

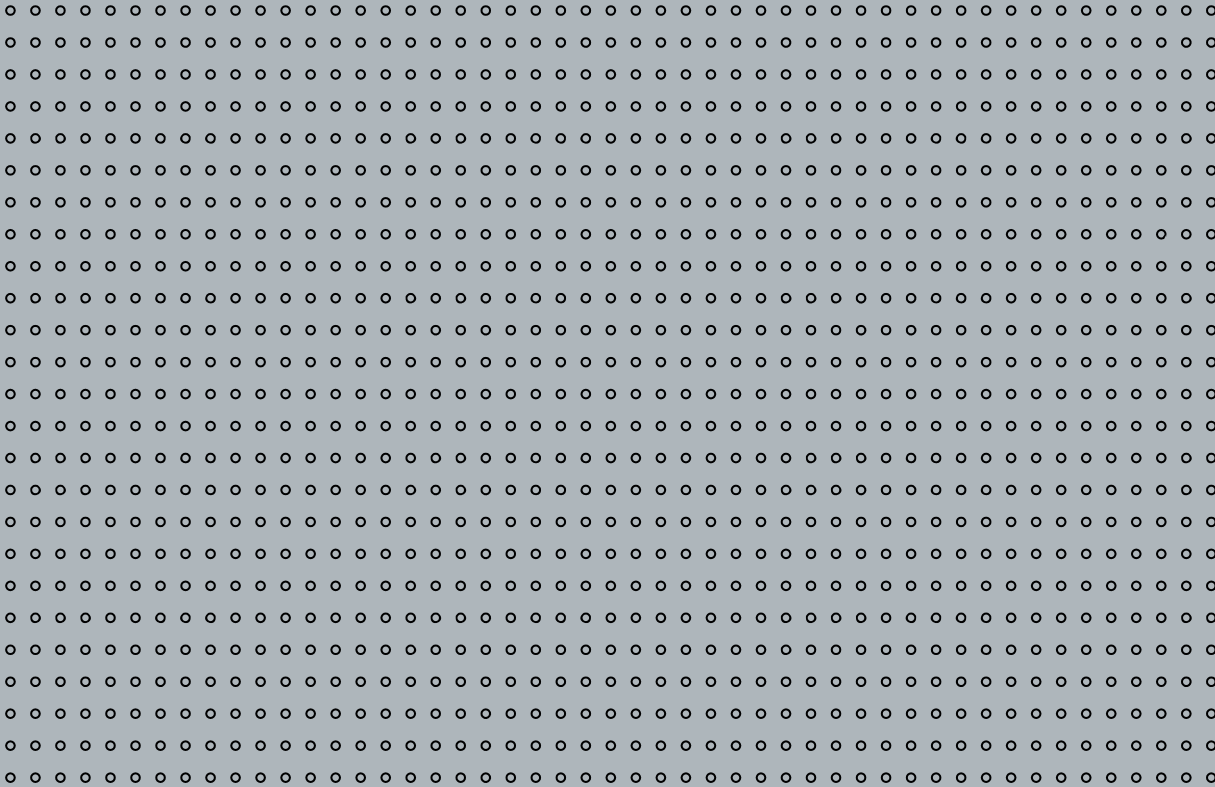


Master the Elements

# Installation Manual

Simrad NSO  
Multi-Function Display

English



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## Preface

### *Disclaimer*

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

It is the owner's sole responsibility to install and use the 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.

NAVICO HOLDING AS AND ITS SUBSIDIARIES, BRANCHES AND AFFILIATES DISCLAIM ALL LIABILITY FOR ANY USE OF THIS PRODUCT IN A WAY THAT MAY CAUSE ACCIDENTS, DAMAGE OR THAT MAY VIOLATE THE LAW.

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

### *Copyright*

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### *Warranty*

The warranty card is supplied as a separate document.

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

[www.simrad-yachting.com](http://www.simrad-yachting.com)

### *Compliance Statements*

The Simrad NSO complies with the following regulations:

- FCC Part 15
- CE compliant per EN60945
- C - Tick

For more information please refer to our website:  
[www.simrad-yachting.com](http://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 has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. 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



<b>Preface .....</b>	<b>1</b>
<b>Introduction .....</b>	<b>7</b>
About this manual .....	7
Conventions .....	7
Important safety and warning information.....	7
Check the parts.....	8
<b>Overview .....</b>	<b>10</b>
<b>Installing the NSO components .....</b>	<b>12</b>
Mounting location.....	12
Secure the Marine Processor Unit.....	12
DI10 / DI15 Display Panel mount.....	13
DI10 / DI15 Display Bracket Mount .....	14
OP40 Panel Mount.....	15
Card Reader Installation .....	16
<b>System architecture .....</b>	<b>17</b>
Networking, Data Interfacing.....	17
SimNet / NMEA 2000 .....	17
Ethernet: (NETWORK ports).....	17
NMEA0183 .....	17
Data Bridging.....	18
<b>Wiring the NSO .....</b>	<b>24</b>
Power.....	25
Connecting power .....	25
Remote Power On .....	26
Video Out .....	28
SimNet .....	30
SimNet: The basics .....	30
Planning and installing a SimNet backbone.....	31
Power the SimNet network.....	31
Integrating SimNet and other CAN networks.....	35
Ethernet .....	37
Connecting NSO to one other Ethernet performance module .....	38
Connecting directly to HD Radar .....	38
Connecting two NSO Processors .....	38
Connecting to two or more performance modules .....	39
NMEA0183 wiring .....	40

External alarm.....	41
Connecting BR24 Radar .....	42
Connecting HD Radar .....	43
Dual Radar Support.....	44
BR24 and HD radar .....	44
Connecting BSM-1 Broadband Echosounder .....	45
BSM-1 Transducer adapter cables .....	46
NSO Auto Pilot Integration .....	47
<b>Commission the system.....</b>	<b>48</b>
Operating the menu system .....	48
Turning on for the first time.....	49
Assigning an OP40 control of a single display.....	49
Assigning an OP40 to control multiple displays.....	49
Unassign a display from an OP40 .....	50
Configure the next OP40 .....	50
Finish OP40 configuration .....	50
OP40 LED sequences.....	50
Turning on / off: Normal operation .....	51
Display control selection: Normal OP40 use .....	51
System settings menu.....	52
Language .....	52
Time: Local Time, Time format, Date Format.....	52
Commissioning checklist .....	53
Data setup .....	55
SimNet / NMEA2000 setup.....	55
Source selection (Auto select) .....	55
Source selection (Manual) .....	55
SimNet Groups .....	57
Damping .....	58
Device List.....	58
Speed Calibration (SimNet Transducers).....	59
Autopilot Setup.....	60
Wiring the autopilot system .....	60
Verifying the autopilot connection.....	60
Commissioning the autopilot .....	60
Dockside setup.....	60
Rudder drive setup .....	62
Seatrials.....	62
Compass calibration.....	63
Setting the transition HI/LO speed .....	64
Autotuning.....	65

Seastate filter .....	65
Setting sailing parameters .....	65
Manually adjusting steering parameters.....	66
Echosounder setup.....	69
Depth offset .....	69
Echo sounder software version.....	69
Water speed calibration (Echosounder transducer) .....	69
Water speed averaging (Echosounder transducer) .....	69
Temperature calibration (Echosounder transducer).....	69
Transducer type (Echosounder) .....	70
Radar setup .....	70
Serial port setup.....	72
NMEA 0183 output.....	72
Fuel and Engines.....	73
Vessel Setup .....	73
AIS own vessel .....	73
Diagnostics .....	74
NMEA2000 Diagnostics.....	74
USER Database UDB .....	74
CZone Setup .....	75
Activate Czone Feature.....	75
Czone Backlight.....	75
Check GPS signal .....	76
System backup.....	76
Restore a backup.....	76
Backup Waypoints routes and tracks .....	77
Software upgrades.....	78
Displaying current software version .....	78
NSO or NSE Processor upgrade .....	79
Screen capture .....	81
File transfer .....	81
<b>NSO Drawings.....</b>	<b>82</b>
NSO Dimensions .....	82
MO19 Dimensions .....	82
DI15 Dimensions.....	83
DI10 Dimensions.....	83
OP40 Dimensions.....	84
NSO Chart Card Reader Dimensions .....	84
<b>Spare parts.....</b>	<b>85</b>
NSO Spare parts.....	85
Displays .....	85

SimNet accessories .....	86
Ethernet cables (yellow) .....	86
Ethernet cables (RJ45 adapters) .....	87
<b>Specifications .....</b>	<b>88</b>
Supported NMEA0183 sentences .....	89
NMEA 2000 PGN List .....	90
NMEA 2000 PGN Receive .....	90
NMEA2000 PGN Transmit .....	91

# Introduction

## About this manual

This manual is a reference guide for installing the Simrad NSO Multi Function Display.

The information in this manual at the time of printing is correct to the best of our knowledge. Navico can not be liable for any inaccuracies or missing information.

Due to the constant improvement of Navico's products. Navico cannot be liable for changes between the product and the manual. Refer to [www.simrad-yachting.com](http://www.simrad-yachting.com) for the latest manuals and addendums.

## Conventions



*Used when it is necessary to warn personnel that a risk of damage to the equipment or injury/death exists if care is not exercised.*



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

## Important safety and warning information

Please read carefully before use.



*When navigating the vessel, use the Simrad NSO system only as a navigational aid. Proper navigation of the vessel is the sole responsibility of the vessel operator.*



*The electronic chart used by the NSO System is an aid to navigation only and is designed to supplement, not replace, official government charts. Only official government charts supplemented by notices to mariners contain the information required for safe and prudent navigation. Always supplement the electronic information provided by the Simrad NSO with other plotting sources such as observations, depth soundings, radar and hand compass bearings. Should the information not agree, the discrepancy must be resolved before proceeding any further.*



*Never operate the NSO in Simulate Mode while you are underway. It is the user's responsibility to ensure that Simulate Mode is used only in safe situations such as when you are moored in a marina.*

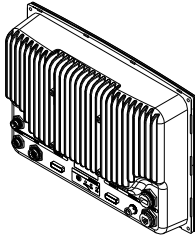
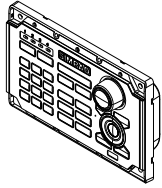
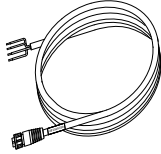
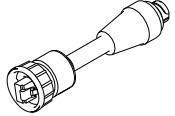
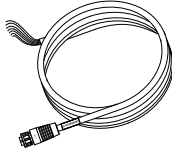
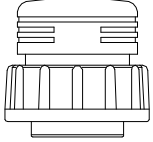
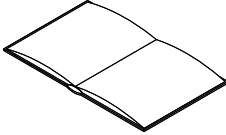
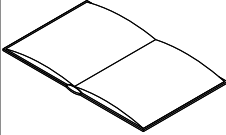
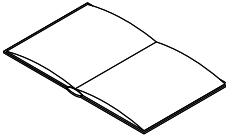
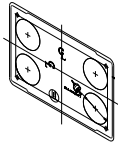
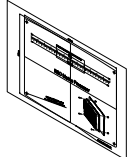

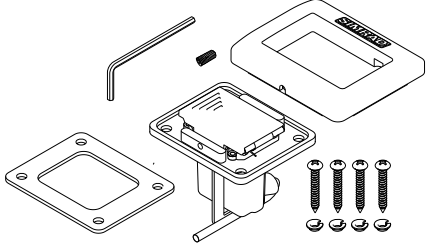
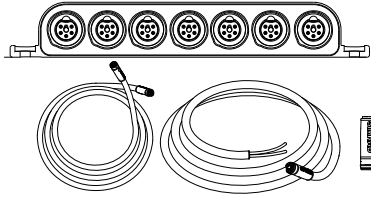


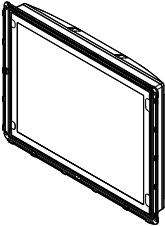
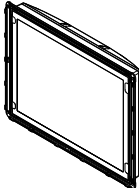
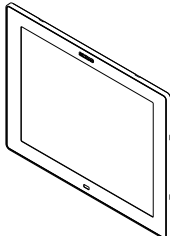
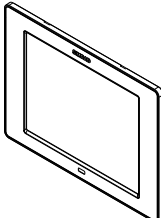
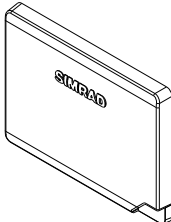
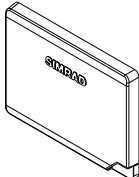
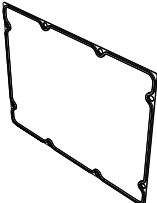
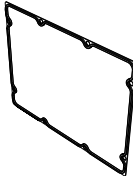
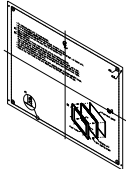
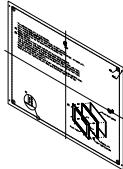
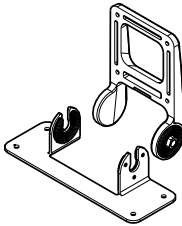
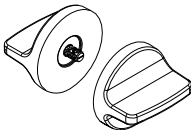
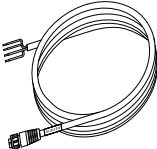


*The Global Positioning System (GPS) is operated by the US Government which is solely responsible for its operation, accuracy and maintenance. The GPS system is subject to changes which could affect the accuracy and performance of all GPS equipment anywhere in the world.*



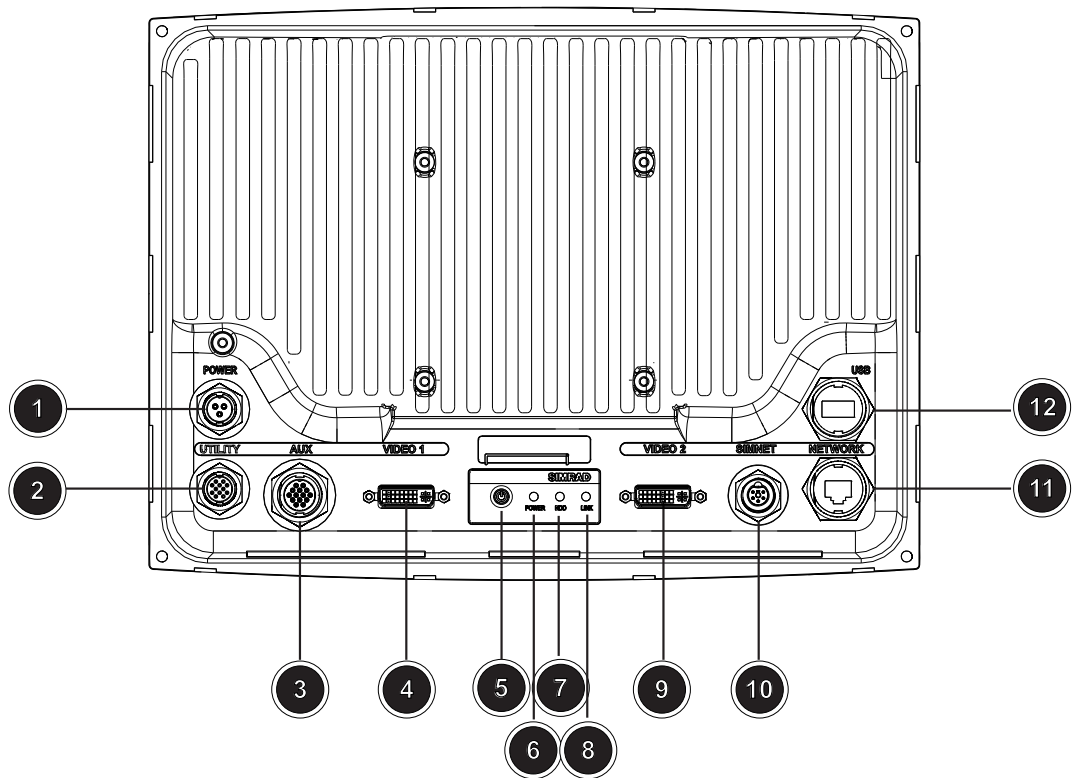
*The accuracy of the Echosounder depth display can be limited by many factors, including the type of transducer, the location of the transducer, and water conditions. Ensure that the transducer is installed correctly and the Echosounder is used correctly.*

## Check the parts

NSO Processor Packaged parts list			
NSO Marine Processor		OP40 Controller w/4 m (13 ft) Micro-C to SimNet cable	
Power cable 2m (6.5 ft)		Ethernet Adapter cable	
Utility Cable 12 Pin 2 m (6 ft) NMEA0183, External alarm, Remote Power on		Connector Caps	
Installation Manual		Operation manual	
Quick start guide		OP40 Controller Mounting Template	
NSO Marine Processor Mounting Template		Mounting Screws for Marine processor 4 x SCREW, 8Gx1, PAN POZI, S/T,16,LO-HEAD	
Card reader kit Includes card reader, gasket, bezel, mounting kit.			
SIMKIT 1: Includes SimNet 5 m (16.5 ft) cable SimNet 7-Prong Multi-Joiner SimNet Termination Plug SimNet 2 m (6 ft) power cable w/terminator			

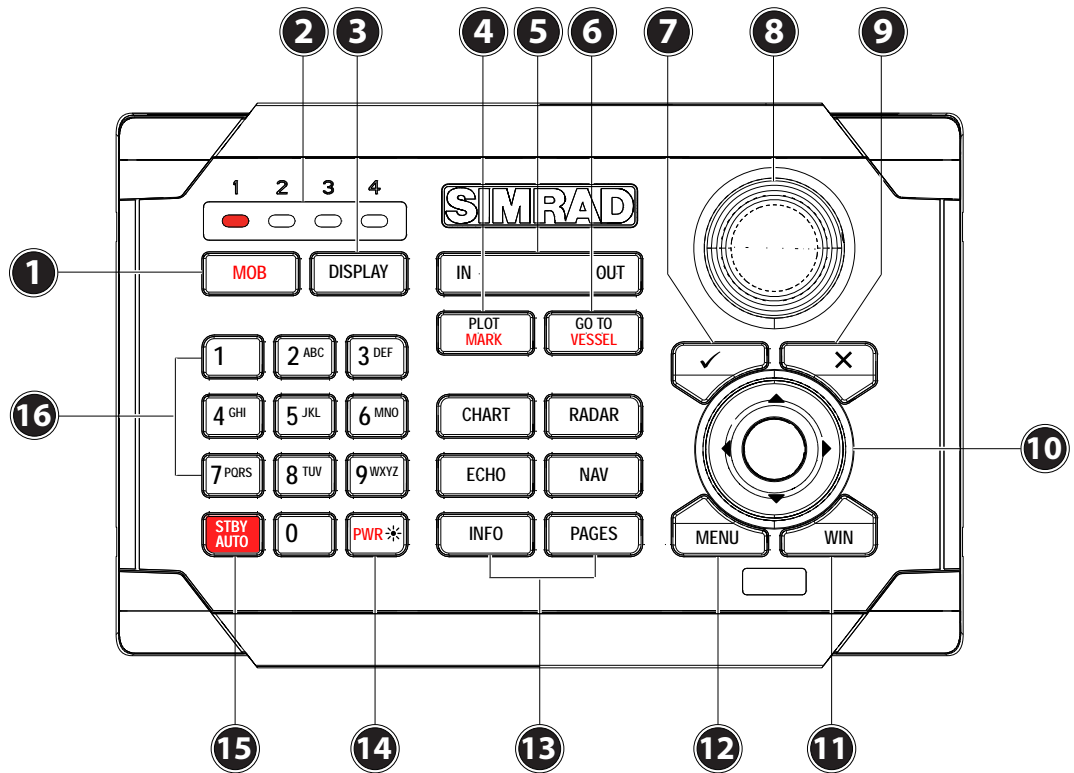
DI 10 and DI 15 display parts			
DI15 Display		DI10 Display	
DI15 Bezel		DI10 Bezel	
DI15 Dust cover		DI10 Dust cover	
DI15 Gasket		DI10 Gasket	
DI15 Cut-out Template		DI10 Cut-out Template	
Common DI 10 / DI 15 display components			
Mounting bracket		Mounting Bracket knobs	
Display power cable		Cleaning cloth	
DI Display 5 x SCREW,14G x 1,PAN POZI,S/T,SS 316,BLACK			

## Overview



Key	Description
1	Power. For power input 12 or 24 V DC input (see <b>power</b> page 25)
2	Utility. NMEA0183 Port TX (see <b>NMEA0183 Wiring</b> page 40), External Alarm (see <b>External Alarm</b> page 41), Remote Power on
3	AUX. Not used.
4	VIDEO 1. DVI-D Video out. Display 1 video out to connect to a DI10, DI15, MO19 or third party DVI monitor.
5	Power On/Off. Power control button.
6	Power LED. Indicated Power status.
7	HDD LED. Indicates hard drive activity.
8	LINK LED. Indicates if there is a valid Ethernet network connection
9	VIDEO 2. DVI-I Video out. Display 2 video out to connect to a DI10, DI15, MO19 or third party DVI monitor. Duplicates the output of Video 1 port
10	SimNet. Connects the marine processor to a SimNet or NMEA2000 network (see <b>SimNet</b> page 30).
11	Network. Ethernet network port for connecting to other Ethernet network devices. (see <b>Ethernet</b> on page 37)
12	USB. Used to connect the supplied SD Card Reader for Software updates, chart cards, chart data base updates, backing up of user data and settings. Connection of portable storage devices.





Key	Description
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. Indicates 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 buttons for radar, echosounder and chart pages
6	GOTO/VESSEL key. 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 depending 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 key, 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 key. 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 D10 or D15 displays if connected (MO15, MO19 or third part monitors will need to be powered on using their power buttons). 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	Alpha numeric keypad used for entering numbers and text in dialog boxes

# Installing the NSO components

## Mounting location

Choose the mounting locations carefully before you drill or cut. The display should be mounted so that the operator can easily use the controls and clearly see the display screen. Be sure to leave a direct path for all of the cables. Simrad displays are high-contrast and anti-reflective, and are viewable in direct sunlight, but for best results install the display out of direct sunlight. The chosen location should have minimal glare from windows or bright objects.

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.

At least 100 mm (4") away from the compass, at least 300 mm (12") away from any radio transmitter and at least 1.2 m (4 ft) away from any antenna.

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.

If bracket mounting the display choose an area where the display will not be subjected to excessive vibration.

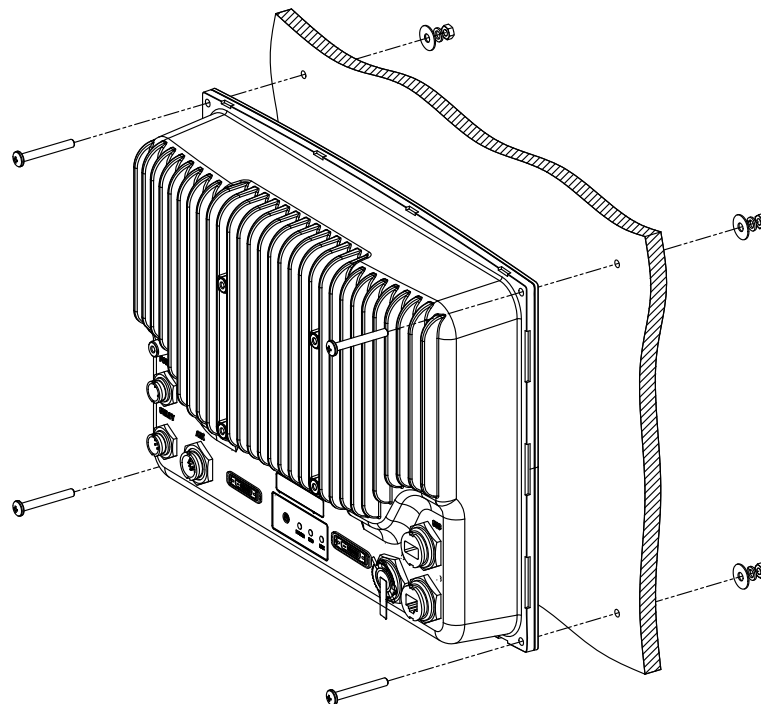
Leave sufficient clearance space to connect all relevant cables.

Good ventilation is required. Poor ventilation may cause the Marine Processor Unit (MPU) or display to overheat. The MPU and Simrad displays are designed to operate in temperatures from -15° C to +55° C (+5° F to +131° F).

For overall width and height requirements, please see the drawings at the back of this manual.

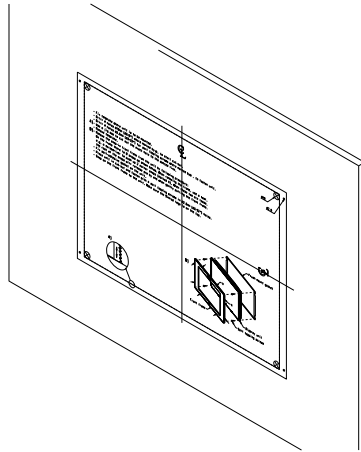
## Secure the Marine Processor Unit

Secure the Marine Processor unit to a flat surface free from vibration.



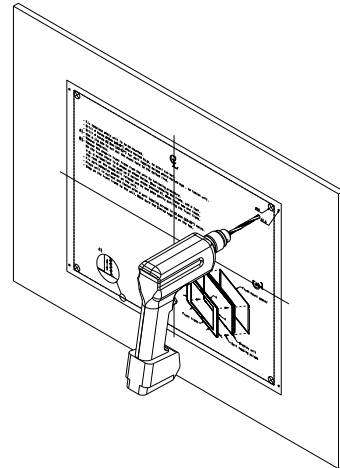
## DI10 / DI15 Display Panel mount

- 1** Attach the flush mounting template to the selected mounting position.

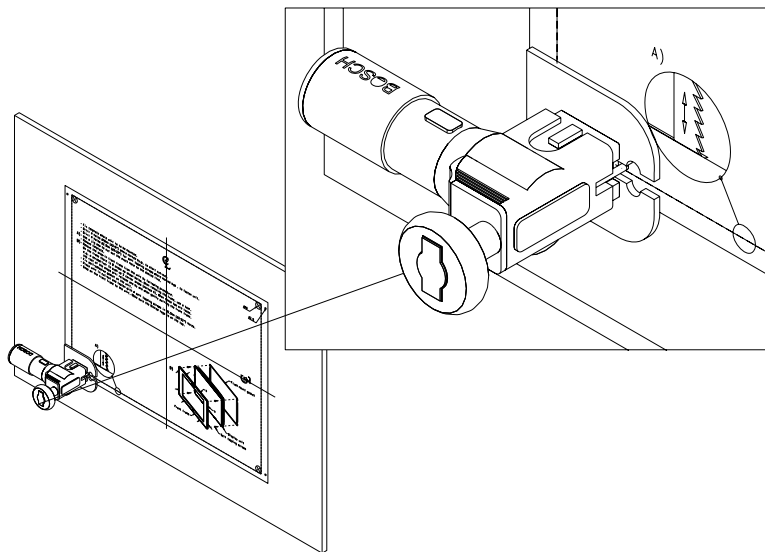


- 2** Drill the four corner radius holes using a 10 mm (3/8 ") drill bit.

- 3** Drill pilot holes for the four self tapping screws used to secure the display. If using M4 machine screws use a 5 mm (3/16") drill bit.

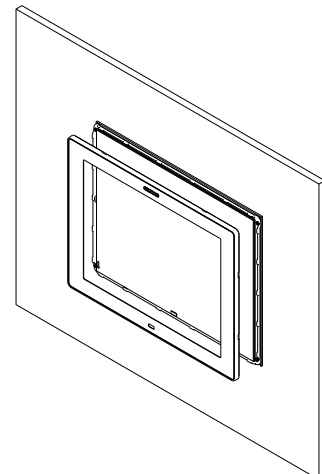
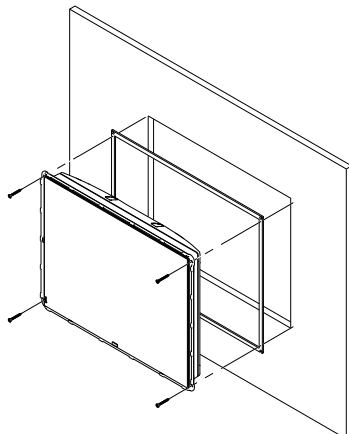


- 4** Cut along the indicated on the template.



- 5** Secure the display to the surface.

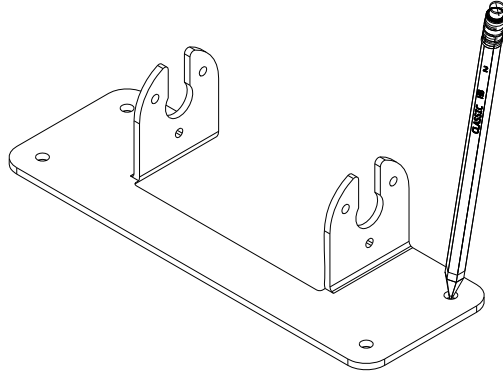
- 6** Secure the front bezel firmly in place



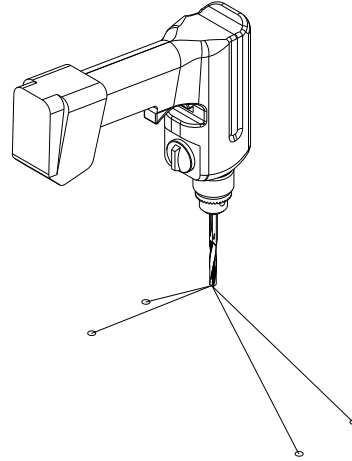
## DI10 / DI15 Display Bracket Mount

An alternative to flush mounting the DI10 or DI15 is to bracket mount the display. The display may be tilted for best possible viewing angle when bracket mounted.

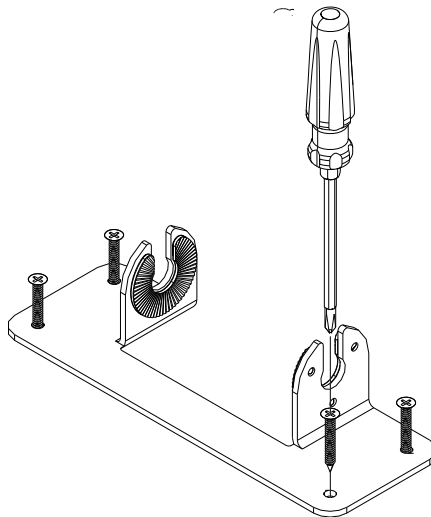
- 1** Use the lower half of the bracket as a template to mark the screw hole location.



