

# **FURUNO**

## **OPERATOR'S MANUAL**

### *SATELLITE COMPASS<sup>TM</sup>*

Model

**SCX-21**

---

NMEA 0183 Specification

**ECF**

(Elemental Chlorine Free)

The paper used in this manual  
is elemental chlorine free.

**FURUNO ELECTRIC CO., LTD.**

• FURUNO Authorized Distributor/Dealer



Printed in Japan

A : DEC. 2019  
C : JUN. 15, 2022

Pub. No. OMC-72870-C

( REFU ) SCX-21



00019529412

# IMPORTANT NOTICES

---

## General

- This manual has been authored with simplified grammar, to meet the needs of international users.
- The operator of this equipment must read and follow the instructions in this manual. Wrong operation or maintenance can void the warranty or cause injury.
- Do not copy any part of this manual without written permission from FURUNO.
- If this manual is lost or worn, contact your dealer about replacement.
- The contents of this manual and the equipment specifications can change without notice.
- The example screens (or illustrations) shown in this manual can be different from the screens you see on your display. The screens you see depend on your system configuration and equipment settings.
- Save this manual for future reference.
- Any modification of the equipment (including software) by persons not authorized by FURUNO will 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: Siriusstraat 86, 5015 BT, Tilburg, The Netherlands
- The following concern acts as our importer in UK, as defined in SI 2016/1025 as amended SI 2019/470.
  - Name: FURUNO (UK) LTD.
  - Address: West Building Penner Road Havant Hampshire PO9 1QY, U.K.
- All brand, product names, trademarks, registered trademarks, and service marks belong to their respective holders.

## How to discard this product

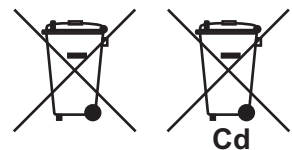
Discard this product according to local regulations for the disposal of industrial waste. For disposal in the USA, see the homepage of the Electronics Industries Alliance (<http://www.eiae.org/>) for the correct method of disposal.

## How to discard a used battery

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

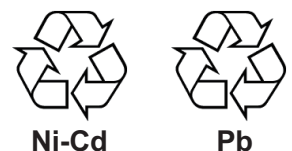
### In the European Union

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.

<b>DANGER</b>	Indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury.
<b>WARNING</b>	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
<b>CAUTION</b>	Indicates a potentially hazardous situation which, if not avoided, can result in minor or moderate injury.






Warning, Caution	Prohibitive Action	Mandatory Action
------------------	--------------------	------------------


### *Safety instructions for the installer*

<b>WARNING</b>
<b>Turn off the power at the mains before beginning the installation.</b> Fire, electrical shock or serious injury can result if the power is left on or is applied while the equipment is being installed.
<b>ELECTRICAL SHOCK HAZARD</b> <b>Do not open the equipment unless totally familiar with electrical circuits and service manual.</b> Only qualified personnel should work inside the equipment.
<b>Use the specified power cable.</b> Fire can result if an incorrect cable is used.
<b>Do not disassemble or modify the equipment.</b> Fire, electrical shock or serious injury can occur.

<b>CAUTION</b>		
	<b>Observe the following safe compass distances to prevent interference to a magnetic compass:</b>	
	Standard compass	Steering compass
Satellite Compass SCX-21	0.30 m	0.30 m

***Safety instructions for the operator***

 <b>WARNING</b>	
	<p><b>ELECTRICAL SHOCK HAZARD</b> Do not open the equipment unless totally familiar with electrical circuits and service manual.</p> <p>Only qualified personnel should work inside the equipment.</p>
	<p><b>Do not disassemble or modify the equipment.</b></p> <p>Fire, electrical shock or serious injury can occur.</p>
	<p><b>Turn off the power immediately if water leaks into the equipment or smoke or fire is coming from the equipment.</b></p> <p>Failure to turn off the equipment can cause fire or electrical shock. Contact a FURUNO agent for service.</p>
	<p><b>Use the correct fuse.</b></p> <p>A wrong fuse can cause fire or serious damage to the equipment.</p>

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

# TABLE OF CONTENTS

---

FOREWORD .....	vi
SYSTEM CONFIGURATION .....	vii
EQUIPMENT LIST .....	viii
<b>1. INSTALLATION .....</b>	<b>1-1</b>
1.1 Installation Considerations .....	1-1
1.1.1 General considerations .....	1-1
1.2 Platform Mount.....	1-2
1.2.1 Required tools .....	1-2
1.2.2 How to mount the Antenna Unit .....	1-2
1.3 Pole Mount.....	1-4
1.3.1 Installation notices.....	1-4
1.3.2 Required tools .....	1-5
1.3.3 How to assemble the pole kit .....	1-5
1.3.4 How to mount the Antenna Unit .....	1-6
1.4 Antenna Mounting Base (option).....	1-7
1.4.1 Installation notices.....	1-8
1.4.2 Required tools .....	1-8
1.4.3 How to mount the Antenna Unit .....	1-8
1.5 Bird Deterrents (Option).....	1-11
1.6 Snow Cover Kit (Option) .....	1-11
1.7 Wiring.....	1-12
1.7.1 How to secure and protect cable connectors .....	1-12
1.7.2 How to protect unused connector of display unit .....	1-12
<b>2. OPERATIONAL OVERVIEW .....</b>	<b>2-1</b>
2.1 How to Turn the Power On/Off.....	2-1
2.2 How to Access the SCX-21 Settings.....	2-1
2.2.1 GP-39 Controls .....	2-1
2.2.2 How to operate the menu.....	2-2
2.2.3 How to change the GP-39 operation mode.....	2-3
2.3 Display Modes.....	2-3
2.3.1 [Satellite monitor] display mode .....	2-4
2.3.2 [Heading] display mode.....	2-5
2.3.3 [3-Axis Speed] display mode.....	2-6
2.3.4 [ROT] user display .....	2-6
2.3.5 [Attitude] user display.....	2-7
2.3.6 How to setup the user displays .....	2-7
2.4 How to View System Information and Conduct Diagnostic Tests .....	2-8
2.4.1 Viewing system information .....	2-8
2.4.2 Conducting a simple diagnostic test.....	2-9
2.4.3 Conducting an advanced diagnostic test .....	2-9
<b>3. INITIAL SETTINGS .....</b>	<b>3-1</b>
3.1 How to Set the Ship Dimensions.....	3-1
3.2 Satellite Settings .....	3-4
3.2.1 How to ignore satellites .....	3-4
3.2.2 How to setup SBAS.....	3-5
3.2.3 How to set an elevation mask .....	3-5
3.2.4 How to set a time limit for dead reckoning .....	3-6
3.3 How to Apply Offsets.....	3-6

3.3.1	Data Smoothing (Damping).....	3-7
3.4	How to Setup Data Output.....	3-8
3.4.1	Setting up a data port for output.....	3-8
3.4.2	How to setup the SCX-21 as a data relay .....	3-9
3.5	Wiring Information between SCX-21 and GP-39.....	3-10
<b>4.</b>	<b>MAINTENANCE.....</b>	<b>4-1</b>
4.1	Preventative Maintenance .....	4-1
4.2	Fuse Replacement .....	4-1
4.3	Troubleshooting.....	4-1
4.4	GP-39 Related Errors and Remedies.....	4-2
	<b>APPENDIX 1 MENU TREE .....</b>	<b>AP-1</b>
	<b>APPENDIX 2 GEODETIC CHART CODES .....</b>	<b>AP-5</b>
	<b>APPENDIX 3 WHAT IS SBAS? .....</b>	<b>AP-6</b>
	<b>SPECIFICATIONS .....</b>	<b>SP-1</b>
	<b>PACKING LISTS .....</b>	<b>A-1</b>
	<b>OUTLINE DRAWINGS .....</b>	<b>D-1</b>
	<b>INTERCONNECTION DIAGRAMS.....</b>	<b>S-1</b>

# FOREWORD

---

## A Word to the Owner of the SCX-21

FURUNO Electric Company thanks you for purchasing the FURUNO SCX-21 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 goal.

Thank you for considering and purchasing FURUNO equipment.

## **Features**

The SCX-21 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:

- Heading accuracy of 0.5° RMS (1.0° when stationary).
- Perfect for use as a heading sensor for RADAR/TT, Echo trails, AIS, Autopilot and Scanning SONARs.
- Outputs accurate heading, position, time, speed and course.
- Pitch and roll output in digital format for ship's motion correction.
- Attitude settling time of 60 seconds.
- Outputs data in NMEA 0183 format
- Aesthetically pleasing antenna fits nicely on recreational boats.
- Can use the GP-39 as a dedicated display unit.

## **Program numbers**

Unit & PC Board	PCB/Application	Program No.*	PCB/Application	Program No.*
Antenna Unit	STARTER	2051599 01.xx	APL	2051601 01.xx
	BOOTER	2051600 01.xx	GNSS (1 to 4)	48505230 xx

\*: "xx" denotes version number.

## **CE/UKCA declaration**

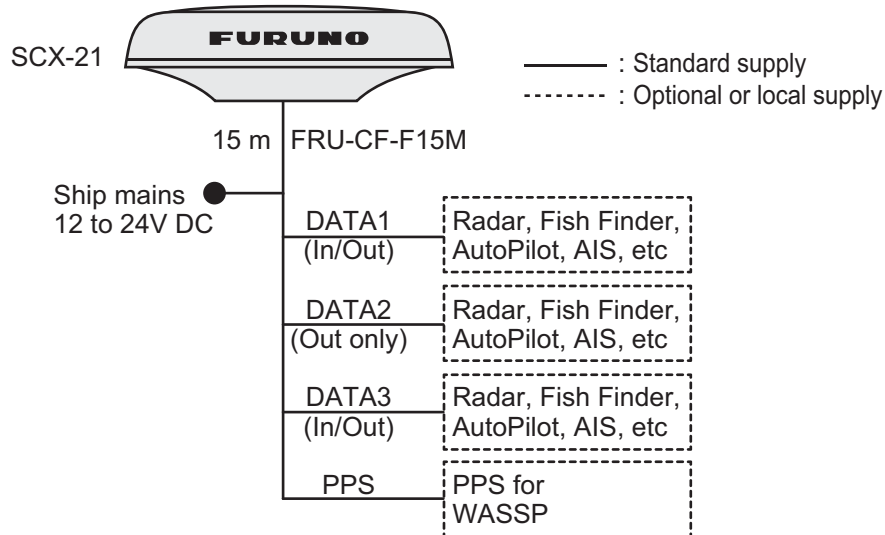
With regards to CE/UKCA declarations, please refer to our website ([www.furuno.com](http://www.furuno.com)) for further information about RoHS conformity declarations

## **Disclosure of Information about China RoHS**

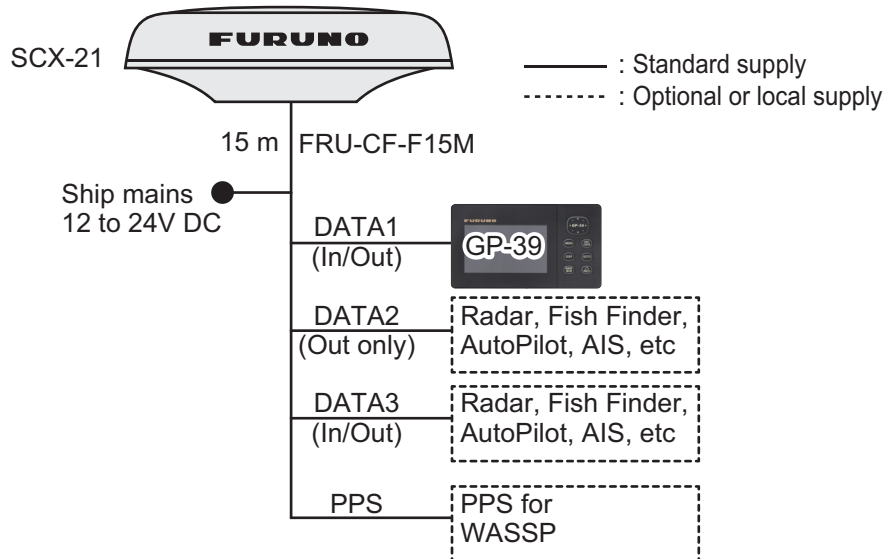
With regards to China RoHS information for our products, please refer to our website ([www.furuno.com](http://www.furuno.com)).

# SYSTEM CONFIGURATION

## Basic configuration for sensor only



## Basic configuration with display unit (GP-39)



# EQUIPMENT LIST

## Standard supply

Name	Type	Code No.	Qty.	Remarks
Antenna Unit	SCX-21	-	1	For NMEA 0183
Spare Parts	SP20-01901	001-556-110	1	Fuse, 2 pcs.
Installation Materials	CP20-04630	000-036-771	1 (Select one)	For pole mount kit of antenna unit with cable FRU-CF-F15M (15 m).
	CP20-04640	000-036-772		For pole mount kit (w/Mast Mounting Kit CP20-04605 <sup>*1</sup> ) of antenna unit. Includes cable FRU-CF-F15M (15 m). <sup>*1</sup> : Includes Fixing Support Fixture, Pipe and Hose Clamp (φ25 to 35 mm), and 32A to 40A (φ35 to 50 mm) diameter mast installations.

## Optional supply

Name	Type	Code No.	Remarks
Cable Assembly	FRU-CF-F15M	001-555-560	
	FRU-CF-F30M	001-555-570	
Right Angle Mounting Base	NO.13-QA330	001-111-910-10	
Pole Mount Kit <sup>*2</sup>	CP20-04603	001-556-200	
Mast Mounting Kit <sup>*2</sup>	CP20-04605	001-556-240	Requires CP20-04603.
Hose Clamp (Large)	OP20-52	001-556-260	For 32A to 40A (φ35 to 50 mm) diameter mast installations.
Bird-Repellent Fixture	OP20-54	001-556-280	2 pcs.
Snow Cover Kit	OP20-53	001-556-320	

<sup>\*2</sup>: Select the appropriate kit depending on the installation location and configuration.

# 1. INSTALLATION

---

## NOTICE

**Do not apply paint, anti-corrosive sealant or contact spray to coating or plastic parts of the equipment.**  
Those items contain organic solvents that can damage coating and plastic parts, especially plastic connectors.

You can install the antenna unit as follows. See the outline drawings at the back of this manual.

- Platform mount, fixed from bottom (section 1.2)
- Pole mount (section 1.3)
- Antenna Base mount (section 1.4, option)

Use the NMEA 0183 antenna cable (FRU-CF-F15/30M) for installation.

## 1.1 Installation Considerations

### 1.1.1 General considerations

- Keep the length of the antenna cable in mind when selecting a mounting location.
- Make sure the mounting location is strong enough to support the weight of the unit. See the outline drawings at the back of the manual.
- Leave enough space around the unit for service and maintenance. See the outline drawings at the back of this manual for minimum service clearance.
- The sensor should be separated more than three meters from Inmarsat F/FB antennas. Select a location outside this transmission area.
- Do not bundle the antenna cable with radio equipment cables. When these noise reductions are insufficient, adjust the squelch on the radio equipment.
- Select a location with no obstructions to the radio waves.
- Select a location with no local vibration or impact (including vibrations generated by an engine or the mounting mast for this equipment) for the GPS sensor in the antenna unit.
- Observe the compass safe distances (see page iii) to prevent interference to a magnetic compass.

#### **How to select the installation site**

The installation site must satisfy the conditions described in the antenna installation procedure at the back of this manual (Dwg. No. C7286-Y01-\*).

## 1.2 Platform Mount

The antenna unit is mounted on a level platform, with the fixing screws inserted from the underside of the unit.

### 1.2.1 Required tools

The following tools should be prepared in advance for this installation.

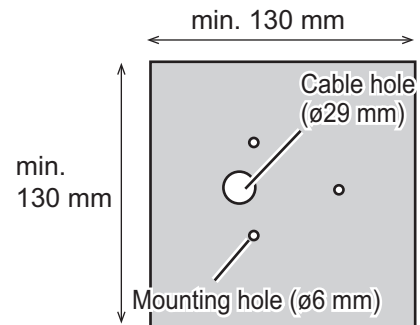
Name	Remarks
Electrical Drill	For making the mounting holes
Drill Bit	φ6
Hole Saw	For making the cable hole φ29 mm.
File	For smoothing the cut edge of the cable hole
Phillips-head Screwdriver	#2

### 1.2.2 How to mount the Antenna Unit

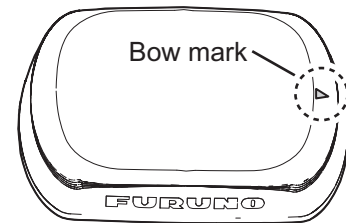
1. Construct a suitable mounting platform, minimum size 130 mm × 130 mm.

**Note:** The mounting platform must be flat, level and firmly secured.

2. Referring to the outline drawing at the back of this manual, drill three mounting holes (φ6 mm) and a cable hole for passing the supplied antenna in the mounting platform. The diameter of a cable hole is φ29±2 mm for SCX-21.

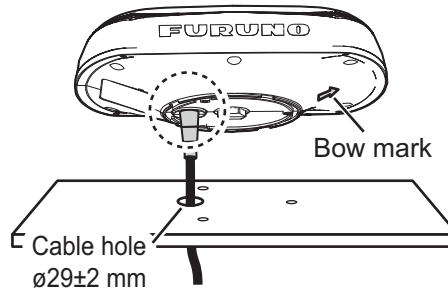


**Note:** Place the antenna unit on the platform, then orient the unit so the bow mark on its base is facing the ship's bow.

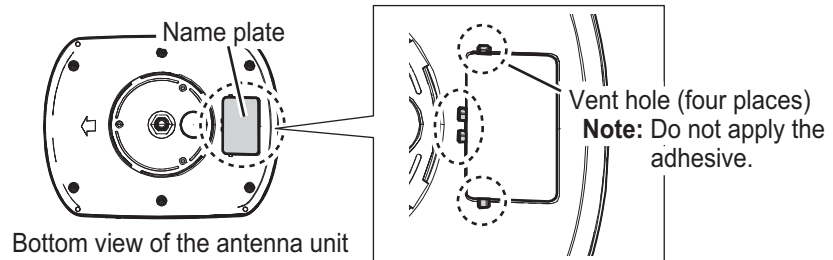


3. Pass the antenna cable through the hole made at step 2 so the connector of the antenna cable exits on the upper side of the mounting platform.

4. Connect the antenna cable to the antenna unit connector.

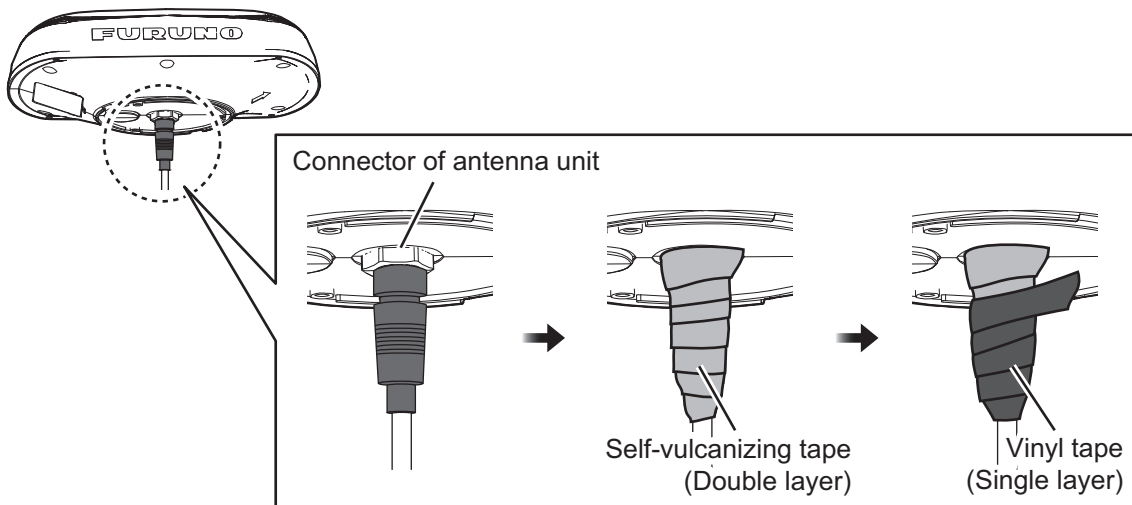


**Note:** DO NOT apply the supplied adhesive to the four vent holes near the name plate.



5. Wrap self-vulcanizing tape **twice** at the junction between connectors of the antenna unit and the antenna cable. Then wrap vinyl tape **once** over the self-vulcanizing tape for waterproofing.

