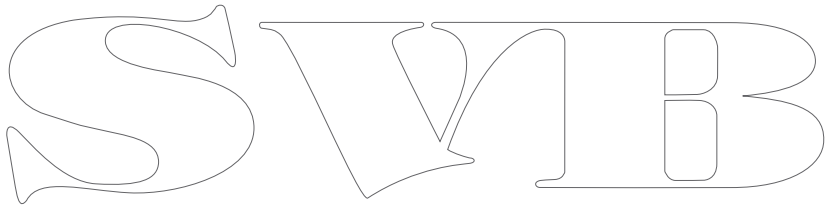
SIMRAD

NSO evo2 Marine Processor
Installation Manual

ENGLISH

SAMPLE

simrad-yachting.com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Preface

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 instrument and transducers 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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Governing Language: This statement, any instruction manuals, user guides and other information relating to the product (Documentation) may be translated to, or has been translated from, another language (Translation). In the event of any conflict between any Translation of the Documentation, the English language version of the Documentation will be the official version of the Documentation.

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.

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Warranty

The warranty card is supplied as a separate document.

In case of any queries, refer to the brand web site of your display or system:

www.simrad-yachting.com

SIMRAD

Declarations and conformance

This equipment is intended for use in international waters as well as coastal sea areas administered by countries of the E.U. and E.E.A.

Compliance Statements

The Simrad NSO evo2;

- complies with CE under EMC directive 2004/108/EC
- complies with the requirements of level 2 devices of the Radio-communications (Electromagnetic Compatibility) standard 2008

For more information please refer to our website:

www.simrad-yachting.com

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

Trademarks

- NMEA 2000 is a registered trademark of the National Marine Electronics Association
- Navionics is a registered trademark of Navionics SpA
- Simrad is a trademark of Kongsberg Maritime AS Company registered in the US and other countries and is being used under license
- B&G, StructureScan, Navico, SonicHub, SimNet, Skimmer, InsightHD, Broadband Radar and Broadband Sonar are trademarks of Navico, registered in the US and other countries

About this manual

This manual is a reference guide for installing the Simrad NSO evo2 Marine Processor.

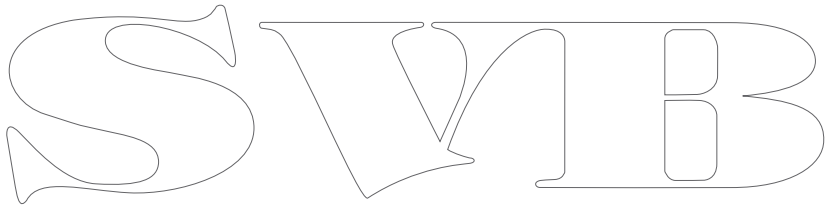
The manual does not cover basic background information about how equipment such as radars, echosounders and AIS work. Such information is available from our web site:

http://support.simrad-yachting.com

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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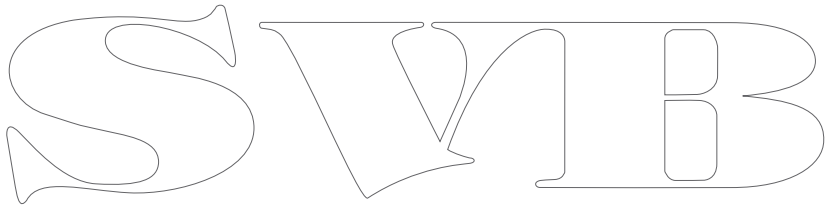


1 NSO evo2 Overview

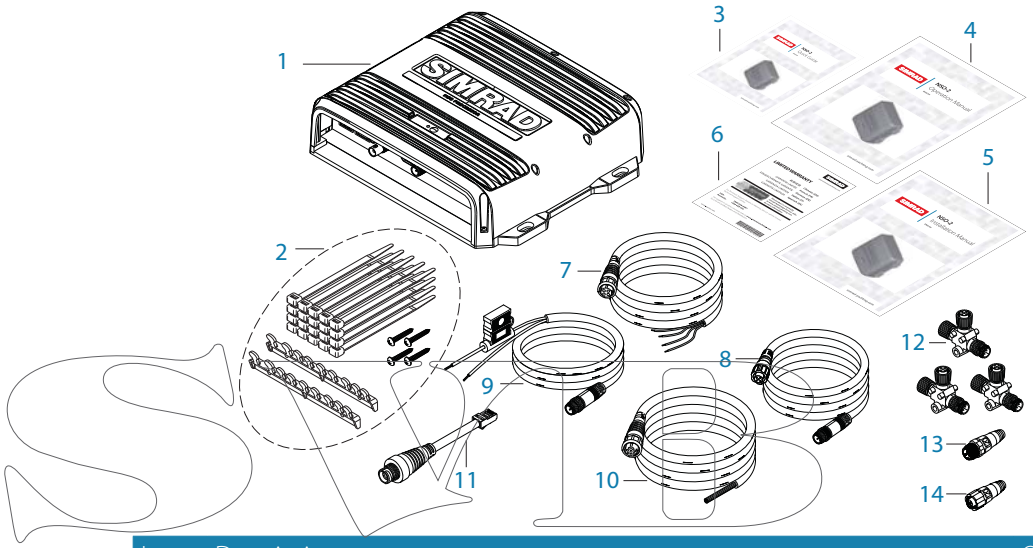
The NSO evo2 Marine Processor features two fast quad core processors, and dual monitor outputs to drive two displays with independant information.

Connectivity options for data are broad, with an internal ethernet switch with three ports, NMEA 0183 transmit and receive ports, and a connection point for a NMEA 2000 compliant data bus.

Networking capability exists with other NSO evo2 processors, as well as NSS evo2, NSS, NSE, NSO, and B&G Zeus multifunction displays.

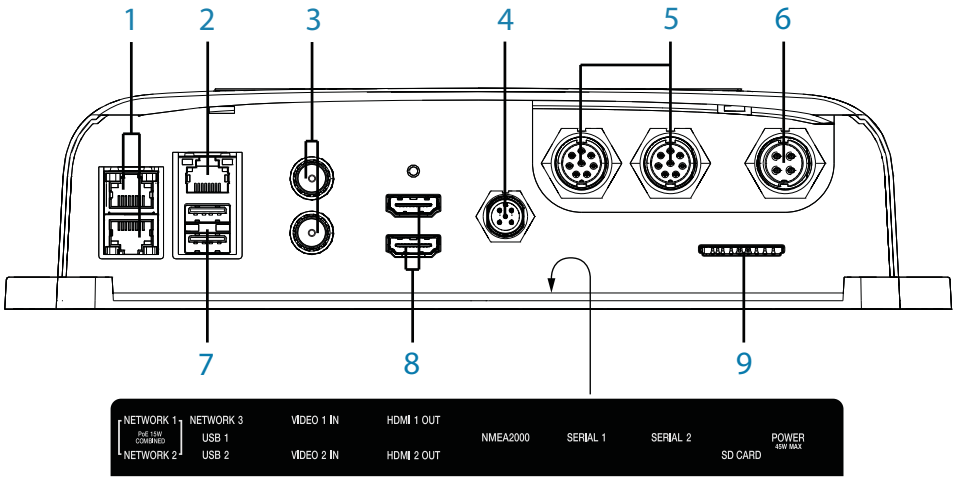
Expansion options include: Integration with AC12N/AC42N autopilot computers, external BSM-1, BSM-2, and LSS StructureScan echosounders, Broadband 3G/4G, and HD Digital radar, SonicHub, SiriusXM™ Weather and Audio Support (USA only), NMEA 2000/SimNet, camera/video signal input, and BEP CZone.

Included Items



Item	Description	Quantity
1	NSO evo2 Marine Processor	1
2	NSO evo2 MPU Installation Kit -	1
	Cable retainer	2
	Cable ties, 102 mm x 2.5 mm, black	20
	Pan head screws 3.5 x 19, A4 DIN7981B	8
3	Quick Start Guide	1
4	Operation manual	1
5	Installation manual	1
6	Simrad Advantage Warranty card	1
7	NSO evo2 Power cable (4 wire)	1
8	Micro-C 1.8 m (6') drop cable. male-female plugs	1
9	Micro-C power cable	1
10	NMEA 0183 serial cable, 2m (8 wire)	1
11	Ethernet adaptor - 5pin female to RJ45 male	1
12	Micro-C T-Connector	3
13	Micro-C terminator -120 ohm, male	1
14	Micro-C terminator -120 ohm, female	1

NSO evo2 Marine Processor Box



1 **Ethernet Network ports with PoE (2x)**

2 **Ethernet Network port (1x)**

3 **Video Input BNC sockets (2x)**

4 **NMEA 2000 data port**

5 **NMEA 0183 & RS422 (2x)**

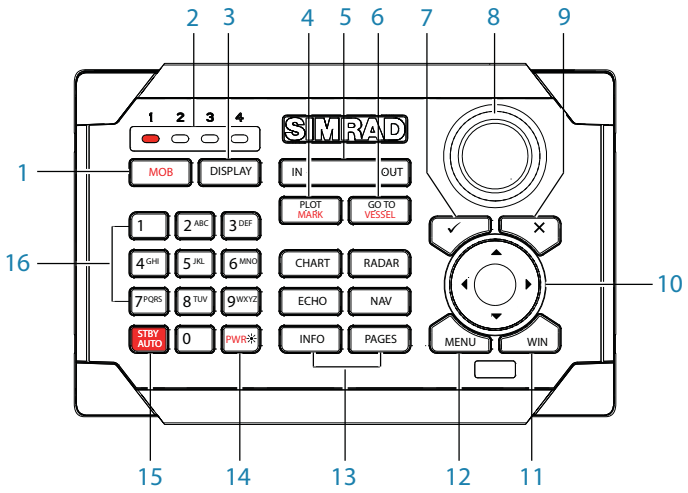
6 **Power connector**

7 **USB ports (2x)**

8 **HDMI sockets (2x)**

9 **SD Card slot**

OP40 Controller (not included)



1 **MOB (Man Overboard): A long press will position a Man Over Board (MOB) waypoint at the vessel's current position**

2 **Display Under Command LEDs: Indicate which display the OP40 is controlling**

3 **DISPLAY: Short press: Change which display the OP40 is controlling. Long 5 second press: enter OP40 configuration and system startup**

4 **PLOT/MARK key: A short press activates the Plot menu, a long press positions a waypoint at the vessel position**

5 **Zoom IN zoom OUT: Mainly to adjust ranges on radar, echosounder and chart pages**

6 **GOTO/VESSEL: A short press activates the Goto menu, a long press centers the chart to vessel position**

7 **✓ key: Activates/confirms current selection**

8 **Rotary knob: The function of the knob is dependent on active context**

9 **x key: Cancels changes and returns to previous menu level**

10 **Cursor keypad: Used to move the cursor on the display, and to maneuver in the menu system**

11 **WIN: Used on multiple panels pages. A short press toggles between the panels, a long press expands active panel to a full page panel and back again**

12 **MENU: Used to display the context menu for the active panel/overlay, and for selecting options in edit mode. . 2 x MENU for system settings menu**

13 **Direct Access Keys (DAK): Provide direct access to a page. Repeated presses of each DAK cycles through several different pages that relate to the DAK**

14 **PWR : Short press used to turn on the active processor and will turn on the DI15 displays, if connected (MO15-L, MO17-L, MO19-L or third party monitors will need to be powered on via their own power button). Note: There will be a five second delay before anything appears on the screen. Short press during operation used to bring up the active displays power control and brightness options. (and Radar STBY if applicable)**

15 **STBY AUTO : Autopilot Auto steer / Stand-By**

16 **Alphanumeric keypad: Used for entering numbers and text in dialog boxes**

SAMPLE

2 Hardware Installation

Mounting location

Choose the mounting locations carefully before you drill or cut. Be sure to leave a direct path for all of the cables.

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.

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

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.

Choose an area where the unit will not be subjected to excessive vibration, or heat.

Choose a location that will not expose the unit to conditions that exceed the IP rating.

Leave sufficient clearance to connect all relevant cables.

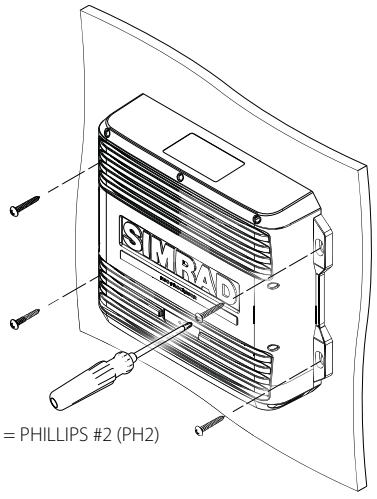
For overall width and height requirements, please see "Dimensioned drawings" on page 46.

> ⚠ **Warning:** When installing, ensure appropriate safety equipment is used, e.g. ear muffs, protective glasses, gloves and a dust mask.
>
> Power tools may exceed safe noise levels, and can cast off dangerous protectiles.
>
> The dust from many materials commonly used in boat construction may cause irritation or damage to eyes, skin, and lungs.

Marine Processor Installation

Hold the processor up to the desired location on the mounting surface, and with a pencil or marker, trace the keyhole at each of the four mounting tabs. Remove the processor and mark the centre of the narrow end (top) of each keyhole.

