ Warning: The positive supply wire (red) should always be connected to (+) DC with the supplied fuse or a circuit breaker (closest available to fuse rating).

Power connection

The plug of the supplied power cable has two discrete cables exiting from it. The thickest of the two cables provides the following:

- power into the system (Red and Black wires)
- remote turn-on for certain Navico expansion modules (Yellow wire)

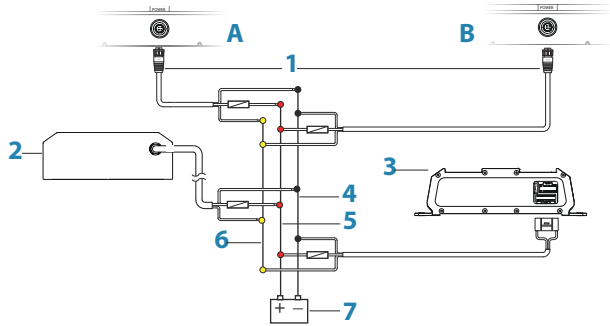


- 1 Power cable
- 2 12 V negative wire (black)
- 3 Accessory Wake Up wire (yellow)
- 4 12 V positive wire (red) shown with fuse holder installed inline
- 5 Vessel's 12 V DC supply
- 6 NMEA 0183 cable

Accessory wake up

The yellow colored accessory wake up line may be used to control the power state of modules such as SonicHub, StructureScan, and Broadband radar. When connected in this manner, the modules are turned on the moment the unit is powered up. For connection, simply combine all yellow wires on a common bus or to a single termination point.

→ **Note:** Broadband radar will be started in **standby** mode, never **transmit** mode, when triggered by the accessory wake up line. The following demonstrates the power connections for a typical small system.



- A** Power connection to unit on the left
- B** Power connection to unit on the right
- 1** Power cable connectors to units
- 2** Radar interface box
- 3** Audio entertainment device (e.g. SonicHub2)
- 4** 12 V DC negative (-)
- 5** 12 V DC positive (+)
- 6** Accessory wake up line
- 7** Vessel's 12 V DC supply

Transducer connection

The unit has internal CHIRP, Broadband, StructureScan, TotalScan and ForwardScan sonar.

Transducers fitted with a 7-pin blue connector can be plugged directly into the corresponding blue socket labeled **Sonar**.

The 9-pin black StructureScan connector can be plugged in to the socket labelled **Structure**.

For connector location, refer to the embossed labeling on the unit or the section "*Rear connections*" on page 14.

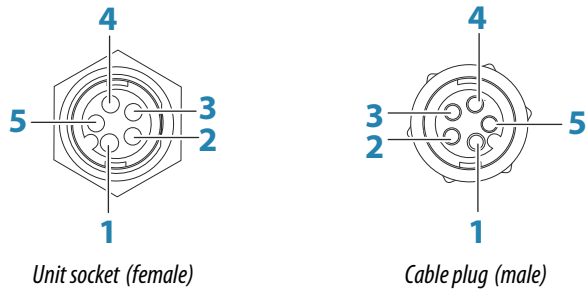
- **Note:** The connector attached to the transducer cable is keyed, and can only be inserted in one orientation. Once inserted, turn locking collar to secure.
- **Note:** A 7-pin transducer cable can be connected to the 9-pin port using a 7-pin to 9-pin adaptor cable.

SpotlightScan

The SpotlightScan transducer uses both the **Sonar** and **Structure** sockets. Refer to the SpotlightScan manual for further information.

Ethernet connector

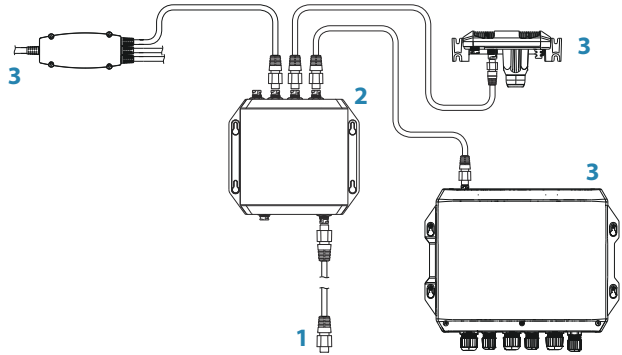
The unit is equipped with an Ethernet port, which allows connecting the unit to your network using the 5 pin Ethernet connector.



Key	Purpose	Color
1	Transmit positive TX+	Blue/White
2	Transmit negative TX-	Blue
3	Receive positive RX+	Orange/White
4	Receive negative RX-	Orange
5	Shield	Bare

Ethernet expansion device

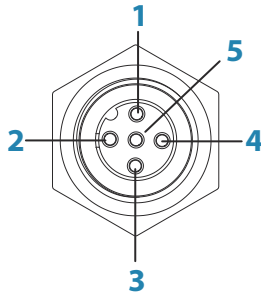
Connection of network devices can be made via an Ethernet expansion device. Additional expansion devices can be added to provide the required number of ports.



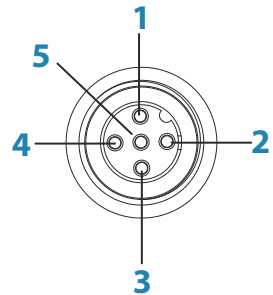
- 1** Ethernet connector to unit
- 2** Ethernet expansion device
- 3** Network devices

NMEA 2000 device connection

The NMEA 2000 data port allows the receiving and sharing of a multitude of data from various sources.



Unit socket (male)



Cable plug (female)

Key	Purpose	Color
1	Shield	Drain
2	NET-S (+12 V DC)	Red

Key	Purpose	Color
3	NET-C (DC negative)	Black
4	NET-H	White
5	NET-L	Blue

Essential network information

The standardized physical cables/connectors for NMEA 2000 are Micro-C and Mini-C, directly derived from the automation industries **DeviceNET - Micro-C** being the more commonly used size.

- A network consists of a linear backbone from which drop-cables connect to NMEA 2000 compliant devices.
- A single drop cable has a maximum length of 6 m (20 ft). The total length of all drop cables combined should not exceed 78 m (256 ft).
- A NMEA 2000 network, using Micro-C cabling, has a maximum cable length of 100 m (328 ft), between any two points.
- A NMEA 2000 network needs to have a terminator at each end of the backbone.

Power the network

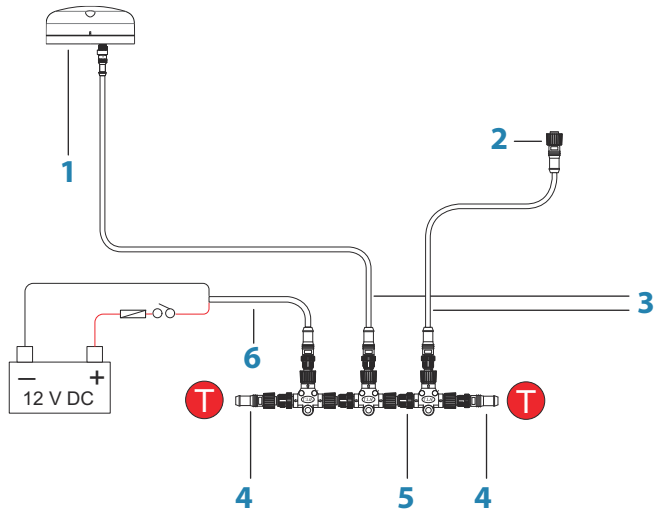
The network requires its own 12 V DC power supply protected by a 3 amp fuse or breaker.

Connect power at any location in the backbone for smaller systems.

For larger systems introduce power at a central point in the backbone to *balance* the voltage drop of the network.

- **Note:** If joining to an existing NMEA 2000 network that already has its own power supply, do not make another power connection elsewhere in the network, and ensure the existing network is not powered by 24 V DC.
- **Note:** Do not connect the NMEA 2000 power cable to the same terminals as the engine start batteries, autopilot computer, bow thruster or other high current devices.

The following drawing demonstrates a typical small network. The backbone is made up of directly interconnected T-connectors.

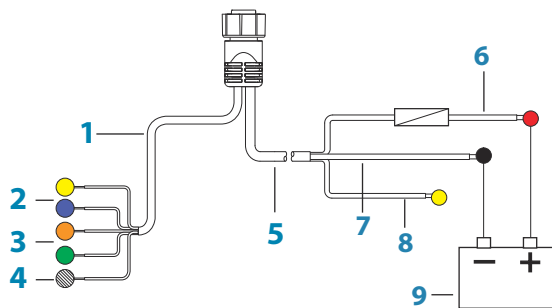


- 1 NMEA 2000 device
- 2 Connector to unit
- 3 Drop-cable, should not exceed 6 m (20 ft)
- 4 Terminators
- 5 Backbone
- 6 Power cable

NMEA 0183 device connection

The unit has an NMEA 0183 serial port, providing both an input and an output. The port uses the NMEA 0183 (serial balanced) standard, and can be configured in the software for different baud rates up to 38,400 baud.

The NMEA 0183 cable shares the same plug as the power cable.



- 1 Data cable (combined in same plug as power cable)
- 2 Transmit (output from this unit): TX_A (yellow), TX_B (blue)
- 3 Receive (input to this unit): RX_A (orange), RX_B (green)
- 4 Ground (shield)
- 5 Power cable
- 6 12 V positive wire (red) shown with fuse holder installed inline
- 7 12 V negative wire (black)
- 8 Accessory Wake Up wire (yellow)
- 9 Vessel's 12 V DC supply

Talkers and Listeners

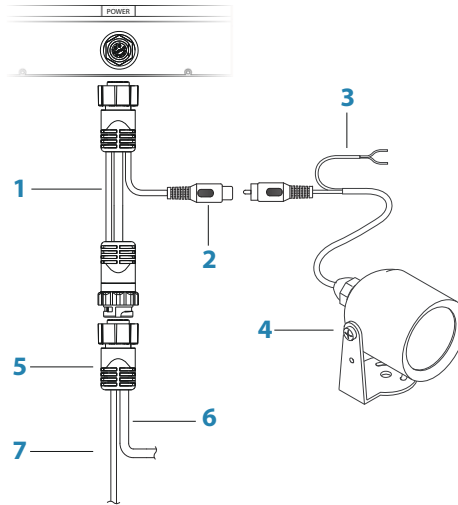
Do not connect multiple devices outputting data (Talkers) on to any serial input (RX) of the unit. The RS422 protocol is not intended for this type of connection, and data will be corrupted if more than one device transmits simultaneously. The output (TX) however may drive multiple receivers (Listeners). The number of receivers is finite, and depends on the receiving hardware. Typically three devices is possible.

