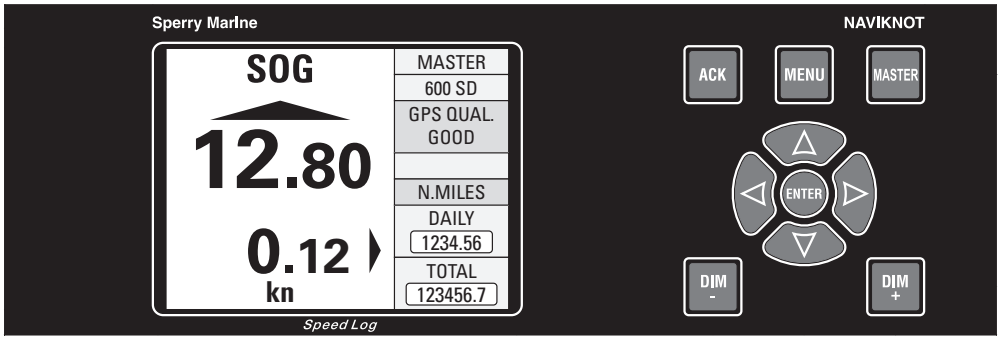
NORTHROP GRUMMAN

Sperry Marine

Operation, Installation and Service Manual



NAVIKNOT 600 SD

Combined Satellite and Single-Axis Doppler Speed Log with Preamplifier D, Type 5005

056353/B, 18 Apr 2008

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Sperry Marine, with worldwide headquarters in Charlottesville, VA, and major engineering and support offices in Melville, NY, New Malden, England, and Hamburg, Germany, is part of the Northrop Grumman Electronic Systems sector.

Revision Record

Rev.	Date	Remarks
B	18 Apr 2008	antenna unit orientation now optionally "forward" or "port"
A	28 Jan 2008	initial version; this manual is valid for NAVIKNOT 600 SD systems delivered with the Preamplifier D, type 5005. For early systems delivered with the SRD 331 Doppler Electronics Unit, refer to manual 056350.

Safety Instructions

Safety Notice Conventions

The following safety notice conventions are followed throughout this manual:

DANGER

A **Danger** notice contains an operating or maintenance procedure, practice, condition, statement, etc., which, if not strictly observed, **will result in injury or death of personnel.**

WARNING

A **Warning** notice contains an operating or maintenance procedure, practice, condition, statement, etc., which, if not strictly observed, **could result in injury or death of personnel.**

CAUTION

A **Caution** notice contains an operating or maintenance procedure, practice, condition, statement, etc., which, if not strictly observed, **could result in damage to, or destruction of equipment.**

Note

A **Note** contains an essential operating or maintenance procedure, condition or statement, which is considered important enough to be highlighted.

Special safety symbols may be used in this manual to indicate:

Risk of electrical shock.
Used in conjunction with a **Danger** or **Warning** notice.

Electronic components sensitive to electrostatic discharge.
Used in conjunction with a **Caution** notice.

General Safety Information for the Operator

CAUTION

In the “Manual” mode of operation, the NAVIKNOT 600 SD transmits valid output signals and data to the receiving equipment connected.

The function of the “Manual” mode is to maintain normal operation of speed receivers such as gyrocompasses, RADAR, ARPA etc., in case of failure of the log sensor.

When operating the NAVIKNOT 600 SD in the “Manual” mode, make sure that ship’s crew are aware of the fact that speed and distance information from the log is not valid.
Operating the NAVIKNOT 600 SD in “Manual” mode may severely affect the proper function of all equipment which depends on accurate speed and/or distance data.

CAUTION

The NAVIKNOT 600 SD is type approved as a speed and distance measuring equipment only.

While the satellite PCB contained in the NAVIKNOT 600 SD electronics unit produces position, heading and rate of turn data, these data are to be regarded internal and may not be used for navigation purposes. The data outputs on the satellite PCB may not be connected to external equipment.

Under no circumstances may the NAVIKNOT 600 SD be used as a substitute for mandatory equipment such as compasses or position receivers.

General Safety Information for Service Personnel

Safety information relating to system configuration, maintenance, servicing and troubleshooting is presented in the respective chapters.

Contents

Chapter 1: Introduction

Chapter 2: Operation

Chapter 6: System Configuration

Chapter 7: Doppler Transducer Calibration

Chapter 8: Troubleshooting

Chapter 9: Corrective Maintenance

Appendix

Chapter 1: Introduction

1.1 Design and Main Features

The NAVIKNOT 600 SD is a compact solid-state microprocessor controlled system to determine a vessel's longitudinal and transverse speeds and distance travelled over ground as well as longitudinal speed and distance travelled through the water.

The system complies with IMO resolutions A. 824(19) and A.694(17) and with EN/IEC standards 61023, 61162 and 60945. The NAVIKNOT 600 SD has been type-approved by Germanischer Lloyd, in accordance with the Maritime Equipment Directive 2002/75/EC and assigned certificate no. 44959-07 Lux.
In accordance with the mutual recognition agreement (MRA), USCG approval no. 165.10/EC 0801/4477307 has been granted.

A basic system consists of the NAVIKNOT 600 SD Electronics Unit, a Control and Display Unit (CDU), a satellite antenna unit and the Doppler transducer (gate valve or tank mount) with Preamplifier D, type 5005. Up to three additional remote CDUs may be connected to the system.

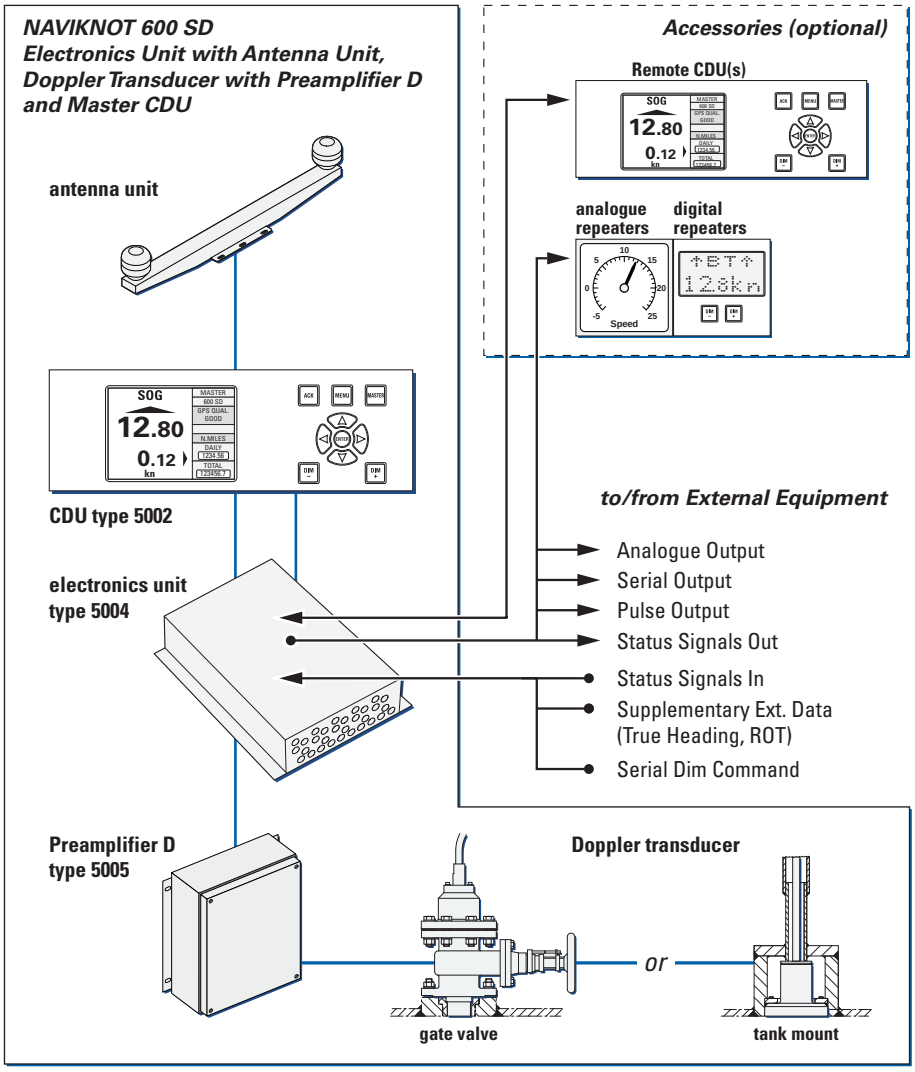


Figure 1-1: NAVIKNOT 600 SD system

Data Outputs

Serial speed and distance data is provided in the NMEA 0183 format at six RS-422 outputs. These are divided into two groups of three outputs each, which may be configured independently to suit the receiving equipment.

Analogue speed signals are provided at one voltage and one current output. The mapping of actual speeds to corresponding output values is configured for each output independently.

The distance travelled is also provided as a pulse signal at six contact closure outputs. These are divided into three groups of three, two and one output respectively, which may be configured independently to provide 10, 100, 200, 400 or 20000 pulses per nautical mile.

1.2 Operating Principle

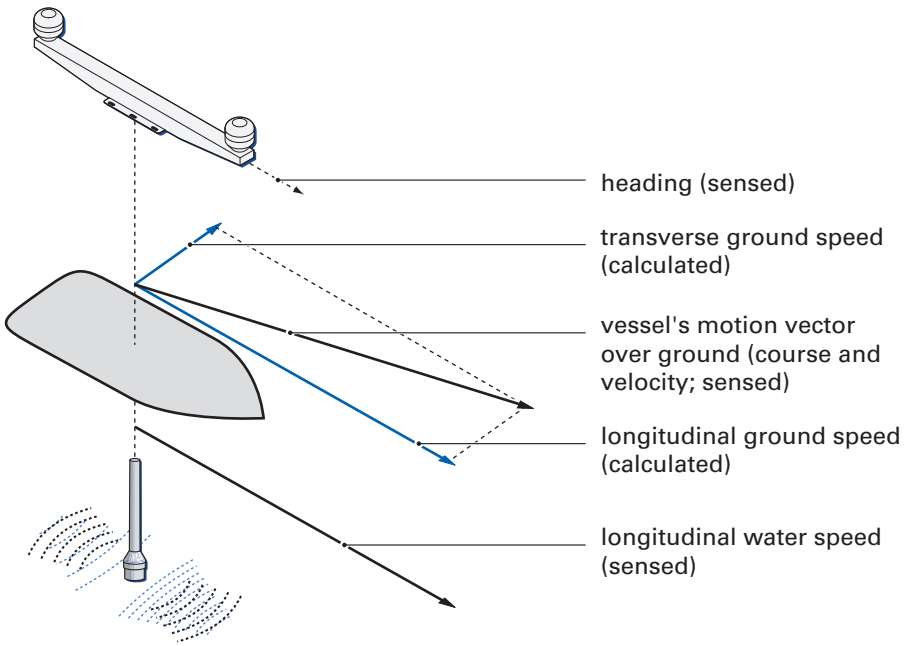
To determine the longitudinal and transverse ground speeds, the system makes use of a self-contained satellite sensing system, consisting of the satellite PCB with two GPS receivers inside the electronics unit and the antenna unit connected to it.
The satellite PCB combines the data from the GPS receivers with data from built-in rate gyros to determine the vessel's heading, velocity, course, and attitude. While the heading is referenced to the vessel's fore-and-aft line, the velocity and course represent the vessel's motion vector, i.e. the magnitude and direction of its motion over ground.

The sensed data are sent to the processing PCB inside the electronics unit, which resolves the velocity data into the vessel-referenced longitudinal and transverse ground speeds.

The speed vectors combined with the sensed rate of turn data are used to discern between translational and rotational movements of the vessel. These are used to determine the bow and stern transverse speeds shown on the "docking display" page.

To determine the longitudinal water speed, the system utilizes the principle of Doppler-shifted sound waves.
The transducer contains two transmitter/receiver windows, which transmit and receive signals in the forward and aft directions respectively. The sensing signals are high frequency sound pulses, generated by the preamplifier D, which also detects the return echo from the water in-between transmissions. The preamplifier processes the return signals and transmits the sensed speed in a digital format to the NAVIKNOT electronics unit.

Figure 1-2: sensed and calculated speeds and directions



The electronics unit transmits all speed data to receiving external equipment and to the connected CDUs. From the longitudinal ground and water speeds, the electronics unit also calculates the distances travelled and maintains the total and daily mile counters for both the ground and water distances.

1.3 Technical Data

General

Ground Speed Range, Accuracies and Operating Parameters, Satellite Sensing System

measuring range	–99 to +99 kn longitudinal –99 to +99 kn transverse
accuracy of ground velocity	0.2 kn or 2% of true velocity
settling time, heading acquisition	4 min. coast time

Water Speed Range and Accuracy, Doppler Transducer

measuring range	–50 to +50 kn
1 σ error of displayed speed for a period of five minutes (under good hydrostatic conditions, pitch angles < 5°)	±1% or 0.1 kn

NAVIKNOT Electronics Unit, Type 5004

Environmental Requirements

ambient temperature, operation	-15°C – +55°C
ambient temperature, storage	-15°C – +55°C
protection grade	IP 23 to DIN EN 60529
environmental conditions / EMC	in accordance with IEC 60945

Power supply

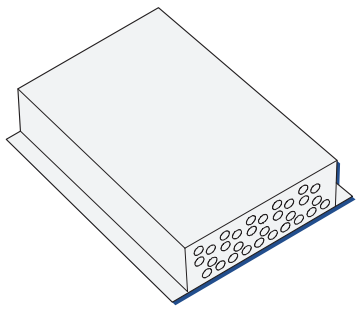
supply voltage	24 VDC (18-36 V)
max. ripple content	±4 Vpp; extreme values may not exceed 36 V or fall below 18 V
power consumption	16 W max.

Magnetic Clearance

to standard magnetic compass	0.5 m
to steering magnetic compass	0.4 m
reduced, to standard magnetic compass	0.3 m
reduced, to steering magnetic compass	0.3 m

Dimensions and Weight

width	340 mm
height	120 mm
depth	545 mm
unit can be deck mounted only; sides of housing must be parallel or perpendicular to vessel's centerline to within ±5°	
weight	8.0 kg



Data Inputs

sensing and status from satellite PCB	NMEA 0183 (proprietary sentences)
Doppler transducer speed data	Sperry SRD 331 protocol
external data (supplementary, not required for basic system functionality)	NMEA 0183 / IEC 61162; true heading, rate of turn
control data from CDUs	NMEA 0183 / IEC 61162 (proprietary sentences)
serial dimming command	NMEA 0183

Signal and Status Inputs

double ended ferry mode	connection to P.Gnd via ext. contact, latching
ext. alarm acknowledge status (mute)	connection to P.Gnd via ext. contact, momentary, normally open
ext. dim+ ext. dim-	connection to P.Gnd via ext. contact, momentary, normally open

Data Outputs

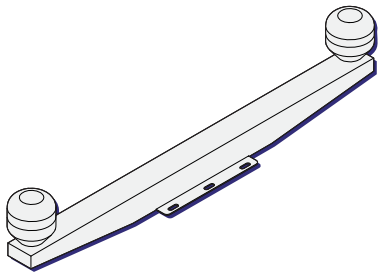
serial data RS-422 outputs, group 1 (3x)	NMEA 0183 / IEC 61162; *all or selected subset of:* longitudinal and transverse ground speeds longitudinal water speed distances travelled log status (proprietary sentence) EMRI DIB10 docking display data (proprietary sentence)
serial data RS-422 outputs, group 2 (3x)	NMEA 0183 / IEC 61162; *all or selected subset of:* longitudinal and transverse ground speeds longitudinal water speed distances travelled log status (proprietary sentence) EMRI DIB10 docking display data (proprietary sentence)
control data to satellite PCB	NMEA 0183, 8N1, 38400; configuration/status/alarms (proprietary sentences)
display data to CDUs	NMEA 0183, 8N1, 38400; speeds/velocity distances travelled heading rate of turn status/alarms (proprietary sentences)

Signal and Status Outputs

analogue speed output, voltage	max. range -9.999 – 9.999 VDC; speed mapped to output voltage through definition of min. and-max. speed/voltage pairs
analogue speed output, current	max. range 0 – 20 mA; speed mapped to output current through definition of min. and-max. speed/current pairs
pulse outputs, group 1 (outputs 1,2 and 3)	10, 100, 200, 400 or 20000 p/nm
pulse outputs, group 2 outputs 4 and 5)	10, 100, 200, 400 or 20000 p/nm
pulse output 6	10, 100, 200, 400 or 20000 p/nm or ext. alarm mute
power failure/general alarm speed log failure alarm speed limit threshold alarm watch alarm acknowledge	potential-free relay contacts, each rated 30 VDC/1.0 A, 100 VDC/0.3 A, 125 VAC/0.5 A;

Satellite Antenna Unit

Dimensions and Weight

width	98 mm	
height	144 mm	
depth	776 mm	
beam supporting the antennas must be aligned parallel or perpendicular to vessel's centerline to within ±9°		
weight	1.9 kg approx.	

Preamplifier D, Type 5005

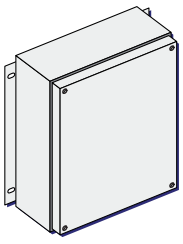
Environmental Requirements

ambient temperature, operation	–15 to +55 °C
ambient temperature, storage	–25 to +70 °C
protection grade	IP 65 to DIN EN 60529
environmental conditions / EMC	in accordance with IEC 60945

Power Supply

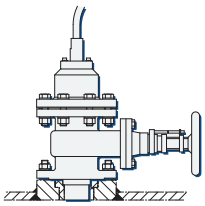
supply voltage	24 VDC (18 - 36 V)
max. ripple content	±4 Vpp; extreme values may not exceed 36 V or fall below 18 V
power consumption	16 W max.

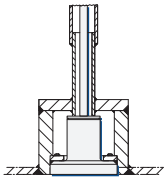
Dimensions and Weight

width	239 mm	
height	285 mm	
depth	83 mm	
weight	3.0 kg	

Doppler Transducers

Common Operational Data	
speed range	-50 to +50 kn
radiated power (electrical)	10 W max.
signal mode	pulse
frequency	2 MHz
number of beams	2
beam width	1.5°
beam angle	15° from vertical
minimum required bottom clearance	1.8 m

Transducer with Gate Valve	
transducer for steel or aluminium vessels, single bottom	
installation method	from inside vessel, through hull fittings
ambient temperature, operation	–2 to +40 °C
protection grade	IP 68 to DIN EN 60529; submersible to 35 m
cable length	18 m (PN 60232) or 36 m (PN 60296)
dimensions and weight	see drawing 4983-0112-01

Tank Mount Transducer	
transducer for steel vessels, single or double bottom	
installation method	from outside vessel; sensor can be exchanged without drydocking by a diver
ambient temperature, operation	–2 to +40 °C
protection grade	IP 68 to DIN EN 60529; submersible to 35 m
cable length	18 m (PN 73494) or 36 m (PN 73496)
dimensions and weight	see drawing 4978-0112-01

Control and Display Unit (CDU)

Environmental Requirements

ambient temperature, operation	-15°C – +55°C
ambient temperature, storage	-25°C – +70°C
protection grade, main CDU and 3x1 remote unit	IP 23 to DIN EN 60529
protection grade, 2x1 remote unit	*PN 73506*: frontside IP 65 to DIN EN 60529, if installed with seal in console panel; IP 23 if installed in console frame *PN 73507 (in housing with bracket):* IP 65 to DIN EN 60529
environmental conditions / EMC	in accordance with IEC 60945

Power supply

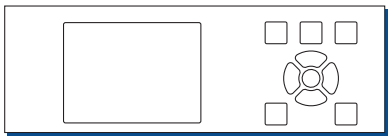
supply voltage	24 VDC (18-36 V)
max. ripple content	±4 Vpp; extreme values may not exceed 36 V or fall below 18 V
power consumption	14 W max. (3x1 unit) 4 W max. (2x1 unit)

Magnetic Clearance

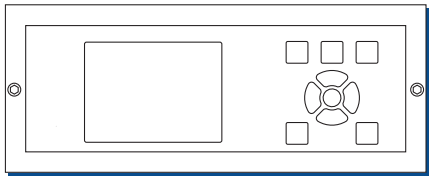
to standard magnetic compass	0.70 m (3x1 unit) 0.80 m (2x1 unit)
to steering magnetic compass	0.40 m (3x1 unit) 0.50 m (2x1 unit)
reduced, to standard magnetic compass	0.45 m (3x1 unit) 0.50 m (2x1 unit)
reduced, to steering magnetic compass	0.30 m (3x1 unit) 0.30 m (2x1 unit)

Dimensions and Weight, Main CDU and 3x1 remote unit

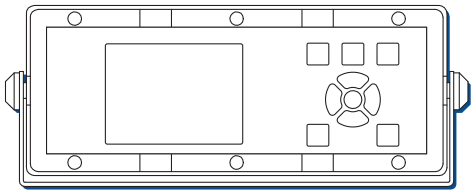
PN 73508 (for console mounting)

width	192 mm	
height	96 mm	
depth	43 mm; approx. 120 mm backward clearance from mounting surface required for connector cable and plug	
weight	2.4 kg	

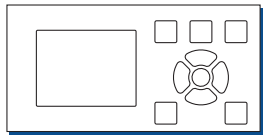
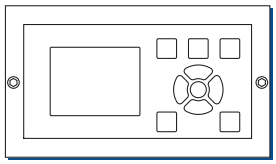
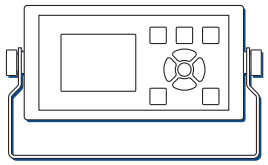
PN 79489 (PN 73508 factory-assembled in console frame)

frame width	319 mm	
frame height	127 mm	

PN 73509 (in housing with bracket)

width	350 mm	
max. height (unit in vertical position)	150 mm	
max. depth (unit in horizontal position)	130 mm	
weight	3.2 kg	

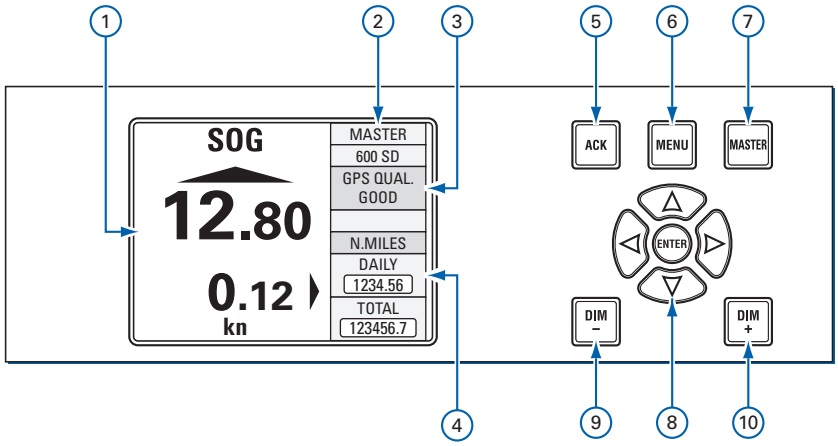
Dimensions and Weight, 2x1 remote unit

PN 73506 (for console mounting)		
width	192 mm	
height	96 mm	
depth	44 mm; approx. 100 mm backward clearance from mounting surface required for connector cable and plug	
weight	2.4 kg	
PN 79488 (PN 73506 factory-assembled in console frame)		
frame width	223 mm	
frame height	127 mm	
PN 73507 (in housing with bracket)		
width	256 mm	
max. height (unit in vertical position)	155 mm	
max. depth (unit in horizontal position)	116 mm	
weight	3.2 kg	

Chapter 2: Operation

2.1 Display and Operating Keys

Figure 2-1: NAVIKNOT 600 SD operating unit



① **Main Display:** shows one of five selectable pages, indicating
- Ground speeds, longitudinal and transverse
- Water speed, longitudinal
- "Docking" display (longitudinal and bow and stern transverse ground speeds)
- Satellite status page
- Alarm page

② **Sidebar:** Shows additional information, indicating

- Operating mode (Master or Repeater).
- ③ GPS signal and alarm status
  - GPS signal status (good/fair/poor)
  - In case of pending alarms, acknowledge status and error code(s) are displayed, alternating with GPS signal status.
- ④ Supplementary Data, depending on active main display page
  - on ground speed page: total and daily mile counters
  - on docking display page: heading, course over ground and rate of turn
  - on satellite status page: GPS HDOP/VDOP, date and time
  - on alarm page: date and time

⑤ **ACK** key. Acknowledges pending alarms; mute alarm buzzer.

⑥ **MENU** key. Calls up or quits the menu mode.

⑦ **MASTER** key. Requests Master operating mode for this unit.

⑧ Navigation Keypad:

In normal operational mode,
UP, DOWN keys scroll through main display pages.
LEFT, RIGHT keys scroll through list of active alarms.
In menu mode,
UP, DOWN, LEFT, RIGHT keys navigate through the operating menu;
ENTER confirms and stores settings made in the menu mode.

⑨⑩ **DIM– / DIM+.** Adjust the display brightness.

2.2 External control devices

Depending on the installation, external devices may be present to remotely control certain functions of the NAVIKNOT 600 SD:

- The audible alarm at the NAVIKNOT 600 SD the may be muted from a remote device, e.g. a central alarm panel.
- External pushbuttons may be used to adjust the display brightness.
- If connected to a central dimming system, the NAVIKNOT 600 SD may receive dimming commands via a serial data connection.
- An external selector switch may be used to activate or de-activate the double-ended ferry mode. In this mode, the NAVIKNOT 600 SD displays and transmits all speeds with the sign reversed.

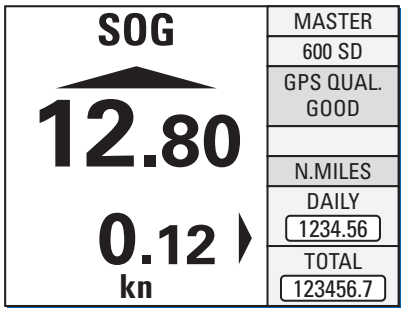
2.3 Power-up Sequence

The individual components of the NAVIKNOT system are not equipped with power switches. All devices power up simultaneously, as soon as supply power is applied to the system.

Upon power up, the startup routine is executed:

The startup screen is shown and a system test sequence is executed.

A status line at the bottom of the screen indicates the progress and results of the following tests:
RAM test
I/O test
Checksum test
Setup Data test



After the system test, the indication “waiting for main unit” may be briefly shown at the CDU, while the Electronics Unit initializes itself.

As soon as the system is fully operational, the actual speed over ground and the daily and total mile counters are displayed.

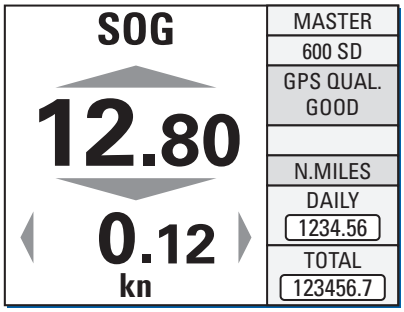
Note

Should the NAVIKNOT electronics fail to establish communication with the CDU(s) after power-up, the indication “waiting for main unit” will be shown permanently at all connected CDUs. An audible alarm is sounded which must be locally acknowledged at each CDU.
The NAVIKNOT system will not operate properly until the cause of failure is eliminated and should be powered down until it can be serviced.

2.4 Display Indications in Normal Operational Mode

Main Display Pages

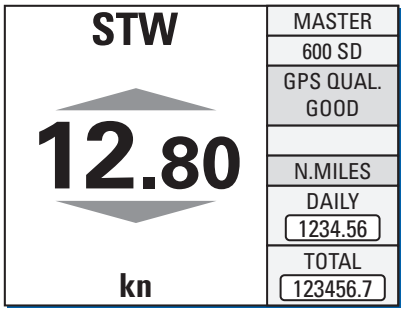
In the normal operational mode, the CDU permanently displays one of the five selectable main display pages.



Ground Speed (SOG)

The main display shows the actual longitudinal and transverse speed over ground.
Arrow symbols indicate the respective direction in which the vessel is moving (up = ahead, down = astern, right = to stb., left = to port).
The values themselves are displayed without sign.

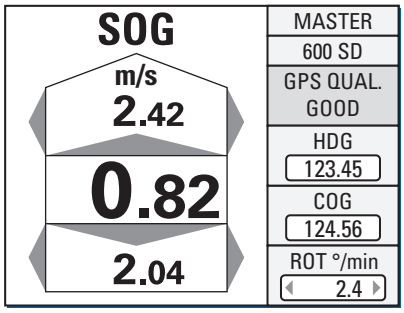
The sidebar shows the GPS signal status and the distance counters (daily and total miles) for the distance made good over ground. The count is incremented at positive speeds only, counting is halted during zero or negative speeds.



Water Speed (STW)

The main display shows the actual longitudinal speed through the water.
Arrow symbols indicate the direction in which the vessel is moving (up = ahead, down = astern).
The value itself is displayed without sign.