The supplied fasteners can be used when installing the processor to a wooden or fibreglass bulkhead. For steel or aluminium it may be preferable to use machine screws with lock nuts. For supplied fasteners, pre-drill the holes at the marked points with no larger than a 2.7 mm drill bit. When drilling in to fibreglass covered in gelcoat, it is recommended to carefully remove the gelcoat layer with a small countersink bit after the hole has been drilled. This will prevent the gelcoat from cracking as the fastener is tightened.



OP40 and monitor installation

Refer to the mounting templates supplied with the OP40 and monitors. MO series monitors include installation instructions that should be carefully read before commencing with installation. While installations using touch monitors do not technically require the OP40 for general operation, they are recommended, especially in integrated autopilot installations where a physical STBY/AUTO key is required during commissioning. Fixed keypads also offer more accurate control in rough operating conditions. Ensure the OP40 is conveniently located within easy reach of helm seating or standing position.

3 Wiring

For easier access to connectors, undo the two philips screws visible on the bottom front of the NSO evo2 case, and remove the lower shroud.

Guidelines

Don't do this:	Do this:
Don't make sharp bends in the cables	Do make drip and service loops
Don't run cables in a way that allows water to flow down into the connectors	Do cable tie all cables to keep them secure
Don't route the data cables in areas adjacent to radar, transmitter, or large current carrying cables	Do solder/crimp and insulate all wiring connections, if extending or shortening power or NMEA 0183 cables
	Do 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 NSO evo2 Marine Processor.

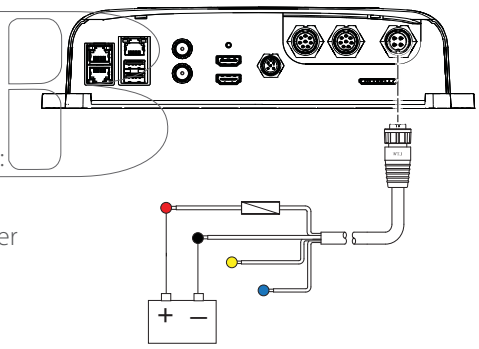
⚠ **Warning:** The positive supply wire (red) should always be connected to (+) DC with the supplied fuse or a circuit breaker (closest available to fuse rating).

Power Connection

The NSO evo2 can be powered by either 12 V or 24 V DC. They are protected against reverse polarity, under voltage and over voltage (for a limited duration).

The supplied power cable has four cores used for:

- power into the system (Red and Black wires)
- controlling power state of the processor or power state of other displays and modules (Yellow wire)
- connecting to an external alarm (Blue wire)



Connect Red to (+) DC using a 3 amp fuse. Connect Black to (-) DC. The processor can be powered on and off using the power button on the front of the case.

Power Control Connection (yellow wire)

Planning is required how you want to be able to turn on and off the NSO evo2 and connected compatible devices.

The yellow Power Control wire on the NSO evo2 power cable can either be an input that will turn on the processor when power is applied, or an output that turns on other devices when the processor is powered on. It can be configured at the installation stage to control the power state of displays and compatible devices. When commissioning the system, the NSO evo2 can be set to be a Power Control Slave or Power Control Master.

Power Control configuration options of the NSO evo2 are:

- use the Power button on case or OP40 to turn on the NSO evo2 only: Yellow wire not connected
- NSO evo2 to turn on when power is applied to the processor: Common red and yellow wires
- use the Power button on case or OP40 to turn on the processor and other NSO evo2s and or compatible devices such as Broadband Radar: Yellow wire connected to a Power Control Bus. (Set one or more displays to be a Power Control Master)

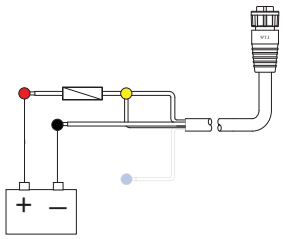
Power Control unconnected

Device will turn on and off when the power button on the front of the unit is pressed.

Leave yellow Power Control wire disconnected. Tape or heat-shrink end to prevent shorting.

Power Control to supply positive (auto on)

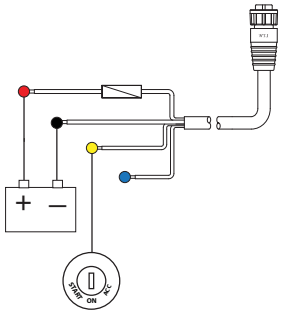
Device will turn on immediately when power is applied. Common the yellow wire with the red wire after the fuse.



➔ ***Note:*** If set to 'Slave' the unit can not be powered down by power button, but can be put in to standby mode. MO series monitors will enter active off state automatically, where back-light is turned off. Unit should not be set as 'Master' using this wiring.

Power Control to ignition

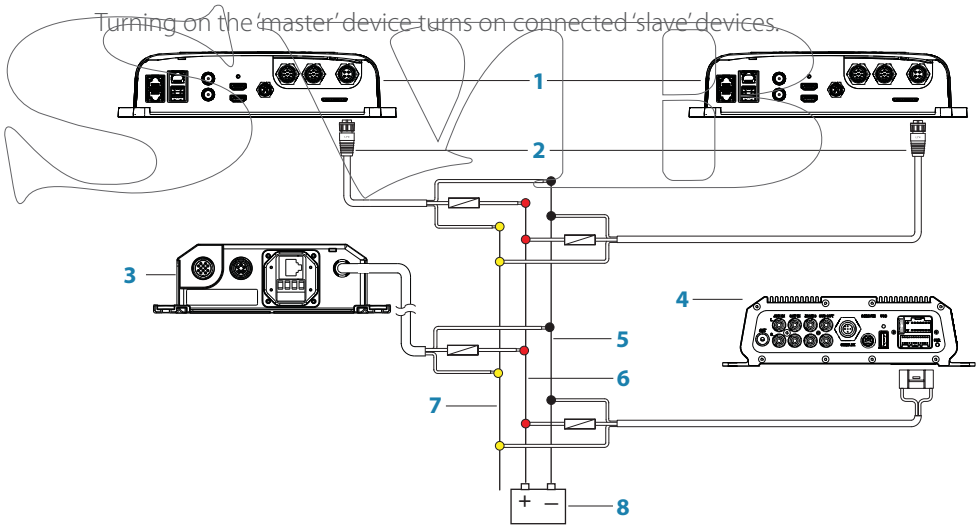
Device will turn on once ignition is turned on to start engines. Connect yellow wire to 'accessories' output of engine key switch.



➔ ***Note:*** Engine start batteries and house batteries should have a common ground connection.

Power Control master/slave bus

Turning on the 'master' device turns on connected 'slave' devices.



1 **NSO evo2 Processors**

2 **Power cable**

3 **Radar Interface box**

4 **Sonic Hub**

5 **ground wire**

6 **positive wire**

7 **power control wire**

8 **DC supply**

In the diagram above, if the left NSO evo2 turns on using the power button and is set as the Power Control Master, it will output voltage on the Power Control bus to power on the other NSO evo2, the Radar Interface, and the SonicHub.

If the right NSO evo2 is set to Power Control Slave, it cannot be powered down using its own power button, but can be set to standby.

If the left NSO evo2 (Power Control Master) is off, the right NSO evo2 can be turned on using its own power button, but won't turn on any other devices.

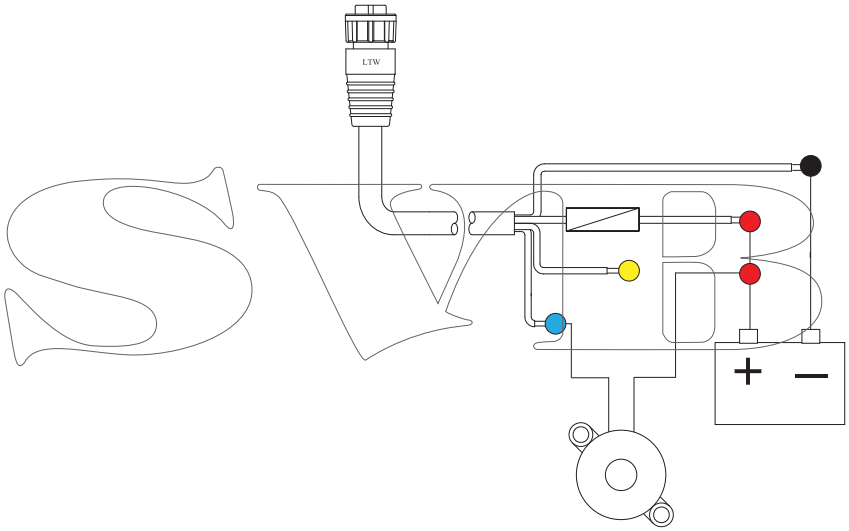
To turn on all network devices from either NSO evo2, both devices can be configured as Power Control Masters.

➔ ***Note:*** If an NSO evo2 processor has its power state controlled by another device (or ignition switch), it can't be totally powered down. It can however enter a standby state to save power. If the power button is pressed and Power Off selected, a message will appear "Preparing to standby…"

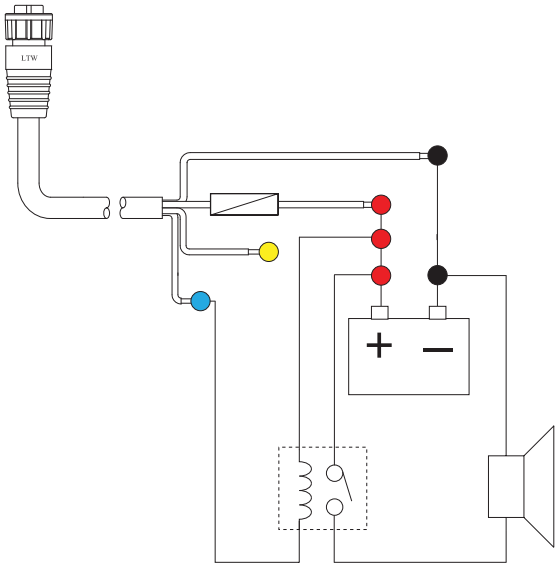
External alarm

An external alarm can be connected to one or more NSO evo2 Processors on the network, via the blue wire. The external alarm can be a small peizo buzzer connected directly, or a horn siren connected via a relay.

Alarms are configured globally in the system i.e they can be configured on any one networked multifunction device or instrument, and be seen, heard, and acknowledged from all devices. Individual devices can also be configured to not sound their internal buzzer, but still display the alarm information. For information on configuring alarms, refer to the Alarms section in the Operation manual.



For sirens that draw more than 1 Amp, use a relay



Connecting monitors

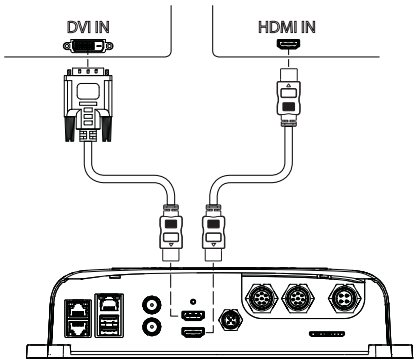
Up to two displays may be connected to the NSO evo2 via the HDMI ports.

Currently supported monitors, are the Simrad DI-15, MO-L 15/17/19, MO16/19/24 (T&P), legacy MO-19, B&G ZM series, and KEPMGB-15T.

It is possible to use third party monitors, however these should conform to the supported resolution and refresh rates defined in "Specifications" on page 45.

➔ ***Note:*** LCD monitors intended for home/office use are not designed to operate in areas exposed to direct sunlight, and will appear dark and difficult to read. Also, unless carefully ventilated and protected from moisture, their service life will be greatly compromised in the marine environment.

Monitors with an HDMI input may be directly connected to. Where monitors have DVI inputs only, an HDMI-DVI adaptor cable or regular HDMI cable and DVI adaptor plug should be used. Adaption will not degrade video quality, as both formats use a digital signal, however brightness control driven by the NSO evo2 is not supported over DVI.



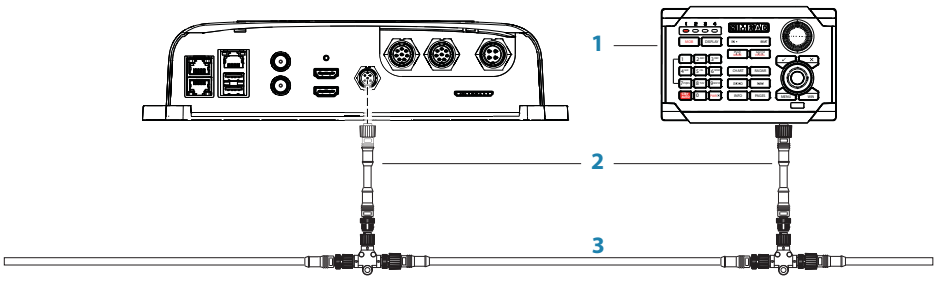
➔ ***Note:*** While the HDMI standard does not state maximum cable length, signal may be compromised on long runs. Only use Navico or other high quality HDMI certified cables. 3rd party cables should be tested before installation. On runs over 10 m it may be required to add an HDMI amplifier or use HDMI-CAT6 adaptors.

➔ ***Note:*** some HDMI TV displays may apply over-scan, which will in effect crop the image possibly causing loss of important content. Check the display manual for an option to disable overscan or adjust scaling.

Connecting control devices

The NSO evo2 can be controlled with an OP40 keypad, a USB keyboard and mouse, or by 1 or 2 Touch screens. If a mixed system is run, with one touch and one non-touch screen, an OP40 or mouse and keyboard will also be required to control the display without touch. The OP40 can control either screen by pressing the DISPLAY key, the keyboard by double press of the CTRL key(s).

