CU-M001-21-SA / CU-M001-21-SB
Panel PC 9inch touch display
User Manual

SKIPPER DL21 Dual Axis
Doppler Speed Log System

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CU-M001	PANEL PC 9” TOUCH DISPLAY. USER MANUAL

CHANGES IN THIS VERSION

This Manual is for the DL2 part of the DL21 system, due to changes in the regultations for Wheelmark (MEDB) The optional Alerts previously in the system have been removed. This is due to introduction of the IEC62923-2018 BAM standard.
Alerts are not Mandatory in speed logs (SDME). Relay outputs for power failure are still available. Contact SKIPPER support for more details.
The DL2 system is no effected

COMMUNICATING WITH US

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If you find errors, misspellings or poorly explained sections in this document, please do not hesitate to contact us at:

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TERMINOLOGY

Terms used in this manual

Units

Unless otherwise stated, all values shown on the display are as follows:

Speed	knots
Distance (Vessel)	Nautical miles
Depth	Meters
Tilt	° Degrees
Temperature	° Centigrade
Rotation	Degrees per minute
Heading	Degrees

Abbreviations

In addition, the following abbreviations are used

WT	Water track
BT	Bottom track
STW	Speed through water
SOG	Speed over ground
TripW TripG	Text for trip/total through water (W) and over ground (G)
ECDIS	Electronic Chart Display and Information System
INS	Inertial Navigation System
VDR	Voyage Data Recorder
ROT	Rotation from Gyro
GYRO	Gyroscopic heading / rotation sensor
HDG	Heading
DL2	2 Axis Doppler Log (with speed over bottom and Speed through water)
DL1	1 Axis speed through water sensor (part of DL21 system)
DL21	A system with combined DL1 and DL2 in the same housings

Symbols

In addition, the following symbols are used

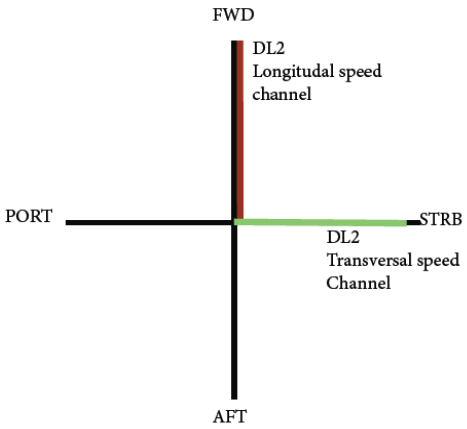
	Indicating that the information presented is partly from the GPS input, and therefore not from this sensor. (outputs may show invalid data in this mode)
	Symbolising that the data presented is longitudinal (forward or backwards for aft)
	Symbolising the data is transversal (port or starboard)
	Symbolising the resultant speed direction
	Simulator Mode - The system is using a simulator to generate the speed and depth
	Option - Mute Mode. The system has a sync option activated and the system is currently being muted (No acoustics)

CHAPTER 1: INTRODUCTION

DL21 Introduction

The Dual and single axis Doppler speed log system (DL21) works by the Doppler principle. This principle is that a sound bouncing off a moving object will change in frequency. This principle can be utilized by making a narrow beam of sound and analyzing the frequency of the returning sound. This frequency change is proportional to the relative speed of the reflecting object.

On a vessel, a transducer is positioned pointing slightly in one direction and the reflected sound comes from particles in the water (STW) and the bottom (SOG). The frequency of these echoes is translated to speed. By having 2 transducers pointing in 90 deg directions, the speed can be measured in two axis.



The DL21 sensor sends from both beams and both sensors at the same time. The transducers are moulded into the same sensor head together with the amplifiers and detection circuitry (transceiver). In addition, the sensor sends at two frequencies giving accurate values. The DL1 part of the system is independant and isolated. It also uses 2 beams at a higher frequency, pointed ahead and AFT. The system is default configured to show STW from the DL1 part of the system, and SOG (2 axis) from the DL2 part of the system. The DL2 part can be reconfigured to also show the STW (2 Axis) from the DL2 part, but this may cause a little confusion if the ahead speeds are slightly different due to the DL1 measuring slightly closer to the Hull

The sensor also contains temperature sensors and tilt sensors to allow compensation of the data. The transceiver contains a small computer which processes the data and signals and converts them to speeds. This data is sent to the electronic unit (JB70D21-XX) where it is formatted transferred to the display and presented on screen , and as data in formats to be integrated into the vessels navigation and presentation systems such as repeaters and conning. this manual is for the DL2 graphic display part of the system, the DL1 part is covered in a different manual

Speed

The screen presents speed through water (STW) used for the autopilot, radar and logged on the voyage data recorder (VDR). The speed data can also be used for setting limits on the rudder and stabilizer wings. It also shows speed over ground (SOG) used as a primary system for speed. Some of this information is also available from the GPS systems. By adding an approved gyro heading input into the system, together with parameters of the vessel, it is possible for the system to calculate the transversal speed at any point of the vessel. This feature known as docking, allows the pilot to be sure that both the fore and aft of the vessel are under tight control.

Alarms/Alerts

This system does not contain any alerts, however a power failure relay is available

Distance

In addition the system shows distance travelled through water, and distance over ground and has a resettable daily trip counter. This information is used for service intervals and navigation. Extra information is available regarding the sea temperature and tilt of the vessel. Note. The Distance over ground measures only when the bottom is within range.

The control unit

The user can operate the system via a touch screen or using an application on the conning unit. The displays are intuitive and have a menu system, but also allows the user to click on the screen to adjust the relevant parameters. Full setup, calibration and diagnostics are available from the screens. Calibration is performed by a two leg sailing procedure, and once set, should not need repeating unless the sensor is moved.

Maintenance

The system is low maintenance. After initial setup and calibration, the system requires no attention except to change alert parameters if required. The sensor is exposed to the water and over time some growth may appear. This can be carefully removed when possible, and is normally not a problem except if the vessel is still for longer periods of time (weeks) in warm waters. The effect of this growth is usually seen as the range of the bottom track being reduced.

Diagnostics

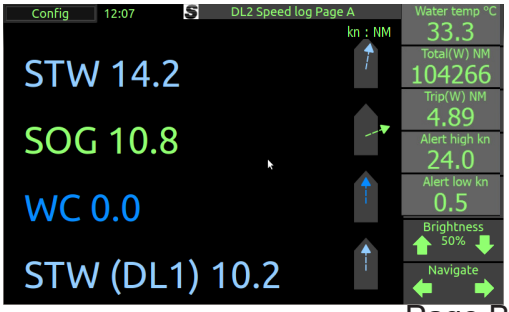
The system has comprehensive built in test (BIT) that can be used to analyse the performance of the equipment and give a warning if the data is not within specification. It also has inbuilt redundancy in some areas, such that even if a failure occurs, it can still give some data. Due to the systems LAN network point, it is possible to set up the system for remote diagnostics and upgrade using network. In time this will help reduce service visits and increase the probability of first time fix. Inserting a USB stick into the electronic unit causes the system to log all the available parameters, and these files can be sent to skipper or your service provider to diagnose errors in the system

CHAPTER 2: DL21 OPERATION

RUN TIME PAGES

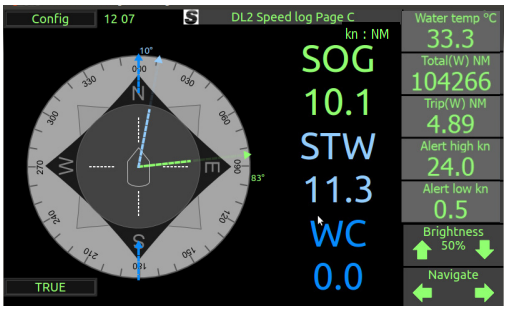
The DL2 display has 5 main runtime pages A-E, all except A can be deactivated..
Additional an optional “page 2.nd system” is available for use on DL21 systems to show STW from DL1 part of DL21.

Page A
Basic

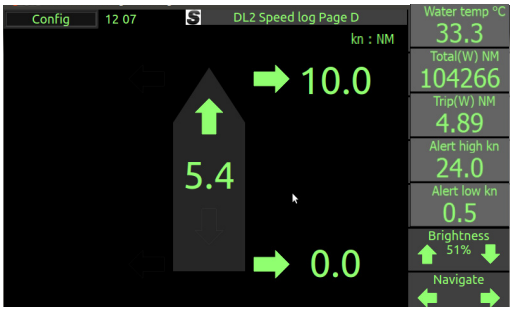


Page B
Combination
(Programmable)
(Optional)

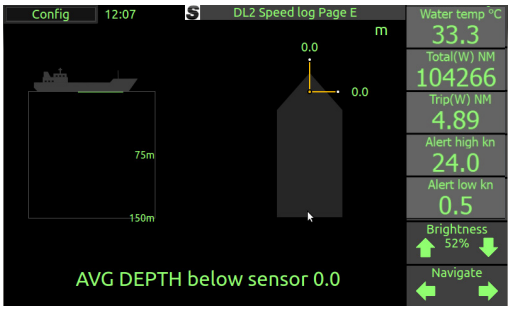
Page C
Rose diagram
(Optional)



Page D
Docking
(Optional)



Page E
Depth
(Optional)