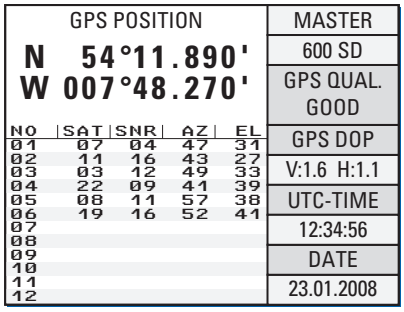
The sidebar shows the GPS signal status and the distance counters (daily and total miles) for the distance made good through the water. The count is incremented at positive speeds only, counting is halted during zero or negative speeds.



Docking Display

The main display shows a graphical representation of the vessel, indicating the actual longitudinal speed over ground as well as the transverse ground speeds at the bow and at the stern.
Arrow symbols indicate the direction in which the vessel is moving (up = ahead, down = astern, right = to stb., left = to port).
The values themselves are displayed without sign.

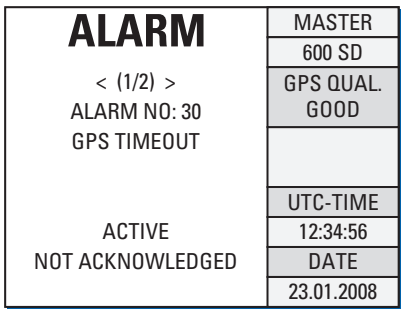
The sidebar shows the GPS signal status and the data used to calculate the speeds displayed, i.e. the vessel's heading (ROT), the direction of the motion vector (course over ground, COG) and the rate of turn (ROT).



Satellite Status

The main display shows the actual GPS position as received from the satellite PCB.
A tabular overview is given of the satellites in view as well as the respective satellite's signal-to-noise ratio, azimuth and elevation

The sidebar shows the GPS signal status, the current VDOP and HDOP figures and the date and time as received from the satellite PCB.



Alarm Page

The alarm page list the alarm messages and acknowledge status of all active alarms.

The sidebar shows the date and time as received from the satellite PCB.

Operating Status Indications

Master/Remote status

The indication “MASTER” is shown in the top right corner of the CDU which is currently assigned the operating master status. Other CDUs, if present, will show the indication “REMOTE”

Manual speed input active

When the manual input mode has been activated in the manual settings menu, the indication “MAN” is shown in the top left corner of the speed display.

Water speed not calibrated

When the sensor calibration table is empty or calibration has been switched off, the indication “UNCAL” is shown in the bottom left corner of the speed display.

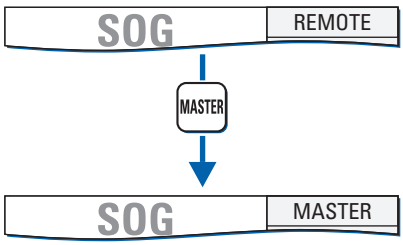
2.5 Requesting Master Control

In cases where more than one CDU is installed, only one of these is assigned master control while all others will operate as remote units.

Only from the master, the operator can access the operating and service menus, acknowledge alarms and scroll through the alarm list.

Remote CDUs permanently display speed and distance. The only keys functional at a remote CDU are the **DIM-**/**DIM+** keys to adjust the brightness level, the **UP** and **DOWN** keys to scroll through the main display pages and the **MASTER** key, which requests master control to be transferred to this CDU.

To request master control at a remote CDU:



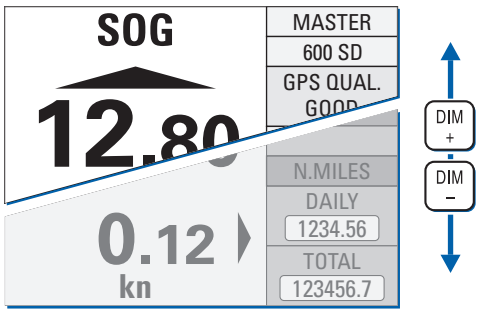
Press the **MASTER** key.
Master control is transferred and the mode indication changes from "REMOTE" to "MASTER".

Note

Master control can only be requested from a CDU which is currently operating as remote unit.
The current master cannot actively transfer control to a remote CDU. Any remote CDU may request master control at any time, i.e. control requests cannot be refused by the current master.

2.6 Adjusting the display brightness

The brightness of the display and keypad illumination is adjusted via the **DIM+**/**DIM-** keys:



Press the **DIM+** key to increase the illumination brightness.
Press the **DIM-** key to reduce the illumination brightness.

Note

The display brightness can only be adjusted in normal operational mode. The brightness setting is not retained between power-ups. The NAVIKNOT 600 SD always powers up at the second brightest level.

2.7 Optional Functions

The following functions may be available if the system is equipped with the respective external controls and configured accordingly.

Muting Alarms Remotely

On alarm, actuate the mute control at a remote device (e.g. a central alarm panel). The audible alarm is muted.

Note

A remotely muted alarm remains in the pending (unacknowledged) state. The alarm is indicated as pending in the sidebar until the alarm is acknowledged at the NAVIKNOT 600 SD or the cause of the alarm is eliminated.

Resetting/Acknowledging a Central Watch Alarm

If connected to a central watch alarm facility ('dead man alarm'), the NAVIKNOT 600 SD will automatically reset the watch alarm timer whenever a key is pressed on the unit.

Should a watch alarm be given, press any key at the NAVIKNOT 600 SD to acknowledge the alarm and reset the watch alarm timer.

External Dimming

If external **DIM+/DIM-** pushbuttons are installed, these operate in parallel with the builtin **DIM+/DIM-** keys.

For future applications, the NAVIKNOT 600 SD also possesses an input for serial data dimming commands from a central dimming facility.

Activating Double-Ended Ferry Mode

In certain installations, a switch may be installed to activate or de-activate the double-ended ferry mode. If this mode is active, all speeds are displayed and transmitted with their sign reversed.

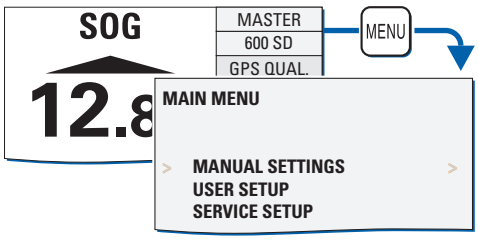
Note

In most installations where the double-ended ferry mode is used, it will be automatically activated via a general take-over system which transfers control between the forward and aft steering positions.

2.8 Operating Menu

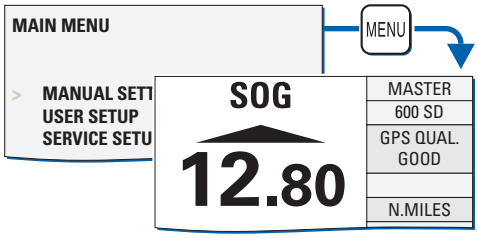
The manual settings, user and service setup sub-menus are accessed through a multilevel operating menu.

Entering and Quitting the Menu Mode



From the normal operational mode, press **MENU** to enter the menu mode.

The Main Menu screen is displayed.
The keys of the navigation keypad may now be used to navigate the menu, to select parameter settings and to edit parameter values.



From the main menu screen, press **MENU** to return to the normal operational mode.

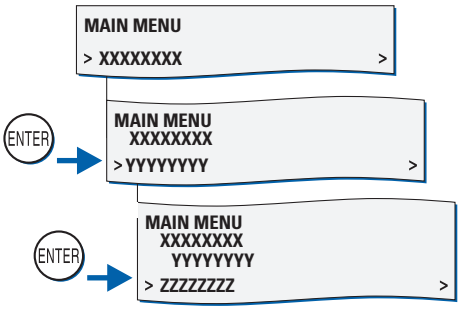
The Main Menu screen is closed and the normal operational display reappears.

Note

In the menu mode, the **MASTER** and the **DIM-/DIM+** keys are disabled. Should an alarm condition occur while the menu mode is active, the audible alarm will sound, but the operator must return to normal operational mode to view the alarm message and acknowledge the alarm.

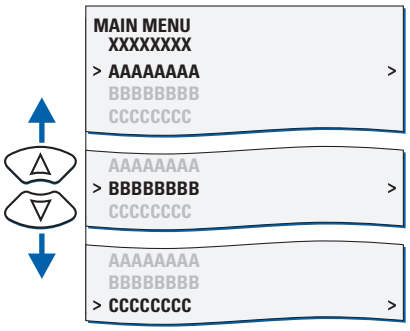
Navigating the Menu

In the menu mode, the operator may navigate through the menu using the **Right**, **Left**, **Up** and **Down** arrow keys.



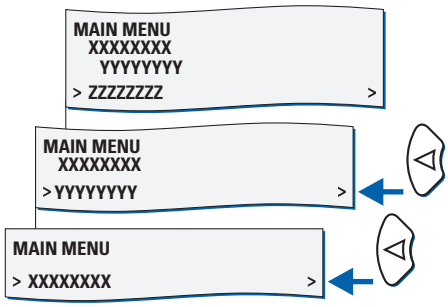
Arrow symbols (>) to the right of the window indicate that a sub-menu exists for the respective option.

Press **ENTER** to enter a sub-menu.



The arrow symbol (>) at the left of the window indicates the cursor position on the current menu level.

With the **Up/Down** arrow keys, move to the cursor to the required sub-menu position.



Press the **Left** arrow key to return to the next higher menu level.

Alternatively, **MENU** may be pressed to jump as high up as possible from the current level. In most cases, this will quit the menu immediately and return to normal operational mode.

Selecting Parameter Settings

In a number of sub-menus, the operator is expected to select parameter settings from a list of available options.

The available options and the current selection are indicated by different symbols:

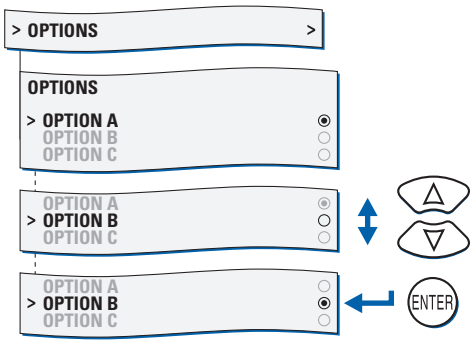
Radio buttons: Allow to select exactly one of the available options.

◉ : selected
○ : deselected

Checkboxes: Allow to select or activate none, one or more of the available options.

☒ : selected
☐ : deselected

To select parameter settings in a sub-menu:



With the **Up/Down** arrow keys, move to the required option.

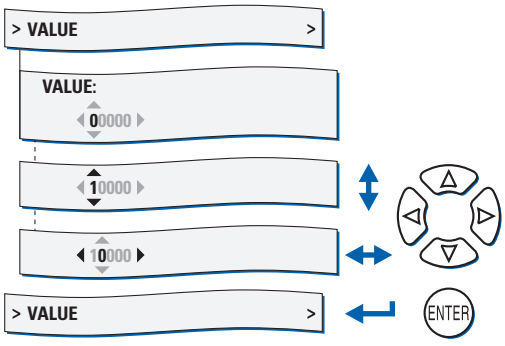
Press **ENTER** to confirm and store the selection.

MENU leaves the option sub-menu without changes.

Editing Parameter Values

In a number of sub-menus, parameters are set by editing a numerical value or an alphanumerical string.

To edit a parameter value in the respective sub-menu:



With the **Up/Down** arrow keys, edit the character at the current cursor position.

With the **Right/Left** arrow keys, move the cursor forward/back to edit the next/previous character.

Press **ENTER** to confirm and store the new value.

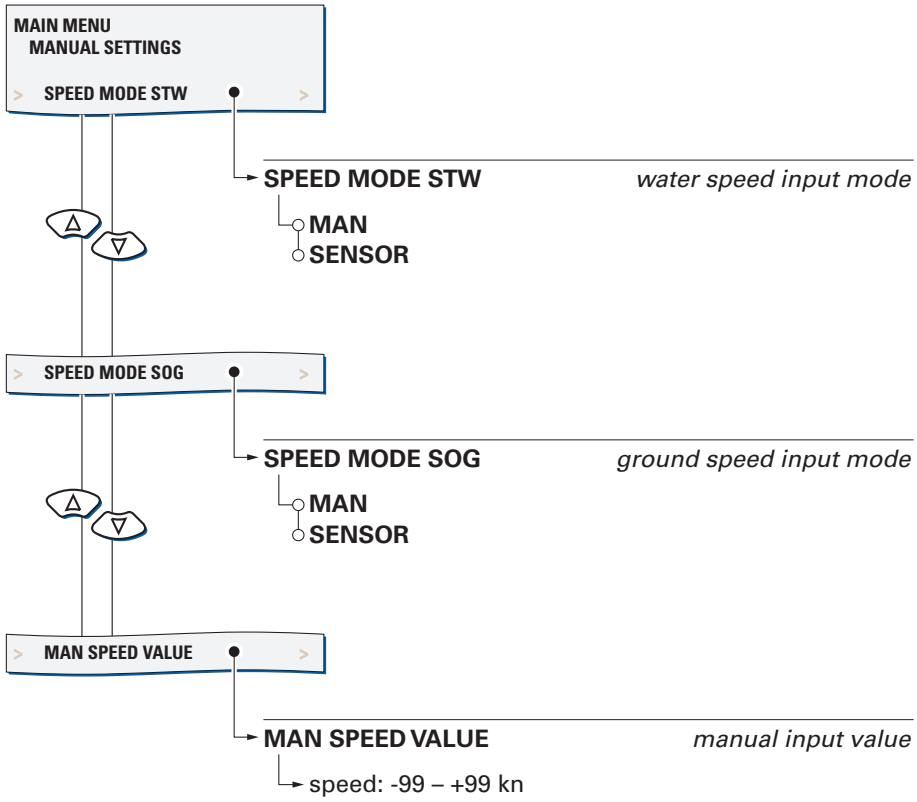
MENU leaves the option sub-menu without changes.

2.9 Manual Settings Menu

The Manual Settings menu provides access to settings which the operator may need to alter more or less frequently during normal operation.

Manual Settings – Overview

Figure 2-2: Manual Settings



Manual Settings – Parameters

Speed Mode STW

Selects the input mode for water speed data.

Settings: **MAN**
The actual speed value is entered manually.
This setting may be activated only temporarily, to generate water speed output data in case of failure of the Doppler transducer or for testing.

SENSOR
Speed data is read from the preamplifier D.
This setting must be active at all times during normal operation of the system.

Speed Mode SOG

Selects the input mode for ground speed data.

Settings: **MAN**
The actual speed value is entered manually.
This setting may be activated only temporarily, to generate speed output data in case of failure of the satellite PCB or for testing. Using manual input, only longitudinal ground speed data is generated; transverse speeds are set to zero.

SENSOR
Speed data is read from the satellite PCB input.
This setting must be active at all times during normal operation of the system.

Man. Speed Value

Sets the input value in the manual input mode.

Value: **-99.9 – 99.9 kn**

2.10 User Setup

The User Setup menu provides access to settings which the operator may need to alter only occasionally.

User Setup – Overview

Figure 2-3: User Setup

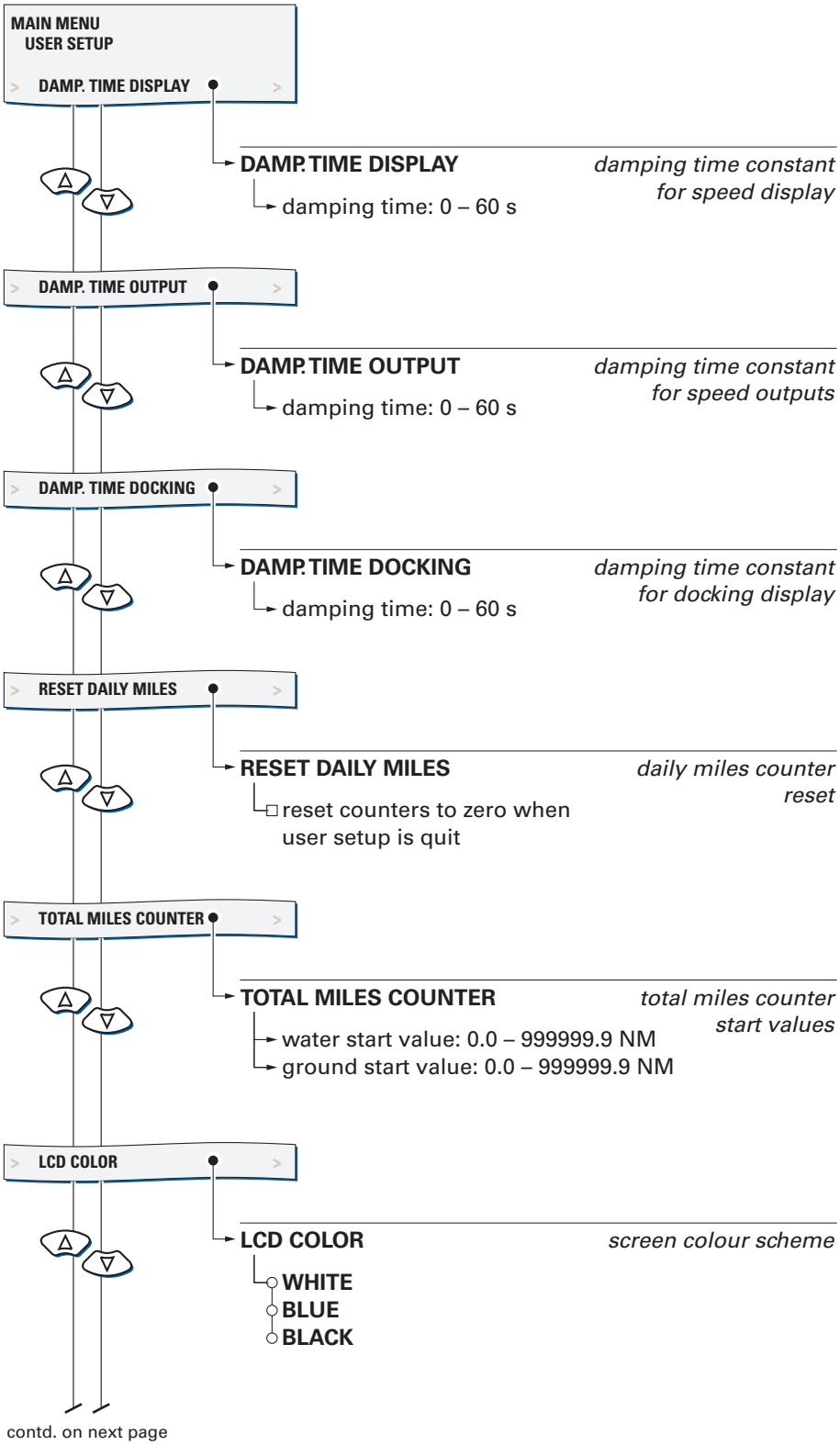
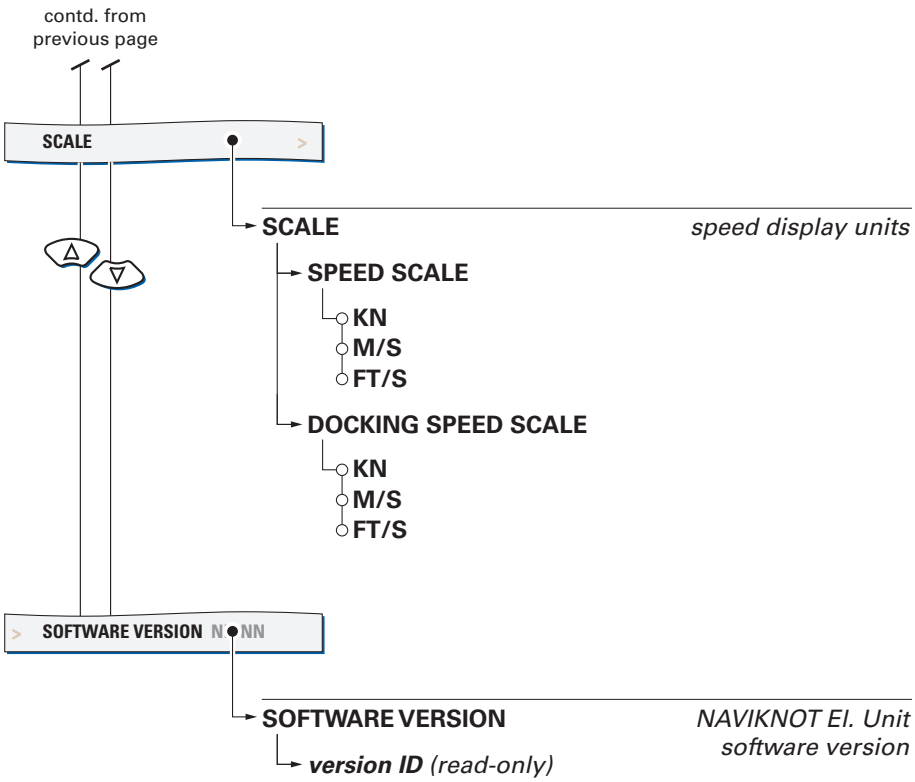


Figure 2-4: User Setup (cont.d)



User Setup – Parameters

Damp. Time Display

Sets the damping time constant for the ground speed display.

The higher the time constant, the stronger sudden peaks of the actual speed will be damped in the ground speed display page.

Value: **0 – 60 s**

Damp. Time Output

Sets the damping time constant for the speed outputs.

The higher the time constant, the stronger sudden peaks of the actual speed output will be damped. The output damping time constant is effective for both the analogue as well as the serial data outputs.

Value: **0 – 60 s**

Damp. Time Docking

Sets the damping time constant for the docking display.

The higher the time constant, the stronger sudden peaks of the actual speed will be damped in the docking display page.

Value: **0 – 60 s**

Reset Daily Miles

Sets the reset flag for the daily miles counter.

If the reset flag is set, the daily miles counter reset to zero as soon as the User Setup is quit.

Settings: **ON** (option checked)
Reset daily miles counter when User Setup is quit

OFF (option unchecked)
Leave daily miles counter untouched

Total Miles Counter

Sets the total miles counters to desired start values.

Values: Water start value **0.0 – 999999.9 NM**
Ground start value **0.0 – 999999.9 NM**

Note

The total miles counters may be set to any desired start value.
A daily mile count may thus be larger than the corresponding total mile count if the daily counter is not reset after altering the total mile counter.

LCD Color

Selects the screen colour scheme for the normal operational display.

Settings: **WHITE**
Speed display and mile counters use black lettering on a white background.

BLUE
Speed display and mile counters use white lettering on a blue background.

BLACK
Speed display and mile counters use white lettering on a black background.

Scale

Selects the unit of measure for the speed displays.

The respective settings act on the actual speed displays at the CDU only and have no further effect on the output data, mile counters etc.

Speed Scale
Unit of measure for the ground speed display page

Settings: **KN**
Speed is displayed in knots.

M/S
Speed is displayed in metres per second.

FT/S
Speed is displayed in feet per second.

Docking Speed Scale
Unit of measure for the docking display page

Settings: **KN**
Speed is displayed in knots.

M/S
Speed is displayed in metres per second.

FT/S
Speed is displayed in feet per second.

Software Version

Displays the software version of the NAVIKNOT Electronics Unit.

Settings: ***none***
The version ID is read-only.

Chapter 3: Alarm System

3.1 Alarm Indication

Audible Alarm Indication

Single Beep: Invalid Action

A single short beep indicates that the operator attempted to carry out an invalid action.
This is the case e.g. if the operator attempts to enter the menu mode from a remote unit.

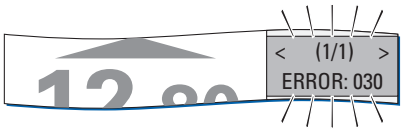
Continuous Beeping: Pending Alarm

Continuous on-off beeping indicates that a pending (unacknowledged) alarm is present.
Simultaneously, the corresponding error code is shown in the sidebar.

Visual Alarm Indication

If an alarm is active and any other than the alarm page is currently selected as main display, an error code is shown in the sidebar which specifies the alarm at hand.

Active alarms have one of two possible states:



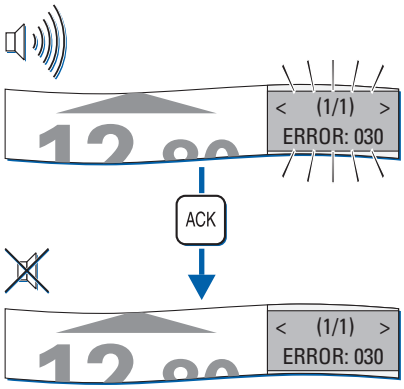
Pending (unacknowledged):
The cause of the alarm is present and the operator has not yet acknowledged the alarm.
The alarm display area background colour flashes red-white.

Acknowledged:
The operator has acknowledged the alarm but the cause of the alarm is still present.
The alarm display area background colour is solid red.

3.2 Acknowledging Alarms/Muting the Audible Alarm

Local Alarm Acknowledge

To acknowledge a pending alarm at the NAVIKNOT 600 SD CDU:



Press **ACK**.

The audible alarm indication is muted.

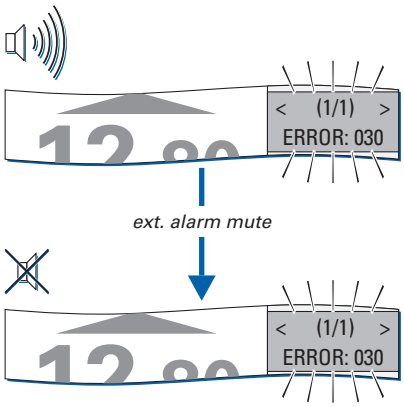
If the system is connected to a central alarm facility and configured accordingly, the audible alarm indication at the central alarm facility will also be muted.

Note

When an alarm has been acknowledged, the ext. alarm status output remains active until the cause of the alarm is eliminated.
When the cause of an alarm is eliminated, the alarm is acknowledged automatically and the alarm status is cleared.
The NAVIKNOT 600 SD does not keep a history of past (inactive) alarms.

External Alarm Mute

To mute the audible alarm externally (e.g. from a central alarm panel):



Actuate the external mute facility.

The audible alarm indication is muted.

The alarm state and visible indication are not affected, i.e. the alarm remains in the pending state until it is locally acknowledged at the NAVIKNOT 600 SD CDU.

3.3 Viewing the active alarms

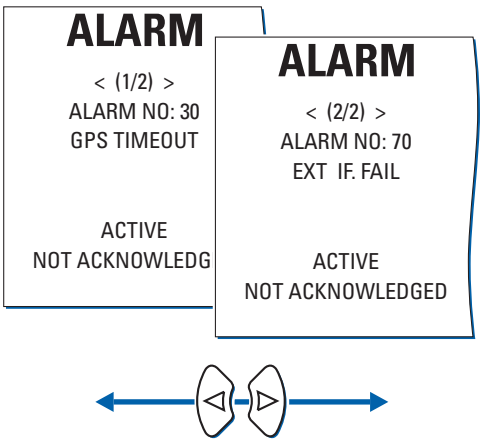
In all main display pages except the alarm page, the total number of active alarms and the error code of the newest alarm are shown in the sidebar.

If more than one alarm is active, the Left or Right arrow keys will scroll through the respective error codes.

To view the detailed error message for the currently active alarms, select the alarm page for the main display.

The active alarms' error codes and corresponding error message texts are displayed as well as the acknowledge status.

The Left or Right arrow keys scroll through the list of active alarms:



Note

As long as any pending (unacknowledged) alarms are present, these will automatically be redisplayed when other messages have been viewed, until all alarms have been acknowledged by the operator.

3.4 Error Messages

Table 3-1: error messages

code	message text	cause	corrective action
	WAITING FOR MAIN UNIT (shown on startup screen)	Communcation between electronics unit and CDU(s) could not be established	Check operation of the electronics unit; Check cabling between CDU and electronics unit. If error persists, power down the system and call service.
001	LOSS OF GPS	GPS receivers track less than five common satellites (errors 002 and 003 arise as GPS is the only hdg. source available for the satellite PCB)	Check that both antennas have a clear view of the sky; check cabling between antennas and satellite PCB
002	SEL SRC INVALID		
003	NO VALID SRC		
030	GPS TIMEOUT	Communication lost between satellite and processing PCBs	Check internal cabling between satellite and processing PCBs; check that satellite PCB is operating (power is on and internal 100 Hz clock is generated).
050	SRD TIMEOUT	Transducer protocol detection failed	Check that the preamplifier is operating; check that protocol is set to NMEA; check cabling between preamplifier and NAVIKNOT electronics unit; check cabling between transducer and preamplifier; check transducer for proper operation.
	PREAMP D. TIMEOUT	Data lost from preamplifier D (protocol detection succeeded and valid data was received previously)	
051	SCAN SRD SENSOR	Transducer protocol detection running (NAVIKNOT electronics unit analyzes incoming data)	Error is cleared once transducer protocol has been determined. If error persists, check preamplifier D for proper operation.

code	message text	cause	corrective action
070	EXT IF. FAIL	No valid data received at external input	Check that external source produces valid data; check cabling between external source and electronics unit.
071	EXT HDT TIMEOUT	No valid external heading data received	Check that external source produces the required data and that it is not marked invalid.
072	EXT ROT TIMEOUT	No valid external rate of turn data received	
080	EXT DIM TIMEOUT	No valid commands received at serial dim input.	Check connection between dimming device and electronics unit.
096	EU TIMEOUT	Communication lost between electronics unit and CDU	Check basic operation of the electronics unit (valid output generated at serial data / analogue outputs); check cabling between CDU and electronics unit.