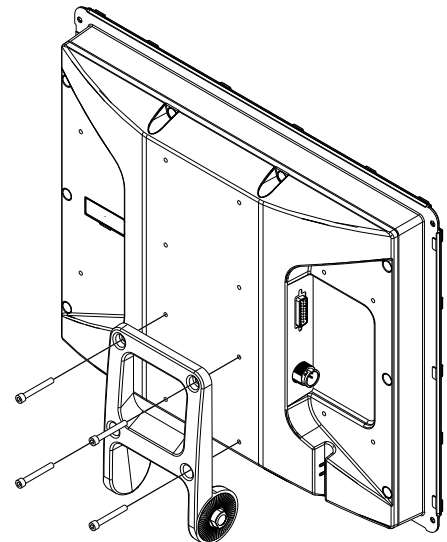
- 2** Drill pilot holes and hole for cables if required



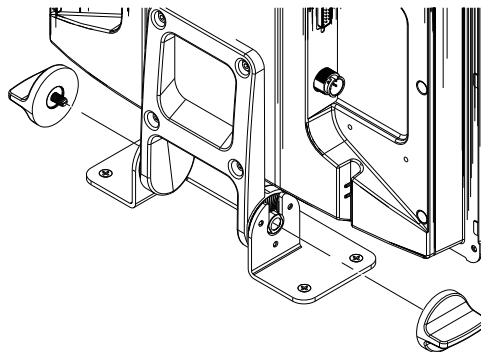
- 3** Secure the bracket base to the surface.



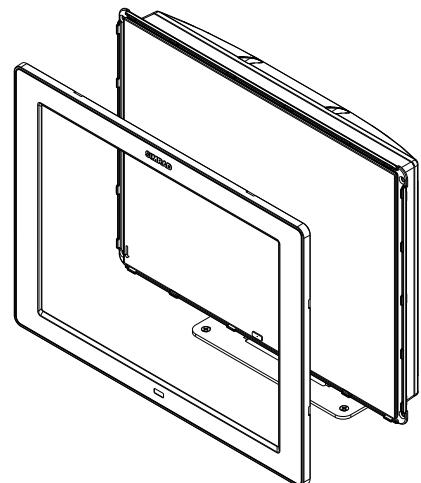
- 4** Secure the upper bracket to the rear of the DI Display



- 5** Tighten the bracket knobs

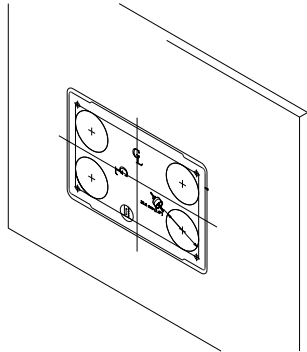


- 6** Secure the front bezel firmly in place

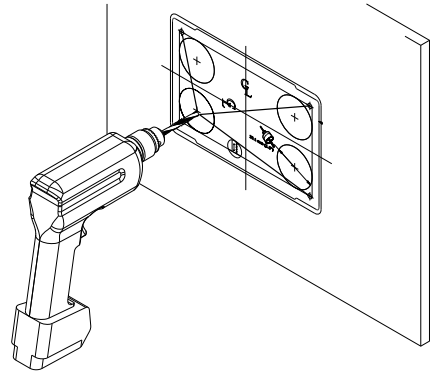


## OP40 Panel Mount

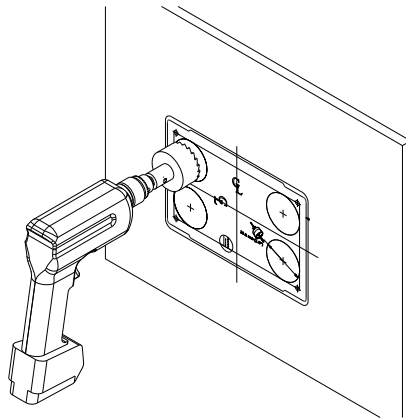
- 1** Secure the flush mount template in the desired location



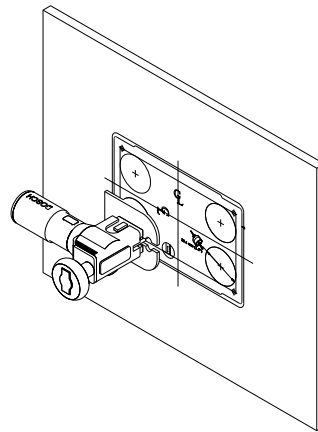
- 2** Drill the four holes to suit M4 machine screw or pilot hole for a self tapping #8 screw



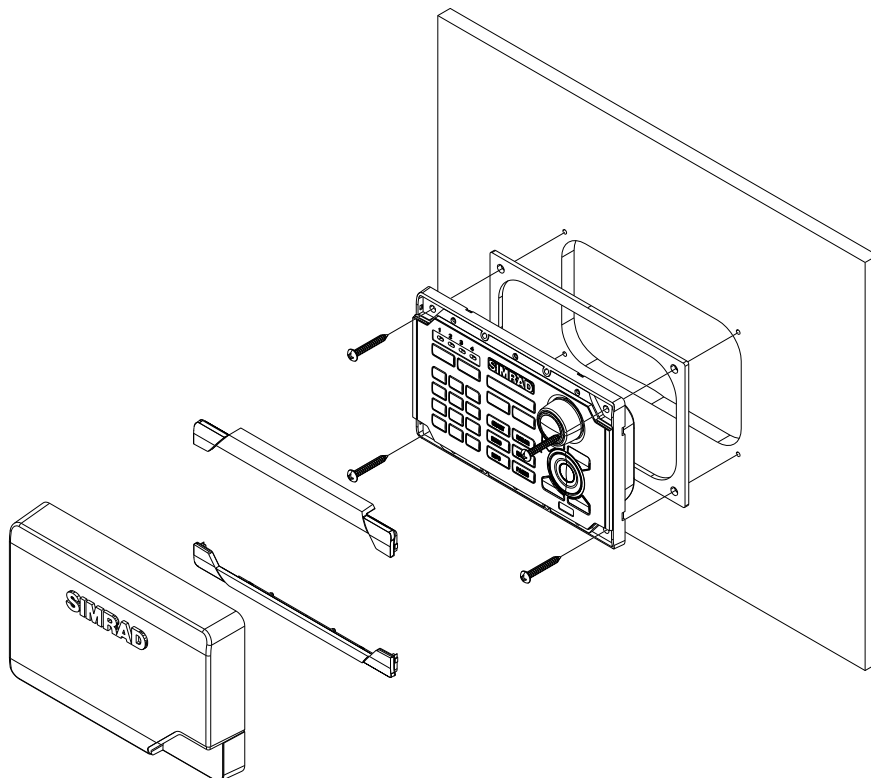
- 3** Use a 38 mm (1.5") hole saw to cut corner radius



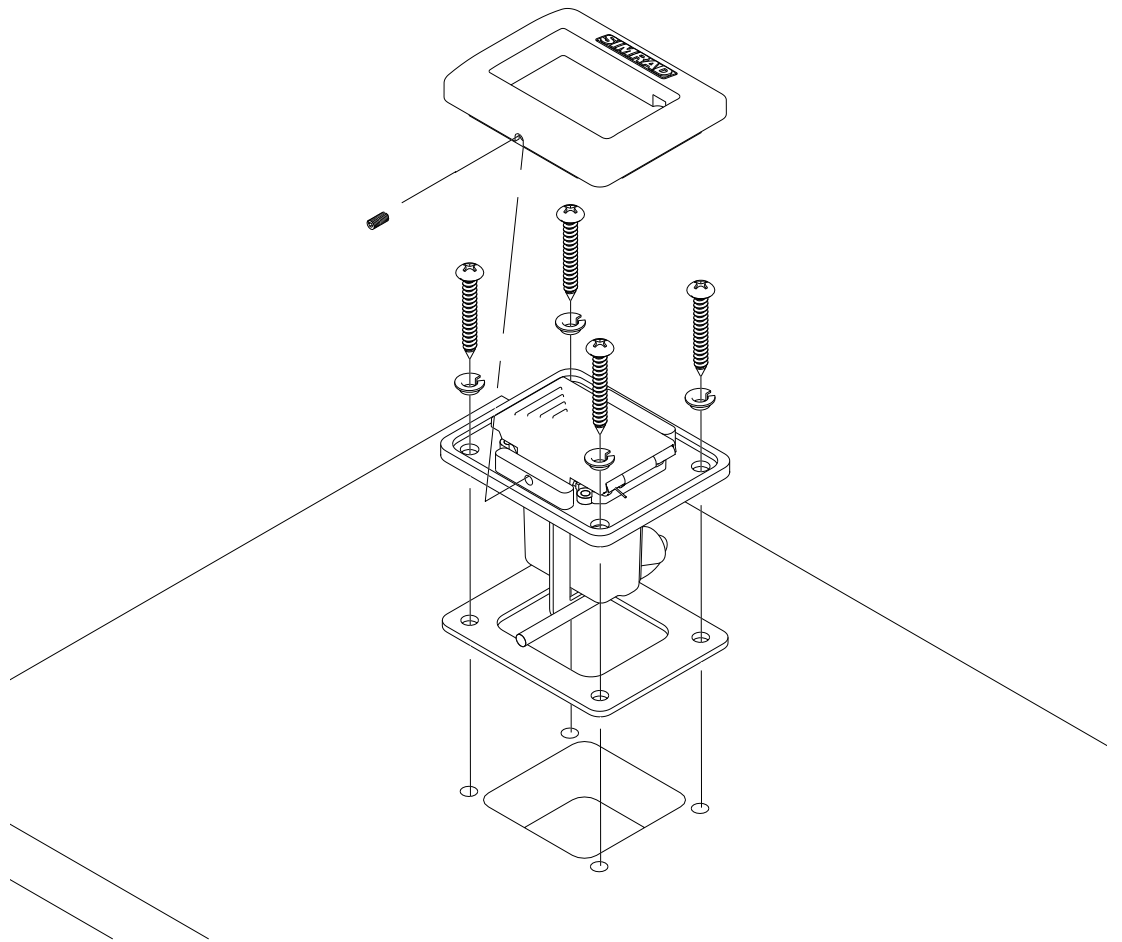
- 4** Cut along line indicated on the template and remove waste material



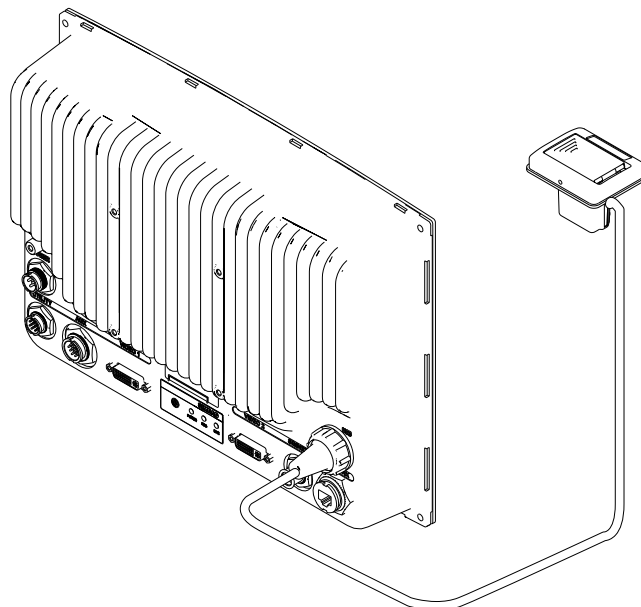
- 5** Secure the OP40 and gasket the surface. Apply cosmetic screw covers to finish the installation



## Card Reader Installation



The card reader connects to the USB port of the NSO MPU.



## System architecture

This section explains how the NSO connects to other devices as part of a system. The NSO has a highly scalable system architecture. A system can consist of a basic stand alone chart plotter, or expand to a networked, multi-display system connected to a wide range of accessories.

The system architecture is modular with a wide range of peripherals and accessories that can be connected to SimNet or NMEA2000 devices such as instrument systems, AIS, GPS and heading sensor to Ethernet devices such as Radar and Echosounder. A NSO Marine Processor can connect to other devices in the system by Ethernet, SimNet / NMEA2000 or NMEA0183.

An NSO system can have:

- between one and four processors. This can be any mix of NSO Marine Processor's and NSE8 and NSE12 displays.
- two HD Pulse radars or two or BR24 Broadband radars (note: a combination of HD Radar and BR24 can be installed at the same time but we do not recommend transmitting at the same time.
- multiple echosounder modules.

### Networking, Data Interfacing

The NSO system can use three data networks. SimNet (NMEA2000), Ethernet and NMEA0183.

#### SimNet / NMEA 2000

- SimNet is Simrad's proprietary CAN bus network for transfer of navigation data such as wind, position, AIS, etc between all SimNet or NMEA2000 devices on a SimNet/NMEA2000 network.
- SimNet is lower bandwidth than the Ethernet network, but is 50 times faster than NMEA0183

#### Ethernet: (NETWORK ports)

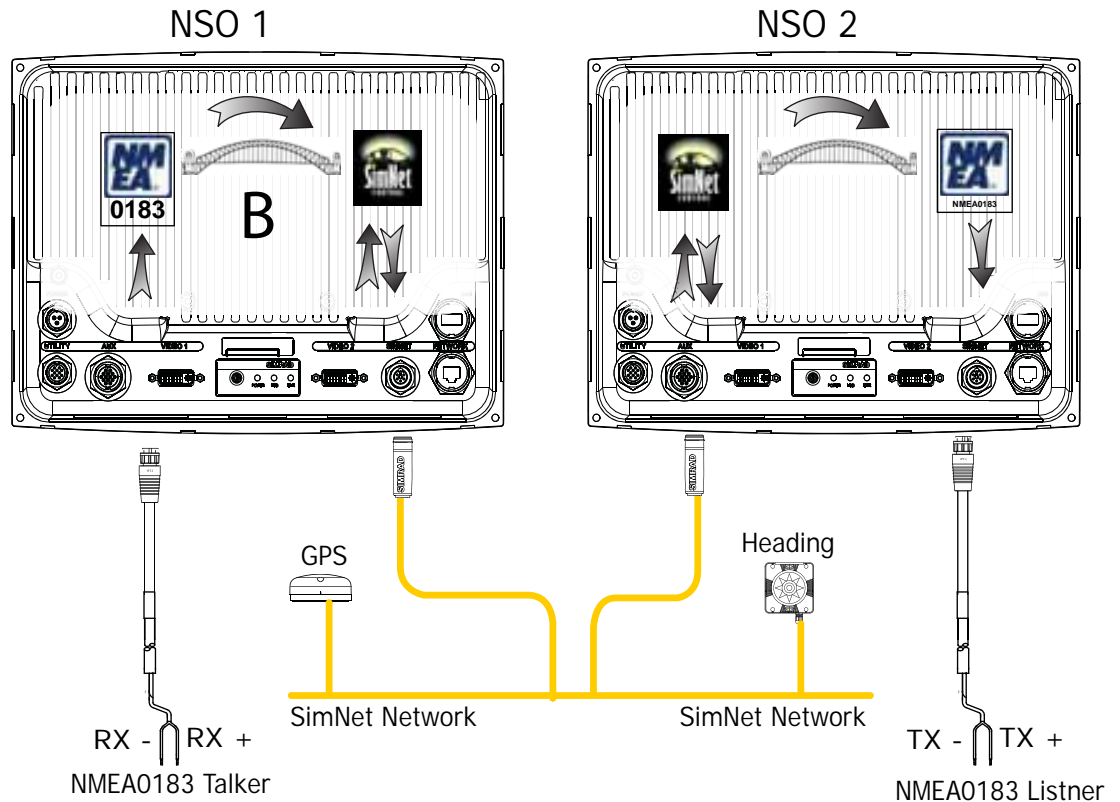
- NSO uses an Ethernet network for the transfer of high bandwidth data between other marine processors and from network modules such as Radar, Echosounder and Weather module. Chart information on an SD card is transferred via Ethernet to other NSO or NSE marine processors.
- Each NSO Marine processor has one Ethernet network port. A RJ45 to yellow 5 pin ethernet adaptor cable is included to connect to other devices using one of the standard Navico 5 pin yellow Ethernet cables.
- Ethernet does not transfer navigation data such as position, heading etc. This is handled either by SimNet and or NMEA 0183. However waypoints, routes, tracks and display settings are synchronized over Ethernet with other marine processors

#### NMEA0183

- NMEA0183 is a point to point connection. Each NSO display has one NMEA0183 port using RS232 protocol. Each Marine processor can output to one NMEA0183 "Listener" and receive from one NMEA0183 "Talker".

## Data Bridging

- Supported NMEA0183 sentences entering the system are bridged (converted) to SimNet / NMEA2000 and distributed on the SimNet backbone for all other displays to use
- Certain SimNet /NMEA2000 PGNs (messages/sentences) are bridged across to NMEA0183 to be available as an output from any NSO / NSE processor
- Ethernet to SimNet: Limited data is bridged from the Ethernet echosounder. Speed, depth and temperature are bridged to SimNet and NMEA0183. Depth, speed and temperature data from the echosounder is the only data bridged from Ethernet



Example of data bridging	
A	In this example a NMEA0183 (talker) is connected to NSO 1
B	The NMEA sentences are bridged across to SimNet and distributed on the SimNet network. Note: AIS data is not bridged.
C	The NMEA0183 listener connected to NSO 2 can receive the NMEA0183 sentences from the device connected to NSO 1 and also from other devices that are on the SimNet network, in this case heading and GPS



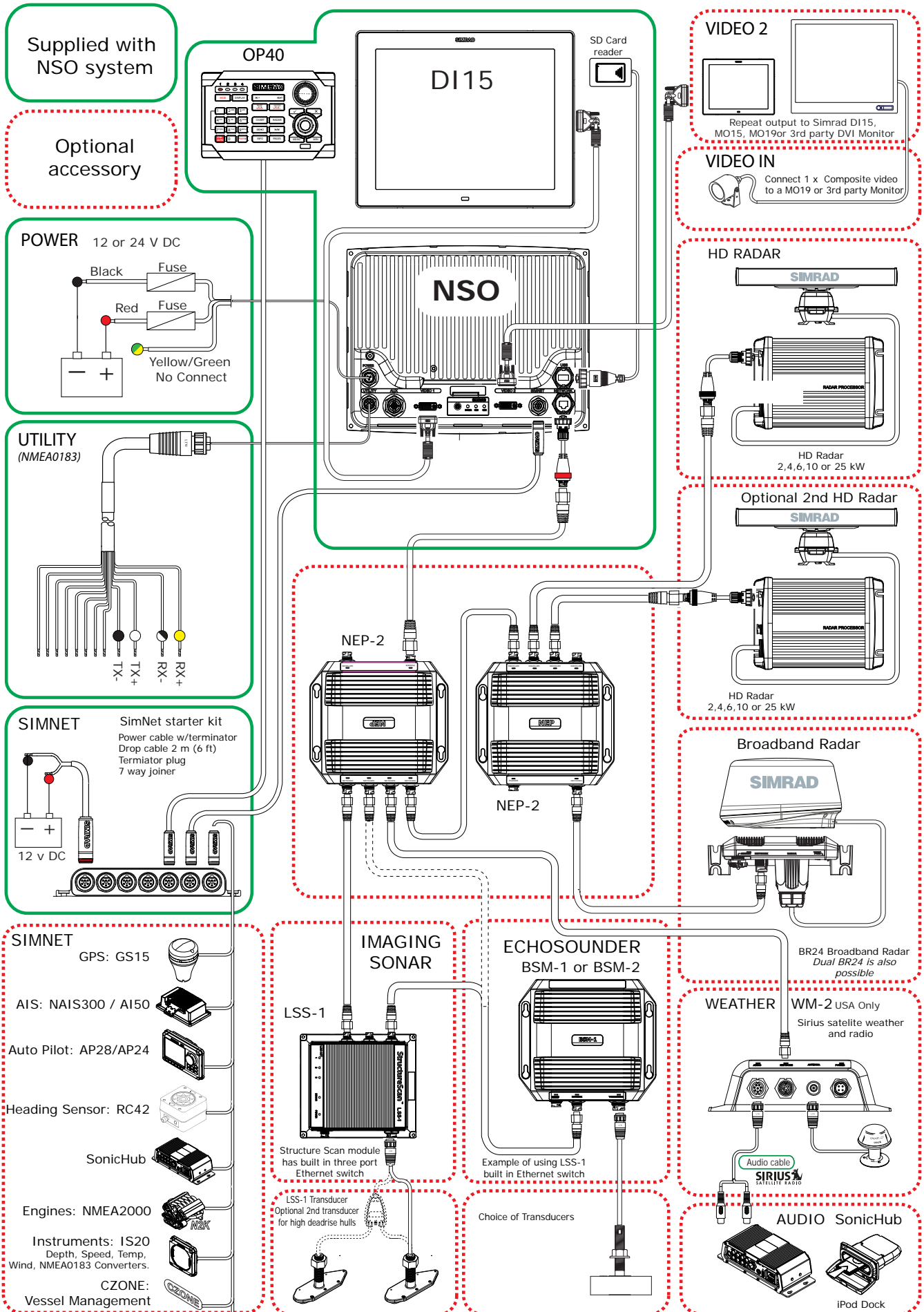
An NMEA talker can be connected to each NSO MPU and both set of data will be converted to SimNet. Each display can be setup for outputting selected NMEA sentences.

Speed, temp and depth data from the echosounder transducer that is to be displayed as an instrument has to be bridged from Ethernet to SimNet. An NSO display has to be nominated to bridge the data. If this nominated display is turned off, no data will be displayed, until the display is turned on or another display is selected to bridge the data (see **Data Setup** on page 55).

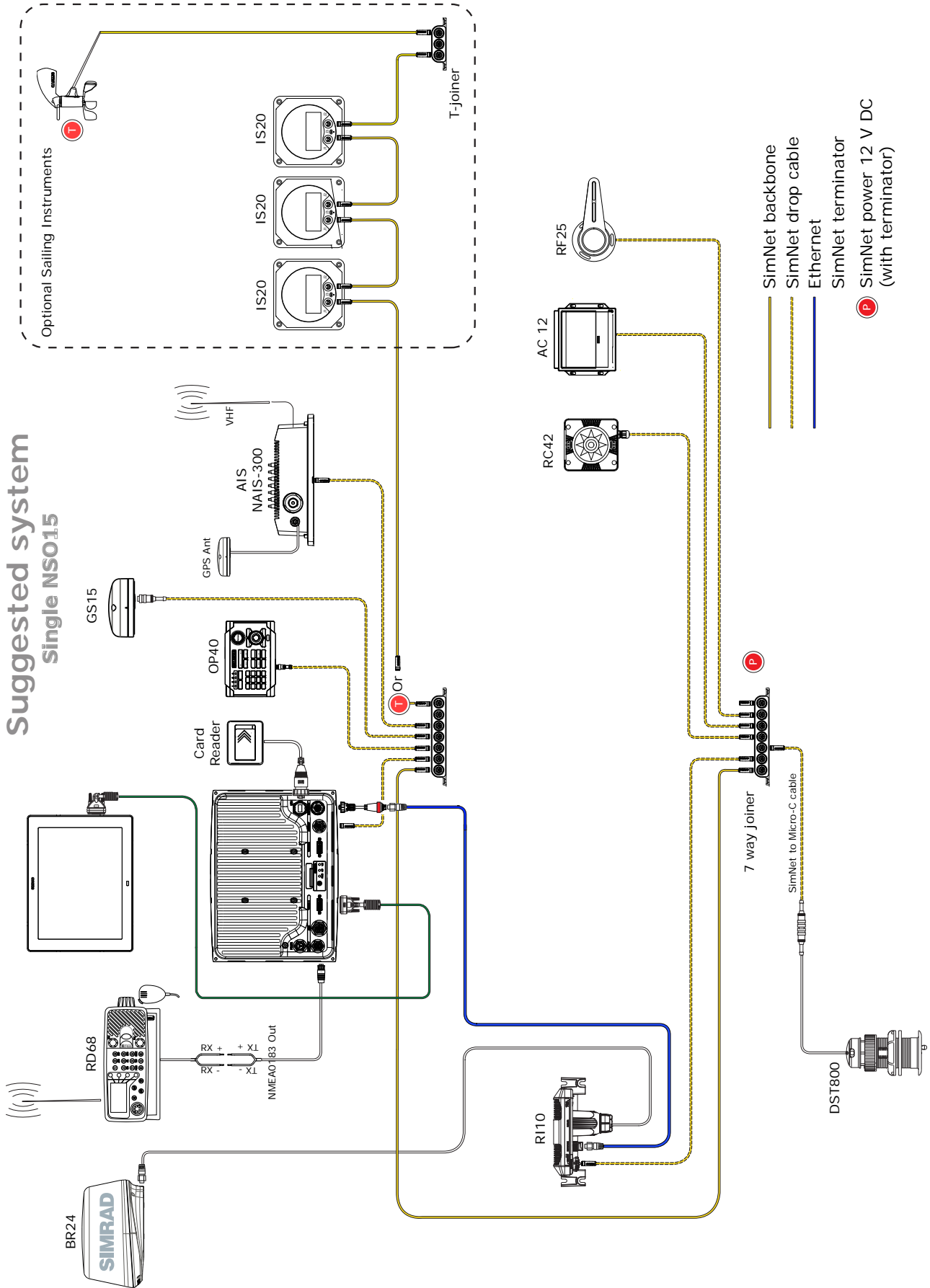
NMEA0183 to SimNet bridging only applies to the NMEA0183 sentences outlined in the **Supported NMEA0183 Sentences** section of this manual (see page 89).

