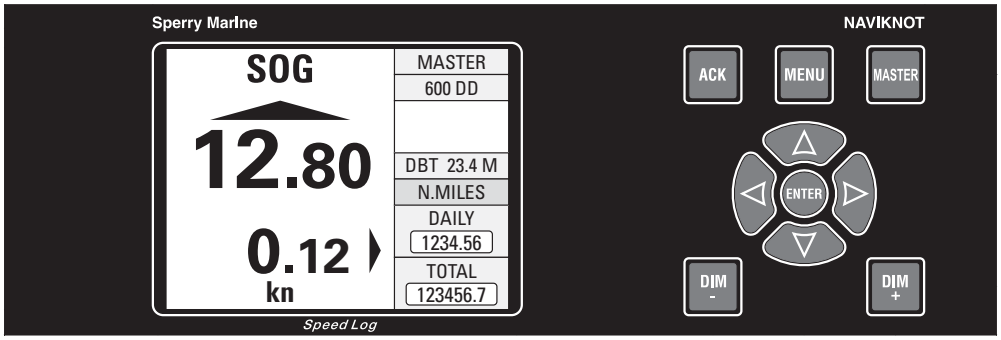
NORTHROP GRUMMAN

Sperry Marine

Operation, Installation and Service Manual



NAVIKNOT 600 DD

Dual-Axis Doppler Speed Log Retrofit Kit

056354/A, 22 Feb 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
A	22 Feb 2008	initial version

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 DD 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 Doppler transducer.

When operating the NAVIKNOT 600 DD 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 DD in “Manual” mode may severely affect the proper function of all equipment which depends on accurate speed and/or distance data.

General Safety Information for Service Personnel

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

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Chapter 1: Introduction

1.1 Design and Main Features

The NAVIKNOT 600 DD Retrofit Kit is a cost-effective replacement for the now discontinued display unit of the Sperry SRD 500 dual-axis Doppler speed log system.

The combination of the NAVIKNOT 600 DD Retrofit Kit and the existing SRD 500 Doppler transducer and electronics unit fully retains the functional and performance characteristics of the SRD 500 system. The system provides ground and water referenced longitudinal and transverse speeds as well as distance and water depth[1] indication.

A basic system consists of the NAVIKNOT 600 DD Electronics Unit and a Control and Display Unit (CDU), connected to the SRD 500 Electronics Unit and Doppler transducer (gate valve or tank mount) from the existing SRD 500 system. Up to three additional remote CDUs may be connected to the NAVIKNOT 600 DD Electronics Unit.

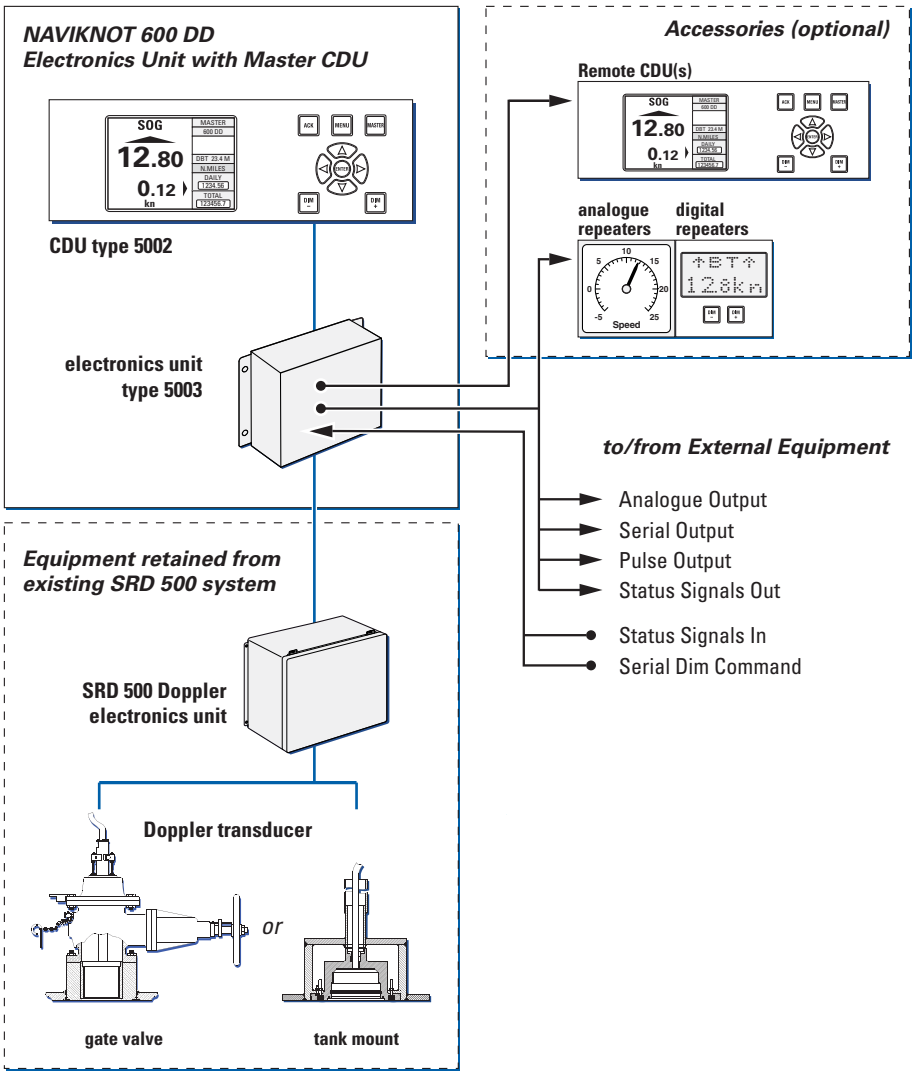


Figure 1-1: NAVIKNOT 600 DD system

1. Depth data is not available in the BSH mode of operation.

Data Outputs

The NAVIKNOT electronics unit transmits speed, distance and depth data to receiving external equipment and to the connected CDUs. While speed and depth data are transmitted as received from the SRD 500 electronics unit, the distances travelled are calculated from the longitudinal ground and water speeds.

Serial speed, distance and depth 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 available at one voltage and one current output. These may be configured to provide either longitudinal ground or longitudinal water speed. 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.

Note

In a given installation, additional outputs from the existing SRD 500 Doppler Electronics Unit, such as the auxiliary serial ports or optional synchro or analogue output boards, may remain in use after retrofitting with the NAVIKNOT 600 DD components.
For specifications of the outputs from the Doppler Electronics Unit, refer to the documentation provided with the existing SRD 500 system.

1.2 Operating Principle

To determine longitudinal and transverse ground and water speeds and depth below the transducer, the system utilizes the principle of Doppler-shifted sound waves.

The SRD 500 electronics unit uses a microprocessor controlled transmitter to generate a series of short duration ultrasonic pulses. These pulses are transmitted into the water by a four-channel transducer which is mounted through the ship's hull.

Each of the four return echo signals from either the water mass or the sea bottom is Doppler shifted in frequency from the transmitted signals by an amount which is proportional to the ship's speed, direction of motion, and signal transmission angle with respect to ship's motion vector. To determine water speed, the system gates the echoes from the surrounding water mass after a time delay which allows the received signals to be returned from undisturbed water outside the ship's boundary layer.

The return signals are amplified and applied through scaling and signal detector circuits to generate Doppler shift data which is processed by the electronics unit microprocessor. In addition to the Doppler shift data from each channel, which is used directly to calculate fore/aft and port/stbd. speed vectors, return signal time for bottom reflections is used to determine depth.

The SRD 500 electronics unit transmits the sensed data in a digital format to the NAVIKNOT electronics unit.

1.3 Technical Data

General Performance Specifications

(As per specification of SRD 500 transducer and electronics unit)

Speed/Distance Ranges and Accuracies[1]

operating requirements	1.0 – 200 m depth below transducer for bottom speed tracking; 3.0 m min. depth below transducer for water speed tracking
speed range (displayed) - fore/aft - port/stbd.	 -20.0 – +50.0 kn -10.0 – +10.0 kn
speed accuracies - bottom - water	 <2 kn: ±0.01 kn >2 kn: ±0.05 kn <10 kn: ±0.01 kn 10 – 25 kn: ±0.025 kn 25 – 50 kn: ±0.1 kn
distance accuracy	within 0.5% or least significant digit (whichever is greater) of actual distance as calculated from displayed speed

1 Based on a dynamic and static roll angle of less than 10° and a pitch angle of less than 5° and good hydrostatic conditions.

Depth Range and Accuracy[1]

depth range	1.0 – 200 m; range may vary based on bottom reflectivity conditions and water temperature
depth accuracy	displayed depth within ± 2% or least significant digit (whichever is greater) of actual depth; based on surface water temperature; exclusive of pitch or roll

1 Depth data not available in BSH operating mode.

For detailed specifications of the SRD 500 trandsducer and electronics unit, refer to the documentation which was provided with the existing SRD 500 system.

NAVIKNOT Electronics Unit, Type 5003

Environmental Requirements

ambient temperature, operation	-15 °C – +55 °C
ambient temperature, storage	-25 °C – +70 °C
protection grade	IP 23 to DIN EN 60529
environmental conditions / EMC	in accordance with IEC 60945

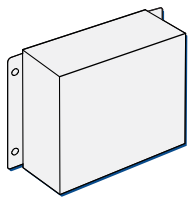
Power Supply

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	5 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	250 mm	
depth	100 mm	
weight	4.0 kg	

Data Inputs

Doppler transducer speed data	SRD500 protocol
Control and Display Unit data	NMEA 0183 / IEC 61162 (proprietary sentences)
serial dimming command	NMEA 0183 / IEC 61162

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

Doppler el. unit control data	SRD500 protocol
serial data RS-422 outputs, group 1 (3x)	NMEA 0183 / IEC 61162; *all or selected subset of:* longitudinal and transverse ground speeds longitudinal and transverse water speeds distances travelled water depth
serial data RS-422 outputs, group 2 (3x)	NMEA 0183 / IEC 61162; *all or selected subset of:* longitudinal and transverse ground speeds longitudinal and transverse water speeds distances travelled water depth

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;

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

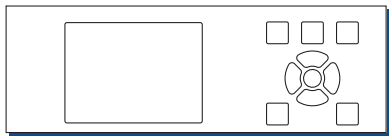
supply voltage	24 VDC (18-36 V)
max. ripple content	±4 Vpp; extreme values may not exceed 36 V or fall below 18 V
power consumption	14 W max. (3x1 unit) 4 W max. (2x1 unit)

Magnetic Clearance

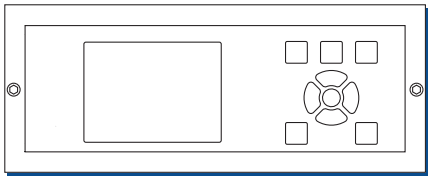
to standard magnetic compass	0.70 m (3x1 unit) 0.80 m (2x1 unit)
to steering magnetic compass	0.40 m (3x1 unit) 0.50 m (2x1 unit)
reduced, to standard magnetic compass	0.45 m (3x1 unit) 0.50 m (2x1 unit)
reduced, to steering magnetic compass	0.30 m (3x1 unit) 0.30 m (2x1 unit)

Dimensions and Weight, Main CDU and 3x1 remote unit

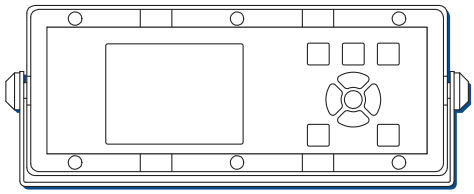
PN 73508 (for console mounting)

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	

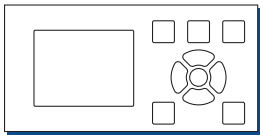
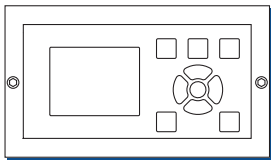
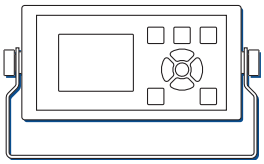
PN 79489 (PN 73508 factory-assembled in console frame)

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	

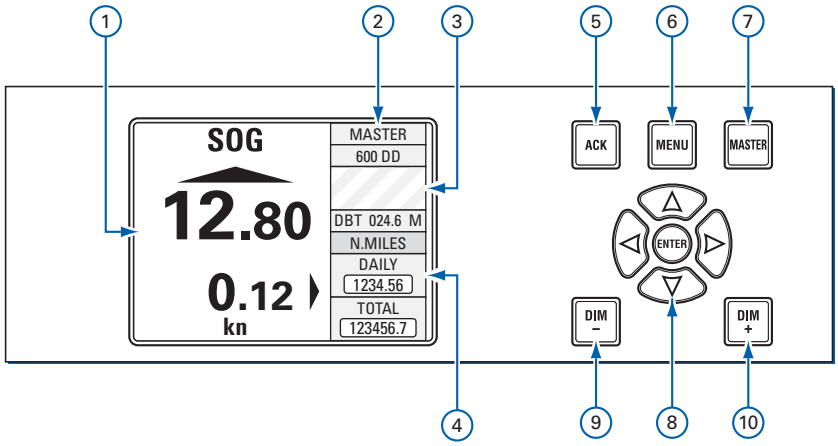
Dimensions and Weight, 2x1 remote unit

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 DD operating unit



① **Main Display:** shows one of two selectable speed pages, indicating
- – Ground speeds (SOG), longitudinal and transverse
  or
- – Water speeds (STW), longitudinal and transverse

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

- Operating mode (Master or Repeater).
- ③ Alarm status
  - – In case of pending alarms, acknowledge status and error code(s) are shown in this area.
- ④ Depth indicator and Mile Counters
  - – Water depth (meters, feet or fathoms, as per user setup configuration)[1]
  - – on ground speed page: total and daily miles made good over ground
  - – on water speed page: total and daily miles made good through the water

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.

1 Depth data not available in BSH mode of operation

2.2 External control devices

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

- The audible alarm at the NAVIKNOT 600 DD 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 DD 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 DD displays and transmits all speeds with the sign reversed.

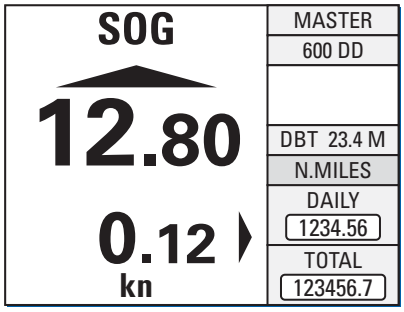
2.3 Power-up Sequence

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.

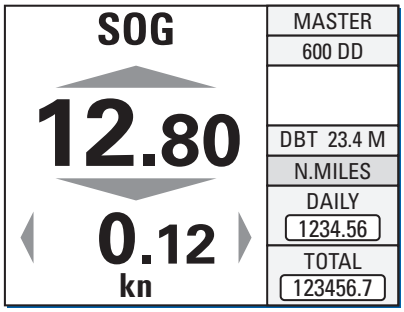
Note

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

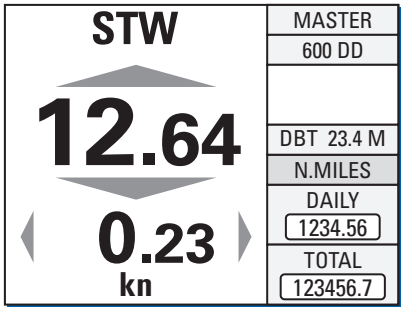
In the normal operational mode, the CDU permanently displays one of two selectable main display pages.



Ground Speed (SOG)

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

The sidebar shows the water depth and the distance counters (daily and total miles) for the ground distance. 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 and transverse speed through the water.
Arrow symbols indicate the respective direction (up = ahead, down = astern, right = to stb., left = to port). The values themselves are displayed without sign.

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

Note

If ground or water speeds are not available:
If the system cannot track the sea bottom, dashes will be appear instead of the actual values on the SOG page.
If the system cannot track water speeds, dashes will appear instead of the actual values on the STW page.
Loss of one type of speed only does not generate an alarm at the CDU.

Note

BSH mode of operation:
If the system is configured for the BSH mode of operation, depth data is not available. The display will show dashes instead of the depth value. The BSH mode is mandatory for systems which must comply with the regulations of the German Federal Hydrographic Agency (BSH), as the system is not type-approved as a depth measuring device.

Operating Status Indications

Master/Remote status

The indication “MASTER” is shown in the top right corner of the screen at 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 main display.

Speed not calibrated

If transducer calibration values have not yet been entered in the Service Setup menu, the indication “UNCAL” is shown in the bottom left corner of the main display.

