KODEN

OPERATION MANUAL

GPS COMPASS

KGC-300

KGC-300.OM.E 0093130002-02A

KGC-300 Operation Manual
Doc No: 0093130002

Document Revision History

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0	0093130002-00	2018/04/03	First edition
1	0093130002-00A	2018/08/02	Main unit → Processor unit
2	0093130002-00B	2019/03/14	Configuration of Equipment, Correction
3	0093130002-00C	2019/12/24	Chapter 7, Chapter 10
4	0093130002-00D	2020/10/28	Cover
5	0093130002-01	2021/07/15	BAM compatible
6	0093130002-01A	2022/03/30	Configuration of Equipment, Chapter 7
7	0093130002-02	2023/03/06	MED compatible (conformed IEC 62288 Ed.3), Cover
8	0093130002-02A	2025/11/28	Installation of Display unit to prevent condensation
9			
10			

Document No. Revised Version Norm

When part of the document needs to be revised, the document has advanced revision number.
The document No. is indicated at the lower right side on the cover and at the left or right side of the footer region of each page.

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For Your Safe Operation

Symbol used in this Operation Manual

The following pictograms are used in this manual. The meaning of each symbols shall be well understood and the maintenance and inspection shall be carried out.

Symbol	Meaning
 Warning	**Mark for warning** This mark denotes that there is a risk of death or serious injury when dealt with incorrectly.
	**Mark for danger of high voltage** This mark denotes that there is a risk of death or serious injury due to electric shock when dealt with incorrectly.
 Caution	**Mark for caution** This mark denotes that there is a risk of slight injury or damages of devices when dealt with incorrectly.
	**Mark for prohibition** This mark denotes prohibition of specified conducts. Description of the prohibition is displayed near the mark.

Precautions on equipment

	**Be careful of high voltage inside** High voltage, which may risk you life, is used. This high voltage may remain in the circuit even after the power is switched off. To prevent contact with the high voltage circuits accidentally, a protective cover or the label with this mark is provided on the high voltage circuit. When the inside is to be checked, ensure to switch off the power and to discharge the residual voltage for safety. An engineer authorized by Koden shall carry out the inspection and maintenance works.
 Warning	**Power off in the boat** An accidental power-on during works may result in worker's electrification. To prevent such accident in advance, ensure that power in the boat and on the equipment are switched off. Furthermore, it is safer to hang a caution tag saying "Under work" near the power switch of equipment.
 Warning	**Be careful of dust** Inhaled dust may cause respiratory affection. At the time of cleaning the inside of equipment, be careful not to inhale dust. Wearing a safety mask is recommended.
 Caution	**Caution on location of installment** The equipment shall not be installed at locations which are excessively damp and suffers from water drops. Otherwise, dew condensation may occur inside the display screen, and corrosion may occur inside the unit box.

 **Caution**	**Measures against static electricity** Static electricity may be generated from the carpet on the floor in the cabin or clothes made of synthetic fiber, and it may destroy the electronic components on circuit boards. The circuit boards shall be handled with appropriate measures against static electricity.

Precautions on handling

 **Warning**	No disassembly or modification of this equipment is allowed. It may lead to failure, firing, smoking or electric shock. In case of failure, please contact Koden's dealers or Koden.
 **Warning**	In case of smoking or firing, switch off the power in the boat and of this equipment. It may lead to firing, electric shock or damages.
	**Be careful of residual high voltage** High voltage may remain in capacitors for several minutes after switching off the power. Before inspection of the inside, please wait at least 5 minutes after switching off or discharge the residual electricity in an appropriate manner. Then, start the work.
 **Caution**	The information displayed on this equipment is not intended to use for your navigation. For your navigation, be sure to see the specified materials.

Installation of Display unit to prevent condensation

If the Display unit is installed near an air conditioner vent or in a location exposed to direct airflow, condensation may occur due to temperature differences between the unit’s interior and the surrounding air.

Condensation inside the Display unit can cause serious damage to electrical components and may render the unit inoperable.

Even models equipped with condensation prevention features (such as direct bonding) are still at risk if moisture forms inside the unit. Therefore, it is essential to carefully consider the installation environment to prevent condensation.

Contents

Introduction

KGC-300 is a GPS compass and navigation GPS receiver

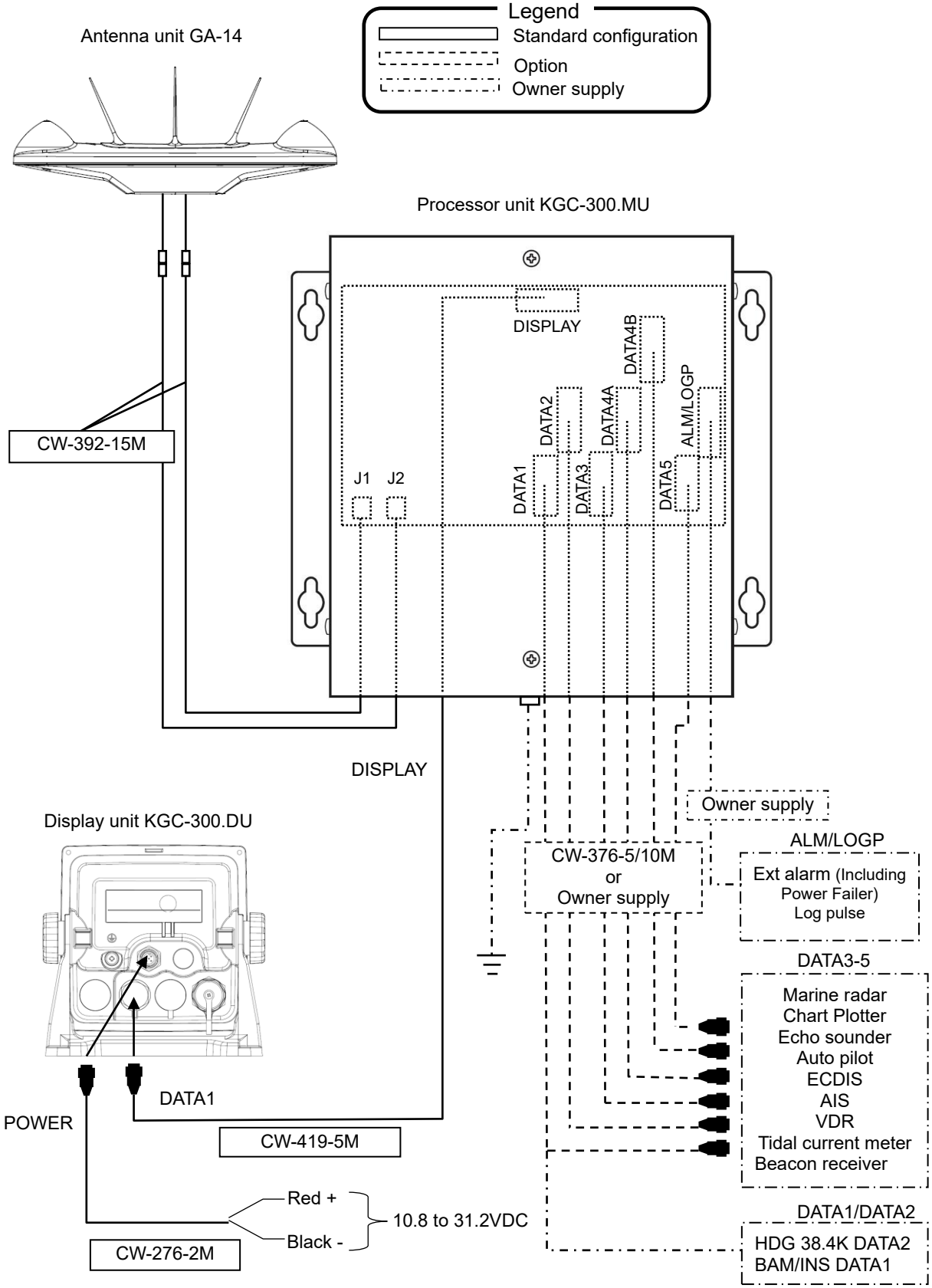
Through the use of GPS satellites, it outputs the heading of vessel with a high degree of accuracy by calibrating the phase difference of two GPS antennas.

The main features of this unit are as follows:

- KGC-300 consists of three components, Processor unit, Display unit and Antenna unit.
- KGC-300 has internal electronic compass as backup sensor.
  This enables the backup sensor to output heading even if the GPS signals are interrupted in such case as the vessel passing under a bridge.
- It has 1 high speed heading data output port and 4 standard outputs.

System Configuration

Connection diagram

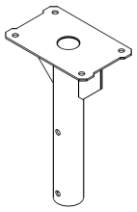
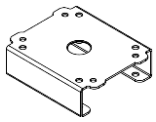


Configuration of Equipment

Standard Equipment Configuration List

No	Item	Type name	Remarks	Weight/ Length	Q'ty
01	Display unit	KGC-300.DU	With mounting bracket and front cover	0.82 kg	1
02	Processor unit	KGC-300.MU			1
03	Antenna unit	GA-14	With bird protector		1
04	DC power cable	CW-276-2M	With a 5-pin connector and one end plain	2.0m	1
05	Connecting cable	CW-419-5M	6 pin water resistant connector and other end plain w/EMI core	5m	1
06	Antenna cable	CW-392-15M	3D-2V with BNC connectors on the both sides	15m	2
07	Connector	MCVR1.5/6-ST-3.81	Accessories		5
08	Installation material	TPT5X20U	Truss tapping screw (8)		1 set
		T.5X20MMX10M	Self-bonding tape (1)		
		10M[gray]	PVC tape (1)		
		B8X25U	Hexagon bolt for antenna installation (4)		
		DS-100	Binding band L=100mm (10)		
09	Operation manual	KGC-300.OM.E	English		1

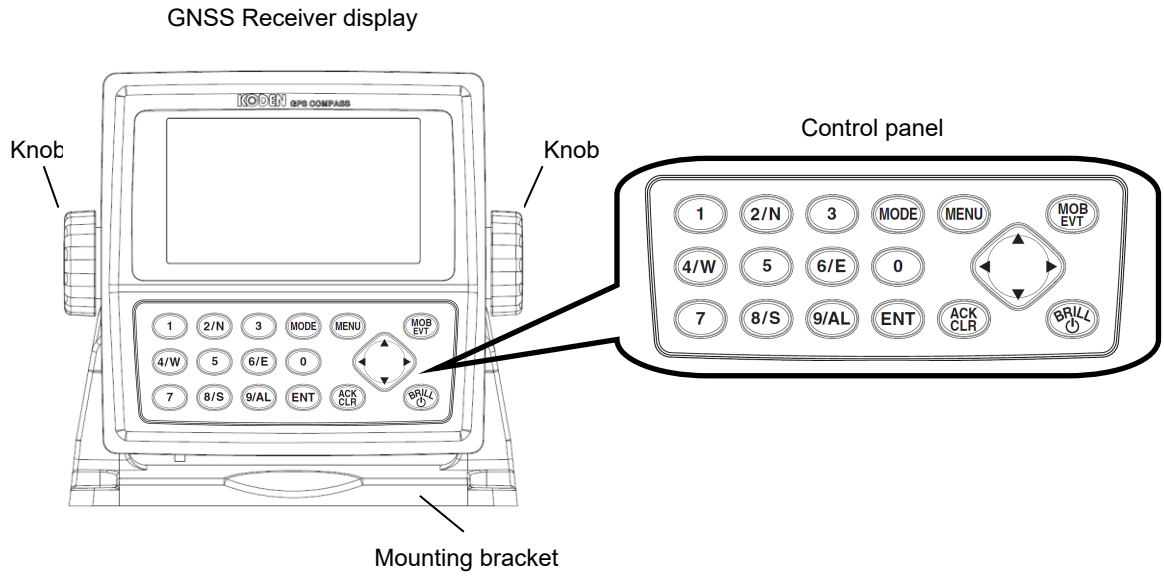
Option List

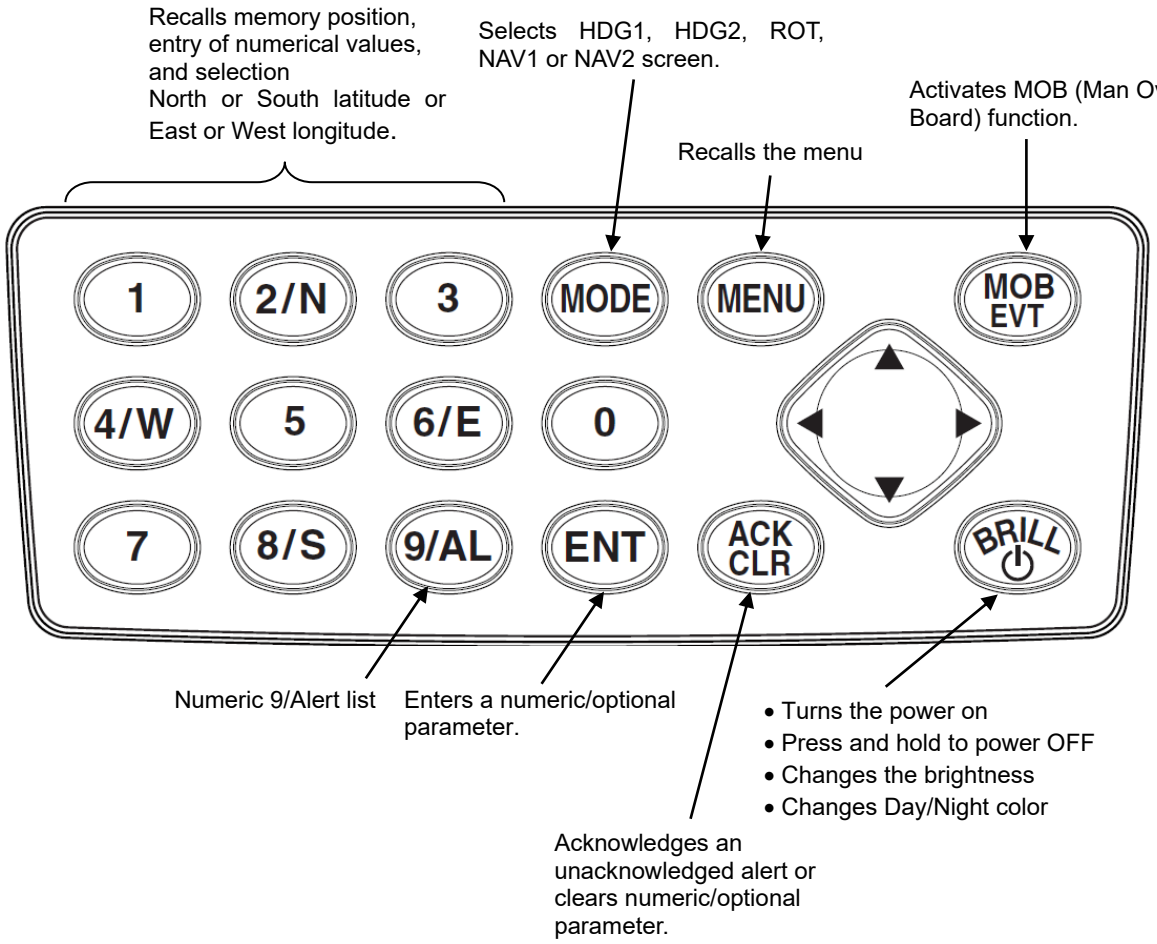
No	Item	Type name	Remarks	Weight/ Length
01	Connecting cable	CW-376-5M/10M	6 pin water resistant connector and other end plain	5m/ 10m
02	Power rectifier	PS-010	With 5A fuses 2pcs	3.5kg
03	AC power cable	VV-2D8-3M	For PS-010, both ends plain	3 m
04	Antenna cable extension kit	CW-393-30M	5D-FB with BNC connectors on the both sides	30m
*05		CW-394-60M KIT	8D-SFA cable with N-J connectors and other end plain, N-J connector, *N-BNC connector and CW-826-0.5M	60m
06	Mount base 	D86MB21110	For Antenna (GA-14)	
07	Attachment 	D86MB21120	Conversion metal attachment (Switching the mounting holes of GA11 to GA14)	
08	Operation manual	KGC-300.OM.E	English	
09	Service manual	KGC-300.SM.E	English	

*05. N-BNC connector in the kit will not be used.

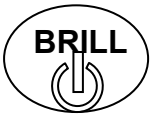
Chapter 1 Basic Operation

1.1 The name and function of each part

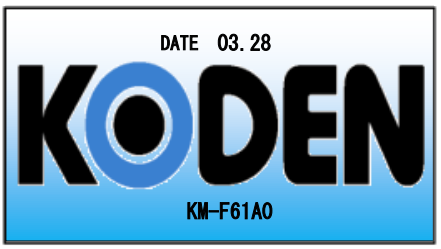




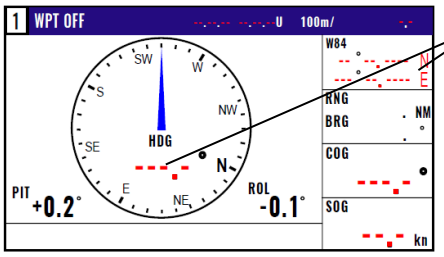
1.2 Power On/Off



Press to power on.

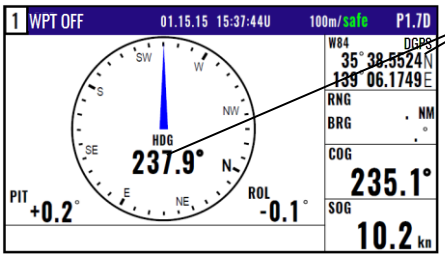


Initial message appears during power-on.
The receiver is performing the self-check.



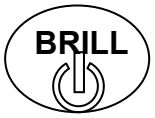
Blank

Heading data and N/S/E/W is not displayed when receiver is searching GPS satellites.



Displayed

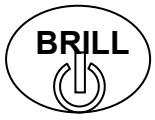
When receives signals from 3 or more satellites, it displays heading data and present latitude and longitude position with solid N (or S) and W (or E).



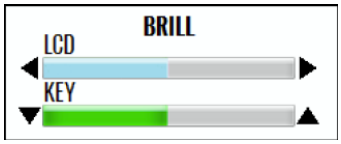
Press until [Power off 3sec] is displayed for turn GPS COMPASS / NAVIGATOR off.
All data before power-off is kept in memory for later use.

CAUTION
Be sure to turn off the power in the above procedure.

1.3 Adjusting brightness of display and panel key



Press to change the LCD brightness in 8 levels.
After the popup of below was displayed, push the  key.



Switch Day/Night color mode:

When the [0] key is pressed while the above pop-up is displayed, the display switches between day mode and night mode. In night mode the background changes from white to black, letters etc from black to white.

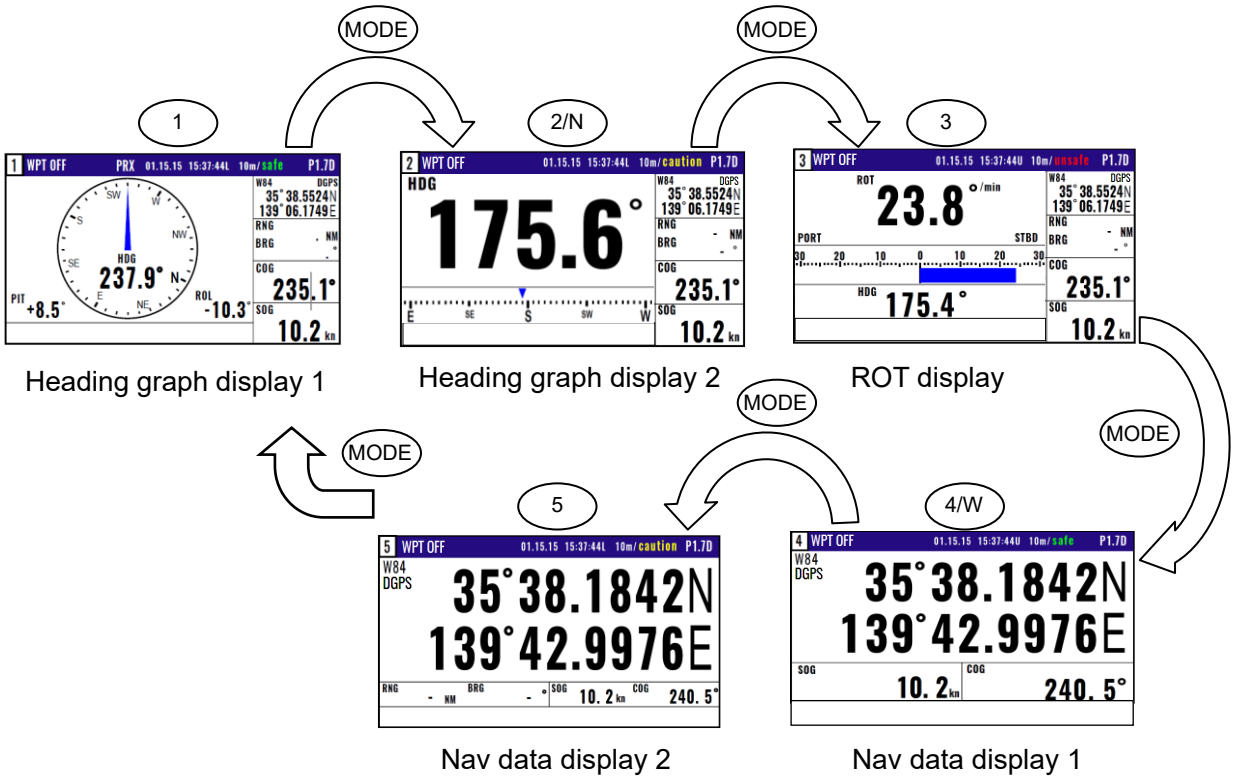
NOTE: *This setup is memorized and turns into the same setup next time at the time of a power supply ON.*

1.4 Selecting the screen

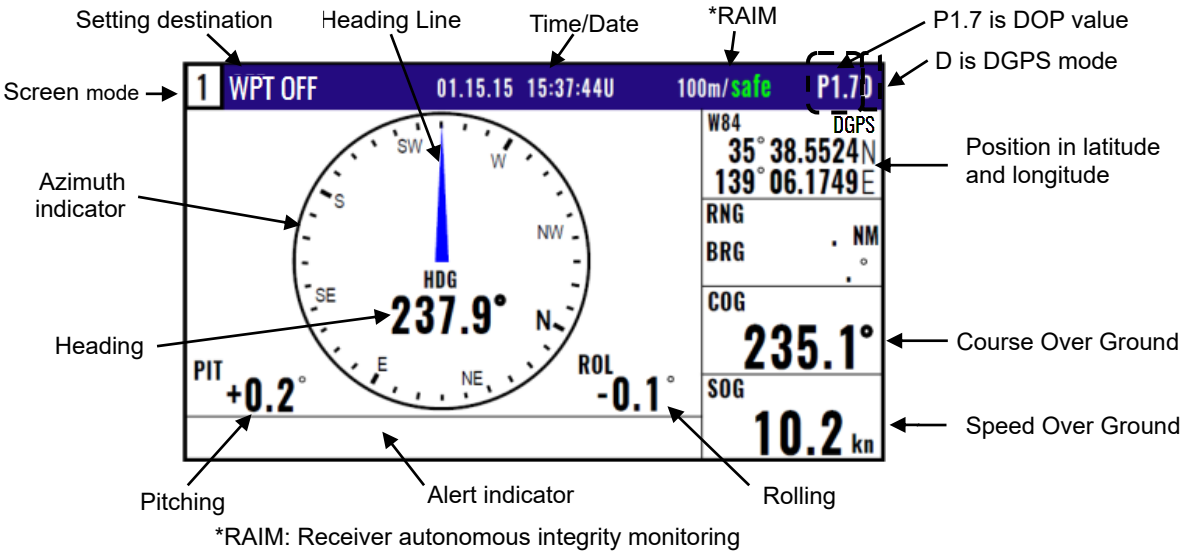
1.4.1 Display Modes

KGC-300 has 5 display modes: Heading graph display 1 (HDG1), Heading graph display 2 (HDG2), ROT display (ROT), Nav data display1 (NAV1), Nav data display2 (NAV2), Screen will change in two ways.

1. Press numeric key on the upper-left corner of the screen.
2. Press (MODE) key to select the display mode.

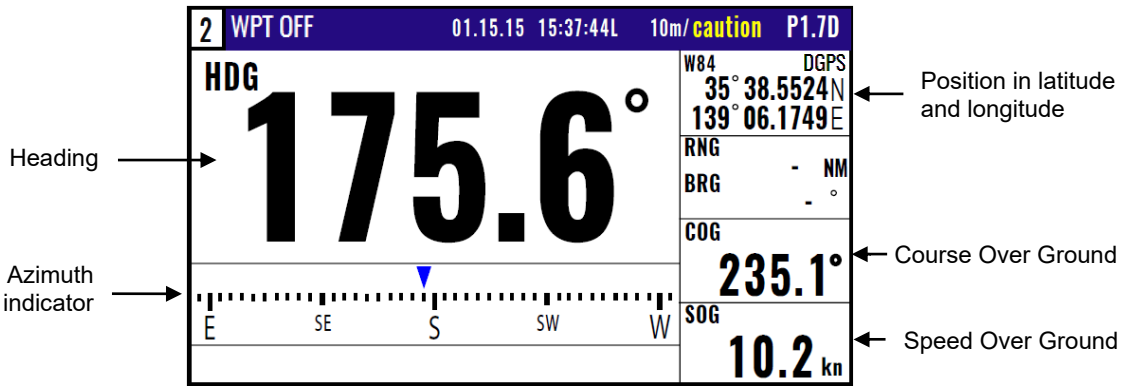


1.4.2 Screen 1: Heading graph display 1 (HDG1)

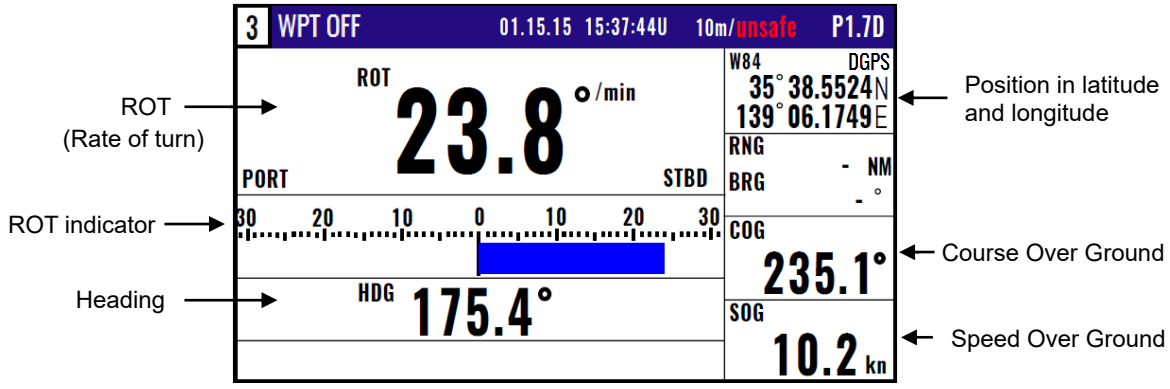


*RAIM: Receiver autonomous integrity monitoring

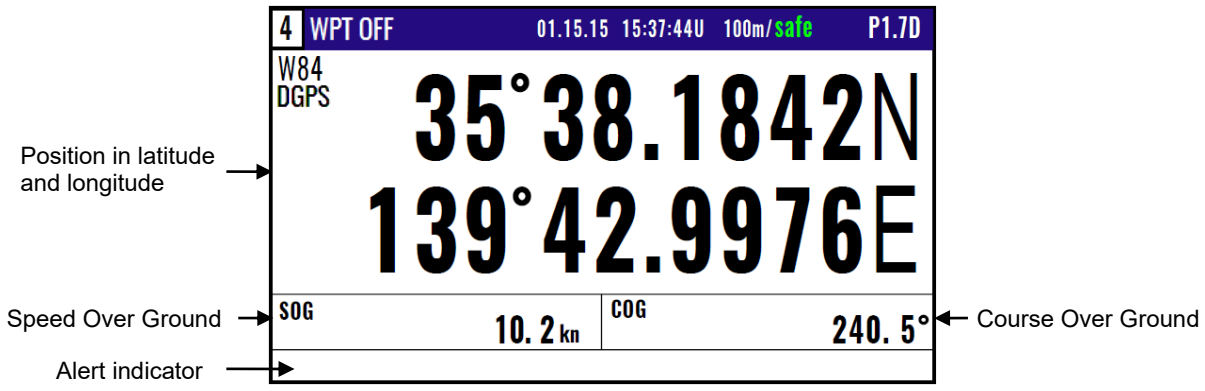
1.4.3 Screen 2: Heading graph display 2 (HDG2)



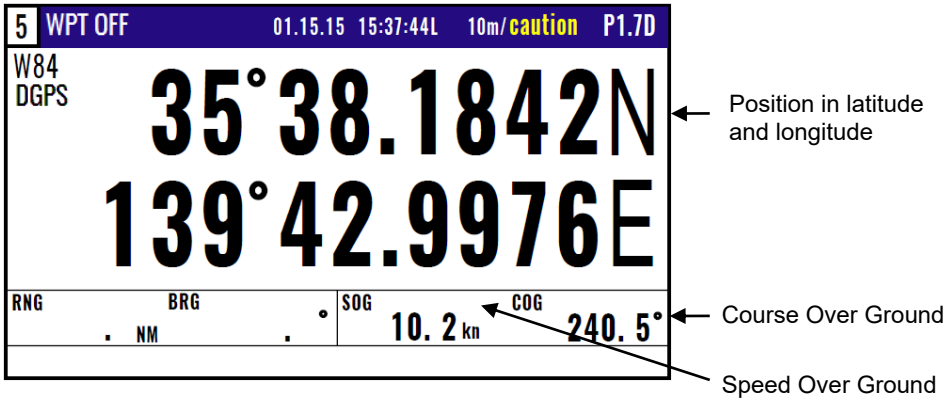
1.4.4 Screen3: Rate of turn display (ROT)



1.4.5 Screen 4: Nav data display 1 (NAV1)



1.4.6 Screen 5: Nav data display 2 (NAV2)



1.5 Storing present position (EVENT)

You can store up to 999 present positions with numbers 0001 to 0999. When you store additional positions, the oldest position is deleted and the newest position is stored in its place.

- The storage date, hours and minutes and position data can be stored.
- It is convenient to store the present position for use later in route navigation.
- These positions can be used as targets or waypoints.
- Event numbering is available both in the automatic or manual mode. Auto or Manual selection is made at the **"6.2.5 Changing a storing method for present position (EVENT)"** (Refer to Page 6-5)

CAUTION
EVT key does not function when positioning is invalid

1.5.1 AUTO

MOB
EVT

(1) Press (MOB) key to appear the pop-up.
(2) Press (ENT) key to store your present position.

Goto MOB :[MOB]
Goto EVENT :[ENT]
Cancel :[CLR]

(3) You can store up to 999 present positions by pressing this key. They have storage numbers 0001 to 0999.

EVENT=W0001 — Increment Waypoint
15 15:37 — Storage date (Day, Hour, Minute)
35°38.184N
139°42.997E — Storage position (Lat, Long)

NOTE: *Auto or Manual selection is made at the **"6.2.5 Changing a storing method for present position (EVENT)"***

1.5.2 MANUAL

MOB
EVT

(1) Press (MOB) key to show the registration number display window.
(2) Press (ENT) key to store your present position.
(3) Specify a desired registration number by numeric keys.
(4) Press (ENT) key. The EVENT will be registered to the number specified.

Blinks for 10 seconds

EVENT=W0001->0000 — The latest EVENT number
+ 15 04 : 59 — Storage date (Day, Hour, Minute)
35°38 . 180N
139°42 . 990E — Storage position (Lat, Long)

NOTE: *Auto or Manual selection is made at the **"6.2.5 Changing a storing method for present position (EVENT)"***

1.6 Using MOB (Man over-board)

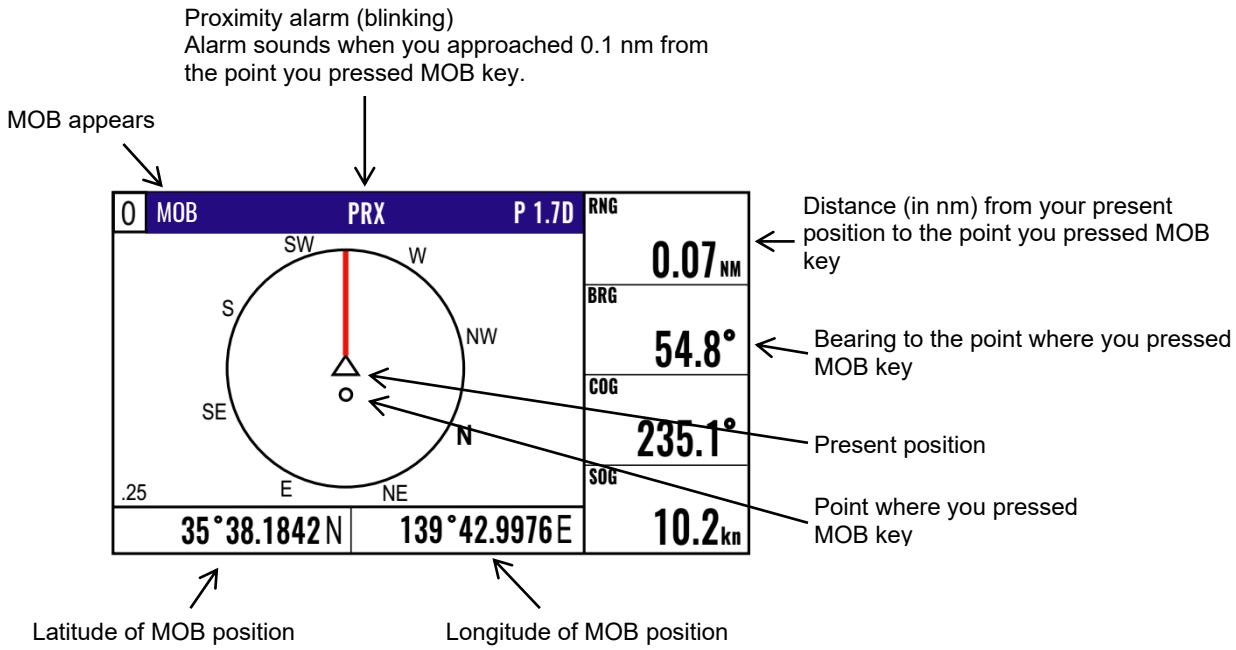
MOB function is provided for an emergency situation (if a person falls into the water) to make it easier to return to MOB point. By pressing the MOB key, a special MOB display appears.

CAUTION
MOB key does not function when the position is invalid

MOB / EVT

(1) Press MOB key to appear the pop-up.
(2) Press MOB key to store MOB position.

Goto MOB	:[MOB]
Goto EVENT	:[ENT]
Cancel	:[CLR]



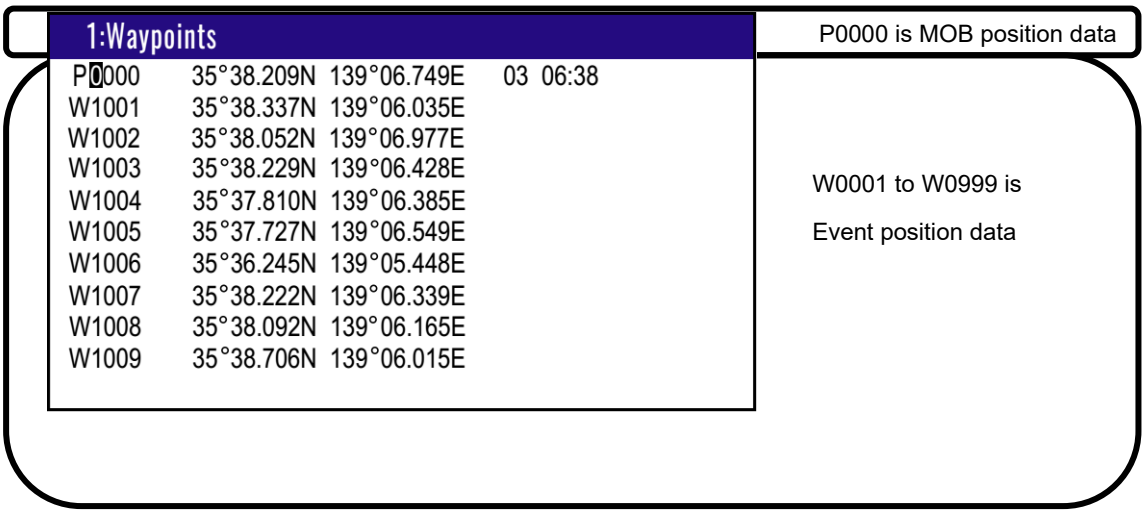
ACK / CLR

Clears the MOB mode, and returns to the previous screen when you pressed MOB key. When alarm sounds, press CLR key to stop it. Press it again to return to the screen you were at before you pressed MOB key.

1.7 Recalling Event and MOB position

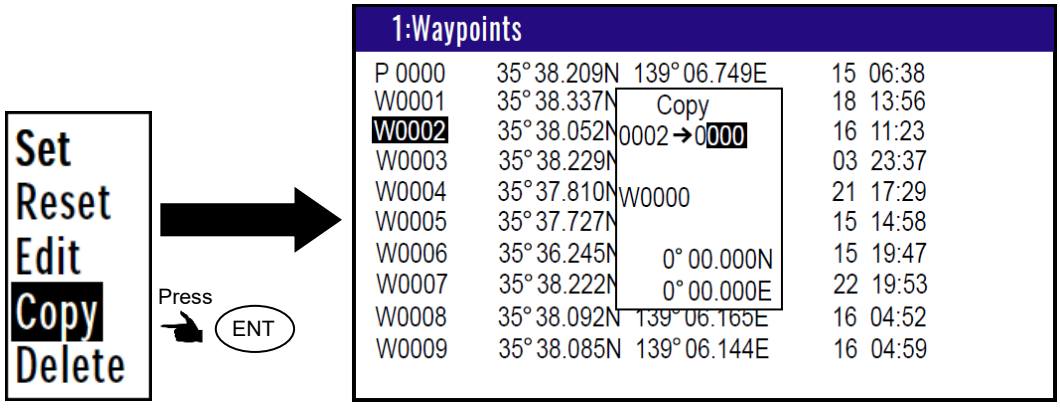
(1) Press MENU key until menu options 1 to 9 appears.
(2) Press 1 key to select "1:WAYPOINT".
(3) Enter a storage number P0000 and W0001 to W0999 is MOB and Event position data.

NOTE: *0000: Position data where you pressed MOB key*
0001 to 0999: Position data that contains events



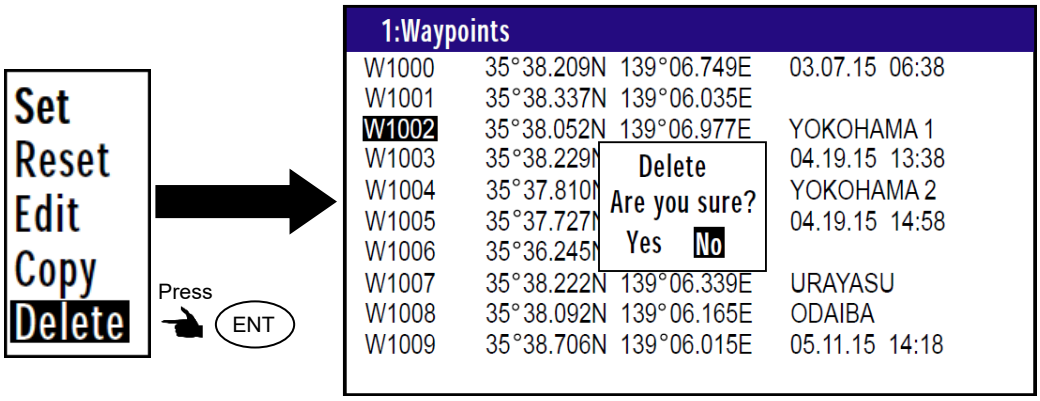
1.8 Copying Event and MOB position

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (1) key to select "**1: Waypoints**".
(3) Enter storage number (0000 to 0999) by numeric keys and press (ENT) key.
(4) Press (ENT) key to display the pop-up.
(5) Select [**Copy**] in the pop-up and press (ENT) key.
(6) Enter a source point number (0000 to 0999) by numeric keys.
(7) Press (ENT) key to copy the storage data.



1.9 Erasing Event and MOB position

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (1) key to select "**1: Waypoints**".
(3) Enter storage number (0001 to 0999) by numeric keys and press (ENT) key.
(4) Press (ENT) key to display the pop-up.
(5) Select [**Delete**] in the pop-up and press (ENT) key.
(6) If OK, select [**Yes**] in the pop-up and press (ENT) key.
If cancel erasing, select [**No**] in the pop-up and press (ENT) key.



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Chapter 2 Various Navigation

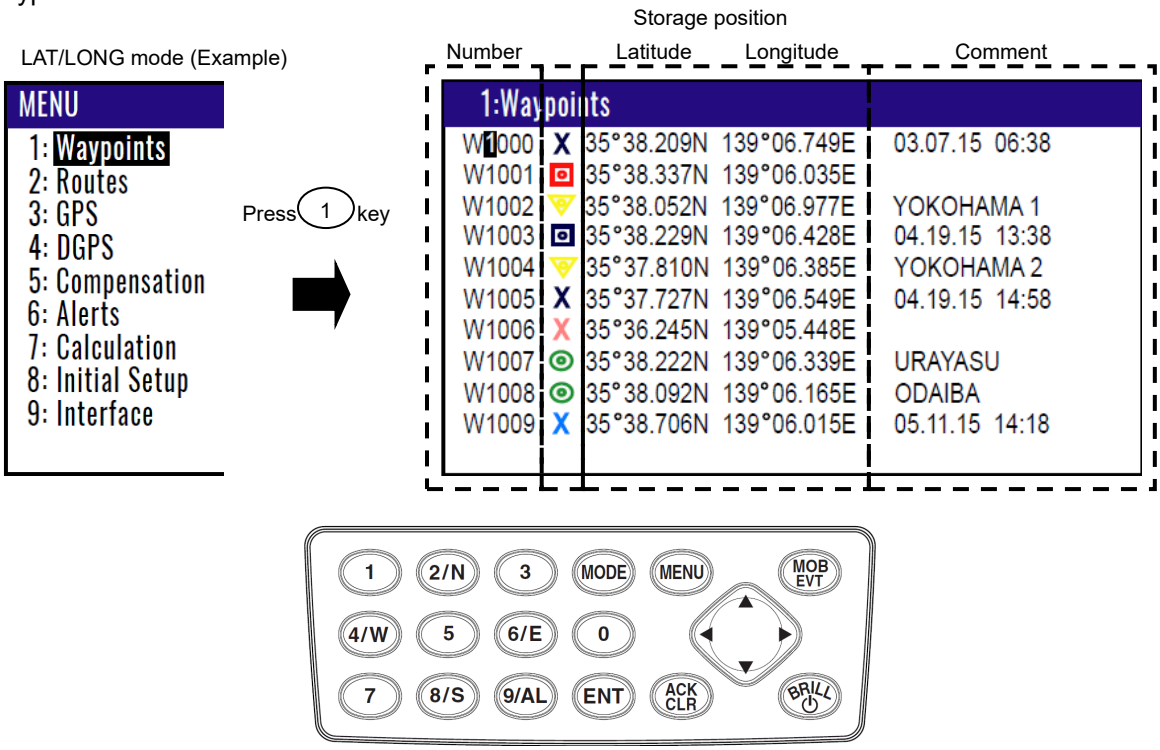
2.1 Storing waypoints (LAT/LONG) data

◀ **NOTE:** *Press to backspace the cursor to correct an input error.*

CLR **NOTE:** *Press to clear incorrect Input. You can reenter Numeric data.*

2.1.1 Storing a new waypoint or updating an existing a waypoint

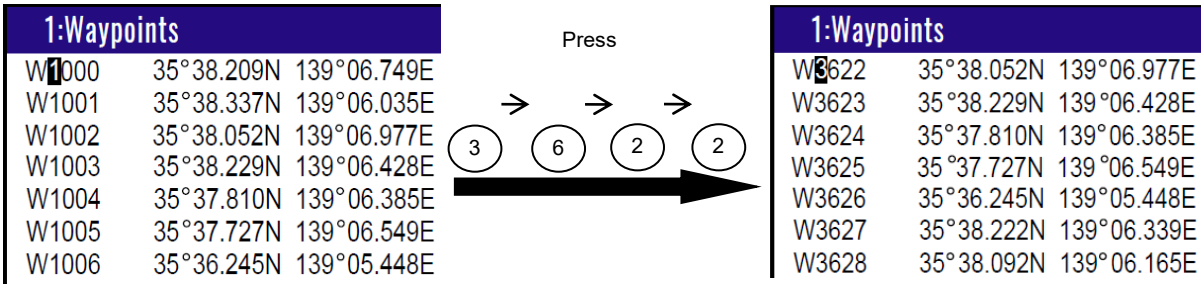
Up to 10000 waypoints can be stored in memory. As 1000 points (numbers: from 0000 to 0999) are reserved for MOB and Event registration, you can use 1000 to 9999 (total of 9000 points) to store waypoints.



(1) Press (MENU) key until Menu options 1 to 9 appears.