Video in

A video camera may be added by installing the optional video adaptor cable between the power socket on the unit, and the plug on the power/data cable.

For video adaptor cable, refer to "*Display accessories*" on page 75.

- **Note:** The video images will not be shared with another unit via the network. It is only possible to view video on the unit connected to the video source.
- **Note:** Both NTSC and PAL formats are supported.



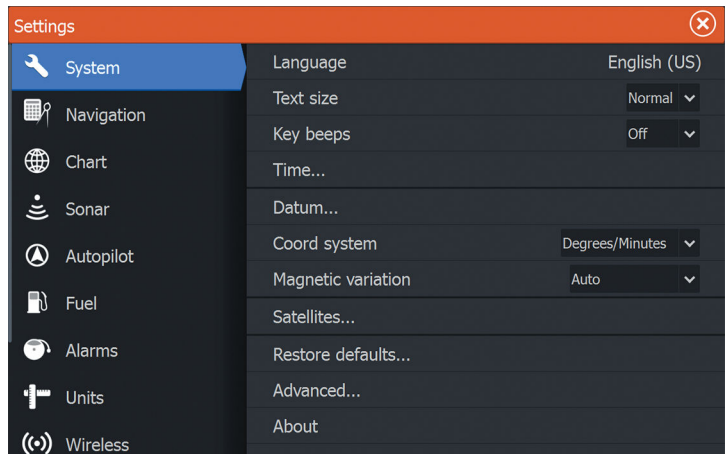
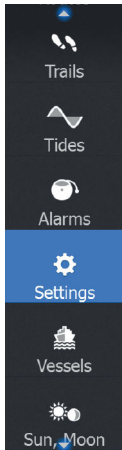
- 1 Video input adaptor cable (optional part)
- 2 RCA plug
- 3 Camera power cable
- 4 Camera
- 5 HDS power/data cable
- 6 Unit power cable
- 7 Data cable

6

Software Setup

This unit requires some initial configuration before use, in order to get the most out of the product. The following sections focus on settings that typically do not require change once configured. User preference settings and operation are covered in the Operator Manual.

Pressing the Pages key opens the Home page, which has three distinct areas. The scrollable left column of icons is the Tools panel. Select Settings in the Tools panel to open the Settings dialog and access items that require configuration.



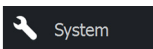
First time startup

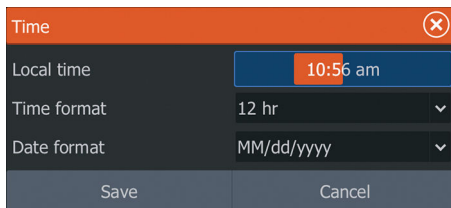
When the unit is started for the first time, or after a factory default, the unit displays a setup wizard. Respond to the setup wizard prompts to select some fundamental setup options.

You can perform further setup using the system settings option and later change settings made with the setup wizard.

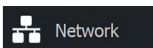
Time and Date

Configure time settings to suit vessel location, along with time and date formats.





Data source selection



→ **Note:** If NMEA 0183 is used, complete the NMEA 0183 setup prior to doing source selection. Refer to "*NMEA 0183 setup*" on page 58.

Data sources provide live data to the system.

The data may originate from modules internal to the unit (for example internal GPS or sonar), or external modules connected to the NMEA 2000 or via NMEA 0183 if available on the unit.

When a device is connected to more than one source providing the same data, the user can choose the preferred source. Before commencing with source selection make sure all external devices and the NMEA 2000 backbone are connected and are turned on.

Device name

Assigning a name is useful in systems using more than one device of the same type and size. When viewing data sources or the device list, the assigned name will append the default product name + virtual device function for easy identification.

Auto configure

The Auto configure option will look for all sources connected to the device. If more than one source is available for each data type, selection will be made from an internal priority list. This option will be suitable for the majority of installations.

→ **Note:** Auto data source selection may already have been selected at first time startup, however it should be redone if any new devices have been added to the network since.

Data sources - manual source selection

Manual selection is generally only required where there is more than one source for the same data, and the **Auto configure** selected source is not the one desired. Pressing the menu key when the desired source is highlighted provides additional options:

Configure device

Additional device options can be configured from both the Data source menu or from the Device list. For further information, refer to "*Device list*" on page 35.

Scope

The active data source under any given category, can be set to be Global or Local.

When a source is set as Global, it will be used by all displays on the network.

When a source is set as Local, it will only be used by the display that selected it as the source.

- **Note:** If changing a display from a Global source to a different Local source, change the Scope setting to Local *before* changing the selected source, otherwise all other displays will be changed over to the new source.
- **Note:** Local and Global data settings apply to the selected data source only. It is not possible to discretely set whether a data source is Global or Local if it is not the active source on the display being operated.

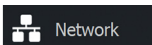
Reset Global/Local

Selecting **Reset Global** runs an Auto data source selection, and overrides all previous manual source selections made on all networked devices.

Selecting **Reset Local** reverts all data source selections on the unit being used to the Global source settings available from other networked units.

Device list

The Device list shows the devices that provide data. This may include a module inside the unit, or any external NMEA 2000 device.



Model ID	Serial No.
NR9 ev3 Navigator	000057#
NR9 ev3 Pilot Controller	000057#
NR9 ev3 iGPS	000057#
OP40	911505#
RC42 Rate compass	000004#
RF25-5 Rudder feedback	004818#

Refresh Sort
Model ID

Selecting a device in this list will bring up additional details and actions:

RC42 Rate compass - Device Information

Device: RC42 Rate compass

Name: [REDACTED]

Manufacturer: Simrad

Software Ver: 1.3.00.00

Model: [REDACTED]

Address: 86

S/N: 007356#

Instance: 0

Status: OK

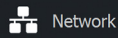
Configure
Calibrate
Data

All devices allow allocation of an instance number in the **Configure** option. Set unique instance numbers on any identical devices on the network to allow for the unit to distinguish between them. The **Data** option shows all data being output by the device.

Some devices will show additional option(s) specific to the device - the RC42 illustrated above has a **Calibration** option, to allow easy setup of this device.

- **Note:** Setting the instance number on a 3rd party product is typically not possible.

Diagnostics



The NMEA 2000 tab on the diagnostics page can provide information useful for identifying an issue with the network.

- **Note:** The following information may not always indicate an issue that can be simply resolved with minor adjustment to network layout or connected devices and their activity on the network. However, Rx and Tx errors are most likely indicating issues with the physical network, which may be resolved by correcting termination, reducing backbone or drop lengths, or reducing the number of network nodes (devices).

Bus state

Simply indicates whether the bus is powered, but not necessarily connected to any data sources. However, if bus shows as **off**, but power is present along with an increasing error count, it is possible that termination or cable topology is incorrect.

Rx Overflows

The unit received too many messages for its buffer before the application could read them.

Rx Overruns

The unit contained too many messages for its buffer before the driver could read them.

Rx/Tx Errors

These two numbers increase when there are error messages, and decrease when messages are received successfully. These (unlike the other values) are not a cumulative count. Under normal operation these should be at 0. Values around 96 upwards indicate a heavily error prone network. If these numbers go too high for a given device, it will automatically drop off the bus.

Rx/Tx Messages

Shows actual traffic in and out of device.

Bus Load

A high value here indicates network is near full capacity. Some devices automatically adjust rate of transmission, if network traffic is heavy.

Fast Packet Errors

Cumulative counter of any fast packet error. This could be a missed frame, or a frame out of sequence etc. NMEA 2000 PGNs are made of up to 32 frames. The entire message will be discarded when a frame is missed.

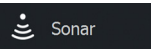
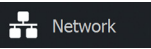
→ **Note:** Rx and Tx Errors often indicate an issue with the physical network, which may be resolved by correcting termination, reducing backbone or drop lengths, or reducing the number of network nodes (devices).

Damping

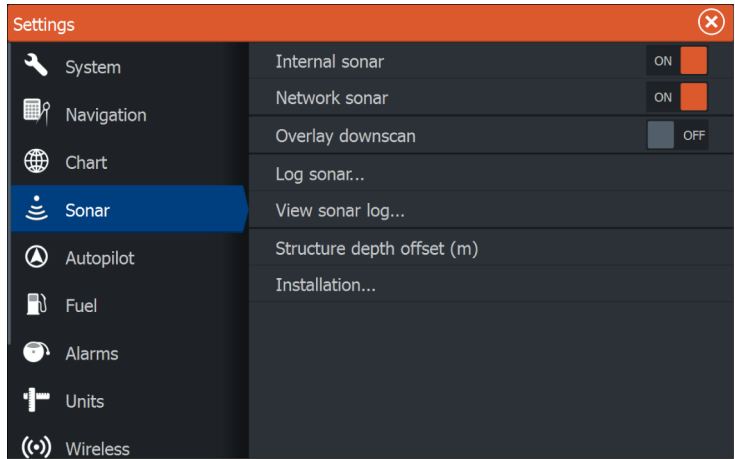
If data appears erratic or too sensitive, damping may be applied to make the information appear more stable. With damping set to off, the data is presented in raw form with no damping applied.

Sonar setup

Make general settings from the Sonar Settings dialog. Define Sonar sources in the Installation dialog.



Sonar settings



Internal Sonar

Select to make the internal Sonar available for selection in the Sonar menu. For more information about panel source selection, refer to the Operator manual.

When set to off, this option disables the internal Sonar in the unit. It will not be listed as a Sonar source for any unit on the network. Select this option on a unit which does not have a transducer connected.

Network Sonar

Enabling Network Sonar allows the display to use other compatible Sonar sources on the Ethernet network as well as sharing its own Sonar with other devices.

Structure depth offset

Setting for Structure transducers.

All transducers measure water depth from the transducer to the bottom. As a result, water depth readings do not account for the distance from the transducer to the lowest point of the boat in the water or from the transducer to the water surface.

To show the depth from the lowest point of the boat to the bottom, do the following. Before setting the Structure offset, measure the distance from the structure transducer to the lowest point of the boat in the water. If, for example, the distance is 0.3 m (1 ft), it will be input as (minus) - 0.3 m (-1 ft).

To show the depth from the water surface to the bottom, do the following. Before setting the Structure offset, measure the distance from the structure transducer to the water surface. If, for example, the distance is 0.3 m (1 ft), it will be input as (plus) 0.3 m (1 ft).

A setting of 0 (zero) causes the depth displayed to be the distance from the transducer to the bottom.