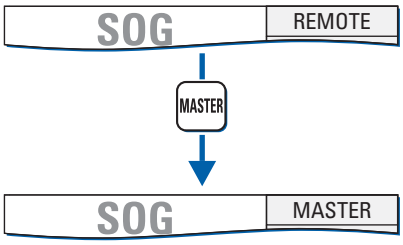
2.5 Requesting Master Control

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, and acknowledge pending alarms.

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:



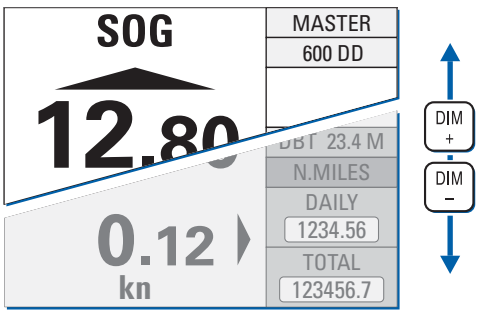
Press the **MASTER** key.
Master control is transferred and the mode indication changes from “REMOTE” to “MASTER”.

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 DD 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 DD 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 DD 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 DD 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 DD is also capable of reading 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.

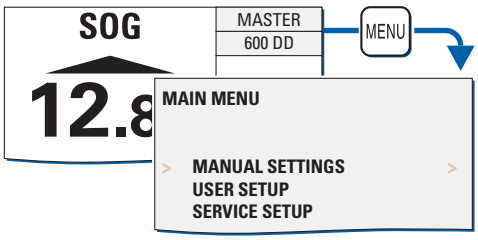
Note

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

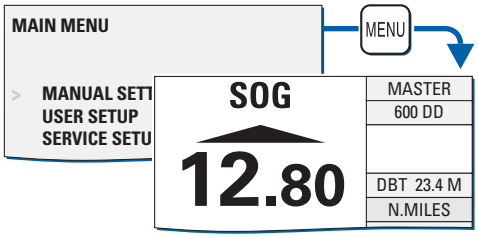
The manual settings, user and service setup sub-menus are accessed through a multilevel operating menu.

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.

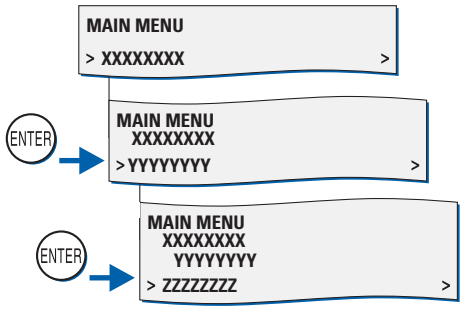
The Main Menu screen is closed and the normal operational display reappears.

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.

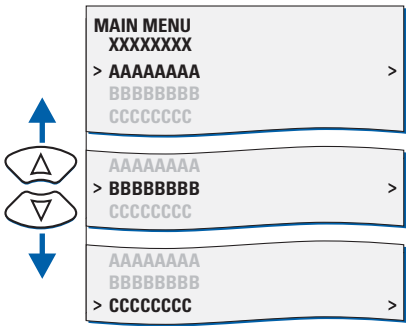
Navigating the Menu

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



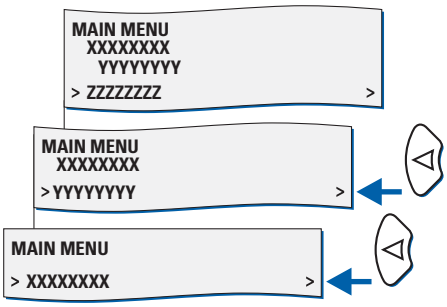
Arrow symbols (>) to the right of the window indicate that a sub-menu exists for the respective option.

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:

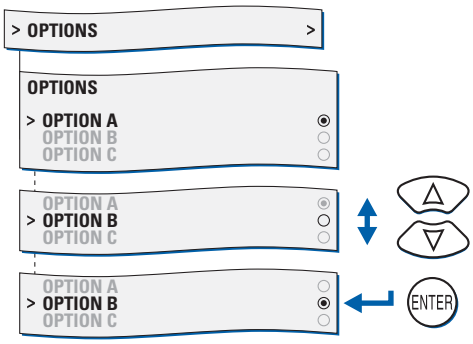
Radio buttons: Allow to select exactly one of the available options.

◉ : 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.

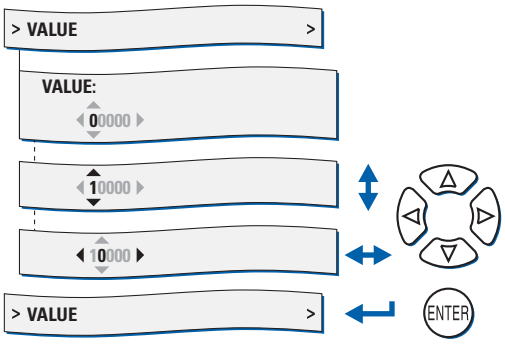
Press **ENTER** to confirm and store the selection.

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

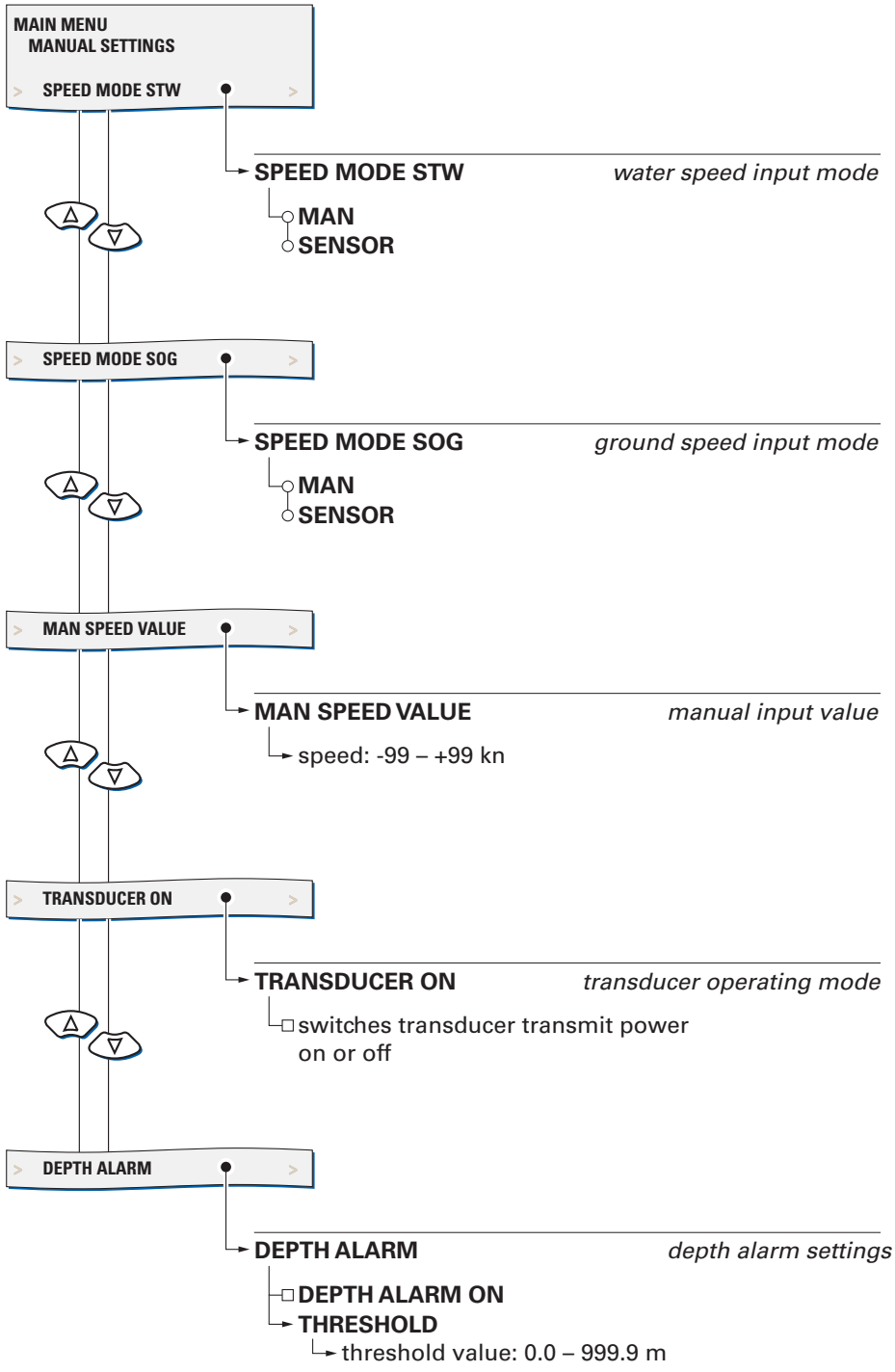


Figure 2-2: Manual Settings

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. In the manual input mode, only longitudinal water speed data is generated; transverse water speed is set to zero.

SENSOR
Speed data is read from the SRD 500 electronics unit.
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 ground speed output data in case of failure of the Doppler transducer or for testing. In the manual input mode, only longitudinal ground speed data is generated; transverse ground speed is set to zero.

SENSOR
Speed data is read from the SRD 500 electronics unit.
This setting must be active at all times during normal operation of the system.

Man. Speed Value

Sets the input value for 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

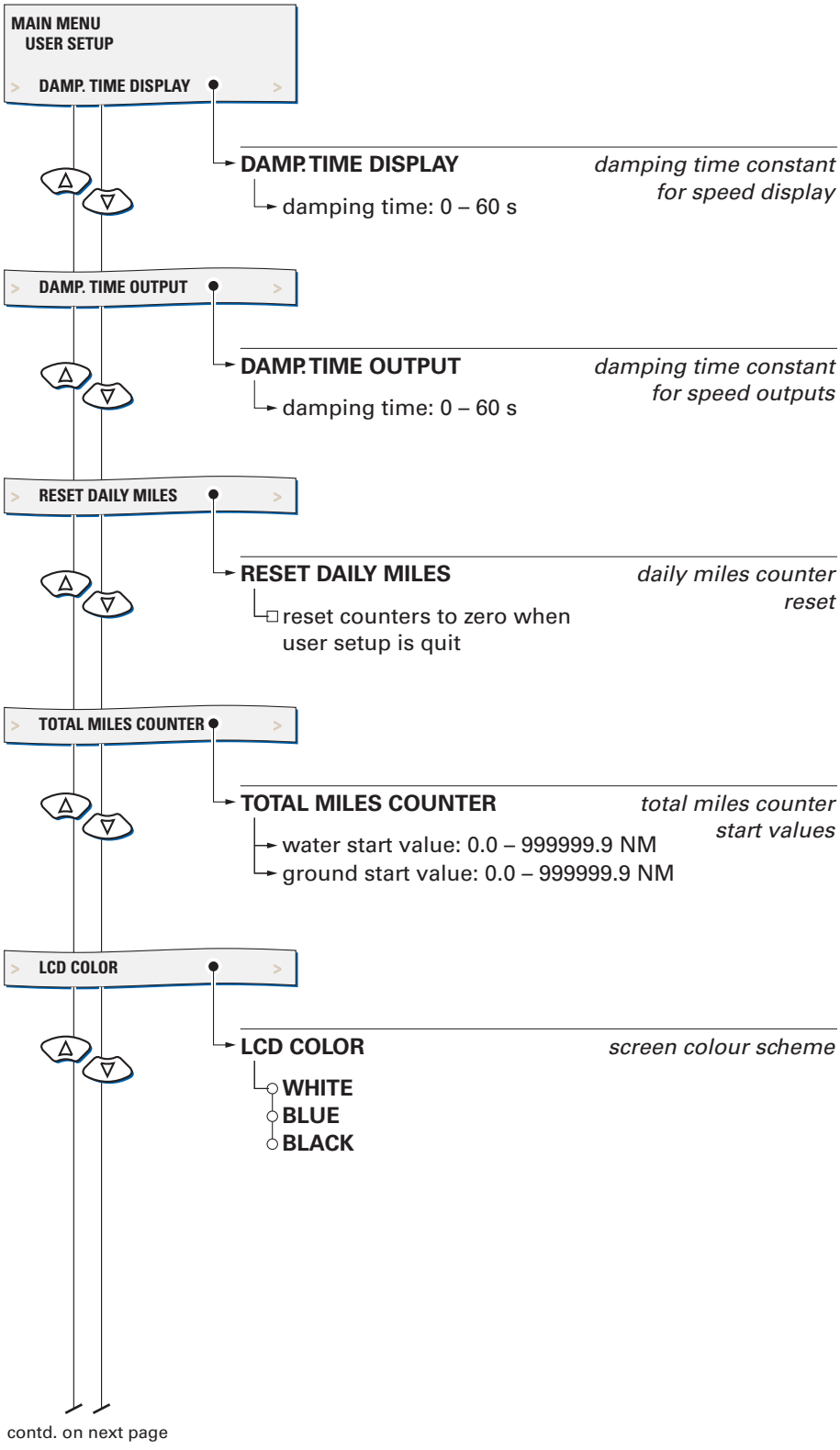
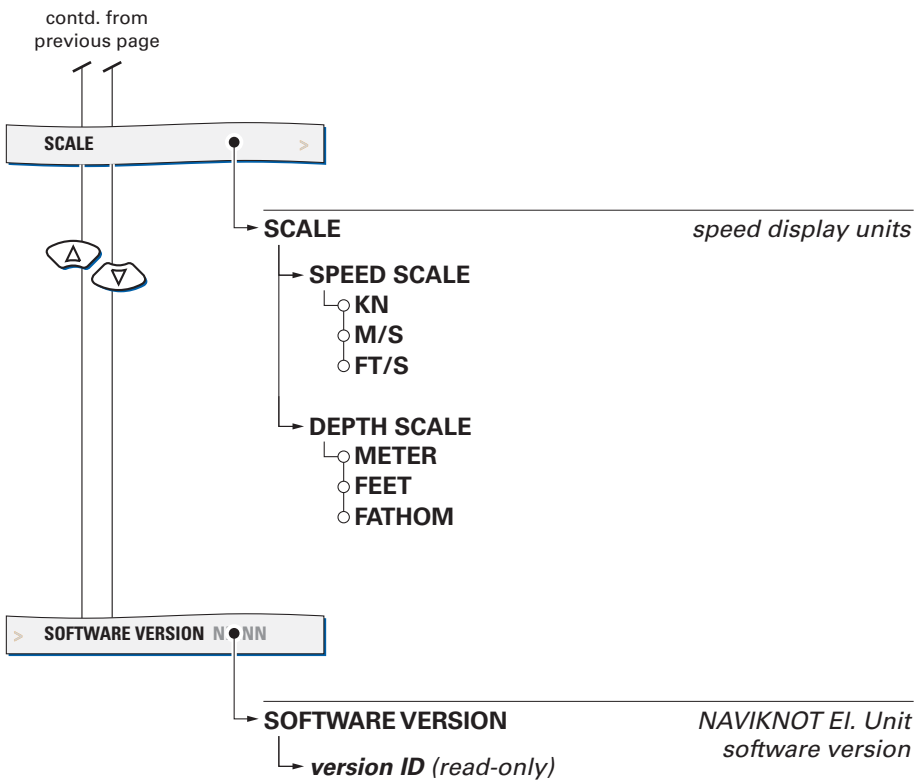


Figure 2-3: User Setup

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**

Reset Daily Miles

Sets the reset flag for the daily mile counters.

If the reset flag is set, the daily mile counters are reset to zero as soon as the User Setup is quit.

Settings: **ON** (option checked)
Reset daily mile counters when User Setup is quit

OFF (option unchecked)
Leave daily mile counters untouched

Total Miles Counter

Sets the total mile 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 mile 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 units of measure for the displayed speeds and depth.

Speed Scale
Unit of measure for the displayed speeds

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

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.

Depth Scale
Unit of measure for the displayed water depth

Settings: **METER**
Depth is displayed in metres.

FEET
Depth is displayed in feet.

FATHOM
Depth is displayed in fathoms.

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

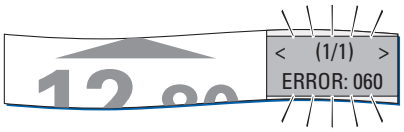
A single short beep indicates that the operator attempted to carry out an invalid action.
This is the case e.g. if the operator attempts to enter the menu mode from a remote unit.

