



KODEN

OPERATION MANUAL

GPS COMPASS

KGC-300

This product is specifically designed to be installed on boats and other means of maritime transport. If your country forms part to the EU, please contact your dealer for advice before attempting to install elsewhere.

KGC-300 Operation Manual
Doc No: 0093130002

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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 | <p>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.</p> |
|--|--|

Precautions on handling

| | |
|--|---|
|  Warning | <p>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.</p> |
|  Warning | <p>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.</p> |
|  | <p>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.</p> |
|  Caution | <p>The information displayed on this equipment is not intended to use for your navigation. For your navigation, be sure to see the specified materials.</p> |

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Introduction

KGC-300 is a GPS compass and navigation GPS receiver

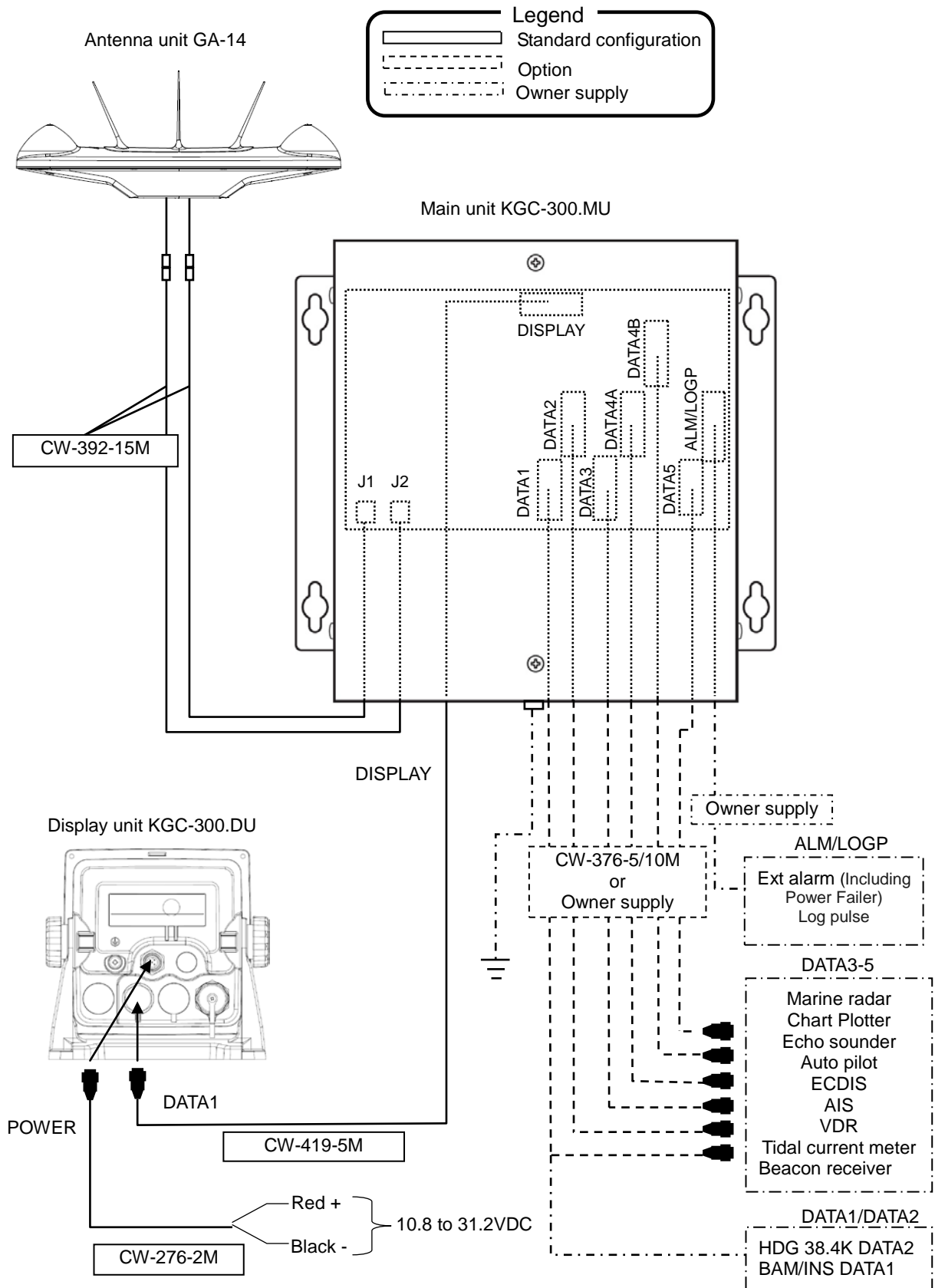
Through the use of GPS satellites, it outputs the heading of vessel with a high degree of accuracy by calibrating the phase difference of two GPS antennas.

The main features of this unit are as follows:

- KGC-300 consists of three components, Main 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 | 0.74 kg | 1 |
| 02 | Main 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 T.5X20MMX10M 10M[gray] B8X25U | Truss tapping screw (4) Self-bonding tape (1) PVC tape(1) Hexagon bolt for antenna installation (4) | | 1 set |
| 09 | Operation manual | KGC-300.OM.E | English | | 1 |

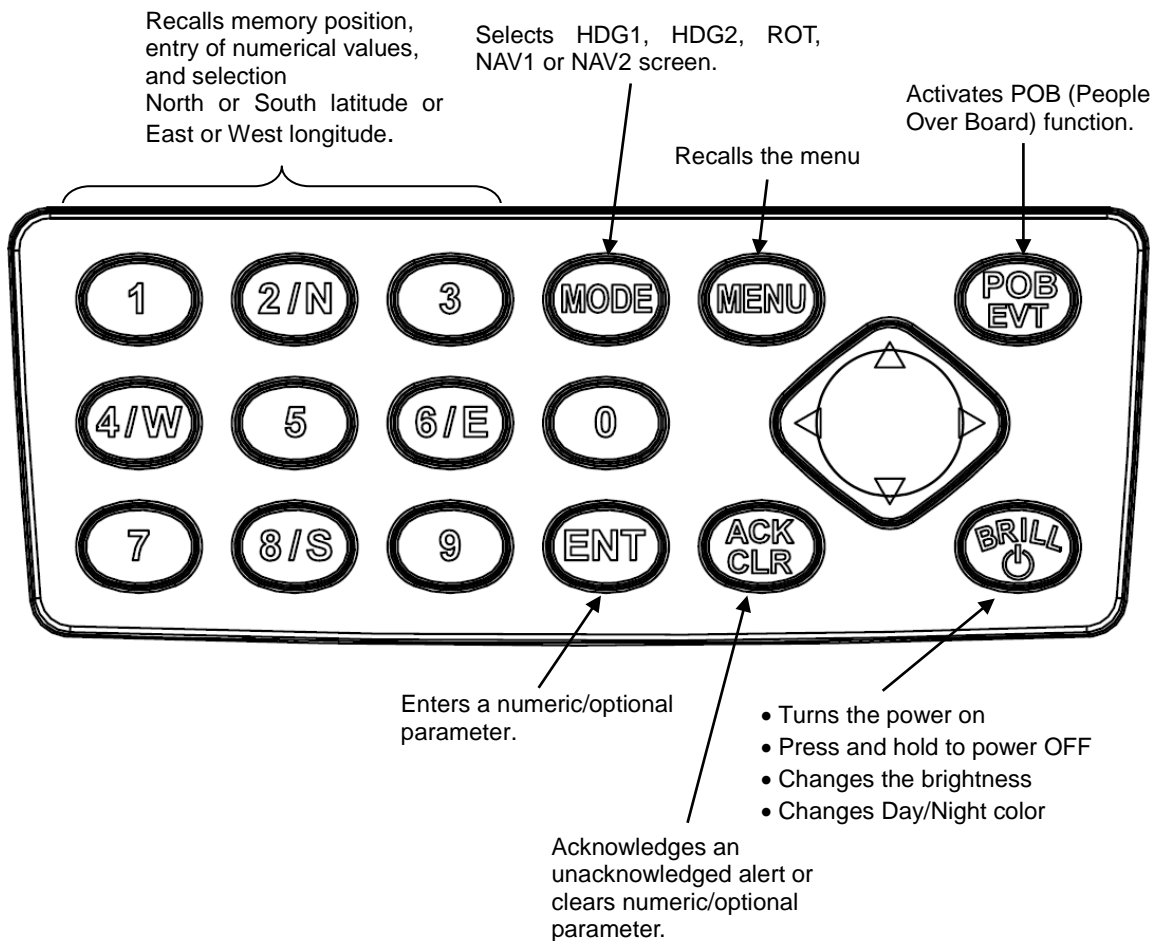
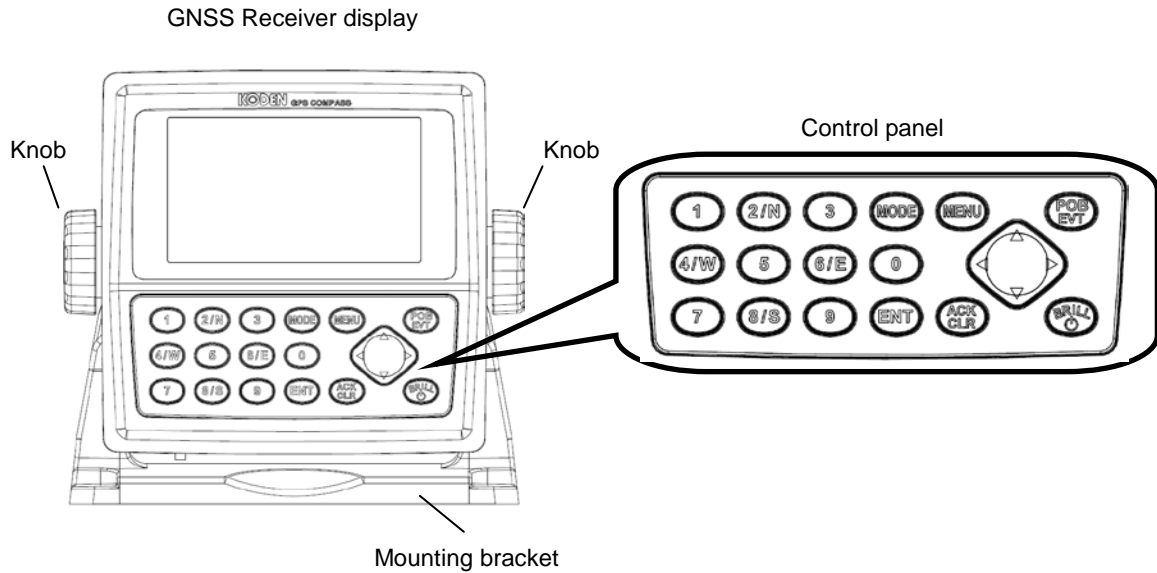
Option List

| 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-839-30M | 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 | Operation manual | KGC-300.OM.E | English | |
| 07 | Service manual | KGC-300.SM.E | English | |

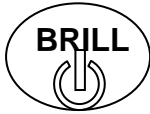
*05. N-BNC connector in the kit will not be used.

Chapter 1 Basic Operation

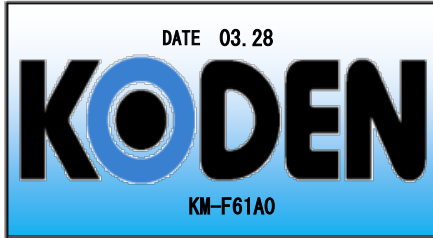
1.1 The name and function of each part



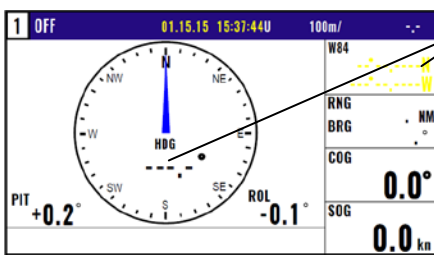
1.2 Power On/Off



Press to power on.

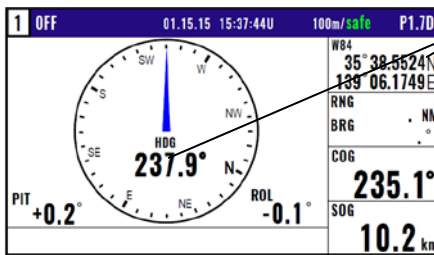


Initial message appears during power-on. The receiver is performing the self-check.



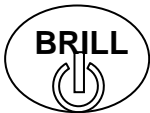
Blank

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

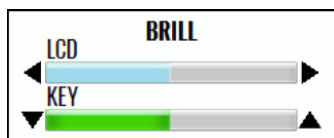
Be sure to turn off the power in the above procedure.

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.

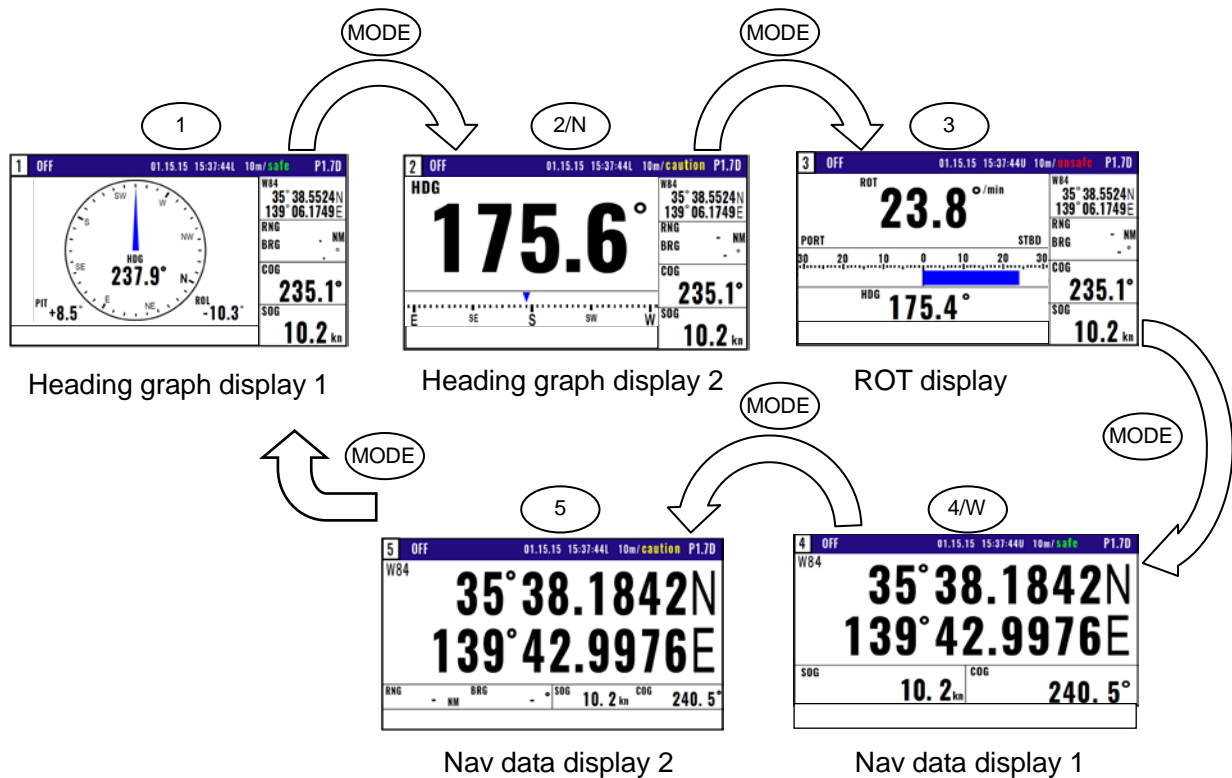
NOTE: This setup is memorized and turns into the same setup next time at the time of a power supply ON.

1.4 Selecting the screen

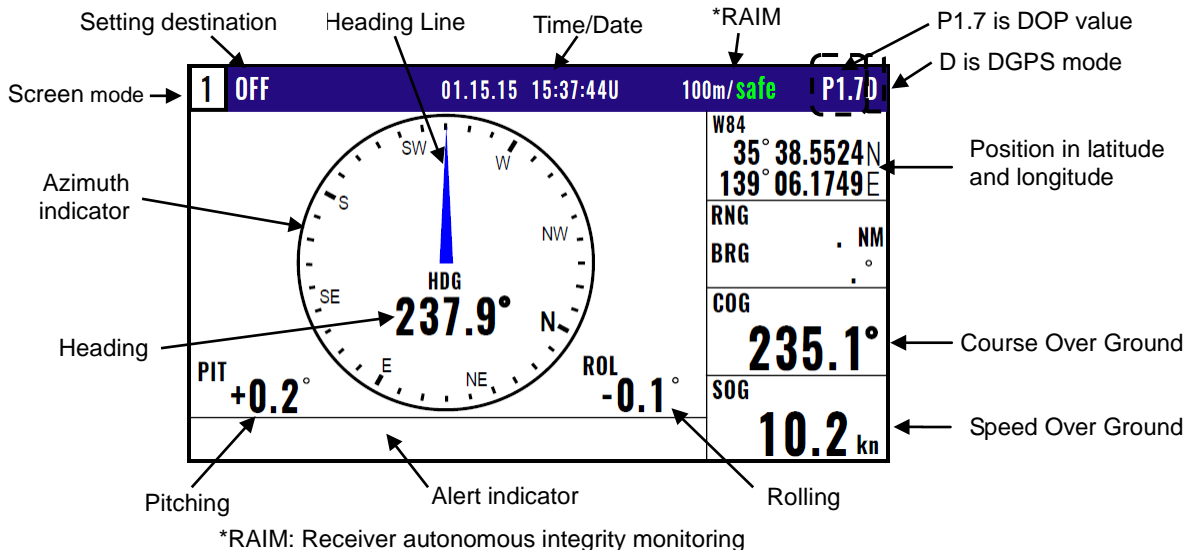
1.4.1 Display Modes

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.

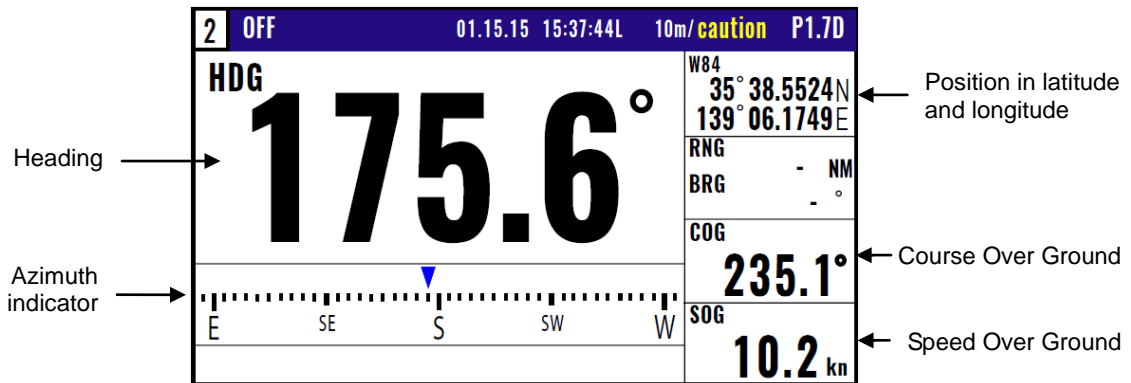
1. Press numeric key on the upper-left corner of the screen.
2. Press **(MODE)** key to select the display mode.



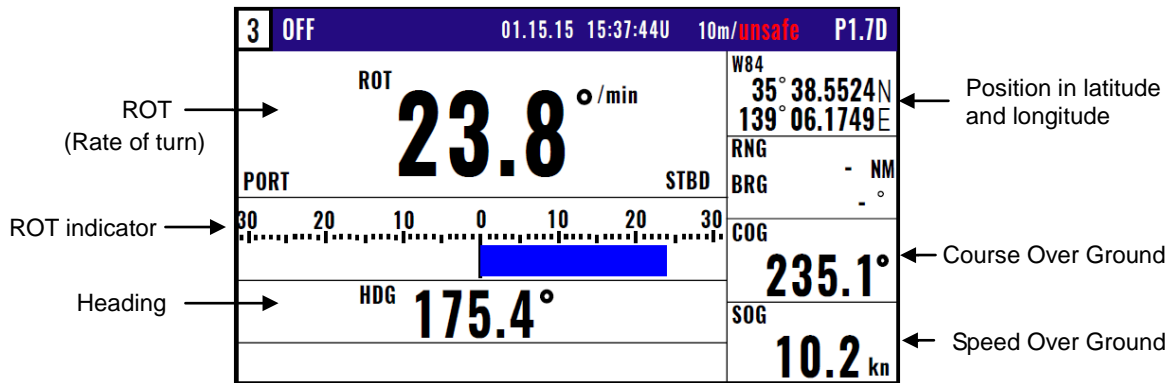
1.4.2 Screen 1: Heading graph display 1 (HDG1)



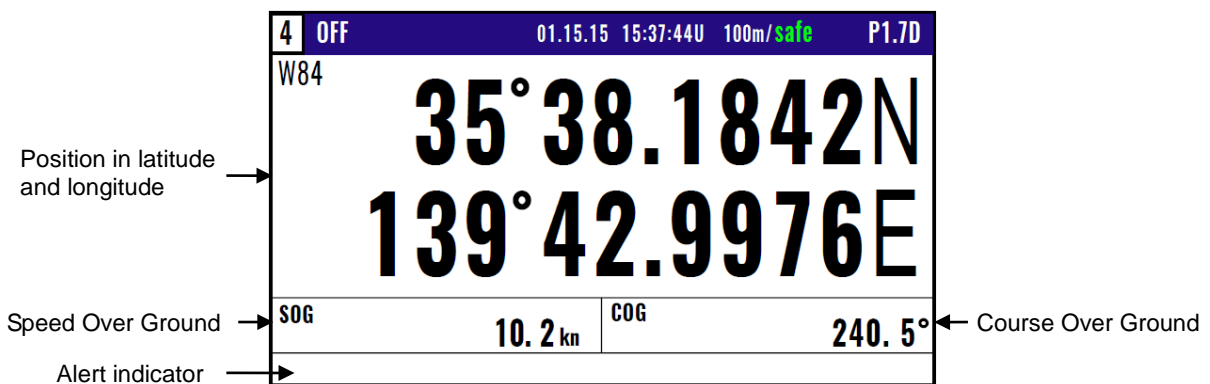
1.4.3 Screen 2: Heading graph display 2 (HDG2)



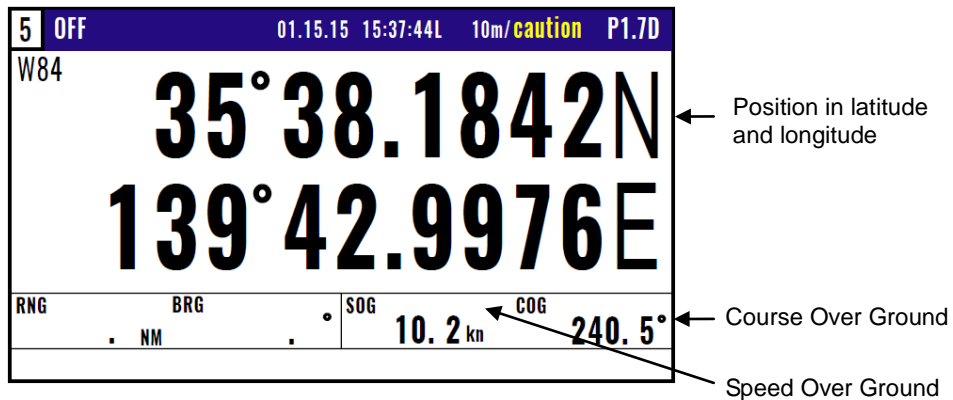
1.4.4 Screen3: Rate of turn display (ROT)



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



- (1) Press  key to appear the pop-up.
- (2) Press  key to store your present position.
- (3) You can store up to 999 present positions by pressing this key.
They have storage numbers 0001 to 0999.

| | |
|------------|--------|
| Goto POB | :[POB] |
| Goto Event | :[ENT] |
| Cancel | :[CLR] |

EVT=W0001 — Increment Waypoint

15 15:37 — Storage date (Day, Hour, Minute)




35°38.184N — Storage position (Lat, Long)

139°42.997E

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

1.5.2 MANUAL



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

Blinks for 10 seconds

EVT=W0001->0000 — The latest event number

+ 15 04 : 59 — Storage date (Day, Hour, Minute)

35°38 . 180N — Storage position (Lat, Long)

139°42 . 990E

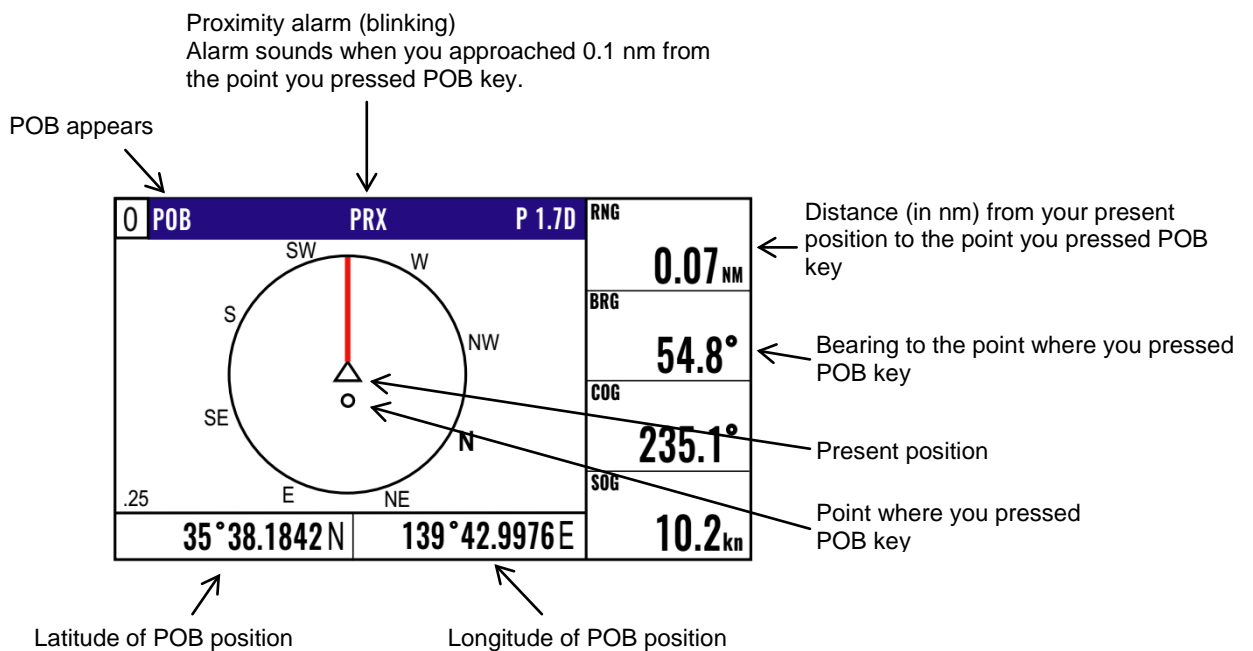
NOTE: *Auto or Manual selection is made at the “6.2.5 Changing a storing method for present position (Event)”*

1.6 Using POB (People over-board)

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

CAUTION
 *POB key does not function when the position is invalid*

- POB** (1) Press **POB** key to appear the pop-up.
EVT (2) Press **POB** key to store POB position.
- | | |
|------------|--------|
| Goto POB | :[POB] |
| Goto Event | :[ENT] |
| Cancel | :[CLR] |



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

1.7 Recalling Event and POB position

- Press **MENU** key until menu options 1 to 9 appears.
- Press **1** key to select "1:WAYPOINT".
- Enter a storage number P0000 and W0001 to W0999 is POB and Event position data.

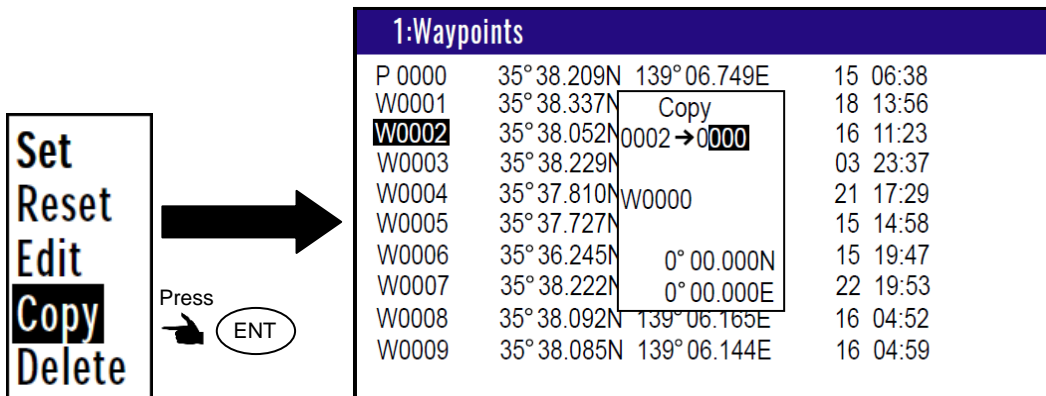
NOTE: 0000: Position data where you pressed POB key
 0001 to 0999: Position data that contains events

| 1:Waypoints | | | | P0000 is POB position data |
|-------------|------------|-------------|----------|----------------------------|
| P0000 | 35°38.209N | 139°06.749E | 03 06:38 | |
| W1001 | 35°38.337N | 139°06.035E | | |
| W1002 | 35°38.052N | 139°06.977E | | |
| W1003 | 35°38.229N | 139°06.428E | | |
| W1004 | 35°37.810N | 139°06.385E | | |
| W1005 | 35°37.727N | 139°06.549E | | |
| W1006 | 35°36.245N | 139°05.448E | | |
| W1007 | 35°38.222N | 139°06.339E | | |
| W1008 | 35°38.092N | 139°06.165E | | |
| W1009 | 35°38.706N | 139°06.015E | | |

W0001~W0999 is Event position data

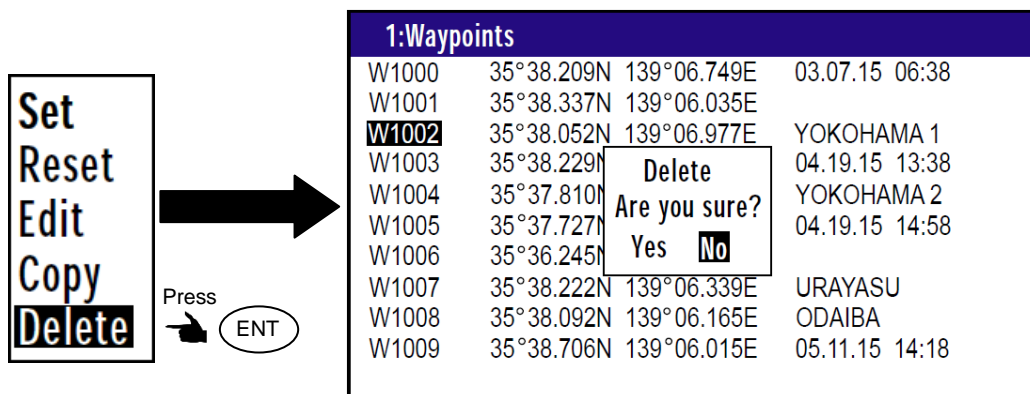
1.8 Copying Event and POB position

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




1.9 Erasing Event and POB 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.



Chapter 2 Various Navigation

2.1 Storing waypoints (LAT/LONG) data

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

 **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 0000 and 0999) are reserved for POB and event registration, you can use 1000 to 9999 (total of 9000 points) to store waypoints.

LAT/LONG mode (Example)

MENU

1: **Waypoints**

2: Routes

3: GPS

4: DGPS


5: Compensation

6: Alerts

7: Calculation

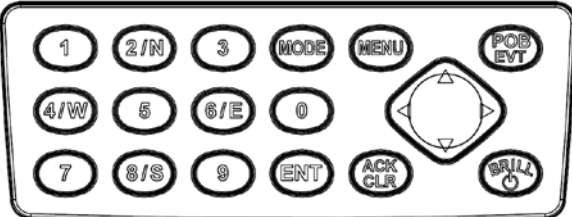
8: Initial Setup




9: Interface

Press  key

➔

| Number | Latitude | Longitude | Comment |
|--------------------|------------|-------------|----------------|
| 1:Waypoints | | | |
| W1000 | 35°38.209N | 139°06.749E | 03.07.15 06:38 |
| W1001 | 35°38.337N | 139°06.035E | |
| W1002 | 35°38.052N | 139°06.977E | YOKOHAMA 1 |
| W1003 | 35°38.229N | 139°06.428E | 04.19.15 13:38 |
| W1004 | 35°37.810N | 139°06.385E | YOKOHAMA 2 |
| W1005 | 35°37.727N | 139°06.549E | 04.19.15 14:58 |
| W1006 | 35°36.245N | 139°05.448E | |
| W1007 | 35°38.222N | 139°06.339E | URAYASU |
| W1008 | 35°38.092N | 139°06.165E | ODAIBA |
| W1009 | 35°38.706N | 139°06.015E | 05.11.15 14:18 |



- (1) Press  key until Menu options 1 to 9 appears.
- (2) Press  key to select "1: Waypoints".
- (3) Enter storage number (1000 to 9999) by numeric keys and press  key.