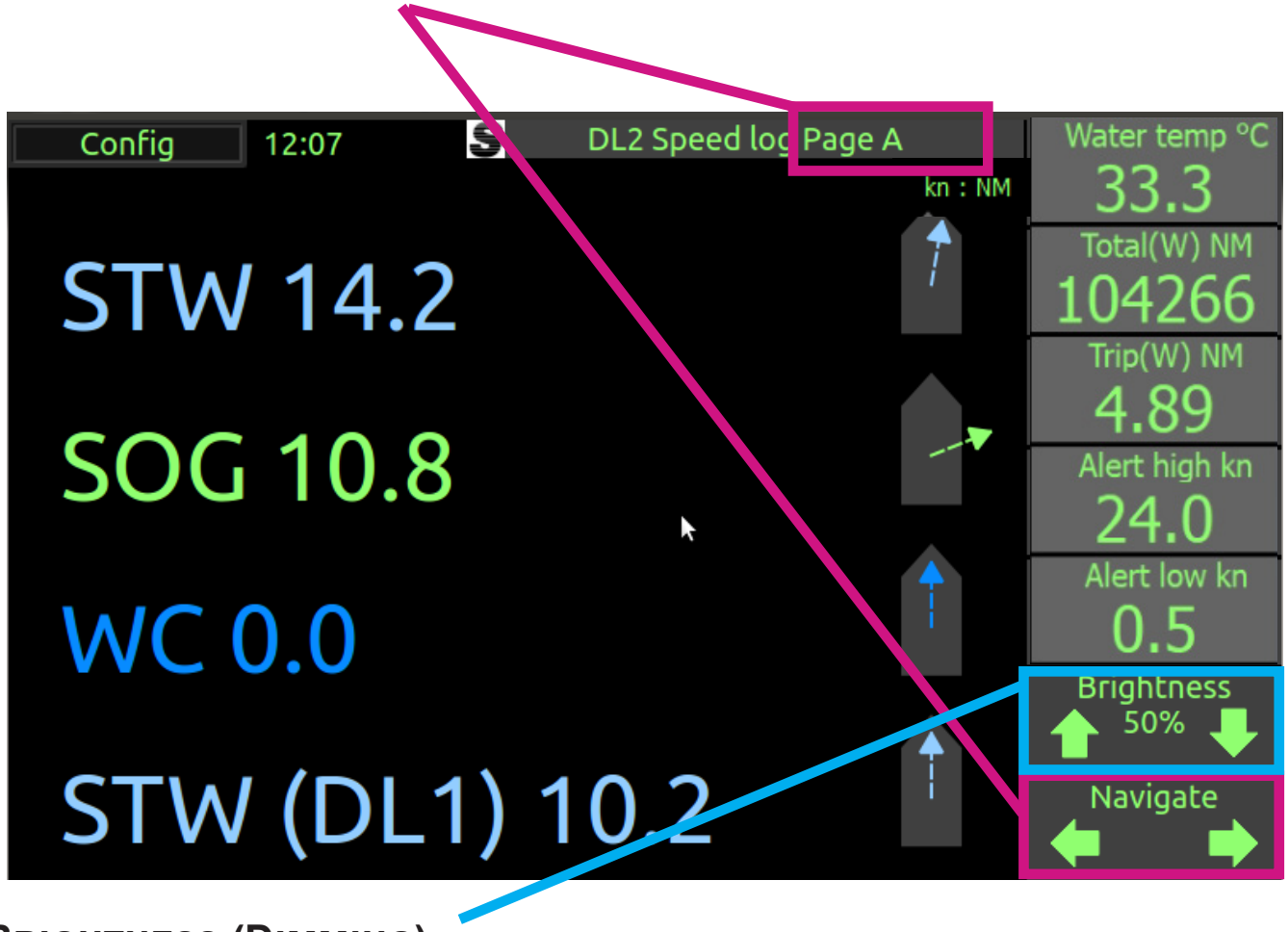


Page 2nd system
DL1 STW data

Page A-E Navigation

Pages can be changed by using the “Navigate” arrows on the lower right side of the screen.
In each of the pages A-E the main area is programmable to enable/disable required information.
Page A is not possible to disable. SOG is always on in page A.

Configuration and enabling of pages is performed in “config” See “Runtime Screen setup”



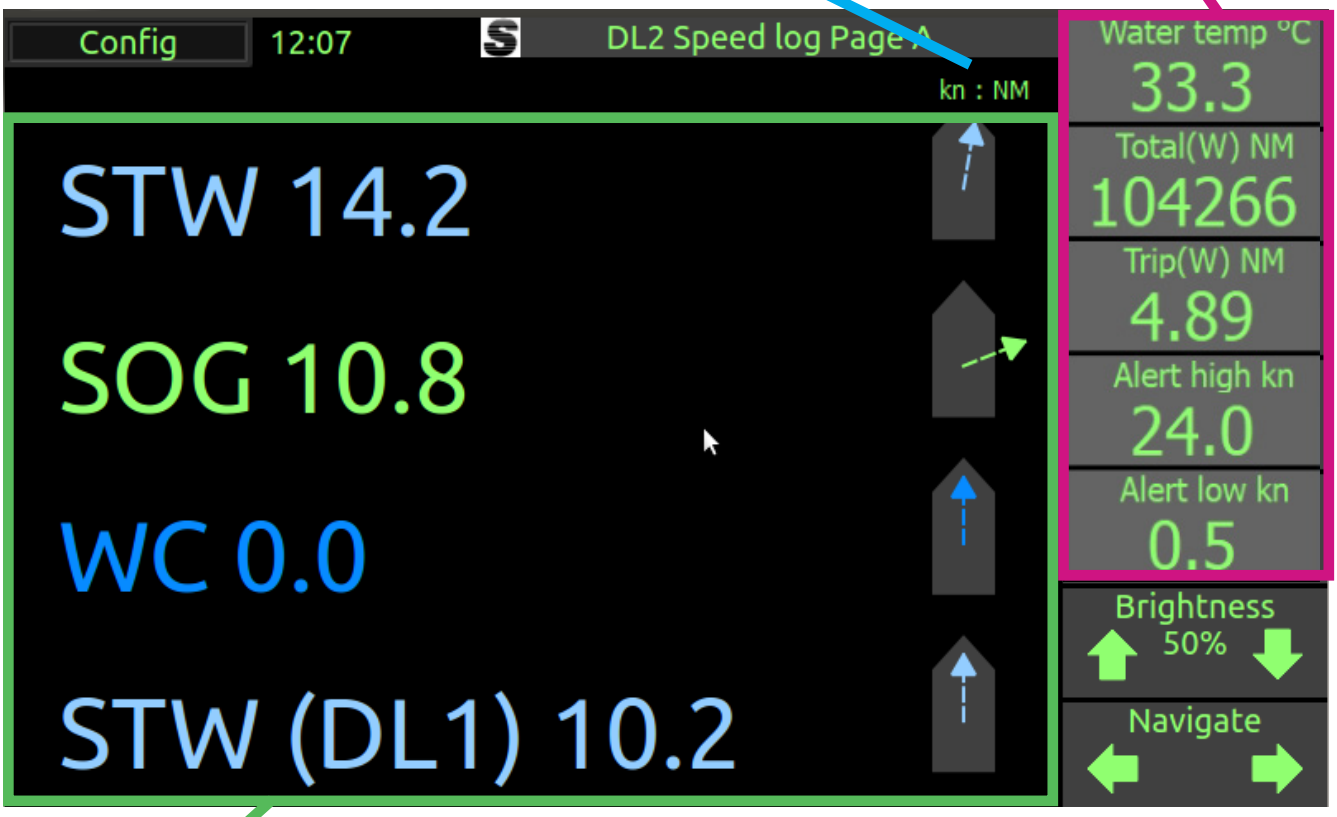
Brightness (Dimming)

The brightness can be set from 1 to 100%.
If an unacknowledged alert is present, the screen cannot be dimmed to the lowest settings.
If the screen is dimmed too low to see. press and hold on the left of the screen, the dimming will raise itself to default (50%)

Information 1-5

Informations can be set to the following: Water temperature / Trip / Total / Alert Hi / Alert lo / Pitch / Roll / SOG from GPS / ROT from gyro / Heading from gyro / STW (DL1) Items that can be changed or reset, will do so by pressing and holding the information panel (Trip/ Alert)

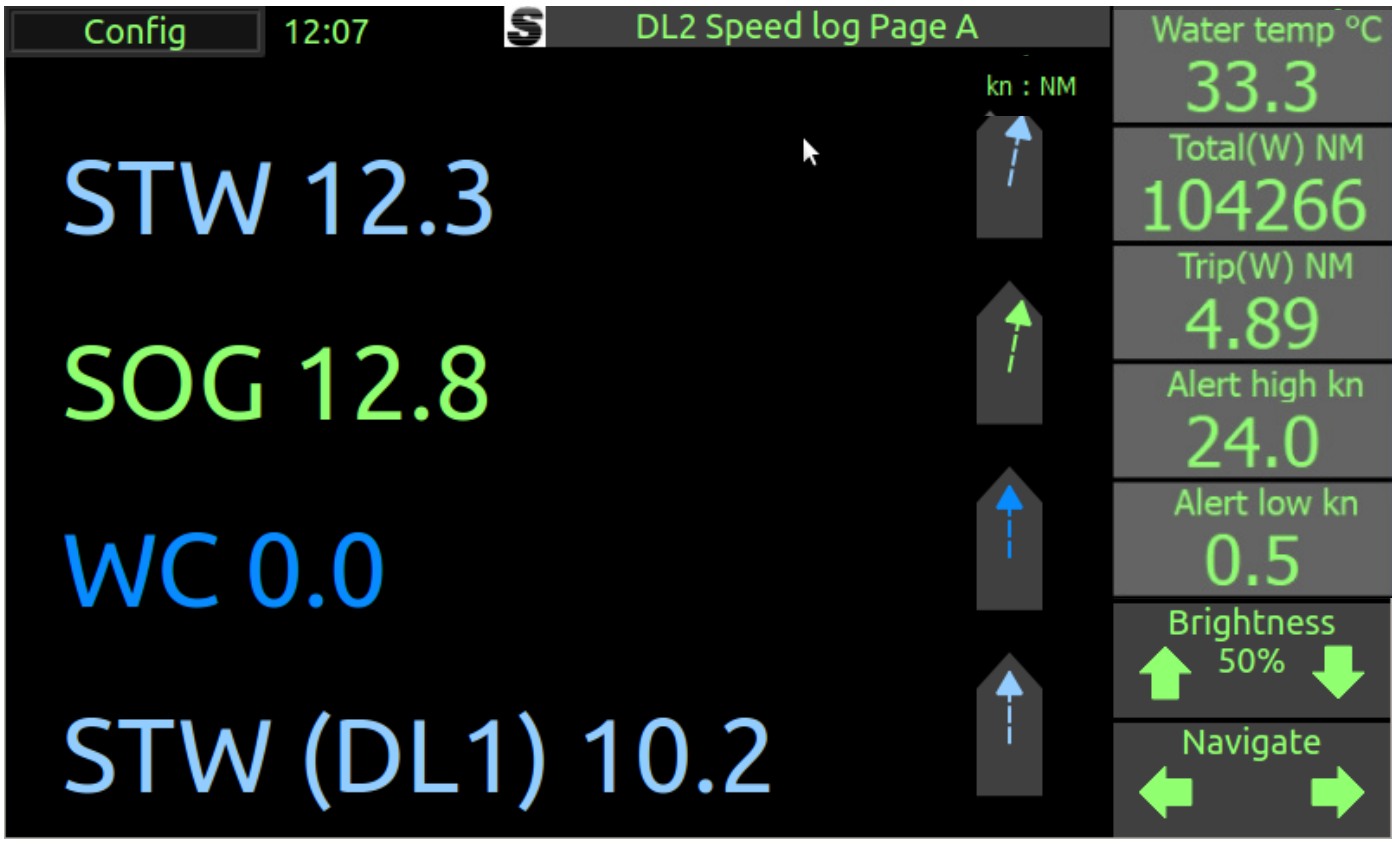
Press this value (kn : NM) to change to other units



Colour code:
Speed Through Water (STW) is in light blue
Speed Over Ground (SOG) is in green/yellow
Water Current (WC) is in dark blue

If the speed value is not available it will show -.- (dashed line).
SOG will be available only when the bottom is within range.(depth <150m)
If GPS and Rate of turn is connected from an external source, the speed will be shown with a symbol, when the depth >150m, bt this will n ot be sent out of the system as this system is not the source of the data.

Page A Primary Data



Options:
This screen shows the primary data of the system. The parameters shown can be selected or removed, and the information on the side panel can be selected

The shown values are resultant values combine both the ahead (Longitudinal) and sideways (Transvesal) data. The angle of the movement is shown in the symbol of a vessel with a moving arrow.
If the system is a DL21 then the information from the DL1 can also be shown on this display as shown above.

An option exists (in DL2 setup), to change the DL2 system tinto a SOG only system (The STW parameter coming from DL1 part) . In this case the STW information will not be available except from DL1.