**Note:** Wrap the tapes so as to cover both connectors of the antenna unit and the antenna cable.

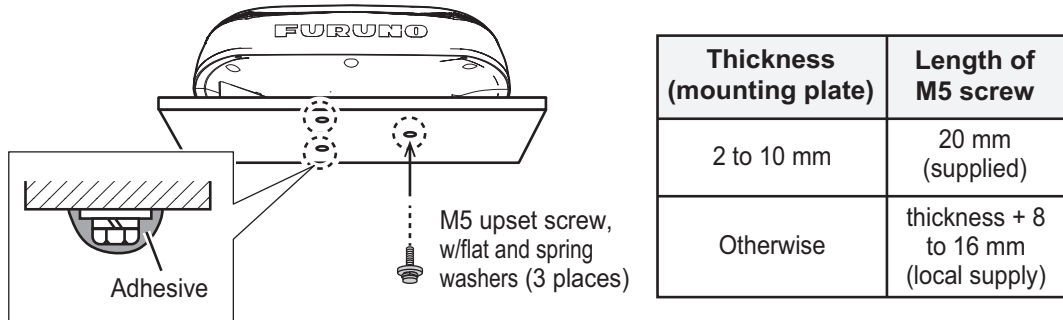


6. Adjust the direction of the antenna unit so the bow mark on its base is facing the ship's bow.

**Note:** When the antenna unit is placed on the platform, make sure that the platform is not inclined.

## 1. INSTALLATION

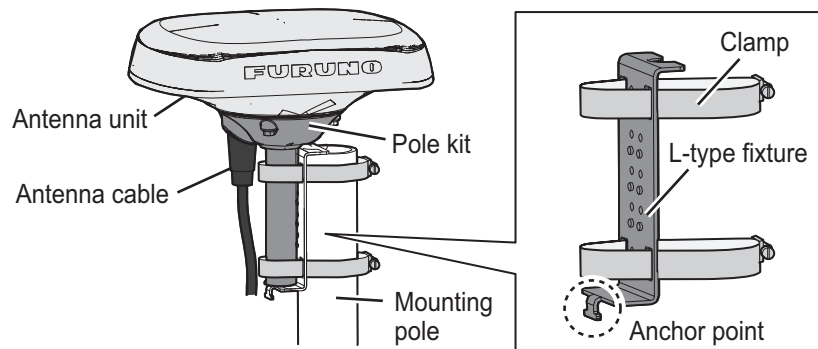
- Fasten the antenna unit to the mounting location with the three sets of supplied upset screws (M5×20, flat and spring washers attached) from the bottom through the mounting holes at step 2. After fastening the screws, coat the screw heads with the supplied adhesive.



**Note:** Screw length is dependent on the thickness of the mounting platform.

## 1.3 Pole Mount

Combine the antenna unit with the pole kit with the pole kit fixture then attach the antenna unit assembly to the mounting pole.

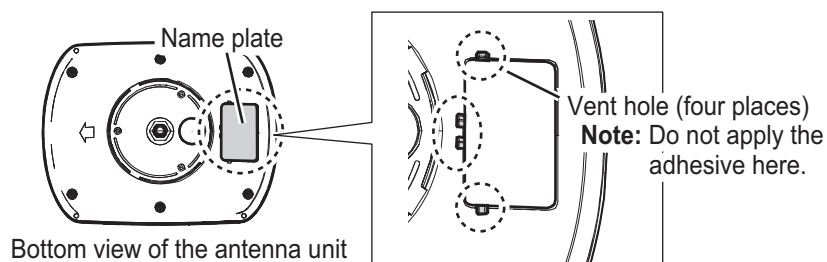


### 1.3.1 Installation notices

- The diameter of the mounting pole must be 25 to 50 mm.
- Use the **supplied** pole kit and the **supplied** pole kit fixture for the pole mount installation so that the bow mark of the antenna unit faces to the bow.
- Select the correct clamp size of the pole kit fixture considering the diameter of the mounting pole.

Name	Mast diameter	Remarks
Hose Clamp	For 20A to 25A (φ25 to 35 mm)	Standard supply with CP20-04603
	For 32A to 40A (φ35 to 50 mm)	Optional supply (OP20-52).

- DO NOT** apply the supplied adhesive to the four vent holes near the name plate.



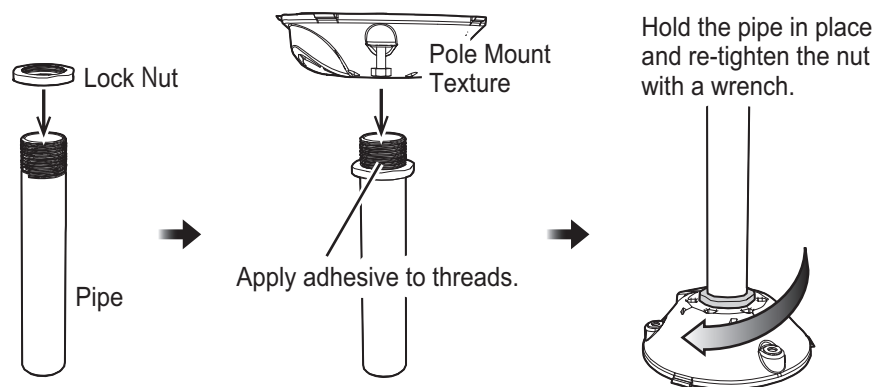
### 1.3.2 Required tools

The following tools should be prepared in advance for this installation.

Name	Remarks
Phillips-head Screwdriver	#2
Slotted Head Screwdriver	For clamp bolts.
Wrench	For fixing lock nut.
Cable tie	Two pieces (at least), for fixing the antenna cable.
Nipper	For removing the cable entrance cover.
Self-vulcanizing tape	For waterproofing the connector.
Vinyl tape	For waterproofing the connector.

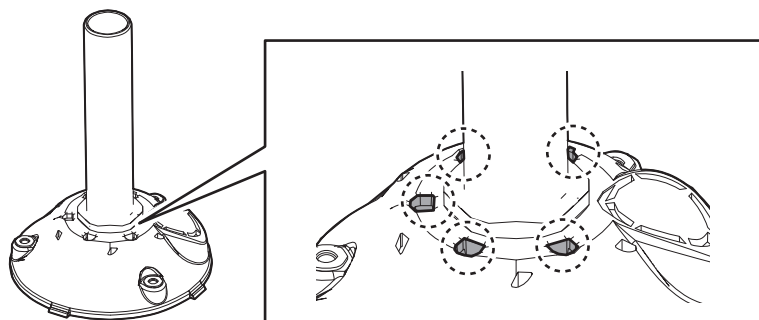
### 1.3.3 How to assemble the pole kit

1. Thread the supplied lock nut onto the supplied pipe then tighten to the end of thread as shown in the figure below.
2. Apply the adhesive around the threads of the pipe then attach the pole mount texture to the pipe.
3. Turn the assembly upside down, hold the pipe steady and tighten the nut again with a wrench. The torque must be  $15 \text{ N}\cdot\text{m}$ .



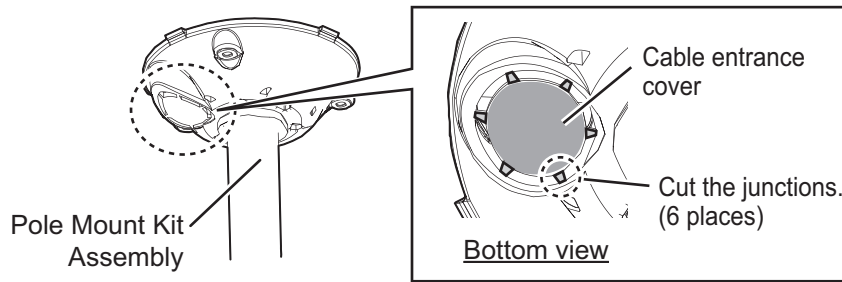
4. Wipe off the excess adhesive.

**Note:** Do not cover the five drain holes (shown in the figure below) with the adhesive.



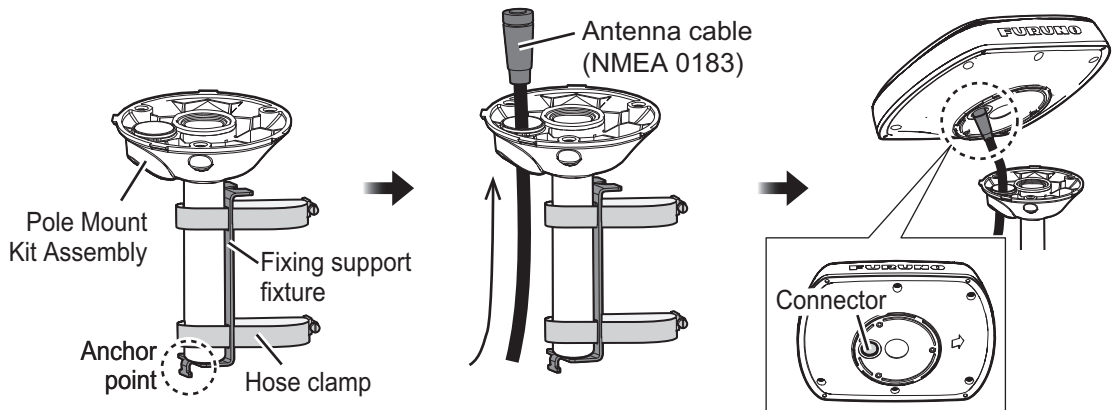
### 1.3.4 How to mount the Antenna Unit

1. Remove the cable entrance cover on the pole mount kit assembly with a nipper to pass through the antenna cable for NMEA 0183 on the antenna base.

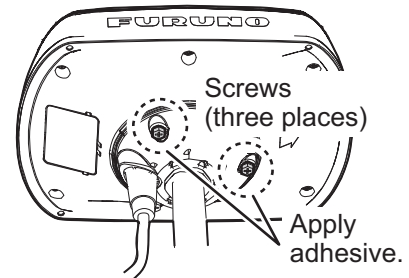


2. Set the hose clamps on the pole mount kit assembly and pass the antenna cable for NMEA 0183 from the underside through the cable entrance of the pole mount kit assembly. Then connect the antenna cable for NMEA 0183 to the connector of the antenna unit.

**Note:** Make sure the anchor point of the fixing support fixture faces downward.

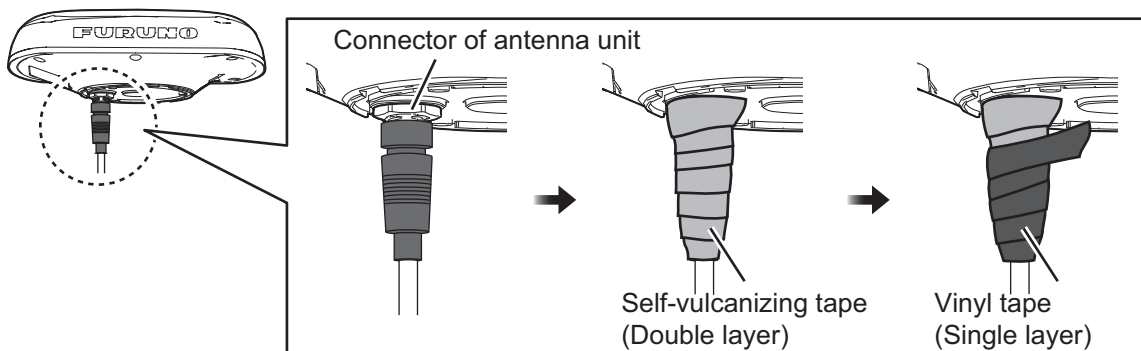


3. Set the antenna unit to the pole mount kit assembly and secure the antenna unit with the three supplied M5 screws from the underside. After fixing screws, coat the screw heads with the supplied adhesive.

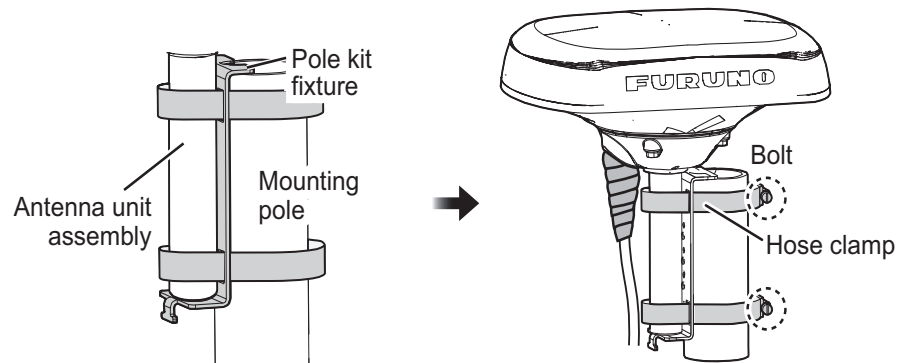


4. Wrap self-vulcanizing tape **twice** at the junction between connectors of the antenna unit and the antenna cable. Then wrap vinyl tape **once** over the self-vulcanizing tape for waterproofing.

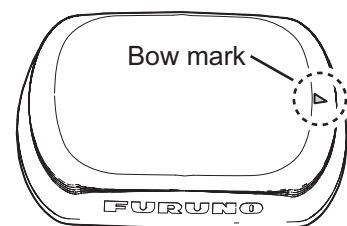
**Note:** Wrap the tapes so as to cover both connectors of the antenna unit and the antenna cable.



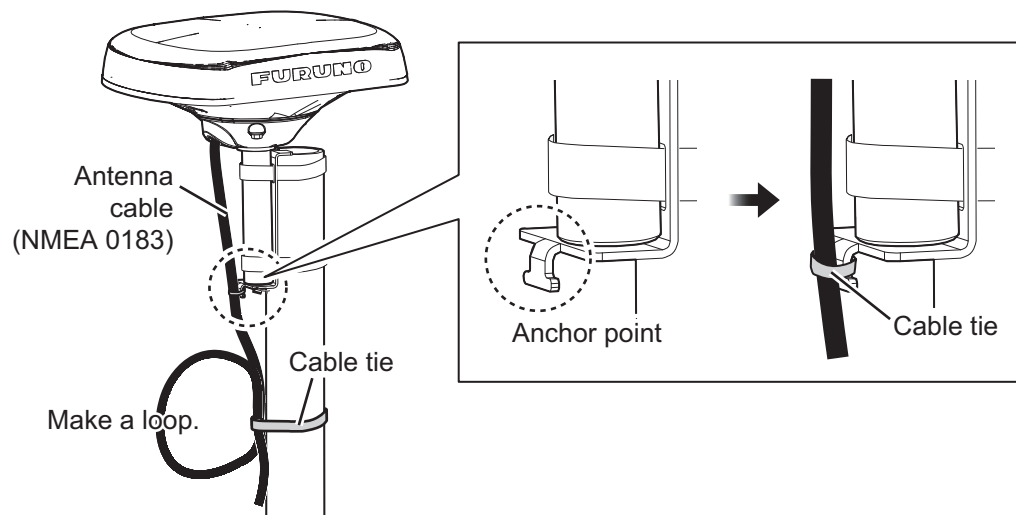
5. Set the antenna unit assembly to the mounting pole so that the pole kit fixture is located at the top of the mounting pole and easily adjust the position of the antenna later in this procedure, as shown in the figure shown below. Then fasten the hose clamps loosely.



6. Adjust the direction of the antenna unit so the bow mark is facing the ship's bow.



7. Fasten the hose clamps to fix the antenna unit.  
8. Secure the antenna cable for NMEA 0183 at the anchor point of the fixing support fixture with the supplied cable tie. Make a loop in the antenna cable, then fix the looped section to the pole as shown in the figure below.



## 1.4 Antenna Mounting Base (option)

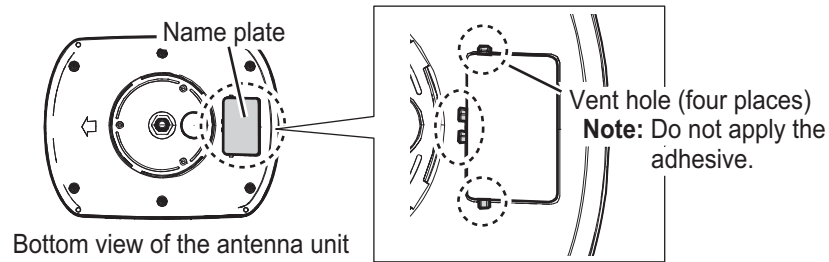
The antenna unit can be mounted on the following locations, using the optional antenna base.

- Inclined surface (adjustable up to 35°)
- Narrow, flat surface

## 1. INSTALLATION

### 1.4.1 Installation notices

- Do not install the unit on an uneven surface.
- DO NOT apply the adhesive to the four vent holes near the name plate.



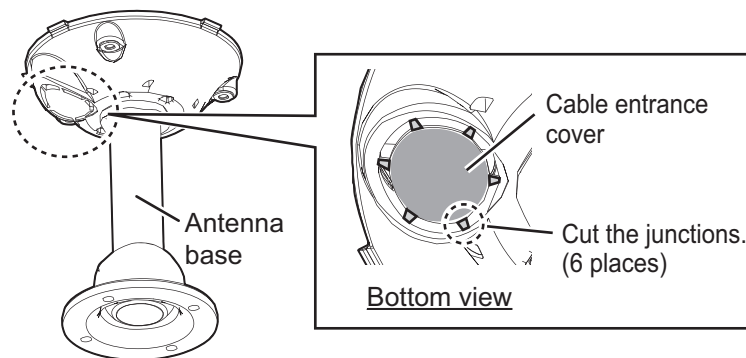
### 1.4.2 Required tools

The following tools should be prepared in advance for this installation.

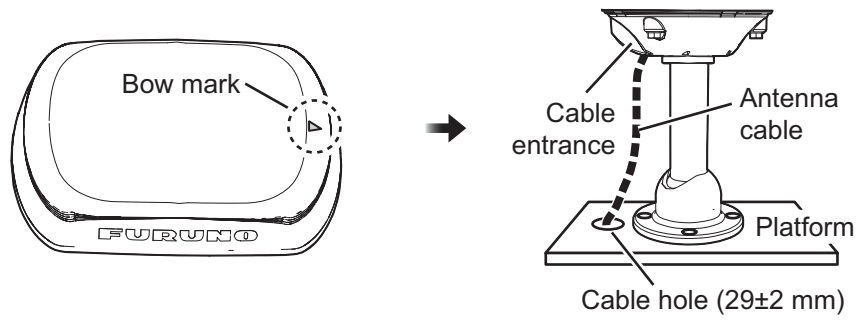
Name	Remarks
Electrical Drill	For making the mounting holes
Drill Bit	φ4.2 to 5
Hole Saw	For making the cable hole (φ25 mm)
File	For smoothing the cut edge of the cable hole
Phillips-head Screwdriver	#2
Nipper	For removing the cable entrance cover

### 1.4.3 How to mount the Antenna Unit

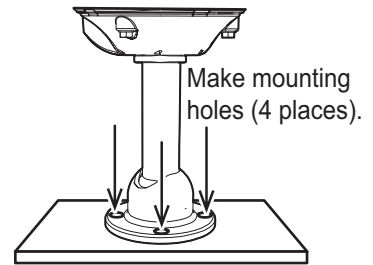
1. Remove the cable entrance cover on the antenna base with a nipper to pass through the antenna cable for NMEA 0183 on the antenna base.



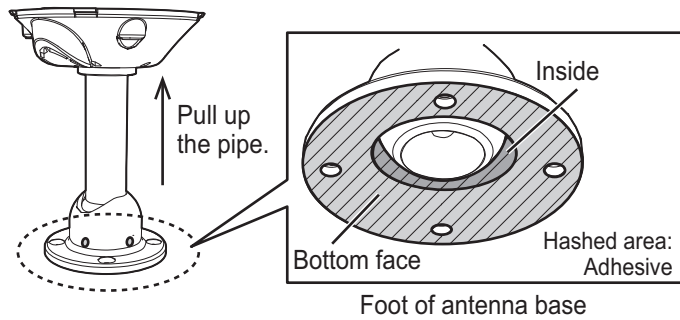
2. Attach the pole mount kit to the antenna base referring to section 1.3.3.  
**Note:** The pipe included in the pole mount kit is not used.
3. Set the antenna base to the mounting location considering the tilt direction of the antenna base. If the antenna cable needs to be pulled out from a hole on the platform, make an antenna cable hole (more than φ29 mm) on the mounting platform considering the location of the cable entrance of the antenna base.  
**Note:** The possible tilt direction of the antenna base depends on the setting position of the antenna base.



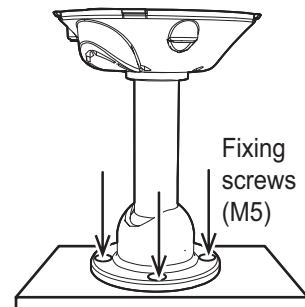
4. Make four mounting holes ( $\phi 4.2$  to 5 mm) on the mounting platform.



5. If a hole (not for the cable hole) is located just below the antenna base, pull the pipe slightly upwards then apply the supplied marine sealant to the inside and bottom face the antenna base footing.

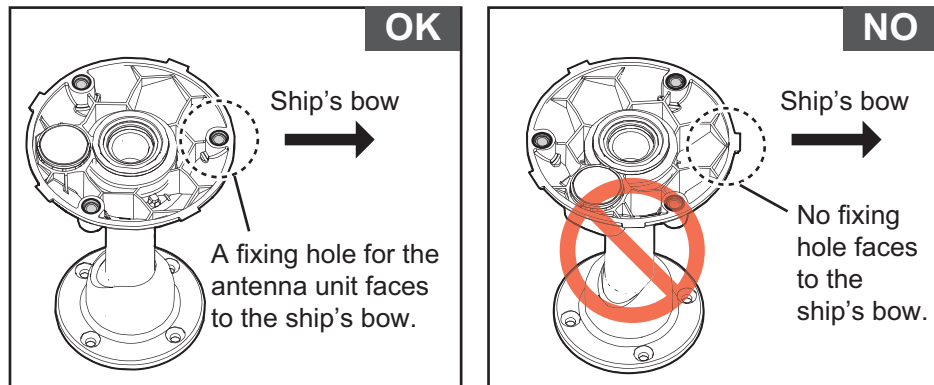


6. Fit the antenna base to the platform so that the mounting holes are aligned with each other, then fasten the four supplied M5 screws tightly to secure the antenna base.