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

Active alarms have one of two possible states:



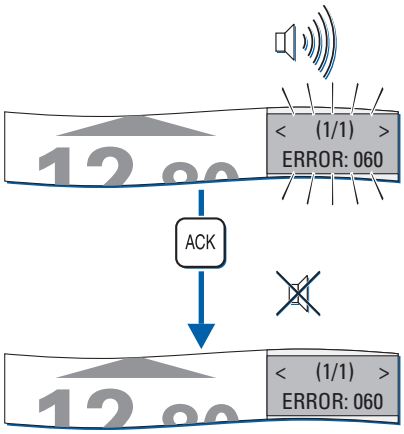
Pending (unacknowledged):
The cause of the alarm is present and the operator has not yet acknowledged the alarm.
The alarm's error code is shown.
The alarm display area background colour flashes red.

Acknowledged:
The operator has acknowledged the alarm but the cause of the alarm is still present.
The alarm's error code is shown.
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 DD CDU:



Press **ACK**.

The audible alarm indication is muted.

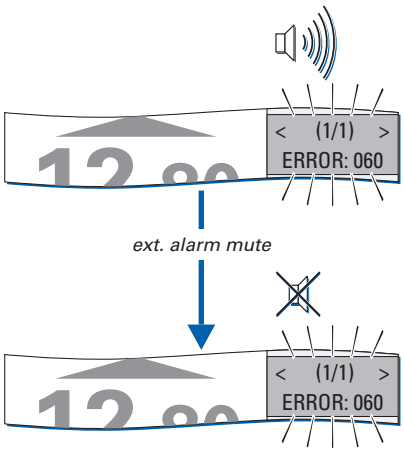
If the system is connected to a central alarm facility and configured accordingly, the audible alarm indication at the central alarm facility will also be muted.

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 DD 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.

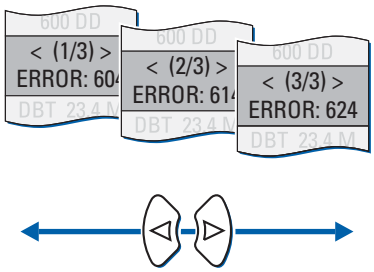
The audible alarm indication is muted.

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 DD CDU.

3.3 Viewing the active alarms

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.



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 NAVIKNOT Error Codes

The NAVIKNOT electronics unit generates the following error codes.

Table 3-1: NAVIKNOT error codes

code	description	cause	corrective action
	electronics unit not responding at power-up (text “WAITING FOR MAIN UNIT “ shown on startup screen)	Communication 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.
060	No communication between NAVIKNOT and SRD 500 electronics units	No or invalid data received from SRD 500 electronics unit.	Check connection between the two electronics unit. Troubleshoot SRD 500 electronics unit according to the documentation provided with the SRD 500 system
061	DEPTH ALARM	The water depth as measured by the Doppler transducer has fallen below the active alarm threshold	Acknowledge alarm and take necessary action to avoid shallow waters. If alarm is given in error, check depth sensing function of transducer for proper operation, according to the documentation provided with the SRD 500 system
080	EXT DIM TIMEOUT	No valid commands received at serial 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.

3.5 SRD 500 Error Codes

The following error codes indicate fault conditions detected by the SRD 500 electronics unit.

For detailed descriptions of the possible causes of these errors, corrective actions required and applicable troubleshooting procedures, refer to the documentation provided with the existing SRD 500 system.

Table 3-1: SRD 500 error codes

code	description
301-304, 307	Faulty message from NAVIKNOT electronics unit
305	No response from NAVIKNOT electronics unit to message from SRD 500 electronics unit
306	Received message garbled
308	No message received from NAVIKNOT electronics unit
355	Can't transmit via auxiliary port 1
365	Can't transmit via auxiliary port 2
401	401Can’t calibrate temperature conversion circuit
402	Water temperature reading fault
403	Transducer temperature reading fault
490	Fault in RAM memory
491	Fault in FLASH EPROM
520-524	Received signal strength too low during transmit
600-604	High noise on receiver channel
610-614	Low sensitivity on receiver channel
620-623	Received signal strength too low immediately after transmit for a single channel
624	Received signal strength too low immediately after transmit for multiple channels
630	Transmitted signal does not correlate as expected or the received signal strength indicator (RSSI) is not within expected limits

Chapter 4: Scheduled Maintenance

4.1 Maintenance by Shipboard Personnel

NAVIKNOT Electronics Unit and CDU

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

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 SRD 500 Electronics Unit

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 gate valve, if applicable.

As the NAVIKNOT 600 DD retrofit kit retains the existing Doppler transducer and SRD 500 electronics unit, established ship's valve overhaul and/or transducer and electronics unit maintenance schedules should remain in force. Refer to the documentation which was provided with the existing SRD 500 system.

Chapter 5: Installation

5.1 Mechanical Installation

Doppler Transducer and Electronics Unit

As the NAVIKNOT 600 DD retrofit kit retains the existing SRD 500 Doppler transducer and electronics unit, these components are already installed and do not normally require any mechanical modification.

NAVIKNOT Electronics Unit

The NAVIKNOT 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 5003-0112-01. The electronics unit may be installed vertically, horizontally or inclined.

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

Wiring Up the System

DANGER

When the AC supply power is switched on, live voltages are present at certain terminals and tracks on the SRD 500 electronics unit.
When wiring up the SRD 500 electronics unit, make sure the AC power supply is switched off and safeguarded against accidental switching-on.

CAUTION

When wiring up the system, make sure that the power supply for the NAVIKNOT system is switched off and 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 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, 5003-0120-001.

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

Note

In a NAVIKNOT 600 DD retrofit, check whether any devices other than a SRD 500 Master Display were connected directly to the SRD 500 electronics unit prior to the retrofit.

Equipment connected to the auxiliary serial ports may require rewiring to use the outputs of the NAVIKNOT electronics unit instead.
Check also whether an optional analogue output board or a speed synchro output assembly are installed in the SRD 500 electronics unit.

Bear in mind that all analogue and pulse speed outputs as well as the distance data from the NAVIKNOT electronics unit are based on longitudinal speeds.
Existing peripheral equipment may also have used signals or data based on vector sum or transverse speeds and may need to be reconfigured.
Make sure that ship's crew is aware of such modifications when retrofitting the system with the NAVIKNOT 600 DD.

Configuring the CDU(s)

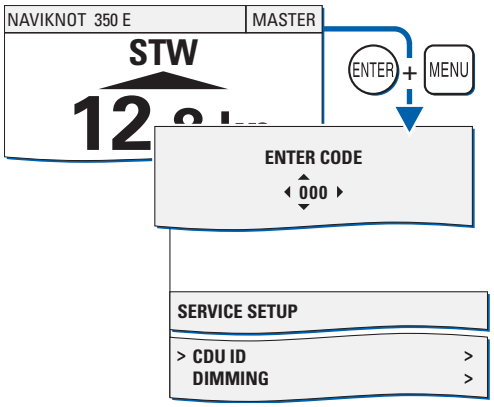
If one CDU is installed only, the unit requires no further configuration.

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:



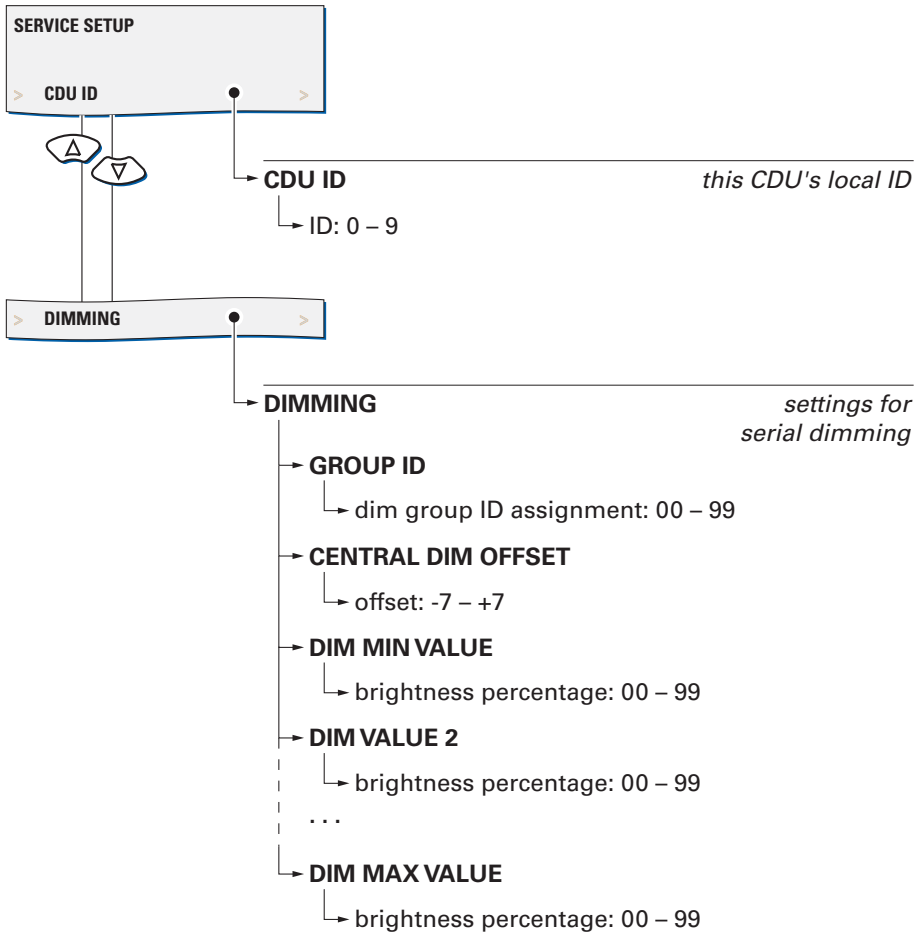
From the normal operational mode, simultaneously press **ENTER** and **MENU** to call up the CDU's local Service Setup menu mode.

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

The CDU's local Service Setup opens.

CDU Service Setup – Overview

Figure 5-1:
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 DD'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 DD".
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 DD system are available through the Service Setup.

After the initial system configuration, note all settings in the NAVIKNOT 600 DD 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

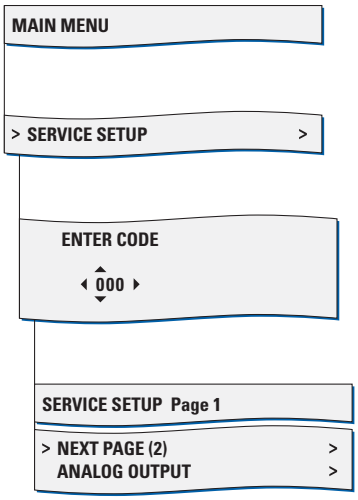
6.1 Service Setup Menu

The Service Setup menu provides access to the system parameters which configure the NAVIKNOT 600 DD 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.

Select the Service Setup.

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

Press **ENTER** to continue.

Page 1 of the Service Setup opens.

Service-Setup – Overview

Figure 6-1: Service Setup, page 1

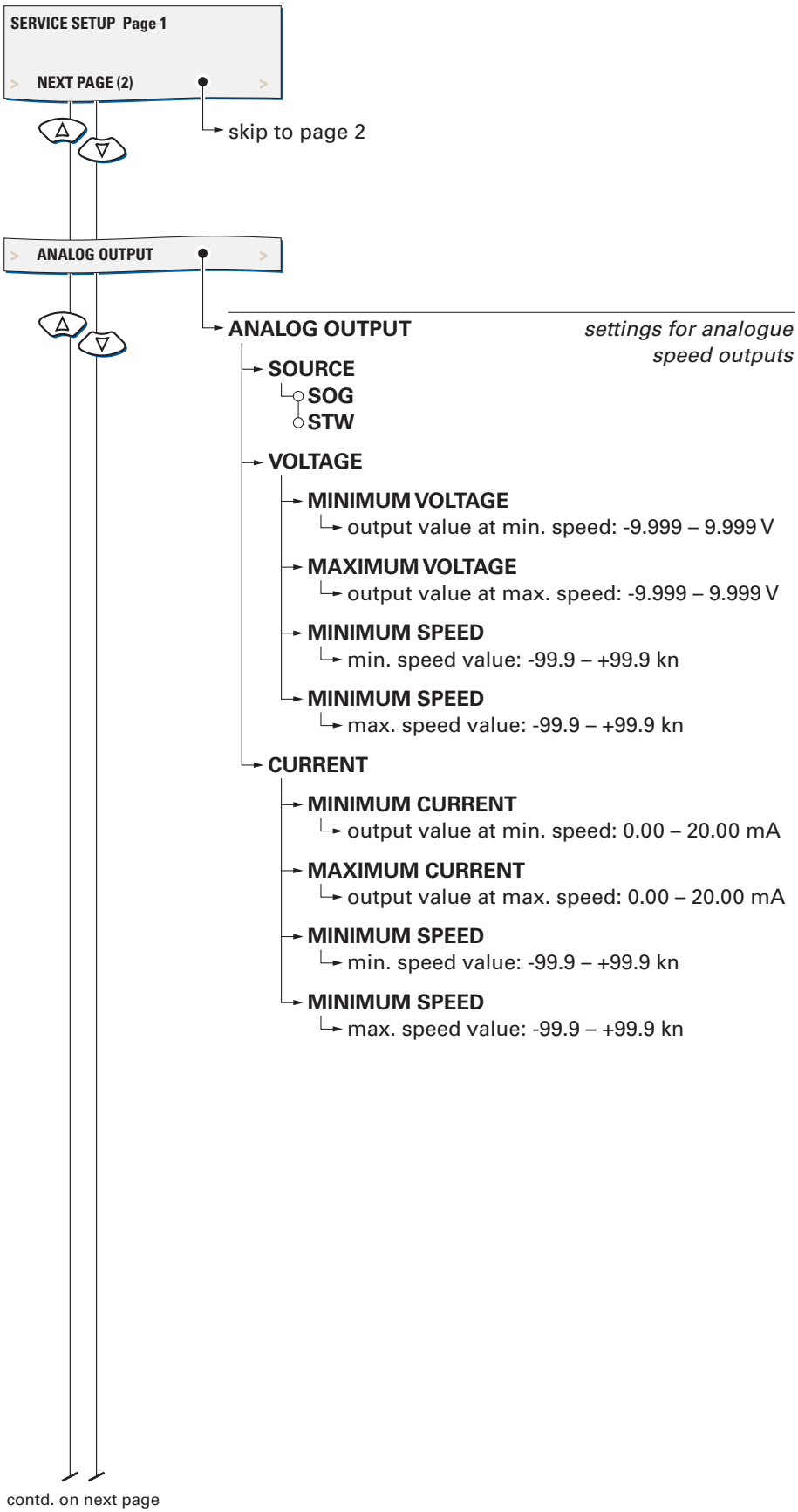


Figure 6-2: Service Setup, page 1 (contd.)

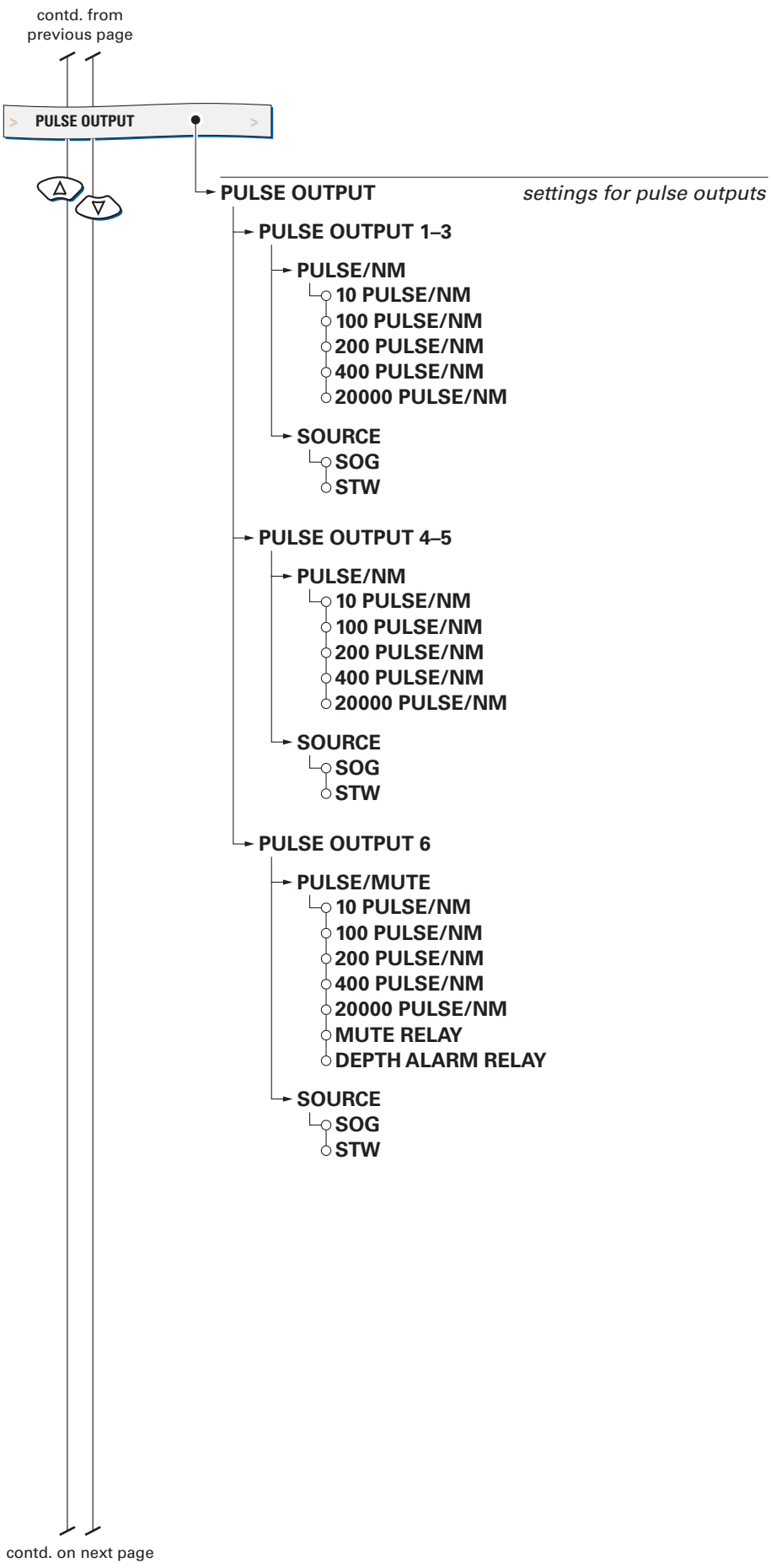


Figure 6-3: Service Setup, page 1 (contd.)

