The paper used in this manual is elemental chlorine free.
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 descriptions in this manual. Wrong operation or maintenance can cancel 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 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 cancel 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 of 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. Follow the instructions below if a battery is used. Tape the + and - terminals of battery before disposal to prevent fire, heat generation caused by short circuit.

In the European Union
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.

In the USA
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.

In the other countries
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

The operator and installer must read the applicable safety instructions before attempting to operate or install the equipment. Failure to comply with these safety instructions may cause injury, loss of life or damage to the equipment.

Warning, Caution ☒ Prohibitive Action ☀ Mandatory Action

Safety instructions for the installer

**WARNING**

- Turn off the power at the mains switchboard before beginning the installation.
  
  Fire, electrical shock or serious injury can occur if the power is left on or is applied while the equipment is being installed.

- **ELECTRICAL SHOCK HAZARD**
  Do not open the equipment unless totally familiar with electrical circuits and service manual.
  
  Only qualified personnel should work inside the equipment.

- Use the specified power cable.
  
  Fire can result if an incorrect cable is used.

- Do not disassemble or modify the equipment.
  
  Fire, electrical shock or serious injury can occur.

- Do not install the equipment where it may get wet from rain or water splash.
  
  Water in the equipment can cause fire, electrical shock or damage to the equipment.

**CAUTION**

- Ground the equipment to prevent electrical shock and mutual interference.

- Observe the following safe compass distances to prevent interference to a magnetic compass:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Standard compass</th>
<th>Steering compass</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display Unit SC-702</td>
<td>0.50 m</td>
<td>0.30 m</td>
</tr>
<tr>
<td>Junction Box SC-701</td>
<td>1.35 m</td>
<td>0.85 m</td>
</tr>
<tr>
<td>Antenna Unit SC-703</td>
<td>0.40 m</td>
<td>0.30 m</td>
</tr>
<tr>
<td>Antenna Unit SC-1303</td>
<td>0.30 m</td>
<td>0.30 m</td>
</tr>
<tr>
<td>Remote Display Unit RD-50</td>
<td>0.45 m</td>
<td>0.30 m</td>
</tr>
<tr>
<td>Remote Display Unit RD-20</td>
<td>1.25 m</td>
<td>0.80 m</td>
</tr>
</tbody>
</table>
SAFETY INSTRUCTIONS

Safety instructions for the operator

**WARNING**

**ELECTRICAL SHOCK HAZARD**
Do not open the equipment unless totally familiar with electrical circuits and service manual.
Only qualified personnel should work inside the equipment.

Do not disassemble or modify the equipment.
Fire, electrical shock or serious injury can occur.

Turn off the power immediately if water leaks into the equipment or smoke or fire is coming from the equipment.
Failure to turn off the equipment can cause fire or electrical shock.
Contact a FURUNO agent for service.

Use the correct fuse.
A wrong fuse can cause fire or serious damage to the equipment.

**CAUTION**

No single navigation aid (including this unit) should ever be relied upon as the exclusive means for navigating your vessel.
The navigator is responsible for checking all aids available to confirm his position. Electronic aids are intended to assist, not replace, the navigator.

**WARNING LABEL**
A warning label is attached to the Junction Box (SC-701). Do not remove the label.
If the label is missing or damaged, contact a FURUNO agent or dealer about replacement.

About the TFT LCD
The TFT LCD is constructed using the latest LCD techniques, and displays 99.99% of its pixels. The remaining 0.01% of the pixels may drop out or blink, however this is not an indication of malfunction.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FOREWORD</strong></td>
<td>vii</td>
</tr>
<tr>
<td><strong>SYSTEM CONFIGURATION</strong></td>
<td>ix</td>
</tr>
<tr>
<td><strong>EQUIPMENT LIST</strong></td>
<td>x</td>
</tr>
<tr>
<td><strong>1. INSTALLATION</strong></td>
<td>1-1</td>
</tr>
<tr>
<td>1.1 How to Install the Antenna Units</td>
<td>1-1</td>
</tr>
<tr>
<td>1.1.1 How to install the SC-703 Antenna Unit</td>
<td>1-3</td>
</tr>
<tr>
<td>1.1.2 How to install the SC-1303 Antenna Unit</td>
<td>1-4</td>
</tr>
<tr>
<td>1.1.3 How to retrofit from SC-603/SC-1203</td>
<td>1-6</td>
</tr>
<tr>
<td>1.2 How to Install the Junction Box (SC-701)</td>
<td>1-7</td>
</tr>
<tr>
<td>1.3 How to Install the Display Unit (SC-702)</td>
<td>1-8</td>
</tr>
<tr>
<td>1.3.1 How to install the SC-702 on a desktop or overhead</td>
<td>1-8</td>
</tr>
<tr>
<td>1.3.2 How to flush mount the SC-702</td>
<td>1-9</td>
</tr>
<tr>
<td>1.4 How to Install the Remote Display Unit (option)</td>
<td>1-10</td>
</tr>
<tr>
<td>1.5 Wiring</td>
<td>1-11</td>
</tr>
<tr>
<td>1.5.1 How to fabricate the cables</td>
<td>1-12</td>
</tr>
<tr>
<td>1.5.2 How to secure and waterproof the cable connections</td>
<td>1-13</td>
</tr>
<tr>
<td>1.5.3 How to fabricate the WAGO connectors</td>
<td>1-14</td>
</tr>
<tr>
<td>1.5.4 How to connect the Antenna Unit (SC-703/SC-1303)</td>
<td>1-15</td>
</tr>
<tr>
<td>1.5.5 How to connect the Junction Box (SC-701)</td>
<td>1-17</td>
</tr>
<tr>
<td>1.5.6 How to connect the Display unit (SC-702)</td>
<td>1-20</td>
</tr>
<tr>
<td>1.5.7 How to connect the Remote Display Unit (option)</td>
<td>1-22</td>
</tr>
<tr>
<td>1.6 Initial Settings</td>
<td>1-23</td>
</tr>
<tr>
<td>1.6.1 Main menu</td>
<td>1-24</td>
</tr>
<tr>
<td>1.6.2 How to set vessel dimensions, antenna location and CCRP</td>
<td>1-25</td>
</tr>
<tr>
<td>1.6.3 How to apply offsets for heading/pitch/heave/roll/position</td>
<td>1-26</td>
</tr>
<tr>
<td>1.7 How to Access and Use the [SERVICE] Menu</td>
<td>1-27</td>
</tr>
<tr>
<td>1.8 I/O Menu Settings</td>
<td>1-27</td>
</tr>
<tr>
<td>1.9 Initial Settings for the Remote Display</td>
<td>1-27</td>
</tr>
<tr>
<td><strong>2. OPERATION</strong></td>
<td>2-1</td>
</tr>
<tr>
<td>2.1 Controls Overview</td>
<td>2-1</td>
</tr>
<tr>
<td>2.2 How to Turn the Power On/Off</td>
<td>2-2</td>
</tr>
<tr>
<td>2.3 How to Adjust the Brilliance, Change the Background Color</td>
<td>2-3</td>
</tr>
<tr>
<td>2.3.1 How to adjust the screen and key panel brilliance</td>
<td>2-3</td>
</tr>
<tr>
<td>2.3.2 How to change the background and text color</td>
<td>2-3</td>
</tr>
<tr>
<td>2.4 Menu Overview</td>
<td>2-4</td>
</tr>
<tr>
<td>2.5 LIST Screens Overview</td>
<td>2-5</td>
</tr>
<tr>
<td>2.6 Display Modes Overview</td>
<td>2-5</td>
</tr>
<tr>
<td>2.6.1 Icons and indications</td>
<td>2-6</td>
</tr>
<tr>
<td>2.7 GPS Display Mode</td>
<td>2-7</td>
</tr>
<tr>
<td>2.7.1 GPS coordinates screen (main screen)</td>
<td>2-7</td>
</tr>
<tr>
<td>2.7.2 GPS integrity screen</td>
<td>2-8</td>
</tr>
<tr>
<td>2.7.3 BEACON INFO/TYPE 16 MESSAGE screen</td>
<td>2-9</td>
</tr>
<tr>
<td>2.8 THD Display Mode</td>
<td>2-10</td>
</tr>
<tr>
<td>2.8.1 HDG data screen</td>
<td>2-10</td>
</tr>
<tr>
<td>2.8.2 ROT data screen</td>
<td>2-11</td>
</tr>
<tr>
<td>2.8.3 HDG/ROT split screen</td>
<td>2-11</td>
</tr>
<tr>
<td>2.8.4 THD integrity screen</td>
<td>2-12</td>
</tr>
<tr>
<td>2.9 ROTI Display Mode</td>
<td>2-13</td>
</tr>
<tr>
<td>2.9.1 ROTI Display for RD-50/RD-20 (option)</td>
<td>2-13</td>
</tr>
</tbody>
</table>
3. MAINTENANCE, TROUBLESHOOTING ................................................................. 3-1
  3.1 Preventative Maintenance ........................................................................... 3-1
  3.2 Replacement of Fuse .................................................................................. 3-2
  3.3 Basic Troubleshooting .................................................................................. 3-2
  3.4 Maintenance Menu ...................................................................................... 3-3
    3.4.1 How to find unit information ................................................................. 3-3
    3.4.2 How to Backup User Settings ............................................................... 3-3
  3.5 Diagnostic Tests .......................................................................................... 3-5
    3.5.1 Memory test .......................................................................................... 3-5
    3.5.2 Keyboard test ....................................................................................... 3-6
    3.5.3 LCD test ............................................................................................... 3-6
    3.5.4 Automatic Test ...................................................................................... 3-7
    3.5.5 Sound test ............................................................................................ 3-7

APPENDIX 1 MENU TREE .................................................................................. AP-1
# TABLE OF CONTENTS

APPENDIX 2 ALERT LIST ................................................................. AP-4
APPENDIX 3 ABBREVIATIONS AND UNITS ................................ AP-6
APPENDIX 4 ICONS AND SYMBOLS ........................................... AP-8
APPENDIX 5 GEODE蒂C CHART CODES ...................................... AP-9
APPENDIX 6 WHAT IS SBAS? ..................................................... AP-10
APPENDIX 7 DIGITAL INTERFACE (IEC 61162-1 EDITION 4(2010-11)) AP-11
APPENDIX 8 PARTS LIST/LOCATION ......................................... AP-23
APPENDIX 9 JIS CABLE GUIDE ................................................... AP-26
SPECIFICATIONS ......................................................................... SP-1

PACKING LISTS ............................................................................ A-1
OUTLINE DRAWINGS .................................................................... D-1
INTERCONNECTION DIAGRAMS .................................................. S-1
INDEX ........................................................................................ IN-1
FOREWORD

A Word to the Owner of the SC-70/SC-130

FURUNO Electric Company thanks you for purchasing the FURUNO SC-70 or SC-130 Satellite Compass™. We are confident you will discover why the FURUNO name has become synonymous with quality and reliability.

Since 1948, FURUNO Electric Company has enjoyed an enviable reputation for quality and reliability throughout the world. This dedication to excellence is furthered by our extensive global network of agents and dealers.

Your equipment is designed and constructed to meet the rigorous demands of the marine environment. However, no machine can perform its intended function unless properly operated and maintained. Please carefully read and follow the operation and maintenance procedures in this manual.

We would appreciate feedback from you, the end-user, about whether we are achieving our purposes.

Thank you for considering and purchasing FURUNO.

Features

The SC-70/SC-130 is a new Satellite Compass™ designed with FURUNO advanced GPS kinematic technology. This compass has a wide range of applications for both land and sea vessels.

The main features are:

- Meets the requirement for the following regulations: IMO MSC. 116(73), ISO 22090 Ed 2.0, IMO A. 694(17), IEC 60945, ISO 22090 Ed 2.0, IEC 61108-1 Ed 2.0, ISO 20672 Ed 1.0, IEC 61924-2 Ed 1.0, IEC 61162-1 Ed 4.0, IEC 61162-2 Ed 1.0, IEC 61162-450 Ed 1.0, IEC 62288 Ed 2.0, IEC 61924-2 Ed 1.0 RESOLUTION MSC. 302(87).

- Can output speed for any set location, allowing monitoring of bow and stern berthing speeds without the use of optional equipment.

- Perfect for use as a heading sensor for RADAR/ARPA, AIS, ECDIS and scanning SONARs.

- There are no mechanical parts such as gimbals or a rotating motor, thus the compass is free from routine maintenance.

- Geomagnetism does not affect the compass performance, making it usable on any vessel.

- No need for speed correction, unlike a gyrocompass.

- Short setting time

- Easily integrated into existing ship-board network via Ethernet.

- Remote Maintenance Service (RMS) ready, allowing hassle-free assistance when in port.

- Can be connected using existing antenna cabling (SC-50/60/110/120 only) by adding the optional conversion kit. Note that existing antennas units must be replaced. (Non-IMO type only)

- Uses multiple satellite types, eliminating the problem of not having enough satellites visible. (Non-IMO type only.)
CE declaration

With regards to CE declarations, please refer to our website (www.furuno.com), for further information about RoHS conformity declarations.

Program numbers

<table>
<thead>
<tr>
<th>Unit &amp; PC Board</th>
<th>PCB/Application</th>
<th>Program No.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antenna Unit</td>
<td>MAIN</td>
<td>2051570-01.xx</td>
</tr>
<tr>
<td></td>
<td>GNSS</td>
<td>48505230.xx</td>
</tr>
<tr>
<td>Junction box</td>
<td>MAIN</td>
<td>2051562-01.xx</td>
</tr>
<tr>
<td>Display Unit</td>
<td>MAIN</td>
<td>2051566-01.xx</td>
</tr>
<tr>
<td>Remote Display Unit RD-50</td>
<td>Starter</td>
<td>2651006-01.xx</td>
</tr>
<tr>
<td></td>
<td>Booter</td>
<td>2651007-01.xx</td>
</tr>
<tr>
<td></td>
<td>Main</td>
<td>2651008-01.xx</td>
</tr>
<tr>
<td>Remote Display Unit RD-20</td>
<td>Starter</td>
<td>2651003-01.xx</td>
</tr>
<tr>
<td></td>
<td>Booter</td>
<td>2651004-01.xx</td>
</tr>
<tr>
<td></td>
<td>Main</td>
<td>2651005-01.xx</td>
</tr>
</tbody>
</table>

*: “xx” denotes version number.
SYSTEM CONFIGURATION

Antenna Unit
SC-703

Display Unit
SC-702

12 to 24 VDC

12 to 24 VDC

100/115/220/230 VAC
1ø, 50/60 Hz

AC/DC Power
Supply Unit
PR-240

LAN cable*

Navigational
Equipment
(IEC61162-1)

AIS
(IEC61162-2)

AD-10

Networked
Equipment
(CANbus)

Alert
Management
System (AMS)

Environmental categories:
Antenna units: Exposed to the weather.
Other units: Protected from the weather.

*: For configurations using the optional LAN conversion kit, the existing LAN cable is used.

Standard supply
Optional/local supply
# EQUIPMENT LIST

## Standard supply

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Code No.</th>
<th>Qty.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antenna unit</td>
<td>SC-703</td>
<td>-</td>
<td>Select one</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>SC-703-L</td>
<td>-</td>
<td>-</td>
<td>Contains LAN-Coax conversion kit.</td>
</tr>
<tr>
<td></td>
<td>SC-1303</td>
<td>-</td>
<td>-</td>
<td>Contains LAN-Coax conversion kit.</td>
</tr>
<tr>
<td></td>
<td>SC-1303-L</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Display Unit</td>
<td>SC-702</td>
<td>-</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Junction Box</td>
<td>SC-701</td>
<td>-</td>
<td>Select one</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>SC-701-L</td>
<td>-</td>
<td>-</td>
<td>Contains LAN-Coax conversion kit.</td>
</tr>
<tr>
<td>Installation materials</td>
<td>CP20-04300</td>
<td>000-033-318</td>
<td>Select one</td>
<td>LAN cable (30 m) for SC-701 to Antenna Unit connection.</td>
</tr>
<tr>
<td></td>
<td>CP20-04310</td>
<td>000-033-319</td>
<td>-</td>
<td>LAN cable (40 m) for SC-701 to Antenna Unit connection.</td>
</tr>
<tr>
<td></td>
<td>CP20-04320</td>
<td>000-033-320</td>
<td>-</td>
<td>LAN cable (50 m) for SC-701 to Antenna Unit connection.</td>
</tr>
<tr>
<td></td>
<td>CP20-04330</td>
<td>000-033-321</td>
<td>-</td>
<td>LAN cable (15 m) for SC-701 to Antenna Unit connection. No shield.</td>
</tr>
<tr>
<td></td>
<td>CP20-04340</td>
<td>000-033-322</td>
<td>-</td>
<td>LAN cable (30 m) for SC-701 to Antenna Unit connection. No shield.</td>
</tr>
<tr>
<td></td>
<td>CP20-04350</td>
<td>000-033-323</td>
<td>-</td>
<td>LAN cable (15 m) for SC-701 to Antenna Unit connection. No shield.</td>
</tr>
<tr>
<td></td>
<td>CP20-04360</td>
<td>000-033-324</td>
<td>-</td>
<td>LAN cable (30 m) for SC-701 to Antenna Unit connection. No shield.</td>
</tr>
<tr>
<td></td>
<td>CP20-04201</td>
<td>001-459-750</td>
<td>1</td>
<td>For SC-703.</td>
</tr>
<tr>
<td></td>
<td>CP20-04202</td>
<td>001-459-760</td>
<td>1</td>
<td>For SC-1303</td>
</tr>
<tr>
<td></td>
<td>CP20-04001</td>
<td>001-459-600</td>
<td>1</td>
<td>For SC-701</td>
</tr>
<tr>
<td></td>
<td>CP20-04100</td>
<td>000-030-913</td>
<td>Select one</td>
<td>For SC-702. 10 m cable.</td>
</tr>
<tr>
<td></td>
<td>CP20-04110</td>
<td>000-030-914</td>
<td>-</td>
<td>For SC-702. 30 m cable.</td>
</tr>
<tr>
<td>Spare parts</td>
<td>SP20-01801</td>
<td>001-474-090</td>
<td>1</td>
<td>For SC-701. (Fuses × 2)</td>
</tr>
</tbody>
</table>

## Optional supply

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Code No.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface Unit</td>
<td>IF-2503</td>
<td>000-010-101</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>IF-NMEA SC</td>
<td>000-011-469</td>
<td>For analog output.</td>
</tr>
<tr>
<td>AC/DC Power Supply Unit</td>
<td>PR-240</td>
<td>000-013-632</td>
<td>100 VAC to 115 VAC, 200 VAC to 230 VAC</td>
</tr>
<tr>
<td>Remote Display Unit</td>
<td>RD-50</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>RD-20</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Cable Assembly (For NMEA2000)</td>
<td>M12-05BFFM-010</td>
<td>001-105-780-10</td>
<td>For NMEA2000 equipment connection.</td>
</tr>
<tr>
<td></td>
<td>M12-05BFFM-020</td>
<td>001-105-790-10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M12-05BFFM-060</td>
<td>001-105-800-10</td>
<td></td>
</tr>
<tr>
<td>LAN cable (For AMS or dual configurations)</td>
<td>FR-FTPC-CY <em>10M</em></td>
<td>001-240-510</td>
<td>For AMS connection.</td>
</tr>
<tr>
<td></td>
<td>FR-FTPC-CY <em>20M</em></td>
<td>001-240-520</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FR-FTPC-CY <em>30M</em></td>
<td>001-240-530</td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>Type</td>
<td>Code No.</td>
<td>Remarks</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>--------------------------</td>
<td>------------</td>
<td>-----------------------------------------------------</td>
</tr>
<tr>
<td>Cable Assembly</td>
<td>Z-#26X2P+0.3SQX1PL30</td>
<td>000-192-277-10</td>
<td>For SC-702, 30 m</td>
</tr>
<tr>
<td></td>
<td>Z-#26X2P+0.3SQX1PL10</td>
<td>000-192-276-10</td>
<td>For SC-702, 10 m</td>
</tr>
<tr>
<td>Connector (waterproof)</td>
<td>FRU-RJ-PLUG-ASSY</td>
<td>000-192-316-10</td>
<td>For connection between SC-701 and SC-703/SC-1303.</td>
</tr>
<tr>
<td></td>
<td>OP20-36</td>
<td>004-380-830</td>
<td>Four pieces.</td>
</tr>
<tr>
<td></td>
<td>OP20-49</td>
<td>001-482-870</td>
<td>Seven pieces.</td>
</tr>
<tr>
<td>Front Fixing Panel</td>
<td>OP24-35</td>
<td>001-247-240</td>
<td>For SC-702.</td>
</tr>
<tr>
<td>Water Proof Kit</td>
<td>OP05-139</td>
<td>001-426-500</td>
<td>For SC-702.</td>
</tr>
<tr>
<td>F_Mount Cushion Kit</td>
<td>OP05-141</td>
<td>001-436-880</td>
<td>For SC-702.</td>
</tr>
<tr>
<td>Modular Connector</td>
<td>MPS588-C</td>
<td>001-459-840</td>
<td>For LAN cable.</td>
</tr>
<tr>
<td>Micro T-Connector</td>
<td>SS-050505-FMF-TS001</td>
<td>000-168-603-10</td>
<td></td>
</tr>
<tr>
<td>Termination Resistor (Micro)</td>
<td>LTWMC-05BFFT-SL8001</td>
<td>000-168-605-10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LTWMC-05BMMT-SL8001</td>
<td>000-168-604-10</td>
<td></td>
</tr>
<tr>
<td>Installation Materials</td>
<td>CP20-04300</td>
<td>000-033-318</td>
<td>LAN cable (30 m) for SC-701 to Antenna Unit connection.</td>
</tr>
<tr>
<td></td>
<td>CP20-04310</td>
<td>000-033-319</td>
<td>LAN cable (40 m) for SC-701 to Antenna Unit connection.</td>
</tr>
<tr>
<td></td>
<td>CP20-04320</td>
<td>000-033-320</td>
<td>LAN cable (50 m) for SC-701 to Antenna Unit connection.</td>
</tr>
<tr>
<td></td>
<td>CP20-04330</td>
<td>000-033-321</td>
<td>LAN cable (15 m) for SC-701 to Antenna Unit connection. No shield.</td>
</tr>
<tr>
<td></td>
<td>CP20-04340</td>
<td>000-033-322</td>
<td>LAN cable (30 m) for SC-701 to Antenna Unit connection. No shield.</td>
</tr>
<tr>
<td></td>
<td>CP20-04350</td>
<td>000-033-323</td>
<td>LAN cable (15 m) for SC-701 to Antenna Unit connection. No shield.</td>
</tr>
<tr>
<td></td>
<td>CP20-04360</td>
<td>000-033-324</td>
<td>LAN cable (30 m) for SC-701 to Antenna Unit connection. No shield.</td>
</tr>
</tbody>
</table>
1. INSTALLATION

This chapter covers the installation procedure and initial set up procedures and settings for the SC-70 and SC-130 systems.

Note: The settings and procedures outlined in this chapter are for technical personnel and should not be adjusted or changed by the user. If you require a change to any of these settings, contact your dealer.

1.1 How to Install the Antenna Units

General considerations

Keep the length of the antenna cable in mind when selecting a mounting location.

Also, select a location with minimal or no vibration.

Installing the antenna above superstructures

It is recommended that the antenna is installed above all other superstructures on the vessel. The antenna can obtain an unobstructed view of the available satellites, regardless of the vessel heading. Failure to install the antenna above all other superstructures can cause shadows and multipath reflection problems.

The figure below shows an example of the antenna installed above all other superstructures.
1. INSTALLATION

**Installing the antenna below superstructures**

Where the antenna is installed below superstructures on the vessel, shadows and multipath problems may occur on at least one heading, and possibly more. To avoid these problems where possible, follow the guidelines in this section.

**Note:** If the antenna is installed below any superstructure, the installation must be done over a two-day period, following the procedure in the service manual. At least 12 hours are required to capture tracking data to measure multipath indexes and locate areas of shading.

- The horizontal separation between the antenna and masts must be as shown in the table below and the figure on the following page:

<table>
<thead>
<tr>
<th>Mast diameter</th>
<th>Minimum separation distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 cm</td>
<td>1.5 m</td>
</tr>
<tr>
<td>30 cm</td>
<td>3 m</td>
</tr>
</tbody>
</table>

- The field of view above the antenna should be as shown in the figure below, ±80° against the zenith. To avoid reflections from masts and other obstacles, locate the antenna well away from shadows of the radar mast, etc.
1. INSTALLATION

- Locate the antenna unit above the radar, out of the radar beam.

1.1.1 How to install the SC-703 Antenna Unit

**Note 1:** Where the installation location is inconvenient for cable connection, connect the cabling (see step 6) before securing the antenna unit to the mounting location.

**Note 2:** The bird-repellent fixtures can be attached to the antenna cover to prevent birds from landing on the cover. If it is more convenient to attach the bird repellent fixtures before securing the antenna unit to the mounting location, do step 7 of the procedure below before fixing the antenna unit.

1. Prepare a mounting platform in accordance with the outline drawing at the back of this manual. If corrosive material is used, take necessary anti-corrosion measures.
   **Note:** Holes drilled into the mounting platform must be parallel with the fore-aft line of the vessel.

2. Orient the antenna unit to face the bow, referring to the figure below. The antenna should be installed within ±2.5° of the bowline.
   **Note:** The antenna cable must be routed via the indent at the rear of the base (see figure below).

3. Coat the thread of the hex. bolts with silicone grease.

4. Secure the unit to the platform with four sets of M10 hex. nuts, spring washers and flat washers (all included as installation materials) with 20 ±2 Nm torque.
   **Note 1:** Take care not to crush the cabling when mounting the antenna to the platform.
   **Note 2:** Take care not to cover the breathing hole on the antenna.
1.  INSTALLATION

5. Coat the exposed parts of the nuts, bolts and washers with marine sealant.

6. Connect the SC-703 cable to the cable from the SC-701, then waterproof the connection (see section 1.5.2 for the waterproofing procedure).

7. If necessary, attach the optional bird-repellent fixtures to the antenna cover using marine sealant (included).

8. Secure the cables to the mast (or superstructure) with cable ties, at regular intervals.

1.1.2 How to install the SC-1303 Antenna Unit

Note 1: Where the installation location is inconvenient for cable connection, connect the cabling (see step 6) before securing the antenna unit to the mounting location.

Note 2: The bird-repellent fixtures can be attached to the antenna cover to prevent birds from landing on the cover. If it is more convenient to attach the bird repellent fixtures before securing the antenna unit to the mounting location, do step 8 before fixing the antenna unit.

1. Prepare a mounting platform in accordance with the outline drawing at the back of this manual. If corrosive material is used, take necessary anti-corrosion measures.

   Note: Holes drilled into the mounting platform must be parallel with the fore-aft line of the vessel.

2. Orient the antenna unit to face the bow, referring to the figure below. The antenna should be installed within ±2.5° of the bowline.

   Note: The antenna cable must be routed via the indent at the rear of the base (see figure on the following page).
3. Coat the thread of the hex. bolts with silicone grease.

4. Fasten the unit to the platform with four sets of M10 hex. bolts, spring washers and flat washers with 20 ±2 Nm torque.

   **Note:** Take care not to crush the cabling when mounting the antenna to the platform.

5. Coat the exposed parts of the nuts, bolts and washers with marine sealant.

6. Connect the SC-1303 cable to the cable from the SC-701, then waterproof the connection (see section 1.5.2 for the waterproofing procedure).