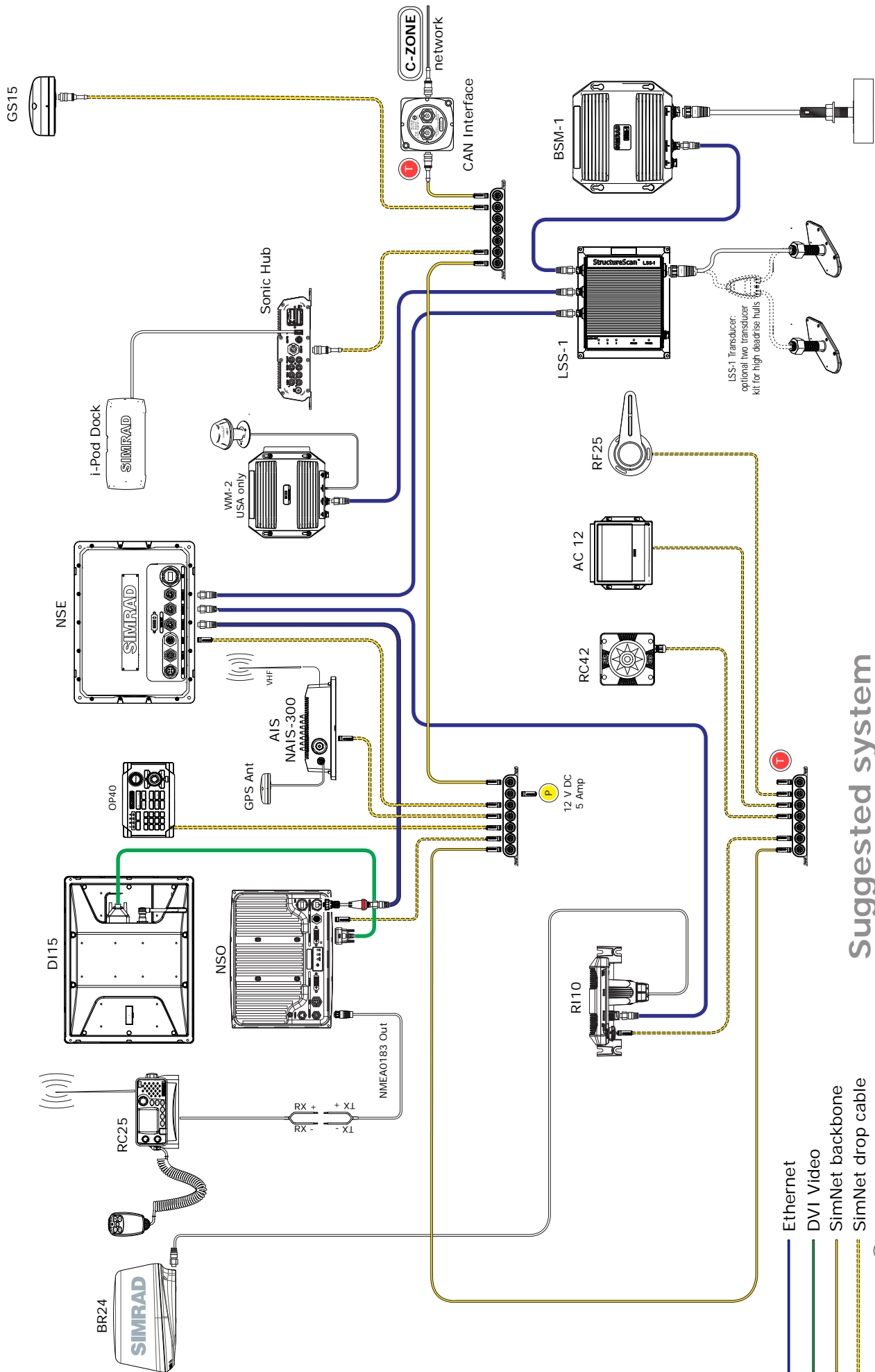


# Single station configuration possibilities



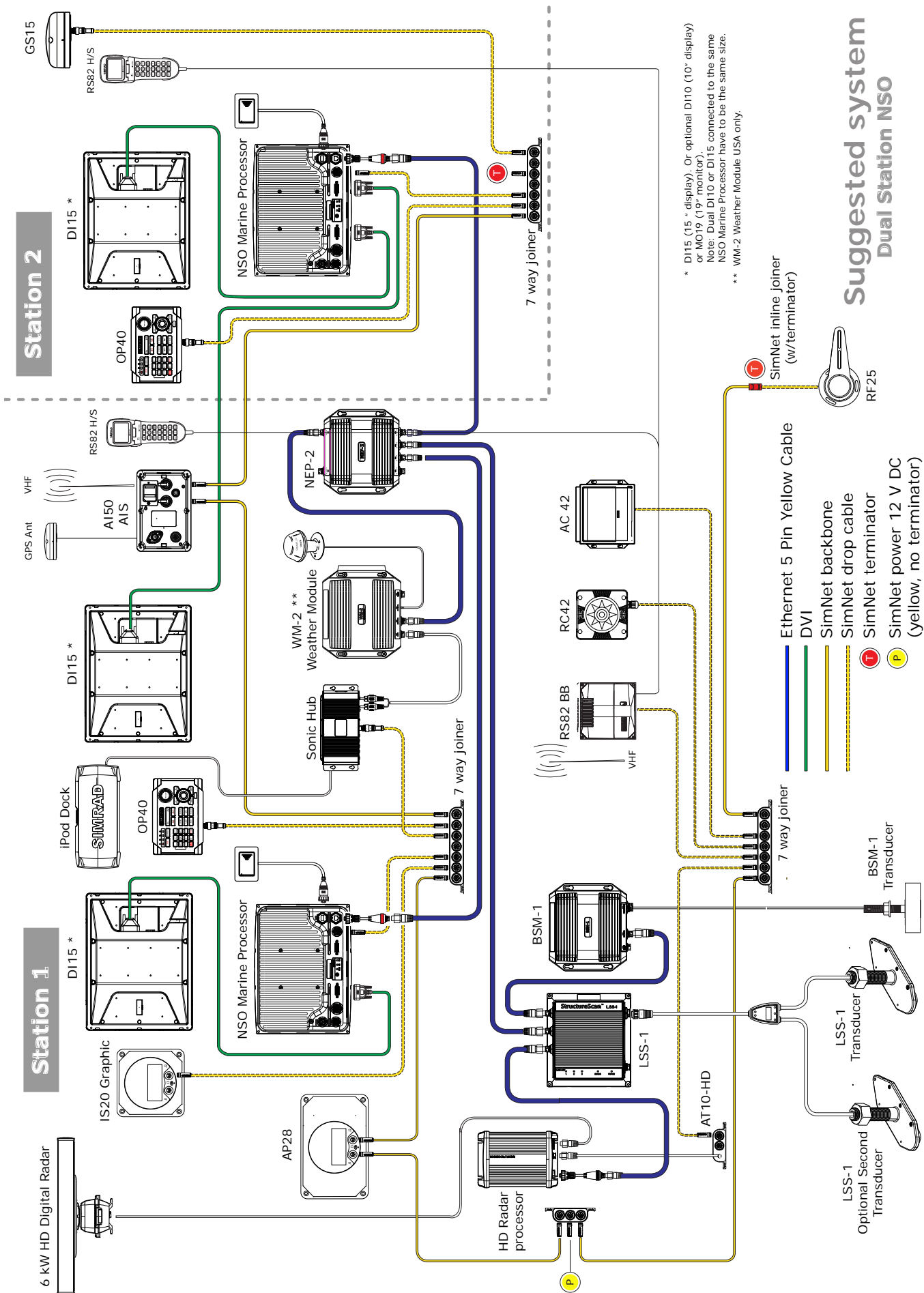
# Suggested system Single NSO15





# Suggested system NSO & NSE

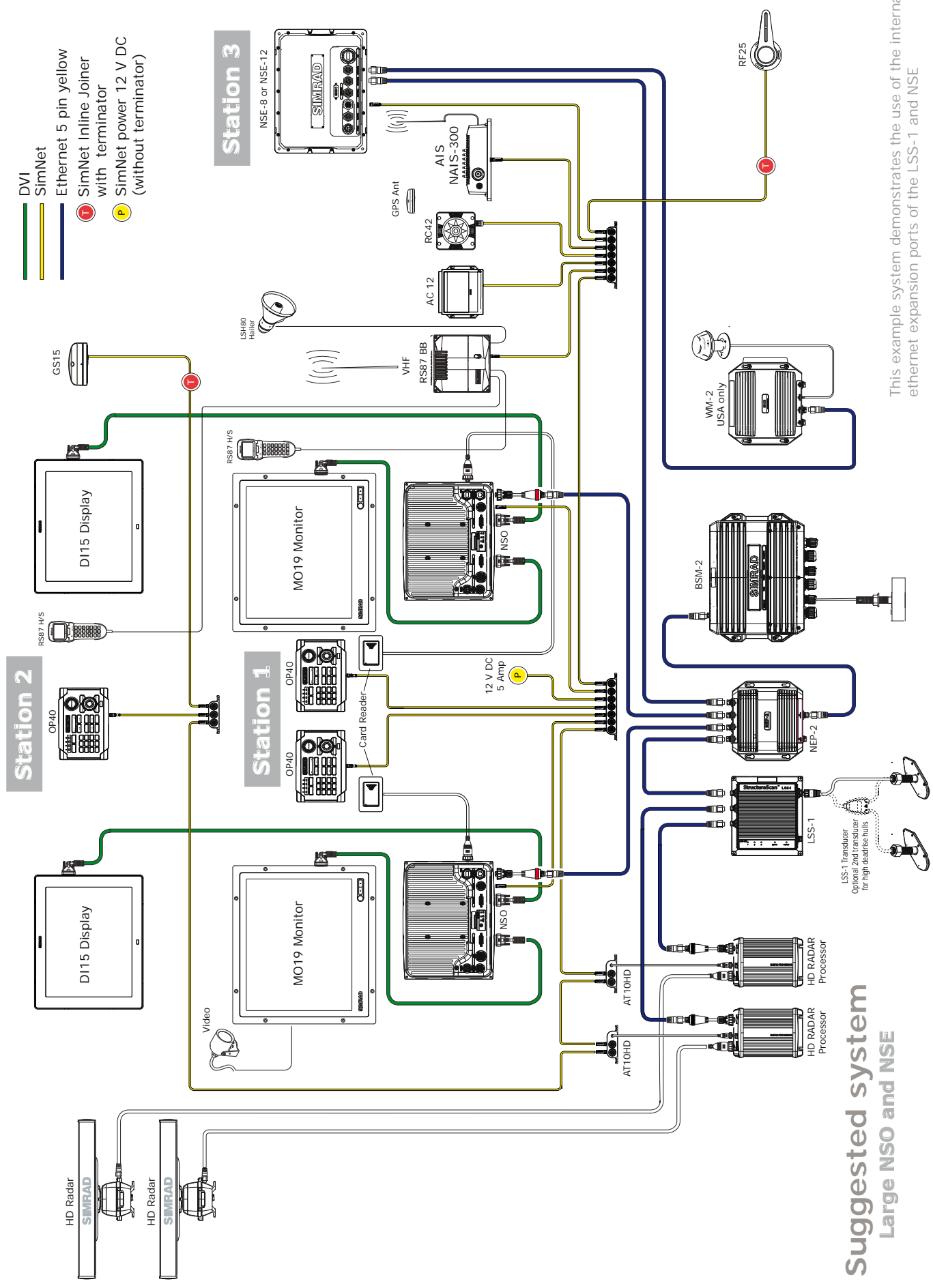
- Ethernet
- DVI Video
- SimNet backbone
- - - SimNet drop cable
- T SimNet terminator
- P SimNet power 12 V DC



\* DI15 (15" display). Or optional DI10 (10" display) or MO19 (19" monitor).  
 Note: Dual DI10 or DI15 connected to the same NSO Marine Processor have to be the same size.  
 \*\* WM-2 Weather Module USA only.

# Suggested system

## Dual Station NSO



# Suggested system Large NSO and NSE

This example system demonstrates the use of the internal ethernet expansion ports of the LSS-1 and NSE

## Wiring the NSO

### Wiring guidelines

Most installation problems are caused by shortcuts taken with system cables. When wiring the NSO, follow the guidelines below.

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 tie-wrap all cables to keep them secure
Don't route the data cables in areas adjacent to radar, transmitter, or large current carrying cables	If cables are shortened, lengthened, or re-terminated, do seal and protect all wiring connections
	Do leave room at the back to install and remove cables



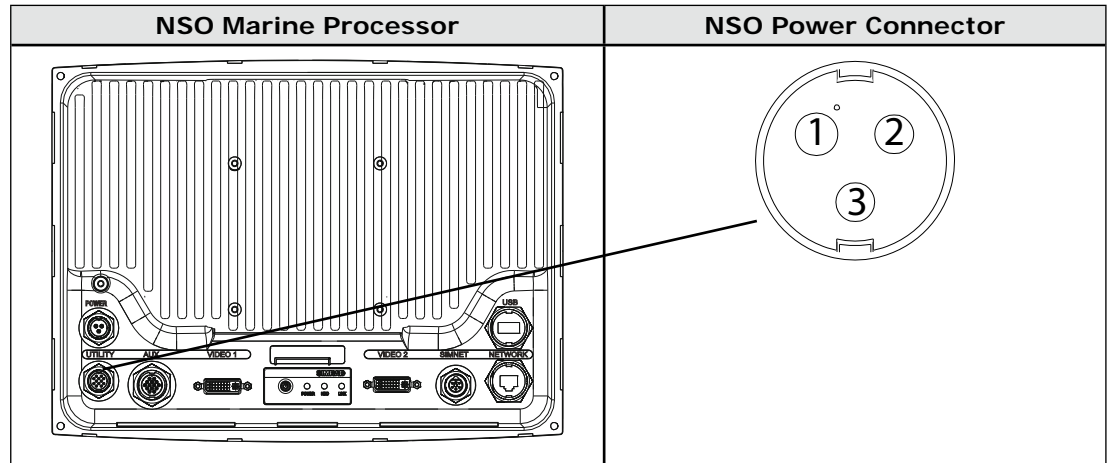
***Before starting the installation, be sure to turn electrical power off. If power is left on or turned on during the installation, fire, electrical shock, or other serious injury may occur. Be sure that the voltage of the power supply is compatible with the system***

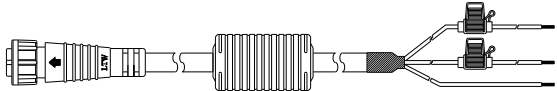


***The NSO has a voltage rating of 12 V DC or 24 V DC. (9 V DC - 32 V DC max range). SimNet is 12 V DC only***

***The red wire should always be connected to (+) DC V using a fuse or thermal breaker (10 Amp)***

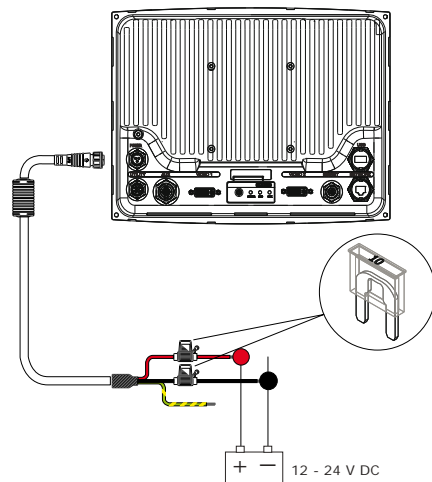
## Power



Power Cable (000-00129-001) 2 m (6 ft)	Pin	Wire color	Function
	1	Black	Battery (-)
	2	Red	Battery (+) 12 - 24 V DC
	3	GRN / Yellow	Ships Ground if available

### Connecting power

- NSO marine processor ships with a 6 ft (2 m) power cable. This can be extended using the following guidelines:
  - for a cable length up to 15 ft (5 m), use 14-gauge wire or heavier
  - for a cable length from 15 ft (5 m) to 30 ft (10 m), use 12-gauge wire or heavier
- If you lengthen the power cable, use an external fuse at the battery end as an added safety precaution. The fuse size should be chosen to be appropriate for the size of the smallest conductor in the circuit. See the NMEA or American Boating and Yachting Counsel specifications to find the correct fuse for your wiring.
- For the best protection from noise, connect the power wiring directly to the battery or dedicated electronics bus. The green ground wire can be connected to the ship's ground if available. The power cable has an in-line fuse on the positive and negative side to protect the vessel's wiring, and prevent electrical fires and damage to the unit. If you shorten or lengthen this cable, be sure to keep the in-line fuse intact (or provide circuit protection).
- Spare in-line fuses are standard automotive type and are not supplied with the unit and should be purchased locally to avoid loss of function.
- The NSO can operate on voltages ranging from 10 V DC to 35 V DC.



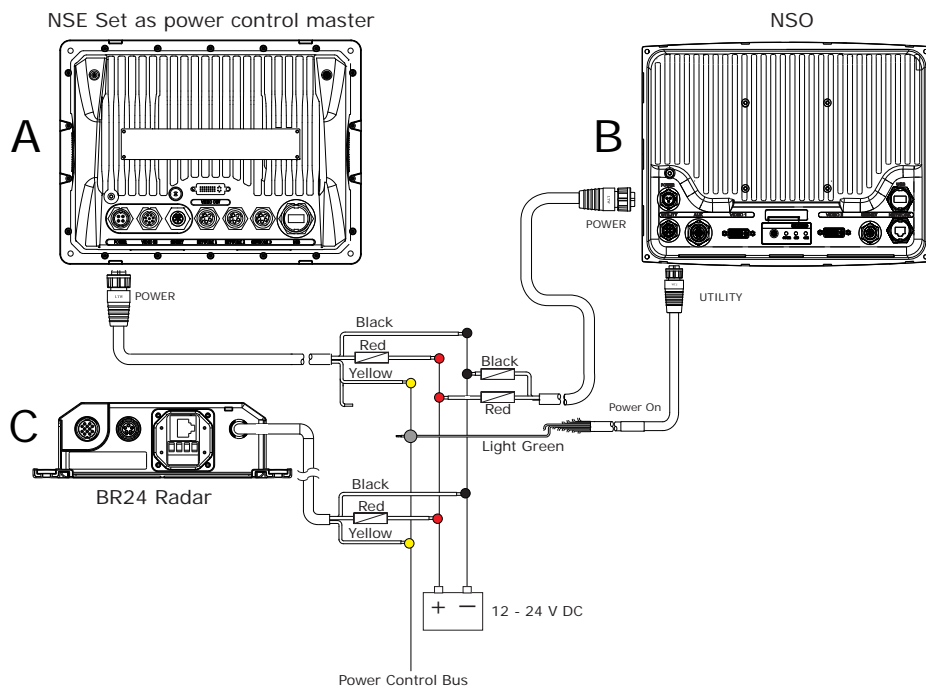
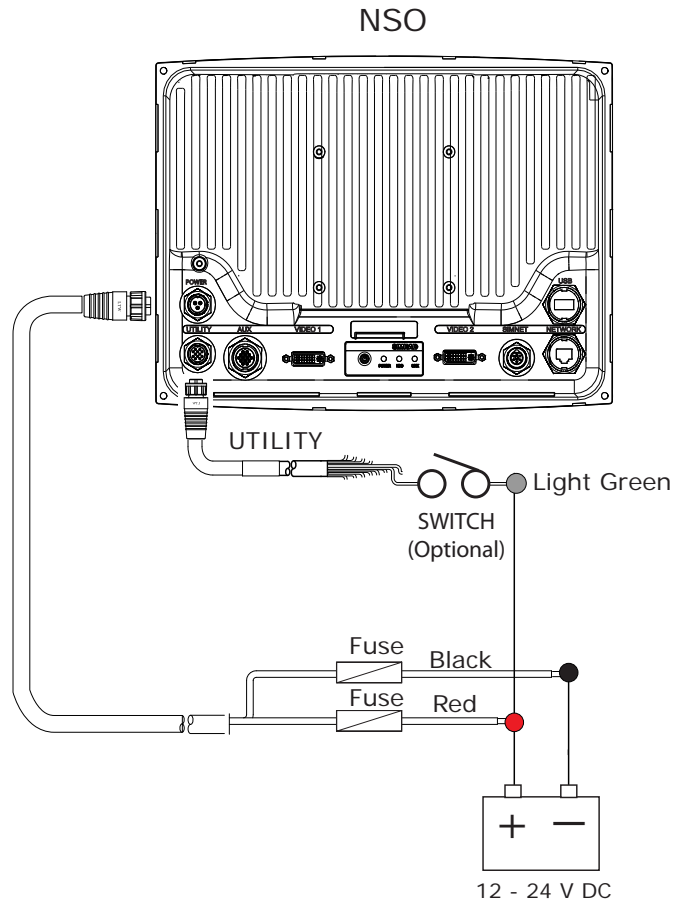
**The red wire should always be connected to (+) DC V. A 10 Amp blade fuse is provided or use thermal breaker (10 Amp)**

**The black wire should also be protected using a 10 amp blade fuse provided**

**The green ground wire can be connected to ship's ground if available**

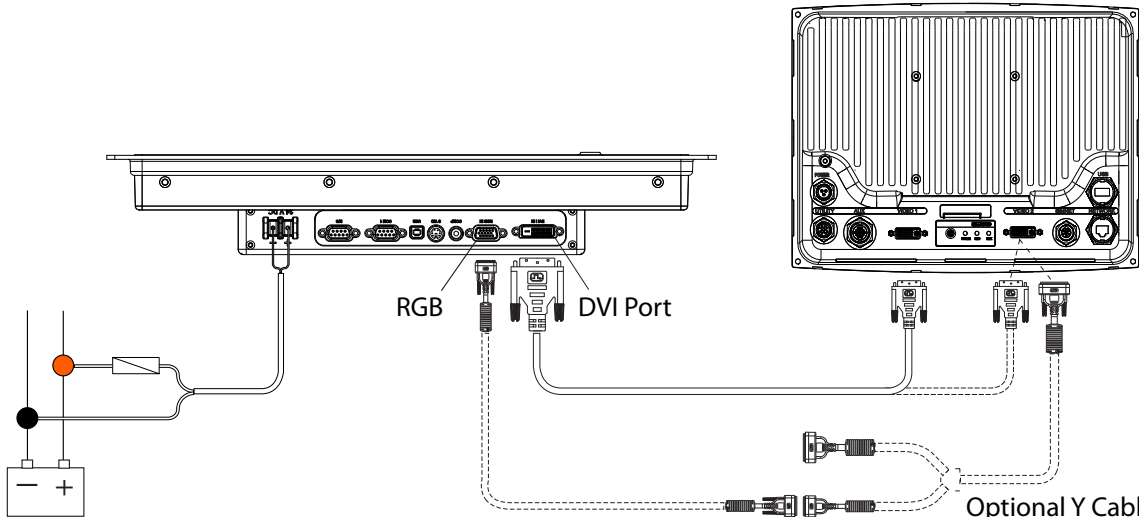
## Remote Power On

The NSO MPU can be turned on by an external powered switch connected to the light green wire of the Utility cable. Voltage applied by the switch needs to be >5 V DC.  
 Note: Removing voltage from the light green wire will not shut down the NSO.





MO19 Monitor Connections. Note: MO19 is 24 V DC Only

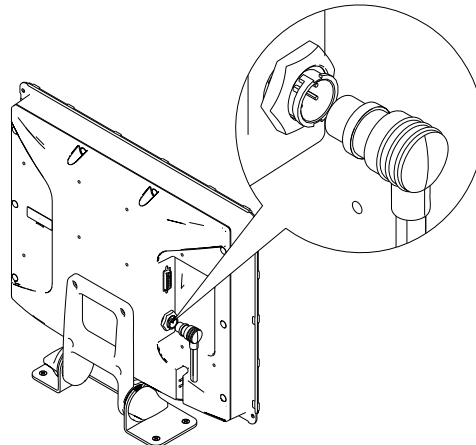
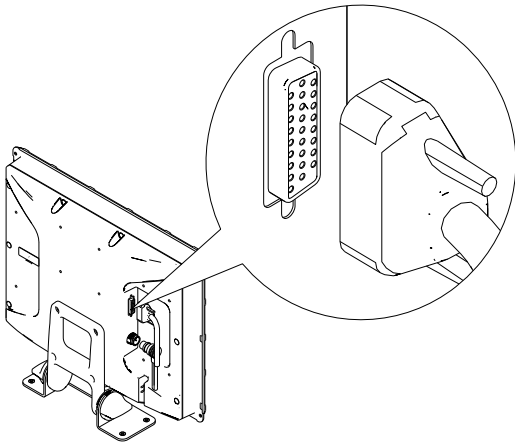


24 V DC Only

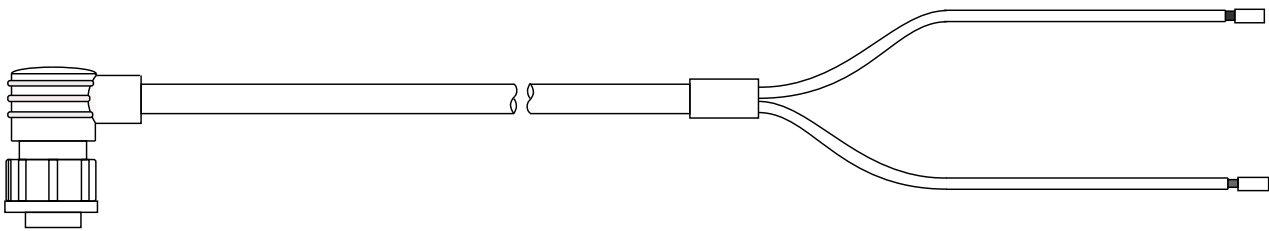
Optional Y Cable for RGB connection. Video 2 Port only

DI10 and DI15 Video connection

DI10 and DI15 Power connection

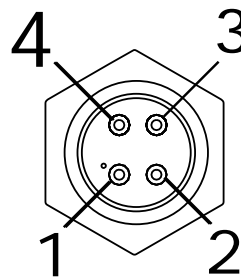
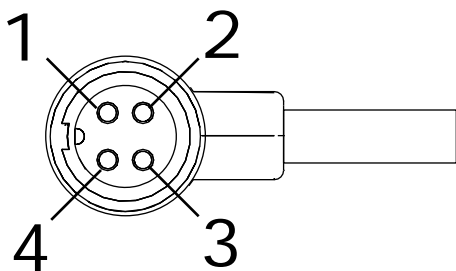


DI10 and DI15 Power cable



DI10, DI15 Power cable

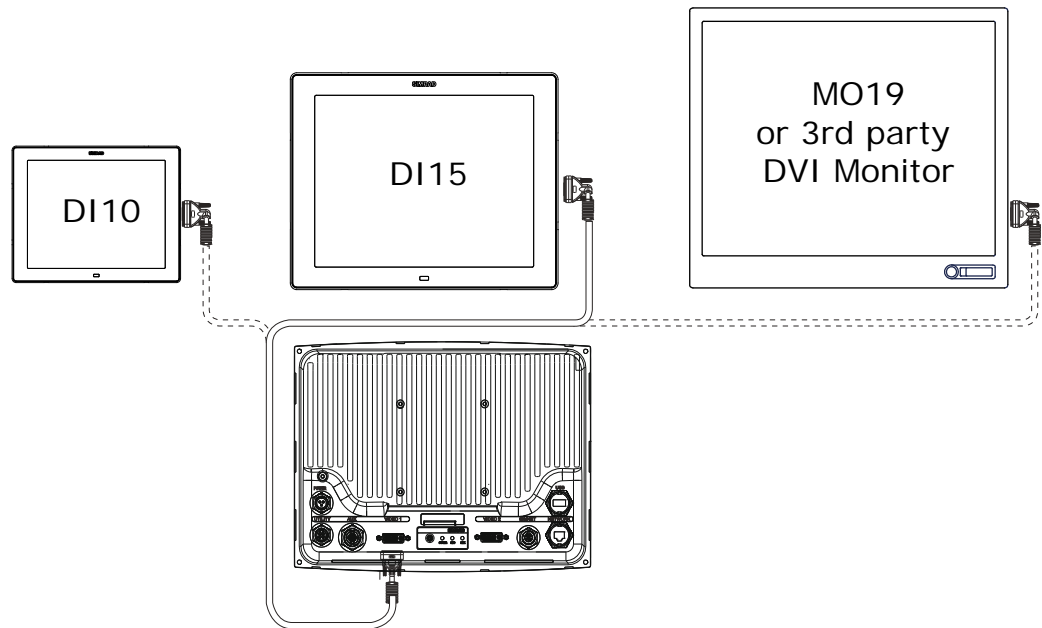
DI10, DI15 Display Power Connector



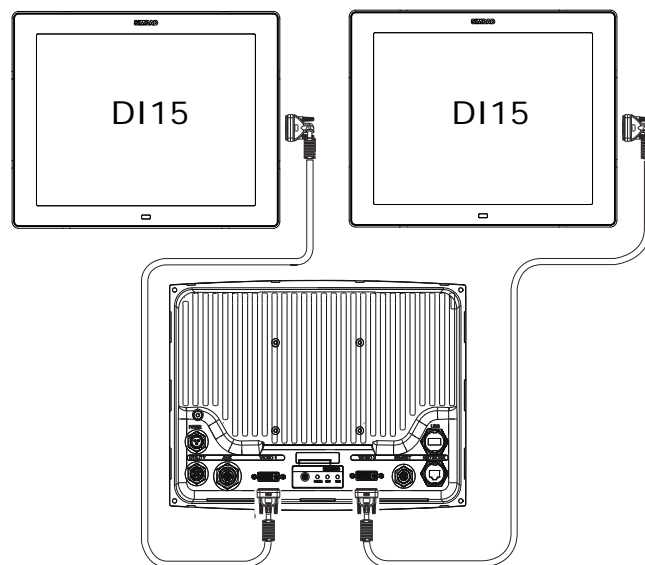
Pin 1 & 2 Black. Battery (-)  
Pin 3 & 4 Red. Battery (+) 12-24 V DC

## Video Out

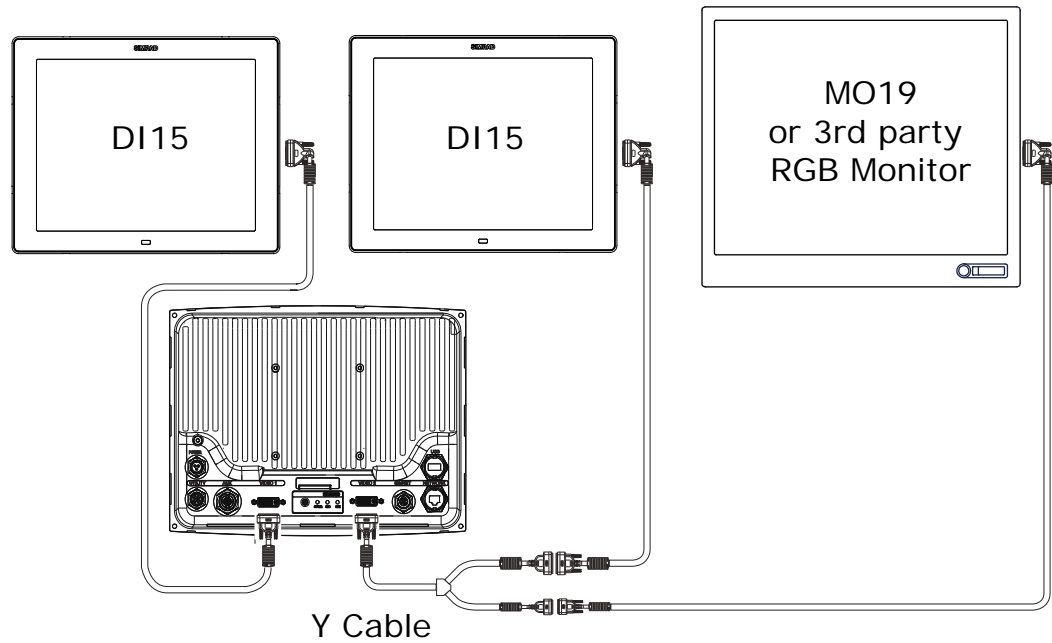
The NSO Marine Processor has 2 DVI connectors. **Video 1** is a DVI-D port supporting just a DVI digital display or monitor.



Both video ports output the same information at the same resolution, so if using DI10 or DI15 displays both screen sizes have to be the same size. However a monitor with a built in scaler such as MO19 can be combined with a different size display.



**Video 2** is DVI-I, which can support a DVI display monitor and also with the use of an optional Y cable, can also output to an RGB monitor.



Video-Out cable part number options

Part Number	Description
AA010152	3 m (9.8 ft) Video cable DVI-HD26 for DI10/DI15
AA010154	10 m (33 ft) Video cable DVI-HD26 for DI10/DI15
AA010159	0.3 m (1 ft) Y Cable. DVI-DVI/RGB
AA010162	5 m (16.5 ft) HDMI small connector option for DI10 or DI15 displays
AA010164	15 m (50 ft) HDMI small connector option for DI10 or DI15 displays
AA010157	5 m (16.5 ft) DVI -DVI video cable for MO19 monitor

## SimNet

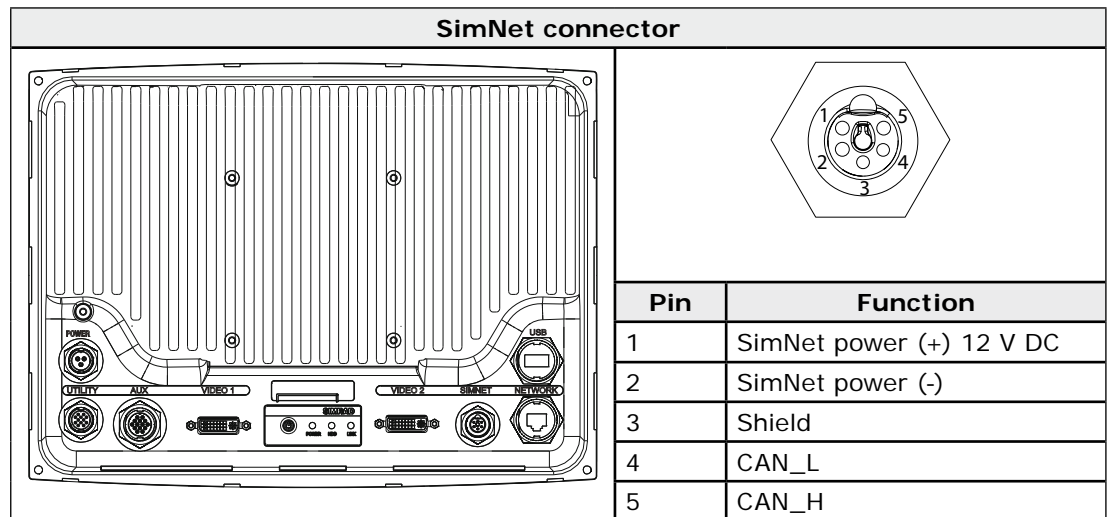
SimNet is a data network based on NMEA2000 CAN bus technology that makes interconnection and integration of Simrad and NMEA2000 products simple. SimNet permits the exchange of data between the interfaced products and enables the flow of commands and instructions between the various SimNet and NMEA2000 compatible products. The data transfer capability of SimNet is 50 times higher than the NMEA0183 standard at 4800 baud.

The advanced SimNet Plug & Play (P&P) function provides flexibility and automatic interface setup to Simrad products. Previous models of Simrad products that are not SimNet compatible and non-Simrad products also benefit from this P&P setup function.

Certain NMEA0183 data can be converted to and from the SimNet network by;

- connecting directly to the NMEA0183 port on an NSO Marine Processor
- using an optional converter unit such as the AT10
- connecting to a device that has built-in capability to convert NMEA0183 to SimNet / NMEA2000

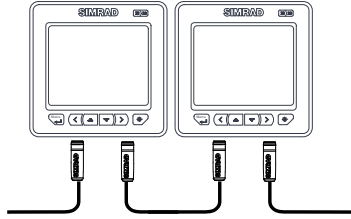
Most NMEA2000 devices can be connected directly to a SimNet backbone and SimNet devices can be connected to a NMEA2000 network by using adapter cables. (see *SimNet cables list on page 86*)



### SimNet: The basics

- SimNet is Simrad's proprietary data network based on NMEA2000 CAN bus.
- SimNet is a powered network. It must have a separate 12-15 V DC power supply protected by a 5 Amp fuse. Do not connect the SimNet power cable to the same terminals as the start batteries, Autopilot Computer, Radar, thruster or other high current products.
- A SimNet network consists of a linear "backbone" from which "drop cables" to SimNet devices connect. Devices that have more than one SimNet connector can be part of a SimNet backbone (daisy chained) (But not as part of a NMEA2000 backbone).
- A drop cable is a SimNet cable that connects a SimNet device to the backbone. A drop cable has a maximum length of 6 m (20 ft).
- A SimNet Network has a maximum cable length of 120 m (394 ft), which includes drop cables + 30 m (98.5 ft) mast cable. Total 150 m (500 ft) max.
- A SimNet network, needs to have a terminator at each end of the backbone. A terminator can be one of the following:
  - a power cable with built in terminator (red cap)
  - a terminator plug (red cap)
  - terminated in-line joiner (red locking collars)
  - a wind transducer (terminator is in the mast head unit as opposed to mast cable).