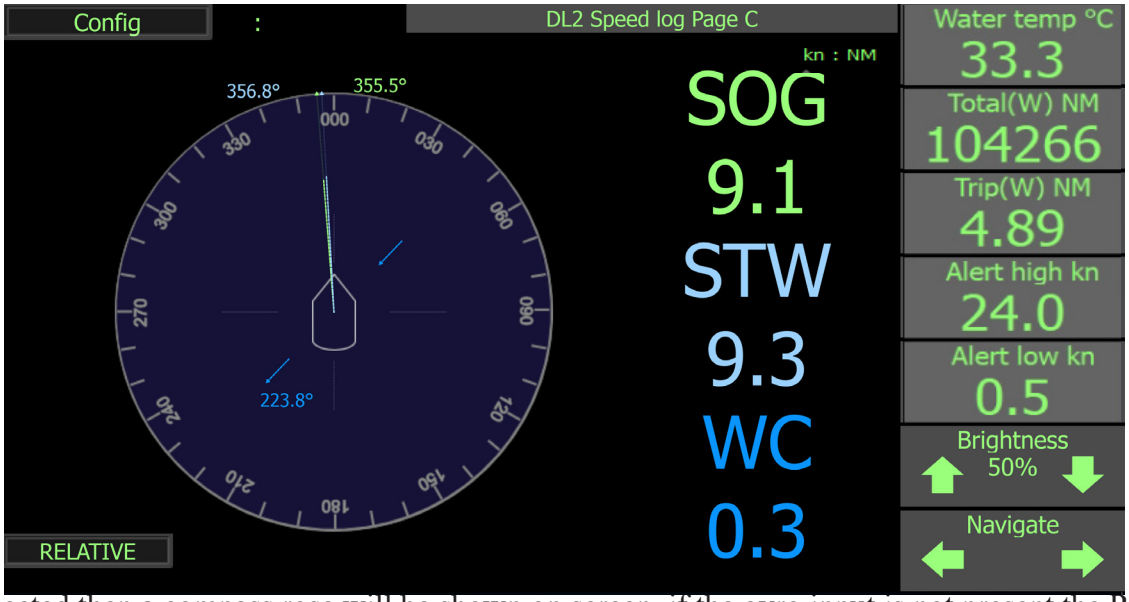
If selected, The GPS speed can be displayed if the bottom tracking fails. In this case a GPS symbol will appear next to the influenced parameters.

Page B User selectable

Options:
This Screen can be used to display combinations of data either as a vector with large arrows (as shown), or as a resultant and direction symbol.
The Information sidebar can be programmed to show whatever is available

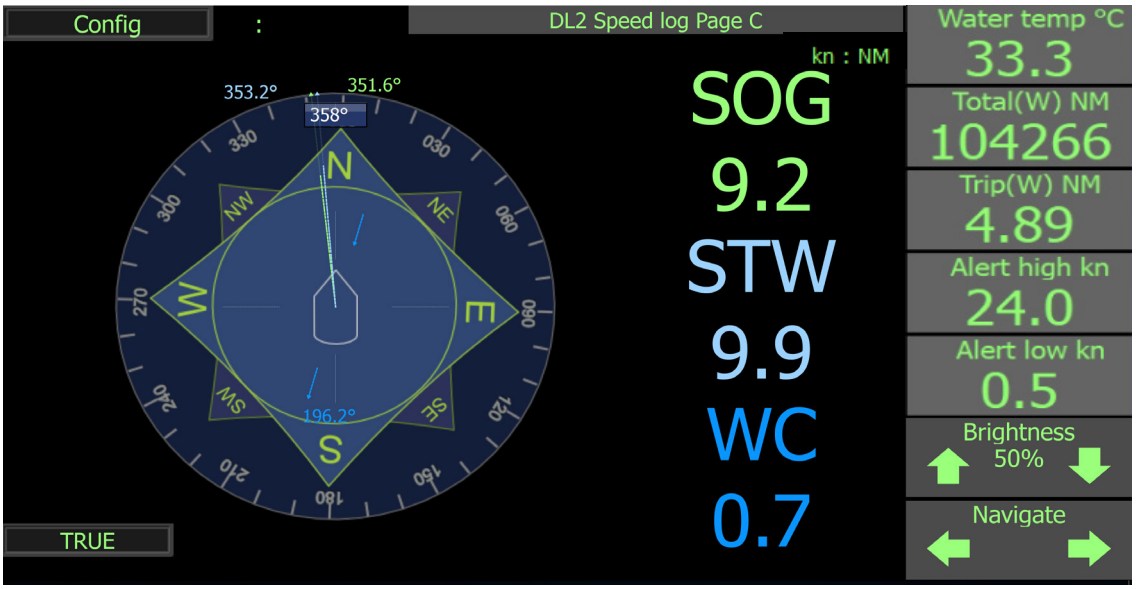
Page C Resultant and direction

Options:
This screen can show the resultant speeds of the vessel, and also the direction of the current. If a Gyro is connected and activated, the angles will be true, if not they will be relative. The length of the vector in the graphic to the left represents the speed. The Outer rim of the compass rose indicates maximum speed (the speed is entered in the DL2 Menu)

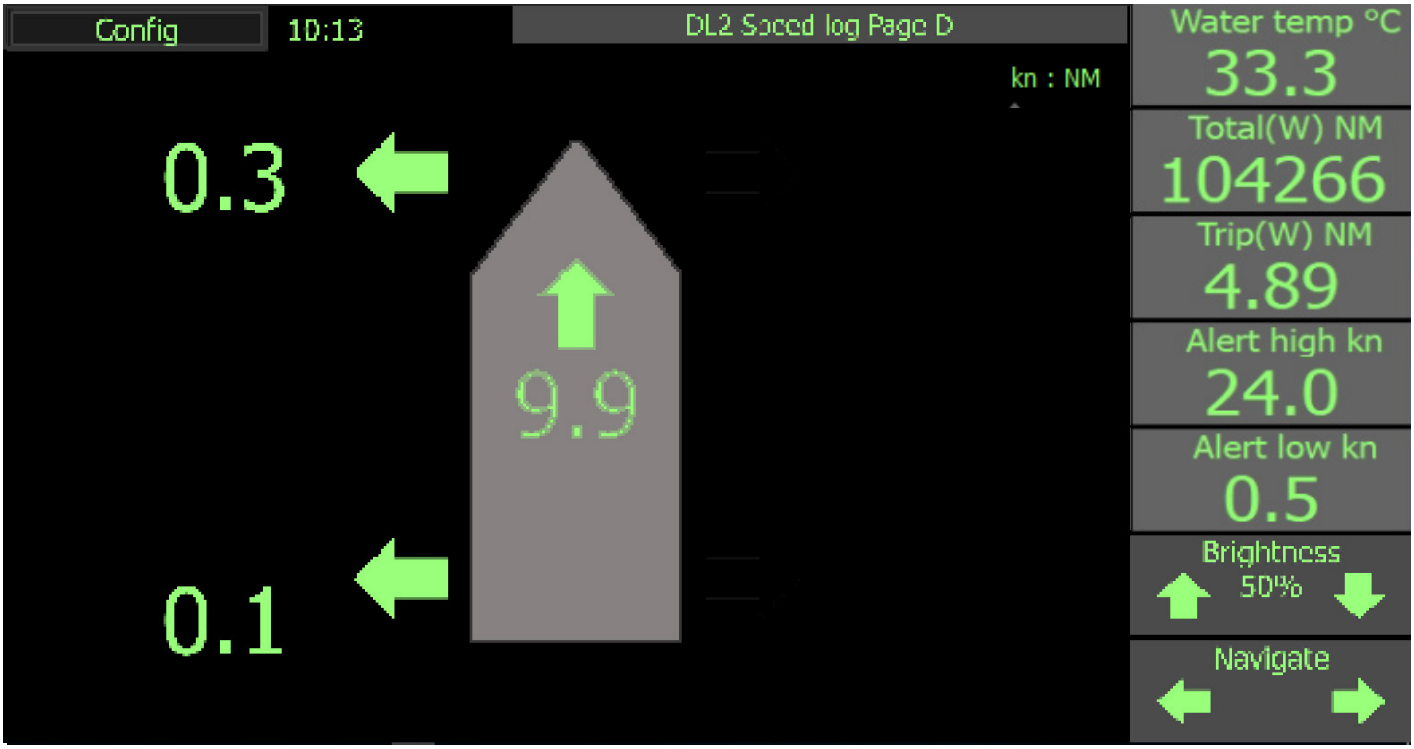


If True is selected then a compass rose will be shown on screen, if the gyro input is not present the Relative display should be selected.
TRUE and RELATIVE can be selected by pressing the text or on the screen setup menu

Water current (WC)
The Dark blue arrow is the calculated current, this only shows direction as the current is normally small. The arrow points in the direction the current flows (sets) This option is default off and can only be turned on if there are a satisfactory number of calibrations (3).
If the bottom tracking of the system fails (too deep or poor signal) and a GPS input is connected, then this display can be made to compensate the current using that signal.

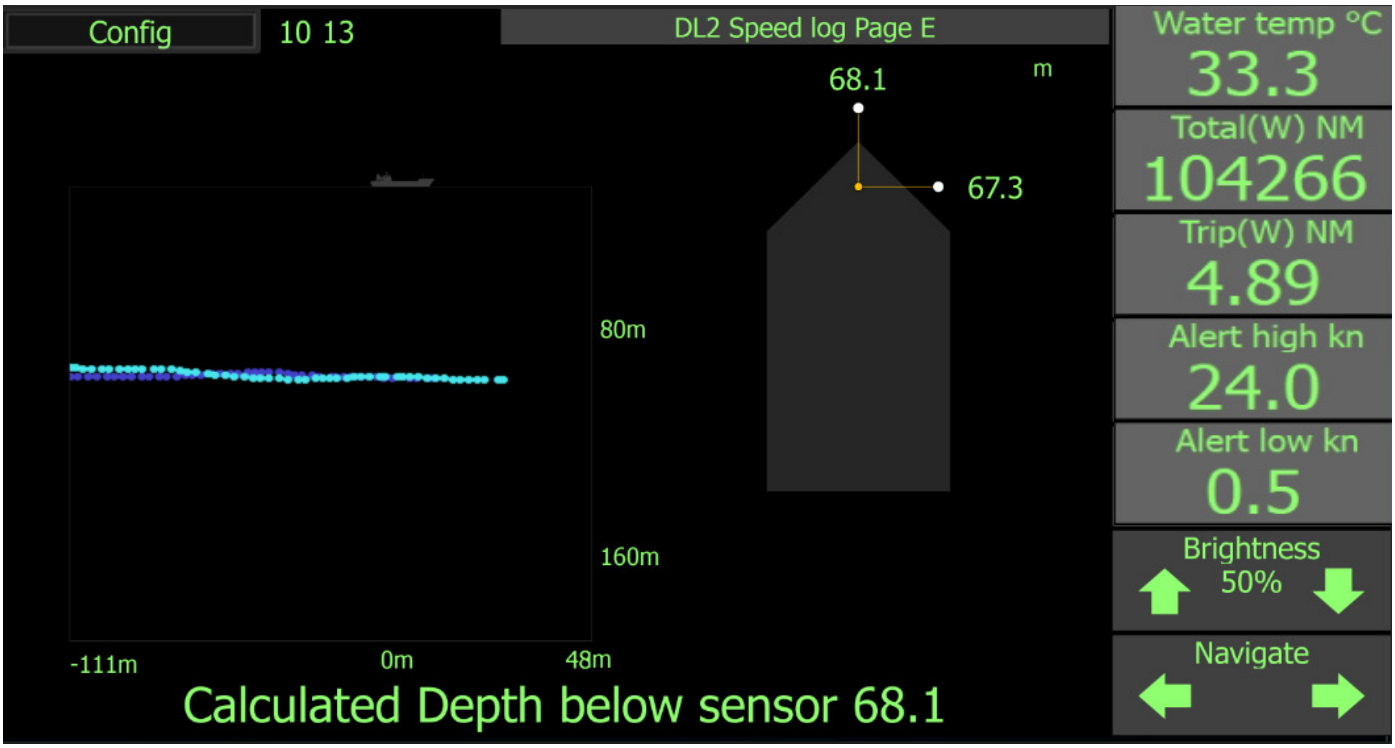


Page D Docking



Options:
This page is designed to clearly show the speed over ground of the vessel, and is particularly useful during docking manouvres and general manouvring.
If Gyro is connected with a valid ROT signal, the system will calculate the Aft speed based on the vessel length measurements entered in DL2 Menu.