7. If necessary, attach the optional bird-repellent fixtures to the antenna cover using marine sealant (included).

8. Secure the cables to the mast (or superstructure) with cable ties, at regular intervals.
1. INSTALLATION

1.1.3 How to retrofit from SC-603/SC-1203

For retrofits from the SC-603 or SC-1203, the following attachments must be fabricated and attached to the mounting platform.

For SC-603 retrofits

For SC-1203 retrofits
1.2 How to Install the Junction Box (SC-701)

The junction box can be mounted on the floor, bulkhead, on a desk/console or on the underside of a desk.

**Mounting considerations**

Select a mounting location, keeping the following points in mind:

- Locate the SC-701 away from heat sources. Heat can build up inside the unit, causing damage to electrical parts.
- Locate the SC-701 away from areas prone to vibrations. The mounting location should have minimal vibrations.
- Locate the SC-701 away from areas prone to water splash and rain.
- Make sure to connect the unit’s ground to the ship’s ground.
- Leave sufficient space around the unit to allow access for maintenance. See the outline drawings at the back of this manual for the recommended maintenance space.
- A magnetic compass will be affected if the junction box is placed too close to the magnetic compass. Refer to the compass safe distances at the front of this manual when selecting a mounting location.
- The power switch has a small light which lights up when the unit is turned on.

**Note 1:** For wall/bulkhead mounted junction boxes, the cabling entrance indicated in the figure below must be oriented to face downwards, to avoid water entering the unit.

**Note 2:** For floor/desk mounted (top or bottom) junction boxes, select a location where water will not reach the cabling entrance indicated in the figure below.

1. Referring to the outline drawing at the back of this manual, drill four pilot holes for the fixing screws.
2. Fasten two self-tapping screws (⌀20, supplied) at the location for the top fixing holes. Leave approximately 5 mm of thread exposed.
3. Hang the SC-701 on the two screws using the two top fixing holes.
4. Fasten two self-tapping screws (⌀20, supplied) to the bottom fixing holes.
5. Fasten all screws to secure the SC-701 in place.
1. INSTALLATION

1.3 How to Install the Display Unit (SC-702)

The display unit can be installed on a desktop, overhead (bulkhead) or flush mounted in a panel. Install the SC-702 on the chart table or near the helm, referring to the outline drawing at the back of this manual.

Mounting considerations

When selecting a mounting location for the display unit, keep the following in mind:

- Keep the unit out of direct sunlight.
- The temperature and humidity should be moderate and stable. (See the specifications at the back of this manual for operating temperatures.)
- Locate the unit away from heat sources, such as exhaust pipes and vents.
- The mounting location should be well ventilated.
- Keep the unit away from areas subject to rain or water splash.
- Install a ship-board earth to the grounding terminal at the rear of the unit.
- Mount the unit where shock and vibration are minimal.
- Keep the unit away from electromagnetic field generating equipment, such as motors and generators.
- Referring to the outline drawings at the back of this manual, leave sufficient space around the unit to allow access for maintenance.
- A magnetic compass will be affected if the unit is placed too close to it. Observe the compass safe distances listed on page ii to prevent magnetic disturbance.
- Leave enough slack in the unit’s cabling to allow for maintenance and service.
- For flush mount installations, make sure the mounting location is flat.
- To avoid damage to the cabling when mounting the SC-702, make sure the cabling is not excessively bent.

1.3.1 How to Install the SC-702 on a desktop or overhead

The display unit is shipped with the hanger, and must removed from the hanger in order to be installed correctly.

1. Place the SC-702 on a firm, flat surface, then unfasten the two knobs on either side of the display unit to remove the unit.
2. Drill four holes for the self-tapping screws (5x20) at the installation location.
3. Secure the hanger to the desktop or overhead bulkhead with four self-tapping screws (5x20, included). The hanger should be oriented with the insertion slots facing forwards. For mounting dimensions and required clearance, see the outline drawing at the back of this manual.
4. Referring to section 1.5.6, connect the cabling to the SC-702.
5. Fit the SC-702 to the hanger and tighten the bolts on either side evenly. Adjust the angle of the SC-702 so the screen can be viewed clearly.
1.3.2 How to flush mount the SC-702

There are two methods for flush mounting the SC-702. You can mount the unit directly onto the mounting area, or use the optional front fixing panel kit.

For both flush mount installation methods, the hanger and knobs are not required. remove the unit from the hanger and discard the hanger and knobs.

Flush mounting the SC-702 (unit only)

1. Cut a hole in the mounting location, using the template at the back of this manual.
2. Drill four holes for the self-tapping screws (Ø5x20) at the installation location.
3. Place the SC-702 on a firm, flat surface, then unfasten the two knobs on either side of the display unit to remove the unit. The hanger can be disposed.
4. Gently lift the locking tabs at the rear of the front panel, then remove the front panel. Take care not to damage the locking tabs or the front panel.
5. Fit the F Mount Cushion Kit (code: 20-032-106, included) to the rear of the SC-702 or to the mounting hole.
6. Run the cabling through the cutout, then referring to section 1.5.6, connect the necessary cabling to the SC-702.
7. Referring to the figure below, fit the SC-702 to the cutout, then use the supplied self-tapping screws (Ø3×20) to secure the SC-702 to the flush mount panel.
8. Re-fit the front panel that was removed at step 4.
1. INSTALLATION

Note: To remove the SC-702 from the mounting location, use the panel remover (FP19-01201, included).

Flush mounting the SC-702 (with optional F Mount Panel)

Use the optional kit (OP24-35), referring to the outline drawings at the back of this manual and the installation instructions (C42-01310) included with the optional kit.

1.4 How to Install the Remote Display Unit (option)

The RD-50/RD-20 can be connected as a ROTI (Rate Of Turn Indicator) display unit.

For installation instructions regarding the RD-50 or RD-20, see the appropriate operator’s manual (RD-50: OME-44530-x, RD20: OME-44540-x; x denotes the manual version), included with your Remote Display.

Note: If your vessel is required to be ROTI type-test compliant, use the RD-50.
1.5 **Wiring**

This section covers general wiring. For further details see the interconnection diagram at the back of this manual.

![Diagram of wiring connections]

- Display Unit SC-702
  - Z-#26X2P+0.3SQX1PL (10/30 m)
- Antenna Unit SC-703
- Antenna Unit SC-1303
- LAN cable* Cat5e/Straight (No cable, 15/30/40/50 m)
- *When using the optional LAN CONV KIT, use the existing cables.
- Navigational equipment (IEC61162-1)
- AIS (IEC61162-2)
- AD-10 equipment
- Networked equipment (CANbus)
- Alert Management System (AMS)

Select one

- TTYCSLA-1Q (4 ports)
- TTYCSLA-4
- TTYCSLA-1Q (2 ports)
- M12-05BFFM (1/2/6 m)
- FR-FTPC-CY (10/20/30 m)

**AC/DC Power Supply Unit**
- PR-240
- 100/115/220/230 VAC 1ø, 50/60 Hz
- Z-#26X2P+0.3SQX1PL (10/30 m)

**USB Flash Memory**
(For maintenance)

**Remote Display**
- RD-50
- RD-20

**PC**
(For maintenance)

**12 to 24 VDC**
- DPYC-1.5

**Nautical Equipment**
- NAV-1.25sq
1. INSTALLATION

1.5.1 How to fabricate the cables

LAN cable

Note: When fabricating the LAN cable for connection to the antenna unit, remove the locking nut on the antenna base, then slide the locking nut onto the LAN cable before fitting the modular plug. If the modular plug is fitted before the nut, repeat the procedure and fit the nut before step 6.

1. Expose inner vinyl sheath.
2. Remove the outer sheath by approx. 25 mm. Be careful not to damage inner shield and cores.
3. Fold back the shield, wrap it onto the outer sheath and cut it, leaving approx. 9 mm.
4. Fold back drain wire and cut it, leaving approx. 9 mm.
5. Straighten and flatten the core in order and cut them, leaving approx. 11 mm.
6. Insert the cable into the modular plug so that the folded part of the shield enters into the plug housing. The drain wire should be located on the tab side of the jack.
7. Using special crimping tool MPT5-8AS (PANDUIT CORP.), crimp the modular plug. Finally check the plug visually.

[Cross-over cable]
[Straight cable]
1. INSTALLATION

Z-#26X2P+0.3SQX1PL10/30, TTYCSLA-1/1Q/4

Power cable DPYC-1.5

1.5.2 How to secure and waterproof the cable connections

All cable connections not inside the equipment, whether exposed to weather or otherwise, should be waterproofed and secured after making the connection.

To waterproof and secure each connection, refer to the procedure outlined below.

**Securing and waterproofing connections**

1) Wrap the connection with self-vulcanizing tape.

2) Wrap a second layer of self-vulcanizing tape in the opposite direction.

3) Wrap vinyl tape over the self-vulcanizing tape.

4) Wrap a second layer of vinyl tape in the opposite direction.

**Measurements are displayed in mm**

<table>
<thead>
<tr>
<th>Unit</th>
<th>L1</th>
<th>L2</th>
<th>L3</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Junction Box</td>
<td>*</td>
<td>80</td>
<td>80</td>
<td>6</td>
</tr>
<tr>
<td>Display Unit</td>
<td>130</td>
<td>80</td>
<td>50</td>
<td>6</td>
</tr>
</tbody>
</table>

*: Length depends on installation configuration. When fabricating this cable, ensure enough slack is left to allow easy access for maintenance and service.

**Note:** L2 lengths displayed in the table above are the minimum recommended length. Adjust the length according to the installation configuration.
1. INSTALLATION

Securing and protecting unused cable connectors

1) Cover the loose end of the cable connector with self-vulcanizing tape.

2) Wrap the connector with a layer of vulcanizing tape, covering approx. 50 mm of the connected cable. Confirm that the connector is covered.

3) Wrap vinyl tape over the self-vulcanizing tape.

4) Wrap the connector with a layer of vinyl tape. Bind the tape end with a cable tie to prevent the tape from unraveling.

1.5.3 How to fabricate the WAGO connectors

Follow the procedure outlined below to fabricate the WAGO terminal connections.

Procedure
1. Twist the cores.
2. Press the terminal opener downward.
3. Insert the wire to hole.
4. Remove the terminal opener.
5. Pull the wire to confirm that it is secure.

Note: Two terminal openers are included inside the SC-701. Check that the size of the opener is correct before use.

- Small opener (labeled as “DISP”): For use on connectors for cabling between the SC-702 and SC-701.
- Large opener: For use on the connectors inside the SC-701.
1. INSTALLATION

1.5.4 How to connect the Antenna Unit (SC-703/SC-1303)

Connect the LAN cable (included as installation materials; see table below) from the antenna LAN port to the J3 terminal inside the SC-701.

<table>
<thead>
<tr>
<th>Installation materials type</th>
<th>LAN cable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Length</td>
</tr>
<tr>
<td>CP20-04300*</td>
<td>30 m</td>
</tr>
<tr>
<td>CP20-04310*</td>
<td>40 m</td>
</tr>
<tr>
<td>CP20-04320*</td>
<td>50 m</td>
</tr>
<tr>
<td>CP20-04330</td>
<td>15 m</td>
</tr>
<tr>
<td>CP20-04340</td>
<td>30 m</td>
</tr>
<tr>
<td>CP20-04350*</td>
<td>15 m</td>
</tr>
<tr>
<td>CP20-04360*</td>
<td>30 m</td>
</tr>
</tbody>
</table>

How to fit the waterproof connector

Follow the procedure below to fit the waterproof connector (included in installation materials marked with “*” in the above table).

**Waterproof connector components**

1. Referring to the figure below, fit the connector components to the LAN cable. Strip approximately 10 mm of the outer sheath to expose the cores, then fold the drain wire back, along the cable.

2. Insert the cable cores into the RJ plug, then secure the cores using a crimping tool (MPT5-8AS, or equivalent, local supply). Make sure the RJ plug is in contact with the drain wire.

3. Push the RJ plug into the housing. Make sure the RJ plug is aligned with the housing guides, then fit the nut, sealing, clip and sealing nut, in order.
1. INSTALLATION

4. Fasten the sealing nut until the thread on the housing is not visible. Fastening torque: 0.72 to 0.98 N•m.

5. Fit the washer to the RJ connector, making sure that the indents on the washer match the indents on the connector.

6. Connect the assembled waterproof connector to the LAN cable on the antenna.
7. Use self-vulcanizing tape and vinyl tape to additionally waterproof the connection. For details on waterproofing cable connections, see section 1.5.2.

Retrofits - Coaxial cable connection

You can use the existing coaxial cable for connection. In this case, the optional LAN_CNV kits (OP20-47 and OP20-48) are required.

Cable connection:

For cable connection, use one of the three existing coaxial cables. Connect both ends of the cable, one end to the antenna unit, the other end to the junction box. Secure and protect the connection points of the coaxial cables, referring to paragraph 1.5.2.

For unused existing coaxial cables, secure and protect both ends of the coaxial cables, referring to paragraph 1.5.2.
1.5.5 How to connect the Junction Box (SC-701)

The Junction Box (SC-701) has two rows of cable entrances for connection. The following figure and table show the internal connection points for the SC-701 and the recommended cable entrance for each connection (based on a configuration which uses all connections). The tables on the following pages show the pin connections for each WAGO connector.

Note 1: LAN cable recommended entrances should be used to prevent undue stress to the LAN cables. The power and DISP cable must be passed through their recommended entrance to prevent damaged to the cabling.

Note 2: Cable entrances 1 though 8 are protected from foreign materials with a small plastic spacer. To use one these cable entrances, remove the spacer, then pass the cable through.

The table on the following page indicates the recommended cable entrance, connector number and the cable type required for connections to the SC-701.
1. INSTALLATION

<table>
<thead>
<tr>
<th>External connection</th>
<th>Recommended entrance</th>
<th>Connector No.</th>
<th>Cable type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>Power cable entrance only</td>
<td>TB1</td>
<td>(JIS) DPYC-1.5</td>
</tr>
<tr>
<td>Shipboard network (AMS, etc.) (IEC61162-450)</td>
<td>1, 2 or 9</td>
<td>J1</td>
<td>(JIS) FR-FTPC-CY</td>
</tr>
<tr>
<td>Antenna unit (SC-703 or SC-1303)</td>
<td>9</td>
<td>J3</td>
<td>LAN</td>
</tr>
<tr>
<td>AD-10 format data output</td>
<td>3 or 10</td>
<td>TB8 or TB9</td>
<td>(JIS) TTYCSLA-1Q</td>
</tr>
<tr>
<td>NMEA0183 (IEC61162-2)</td>
<td>3 or 10</td>
<td>TB7</td>
<td>(JIS) TTYCSLA-4</td>
</tr>
<tr>
<td>NMEA0183 (IEC61161-1)</td>
<td>4, 5, 6, 7 or 11, 12, 13, 14</td>
<td>TB3 to TB6</td>
<td>(JIS) TTYCSLA-1 or TTYCSLA-1Q</td>
</tr>
<tr>
<td>Display unit (SC-702)</td>
<td>15 only</td>
<td>TB2</td>
<td>(JIS) TTYCSLA-4</td>
</tr>
<tr>
<td>CANbus</td>
<td>4, 5, 6, 7 or 11, 12, 13, 14</td>
<td>TB10</td>
<td>M12-05BFFM** (*** indicates length)</td>
</tr>
<tr>
<td>USB Flash Memory*</td>
<td>-</td>
<td>USB port</td>
<td>-</td>
</tr>
</tbody>
</table>

*: To remove the USB Flash Memory, see "How to remove the USB Flash Memory" on page 3-4.

Note: For (JIS) cable equivalents, see the JIS cable guide at the back of this manual.

TB2 WAGO connector (9-pin, TTYCSLA-4)

<table>
<thead>
<tr>
<th>Pin no.</th>
<th>Connection (signal)</th>
<th>Description</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>P12V</td>
<td>Power</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
<td>Grounding.</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>TD6_A</td>
<td>TX data</td>
<td>Fixed at 115200 bps.</td>
</tr>
<tr>
<td>6</td>
<td>TD6_B</td>
<td>TX data</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>RD6_A</td>
<td>RX data</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>RD6_B</td>
<td>RX data</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>GND</td>
<td>Drain wire</td>
<td>Connect to drain wire.</td>
</tr>
</tbody>
</table>

TB3 to TB6WAGO connectors (7-pin, TTYCSLA-1/TTYCSLA-1Q)

<table>
<thead>
<tr>
<th>Pin no.</th>
<th>Connection (signal)</th>
<th>Description</th>
<th>Remarks</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TDx_1A</td>
<td>TX data</td>
<td>NMEA(Ver1.5/2.0/3.0/4.0), IEC61162-1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>TDx_1B</td>
<td>TX data</td>
<td>&quot;x&quot; denotes the connection to terminals as shown below.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>TDx_2A</td>
<td>TX data</td>
<td>Signal</td>
<td>Terminal</td>
</tr>
<tr>
<td>4</td>
<td>TDx_2B</td>
<td>TX data</td>
<td>TD/RD5</td>
<td>TB3</td>
</tr>
<tr>
<td>5</td>
<td>RDx_H</td>
<td>RX data (Hot)</td>
<td>TD/RD4</td>
<td>TB4</td>
</tr>
<tr>
<td>6</td>
<td>RDx_C</td>
<td>RX data (Cold)</td>
<td>TD/RD3</td>
<td>TB5</td>
</tr>
<tr>
<td>7</td>
<td>GND</td>
<td>Drain wire</td>
<td>TD/RD2</td>
<td>TB6</td>
</tr>
</tbody>
</table>
### TB7 WAGO connector (6-pin, TTYCSLA-4)

<table>
<thead>
<tr>
<th>Pin no.</th>
<th>Connection (signal)</th>
<th>Description</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TD1_A</td>
<td>TX data</td>
<td>NMEA(Ver1.5/2.0/3.0/4.0) IEC61162-2</td>
</tr>
<tr>
<td>2</td>
<td>TD1_B</td>
<td>TX data</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>RD1_A</td>
<td>RX data</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>RD1_B</td>
<td>RX data</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>ISO_GND</td>
<td>Isolating ground</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>GND</td>
<td>Drain wire</td>
<td></td>
</tr>
</tbody>
</table>

### TB8 WAGO connector (9-pin, TTYCSLA-1Q)

<table>
<thead>
<tr>
<th>Pin no.</th>
<th>Connection (signal)</th>
<th>Description</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DATA_3A</td>
<td>RS-485</td>
<td>Data output in AD-10 format.</td>
</tr>
<tr>
<td>2</td>
<td>DATA_3B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>SHIFT_3A</td>
<td>Shift output in AD-10 format.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>SHIFT_3B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>DATA_4A</td>
<td>Data output in AD-10 format.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>DATA_4B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>SHIFT_4A</td>
<td>Shift output in AD-10 format.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>SHIFT_4B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>GND</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### TB9 WAGO connector (9-pin, TTYCSLA-1Q)

<table>
<thead>
<tr>
<th>Pin no.</th>
<th>Connection (signal)</th>
<th>Description</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DATA_1A</td>
<td>RS-485</td>
<td>Data output in AD-10 format.</td>
</tr>
<tr>
<td>2</td>
<td>DATA_1B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>SHIFT_1A</td>
<td>Shift output in AD-10 format.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>SHIFT_1B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>DATA_2A</td>
<td>Data output in AD-10 format.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>DATA_2B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>SHIFT_2A</td>
<td>Shift output in AD-10 format.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>SHIFT_2B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>GND</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### TB10 WAGO connector (5-pin, M12-05BFFM-010/020/060)

<table>
<thead>
<tr>
<th>Pin no.</th>
<th>Connection (signal)</th>
<th>Description</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shield</td>
<td>CAN_Shield</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>NET_S</td>
<td>Power input</td>
<td>+9 V DC to +16 V DC</td>
</tr>
<tr>
<td>3</td>
<td>NET_C</td>
<td>CAN_GND</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>NET_H</td>
<td>CANbus</td>
<td>Data I/O (Hot)</td>
</tr>
<tr>
<td>5</td>
<td>NET_L</td>
<td>CANbus</td>
<td>Data I/O (Cold)</td>
</tr>
</tbody>
</table>
1. INSTALLATION

1.5.6 How to connect the Display unit (SC-702)

The display unit is connected to the Junction Box using a 9-pin WAGO connector. Referring to section 1.5.3 and the table below, fabricate the WAGO connector. Note that the WAGO connector is included inside the SC-702 and must first be removed from the unit.

1. Unfasten the four screws on the rear cable clamp of the SC-702, then remove the cable clamp to reveal the WAGO connector.
2. Unplug the WAGO connector from the SC-702.
3. Pass the cable through the cable clamp.
4. Referring to the table on the following page and the interconnection diagram at the back of this manual, connect the cable to the WAGO connector.

**Display unit (SC-702) internal J301 WAGO connector (9-pin, TTYCSLA-4)**

<table>
<thead>
<tr>
<th>Pin no.</th>
<th>Connection (signal)</th>
<th>Description</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>P12V</td>
<td>Power</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
<td>Grounding.</td>
<td>Connect to SC-701.</td>
</tr>
<tr>
<td>3</td>
<td>TD_A</td>
<td>TX data</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>TD_B</td>
<td>TX data</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>RD_A</td>
<td>RX data</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>RD_B</td>
<td>RX data</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>GND</td>
<td>Drain wire</td>
<td>Connect to drain wire.</td>
</tr>
</tbody>
</table>

5. Slide the clamp along the cable towards the SC-702, then fasten the four screws which were removed at step 1.
6. Secure the cable to the cable clamp, referring to the figure below.

**Note:** In cases where the WAGO connector is connected to the cable before the cable is passed through the cable clamp, the cable clamp can be adjusted to allow connection. Adjusting the cable clamp as outlined in the figure below voids the IPx5 waterproof rating of the clamp and the unit.

![Cable tie locations](image)

To keep the IPx5 rating, remove the WAGO connector, then repeat the procedure above.
1. INSTALLATION

How to fit the optional waterproofing kit (OP05-139)

The optional waterproofing kit must be fitted at the same time as the cabling is connected to the SC-702. The kit contains the following items:

- Cover gasket (Code:100-403-800-10) ×1
- Cable gasket (Code:100-403-791-10) ×1

Note: To satisfy the requirements for IPX5 waterproof rating, the cable used must have a diameter of 14.4 mm (±0.4 mm).

1. Unfasten the four screws on the rear cable clamp, then remove the cable clamp to reveal the WAGO connector.
2. Fit the cable gasket to the cable clamp, referring to the figure below.

1. Fit the cable gasket to the cable clamp, passing the fixing lip partially through the cable clamp.
2. To pass the fixing lip completely through the cable gasket, twist the cable gasket gently.

3. Check that the cable gasket is flush against the cable clamp, as shown below.
4. Check that the cable gasket’s fixing lip is flush against the inside of the cable clamp.

3. Pass the cabling through the cable gasket and cable clamp.
4. Fit the cover gasket (rubber seal) to the rear of the SC-702. Make sure the rubber seal is placed inside the groove indicated in the figure below.

5. Connect the cabling to the SC-702, referring to section 1.5.6.
6. Slide the cable clamp along the cable until the clamp is flush against the rear of the SC-702.
   Note: The cable clamp must be oriented with the dome facing upwards in order to retain it’s waterproofing rating.
7. Fasten the four screws removed at step 1.
8. Secure the cables to the cable clamp with cable ties.
1. INSTALLATION

1.5.7 How to connect the Remote Display Unit (option)

Connect the RD-50 to the SC-70/SC-130 referring to the connection diagram below.

**RD-50 connection**
*(For details, see the RD-50 Operator's Manual OME-44530)*

![RD-50 Connection Diagram](image)

**RD-20 Connection**
*(For details, see the RD-20 Operator's Manual OME-44540)*

![RD-20 Connection Diagram](image)
1.6 Initial Settings

The initial setup for your SC-70/SC-130 requires the system to be powered. Referring to the instructions at section 2.2, turn the power on.

For the sake of brevity, the following terminology is used.

<table>
<thead>
<tr>
<th>Terminology</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Select&quot;</td>
<td>Example: &quot;Select [SENSOR], then press the ENT key. Use the Cursorpad to select the menu item.</td>
</tr>
<tr>
<td>&quot;Open the [MENU].&quot;</td>
<td>Press the MENU ESC key; this opens the [MENU].</td>
</tr>
<tr>
<td>&quot;Close the [MENU].&quot;</td>
<td>• Press the MENU ESC key; this closes the [MENU] and returns to the last used display screen or sub-screen.</td>
</tr>
<tr>
<td></td>
<td>• Press the DISP key; this closes the [MENU] and returns to the main screen.</td>
</tr>
<tr>
<td>IMO type</td>
<td>SC-70 or SC-130 systems which have been assigned as [MERCHANT] at installation and installed on vessels which meet the applicable IMO standards.</td>
</tr>
<tr>
<td>Non-IMO type</td>
<td>SC-70 or SC-130 systems which have been assigned as [FISHING] at installation and installed on vessels which do not meet the applicable IMO standards.</td>
</tr>
</tbody>
</table>

When the unit is powered for the first time, it is in a "cold start" state. There is no satellite data (almanac data) stored. In this state, the unit searches for, and stores, satellites to find its heading. This process takes approximately 90 seconds. If the heading is not found within 30 minutes, the antenna installation location may not be suitable. A lack of visible satellites (less than five) can also prevent the unit from finding a heading. Resolve the problem, then re-check the tracking status.

If the heading error is between 5° and 10°, adjust the antenna unit orientation while monitoring the heading indication on the SC-702.

Once a heading has been found, the following items may need setting or adjustment:

- Vessel dimensions.
- Antenna location.
- Offset heading, roll, pitch, heave, etc.
- Main device mode.
- Password (as necessary).
- Alert mode.
- Legacy sentence input.
- I/O menu settings as appropriate. (See section 1.8.)

**Note:** Some settings are set at installation and are non-selectable (gray in color) from the menu. These settings require password input. Password input is not covered in the setting procedures for these items. To adjust these settings, contact your dealer.
1. INSTALLATION

1.6.1 Main menu

How to access the menu

The menu is locked with a password. Press the MENU ESC key to show the password input window (shown below-right).

If this is the first time the unit has been turned on, the password is not set at default. Press the ENT key to access the menu. It is recommended to set a new password in this case.

If the unit has a previously set password, input the password, then press the ENT key to access the menu.

Note 1: Password input is required to access the menu each time the unit is turned off, then on again.

Note 2: The menu closes automatically if no keys are pressed within one minute.

How to change/set the password

1. Open the [MENU].
2. Select [SYSTEM], then press the ENT key.
3. Select [PASSWORD], then press the ENT key.
4. Select [CHANGE], then press the ENT key. An input window appears. The currently selected input box is indicated with a small arrow to the left-side of the input box, as shown in the figure to the right.
   To set the password for the first time, press the ENT key to select the [NEW PASSWORD] input box, then skip to step 6.
5. Enter the current user password. If the password is incorrect, the input window is reset to blank. If the password is correct, the arrow indication moves to the [NEW PASSWORD] input box.
6. Enter a new password, then press the ENT key. The arrow indication moves to the [NEW PASSWORD (CONFIRM)] input box.
7. Enter the new password again, then press the ENT key. If the passwords match, the [CHANGE PASSWORD] input window disappears. If the passwords do not match, the input boxes for [NEW PASSWORD] and [NEW PASSWORD (CONFIRM)] are reset and the arrow indication returns to the [NEW PASSWORD] box. Repeat the procedure from step 6.
8. Close the [MENU].
How to disable access to the menu

Where necessary, you can disable menu access by doing the following:

1. Open the [MENU].
2. Select [SYSTEM], then press the ENT key.
3. Select [PASSWORD], then press the ENT key.
4. Select [LOGOUT], then press the ENT key. The menu closes.