1:Waypoints

W1000 35°38.209N 139°06.749E

W1001 35°38.337N 139°06.035E

W1002 35°38.052N 139°06.977E

W1003 35°38.229N 139°06.428E





W1004 35°37.810N 139°06.385E

W1005 35°37.727N 139°06.549E

W1006 35°36.245N 139°05.448E

Press

➔ ➔ ➔

➔

1:Waypoints

W3622 35°38.052N 139°06.977E

W3623 35°38.229N 139°06.428E



W3624 35°37.810N 139°06.385E

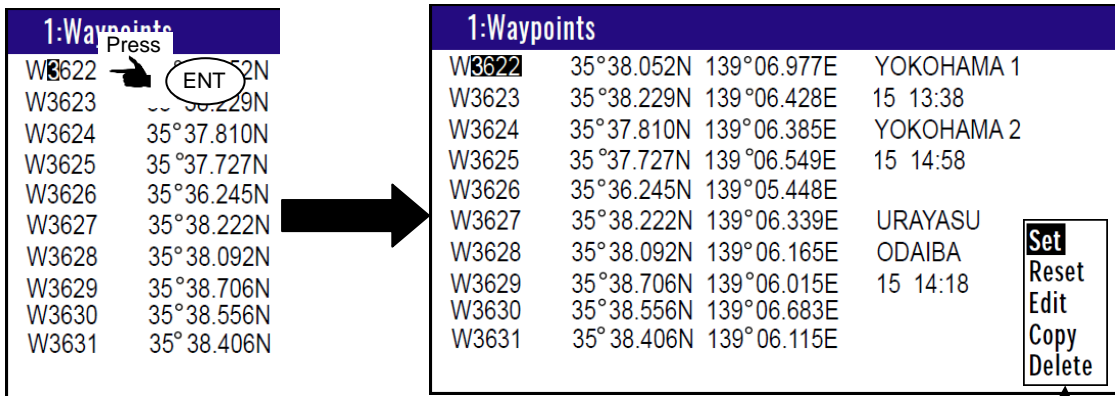
W3625 35°37.727N 139°06.549E

W3626 35°36.245N 139°05.448E

W3627 35°38.222N 139°06.339E

W3628 35°38.092N 139°06.165E

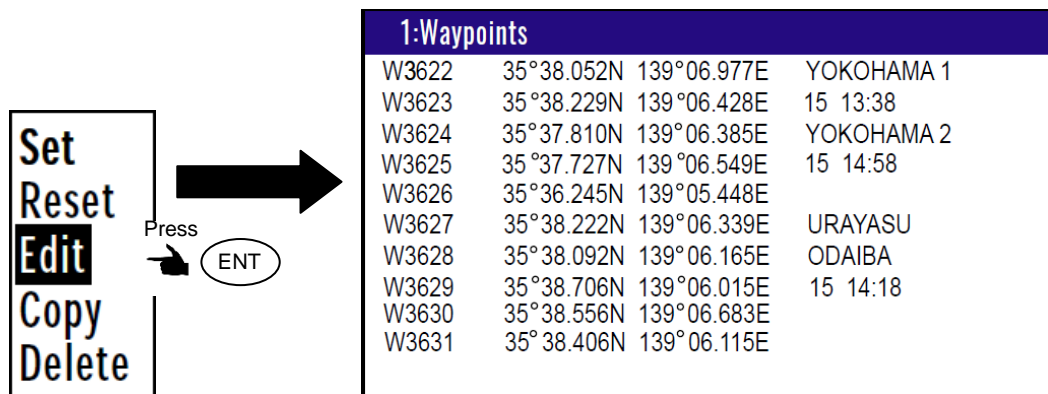
- (4) Press  key to display the pop-up.
- (5) Select [Edit] in the pop-up and press  key.



Pop-up appear

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

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



(7) If you want to change the [Mark].

- 1) Press **ENT** key to select of the [Mark].
- 2) Press [] key to select the shape of the mark.
- 3) Press **ENT** key.

(8) 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].

(9) 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.

(10) 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.

Original number Enter the number of the copy destination

| 1:Waypoints | | | | |
|--------------|------------|-------------|------------|-------|
| W1000 | 35°38.209N | 139°06.749E | 03.07.15 | 06:38 |
| W1001 | 35°38.337N | 139°06.035E | | |
| W1002 | 35°38.052N | 139°06.977E | YOKOHAMA 1 | |
| W1003 | 35°38.229N | 139°06.165E | 04.19.15 | 13:38 |
| W1004 | 35°37.810N | 139°06.015E | YOKOHAMA 2 | |
| W1005 | 35°37.727N | 0° 00.000N | 04.19.15 | 14:58 |
| W1006 | 35°36.245N | 0° 00.000E | URAYASU | |
| W1007 | 35°38.222N | 139°06.339E | ODAIBA | |
| W1008 | 35°38.092N | 139°06.165E | ODAIBA | |
| W1009 | 35°38.706N | 139°06.015E | 05.11.15 | 14:18 |

Information of the copy destination


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.

| 1:Waypoints | | | | |
|--------------|------------|-------------|------------|-------|
| W1000 | 35°38.209N | 139°06.749E | 03.07.15 | 06:38 |
| W1001 | 35°38.337N | 139°06.035E | | |
| W1002 | 35°38.052N | 139°06.977E | YOKOHAMA 1 | |
| W1003 | 35°38.229N | 139°06.165E | 04.19.15 | 13:38 |
| W1004 | 35°37.810N | 139°06.015E | YOKOHAMA 2 | |
| W1005 | 35°37.727N | 0° 00.000N | 04.19.15 | 14:58 |
| W1006 | 35°36.245N | 0° 00.000E | URAYASU | |
| W1007 | 35°38.222N | 139°06.339E | ODAIBA | |
| W1008 | 35°38.092N | 139°06.165E | ODAIBA | |
| W1009 | 35°38.706N | 139°06.015E | 05.11.15 | 14:18 |

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






2.2 Setup of waypoint navigation

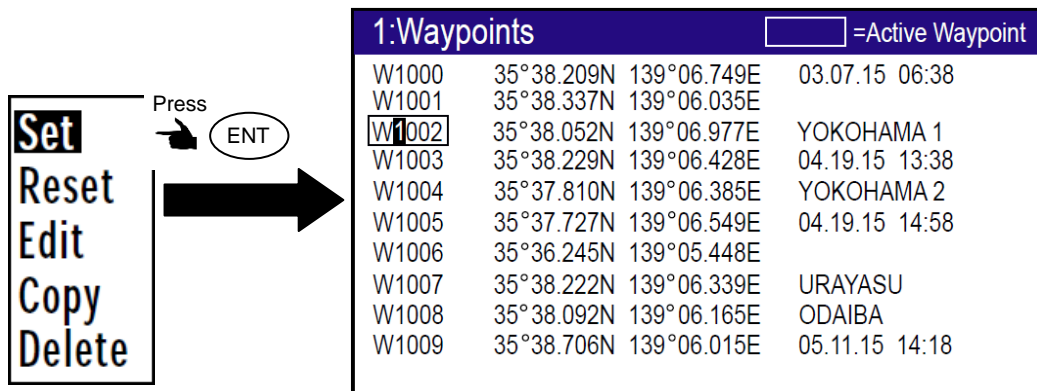
 **NOTE:** Press to backspace the cursor to correct an input error.


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



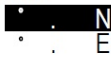
| 1:Waypoints | | | |  =Active Waypoint |
|--------------|------------|-------------|--|---|
| W1000 | 35°38.209N | 139°06.749E | | 03.07.15 06:38 |
| W1001 | 35°38.337N | 139°06.035E | | |
| W1002 | 35°38.052N | 139°06.977E | | YOKOHAMA 1 |
| W1003 | 35°38.229N | 139°06.428E | | 04.19.15 13:38 |
| W1004 | 35°37.810N | 139°06.385E | | YOKOHAMA 2 |
| W1005 | 35°37.727N | 139°06.549E | | 04.19.15 14:58 |
| W1006 | 35°36.245N | 139°05.448E | | |
| W1007 | 35°38.222N | 139°06.339E | | URAYASU |
| W1008 | 35°38.092N | 139°06.165E | | ODAIBA |
| W1009 | 35°38.706N | 139°06.015E | | 05.11.15 14:18 |

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  key to display “QUICK” pop-up menu.

Quick Waypoint
Q9998


(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.

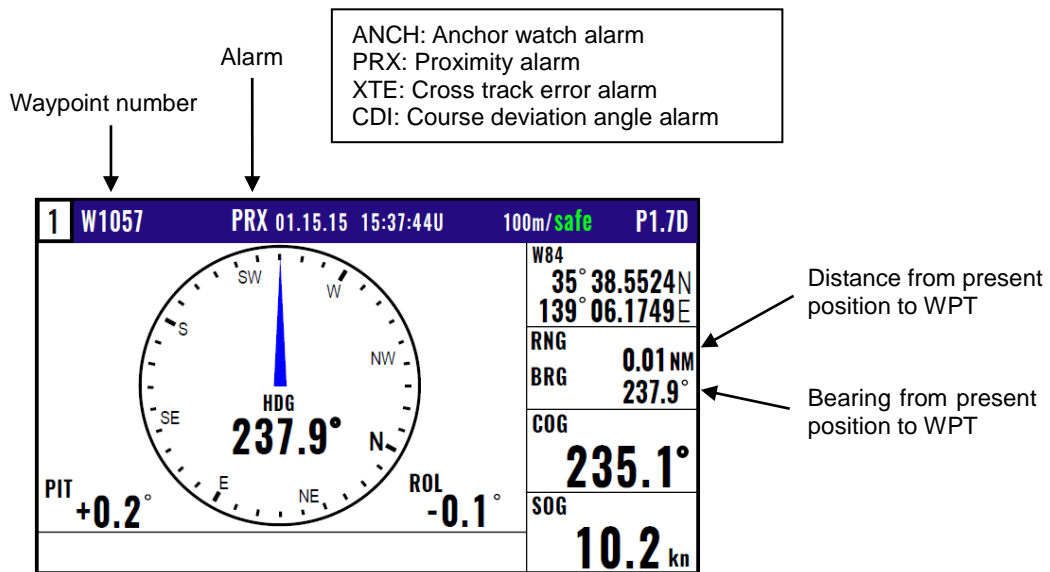
| 1:Waypoints | | | |
|-------------|------------|-------------|----------------|
| W1000 | 35°38.209N | 139°06.749E | 03.07.15 06:38 |
| W1001 | 35°38.337N | 139°06.035E | |
| W1002 | 35°38.052N | 139°06.977E | YOKOHAMA 1 |
| W1003 | 35°38.229N | 139°06.428E | 04.19.15 13:38 |
| W1004 | 35°37.810N | 139°06.385E | YOKOHAMA 2 |
| W1005 | 35°37.727N | 139°06.549E | 04.19.15 14:58 |
| W1006 | 35°36.245N | 139°05.448E | |
| W1007 | 35°38.222N | 139°06.339E | URAYASU |
| W1008 | 35°38.092N | 139°06.165E | ODAIBA |
| W1009 | 35°38.706N | 139°06.015E | 05.11.15 14:18 |

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

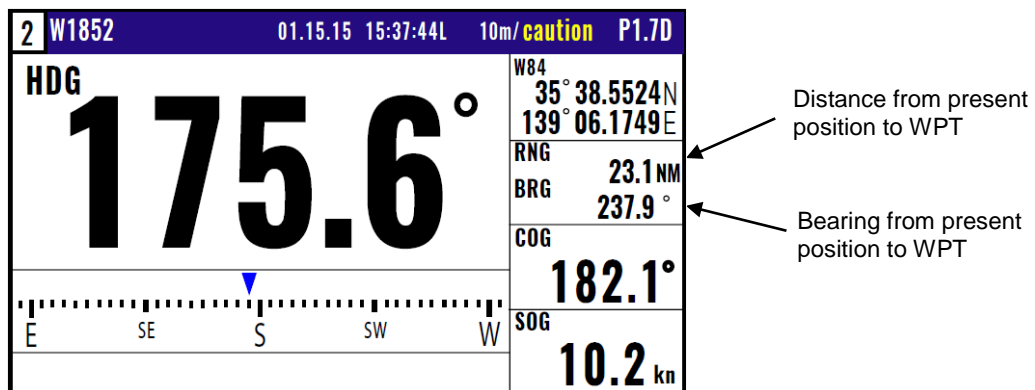
- (1) Press **CLR** key.
- (2) If OK, select **Yes** in the pop-up and press **ENT** key.
If cancel erasing, select **No** in the pop-up and press **ENT** key.

Waypoint reset
Are you sure?
Yes **No**

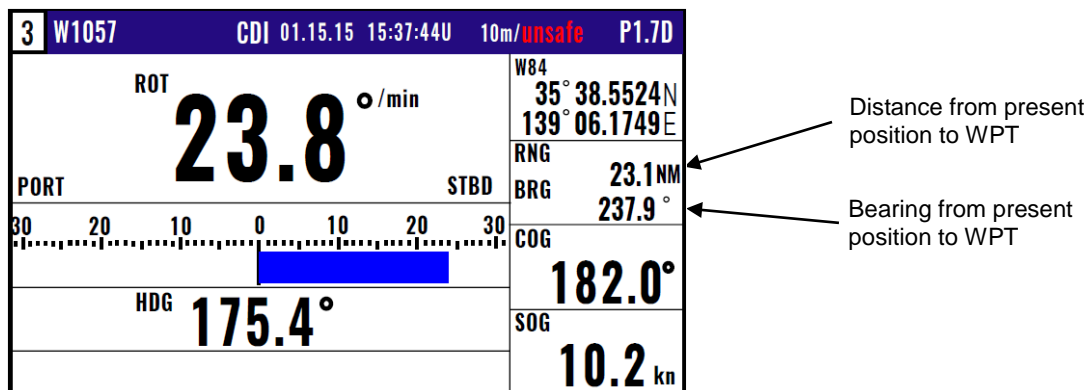
2.2.4 HDG1 screen during waypoint navigation



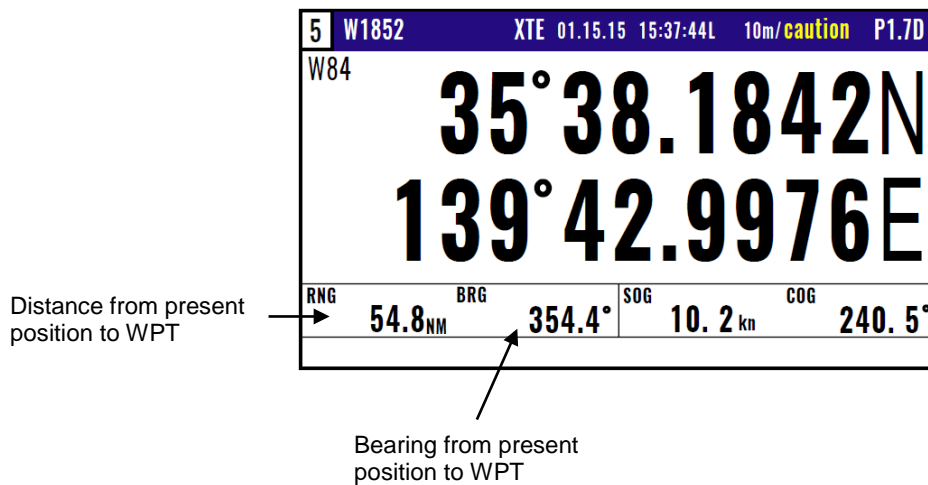
2.2.5 HDG2 screen during waypoint navigation




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.

 **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.

| 2-1:Route Set / Edit | | | 2-1:Route Set / Edit | | | | |
|----------------------|--|---------------|----------------------|------------|---------------|--------|---|
| | 1st WP | last WP | | 1st WP | last WP | T.RNG | NM |
| R001: | SURUGAWAN | W1000 - W1010 | R001: | SURUGAWAN | W1000 - W1010 | 256.80 | |
| R002: | YOKOHAMA3 | W0020 - W0025 | R002: | YOKOHAMA3 | W0020 - W0025 | 21.74 | |
| R003: | SURUGAWAN2 | W1011 - W1054 | R003: | SURUGAWAN2 | W1011 - W1054 | 9.98 | |
| R004: | Press | W2022 - W2075 | R004: | | W2022 - W2075 | 198.80 | |
| R005: |  ENT | W0003 - W0010 | R005: | ODAWARA2 | W0003 - W0010 | 224.50 | <div style="border: 1px solid black; padding: 2px;"> Set Reset Edit Copy Delete </div> |
| R006: | | W0004 - W0018 | R006: | ODAWARA3 | W0004 - W0018 | 48.29 | |
| R007: | ODAIBA | W3000 - W3040 | R007: | ODAIBA | W3000 - W3040 | 27.13 | |
| R008: | | W3041 - W3049 | R008: | | W3041 - W3049 | 6.74 | |
| R009: | | W3050 - W3065 | R009: | | W3050 - W3065 | 187.50 | |
| R010: | W | - W | R010: | W | - W | . | |

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

- Press **[▲]** **[▼]** key to move the cursor.

Input of Comment

Input location of Waypoint →

| 2-1:Route Set / Edit | |
|----------------------|-------------|
| R010: | Total:000 |
| 01: W | ° . N ° . E |
| 02: W | ° . N ° . E |
| 03: W | ° . N ° . E |
| 04: W | ° . N ° . E |
| 05: W | ° . N ° . E |
| 06: W | ° . N ° . E |
| 07: W | ° . N ° . E |
| 08: W | ° . N ° . E |
| 09: W | ° . N ° . E |
| 10: W | ° . N ° . E |

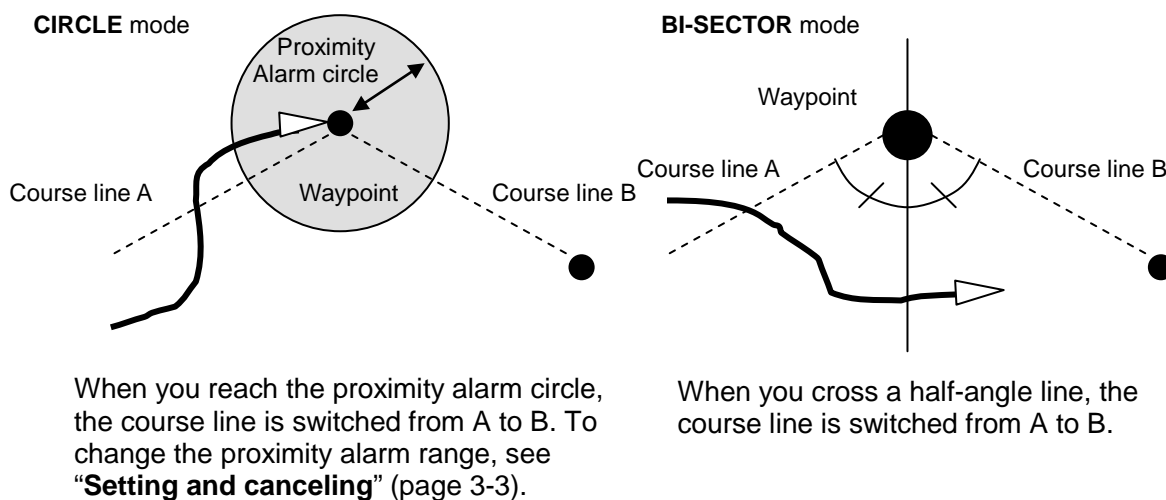
- (7) If you want to change the [Comment]

- 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.

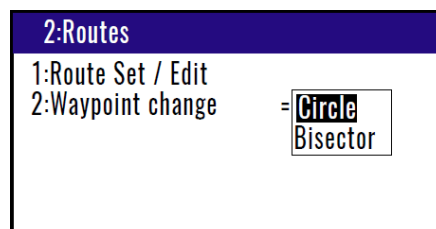
- (8) If you want to change the [Waypoint]
- 1) Press **ENT** key to select of the Input location of Waypoint.
 - 2) Enter a waypoint number (0000 to 9999) of the route by numeric keys. (You can check its memory data on the screen.)
 - 3) Press **ENT** key to store the waypoint number.
- (9) Repeat (8)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

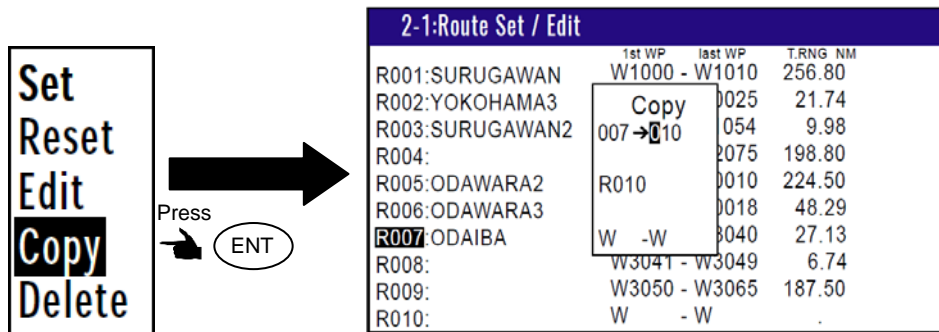


- (1) Press **MENU** key until Menu options 1 to 9 appears.
- (2) Press **2/N** key to select **“2: Route”**.
- (3) Press **2/N** key to select **“2: CHANGE”**.
- (4) Press **[▲]** or **[▼]** key to locate cursor to select a mode.
- (5) Press **ENT** key. The selected mode will be shown.



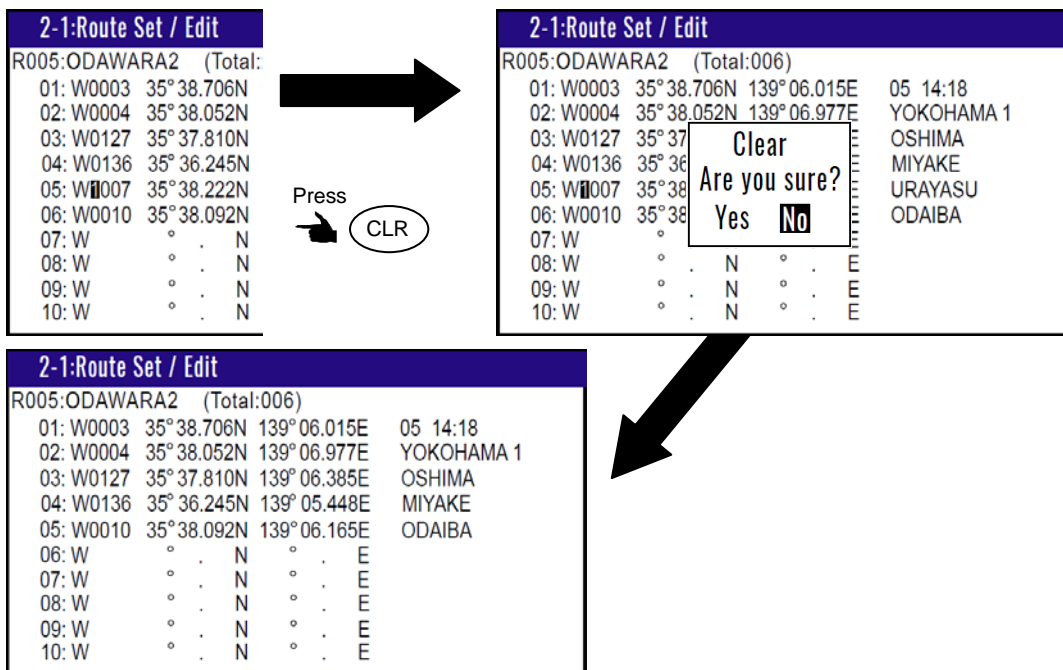
2.3.3 Copying a single route

- (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

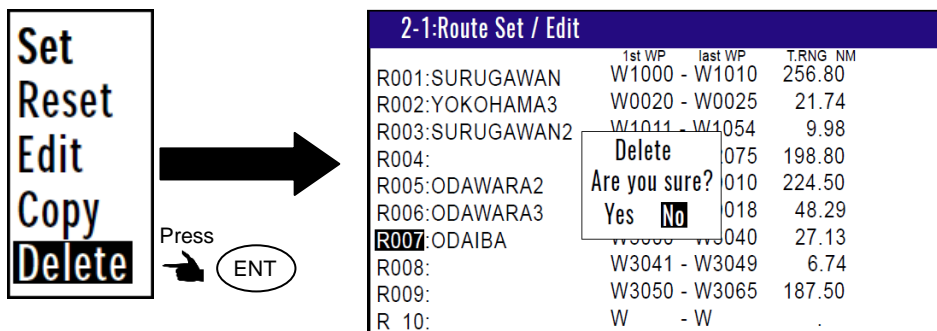
- Press **MENU** key until Menu options 1 to 9 appears.
- Press **2/N** key to select "2: Route".
- Press **1** key to select "1: Route Set / Edit". Route Input screen is displayed.
- Enter a route number (01 to 100) by numeric keys and press **ENT** key.
- Press **ENT** key to display the pop-up.
- Select **[Edit]** in the pop-up and press **ENT** key.
- If you want to delete any Waypoint, press **CLR** key in a place that is registered
- 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

- Press **MENU** key until Menu options 1 to 9 appears.
- Press **2/N** key to select "2: Route".
- 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).

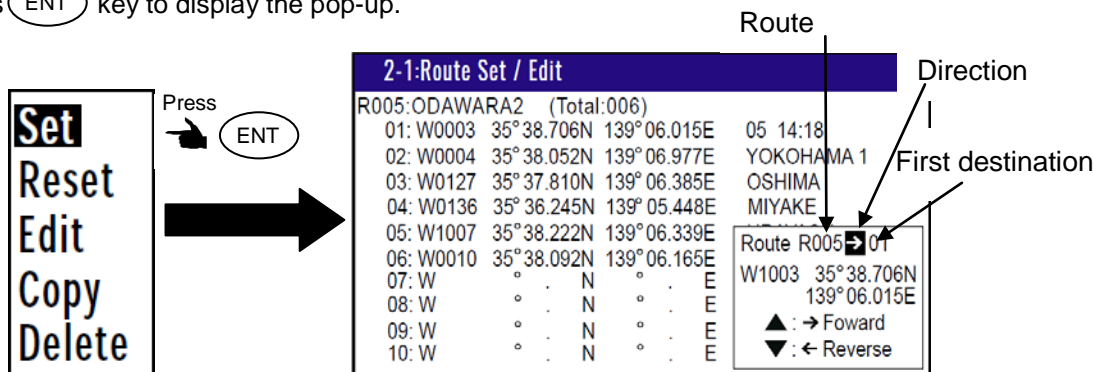
You can set the route by entering a route number, forward/backward navigation, and start waypoint number of the route.

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.

| 2-1:Route Set / Edit | | :Active Route | |
|----------------------|--------|---------------|----------|
| | 1st WP | last WP | T.RNG NM |
| R001: SURUGAWAN | W1000 | - W1010 | 256.80 |
| R002: YOKOHAMA3 | W0020 | - W0025 | 21.74 |
| R003: SURUGAWAN2 | W1011 | - W1054 | 9.98 |
| R004: | W2022 | - W2075 | 198.80 |
| R005: ODAWARA2 | W0003 | - W0010 | 224.50 |
| R006: ODAWARA3 | W0004 | - W0018 | 48.29 |
| R007: ODAIBA | W3000 | - W3040 | 27.13 |
| R008: | W3041 | - W3049 | 6.74 |
| R009: | W3050 | - W3065 | 187.50 |
| R010: | W | - W | . |

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.

| 2-1:Route Set / Edit | | | |
|----------------------|-------------|--------------|------------|
| R005: ODAWARA2 | (Total:006) | | |
| 01: W0003 | 35° 38.706N | 139° 06.015E | 05 14:18 |
| 02: W0004 | 35° 38.052N | 139° 06.977E | YOKOHAMA 1 |
| 03: W0127 | 35° 37.810N | 139° 06.385E | OSHIMA |
| 04: W0136 | 35° 36.245N | 139° 05.448E | MIYAKE |
| 05: W1007 | 35° 38.222N | 139° 06.339E | URAYASU |
| 06: W0010 | 35° 38.092N | 139° 06.165E | ODAIBA |
| 07: W | ° . N | ° . E | |
| 08: W | ° . N | ° . E | |
| 09: W | ° . N | ° . E | |
| 10: W | ° . N | ° . E | |

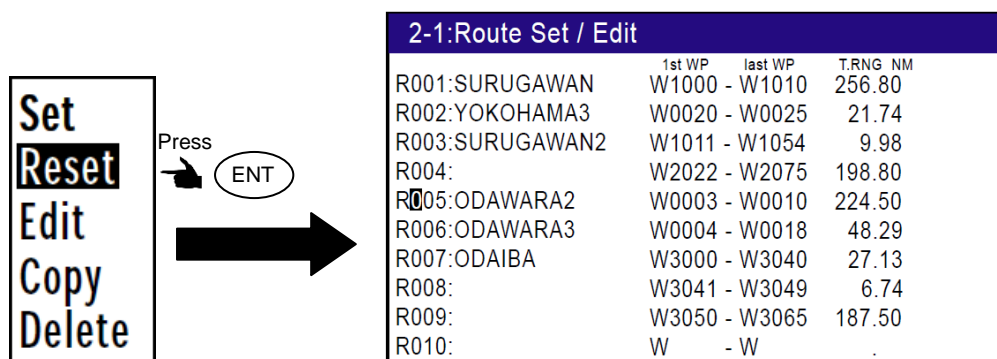
2.4.3 Canceling route navigation

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.

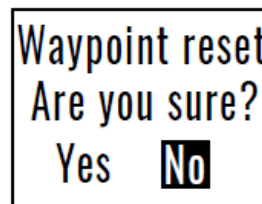
1) When Reset from [MENU]

- (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 [**Edit**] 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.

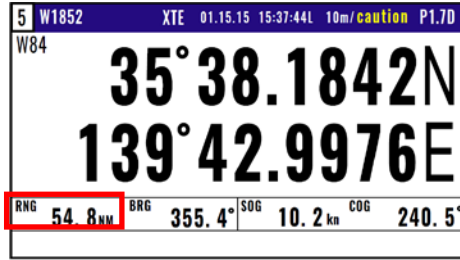
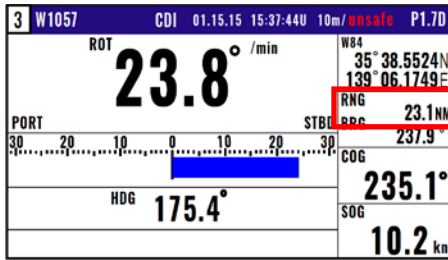
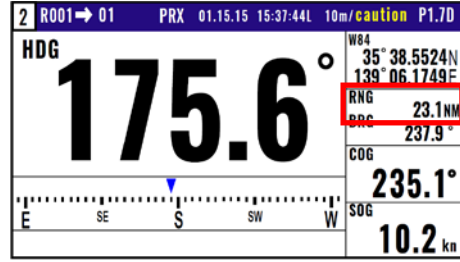
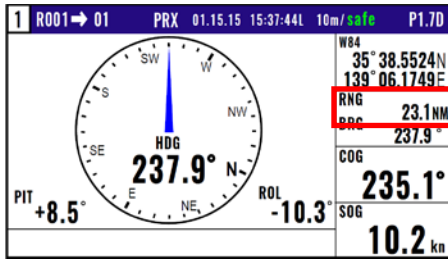


2.4.4 Switching between distance and time to go

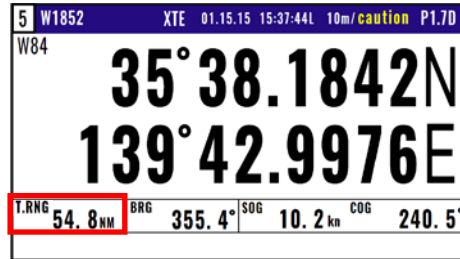
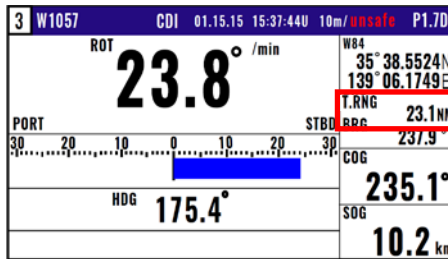
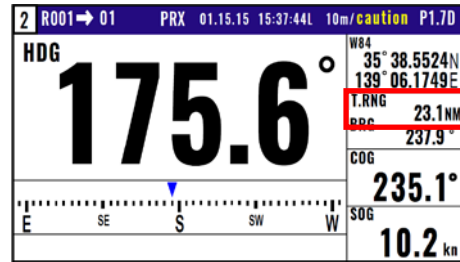
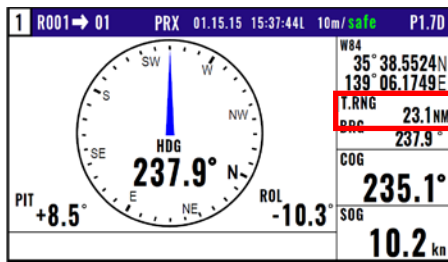
When you select the “**RNG**” (Distance to WPT) or “**TRNG**” (Total distance) on HDG1, HDG2, ROT, or NAV2 screen in route navigation,

NOTE: “**RNG**” shows the distance to the next waypoint.
“**TRNG**” 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.

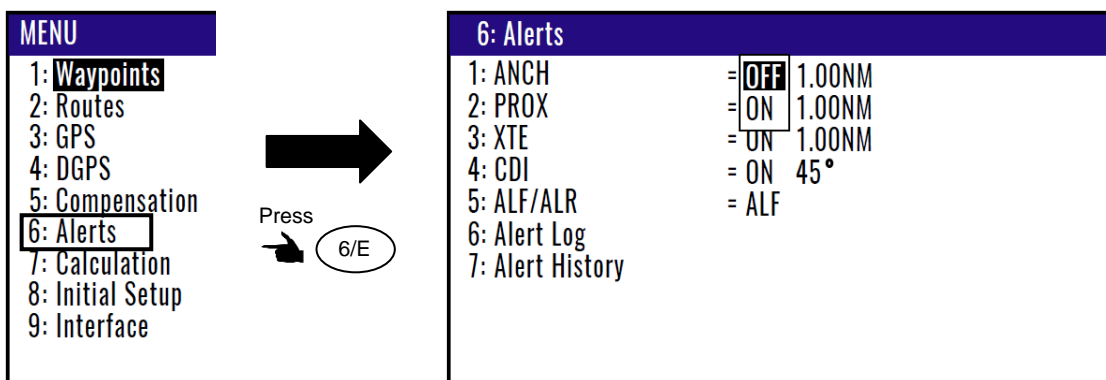
Once the anchor position is stored in memory, it is easy to check the distance and bearing moved from the anchor position.

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.

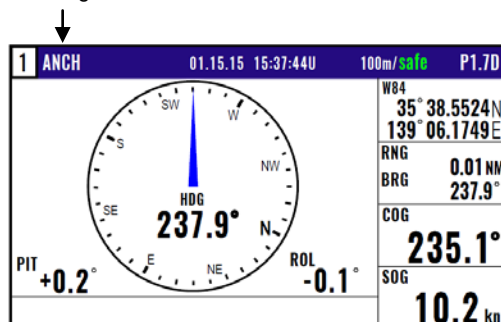
- (1) Press **MENU** key until Menu options 1 to 9 appears.
- (2) Press **6/E** key to select "6: Alerts".
- (3) Press **1** key to select "1: ANCH".
- (4) Select **[ON]** in the pop-up and press **ENT** key.



