FURUNO

OPERATOR'S MANUAL

DOPPLER SPEED LOG

Model **DS-85**

IMPORTANT NOTICES

General
- This manual has been authored with simplified grammar, to meet the needs of international users.
- The operator of this equipment must read and follow the instructions in this manual.
  Wrong operation or maintenance can void the warranty or cause injury.
- Do not copy any part of this manual without written permission from FURUNO.
- If this manual is lost or worn, contact your dealer about replacement.
- The contents of this manual and the equipment specifications can change without notice.
- The example screens (or illustrations) shown in this manual can be different from the screens you see on your display. The screens you see depend on your system configuration and equipment settings.
- Save this manual for future reference.
- Any modification of the equipment (including software) by persons not authorized by FURUNO will void the warranty.
- The following concern acts as our importer in Europe, as defined in DECISION No 768/2008/EC.
  - Name: FURUNO EUROPE B.V.
  - Address: Ridderhaven 19B, 2984 BT Ridderkerk, The Netherlands
- All brand and product names are trademarks, registered trademarks or service marks belong to their respective holders.

How to discard this product
Discard this product according to local regulations for the disposal of industrial waste. For disposal in the USA, see the homepage of the Electronics Industries Alliance (http://www.eiae.org/) for the correct method of disposal.

How to discard a used battery
Some FURUNO products have a battery(ies). To see if your product has a battery, see the chapter on Maintenance. If a battery is used, tape the + and - terminals of the battery before disposal to prevent fire, heat generation caused by short circuit.

<u>In the European Union</u>
The crossed-out trash can symbol indicates that all types of batteries must not be discarded in standard trash, or at a trash site. Take the used batteries to a battery collection site according to your national legislation and the Batteries Directive 2006/66/EU.
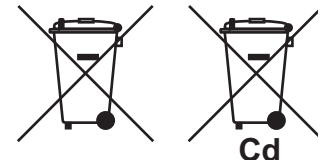
<u>In the USA</u>
The Mobius loop symbol (three chasing arrows) indicates that Ni-Cd and lead-acid rechargeable batteries must be recycled. Take the used batteries to a battery collection site according to local laws.
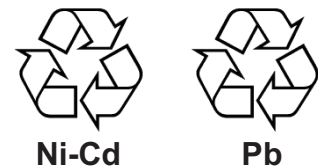
<u>In the other countries</u>
There are no international standards for the battery recycle symbol. The number of symbols can increase when the other countries make their own recycle symbols in the future.

⚠ **SAFETY INSTRUCTIONS**

⚠ **WARNING**	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

⚠ Warning, Caution	🚫 Prohibitive Action	❗ Mandatory Action

WARNING

⚡	**ELECTRICAL SHOCK HAZARD** **Do not open the equipment.** Only qualified personnel are permitted to work inside the equipment.
❗	**Immediately turn off the power at the switchboard if water leaks into the equipment or an object is dropped into the equipment.** Continued use of the equipment can cause fire or electrical shock. Contact your dealer for service.
🚫	**Do not place liquid-filled containers on the top of the equipment.** Fire or electrical shock can result if the liquid spills into the equipment.
🚫	**Do not disassemble or modify the equipment.** Fire, electrical shock or serious injury can result.
🚫	**Keep the equipment away from rain and water splash.** Fire or electrical shock can result if the rain or water gets into the equipment.
🚫	**Do not operate the equipment with wet hands.** Electrical shock can result.
❗	**Keep heater away from equipment.** A heater can melt the equipment's power cord, which can cause fire or electrical shock.
❗	**Use the proper fuse.** Fuse rating is shown on the equipment. Use of a wrong fuse can result in damage to the equipment and cause fire.

CAUTION

Do not use the equipment for other than its intended purpose.

Improper use of the equipment can result in personal injury or equipment damage.

NOTICE

Turn off the equipment immediately if you feel it is abnormal.

Turn off the power from the switchboard if the equipment is emitting strange noises or becomes excessively hot. Contact your dealer for advice.

Observe the following useable ambient temperature ranges to prevent malfunction.

Transducer: -5°C to +35°C   All other units: -15°C to +55°C

Do not place objects around the units of the system.

Overheating may result.

Do not power the system when the transducer is in air.

The transducer may become damaged.

Handle all units carefully.

Damage can lead to corrosion.

Do not use chemical cleaners (alcohol, acetone, benzine, etc.) to clean the equipment.

Chemical cleaners can remove paint and markings. Use only a soft, dry cloth. For stubborn dirt, use a soft cloth moistened with water-diluted mild detergent.

When the vessel is dry docked, remove marine life from the transducer.

Remove marine life to maintain good sensitivity.

Do not paint the transducer face. Further, handle the transducer with care.

Paint will affect equipment performance, and rough handling will damage the transducer.

TFT LCD

The high quality TFT LCD displays better than 99.99% of its pixels. Some pixels may not appear or are blacked out. However, this is not a sign of malfunction; it is an inherent property of the LCD.

WARNING LABEL

A warning label is attached to the Distributor Unit and Transceiver Unit.
Do not remove the labels. If a label is missing or is illegible, contact a FURUNO dealer or agent about replacement.

⚠ WARNING ⚠
To avoid electrical shock, do not remove cover. No user-serviceable parts inside.
⚠ 警告 ⚠
感電の恐れあり。
サービスマン以外の方はカバーを開けないで下さい。内部には高電圧部分が数多くあり、万一さわると危険です。

Name: Warning Label (1)
Type: 86-003-1011-3
Code No.: 100-236-233-10

REMARKS ON USAGE

Principle of operation

The Doppler speed log measures ship's speed by using the Doppler Effect, which is observed as a frequency shift resulting from relative motion between a transmitter and receiver or reflector of acoustic or electro-magnetic energy. A common example of the Doppler Effect is a train. When a train is approaching, the whistle has a higher pitch than normal. You can hear the change in pitch as the train passes.

The DS-85 has a pair-beam, one directed in the fore direction and the other in the aft direction, which emits ultrasonic waves at an angle of θ to the waterline towards ship's fore and aft directions. The frequency of the received signal is then compared with that of the transmitted frequency to measure Doppler shift to calculate ship's speed.

The relative motion causes the Doppler shift and the ultrasonic waves reflected at the water mass (plankton or any underwater objects) are received at the frequency of fr = fo + fd where fd is the number of frequency shifts counted at the receiver circuit. To calculate ship's speed, the following formula is used.

$$V = fd/fo \cdot c/\sin\theta$$
c: Underwater velocity

Note that the sound velocity in water changes with water temperature and water pressure but the DS-85 readout is automatically compensated for change by using a temperature sensor.
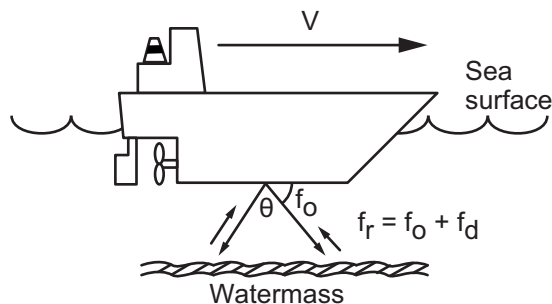
Remarks on usage

The DS-85 measures ship's speed by detecting the Doppler shift frequency of the echo reflected by a water mass (water layer containing plankton and other micro-organisms) located within the measuring area, which is usually about 2 m. In some instances, however, no signal is returned because of too few plankton in the sensing depths. This phenomenon can occur in particular areas in particular seasons. The probable cause is the plankton are lying in deep water because an ice-melted cold water mass covers the sea surface. Similar cases may also occur in a freshwater lake. Under these circumstances the DS-85 will not show the correct ship's speed.

Conditions affecting accuracy

(with ref to IMO A.824/3.3)

The Doppler speed log DS-85 is designed for reliable and accurate performance through FURU-NO's long experience and advanced technology. It operates on the best choice of system frequency and power output. As far as the sonic energy is used, the performance (accuracy) may be reduced or even lost in the following conditions:

- rough weather (may be sea state 6 or higher severity).
- improper location of sensor; for example, too close to the propeller, thrusters, drain tubes or echo sounder's transducer.
- depth under the keel if less than 3 m.
- Pitch and roll is ±10% or more.

Take care to the transducer location

The transducer may be damaged if it hits the dry dock blocks. Take the following measures to prevent damage to the transducer when the ship is put in drydock.

1. Before delivering the ship, draw up a suitable docking plan taking into account the dimensions and location of the transducer. Store the plans aboard the ship.

2. Place the dry dock blocks according to the plan.

3. Have a diver check the position between the transducer and the blocks **before removing the water**. Confirm that the transducer will not touch the blocks.

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FOREWORD

Foreword

Thank you for purchasing the FURUNO DS-85 Doppler Speed Log. We are confident you will discover why FURUNO has become synonymous with quality and reliability.

Since 1948, FURUNO Electric Company has enjoyed an enviable reputation for innovative and dependable marine electronics equipment. This dedication to excellence is furthered by our extensive global network of agents and dealers.

Please carefully read and follow the safety information and operating and maintenance instructions set forth in this manual before attempting to operate the equipment and conduct any maintenance. Your Doppler speed log will perform to the utmost of its ability only if it is operated and maintained in accordance with the correct procedures.