1.6.2 How to set vessel dimensions, antenna location and CCRP

Access to the [OFFSET] menu requires the [SERVICE] menu to be unlocked. To unlock the service menu, see section 1.7.

1. Open the [MENU].
2. Select [SENSOR], then press the ENT key.
3. Select [OFFSET], press the ENT key.
4. Select [DIMENSIONS/CCRP], then press the ENT key. The settings window appears. The figure below is an example of the settings window.

5. Select [EQUIPMENT NO.], then press the ENT key. The [INPUT EQUIPMENT NO.] pop up window appears.
6. Set the antenna number you wish to set the location for.
7. Select [ENTER], at the bottom of the pop up window, then press the ENT key. The antenna selected here is used to output the POS sentence to external equipment.
8. Select [SHIP’S WIDTH], then press the ENT key. A numerical pop up window appears. Referring to the figure above, set the dimensions of the vessel.
9. Set [SHIP’S LENGTH] and [SHIP’S HEIGHT] in a similar manner.
10. Referring to the table below, set the antenna mounting position (CCRP) and the speed calculation adjustments.

   **Note:** These settings require CCRP and ship dimensions. Do step 5 and 6 before changing these settings.

<table>
<thead>
<tr>
<th>Indication</th>
<th>Description</th>
<th>Setting range</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ANT POSN X0]</td>
<td>Port-starboard location of antenna unit. Enter a negative value for port-side, positive value for starboard-side. The center of the vessel is [0 m].</td>
<td>- ([SHIP’S WIDTH]/2) to + ([SHIP’S WIDTH]/2). For example, if the [SHIP’S WIDTH] is set to [100 m], the range is [-50 m] to [+50 m].</td>
</tr>
</tbody>
</table>
1. INSTALLATION

1. To apply the settings, select [ENTER], then press the ENT key.
To discard the changes and start again, select [CANCEL], then press the ENT key.
12. Close the [MENU].

1.6.3 How to apply offsets for heading/pitch/heave/roll/position

Note: Access to the [OFFSET] menu requires the [SERVICE] menu to be unlocked. To unlock the service menu, see section 1.7.

1. Open the [MENU].
2. Select [SENSOR], then press the ENT key.
3. Select [OFFSET], then press the ENT key.
4. Referring to the table below, select the appropriate item to offset, then press the ENT key.

<table>
<thead>
<tr>
<th>Menu item</th>
<th>Description</th>
<th>Offset range</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDG OFFSET</td>
<td>Offset the heading.</td>
<td>-180° to +180°</td>
</tr>
<tr>
<td>PITCH OFFSET</td>
<td>Offset to compensate for pitch.</td>
<td>-10°000 to +10°000</td>
</tr>
<tr>
<td>ROLL OFFSET</td>
<td>Offset to compensate for roll.</td>
<td></td>
</tr>
<tr>
<td>POSITION OFFSET</td>
<td>Offset the Own Ship position.</td>
<td>North/South: 00.0000' to 59.9999'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>East/West: 00.0000' to 59.9999'</td>
</tr>
<tr>
<td>DIMENSIONS/CCRP</td>
<td>Set the ship size, location of the antenna and CCRP.</td>
<td>See section 1.6.2.</td>
</tr>
<tr>
<td>SOG OFFSET</td>
<td>Offset the SOG.</td>
<td>-12.5% to +12.5%</td>
</tr>
<tr>
<td>ATM OFFSET</td>
<td>Offset atmospheric pressure.</td>
<td>-99.9 hPa to +99.9 hPa</td>
</tr>
<tr>
<td>TEMP OFFSET</td>
<td>Offset the temperature.</td>
<td>-99.9°C to +99.9°C</td>
</tr>
</tbody>
</table>

5. Use the arrows key to set the offset, then press the ENT key.
6. Close the [MENU].
1.7 How to Access and Use the [SERVICE] Menu

Menu items which require service level access are shown in gray. A password, obtained from FURUNO, is required to access the [SERVICE] menu. Several initial settings must be done from this menu to complete the setup of your SC-70 or SC-130. To adjust or change any of these settings, consult your local dealer.

1.8 I/O Menu Settings

To set which data to output to external equipment from the SC-70/SC-130, see section 2.15.

1.9 Initial Settings for the Remote Display

After wiring is complete for all units in the configuration, setup the [ROTI Display] as follows. The RD-50 requires menu setup.

For detailed operational guidance for either Remote Display unit, see the appropriate Operator’s Manual (RD-50: OME-44530-x, RD-20: OME-44540-x: “x” denotes version).

How to setup the RD-50 for ROTI display.

1. Open the [SERVICE] menu for the RD-50.

   | UNIT Name | RD-50          |
   | Serial No | 6408-XXXX     |
   | PWB No    | 26P0006-XX    |
   | Remote Dimmer | Main |
   | Depth Select | Auto |
   | Depth Position | Single |
   | L/L Digit | 4digit         |
   | Without Checksum | Disable |
   | I/O Port | 4800           |
   | Port1 | 4800           |
   | SIO Monitor | ON          |
   | Sensor Out | Normal |
   | Device Mode | Normal |
   | LCD RESET | OFF           |
   | SIM | OFF            |
   | Service RESET | OFF |

2. Select [Device Mode], then press the ENT key.
   Note: Do not change the settings for any other items in the [SYSTEM] menu for the RD-50.

3. Select [ROTI], then press the ENT key.

4. Press the PWR key to close the menu and turn off the power. When the power is next turned on, your RD-50 shows the [ROTI Display] from the SC-70/SC-130.

How to setup the RD-20 for ROTI display

Press the DISP key on the RD-20 to show the ROTI display.
This page is intentionally left blank.
2. OPERATION

2.1 Controls Overview

<table>
<thead>
<tr>
<th>No.</th>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BRILL</td>
<td>• Opens the [BRILL SETTING] window.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• With the BRILL SETTING window open, adjusts the screen brilliance.</td>
</tr>
<tr>
<td>2</td>
<td>DISP</td>
<td>• With the menu open: Close the menu and return to the last used display</td>
</tr>
<tr>
<td></td>
<td></td>
<td>mode’s main screen.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Without the menu open: Change the display mode.</td>
</tr>
<tr>
<td>3</td>
<td>MENU</td>
<td>• Open the main menu.</td>
</tr>
<tr>
<td></td>
<td>ESC</td>
<td>• Close the menu and return to the last used screen.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Close settings pop up window and return to the last used menu.</td>
</tr>
<tr>
<td>4</td>
<td>ACK</td>
<td>• Acknowledge an individual alert and close the alert pop up message.</td>
</tr>
<tr>
<td>5</td>
<td>LIST</td>
<td>• Show the [LIST] display.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Cycle through the [LIST] display.</td>
</tr>
<tr>
<td>6</td>
<td>ENT</td>
<td>• Open a menu item.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Confirm selected setting in pop up window.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Switch between graphic and main display for the current device mode.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• From the SPD main screen: Long press to reset track (for non-IMO types</td>
</tr>
<tr>
<td></td>
<td></td>
<td>only).</td>
</tr>
<tr>
<td>7</td>
<td>Cursorpad</td>
<td>• Navigate menus.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▲ button: Go back one layer in the menu.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▶ button: Open the selected menu item.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▲ button: Move selection cursor to the item above the current selection.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▼ button: Move selection cursor to the item below the current selection.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Adjust settings.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▲ button: Move cursor to the left.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▶ button: Move cursor to the right.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▲ button: Increase the value of the selected item.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▼ button: Decrease the value of the selected item.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• With [INTEGRITY] screen shown: scroll through the displayed data when</td>
</tr>
<tr>
<td></td>
<td></td>
<td>more than one screen is available.</td>
</tr>
</tbody>
</table>
2.2 How to Turn the Power On/Off

The power is turned on or off from the Junction Box (SC-701). Turn the SC-701 on/off to turn the SC-702 on/off.

The startup screen appears for five seconds, then the system starts a diagnostic test. The diagnostic test takes approximately 30 seconds to complete. After the diagnostic test is complete, the main screen appears. You can also bypass the diagnostic test and show the main screen at any time during the test, by pressing any key.

**Note 1:** If the startup process has one or more errors, the message "COMMUNICATION ERROR" appears at the bottom of the diagnostic test screen.

**Note 2:** The display may appear "sluggish" if the ambient temperature is low.

**Note 3:** Viewable angles may vary between daylight and nighttime.

*: The [DEVICE MODE] is set at installation. To change this setting, consult your local dealer.
2.3 How to Adjust the Brilliance, Change the Background Color

The display unit (SC-702) has brilliance (brightness) controls for the screen and the key panel.

2.3.1 How to adjust the screen and key panel brilliance

To change the brilliance, do the following:

1. Press the **BRILL** key. The brilliance pop up window appears.

   ![BRILL Setting](image)

   **Note:** The pop up window automatically disappears if there is no operation detected.

2. Press ▼ to reduce, or ► to increase, the display brilliance.
3. Press ▼ to reduce, or ▲ to increase, the key panel brilliance.
4. Press the **ENT** key to close the pop up window.

The factory default settings and setting range for brilliance are listed in the table below.

<table>
<thead>
<tr>
<th>Display</th>
<th>Panel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting range: [1] to [17]</td>
<td>Setting Range: [0] to [17]</td>
</tr>
</tbody>
</table>

   **Note:** The brilliance default setting for RD-50/RD-20 is [9], and the setting range is [0] to [9]. See the operator’s manual (RD-50: OME-44530-x, RD-20: OME-44540-x; “x” denotes version) for details.

2.3.2 How to change the background and text color

1. Press the **BRILL** key to show the brilliance pop up window.
2. Press the **DISP** key to alternate background/text color.

   ![BRILL Setting](image)

   ![BRILL Setting](image)

3. Press the **ENT** key to close the pop up window.

   The background color can also be changed from the menu, see section 2.13.1.
2. OPERATION

2.4 Menu Overview

The main menu can be password protected. For information on how to access and operate the main menu, see section 1.6.1.

For the sake of brevity, the following terminology is used in this manual:

<table>
<thead>
<tr>
<th>Terminology</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Select&quot;</td>
<td>Example: &quot;Select [SENSOR], then press the ENT key.&quot; Use the Cursorpad to select the menu item.</td>
</tr>
<tr>
<td>&quot;Open the [MENU].&quot;</td>
<td>Press the MENU ESC key; this opens the [MENU].</td>
</tr>
</tbody>
</table>
| "Close the [MENU]." | • Press the MENU ESC key; this closes the [MENU] and returns to the last used display screen or sub-screen.  
                         | • Press the DISP key; this closes the [MENU] and returns to the main screen. |
| IMO type          | SC-70 or SC-130 systems which have been assigned as [MERCHANT] at installation and installed on vessels which meet the applicable IMO standards. |
| Non-IMO type      | SC-70 or SC-130 systems which have been assigned as [FISHING] at installation and installed on vessels which do not meet the applicable IMO standards. |

Note: The default operation mode for the SC-70/SC-130 is [MERCHANT] (IMO compliant). [FISHING] is not compliant with the IMO regulations and must not be used for vessels which are required to be IMO compliant. To change the operation mode, consult your local dealer.

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

2. Press ▲ or ▼ to select a menu item, then press the ENT key. "►" next to a menu item indicates that there is a sub-menu available.

3. Press the MENU ESC key to close the menu.
2.5 LIST Screens Overview

LIST display mode shows the [ACTIVE ALERT] list, [ALERT LOG] and [DEVICE LIST] in cyclic order with the display mode currently in use.

Press the LIST key to cycle through the lists in the order shown below. Press and hold the LIST key to cycle through the lists in reverse order.

Main screen ➔ [ALERT LIST] ➔ [ALERT LOG] ➔ [DEVICE LIST]

2.6 Display Modes Overview

The available display modes are GPS, THD, ROTI and SPD.

Note: The SPD display mode is available only for non-IMO compliant vessels. If the device mode is changed to [MERCHANT] and the SPD display mode is in use, it is automatically changed to the THD display mode. Consult your local dealer for details.

How to change the display mode

Press the DISP key to cycle through the display modes. The order in which the display modes are shown is: GPS → THD → ROTI → SPD → GPS...

Note: Some display modes may not be available, depending on vessel configuration. The figures below shows all four available display modes.

*: Non-IMO type only
2.6.1 Icons and indications

The top section of all device modes displays various icons and the operational status icon is always displayed. The example figure below shows all icons, along with a brief description.

Alerts and operational guidance

The bottom section of the screen for all device display modes shows operational guidance and alerts.

Alerts take priority over guidance and must be acknowledged before normal operational guidance can be displayed again.
2.7 GPS Display Mode

The GPS display mode has three display screens. Press the ENT key to cycle through the screens in the following order: Main screen → INTERGITY → BEACON/TYP16 MESSAGE → main screen...

2.7.1 GPS coordinates screen (main screen)

The GPS main screen shows own position, COG, SOG and other important GPS information.

<table>
<thead>
<tr>
<th>No.</th>
<th>Indication</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>[FIX]</td>
<td>Current position fixing method (GP-3D, GP-D3D, etc.)</td>
</tr>
</tbody>
</table>
| 2   | [RAIM]     | Current RAIM status.  
|      |            | • SAFE: GPS signal is normal, positioning accuracy satisfies the setting value.  
|      |            | • CAUTION: RAIM accuracy cannot be calculated. (Signals from more than five GPS satellites are necessary.) The positioning accuracy does not satisfy the setting value.  
|      |            | • UNSAFE: GPS signal is abnormal, therefore the positioning accuracy is not reliable.  
|      |            | • OFF: RAIM is disabled. |
| 3   | [PDOP], [HDOP] | Current DOP (Dilution Of Precision). Displayed as PDOP for positional dilution, HDOP for horizontal dilution. |
| 4   | [A. LEVEL] | Accuracy offset for RAIM. |
| 5   | [TIME]     | Time and date. Displayed with the prefix “L” for local time, “U” for UTC. |
| 6   | Datum      | Current Datum in use. |
| 7   | Location   | Own ship latitude and longitude (coordinates). |
| 8   | [POSN]     | Time and date of last position calculation. Displayed in a orange color when the unit is restarted. When connection is established and positioning can be calculated, the indication changes to the opposite color of the setting selected from the [DISPLAY] → [BKGD COLOR] menu. |
| 9   | [COG]      | Course Over Ground. |
| 10  | [SOG]      | Speed Over Ground. |
2. OPERATION

2.7.2 GPS integrity screen

The GPS integrity display shows satellite status and various integrity-related data, as shown in the figure and table below.

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Satellite positions</td>
<td>Shows the available satellites and their elevation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Light blue shaded circle: Indicates area where multipath can be used.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• White numerals: Indicates satellites used for position fix.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Own ship is shown at the center of the circle. Press ▲ to alternate between North-Up and Head-Up orientations.</td>
</tr>
<tr>
<td>2</td>
<td>Own ship position/positioning</td>
<td>Shows OS coordinates and positioning reference.</td>
</tr>
<tr>
<td></td>
<td>reference</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Text data box</td>
<td>See section 2.7.1.</td>
</tr>
<tr>
<td>4</td>
<td>RX level</td>
<td>Shows the strength of the signal received from the satellite code.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• [SV PRN]: Satellite number.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• [SNR]: Signal to Noise Ratio.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When more than 10 satellites are in use, press ▲ or ▼ to scroll though the list.</td>
</tr>
<tr>
<td>5</td>
<td>Satellite color codes</td>
<td>Shows the color code for the satellites currently in use. The displayed indications are abbreviated as follows:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• [GP]: GPS.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• [GL]: GLONASS.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• [GA]: Galileo</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• [SBAS]: SBAS</td>
</tr>
</tbody>
</table>
2.7.3 BEACON INFO/TYP 16 MESSAGE screen

The beacon information display screen has two information tabs, the [BEACON INFO] tab and the [TYPE16 MESSAGE] tab.

The GPS [BEACON INFO] tab displays important information about the selected GPS beacon.

The [TYPE16 MESSAGE] tab displays all received TYPE16 messages received from beacons.

To switch tabs, press either the ↓ or the ↑ arrow key.

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Own ship position/positioning reference</td>
<td>Shows OS coordinates and positioning reference</td>
</tr>
<tr>
<td>2</td>
<td>Text data box</td>
<td>See section 2.7.1.</td>
</tr>
</tbody>
</table>
| 3   | Information/message box                  | **BEACON INFO tab:**
|     |                                         | • STATION NAME: Name of the station/beacon
|     |                                         | • FREQUENCY: Beacon/station’s frequency
|     |                                         | • STATION HEALTH: Shows the received signal health;
|     |                                         | • SIGNAL QUALITY: SN = Signal to noise ratio (range: 00 dB to 99 dB);
|     |                                         | SS = Signal strength (range: 00 dB to 99 dB).
|     |                                         | **Note:** Where the value for SN or SS exceeds the maximum displayable value,
|     |                                         | the indicated value appears as bars ("99dB").                              |
| 4   | [BEACON INFO] / [TYPE16 MESSAGE] tabs    | Displays beacon information ([BEACON INFO] tab), or displays received [TYPE16 MESSAGE] messages. |
2.8 THD Display Mode

THD (Transmitting Heading Device) display mode outputs heading data to external equipment. This display mode has three sub display screens. The default screen is the HDG (heading) data screen. The sub screens, in displayed order, are: ROT (Rate Of Turn) screen → HDG/ROT split screen → THD integrity screen.

Press the ENT key to cycle through the display screens.

2.8.1 HDG data screen

The HDG data screen shows your current heading and any offset applied to the heading data.

<table>
<thead>
<tr>
<th>Indication</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIX</td>
<td>Current position fixing method (GP-3D, GP-D3D, etc.)</td>
</tr>
<tr>
<td>PDOP</td>
<td>Current DOP (Dilution Of Precision). Displayed as PDOP for positional dilution, HDOP for horizontal dilution.</td>
</tr>
<tr>
<td>CALC</td>
<td>Calculation status.</td>
</tr>
<tr>
<td></td>
<td>• [NORMAL]: HDG and ROT are calculated normally.</td>
</tr>
<tr>
<td></td>
<td>• [DR]: HDG and ROT are calculated using Dead Reckoning.</td>
</tr>
<tr>
<td></td>
<td>• [STOPPED]: HDG calculation stopped.</td>
</tr>
<tr>
<td></td>
<td>• [SYS FAULT]: System fault.</td>
</tr>
<tr>
<td>COM. SV</td>
<td>Commonly used satellite’s number.</td>
</tr>
</tbody>
</table>
2.8.2 ROT data screen

The ROT data screen shows your vessel’s current rate of turn.

How to interpret the ROT data screen

<table>
<thead>
<tr>
<th>Indication</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIX</td>
<td>Current position fixing method (GP-3D, GP-D3D, etc.)</td>
</tr>
<tr>
<td>PDOP</td>
<td>Current DOP (Dilution Of Precision). Displayed as PDOP for positional dilution, HDOP for horizontal dilution.</td>
</tr>
</tbody>
</table>
| CALC       | Calculation status.  
  • [NORMAL]: HDG and ROT are calculated normally.  
  • [DR]: HDG and ROT are calculated using Dead Reckoning.  
  • [STOPPED]: HDG calculation stopped.  
  • [SYS FAULT]: System fault. |
| COM. SAT   | Commonly used satellite’s number. |

2.8.3 HDG/ROT split screen

The HDG/ROT split screen shows heading and rate of turn data with roll/pitch/heave.
2.8.4 THD integrity screen

The THD integrity display shows satellite status and various integrity-related data, as shown in the figure and table below.

### Table: THD integrity display

<table>
<thead>
<tr>
<th>No.</th>
<th>Indication</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HDG</td>
<td>Current heading.</td>
</tr>
<tr>
<td>2</td>
<td>Available satellites</td>
<td>Shows the available satellites and their elevation. Press ▲ to alternate between North-Up and Head-Up orientations.</td>
</tr>
<tr>
<td>3</td>
<td>• ROT</td>
<td>• Current Rate Of Turn.</td>
</tr>
<tr>
<td></td>
<td>• CALC</td>
<td>• Calculation status. (See the table in &quot;HDG data screen&quot; on page 2-10 for details.)</td>
</tr>
<tr>
<td></td>
<td>• COM. SAT</td>
<td>• Commonly used satellite's number.</td>
</tr>
<tr>
<td>4</td>
<td>Satellite details</td>
<td>Shows the strength of the signal received from the satellites. More than one bar indicates that more than one antenna is using that satellite.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• [SV PRN]: Satellite number.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• [SNR]: Signal to Noise Ratio.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When more than 10 satellites are in use, press ▲ or ▼ to scroll through the list.</td>
</tr>
<tr>
<td>5</td>
<td>Antenna baseline color codes</td>
<td>Shows the color for each antenna baseline in use. The displayed indications are abbreviated as follows:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• [BL 1] - Antenna No. 1 + Antenna No. 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• [BL 2]* - Antenna No. 2 + Antenna No. 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• [BL 3]* - Antenna No. 3 + Antenna No. 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• COM - Common</td>
</tr>
<tr>
<td></td>
<td></td>
<td>*: Shown only when a SC-1303 is connected.</td>
</tr>
</tbody>
</table>
2.9 ROTI Display Mode

The ROTI display mode is essentially the same as the THD display mode, in terms of displayed data. However, the following items are displayed in a different manner:

- [DOP] and [FIX] are not shown.
- The indications for [ROT] and [HDG] in the split-screen are reversed.

This display mode has three sub display screens. The default screen is the ROT (Rate Of Turn) data screen. The sub screens, in displayed order, are: HDG (Heading) screen → ROT/HDG split screen → THD integrity screen.

2.9.1 ROTI Display for RD-50/RD-20 (option)

For vessels with the optional RD-50/RD-20 installed as part of the SC system configuration, you can show the ROTI data on the RD-50/RD-20 display. See the appropriate operator’s manual for details (RD-50: OME-44530-x; RD-20: OME-44540-x; “x” denotes the manual version).

Note: For IMO-type vessels, the RD-50 remote display is compatible with IMO regulations. If you use the RD-20 remote display, your vessels no longer meets the IMO requirements.
2.10 SPD Display Mode (Non-IMO types only)

The speed and distance data display screen is the default. The sub screen shows navigational data. This display mode is only available for non-IMO types.

2.10.1 Speed and distance display screen

How to interpret the speed and distance display screen

<table>
<thead>
<tr>
<th>No.</th>
<th>Indication</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>[FIX], [DOP], [CALC], [COM. SV]</td>
<td>See section 2.8.1.</td>
</tr>
<tr>
<td>2</td>
<td>Lateral bow speed*</td>
<td>Shows the calculated speed at the bow of your vessel. The arrow indicates tendency to port or starboard.</td>
</tr>
<tr>
<td>3</td>
<td>Bow to stern speed*</td>
<td>Shows the calculated speed of your vessel. The arrow indicates forward or reverse motion.</td>
</tr>
<tr>
<td>4</td>
<td>Lateral stern speed*</td>
<td>Shows the calculated speed at the stern of your vessel. The arrow indicates tendency to port or starboard.</td>
</tr>
<tr>
<td>5</td>
<td>Distance traveled</td>
<td>Shows the distance traveled for this trip.</td>
</tr>
</tbody>
</table>

*: CALC-SPD values must be set at installation to show these speeds. See section 1.6.2 for details.
2.10.2 Navigational data screen

How to interpret the navigational data

<table>
<thead>
<tr>
<th>No.</th>
<th>Indication</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FIX</td>
<td>See section 2.8.1.</td>
</tr>
<tr>
<td>2</td>
<td>HDG</td>
<td>Current heading</td>
</tr>
<tr>
<td>3</td>
<td>ROT</td>
<td>Rate of turn.</td>
</tr>
<tr>
<td>4</td>
<td>COG</td>
<td>Course Over Ground.</td>
</tr>
<tr>
<td>5</td>
<td>Speed data</td>
<td>Top line: Lateral bow speed. Middle line: Bow to stern speed. Bottom line: Lateral stern speed.</td>
</tr>
</tbody>
</table>

2.11 Alerts

When an alert is triggered, a flashing indication appears at the bottom of the screen and an alert sound is released. The indication shows the alert name, alert code and alert icon.

[Warning] level alerts are shown in yellow-orange color, [Caution] level alerts are shown in yellow color.

Example alert message (flashing)

![Alert Message](image)

The SC-70/SC-130 tracks active (acknowledged but not rectified, or unacknowledged) alerts in the [ALERT LIST] (see section 2.11.3). Alerts which are acknowledged and rectified are saved in the [ALERT LOG] (see section 2.11.4).

For a full list of possible alerts, along with their details such as alert codes and remedies or action required, see "ALERT LIST" on page AP-4.
2.11.1 How to acknowledge alerts

There are two methods by which you can acknowledge an alert.

**How to acknowledge an alert from the display unit (All alert modes)**

Press the **ACK** key to acknowledge the alert.

**How to acknowledge an alert remotely (LEGACY alert mode only)**

The [REMOTE ACK I/F] setting sets the behavior of external equipment which can acknowledge alerts. To use this function, the [ALERT MODE] must be set to [LEGACY] at installation. (Consult your dealer to change this setting.)

To set remote acknowledge, do the following:

1. Open the [MENU].
2. Select [ALERT], then press the **ENT** key.
3. Select [REMOTE ACK I/F], then press the **ENT** key.
4. Select the appropriate setting, then press the **ENT** key.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ACK]</td>
<td>External equipment can acknowledge alerts.</td>
</tr>
<tr>
<td>[BUZZER STOP]</td>
<td>External equipment can stop aural alerts, but cannot acknowledge alerts.</td>
</tr>
</tbody>
</table>

5. Close the [MENU].

Refer to the operator’s manual for the external equipment for alert acknowledgment procedures.

2.11.2 How to enable/disable the aural alert (Non-IMO type only)

This setting is only available for non-IMO types.

1. Open the [MENU].
2. Select [ALERT], then press the **ENT** key.
3. Select [SOUND], then press the **ENT** key. An options pop up window appears.
4. Select the appropriate option, then press the **ENT** key.

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[OFF]</td>
<td>Disable aural alerts.</td>
</tr>
<tr>
<td>[SHORT]</td>
<td>Release two short beeps when an alert is triggered.</td>
</tr>
<tr>
<td>[LONG]</td>
<td>Release three long beeps when an alert is triggered.</td>
</tr>
<tr>
<td>[CONTINUOUS]</td>
<td>Release a continuous beep when an alert is triggered.</td>
</tr>
</tbody>
</table>

5. Close the [MENU].
2.11.3 How to access the alert list

The alert list shows all currently violated alerts and state of acknowledgment.

All unacknowledged alerts are shown, even those whose reason for the alert has been rectified or passed (except for cautions). To access the alert list, do the following:

1. Open the [MENU].
2. Select [ALERT], then press the ENT key.
3. Select [ALERT LIST], then press the ENT key. The list of active alerts appears.
4. Press ▲ or ▼ to scroll up or down through the alert log.
5. Press the DISP key to close the [ALERT LIST].

Note: You can also access the [ALERT LIST] from the [LIST] display. Press the LIST key to cycle through the lists.