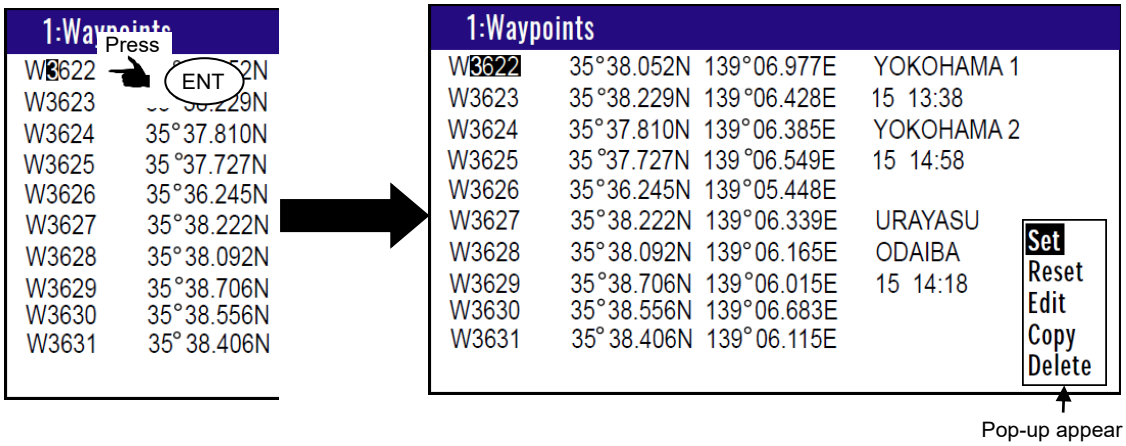
(2) Press (1) key to select "**1: Waypoints**".

(3) Enter storage number (1000 to 9999) by numeric keys and press (ENT) key.



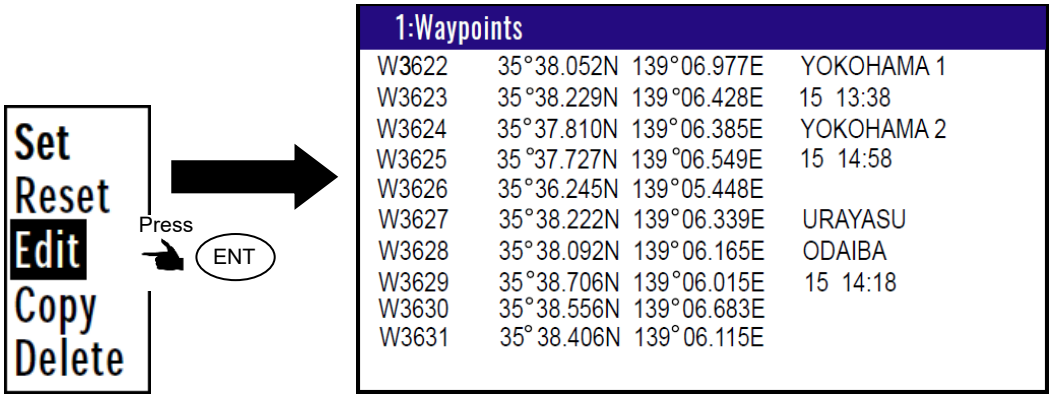
(4) Press (ENT) key to display the pop-up.

(5) Select [**Edit**] in the pop-up and press (ENT) key.



(6) Move the cursor to where you want to change. [Latitude] or [Longitude] or [Comment]

• Press [▶] [◀] key to move the cursor.



(7) If you want to change the [Latitude] and [Longitude].

Example: The position “N35°38.180 / E139°42.990” is entered by pressing the following keys in exact order given below. **[3]**,**[5]**,**[3]**,**[8]**,**[1]**,**[8]**,**[0]**,**[N]**,**[1]**,**[3]**,**[9]**,**[4]**,**[2]**,**[9]**,**[9]**,**[0]**,**[E]**.

(8) If you want to change the [Comment].

1) Press ENT key to select of the [Comment].

2) Press [◇] key to select a comment letter in the pop-up.

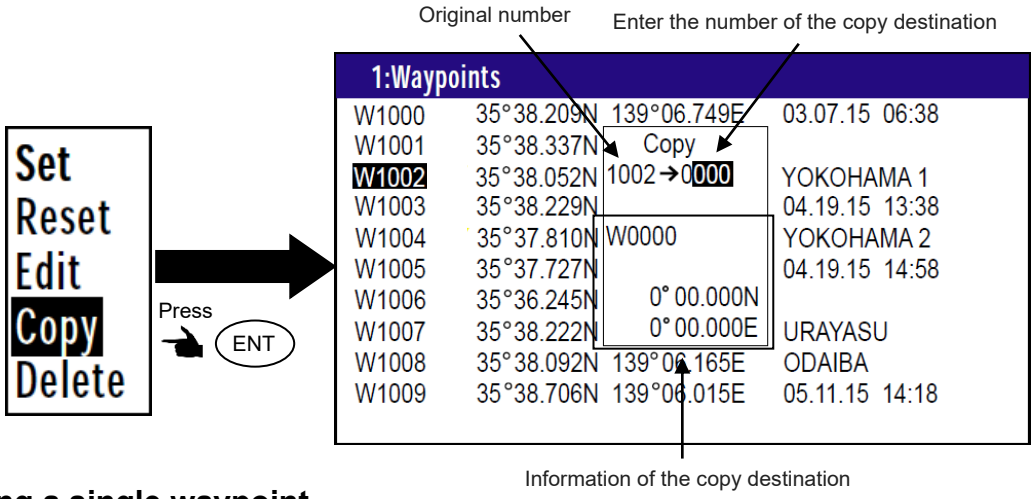
3) Finally press ENT key after moved a cursor to the [**APPLY**] in the pop-up.

(9) Press [▲] [▼] key when the work has been completed.

2.1.2 Copying a position

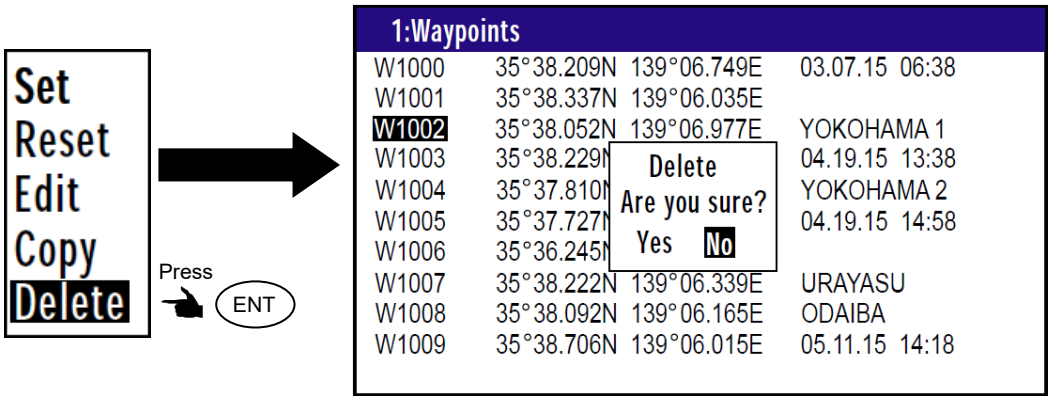
You can copy the position data (stored with numbers 0000 to 9999) to the waypoint data (having numbers 1000 to 9999).

(1) Press MENU key until Menu options 1 to 9 appears.
(2) Press 1 key to select "**1: Waypoints**".
(3) Enter storage number (0000 to 9999) by numeric keys and press ENT key.
(4) Press ENT key to display the pop-up.
(5) Select [**Copy**] in the pop-up and press ENT key.
(6) Enter a source point number (1000 to 9999) by numeric keys.
(7) Press ENT key to copy the storage data.



2.1.3 Erasing a single waypoint

(1) Press MENU key until Menu options 1 to 9 appears.
(2) Press 1 key to select "**1: Waypoints**".
(3) Enter storage number (0001 to 9999) by numeric keys and press ENT key.
(4) Press ENT key to display the pop-up.
(5) Select [**Delete**] in the pop-up and press ENT key.
(6) If OK, select [**Yes**] in the pop-up and press ENT key.
If cancel erasing, select [**No**] in the pop-up and press ENT key.



NOTE: *To erase an entire data from memory simultaneously, see* ***"WPT./Route clear"*** *(page 6-5).*

2.2 Setup of waypoint navigation

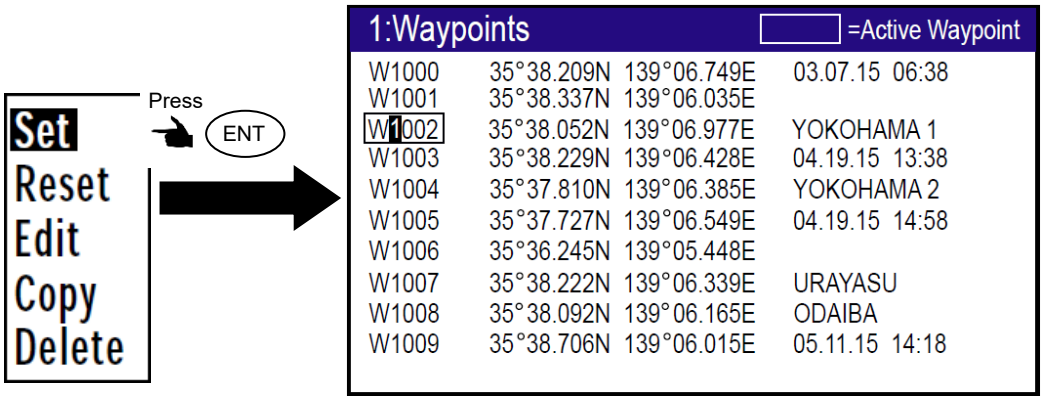
◀ **NOTE:** *Press to backspace the cursor to correct an input error.*

CLR **NOTE:** *Press to clear incorrect Input. You can reenter Numeric data.*

2.2.1 Setting waypoint navigation

The position data for each waypoint must be set prior to navigating to waypoints. You can use the data already stored from Menu, or you can set the waypoints from the HDG1, HDG2, ROT, NAV1 or NAV2 screen (called the quick waypoint navigation).

(1) Press MENU key until Menu options 1 to 9 appears.
(2) Press 1 key to select "**1: Waypoints**".
(3) Enter storage number (1000 to 9999) by numeric keys and press ENT key.
(4) Press ENT key to display the pop-up.
(5) Select [**Set**] in the pop-up and press ENT key.
(6) Number is surrounded by square.

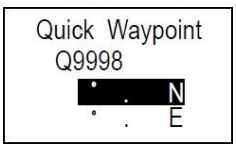


2.2.2 Quick waypoint setup

Quick WPT (first priority waypoint) can be set by specifying it directly either from the HDG1, HDG2, ROT, NAV1 or NAV2 screen. When the new waypoint is selected, the waypoint navigation to it will commence and the specified position, along with the comment (**QUICK**), will be assigned to the position number 9998. Old data is replaced with a new during quick WPT setup.

While the 1st to 6th pages of either the HDG1, HDG2, ROT, NAV1 or NAV2 are displayed.

(1) Press 0 key to display "**QUICK**" pop-up menu.



(2) Enter latitude and longitude.
For example, if “N35°38.180 / E139°42.990” is inputted, a key will be pressed in order of [**3**],[**5**],[**3**],[**8**],[**1**],[**8**],[**0**],[**N**], [**1**],[**3**],[**9**],[**4**],[**2**],[**9**],[**9**],[**0**],[**E**].
(3) The waypoint is set and the point data is stored in number 9998.

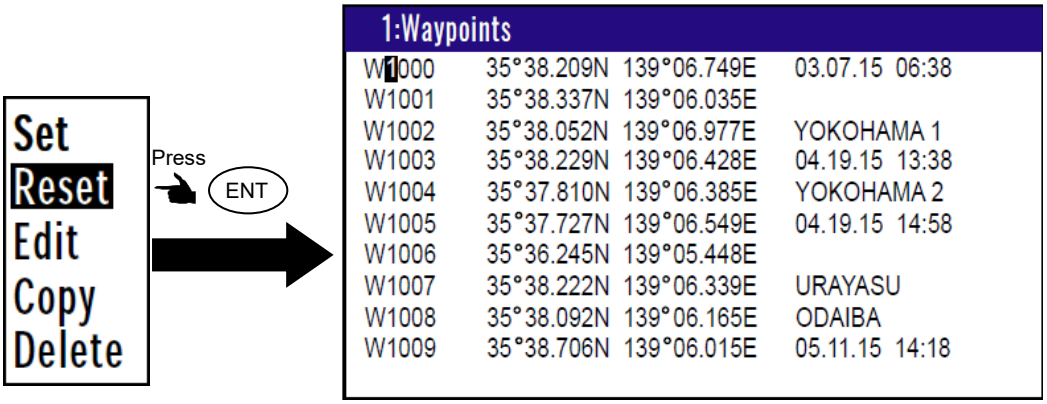
2.2.3 Canceling waypoint navigation

To cancel waypoint navigation, turn WPT to Reset on HDG1, HDG2, ROT, NAV1 or NAV2 screen. There are two ways.

- Cancel from [MENU].
- Cancel from HDG1, HDG2, ROT, NAV1 or NAV2 screen.

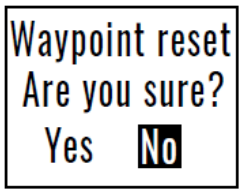
1) When Reset from [MENU].

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (1) key to select “**1: Waypoints**”.
(3) Enter storage number (0000 to 9999) by numeric keys and press (ENT) key.
(4) Press (ENT) key to display the pop-up.
(5) Select [**Reset**] in the pop-up and press (ENT) key.
(6) No square from Number.

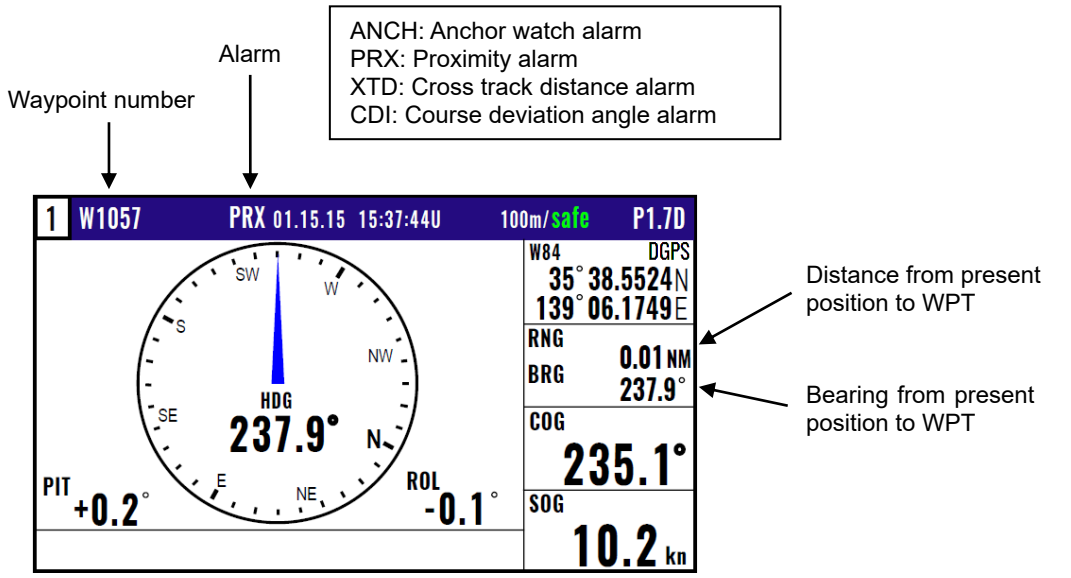


2) When Reset from HDG1, HDG2, ROT, NAV1 or NAV2 screen.

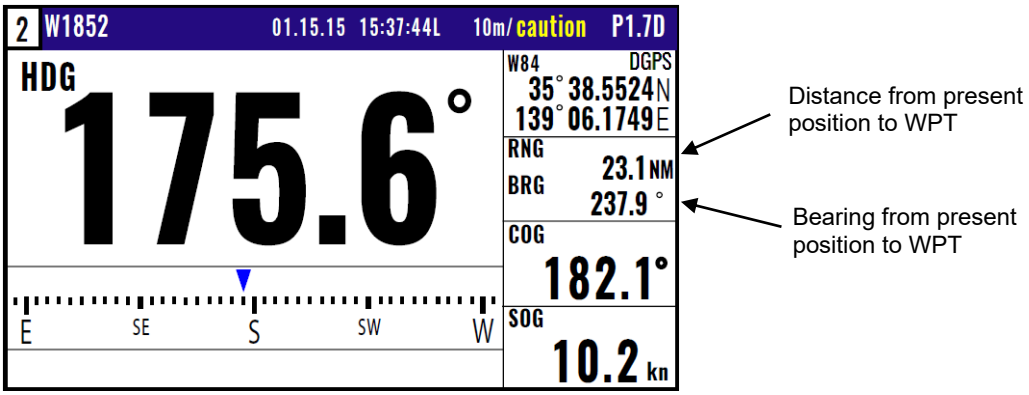
(1) Press (CLR) key.
(2) If OK, select [**Yes**] in the pop-up and press (ENT) key.
If cancel erasing, select [**No**] in the pop-up and press (ENT) key.



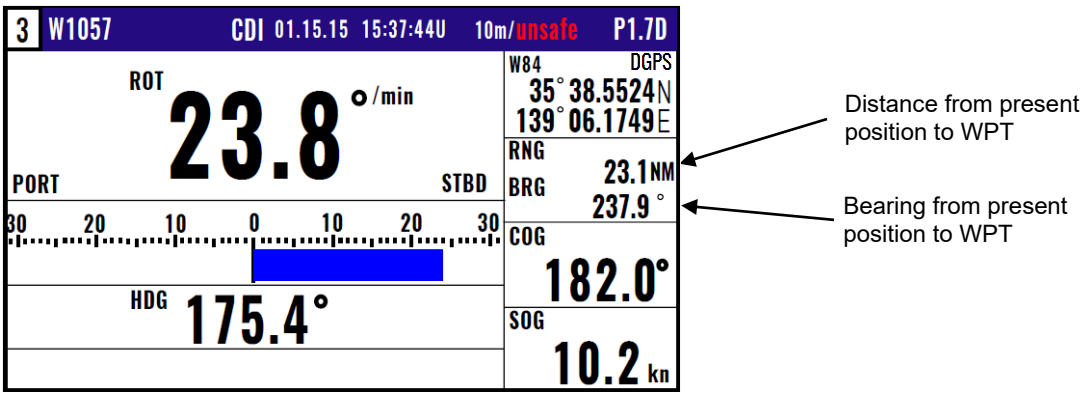
2.2.4 HDG1 screen during waypoint navigation



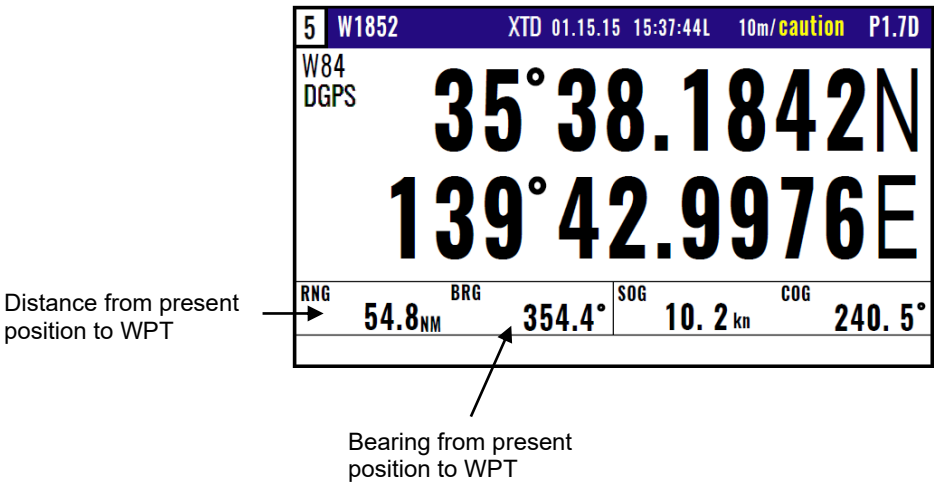
2.2.5 HDG2 screen during waypoint navigation



2.2.6 ROT screen during waypoint navigation



2.2.7 NAV2 screen during waypoint navigation



2.3 Storing and erasing routes

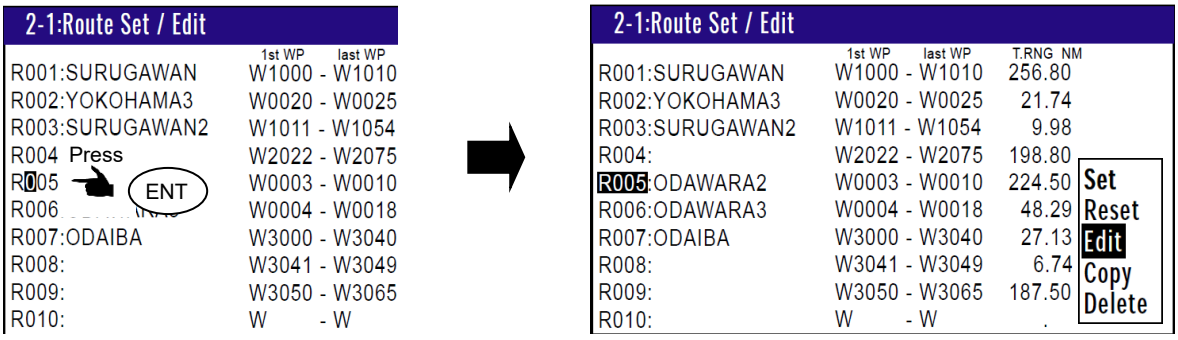
◀ **NOTE:** *Press to backspace the cursor to correct an input error.*

CLR **NOTE:** *Press to clear incorrect Input. You can reenter Numeric data.*

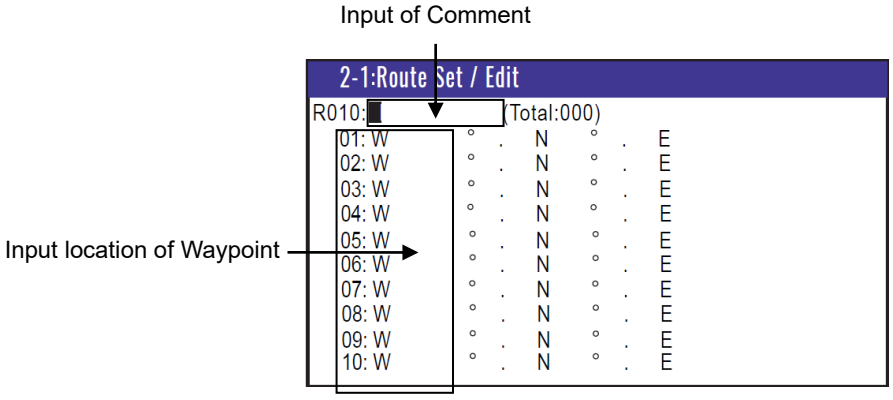
2.3.1 Storing your route

• Up to 100 routes with 50 waypoints within one route can be registered.

(1) Press MENU key until Menu options 1 to 9 appears.
(2) Press 2/N key to select "**2: Route**".
(3) Press 1 key to select "**1: Route Set / Edit**". Route Input screen is displayed.
(4) Enter a route number (01 to 100) by numeric keys and press ENT key.
(5) Press ENT key to display the pop-up.
(6) Select [**Edit**] in pop-up and press ENT key.



(6) Move the cursor to where you want to change. [Comment] or [Waypoint]
• Press [▲] [▼] key to move the cursor.

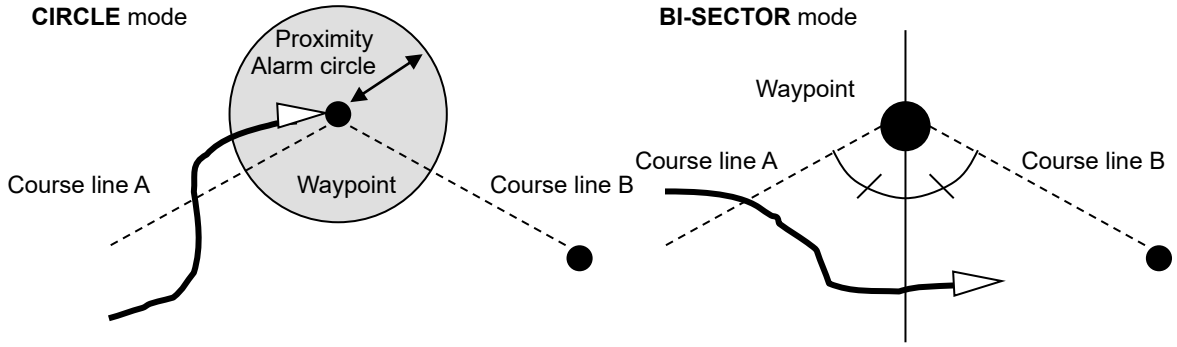


(7) If you want to change the [Comment]
1) Press ENT key to select of the [Comment].
2) Press [◇] key to select a comment letter in pop-up.
3) Press ENT key to after moved a cursor to the [**DECISION**] in the pop-up.

(8) If you want to change the [Waypoint]
1) Press (ENT) key to select of the Input location of Waypoint.
2) Enter a waypoint number (0000 to 9999) of the route by numeric keys. (You can check its memory data on the screen.)
3) Press (ENT) key to store the waypoint number.
(9) Repeat (8) steps to set another waypoint in the route.

2.3.2 Automatic switching of waypoints

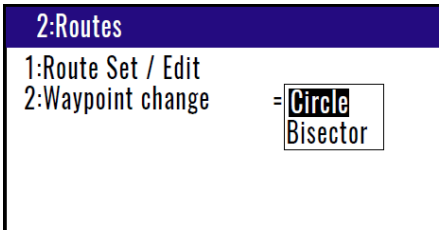
Route navigation can switch the current waypoint in two ways: switching in CIRCLE mode and switching in BI-SECTOR mode. In CIRCLE mode, the next waypoint is shown when you reach the proximity alarm circle. In BI-SECTOR mode, the next waypoint is shown when you cross a half-angle line.



When you reach the proximity alarm circle, the course line is switched from A to B. To change the proximity alarm range, see "**Setting and canceling**" (page 3-3).

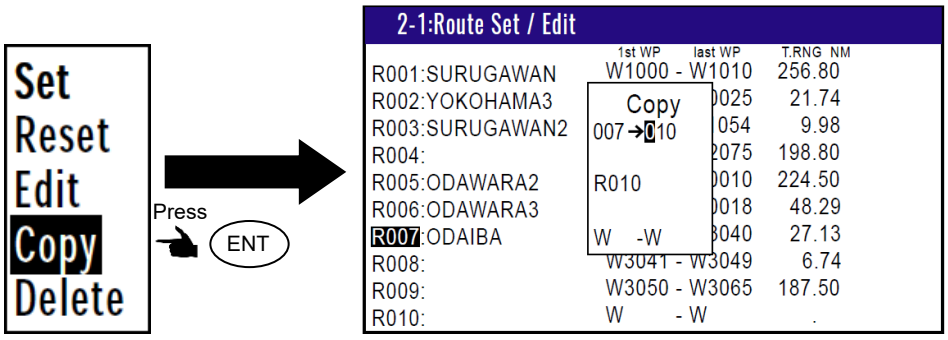
When you cross a half-angle line, the course line is switched from A to B.

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (2/N) key to select "**2: Route**".
(3) Press (2/N) key to select "**2: CHANGE**".
(4) Press [▲] or [▼] key to locate cursor to select a mode.
(5) Press (ENT) key. The selected mode will be shown.



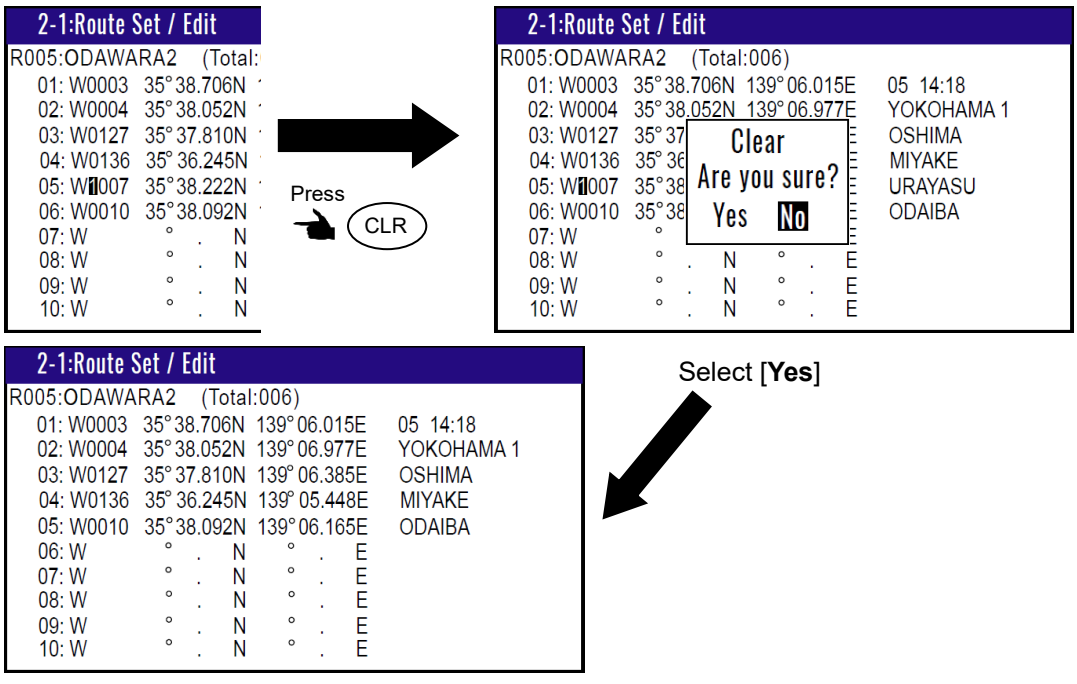
2.3.3 Copying a single route

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (2/N) key to select "**2: Route**".
(3) Press (1) key to select "**1: Route Set / Edit**". Route Input screen is displayed.
(4) Enter a route number (01 to 100) using numeric keys and press (ENT) key.
(5) Press (ENT) key to display the pop-up.
(6) Select [**Copy**] in the pop-up and press (ENT) key.
(7) Enter a source point number (001 to 100) by numeric keys.
(8) Press (ENT) key to copy the route data.



2.3.4 Erasing point data

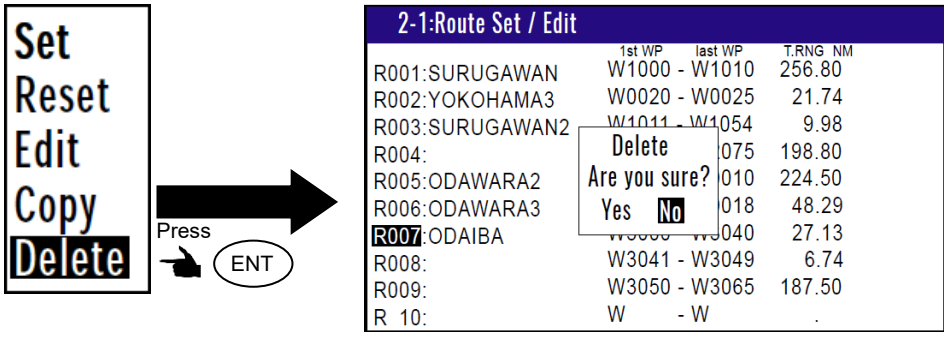
(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (2/N) key to select "**2: Route**".
(3) Press (1) key to select "**1: Route Set / Edit**". Route Input screen is displayed.
(4) Enter a route number (01 to 100) by numeric keys and press (ENT) key.
(5) Press (ENT) key to display the pop-up.
(6) Select [**Edit**] in the pop-up and press (ENT) key.
(7) If you want to delete any Waypoint, press (CLR) key in a place that is registered
(8) If OK, select [**Yes**] in the pop-up and press (ENT) key.
If Cancel, select [**No**] in the pop-up and press (ENT) key.



2.3.5 Erasing a single route

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (2/N) key to select "**2: Route**".
(3) Press (1) key to select "**1: Route Set / Edit**". Route Input screen is displayed.
(4) Enter a route number (01 to 100) by numeric keys and press (ENT) key.

(5) Press ENT key to display the pop-up.
(6) Select [**Delete**] in the pop-up and press ENT key.
(7) Press ENT key to display the pop-up.
(8) If OK, select [**Yes**] in the pop-up and press ENT key.
If Cancel, select [**No**] in the pop-up and press ENT key.



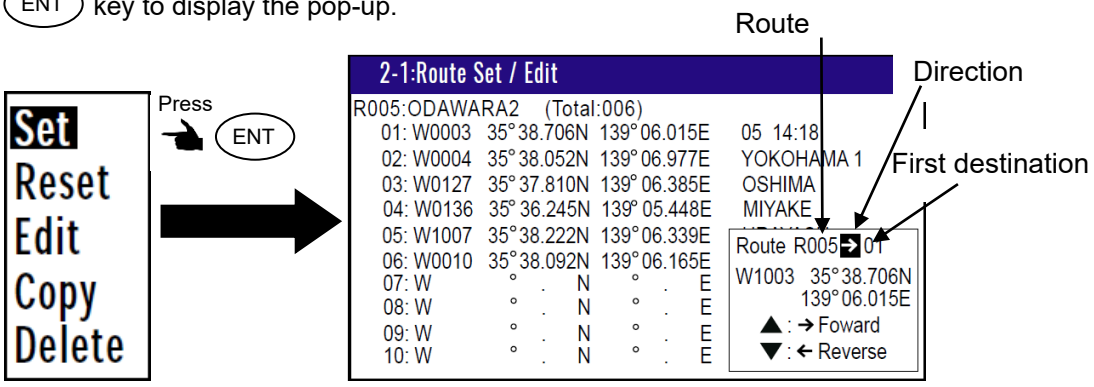
NOTE: *To erase all stored data from memory, see* ***"WPT./Route clear"*** *(page 6-5).*

2.4 Route setup

You can use up to 50 waypoints to go to a final destination using route navigation. You can also reverse the navigation route to return to the start point. To do so, you must first store the waypoints and create the route with MENU 1. See "**2.1 Storing waypoints (LAT/LONG) data**" (page 2-1).
You can set the route by entering a route number, forward/backward navigation, and start waypoint number of the route.

2.4.1 Selecting route navigation

You navigate on a route, following the course line, which is automatically updated as you reach each waypoint. Use the following steps to start route navigation.
Select the reverse navigation only after you have reached the final destination, or the route navigation may not work properly.
(1) Press MENU key until Menu options 1 to 9 appears.
(2) Press 2/N key to select "**2: Route**".
(3) Press 1 key to select "**1: Route Set / Edit**". Route Input screen is displayed.
(4) Enter a route number (01 to 100) by numeric keys and press ENT key.
(5) Press ENT key to display the pop-up.



(6) Select [**Set**] in the pop-up and press (ENT) key.

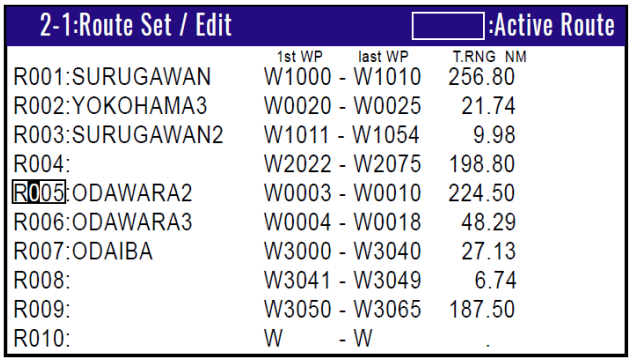
(7) You can select the first destination. In addition, you can be selected to Forward and Reverse.

1) Press [▲] key if you go Forward.
Press [▼] key if you go Reverse.

2) Select the first destination.

3) Determined by (ENT) key.

(8) Number is surrounded by square.



2.4.2 Checking a route point position

You can check the waypoints on a route from the Menu.

(1) Press (MENU) key until Menu options 1 to 9 appears.

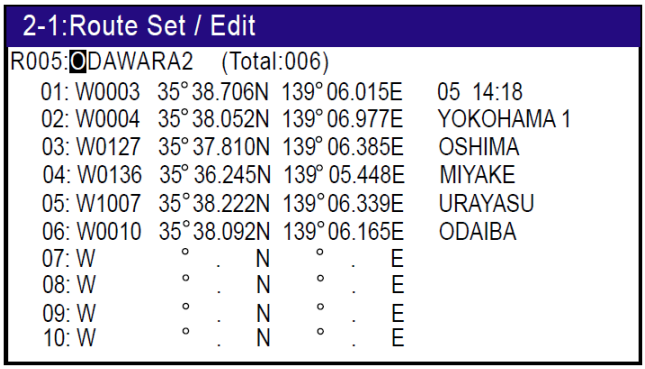
(2) Press (2/N) key to select "**2: Route**".

(3) Press (1) key to select "**1: Route Set / Edit**". Route Input screen is displayed.

(4) Enter a route number (01 to 100) by numeric keys and press (ENT) key.

(5) Press (ENT) key to display the pop-up.

(6) Select [**Edit**] in the pop-up and press (ENT) key.



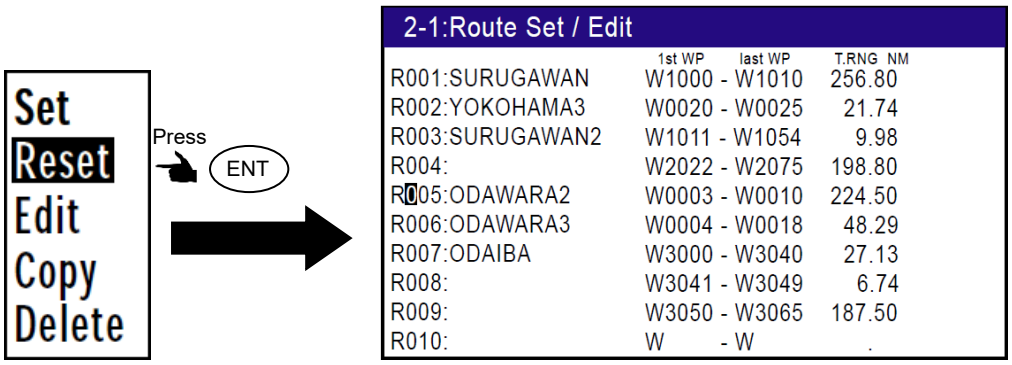
2.4.3 Canceling route navigation

To cancel waypoint navigation, turn Route to OFF on HDG1, HDG2, ROT, NAV1 or NAV2 screen.

- Cancel from [MENU]
- Cancel from HDG1, HDG 2, ROT, NAV1 or NAV2 screen.

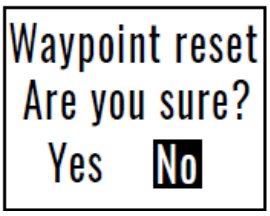
1) When Reset from [MENU]

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (2/N) key to select "**2: Route**".
(3) Press (1) key to select "**1: Route Set / Edit**". Route Input screen is displayed.
(4) Enter a route number (01 to 100) by numeric keys and press (ENT) key.
(5) Press (ENT) key to display the pop-up.
(6) Select [**Reset**] in the pop-up and press (ENT) key.



2) When Reset from HDG1, HDG2, ROT, NAV1 or NAV2 screen.

(1) Press (CLR) key.
(2) If OK, select [**Yes**] in the pop-up and press (ENT) key.
If Cancel, select [**No**] in the pop-up and press (ENT) key.

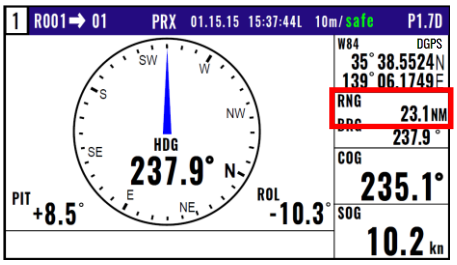


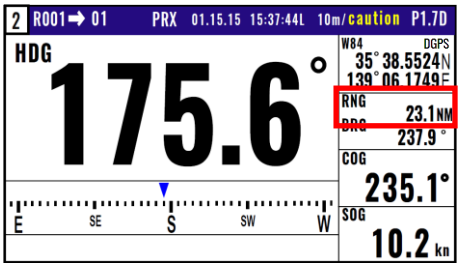
2.4.4 Switching distance display during route navigation

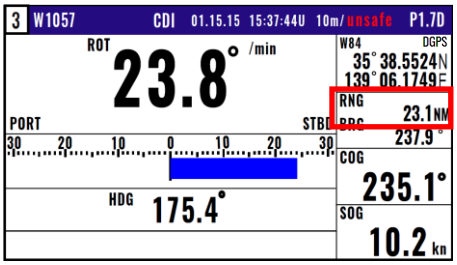
Switch the destination distance RNG to the destination total distance T.RNG display on any (HDG1, HDG2, ROT, or NAV2) screen in route navigation.

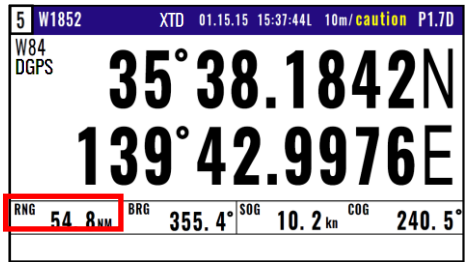
> **NOTE:** *"**RNG**" shows the distance to the next waypoint.*
> *"**T.RNG**" shows the total distance to the final destination..*

(1) Press (MODE) key until HDG1, HDG2, ROT, or NAV2 screen appears.
(2) Press [◀] key to display "**RNG**".

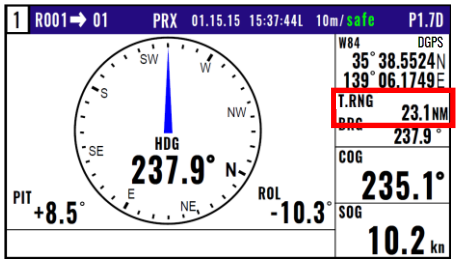


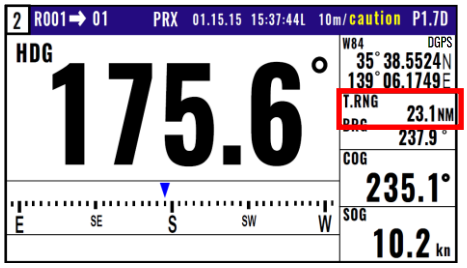


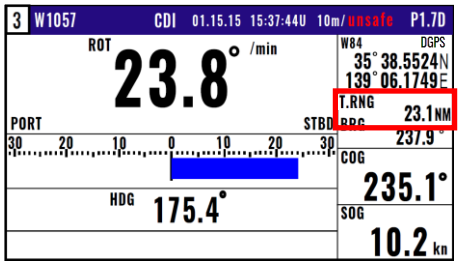


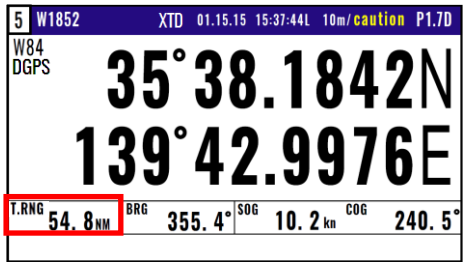


(3) Press [▶] key to display "**T.RNG**".









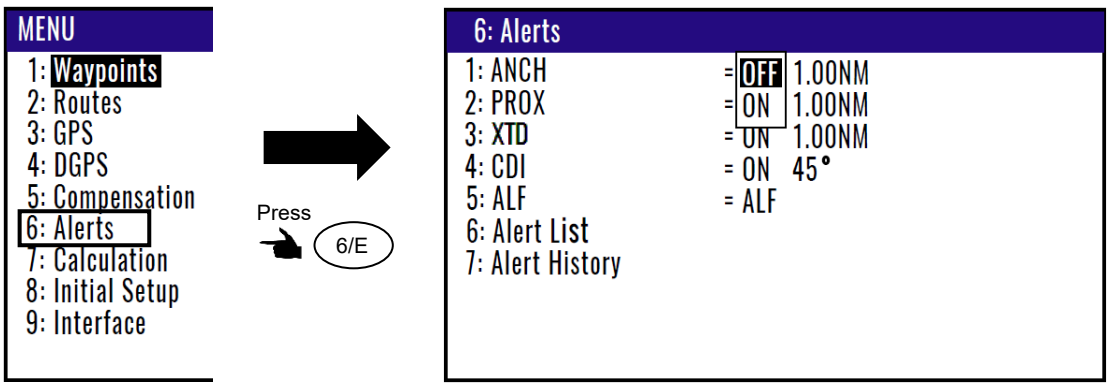
2.5 Setting an anchor position

After arriving at your destination, it is possible to drift from the anchor position due to a tide or wind. Once the anchor position is stored in memory, it is easy to check the distance and bearing moved from the anchor position.

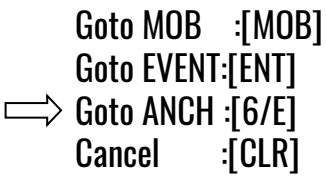
2.5.1 Storing an anchor position

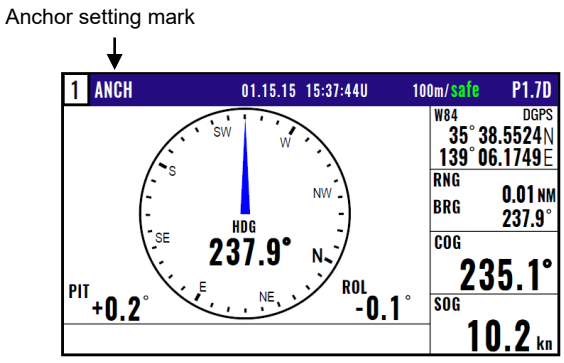
You can set the anchor position from the HDG1, HDG2, ROT, NAV1 or NAV2 screen.
The following operations allow you to store and specify the current position as the anchor position. The anchor position is registered to memory number A9997 along with the comment.

