KODEN

OPERATION MANUAL

GPS COMPASS

KGC-300

This product is specifically desingned 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
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Document Revision History

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1	0093130002-00A	2018/08/02	Main unit → Processor unit
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3	0093130002-00C	2019/12/24	Chapter 7, Chapter 10
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For Your Safe Operation

Symbol used in this Operation Manual

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

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

Precautions on equipment

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

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

Precautions on handling

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

Contents

Introduction

KGC-300 is a GPS compass and navigation GPS receiver

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

The main features of this unit are as follows:

- KGC-300 consists of three components, Processor unit, Display unit and Antenna unit.

- KGC-300 has internal electronic compass as backup sensor.
  This enables the backup sensor to output heading even if the GPS signals are interrupted in such case as the vessel passing under a bridge.

- It has 1 high speed heading data output port and 4 standard outputs.

System Configuration

Connection diagram

Antenna unit GA-14

Legend
- Standard configuration
- Option
- Owner supply

Processor unit KGC-300.MU

DISPLAY

DATA4B

DATA2

DATA4A

ALM/LOGP

DATA1   DATA3   DATA5

J1   J2

CW-392-15M

DISPLAY

Display unit KGC-300.DU

DISPLAY

Owner supply

ALM/LOGP

Ext alarm (Including
Power Failer)
Log pulse

CW-376-5/10M
or
Owner supply

DATA3-5

Marine radar
Chart Plotter
Echo sounder
Auto pilot
ECDIS
AIS
VDR
Tidal current meter
Beacon receiver

POWER

DATA1

CW-419-5M

Red +

10.8 to 31.2VDC

Black -

CW-276-2M

DATA1/DATA2

HDG 38.4K DATA2
BAM/INS DATA1

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	Processor unit	KGC-300.MU			1
03	Antenna unit	GA-14	With bird protector		1
04	DC power cable	CW-276-2M	With a 5-pin connector and one end plain	2.0m	1
05	Connecting cable	CW-419-5M	6 pin water resistant connector and other end plain w/EMI core	5m	1
06	Antenna cable	CW-392-15M	3D-2V with BNC connectors on the both sides	15m	2
07	Connector	MCVR1.5/6-ST-3.81	Accessories		5
08	Installation material	TPT5X20U	Truss tapping screw (8)		1 set
		T.5X20MMX10M	Self-bonding tape (1)		
		10M[gray]	PVC tape(1)		
		B8X25U	Hexagon bolt for antenna installation (4)		
09	Operation manual	KGC-300.OM.E	English		1

Option List

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

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

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Chapter 1   Basic Operation

1.1   The name and function of each part

GNSS Receiver display

Knob

Knob

Control panel

Mounting bracket

Recalls memory position,
entry of numerical values,
and selection
North or South latitude or
East or West longitude.

Selects HDG1, HDG2, ROT,
NAV1 or NAV2 screen.

Recalls the menu

Activates POB (People
Over Board) function.

Enters a numeric/optional
parameter.

Acknowledges an
unacknowledged alert or
clears numeric/optional
parameter.

- Turns the power on
- Press and hold to power OFF
- Changes the brightness
- Changes Day/Night color

1.2 Power On/Off

BRILL Press to power on.

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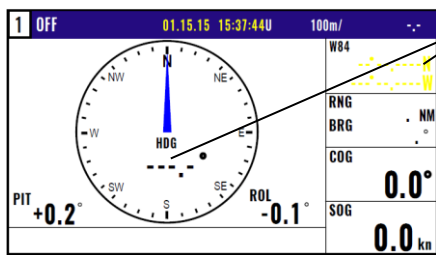
Blank

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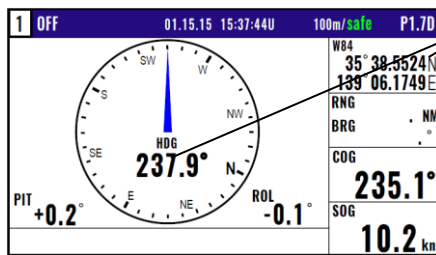
Displayed

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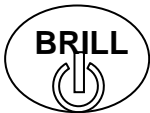
BRILL Press until [Power off 3sec] is displayed for turn GPS COMPASS /
NAVIGATOR off.
All data before power-off is kept in memory for later use.

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

1.3 Adjusting brightness of display and panel key

BRILL Press to change the LCD brightness in 8 levels.
After the popup of below was displayed, push the ◇ key.
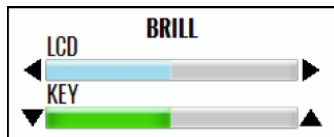
Switch Day/Night color mode:

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

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

1.4 Selecting the screen

1.4.1 Display Modes

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

1. Press numeric key on the upper-left corner of the screen.

2. Press (MODE) key to select the display mode.
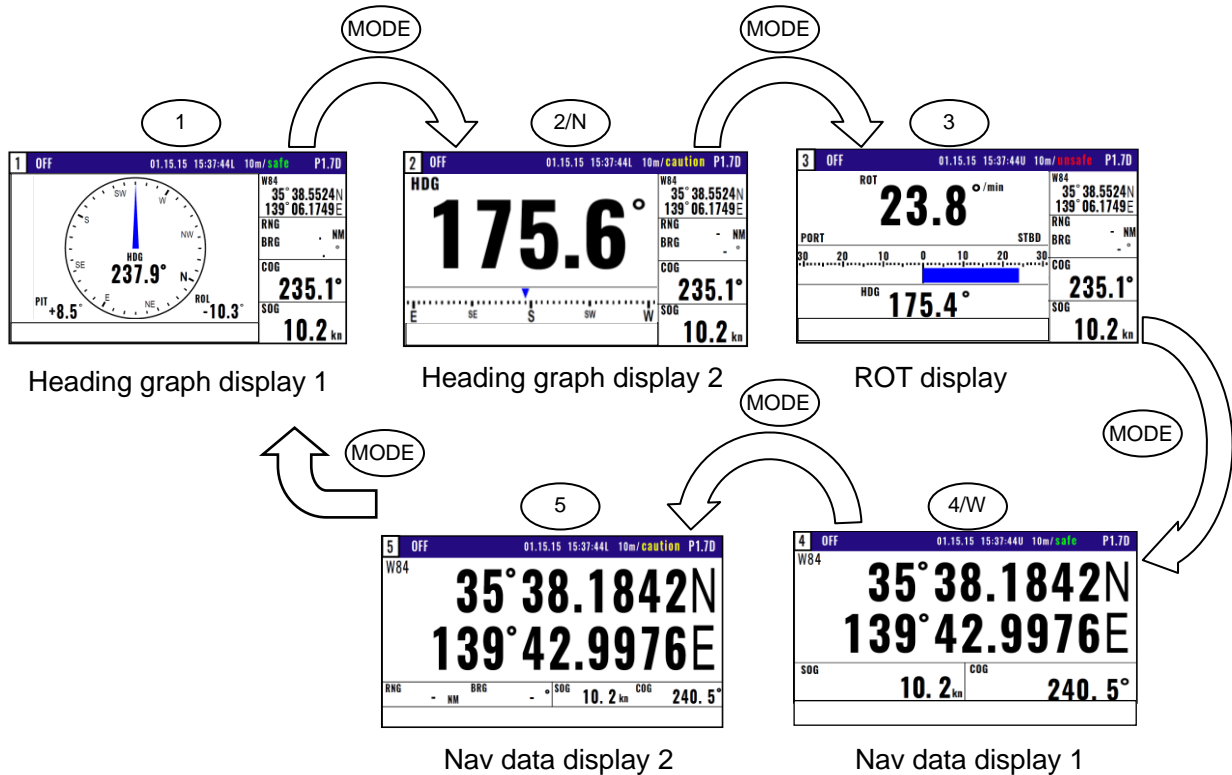
1.4.2 Screen 1: Heading graph display 1 (HDG1)

*RAIM: Receiver autonomous integrity monitoring
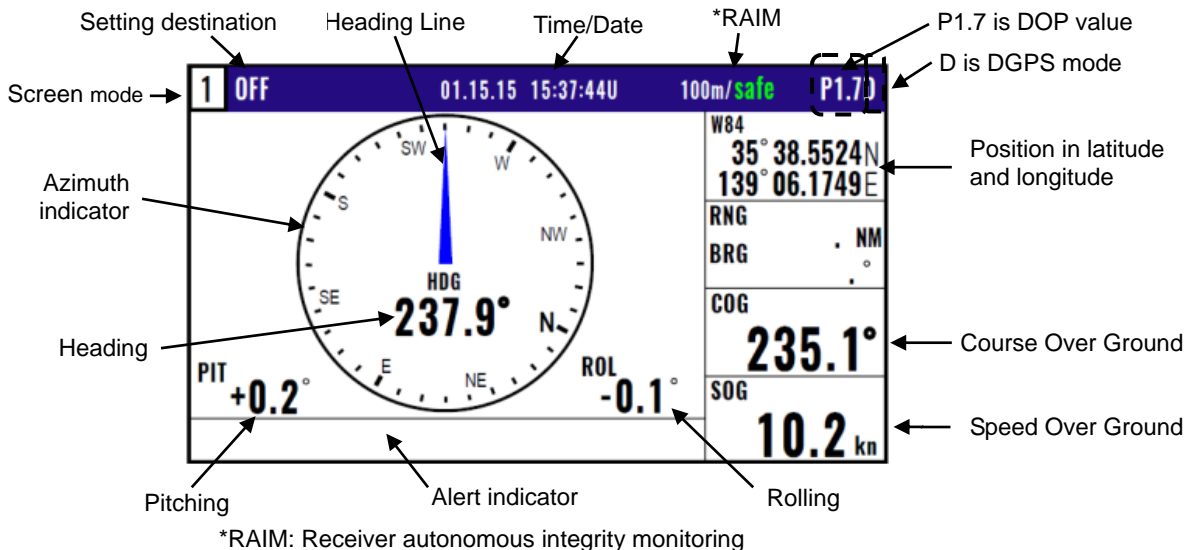
1.4.3 Screen 2: Heading graph display 2 (HDG2)

Heading

Azimuth indicator

| 2 | OFF | 01.15.15 15:37:44L | 10m/caution | P1.7D |

HDG
175.6°

E   SE   S   SW   W

W84
35° 38.5524N
139° 06.1749E

RNG   - NM
BRG   - °

COG
235.1°

SOG
10.2 kn

Position in latitude and longitude

Course Over Ground

Speed Over Ground
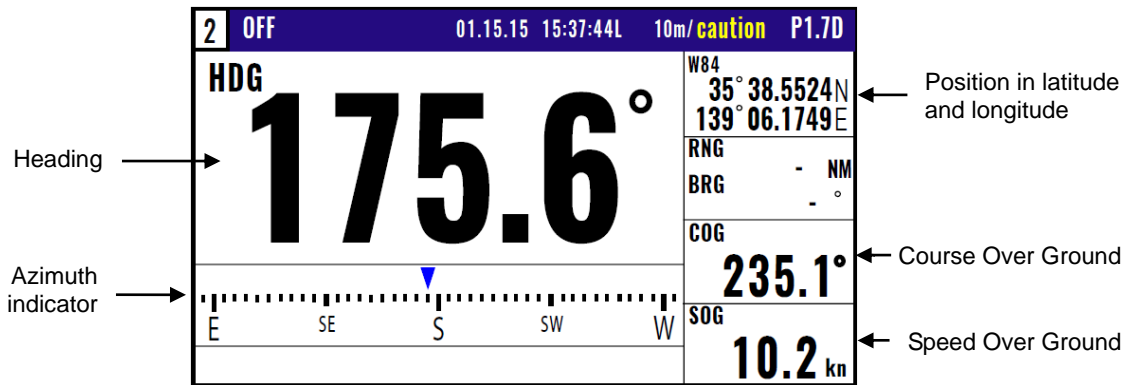
1.4.4 Screen3: Rate of turn display (ROT)

ROT (Rate of turn)

ROT indicator

Heading

| 3 | OFF | 01.15.15 15:37:44U | 10m/unsafe | P1.7D |

ROT
23.8 °/min

PORT   STBD
30 20 10 0 10 20 30

HDG **175.4°**

W84
35° 38.5524N
139° 06.1749E

RNG   - NM
BRG   - °

COG
235.1°

SOG
10.2 kn

Position in latitude and longitude

Course Over Ground

Speed Over Ground
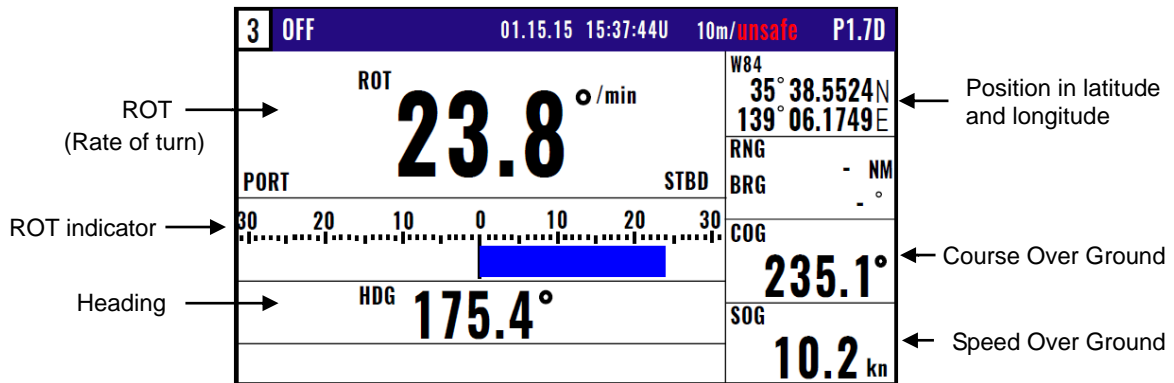
1.4.5 Screen 4: Nav data display 1 (NAV1)

Position in latitude and longitude

Speed Over Ground

Alert indicator

| 4 | OFF | 01.15.15 15:37:44U | 100m/safe | P1.7D |

W84
35°38.1842N
139°42.9976E

SOG   **10.2** kn   COG   **240.5°**

Course Over Ground
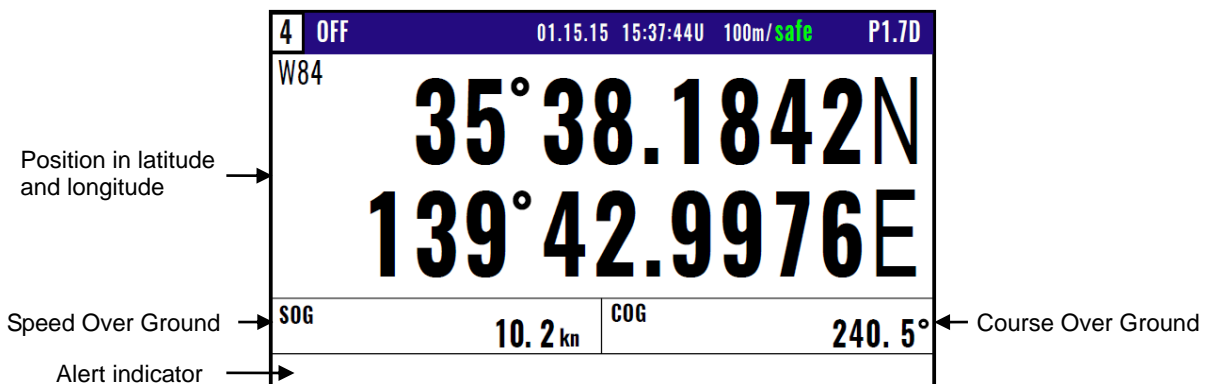
1.4.6   Screen 5: Nav data display 2 (NAV2)

Position in latitude and longitude

Course Over Ground

Speed Over Ground
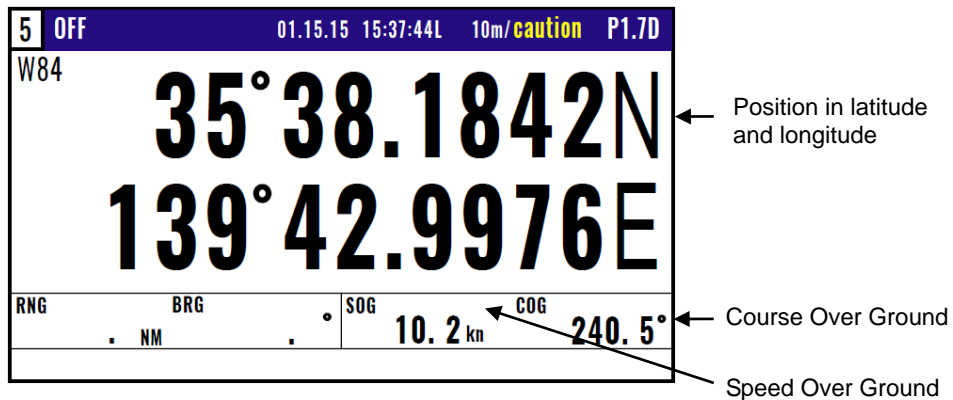
1.5 Storing present position (EVENT)

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

```
Goto POB    :[POB]
Goto Event  :[ENT]
Cancel      :[CLR]
```

POB
EVT

(1) Press (POB) key to appear the pop-up.

(2) Press (ENT) 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.

```
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

POB
EVT

(1) Press (POB) key to show the registration number display window.

(2) Press (ENT) key to store your present position.

(3) Specify a desired registration number by numeric keys.

(4) Press (ENT) key. The event will be registered to the number specified.

Blinks for 10 seconds

```
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
EVT

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

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

Proximity alarm (blinking)
Alarm sounds when you approached 0.1 nm from the point you pressed POB key.

POB appears

Distance (in nm) from your present position to the point you pressed POB key

Bearing to the point where you pressed POB key

Present position

Point where you pressed POB key

Latitude of POB position

Longitude of POB position
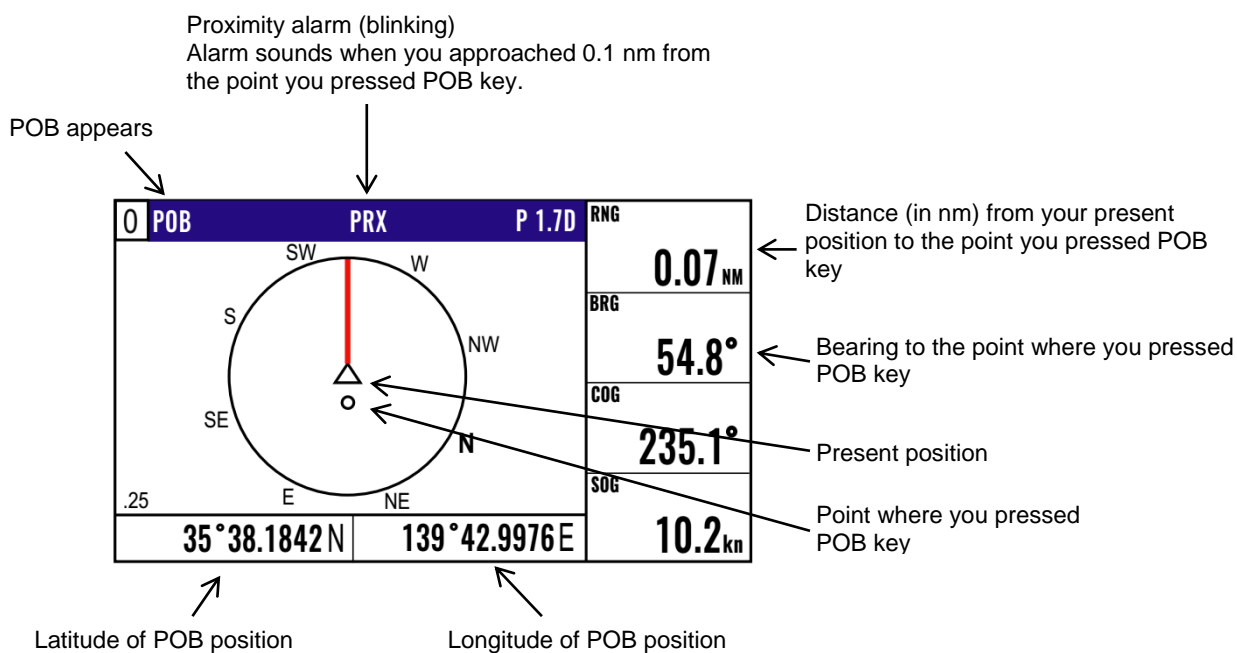
ACK
CLR

Clears the POB mode, and returns to the previous screen when you pressed 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

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

(2) Press 1 key to select "1:WAYPOINT".

(3) Enter a storage number P0000 and W0001 to W0999 is 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          W0001~W0999 is
 W1005    35°37.727N 139°06.549E
 W1006    35°36.245N 139°05.448E          Event position data
 W1007    35°38.222N 139°06.339E
 W1008    35°38.092N 139°06.165E
 W1009    35°38.706N 139°06.015E
```

1.8 Copying 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 (0000 to 0999) by numeric keys and press (ENT) key.

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

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

(6) Enter a source point number (0000 to 0999) by numeric keys.

(7) Press (ENT) key to copy the storage data.

