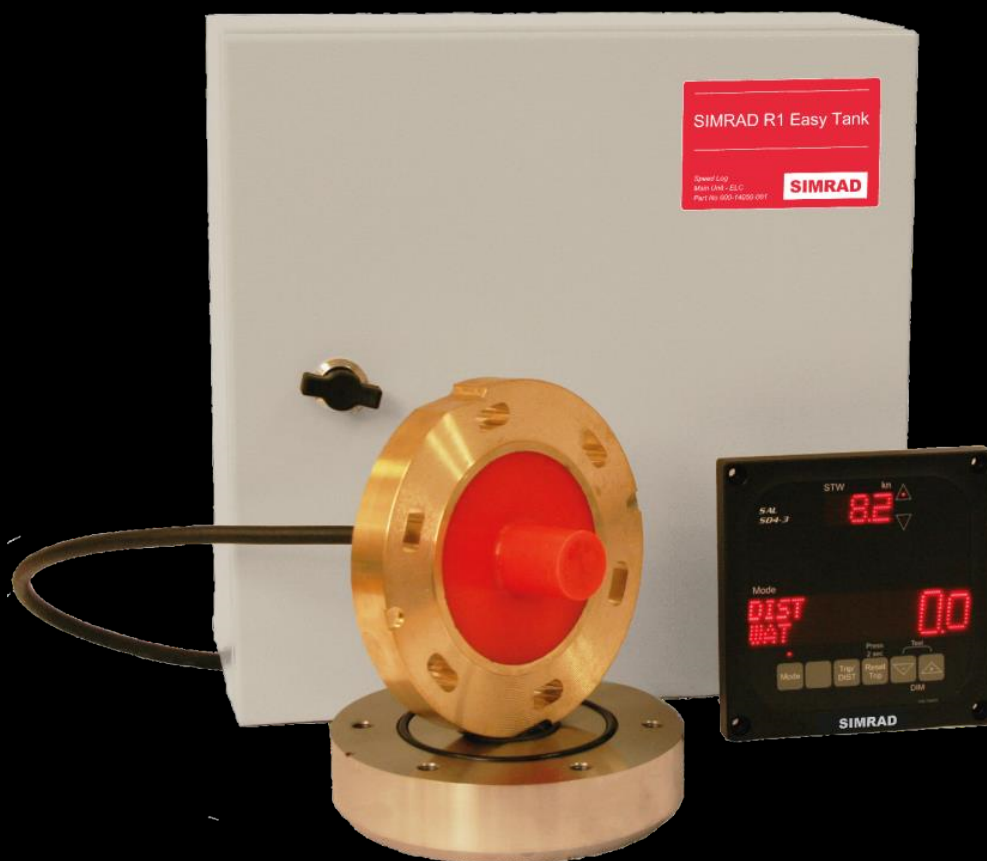

SAL R1

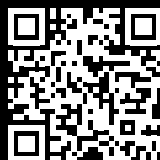
Easy Tank System

Operator manual

English



www.navico-commercial.com



Scan to save a copy

Disclaimer

⚠ WARNING: Refer to important safety information in the operator manual and review all warnings, limitations, and disclaimers before using this product.

This product is not a substitute for proper training and prudent seamanship. It is the owner’s sole responsibility to install and use the equipment in a manner that will not cause accidents, personal injury or property damage. The user of this product is solely responsible for observing maritime safety practices. Navigational features that appear in this document are not a substitute for proper training and prudent seamanship. They do not replace a human navigator and SHOULD NOT be relied on as a sole or primary source of navigation. It is the operator’s sole responsibility to use more than one navigational method to ensure safe passage.

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

This document represents the product as at the time of printing. Navico Group and its subsidiaries, branches and affiliates reserve the right to make changes to the product and/or specifications at any time without notice. Please contact your nearest distributor if you require any further assistance.

Governing language

This statement, any instruction manuals, user guides and other information relating to the product (Documentation) may be translated to, or has been translated from, another language (Translation). In the event of any conflict between any Translation of the Documentation, the English language version of the Documentation will be the official version of the Documentation.

Copyright

©2025 Navico Group. All Rights Reserved. Navico Group is a division of Brunswick Corporation.

Trademarks

®Reg. U.S. Pat. & Tm. Off, and ™ common law marks. Visit www.navico.com/intellectual-property to review the global trademark rights and accreditations for Navico Group and other entities.

- Navico® is a trademark of Navico Group.
- Simrad® is a trademark of Kongsberg Maritime AS, licensed to Navico Group.
- Loctite® is a trademark of Henkel IP & Holding GmbH.
- NMEA®, NMEA 0183® and NMEA 2000® are trademarks of the National Marine Electronics Association.
- SD® and microSD® are trademarks of SD-3C, LLC.

Warranty

The warranty card is supplied as a separate document. In case of any queries, refer to the brand website of your unit or system:
www.navico-commercial.com

About this manual

Product features

Features described and illustrated in this document may vary from your unit due to continuous development of the software.

Revision

Date	Version	Author	Comment
2017-03-30	A01-A04	TE/AF/OM	Created as 703822C1-01, editorial, SIMRAD Part No. added WTU-Assy menu tree
2025-03-30	A05	TB	Updated to comply with new branding and updates to product name and revised software version.

More information

Document version 002
This document was prepared using software version 5400130A11
For the latest version of this document in supported languages, visit: www.navico-commercial.com.

CONTENTS

1 Introduction	5
1.1 Warnings.....	6
1.2 Handling.....	7
1.2.1 Shipping.....	7
1.2.2 Storage.....	7
1.2.3 Handling	7
2 Technical specifications.....	8
2.1 Basic system.....	8
2.1.1 Electronics Cabinet (ELC).....	8
2.1.2 SD4-3, One axis STW and distance serial display.....	9
2.1.3 SAL Easy Tank	9
2.2 Data transmission / reception.....	10
3 User guide.....	11
3.1 General.....	11
3.2 Daily use of SAL R1	12
3.3 Alert messages.....	12
3.4 Menu mode.....	13
3.5 SD4-3 in Menu mode	14
3.6 Write and read only access	14
3.7 Menu functions	14
3.8 Calibration	14
3.8.1 TRU Calibration.....	15
3.8.2 Draught dependent calibration – (Single point calibration)	15
3.8.3 Speed dependent calibration – (Multiple point calibration)	16
3.9 Averaging Speed Constants	16
3.10 Software revisions	16
3.11 SD4-3 & SAL R1 Menus	17
4 Setting Up guide	19
5 Trouble-shooting.....	20
5.1 Alert codes.....	20
5.2 Possible faults and actions.....	22
5.3 Jumper settings	23