This equipment is designed, produced and documented by FURUNO Electric Co., Ltd., complying with ISO 9001 standards as certified by the Lloyd's Register of Quality Assurance System.

Features

The FURUNO DS-85 displays ship's speed relative to water, using the Doppler effect; ship's speed is measured by detecting the Doppler shift frequency from the signal returned from the water mass.

The output is interfaced with ARPA, AIS, and other shipborne equipment, in IEC 61161-1/-2-450 format.

The main features of the DS-85 are:

- Measures ship's speed through the water.
- Pair-beam system effectively reduces error caused by pitching. The transducer assembly symmetrically emits two sonic beams, one fore and the other aft. By averaging the Doppler shift in both directions accurate speed data is available under rough sea conditions.
- Speed and distance information on the LCD display.
- When the speed measurement is abnormal, the speed value from a navigation device can be displayed.
- Conforms to the following standards: IMO A.824(19), as amended by MSC.97(72), IMO A.694(17), IEC 61023 Ed. 3, IEC 60945 Ed.4, IEC 61162-1 Ed.5, IEC 61162-1 450 Ed.2, IEC 61162-2 Ed.1, IEC 62288 Ed.2, IEC 62923-1 Ed.1, EC 62923-2 Ed.1.

Program numbers

Unit	Prog. No.
Display Unit (DS-8500)	6550304-01.xx
Distributor Unit (DS-8510)	6550308-01.xx
Transceiver Unit (DS-8520)	6550313-01.xx

"xx" denotes minor version number.

SYSTEM CONFIGURATION

```
                              ┌─────────────────┐
                              │  DISPLAY UNIT   │
                              │     (Main)      │
                              │    DS-8500      │
                              └─────────────────┘
```

——— : Standard supply
- - - - : Optional or local supply

```
100-115/200-220 VAC
1Ø, 50/60 Hz
```

┌─────────────────┐
│   DIMMER   │
│   CONTROLLER   │
│   RD-502   │
└─────────────────┘

┌─────────────────┐
│ Nav Equipment │
│   (LAN)   │
│ IEC61162-450   │
└─────────────────┘

┌─────────────────┐
│ Nav Equipment │
│ (POWER FAIL)   │
└─────────────────┘

┌─────────────────┐
│   External KP   │
│   (EXT KP IN)   │
└─────────────────┘

┌─────────────────┐
│ DISTRIBUTOR   │
│   UNIT   │
│   DS-8510   │
└─────────────────┘

┌─────────────────┐
│   Sub display   │
│   RD-50 or   │
│   RD-20 or   │
│   DS-8500   │
└─────────────────┘

┌─────────────────┐
│   Sub display   │
│   RD-20 or   │
│   DS-8500   │
└─────────────────┘

┌─────────────────┐
│   REMOTE   │
│   CONTROLLER   │
│   RD-501*1   │
│   or   │
│   DIMMER   │
│   CONTROLLER   │
│   RD-502*1   │
└─────────────────┘

*1: Not available for DS-8500

┌─────────────────┐   ┌──────────┐   ┌──────────┐
│ RANGE   │   │ ANALOG   │   │ DIMMER   │
│ SELECTOR*2   │   │ DISPLAY │   │ for   │
│   │   │ UNIT   │   │ ANALOG   │
│ MF22R-1 or   │   │   │   │ DISPLAY │
│ MF22R-2   │   │   │   │ UNIT   │
└─────────────────┘   └──────────┘   └──────────┘

*2: Range Selector may or may not be connected.

100-115/200-220 VAC
1Ø, 50/60 Hz

┌─────────────────┐
│ Nav Equipment │
│ (SYSTEM FAIL*3)*│
└─────────────────┘

┌─────────────────┐
│ Nav Equipment │
│   (LOG OUT*3)   │
└─────────────────┘

┌─────────────────┐
│ Nav Equipment │
│ (Serial, Input) │
│ - IEC61162-1 × 1│
│ - IEC61162-1/2 × 1│
└─────────────────┘

┌─────────────────┐
│ Nav Equipment │
│(Serial, Output) │
│ - IEC61162-1 × 7│
│ - IEC61162-1/2 × 1│
└─────────────────┘

┌─────────────────┐   ┌──────────┐   ┌──────────┐
│ RANGE   │   │ ANALOG   │   │ DIMMER   │
│ SELECTOR*2*3   │   │ DISPLAY │   │ for   │
│   │   │ UNIT*3   │   │ ANALOG   │
│ MF22R-1 or   │   │   │   │ DISPLAY │
│ MF22R-2   │   │   │   │ UNIT*3   │
└─────────────────┘   └──────────┘   └──────────┘

┌──────────────────────────────────┐
│ Analog Current Signal Output*3   │
└──────────────────────────────────┘

┌──────────────────────────────────┐
│ Analog Current Signal Output*3   │
└──────────────────────────────────┘

┌──────────────────────────────────┐
│ Analog Voltage Signal Output*3   │
└──────────────────────────────────┘

*3: LIF board is required in the distributor unit.

┌─────────────────┐
│ JUNCTION BOX   │
│   CI-630   │
└─────────────────┘

┌─────────────────┐   ┌─────────────────┐
│   TRANSDUCER   │─────────│ TRANSCEIVER   │
│   DS-8530   │   │   UNIT   │
│   │   │   DS-8520   │
└─────────────────┘   └─────────────────┘

Category of units

Display Unit	Protected from the weather
Distributor Unit	Protected from the weather
Transceiver Unit	Protected from the weather
Transducer	Submerged or in continuous contact with seawater

1. OPERATION

1.1 Controls Overview

No.	Name	Function
①	BRILL	Shows the brilliance pop-up window.
②	DISP	• Changes the display mode. • Closes all active menu windows and returns to the last used display screen.
③	MENU/ESC	Short press: • Opens/closes the main menu. • Goes back to the main menu from a sub menu. • Closes the settings window and cancels any changes. Long press: • Shows the alert list.
④	POWER	• **Short press**: Turns the power on. • **Long press**: Turns the power off.
⑤	DAY/NT	Switches between Daytime display and Nighttime display.
⑥	ENT	• Opens the menu for the highlighted item. • Applies the settings/options selected.
⑦	CursorPad (◄, ▲, ►, ▼)	• Highlights a menu item/setting. • ▲, ▼: Set numerical value in setting windows. • ◄, ►: Move cursor in setting window.

1.2 How to Turn the Power On/Off

Press the **POWER** button (⏻) to turn the equipment on. The splash screen (see right figure) appears when the start-up process is complete. The serial numbers and program numbers are shown for each unit in the system. The ROM and RAM of each unit is checked for proper operation, and the check results are shown as "OK" or "NG" (No Good). When "NG" appears, the equipment cannot start and the message "Not Connected" is displayed. Try resetting the power to restore normal operation. If normal operation cannot be restored, contact your dealer for assistance.

To turn the power off, press and hold the **POWER** button (⏻).

Note: Keep the DS-85 powered continuously, unless it fails. Turning off the DS-85 may cause an error in associated equipment.

1.3   How to Adjust the Brilliance

You can adjust the brilliance for the display and the panel as follows:

1. Press the **BRILL** key to show the brilliance pop-up window.

Daytime display   *Nighttime display*
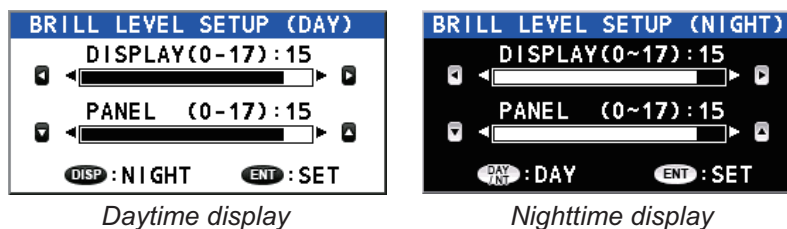
The default brilliance setting for both [DISPLAY] and [PANEL] is [15].

2. **Display brilliance**: Press ◄ to decrease the display brilliance, or press ► to increase the display brilliance.
    Note: With the brilliance pop-up window displayed, you can also adjust the display brilliance with the **BRILL** key.

    Panel brilliance: Press ▼ to decrease the panel brilliance, or press ▲ to increase the panel brilliance.

3. Press the **ENT** key to apply the new settings.

Note: The brilliance pop-up window disappears after approximately four seconds if there is no interaction from the user.

1.4   How to Switch Between Daytime and Nighttime Displays

A daytime display and a nighttime display are provided for optimal viewing under any lighting conditions. Press the **DAY/NT** key to switch between the two displays.

Note: You may use either display at any time of the day, however the daytime display may be too bright for nighttime use, depending on local conditions.
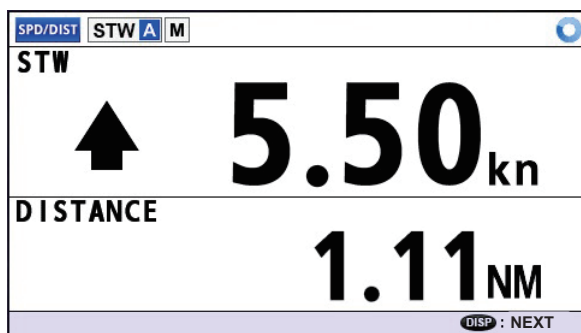
Daytime display   *Nighttime display*

The color of the background and the character(s) in display icons (other than the display mode icon) change according to the display type. The illustrations used in this manual are made with the daytime screens.