Overlay downscan

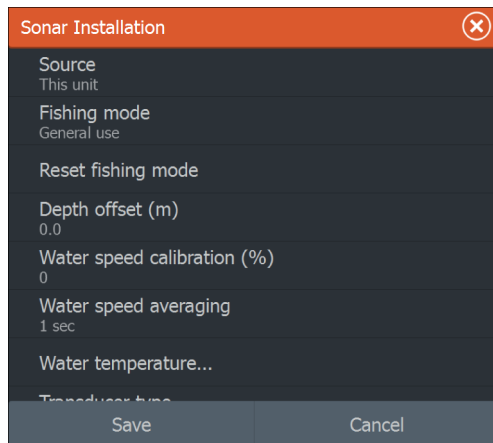
When a DownScan source is connected to your system, you can overlay DownScan images on the regular Sonar image.

When activated, the Sonar menu expands to include basic DownScan options.

Select Overlay on the Structure options menu to adjust the level of structure overlay shown on the screen. You can make adjustments using the Overlay slider bar.

Sonar installation

Use this dialog to setup and configure available Sonar sources.



Source

Select this option to display a list of Sonar sources available for setup. The settings you make in the rest of the dialog pertain to the source selected. The sources setup in this dialog are available for selecting to display in the image in the Sonar panel.

Fishing mode

This feature consists of preset packages of sonar settings designed for specific fishing conditions.

→ **Note:** Selecting the proper fishing mode is critical to optimal sonar performance.

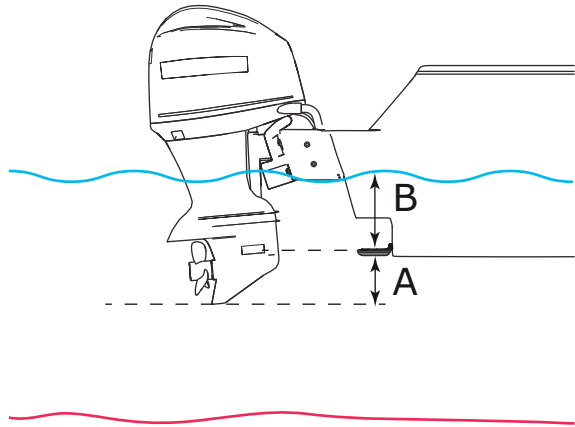
Fishing mode	Depth	Palette
General Use	≤ 1,000 ft	White background
Shallow Water	≤ 60 ft	White background
Fresh Water	≤ 400 ft	White background
Deep Water	≤ 5,000 ft	Deep Blue
Slow Trolling	≤ 400 ft	White background
Fast Trolling	≤ 400 ft	White background
Clear Water	≤ 400 ft	White background
Ice Fishing	≤ 400 ft	White background

Reset fishing mode

Resets selected fishing mode to default settings, allowing you to clear settings adjustments made while using a fishing mode.

Depth offset

All transducers measure water depth from the transducer to the bottom. As a result, water depth readings do not account for the distance from the transducer to the lowest point of the boat (for example; bottom of the keel, rudder, or skeg) in the water or from the transducer to the water surface.



- A** Lowest point of vessel offset: Set the distance from the transducer to the lowest point of the boat in the water - this should be set as a negative value. For example, -0.3 m (-1 ft).
- B** Depth below surface (waterline) offset: Set the distance from the transducer to the surface - this should be set as a positive value. For example, +0.5 m (+1.77 ft).

For depth below transducer, set the offset to 0.

Water speed calibration

Water speed calibration is used to adjust the speed value from the paddle wheel to match the actual boat speed through the water. Actual speed can be determined from GPS speed over ground (SOG) or by timing the boat over a known distance. Water speed calibration should be performed in calm conditions, with minimal wind and current movement.

Increase this value above 100 % if the paddle wheel is under reading, and decrease this value if it is over reading. For example, if the average water speed reads 8.5 knots (9.8 MPH) and SOG records 10 knots (11.5 MPH) the calibration value needs to be increased to 117 %. To calculate the adjustment, divide the SOG by the paddlewheel speed, and multiply the product by 100.

Calibration range: 50-200 %. Default is 100 %.

Water speed averaging

Averages water speed by measuring your speed at a selected interval of time. Water speed intervals range from one to thirty seconds. For example if you select five seconds, your displayed water speed will be based on averaging over 5 seconds of sampling. Calibration range: 1-30 seconds. Default is 1 second.

Water temperature calibration

Temperature calibration is used to adjust the water temperature value from the sonar transducer to match the data from another temperature sensor. It may be required to correct for localized influences to the measured temperature.

Calibration range: -9.9° - +9.9°. Default is 0°.

→ **Note:** Water temperature calibration only appears if the transducer is temperature capable. Check transducer type selection if this option should be available.

Transducer type

Transducer type is used for selecting the transducer model connected to the sonar module. The transducer selected will determine what frequencies the user can select during sonar operation. In some transducers with built-in temperature sensors, the temperature reading may be inaccurate or not available at all if the wrong transducer is selected. Transducer temperature sensors are one of two impedances - 5k or 10k. Where both options are given for the same model transducer, refer to paperwork supplied with transducer to determine impedance.

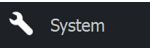
StructureScan

This feature is automatically enabled when a TotalScan or StructureScan HD transducer is plugged in before the unit has been powered on.

It is possible to set a **Structure depth offset** for the structure transducer. This setting is in the Sonar Settings dialog.

SpotlightScan

This feature is enabled automatically when a SpotlightScan transducer and sensor is plugged in before the unit has been



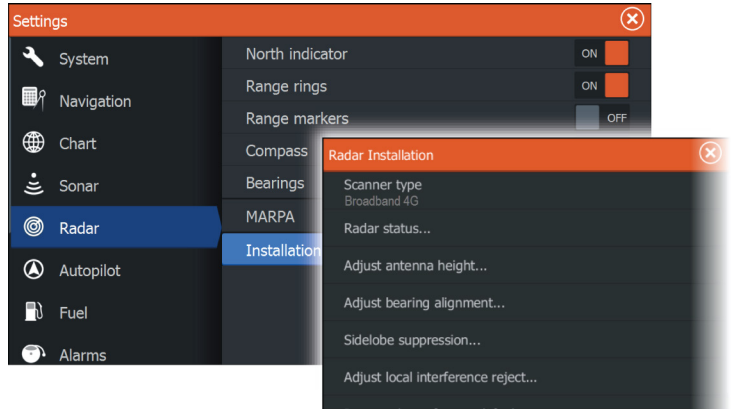
powered on. The SpotlightScan transducer has a Medium/High CHIRP element incorporated. This transducer has XID (transducer ID), so manual selection of the transducer is not required.

Radar setup



Use the Radar Installation dialog to setup the radar.

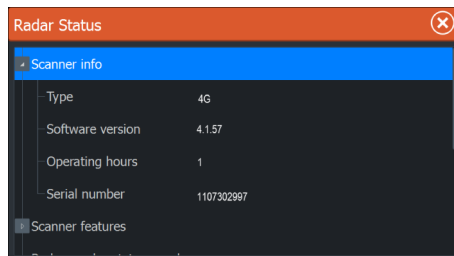
→ **Note:** The installation can vary depending on the radar. Follow the installation and setup instructions supplied with the radar.



Scanner type

Identifies the model of scanner connected to the network.

Radar status



Scanner type

Identifies the model of scanner connected to the network.

Software version

Check to make sure you have the latest software. Check the latest software version available at: www.lowrance.com.

Serial Number

This number should be recorded for support and insurance purposes.

MARPA status

The MARPA status can identify if a heading sensor is on the network and that the radar is receiving heading information essential for MARPA calculations.

Reset device ID

Should a radar be connected to the network that has been connected to a dual radar network in the past, it might not be detected by the system because it might have an invalid Device ID. With the radar connected and powered up, select the Reset Device ID button to resolve this problem.

→ **Note:** This procedure must be performed with only one radar on the network, and only applies where a network combines an older MFD with other MFDs.

Adjust bearing alignment

This is to align the heading marker on the screen with the center line of the vessel. This will compensate for any slight misalignment of the scanner during installation. Any inaccuracy will be evident when using MARPA or chart overlay.

Point the boat to be perpendicular to the very end of a breakwater or peninsula. Adjust the bearing alignment setting, so that the heading marker and land mass intersect.

Adjust antenna height

Set the radar scanner height relative to the water surface. The Radar uses this value to calculate the correct STC settings.

Adjust local interference reject

Interference from some onboard sources can interfere with the Broadband radar. One symptom of this could be a large target on the screen that remains in the same relative bearing even if the vessel changes direction.

Choose from Local interference rejection LOW, MED or HIGH. Default is LOW.

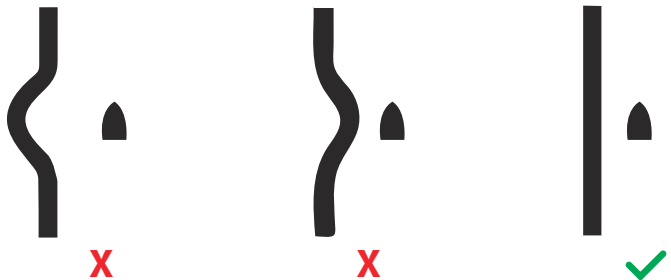
Adjust range offset

(Pulse Radar only)

The radar sweep should commence at your vessel (a radar range of zero). You may need to adjust the radar range offset to achieve this. If this is set incorrectly, a large dark circle in the center of the sweep might occur. You might notice straight objects such as straight sea walls or piers having curves or an indentation. Objects close to your vessel may appear **pulled in** or **pushed out**.

Adjust the range offset as below when the vessel is about 45 to 90 m (50 to 100 yards) from a straight-walled jetty or similar feature that produces a straight line echo on the display.

- Point the boat towards the jetty
- Adjust the gain setting until a reasonably good image of the jetty echo is displayed



Sidelobe suppression

Occasionally false target returns can occur adjacent to strong target returns such as large ships or container ports. This occurs because not all of the transmitted radar energy can be focused into a single beam by the radar antenna, a small amount energy is transmitted in

other directions. This energy is referred to as sidelobe energy and occurs in all radar systems. The returns caused by sidelobes tend to appear as arcs.

→ **Note:** This control should only be adjusted by experienced radar users. Target loss in harbor environments may occur if this control is not adjusted correctly.

When the radar is mounted where there are metallic objects near the radar, sidelobe energy increases because the beam focus is degraded. The increased sidelobe returns can be eliminated using the Sidelobe Suppression control.