1 INTRODUCTION

This manual is grouped in the following manner:

- the Table of Contents
- this Introduction including general Warnings to be followed while working with the SAL R1
- general Shipping and Storing recommendations which are conditions of warranty
- the SAL R1 Technical Specification to be used as a fact and reference chapter and
- the Basic System Information which we highly recommend to read before starting any work with the SAL R1 speed log

1.1 Warnings

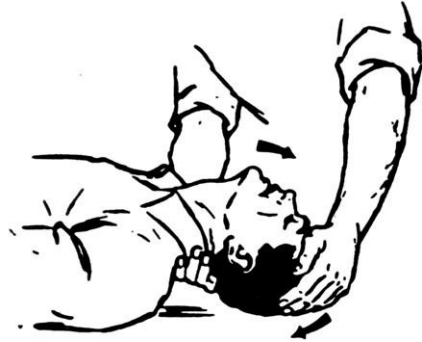
Lethal Warning!



Voltages within this equipment are sufficiently high to endanger life.

Covers are **not** to be removed, except by persons qualified and authorized to do so, and these persons should always take extreme care once the covers have been removed.

First Aid in case of electric shock



- 1 Lay victim on his back.
- 2 Clear victim's mouth and throat
- 3 Tilt victim's head back as far as possible and raise their head



- 4 Pinch victim's nostrils
- 5 Take a deep breath
- 6 Cover the victim's mouth with yours and blow, watching their chest rise.
→ **Note:** Blow forcefully into adults, but gently into children.
- 7 Move your face away to allow victim to breathe out, watching their chest fall.
- 8 Repeat first five to ten breaths at rapid rate; thereafter, take one breath every three to five seconds.
- 9 Keep victim's head back as far as possible at all times.

Have someone else send for a doctor. Keep the victim warm and loosen their clothing

⚠ WARNING: Do not give liquids until the victim is conscious.

1.2 Handling

1.2.1 Shipping

Following general rules apply:

- Inspection for damage during transport
- When the unit(s) arrives at destination, inspection should be performed immediately to register any damage that may have occurred during transfer.
- The customer is normally responsible for insurance during the transportation. If any damage is found, both the insurance company and the shipping agent must be informed immediately

1.2.2 Storage

- After the material, contained in the boxes, has been inspected in the presence of customer and it has been verified that no damage has occurred, the unit shall be stored in its original packing until the time of installation. The storage premises must be dry and well protected.
- If the electronic units must be kept in storage for more than one month, it is advisable to insert hygroscope substances, such as silicone gel salts, in the crates.

1.2.3 Handling

- The electrical part should be kept in their packing as long as possible and shall be unpacked at the place of installation.
- The bottom unit shall be unpacked and mounted at the place of installation. It should not be transported assembled.
- The Transducer and particularly the sensor surface must be handled with care.

 **WARNING:** Under any circumstances, do not cut or alter the length of cable!

2 TECHNICAL SPECIFICATIONS

SAL R1 System performance data

Working principle:	Acoustic correlation
Operating frequencies:	Jumping frequencies in the range 3.8 MHz – 4.2 MHz
Measuring distance:	130 mm from the surface of the transducer.
Speed Range:	+/- 50 knots sensed speed
Speed Accuracy:	Better than 1% or 0.1 knots relative to sensed water flow whichever is the greatest
Distance Accuracy:	Better than 1%

2.1 Basic system

2.1.1 Electronics Cabinet (ELC)

Water Track Unit (WTU)

Part number SAL R1 ELC, SPEED LOG MAIN UNIT: 000-14050-001

Mechanical specification:

Enclosure material:	Painted Steel plate
Height:	360 mm (reserve space for cable entry at bottom)
Width:	360 mm
Depth:	170 mm
Weight:	10.0 kg
Colour:	RAL 7035

Electrical specification:

Input voltage:	110–115 VAC / 220–230 VAC +/-10% 50-60 Hz
Power consumption:	30 VA nominal (Approx. 30 Watt)
SD4-display power output:	24 VDC to power up to 4 SD-displays (load < 1.2A)
Main Speed output:	IEC 61162-1 / NMEA0183. Serial driver RS 422/485; max load 100 ohm (10 SD4-displays)
Analogue Speed output:	0.1 V/knot (load max 5 mA)
Relay outputs:	2 x 200 p/NM contact closure, (30V/30mA or 15V/100mA recommended max load)
Alarm relay outputs:	Switching relay, default setting: power failure (30V/2A recommended max load)
Serial input:	IEC 61162-1 / NMEA0183 (used for remote user interface)
Service connection:	9-pole female D-sub serial data connector (RS 232, for additional PC based user interface and software upgrade)

Environmental specification:

Enclosure protection:	IP44
Environmental:	IEC 60945, protected class
Recommended operating temperature:	0°C to +40° C
Extreme operating humidity:	Less than 93 % RH (non-condensing) at 40°C

2.1.2 SD4-3, One axis STW and distance serial display

Part number: 000-14049-001

Mechanical specification:

Height:	144 mm
Width:	144 mm
Depth:	16 mm
Weight:	0.6 kg

Electrical specification:

Input voltage:	12 or 24 VDC nominal (10-32VDC)
Current:	Maximum 200 mA at 15VDC
Power consumption:	Maximum 3 Watt
Serial input:	IEC 61162-1 / NMEA0183
Remote inputs:	3 inputs with internal pull-up to +5V, activated by grounding to 0 V
Serial output:	IEC 61162-1 / NMEA0183. Serial driver RS 422/485; max load 100 ohm (10 SD4-displays)
SW controlled DC (pulse) output:	+5 V with 35 mA current capacity

Environmental specification:

Enclosure material:	House/frame: aluminium, front: polyester foil, backside: stainless steel
Enclosure protection (front):	IP66 in SD4-BMB box or panel mounted on a flat surface
Environmental:	IEC 60945, exposed class
Colour:	House, black Front, background: Satin black (NCS 9000-N)
Operating temperature:	-25°C to +55° C
Operating humidity:	Less than 93 % RH (non-condensing) at 40°C