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (6/E) key to select "**6: Alerts**".
(3) Press (1) key to select "**1: ANCH**".
(4) Select [**ON**] in the pop-up and press (ENT) key.



(5) Press (MODE) key until HDG1, HDG2, ROT, NAV1 or NAV2 screen appears.
(6) Press (MOB) key.
(7) Press (6/E) key. (Goto ANCH)





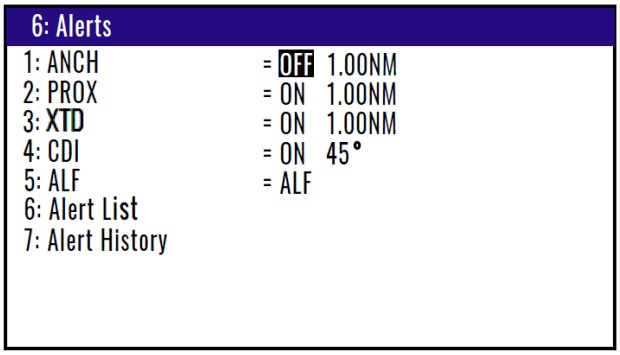
2.5.2 Canceling anchor position

(1) Press MODE key until HDG1, HDG2, ROT, NAV1 or NAV2 screen appears.
(2) Press CLR key.
(3) If OK, select [**Yes**] in the pop-up and press ENT key.
If Cancel, select [**No**] in the pop-up and press ENT key.

Chapter 3 Alarms/Alerts

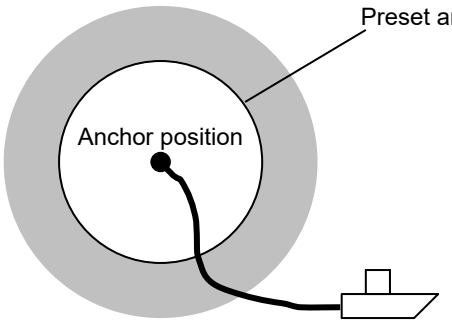
3.1 Alerts

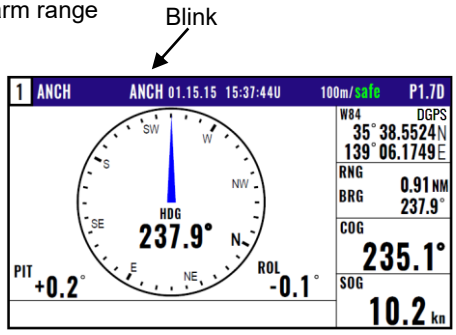
There are four kinds of navigation alarms, anchor watch (**ANCH**), proximity (**PROX**), cross track distance (**XTD**) and course deviation angle (**CDI**).



3.1.1 Anchor watch alarm (ANCH)

An anchor watch alarm can alert you if your boat drifts a set distance from where it is activated. This alarm function will not work if the alarm range is set to "0.00". **ANCH** letters blink and buzzer (short beep) sounds when outside of alarm range. Please refer to "**2.5.1 Storing an anchor position**". Press **CLR** key if you want to turn the buzzer off.

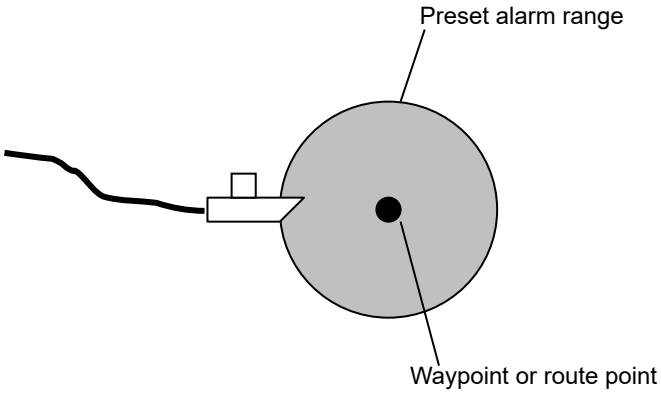


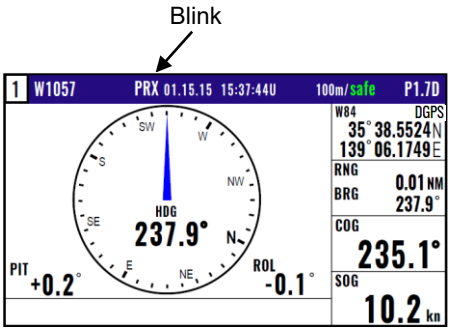


Initial setup: OFF, 1.00NM
Enter an alarm range: 0.00 to 9.99

3.1.2 Proximity alarm (PROX)

A proximity alarm alerts you when you arrive to within a preset distance to a waypoint.
The proximity alarm will not work if the alarm range is set to "0.00". Note: you will automatically advance to the next waypoint at the alarm range if you have selected the CIRCLE mode of route navigation by "Automatic switching of waypoints" (page 2-9). **PRX** letters blink and buzzer (short beep) sounds when you arrive. Press **CLR** key, if you want to turn the buzzer off.

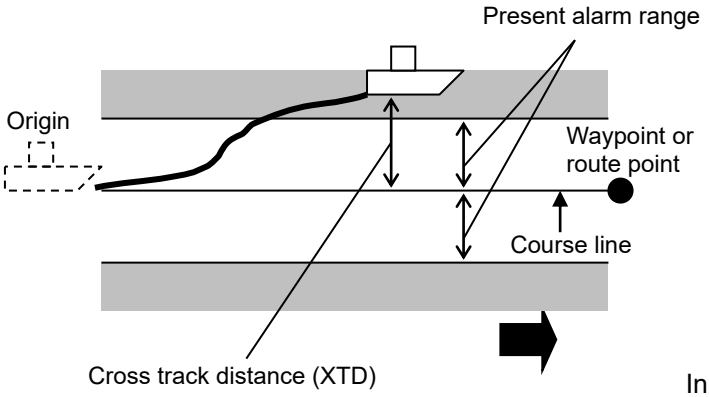


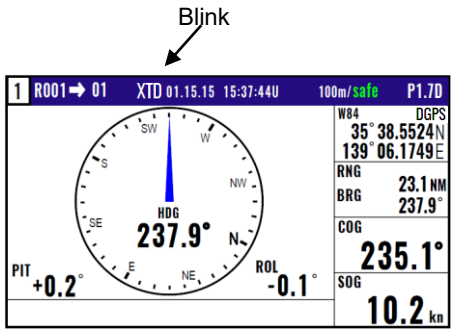


Initial setup: ON, 1.00
Enter an alarm range: 0.00 to 9.99

3.1.3 Cross track distance alarm (XTD)

The cross track distance (XTD) alarm alerts you when you have deviated from your course line by a predetermined distance. The alarm function does not work if the alarm range is set to '0.00'. **XTD** letters blink and buzzer (long beep) sounds when you are out from XTD range.
Press **CLR** key, if you want to turn the buzzer off.

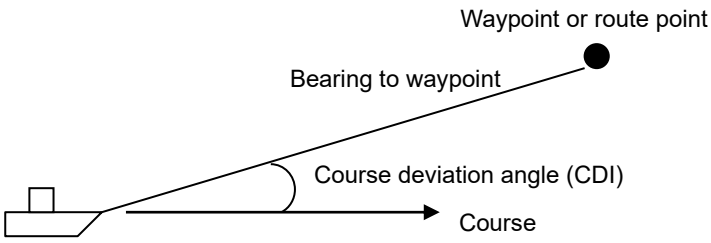


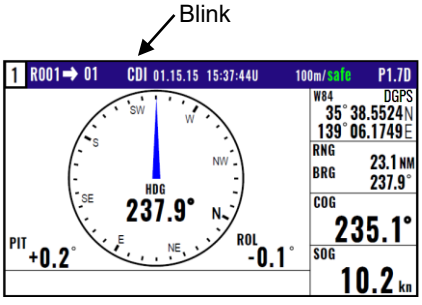


Initial setup: ON, 1.00
Enter an alarm range: 0.00 to 9.99

3.1.4 Course deviation angle alarm (CDI)

The CDI alarm alerts you when you deviate from your course to steer by a predetermined margin. The alarm function does not work if the alarm range is set to “00”. **CDI** letters blink and buzzer (long beep) sounds when I’m away from CDI range. Press **CLR** key, if you want to turn off buzzer.





Initial setup: ON, 45 degrees
Enter an alarm range: 00 to 99 degrees

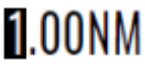
3.2 Setting and canceling

(Setting alarm)

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (6/E) key to select "**6: Alerts**".
(3) Select item number of the alarm to be set by numeric keys.
(4) Press [▲] or [▼] key to move cursor to **ON**.
(5) Press (ENT) key.

(Changing alarm range)

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (6/E) key to select "**6: Alerts**".
(3) Select item number of the alarm to be set by numeric keys.
(4) Press [▶] key to move cursor to alarm range field.
(5) Enter an alarm range by numeric keys. CDI alarm range is 2-digit.
(6) Press (ENT) key.



(Canceling alarm)

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (6/E) key to select "**6: Alerts**".
(3) Select desired alarm number by numeric keys.
(4) Press [▲] or [▼] key to move cursor to [**OFF**].
(5) Press (ENT) key.

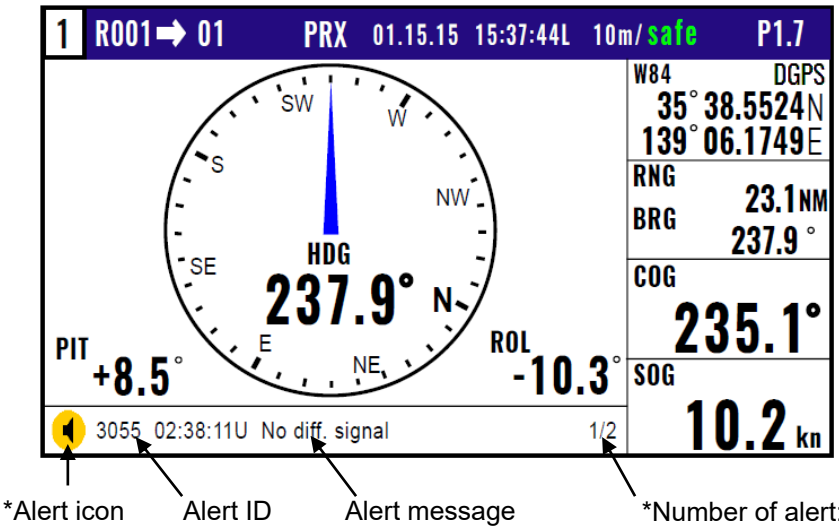
3.3 Alerts

Alerts are different from navigation alarms. There is no setting on / off by the operator. It occurs when you should pay attention to or warn about system and operating conditions.

There are two types of Alerts: Warning, and Caution.

Warning: In situations where it is necessary to immediately check the status and take preventive measures.

Caution: There is no urgency but need to pay attention.



*When multiple alerts are occurring, pressing the [▲]key will display the next alert.

*Type of Alert icon

: Active –unacknowledged Warning

: Active –silenced Warning

: Active –acknowledged Warning

: Active –responsibility transferred Warning

: Rectified –unacknowledged Warning

: Caution

3.3.1 Acknowledge of alerts

When an alert occurs, the buzzer sounds (except Caution) and the contents of the alert is displayed at the bottom of the screen. When you acknowledge an alert and press the **ACK/CLR** key, the buzzer is silence. When multiple alerts are occurring, pressing the [▲] key will display the next alert. If the condition recovers before acknowledge, the buzzer will be silence, but the alert display remains as Rectified.

3.3.2 Alert List

You can check the date/time and the latitude/longitude of alert occurrence. The procedure is as follows:

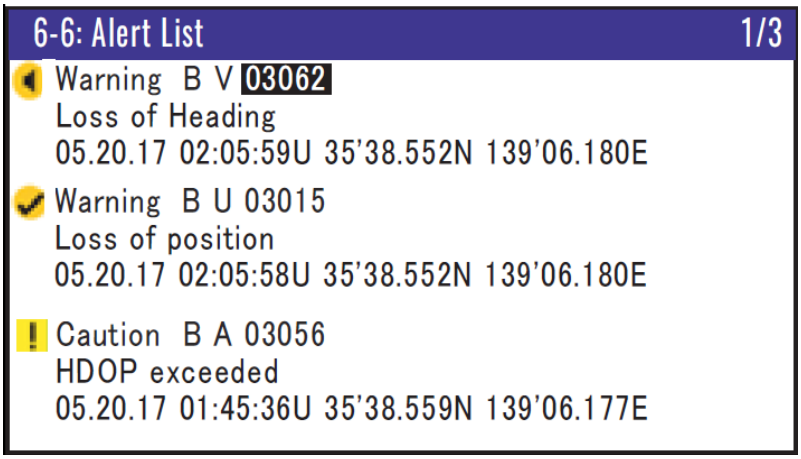
(Single action in emergency)

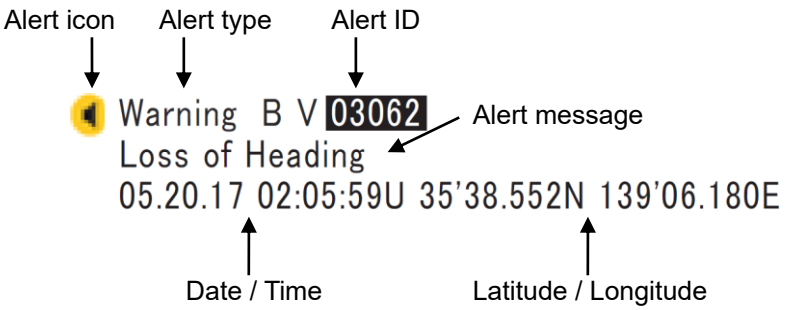
(1) Press (9/AL) key.

(Normal operation)

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (6/E) key to select "**6: Alerts**".
(3) Press (6/E) key to select "**6: Alert List**".

*Up to 9 alerts will be displayed in the list.





The cursor on Alert ID moves up and down with the [▲] or [▼] key. When you acknowledge an alert, select ID and press the ACK/CLR key, the buzzer is silence. Press the [▶] key to switch pages. Switching directly to the alert entry with the highest priority is possible be pressing the key (9/AL)

Alert type: "B" is the Alert category and means that there is no additional information for decision support necessary.
"V" is a valid active alert.
"U" is an unacknowledged alert, no more active.
"A" is an acknowledged alert.

3.3.3 Alert History

You can check the history of alerts. The procedure is as follows:

(1) Press (MENU) key until Menu options 1 to 9 appears.

(2) Press (6/E) key to select "**6: Alerts**".

(3) Press (7) key to select "**7: Alert History**".

*Up to 40 alerts will be displayed in the history.

No. Time Type ID Short message

```
01 014536 B C A   03056   HDOP exceed
02 020550 B W V   20182   Lost ANT1 signal
03 020558                 Antenna fault 1
                    :
10 020629 B C A   20223   Settling wait
```

3.3.4 Alert list

Cat*)	Priority	ID	Instance	Alert title	Reason
B	Warning	3008	1	No calculation	Can not calculate position for more than 5 minutes
B	Warning	3012	1	DGPS integrity	Station is unhealthy, unmonitored, or signal quality is below threshold
B	Warning	3015	1	Loss of position	A new position has not been calculated for more than 1 s
B	Warning	3055	1	DGPS fail	Loss of differential signal
B	Warning	3055	2	DGPS not applied	Differential correction not applied
B	Caution	3056	1	HDOP exceeded	The value of HDOP exceeded 4.0
B	Warning	3062	1	Loss of Heading	Can not output heading data for more than 1 minute
B	Warning	3062	2	RAIM Limit	RAIM Limt exceeded
B	Warning	20182	1	Loss of ANT1 signal	Antenna 1 unreceivable
B	Warning	20182	2	Loss of ANT2 signal	Antenna 2 unreceivable
B	Caution	20203	1	Low Battery	Processor unit battery voltage drop
B	Caution	20223	1	Settling wait	Heading data and backup sensor is settling
—	—	—	—	Sensor fault x	Processor unit failure
—	—	—	—	Antenna fault 1	ANT1 failure (Not connection)
—	—	—	—	Antenna fault 2	ANT2 failure (Not connection)

*): Alert Category

1) The Warnings / Cautions from 20182 to 20223 are manufacturer alerts. The ID numbers 3008 to 3062 are IMO defined alerts. Both are specified to be in compliant with a Bridge Alert Management system.
2) Category B: Alerts where no additional information for decision support is necessary besides the information which can be presented using alert source and alert description text.
3) Escalation: All Warnings are escalating to a Warning after a fixed time of 60s.
4) Responsibility Transfer: For all CAT B Warnings, the Responsibility Transfer is allowed. Active Responsibility Transfer cannot be hidden.
5) Silencing an Alert: Silencing an alert is possible with the alert acknowledgement or by the BAM/CAM with the alert communication.
6) Alerts with an alert category of **"-"** are errors due to the result of self-test. This alert does not appear in the alert list, instead you can see it in the alert history.

3.3.5 Alert sentence

You can output alert related sentences to external devices from the DATA1 connector. The procedure is as follows:

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (6/E) key to select "**6: Alerts**".
(3) Press (5) key to select "**5: ALF**.
(4) Press [▲] or [▼] key to move cursor onto "**OFF**" or "**ALF**".
(5) Press (ENT) key.

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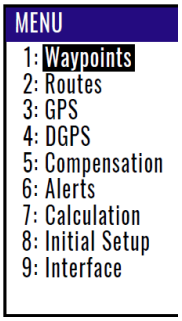
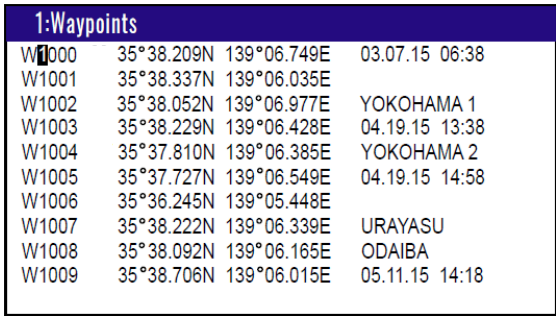
Chapter 4 Setup Procedure

4.1 Menu options

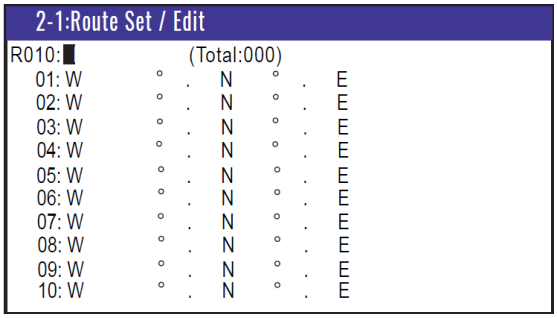


NOTE: *You can select an option from Menu in two ways: by direct numeric key entry or by cursor shifting. This manual explains how to enter numeric values for easy understanding, but you can also use the cursor for option selection.*

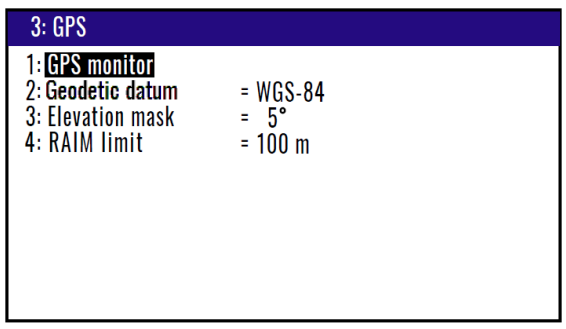
(1) Waypoints
You can set up about Waypoints. Store, edit, copy and erase waypoints. (See pages 2-1 to 2-5)



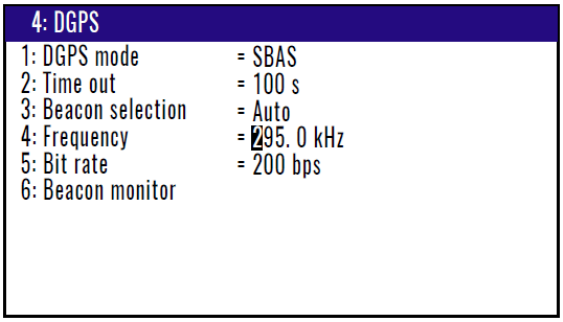
(2) Routes
You can set up about Routes. Store and erase a route. Forward/backward navigation Selection. Automatic route switching. Waypoint data switching. (See pages 2-8 to 2-14).



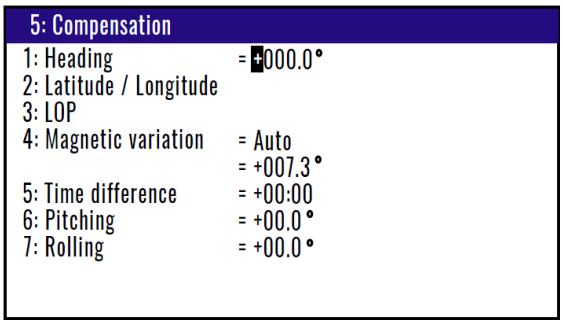
(3) GPS
You can set up about GPS. Display of GPS satellite status. Select geodetic datum. Set satellite elevation angle limit. Select RAIM accuracy.



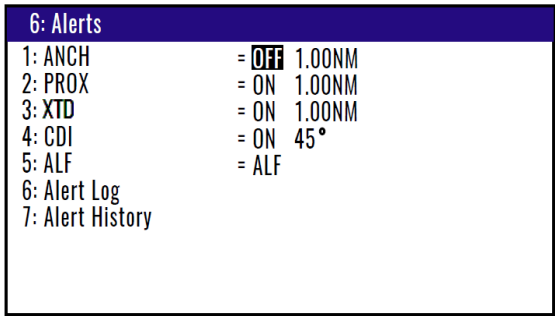
(4) Differential GPS (DGPS)
You can set up about DGPS. Select DGPS mode. Set DGPS timeout. Select beacon station. Set beacon frequency. Select beacon bit rate. Monitor DGPS data. Monitor beacon message.



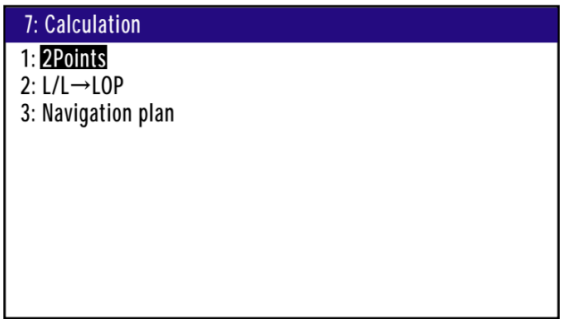
(5) Compensation
You can compensate for output data. Heading, Position correction (LAT/LONG, LOPs), Compass correction, Time difference, Pitching, Rolling.



(6) Alerts (See pages 3-1 to 3-6)
You can set up about navigation alarms. Anchor watch alarm. Proximity alarm. XTD alarm. CDI alarm, ALF.
And you can check alert status.



(7) Calculation
You can calculate about the various situations. Distance and bearing between two points LAT/LONG into LOPs data conversion Calculation of estimated time length from the current position to the destination, or required speed.

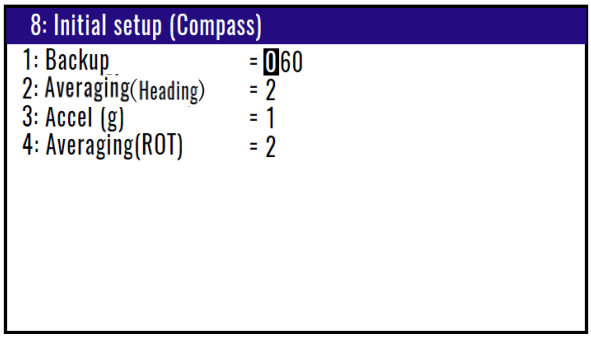


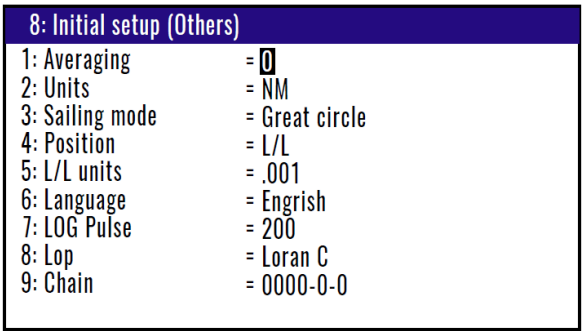
(8) Initial setup

You can set various initial settings.

Compass items: Backup compass timeout, Heading averaging, Following acceleration, ROT averaging.

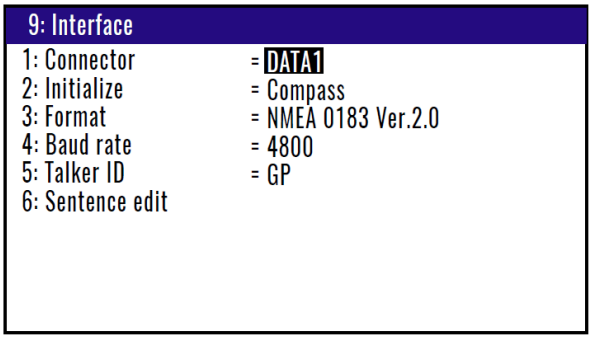
Other general: Position/SOG/COG averaging, Select distance/speed units. Select Sailing mode. Select position (LAT/ LONG, LOPs). Select digits of LAT/LONG, Language, Log pulse and LOP/Chain.





(9) Interface

You can set up about interfacing. Select of output format. Select of connected equipment. Edit the output format. Select of Baud rate. Select of Talker ID. Edit the used sentences.

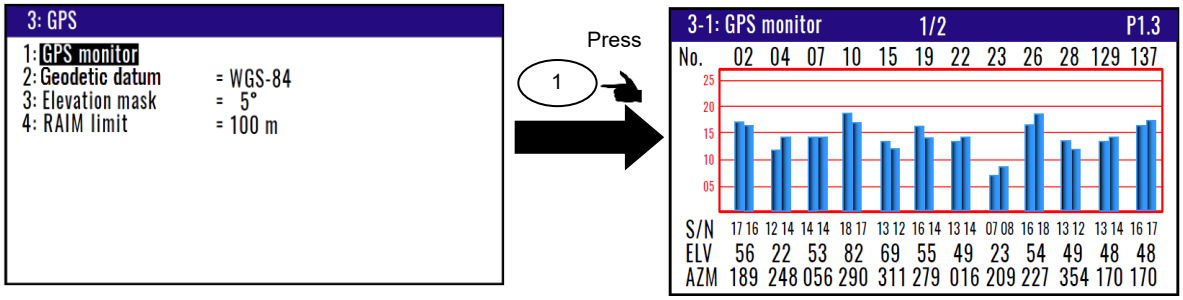


4.2 Menu 3: GPS

4.2.1 Monitoring GPS satellite signal reception

You can monitor the signal status from GPS (SBAS) satellites. The signals from 3 satellites are used for two-dimensional positioning, but signals from 4 or more satellites are required for three-dimensional positioning.

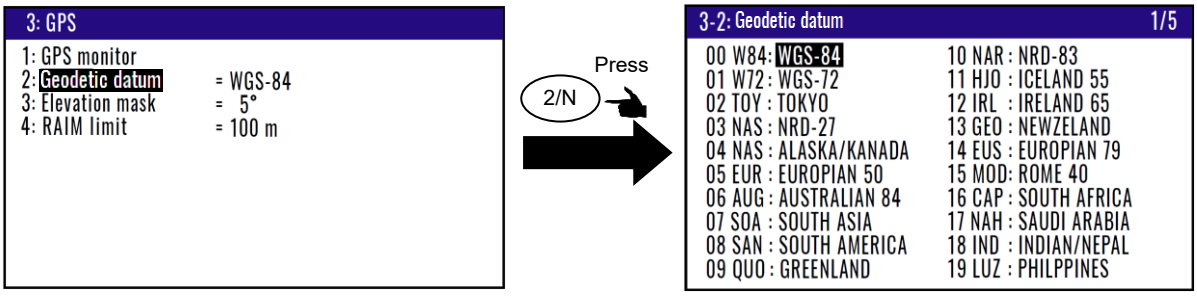
(1) Press MENU key until Menu options 1 to 9 appears.
(2) Press 3 key to select "**3: GPS**".
(3) Press 1 key to select "**1: GPS Monitor**". Satellite information is displayed (direction / signal)



4.2.2 Selecting a geodetic datum

The latitude and longitude are calculated based on the WGS-84 with GPS system. However, the charts used in many countries are based on different geodetic datum. You can compensate this difference from your chart by converting GPS position data into your actual chart system. To select a geodetic datum, see "Local Geodetic Systems" (Chapter 9 Annex).

(1) Press MENU key until Menu options 1 to 9 appears.
(2) Press 3 key to select "**3: GPS**".
(3) Press 2/N key to select "**2: Geodetic datum**".
(4) Press [▲] or [▼] key to move cursor onto the desired geodetic datum.
(5) Press ENT key.

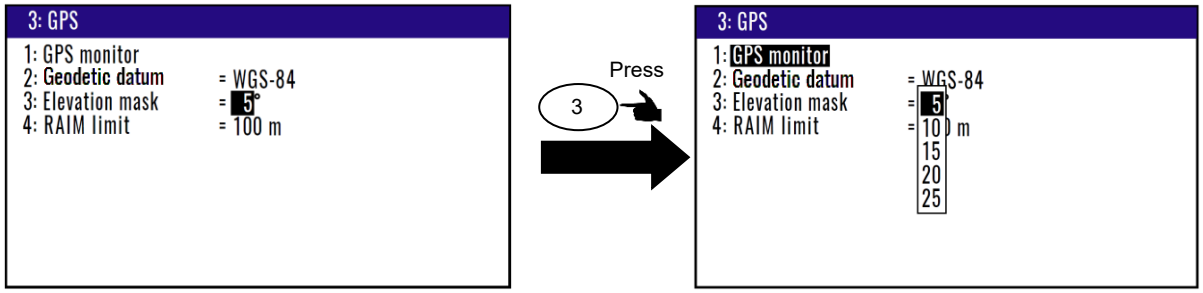


Initial setup: WGS-84

4.2.3 Masking satellite elevation angle

When the satellite is below 5 degrees above the horizon, signal reflection and interference can cause erroneous positioning. You can improve the positioning accuracy by masking the elevation angle. However, a large mask value shortens the signal receive time and most satellite combinations are rejected.

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (3) key to select "**3: GPS**".
(3) Press (3) key to select "**3: Elevation mask**".
(4) Press [▲] or [▼] key to move cursor onto elevation angle masking.
(5) Press (ENT) key.

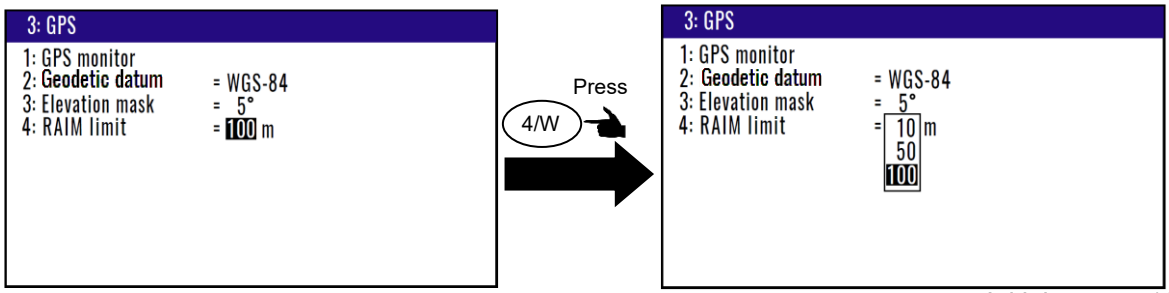


Initial setup: 5°

4.2.4 RAIM

RAIM (Receiver Autonomous Integrity Monitoring) is the function, which supervises whether GPS holds the accuracy, which the user chose (100m/50m/10m). And the status is displayed after position fix is available.

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (3) key to select "**3: GPS**".
(3) Press (4/W) key to select "**4: RAIM limit**".
(4) Press [▲] or [▼] key to move cursor onto raim limit setting value.
(5) Press (ENT) key.



Initial setup: 100m

RAIM limit

RAIM status

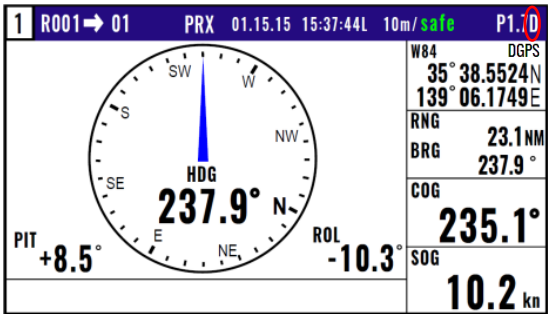
Safe: When the expected position error is within the RAIM limit.
Caution: When can not calculate the expected position error.
Unsafe: When the expected position error exceeds the RAIM limit.

4.3 Menu 4: Differential GPS(DGPS)

This DGPS system can improve the GPS positioning accuracy. There are three styles, AUTO, SBAS and Beacon. “BEACON” requires a signal from the external receiver system which outputs the compensation data of RTCM SC-104. (Example KBG-3 or other brand)
“AUTO” mode is automatically changes SBAS and Beacon which continue DGPS performance.

4.3.1 Displaying DGPS

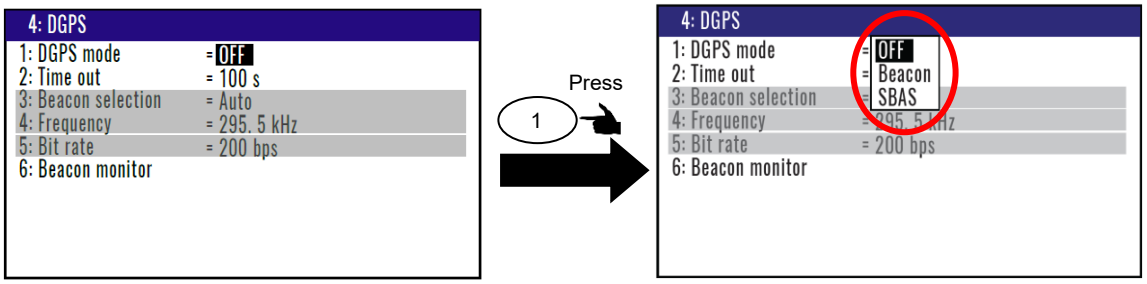
When the DGPS is set, the DGPS status is displayed with letters **D** by the top right corner of the screen. In addition, the position accuracy (GPS / DGPS) is in the field of position information.



4.3.2 Selecting a style of DGPS

OFF: Normal GNSS positioning takes place. **D** letter is not shown.
BEACON: DGPS for RTCM SC-104.
SBAS: WAAS / EGNOS / MSAS / GAGAN / SDCM / Other

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (4/W) key to select “**4: DGPS**”.
(3) Press (1) key to select “**1: DGPS mode**”.
(4) Press [▲] or [▼] key to move cursor onto “**OFF**” or “**Beacon**” or “**SBAS**”.
(5) Press (ENT) key.

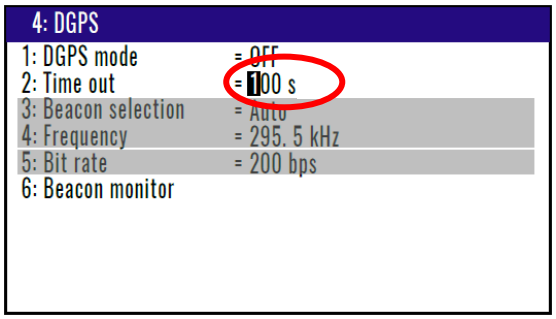


Initial setup: OFF

4.3.3 Setting a DGPS time out

If the correction data from beacon receiver is interrupted or has errors, NAVIGATOR holds the last differential correction for the duration of timeout. You can set Time out to 010 to 180 seconds. However, the position accuracy degrades as Time out lengthens.

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (4/W) key to select "**4: DGPS**".
(3) Press (2/N) key to select "**2: Time out**".
(4) Enter a timeout (010 to 180 seconds) by numeric keys.
(5) Press (ENT) key.



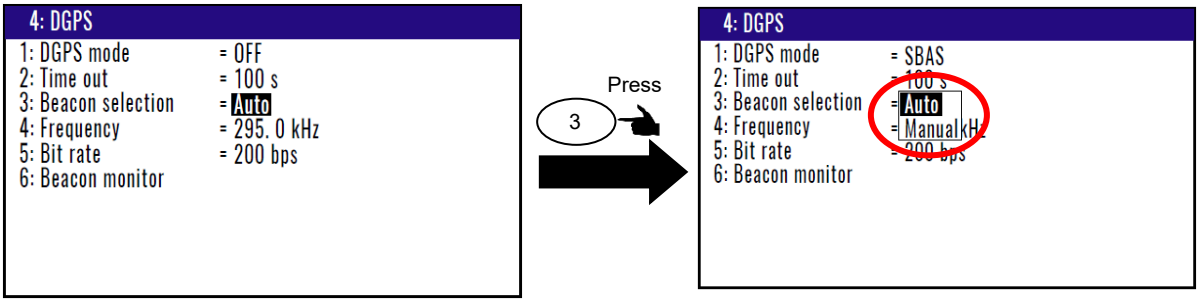
Initial setup: 100 s

4.3.4 Selecting a beacon station (Beacon DGPS only)

A beacon station is selectable in both the manual or auto mode. This mode is enable when "**1: DGPS mode**" is "**Beacon**" or "**SBAS**".

If the beacon receiver to be connected supports automatic tuning, in the auto mode, the nearest station will be selected based on actual longitude and latitude among all the stored beacon stations.

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (4/W) key to select "**4: DGPS**".
(3) Press (3) key to select "**3: Beacon selection**".
(4) Press [▲] or [▼] key to move cursor settings you select.
(5) Press (ENT) key.

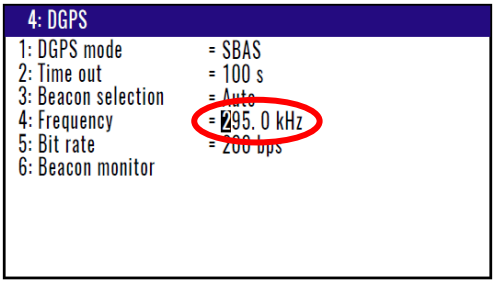


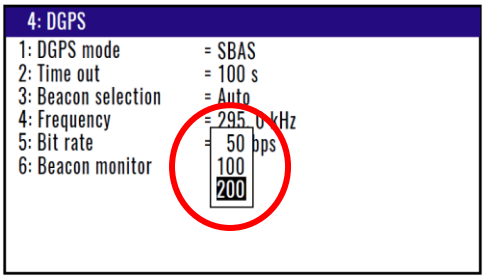
Initial setup: Auto

4.3.5 Setting receiving frequency and bit rate of a beacon station

You can set the receiving frequency (283.5 kHz to 325.0 kHz) that is transmitted from a beacon station. In addition, Bit rate you can also change “50bps”, “100bps”, “200bps”. This mode is disabled when “**3: Beacon selection**” is “**AUTO**”.

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (4/W) key to select “**4: DGPS**”.
(3) Press (3) key to select “**3: Beacon selection**”.
(4) Press [▲] or [▼] key to select [**Manual**] in the pop-up and press (ENT) key.
(5) Press [▼] key to move cursor “**4: Frequency**”.
(6) Specify receiving frequency (4-digit) of beacon station by numeric keys (0 to 9).
(7) Press (ENT) key to set receiving frequency.
(8) Press [▼] key to move cursor onto “**5: Bit rate**”.
(9) Press (ENT) key.
(10) Press [▲] or [▼] key to set bit rate “50bps”, “100bps”, “200bps”.
(11) Press (ENT) key.



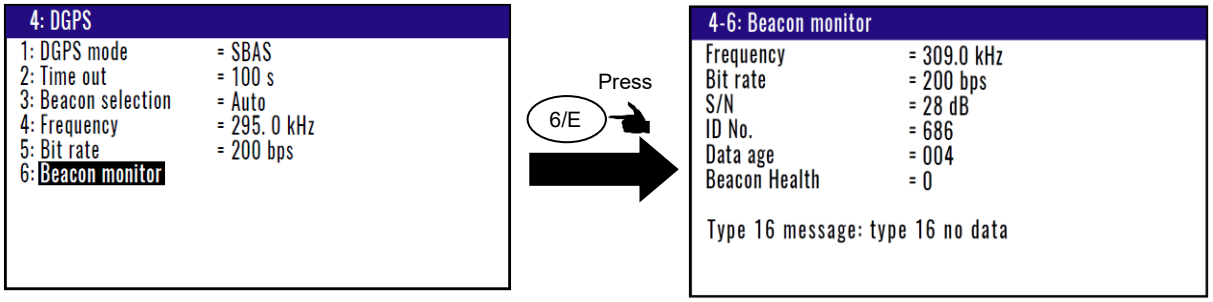


Frequency Initial setup: **283.5 kHz**
Selectable range: **283.5 to 325.0 kHz**
Bit rate Initial setup: **200 bps**

4.3.6 Beacon monitor

DGNSS monitor provides information on the DGNSS beacon receiver interface and receiving status.

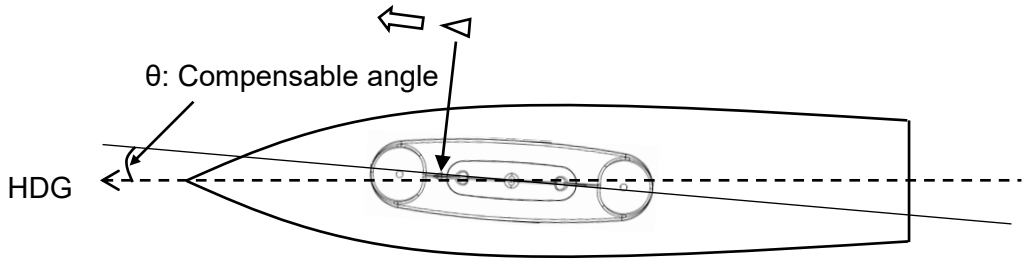
(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (4/W) key to select “**4: DGPS**”.
(3) Press (6/E) key to select “**6: Beacon monitor**”.



4.4 Menu 5: Compensation

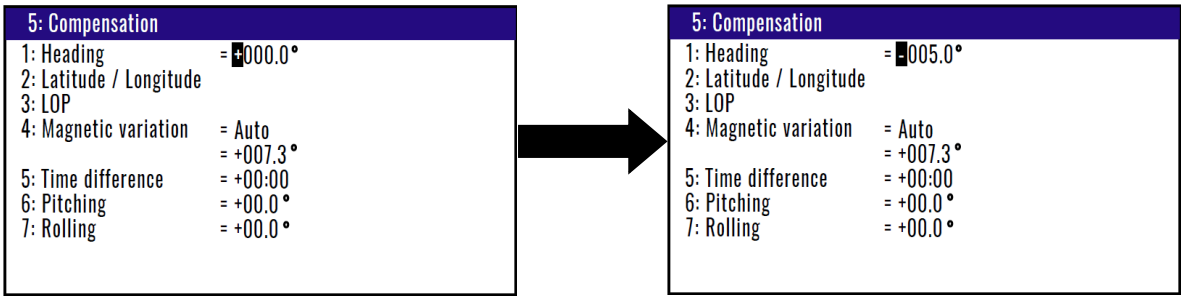
4.4.1 Compensating the heading

The GPS antenna should be installed on the keel line with the BOW mark oriented to the ship's bow. If not, it should be compensated.



When it is installed with 5° clockwise, enter a compensation value [-005.0°] using numeric keys.
When it is installed with 5° counterclockwise, enter a compensation value [+005.0°] using numeric keys.

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (5) key to select "**5: Compensation**".
(3) Press (1) key to select "**1: Heading**".
(4) Press [▲] or [▼] key to use the current positive (+) or negative (-) sign as it is.
(5) Enter a (4-digit) compensation offset by numeric keys.
(6) Press (ENT) key.



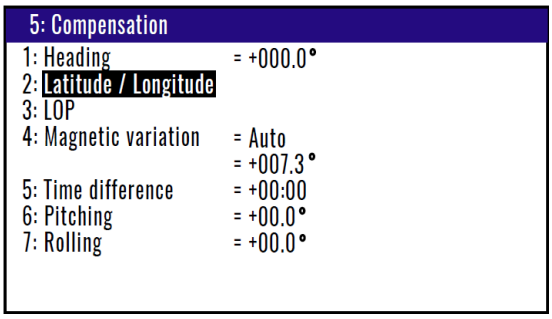
Initial setup: 000.0°

4.4.2 Correcting your position

You can compensate your GPS present position given by GPS in the following two ways:

• Enter the latitude and longitude of your actual position by numeric keys.

• Enter the correction offset to use.



(Direct entry of actual position data)

When your present position is displayed in Latitude / Longitude mode, you can correct it by entering the known Latitude/Longitude data.

(1) Press (MENU) key until Menu options 1 to 9 appears.

(2) Press (5) key to select "**5: Compensation**".