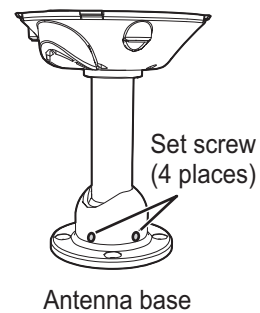
## 1. INSTALLATION

- Loosen the four set screws on the antenna base with the supplied hex wrench and adjust the direction of the pipe while keeping in mind the fixing hole is pointed towards the ship's bow as illustrated below.

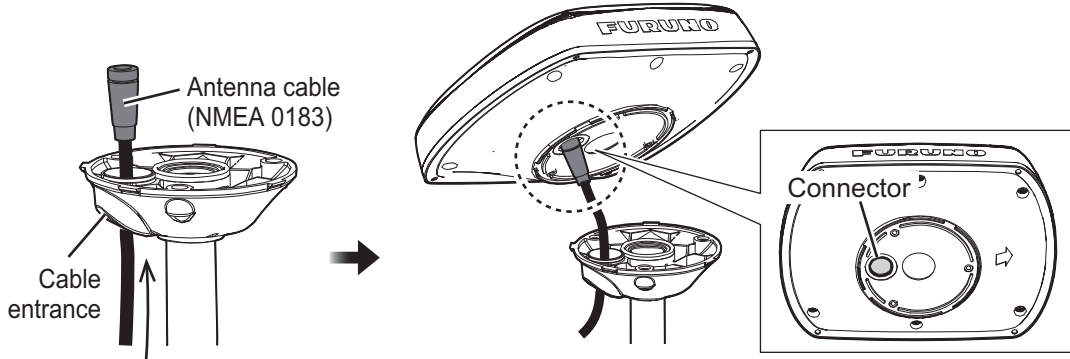


- Remove the hex socket head bolt one by one and fasten the supplied screws with adhesive loosely. After loosely fastening four screws, fasten them tightly then wipe off the excess adhesive.

**Note:** The adhesive takes approximately 30 minutes to adhere.

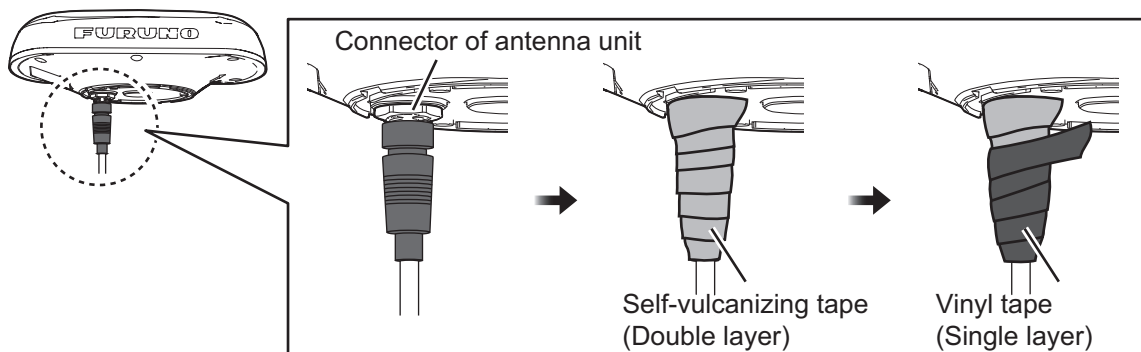


- Pass NMEA 0183 cable through the cable entrance of the antenna base then connect the NMEA 0183 antenna cable to the bottom of the antenna unit.

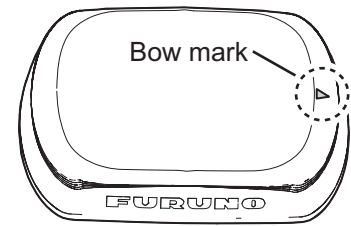


- Wrap self-vulcanizing tape **twice** at the junction between connectors of the antenna unit and the antenna cable. Then wrap vinyl tape **once** over the self-vulcanizing tape for waterproofing.

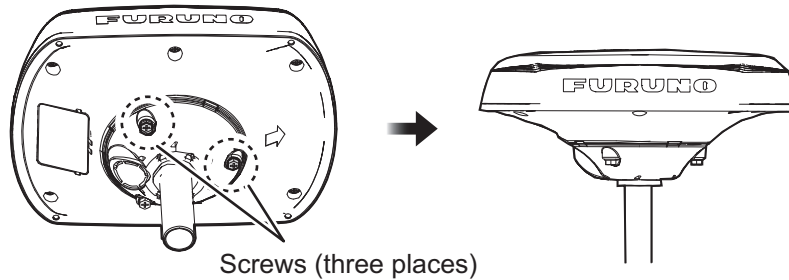
**Note:** Wrap the tapes so as to cover both connectors of the antenna unit and the antenna cable.



11. Set the antenna unit to the antenna base, then adjust the direction of the antenna unit so the bow mark on its base is facing the ship's bow.



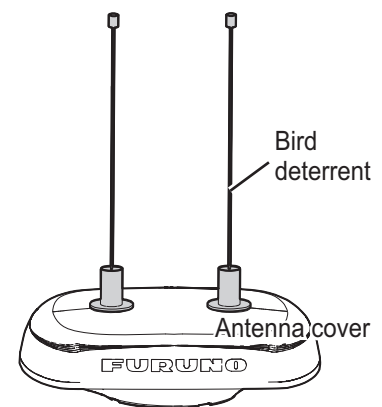
12. Secure the antenna unit with the supplied three M5 screws from the underside.



## 1.5 Bird Deterrents (Option)

The optional bird deterrents (OP20-54) can help keep birds from resting on your antenna.

Remove the double-sided tape from two bird deterrents, then attach to the antenna cover. Coat around the contact area of both bird deterrents with the supplied adhesive.



## 1.6 Snow Cover Kit (Option)

The optional Snow Cover Kit (Type: OP20-53; Code: 001-556-320) is available to reduce snow build-up on your antenna.

To install this kit, see the instructions (C72-01901) supplied with the kit.

## 1.7 Wiring

Connect the antenna cable to each navigational equipment using data ports.

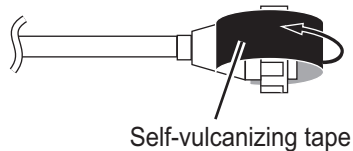
**Note:** When using the GP-39 as a dedicated display unit, connect the DATA1 cable to the GP-39 port1 connector.

### 1.7.1 How to secure and protect cable connectors

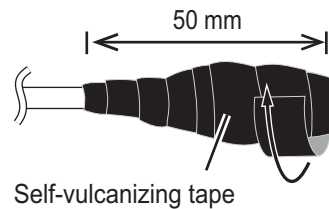
Where the connectors are subject to rain or water splash, the connectors should be wrapped with vinyl tape to prevent corrosion and avoid short-circuits. This also includes any unused connectors.

#### Securing and protecting unused cable connectors

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



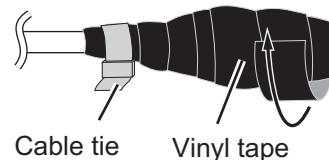
- 2) Wrap the connector with a layer of vulcanizing tape, covering approx. 50 mm of the connected cable. Confirm that the connector is covered.



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

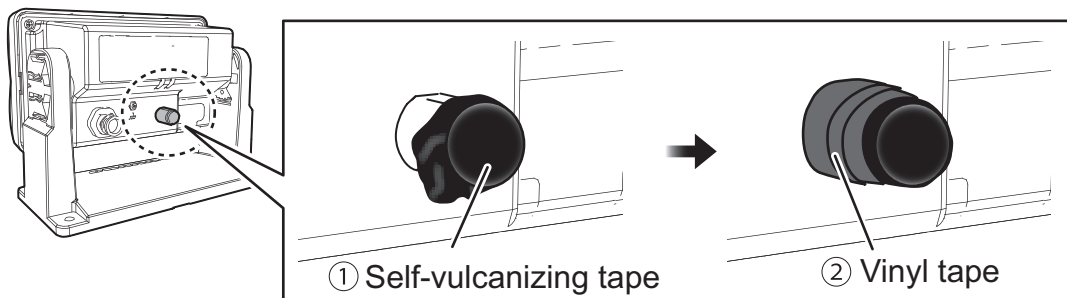


- 4) Wrap the connector with a layer of vinyl tape. Bind the tape end with a cable tie to prevent the tape from unraveling.



### 1.7.2 How to protect unused connector of display unit

The unused connector of GP-39 should be wrapped with self-vulcanizing tape and vinyl tape (local supply) to prevent corrosion and avoid short-circuits.



1. Cover the cable entry for unused connector of GP-39 with self-vulcanizing tape.
2. Wrap the side of the connector with vinyl tape to prevent the self-vulcanizing tape from peeling off.

## 2. OPERATIONAL OVERVIEW

### 2.1 How to Turn the Power On/Off

Your SCX-21 has no power switch. To turn the SCX-21 on or off, use the ship's mains.

### 2.2 How to Access the SCX-21 Settings

You can view and change the settings for your SCX-21 using one of two methods:

- 1) From the dedicated display (GP-39 using SCX-21 operation mode).  
This manual uses the GP-39 for all operations and display examples are taken from the GP-39. For detailed instruction on how to use the GP-39, see the operator's manual included with the GP-39.

Also, the applicable program version of GP-39 for SCX-21 connection is shown below;

- CPU Main: 2051584-03.01 (or later)
- CPU Boot: 2051583-03.01 (or later)

- 2) From the PC Setting Tool software.  
For operation from the PC Setting Tool, see the manual included with the software.

#### 2.2.1 GP-39 Controls



No.	Key name	Description
1	CursorPad	<ul style="list-style-type: none"><li>• Moves the cursor</li><li>• Selects (highlights) items in the menu.</li></ul>
2	MENU key	<ul style="list-style-type: none"><li>• Opens the menu. For plotter and highway displays, press twice. For all other displays, press once.</li><li>• Shows the zoom window (plotter and highways displays only).</li></ul>
3	DISP key	Changes the display mode.
4	MARK/MOB key	<ul style="list-style-type: none"><li>• <b>Long press:</b> Inscribe a MOB mark.</li><li>• <b>Short press:</b> Registers own ship position as waypoint.</li></ul>

## 2. OPERATIONAL OVERVIEW

No.	Key name	Description
5	ENT/CNTR key	<ul style="list-style-type: none"><li>• <b>Long press:</b> Returns own ship position to center (plotter display only).</li><li>• <b>Short press:</b> Confirms menu selection.</li></ul>
6	GOTO key	<ul style="list-style-type: none"><li>• Set the cursor location on the screen as a destination.</li><li>• Switch the screen left and right.</li></ul>
7	PWR/BRILL key	<ul style="list-style-type: none"><li>• <b>Long press:</b> Turns power off.</li><li>• <b>Short press:</b> Turns power on, shows Brill window.</li></ul>

### 2.2.2 How to operate the menu

To operate the menu, do the following:

1. Press the **MENU** key to show the main menu. From [Plotter] or [Highway] display modes, press the **MENU** key twice.
2. Press ▼ or ▲ on the CursorPad to select the desired menu item, then press the **ENTER** key.
3. Press ▼ or ▲ on the CursorPad to select the desired sub-menu item, then press the **ENTER** key.
4. Press ▼ or ▲ on the CursorPad to select the desired setting, then press the **ENTER** key.
5. Press the **DISP** key to close the menu or press the **MENU** key to go back one layer in the menu.

For the sake of brevity, procedures in this manual use the following terminology:

Terminology	Meaning
Open the menu.	Do step 1 of the above procedure.
Select "xxx".	Press ▼ or ▲ on the CursorPad to select xxx, then press the <b>ENTER</b> key.
Close the menu.	Do step 5 of the above procedure.

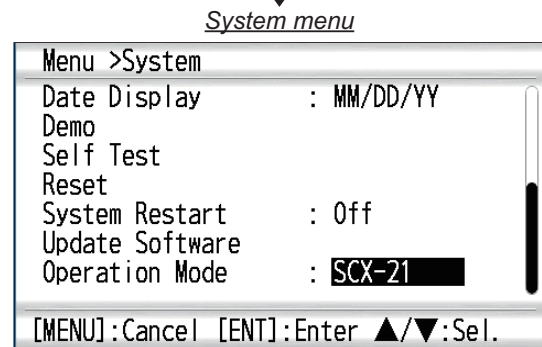
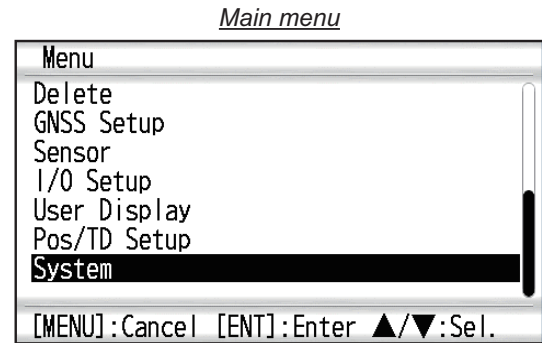
### 2.2.3 How to change the GP-39 operation mode

1. Open the menu.
2. Select [System] to show the [System] menu.
3. Select [Operation Mode] to show the setting options.
4. Select the required operation mode.  
**To use the GP-39 as a dedicated display for the SCX-21**, select [SCX-21].  
**To use the GP-39 normally (with no access to the SCX-21 settings)**, select [GP-39].
5. Close the menu.

**Note 1:** Settings are not shared between operation modes.

**Note 2:** Some default settings are different, depending on the operation mode. For details, see the menu tree at the back of this manual. This manual uses the default settings for SCX-21 operation mode.

If you selected SCX-21 as the operation mode, you can now use your GP-39 as a dedicated display unit for the SCX-21. You also have access to all GP-39 functions.



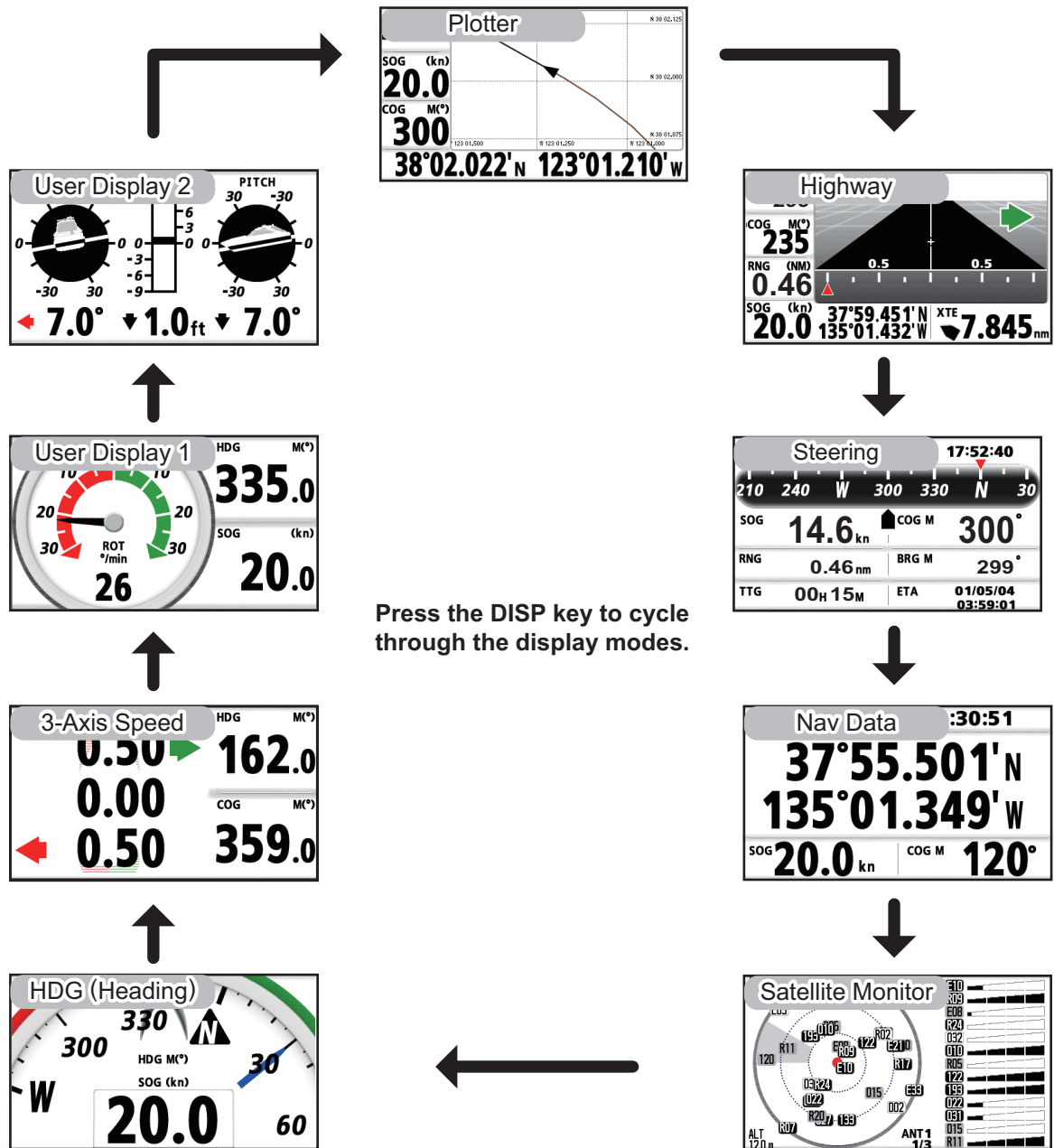
## 2.3 Display Modes

As a dedicated display for the SCX-21, the GP-39 has the following additions to its current display modes and User Displays.

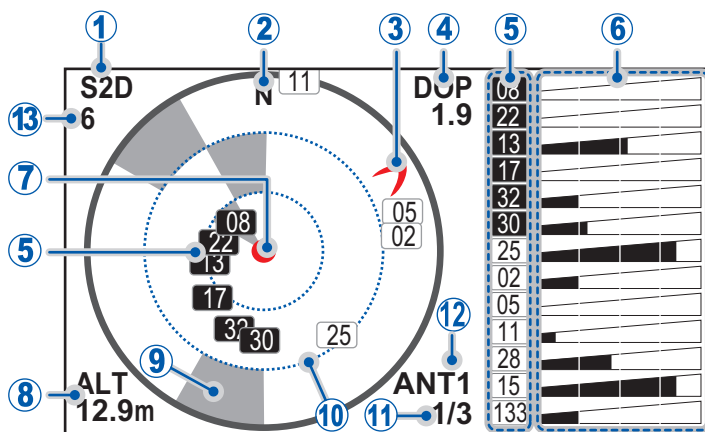
- HDG (Heading) display mode (see section 2.3.2).
- 3-axis speed display mode (see section 2.3.3).
- ROT (Rate Of Turn) User Display (see section 2.3.4).  
Appears as [User Display 1] under default settings.
- Attitude (roll and pitch) User Display (see section 2.3.5).  
Appears as [User Display 2] under default settings.

**Note:** For detailed information regarding the existing display modes, see the GP-39 operator's manual.

## 2. OPERATIONAL OVERVIEW



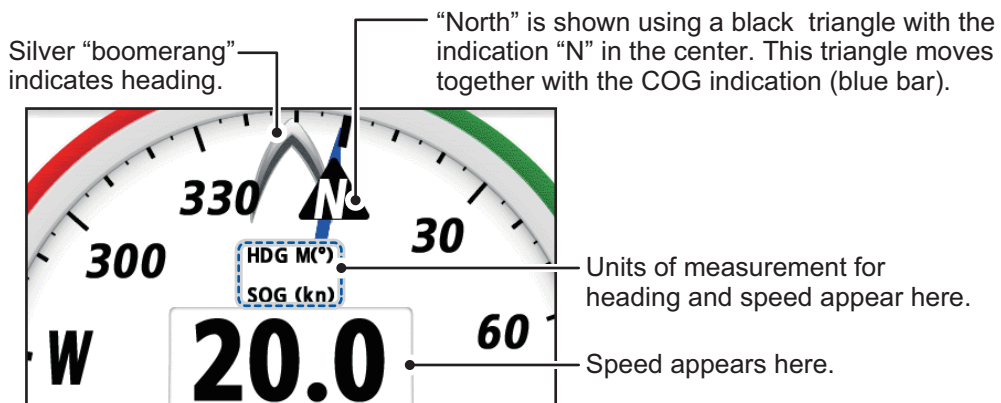
### 2.3.1 [Satellite monitor] display mode



The satellite monitor display mode shows the following information:

No.	Name/description
1	<b>Positioning mode</b> - indicated as [2D], [S2D], [3D] or [S3D]. If positioning is interrupted or the signal is stopped, this indication changes to show "---" (hyphens). The prefix "S" appears when SBAS is used to assist positioning.
2	<b>North mark</b> - indicates magnetic north as "N". The indication appears at the outer edge of the elevation rings.
3	<b>Heading mark</b> - shows your current heading. The mark appears as a red "boomerang" shape at the outer edge of the elevation rings.
4	<b>DOP (Dilution Of Position)</b> - indicates the reliability of the positioning fix. A lower value indicates high reliability.
5	<b>Satellite number and signal strength</b> - shows the number of each satellite currently in view, indicated as a small box with the satellite number in the center. The satellites are color coded as follows: <ul style="list-style-type: none"> <li>• <b>White:</b> satellite is not used for any calculations.</li> <li>• <b>Gray:</b> satellite is used for calculating positioning only.</li> <li>• <b>Black:</b> satellite is used for calculating positioning and heading.</li> </ul>
6	<b>SNR (Signal to Noise Ratio)</b> - shows the overall reliability of the satellite signal. Signal to noise ratio, or the overall reliability of the signal, is indicated in black. A longer bar indicates a more reliable signal.
7	<b>Own ship position</b> - indicated as a red circle at the center of the satellite details.
8	<b>ALT (Altitude)</b> - shows your altitude. When the positioning mode is S2D or 2D, the value indicated is the antenna height. When the positioning mode is S3D or 3D, the value indicated is calculated from sea level.
9	<b>Blocked areas</b> - indicated as gray-colored "sectors" in each elevation range. Indicates areas which have been detected to be blocked. Satellites which appear within a blocked area may not be reliable.
10	<b>Elevation rings</b> - indicates elevation in relation to your ship. The outermost ring (thick, gray line) indicates 0°. The outermost of the two inner rings (blue, dashed lines) indicates 30° and the innermost ring indicates 60°.
11	<b>Page number</b> - When over 13 satellites are acquired, page number appears at the bottom center of the display. To see the receiver signal levels of satellites not shown on the first page, press ▲ or ▼ to switch the page.
12	<b>ANTx (Antenna number)</b> - shows the antenna whose details are currently displayed as "ANT1", "ANT2", "ANT3" or "ANT4". The number of the details page currently displayed (indicated "1/2", "2/3" or "3/3") appears below the antenna number. <b>Note:</b> ANT4 (antenna number 4) cannot detect GLONASS satellites.
13	<b>Bearing status</b> - The number of common satellites are shown (1 to 32). "0" and "DR" means under dead-reckoning. "-" means the signal is not received.