2.1.3 SAL Easy Tank

Name:	Part number:
EASY TANK TRU W/10M CBL:	000-14051-001
EASY TANK BOTTOM STEEL FLANGE, STEEL:	000-14052-001
Alternative flange	
EASY TANK BOTTOM FLANGE, ALU 5083:	000-14053-001

Mechanical specification installed:

Height:	~ 85 mm (+ cable)
Weight:	~ 12 Kg including steel flange ~ 7.5 Kg including aluminium flange
Diameter:	168 mm
Hydrostatically test pressure:	24 bar

Material:

Top cover on TRU	SS5204 (Gun metal)
Bottom flange Steel	SS 2142/2172 (S355JR, St52.3N)
Bottom Flange ALU	EN-AW 5083

2.2 Data transmission / reception

- Up to 10 NMEA (IEC 61162-1) receiving units, e.g. SD4-3, radars, gyros etc.
- Maximum 4pc of SD4- displays can be powered directly from the ELC.
- Two contact closure relays, 200p/NM.
- One 0.1 VDC/knot output.
- One power failure alarm relay output.

3 USER GUIDE

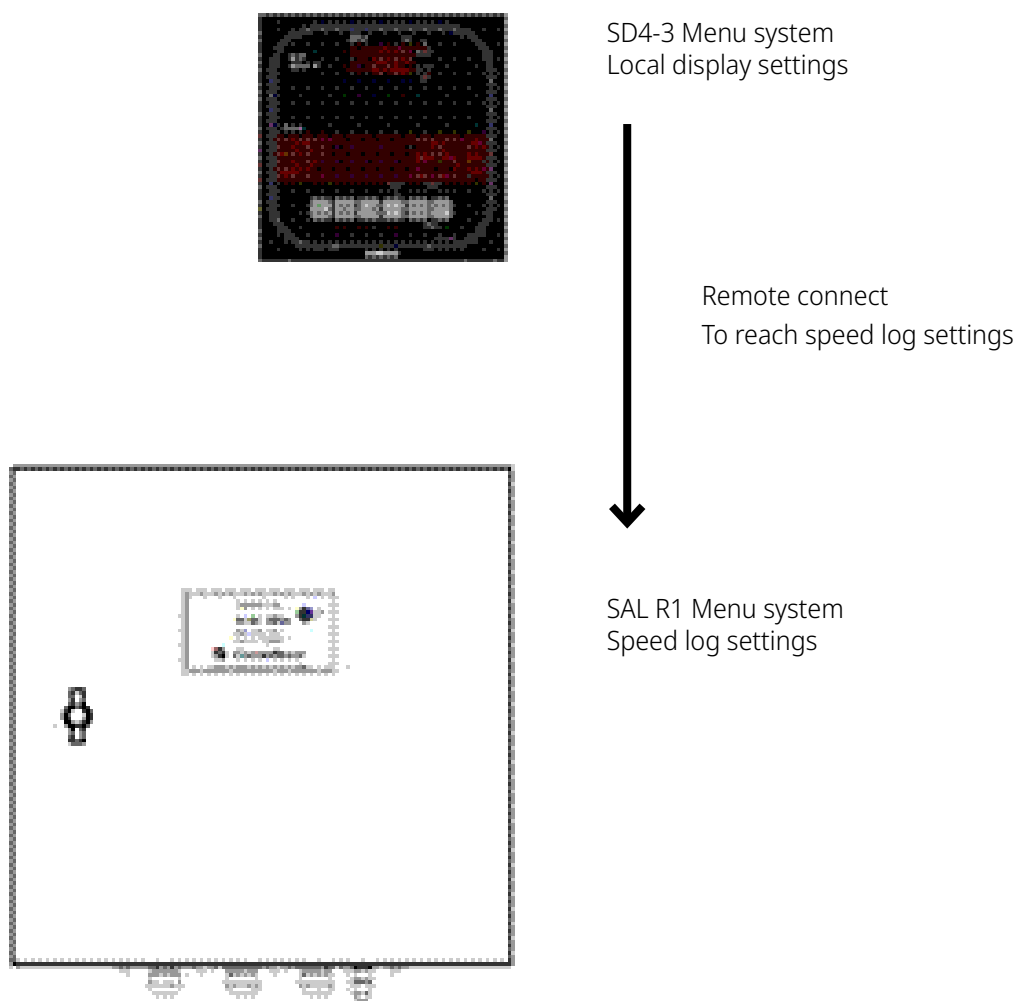


Figure 1: The settings of the display (SD4-3 Menu) and the settings of the speed log (R1 Menu) are physically separated. The speed log settings are reached by Remote Connect from the display menu.

3.1 General

The SAL R1 is normally conducted from the SD4-3 display on the bridge. If more than one SD4-3 is installed, one of them shall be designated as the Speed Log Master Display, which means that it is the remote display for the WTU menu in the SAL R1 speed log. This SD4-3 is to be labelled "Master". Same SD4-3 display or another SD4-3 display can also remotely control other slave SD4 displays e.g. dimming function (See Basic System Information in Section 1 General).

The Main Unit - ELC (Electronics Cabinet), which due to the TRU-cable length is mounted in the vicinity of the Bottom Parts, has fuses and indicating LEDs, which can be checked if a system failure occurs. (See TROUBLE-SHOOTING GUIDE)



Serial Digital Display SD4-3 for STW (WT) indication

3.2 Daily use of SAL R1

The SD4-3 display is configured especially for the water tracking speed log SAL R1. The display has an upper window showing the longitudinal Speed Through the Water, STW, ahead or astern. The upward pointing arrow LED is lit when the speed is ahead and the downward pointing arrow LED is lit when the speed is astern.

The lower Mode window shows as default the distance the ship has sailed, in nautical miles, either total indicated as DIST WAT or since latest reset of the trip counter indicated as TRIP WAT.

→ **Note:** Only ahead motion is added to these distance counters.

Use the Trip/DIST button to toggle the Mode window between showing trip distance TRIP WAT and total distance DIST WAT.