How to interpret the alert list

<table>
<thead>
<tr>
<th>No.</th>
<th>Indication name</th>
<th>Description</th>
</tr>
</thead>
</table>
| 1   | DATUM/OS coordinates or [HDG]/[ROT] | Where the device mode is [THD] or [ROT]:  
  - [HDG]: OS heading, oriented to North. If the heading data is received from an external device, the device name and external input talker are shown.  
  - [ROT]: Rate of turn with arrow indicating turn direction to port or starboard.  
  Where the device mode is [SPD] or [GPS]:  
  Datum and OS coordinates are displayed. |
| 2   | FIX             | Current position fixing method (GP-3D, GP-D3D, etc.) |
| 3   | CALC            | Calculation status.  
  - [NORMAL]: Data is calculated normally.  
  - [DR]: Data is calculated using Dead Reckoning.  
  - [STOPPED]: Data calculation stopped.  
  - [SYS FAULT]: System fault. |
| 4   | Alert icon      | Shows alert status. See page AP-8 for details. |
| 5   | Alert details   | Top line: alert code, alert message  
  Bottom line: time of alert, coordinates at time of alert.  
  Note: A full list of alert codes, meaning and measure is included at "ALERT LIST" on page AP-4. |
2.11.4 How to access the alert log

The alert log shows the latest 50 alerts. When the log becomes full, the oldest entry is erased to make room for current alerts. To access the alert log, do the following:

1. Open the [MENU].
2. Select [ALERT], then press the ENT key.
3. Select [ALERT LOG], then press the ENT key.
4. Press ▲ or ▼ to scroll up or down through the alert log.
5. Press the DISP key to close the [ALERT LOG].

Note: The [ALERT LOG] can also be accessed from the [LIST] display. Press the LIST key to cycle through the lists.

How to interpret the alert log

<table>
<thead>
<tr>
<th>No.</th>
<th>Indication name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DATUM, OS coordinates, Calculation status, [HDG], [ROT]</td>
<td>See section 2.11.3.</td>
</tr>
<tr>
<td>2</td>
<td>Alert code and message</td>
<td>Alert code appears in six digit format. Note: A full list of alert codes, meaning and measure is included at &quot;ALERT LIST&quot; on page AP-4.</td>
</tr>
<tr>
<td>3</td>
<td>Alert number</td>
<td>Number assigned to the selected alert by the alert log. Up to 50 alerts are stored. Note: This is not an alert code.</td>
</tr>
<tr>
<td>4</td>
<td>[ACK]</td>
<td>Time and date the alert was acknowledged.</td>
</tr>
<tr>
<td>5</td>
<td>Alert priority</td>
<td>The priority level assigned to the selected alert. Displayed as &quot;WARNING&quot; or &quot;CAUTION&quot;.</td>
</tr>
<tr>
<td>6</td>
<td>Alert time / coordinates</td>
<td>Time of alert, coordinates at time of alert.</td>
</tr>
<tr>
<td>7</td>
<td>[RECT]</td>
<td>Time and date alert was rectified.</td>
</tr>
</tbody>
</table>
2.12 How to View the Connected Devices

The [DEVICE LIST] shows up to 51 devices connected to the same CANbus network. You can also view details for each displayed device.

To view the [DEVICE LIST], press the LIST button to cycle through the [LIST] screens.

**Note:** The [DEVICE LIST] is updated each time it is accessed. If a device is added to the network while the [DEVICE LIST] is open, close, then re-open the [DEVICE LIST] to show the newly added device.

**How to interpret the device list**

<table>
<thead>
<tr>
<th>No.</th>
<th>Indication name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DATUM, OS coordinates, Calculation status, [HDG], [ROT]</td>
<td>See section 2.11.3.</td>
</tr>
<tr>
<td>2</td>
<td>[ADR]</td>
<td>CANbus network address (0 to 255). Devices are listed in numerical order.</td>
</tr>
<tr>
<td></td>
<td>[NAME]</td>
<td>CAN Device name.</td>
</tr>
<tr>
<td></td>
<td>[SERIAL CODE]</td>
<td>CAN device’s address claim.</td>
</tr>
<tr>
<td></td>
<td>[LEN]</td>
<td>CAN device’s LEN (Load Equivalency Number).</td>
</tr>
<tr>
<td>3</td>
<td>Selected item (highlighted)</td>
<td>Press ▼ or ▲ to scroll through the device list.</td>
</tr>
</tbody>
</table>

**How to interpret device details**

Select the device whose details you want to view, then press ▶. The device details appears at the center of the screen.
2.13 DISPLAY Menu

You can customize the manner in which most items are displayed on your screen, from the [DISPLAY] menu.

Press the MENU ESC key, select [DISPLAY], then press the ENT key to show the [DISPLAY] menu.

2.13.1 How To Change the Display Color

You can change the background and text color for better visibility. There are two options, White background and Black background.

The color change can be made using of the two following methods:

**How to change the color from the menu**

1. Open the [DISPLAY] menu.
2. Select [BKGD COLOR], then press the ENT key.
3. Select [BLACK] or [WHITE] as appropriate, then press the ENT key.
4. Close the [MENU].

**How to change the color from the controls**

See section 2.3.2 for details.

2.13.2 How to Change the Units of Measurement

To change the unit of measurement for distance, follow the procedure below.

1. Open the [DISPLAY] menu.
2. Select [UNIT], then press the ENT key.
3. [DISTANCE] is selected, press the ENT key.
4. Select the appropriate distance unit, then press the ENT key.
   **Note:** The unit of measurement for speed is also changed, as shown below
   - [NM]: Nautical Miles - speed shown as [kn].
   - [KM]: Kilometers - speed shown as [km/h].
   - [SM]: Statute Miles - speed shown as [mph].
5. Close the [MENU].
2.13.3 **How To Use The Smoothing Menu**

Data received from external sensors can be smoothed. This helps to reduce variations caused by unfavorable receiving conditions or other factors.

1. Open the [DISPLAY] menu.
2. Select [SMOOTHING], then press the **ENT** key.
3. Select the appropriate item to smooth, then press the **ENT** key.

4. Close the [MENU].

To disable smoothing for any of the above menu items, repeat the above procedure, then set the smoothing value to [0] (zero).

<table>
<thead>
<tr>
<th>Menu item</th>
<th>Description</th>
<th>Setting range</th>
</tr>
</thead>
<tbody>
<tr>
<td>VTG</td>
<td>Course over ground, ground speed</td>
<td>0000 s to 9999 s</td>
</tr>
<tr>
<td>6DoF</td>
<td>Six Degrees of Freedom - Roll/Pitch</td>
<td>0000 s to 9999 s</td>
</tr>
<tr>
<td>OS SPEED (X,Y)</td>
<td>Dual water/ground speed</td>
<td>0000 s to 9999 s</td>
</tr>
<tr>
<td>ROT</td>
<td>Rate of turn</td>
<td>00 s to 30 s</td>
</tr>
</tbody>
</table>

**Note:** Available for non-IMO types only.

2.13.4 **How to set the number of digits after a decimal point**

To change the number of digits displayed after a decimal point, follow the procedure below. Up to three digits can be set.

1. Open the [DISPLAY] menu.
2. Select [DECIMAL ROUNDDING], then press the **ENT** key.
3. Select the appropriate item, then press the **ENT** key.

4. Select [1], [2] or [3] as appropriate, then press the **ENT** key.

   **Note:** This setting also affects serial output data, sent to other equipment.

4. Select [1], [2] or [3] as appropriate, then press the **ENT** key.

   - [1]: Values are displayed with one digit after the decimal point. The values are also rounded up or down as appropriate.
   - [2]: Values are displayed with two digits after the decimal point. The values are also rounded up or down as appropriate.
   - [3]: Values are displayed with three digits after the decimal point. The values are also rounded up or down as appropriate.

5. Close the [MENU].
2.13.5 How to Set Geodetic Data

The SC-70/SC-130 uses the WGS84 datum as the default geodetic datum. To change the datum used, follow the procedure below.

1. Open the [DISPLAY] menu.
2. Select [DATUM], then press the ENT key.
3. Select the appropriate datum, then press the ENT key. The available selections are: [WGS84], [WGS72], [PZ90], [CK42], [CK95] and [OTHERS]. If the datum you wish to use is not displayed, select [OTHERS].
4. If you selected [OTHERS], proceed to step 5. For all other selections, close the menu.
5. Input the chart number, referring to the geodetic chart list at the back of this manual, then press the ENT key.
6. Close the [MENU].

2.13.6 How to Reset the Trip Meter

The trip meter calculates the distance your vessel has traveled and can be restarted at any time. This menu is not available for IMO types.

To reset the trip meter, do the following:

1. Open the [DISPLAY] menu.
2. Select [TRIP SETTING], then press the ENT key.
3. [CLEAR] is already selected. Press the ENT key to reset the meter.
4. Close the [MENU].

2.13.7 How to Adjust the Date and Time

The SC-70/SC-130 can display the date and time in UTC format or as the local (geographical) time. You can also set for summer time. To adjust time settings, refer to the appropriate topic below.

How to change the time display format

1. Open the [DISPLAY] menu.
2. Select [TIME], then press the ENT key.
3. Select [LOCAL TIME], then press the ENT key.
4. Select [UTC] or [LOCAL] as appropriate, then press the ENT key.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>[UTC]</td>
<td>UTC (Coordinated Universal Time) time is calculated automatically.</td>
</tr>
<tr>
<td>[LOCAL]</td>
<td>Manually input the time offset (based on UTC time).</td>
</tr>
</tbody>
</table>
5. Close the [MENU].
How to enable/disable summer time

You can manually adjust the time to reflect summer (daylight saving) time.

1. Open the [DISPLAY] menu.
2. Select [TIME], then press the ENT key.
3. Select [SUMMER TIME], then press the ENT key.
4. Select [ON] to enable summer time, [OFF] to disable summer time.
5. Close the [MENU].

2.13.8 How to Set the Display Language

The SC-70/SC-130 can display menus and data in English or Japanese. If the display language has been changed to Japanese, do the following to change the language back to English.

Note: This procedure uses the menu item numbers which are displayed at the left-side of each menu.

1. Open the [MENU].
2. Select [1], then press the ENT key.
3. Select [8], then press the ENT key.
4. Select [ENGLISH], then press the ENT key.
5. Close the [MENU].

2.14 GNSS Menu

You can adjust various GNSS-related settings from the [GNSS] menu.

Press the MENU ESC key, select [GNSS], then press the ENT key to show the [GNSS] menu.

<table>
<thead>
<tr>
<th>GNSS</th>
<th>POSN. SYSTEM : GPS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MODE : AUTO (2D/3D)</td>
</tr>
<tr>
<td></td>
<td>POSN. CONDITION</td>
</tr>
<tr>
<td></td>
<td>DGPS/SBAS</td>
</tr>
<tr>
<td></td>
<td>RAIM</td>
</tr>
<tr>
<td></td>
<td>ROLL OVER : 2016</td>
</tr>
<tr>
<td></td>
<td>SETUP</td>
</tr>
</tbody>
</table>

2.14.1 How to select the positioning system to use

1. Open the [GNSS] menu.
2. Select [POSN. SYSTEM], then press the ENT key.
3. Select the appropriate positioning system, then press the ENT key.
   Note: At the time of printing, only [GPS] is available for selection. Other positioning system may be added at a later date.
4. Close the [MENU].
2.14.2 How to set the positioning conditions

1. Open the [GNSS] menu.
2. Select [POSN. CONDITION], then press the ENT key.
3. Referring to the table below, set the conditions for position fixing, then press the ENT key.

<table>
<thead>
<tr>
<th>Menu item</th>
<th>Options</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>QZSS</td>
<td>• [OFF]</td>
<td>Enable/disable the use of the QZSS system.</td>
</tr>
<tr>
<td></td>
<td>• [ON] (default)</td>
<td></td>
</tr>
<tr>
<td>ELEVATION MASK</td>
<td></td>
<td>For technical personnel only. Not changeable.</td>
</tr>
</tbody>
</table>
| IGNORED GNSS    | [000] to [999]   | The system uses the on-board almanac to ignore satellites which are known to provide incorrect data. However, some of these satellites may not be registered in the almanac. You can add satellites to be ignored using this function.  
1) Select the satellite network to which the satellite you want to ignore is registered. The [IGNORED SATELLITE] window appears. 
2) Enter the satellite number to be ignored. You can enter up to 3 satellites per network. Press ▲ to increase the value, ▼ to decrease the value and press ► or ◄ to move the input cursor. 
3) Select [ENTER], then press the ENT key. |

4. Close the [MENU].
2.14.3 How to Set Up DGPS/SBAS

The SC-70/SC-130 can connect to DGPS beacons or SBAS (Satellite Based Augmentation Systems) to refine position fixing.

**How to select the mode of refinement**

1) Open the [GNSS] menu.
2) Select [DGPS/SBAS], then press the ENT key.
3) Select [DIFFERENTIAL], then press the ENT key.
4) Referring to the list below, select the appropriate mode, then press the ENT key.
   - [GNSS]: No position refinement used.
   - [GNSS+SBAS]: Use SBAS to refine position fixing.
   - [GNSS+EXTERNAL]: Use beacons to refine position fixing.
     
     **Note:** The [MODE] setting for [DATA5] in the [I/O] menu must be set to [RTCM] to enable this mode.
   - [AUTO]: The SC-70/SC-130 automatically switches modes as required. The priority is: [EXTERNAL] > [SBAS] > [GNSS].
5) Close the [MENU].

**How to search for available SBAS**

1) Open the [GNSS] menu.
2) Select [DGPS/SBAS], then press the ENT key.
3) Select [SBAS SEARCH], then press the ENT key.
4) Select [AUTO] or [MANUAL] as appropriate, then press the ENT key.
   - [AUTO] selects the highest elevated satellite available.
   - [MANUAL] requires the manual input of the three-digit satellite number.
5) Close the [MENU].

**How to ignore SBAS satellites**

1) Open the [GNSS] menu.
2) Select [DGPS/SBAS], then press the ENT key.
3) Select [IGNORED SBAS], then press the ENT key.
4) Enter the satellite number to be ignored. You can enter up to 3 satellites per network.
   
   Press ▲ to increase the value, ▼ to decrease the value and press ► or ◄ to move the input cursor.
5) Close the [MENU].

**How to select the DGPS beacon**

1) Open the [GNSS] menu.
2) Select [DGPS/SBAS], then press the ENT key.
3) Select [BEACON SETUP], then press the ENT key.
4) Select [AUTO] or [MANUAL], then press the ENT key.
   - [AUTO]: The SC-70/SC-130 automatically selects the beacon to use.
   - [MANUAL]: Manually input the beacon frequency and bit rate.
5) Close the [MENU].
2.14.4 How to Set Up RAIM

RAIM (Receiver Autonomous Integrity Monitoring) is a diagnostic feature which tests the integrity (accuracy) of the position fixing signal.

The receiver estimates position confidence using range value and detected satellite error, and displays (provided the RAIM function is active) the results as one of three levels of position confidence in the text data box of the GPS display mode only. The three levels are as follows:

- **SAFE**: GPS signal is normal. The positioning accuracy satisfies the setting value.
- **CAUTION**: RAIM accuracy cannot be calculated. (Signals from five or more GPS satellites are necessary for calculation.) The positioning accuracy does not satisfy the setting value.
- **UNSAFE**: GPS signal is abnormal, therefore the positioning accuracy is not reliable.

To use the RAIM feature, do the following:

1. Open the [GNSS] menu.
2. Select [RAIM], then press the **ENT** key.
3. Select [RAIM FOR GPS], then press the **ENT** key.
4. Select [SETTING], then press the **ENT** key. An options pop up window appears.
5. Select [ON] to enable the RAIM feature, select [OFF] to disable the RAIM feature.
6. Select [ACCURACY LEVEL], then press the **ENT** key. A numerical input pop up window appears.
7. Set the compensation for RAIM accuracy.
8. Select [ENTER], then press the **ENT** key to apply the RAIM settings, or select [CANCEL] then press the **ENT** key ignore the settings changes.
9. Close the [MENU].

2.14.5 How to set the rollover timing

The SC-70/SC-130 uses the positioning system to calculated date and time. Date and time data sent via satellite signal is reset once every few years, which can cause problems in date/time display. The rollover is used to prevent this from occurring. By setting the correct year on your SC-70/SC-130, the satellites and your system become synchronized.

1. Open the [GNSS] menu.
2. Select [RAIM], then press the **ENT** key.
3. Select [ROLL OVER], then press the **ENT** key. The [INPUT ROLL OVER] window appears.
4. Enter the current year.
   - Press ▲ to increase the value, ◄ to decrease the value and press ► or ◄ to move the input cursor.
5. Select [ENTER] to apply the new setting, select [CANCEL] to keep the current setting.
   - If you select [ENTER], a confirmation window appears. Select [YES] to confirm and restart the system with the new setting.
2.0  OPERATION

2.15 How to Set Up the I/O Menu

Besides its fundamental function of displaying position, the SC-70/SC-130 can also output various data to external equipment. Before outputting data to external equipment, first determine what data the external equipment requires. Only the necessary data should be output, to ensure that the data will be output correctly.

All data transmitted by marine electronics equipment are prefixed with a two character code, known as a “talker”. The same talker must be shared by the transmitting and receiving equipment to transmit and receive data successfully.

2.15.1 How to set up serial data output

The SC-70/SC-130 has five serial data ports which can be set up for data output. To set up more than one port, repeat the procedure below as necessary.

1. Open the [MENU].
2. Select [I/O], then press the ENT key.
3. Select [DATA 1], or the appropriate data port, then press the ENT key.
4. Select [DATA OUTPUT], then press the ENT key. An options pop up window appears.
5. Select [IEC/NMEA] or [RTCM] as appropriate, then press the ENT key.
   - [IEC/NMEA]: Output data in NMEA format.
   - [RTCM]: Output data in binary format.
   **Note:** [RTCM] can only be selected as the mode of output at [DATA 5], all other ports display [RTCM] in gray color and [RTCM] is not selectable.
6. For non-IMO vessels only, select [OUTPUT FORMAT], then press the ENT key. An options pop up window appears.
   For IMO type vessels, go to step 12. [OUTPUT FORMAT] and [BAUD RATE] are fixed for IMO type vessels.
7. Select the appropriate port output format, then press the ENT key. The available options are: [IEC61162-1ED.4], [IEC61162-1ED.3], [NMEA V2.0], [NMEA V1.5].
8. Select [TALKER], then press the ENT key. An options pop up window appears.
9. Select the appropriate talker, then press the ENT key. The available options are listed in the table below with a brief description.

<table>
<thead>
<tr>
<th>Talker</th>
<th>Description</th>
<th>Talker</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GN</td>
<td>Mixed GPS and GLONASS</td>
<td>GP</td>
<td>GPS</td>
</tr>
<tr>
<td>HE</td>
<td>Heading - North seeking gyrocompass</td>
<td>GL</td>
<td>GLONASS</td>
</tr>
<tr>
<td>HN</td>
<td>Heading - Non-north seeking gyrocompass</td>
<td>GA</td>
<td>Galileo</td>
</tr>
<tr>
<td>HC</td>
<td>Heading - Magnetic compass</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** For IMO-types, the talkers are fixed as follows.
   - THD, ROTI device mode : Fixed at [HE].
   - GPS device mode      : Fixed at [GP].
10. Select [BAUD RATE], then press the ENT key. An options pop up window appears.
11. Select the appropriate baud rate for data transfer, then press the ENT key.
12. Select [SENTENCES], then press the **ENT** key. The sentence setup window appears.

13. Press the arrow keys to move the selection cursor and highlight the sentence to set up, then press the **ENT** key. The cycle section of the sentence is now highlighted.

14. Press ‹ or › to adjust the sentence output cycle, then press the **ENT** key.

15. To set up other sentences, repeat steps 13 and 14 as necessary.

**Note:** The sentence load rate indicates the workload required to process the sentences. When setting sentences, observe the load rate carefully and ensure it does not reach or exceed 100%.

16. To apply the changes, select [ENTER], at the bottom of the sentence list, then press the **ENT** key.

   To cancel any changes to the sentences, select [CANCEL], then press the **ENT** key.

17. Close the [MENU].

### 2.15.2 How to set up LAN data output

When connecting the SC-70/SC-130 to a shipboard LAN network, perform the following procedure to set up data output.

1. Open the [MENU].

2. Select [I/O], then press the **ENT** key.

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

4. For non-IMO vessels, select [TALKER], then press the **ENT** key. An options pop up window appears. For IMO-type vessels, go to step 6.

5. Select the appropriate talker, then press the **ENT** key. The available options are listed in the table at step 9 of section 2.15.1.

   **Note:** For IMO-types, the talkers are fixed as follows.
   
   THD, ROTI device mode : Fixed at [HE].
   
   GPS device mode : Fixed at [GP].

6. Referring to steps 12 through 15 of section 2.15.1, set up the sentences as appropriate.

7. Select [IP ADDRESS/PORT], then press the **ENT** key. A numerical pop up window appears. Use the following IP Address and Port combinations to show the log data in the [ETHERNET] log:

<table>
<thead>
<tr>
<th>IP Address</th>
<th>Port</th>
<th>IP Address</th>
<th>Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>239.192.111.001</td>
<td>60001</td>
<td>239.192.000.004</td>
<td>60004</td>
</tr>
<tr>
<td>239.192.000.003</td>
<td>60003</td>
<td>239.192.000.008</td>
<td>60008</td>
</tr>
</tbody>
</table>

8. Set the IP address and port as appropriate, select [ENTER], then press the **ENT** key.

9. Close the [MENU].
### 2.15.3 How to set up data sources (data input)

1. Open the [MENU].
2. Select [I/O], then press the **ENT** key.
3. Select [DATA SOURCE], then press the **ENT** key.
4. Select [HDG] (Heading) or [EXT. STW] (External Speed Thru Water), then press the **ENT** key. An options pop up window appears.
5. Referring to the table below, set the appropriate data source for [HDG] or [EXT. STW].

<table>
<thead>
<tr>
<th>Menu option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[INTERNAL LAN]*</td>
<td>Use the SC-70/SC-130 antenna as the data source. This is the default setting.</td>
</tr>
<tr>
<td>[DATA 1] to [DATA 5]</td>
<td>Select the serial port for position data input from an external source.</td>
</tr>
<tr>
<td>[USER PRIORITY]</td>
<td>Set the priority for serial ports. If the signal from a port is interrupted, the SC-70/SC-130 automatically switches to the next available port (sensor), in priority order.</td>
</tr>
</tbody>
</table>

The port numbers are listed on the left-side of the window. The priority settings, at the right-side of the window, show the highest priority sensor to the left, and the lowest priority sensor to the right. In the example figure, the priority order is set as follows: 1→6→4→2→5→3.

**Note:** [1: INTERNAL LAN] is fixed as the highest priority data source.

*: The [INTERNAL LAN] menu option is not available for [EXT. STW].

6. Close the [MENU].
2.15.4 How to use the input/output logs

The [I/O LOGS] display logged data for input/output information for serial ports and LAN connections. You can export the logged data to an external flash memory.

The following keys have specific functions when a log screen appears.

<table>
<thead>
<tr>
<th>Key</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>❯</td>
<td>Close the log and return to the [I/O] menu.</td>
</tr>
<tr>
<td>▲ or ▼</td>
<td>Toggle input and output log displays.</td>
</tr>
<tr>
<td>ENT</td>
<td>Press with external flash memory connected: start/pause saving the log.</td>
</tr>
<tr>
<td>MENU ESC</td>
<td>Close the logs and the [I/O] menu.</td>
</tr>
</tbody>
</table>

Saved log files are automatically named in the following format:

```
This equipment's name
The log type
Time and date when the log was saved.

SC70_Tx_DATA1_20150917235959
```

The logged port. Displayed in the filename as follows:

- DATA 1 to DATA 5: Data from serial port 1 to 5.
- Network: Data from the connected LAN network.
- CANbus: PGN data from the CAN bus network.
- RAW: Raw data from the connected antenna.

The log data which can be saved depends on the monitor type selected.

**[DATA1] to [DATA5] - Serial data**
2. OPERATION

[ETHERNET] - LAN data

Note: If the IP address & port combination is not a recognized combination (see section 2.15.2), the [ETHERNET] log screen appears blank.

Packet summary
Press ▲ or ▼ to select a packet. Selection is highlighted in gray.

Select a packet, then press ► to view the packet details.

Data source’s IP address

[CAN] - CAN Bus network data

Select a PGN, then press ► to view the PGN details.

PGN destination’s CAN address (broadcast to 255)

USB status
No USB = No external flash memory connected.
SAVING = Saving log data to external flash memory.
STOP SAVING = Flash memory connected, no log data currently being saved.
2. OPERATION

[LAN ERROR LOG]

The [LAN ERROR LOG] counts LAN errors, filing the errors in one of six error groups. The table below shows the error groups along with possible causes for their errors.

<table>
<thead>
<tr>
<th>Error</th>
<th>Possible cause(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>INCORRECT SENTENCE</td>
<td>• Sentence in TAG block has an error.</td>
</tr>
<tr>
<td></td>
<td>• CHECKSUM error.</td>
</tr>
<tr>
<td></td>
<td>• Sentence does not meet NMEA0183 standards.</td>
</tr>
<tr>
<td>TAG BLOCK FRAMING ERROR</td>
<td>Unexpected transmission start/stop in TAG block.</td>
</tr>
<tr>
<td>TAG SYNTAX ERROR</td>
<td>• One or more errors in TAG block.</td>
</tr>
<tr>
<td></td>
<td>• Data length is too long or too short.</td>
</tr>
<tr>
<td></td>
<td>• Delimiter is in use.</td>
</tr>
<tr>
<td></td>
<td>• Use of incorrect characters.</td>
</tr>
<tr>
<td>TAG BLOCK CHECKSUM ERROR</td>
<td>TAG block has one or more CHECKSUM errors.</td>
</tr>
<tr>
<td>INCORRECT TAG BLOCK</td>
<td>One or more instances of the following:</td>
</tr>
<tr>
<td></td>
<td>• Incorrect talker used.</td>
</tr>
<tr>
<td></td>
<td>• Incorrect SFI used.</td>
</tr>
<tr>
<td></td>
<td>• Incorrect parameters (g, s, p, n, t) used.</td>
</tr>
<tr>
<td>INVALID HEADER</td>
<td>One or more instances where the following are not included:</td>
</tr>
<tr>
<td></td>
<td>• UdPbC</td>
</tr>
<tr>
<td></td>
<td>• RaUdP</td>
</tr>
<tr>
<td></td>
<td>• RrUdP</td>
</tr>
</tbody>
</table>

Press and hold the ENT key to clear the [LAN ERROR LOG].

2.15.5 How to restart heading output

In cases where the heading signal is lost or interrupted, the SC-70/SC-130 can restart signal output. There are two methods, [AUTO] and [MANUAL].

1. Open the [MENU].
2. Select I/O, then press the ENT key.
3. Select [MISCELLANEOUS], then press the ENT key.
4. Select [HDG OUTPUT RESTART], then press the ENT key. An options pop up window appears.
5. Select [AUTO] or [MANUAL] as appropriate, then press the ENT key.
   [AUTO] : Automatically restart heading output when the signal is restored.
   [MANUAL] : When the signal is restored the following occurs.
               • A pop up message alerting the user to signal restoration is shown.
               • An audible alert is released.
               Press the ENT key to close the pop up message and stop the audible alert. Output is now resumed.
   Note: The default setting is AUTO. Select MANUAL depending on connected equipment.
6. Close the [MENU].
2.15.6 **How to change the speed reference (Non-IMO types only)**

The speed reference is used in the VHW sentence for speed data output to external equipment.