1.5 Display Overview

As shown in the figure below, the DS-85 display is made up of three major parts, status bar, details display, and guidance/alert info.

Status bar

Details display

Guidance/alert info*

* Example alert info display
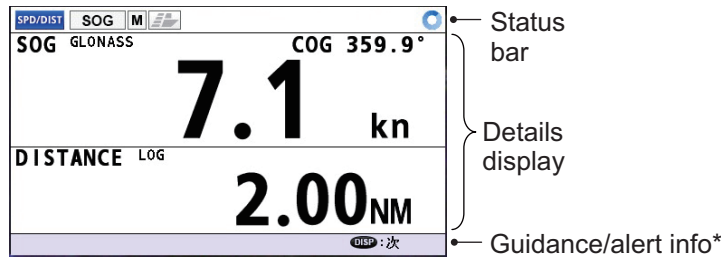
Status bar

The status bar is shown on every screen, and gives you a quick, at-a-glance view of the DS-85's current status. Icons and indications shown in the status bar are described in the table below.

Icon(s)	Icon name	Description
SPD/DIST SPEED DIST	Display mode	Indicate the display mode. [SPD/DIST]: Speed data and distance log. [SPEED]: Speed mode [DIST]: Distance log
STW SOG STW A SOG A	Speed measurement method	Show speed measurement method. [STW]: Speed Through the Water (Doppler calculation). [SOG]: Speed Over the Ground. [STW A]: Speed Through the Water, automatic selection. [SOG A]: Speed Over the Ground, automatic selection.
M S	Display unit function	Show the function of the display unit. [M]: Main display [S]: Sub display
	Ship speed notification	The speed notification is active but the current speed does not meet the conditions of the speed notice. Does not appear on sub displays.
	Ship speed notification	The speed notification is active and the current speed meets the conditions of the speed notice. Does not appear on sub displays.
	Operational status	The icon rotates in a clockwise direction to indicate the equipment is working normally.
SIM TEST	Service mode icons	These modes are accessible only by service technicians. See the Installation Manual for details. The icons do not appear on sub displays.
	High temperature	High temperature detected at the transducer. Does not appear on sub displays.

Details display

The details for the selected display mode are shown in this section of the screen. See section 1.6 for display mode information.

Guidance/alert info

The guidance/alert info area mainly provides operating information for the current display. The contents of the guidance changes according to the display.

Alert info appears when an alert is generated. See Appendix 4 for alert information.

1.6   Display Modes

The DS-85 has five display modes: speed/distance log, speed (digital), speed (analog and digital indications), distance log, and alert display.

To select a display mode other than the alert display, press the **DISP** key successively. The mode changes in the sequence shown in the figure below.

To display the alert list display, long press the **MENU/ESC** key.

Speed/Distance Log   *Speed (digital)*   *Alert display (Hold MENU/ESC key to show.)*

Distance Log   *Speed (analog and digital)*
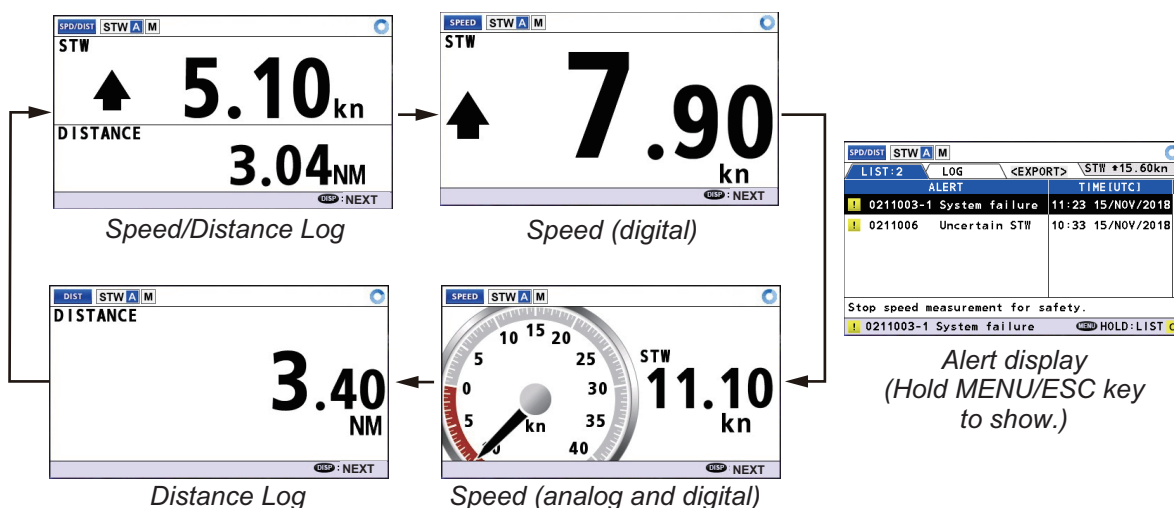
1.6.1   Speed/distance log display

The speed/distance log display shows the speed and distance log on a horizontal split screen, speed and vessel direction on the top, and the distance log on the bottom. The arrow indication to the left of the speed reading indicates the direction in which the vessel is moving. ⬆ for forward, ⬇ for reverse.

STW, distance display   *SOG, distance display*
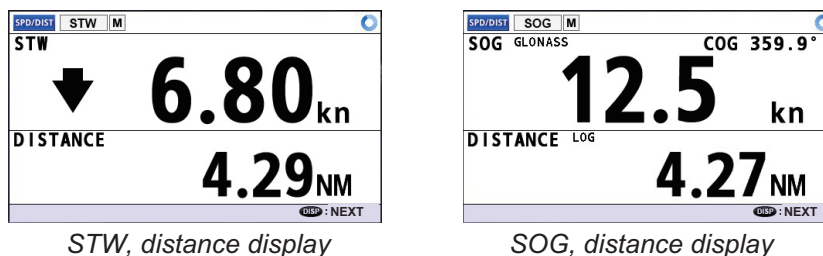
Note: In stormy weather, speed error may occur due to the effect of air bubbles. When this type of error occurs, the speed indication freezes and the background color of the speed unit becomes yellow. If the error continues for more than 30 seconds, the speed indication will be displayed as "- -.-" or - -.- -".
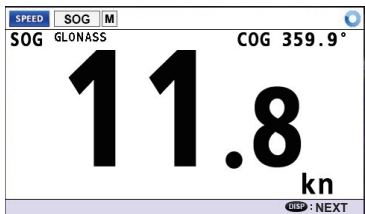
4

1.6.2 Speed display

The speed display shows the speed through the water or speed over the ground, in digital or both analog and digital formats.

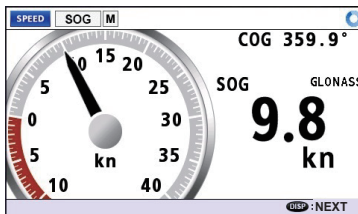*Digital speed display (STW)*
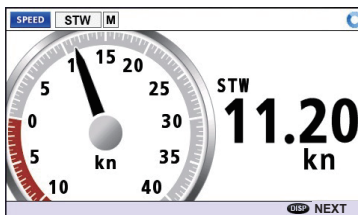
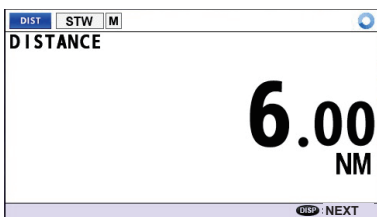*Analog/Digital speed display (STW)*
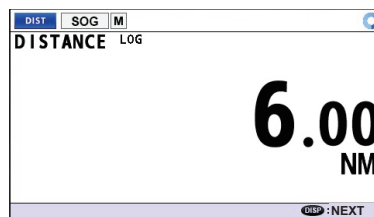
Digital speed display (SOG)

Analog/Digital speed display (SOG)

1.6.3 Distance log display

The distance log display shows the total distance during the current voyage. The distance is saved when the power is turned OFF, which allows you to keep track of consecutive trips.

Distance indication (STW)

Distance indication (SOG)

When the distance log exceeds 999999.99, "*99999.99" is shown.

Note: The value of speed through the water (STW) is not reflected in the distance indication. If the mode is [SOG] ([DISPLAY] menu→[MODE SELECT], see section 1.10.1), the accumulated distance based on the value of the speed through the water is displayed.

1.6.4   Alert display

The alert display consists of the active alert list and the alert log. For details, see section 2.5.

Use ◄, ► to switch between the alert log and alert list.
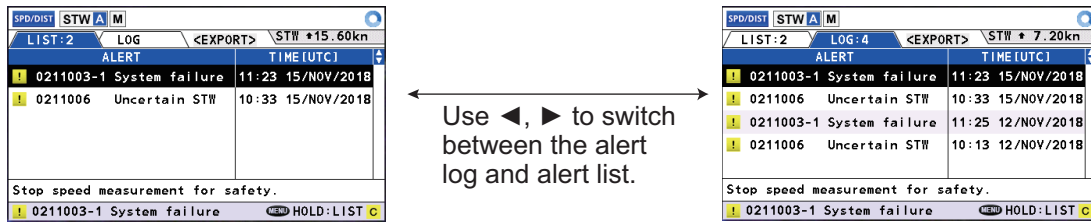
1.7   Menu Overview

You can access various functions for your DS-85 from the menu. The menu has a simple, easy to understand structure, as indicated in the figure below.