```
Set                                    1:Waypoints
Reset                                  P 0000   35°38.209N 139°06.749E   15  06:38
Edit          Press                    W0001   35°38.337N    Copy       18  13:56
Copy    ➡        ENT                   W0002   35°38.052N 0002➤0000      16  11:23
Delete                                 W0003   35°38.229N                03  23:37
                                       W0004   35°37.810N W0000          21  17:29
                                       W0005   35°37.727N                15  14:58
                                       W0006   35°36.245N     0°00.000N  15  19:47
                                       W0007   35°38.222N     0°00.000E  22  19:53
                                       W0008   35°38.092N 139°06.165E    16  04:52
                                       W0009   35°38.085N 139°06.144E    16  04:59
```
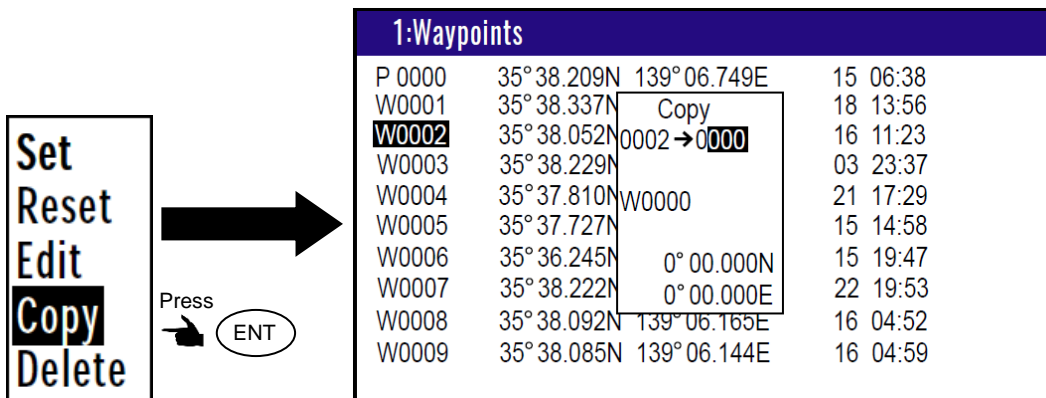
1.9 Erasing Event and POB position

(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.
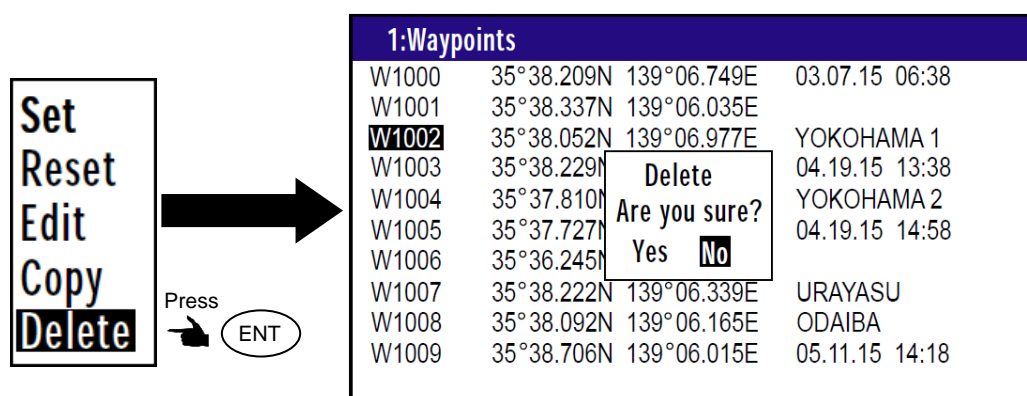
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Chapter 2   Various Navigation

2.1 Storing waypoints (LAT/LONG) data

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

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

2.1.1   Storing a new waypoint or updating an existing a waypoint

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

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

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

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

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

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

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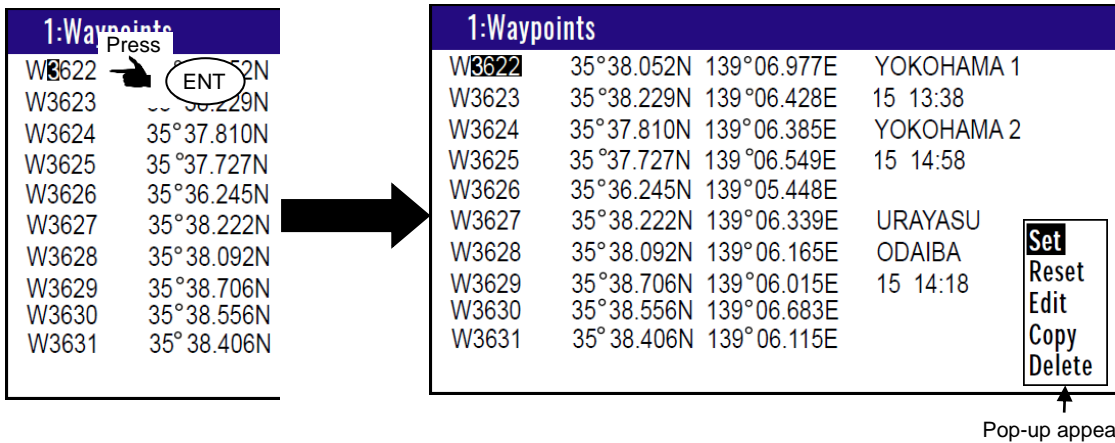
(6) Move the cursor to where you want to change. [Latitude] or [Longitude] or [Comment]

• Press [▶] [◀] key to move the cursor.
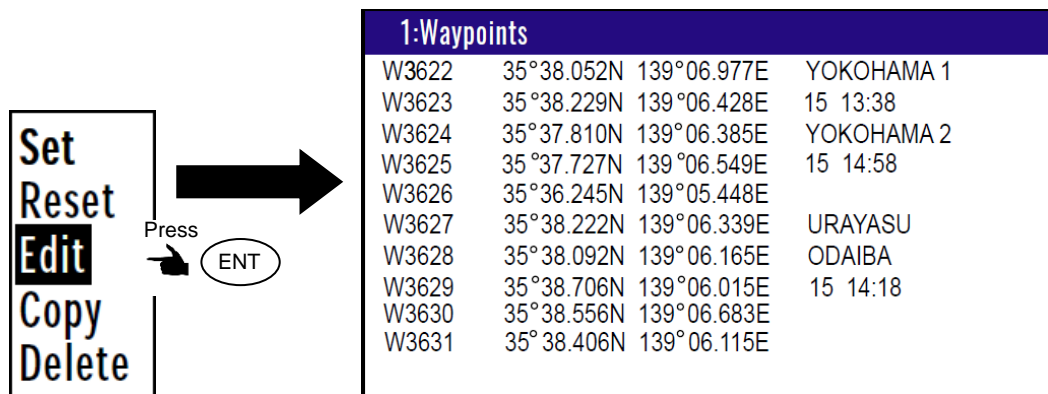
(7) If you want to change the [Latitude] and [Longitude].

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

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

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

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

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

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

2.1.2 Copying a position

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

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

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

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

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

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

(6) Enter a source point number (1000 to 9999) by numeric keys.

(7) Press (ENT) key to copy the storage data.

Original number   Enter the number of the copy destination

Set
Reset
Edit
Copy
Delete

Press
👆 (ENT)

1:Waypoints

W1000	35°38.209N	139°06.749E	03.07.15 06:38
W1001	35°38.337N	Copy	
W1002	35°38.052N	1002→0000	YOKOHAMA 1
W1003	35°38.229N		04.19.15 13:38
W1004	35°37.810N	W0000	YOKOHAMA 2
W1005	35°37.727N		04.19.15 14:58
W1006	35°36.245N	0° 00.000N	
W1007	35°38.222N	0° 00.000E	URAYASU
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.

Set
Reset
Edit
Copy
Delete

Press
👆 (ENT)

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	Delete	04.19.15 13:38
W1004	35°37.810N	Are you sure?	YOKOHAMA 2
W1005	35°37.727N		04.19.15 14:58
W1006	35°36.245N	Yes No	
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
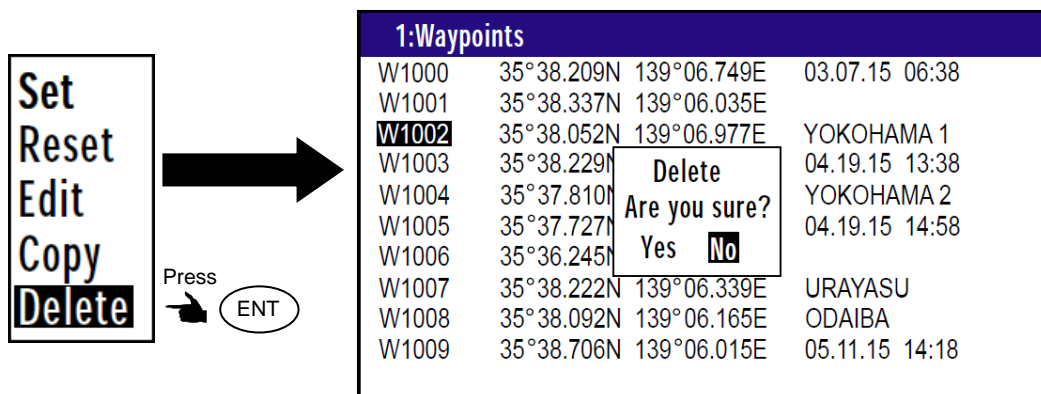
NOTE: *To erase an entire data from memory simultaneously, see* **"WPT./Route clear"** *(page 6-5).*

2.2 Setup of waypoint navigation
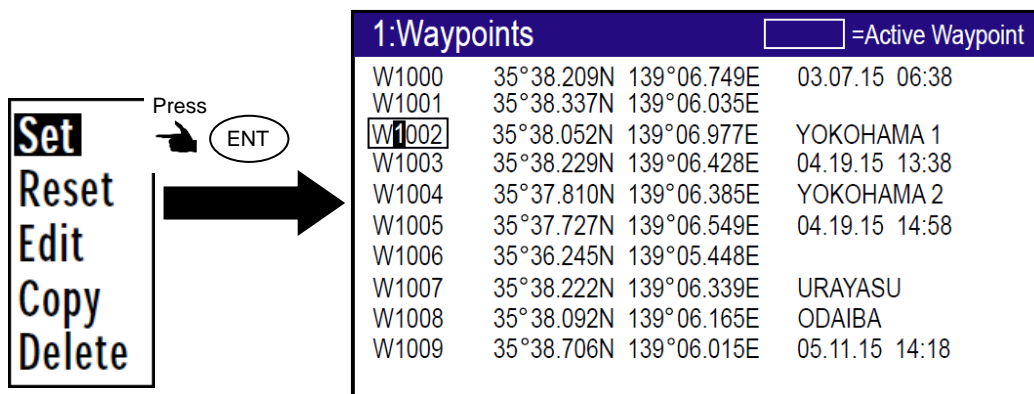
┌──────────────────────────────────┐   ┌──────────────────────────────────┐
│ ◄   **NOTE:** *Press to backspace the* │   │ **CLR** **NOTE:** *Press to clear incorrect* │
│   *cursor to correct an input*   │   │   *Input. You can reenter*   │
│   *error.*   │   │   *Numeric data.*   │
└──────────────────────────────────┘   └──────────────────────────────────┘

2.2.1   Setting waypoint navigation

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

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

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

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

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

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

(6) Number is surrounded by square.

Press → (ENT)

Set
Reset
Edit
Copy
Delete
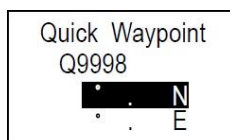
1:Waypoints			☐ =Active Waypoint
W1000	35°38.209N	139°06.749E	03.07.15 06:38
W1001	35°38.337N	139°06.035E	
W1002	35°38.052N	139°06.977E	YOKOHAMA 1
W1003	35°38.229N	139°06.428E	04.19.15 13:38
W1004	35°37.810N	139°06.385E	YOKOHAMA 2
W1005	35°37.727N	139°06.549E	04.19.15 14:58
W1006	35°36.245N	139°05.448E	
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 (0) key to display "**QUICK**" pop-up menu.

┌──────────────────────────┐
│   Quick Waypoint   │
│   Q9998   │
│   °   .   N   │
│   °   .   E   │
└──────────────────────────┘

(2) Enter latitude and longitude.

For example, if "N35°38.180 / E139°42.990" is inputted, a key will be pressed in order of [**3**],[**5**],[**3**],[**8**],[**1**],[**8**],[**0**],[**N**], [**1**],[**3**],[**9**],[**4**],[**2**],[**9**],[**9**],[**0**],[**E**].

(3) The waypoint is set and the point data is stored in number 9998.

2.2.3   Canceling waypoint navigation

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

There are two ways.

• Cancel from [MENU].

• Cancel from HDG1, HDG2, ROT, NAV1 or NAV2 screen.

1) When Reset from [MENU].

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

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

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

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

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

(6) No square from Number.

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

(1) Press (CLR) key.

(2) If OK, select [**Yes**] in the pop-up and press (ENT) key.

If cancel erasing, select [**No**] in the pop-up and press (ENT)key.

2.2.4 HDG1 screen during waypoint navigation

Waypoint number

Alarm

ANCH: Anchor watch alarm
PRX: Proximity alarm
XTE: Cross track error alarm
CDI: Course deviation angle alarm

| 1 | W1057 | PRX 01.15.15 15:37:44U | 100m/safe | P1.7D |

W84
35° 38.5524 N
139° 06.1749 E

RNG   0.01 NM
BRG   237.9°

COG
235.1°

SOG
10.2 kn

HDG
237.9°

PIT +0.2°   ROL -0.1°

Distance from present position to WPT

Bearing from present position to WPT

2.2.5 HDG2 screen during waypoint navigation

| 2 | W1852 | 01.15.15 15:37:44L | 10m/caution | P1.7D |

HDG
175.6°

E   SE   S   SW   W

W84
35° 38.5524 N
139° 06.1749 E

RNG   23.1 NM
BRG   237.9°

COG
182.1°

SOG
10.2 kn

Distance from present position to WPT

Bearing from present position to WPT

2.2.6   ROT screen during waypoint navigation

3 W1057 CDI 01.15.15 15:37:44U 10m/unsafe P1.7D	

ROT
23.8 ○/min

PORT   STBD

30 20 10 0 10 20 30

HDG **175.4°**

W84
35° 38.5524N
139° 06.1749E

RNG   **23.1**NM   → Distance from present position to WPT
BRG   **237.9** °   → Bearing from present position to WPT

COG
182.0°

SOG
10.2 kn

2.2.7   NAV2 screen during waypoint navigation

5 W1852   XTE 01.15.15 15:37:44L 10m/caution P1.7D

W84
35°38.1842N
139°42.9976E

RNG **54.8**NM   BRG **354.4°**   SOG **10.2** kn   COG **240.5°**

Distance from present position to WPT →

Bearing from present position to WPT

2.3 Storing and erasing routes

<table>
<tr><td>◄</td><td>NOTE: Press to backspace the cursor to correct an input error.</td><td>CLR</td><td>NOTE: Press to clear incorrect Input. You can reenter Numeric data.</td></tr>
</table>

2.3.1 Storing your route

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

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

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

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

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

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

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

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

  • Press [▲] [▼] key to move the cursor.

Input of Comment

Input location of Waypoint

(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.

CIRCLE mode

Proximity
Alarm circle

Course line A   Waypoint   Course line B

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

BI-SECTOR mode

Waypoint

Course line A   Course line B

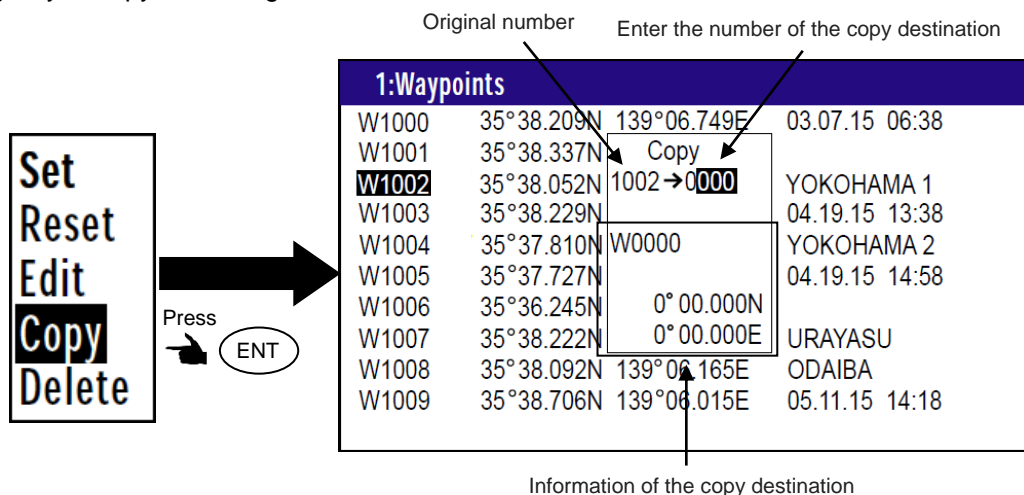When you cross a half-angle line, the course line is switched from A to B.
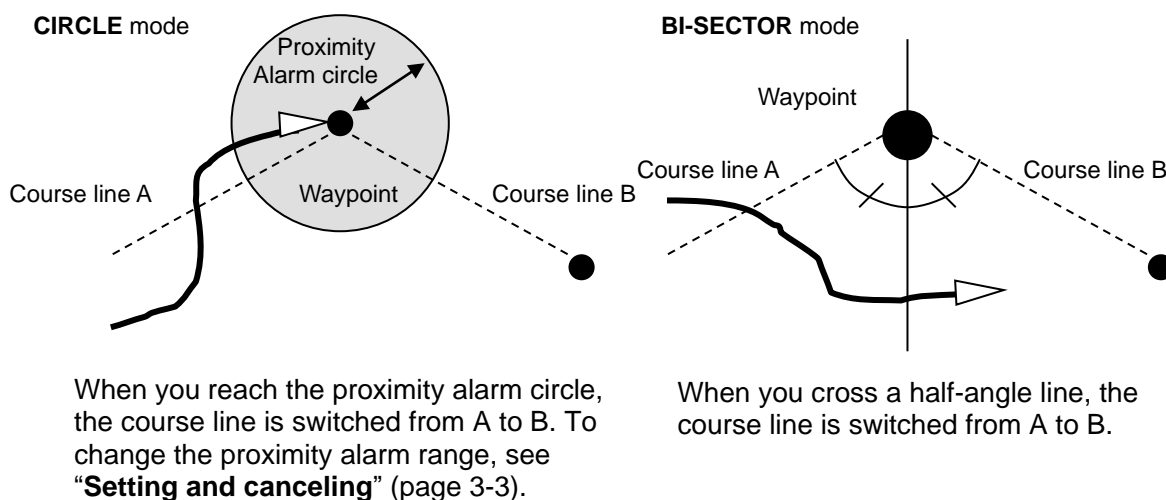
(1) Press (MENU) key until Menu options 1 to 9 appears.

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

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

(4) Press [▲] or [▼] key to locate cursor to select a mode.

(5) Press (ENT) key. The selected mode will be shown.