OP40 control



1 OP40 Controller

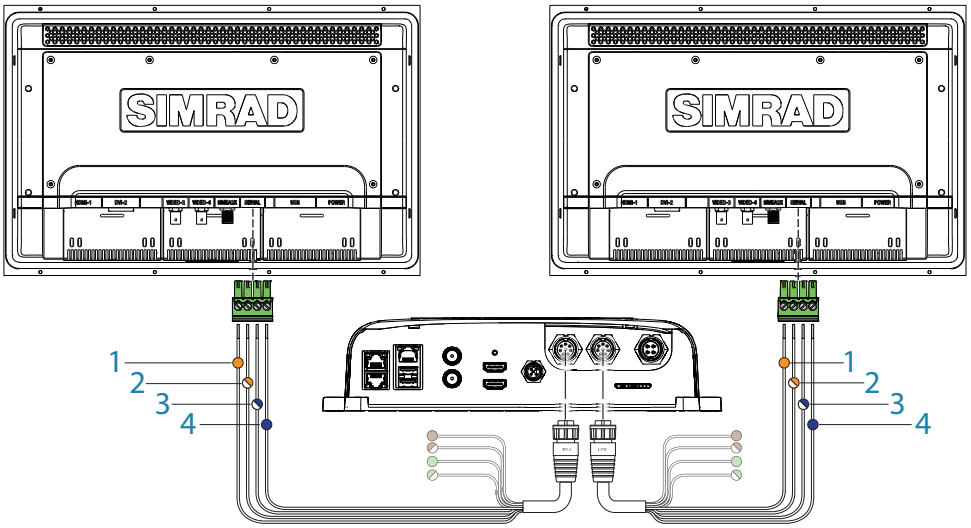
2 Micro-C drop cable (must be ≤ 6 m (19.7'))

3 Micro-C backbone for NMEA 2000 data

Touch screen control

The NSO evo2 may be controlled solely by touchscreen displays. Support is included to interface with the MO16-T, MO19-T, and MO24-T, and KEPMGB-15T but other screens may also work, though no official support can be offered. The MO series monitors require serial (RS422) connection, whereas the KEP monitor control is connected via USB. By default, 'USB 1' and 'Serial 1' relate to HDMI 1 OUT, and 'USB 2' and 'Serial 2' relate to HDMI 2 OUT.

Connection to MO series displays



1 **RS422_RX+ (blue)**

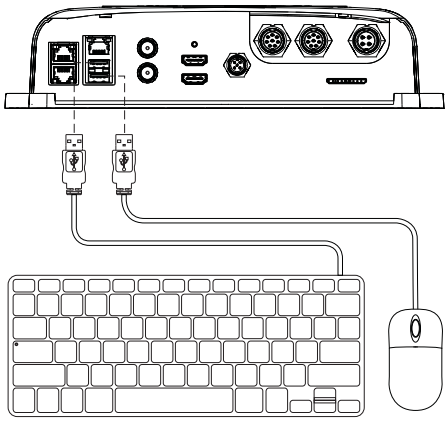
2 **RS422_RX- (blue/white)**

3 **RS422_TX+ (orange/white)**

4 **RS422_TX- (orange)**

Keyboard and mouse control

Keyboard and mouse should be USB type, and may plugged in individually, using both USB ports, or share a single port via a passive USB hub. The keyboard and mouse should be standard PC compatible harware.



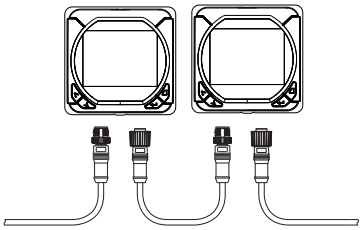
→ ***Note:*** If a USB chart card reader is used, the keyboard and mouse will have to share a single USB port via a passive USB hub.

→ ***Note:*** In order to control both monitors connected to the NSO evo2 system, the USB ports must be configured to suit. See "USB switching" on page 20.

NMEA 2000 / SimNet

Device connection

The NSO evo2 Marine Processors are equiped with a NMEA 2000 data port, which allows the receiving and sharing of a multitude of data from various sources.



Essential network information

- The standardised physical cables/connectors for NMEA 2000 are 'Micro-C' and 'Mini-C', directly derived from the automation industies 'DeviceNET' - 'Micro-C' being the more commonly used size.
- While most Simrad products now use 'Micro-C' cabling and connectors, some products still use proprietary 'SimNet' connectors, which are easily made compatible via adaptor cables.
- 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 (19.7 ft). The total length of all drop cables combined should not exceed 78m (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. A terminator can be one of the following:
    - a terminator blank plug
    - a wind transducer (where the mast cable is one end of the backbone)

Planning and installing a network backbone

The Micro-C backbone needs to run between the locations of all products to be installed - typically in a bow to stern layout - and be no further than 6 m from a device to be connected.

Choose from the following components to make up the backbone:

- Micro-C cables: 0.4 m (1.3 ft), 2 m (6.6 ft), 5 m (16.6 ft), and 9 m (29.5 ft) cables
- T-connector. Used to connect a drop cable to the backbone
- Micro-C power cable. Connected to backbone via a T-connector

→ ***Note:*** When using a wind sensor, the mast cable should be connected at one end of the backbone, as the sensor is fitted with a termination resistor.

→ ***Note:*** Most NMEA 2000 devices can be connected directly to a Simrad SimNet backbone and SimNet devices can be connected to a NMEA 2000 network by using adapter cables.

→ ***Note:*** Simrad devices with Micro-C NMEA 2000 connectors are fully compatible with a Sim-Net network by using a Micro-C to SimNet adapter cable.

→ ***Note:*** IS40 displays have two Micro-C connectors, and can either be connected inline with the backbone, or wired individually off a drop cable. Connecting from device to device is known as 'daisy chaining' This network topology is not officially NMEA 2000 compliant.

Power the network

The network requires its own 12 V DC power supply protected by a 5 amp fuse or breaker. For vessels fitted with 24 V systems, use a DC-DC converter to supply 12 V.

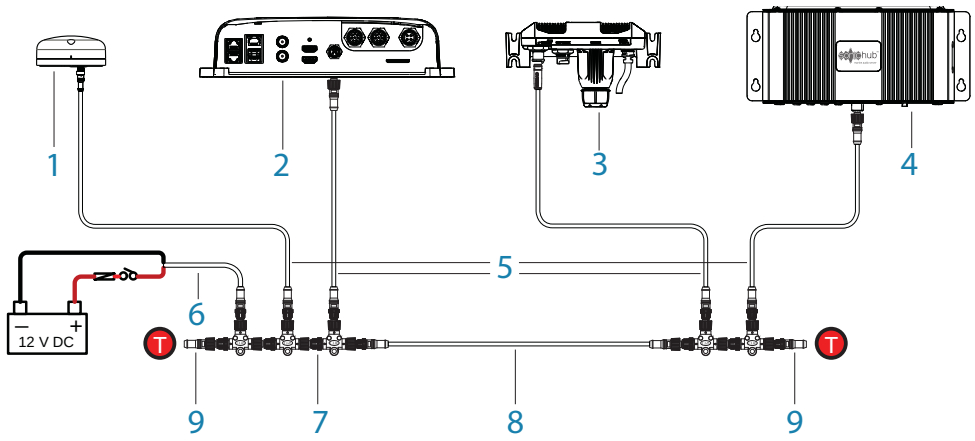
Connect power at any location in the backbone for smaller systems.

For larger systems introduce power at 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 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, radar, bow thruster or other high current devices.

The following drawing demonstrates a typical small network. The backbone is made up of directly interconnected T-piece joiners and an extension cable, which is terminated at each end.



1 **GPS antenna**

2 **NSO evo2 Marine Processor**

3 **Broadband radar interface**

4 **SonicHub**

5 **'Drop' cables (should not exceed 6 m (20 ft) each)**

6 **Power cable**

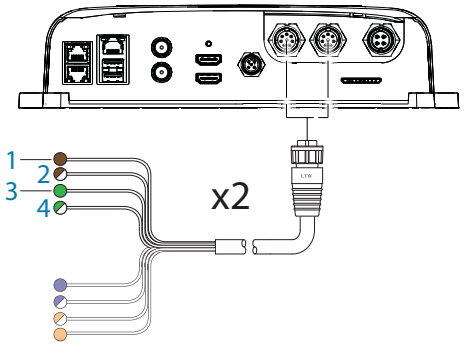
7 **Micro-C T junctions**

8 **Backbone**

9 **Micro-C terminator (one male, one female)**

NMEA 0183 device connection

The NSO evo2 has two 2-way NMEA 0183 ports, which are connected via two discrete cables. Each cable is dedicated to one of the two internal processors. Both the baud rate (up to 38,400 baud) and sentences output by the NSO evo2, can be configured. Refer to "NMEA 0183 supported sentences" on page 44 for a complete list of sentences.



1 NMEA0 183 RX_A (balanced) (brown)

2 NMEA0 183 RX_B (balanced) (brown/white)

3 NMEA0 183 TX_A (balanced) (green)

4 NMEA0 183 TX_B (balanced) (green/white)

→ ***Note:*** The majority of NMEA 0183 devices communicate at 4,800 baud. AIS is a common exception, and normally transmits at 38,400 baud.

→ ***Note:*** AIS is not internallly bridged, so must be connected to both NMEA 0183 ports if required on both screens. AIS data supplied via NMEA 2000 is available to both processors.

Talkers and Listeners

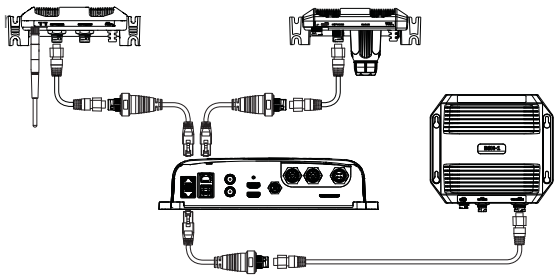
Do not connect multiple devices outputing data (Talkers) on to any serial input (Rx) of the unit. The NMEA 0183/RS422 standard is not intended for this type of connection, and data will be corrupted if multiple devices transmit simultaneously. The output however may drive multiple receivers (Listeners). The number of receivers is finite, and depends largely on the receiving hardware. Typically driving three devices is possible.

Ethernet device connection

Ethernet is used to interconnect high bandwidth devices such as radar, sonar, and other Marine Processors. The NSO evo2 Marine Processor has three ethernet ports, which are interconneted via an internal ethernet switch.

Connecting directly to three devices

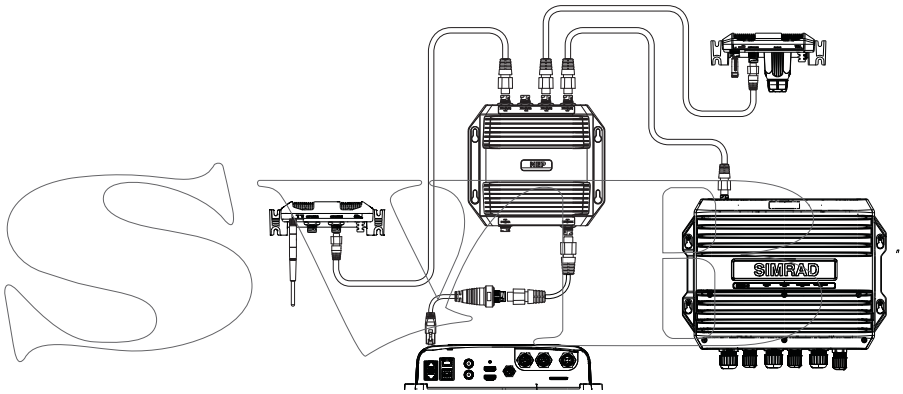
Due to the internal switch, the NSO evo2 can connect to network devices directly, without the use of a cross-over cable or external switch.



→ ***Note:*** the NSO evo2 uses RJ45 sockets, so the RJ45 to 5-pin adaptor is needed for connection to 5-pin (orange plug) ethernet cables. One is supplied with unit.

Connecting to more than three devices

If connecting more than three devices to an NSO evo2 , a network expansion Port (NEP-2) must be used. If the connected device has its own additional ports, (eg LSS-2) these ports may be used instead.



If the number of ethernet devices exceeds the number of available ports on the NEP-2, it is possible to link two or more NEP-2 modules together to provide the required ports. The NEP-2 modules are fitted with 5 ethernet ports.

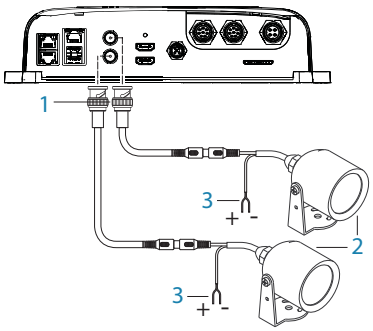
→ ***Note:*** When designing a system, take in to account the ports 'lost' when used for linking multiple NEP-2 modules together.

Video In

Each NSO evo2 can be connected to two composite video sources, and display video images on its displays. Both NTSC and PAL formats are supported.

→ ***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.