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

Goto POB :[POB]
 Goto Event :[ENT]
 Goto ANCH:[6/E]
 Cancel :[CLR]

Anchor setting mark



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

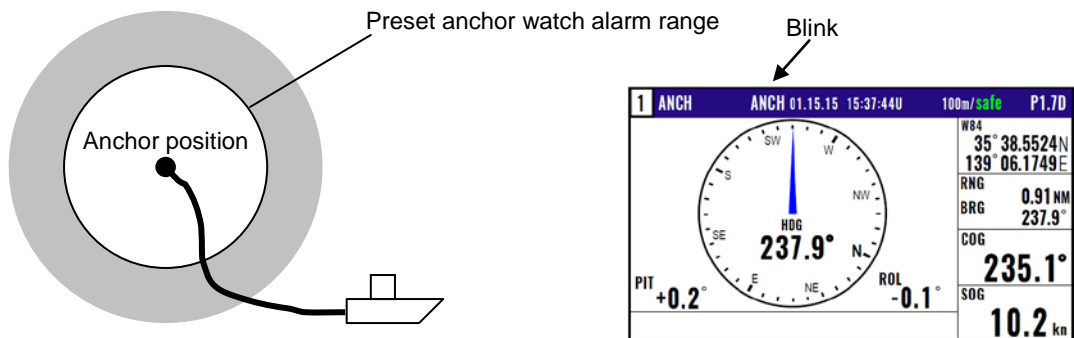
3.1 Alerts

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

| 6: Alerts | | |
|------------------|---|-------------------|
| 1: ANCH | = | OFF 1.00NM |
| 2: PROX | = | ON 1.00NM |
| 3: XTE | = | ON 1.00NM |
| 4: CDI | = | ON 45° |
| 5: ALF/ALR | = | ALF |
| 6: Alert Log | | |
| 7: Alert History | | |

3.1.1 Anchor watch alarm (ANCH)

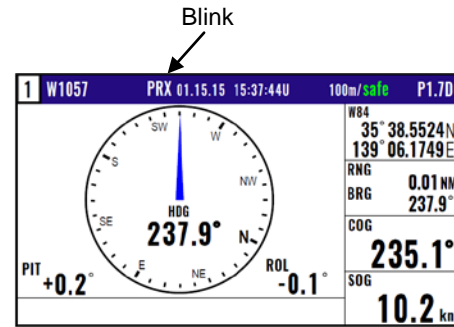
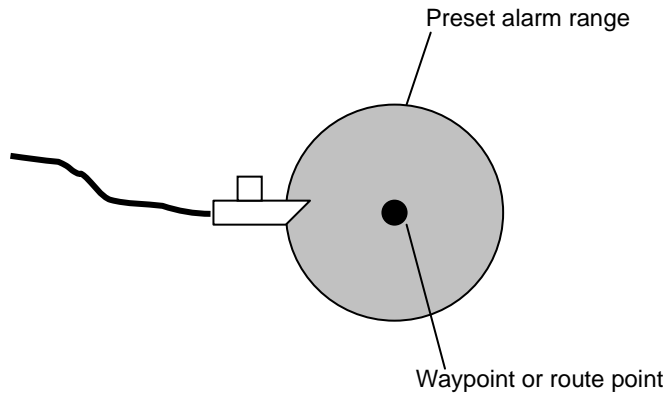
An anchor watch alarm can alert you if your boat drifts a set distance from where it is activated. This alarm function will not work if the alarm range is set to "0.00". **ANCH** letters blink and buzzer (short beep) sounds when outside of alarm range. Please refer to "2.5.1 Storing an anchor position".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

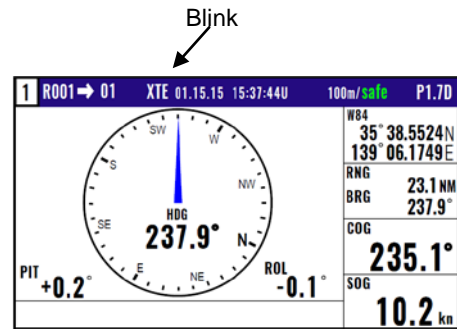
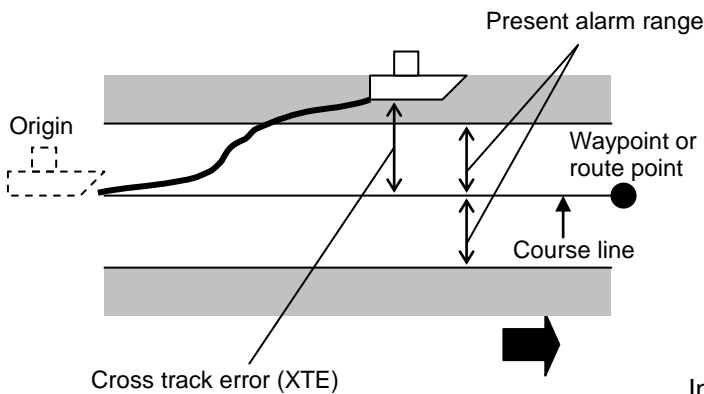


Initial setup: ON, 1.00
Enter an alarm range: 0.00 to 9.99

3.1.3 Cross track error alarm (XTE)

The cross track error (XTE) 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'. XTE letters blink and buzzer (long beep) sounds when you are out from XTE range.

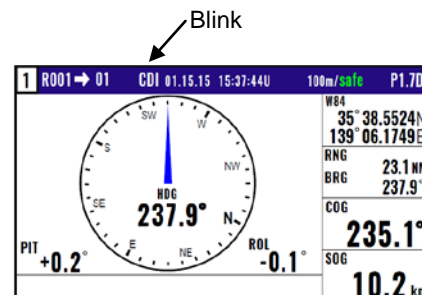
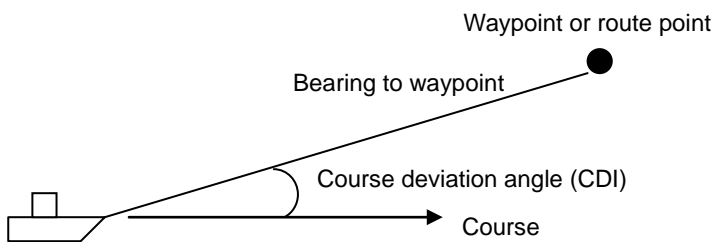
Press CLR key, if you want to turn the buzzer off.



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.

1.00NM

(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 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.

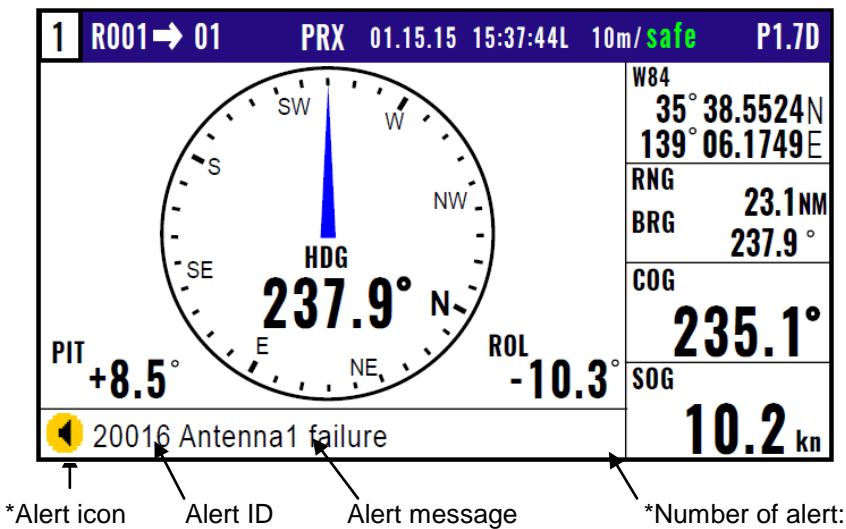
There are three types of Alerts: Alarm, Warning, and Caution.

Alarm: Condition requiring immediate attention and action to maintain safe navigation

Note: GNSS products do not initiate alarms

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 Alarm (**Note: Not used in GNSS products**)
 - : Rectified –unacknowledged Alarm (**Note: Not used in GNSS products**)
 - : Active –unacknowledged Warning
 - : Rectified –unacknowledged Warning
 - : Caution

3.3.1 Acknowledge of alerts

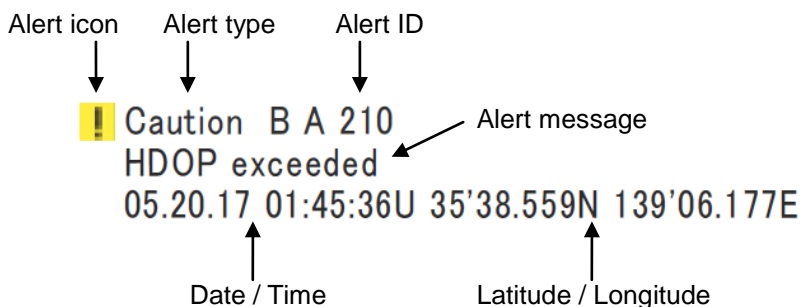
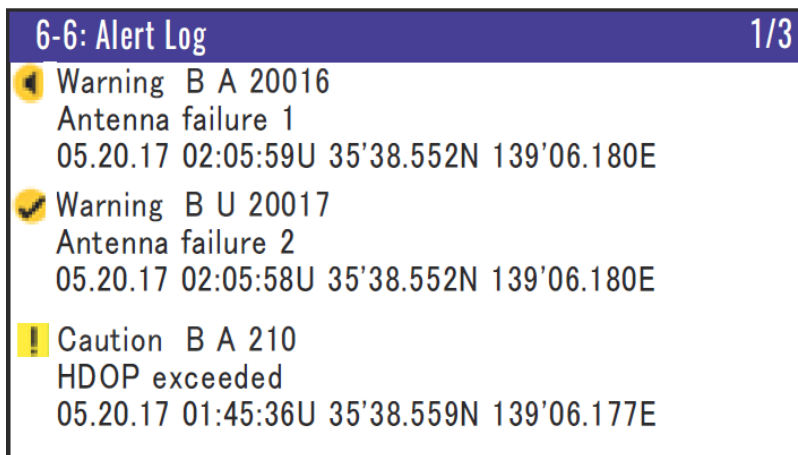
When an alert occurs, the buzzer sounds (except Caution) and the contents of the alert is displayed at the bottom of the screen. When you acknowledge an alert and press the **ACK/CLR** key, the buzzer is silence and the alert disappears. When multiple alerts are occurring, pressing the [▲] key will display 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 Log

You can check the date/time and the latitude/longitude of alert occurrence. 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 **(6/E)** key to select “**6: Alert Log**”.

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



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: Alarms**”.
- (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 | 210 | HDOP exceed |
| 02 | 020550 | B W A | 20017 | Antenna fault |
| 03 | 020558 | B W U | 20017 | Antenna fault |
| | | | ⋮ | |
| 06 | 020629 | B W A | 20016 | Antenna fault |

3.3.4 Alert list

| ID | Type | Message | Contents |
|-------------|---------|-------------------------------------|---|
| 20002-20015 | Warning | Self test failure x | Main unit failure |
| 20016 | Warning | Antenna failure 1 | ANT1 failure (Not connection) |
| 20017 | Warning | Antenna failure 2 | ANT1 failure (Not connection) |
| 20018 | Warning | Loss of ANT1 signal | ANT1 unreceivable |
| 20019 | Warning | Loss of ANT2 signal | ANT2 unreceivable |
| 20020 | Caution | Low Battery | Main unit battery voltage drop |
| 20021 | Caution | Collecting almanac data | No almanac data |
| 20022 | Caution | During the setting | Heading data and backup sensor is setting |
| 210 | Caution | HDOP exceeded | The value of HDOP exceeded 4.0 |
| 211 | Warning | No calculation of position | Can not calculate position for more than 5 minutes |
| 212 | Warning | Loss of position | A new position has not been calculated for more than 1 s |
| 213 | Warning | Loss of differential signal | Can not receive differential signal and timeout over |
| 214 | Warning | Differential correction not applied | |
| 215 | Warning | Differential integrity status | Station is unhealthy, unmonitored, or signal quality is below threshold |
| 240 | Warning | Loss of Heading | Can not output heading data for more than 1 minute |

The Warnings / Cautions from 20002 to 20022 are manufacturer alerts, while 20002 to 20015 are identifications for a Main unit failure. The ID numbers 210 to 240 are IMO defined alerts, specified to be in compliance with a Bridge Alert Management system.

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/ALR**".
- (4) Press [**▲**] or [**▼**] key to move cursor onto "**OFF**" or "**ALF**" or "**ALR**".
- (5) Press **ENT** key.

Chapter 4 Setup Procedure

4.1 Menu options

| MENU | |
|------|---------------|
| 1: | Waypoints |
| 2: | Routes |
| 3: | GPS |
| 4: | DGPS |
| 5: | Compensation |
| 6: | Alerts |
| 7: | Calculation |
| 8: | Initial Setup |
| 9: | Interface |

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)

| 1:Waypoints | | | |
|-------------|------------|-------------|----------------|
| W1000 | 35°38.209N | 139°06.749E | 03.07.15 06:38 |
| W1001 | 35°38.337N | 139°06.035E | |
| W1002 | 35°38.052N | 139°06.977E | YOKOHAMA 1 |
| W1003 | 35°38.229N | 139°06.428E | 04.19.15 13:38 |
| W1004 | 35°37.810N | 139°06.385E | YOKOHAMA 2 |
| W1005 | 35°37.727N | 139°06.549E | 04.19.15 14:58 |
| W1006 | 35°36.245N | 139°05.448E | |
| W1007 | 35°38.222N | 139°06.339E | URAYASU |
| W1008 | 35°38.092N | 139°06.165E | ODAIBA |
| W1009 | 35°38.706N | 139°06.015E | 05.11.15 14:18 |

(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).

| 2-1:Route Set / Edit | | | |
|----------------------|---|-------------|-----|
| R010: | | (Total:000) | |
| 01: W | ° | N | ° E |
| 02: W | ° | N | ° E |
| 03: W | ° | N | ° E |
| 04: W | ° | N | ° E |
| 05: W | ° | N | ° E |
| 06: W | ° | N | ° E |
| 07: W | ° | N | ° E |
| 08: W | ° | N | ° E |
| 09: W | ° | N | ° E |
| 10: W | ° | N | ° E |

(3) GPS

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

| 3: GPS | |
|-------------------|----------|
| 1: GPS monitor | |
| 2: Datum | = WGS-84 |
| 3: Elevation mask | = 5° |
| 4: RAIM limit | = 100 m |

(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.

| 4: DGPS | |
|---------------------|-------------|
| 1: DGPS mode | = SBAS |
| 2: Time out | = 060 sec. |
| 3: Beacon selection | = Auto |
| 4: Frequency | = 295.0 kHz |
| 5: Bit rate | = 200 bps |
| 6: Beacon monitor | |

(5) Compensation

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

| 5: Compensation | |
|-------------------------|-----------|
| 1: Heading | = +000.0° |
| 2: Latitude / Longitude | |
| 3: LOP | |
| 4: Magnetic variation | = Auto |
| | = +007.3° |
| 5: Time difference | = +00:00 |
| 6: Pitching | = +00.0° |
| 7: Rolling | = +00.0° |

(6) Alerts (See pages 3-1 to 3-6)

You can set up about alarm. Anchor watch alarm. Proximity alarm. XTE alarm. CDI alarm, ALF/ALR. And you can check alert status.

| 6: Alerts | |
|------------------|--------------|
| 1: ANCH | = OFF 1.00NM |
| 2: PROX | = ON 1.00NM |
| 3: XTE | = ON 1.00NM |
| 4: CDI | = ON 45° |
| 5: ALF/ALR | = ALF |
| 6: Alert Log | |
| 7: Alert History | |

(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.

| 7: Calculation | |
|--------------------|--|
| 1: 2Points | |
| 2: L/L→LOP | |
| 3: Navigation plan | |

(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.

| 8: Initial setup (Compass) | | 8: Initial setup (Others) | |
|----------------------------|-------|---------------------------|----------------|
| 1: Backup | = 060 | 1: Averaging | = 0 |
| 2: Average (Heding) | = 2 | 2: Units | = NM |
| 3: Accel (g) | = 1 | 3: Sailing mode | = Great circle |
| 4: Averaging(ROT) | = 2 | 4: Position | = L/L |
| | | 5: L/L units | = .001 |
| | | 6: Language | = English |
| | | 7: LOG Pulse | = 200 |
| | | 8: Lop | = Loran C |
| | | 9: Chain | = 0000-0-0 |

(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.

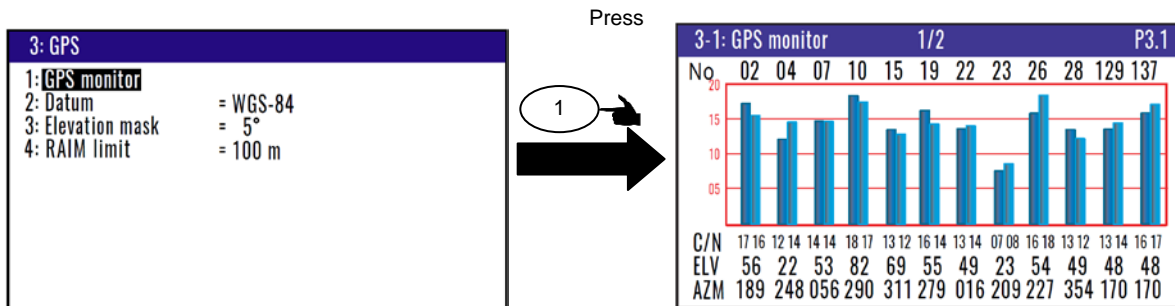
| 9: Interface | |
|------------------|---------------------|
| 1: Connector | = DATA |
| 2: Initialize | = Compass |
| 3: Format | = NMEA 0183 Ver.2.0 |
| 4: Baud rate | = 4800 |
| 5: Talker ID | = GP |
| 6: Sentence edit | |

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.

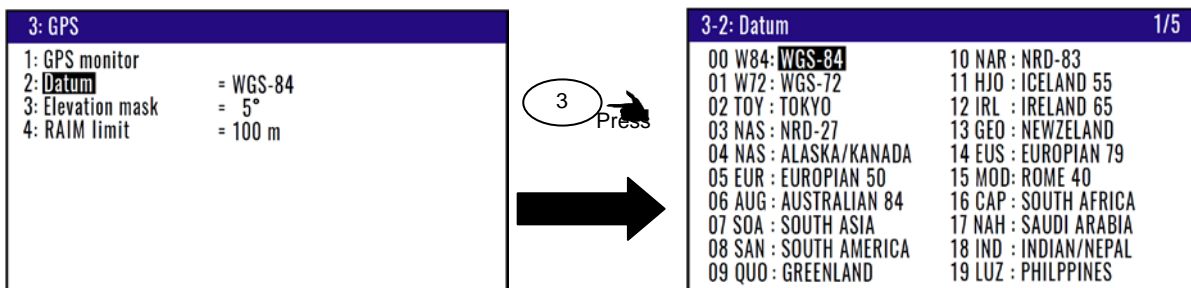
- (1) Press **MENU** key until Menu options 1 to 9 appears.
- (2) Press **3** key to select “**3: GPS**”.
- (3) Press **1** key to select “**1: GPS Monitor**”. Satellite information is displayed (direction / signal)



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** key to select “**2: DATUM**”.
- (4) Press [▲] or [▼] key to move cursor onto the desired geodetic datum.
- (5) Press **ENT** key.

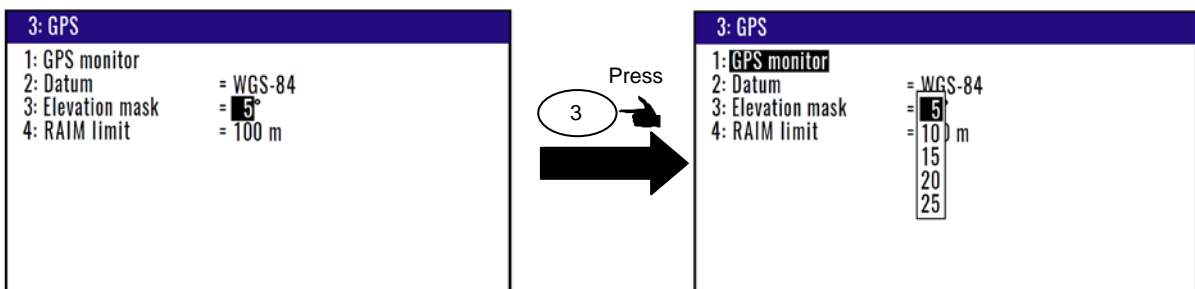


Initial setup: WGS-84

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.

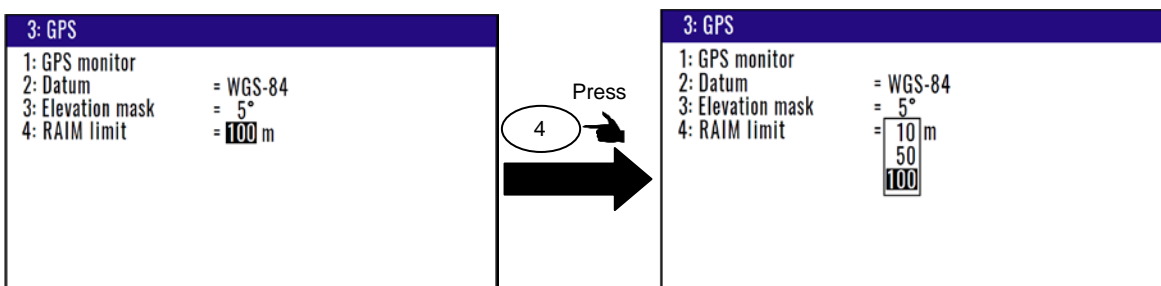


Initial setup: 5°

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** key to select "**4: RAIM limit**".
- (4) Press [**▲**] or [**▼**] key to move cursor onto elevation angle masking.
- (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.

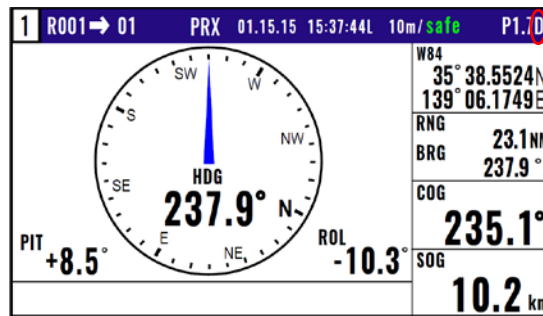
4.3 Menu 4: Differential GPS(DGPS)

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.



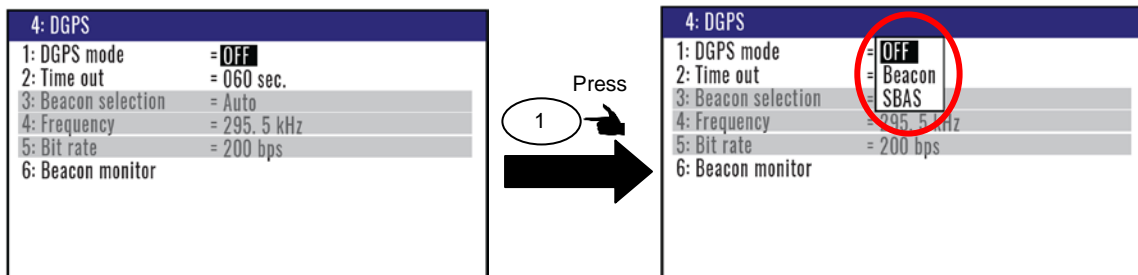
4.3.2 Selecting a style of DGPS

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)** 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.

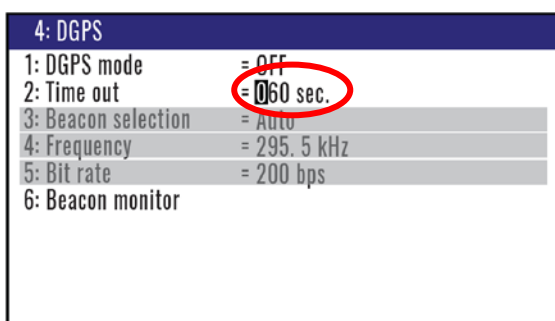


Initial setup: OFF

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)** 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.



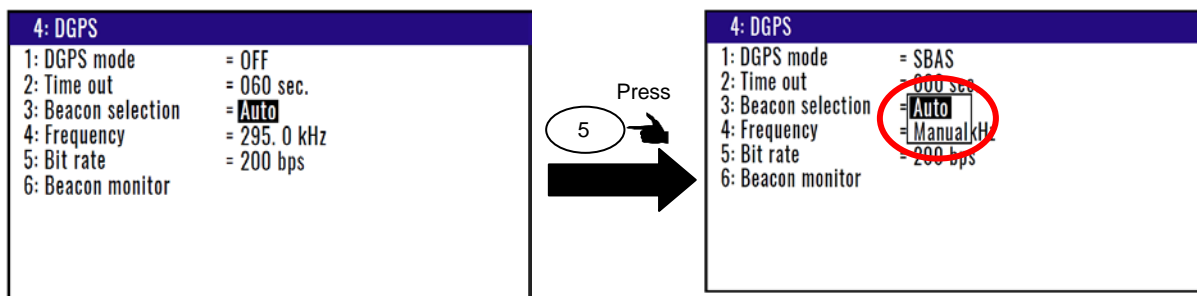
Initial setup: 000 sec

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)** 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.

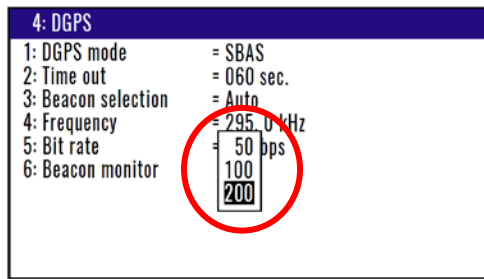
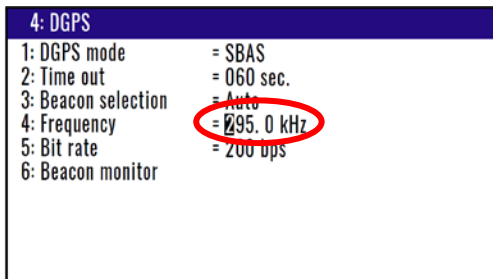


Initial setup: Auto

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** key to select “4: DGPS”.
- (3) Press [**▲**] or [**▼**] key to move cursor “4: Frequency”.
- (4) Specify receiving frequency (4-digit) of beacon station by numeric keys (0 to 9).
- (5) Press **ENT** key to set receiving frequency.
- (6) Press [**▼**] key to move cursor onto “5: Bit rate”.
- (7) Press **ENT** key.
- (8) Press [**▲**] or [**▼**] key to set bit rate “50bps”, “100bps”, “200bps”.
- (9) Press **ENT** key.

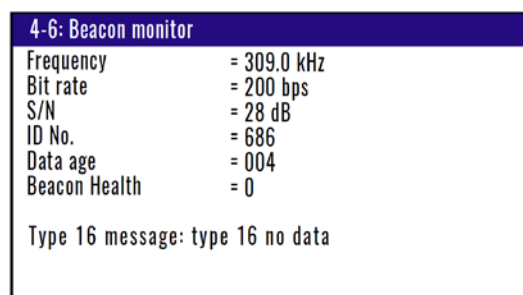
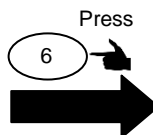
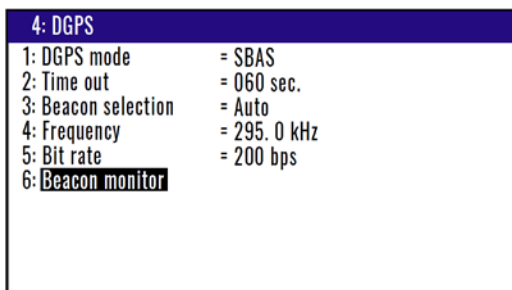


Frequency Initial setup: **283.5 kHz**
Selectable range: **283.5 to 325.0 kHz**
Bit rate Initial setup: **200 bps**

4.3.6 Beacon monitor

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

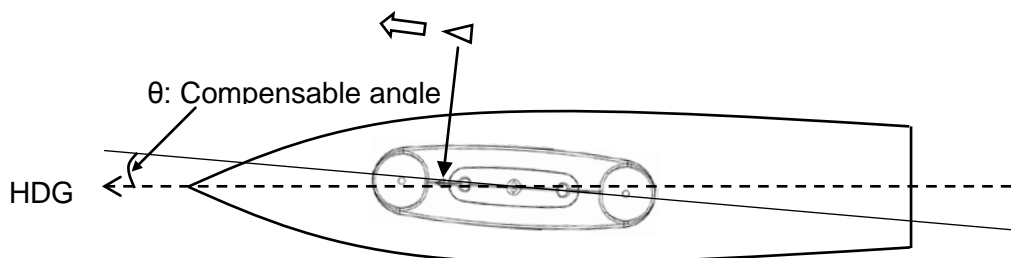
- (1) Press **MENU** key until Menu options 1 to 9 appears.
- (2) Press **4** key to select “4: DGPS”.
- (3) Press **6** key to select “6: Beacon monitor”.



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.

| 5: Compensation | |
|-------------------------|-----------|
| 1: Heading | = 000.0° |
| 2: Latitude / Longitude | |
| 3: LOP | |
| 4: Magnetic variation | = Auto |
| | = +007.3° |
| 5: Time difference | = +00:00 |
| 6: Pitching | = +00.0° |
| 7: Rolling | = +00.0° |



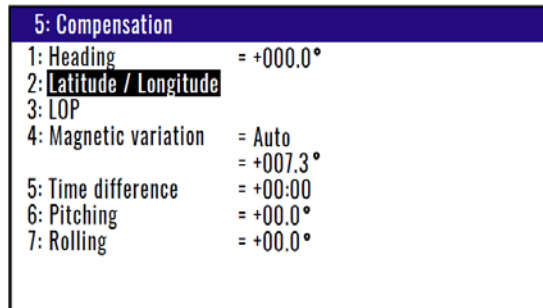
| 5: Compensation | |
|-------------------------|-----------|
| 1: Heading | = -005.0° |
| 2: Latitude / Longitude | |
| 3: LOP | |
| 4: Magnetic variation | = Auto |
| | = +007.3° |
| 5: Time difference | = +00:00 |
| 6: Pitching | = +00.0° |
| 7: Rolling | = +00.0° |

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.



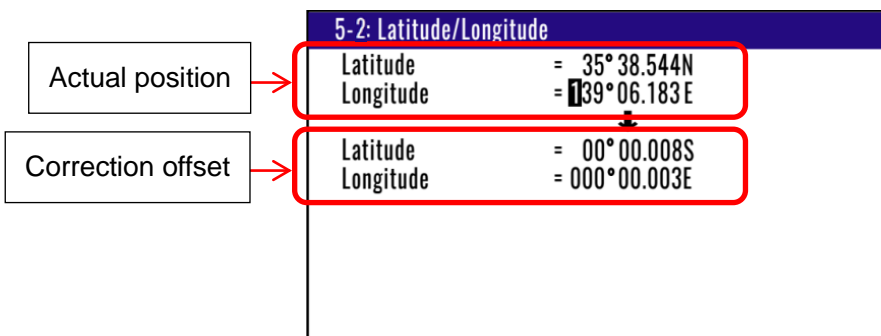
(Direct entry of actual position data)

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)** 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]



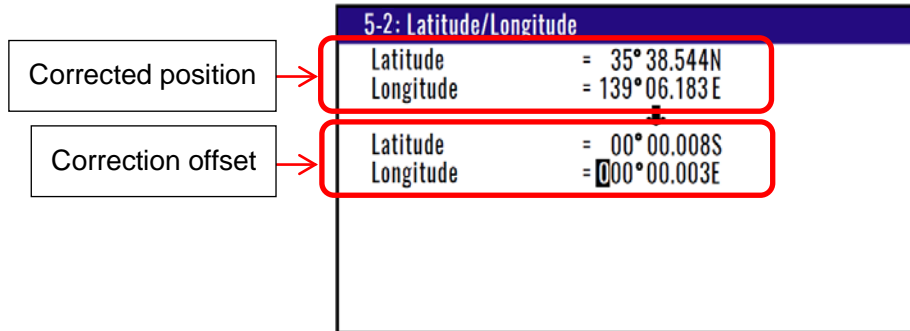
(Entry of correction offset)

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)** 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.

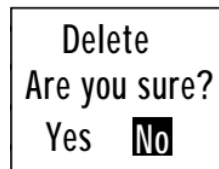
[0], [0], [0], [0], [0], [0], [8], [S], [ENT], [▼]
 [0], [0], [0], [0], [0], [0], [0], [3], [E], [ENT]



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)** 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**.

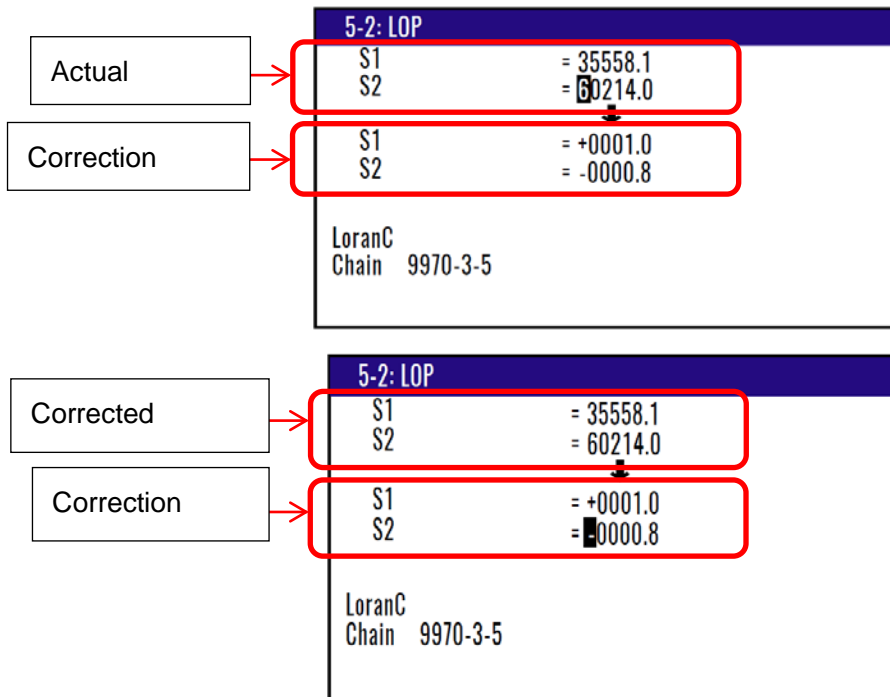
- (1) Press **(MENU)** key until Menu options 1 to 9 appears.
- (2) Press **(8/S)** key to select “8: Initial setup (Compass)”.
- (3) Press **[▶]** key to open next page “8: Initial setup (Others)”.
- (4) Press **(8/S)** key to select “8: Lop”.
- (5) Setting “LoranA” or “LoranC” or “Decca”
- (6) Press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

| 8: Initial setup | |
|------------------|----------------|
| 1: Averaging | = 0 |
| 2: Units | = NM |
| 3: Sailing mode | = Great circle |
| 4: Position | = LOP |
| 5: L/L units | = .001 |
| 6: Language | = English |
| 7: LOG Pulse | = 200 |
| 8: Lop | = Loran C |
| 9: Chain | = 0000-0-0 |

To change the "2: 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

| 5-2: LOP | |
|----------|----------|
| S1 | = 4398.3 |
| S2 | = 1254.3 |
| | ↓ |
| S1 | = -001.2 |
| S2 | = +000.9 |
| LoranA | |
| Chain | 2S1-2S2 |

In the case of DECCA

| 5-2: LOP | |
|----------|------------|
| S1 | = 0F:31:95 |
| S2 | = 0G:53:19 |
| | ↓ |
| S1 | = +:00:02 |
| S2 | = +:00:05 |
| DECCA | |
| Chain | Auto |
| | 41-GP |

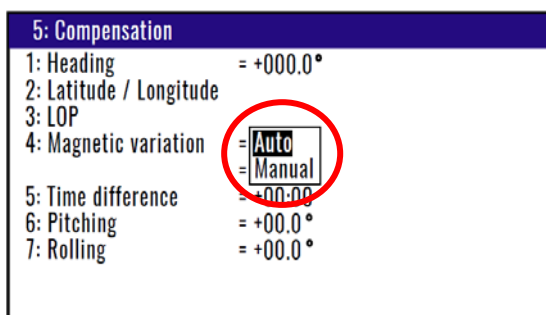
4.4.5 Compensating the compass

The course and bearing to waypoint is 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.