```
2:Routes
1:Route Set / Edit
2:Waypoint change   = Circle
                      Bisector
```
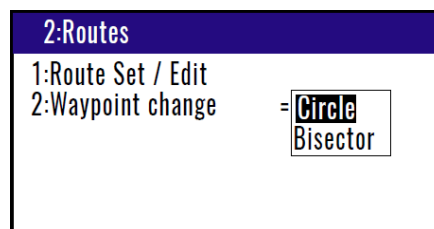
2.3.3   Copying a single route

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

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

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

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

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

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

(7) Enter a source point number (001 to 100) by numeric keys.

(8) Press (ENT) key to copy the route data.
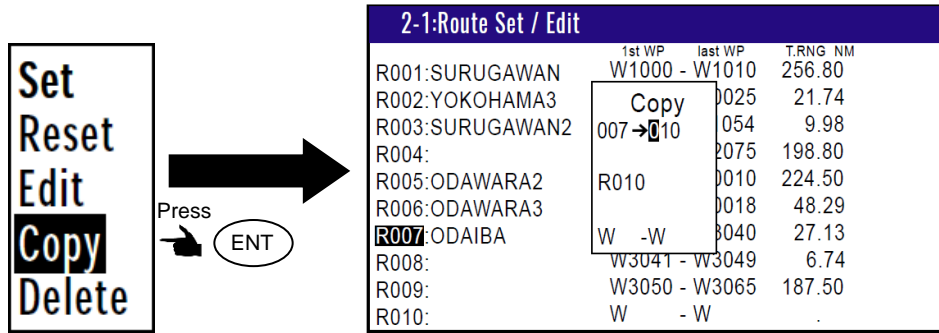
2.3.4   Erasing point data

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

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

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

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

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

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

(7) If you want to delete any Waypoint, press (CLR) key in a place that is registered

(8) If OK, select [**Yes**] in the pop-up and press (ENT) key.

   If Cancel, select [**No**] in the pop-up and press (ENT) key.
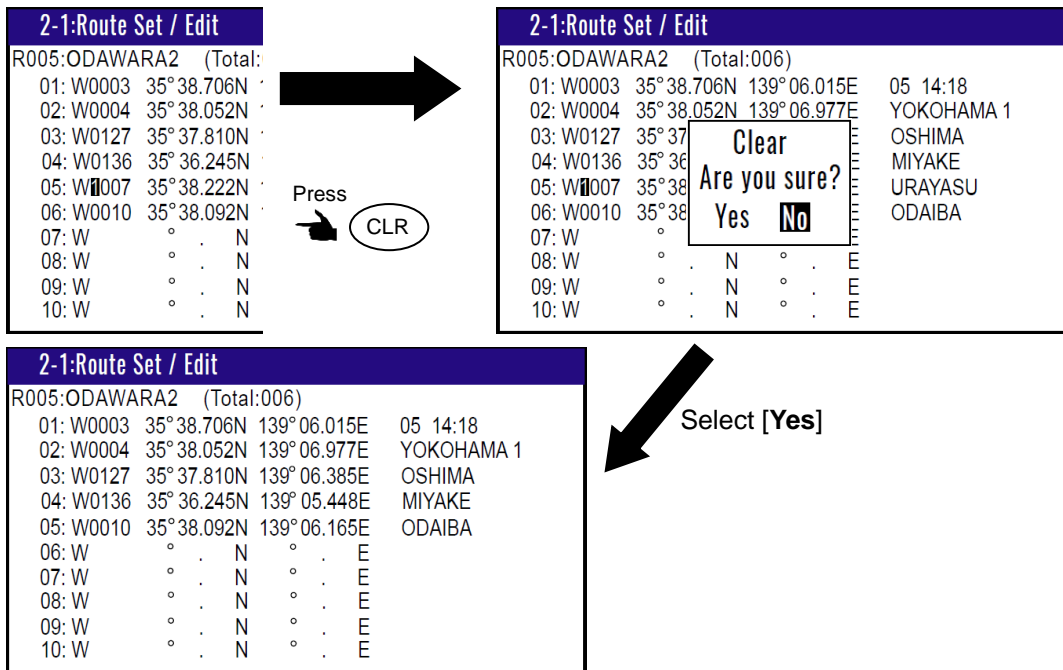
2.3.5   Erasing a single route

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

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

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

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

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

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

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

(8) If OK, select [**Yes**] in the pop-up and press (ENT) key.

　　If Cancel, select [**No**] in the pop-up and press (ENT) key.

Set
Reset
Edit
Copy
Delete

Press
👉 (ENT)

2-1:Route Set / Edit

	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:	Delete	075	198.80
R005:ODAWARA2	Are you sure?	010	224.50
R006:ODAWARA3	Yes **No**	018	48.29
R007:ODAIBA	W0000 - W3040		27.13
R008:	W3041 - W3049		6.74
R009:	W3050 - W3065		187.50
R 10:	W - W		.
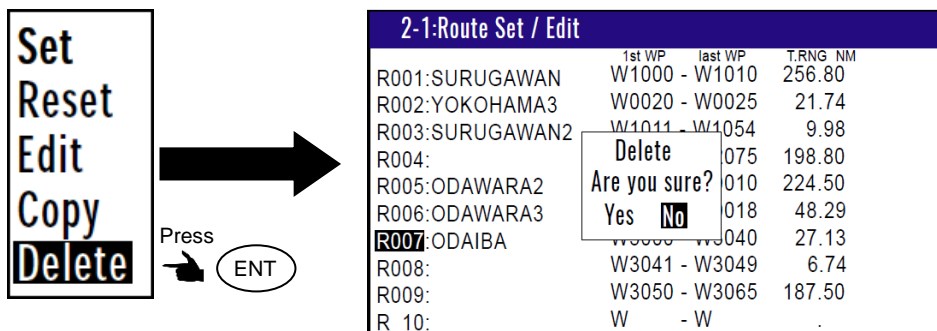
NOTE: *To erase all stored data from memory, see* **"WPT./Route clear"** *(page 6-5).*

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.

Route

Direction

First destination

Set
Reset
Edit
Copy
Delete

Press
👉 (ENT)

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
06: W0010 35°38.092N 139°06.165E
07: W   °   .   N   °   .   E
08: W   °   .   N   °   .   E
09: W   °   .   N   °   .   E
10: W   °   .   N   °   .   E

Route R005 ➡ 01
W1003 35°38.706N
　　　　139°06.015E
▲ : → Foward
▼ : ← Reverse
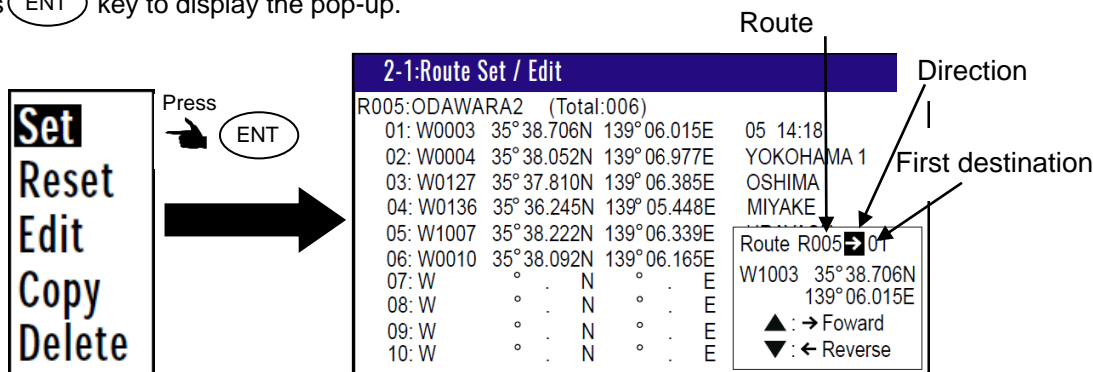
(6) Select [**Set**] in the pop-up and press (ENT) key.

(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 [**Reset**] in the pop-up and press (ENT) key.
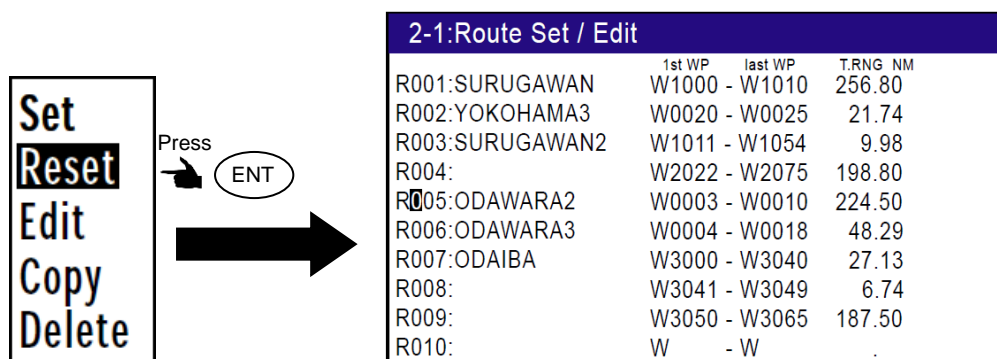
2-1:Route Set / Edit			
	1st WP	last WP	T.RNG NM
R001:SURUGAWAN	W1000	- W1010	256.80
R002:YOKOHAMA3	W0020	- W0025	21.74
R003:SURUGAWAN2	W1011	- W1054	9.98
R004:	W2022	- W2075	198.80
R005:ODAWARA2	W0003	- W0010	224.50
R006:ODAWARA3	W0004	- W0018	48.29
R007:ODAIBA	W3000	- W3040	27.13
R008:	W3041	- W3049	6.74
R009:	W3050	- W3065	187.50
R010:	W	- W	.

Set
Reset
Edit
Copy
Delete

Press → (ENT)
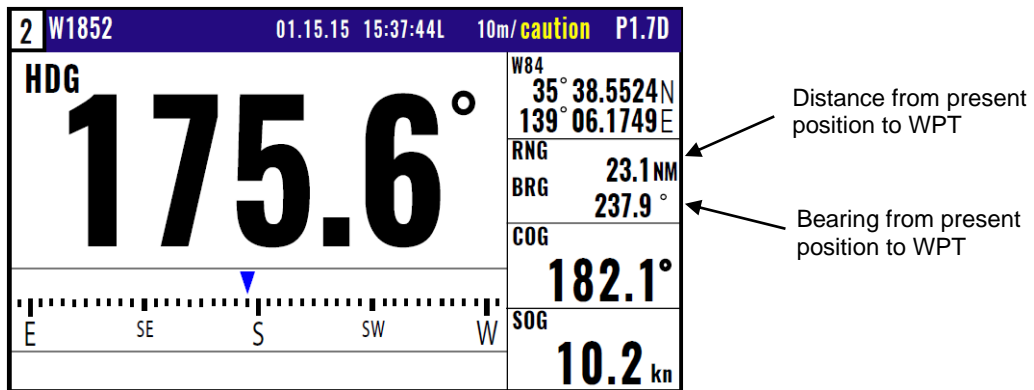
2) When Reset from HDG1, HDG2, ROT, NAV1 or NAV2 screen.

(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.

Waypoint reset
Are you sure?
Yes   No

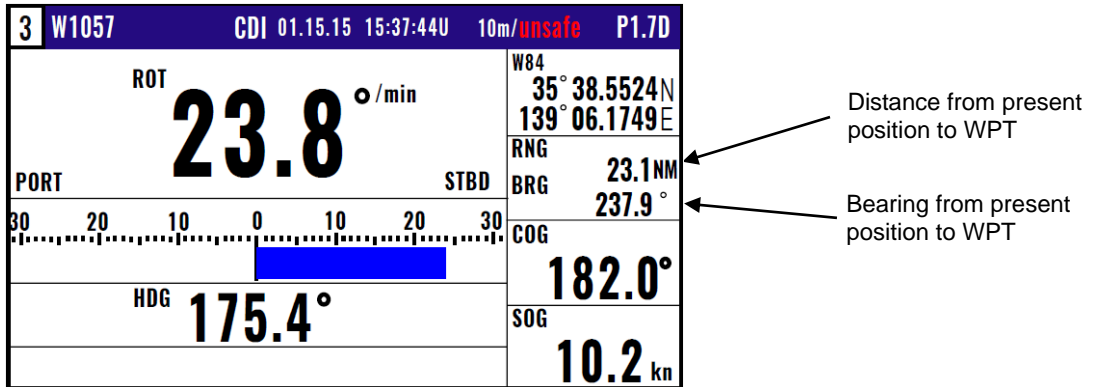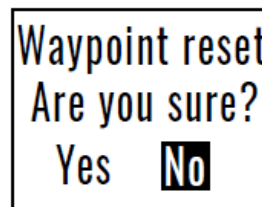## 2.4.4   Switching between distance and time to go

When you select the "**RNG**" (Distance to WPT) or "**T.RNG**" (Total distance) on HDG1, HDG2, ROT, or NAV2 screen in route navigation, the respective "**TTG**" (Time to go to WPT) or "**T.TTG**" (Total time to go) is shown.

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

(1) Press (MODE) key until HDG1, HDG2, ROT, or NAV2 screen appears.

(2) Press [◀] key to display "**RNG**".
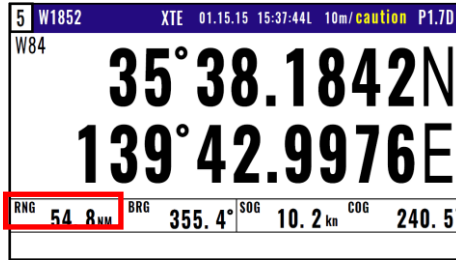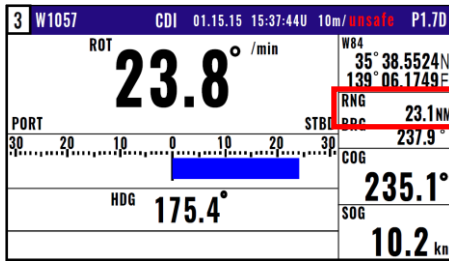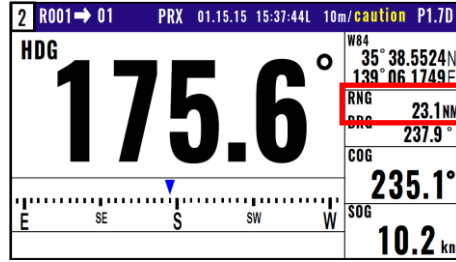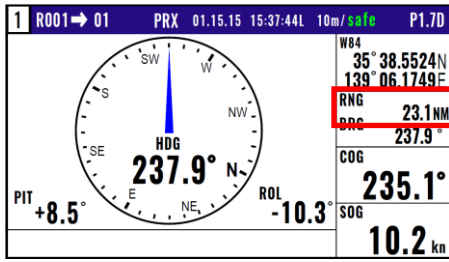
(3) Press [▶] key to display "**T.RNG**".
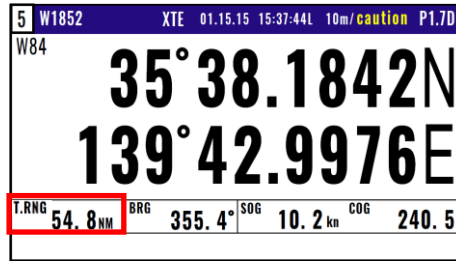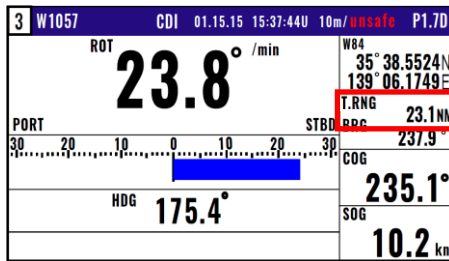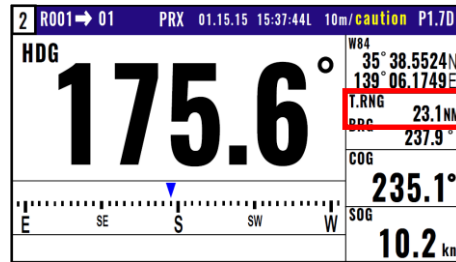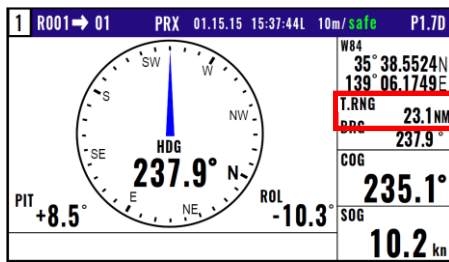
2.5 Setting an anchor position

After arriving at your destination, it is possible to drift from the anchor position due to a tide or wind.

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

2.5.1 Storing an anchor position

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

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

```
MENU                              6: Alerts
1: Waypoints                      1: ANCH      = OFF  1.00NM
2: Routes                         2: PROX      = ON   1.00NM
3: GPS                            3: XTE       = ON   1.00NM
4: DGPS             Press         4: CDI       = ON   45°
5: Compensation                   5: ALF/ALR   = ALF
6: Alerts           👉 6/E        6: Alert Log
7: Calculation                    7: Alert History
8: Initial Setup
9: Interface
```
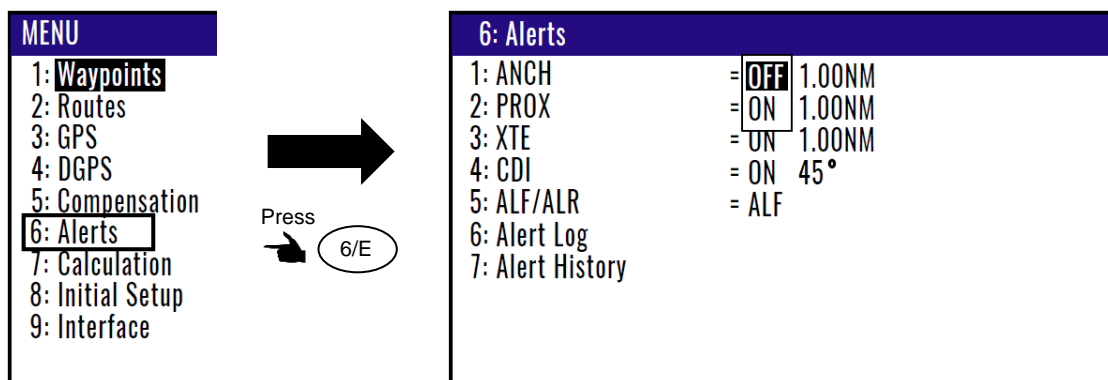
(5) Press (MODE) key until HDG1, HDG2, ROT, NAV1 or NAV2 screen appears.
(6) Press (POB) key.
(7) Press (6/E) key. (Goto ANCH)

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

Anchor setting mark

```
1 ANCH        01.15.15 15:37:44U   100m/safe   P1.7D
                                   W84
              SW      W                 35°38.5524N
                                       139°06.1749E
          S              NW        RNG
                                   BRG        0.01 NM
                                              237.9°
          SE      HDG   N          COG
               237.9°                   235.1°
     PIT            E   NE   ROL      SOG
     +0.2°                  -0.1°         10.2 kn
```

2.5.2   Canceling anchor position

(1) Press $\overset{\frown}{\text{MODE}}$ key until HDG1, HDG2, ROT, NAV1 or NAV2 screen appears.

(2) Press $\overset{\frown}{\text{CLR}}$ key.

(3) If OK, select [**Yes**] in the pop-up and press $\overset{\frown}{\text{ENT}}$ key.

If Cancel, select [**No**] in the pop-up and press $\overset{\frown}{\text{ENT}}$ 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.

Preset anchor watch alarm range   Blink

Anchor position

```
1 ANCH        ANCH 01.15.15 15:37:44U    100m/safe   P1.7D
                                                W84
                    SW    W                    35° 38.5524N
              S              NW                139° 06.1749E
                                              RNG
             SE          HDG                           0.91 NM
                       237.9°  N           BRG         237.9°
          PIT        E    NE    ROL         COG
           +0.2°                 -0.1°              235.1°
                                            SOG
                                                    10.2 kn
```
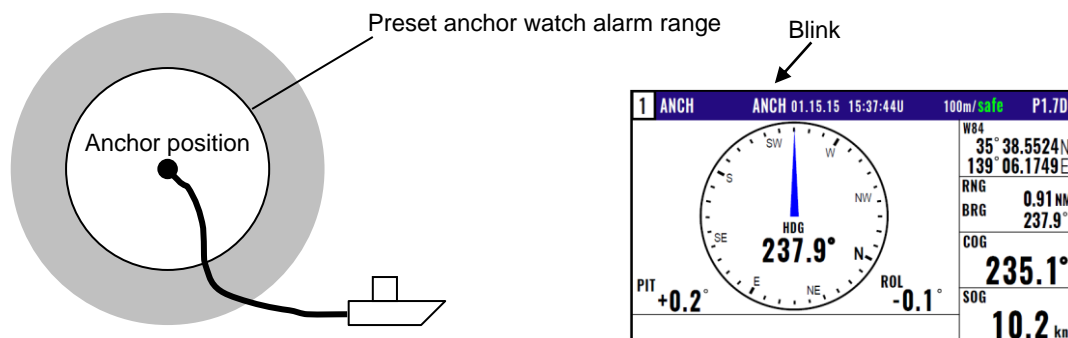
Initial setup: OFF, 1.00NM
Enter an alarm range: 0.00 to 9.99

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.

Preset alarm range

Blink

Waypoint or route point
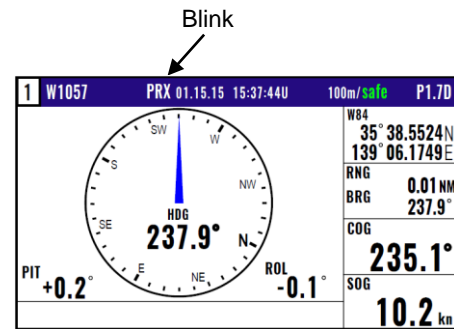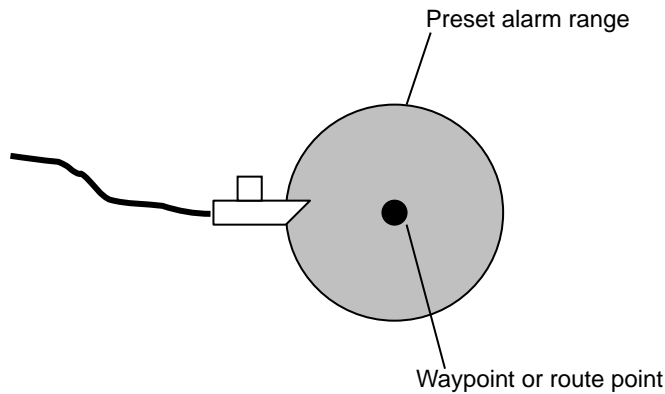
Initial setup: ON, 1.00
Enter an alarm range: 0.00 to 9.99

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.

Present alarm range

Blink

Origin

Waypoint or route point

Course line

Cross track error (XTE)
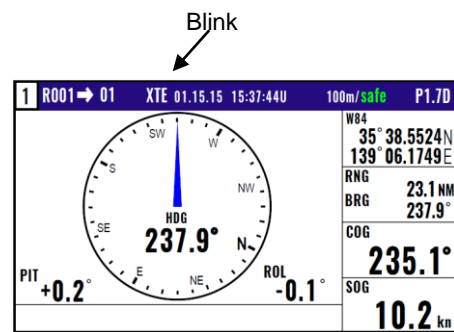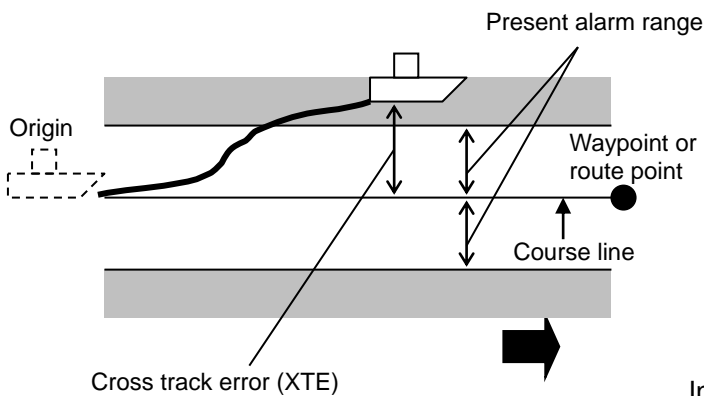
Initial setup: ON, 1.00
Enter an alarm range: 0.00 to 9.99

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.

Waypoint or route point

Blink

Bearing to waypoint

Course deviation angle (CDI)

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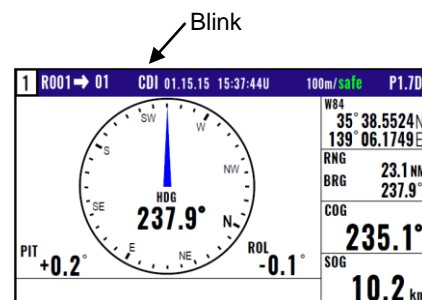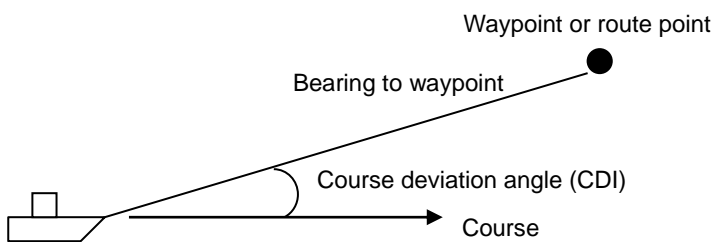
Initial setup: ON, 45 degrees
Enter an alarm range: 00 to 99 degrees

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.