### 2.3.2 [Heading] display mode

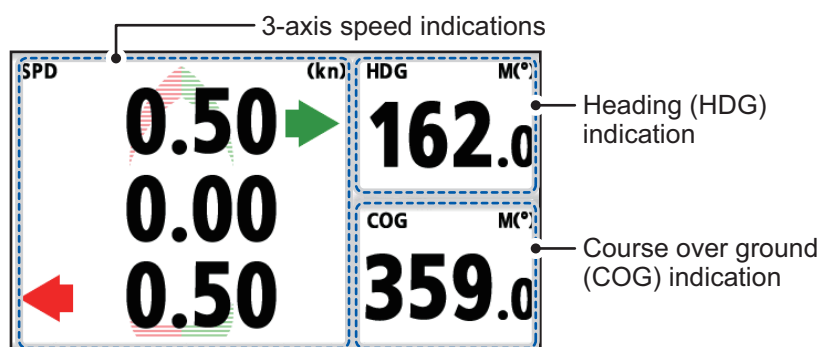


## 2. OPERATIONAL OVERVIEW

The heading display mode shows the following information:

- **HDG (heading)** - shown as a silver “boomerang” indicating your current heading with the reference method used (selected in [COG/BRG ref.] from the [Plotter Setup] menu).
- **COG (course over ground)** - shows your course. The indication for North also appears as a triangle, with the top of the triangle pointing to the north.
- **SOG (speed over ground)** - your vessel speed is indicated at the bottom-center of the display.

### 2.3.3 [3-Axis Speed] display mode

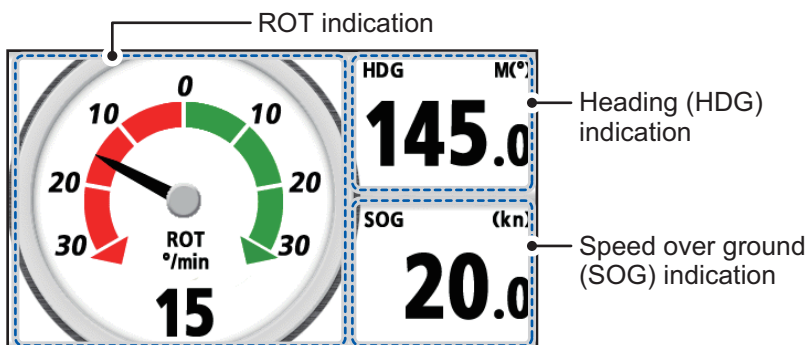


The 3-Axis Speed display mode shows the following information:

- **SPD (speed)** - shows the speeds for fore (uppermost) and aft (lowermost), and appears along with the direction in which the fore/aft of your vessel is moving. The center value shows the forward/reverse speed of your vessel. Forward speed is indicated with an arrow pointing upwards, reverse speed with an arrow pointing downwards. For the fore/aft speeds, the direction is indicated with a green arrow for starboard, red arrow for port movement. The speed measurement unit (selected in [Units] from the [System] menu) appears at the top-left of the display section.
- **HDG (heading)** - shows your current heading and the reference method used (selected in [COG/BRG ref.] from the [Plotter Setup] menu).
- **COG (course over ground)** - shows your current course and the reference method used (selected in [COG/BRG ref.] from the [Plotter Setup] menu).

### 2.3.4 [ROT] user display

**Note:** This user display is set by default as User Display 1. To change these contents, see section 2.3.6.

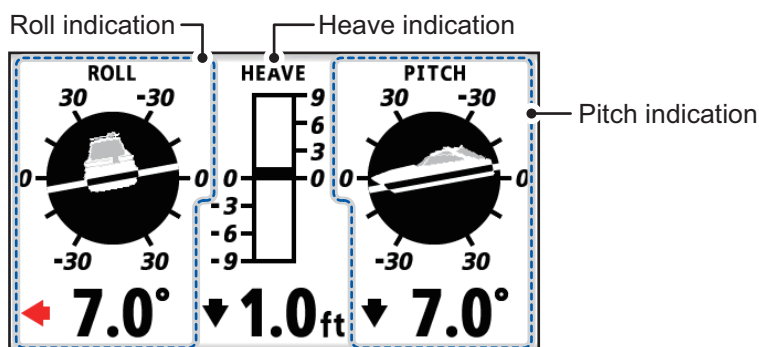


The ROT user display shows the following information:

- **ROT (rate of turn)** - indicated with a black needle with the background dial representing either port (red) or starboard (green) direction for the turn.
- **HDG (heading)** - shows your current heading and the reference method used (selected in [COG/BRG ref.] from the [Plotter Setup] menu).
- **SOG (speed over ground)** - shows your current speed and the measurement unit (selected in [Units] from the [System] menu).

### 2.3.5 [Attitude] user display

**Note:** This user display is set by default as User Display 2. To change these contents, see section 2.3.6.



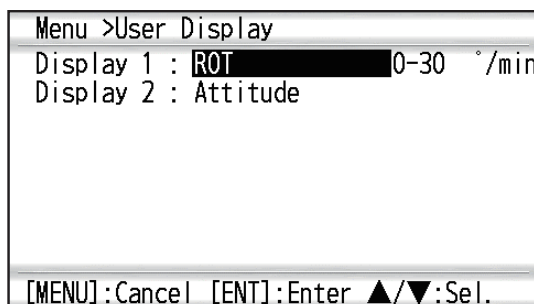
The attitude user display shows the following information:

- **ROLL** - your vessel's attitude in the port-starboard direction and the amount of roll, in degrees.
- **PITCH** - your vessel's attitude in the fore-aft direction and the amount of pitch, in degrees.
- **HEAVE** - your vessel's motion in the upwards/downwards direction, with the amount of heave. Heave amount is shown with the measurement unit selected in [Units] from the [System] menu.

### 2.3.6 How to setup the user displays

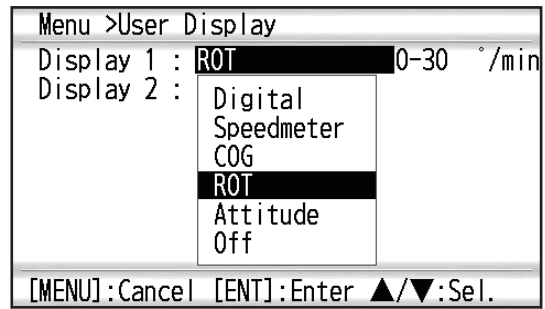
When used as a dedicated display for the SCX-21, your GP-39 has two customizable displays. To change the contents of these displays, do the following:

1. Open the menu.
2. Select [User Display] to show the [User Display] menu.



## 2. OPERATIONAL OVERVIEW

3. Select [Display 1] or [Display 2] as required to show the available display options.



4. Select the desired display option.
5. Close the menu.

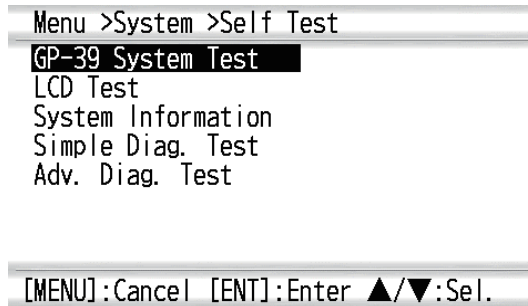
## 2.4 How to View System Information and Conduct Diagnostic Tests

When connected with the GP-39 as a dedicated display, the SCX-21 can display its system data and conduct a test to see if the SCX-21 is functioning correctly.

### 2.4.1 Viewing system information

The system information screen shows program numbers, operating times and the SCX-21's serial number. To access the system information, do the following:

1. Open the menu.
2. Select [System] → [Selftest] to show the [Selftest] menu.



3. Select [System Information]. The following information appears.

Displayed item	Meaning/description
[Main PCB]	SCX-21's main PCB program version.
[Starter Ver.]	Starter application program version.
[Booter1(2) Ver.]	Booter applications 1 & 2 program versions.
[App. Ver.]	Main application program version.
[Powered Time]	Time since the SCX-21 was last turned on.
[Overall Powered Time]	Total time the SCX-21 has been powered since installation.
[GP-39 SW Ver.]	GP-39's software program version.
[GP-39 Overall Powered Time]	Total time the GP-39 has been powered since installation.
[Serial No.]	SCX-21's serial number.
[GNSS1(2/3/4)]	Program number for each of SCX-21's GNSS modules.

## 2.4.2 Conducting a simple diagnostic test

1. Open the menu.
2. Select [System] → [Selftest] to show the [Selftest] menu.
3. Select [Simple Diagnostic Test]. Test results appear as follows ("NG" means "No Good"). The following items are tested in this diagnostic:

Item	Description
[ROM]	ROM status (OK/NG (No Good))
[RAM]	RAM status (OK/NG) (No Good)
[Rate Gyro]	Gyro meter status (Good/Bad)
[Acceleromtr]	Accelerometer status (Good/Bad)
[Magnetic]	Magnetometer status (Good/Bad)
[Press./Temp.]	Status for atmospheric pressure/air temperature sensor (Good/Bad).
[Installation]	Detects the numbers of antenna vibrations (0 to 99).
Port1/2/3 IO	Exception for diagnostic test
GNSS1/2/3/4	Status for GNSS modules 1, 2, 3 and 4 (Good/Bad).
ANT1/2/3/4	Status for antennas 1, 2, 3 and 4 (OK/NG (No Good)).

## 2.4.3 Conducting an advanced diagnostic test

1. Open the menu.
2. Select [System] → [Selftest] to show the [Selftest] menu.
3. Select [Advanced Diagnostic Test]. Test results appear as either "OK" or "NG" (No good). The following items are tested in this diagnostic:

Item	Description
[ROM]	ROM status
[RAM]	RAM status
[Rate Gyro]	Gyrocompass status
[Acceleromtr]	Accelerometer status
Port1/2/3 IO	For factory setting.
GNSS1/2/3/4 RAM	RAM status for GNSS modules 1, 2, 3 and 4.
GNSS1/2/3/4 ROM	ROM status for GNSS modules 1, 2, 3 and 4.

## 2. OPERATIONAL OVERVIEW

This page is intentionally left blank.

# 3. INITIAL SETTINGS

---

When the unit is powered for the first time, it is in a “cold start” state, meaning 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 60 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 installed heading error is found to be 5° or higher, physically turn the antenna while monitoring the heading indication to reduce the error as much as possible. Errors less than 5° can be adjusted in software.

Once a heading is found, check the following items and set or adjust them as required.

- Vessel dimensions and antenna location. See section 3.1.
- Satellite settings (SBAS, elevation mask, smoothing, etc). See section 3.2.
- Offset for heading, roll, pitch, heave, etc. See section 3.3.
- I/O menu settings as appropriate. See section 3.4.

Initial settings can be done with one of the following methods:

- From a dedicated GP-39  
This method is covered within this manual.
- Connect a PC and setup the SCX-21 using the SC setting tool  
You can download the SC setting tool from the quick response code to the right. For how to use the SC setting tool, see the operator's manual of the SC setting tool (OME-72851).



**Note:** This manual covers only SCX-21-specific menus and settings. Detailed settings and procedures for the GP-39 are covered in the GP-39 operator's manual.

## 3.1 How to Set the Ship Dimensions

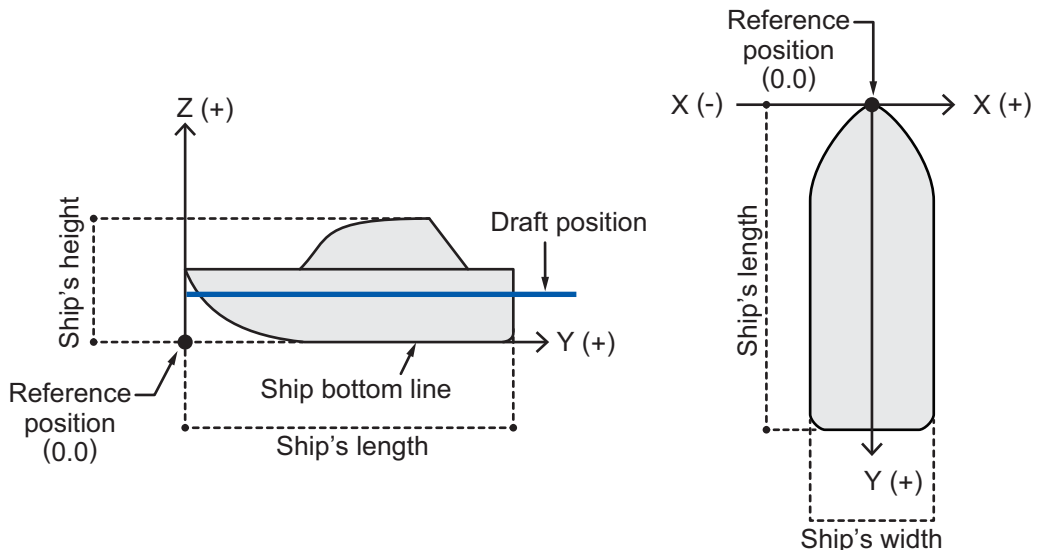
Some features, such as 3-axis speed, require ship dimensions and reference points in order to calculate and display a correct value.

You can set your vessel's dimension with the following procedure.

### 3. INITIAL SETTINGS

1. Open the menu.
2. Select [Sensor], then [Ship Size, ANT POSN].
3. Select [Ship's Width], then enter the width of your vessel. This is the distance at the widest point of the vessel, from starboard edge to port edge.
4. Select [Ship's Length], then enter the length of your vessel. This is distance at the longest point of the vessel, from bow to stern.
5. Select [Ship's Height], then enter the height of your vessel. This is the distance at the highest point of the vessel, from keel to mast-top.
6. Referring to the following table, set the remainder of the menu items accordingly. Enter the appropriate value according to the ship's size, **to improve the accuracy of the 3-axis speed**. The reference position for installation location and calculating position of the 3-axis speed is shown in the following figure.

Ship Size, ANT POSN	
Show ANT POSN	
Ship's Width	: 3.0 m
Ship's Length	: 10.0 m
Ship's Height	: 5.0 m
ANT Position X0	: + 0.00 m
ANT Position Y0	: 5.0 m
ANT Position Z0	: 2.5 m
[MENU]:Cancel [ENT]:Enter ▲/▼:Sel.	



**Note:** Antenna location and speed calculation values require ship dimensions. If ship dimensions are not yet set, restart this procedure.

[ANT Position X0]	Set the port-starboard (Lateral) location of the SCX-21. Enter negative value for port-side, positive value for starboard-side. The center of the vessel is "0" (Setting range: -327.64 to +327.64 m).
[ANT Position Y0]	Set the bow-stern (Longitudinal) location of the SCX-21. Set the distance from the bow to the stern with the bow as 0 m (Setting range: 0.0 to 999.9 m).
[ANT Position Z0]	Set height of the SCX-21, from the bottom of the ship (Setting range: 0.0 to 199.9 m).

[CALC-SPD- POSN Y1 (BOW)]**	Set the bow-stern location for calculating the 3-axis speed. Ship's speed can be measured at two locations in addition to the antenna position. Enter the backward distance from the reference position (Fwd Center of the bow) to the position where you want to measure the ship's speed. Normally, the default settings should be kept.
[CALC-SPD- POSN Y2 (Stern)]**	<p><b>Note:</b> The value for [CALC-SPD-Y1] is set to [0 m] as default. [CALC-SPD-Y2] is automatically set to the ship's length (set previously, in the same menu). For most vessels, these two settings do not require adjustment. On large vessels, where speed and location is required at locations other than the bow, such as for docking, these two values should be adjusted as required. For all vessels, [CALC-SPD-Z] should be set to the vessel's draft value. For further information, contact your local FURUNO dealer.</p>
[CALC-SPD- POSN Z (Height)]**	Set the height for calculating the 3-axis speed. Enter the distance from the bottom of the ship to the position where you want to measure the ship's speed. For example, enter the draft value when you want to measure the speed at draft position.

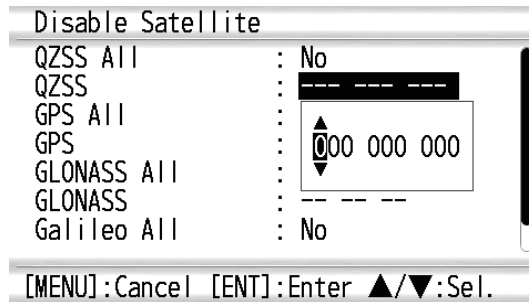
7. To apply the settings, press the **ENT** key.  
To discard the changes and start again, press the **MENU** key.
8. Close the menu.

## 3.2 Satellite Settings

### 3.2.1 How to ignore satellites

The SCX-21 has an almanac of satellite numbers which is used to filter and ignore disabled or inoperative satellites. You can manually set a satellite to ignore with the following procedure.

1. Open the menu.
2. Select [GNSS Setup], then select [Disable Satellite] to show the [Disable Satellite] menu.



3. Referring to the table below, select and set the satellite(s) to ignore. Up to three individually specified satellites can be ignored for each satellite group.

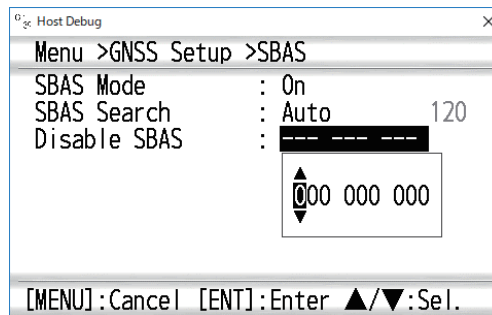
Menu item	Description
[QZSS All]	Select [Yes] to ignore all QZSS satellites, or select [No] to ignore only the specified satellites, set at [QZSS].
[QZSS]	Set the satellite number for each satellite you want to ignore.
[GPS All]	Select [Yes] to ignore all GPS satellites, or select [No] to ignore only the specified satellites, set at [GPS].
[GPS]	Set the satellite number for each satellite you want to ignore.
[GLONASS All]	Select [Yes] to ignore all GLONASS satellites, or select [No] to ignore only the specified satellites, set at [GLONASS].
[GLONASS]	Set the satellite number for each satellite you want to ignore.
[Galileo All]	Select [Yes] to ignore all Galileo satellites, or select [No] to ignore only the specified satellites, set at [Galileo].
[Galileo]	Set the satellite number for each satellite you want to ignore.

4. Close the menu.

### 3.2.2 How to setup SBAS

SBAS (Satellite Based Augmentation Systems) are available to assist with position fixing. These systems correct measurement errors and improve the overall reliability of your GNSS position fix. You can enable, disable and setup how you want to use SBAS with the following procedure.

1. Open the menu.
2. Select [GNSS Setup], then select [SBAS] to show the [SBAS] menu.



3. Referring to the table below, setup the SBAS as required.

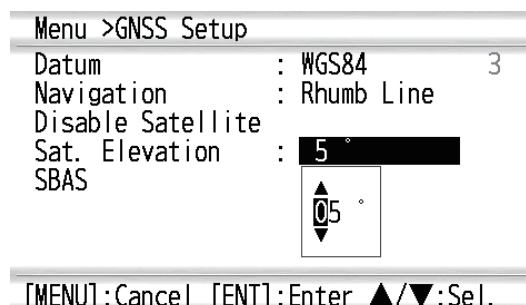
Menu item	Description
[SBAS Mode]	Select [On] to enable SBAS or select [Off] to disable the feature.
[SBAS Search]	Select the appropriate option. <ul style="list-style-type: none"> <li>• Auto: automatically search for and use SBAS.</li> <li>• Manual: manually enter the SBAS you want to use.</li> </ul>
[Disable SBAS]	Set the number for each SBAS you want to ignore.

**Note:** You cannot manually select an SBAS which is set to ignore at [Disable SBAS]. Further, you cannot ignore an SBAS which is already manually selected at [SBAS Search].

### 3.2.3 How to set an elevation mask

Satellites with a low elevation may be unreliable due to atmospheric conditions or signal multipath. For this reason, you may want to apply an elevation mask, which excludes satellites below the specified elevation. You can set an elevation mask with the following procedure.