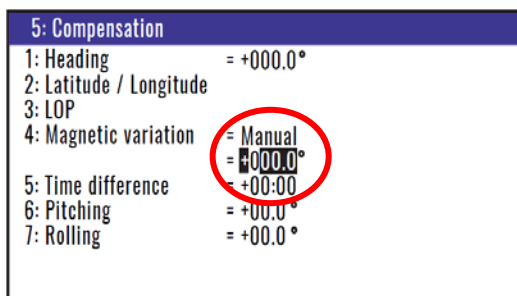
- (1) Press **(MENU)** key until Menu options 1 to 9 appears.
- (2) Press **(5)** key to select “**5: Compensation**”.
- (3) Press **(4/W)** key to select “**4: Magnetic variation**”.
- (4) Press **[▲]** or **[▼]** key to move cursor onto “**Auto**”.
- (5) Press **(ENT)** key.



Initial setup: AUTO

(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.

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

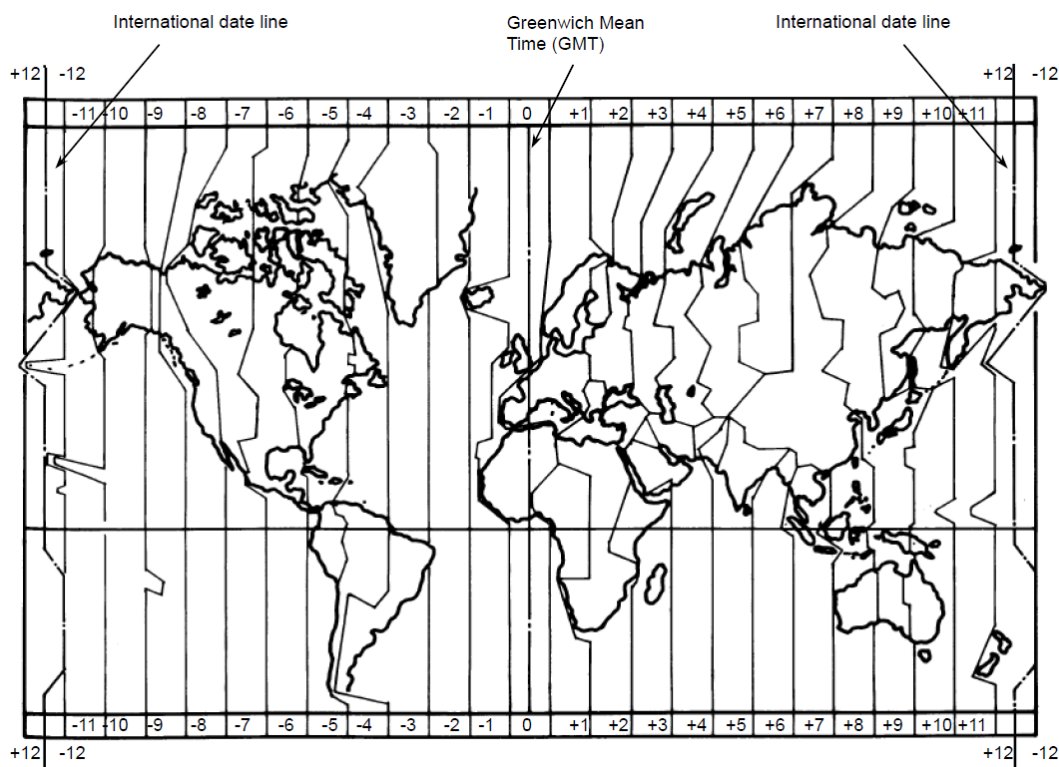


Figure 4.1 Time difference chart

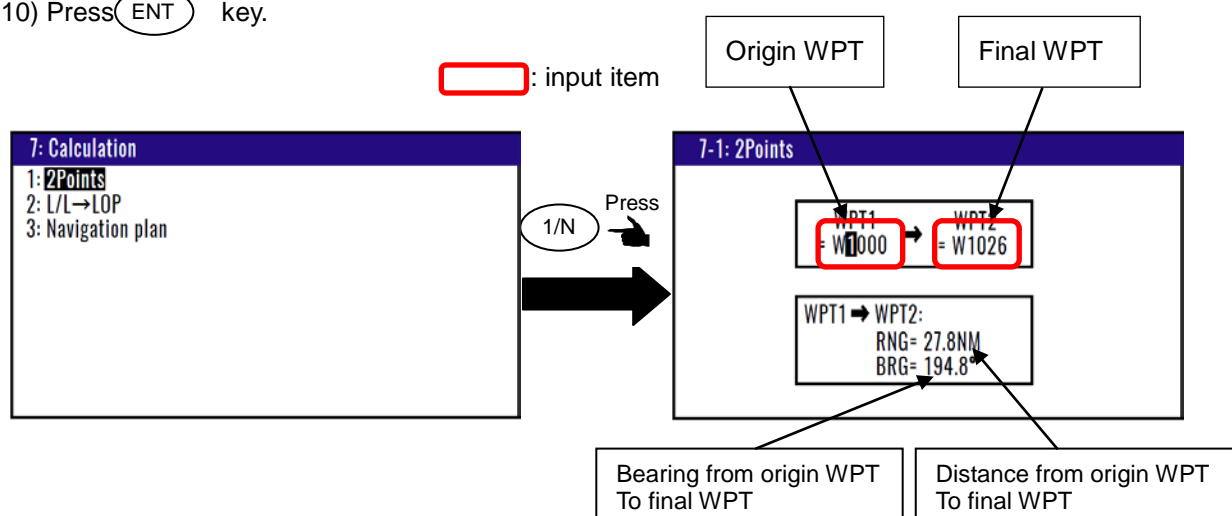
Initial setup: 00:00 hour

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.

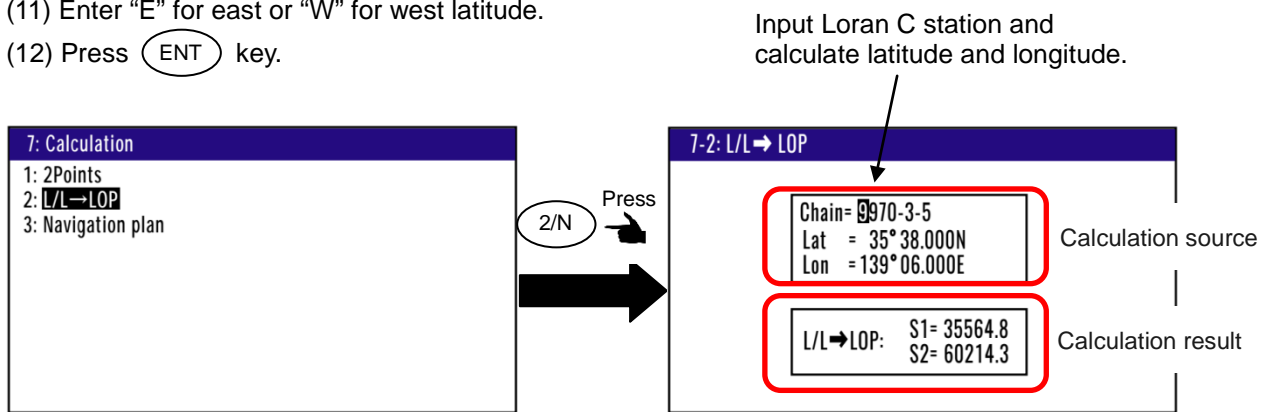
To change the “3: LOP”, the following settings are required

You can set of LoranA, LoranC or Decca of “3: LOP” change when you changed **7:Lop** and **8: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 **(7)** key to select “7: Lop”.
- (4) Setting “LoranA” or “LoranC” or “Decca”
- (5) Press **(ENT)** key.
- (6) Press **(8/S)** key to select “8: 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)** 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

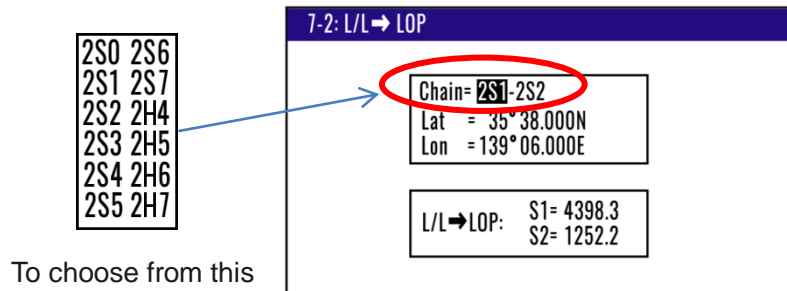
- (1) Press [**▼**] key to display page 2/2.
- (2) Enter a data number (1000 to 9999) using numeric keys.
- (3) The existing data, if any, is displayed for your checkout.
- (4) Press **[ENT]** key.

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)** 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.



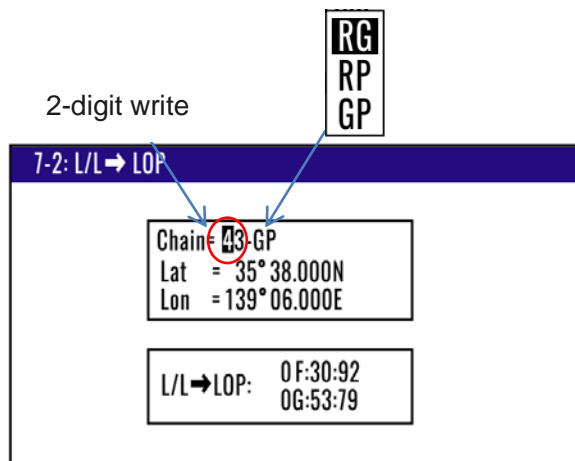
To choose from this

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** 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

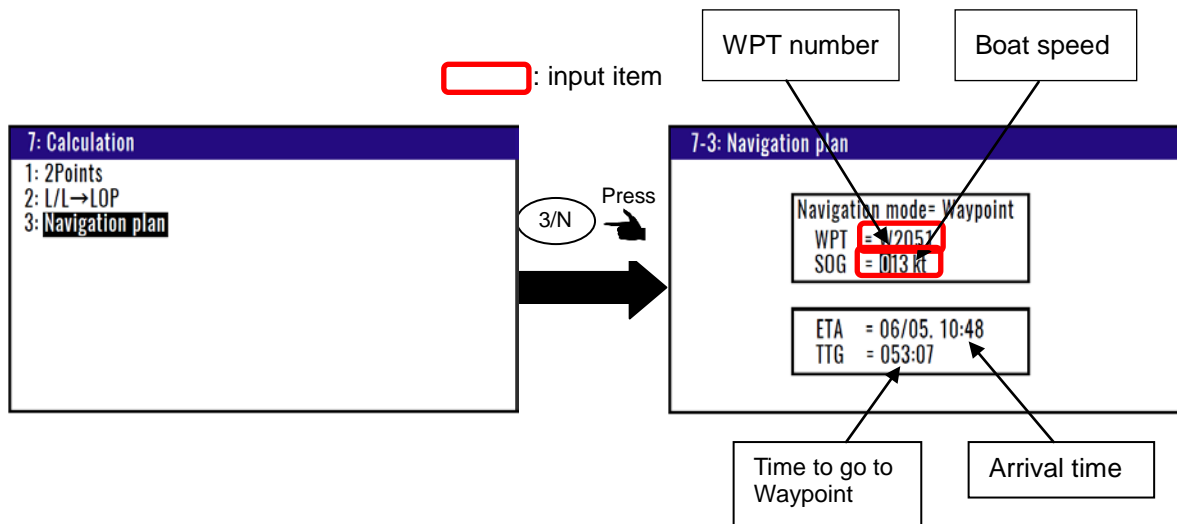
You can calculate the following various navigation plan.

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

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

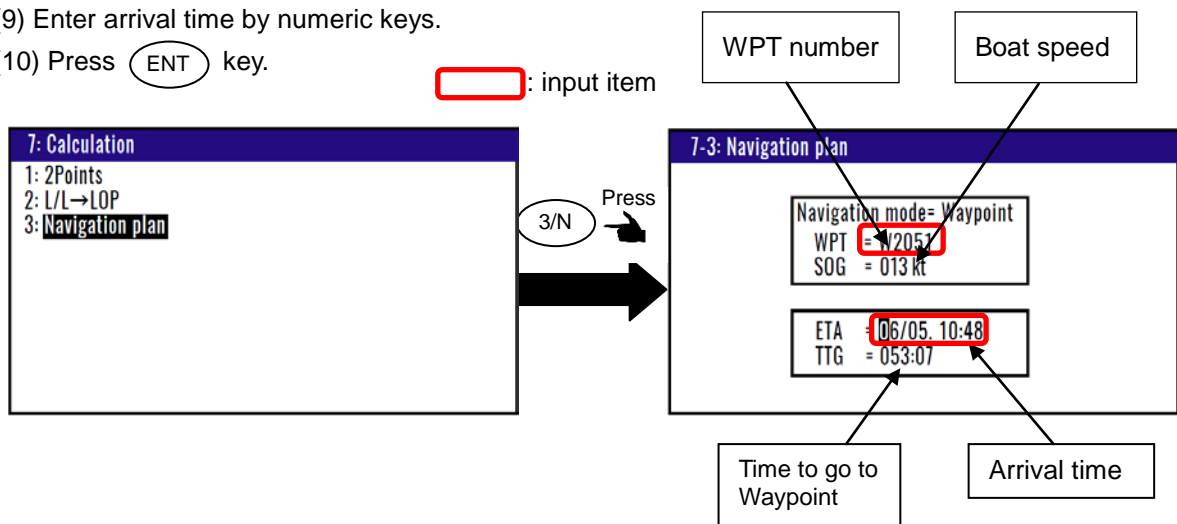
Calculating arrival time and time to go to waypoint from WPT number and boat speed

- (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.

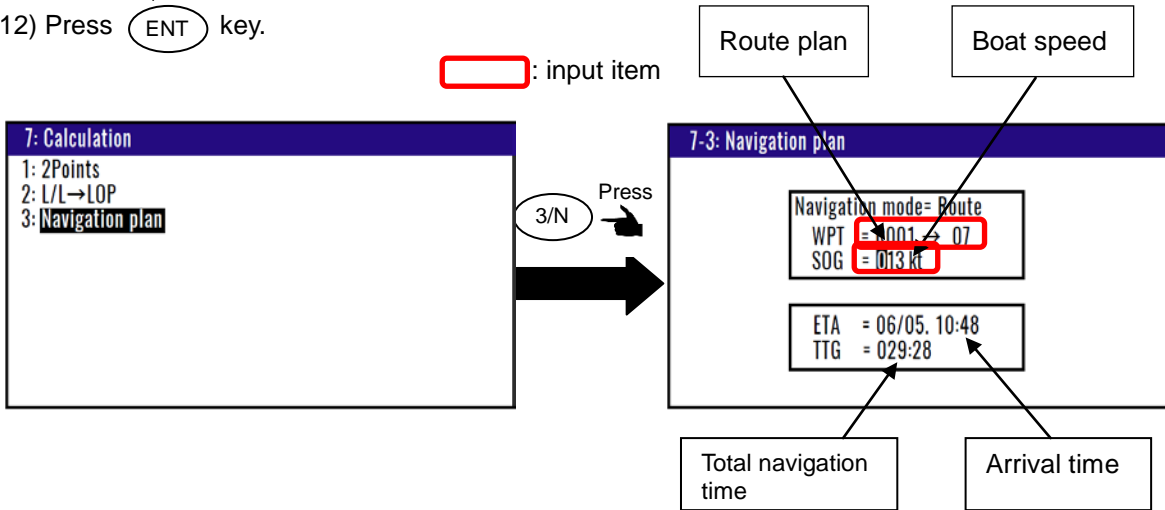
- (1) Press **(MENU)** key until Menu options 1 to 9 appears.
- (2) Press **(7)** key to select “7: Calculation”.
- (3) Press **(3)** key to select “3: Navigation plan”.
- (4) Press **(ENT)** key and select “Waypoint” in the pop-up.
- (5) Press **(ENT)** key.
- (6) Press [**▼**] key and enter an (4-digit) 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

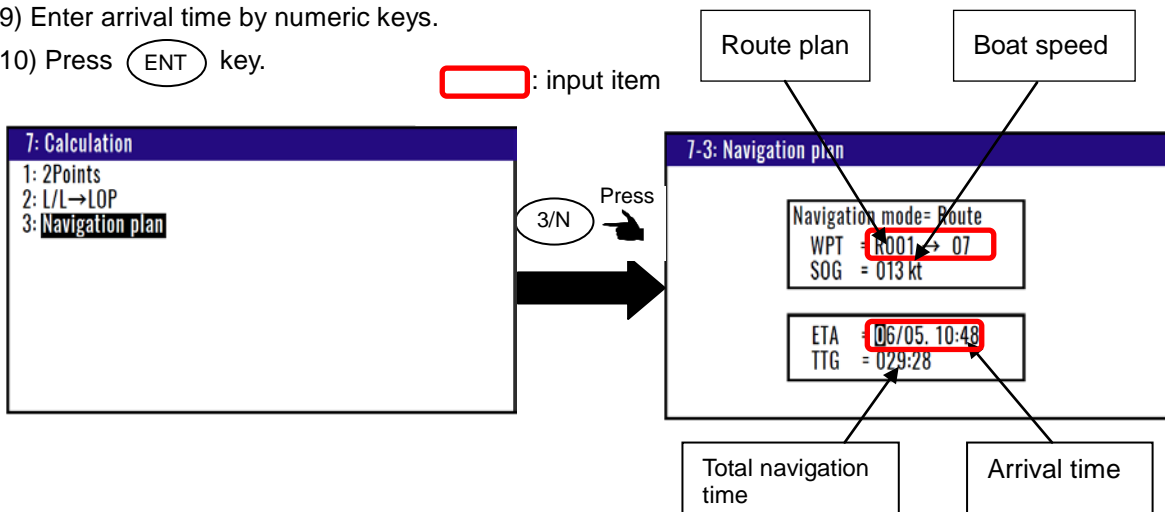
- (1) Press **(MENU)** key until Menu options 1 to 9 appears.
- (2) Press **(7)** key to select “7: Calculation”.
- (3) Press **(3)** key to select “3: Navigation plan”.
- (4) Press **(ENT)** key and select “Route” in the pop-up.
- (5) Press **(ENT)** key.

- (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 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.



4.6 Menu 8: Initial setup

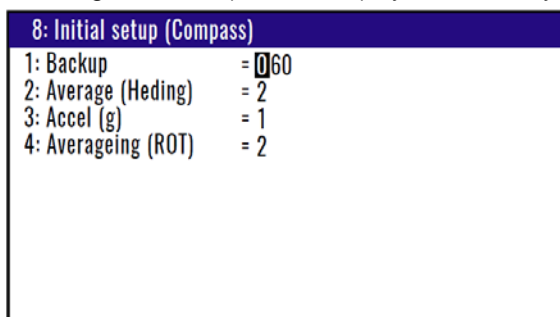
There are two screens in the initial setup menu “Compass” and “Others”.

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) by numeric keys and (ENT) key.



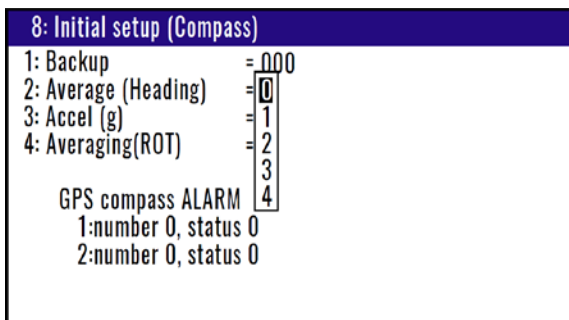
Initial setup: 060sec

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 averaging 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 averaged 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) 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.

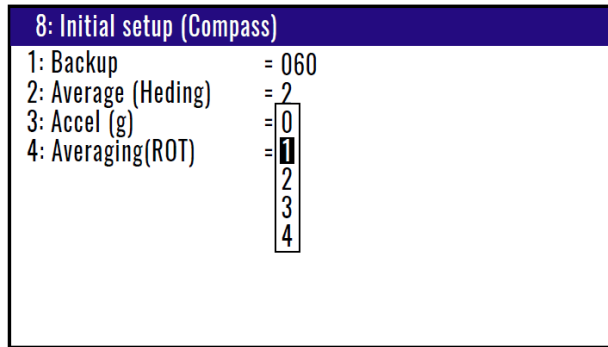


Initial setup: 2

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.

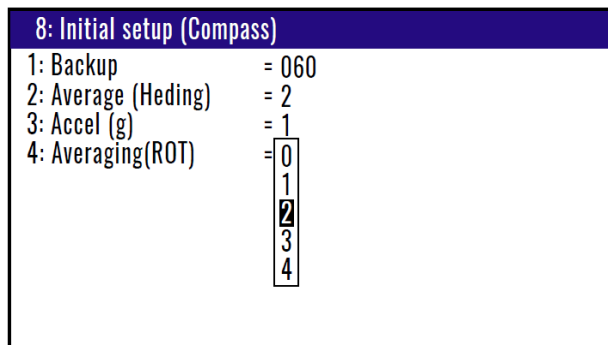


Initial setup: 1

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 **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: 2

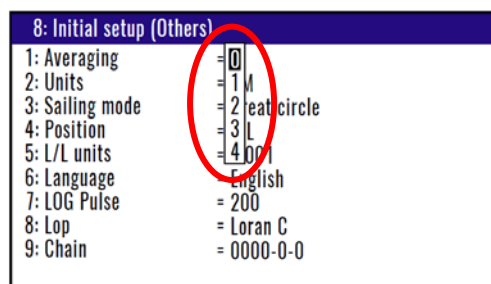
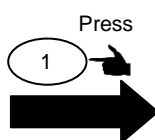
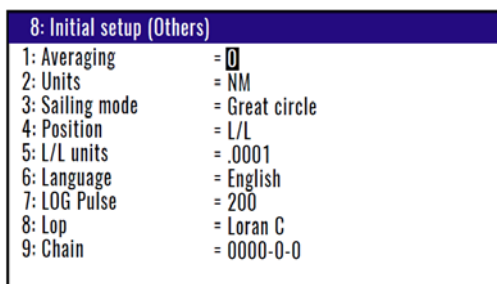
4.6.5 Setting average constants(measuring position, speed and course)

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**”.
- (4) Press [**▲**] or [**▼**] key to move cursor onto the average constants to select “0 to 4”.
- (5) Press **(ENT)** key.

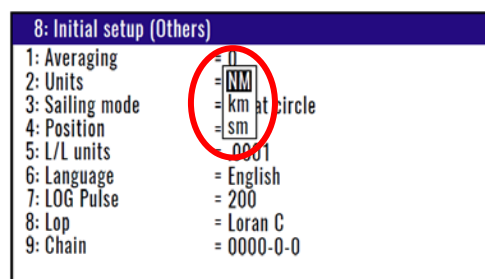
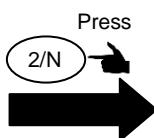
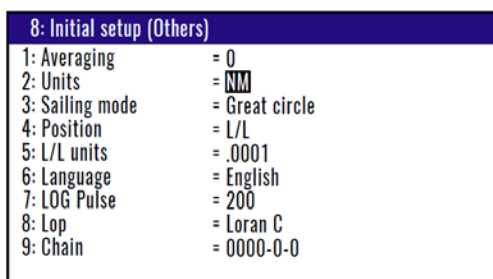


Initial setup: 0

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)** 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

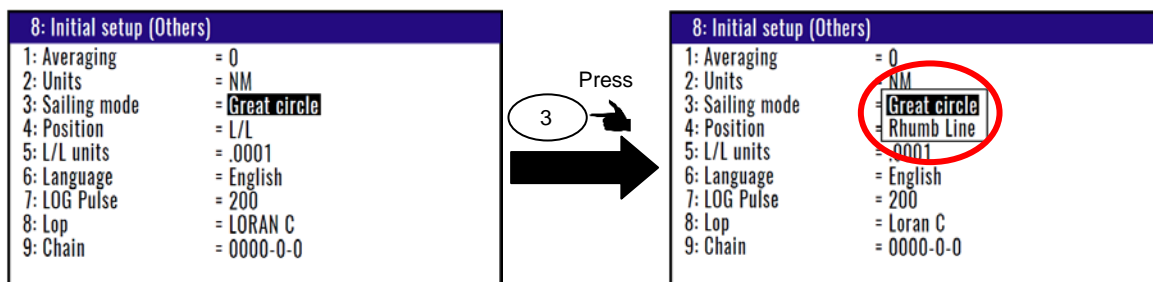
4.6.7 Changing sail mode

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.

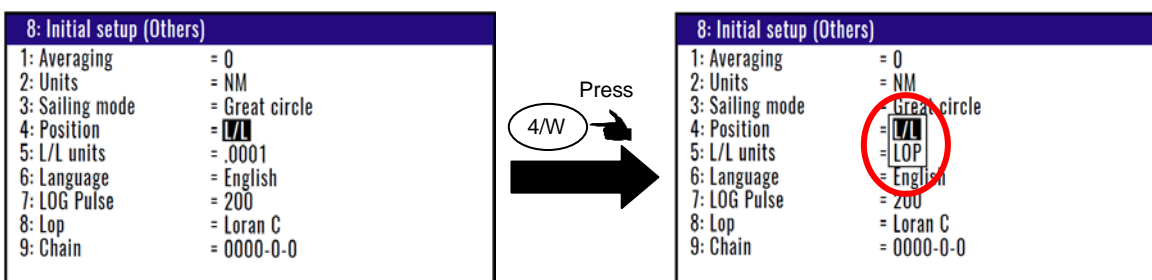


Initial setup: Great circle

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.

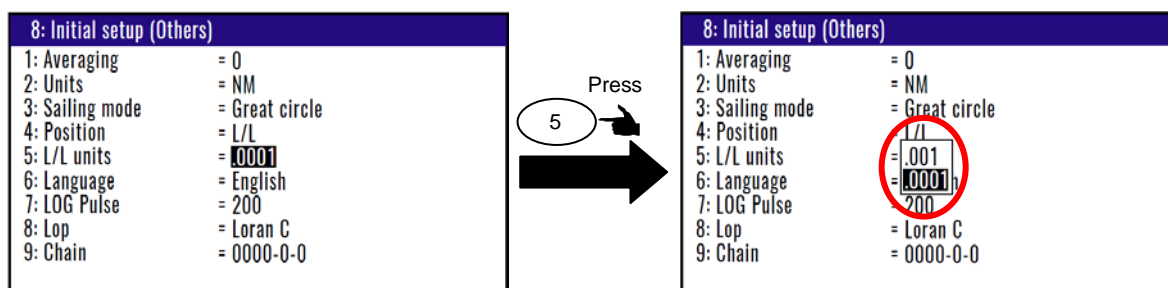


Initial setup: L/L

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.



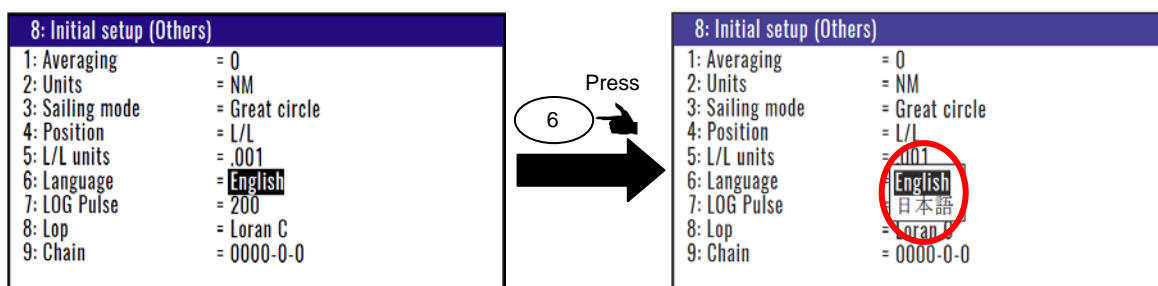
Initial setup: .0001'

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)** key to select “**6: Language**”.
- (5) Press [**▲**] or [**▼**] key to move cursor onto the language.
- (6) Press **(ENT)** key.



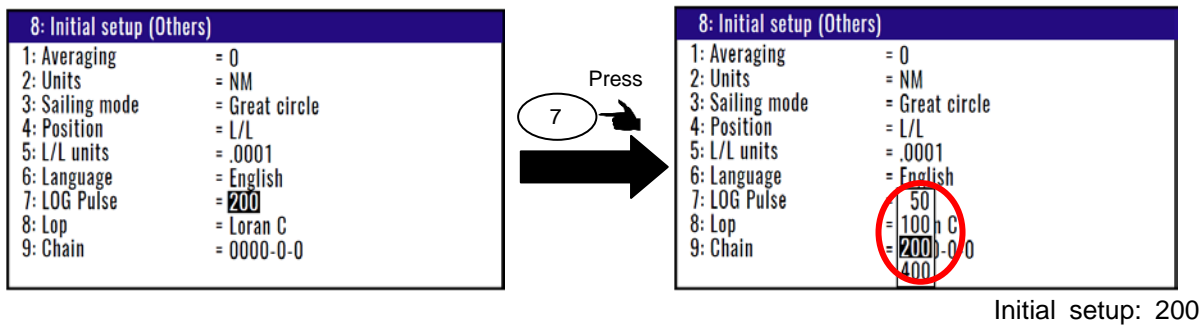
Initial setup: English

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.



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

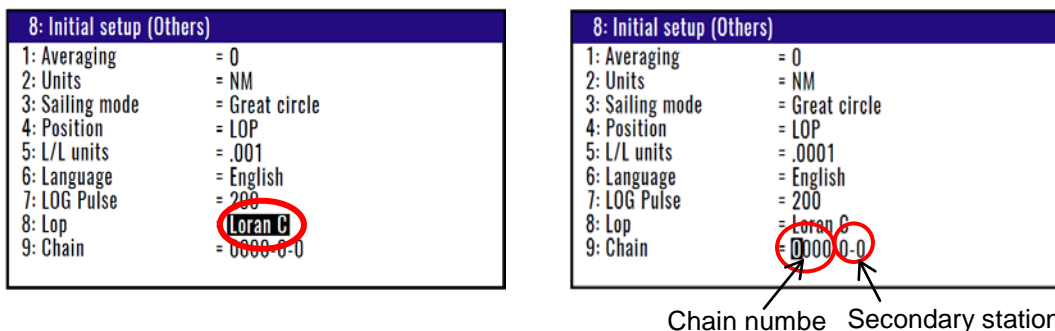
For the operating procedure, refer to 5.1 "Initial setup for LOPs display".

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 **7** key to select **"7: Lop"**.

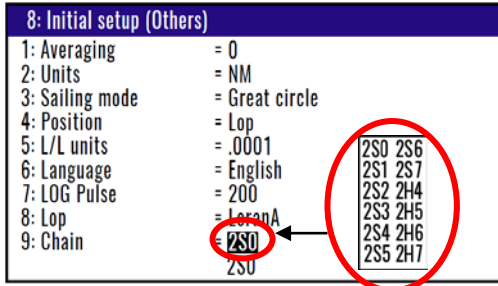
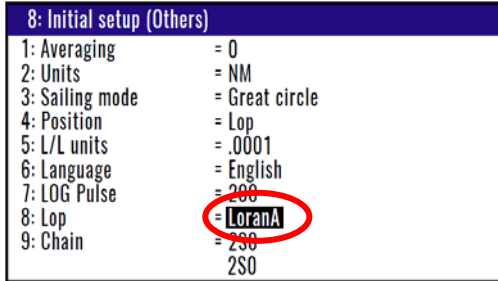
In the case "LoranC"

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

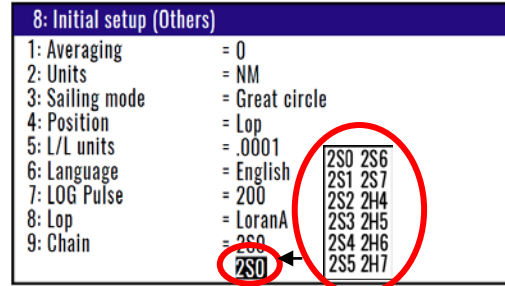


In the case “LoranA”

- (5) Press [▲] or [▼] key to move cursor onto the “LoranA”.
- (6) Press (ENT) key.
- (7) Press [▼] key to move cursor onto the “8: Chain” and press (ENT) key.
- (8) Select two stations of LoranA by a [▲] or [▼] or [►] or [◀] key and press (ENT) key.