1. Open the [MENU].
2. Select [I/O], then press the ENT key.
3. Select [MISCELLANEOUS], then press the ENT key.
4. Select [STW] (Speed Through Water), then press the ENT key. An options pop up window appears.
5. Select [AUTO] or [MANUAL] as appropriate, then press the ENT key.
   
   **[VECTOR]** : Speed is calculated based on own ship vector.
   **[SCALAR]** : Speed is calculated based on SOG (Speed Over Ground).
6. Close the [MENU].

2.16 **SENSOR Menu**

The [SENSOR] menu contains settings for the connected sensors. Some settings in this menu require service level access and are not changeable by the user.

To access this menu, open the [MENU], then select [SENSOR].

**Note:** The [OFFSET] menu is reserved for technical personnel only.

2.16.1 **OTHER menu**

1. Open the [MENU].
2. Select [SENSOR], then press the ENT key.
3. Select [OTHER], then press the ENT key.
4. Select the appropriate menu item, then press the ENT key.
   
   - **[GNSS RESTART]**: Restarts the GNSS cores. A confirmation message appears; select [YES] to reset the GNSS cores or select [NO] to cancel the reset.
   - **[DR TIME]**: Set the Dead Reckoning time. Available options are [1 min], [2 min], [3 min], [4 min] and [5 min] (default setting). Select the required time, then press the ENT key.
   - **[MAGNETIC VARIATION]**: Select whether to adjust for magnetic variation automatically ([AUTO]) or manually ([MANUAL]). If you selected [MANUAL], the [INPUT MAGNETIC VARIATION] pop up window appears. Enter the variation amount, select [ENTER], then press the ENT key.
     
     **Note:** The [MAGNETIC VARIATION] menu item is not available for IMO types.
5. Close the [MENU].
2.16.2 SENSOR STATUS menu

You can check the status of your sensors from this menu. Select [SENSOR STATUS] from the [SENSOR] menu to show the window below.

Possible statuses for each item are listed in the table below.

<table>
<thead>
<tr>
<th>No.</th>
<th>Possible status</th>
</tr>
</thead>
</table>
| 1   | • "OK": Sensor is functioning normally.  
     |     | • "NG (axis)": The sensor is not functioning normally on the axis shown. For example, "NG X,Y" means the X and Y axis are not functioning normally. |
| 2   | • "OK": Sensor is functioning normally.  
     |     | • "NG (axis)": The sensor is not functioning normally on the axis shown. For example, "NG X,Y" means the X and Y axis are not functioning normally. |
| 3   | • "NORMAL": Sensor is functioning normally.  
     |     | • "DR": Dead Reckoning in use.  
     |     | • "OUTPUT STOPPED": Sensor output has stopped.  
     |     | • "NOT EXPECTED": An unexpected error has occurred. |
| 4   | Hexadecimal code is displayed. |
| 5   | • "OK": Sensor is functioning normally.  
     |     | • "BLOCKED": One or more sensors' line of view is blocked.  
     |     | • "VIBRATED": One or more sensors are in a location which is subject to excessive vibrations. |

2.17 SYSTEM Menu

The SYSTEM menu contains settings for your SC-70/SC-130 system. To access this menu, open the [MENU] then select [SYSTEM].

**Note 1:** The [USB FLASH DRIVE] menu item is selectable only when a USB Flash Memory is connected to the Junction Box.

**Note 2:** The [NETWORK] menu item is reserved for technical personnel only and require password level access from the [SERVICE] menu.
### 2.17.1 Simulation mode

Simulation mode uses data from the internal memory to provide a simulation of the systems functions. To use the simulation mode, several settings are required, as listed in the procedure below.

1. Open the [MENU].
2. Select [SYSTEM], then press the **ENT** key.
3. Select [SIMULATION], then press the **ENT** key.

4. Select [MOVEMENT SETTING], then press the **ENT** key. The [SIMULATION(MOVEMENT) SETTING] window appears.

![Simulation Mode Window](image)

- **[DATE]**
  - Sets the date for the simulation.
- **[POSN]**
  - Sets the position (coordinates) for the simulation.
- **[STRAIGHT]**
  - Sets a simulated course in a straight line.
  - **[DIRECT]**
    - Sets the heading for the simulation.
  - **[SOG]**
    - Sets the SOG (Speed Over Ground) for the simulation.
- **[CIRCLE]**
  - Sets a simulated course in a circle.
  - **[DIRECT]**
    - Sets the direction of the circle. ([CW]: Clockwise; [CCW]: Counter-clockwise)
  - **[RADIUS]**
    - Sets the radius of the circle, in Nautical Miles.
  - **[ANGULAR SPD]**
    - Sets the speed at which to turn during the simulation.

5. Referring to the figure and table above, select a parameter to set for the simulation, then press the **ENT** key. A settings pop up window appears.

6. Press the CursorPad to move the cursor and adjust the settings for the selected parameter. When the settings for the selected parameter are complete, select **ENTER**, at the bottom of the window, then press the **ENT** key. The [SIMULATION(MOVEMENT) SETTING] window appears.

7. When all parameter settings are complete, select **ENTER**, at the bottom of the [SIMULATION(MOVEMENT) SETTING] window, then press the **ENT** key. The [SIMULATION] menu appears.
8. Select [ATTITUDE SETTING], then press the **ENT** key. The [SIMULATION(ATTITUDE) SETTING] window appears.

9. Referring to the figure and table above, select a parameter to set for the simulation, then press the **ENT** key. A settings pop up window appears.

10. Press the CursorPad to move the cursor and adjust the settings for the selected parameter. When the settings for the selected parameter are complete, select **ENTER**, at the bottom of the window, then press the **ENT** key. The [SIMULATION(ATTITUDE) SETTING] window appears.

11. When all parameter settings are complete, select **ENTER**, at the bottom of the [SIMULATION(ATTITUDE) SETTING] window, then press the **ENT** key. The [SIMULATION] menu appears.

12. Select [SIMULATION], then press the **ENT** key. The start/stop options window appears.

13. Select [START]. A confirmation window appears. Select [YES] to start the simulation, or select [NO] to cancel.

   If you select [YES], the system restarts. When the restart is completed, the system operates in simulation mode and the simulation indicator is shown at the top-right of the display.

### How to stop the simulation

You can stop the simulation at any time from the menu.

1) Referring to the steps 1 to 3 of the above procedure, open the [SIMULATION] menu.
2) Select [SIMULATION], then press the **ENT** key. The start/stop options window appears.
3) Select [STOP]. A confirmation window appears. Select [YES] to start the simulation, or select [NO] to cancel.

   If you select [YES], the system restarts. When the restart is completed, the system operates in normal mode and the simulation indicator is not shown at the top-right of the display.
2.17.2 SYSTEM SOUND menu

When a key is pressed the system releases a “key beep”. You can turn the key beeps on or off, to suit your preference.

1. Open the [MENU].
2. Select [SYSTEM], then press the ENT key.
3. Select [SYSTEM SOUND], then press the ENT key. The [SYSTEM SOUND] menu appears.

<table>
<thead>
<tr>
<th>SYSTEM SOUND</th>
</tr>
</thead>
<tbody>
<tr>
<td>KEY BEEP: ON</td>
</tr>
<tr>
<td>NOTIFICATION SOUND: ON</td>
</tr>
</tbody>
</table>

4. [KEY BEEP] is already selected, press the ENT key. The settings options window appears.
   
   **Note:** The [NOTIFICATION SOUND] menu item is reserved for technical personnel and is not selectable.

5. Select [ON] or [OFF] as appropriate, then press the ENT key.
6. Close the [MENU].

2.17.3 SYSTEM LOG menu

If a USB Flash Memory is connected to the Junction Box, you can save a system log file to the USB. To save a log file, do the following:

1. Open the [MENU].
2. Select [SYSTEM], then press the ENT key.
3. Select [SYSTEM LOG], then press the ENT key. The [SYSTEM LOG] menu appears.

<table>
<thead>
<tr>
<th>SYSTEM LOG</th>
</tr>
</thead>
<tbody>
<tr>
<td>RECORDING: OFF</td>
</tr>
<tr>
<td>LOG LEVEL: FATAL</td>
</tr>
</tbody>
</table>

4. [RECORDING] is already selected, press the ENT key. The settings options window appears.
   
   **Note:** The [LOG LEVEL] menu item is reserved for technical personnel and is not selectable.

5. Select [ON] or [OFF] as appropriate, then press the ENT key.
6. Close the [MENU].
2.17.4 How to save a sensor log

You can save a log file for your GNSS, sensor or offline (both GNSS and sensor) data.

1. Open the [MENU].
2. Select [SYSTEM], then press the ENT key.
3. Select [LOG RECORDING], then press the ENT key. The [LOG RECORDING] menu appears.
4. Select [LOG TYPE], then press the ENT key. An options pop up window appears.
5. Select the appropriate option, then press the ENT key.
   - [OFF]: No log data is saved.
   - [GNSS ONLY]: Only GNSS core log data is saved.
   - [SENSOR ONLY]: Only sensor log data is saved.
   - [OFFLINE DATA]: Both GNSS and sensor log data is saved as offline data.
6. Select [DESTINATION], then press the ENT key. An options pop up window appears.
7. Select the appropriate option, then press the ENT key.
   - [USB]: Log data is saved to the USB Flash Memory.
   - [MP]: Log data is saved to the device connected via the Remote Maintenance port.
8. Close the [MENU].

2.17.5 How to clear display settings and GPS memory

You can reset the display settings and clear the GNSS (GPS) memory.

1. Open the [MENU].
2. Select [SYSTEM], then press the ENT key.
3. Select [RESET SETTING], then press the ENT key. The [RESET SETTINGS] menu appears.
4. Select the appropriate option, then press the ENT key. A confirmation window appears.
   **Note:** The [FACTORY DEFAULT] menu item is reserved for technical personnel and is not selectable.
5. Select [YES] to reset the settings, or [NO] to cancel.

2.18 ROTI Display Operations (RD-50/RD-20, option)

The optional RD-50/RD-20 Remote Display Unit is available as a remote display for ROTI data only. Operations and settings for the RD-50 are outlined in the RD-50 operator’s manual (OME-44530-x; x denotes the manual version), supplied with the RD-50.
3. MAINTENANCE, TROUBLE-SHOOTING

3.1 Preventative Maintenance

Regular maintenance is necessary to maintain performance. A monthly maintenance program should be established and should at least include the items listed in the table below.

<table>
<thead>
<tr>
<th>Item</th>
<th>Check point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connectors</td>
<td>Check that all connectors on the rear panel of the Junction Box and display unit are firmly connected.</td>
</tr>
<tr>
<td>Cabling</td>
<td>Check cabling for damage. Replace if damaged.</td>
</tr>
<tr>
<td>Ground terminal</td>
<td>Check the ground terminal on the display unit and Junction Box for rust. Clean if necessary.</td>
</tr>
<tr>
<td>Ground wire</td>
<td>Check that the ground wire on the display unit and Junction Box is firmly fastened.</td>
</tr>
<tr>
<td>Display unit, Junction Box</td>
<td>Dirt and dust should be removed from units with a soft, dry cloth. For the LCD, wipe it 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 any unit; they can remove paint and marks and deform the equipment.</td>
</tr>
</tbody>
</table>

3.2 Replacement of Fuse

WARNING

Use the proper fuse.

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

The Junction Box (SC-701) contains fuses which protects the equipment from over-voltage, reverse polarity and equipment fault. If power cannot be turned on, check if the fuse has blown.

Only a qualified technician should change the fuse, contact your dealer and quote the fuse details listed below.

<table>
<thead>
<tr>
<th>Used for</th>
<th>Fuse type</th>
<th>Code No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC-701</td>
<td>FBG0-A 125V 3A PBF</td>
<td>000-155-830-10</td>
</tr>
<tr>
<td>SC-702</td>
<td>FGMB 125V 0.3A PBF</td>
<td>000-176-821-10</td>
</tr>
</tbody>
</table>
### 3.3 Basic Troubleshooting

This section provides basic troubleshooting which the user may follow to restore normal operation. If the problem is not rectified, contact your dealer for advice.

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Possible cause and remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cannot turn the power on.</td>
<td>Power cables may be damaged or corroded. Check the cables for corrosion or damage; replace as necessary.</td>
</tr>
<tr>
<td></td>
<td>Power cable may be loose or disconnected. Check the cable connections are fastened firmly.</td>
</tr>
<tr>
<td></td>
<td>Blown fuse. Check the fuses. If blown, contact your dealer for replacement.</td>
</tr>
<tr>
<td></td>
<td>Ship battery may have low voltage. Check that the battery voltage is within rating.</td>
</tr>
<tr>
<td>Display screen is blank.</td>
<td>Brilliance level may be too low. Press the BRILL key to adjust the brilliance.</td>
</tr>
<tr>
<td>No position fix.</td>
<td>Antenna cable may be loose or disconnected. Check the antenna cable is fastened firmly.</td>
</tr>
<tr>
<td></td>
<td>Unable to see more than two satellites. Check that there are no large obstructions preventing a clear view to the sky.</td>
</tr>
<tr>
<td></td>
<td>GPS needs to be restarted. From the main menu, select [SYSTEM]→[RESET SETTINGS]→[CLEAR GNSS]→[YES].</td>
</tr>
<tr>
<td>Large error between actual and indicated location.</td>
<td>Positioning system may be incorrect or sensor is faulty. From the main menu, select [GNSS]. Confirm that the settings for [POSN. SYSTEM] and [MODE] are correct.</td>
</tr>
<tr>
<td>Heading indication changes randomly when the vessel is anchored or does not change when the vessel is moving.</td>
<td>Antenna may be poorly located or unable to obtain a positioning fix. 1) Check that the antenna has a clear view to the sky. 2) Check that the installation location is not subjected to excessive vibrations. 3) Check that the antenna is not subject to interference from nearby equipment</td>
</tr>
<tr>
<td></td>
<td>Sensor may be faulty. 1) Check the sensor status from the [SENSOR] menu. 2) Run a [DIAGNOSTIC TEST] from the [MAINTENANCE] menu. If one or more sensors are faulty, contact your dealer for advice.</td>
</tr>
<tr>
<td>Data output from the SC-70/SC-130 does not appear on external equipment.</td>
<td>Connection between the SC-70/SC-130 and external equipment is loose or damaged. Check connection, replace or reconnect/refasten as necessary.</td>
</tr>
<tr>
<td></td>
<td>Output settings are incorrect. From the main menu, select [I/O], then select the output port. Confirm that the settings are correct.</td>
</tr>
<tr>
<td></td>
<td>Sensor may be faulty. 1) Check the sensor status from the [SENSOR] menu. 2) Run a [DIAGNOSTIC TEST] from the [MAINTENANCE] menu. If one or more sensors are faulty, contact your dealer for advice.</td>
</tr>
<tr>
<td></td>
<td>External equipment not set correctly. 1) Check the external equipment data input settings. 2) Output data and input data connection should set as follows: SC70/SC-130=TD-A (\leftrightarrow) external equipment=RD-A SC70/SC-130=TD-B (\leftrightarrow) external equipment=RD-B</td>
</tr>
<tr>
<td>The external equipment can not received CANbus (NMEA2000) data from SC-70/SC-130.</td>
<td>Turn on the CANbus network (NMEA2000) before the SC-70/SC-130. If the SC-70/SC-130 is turned on before the CANbus network (NMEA2000), reboot the SC-70/SC-130.</td>
</tr>
</tbody>
</table>
3.4 Maintenance Menu

The [MAINTENANCE] menu contains items such as diagnostic tests, unit information and other maintenance-specific menus. You can also save or load your user settings from this menu.

To access the [MAINTENANCE] menu, open the [MENU], then select [MAINTENANCE]. The [MAINTENANCE] menu appears.

3.4.1 How to find unit information

You can view your equipment’s details from the [INFORMATION] menu. The displayed details include handy information such as program numbers and serial numbers.

1. From the [MAINTENANCE] menu, select [INFORMATION], then press the ENT key.
2. Select the unit whose information you want to view, then press the ENT key.
3. Select the part of the unit whose information you want to view, then press the ENT key.
   Items shown in gray are either not selectable, or have no information to view. Press ▲ or ◀ to scroll through the displayed information.

3.4.2 How to Backup User Settings

If a USB Flash Memory is connected at installation (see section 1.5.5), the SC-70/SC-130 can import or export user settings via external USB flash memory. This allows you to apply the same settings to multiple units, or recover settings if they are accidentally changed.

Note: The menu is inoperable while importing or exporting settings. Also, the import/export procedure cannot be stopped once it starts. For safety, conduct these operations while moored safely.

To import or export settings, do the following:

1. Open the [MENU].
2. Select [MAINTENANCE], then press the ENT key.
3. Select [IMPORT/EXPORT], then press the ENT key.
4. Select [IMPORT USER SETTINGS] or [EXPORT USER SETTINGS] as appropriate, then press the ENT key. A confirmation pop up window appears.
5. Select [YES] to import/export the user settings, [NO] to cancel the import/export. If [YES] is selected, a progress widow appears, showing the overall progress of the import/export.
   If an error occurs during the import/export, an error message appears. Referring to the table on the following page, take the appropriate action.
3. MAINTENANCE, TROUBLESHOOTING

<table>
<thead>
<tr>
<th>Error message</th>
<th>Meaning</th>
<th>Recommended action</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;NO USB!&quot;</td>
<td>No USB flash memory is connected to this unit.</td>
<td>Press the MENU ESC key to close the pop up. Check the connection. If a flash memory is connected, the USB connector/cable may be damaged, contact your dealer.</td>
</tr>
<tr>
<td>&quot;ERROR DETECTED IN SETTINGS TRANSFER! RESTORING PREVIOUS SETTINGS.&quot;</td>
<td>Data transfer to/from the USB flash memory was interrupted/stopped. This unit will restore the settings used prior to import.</td>
<td>Press the ACK key to close the pop up and start restoring the settings.</td>
</tr>
<tr>
<td>&quot;NOT ENOUGH SPACE ON USB.&quot;</td>
<td>USB flash memory does not have enough space to save the settings.</td>
<td>Delete unnecessary files from the USB or use a USB with sufficient memory.</td>
</tr>
<tr>
<td>&quot;NO FILE FOUND ON USB.&quot;</td>
<td>There is no settings file saved on the connected USB.</td>
<td>Connect the correct USB.</td>
</tr>
<tr>
<td>&quot;OTHER BACKUP PROCESS IS RUNNING.&quot;</td>
<td>Import/export was attempted while a separate backup (or log) is in progress.</td>
<td>Wait for the other backup/log to complete, then try again.</td>
</tr>
</tbody>
</table>

6. When the import/export is complete the progress window is replaced with a pop up window displaying the message "IMPORT COMPLETE" or "EXPORT COMPLETE".

7. Press the ENT key. The last used display screen appears.

8. Open the [MENU].

9. Select [SYSTEM], then press the ENT key.

10. Select [USB FLASH DRIVE], then press the ENT key.

11. Select [UNMOUNT], then press the ENT key.

12. Close the [MENU].

How to remove the USB Flash Memory

To remove the USB Flash Memory, open the MENU, then select [SYSTEM] → [USB FLASH DRIVE] → [UNMOUNT]. When the process is completed, the message "YOU CAN REMOVE THE USB SAFELY" appears. Remove the USB Flash Memory.
3. MAINTENANCE, TROUBLESHOOTING

3.5 Diagnostic Tests

The [DIAGNOSTICS] menu has several diagnostic tests which may help find the cause of a problem. To access the [DIAGNOSTICS] menu, do the following:

1. Press the MENU ESC key to access the menu.
2. Select [MAINTENANCE], then press the ENT key.
3. Select [DIAGNOSTICS], then press the ENT key.

The following tests are available:

- [MEMORY] TEST : See section 3.5.1.
- [KEY TEST] : See section 3.5.2.
- [LCD TEST] : See section 3.5.3.
- [AUTOMATIC TEST] : See section 3.5.4.
- [MANUAL TEST] : For technical personnel only.
- [SOUND TEST] : See section 3.5.5.

4. Select the appropriate test, then press the ENT key.
5. Close the [MENU].

3.5.1 Memory test

The [MEMORY] test checks RAM, ROM, USB, LAN ports and data ports for the Junction Box (SC-701), the display unit (SC-702) and the antenna unit (SC-703/SC-1303).

Press the ▲ or ▼ to cycle through the test result for each tested unit.

Press the MENU ESC key to close the results screen and return to the [SELF TEST] menu, or press the ENT key to repeat the test.
3. MAINTENANCE, TROUBLESHOOTING

3.5.2 **Keyboard test**

The [KEYBOARD] test checks that the keys are functioning correctly.

If a key is malfunctioning, contact your dealer.

To close this test screen, press the **MENU ESC** key three times.

3.5.3 **LCD test**

The [TEST PATTERN] test checks the LCD display colors and patterns. This test changes the display color and shows patterns.

The test start screen shows operational guidance for the LCD test, as shown in the figure below.

Press the **ENT** key to continue the test, or press the **MENU ESC** key to abort the test.

The colors and patterns appear in the order shown below.

If the colors are not displayed correctly, or show signs of LCD damage, contact your dealer.
3.5.4 Automatic Test

The [AUTOMATIC TEST] conducts a brief test on the LCD, keyboard (SC-702) and memory (SC-701, SC-702 and SC-703).

This saves you the time it takes to conduct each test individually. If an error is detected during any of the automatic tests, the test stops. Check the item in question and consult your dealer if necessary.

The [AUTOMATIC TEST] does the following in numerical order:

1) Displays the PC board version numbers and program version numbers for the display unit, junction box and the connected antenna. Results are displayed for approximately five seconds, then step 2 is initiated.
2) Tests RAM/ROM and data input/output. (See section 3.5.1.) Results are displayed for approximately five seconds, then step 3 is initiated.
3) Tests the SC-702 keys. (See section 3.5.2.) Proceeds to step 4 if no key is pressed within five seconds.
4) Tests the LCD. (See section 3.5.3.) Displayed test screens changes after two seconds until the “checkered flag” screen appears. Proceeds to step 5 if no key is pressed within five seconds.
5) Tests screen brilliance. Press the BRILL key to cycle through the brilliance settings in the following order:

   Maximum brilliance → Medium brilliance → Minimum brilliance

   Repeats the tests from step 1 if no key is pressed within five seconds.
   To exit this test, press the MENU ESC key.

Note: The SC-70/SC-130 continues data output while this test is active.

3.5.5 Sound test

Use the sound test to check the buzzer. Press ▲ or ▼ to change the buzzer’s sound frequency.

<table>
<thead>
<tr>
<th>SOUND TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>FREQ. 1600</td>
</tr>
<tr>
<td>[ ] END BEEP/STOP SOUND</td>
</tr>
</tbody>
</table>

The frequency range is 1400 (Hz) to 1850 (Hz).

Note: The settings used for the sound test are not saved.
3. MAINTENANCE, TROUBLESHOOTING

This page is intentionally left blank.
APPENDIX 1 MENU TREE

Main menu
- 1 DISPLAY
- 2 GNSS
- 3 ALERT
- 4 MAINTENANCE
- 5 I/O
- 6 SENSOR
- 7 SYSTEM
- 8 SERVICE*

1 DISPLAY
- 1 BKGD COLOR *(WHITE, BLACK)*
- 2 UNIT
  - 1 DISTANCE *(NM, KM, SM)*
- 3 SMOOTHING
  - 1 VTG *(0000s to 9999s)*
  - 2 6DoF *(0000s to 9999s)*
  - 3 OS SPEED(X,Y)*6 (0000s to 9999s)
  - 4 ROT (00s to 30s, default: 04s)
- 4 DECIMAL Rounding
  - 1 VTG (1, 2, 3)
  - 2 VBW*6 (1, 2, 3)
  - 3 HDG (1, 2, 3)
  - 4 ROT, PITCH (1, 2, 3)
- 5 DATUM *(WGS84, WGS72, PZ90, CK42, CK95, OTHERS)*
- 6 TRIP SETTING*6
  - 1 CLEAR
- 7 TIME
  - 1 LOCAL TIME *(UTC, LOCAL)*
  - 2 SUMMER TIME *(ON, OFF)*
- 8 LANGUAGE
  - 1 ENGLISH
  - 2 日本語 *(Japanese)*

2 GNSS
- 1 POSN. SYSTEM
  - 1 GPS
- 2 MODE *(AUTO(2D/3D), 2D)* *(For technical personnel only. Do not use.)*
- 3 POSN. CONDITION
  - 1 QZSS *(ON, OFF)*
  - 2 ELEVATION MASK *(5° to 90°)* *(For technical personnel only. Do not use.)*
- 4 IGNORED GNSS
  - 1 QZSS
  - 2 GPS
  - 3 GLONASS
  - 4 GALILEO
- 5 DGPS/SBAS
  - 1 DIFFERENTIAL *(GNSS, GNSS+SBAS, GNSS+EXTERNAL, AUTO)*
  - 2 SBAS SEARCH *(AUTO, MANUAL)*
  - 3 IGNORED SBAS
  - 4 BEACON SETUP *(AUTO, MANUAL)*
- 6 RAIM
  - 1 RAIM FOR GPS
    - 1 SETTING *(ON, OFF)*
    - 2 ACCURACY LEVEL *(001m to 999m, default: 100m)*
  - 6 ROLL OVER *(2000 to 2099, default: 2016)*
  - 7 SETUP*1

*1: Requires password access.
For service personnel only.