```
OFF
ON
```

(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.

```
OFF
ON
```

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.

| *Alert icon | Alert ID | Alert message | *Number of alert: |
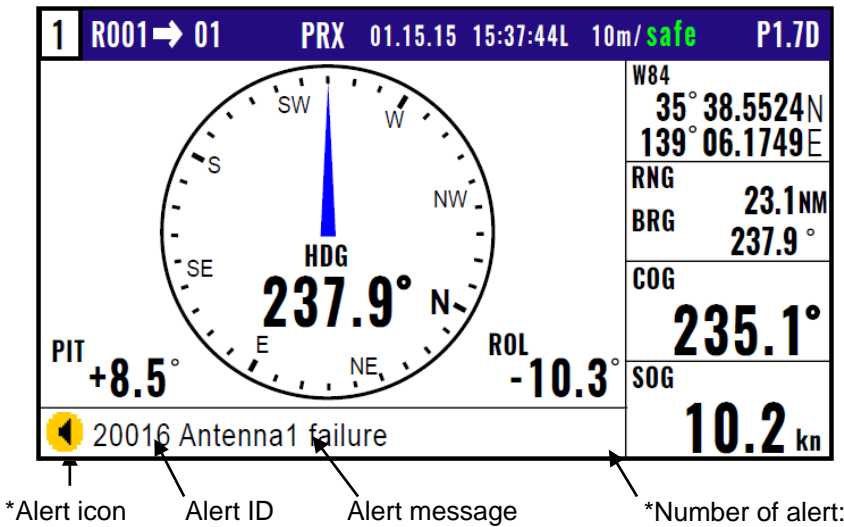
*When multiple alerts are occurring, pressing the [▲]key will display the next alert.

*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

❗ : Active –acknowledged 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.
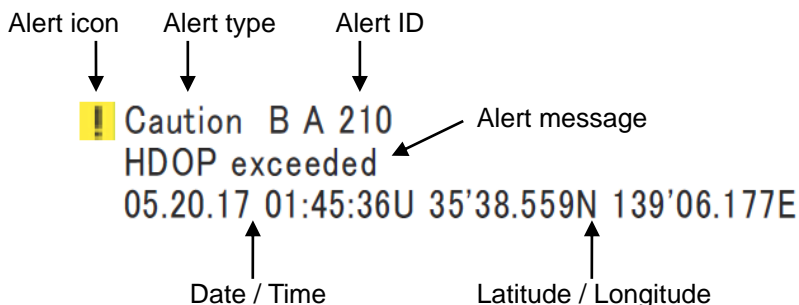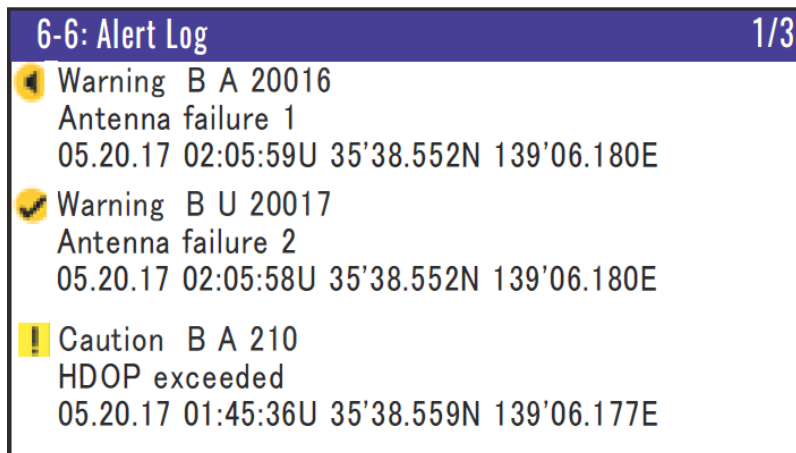
3.3.3　Alert History

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 histry.

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	Processor 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	Processor 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 Processor 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**".

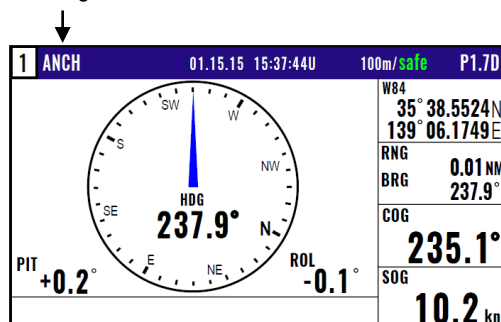(5) Press (ENT) key.

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)

1: Backup              = [0]60
2: Averaging(Heading)  = 2
3: Accel (g)           = 1
4: Averaging(ROT)      = 2
```

```
8: Initial setup (Others)

1: Averaging     = [0]
2: Units         = NM
3: Sailing mode  = Great circle
4: Position      = L/L
5: L/L units     = .001
6: Language      = Engrish
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      = [DATA1]
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)

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

Press (1) →

```
 3-1: GPS monitor        1/2            P1.3
 No.   02  04  07  10  15  19  22  23  26  28 129 137
 25
 20
 15
 10
 05
 S/N  17 16 12 14 14 14 18 17 13 12 16 14 13 14 07 08 16 18 13 12 13 14 16 17
 ELV   56   22   53   82   69   55   49   23   54   49   48   48
 AZM  189  248  056  290  311  279  016  209  227  354  170  170
```
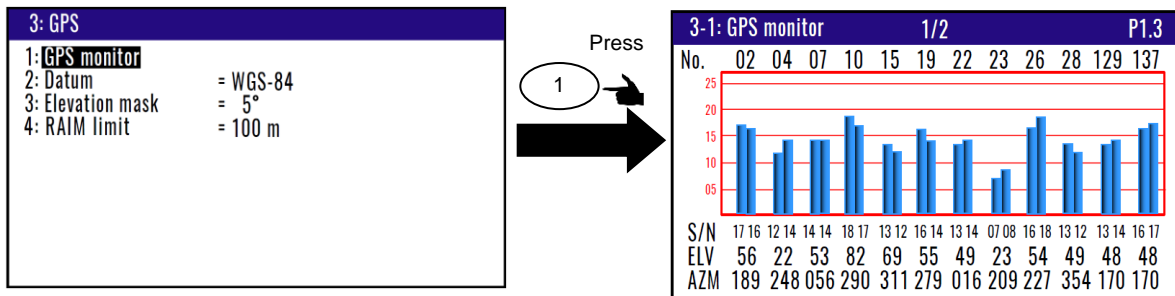
4.2.2   Selecting a geodetic datum

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

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

(2) Press (3) key to select "**3: GPS**".

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

(4) Press [▲] or [▼] key to move cursor onto the desired geodetic datum.

(5) Press (ENT) key.

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

Press (2/N) →

```
 3-2: Datum                              1/5
 00 W84: WGS-84          10 NAR : NRD-83
 01 W72: WGS-72          11 HJO : ICELAND 55
 02 TOY : TOKYO          12 IRL : IRELAND 65
 03 NAS : NRD-27         13 GEO : NEWZELAND
 04 NAS : ALASKA/KANADA  14 EUS : EUROPIAN 79
 05 EUR : EUROPIAN 50    15 MOD : ROME 40
 06 AUG : AUSTRALIAN 84  16 CAP : SOUTH AFRICA
 07 SOA : SOUTH ASIA     17 NAH : SAUDI ARABIA
 08 SAN : SOUTH AMERICA  18 IND : INDIAN/NEPAL
 09 QUO : GREENLAND      19 LUZ : PHILPPINES
```

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.

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

Press
(3)

3: GPS	
1: GPS monitor	
2: Datum	= WGS-84
3: Elevation mask	= 5
4: RAIM limit	= 10 m
	15
	20
	25
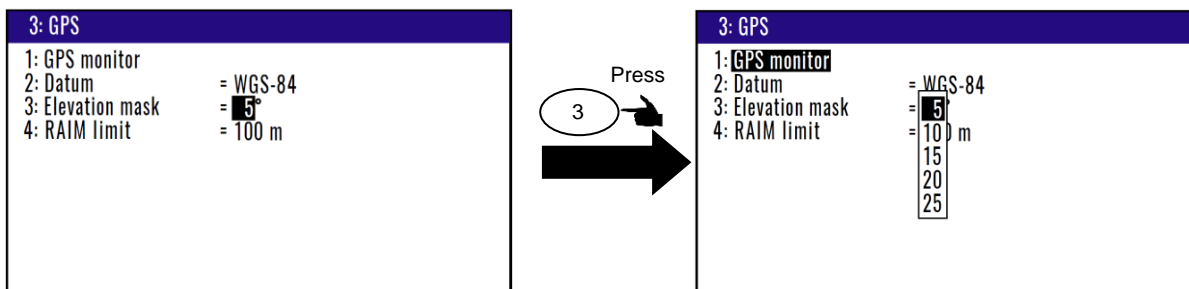
Initial setup: 5°

4.2.4 RAIM

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

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

(2) Press (3) key to select "**3: GPS**".

(3) Press (4/W) key to select "**4: RAIM limit**".

(4) Press [▲] or [▼] key to move cursor onto elevation angle masking.

(5) Press (ENT) key.

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

Press
(4/W)

3: GPS	
1: GPS monitor	
2: Datum	= WGS-84
3: Elevation mask	= 5°
4: RAIM limit	= 10 m
	50
	100
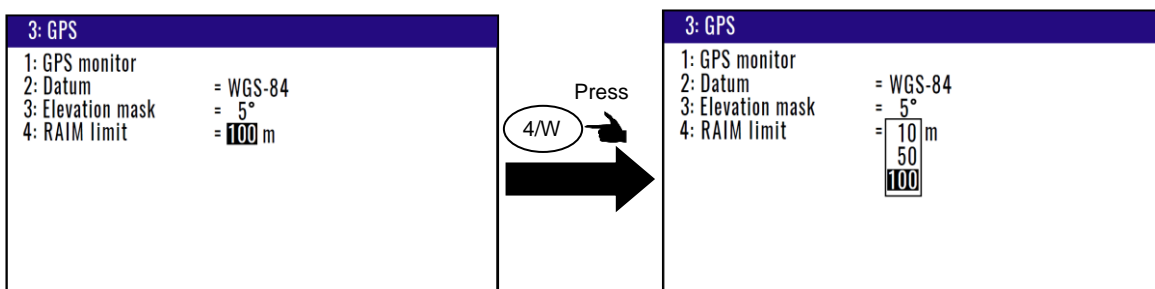
Initial setup: 100m

100m/safe   P1.7D

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.
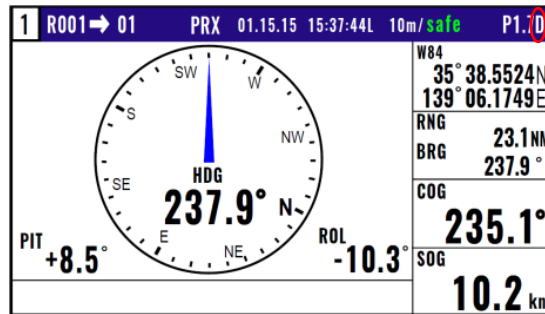
4.3.2   Selecting a style of DGPS

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/W)   key to select "**4: DGPS**".

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

(4) Press [▲] or [▼] key to move cursor onto "**OFF**" or "**Beacon**" or "**SBAS**".

(5) Press (ENT)   key.
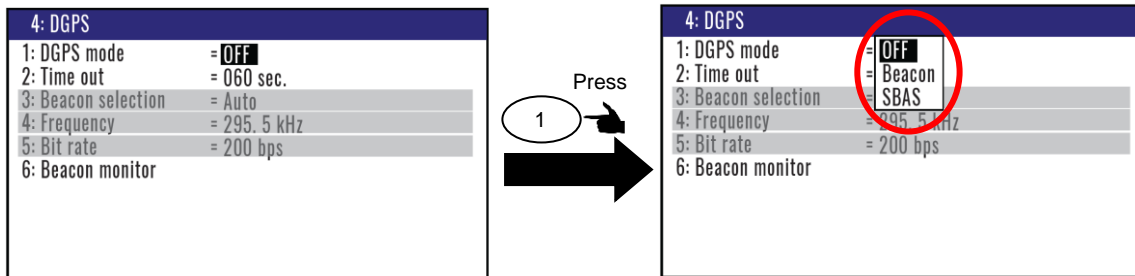
Initial setup: OFF

4.3.3   Setting a DGPS time out

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

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

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

(3) Press (2/N) key to select "**2: Time out**".

(4) Enter a timeout (010 to 180 seconds) by numeric keys.

(5) Press (ENT) key.

```
4: DGPS
1: DGPS mode        = OFF
2: Time out         = 060 sec.
3: Beacon selection = Auto
4: Frequency        = 295. 5 kHz
5: Bit rate         = 200 bps
6: Beacon monitor
```
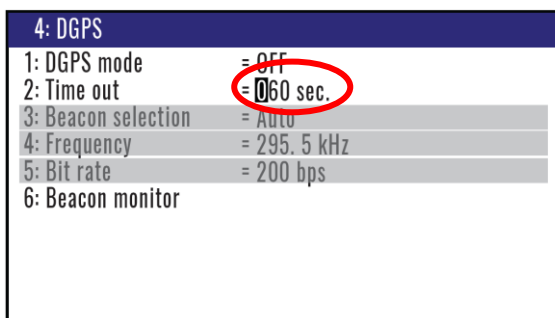
Initial setup: 000 sec

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/W) key to select "**4: DGPS**".

(3) Press (3) key to select "**3: Beacon selection**".

(4) Press [▲] or [▼] key to move cursor settings you select.

(5) Press (ENT) key.

```
4: DGPS
1: DGPS mode        = OFF
2: Time out         = 060 sec.
3: Beacon selection = Auto
4: Frequency        = 295. 0 kHz
5: Bit rate         = 200 bps
6: Beacon monitor
```

Press (3) →

```
4: DGPS
1: DGPS mode        = SBAS
2: Time out         = 000 sec
3: Beacon selection = Auto
4: Frequency        = Manual kHz
5: Bit rate         = 200 bps
6: Beacon monitor
```
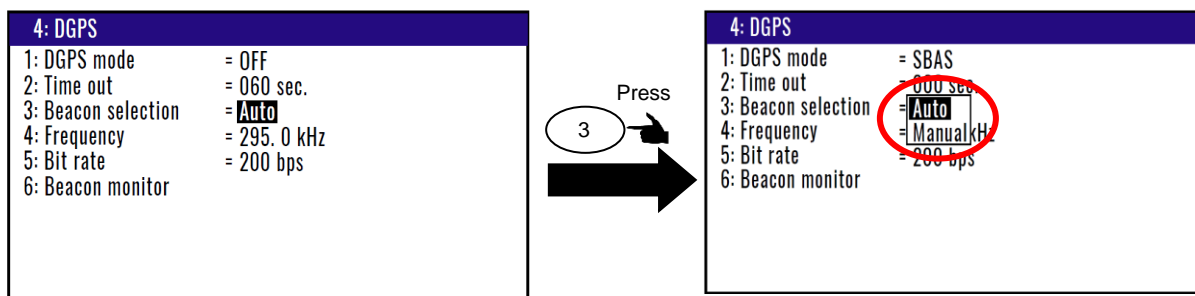
Initial setup: Auto

4.3.5   Setting receiving frequency and bit rate of a beacon station

You can set the receiving frequency (283.5 kHz to 325.0 kHz) that is transmitted from a beacon station.

In addition, Bit rate you can also change "50bps", "100bps", "200bps". This mode is disabled when "**3: Beacon selection**" is "**AUTO**".

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

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

(3) Press (3) key to select "**3: Beacon selection**".

(4) Press [▲] or [▼] key to select [**Manual**] in the pop-up and press (ENT) key.

(5) Press [▼] key to move cursor "**4: Frequency**".

(6) Specify receiving frequency (4-digit) of beacon station by numeric keys (0 to 9).

(7) Press (ENT) key to set receiving frequency.

(8) Press [▼] key to move cursor onto "**5: Bit rate**".

(9) Press (ENT) key.

(10) Press [▲] or [▼] key to set bit rate "50bps", "100bps", "200bps".

(11) Press (ENT) key.
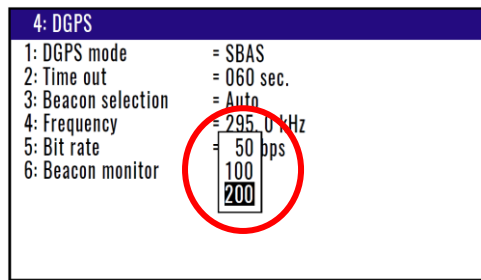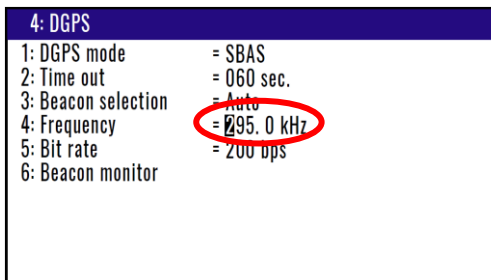
Frequency Initial setup: **283.5 kHz**
Selectable range: **283.5 to 325.0 kHz**
Bit rate Initial setup: **200 bps**

4.3.6   Beacon monitor

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

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

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

(3) Press (6/E) key to select "**6: Beacon monitor**".
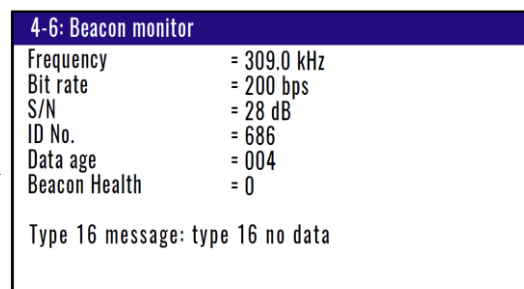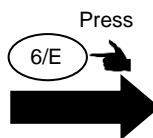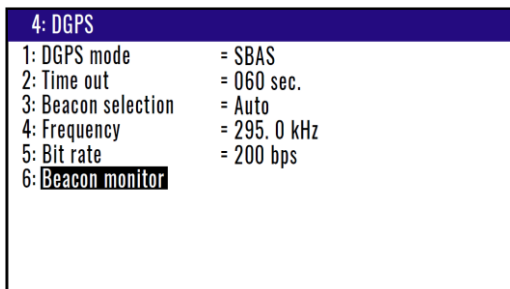
4.4   Menu 5: Compensation

4.4.1   Compensating the heading

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

θ: Compensable angle

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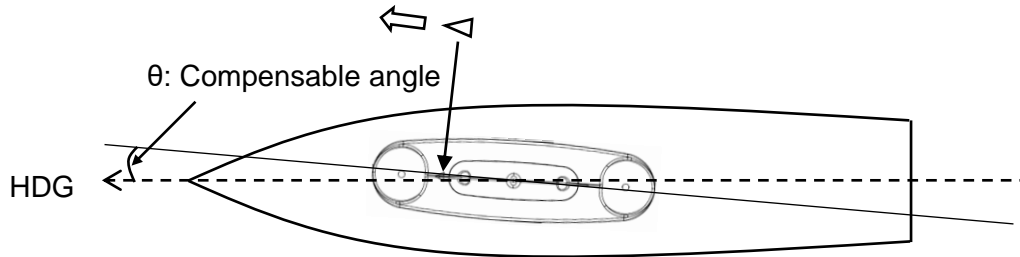
When it is installed with 5° clockwise, enter a compensation value [-005.0°] using numeric keys.
When it is installed with 5° counterclockwise, enter a compensation value [+005.0°] using numeric keys.

(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.