Note

In case of an “EU timeout” error, dashes will appear in the speed and distance displays. The timeout will be shown as the only fault present, as the CDU receives no messages from the electronics unit when communication is lost.

Chapter 4: Scheduled Maintenance

4.1 Maintenance by Shipboard Personnel

NAVIKNOT Electronics Unit, CDU and Antenna Unit

The electronic components of the NAVIKNOT 600 SD system are solid-state devices and contain no consumable parts. Therefore, no set maintenance schedule is required.

The satellite antenna unit should regularly be checked visually to detect any signs of mechanical damage or wear and to make sure it is still aligned correctly to the vessel's fore and aft axis.

The CDU front plate should be kept clean and the system's cables and connectors should regularly be checked visually to detect any signs of damage or deterioration.

CAUTION

The CDU front plate is made of clear polycarbonate.
Do not clean the front plate with organic solvents, acetone or any other substance which could damage or discolor plastic.
Use only water and soap or a mild detergent to clean the front plate.

Doppler Transducer and Preamplifier D

Depending on the type of transducer installed, certain maintenance procedures are to be carried out at regular intervals, such as cleaning of the transducer face and lubrication/overhaul of the sea valve, if applicable.

The recommended maintenance schedule and procedures are described in the installation, maintenance and service instructions for the Doppler transducers and preamplifier D, document no. 005005-0125-001.

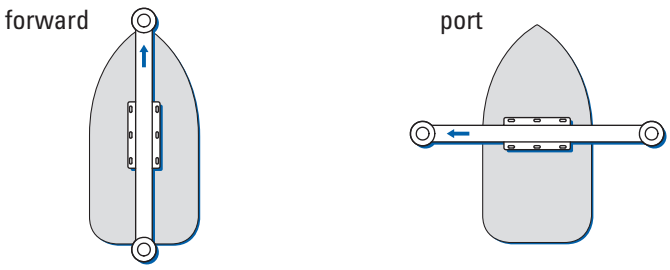
Chapter 5: Installation

5.1 Mechanical Installation

Antenna Unit

The antenna unit consists of a bow and stern GPS antenna mounted on a beam-shaped support. The arrow on the support must point either ahead or to the port side. The chosen orientation must be entered in the GPS setup menu during system configuration. Possible misalignment of up to ±9.9° may be electronically compensated for in the setup menu.

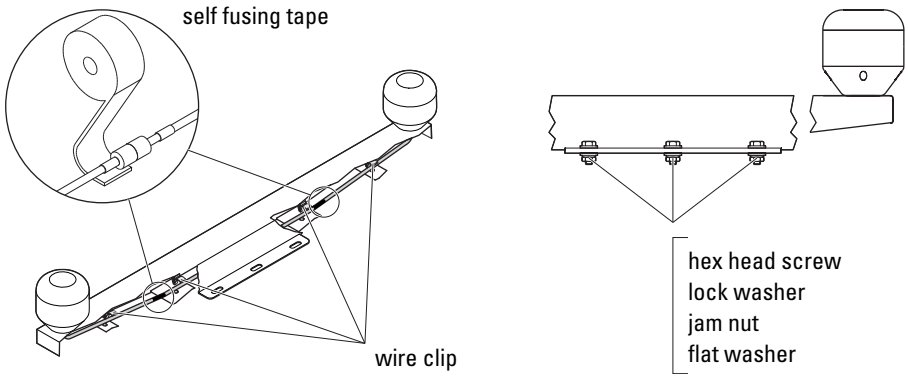
Figure 5-1: antenna unit alignment



The location of the antenna must provide an unobstructed view of the sky. It should be clear of reflections from masts, out of the path of the radar beam, and out of the range of any object that may shadow or interfere with the reception of GPS signals.

The antenna support may be mounted directly onto the mounting surface or on a pedestal. The required mounting material is contained in the installation kit 4302244, included with the antenna.

Figure 5-2: mounting material from installation kit 4302244



When installing the antenna unit, the cable assembly must be connected to the cables from the bow and stern antenna. After connecting the cables, secure them to the support with the wire clips and seal the cable connections with the self-fusing tape provided.

CAUTION

Do not shorten or lengthen the antenna cables. The antennas' output gain is matched to the cable length of 15 or 50 m respectively.
Antenna unit 73513 may only be used with the 15 m cables supplied.
Antenna unit 73514 may only be used with the 50 m cables supplied.

Note

The installation kit contains connectors intended for use of the satellite PCB in the NAVISTAR satellite compass system. These are not required in the NAVIKNOT 600 SD system, at the electronics unit is delivered prewired with all internal connections between the satellite and processing PCBs being installed at the factory.
Likewise, installation drawings referring to other parts than the antenna unit are not relevant in conjunction with the NAVIKNOT 600 SD system.

Doppler Transducer and Preamplifier D

Details of the installation of the Doppler transducer and preamplifier D, type 5005, are contained in the installation, maintenance and service instructions for the Doppler transducers and preamplifier D, document no. 005005-0125-001, and in the dimension/installation drawing for the respective transducer.

In general, field service will attend a vessel after the transducer hardware has been installed mechanically by the shipyard. I.e., in case of the gate valve transducer, the gate valve will be installed and in case of the tank mount transducer, the cofferdam tank and transducer will be installed completely. In most cases, the vessel will be afloat at this point in time.
The preamplifier D, type 5005, may be installed at the same time as the sensor or later, together with the other electronic components of the NAVIKNOT 600 SD system.

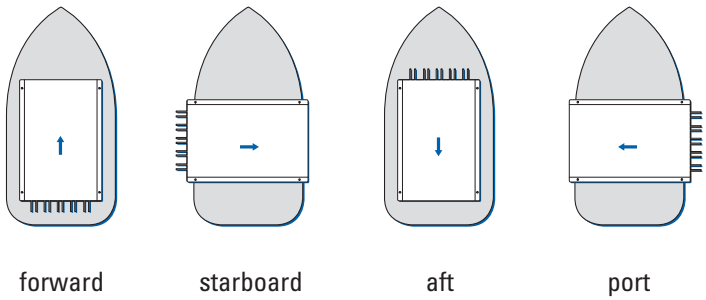
NAVIKNOT Electronics Unit

The electronics unit is to be installed at a protected location. In most cases, it will be mounted in the vicinity of the master CDU.

The electronics unit is to be attached to a level surface with four M6 screws (or nuts and bolts). For the dimensions of the housing, refer to drawing 5004-0112-01.

The electronics unit may be deck-mounted only and must face in either the forward, aft, port or starboard direction, relative to the vessel's fore-and-aft line, to an accuracy within ±5°.

Figure 5-3: electronics unit alignment



Control and Display Units

Console Mounting

3x1 CDU (main or remote)
To mount a NAVIKNOT 3x1 CDU directly in a console panel (without console frame), a panel cutout is required as shown in drawing 5002-0112-02 (see Appendix). Suitable fasteners for console mounting are provided in the installation kit 22596, included with the CDU.

A backward clearance of approx. 120 mm from the mounting surface is required for the connector cable and plug.

2x1 CDU (remote)
To mount a 2x1 CDU directly in a console panel (without console frame), a panel cutout is required as shown in drawing 5001-0112-02 (see Appendix). Suitable fasteners for console mounting are provided in the installation kit 22724, included with the CDU.

A backward clearance of approx. 100 mm from the mounting surface is required to protect the connector cable from being bent too strongly at the cable gland.

Console Frame Versions

When ordered factory-assembled in a console frame, the CDU is already fastened to the frame. The required cutouts for standard 3x1 and 2x1 frames are shown in drawings 0031-0112-02 and 0021-0112-02 respectively (see Appendix).

If a custom frame is delivered, installation-specific dimensional drawings for the frame and cutout will be provided with the equipment.

Units in Housing with Bracket

The CDUs in housing with bracket are shown in dimensional drawings 5002-0112-02 and 5003-0112-002 respectively (see Appendix). The mounting brackets carry four holes of 5.3 mm dia. for fixing the bracket to any plane surface, such as a console panel, wall or ceiling. The required fasteners are to be provided by the shipyard or installer.

Connector Cables

The NAVIKNOT CDU connector cables terminate into a 7-wire pigtail for direct connection to the terminals at the Electronics Unit or to separate terminal blocks.

If required, separate terminal block is to be provided by the shipyard or installer.
The installer must make sure that the ends of cable sheaths are firmly secured to the vessel structure with tie-wraps or other suitable means, so that the individual wires are free from tension at the terminals.

5.2 Electrical Installation

Preamplifier D Configuration

The preamplifier D, as delivered by Sperry Marine, will be preconfigured for use within the NAVIKNOT system. However, the setting of configuration jumpers and dip-switch contacts as well as the transmit power adjustment should be checked prior to first-time operation.
Details of the preamplifier configuration and transmit power adjustment are contained in the installation, maintenance and service instructions for the Doppler transducers and preamplifier D, document no. 005005-0125-001.

Wiring Up the System

WARNING

Hazardous voltage is present at the transducer terminals located on the fore and aft channel transmit/receive PCBs in the preamplifier D.
Danger of electrical shock or burn when the transducer terminals are touched while power is applied to the preamplifier.
Do not touch the transducer terminals and do not connect or disconnect the transducer cable while power is applied to the preamplifier.

CAUTION

When wiring up the system, make sure that the power supply for the NAVIKNOT system is switched off and is safeguarded against accidental switching-on.

CAUTION

Components on the devices' PCBs are sensitive to static discharge. Take the necessary precautions to prevent electrostatic discharges.

Wire up the system according to the connection diagrams and other relevant documents provided.

If installation-specific connection diagrams have been provided for a given system, these supersede any connection information contained in standard connection diagrams.

If wiring up according to standard connection diagrams, make sure beforehand that all data and signals to receive from or transmit to external equipment comply to the NAVIKNOT Electronics Unit interface specification, 5004-0120-001.

Configuring the CDU(s)

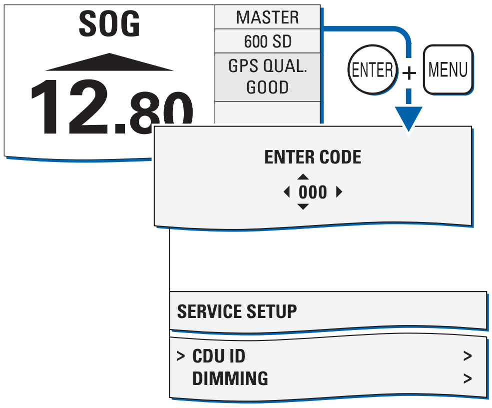
If one CDU is installed only, the unit requires no further configuration.

In case more than one CDU is installed, each CDU must be assigned a unique ID through its local Service Setup menu.

CDU Setup Access Code

To prevent inadvertent or unauthorized changes to the CDU configuration, the local setup menu is protected by an access codes

To access the local CDU Service Setup:



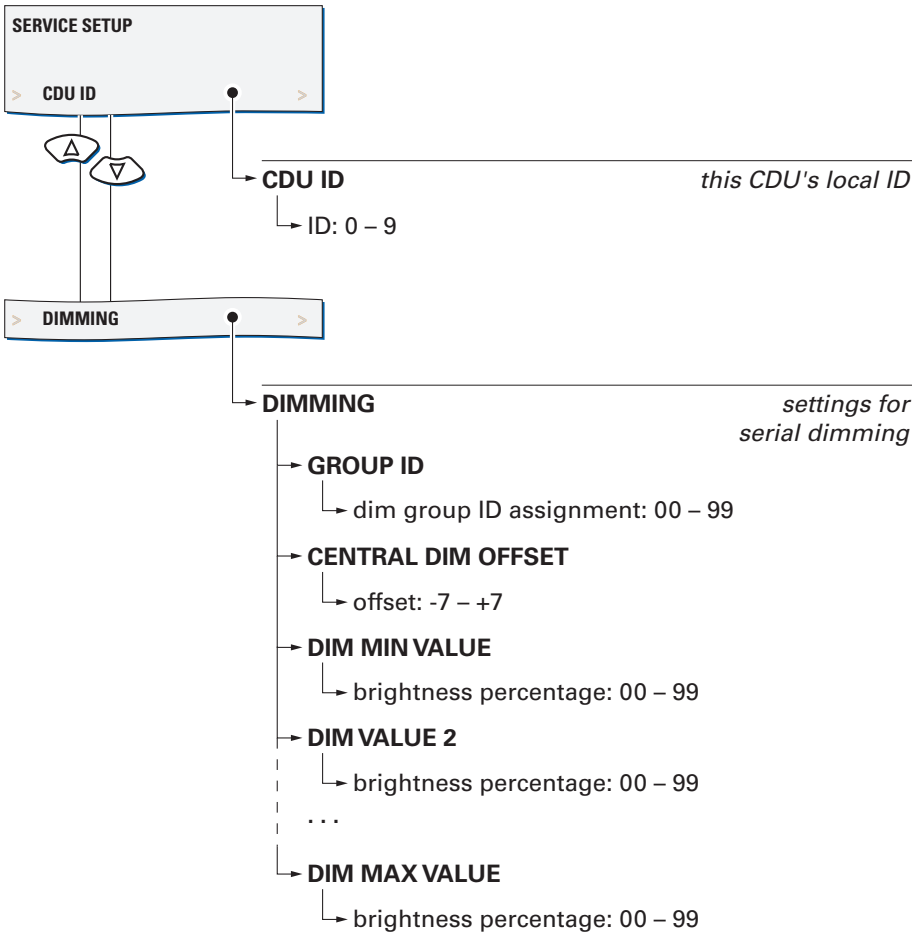
From the normal operational mode, simultaneously press **ENTER** and **MENU** to call up the CDU's local Service Setup menu mode.

When prompted for the setup code, enter code **600**.

The CDU's local Service Setup opens.

CDU Service Setup – Overview

Figure 5-4:
CDU Service Setup



CDU Service Setup – Parameters

CDU ID

Sets the CDU's local ID.
The ID serves to identify the individual CDUs in systems where one or more remote CDUs are installed. The electronics unit uses the ID to keep track of which CDU is currently assigned master command.

Setting: **0 – 9**
Select an ID between "1" and "9" if more than one CDU is installed. A given ID may only be assigned to one CDU within the system.
In a single-CDU system, select ID "0".

Dimming

Group ID

Assigns the CDU to a dim group.
The ID setting is only effective if dimming commands are read from the proprietary NMEA sentence $PPLAI.

Setting: **00 – 99**
Select an ID between "01" and "09" to assign the CDU to the respective dim group.
Selecting ID "00" lets the CDU accept any dim command received, regardless of group assignment.

Central Dim Offset

Sets a local offset for the brightness level.

Setting: **-7 – +7**
Select an offset as required to match the brightness of the CDU to that of other equipment controlled through the same dim command device.
Offsets below 0 decrease, offsets above 0 increase the CDU's overall brightness by the corresponding number of brightness levels. However, the offset will not alter the brightness beyond the min. and max levels respectively.
The factory default for the offset is 0.

Dim Values (min. through max.)

Maps the ordered brightness setting as read from the serial dim command to the NAVIKNOT 600 SD's nine discrete brightness levels.

Settings: **00 – 99**

For each brightness level, set the smallest intensity order at which the level should be active. If the order received is smaller than the set value, brightness is reduced to the next lower level.

Configuring System Parameters

When the system has been wired up, all configuration parameters are to be set to the required values in the Service Setup in order to make the NAVIKNOT system fully functional. For a description of the Service Setup, refer to Chapter 6, "System Configuration".

Note

As the first step in an initial system configuration, call up the Service Setup and the system type parameter to "NAVIKNOT 600 SD".
Then, quit the setup menu and cycle the power to make sure that only those parameter settings and configuration options which apply to a NAVIKNOT 600 SD system are available through the Service Setup.

After the initial system configuration, note all settings in the NAVIKNOT 600 SD system setup table (see Appendix). Send one copy of the filled-out table to Sperry Marine for inclusion in the ship's file.

The operating parameters in the User Setup and Manual Settings menus should also be set as required for normal operation within the given system.

Chapter 6: System Configuration

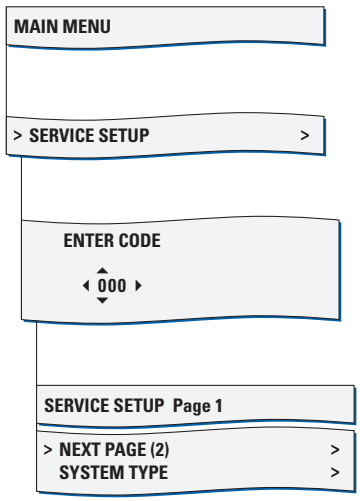
6.1 Service Setup Menu

The Service Setup menu provides access to the system parameters which configure the NAVIKNOT 600 SD according to the requirements of the installation at hand.

Setup Access Code

To prevent inadvertent or unauthorized changes to the system configuration, setup menus which are to be accessed by service personnel only are protected by access codes.

To access the Service Setup:



Call up the Main Menu.

Go to the **SERVICE SETUP**.

When prompted for the setup code:

Enter code "**600** "
Press **ENTER** to confirm the code..

Page 1 of the Service Setup opens.

Service-Setup – Overview

Figure 6-1: Service Setup, page 1

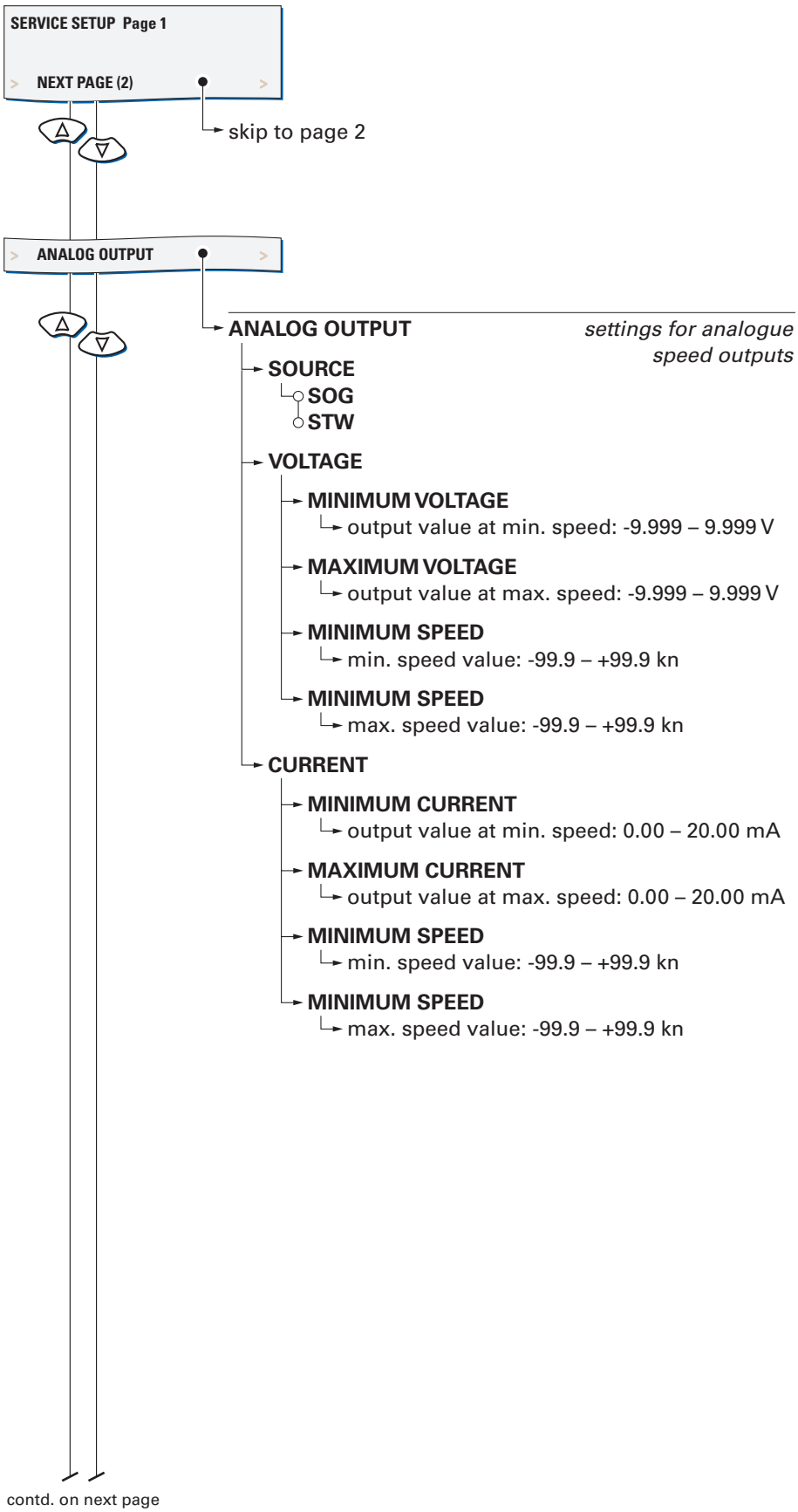


Figure 6-2: Service Setup, page 1 (cont.d)

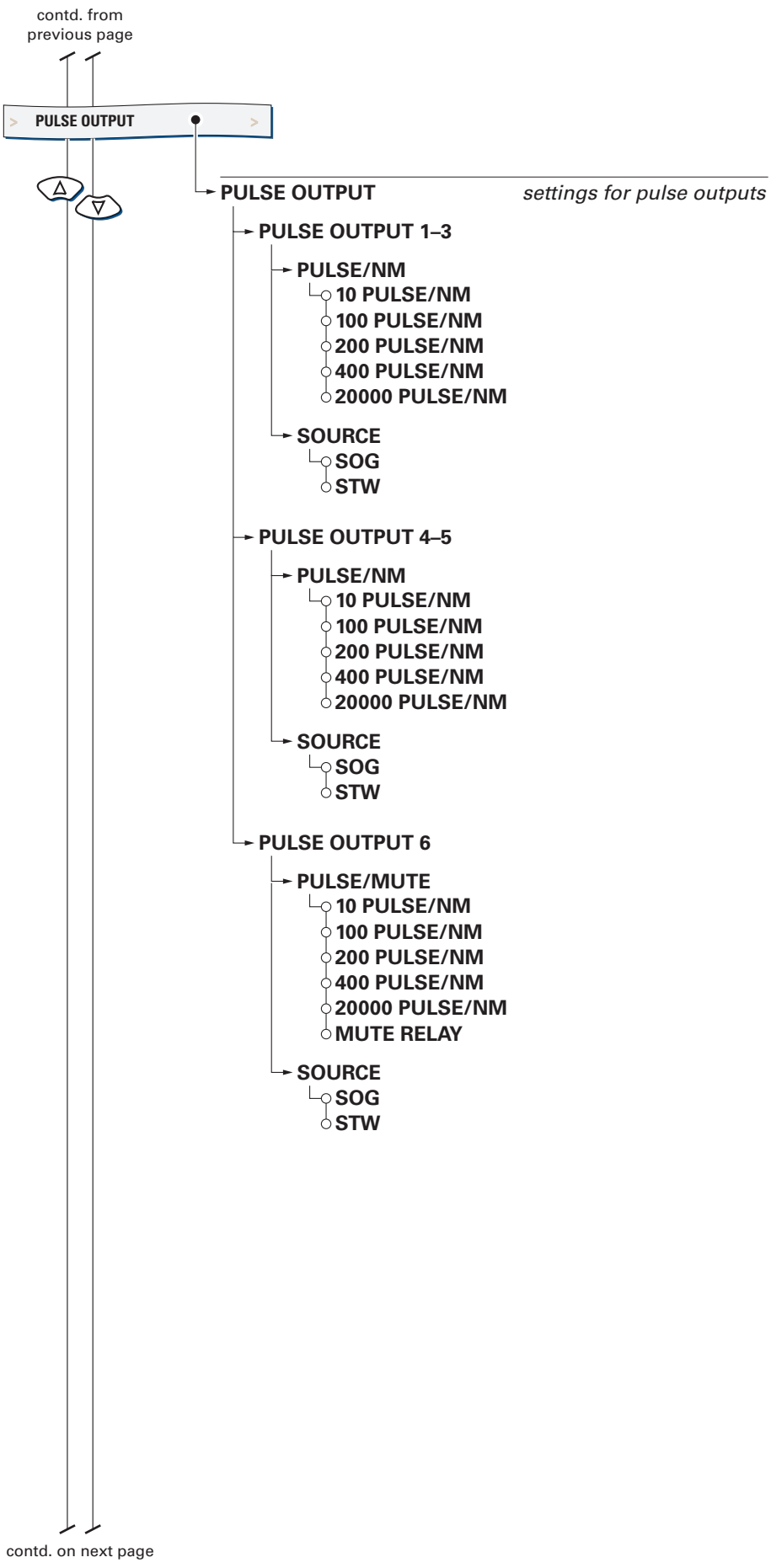


Figure 6-3: Service Setup, page 1 (cont.d)

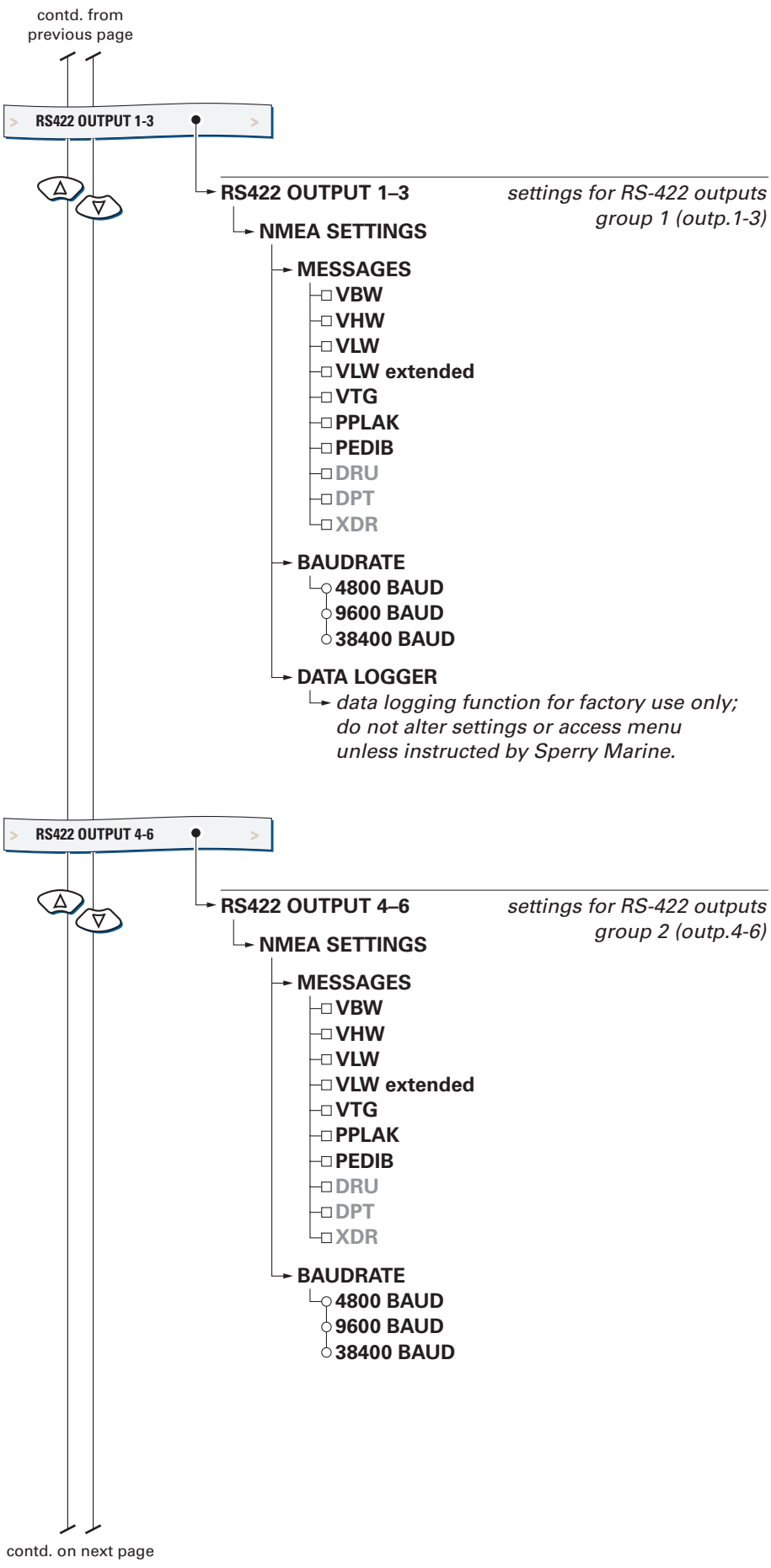


Figure 6-4: Service Setup, page 1 (cont.d)