1. Open the menu.
2. Select [GNSS Setup] to show the [GNSS Setup] menu.

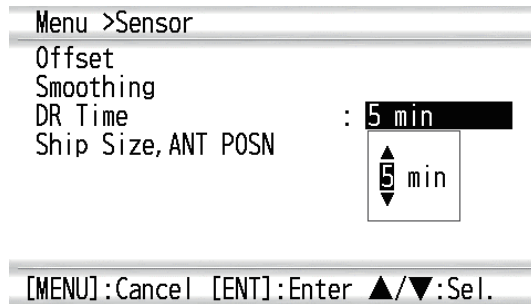


3. Select [Sat. Elevation].
4. Set the elevation at which you want the mask to stop. Satellites below this elevation will be ignored.
5. Close the menu.

### 3.2.4 How to set a time limit for dead reckoning

When the SCX-21 cannot receive the signal from a satellite, the SCX-21 continues to output heading data as “dead reckoning” for the time set here. If the signal from the satellite cannot be retrieved within the time set here, the SCX-21 stops outputting the heading data. You can set a time limit for the use of dead reckoning with the following procedure.

1. Open the menu.
2. Select [Sensor]. The [Sensor] menu appears.



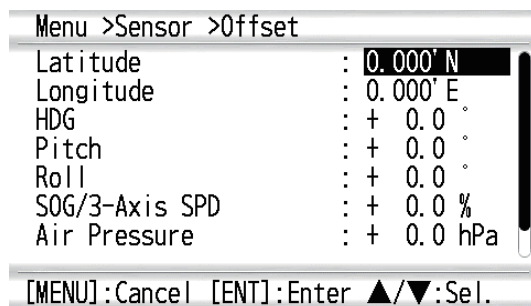
3. Select [DR Time], then select the desired time limit.
4. Close the menu.

### 3.3 How to Apply Offsets

The SCX-21 outputs various data, such as roll and pitch, which may require minor adjustment based on installation location and other factors. You can offset the sensor data with the following procedure.

**Note:** Offsets selected in the following procedure are applied only to the SCX-21; to offset data for other sensors on your vessel, access the respective sensor.

1. Open the menu.
2. Select [Sensor], then select [Offset] to show the [Offset] menu.



3. Referring to the following table, apply any necessary offsets.

Menu item	Description
[Latitude], [Longitude]	Offset the position of your own vessel. Only change this setting if you are absolutely sure of the offset value required. Typically, this adjustment should be done by a qualified technician.
[HDG]	Offset the heading value. Set a negative value to offset in the port direction, set a positive value to offset in the starboard direction. For example, if the on-screen heading shows 10° to port, and the actual heading is 0°, set the offset as [+10°].

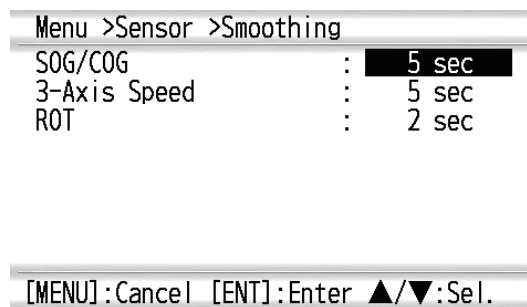
Menu item	Description
[Pitch]	Offset the pitch value. Set a negative value to lower the bow, set a positive value to raise the bow. For example, if the on-screen pitch shows +10°, and the vessel is in fact moored and in calm waters, set the offset as [-10°].
[Roll]	Offset the roll value. Set a negative value to offset in the port direction, set a positive value to offset in the starboard direction. For example, if the on-screen roll shows +0°, and the vessel is in fact listing to port at 10°, set the offset as [+10°].
[SOG/3-Axis SPD]	Offset the speed value. Set a negative value (%) to reduce the displayed speed, set a positive value (%) to increase the displayed speed.
[Air Pressure]	Offset the atmospheric air pressure value. Set a negative value to reduce the displayed pressure, set a positive value to increase the displayed pressure.
[Air Temperature]	Offset the atmospheric air temperature value. Set a negative value to reduce the displayed temperature, set a positive value to increase the displayed temperature.

4. Close the menu.

### 3.3.1 Data Smoothing (Damping)

Data output from the SCX-21 and input to the GP-39 can be smoothed (damped). Smoothing places a small delay on the output of data from the SCX-21, which reduces variations caused by unfavorable receiving conditions, or other factors.

1. Open the menu.
2. Select [Sensor], then select [Smoothing] to show the [Smoothing] menu.



3. Select the item whose data you want smooth, then select the smoothing time.
4. Close the menu.

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

## 3.4 How to Setup Data Output

The SCX-21 can output NMEA 0183 sentences to other equipment on the same NMEA 0183 connection. Output can be setup for up to three channels (data ports) depending on your ship's equipment configuration.

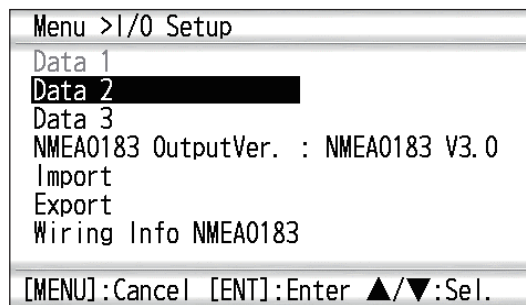
When a GP-39 is used as a dedicated display unit, the Data 1 port is not available for output. However, in this case, both Data 2 and Data 3 ports are available for data output.

When the SCX-21 is connected directly to the NMEA 0183, all three data ports can output.

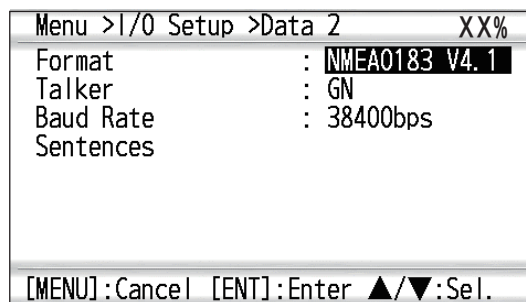
### 3.4.1 Setting up a data port for output

All three data ports can be setup for output with the following procedure.

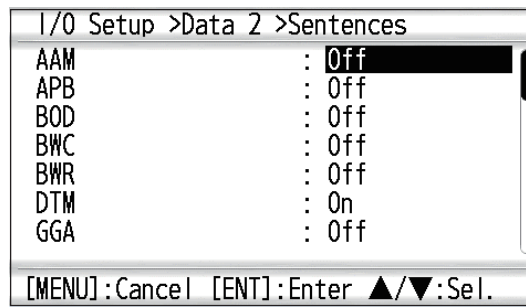
1. Open the menu.
2. Select [I/O Setup] to show the [I/O Setup] menu.



3. Select the data port you want to setup.  
**Note:** Data 1 is not available for output when a GP-39 is connected as a dedicated display unit.



4. Select [Format], to show the NMEA 0183 versions available for output.
5. Select the NMEA 0183 version used within your ship's network.  
 For configurations using a NMEA data converter to output NMEA 0183 data to a NMEA 2000 device or network, select [IEC61162-1 Ed.5].
6. Select [Talker], then select the talker to use.
7. Select [Baud Rate], then select the same baud rate as used by your NMEA 0183 network.
8. Select [Sentences] to show the sentence setup menu. This menu allows you to select which sentences you want the SCX-21 to output and the cycle at which to send each sentence.  
**Note:** Output cycle is dependent on the sentence and available options differ.



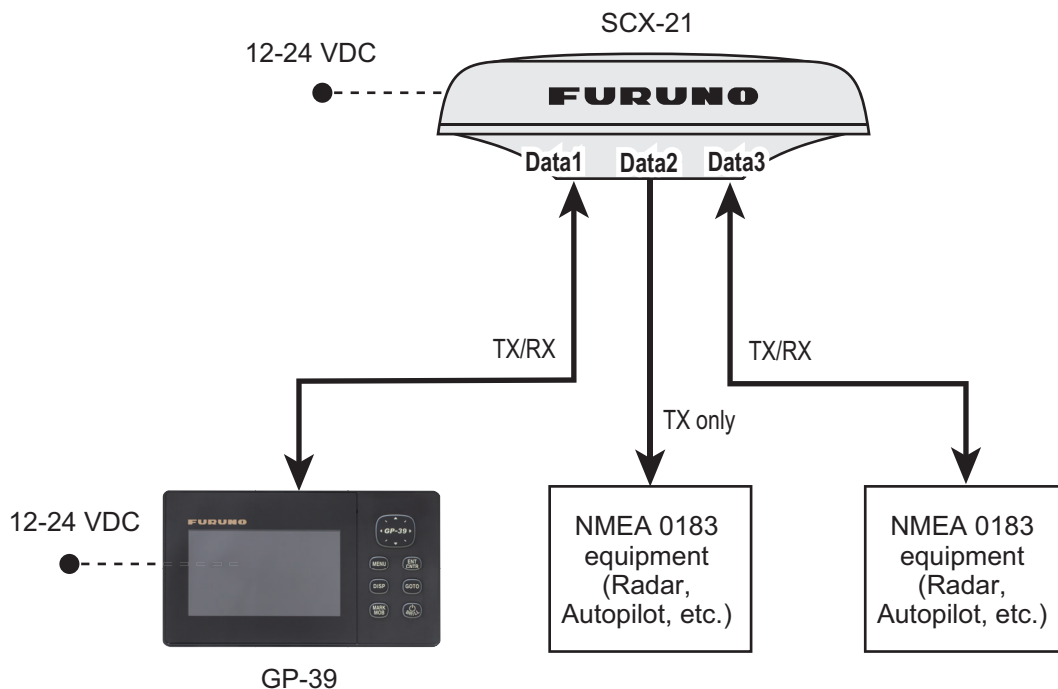
9. Select the sentence you want to setup.
10. To prevent the output of a selected sentence, select [Off]. In all other cases, select the appropriate output cycle for the sentence.
11. Repeat steps 9 and 10 as required to setup other sentences (noting output percentage utilized at the top of screen).
12. Close the menu.

### 3.4.2 How to setup the SCX-21 as a data relay

The GP-39 has only one SIO port, allowing only a single connection to an NMEA 0183 network. The SCX-21 can act as a “data relay”, allowing multiple data connections to the GP-39.

The following figure shows a connection example. For further details regarding the relay feature, consult your local FURUNO dealer.

**Note:** The SCX-21 and GP-39 require different power supplies. You cannot turn SCX-21 on/off from power button on GP-39.



Connect the external equipment to the appropriate data port (Data 1 to Data 3) on the SCX-21. Each port role is shown below;

Data 1 port: Connect the GP-39. **Receive/Send** relayed data between GP-39 and the external equipment via SCX-21.

### 3. INITIAL SETTINGS

Data 2 port: **Send** relayed data from GP-39 to the external equipment via SCX-21.

Data 3 port: **Receive/Send** relayed data between GP-39 and the external equipment via SCX-21.

#### **Setup on the external equipment**

Select the output data sentences you want to send to the GP-39. See the appropriate equipment's operator's manual for how to set up sentence output.

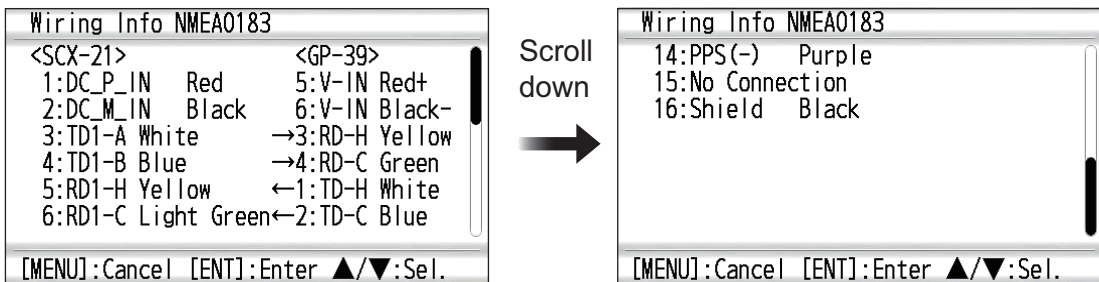
#### **Setup on GP-39s**

Set up sentence output referring to subsection 3.4.1.

Set the sentence formats which is output to an external equipment via SCX-21 from GP-39 at [NMEA0183 Output Version for GP-39] menu on [I/O Setup] menu.

## 3.5 Wiring Information between SCX-21 and GP-39

To show the wiring information between SCX-21 and GP-39, select [Wiring Info. NMEA 0183] menu on [I/O Setup] menu.



# 4. MAINTENANCE

## 4.1 Preventative Maintenance

The following preventative maintenance and checks are important for good performance.

Item to check	Points to check	Remedy
Connectors	Check that the connectors are firmly connected.	Reconnect loosened cables.
Cable run (cabling)	Visually check the cables for wear and tear or damage.	Consult your dealer for cable replacement.
Cover	Cleanliness of the cover	Dust can be removed with a soft cloth. Do not use chemical-based cleaners or solvents as they can remove paint/markings and cause the cover to deform.

## 4.2 Fuse Replacement

The SCX-21 has a fuse, located on the power cable, to protect the equipment from overcurrent, reverse polarity and equipment fault. If power cannot be turned on, check if the fuse has blown. If the fuse has blown, determine and rectify the cause before replacing the fuse.

Type	Code
FRU-60V-FU-2A	000-195-429-10

## 4.3 Troubleshooting

This section covers possible problems which may arise while using the SCX-21 and how to address each problem.

Problem	Possible cause	Remedy
Data is not received from the SCX-21.	Cable is disconnected, damaged, or faulty.	Check the SCX-21 cable connectors are firmly connected. Check that the cable is not damaged or severed. Also confirm that the power source of SCX-21 is powered and functioning normally. Contact your local dealer for service as required.
	Incorrect settings at the SCX-21.	Check the SCX-21 output settings are correct and the following settings for output sentences matches the display unit's specifications. <ul style="list-style-type: none"><li>• Format</li><li>• Talker</li><li>• Baud rate</li></ul>
	Incorrect settings at the display.	Refer to the display unit's manual and adjust the settings as required.

#### 4. MAINTENANCE

Problem	Possible cause	Remedy
Data (heading, etc.) shown on the screen is not correct.	Offsets not applied at installation, or not applied correctly.	<ul style="list-style-type: none"> <li>• Check that the antennalocation is proper.</li> <li>• Check the incorrect item against other equipment by sight. Adjust the offsets as required.</li> </ul>
GLONASS satellites do not appear on the satellite monitor.	ANT4 is selected.	Antenna number 4 cannot detect GLONASS satellites. Select a different antenna.
Diagnostic test is not completed, or results seem incorrect.	The diagnostic test is started before the SCX-21 has completed startup and obtained a position fix.	Wait until data output from the SCX-21 is stable, then retry the diagnostic test.

### 4.4 GP-39 Related Errors and Remedies

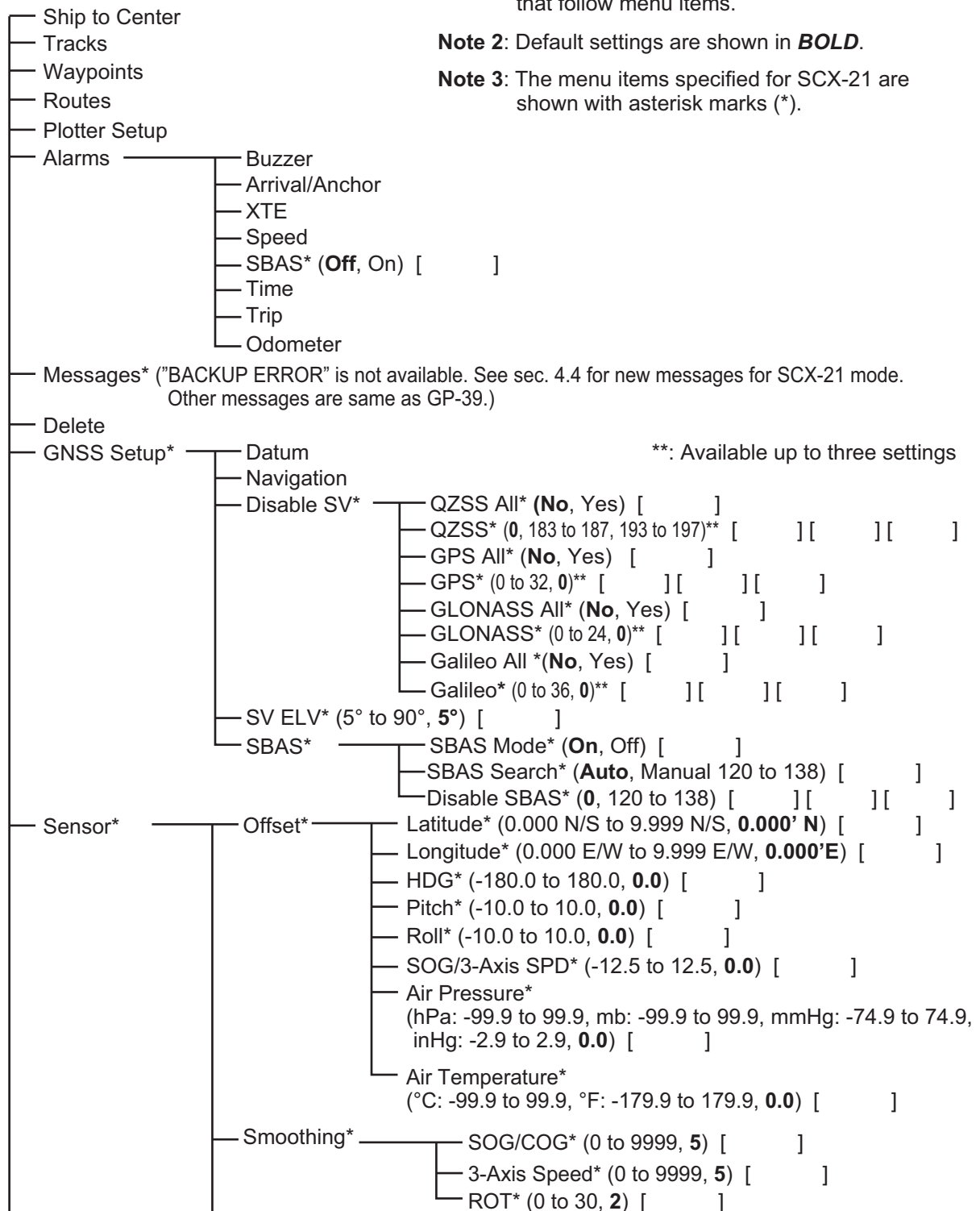
This section covers errors which may occur when the SCX-21 is connected with the GP-39 as a dedicated display. For GP-39 specific errors and remedies, see the GP-39 operator's manual.

Error text	Meaning, possible cause(s), remedies
HDG ERROR!	<b>Meaning:</b> Heading data has not been received from the SCX-21 for more than 5 seconds.
	<b>Possible cause:</b> Power is not supplied to the SCX-21. <b>Remedy:</b> Check that power is supplied to the SCX-21. If the problem persists, contact your local dealer.
	<b>Possible cause:</b> The SCX-21 is currently in diagnostic test mode, or a factory reset is in process. <b>Remedy:</b> Wait until the test or reset is complete.
COMMUNICATION TIMEOUT!	<b>Meaning:</b> Communications between the SCX-21 and GP-39 is not possible or has been interrupted.
	<b>Possible cause:</b> Bad/loose connection. <b>Remedy:</b> Check the connections between the units and re-fasten any loose connections. If the problem persists, contact your local dealer.
	<b>Possible cause:</b> SCX-21 is not powered. <b>Remedy:</b> Check that power is supplied to the SCX-21. If the problem persists, contact your local dealer.
	<b>Possible cause:</b> Damaged cables. <b>Remedy:</b> Check connecting cables for damage, replace as required. If the problem persists, contact your local dealer.
Antenna1 Error	<b>Meaning:</b> The indicated antenna has malfunctioned or is damaged. <b>Remedy:</b> Contact your local dealer for service.
Antenna2 Error	
Antenna3 Error	
Antenna4 Error	
GPS NO FIX!	<b>Meaning:</b> SCX-21 is unable to obtain a positioning fix for more than 80 seconds. <b>Possible cause:</b> Too many obstructions. <b>Remedy:</b> Check the area around the SCX-21 for obstructions. Move the unit if necessary.
	<b>Possible cause:</b> Insufficient satellites available from the selected group. <b>Remedy:</b> Check the settings at [GNSS Setup] → [Disable SV] and adjust as necessary.

# APPENDIX 1 MENU TREE

The following menu trees are shown the menu tree of GP-39 which connected to SCX-21. Basically, the menu items are common to GP-39 when it is not connected to SCX-21. Unique menu settings when connected to the SCX21 are shown with "\*" (Asterisk) mark. Otherwise, see the menu tree in the Operator's manual for GP-39 for details.