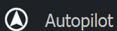
By default, this control is set to Auto and normally should not need to be adjusted. However, if there is significant metallic clutter around the radar, sidelobe suppression may need to be increased. The control should be adjusted as follows:

1. Set Radar range to between 1/2 nm to 1 nm and Sidelobe Suppression to Auto
2. Take the vessel to a location where sidelobe returns are likely to be seen. Typically, this would be near a large ship, container port, or metal bridge.
3. Traverse the area until the strongest sidelobe returns are seen.
4. Change Auto sidelobe suppression to OFF then select and adjust the sidelobe suppression control until the sidelobe returns are just eliminated. You may need to monitor 5-10 radar sweeps to be sure they have been eliminated.
5. Traverse the area again and readjust if sidelobes returns still occur.
6. Exit the dialog.

Restore radar to factory defaults

This option can be used to revert all user adjustments.

Autopilot setup



Autopilot features will be enabled when a pilot computer is connected.

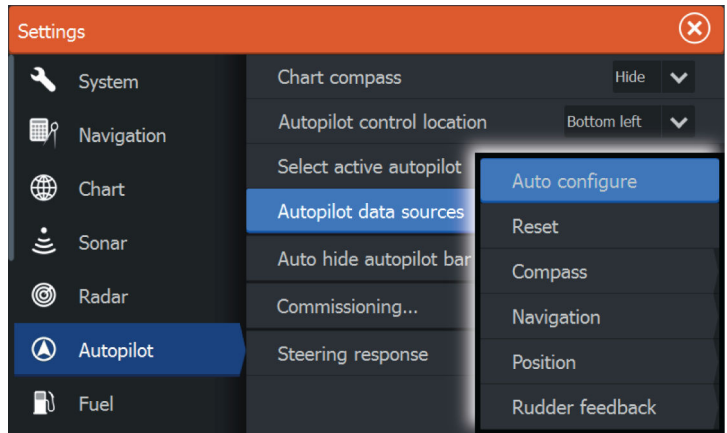
For the trolling motor autopilot, no special setup is required. See the operator manual for further details.

After installation is completed, the NAC-1 autopilot computer (outboard motor autopilot) requires setup as described in the following sections.

→ **Note:** The word rudder is sometimes used in menus and dialogs. In this context, the outboard motor acts as a rudder.

Selecting data sources for the outboard motor autopilot

Data sources for the outboard motor autopilot must be selected before commissioning the autopilot to ensure best performance. You can let the system automatically select data sources and later manually make changes if needed.



Auto configure

Automatically selects data sources for the autopilot.

Manually select data sources

You can manually select the preferred source. This is useful if you have more than one of the same type of data sources.

For example, if you have 2 compasses on your network you want to ensure that the same compass is selected for the MFD and the autopilot.

→ **Note:** You change the MDF data sources from the Network settings dialog.

Autopilot commissioning

Used to calibrate your boat's steering (Cablesteer or Hydraulic steering) with the NAC-1.

- **Note:** The autopilot must be commissioned prior to first use and any time after autopilot default settings have been restored.

Cablesteer rudder calibration

1. Select **Commissioning**.
2. Select **Rudder feedback calibration**.
3. Follow the onscreen instructions.

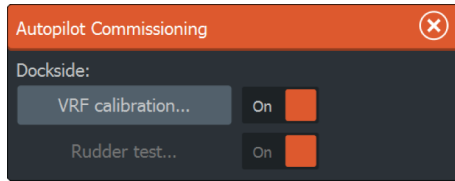
- **Note:** When centering the motor during the calibration process, ensure that the motor is centered visually. The rudder feedback calibration dialog may show the motor is centered (00 value) when the motor is not centered. After centering the motor visually, press **OK** and the rudder center calibration setting is set to centered (00 value).

4. Select **Rudder test**.
5. If the calibration does not pass the rudder test:
 - Confirm motor is moving.
 - Confirm rudder feedback reading moves accordingly.
 - Check NAC-1 drive cable.
 - Confirm motor can be manually moved smoothly in each direction.
 - Check for other mechanical issues.
 - Check wiring connections.
 - Repeat rudder calibration steps.

Hydraulic system calibration

Virtual rudder feedback (VRF) calibration is used for vessels with hydraulic steering.

1. Select **Commissioning**.
2. Select **VRF calibration**.



3. Follow the onscreen instructions.
- **Note:** When the autopilot attempts to turn the motor during the calibration process, ensure motor movement is noticeable and that it is turning in the correct direction before selecting **Yes** on the Virtual Rudder Feedback Calibration dialog. When **No** is selected in the dialog, the NAC-1 reverses direction and increases power the next time it turns the motor during the calibration process.
 - **Note:** You may have to select **No** a few times to ensure the pump provides enough power to turn the motor at high boat speeds.

Troubleshooting

The following are possible symptoms or * messages displayed by the MFD. If the problem persists after trying the recommended action, contact support.

No active autopilot control unit

Probable cause: The NAC-1 computer has lost contact with the active control unit.

Recommended action: Check the cable connections from the NAC-1 and MFD to the CAN bus network.

No autopilot computer

Probable cause: The MFD has lost contact with the NAC-1 Computer.

Recommended action:

- Make sure the NAC-1 computer is powered.
- Check connections from the NAC-1 to the CAN bus network.

AP Position data missing*

Probable cause: Missing or invalid position data.

Recommended action:

- Check the GPS cable connections to CAN network.

- Check the GPS antenna location.
- Check that the correct position source is selected. (Run a new source selection.)

AP Speed data missing (SOG)*

Probable cause: Missing or invalid speed data.

Recommended action:

- Check the GPS cable connections to the CAN network.
- Check the GPS antenna location.
- Check that the correct position source is selected. (Run a new source selection.)

AP Depth data missing*

Probable cause: Missing or invalid depth data.

Recommended action:

- Check the depth transducer.
- Check transducer cable connections to the MFD or to the CAN network.
- Check that the correct depth source is selected. (Run a new source selection.)

AP Heading data missing*

Probable cause: Missing or invalid heading data.

Recommended action:

- Check the compass cable connections to the CAN network.
- Check that the correct heading source is selected. (Run a new source selection.)

AP Nav data missing*

Probable cause: Missing or invalid NAV data.

Recommended action:

- Check for valid data on the MFD screen.
- Check the source selection setting.

AP Rudder data missing (For Helm-1/ cable steer only)*

Probable cause:

- Rudder feedback signal missing due to a broken wire or connection.
- Misaligned potentiometer in the Helm-1.

Recommended action:

- Check cable and connector.
- Check the alignment as per the installation instructions.

AP Off course*

Probable cause:

- The boat's heading is outside the fixed off course limit of 20 deg. (Automatic reset when inside limit).
- The boat speed is too low.
- The response setting is too low.

Recommended action:

- Check the steering response setting and increase the steering response setting.
- Increase the boat speed if possible, or steer by hand.

AP clutch overload (For Helm-1/ cable steer only)*

Probable cause: The clutch in Helm-1 is drawing too much current.

Recommended action:

- Disconnect the Helm-1 and verify that the alarm disappears.
- Check resistance of the clutch coil equals 16 ohms (pin 1 and 2 in connector).

No rudder response (For Helm-1/cable steer only)*

Probable cause: No response to rudder commands.

Recommended action:

- Check the cable connections between NAC-1 and Helm-1.
- Check the Rudder FB potentiometer in Helm-1.
- Check the Helm-1 drive motor.

Rudder drive overload*

Probable cause: The drive unit shuts down due to an excessive load or a short circuit.

Recommended action:

- Check the drive unit and drive unit installation.
- Look for mechanical obstructions.
- Check the manual steering.

High drive temp*

Probable cause: The NAC-1 drive output circuit is overheated due to excessive load.

Recommended action:

- Switch the Autopilot to Standby.
- Check the drive unit (see “Rudder drive overload”).

Drive inhibit*

Probable cause: There is an internal NAC-1 failure causing the drive output circuit to shut down.

Recommended action: Contact support.

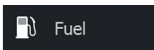
Low CAN bus voltage

Probable cause: The CAN bus voltage is less than 9V.

Recommended action:

- Check cabling.
- Check battery condition.
- Check charging voltage.

Fuel setup



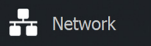
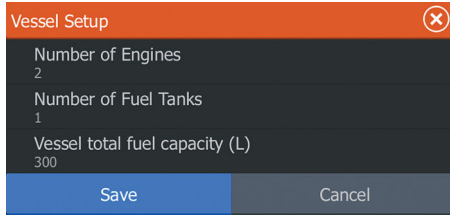
The fuel utility monitors a vessel's fuel consumption. This information is totaled to indicate trip and seasonal fuel usage, and is used to calculate fuel economy for display on instrument pages and the data bar.

To use the utility, a Navico Fuel Flow sensor, or a NMEA 2000 engine adaptor cable/gateway with Navico Fuel Data Storage device must be fitted to the vessel. Neither the Navico Fuel Flow sensor, nor the Suzuki engine interface require the use of a separate Fuel Storage device. Refer to the engine manufacturer or dealer for information on whether or not your engine provides a data output, and what adaptor is available to connect to NMEA 2000.

Once the physical connection is made, ensure source selection is completed. Multiple engine installations using Fuel Flow sensors, or Fuel Data Storage devices, require setup of related engine location in the Device list. For general source selection information, refer to "*Data source selection*" on page 34.

Vessel setup

The Vessel setup dialog must be used to select the number of engines, the number of tanks and vessel's total fuel capacity across all tanks.



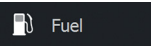
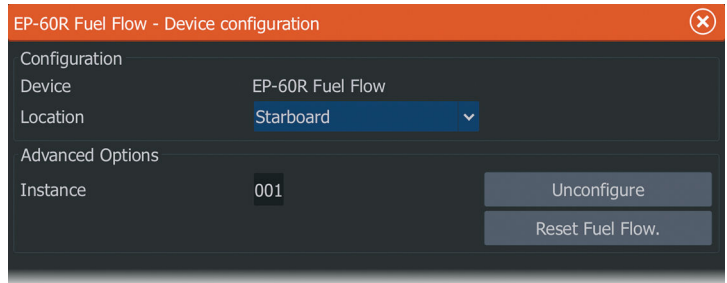
Network

Fuel flow configuration

After the number of engines is set, it is required to set which fuel flow sensor is connected to which engine. Under **Device list** on the Network page, view the Device Configuration dialog for each sensor, and set the **Location** to match the engine the device is connected to.

Unconfigure - defaults the device which clears all user settings.