```
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°
```

(Direct entry of actual position data)

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

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

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

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

(4) Enter the correct latitude and longitude value.

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

$$[3], [5], [3], [8], [5], [4], [4], [N], [ENT], [\blacktriangledown]$$
$$[1], [3], [9], [0], [6], [1], [8], [3], [E], [ENT]$$

```
5-2: Latitude/Longitude
```

Actual position →
```
Latitude   =  35°38.544N
Longitude  = 139°06.183E
```

Correction offset →
```
Latitude   = 00°00.008S
Longitude  = 000°00.003E
```

(Entry of correction offset)

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

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

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

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

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

(5) Enter the latitude and longitude correction offset.

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

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

[0], [0], [0], [0], [0], [0], [0], [3], [E], [ENT]

```
5-2: Latitude/Longitude
Latitude        =   35° 38.544N
Longitude       = 139° 06.183 E

Latitude        =   00° 00.008S
Longitude       = 000° 00.003E
```

Corrected position →
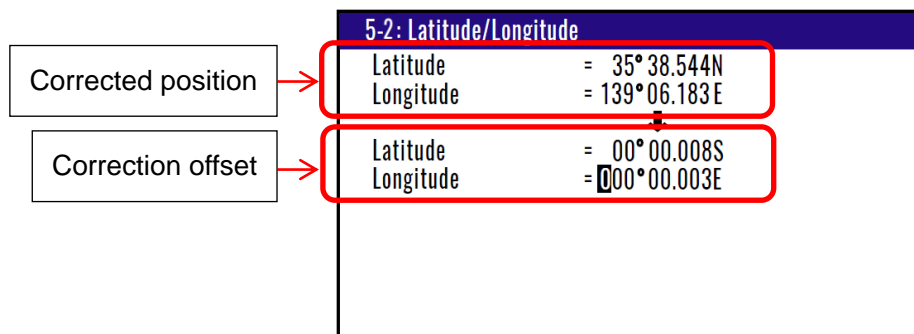
Correction offset →

4.4.3   Disable position correction

To delete and disable the correction offset follow these steps:

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

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

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

(4) Press (CLR) key to set 0 of offset corrections.

(5) If OK, select [**Yes**] in the pop-up and press (ENT) key.

   If Cancel, select [**No**] in the pop-up and press (ENT) key.

```
Delete
Are you sure?
Yes    No
```
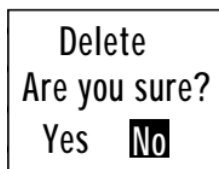
4.4.4   Compensating the LOP

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 "**3: LOP**"

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

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

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

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

In the case of LoranC

Actual →
```
5-3 LOP
S1              = 35558.1
S2              = 60214.0
```

Correction →
```
S1              = +0001.0
S2              = -0000.8
```

```
LoranC
Chain    9970-3-5
```

Corrected →
```
5-3 LOP
S1              = 35558.1
S2              = 60214.0
```

Correction →
```
S1              = +0001.0
S2              = -0000.8
```

```
LoranC
Chain    9970-3-5
```

In the case of LoranA

```
5-3 LOP
S1              = 4398.3
S2              = 1254.3

S1              = -001.2
S2              = +000.9


LoranA
Chain    2S1-2S2
```

In the case of DECCA

```
5-3 LOP
S1              = 0 F:31:95
S2              = 0 G: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.

```
5: Compensation
1: Heading              = +000.0°
2: Latitude / Longitude
3: LOP
4: Magnetic variation  = Auto
                       = Manual
5: Time difference     = +00:00
6: Pitching            = +00.0°
7: Rolling             = +00.0°
```
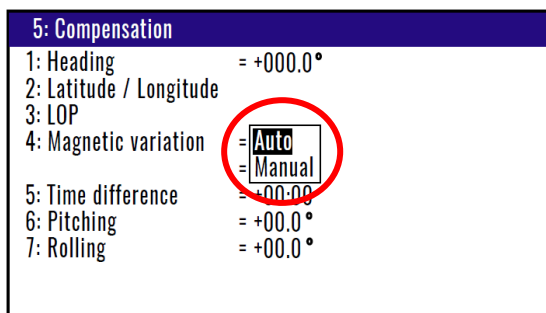
Initial setup: Manual

(Manual compensation)

(4) Press [▲] or [▼] key to move cursor onto "**Manual**".

(5) Press (ENT) key.

(6) Press (ENT) key to change the correction offset.

(7) Press [▲] or [▼] key to use the current positive (+) or negative (-) sign as it is.

(8) Enter a (4-digit) compensation offset by numeric keys.

(9) Press (ENT) key.

```
5: Compensation
1: Heading              = +000.0°
2: Latitude / Longitude
3: LOP
4: Magnetic variation  = Manual
                       = +000.0°
5: Time difference     = +00:00
6: Pitching            = +00.0°
7: Rolling             = +00.0°
```
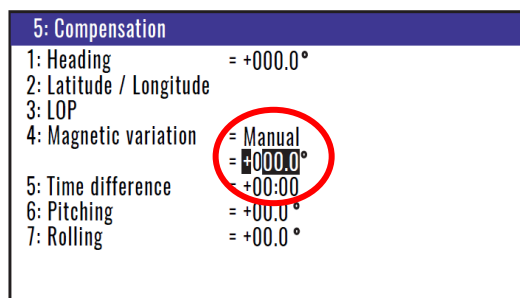
Initial setup: 0.0°
Setup range: -180.0° to +180.0°

4.4.6   Displaying local time

You can display your local time by entering a time difference from the Greenwich Mean Time (GMT).

See the following figure 4.1 to determine zone time difference.

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

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

(3) Press (5) key to select "**5: Time difference**".

(4) Press (ENT) key to change the correction offset.

(5) Press [▲] or [▼] key to use the current positive (+) or negative (-) sign as it is.

(6) Enter a (4-digit) compensation offset by numeric keys.

(7) Press (ENT) key.

> (CLR) **NOTE:** *Press to clear incorrect input. You can reenter a "+" or "-" sign and numeric data.*
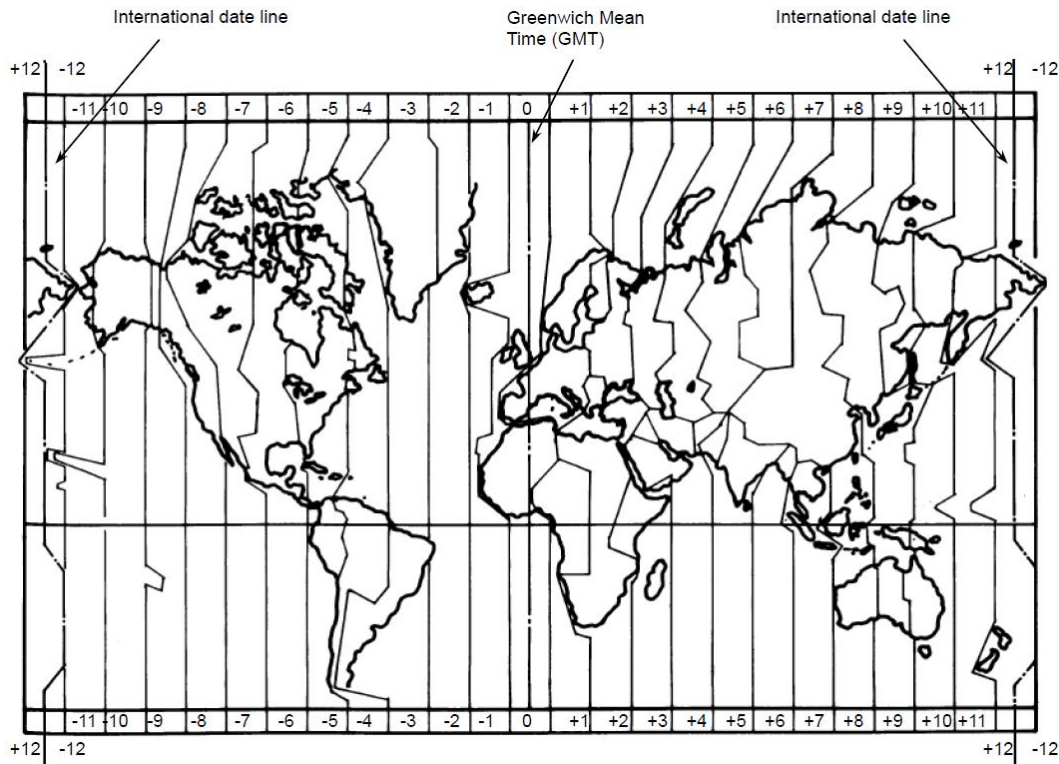
Figure 4.1 Time difference chart

Initial setup: 00:00 hour

4.5   Menu 7: Calculation

4.5.1   Calculating the distance and bearing between two points

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

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

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

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

(4) Enter a (4-digit) origin WPT number (0000 to 9999).

(6) Press (ENT) key.

(7) Press [▶] key.

(8) Enter a (4-digit) final WPT number (0000 to 9999).

(9) Enter "N" for north or "S" for south latitude.

(10) Press(ENT)   key.
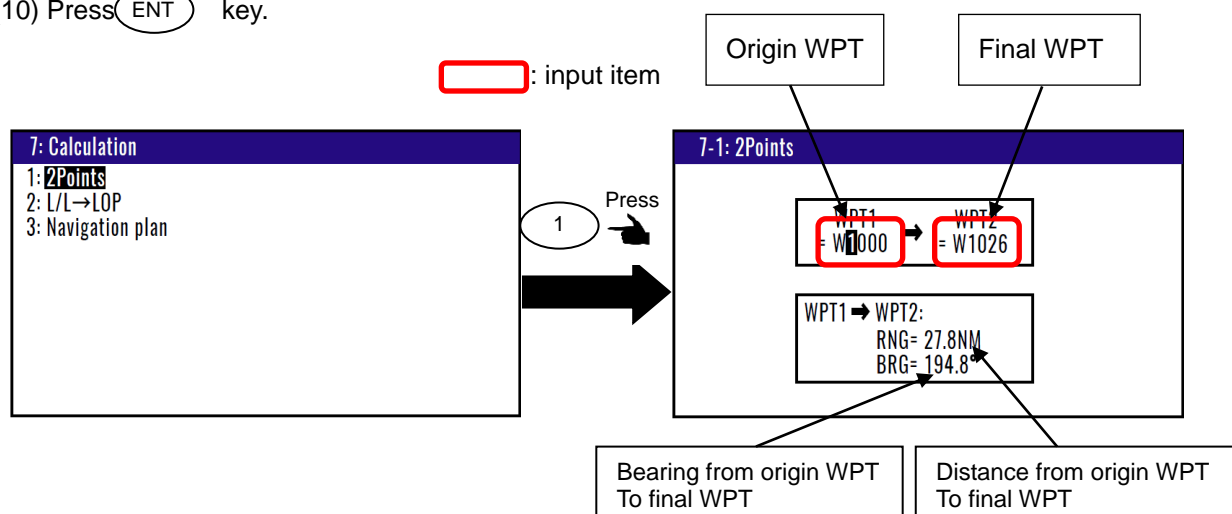
4.5.2   Calculating LOPs based on LAT/LONG data

You can enter a Loran C or Loran A or DECCA chain number and two secondary stations,

NAVIGATOR calculates the LOPs based on the specified LAT/LONG data and displays the LOP

values.

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

You can set of LoranA, LoranC or Decca of "**3: LOP**" change when you changed **8:Lop** and

9:Chain in the **Menu8: Initial setup.**

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

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

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

(4) Setting "LoranA" or "LoranC" or "Decca"

(5) Press (ENT) key.

(6) Press (9) key to select "**9: Chain**".

(7) Select a station you want to measure.

In the case of Loran C

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

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

(3) Press (2/N) key to select "**2: L/L→LOP**".

(4) Enter (4-digit) Loran C chain number.

(5) Enter the first digit of two Loran C secondary stations.

(6) Press (ENT) key.

(7) Enter (7-digit) latitude using numeric keys.

(8) Enter "N" for north or "S" for south latitude.

(9) Press (ENT) key.

(10) Enter (8-digit) longitude using numeric keys.

(11) Enter "E" for east or "W" for west latitude.

(12) Press (ENT) key.
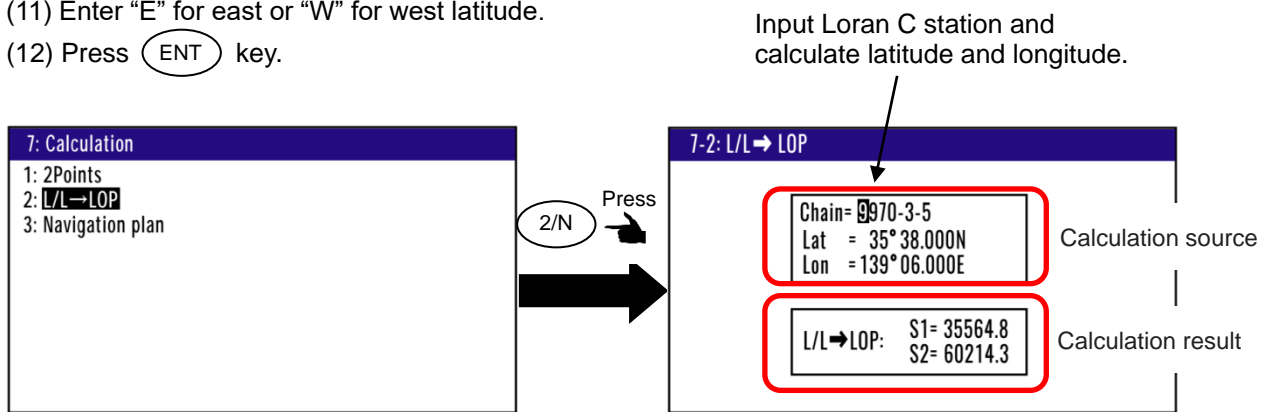
Input Loran C station and
calculate latitude and longitude.

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

Press
2/N

7-2: L/L➡ LOP

Chain= 9970-3-5
Lat = 35° 38.000N
Lon = 139° 06.000E

Calculation source

L/L➡LOP: S1= 35564.8
            S2= 60214.3

Calculation result

If you store the calculation result

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

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

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

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

In the case of Loran A

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

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

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

(3) Press (2/N) key to select "**2: L/L→LOP**".

(4) Press (ENT) key.

(5) Press [▲] or [▼] [►] or [◄] key to select the secondary station 1.

(6) Press (ENT) key.

(7) Press [►] key to move the cursor to secondary station 2 field.

(8) Press (ENT) key.

(9) Press [▲] or [▼] key to select the secondary station 2.

(10) Press (ENT) key.

(11) Press [▼] key to move the cursor to latitude field.

(12) Enter a (7-digit) latitude using numeric keys.

(13) Enter "N" for north or "S" for south latitude.

(14) Press (ENT) key.

(15) Enter (8-digit) longitude using numeric keys.

(16) Enter "E" for east or "W" for west latitude.

(17) Press (ENT)key.

```
2S0 2S6
2S1 2S7
2S2 2H4
2S3 2H5
2S4 2H6
2S5 2H7
```

To choose from this

```
7-2: L/L ➡ LOP

Chain= 2S1-2S2
Lat   = 35°38.000N
Lon   = 139°06.000E

L/L➡LOP:   S1= 4398.3
           S2= 1252.2
```
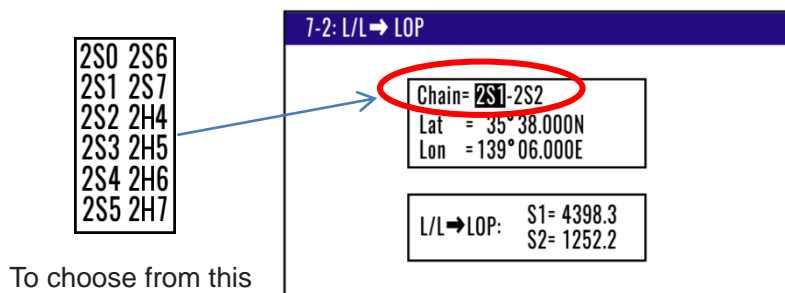
If you store the calculation result

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

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

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

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

In the case of DECCA

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

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

(3) Press (2/N) key to select "**2: L/L→LOP**".

(4) Press (ENT) key.

(5) Enter (2-digit) Decca chain number.

(6) Press (ENT) key.

(7) Press [▶] key to move the cursor to combination field of secondary stations.

(8) Press (ENT) key.

(9) Press [▲] or [▼] key to select a combination of secondary stations.

(10) Press(ENT) key.

(11) Press [▼] key to move the cursor to latitude field.

(12) Enter (7-digit) latitude using numeric keys.

(13) Enter "N" for north or "S" for south latitude.

(14) Press (ENT) key.

(15) Enter (8-digit) longitude using numeric keys.

(16) Enter "E" for east or "W" for west latitude.

(17) Press (ENT) key.

2-digit write

RG
RP
GP

7-2: L/L ➡ LOP

Chain = **43** GP
Lat = 35° 38.000N
Lon = 139° 06.000E

L/L ➡ LOP: 0 F:30:92
              0 G:53:79
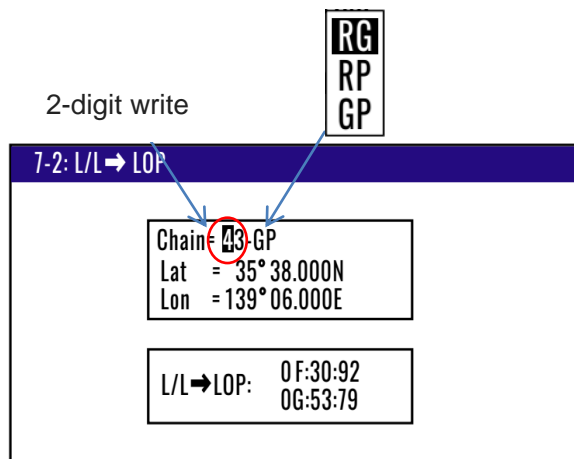
If you store the calculation result.

(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.
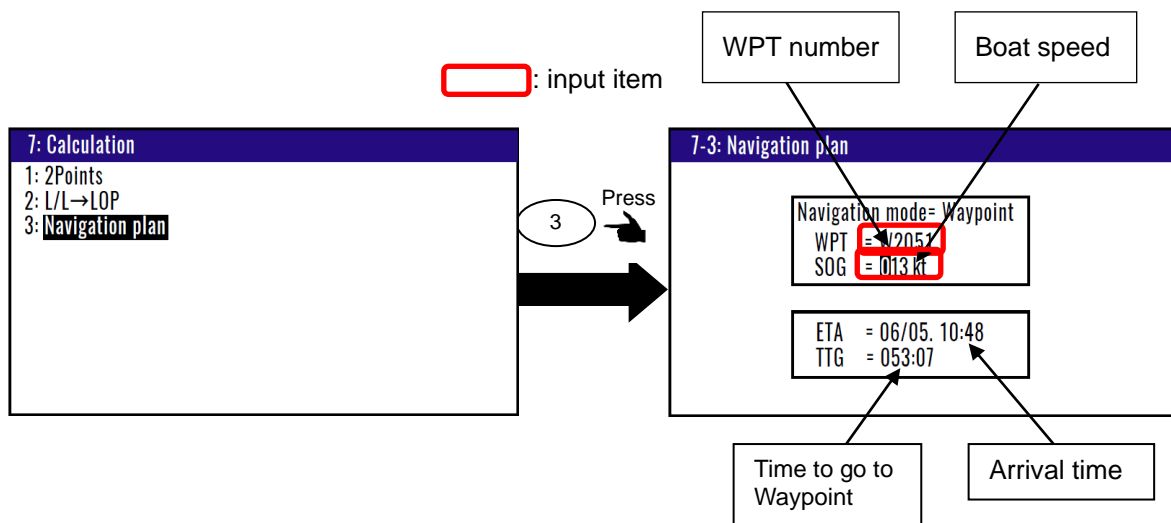
□ : input item

WPT number   Boat speed

7: Calculation		7-3: Navigation plan
1: 2Points		
2: L/L→LOP	Press 3	Navigation mode= Waypoint
3: Navigation plan		WPT = N2051
		SOG = 013 kt
		ETA = 06/05. 10:48
		TTG = 053:07

Time to go to   Arrival time
Waypoint

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.