[MENU] key



**Note 1:** Record user settings inside the brackets ([ ]) that follow menu items.

**Note 2:** Default settings are shown in **BOLD**.

**Note 3:** The menu items specified for SCX-21 are shown with asterisk marks (\*).

\*\* : Available up to three settings

1

2 Continued on the following page

1

2 **Continued from the previous page**

- DR Time\* (1 to 5, **5**) [       ]
- Ship Size, ANT/CALCSPD POSN\*
  - Show ANT POSN\* (Displays antenna position.)
  - Ship's Width\* (1.0 to 999.9, **3.0**) [       ]
  - Ship's Length\* (1.0 to 999.9, **10.0**) [       ]
  - Ship's Height\* (1.0 to 199.9, **5.0**) [       ]
  - ANT Position X0\* (-327.64 to +327.64, **0.00**) [       ]
  - ANT Position Y0\* (0.0 to 999.9, **5.0**) [       ]
  - ANT Position Z0\* (0.0 to 199.9, **2.5**) [       ]
  - CALC-SPD-POSN Y1 (BOW)\* (0.0 to 999.9, **0.0**) [       ]
  - CALC-SPD-POSN Y2 (Stern)\* (0.0 to 999.9, **10.0**) [       ]
  - CALC-SPD-POSN Z (Height)\* (0.0 to 199.9, **0.0**) [       ]

I/O Setup\*

DATA 1\* (shown in grey and cannot be changed if a GP-39 is connected at any time)

- Format\* (NMEA0183 V3.0) • Talker\* (GN) • Baud Rate\* (38400)
- Sentences\*: AAM (Off), APB (Off), BOD (Off), BWC (Off), BWR (Off), DTM (Off), GGA (Off), GLL (Off), GNS (1sec), GSA (Off), GSV (Off), HDG (Off), HDT (Off), HRM (Off), POS (Off), RMB (Off), RMC (1sec), ROT (200msec), THS (200msec), VBW (1sec), VTG (1sec), XDR (1sec), XTE (Off), ZDA (1sec), GPatt (200msec), GPhve (200msec), GPimu (Off), GPmsv (On)

**Note:** SCX-21 default settings when GP-39 has never been connected.

- Format\* (**NMEA0183 V4.1**) • Talker\* (**GN**) • Baud Rate\* (**38400**)
- Sentences\*: AAM (**Off**), APB (**Off**), BOD (**Off**), BWC (**Off**), BWR (**Off**), DTM (**On**), GGA (**Off**), GLL (**Off**), GNS (**1sec**), GSA (**Off**), GSV (**1sec**), HDG (**Off**), HDT (**100msec**), HRM (**Off**), POS (**Off**), RMB (**Off**), RMC (**Off**), ROT (**200msec**), THS (**100msec**), VBW (**1sec**), VTG (**1sec**), XDR (**Off**), XTE (**Off**), ZDA (**1sec**), GPatt (**100msec**), GPhve (**100msec**), GPimu (**Off**), GPmsv (**Off**)

DATA 2\*

- Format\* (NMEA0183 V1.5, NMEA0183 V2.0, NMEA0183 V3.0, **NMEA0183 V4.1**, IEC61162-1 Ed.5) [       ]
- Talker\* (GP, GL, GA, **GN**, HE, HN, HC) [       ]
- Baud Rate\* (4800, **38400**) [       ]
- Sentences\*;
- AAM (**Off**, 1sec) [       ]
- APB (**Off**, 1sec) [       ]
- BOD (**Off**, 1sec) [       ]
- BWC (**Off**, 1sec) [       ]
- BWR (**Off**, 1sec) [       ]
- DTM (Off, **On**) [       ]
- GGA (**Off**, 100msec, 200msec, 1sec, 2sec) [       ]
- GLL (**Off**, 100msec, 200msec, 1sec, 2sec) [       ]
- GNS (Off, 100msec, 200msec, **1sec**, 2sec) [       ]
- GSA (**Off**, 1sec, 2sec) [       ]
- GSV (Off, **1sec**, 2sec) [       ]
- HDG (**Off**, 20msec, **25msec**, 100msec, 200msec, 1sec, 2sec) [       ]
- HDT (Off, 20msec, **25msec**, 100msec, 200msec, 1sec, 2sec) [       ]
- HRM (**Off**, 20msec, 25msec, 100msec, 200msec) [       ]
- POS (**Off**, 3sec, 30sec) [       ]
- RMB (**Off**, 1sec) [       ]
- RMC (**Off**, 100msec, 200msec, 1sec, 2sec) [       ]
- ROT (**Off**, 20msec, 25msec, 100msec, 200msec, 1sec, 2sec) [       ]
- THS (**Off**, 20msec, 25msec, 100msec, 200msec, 1sec, 2sec) [       ]
- VBW (**Off**, 1sec, 2sec) [       ]
- VTG (Off, **1sec**, 2sec) [       ]
- XDR (**Off**, 1sec, 2sec) [       ]
- XTE (**Off**, 1sec) [       ]
- ZDA (Off, **1sec**, 2sec) [       ]
- GPatt (**Off**, 20msec, 25msec, 100msec, 200msec, 1sec, 2sec) [       ]
- GPhve (**Off**, 20msec, 25msec, 100msec, 200msec, 1sec, 2sec) [       ]
- GPimu (**Off**, 25msec, 100msec, 200msec, 1sec, 2sec) [       ]
- GPmsv (**Off**, On) [       ]

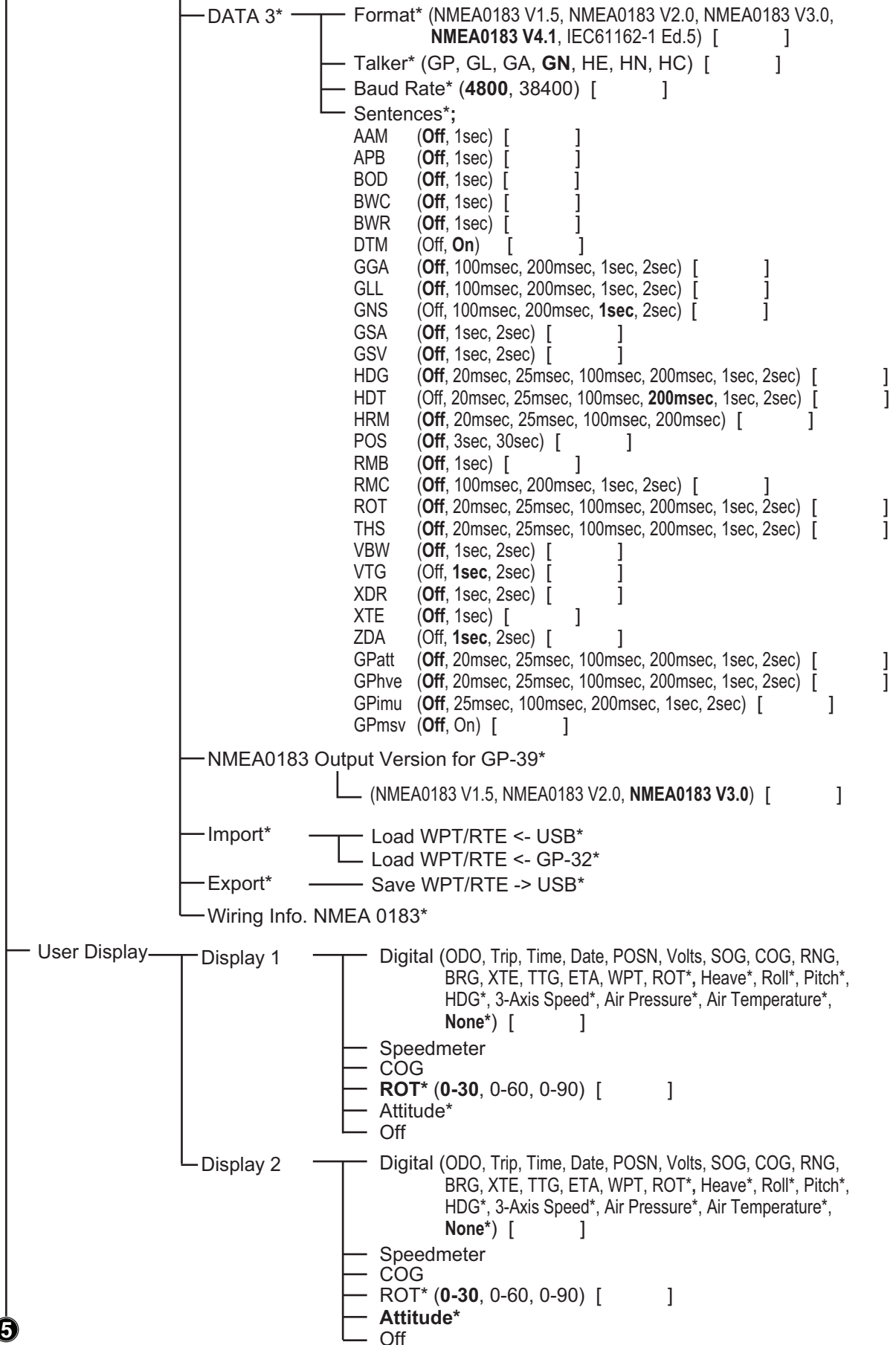
3

4

**Continued on the following page**

3

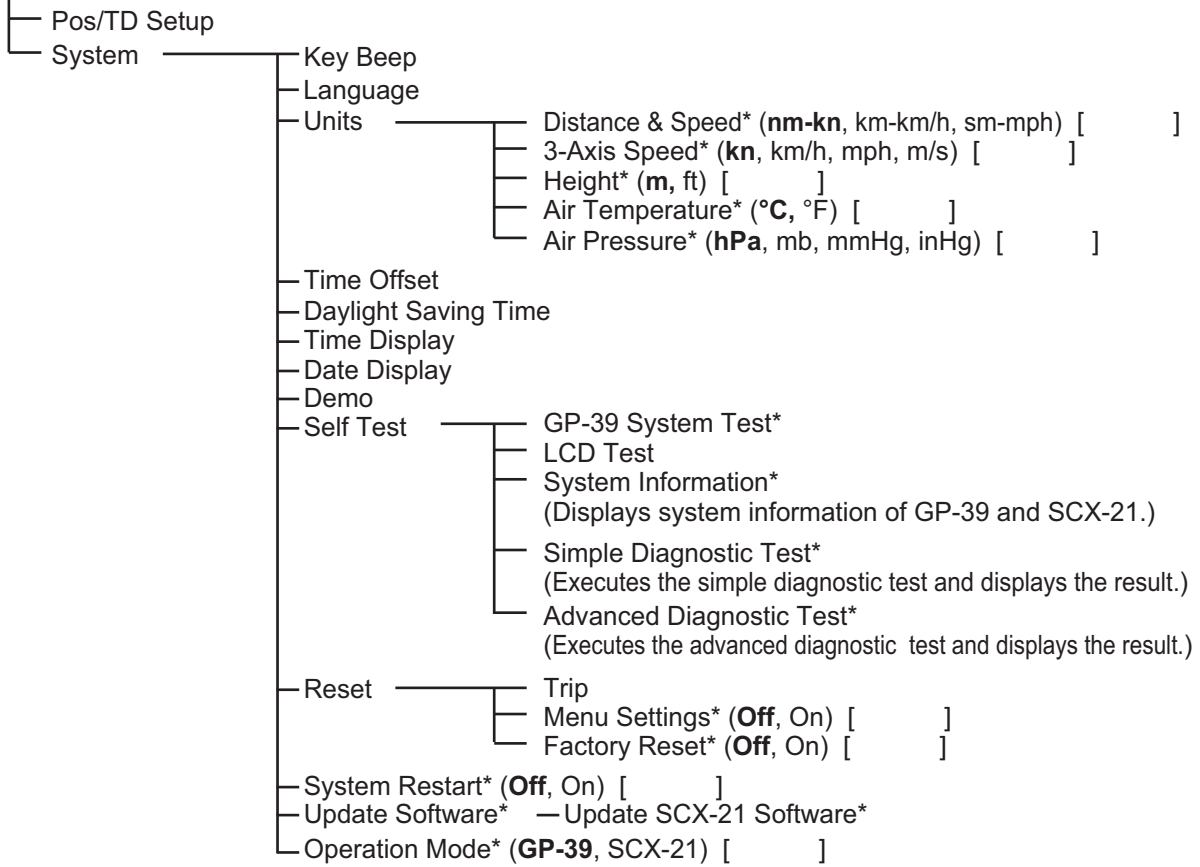
4 *Continued from the previous page*



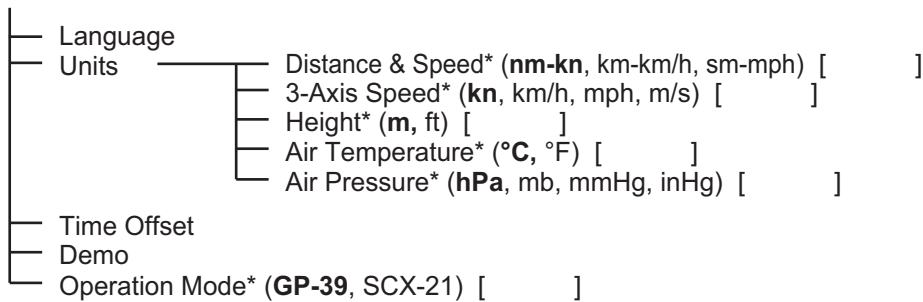
5

*Continued on the following page*

⑤ Continued from the previous page



Installation (Displayed at startup of GP-39)



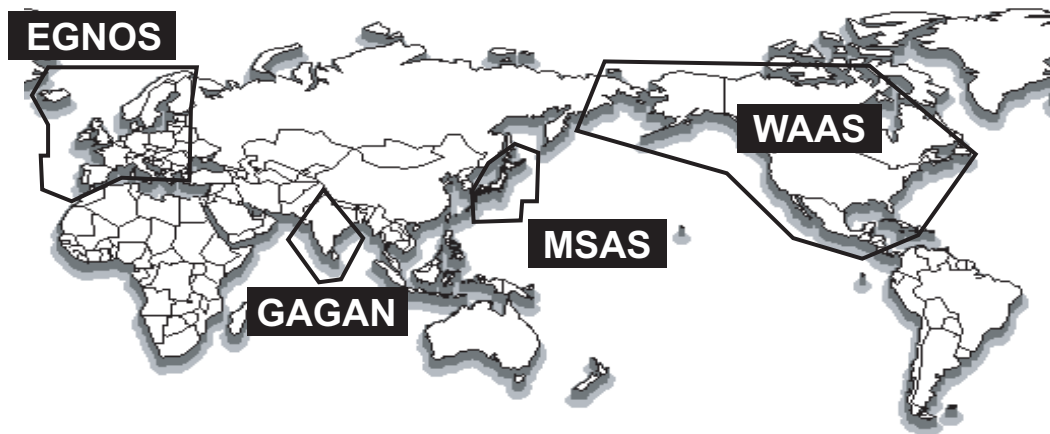
# APPENDIX 2 GEODETIC CHART CODES

001: WGS84		
002: WGS72		
003: TOKYO	: Mean Value (Japan, Korea & Okinawa)	
004: NORTH AMERICAN 1927	: Mean Value (CONUS)	
005: EUROPEAN 1950	: Mean Value	
006: AUSTRALIAN GEODETIC 1984	: Australia & Tasmania	
007: ADINDAN	: Mean Value (Ethiopia & Sudan)	
008: ADINDAN	: Ethiopia	
009: ADINDAN	: Mali	
010: ADINDAN	: Senegal	
011: ADINDAN	: Sudan	
012: AFG	: Somalia	
013: AIN EL ABD 1970	: Bahrain Is.	
014: ANNA 1 ASTRO 1965	: Cocos Is.	
015: ARC 1950	: Mean Value	
016: ARC 1950	: Botswana	
017: ARC 1950	: Lesotho	
018: ARC 1950	: Malawi	
019: ARC 1950	: Swaziland	
020: ARC 1950	: Zaire	
021: ARC 1950	: Zambia	
022: ARC 1950	: Zimbabwe	
023: ARC 1960	: Mean Value (Kenya & Tanzania)	
024: ARC 1960	: Kenya	
025: ARC 1960	: Tanzania	
026: ASCENSION IS. 1958	: Ascension Is.	
027: ASTRO BEACON "E"	: Iwo Jima Is.	
028: ASTRO B4 SOR. ATOLL	: Tern Is.	
029: ASTRO POS 71/4	: St. Helena Is.	
030: ASTRONOMIC STATION 1952	: Marcus Is.	
031: AUSTRALIAN GEODETIC 1966	: Australia & Tasmania	
032: BELLEVUE (IGN)	: Efate & Erromango Is.	
033: BERMUDA 1957	: Bermuda Is.	
034: BOGOTA OBSERVATORY	: Columbia	
035: CAMPO INCHAUSPE	: Argentina	
036: CANTON IS. 1966	: Phoenix Is.	
037: CAPE	: South Africa	
038: CAPE CANAVERAL	: Mean Value (Florida & Bahama Is.)	
039: CARTHAGE	: Tunisia	
040: CHATHAM 1971	: Chatham Is. (New Zealand)	
041: CHUA ASTRO	: Paraguay	
042: CORREGO ALEGRE	: Brazil	
043: DJAKARTA (BATAVIA)	: Sumatra Is. (Indonesia)	
044: DOS 1968	: Gizo Is. (New Georgia Is.)	
045: EASTER IS. 1967	: Easter Is.	
046: EUROPEAN 1950 (Cont'd)	: Western Europe	
047: EUROPEAN 1950 (Cont'd)	: Cyprus	
048: EUROPEAN 1950 (Cont'd)	: Egypt	
049: EUROPEAN 1950 (Cont'd)	: England, Scotland, Channel & Shetland Is.	
050: EUROPEAN 1950 (Cont'd)	: England, Ireland, Scotland & Shetland Is.	
051: EUROPEAN 1950 (Cont'd)	: Greece	
052: EUROPEAN 1950 (Cont'd)	: Iran	
053: EUROPEAN 1950 (Cont'd)	: Italy, Sardinia	
054: EUROPEAN 1950 (Cont'd)	: Italy, Sicily	
055: EUROPEAN 1950 (Cont'd)	: Norway & Finland	
056: EUROPEAN 1950 (Cont'd)	: Portugal & Spain	
057: EUROPEAN 1979	: Mean Value	
058: GANDAJIKA BASE	: Republic of Maldives	
059: GEODETIC DATUM 1949	: New Zealand	
060: GUAM 1963	: Guam Is.	
061: GUX 1 ASTRO	: Guadalcanal Is.	
062: HJORSEY 1955	: Iceland	
063: HONG KONG 1963	: Hong Kong	
064: INDIAN	: Thailand & Vietnam	
065: INDIAN	: Bangladesh, India & Nepal	
066: IRELAND 1965	: Ireland	
067: ISTS 073 ASTRO 1969	: Diego Garcia	
068: JOHNSTON IS. 1961	: Johnston Is.	
069: KANDAWALA	: Sri Lanka	
070: KERGUELEN IS.	: Kerguelen Is.	
071: KERTAU 1948	: West Malaysia & Singapore	
072: LA REUNION	: Mascarene Is.	
073: L. C. 5 ASTRO	: Cayman Brac Is.	
074: LIBERIA 1964	: Liberia	
075: LUZON	: Philippines (excl. Mindanao Is.)	
076: LUZON	: Mindanao Is.	
077: MAHE 1971	: Mahe Is.	
078: MARCO ASTRO	: Salvage Islands	
079: MASSAWA	: Eritrea (Ethiopia)	
080: MERCHICH	: Morocco	
081: MIDWAY ASTRO 1961	: Midway Is.	
082: MINNA	: Nigeria	
083: NAHRWAN	: Masirah Is. (Oman)	
084: NAHRWAN	: United Arab Emirates	
085: NAHRWAN	: Saudi Arabia	
086: NAMIBIA	: Namibia	
087: MAPARIMA, BWI	: Trinidad & Tobago	
088: NORTH AMERICAN 1927	: Western United States	
089: NORTH AMERICAN 1927	: Eastern United States	
090: NORTH AMERICAN 1927	: Alaska	
091: NORTH AMERICAN 1927	: Bahamas (excl. San Salvador Is.)	
092: NORTH AMERICAN 1927	: Bahamas, San Salvador Is.	
093: NORTH AMERICAN 1927 (Cont'd)	: Canada (incl. Newfoundland Is.)	
094: NORTH AMERICAN 1927 (Cont'd)	: Alberta & British Columbia	
095: NORTH AMERICAN 1927 (Cont'd)	: East Canada	
096: NORTH AMERICAN 1927 (Cont'd)	: Manitoba & Ontario	
097: NORTH AMERICAN 1927 (Cont'd)	: Northwest Territories & Saskatchewan	
098: NORTH AMERICAN 1927 (Cont'd)	: Yukon	
099: NORTH AMERICAN 1927 (Cont'd)	: Canal Zone	
100: NORTH AMERICAN 1927 (Cont'd)	: Caribbean	
101: NORTH AMERICAN 1927 (Cont'd)	: Central America	
102: NORTH AMERICAN 1927 (Cont'd)	: Cuba	
103: NORTH AMERICAN 1927 (Cont'd)	: Greenland	
104: NORTH AMERICAN 1927 (Cont'd)	: Mexico	
105: NORTH AMERICAN 1983	: Alaska	
106: NORTH AMERICAN 1983	: Canada	
107: NORTH AMERICAN 1983	: CONUS	
108: NORTH AMERICAN 1983	: Mexico, Central America	
109: OBSERVATORIO 1966	: Corvo & Flores Is. (Azores)	
110: OLD EGYPTIAN 1930	: Egypt	
111: OLD HAWAIIAN	: Mean Value	
112: OLD HAWAIIAN	: Hawaii	
113: OLD HAWAIIAN	: Kauai	
114: OLD HAWAIIAN	: Maui	
115: OLD HAWAIIAN	: Oahu	
116: OMAN	: Oman	
117: ORDNANCE SURVEY OF GREAT BRITAIN 1936	: Mean Value	
118: ORDNANCE SURVEY OF GREAT BRITAIN 1936	: England	
119: ORDNANCE SURVEY OF GREAT BRITAIN 1936	: England, Isle of Man & Wales	
120: ORDNANCE SURVEY OF GREAT BRITAIN 1936	: Scotland & Shetland Is.	
121: ORDNANCE SURVEY OF GREAT BRITAIN 1936	: Wales	
122: PICO DE LAS NIVIES	: Canary Is.	
123: PITCAIRN ASTRO 1967	: Pitcairn Is.	
124: PROVISIONAL SOUTH CHILEAN 1963	: South Chile (near 53°S)	
125: PROVISIONAL SOUTH AMERICAN 1956	: Mean Value	
126: PROVISIONAL SOUTH AMERICAN 1956	: Bolivia	
127: PROVISIONAL SOUTH AMERICAN 1956	: Chile-Northern Chile (near 19°S)	
128: PROVISIONAL SOUTH AMERICAN 1956	: Chile-Southern Chile (near 43°S)	
129: PROVISIONAL SOUTH AMERICAN 1956	: Columbia	
130: PROVISIONAL SOUTH AMERICAN 1956	: Ecuador	
131: PROVISIONAL SOUTH AMERICAN 1956	: Guyana	
132: PROVISIONAL SOUTH AMERICAN 1956	: Peru	
133: PROVISIONAL SOUTH AMERICAN 1956	: Venezuela	
134: PUERTO RICO	: Puerto Rico & Virgin Is.	
135: QATAR NATIONAL	: Qatar	
136: QORNOQ	: South Greenland	
137: ROME 1940	: Sardinia Is.	
138: SANTA BRAZ	: Sao Miguel, Santa Maria Is. (Azores)	
139: SANTO (DOS)	: Espirito Santo Is.	
140: SAPPER HILL 1943	: East Falkland Is.	
141: SOUTH AMERICAN 1969	: Mean Value	
142: SOUTH AMERICAN 1969	: Argentina	
143: SOUTH AMERICAN 1969	: Bolivia	
144: SOUTH AMERICAN 1969	: Brazil	
145: SOUTH AMERICAN 1969	: Chile	
146: SOUTH AMERICAN 1969	: Columbia	
147: SOUTH AMERICAN 1969	: Ecuador	
148: SOUTH AMERICAN 1969	: Guyana	
149: SOUTH AMERICAN 1969	: Paraguay	
150: SOUTH AMERICAN 1969	: Peru	
151: SOUTH AMERICAN 1969	: Trinidad & Tobago	
152: SOUTH AMERICAN 1969	: Venezuela	
153: SOUTH ASIA	: Singapore	
154: SOUTHEAST BASE	: Porto Santo & Madeira Is.	
155: SOUTHWEST BASE	: Faial, Graciosa, Pico, Sao Jorge & Terceira Is.	
156: TIMBALAI 1948	: Brunei & East Malaysia (Sarawak & Sabah)	
157: TOKYO	: Japan	
158: TOKYO	: Korea	
159: TOKYO	: Okinawa	
160: TRISTAN ASTRO 1968	: Tristan da Cunha	
161: VITI LEVU 1916	: Viti Levu Is. (Fiji Is.)	
162: WAKE-ENIWETOK 1960	: Marshall Is.	
163: ZANDERIJ	: Surinam	
164: BUKIT RIMPAH	: Bangka & Belitung Is. (Indonesia)	
165: CAMP AREA ASTRO	: Camp Mowuro Area, Antarctica	
166: G. SEGARA	: Kalimantan Is. (Indonesia)	
167: HERAT NORTH	: Afghanistan	
168: HU-TZU-SHAN	: Taiwan	
169: TANANARIVE OBSERVATORY 1925	: Madagascar	
170: YACARE	: Uruguay	
171: RT-90	: Sweden	
172: CK42 (PULKOVO 1942)	: Russia	
173: FINNISH KKJ	: Finland	
174: PZ90	: Russia	
175: CK95	: Russia	