Main menu

Sub menu

Pop-up window
(options window, numeric data input window)
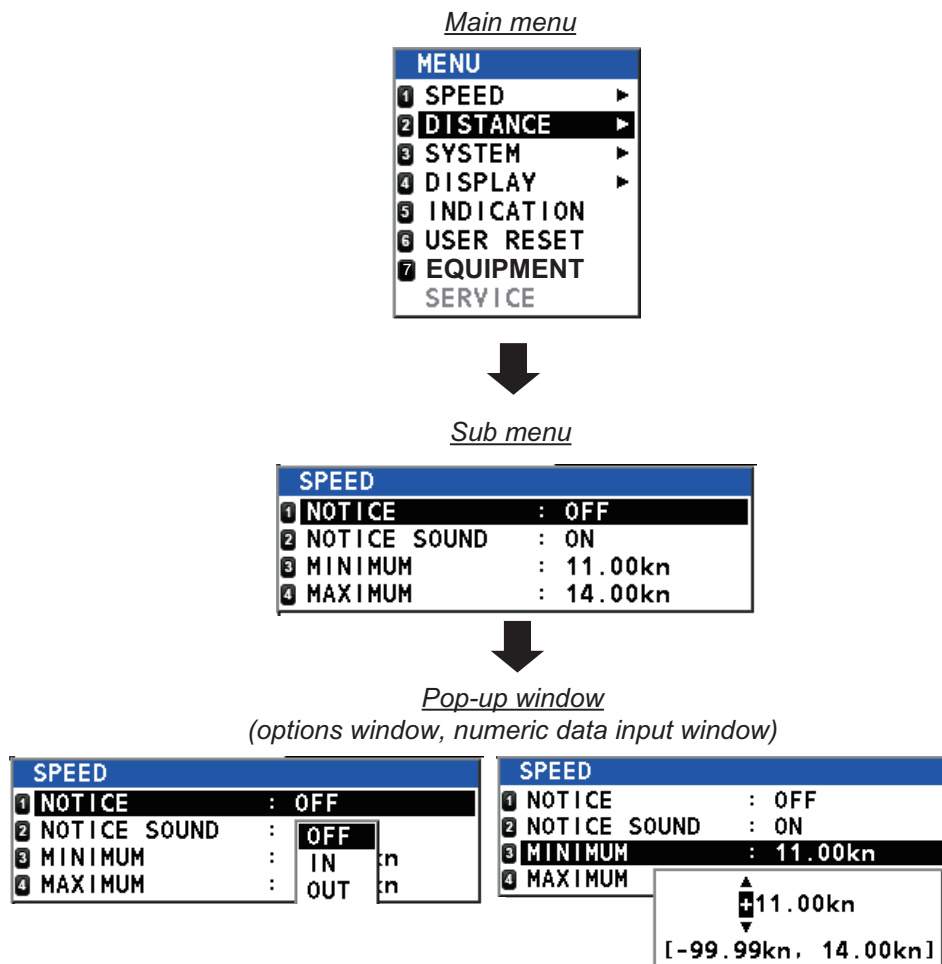
1.7.1   Menu operations

1. Press the **MENU/ESC** key to open the main menu.

2. Select an item, then press the **ENT** key to show the associated sub menu.

3. Select the setting to change, then press the **ENT** key. A pop-up window showing options or numeric data input controls appears depending on the menu item selected.

4. Do one of the following depending on the window type.
   <u>Options pop-up window</u>
   All options pop-up windows provide a list-type menu, which provides the available options in list form, as shown in the right-hand figure. Select the desired option with ▲ or ▼, then press the **ENT** key.

   <u>Numeric data input pop-up window</u>
   All numeric data input pop-up windows are of the meter-type menu, which cycles through the available options. The figure at right shows an example of the meter-type menu.
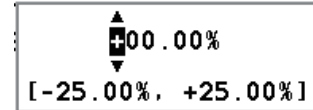
   1) Press ▲ or ▼ to change numeric value. ▲ to increase the value of the selected numeric, or ▼ to decrease the value. Where the highlighted character is "+" or "-", press either ▼ or ▲ to switch between the symbols.
   2) Press ► to move the selection cursor to the right, press ◄ to move the cursor to the left.
   3) Repeat steps 1 and 2 continue numeric input.
   4) Press the **ENT** key to apply the changes.

   To cancel the changes, press the **MENU/ESC** key.
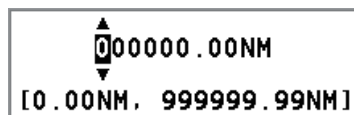
5. Press the **DISP** key to close the menu.

Note: For sake of brevity, this manual states "select [menu name]" instead of "press ▼ or ▲ to select [menu name]".

1.8   How to Set the Distance Indication

You can set the start distance to suit your needs. In this case, the distance log begins at the set distance.

1. Press the **MENU/ESC** key to open the main menu.

2. Select [2 DISTANCE], then press the **ENT** key.

3. Select [1 SET], then press the **ENT** key. The numeric data input pop-up window shown below appears.

4. Use the CursorPad to set the start distance as required, referring to "Numeric data input pop-up window" in section 1.7.1.
   The available setting range is [0.00 NM] to [999999.99 NM].

5. Press the **DISP** key to close the menu.

Note: The distance cannot be reset from the [6 USER RESET] menu.

1.9 How to Use the Speed Notice

The speed notice feature provides visual and aural (single beep) notifications when the ship's speed is within the range set or higher or lower than a given speed range.

1.9.1 How to set the speed notice

1. Press the **MENU/ESC** key to open the main menu.

2. Select [1 SPEED], then press the **ENT** key.

```
SPEED
1 NOTICE        : OFF
2 NOTICE SOUND  : ON
3 MINIMUM       : 11.00kn
4 MAXIMUM       : 14.00kn
```

3. Select [1 NOTICE], then press the **ENT** key. The options pop-up window shown right appears.

```
OFF
INSIDE
OUTSIDE
```

4. Select [OFF], [INSIDE] or [OUTSIDE], then press the **ENT** key.

   • [OFF]: Deactivates the speed notice.

   • [INSIDE]: The audiovisual notices are released when the speed is within the minimum and maximum speeds set.

   • [OUTSIDE]: The audiovisual notices are released when the speed is under the minimum speed or over the maximum speed set.

   Note: When both the minimum and the maximum speeds are the same, the audiovisual notices are released under the following conditions:

   • [INSIDE]: The minimum and maximum speed are lower than the current speed.

   • [OUTSIDE]: Current speed is lower than the minimum and maximum speed.

5. Select [3 MINIMUM], then press the **ENT** key.

```
    ▲
    ▯11.00kn
    ▼
[-99.99kn,  99.99kn]
```
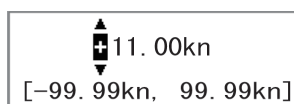
6. Use the CursorPad to set the minimum speed, referring to "Numeric data input pop-up window" in section 1.7.1.

7. Select [4 MAXIMUM]. Set the maximum speed to use, referring to step 6.

8. Set the maximum speed to use, referring to step 6.

9. Press the **DISP** key to close the menu.

When this feature is activated, the speed notification icon in the status bar changes according to notice status.

1.9.2 How to turn the aural notification on or off

1. Press the **MENU/ESC** key to open the main menu.

2. Select [1 SPEED], then press the **ENT** key.

3. Select [2 NOTICE SOUND], then press the **ENT** key. The options pop-up window shown right appears.

4. Select [ON] or [OFF], then press the **ENT** key.

5. Press the **DISP** key to close the menu.

The color of the speed icon turns blue, regardless of the speed notice setting.

1.10 DISPLAY Menu

The [DISPLAY] menu sets items such as key beep and system language.

```
DISPLAY
1 MODE SELECT    : AUTO
2 KEY BEEP       : ON
3 LANGUAGE(言語)  : ENGLISH
4 SPD METER SCALE: -10~40
5 SYM LOCATION   : LEFT
6 UNIT           : NM(kn)
```

1.10.1 How to set the source for speed data

To set the data source for speed data, do the following:

1. Press the **MENU/ESC** key to open the main menu.

2. Select [4 DISPLAY], then press the **ENT** key.

3. Select [1 MODE SELECT], then press the **ENT** key. The options pop-up window shown right appears.

4. Select the appropriate source, then press the **ENT** key.

   - [SOG]: Uses speed data input from connected navigation device. If speed data is interrupted for more than 30 seconds, the speed is shown as "--.-.kn".
   - [STW]: Speed is calculated internally. If speed data is interrupted for more than 30 seconds, the speed is shown as "--.--kn".
   - [AUTO]: Speed is calculated internally. However, if the DS-85 fails, the speed data (SOG) from the connected navigation device is used. If neither STW or SOG is available, the speed indication appears as "--.-" (SOG) or "--.--" (STW).