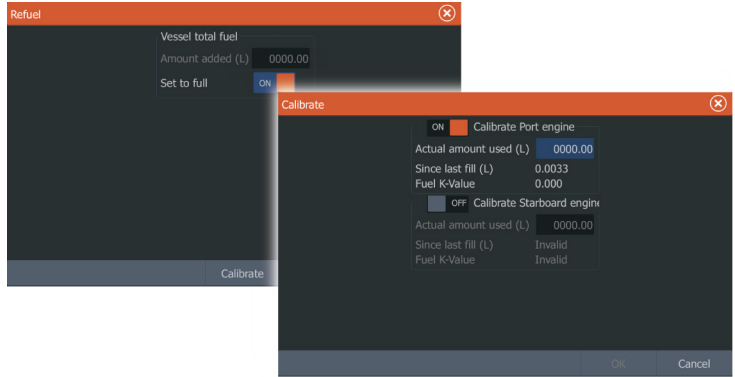
Reset Fuel Flow - restores only the Fuel K-Value setting, if set in Calibrate. Only Navico devices can be reset.



Fuel

Calibrate

Calibration may be required to accurately match measured flow with actual fuel flow. Access calibration from the **Refuel** dialog. Calibration is only possible on Navico's Fuel Flow sensor.

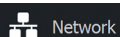


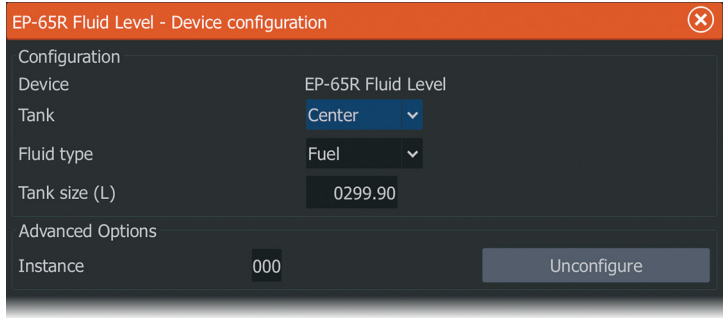
1. Start with a full tank and run the engine as it would normally be operated.
 2. After at least several liters (a few gallons) have been used, the tank should be fully refilled, and the **Set to full** option selected.
 3. Select the **Calibrate** option.
 4. Set the **actual amount used** based on amount of fuel added to the tank.
 5. Select **OK** to save settings. The **Fuel K-Value** should now show a new value.
- **Note:** To calibrate multiple engines repeat the steps above, one engine at a time. Alternatively, run all engines simultaneously, and divide the *Actual amount used* by the number of engines. This assumes reasonably even fuel consumption on all engines.
- **Note:** The **Calibrate** option is only available when **Set to full** is selected, and a Fuel Flow is connected and set up as a source.
- **Note:** A maximum of 8 engines is supported using Fuel Flow sensors.

Fuel Level

With the use of a Navico Fluid Level device connected to a suitable tank level sensor, it is possible to measure the amount of fuel remaining in any equipped tank. The number of tanks must be set in Vessel Setup dialog, initiated from the Fuel setting options page, to allow discrete tank assignment of the Fluid Level devices.

Select **Device list** on the Network page, and view the Device Configuration dialog for each sensor, and set the Tank location, Fluid type, and Tank size.





For setting up the Instrument bar or a gauge on the Instrument page with Fluid Level device data, refer to the Operator Manual.

- **Note:** A maximum of 5 tanks is supported using Fluid Level devices.
- **Note:** Tank data that is output by a compatible engine gateway can also be displayed, however tank configuration for such a data source is not possible from this unit.

CZone setup

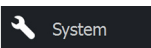
In order to communicate with the CZone modules connected to the network, the HDS Carbon must be assigned a unique CZone Display Dipswitch setting.

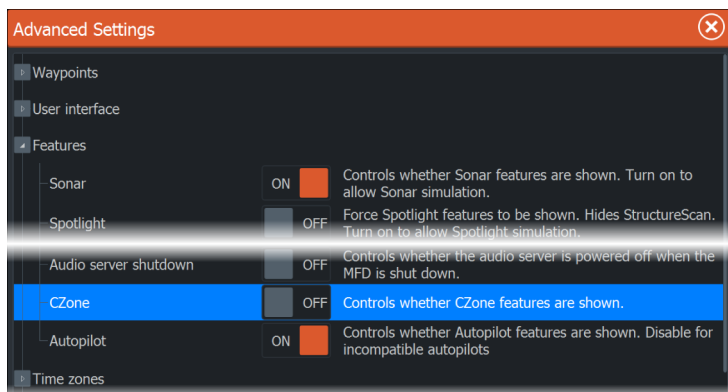
The functionality of the CZone system is determined by the CZone Config File (.zcf), which is stored on all CZone modules and the HDS Carbon. The file is created using the CZone Configuration Tool, a specialized PC application available from BEP Marine Ltd, and associated CZone distributors.

The HDS Carbon system provides a means to load the Config file, as well as apply updates to module firmware, removing the need to take a laptop computer aboard the vessel.

Enabling CZone functionality

If the CZone device(s) are not automatically detected, it is possible to manually enable CZone.





Assigning the dipswitch setting

Every product capable of controlling and viewing CZone devices must be assigned a virtual dipswitch setting. This setting is unique for each device. Typically it is set after the configuration file already exists on the CZone system, but it may also be set in advance. To do so, access the CZone menu on the Settings page.

When the configuration is already available on the network, it will immediately commence uploading to the HDS Carbon once the dipswitch is set. Allow this to complete, without interruption.

CZone backlight control

Enabling this causes the HDS Carbon to synchronize its backlight setting with that of any CZone Display Interfaces set up to share backlight settings.

→ **Note:** CZone Config also needs to have the HDS Carbon set as a controller.

Import and backup a configuration file

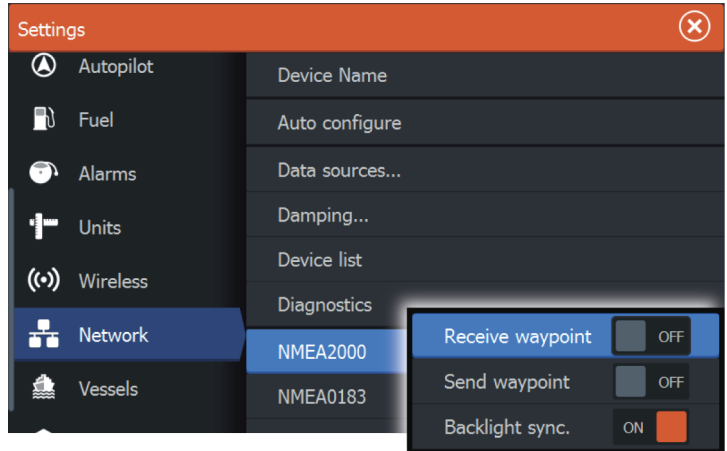
The files page may be used to import CZone configuration files, or export a copy to a memory card in the card reader. Importing overwrites the existing file on the HDS Carbon and all connected CZone devices.

For further information, see *"Backing up and Importing user data"* on page 71.

Upgrading module firmware

The Files page also allows the loading of NMEA 2000 devices firmware upgrades. For example, CZone firmware updates. For more information, refer to *"NMEA 2000 device upgrades"* on page 70.

NMEA 2000 setup



Receive waypoint

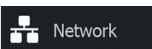
Select this option to allow another device capable of creating and exporting waypoints via NMEA 2000 to transfer directly to this unit.

Send waypoint

Select this option to allow this unit to send waypoints to another device via NMEA 2000.

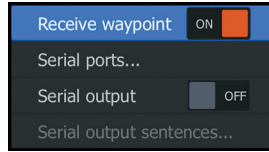
NMEA 0183 setup

The NMEA 0183 port must be set to suit the speed of connected devices, and can be configured to output only the sentences required by listening devices.



Receive waypoint

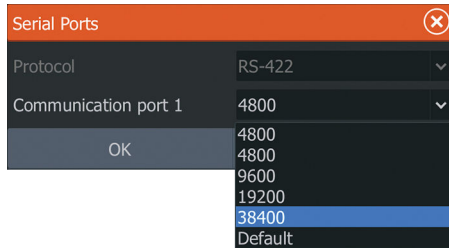
Select this option to allow a device capable of creating and exporting waypoints via NMEA 0183 to transfer directly to this unit.



Baud rate

This should be set to correspond with devices connected to the NMEA 0183 input and output. The input and output (Tx, Rx) use the same baud rate setting.

→ **Note:** AIS transponders typically operate at NMEA 0183-HS (high speed), and will require the baud rate to be set to 38,400.



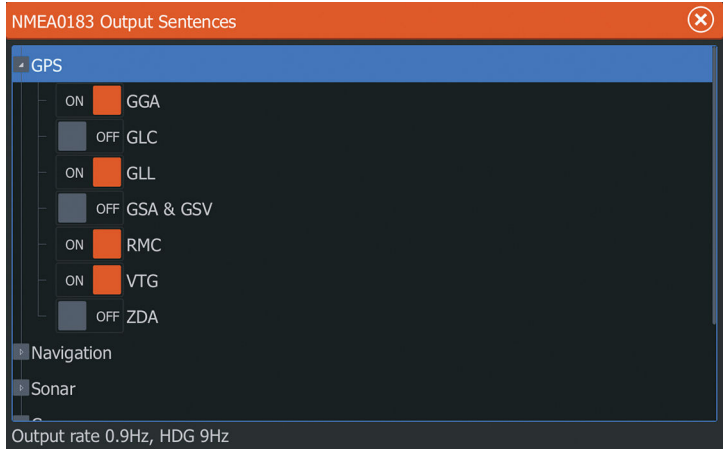
Serial Output

Selection determines whether the data is output via Tx lines, and will enable editing of the output sentences list.

Serial Output Sentences

This list allows control over which sentences need to be transmitted to other devices from the NMEA 0183 port. Due to the limited bandwidth of NMEA 0183 it is desirable to only enable the data that is required. The less sentences that are selected, the higher the output rate of the enabled sentences.

Commonly used sentences are enabled by default.



NMEA 0183 over Ethernet

The NMEA 0183 data stream is also output over ethernet, which is made available to tablet devices and PCs, using the internal wireless. The Ethernet dialogue provides IP and port data typically required for configuring the application on the third party device.

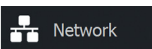
→ **Note:** Other MFDs cannot decode this information back to NMEA 0183, to use the data as a source. To share data a physical NMEA 2000 or NMEA 0183 connection is still required.

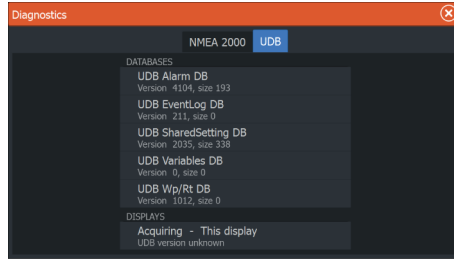
Ethernet setup

No special setup is required for establishing an ethernet network, it is all *plug-and-play*. An optional ethernet expansion device connected between the unit and another network module (e.g. 4G radar) will automatically start working, and relay data between the two devices.