□ : input item

WPT number   Boat speed

7: Calculation		7-3: Navigation plan
1: 2Points		
2: L/L→LOP	Press 3	Navigation mode= Waypoint
3: Navigation plan		WPT = N2051
		SOG = 013 kt
		ETA = 06/05. 10:48
		TTG = 053:07

Time to go to   Arrival time
Waypoint
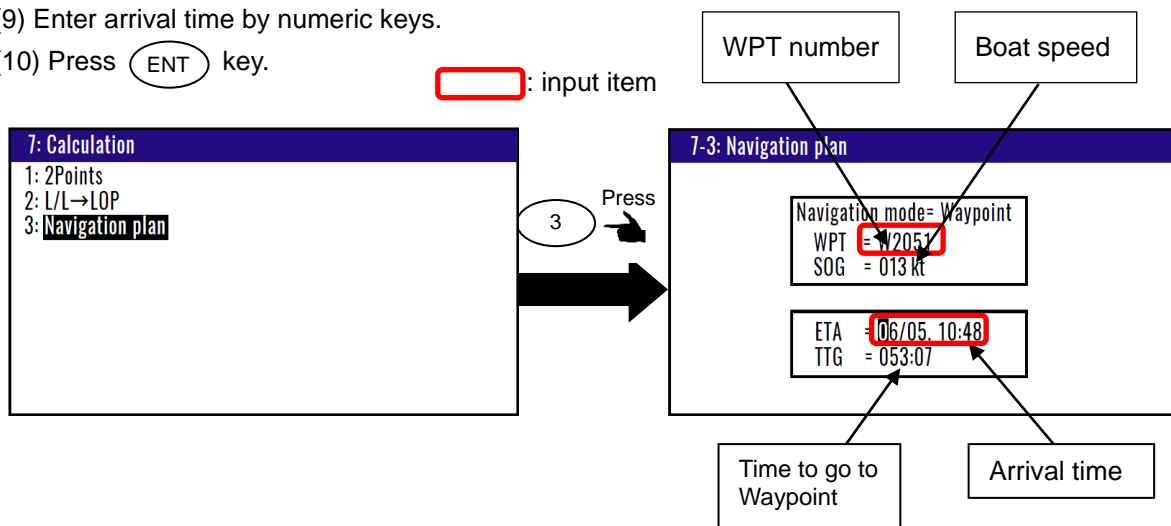
Calculating arrival time and total navigation time from route plan and boat speed

(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.
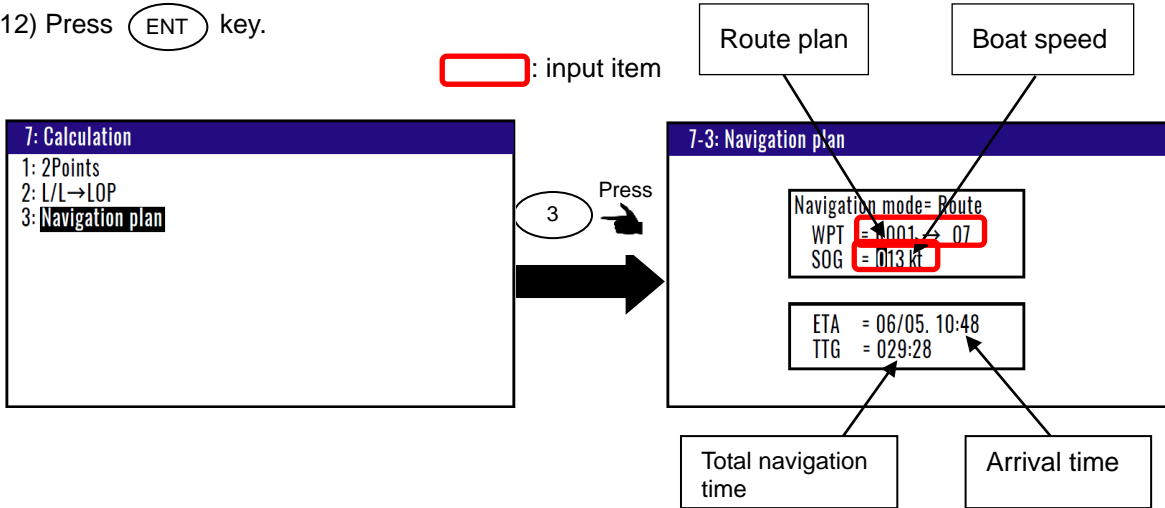
⬜ : input item

| Route plan | Boat speed |

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

Press ③ →

```
7-3: Navigation plan

Navigation mode= Route
  WPT  = R001 → 07
  SOG  = 013 kt

  ETA  = 06/05. 10:48
  TTG  = 029:28
```

| Total navigation time | Arrival time |

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 "**Route**" in the pop-up.

(5) Press (ENT) key.

(6) Press [▼] key and enter a (3-digit) route number (001 to 100).

(7) Press (ENT) key.

(8) Press [▼] key two times.

(9) Enter arrival time by numeric keys.

(10) Press (ENT) key.

⬜ : input item

| Route plan | Boat speed |

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

Press ③ →

```
7-3: Navigation plan

Navigation mode= Route
  WPT  = R001 → 07
  SOG  = 013 kt

  ETA  = 06/05. 10:48
  TTG  = 029:28
```

| Total navigation time | Arrival time |
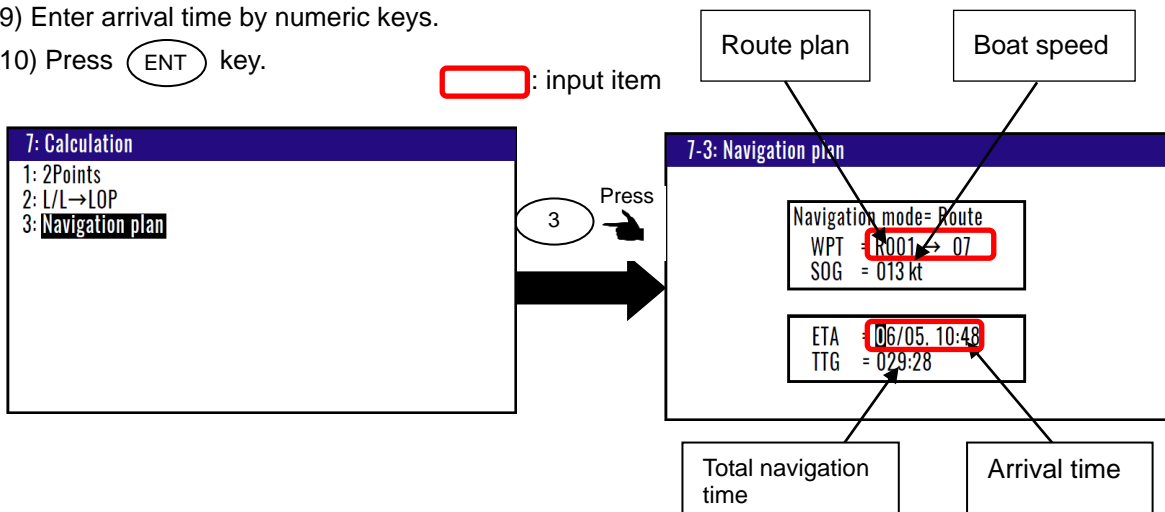
4.6   Menu 8: Initial setup

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.

```
┌────────────────────────────────────────────┐
│ 8: Initial setup (Compass)                  │
│ 1: Backup              = [0]60              │
│ 2: Averaging Heading   = 2                  │
│ 3: Accel (g)           = 1                  │
│ 4: Averaging(ROT)      = 2                  │
│                                             │
│                                             │
│                                             │
└────────────────────────────────────────────┘
```
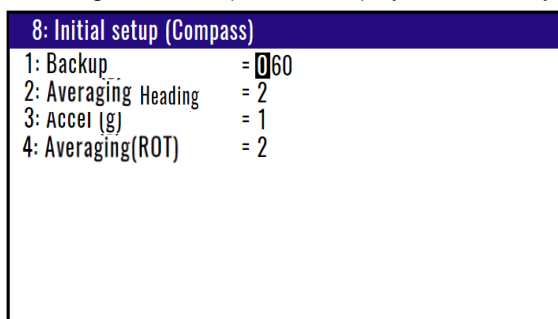
Initial setup: 060sec

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

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

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

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

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

(5) Press (ENT) key.

```
┌────────────────────────────────────────────┐
│ 8: Initial setup (Compass)                  │
│ 1: Backup              = 000                │
│ 2: Averaging(Heading)  = [0]                │
│ 3: Accel (g)           = 1                  │
│ 4: Averaging(ROT)      = 2                  │
│                          3                  │
│                          4                  │
│                                             │
└────────────────────────────────────────────┘
```
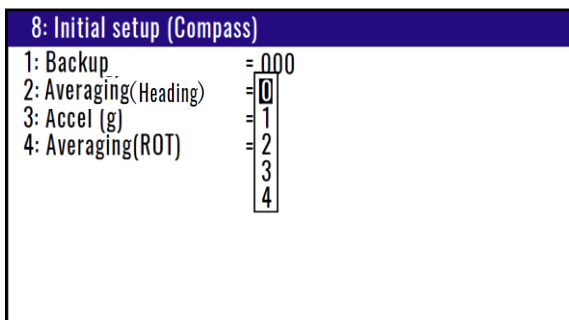
Initial setup: 2

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.

```
8: Initial setup (Compass)
1: Backup              = 060
2: Averaging(Heading)  = 2
3: Accel (g)           = 0
4: Averaging(ROT)      = 1
                         2
                         3
                         4
```
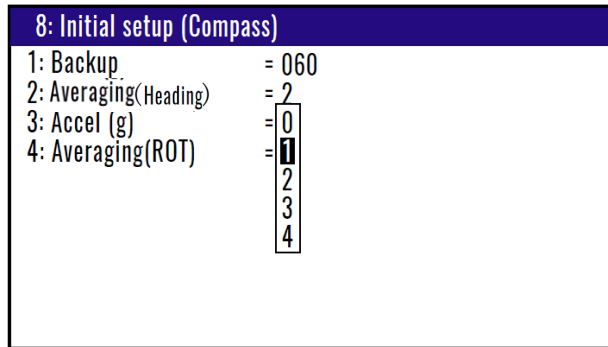
Initial setup: 1

4.6.4   Averaging(ROT)

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

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

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

(3) Press (4/W) key to select "**4: Averaging (ROT)**".

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

(5) Press (ENT) key.

```
8: Initial setup (Compass)
1: Backup              = 060
2: Averaging(Heading)  = 2
3: Accel (g)           = 1
4: Averaging(ROT)      = 0
                         1
                         2
                         3
                         4
```
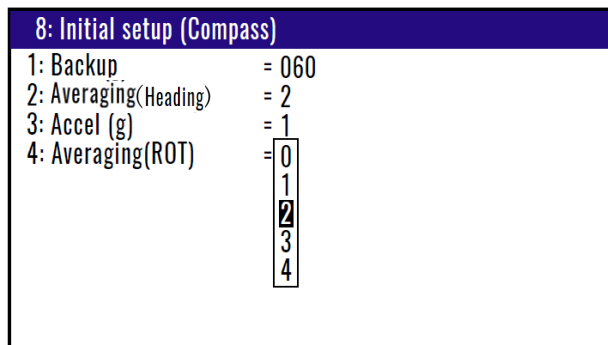
Initial setup: 2

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

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

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

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

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

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

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

(5) Press (ENT) key.
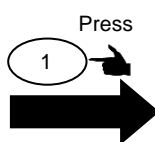
Initial setup: 0

4.6.6   Changing the distance or speed unit

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

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

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

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

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

(5) Press [▲] or [▼] key to move cursor onto the distance or speed unit "NM", "km", "sm".

(6) Press (ENT) key.

Initial setup: NM

4.6.7　Changing sail mode

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

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

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

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

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

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

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

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

(6) Press (ENT) key.

Initial setup: Great circle
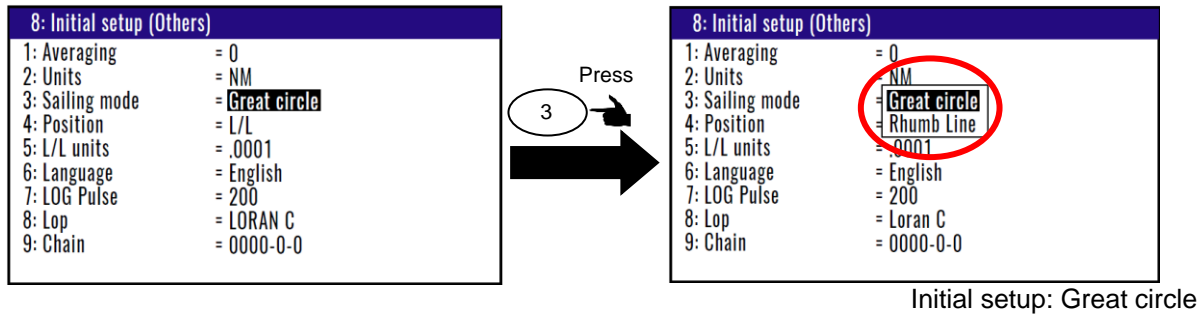
4.6.8　Displaying position data in LAT/LONG mode

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

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

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

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

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

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

(6) Press (ENT) key.

Initial setup: L/L
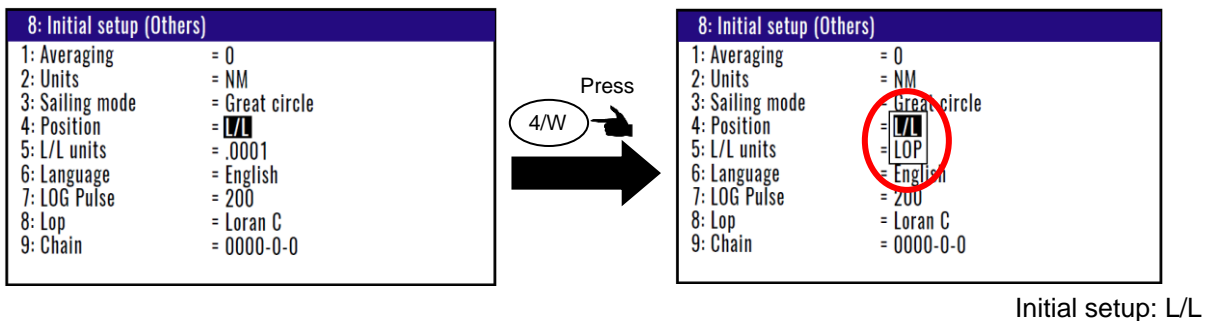
4.6.9   Changing the latitude and longitudinal display digits

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

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

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

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

(4) Press (5) key to select "**5: L/L units**".

(5) Press [▲] or [▼] key to move cursor to ".001", ".0001".

(6) Press (ENT) key.

```
8: Initial setup (Others)
1: Averaging          = 0
2: Units              = NM
3: Sailing mode       = Great circle
4: Position           = L/L
5: L/L units          = .0001
6: Language           = English
7: LOG Pulse          = 200
8: Lop                = Loran C
9: Chain              = 0000-0-0
```

Press (5) ➡

```
8: Initial setup (Others)
1: Averaging          = 0
2: Units              = NM
3: Sailing mode       = Great circle
4: Position           = L/L
5: L/L units          = .001
                        .0001
6: Language           = English
7: LOG Pulse          = 200
8: Lop                = Loran C
9: Chain              = 0000-0-0
```
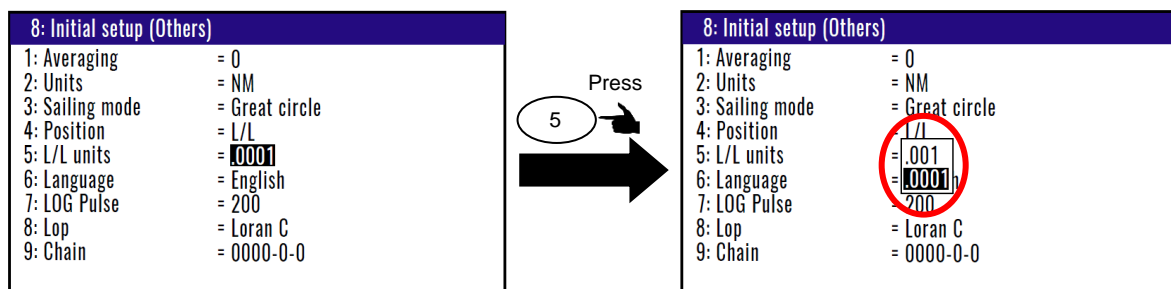
Initial setup: .0001'

4.6.10   Selecting a Language

You can select the language from the pop-up.

The procedure is as follows:

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

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

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

(4) Press (6/E) key to select "**6: Language**".

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

(6) Press (ENT) key.

```
8: Initial setup (Others)
1: Averaging          = 0
2: Units              = NM
3: Sailing mode       = Great circle
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
```

Press (6/E) ➡

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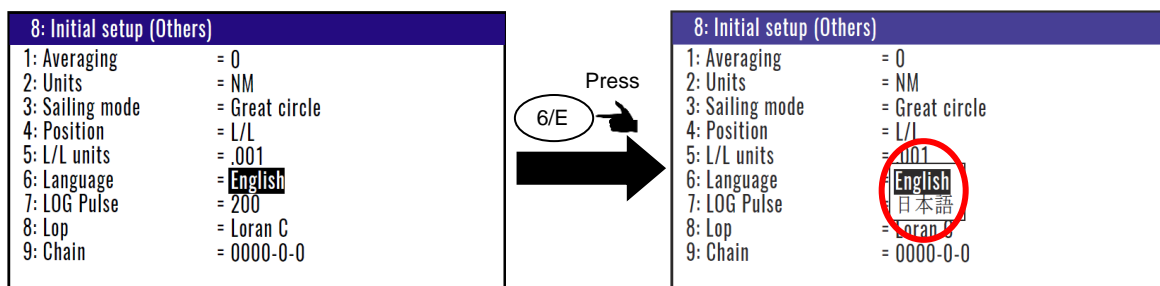
Initial setup: English

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.

```
8: Initial setup (Others)
1: Averaging        = 0
2: Units            = NM
3: Sailing mode     = Great circle
4: Position         = L/L
5: L/L units        = .0001
6: Language         = English
7: LOG Pulse        = 200
8: Lop              = Loran C
9: Chain            = 0000-0-0
```

Press ◯7 ➡

```
8: Initial setup (Others)
1: Averaging        = 0
2: Units            = NM
3: Sailing mode     = Great circle
4: Position         = L/L
5: L/L units        = .0001
6: Language         = English
7: LOG Pulse          50
8: Lop            = 100 n C
9: Chain          = 200 0-0-0
                     400
```
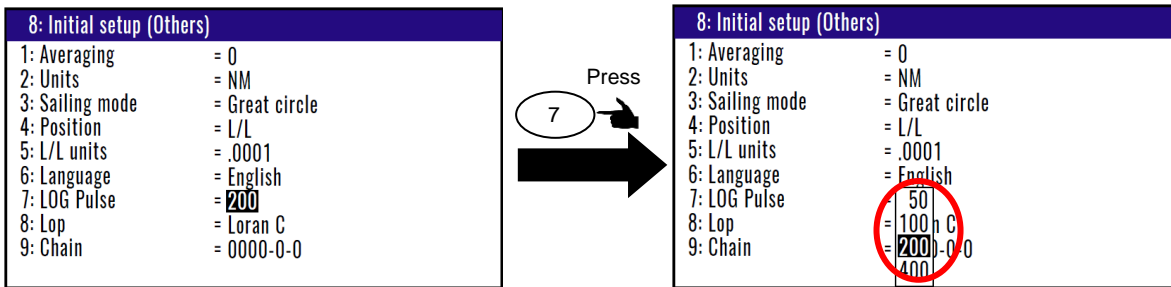
Initial setup: 200

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

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

The procedure is as follows:

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

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

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

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

In the case "LoranC"

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

(6) Press ⬭ENT key.

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

(8) Input chain number and first digit of two secondary stations of LoranC by numeric keys.