5. Press the **DISP** key to close the menu.

1.10.2 How to turn the key beep on or off

In the default setting, a beep sounds whenever a key is pressed. You can turn the beep on or off as follows.

1. Press the **MENU/ESC** key to open the main menu.

2. Select [4 DISPLAY], then press the **ENT** key.

3. Select [2 KEY BEEP], then press the **ENT** key. The options pop-up window shown right appears.

4. Select [ON] or [OFF], then press the **ENT** key.

5. Press the **DISP** key to close the menu.

1.10.3   How to change the display language

You can change the language in which the menu and pop-up windows are displayed.
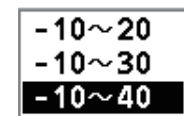
1. Press the **MENU/ESC** key to open the main menu.
2. Select [4 DISPLAY], then press the **ENT** key.
3. Select [3 LANGUAGE], then press the **ENT** key to show the language choices pop-up window.
4. Select the appropriate language, then press the **ENT** key.
5. Press the **DISP** key to close the menu.

1.10.4   How to change the analog speed meter scale

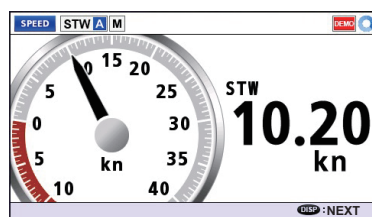You can change the analog speed meter scale to match ship's speed specifications.

1. Press the **MENU/ESC** key to open the main menu.
2. Select [4 DISPLAY], then press the **ENT** key.
3. Select [4 SPD METER SCALE], then press the **ENT** key to show the speed meter scale pop-up window.
4. Select the appropriate scale, then press the **ENT** key.
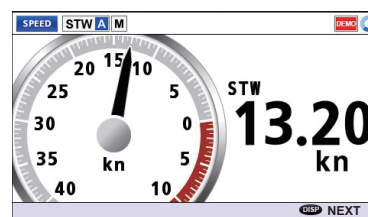5. Press the **DISP** key to close the menu.

1.10.5   How to change the direction of the analog speed meter pointer

You can change the direction of the analog speed meter pointer to move right or left.

1. Press the **MENU/ESC** key to open the main menu.
2. Select [4 DISPLAY], then press the **ENT** key.
3. Select [5 SYM LOCATION], then press the **ENT** key to show the speed meter pointer options pop-up window.
4. Select [LEFT] or [RIGHT] as appropriate, then press the **ENT** key.
    [LEFT]: The needle moves clockwise with ship's forward movement.
    [RIGHT]: The needle moves counter-clockwise with ship's forward movement.

[LEFT] option	*[RIGHT] option*

5. Press the **DISP** key to close the menu.

1.10.6 How to change the unit of speed and distance measurement

The unit of speed and distance measurement can be selected to nautical miles, kilometers, or statute miles.

1. Press the **MENU/ESC** key to open the main menu.

2. Select [4 DISPLAY], then press the **ENT** key.

3. Select [6 UNIT], then press the **ENT** key. The options pop-up window shown right appears

4. Select desired unit, then press the **ENT** key.

5. Press the **DISP** key to close the menu.

1.11 SYSTEM Menu

The [SYSTEM] menu contains various parameter settings for this equipment, to provide better performance.

1.11.1 How to adjust the speed average

Wind and currents can affect the ship's speed. Speed data is averaged over time to provide a stable reading. If the reading becomes unstable, do the following:

1. Press the **MENU/ESC** key to open the menu.

2. Select [3 SYSTEM], then press the **ENT** key.

3. The [1 SPEED AVERAGE] item is already selected, press the **ENT** key. The options pop-up window shown right appears.

4. Select the averaging time period, then press the **ENT** key. A longer period stabilizes the speed indication, however the response to acceleration or deceleration is delayed.

5. Press the **DISP** key to close the menu.
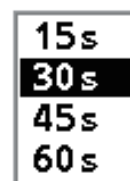
1.11.2   How to calibrate speed

Calibration of any speed log is necessary through the sea trials during the commissioning tests. Fill in the calibration sheet at the back of this manual. Use the resultant data to calculate the speed offset.

Note: Do not change the setting unnecessarily. Accuracy of speed measurement may be affected.

1. Press the **MENU/ESC** key to open the menu.

2. Select [3 SYSTEM], then press the **ENT** key.

3. Select [2 SPEED CAL], then press the **ENT** key to show the numeric data input pop-up window.

4. Referring to "Numeric data input pop-up window" in section 1.7.1, set the offset as calculated on the calibration sheet, then press the **ENT** key.

```
  ▲
 +00.00%
  ▼
[-25.00%,  +25.00%]
```

5. Press the **DISP** key to close the menu.
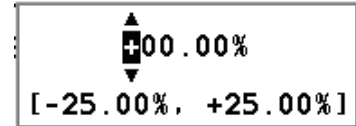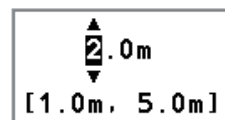

1.11.3   How to adjust tracking depth

Doppler shift measuring depth in the DS-85 is [2 m] at default. If the speed readout is unstable due to air bubbles near the ship's hull, increase or decrease the track depth to stabilize the readout.

Note 1: Incorrect adjustment of tracking depth can prevent detection of ship speed in some sea areas.

Note 2: The IMO standard for STW (A.824(19)) requires that devices measuring STW perform in water of depth greater than 3 m beneath the keel. So if the "track depth" is set higher than 3 m in shallow water, this does not comply with the standard and the accuracy of true vector presentation of the ARPA may be affected.

1. Press the **MENU/ESC** key to open the menu.

2. Select [3 SYSTEM], then press the **ENT** key.

3. Select [3 TRACK DEPTH], then press the **ENT** key to show the numeric data input pop-up window.

```
  ▲
 2.0m
  ▼
[1.0m,  5.0m]
```

4. Referring to "Numeric data input pop-up window" in section 1.7.1, set the offset as required, then press the **ENT** key.
   **Note:** The available setting range depends on the transducer settings, set at installation.

5. Press the **DISP** key to close the menu.

1.11.4   How to adjust echo criteria

Set how sensitively the equipment judges echo error.

1. Press the **MENU/ESC** key to open the menu.

2. Select [3 SYSTEM], then press the **ENT** key.

3. Select [4 ECHO CRITERIA], then press the **ENT** key to show the numeric data input pop-up window.

```
  ▲
  0
  ▼
[0,  9]
```

4. Referring to "Numeric data input pop-up window" in section 1.7.1, set the criteria level as required, then press the **ENT** key. The [9] setting provides the lowest error detection frequency.

5. Press the **DISP** key to close the menu.
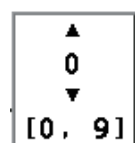
1.11.5   Dimmer unit setting

Follow the procedure below to set up the dimmer unit (RD-502).

1.   Press the **MENU/ESC** key to open the main menu.

2.   Select [3 SYSTEM], then press the **ENT** key.

3.   Select [6 RD-502], then press the **ENT** key. The options pop-up window shown right appears.

4.   Select [ON] or [OFF], then press the **ENT** key. [ON] allows remote operation from the RD-502; [OFF] disables operations from the RD-502.

5.   Press the **DISP** key to close the menu.

1.11.6   Interference rejector setting

If the DS-85 receives interference from another echo sounder, sonar or other electronic device onboard your vessel, use the interference rejector to reduce the interference.

Note: The external KP must be connected to use the interference rejector. Contact a FURUNO agent or dealer for details.

1.   Press the **MENU/ESC** key to open the main menu.

2.   Select [3 SYSTEM], then press the **ENT** key.

3.   Select [5 IR], then press the **ENT** key. The options pop-up window shown right appears.

4.   Select [ON] to activate the interference rejector, then press the **ENT** key. The following message appears.

```
ON:STOPS MEASUREMENT OF SHIP
SPEED WHILE THE EXTERNAL
EQUIPMENT IS TRANSMITTING.
ARE YOU SURE?

          YES          NO
```

5.   Select [YES], then press the **ENT** key.

6.   Press the **DISP** key to close the menu.

2. MAINTENANCE

2.1   Maintenance

⚠ WARNING	NOTICE
ELECTRICAL SHOCK HAZARD **Do not open the equipment.** Only qualified personnel are permitted to work inside the equipment.	**Items containing organic solvents (rust inhibitors, electrical contact spray, etc.) must not be used on painted and plastic parts of the equipment.** Plastic parts and paint may be damaged.

Regular maintenance

Check the following points regularly to maintain performance.

• Check that the connectors on all units of the system are firmly fastened and free of rust. Clean if soiled or corroded.

• Check that all ground wires are tightly fastened.

• Check for dust or dirt on the LCD. Wipe the LCD carefully to prevent scratching, using tissue paper and an LCD cleaner. To remove dirt or salt deposits, use an LCD cleaner, wiping slowly with tissue paper so as to dissolve the dirt or salt. Change paper frequently so the salt or dirt will not scratch the LCD. Do not use solvents such as thinner, acetone or benzene for cleaning. Also, do not use degreaser or anti-fog solution, as they can strip the coating from the LCD.