Diagnostics

The UDB (User Data Base) tab on the diagnostics page, provides information on Ethernet activity, as shown below.





The **Reset Display List** option can be used to refresh the list of connected displays and their UDB version.

Databases

The upper table gives an account of the various automatically synchronised databases that ensure units are all using the same user settings and data. Each unit stores the database locally, so that all information is available if the device is run in standalone.

Databases can become unsynchronised when one or more displays in a multi display network are not powered up while other displays are being operated. Creation of waypoints, routes, tracks, and altering global settings all affect databases.

When the check-box **Dirty** is selected, the unit has identified that its database is older than that of another device on the network. The check-box should clear within seconds of both devices being powered up, and the databases synchronising. If it does not clear, it is recommended that all devices are power cycled.

IP address

The lower table shows the IP address of the display being viewed (top of list), the Master display (with **This display** next to it), and any other displays in a multiple display network.

The function of the Master is invisible to the end user - It manages database synchronization, however this task automatically shifts to another display if the current master is shut down.

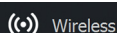
The IP address list only refreshes after all devices on the network have been powered down - a single device that is shutdown on the network will not be removed from the table shown on other devices. When powering up a system that has been completely shutdown, a network connectivity issue can be identified if a display does not show any other IP addresses than its own.

The **UDB version** is dependent on the software version installed on the display. It will never change on its own, unlike the **Version** of the Databases on the upper table. It is preferable to have all UDB versions the same. This can usually be achieved by loading the latest software on to your display - refer to "*Software upgrades*" on page 70.

Module network light

The network LED on network expansion devices can be useful for determining if the network is fundamentally operational. No light indicates no connection. A rapidly blinking green LED means the network module is communicating with another device.

Wireless setup



The unit includes built-in wireless functionality that lets you:

- Use a wireless device to remotely view (smartphone and tablet) and control the system (tablet only). Wireless devices use the GoFree app downloaded from their relevant application store.
- Access the GoFree Shop.
- Upload your logs to create custom maps at Insight Genesis.
- Download software updates
- Connect to third party applications

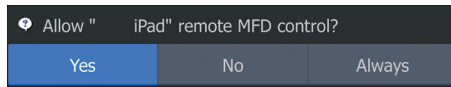
Connecting a tablet

Install the GoFree App on the tablet before following this procedure.

1. Set the internal wireless to **Access Point** mode. To do this, select the **Wireless devices** page in the Wireless settings dialog and then select the Internal wireless. Next, select the **Mode** option and then select **Internal Access Point**.
2. Select a device on the **Wireless devices** page to view its network key.
3. Navigate to the wireless network connection page on the tablet, and find the unit or GoFree wireless **xxx** network. If more than one is in range, review the **Wireless devices** page on the unit to confirm which wireless device is connected to the unit.
4. Enter the Network Key in the tablet to connect to the network.
5. Open the GoFree application - the unit should be automatically detected. The name displayed will be either the default, or that assigned in the Device Name setting. If the unit does not

appear, follow the on screen instructions to manually find the device.

6. Select the graphic icon of the unit. The unit displays a prompt similar to the following:



7. Select **Yes** for one-time connection, or **Always** if device is to be remembered for regular connection. This setting can be changed later if required.

→ **Note:** The internal wireless module only supports GoFree connection to itself. Other units connected on the network are not visible.

Connecting a smartphone

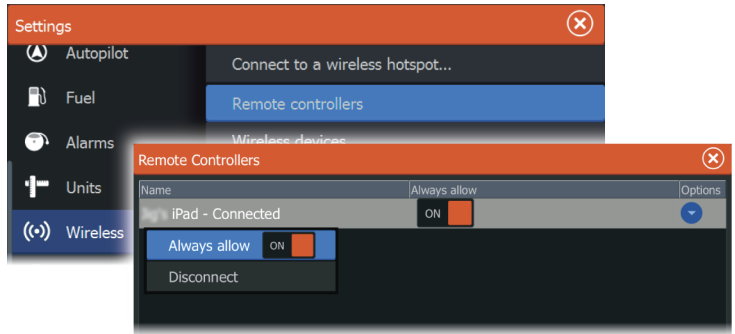
Install the GoFree App on the smartphone before following this procedure.

1. Set the internal wireless to **Access Point** mode. To do this, select the **Wireless devices** page in the Wireless settings dialog and then select the unit's Internal Wireless. Next, select the **Mode** option and then select **Internal Access Point**.
2. Select a device on the **Wireless devices** page to view its Network Key.
3. Navigate to the wireless network connection page on the smartphone, and find the unit or GoFree wireless **xxxx** network. If more than one is in range, review the **Wireless devices** page from the unit's Wireless settings dialog to confirm which wireless device is connected to the unit.
4. Enter the Network Key in the smartphone to connect to the network.
5. Open the GoFree application on the smartphone, the unit should be automatically detected. The name displayed will be either the default, or that assigned in the Device Name setting. If the unit does not appear, follow the on screen instructions to manually find the device.

The MFD's display is shown on the smartphone. To change the MFD's display on the smartphone, use the MFD to change the display on the MFD. The display change on the MFD is reflected on the smartphone.

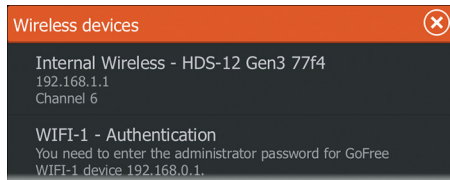
Remote controllers

When a wireless device is connected, it should appear in the **Remote controllers** list.



Selecting **Always allow** means the device can automatically connect without needing a password each time. This menu also allows disconnection of devices that no longer require access.

Wireless devices



This dialog shows the internal wireless and any connected WIFI-1 devices, as well as their IP and channel number. Selecting the internal wireless or a WIFI-1 device provides additional detail.

To view and change internal wireless detail values (Network name (SSID), Network key, or Channel) the internal wireless must be in **Access Point** (Internal Wifi) mode. To select a network (hotspot) to connect to, the internal wireless must be in **Client Mode**.

Network Name (SSID)

Displays the name of the internal wireless network.

Only visible if the internal wireless is set to **Access Point** (Internal Wifi) mode when the device is selected. You can select it and change the internal wireless network to any name you want for easy identification.

Network Key

Required by the smartphone or tablet to connect to the internal wireless network.

Only visible if the internal wireless is set to **Access Point** (Internal Wifi) mode when the device is selected. You can select it and change it to increase network security. The key must be at least 8 characters.

Mode

Displays if the internal wireless is set to **Access Point** (Internal Wifi) mode or **Client Mode**. Select it to change the wireless between **Access Point** mode and **Client Mode**.

If the internal wireless is set to **Access Point** (Internal Wifi) mode, smartphones and tablets can access the unit to view and control (tablet only) it. Also when set to **Access Point** (Internal Wifi) mode you can view and change the internal wireless details. **Client Mode** allows the unit internet access via a wireless hotspot.

When viewing this menu for a WIFI-1 set to **Access Point** mode, it's also possible to switch between **Primary** and **Secondary** access point modes so two WIFI-1 devices can exist on the network at the same time.

Only one WIFI-1 may operate as **Primary**, which determines that the device is acting as DHCP server. Only one DHCP server may exist on a network at a time.

To use two WIFI-1s as access points simultaneously the unit must initially be connected to only one unit. Once this unit is set to secondary, a second module may be turned on/connected, and will automatically default to primary.

→ **Note:** In a network with only one WIFI-1 and one or more internal wireless modules, the WIFI-1 should be left in **Primary** mode. The internal modules do not act as a DHCP server.

Channel

Only visible if the internal wireless is set to **Access Point** (Internal Wifi) mode when the device is selected. Select it to change the

Channel setting to overcome potential interference to the internal wireless by another RF device transmitting in the same frequency band.

Hardware

Provides MAC address details of the wireless.

Networks

Only visible if the internal wireless is in **Client Mode** when the device is selected. Shows a list of all networks (hotspots) available for connection. Select the name of the desired network to enter its network key and connect to it.

Change administrator password (Access Point mode, WIFI-1 only)

This can be set to increase WIFI-1 security, preventing change of settings via a connected device's browser (eg on a tablet), or other MFDs on the network. The default user and password are both **admin**.

Restore defaults

Deletes all user made changes, and restores the wireless to factory settings.

Client settings

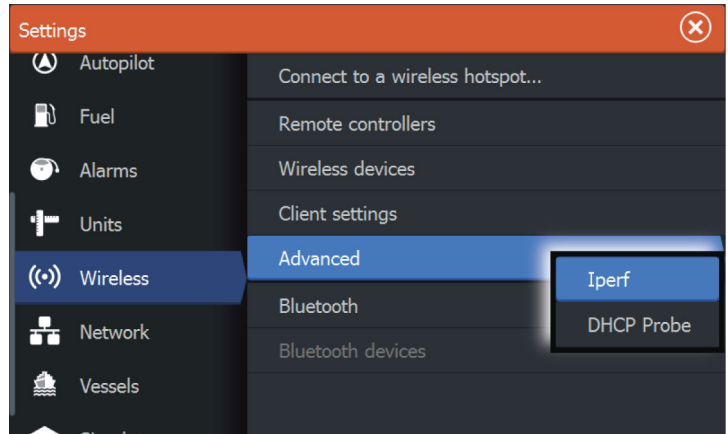
Opens the Wireless Client Settings dialogue, which shows networks previously connected to, regardless of whether they are currently visible or not. Allows deletion of a network from the list, and toggling of Automatic connection setting.

Simultaneous Client and Access Point operation

If it is desirable to have the MFD accessible to a tablet while also having internet access for GoFree store and Insight Genesis, it is necessary to use two wireless units - one must be in Client mode, the other in Access Point mode. This can be a combination of internal wireless and an external WIFI-1, or two external WIFI-1 units. Two external WIFI-1 units will offer the advantage of providing both features to all MFDs on the network (where applicable).

Advanced

Tools are available within the software to assist in fault-finding and setting up the wireless network.



Iperf

Iperf is a commonly used network performance tool. It is provided for testing wireless network performance around the vessel so weak spots or problem areas can be identified. The application must be installed on and run from a tablet device.

The HDS Carbon must be running Iperf server before initiating the test from the tablet. On exiting the page, Iperf automatically stops running.

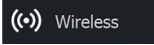
DHCP Probe

The wireless module contains a DHCP server that allocates IP addresses for all the MFDs, and Sonar in a network. If integrating with other devices, such as a 3G modem or satellite phone, other devices in the network may also be acting as DHCP servers. To make it easy to find all DHCP servers on a network, dhcp_probe may be run from the HDS Carbon. Only one DHCP device may be operational on the same network at a time. If a second device is found, turn off its DHCP feature if possible. Refer to the device's own instructions for further assistance.