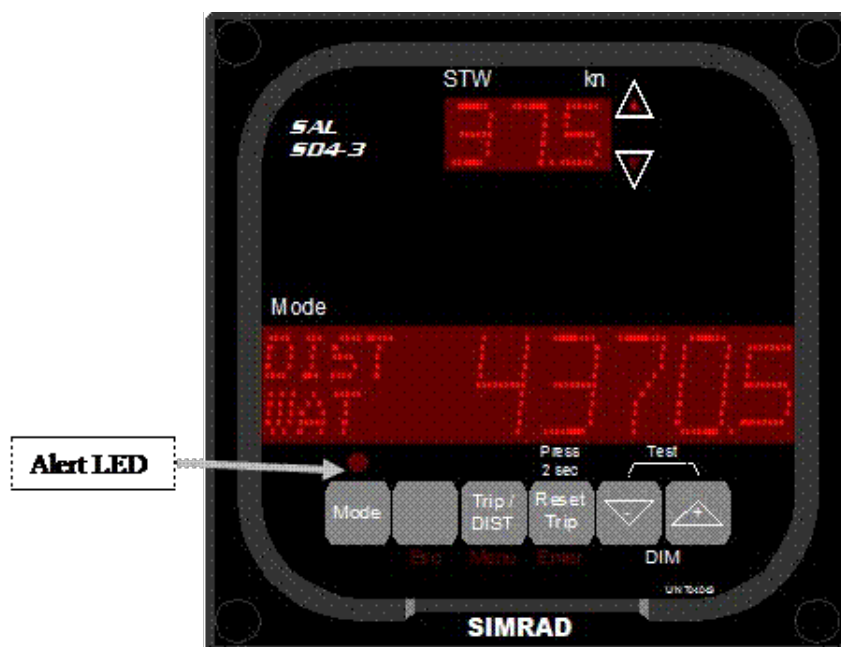
Use the Reset Trip button to zero the trip counter by pressing longer than 2 seconds. To adjust/DIM the display brightness, use plus (+) button to increase and minus (-) button to decrease. Both buttons pressed simultaneously presents a complete display lamp/LED test.

3.3 Alert messages

The Alert mode indication is intended for service purpose and trouble shooting of the SAL speed log system. A list of Alert codes can be found in the Trouble Shooting Guide in this manual.

The Alert mode is enabled as default in menu LP2.21. In this mode, proprietary **\$PSALW** NMEA messages will be translated and displayed as Alerts on the SD4 mode window.

SD4 Displays, with the Alert mode enabled, will light the LED above the Mode button when the SD4 Display receives active Alert messages.



The Alert message is displayed in the Mode window with the following field descriptors:

```
ALERT XXX YYY
TEXT
```

XXX: Alert code.

YYY: Input in LPU2 (only seen on systems with LPU2).

TEXT: 16 characters Alert description text.

When an Alert message is received the Mode window will automatically switch to ALERT mode and display the message.

Example of STW simulation Alert from the STW Speed log:

```
ALERT 301 LPUIN5
STW SIMULATION
```

The text "LPUIN5" is indicating that the Alert message is received on the LPU2 input No. 5 and will only appear when the SD4 is connected to an LPU2. The indication for STW simulation without LPU2 is:

ALERT 301

STW SIMULATION

If more than one Alert message is sent to the SD4-3, the Alerts are stored in a list in the sequence order they were received. To view next Alert message press the Mode button.

The SD4 has a capacity of storing a maximum of 10 Alerts.

If more than 10 different Alerts are received, Alert nr 11 and further the Mode window shows "OVERFLOW"

An Alert is treated as inactive when indicated in the received NMEA message or after a timeout of one minute if no more Alert messages are received with the corresponding Alert number.

When no Alerts are received, the Alert mode on the Mode window will show:

ALERT ---

3.4 Menu mode

The Mode window of the SD4-3 Display can also be set to Menu mode. The Menu mode is used for internal settings of the display and when SD4-3 is used as a remote display for other units e.g. the R1/WTU menu structure or for remotely dimming of other SD-displays.

The Menu mode is activated by pressing the Mode button for minimum 5 seconds. The Mode window will switch to show the text "PRESS ENTER FOR MENU". Then press the Enter button (Reset Trip) within 5 seconds.

The Mode window will now show the current menu and the upper window will maintain the speed presentation sent out from the WTU.

Three buttons under the Mode window have now changed to alternative functions. These are lit in red text below relevant button.

From left to right the buttons now have the following functions:

- | | |
|--|--|
| Mode: | Will inform which remote device that is connected. |
| Esc: | "Blank". When in "Remote Device menu" Esc is used to leave the "Remote Device menu" (i.e. the WTU menu). When not in "Remote Device menu" Esc has the same function as Menu and Enter pressed simultaneously (see Menu-button below). |
| Menu: | "Trip/DIST". Is used alone, or together with Arrow down (-), or together with Enter, to move/navigate in the menus as described below. Menu alone, will display next menu, i.e. step forward on same menu level. Menu and Arrow down (-) pressed simultaneously will display previous menu, i.e. step backwards on same menu level. Menu and Enter pressed simultaneously will move up one menu level, except when leaving the "Remote Device menu". For this instead use Esc. |
| Enter: | "Reset Trip" is used to save changed values/settings or to move to sub-menus. |
|   | "Arrow down" and "Arrow up" are used to change status, e.g. Write Access OFF/ON, and /or to change set values. |

➔ **Note:** When being in the Menu System and no button is pressed for 3 minutes, the **Mode** window will return to previous information displayed before the Menu System was entered.

3.5 SD4-3 in Menu mode

The Menu mode has three “Local Menus” and one “Remote Device menu” on the first set-up level:

- SD4-3 LOCAL. This is the start menu when entering the Menu mode. If one or more other displays are remotely dimmed from the display, this menu shows a second text line and can easily be used to turn the remote dimming function ON/OFF.
 - **Note:** Do not change to Write Access **ON** without special training.
- LP0 PROPERTIES. This menu contains sub-menus for local setting-up of the display.
 - **Note:** Do not change to Write Access **ON** without special training.
- LS0 REMOTE SETUP. This menu contains sub-menus for setting-up when the display is used as a Speed Log Master Display.
 - **Note:** Do not change to Write Access **ON** without special training.
- R0 REMOTE DEV. On a designated Speed Log Master Display this menu provides access to a Remote Device, e.g. SAL R1/WTU menu structure.
 - **Note:** Verify the setting in menu LS7, normally ON is default.

3.6 Write and read only access

Default for sub-menus when entering the menu system is read only access, i.e. the Mode window shows WRITE ACCESS OFF. When changing to Write Access ON (“+” and confirmed by Enter) then sub-menus are accessible for changes. Be careful to change intended parameters only. When leaving sub-menus the write access is automatically set to OFF.