Continued on page AP-2
APPENDIX 1 MENU TREE

Continued from page AP-1

3 ALERT
- 1 ALERT LIST
- 2 REMOTE ACK I/F *(ACK, BUZZER STOP)*\(^7\)
- 3 SOUND (OFF, SHORT, LONG, CONTINUOUS)*\(^5\)  *5: Non-IMO types only. Fixed for IMO types.
- 4 ALERT LOG

4 MAINTENANCE
- 1 INFORMATION
  - 1 DISPLAY UNIT
    - 1 MAIN PCB
    - 2 LCD
  - 2 ANTENNA UNIT
    - 1 MAIN PCB
    - 2 SUB IMU (Not available where there is no SUB IMU board)
    - 3 LAN_CNV PCB
    - 4 GNSS_LNA 1
    - 5 GNSS_LNA 2
    - 6 GNSS_LNA 3 (Available only for SC-130 systems)
  - 3 JUNCTION BOX
    - 1 MAIN PCB
    - 2 LAN_CNV PCB
    - 3 TB_PWR PCB
- 2 DIAGNOSTICS
  - 1 MEMORY TEST
  - 2 KEY TEST
  - 3 LCD TEST
  - 4 AUTOMATIC TEST
  - 5 MANUAL TEST (For technical personnel only. Do not use.)
  - 6 SOUND TEST
- 3 IMPORT/EXPORT
  - IMPORT USER SETTING
  - EXPORT USER SETTING
- 4 NETWORK
  - 1 TALKER*6 (GP, GL, GA, GN, HE, HN, HC)  *6: Non-IMO only, fixed for IMO
  - 2 SENTENCES
  - 3 IP ADDRESS/PORT
- 5 DATA SOURCE
  - 1 HDG *(INTERNAL LAN, DATA 1, DATA 2, DATA 3, DATA 4, DATA 5, USER PRIORITY)*
  - 2 EXT. STW*6 (DATA 1, DATA 2, DATA 3, DATA 4, DATA 5, USER PRIORITY)
- 6 NETWORK
  - 1 TALKER*6 (GP, GL, GA, GN, HE, HN, HC)  *6: Non-IMO only, fixed for IMO
  - 2 SENTENCES
  - 3 IP ADDRESS/PORT
- 7 DATA SOURCE
  - 1 HDG *(INTERNAL LAN, DATA 1, DATA 2, DATA 3, DATA 4, DATA 5, USER PRIORITY)*
  - 2 EXT. STW*6 (DATA 1, DATA 2, DATA 3, DATA 4, DATA 5, USER PRIORITY)
- 8 I/O LOGS
  - 1 DATA 1 (Shows TX/RX log)
  - 2 DATA 2 (Shows TX/RX log)
  - 3 DATA 3 (Shows TX/RX log)
  - 4 DATA 4 (Shows TX/RX log)
  - 5 DATA 5 (Shows TX/RX log)
  - 6 ETHERNET
  - 7 CANbus
  - 8 LAN ERROR LOG
- 9 MISCELLANEOUS
  - 1 HDG OUTPUT RESTART *(AUTO, MANUAL)*
  - 2 STW*6 *(VECTOR, SCALAR)*

Continued on page AP-3
APPENDIX 1 MENU TREE

6 SENSOR
- 1 OFFSET (For technical personnel only. Do not use.)
  - 1 HDG OFFSET (-180º000’ to +180º000’, default: +0.000º)
  - 2 PITCH OFFSET (-10º000’ to +10º000’, default: +0.000º)
  - 3 ROLL OFFSET (-10º000’ to +10º000’, default: +0.000º)
  - 4 POSITION OFFSET
  - 5 DIMENSIONS/CCRP
  - 6 SOG OFFSET -12.5% to +12.5%, default: +00.0%
  - 7 ATM OFFSET (-99.9hPa to +99.9hPa, default: 00.0hPa)
  - 8 TEMP OFFSET (-99.9ºC to +99.9ºC, default: +00.0ºC)
- 2 OTHER
  - 1 ANTENNA RESTART (For technical personnel only. Do not use.)
  - 2 GNSS RESTART
  - 3 CLEAR MAGNETIC DEVICE (For technical personnel only. Do not use.)
  - 4 DR TIME (1min, 2min, 3min, 4min, 5min)
  - 5 MAGNETIC VARIATION*6 (AUTO, MANUAL)
- 3 SENSOR STATUS
  *6: Non-IMO only, fixed for IMO

7 SYSTEM
- 1 NETWORK (For technical personnel only. Do not use.)
  - 1 ETHERNET
  - 2 EQUIPMENT ID (001 to 999, default: 1)
  - 3 MP PORT (ENABLE, DISABLE)
  - 4 SFI
- 2 SIMULATION
  - 1 MOVEMENT SETTING
  - 2 ATTITUDE SETTING
  - 3 SIMULATED OUTPUT (FULL SIMULATION, FIX, DIFFERENTIAL FIX, ESTIMATION (DR), MANUAL INPUT, NO FIX) (For technical personnel only. Do not use.)
  - 4 SIMULATION START (START, STOP)
- 3 SYSTEM SOUND
  - 1 KEY BEEP (ON, OFF)
  - 2 NOTIFICATION SOUND (OFF, ON, CONTINUOUS) (For technical personnel only. Do not use.)
- 4 SYSTEM LOG
  - 1 RECORDING (ON, OFF)
  - 2 LOG LEVEL (For technical personnel only. Do not use.)
- 5 LOG RECORDING
  - 1 LOG TYPE (OFF, GNSS ONLY, SENSOR ONLY, OFFLINE DATA)
  - 2 DESTINATION (USB, MP)
- 6 RESET SETTINGS
  - 1 CLEAR DISPLAY SETTINGS
  - 2 CLEAR GNSS
  - 3 FACTORY DEFAULT (For service personnel only. Do not use.)
- 7 PASSWORD
  - 1 LOGOUT *7: Shown only if a USB device is connected.
  - 2 CHANGE
- 8 USB FLASH DRIVE (UNMOUNT) *7

8 SERVICE — EDIT (LOCK, UNLOCK) (Password protected. For technical personnel only.)
## APPENDIX 2 ALERT LIST

The table below shows the alert no., alert name, text, priority, meaning and remedy for each alert. The alerts table is grouped by device mode. Alerts are not shared between device modes.

**Note 1:** "Inst." in the following tables denotes "Instance number" for the alert.

**Note 2:** "GNSS CORE(4) FAULT" appears only if SC-1303 is connected to the system.

<table>
<thead>
<tr>
<th>No.</th>
<th>Inst.</th>
<th>Alert name</th>
<th>Text</th>
<th>Priority/Category</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>GPS mode alerts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>210</td>
<td>1</td>
<td>HDOP EXCEEDED</td>
<td>HDOP EXCEEDED</td>
<td>Caution/B</td>
<td>The value of HDOP (Horizontal Dilution of Precision) is 4 or above. HDOP threshold being permanently set to 4.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>212</td>
<td>1</td>
<td>LOSS OF POSITION</td>
<td>GNSS CORE(1) FAULT</td>
<td>Warning/B</td>
<td>GNSS module may be faulty.</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td></td>
<td>TOO FEW TRACKING SATELLITES</td>
<td></td>
<td>Not enough satellites available to fix position.</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
<td>ANTENNA UNIT CONNECTION LOST</td>
<td></td>
<td>Data connection to the antenna has been interrupted or the physical connection is disconnected.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>THD mode alerts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>440301</td>
<td>1</td>
<td>DEAD RECKONING</td>
<td>DEAD-RECKONING</td>
<td>Caution/B</td>
<td>The heading is calculated using ROT, not GPS position.</td>
</tr>
<tr>
<td>440302</td>
<td>2</td>
<td>OUTPUT STOPPED (HDG)</td>
<td>GNSS CORE(2) FAULT</td>
<td>Warning/B</td>
<td>GNSS module may be faulty.</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
<td>GNSS CORE(3) FAULT</td>
<td></td>
<td>GNSS module may be faulty.</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td></td>
<td>GNSS CORE(4) FAULT</td>
<td></td>
<td>GNSS module may be faulty.</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td></td>
<td>TOO FEW TRACKING SATELLITES</td>
<td></td>
<td>Not enough satellites available to fix position.</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
<td>ANTENNA UNIT CONNECTION LOST</td>
<td></td>
<td>Data connection to the antenna has been interrupted or the physical connection is disconnected.</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td></td>
<td>RATE GYRO BROKEN DOWN</td>
<td></td>
<td>Rate gyro may be faulty.</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td></td>
<td>ACCELEROMETER BROKEN DOWN</td>
<td></td>
<td>Accelerometer may be faulty.</td>
</tr>
</tbody>
</table>

Remedy: If the same state continues for five minutes, contact your dealer.
<table>
<thead>
<tr>
<th>No.</th>
<th>Inst.</th>
<th>Alert name</th>
<th>Text</th>
<th>Priority/Category</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>ROTI mode alerts</strong></td>
</tr>
<tr>
<td>440303</td>
<td>2</td>
<td>OUTPUT STOPPED</td>
<td>GNSS CORE(2) FAULT</td>
<td>Warning/B</td>
<td>GNSS module may be faulty.</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>(ROT)</td>
<td>GNSS CORE(3) FAULT</td>
<td></td>
<td>GNSS module may be faulty.</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td></td>
<td>GNSS CORE(4) FAULT</td>
<td></td>
<td>GNSS module may be faulty.</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td></td>
<td>TOO FEW TRACKING SATELLITES</td>
<td></td>
<td>Not enough satellites available to fix position.</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
<td>ANTENNA UNIT CONNECTION LOST</td>
<td></td>
<td>Data connection to the antenna has been interrupted or the physical connection is disconnected.</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td></td>
<td>RATE GYRO BROKEN DOWN</td>
<td></td>
<td>Rate gyro may be faulty.</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td></td>
<td>ACCELEROMETER BROKEN DOWN</td>
<td></td>
<td>Accelerometer may be faulty</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Note:</strong> Shown only for system configuration with SC-1303 included.</td>
</tr>
</tbody>
</table>

Remedy: If the same state continues for five minutes, contact your dealer.

<table>
<thead>
<tr>
<th>No.</th>
<th>Inst.</th>
<th>Alert name</th>
<th>Text</th>
<th>Priority/Category</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>440311</td>
<td>2</td>
<td>OUTPUT STOPPED</td>
<td>GNSS CORE(2) FAULT</td>
<td>Warning/B</td>
<td>GNSS module may be faulty.</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>(SPD)</td>
<td>GNSS CORE(3) FAULT</td>
<td></td>
<td>GNSS module may be faulty.</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td></td>
<td>GNSS CORE(4) FAULT</td>
<td></td>
<td>GNSS module may be faulty.</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td></td>
<td>TOO FEW TRACKING SATELLITES</td>
<td></td>
<td>Not enough satellites available to fix position.</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
<td>ANTENNA UNIT CONNECTION LOST</td>
<td></td>
<td>Data connection to the antenna has been interrupted or the physical connection is disconnected.</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td></td>
<td>RATE GYRO BROKEN DOWN</td>
<td></td>
<td>Rate gyro may be faulty.</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td></td>
<td>ACCELEROMETER BROKEN DOWN</td>
<td></td>
<td>Accelerometer may be faulty</td>
</tr>
</tbody>
</table>

Remedy: If the same state continues for five minutes, contact your dealer.
# APPENDIX 3 ABBREVIATIONS AND UNITS

<table>
<thead>
<tr>
<th>Term</th>
<th>Meaning</th>
<th>Term</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Numerical:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2D</td>
<td>Two Dimensional Positioning</td>
<td>3D</td>
<td>Three Dimensional Positioning</td>
</tr>
<tr>
<td><strong>A:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACK</td>
<td>Acknowledge</td>
<td>APR</td>
<td>April</td>
</tr>
<tr>
<td>ADR</td>
<td>Address</td>
<td>ARPA</td>
<td>Automatic Radar Plotting Aid</td>
</tr>
<tr>
<td>AIS</td>
<td>Automatic Identification System</td>
<td>ATM</td>
<td>Atmospheric Pressure</td>
</tr>
<tr>
<td>ALARM</td>
<td>Alarm</td>
<td>AUG</td>
<td>August</td>
</tr>
<tr>
<td>ANT</td>
<td>Antenna</td>
<td>Auto</td>
<td>Automatic</td>
</tr>
<tr>
<td><strong>B:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAM(S)</td>
<td>Bridge Alert Management (System)</td>
<td>BRG</td>
<td>Bearing</td>
</tr>
<tr>
<td>BKGD</td>
<td>Background</td>
<td>BRILL</td>
<td>Brilliance</td>
</tr>
<tr>
<td>BL</td>
<td>BaseLine</td>
<td>bps</td>
<td>Bits Per Second</td>
</tr>
<tr>
<td><strong>C:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAN</td>
<td>Controlled Area Network</td>
<td>CNV</td>
<td>Converter</td>
</tr>
<tr>
<td>CALC</td>
<td>GPS baseline calculation</td>
<td>COM.</td>
<td>Common</td>
</tr>
<tr>
<td>CCRP</td>
<td>Consistent Common Reference Point</td>
<td>COG</td>
<td>Course Over Ground</td>
</tr>
<tr>
<td>CLR</td>
<td>Clear</td>
<td>CPU</td>
<td>Central Processing Unit</td>
</tr>
<tr>
<td><strong>D:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEC</td>
<td>December</td>
<td>DR</td>
<td>Dead Reckoning</td>
</tr>
<tr>
<td>deg</td>
<td>Degree(s)</td>
<td>DST</td>
<td>Destination</td>
</tr>
<tr>
<td>deg/min</td>
<td>Degree(s) per minute</td>
<td>D2D</td>
<td>Differential + 2D</td>
</tr>
<tr>
<td>DISP</td>
<td>Display</td>
<td>D3D</td>
<td>Differential + 3D</td>
</tr>
<tr>
<td>DGPS</td>
<td>Differential GPS</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>E:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EGW</td>
<td>East</td>
<td>ENT</td>
<td>Enter</td>
</tr>
<tr>
<td>ECDIS</td>
<td>Electronic Chart Display and Information System</td>
<td>EXT.</td>
<td>External</td>
</tr>
<tr>
<td>EGNOS</td>
<td>European Geostationary Navigational Overlay System</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>F:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FEB</td>
<td>February</td>
<td>FREQ</td>
<td>Frequency</td>
</tr>
<tr>
<td>FIX</td>
<td>Fix</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>G:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GND</td>
<td>Ground</td>
<td>GPS</td>
<td>Global Positioning System</td>
</tr>
<tr>
<td>GP-3D</td>
<td>GPS used for position fix.</td>
<td>GP-D3D</td>
<td>GPS differential used for position fix.</td>
</tr>
<tr>
<td><strong>H:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HDG</td>
<td>Heading</td>
<td>hPa</td>
<td>Hectopascal</td>
</tr>
<tr>
<td>HDOP</td>
<td>Horizontal Dilution of Position</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>I:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ID</td>
<td>Identification</td>
<td>INFO</td>
<td>Information</td>
</tr>
<tr>
<td>I/F</td>
<td>Interface</td>
<td>INIT</td>
<td>Initial</td>
</tr>
<tr>
<td>IEC</td>
<td>International Electrotechnical Commission</td>
<td>I/O</td>
<td>Input/Output</td>
</tr>
<tr>
<td>IMO</td>
<td>International Maritime Organization</td>
<td>IP</td>
<td>Internet Protocol</td>
</tr>
<tr>
<td>IMU</td>
<td>Inertial Measurement Unit</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>J:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JAN</td>
<td>January</td>
<td>JUN</td>
<td>June</td>
</tr>
<tr>
<td>JUL</td>
<td>July</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>L:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>Local (time)</td>
<td>LL</td>
<td>Latitude/Longitude</td>
</tr>
<tr>
<td>LAN</td>
<td>Local Area Network</td>
<td>LOC</td>
<td>Location</td>
</tr>
<tr>
<td>LEN</td>
<td>Load Equivalency Number</td>
<td>LOG</td>
<td>Log</td>
</tr>
<tr>
<td>LCD</td>
<td>Liquid Crystal Display</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX 3 ABBREVIATIONS AND UNITS

<table>
<thead>
<tr>
<th>M:</th>
<th>MP</th>
<th>Management Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAR</td>
<td>March</td>
<td></td>
</tr>
<tr>
<td>MAY</td>
<td>May</td>
<td>MSAS</td>
</tr>
<tr>
<td>MENU</td>
<td>Menu</td>
<td></td>
</tr>
<tr>
<td>N:</td>
<td>NMEA</td>
<td>National Marine Electronics Association</td>
</tr>
<tr>
<td>N/A</td>
<td>Not Available</td>
<td>NOV</td>
</tr>
<tr>
<td>NG</td>
<td>Not Good</td>
<td>NO.</td>
</tr>
<tr>
<td>OCT</td>
<td>October</td>
<td>ON</td>
</tr>
<tr>
<td>OFFSET</td>
<td>Offset</td>
<td>OS</td>
</tr>
<tr>
<td>P:</td>
<td>PGN</td>
<td>Parameter Group Number</td>
</tr>
<tr>
<td>PC</td>
<td>Printed Circuit</td>
<td>PORT</td>
</tr>
<tr>
<td>PCB</td>
<td>Printed Circuit Board</td>
<td></td>
</tr>
<tr>
<td>PDOP</td>
<td>Positional Dilution Of Precision</td>
<td>PRN</td>
</tr>
<tr>
<td>POSN</td>
<td>Position</td>
<td></td>
</tr>
<tr>
<td>Q:</td>
<td>QZSS</td>
<td></td>
</tr>
<tr>
<td>R:</td>
<td>RAM</td>
<td>Read Only Memory</td>
</tr>
<tr>
<td>RAIM</td>
<td>Receiver Autonomous Integrity Monitoring</td>
<td>ROT</td>
</tr>
<tr>
<td>RECT</td>
<td>Rectified</td>
<td>ROTI</td>
</tr>
<tr>
<td>RMS</td>
<td>Root Mean Square</td>
<td>RTCM</td>
</tr>
<tr>
<td>RNG</td>
<td>Range</td>
<td>RX</td>
</tr>
<tr>
<td>S:</td>
<td>South</td>
<td>SOG</td>
</tr>
<tr>
<td>SAT</td>
<td>Satellite Base Argument System</td>
<td>SRC</td>
</tr>
<tr>
<td>SC</td>
<td>Satellite Compass</td>
<td>SS</td>
</tr>
<tr>
<td>SEP</td>
<td>September</td>
<td>STBD</td>
</tr>
<tr>
<td>SET</td>
<td>Set (i.e. set and drift, or setting a value)</td>
<td>STW</td>
</tr>
<tr>
<td>SFI</td>
<td>System Function ID</td>
<td>SV</td>
</tr>
<tr>
<td>SIM</td>
<td>Simulation</td>
<td>SYS</td>
</tr>
<tr>
<td>SN</td>
<td>Signal to Noise</td>
<td>S2D</td>
</tr>
<tr>
<td>SNR</td>
<td>Signal to Noise Ratio</td>
<td>S3D</td>
</tr>
<tr>
<td>T:</td>
<td>TRUE</td>
<td>THD</td>
</tr>
<tr>
<td>TEST</td>
<td>Test</td>
<td>TIME</td>
</tr>
<tr>
<td>TEMP</td>
<td>Temperature</td>
<td>TX</td>
</tr>
<tr>
<td>U:</td>
<td>U/UTC</td>
<td>USB</td>
</tr>
<tr>
<td>U/UTC</td>
<td>Universal Time, Coordinated</td>
<td></td>
</tr>
<tr>
<td>W:</td>
<td>West</td>
<td>WGS</td>
</tr>
<tr>
<td>WAAS</td>
<td>Wide Area Augmentation System</td>
<td>WGS84</td>
</tr>
</tbody>
</table>

Units of measurement

<table>
<thead>
<tr>
<th>Unit</th>
<th>Meaning</th>
<th>Unit</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>°</td>
<td>Degree(s)</td>
<td>m/s</td>
<td>Meter(s) per second</td>
</tr>
<tr>
<td>°/min</td>
<td>Degree(s) per minute</td>
<td>ms</td>
<td>Milisecond(s)</td>
</tr>
<tr>
<td>dB</td>
<td>Decibel(s)</td>
<td>NM</td>
<td>Nautical Mile(s)</td>
</tr>
<tr>
<td>kHz</td>
<td>Kilohertz</td>
<td>Ω</td>
<td>Ohm(s)</td>
</tr>
<tr>
<td>KM</td>
<td>Kilometer(s)</td>
<td>s</td>
<td>Second(s)</td>
</tr>
<tr>
<td>m</td>
<td>Meter(s)</td>
<td>SM</td>
<td>Statue Mile(s)</td>
</tr>
<tr>
<td>min or ′</td>
<td>Minute(s)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# APPENDIX 4 ICONS AND SYMBOLS

## Standard icons and their meanings

<table>
<thead>
<tr>
<th>Icon</th>
<th>Meaning</th>
<th>Icon</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Icon 1" /> <img src="image2" alt="Icon 2" /></td>
<td>Excessive vibrations detected at the antenna installation location. Check the antenna installation location and change if necessary.</td>
<td><img src="image3" alt="Icon 3" /></td>
<td>Blue indication rotates in a clockwise direction, indicating that the equipment is functioning correctly. If this indication is not moving, the system may be frozen. Restart the system. If the problem recurs, contact your dealer.</td>
</tr>
<tr>
<td><img src="image4" alt="Icon 4" /> <img src="image5" alt="Icon 5" /></td>
<td>Indicates that five or more satellites are under use for calculating velocity and own ship’s movement.</td>
<td><img src="image6" alt="Icon 6" /></td>
<td>Simulation icon. The system is currently operating in simulation mode.</td>
</tr>
</tbody>
</table>

*Note: Icon background color changes according to the SC-702 background color.*

## Alert icons and their meanings

<table>
<thead>
<tr>
<th>Icons</th>
<th>Meaning</th>
<th>Icons</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image7" alt="Icon 7" /> <img src="image8" alt="Icon 8" /></td>
<td>Active, unacknowledged warning</td>
<td><img src="image9" alt="Icon 9" /> <img src="image10" alt="Icon 10" /></td>
<td>Active, responsibility transferred warning</td>
</tr>
<tr>
<td><img src="image11" alt="Icon 11" /> <img src="image12" alt="Icon 12" /></td>
<td>Silenced warning</td>
<td><img src="image13" alt="Icon 13" /> <img src="image14" alt="Icon 14" /></td>
<td>Active, acknowledged warning</td>
</tr>
<tr>
<td><img src="image15" alt="Icon 15" /> <img src="image16" alt="Icon 16" /></td>
<td>Rectified, unacknowledged warning</td>
<td><img src="image17" alt="Icon 17" /></td>
<td>Caution</td>
</tr>
</tbody>
</table>
CODES
AP-9
A satellite based augmentation system, or SBAS (Satellite Based Augmentation System), is an augmentation system that uses additional messages from satellite broadcasts to support regional and wide area augmentation. SBAS provides GPS signal corrections to SBAS users, for even better position accuracy, through the GPS error corrections that are widely broadcast from the geostationary satellite.

SBAS is used in America, Europe, Japan and India.

- America: WAAS (Wide Area Augmentation System)
- Europe: EGNOS (Euro Geostationary Navigation Overlay Service)
- Japan: MSAS (Multi-Functional Satellite Augmentation System)
- India: GAGAN (GPS And GEO Augmented Navigation)

These four systems have interoperability. The illustration below shows the coverage area for each provider. This manual uses "SBAS" for these four providers generically.

![Map of SBAS Providers]

<table>
<thead>
<tr>
<th>Provider</th>
<th>Satellite type</th>
<th>Longitude</th>
<th>Satellite No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAAS</td>
<td>Intelsat Galaxy XV</td>
<td>133°W</td>
<td>135</td>
</tr>
<tr>
<td></td>
<td>TeleSat Anik F1R</td>
<td>107.3°W</td>
<td>138</td>
</tr>
<tr>
<td></td>
<td>Inmarsat-4-F3</td>
<td>98°W</td>
<td>133</td>
</tr>
<tr>
<td>EGNOS</td>
<td>Inmarsat-3-F2/AOR-E</td>
<td>15.5°W</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>Inmarsat-4-F2</td>
<td>25°E</td>
<td>126</td>
</tr>
<tr>
<td></td>
<td>SES-5</td>
<td>5°E</td>
<td>136</td>
</tr>
<tr>
<td>MSAS</td>
<td>MTSAT-1R</td>
<td>140°E</td>
<td>129</td>
</tr>
<tr>
<td></td>
<td>MTSAT-2</td>
<td>145°E</td>
<td>137</td>
</tr>
<tr>
<td>GAGAN</td>
<td>GSAT-8</td>
<td>55°E</td>
<td>127</td>
</tr>
<tr>
<td></td>
<td>GSAT-10</td>
<td>83°E</td>
<td>128</td>
</tr>
</tbody>
</table>

As of March 6th, 2014
Serial data sentences

**Input:** ACK, ACN (ACM), HBT, HDT\(^*1\), MSK, MSS, THS, VBW\(^*2\), VDR\(^*2\)

**Output:** ALC, ALF, ALR, ARC, DTM, GBS, GGA, GLL, GNS, GRS, GSA, GST, GSV, HBT, HDG\(^*2\), HDM\(^*2\), HDT\(^*1\), HRM\(^*2\), MSK, POS, RMC, ROT, THS, VBW\(^*2\), VDR\(^*2\), VHW\(^*2\), VLV\(^*2\), VTG, XDR\(^*2\), ZDA

Ethernet sentences

**Input:** ACK, ACN (ACM), HBT

**Output:** ALC, ALF, ALR, ARC, DTM, GBS, GGA, GLL, GNS, GRS, GSA, GST, GSV, HBT, HDG, HDM, HDT\(^*1\), HRM\(^*2\), POS, RMC, ROT, THS, VBW\(^*2\), VDR\(^*2\), VHW\(^*2\), VLV\(^*2\), VTG, XDR\(^*2\), ZDA

\(^*1\): Not used for SOLAS vessels.

\(^*2\): For Non-IMO types only.

**FURUNO proprietary (PFEC) sentences**

**Input:** GPatt, GPhve, Ilals, pireq

**Output:** GPatt, GPhve, GPimu, Ilalr, pidat

**Transmission Interval**

<table>
<thead>
<tr>
<th>Sentence</th>
<th>Available intervals</th>
</tr>
</thead>
<tbody>
<tr>
<td>DTM*/GBS/GGA/QLL/GNS/GRS/GSA/GST/GSV/RMC/VBW/VDR/VHW/VLW/VTG/XDR/ZDA</td>
<td>0s, 1s, 2s</td>
</tr>
<tr>
<td>HDT/ROT/THS/GPatt/GPhve/GPimu/HDG/HDM/HRM</td>
<td>20ms, 25ms, 100ms, 200ms, 1s, 2s</td>
</tr>
<tr>
<td>ALC/ALF/ALR/ARC/MSK</td>
<td>Fixed (Not changeable).</td>
</tr>
</tbody>
</table>

\(^*\): Fixed for IMO type vessels.

**Load requirements as listener**

Isolation: Photo coupler
Input impedance: 470 ohms
Max. voltage: ±15 V
Threshold: 3 mA (in case of connection with FURUNO device talker)

**Data transmission**

Data is transmitted in serial asynchronous form in accordance with the standard referenced in IEC 61162-1 and IEC 61162-2. The first bit is a start bit and is followed by data bits.

The following parameters are used:

Baud rate: 4800 for IEC 61162-1, 38400 for IEC 61162-2
Data bits: 8, parity = none
Stop bits: 1
Schematic diagrams

Data ports 2 through 5

*: Numerals in bold change as follows, with their respective terminal blocks.
TB4: 4; TB5: 3; TB6: 2

Data port 1

Sentence description (Input)

- **ACK**: Acknowledge Alarm
  
  $**$ACK,xxx,*hh<CR><LF>
  
  1. Local alarm number (identifier) (000 to 999)

- **ACN** (ACM): Alert Command
  
  $**$ACN,hhmmss.ss,aaa,x.x,x.x,c,a*hh<CR><LF>
  
  1. Time (UTC, unused)
  2. Manufacturer mnemonic code (3 digits)
  3. Alert Identifier (000 - 999999)
  4. Alert Instance (1 - 999999, unused)
  5. Alert command (A,Q,O,S)
     
     A=acknowledge
     Q=request/repeat information
     O=responsibility transfer
     S=silence
  6. Sentence status flag (C) (fixed)
• HBT: Heartbeat Supervision Sentence

$**HBT,x.x,A,x*hh<CR><LF>
   1 2 3
1. Configured repeat interval (1 to 999(s))
2. Equipment status (A=Normal  V=System fail)
3. Sequential sentence identifier (0 to 9)

• HDT: Heading, true

$**HDT,xxx.x,T*hh<CR><LF>
   1 2
1. Heading, degrees (0.0 to 360.0)
2. True (T)

• MSK: Receiver Interface Command

$**MSK,x.x,a,x.x,a,x.x,x.a *hh<CR><LF>
   1 2 3 4 5 6 7
1. Beacon frequency, kHz (283.45 to 325.04)
2. Auto/Manual frequency (See note 2) (A=Auto, M=Manual)
3. Beacon bit rate, bits/s (25, 50, 100, 150, 200)
4. Auto/Manual beacon bit rate (See note 2) (A=Auto, M=Manual)
5. Interval for sending $**MSS (status) in seconds (See note 1) (1 to 99, null))
6. Channel number (See note 3) (Fixed at 1)
7. Sentence status flag (See note 4) (R, C) (R=Sentence status is a report of current settings (use for a reply to a query, C=Sentence is a configuration command to change settings. A sentence without “C” is not a command.)