→ **Note:** Iperf and DHCP Probe are tools provided for diagnostic purposes by users familiar with network terminology and configuration. Navico is not the original developer of these tools, and cannot provide support related to their use.

Bluetooth wireless technology

The unit includes built-in Bluetooth wireless technology. To connect the unit to Bluetooth enabled devices you must pair them. For more information about Bluetooth and connecting devices, refer to the unit's Operator manual.



Internal Wireless

Select this option to enable or disable the internal wireless module. Disabling wireless when not in use reduces the unit's power consumption.

Video In configuration

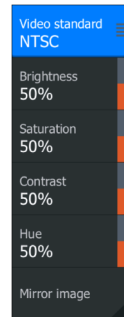


Open the menu on the video panel to set up video.

Enable PAL or NTSC depending on the video output standard of the selected camera.

You can optimize the video display by adjusting the video image settings (brightness, saturation, etc.).

Mirror image may be applied where the camera is providing a rear view, and the user wishes to see objects as they would appear in a vehicle rear view mirror, i.e., on the same side as they actually are.



Mercury®

If the unit is on the same NMEA 2000 network as a Mercury VesselView® 4, 7, 403, 502, 702, 703, or Link, a host of Mercury® specific features are automatically unlocked on the unit. When the features are enabled, the display may prompt the user for some basic configuration information. Refer to the VesselView® manual or engine supplier for further information.

Suzuki Marine®

If the unit is on the same NMEA 2000 network as a Suzuki C10 color gauge, a dedicated Suzuki instrument panel is unlocked and automatically enabled. Data source selection is done the same way as for any regular NMEA 2000 sources.

Software updates and data backup

From time to time we release software updates to our existing products. Updates are created for a variety of reasons; to add or improve features, to add support for new external devices, or to fix software bugs.

Updates can be found on the website: www.lowrance.com

When the unit is connected to the internet, a pop-up can appear advising that a software update is available and encourages you to download the update.

The unit may be used to apply software updates to itself, and to supported network devices, with files read off a memory card inserted in the card reader.

Before initiating an update to the unit itself, be sure to back up any potentially valuable user data.

Network analyzer and service assistant

The system has a built-in service assistant that creates a report of the devices installed on the NMEA 2000 and Ethernet network such as the software versions, serial numbers, and information from the settings file to assist in technical support enquiries.

To use the analyzer, open the About page of the System settings dialog and select Support. Two options are displayed:

Create report

Analyzes your network and prompts you for information required for support and creates the report with information automatically gathered from the network. You can add screenshots and log files that will be attached to the report. There is a 20MB limit for the report attachments. You can save the report to a memory card and email it to support or upload it directly if you have an internet connection. If you call technical support first, you can enter an incident number to assist with tracking.

Check system for updates

Analyzes your network and checks if updates are available for compatible devices.

→ **Note:** Connect your unit to the internet to check for the latest available software versions. The software versions will be up to date as of the last time you updated your unit or connected to the internet.

Software upgrades

The update file must be loaded to the root directory of the memory card.

The update may be initiated at boot up: insert the memory card into the card reader before turning the unit on, boot the unit, and follow the on-screen instructions.

Alternatively, in the Files menu, locate the update file on the memory card inserted in the card reader and select **Upgrade**, followed by **This Display**. Accept the prompt to reboot the unit, and wait a few moments as the unit restarts. Do not remove the memory card or repower the unit until the process is completed (this typically takes no more than a couple of minutes).

NMEA 2000 device upgrades

The update file must be loaded to the root directory of a memory card inserted in the card reader.

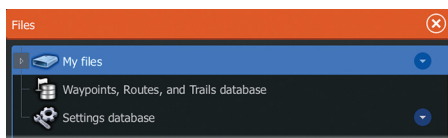
1. Select the Files toolbar option and select the update file under Memory card.
 2. Select the Upgrade option presented when the file is highlighted. A list should appear displaying any compatible devices the update file applies to. In most cases this will be a single device.
- **Note:** If no device is shown, check that the device to be updated has power, and run any outstanding updates for the unit first.
3. Select the device and initiate the upgrade. Do not interrupt the upgrade process.

Backing up and Importing user data



There are two files that can be backed up that relate to user changes made to the system:

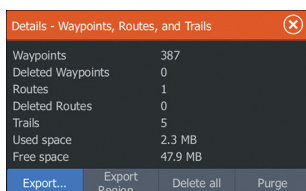
- Waypoints, Routes, and Trails database.
- Settings database (includes preferences such as unit settings and custom pages).



Insert a memory card into the unit's card reader as a storage location for backup data.

Waypoints, Routes, and Trails database backup

You can export all Waypoints, Routes, and Trails, or export only those contained within a specific region.



If Export Region is selected, the chart page will be displayed, centered on vessel location. Using the touch screen, adjust the red boundary box to outline the area to be exported. The export option offers different file formats to save as:

- **User data file version 5:** Use with current units (NSO evo2/3, NSS evo2/3, NSS, NSO, NSE, Zeus, Zeus Touch, HDS Gen2, HDS Gen2 Touch, HDS Gen3, HDS Carbon, GO XSE units, Vulcan units, and ELITE Ti units). Offers most detail.
- **User data file version 4:** Use with current units (NSO evo2/3, NSS evo2/3, NSS, NSO, NSE, Zeus, Zeus Touch, HDS Gen2, HDS

Gen2 Touch, HDS Gen3, HDS Carbon, GO XSE units, Vulcan units, and ELITE Ti units).

- **User data file version 3 (with depth):** Use with legacy GPS chartplotters.
- **User data file version 2 (no depth):** Use with legacy GPS chartplotters.
- **GPX (GPS Exchange, no depth):** Use with some other manufacturers' GPS products, and PC applications.

After you select the file type, select Export and destination memory card. The receiving GPS/PC typically needs to be set to allow import of Waypoints.

The **Serial port** option outputs the waypoints over NMEA 0183. The receiving GPS/PC will typically need to be set to allow import of waypoints.

Settings database export

Select **Setting database** to export the Settings database and select the memory card destination.

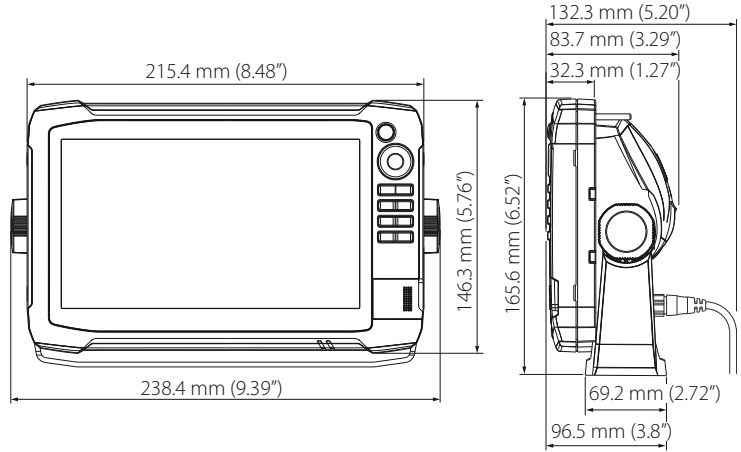
Importing a database

Later, if the unit has been restored to factory defaults or user data is accidentally deleted, return to the files page, select the backed up file, and then **Import**. View file details for creation date.

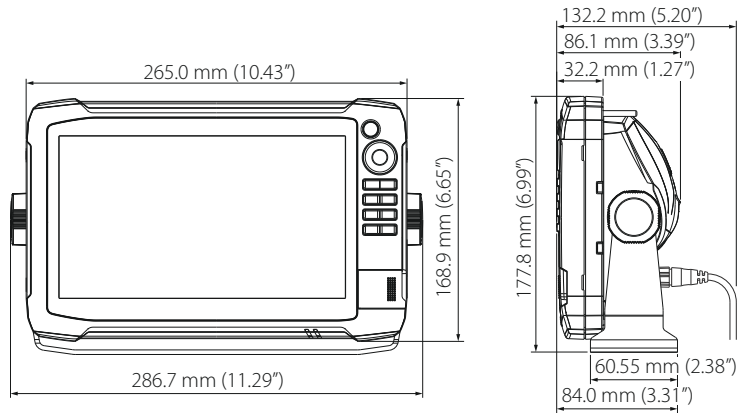
7

Dimensional drawings

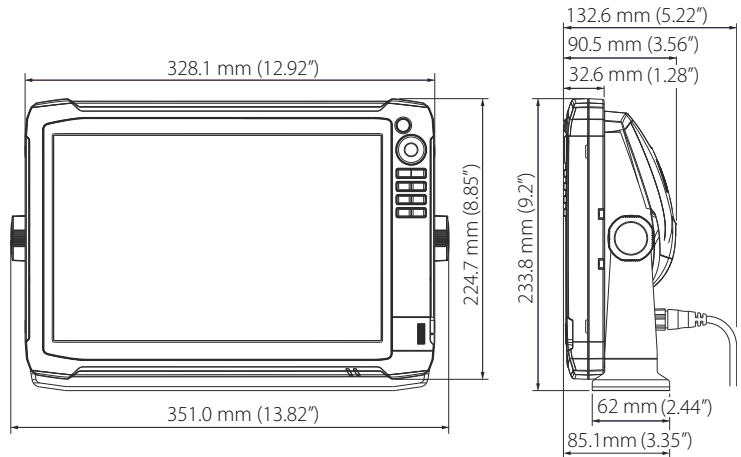
HDS 7 Carbon



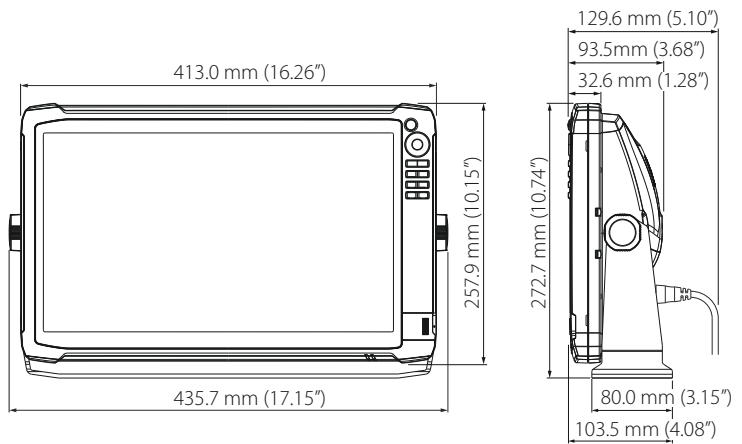
HDS 9 Carbon



HDS 12 Carbon



HDS 16 Carbon



8

Accessories

The most up-to-date accessories list is available at:
www.lowrance.com

NMEA 2000

Part Number	Description
000-0124-69	NMEA 2000 Starter kit
000-0119-88	NMEA 2000 2' (0.61M) Extension cable
000-0127-53	NMEA 2000 6' (1.82M) Extension cable
000-0119-86	NMEA 2000 15' (4.55M) Extension cable
000-0119-83	NMEA 2000 25' (7.58M) Extension cable
000-11517-001	Fuel Flow Sensor
000-11518-001	Fluid Level Sensor
000-11519-001	Speed Sensor
000-11520-001	Temperature Sensor
000-11521-001	Thru-Hull Temperature Sensor
000-11522-001	Fuel Data Manager
000-11523-001	Pressure Sensor
000-11047-001	Point-1 high speed GPS antenna with built-in compass