3.7 Menu functions

The list for fast indexing of the Menu System, available for the daily user, is included in Section 3 SD4-3 & SAL R1 Menus. A complete list is found in the Installation manual.

Parameters which can be changed during the operation of the SAL R1 speed log are described below. Special menus for testing can be found under TROUBLE-SHOOTING GUIDE.

3.8 Calibration

This part describes the calibration procedure. How to enter calibration values using the menu system is described in Section 4.

The SAL R1 has two major methods for calibrating the speed which refers to ship's hull boundary layer affecting the water flow near the hull and past the transducer sensor surface.

- Draught dependent calibration — **single point** calibration factors compensating differences in indicated speed, due to load and trim of the ship. Three different preset draught conditions can be programmed. They are named: FULL LOAD, BALLAST 1 and BALLAST 2 and should be determined under long term observations.
 - Speed dependent calibration — **multiple point** calibration factors compensating differences in indicated speed over the whole speed range. Factors can be preset for up to ten different speed levels. Speeds between the calibrated points are interpolated automatically.
- **Note:** The minimum necessary calibrations to be set are the TRU TC-calibration plus at least one of the draught calibrations. If so, after setting the TRU TC-calibration (see below), choose e.g. FULL LOAD and determine and set a compensating calibration factor for the normal cruising speed used at normal load conditions (see below).

Draught dependent calibration and Speed dependent calibration should normally not be used at the same time.

The system also has a function for compensating small differences in characteristics of individual transducers. This TRU calibration is a fixed compensation factor, TC. The TC factor is marked on the transducer body and on the transducer cable termination end.

This factor has to be set at commissioning and before any other calibration method is initiated.

When replacing the transducer the new TC factor has to be entered according to the TC factor marked on the new transducer.

3.8.1 TRU Calibration

Each transducer has been individually calibrated in factory and its compensation factor must be entered into the speed log it is connected to. The factor is engraved on the transducer housing as TC±XXX. It is also labelled at the termination end of the TRU-cable core No.1. Example: TC+123 means calibration actually indicate a factor +1.23% and TC-101 consequently -1.01%.

Note: The TC value shall be set before any other calibration is performed.

Procedure to set TC calibration:

(Refer to paragraph **1.4 Menu mode** above how to move in the Menu System)

Go to the Menu mode;

Step to R0 REMOTE DEV and then down to R1/WTU sub-menu C0.

Choose WRITE ACCESS ON (+ and Enter) and proceed to menu C4.

C4 TRU CALIBRAT.

MARKING: TC±000

Change the value by using +/- buttons and then press Enter to save.

To leave this menu, press Menu and Enter simultaneously two times.

Leave the WTU Normal Operation menu and the SD4 Menu mode and return to the normal Trip/Total display mode by pressing Esc three times.

3.8.2 Draught dependent calibration – (Single point calibration)

This type of calibration is meant for merchant vessels where the water flow around the hull is changing due to varying draught and trim. Three calibrations can be performed for cruising speeds relevant to each of three decided draught/load conditions (FULL LOAD or BALLAST 1 or BALLAST 2). These calibrations are compensating with the same calibration percentage, respectively, over the whole speed range. Determining these calibrations will need to be done under long term observations/records when underway using various draught and/or trim.

It can be both time consuming and difficult to achieve proper results under a shipyard sea trial. Still the below procedure refers to common a common sea trial procedure.

Changing between the three draught/load calibration conditions can then be done in sub-menu C1 by pressing plus (+) or minus (-) provided WRITE ACCESS ON is granted in menu C0. The altered choice must then be saved by pressing **Enter**.

Before initial calibration runs, make sure:

- that correct TRU TC factor is set in menu C4 (see above);
- that all three draught condition factors are set to 0% (Menus C1 /C1.1)Menu C2);
- the Multi-Point Calibration is DISABLED (Menu C3, default is ENABLED) if any points have entered values or just assure that all ten points are set to 0%;

The system is calibrated by sailing a true, known distance in calm waters. To eliminate variations caused by tide, current and wind, the ship should run the same route in both directions. For each separate run, carefully observe and record beginning and end of the true sailed distance and corresponding measured distance on speed log display.

Then calculate the deviation according to following equation and examples:

(CF = Calibration Factor to be set)

$$CF = [(expected\ dist.\#1 + expected\ dist.\#2)/(measured\ dist.\#1 + measured\ dist.\#2)] \times 100 - 100$$

The *expected* (true) distance may be based on optical observations (fixed mile posts/land marks), but generally reference systems like DGPS or similar are commonly used.

The *measured* (indicated) distance is obtained from the accumulated value indicated on the speed log display Trip distance counter (or Total distance counter).

If the calibration factor is based on a very long (several hours or days) comparison with GPS observations, be aware and consider the records being likely affected by wind and sea current.

Use the menu system to enter the calibration factor in menu C1.1. C2.

Note that the calibration factor shall be expressed in percentage as obtained from the above equation, e.g. examples as follows:

$$CF = (1 + 1) : (0.95 + 0.98) \times 100 - 100 = +3.63\%$$

i.e. the speed log is measuring too low speed/short distance, thus needs to **increase** CF;

$$CF = (1 + 1) : (1.06 + 1.09) \times 100 - 100 = -6.98\%$$

i.e. the speed log is measuring too high speed/long distance, thus needs to **decrease** CF;

With the above procedure it is now possible to change between defined calibration factors in menu C1 DRAUGHT COND for three draught conditions as evaluated and specified by the user for the individual ship.

3.8.3 Speed dependent calibration – (Multiple point calibration)

This type of calibration is intended for vessels where it has been determined during speed trial runs at various speeds that the CF is not linear throughout the speed range, thus different CFs need to be entered at defined *expected* (true) speed levels as calculated.

Up to ten different speed points can be calibrated for, spread to speeds both ahead and astern. Speeds between the calibration points are interpolated automatically, except the area nearest zero, which uses its nearest calibration factor down (up) to speed zero.

The Multiple Point Calibration can be ENABLED and DISABLED in menu C3. The change must be stored by pressing the ENTER button.

The calibration Trial runs and calculations shall be done and defined for **each** speed point in the same way as described under Single Point Calibration above.

To be able to enter the expected (true) speed value in the C3 menu it is also necessary to define/calculate the actual true speed from the reference (DGPS) system for **each** speed trial run.