- Certain Simrad products have two SimNet connectors, which can be made to be part of the backbone. This daisy chaining cannot be part of a NMEA2000 backbone



- NMEA2000 devices can be connected to the SimNet Network providing they:
  - are NMEA2000 certified
  - meet the CE, FCC regulations with a SimNet adapter cable
  - do not exceed the SimNet load specification (please refer to separate document Simrad SimNet Installation Manual (20222006))

## Planning and installing a SimNet backbone

Plan the SimNet backbone carefully

For part numbers refer to **SimNet Accessories** page 86

The SimNet backbone needs to run between the locations of all SimNet products you want to install, and be less than a 5.5 m (18 ft) cable run from a SimNet device.

Choose from the following components to make up your SimNet backbone

- SimNet cables: 0.3 m (1 ft), 2 m (6,6 ft), 5 m (16.6 ft), and 10 m (33 ft) cables
- SimNet power cables with or without termination
- SimNet in-line joiner with or without termination
- T-Joiner. Use at locations where you want to connect a single SimNet device or join lengths of SimNet cable
- 7 way joiner. Use to connect up to 5 devices at one location
- Wind transducer. If using a wind sensor, plan to connect this to one end of the backbone as this has a terminator built in

## Power the SimNet network

A SimNet network requires its own 12 V DC power supply protected by a 5 amp fuse or breaker. For 24 V use a DC-DC converter

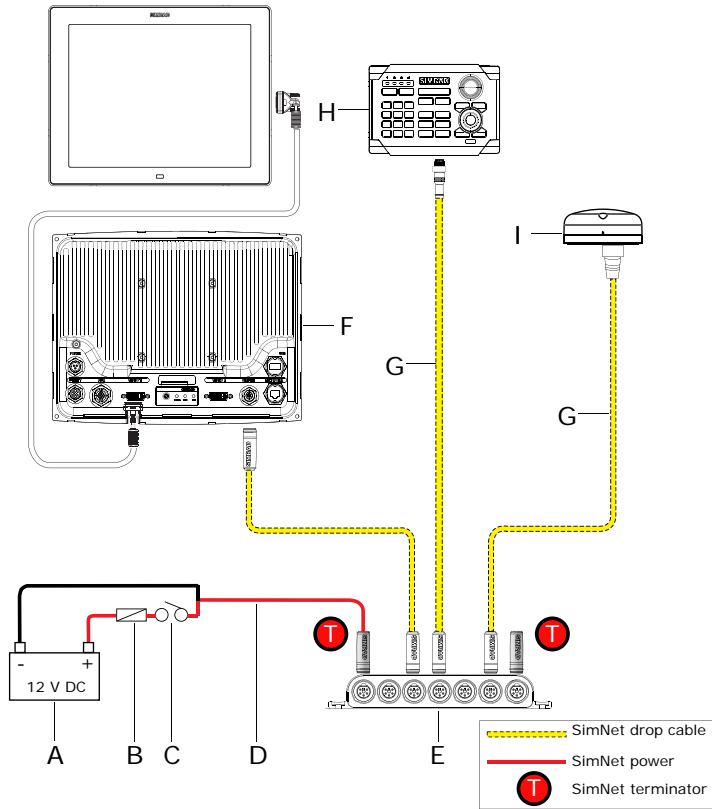
Connect power at one end of the backbone for smaller systems using a SimNet power cable with termination (red cap).

For larger systems introduce power at central point in the backbone to “balance” the voltage drop of the network. Use SimNet cable without termination (yellow cap) (24005910) (See system drawings following)

*If joining to an existing NMEA2000 network or similar CAN bus network that has it's own power supply, do not connect to another power supply.*

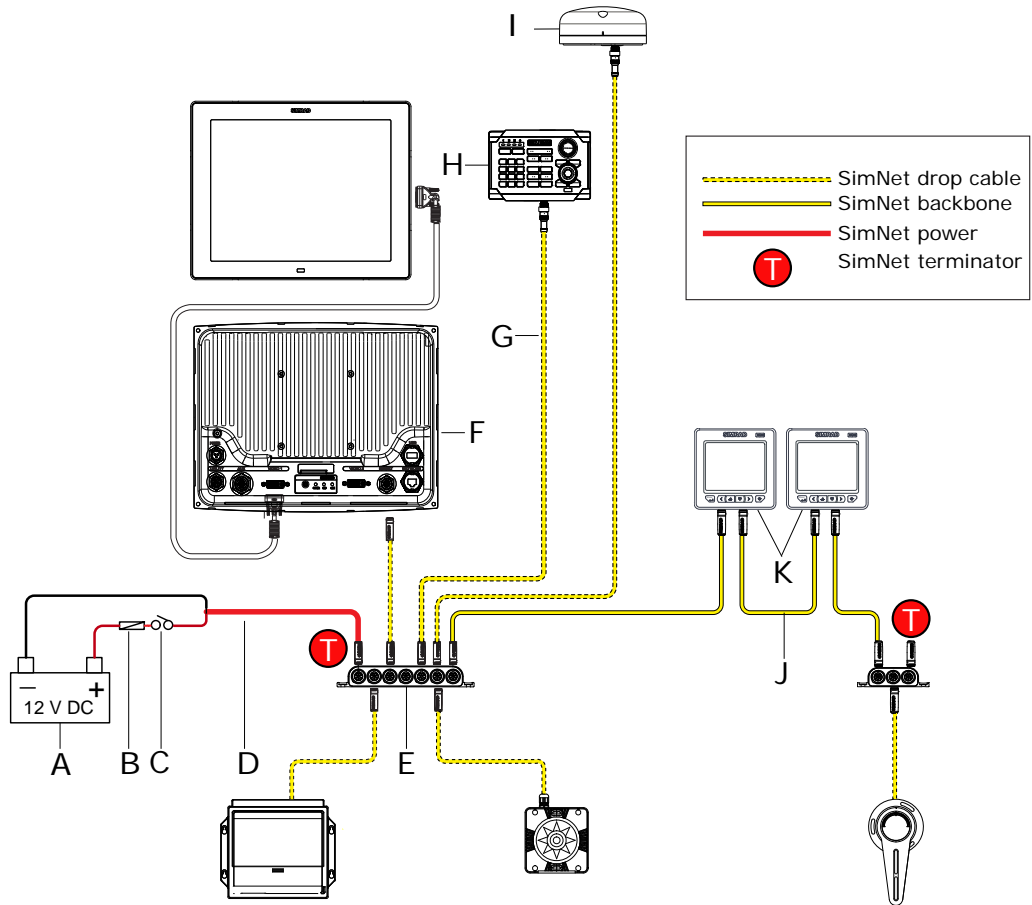
*Do not connect the SimNet power cable to the same terminals as the start batteries, Autopilot Computer, Radar, thruster or other high current products*

The drawing below shows a small SimNet network. Power is introduced at one end using a SimNet power cable with termination ending with a second terminator.



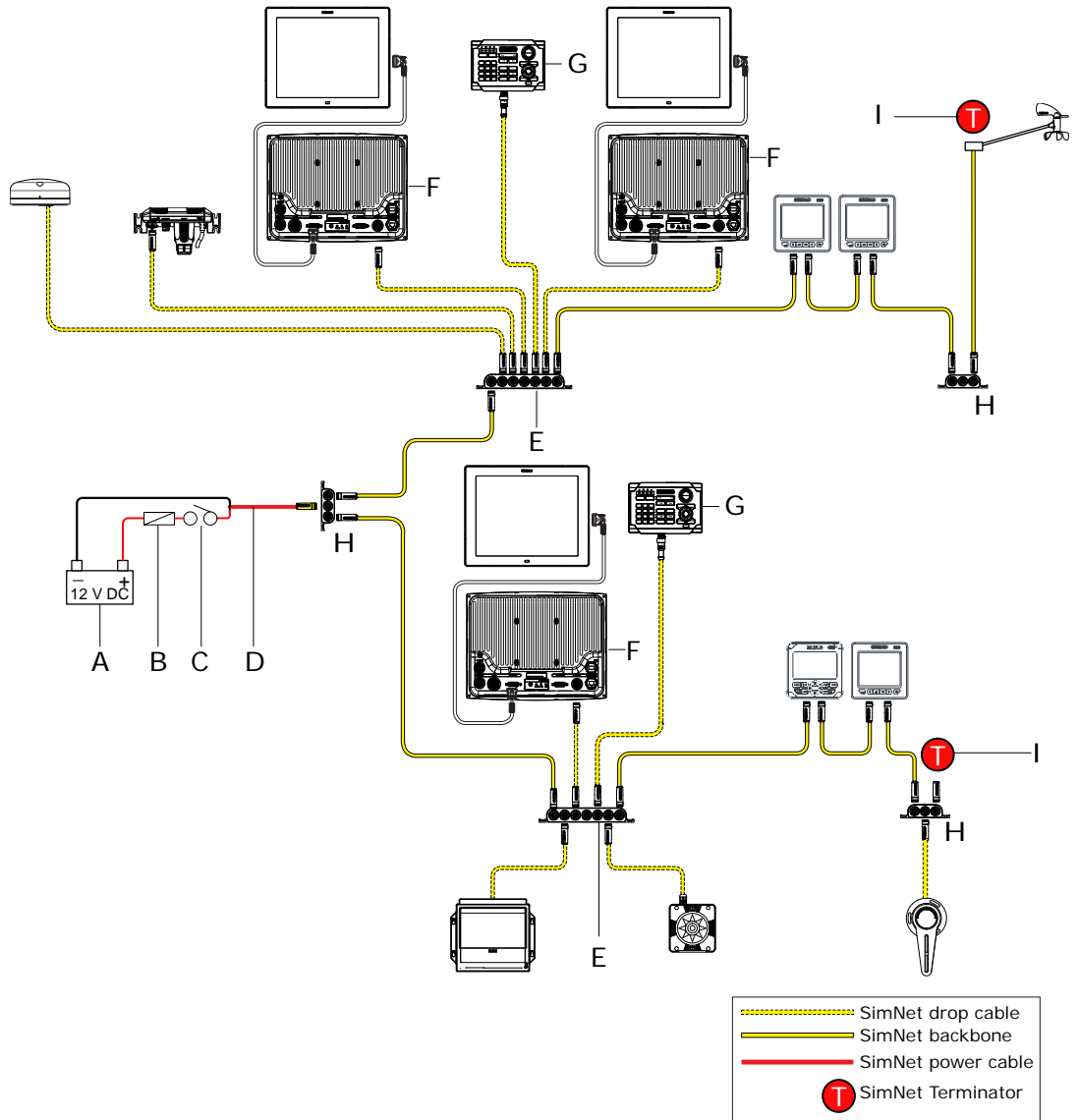
Key	Description
A	SimNet power source. Stable 12 V DC only
B	5 Amp fuse or breaker
C	Switch
D	SimNet power cable with termination (red disc) (24005902)
E	SimNet 7 way joiner
F	NSO Marine Processor
G	Micro-C to SimNet cable
H	OP40 Controller
I	GS15

A slightly larger system below. Power is connected at one end using terminated power cable. A second terminator is required at the end of the backbone.



Key	Description
A	SimNet power source. Stable 12 V DC only
B	5 Amp fuse or breaker
C	Switch
D	SimNet power cable with termination (red disc) (24005902)
E	SimNet 7 way joiner
F	NSO Marine Processor
G	OP40 with Micro-C to SimNet cable
H	OP40 Controller
I	SimNet or NMEA 2000 GPS antenna
J	SimNet backbone
K	SimNet backbone daisy chained using instruments with two SimNet ports.

For larger systems introduce power at central point in the backbone to “balance” the voltage drop of the network. Use SimNet cable without termination (yellow cap) (24005910)



Key	Description
A	SimNet power source. Stable 12 V DC only
B	5 Amp fuse or breaker
C	Switch
D	SimNet power cable without termination (yellow disc) (24005910)
E	SimNet 7 way joiner
F	NSO Marine Processor
G	OP40 Controller with Micro-C to SimNet cable
H	SimNet 3 way joiner
I	Terminator (SimNet Wind Vane includes built-in terminator)



## Integrating SimNet and other CAN networks

Increasingly there are vessels that will have NMEA2000 based networks provided by different manufacturers. If networks from different manufacturers are required to share data, it is important to plan how both networks are going to interface to each other.

All NMEA2000 networks such as SimNet or C-ZONE follow the same NMEA2000 rules:

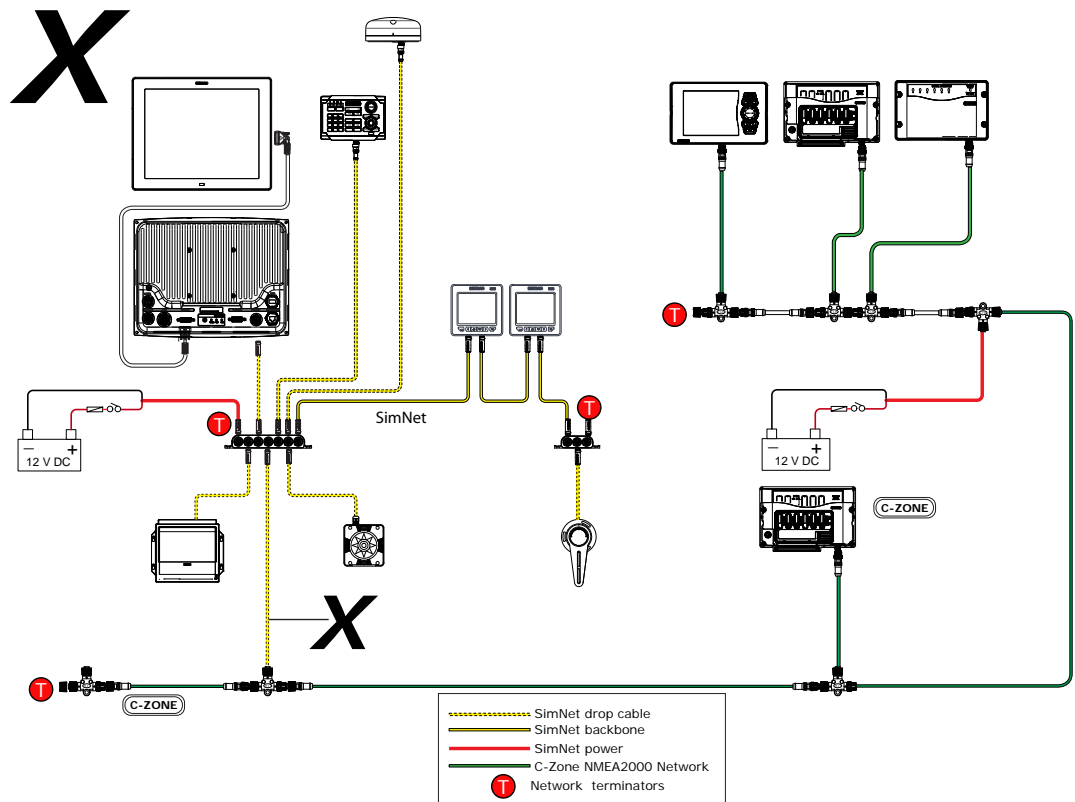
- a continuous backbone with devices connecting by a drop cable no more than 6 m (20 ft)
- two terminators, one at each end of the network
- a single 12 V DC power supply

Problems can occur if two networks are connected without consideration of the above rules.

The example below shows an **incorrect** installation.

The issues are:

- the SimNet network connects to the C-Zone network via a drop cable
- there are four terminators
- 12 V DC is connected in two places without been isolated. This can be serious especially if the power is coming from two separate sources such as the house bank and from the start batteries.



When interfacing to C-ZONE or another NMEA2000 network it is recommended to use a BEP Network interface bridge (A) to join the two network backbones together.

C-ZONE / NMEA2000 Network interface bridge isolates the power of the two networks but allows data to be freely shared between.

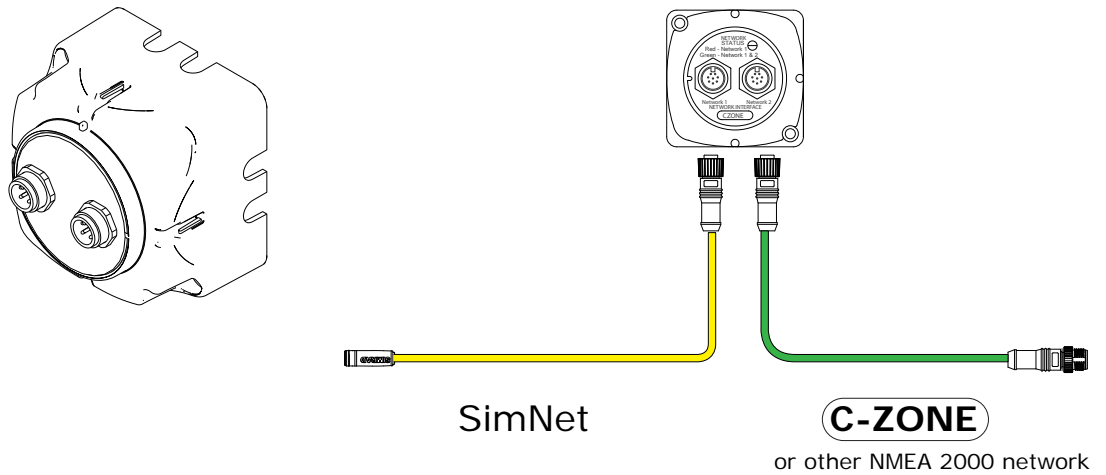
The Network Interface has built in terminators so needs to be placed at the extremity of each network backbone.

The Interface Bridge can also be used for expansion of the SimNet network, when the maximum node limit (node = any device connected to the SimNet network) for the network has been reached. Once a Interface Bridge has been fitted, a further 40 nodes can be added.

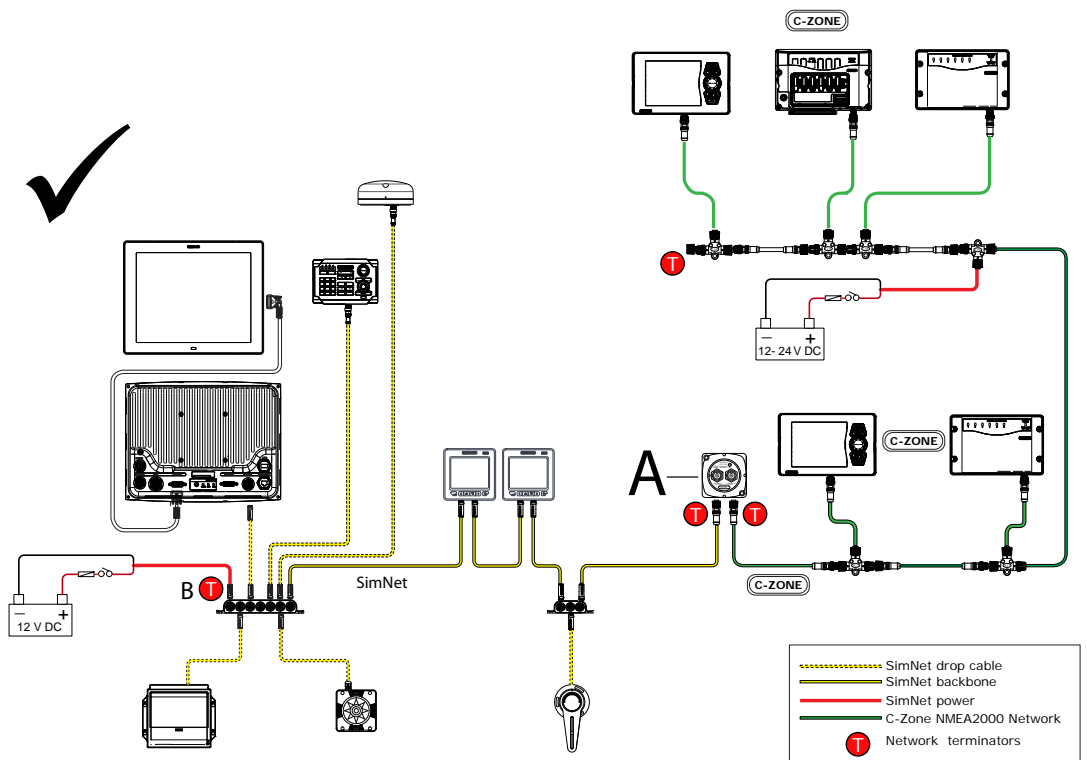
The Network Interface is available from your BEP dealer. For more information please refer to the BEP web site [www.bepmarine.com](http://www.bepmarine.com).

BEP part number 80-911-0057-00

A SimNet to Micro-C cable (24006413 ) is required to connect to a SimNet network



Below is the correct method to interface to another NMEA2000 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

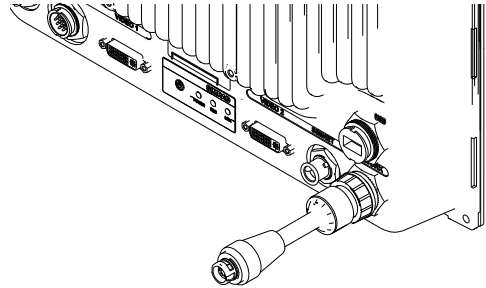


## Ethernet

The NSO system uses an Ethernet network to interconnect high bandwidth devices such as radar and echo sounder. The NSO marine processor has one Ethernet network port with an RJ45 connector.

A short RJ45 male to 5 pin female cable 160mm (6") is included with the NSO and is fitted to the NETWORK port. This cable is a cross-over Ethernet cable and will allow the NSO to connect directly or via an NEP network switch to the latest Ethernet performance modules using the range of yellow 5 pin Ethernet cables.

Cables are retained by a bayonet type locking collar.



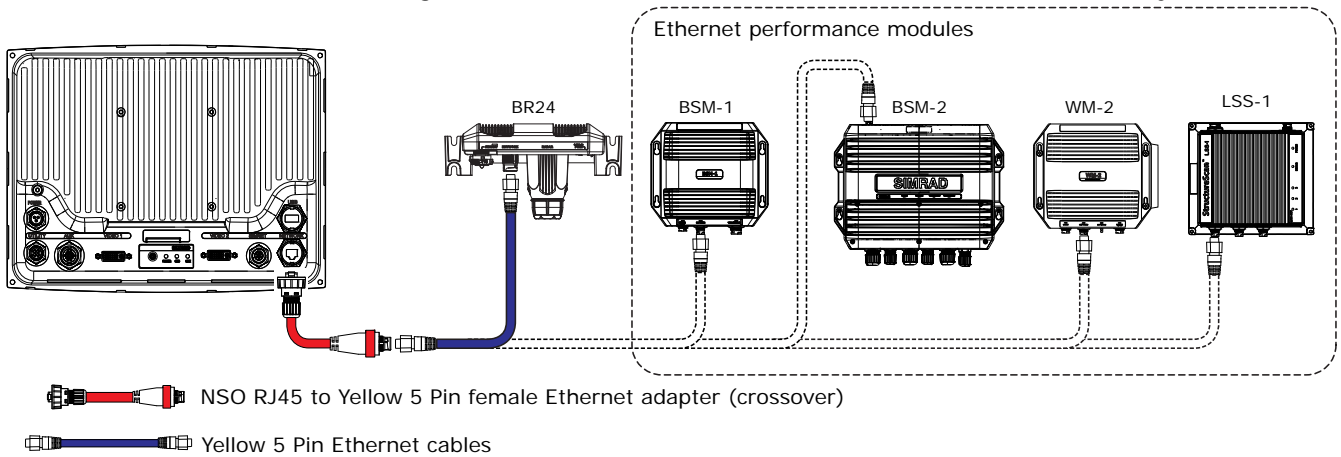
<b>RJ45 to 5 Pin Ethernet Adapter cable for NSO (Red) crossover 000-10437-001</b>			
<b>5 Pin Yellow</b>		<b>RJ45</b>	
Pin	Func	Pin	
1	TX +	3	TX +
2	TX -	6	TX -
3	RX +	1	RX +
4	RX -	2	RX -
5	NC		

Note: For adaptation of the RJ45 connector found on the range of HD radar processors, a straight through RJ45 male to 5 pin yellow adapter cable is available

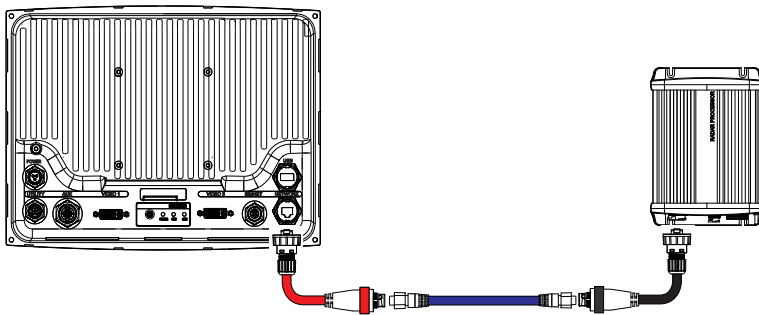
<b>RJ45 to 5 Pin Ethernet Adapter cable for HD Radar straight 000-10438-001</b>			
<b>5 Pin Yellow</b>		<b>RJ45</b>	
Pin	Func	Pin	
1	TX +	1	TX +
2	TX -	2	TX -
3	RX +	3	RX +
4	RX -	6	RX -
5	NC		

## Connecting NSO to one other Ethernet performance module

Using the supplied RJ45 to 5 Pin yellow adapter, any one of the Ethernet performance modules using one of the 5 Pin Yellow Ethernet cables can connect directly to an NSO



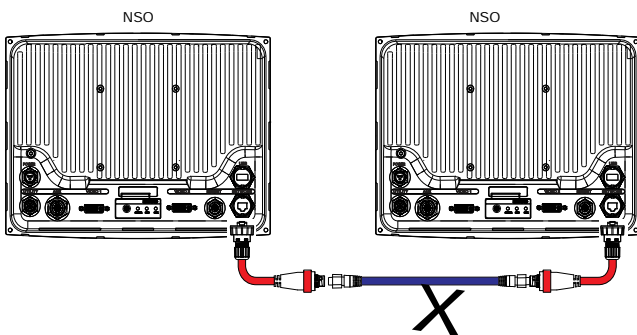
## Connecting directly to HD Radar



- NSO RJ45 to Yellow 5 Pin female Ethernet adapter RED (crossover)
- HD Radar RJ45 to Yellow 5 Pin female Ethernet adapter BLACK (straight through)
- Yellow 5 Pin Ethernet cable

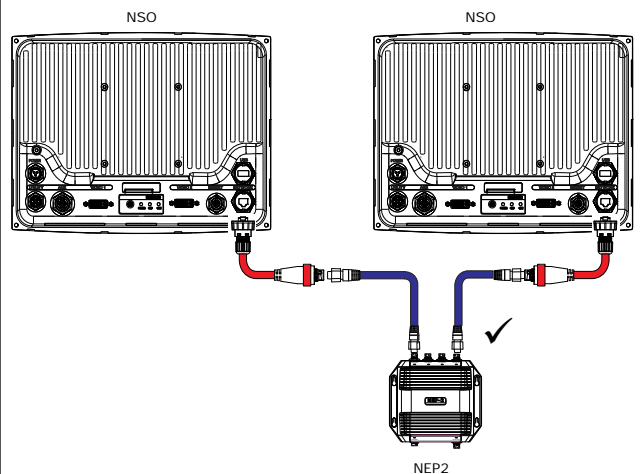
## Connecting two NSO Processors

Two NSO Marine processors cannot be joined when they both use the supplied crossover adapter cable



- NSO RJ45 to Yellow 5 Pin female adapter (crossover)
- Yellow 5 Pin Ethernet cable

It is recommended to use an NEP-2 network switch to connect two NSO processors

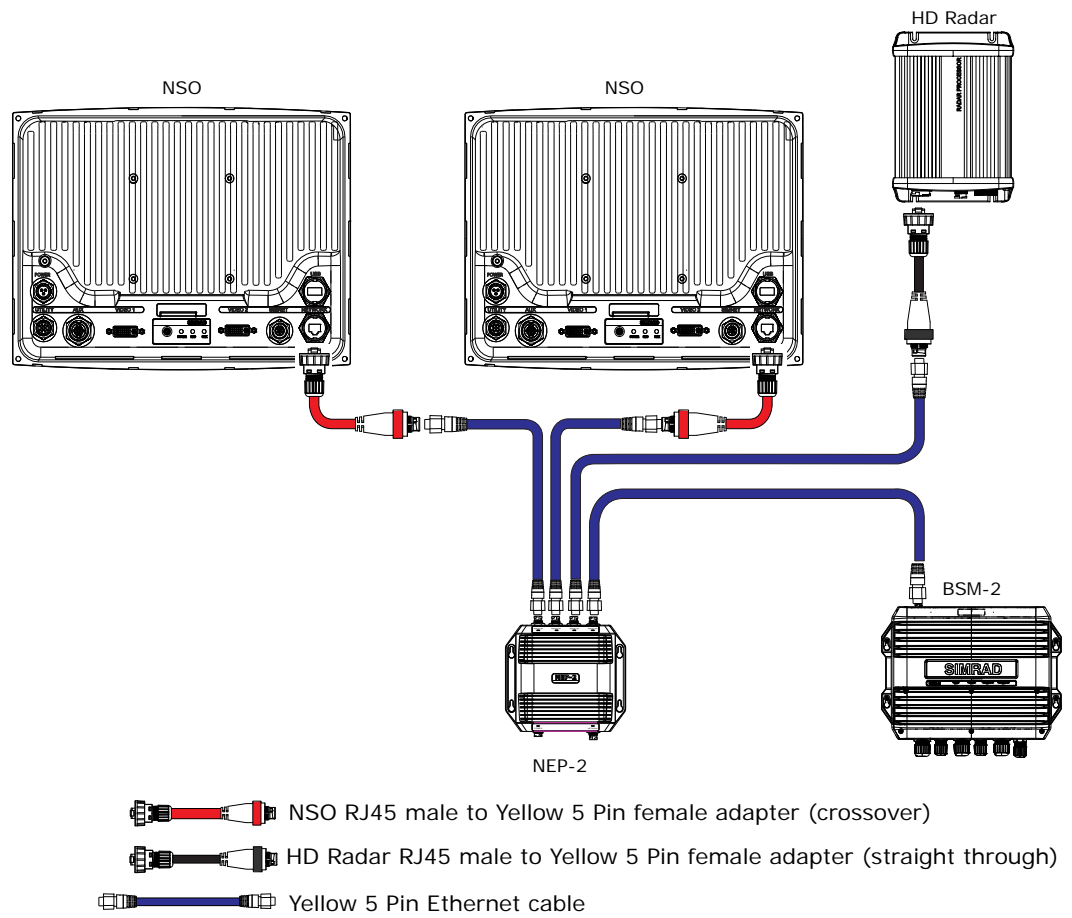


- NSO RJ45 to Yellow 5 Pin female adapter (crossover)
- Yellow 5 Pin Ethernet cable

## Connecting to two or more performance modules

Connecting to more than one Ethernet device will require using an Ethernet network switch such as NEP-2.