Display accessories

Part Number	Description
000-11010-001	HDS Carbon video adapter cable
000-13978-001	HDS 7 Carbon bezel and card door
000-13979-001	HDS 9 Carbon bezel and card door
000-13980-001	HDS 12 Carbon bezel and card door
000-13995-001	HDS 16 Carbon bezel and card door
000-12242-001	HDS 7 Carbon suncover

Part Number	Description
000-12244-001	HDS 9 Carbon suncover
000-12246-001	HDS 12 Carbon suncover
000-13993-001	HDS 16 Carbon suncover
000-11019-001	HDS 7 Carbon gimbal bracket
000-11020-001	HDS 9 Carbon gimbal bracket
000-11021-001	HDS 12 Carbon gimbal bracket
000-13994-001	HDS 16 Carbon gimbal bracket
000-11050-001	HDS Carbon flush mount kit
000-10467-001	HDS Carbon bracket knobs (pair)
000-0127-49	HDS Carbon power cable
000-0124-70	HDS Carbon connector caps
000-0127-50	HDS Carbon fuse holder with fuse

Ethernet cables

Part Number	Description
000-0124-51	Ethernet cable yellow - 5 pin - 2 m (6.5 ft)
000-0124-29	Ethernet cable yellow - 5 pin - 4.5 m (15 ft)
000-0124-30	Ethernet cable yellow - 5 pin - 7.7 m (25 ft)
000-0124-37	Ethernet cable yellow - 5 pin - 15.2 m (50 ft)

Other accessories

Part Number	Description
000-11076-001	WM-3 SIRIUS® weather module
000-11068-001	WiFi-1 Wireless network module
000-10418-001	3G Broadband radar
000-10419-001	4G Broadband radar

Sonar accessories

Part Number	Description
000-12568-001	TotalScan transducer
000-0106-72	Skimmer Medium/High CHIRP transducer
000-0106-77	Skimmer Low/High CHIRP transducer
000-0106-74	Trolling motor transducer, Medium/High CHIRP
000-0106-73	In-hull shoot-thru transducer, depth only
000-0106-89	In-hull, shoot-thru transducer, depth and remote temperature
000-12572-001	7-pin transducer to 9-pin adapter cable

For additional transducer options, visit www.lowrance.com

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Supported data

NMEA 2000 compliant PGN List

NMEA 2000 PGN (receive)

59392	ISO Acknowledgement
59904	ISO Request
60160	ISO Transport Protocol, Data Transfer
60416	ISO Transport Protocol, Connection M.
60928	ISO Address Claim
65240	ISO Commanded Address
126208	NMEA Cmd/Req/Ack Group Function
126992	System Time
126996	Product Information
126998	Configuration Information
127237	Heading/Track Control
127245	Rudder
127250	Vessel Heading
127251	Rate of Turn
127257	Attitude
127258	Magnetic Variation
127488	Engine Parameters, Rapid Update
127489	Engine Parameters, Dynamic
127493	Transmission Parameters, Dynamic
127503	AC input status
127505	Fluid Level
127506	DC Detailed Status
127508	Battery Status
127509	Inverter Status
128259	Speed, Water referenced
128267	Water Depth

128275 Distance Log
129025 Position, Rapid Update
129026 COG & SOG, Rapid Update
129029 GNSS Position Data
129033 Time & Date
129038 AIS Class A Position Report
129039 AIS Class B Position Report
129040 AIS Class B Extended Position Report
129041 AIS Aids to Navigation Report
129283 Cross Track Error
129284 Navigation Data
129539 GNSS DOPs
129540 GNSS Sats in View
129545 GNSS RAIM Output
129794 AIS Class A Static and Voyage Related Data
129801 AIS Addressed Safety Related Message
129802 AIS Safety Related Broadcast Message
129808 DSC Call Information
129809 AIS Class B Static Data Report, Part A
129810 AIS Class B Statis Data Report, Part B
130074 Route and WP Service - WP List - N&P
130306 Wind Data
130310 Environmental Parameters
130311 Environmental Parameters
130312 Temperature
130313 Humidity
130314 Actual Pressure
130569 Entertainment - Current File and Status
130570 Entertainment - Library Data File
130571 Entertainment - Library Data Group
130572 Entertainment - Library Data Search
130573 Entertainment - Supported Source Data

130574 Entertainment - Supported Zone Data
130576 Small Craft Status
130577 Direction Data
130580 Entertainment - System Configuration Status
130581 Entertainment - Zone Configuration Status
130582 Entertainment - Zone Volume Status
130583 Entertainment - Available Audio EQ Presets
130584 Entertainment - Bluetooth Devices
130585 Entertainment - Bluetooth Source Status

NMEA 2000 PGN (transmit)

59392 ISO Acknowledgement
59904 ISO Request
60160 ISO Transport Protocol, Data Transfer
60416 ISO Transport Protocol, Connection M.
60928 ISO Address Claim
126208 NMEA Cmd/Req/Ack Group Function
126992 System Time
126996 Product Information
130074 Route and WP Service - WP List - N&P
130306 Wind Data
127237 Heading / Track Control
127250 Vessel Heading
127258 Magnetic Variation
128259 Speed, Water Referenced
128267 Water Depth
128275 Distance Log
129025 Position, Rapid Update
129026 COG & SOG, Rapid Update
129029 GNSS Position Data
129283 Cross Track Error

- 129284 Navigation Data
- 129285 Navigation - Route/WP Information
- 129539 GNSS DOPs
- 129540 GNSS Sats in View
- 130074 Route and WP Service - WP List - N&P
- 130306 Wind Data
- 130310 Environmental Parameters
- 130311 Environmental Parameters
- 130312 Temperature
- 130577 Direction Data

NMEA 0183 supported sentences

TX / RX - GPS

Receive	GGA	GLL	GSA	GSV	VTG	ZDA	
Transmit	GGA	GLL	GSA	GSV	VTG	ZDA	GLC

TX / RX - Navigation

Receive	RMC				
Transmit	AAM	APB	BOD	BWC	BWR

Receive					
Transmit	RMC	RMB	XTE	XDR	

TX / RX - Sonar

Receive	DBT	DPT	MTW	VLW	VHM
Transmit	DBT	DPT	MTW	VLW	VHM

TX / RX - Compass

Receive	HDG	HDT	HDM
Transmit	HDG		

TX / RX - Wind

Receive	MWV	MWD
Transmit	MWV	MWD

TX / RX - AIS / DSC

Receive	DSC	DSE	VDM
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→ **Note:** AIS sentences are not bridged to or from NMEA 2000.

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Technical specifications

→ **Note:** The most up-to-date specifications list is available at: www.lowrance.com

HDS Carbon technical specifications

Approvals	
Compliance	FCC, Industry Canada, Radio Equipment Directive, ACMA, RSM
Display	
Resolution	
HDS-7	1024x600
HDS-9	1280x720
HDS-12	1280x800
HDS-16	1920x1080
Type	SolarMAX HD (TM) IPS technology
Brightness	>1200 nits
Touch screen	Multi-touch, P-CAP
Viewing angles in degrees (typical value @ contrast ratio = 10)	
HDS-7	85° top/bottom, 85° left/right
HDS-9	85° top/bottom, 85° left/right
HDS-12	88° top/bottom, 88° left/right
HDS-16	88° top/bottom, 88° left/right
Electrical	
Supply voltage	12 V DC (10.8 - 17.0 V DC min - max)
Power consumption - Max	
HDS-7	24 W (2.3 A @ 13.8 V DC)
HDS-9	28 W (2.3 A @ 13.8 V DC)

	HDS-12	32 W (2.3 A @ 13.8 V DC)
	HDS-16	50 W (3.6 A @ 13.8 V DC)
Power consumption - Typical		
	HDS-7	20 W (1.5A @ 13.8V DC)
	HDS-9	24 W (1.75 A @ 13.8 V DC)
	HDS-12	28 W (2 A @ 13.8 V DC)
	HDS-16	38 W (2,75 A @ 13,8 V DC)
Recommended fuse rating		5 A
Low power standby		
	HDS-7	<650 mA
	HDS-9	<650 mA
	HDS-12	<720 mA
	HDS-16	<810 mA
Environmental		
Operating temperature range		-15°C to +55°C (+5°F to +131°F)
Storage temperature		-40°C to +85°C (-40°F to +185°F)
Waterproof rating		IPX6 and 7
Humidity		60°C, 95% relative humidity (RH) for 18 hours
Shock and vibration		100 000 cycles of 20 G
GPS		10Hz high speed update. GPS & GLONASS. WAAS, MSAS, EGNOS
Interface		
Ethernet		
	HDS-7	1 Port
	HDS-9	2 Ports
	HDS-12	2 Ports
	HDS-16	2 Ports
NMEA 2000		Micro-C (1)
NMEA 0183		input/output. 4800, 9600, 19200, 38400 baud

Video input	Composite video RCA - single channel via optional adaptor
Data card slot	2x microSD
Wireless	Internal 802.11b/g/n
Bluetooth	Internal
Physical	
Dimensions (W x H x D)	Refer to " <i>Dimensional drawings</i> " on page 73
Weight (display only)	
HDS-7	1.13 kg (2.49 lb)
HDS-9	1.55 kg (3.42 lb)
HDS-12	2.44 kg (5.38 lb)
HDS-16	3.60 kg (7.94 lb)
Mounting type	Bracket (supplied) or panel mount
Sonar	
Sonar frequency	CHIRP (high, medium, low) + Broadband (200/83/50 kHz) + StructureScan (800/455 kHz)
Sonar output power	Max power 500 W RMS
Warranty Period	2 Year + part of the 5 year upgrade program



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