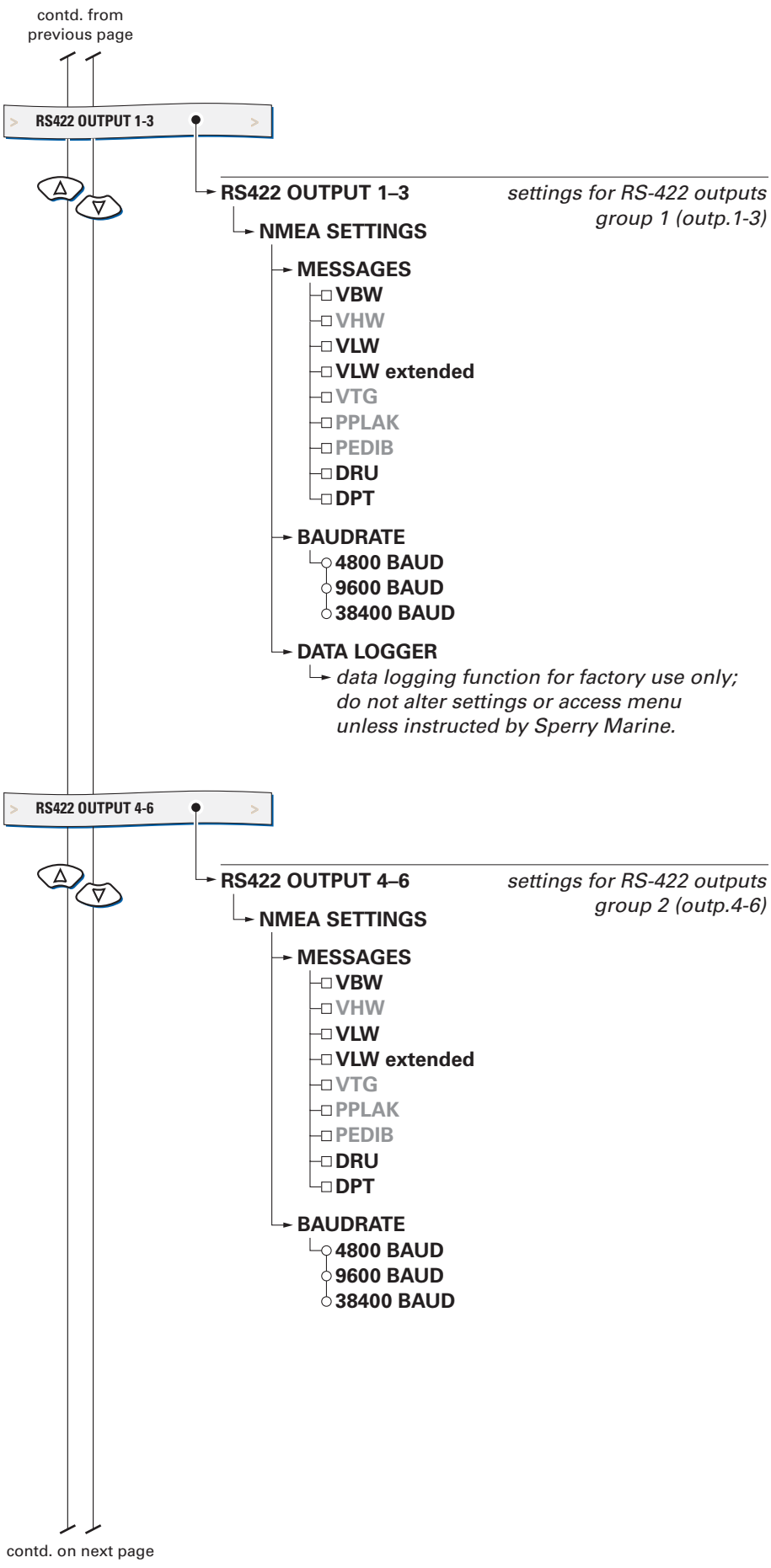


Figure 6-4: Service Setup, page 1 (contd.)

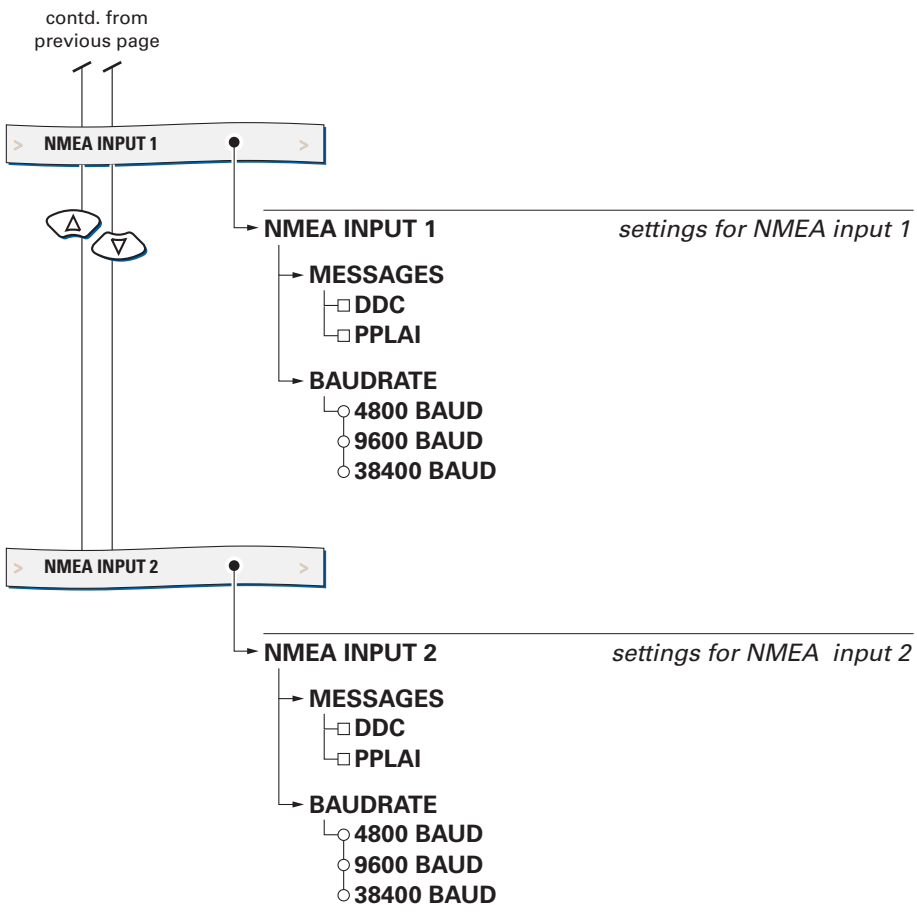
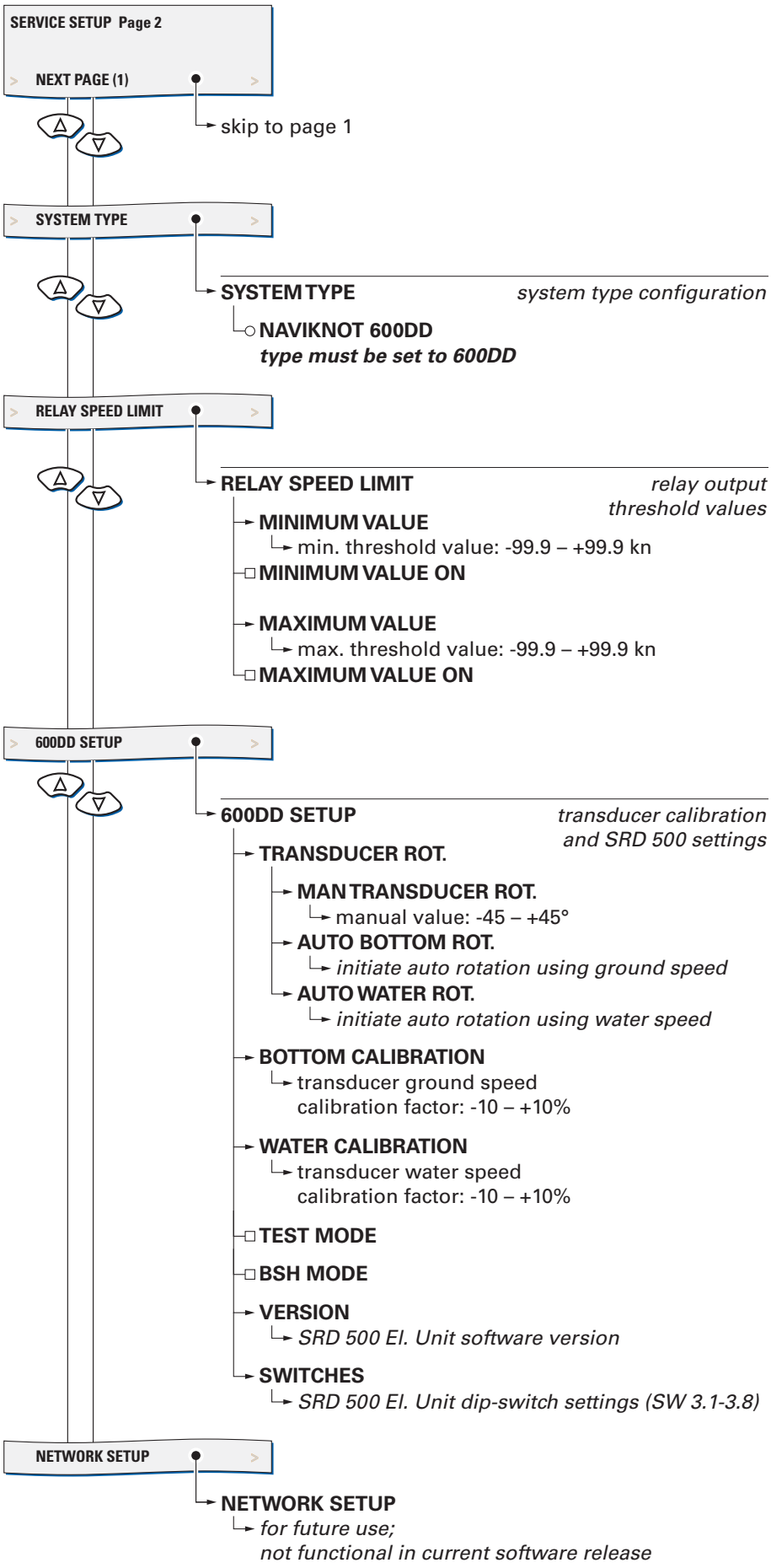


Figure 6-5: Service Setup, page 2



Service Setup – Parameters

Analog Output

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

Source

Selects the data source for the analogue outputs.

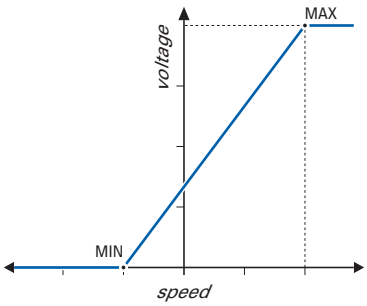
Setting: **SOG**
The outputs provide the actual longitudinal ground speed

STW
The outputs provide the actual longitudinal water speed

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**

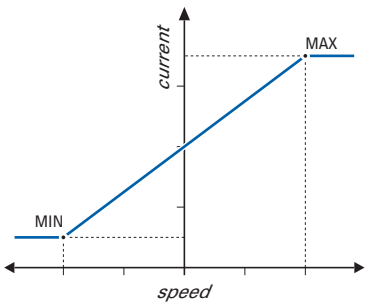
Minimum Speed
value: **-99.9 – +99.9 kn**

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 or as a depth alarm status output.
If the alarm mute option is active, a 100 ms pulse, is generated to mute the audible alarm indication at a central alarm facility when the respective alarm is acknowledged locally at the NAVIKNOT 600 DD CDU.
If the depth alarm option is active, the relay is attracted (contact closed) in the no-alarm state. When a depth alarm condition occurs, the relay is released (contact open).

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.

Source

Selects the data source for pulse outputs 4– 5.

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

STW
The outputs provide the actual speed through the water

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 DD CDU, the output delivers a pulse to mute the audible alarm indication at a central alarm facility.

DEPTH ALARM RELAY
Configures the output as a depth alarm status relay output. In the no-alarm state, the relay is attracted (contact closed). When a depth alarm condition occurs, the relay is released (contact open).

Source

Selects the data source for pulse output 6.
In case the alarm mute or depth alarm 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 DD 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 DD.

Settings: **VBW**
Longitudinal and transverse ground and longitudinal and transverse water speeds 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.

DRU
The water depth is transmitted using the $--DRU sentence (deprecated since NMEA 0183 Ver. 2). Unless required by the existing system, this option should not be selected.

DPT
The water depth is transmitted using the $--DPT sentence. This is the recommended sentence for depth data.

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 DD 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 DD.

Settings: **VBW**
Longitudinal and transverse ground and longitudinal and transverse water speeds 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.

DRU
The water depth is transmitted using the $--DRU sentence (deprecated since NMEA 0183 Ver. 2). Unless required by the existing system, this option should not be selected.

DPT
The water depth is transmitted using the $--DPT sentence. This is the recommended sentence for depth data.

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: **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: **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 DD, the type must be set to 600DD; all other options are to be ignored.

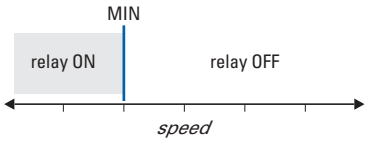
Settings: **NAVIKNOT 600 DD**

Relay Speed Limit

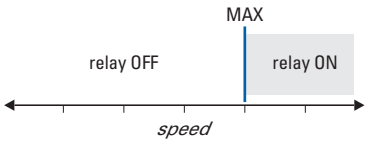
Sets the lower and/or upper switching thresholds for the speed limit relay output.

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.

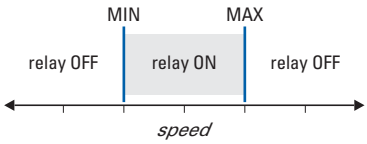
The switching behaviour of the limit relay is determined by the combined settings of two values, the minimum (lower threshold) and the maximum (upper threshold) value:



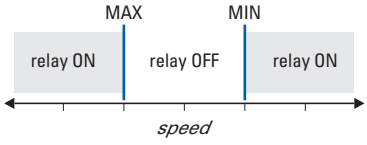
If only a minimum threshold value is set and active, the relay is attracted at speeds below and released at speeds above the threshold value.



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

600DD Setup

Accesses the transducer rotation and calibration settings, selects the BSH and test modes and displays the SRD 500 electronic unit's software version and dip-switch settings.

Transducer Rot.