*Note: LSS-1 structure scan module has a built in 3 port Ethernet switch*

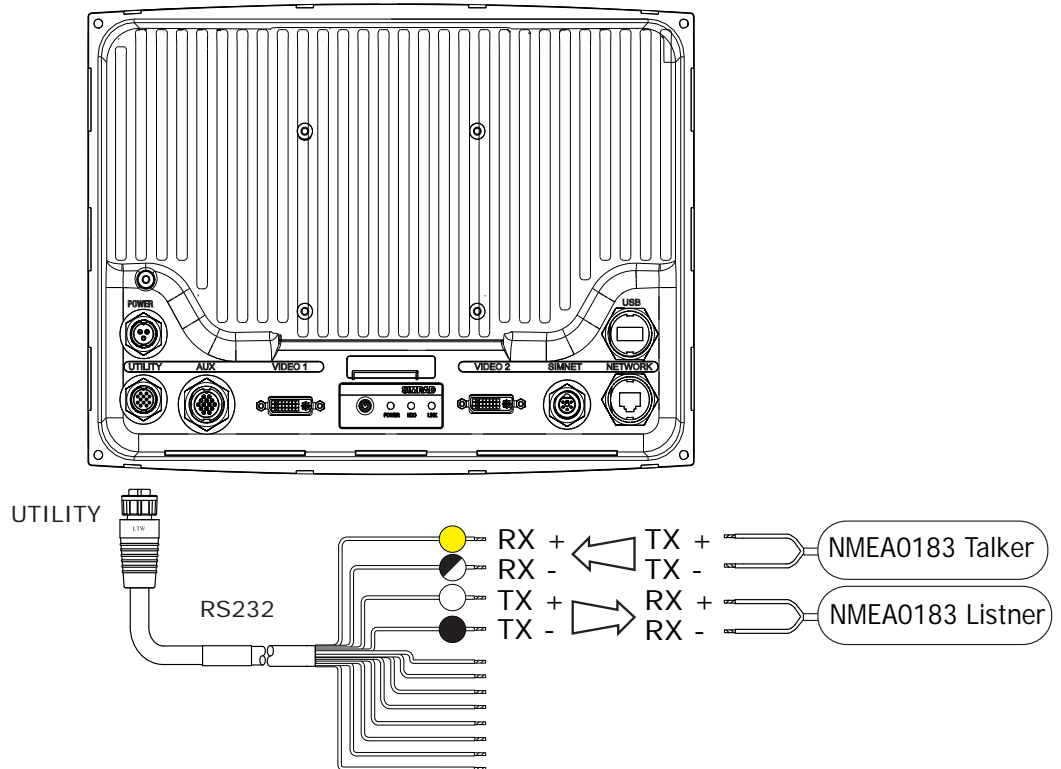


## NMEA0183 wiring

To exchange NMEA0183 data, the NSO has one NMEA0183 communication.

The port uses RS232 protocol and can be configured in the software for different baud rates. NMEA sentences can be turned on or off. See **Serial Port Setup**, page 72

Refer to **Supported NMEA0183 sentences** on page 89 for a complete list of sentences



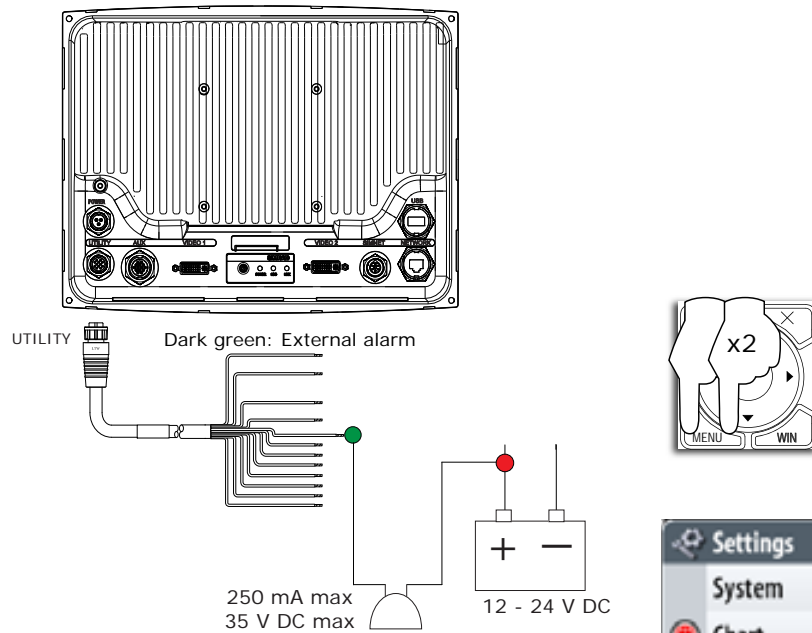
Pin	Color	Cable color description	Cable Connector
3	Yellow	NMEA0183 RS232 RX +	
6	Black/White	NMEA0183 RS232 RX -	
5	White	NMEA0183 RS232 TX +	
4	Black	NMEA0183 RS232 TX - (GND)	
7	Orange	No Connection: Isolate	
8	Blue	No Connection: Isolate	
9	Dark Green	External Alarm	
11	Gray	No Connection: Isolate	
12	Light Green	Remote Power On	
1	Purple	No Connection: Isolate	
2	Pink	No Connection: Isolate	
10	Brown/White	No Connection: Isolate	

## External alarm

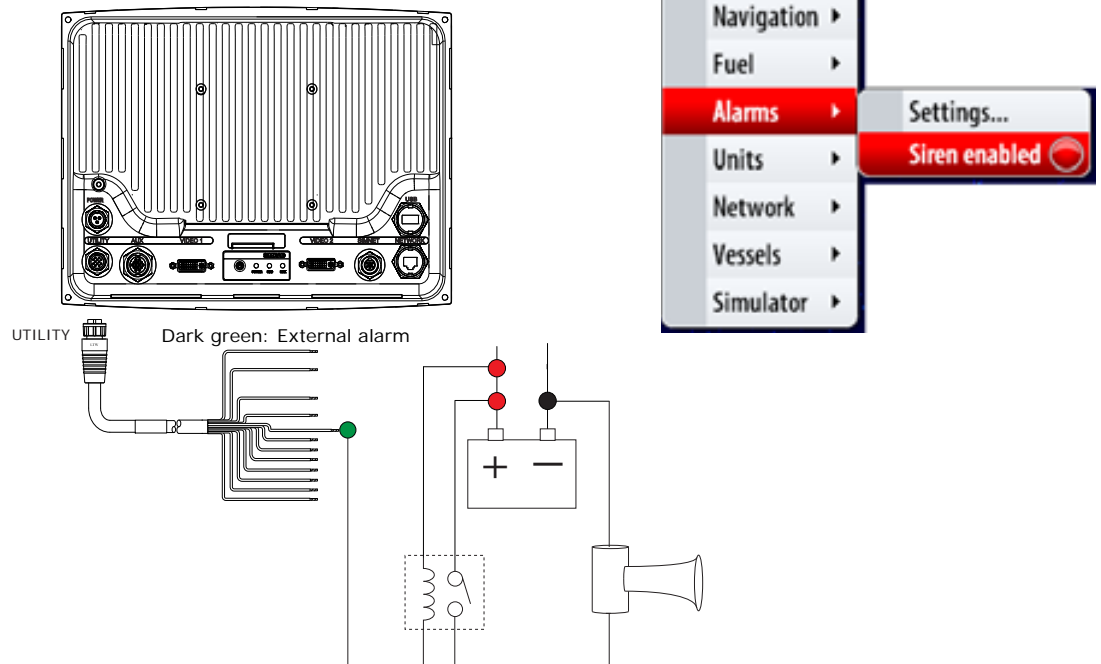
An external alarm can be connected to one or more NSO processors on the network. The external alarm can be a small peizo buzzer connected directly or a horn siren connected via a relay.

The external alarm output is the dark green wire on the Utility cable. This pulls to ground to sound the alarm. If the current drawn by the external alarms is more than 250 mA, fit a relay.

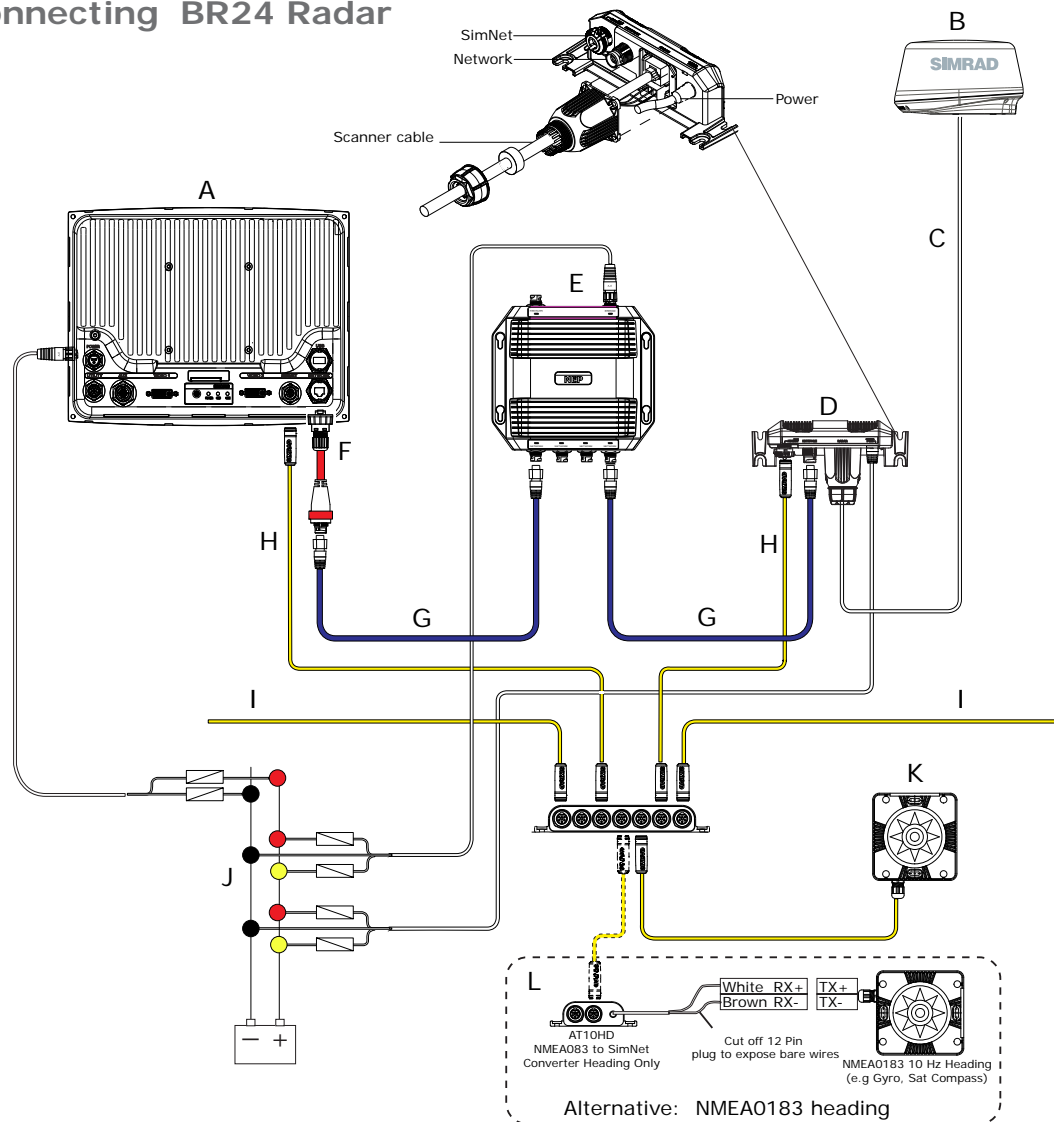
Alarms are configured globally in the system i.e they can be configured on one display and be seen, heard and acknowledged from all displays. How ever the external alarm siren can be enabled or disabled on individual displays. For information on configuring alarms refer to the Alarms section in the operation manual



For sirens that draw more than 250 mA use a relay



## Connecting BR24 Radar

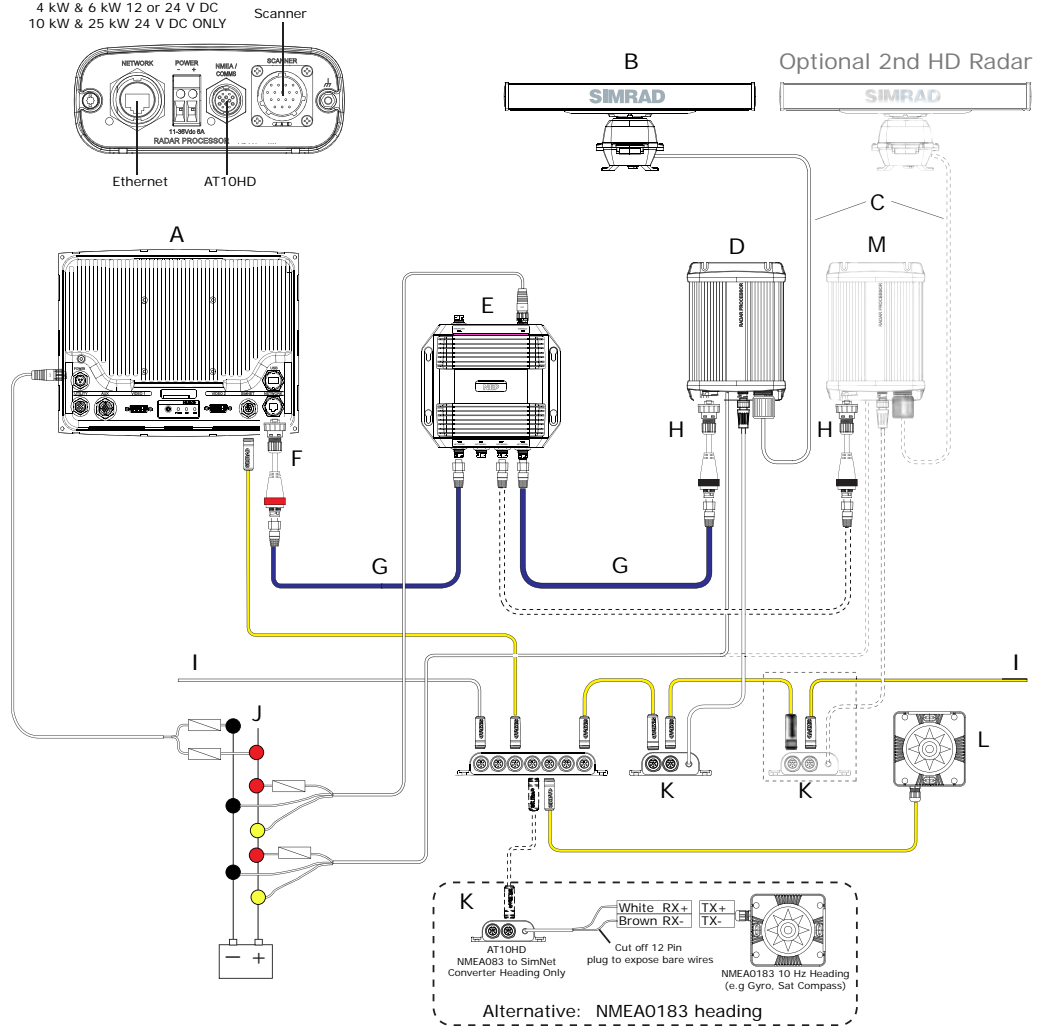


Key	Description
A	NSO Marine Processor.
B	BR24 BroadBand™ Radar scanner.
C	Scanner cable. 20 m (65 ft) : Optional 10 m (33 ft) and 30 m (98 ft).
D	RI10 Radar interface box.
E	NEP (Network Expansion port) 5 port ethernet switch (or LLS-1 structure scan module that has a built in 3 port Ethernet switch).
F	Ethernet adapter RJ45 male to 5 pin yellow female
G	Ethernet cable 5 pin yellow. BR24 comes with a 2 m (6.5 ft) 5 pin cable. See <b>Ethernet cables yellow</b> on page 86 for more cable length options.
H	SimNet Drop Cables: The BR24 and NSO are connected to the SimNet backbone. BR24 uses heading at 10 Hz to calculate MARPA and enable radar overlay.
I	SimNet backbone. Refer to <b>SimNet</b> section on page 30.
J	Power 12-24 V DC. Make sure yellow power on wire of BR24 is connected to power.
K	For MARPA and radar overlay a heading sensor is required. Use a SimNet / NMEA2000 heading sensor such as the RC42.
L	If a NMEA0183 10 Hz heading sensor is installed, convert to NMEA0183 to SimNet using an AT10HD.



## Connecting HD Radar

2 kW 12 V DC ONLY  
4 kW & 6 kW 12 or 24 V DC  
10 kW & 25 kW 24 V DC ONLY

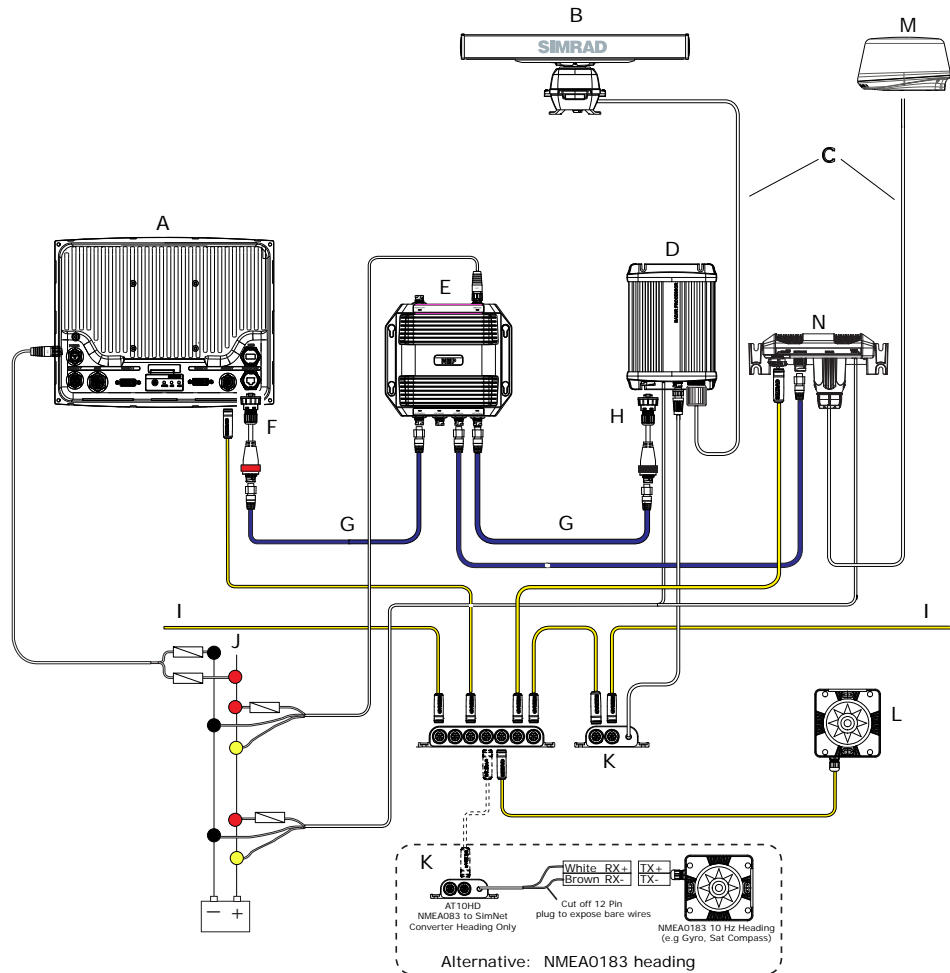


Key	Description
A	NSO Marine Processor
B	HD Radar Scanner: Options are 2 kW or 4 kW Radome, and 6 kW, 10 kW or 25 kW open array.
C	Scanner cable
D	HD Radar Processor
E	Network Expansion Port (NEP)
F	Ethernet Adapter X over. RJ45 to Yellow 5 pin
G	Ethernet network cable 5 pin yellow Male / Male
H	Ethernet Adapter Straight through. RJ45 to Yellow 5 pin
I	SimNet backbone.
J	Power cable. Make sure a fuse is used. See Radar installation manual for fuse size. <i>Note voltage requirements are model dependant</i>
K	AT10HD: SimNet to NMEA0183 converter (Heading only @10 Hz). Provides heading to the radar processor for MARPA calculations
L	RC42 SimNet heading sensor. Required for radar chart overlay and MARPA)
M	Optional 2nd Radar

## Dual Radar Support

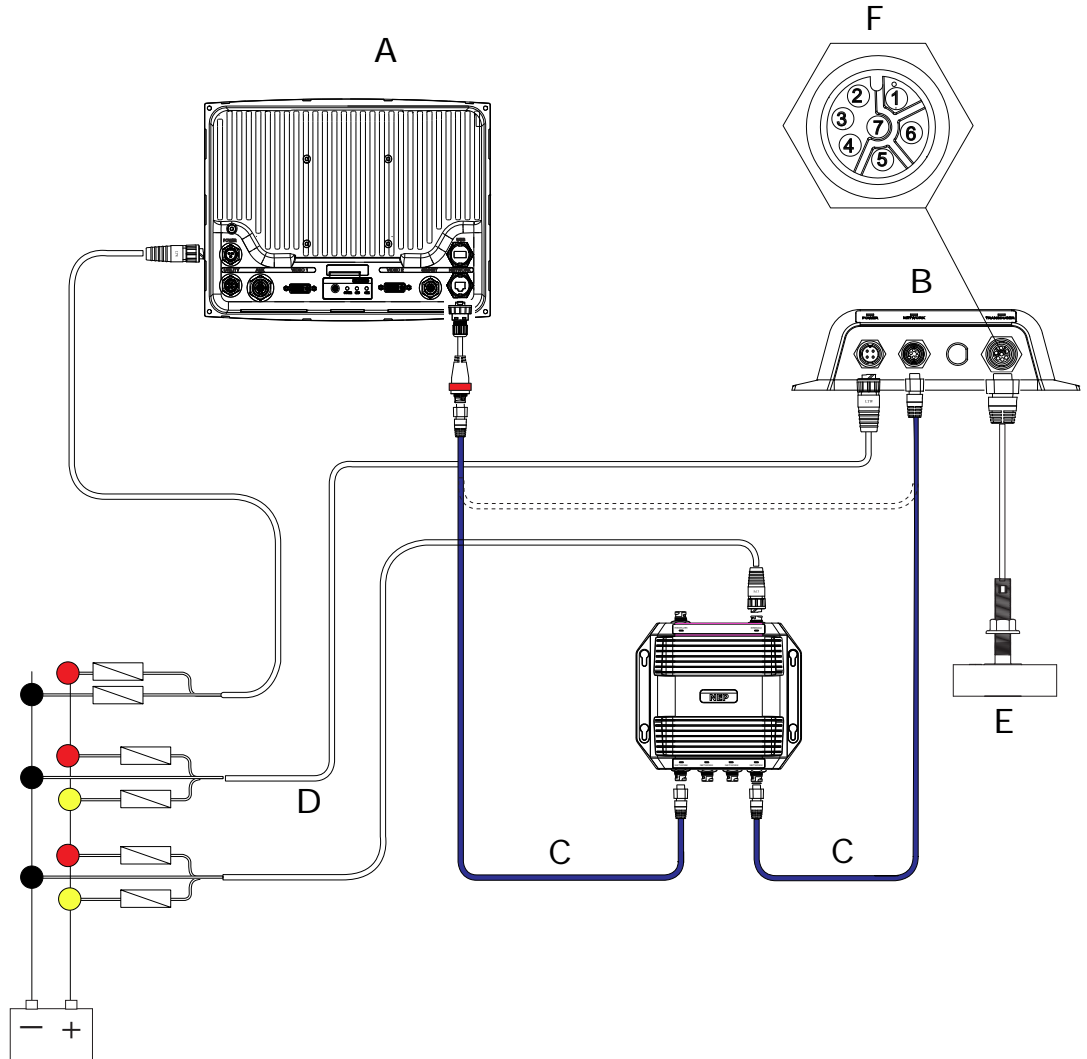
### BR24 and HD radar

Interference will be seen on BR24 at most ranges, when a pulse radar is transmitting at the same time on the same boat. It is Navico's recommendation to only transmit one radar at a time: e.g. BR24 for typical navigational usage, or pulse radar to locate weather cells, defined coastlines at a distance and to trigger Racons.



Key	Description
A	NSO Marine Processor
B	HD radar Scanner: Options are 2 kW or 4 kW Radome and 6 kW, 10 kW or 25 kW open array.
C	Scanner cables
D	HD Radar Processor
E	Network Expansion Port (NEP)
F	Ethernet Adapter X over. RJ45 to Yellow 5 pin (RED)
G	Ethernet network cable 5 pin yellow Male / Male
H	Ethernet Adapter Straight through. RJ45 to Yellow 5 pin (BLACK)
I	SimNet backbone.
J	Power cable. Make sure a fuse is used. See Radar installation manual for fuse size. <i>Note voltage requirements are model dependant</i>
K	AT10HD: SimNet to NMEA0183 converter (Heading only @10 Hz). Provides heading to the radar processor for MARPA calculations
L	RC42 SimNet heading sensor (required for chart overlay and MARPA)
M	BR24 Scanner
N	RI10 Radar Interface box for BR24

## Connecting BSM-1 Broadband Echosounder



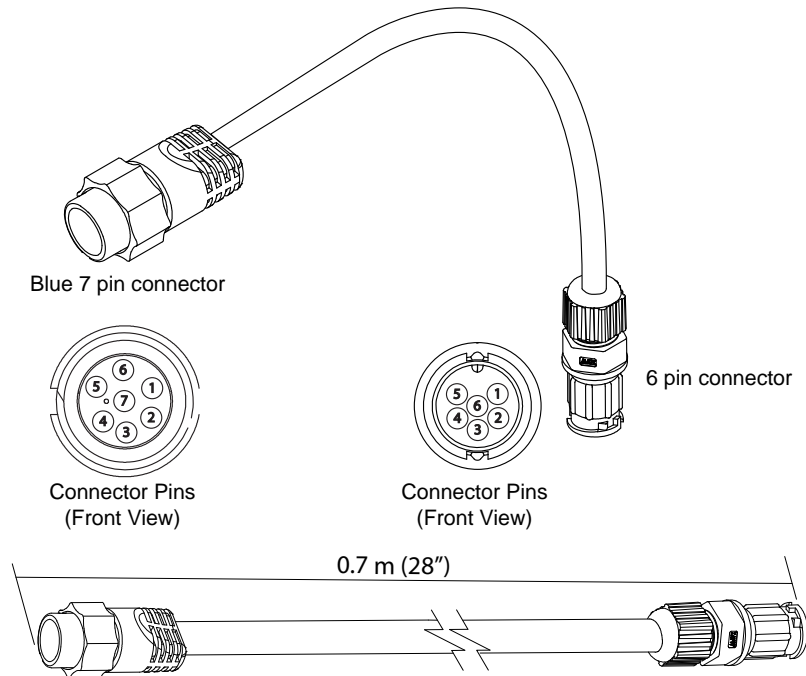
Key	Description
A	NSO display
B	BSM-1 Broadband Echosounder module
C	Ethernet cable yellow 5 pin see <b><i>Ethernet cables yellow</i></b> on page for more cable length options. Cable can be connected directly to NSO or via a Network Expansion Port see <b><i>Ethernet</i></b> page 37
D	12 or 24 V DC
E	Transducer: See <b><i>compatible transducer list</i></b> on page 86
<b>F</b>	<b>Transducer Connector</b>
Pin 1	Depth +
Pin 2	Speed
Pin 3	Speed volts
Pin 4	Temp +
Pin 5	Depth -
Pin 6	Shield
Pin 7	Temp - / speed ground

## BSM-1 Transducer adapter cables

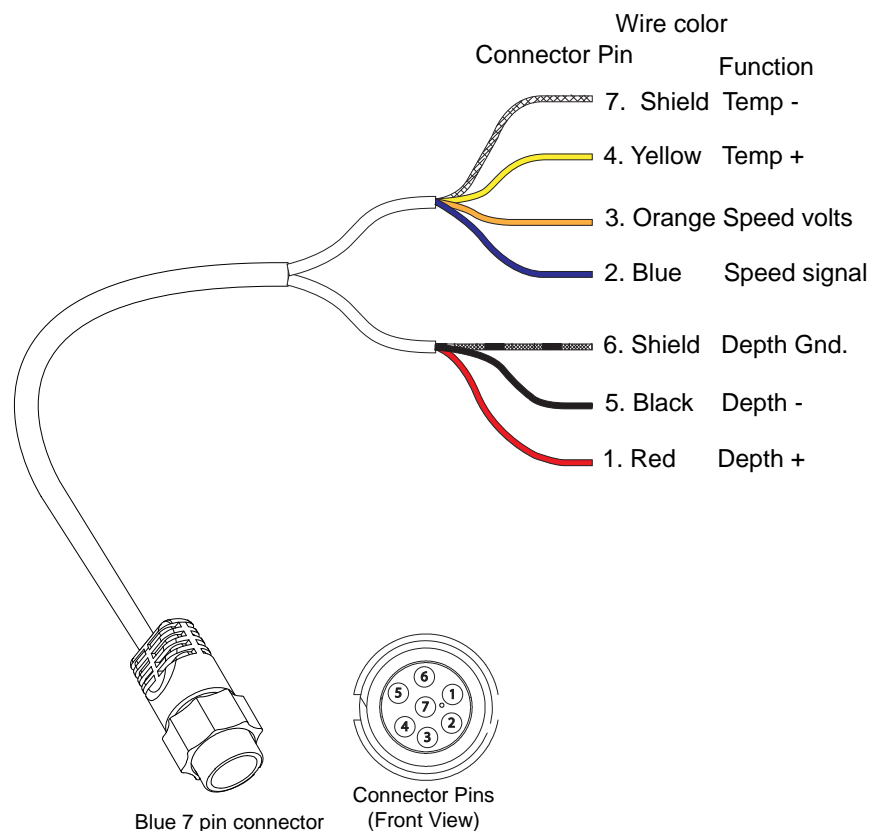
For vessels with existing transducers there are two adapter cables available to assist with BSM-1 installation.

For vessels that already have a transducer that was used with older Navico products that has 6 pin connector. Use 000-00022-001 6 pin to 7 pin transducer adapter cable.

These transducers will require the 10 k temp version of the transducer selected for transducer type in Echo Installation. See the Echosounder Setup section on page 69 for further information.