(9) Press ⬭ENT key.

```
8: Initial setup (Others)
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
```
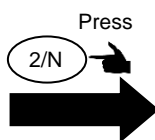
```
8: Initial setup (Others)
1: Averaging        = 0
2: Units            = NM
3: Sailing mode     = Great circle
4: Position         = LOP
5: L/L units        = .0001
6: Language         = English
7: LOG Pulse        = 200
8: Lop              = Loran C
9: Chain            = 0000-0-0
```
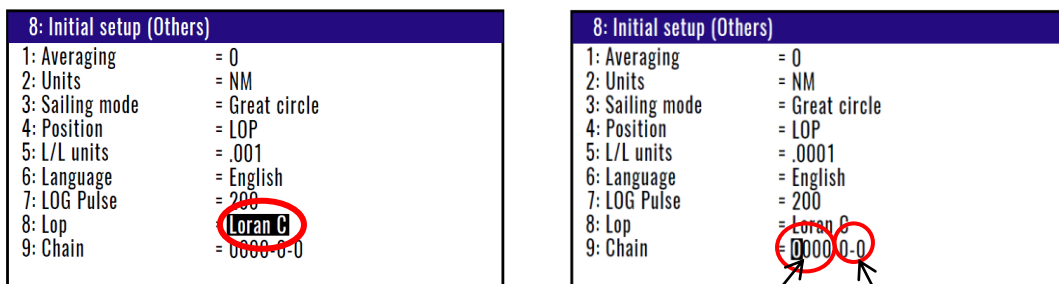
Chain number   Secondary station

In the case "LoranA"

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

(6) Press (ENT) key.

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

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

```
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                = LoranA
9: Chain              = 2S0
                        2S0
```

```
8: Initial setup (Others)
1: Averaging          = 0
2: Units              = NM
3: Sailing mode       = Great circle
4: Position           = Lop
5: L/L units          = .0001       2S0 2S6
6: Language           = English     2S1 2S7
7: LOG Pulse          = 200         2S2 2H4
8: Lop                = LoranA      2S3 2H5
9: Chain              = 2S0         2S4 2H6
                        2S0         2S5 2H7
```

Station 1

```
8: Initial setup (Others)
1: Averaging          = 0
2: Units              = NM
3: Sailing mode       = Great circle
4: Position           = Lop
5: L/L units          = .0001       2S0 2S6
6: Language           = English     2S1 2S7
7: LOG Pulse          = 200         2S2 2H4
8: Lop                = LoranA      2S3 2H5
9: Chain              = 2S0         2S4 2H6
                        2S0         2S5 2H7
```

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.

```
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              = Auto
   Chain                47-RG
```

```
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              = Auto
   Chain                47-RG
```

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

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	= DECC RG
9: Chain	= Man RP
Chain	43 GP

Chain number   Combination of two secondary station

4.7   Menu 9: Interface

4.7.1   Selecting a DATA port to setting.
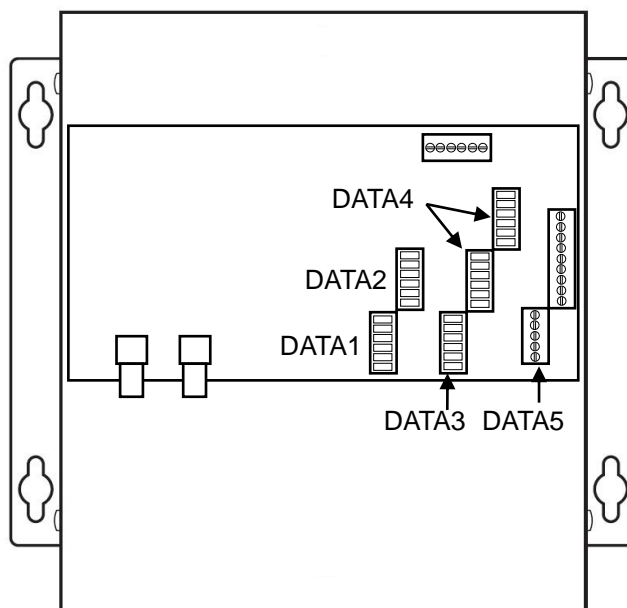
You can select the format of output data.

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

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

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

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

(5) Press (ENT) key.
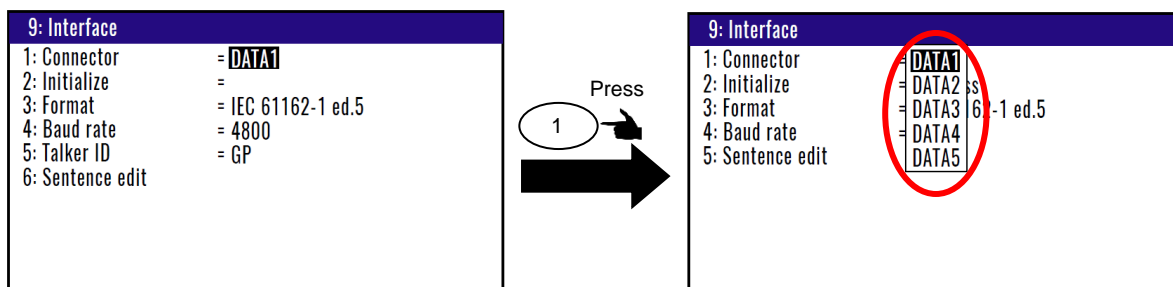
4.7.2   Selecting initialized equipment
You can select the initialized equipment. It's possible to choose a sentence which matches equipment by this setting.

  COMPASS: Should be selected when connected to marine radar and requires high
            rate HDG.
  PLOTTER: Should be selected when connecting to plotter and no need for a high
            speed HDG.
  RADAR-1: Should be selected when connecting to KODEN's marine radar
            (MDC-5200/-5500/-5000/-7000/-7900 series).
  RADAR-2: Should be selected when connecting to KODEN's marine radar
            (MDC-900(A)/-2000(A) series).

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

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

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

(4) Press [▲] or [▼] key to move cursor onto the output data format to select "Compass" "Plotter" "Radar-1" "Radar-2".

(5) Press (ENT) key.
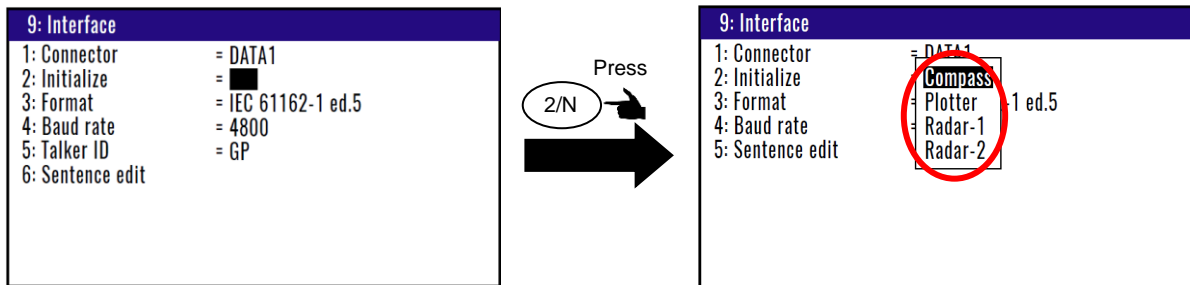
Initial setup: None

4.7.3   Selecting an output data format of DATA1-5 port

You can select the format of output data format.

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

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

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

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

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

(5) Press (ENT) key.
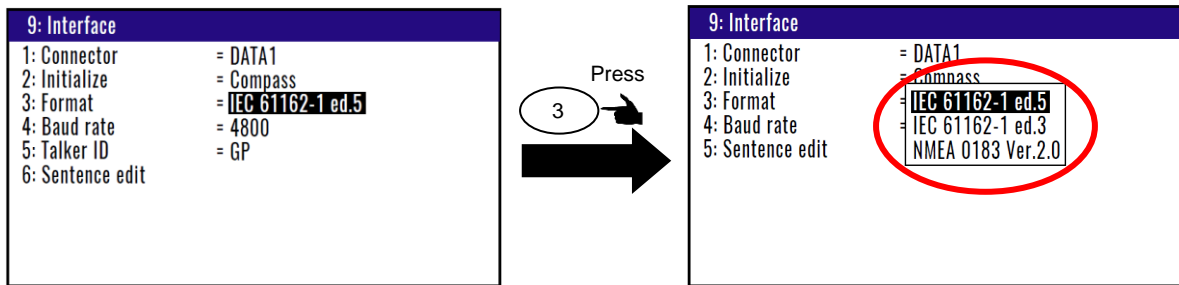
Initial setup: IEC 61162-1 ed.5

You can select from following three formats.

1) IEC61162-1 ed5

2) IEC61162-1 ed3

3) NMEA 0183 Ver.2.0

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

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

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

(5) Press (ENT) key.
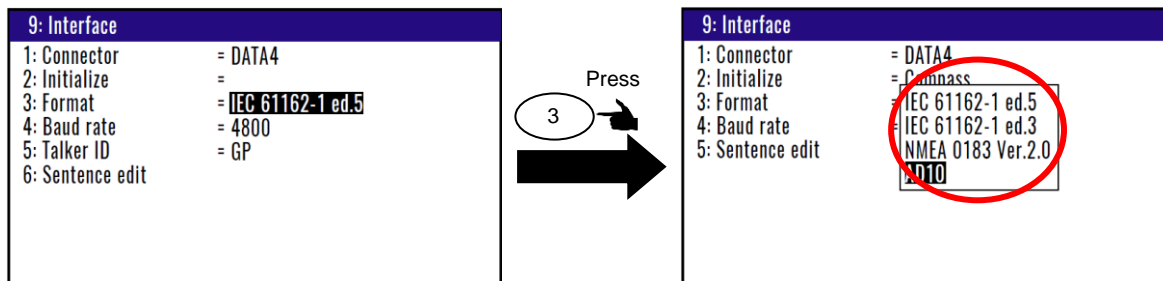
Initial setup: IEC 61162-1 ed.5

You can select from following four formats.

1) IEC61162-1 ed5

2) IEC61162-1 ed3

3) NMEA 0183 Ver.2.0

4) AD10 (Furuno's format)

4.7.4 Setting the Baud rate

You can change the Baud rate of DATA1 and DATA2.

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

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

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

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

(5) Press (ENT) key.
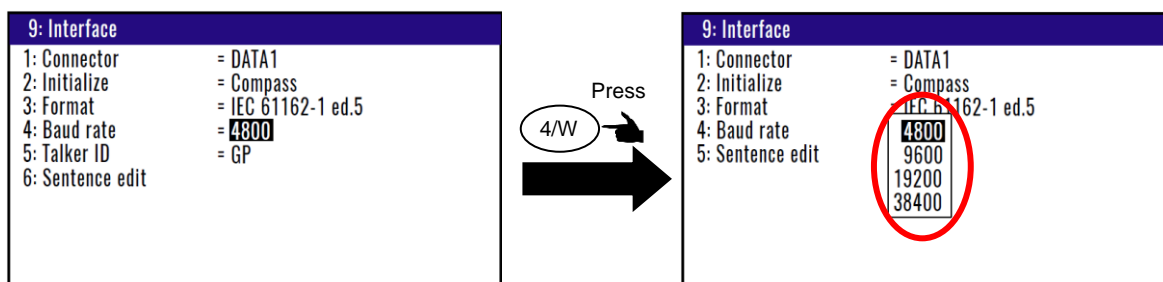
Initial setup: 4800

4.7.5 Setting the output Talker ID

You can change the Talker ID.

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

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

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

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

(5) Press (ENT) key.

9: Interface
1: Connector	= DATA1
2: Initialize	= Compass
3: Format	= IEC 61162-1 ed.5
4: Baud rate	= 4800
5: Talker ID	= GP
6: Sentence edit	

Press
5

9: Interface
1: Connector	= DATA1
2: Initialize	= Compass
3: Format	= IEC 61162-1 ed.5
4: Baud rate	= 4800
5: Talker ID	= GP / HE
6: Sentence edit	

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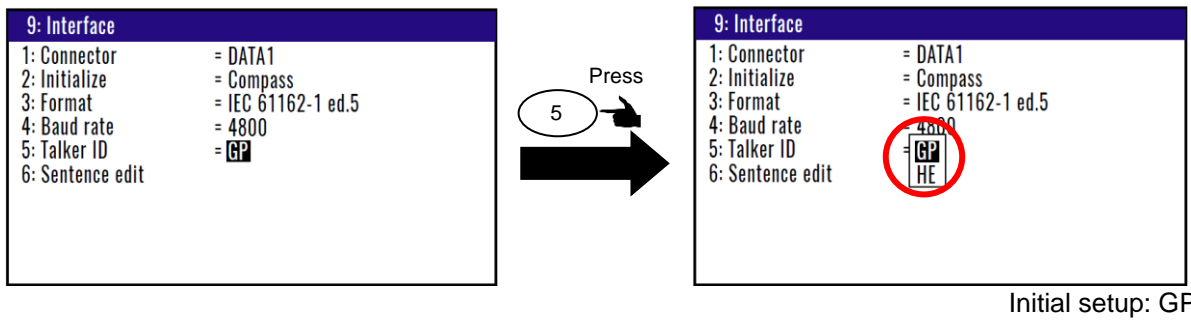
NOTE: *"HE" can use on only Non SOLAS ships.*

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

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

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

(5) Press (ENT) key.

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

(7) Press (ENT) key.

9: Interface
1: Connector	= DATA1
2: Initialize	=
3: Format	= IEC 61162-1 ed.5
4: Baud rate	= 4800
5: Talker ID	= GP
6: Sentence edit	

Press
6/E

9-6: Sentence edit
AAM = OFF	APB = OFF	ATT = OFF	BOD = OFF
BWC = OFF	DTM = 1s	HDM = OFF	HDT = 100ms
HVE = OFF	GBS = OFF	GGA = 1s	GLL = 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
PKODA = OFF	PKODG1 = OFF	PKODG21 = OFF	
PKODG7 = OFF	PKODQ = OFF		

0% 100%

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

0% 100%

Explanation of sentence (Refer to "10.5 Output sentence")

Heading data sentence

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

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

```
OFF
1s
```

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Chapter 5　How to use LOPs

5.1　Initial setup for LOPs display

Measured longitude and latitude can be translated into loran C, loran A or DECCA. To turn on the LOPs mode, the following initial setup is required.
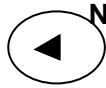
NOTE: *Press to backspace the cursor to correct an input error.*
◄
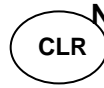
NOTE: *Press to clear incorrect Input. You can reenter Numeric data.*
CLR

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

The procedure is as follows:

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

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

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

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

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

(6) Press (ENT) key.

8: Initial setup (Others)	
1: Averaging	= 0
2: Units	= NM
3: Sailing mode	= Great circle
4: Position	= L/L
5: L/L units	= .0001
6: Language	= English
7: LOG Pulse	= 200
8: Lop	= Loran C
9: Chain	= 0000-0-0

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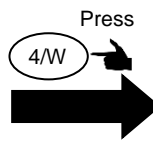
8: Initial setup (Others)	
1: Averaging	= 0
2: Units	= NM
3: Sailing mode	= Great circle
4: Position	= L/L
5: L/L units	= LOP
6: Language	= English
7: LOG Pulse	= 200
8: Lop	= Loran C
9: Chain	= 0000-0-0

In the case "LoranC"

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

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

(9) Press (ENT) key.

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

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

8: Initial setup (Others)	
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

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	= Loran C
9: Chain	= 9970-3-5

When serect Loran C, you must select station

4 OFF 01.15.15 15:37:44U 100m/safe P1.7D	
W84 **S1 30253.6**	← Secondary station 1
S2 59539.0	← Secondary station 2
SOG 10. 2 kn COG 240. 5°	

In the case "LoranA"

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

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

(9) Press 〔ENT〕 key.

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

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

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   = LoranA
9: Chain   = 2S0
                        2S0

8: Initial setup (Others)
1: Averaging   = 0
2: Units   = NM
3: Sailing mode   = Great circle
4: Position   = Lop
5: L/L units   = .0001   2S0 2S6
6: Language   = English   2S1 2S7
7: LOG Pulse   = 200   2S2 2H4
8: Lop   = LoranA   2S3 2H5
9: Chain   = 2S0   2S4 2H6
                        2S0   2S5 2H7

8: Initial setup (Others)
1: Averaging   = 0
2: Units   = NM
3: Sailing mode   = Great circle
4: Position   = Lop
5: L/L units   = .0001   2S0 2S6
6: Language   = English   2S1 2S7
7: LOG Pulse   = 200   2S2 2H4
8: Lop   = LoranA   2S3 2H5
9: Chain   = 2S0   2S4 2H6
                        2S0   2S5 2H7

4 OFF 01.15.15 15:37:44U 100m/safe P1.7D	
W84 **S1 1056.7**	← Secondary station 1
S2 3778.3	← Secondary station 2
SOG 10. 2 kn COG 240. 5°	

In the case "DECCA"

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

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

(9) Press (ENT) key.

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

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

(12) Press (ENT) key.

```
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            = Auto
   Chain             47-RG
```
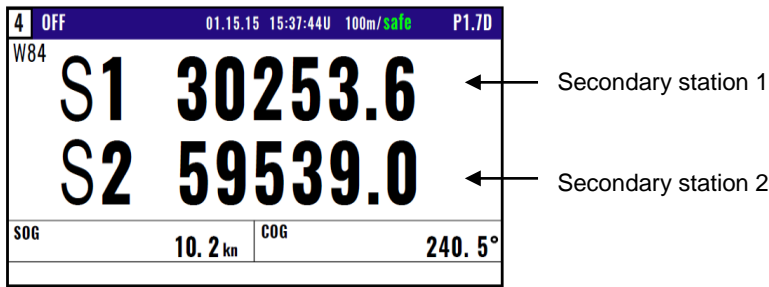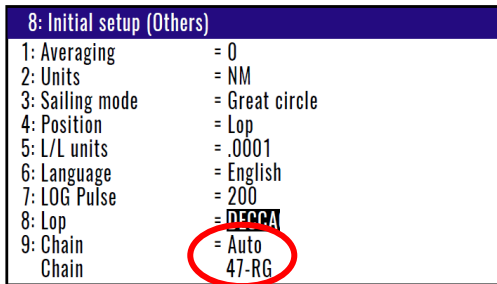
When select auto mode, KGC-300 finds the optimal station

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.

```
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
```
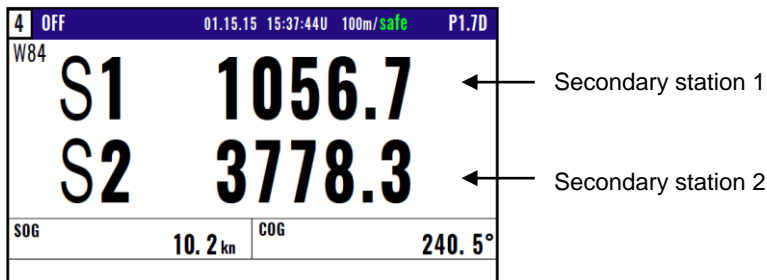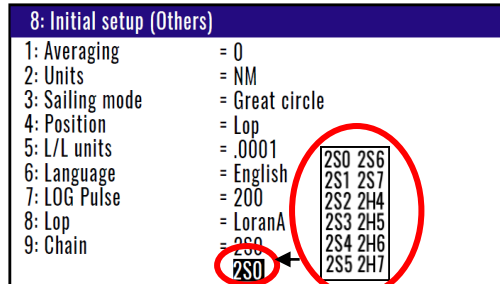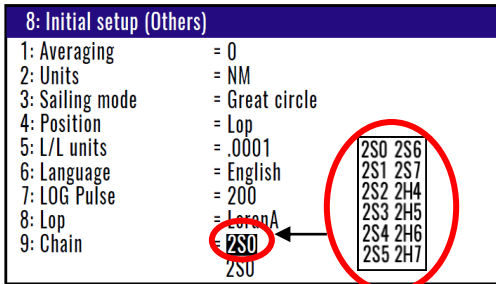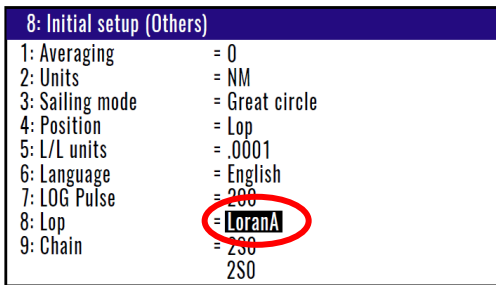
```
8: Initial setup (Others)
1: Averaging        = 0
2: Units            = NM
3: Sailing mode     = Great circle
4: Position         = Lop
5: L/L units        = .0001
6: Language         = English
7: LOG Pulse        = 20
8: Lop              = D C RG
9: Chain            = Man  RP
   Chain             43   GP
```
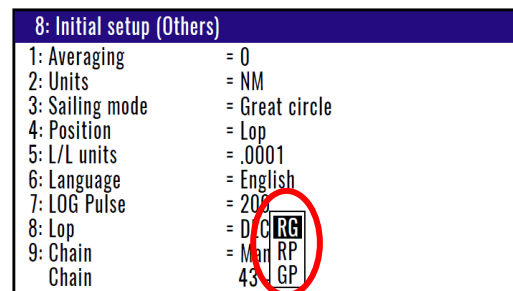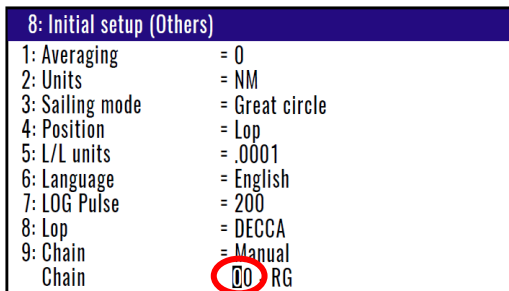
When select manual mode, you must select station

```
4  OFF        01.15.15  15:37:44U  100m/safe    P1.7D
W84
   R  0A:23:88          ← Red station
   G  1D:32:07          ← Green station
SOG              COG
       10.2 kn               240.5°
```
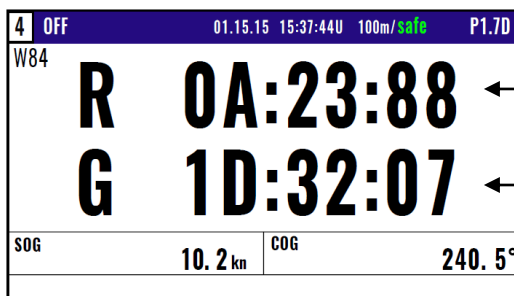
5.2   Storing Waypoints (LOPs data)