Station 1



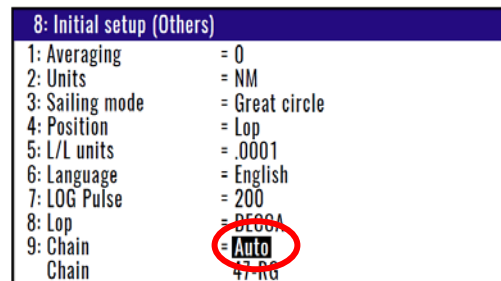
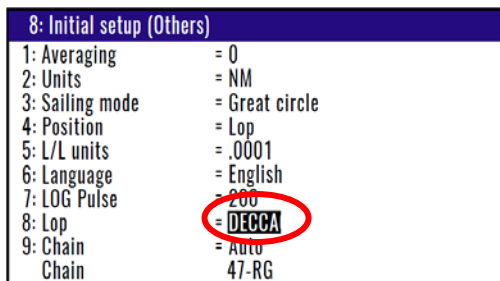
Station 2

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.

| 8: Initial setup (Others) | |
|---------------------------|----------------|
| 1: Averaging | = 0 |
| 2: Units | = NM |
| 3: Sailing mode | = Great circle |
| 4: Position | = Lop |
| 5: L/L units | = .0001 |
| 6: Language | = English |
| 7: LOG Pulse | = 200 |
| 8: Lop | = DECCA |
| 9: Chain | = Manual |
| Chain | 00 RG |

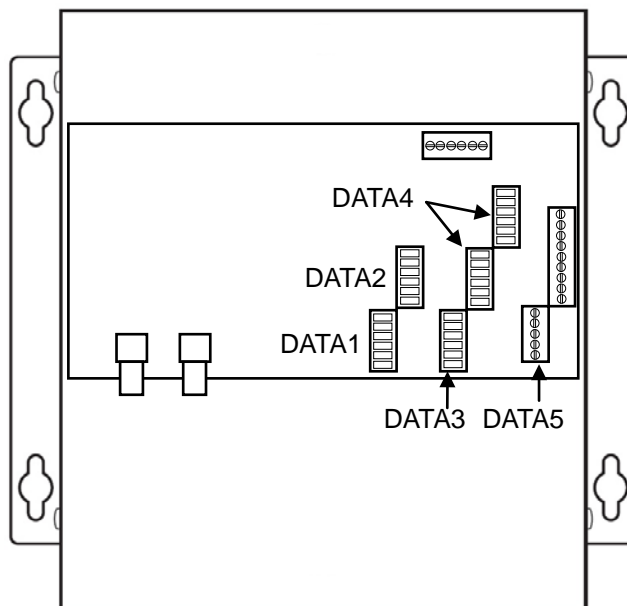
Chain number

| 8: Initial setup (Others) | |
|---------------------------|-------------------|
| 1: Averaging | = 0 |
| 2: Units | = NM |
| 3: Sailing mode | = Great circle |
| 4: Position | = Lop |
| 5: L/L units | = .0001 |
| 6: Language | = English |
| 7: LOG Pulse | = 200 |
| 8: Lop | = DECCA |
| 9: Chain | = Manual |
| Chain | 43 RG RP GP |

Combination of two secondary station

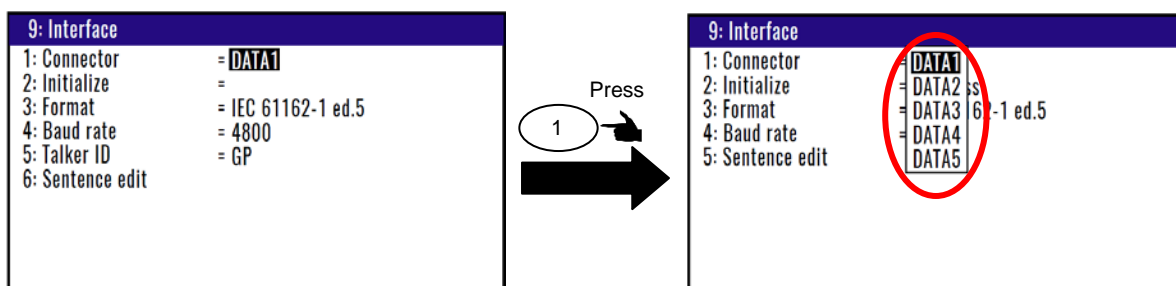
4.7 Menu 9: Interface

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.

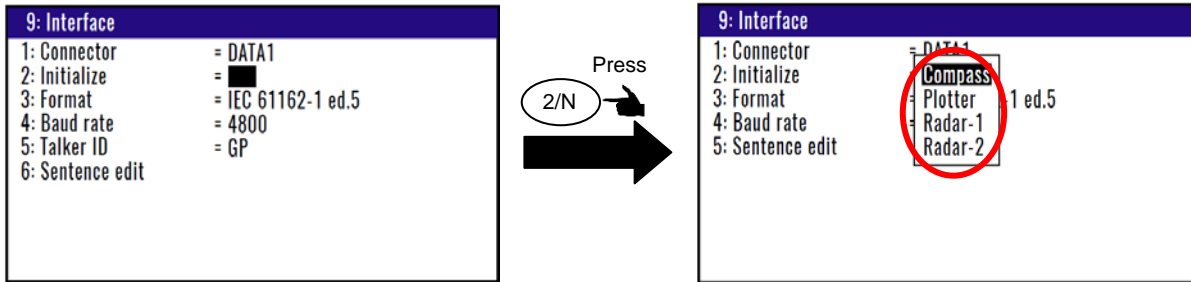


4.7.2 Selecting initialized equipment

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

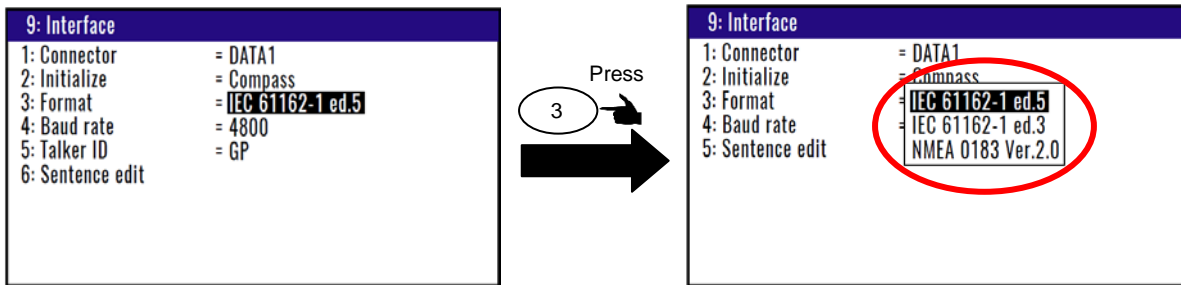
4.7.3 Selecting an output data format of DATA1-5 port

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

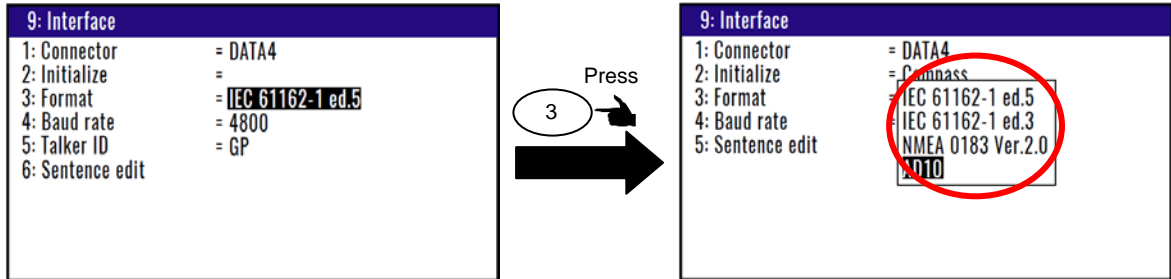
You can select from following three formats.

- 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

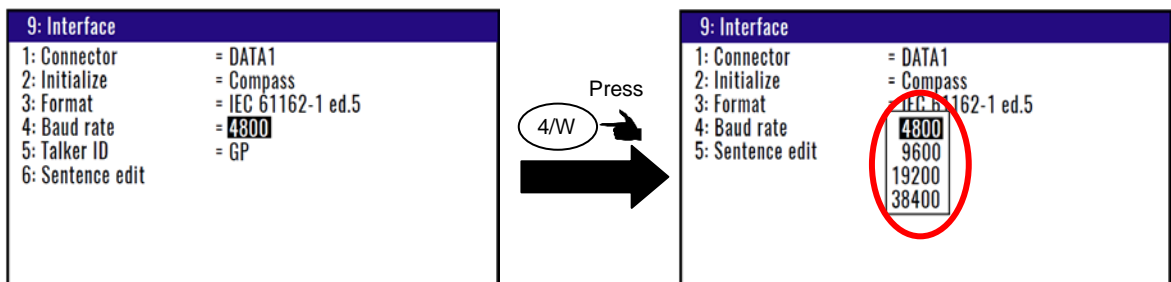
You can select from following four formats.

- 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.

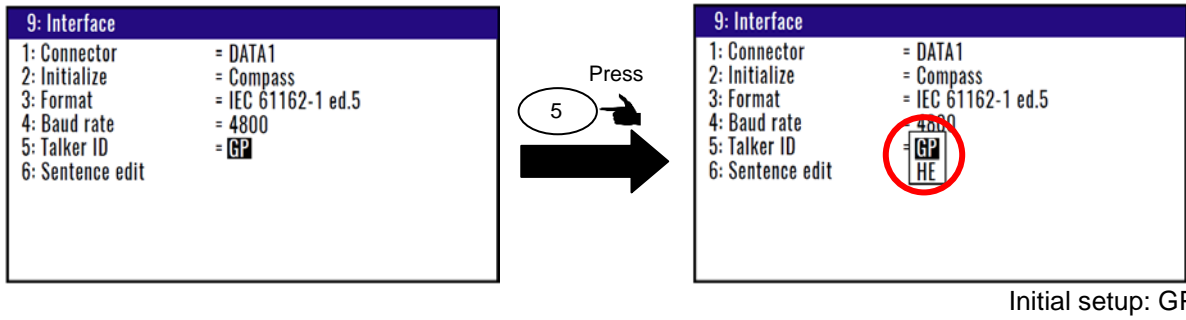


Initial setup: 4800

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: Main Talker ID”.
- (4) Press [▲] or [▼] key to move cursor onto the baud rate “GP”, “HE”.
- (5) Press (ENT) key.



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

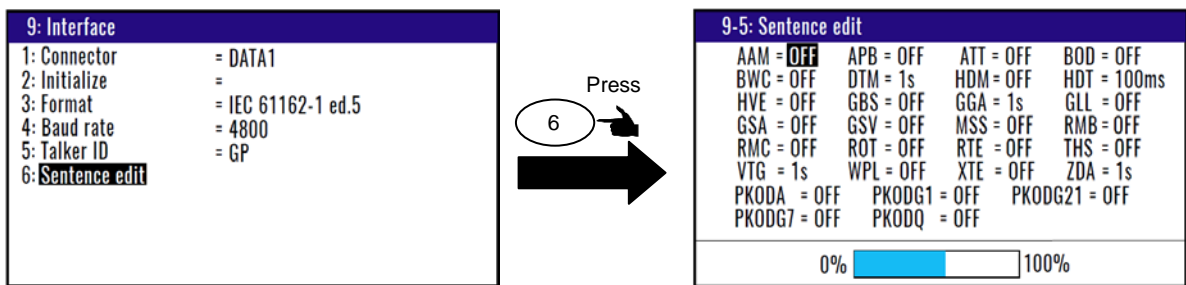
*If you try to change to "HE", the following notice will be displayed. Attention is required for change.

Only for Non SOLAS
Are you sure?
Yes No

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** 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 “10.3 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

| |
|-------|
| Off |
| 20ms |
| 40ms |
| 50ms |
| 100ms |
| 1s |

Navigation data sentence

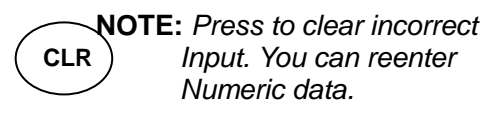
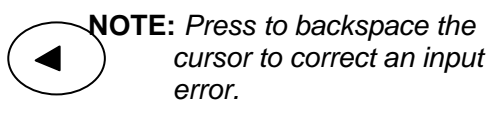
AAM: Waypoint Arrival Alarm
 APB: Autopilot Sentence "B" (Bearing from origin or present position to the waypoint)
 BOD: Bearing - Point of Origin to Destination
 BWC: Bearing & Distance to Waypoint in Great Circuit navigation
 DTM: Datum reference
 GGA: Global Positioning System Fix Data (time, lat/lon, 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 status
 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)

| |
|-----|
| Off |
| 1s |

Chapter 5 How to use LOPs

5.1 Initial setup for LOPs display

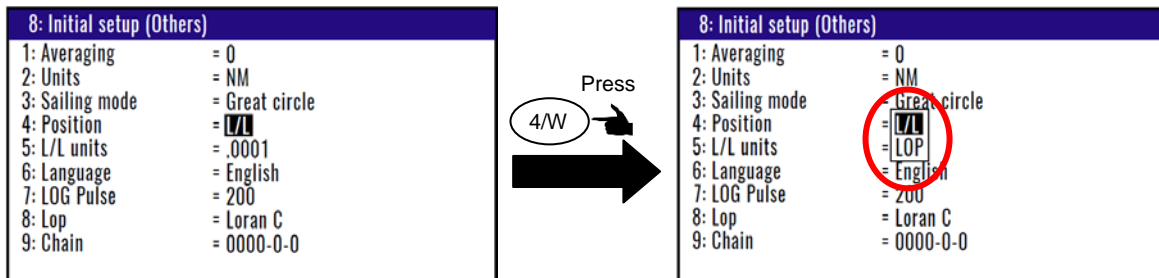
Measured longitude and latitude can be translated into loran C, loran A or DECCA. To turn on the LOPs mode, the following initial setup is required.



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

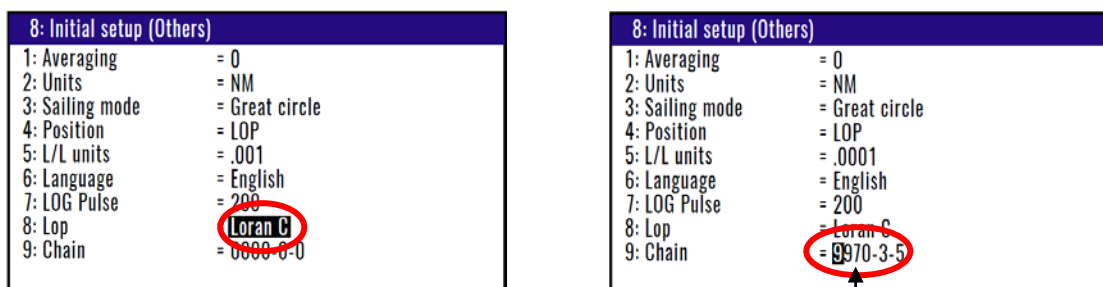
The procedure is as follows:

- (1) Press **(MENU)** key until Menu options 1 to 9 appears.
- (2) Press **(8)** key to select "**8: Initial setup(compass)**".
- (3) Press **[◀]** or **[▶]** key to select "**8: Initial setup(others)**".
- (4) Press **(4)** key to select "**4: Position**".
- (5) Press **[▲]** or **[▼]** key to move cursor onto the "Lop".
- (6) Press **(ENT)** key.

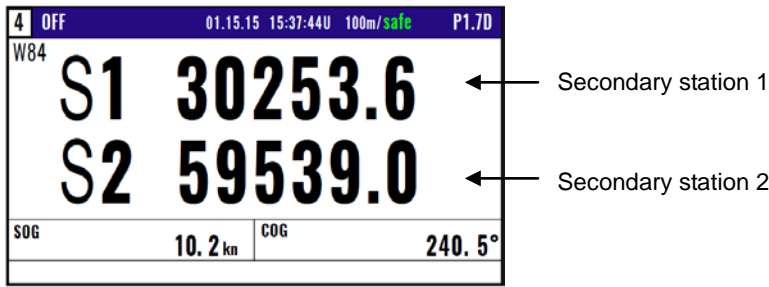


In the case "LoranC"

- (7) Press **(7)** key to select "**7: Lop**".
- (8) Press **[▲]** or **[▼]** key to move cursor onto the "LoranC".
- (9) Press **(ENT)** key.
- (10) Press **[▼]** key to move cursor onto the "**8: Chain**".
- (11) Input the station of LoranC by numeric keys.

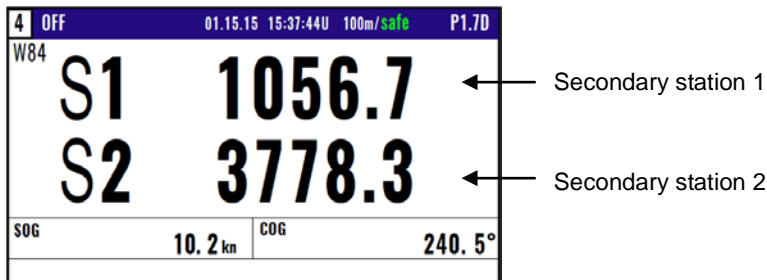
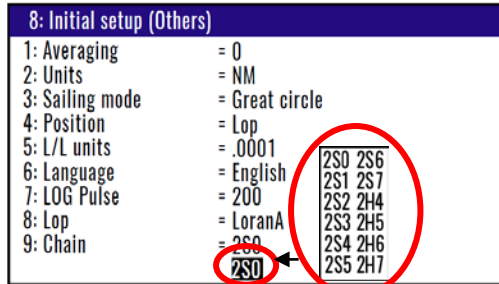
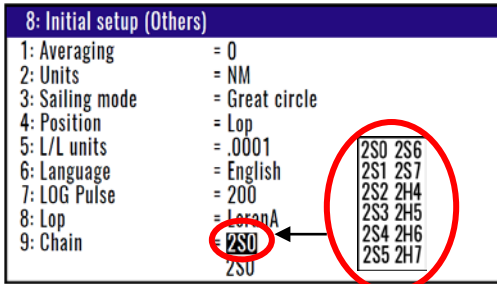
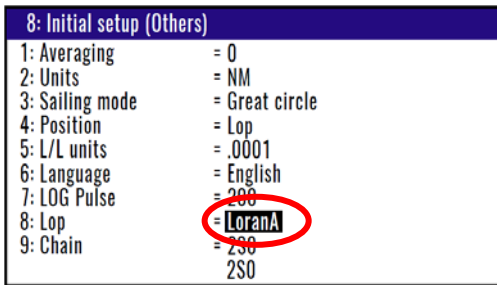


When select Loran C, you must select station



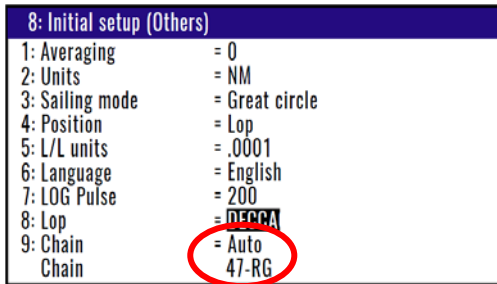
In the case “LoranA”

- (7) Press **7** key to select “7: Lop”.
- (8) Press [▲] or [▼] key to move cursor onto the “LoranA”.
- (9) Press **ENT** key.
- (10) Press [▼] key to move cursor onto the “8: Chain”.
- (11) Input the station of LoranA use to [▲], [▼], [▶] or [◀] key.



In the case “DECCA”

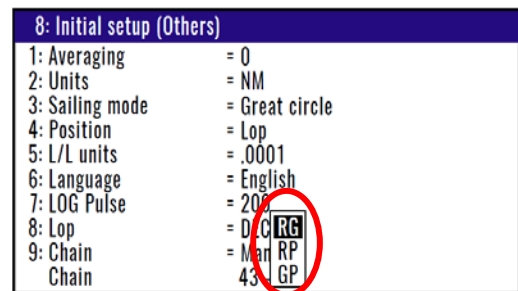
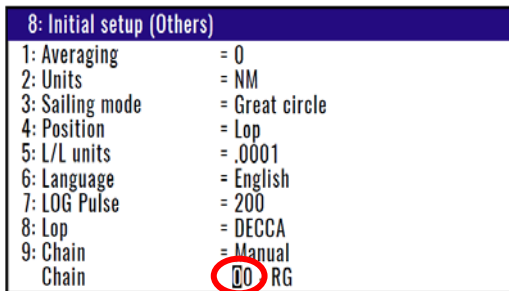
- (7) Press **7** key to select “7: Lop”.
- (8) Press [▲] or [▼] key to move cursor onto the “DECCA”.
- (9) Press **ENT** key.
- (10) Press [▼] key to move cursor onto the “8: Chain”.
- (11) Press [▲] or [▼] key to move cursor onto the “Auto” or “Manual”.
- (12) Press **ENT** key.



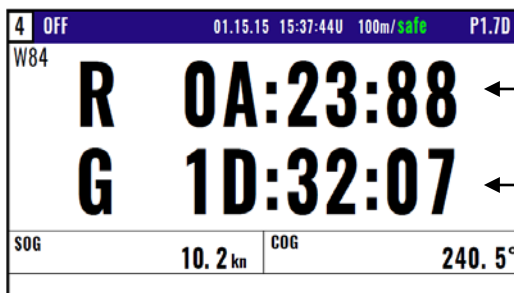
When select auto mode, KGC-300 finds the optimal station

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




Red station




Green station

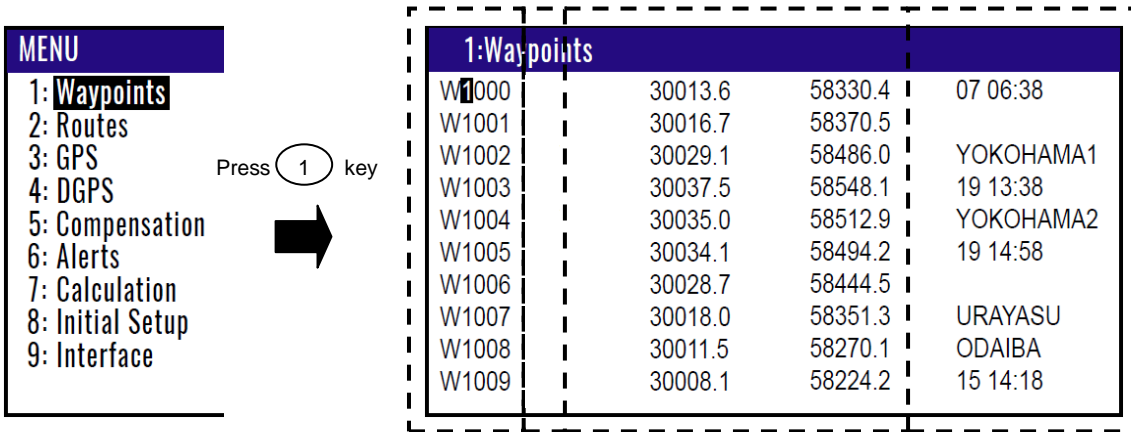
5.2 Storing Waypoints (LOPs data)

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

 **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  key until Menu options 1 to 9 appears.
- (2) Press  key to select "1: Waypoints".
- (3) Enter storage number (0000 to 9999) by numeric keys and  key.



| 1:Waypoints | | | |
|-------------|--------|--------|-----------|
| W1000 | 1155.2 | 3765.1 | 07 06:38 |
| W1001 | 1151.4 | 3766.3 | |
| W1002 | 1139.1 | 3769.8 | YOKOHAMA1 |
| W1003 | 1132.5 | 3771.5 | 19 13:38 |
| W1004 | 1134.6 | 3770.9 | YOKOHAMA2 |
| W1005 | 1135.4 | 3770.6 | 19 14:58 |
| W1006 | 1139.8 | 3769.4 | |
| W1007 | 1150.2 | 3766.5 | URAYASU |
| W1008 | 1158.2 | 3764.0 | ODAIBA |
| W1009 | 1163.5 | 3762.3 | 15 14:18 |

Storage position: **DECCA**

| 1:Waypoints | | | |
|-------------|----------|----------|-----------|
| W1000 | 51:47:19 | 6F:79:06 | 07 06:38 |
| W1001 | 01:32:04 | 0J:77:46 | |
| W1002 | 01:33:44 | 0J:73:96 | YOKOHAMA1 |
| W1003 | 01:34:24 | 0J:71:97 | 19 13:38 |
| W1004 | 01:34:14 | 0J:72:27 | YOKOHAMA2 |
| W1005 | 01:34:15 | 0J:72:29 | 19 14:58 |
| W1006 | 01:33:70 | 0J:73:34 | |
| W1007 | 01:32:51 | 0J:76:40 | URAYASU |
| W1008 | 01:31:72 | 0J:78:38 | ODAIBA |
| W1009 | 01:31:15 | 0J:79:78 | 15 14:18 |

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 4-15)

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)

Chapter 6 Data backup and initialization

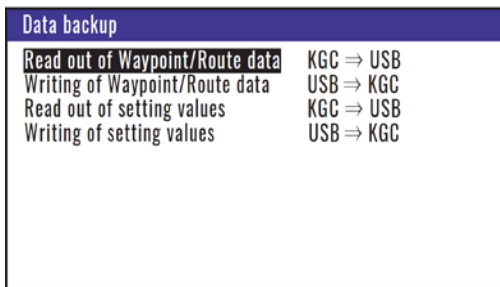
6.1 Data backup

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

6.1.1 Displaying the “Data backup” menu

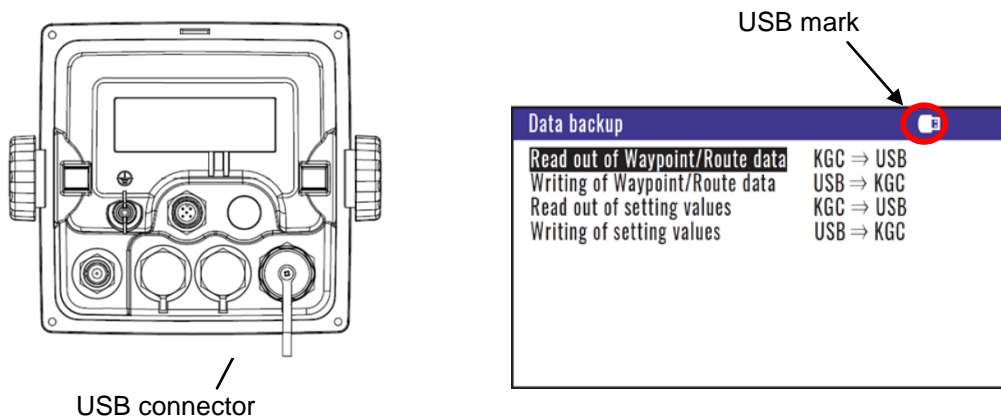
The procedure is as follows:

- (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.

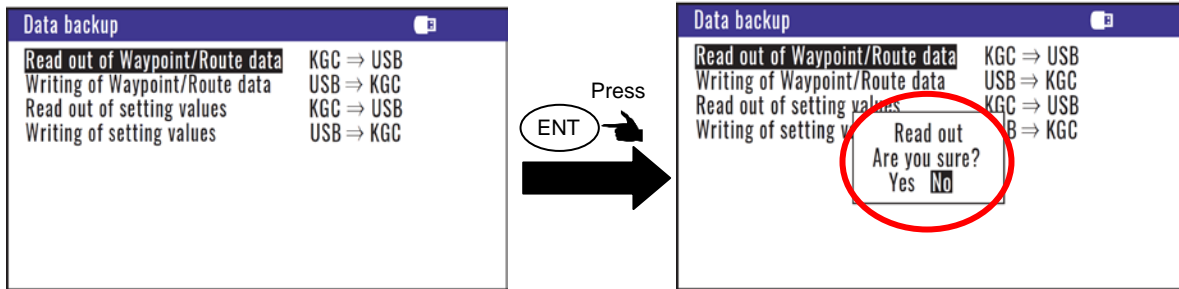
6.1.3 Read out of data

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.

Read out complete

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

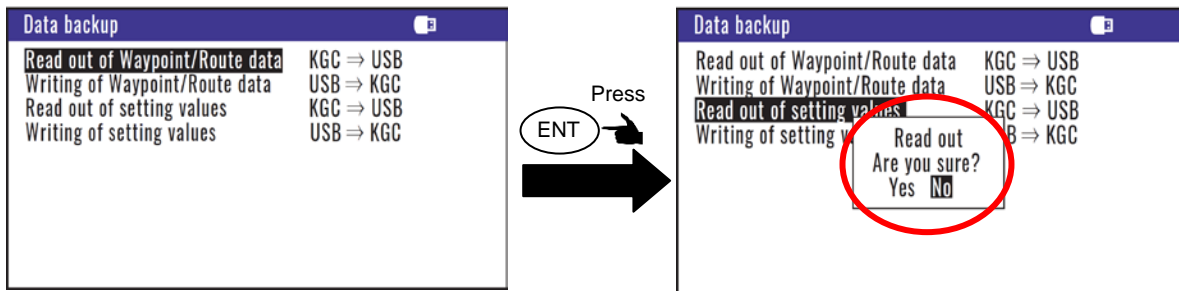


In the case “Read out of setting values”

- (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

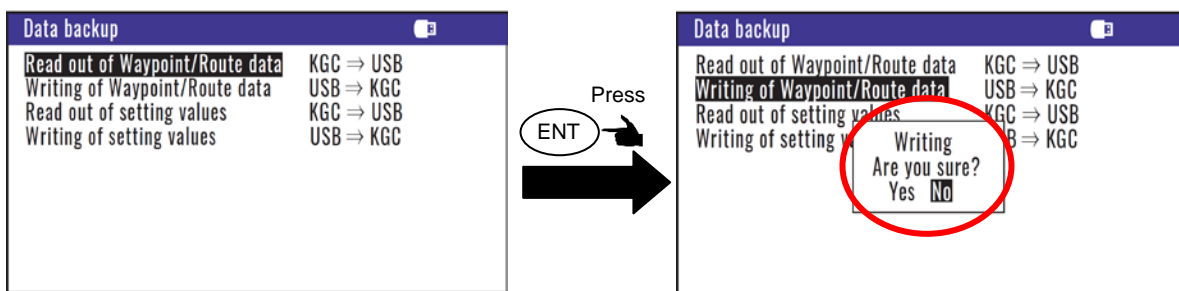
In the case “Writing of Waypoint / Route data”

*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

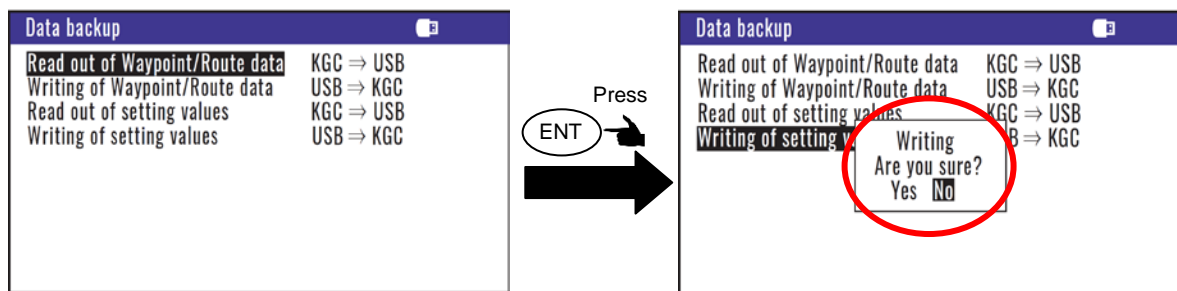


In the case “Writing of setting value”

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.

Writing complete



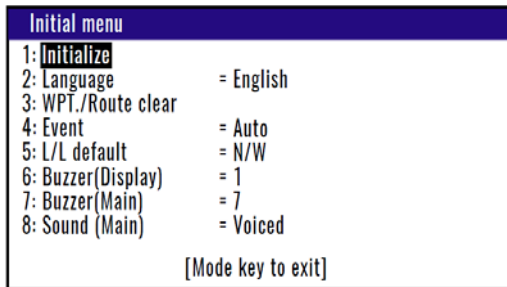
6.2 Initialization

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.

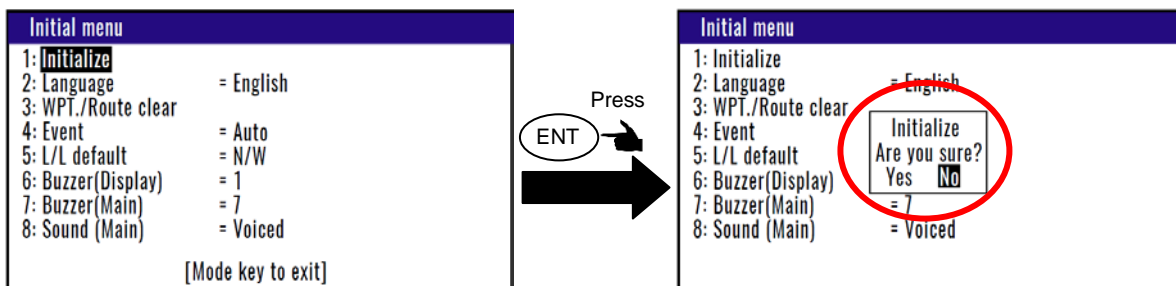


6.2.2 Initialize

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.

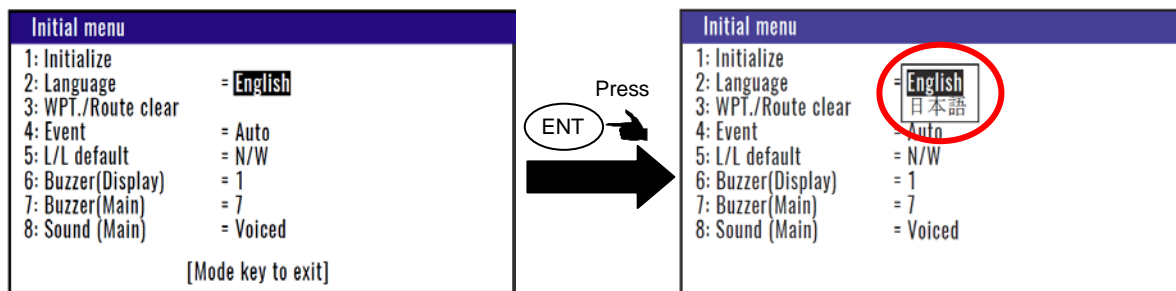


NOTE: If you want to backup the setting before initializing, please write setting value on USB memory. Refer to 6.1.3 and 6.1.4.

6.2.3 Language

You can select an indicated language.