Connecting video sources



1 **BNC male plugs**

2 **Composite video cameras**

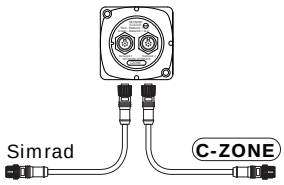
3 **Camera power feed**

➔ ***Note*** camera cables are not supplied, and will need to be selected to suit termination - BNC at the NSO evo2, and typically BNC or RCA plug at the camera end.

➔ ***Note*** camera power is externally supplied, see camera installation instructions for requirements.

CZone connection to NMEA 2000

When interfacing to C-ZONE network it is recommended to use a BEP Network interface bridge to join the two network backbones together.

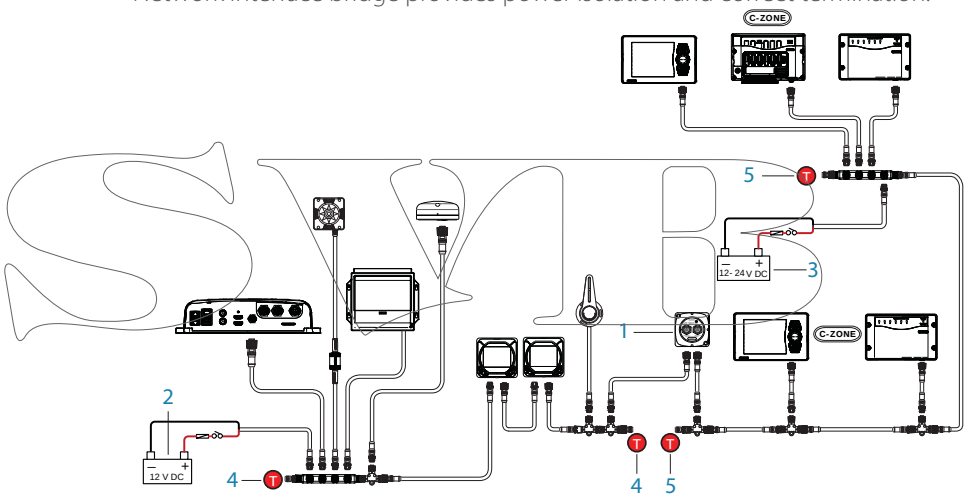


The CZONE / NMEA 2000 Network interface bridge isolates the power of the two networks, but allows data to be freely shared between both sides.

The Interface Bridge can also be used for expansion of the NMEA 2000 network, when the maximum node limit (node = any device connected to network) for the network has been reached or the maximum cable length of 150m will be exceeded. Once an Interface Bridge has been fitted, a further 40 nodes and additional cable length can be added.

The Network Interface is available from your BEP dealer. For more information please refer to the BEP web site www.bepmarine.com.

Below is the correct method to interface to a C-ZONE network. In this example, power is injected twice but connecting the two networks together via the BEP Network interface bridge provides power isolation and correct termination.



1 Network interface bridge

2 Simrad network power

3 Czone network power

4 Simrad network termination

5 CZone network termination

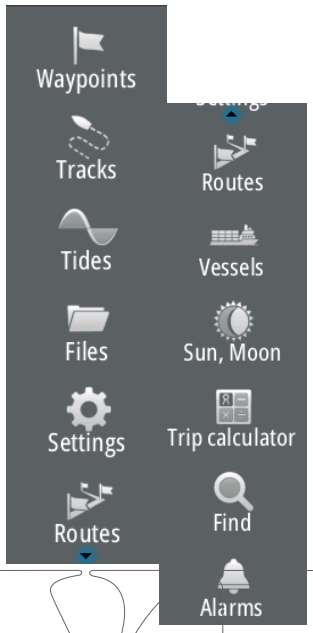
4 Software setup

The NSO evo2 requires some initial configuration before use, in order to get the most out of the product.

The following sections focus on settings that typically will not require change once configured. User preference settings and operation are covered in the operator manual.

Pressing the home key brings up the home page, which has three distinct panels.

The scrollable left column of icons access most settings that require configuration;



SAMPLE

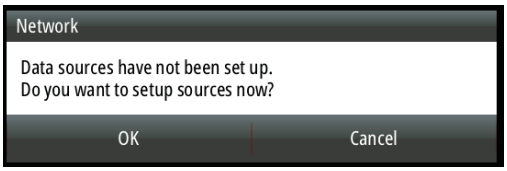
First time startup

When the NSO evo2 is started for the first time, or after a factory default, the unit will raise prompts requesting the user to select some fundamental setup options;

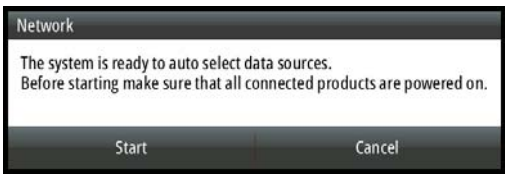
Choose language. Confirm Selection.

Read and accept warning.

Skip demo mode by selecting NO



Initiate source selection for data sources both internal and external to device.

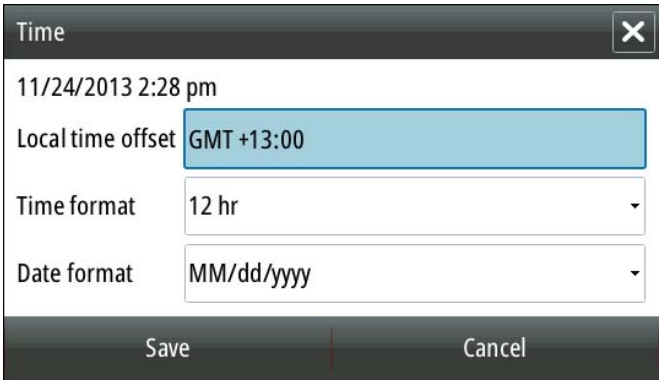


Check all external data sources and NMEA 2000 data bus are turned on.

System

Time and Date

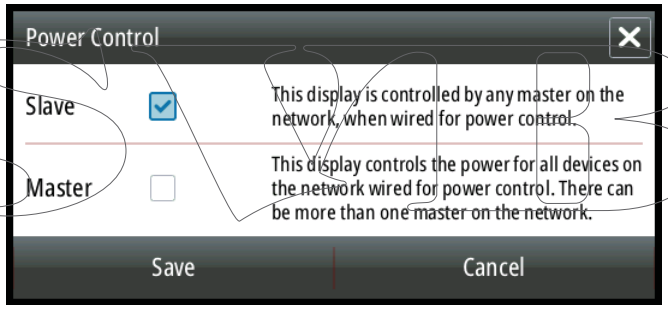
Configure time settings to suit vessel location.



System

Power Control setup

Determines unit response to signal applied to yellow wire of power cable.



These settings do not require adjustment if the yellow wire is connected to ignition or to a stand-alone switch that applies 12V/24V.

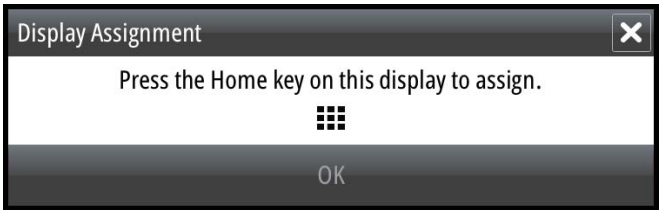
→ ***Note:*** The System Controls menu will not display the 'Power Off' option when unit is configured as slave. To power down device, the master device must be powered down, or system power removed.

Network

Display assignment

Display assignment must be performed to enable the 'home' button on MO series monitors. It also ensures that when pressed, the home page is opened on the correct display.

Select 'Display Assignment' seperately on both displays connected.



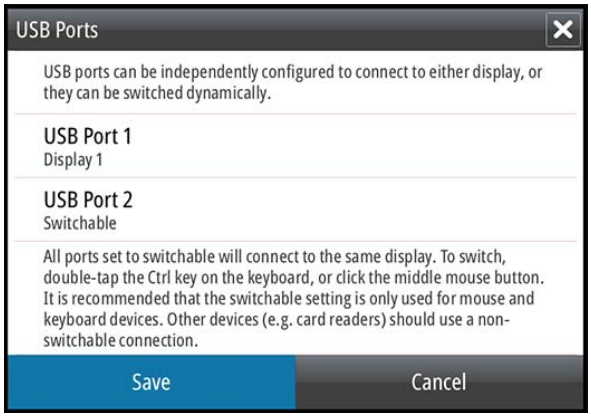
→ ***Note:*** This feature is dependant on both the NSOevo2 processor and the MO series monitor being connected to a NMEA 2000 network.

System

USB switching

By default, one USB port is assigned to each display.

If mouse and keyboard are used, the USB ports need to be setup to be switchable between displays, or if not required on one of the displays, simply set both USB ports to be permanently assigned to one display.



Network

Source selection

Data sources provide live data such as GPS position, heading, wind speed, and temperature. The data may originate from modules internal to the device (eg internal GPS on some products), or external modules connected via NMEA 2000 or NMEA 0183. Internal sources presented on NMEA 2000 as 'virtual' devices typically include echo, MFD, Navigator, Pilot Controller, and iGPS. When a device is connected to more than one source providing the same data, the user has the flexibility to choose the prefered source. Before commencing with source selection make sure all external devices and the NMEA 2000 bus are connected and are turned on. If NMEA 0183 is used, complete "NMEA 0183 setup" on page 35 prior to doing source selection.

→ ***Note:*** high bandwidth external modules such as echo and radar are connected via ethernet, and are not handled under source selection. Use the device specific menus to select which device is set as source. This is only required when there are multiple sources, as ethernet modules are automatically detected and made available.

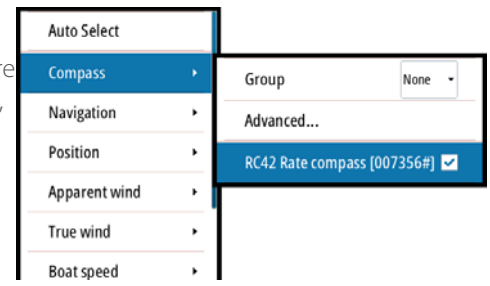
Auto Select

The Auto Select 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 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 nework since.

Manual source selection

Manual selection is generally only required where there is more than one source for the same data, and the automatically selected source is not the one desired.

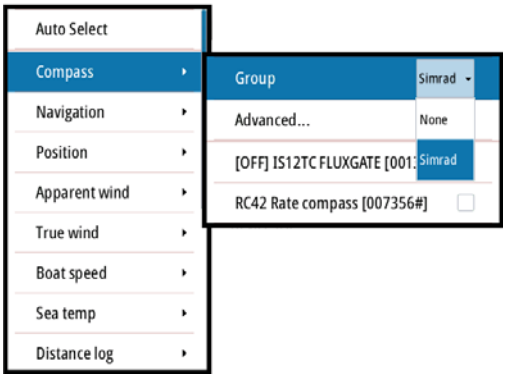


Group source selection

Simrad multifunction displays, autopilot controllers, and instruments have the ability to;

- use data sources (eg position, wind direction, etc) that all other products on the network use, or alternatively use a data source independently from other units.
- globally change all displays over to a different source from any display. (This will only include products set to Group mode.)

In order to enable group selection, the display must be set to 'Simrad' group.



Devices with the Group set to None can be set to use different sources to those of the rest of the network devices.

Advanced source selection

This allows the most flexible and precise manual control over which devices provide data. Some data sources, such as those for fuel level, or engine RPM, can only be changed via the **Advanced** menu. Occassionally Auto Select may not assign the desired source, which may be corrected using the Advanced source selection. An example of this is where twin installations of NMEA 2000 compliant engines are not programmed with unique instance numbers. This means that the auto select feature can't determine which engine is fitted on the port and which is fitted on the starboard side.

→ ***Note:*** the **Advanced** option is visible in multiple places - the bottom of the **Sources** list, and under each source category (eg Compass). The latter shows a filtered list that only relates to devices that output data relevant to the category.

Network

Device list

The device list shows the physical and virtual devices that provide data. This may include a module inside the NSO evo2, the NMEA 0183 port, or any external NMEA 2000 device.

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

All devices allow allocation of an instance number via the **Configure** option. Set unique instance numbers on any identical devices on the network. 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 which does not have it's own user interface.

Network

SimNet Groups

It is possible to group certain settings so they are duplicated across the network on multiple displays. **Display** (ie backlighting), **Units** (ie metric, imperial), **Damping** (to dynamic data), and **Alarms** can be grouped either in 'Simrad' group, or groups '1' through to '6'. If any of the settings require discrete control, set it to 'none'.

Network

Diagnostics

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

Bus state: This 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 CAN driver got too many messages for its buffer before the application could read them.

Rx Overruns: The CAN hardware got too many messages for its buffer before the CAN 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.

Fast Packet Errors: Cumulative counter of any fast packet error. This could be missed frame, or 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:*** The above information may not always indicate an issue that can be simply resolved with minor adjustment to network topology 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).

Network

Damping

If data appears erratic or too sensitive, damping may be applied to make the information appear more stable. With damping set at MIN, the data is presented in raw form with no damping applied. This is available for heading, course over ground, speed over ground, apparent wind, true wind, boat speed, depth, and tide sourced from NMEA 2000.

Network

Calibration

An offset (positive or negative) can be applied to correct inaccuracies in boat speed, sea temp, air temp, barometric pressure, and depth sourced from NMEA 2000.