Page E Depth

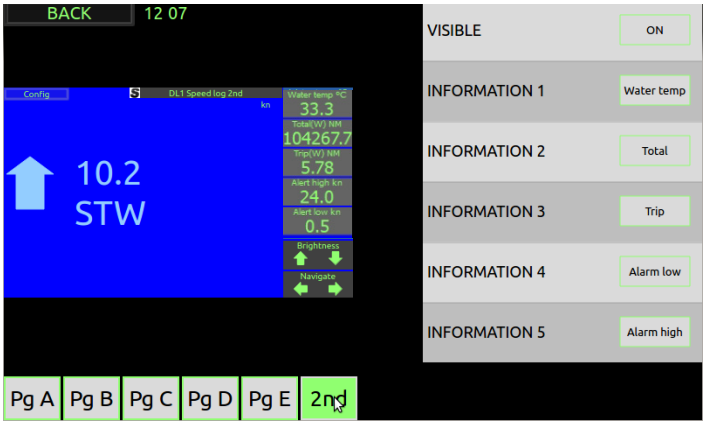


Depth is measured on the two main measurement beams of the system. These are tilted at 30 degrees from vertical and will therefore measure in front of the sensor and to the side.
As the system does not measure vertically, there is a danger that the beam will be bent (refracted) in the water as the water temperature (and therfore sound speed) changes. This is impossible to predict, and so there will be some error in the system particularly in deeper water.
This system is therefore not approved to be used as the primary echo sounder for the vessel.
The average value takes the forward looking beam, and calulates the depth at that point and using the measured speeds predicts when that point is vertically under the vessel
The graphic on the left shows an echogram of the depth below the vessel. This graphic is unusual in that it uses the speed to calulate where the displayed points are relative to the vessel. If the vessel sails backawards the plot will grow to the right, if still all the points will congregate in front of the vessel. The calculated depth directly below the sensor is shown as the depth.
The graphic on the right shows the individual beams depths adjusted to vertical depth.
Options: There are no options on this page, pressing the depth unit (default meters) will change the unit to feet, or fathoms.

Page 2nd Data From DL1 (Only in DL21)

Options:
This page may be used in the DL21 dual system configuration. In this configuration the second DL1 Single axis system communicates internally (no additional wiring needed) with the DL2 and allows it to display the calibrated speeds from that system.

The Information on the sidepanel is from the this DL2 system
The Colour background is in place to highlight that this is secondary information. In the case of an alert on the DL2 the system will jump back to page A



Loss of bottom track/open ocean

If the bottom track is lost, normally due to depth outside of the range of the vessel, the system will put dashes into the areas with no data. If water current is selected and both GPS and heading are input, the current will use these data for compensation. If not, this parameter will not be available.

Display of bottom track from GPS

If this function is enabled, the unit can be made to replace SOG information on screen with information derived from GPS and heading. This information is not given out from the units communication system, as it is not generated from this unit.(MED regulations) if GPS data is inuse for all or part of the calculation of the displayed data, a symbol will be displayed by the effected data

Surface current measurement

Surface current is measured in the water track cell.(1-3m distance from sensor)
This cell size may vary in different water depth conditions, but it is shown on the depth display. Surface current has its own separate display allowing the user to adjust some of the parameters.

Other parameters

- **Temperature**: is measured at the water boundary, with in the sensor, its data is used internally to compensate for sound speed
- **Tilt**, is measured in the sensor, and is used internally for quality control of data
- **Depth**, is measured from all beams. These beams are slanted at approx. 30 degrees and will therefore not measure directly underneath the vessel. For this reason, they cannot be used as an approved sounder. However they cvan be ouput as a PSKPDPC NMEA message

Trip

The trip values measure the distance travelled over the ground, or through the water (From the DL1 system)S. The total is the distance since system installation, the trip can be reset to show daily trip or service intervals. If presented in an information the trip can be reset by pressing and holding the Trip information, otherwise the trip reset can be found in the DL setup menu. Trip can also be reset remotely as required in some standards, from SKIPPER multi-repeaters, or by NMEA command.
If presented on the main screen, the trip and total through water will show in blue, and the ground values will show in green/yellow. Trip through water is the most meaningful in this system and is displayed by default. Trip over ground can be selected, but will become inaccurate once the bottom is lost, it is then displayed as yellow, for ‘low integrity’

Total

The total value is by default the total distance sailed through water (using the STW value that should always be present) or over ground. This value cannot be reset except by qualified service personnel. Water total is shown by default, but Ground distance total can also be selected. This will also show as yellow once the bottom is lost and the number becomes inaccurate

Depth

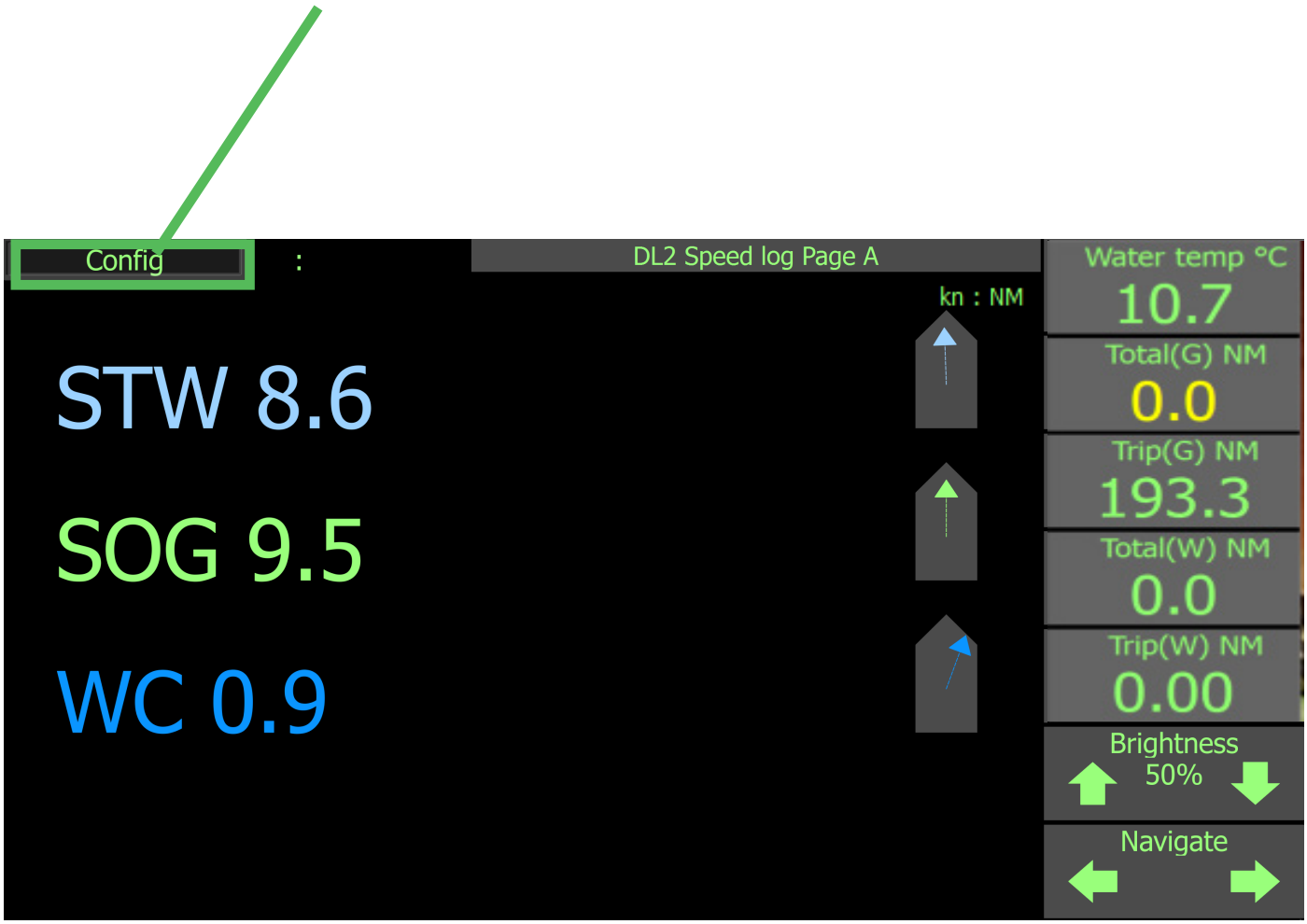
Depth is calculated from the bottom track (SOG) signal. Depth from each individual beam can be plotted on a depth plot and the average of both can also be displayed. These depths are default from the sensor, and the draught setting must be used to make them display from the surface or from the hull bottom. There is no calibration for this sensor, however it is important the tilt and temperature are correct to allow the best possible correction for beam bending and soundspeed in water.

Things that may effect performance:

The system sends acoustic beams into the water. These need reflections from the bottom for SOG and from particals in the water for STW. If the bottom is out of range then the bottom track will fail. If there are very few particals in the water, the signal may also be weakened.
If the vessel bow is breaching the surface, so that there is air in front of the sensor, then the system may temporarily loose the signal. Increasing the averaging will stabilise this data.
Interpretation of the IEC61023 standard can vary, and generally it is expected that the STW parameter should be measured within 3m of the vessel. In some cases the vessel may drag water with it, and this is compensated by calibration. This unit meausres within the first 3 m, but if required the sampling volume can be moved out from the vessel in the DL2 setup pages to give better results. At low depths the system will adjust its sampling volume down to be within the water volume. This may increase the STW noise.

CONFIGURATION MENU

By pressing the Config button on the top left, a set of configuration menus are entered.



The “Config” page is used to enter all set up functions.