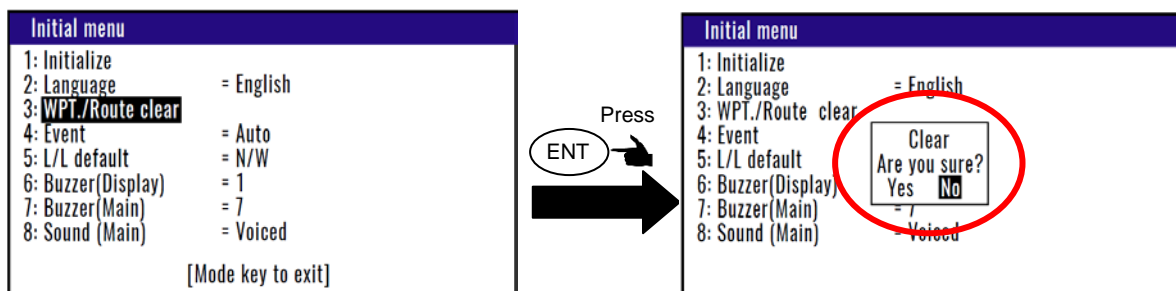
- (1) Press [▲] or [▼] key to move cursor onto the “Language”.
- (2) Press **ENT** key.
- (3) Select “English” or “Japanese” in the pop-up and press key. **ENT**
- (4) Press **MODE** key to exit initial menu.



6.2.4 WPT./Route clear

You can erase the entire data such as waypoints, events, POB, 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.

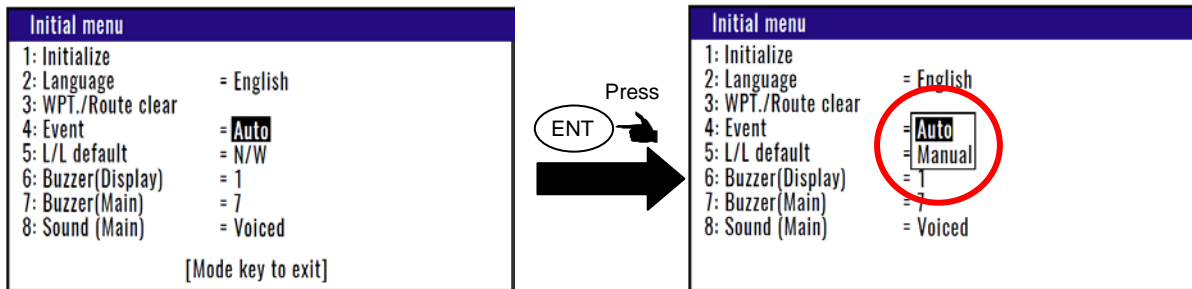
6.2.5 Changing a storing method for present position (Event)

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

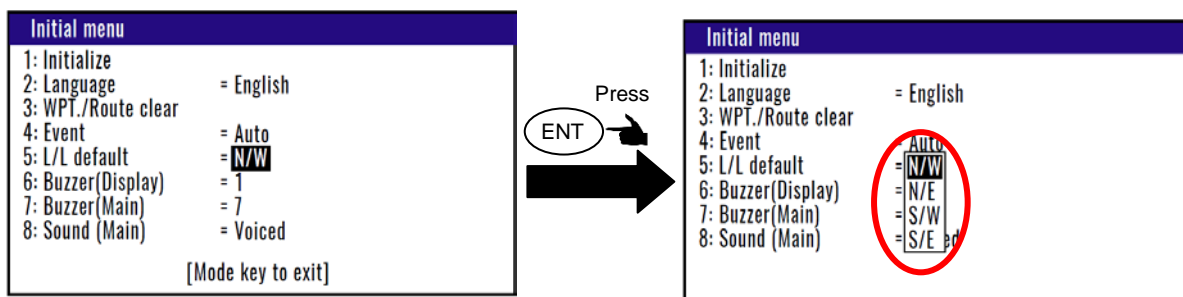
6.2.6 Selecting an initial value (North, South, East, West) of latitude/longitude.

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.

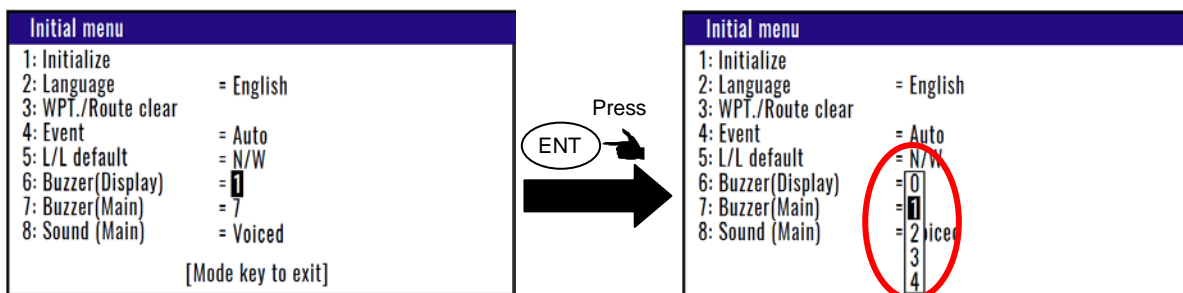
S/E (S. Lat./E. Long.): When editing a waypoint, GNSS position measurement is started using the south latitude/east longitude region as the initial value.



Initial setup: N/W

6.2.7 Frequency adjustment of the buzzer for display unit

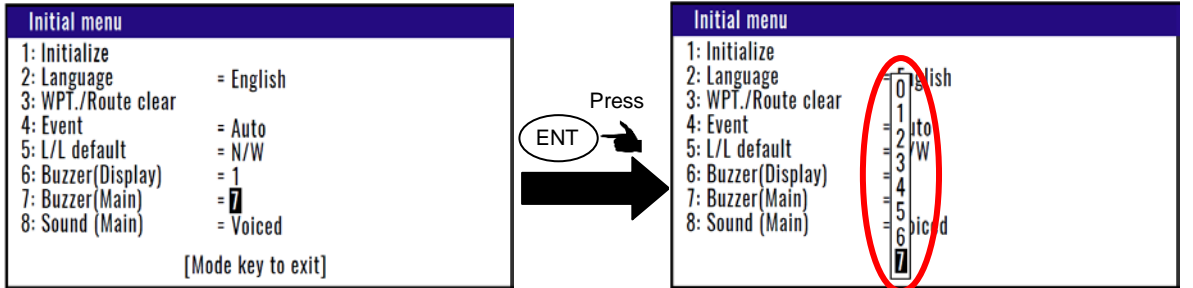
You can change the frequency of the buzzer for display unit. You can select the four frequencies. "0" is the lowest sound. "4" is the highest sound.



Initial setup: 4

6.2.8 Volume adjustment of the buzzer for main unit

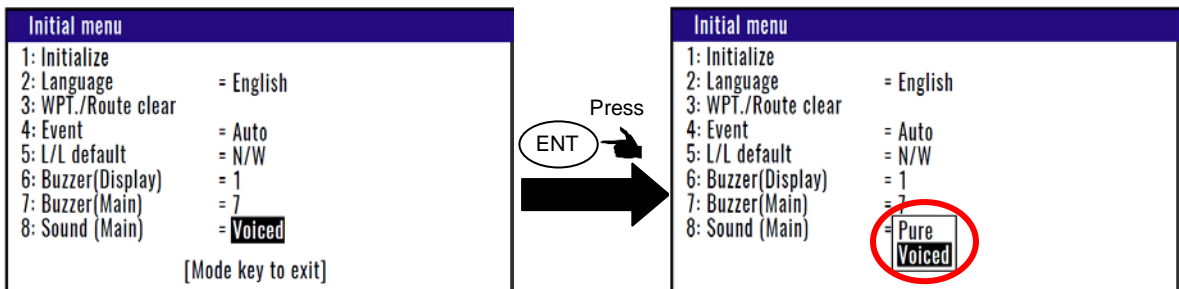
You can change the volume of the buzzer for main unit. You can select the 8 volumes. "0" is the lowest volume. "7" is the highest volume.



Initial setup: 7

6.2.9 Sound selection of the buzzer for main unit

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



Initial setup: Voiced

Chapter 7 Installation





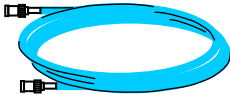
7.1 Installation consideration

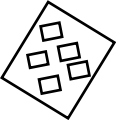
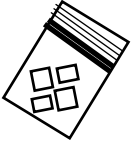

Qualified service technicians should perform the installation of KGC-300 that comprises the following operations.

- (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 | 0.74 kg | 1 |
| 2 | Main 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 | Antenna cable  | CW-392-15M | 3D-2V with BNC connectors on the both sides | 15m | 2 |

| | | | | | |
|---|--|---|---|--|----------|
| 6 | Accessories  | MCVR1.5/6-ST-3.81 | Connector (5) | | 1 set |
| 7 | Installation material  | TPT5X20U T.5X20MMX10M 10M[gray] B8X25U | Truss tapping screw (4) Self-bonding tape (1) PVC tape(1) Hexagon bolt for antenna Installation (4) | | 1 set |
| 8 | 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.

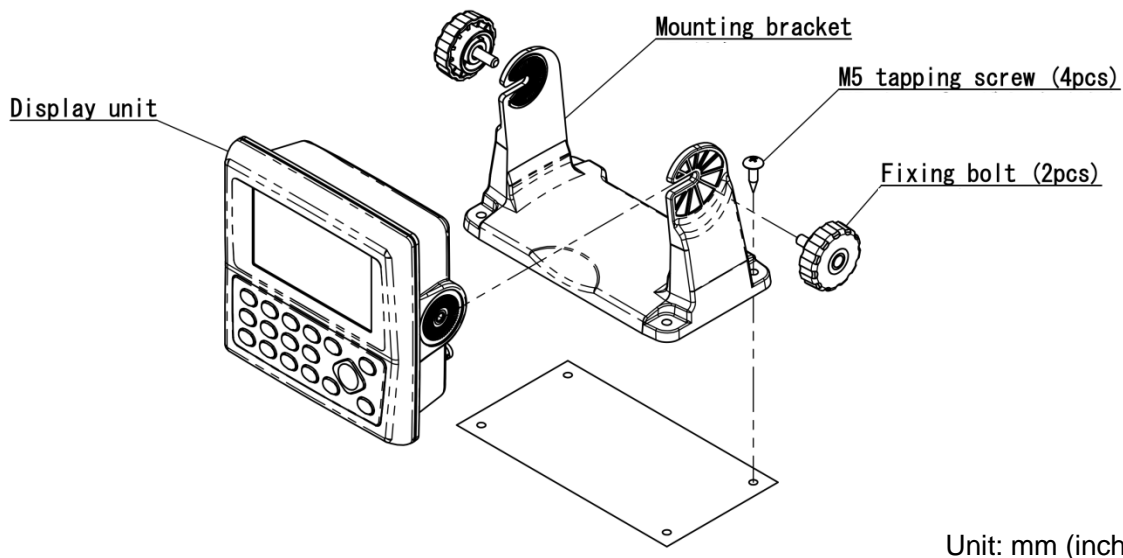
7.4 Display unit installation

Display unit can be installed either on pedestal or flush-mounted.

The following points shall be taken into consideration:

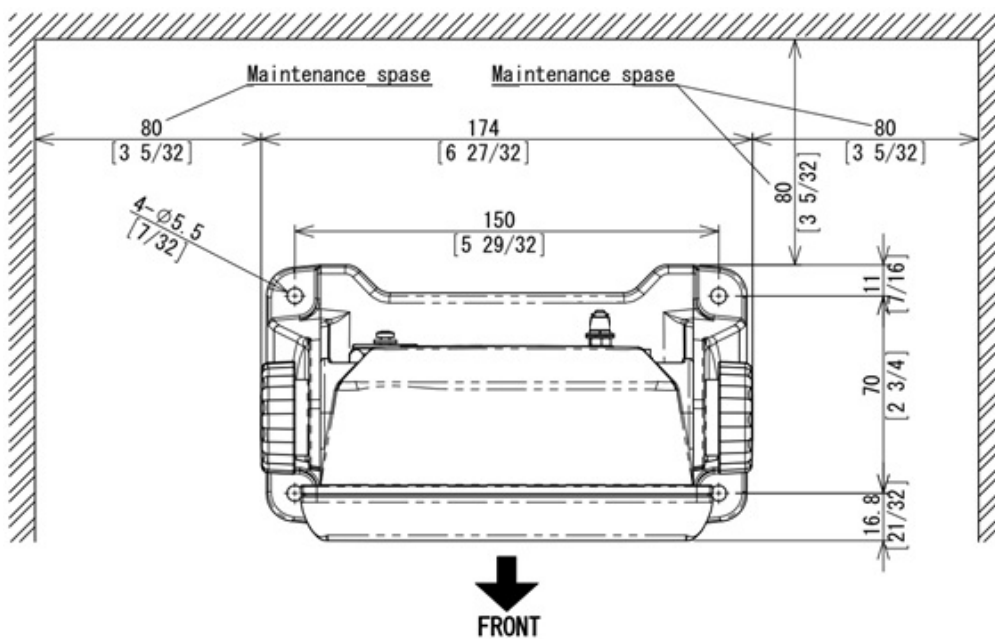
7.4.1 Table mounting

- (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.



Unit: mm (inch)

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).

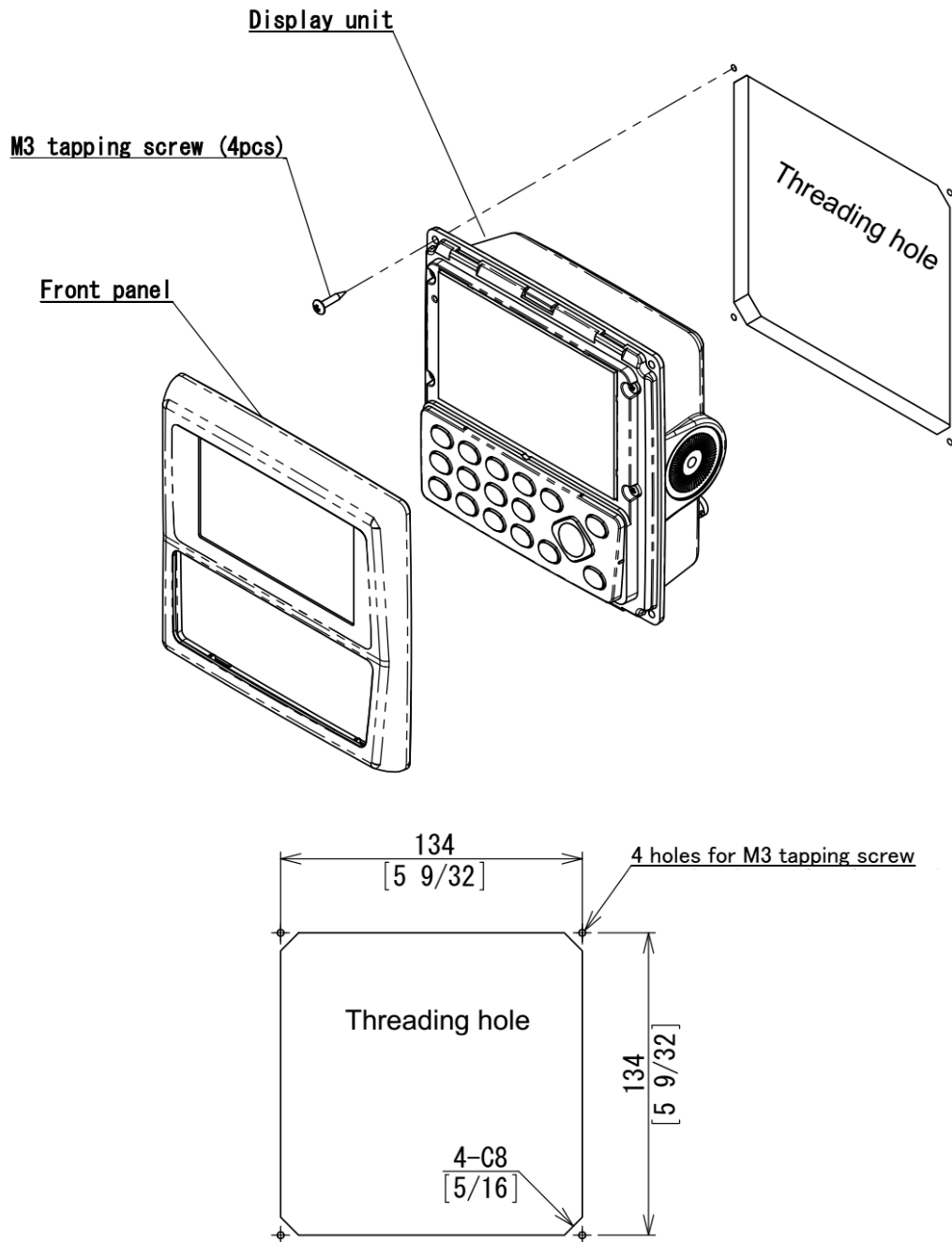


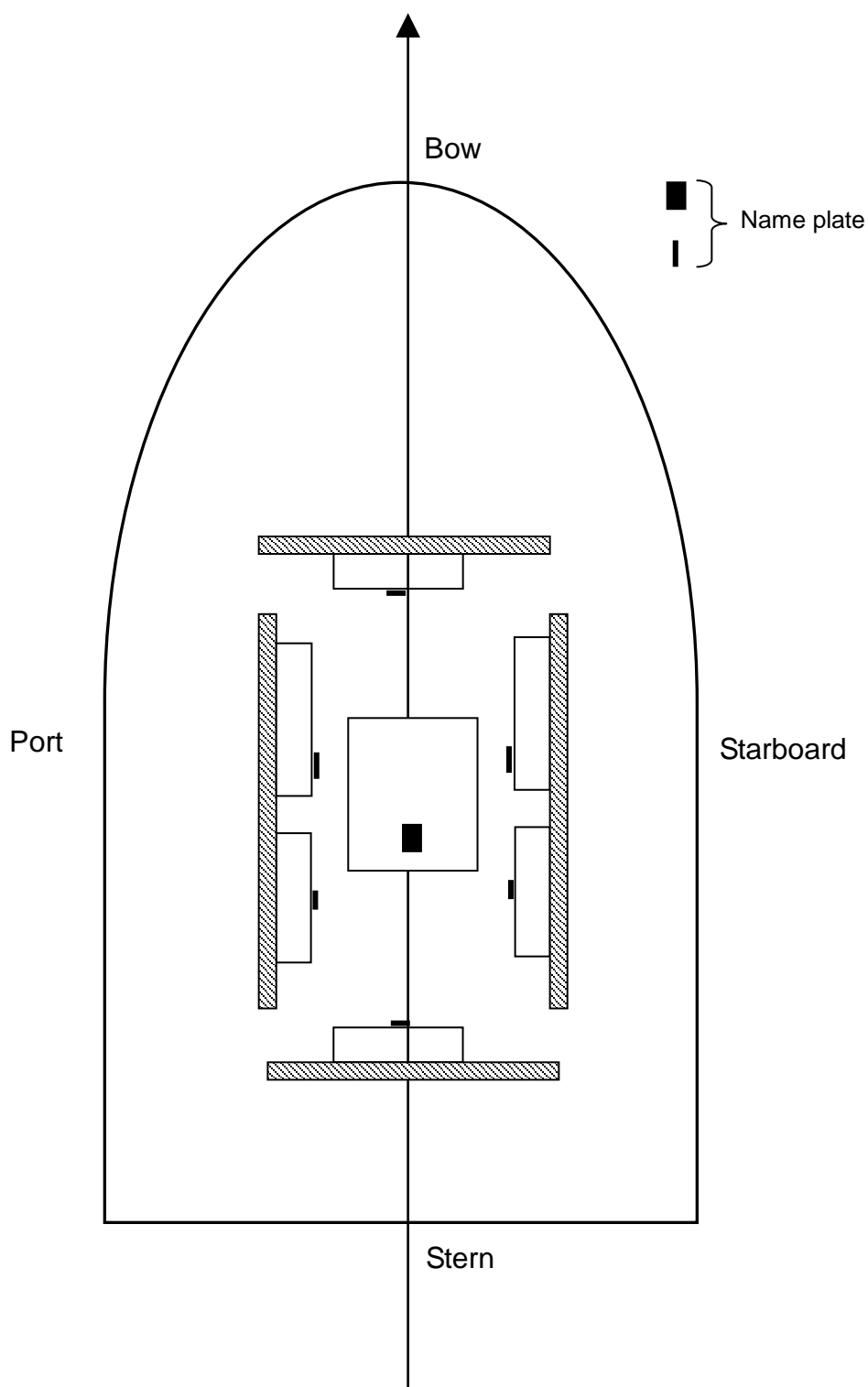
Figure 7.3 Flush mount installation

Unit: mm (inch)

7.5 Main unit installation

7.5.1 Main unit Installation of direction

The main unit can be installed vertical 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.

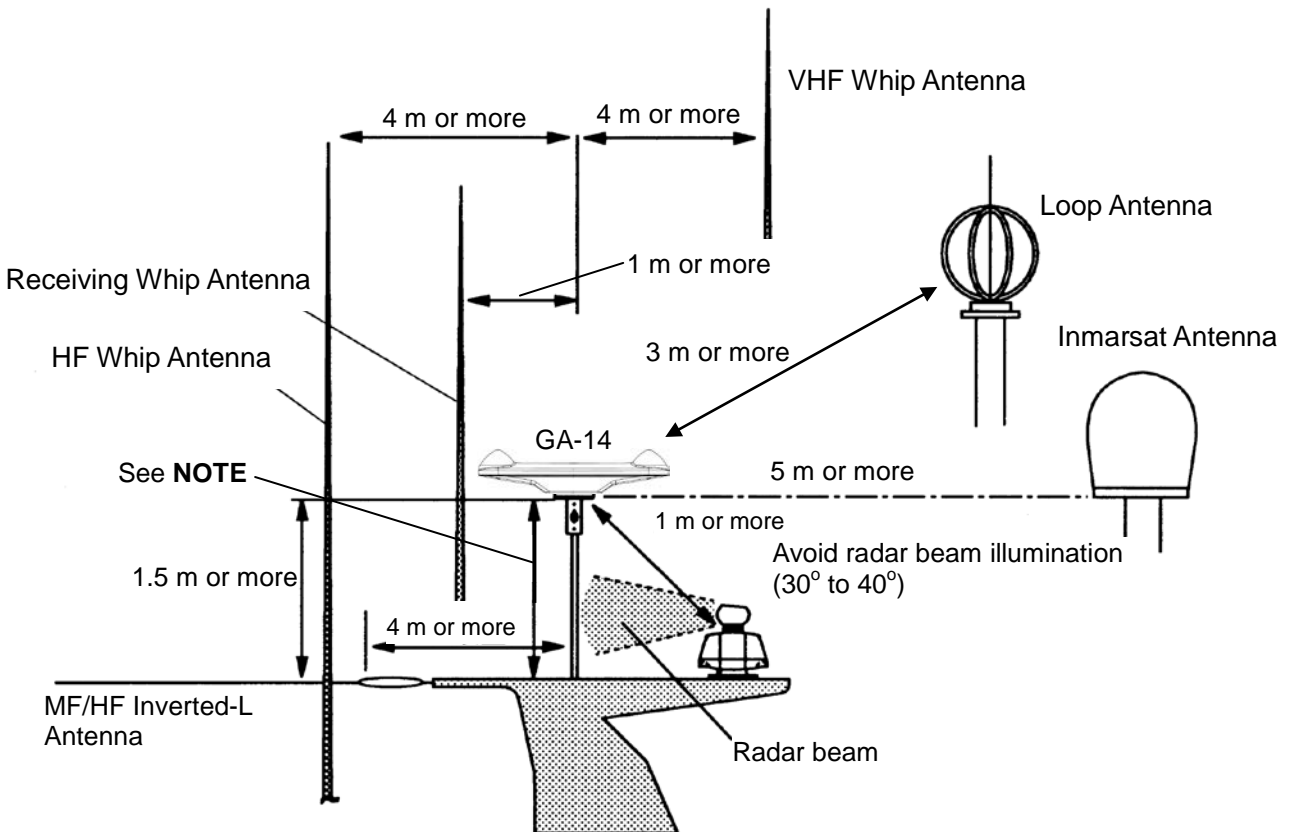


7.6 Antenna unit installation

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.

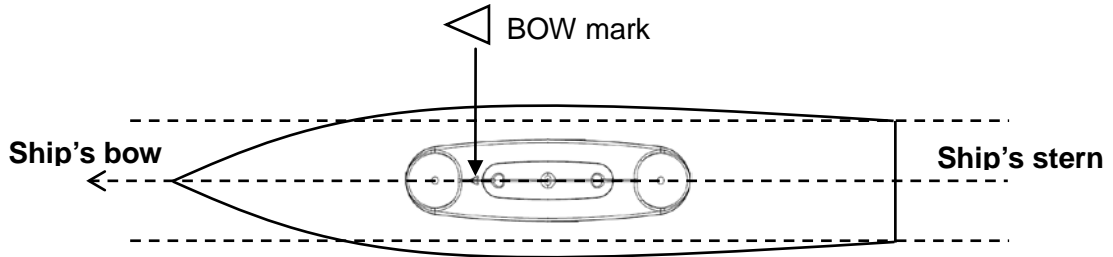
- (1) As far away from any metallic objects as possible.
- (2) At least 4 meters (13.2 feet) away from the MF/HF reversed L-type TX antenna, VHF or HF whip antenna.
- (3) At least 1.5 meter (4.9 feet) above the MF/HF reversed L-type TX antenna.
- (4) At least 1 meter (3.3 feet) away from the receiving 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 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

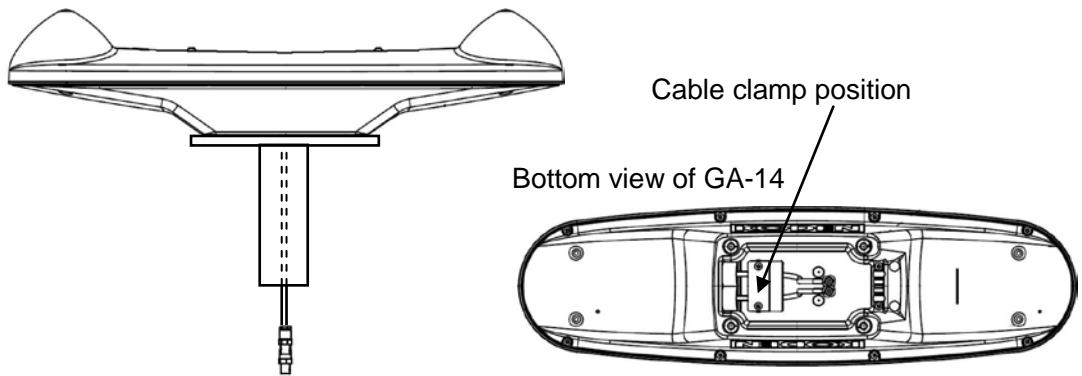
The GPS antenna GA-14 should be installed, as illustrated below, on the keel line with the BOW mark oriented to the ship's bow. If this is not possible due to the ship's superstructure, the antenna may be moved in parallel to the keel line. However, the antenna should be, where possible, installed on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



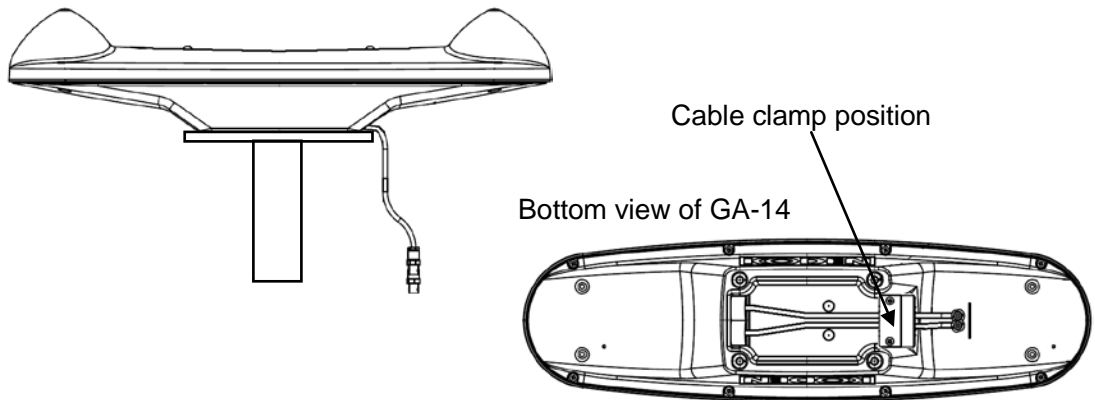
7.6.2 Antenna cable layout method

Two ways to run antenna cable from the antenna.

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

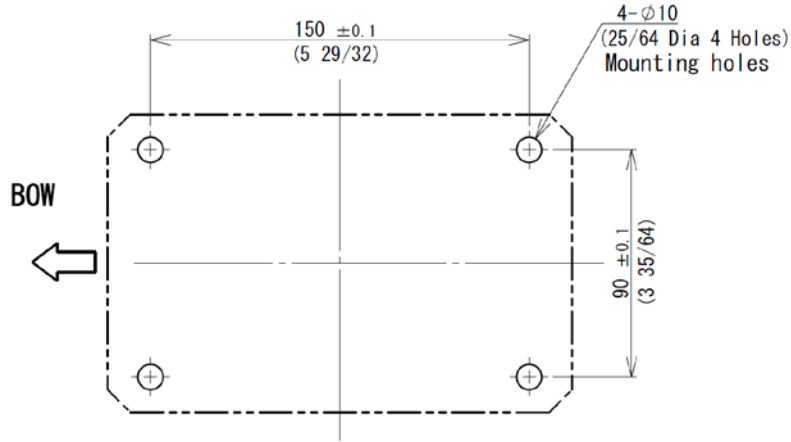


- (2) Antenna cable is dropped off from the side of the antennal and ran outside of the mast pipe. In this case it is necessary to change the setting position of the cable clamp.



7.6.3 Installation of GPS antenna

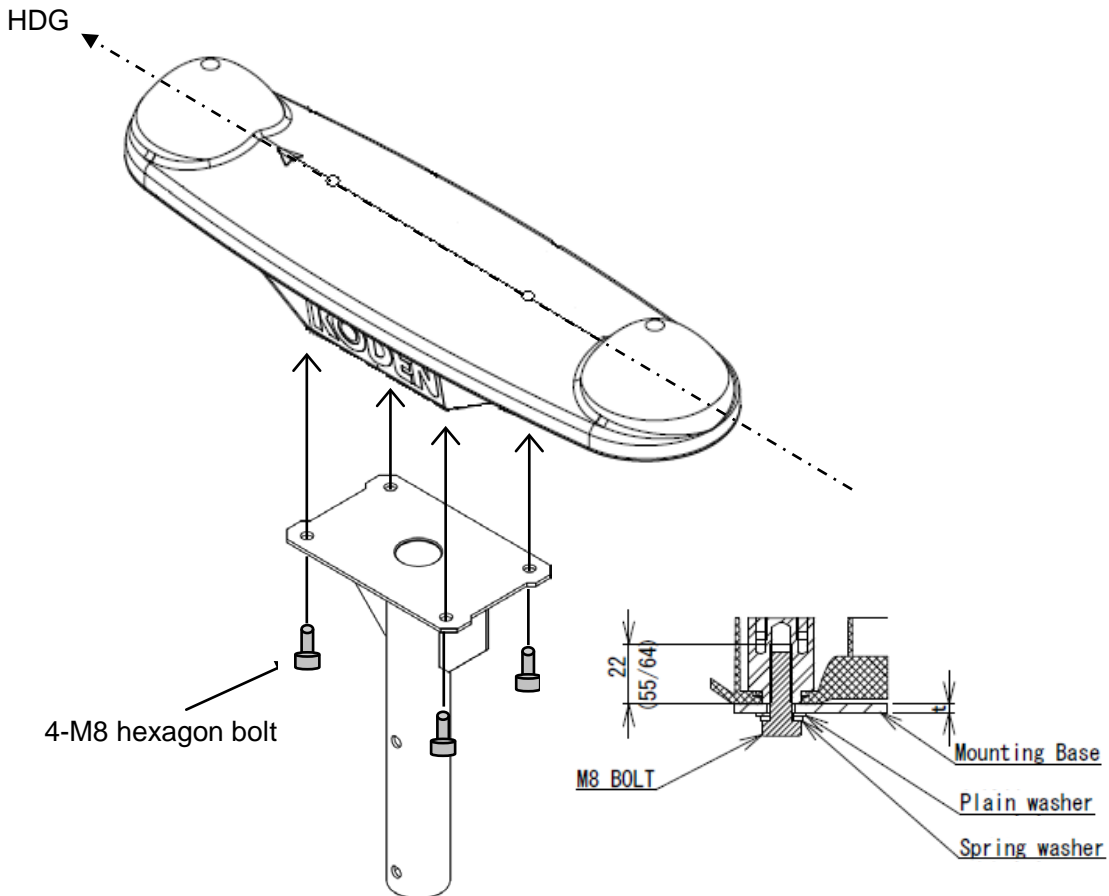
To attach the GPS antenna, four (4) M8 bolts are used. Referring to the illustration below, make four (4) holes on the cradle, fix the bracket. When the thickness of the bracket is 4 to 5mm, supplied bolts may be used (M8 x 25). When the bracket is more than 6 mm thick, the bolts should be chosen from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



Unit: mm (inch)

Drawing of work for mounting holes

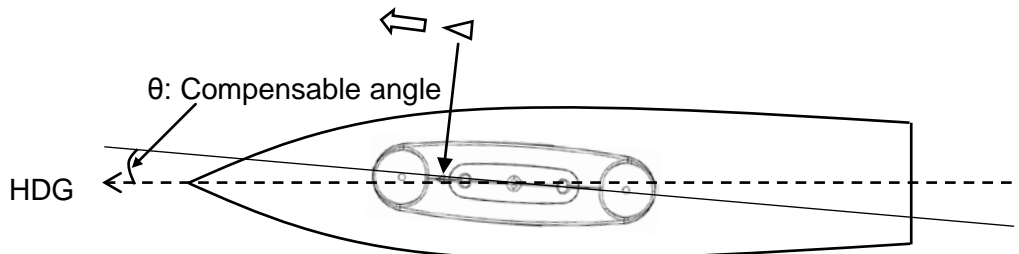
| Platform thickness | Bolt for fixing the antenna |
|--------------------|-----------------------------|
| 4 to 5 mm | M8x25 |
| 6 to 10 mm | M8x30 |



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")

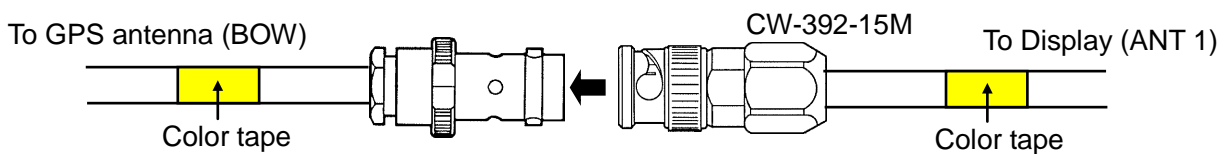
When it is installed with θ° clockwise off, enter a compensation value $[-\theta]$ in the "MENU 3, COMPENSATION". When it is installed with θ° counterclockwise off, enter a compensation value $[+\theta]$ in the menu.