Sets the rotational offset for the transducer. The offset compensates for the existing angular misalignment of the transducer with respect to the vessel's centerline.
Refer to chapter 7, "Doppler Transducer Calibration", for a description how to determine the rotational offset manually or automatically.

Man. Transducer Rot.

Sets the rotational offset manually.

Value: **-45 – +45°**

Auto Bottom Rot.

Determines the rotational offset automatically, using bottom speed measurements.

Auto Water Rot.

Determines the rotational offset automatically, using bottom speed measurements.

Bottom Calibration

Sets the calibration factor for the ground speeds.
Refer to chapter 7, "Doppler Transducer Calibration", for a description how to determine the bottom calibration factor.

Value: **-10 – +10%**

Water Calibration

Sets the calibration factor for the water speeds.
Refer to chapter 7, "Doppler Transducer Calibration", for a description how to determine the water calibration factor.

Value: **-10 – +10%**

Test Mode

Puts the system into the TEST mode.
In this mode a loopback test of the interface between the NAVIKNOT and SRD 500 electronics units is conducted. Speed data is continuously sent to and received back from the SRD 500 electronics unit.

After activating the TEST mode, quit the setup and observe the displayed speeds. If the speeds increase continuously from 0.0 kn, the communication between the electronics unit is working faultlessly. If dashes are displayed or speeds are frozen at 0.0 kn, the communication is faulty.

Once activated, the TEST mode remains active until the setup is called up again and the TEST mode is de-activated.
Make sure to de-activate the TEST mode when service is complete to put the system back into the normal operational mode

Settings: **ON** (option checked)
TEST mode active

OFF (option unchecked)
TEST mode off

BSH Mode

Puts the system into the BSH mode of operation.
In this mode, the display and transmission of water depth data is disabled. The BSH mode must be activated for vessels required to comply with the regulations of the German Federal Hydrographic Agency (BSH).

Settings: **ON** (option checked)
BSH mode active

OFF (option unchecked)
BSH mode off

Version

Displays the software version of the SRD 500 electronics unit.

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

Switches

Displays the setting of the configuration dip-switches SW 3.1 to 3.8 inside the SRD 500 electronics unit.

Settings: ***none***
The dip-switch setting is read-only.

Network Setup

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

Chapter 7: Doppler Transducer Calibration

In most cases, the existing SRD 500 system to be retrofit with a NAVIKNOT 600 DD will have been calibrated previously.
If the required transducer rotational offset and the bottom and water speed calibration factors are known and the system accuracies were within the specified ranges before the retrofit, the previous values may simply be re-entered in the NAVIKNOT 600 DD Service Setup menu.

However, if system accuracies fall outside the specified ranges or if either the SRD 500 Doppler transducer or the SRD 500 electronics unit are exchanged, the speed calibration values must be determined as described below. Upon exchange of the transducer, the actual rotational offset must be newly determined and compensated for as well.

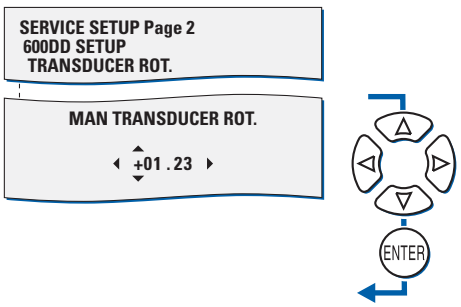
7.1 Transducer Rotational Offset Correction

Existing misalignment of the transducer relative to the vessel's centerline will lead to a rotational offset which results in speed errors. If the offset is not corrected, the athwartships speed will show a bias to either port or starboard.
To compensate for the transducer rotational offset, the required rotation angle in degrees may either be entered manually or automatically. This "transducer rotation" is an electronic offset correction, which needs to be performed only once after transducer installation or replacement.

Manual Transducer Rotation

Manual rotation allows to directly enter a transducer rotation angle or to alter the angle computed by the automatic rotation function. Decreasing the angle will reduce the port speed. Increasing the angle will reduce the starboard speed.

To enter the transducer rotation angle manually:



1. Go to page 2 of the Service Setup and select the 600DD Setup | Transducer Rot. | Man Transducer Rot. submenu.
2. With the **Up/Down** and **Right/Left** keys, set the rotation angle as required.
3. press **ENTER** to store the value and exit the submenu.

Note

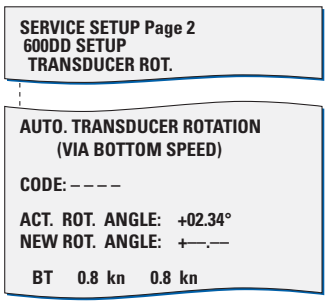
The manual input permits to enter rotation angles of up to ±45°. However, if the angle required is greater than ±10°, it is desirable to physically rotate the transducer to a position that requires a smaller angle.

Automatic Transducer Rotation using Ground Speed

Selection of the automatic rotation lets the system automatically compute a transducer rotation angle.

To use ground speed for automatic rotation, the water depth below the Transducer must be between one and 200 metres.
To perform the procedure using ground speed, the ship must be turned into the wind and into the current. This is best done when at least one of the two effects is negligible. In addition, the vessel must move at a speed of at least 5 kn, preferably at cruise speed.

To execute the auto rotation procedure:



1. Go to page 2 of the Service Setup and select the 600DD Setup | Transducer Rot. | Auto Bottom Rot. sub-menu.
2. The screen now shows a status code indication, the actual and the new rotation angles and the actual and new transverse ground speeds.

   Until the auto rotation procedure is started, dashes are shown for the status code and the new rotation angle.
3. press **ENTER** to start the auto rotation procedure.

   Status code 0900 (bottom rotation in progress) should be indicated within a few seconds.

   The computed new rotation angle will now be shown and will gradually be altered. Simultaneously, the new transverse speed will decrease towards zero kn.

   When the auto rotation is completed, status code 0909 (rotation completed successfully) should be indicated.
4. Press **ENTER** to store the computed value and exit the sub-menu.

Note

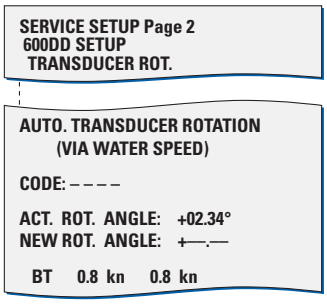
In case the prevailing conditions do not permit successful completion of the auto rotation, the procedure will be interrupted and one of the following status codes will be shown.
0998: selected mode (bottom or water) not available.
0999: vessel's speed is below 5 kn; auto rotation procedure not possible.

Automatic Transducer Rotation using Water Speed

Selection of the automatic rotation lets the system automatically compute a transducer rotation angle.

To use water speed for automatic rotation, the water depth below the Transducer must be greater than 3 metres.
To perform the procedure using water speed, the ship must be turned directly into the wind. In addition, the vessel must move at a speed of at least 5 kn, preferably at cruise speed.

To execute the auto rotation procedure:



1. Go to page 2 of the Service Setup and select the 600DD Setup | Transducer Rot. | Auto Water Rot. sub-menu.
2. The screen now shows a status code indication, the actual and the new rotation angles and the actual and new transverse water speeds.

   Until the auto rotation procedure is started, dashes are shown for the status code and the new rotation angle.

3. press **ENTER** to start the auto rotation procedure.

   Status code 0901 (water rotation in progress) should be indicated within a few seconds.

   The computed new rotation angle will now be shown and will gradually be altered. Simultaneously, the new transverse speed will decrease towards zero kn.

   When the auto rotation is completed, status code 0909 (rotation completed successfully) should be indicated.

4. Press **ENTER** to store the computed value and exit the sub-menu.

Note

In case the prevailing conditions do not permit successful completion of the auto rotation, the procedure will be interrupted and one of the following status codes will be shown.
0998: selected mode (bottom or water) not available.
0999: vessel's speed is below 5 kn; auto rotation procedure not possible.

7.2 Ground and Water Speed Calibration

The ground and water speed displayed and output by the system can be manually calibrated at any time to change the magnitude of these values up to ±10%. Separate calibration values are maintained for water and ground speeds The calibration values are applied to the longitudinal (fore-and-aft) speeds only.

To determine the existing speed error, a series of calibration trial runs must be conducted and the required calibration values must then be calculated, based on a reference source or other indications such as navigation or radar displays.
The correction values are then entered as a percentage to increase or reduce the displayed speed to agree with the reference source.

Speed Calibration Trial Runs

To determine the existing ground and water speed errors, speed calibration trial runs are to be conducted. A minimum of six runs should be made to determine the existing errors upon which the required correction values are calculated.

Preparing for Trial Runs

Before beginning formal testing, check the general system operation:

- Check that valid speed and depth data is displayed on both the SOG and the STW main display pages.
- Check that the longitudinal speeds are reasonable given the actual ship's motion.
- Check that the displayed water depth is reasonable given the applicable navigational chart readings.
- Observe the transverse speeds to determine whether the rotational offset correction procedure should be carried out. It should be carried out if the values displayed are considered unreasonable given the actual athwartships motion.
- Check that environmental conditions permit proper measurements to be carried out. The following requirements should be met:
  - Good hydroacoustic conditions should prevail.
  - Trial runs should be a minimum of five minutes in length.
  - A steady course and speed should be maintained during runs.
  - The speed or distance measurement reference source should introduce minimal errors to the speed accuracy testing.
  - Water speed accuracy testing must be conducted using the reverse course method. The accuracy of this method is adversely affected by crosstrack wind and changes in water current direction and magnitude. Attempts should be made to minimize these error sources.

  Typical magnitudes of measurement error when proper measurement methods are used are 0.25% for ground speed and 0.5% for water speed.

Conducting Trial Runs

The purpose of the calibration trial runs is to establish the existing errors in ground and water speed sensing and determine the required calibration values to compensate for these errors. The “Record of Calibration Trial Runs” (see appendix) or a similar form should be used to record the trial run data.

Ground Speed Trial Runs

Ground speed trial runs are made by running between two points of known distance and then comparing the actual distance with the distance measured by the speed log.

The following formula is used to calculate the error of each run:

$$\% \text{ Error} = 100*(DOP-ACT) / ACT$$

where:
DOP: distance measured by the Doppler speed log
ACT: actual distance over bottom as measured by the reference system

When conducting ground speed trial runs, the SOG display page must be active. Do not switch back and forth between the SOG and STW pages during the runs.

When trial runs have been completed, calculate the mean (average) calibration error from all ground speed runs. The resultant error with the sign reversed (multiplied by -1) gives the required correction value to be entered in the Service Setup.

Water Speed Trial Runs

Water speed calibration runs are made by running between two points of known distance, recording the measured time and distance, then reversing course and recording the measured time and distance of the reverse leg. It is important that the reverse leg be over the same track as the initial leg and the time between traversal of the two legs be minimized.

The following formula is used to compute the error of each run:

$$\% \text{ Error} = 100*(((DOP_i / t_i + DOP_r / t_r) / (ACT_i / t_i + ACT_r / t_r)) -1)$$

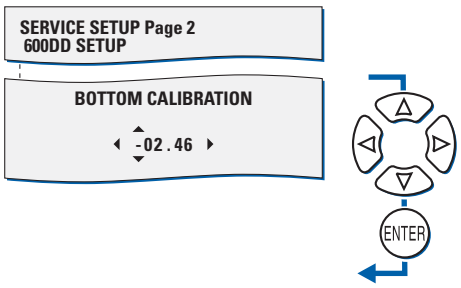
where:
DOP_i : distance measured by Doppler speed log on initial leg
DOP_r : distance measure by Doppler speed log on reverse leg
ACT_i : actual distance over bottom for initial leg as measured by the reference system
ACT_r : actual distance over bottom for reverse leg as measured by the reference system
t_i : elapsed time of the initial leg in seconds
t_r : elapsed time of the reverse leg in seconds

When conducting water speed trial runs, the STW display page must be active. Do not switch back and forth between the STW and SOG pages during the runs.

When trial runs have been completed, calculate the mean (average) calibration error from all water speed runs. The resultant error with the sign reversed (multiplied by -1) gives the required correction value to be entered in the Service Setup.

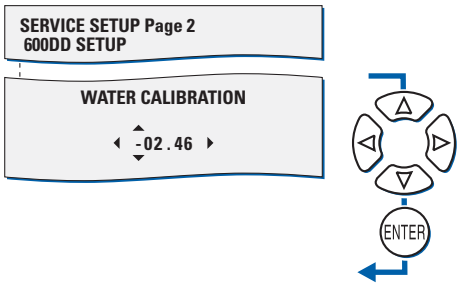
Entering the Calibration Values

To set the ground speed calibration value:



1. Go to page 2 of the Service Setup and select the 600DD Setup | Bottom Calibration sub-menu.
2. With the **Up/Down** and **Right/Left** keys, set the correction value as required.
3. press **ENTER** to store the value and exit the sub-menu.

To set the water speed calibration value:



1. Go to page 2 of the Service Setup and select the 600DD Setup | Water Calibration sub-menu.
2. With the **Up/Down** and **Right/Left** keys, set the correction value as required.
3. press **ENTER** to store the value and exit the sub-menu.

Chapter 8: Troubleshooting

8.1 NAVIKNOT 600 DD Electronics Unit and CDU(s)

The NAVIKNOT 600 DD 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 electronics unit PCB 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.

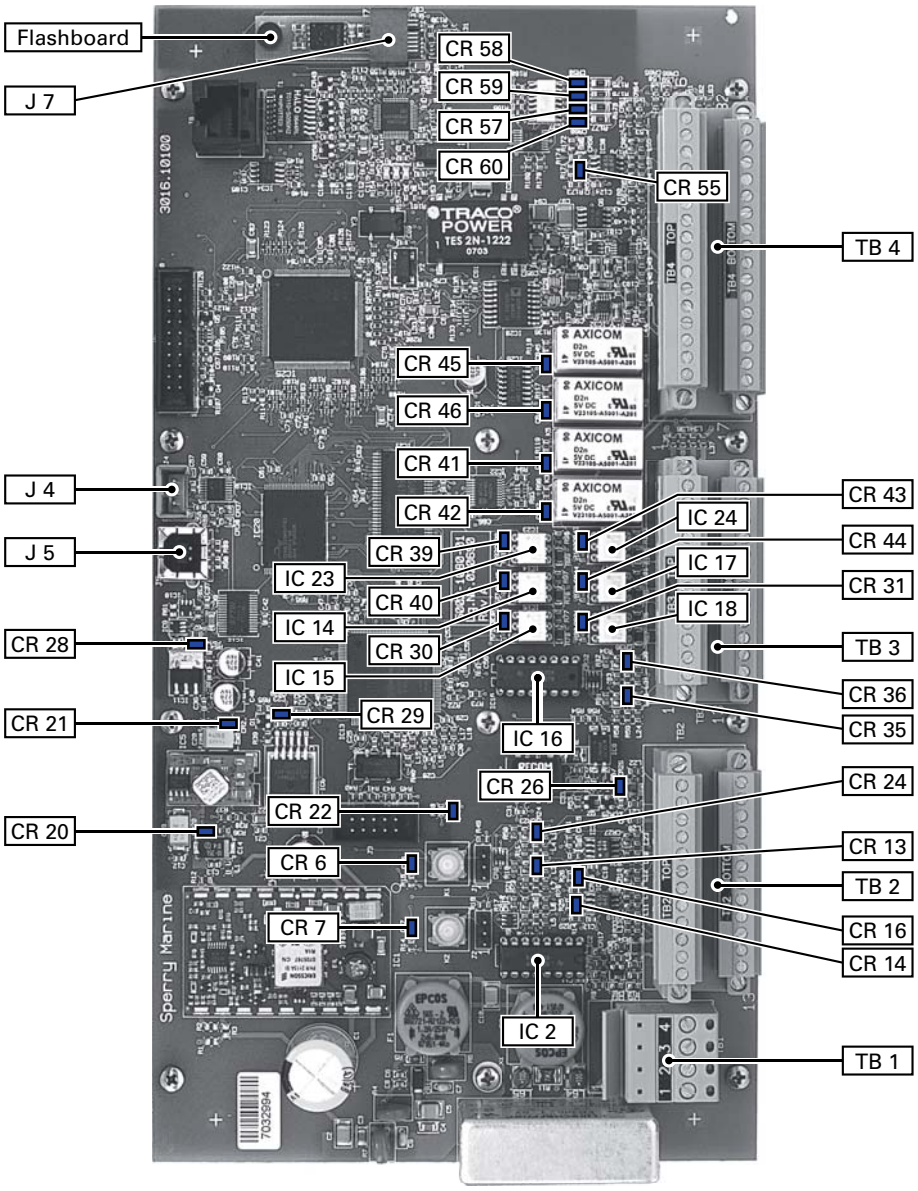
  When components on the PCB, other than socketed ICs or the exchangeable system software flashboard, are assumed to cause malfunction, the complete PCB, Stock No. 20692, is to be exchanged.
- For the CDU(s):
  - Visual inspection of mechanical components and wiring.
  - Continuity checks of wiring connections 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 Electronics Unit PCB

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

Figure 8-1: location of parts on the electronics unit PCB



Exchangeable Components

Table 8-1: Exchangeable components on the electronics unit 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

Table 8-2: Terminal boards and connectors on the electronics unit 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

As an aid in troubleshooting, a number of diagnostic LED indicators are provided on the electronics unit 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 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 16	green	activity on Rx line, SRD 500 el. unit, 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, SRD 500 el. unit, 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

8.2 Doppler Transducer and SRD 500 Electronics Unit

Should no communication be possible between the NAVIKNOT 600 DD and the SRD 500 electronics units, error code 060 will be shown at the NAVIKNOT 600 DD CDU. The problem in such a case may be a mechanical or electrical fault in the wiring between the units or a defective SRD 500 electronics unit.