Do not enter any values in menu C3 until all speed trials are completed and calculated.

Before initial calibration runs, make sure:

- that correct TRU TC factor is set in menu C4 (see above);
- the MULTI-P CAL is DISABLED (Menu C3, default is ENABLED) if any points have entered values or just assure that all ten points are set to 0%;

Due to the interpolation between the calibration factors the MULTI-P CAL should be DISABLED during all calibration runs, also when making a later run for an extra speed calibration point.

The MULTI-P CAL can be ENABLED and DISABLED in menu C3.

3.9 Averaging Speed Constants

Refer to paragraph 1.4 **Menu mode** above how to move in the Menu System.

If the speed output is fluctuating in an improper manner it may be possible to level it out with a filtering time constant. Two different constants can be set, one for a lower speed range – menu S1 –, for faster reaction of speed changes, and one for a higher speed range – menu S3 – normally needing more equalized speeds. The threshold between low and high averaging speed constants can also be set in menu S2 as desired for the instant use.

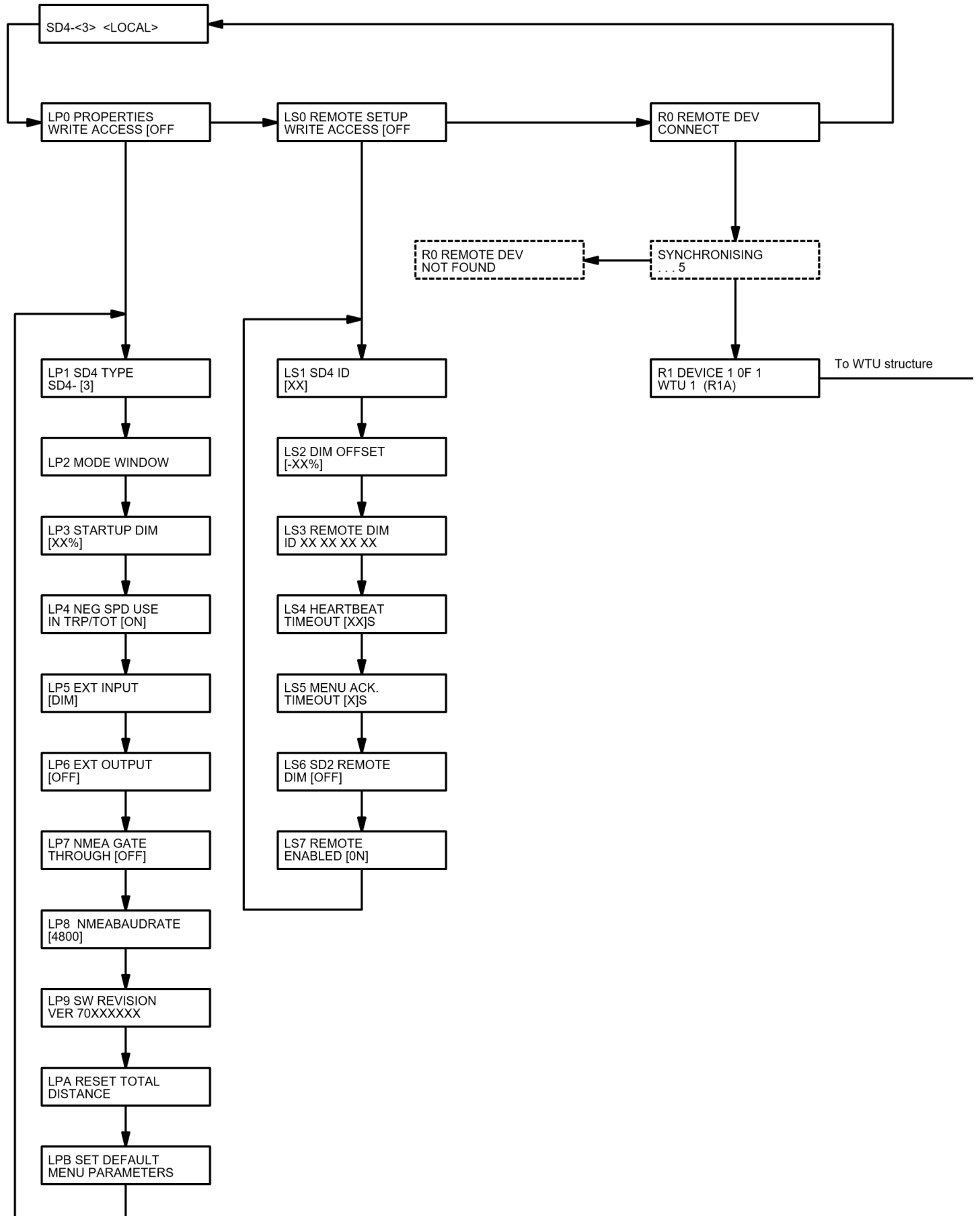
3.10 Software revisions

The SD4 display software revision can be found in menu LP9 in the SD4 Menu System.

The R1 / WTU software revisions can be found in menu M6 in the WTU Menu System.