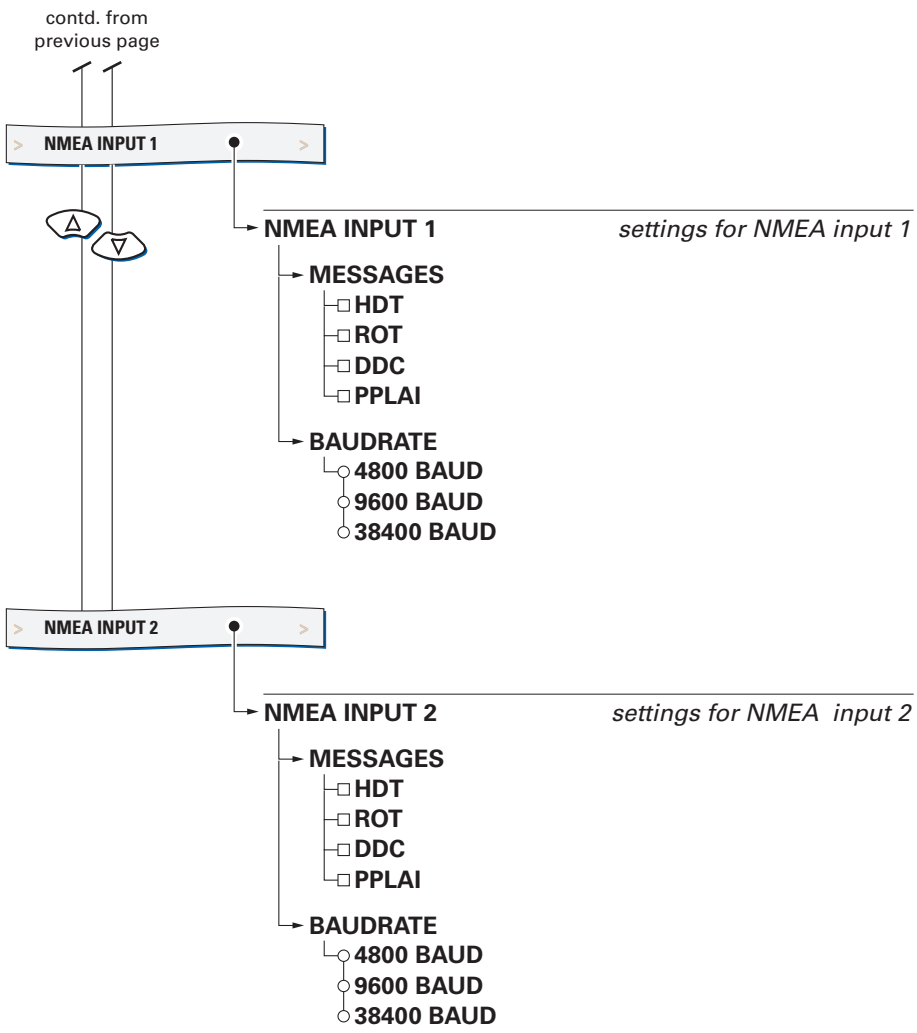


Figure 6-5: Service Setup, page 2

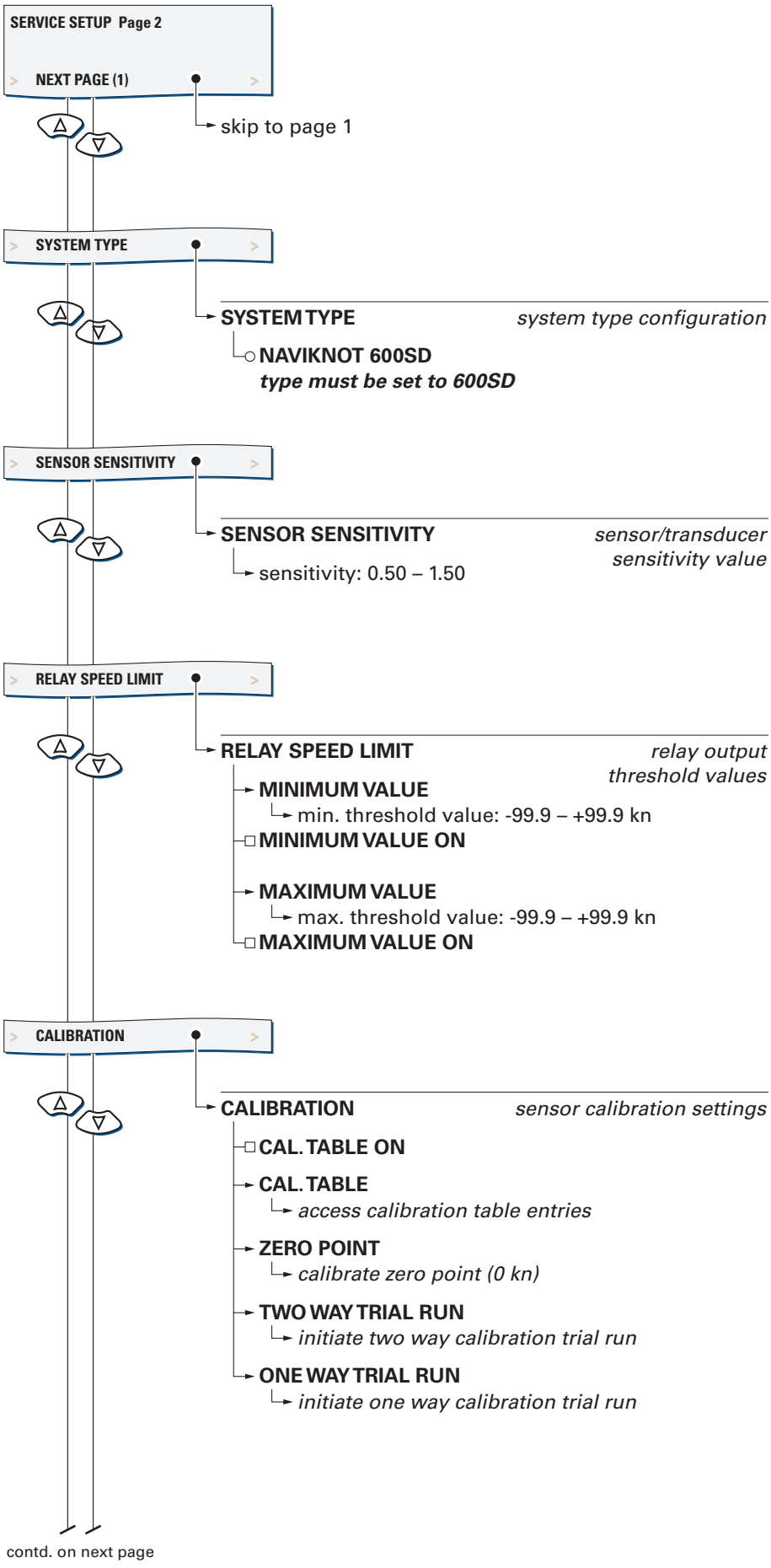
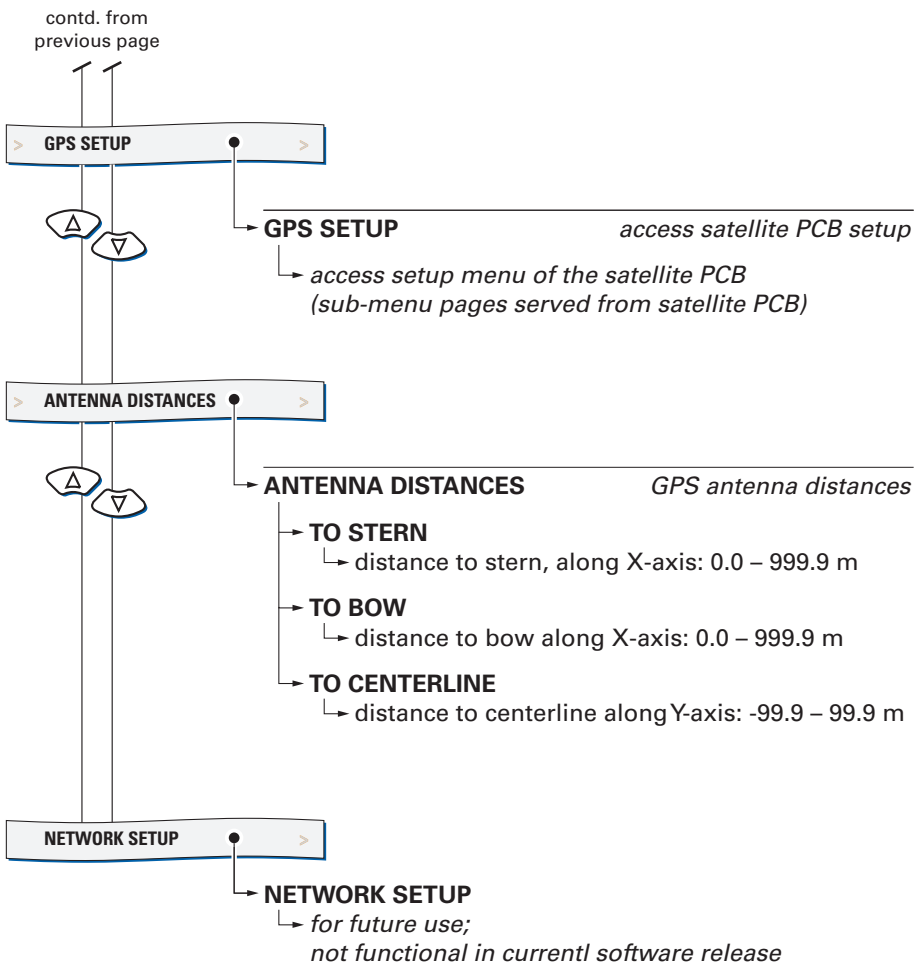


Figure 6-6: Service Setup, page 2 (cont.d)



Service Setup – Parameters

Analog Output

Configures the analogue speed outputs (voltage and current output).

Source

Selects the data source for the analogue outputs.

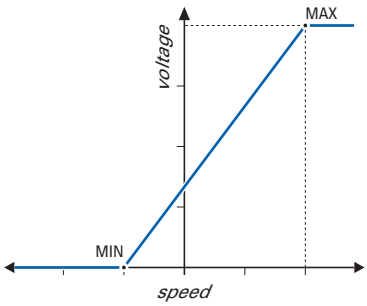
Setting: **SOG**
The outputs provide the actual speed over ground

STW
The outputs provide the actual speed through the water

Voltage

Configures the analogue output voltage range.

The output voltage range is defined by two pairs of values:
The minimum speed and associated minimum voltage determine the lower limit of the output range, while the maximum speed and associated maximum voltage define its upper limit.



At speeds equal to or below the minimum speed, the output delivers the minimum voltage; at speeds equal or above the maximum speed, the output delivers the maximum voltage.

Speeds in-between the minimum and maximum speed are linearly mapped to the corresponding output voltage.

The absolute limits of the output are -9.999 V min. and 9.999 V max.

Example:
Moving coil speed indicators are to be used which are scaled from -5 kn at zero deflection to +25 kn at a full-scale deflection of 10 VDC.
The required settings are:
min. voltage = 0.000 V; min. speed = -5 kn;
max. voltage = 9.999 V; max. speed = +25 kn

Settings: **Minimum Voltage**
value: **-9.999 – 9.999 VDC**

Maximum Voltage
value: **-9.999– 9.999 VDC**

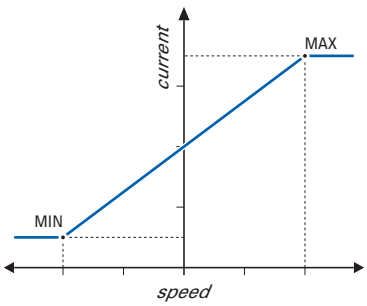
Minimum Speed
value: **-99.9 – +99.9 kn**

Maximum Speed
value: **-99.9 – +99.9 kn**

Current

Configures the analogue output current range.

The output current range is defined by two pairs of values:
The minimum speed and associated minimum current determine the lower limit of the output range, while the maximum speed and associated maximum current define its upper limit.



At speeds equal to or below the minimum speed, the output delivers the minimum current; at speeds equal or above the maximum speed, the output delivers the maximum current.

Speeds in-between the minimum and maximum speed are linearly mapped to the corresponding output current.

The absolute limits of the output are 0.00 mA min. and 20.00 mA max.

Example:
The speed range of -25 to +25 kn is to be mapped to a 4 – 20 mA output.
The required settings are:
min. current = 4.00 mA; min. speed = -25 kn;
max. voltage = 20.00 mA; max. speed = +25 kn

Settings: **Minimum Current**
value: **0.00 – 20.00 mA**

Maximum Current
value: **0.00 – 20.00 mA**

Minimum Speed
value: **-99.9 – +99.9 kn**

Maximum Speed
value: **-99.9 – +99.9 kn**

Pulse Output

Configures the pulse signal outputs.

The outputs are divided into three individually configurable groups. Each group may be configured to deliver 10, 100, 200, 400 or 20000 pulses per nautical mile.
The generated pulses possess a fixed “on” duty cycle of 100 ms for the 10, 100 or 200 pulse/NM setting, 50 ms for the 400 pulse/NM setting and 1 ms for the 20000 pulse/NM setting.

Group 3 (output 6) may alternatively be configured to generate an alarm mute signal. This signal, a 100 ms pulse, is used to mute the audible alarm indication at a central alarm facility when the respective alarm is acknowledged locally at the NAVIKNOT 600 SD CDU.

Pulse Output 1–3

Configures group 1 of the pulse outputs (outputs 1 – 3).

Pulse/NM

Selects the output pulse frequency.

Setting: **10 Pulse/NM**
The output delivers 10 pulses per nautical mile.

100 Pulse/NM
The output delivers 100 pulses per nautical mile.

200 Pulse/NM
The output delivers 200 pulses per nautical mile.

400 Pulse/NM
The output delivers 400 pulses per nautical mile.

20000 Pulse/NM
The output delivers 20000 pulses per nautical mile.

Source

Selects the data source for pulse outputs 1 – 3.

Setting: **SOG**
The outputs provide the actual speed over ground

STW
The outputs provide the actual speed through the water

Pulse Output 4–5

Configures group 2 of the pulse outputs (outputs 4– 5).

Pulse/NM

Selects the output pulse frequency.

Setting: **10 Pulse/NM**
The output delivers 10 pulses per nautical mile.

100 Pulse/NM
The output delivers 100 pulses per nautical mile.

200 Pulse/NM
The output delivers 200 pulses per nautical mile.

400 Pulse/NM
The output delivers 400 pulses per nautical mile.

20000 Pulse/NM
The output delivers 20000 pulses per nautical mile.

Pulse Output 6

Configures group 3 of the pulse outputs (output 6).

Pulse / Mute

Selects the output pulse frequency or activates the alarm mute output function.

Setting: **10 Pulse/NM**
The output delivers 10 pulses per nautical mile.

100 Pulse/NM
The output delivers 100 pulses per nautical mile.

200 Pulse/NM
The output delivers 200 pulses per nautical mile.

400 Pulse/NM
The output delivers 400 pulses per nautical mile.

20000 Pulse/NM
The output delivers 20000 pulses per nautical mile.

MUTE RELAY
When an alarm is acknowledged locally at the NAVIKNOT 600 SD CDU, the output delivers a pulse to mute the audible alarm indication at a central alarm facility.

Source

Selects the data source for pulse output 6.
In case the alarm mute function is active, this setting is not effective.

Setting: **SOG**
The output provides the actual ground speed

STW
The output provides the actual water speed

RS-422 Output 1–3

Configures group 1 of the RS-422 serial data outputs (outputs 1–3).

Messages

Selects the NMEA sentences to transmit.

If the NAVIKNOT 600 SD cannot provide valid data for an NMEA sentence field, a null field (empty field) is sent. Status fields for invalid or unknown data are marked invalid ("V"). Other sentences than those described below must not be activated for the NAVIKNOT 600 SD.

Settings: **VBW**
Longitudinal and transverse ground speed and speed status (valid/invalid) are transmitted using the $--VBW sentence.

VLW / VLW extended
The distance travelled since last reset (daily miles) and total cumulative distance (total miles) are transmitted using the $--VLW sentence. The "extended" form of the sentence includes trailing fields for ground distances as per IEC 61162-1/ Ed. 3. The non-extended form omits these fields.

VHW
Longitudinal water speed is transmitted using the $--VHW sentence.

VTG
The vessel's speed over ground in the direction of its motion vector or "course over ground" is transmitted using the $--VTG sentence.

PEDIB
All relevant data to operate an EMRI DIB10 docking information display in slave mode is transmitted using EMRI's proprietary $PEDIB sentence.

PPLAK
Log status and operating mode information is transmitted using the proprietary $PPLAK sentence.

Baudrate

Selects the transmit baudrate.

Settings: **4800 Baud**
Data is transmitted at 4800 Baud
(standard according to NMEA / IEC 61162-1)

9600 Baud
Data is transmitted at 9600 Baud
(non-standard)

38400 Baud
Data is transmitted at 38400 Baud
(high-speed according to IEC 61162-2)

Data Logger

Puts the output into a special data logging mode.
This option is intended for test purposes only and must never be activated during normal operation. If the logging mode is made active, the serial data outputs 1–3 do no longer provide regular NMEA data.

RS422 Output 4–6

Configures group 1 of the RS-422 serial data outputs (outputs 1–3).

Messages

Selects the NMEA sentences to transmit.

If the NAVIKNOT 600 SD cannot provide valid data for an NMEA sentence field, a null field (empty field) is sent. Status fields for invalid or unknown data are marked invalid ("V"). Other sentences than those described below must not be activated for the NAVIKNOT 600 SD.

Settings: **VBW**
Longitudinal and transverse ground speed and speed status (valid/invalid) are transmitted using the $--VBW sentence.

VLW / VLW extended
The distance travelled since last reset (daily miles) and total cumulative distance (total miles) are transmitted using the $--VLW sentence. The "extended" form of the sentence includes trailing fields for ground distances as per IEC 61162-1/ Ed. 3. The non-extended form omits these fields.

VHW
Longitudinal water speed is transmitted using the $--VHW sentence.

VTG
The vessel's speed over ground in the direction of its motion vector or "course over ground" is transmitted using the $--VTG sentence.

PEDIB
All relevant data to operate an EMRI DIB10 docking information display in slave mode is transmitted using EMRI's proprietary $PEDIB sentence.

PPLAK
Log status and operating mode information is transmitted using the proprietary $PPLAK sentence.

Baudrate

Selects the transmit baudrate.

Settings: **4800 Baud**
Data is transmitted at 4800 Baud
(standard according to NMEA / IEC 61162-1)

9600 Baud
Data is transmitted at 9600 Baud
(non-standard)

38400 Baud
Data is transmitted at 38400 Baud
(high-speed according to IEC 61162-2)

NMEA Input 1

Configures the NMEA input 1.

Messages

Selects the NMEA sentences to receive.

Settings: **HDT**
Enables the input to receive true heading data from the $--HDT sentence.
Selecting this option lets the system ignore heading data from the satellite PCB in favour of the external data.
HDT (true heading) may be read from any source which meets or exceeds the performance specifications of the satellite PCB's heading output. Using external heading from a gyrocompass will improve the accuracy at which the vessel's velocity over ground is resolved into the longitudinal and transverse ground speeds.

ROT
Enables the input to receive rate of turn data from the $--ROT sentence.
Selecting this option lets the system ignore rate of turn data from the satellite PCB in favour of the external data.
ROT (rate of turn) may be read from any source which meets or exceeds the performance specifications of the satellite PCB's rate outputs.

DDC
Dimming commands are read from the $--DDC sentence.

PPLAI
Dimming commands are read from the proprietary $PPLAI sentence.

Baudrate

Selects the receive baudrate

Settings: **4800 Baud**
Data is received at 4800 Baud
(standard according to NMEA / IEC 61162-1)

9600 Baud
Data is received at 9600 Baud
(non-standard)

38400 Baud
Data is received at 38400 Baud
(high-speed according to IEC 61162-2)

NMEA Input 2

Configures the NMEA input 2.

Messages

Selects the NMEA sentences to receive.

Settings: **HDT**
Enables the input to receive true heading data from the $--HDT sentence.
Selecting this option lets the system ignore heading data from the satellite PCB in favour of the external data.
HDT (true heading) may be read from any source which meets or exceeds the performance specifications of the satellite PCB's heading output. Using external heading from a gyrocompass will improve the accuracy at which the vessel's velocity over ground is resolved into the longitudinal and transverse ground speeds.

ROT
Enables the input to receive rate of turn data from the $--ROT sentence.
Selecting this option lets the system ignore rate of turn data from the satellite PCB in favour of the external data.
ROT (rate of turn) may be read from any source which meets or exceeds the performance specifications of the satellite PCB's rate outputs.

DDC
Dimming commands are read from the $--DDC sentence.

PPLAI
Dimming commands are read from the proprietary $PPLAI sentence.

Baudrate

Selects the receive baudrate

Settings: **4800 Baud**
Data is received at 4800 Baud
(standard according to NMEA / IEC 61162-1)

9600 Baud
Data is received at 9600 Baud
(non-standard)

38400 Baud
Data is received at 38400 Baud
(high-speed according to IEC 61162-2)

System Type

Configures the NAVIKNOT system type.

For the NAVIKNOT 600 SD, the type must be set to 600SD; all other options are to be ignored.

Settings: **NAVIKNOT 600 SD**

Sensor Sensitivity

Sets the sensitivity value for the Doppler transducer.

For a detailed explanation of the effect of the sensitivity setting, refer to chapter 7, "Doppler Transducer Calibration".

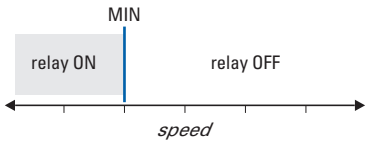
Value: **0.5 – 1.5**

Relay Speed Limit

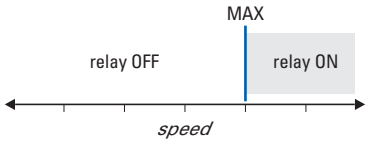
Sets the lower and/or upper switching thresholds for the speed limit relay output.

The speed limit relay output provides a status signal to external equipment, to indicate that the actual speed has exceeded or fallen below a set threshold. This signal may be e.g. for speed-dependent rudder angle limiting or similar applications.

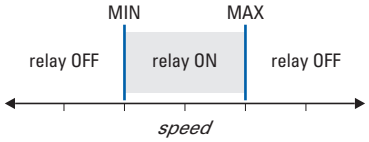
The switching behaviour of the limit relay is determined by the combined settings of two values, the minimum (lower threshold) and the maximum (upper threshold) value:



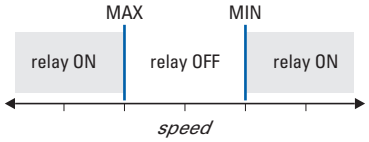
If only a minimum threshold value is set and active, the relay is attracted at speeds below and released at speeds above the threshold value.



If only a maximum threshold value is set and active, the relay is attracted at speeds above and released at speeds below the threshold value.



If both a minimum and a maximum threshold value are set and active, the relay is released at speeds below the min. value, attracted at speeds in-between both values and released again at speeds above the max. threshold.



If the max. threshold is set to a value below the min. threshold, the relay is attracted at speeds below the min. value, released at speeds in-between both values and attracted again at speeds above the max. threshold.

If both threshold values are de-activated or set to exactly the same value, the limit relay function is disabled.

Minimum Value

Sets the lower switching threshold for the limit relay.

Value: **-99.9 – +99.9 kn**

Minimum Value ON

Activates or de-activates switching at the lower threshold

Settings: **ON** (option checked)
Switching is active at the lower threshold

OFF (option unchecked)
Switching is inactive at the lower threshold

Maximum Value

Sets the upper switching threshold for the limit relay.

Value: **-99.9 – +99.9 kn**

Maximum Value ON

Activates ore de-activates switching at the upper threshold

Settings: **ON** (option checked)
Switching is active at the upper threshold

OFF (option unchecked)
Switching is inactive at the upper threshold

Calibration

Turns sensor calibration on or off, edits the calibration table and accesses the calibration trial run menus.

Cal. Table On

Activates or de-activates the calibration table.

Settings: **ON** (option checked)
Calibration is active. The NAVIKNOT 600 SD corrects the data received from the preamplifier D according to the calibration table. The resulting calibrated speed is displayed and transmitted at the data outputs.

OFF (option unchecked)
Calibration is disabled. The NAVIKNOT 600 SD does not apply any corrections to the data received from the preamplifier D. Raw speed only is displayed and transmitted at the data outputs. The indication "Uncal" is shown on the CDU display as a reminder that calibration is disabled.

Cal. Table

Edits the calibration table entries directly.

Settings: *refer to chapter 7, "Doppler Transducer Calibration", for a detailed description of the calibration and related procedures*

Zero Point

Sets the calibration zero point (correction value at a true speed of 0 kn).

Settings: *refer to chapter 7, "Doppler Transducer Calibration", for a detailed description of the calibration and related procedures*

Two Way Trial Run

Accesses the sub-menu for conducting a two-way calibration trial run.

Settings: *refer to chapter 7, "Doppler Transducer Calibration", for a detailed description of the calibration and related procedures*

One Way Trial Run

Accesses the sub-menu for conducting a one-way calibration trial run.

Settings: *refer to chapter 7, "Doppler Transducer Calibration", for a detailed description of the calibration and related procedures*

GSP Setup

Accesses the satellite PCB configuration menu

Settings: *the GPS setup menu pages are directly served by the satellite PCB; refer to section 6.2, "GPS Setup", for a detailed description of the GPS setup menu.*

Antenna Distances

Configures the geometrical parameters of the GPS antenna location.

These values are required to correctly calculate of the bow and stern transverse speeds shown in the docking display page.

To Stern

Sets the distance from the antenna to the stern

Settings: **0.0 - 999.9 m**
Distance from antenna to stern; measured along the vessel's X-axis, i. e. parallel to the centerline

To Bow

Sets the distance from the antenna to the stern

Settings: **0.0 - 999.9 m**
Distance from antenna to bow; measured along the vessel's X-axis, i. e. parallel to the centerline

To Centerline

Sets the distance from the antenna to the centerline

Settings: **-99.9 – +99.9 m**
Distance from antenna to centerline (Y-offset); measured along the vessel's Y-axis, i. e. perpendicular to the centerline; negative values indicate offset to port

Network Setup

This option is reserved for future applications. Settings are not relevant and have no effect in the current software release.

6.2 GPS Setup

To make the NAVIKNOT 600 SD system fully functional after the mechanical and electrical installation, the available heading sources, the orientations of the antenna and electronics units and the required alignment correction for the antenna unit must be configured by accessing the GPS setup from the Service Setup menu.

When "GPS Setup" is selected from the Service Setup menu pages, the NAVIKNOT 600 SD electronics unit acts as a gateway to the satellite PCB's own configuration and setup menu. The GPS setup pages are directly served by the satellite PCB. The indication "external" is shown at the top of the respective pages.

The appearance of the GPS setup pages and the operation of the menu differs slightly from other pages of the NAVIKNOT 600 SD setup.

Note

Some of the available GPS configuration options do not apply to the NAVIKNOT 600 SD system. These must be left at the factory default settings as noted in the GPS setup descriptions below.

GPS Setup Operation

▸ (solid arrow): Indicates the current cursor position on the screen (equivalent to angle bracket symbol in the NAVIKNOT 600 SD setup).

> (angle bracket): Indicates the currently active selection in case of mutually exclusive options (equivalent to radio buttons in the NAVIKNOT 600 SD setup).

ON/OFF: Indicates the currently active selection in case of independent options (equivalent to checkboxes in the NAVIKNOT 600 SD setup).

Right, **Left**, **Up**, and **Down** arrow keys: Move the cursor position within the GPS setup pages.
The **Up** and **Down** keys also edit numerical values; the **Right** key also returns to next higher menu level when cursor is at leftmost position on the page.

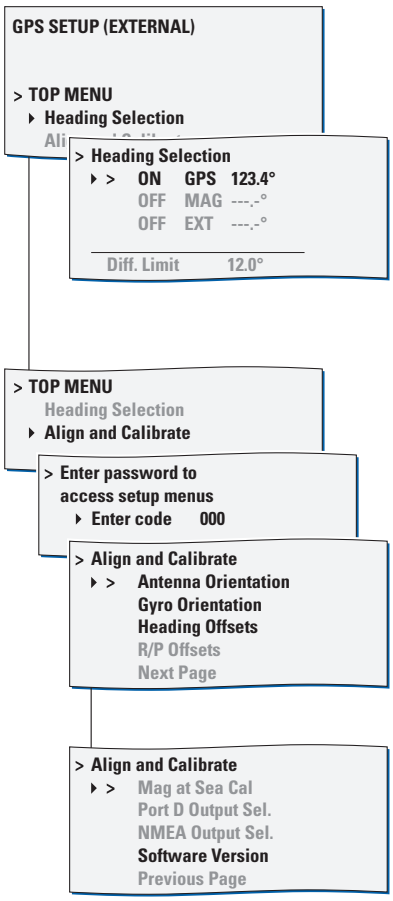
ENTER key: Enters sub-menus, confirms numerical entries and selects or de-selects settings (on /off toggle).