SAMPLE

Alarms

External Alarm Setup

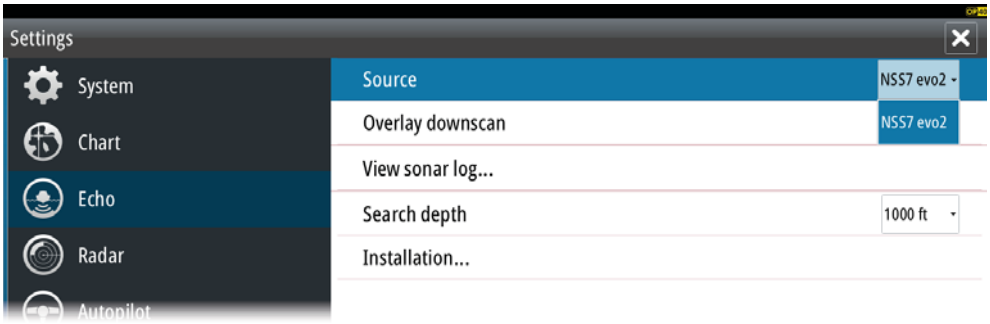
The **Siren Enabled** option must be set in order for the unit to drive the buzzer when an alarm condition arises. Its setting also determines the operation of the external alarm output (blue wire).

Echo

Echosounder setup

Select echosounder source

If only one sonar source is present in the network, selection is not required as it should be picked up automatically. However when more than one source exists (eg a BSM-2 or other display with internal sonar), select the desired source in the Echo Settings.



Depth offset

This is a value that can be entered on the Echo Installation page to make depth readings relate to any point from the water surface, to the deepest point of the vessel.

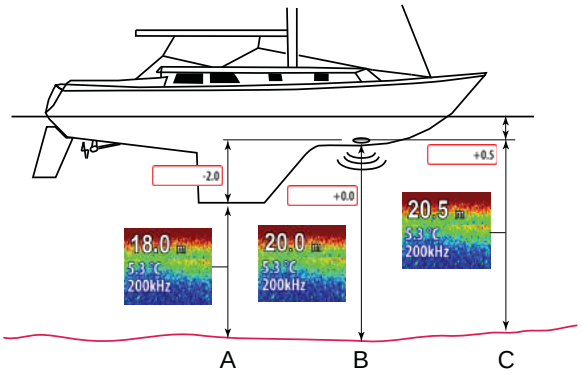
This value is applied to a sonar source connected via ethernet, and changes will be seen on all devices connected to the network.

Below are some typical ways in which the offset is used:

A) For Depth below Keel: Set the distance from transducer to the bottom of the keel - this should be set as a negative value.

B) For Depth Below Transducer: no offset required.

C) For Depth Below Surface (waterline): Set the distance from transducer to the surface - this should be set as a positive value.



Echosounder software version

For external sounder modules, the software version is displayed in the header of the Echo Installation dialogue. To upgrade Sonar software, see "NMEA 2000 and Ethernet device upgrades" on page 39

Water speed calibration (echosounder transducer)

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 overreading, e.g. if the average water speed reads 8.5 knots and SOG records 10 knots 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 (echosounder transducer)

Averages water speed by measuring your speed at a selected interval of time. Water speed intervals range from one to thirty seconds, e.g. 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 (echosounder transducer)

Temperature calibration is used to adjust the water temperature value from the echosounder transducer to match the data from another temperature sensor. It may be required to correct for localised 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 echosounder module. In some transducers with built-in temperature sensors, the temperature reading may be inaccurate if the wrong transducer is selected from the transducer type menu.

Radar

Radar setup

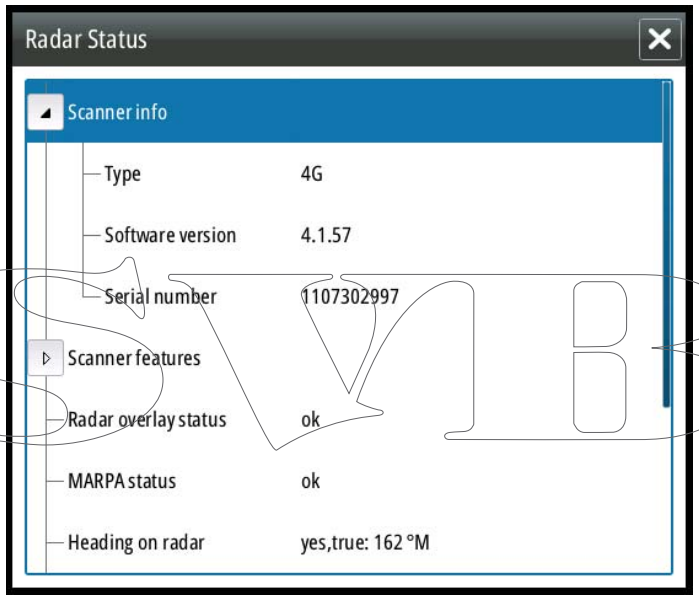
Setup and configuration of the Broadband radar has been simplified compared to traditional pulse radars. There is no zero range (time delay), no warm up time, and no burn-in required..

Radar source

In a system with more than one radar, the correct device to configure can be selected from this menu.

→ ***Note:*** some radar like the broadband 4G support dual radar mode, and therefore are represented twice in the source list, with an A and B suffix.

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 website for the latest version; www.simrad-yachting.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

The first generation NSS only supports one radar on the network. Should a radar be connected, that has been connected to a dual radar network in the past, it may not be detected by the NSS because it may 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 NSS with NSO evo2.

Adjust bearing alignment

This is to align with 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.

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 harbour 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 in the Radar installation menu.

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:

- Set Radar range to between 1/2 nm to 1 nm and Sidelobe Suppression to Auto.
- 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.
- Traverse the area until the strongest sidelobe returns are seen.
- 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.
- Traverse the area again and readjust if sidelobes returns still occur.
- Exit the installation menu.

Restore radar to Factory Default

This can be used to revert all user adjustments.

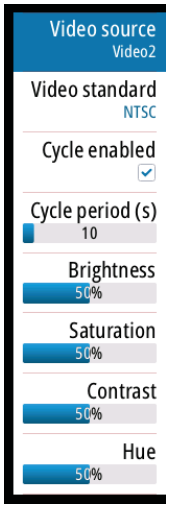
Video In configuration

Press the menu key when on the video page or panel to open the setup dialogue.

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

You can optimize the video display by adjusting the video image settings (brightness, saturation, etc.). The settings are applied individually for each video source.

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 rearview mirror, ie, on the same side as they actually are.



SAMPLE

Autopilot setup

Verifying the autopilot connection

When an AC12N, AC42N, or SG05 is connected to the NSO evo2 system, the NSO evo2 should automatically detect the autopilot and an Autopilot menu icon will be included in the 'Settings' menu.

If no 'Autopilot' icon is available in the menu, see "Source selection" on page 20 to manually enable communication.

If after successful communication, the AC12N, AC42N or SG05 is turned off independantly of the display, the 'Autopilot' menu icon will remain available, but limited menu items will be available.

Commissioning the autopilot

When installation of a new autopilot is completed, the commissioning procedures must be performed. Failure in setting up the autopilot correctly may prohibit the autopilot from functioning properly.

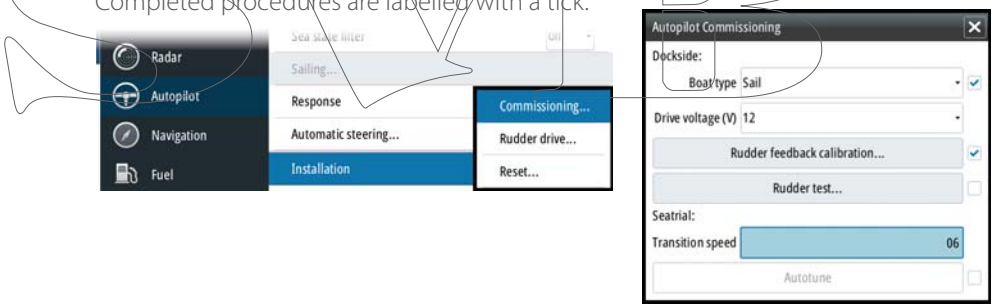
If an NSO evo2 is added to an existing, already commissioned autopilot system, it is only required to do an automatic source selection before the autopilot is ready to be used.

The setup of the autopilot computers (AC12N/42N) can be done in full from compatible Simrad displays that feature a STDBY/AUTO key, an IS40 Display, or from an AP24/AP28 control head. An NSO system with touchscreen control, and/or keyboard and mouse, will require a dedicated physical keypad for commissioning - the OP40 and OP10 are ideally suited to this. Once commissioned, regular operation of the autopilot is possible via solely the touch interface, however a physical keypad as backup is always recommended.

The following sections describe how you configure the autopilot from the NSO evo2.

Dockside setup

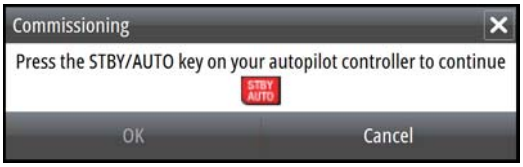
Initiating the required dockside setup is done from within the Commissioning dialog. Completed procedures are labelled with a tick.



When the autopilot computer is delivered from factory AND ANY TIME AFTER AN AUTOPILOT RESET HAS BEEN PERFORMED, you will have to run a complete setup again.

All steps in all commissioning procedures are clearly described on-screen, and you will be guided step by step through the process.

1. Ensure that the autopilot is in standby mode before starting (only relevant if previously commissioned).
2. Select the Commissioning option and follow on screen instructions when the following prompt is displayed;



3. Select the boat type
   - The boat type setting is used by the system to select appropriate preset steering parameters. It will also affect available autopilot features.
4. Perform the rudder calibration
   - Used if you have a rudder feedback unit installed. This calibration is used to ensure that the physical rudder movement corresponds to the rudder angle displayed on the NSO evo2 unit.

VRF (Virtual Rudder Feedback) calibration

- The Virtual Feedback option enables your autopilot to steer without a conventional rudder feedback unit. This function is designed for vessels up to 40 ft. powered by outboard or stern drives only.
- The Virtual Feedback option will only be available when there is no feedback unit connected at first time turn on, or at turn on after an autopilot reset.

➔ ***Note:*** Installing a feedback unit will enhance the performance of the autopilot and provide an accurate rudder angle indicator on the autopilot display. Unless impractical or impossible, a rudder feedback unit should be installed.

5. Set the drive voltage
   - Refer to the drive unit table in the AC12N/AC42N Installation manual or to your drive unit documentation for information.
6. Run the rudder test as described in the on-screen instructions

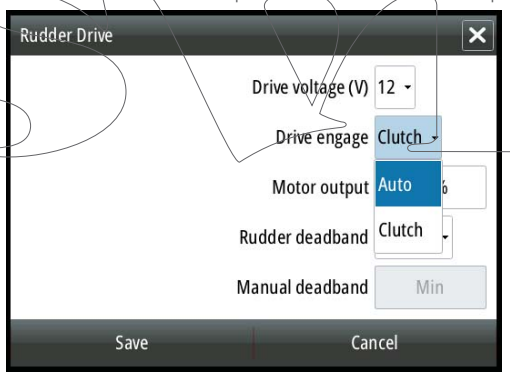
➔ ***Note:*** If the boat uses power assisted steering, it is important that the engine or electric motor used to enable the power assist steering is turned on prior to this test.

Stand CLEAR of the wheel and do not attempt to take manual control of the wheel during this test!

- When this test is started the autopilot computer will issue a series of PORT and STBD rudder commands and automatically verify correct rudder direction. It detects minimum power to drive the rudder and reduces the rudder angle if boat turning exceeds the maximum preferred speed (8°/sec.) for autopilot operation. The system will also detect whether the drive unit is a reversible motor or if a solenoid valve is operated.

Rudder drive setup

The rudder drive setup controls how the autopilot computer controls the steering system.



Drive voltage

Voltage specified for your drive unit.

The Drive unit voltage setting does not apply when the system operates solenoids on a continuous running pump/steering gear. Hence, the output voltage to the solenoids will be the same as the input voltage.

Refer to the drive unit table in the AC12N/AC42N Installation manual or to your drive unit documentation for information.

⚠ **Warning:** Selection of improper voltage level for your drive unit may damage both the drive unit and the AC12N/AC42N even if the protection circuits are activated.

Drive engage

Clutch	This is the default setting and it allows you to steer the boat with the helm or wheel when in STBY mode (FU and NFU modes) as well as in all auto steering modes
Auto	This option is typically used to switch between two rudder speeds on a continuous running pump, used when different rudder speeds are required for automatic and Follow-up/Non-Follow-up steering

Motor output

Shows the amount of power needed to achieve the correct rudder speed. The reading is obtained from the Rudder test.

The automatically set value may be increased or decreased.

Rudder deadband

This parameter is used to prevent the rudder from hunting. The reading is obtained from the Rudder test which optimizes the deadband to the speed of the boat and the pressure on the rudder.

If the auto-setting does not perform properly due to high inertia from the wheel or a loose steering gear, it can be adjusted manually. Find the lowest possible value that will prevent the rudder from continuous hunting. A wide deadband will cause inaccurate steering.

→ ***Note:*** The rudder deadband setting is not available when the autopilot is configured for Virtual Rudder Feedback.

Seatrials

A seatrial can only be performed if the dockside settings are completed and confirmed. The seatrial must always be performed in open waters at a safe distance from other traffic.