In cases where the SRD 500 electronics itself diagnoses an error, an alarm will be raised at the NAVIKNOT 600 DD CDU and the corresponding SRD 500 error code will be displayed. For the applicable troubleshooting procedures in such cases, refer to the documentation which was provided with the existing SRD 500 system.

Chapter 9: Corrective Maintenance

Note

Corrective Maintenance procedures given below apply to the NAVIKNOT 600 DD components (electronics unit and CDU) only.
For corrective maintenance procedures applicable to the SRD 500 transducers and electronics unit, refer to the documentation which was provided with the existing SRD 500 system.

The NAVIKNOT 600 DD 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 DD 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 DD 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.

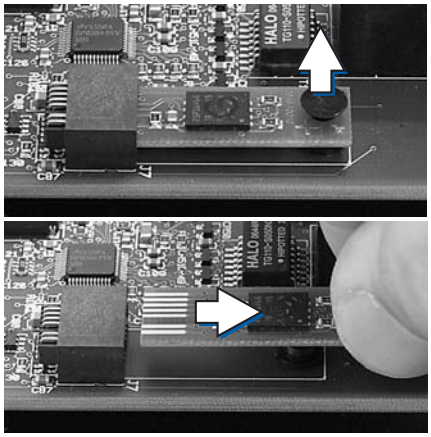
This allows both to upgrade to newer and to downgrade to previous releases by simply exchanging the flashboard.

CAUTION

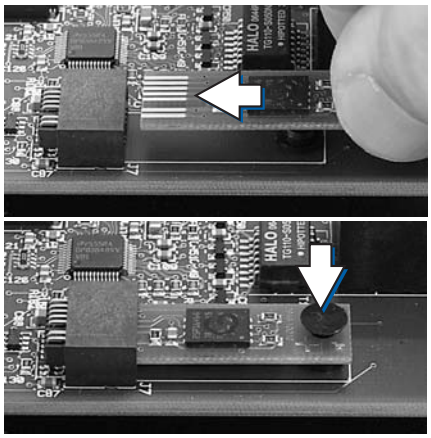
It cannot be guaranteed that parameters settings in the User and Setup menus and the currently active manual settings are left intact during the software download.
Before exchanging the flashboard, record all settings to be able to re-enter them manually, if required.

Exchanging the Flashboard

1. Power down the NAVIKNOT 600 DD 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 DD 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 DD Setup Table	5003-0125-08
NAVIKNOT 600 DD Record of Calibration Trial Runs	5003-0125-09

Note

After installation of the NAVIKNOT 600 DD, 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	5003-0112-01
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
Doppler Speed Log NAVIKNOT 600 DD; Standard Connection Drawing	5002-0153-14

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 DD
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): _____

LCD Color

- ◯ white
- ◯ blue
- ◯ black

Scales

Speed	*Depth*
◯ kn	◯ meter
◯ m/s	◯ feet
◯ ft/s	◯ fathom

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	
◯ Depth Alarm Relay	

RS-422 Output 1-3

Messages	*Baudrate*
☐ VBW	◯ 4800 Baud
☐ VLW	◯ 9600 Baud
☐ VLW extended	◯ 38400 Baud
☐ DRU	
☐ DPT	

RS-422 Output 4-6

Messages	*Baudrate*
☐ VBW	◯ 4800 Baud
☐ VLW	◯ 9600 Baud
☐ VLW extended	◯ 38400 Baud
☐ DRU	
☐ DPT	

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		NMEA Input 2	
Messages	***Baudrate***	***Messages***	***Baudrate***
☐ DDC	◯ 4800 Baud	☐ DDC	◯ 4800 Baud
☐ PPLAI	◯ 9600 Baud	☐ PPLAI	◯ 9600 Baud
	◯ 38400 Baud		◯ 38400 Baud

Service Setup - Page 2

System Type

☒ NAVIKNOT 600 DD

Relay Speed Limit

Min.Value (kn): _____ Max.Value (kn): _____

☐ Min. Value ON ☐ Max. Value ON

600DD Setup

Transducer Rotation

Rot. Angle (°): _____

Entry Method:
- ◯ manual
- ◯ auto bottom
- ◯ auto water

Bottom Calibration

Cal. Value (%): _____

Water Calibration

Diff. Limit: _____

BSH Mode

☐ ON

BSH mode must be selected if the system is required to comply with the regulations of the German Federal Hydrographic Agency (BSH)

Version

SRD 500 El. Unit Software: _____

Settings

SRD 500 El. Unit Dip-Sw. 3.1 - 3.8: _____

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 DD
Record of Calibration Trial Runs

005003-0125-009/A; Feb 2008

Vessel: _____ Hull No.: _____

IMO No.: _____ Shipyard: _____

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

Location: _____

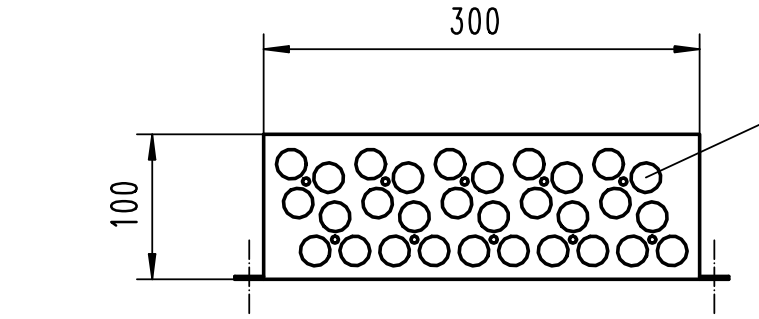
Sea State: _____ Water Depth: _____

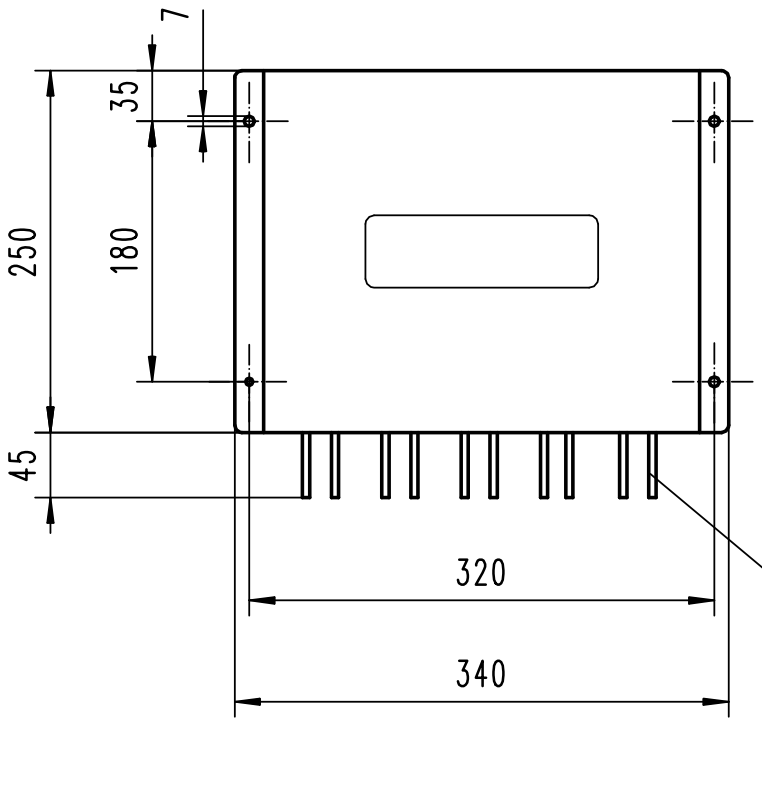
Run #	Mode SOG /STW	Distance		Elapsed Time	Error %	Engine RPM	Heading	Wind Speed	Wind Direction
		ACT	DOP						

Average Error SOG (%): _____ Average Error STW (%): _____

Remarks:

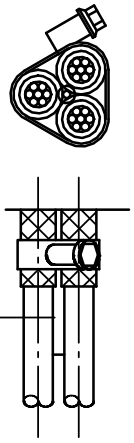
Northrop Grumman Sperry Marine B.V. (Representative Office)
Woltmanstr. 19, 20097 Hamburg, Germany
Tel.: +49-40-29900-0, Fax: +49-40-29900-298, E-mail: service.de@sperry.ngc.com





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 : 4 kg
Schutzart/Protection grade : IP 23

REV	ECO-No.	DATE	NAME
B	982016	15.03.07	Ho.
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	5003-0112-01	

DRAWING No. 5003-0112-01

FIRST ANGLE PROJECTION | DIMENSIONS IN MILLIMETERS

STOCK No. 73510

DIMENSION DRAWING
Electronics Unit

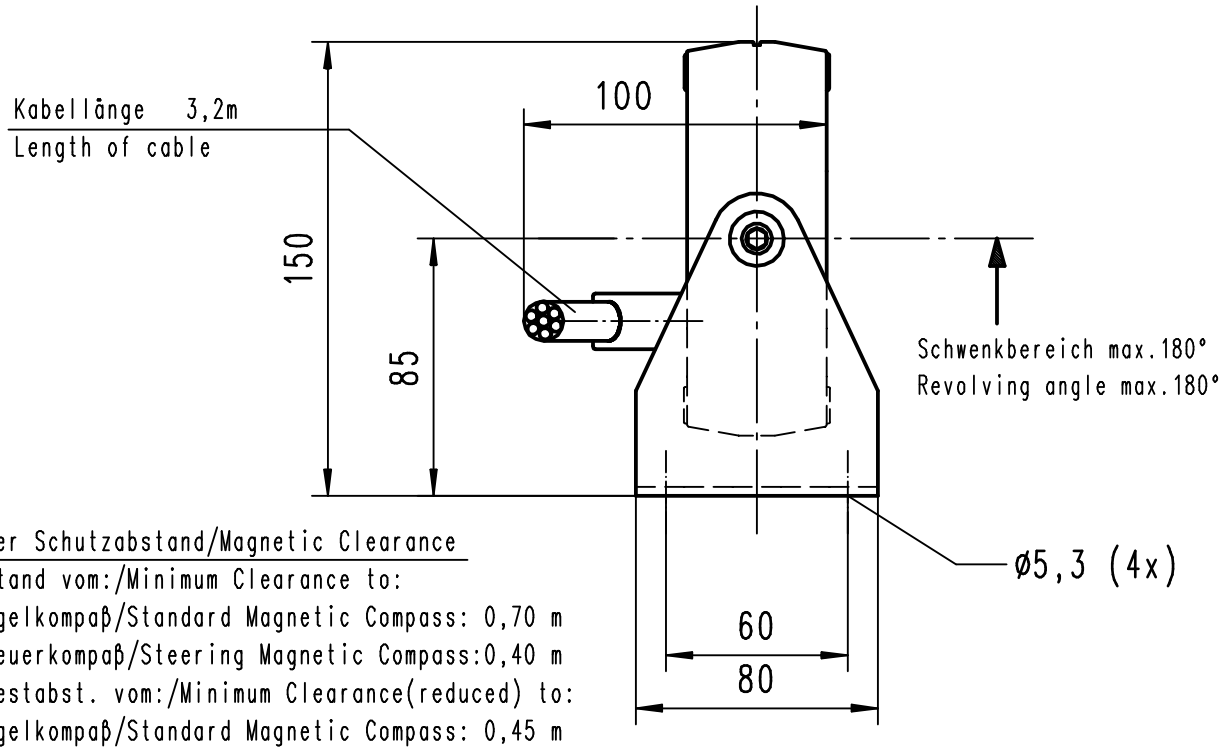
REPLACEMENT FOR:

FREE SCALE: DIN ISO 2768 mH

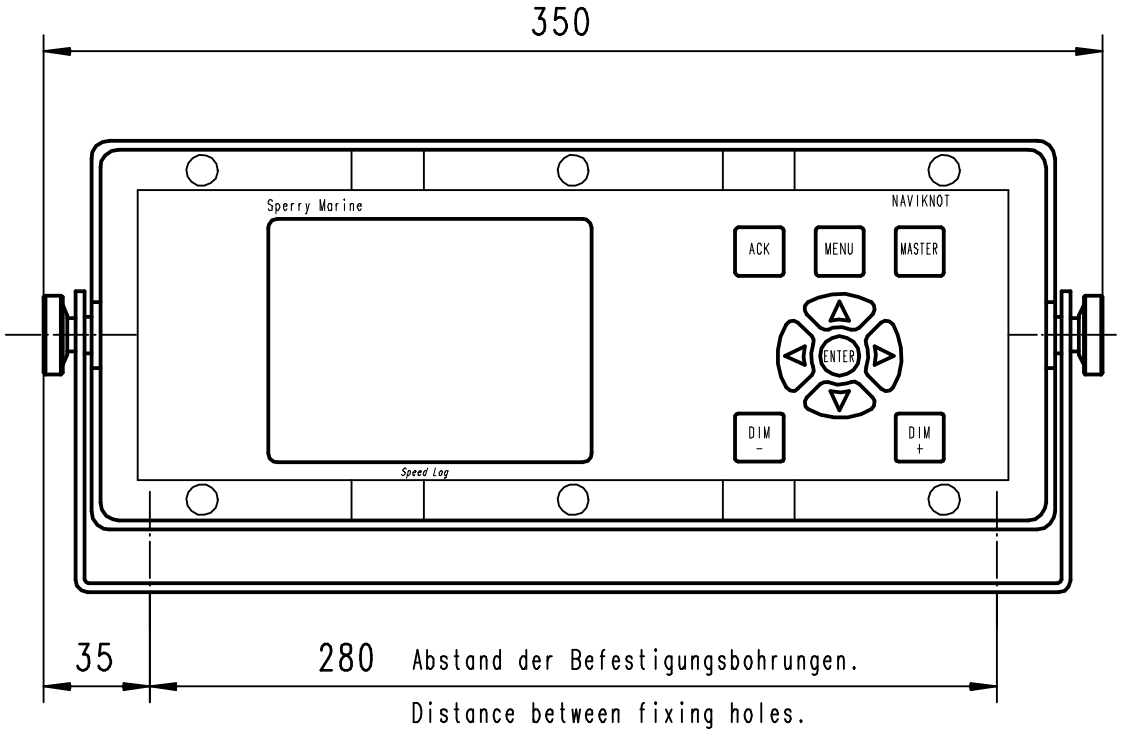
SCALE /

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

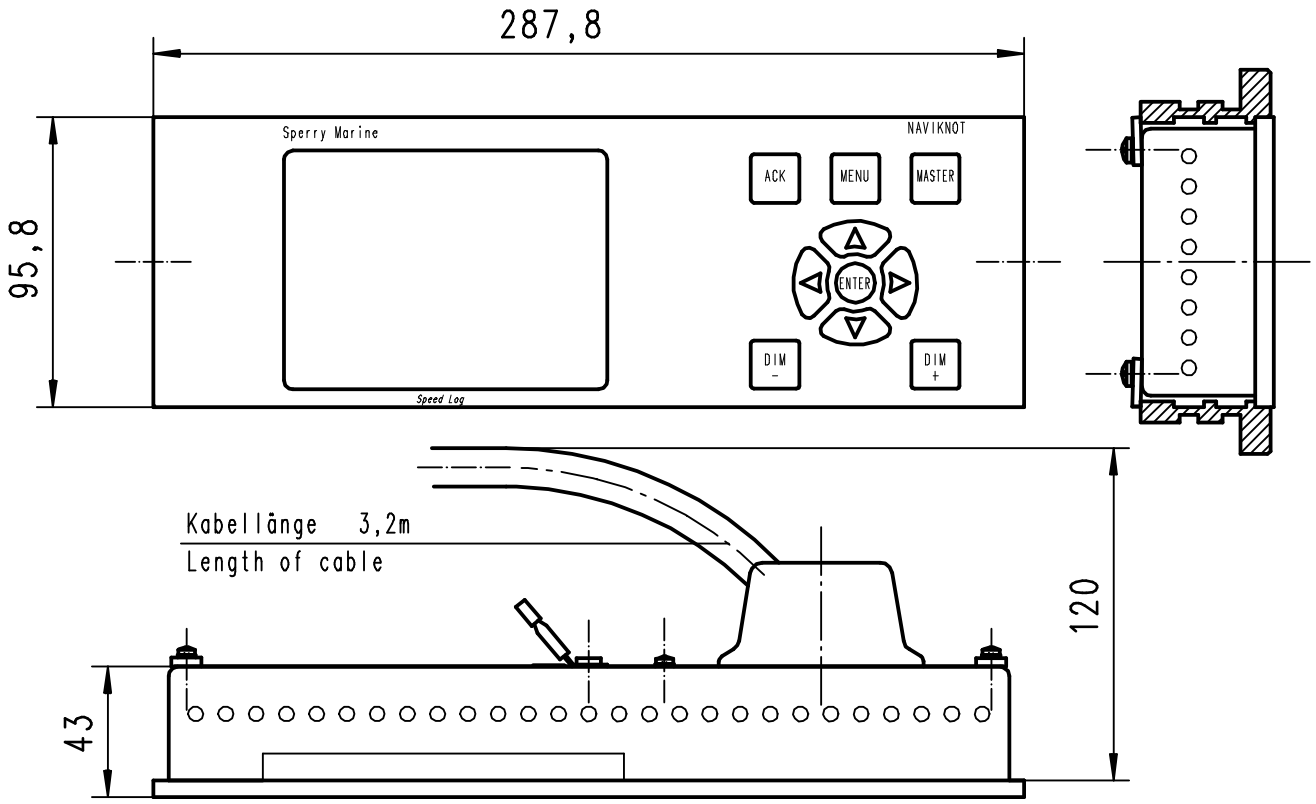
REPLACEMENT FOR:

FREE SCALE: DIN ISO 2768 mH

SCALE /

SHEET 1

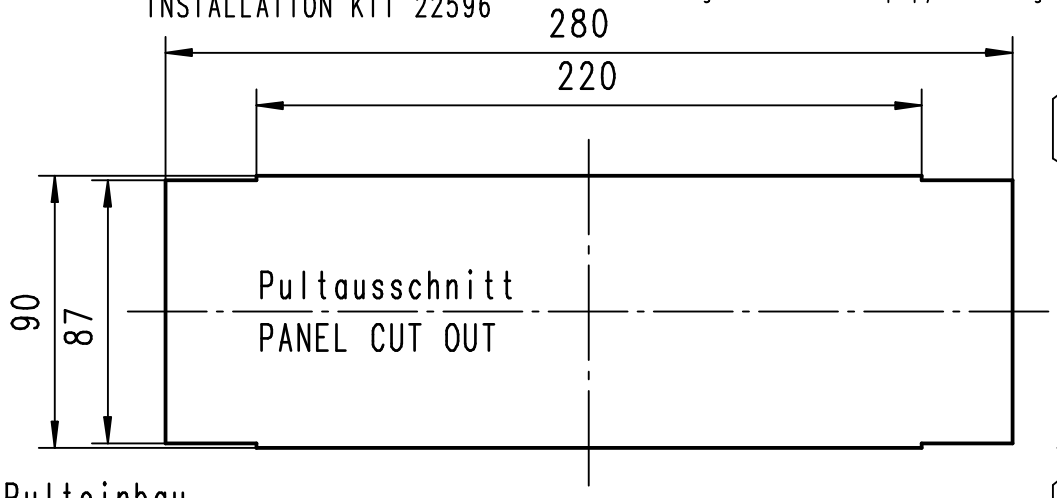
SHEETS 1

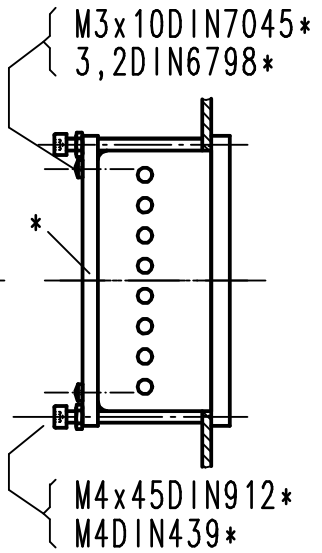


Einbau in Pultrahmen
INSTALLATION IN CONSOLE FRAME

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

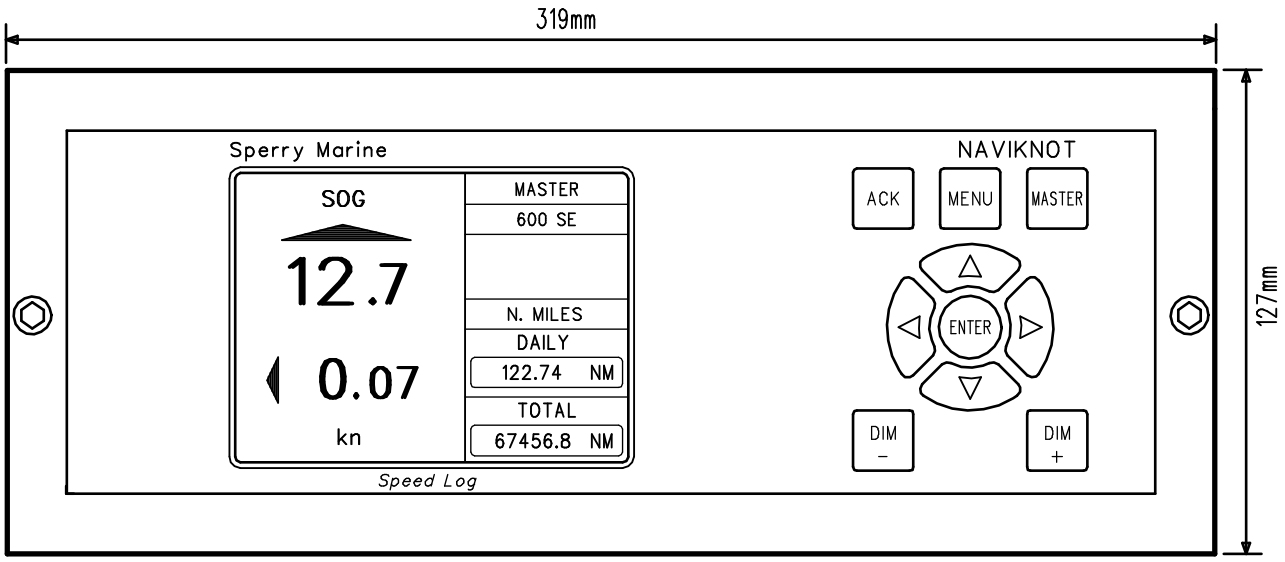
DIMENSION DRAWING
NAVIKNOT 600
Control and Display Unit

REPLACEMENT FOR:

FREE SCALE: DIN ISO 2768 mH

SCALE /

SHEET 1
SHEETS 1



Depth: 150mm

REV	ECO-No.	DATE	NAME
A	981 901	13.03.07	Schütt

NORTHROP GRUMMAN
Sperry Marine
Hamburg Germany

		Date	Name
DRAWN	13.03.2007	Schütt	
DESIGN	13.03.2007	Reinecke	
RAHMEN00\0031-0112-73S01	CHD ECO		