RUNTIME SCREEN SETUP - Programing of page A-D setup.
CALIBRATION - Calibration of speed, offset, tilt and temperature
ALERT SETUP - High speed and low speed alert setup.
DIAGNOSTICS - Diagnostics of DL2 system.
CU-M001 SETUP - Display communication setup. *
JB70 SETUP - Electronic unit communication setup. *
DL2 SETUP - DL2 sensor vessel specific setup.*

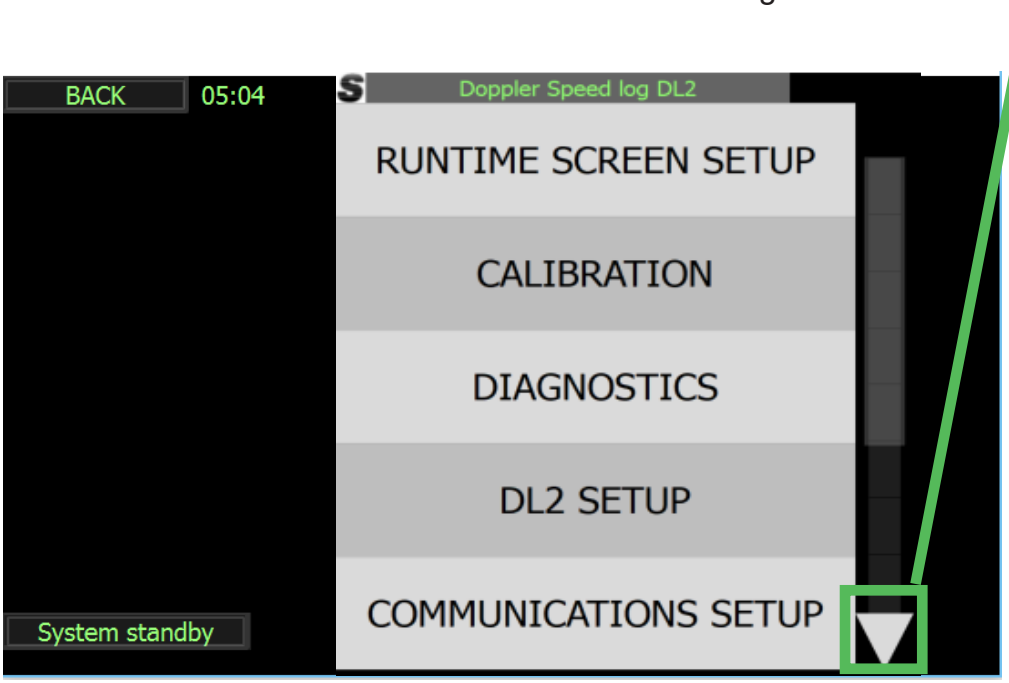
COMMUNICATION SETUP - Setup of NMEA input/Output. *
AUX SETUP - Setup of AUX input/output. *

To return back to “page A-D” from “Config” press ‘BACK’ which is in the top left.

Cofiguration screens marked * are Password protected. Please see “Installation manual” for more details.

If communication with JB70 Electronic unit is not possible from display unit the communicatiuon may be reestablished by use of SKIPPER service software.
See the “Installation manual” for more details.

Pressing ▼ will uncover more setups:



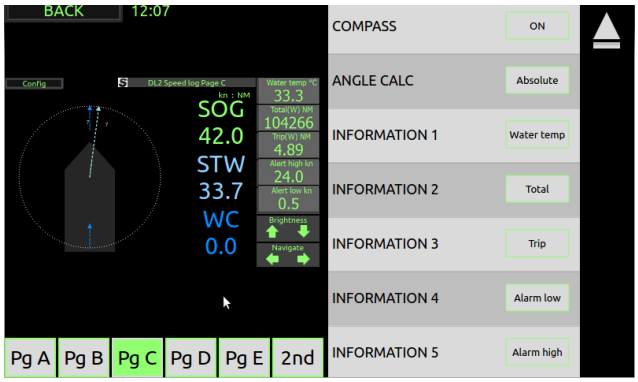
RUNTIME SCREEN SETUP

In this menu a runtime screen is selected on the left , and the available information is shown on the menus on the right. The first items are the main information, and the items information 1-5 allow the configuration of the information boxes on the right of the runtime screens. Buttons on the lower left are to select the available pages. On the right it is possible to select the main information to be displayed and the information panels can be changed. to show other relevant information
More information of the main display options can be found on the page descriptions.

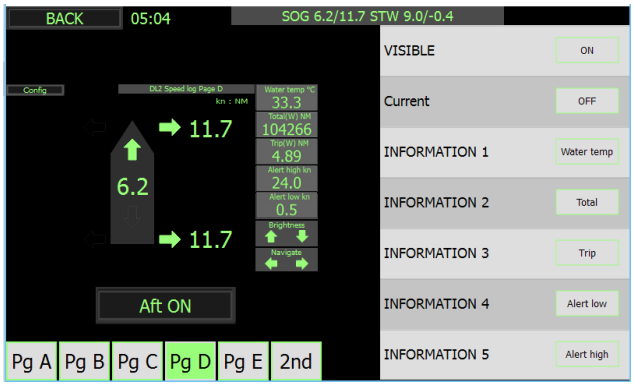
Page A Setup

Page B Setup

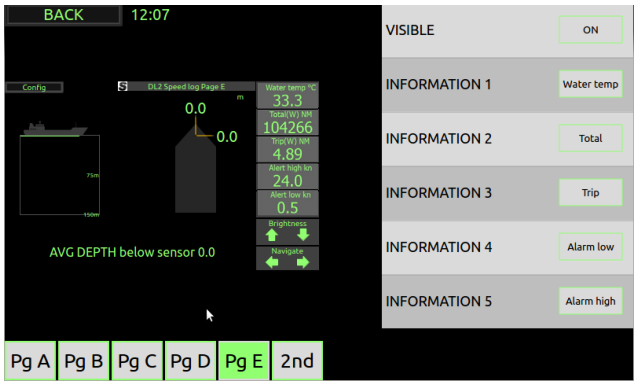
Page C Setup



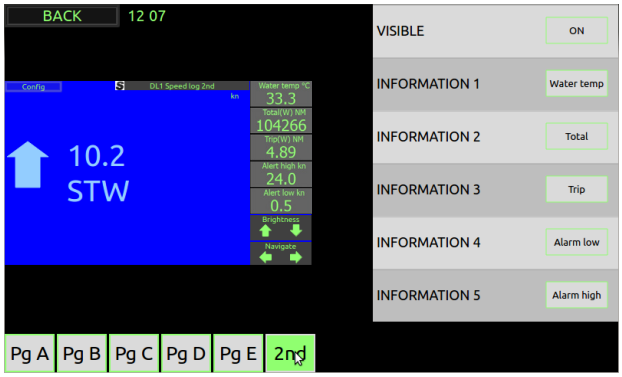
Page D Setup



Page E Setup



Page 2nd. Setup



Current parameters are calulated by combining the SOG and STW parameters. As currents are small, the value amplifies small errors in the SOG and STW, and therefore requires careful and accurate calibration. If the system detects that this is not performed, the value will not be made available.

CHAPTER 3 CALIBRATION

Calibration needs to be performed when the system is new or service has been performed on the sensor mounting

Calibration is designed to adjust for differences of mounting and hydrodynamics (water flow around the vessel). The mounting will have a tilt, it will be offset in heading and the water drag of the ship may cause some variations. Mounting parameters are fixed, and speed changes due to drag are usually linear with speed. In most cases a single calibration is adequate, however on some vessels more may be required.

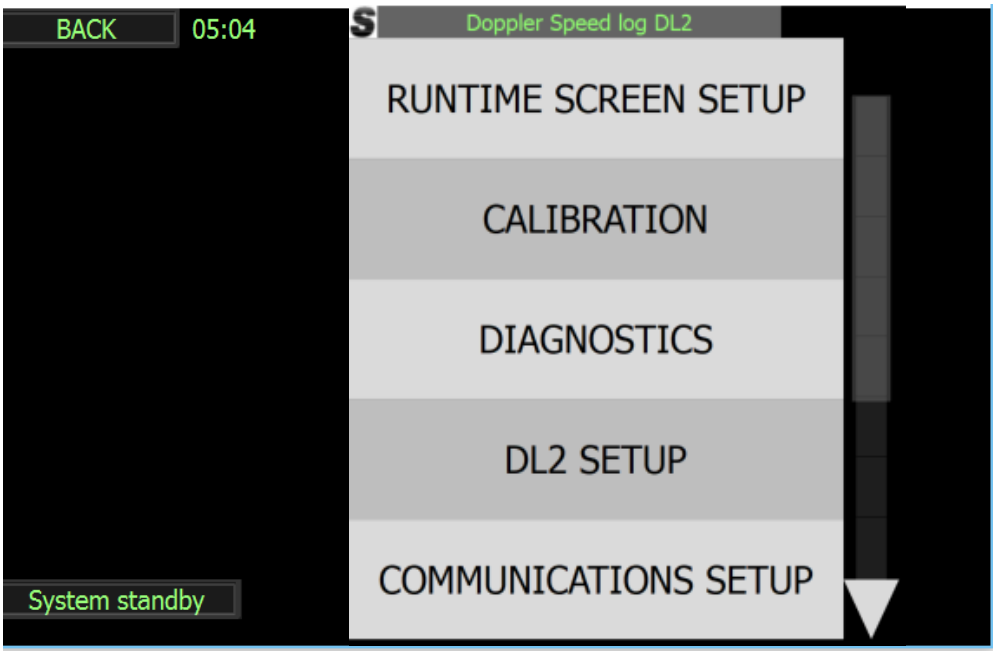
Speed logs are calibrated in the factory to give reasonable results after installation, however installation and hydrodynamics vary from vessel to vessel. It is therefore necessary to calibrate speed logs once in place.

SKIPPER speed logs have 4 parameters that need to be corrected by calibration.

1. Temperature.
1. Angular sensor installation angle (heading error)
2. Speed calculation
3. Tilt

Access to Calibration pages

The user enters from “Config” page. Press “Down” button ▼ until “Calibration”

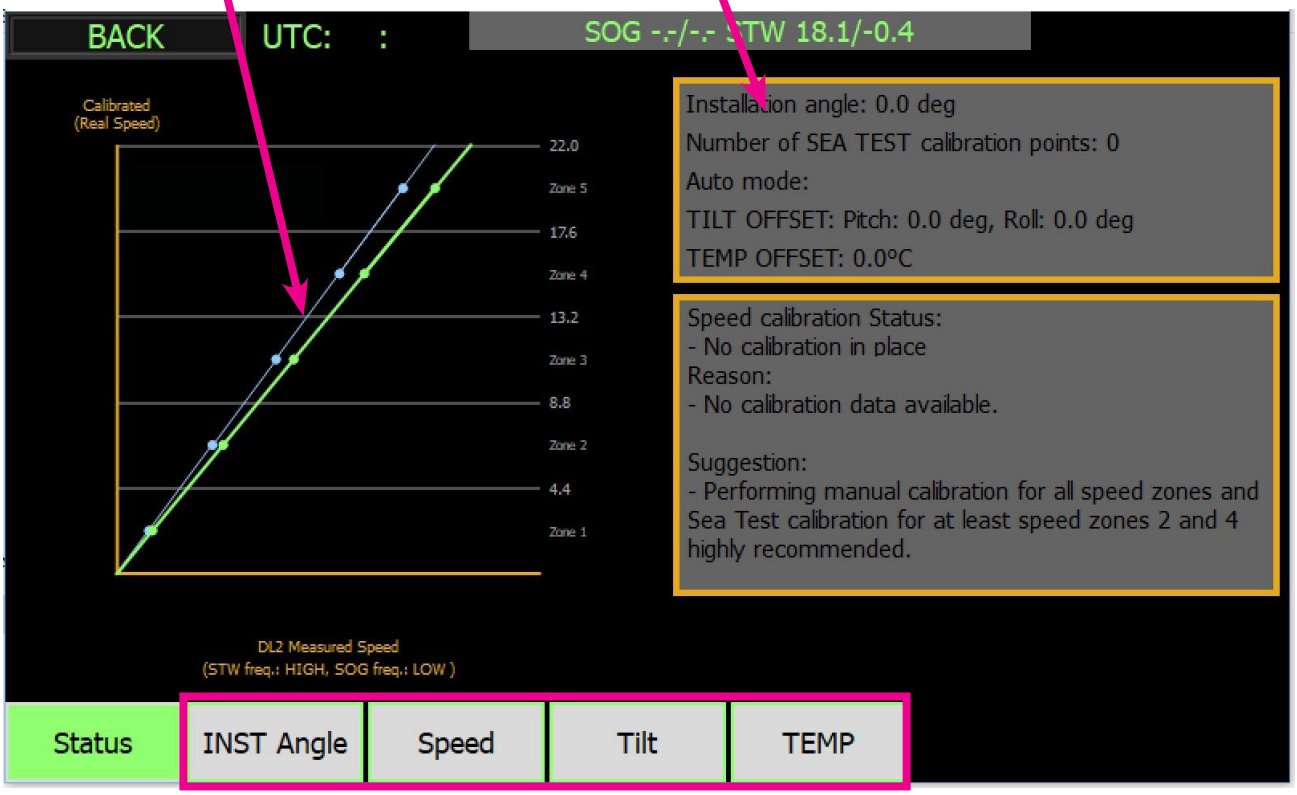


Calibration Status

The first calibration page is the “Calibration status”.(Indicated in green in below picture)
The page is set up to have an overview of calibration of the promary (speed and mounting) and secondary sensors (tilt and temperature) . The system has 5 default speed calibration points. Each of these can be adjusted within the indicated speed zone. The graph on the left shows these points as well as the current measured speed and GPS SOG if available. The table to the right indicates the likely quality of this data. The vessel should always have at least one ‘Sea test’ calibration at a high speed.
To adjust, or to look closer at any of these settings, The type of adjustment can be selected at the bottom of the page.
Pressing ‘BACK’ will return the user to the previous menu or displays.