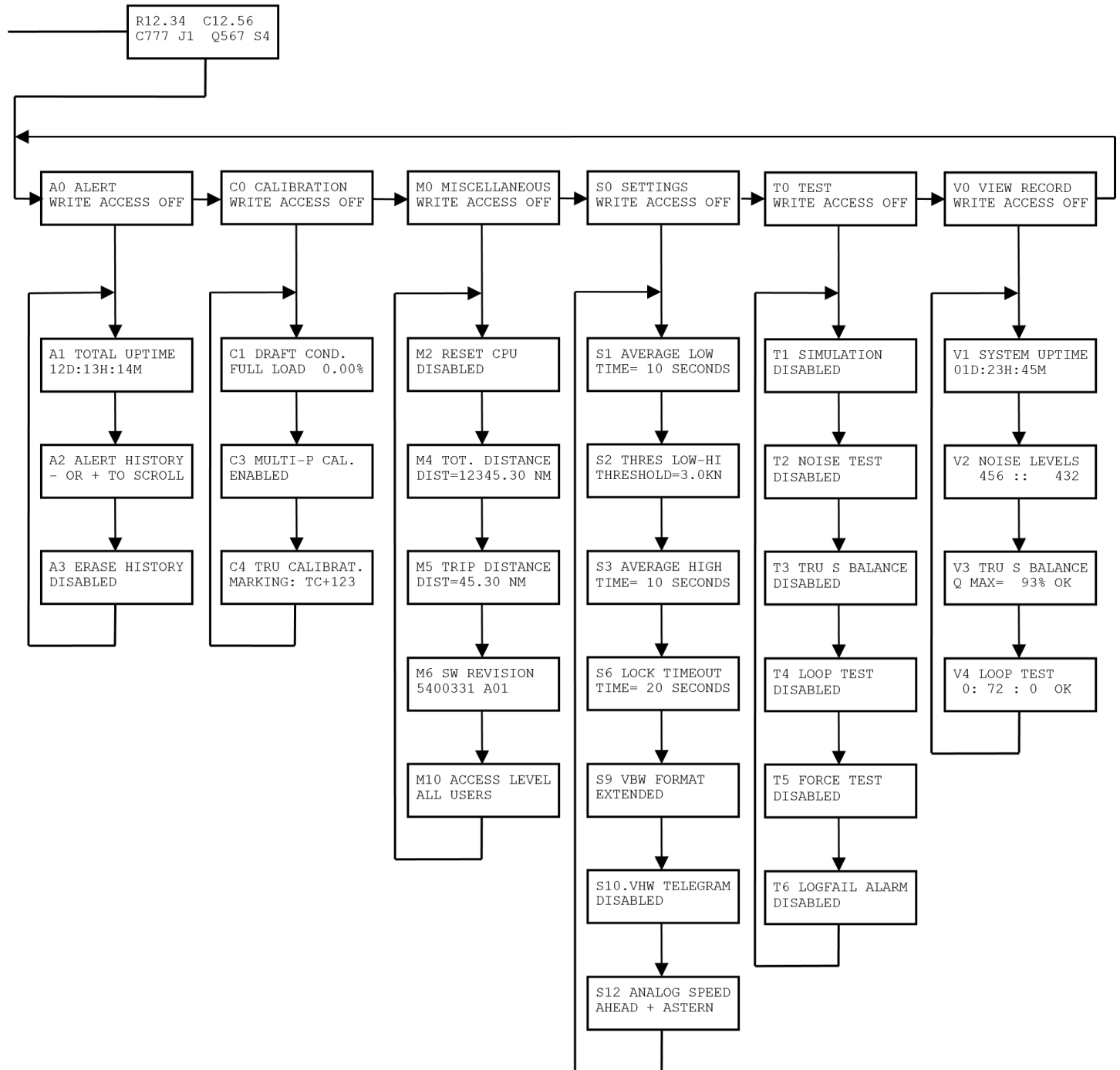
3.11 SD4-3 & SAL R1 Menus

SD4-3 MENU STRUCTURE (Simplified structure without any submenus):



SAL R1 MENU STRUCTURE (Simplified structure without any submenus, all user level structure):

From SD4-3 structure



4 SETTING UP GUIDE

The SAL R1 Setting Up Procedure includes all steps after the Mechanical and Electrical Installations have been performed and up to the calibration of the speed log. (For calibration see **3.8 Calibration**.)

The Setting Up Guide is limited to short instructions and we therefore recommend to using it as a check list. For errors or disruptions during the setting up procedure, please refer to **5 Trouble-shooting**.

Each electrical installation is instructed to be completed by the Pre Set up Procedure. We recommend to double check these points before supplying power to the unit:

- Remove any possible particles from the cabinet(s)
- Carry out a visual inspection of the installed components and cables referring to the layouts of the unit and to the interconnection drawings
- Check that cable terminations have a firm grip of the cable wires
- Check that cable glands have a firm grip around the cables
- Check that the Transducer cable shield is firmly grounded in the cable gland of the ELC.
- Check for proper cable bends to assure a proper amount of slack
- Check that ground connections are duly tightened.
- Carefully check the main power voltage and the integrity of the fuses.

Also check that the transducer is correctly installed down in working position and longitudinally aligned.

Set the SAL R1 Speed log to power, follow the procedure below and act accordingly. If a fault occurs or is detected, use the Trouble-Shooting Guide to analyse and eliminate the reason.

- Check that the default settings, (LED 2) on the WTU-Assy board is turned on.
- Check that the red Alert LED on the WTU-Assy board is turned off.
- Use the Speed Log Master Display, SD4-3 to communicate with the WTU-Assy by going into the R0 REMOTE DEV menu.
- Go to Menu T0
- Change to WRITE ACCESS ON
- Move down to T1 and use default speed 8 knots or use speed as desired

→ **Note:** Now the SAL R1 will stop measuring ship's speed and instead it is showing the simulated speed on all users connected.

- Check that all connected users show the same speed.
- Change to and check at least two more speeds within the ship's speed range, including one speed astern (minus).
- Enable menu T2 – noise test, using sub menu T2.1 and read the two values. Both displayed values shall preferably be below 700 over time (values will vary). Higher values may degrade the measuring performance of the log.
- Enable menu T3 – signal balance, using sub menu T3.1 and read the value. The readings shall be in the interval 50% – 200% and state OK, but if the ship is not moving the values may vary a lot over time and be outside the allowed interval during short periods. Check the reading for a couple of minutes before any conclusions are drawn. A faulty TRU will seldom hit the correct interval.
- Enable menu T4 – loop test, using sub menu T4.1 and read the three values. First and last value shall be below 2, middle value in the interval 40 to 120.
- Move to T6 menu and simulate Log Failure Alarm.
- Check that connected alarm is activated (if any).
- Leave the T menu by pressing **Menu** and **Enter** simultaneously two times.
- Check that simulated speed has been replaced by actual speed.
- Check that TC factor (in Menu C4) is set according to calibration factor as marked on TRU cable core No.1. (See **3 User Guide**).
- Leave the WTU Menu and the SD4-3 Menu Mode by pressing **Esc** three times.

5 TROUBLE-SHOOTING

The first part of the Trouble-Shooting Guide explains the alert codes.

The second part is built-up around possible and likely faults and disruptions acquired from experience. It also includes practical suggestions and actions to solve the listed problems.

The third part consists of test methods, referred to in the second part, as help at fault finding.

However, actions for analysing and fault finding incorporate knowledge and experience of SAL R1 Speed Log working principles and how to communicate with and navigate in the SAL R1 menu system.

5.1 Alert codes

5.1.1 The Alert mode on the SD4 display is intended as support for service purposes and trouble-shooting of the SAL speed log system. Following is a list of Alert codes that may occur on a SAL R1 system.