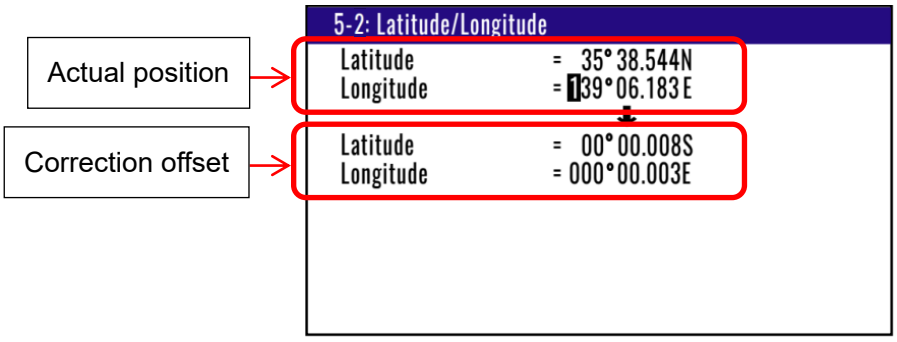
(3) Press (2/N) key to select "**2: Latitude / Longitude**".

(4) Enter the correct latitude and longitude value.

Example: The position "N35°38.544 / E139°06.183" is entered by pressing the following keys in exact order given below.

[3], [5], [3], [8], [5], [4], [4], [N], [ENT], [▼]

[1], [3], [9], [0], [6], [1], [8], [3], [E], [ENT]



(Entry of correction offset)

When your present position is displayed in Latitude / Longitude mode, you can correct it by entering the Latitude/Longitude correction data.

(1) Press (MENU) key until Menu options 1 to 9 appears.

(2) Press (5) key to select "**5: Compensation**".

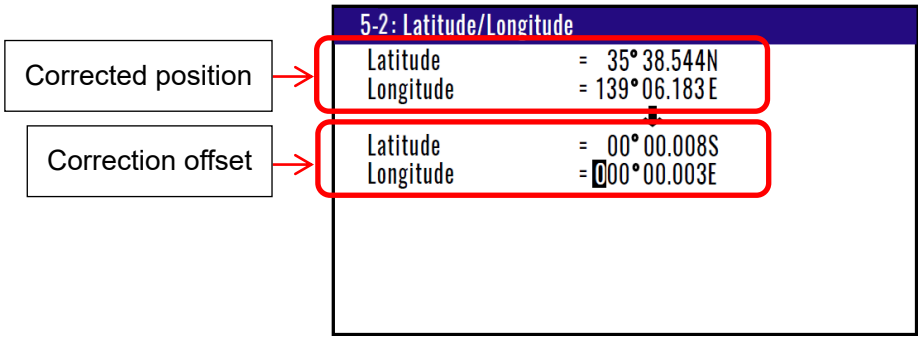
(3) Press (2/N) key to select "**2: Latitude / Longitude**".

(4) Press [▲] or [▼] key to move cursor onto correction offset field of latitude.

(5) Enter the latitude and longitude correction offset.

Example: The position “S0°00.008 / E0°00.003” is entered by pressing the following keys in exact order given below.

[0], **[0]**, **[0]**, **[0]**, **[0]**, **[0]**, **[8]**, **[S]**, **[ENT]**, [▼]
[0], **[0]**, **[0]**, **[0]**, **[0]**, **[0]**, **[0]**, **[3]**, **[E]**, **[ENT]**



4.4.3 Disable position correction

To delete and disable the correction offset follow these steps:

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (5) key to select “**5: Compensation**”.
(3) Press (2/N) key to select “**2: Latitude / Longitude**”.
(4) Press (CLR) key to set 0 of offset corrections.
(5) If OK, select [**Yes**] in the pop-up and press (ENT) key.
If Cancel, select [**No**] in the pop-up and press (ENT) key.

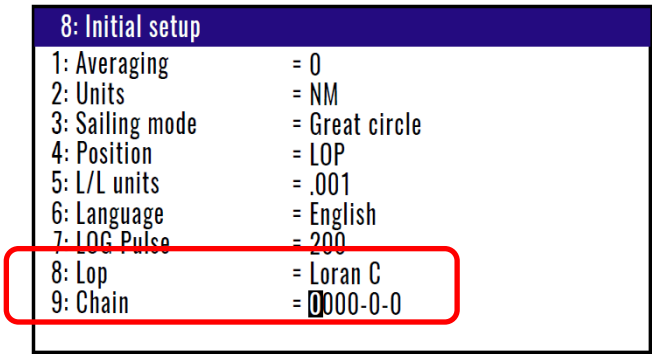
4.4.4 Compensating the LOP

The position is converted from Latitude and Longitude to LoranC, LoranA and Decca. It can be corrected in the converted data. (Caution: Can not convert Decca LOP.)

To change the “3: LOP”, the following settings are required

You can set of LoranA, LoranC of “**3: LOP**” change when you changed **8: Lop** and **9: Chain** in the **Menu8: Initial setup.**

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (8/S) key to select “**8: Initial setup (Compass)**”.
(3) Press [▶] key to open next page “**8: Initial setup (Others)**”.
(4) Press (8/S) key to select “**8: Lop**”.
(5) Setting “LoranA” or “LoranC” or “Decca”
(6) Press (ENT) key.
(7) Press (9) key to select “**9: Chain**”.
(8) Select a station you want to measure.



To change the "3: LOP"

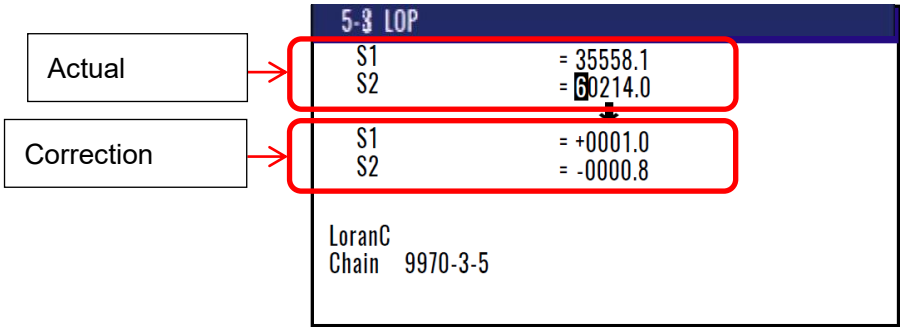
(1) Press (MENU) key until Menu options 1 to 9 appears.

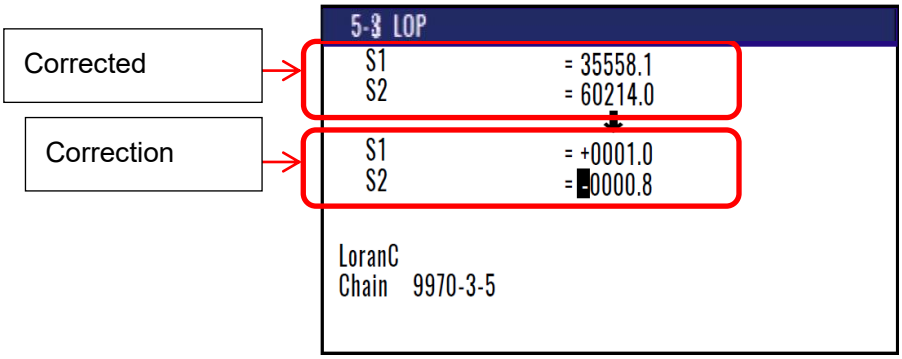
(2) Press (5) key to select "**5: Compensation**".

(3) Press (3) key to select "**3: LOP**".

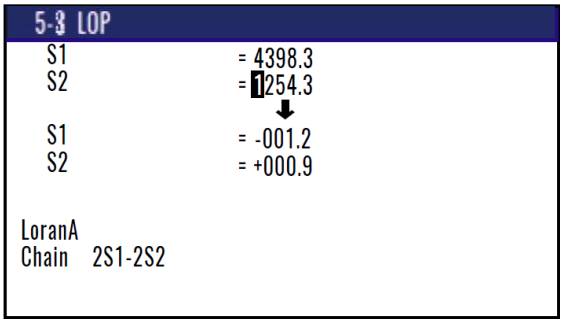
(4) Enter the correct S1 and S2 value. The difference between the GPS position is reflected in the Correction offset when you enter the Actual position.

In the case of LoranC

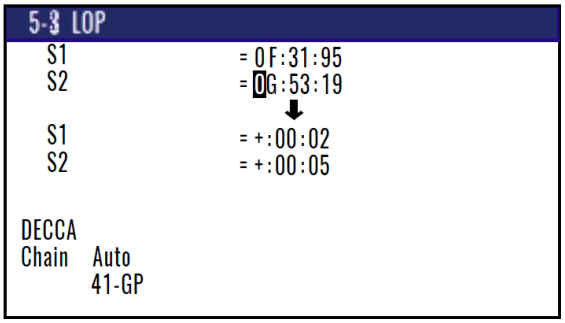




In the case of LoranA



In the case of DECCA



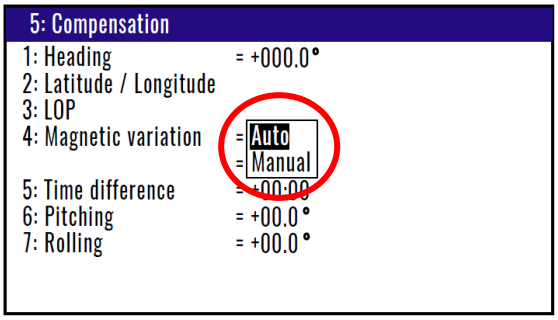
4.4.5 Compensating the compass

The course and bearing to waypoint are shown in true bearing. You can adjust the GPS true bearing to the magnetic compass bearing.

(Automatic compensation)

In the Auto mode, the magnetic compass is compensated based on the built-in global magnetic variation maps. However, avoid using this mode if you are higher than 75 degrees North or South latitude. The compass may have a small error because the system contains world maps. Manual correction is recommended. For areas that do not allow exact translation of a true bearing to a magnetic bearing, despite the map covering the whole world, the resulting value may differ from the actual deviation.

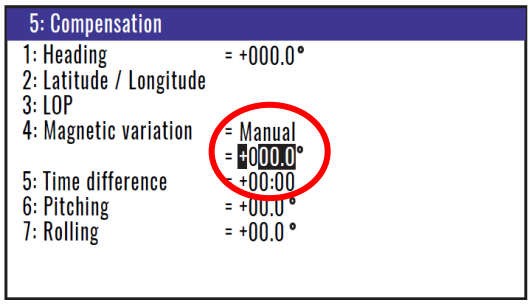
(1) Press MENU key until Menu options 1 to 9 appears.
(2) Press 5 key to select "**5: Compensation**".
(3) Press 4/W key to select "**4: Magnetic variation**".
(4) Press [▲] or [▼] key to move cursor onto "**Auto**".
(5) Press ENT key.



Initial setup: Manual

(Manual compensation)

(4) Press [▲] or [▼] key to move cursor onto "**Manual**".
(5) Press ENT key.
(6) Press ENT key to change the correction offset.
(7) Press [▲] or [▼] key to use the current positive (+) or negative (-) sign as it is.
(8) Enter a (4-digit) compensation offset by numeric keys.
(9) Press ENT key.



Initial setup: 0.0°
Setup range: -180.0° to +180.0°

4.4.6 Displaying local time

You can display your local time by entering a time difference from the Greenwich Mean Time (GMT). See the following figure 4.1 to determine zone time difference.

(1) Press MENU key until Menu options 1 to 9 appears.
(2) Press 5 key to select "**5: Compensation**".
(3) Press 5 key to select "**5: Time difference**".
(4) Press ENT key to change the correction offset.
(5) Press [▲] or [▼] key to use the current positive (+) or negative (-) sign as it is.
(6) Enter a (4-digit) compensation offset by numeric keys.
(7) Press ENT key.

> CLR **NOTE:** *Press to clear incorrect input. You can reenter a "+" or "-" sign and numeric data.*

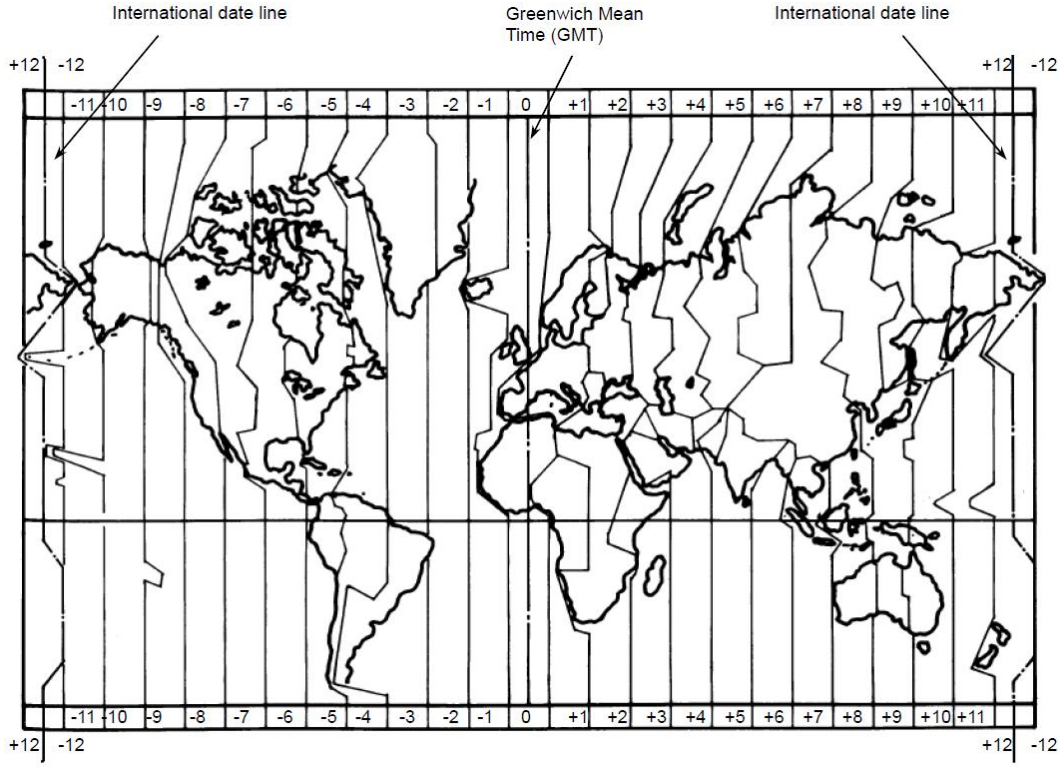


Figure 4.1 Time difference chart

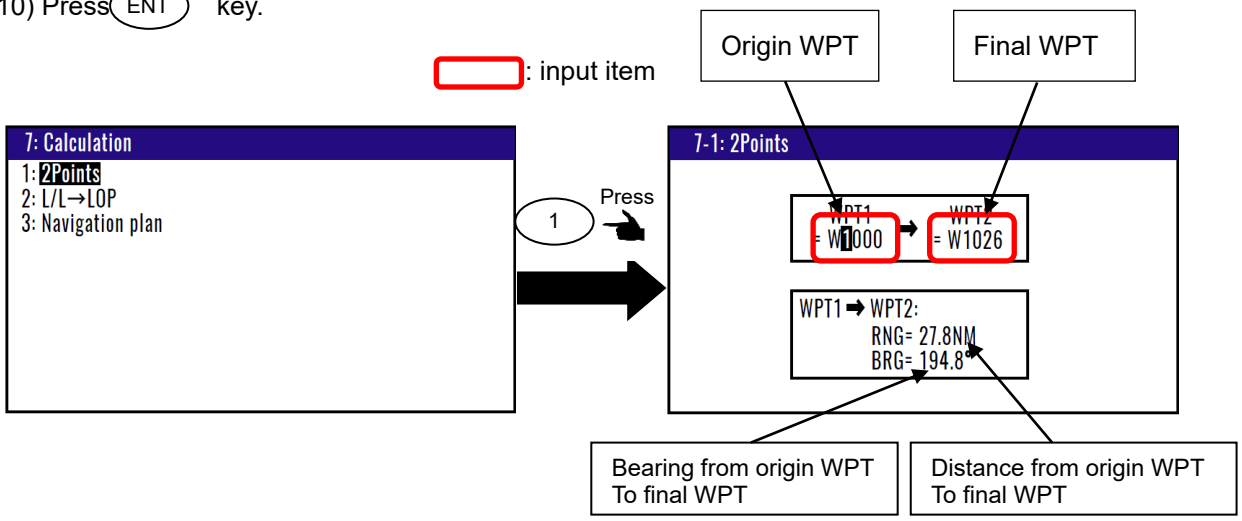
Initial setup: 00:00 hour

4.5 Menu 7: Calculation

4.5.1 Calculating the distance and bearing between two points

You can calculate the distance and bearing between two points stored in memory.

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (7) key to select "**7: Calculation**".
(3) Press (1) key to select "**1: 2Points**".
(4) Enter a (4-digit) origin WPT number (0000 to 9999).
(6) Press (ENT) key.
(7) Press [▶] key.
(8) Enter a (4-digit) final WPT number (0000 to 9999).
(9) Enter "N" for north or "S" for south latitude.
(10) Press (ENT) key.



4.5.2 Calculating LOPs based on LAT/LONG data

You can enter a Loran C or Loran A or DECCA chain number and two secondary stations, NAVIGATOR calculates the LOPs based on the specified LAT/LONG data and displays the LOP values.

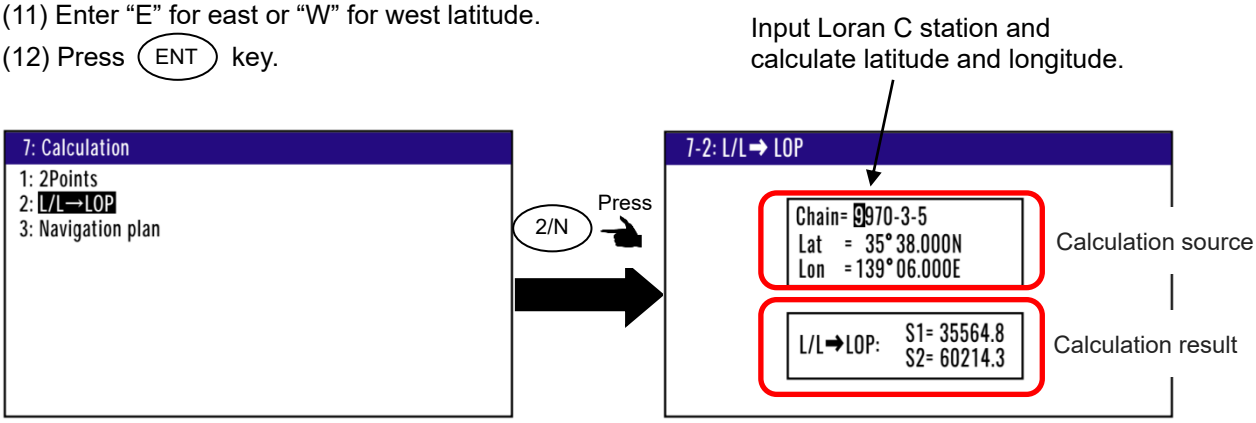
To change the "3: LOP", the following settings are required

You can set of LoranA, LoranC or Decca of "**3: LOP**" change when you changed **8:Lop** and **9:Chain** in the **Menu8: Initial setup.**

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (8/S) key to select "**8: Initial setup**".
(3) Press (8/S) key to select "**8: Lop**".
(4) Setting "LoranA" or "LoranC" or "Decca"
(5) Press (ENT) key.
(6) Press (9) key to select "**9: Chain**".
(7) Select a station you want to measure.

In the case of Loran C

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (7) key to select "**7: Calculation**".
(3) Press (2/N) key to select "**2: L/L→LOP**".
(4) Enter (4-digit) Loran C chain number.
(5) Enter the first digit of two Loran C secondary stations.
(6) Press (ENT) key.
(7) Enter (7-digit) latitude using numeric keys.
(8) Enter "N" for north or "S" for south latitude.
(9) Press (ENT) key.
(10) Enter (8-digit) longitude using numeric keys.
(11) Enter "E" for east or "W" for west latitude.
(12) Press (ENT) key.



If you store the calculation result

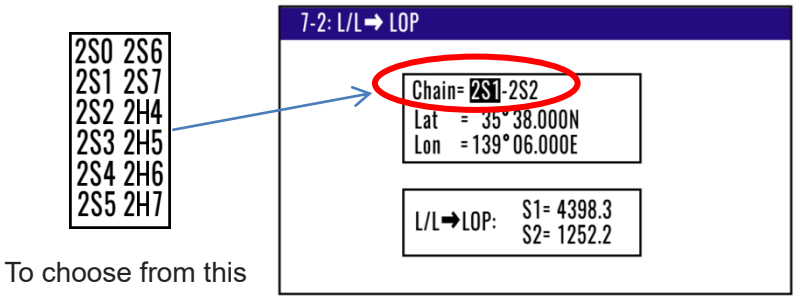
(1) Press [▼] key to display page 2/2.
(2) Enter a data number (1000 to 9999) using numeric keys.
(3) The existing data, if any, is displayed for your checkout.
(4) Press (ENT) key.

In the case of Loran A

When you enter a combination of two secondary stations of Loran A, NAVIGATOR calculates the Loran A LOPs based on the specified LAT/LONG data and displays the LOP values.

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (7) key to select "**7: Calculation**".
(3) Press (2/N) key to select "**2: L/L→LOP**".
(4) Press (ENT) key.
(5) Press [▲] or [▼] [▶] or [◀] key to select the secondary station 1.
(6) Press (ENT) key.
(7) Press [▶] key to move the cursor to secondary station 2 field.
(8) Press (ENT) key.
(9) Press [▲] or [▼] key to select the secondary station 2.
(10) Press (ENT) key.
(11) Press [▼] key to move the cursor to latitude field.

(12) Enter a (7-digit) latitude using numeric keys.
(13) Enter “N” for north or “S” for south latitude.
(14) Press (ENT) key.
(15) Enter (8-digit) longitude using numeric keys.
(16) Enter “E” for east or “W” for west latitude.
(17) Press (ENT) key.

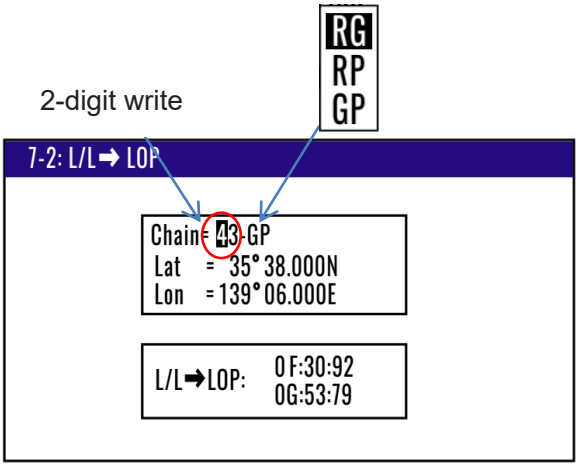


If you store the calculation result

(1) Press [▼] key to display page 2/2.
(2) Enter a data number (1000 to 9999) using numeric keys.
(3) The existing data, if any, is displayed for your checkout.
(4) Press [**ENT**] key.

In the case of DECCA

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (7) key to select “**7: Calculation**”.
(3) Press (2/N) key to select “**2: L/L→LOP**”.
(4) Press (ENT) key.
(5) Enter (2-digit) Decca chain number.
(6) Press (ENT) key.
(7) Press [▶] key to move the cursor to combination field of secondary stations.
(8) Press (ENT) key.
(9) Press [▲] or [▼] key to select a combination of secondary stations.
(10) Press (ENT) key.
(11) Press [▼] key to move the cursor to latitude field.
(12) Enter (7-digit) latitude using numeric keys.
(13) Enter “N” for north or “S” for south latitude.
(14) Press (ENT) key.
(15) Enter (8-digit) longitude using numeric keys.
(16) Enter “E” for east or “W” for west latitude.
(17) Press (ENT) key.



If you store the calculation result.

(1) Press [▼] key to display page 2/2.

(2) Enter a data number (1000 to 9999) using numeric keys.

(3) The existing data, if any, is displayed for your checkout.

(4) Press [**ENT**] key.

4.5.3 Calculating navigation plan

You can calculate the following various navigation plan.

Navigation mode = **Waypoint**: Boat speed, Arrival time, Time to go to waypoint.

Navigation mode = **Route** : Boat speed, Final arrives time, Total navigation time.

Calculating arrival time and time to go to waypoint from WPT number and boat speed.

(1) Press (MENU) key until Menu options 1 to 9 appears.

(2) Press (7) key to select "**7: Calculation**".

(3) Press (3) key to select "**3: Navigation plan**".

(4) Press (ENT) key and select "**Waypoint**" in the pop-up.

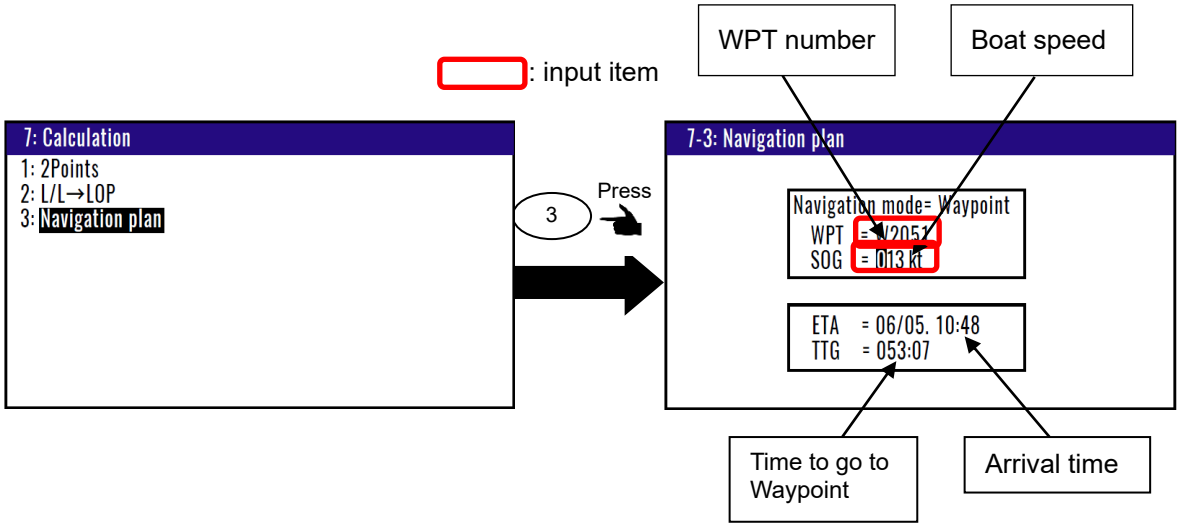
(5) Press (ENT) key.

(6) Press [▼] key and enter an (4-digit) origin WPT number (0000 to 9999).

(7) Press (ENT) key.

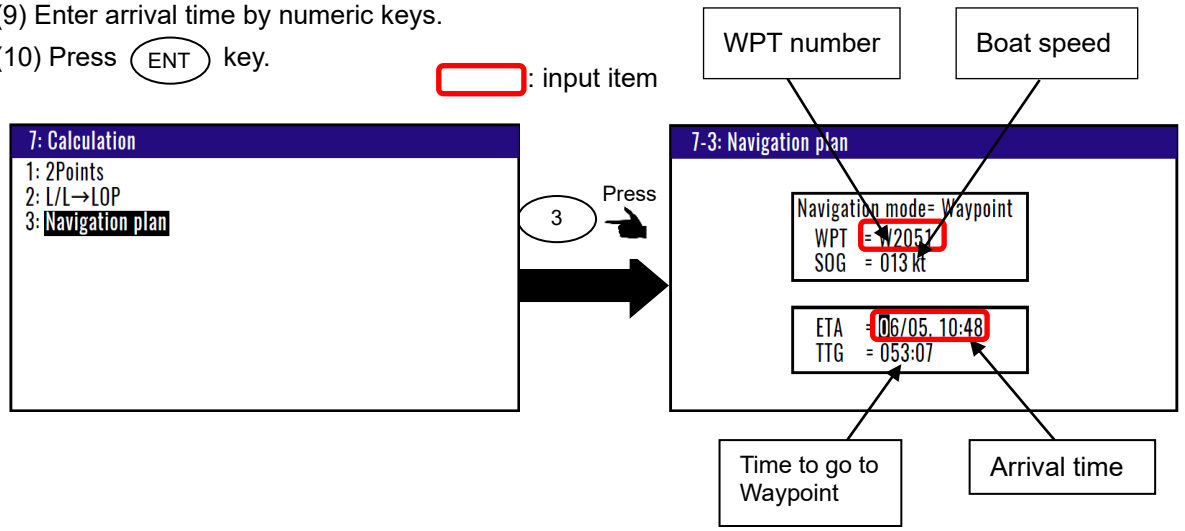
(8) Press [▼] key and enter a (3-digit) boat speed.

(9) Press (ENT) key.



Calculating boat speed and time to go to waypoint from WPT number and arrival time.

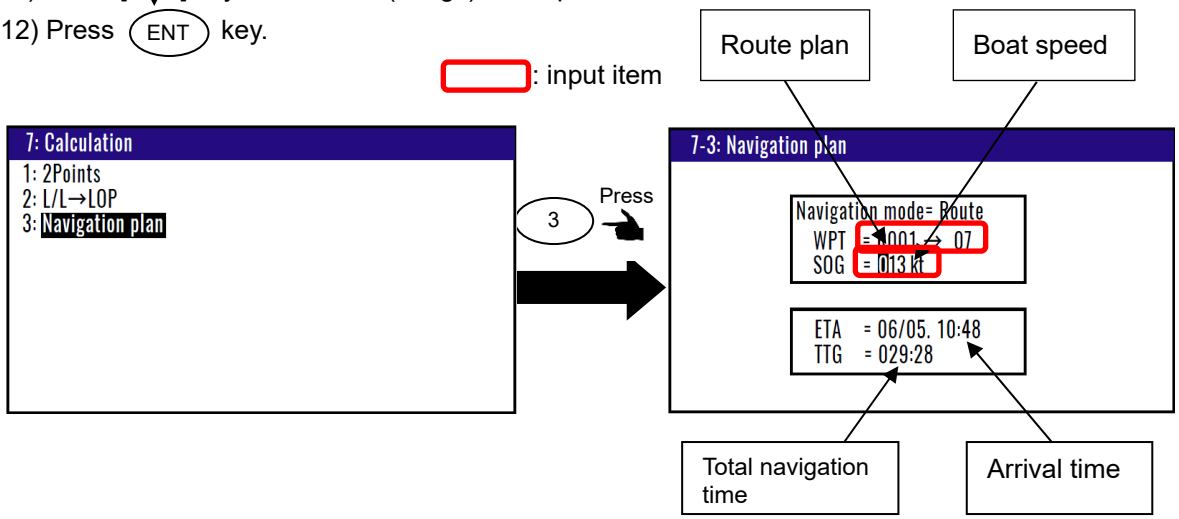
(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (7) key to select "**7: Calculation**".
(3) Press (3) key to select "**3: Navigation plan**".
(4) Press (ENT) key and select "**Waypoint**" in the pop-up.
(5) Press (ENT) key.
(6) Press [▼] key and enter an (4-digit) origin WPT number (0000 to 9999).
(7) Press (ENT) key.
(8) Press [▼] key two times.
(9) Enter arrival time by numeric keys.
(10) Press (ENT) key.



Calculating arrival time and total navigation time from route plan and boat speed

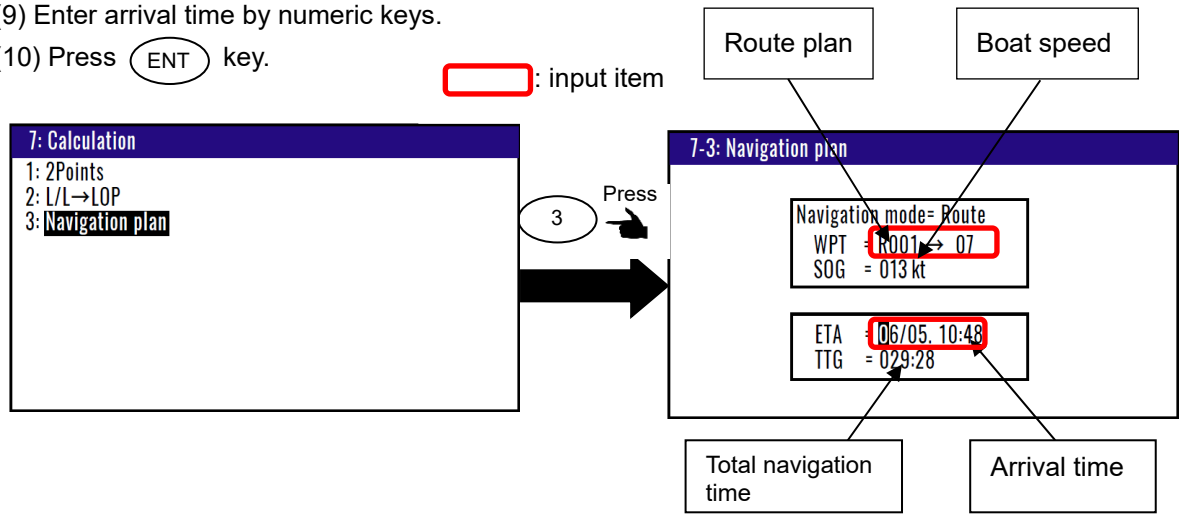
(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (7) key to select "**7: Calculation**".
(3) Press (3) key to select "**3: Navigation plan**".
(4) Press (ENT) key and select "**Route**" in the pop-up.
(5) Press (ENT) key.

(6) Press [▼] key and enter a (3-digit) route number (001 to 100).
(7) Press ENT key.
(8) Press [▶] key and press ENT key to select Forward or Revers.
(9) Press [▶] key and enter an (2-digit) origin waypoint number (01 to 50).
(10) Press ENT key.
(11) Press [▼] key and enter a (3-digit) boat speed.
(12) Press ENT key.



Calculating boat speed and time to go to waypoint from route number and arrival time

(1) Press MENU key until Menu options 1 to 9 appears.
(2) Press 7 key to select "**7: Calculation**".
(3) Press 3 key to select "**3: Navigation plan**".
(4) Press ENT key and select "**Route**" in the pop-up.
(5) Press ENT key.
(6) Press [▼] key and enter a (3-digit) route number (001 to 100).
(7) Press ENT key.
(8) Press [▼] key two times.
(9) Enter arrival time by numeric keys.
(10) Press ENT key.



4.6 Menu 8: Initial setup

There are two screens in the initial setup menu "**Compass**" and "**Others**".

Press [▶] or [◀] key to switch screens.

4.6.1 Backup:Compass

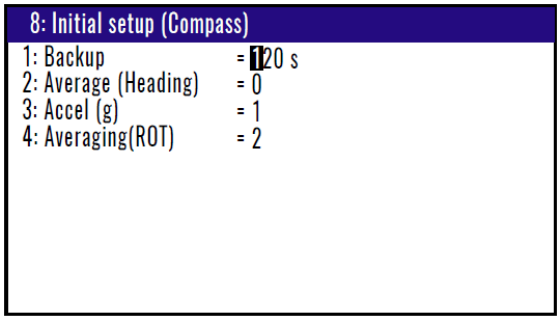
If heading becomes temporarily unavailable due to signal blocking or other reason, HDG can be provided by the internal auxiliary backup sensor. The backup duration time can be set from 60 sec to 600 sec.

(1) Press (MENU) key until Menu options 1 to 9 appears.

(2) Press (8/S) key to select "**8: Initial setup (Compass)**". If **(Others)** screen is displayed, press [▶] or [◀] key to switch to the **(Compass)** screen.

(3) Press [▲] or [▼] key to select "**1: Backup**".

(4) Enter storage number (060 to 600 seconds) by numeric keys and (ENT) key.



Initial setup: 120s

Note: With setting up the BACKUP time to more than 120 sec. , the accuracy of the heading data becomes out of the required limit of about 2°, but the bearing calculation do not restart and the accurate heading is much faster available after receiving satellite information again.

4.6.2 Averaging (Heading):Compass

This setting is used to the avaraging of the Heading to stabilize the Heading data. The maximum averaging rate is "4" and the minimum averaging rate is "0". When a higher value is selected, heading data is averaged more often and more stable, but the avaraged heading data will be far from the actual Heading. When a lower value is selected, heading data is averaged less, but heading data will not be far from the actual Heading and react quickly.

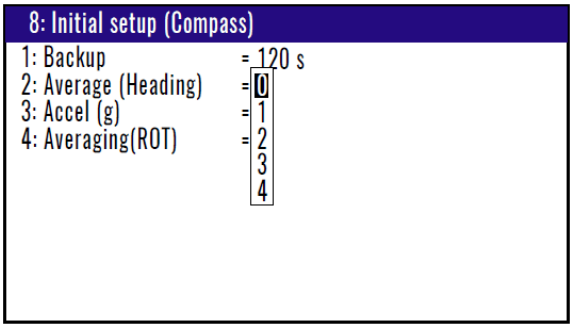
(1) Press (MENU) key until Menu options 1 to 9 appears.

(2) Press (8/S) key to select "**8: Initial setup (Compass)**".

(3) Press (2/N) key to select "**2: Averaging (Heading)**".

(4) Press [▲] or [▼] key to move cursor onto the average constants to select "0 to 4".

(5) Press (ENT) key.

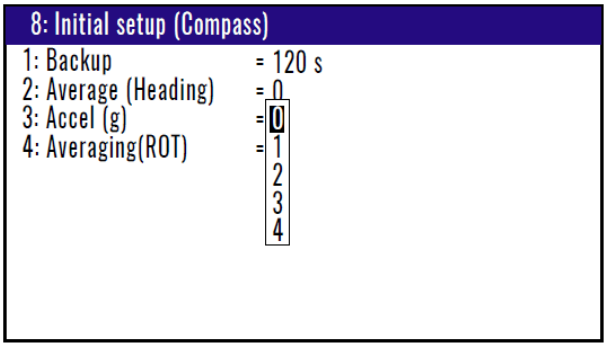


Initial setup: 0

4.6.3 Accel(g)

This setting is used to the following performance of the antenna swinging to avoid losing Heading data. The maximum acceleration rate is “4” and minimum acceleration rate is “0”. When a higher value is selected, the following performance of the antenna swinging is more often and more hard to lose the heading, but the Heading data will be unstable. Normally, it should be set to “1” to stabilize the Heading data. In the heavy sea, it should be set to “2” to avoid losing the Heading data.

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (8/S) key to select “**8: Initial setup (Compass)**”.
(3) Press (3) key to select “**3: Accel (g)**”.
(4) Press [▲] or [▼] key to move cursor onto the average constants to select “0 to 4”.
(5) Press (ENT) key.

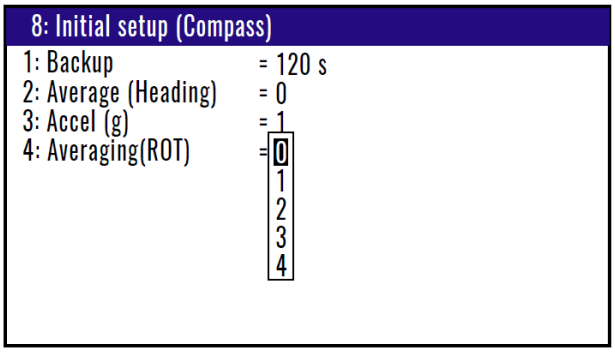


Initial setup: 1

4.6.4 Averaging(ROT)

This setting is used to the avaraging of the Heading to stabilize the ROT (Rate of turn) data.
The maximum averaging rate is “4” and the minimum averaging rate is “0”. When a higher value is selected, heading data is averaged more often and more stable, but the avaraged ROT data will be far from the actual ROT. When a lower value is selected, ROT data is averaged less, but ROT data will not be far from the actual ROT and react quickly.

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (8/S) key to select “**8: Initial setup (Compass)**”.
(3) Press (4/W) key to select “**4: Averaging (ROT)**”.
(4) Press [▲] or [▼] key to move cursor onto the average constants to select “0 to 4”.
(5) Press (ENT) key.



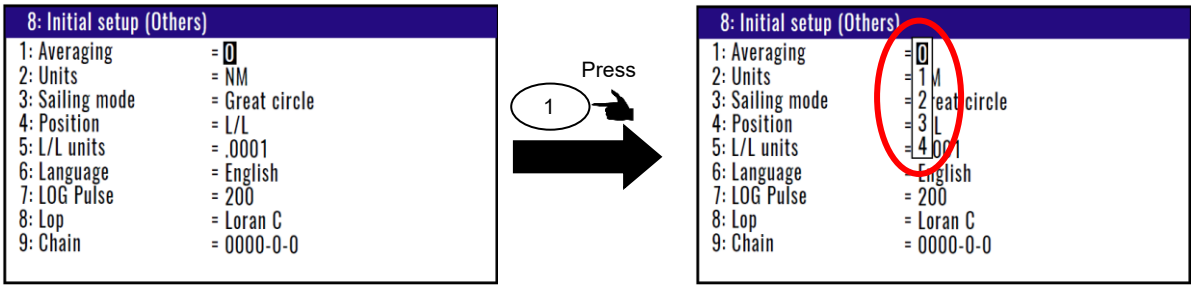
Initial setup: 2

4.6.5 Setting average constants(measuring position, speed and course)

Use the averaging function to compare GNSS sensor signals several times and get their average. This stabilizes speed and course data. The maximum averaging rate is “4” and the minimum averaging rate is “0”. When you select “4” value, data is averaged more often and the display data has smaller variations. However, delays for updating occur. When you select a “0” value, data is averaged less but the display data responds quicker.

Selecting a constant (averaging constant) suitable for your boat speed will provide you with smoother data of course and speed.

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (8/S) key to select “**8: Initial setup (Others)**”. If **(Compass)** screen is displayed, press [◀] or [▶] key to switch to the **(Others)** screen.
(3) Press (1) key to select “**1: Averaging (Position)**”.
(4) Press [▲] or [▼] key to move cursor onto the average constants to select “0 to 4”.
(5) Press (ENT) key.

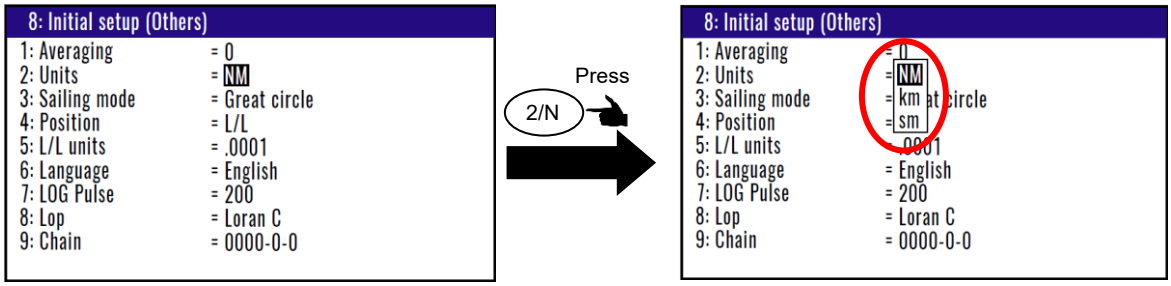


Initial setup: 0

4.6.6 Changing the distance or speed unit

You can change the measuring unit of distance (to WPT or final destination) and speed.

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (8/S) key to select “**8: Initial setup**”.
(3) Press [◀] or [▶] key to select “**8: Initial setup (Others)”.**
(4) Press (2/N) key to select “**2: Units**”.
(5) Press [▲] or [▼] key to move cursor onto the distance or speed unit “NM”, “km”, “sm”.
(6) Press (ENT) key.



Initial setup: NM

4.6.7 Changing sail mode

You can change the navigation mode. There are two navigation modes.

Great Circle course: ..... the shortest course on a sphere.

Rhumb Line course: ..... straight course on a Rhumb chart.

(1) Press (MENU) key until Menu options 1 to 9 appears.

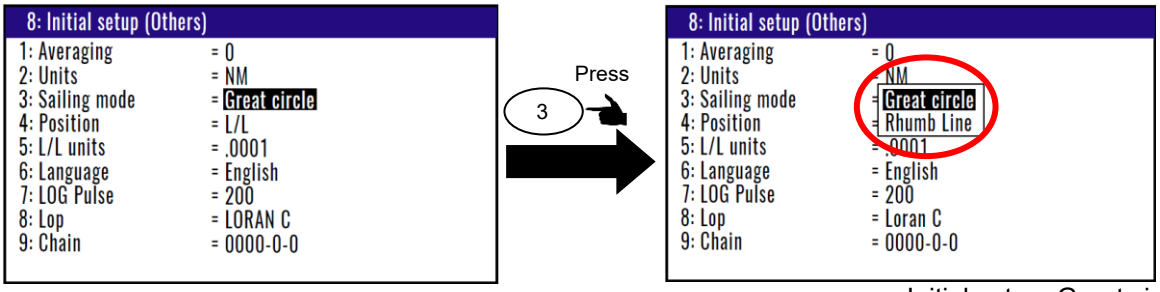
(2) Press (8/S) key to select "**8: Initial setup**".

(3) Press [◀] or [▶] key to select "**8: Initial setup (Others)".**

(4) Press (3) key to select "**3: Sailing mode**".

(5) Press [▲] or [▼] key to move cursor onto the sail mode to "Great circle", "Rhumb Line".

(6) Press (ENT) key.



Initial setup: Great circle

4.6.8 Displaying position data in LAT/LONG mode

You can change the displaying position data, "LAT/LONG" or "Lop".

(1) Press (MENU) key until Menu options 1 to 9 appears.