Calibration curves
Blue line: STW calibration curve
Green line: SOG Calibration curve

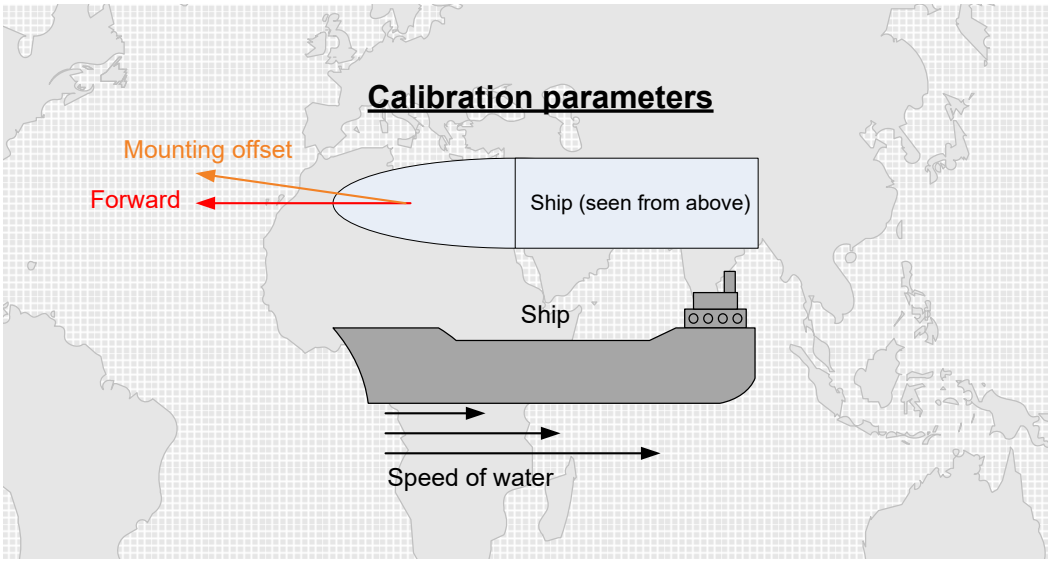
Status of:
Speed calibration
Installation angle of sensor
Sea test speed calibration
Tilt offset
Temperature offset



Select calibration type:
Installation angle of sensor
Speed calibration
Tilt offset
Temperature offset

Calibration. Installation angle

A DL2 is measuring speed speed through water (STW) and speed over ground (SOG) in 2 axis. Longitudal and transversal.
For correct longitudal and transversal measument the sensor needs to know forward direction of the vessel. This is done during installation by aligning sensor forward point with vessel forward point.
Any mounting offset will result in a rotation of the measurement axes (Installation angle). The resultant speed will be unaffected, but the longitudinal and transversal components will be incorrect. An offset will result in the vessel typically showing too much transversal speed, but may also result in speed calibration failing.



Measuring Installation angle

A software measument of installation angle is only possible on 2-axis (longitudal + transversal) speed logs such the DL2.
The installation angle measurement must be performed when the vessel is in steady speed and steady heading in calm waters.
Please note that all installation angle measurements when vessel is in zero or around zero knot will be only noise.

Reducing Heading errors.

The sensor forward position can be physically manually adjusted in the sea valve. To minimize the offset, the sensor should be mounted pointing ahead.
See installation manual for procedure.

Installation angle >10deg should be corrected by physical adjusting the sensor forward alignment in the sea valve.

Fine adjust Installation angle in software

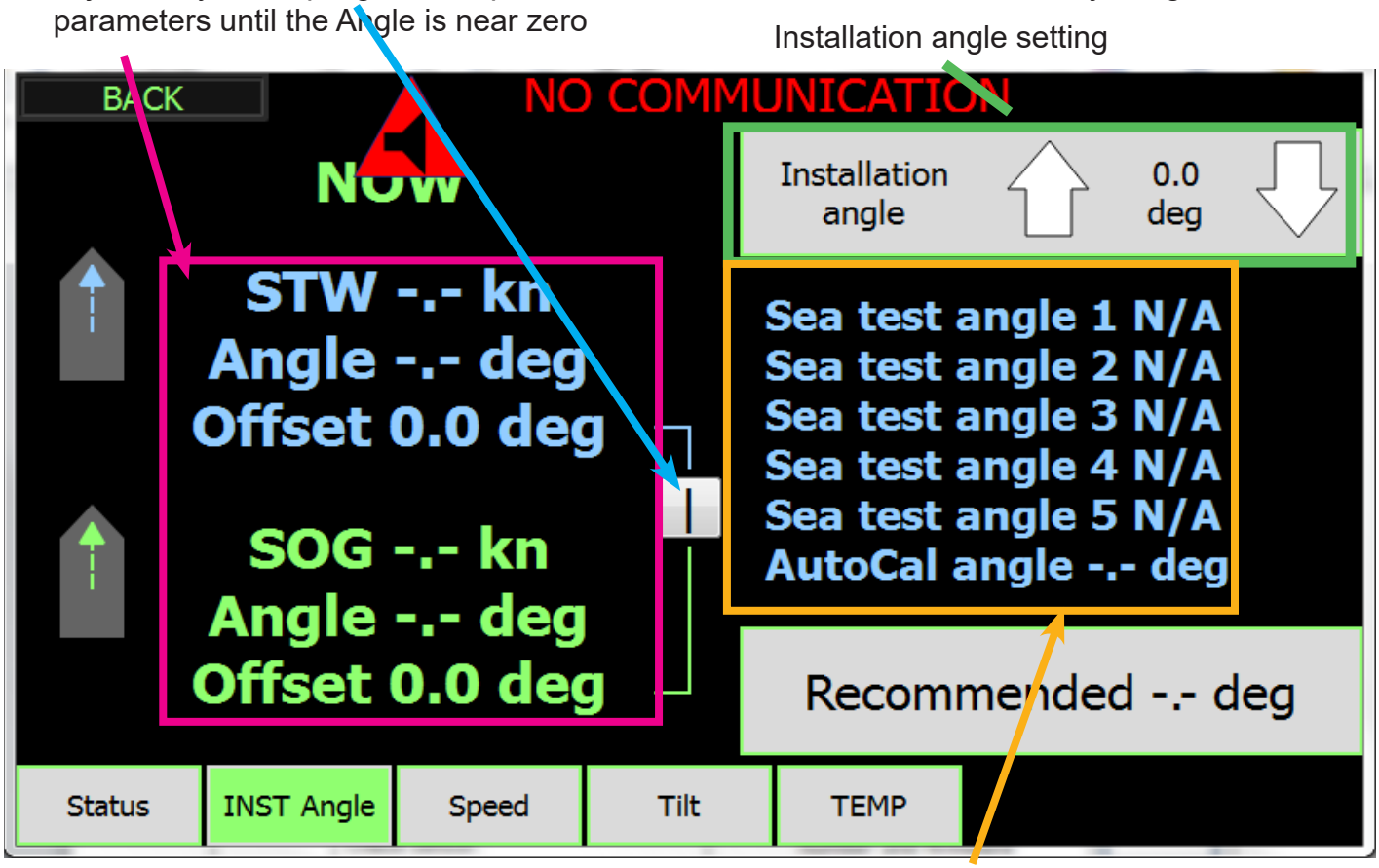
Installation angle offset in the software is recommended to fine adjust the angle inside +/-10deg. Allthough the installation error in the software may be set to +/-180deg.

The software will present “live” (NOW) speed and angle of STW and SOG. Any deviation between the two measurements will, in most cases, be caused by current in the water.

Installation angle calibration procedure

There are two ways to calibrate the installation angle:

1. When the vessel is in steady speed and steady heading in calm waters look at the live “NOW” measurement of STW angle. Set installation angle to same value with oposite value(i.e. measure 2.2, insert -2.2) with the usage og up/down keys. Wait 30 seconds to see effect on “NOW” mesument angle.
2. On Large vessels the water may be dragged at an angle to the ship. This can be seperately adjusted by uncoupling the two parameters for STW and SOG, and then adjusting the two parameters until the Angle is near zero



2. The DL2 will measure this Installation angle over a longer time period and suggest the value to enter. Each time a sea test is performed a installation angle will be shown on the right (in green). Pressing the recomended button will enter the recomended value into the installation angle setting, alternatively the value can be adjusted manually.

The user can select the SOG or STW value by touching that area on the left, the sea test angles shown will then correspond to that parameter.

The angle for STW is most accurate after a sea test of 2 legs, The SOG value should be accurate at all times when compared to GPS values.

Experience has shown that fine adjustment of this parameter has a significant effect on the accuracy of the transversal speed at low speeds.

Calibration, Speed

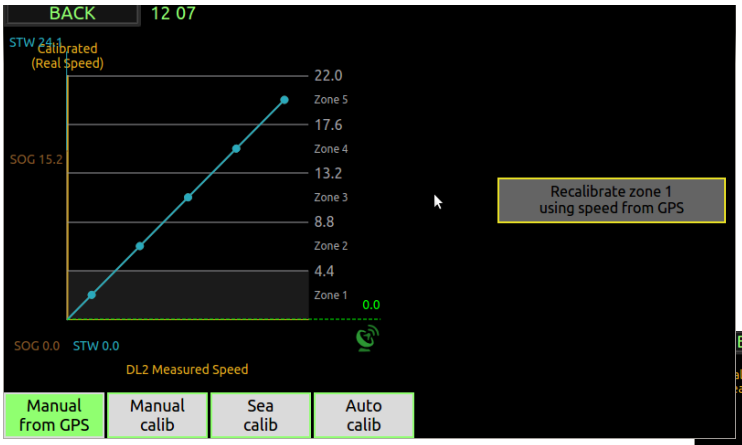
The DL2 system measures 2 parameters; Speed Over Ground (SOG), and Speed Through Water. Both these need calibrating , and calibration values may be slightly different for each. SOG can be calibrated in two ways. (manual and sea test). Once correctly calibrated, the system will use the secondary sensors to ensure that any small devaitions from the main calibration of speed are compensated. This results in a stable calibration set , that should not require adjustment. STW should be calibrated by sea test. But temporary values can be entered using the manual calibration methods.