Note

To enter numerical values or toggle settings on/off, the cursor must be positioned vertically and horizontally with the arrow keys to the respective point of entry.

GPS Setup – Overview

Figure 6-7:
GPS Setup pages



Heading Selection

- **GPS** must be **ON** and active
- **MAG** must be **OFF**
- **EXT** must be **OFF**
- *Diff. Limit setting not applicable in NAVIKNOT systems*

Align and Calibrate

*Menu protected by access code; enter code **600***

- **Antenna Orientation**
  - **Forward**
  - **Port**
- **Gyro Orientation**
  - **Forward**
  - **Starboard**
  - **Aft**
  - **Port**
- **Heading Offsets**
  - **GPS**
    - delta: -9.9 – +9.9°
  - *MAG and EXT offsets not applicable in NAVIKNOT systems*
- **Software Version**
  - view software version number (read-only)
- *R/P Offsets, Mag at Sea Cal., NMEA Output Sel. and Port D Output Sel. not applicable in NAVIKNOT systems*

GPS Setup – Parameters

Heading Selection

Configures the heading sources available to the satellite PCB.
The currently active source provides the heading sent from the satellite PCB to the NAVIKNOT 600 SD electronics unit.

Only the GPS source may be made active, i.e. the satellite PCB must always determine the vessel's heading internally from the two GPS receivers' signals.

The MAG and EXT source options are not applicable in the NAVIKNOT 600 SD system.

Settings: **GPS**
The GPS source must be enabled, i.e. set to **ON** at all times.

The GPS source will be activated automatically, if no other source is enabled.

MAG
The MAG source must be disabled, i.e. set to **OFF** at all times.

EXT
The EXT source must be disabled, i.e. set to **OFF** at all times.

Align and Calibrate

Sets the mounting orientation and alignment correction values for the satellite PCB and the antenna unit respectively.

Access Code

The access to the Align and Calibrate menu pages is code-protected.
To access the Align and Calibrate sub-menu, enter code **600**.

Antenna Orientation

Configures the orientation of antenna assembly, relative to the vessel's fore-and-aft line.

Settings: **Forward**
The arrow symbol on the antenna support beam points towards the bow.

Port
The arrow symbol on the antenna support beam points towards the port side.

Gyro Orientation

Configures the orientation of the rate gyro assembly on the satellite PCB, relative to the vessel's fore-and-aft line.

Settings: **Forward**
The arrow symbol on the electronics unit's cover points towards the bow.

Starboard
The arrow symbol on the electronics unit's cover points towards the starboard side.

Aft
The arrow symbol on the electronics unit's cover points towards the stern.

Port
The arrow symbol on the electronics unit's cover points towards the port side.

In all cases, the electronics unit must be mounted such that it is aligned with the respective direction to within ±5°.

Heading Offsets

Sets the correction values ("deltas") to compensate for existing offsets of the heading sources relative to the vessel's fore-and-aft line.

As only the GPS source is used within the NAVIKNOT 600 SD system, a delta value must be entered for the GPS source only. This compensates for misalignment of the GPS antenna support with the vessel's fore-and-aft line

Settings: **GPS**
delta (correction value): **-9.9 – +9.9°**

Determine the existing misalignment by comparing the GPS heading as shown on the setup page with the true heading from the vessel's heading reference (e.g. the gyrocompass).

Enter the required delta to match the GPS heading with the heading reference. The correction is effective immediately, so that the GPS heading displayed on screen should now exactly match with the reference.

MAG
Not applicable in NAVIKNOT systems; do not alter the factory default setting (delta = 0.0°).

EXT
Not applicable in NAVIKNOT systems; do not alter the factory default setting (delta = 0.0°).

R/P Offsets

Sets the correction values for misalignment of the PCB with the roll and pitch axes.

As roll and pitch angles from the satellite PCB are not evaluated in the NAVIKNOT 600 SD system, the R/P offsets are not applicable.
Do not alter the factory default settings (roll and pitch delta = 0.0°)

Mag at Sea Cal.

Calibrates the magnetic heading sensor on the satellite PCB.

The magnetic heading sensor contained on the satellite PCB is not suitable for use within the NAVIKNOT 600 SD system. Therefore it must not be calibrated.
Do not carry out the Mag. at Sea Cal. procedure. Leaving the sensor in the uncalibrated state will prevent it from being activated by accident.

Port D Output Sel.

Configures the data output port D on the satellite PCB.

The satellite PCB's outputs to external equipment are not used in the NAVIKNOT 600 SD system.
Do not alter the factory default setting (port D output = NMEA)

NMEA Output Sel.

Configures the NMEA heading data output sentence at ports C, D and H on the satellite PCB.

The satellite PCB's outputs to external equipment are not used in the NAVIKNOT 600 SD system.
Do not alter the factory default setting (all ports set to HDT)

Version Number

Displays the version number of the satellite PCB software.

Settings: ***none***
the version number page is read-only.

Chapter 7: Doppler Transducer Calibration

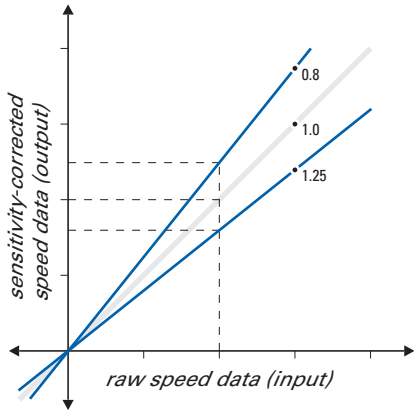
Once the NAVIKNOT 600 SD system has been installed and the basic configuration carried out, the Doppler transducer must be calibrated to make sure that the system's speed and distance outputs meet the specified accuracy.

7.1 Sensor Sensitivity Setting

The sensitivity value represents the ratio between the actual and nominal speed output from the speed sensor. While primarily intended for use with NAVIKNOT EM-Log variants, the sensitivity setting may also be used in Doppler systems to linearly amplify or attenuate the raw speed data received from the preamplifier D

Normally, however, the sensitivity setting should be left at the factory default of 1 (unity gain) and the transducer data should be calibrated by means of the calibration table only.

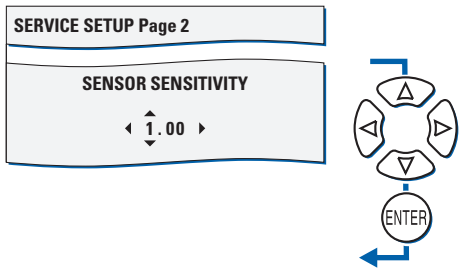
Figure 7-1: effect of the sensor sensitivity



Note

When setting the sensitivity to any other value than 1, bear in mind that the value does not equal the gain applied but, rather, its reciprocal. Thus, for example, a sensitivity value of 0.8 multiplies the raw speed by 1.25, while a value of 1.25 multiplies it by 0.8.

To set the sensitivity value:



1. Go to page 2 of the Service Setup and select the Sensor Sensitivity submenu.
2. With the **Up/Down** and **Right/Left** keys, set the sensitivity as required.
3. press **ENTER** to store the value and exit the submenu.

7.2 Doppler Transducer Calibration

To minimize the deviation between the vessel's actual water speed and the speed displayed and transmitted, the NAVIKNOT 600 SD stores transducer-specific calibration data in a so-called calibration table.

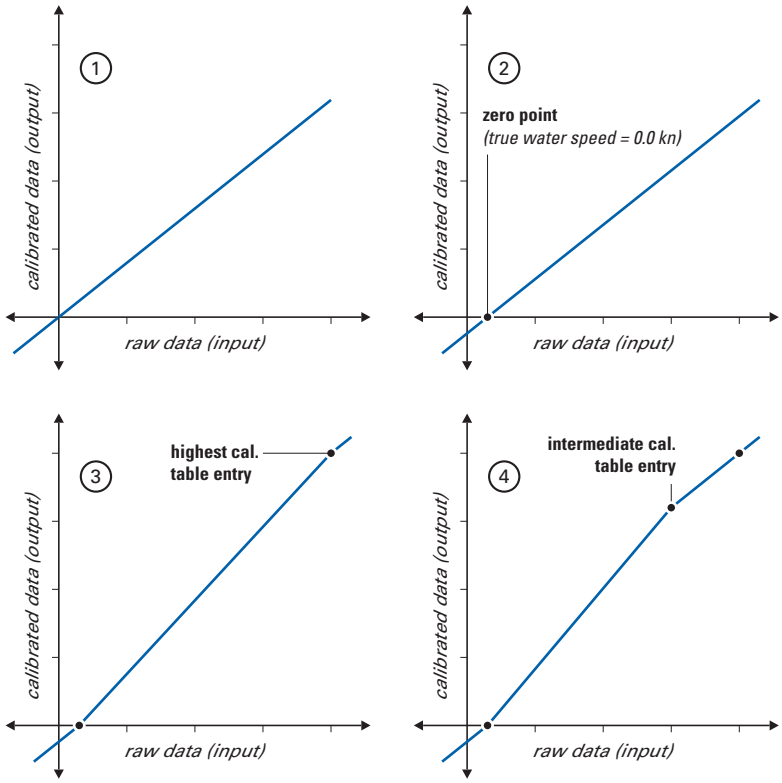
The calibration table holds up to 21 entries ("calibration points"), each of which relates an uncalibrated raw value to a corresponding true water speed value. The entries holding the lowest and highest uncalibrated values determine the range over which calibration is effective.

Note

To calibrate speeds astern, at least one calibration point with a negative uncalibrated speed value must be stored. Otherwise, calibration is effective for speeds ahead only.

The effects of setting calibration points (i.e. adding entries to the calibration table) at different states of calibration are illustrated below.

Figure 7-2: effect of calibration table entries



① calibration table empty:
linear transducer characteristic assumed;
display and output = 0.0 kn at raw data value of 0.0 kn

② zero point calibrated
linear transducer curve is offset by zero point calibration value

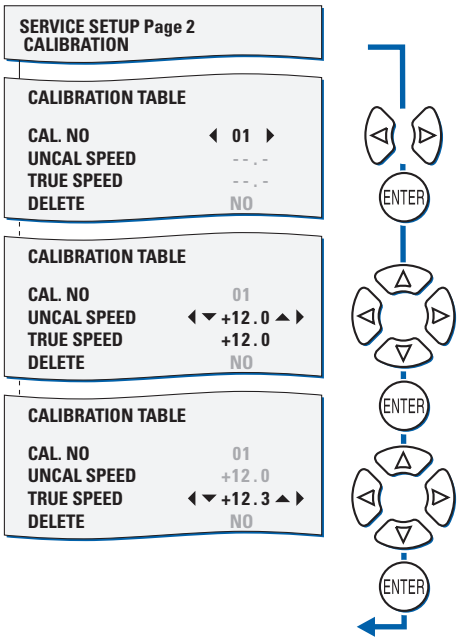
③ one additional point calibrated (highest table entry)
calibration points joined by straight line (linear interpolation)

④ additional intermediate points calibrated
calibrated range is split into linear segments of different slope

Editing the Calibration Table Directly

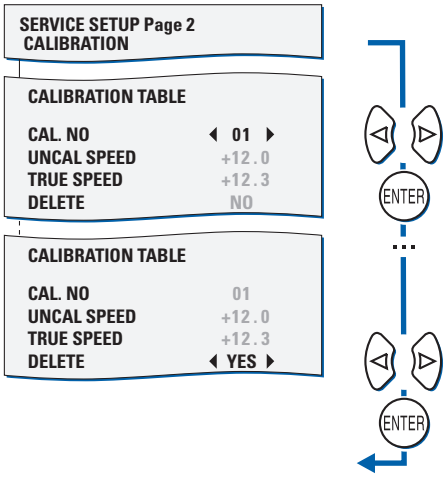
To add, edit or delete calibration points directly, go to page 2 of the Service Setup and select the Calibration | Cal.Table sub-menu.
The data stored at calibration point no. 00 is shown (dashes will appear if the table is empty).

To add or edit a calibration point:



1. With the **Right/Left** keys, select the calibration point to add or edit. Press **ENTER** to continue.
2. With the **Up/Down** keys (knots) and the **Right/Left** keys (tenths of knots), set the uncalibrated speed to the required value. The true speed indication is altered by the same amount. Press **ENTER** to continue.
3. With the **Up/Down** keys and the **Right/Left** keys, now alter the true speed indication as required. The uncalibrated speed value is not altered. Press **ENTER** to store the edited data.
4. Press **ENTER** again to continue editing or **MENU** to quit the Cal.Table sub-menu.

To delete a calibration point:.



5. With the **Right/Left** arrow keys, select the calibration point to delete.
6. With **ENTER**, go down to the "delete" option, press the **Right** or **Left** key to select "yes", then press **ENTER** to delete the calibration point.
7. Select another calibration point to delete or press **MENU** to quit the Cal.Table sub-menu.

Note

Upon quitting the Cal. Table sub menu, the entries are sorted and renumbered according to their uncalibrated speed values. Point 00 always holds the entry with the smallest uncalibrated speed value.

Zero Point Calibration

Before any entries for non-zero speeds are stored in the calibration table or calibration trial runs are conducted, the zero point calibration should be carried out.

The “zero point” refers to the calibration table entry which holds the uncalibrated (“raw“) speed value corresponding to a true water speed of zero knots. Two methods are available to calibrate the zero point: manual and auto.

Note

Both the manual and the automatic zero point calibration require that the vessel is stationary.

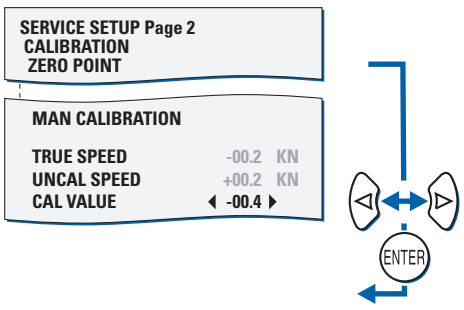
Manual Entry

The manual entry method permits zero point calibration in waters which are not free of current. However, the longitudinal component of the current must be known and it must be small enough to regard the sensor as operating near zero speed.

To carry out the manual zero-point calibration:

1. Go to page 2 of the Service Setup;
   select the Calibration | Zero Point | Man Calibration sub-menu.

   Three values are shown, the true speed, the uncalibrated speed and the calibration value (i.e. the difference of the two speeds).
   The uncalibrated speed is the raw speed value as currently received from the preamplifier D (not editable).
   The objective of the calibration is now to alter the calibration value until the displayed true speed value matches the known actual water speed.
   Thus, in waters free of current, the displayed true speed value must be brought to zero; in the presence of current, the true speed value must be made equal to the known longitudinal component of the current.



2. With the **Right/Left** arrow keys, alter the calibration value until the displayed true speed exactly matches the known actual water speed.
3. Press **ENTER** to confirm the setting and leave the manual calibration sub-menu.

Note

When the manual entry is stored, the true speed entered is automatically subtracted from both the uncalibrated and true speed values.
Thus, the entry written to the table will always contain the uncalibrated value corresponding to a true speed of zero knots.

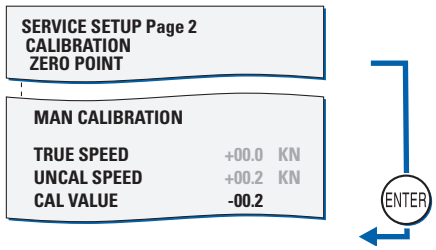
Automatic Entry

With the automatic entry method, the required zero point setting is determined automatically. Automatic entry may only be used when the vessel is stationary in waters free of current, i.e., if the actual water speed is known to be zero.

To carry out the automatic zero-point calibration:

1. Go to page 2 of the Service Setup;
   select the Calibration | Zero Point | Auto Calibration sub-menu.

   As with the manual entry method, the true speed, the uncalibrated speed and the calibration value are shown.
   However, the true speed value is fixed to zero knots and cannot be adjusted by the operator. The uncalibrated speed is the raw speed value as currently received from the preamplifier D, thus the calibration value will be equal to the uncalibrated speed with the sign reversed.



2. Press **ENTER** to confirm the setting and leave the auto calibration sub-menu.

Calibration by Trial Runs

Calibration by trial runs is the recommended method to calibrate the Doppler transducer in the NAVIKNOT 600 SD. system. The procedure resembles the familiar “milepost run”, but permits any known distance to be taken as the length of a run.

The known distance may be given by the distance between sidebearings to prominent landmarks. The regular procedure in this case is to start and stop the run clock exactly at the points in time when the landmarks are sighted athwartships.
However, as the NAVIKNOT 600 SD obtains the vessel’s current position from the sattelite PCB, it is equally acceptable to start the run clock at a given point in time and to stop it as soon as a distance of at least one mile has been traversed.

Generally, for each correction value to be determined, a two way trial run should be carried out, i.e. the same known distance “l” should be traversed in opposite directions (runs A and B). This will make the effects of drift due to wind and current cancel out each other automatically. Only when no wind and current are present, a one way trial run may be carried out.

The first two or one way trial run should be carried out at maximum sea speed, to define the upper limit of the calibrated range. Additional trial runs may be carried out later at lower speeds to improve the accuracy within the calibrated range.

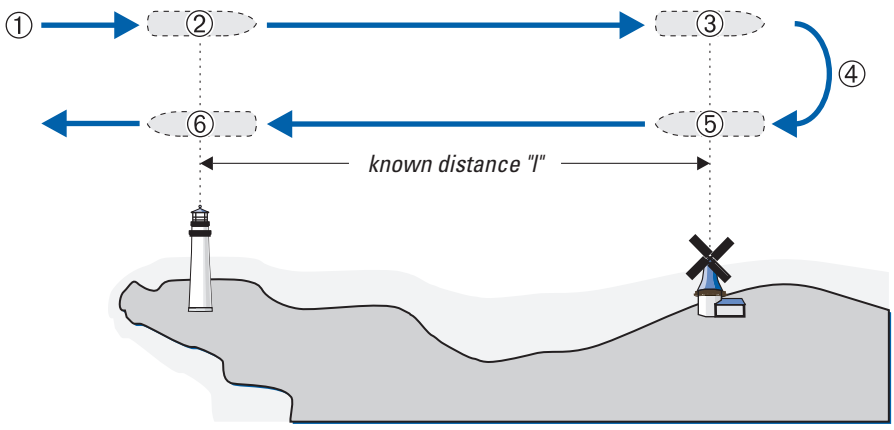


Figure 7-3: calibration by trial runs

① approach to run A or one-way run

② start of run A or one-way run

③ end of run A or one-way run

④ approach to run B

⑤ start of run B

⑥ end of run B

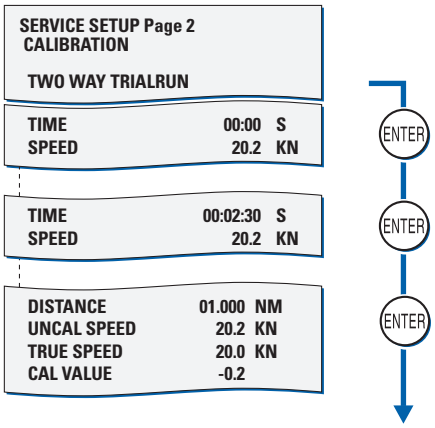
Two Way Trial Run

Note

During a two way trial run, the vessel's heading during runs A and B should ideally be parallel to the direction of the effective drift, as the drift component perpendicular to the heading cannot be compensated for.

To carry out a two way trial run:

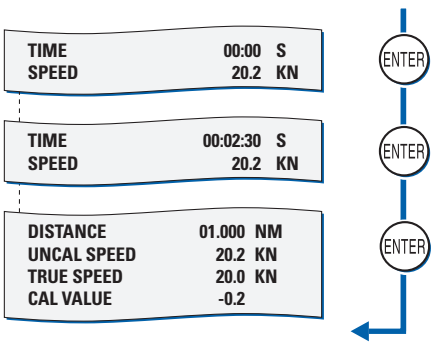
1. Bring the vessel on the required course for the approach to run A.
2. Approach the run with the speed (engine rev.s) at which the calibration is to be carried out. Keep the heading and speed steady.
3. Go to page 2 of the Service Setup and select the Calibration | Two Way Trial Run sub-menu.
   The run clock is shown, indicating 00:00 s run time and the uncalibrated water speed as received from the preamplifier D.



4. Exactly at the start of run A (first landmark athwartships or "start" announced by supervisor), press **ENTER** to start the run clock.
5. Exactly at the end of run A (second landmark athwartships or "stop" announced by supervisor), press **ENTER** to stop the run clock.

   The display now indicates the run distance, the average uncalibrated speed for the run, the true speed over ground (calculated from the run time and distance) and the calculated calibration value.
6. Press **ENTER** to store the run parameters.

   The run clock is shown again, indicating 00:00 s run time and the uncalibrated water speed as received from the preamplifier D.
7. Turn the vessel around and bring it on the required course for the approach to run B. This is the exact reverse of the course maintained during run A.
   Approach the run with the same speed (engine rev.s) at which run A was carried out. Keep the heading and speed steady.



8. Exactly at the start of run B (second landmark athwartships or "start" announced by supervisor), press **ENTER** to start the run clock.
9. Exactly at the end of run B (first landmark athwartships or "stop" announced by supervisor), press **ENTER** to stop the run clock.

The display again indicates the run distance, the average uncalibrated speed, the true speed over ground and the calculated calibration value.

10. Press **ENTER** to store the run parameters.

    The Two Way Trial Run sub-menu is quit automatically.

As the result of the two way trial run, one new entry will now be found in the calibration table.
The uncalibrated speed stored at this entry is the average of the two averaged uncalibrated speeds from run A and run B.
The true speed stored at this entry is the average of the two true speeds calculated for run A and run B.

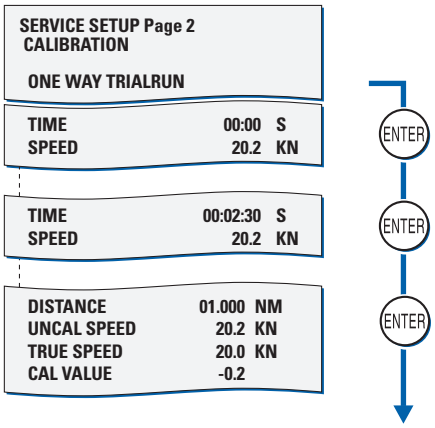
One Way Trial Run

Note

In a one way trial run, any drift due to wind and/or current will adversely affect the calibration. Conducting a one way trial run in the presence of drift, may degrade instead of improve the speed accuracy.

To carry out a one way trial run:

1. Bring the vessel on the required course for the approach to the run.
2. Approach the run with the speed (engine rev.s) at which the calibration is to be carried out. Keep the heading and speed steady.
3. Go to page 2 of the Service Setup and select the Calibration | One Way Trial Run sub-menu.
   The run clock is shown, indicating 00:00 s run time and the uncalibrated water speed as received from the preamplifier D.



4. Exactly at the start of the run (first landmark athwartships or “start” announced by supervisor), press **ENTER** to start the run clock.
5. Exactly at the end of the run (second landmark athwartships or “stop” announced by supervisor), press **ENTER** to stop the run clock.

   The display now indicates the run distance, the average uncalibrated speed for the run, the true speed over ground (calculated from the run time and distance) and the calculated calibration value.
6. Press **ENTER** to store the run parameters.

   The One Way Trial Run sub-menu is quit automatically.

As the result of the trial run, one new entry will now be found in the calibration table, holding the average uncalibrated speed and the calculated true speeds for the run.

Chapter 8: Troubleshooting

8.1 NAVIKNOT 600 SD Electronics Unit and CDU(s)

The NAVIKNOT 600 SD electronics unit and the CDU are complex electronic devices. In case of malfunction, it would neither be practical nor economical to carry out troubleshooting and servicing in the field down to the level of individual circuit components.

Unless instructed otherwise by Sperry Marine engineering, field service personnel should limit troubleshooting to the basic checks given below.

- For the electronics unit:
  - Visual inspection of mechanical components, the processor and satellite PCBs and wiring.
  - Continuity checks of wiring connections.
  - Checks for short circuit or overload conditions or reversed polarity of the external supply powers.
  - Checks of the on-board supply voltages and I/O signals and data. The presence of voltages, signals and data is indicated by diagnostic LEDs on the PCB.
    Exact voltage levels must be checked with a voltmeter.
    The data content on serial I/O lines must be checked with the aid of suitable analyzing tools, such as PC-based protocol interpreters or terminal programs.

  When components on the processor PCB, other than socketed ICs or the exchangeable system software flashboard, are assumed to cause malfunction, the complete PCB, Stock No. 20692, is to be exchanged.

  When malfunction of the satellite PCB is assumed, the complete PCB, Stock No. 20711 is to be exchanged.

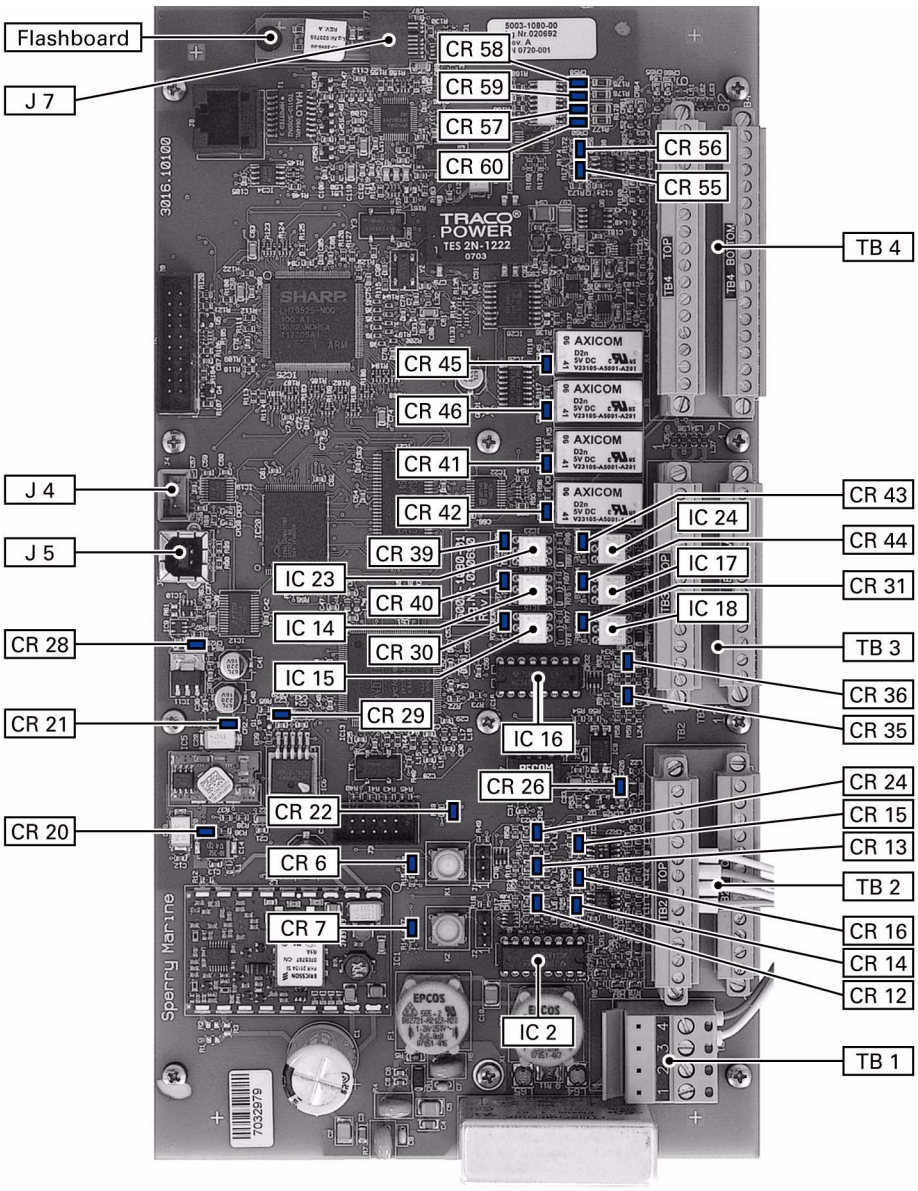
  If malfunction of the electronics unit cannot be tracked down to one of the PCBs, the electronics unit as a whole is to be exchanged.
- For the CDU(s):
  - Visual inspection of mechanical components and wiring.
  - Continuity checks of wiring connections at the terminals or terminal block to which the 6-wire CDU connection cable is fastened.
  - Checks for the presence and correct polarity of the external supply power.

  The CDU is not field-serviceable and should not be opened for troubleshooting purposes. Defective CDUs must be sent back to Sperry Marine for repair.

Location of Parts on the Processor PCB

Figure 8-1 below shows the locations of exchangeable components, connectors and diagnostic LED indicators of the processor PCB in the NAVIKNOT 600 SD electronics unit.