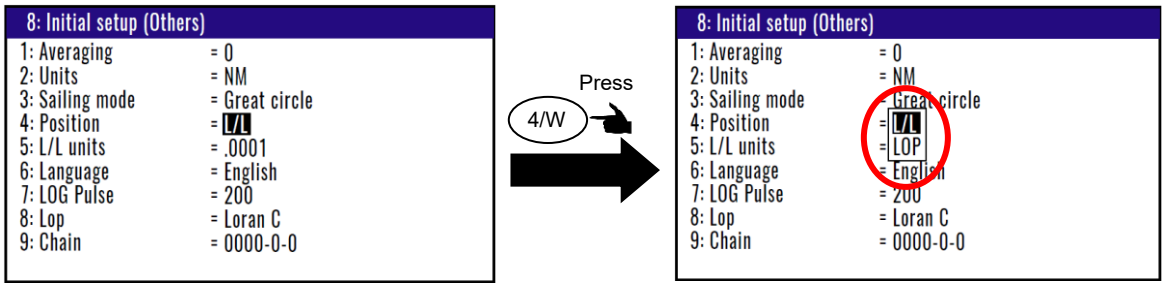
(2) Press (8/S) key to select "**8: Initial setup**".

(3) Press [◀] or [▶] key to select "**8: Initial setup (Others)".**

(4) Press (4/W) key to select "**4: Position**".

(5) Press [▲] or [▼] key to move cursor to "L/L", "Lop".

(6) Press (ENT) key.

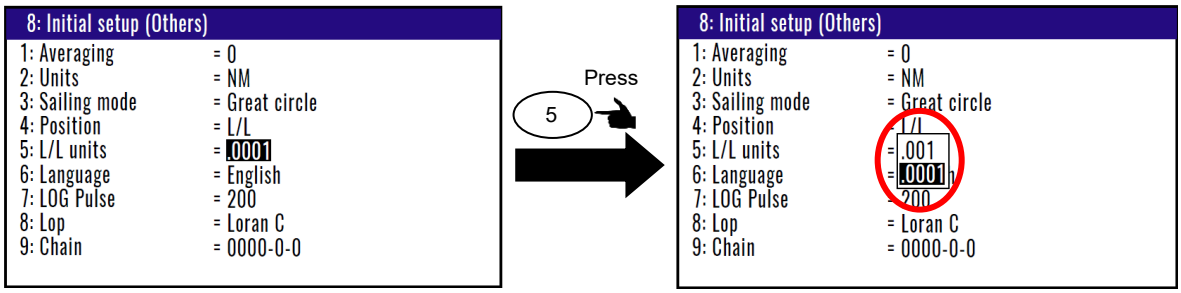


Initial setup: L/L

4.6.9 Changing the latitude and longitudinal display digits

The following operations enable to display the latitude and longitude of present position 0.0001 or 0.001minute.

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (8/S) key to select "**8: Initial setup**".
(3) Press [◀] or [▶] key to select "**8: Initial setup (Others)".**
(4) Press (5) key to select "**5: L/L units**".
(5) Press [▲] or [▼] key to move cursor to ".001", ".0001".
(6) Press (ENT) key.



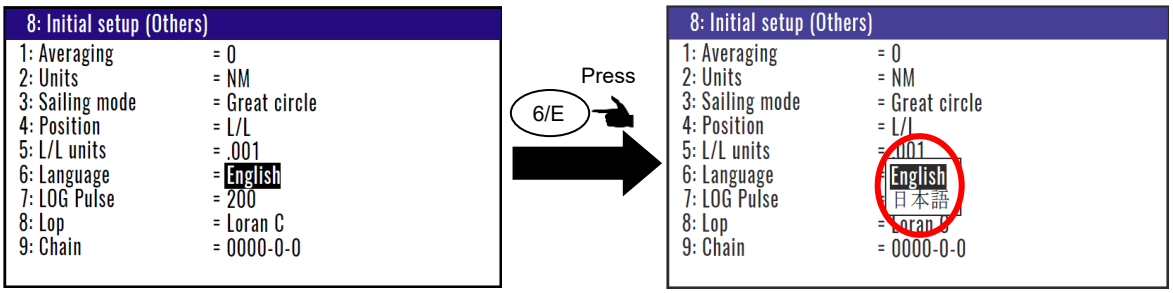
Initial setup: .0001'

4.6.10 Selecting a Language

You can select the language from the pop-up.

The procedure is as follows:

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (8/S) key to select "**8: Initial setup**".
(3) Press [◀] or [▶] key to select "**8: Initial setup (Others)".**
(4) Press (6/E) key to select "**6: Language**".
(5) Press [▲] or [▼] key to move cursor onto the language.
(6) Press (ENT) key.



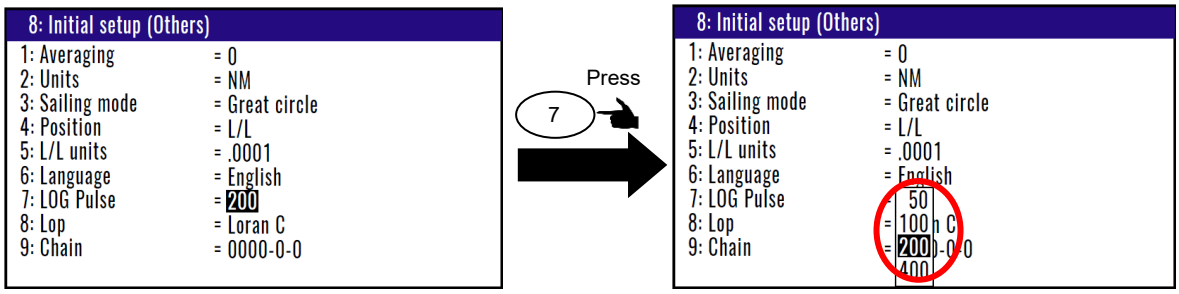
Initial setup: English

4.6.11 Selecting the LOG Pulse

You can select the rate of speed log pulse (contact signal) from the pop-up.

There are four parameters 50/100/200/400 pulse/NM. The procedure is as follows:

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (8/S) key to select "**8: Initial setup**".
(3) Press [◀] or [▶] key to select "**8: Initial setup (Others)".**
(4) Press (7) key to select "**7: LOG Pulse**".
(5) Press [▲] or [▼] key to move cursor onto the rate of log pulse.
(6) Press (ENT) key.



Initial setup: 200

4.6.12 Specifying the chain and secondary stations for Loran C, Loran A or Decca

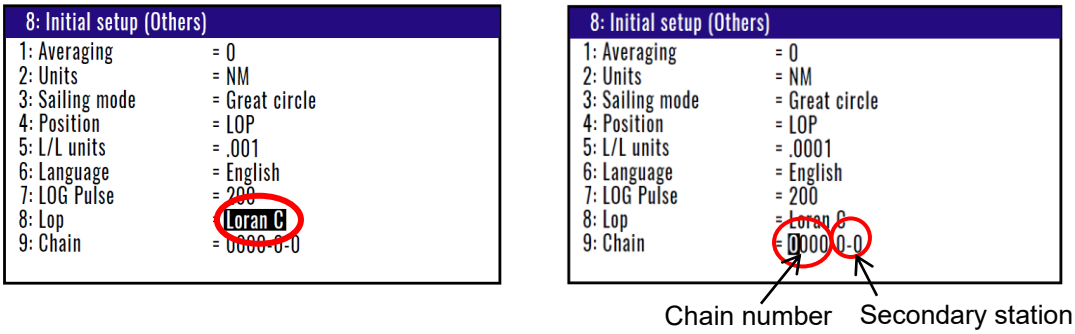
For the operating procedure, refer to 5.1 "Initial setup for LOPs display".

The procedure is as follows:

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (8/S) key to select "**8: Initial setup**".
(3) Press [◀] or [▶] key to select "**8: Initial setup (Others)".**
(4) Press (8/S) key to select "**8: Lop**".

In the case "LoranC"

(5) Press [▲] or [▼] key to move cursor onto the "LoranC".
(6) Press (ENT) key.
(7) Press [▼] key to move cursor onto the "**9: Chain**".
(8) Input chain number and first digit of two secondary stations of LoranC by numeric keys.
(9) Press (ENT) key.



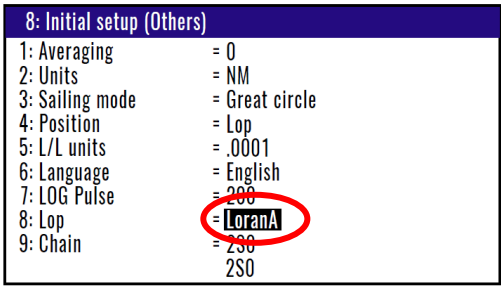
In the case "LoranA"

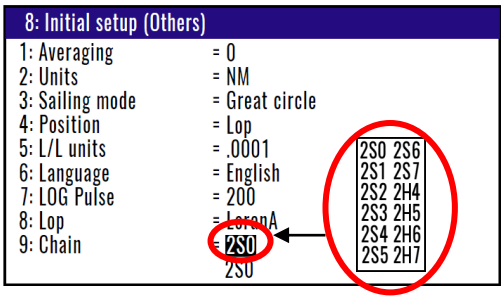
(5) Press [▲] or [▼] key to move cursor onto the "LoranA".

(6) Press (ENT) key.

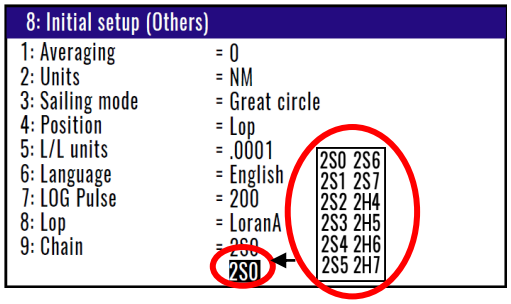
(7) Press [▼] key to move cursor onto the "**9: Chain**" and press (ENT) key.

(8) Select two stations of LoranA by a [▲] or [▼] or [▶] or [◀] key and press (ENT) key.





Station 1



Station 2

In the case "DECCA"

(5) Press [▲] or [▼] key to move cursor onto the "DECCA".

(6) Press (ENT) key.

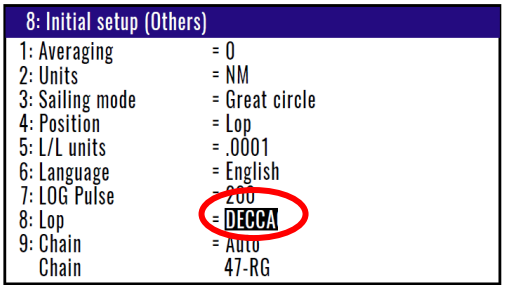
(7) Press [▼] key to move cursor onto the "**9: Chain**" and press (ENT) key.

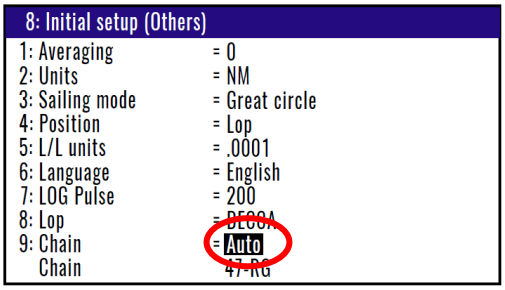
(8) Press [▲] or [▼] key to move cursor onto the "Auto" or "Manual".

(9) Press (ENT) key.

If you select "Auto"

You can convert your GPS present position and stored position memory (waypoints and event data) from LAT/LONG into DECCA LOPs by automatic selection of DECCA chain.





If you select "Manual"

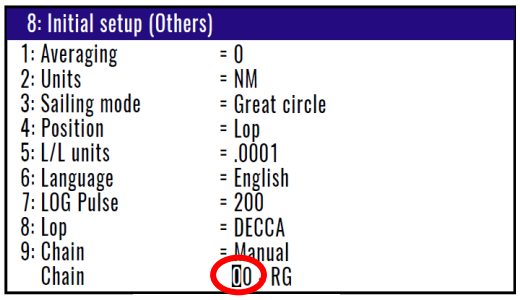
(10) Press [▼] key to move cursor onto cursor chain number.

(11) Input chain number of DECCA by numeric keys and press (ENT) key.

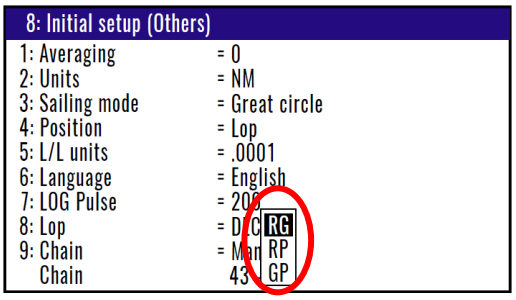
(12) Press [▼] key to move cursor onto secondary station and press (ENT) key.

(13) Select combination of two secondary station of DECCA by [▲] or [▼] key.

(14) Press (ENT) key.



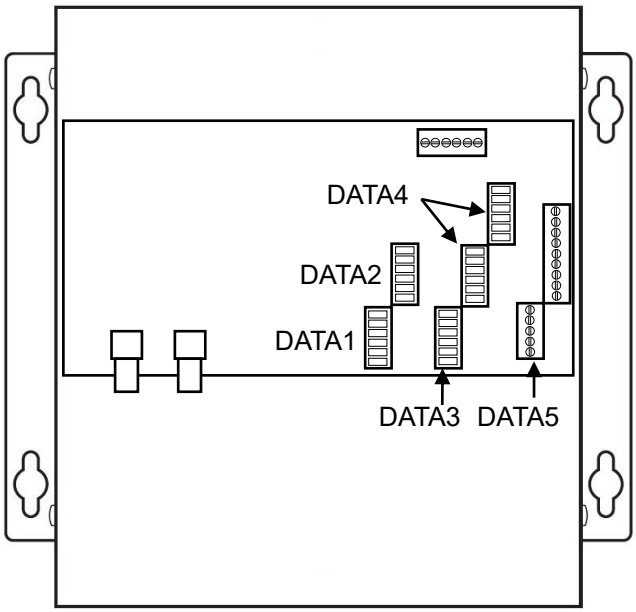
Chain number



Combination of two secondary station

4.7 Menu 9: Interface

4.7.1 Selecting a DATA port to setting.



You can select the format of output data.

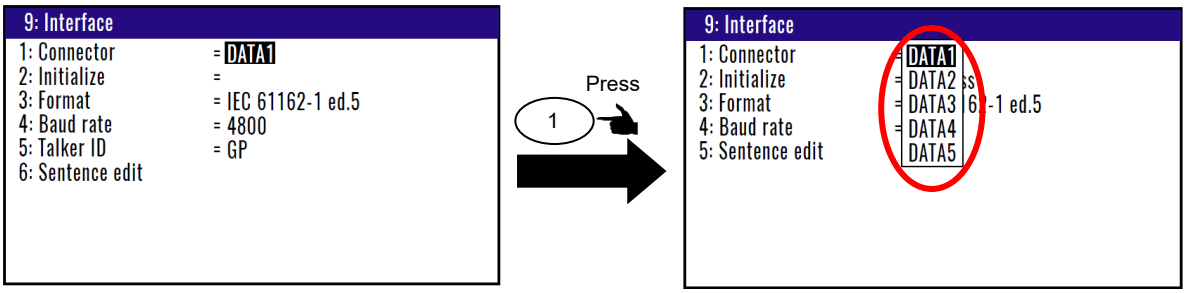
(1) Press (MENU) key until Menu options 1 to 9 appears.

(2) Press (9) key to select "**9: Interface**".

(3) Press (1) key to select "**1: Connector**".

(4) Press [▲] or [▼] key to move cursor onto the data port to select "DATA1" or "DATA2" or "DATA3" or "DATA4" or "DATA5".

(5) Press (ENT) key.



4.7.2 Selecting initialized equipment

You can select the initialized equipment. It's possible to choose a sentence which matches equipment by this setting.

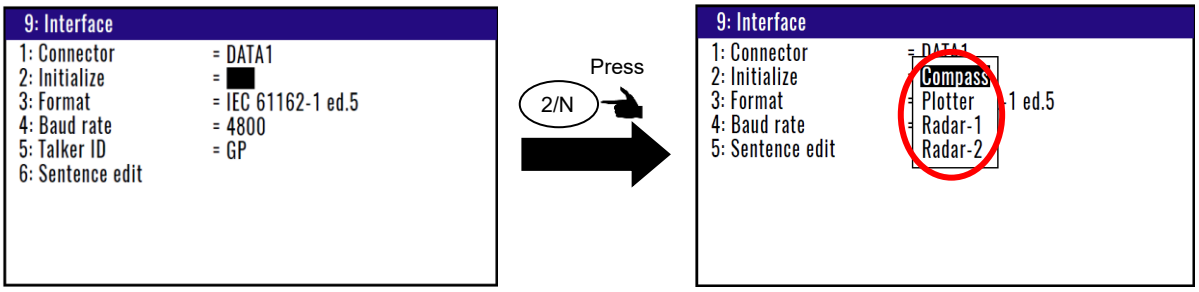
COMPASS: Should be selected when connected to marine radar and requires high rate HDG.

PLOTTER: Should be selected when connecting to plotter and no need for a high speed HDG.

RADAR-1: Should be selected when connecting to KODEN's marine radar (MDC-5200/-5500/-5000/-7000/-7900 series).

RADAR-2: Should be selected when connecting to KODEN's marine radar (MDC-900(A)/-2000(A) series).

(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (9) key to select "**9: Interface**".
(3) Press (2/N) key to select "**2: Initialize**".
(4) Press [▲] or [▼] key to move cursor onto the output data format to select "Compass" "Plotter" "Radar-1" "Radar-2".
(5) Press (ENT) key.



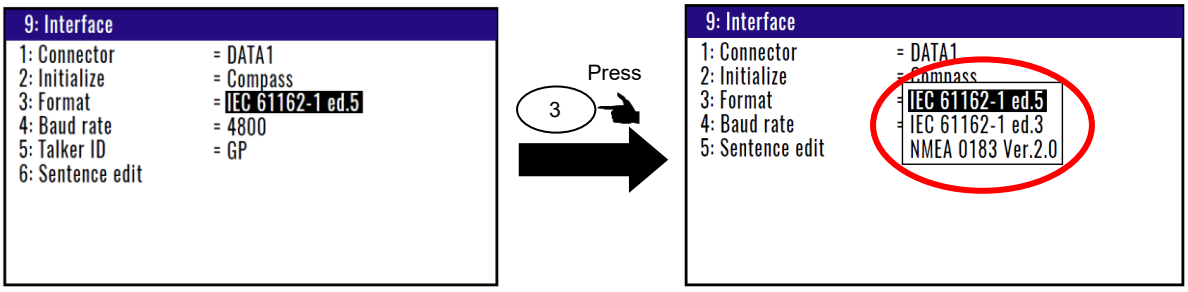
Initial setup: None

4.7.3 Selecting an output data format of DATA1-5 port

You can select the format of output data format.
(1) Press (MENU) key until Menu options 1 to 9 appears.
(2) Press (9) key to select "**9: Interface**".
(3) Press (3) key to select "**3: Format**".

In the case "DATA1-3" of "1: Connector"

(4) Press [▲] or [▼] key to move cursor onto the output data format to select "DATA1-3".
(5) Press (ENT) key.



Initial setup: IEC 61162-1 ed.5

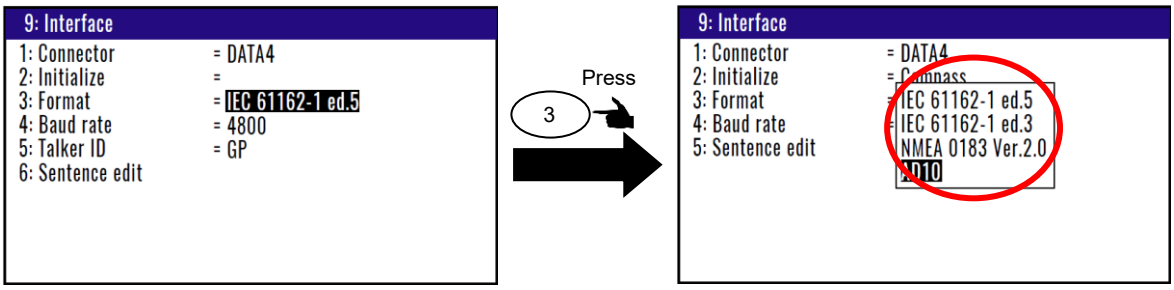
You can select from following three formats.
1) IEC61162-1 ed5
2) IEC61162-1 ed3
3) NMEA 0183 Ver.2.0

Note: High Speed output data (38.4K) in accordance to IEC61162-2 should be connected to DATA2. Additional High Speed outputs are due to regulations not allowed. If necessary to connect to a BAM/INS, DATA1 should be used.

In the case "DATA4, 5" of "1: Connector"

(4) Press [▲] or [▼] key to move cursor onto the output data format to select "DATA4, 5".

(5) Press ENT key.



Initial setup: IEC 61162-1 ed.5

You can select from following four formats.

1) IEC61162-1 ed5

2) IEC61162-1 ed3

3) NMEA 0183 Ver.2.0

4) AD10 (Furuno's format)

4.7.4 Setting the Baud rate

You can change the Baud rate of DATA1 and DATA2.

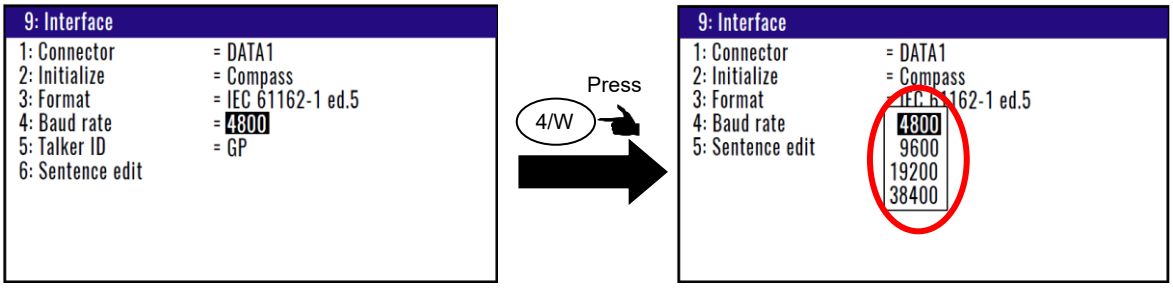
(1) Press MENU key until Menu options 1 to 9 appears.

(2) Press 9 key to select "**9: Interface**".

(3) Press 4/W key to select "**4: Baud rate**".

(4) Press [▲] or [▼] key to move cursor onto the baud rate "4800", "9600", "19200" "38400".

(5) Press ENT key.



Initial setup: 4800

4.7.5 Setting the output Talker ID

You can change the Talker ID.

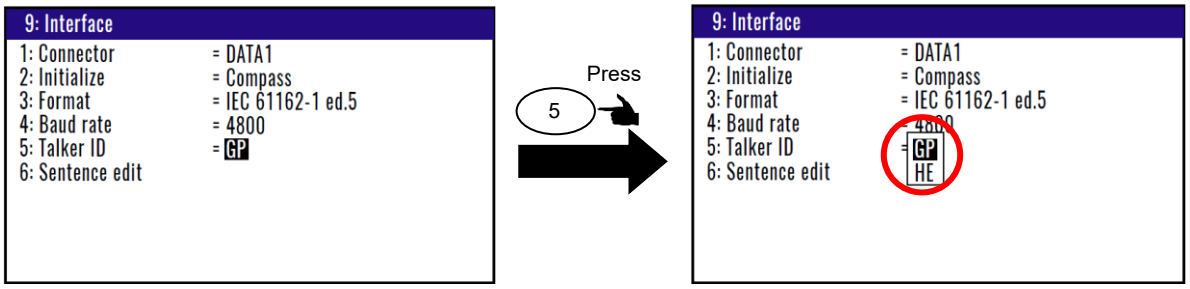
(1) Press MENU key until Menu options 1 to 9 appears.

(2) Press 9 key to select "**9: Interface**".

(3) Press 5 key to select "**5: Talker ID**".

(4) Press [▲] or [▼] key to move cursor onto the baud rate "GP", "HE".

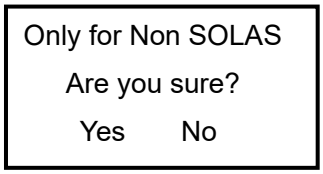
(5) Press ENT key.



Initial setup: GP

NOTE: *"HE" can use on only Non SOLAS ships.*

*If you try to change to "HE", the following notice will be displayed. Attention is required for change.



4.7.6 Selecting an output sentence

Output sentences of the data port selected by "**1: Connector**" can be edited.

Output interval can set 20msec to 1sec. Sentence does not output when output interval sets OFF.

(1) Press (MENU) key until Menu options 1 to 9 appears.

(2) Press (9) key to select "**9: Interface**".

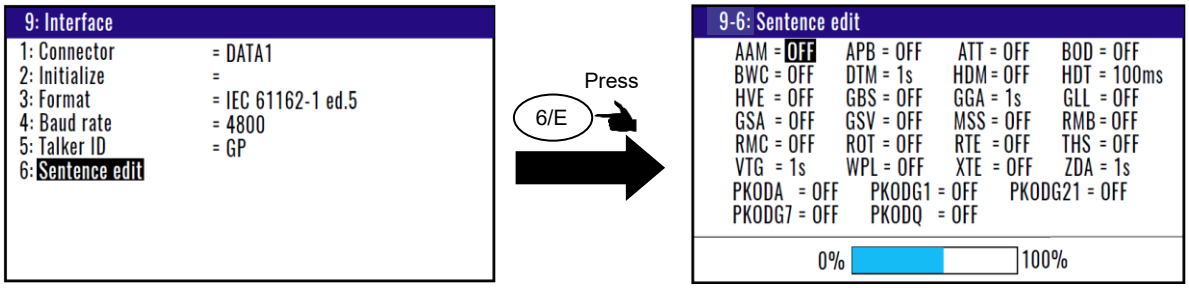
(3) Press (6/E) key to select "**6: Sentence edit**".

(4) Press [▲] or [▼] or [▶] or [◀] key to select the output sentence.

(5) Press (ENT) key.

(6) Press [▲] or [▼] key to move cursor for select output interval

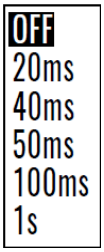
(7) Press (ENT) key.



* Bar meter at the bottom of screen is the occupancy rate of the NMEA. Please set to be 100% or less.

Explanation of sentence (Refer to “10.5 Output sentence”)

Heading data sentence



ATT: Pitch / Roll
HDM: Heading magnetic
HDT: Heading true
HVE: Heaving
ROT: Rate of turn
PKODG,21: Pitch / Roll, Heaving
THS: True heading and status

Navigation data sentence

AAM: Waypoint Arrival Alarm
APB: Autopilot Sentence "B" (Bearing from origin or present position to the waypoint)
BOD: Bearing - Point of Origin to Destination
BWC: Bearing & Distance to Waypoint in Great Circuit navigation
DTM: Datum reference
GBS: GPS satellite fault detection
GGA: Global Positioning System Fix Data (time, lat/lon, S/N, SV, DOP)
GLL: Geographic Position - Latitude/Longitude/Time
GSA: GPS DOP and Active Satellites
GSV: GPS Satellites in View
MSS: MSK receiver signal status (S/N, frequency, data rate)
RMB: Recommended Minimum Navigation Information (Cross track error, Bearing to steer, Position number of point of origin, Lat/long, Bearing and distance from present position to waypoint, approaching speed to waypoint, proximity alarm)
RMC: Recommended Minimum Specific GPS/TRANSIT Data (UTC time, lat/lon, ground speed, true bearing, magnetic deviation, date)
RTE: Route number and waypoint number (Max. 4 points including next waypoint)
THS: True heading and statas
VTG: Course Over Ground (true and magnetic bearing) and Ground Speed
WPL: Waypoint Location Lat/long, waypoint number
XTE: Cross-Track Error, Bearing to steer
ZDA: Time & Date (hour, minute, second, day, month, year, time difference) by UTC
PKODA: Satellite Information (satellite information, signal to noise ratio)
PKODG,1: Satellite Information (satellite information, elevation angle, azimuth, command)
PKODG,7: DGPS Information (mode, status, time out)

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Chapter 5 How to use LOPs

5.1 Initial setup for LOPs display

Measured longitude and latitude can be translated into loran C, loran A or DECCA. To turn on the LOPs mode, the following initial setup is required.

◀	**NOTE:** *Press to backspace the cursor to correct an input error.*
CLR	**NOTE:** *Press to clear incorrect Input. You can reenter Numeric data.*

You can select the type to translate from longitude and latitude.

The procedure is as follows:

(1) Press (MENU) key until Menu options 1 to 9 appears.

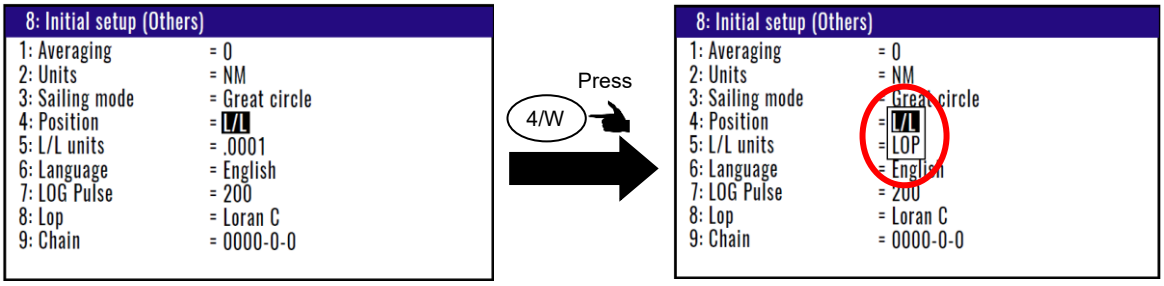
(2) Press (8/S) key to select "**8: Initial setup (compass)**".

(3) Press [◀] or [▶] key to select "**8: Initial setup (others)".**

(4) Press (4/W) key to select "**4: Position**".

(5) Press [▲] or [▼] key to move cursor onto the "Lop".

(6) Press (ENT) key.



In the case "LoranC"

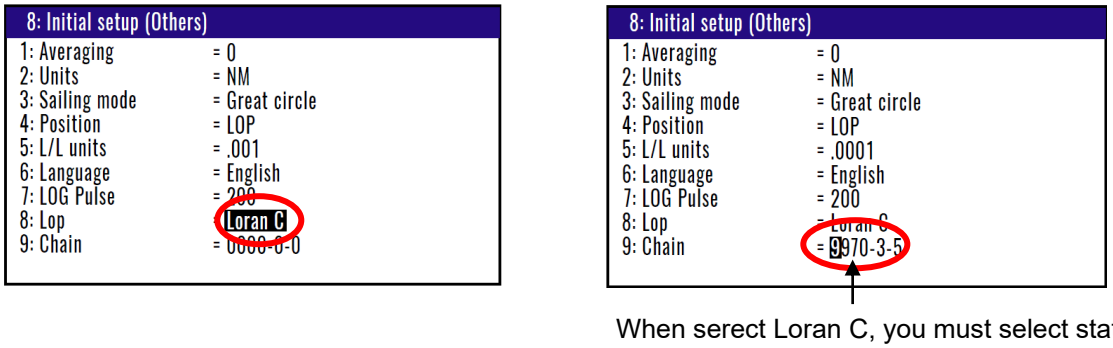
(7) Press (8/S) key to select "**8: Lop**".

(8) Press [▲] or [▼] key to move cursor onto the "LoranC".

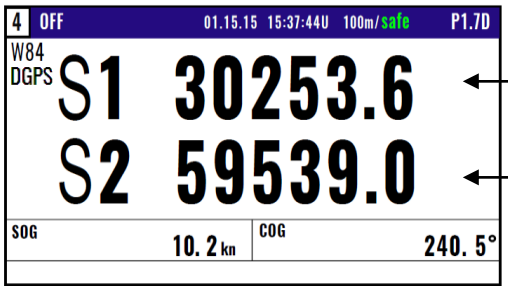
(9) Press (ENT) key.

(10) Press [▼] key to move cursor onto the "**9: Chain**".

(11) Input the station of LoranC by numeric keys.



When serect Loran C, you must select station



In the case "LoranA"

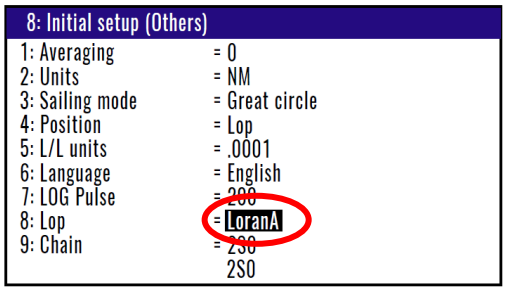
(7) Press (8/S) key to select "**8: Lop**".

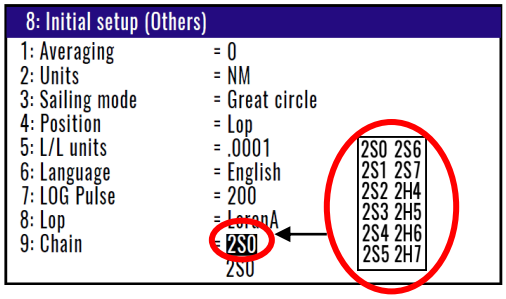
(8) Press [▲] or [▼] key to move cursor onto the "LoranA".

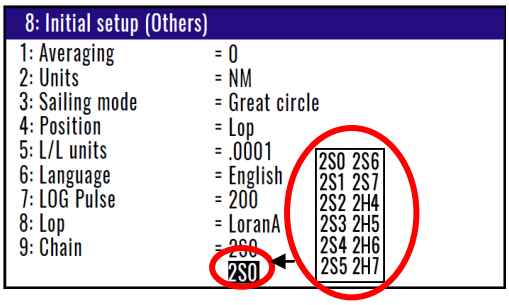
(9) Press (ENT) key.

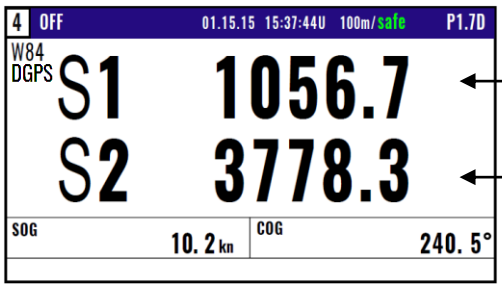
(10) Press [▼] key to move cursor onto the "**9: Chain**".

(11) Input the station of LoranA use to [▲], [▼], [▶] or [◀] key.









In the case "DECCA"

(7) Press (8/S) key to select "**8: Lop**".

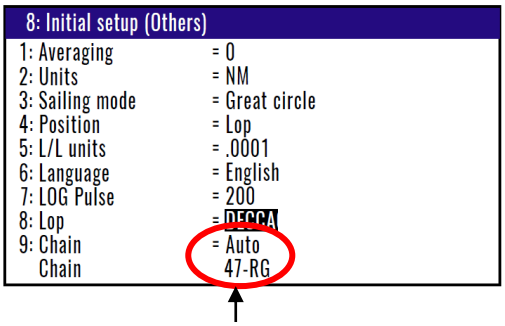
(8) Press [▲] or [▼] key to move cursor onto the "DECCA".

(9) Press (ENT) key.

(10) Press [▼] key to move cursor onto the "**9: Chain**".

(11) Press [▲] or [▼] key to move cursor onto the "Auto" or "Manual".

(12) Press (ENT) key.



When select auto mode, KGC-300 finds the optimal station

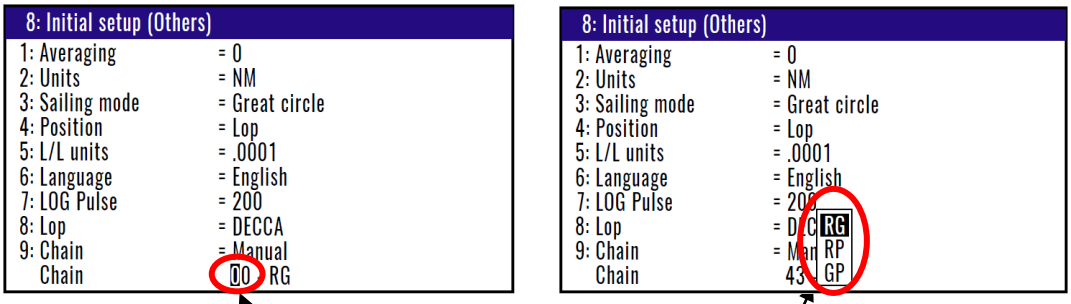
If you select "Manual"

(13) Input the station of DECCA by numeric keys.

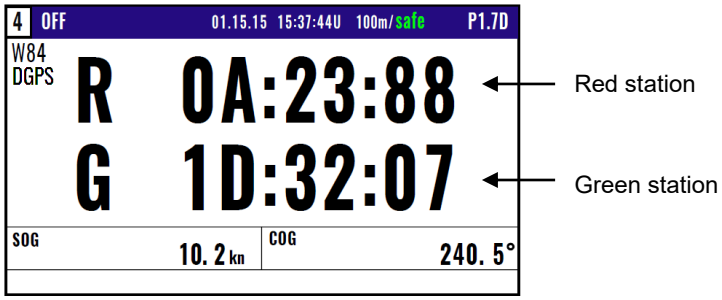
(14) Press [▶] key.

(15) Input the station of DECCA use to [▲] or [▼] key. You can select "RG", "RP" or "GP".

(16) Press (ENT) key.



When select manual mode, you must select station



5.2 Storing Waypoints (LOPs data)

◀ **NOTE:** *Press to backspace the cursor to correct an input error.*

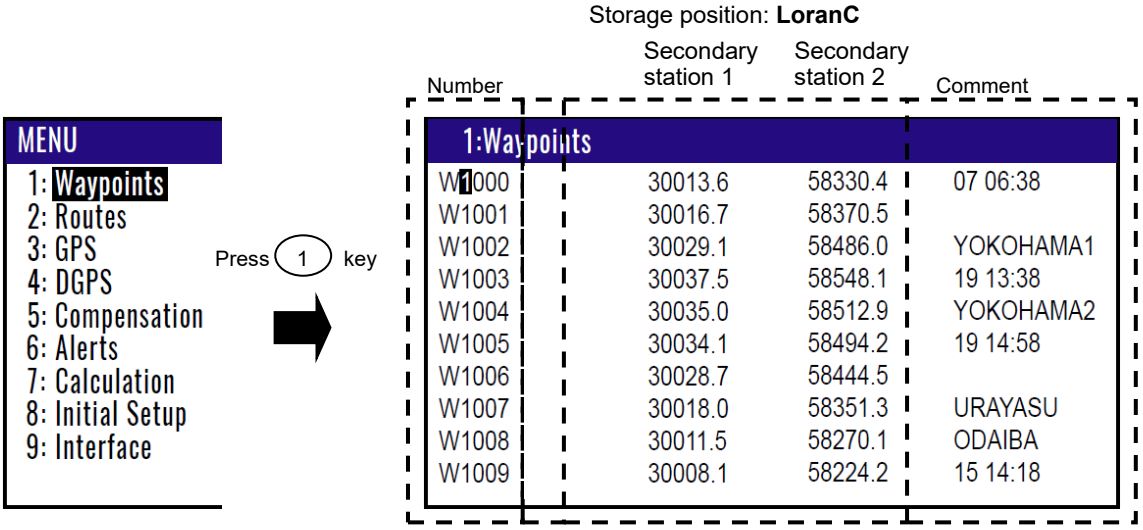
CLR **NOTE:** *Press to clear incorrect Input. You can reenter Numeric data.*

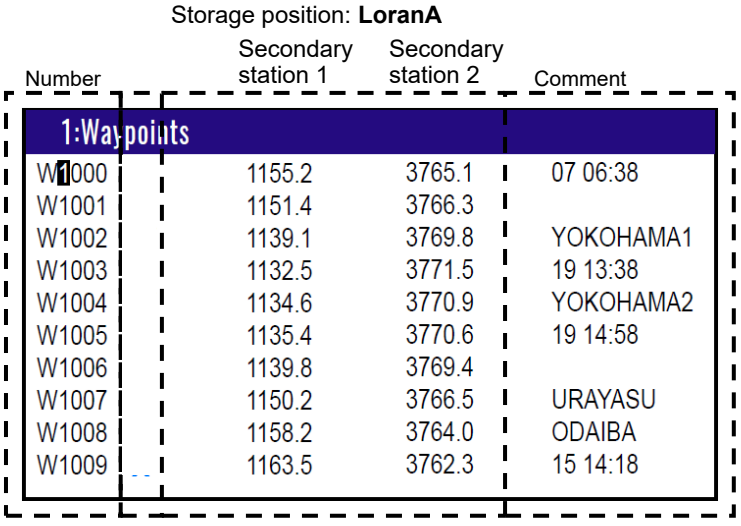
Up to 10000 waypoints can be stored in memory. As 1000 points (numbers 0000 and 0999) are reserved for MOB and Event registration, you can use 1000 to 9999 (total of 9000 points) to store waypoints.

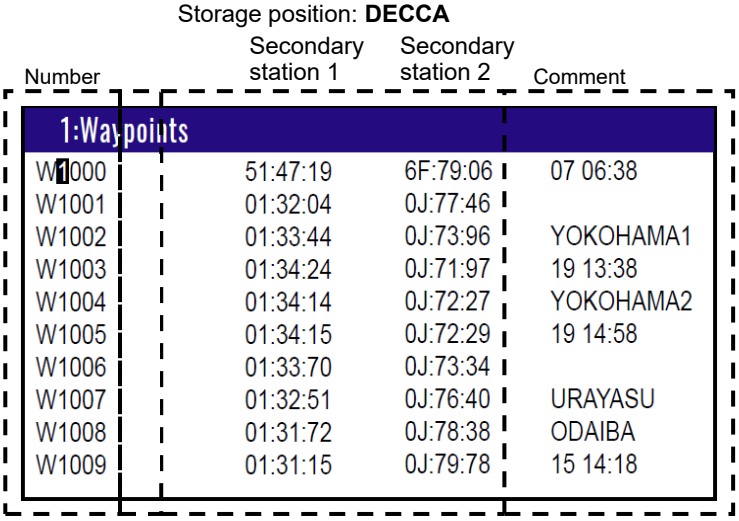
(1) Press (MENU) key until Menu options 1 to 9 appears.

(2) Press (1) key to select "**1: Waypoints**".

(3) Enter storage number (0000 to 9999) by numeric keys and (ENT) key.







For the following operations, refer to 2.1 "Storing waypoints (LAT/LONG) data"

• "Writing or changing comment" (See page 2-2)

• "Copying a position" (See page 2-3)

• "Erasing a single waypoint" (See page 2-3)

5.3 Compensating the LOP

KGC-300 can be converted from Latitude and Longitude to LoranC, LoranA and DECCA. It can be corrected in the converted data.

For the following operations, refer to 4.4.4 "Compensating the LOP"

• "In the case of LoranC" (See page 4-12)

• "In the case of LoranA" (See page 4-12)

• "In the case of DECCA" (See page 4-17)

5.4 Calculating LOPs based on LAT/LONG data

KGC-300 can calculate the LOPs based on the specified LAT/LONG data and displays the LOP values.

• "In the case of LoranC" (See page 4-16)

• "In the case of LoranA" (See page 4-16/17)

• "In the case of DECCA" (See page 4-17/18)

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Chapter 6 Data backup and initialization

6.1 Data backup

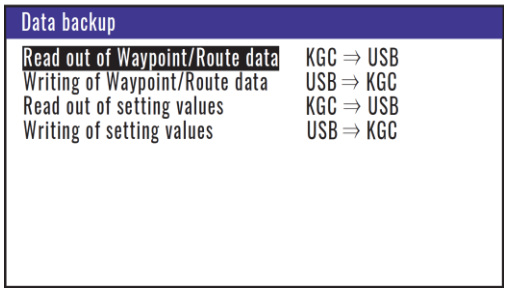
You can back up the waypoint/route data and setting values by USB memory.

6.1.1 Displaying the “Data backup” menu

The procedure is as follows:

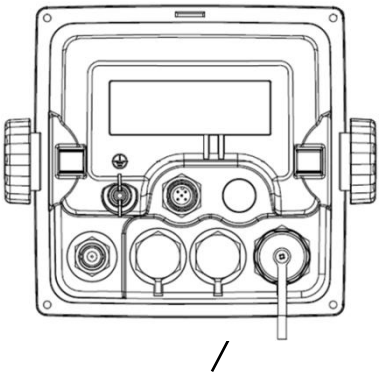
(1) Press (7) key and Power ON.

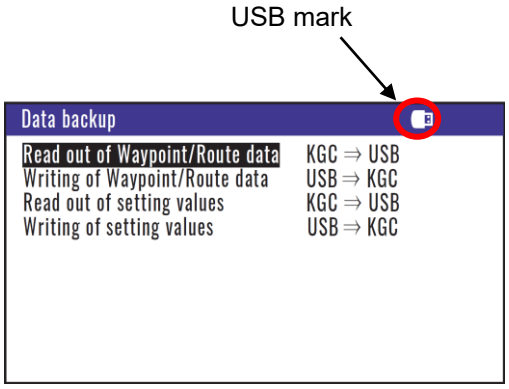
(2) Release your finger from (7) key when appear opening screen.



6.1.2 Insert USB memory

Insert USB memory in the USB connector of the rear panel, and confirm USB mark on the display.





NOTE: *If USB mark is not appear,*
Change USB memory for new one.

6.1.3 Read out of data

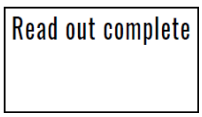
In the case “Read out of Waypoint / Route data”

(1) Press [▲] or [▼] key to move cursor onto the “Read out of Waypoint / Route data”.