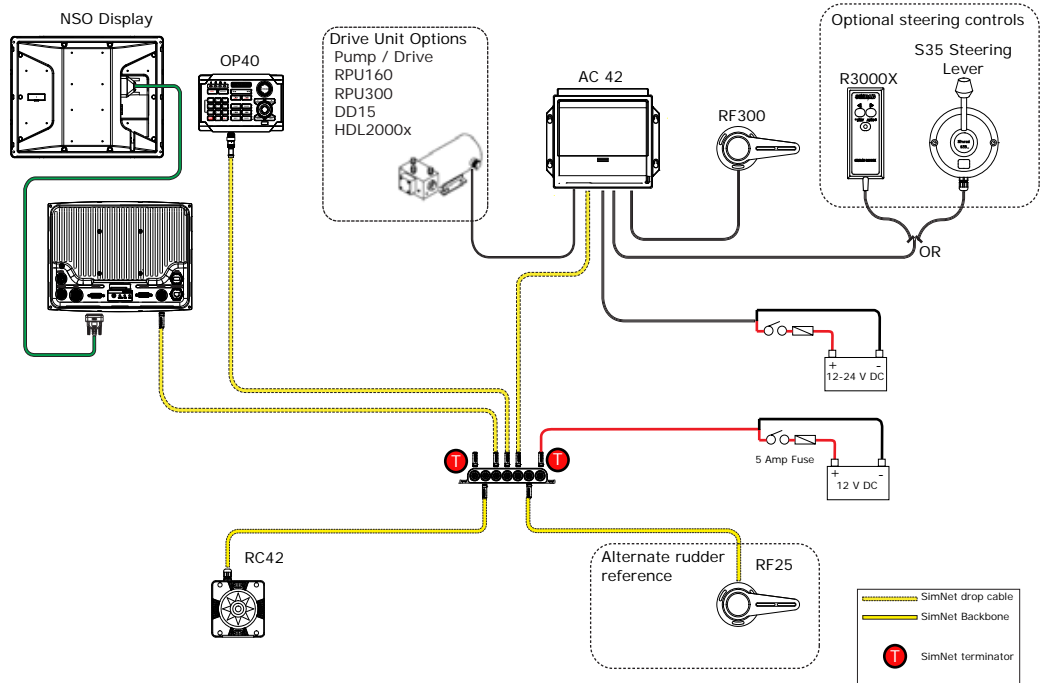
For other transducers that do not have 7 Pin BSM-1 or 6 pin (above) connector that require the connector to be removed. Use 000-10046-001 7 pin to bare wire adapter cable.



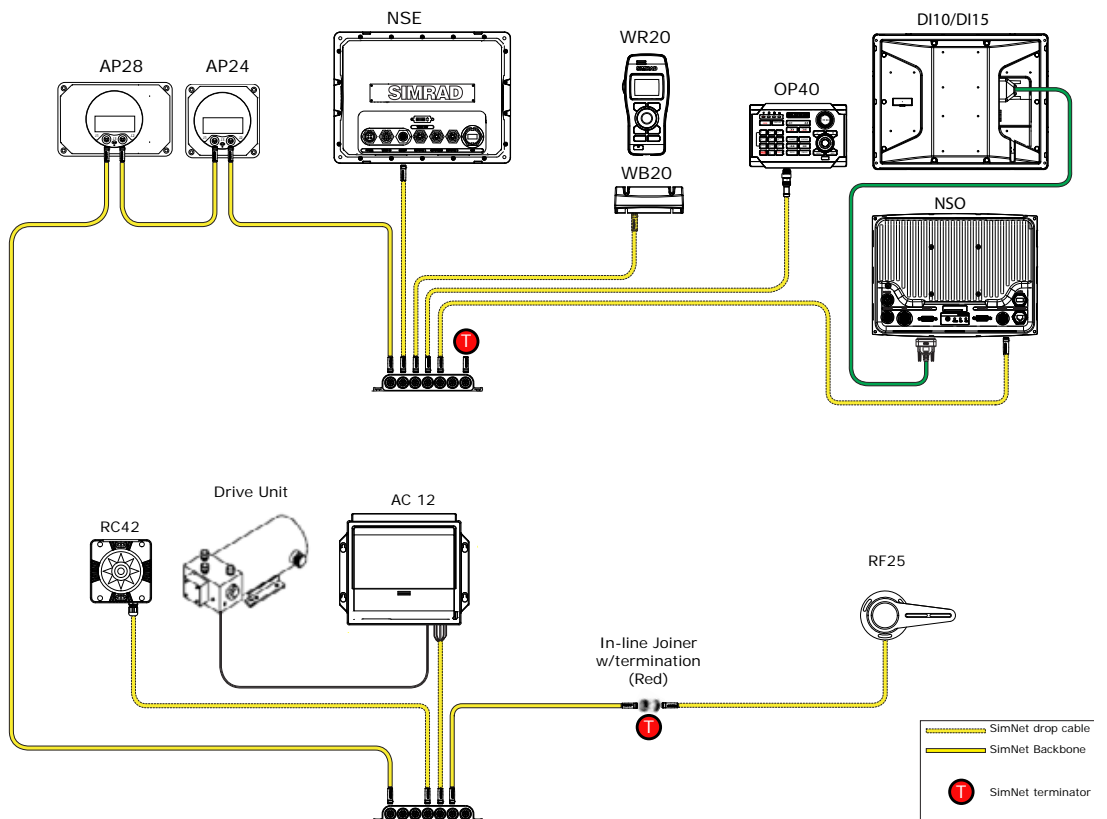
## NSO Auto Pilot Integration

An NSO can be used as a control head for the Simrad AC12 or AC42 Auto pilot computers. It can be used as the sole control head unit or in parallel to AP24 or AP28 control head units.

Full setup and commissioning of the ACxx Auto pilot computer is achievable from an NSO



The NSO in parallel with AP24 and AP28 control head units.

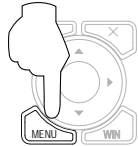


# Commission the system

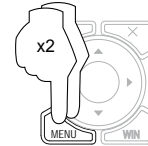
## Operating the menu system

In this manual you will see few direct text references to keys, menus and menu entries, and few step-by-step descriptions. By using graphics we will guide you to the key and the required menu selections.

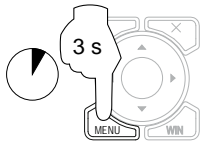
In the illustrations throughout the commissioning section the following symbols are used:



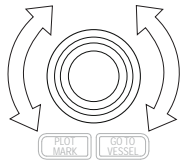
Single short press on illustrated key



Press twice on illustrated key



Press and hold on illustrated key with time indication



Rotate rotary knob



Single short press on rotary knob

References to keys on the operator panel are written in boldface, e.g. **WIN** key.

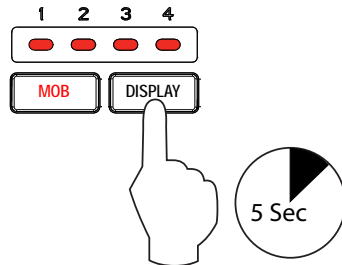
For further information on the operating the system refer to the Operation Manual

## Turning on for the first time

From the factory the OP40 controller is not assigned to control any NSO processors and will not be responsive until it has been assigned to control an NSO or NSE processor.

A press and hold of the **DISPLAY** key for 5 seconds from any OP40 will start all NSO processors and display the OP40 Configuration Wizard on the screen

Turn on all NSO processors



System starts and enters OP40 configuration wizard

(Active display)



All NSO will start and enter into the OP40 Configuration mode. *Note: NSE displays will need to be turned on using their PWR button (if not already switched on by the yellow power control wire)*

When in OP40 configuration mode, all four OP40 LEDs will be lit red

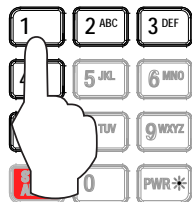
*Note: OP40 configuration wizard can be entered into at any time with a 5 second press of the DISPLAY key.*

## Assigning an OP40 control of a single display

Press 1, 2, 3 or 4 to assign DISPLAY A to LED position 1, 2, 3 or 4 respectively.

DISPLAY A is now assigned to LED position 1 of this OP40

Example user presses 1



## Assigning an OP40 to control multiple displays

Press **DISPLAY** key until the display to be assigned shows the active display page.

Displays connected to other NSO processors will show the inactive selection page

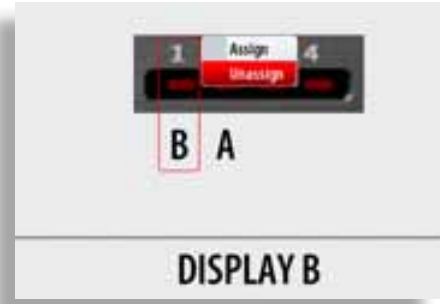
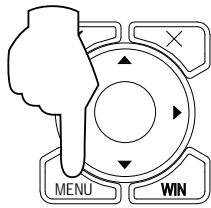


It is logical to assign LED(s) 1 through 4 (left to right) to displays moving from left to right.

*Note: that during assignment the letters assigned to each display (for assignment purposes only) are random and are not in any particular order.*

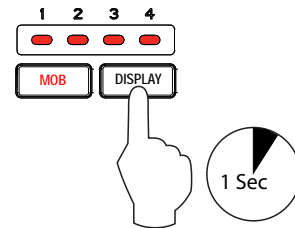
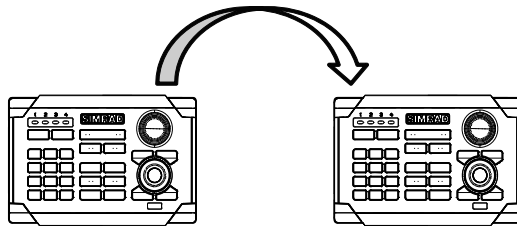
Assign each display to an LED number by selecting a number one through four

## Unassign a display from an OP40



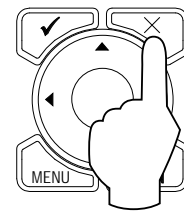
## Configure the next OP40

To take command of another OP40 in configuration mode press and hold the DISPLAY key for 1 second

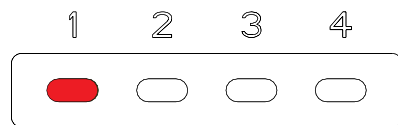


## Finish OP40 configuration

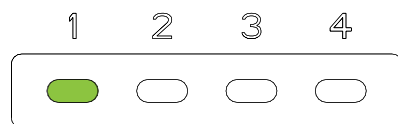
To Exit out of OP40 configuration mode press X



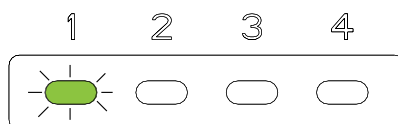
## OP40 LED sequences



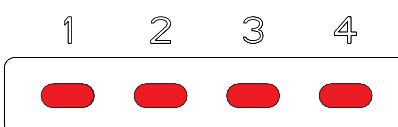
Steady Red: Processor assigned to LED position 1 powered OFF



Steady Green: Processor assigned to LED position 1 powered ON



Flashing Green: Power button has been pressed and the processor is starting up



All LEDs steady RED: System started but the OP40 is not assigned to any display



## Turning on / off: Normal operation

Normal operation mode of turning the unit on /off after OP40s have been configured

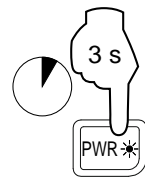
### POWER ON



### STAND BY



### POWER OFF



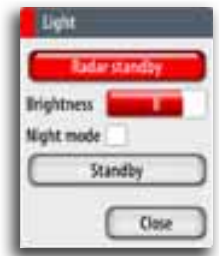
A quick press of the PWR button will start the system: note it may take a few seconds for something to appear on the screen.

If you turn the unit ON when no external equipment is connected you will be asked to run in simulator mode.

When you turn ON the system after the first-time initialization, the system will start with the same page and with settings that were activated when the system was turned OFF.

Pressing standby will turn off the backlight to conserve power. All other functions remain in operation.

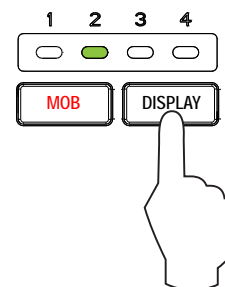
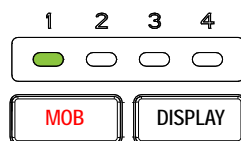
If the radar is transmitting you can turn it to standby mode from within the Light dialog.

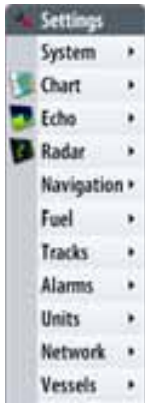


*Note: When turning off the system: The Marine Processor will take approximately 20 seconds to shut down after the display has turned off. It is recommended NOT to remove power from the system until the processor has shut down completely and the OP40 is indicating a red LED*

## Display control selection: Normal OP40 use

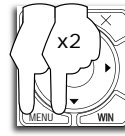
In normal operation mode a green LED indicates which display is being controlled. To take control of the next display press the DISPLAY key. A short press of the DISPLAY key will toggle control through to the next assigned Display LED. The OP40 will only toggle through LED positions that have been assigned to processors.





### System settings menu




To access the system settings menu press










### Language

Language used on menus and dialog boxes



Step 1	Step 2	Step 3	Notes
 <p>Choose Language</p>	 <p>Select Language</p>	 <p>Yes to restart</p>	<p>The display will need to be restarted for change to take effect</p>

### Time: Local Time, Time format, Date Format

Step 1	Step 2	Step 3	Notes
 <p>Choose Local time</p>	 <p>To time format or save</p>		<p>Local time (Time Offset) against GMT from the GPS. Default is GMT</p>
 <p>Highlight Time format</p>	 <p>Choose Time format</p>	 <p>To date format or Save</p>	<p>12 or 24 hour time values Default is 12 hour</p>
 <p>Highlight Date format</p>	 <p>Choose Date format</p>	<p>Save Or Cancel</p>	<p>Day/Month/Year Month/Day/Year</p>



## Commissioning checklist

The NSO has a number of advanced features which can be configured through the settings menu.

It is recommend you become familiar with the operation of the unit using the default settings before making any changes to these menus.

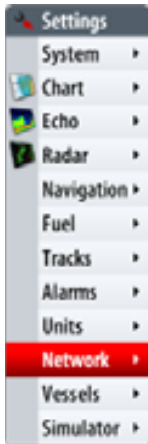
Settings menus will vary depending on the optional sensors and devices attached.

Before changing system settings make sure that all displays are powered on as a lot of settings are global and are shared across the Ethernet network.

It is recommended to note the original settings before making adjustments or changes.

<b>NSO related check list</b>
<b>System</b>
Turn system on for the first time
Configure OP40 controller (s)
Set Language
Set Units
Set time
Set Time and Date format
Set power control option if used. Repeat on all relevant displays
<b>Data sources</b>
Perform auto source selection
Perform any manual source set up
Set NMEA0183 baud rate and output sentences. Settings relevant to displays with NMEA0183 devices attached.
Set up of SimNet groups for parameters such as dimming and alarms
Set up SimNet source selection groups as needed or leave as default. Default is all parameters are set to SIMRAD group
Any custom setup of devices such as renaming sources. Source select advanced
Calibrate any dock side devices e.g SimNet depth offset
Confirm Auto pilot interface
<b>Auto Pilot Setup</b>
Dock side setup
<ul style="list-style-type: none"> <li>• Boat type</li> <li>• Rudder Calibration (VRF)</li> <li>• Rudder Test</li> <li>• Drive voltage</li> </ul>
Sea trial
<ul style="list-style-type: none"> <li>• Compass calibration</li> <li>• Compass offset</li> <li>• Boat speed calibration</li> <li>• Transition speed</li> <li>• Sea state filter</li> <li>• Sail boat setups</li> </ul>
<b>Echosounder</b>
Set transducer type
Set depth offset
Sea temperature calibration
Speed calibration
Water speed averaging
<b>Radar</b>
Dual Radar support:

Set antenna height: HD and Broadband Radar
Set zero bearing: HD and Broadband Radar (note, perform heading sensor calibration first)
Set zero range (main bang): HD Radar
Adjust for local interference: Broadband Radar
Park angle: Open array HD Radar
Heading sensor calibration
<b>AIS</b>
Enter own ships MMSI number
<b>Back up settings</b>
Create a backup of the display settings and transfer to portable drive or SD card

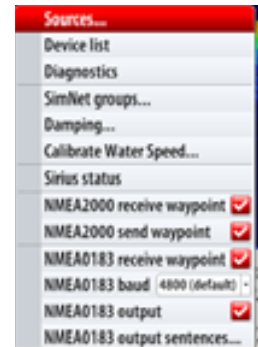


## Data setup

Data set up is required on initial start up of the system, or if any part of the SimNet or NMEA 2000 network has been changed or replaced.

From Network in the main system settings menu you can

- Select SimNet / NMEA2000 data sources either automatically or manually
- Configure SimNet / NMEA2000 devices
- Control how device parameters such as backlighting, units and damping are grouped on the network
- Share waypoints via SimNet or NMEA2000
- Monitor and diagnose both Ethernet and SimNet Networks
- Setup NMEA0183 port, baud rate and output data
- Control damping

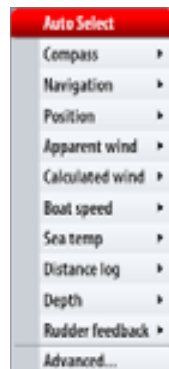


## SimNet / NMEA2000 setup





### Source selection (Auto select)

SimNet Plug and Play offers easy and uncomplicated interfacing to data sources with automatic system setup.

The Auto Select option will look for all sources connected to the NSO system. If more than one source is available for each data type, the NSO will automatically select from an internal SimNet priority list.



Make sure all devices are connected and are turned on

Step 1	Step 2	Step 3	Step 4
 Choose Auto Select	 Start Auto Select		 Select OK when finished

### Source selection (Manual)

Devices can be selected manually to be the preferred source. This is useful if you have more than one of the same type of device on the network e.g. two GPS antennas.

It is also useful if you prefer that one display is to get position from one GPS antenna and another display to get position from another GPS antenna.

### Group Source Selection (SIMRAD)

SimNet products such as the NSO, IS20 or AP24 have the ability to;

- use data sources that all other products on the network use, or 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 Simrad Group mode.)

When configuring data sources on an NSO display you can select or change a source used by all the displays on the SimNet network, this is called group source selection.

For example you can select to change the position source globally on all displays that are in a source selection group.

There is only one source selection group available and this is group is called Simrad.

There are ten categories of sources such as Compass, Navigation, Position etc. Under each of these categories a display can be set to receive data from sources as part of the Simrad group or receive the source data independently from the group (None)

The example below shows the available options for position sources, and that the GS15 GPS is used by all displays with group selection set to Simrad. If you selected the GS10 all displays in the Simrad group would use the GS10 GPS.



**Group Source Selection (NONE)**

You may prefer one display to receive its position information from the GS10 antenna independently from the rest of the displays in the source selection group Simrad.

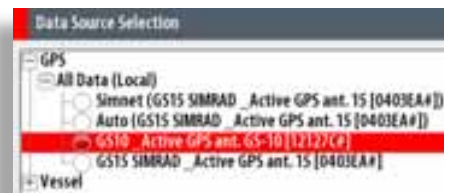
Set the position information to None.



Select None



Select the GS10 antenna



to confirm and exit

Under the position category, change group selection from Simrad to None



**Source selection advanced**

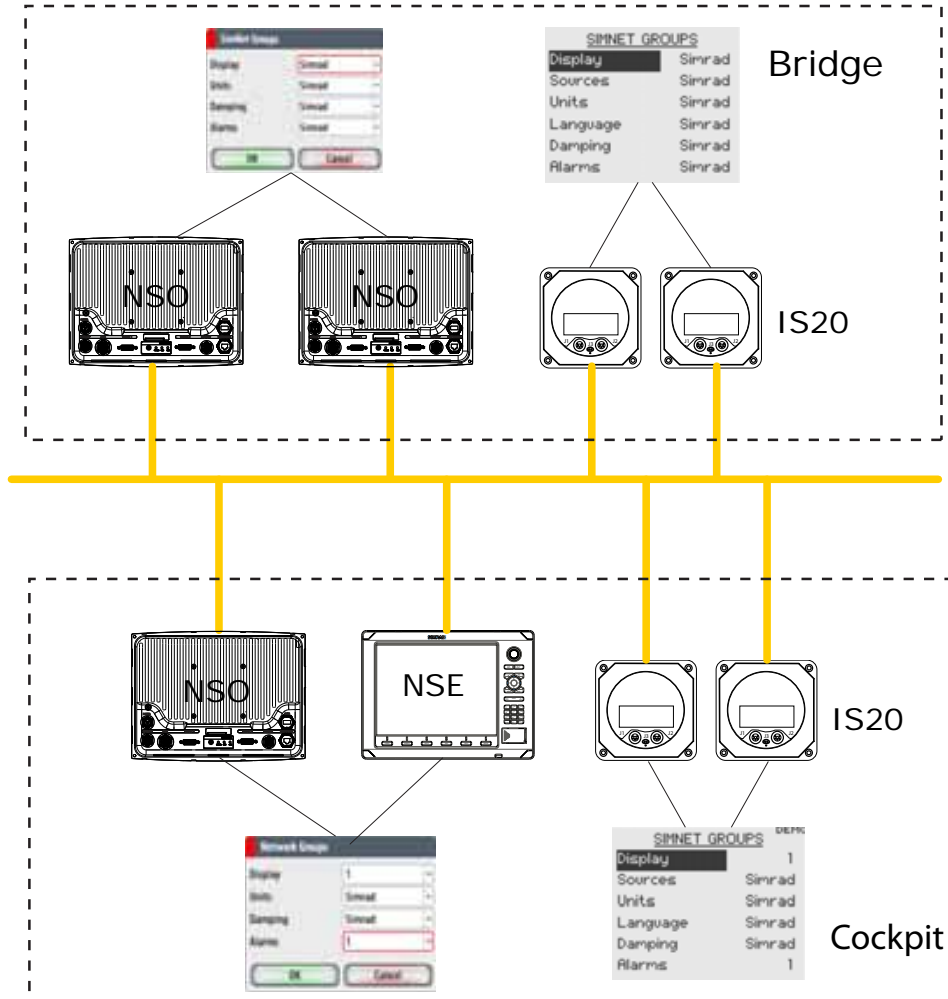
Allows the selection of a source not using Simrad group - eg Engine and Tank sources.



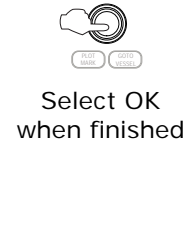


## SimNet Groups

The SimNet Group function is used to control parameter settings, either globally or in groups of units. It groups parameter settings such as backlighting, units and alarms. The function is used on larger vessels where several units are connected via the SimNet network. By assigning several units to the same group, a parameter update on one unit will have the same effect on the rest of the group members.

The following example shows a two station installation. All four displays in the cockpit have their Display and Alarms in a different SimNet Group from the displays on the bridge. If a back light or alarm is adjusted on a display in the cockpit, it will change on all displays in the cockpit. It won't change the back light or alarms or displays on the bridge.



Step 1	Step 2	Step 3	Notes
 <p>Select the SimNet Group to be applied to the category</p>	 <p>Choose the SimNet Group</p>	 <p>Select OK when finished</p>	<p>There are seven groups or none to choose from. Default is Simrad</p>



## Damping

Controls how quickly instruments respond to changes in values from sensors.

Damping can be used for heading, wind, boat speed and depth instruments.

Increasing the damping applies more averaging or smoothing of the data update rate on the instrument or display. Damping settings are applied to SimNet displays and Instruments belonging to particular damping SimNet Groups.

## Device List

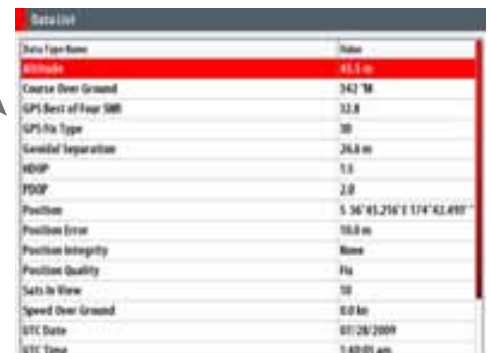
Using the Device List Function you can:

- list all of the active SimNet and NMEA2000 devices on the network, showing model description and serial number. Devices can be sorted by model ID or by serial number
- display information relating to a device such as, name, manufacturer, software version, instance, status
- give the device a logical name relevant to the user
- see data coming from the device

Enter a logical name for the device such as a location to differentiate same devices e.g. GS15 Port



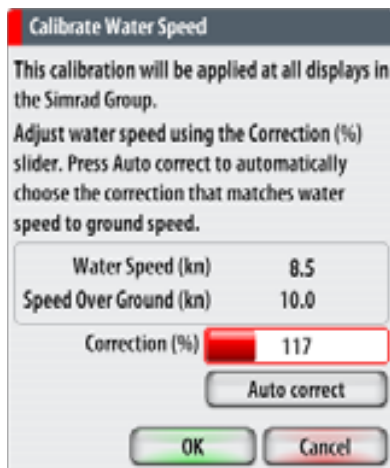
Some devices can be configured further



Device data can be viewed



## Speed Calibration (SimNet Transducers)



### Water speed off set

Water speed calibration is used to adjust the speed value from the paddle wheel to match the actual speed. This can be measured either from the GPS speed over ground (SOG) or by timing the boat over a known distance. Water speed calibration should be performed with as little wind and current movement as possible.

Select Auto correct to match water speed to ground speed

Manual calculation. If in average the water speed reads 8.5 knots and SOG records 10 knots. Increase the off-set to 117%. The calculation is:

$\frac{\text{Difference in speed}}{\text{Paddle wheel speed}} \times 100.$

If water speed is lower than SOG then increase the calibration value.

Calibration range is 10-400 %, Default is 100 %.

## Autopilot Setup

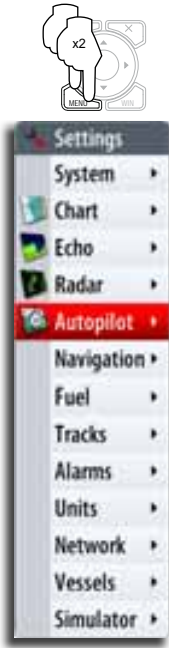
If an AC12 or AC42 autopilot computer is connected to the NSO system, autopilot functionality will be included in the NSO.

The NSO can be connected to a full autopilot system including an AP24 or AP28 control head, or the NSO can be used as the only control head in the autopilot system.

### Wiring the autopilot system

The AC12/AC42 is connected to the NSO system using the SimNet network.

For more information about how to install and wire the autopilot, refer to the separate AC12/AC42 Installation manual (part no 20222568).



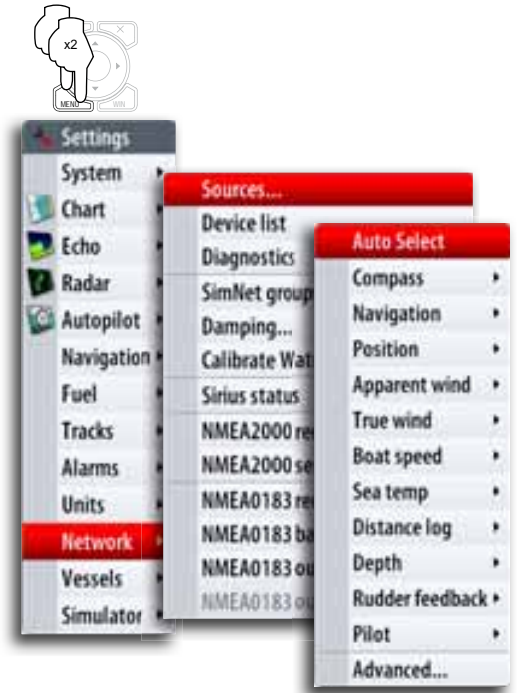
### Verifying the autopilot connection

When an AC12 or AC42 is connected to the NSO system, the NSO will automatically detect the autopilot and an Autopilot menu item will be included in the **Settings** menu.

If no **Autopilot** item is available in the menu, establish the connection by running the auto select process.

The auto select process may also be used if the list of data sources needs to be updated when a unit has been physically replaced.

If the AC12/42 later is disconnected the **Autopilot** menu item will remain available, but only a few of the menu items will be available.



### Commissioning the autopilot

Before you perform any commissioning of the autopilot, the hardware installation and electrical connections must be completed as described above and in the separate AC12/24 Installation manual.

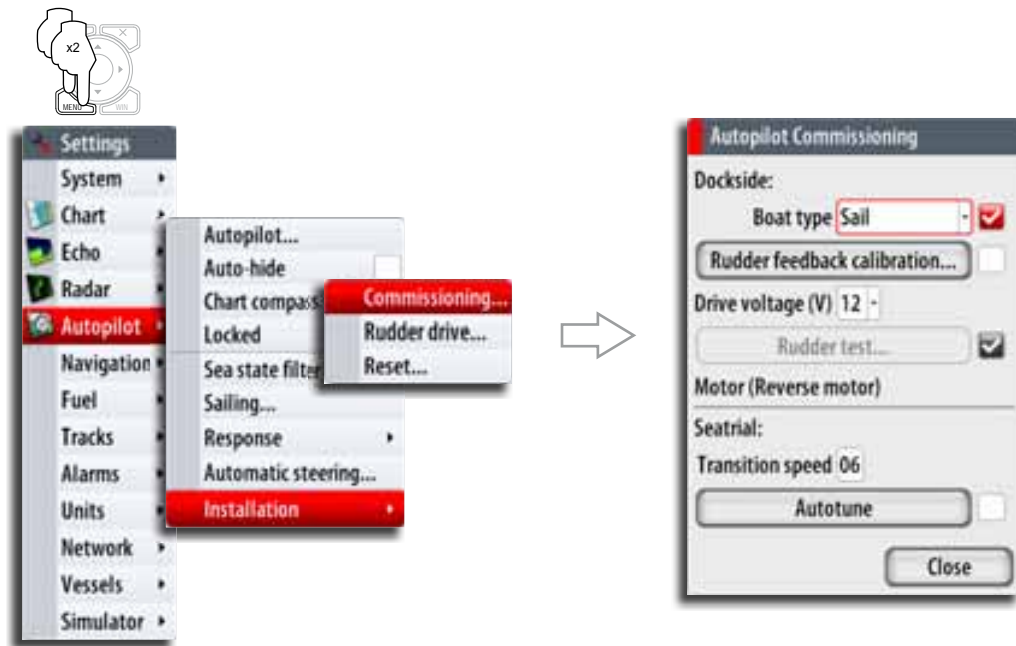
When the autopilot installation is confirmed, the commissioning procedures must be performed. Failure in setting up the autopilot correctly may prohibit the autopilot from functioning properly.