Figure 8-1: location of parts on the processor PCB



Exchangeable Components, Processor PCB

Table 8-1: Exchangeable components on the processor PCB

Part	Function	Stock No.
Flash-board	Flahsboard (flash-memory card), pre-programmed with system software	020705-0000-000
IC 2	quad RS-422 output driver IC; drives serial data RS-422 outputs 1 to 3	046485-0000-000
IC 14	photocoupler/photo relay; pulse output 1 contact closure	042842-0000-000
IC 15	photocoupler/photo relay; pulse output 2 contact closure	042842-0000-000
IC 16	quad RS-422 output driver IC; drives serial data RS-422 outputs 4 to 6	046485-0000-000
IC 17	photocoupler/photo relay; pulse output 3 contact closure	042842-0000-000
IC 18	photocoupler/photo relay; pulse output 4 contact closure	042842-0000-000
IC 23	photocoupler/photo relay; pulse output 5 contact closure	042842-0000-000
IC 24	photocoupler/photo relay; pulse output 6 contact closure	042842-0000-000

Terminal Boards and Connectors, Processor PCB

Table 8-2: Terminal boards and connectors on the processor PCB

	Function
TB 1	24 VDC supply power in/out
TB 2	speed sensor interfaces, CDU interfaces
TB 3	serial data and pulse outputs
TB 4	analogue outputs, status in-/outputs, ext. data inputs
J 4	RS-232 service interface connector
J 5	USB programming connector (for factory use only)
J 7	Socket for exchangeable system software flashboard

Diagnostic LEDs, Processor PCB

As an aid in troubleshooting, a number of diagnostic LED indicators are provided on the processor PCB. These indicate the presence of supply voltages, activities on the serial data I/O lines and the current states of the status I/O ports.

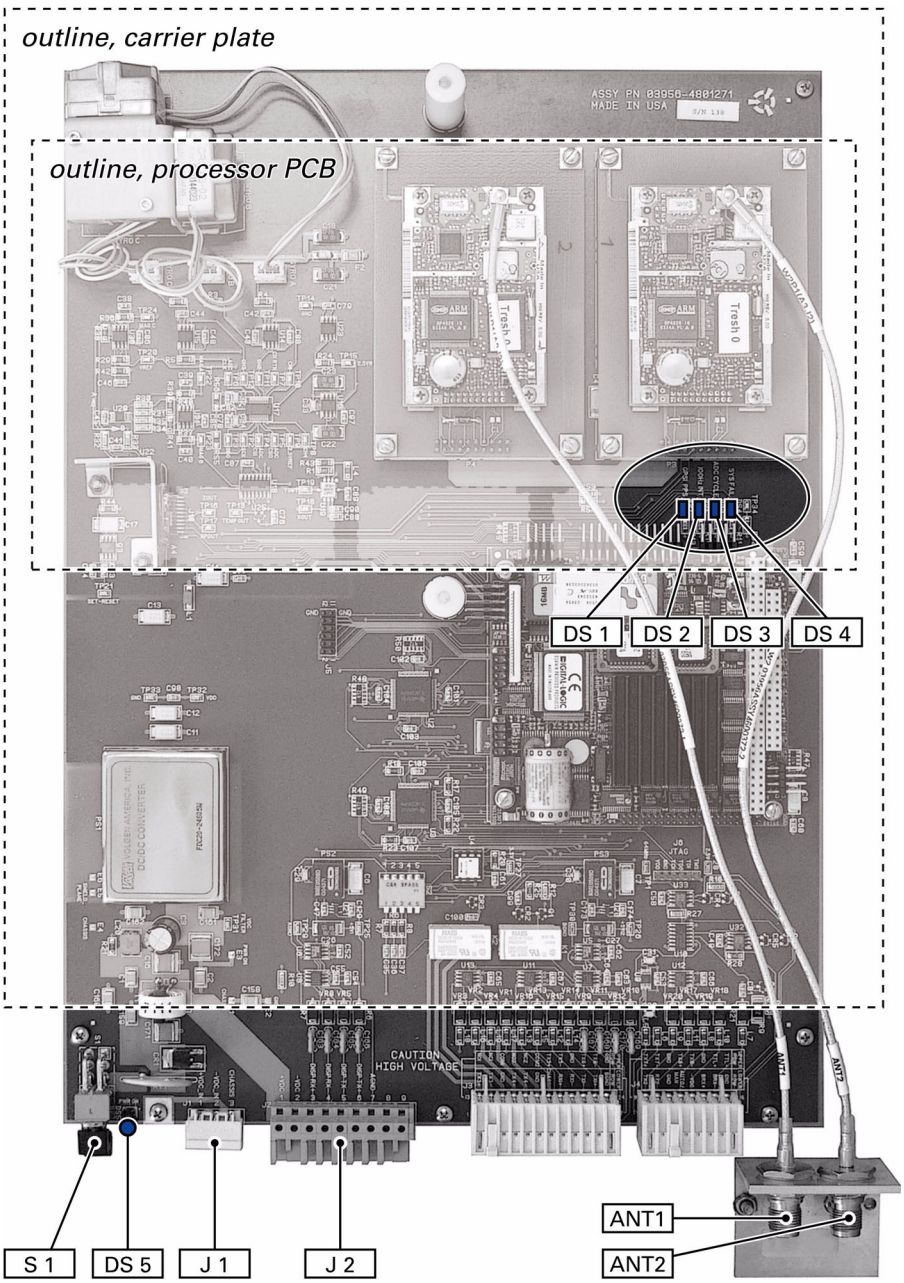
Table 8-3: Diagnostic LEDs

LED	Colour	Indication
CR 6	red	CPU status indicator, normally off, flashes at boot-up
CR 7	red	CPU status indicator, normally off, flashes at boot-up
CR 12	green	activity on Tx line, satellite PCB, TB 2.5/2.6
CR 13	green	activity on Tx line, CDUs, TB 2.15/2.16, 2.19/2.20
CR 14	green	activity on Rx line, CDUs, TB 2.13/2.14, 2.17/2.18
CR 15	green	activity on Rx line, satellite PCB, TB 2.7/2.8
CR 16	green	activity on Rx line, preamplifier D, TB 2.21/2.22
CR 20	green	internal +12 VDC supply power present
CR 21	green	internal +5 VDC supply power present
CR 22	red	CPU status indicator, normally off, flashes at boot-up
CR 24	green	activity on Tx line, preamplifier D, TB 2.23/2.24
CR 28	green	internal +3.3 VDC supply power present (Vcc)
CR 29	green	internal +1.2 VDC reference present
CR 30	green	pulse relay output active, outp. 2, TB 3.15/3.16
CR 31	green	pulse relay output active, outp. 1, TB 3.13/3.14
CR 35	green	activity on Tx line, serial data outputs group 1, TB 3.1/3.2, 3.3/3.4, 3.5/3.6
CR 36	green	activity on Tx line, serial data outputs group 2, TB 3.7/3.8, 3.9/3.10, 3.11/3.12
CR 39	green	pulse relay output active, outp. 6, TB 3.23/3.24
CR 40	green	pulse relay output active, outp. 4, TB 3.19/3.20
CR 41	green	relay output active, log failure alarm, TB 4.19/4.20
CR 42	green	relay output active, power failure alarm, TB 4.17/4.18
CR 43	green	pulse relay output active, outp. 5, TB 3.21/3.22
CR 44	green	pulse relay output active, outp. 3, TB 3.17/3.18
CR 45	green	relay output active, watch alarm trigger, TB 4.23/4.24
CR 46	green	relay output active, speed limit, TB 4.21/4.22
CR 55	green	activity on Rx line, serial dim input, TB 4.28/4.29
CR 57	green	status input active, double ended ferry, TB 4.11/4.12
CR 58	green	status input active, ext. dim+, TB 4.15/4.16
CR 59	green	status input active, ext. dim-, TB 4.13/4.14
CR 60	green	status input active, ext. alarm mute, TB 4.9/4.10

Location of Parts on the Satellite PCB

Figure 8-2 below shows the locations of relevant connectors, diagnostic LED indicators and the power switch of the satellite PCB inside the NAVIKNOT 600 SD electronics unit.

Figure 8-2: location of parts on the satellite PCB



Connectors and Power Switch, Satellite PCB

Table 8-4: Connnectors and power switch on the satellite PCB

	Function
J 1	24 VDC supply power in from processor PCB; factory prewired: satellite PCB – processor PCB J 1.1 – TB 1.3 J 1.2 – TB 1.4
J 2	serial data receive and transmit lines to/from processor PCB; factory prewired: satellite PCB – processor PCB J 2.3 – TB 2.5 J 2.4 – TB 2.6 J 2.5 – TB 2.8 J 2.6 – TB 2.7
ANT1	antenna connector, antenna 1 (bow or port)
ANT1	antenna connector, antenna 2 (stern or starboard)
S 1	power switch; must be switched on at all times

Diagnostic LEDs, Satellite PCB

Table 8-5: Diagnostic LEDs on the satellite PCB

LED	Colour	Indication
DS 1	green	GPS 1PPS; indicates reception of 1PPS timing pulse from GPS receivers
DS 2	green	100 Hz INT; flashes at internal 100 Hz clock rate
DS 3	green	ADC cycle; flashes at cycle rate of on-board analog-to-digital converter
DS 4	red	SYS FAIL; bright red at power-up and in case of system failure, remains dimly lit during normal operation.
DS 5	green	24 VDC supply power present

8.2 Doppler Transducer and Preamplifier D

Failure to receive valid speed data from the preamplifier D, resulting in a “SRD Timeout” or “Preamp D Timeout” alarm, may be caused by a mechanical or electrical defect in the transducer or by a defective preamplifier.

The applicable troubleshooting procedures are described in the installation, maintenance and service instructions for the Doppler transducers and preamplifier D, document no. 005005-0125-001.

Chapter 9: Corrective Maintenance

The NAVIKNOT 600 SD CDU and the PCBs inside the NAVIKNOT electronics unit are generally not field-serviceable on the component level. Defective devices must be sent back to Sperry Marine for repair.

The only corrective maintenance procedures which may be performed by field service personnel are the exchange of the system software in the electronics unit and the replacement of the RS-422 output drivers and the pulse output relays.

CAUTION

The NAVIKNOT 600 SD electronics unit contains electrostatic sensitive components.

Electrostatic discharge may permanently damage components.

When servicing the electronics unit, take precautions to prevent electrostatic discharge. Avoid touching any of the electronic circuitry.

9.1 Exchanging the System Software

Downloading Software from the Flashboard

The NAVIKNOT 600 SD electronics unit keeps two separate copies of the system software, one in an onboard flash memory and the other on the exchangeable software flashboard 20705.

The system always boots up from the onboard memory. Should, at power-up, a different software version be found on the flashboard than is currently stored onboard, the software from the flashboard is automatically copied to the onboard memory and the system is restarted.

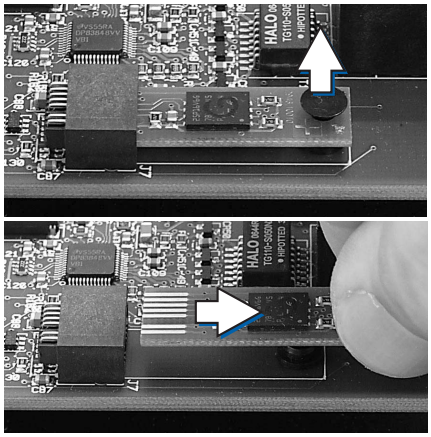
This allows both to upgrade to newer and to downgrade to previous releases by simply exchanging the flashboard.

CAUTION

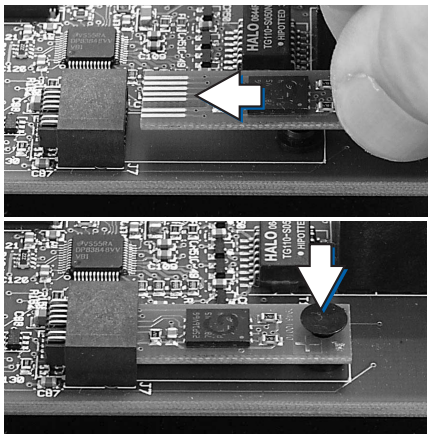
It cannot be guaranteed that parameters settings in the User and Setup menus and the currently active manual settings are left intact during the software download.
Before exchanging the flashboard, record all settings to be able to re-enter them manually, if required.

Exchanging the Flashboard

1. Power down the NAVIKNOT 600 SD system.
2. Open the electronics unit and locate the old flashboard in its socket (J7) on the PCB.



3. Carefully remove the plastic pin which secures the flashboard to the PCB.
4. Pull the old flashboard out of the socket, making sure to touch it at the edges only.



5. Insert the new flashboard into the socket.
6. Secure the flashboard with the plastic pin.
7. Power-up the NAVIKNOT 600 SD system.
8. The electronics unit will recognize the new flashboard and download the updated software to the onboard memory.

9. The CDU shows the “waiting for main unit” message for several minutes while the software is downloaded. During the download, the LEDs CR 6, 7 and 22 on the electronics unit PCB will flash in sequence.
   Upon completion of the download, the system automatically restarts.

CAUTION

Do not disconnect power or otherwise interrupt the power-up process after an exchange of the flashboard.

Uploading Software via the Service Interface

The system software may also be uploaded from a PC or laptop via the RS-232 service interface on the electronics unit PCB.

At the time of writing of this manual, however, an upload program for field service use is not yet available. Sperry Marine will issue an official Service Bulletin as soon as such a program becomes available.

9.2 Replacing RS-422 Output Driver ICs

The RS-422 output drivers, ICs 2 and 16, are socketed 16-pin DIL chips. If failure or malfunction of RS-422 outputs is attributed to a defective driver IC, the respective chip can easily be replaced against a new one.

The driver ICs are standard quadruple RS-422 line drivers (MC3487), available from Sperry Marine Hamburg under part no. 46485.

9.3 Replacing Pulse Output Relays

The pulse output relays, ICs 14, 15, 17, 18, 23 and 24, are socketed solid state relays in a 6-pin DIL package.
If failure of a pulse output is attributed to a defective relay, the respective component can easily be replaced against a new one.

The pulse relays are photocoupler photo relays (TLP 598G), available from Sperry Marine Hamburg under part no. 42842.

Appendix

A Setup and Configuration Tables

The following tables (blank forms) are appended to this manual:

Designation	Drawing No.
NAVIKNOT 600 SD Setup Table	5004-0125-03
NAVIKNOT 600 SD Record of Calibration Trial Runs	5004-0125-05

Note

After installation of the NAVIKNOT 600 SD, please return a filled-out copy of the Setup Table to Sperry Marine for inclusion in the ship's file.
When permanent changes are made to the system configuration, please return an updated copy of the Setup Table to Sperry Marine.

B Drawings

The following drawings are appended to this manual:

Designation	Drawing No.
NAVIKNOT Electronics Unit; Dimension Drawing	5004-0112-01
NAVIKNOT Control and Display Unit 3x1 (in housing with bracket); Dimension Drawing	5002-0112-01
NAVIKNOT Control and Display Unit 3x1 (for console frame or panel mounting); Dimension Drawing	5002-0112-02
Console Frame Layout NAVIKNOT CDU 3x1; Dimension Drawing	0031-0112-73
Console Cutout 3x1; Dimension Drawing	0031-0112-02
NAVIKNOT Control and Display Unit 2x1 (in housing with bracket); Dimension Drawing	5001-0112-01
NAVIKNOT Control and Display Unit 2x1 (for console frame or panel mounting); Dimension Drawing	5001-0112-02
Console Frame Layout NAVIKNOT CDU 2x1; Dimension Drawing	0021-0112-86
Console Cutout 2x1; Dimension Drawing	0021-0112-02
NAVIKNOT Antenna	5008-0112-01
Satellite Speed Log NAVIKNOT 600 SD; Standard Connection Drawing	5002-0153-12

Note

All appended documents and drawings are revision-controlled separately at Sperry Marine.
In case of doubt, verify the current revision status of the drawings with Sperry Marine. This manual's revision status does not change when the revision of an appended document or drawing changes.

NORTHROP GRUMMAN
Sperry Marine

NAVIKNOT 600 SD
Setup Table

Vessel: _____ Hull No.: _____

IMO No.: _____ Shipyard: _____

Service Station / Installer: _____ Date / Signature: _____ / _____

CDU Configuration (local CDU setups)

CDU 1	CDU 2	CDU 3	CDU 4
ID:	ID:	ID:	ID:
Dim Grp.:	Dim Grp.:	Dim Grp.:	Dim Grp.:

User Setup

Damping Times

Display (s): _____

Output (s): _____

Docking (s): _____

LCD Color

- ◯ white
- ◯ blue
- ◯ black

Scales

Speed	*Docking*
◯ kn	◯ kn
◯ m/s	◯ m/s
◯ ft/s	◯ ft/s

Service Setup - Page 1

Analog Output *Source* ◯ SOG ◯ STW

Voltage	Min. Voltage (V):	_____	Max. Voltage (V):	_____
	Min. Speed (kn):	_____	Max. Speed (kn):	_____
Current	Min. Current (mA):	_____	Max. Current (mA):	_____
	Min. Speed (kn):	_____	Max. Speed (kn):	_____

Pulse Output 1-3

Pulse/NM	*Source*
◯ 10 P/NM	◯ SOG
◯ 100 P/NM	◯ STW
◯ 200 P/NM	
◯ 400 P/NM	
◯ 20000 P/NM	

Pulse Output 4-5

Pulse/NM	*Source*
◯ 10 P/NM	◯ SOG
◯ 100 P/NM	◯ STW
◯ 200 P/NM	
◯ 400 P/NM	
◯ 20000 P/NM	

Pulse Output 6

Pulse/Mute	*Source*
◯ 10 P/NM	◯ SOG
◯ 100 P/NM	◯ STW
◯ 200 P/NM	
◯ 400 P/NM	
◯ 20000 P/NM	
◯ Mute Relay	

RS-422 Output 1-3

Messages	*Baudrate*
☐ VBW	◯ 4800 Baud
☐ VHW	◯ 9600 Baud
☐ VLW	◯ 38400 Baud
☐ VLW extended	
☐ VTG	
☐ PPLAK	
☐ PEDIB	

RS-422 Output 4-6

Messages	*Baudrate*
☐ VBW	◯ 4800 Baud
☐ VHW	◯ 9600 Baud
☐ VLW	◯ 38400 Baud
☐ VLW extended	
☐ VTG	
☐ PPLAK	
☐ PEDIB	

Northrop Grumman Sperry Marine B.V. (Representative Office)
Woltmanstr. 19, 20097 Hamburg, Germany
Tel.: +49-40-29900-0, Fax: +49-40-29900-298, E-mail: service.de@sperry.ngc.com

Service Setup - Page 1, contd.

NMEA Input 1

Messages

- ☐ HDT
- ☐ ROT
- ☐ DDC
- ☐ PPLAI

Baudrate

- ○ 4800 Baud
- ○ 9600 Baud
- ○ 38400 Baud

NMEA Input 2

Messages

- ☐ HDT
- ☐ ROT
- ☐ DDC
- ☐ PPLAI

Baudrate

- ○ 4800 Baud
- ○ 9600 Baud
- ○ 38400 Baud

Service Setup - Page 2

System Type ☒ NAVIKNOT 600 SD

Sensor Sensitivity Value: _____

Relay Speed Limit Min.Value (kn): _____ Max.Value (kn): _____

☐ Min. Value ON ☐ Max. Value ON

Calibration ☐ Cal. Table ON

Calibration Table

Cal. No.	Uncal. Sp	True Spd.	Cal. No.	Uncal. Sp	True Spd.	Cal. No.	Uncal. Sp	True Spd.
0			7			14		
1			8			15		
2			9			16		
3			10			17		
4			11			18		
5			12			19		
6			13			20		

GPS Setup

(menu pages served from satellite PCB)

Heading Selection

GPS: ON *Diff. Limit: not applicable*

MAG: OFF

EXT: OFF

Align and Calibrate

Antenna Orientation

- ○ Forward
- ○ Port

Gyro Orientation

- ○ Forward
- ○ Starboard
- ○ Aft
- ○ Port

Heading Offsets

GPS: _____

MAG: not applicable

EXT: not applicable

R/P Offsets, Mag at Sea Cal., NMEA Output Sel. and Port D Output Sel. not applicable in NAVIKNOT systems

Antenna Distances To Stern (m): _____ To Centerline (m): _____

To Bow (m): _____

Northrop Grumman Sperry Marine B.V. (Representative Office)
Woltmanstr. 19, 20097 Hamburg, Germany
Tel.: +49-40-299 00-0, Fax: +49-40-299 00-298, E-mail: service.de@sperry.ngc.com

NORTHROP GRUMMAN
Sperry Marine

NAVIKNOT 600 SD
Record of Calibration Trial Runs

005004-0125-005/A; Aug 2007

Vessel: ______________________ Hull No.: ______________________

IMO No.: ______________________ Shipyard: ______________________

Service Station / Installer: ______________________ Date / Signature: __________ / ______________________

Location of runs:

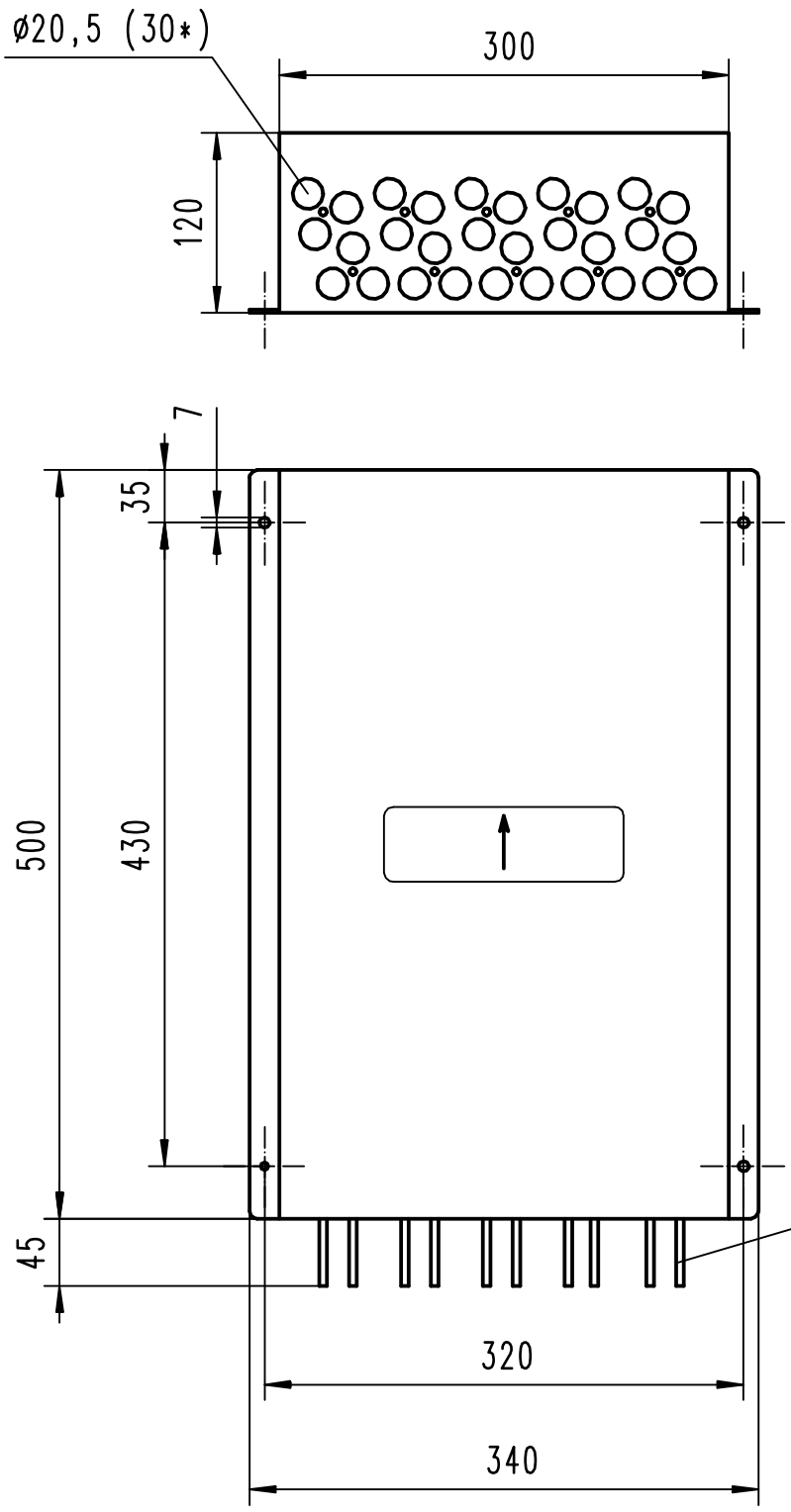
Remarks:

Run #:	engine RPM:				
	run parameters			**computed values**	
	elapsed time (s)	**distance (NM)**	**heading (°)**	**avg. uncal. spd.**	**true water speed**
Run A (or single run)					
Run B (return run)					
averaged values (cal. table entry)					

Run #:	engine RPM:				
	run parameters			**computed values**	
	elapsed time (s)	**distance (NM)**	**heading (°)**	**avg. uncal. spd.**	**true water speed**
Run A (or single run)					
Run B (return run)					
averaged values (cal. table entry)					

Run #:	engine RPM:				
	run parameters			**computed values**	
	elapsed time (s)	**distance (NM)**	**heading (°)**	**avg. uncal. spd.**	**true water speed**
Run A (or single run)					
Run B (return run)					
averaged values (cal. table entry)					

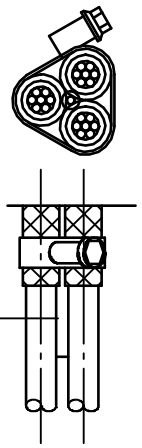
Northrop Grumman Sperry Marine B.V. (Representative Office)
Woltmanstr. 19, 20097 Hamburg, Germany
Tel.: +49-40-29900-0, Fax: +49-40-29900-298, E-mail: service.de@sperry.ngc.com



Diese Gerät kann nur horizontal befestigt werden, der Pfeil des Gerätes muß nach voraus, achtern, Backbord oder Steuerbord zeigen, ± 5°.

This unit can be deck mounted only, the arrow on the unit may point in any one of the four directions: towards the bow, the stern, port, or starboard, ± 5°.

Schirmgeflecht über den Kabelmantel gezogen und mit Schellen oder Kabelbindern befestigt.



Draw the screen back over the outer cable cover and attach it to the unit with clamps or cable bands.

Gewicht/Weight : 8 kg

Schutzart/Protection grade : IP 23

REV	ECO-No.	DATE	NAME
B	982016	15.03.07	Hinr
A	981992	27.02.07	Ho.
0	-	06.12.06	Ho.