5.1.2 Alert codes 300 to 399, Speed Through the Water

Alert	Display text	Note
301	STW simulation	Alert raised if simulation mode is activated from the WTU Menu T0 TEST.
350	STW Noise level	Alert is raised if background noise level is too high. The noise levels can be read using menu T2.1 (real time forced noise test) or menu V2 (last measuring sequence) Indicates problem with transducer connection / wiring or disturbance from external equipment. It can take more than 1 minute for the alert to be raised or cleared. This Alert is not shown on the SD4 if the software used in WTU-Assy is 5400130A04, only on the WTU COM port. Action: • Verify TRU connections and that the TRU cable braid is connected in the ELC cable gland, reconnect if faulty. • Verify that the ELC ground bolt is connected correctly. • Verify that TRU cable isn't clamped to or paralleled with high power cables. Release if necessary.
351	STW PCB Fail	Alert if internal PCB loop test fails. The loop test values can be read in real time using menu T4.1. It can take more than 1 minute for the alert to be raised or cleared. Action: • Replace WTU - Assy. or ELC.
352	STW Bad TRU	Alert if transducer seems broken. Indicates problem with transducer or transducer connection. It can take more than 1 minute for the alert to be raised or cleared. This Alert is not shown on the SD4 if the software used in WTU-Assy is 5400130A04, only on the WTU COM port. Action • Verify TRU connections and reconnect if faulty. • Replace TRU.
353	STW No TRU	Alert if transducer seems to be missing. Indicates problem with transducer or transducer connection. It can take more than 1 minute for the alert to be raised or cleared. This Alert is not shown on the SD4 if the software used in WTU-Assy is 5400130A04, only on the WTU COM port. Action • Verify TRU connections and reconnect if faulty. • Replace TRU.

Alert	Display text	Note
354	STW Signal Balance	Alert if signal balance, i.e. the difference in signal strength between channels is too large. The signal balance can be read in real time using menu T3.1. Indicates problem with transducer or transducer connection. It can take more than 1 minute for the alert to be raised or cleared. This Alert is not shown on the SD4 if the software used in WTU-Assy is 5400130A04, only on the WTU COM port. Action • Verify TRU connections and reconnect if faulty. • Verify TRU mounting in e.g. sea valve. • Replace TRU.
355	STW Mute or HW	Alert if internal PCB FPGA fails or a SOG log mutes the WTU. It can take more than 1 minute for the alert to be raised or cleared. This Alert is not shown on the SD4 if the software used in WTU-Assy is 5400130A04, only on the WTU COM port. Action • Reboot the ELC (power Off -> On) • Replace WTU - Assy. or ELC.

5.2 Possible faults and actions

1 R1 indicates wrong speed

Reason	Action
The TRU is not aligned longitudinal	Check the TRU according to TRU Mounting Inspection described below
The log is set to wrong speed calibration (WTU-menu C1, C3).	Change calibration alternative. See topic 3.8 Calibration
The log is set to wrong TRU calibration (WTU-menu C4).	Check TRU calibration. See topic 3.8 Calibration
The speed calibration is not relevant to present conditions.	Make a new log calibration. See topic 3.8 Calibration

2 R1 has locked on constant speed

Reason	Action
The WTU is in test mode.	Enter the WTU T-menu and leave that mode by pressing Menu and Enter simultaneously two times and then ESC two Esc three times.

3 R1 indicates a delayed speed at accelerations and retardation

Reason	Action
Too high averaging time constant or wrong speed limit between constants.	Change averaging time constant or speed limit between constants. See topic 3.9 Averaging Speed Constants

4 R1 indicates an oscillating speed around correct value

Reason	Action
Too low averaging time constant or wrong speed limit between constants.	Change averaging time constant or speed limit between constants. See topic 3.9 Averaging Speed Constants

5 Some of connected displays/users indicate wrong speed or no speed at all

Reason	Action
At any of reasons below in this table.	Change to simulated speed as described below.
Bad contact between ELC / NMEA Unit(s) (LPU2) and display / user.	Check terminations in ELC / NMEA Unit(s) (LPU2) and display / user. Check cables.
Only serial (NMEA) displays not working. Serial output not working in ELC / NMEA Unit(s) (LPU2).	Measure serial (NMEA) signal in ELC / NMEA Unit(s) (LPU2) as described below.

6 R1 indicates speed only intermittently and between that, three dashes (– – –) in SD4-3 Speed Window

➔ **Note:** SAL R1 is primarily a longitudinal speed measuring system, thus this behavior may be normal due to e.g. sharp/hard turning maneuvering

Reason	Action
The TRU is not aligned longitudinal or not in working position.	Check the TRU according to TRU Mounting Inspection described below.
TRU cable shield not connected in R1 cabinet gland may cause disturbances.	Check that the TRU cable shield is firmly connected in the ELC cable gland.
The TRU sensor surface is covered by algae/marine growth.	Check the TRU according to TRU Sensor Surface Inspection described below.

7 R1 indicates continuously no speed and only three lines (– – –) in SD4-3 Speed Window

Reason	Action
The TRU is not aligned longitudinal or not in working position.	Check the TRU according to TRU Mounting Inspection described below.
The TRU sensor surface is covered by algae/marine growth.	Check the TRU according to TRU Sensor Surface Inspection described below.

8 R1 indicates no speed at all and the SD4-3 shows NO NMEA in Mode Window and **Err** in the Speed Window

Reason	Action
The speed log ELC has lost power.	Check that ELC is in operation.
The log distribution unit has lost power.	Check that NMEA Unit(s) (LPU2) is in operation.
The serial connection is broken.	Check cables and terminal connections.

5.3 Jumper settings

The jumper settings shall be checked when the ELC is installed. Names refer to Pcb screen print. The jumpers shall be kept in default positions for normal operation.

Default positions are shown in **bold**:

Jumper	Position	Function
RESET	CONNECTED OPEN	Normal operation CPU will reset until jumper is restored
FACTORY	CONNECTED OPEN	Normal operation If open during restart all settable menu parameters will be restored to default
PROGRAM	CONNECTED OPEN	Normal operation Not to be used
TEST	CONNECTED OPEN	Normal operation Not to be used without special test equipment

Before setting the ELC to power, check that also other units powered and controlled from the ELC are properly connected.