→ ***Note:*** You can switch the autopilot to standby mode and take manual control of the boat at any time during the seatrial by pressing the 'STBY/AUTO' key.

The following seatrial calibration should be done:

- Compass calibration; used to automatically compensate for on-board magnetic interference
- Compass offset adjustment, used to compensate for a fixed offset in the final heading readout
- Wind vane offset to compensate for a wind vane that is not mounted facing in exactly the same direction as the bow of the vessel (dead ahead)
- Boat speed calibration
- Transition HI/LO speed setting (the speed at which you want to change the set of steering parameters)
- Automatic tuning of the steering parameters
- Setting the seastate filter
- 'Saiboat Setup' menu items

Compass calibration

Before the compass calibration is started, make sure that there is enough open water around the vessel to make a full turn.

The calibration should be done in calm sea conditions and with minimal wind to obtain good results. Follow the on-screen instruction, and use about 60-90 seconds to make a full circle.

During the calibration, the compass will measure the magnitude and direction of the local magnetic field.

- If the local magnetic field is stronger than the earth's magnetic field (the local field is reading more than 100 %), the compass calibration will fail.
- If the local field is reading more than 30 %, you should look for any interfering magnetic objects and remove them, or you should move the compass to a different location. The (local) field angle will guide you to the local interfering magnetic object.

→ ***Note:*** Calibration must be made on the compass that is active for the autopilot. If the compass is not possible to initiate calibration from the device list on the NSO evo2, refer to the

compass' own instructions regarding calibration.

➔ ***Note:*** In certain areas and at high latitudes the local magnetic interference becomes more significant and heading errors exceeding ±3° may have to be accepted.

Compass mounting offset

After compass calibration, the difference (if any) between the compass lubber line and the boat's center line should be compensated for.

1. Find the bearing from the boat position to a visible object. Use a chart or a chart plotter
2. Steer the boat so that the center line of the boat is aligned with the bearing line pointing towards the object
2. Change the offset parameter so that the bearing to the object and the compass readout becomes equal.

➔ ***Note:*** Make sure that both the compass heading and the bearing to the object have the same unit (°M or °T).

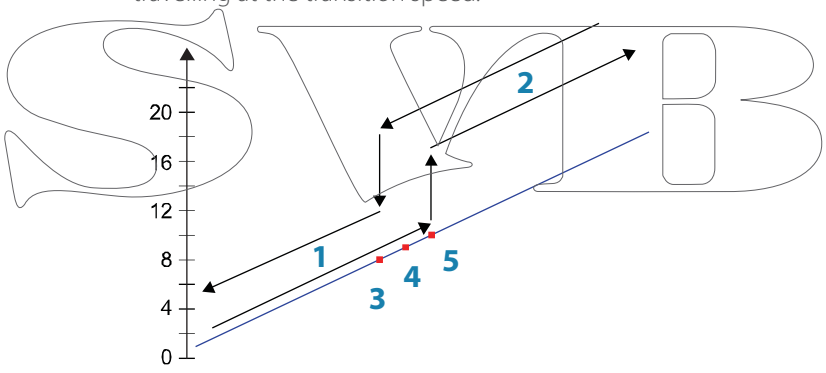
Setting the Transition speed (HI/LO)

This is the speed at which the system automatically changes from LO to HI steering parameters.

On power boats it is recommended that you set a value that represents the speed where the hull begins to plane or the speed where you change from slow to cruising speed.

On sailboats the transition speed should be set to around 3-4 knots to give the best response in a tack.

A deadband of 2 knots is incorporated to prevent oscillation of HI/LO settings when vessel is travelling at the transition speed.



1 HI response

2 LO response

3 Transition to HI parameters with decreasing speed: 8kn

4 Transition speed set to 9kn

5 Transition to LO parameters with increasing speed: 10kn

Active response parameter set is shown in the autopilot popup, and the following abbreviations are used:

HI-A	High response parameters set automatically
LO-A	Low response parameters set automatically
HI-M	High response parameters set manually
LO-M	Low response parameter set manually

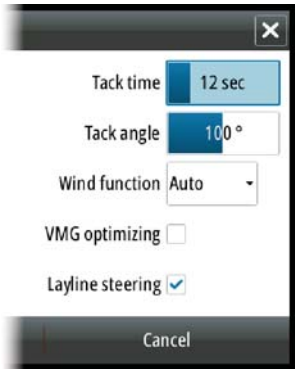
Autotuning

The autotune feature will run the boat through several tests and then automatically set the most important steering parameters. Autotune is not required for the autopilot to function, as it is preset with steering parameters that should steer most boats in the 30-50 foot range. You can manually adjust all parameters that are set during autotuning.

Seastate filter

The Seastate filter is used to reduce rudder activity and autopilot sensitivity in rough weather.

OFF	Seastate filter is disabled. This is default
AUTO	Reduces rudder activity and autopilot sensitivity in rough weather by an adaptive process. The AUTO setting is recommended if you want to use the seastate filter
MANUAL	Linked to the steering response control settings described previously. It may be used to manually find the optimum combination of course keeping and low rudder activity in rough but steady sea conditions



Setting sailing parameters

➔ ***Note:*** Sailing parameter settings are only available if the boat type is set to Sail.

Tack time

When performing a tack in WIND mode, the rate of turn (tack time) can be adjusted. This will give single-handed sailors time to handle the boat and the sails during a tack.

A turn performed without shifting wind side, will also be made at a controlled turn rate.

Range	Change per step	Default	Units
2 - 50	1	12	seconds

Tack angle

This value is used to preset the course change used when tacking in AUTO mode. By pressing the left/right arrow keys the course will change as much as this value.

Range	Change per step	Default	Units
50 - 150	1	100	°

Wind function

With wind function set to Auto, the autopilot will automatically select between apparent and true wind steering. Auto is default and recommended for cruising.

When the boat is running or on a broad reach, there is a heightened chance it will surf on the waves. This may lead to significant changes in boat speed, and thereby changes in apparent wind angle. True wind steering is therefore used to prevent undesired corrections by the autopilot when heading downwind (or close to), while steering to apparent wind is used when beating or reaching.

Apparent wind steering is preferred when you want to maintain maximum boat speed without continuous trimming of the sails.

VMG optimizing

You can optimize the VMG to wind. When selected the function will be active for 5–10 minutes after a new wind angle has been set and only when beating.

Layline steering

Layline steering is useful when navigating. Cross Track Error (XTE) from the navigator will keep the boat on the track line. If the XTE from the navigator exceeds 0.15 nm, the autopilot will calculate the layline and track towards the waypoint.

Automatic steering: manual parameter adjustment

The autotune function in the autopilot is so refined that the majority of boats will need no further adjustments of the steering parameters. On some boats however, or in particular sea conditions, fine tuning of the steering parameters may improve the performance of the autopilot.

Transition speed

Refer previous description.

Rudder

This parameter determines the ratio between commanded rudder and the heading error. The

higher rudder value the more rudder is applied.

If the value is too small it will take a long time to compensate for a heading error, and the autopilot will fail to keep a steady course.

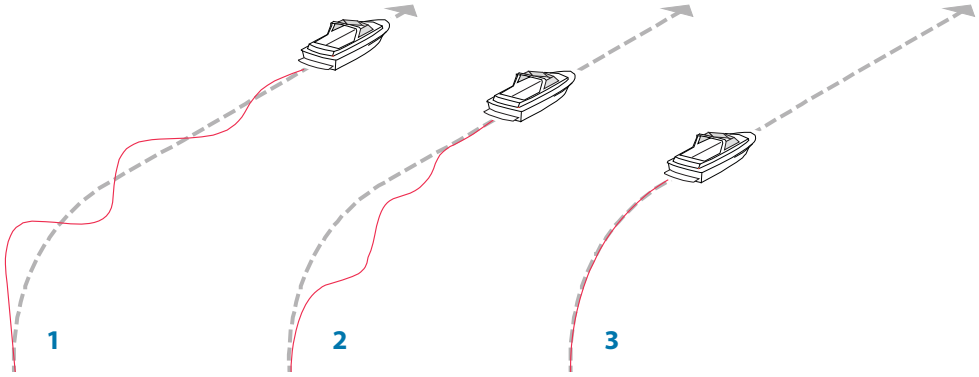
If the value is set too high the overshoot will increase and the steering will be unstable.

Counter rudder

Counter rudder is the amount of rudder used to try to prevent the boat from yawing around the set course. Higher counter rudder settings result in more rudder being applied.

The best way of checking the value of the Counter rudder setting is when making turns.

The figures illustrate the effects of various Counter Rudder settings;



1 **Counter rudder too low; overshoot response**

2 **Counter rudder too high; sluggish and creeping response**

3 **Correct setting or counter rudder; ideal response**

SVIB

Auto trim

This parameter defines how fast the autopilot shall correspond after having registered a heading error.

The standard value is 40 seconds which should work well on most boats. Rule of thumb: Set to same value (seconds) as the boat's length in feet. On boats operating on VRF the value should be set to 20 seconds.

Rate limit

Sets the maximum allowed rate of turn.

The value should be kept at 6.0°/second unless there is a need for more rapid response in turns.

Minimum rudder

This parameter filters small rudder commands to prevent high rudder activity.

Some boats may have a tendency to not respond to small rudder commands around the "course keeping" position because of a small rudder, a rudder deadband, whirls/disturbance of the water-stream passing the rudder or it is a single nozzle water jet boat.

By increasing the Minimum rudder parameter you may improve the course keeping performance on some boats. This will however increase the rudder activity.

Minimum wind angle to port and starboard

These parameters should be set identical to the minimum apparent wind angle that will keep the sails from stalling and maintain boat speed. The parameters will vary from boat to boat.

The settings are used for the tack-prevent function. They also apply when the autopilot is operating in WindNAV mode.

You can select different minimum wind angles for port and starboard. The difference between port and starboard will be taken into account when calculating the Distance To Turn (DTT).

Navigation change limit

This parameter defines the maximum course change that the autopilot is allowed to make

when the NSO evo2 is following a route (NAV steering).

If the required course change to the next waypoint in a route is more than the set limit, you are prompted and must acknowledge the course change before the autopilot will turn the vessel.

Fuel

Fuel setup

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

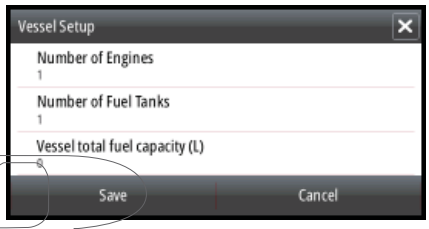
To use the utility, a Navico Fuel Flow sensor, or a NMEA 2000 engine adaptor cable/gateway with Navico Fuel Data Storage device must be fitted to the vessel. Neither the Navico Fuel Flow sensor, nor the Suzuki engine interface require the use of a seperate Fuel Storage device. Refer to the engine manufacturer 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 physical connection is made, ensure source selection is completed. Multiple engine installations using Fuel Flow sensors, or Fuel Data Storage devices, will require setup of related engine location in the device list. For general source selection information refer to "Source selection" on page 20.

→ ***note:*** Multiple engines utilising a single gateway will not work with the Navico Fuel Storage device.

Vessel setup

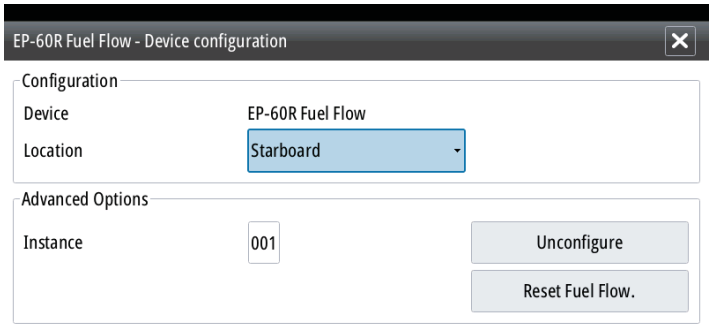
This dialog must be used to select the number of engines, the number of tanks and vessel's total fuel capacity across all tanks.



Network

Fuel flow configuration

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

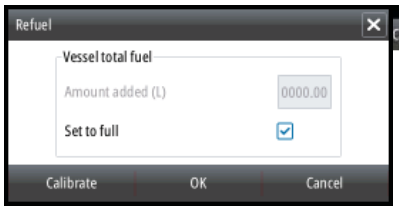


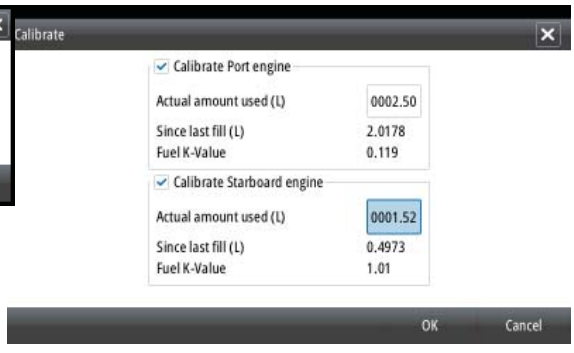
'Unconfigure' is for defaulting the device clearing all user settings, and 'Reset Fuel Flow' will restore only the 'Fuel K-Value' setting, if set in 'Calibrate'. Only Navico devices can be reset.

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 litres (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 tank.
5. Select OK to save settings. The 'Fuel K-Value' should now show a new value.