NORTHROP GRUMMAN
Sperry Marine
HAMBURG GERMANY

	DATE	NAME
DRAWN	06.12.2006	Ho.
CHD	see ECO	
DOS	5004-0112-01	

DRAWING No. 5004-0112-01

FIRST ANGLE PROJECTION | DIMENSIONS IN MILLIMETERS

STOCK No. 73511

DIMENSION DRAWING
Electronics Unit 600S

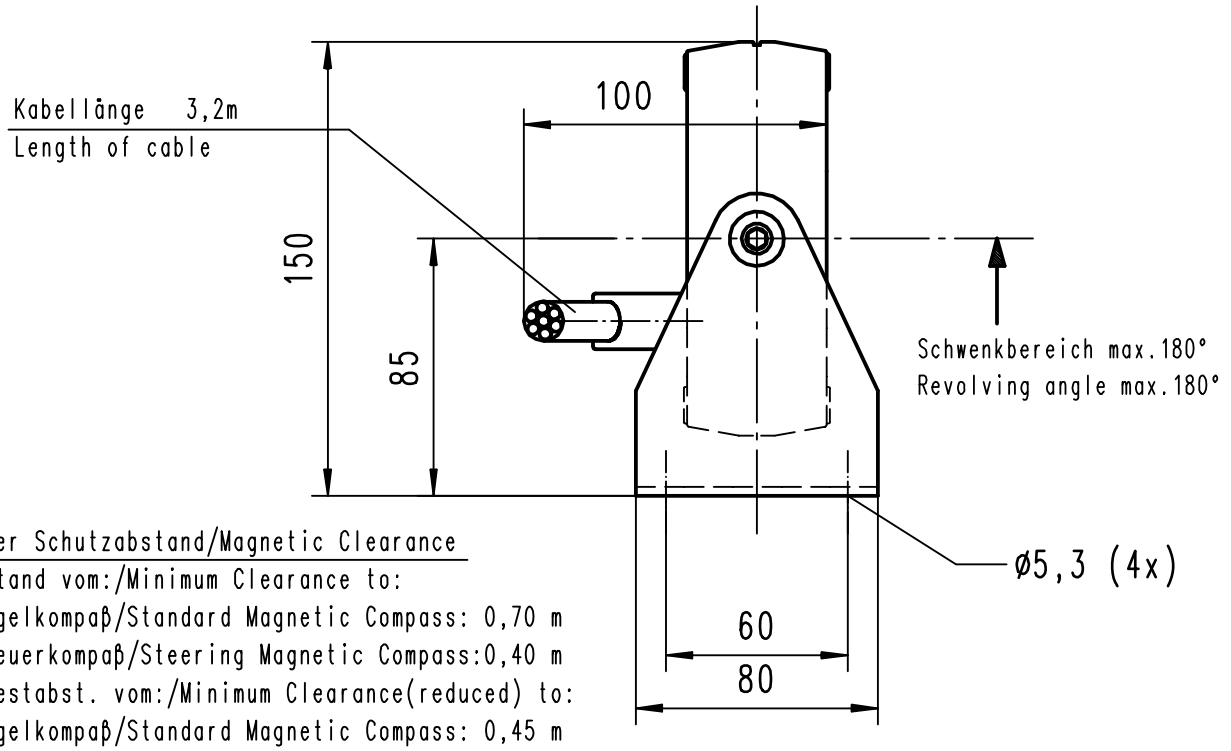
REPLACEMENT FOR:

FREE SCALE: DIN ISO 2768 mH

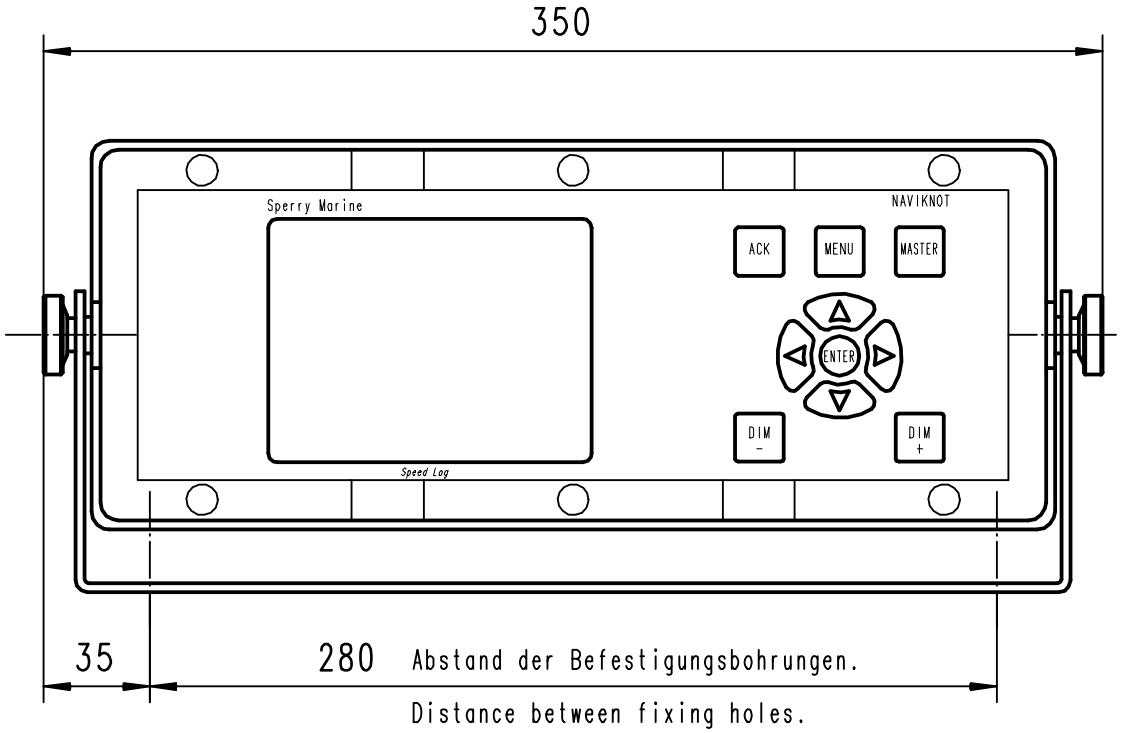
SCALE /

SHEET 1

SHEETS 1



Magnetischer Schutzabstand/Magnetic Clearance
Mindestabstand vom:/Minimum Clearance to:
Magnet-Regelkompaß/Standard Magnetic Compass: 0,70 m
Magnet-Steuerkompaß/Steering Magnetic Compass:0,40 m
Reduz.Mindestabst. vom:/Minimum Clearance(reduced) to:
Magnet-Regelkompaß/Standard Magnetic Compass: 0,45 m
Magnet-Steuerkompaß/Steering Magnetic Compass:0,30 m



Gewicht/Weight: 3,2 kg

REV	ECO-No.	DATE	NAME
A	982006	06.03.07	Hinr
0	–	27.11.05	Ho.

NORTHROP GRUMMAN
Sperry Marine
HAMBURG GERMANY

	DATE	NAME
DRAWN	27.11.2006	Ho.
CHD	see ECO	
DOS	5002-0112-01	

DRAWING No. 5002-0112-01

FIRST ANGLE PROJECTION | DIMENSIONS IN MILLIMETERS

STOCK No. 73509

DIMENSION DRAWING

NAVIKNOT 600
Control and Display Unit

in housing with brackets

im Gehäuse mit Bügel

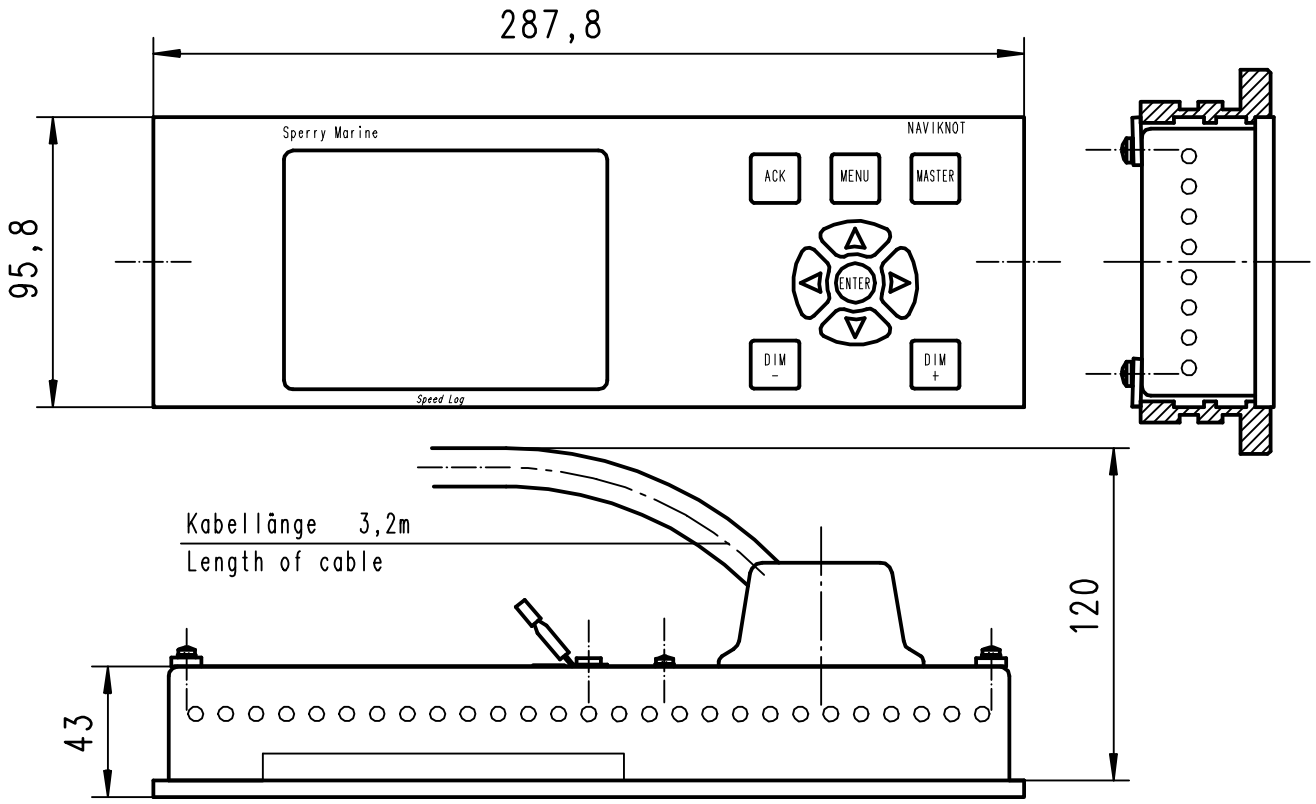
REPLACEMENT FOR:

FREE SCALE: DIN ISO 2768 mH

SCALE /

SHEET 1

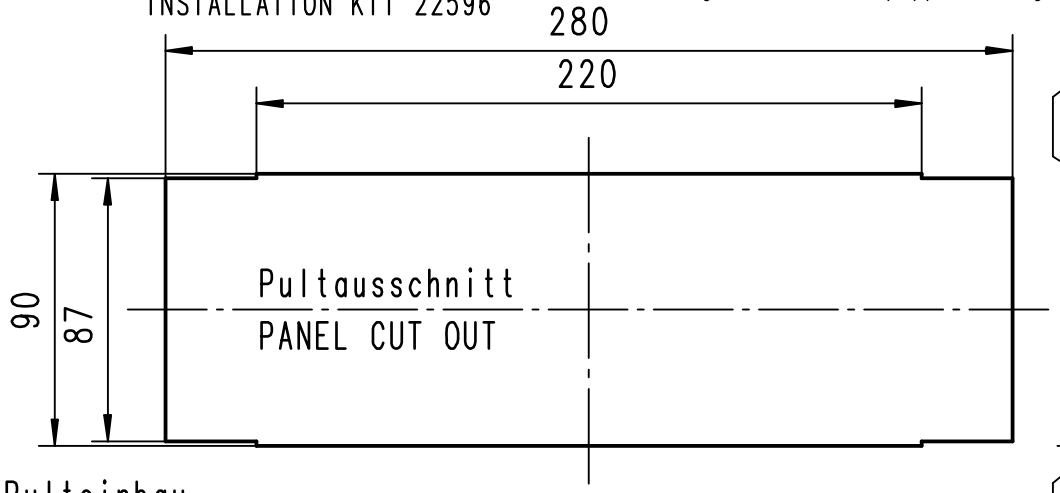
SHEETS 1

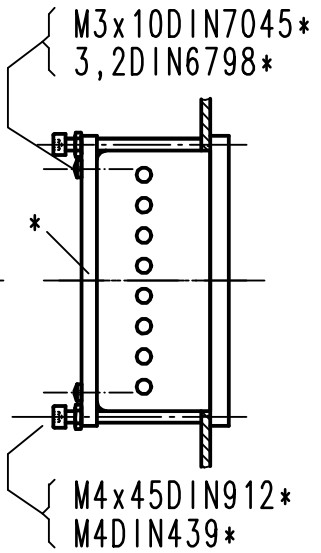


Einbau in Pultrahmen
INSTALLATION IN CONSOLE FRAME

Magnetischer Schutzabstand/Magnetic Clearance
Mindestabstand vom:/Minimum Clearance to:
Magnet-Regelkompaß/Standard Magnetic Compass: 0,70 m
Magnet-Steuerkompaß/Steering Magnetic Compass:0,40 m
Reduz.Mindestabst. vom:/Minimum Clearance(reduced) to:
Magnet-Regelkompaß/Standard Magnetic Compass: 0,45 m
Magnet-Steuerkompaß/Steering Magnetic Compass:0,30 m

* = Montagesatz 22596
INSTALLATION KIT 22596





Pulteinbau
PANEL INSTALLATION

Gewicht/Weight: 2,4 kg

REV	ECO-No.	DATE	NAME
A	982006	06.03.07	Hinr
0	-	27.11.06	Ho.

NORTHROP GRUMMAN Sperry Marine
HAMBURG GERMANY

	DATE	NAME
DRAWN	27.11.2006	Ho.
CHD	see ECO	
DOS	5002-0112-02	

DRAWING No. 5002-0112-02

FIRST ANGLE PROJECTION | DIMENSIONS IN MILLIMETERS

STOCK No. 73508

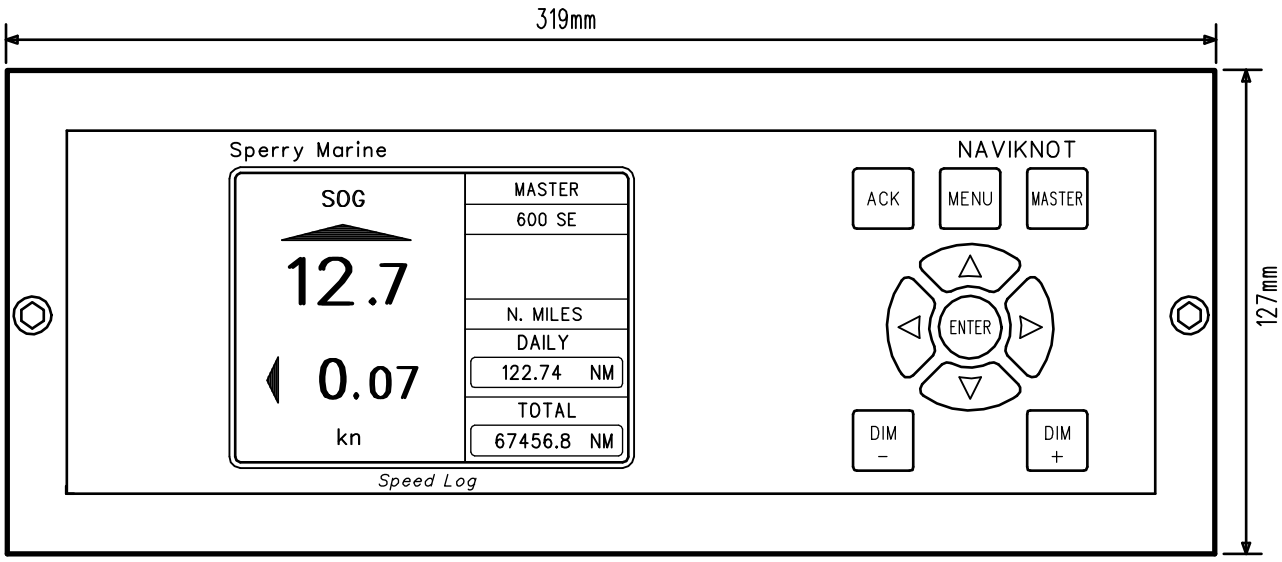
DIMENSION DRAWING
NAVIKNOT 600
Control and Display Unit

REPLACEMENT FOR:

FREE SCALE: DIN ISO 2768 mH

SCALE /

SHEET 1
SHEETS 1



Depth: 150mm

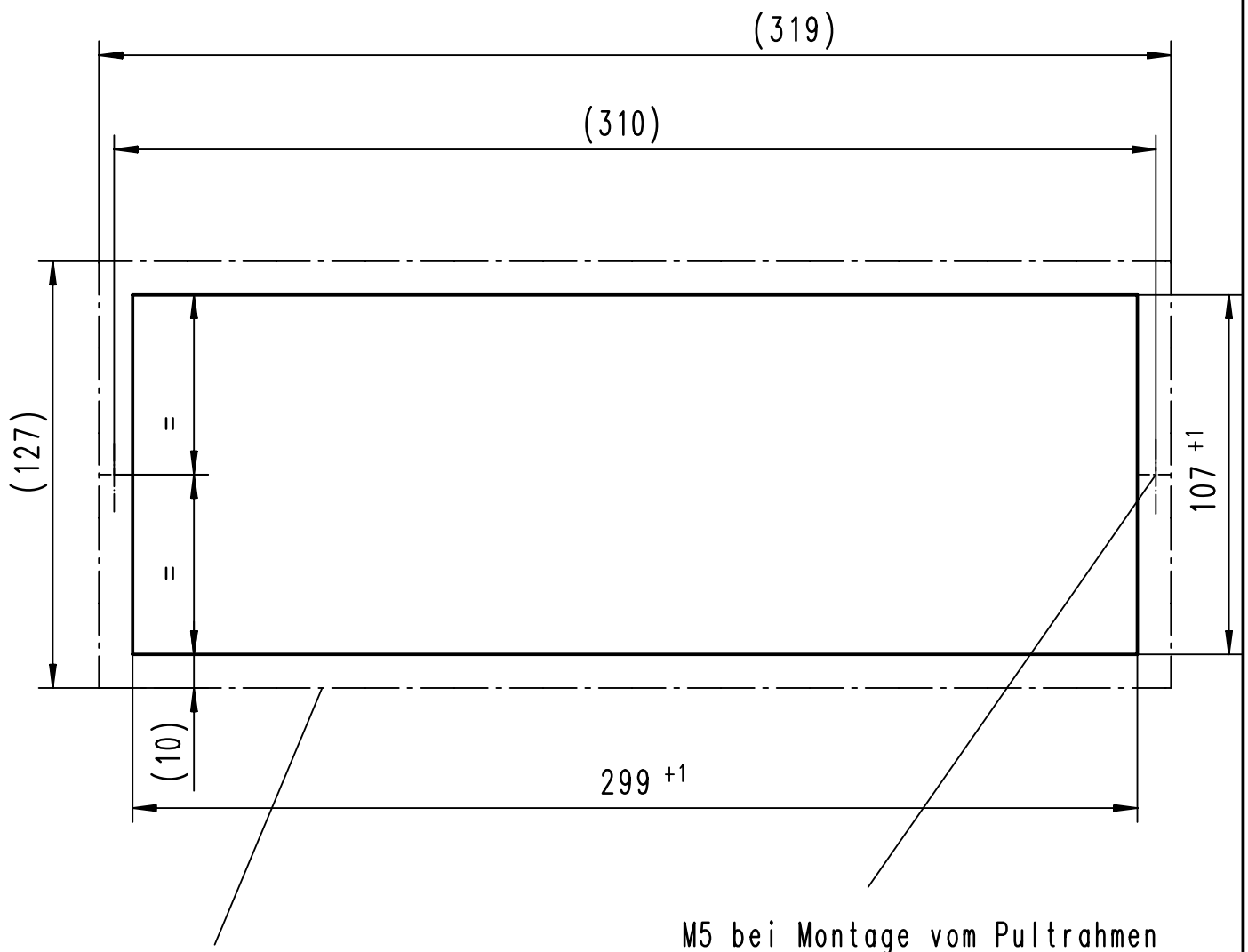
				NORTHROP GRUMMAN Sperry Marine		Date	Name
					DRAWN	13.03.2007	Schütt
				Hamburg Germany	DESIGN	13.03.2007	Reinecke
				RAHMEN00\0031-0112-73S01	CHD ECO		
				Rahmen Lg-Nr. 29885			
A	981 901	13.03.07	Schütt	STOCK No. 79 489			
REV	ECO-No.	DATE	NAME				

TITLE

Ansicht Pultplatte
CONSOLE FRAME LAYOUT

DRAWING No. 0031-0112-73

SHEET 1 SHEETS 1



Platzbedarf für Rahmen
Space requirement for frame

M5 bei Montage vom Pultrahmen
abbohren und gewindeschneiden
Drilled off from console frame
and threaded M5

Pultplatte max. 20 mm dick
Thickness of panel max.20 mm

REV	ECO-No.	DATE	NAME
AC	98351	20.04.01	Ho.
AB	99669	10.07.96	Ho.
AA	99224	16.02.94	Ho.

NORTHROP GRUMMAN
Sperry Marine
HAMBURG GERMANY

	DATE	NAME
DRAWN	10.02.1994	Ho.
CHD	see ECO	
DOS	0031-0112-02	

DRAWING No.
0031-0112-02

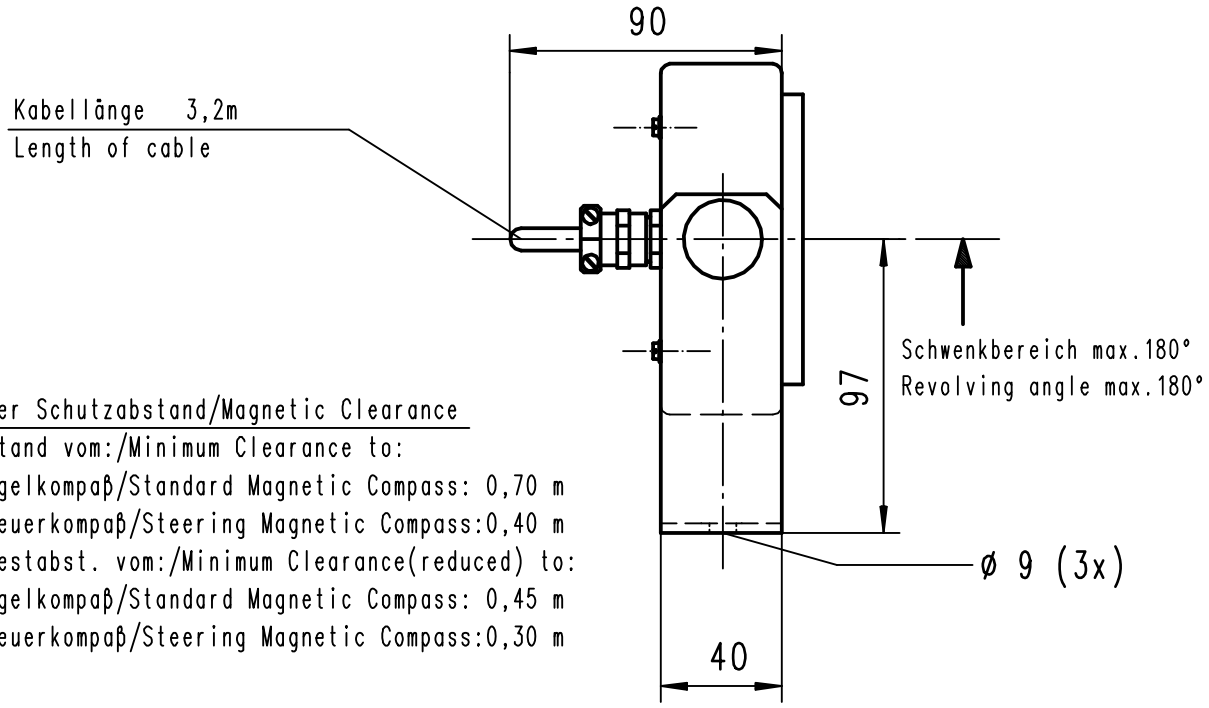
FIRST ANGLE PROJECTION | DIMENSIONS IN MILLIMETERS

STOCK No.

DIMENSION DRAWING
Pultausschnitt
Console cut out
3 * 1

REPLACEMENT FOR: Ausgabe 00
FREE SCALE: DIN ISO 2768 mH

SCALE /
SHEET 1
SHEETS 1



Magnetischer Schutzabstand/Magnetic Clearance

Mindestabstand vom:/Minimum Clearance to:

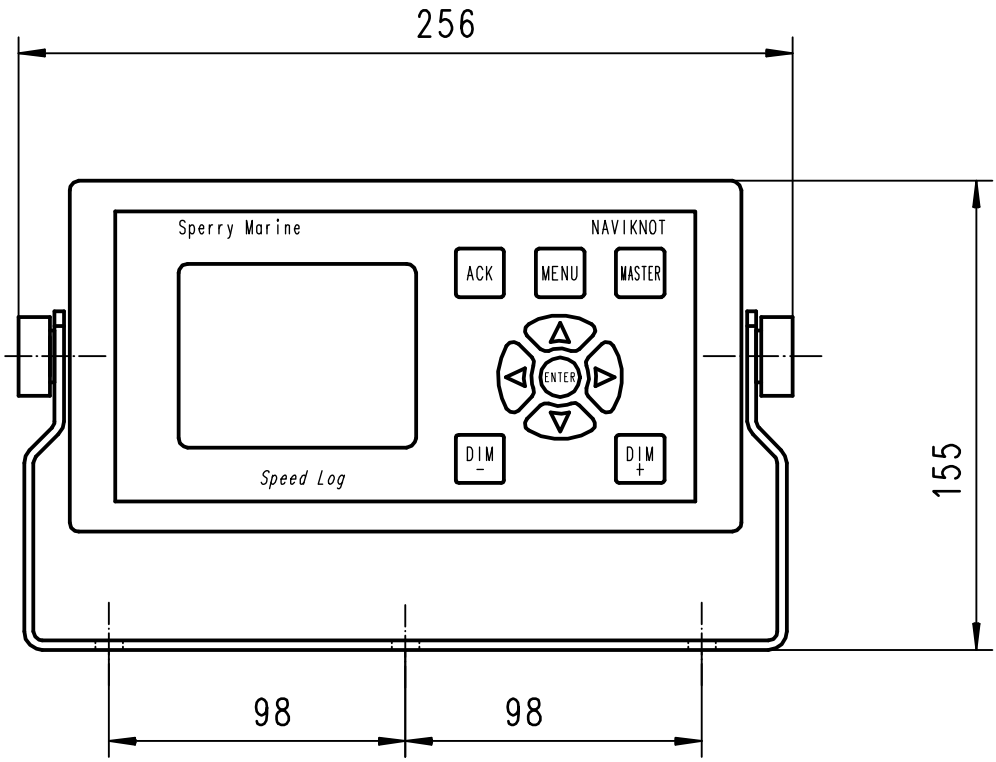
Magnet-Regelkompaß/Standard Magnetic Compass: 0,70 m

Magnet-Steuerkompaß/Steering Magnetic Compass:0,40 m

Reduz.Mindestabst. vom:/Minimum Clearance(reduced) to:

Magnet-Regelkompaß/Standard Magnetic Compass: 0,45 m

Magnet-Steuerkompaß/Steering Magnetic Compass:0,30 m



Gewicht/Weight: 3,2 kg

REV	ECO-No.	DATE	NAME
A	982006	06.03.07	Hinr
0	–	27.11.05	Ho.

NORTHROP GRUMMAN
Sperry Marine
HAMBURG GERMANY

	DATE	NAME
DRAWN	20.02.2007	Ho.
CHD	see ECO	
DOS	5001-0112-01	

DRAWING No. 5001-0112-01

FIRST ANGLE PROJECTION | DIMENSIONS IN MILLIMETERS

STOCK No. 73507

DIMENSION DRAWING

NAVIKNOT 350/450
Control and Display Unit

in housing with brackets

im Gehäuse mit Bügel

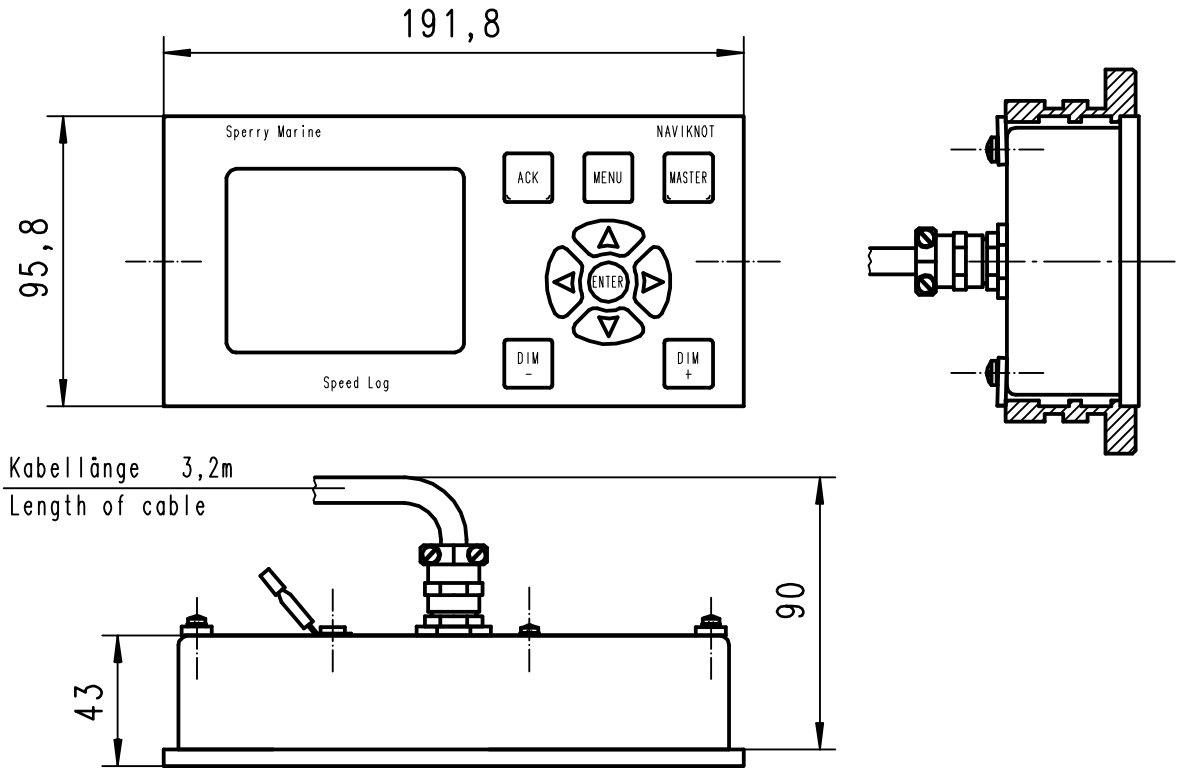
REPLACEMENT FOR:

FREE SCALE: DIN ISO 2768 mH

SCALE /

SHEET 1

SHEETS 1



Magnetischer Schutzabstand/Magnetic Clearance

Mindestabstand vom:/Minimum Clearance to:

Magnet-Regelkompaß/Standard Magnetic Compass: 0,70 m

Magnet-Steuerkompaß/Steering Magnetic Compass:0,40 m

Reduz.Mindestabst. vom:/Minimum Clearance(reduced) to:

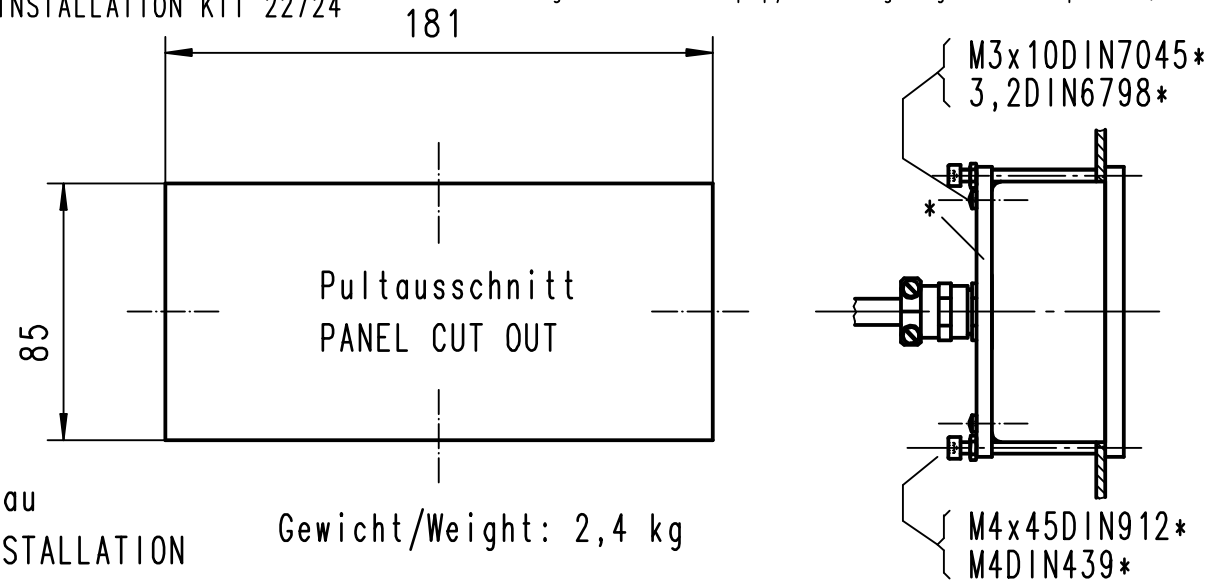
Magnet-Regelkompaß/Standard Magnetic Compass: 0,45 m

Magnet-Steuerkompaß/Steering Magnetic Compass:0,30 m

Einbau in Pultrahmen
INSTALLATION IN CONSOLE FRAME

* = Montagesatz 22724

INSTALLATION KIT 22724



Pulteinbau
PANEL INSTALLATION

Gewicht/Weight: 2,4 kg

REV	ECO-No.	DATE	NAME
A1	982028	27.03.07	Ho.
A	982006	06.03.07	Hinr
0	–	27.11.06	Ho.