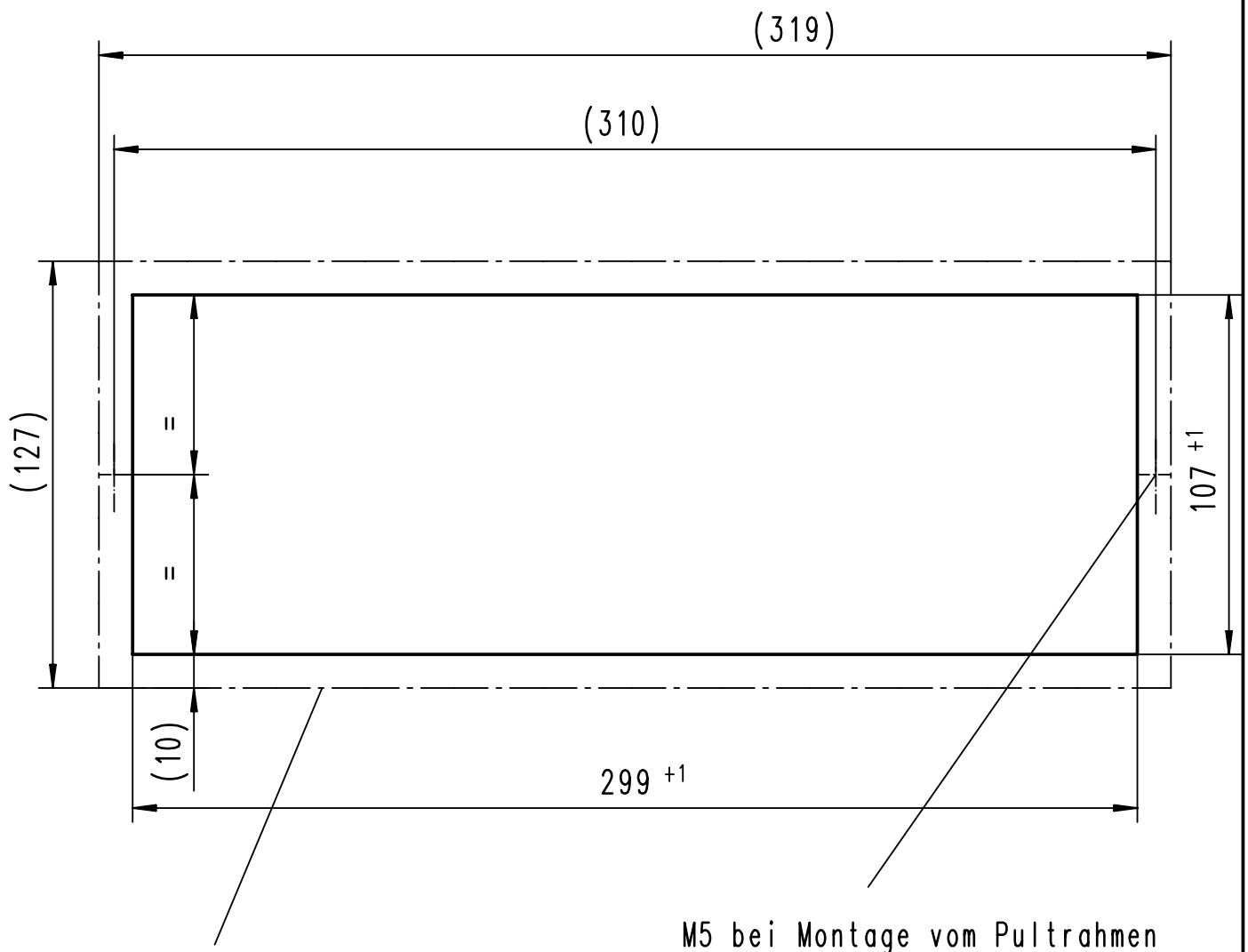
Rahmen Lg-Nr.
29885

STOCK No. 79 489

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

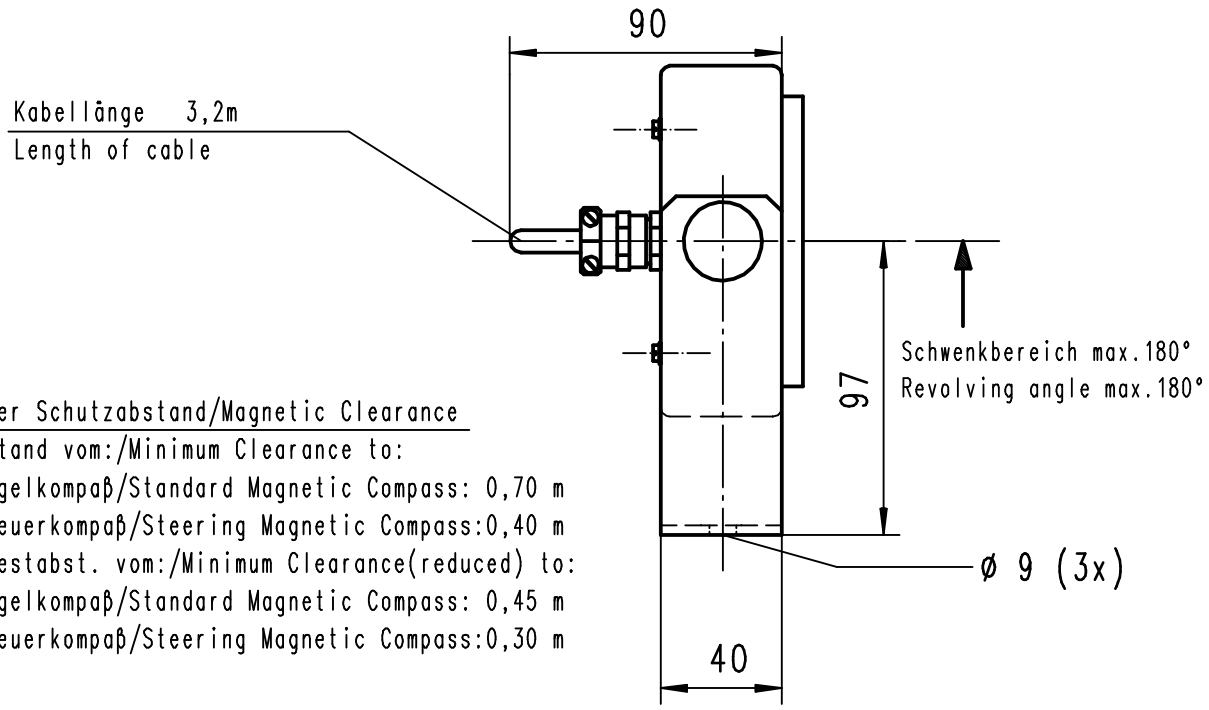
REPLACEMENT FOR: Ausgabe 00

FREE SCALE: DIN ISO 2768 mH

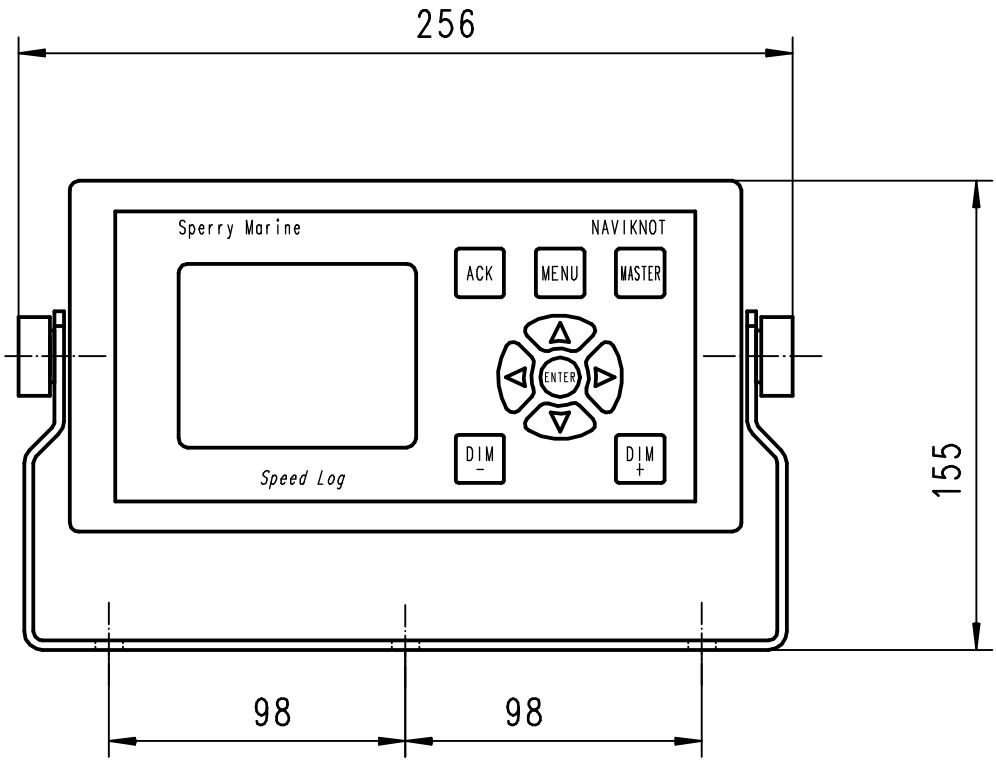
SCALE /

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

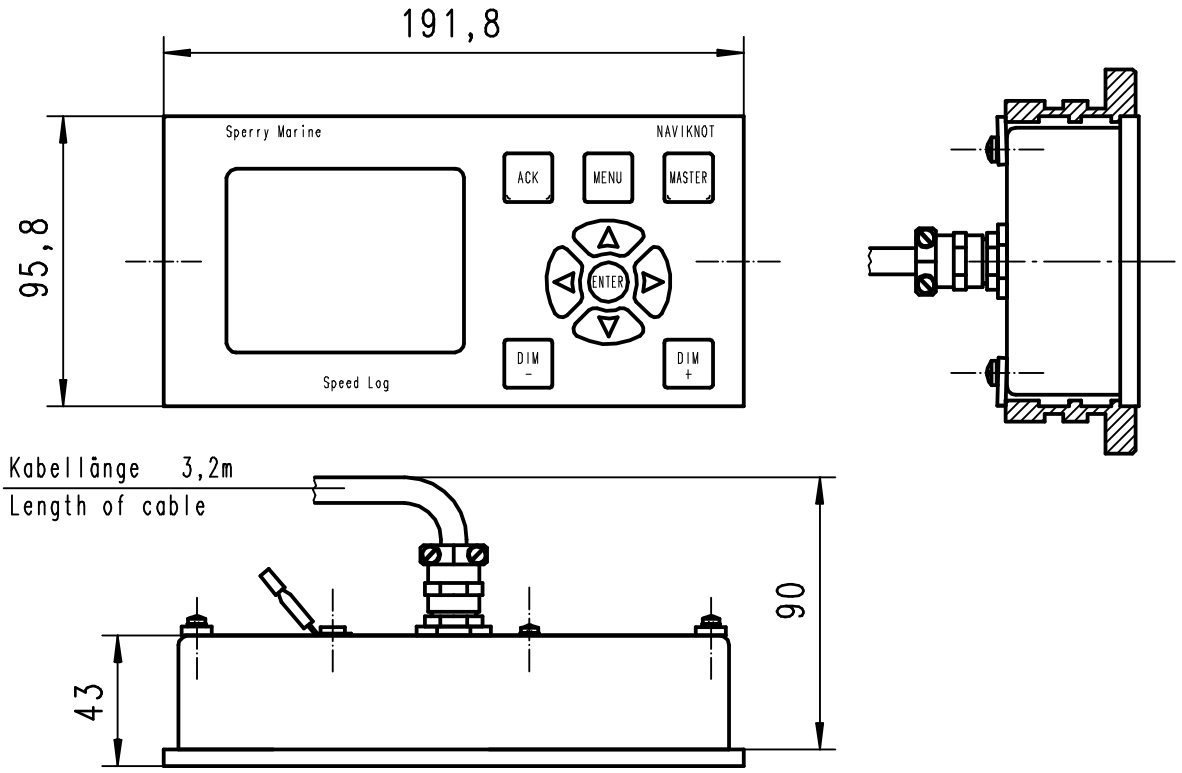
REPLACEMENT FOR:

FREE SCALE: DIN ISO 2768 mH

SCALE /

SHEET 1

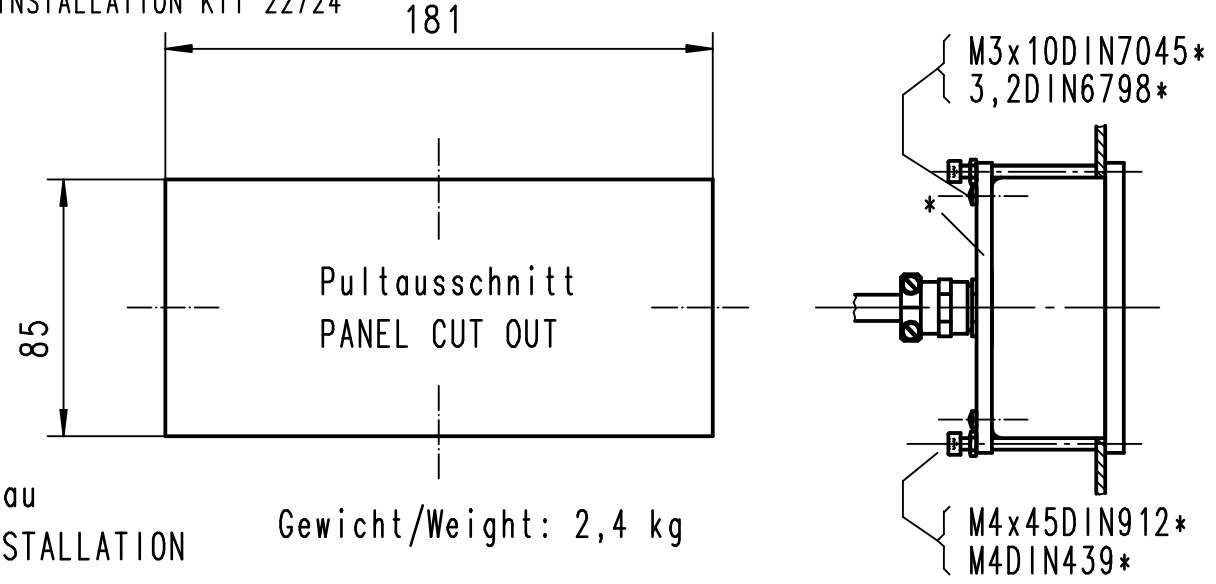
SHEETS 1



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 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

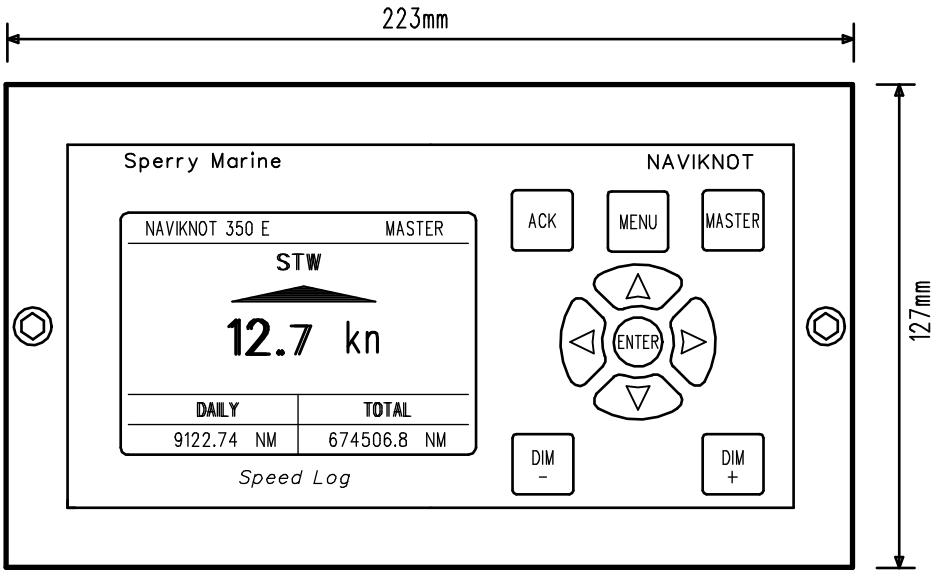
Frontseitig wasserdicht IP 65
Watertight front IP 65

REPLACEMENT FOR:

FREE SCALE:
DIN ISO 2768 mH

SCALE /

SHEET 1
SHEETS 1



Depth: 150mm

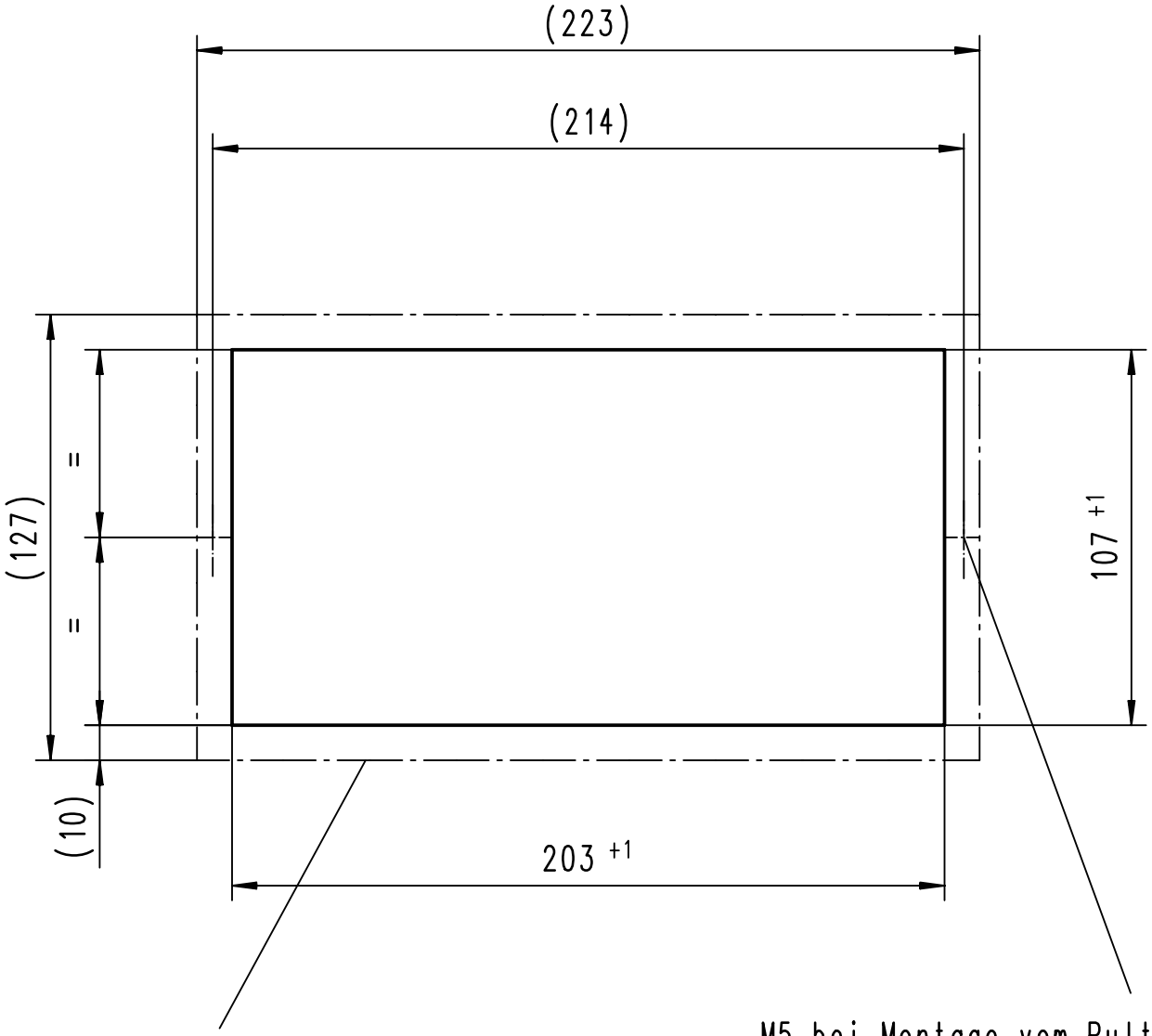
				NORTHROP GRUMMAN Sperry Marine		Date	Name
					DRAWN	13.03.2007	Schütt
				Hamburg Germany	DESIGN	13.03.2007	Reinecke
				RAHMEN00\0021-0112-86S01	CHD ECO		
A	981 901	13.03.07	Schütt	Rahmen Lg-Nr. 39086			
REV	ECO-No.	DATE	NAME	STOCK No. 79 488			

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

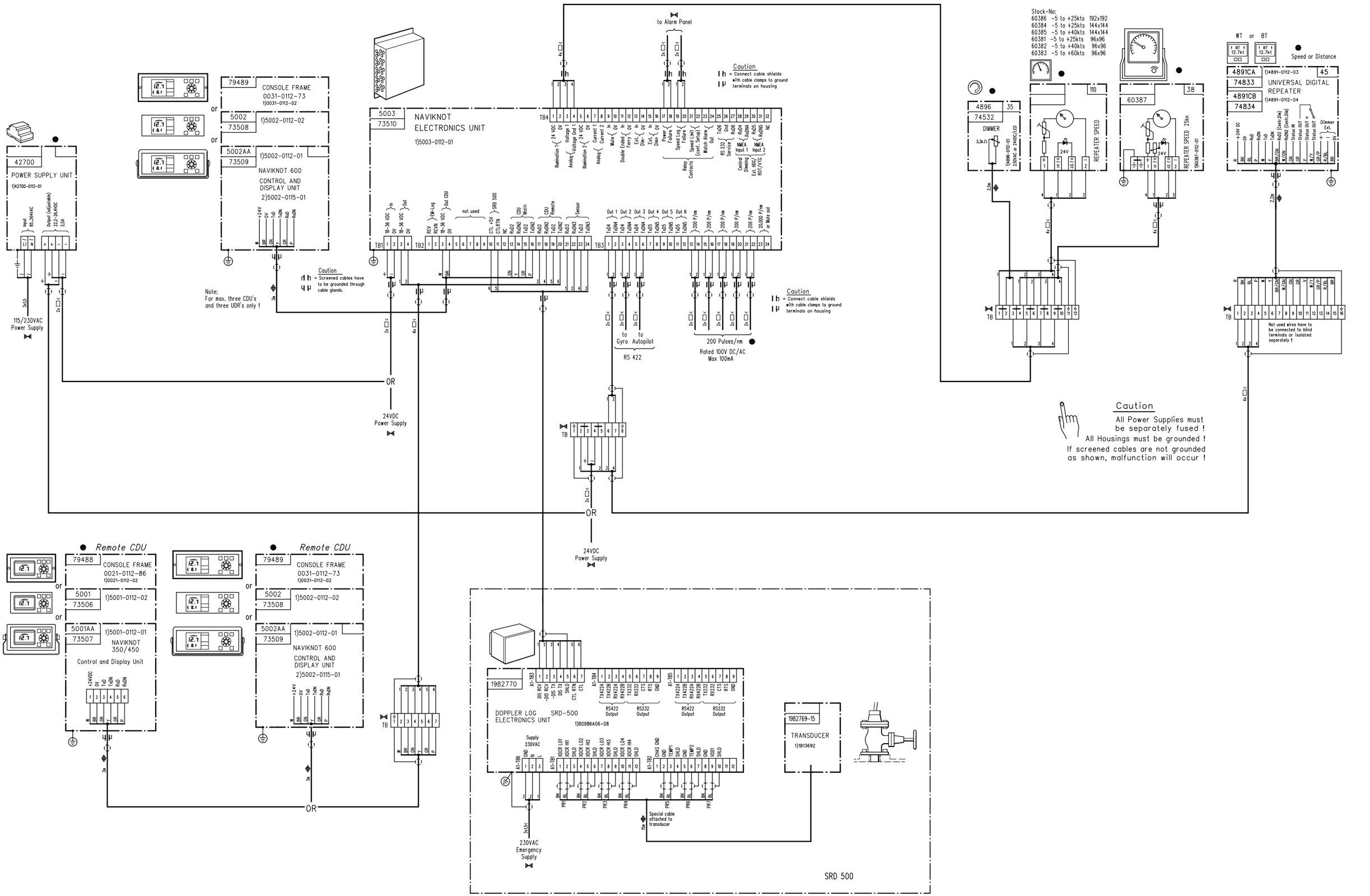
REPLACEMENT FOR: Ausgabe 00

FREE SCALE: DIN ISO 2768 mH

SCALE /

SHEET 1

SHEETS 1



Cables marked with □:
Cross Section
up to 100m length: 0,75mm²
over 100m length: 1,5mm²

TYPE-NO | IDENT-NO
STOCK-NO

Mounting of console frames
For servicing, arrange the cable so that the entire console frame can be raised by approximately 1m

REMARKS
1) Dimension Drawing
2) Wiring Diagram
● If required
< Screened Cable
(AA) 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

DESCRIPTION	REV	ECO-No.	DATE	NAME
initial	A	981 900	11.06.07	Sung

	Date	Name
DRAWN	11.06.2007	Sung
DESIGN	11.06.2007	Dietmann
5002\5002-0153-14501 CHD ECO	21.06.2007	Steiger

NORTHROP GRUMMAN
Sperry Marine
Hamburg Germany

TITLE
DOPPLER LOG NAVIKNOT 600 DD
Retrofit SRD 500

DRAWING No.
5002-0153-14 /A

SHEET 1 SHEETS 1