Notes:
1) When status data is not to be transmitted this field is "null".
2) If Auto is specified the previous field value is ignored.
3) Set equal to “1” or null for single channel receiver.
4) This field is used to indicate a sentence that is a status report of current settings or a configuration command changing settings. This field should not be null.

• MSS: MSK Receiver Signal Status

$**MSS,x.x,a,x.x,a,x.x,x.a *hh<CR><LF>
   1 2 3 4 5
1. Signal strength (SS), dB/(1μV/m) (0.0 to 999.94)
2. Signal-to-noise ratio (SN), dB (0.0 to 999.94)
3. Beacon frequency, kHz (283.5 to 325.04)
4. Beacon bit rate, bits/s (25, 50, 100, 200)
5. Channel number (1,null)(Set to “1” or “null” for single channel receivers.)

• THS: True Heading And Status

$**THS,x.x,a*hh<CR><LF>
   1 2
1. Heading, degrees True (0.0 to 360.0)
2. Mode indicator (A=Autonomous, S=Simulator)
• **VBW: Dual Ground/water Speed**

\[
\text{\$**VBW,x,x,x,a,x,x,a,x,x,a,x,x,a,a,\text{hh} <CR><LF>}
\]

1. Longitudinal water speed, knots (-999.994 to 999.994, null)
2. Transverse water speed, knots (-999.994 to 999.994, null)
3. Status: water speed (A=Data valid)
4. Longitudinal ground speed, knots (unused)
5. Transverse ground speed, knots (unused)
6. Status: ground speed, (A=Data valid, V=Data invalid)
7. Stern transverse water speed, knots (-999.994 to 999.994, null)
8. Status: stern water speed (A=Data valid)
9. Stern transverse ground speed, knots (unused)
10. Status: stern ground speed, (A=Data valid, V=Data invalid)

• **VDR: Set and Drift**

\[
\text{\$**VDR,x,x,M,x,x,N*hh <CR><LF>}
\]

1. Direction, degrees True (0.0 to 360.0,null)
2. T=True (fixed)
3. Direction, degrees Magnetic (0.0 to 360.0,null)
4. M=Magnetic (fixed)
5. Current speed (0 to 99.99)
6. N=Knots (fixed)

• **Proprietary sentences: GPatt, GPhve, llals, pireq.**

**Sentence description (Output)**

• **ALC: Cyclic Alert List**

\[
\text{\$**ALC,xx,xx,xx,xx,aaa,x,x,x,x,x,x,x,x,x,x,x,x,x,c-hh <CR><LF>}
\]

1. Total number of sentences this message (01 to 99)
2. Sentence number (01 to 99)
3. Sequential message identifier (00 to 99)
4. Number of alert entries (0 to 2)
5. Manufacturer mnemonic code (FEC, null)
6. Alert identifier (000 to 999999)
7. Alert instance (1 to 999999)
8. Revision counter (1 to 99)
9. Additional alert entries (same as 5 to 8)

• **ALF: Alert Sentence**

\[
\text{\$**ALF,x,x,xx,hhmms.ssa,a,a,a,aaa,x,x,x,x,x,x,x,c-c-hh <CR><LF>}
\]

1. Total number of ALF sentences this message (1, 2)
2. Sentence number (1, 2)
3. Sequential message identifier (0 to 9)
4. Time of last change (hh=00 to 23, mm=00 to 59, ss.ss=00.00 to 59.99), null
5. Alert category (B=Alert category B,), null when #2 is 2.
6. Alert priority (W=Warning, C=Caution), null when #2 is 2.
7. Alert state (V=Not ACKed, S=Silence, A=ACked, O/U=Resolved, Not ACKed, N=Normal state), null when #2 is 2.
8. Manufacturer mnemonic code (FEC, null)
9. Alert identifier (000 to 999999)
10. Alert instance (1 to 999999)
11. Revision counter (1 to 99)
12. Escalation counter (0 to 9)
13. Alert text (when #2 =1: max. 16 characters; when #2=2: max. characters according to regulation)
• ALR: Set Alarm State

\$**ALR,Hhmmss.ss,xxx,A,A,c—c*hh<CR><LF>
  1  2  3  4  5
1. Time of alarm condition change, UTC (000000.00 to 235959.99), null
2. Unique alarm number (identifier) at alarm source (000 to 999), null
3. Alarm condition (A=threshold exceeded, V=threshold not exceeded)
4. Alarm acknowledge state (A=acknowledged, V=not acknowledged)
5. Alarm description text (alphanumeric), null

• ARC: Alert Command Refused

\$**ARC,hhmmss.ss,aaa,x.x,x.x,c*hh<CR><LF>
  1  2  3  4  5
1. Release time of the Alert Command Refused (UTC)
2. Used for proprietary alerts, defined by the manufacturer (FEC, null)
3. The alert identifier (000 to 999999)
4. The alert instance (1 to 999999)
5. Refused Alert Command (A, Q, O, S)
   A=acknowledge
   Q=request/repeat information
   O=responsibility transfer
   S=silence

• DTM: Datum Reference

\$**DTM,ccc,a,x.x,a,x.x,a,x.x,a,x.x,ccc*hh<CR><LF>
  1  2  3  4  5  6  7  8
1. Local datum (W84:WGS84; W72:WGS72; P90:PZ90; User defined:999, IHO datum code)
2. Local datum subdivision code (null or one character)
3. Lat offset, minutes (0 to 59.9999)
4. N/S
5. Lon offset, min (0 to 59.9999)
6. E/W
7. Altitude offset, meters (null)
8. Reference datum (W84:WGS84; W72:WGS72; P90:PZ90)

• GBS: GNSS Satellite Fault Detection

\$**GBS, hhmmss.ss, x.x, x.x, xx, x.x, x.x, x.x, x.x, h, h *hh<CR><LF>
  1  2  3  4  5  6  7  8  9 10
1. UTC time of GGA or GNS fix associated with this sentence (000000.00 to 235959)
2. Expected error in latitude (0.00 to 999.99), null
3. Expected error in longitude (0.00 to 999.99), null
4. Expected error in altitude (0.00 to 999.99), null
5. ID number of most likely failed satellite (1 to 255), null
6. Probability of missed detection for most likely failed satellite (0.00 to 100.00), null
7. Estimate of bias in meters on most likely failed satellite (-999.99 to 999.99), null
8. Standard deviation of bias estimate (0.00 to 999.99), null
9. GNSS system ID (1 to F)
10. GNSS signal ID (0 to F)
• **GGA - Global Positioning System Fix Data**

\$**GGA,hhmmss.ss,llll.lll,a,yyyyy.yyy,a,x,xx,x,x,x,M,x,x,M,x,x,xxxx*hh<CR><LF>

1. UTC of position (000000.00 to 235959.99)
2. Latitude (0000.0000 to 9000.0000)
3. N/S
4. Longitude (0000.0000 to 18000.0000)
5. E/W
6. GPS quality indicator (0 to 8)
7. Number of satellites in use (00 to 99)
8. Horizontal dilution of precision (0.0 to 99.9)
9. Antenna altitude above/below mean sea level (-9999 to 9999)
10. Unit, (Fixed at m)
11. Geoidal separation (-9999 to 9999)
12. Unit, (Fixed at m)
13. Age of differential GPS data (0 to 299), null
14. Differential reference station ID (0000 to 1023), null

• **GLL: Geographic Position - Latitude/Longitude**

\$**GLL,llll.lll,a,yyyyy.yyy,a,hhmmss.ss,a,x*hh<CR><LF>

1. Latitude (0000.0000 to 9000.0000)
2. N/S
3. Longitude (0000.0000 to 18000.0000)
4. E/W
5. UTC of position (000000.00 to 235959.99)
6. Status (A=data valid  V=data invalid)
7. Mode indicator (A=Autonomous, D=Differential, E=Estimated (dead reckoning), M=Manual input, S=Simulator, N=Data not valid)

• **GNS: GNSS Fix Data**

\$**GNS,hhmmss.ss,llll.lll,a,III,III,a,c--c,xx,x,x,x,x,x,x,x,x,a*hh<CR><LF>

1. UTC of position (000000.00 to 235959.99)
2. Latitude (0000.0000 to 9000.0000)
3. N/S
4. Longitude (0000.0000 to 18000.0000)
5. E/W
6. Mode indicator
   N=No fix  A=Autonomous  D=Differential  P=Precise  R=Real Time Kinematic  
   F=Float RTK  E=Estimated Mode  M=Manual Input Mode  S=Simulator Mode
7. Total number of satellites in use (00 to 99)
8. HDOP (0.0 to 50.0)
9. Antenna altitude, meters (-9999 to 9999)
10. Geoidal separation (-9999 to 9999)
11. Age of differential data (0 to 99)
12. Differential reference station ID (0000 to 1023)
13. Navigational status indicator
   S=Safe  C=Caution  U=Unsafe  V=Navigational status not valid
• GRS: GNSS Range Residual

$**GRS,hhmmss.ss,x,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,h,h<CR><LF>

1. UTC time of GGA/GNS fix
2. Mode: 0=Residuals were used to calculate the position given in the matching GGA or GNS sentence; 1=Residuals were recomputed after the GGA or GNS position was computed
3. Range residuals in meters for satellites used in the navigation solution (-99 to 99, null) See notes 1&2.
4 to 14. Same as #3.
15. GNSS System ID (1 to F; 1=GP, 2=GL, 3=GA, 4 to F=RESERVED)
16. Signal ID (0 to F)

Notes:
1) If the range residual exceeds +99.9 meters, then the decimal part is dropped, resulting in an integer (-13.7 becomes -13). The maximum value for this field is +99.
2) The sense or sign of the range residual is determined by the order of parameters used in the calculation.
The expected order is as follows: range residual = calculated range - measured range.
3) When multiple GRS sentences are being sent then their order of transmission must match the order of corresponding GSA sentences.
   Listeners shall keep track of pairs of GSA and GRS sentences and discard data if pairs are incomplete.
4) Signal ID identifies the actual ranging signal according to the Table below.
5) System ID according to Table below.

GRS Table

<table>
<thead>
<tr>
<th>System</th>
<th>System ID</th>
<th>Satellite ID</th>
<th>Signal ID</th>
<th>Signal Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPS</td>
<td>1 (GP)</td>
<td>1 to 99</td>
<td>0</td>
<td>All Signals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 to 32 is reserved for GPS</td>
<td>1</td>
<td>L1 C/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>33 to 64 is reserved for SBAS</td>
<td>2</td>
<td>L1 P(Y)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>65 to 99 is undefined</td>
<td>3</td>
<td>L1 M</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>L2 P(Y)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td>L2C-M</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6</td>
<td>L2C-L</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7</td>
<td>L5-I</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8</td>
<td>L5-Q</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>9 to F</td>
<td>Reserved</td>
</tr>
<tr>
<td>GLONASS</td>
<td>2 (GL)</td>
<td>1 to 99</td>
<td>0</td>
<td>All Signals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 to 32 is undefined</td>
<td>1</td>
<td>G1 C/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>33 to 64 is reserved for SBAS</td>
<td>2</td>
<td>G1 P</td>
</tr>
<tr>
<td></td>
<td></td>
<td>65 to 99 is reserved for GLONASS</td>
<td>3</td>
<td>G2 C/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>GLONASS (M) G2 P</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5 to F</td>
<td>Reserved</td>
</tr>
<tr>
<td>GALILEO</td>
<td>3 (GA)</td>
<td>1 to 99</td>
<td>0</td>
<td>All Signals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 to 36 is reserved for Galileo SVs</td>
<td>1</td>
<td>E5a</td>
</tr>
<tr>
<td></td>
<td></td>
<td>37 to 64 is reserved for Galileo SBAS</td>
<td>2</td>
<td>E5b</td>
</tr>
<tr>
<td></td>
<td></td>
<td>65 to 99 is undefined</td>
<td>3</td>
<td>E5 a+b</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>E6-A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td>E6-BC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6</td>
<td>L1-A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7</td>
<td>L1-BC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8 to F</td>
<td>Reserved</td>
</tr>
<tr>
<td>Reserved</td>
<td>4 to F</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
• **GSA**: GNSS DOP and Active Satellites

```plaintext
$--GSA,a.x.xx.xx.xx.xx.xx.xx.xx.xx.xx.xx.xx.xx.xx.x.x.x.x.x.x.h *hh<CR><LF>
1 2 3 4 5 6 7

1. Mode (M=manual, forced to operate in 2=2D 3=3D mode
   A=automatic, allowed to automatically switch 2D/3D)
2. Mode (1=fix not available 2=2D 3=3D)
3. ID number of satellites used in solution (01 to 96, null)
4. PDOP (0.0 to 50.0),null
5. HDOP (0.0 to 50.0),null
6. VDOP (0.0 to 50.0),null
7. GNSS System ID (See GRS table:System ID)
```

• **GST**: GNSS Pseudorange Error Statistics

```plaintext
$**GST,hhmmss.ss,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,h *hh<CR><LF>
1 2 3 4 5 6 7 8

1. UTC time fo the GGA or GNS fix. (000000.00 to 235959.99)
2. RMS value of the standard deviation of the range inputs to the navigation process. Range inputs
   include pseudoranges & DGNSS corrections. (1 to 999, null)
3. Standard deviation of semi-major axis of error ellipse (meters) (0 to 655.34, null)
4. Standard deviation of semi-minor axis of error ellipse (meters) (0 to 655.34, null)
5. Orientation of semi-major axis of error ellipse (degrees from true north) (0 to 180, null)
6. Standard deviation of latitude error (meters) (0 to 999.9, null)
7. Standard deviation of longitude error (meters) (0 to 999.9, null)
8. Standard deviation of altitude error (meters) (0 to 999.9, null)
```

• **GSV**: GNSS Satellites in View

```plaintext
1 2 3 4 5 6 7 8 9 10

1. Total number of messages (1 to 4)
2. Message number (1 to 4)
3. Total number of satellites in view (00 to 14)
4. Satellite ID number (01 to 96),null
5. Elevation, degrees (00 to 90),null
6. Azimuth, degrees true (000 to 359),null
7. SNR(C/No) (00 to 99(dB-Hz), null when not tracking)
8. Second and third SVs
9. Fourth SV
10. Signal ID (See GRS table:Signal ID)
```

• **HBT** - Heartbeat Supervision Sentence

```plaintext
$**HBT,x.x.x.x.a*x.hhh<CR><LF>
1 2 3

1. Configured repeat interval (50.0(s))(+1)
2. Equipment status (A=Normal)
3. Sequential sentence identifier (0 to 9)
```

• **HDG**: Heading, Deviation and Variation

```plaintext
$**HDG,x.x.x.a.x.x.a.x.x.a.x.a.x.a.x.a.x.a.x.a.x.h *hh<CR><LF>
1 2 3 4 5

1. Magnetic sensor heading, degrees (0.0 to 359.9)
2. Magnetic deviation, degrees (0.0 to 180.0)
3. E/W
4. Magnetic variation, degrees (0.0 to 180.00)
5. E/W
```
### APPENDIX 7 DIGITAL INTERFACE (IEC 61162-1 EDITION 4(2010-11))

- **HDM: Heading, Magnetic**

  ```
  $**HDM,x.x,M*hh<CR><LF>
  1  2
  1. Heading, degrees (0.0 to 359.9)
  2. Magnetic (M)
  ```

- **HDT: Heading, True**

  ```
  $**HDT,xxx.x,T*hh<CR><LF>
  1  2
  1. Heading, degrees (0.0 to 359.9)
  2. True (T)
  ```

- **HRM: Heel Angle, Roll Period and Roll Amplitude Measurement Device**

  ```
  $**HRM,hhmsss.ss,x.x,x,x,x,x,A,x.x,x.x,hhmsss.ss,x.x,x.x *hh<CR><LF>
  1  2  3  4  5  6  7  8  9  10
  1. Actual heel angle, degrees (-89.999 to 89.999, null)
  2. Roll period, seconds (0 to 99.9, null)
  3. Roll amplitude, port side, degrees (0 to 89.999, null)
  4. Roll amplitude, starboard side, degrees (0 to 89.999, null)
  5. Status (A/V) A=Data valid, V=Data invalid
  6. Roll peak hold value, port side, degrees (null)
  7. Roll peak hold value, starboard side, degrees (null)
  8. Peak hold value reset time (fixed at null)
  9. Peak hold value reset day (fixed at null)
  10. Peak hold value reset month (fixed at null)
  ```

- **MSK: Receiver Interface Command**

  ```
  $**MSK,x.x,a,x.x,a,x.x,x.a *hh<CR><LF>
  1  2  3  4  5
  1. Beacon frequency, kHz (283.5 to 325.0, null)
  2. Auto/Manual frequency (See note 2) (A=Auto, M=Manual)
  3. Beacon bit rate, bits/s (25, 50, 100, 150, 200, null)
  4. Auto/Manual beacon bit rate (See note 2) (A=Auto, M=Manual)
  5. Interval for sending $**MSS (status) in seconds (See note 1) (Fixed at 5)
  6. Channel number (See note 3) (Fixed at 1)
  7. Sentence status flag (See note 4) (C - Sentence is a configuration command to change settings. A sentence without “C” is not a command.)
  ```

**Notes:**

1. When status data is not to be transmitted this field is "null".
2. If Auto is specified the previous field value is ignored.
3. Set equal to “1” or null for single channel receiver.
4. This field is used to indicate a sentence that is a status report of current settings or a configuration command changing settings. This field should not be null.
APPENDIX 7 DIGITAL INTERFACE (IEC 61162-1 EDITION 4(2010-11))

- **POS: Device Position and Ship Dimensions Report or Confirmation Command**

```
$**POS,cc,xx,a,x,x,x,x,x,x,a,x,x,x,a*hh <CR><LF>
```

1. Equipment ID (GP, GL, GA, GN, HE, HN, HC)
2. Equipment number (01 to 99)
3. Position validity flag (A=Valid  V=Invalid)
4. Position X-coordinate (-999.9 to 999.9)
5. Position Y-coordinate (0 to 999.9)
6. Position Z-coordinate (0 to 999.9)
7. Ship’s width and length (A=Valid)
8. Ship’s width (000.0 to 999.9)
9. Ship’s length (000.0 to 999.9)
10. Sentence status flag (R=Sentence is status report of current settings)

- **RMC: Recommended Minimum Specific GNSS Data**

```
$**RMC,hhmss.ss,A,III.II,a,yyyyyy.yy,a,x,x,x,x,ddmmmyy,x,x,a,a,a*hh<CR><LF>
```

1. UTC of position fix (000000.00 to 235959.99)
2. Status (A=data valid, V=navigation receiver warning)
3. Latitude (0000.0000 to 9000.0000)
4. N/S
5. Longitude (0000.0000 to 18000.0000)
6. E/W
7. Speed over ground, knots (0.000 to 9999.999)
8. Course over ground, degrees true (0.0 to 359.9)
9. Date (010100 to 311299)
10. Magnetic variation, degrees (0.0 to 180.0,null)
11. E/W (E/W,null)
12. Mode indicator (A= Autonomous mode, D= Differential mode, E=Estimated (DR), S= Simulator, M=Manual, N=Data not valid, P=Precise)
13. Navigational status indication (S=Safe  C=Caution  U=Unsafe  V=Navigational status not valid)

- **ROT: Rate of Turn**

```
$**ROT,x.x,A *hh<CR><LF>
```

1. Rate of turn, deg/min, "-"=bow turns to port (-9999.9 - 9999.9,null)
2. Status (A=data valid, V=data invalid)

- **THS: True Heading & Status**

```
$**THS,x.x,a*hh<CR><LF>
```

1. Heading, degrees True (0.0 to 359.9 null)
• **VBW: Dual Ground/Water Speed**

```
$**VBW,x.x,x,x,a,x.x,x,a,x.x,x,a,x.x,a,x.x,a**hh<CR><LF>
1  2  3  4  5  6  7  8  9  10
1. Longitudinal water speed, knots (-999.999 to 999.999),null
2. Transverse water speed, knots (-999.999 to 999.999),null
3. Status: water speed, A=Data valid V=Data invalid
4. Longitudinal ground speed, knots (-999.999 to 999.999),null
5. Transverse ground speed, knots (-999.999 to 999.999),null
6. Status: ground speed, A=Data valid V=Data invalid
7. Stern transverse water speed, knots (-999.999 to 999.999),null
8. Status: stern water speed, A=Data valid V=Data invalid
9. Stern transverse ground speed, knots (-999.999 to 999.999),null
10. Status: stern ground speed, A=Data valid V=Data invalid
```

• **VDR: Set and Drift**

```
$**VDR,x.x,T,x.x,M,x.x,N**<CR><LF>
1  2  3  4  5  6
1. Direction, degrees (0.0 to 359.9),null
2. T=True (fixed)
3. Direction, degrees (0.0 to 359.9),null
4. M=Magnetic (fixed)
5. Current speed (0 to 99.99),null
6. N=Knots (fixed)
```

• **VHW: Water Speed and Heading**

```
$**VHW,x.x,T,x.x,M,x.x,N,x.x,K,**hh<CR><LF>
1  2  3  4  5  6  7  8
1. Heading, degrees (0.000 to 359.999, null)
2. T=True (fixed)
3. Heading, degrees (0.000 to 359.999, null)
4. M=Magnetic (fixed)
5. Speed, knots (-999.999 to 999.999, null)
6. N=Knots (fixed)
7. Speed, km/hr (-999.999 to 999.999, null)
8. K=km/hr (fixed)
```