NORTHROP GRUMMAN
Sperry Marine
HAMBURG GERMANY

	DATE	NAME
DRAWN	27.11.2006	Ho.
CHD	see ECO	
DOS	5001-0112-02	

DRAWING No. 5001-0112-02

FIRST ANGLE PROJECTION | DIMENSIONS IN MILLIMETERS

STOCK No. 73506

DIMENSION DRAWING

NAVIKNOT 350/450

Control and Display Unit

Frontseitig wasserdicht IP 65

Watertight front IP 65

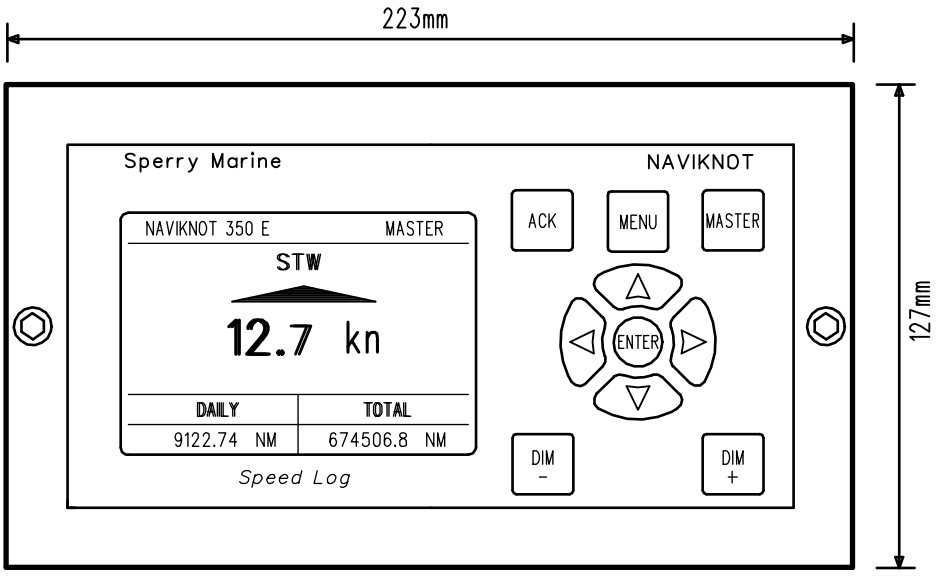
REPLACEMENT FOR:

FREE SCALE: DIN ISO 2768 mH

SCALE /

SHEET 1

SHEETS 1



Depth: 150mm

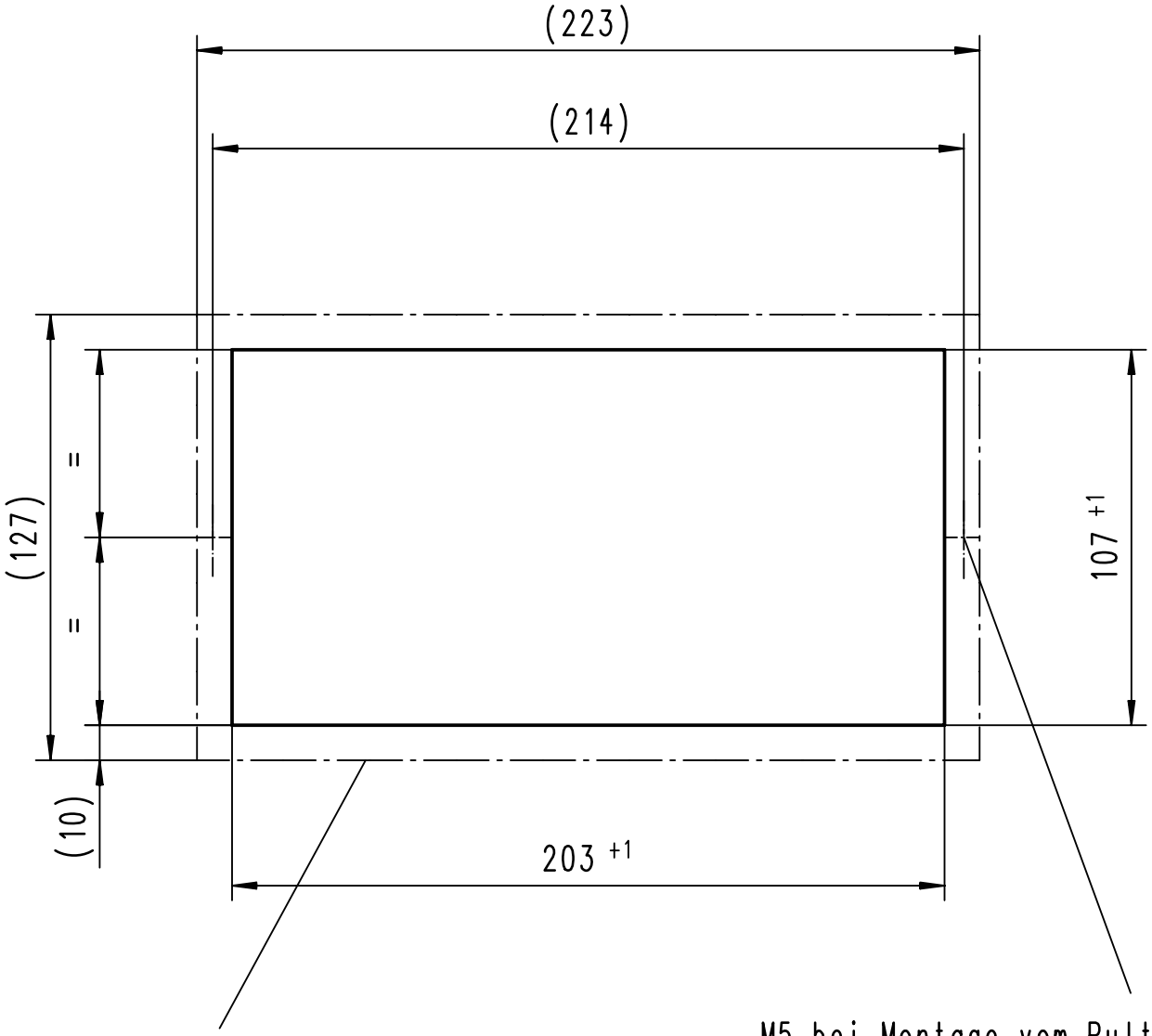
				NORTHROP GRUMMAN Sperry Marine		Date	Name
					DRAWN	13.03.2007	Schütt
				Hamburg Germany	DESIGN	13.03.2007	Reinecke
				RAHMEN00\0021-0112-86S01	CHD ECO		
				Rahmen Lg-Nr. 39086			
A	981 901	13.03.07	Schütt	STOCK No. 79 488			
REV	ECO-No.	DATE	NAME				

TITLE

Ansicht Pultplatte
CONSOLE FRAME LAYOUT

DRAWING No. 0021-0112-86

SHEET 1 SHEETS 1



Platzbedarf für Rahmen
Space requirement for frame

M5 bei Montage vom Pultrahmen abbohren und gewindeschneiden
Drilled off from console frame and threaded M5

Pultplatte max. 20 mm dick
Thickness of panel max.20 mm

REV	ECO-No.	DATE	NAME
AC	98351	20.04.01	Ho.
AB	99669	10.07.96	Ho.
AA	99224	16.02.94	Ho.

NORTHROP GRUMMAN
Sperry Marine
HAMBURG GERMANY

	DATE	NAME
DRAWN	10.02.1994	Ho.
CHD	see ECO	
DOS	0021-0112-02	

DRAWING No. 0021-0112-02

FIRST ANGLE PROJECTION | DIMENSIONS IN MILLIMETERS

STOCK No.

DIMENSION DRAWING
Pultausschnitt
Console cut out
2 * 1

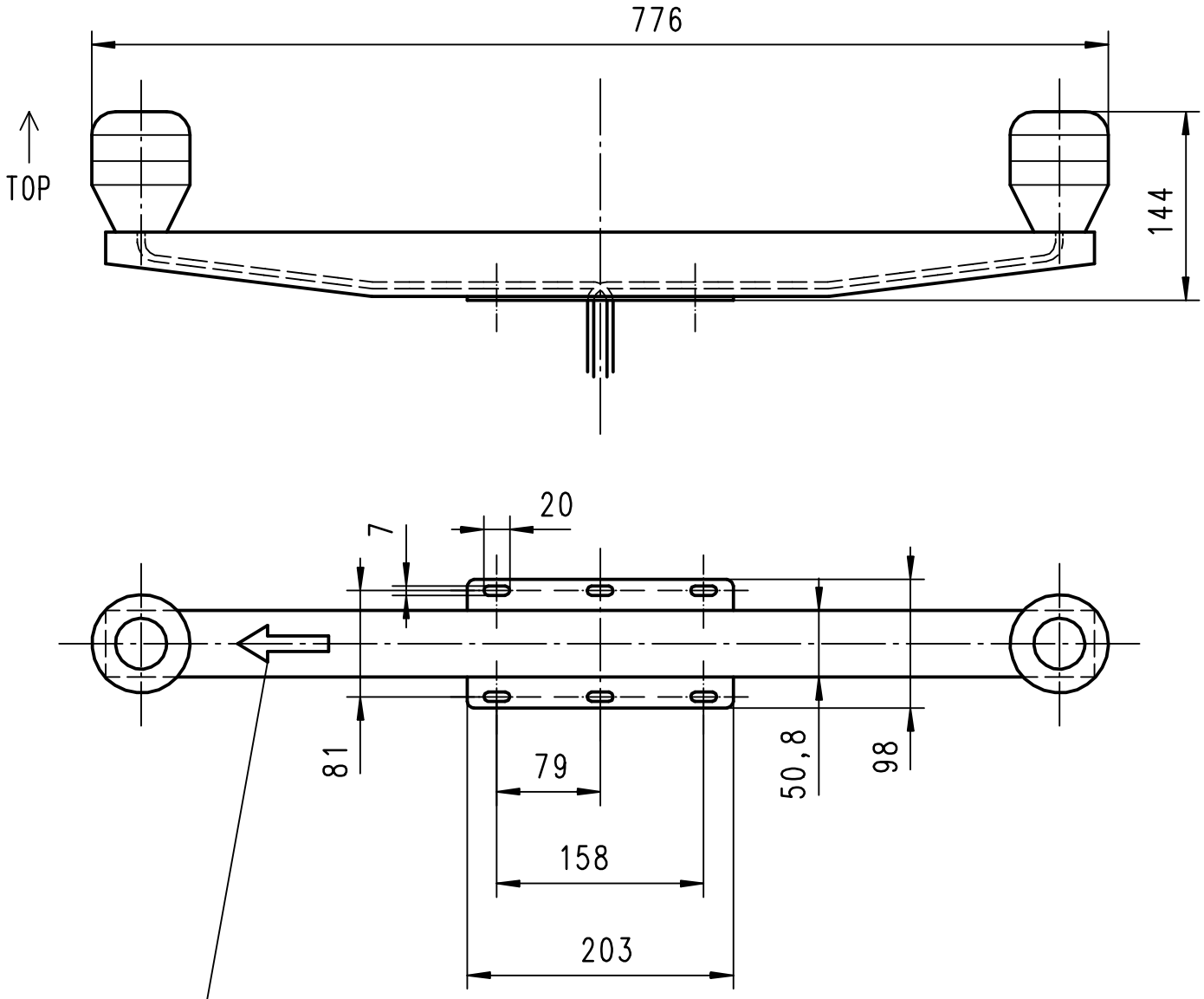
REPLACEMENT FOR: Ausgabe 00

FREE SCALE: DIN ISO 2768 mH

SCALE /

SHEET 1

SHEETS 1



Pfeil nach Voraus oder Backbord ausrichten.
Orientierung muss im Installationsmenu gewählt werden.
ARROW MUST POINT TOWARD FORWARD (BOW) OR PORT OF SHIP.
ORIENTATION MUST BE SELECTED DURING CONFIGURATION.

	Lager Nr. STOCK NO.	Gewicht Antenne WEIGHT ANTENNA	Gewicht Kabel WEIGHT CABLE
ANTENNA WITH 15M CABLE	-73513	1,9KG	1,0KG
ANTENNA WITH 50M CABLE	-73514	1,9KG	3,2KG

REV	ECO-No.	DATE	NAME
B	982312	15.04.08	Kie
A	982037	28.03.07	Kie

NORTHROP GRUMMAN
Sperry Marine
HAMBURG GERMANY

	DATE	NAME
DRAWN	05.04.2007	Kie
CHD	see ECO	
DOS	5008-0112-011	

DRAWING No. 5008-0112-01

FIRST ANGLE PROJECTION | DIMENSIONS IN MILLIMETERS

STOCK No. SEE ABOVE

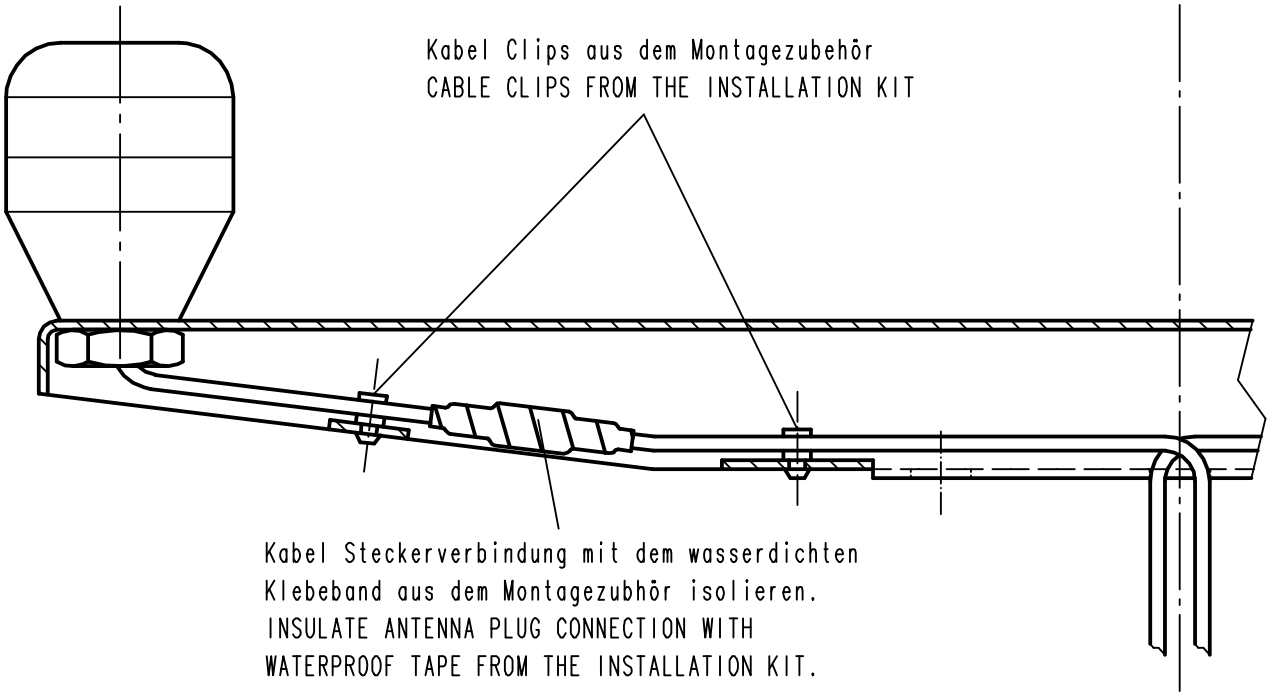
DIMENSION DRAWING
NAVIKNOT
ANTENNA

REPLACEMENT FOR:

FREE SCALE: DIN ISO 2768 mH

SCALE /

SHEET 1
SHEETS 2



Die Antenne muss einen möglichst offenen Zugang zum Himmel haben. Nicht nahe an großen vertikalen Metallaufbauten die das GPS Signal blockieren montieren.

Die Antennen sind präzise zueinander ausgerichtet und dürfen nicht verdreht werden.
Die Mutter an der Antenne nicht lösen.

Pfeil nach Voraus oder Backbord ausrichten. Orientierung muss im Installationsmenu gewählt werden.

Im Installationsmenu kann eine horizontale Verdrehung von ±9° kompensiert werden. Siehe Handbuch.

Verschiedene Antennenausführungen werden mit unterschiedlichen Kabellängen kombiniert.
Diese sind speziell auf die Antenne abgestimmt und dürfen nicht geändert werden.
Kabel nicht verlängern oder kürzen.

THE ANTENNA MUST BE MOUNTED TO HAVE AS CLEAR A VIEW OF THE SKY AS POSSIBLE AND NOT BE LOCATED NEXT TO ANY LARGE VERTICAL METAL STRUCTURE THAT WILL BLOCK THE GPS SIGNAL TO ANTENNA.

EACH ANTENNAS ROTATIONEL POSITION IS ALIGNED RELATIVE TO THE OTHER ANTENNA DURING MANUFACTURING FOR PRECISE SIGNAL PHASING. DO NOT LOOSEN JAM NUT OR CAUSE ANTENNA BASE TO ROTATE.

ARROW MUST POINT TOWARD FORWARD (BOW) OR PORT OF SHIP. ORIENTATION MUST BE SELECTED DURING CONFIGURATION.

THE INSTALLATION MENU CAN COMPENSATE FOR THE SLEWING OF THE ANTENNA AZIMUTH BY ±9°. REFER TO MANUAL.

DIFFERENT ANTENNA ASSEMBLIES ARE USED WITH DIFFERENT CABLE LENGTHS. CABLE LOSS IS MATCHED SPECIFICALLY WITH ANTENNA. DO NOT COMBINE IN ANY OTHER WAY. DO NOT EXTEND OR REDUCE CABLE.

REV	ECO-No.	DATE	NAME
B	982312	15.04.08	Kie
A	982037	28.03.07	Kie

NORTHROP GRUMMAN Sperry Marine
HAMBURG GERMANY

	DATE	NAME
DRAWN	05.04.2007	Kie
CHD	see ECO	
DOS	5008-0112-012	

DRAWING No. 5008-0112-01

FIRST ANGLE PROJECTION | DIMENSIONS IN MILLIMETERS

STOCK No. /

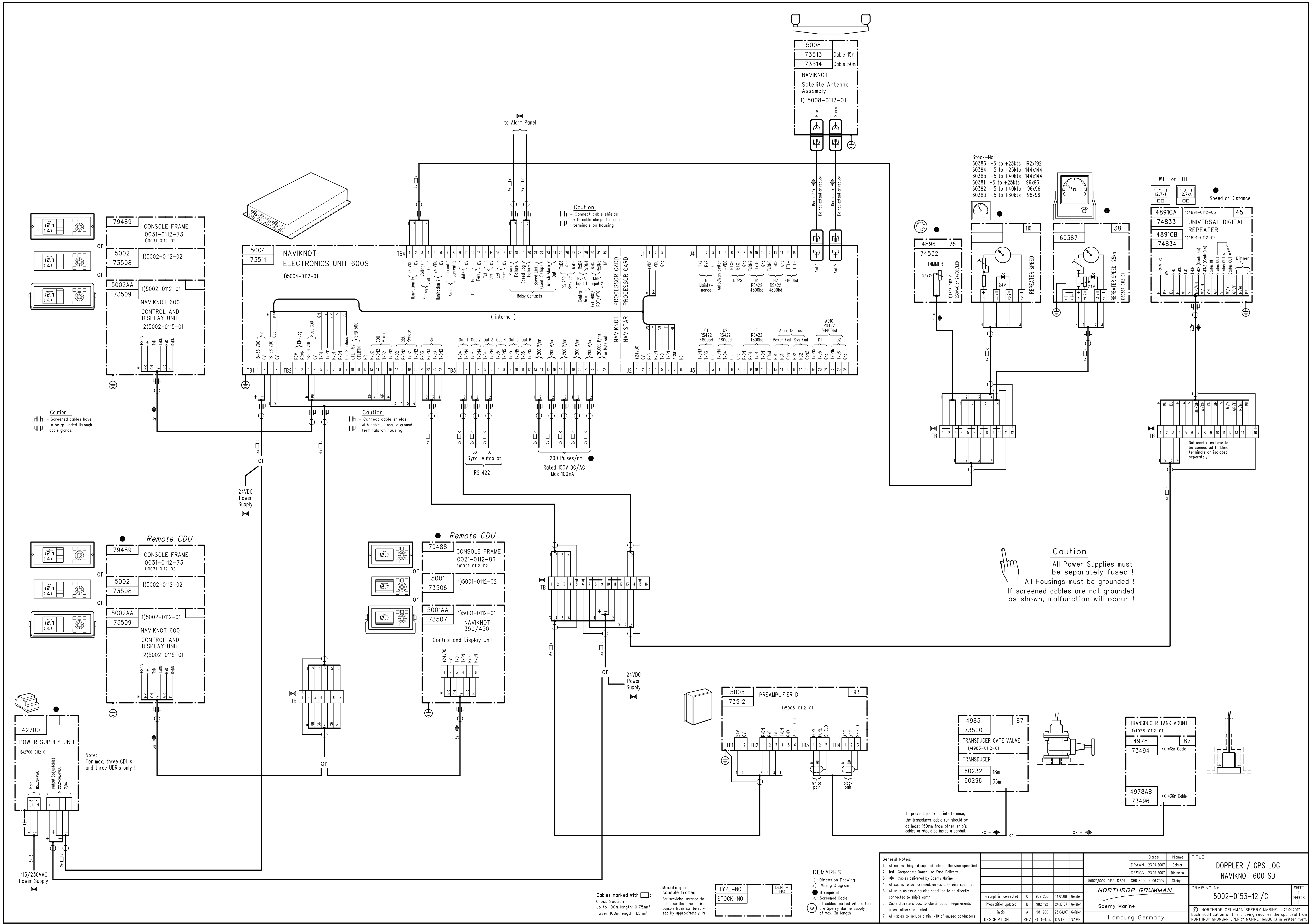
DIMENSION DRAWING
NAVIKNOT
ANTENNA

REPLACEMENT FOR:

FREE SCALE: DIN ISO 2768 mH

SCALE /

SHEET 2
SHEETS 2


5008
73513 Cable 15m
73514 Cable 50m
NAVIKNOT
Satellite Antenna Assembly
1) 5008-0112-01
Bow
Stern
to Alarm Panel
Caution
Connect cable shields with cable clamps to ground terminals on housing
5004
73511
NAVIKNOT
ELECTRONICS UNIT 600S
1)5004-0112-01
PROCESSOR CARD
NAVIKNOT
NAVISTAR
(internal)
Relay Contacts
Ant 1
Ant 2
79489
CONSOLE FRAME
0031-0112-73
1)0031-0112-02
or
5002
73508
1)5002-0112-02
5002AA
73509
1)5002-0112-01
NAVIKNOT 600
CONTROL AND DISPLAY UNIT
2)5002-0115-01
Caution
Screened cables have to be grounded through cable glands.
to Gyro
to Autopilot
RS 422
200 Pulses/nm
Rated 100V DC/AC
Max 100mA
24VDC Power Supply
Stock-No:
60386 -5 to +25kts 192x192
60384 -5 to +25kts 144x144
60385 -5 to +40kts 144x144
60381 -5 to +25kts 96x96
60382 -5 to +40kts 96x96
60383 -5 to +60kts 96x96
4896 35
74532
DIMMER
110
REPEATER SPEED
60387 38
REPEATER SPEED 25kn
WT or BT
Speed or Distance
4891CA 45
74833
4891CB
74834
UNIVERSAL DIGITAL REPEATER
1)4891-0112-03
1)4891-0112-04
TB
Not used wires have to be connected to blind terminals or isolated separately !
Remote CDU
79488
CONSOLE FRAME
0021-0112-86
1)0021-0112-02
5001
73506
1)5001-0112-02
5001AA
73507
1)5001-0112-01
NAVIKNOT 350/450
Control and Display Unit
Caution
All Power Supplies must be separately fused !
All Housings must be grounded !
If screened cables are not grounded as shown, malfunction will occur !
42700
POWER SUPPLY UNIT
1)42700-0112-01
Note:
For max. three CDU's and three UDR's only !
115/230VAC Power Supply
5005
73512
PREAMPLIFIER D
93
1)5005-0112-01
white pair
black pair
4983 87
73500
TRANSDUCER GATE VALVE
1)4983-0112-01
TRANSDUCER
60232 18m
60296 36m
TRANSDUCER TANK MOUNT
1)4978-0112-01
4978 87
73494 XX =18m Cable
4978AB
73496 XX =36m Cable
To prevent electrical interference, the transducer cable run should be at least 150mm from other ship's cables or should be inside a conduit.
Cables marked with: Cross Section up to 100m length: 0,75mm² over 100m length: 1,5mm²
Mounting of console frames
For servicing, arrange the cable so that the entire console frame can be raised by approximately 1m
TYPE-NO
STOCK-NO
IDENT-NO
REMARKS
1) Dimension Drawing
2) Wiring Diagram
if required
Screened Cable
all cables marked with letters are Sperry Marine Supply of max. 3m length
General Notes:
1. All cables shipyard supplied unless otherwise specified
2. Components Owner- or Yard-Delivery
3. Cables delivered by Sperry Marine
4. All cables to be screened, unless otherwise specified
5. All units unless otherwise specified to be directly connected to ship's earth
6. Cable diameters acc. to classification requirements unless otherwise stated
7. All cables to include a min 1/10 of unused conductors
Preamplifier corrected C 982 235 14.01.08 Geisler
Preamplifier updated B 982 192 24.10.07 Geisler
initial A 981 900 23.04.07 Geisler
DESCRIPTION REV ECO-No. DATE NAME
DRAWN 23.04.2007 Geisler
DESIGN 23.04.2007 Dietmann
CHD ECO 21.06.2007 Steiger
NORTHROP GRUMMAN
Sperry Marine
Hamburg Germany
TITLE
DOPPLER / GPS LOG
NAVIKNOT 600 SD
DRAWING No.
5002-0153-12 /C
SHEET 1
SHEETS 1
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Each modification of this drawing requires the approval from NORTHROP GRUMMAN SPERRY MARINE HAMBURG in written form.