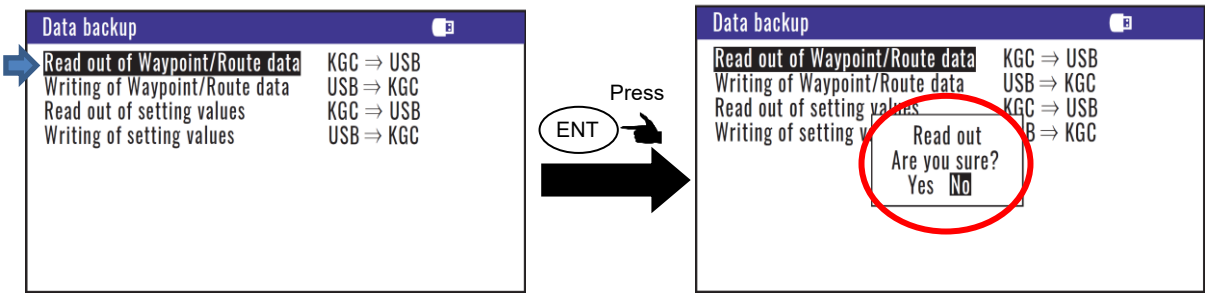
(2) Press (ENT) key.

(3) Select “Yes” in the pop-up and press (ENT) key.

(4) If a message called “Read out complete” appears, it is the end.



*The name of data file is “KM-F61_WPT_RTE.dat”.



In the case "Read out of setting values"

(1) Press [▲] or [▼] key to move cursor onto the "Read out of setting values".

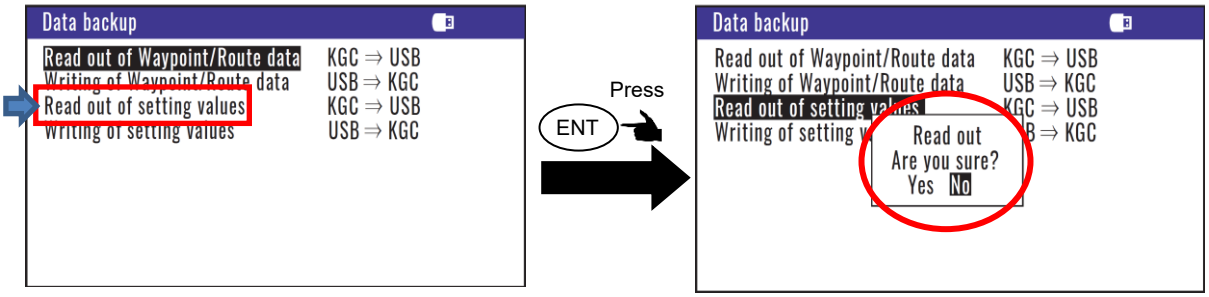
(2) Press (ENT) key.

(3) Select "Yes" in the pop-up and press (ENT) key.

(4) If a message called "Read out complete" appears, it is the end.

Read out complete

*The name of data file is "KM-F61_SETUP.dat".



6.1.4 Writing of data

In the case "Writing of Waypoint / Route data"

*The data file is necessary in USB memory named "KM-F61_WPT_RTE.dat".

(1) Press [▲] or [▼] key to move cursor onto the "Writing of Waypoint / Route data".

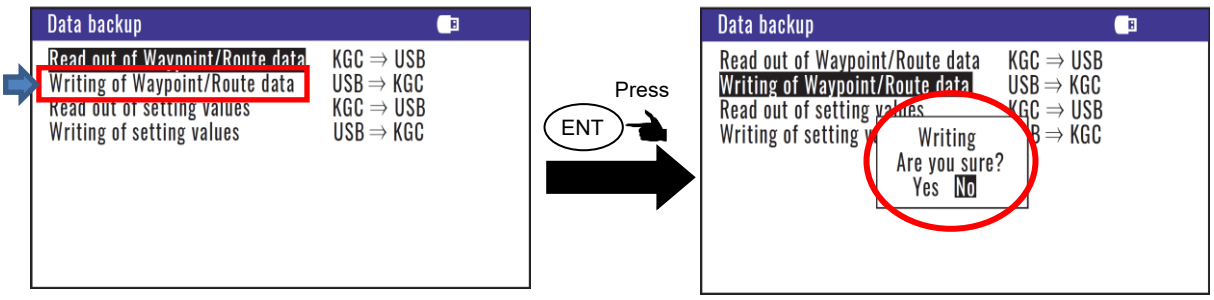
(2) Press (ENT) key.

(3) Select "Yes" in the pop-up and press (ENT) key.

(4) If a message called "Writing complete" appears, it is the end.

Writing complete

CAUTION
Data is overwritten



In the case “Writing of setting value”

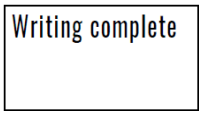
The data file is necessary in USB memory named “KM-F61_SETUP.dat”.

(1) Press [▲] or [▼] key to move cursor onto the “Writing of setting value”.

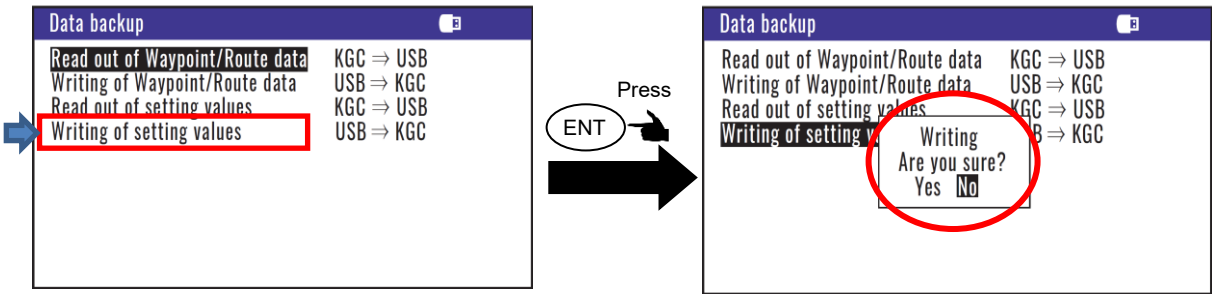
(2) Press (ENT) key.

(3) Select “Yes” in the pop-up and press (ENT) key.

(4) If a message called “Writing complete” appears, it is the end.



CAUTION
Data is overwritten



6.2 Initialization

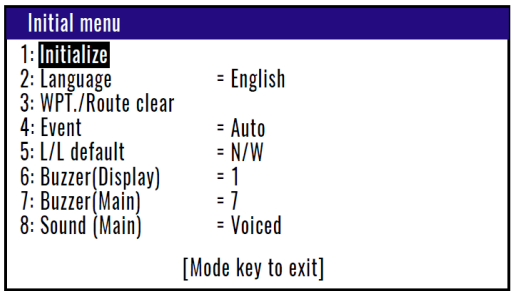
When some malfunction of Display unit is found, following initialization procedure may be required. It returns all the settings in the menu to the factory settings.

6.2.1 Displaying the “Initial menu”

The procedure is as follows:

(1) Press (MENU) key and (ENT) key, and Power ON.

(2) Release your finger from (MENU) key and (ENT) key when opening screen appears.



6.2.2 Initialize

Before initializing please note all system parameters and reset them after initialize, or backup for setting value in USB memory. (Refer to “**6.1.3 Read out of data**”)

(1) Press [▲] or [▼] key to move cursor onto the “**Initialize**”.

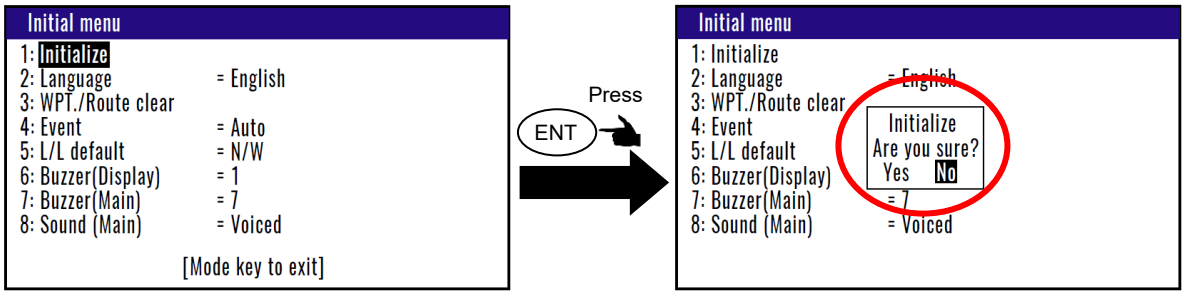
(2) Press (ENT) key.

(3) Select “Yes” in the pop-up and press (ENT) key.

(4) Select language in the pop-up and press (ENT) key.

(5) Press (MODE) key to exit initial menu.

> **NOTE:** *Already registered data on the waypoints, events, MOBs and routes remain unchanged.*

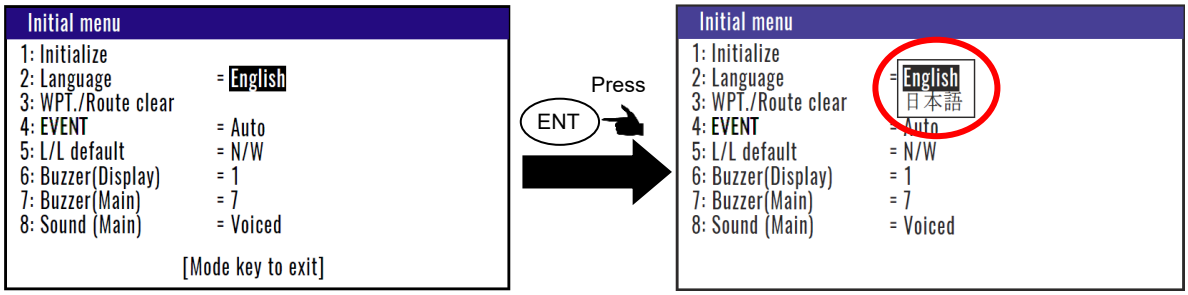


> **NOTE:** *If you want to backup the setting before initializing, please write setting value on USB memory. Refer to 6.1.3 and 6.1.4.*

6.2.3 Language”

You can select an indicated language.

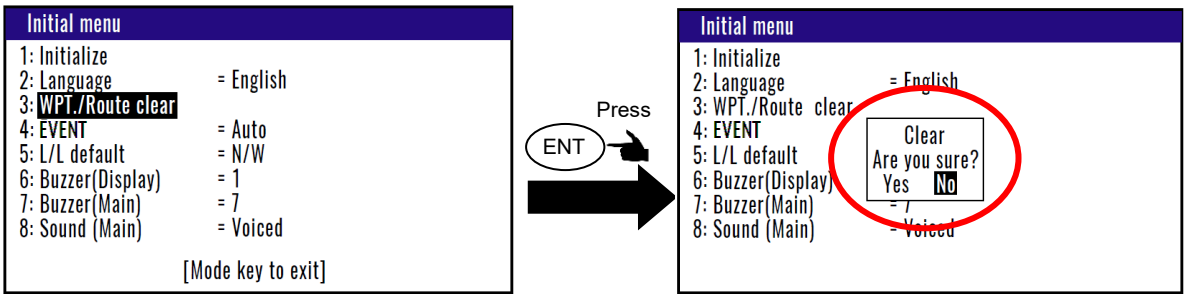
(1) Press [▲] or [▼] key to move cursor onto the “Language”.
(2) Press (ENT) key.
(3) Select “English” or “Japanese” in the pop-up and press key. (ENT)
(4) Press (MODE) key to exit initial menu.



6.2.4 WPT./Route clear

You can erase the entire data such as waypoints, events, MOB, and routes from internal memory.

(1) Press [▲] or [▼] key to move cursor onto the “WPT. / Route clear”.
(2) Press (ENT) key.
(3) Select “Yes” in the pop-up and press (ENT) key.
(4) Press (MODE) key to exit initial menu.



Note: *If you want backup waypoint/route data before clear, please write Waypoint/Route data on USB memory. Refer to 6.1.3 and 6.1.4.*

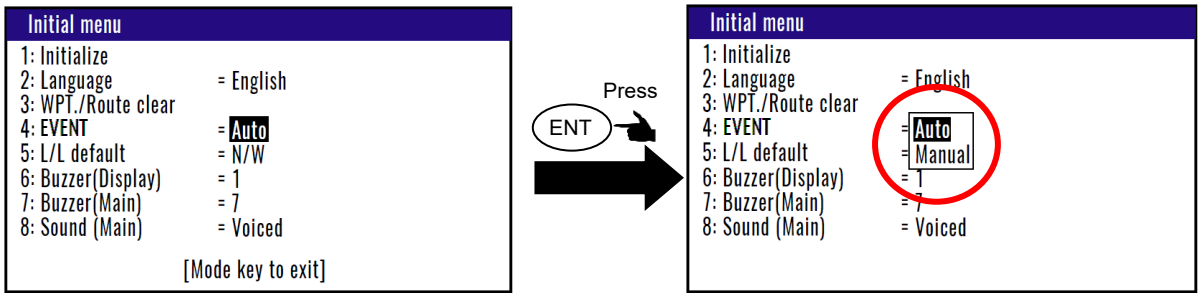
6.2.5 Changing a storing method for present position (EVENT)

You can use either of the following two procedures for registering your current position (EVENT).

(1) Press [▲] or [▼] key to move cursor onto the “EVENT”.
(2) Press (ENT) key.
(3) Select “Auto” or “Manual” in the pop-up and press (ENT) key.
(4) Press (MODE) key to exit initial menu.

AUTO: Pressing the **EVT** key automatically registers the points starting from No. 0001 through 0999. When the 1000th point is reached, the number is returned to 0001 again and the older data is sequentially replaced by the newer one.

MANUAL: Press the **EVT** key, then specify desired registration numbers (in the range of 0001 to 0999) by numeric keys.



initial setup: AUTO

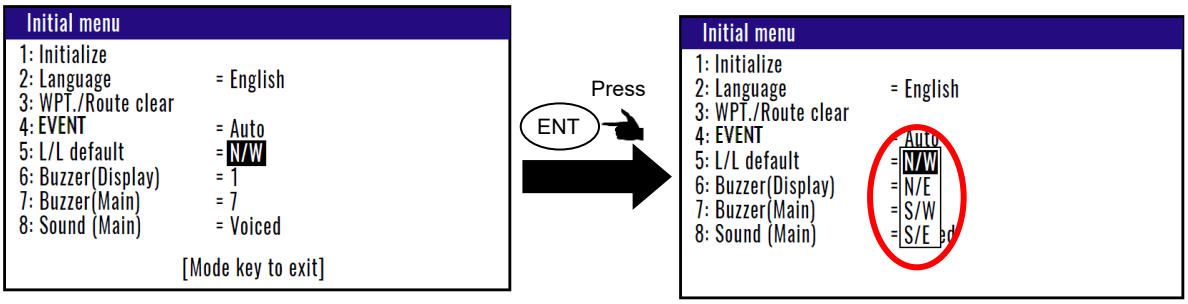
6.2.6 Selecting an initial value (North, South, East, West) of latitude/longitude.

N/W (N. Lat./W. Long.): When editing a waypoint, GNSS position is started using the north latitude/west longitude region as the initial value.

N/E (N. Lat./E. Long.): When editing a waypoint, GNSS position measurement is started using the north latitude/east longitude region as the initial value.

S/W (S. Lat./W. Long.): When editing a waypoint, GNSS position measurement is started using the south latitude/west longitude region as the initial value.

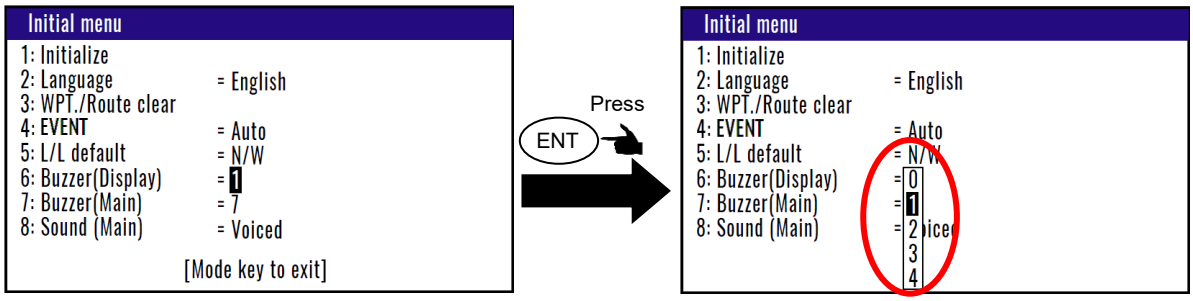
S/E (S. Lat./E. Long.): When editing a waypoint, GNSS position measurement is started using the south latitude/east longitude region as the initial value.



Initial setup: N/W

6.2.7 Frequency adjustment of the buzzer for display unit

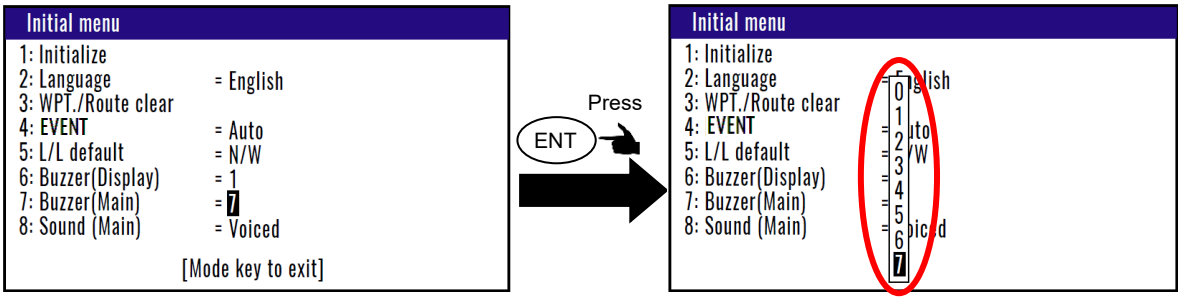
You can change the frequency of the buzzer for display unit. You can select the four frequencies. "**0**" is the lowest sound. "**4**" is the highest sound.



Initial setup: 4

6.2.8 Volume adjustment of the buzzer for Processor unit

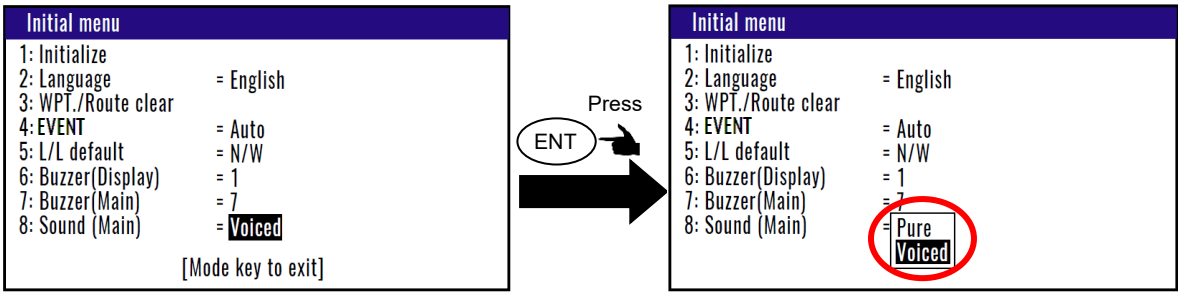
You can change the volume of the buzzer for Processor unit. You can select the 8 volumes. "**0**" is the lowest volume. "**7**" is the highest volume.



Initial setup: 7

6.2.9 Sound selection of the buzzer for Processor unit

You can change the sound of the buzzer for Processor unit. You can select the sound. "**Voiced**" is cloudy sound. "**Pure**" is pure sound.



Initial setup: Voiced

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Chapter 7 Installation

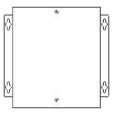
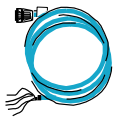
7.1 Installation consideration

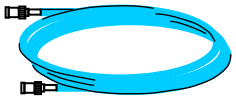
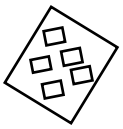
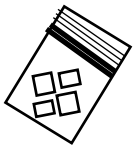
Qualified service technicians should perform the installation of KGC-300 that comprises the following operations.

(1) Unpacking each component of the system.
(2) Inspection of the exterior of each component unit and accessory.
(3) Checking the ship's mains voltage and current capacity.
(4) Determining the installation site
(5) Installing the Display unit
(6) Planning the cable routing and connections
(7) Adjustment and setups

7.2 Unpacking of the goods

Unpack your package and check if all of the items stated in the packing list are contained in the package. If not, report this to an insurance agent for tracing missing goods or refund.

No	Item	Type name	Remarks	Weight/ Length	Q'ty
1	Display unit 	KGC-300.DU	With mounting bracket and front cover	0.82 kg	1
2	Processor unit 	KGC-300.MU		1.1kg	1
3	Antenna unit 	GA-14	With bird protector	2.2kg	1
4	DC power cable 	CW-276-2M	With a 5-pin connector and one end plain	2.0m	1
5	Connecting cable 	CW-419-5M	6 pin water resistant connector and other end plain w/EMI core	5.0m	1

6	Antenna cable 	CW-392-15M	3D-2V with BNC connectors on the both sides	15m	2
7	Accessories 	MCVR1.5/6-ST-3.81	Connector (5)		1 set
8	Installation material 	TPT5X20U	Truss tapping screw (8)		1 set
		T.5X20MMX10M	Self-bonding tape (1)		
		10M[gray]	PVC tape(1)		
		B8X25U	Hexagon bolt for antenna Installation (4)		
9	Operation manual 	KGC-300.OM.E	English		1

Note: Option of equipment is not included.

Carefully check the exterior of each component unit for dents, damage, etc. Also check the inside of component units for electrical and mechanical damages.

7.3 Siting the units

To achieve best operational performance, the following factors must be considered.

(1) The display unit should be positioned in the location where the external situation can be viewed.

(2) Locate the display so that it provides easy viewing from all likely operator's positions.

(3) Select a position safe and free from dampness, water spray, rain and direct sunlight.

(4) Provide enough space for servicing. Consider access to the rear panel for connecting cables.

(5) Position the display unit as possible away from other radio equipment.

7.4 Display unit installation

Display unit can be installed either on pedestal or flush-mounted.
The following points shall be taken into consideration:

7.4.1 Table mounting

(1) Remove the two knurled fixing knobs that fix the display unit to the mounting bracket.
(2) Remove the display unit from the bracket and place it on a flat and safe area.
(3) Place the mounting bracket to the place where the display unit is to be installed, and fix the bracket with four tapping screws.
(4) Reset the display unit on to the bracket and fix it using the two knurled fixing knobs that were removed in step (1). Refer to Figure 7.1 for detail.

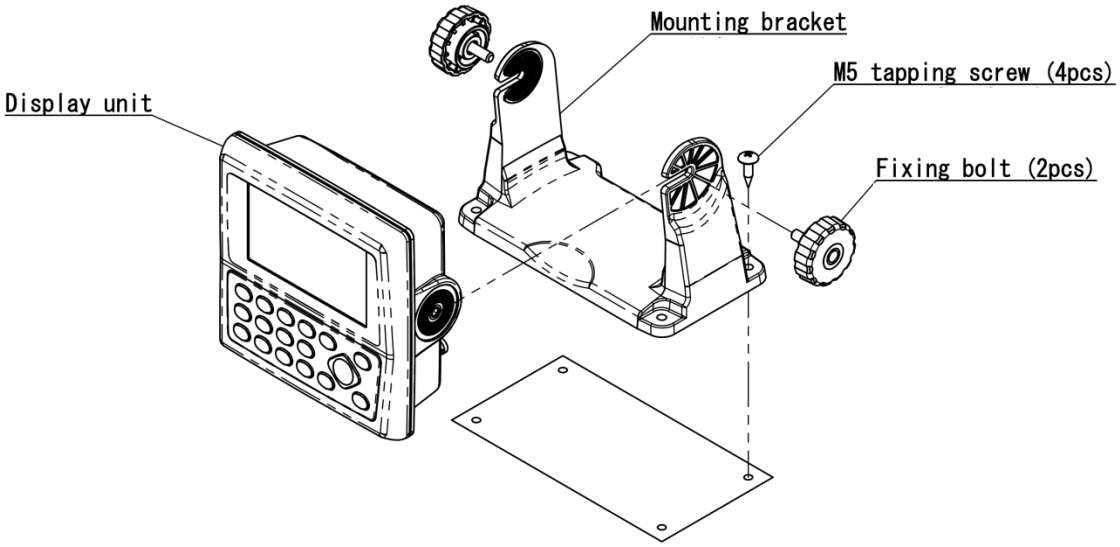
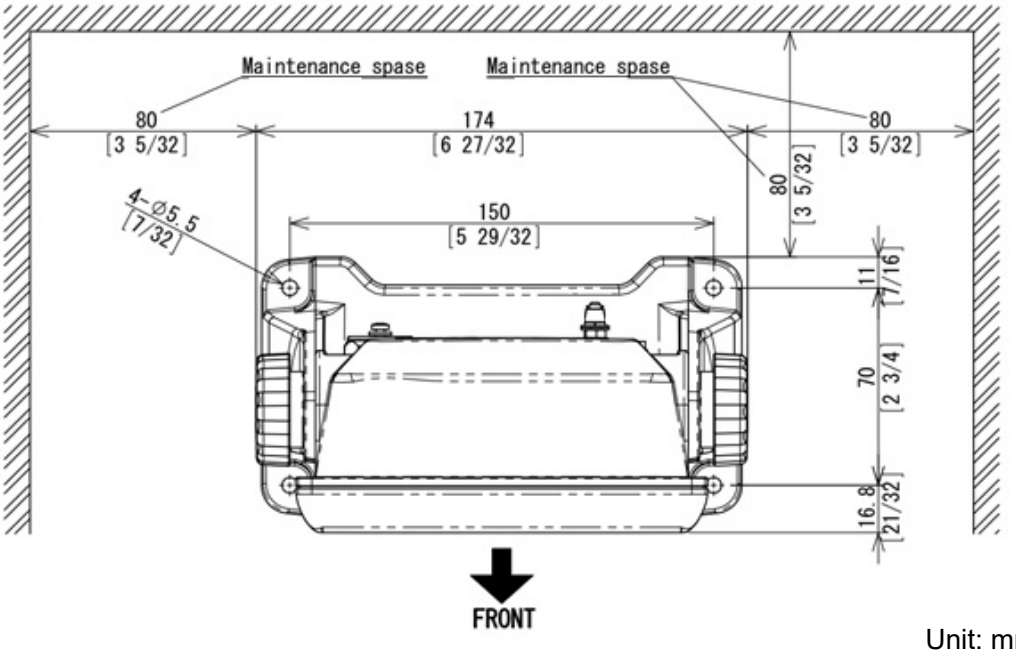


Figure 7.1 Fitting detail of KGC-300 in table mounting mode



Unit: mm (inch)

Figure 7.2 Maintenance space required for KGC-300

7.4.2 Flush mounting

(1) Cut a rectangle opening as shown in a figure 7.3.

(2) Loosen two fixing knobs that fasten the display unit onto the mounting bracket.

(3) Insert a coin in the two gaps at the lower part of the Display unit and remove the front frame.

(4) Connect the connectors for power, antenna and others to the Display unit respectively.

(5) Put the display on the opening and fix with four tapping screws. In case you use M3 screws to fix the display, select an appropriate screw length that best suits fixing the unit to the panel thickness.

(6) Install the front frame removed in step (3).

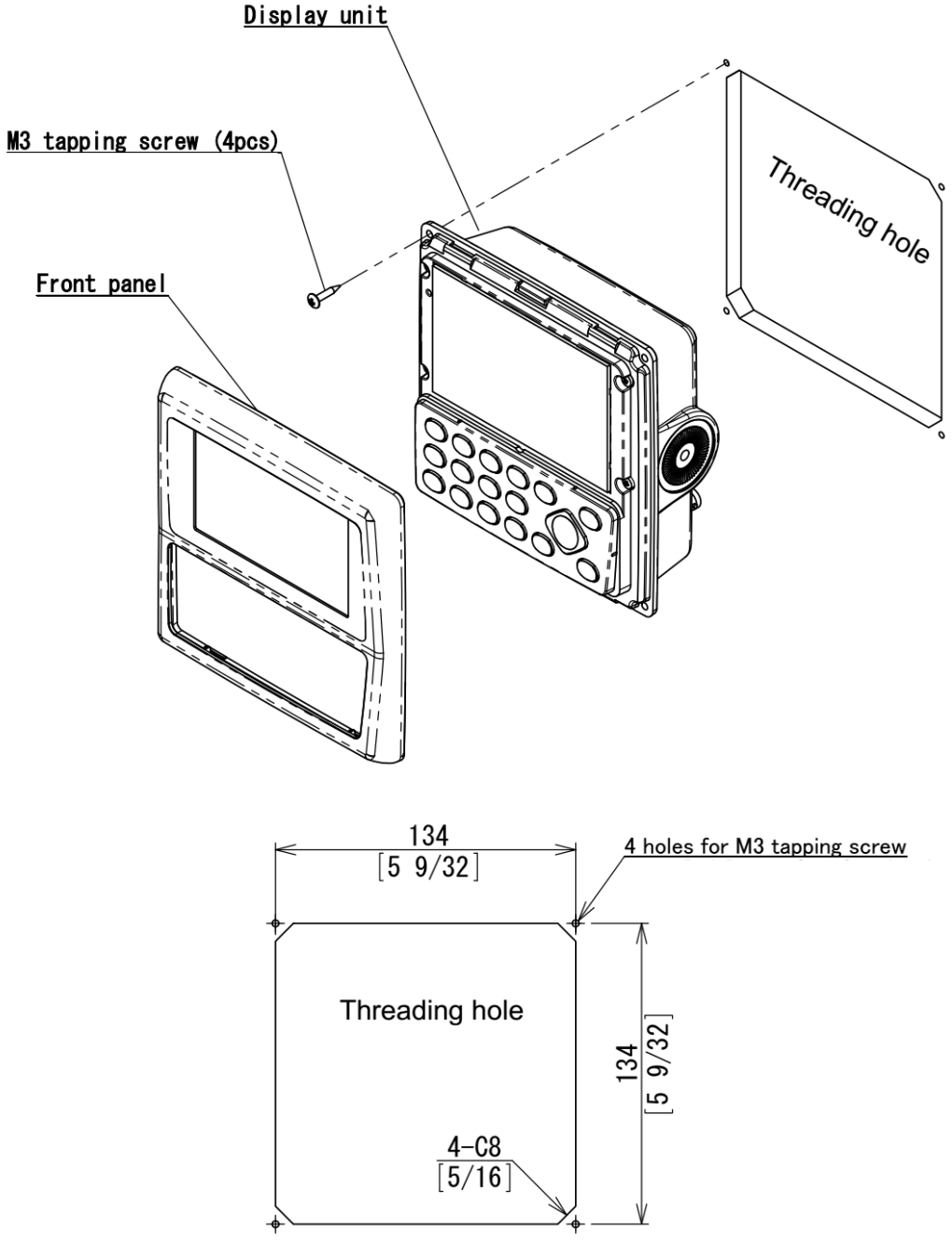
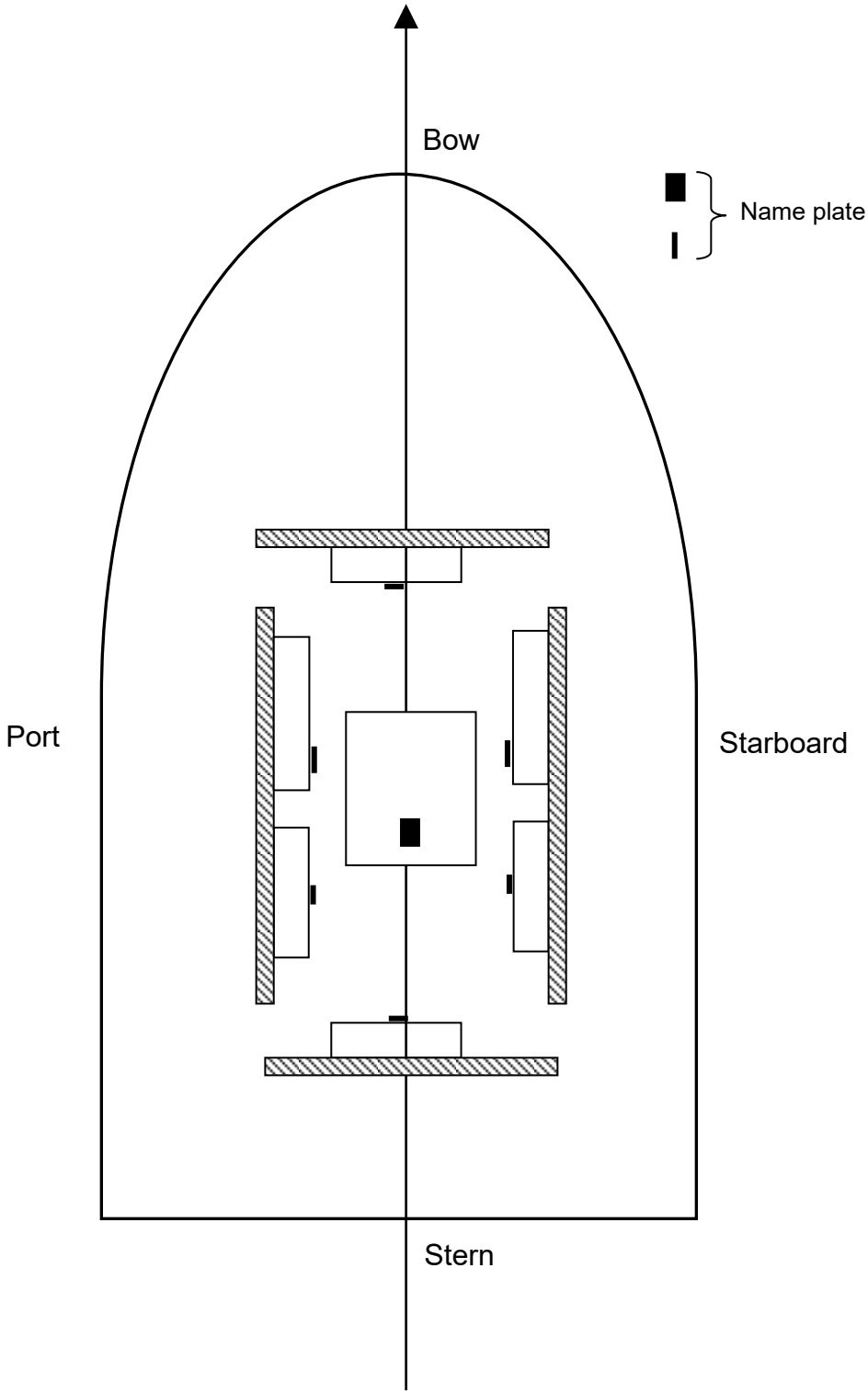


Figure 7.3 Flush mount installation Unit: mm (inch)

7.5 Processor unit installation

7.5.1 Processor unit Installation of direction

The Processor unit can be installed verticall and horizontal. However, in either case please install so that it is in the same direction as the keel line, or perpendicular to the keel line. If not, the heading accuracy of the backup will be worse. The example of correct equipment is shown below.



7.6 Antenna unit installation

7.6.1 Selecting the best site of GA-14 antenna

Make sure to install the antenna unit at a location where nothing shades the antenna of a view above the horizon. Objects placed above the antenna unit or too close to the antenna unit may cause signal to noise ratio to degrade and shorten measuring time.

(1) As far away from any metallic objects as possible.

(2) At least 4 meters (13.2 feet) away from the MF/HF reversed L-type TX antenna, VHF or HF whip antenna.

(3) At least 1.5 meter (4.9 feet) above the MF/HF reversed L-type TX antenna.

(4) At least 1 meter (3.3 feet) away from the receiving antenna.

(5) Outside radar transmitting beam (30° to 40°).

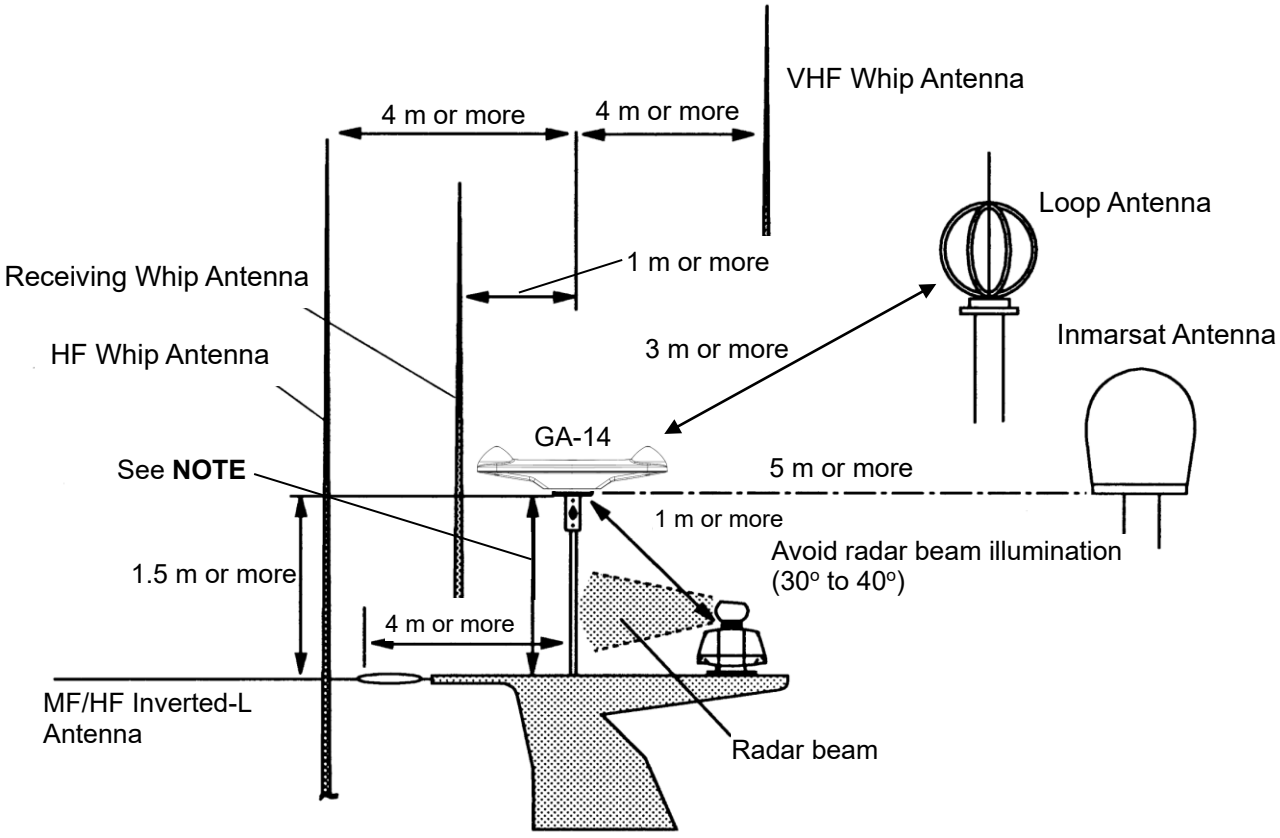
(6) At least 1 meter (3.3 feet) away from the radar antenna.

(7) At least 5 meters (16.5 feet) away from the Inmarsat antenna.

(8) At least 3 meters (9.8 feet) away from the loop antenna.

(9) At least 2 meters (6.6 feet) away from the ship's engine.

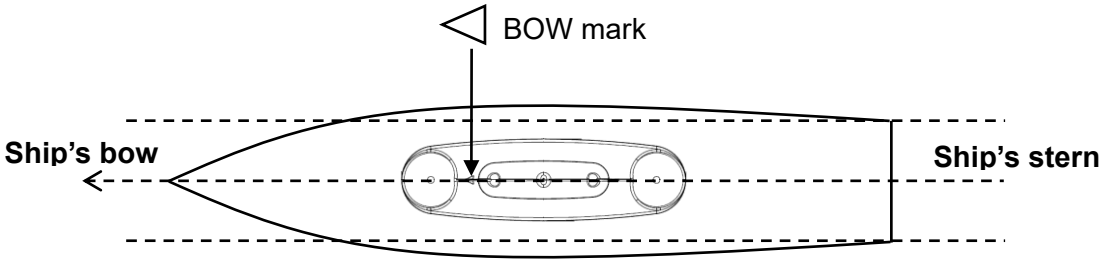
(10) At least 0.5 meters (1.6 feet) above the large metal surface.



NOTE: Keep away from metallic objects at least 0.5 m.

Figure 7.4 Recommended GA-14 Antenna installation

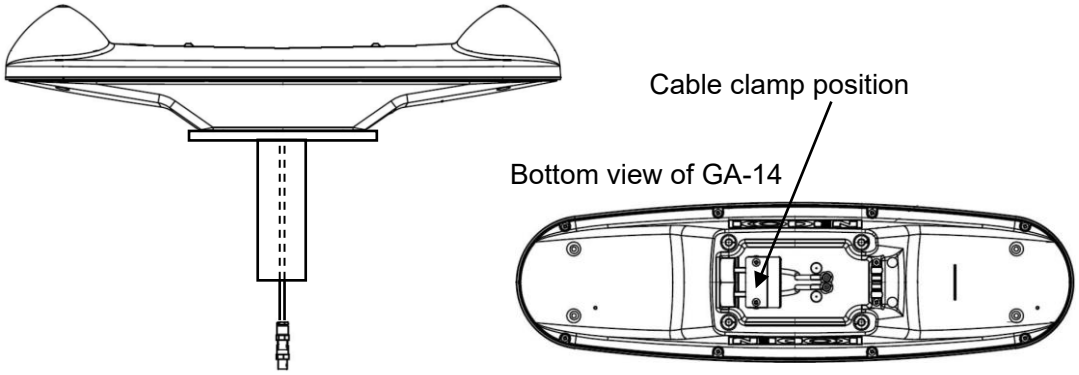
The GPS antenna GA-14 should be installed, as illustrated below, on the keel line with the BOW mark oriented to the ship's bow. If this is not possible due to the ship's superstructure, the antenna may be moved in parallel to the keel line. However, the antenna should be, where possible, installed on the midship, to minimize bearing deviation between the ship's bearing and course.



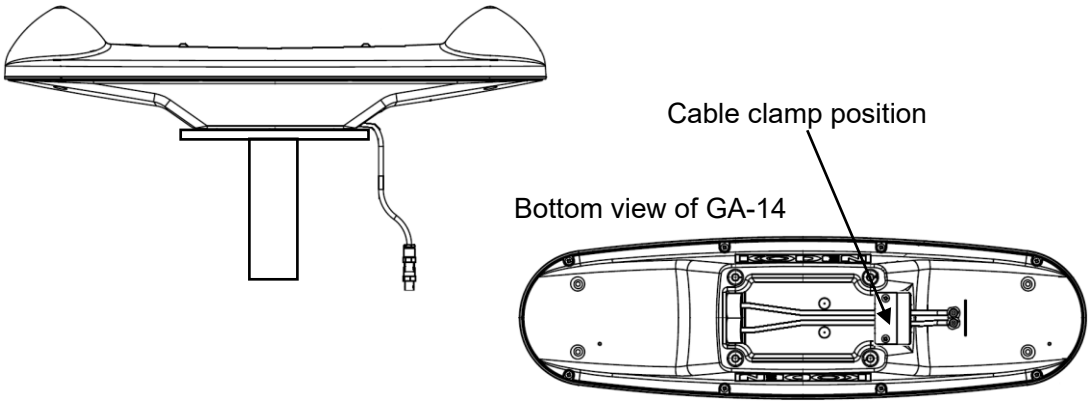
7.6.2 Antenna cable layout method

Two ways to run antenna cable from the antenna.

(1) Antenna cable inserted into the bracked and ran inside the mast pipe.

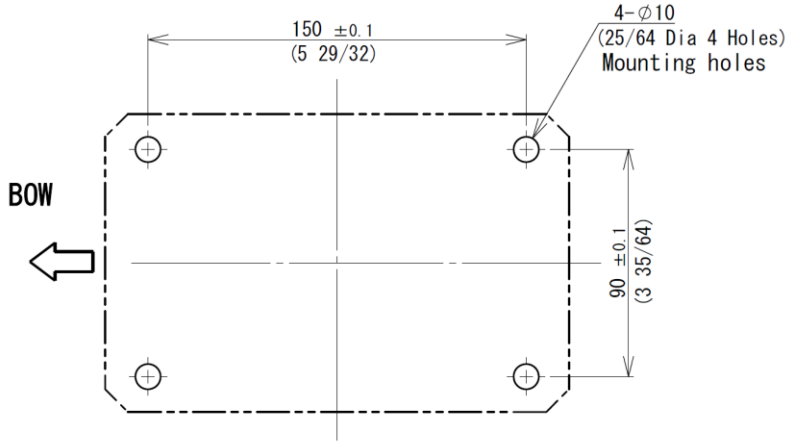


(2) Antenna cable is dropped off from the side of the antennal and ran outside of the mast pipe. In this case it is necessary to change the setting position of the cable clamp.