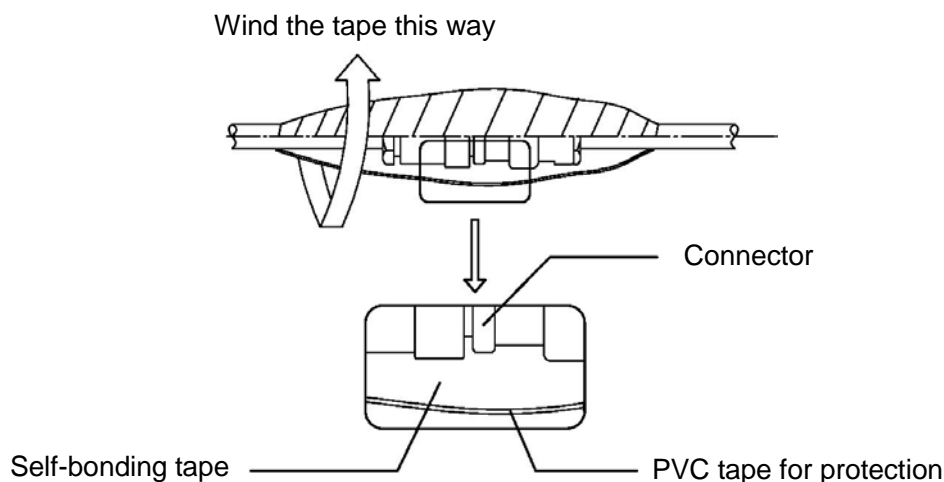
7.6.5 Waterproofing connection

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

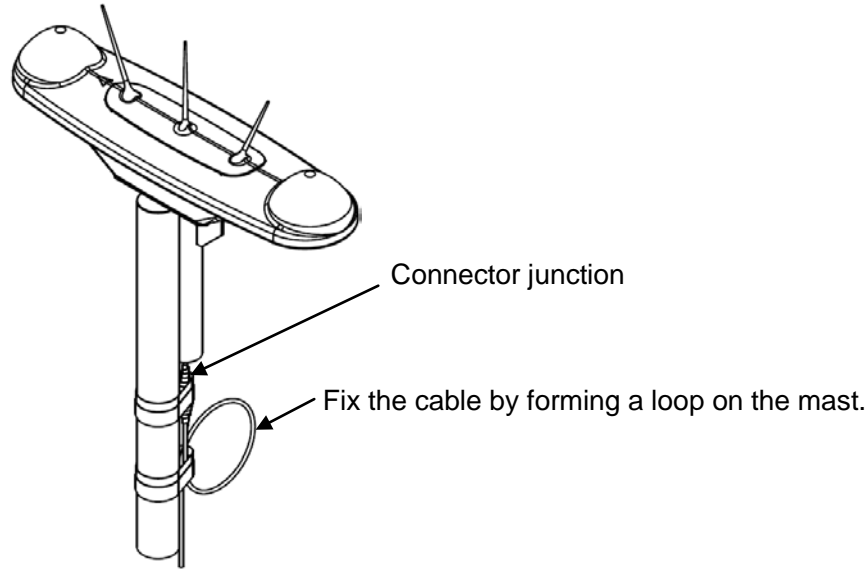
- (1) Pay attention to the BOW antenna cable marked with tape.



- (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.



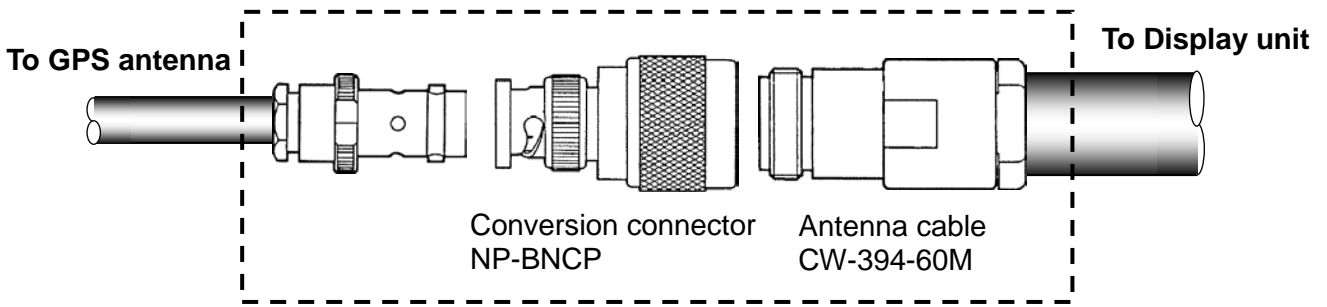
To prevent the tension hanging over the connector junction, the cable shall be fixed as described in the illustration below.



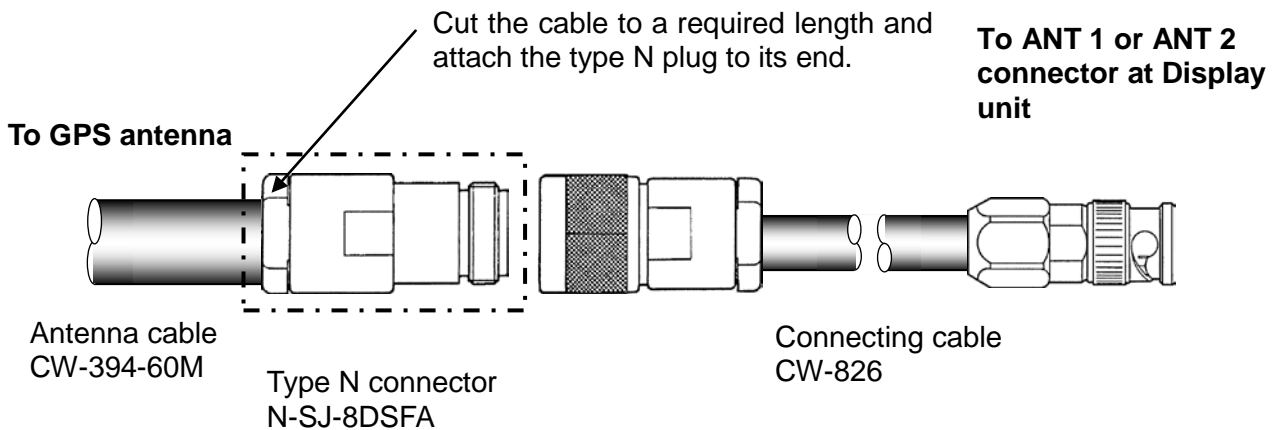
7.6.6 Connecting the 60m antenna cable kit CW-394.KIT to GPS antenna

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

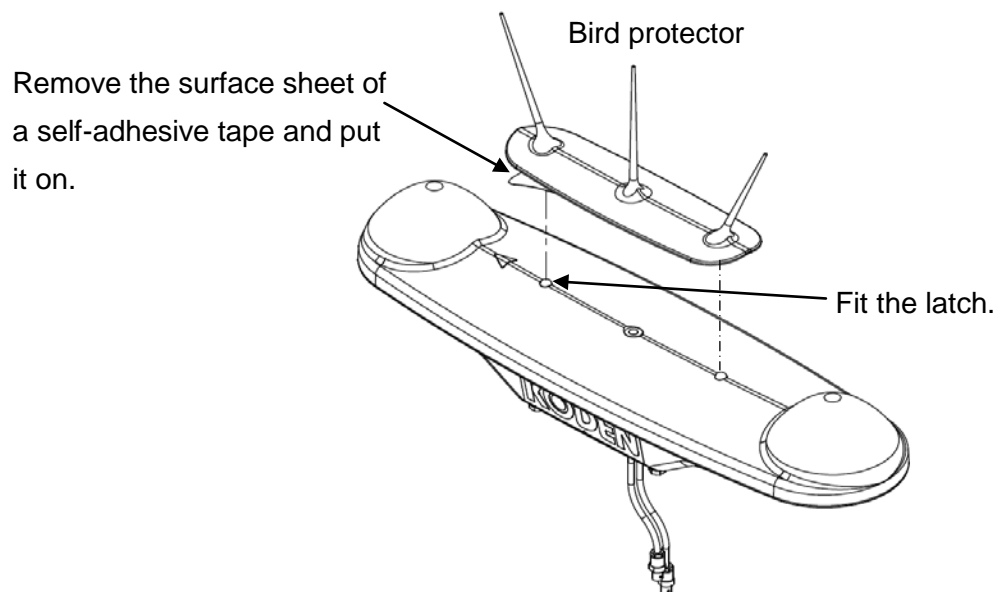



(2) Connecting the Display unit



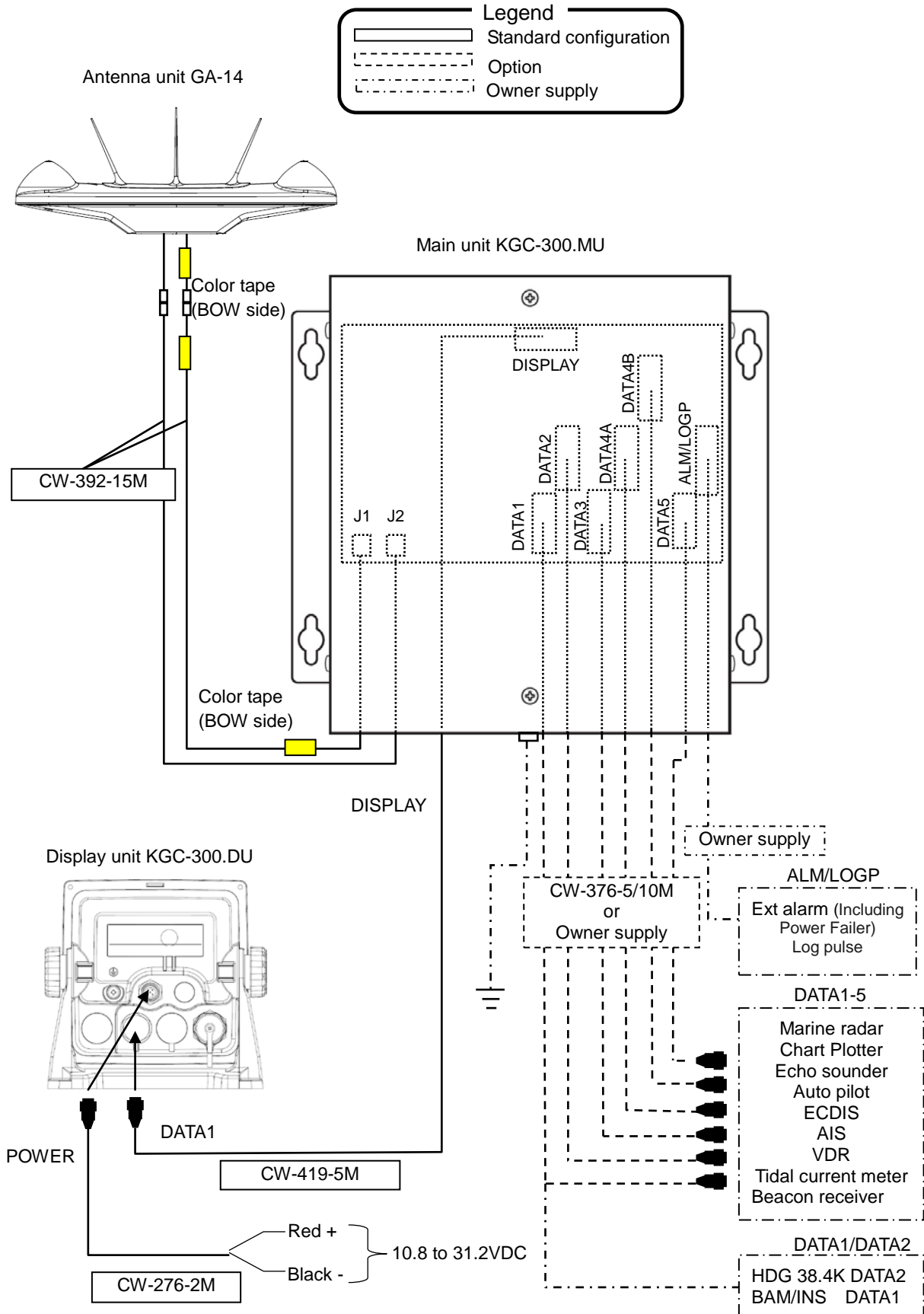
7.6.7 Installing the bird protector to Antenna unit

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.

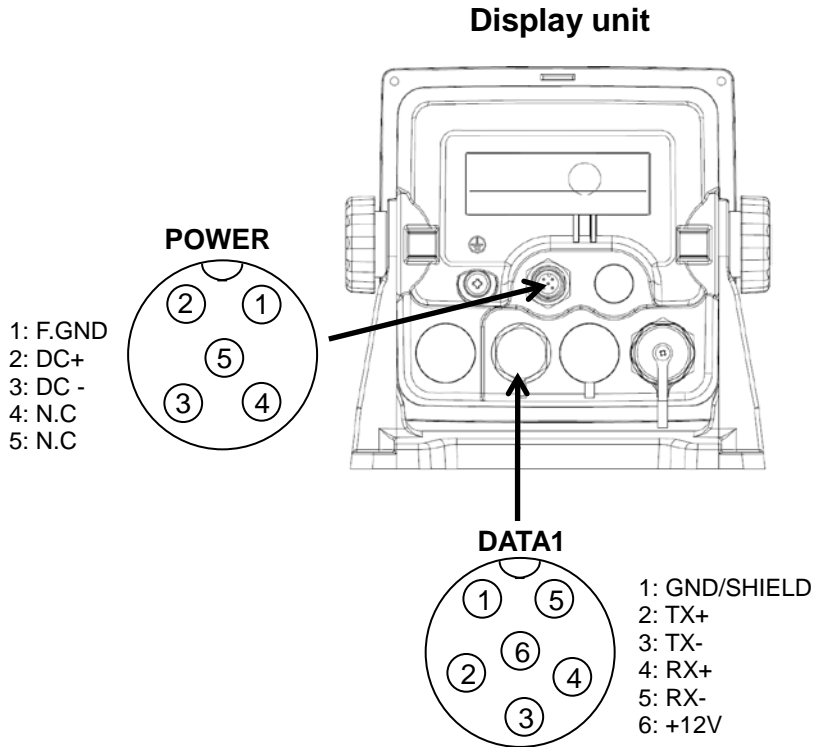


 **Caution: Put it on the surface without any gaps.**

7.7 Cable connections to KGC-300

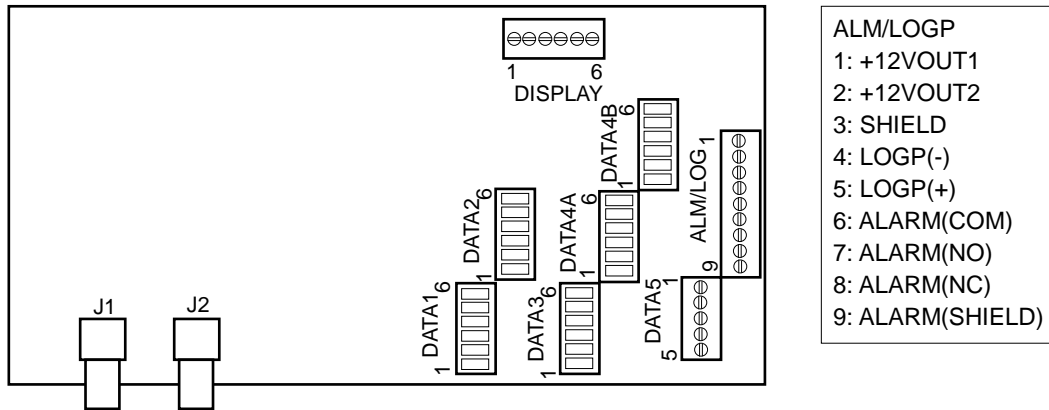


7.8 Connector pin outs



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

Main unit

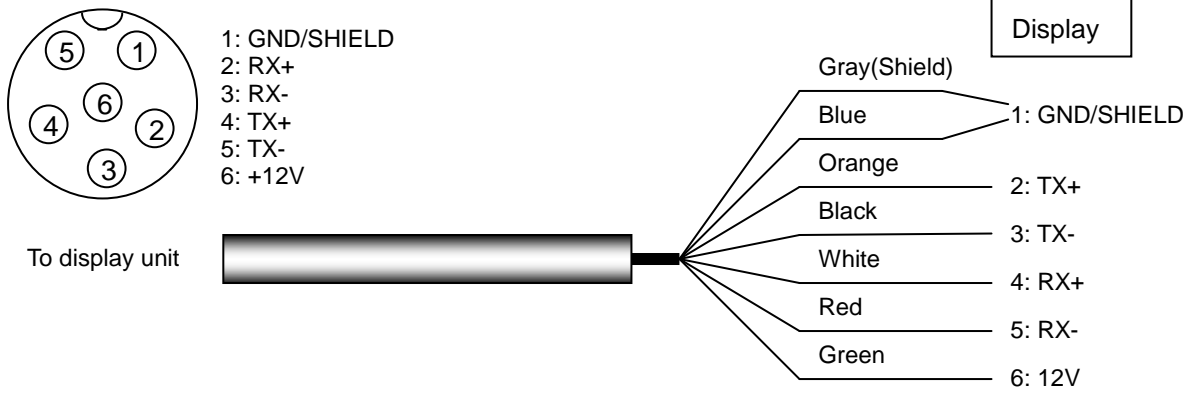


*Pin6 and Pin8 of [ALM/LOGP] are output of the power failer.

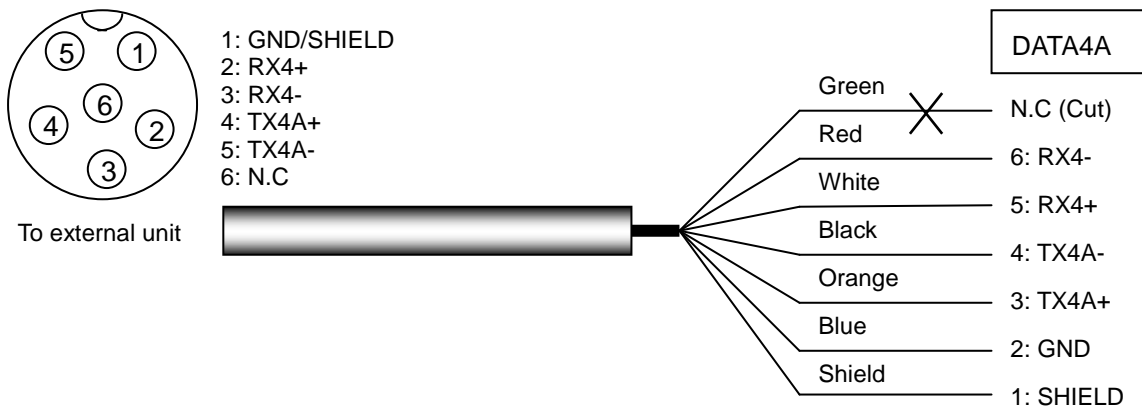
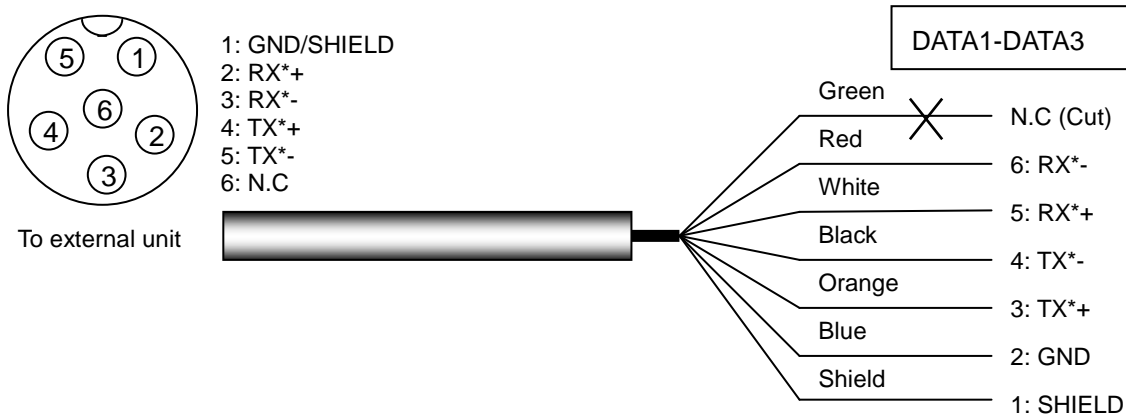
| | | | | | | |
|--|---|---|---|--|--|--|
| <p>DISPLAY</p> <p>1: GND/SHIELD 2: TX+ 3: TX- 4: RX+ 5: RX- 6: +12V</p> | <p>DATA1</p> <p>6: RX1- 5: RX1+ 4: TX1- 3: TX1+ 2: GND 1: SHIELD</p> | <p>DATA2</p> <p>6: RX2- 5: RX2+ 4: TX2- 3: TX2+ 2: GND 1: SHIELD</p> | <p>DATA3</p> <p>6: RX3- 5: RX3+ 4: TX3- 3: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

For details of the interface circuit, refer to “10.6 Input / Output circuit”

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

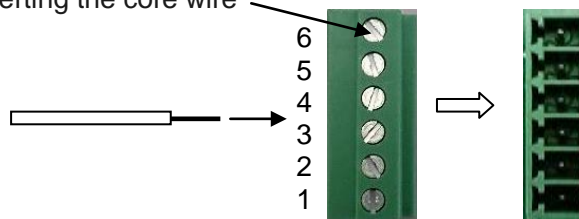


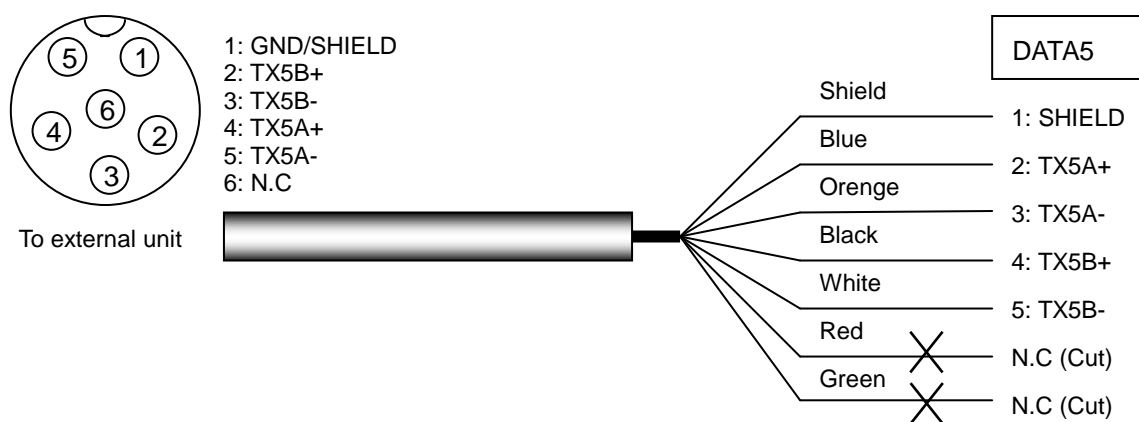
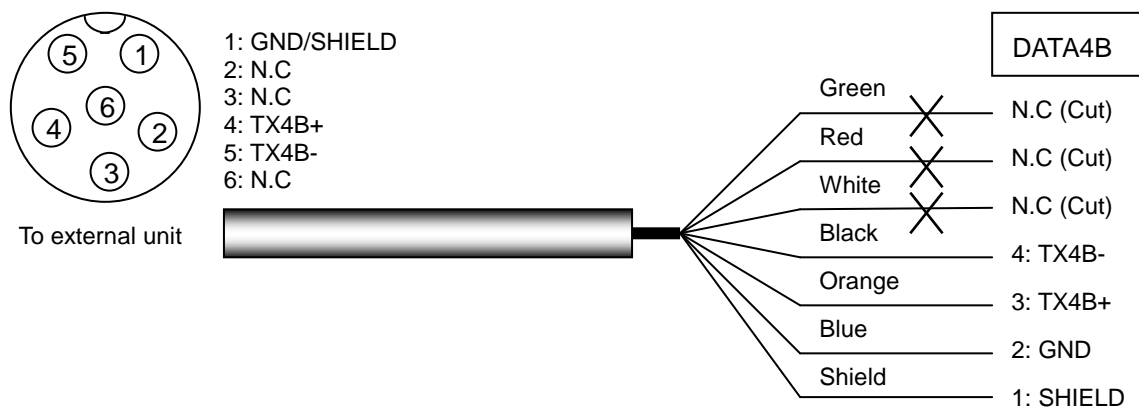
(CW-376-5M/10M Pin number form cable side)



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

Tighten the screw after inserting the core wire





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?

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 PDOP: 3 or less | Heading | 0.5 ° rms |
| | 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 ° | |
| Maximum rate of turn | 45 °/sec | |
| Maximum roll/pitch angle | 30 ° | |
| Maximum follow-up acceleration | 1g | |
| Base line length | 0.5m | |
| Display | 4.3 inch color LCD (480x272 dot's, effective picture area: 95.04 x 53.86 mm) | |
| Display mode | HDG1, HDG2, ROT, NAV1, NAV2, POB (People 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, POB 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, 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 or ALR, HBT *DATA1 only) *ARC, ACN 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: Main unit: 0.4m Display unit: 0.8m
 Steering: Main unit: 0.2m Display unit: 0.4m

8.1.4 Environmental conditions**(1) Temperature and humidity**

| | |
|-----------------------|-------------------------------|
| Operating temperature | Main 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 $\pm 1\text{mm} \pm 10\%$ (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

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

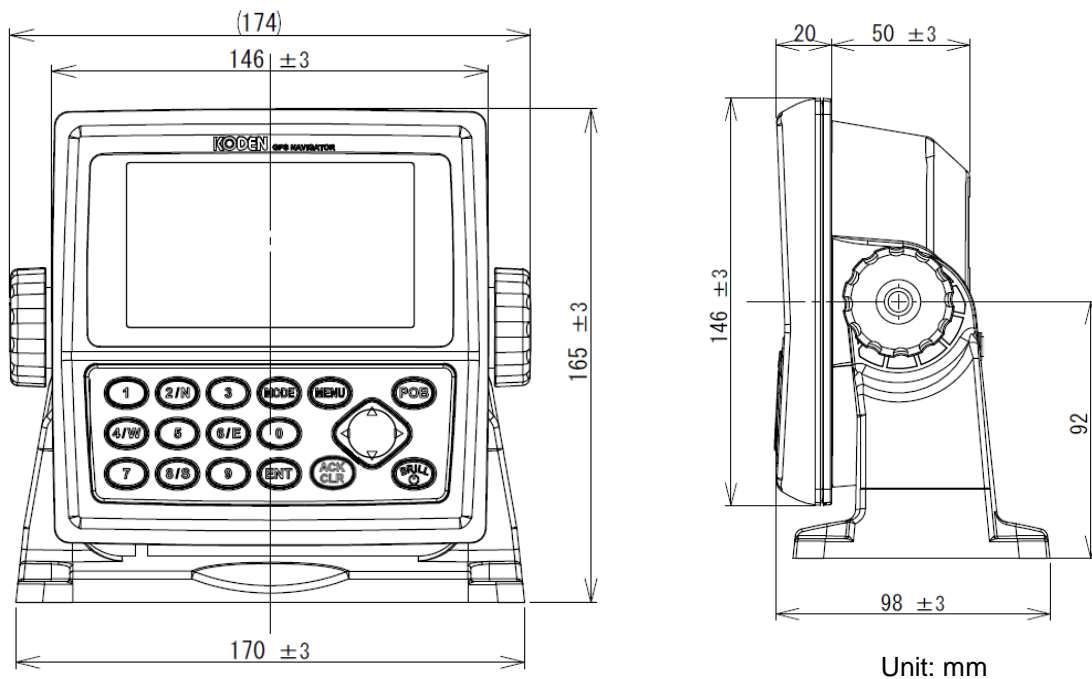
8.2 External dimensions and weight

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

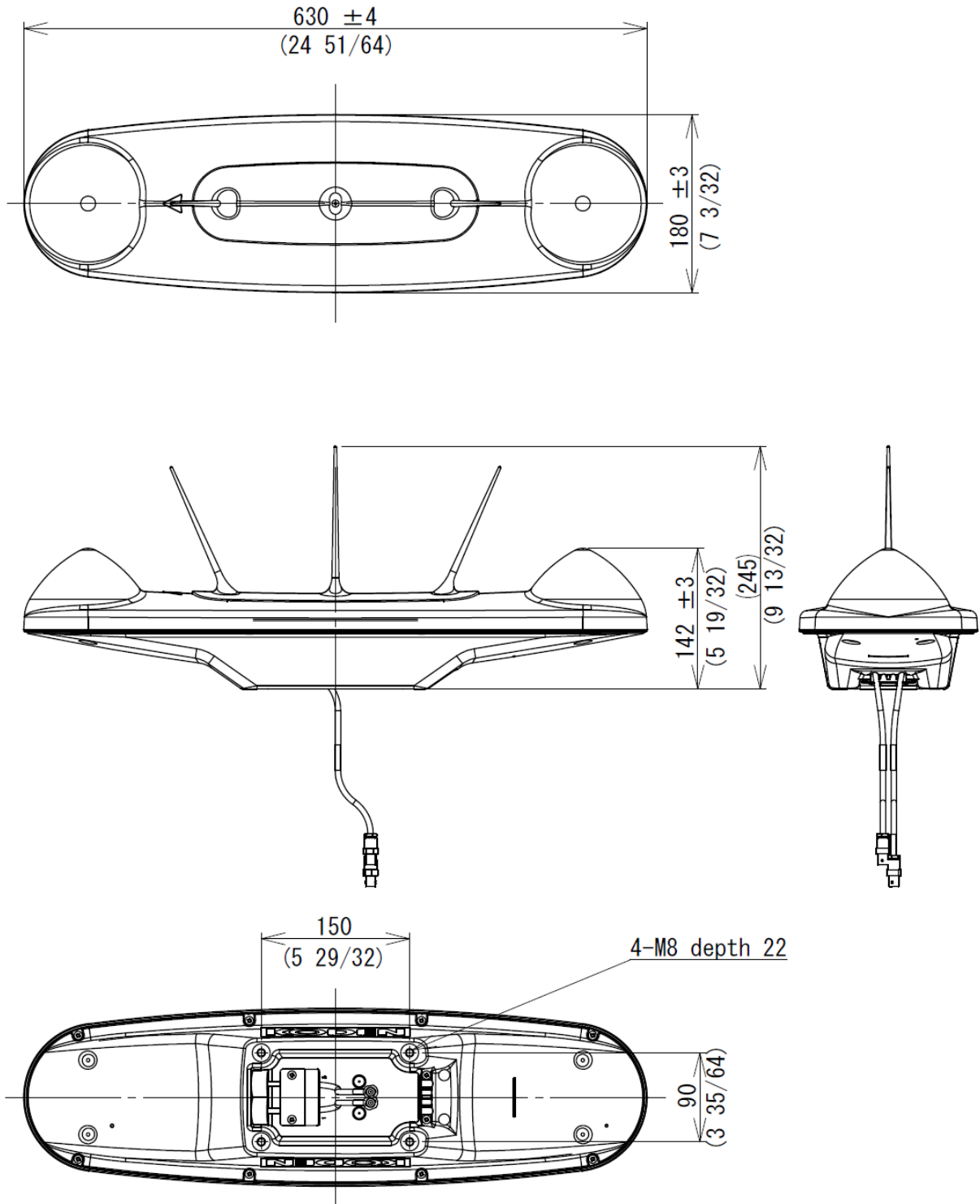
External dimensions: Width x Height x Depth

Dimensions (WxHxD): 146 x 146 x 70 (mm)

Weight: 0.74 kg



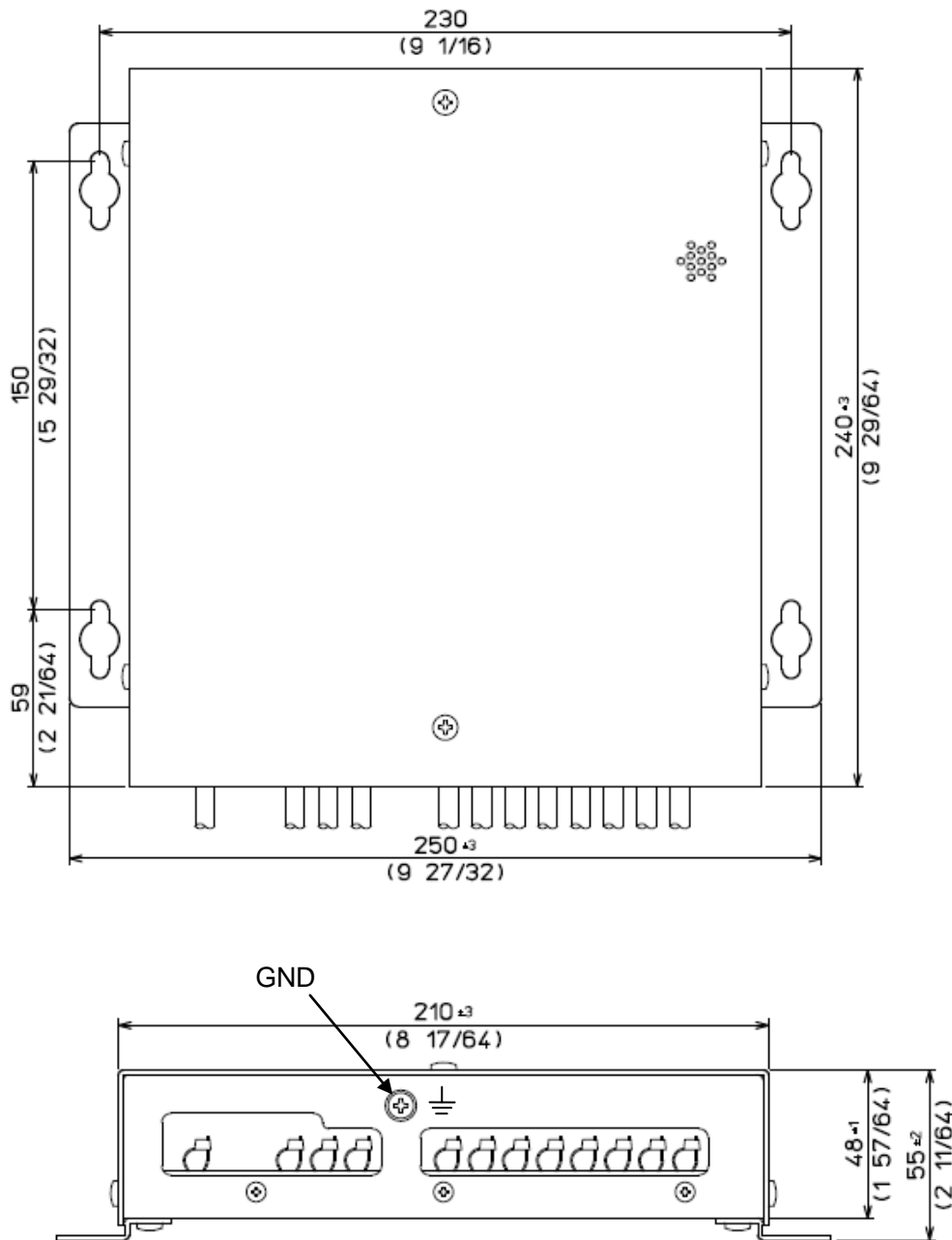
8.2.2 GPS Antenna : GA-14



Weight: 2.2kg (With antenna cables)