# APPENDIX 3 WHAT IS SBAS?

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 broadcasted from the geostationary satellite.

SBAS is used in America, Europe, Japan and India. These four systems; WAAS, EGNOS, MSAS and GAGAN, have interoperability. The illustration below shows the coverage area for each provider. This manual uses "SBAS" for these four providers generically.



Provider	Satellite type	Longitude	Satellite No.
WAAS (Wide Area Augmentation System, America)	Intelsat Galaxy XV	133°W	135
	TeleSat Anik F1R	107.3°W	138
	Inmarsat-4-F3	98°W	133
EGNOS (Euro Geostationary Navigation Overlay Service, Europe)	Inmarsat-3-F2/AOR-E	15.5°W	120
	Artemis	21.5°E	124
	Inmarsat-4-F2	25°E	126
	SES-5	5°E	136
MSAS (Multi-Functional Satellite Augmentation System, Japan)	MTSAT-1R	140°E	129
	MTSAT-2	145°E	137
GAGAN (GPS And GEO Augmented Navigation, India)	GSAT-8	55°E	127
	GSAT-10	83°E	128

**SPECIFICATIONS OF SATELLITE COMPASS  
SCX-21**

**1 GENERAL**

- 1.1 Receiving frequency 1575.42 MHz (GPS/Galileo/QZSS/SBAS),  
1602.5625 MHz (GLONASS)
- 1.2 Tracking code C/A code (GPS/QZSS/SBAS), E1B (Galileo), L1OF (GLONASS)
- 1.3 Attitude resolution Heading/ Roll/ Pitch  
1.0° rms (static), 0.5° rms (dynamic)
- 1.4 Tracking bearing 45°/s
- 1.5 Heave accuracy 5 cm (1σ)
- 1.6 Attitude setting time 60 s approx.
- 1.7 Positional accuracy (dependent on ionospheric activity and multipath)
  - GNSS 5 m approx. (2drms, HDOP<4)
  - MSAS 4 m approx. (2drms, HDOP<4)
  - WAAS 3 m approx. (2drms, HDOP<4)
- 1.8 Position fixing time 50 s approx.
- 1.9 Update interval Attitude: 50 Hz max, Position: 10 Hz max.
- 1.10 Ship's speed accuracy
  - SOG 0.02 kn rms (tracking satellites 5 or more)  
0.2 kn rms (tracking satellites 3 or 4)
  - VBW (speed on ground) 0.02 kn rms (tracking satellites 5 or more, at antenna position)  
0.08 kn rms (tracking satellites 5 or more, at another position)  
2.0% of ship's speed or 0.2 kn whichever is the greater  
(tracking satellites 3 or 4)
- 1.11 Atmosphere sensor
  - Pressure 850 to 1100 hPa (temperature range: 0°C to +50°C ),  
accuracy: ±1.0 hPa (offset adjustment)
  - Temperature -20°C to +55°C (relative wind: 4 kn or more),  
accuracy: ±2.0°C (offset adjustment)
- 1.12 Timing (1PPS) accuracy 50 μs

**2 INTERFACE**

- 2.1 Number of ports NMEA0183: Tx 3 channel, Rx 2 channel  
PPS: 1 channel, RS-485, rising edge detecting
- 2.2 Data sentences
  - Input AAM\*, APB\*, BOD\*, BWC\*, BWR\*, RMB\*, TLL\*, XTE\*
  - Output (talker: GN/GA/GL/GP/HC/HE, default: GN)  
AAM\*, APB\*, BOD\*, BWC\*, BWR\*, DTM, GGA, GLL, GNS, GSA,  
GSV, HDG, HDT, HRM, POS, RMB\*, RMC\*\*, ROT, THS, VBW,  
VTG, XDR, XTE\*, ZDA
  - Output (talker: SD) TLL\*
- 2.3 Output P sentences
  - PFEC GPatt, GPhve, GPimu, pidat, SDmrk\*, GPmsv, hdcom

\*: GP-39 required

\*\* : Speed output rate at 200 ms (5 Hz) max. with 100 ms (10 Hz) set.

**3 POWER SUPPLY**

12-24 VDC (10.8-31.2V): 0.2-0.1 A

**4 ENVIRONMENTAL CONDITIONS**

4.1 Ambient temperature -25°C to +55°C (storage: -30°C to +70°C)

4.2 Relative humidity 95% or less at +40°C

4.3 Degree of protection IP56

4.4 Vibration IEC 60945 Ed.4

**5 UNIT COLOR**

N9.5

# PACKING LIST

20BK-X-9852 -1 1/1

SCX-21-\*

A-1

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ユニット			
サテライトコンパス		SCX-21 000-036-767-00	1
予備品			
予備品		SP20-01901 001-556-110-00	1
工事材料			
ケーブル(組品)		FRU-OF-F15M 001-556-560-00	1
CABLE ASSEMBLY		CP20-04601 001-556-150-00	1
工事材料		CP20-04603 001-556-200-00	1
ポールマウントキット		CP20-04605 001-556-240-00	1
マスト取付金具			(*1)
MAST MOUNTING KIT			
図書			
取扱説明書(和/英)		OMC-72870-* 000-195-294-1*	1
OPERATOR'S MANUAL (JP/EN)			

(\*1)の工事材料はP-M仕様のみ必要  
(\*1) IS ONLY REQUIRED FOR P-M SPECIFICATION

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

C7287-Z01-B

# FURUNO

A-2

CODE NO.	TYPE	001-556-150-00	20BK-X-9401-0		
		CP20-04601	1/1		
工事材料表					
INSTALLATION MATERIALS					
番号	名称	略図	型名/規格	数量	用途/備考
1	UP SET UI SCREW		MSX20 SUS304	3	
			000-160-442-10		

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

FURUNO ELECTRIC CO., LTD.

C7286-M01-A

**FURUNO**

CODE NO.	001-556-200-00	20BK-X-9403-0	1/1
TYPE	CP20-04603		

**工事材料表**

## INSTALLATION MATERIALS

番号 NO.	名称 NAME	略図 OUTLINE	型名/規格 DESCRIPTIONS	数量 Q'TY	用途/備考 REMARKS
1	ポールマウント POLE MOUNT ASSEMBLY		CP20-04604 CODE NO. 001-556-210-00	1	
2	ロックナット LOCK NUT		ZO-040-111B-0 CODE NO. 100-429-750-10	1	
3	接着剤 ADHESIVE		T85Z11-506 CODE NO. 001-477-870-00	1	

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

FURUNO ELECTRIC CO . . LTD.

C7286-M03-A

**FURUNO**

CODE NO.	001-556-240-00	20BK-X-9404-0	1/1
TYPE	CP20-04605		

**工事材料表**

## INSTALLATION MATERIALS

番号 NO.	名称 NAME	略図 OUTLINE	型名/規格 DESCRIPTIONS	数量 Q'TY	用途/備考 REMARKS
1	パイプ PIPE		ZO-007-301T-4 CODE NO. 100-183-264-10	1	
2	取付補助金具 FIXING SUPPORT FIXTURE		ZO-040-1117-2 CODE NO. 100-429-742-10	1	
3	ケーブルタイ CABLE TIE		CV-150B CODE NO. 000-167-183-10	1	
4	ホースクリップ (ABA) HOSE CLAMP		SUS316 12MM 38-50 CODE NO. 000-196-736-10	2	

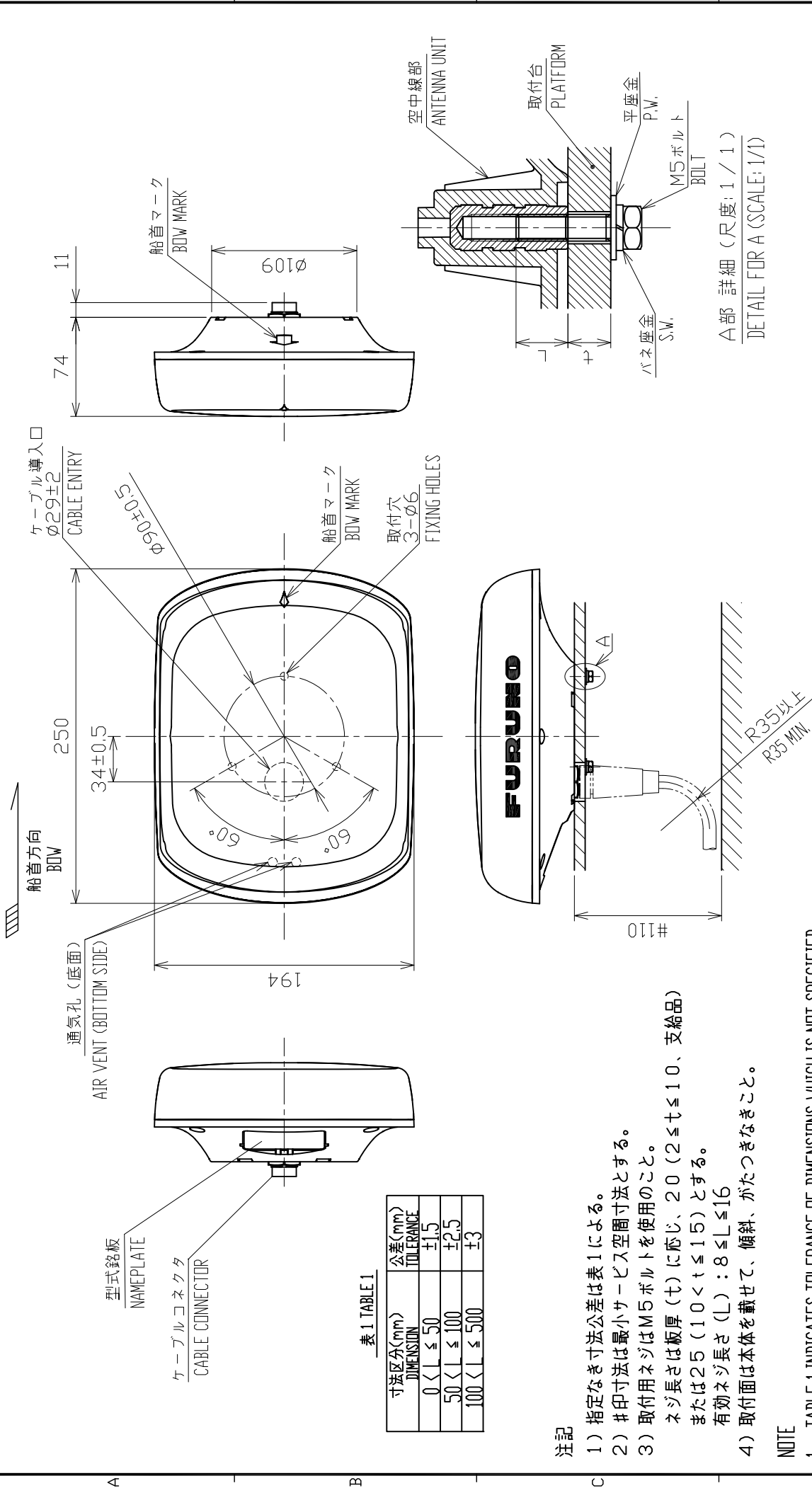
(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO ELECTRIC CO . . LTD.

C7286-M04-A







DRAWN	18/JUL/2019	A. MURAO	TITLE	SCX-21
CHECKED	18/JUL/2019	I. YAMASAKI	名称	サテライトコンパス
APPROVED	31/JUL/2019	H. MAKI	外寸図	
SCALE	1/4	PLSS 1.0	NAME	SATELLITE COMPASS
DWG. No.	C7287-G01-B	REF. No.	20-040-101G-1	OUTLINE DRAWING

注記

- 1) 指定なき寸法公差は表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M5ボルトを使用のこと。  
ネジ長さは板厚 (t) に応じ、20 (2 ≤ t ≤ 10、支給品) または25 (10 < t ≤ 15) とする。  
有効ネジ長さ (L) : 8 ≤ L ≤ 16
- 4) 取付面は本体を載せて、傾斜、がたつきなきこと。

NOTE

1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. # MINIMUM SERVICE CLEARANCE
3. USE M5 BOLTS FOR FIXING THE UNIT.  
SCREW LENGTH SHOULD BE 20 (2 ≤ t ≤ 10) OR 25 (10 < t ≤ 15), t: THICKNESS OF PLATFORM.  
EFFECTIVE THREAD LENGTH (L): 8 ≤ L ≤ 16.
4. MOUNTING AREA MUST BE LEVEL AND STABLE.

表1 TABLE 1

寸法区分 (mm) DIMENSION	公差 (mm) TOLERANCE
L ≤ 50	±1.5
50 < L ≤ 100	±2.5
100 < L ≤ 500	±3

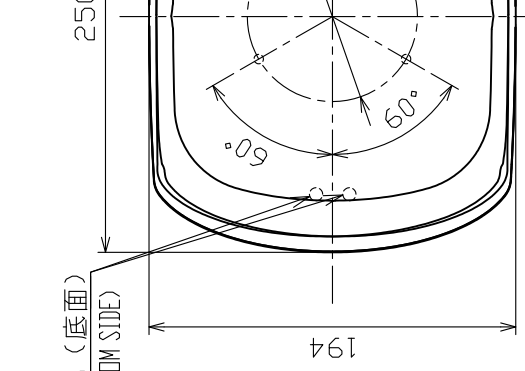
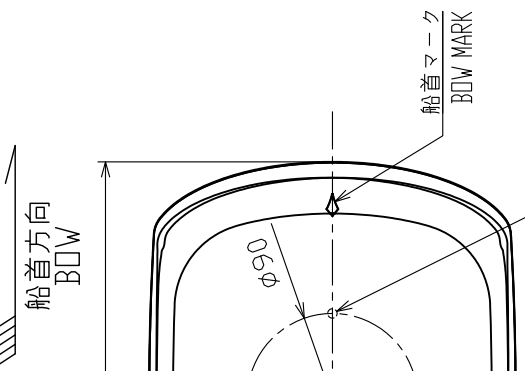
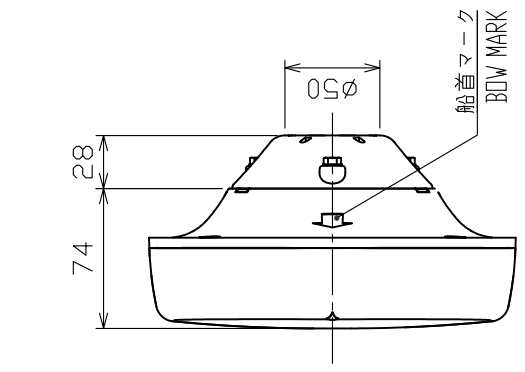


表2 TABLE 2

適応ポール径 POLE DIAMETER	型式 MODEL
φ25-35 (20A-25A)	CP20-4603 (標準) STANDARD
φ35-50 (32A-40A)	DP20-52 (オプション) OPTION

注記  
 1) 指定外の寸法公差は表1による。  
 2) 適応するホースクランプは表2による。

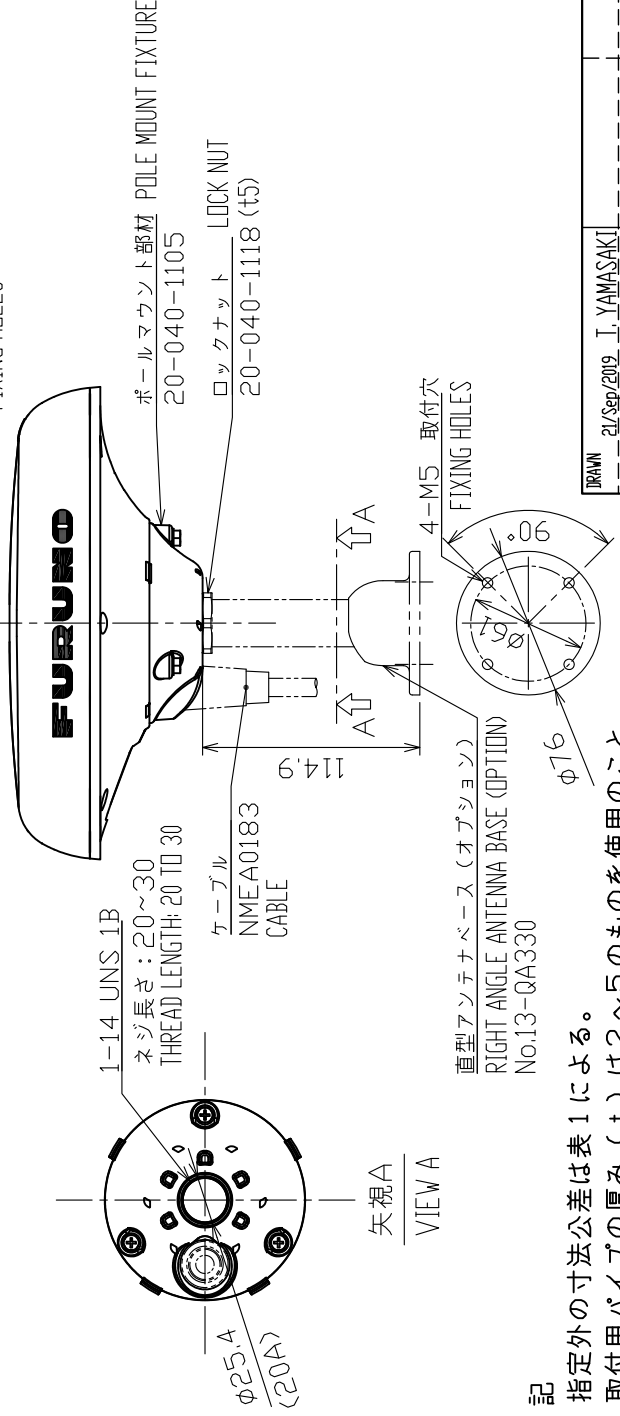
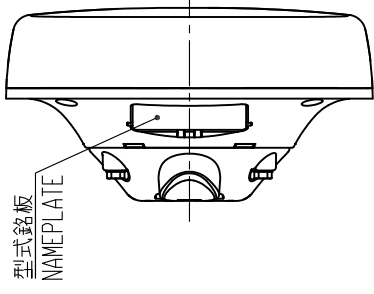
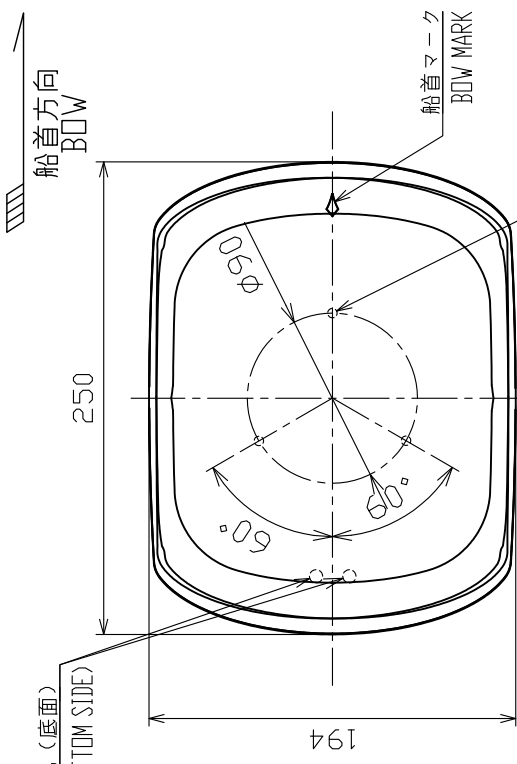
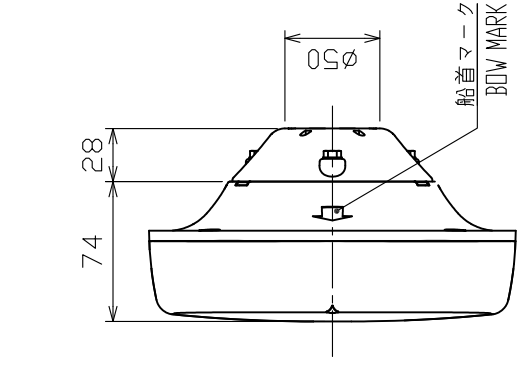
NOTE

- TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
- TABLE 2 INDICATES HOSE CLAMP SIZE.