The setup of the autopilot computers (AC12/42) can be done from the NSO unit or from the AP24 or AP28 control head if such is included in the system. The following sections describe how you configure the autopilot from the NSO unit. If you select to setup the system from an AP24 or AP28 control head, refer to the AP24 Operator manual (part no 20222535) or the AP28 Operator manual (part no 20222527).

If you connect the NSO to an already commissioned autopilot system, you only have to do an automatic source selection as described above before the autopilot is ready to be used.

### Dockside setup

You initiate the required dockside procedures from 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 Press the **STBY/AUTO** key to ensure that the autopilot is in standby mode
- 2 Activate the autopilot commissioning dialog as shown above
- 3 Select 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
 

**Rudder feedback 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 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.

 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 AC12/AC42 Installation manual or to your drive unit documentation for information.
- 6 Run the rudder test as described in the on-screen instructions

 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 speed if it 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 AC12/AC42 Installation manual or to your drive unit documentation for information.



***Selection of improper voltage level for your drive unit may damage both the drive unit and the AC12/42 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.



*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.



*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.*

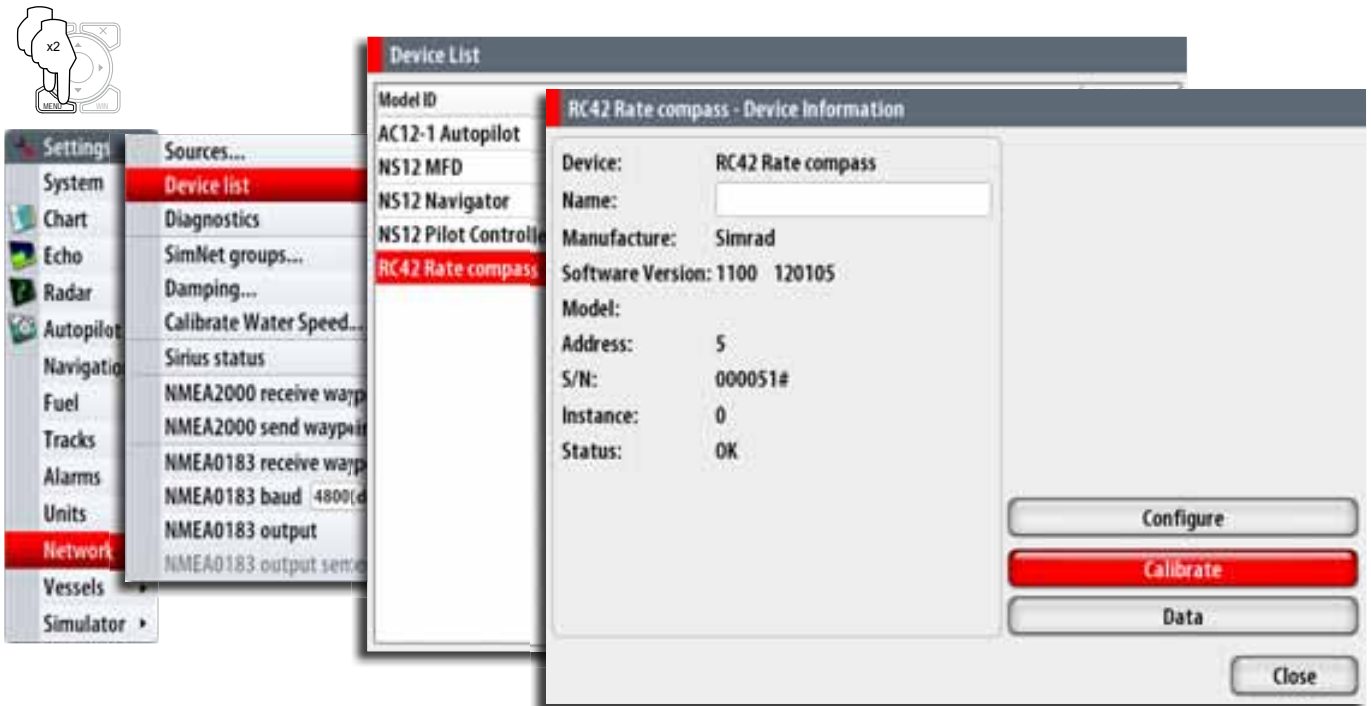
The following seatrial calibration should be done:

- 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 calibration to compensate for a fixed mechanical offset of the Wind vane
- 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 filer
- Saiboat setup

### 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.

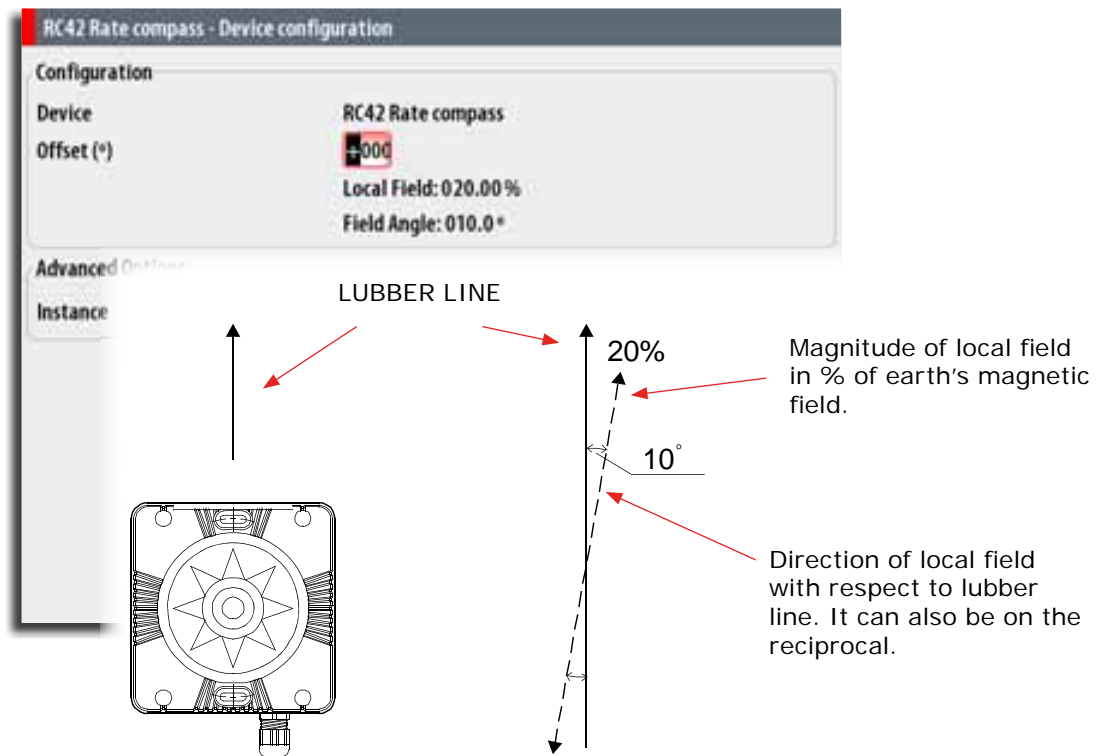



During the calibration, the compass will measure the magnitude and direction of the local magnetic field. Refer graphic on next page.

- 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.



*Calibration must be made on the compass that is active for the autopilot. If another model compass from Simrad or another manufacturer is installed, refer to the instruction for that compass regarding calibration.*




 *In certain areas and at high latitudes the local magnetic interference becomes more significant and heading errors exceeding  $\pm 3^\circ$  may have to be accepted.*

### Compass mounting offset

After compass calibration, the difference 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
- 3 Change the offset parameter so that the bearing to the object and the compass readout becomes equal. Refer graphic above

 *Make sure that both the compass heading and the bearing to the object have the same unit ( $^\circ M$  or  $^\circ T$ ).*

### Setting the transition HI/LO speed

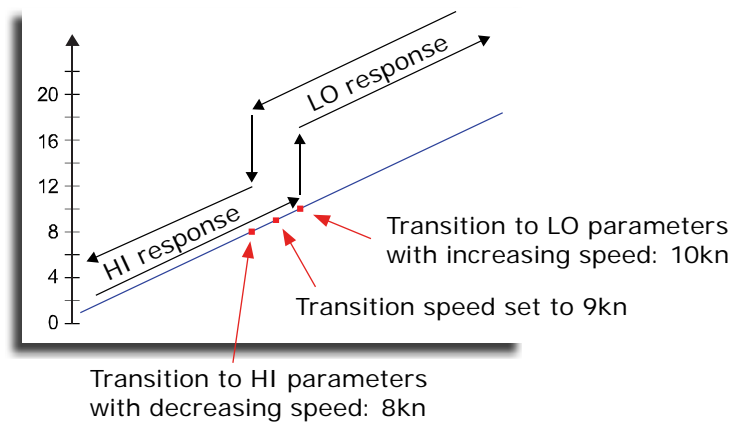
This is the speed at which the system automatically changes from LO to HI steering parameters.

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 3-4 knots to give the best response in a tack.







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 set all parameters that are set during autotuning. Refer next page.

### 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



*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, it will also be surfing on the waves. This may lead to significant changes in boat speed, and thereby also changes in apparent wind angle. True wind steering is therefore used when running, while steering to apparent wind is used when beating or reaching.

Apparent wind steering is preferred when you want to achieve maximum boat speed. The autopilot tries to maintain a constant apparent wind angle to get maximum thrust from a given trim of the sails.

When sailing in closed waters, the apparent wind angle may change temporarily due to wind gusts. It may then be preferred to sail to the true wind.

### VMG optimizing

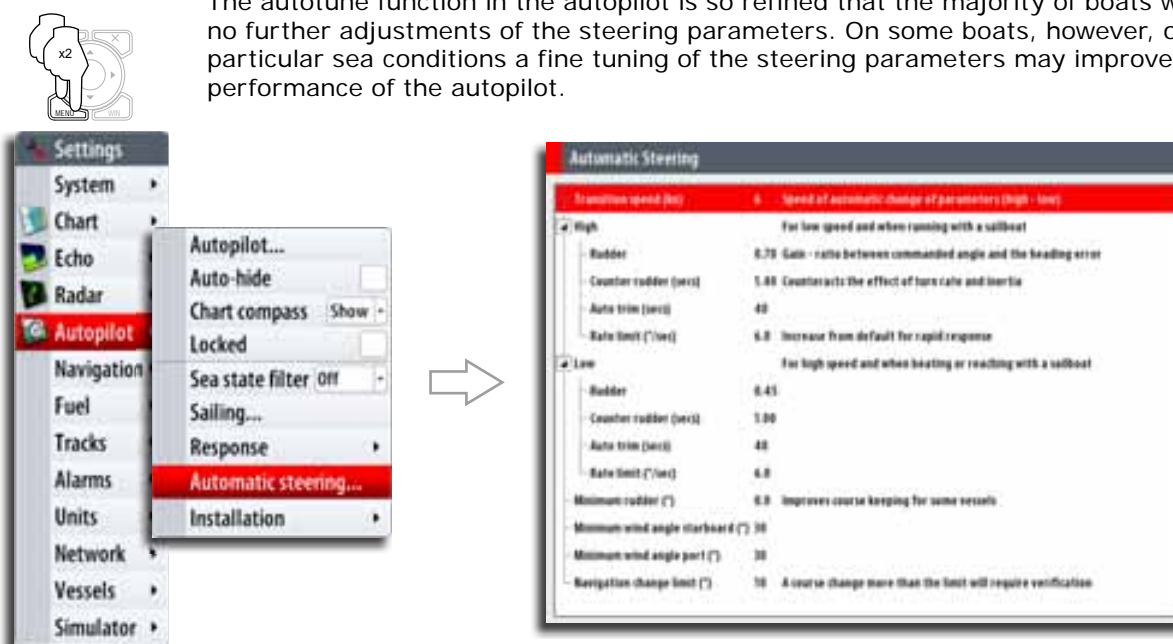
You can optimize the VMG to wind. When selected the function will be active for 5–10 minutes after a new wind angle has been set and only when beating.

### 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.

## Manually adjusting steering parameters

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 at particular sea conditions a 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.

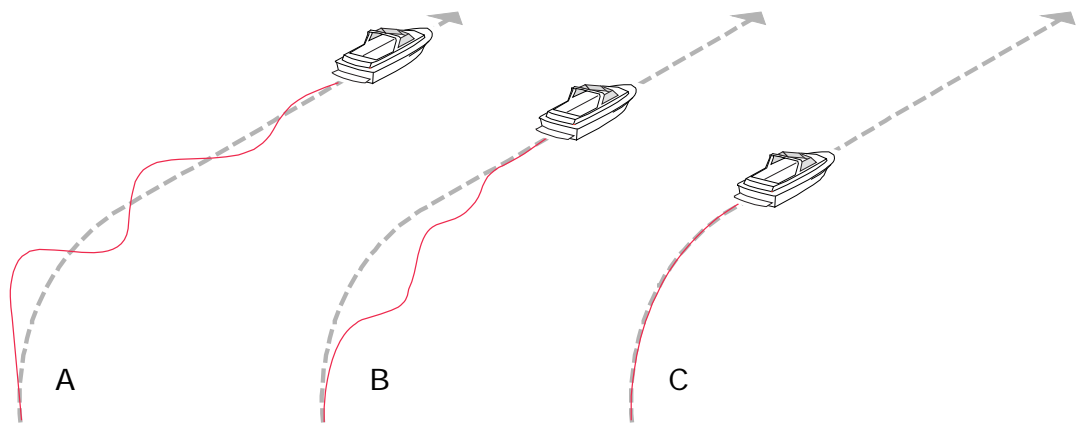
The best way of checking the value of the Counter rudder setting is when making turns.

The figures illustrate the effects of various Counter Rudder settings;

A: Counter rudder too low; overshoot response

B: Counter rudder too high; sluggish and creeping response

C: Correct setting or counter rudder; ideal response



### ***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 well shaped and give an acceptable thrust. The parameters will vary from boat to boat.

The settings are used for the tack-prevent function. They also applies when the autopilot is operating in WindNAV mode. Refer to the ***Operating the autopilot*** section.

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 where the autopilot is allowed to automatically change the course when the NSO follows a route (NAV steering).

If the required course change to next waypoint in a route is more than the set limit, you are prompted to verify that the upcoming course change is acceptable.

## Echosounder setup

### Depth offset

This is a value that can be entered on the Echo Installation page to make the depth represent either depth below the transducer or depth below the surface.

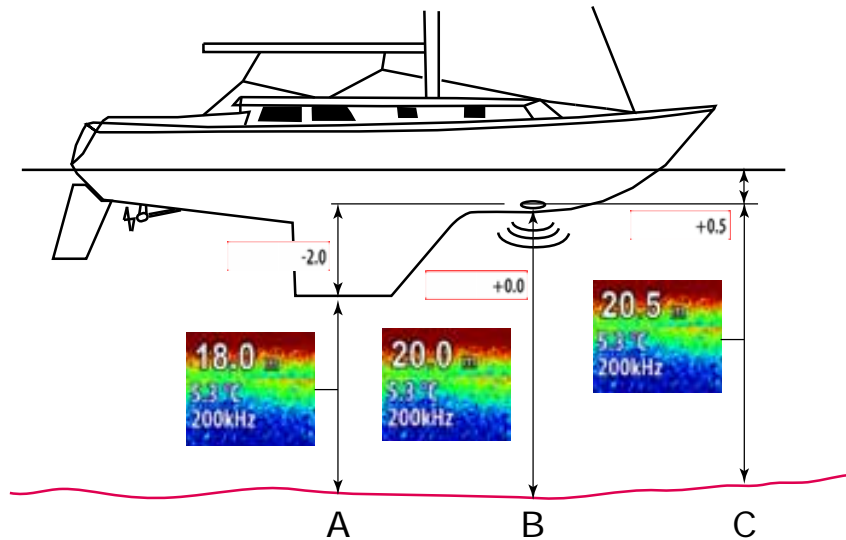
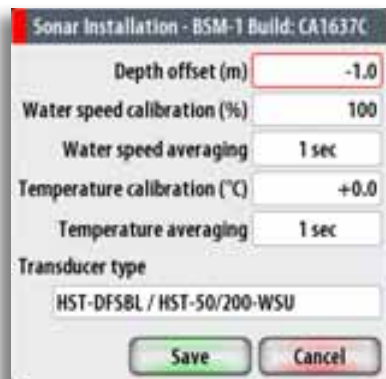
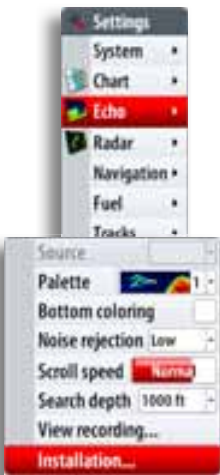
A) Depth below Keel value: Is the distance from transducer to the keel:

Enter a negative value.

B) Depth Below Transducer: no offset required.

C) Depth Below Surface (waterline) value: Is the distance from transducer to the surface:

Enter a positive value.



Echo sounder software version	
Software version are displayed under Sonar installation. To upgrade Sonar software refer to <b>Software upgrades</b> on page 78	

### Water speed calibration (Echosounder transducer)

### Water speed averaging (Echosounder transducer)

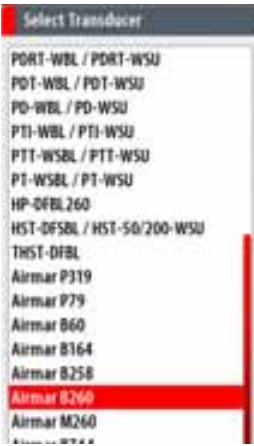
Averages water speed by measuring your speed at a selected interval of time. Water speed intervals range from one to thirty seconds. If you select five seconds, your water speed will be recorded every five seconds, then averaged.

Calibration range: 1-30 seconds. Default is 1 second.

### Temperature calibration (Echosounder transducer)

Temperature calibration is used to adjust the water temperature value from the echo sounder transducer to match the data from another temperature sensor.

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



## Transducer type (Echosounder)

Transducer type is used for selecting the transducer model connected to the echo sounder module. In some transducers with built-in temperature sensors, the temperature may not be correct if the correct transducer is not selected from the transducer type menu. Note: Transducers with a 6 pin connector

See **compatible transducer list** on page 86

*Note: SimNet depth sources will have their own calibration please see page 59*

## Radar setup

Before starting the system for the first time, check the following;

- Check radar is physically clear to rotate
- Leave a HD pulse radar in standby for 30 minutes before transmitting for the first time
- Check all personnel are clear of radar beam (HD Radar)
- Check all wiring is correctly connected. Apply power to the breaker

Basic set up is required on all new radar installations. The set up varies slightly between Broadband radar and the range of conventional HD pulse radars. The NSO will detect the type of radar and display relevant information.



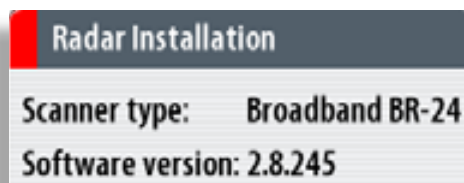
Broadband Radar™		HD Pulse Radar	
	<p>To commission a BR24 Radar:</p> <ul style="list-style-type: none"> <li>• set bearing alignment</li> <li>• set antenna height</li> <li>• local interference rejection (if needed)</li> </ul>		<p>To commission a pulse radar;</p> <ul style="list-style-type: none"> <li>• set bearing alignment</li> <li>• set antenna height.</li> <li>• set range offset</li> <li>• Park angle for open array scanners</li> </ul>

*HD Pulse Radars: Leave in standby for 30 min before transmitting. (first time only) to burn in the magnetron.*

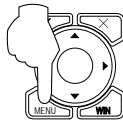


### Radar software version

Radar type and software version are displayed under radar installation. To upgrade radar software refer to **Software Upgrades** on page 78.



**Radar Transmit, Standby or off**  
Press Radar function button to display the radar



Press Menu to bring up radar options

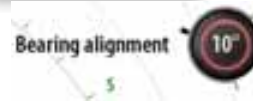


To make radar adjustments.

- select item to adjust



Adjust the setting value as needed



Setting value is displayed on screen






To confirm

<b>Broadband Radar™</b>	
<b>Adjust local interference reject.</b>	<p>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.</p> <p>Choose from Local interference rejection Low, Med or high. Default is off</p>
<b>HD Pulse Radar</b>	
Range Offset	<p>The timing of the transmit and receive circuits can be adjusted to determine zero range.</p> <p>Position the vessel stationary about 150-200 m from a straight jetty or sea wall. Set the radar to 1/8 nm. If the sea wall appears bent or bowed adjust until the wall appears straight</p> <div style="text-align: center;"> </div>
<b>All Radars</b>	
<b>Adjust bearing alignment.</b>	<ul style="list-style-type: none"> <li>• This will compensate for any physical misalignment of the scanner in relation to the center line of the vessel Set the radar to transmit. Point the boat in the direction of a stationary object such as a pier or the end of a head land or peninsular. Adjust the bearing alignment so the heading line touches the end of the same head land or peninsular.</li> </ul>
<b>Adjust antenna height.</b>	<p>Set the radar scanner height. The Radar uses this value to calculate sea clutter</p>

## Serial port setup

Configure the serial port to match the NMEA0183 device that it is connected to.

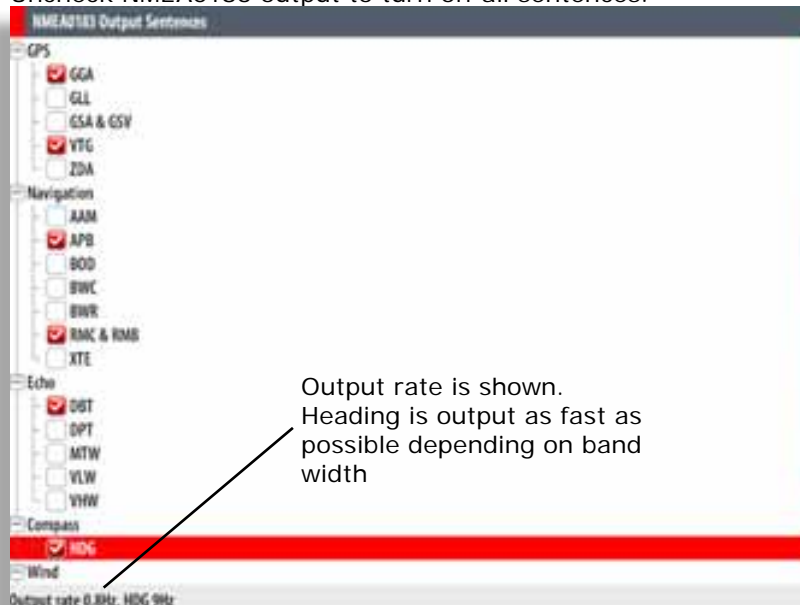
Baud Rate (common for input and output)

Step 1	Step 2	Step 3
	 <p>Select Baud Rate</p>	 <p>Select OK</p>

## NMEA 0183 output

Select the desired NMEA0183 sentences to be transmitted. (see *Supported NMEA0183 sentences* page 89).

Uncheck NMEA0183 output to turn off all sentences.



*All NEMA0183 sentences are set to off when unit is shipped*



## Fuel and Engines

If the vessel has an NMEA2000 interface to its engines and fuel tanks the NSO can display the following fuel consumption information:

- Fuel used since last fill
- Fuel used on current trip
- Fuel used during the season

Calibration of the tanks is needed to display accurate fuel levels.

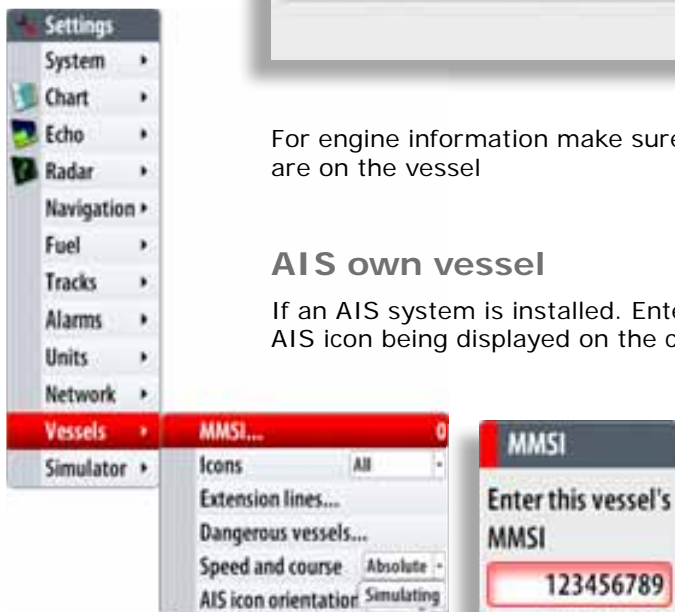
## Vessel Setup



For engine information make sure to configure the system to how many tanks an engines are on the vessel

## AIS own vessel

If an AIS system is installed. Enter the vessels MMSI number to prevent the own vessels AIS icon being displayed on the chart



# Diagnostics

## NMEA2000 Diagnostics

The screenshot shows the 'Diagnostics' window with the 'NMEA 2000' tab selected. The 'UDB' sub-tab is also active. The following table represents the data shown in the window:

Metric	Value
Bus State:	Bus Off
Rx Overflows:	0
Rx Overruns:	0
Rx Errors:	0
Tx Errors:	0
Fast packet Errors:	0
Rx Messages:	0
Tx Messages:	0
Bus Load:	0.0%

**Bus State:** Indicates if SimNet backbone is operating: Check power: Check termination

**RX Overflows / Overruns** greater than 0 could indicate the software is very busy and unable to keep up with incoming messages.

**RX / TX Errors:** CAN interface error counters. Count up when there are errors on the CAN bus, and down when things are Ok. Should normally be 0. Goes bus off when 255 is reached. Check same things as for Bus state if greater than 0 observed.

**Fast Packet Errors:** Detected errors since power up. Check the network if this is continually increasing.

**Rx / Tx Messages:** A count since power up of messages received / transmitted.

## USER Database UDB

The diagnostic page shows the MAC address of the display, the status and versions of the five user data bases.

The UDB (user database) is a database of all user created items and settings. Every time a change is made on a NSO display, the databases are synchronized so no one display holds all the user information. All displays should display the same version number for all databases.

The IP address of NSO displays that have had changes made to their settings are also shown.

The screenshot shows the 'Diagnostics' window with the 'UDB' sub-tab selected. The following table represents the data shown in the window:

Database name	Version	Dirty	Size
UDB Wp/Rt DB	21	<input type="radio"/>	19
UDB EventLog DB	9	<input type="radio"/>	9
UDB Variables DB	54	<input type="radio"/>	50
UDB Alarm DB	110	<input type="radio"/>	101
UDB SharedSetting DB	145	<input type="radio"/>	98

Master IP address (this display first):

- 172.28.29.56



## CZone Setup

BEP CZone is a NMEA 2000 compliant (SimNet) system that can monitor AC and DC circuits, as well as control DC circuits. It also features onboard diagnostics, multifunction timer capabilities, dimming control and handles a wide DC voltage range (9-32V DC). When connected on the same NMEA 2000 network, the NSO provides a clear and intuitive user interface for the CZone system.

### Activate Czone Feature

To activate CZone functionality the CZone option must be selected in Advanced Settings of the Settings/System menu.



### CZone dipswitch setup

The NSO must be assigned the virtual dipswitch number intended for it in accordance with the CZone configuration file.



### Czone at Startup

Select this option in the Advanced Menu in order to show the Czone Panel as the first screen at every power up of the NSO.

### Czone Backlight

Select this option in the Advanced Menu in order to allow Czone backlight controls to be applied to the monitor attached to the NSO.

*Note: backlight control will only work when the NSO is connected to a DI10 or DI15 display*



*Editing of the Czone configuration file can be only done by the BEP CZone display interface (DI), or PC configuration utility. For installation information on Czone modules, refer to the BEP CZone Installation Manual.*

## Check GPS signal

Press direct access key **PAGES** >3



## System backup

A backup of all the NSO settings such as page layouts, custom instruments can be made at any time, and either stored on the NSO or transferred to a USB key or SD Card

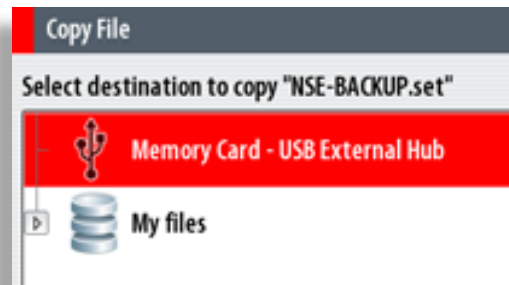
Press direct access key **PAGES** > 9. Name the backup using the alphanumeric key pad.



Press MENU select copy.

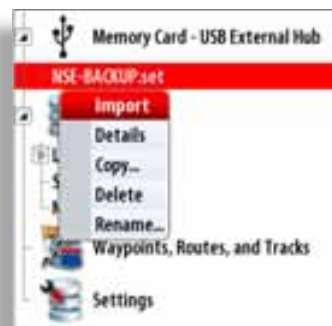


Select destination to copy file too.



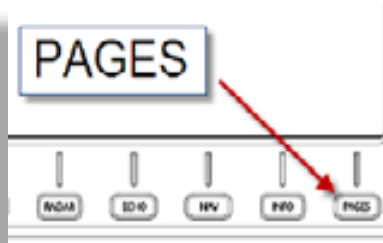
## Restore a backup

To restore or import a backup, Select the file, Press menu and select import. The system will perform a restart for imported settings to take effect.



## Backup Waypoints routes and tracks

- 1 Press the **PAGES** direct access key along the bottom of the screen.



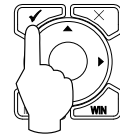
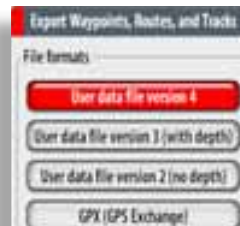
- 2 Select **"Files"** or press **"9"** on the alphanumeric keypad.



- 3 Select **Waypoints Routes and Tracks**, then press ✓



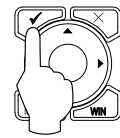
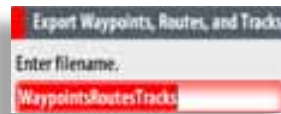
- 4 Select the desired file format, then press ✓



- 5 Select the Portable Drive as the Destination folder... Then press ✓



- 6 Name the backup using the alphanumeric keypad, then press ✓



## Software upgrades

Download the latest software from [www.simrad-yachting.com](http://www.simrad-yachting.com)

Software upgrades can be performed on the following types of devices from any NSO or NSE display.

- NSO / NSE Marine processors
- SimNet devices
- Ethernet devices

The same procedure is used to upgrade software on all types of devices. Upgrade files for different types of devices have different file extensions.