7.6.3 Installation of GPS antenna

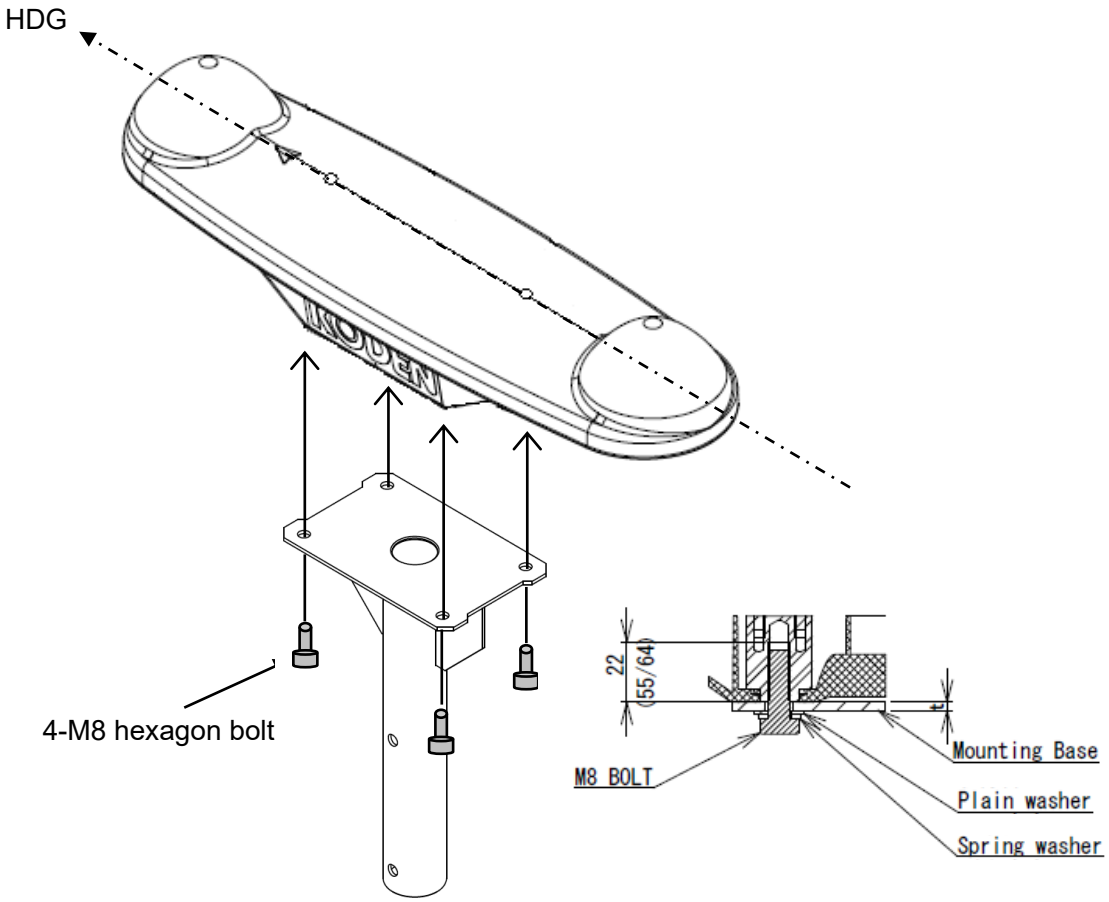
To attach the GPS antenna, four (4) M8 bolts are used. Referring to the illustration below, make four (4) holes on the cradle, fix the bracket. When the thickness of the bracket is 4 to 5mm, supplied bolts may be used (M8 x 25). When the bracket is more than 6 mm thick, the bolts should be choosen from the below table.



Unit: mm (inch)

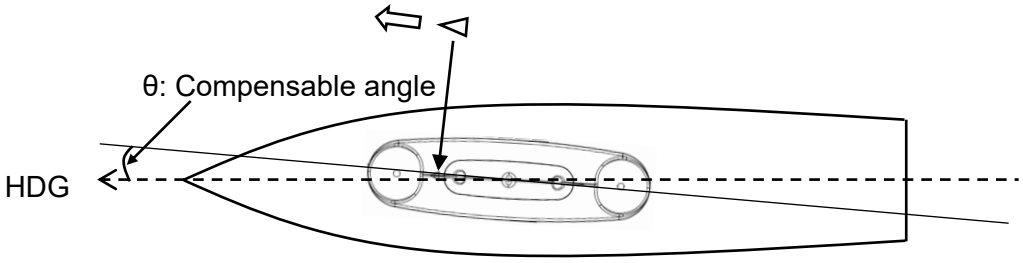
Drawing of work for mounting holes

Platform thickness	Bolt for fixing the antenna
4 to 5 mm	M8x25
6 to 10 mm	M8x30



7.6.4 Angle compensation of Antenna

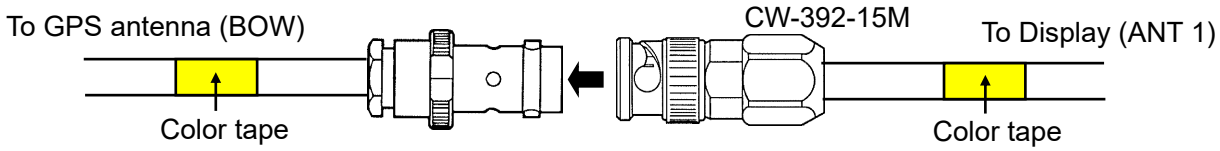
The GPS antenna should be installed on the keel line with the BOW mark oriented to the ship's bow. If not, HDG should be compensated. (Refer to "**4.4.1 Compensating the heading**")
When it is installed with θ° clockwise off, enter a compensation value [-θ] in the "MENU 3, COMPENSATION". When it is installed with θ° counterclockwise off, enter a compensation value [+θ] in the menu.



7.6.5 Waterproofing connection

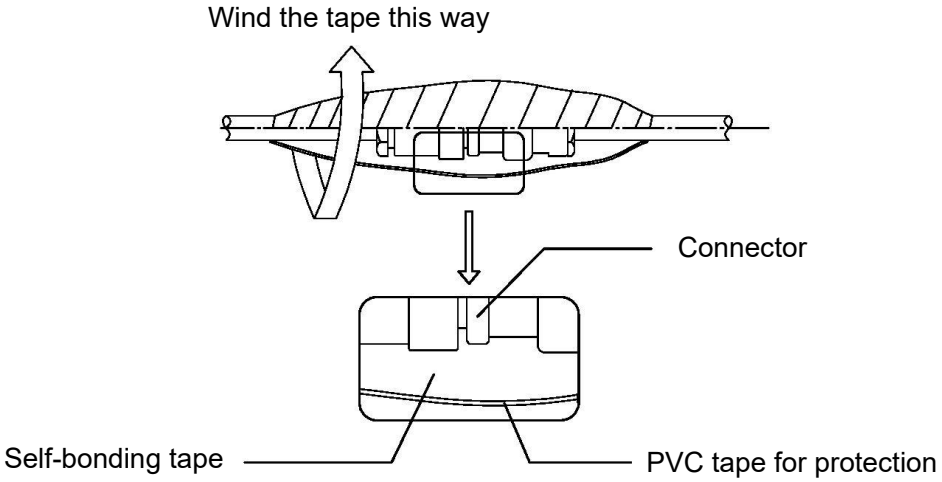
Make sure the BOW antenna cable is connected to ANT 1 of the display unit.

(1) Pay attention to the BOW antenna cable marked with tape.

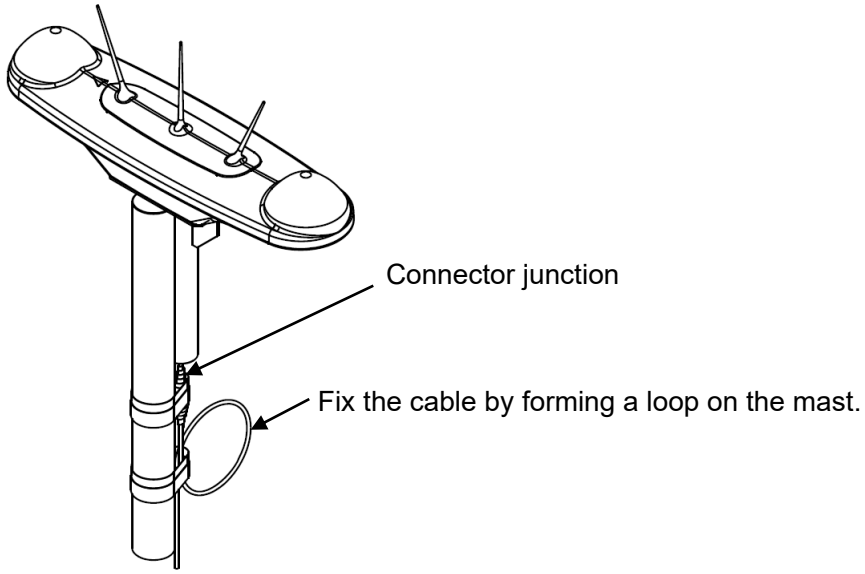


(2) Wind the self-bonding tape around the joint section after connecting.
Pull the end of the tape and stretch it to twice its length. Wrap it around joint section a total of 3 layers. When completed, apply gentle pressure over the surface with fingers to expedite the fusion.

(3) Use PVC tape for extra protection.
PVC tape should not be strained. Wrap it around joint section a total of 3 layers. When finished, press the surface evenly without strain for complete adhesion of the tape.



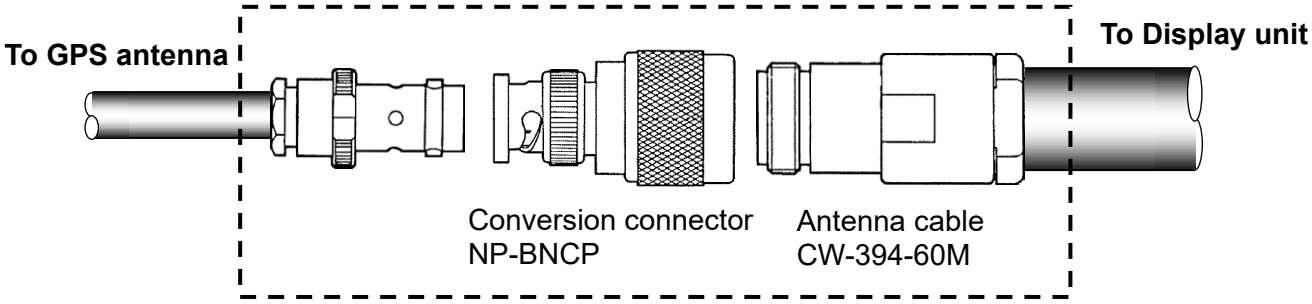
To prevent the tension hanging over the connector junction, the cable shall be fixed as described in the illustration below.



7.6.6 Connecting the 60m antenna cable kit CW-394.KIT to GPS antenna

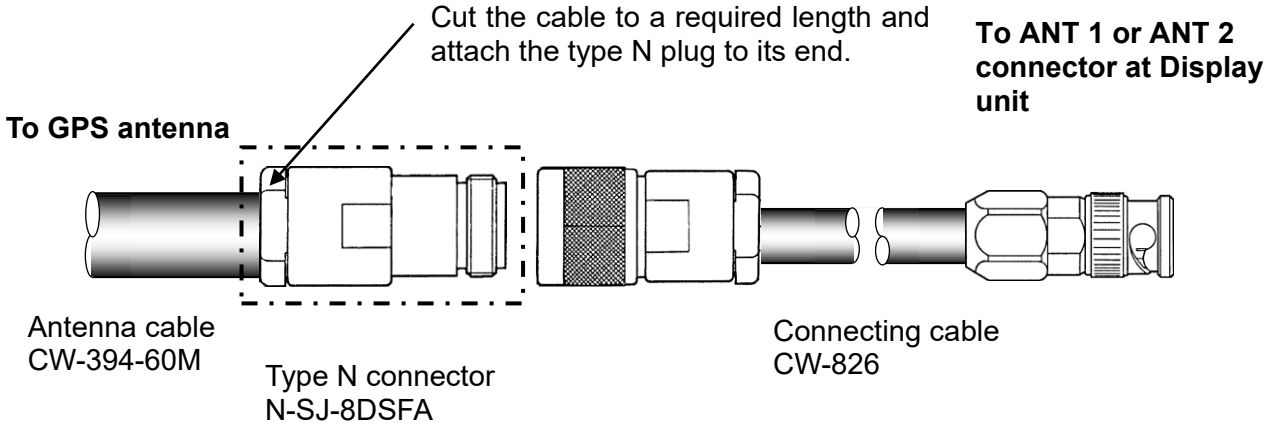
The optional 60 m length cable kit, CW-394.KIT, is composed of the Antenna cable CW-394-60M and the N-to BNC conversion connector. Connect the GPS antenna and Display unit via the cable kit as shown in the following figure.

(1) Connection at GPS Antenna side



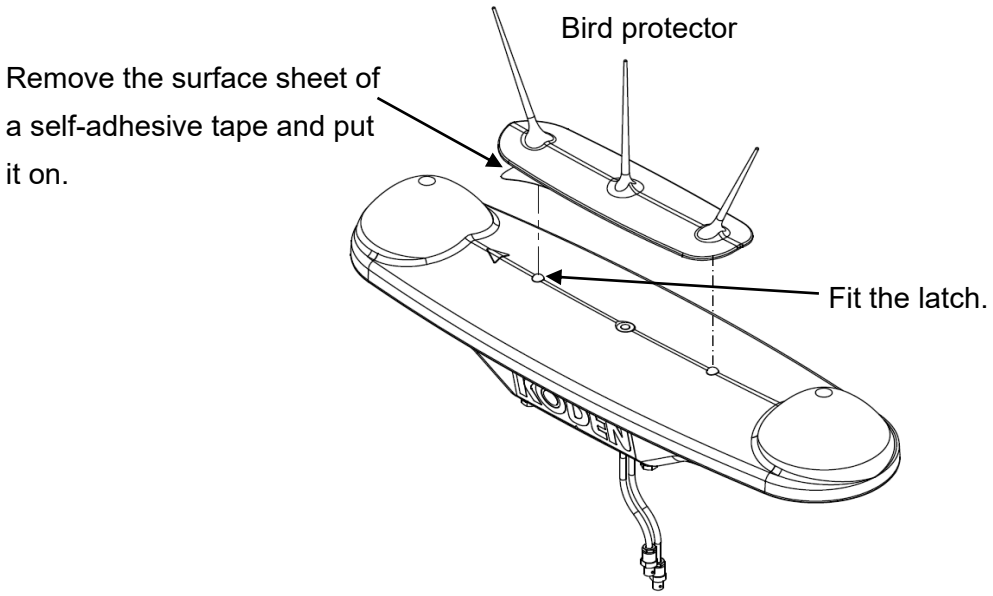
Waterproof the jointing section using self-bonding tape and PVC tape. (Refer to page 7-9 for detail)

(2) Connecting the Display unit



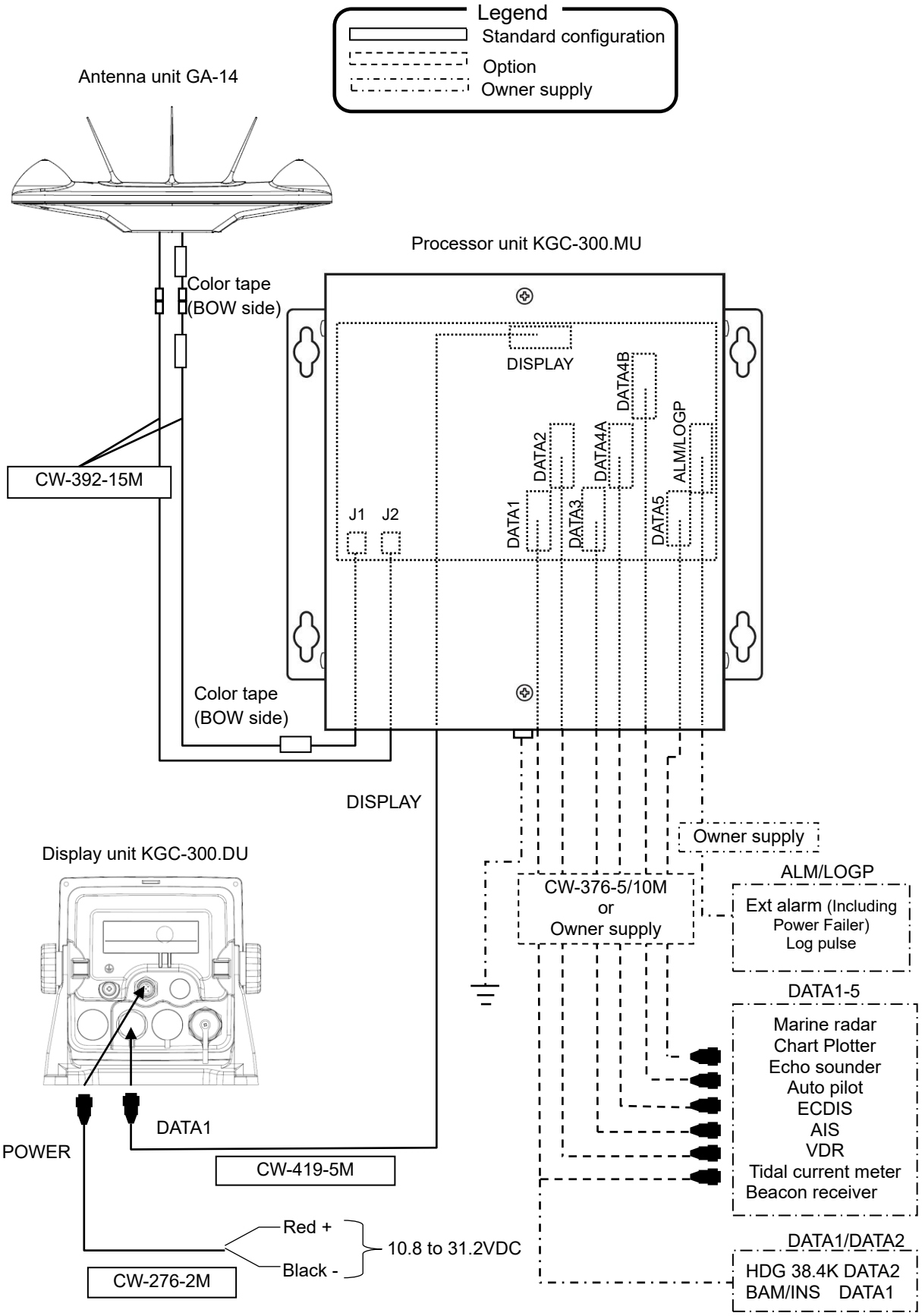
7.6.7 Installing the bird protector to Antenna unit

Sea birds such as seagulls may be the cause of poor reception of the GPS signal when perched on top of the GPS antenna unit. The use of bird protector is recommended to avoid this problem. To fit this device, use the following procedure.



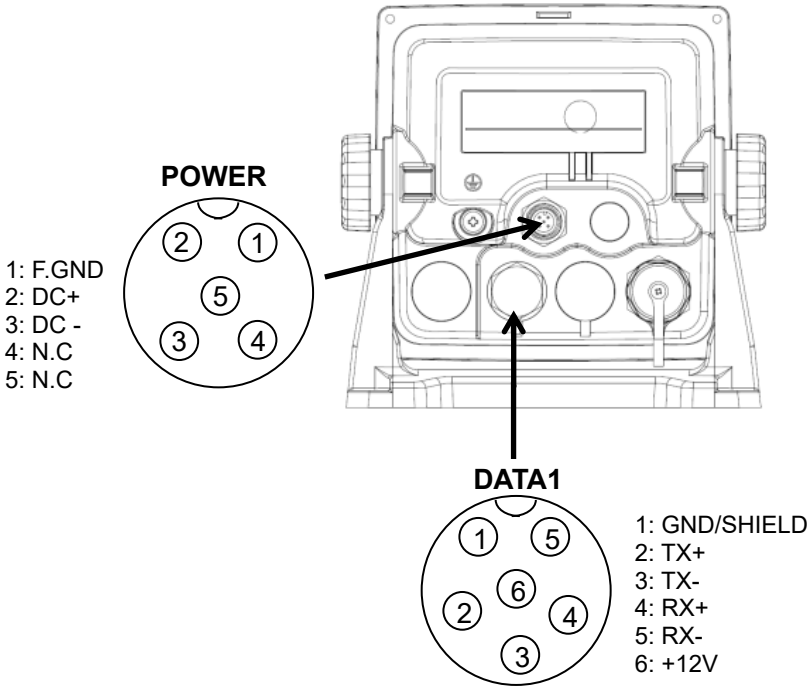
⚠Caution: Put it on the surface without any gaps.

7.7 Cable connections to KGC-300



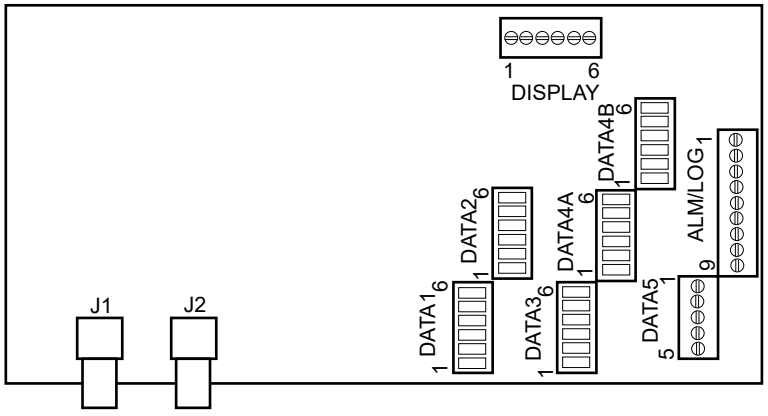
7.8 Connector pin outs

Display unit



(Connect to the DISPLAY connector inside the Processor unit with CW-419-5M)

Processor unit



ALM/LOGP
1: +12VOUT1
2: +12VOUT2
3: SHIELD
4: LOGP (-)
5: LOGP (+)
6: ALARM (COM)
7: ALARM (NO)
8: ALARM (NC)
9: ALARM (SHIELD)

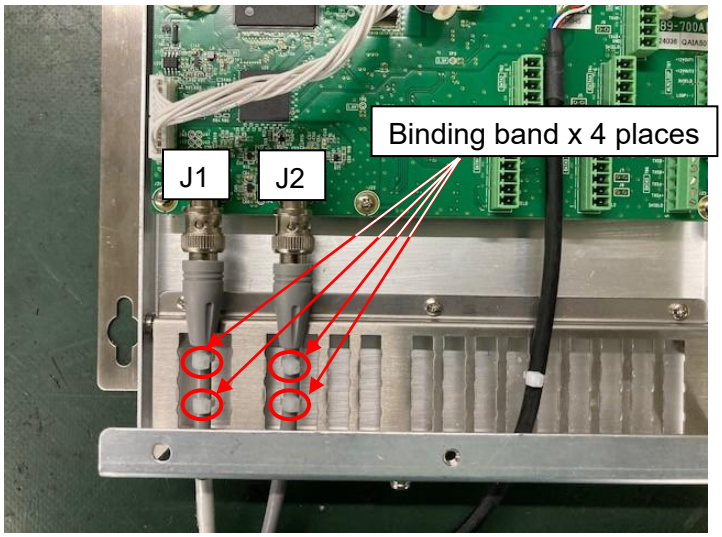
*Pin6 and Pin8 of [ALM/LOGP] are output of the power failer.

DISPLAY	DATA1	DATA2	DATA3	DATA4A	DATA4B	DATA5
1: GND/SHIELD	6: RX1-	6: RX2-	6: RX3-	6: RX4-	6: N.C	1: SHIELD
2: TX+	5: RX1+	5: RX2+	5: RX3+	5: RX4+	5: N.C	2: TX5A+
3: TX-	4: TX1-	4: TX2-	4: TX3-	4: TX4A-	4: TX4B-	3: TX5A-
4: RX+	3: TX1+	3: TX2+	3: TX3+	3: TX4A+	3: TX4B+	4: TX5B+
5: RX-	2: GND	2: GND	2: GND	2: GND	2: GND	5: TX5B-
6: +12V	1: SHIELD	1: SHIELD	1: SHIELD	1: SHIELD	1: SHIELD	

For details of the interface circuit, refer to "**10.6 Input / Output circuit**"

(J1/J2 Connection)

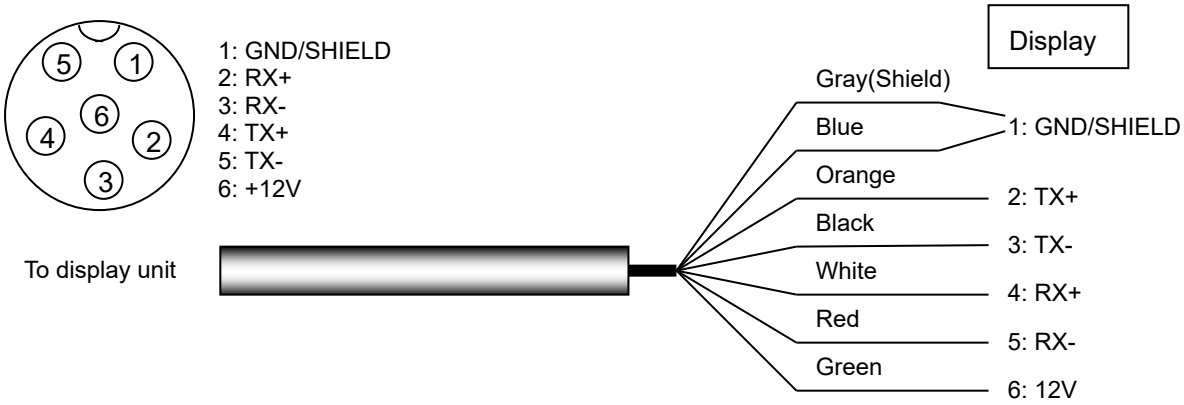
Connect the antenna cable of BOW side (with color tape affixed) to J1 and the other to J2, and fix each of the two places（four places in total) with Binding bands.



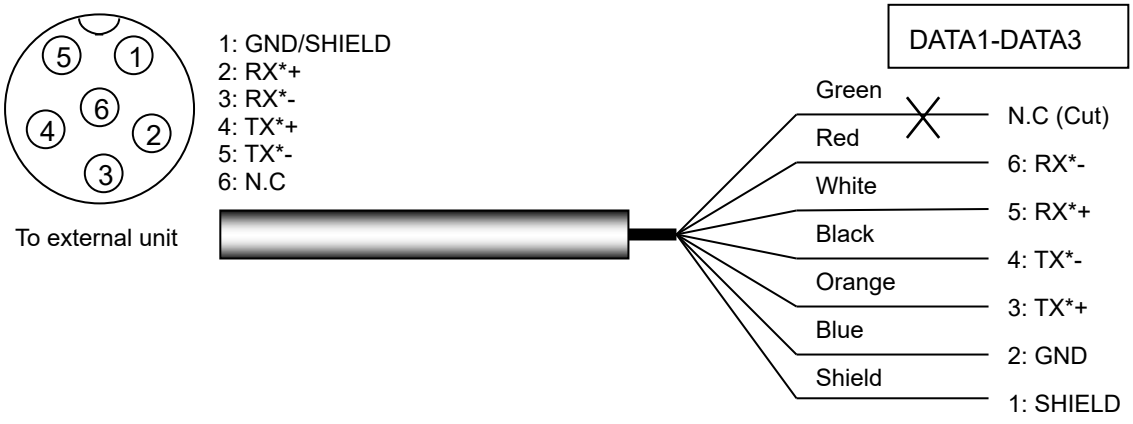
CAUTION

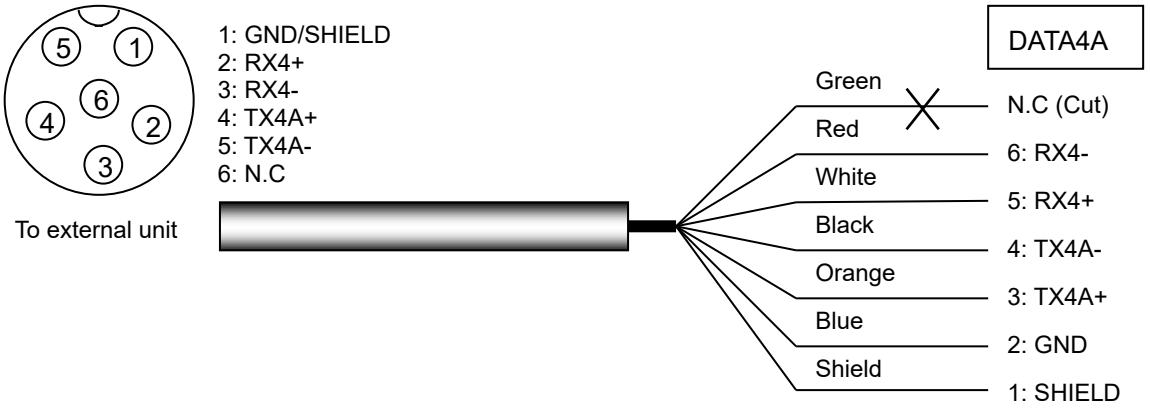
If the antenna cable is not fixed, reception may become unstable due to vibration.

(CW-419-5M Pin number from cable side)

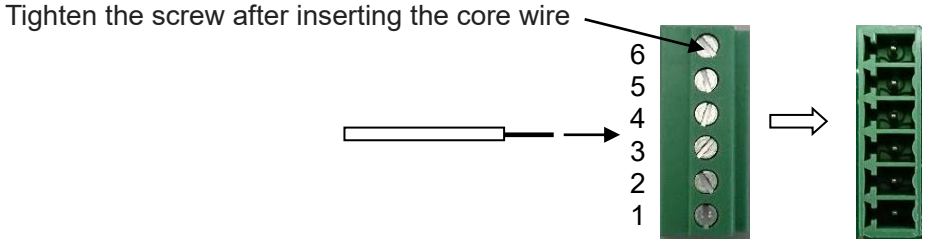


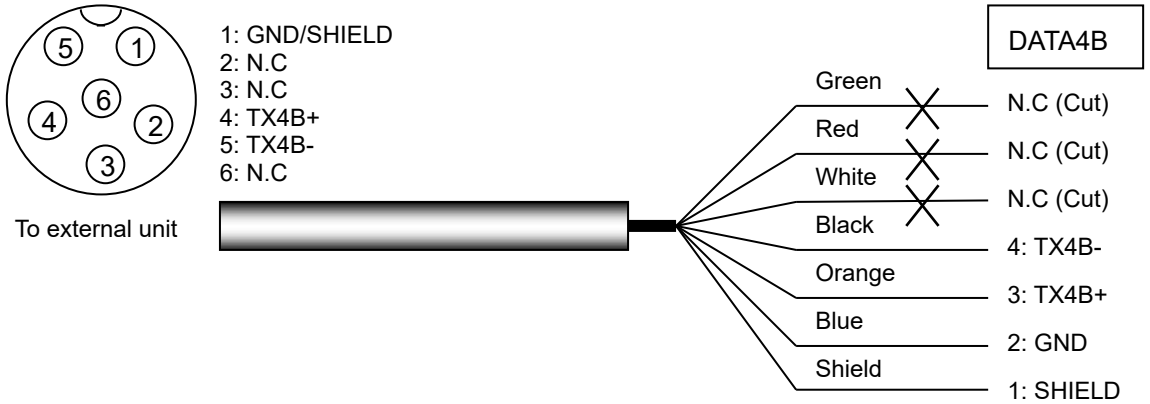
(CW-376-5M/10M Pin number from cable side)

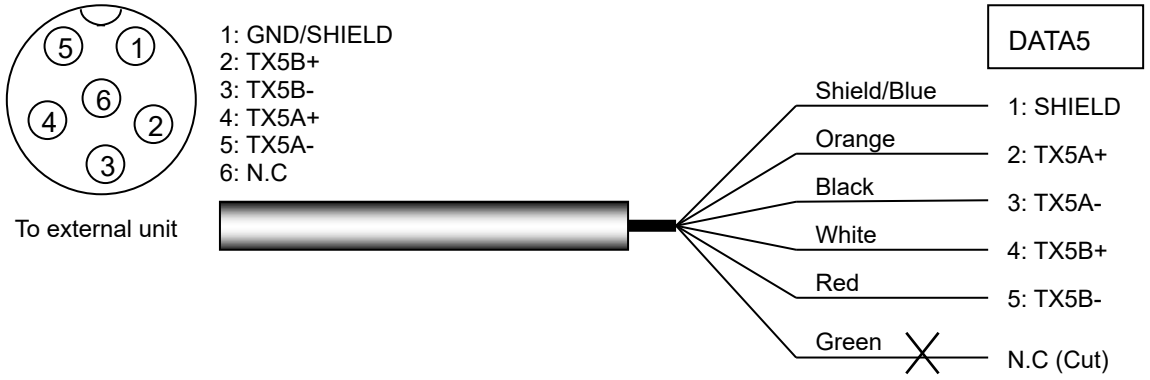




*DATA1-3, DATA4A/4B connection and connector insertion are shown below







7.9 Inspection after installation

Before you turn the unit on, check the following points to make sure the system operates properly.

(1) Is the ship's supply voltage and current within the rated range?

(2) Is the connection between the display and antenna unit correct?

(3) Are the cables routed and connected properly?

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Chapter 8 Specifications

8.1 Specification

8.1.1 Main function

Receiving frequency		1575.42 MHz±1MHz
Receiving channel		16 channel parallel
Receiving code		C/A code
Sensitivity		Better than –130 dBm
Setting time		2 minutes (at standard hot-start time)
Time to Position fix	Cold start	50sec (standard)
	Warm start	45sec (standard)
	Hot start	20sec (standard)
Accuracy	Heading	0.5 º rms
PDOP: 3 or less	Position	GPS: 10m (2 drms, SA:OFF, PDOP: 3 or less) DGPS: 3m (2 drms, SA:OFF, PDOP: 3 or less)
	Velocity	1m / sec (rms, SA:OFF, PDOP: 3 or less)
Heading resolution		0.1 º
Maximum rate of turn		45 º/sec
Maximum role/pitch angle		30 º
Maximum follow-up acceleration		1g
Base line length		0.5m
Display		4.3 inch color LCD (480×272 dot's, effective picture area: 95.04 x 53.86 mm)
Display mode		HDG1, HDG2, ROT, NAV1, NAV2, MOB (Man Over Board)
Position data display		Latitude/longitude in increments of 0.0001 minute, converted Loran C LOPs, converted Loran A LOPs, converted Decca LOPs,
Navigational display		Speed, Course, Distance/Bearing to waypoint, DOP value, Present time(UTC or LTC), Satellite status, Beacon receiving status, Distance/Bearing between two points, MOB display
Instant (event) memory		1000 points
Waypoint memory		9000 points
Route memory		100 routes reverse trail possible
Alarm		Proximity, Cross track error, CDI, Anchor watch
Position compensation		Latitude/longitude, LOPs, Geodetic Datum
Magnetic compensation		Auto or Manual
Parameters		Loran C LOPs conversion, Loran A LOPs conversion, Decca LOPs conversion, memory of waypoints and name (up to 10 letters), selection of measuring unit (nm, sm, km), averaging (smooth) factor, position mode, beacon stations selection
Output data format		IEC 61162-1, IEC 61162-2(TX only), NMEA 0183 Ver.2.0 AAM, APB, ATT, BOD, BWC, DTM, HDM, HDT, HVE, GBS, GGA, GLL, GNS, GSA, GSV, MSS, RMB, RMC, ROT, RTE, THS, VTG, WPL, XTE, ZDA, PKODA, PKODG1, PKODG21, PKODG7 (ALC, ALF, HBT *DATA1 only) *ARC not used
Input data format		RTCM SC104 Ver.2.0 (DGPS)

Note: **Accuracy is subject to change in accordance with DoD civil GNSS user policy.**

8.1.2 Power requirements

Input voltage	10.8 to 31.2 VDC
Power consumption:	Less than 9.0 W (at 24VDC)
AC Operation:	AC/DC rectifier PS-010 is required.
	Input voltage range: 115 VAC or 230 VAC

8.1.3 Compass safe distance

Standard:	Processor unit: 0.4m	Display unit: 0.8m
Steering:	Processor unit: 0.2m	Display unit: 0.4m

8.1.4 Environmental conditions

(1) Temperature and humidity

Operating temperature	Processor unit: - 15° to + 55°C
	Display unit: - 15° to + 55°C
	Antenna unit: - 25° to + 55°C
Humidity	93% (+40°C)

(2) Vibration

The equipment operates normally under the following vibrating conditions.

2 - 5 Hz to 13.2 Hz: Amplitude ±1mm ±10 % (Maximum acceleration of 7 m/s^2 at 13.2 Hz)

13.2 Hz to 100 Hz: Maximum acceleration of 7 m/s^2 being applied

(3) Water proof

Processor unit	KGC-300.MU: IPX0 PROTECTED	
Display unit	KGC-300.DU: IPX4 PROTECTED	
Antenna unit	GA-14	: IPX6 EXPOSED

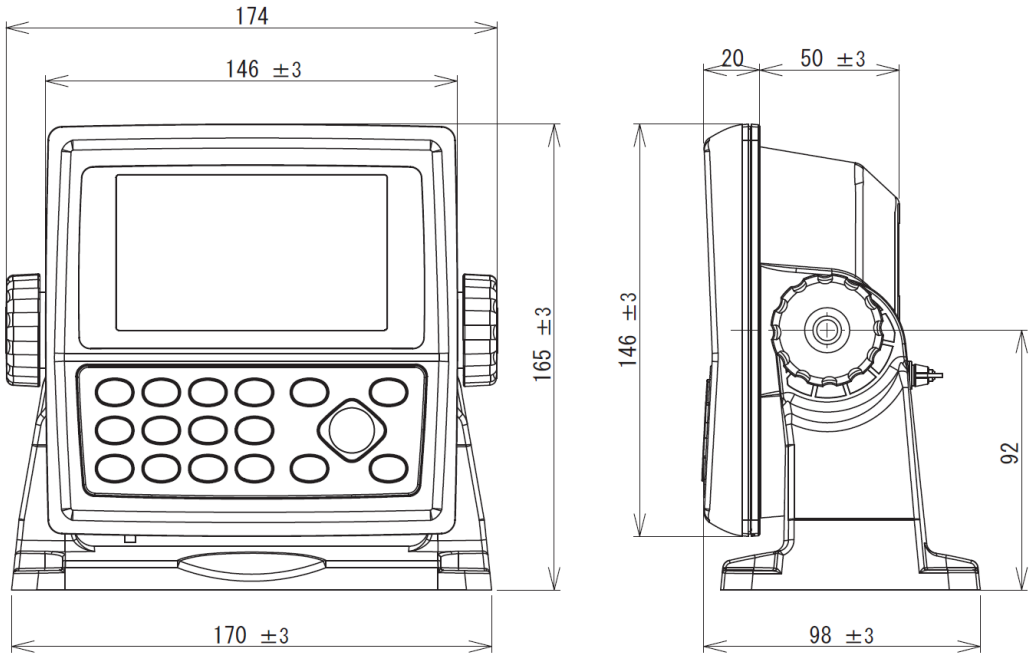
8.2 External dimensions and weight

8.2.1 External dimensions and weight of the display unit : KGC-300.DU

External dimensions: Width x Height x Depth

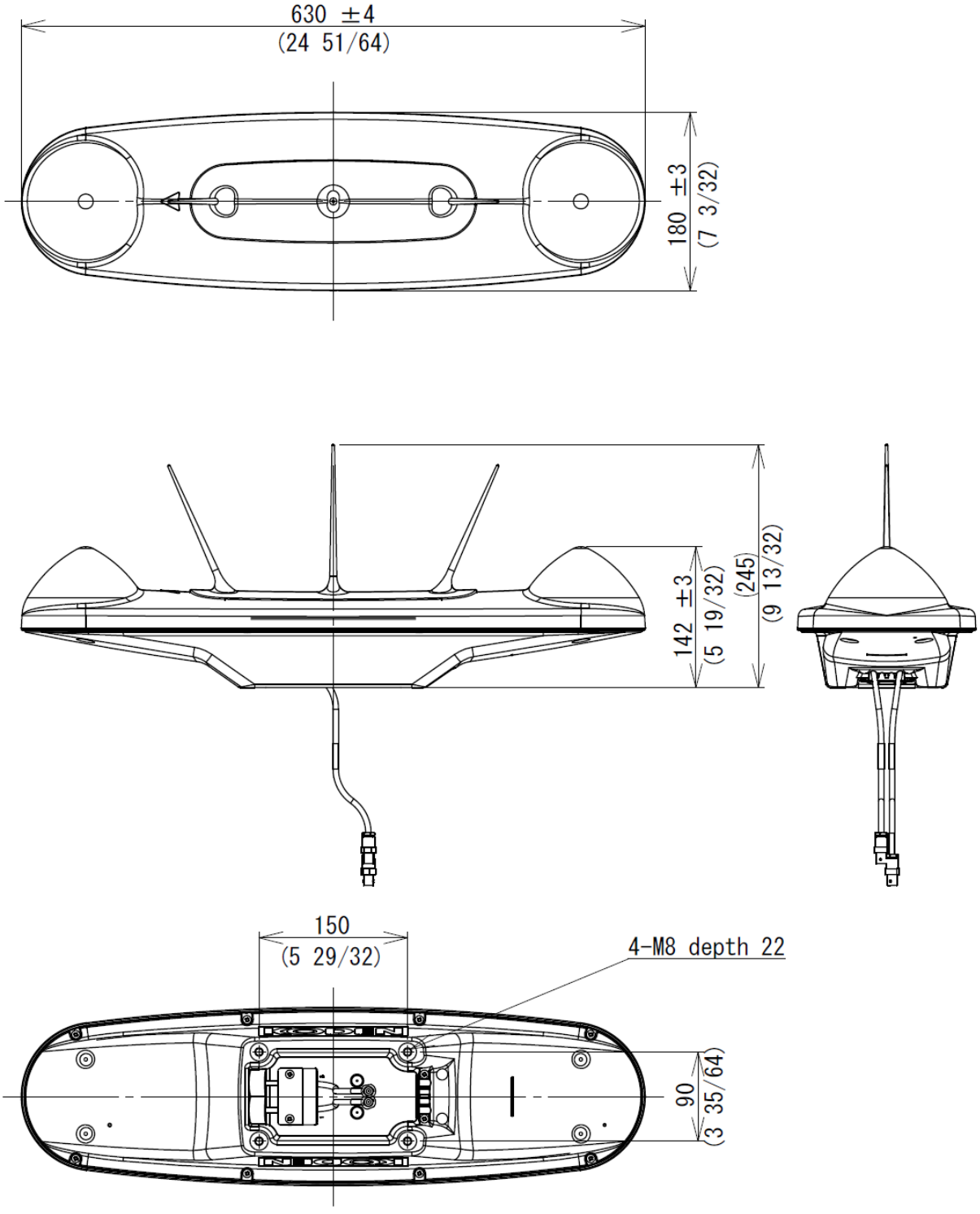
Dimensions (WxHxD): 174mm x 165mm x 98mm (with mounting bracket and knobs)

Weight: 0.82 kg (with mounting bracket and knobs)



Unit (mm)

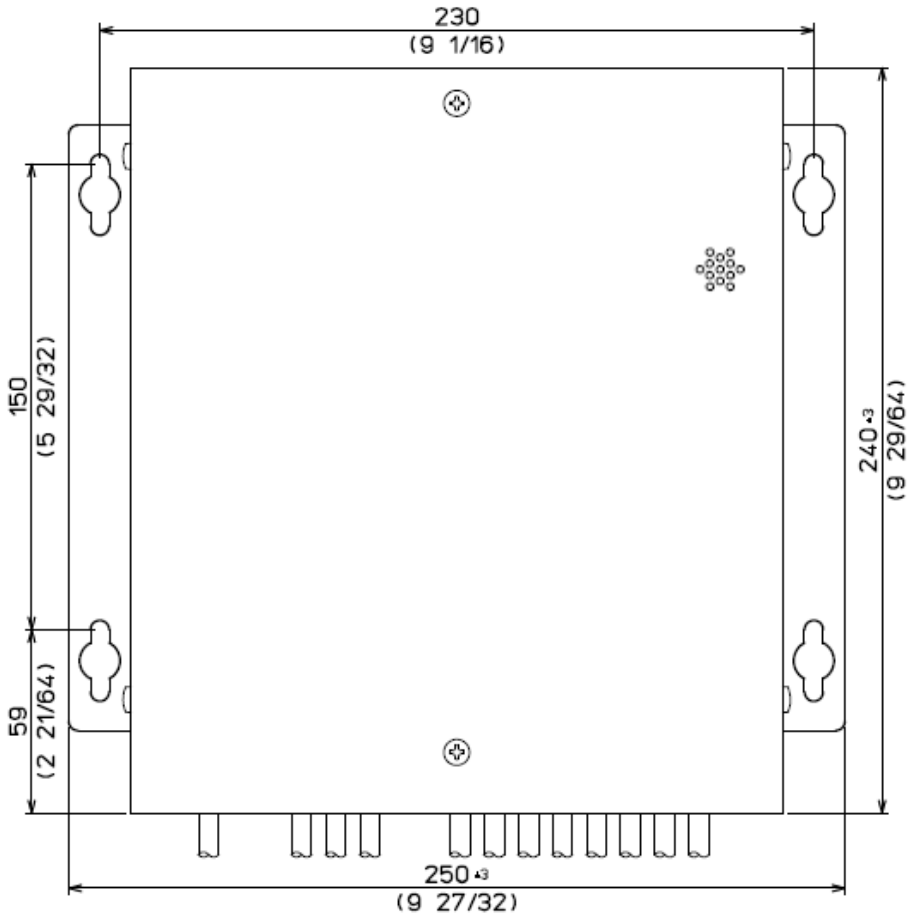
8.2.2 GPS Antenna : GA-14

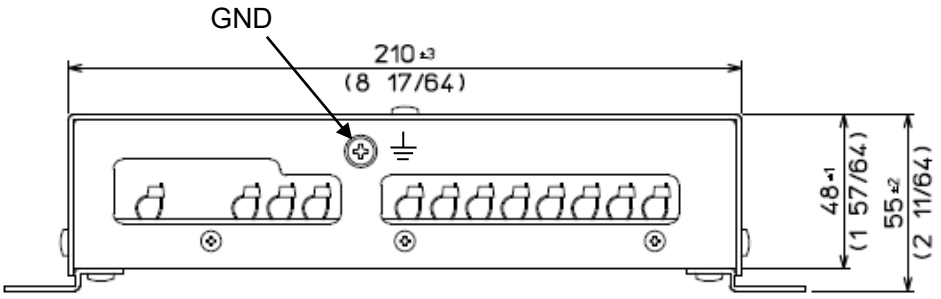


Weight: 2.2kg (With antenna cables)

Unit: mm (inch)

8.2.3 Processor unit : KGC-300.MU





Weight: 1.1kg

Unit: mm (inch)

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Chapter 9 Maintenance and troubleshooting

9.1 Periodic inspection and cleaning

9.1.1 Monthly check

Check if there is any loose connection on the Processor unit for GPS Antenna, radar or navigational unit.