• **VLW: Dual Ground/Water Distance**

```
$**VLW,x.x,N,x.x,N,x.x,N,x.x,N**hh<CR><LF>
1  2  3  4  5  6  7  8
1. Total cumulative water distance (null)
2. N=Nautical miles
3. Water distance since reset (null)
4. N=Nautical miles
5. Total cumulative ground distance (null)
6. N=Nautical miles
7. Ground distance since reset (0.00 to 999999.99)
8. N=Nautical miles
• VTG: Course Over Ground and Ground Speed

$**VTG,x.x,T,x.x,M,x.x,N,x.x,K,a*hh <CR><LF>
   1 2 3 4 5 6 7 8 9
1. Course over ground, degrees (0.0 to 359.9),null
2. T= True (fixed)
3. Course over ground, degrees (0.0 to 359.9),null
4. M=Magnetic (fixed)
5. Speed over ground, knots (0.0 to 999.9),null
6. N=NKnts (fixed)
7. Speed over ground (0.0 to 999.9),null
8. K=km/h (fixed)
9. Mode indicator (A=Autonomous, D=Differential, E=Estimated (dead reckoning),
   M=Manual input, S=Simulator, N=Data not valid, P=Precise)

• XDR: Transducer Measurements

$**XDR, a, x.x, a, c--c, a, x.x, a, c--c *hh<CR><LF>
   1 2 3 4 5 6 7 8
1. Transducer type, transducer no. 1 (C=Celcius, fixed)
2. Measurement data, transducer no. 1 (-50.00 to 99.99)
3. Units of measure (C=Celcius, fixed)
4. Transducer no.1 ID (AIRT, fixed)
5. Transducer type, transducer no. 2 (P=Pressure, fixed)
6. Measurement data, transducer no. 2 (0.00 to 120000.00)
7. Units of measure (P=Pascal, fixed)
8. Transducer no.2 ID (AIRP, fixed)

• ZDA: Time and date

$**ZDA, hhmmss.ss, xx, xx, xxxx, xx, xx<CR><LF>
   1 2 3 4 5 6
1. UTC (000000.00 to 235959.99)
2. Day (01 to 31)
3. Month (01 to 12)
4. Year (UTC, 0000 to 9999)
5. Local zone, hours (-14 to +14)
6. Local zone, minutes (00 to +59)
Parts List

This equipment contains complex modules in which fault diagnosis and repair down to component level are not practical (IMO A.694(17)/8.3.1). Only some discrete components are used. FURUNO Electric Co., Ltd. believes identifying these components is of no value for shipboard maintenance; therefore, they are not listed in the manual. Major modules can be located on the parts location figures below.

### FURUNO

#### ELECTRICAL PARTS LIST

<table>
<thead>
<tr>
<th>Type, Name</th>
<th>Model</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRINTED CIRCUIT BOARD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20P8200E, MAIN</td>
<td>SC-70/SC-130</td>
<td>DISPLAY UNIT, JUNCTION BOX,</td>
</tr>
<tr>
<td>05P0894A, C-IF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20P8232, MAIN</td>
<td></td>
<td>JUNCTION BOX SC-701</td>
</tr>
<tr>
<td>20P8233, TB_PWR</td>
<td></td>
<td>JUNCTION BOX SC-701</td>
</tr>
<tr>
<td>20P8229A, LAN_CNV</td>
<td></td>
<td>JUNCTION BOX SC-701</td>
</tr>
</tbody>
</table>

*: Optional LAN to Coax conversion kit.

Note: SC-701 and SC-702 are not shown to scale in this figure.
### FURUNO

**ELECTRICAL PARTS LIST**

<table>
<thead>
<tr>
<th>TYPE, NAME</th>
<th>LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRINTED CIRCUIT BOARD</td>
<td></td>
</tr>
<tr>
<td>20P8228A, MAIN</td>
<td>ANTENNA UNIT SC-703</td>
</tr>
<tr>
<td>20P8222A, GNSS_LNA</td>
<td>ANTENNA UNIT SC-703</td>
</tr>
<tr>
<td>20P8229B, LAN_CNV</td>
<td>ANTENNA UNIT SC-703</td>
</tr>
<tr>
<td>20P8230, SUB_IMU</td>
<td>ANTENNA UNIT SC-703</td>
</tr>
</tbody>
</table>

**PCB locations for SC-703**

- **LAN to Coax conversion kit (Option)**
- **LAN_CNV board**
  - 20P8229
- **SUB_IMU board**
  - 20P8230
- **MAIN board**
  - 20P8228B
- **GNSS_LNA board**
  - 20P8222A
### PARTS LIST/LOCATION

**FURUNO**

**Electrical Parts List**

<table>
<thead>
<tr>
<th>Type, Name</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRINTED CIRCUIT BOARD</td>
<td></td>
</tr>
<tr>
<td>20P8228B, MAIN</td>
<td>ANTENNA UNIT SC-1303</td>
</tr>
<tr>
<td>20P8222A, GNSS_LNA</td>
<td>ANTENNA UNIT SC-1303</td>
</tr>
<tr>
<td>20P8229B, LAN_CNV</td>
<td>ANTENNA UNIT SC-1303</td>
</tr>
<tr>
<td>20P8230, SUB_IMU</td>
<td>ANTENNA UNIT SC-1303</td>
</tr>
</tbody>
</table>

**PCB Locations for SC-1303**

- MAIN board 20P8228A
- GNSS_LNA board 20P8222A
- SUB_IMU board 20P8230
- LAN_CNV board 20P8229
- LAN to Coax conversion kit (Option)
Cables listed in the manual are usually shown as Japanese Industrial Standard (JIS). Use the following guide to locate an equivalent cable locally.

JIS cable names may have up to 6 alphabetical characters, followed by a dash and a numerical value (example: DPYC-2.5).

For core types D and T, the numerical designation indicates the cross-sectional Area (mm²) of the core wire(s) in the cable.

For core types M and TT, the numerical designation indicates the number of core wires in the cable.

1. Core Type
   D: Double core power line
   T: Triple core power line
   M: Multi core
   TT: Twisted pair communications
   (1Q=quad cable)

2. Insulation Type
   P: Ethylene Propylene Rubber

3. Sheath Type
   Y: PVC (Vinyl)

4. Armor Type
   C: Steel

5. Sheath Type
   Y: Anticorrosive vinyl sheath

6. Shielding Type
   S: All cores in one sheath
   -S: Individually sheathed cores
   SLA: All cores in one shield, plastic tape w/aluminum tape
   -SLA: Individually shielded cores, plastic tape w/aluminum tape

The following reference table gives the measurements of JIS cables commonly used with Furuno products:

<table>
<thead>
<tr>
<th>Type</th>
<th>Core Area</th>
<th>Core Diameter</th>
<th>Cable Diameter</th>
<th>Type</th>
<th>Core Area</th>
<th>Core Diameter</th>
<th>Cable Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>DPYC-1.5</td>
<td>1.5mm²</td>
<td>1.56mm</td>
<td>11.7mm</td>
<td>TTYCS-1</td>
<td>0.75mm²</td>
<td>1.11mm</td>
<td>10.1mm</td>
</tr>
<tr>
<td>DPYC-2.5</td>
<td>2.5mm²</td>
<td>2.01mm</td>
<td>12.8mm</td>
<td>TTYCS-1T</td>
<td>0.75mm²</td>
<td>1.11mm</td>
<td>10.6mm</td>
</tr>
<tr>
<td>DPYC-4</td>
<td>4.0mm²</td>
<td>2.55mm</td>
<td>13.9mm</td>
<td>TTYCS-1Q</td>
<td>0.75mm²</td>
<td>1.11mm</td>
<td>11.3mm</td>
</tr>
<tr>
<td>DPYC-6</td>
<td>6.0mm²</td>
<td>3.12mm</td>
<td>15.2mm</td>
<td>TTYCS-4</td>
<td>0.75mm²</td>
<td>1.11mm</td>
<td>16.3mm</td>
</tr>
<tr>
<td>DPYC-10</td>
<td>10.0mm²</td>
<td>4.05mm</td>
<td>17.1mm</td>
<td>TTYCSLA-1</td>
<td>0.75mm²</td>
<td>1.11mm</td>
<td>9.4mm</td>
</tr>
<tr>
<td>DPYCY-1.5</td>
<td>1.5mm²</td>
<td>1.56mm</td>
<td>13.7mm</td>
<td>TTYCSLA-1T</td>
<td>0.75mm²</td>
<td>1.11mm</td>
<td>10.1mm</td>
</tr>
<tr>
<td>DPYCY-2.5</td>
<td>2.5mm²</td>
<td>2.01mm</td>
<td>14.8mm</td>
<td>TTYCSLA-1Q</td>
<td>0.75mm²</td>
<td>1.11mm</td>
<td>10.8mm</td>
</tr>
<tr>
<td>DPYCY-4</td>
<td>4.0mm²</td>
<td>2.55mm</td>
<td>15.9mm</td>
<td>TTYCSLA-4</td>
<td>0.75mm²</td>
<td>1.11mm</td>
<td>15.7mm</td>
</tr>
<tr>
<td>MPYC-2</td>
<td>1.0mm²</td>
<td>1.29mm</td>
<td>10.0mm</td>
<td>TTYC-1</td>
<td>0.75mm²</td>
<td>1.11mm</td>
<td>11.0mm</td>
</tr>
<tr>
<td>MPYC-4</td>
<td>1.0mm²</td>
<td>1.29mm</td>
<td>11.2mm</td>
<td>TTYC-1T</td>
<td>0.75mm²</td>
<td>1.11mm</td>
<td>11.7mm</td>
</tr>
<tr>
<td>MPYC-7</td>
<td>1.0mm²</td>
<td>1.29mm</td>
<td>13.2mm</td>
<td>TTYC-1Q</td>
<td>0.75mm²</td>
<td>1.11mm</td>
<td>12.6mm</td>
</tr>
<tr>
<td>MPYC-12</td>
<td>1.0mm²</td>
<td>1.29mm</td>
<td>16.8mm</td>
<td>TTYC-4</td>
<td>0.75mm²</td>
<td>1.11mm</td>
<td>17.7mm</td>
</tr>
<tr>
<td>TPYC-1.5</td>
<td>1.5mm²</td>
<td>1.56mm</td>
<td>12.5mm</td>
<td>TTYC-4S</td>
<td>0.75mm²</td>
<td>1.11mm</td>
<td>21.1mm</td>
</tr>
<tr>
<td>TPYC-2.5</td>
<td>2.5mm²</td>
<td>2.01mm</td>
<td>13.5mm</td>
<td>TTYC-4SLA</td>
<td>0.75mm²</td>
<td>1.11mm</td>
<td>19.5mm</td>
</tr>
<tr>
<td>TPYC-4</td>
<td>4.0mm²</td>
<td>2.55mm</td>
<td>14.7mm</td>
<td>TTYCYS-1</td>
<td>0.75mm²</td>
<td>1.11mm</td>
<td>12.1mm</td>
</tr>
<tr>
<td>TPYCY-1.5</td>
<td>1.5mm²</td>
<td>1.56mm</td>
<td>14.5mm</td>
<td>TTYCYS-4</td>
<td>0.75mm²</td>
<td>1.11mm</td>
<td>18.5mm</td>
</tr>
<tr>
<td>TPYCY-2.5</td>
<td>2.5mm²</td>
<td>2.01mm</td>
<td>15.5mm</td>
<td>TTYCYSLA-1</td>
<td>0.75mm²</td>
<td>1.11mm</td>
<td>11.2mm</td>
</tr>
<tr>
<td>TPYCY-4</td>
<td>4.0mm²</td>
<td>2.55mm</td>
<td>16.9mm</td>
<td>TTYCYSLA-4</td>
<td>0.75mm²</td>
<td>1.11mm</td>
<td>17.9mm</td>
</tr>
</tbody>
</table>
SPECIFICATIONS OF SATELLITE COMPASS
SC-70/130

1 GENERAL
1.1 Receiving frequency 1575.42 MHz (GPS/GALILEO), 1602.5625 MHz (GLONASS)
1.2 Tracking code C/A code (GPS), E1B (GALILEO), 1OF (GLONASS)
1.3 Positional accuracy (dependent on ionospheric activity and multipath)
   GPS 10 m approx. (2drms, HDOP<4)
   DGPS 5 m approx. (2drms, HDOP<4)
   WAAS 3 m approx. (2drms, HDOP<4)
   MSAS 7 m approx. (2drms, HDOP<4)
1.4 Ship’s speed accuracy (SOG)
   0.2 kn rms (tracking satellites 3 or 4)
   0.02 kn rms (tracking satellites 5 or more)
1.5 Ship’s speed accuracy (VBW, speed on ground)
   2.0% of ship’s speed or 0.2 kn whichever is the greater
   (tracking satellites 3 or 4)
   0.2% of ship’s speed or 0.02 kn whichever is the greater
   (tracking satellites 5 or more, at antenna position)
   0.2% of ship’s speed or 0.08 kn rms
   (tracking satellites 5 or more, at another position)
1.6 Course accuracy
   SC-70 0.4° RMS
   SC-130 0.25° RMS
1.7 Course resolution 0.1°, 0.01° or 0.001° (select from menu)
1.8 Attitude resolution 0.1°, 0.01° or 0.001° (select from menu)
1.9 Rate of turn 0.1°/s, 0.01°/s or 0.001°/s (select from menu)
1.10 Tracking bearing 40°/s
1.11 Position fixing time 90 s approx. (typical)
1.12 Attitude accuracy Pitch/ Roll: 0.4° RMS

2 DISPLAY UNIT
2.1 Screen 4.3-inch color LCD, 95.04 mm (W) x 87.12 mm (H)
2.2 Resolution 480 x 272 dots (WQVGA)
2.3 Brilliance 600 cd/m² typical
2.4 Contrast 17 levels
2.5 Display mode Heading, Nav data, Rate of turn and Speed (Non-IMO mode only)
2.6 Visible distance 0.65 m nominal

3 INTERFACE (JUNCTION BOX)
3.1 Number of ports (junction box)
   IEC61162 (NMEA0183) IEC61162-2: 1 port, IEC61162-1: 8 ports (I/O: 4, O: 4)
   External beacon input (DATA5 port):
   RTCM SC-104 V2.3 (RS-485), ITU-R M823
   CANbus 1 port
   AD-10 4 ports, for heading output
   RS-485 1 port, for display unit connection
   LAN 2 ports, Ethernet, 100Base-TX, RJ45 connector
   (for IEC61162-450 and maintenance)
3.2 Data sentences
DATA ports
  Input  ACK, ACM, ACN, HBT, HDT, MSK, MSS, THS, VBW\(^*2\), VDR\(^*2\)
  Output ALC, ALF, ALR, ARC, DTM, GBS, GGA, GLL, GNS, GRS, GSA, GST, GSV, HBT, HDG\(^*2\), HDM\(^*2\), HDT\(^*1\), HRM\(^*2\), MSK, POS, RMC, ROT, THS, VBW\(^*2\), VDR\(^*2\), VHW\(^*2\), VLW\(^*2\), VTG, XDR\(^*2\), ZDA

NETWORK port
  Input  ACK, ACM, ACN, HBT
  Output ALC, ALF, ALR, ARC, DTM, GBS, GGA, GLL, GNS, GRS, GSA, GST, GSV, HBT, HDG, HDM, HDT\(^*1\), HRM\(^*2\), POS, RMC, ROT, THS, VBW\(^*2\), VDR\(^*2\), VHW\(^*2\), VLW\(^*2\), VTG, XDR\(^*2\), ZDA
*1: Not used for new SOLAS vessels.
*2: for Non-IMO types only.

3.3 Output proprietary sentences
PFEC GPatt, GPhve, GPimu, pidat, pireq

3.4 PGN
  Input  059392/904, 060928, 061184, 126208/720/996
  Output 059392/904, 060928, 061184, 065280,
     126208/464/720/992/996, 127250/251/252/257/258,
     129025/026/029/033/044/291/539/540/545/547,
     130310/312/314/316/577/578/822/823/842/843/845/846

3.5 IEC61162-450 transmission group
  Input  MISC, SATD, NAVD, PROP
  Output Arbitrary (default: SATD)

3.6 Other network function excepted IEC61162-450
    NTP, HTTP

4 POWER SUPPLY
4.1 Junction box  12-24 VDC: 2.1-1.1 A (included antenna unit and display unit)
4.2 Rectifier (PR-240, option)  100-115/220-230 VAC, 1 phase, 50/60Hz and 24VDC

5 ENVIRONMENTAL CONDITIONS
5.1 Ambient temperature
  Antenna unit  -25°C to +55°C (storage: -25°C to +70°C )
  Display unit/ Junction box  -15°C to +55°C
5.2 Relative humidity  95% or less at +40°C
5.3 Degree of protection
  Antenna unit  IP56
  Display unit  IP22 (IP35: option)
  Junction box  IP20 (IP22: bulkhead mount)
5.4 Vibration  IEC 60945 Ed.4

6 UNIT COLOR
6.1 Antenna unit  N9.5
6.2 Display unit/ Junction box  N2.5
### PACKING LIST

<table>
<thead>
<tr>
<th>UNIT</th>
<th>OUTLINE</th>
<th>DESCRIPTION/ CODE No.</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANTENNA UNIT</td>
<td><img src="image1" alt="Image" /></td>
<td>SC-703-**</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UNIT</th>
<th>OUTLINE</th>
<th>DESCRIPTION/ CODE No.</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANTENNA UNIT</td>
<td><img src="image2" alt="Image" /></td>
<td>SC-1303-**</td>
<td>1</td>
</tr>
</tbody>
</table>

コード番号末尾の**（）は、選択品の代表コードを表します。

CODE NUMBER ENDING WITH "**" INDICATES THE CODE NUMBER OF REPRESENTATIVE MATERIAL.

（図面の寸法は、参考値です。DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

C7282-Z07-A

C7283-Z01-A
### PACKING LIST

**SC-701**, **SC-701-HK**

<table>
<thead>
<tr>
<th>NAME</th>
<th>OUTLINE</th>
<th>DESCRIPTION/NO.</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>極箱</td>
<td>JUNCTION BOX</td>
<td>SC-701-**</td>
<td>1</td>
</tr>
<tr>
<td>予備品</td>
<td>SPARE PARTS</td>
<td>SP20-01801</td>
<td>1</td>
</tr>
<tr>
<td>工事材料</td>
<td>INSTALLATION MATERIALS</td>
<td>OP05-04001</td>
<td>1</td>
</tr>
</tbody>
</table>

#### SPARE PARTS

<table>
<thead>
<tr>
<th>NAME</th>
<th>OUTLINE</th>
<th>DESCRIPTION/NO.</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>付属品</td>
<td>ACCESSORIES</td>
<td>FP19-01201</td>
<td>1</td>
</tr>
<tr>
<td>工事材料</td>
<td>INSTALLATION MATERIALS</td>
<td>OP05-13701</td>
<td>1</td>
</tr>
</tbody>
</table>

#### DOCUMENT

<table>
<thead>
<tr>
<th>NAME</th>
<th>OUTLINE</th>
<th>DESCRIPTION/NO.</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>取扱説明書</td>
<td>OPERATOR'S MANUAL</td>
<td>000-179-205-1x **</td>
<td>1</td>
</tr>
</tbody>
</table>

コード番号末尾の**（**）は、選択品の代表コードを表します。
CODE NUMBER ENDING WITH "**" INDICATES THE CODE NUMBER OF REPRESENTATIVE MATERIAL.

（略図の寸法は、参考値です。DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）
### PACKING LIST

**SC-702-1/3 , SC-702-1/3-HK**

<table>
<thead>
<tr>
<th>UNIT</th>
<th>OUTLINE</th>
<th>DESCRIPTION</th>
<th>CODE No.</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>表示部</td>
<td>DISPLAY UNIT</td>
<td>SC-702=</td>
<td>000-030-382-00-**</td>
<td>1</td>
</tr>
</tbody>
</table>

**ACCESSORIES**

<table>
<thead>
<tr>
<th>ACCESSORIES</th>
<th>OUTLINE</th>
<th>DESCRIPTION</th>
<th>CODE No.</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1F19-01201</td>
<td></td>
<td></td>
<td>001-030-780-00-**</td>
<td>1</td>
</tr>
</tbody>
</table>

**INSTALLATION MATERIALS**

<table>
<thead>
<tr>
<th>CABLE ASSEMBLY</th>
<th>OUTLINE</th>
<th>DESCRIPTION</th>
<th>CODE No.</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z-426X2P-0.35X1PL10</td>
<td></td>
<td></td>
<td>000-192-977-10</td>
<td>1</td>
</tr>
<tr>
<td>Z-426X2P-0.35X1PL30</td>
<td></td>
<td></td>
<td>000-192-977-10</td>
<td>1</td>
</tr>
</tbody>
</table>

**DOCUMENT**

<table>
<thead>
<tr>
<th>OPERATOR'S MANUAL</th>
<th>OUTLINE</th>
<th>DESCRIPTION</th>
<th>CODE No.</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>000-192-405-1**</td>
<td>1</td>
</tr>
</tbody>
</table>

---

### INSTALLATION MATERIALS

<table>
<thead>
<tr>
<th>No.</th>
<th>NAME</th>
<th>OUTLINE</th>
<th>DESCRIPTION</th>
<th>CODE No.</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CABLE ASSEMBLY</td>
<td>L=30M</td>
<td></td>
<td>000-192-405-1**</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>CABLE ASSEMBLY</td>
<td>L=40M</td>
<td></td>
<td>000-192-405-1**</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>CABLE ASSEMBLY</td>
<td>L=50M</td>
<td></td>
<td>000-192-405-1**</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>CABLE ASSEMBLY</td>
<td>L=15M</td>
<td></td>
<td>000-192-405-1**</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>CABLE ASSEMBLY</td>
<td>L=20M</td>
<td></td>
<td>000-192-405-1**</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>CABLE ASSEMBLY</td>
<td>L=15M</td>
<td></td>
<td>000-192-405-1**</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>CABLE ASSEMBLY</td>
<td>L=30M</td>
<td></td>
<td>000-192-405-1**</td>
<td>1</td>
</tr>
</tbody>
</table>

---

**FURUNO ELECTRIC CO., LTD.**

**A-5**

A-6
<table>
<thead>
<tr>
<th>NO.</th>
<th>NAME</th>
<th>OUTLINE</th>
<th>DESCRIPTION</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>INSULATION TUBE</td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>SELF-TAPPING SCREW</td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>CABLE TIE</td>
<td></td>
<td></td>
<td>32</td>
</tr>
</tbody>
</table>
### A-9

工事材料表

**INSTALLATION MATERIALS**

<table>
<thead>
<tr>
<th>番号</th>
<th>名称</th>
<th>番号</th>
<th>名称</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>F, MOUNT CUSHION</td>
<td>2</td>
<td>SELF-TAPPING SCREW</td>
</tr>
<tr>
<td>2</td>
<td>SELF-TAPPING SCREW</td>
<td>3</td>
<td>SELF-TAPPING SCREW</td>
</tr>
<tr>
<td>4</td>
<td>CABLE TIE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

コード NO. 000-356-120-000

### A-10

工事材料表

**INSTALLATION MATERIALS**

<table>
<thead>
<tr>
<th>番号</th>
<th>名称</th>
<th>番号</th>
<th>名称</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BIRD DETECT</td>
<td>2</td>
<td>HEX NUT</td>
</tr>
<tr>
<td>3</td>
<td>SPRING WASHER</td>
<td>4</td>
<td>FLAT WASHER</td>
</tr>
<tr>
<td>5</td>
<td>ADHESIVE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

コード NO. 000-356-120-000

(機器の寸法は、参考値です。DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO ELECTRIC CO., LTD.
### A-11

#### 工事材料表

**INSTALLATION MATERIALS**

<table>
<thead>
<tr>
<th>番号</th>
<th>名称</th>
<th>番号</th>
<th>型名/規格</th>
<th>数量</th>
<th>用途/備考</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>鳥駆け</td>
<td>250</td>
<td>20-624-0100-9 RING</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CODE NO.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>六角ナット</td>
<td>1/8</td>
<td>W10 303204</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CODE NO.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>スプリングナッシャー</td>
<td>16</td>
<td>W10 303204</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CODE NO.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>フラットナッシャー</td>
<td>φ21</td>
<td>W10 303204</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CODE NO.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>背景粘着剤</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CODE NO.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(略す寸法は参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO ELECTRIC CO., LTD.
<table>
<thead>
<tr>
<th>番号</th>
<th>名称</th>
<th>シアト</th>
<th>型式/規格</th>
<th>数量</th>
<th>用途/備考</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>模型コネクター</td>
<td>23</td>
<td>CPM/209-C</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>コネクター</td>
<td>12</td>
<td>MB2090-105</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>ケーブルアセンブリ</td>
<td>L=40m</td>
<td>00020701116</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
### 工事材料表
#### INSTALLATION MATERIALS

<table>
<thead>
<tr>
<th>番号</th>
<th>名称</th>
<th>番号</th>
<th>型式/規格</th>
<th>数量</th>
<th>用途/備考</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MODULAR CONNECTOR</td>
<td>23</td>
<td>MPS200-C</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>CONNECTOR</td>
<td></td>
<td>FPH-4J-PLUG-ASSY</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>CABLE ASSEMBLY</td>
<td></td>
<td>E07C0350SLANNI 01 GT</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
NOTE
1. **TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.**
2. # MINIMUM SERVICE CLEARANCE.
3. USE TAPPING SCREWS Ø5x20 FOR FIXING THE UNIT.
### Table 1: TABLE 1

<table>
<thead>
<tr>
<th>Dimension (mm)</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>L ≤ 50</td>
<td>± 1.5</td>
</tr>
<tr>
<td>50 &lt; L ≤ 100</td>
<td>± 2.5</td>
</tr>
<tr>
<td>100 &lt; L ≤ 500</td>
<td>± 3</td>
</tr>
</tbody>
</table>

### Notes:

1. **NOTE:** TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE PAN-HEAD TAPPING SCREWS ø3x20 FOR FIXING THE UNIT.

---

**Nameplate**

- **Model:** SC-702
- **Approval:** 28/Jul/2015 H. MAKI
- **Scale:** 1/3
- **Weight:** 0.60 kg
- **Wiring Diagram:** DISPLAY UNIT (FLUSH MOUNT)

---

**Cable Entry**

- **Cable Entry:**
- **Model:** C7262-G02-A
- **Part Number:** 20-037-201G-1

---

**Cutout Dimensions**

- **Dimensions:**
  - Width: 125 mm
  - Height: 120 mm
  - Depth: 110 mm

---

**Pilot Holes**

- **Pilot Holes:**
  - 127 ± 0.5 mm
  - 110 ± 0.5 mm
  - 130 ± 1 mm

---

**Fixing Holes**

- **Fixing Holes:**
  - ø4.0
  - 4 locations

---

**Gasket (Option)**

- **Gasket:**
  - Optional
  - Dimensions: 125 x 120 mm

---

**Cable Entry**

- **Cable Entry:**
- **Dimensions:**
  - Width: 120 mm
  - Height: 110 mm
  - Depth: 110 mm

---

**Outline Drawing**

- **Outline Drawing:**
- **Dimensions:**
  - Width: 250 mm
  - Height: 250 mm

---

**Notes in Japanese:**

1. 指定寸法公差は表1による。
2. #寸法は、最小小さい寸法とする。
3. 取付用ネジはネバタッピングネジ呼び径3×20を使用のこと。
注記
1）指定外寸法公差は表1による。
2）#印寸法は、最小サービス空間寸法とする。
3）取付用ネジはトラスタッチネジ呼び径4×16を使用のこと。

NOTE
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE TAPPING SCREWS Ø4×16 FOR FIXING THE UNIT.
**NOTE**

1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. # MINIMUM SERVICE CLEARANCE.
3. USE M5 BOLTS OR TAPPING SCREWS M5x20 FOR FIXING THE UNIT.

---

**DRAWN**

17/Jan/2017 T.YAMASAKI

**CHECKED**

17/Jan/2017 H.MAKI

**APPROVED**

17/Jan/2017 H.MAKI

**SCALE**

1/4

**MATERIALS**

SC-701

**NAME**

JUNCTION BOX

**OUTLINE DRAWING**

C7282-G04-C 20-037-1006-3
注 記 1）指定外の寸法公差は表1による。
2）取付台の厚さ (t) は、15 mm以下とする。

NOTE 1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. THICKNESS OF PLATFORM (t): 15 OR LESS.
注記
*1 造船所手配。
*2 オプション。
*3 コネクタを取り外して接続する。

NOTE
*1: SHIPYARD SUPPLY.
*2: OPTION.
*3: REMOVE THE PLUG FOR FABRICATION.
INDEX

A
Alerts ....................................................... 2-15
acknowledge ......................................... 2-16
alert codes............................................. AP-4
alert list .............................................. AP-4
buzzer on/off ......................................... 2-16
list ........................................................ 2-17
log ....................................................... 2-18

B
Background color .................................... 2-20
Backup user settings................................. 3-3
Basic troubleshooting................................ 3-2

C
Controls..................................................... 2-1

D
Data schematics ..................................... AP-12
Data sentences ..................................... AP-11
Data transmission ................................. AP-11
Date ....................................................... 2-22
DGPS/SBAS settings .............................. 2-25
Diagnostics ................................................ 3-5
automatic test ........................................ 3-7
keyboard test ........................................... 3-6
LCD test ................................................... 3-6
memory test ............................................. 3-5
sound test ................................................ 3-7
Display
change mode .......................................... 2-5
GPS mode ............................................... 2-7
icons ....................................................... 2-6
indications ............................................. 2-6
navigational data ................................... 2-15
ROTI mode ............................................. 2-13
SPD mode .............................................. 2-14
THD mode ............................................. 2-10
Display overview ..................................... 2-5

E
EGNOS .................................................... AP-10

F
Fuse ........................................................ 3-1

G
GAGAN .................................................... AP-10
Geodetic chart codes .............................. AP-9
Geodetic data settings ............................ 2-22
GNSS settings ......................................... 2-24

I
I/O settings
data logs.............................................. 2-30
data sources ........................................ 2-29
HDG output restart ................................. 2-32
LAN data output ..................................... 2-28
serial data output ................................... 2-27

Initial Settings
offsets ................................................... 1-26
OS dimensions ...................................... 1-25
Input sentences ..................................... AP-12

Installation
display unit - bulkhead ............................ 1-8
display unit - desktop ............................... 1-8
display unit - flushmount .......................... 1-9
optional waterproofing kit ....................... 1-21
RD-50 remote display unit ....................... 1-10
SC-1303 antenna unit .............................. 1-4
SC-701 junction box ................................ 1-7
SC-702 display unit ................................ 1-8
SC-703 antenna unit ................................ 1-3
waterproofing connections ..................... 1-13
Installation considerations
SC-701 junction box ................................. 1-7
SC-702 display unit ................................ 1-8
SC-703/SC-1303 antenna units ................. 1-1

J
JIS cable guide ......................................... AP-26

L
Language ................................................ 2-23

M
Maintenance .......................................... 3-1
fuse ....................................................... 3-1
Menu tree ............................................. AP-1
MSAS .................................................... AP-10

O
Output sentences .................................. AP-14

R
RAIM
setup ..................................................... 2-26

S
SBAS providers ...................................... AP-10
SBAS search .......................................... 2-25
Smoothing ............................................. 2-21

T
Time ....................................................... 2-22
Transmission intervals ......................... AP-11
Trip meter ............................................. 2-22

U
Units of measurement ............................. 2-20
User settings
backup ............................................... 3-3

W
WAAS ..................................................... AP-10
Wiring ................................................... 1-11
INDEX

cable fabrication.....................................1-12
display unit.............................................1-20
junction box............................................1-17
Declaration of Conformity

We, FURUNO ELECTRIC CO., LTD.

(Manufacturer)

9-52 Ashihara-Cho, Nishinomiya City, 662-8580, Hyogo, Japan

(Address)

declare under our sole responsibility that the product

SATELLITE COMPASS SC-70 and SC-130

(Model name, type number)

to which this declaration relates conforms to the following standard(s) or normative document(s)

IMO Resolution A.526(13) ISO 20672 Ed.1.0: 2007
IMO Resolution A.694(17) ISO 22090-3 Ed.2.0: 2014
IMO Resolution MSC.112(73) IEC 60945 Ed.4.0: 2002
IMO Resolution MSC.116(73) IEC 61108-1 Ed.2.0: 2003
IMO Resolution MSC.191(79) IEC 61162-1 Ed.5.0: 2016
IMO Resolution MSC.302(87) IEC 61162-2 Ed.1.0: 1998
2000 HSC Code 13 IEC 61162-450 Ed.1.0: 2011

(title and/or number and date of issue of the standard(s) or other normative document(s))

For assessment, see

- EC type examination (Module B) certificate No. MEDB00001BW, MEDB00001BX and MEDB00001BY issued by DNV GL, Norway.
- Product Quality System (Module D) certificate No. P 112 issued by Telefication, The Netherlands.


On behalf of Furuno Electric Co., Ltd.

Nishinomiya City, Japan
March 7, 2017

Place and Date of Issue

Yoshitaka Shogaki
Department General Manager
Quality Assurance Department

(name and signature or equivalent marking of authorized person)