NSO /NSE displays	Ethernet devices	SimNet / NMEA2000 devices
xxx.xxx.xxx.UPD	device.RIW	Device_x.x.xx.xx.swup (or .luf)

## Displaying current software version

**NSO Display software version**

In this example, software version is 2.5.33.218  
Platform is 2.5.9213-r15

**Ethernet module software version**

Echosounder: On Echo page select Menu      Radar: On Radar page select Menu

StructureScan firmware version

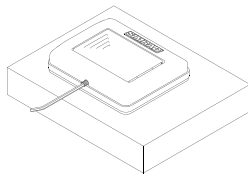
BSM Sounder firmware version

## Ethernet module software version



Example below shows upgrading a SimNet IS20 Combi instrument but is the same for NSO displays

1 Copy upgrade files on to a USB Stick or SD card



Insert USB Stick or SD card into USB port or card reader

2 Press function button PAGES

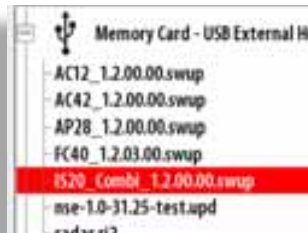
Press 9 or navigate to files button



3 Select Memory card



Select the upgrade file



4 Press Menu



Select Upgrade



## NSO or NSE Processor upgrade

Important things to remember

EACH NSO MUST BE UPGRADED INDIVIDUALLY (THERE IS NO NETWORK UPGRADE FEATURE)

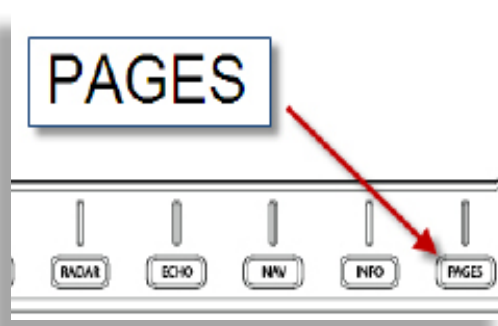
DO NOT REMOVE THE PORTABLE DRIVE DURING THE UPGRADE PROCESS

DO NOT TURN OFF THE NSO OR REMOVE POWER DURING AN UPGRADE

HAVE YOU BACKED UP YOUR WAYPOINT'S ROUTES AND TRACKS?

Begin the process with the NSO turned on and the Portable Drive inserted in to the display as mentioned above.

1 Press the PAGES direct access key along the bottom of the screen



2 Select "Files" or press "9" on the alphanumeric keypad



3 Select the Portable Drive, then press ✓

4 Select the Upgrade file then press ✓



5 Highlight OK to confirm that you want to upgrade your display then press ✓



6 The NSO will automatically shut down and restart. After 10 seconds there will be a Simrad logo and after another 20 seconds basic text will prompt you to upgrade or start normally. Press the "1" key followed by the ✓ key to start the upgrade or the "0" key to cancel and start normally

7 The Upgrade will start. At this stage do not remove the Portable Drive turn off the NSE. The upgrade will take about 4-5 minutes.

The following updates were found:  
00: Normal system start  
01: NSE-2.5.33.218-Standard-3.upd

8 After the upgrade process has finished and you will be prompted to remove the "update media" Remove the portable drive and then press ✓. The NSO will now restart.

The update may take a while. Please be patient

9 The Upgrade process has finished Successful. You MAY remove the update media. A System package has been updated and a restart is required. Press the check button to continue.

After the NSO has started accept the safety warning and just take a minute to verify the software has been upgraded correctly.

Press MENU > MENU > System > About.



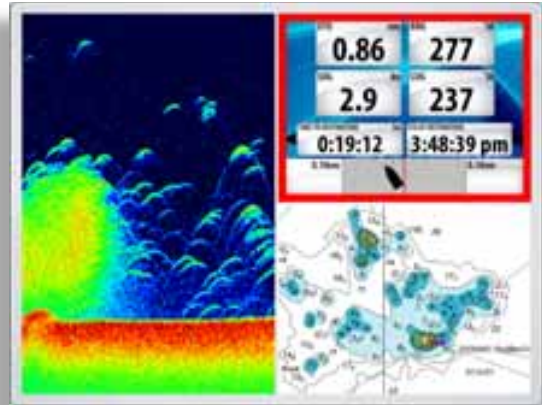
## Screen capture

It is possible to capture a snap shot of the current screen

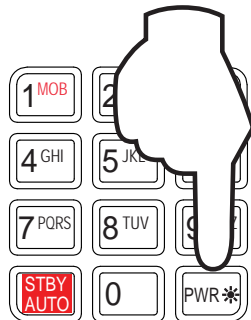
- 1 Enable screen capture



- 2 Create desired screen to capture



- 3 Short press on PWR button to capture screen shot



## File transfer

- 1 Insert a USB Flash drive or SD card
- 2 Press PAGES > 9

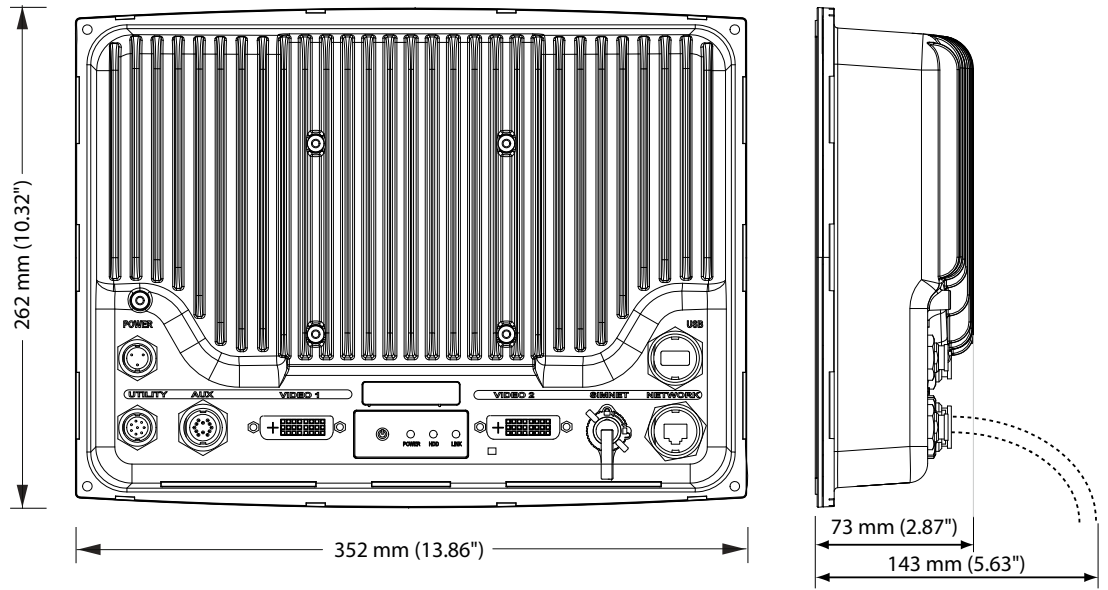


- 3 Browse to the desired screen shot to copy
- 4 Press MENU and select Copy
- 5 Select the USB Drive or SD card as the location to copy the file too.

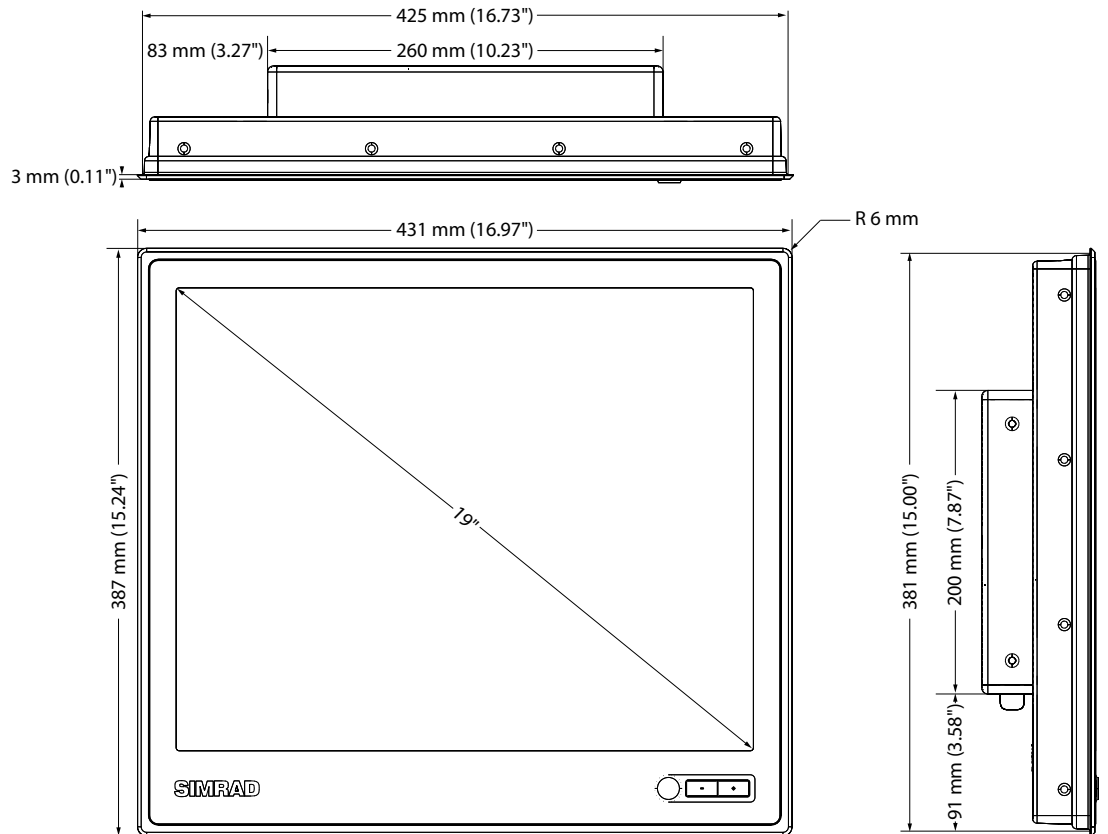


# NSO Drawings

## NSO Dimensions

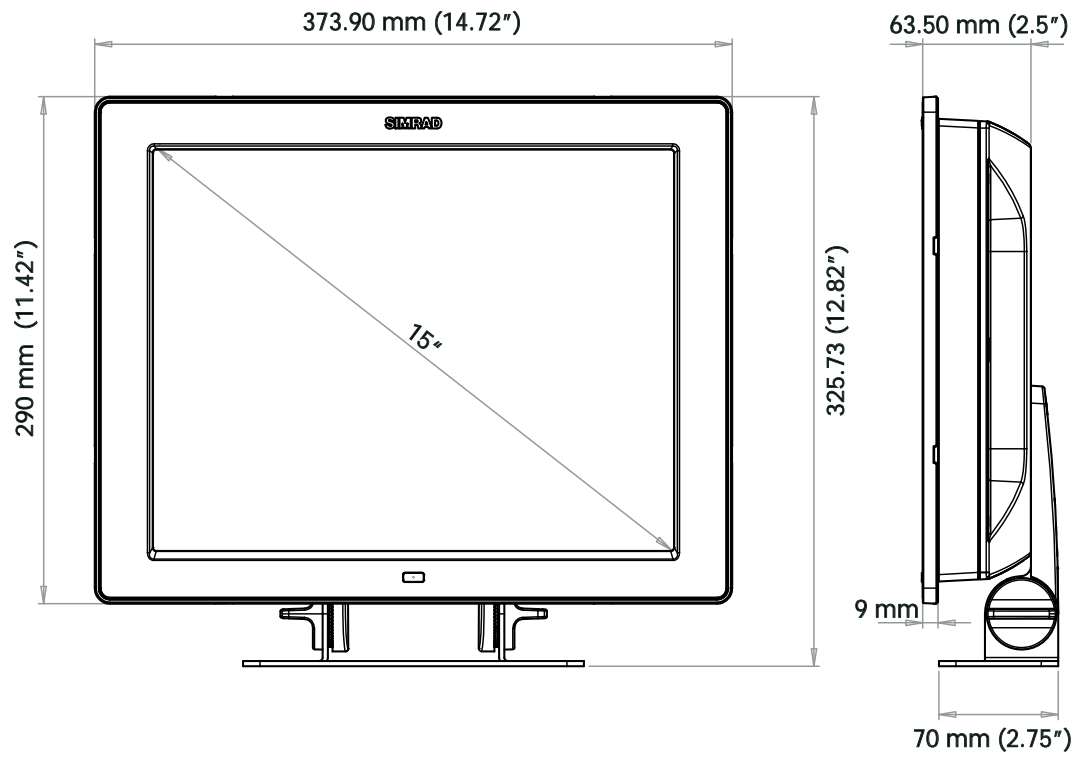


## MO19 Dimensions

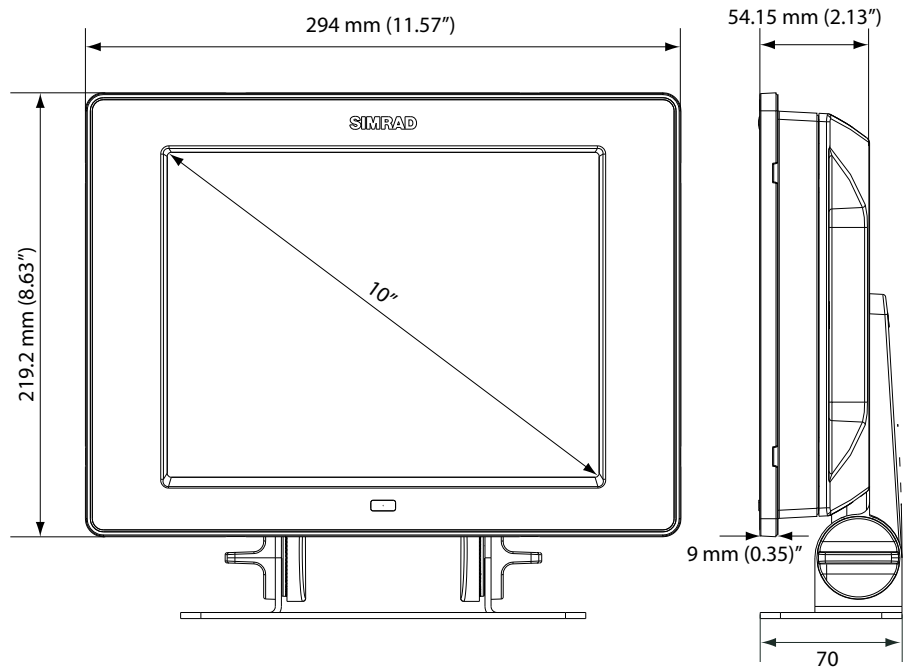




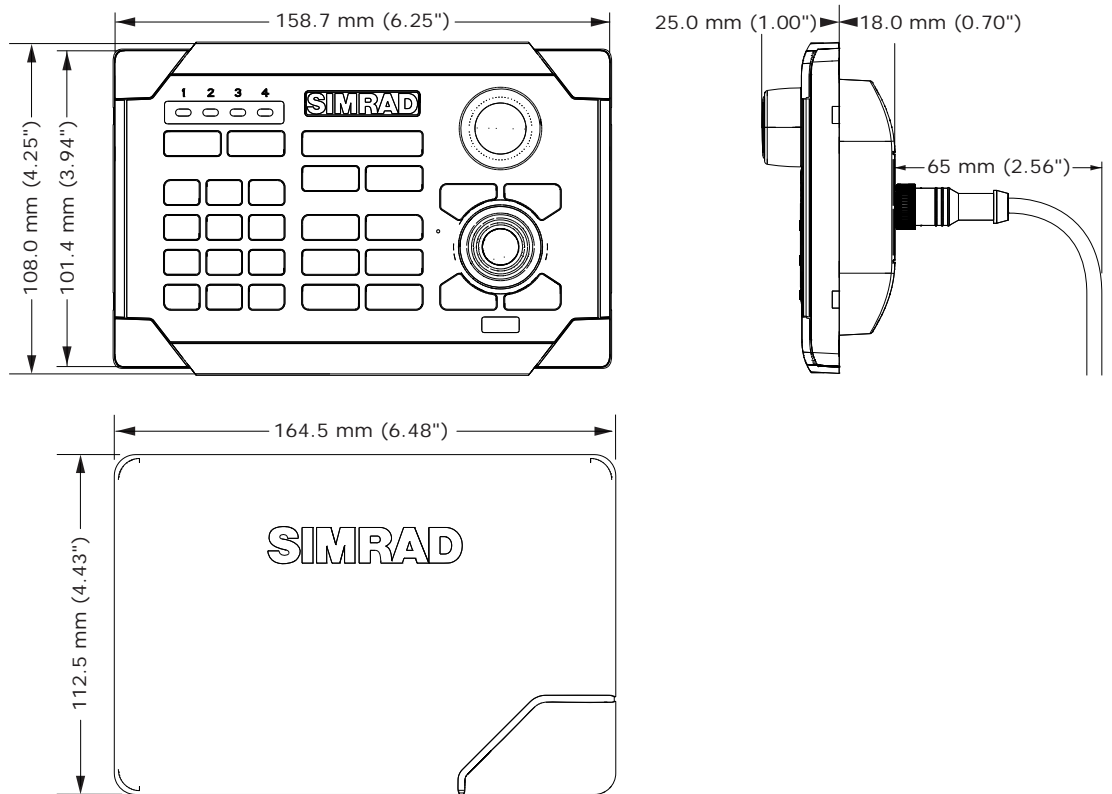
## DI 15 Dimensions



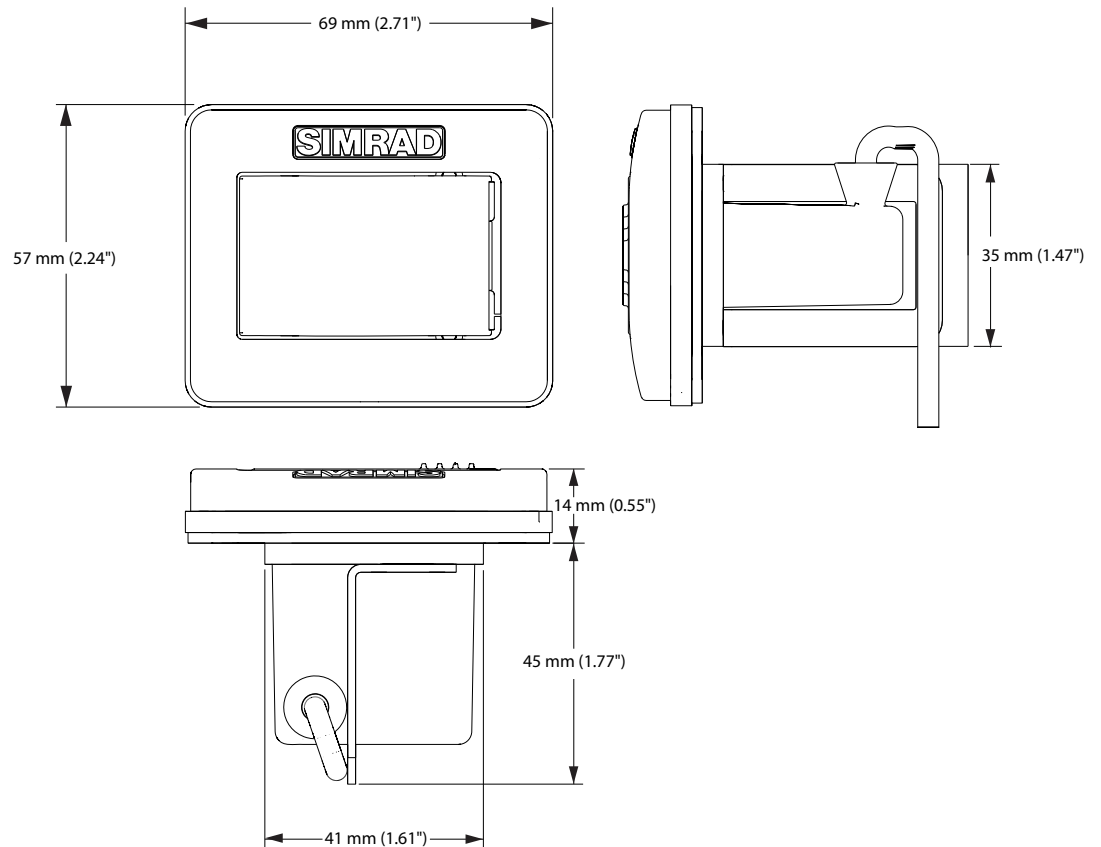
## DI 10 Dimensions



## OP40 Dimensions



## NSO Chart Card Reader Dimensions



## Spare parts

### NSO Spare parts

Part Number	Description
000-10290-001	NSO Marine Processor AMER
000-10292-001	NSO Marine Processor EMEA
000-10291-001	NSO Marine Processor ROW
000-10298-001	OP40 Controller
000-10349-001	OP40 Cover
000-0139-001	OP40 Rotary knob
000-10299-001	NSO Chart card reader 5 m (16.4 ft)
000-00140-001	NSO / NSE Chart card reader door
AA010069	Power cable for NSO (3 pin)
AA010070	NSO Utility cable 12 pin

### Displays

Part Number	Description
000-0134-00	DI10 10" Display (Excludes video cable) *Not compatible as second monitor with NSO + DI15
000-10306-001	DI10 Sun cover
000-10304-001	DI10 Bezel
000-10300-001	DI10 Flush mount kit
000-0134-01	DI15 15" Display (Excludes video cable) *Not compatible as second monitor with NSO + DI10
000-10300-001	DI15 Sun cover
000-10305-001	DI15 Bezel
000-10301-001	DI15 Flush mount kit
000-10303-001	DI10 / DI15 Mounting bracket
000-10302-001	DI10 / DI15 Power cable
2603404	MO15F 15" Simrad monitor with 3mm flange mount (with 1.8 m -6 ft- DVI Cable).
26063446	MO19F Monitor - MO19F 19" Simrad monitor with 3 mm -6 ft- flange mount (with 1.8 m DVI Cable).
26058578	MO19B Monitor - MO19B 19" Simrad monitor with rear or bracket mount (with 1.8 m -6 ft- DVI Cable).

Part Number	Description
AA010152	3 m (9.8 ft) Video cable DVI-HD26
AA010154	10 m (33 ft) Video cable DVI-HD26
AA010162	5 m (16.5 ft) HDMI small connector option for DI10 or DI15 displays
AA010164	15 m (50 ft) HDMI small connector option for DI10 or DI15 displays
AA010157	5 m DVI -DVI video cable for MO19 monitor

## SimNet accessories

Part Number	Description
SIMKIT-1	SimNet Starter Kit: Includes <ul style="list-style-type: none"> <li>• 24005845 SimNet 5 m (16.5 ft) cable</li> <li>• 24006298 SimNet 7-Prong Multi-Joiner</li> <li>• 24005894 SimNet Termination Plug</li> <li>• 24005902 SimNet 2 m (6 ft) power cable w/terminator</li> </ul>
SIMKIT-2	SimNet Starter Kit with one AT10 NMEA0183 interface <ul style="list-style-type: none"> <li>• 24005936 AT10 two way general NMEA0183 to SimNet Converter</li> <li>• 24005837 SimNet 2 m (6 ft) cable</li> <li>• 24005845 SimNet 5 m (16.5 ft) cable</li> <li>• 24006298 SimNet 7 Prong Multi-joiner</li> <li>• 24005894 SimNet termination plug</li> <li>• 24005902 SimNet 2 m (6 ft) power cable w/terminator</li> </ul>
24005829	0.3 m (1 ft) SimNet cable
24005837	2 m (6.6 ft) SimNet cable
24005845	5 m (16.6 ft) SimNet cable
24005852	10 m (33 ft) SimNet cable
44172260	SimNet In-line joiner
24005860	SimNet T-joiner (3 prong)
24006298	SimNet Multijoiner (7 prong)
24006306	SimNet Bulkhead T-connector
24005878	SimNet cable gland
24005886	SimNet protection plug
24005894	SimNet termination plug
44172278	SimNet termination In-Line joiner
24005902	2 m (6.6 ft) SimNet power w/termination
24005910	2 m (6.6 ft) SimNet power w/o termination
24005936	AT10 Universal NMEA0183 converter
24005944	AT15 Active T-connector, IS15
24005928	SimNet cable protection cap
24005729	SimNet to Micro-C (male) cable that connects a SimNet product to a NMEA2000 network
24006199	SimNet to Micro-C (female) cable that connects a NMEA2000 product to SimNet
24006413	SimNet to Micro-C female to SimNet 4 m (13 ft)
24006363	SimNet cable, 5.5 m (18 ft), with 1 plug

## Ethernet cables (yellow)

Part Number	Description
000-0127-55	Adapter cable: Ethernet Yellow male to RJ45 female 0.3 m (1 ft)
000-0127-56	Adapter cable: Ethernet Yellow male to RJ45 female 2 m (6.5 ft)
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)

### Ethernet cables (RJ45 adapters)

Part Number	Description
000-10437-001	RJ45 to 5 pin yellow female (crossover) for NSO
000-10438-001	RJ45 to 5 pin yellow female (straight though) for HD Radar

## Specifications

<b>Mechanical</b>	
Back Case	Die cast aluminium
Heat Sinking	Direct heat transfer from processor to casting
<b>Environmental</b>	
Operating temperature	-15° C to +55° C (+5° F to +131° F)
Waterproof integrity	IPx5
Certificates of Conformity	CE(EN60945:2002)/CTick
<b>Electrical</b>	
Operating Voltage	12 or 24 V DC (9 - 34 V DC max)
Processor	Intel Pentium M 1.6 GHz
RAM	512 MB
Hard drive	80 GB
<b>User interface</b>	
User interface	Interface via OP40 controller. Direct access keys (DAK's), alphanumeric keypad, rotary knob with push-to-Enter
Keypad Interface	CAN/NMEA2000/SimNet
Keypad Beeper	>80dBA@0.5m
Keypad Backlight	White (day) Red (night), dimmable with SimNet grouping
Keypad environmental	IPX6
Languages	(31) English (UK), English (US), German, French, Spanish, Italian, Portuguese, Croatian, Finnish, Icelandic, Dutch, Norwegian, Polish, Swedish, Slovenian, Russian, Ukrainian, Bulgarian and Asian language pack
<b>Plotter Characteristics</b>	
Display modes	Head-up*, Course-up, North-up (*external heading or COG)
Cartography	Embedded: Navico Insight HD US/Navionics Silver Rest of World; Navionics Platinum Plus via SD Card
Latitude Limit	83° North, 85° South
Alarms	Position, Off-Course, Waypoint Radius, Arrival, Anchor, Anchor Depth, Shallow, Deep, Water Temp Rate, Low Boat Speed, True Wind Shift, True Wind High, True Wind Low, Guard Zone 1 & 2, Voltage Hi/Lo, Missing Data: Depth/Rudder/Wind/Heading/Weather, Weather: Lightning, Severe Weather, Storm, Weather Watchbox, Vessels: Dangerous, AIS Lost, Message, MARPA Lost, MARPA Unavailable, Autopilot Alarms
<b>Radar Characteristics</b>	
Radar compatibility	Broadband: Simrad BR24 Simrad HD Digital Series 2 kW to 25 kW
Display Modes	Head-up, Course-up*, North-up*, True Motion*. Relative Motion (*Heading input required)
Echo Trails	Intervals: 15 sec, 30 sec, 1 min, 3 min, Continuous. Clear Trails
VRM/EBL	2: User configurable
<b>Video In</b>	
	MO19 Monitor (1x composite) or third party monitor with a composite video input

Comms	
NMEA0183	1 x Transmit, 1 x Receive port
External Alarm	<250 mA
Supported baud rates	4,800, 9,600, 19,200, 38,400 baud. Note: Port will transmit and receive at the set baud rate
Ethernet	10/100 base Ethernet, one port
Max number of displays/processors	4 in any combination NSO or NSE
External Connectors (rear)	Power, Utility (ext. alarm, NMEA 0183), SimNet (NMEA2000), Network (1 x ethernet, USB x 1, Video Out (1 x DVI-D, 1 x DVI-I), Aux. Not used

Display specific specifications			
DI 10 and DI 15		MO19	
Power Supply	10-32 V DC	Power Supply	24 VDC (21-32 VDC)
Environmental	IPX6	Environmental	IPX6 when flush mounted
Video Input	DVI-D only	Video Input	DVI-D only
Resolution	10.4" TFT SVGA bonded	Resolution	15" TFT XGA bonded

## Supported NMEA0183 sentences

TX / RX		GPS							
Receive	GGA	GLL	GSA	GSV	VTG	ZDA			
Transmit	GGA	GLL	GSA	GSV	VTG	ZDA			
		Navigation							
Receive	RMC								
Transmit	AAM	APB	BOD	BWC	BWR	RMC	RMB	XTE	
		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								
		AIS / DSC							
Receive	DSC	DSE	VDM	AIS sentences are not bridged to or from SimNet.					
		MARPA							
Transmit	TLL	TTM	These are only output sentences						

## NMEA 2000 PGN List

### NMEA 2000 PGN Receive

59392	ISO Acknowledgement	129284	Navigation Data
59904	ISO Request	129539	GNSS DOPs
60928	ISO Address Claim	129540	GNSS Sats in View
61184	Parameter Request/Command	129794	AIS Class A Static and Voyage Related Data
65285	Temperature with Instance	129801	AIS Addressed Safety Related Message
65289	Trim Tab Insect Configuration	129802	AIS Safety Related Broadcast Message
65291	Backlight Control	129808	DSC Call Information
65292	Clear Fluid Level Warnings	130074	Route and WP Service - WP List - WP Name & Position
65293	LGC-2000 Configuration	130306	Wind Data
65323	Data User Group Request	130310	Environmental Parameters
65325	Reprogram Status	130311	Environmental Parameters
65341	Autopilot Mode	130312	Temperature
65480	Autopilot Mode	130313	Humidity
126208	ISO Command Group Function	130314	Actual Pressure
126992	System Time	130576	Small Craft Status
126996	Product Info	130577	Direction Data
127237	Heading/Track Control	130840	Data User Group Configuration
127245	Rudder	130842	SimNet DSC Message
127250	Vessel Heading	130845	Parameter Handle
127251	Rate of Turn	130850	Event Command
127257	Attitude	130851	Event Reply
127258	Magnetic Variation	130817	Product Info
127488	Engine Parameters, Rapid Update	130820	Reprogram Status
127489	Engine Parameters, Dynamic	130831	Suzuki Engine and Storage Device Config
127493	Transmission Parameters, Dynamic	130832	Fuel Used - High Resolution
127503	AC input status	130834	Engine and Tank Configuration
127505	Fluid Level	130835	SetEngineAndTankConfiguration
127506	DC Detailed Status	130838	Fluid Level Warning
127508	Battery Status	130839	Pressure Insect Configuration
128259	Speed, Water referenced	130843	Sonar Status, Frequency and DSP Voltage
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		



## NMEA2000 PGN Transmit

61184	Parameter Request/Command	130845	"Weather and Fish Prediction and Barometric Pressure History"
65287	Configure Temperature INSOcts	130850	Evinrude Engine Warnings
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 INSOct Configuration		
130837	Fuel Flow Turbine Configuration		
130839	Pressure INSOct Configuration		

\* 988-10027-001 \*