Transducer maintenance

Marine life (barnacles, etc.) adhering to the transducer face can reduce sensitivity. Periodically remove any marine life from the transducer face with fine sandpaper or a piece of wood.

Do no paint the transducer face. Performance will be affected.

The transducer has a limited life. Contact your dealer about the time of replacement for the transducer.

2.2 Fuse Replacement

⚠ **WARNING**

🛈 **Use the proper fuse.**

Use of a wrong fuse can cause fire or damage the equipment.

A fuse in both the transceiver unit and distributor unit protects their electrical circuitry from burning by over-current or equipment fault. If a unit cannot be powered, a fuse may have blown. Have a qualified FURUNO technician check the unit.

Unit	Fuse Rating	Type	Code No.	Qty
Distributor Unit (DS-8510)	2A	FGMB-A 250V 2A PBF	000-157-497-10	2
	1A	FGMB-A 250V 1A PBF	000-157-496-10	1
Transceiver Unit (DS-8520)	2A	FGMB-A 250V 2A PBF	000-157-497-10	2

2.3 Consumable Parts

The table below lists the consumable parts in the DS-85 system. Have a qualified FURUNO technician replace the parts at their recommended replacement intervals.

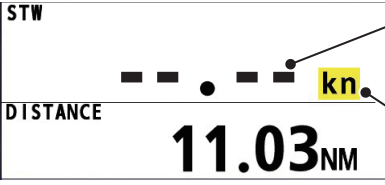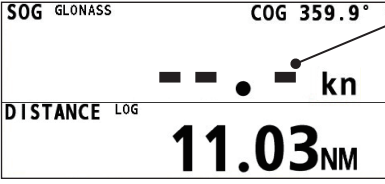| Unit	Part name	Type	Code no.	Recommended replacement interval	Symptom
Display Unit	LCD	SD80003T00	000-196-044-11	50,000 hours	Brilliance cannot be raised sufficiently.
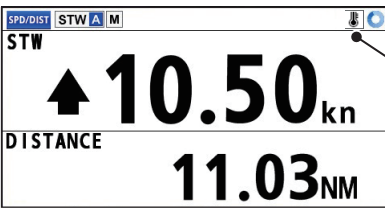
2.4 Troubleshooting

This section provides basic troubleshooting procedures. Advanced level troubleshooting should be done by a qualified service technician, referring to the Service Manual (optional supply).

General troubleshooting

Problem	Probable cause	Remedy
Cannot turn the power on.	Power cable is loose or disconnected.	Connect the cable securely.
	Blown fuse.	Have a FURUNO agent or dealer find the cause and replace the fuse.
Power is on but nothing appears on the screen.	Brilliance is too low.	Adjust the brilliance accordingly.
The equipment is inoperative and the [TEST] icon appears in the status bar.	The "factory setting" mode is active.	Contact a FURUNO agent or dealer for advice.

Speed error and abnormal temperature at transducer

Display example	Probable cause
Speed through the water (STW)	
STW ▲**10.50**kn DISTANCE **11.03**NM — Last correct speed is displayed, however the displayed value is frozen. Speed unit is highlighted in yellow.	Ship's speed cannot be calculated for 30 seconds, because of air bubbles, etc.
STW – – . – – kn DISTANCE **11.03**NM — Speed is shown as "--.--" Speed unit is highlighted in yellow. **Note:** As a remedy, change the echo reference setting to a large number such as 9 (see section 1.11.4).	• Transducer error or air bubbles on the transducer. • Speed error continues for more than 30 seconds.
Speed over the ground (SOG)	
Display example: GLONASS SOG GLONASS COG 359.9° – – . – kn DISTANCE LOG **11.03**NM — Speed is shown as "--.-" **Note:** When the ship's speed source is "AUTO" and SOG input is lost, the error message will be for STW, not SOG.	• GLONASS data error. • GLONASS receiver disconnected. • No GLONASS data received for 30 seconds.
Abnormal temperature at transducer	
SPD/DIST STW A M STW ▲**10.50**kn DISTANCE **11.03**NM — Abnormal transducer temperature icon	Abnormal temperature found at transducer.

If any abnormal speed indication or abnormal temperature continues to occur, contact your dealer for advice.

2.5 Alerts

The DS-85 generates caution level alerts only. When an alert is generated, the applicable alert message appears in the guidance/alert info area. In the case of multiple alerts, the alert with the highest priority is shown. The alert message remains on the screen until the reason for the alert is rectified.

2.5.1 Active alert list

The active alert list shows all the active alerts, the latest one at the top of the list. If there are no active alerts, [=NO ACTIVE ALERTS=] appears on the list. You can view the list as follows:

1. Long-press the **MENU/ESC** key until the active alert list appears.
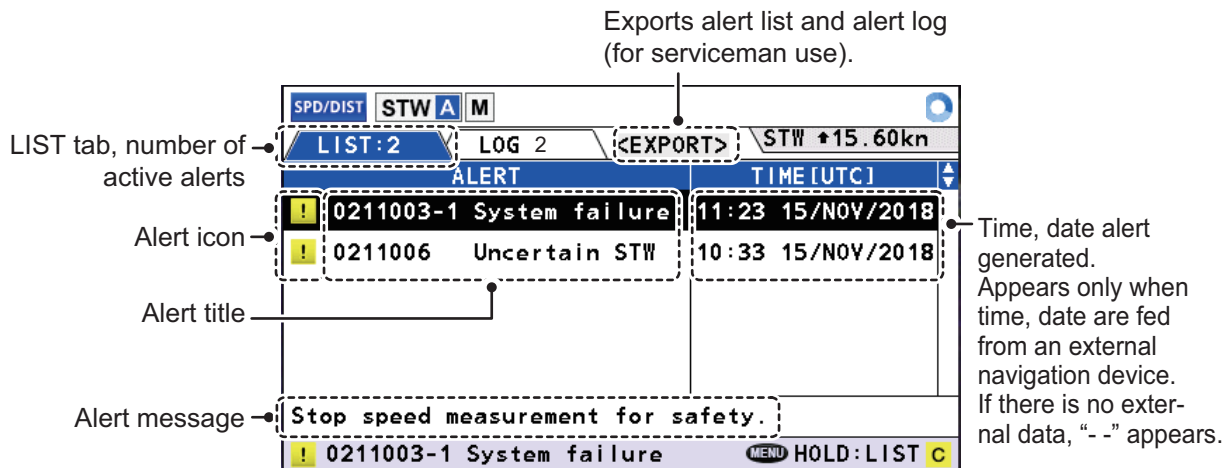
2. To show the associated alert message for an alert title (in the guidance/alert info area), select the alert title with the cursor.

3. Press the **DISP** key to close the list.

2.5.2 Alert log

The alert log stores the latest 100 alerts, the latest one at the top of the list. When the log becomes full, the oldest entry is erased to make room for the latest. The log is updated whenever there is a change in the status of the alerts. If the log contains no entries, [= NO ALERTS =] appears in the log.

To view the alert log do the following:

1. Long-press the **MENU/ESC** key until the alert log appears.

2. Press ▶ on the CursorPad to select the [LOG] tab to show the alert log.

LOG tab, number of entries in log

Exports alert list and alert log (for serviceman use).

Alert icon

Alert title

Alert message

Time, date alert generated. Appears only when time, date are fed from an external navigation device. If there is no external data, "- -" appears.

3. To show the associated alert message for an alert title (in the guidance/alert info area), select the alert title with the cursor.

4. Press the **DISP** key key to close the log.
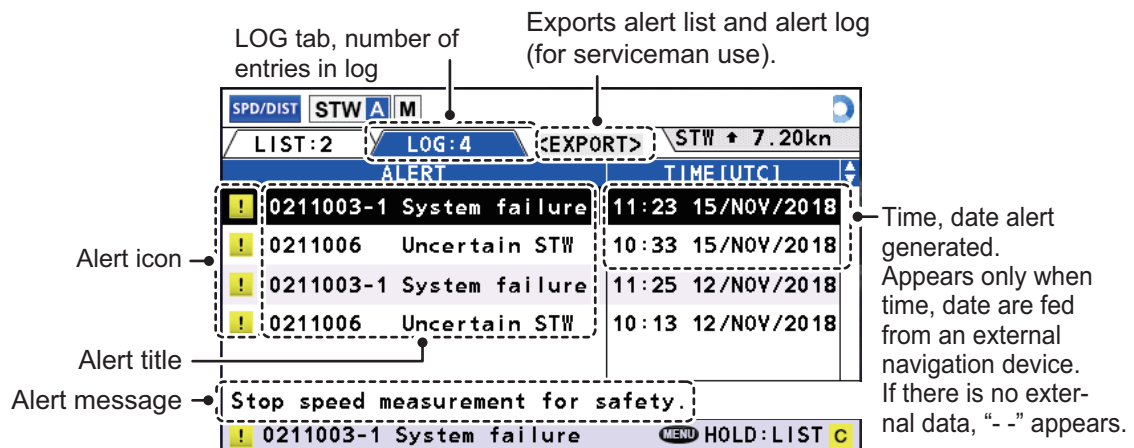
2.6   Indications

Indication messages are generated for the errors not covered in IEC 61924-2. When an indication is generated, the applicable indication message appears in the guidance/alert info area. In the case of multiple indications, the indication with the highest priority is shown. The indication message remains on the screen until the reason for the indication is removed or rectified.