The **approved way** of speed calibration is performed by sailing on opposite courses to get an accurate value. This is performed in a 'SEA TEST' It is typical that the user may perform a manual calibration in the period before a sea test. This can be performed with the aid of GPS (if available) or manually by entering the known speed from a GPS and the current measured speed.

Step 2a. Manual speed calibration/adjustment:

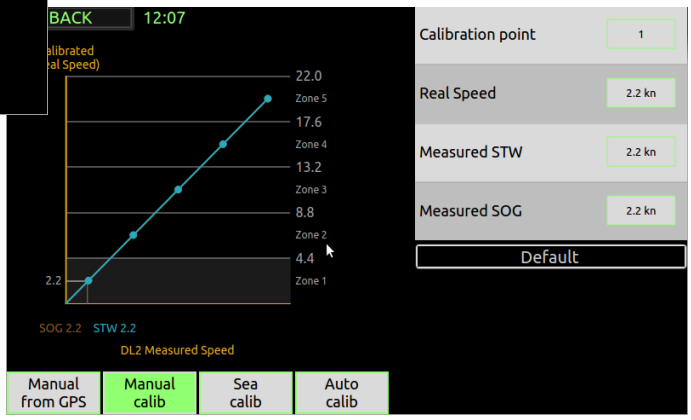
The user enters speed values directly into the calibration table by comparing to other equipment, such as GPS. This can also be used to adjust values. The calibration table is split into five 'real speed' zones. It is not possible to calibrate more than one point within each zone. It is important that at least one high speed zone is calibrated, however the other zones will automatically adjust if they have not been calibrated before. The scale of the real speed on the table is set by the maximum speed of the vessel. This and other important parameters can be entered in the DL2 setup menu.

To use the GPS calibration, a GPS Speed signal must be connected to the systems input (Either via 'NMEA (IEC61162-1) or LAN (IEC61162-450). This is recomended. The GPS speed information will be used as a quality control throughout the system. Sail the vessel within the speed limits of the zone to be calibrated, and when sailing at a stable heading and speed, in a low current area. Press the use current. The current GPS speed value will then transfer to the cuurent zone within the table.



To manually adjust the calibration point, select the 'Manual calib' button. Use the buttons on the right to select a speed zone and then enter the speed value displayed that is measured by the system, and the actual current speed.

Each calibration zone can have 3 points. Manual, typed in value



Sea Test, Calibrated by 2 leg sea test
Default. No calibration is entered in this point so the system works out the most likely based on the other pioints.
The point in use can be selected using the lower button on the right.

SEA TEST (SPEED CALIBRATION):

The Sea test method of calibration takes account of water current, and drag of the water by the vessel (that may cause lower measurements for STW) This should be performed when the vessel is new, the sensor is changed, or if the calibration data is questioned or deemed low quality by the systems internal control systems. (See status page)

The vessel is made to sail a known distance and course in both directions. This to remove any water current factors from the speeds. If a current is present, the 1st leg may show a different speed to the 2nd leg, however by sailing in opposite directions, the average will be correct.

SEA TEST METHOD:

Find a time and area with low sea state and low wind. In an area where the depth is <120m and where there is little or no current .
Plot a line on the chart, that will take minimum 3 minutes to sail. (For a calibration at 15 knot you will need a distance of at least 0.75 nm

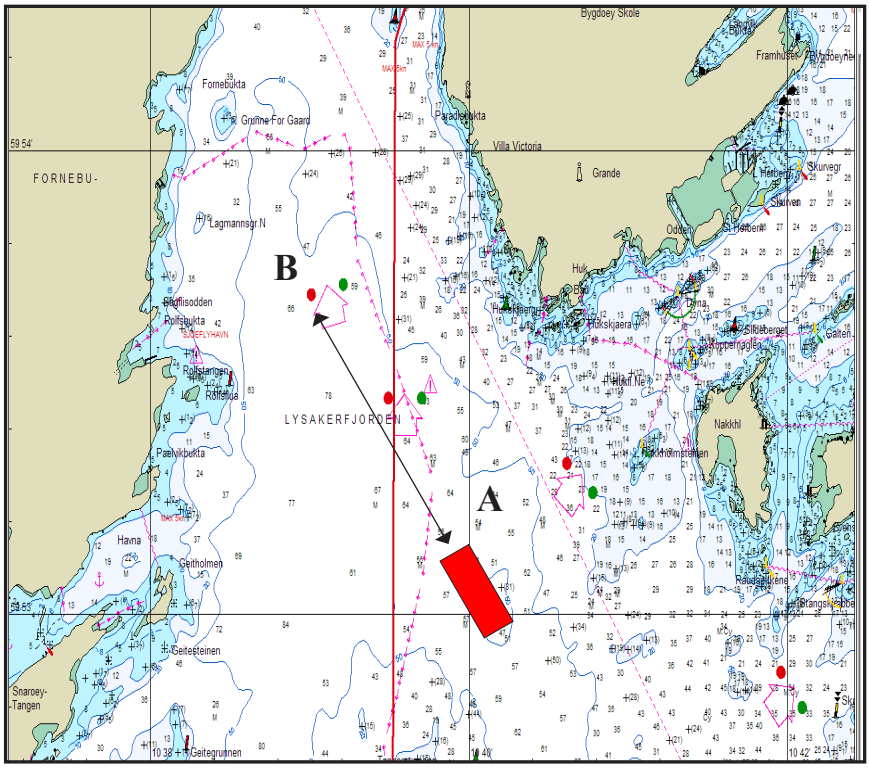
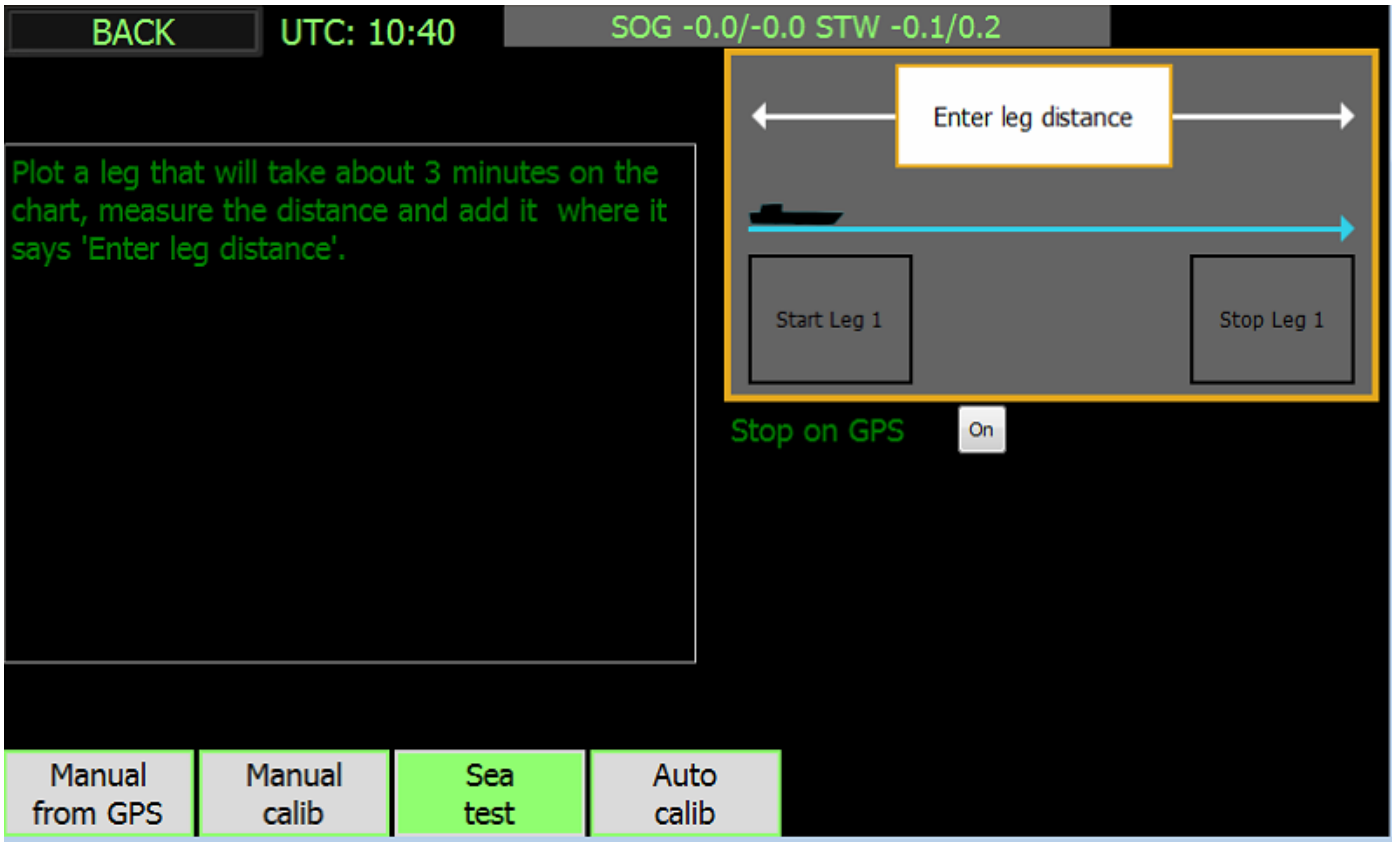


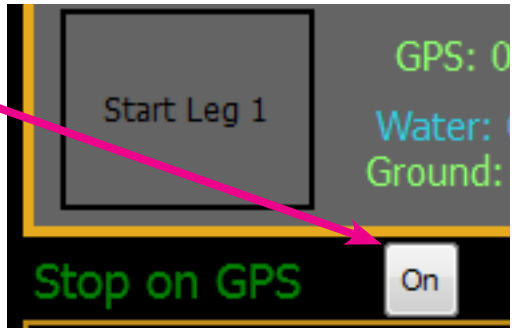
Figure shows plotting a calibration path on the chart.

The leg should take at least 3 minutes to sail (distance can be shorter when sailing slowly). Depth should be < 120 m to ensure that bottom track also calibrates correctly.

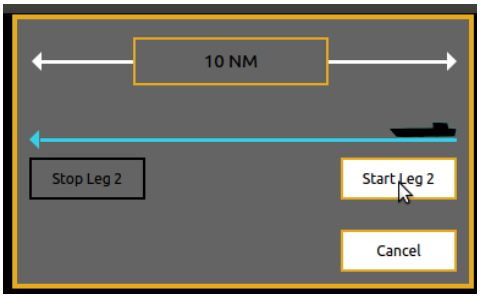
On the ‘SEA TEST’ calibration page
Enter the calibration leg distance into the middle field, and then sail along the line at a constant speed, pressing the “Start Leg 1” and “Stop Leg 1” at the beginning and end as instructed.



If the system has GPS on an input (VTG) then the system can be made to automatically stop the leg when the desired distance has been sailed. In this case it is not necessary to sail exact legs but just make sure leg 2 is parallel and in the same area.



Turn the vessel and perform “Leg 2” along the same line in opposite direction in the same speed.



If the resulting factors look correct, click ‘Save’ to transfer the data into the calibration number on the right.