Unit: mm (inch)

8.2.3 Main unit : KGC-300.MU



Weight: 1.1kg

Unit: mm (inch)

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. | <ul style="list-style-type: none"> • 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. | <ul style="list-style-type: none"> • Connect the connector securely. • Use a proper power as per specification. • Check the connection between power cable and battery. • Replace the display unit. |

| | | |
|---|---|---|
| <p>Unstable signal reception</p> | <ul style="list-style-type: none"> • Are the connections between the GPS antenna and the display unit is correct and firm? • Is there any obstacle preventing the GPS antenna unit from receiving the GPS signal? | <ul style="list-style-type: none"> • Check the connection and reconnect, if necessary. • If an obstacle exists viewed from the GPS antenna site, the GPS signal cannot be received properly. Remove the obstacle or, if this is not possible, change the antenna position for better viewing range available. |
| <p>Heading bearing is not displayed. (---.° is displayed)</p> | <ul style="list-style-type: none"> • Antenna connection on the back of display may be loose. • Antenna view may be blocked by obstacles. | <ul style="list-style-type: none"> • Connect the connector securely. • Change the installation position of the GPS antenna. |
| <p>Heading bearing is displayed, but heading output is not available.</p> | <ul style="list-style-type: none"> • 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. | <ul style="list-style-type: none"> • 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) |
| <p>Incorrect heading bearing data is displayed / output.</p> | <ul style="list-style-type: none"> • Cables on the back of the display may be swapped between ANT1 and ANT2 • Forward orientation of the antenna may not be correct. | <ul style="list-style-type: none"> • Connect the bow side antenna cable to ANT 1 connector of main unit, and connect the stern side antenna cable to ANT 2 connector of main 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, and ALC, /ALF are used for alert handling. (Need to activate the ALF sentence for ACN input. Refer to Page 3-6)

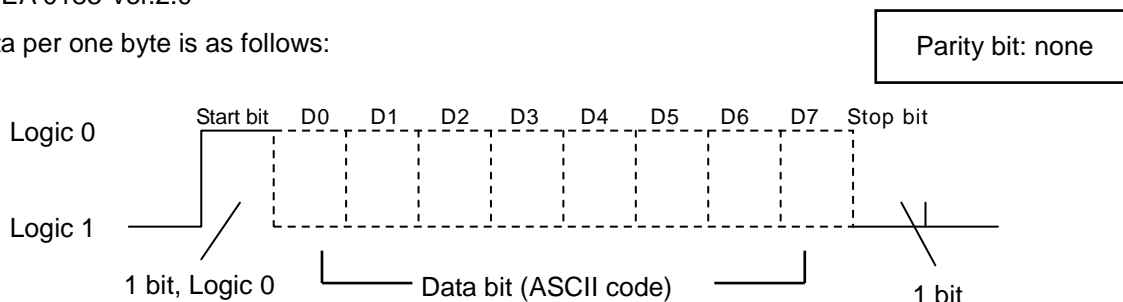
| Description | Contents of data field |
|-------------|--|
| ACN | <p>Alert command</p> <p>\$ --ACN, hhmmss.ss,aaa,x.x,x.x,c,a*hh <CR><LF></p> <p>Legend:</p> <ul style="list-style-type: none"> A = acknowledge Q = request / repeat information O = responsibility transfer S = silence |

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:



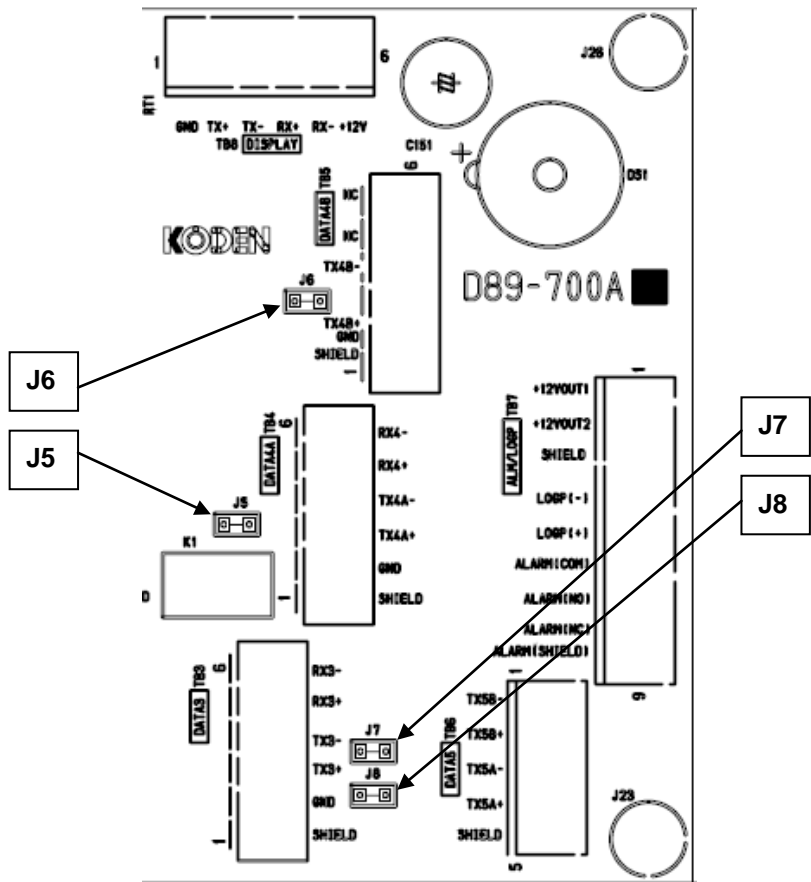
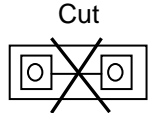
10.3 Output data specification

| 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 or ALR, 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



- AD-10-1-**
- DATA4A**
 - 6: RX4-
 - 5: RX4+
 - 4: TX4A- AD-10 DATA-
 - 3: TX4A+ AD-10 DATA+
 - 2: GND
 - 1: SHIELD
- DATA4B**
- 6: RX4-
 - 5: RX4+
 - 4: TX4B- AD-10 CLOCK-
 - 3: TX4B+ AD-10 CLOCK+
 - 2: GND
 - 1: SHIELD

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

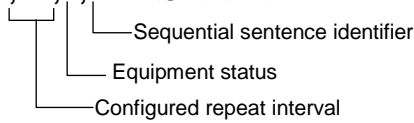
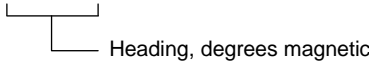
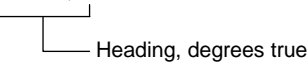
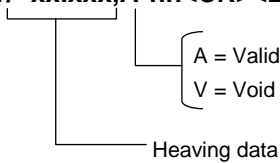
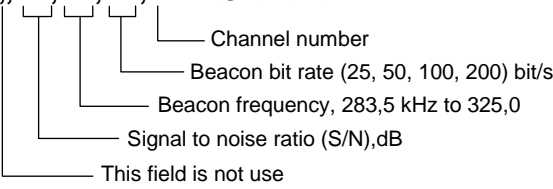
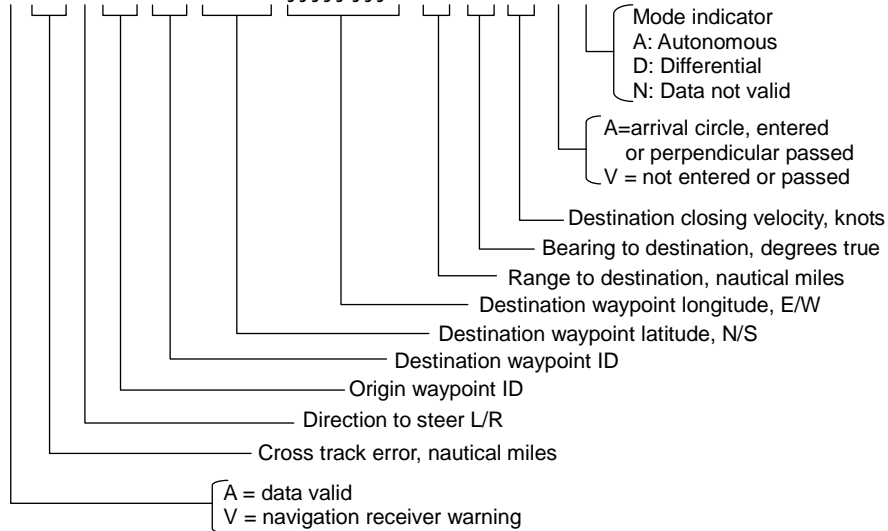
10.5 Output sentence

| Description | Contents of data field |
|----------------------------|---|
| <p>AAM</p> | <p>Waypoint arrival alarm</p> <p>\$ GP AAM, A, A, x.x, N, c--c*hh <CR><LF></p> <ul style="list-style-type: none"> GP: Talker device A: Sentence type A: Arrival circle entered (A) / Not entered (V) x.x: Arrival circle radius N: Units of radius, nautical miles c--c*hh: Waypoint ID |
| <p>ALC *DATA1 only</p> | <p>Cyclic alert list</p> <p>\$--ALC,xx,xx,xx,x.x,aaa,x.x,x.x,x.x,.....,aaa,x.x,x.x,x.x*hh<CR><LF></p> <ul style="list-style-type: none"> --: Sentence number, 01 to 99 ALC: Alert identifier xx: Manufacturer mnemonic code xx: Number of alert entries xx: Sequential message identifier, 00 to 99 x.x: Alert instance x.x: Revision counter x.x: Alert entry n: Additional Alert entries aaa: Alert text x.x,x.x,x.x: Alert instance, revision counter, alert entry n *hh: Waypoint ID |
| <p>ALF *DATA1 only</p> | <p>Alert sentence</p> <p>\$--ALF,x,x,x,hmmss.ss,a,a,aaa,x.x,x.x,x.x,c---c*hh<CR><LF></p> <ul style="list-style-type: none"> --: Sentence number, 1 to 2 ALF: Alert identifier x,x,x: Manufacturer mnemonic code hmmss.ss: Time of last change a,a: Alert priority (E=Emergency Alarm, A=Alarm, W=Warning, C=Caution) aaa: Alert text x.x,x.x,x.x: Alert instance, revision counter, alert entry n c---c: Alert status (V=active-unacknowledged, S=active-silenced, A=active-acknowledged, O=active-responsibility transferred, U=rectified-unacknowledged) *hh: Waypoint ID |

| Description | Contents of data field |
|---|--|
| <p>ALR *DATA1 only</p> | <p>Set alarm state \$--ALR, hhmmss.ss, xxx, A, A, c--c*hh<CR><LF></p> |
| <p>APB *Do not use on SOLAS ships</p> | <p>Heading / track controller (autopilot) 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></p> |
| <p>ATT</p> | <p>Ship's heading, Pitch and Roll information (FURUNO proprietary sentence) \$ PFEC, GPatt, xxx.x, +/-00.0, +/-00.0 *hh <CR><LF></p> |
| <p>BOD</p> | <p>Bearing origin to destination \$--BOD, x.x, T, x.x, M, c--c, c--c*hh<CR><LF></p> |

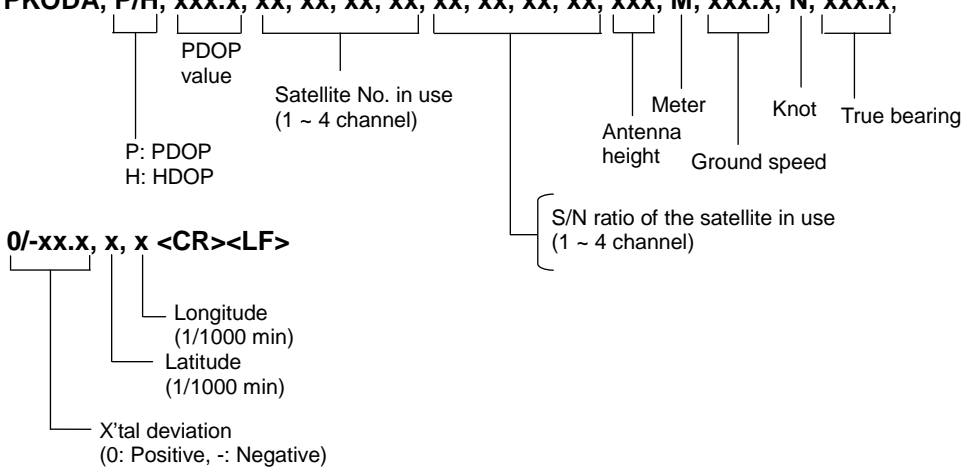
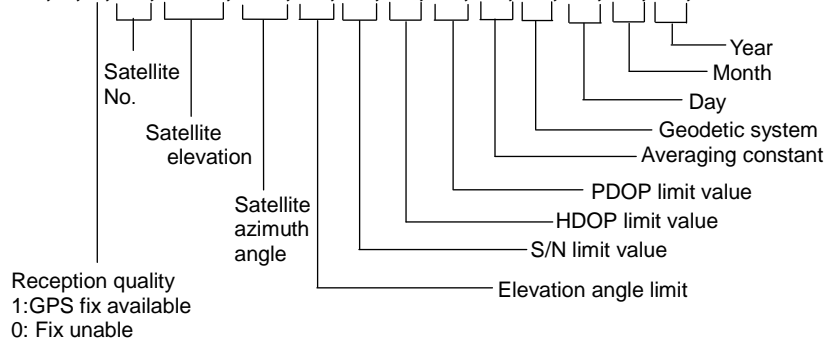
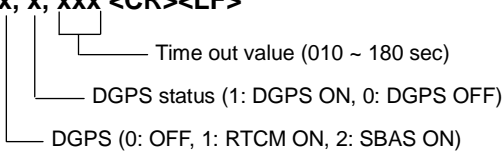
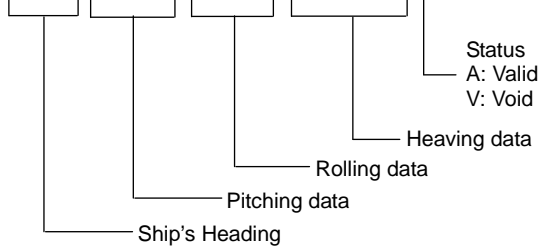
| Description | Contents of data field |
|-------------|--|
| <p>BWC</p> | <p>Bearing and distance to waypoint \$--BWC, hhmss, lll.lll, a, yyyy.yyy, a, x.x, T, x.x, M, xx, N, c-c, a*hh<CR><LF></p> <p>Mode indicator A: Autonomous D: Differential N: Data not valid</p> <p>Waypoint ID Distance, nautical miles Bearing, degrees magnetic Bearing, degrees true Waypoint longitude, E/W Waypoint latitude, N/S UTC of observation</p> |
| <p>DTM</p> | <p>Datum reference \$--DTM,ccc,a,x.x,a,x.x,a, x.x,ccc*hh<CR><LF></p> <p>Reference datum WGS84 Altitude offset, m Lon offset, min, E/W Lat offset, min, N/S Local datum subdivision code Local datum: IHO datum code WGS84 = W84 WGS72 = W72 999 = user defined</p> |
| <p>GBS</p> | <p>GPS satellite fault detection \$--GBS, hhmss.ss, x.x, x.x, x.x, x.x, x.x, x.x, x.x, h, h*hh<CR><LF></p> <p>GNSS Signal ID GNSS System ID Standard deviation of bias estimate Estimate of bias on most likely failed satellite Probability missed detection for most likely failed satellite ID number of most likely failed satellite Expected error in altitude Expected error in longitude Expected error in latitude UTC time of the GGA or GNS fix associated with this sentence</p> |

| Description | Contents of data field |
|-------------|--|
| <p>GGA</p> | <p>GPS fix data</p> <p>\$--GGA, hhhmss.ss, xxxx.xxx, N/S, xxxxx.xxx, E/W, x, xx</p> <p>UTC of position fix (Hour, Min, Sec)</p> <p>Latitude</p> <p>Longitude</p> <p>Number of satellite in use</p> <p>Status of GPS fix mode 0: Fix unable 1: GPS fix 2: DGPS fix</p> <p>N : North latitude S : South latitude</p> <p>E: East longitude: W: West longitude</p> <p>xxx, 0/-xxxx, M, 0/-xxx, M, xxx, xxxx *hh <CR><LF></p> <p>HDOP value</p> <p>Antenna height -: Negative</p> <p>Meter</p> <p>Gioid height -: Negative</p> <p>Meter</p> <p>DGPS reference station ID</p> <p>DGPS data correction time elapsed</p> |
| <p>GLL</p> | <p>Geographic position – Latitude/longitude</p> <p>\$--GLL, xxxx.xxx, N/S, xxxxx.xxx, E/W, hhhmss, a *hh <CR><LF></p> <p>Latitude</p> <p>Longitude</p> <p>Status A: Valid V: Void</p> <p>Fix measurement time elapsed (Hour, Min, Sec)</p> <p>N: North latitude S: South latitude</p> <p>E: East longitude W: West longitude</p> |
| <p>GSA</p> | <p>GNSS DOP and active Satellite</p> <p>\$--GSA, a, x, xx, xx, xx, xx, xx, xx, xx, xx, xx, xx, xx, xx, x, x, x, x, x, h *hh <CR><LF></p> <p>Satellite number in use</p> <p>GNSS System ID</p> <p>VDOP</p> <p>HDOP</p> <p>PDOP</p> <p>1 = fix not available 2 = 2D 3 = 3D</p> <p>M = Manual A = Auto</p> |
| <p>GSV</p> | <p>GNSS satellites in view</p> <p>\$--GSV, x, x, xx, xx, xx, xxx, xx, , xx, xx, xxx, xx, h *hh <CR><LF></p> <p>Signal ID</p> <p>Fourth SV</p> <p>Second and third SVs</p> <p>S/N (Signal to Noise ratio)</p> <p>Azimuth angle</p> <p>Elevation</p> <p>Satellite No.</p> <p>First satellite</p> <p>Available number of satellites</p> <p>Message number</p> <p>Total message number, 1 ~ 3</p> |

| Description | Contents of data field |
|----------------------------|---|
| <p>HBT *DATA1 only</p> | <p>Heartbeat supervision sentence \$--HBT,x.x,A,x*hh<CR><LF> </p> |
| <p>HDM</p> | <p>Heading magnetic \$--HDM,xxx.x,M*hh<CR><LF> </p> |
| <p>HDT</p> | <p>Heading true \$--HDT,xxx.x,T*hh<CR><LF> </p> |
| <p>HVE</p> | <p>Heaving information (FURUNO proprietary sentence) \$PFEC,GPhve,+/- xx.xxx,A*hh<CR><LF> </p> |
| <p>MSS</p> | <p>MSK receiver signal status \$--MSS,x.x,x.x,x.x,x*hh<CR><LF> </p> |
| <p>RMB</p> | <p>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> </p> |

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

| Description | Contents of data field |
|-------------|---|
| VTG | <p>Course over ground and ground speed \$--VTG,x.x,T,x.x,M,x.x,N,x.x,K,a*hh<CR><LF></p> <p>A = Autonomous mode; D = Differential mode; E = Estimated (dead reckoning) mode; M = Manual input mode; P = Precise. Satellite system used in precision mode. S = Simulator mode; N = Data not valid.</p> <p>Speed over ground, km/h Speed over ground, knots Course over ground, degrees magnetic Course over ground, degrees true</p> |
| WPL | <p>Waypoint location \$--WPL,IIII.II,a,yyyyy.yy,a,c--c*hh<CR><LF></p> <p>Waypoint identifier Waypoint longitude, E/W Waypoint latitude, N/S</p> |
| XTE | <p>Cross-track error, measured \$--XTE,A,A,x.x,a,N,a*hh<CR><LF></p> <p>A = Autonomous mode D = Differential mode E = Estimated (dead reckoning) mode M = Manual input mode S = Simulator mode</p> <p>Units, nautical miles Direction to steer, Magnitude of cross-track</p> <p>A = data valid V = data invalid</p> <p>A = data valid V = data invalid</p> |
| ZDA | <p>Time and date \$--ZDA, hhmmss.ss, xx, xx, xxxx, xx, xx*hh<CR><LF></p> <p>Local zone minutes , 00 to 59 Local zone hours , 00 h to ± 13h Year (UTC) Month, 01 to 12 (UTC) Day, 01 to 31 (UTC) UTC</p> |

| Description | Contents of data field |
|-----------------|--|
| <p>PKODA</p> | <p>Satellite information (KODEN proprietary sentence) \$ PKODA, P/H, xxx.x, xx, xx, xx, xx, xx, xx, xx, xxx, M, xxx.x, N, xxx.x, </p> |
| <p>PKODG,1</p> | <p>Satellite information (KODEN proprietary sentence) \$ PKODG, 1, x, xx, +/-xx, xxx, xx, xx, xx, xx, xx, xx, xx, xx, xx, <CR><LF> </p> |
| <p>PKODG,7</p> | <p>DGPS information (KODEN proprietary sentence) \$ PKODG, 7, x, x, xxx <CR><LF> </p> |
| <p>PKODG,21</p> | <p>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> </p> |

10.6 Input / Output circuit

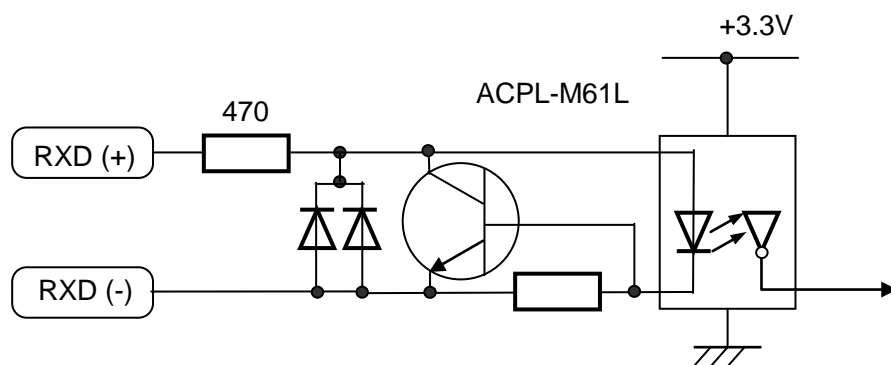
Port (connector) name: DATA1~5, LOGP, ALARM

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)

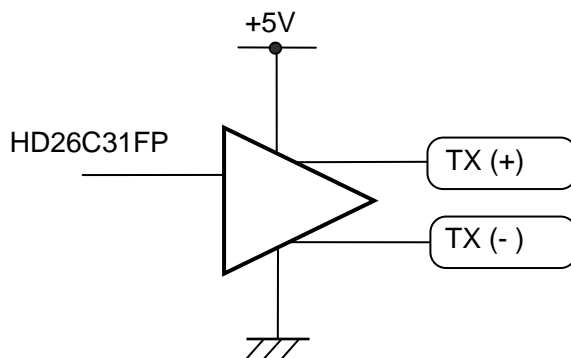
Input load: 470 ohm

Device: Photo-coupler ACPL-M61L (Avago)



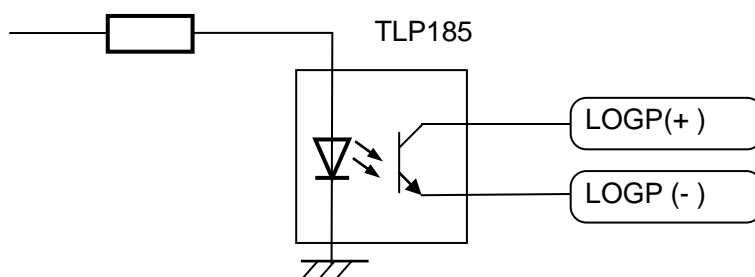
(DATA port output circuit)

Device: Driver IC HD26C31FP (Renesas)



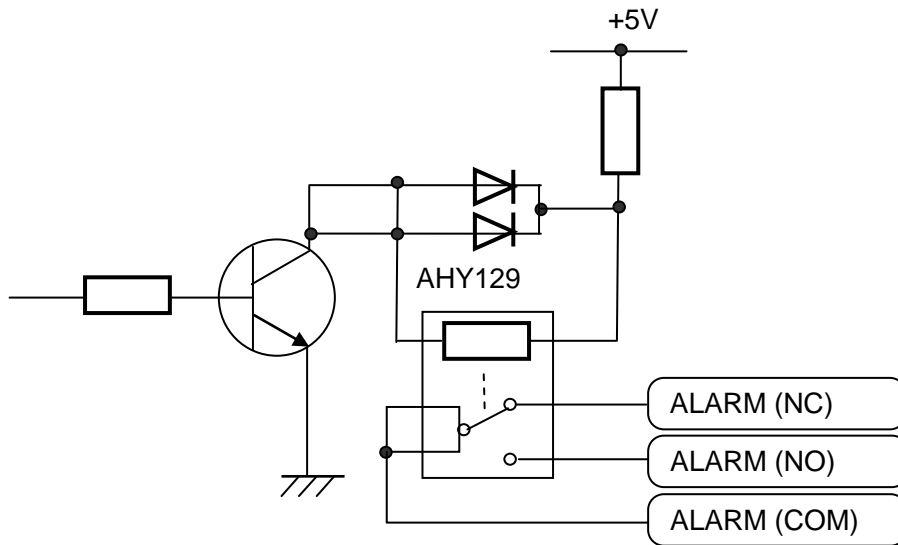
(LOGP circuit)

Device: Photo-coupler TLP185 (Toshiba)



(Alarm circuit)

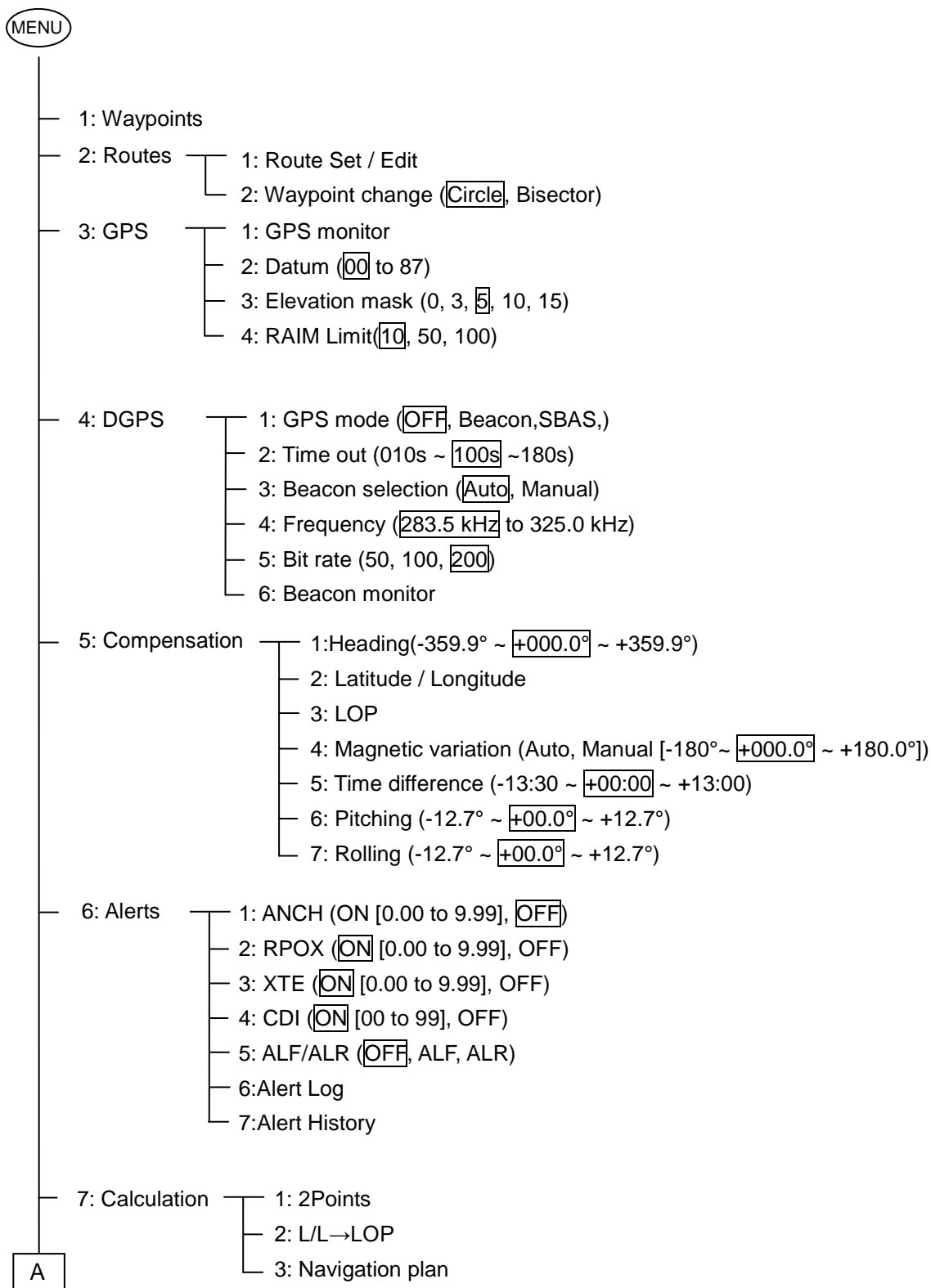
Device: Relay AHY129

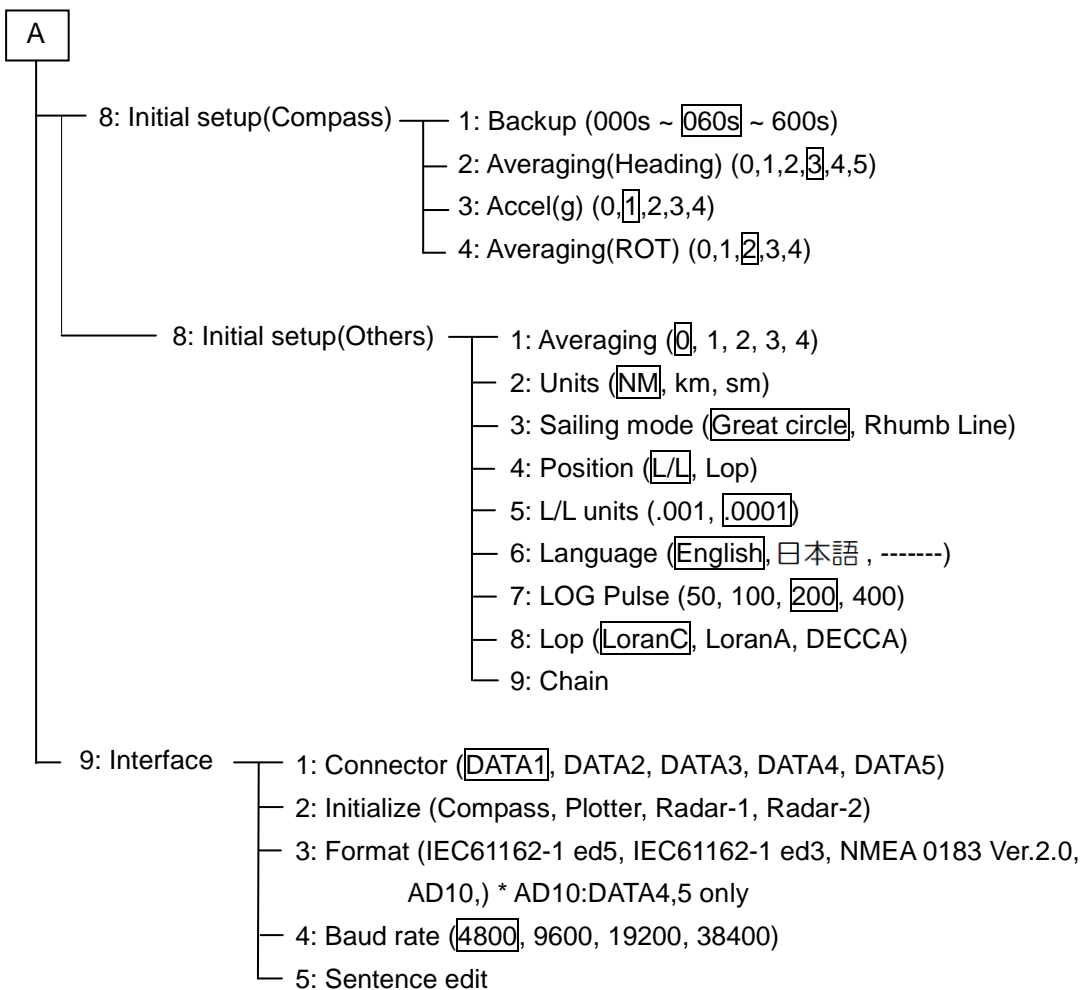


Chapter 11 Annex

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 | |
| PKODG=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 |
| ARGENTIN | 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 | KELGUELEN | 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 | | |

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XTE3-2



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