2.6.1   Active indications list

The active indications list shows all the active indications, the latest one at the top of the list. If there are no active indications, [=NO ACTIVE INDICATIONS=] appears on the list. The list is updated whenever the status of an active indication changes.

You can see the active indications as follows:

1. Press the **MENU/ESC** key to open the main menu.
2. Select [5 INDICATION], then press the **ENT** key to show the indications list.

Exports indications list and indications log (for serviceman use).

LIST tab, number of active indications

Indication icon

Indication title

Indication mesage

Time, date alert generated. Appears only when time, date are fed from an external navigation device. If there is no external data, "- -" appears.

3. To show the associated indication message (in the guidance/alert info area) for an indication title, select the indication title with the cursor.
4. Press the **DISP** key to close the list.

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2.6.2 Indications log

The indications log stores the latest non-active 100 indications, the latest one at the top of the list. When the log becomes full, the oldest entry is erased to make room for the latest. The log is updated whenever there is a change to the status of any indication. If the log contains no entries, [= NO INDICATIONS =] appears in the log.

To show the indications log do the following:

1.   Press the **MENU/ESC** key to open the main menu.

2.   Select [5 INDICATION], then press the **ENT** key.

3.   Press ▶ on the CursorPad to select the [LOG] tab to show the indication log.

4.   To show the associated indication message (in the guidance/alert info area) for an indication title, select the indication title with the cursor.

5.   Press the **DISP** key to close the list.

2.7 Alert Icons

The table below shows the alert icons that appear in the alert log and indications log. If no icons are shown there are no active or inactive alerts or indications.

Icon	Priority level	Coloring	Description
	Caution	Yellow color, black symbol	An error that requires immediate attention.
	Indication	Blue color, white symbol	An error that requires attention.

2.8   How to Restore Default User Settings

You can restore all default user settings as shown below. Items set by the installer (transducer position, etc.) are not disturbed.

1. Press the **MENU/ESC** key to open the main menu.

2. Select [6 USER RESET], then press the **ENT** key. You are asked if you are sure to reset user settings.

```
┌─────────────────────────┐
│ RESET USER SETTING OK?   │
│                          │
│      YES        NO       │
└─────────────────────────┘
```

3. Select [YES], then press the **ENT** key.

APPENDIX 1 MENU TREE

```
MENU/ESC              │ Default settings in bold italic. │
key
 │
 ├── 1 SPEED ────────── 1 NOTICE (OFF, INSIDE, OUTSIDE)
 │                      2 NOTICE SOUND (ON, OFF)
 │                      3 MINIMUM (-99.99kn~99.99kn, 11.00kn)
 │                      4 MAXIMUM (-99.99kn~99.99kn, 14.00kn)
 │
 ├── 2 DISTANCE ─────── 1 SET (000000.00NM~999999.99NM)
 │
 ├── 3 SYSTEM ───────── 1 SPEED AVERAGE (15 s, 30 s, 45 s, 60 s)
 │                      2 SPEED CAL (-25.00% to 25.00%, 00.00%)
 │                      3 TRACK DEPTH (1.0 m to 9.9 m (DS-820),
 │                          1.0 m to 5.0 m (DS-8530), default 2.0 m)
 │                      4 ECHO CRITERIA (0~9, 7)
 │                      5 IR (ON, OFF) (Requires connection of external KP signal.
 │                          Contact a FURUNO agent or dealer for details.)
 │                      6 RD-502 (ON, OFF)
 │
 ├── 4 DISPLAY ──────── 1 MODE SELECT (SOG, STW, AUTO)
 │                      2 KEY BEEP (ON, OFF)
 │                      3 LANGUAGE (ENGLISH, 日本語 (JAPANESE))
 │                      4 SPD METER SCALE (-10~20, -10~30, -10~40)
 │                      5 SYM LOCATION (LEFT, RIGHT)
 │                      6 UNIT (NM(kn), km(km/h), SM(SM/h))
 │
 ├── 5 INDICATION ───── Display / export indications list, indications log.
 │
 ├── 6 USER RESET ───── Yes, No (Restore default user settings.)
 │
 ├── EQUIPMENT ──────── Iniital settings. For the service technician. Password required.
 │
 └── SERVICE ────────── Service menu. Unlocked by password. For the service technician.
```

APPENDIX 2 PARTS LIST AND LOCA-TION

This equipment contains complex modules in which fault diagnosis and repair down to component level are not practicable (IMO A.694(17)/8.3.1). Only some discrete components are used. FURU-NO ELECTRIC CO., LTD. believes identifying these components is of no use for shipborne main-tenance; therefore, they are not listed in this manual. Major modules can be located on the parts location photos in this appendix.
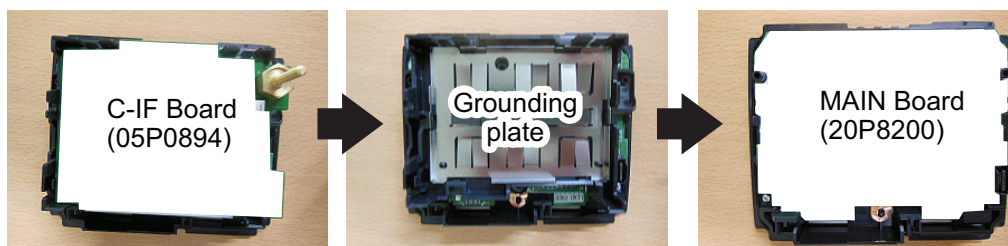
Parts list

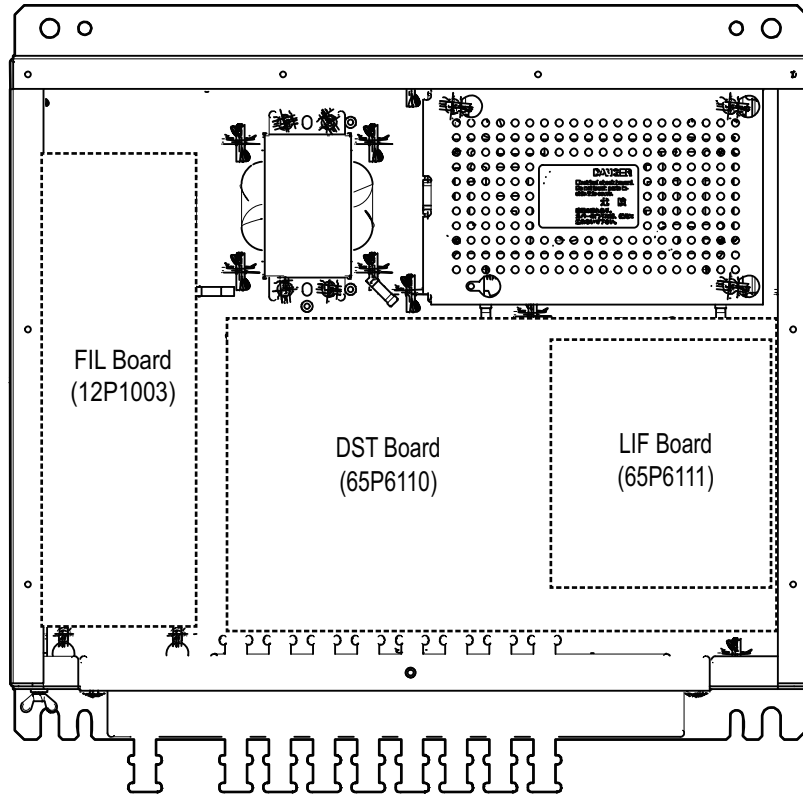| FURUNO	Model	DS-85	
ELECTRICAL PARTS LIST	Unit	DISPLAY UNIT, DISTRIBUTOR UNIT TRANSCEIVER UNIT	
	Blk.No.		
TYPE, NAME	LOCATION		
PRINTED CIRCUIT BOARD			
20P8200, MAIN	DISPLAY UNIT DS-8500		
05P0894, C-IF	DISPLAY UNIT DS-8500		
12P1003, FIL	DISTRIBUTOR UNIT DS-8510		
65P6110, DST	DISTRIBUTOR UNIT DS-8510		
65P6111, LIF	DISTRIBUTOR UNIT DS-8510		
12P1003, FIL	TRANSCEIVER UNIT DS-8520		
65P6120, MAIN	TRANSCEIVER UNIT DS-8520		
65P6121, TRX	TRANSCEIVER UNIT DS-8520		

Parts locations

Note: Units not shown to scale.

Display Unit DS-8500

Remove the C-IF board, then remove the grounding plate to expose the main board.