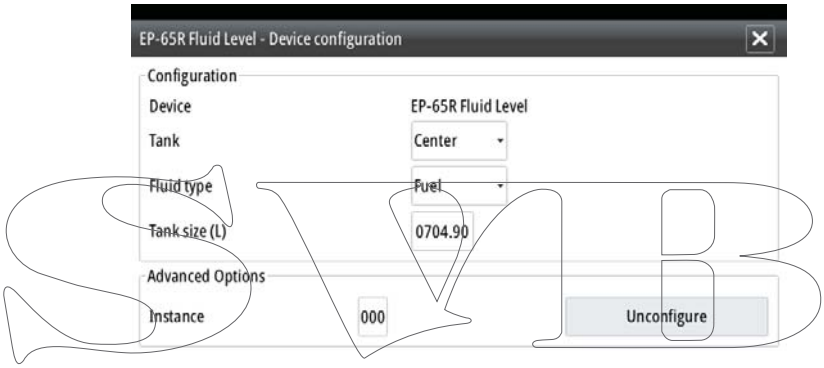
➔ ***Note:*** To calibrate multiple engines repeat the steps above, one engine at a time. Alternatively, run all engines simultaneously, and divide the 'Actual amount used' by the number of engines. This assumes reasonably even fuel consumption on all engines.

➔ ***Note:*** 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 equiped tank. The number of tanks must be set in 'Vessel Configuration' to allow discrete tank assignment of the Fluid Level devices. Under 'Device list' on the Network page, view the 'Device Configuration' page for each sensor, and set Tank location, Fluid type, and Tank size.



Refer to the Operator manual on setting up the Instrument bar or a gauge on the Instruments page using the Fluid Level device data.

➔ ***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 via the NSO evo2 displays.

CZone setup

In order to communicate with the CZone modules connected to the network, the NSO evo2 must be assigned a unique CZone Display Dipswitch setting.

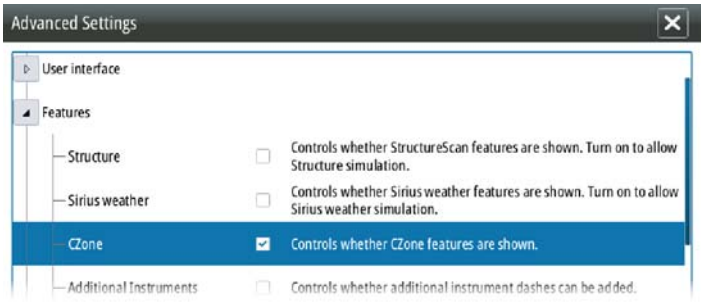
The functionality of the CZone system is determined by the CZone Config File (.zcf), which is stored on all CZone modules and supported Simrad displays, such as the NSO evo2. The file is created using the CZone Configuration Tool, a specialised PC application available from BEP Marine Ltd, and associated CZone distributors.

The NSO evo2 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.

System

Enabling CZone functionality

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



Once CZone is enabled, a CZone icon appears in the Settings menu.

CZone

Assigning the dipswitch setting

Every Simrad 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 config 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 config is already available on the network, it will immediately commence uploading to the NSO evo2 once the dipswitch is set. Allow this to complete, without interruption.

Setting CZone to display at startup

With this option selected, the CZone control page will be shown first, every time the NSO evo2 is powered up.

CZone backlight control

Enabling this will cause the NSO evo2 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 NSO evo2 set as a controller.

Import and backup a config file

The files page may be used to import CZone config files, or export a copy to a Micro SD card. Importing will overwrite the existing file on the NSO evo2 and all connected CZone devices.

For further information see "Backing up and Importing user data" on page 39

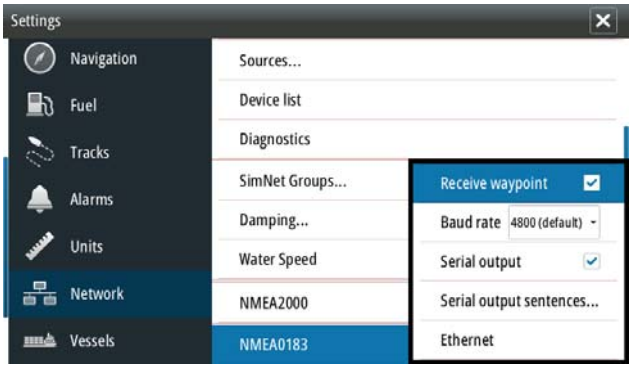
Upgrading module firmware

The files page also allows the loading of CZone module firmware updates. For further information refer to "NMEA 2000 and Ethernet device upgrades" on page 39

Network

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 the NSO evo2.

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.

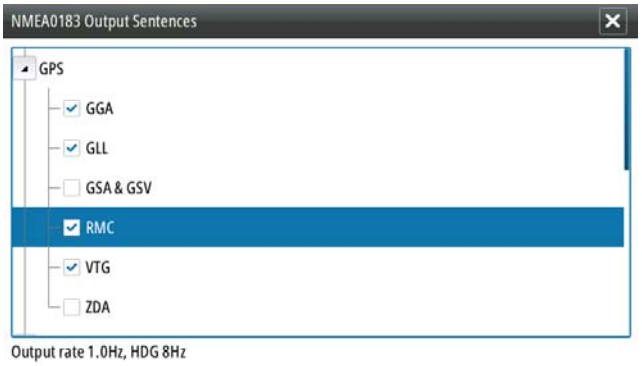
➔ ***Note:*** AIS transponders typically operate at NMEA 0183-HS (high speed), and will require the baud rate to be set to 38,400.

Serial Output

Selection will determine 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 transmit 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 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 WiFi1 wireless adaptor.

The ethernet dialogue provides IP and port data typically required for configuring the application on the third party device.

➔ ***Note:*** Other MFDs can't 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 NEP-2 connected between an NSO evo2 and another network module (e.g. BSM-1) 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' 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 Simrad display 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, and altering global settings all affect databases. When the tick box 'Dirty' is ticked, the unit has identified that its database is older than that of another device on the network. The tickbox 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 have the power cycled.

If any database wont synchronise, it may be necessary to use the Restore Defaults option found under the System menu. Backup any user settings if required - see "Backing up and Importing user data" on page 39. The Restore Defaults operation should be done one device at a time, with all other devices powered off. Once a device is defaulted, it should be turned off until all other devices have also been defaulted.

IP addresses

The lower table shows the IP address of the display being viewed (top of list), the Master display (with a tick next to it), and any other displays in a multi display network. The function of the Master is invisible to the end user - It manages database synchronisation, 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 dependant 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 acheived by loading the latest software on to your display - refer to "Software updates and data backup" on page 39.

Module network light

The network LED on modules such as NEP-2, BSM-1, and RI10, 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.

Network

FLIR® camera setup

The FLIR M-series cameras are plug and play when used in conjuction with the WiFi-1 acting as a DHCP host. For setup on networks not utilizing a DHCP host, refer to the Simrad website www.simrad-yachting.com or contact Simrad technical support.

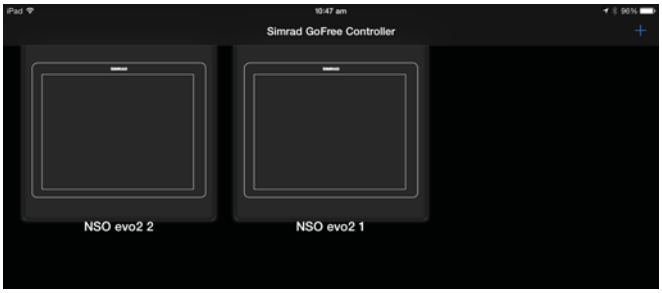
Wifi setup

The NSO evo2 can be veiwed and controlled via an Android or Apple tablet, using the WiFi1 module and GoFree application. Various 3rd party applications can also use the data stream.

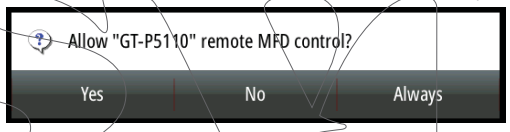
The GoFree application should be downloaded from Android Play Store, or Apple Store.

Navigate to the wifi network connection page on the tablet, and find the 'GoFree Wifi xxxx' network. If more than one is in range, check which unit is wired to your network by viewing the 'Access Points' page on the NSO evo2. Connect to the network using the eight character password printed on the silver label of the GoFree module, which is also available on the 'Access Points' page.

Open the application, the NSO evo2 should be automatically detected. If the NSO evo2 does not appear, follow on screen instructions. Select graphic icon of display to view - both video outputs on the NSO evo2 should be available for selection.



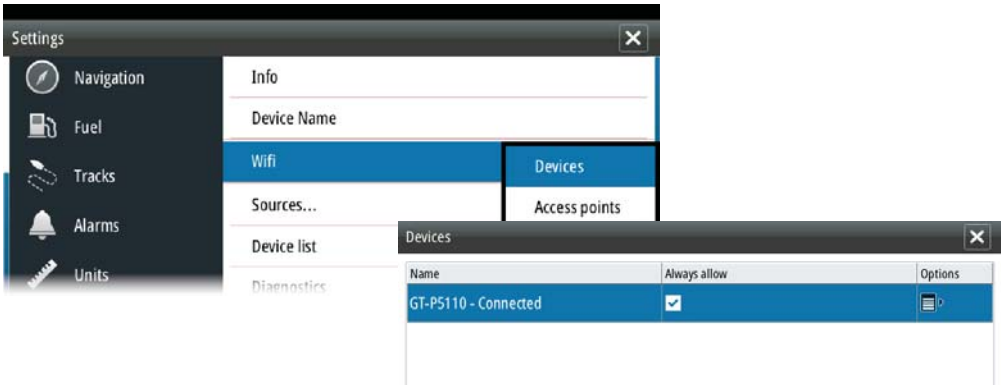
The NSO evo2 to which connection is attempted will raise a prompt.



Select 'Yes' for one-time connection, or 'Always' if device is to be remembered for regular connection.

Devices

When a wifi device is connected, it should appear in the wifi devices list. Selecting 'Always allow' will mean the device can automatically connect without needing a password each time. This menu also allows disconnection of devices that no longer require access.

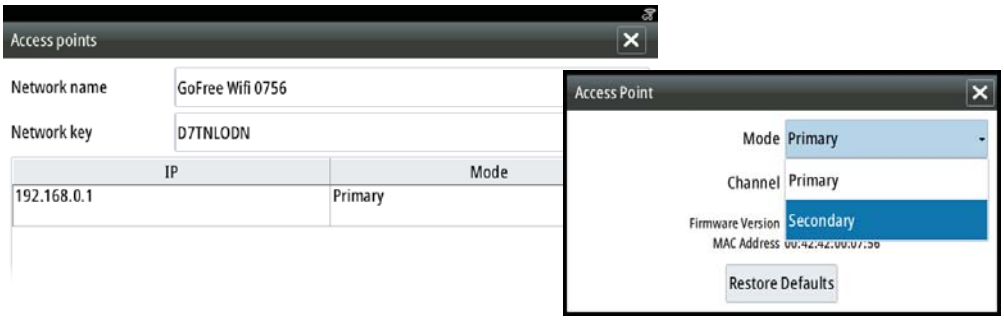


Access Points

This page shows connected GoFree devices, their IP address, and mode.

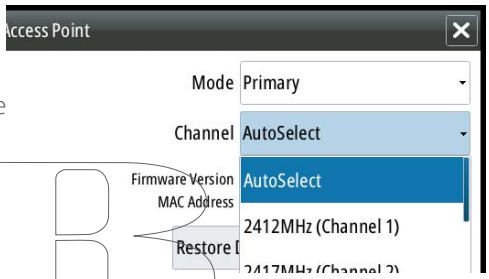
Mode

When more than one Wifi-1 device is connected (ie on large installations), only one may operate as 'Primary'. Primary mode determines that the device is acting as DHCP server - only one DHCP server may exist on a network at a time.



To set a device as secondary, the NSO evo2 must initially be connected to only one GoFree module. Pressing 'menu' with the device highlighted, opens the dialogue that allows setting to secondary. Once completed, a second module may be plugged in, and will automatically default to primary.

➔ ***Note:*** Use of multiple devices is solely for range extension purposes, and is usually only required on larger vessels.



Channel

Channel setting is available in order to overcome potential interference to the GoFree device by another RF device transmitting in the same frequency band.

Advanced

Tools are available within the NSO evo2 software to assist in fault-finding and setting up the wifi network.

Iperf

Iperf is a commonly used network performance tool. It's provided for testing Wifi network performance around the vessel so weak spots or problem areas can be identified. The application must be installed on and run from the tablet device. The Zeus² must be running Iperf server before initiating the test from the tablet. On exiting the page, Iperf will automatically stop running.

DHCP Probe

The GoFree Wifi module contains a DHCP server that will allocate IP addresses for all the MFDs, radars and sonars 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 Zeus².

Only one DHCP device may be operational on the same network at a time. If a second device is found, turn off it's 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 can not provide support related to their use.

Software updates and data backup

From time to time Simrad releases software updates to its 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 Simrad website: http://www.simrad-yachting.com/Downloads/Software-Updates/

The NSO evo2 may be used to apply software updates to itself, and to supported NMEA 2000 and ethernet devices, with files read off an SD card.

Before initiating an update to the NSO evo2 itself, be sure to back up any potentially valuable user data.