9.1.2 Maintenance

If the display unit is smeared or stained with dirt, wipe the surface of the unit with soft dry cloth.

CAUTION
Never use solvent like thinner, alcohol, turpentine, etc.

9.2 Trouble shooting

This chapter covers simplified fault locating procedures to assist the ship's crew to locate a faulty module as well as simple fuse replacement. If the problem continues, call for service.

9.2.1 Information required for service

Please advise the following details:

(1) Name of vessel, Satcom number if available.
(2) Equipment type name
(3) Equipment serial number
(4) Next port of call, ship's agent name, fax number, email address, etc.
(5) Faulty conditions (precisely as possible) and the result of on board check

9.2.2 Trouble shooting

The following table provides information about first line check schedules to locate a faulty area and gives remedial measure(s), where applicable.

Symptom	Possible cause of trouble	Measure
Even with power on, nothing is displayed.	• Power connector may be loose. • The power supply voltage is out of specification (10.8 to 31.2 VDC). • Poor connection between power cable and battery. • Defect of display unit.	• Connect the connector securely. • Use a proper power as per specification. • Check the connection between power cable and battery. • Replace the display unit.

Heading bearing is not displayed. (---.-° is displayed)	• Antenna connection on the back of display may be loose. • Antenna view may be blocked by obstacles.	• Connect the connector securely. • Change the installation position of the GPS antenna.
Heading bearing is displayed, but heading output is not available.	• DATA connector of Display unit may be loose. • The baud rate output for external equipment is wrong. • Heading data output may be turned off in settings.	• Tighten the connector surely. • Change the baud rate output (4800 or 38400) for proper connection with external equipment.(Refer to Menu 9:Interface, 4:Baud rate) • Check sentence output. (Refer to Menu 9:Interface, 6:Sentence edit)
Incorrect heading bearing data is displayed / output.	• Cables on the back of the display may be swapped between ANT1 and ANT2 • Forward orientation of the antenna may not be correct.	• Connect the bow side antenna cable to ANT 1 connector of Processor unit, and connect the stern side antenna cable to ANT 2 connector of Processor unit. • The direction of GPS antenna should be installed in conformity to the ship's bow. Compensate of Heading. (Refer to Menu5:(Compensation,1:Heading)

Chapter 10 Technical Reference

10.1 Input data format / sentence

RTCM SC-104 Ver 2.0 (DGPS) *Baud rate: 4800/9600/19200/38400, DATA3 connector only.

ACN sentence *Baud rate: 4800/9600/19200/38400, DATA1 connector only. Sentences ACN is used for alert handling.

Description	Contents of data field
ACN	Alert command **$ --ACN, hhmmss.ss,aaa,x.x,x.x,c,a*hh <CR><LF>** Sentence status flag Alert command (A = acknowledge, Q = request / repeat infomation, O = responsibility transfer, S = silence) Alert Instance, 1 to 999999 Alert Identifier Manufacturer mnemonic code Time Sentence type Talker device Start of sentence

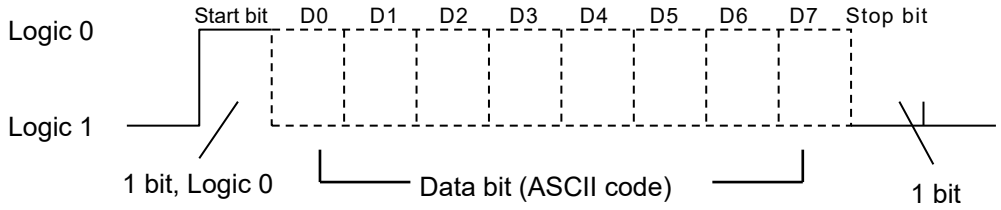
10.2 Output data format

IEC 61162-1, IEC 61162-2(TX at one port only – DATA2)

NMEA 0183 Ver.2.0

Data per one byte is as follows:

Parity bit: none



10.3 Output data specification

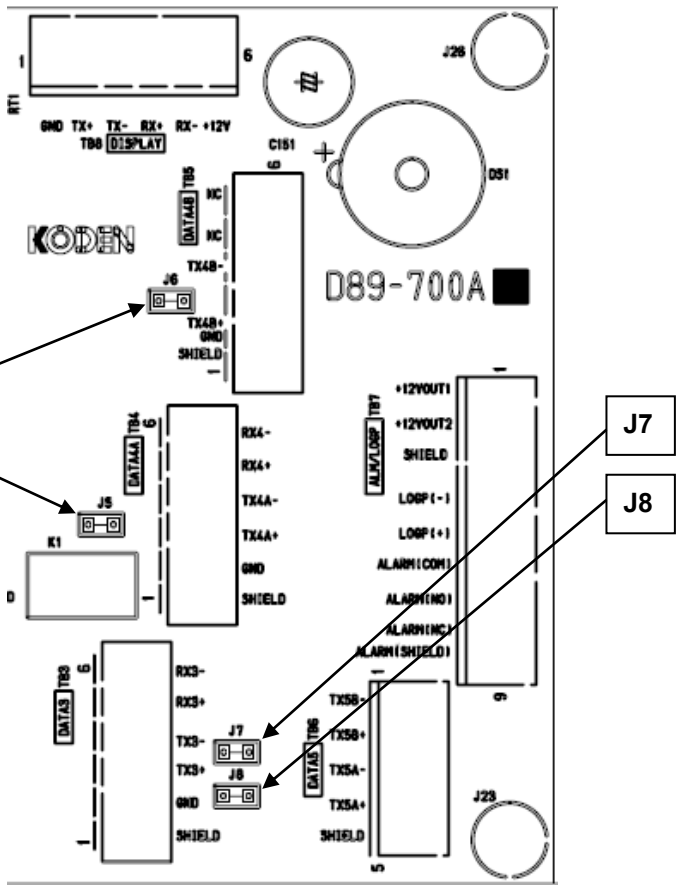
Baud rate	Output level	Output current	Sentence	Update rate
4800, 9600, 19200, 38400	RS422	20mA max	ATT, HDM, HDT, HVE, ROT, PKODG,21	Any of 20msec to 1sec or OFF
			AAM, APB*, BOD, BWC, DTM, GGA, GLL, GSA, GSV, MSS, RMB, RMC, RTE, THS, VTG, WPL, XTE, ZDA PKODA, PKODG,1 *(Do not use APB on SOLAS ships)	Any of 1sec or OFF
			ALC, ALF, HBT (DATA1 only)	Per Event

10.4 Furuno AD-10 Output

You can use two Furuno AD-10 outputs. In that case, it is necessary to cut pattern J5 to J8 on the PCB depending on the port to be used. The comparison between the port to be used and pattern to cut is as follows.

AD-10-1: DATA4A/4B [TB4 and TB5] :J5 and J6
AD-10-2: DATA5 [TB6] : J7 and J8

Cut



AD-10-1-

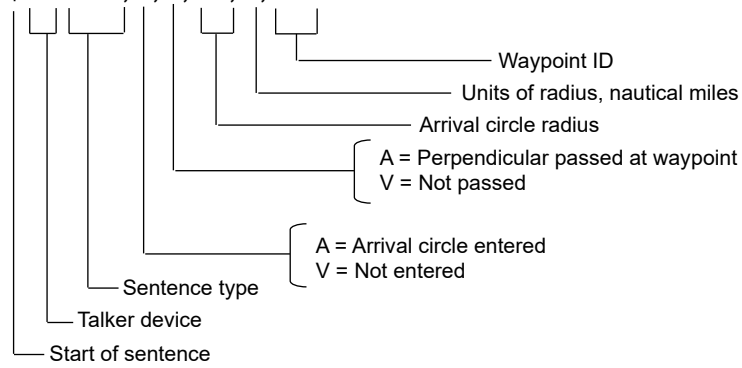
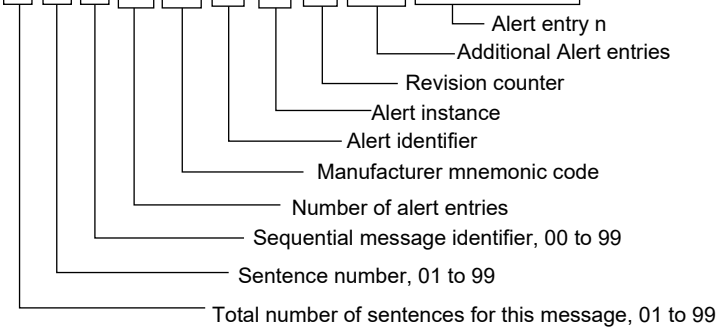
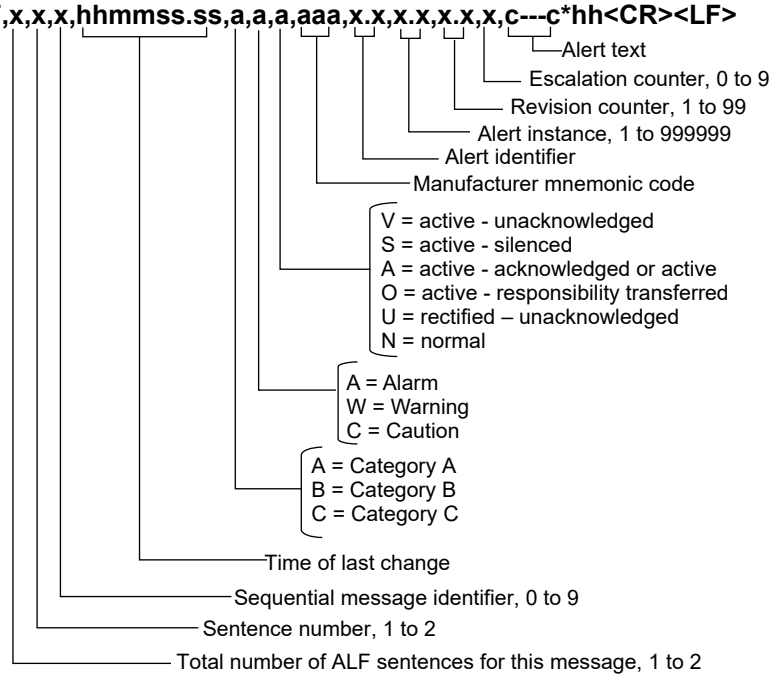
DATA4A
6: RX4-
5: RX4+
4: TX4A- AD-10 CLOCK-H
3: TX4A+ AD-10 CLOCK-C
2: GND
1: SHIELD

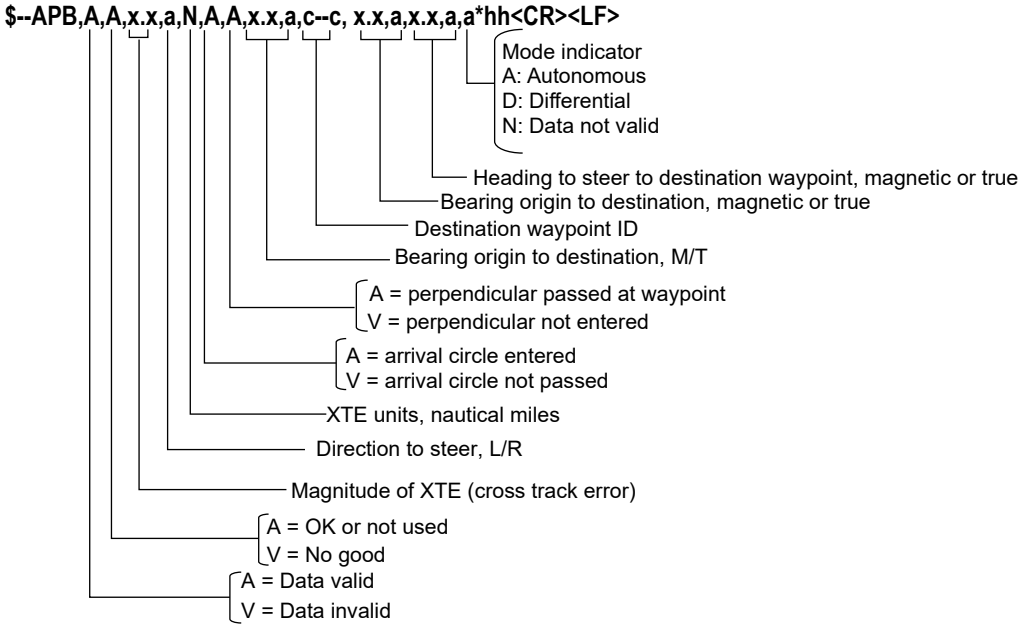
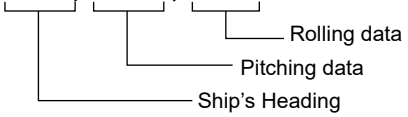
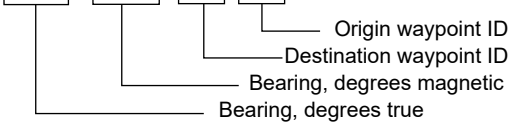
DATA4B
6: RX4-
5: RX4+
4: TX4B- AD-10 DATA-H
3: TX4B+ AD-10 DATA-C
2: GND
1: SHIELD

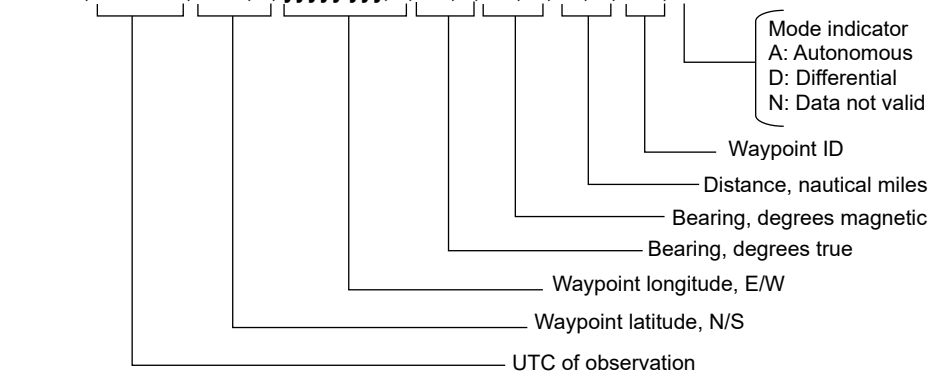
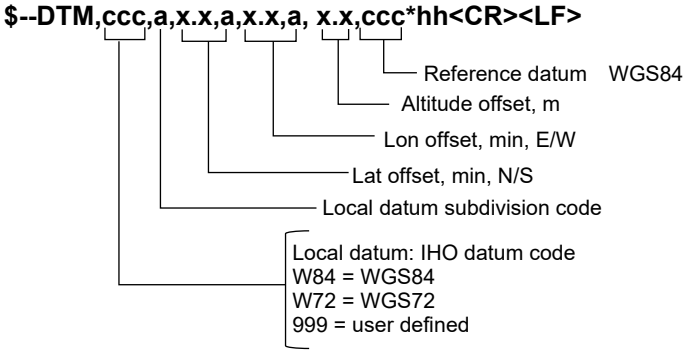
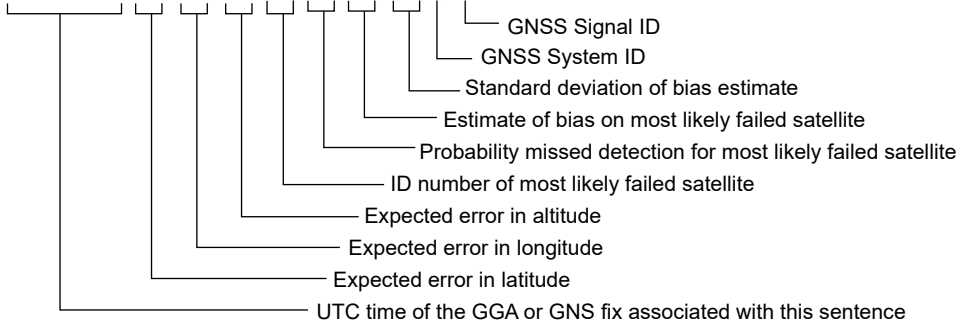
AD-10-2-

DATA5
1: TX5B- AD-10 DATA-H
2: TX5B+ AD-10 DATA-C
3: TX5A- AD-10 CLOCK-H
4: TX5A+ AD-10 CLOCK-C
5: SHILD

10.5 Output sentence

Description	Contents of data field
AAM	Waypoint arrival alarm **$ GP AAM, A, A, x.x, N, c--c*hh <CR><LF>** 
ALC *DATA1 only	Cyclic alert list **$--ALC,xx,xx,xx,x.x,aaa,x.x,x.x,x.x,.....,aaa,x.x,x.x,x.x*hh<CR><LF>** 
ALF *DATA1 only	Alert sentence **$--ALF,x,x,x,hhmmss.ss,a,a,a,aaa,x.x,x.x,x.x,x,c---c*hh<CR><LF>** 

Description	Contents of data field
APB *Do not use on SOLAS ships	Heading / track contoroller (autopoilot) sentence B **$--APB,A,A,x.x,a,N,A,A,x.x,a,c--c, x.x,a,x.x,a,a*hh<CR><LF>** 
ATT	Ship's heading, Pitch and Roll information (FURUNO proprietary sentence) **$ PFEC,GPatt, xxx.x, +/-00.0, +/-00.0 *hh <CR><LF>** 
BOD	Bearing origin to destination **$--BOD, x.x, T, x.x, M, c--c, c--c*hh<CR><LF>** 

Description	Contents of data field
BWC	Bearing and distance to waypoint **$--BWC, hhmmss, llll.lll, a, yyyyy.yyy, a, x.x, T, x.x, M, xx, N, c--c, a*hh<CR><LF>** 
DTM	Datum reference **$--DTM,ccc,a,x.x,a,x.x,a, x.x,ccc*hh<CR><LF>** 
GBS	GPS satellite fault detection **$--GBS, hhmmss.ss, x.x, x.x, x.x, x.x, x.x, x.x, x.x, x.x, h, h*hh<CR><LF>** 
Description	Contents of data field

GGA

GPS fix data

$--GGA, hhmmss.ss, xxxx.xxx, N/S, xxxxx.xxx, E/W, x, xx

- hhmmss.ss: UTC of position fix (Hour, Min, Sec)
- xxxx.xxx: Latitud
- N/S: N：North latitude, S：South latitude
- xxxxx.xxx: Longitude
- E/W: E: East longitude, W: West longitude
- x: Status of GPS fix mode — 0: Fix unable, 1: GPS fix, 2: DGPS fix
- xx: Number of satellite in use

xxx, 0/-xxxx, M, 0/-xxx, M, xxx, xxxx *hh <CR><LF>

- xxx: HDOP value
- 0/-xxxx: Antenna height, -: Negative
- M: Meter
- 0/-xxx: Gioid height, -: Negative
- M: Meter
- xxx: DGPS data correction time elapsed
- xxxx: DGPS reference station ID

GLL

Geographic position – Latitude/longitude

$--GLL, xxxx.xxx, N/S, xxxxx.xxx, E/W,hhmmss , a *hh <CR><LF>

- xxxx.xxx: Latitude
- N/S: N: North latitude, S: South latitude
- xxxxx.xxx: Longitude
- E/W: E: East longitude, W: West longitude
- hhmmss: Fix measurement time elapsed (Hour, Min, Sec)
- a: Status — A: Valid, V: Void

GSA

GNSS DOP and active Satellite

$--GSA,a,x,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,x.x,x.x,x.x,h*hh<CR><LF>

- a: M = Manual, A = Auto
- x: 1 = fix not available, 2 = 2D, 3 = 3D
- xx...xx: Satellite number in use
- x.x: PDOP
- x.x: HDOP
- x.x: VDOP
- h: GNSS System ID

GSV

GNSS satellites in view

$--GSV,x,x,xx,xx,xx,xxx,xx.....,xx,xx,xxx,xx,h*hh<CR><LF>

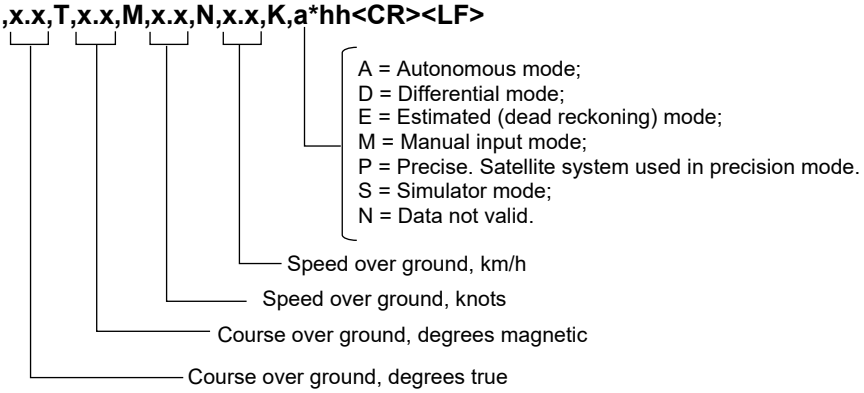
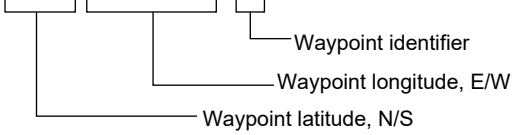
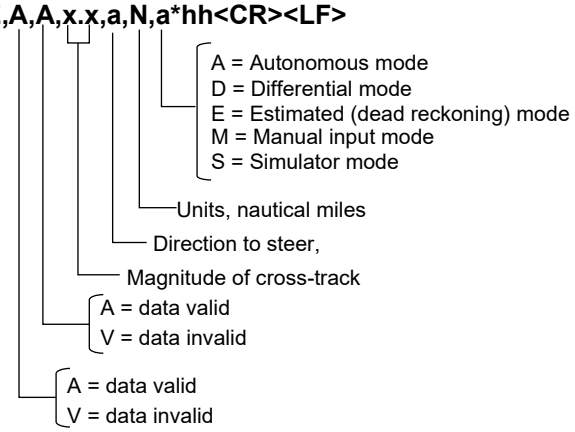
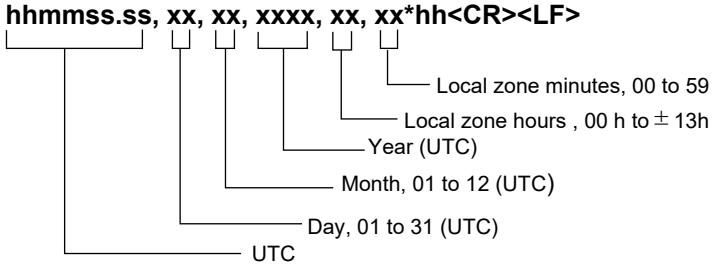
- x: Total message number, 1 ~ 3
- x: Message number
- xx: Available number of satellites
- xx: Satellite No.
- xx: Elevation
- xxx: Azimuth angle
- xx: S/N (Signal to Noise ratio)

First satellite

- xx,xx: Second and third SVs
- xx: Fourth SV
- h: Signal ID

Description	Contents of data field
HBT *DATA1 only	Heartbeat supervision sentence **$--HBT,x.x,A,x*hh<CR><LF>** Sequential sentence identifier Equipment status Configured repeat interval
HDM	Heading magnetic **$--HDM,xxx.x,M*hh<CR><LF>** Heading, degrees magnetic
HDT	Heading true **$--HDT,xxx.x,T*hh<CR><LF>** Heading, degrees true
HVE	Heaving information (FURUNO proprietary sentence) **$PFEC,GPhve,+/- xx.xxx,A*hh<CR><LF>** A = Valid V = Void Heaving data
MSS	MSK receiver signal status **$--MSS,,x.x,x.x,x.x,x*hh<CR><LF>** Channel number Beacon bit rate (25, 50, 100, 200) bit/s Beacon frequency, 283,5 kHz to 325,0 Signal to noise ratio (S/N), dB This field is not use
RMB	Recommended minimum navigation information **$--RMB, A, x.x, a, c--c, c--c, llll.lll, a, yyyyy.yyy, a, x.x, x.x, x.x, A, a*hh<CR><LF>** Mode indicator A: Autonomous D: Differential N: Data not valid A=arrival circle, entered or perpendicular passed V = not entered or passed Destination closing velocity, knots Bearing to destination, degrees true Range to destination, nautical miles Destination waypoint longitude, E/W Destination waypoint latitude, N/S Destination waypoint ID Origin waypoint ID Direction to steer L/R Cross track error, nautical miles A = data valid V = navigation receiver warning

Description	Contents of data field
RMC	Recommended minimum specific GPS data **$--RMC, hhmmss.ss, A, llll.lll, a, yyyyy.yyy, a, x.x, x.x, xxxxxx, x.x, a, a*hh <CR><LF>** UTC of position fix (hour/min/sec) Latitude, N/S Longitude, E/W Navigational status Mode indicator A: Autonomous D: Differential N: Data not valid Magnetic variation Degrees, E/W Date: dd/mm/yy Course over ground, degree true Speed over ground, knots A: Data valid V: Navigation receiver warning
ROT	Rate of turn **$--ROT, x.x, A*hh<CR><LF>** A = data valid V = data invalid Rate of turn, °/min, "-" = bow turns to port
RTE	Routes *Maximum of four Waypoints are outputted **$--RTE, x.x, x.x, a, c--c, c--c, ….. c--c*hh <CR><LF>** Waypoint "n" identifier Additional waypoint identifiers Waypoint identifier Route identifier C = complete route, all waypoints W = working route, first listed waypoint is "FROM", second is "TO" and remaining are rest of true Message number Total number of messages being transmitted
THS	True heading and status **$--THS,x.x,a*hh<CR><LF>** A = Autonomous E = Estimated (dead reckoning) M = Manual input S = Simulator mode V = Data not valid (including standby) Heading, degrees
Description	Contents of data field

VTG	Course over ground and ground speed **$--VTG,x.x,T,x.x,M,x.x,N,x.x,K,a*hh<CR><LF>** 
WPL	Waypoint location **$--WPL,llll.ll,a,yyyyy.yy,a,c--c*hh<CR><LF>** 
XTE	Cross-track error, measured **$--XTE,A,A,x.x,a,N,a*hh<CR><LF>** 
ZDA	Time and date **$--ZDA, hhmmss.ss, xx, xx, xxxx, xx, xx*hh<CR><LF>** 
Description	Contents of data field

PKODA

Satellite information (KODEN proprietary sentence)

$ PKODA, P/H, xxx.x, xx, xx, xx, xx, xx, xx, xx, xx, xxx, M, xxx.x, N, xxx.x,

- P/H: P: PDOP, H: HDOP
- xxx.x: PDOP value
- xx, xx, xx, xx: Satellite No. in use (1 to 4 channel)
- xx, xx, xx, xx: S/N ratio of the satellite in use (1 to 4 channel)
- xxx: Antenna height
- M: Meter
- xxx.x: Ground speed
- N: Knot
- xxx.x: True bearing

0/-xx.x, x, x <CR><LF>

- 0/-: X'tal deviation (0: Positive, -: Negative)
- xx.x: Latitude (1/1000 min)
- x: Longitude (1/1000 min)

PKODG,1

Satellite information (KODEN proprietary sentence)

$ PKODG, 1, x, xx, +/-xx, xxx, xx, xx, xx, xx, xx, xx, xx, xx, xx, <CR><LF>

- 1: Reception quality (1: GPS fix available, 0: Fix unable)
- xx: Satellite No.
- +/-xx: Satellite elevation
- xxx: Satellite azimuth angle
- xx: Elevation angle limit
- xx: S/N limit value
- xx: HDOP limit value
- xx: PDOP limit value
- xx: Averaging constant
- xx: Geodetic system
- xx: Day
- xx: Month
- xx: Year

PKODG,7

DGPS information (KODEN proprietary sentence)

$ PKODG, 7, x, x, xxx <CR><LF>

- x: DGPS (0: OFF, 1: RTCM ON, 2: SBAS ON)
- x: DGPS status (1: DGPS ON, 0: DGPS OFF)
- xxx: Time out value (010 ~ 180 sec)

PKODG,21

Ship's heading, Pitch/Roll and Heaving information (KODEN proprietary sentence)

$PKODG, 21 ,xxx.x, +/-xx.x, +/-xx.x, +/-xx.xxx, a *hh <CR><LF>

- xxx.x: Ship's Heading
- +/-xx.x: Pitching data
- +/-xx.x: Rolling data
- +/-xx.xxx: Heaving data
- a: Status (A: Valid, V: Void)

10.6 Input / Output circuit

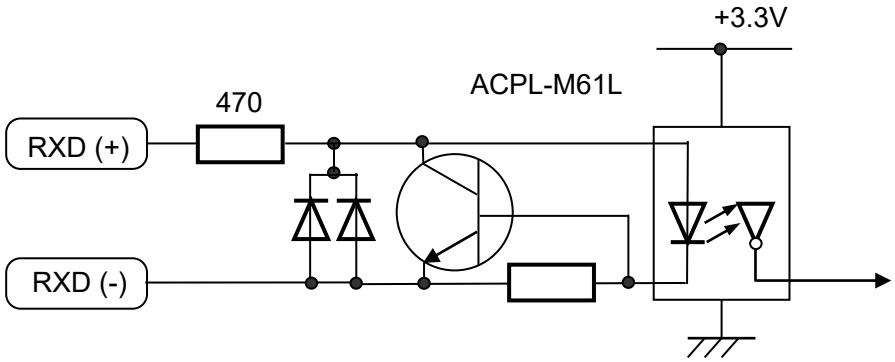
Port (connector) name: DATA1～5, LOGP, ALARM

The connector used: MCV1.5/6-G-3.81 (DATA1 4), MKDS1/5-3.81 (DATA5),
MKDS1/9-3.81 (ALARM, LOGP)

(DATA port Input circuit)

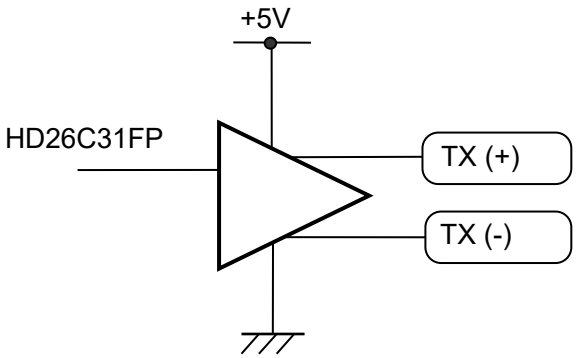
Input load: 470 ohm

Device: Photo-coupler ACPL-M61L (Avago)



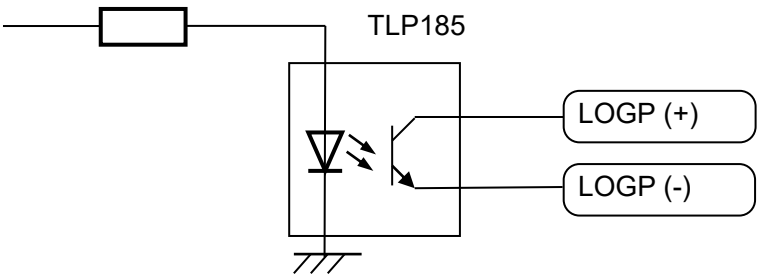
(DATA port output circuit)

Device: Driver IC HD26C31FP (Renesas)



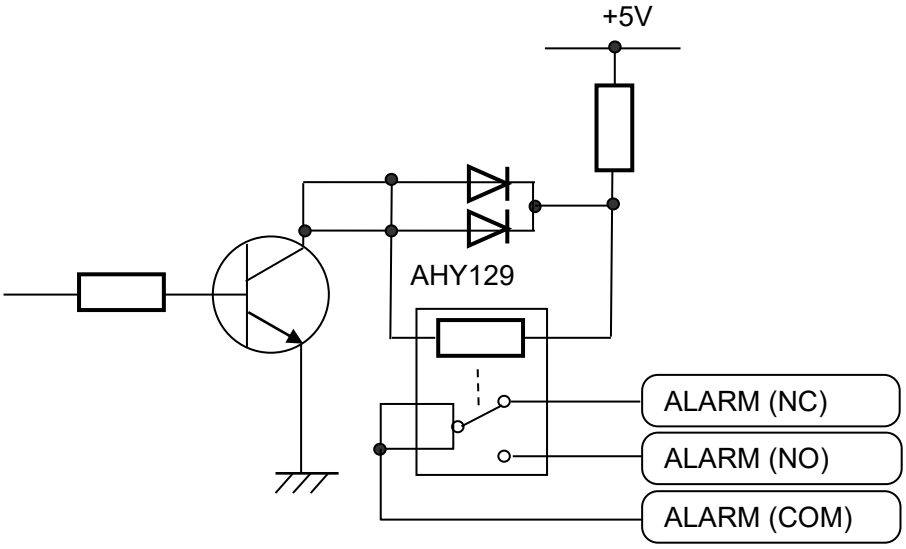
(LOGP circuit)

Device: Photo-coupler TLP185 (Toshiba)



(Alarm circuit)

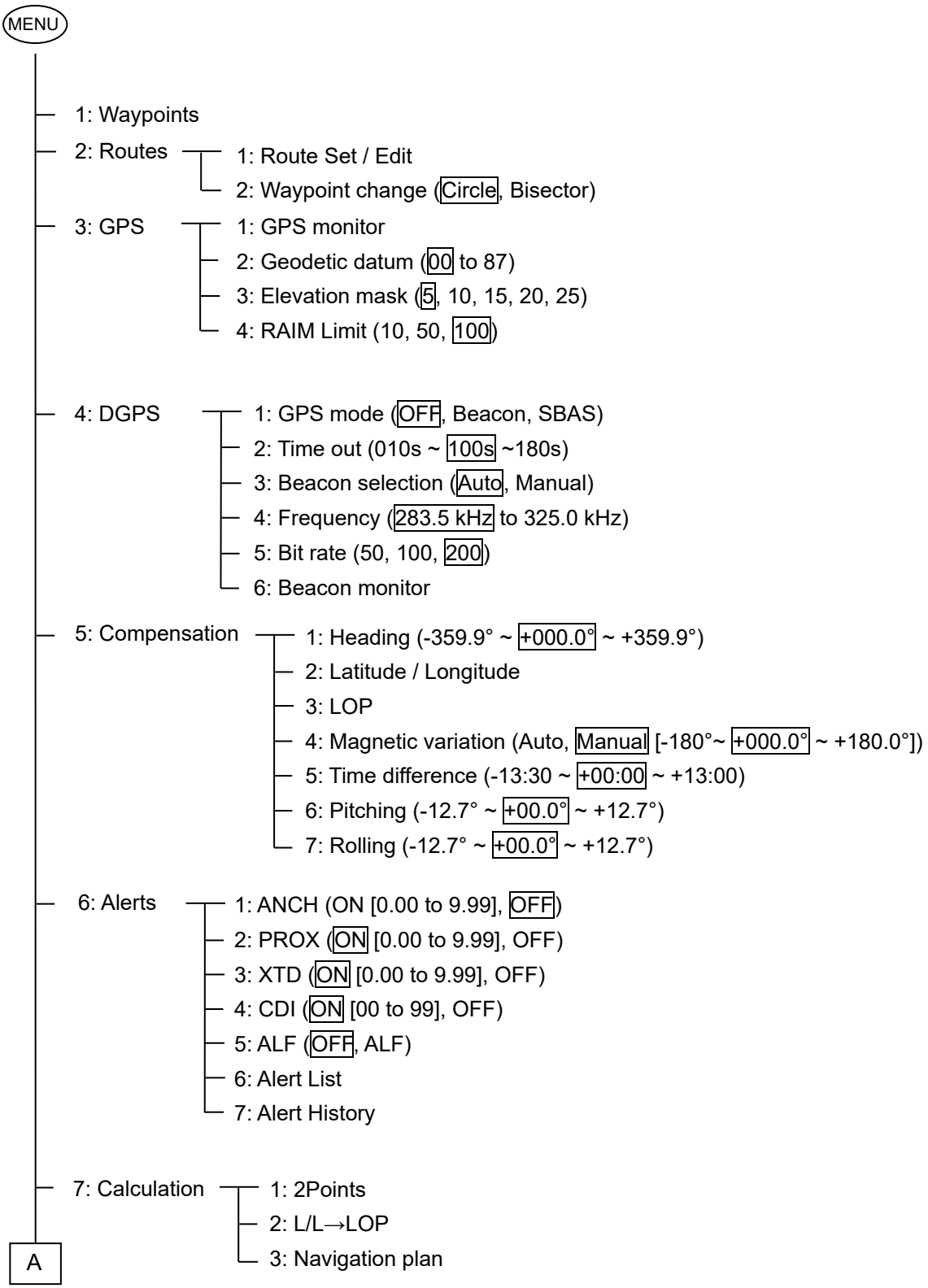
Device: Relay AHY129

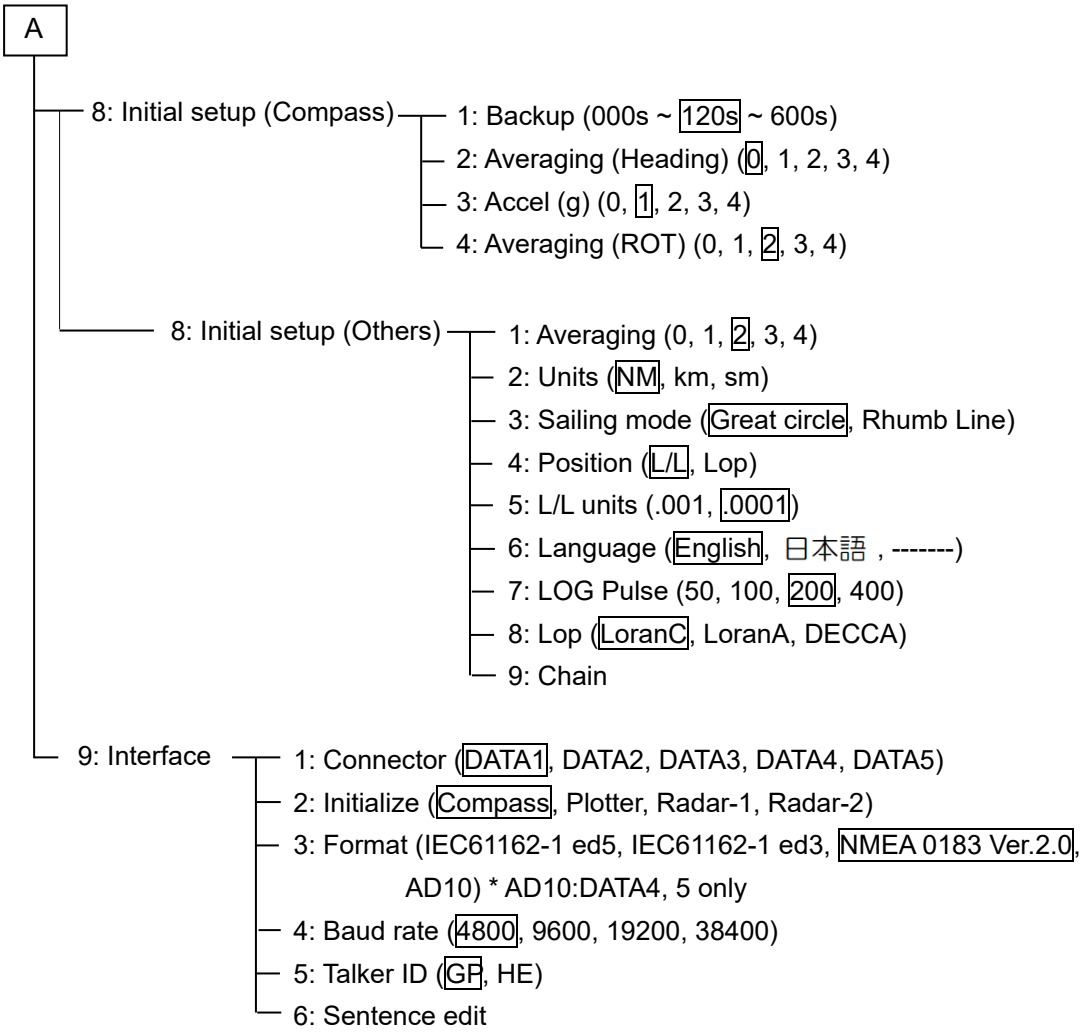


Chapter 11 Annex

11.1 Menu configuration

The factory set value is shown by the surrounding boxes.





AAM=OFF	APB=OFF	ATT=OFF	BOD=OFF
BWC=OFF	DTM=1s	HDM=OFF	HDT=100ms
HVE =OFF	GBS=OFF	GGA=1s	GLL =OFF
GNS=OFF	GSA=OFF	GSV=OFF	MSS=OFF
RMB=OFF	RMC=OFF	ROT=OFF	RTE=OFF
THS=OFF	VTG =1s	WPL=OFF	XTE=OFF
ZDA =1s	PKODG1=OFF	PKODG21=OFF	
PKODG7=OFF	PKODA =OFF		

11.2 Local Geodetic Systems

The number assigned to each place name is the set values used in the “Selecting a geodetic datum” (Page 4-4)

Name	No.	Name	No.	Name	No.
ALASKA / CANADA	04	FLORIDA	41	PHOENIX	40
ARC 50	29	GREENLAND	09	PITCAIRN	69
ARC 60	30	GUADALCANAL	50	PORTO SANTO	77
ARGENTINA	39	GUAM 63	49	PUERTO RICO	71
ASCENSION	31	HAWAII	21	QATAR	72
AUSTRALIAN 84	06	HONG KONG 63	51	ROME 40	15
BAHRAIN	27	ICELAND 55	11	SALVAGE	59
BERMUDA	37	INDIAN / NEPAL	18	SANTA MARIA	75
BRAZIL	45	IRELAND 65	12	SANTO	74
CANARY	68	IWO JIMA	32	SAUDIARABIA	17
CAYMAN BRAC	56	JAPAN	24	SOMALIA	26
CHATHAM	43	JOHNSTON	53	SOUTH AFRICA	16
COCOS	28	KERGUELEN	55	SOUTH AMERICA	08
COLOMBIA	38	LIBERIA 64	57	SOUTH ASIA	07
CORVO/FLORES	65	MAHA 71	58	SOUTH CHILE	70
DIEGO GARCIA	52	MALAYSIA	23	SRILANKA	54
DJAKARTE	22	MALDIVE	48	ST.HELENA	34
EAST FALKLAND	76	MARCUS	35	SURINAM	83
EAST MALAYSIA	79	MARSHALL	82	SWEDEN	85
EASTER	47	MASCARENE	73	TERN	33
EFATE	36	MIDWAY 61	62	TOKYO	02
EGYPT	66	MOROCCO	61	TRINIDAD	64
ENGLAND	20	NAD-27	03	TRISTAN	80
ERITREA	60	NAD-83	10	TUNISIA	42
ETHIOPIA	25	NEW GEORGIA	46	WGS-72	01
EUROPEAN 50	05	NEW ZELAND	13	WGS-84	00
EUROPEAN 79	14	NIGERIA	63	TAIWAN	86
FAIAL	78	OMAN	67	RUSSIA	87
FIJI	81	PARAGUAY	44		
FINLAND	84	PHILLIPPINES	19		

11.3 Used abbreviations / icons and symbols

Abbreviation	Meaning	Abbreviation	Meaning
MODE	Switch to another display	PORT	Port Side
MENU	Change the display to the Menu	STBD	Starboard Side
MOB	Man Overboard – set a position	SBAS	Satellite Based Augmentation System
EVENT	Event – set a position	ANCH	Anchor watch navigation alarm
EVT (Key)	Event – set a position	PRX	Proximity navigation alarm
AL	Short cut to the Alert List	XTD	Cross track distance
ACK	Acknowledge an alert	CDI	Course deviation navigation alarm
CLR	Clear an input / menu	Wxxxx	Waypoint with number
BRILL	Set the LCD/Key brightness	L/L	Latitude/Longitude
N	North latitude	LOP	Line of Position
S	South latitude		
E	East longitude	**Icon/Symbol**	**Meaning**
W	West longitude		Power on/off
WPT OFF	No waypoint navigation		Active -unacknowledged Warning
U	UTC time		Active -silenced Warning
L	Local time		Active -acknowledged Warning
Px.x	Dilution of Precision (DOP) value		Active -responsibility transferred Warning
D	DGPS (SBAS)		Rectified -unacknowledged Warning
GPS	Position is in GPS accuracy		Caution
DGPS	Position is in DGPS accuracy		
W84	Geodetic datum WGS84 (refer to 11.2)	**Unit**	**Meaning**
HDG	Heading	NM	Nautical Mile
RNG	Range to the next waypoint	s	Seconds
BRG	Bearing to the next waypoint	ms	Milliseconds
T.RNG	Total range of a route	°	Degree(s)
Rxxx	Route navigation with number	m	Metre
COG	Course Over Ground	kHz	Kilohertz
SOG	Speed Over Ground	bps	Bits per second
PIT	Pitch angle	km	Kilometre
ROL	Rolling angle	sm	Statute mile

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