Distributor Unit DS-8510

FIL Board
(12P1003)

DST Board
(65P6110)

LIF Board
(65P6111)

Transceiver Unit DS-8520

MAIN Board
(65P6120)

FIL Board
(12P0003)

TRX Board
(65P6121)

AP-3
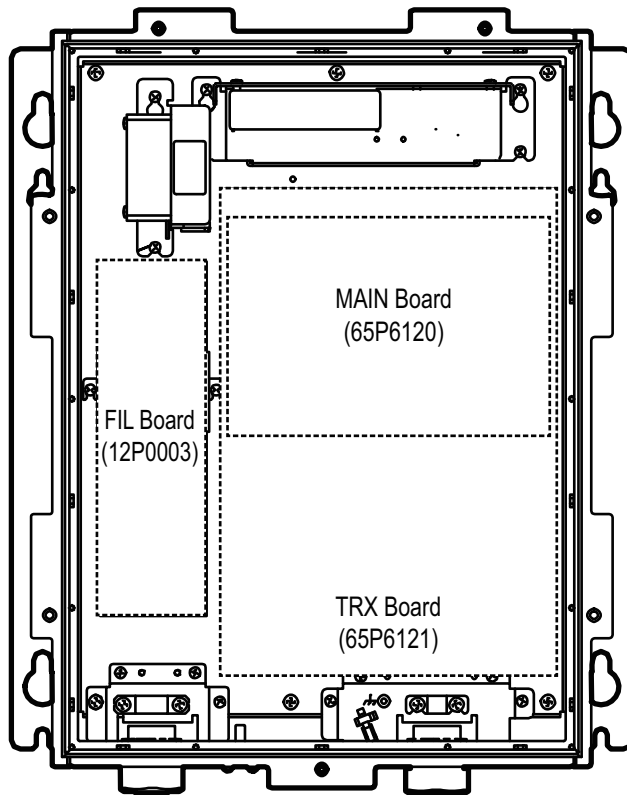
APPENDIX 3 ABBREVIATIONS

The table below shows all the abbreviations that appear in this manual or on the equipment display.

Abbreviation	Meaning
%	per cent
A, AUTO	Automatic
aft	aft
AIS	Automatic Identification System
APR	April
ARPA	Automatic Radar Plotting Aid
AUG	August
AVG	Average
BRILL	Brilliance
CAL	Calibration
COG	Course Over the Ground
CON	Contact
DAY	Day
DEC	December
DEMO	Demonstration
DISP	Display
DISTANCE	Distance
ENT	Enter
ESC	Escape
EXT	External
FEB	February
fore	fore
FUNC	Function
GLONASS	Global Navigation Satellite System
IP	Internet Protocol
IR	Interference Rejector
JAN	January
JUL	July
JUN	June
km	kilometer
km/h	kilometer per hour
kn	Knots
KP	Keying Pulse
KTS	Knots
LAN	Local Area Network
LANGUAGE	Language
LCD	Liquid Crystal Display
m	Meter(s)
M	Main
MAR	March
MAY	May
MENU	Menu

Abbreviation	Meaning
Nav.	Navigation
NM	Nautical Miles
NOV	November
NT	Night
OCT	October
P/N	Program Number
Prog.	Program
PWR	Power
RAM	Random Access Memory
ROM	Read Only Memory
S	Sub
S/N	Serial Number
SEC, s	Seconds
SEP	September
SIM	Simulation
SM	Statute Mile
SM/h	Statute Mile per hour
SOG	Speed Over the Ground
SPD	Speed
STW	Speed Through the Water
SYM	Symbol
TCVR	Transceiver
TEMP	Temperature
TX	Transmit
UTC	Coordinated Universal Time
VLW	Dual Ground/Water Distance
WQVGA	Wide Quarter Video Graphics Array
XDCR	Transducer

APPENDIX 4 ALERTS & INDICATIONS

Alerts

Alert No.	Title	Priority/ Category	Instance	Message	Remedy
0211003	System failure	Caution/B	1	Stop speed measurement for safety.	Have a qualified technician check the set.
0211003	System failure	Caution/B	2	Communication error with Transceiver.	Check the connections between the distributor unit and the transceiver unit. If the connections are normal, have a qualified technician check the set.
0211006	Uncertain STW	Caution/B	—	Speed reliability is low.	**The condition can be temporary**: **Air bubbles, etc. can temporarily interrupt both transmission and reception.** As a remedy, change the speed source. If the alert re-occurs, have a qualified technician check the set.

* The number of digits shown depends on the setting of [ALERT MODE] (in the installation menu).

Indications

Title	Message	Meaning	Remedy
DIST COM Error	Communication error with Distributor.	Cannot communicate with the Distributor Unit.	Check connections between the display unit and the distributor unit.
DISP 12V Error	Display 12 volt error.	12 V power in the Display Unit is not within the specifications.	Have a qualified technician check the set.
TVCR 5V Error	Transceiver 5 volt error.	5 V power in the Transceiver Unit is not within the specifications.	
TVCR 12V(D) Error	TCVR 12 volt digital error.	12 V digital power in the Transceiver Unit is not within the specifications.	
TVCR 12V(A) Error	TCVR 12 volt analog error.	5 V analog power in the Transceiver Unit is not within the specifications.	
TCVR 24V Error	Transceiver 24 volt error.	24 V power in the Transceiver Unit is not within the specifications.	
TVCR TEMP Error	Transceiver TEMP error.	Transceiver temperature is too high.	Turn off the transceiver. Wait 2-3 minutes, then power the unit. If the error re-occurs, have a qualified technician check the set.

Title	Message	Meaning	Remedy
XDCR TEMP Error	Transducer TEMP error.	Transducer temperature is too high.	Have a qualified technician check the set.
DIST 5V Error	Distributor 5 volt error.	5 V power in the Distributor Unit is not within the specifications.	Have a qualified technician check the set.
DIST 12V Error	Distributor 12 volt error.	12 V power in the Distributor Unit is not within the specifications.	
DIST TEMP Error	Distributor TEMP error.	Distributor Unit temperature is too high.	
IP Address Error	IP Address duplication.	Identical IP addresses found.	Enter a different IP address. (See the Installation Manual.)
TVCR Fan Speed	Fan speed below the limit.	Fan speed in the Transceiver Unit or Distributor Unit is too low.	Have a qualified technician check the set.
TVCR Rebooted	Rebooted error with Transceiver.	Software error caused rebooting of Transceiver Unit.	—
DIST Rebooted	Rebooted error with Distributor.	Software error caused rebooting of Distributor Unit.	—
DISP Rebooted	Rebooted error with Display.	Software error caused rebooting of Display Unit.	—

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SPECIFICATIONS OF DOPPLER SPEED LOG
DS-85

1   GENERAL

1.1	Transmit frequency	2 MHz
1.2	Number of beams	2 beams
1.3	Speed range	-40.00 to +40.00 kn
1.4	Distance run	0.00 to 999999.99 NM through the water
1.5	Working depth	Greater than 3 m beneath the keel
1.6	Speed accuracy	±1% or 0.1 kn whichever is the greater (±2% for standard range)
1.7	Distance accuracy	±1% or 0.1 NM whichever is the greater

2   DISPLAY UNIT

2.1	Screen	4.3-inch color LCD, 480 x 272 (WQVGA)
2.2	Brilliance	600 cd/m^2
2.3	Tone	18 steps
2.4	Visible distance	
	Speed	8.5 m (combine mode: 4.8 m)
	Distance log	4.8 m (combine mode: 3.3 m)
	Others	0.6 m
2.5	Language	UK/USA, Japanese

3   INTERFACE

3.1	Number of ports	
	Serial signal	IEC61162-1 Ed.5, IEC61162-2 Ed.1
		Input: 2 ports (4800/38400 bps: 1, 4800 bps: 1),
		Output: 8 ports (4800/38400 bps: 1, 4800 bps: 7)
	LAN	1 port, Ethernet 100Base-TX, IEEE802.3 data link
	USB	1 port, USB2.0, for maintenance
	Power failure	1 port, 30VDC: 0.2 A
	System failure (option)	1 port, 30VDC: 0.2 A
	External KP	1 port
	Sub monitor	2 ports
	Dimmer	1 port, for control of DS-8500
	Analog signal (option)	4 ports, for analog indicator
	Distance run (option)	1 ports; Contact closure each 0.005 NM, 30VDC: 0.2A, pulse length: 0.1 s
3.2	Data sentences	
	Input	ACN, GGA, RMC, VTG, ZDA
	Output	ALC, ALF, ALR, POS, VBW, VHW, VLW
3.3	Output proprietary sentences	
	PFEC	pidat
3.4	IEC61162-450 Transmission group	
	Input	MISC, NAVD, NETA
	Output	Arbitrary (default: NAVD)
3.5	Other network functions except IEC61162-450	
	Input/output	HTTP, SNMP

4   POWER SUPPLY

100-115/200-220 VAC: 0.6/0.4 A, 1 phase, 50-60 Hz

5   ENVIRONMENTAL CONDITIONS

5.1   Ambient temperature
Transducer   -5°C to +35°C
Others   -15°C to +55°C
5.2   Relative humidity   93% or less at +40°C
5.3   Degree of protection
Display unit   IP22 (IP35, option)
Distributor unit   IP22 (bulkhead mount), IP20 (tabletop mount)
Transceiver unit   IP44
Transducer   IPX8, for submerged 600 kPa x 12 h
5.4   Vibration   IEC 60945 Ed.4

6   UNIT COLOR

N2.5

ECF

(Elemental Chlorine Free)

The paper used in this manual
is elemental chlorine free.

FURUNO ELECTRIC CO., LTD.

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Pub. No. OME-72880-B1

（YOTA） DS-85

・FURUNO Authorized Distributor/Dealer

A ：MAY　2020
B1：DEC. 01, 2020

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