DRAWN	21/Sep/2019	T. YAMASAKI	TITLE	SCX-21
CHECKED	21/Sep/2019	H. MAKI	名称	サテライトコンパス (ポールマウント)
APPROVED	24/Sep/2019	H. MAKI	外寸図	
SCALE	1/4	質量はケーブル・工材を含みません。 MASS DOES NOT INCLUDE CABLE/INST. MATERIAL.	NAME	SATELLITE COMPASS (POLE MOUNT)
DWG. No.	C7287-G02-C	REF. No.	20-040-103G-2	OUTLINE DRAWING

表1 TABLE 1

寸法区分 (mm) DIMENSION	公差 (mm) TOLERANCE
L ≤ 50	±1.5
50 < L ≤ 100	±2.5
100 < L ≤ 500	±3



DRAWN	21/Sep/2019	I. YAMASAKI	TITLE	SCX-21
CHECKED	21/Sep/2019	H. MAKI	名称	サテライトコンパス (直型アンテナベース)
APPROVED	24/Sep/2019	H. MAKI		外寸図
SCALE	1/4	質量 1.2 kg	NAME	SATELLITE COMPASS (RIGHT ANGLE ANTENNA BASE)
DWG.No.	C7287-G03-A	質量はケーブル・工材を含みません。 MASS DOES NOT INCLUDE CABLE/MST. MATERIAL.	REF.No.	20-040-106G-0
				OUTLINE DRAWING

注 記

1) 指定外の寸法公差は表1による。

2) 取付用パイプの厚み (t) は2~5のものを使用のこと。

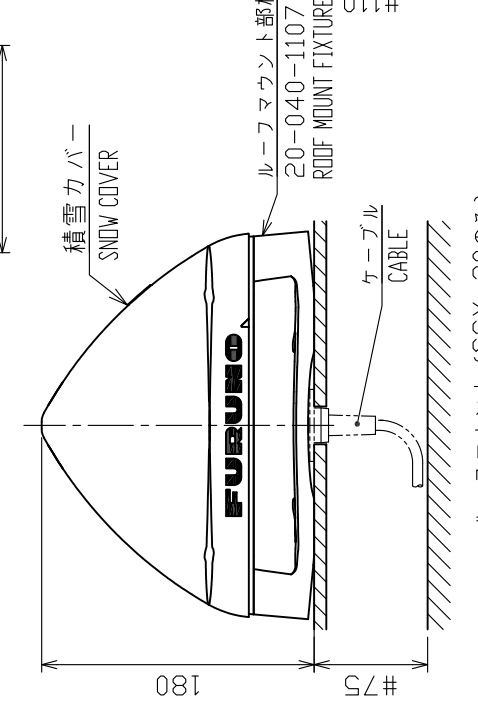
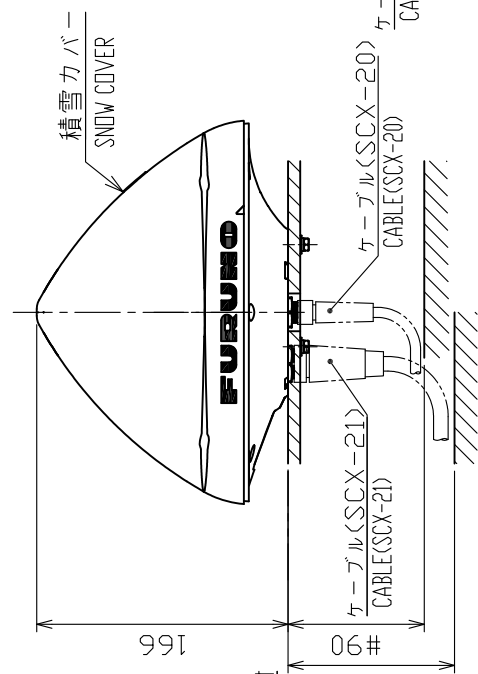
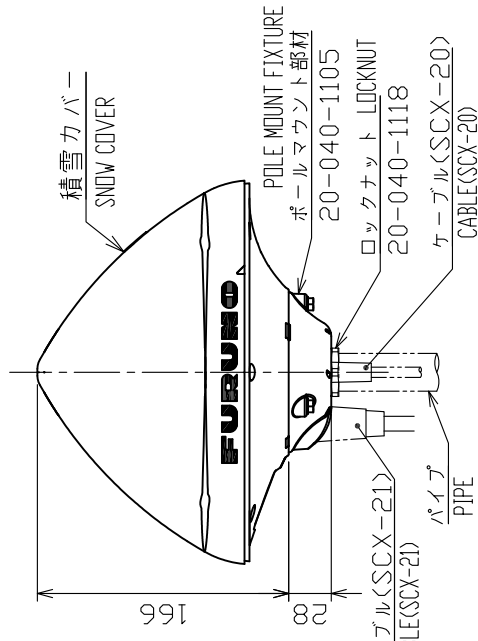
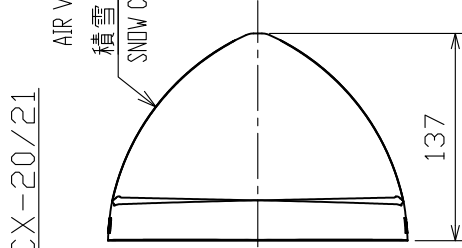
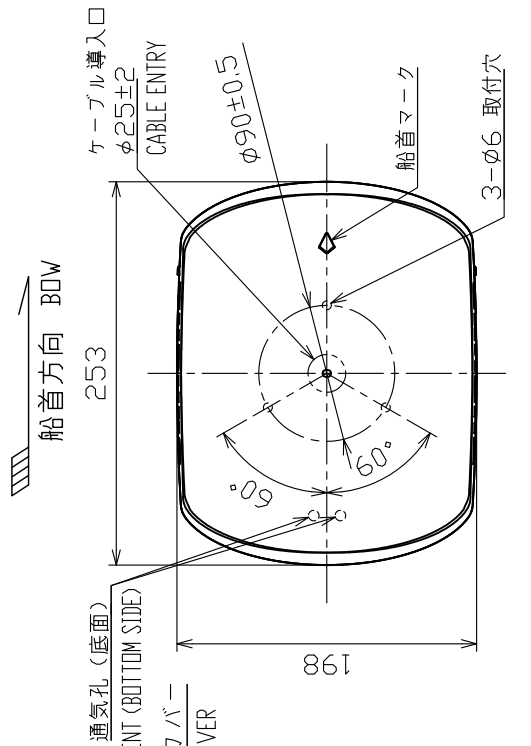
NOTE

1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.

2. THICKNESS OF FIXING PIPE (t): 2 TO 5 mm.

表1 TABLE 1

寸法区分 (mm) DIMENSION	公差 (mm) TOLERANCE
L ≤ 50	±1.5
50 < L ≤ 100	±2.5
100 < L ≤ 500	±3



ルーフマウント (SCX-20のみ)  
ROOF MOUNT (SCX-20 ONLY)

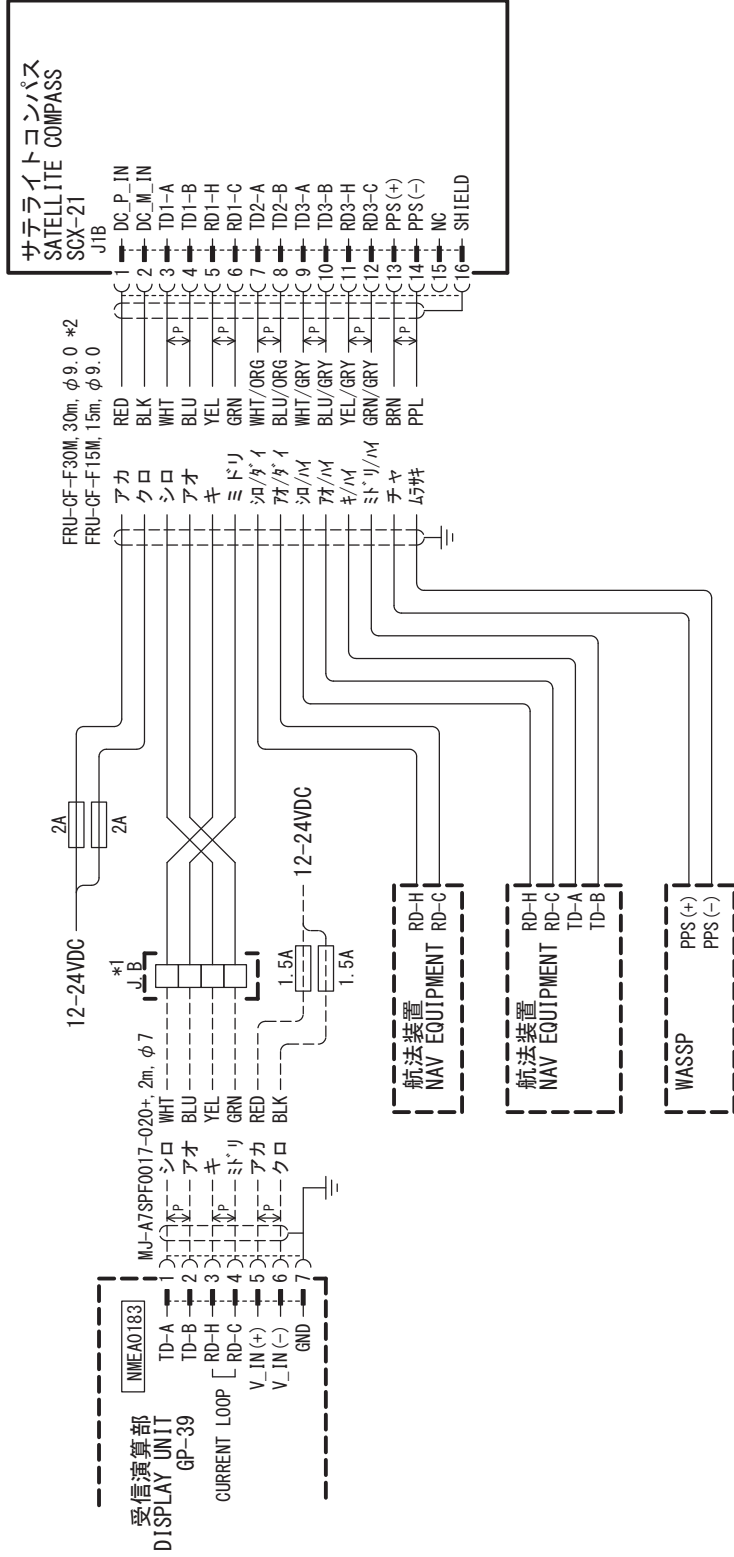
注記

- 1) 指定外の寸法公差は表1による。
- 2) #印寸法は最小サービス空間寸法とする。

NOTE

1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.

DRAWN	26/Nov/2019	J. YAMASAKI	TITLE	SCX-20/21
CHECKED	26/Nov/2019	H. MAKI	名称	積雪カバー
APPROVED	27/Nov/2019	H. MAKI	装備要領	
SCALE	1/5	1/5	NAME	SNOW COVER
FIG. No.	C7286-Y02-A	REF. No.	20-040-110G-1	INSTALLATION INSTRUCTION



注記

- \* 1) 造船所手配。
- \* 2) オプション。

NOTE

- \* 1: SHIPYARD SUPPLY.
- \* 2: OPTION.

DRAWN 29/Sep/2020 CHECKED 29/Sep/2020 APPROVED 29/Sep/2020 SCALE DWG. No.	T. YAMASAKI H. MAKI 29/Sep/2020 H. MAKI MASS C7287-C01-D	TITLE 名称 相互結線図 SATELLITE COMPASS INTERCONNECTION DIAGRAM	SCX-21 サテライトコンパス 相互結線図 SATELLITE COMPASS INTERCONNECTION DIAGRAM
--	--	--	--

## Declaration of Conformity

[SCX-21]

- Bulgarian (BG)** С настоящото Furuno Electric Co., Ltd. декларира, че гореспоменат тип радиосъоръжение е в съответствие с Директива 2014/53/ЕС, СИ 2017/1206. Цялостният текст на ЕС/УК декларацията за съответствие може да се намери на следния интернет адрес:
- Spanish (ES)** Por la presente, Furuno Electric Co., Ltd. declara que el tipo de equipo radioeléctrico arriba mencionado es conforme con la Directiva 2014/53/UE, SI 2017/1206. El texto completo de la declaración de conformidad de la EU/UK está disponible en la siguiente dirección Internet:
- Czech (CS)** Tímto Furuno Electric Co., Ltd. prohlašuje, že výše zmíněné typ rádiového zařízení je v souladu se směrnici 2014/53/EU, SI 2017/1206. Úplné znění EU/SK prohlášení o shodě je k dispozici na této internetové adrese:
- Danish (DA)** Hermed erklærer Furuno Electric Co., Ltd., at ovennævnte radioudstyr er i overensstemmelse med direktiv 2014/53/EU, SI 2017/1206. EU/UK-overensstemmelseserklæringens fulde tekst kan findes på følgende internetadresse:
- German (DE)** Hiermit erklärt die Furuno Electric Co., Ltd., dass der oben genannte Funkanlagentyp der Richtlinie 2014/53/EU, SI 2017/1206 entspricht. Der vollständige Text der EU/UK-Konformitätserklärung ist unter der folgenden Internetadresse verfügbar:
- Estonian (ET)** Käesolevaga deklareerib Furuno Electric Co., Ltd., et ülalmainitud raadioseadme tüüp vastab direktiivi 2014/53/EL, SI 2017/1206 nõuetele. EL/GB vastavusdeklaratsiooni täielik tekst on kättesaadav järgmisel internetiaadressil:
- Greek (EL)** Με την παρούσα η Furuno Electric Co., Ltd., δηλώνει ότι ο προαναφερθέντας ραδιοεξοπλισμός πληροί την οδηγία 2014/53/ΕΕ, SI 2017/1206. Το πλήρες κείμενο της δήλωσης συμμόρφωσης ΕΕ/UK διατίθεται στην ακόλουθη ιστοσελίδα στο διαδίκτυο:
- English (EN)** Hereby, Furuno Electric Co., Ltd. declares that the above-mentioned radio equipment type is in compliance with Directive 2014/53/EU, SI 2017/1206. The full text of the EU/UK declaration of conformity is available at the following internet address:
- French (FR)** Le soussigné, Furuno Electric Co., Ltd., déclare que l'équipement radioélectrique du type mentionné ci-dessus est conforme à la directive 2014/53/UE, SI 2017/1206. Le texte complet de la déclaration UE/RU de conformité est disponible à l'adresse internet suivante:
- Croatian (HR)** Furuno Electric Co., Ltd. ovime izjavljuje da je gore rečeno radijska oprema tipa u skladu s Direktivom 2014/53/EU, SI 2017/1206. Cjeloviti tekst EU/UK izjave o sukladnosti dostupan je na sljedećoj internetskoj adresi:
- Italian (IT)** Il fabbricante, Furuno Electric Co., Ltd., dichiara che il tipo di apparecchiatura radio menzionato sopra è conforme alla direttiva 2014/53/UE, SI 2017/1206. Il testo completo della dichiarazione di conformità UE/RU è disponibile al seguente indirizzo Internet:
- Latvian (LV)** Ar šo Furuno Electric Co., Ltd. deklarē, ka augstāk minēts radioiekārta atbilst Direktīvai 2014/53/ES, SI 2017/1206. Pilns ES/AK atbilstības deklarācijas teksts ir pieejams šādā interneta vietnē:

- Lithuanian (LT) Aš, Furuno Electric Co., Ltd., patvirtinu, kad pirmiau minėta radijo įrenginių tipas atitinka Direktyvą 2014/53/ES, SI 2017/1206.  
Visas ES/JK atitikties deklaracijos tekstas prieinamas šiuo interneto adresu:
- Hungarian (HU) Furuno Electric Co., Ltd. igazolja, hogy fent említett típusú rádióberendezés megfelel a 2014/53/EU, SI 2017/1206 irányelvnek.  
Az EU/EK-megfelelőségi nyilatkozat teljes szövege elérhető a következő internetes címen:
- Maltese (MT) B'dan, Furuno Electric Co., Ltd., niddikjara li msemmija hawn fuq-tip ta' taghmir tar-radju huwa konformi mad-Direttiva 2014/53/UE, SI 2017/1206.  
It-test kollu tad-dikjarazzjoni ta' konformità tal-UE/RU huwa disponibbli f'dan l-indirizz tal-Internet li ġej:
- Dutch (NL) Hierbij verklaar ik, Furuno Electric Co., Ltd., dat het hierboven genoemde type radioapparaat conform is met Richtlijn 2014/53/EU, SI 2017/1206.  
De volledige tekst van de EU/VK-conformiteitsverklaring kan worden geraadpleegd op het volgende internetadres:
- Polish (PL) Furuno Electric Co., Ltd. niniejszym oświadcza, że wyżej wymieniony typ urządzenia radiowego jest zgodny z dyrektywą 2014/53/UE, SI 2017/1206.  
Pełny tekst deklaracji zgodności UE/UK jest dostępny pod następującym adresem internetowym:
- Portuguese (PT) O(a) abaixo assinado(a) Furuno Electric Co., Ltd. declara que o mencionado acima tipo de equipamento de rádio está em conformidade com a Diretiva 2014/53/UE, SI 2017/1206.  
O texto integral da declaração de conformidade da EU/UK está disponível no seguinte endereço de Internet:
- Romanian (RO) Prin prezenta, Furuno Electric Co., Ltd. declară că echipamentul radio menționat mai sus este în conformitate cu Directiva 2014/53/UE, SI 2017/1206.  
Textul integral al declarației de conformitate UE/RU este disponibil la următoarea adresă internet:
- Slovak (SK) Furuno Electric Co., Ltd. týmto vyhlasuje, že vyššie spomínané rádiové zariadenie typu je v súlade so smernicou 2014/53/EÚ, SI 2017/1206.  
Úplné EÚ/SK vyhlásenie o zhode je k dispozícii na tejto internetovej adrese:
- Slovenian (SL) Furuno Electric Co., Ltd. potrjuje, da je zgoraj omenjeno tip radijske opreme skladen z Direktivo 2014/53/EU, SI 2017/1206.  
Celotno besedilo izjave EU/ZK o skladnosti je na voljo na naslednjem spletnem naslovu:
- Finnish (FI) Furuno Electric Co., Ltd. vakuuttaa, että yllä mainittu radiolaitetyyppi on direktiivin 2014/53/EU, SI 2017/1206 mukainen.  
EU/UK-vaatimustenmukaisuusvakuutuksen täysimittainen teksti on saatavilla seuraavassa internetosoitteessa:
- Swedish (SV) Härmed försäkrar Furuno Electric Co., Ltd. att ovan nämnda typ av radioutrustning överensstämmer med direktiv 2014/53/EU, SI 2017/1206.  
Den fullständiga texten till EU/Storbritannien-försäkran om överensstämmelse finns på följande webbadress:

#### Online Resource

[http://www.furuno.com/en/support/red\\_doc](http://www.furuno.com/en/support/red_doc)

#### **Notice for radiated immunity**

**The test for the radiated immunity is performed up to 2.7 GHz only without the special condition of spot frequency being applied. There is a chance that this equipment may interfere with allocated services in the frequency range of 2.7 GHz to 6 GHz, particularly in harbors, rivers, lake banks, etc.**