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 Tracks database'
- 'Settings database' (includes preferences such as unit settings, custom new pages, and Czone configuration files)

The backup procedure is similar for both - simply select which you want to backup and select the destination to save to, e.g. on the unit, or to an SD card.

The user has the option of exporting all waypoints, or exporting only waypoints contained within a specific region.

Waypoint backup offers different file formats to save as:

- User data file version 5: Use with current Navico MFDs (NSO evo2, NSS evo2, NSS, NSO, NSE, Zeus, Zeus Touch, HDS Gen2, HDS Gen2 Touch). Offers most detail
- User data file version 4: Use with current Navico MFDs (NSO evo2, NSS evo2, NSS, NSO, NSE, Zeus, Zeus Touch, HDS Gen2, HDS Gen2 Touch).
- User data file version 3 (with depth): Use with legacy Lowrance GPS chartplotters
- User data file version 2 (no depth): Use with legacy Lowrance GPS chartplotters
- GPX (GPS Exchange): Use with some other manufacturers' GPS products, and PC applications
- Northstar .dat (no Tracks): Use with legacy Northstar chartplotters

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.

Later, if the NSO evo2 is defaulted or user data is accidentally deleted, simply return to the files page, highlight the backed up file, and select 'Import'. View file details for creation date.

NS0 evo2 software upgrades

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

In the files menu, locate the update file on the SD card and select 'Upgrade'. Accept the prompt to reboot the unit, and wait a few moments as the unit restarts. Do not remove the SD card or repower the NS0 evo2 until the process is completed (this will typically take no more than a couple of minutes). Update may also be initiated at boot up - simply insert the SD card, before turning unit on, boot unit and follow on-screen instructions.

NMEA 2000 and Ethernet device upgrades

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

To update NMEA 2000 and ethernet devices 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. Select device and initiate upgrade. Do not interrupt the upgrade process.

→ ***note:*** If no device is shown, check device to be updated has power, and run any outstanding updates for the display first.

5 Accessories

Processor accessories

Part Number	Description
000-11245-001	flush mount chart card reader
000-11246-001	Ethernet adaptor cable, yellow 5 Pin - RJ45
000-11247-001	Serial cable NMEA0183 8-way 2m
000-11584-001	Serial cable NMEA0183 8-way 10m
000-11248-001	HDMI cable 3m
000-11249-001	HDMI cable 10m

NMEA 2000 compliant data cables

Part Number	Description
000-0124-69	**Micro-C starter kit:** 120 ohm female terminator cap 120 ohm male terminator cap Micro-C T-piece connector Micro-C 2' (0.61M) extension cable Micro-C 15' (4.55M) extension cable Mirco-C power cable
000-10996-001	Micro-C 4-way T-piece connector
000-0127-52	Micro-C Terminator kit (male and female caps)
000-0119-79	Micro-C T-piece connector
000-0119-75	Mirco-C power cable
000-0119-88	Micro-C 2' (0.61M) extension cable
000-0127-53	Micro-C 6' (1.82M) extension cable
000-0119-86	Micro-C 15' (4.55M) extension cable
000-0119-83	Micro-C 25' (7.58M) extension cable
000-0127-45	**SimNet - Micro-C adaptor kit:** Simnet cable joiner SimNet to Micro–C male plug, 0.5m (cable for connection of a SimNet device to a Micro-C backbone) Micro-C T-piece connector
24005729	SimNet to Micro–C male plug, 0.5m (cable for connection of a SimNet device to a Micro-C backbone)
24006199	SimNet to Micro-C female plug, 1m (cable for connection of a NMEA 2000 data device to SimNet backbone)
24006413	SimNet to Micro-C female, 4m (13 ft) (cable for connection of a NMEA 2000 data device to SimNet backbone)

Ethernet cables

Part Number	Description
000-0127-51	Ethernet cable yellow 5 Pin 2 m (6.5 ft)
000-0127-29	Ethernet cable yellow 5 Pin 4.5 m (15 ft)
000-0127-30	Ethernet cable yellow 5 Pin 7.7 m (25 ft)
000-0127-37	Ethernet cable yellow 5 Pin 15.2 m (50 ft)

6 Supported data

NMEA 2000 compliant PGN List

NMEA 2000 PGN (receive)

59392	ISO Acknowledgement
59904	ISO Request
60928	ISO Address Claim
61184	Parameter Request/Command
65285	Temperature with Instance
65289	Trim Tab Insect Configuration
65291	Backlight Control
65292	Clear Fluid Level Warnings
65293	LGC-2000 Configuration
65323	Data User Group Request
65325	Reprogram Status
65341	Autopilot Mode
65480	Autopilot Mode
126208	ISO Command Group Function
126992	System Time
126996	Product Info
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
127504	AC Output Status
127505	Fluid Level
127506	DC Detailed Status
127507	Charger Status
127508	Battery Status
127509	Inverter Status
128259	Speed, Water referenced
128267	Water Depth
128275	DistanceLog
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
129283	Cross Track Error
129284	Navigation Data
129539	GNSS DOPs

SMB

129540	GNSS Sats in View
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 "CS" Static Data Report, Part A
129810	AIS Class B "CS" Static Data Report, Part B
130074	Route and WP Service - WP List - WP Name & Position
130306	Wind Data
130310	Environmental Parameters
130311	Environmental Parameters
130312	Temperature
130313	Humidity
130314	Actual Pressure
130576	Small Craft Status
130577	Direction Data
130840	Data User Group Configuration
130842	SimNet DSC Message
130845	Parameter Handle
130850	Event Command
130851	Event Reply
130817	Product Info
130820	Reprogram Status
130831	Suzuki Engine and Storage Device Config
130832	Fuel Used - High Reolution
130834	Engine and Tank Configuration
130835	SetEngineAndTankConfiguration
130838	Fluid Level Warning
130839	Pressure Insect Configuration
130843	Sonar Status, Frequency and DSP Voltage

SAMPLE

NMEA 2000 PGN (transmit)

61184	Parameter Request/Command
65287	Configure Temperature Insects
65289	Trim Tab Insect Calibration
65290	Paddle Wheel Speed Configuration
65291	Backlight Control
65292	Clear Fluid Level Warnings
65293	LGC-2000 Configuration
126208	ISO Command Group Function
126992	System Time
126996	Product Info
127237	Heading/Track Control
127250	Vessel Heading
127258	Magnetic Variation
128259	Speed, Water referenced
128267	Water Depth
128275	DistanceLog
129025	Position, Rapid Update
129026	COG & SOG, Rapid Update
129029	GNSS Position Data
129283	Cross Track Error
129284	Navigation Data
129285	Route/Waypoint Data
129539	GNSS DOPs
129540	GNSS Sats in View
130074	Route and WP Service - WP List - WP Name & Position
130306	Wind Data
130310	Environmental Parameters
130311	Environmental Parameters
130312	Temperature
130577	Direction Data
130840	Data User Group Configuration
130845	Parameter Handle
130850	Event Command
130818	Reprogram Data
130819	Request Reprogram
130828	Set Serial Number
130831	Suzuki Engine and Storage Device Config
130835	SetEngineAndTankConfiguration
130836	Fluid Level Insect Configuration
130837	Fuel Flow Turbine Configuration
130839	Pressure Insect Configuration
130845	Weather and Fish Prediction and Barometric Pressure History
130850	Evinrude Engine Warnings

SNR

NMEA 0183 supported sentences

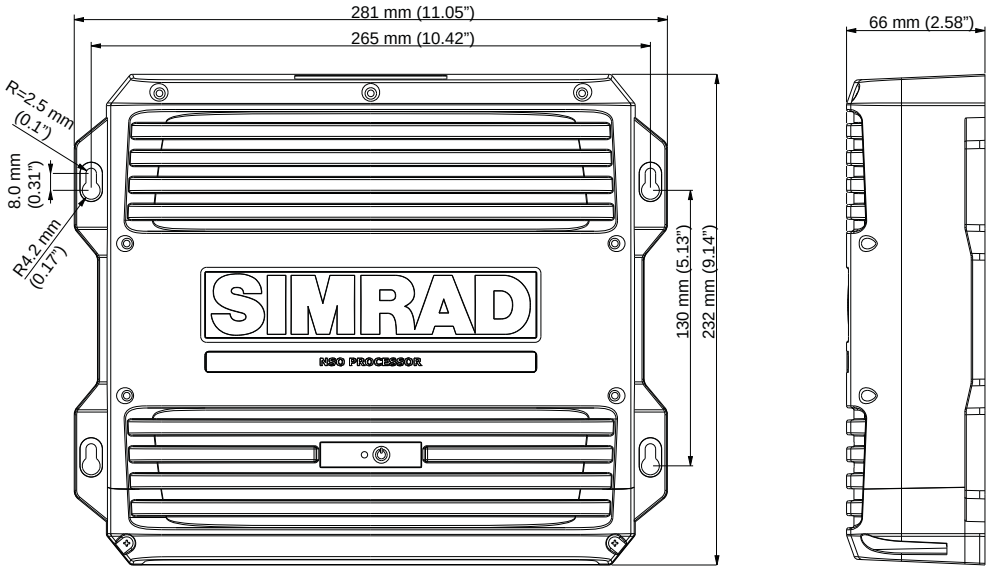
TX / RX	GPS								
Receive	GGA	GLL	GSA	GSV	VTG	ZDA			
Transmit	GGA	GLL	GSA	GSV	VTG	ZDA	GLC		
	Navigation								
Receive	RMC								
Transmit	AAM	APB	BOD	BWC	BWR	RMC	RMB	XTE	XDR
	Echo								
Receive	DBT	DPT	MTW	VLW	VHW				
Transmit	DBT	DPT	MTW	VLW	VHW				
	Compass								
Receive	HDG	HDT	HDM						
Transmit	HDG								
	Wind								
Receive	MWV	MWD							
Transmit	MWV	MWD							
	AIS / DSC								
Receive	DSC	DSE	VDM	AIS sentences are not bridged to or from NMEA 2000.					
	MARPA								
Transmit	TLL	TTM	These are only output sentences						

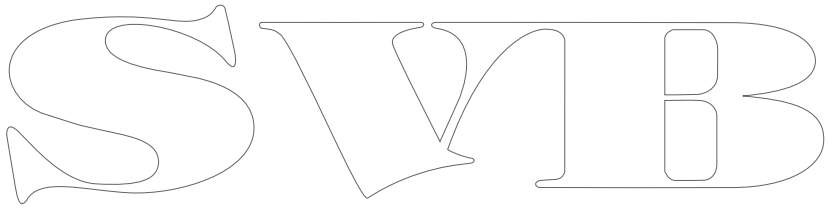
7 Specifications

Mechanical/Environmental	
Casing	ABS plastic
Operating temp	-15°C to +55°C
Water ingress	IPx2
Weight - processor unit only	1060 grams
Dimensions (overall)	281 mm (W) x 232 mm (H) x 65.5 mm (D)
Electrical	
Operating voltage	9 - 31.2 V DC
Power consumption	45 W max, 1 W off (power connected to +ve supply)
Low power standby mode	yes
Protection	reverse polarity and temporary over-voltage to 36V
Alarm output current	1 A
Processors	iMX61 quad core (x2)
RAM	DDR3 1GB
Storage	4 - 8GB Flash
Conformity	CE, C-Tick, HDMI
Interfaces	
Ethernet	3 ports total - 1 & 2 are PoE (RJ45 socket)
NMEA 2000 (compliant)	1 port on rear (Micro-C male, LEN = 1)
Video input	2 ports on rear (BNC female. NTCS or PAL format)
Video output (60Hz nominal)	800x600 (SVGA 4:3) 1024x768 (XGA 4:3) 1280x720 (HD 16:9) 1366x768 (WXGA) 1920x1080 (Full HD 16:9) 1920x1200 (WUXGA 16:10) 1280x800 (16:10) 1280x1024 (SXGA 5:4)
USB	mass storage (Type A socket)
SD	32GB (Full size SD card socket)
NMEA 0183 port baud rate	4800, 9600, 19200, & 38400 (via proprietary cable)
RS422 port baud rate	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200
Charting support	Embedded low detail backround + Insight, Navionics and CMap on SD card

SVB

8 Dimensioned drawings

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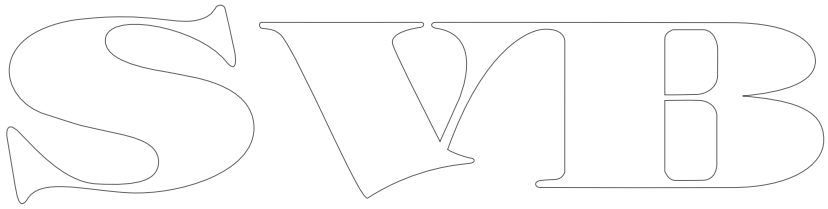
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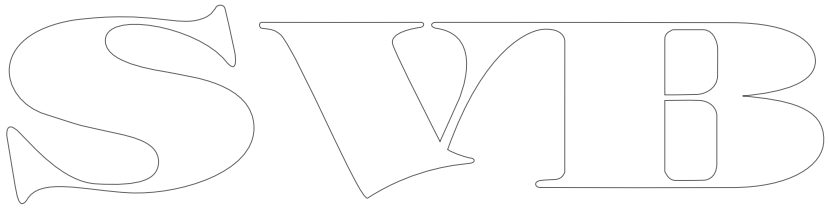
SVB

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CE