If you wish to perform a second calibration at another speed, move to the next calibration number and repeat.

GPS The distance the vessel has sailed based on the GPS input
Water, the distance the vessel has sailed through water based on the current calibrations (this will be more or less than GPS depending on the water current)
Ground, The distance sailed over the sea bed, based on the current calibrations.
These values are good for validation of the systems accuracy, Ground and GPS should be the within 2% E.g. GPS=1.000 Ground = 0.980 to 1.020

Avg measured STW. The Water Speed measured in leg
Avg measured SOG. The bottom Speed measured in leg
Calcul real speed. The Real speed calculated by distance set / time taken
GPS AVG the average speed during the leg (Max and Min are below) This should be within 0.2 kn the real speed, if not the vessel has not sailed evenly.
Leg Validity. % of accepted measurements. This will fall if quality is bad or the bottom is lost. And will change colour. If red or orange, redo the calibration.

Note: The stored calibration settings may be overwritten in some software upgrades or if master reset is performed. We advise recording the values somewhere, just in case.

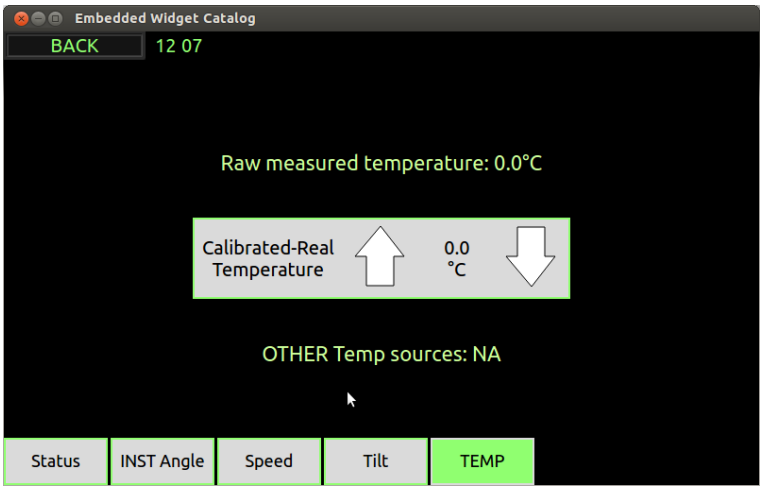
Doppler systems typically have a calibration factor within 10 % i.e. measured 9 kn, real 10 kn.

During and after each leg a distance will be shown in 0.001NM resolution. This shows the measured distance using the current calibrated values. This information can be used to measure the performance of the system. The SOG (Brown) should be within 2% of the set distance on each leg. The STW should be within 2% on the average of 2 legs (These percentages can only be meausred after at least one succesful calibration

Calibration, Temperature

Speed sensors have a temperature sensor placed close to the front face of the transducer. This is designed to measure the water temperature. Although adjusted at the factory, In some installations the heat generated by the sensor may slightly change the temperature sensor offset. This can be adjusted using the temperature calibration page.

The Calibration has two points, one below 10 degrees and 1 above 10 degrees. Enter correct temperature and the current measured temperature.



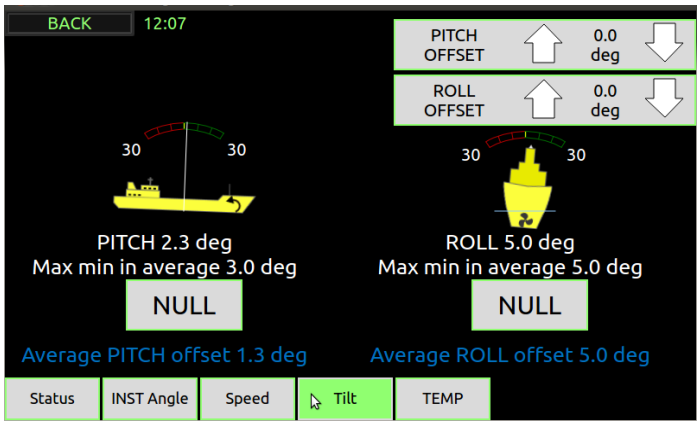
Calibration, Tilt

The sensor includes a gravity based sensor to measure the motion of the vessel. This is used to compensate the measured speed as the vessel pitches and rolls. Rapid measurements allow the system to compensate for tilt and acceleration.

The sensor is calibrated at the factory, but if the user wishes to use the tilt values, the sensor axis, may need to be rotated to fit the vessel. This is done by by nulling the sensor when the vessel is trimmed to zero pitch and zero roll.

This is done by using the Tilt Calibration screen. This screen shows the current tilt and the amount of movement of the vessel. This should be nulled in harbour.

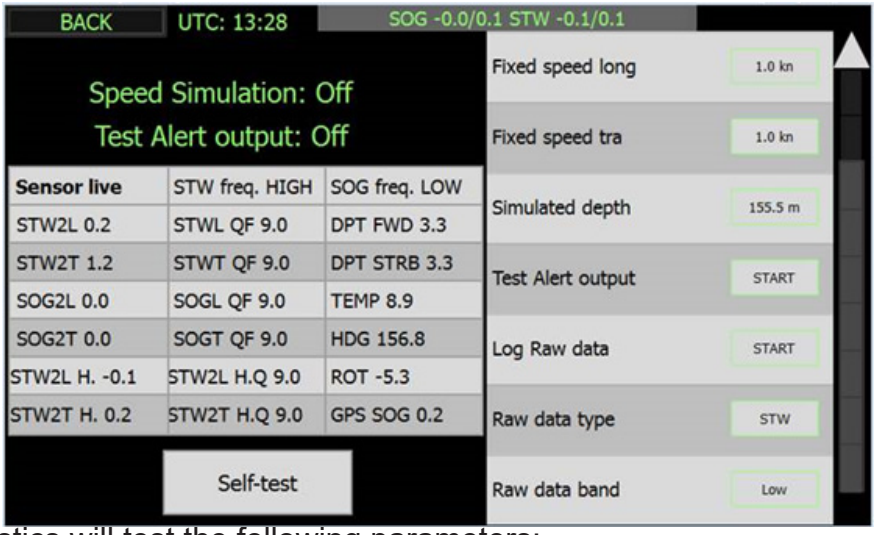
The tilt sensors can be nulled using the null button on the calibration screen. If the vessel is listing, the user can add the actual list as an offset calibration. The tilt sensor is used for correction of the speed due to heavy rolling of the vessel. It has not been approved as an inclinometer, and is therefore not reported out of the system.



CHAPTER 4: DIAGNOSTICS

The DL2 is a Doppler speed log system with 4-6 PCBs (depending on option choices), a significant amount of cabling, an acoustic sensor and a hull mounting. All of these elements can fail, and SKIPPER has strived to make the system detect as many problems with these units as possible automatically. If the system does show signs of measuring wrongly, do the following:

- Recycle the power (The DL2 has no power switch, use power input switches)
- Check the calibration
- Check the self diagnostics



The diagnostics will test the following parameters:

- NMEA outputs
- Communication to the sensor
- Sensor Receiver functionality
- Internal voltages
- Temperature
- Other internal parameters

If it finds an error, . Press the SKIPPER Logo on the left of the test with error and check which parameters are not approved. If this gives no help, contact SKIPPER service or your local dealer. A full list of SKIPPER dealers is available on www.skipper.no.

This page allows diagnostic testing, a speed simulation (forcing the sensor to simulate a speed. an alert simulation and some parameters adjustments), If the sensor is not attached, the source can be changed to the JB70 electronic unit , or to an input GPS. When active an S will be shown on screen.

The diagnostics page is under continuous development and may change in software upgrades.

AVAILABLE OPTIONS IN THE DIAGNOSTIC PAGE

Simulators

Speed

In this page it is possible to set a fixed speed and to send this to the sensor. This will result in the speed being presented on all displays and outputs. This mode is a full simulator and will verify that all electronics and processing in the system are operational. When active an orange ‘S’ will show on screen.

Alert

By pressing the alert simulator a typical alert will become active. this can be acknowledged as normal, and will disapear when the simulator is removed.

If the received data does not seem to be correct, it is possible to tune the system . The system has 3 operational modes

1. Shallow water <3m, The system adjusts the sampling length to the minimum available. at some stage the bottom factor may interfere.
2. Deeper water >3-40m, The system will adjust the sample length for bottom and water to maximalise the accuracy
3 Very deep water>80m The bottom track (SOG) switches to a long distance mode. In this mode the system may be susceptable to noise if there is rapid acceleration of the vessel. (small vessels are most susceptable)

If the system is cutting out occasionally, this could be related to acoustic interference. with a usb stick inserted, the system can be made to logg a deeper raw data to the stick. these files can be sent to skipper for analysis, or viewed using the tools in the skipper service software. set the raw data type to the parameter with problems and press start. The system will present the GPS data while this function is in use to prevent interference with navigation. This data should be collected when the vessel is experiencing the issue.
if the system has problems stopping this function, a restart of the electronic unit may be required.

In coastal areas it is not uncommon to find a layer of warmer fresher water on top of a lower colder water. These layers can slide across each other in different directions and if the sensor samples across this layer its result will be wrong. For this reason the default is to measure as close to the vessel as possible to avoid this situation.

Currents in this lower area is often less than at the surface, if the STW reading is moved further from the vessel then the current value will reflect that area, not the area influencing the vessel.

Logging data: If you require external help to solve a problem Data can be logged and sent to service@skipper.no. Placing a USB stick in the JB70 unit will start the logging. You can also use the free SKIPPER service software available at www.skipper.no to log via the network port.
In this case, connect a PC via LAN. start the communications button, and log on the UDP terminal. To get the most out of this data, turn on the DIAG sentence in the communications setup for UDPM on the display. The files generated, both in LAN logging and USB, log the data currently being sent on the UDPM output. It is therefore important to turn on the DIAG output on the UDPM channel to ensure the sensor and relevant input data is also logged.

OTHER SETUP PAGES

Other available configuration pages are for first time setup of the IO and vessel features. These pages are password protected to reduce the risk of user error. More information of these is available in the Installation manual.
CU-M001 SETUP - Display communication setup. *
JB70 SETUP - Electronic unit communication setup. *
DL2 SETUP - DL2 sensor vessel specific setup.*
COMMUNICATION SETUP - Setup of NMEA input/Output. *
AUX SETUP - Setup of AUX input/output. *

CHAPTER 5: OPTIONS ON THE SYSTEM

The system has the following pay options.

SYNCHRONISATION

The Aux input can be used to stop/Mute the sensor. If just for a short time, the data quality is not reduced, if for a longer time the on screen data will become invalid.
While the system is being muted an M symbol will show on the screen.
Mute is activated via Aux input or NMEA command when this mode is activated.

1% ACCURACY

The signal analysis is changed and extra decimals are added to the outputs to give a better accuracy and resolution. 1% accuracy requires careful calibration in very calm conditions, and may require all 5 calibration points.

ACTIVATION OF OPTIONS

It is possible to activate some options by entering a code number in the “DL2 Setup” . In the bottom left of the screen the screen, select options, and enter the code to enable the option you require. The option will be activated, and can then be enabled or disabled by the user. These codes can be optained from SKIPPER Electronics directly or via your distributer. To get this code you must supply the serial number of the DL2 system (available on the JB70D2 setup menu) and a code unique to your system will be sent in return (fees may apply). If the system is supplied with options activated, the code number for this option will be labelled on the JB70 unit close to the serial number label

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