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

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

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

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

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

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

Storage position: **LoranC**

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

Press (1) key

Number	Secondary station 1	Secondary station 2	Comment
1:Waypoints			
W1000	30013.6	58330.4	07 06:38
W1001	30016.7	58370.5	
W1002	30029.1	58486.0	YOKOHAMA1
W1003	30037.5	58548.1	19 13:38
W1004	30035.0	58512.9	YOKOHAMA2
W1005	30034.1	58494.2	19 14:58
W1006	30028.7	58444.5	
W1007	30018.0	58351.3	URAYASU
W1008	30011.5	58270.1	ODAIBA
W1009	30008.1	58224.2	15 14:18

Storage position: **LoranA**

Number	Secondary station 1	Secondary station 2	Comment
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**

Number	Secondary station 1	Secondary station 2	Comment
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 4-17)

5.4   Calculating LOPs based on LAT/LONG data

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

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

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

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

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Chapter 6   Data backup and initialization

6.1   Data backup

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

6.1.1   Displaying the "Data backup" menu

The procedure is as follows:

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

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

```
Data backup
Read out of Waypoint/Route data    KGC ⇒ USB
Writing of Waypoint/Route data     USB ⇒ KGC
Read out of setting values         KGC ⇒ USB
Writing of setting values          USB ⇒ KGC
```

6.1.2   Insert USB memory

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

USB mark

```
Data backup                              [USB]
Read out of Waypoint/Route data    KGC ⇒ USB
Writing of Waypoint/Route data     USB ⇒ KGC
Read out of setting values         KGC ⇒ USB
Writing of setting values          USB ⇒ KGC
```

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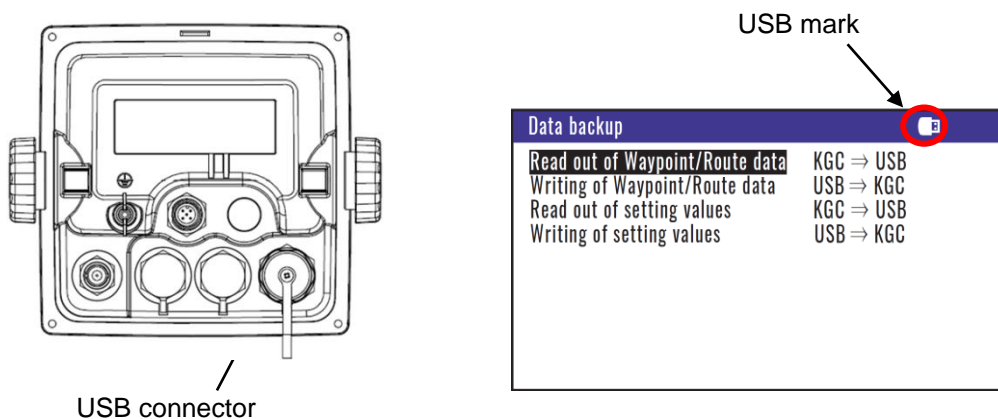
NOTE: *If USB mark is not appear,*
Change USB memory for new one.

6.1.3   Read out of data

In the case "Read out of Waypoint / Route data"

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

(2) Press (ENT) key.

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

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

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

```
Read out complete
```
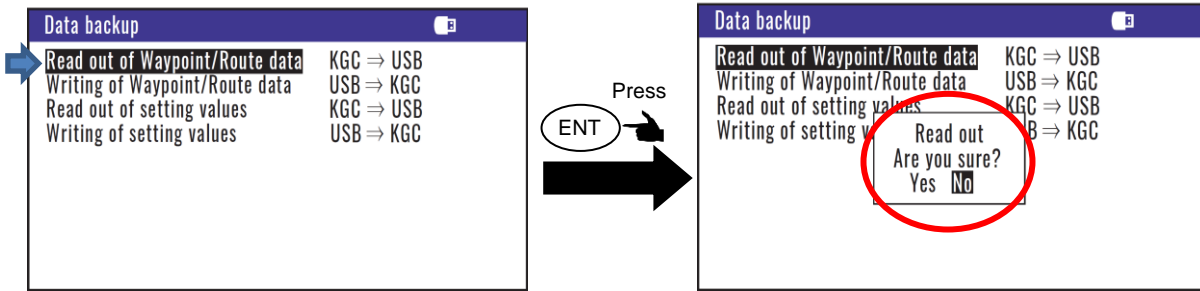
In the case "Read out of setting values"

(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.

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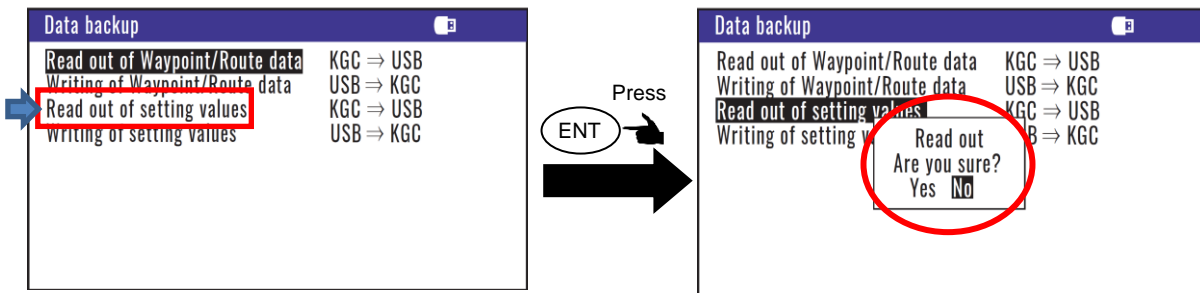
6.1.4   Writing of data

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.

⚠ **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
```

⚠ **CAUTION**
Data is overwritten

6.2   Initialization

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

6.2.1   Displaying the "Initial menu"

The procedure is as follows:

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

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

```
Initial menu
1: Initialize
2: Language          = English
3: WPT./Route clear
4: Event             = Auto
5: L/L default       = N/W
6: Buzzer(Display)   = 1
7: Buzzer(Main)      = 7
8: Sound (Main)      = Voiced

          [Mode key to exit]
```
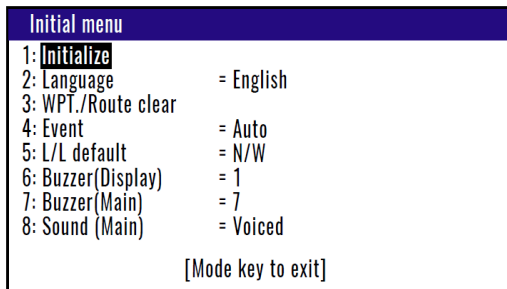
6.2.2   Initialize

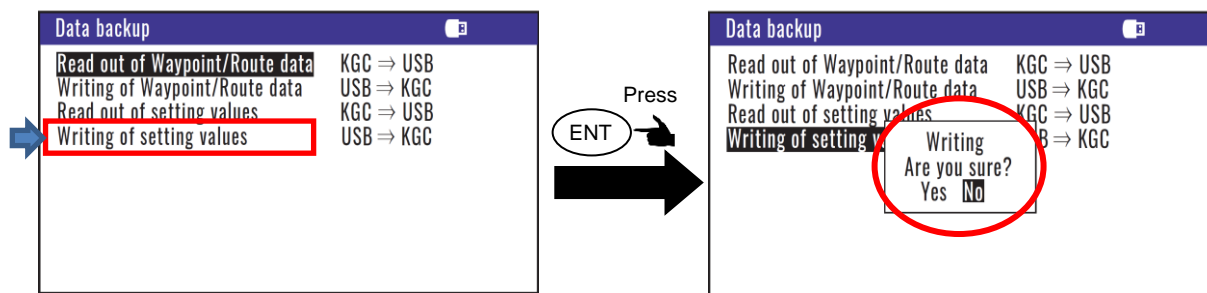Before initializing please note all system parameters and reset them after initialize, or backup for setting value in USB memory. (Refer to "**6.1.3 Read out of data**")

(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.*

```
Initial menu                              Initial menu
1: Initialize                             1: Initialize
2: Language     = English        Press    2: Language     = English
3: WPT./Route clear                       3: WPT./Route clear
4: Event        = Auto          (ENT)     4: Event        | Initialize
5: L/L default  = N/W                     5: L/L default  | Are you sure?
6: Buzzer(Display) = 1                    6: Buzzer(Display) | Yes   No
7: Buzzer(Main) = 7                       7: Buzzer(Main) = 7
8: Sound (Main) = Voiced                  8: Sound (Main) = Voiced

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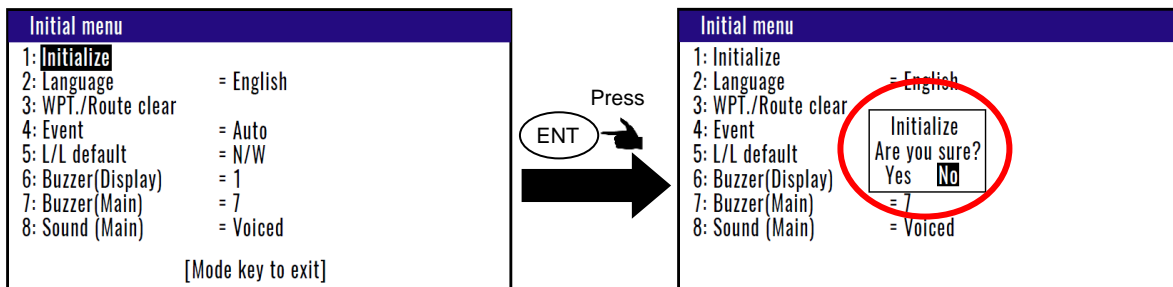
> **NOTE:** *If you want to backup the setting before initializing, please write setting value on USB memory. Refer to 6.1.3 and 6.1.4.*

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.

```
Initial menu
1: Initialize
2: Language        = English
3: WPT./Route clear
4: Event           = Auto
5: L/L default     = N/W
6: Buzzer(Display) = 1
7: Buzzer(Main)    = 7
8: Sound (Main)    = Voiced

        [Mode key to exit]
```

Press
ENT

```
Initial menu
1: Initialize
2: Language        = English
3: WPT./Route clear    日本語
4: Event           = Auto
5: L/L default     = N/W
6: Buzzer(Display) = 1
7: Buzzer(Main)    = 7
8: Sound (Main)    = Voiced
```

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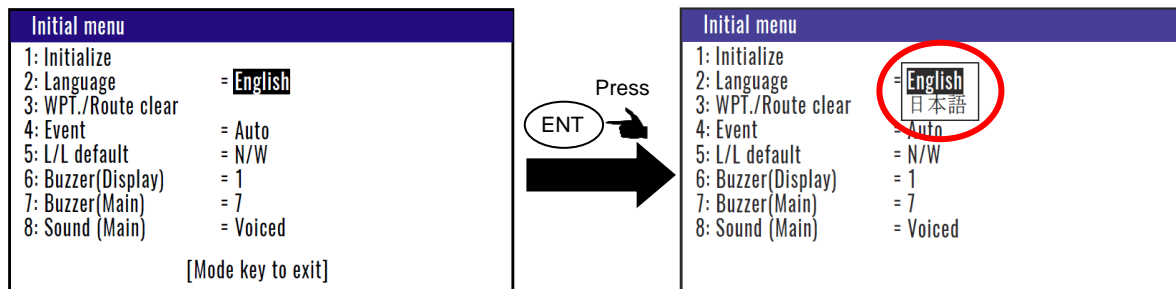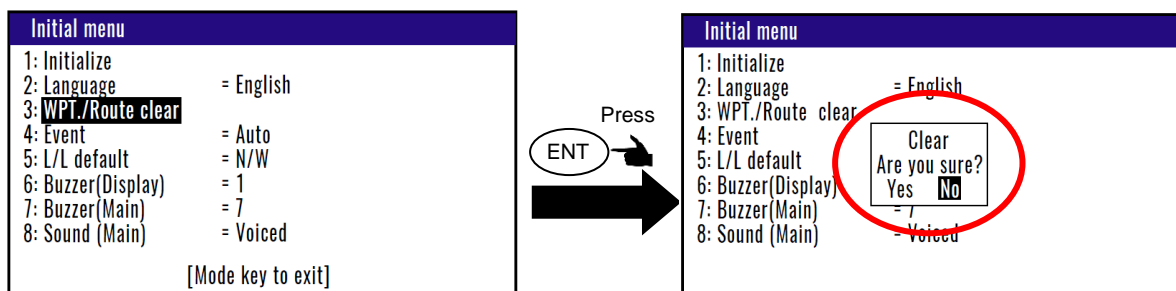
(4) Press (MODE) key to exit initial menu.

```
Initial menu
1: Initialize
2: Language        = English
3: WPT./Route clear
4: Event           = Auto
5: L/L default     = N/W
6: Buzzer(Display) = 1
7: Buzzer(Main)    = 7
8: Sound (Main)    = Voiced

        [Mode key to exit]
```

Press
ENT

```
Initial menu
1: Initialize
2: Language        = English
3: WPT./Route  clear
4: Event          Clear
5: L/L default   Are you sure?
6: Buzzer(Display) Yes  No
7: Buzzer(Main)    = 7
8: Sound (Main)    = Voiced
```

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

6.2.5 Changing a storing method for present position (Event)

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

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

(2) Press (ENT) key.

(3) Select "Auto" or "Manual" in the pop-up and press (ENT) key.

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

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

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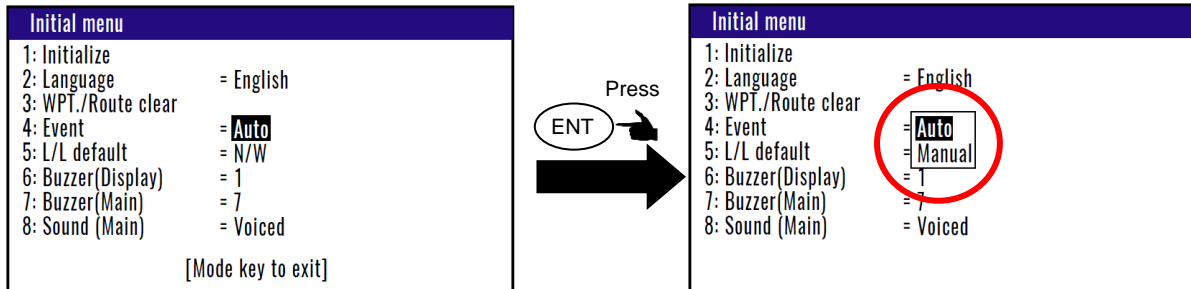
initial setup: AUTO

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

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

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

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

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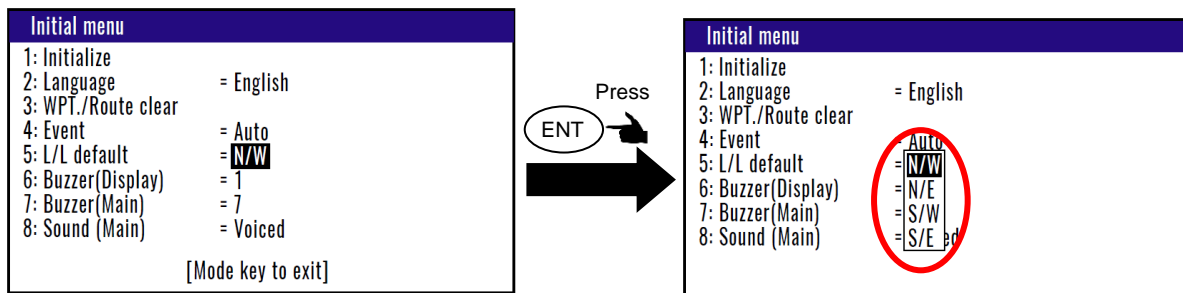
Initial setup: N/W

6.2.7   Frequency adjustment of the buzzer for display unit

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

Initial setup: 4

6.2.8 Volume adjustment of the buzzer for Processor unit

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

```
Initial menu
1: Initialize
2: Language        = English
3: WPT./Route clear
4: Event           = Auto
5: L/L default     = N/W
6: Buzzer(Display) = 1
7: Buzzer(Main)    = 7
8: Sound (Main)    = Voiced

        [Mode key to exit]
```
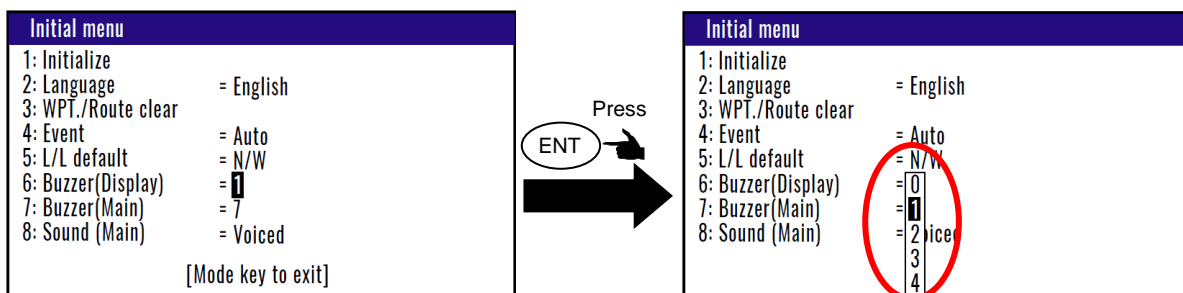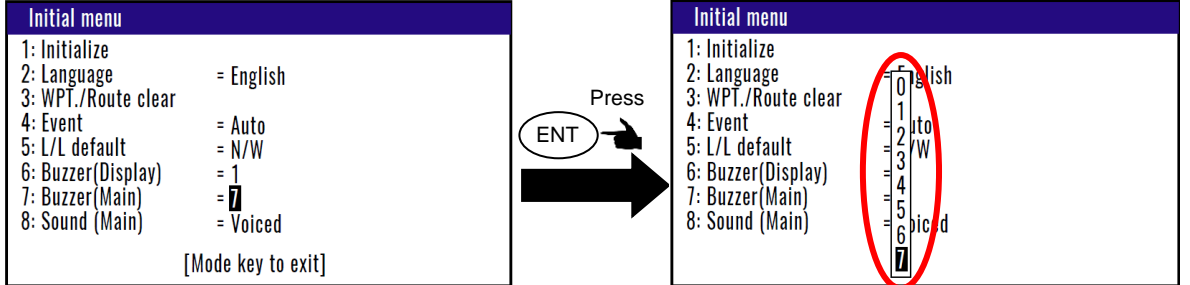
Press ENT →

```
Initial menu
1: Initialize
2: Language        = English
3: WPT./Route clear
4: Event           = Auto
5: L/L default     = N/W
6: Buzzer(Display) = 1
7: Buzzer(Main)    = 0
                     1
                     2
                     3
                     4
                     5
8: Sound (Main)    = 6
                     7
```

Initial setup: 7

6.2.9 Sound selection of the buzzer for Processor unit

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

```
Initial menu
1: Initialize
2: Language        = English
3: WPT./Route clear
4: Event           = Auto
5: L/L default     = N/W
6: Buzzer(Display) = 1
7: Buzzer(Main)    = 7
8: Sound (Main)    = Voiced

        [Mode key to exit]
```

Press ENT →

```
Initial menu
1: Initialize
2: Language        = English
3: WPT./Route clear
4: Event           = Auto
5: L/L default     = N/W
6: Buzzer(Display) = 1
7: Buzzer(Main)    = 7
8: Sound (Main)    = Pure
                     Voiced
```
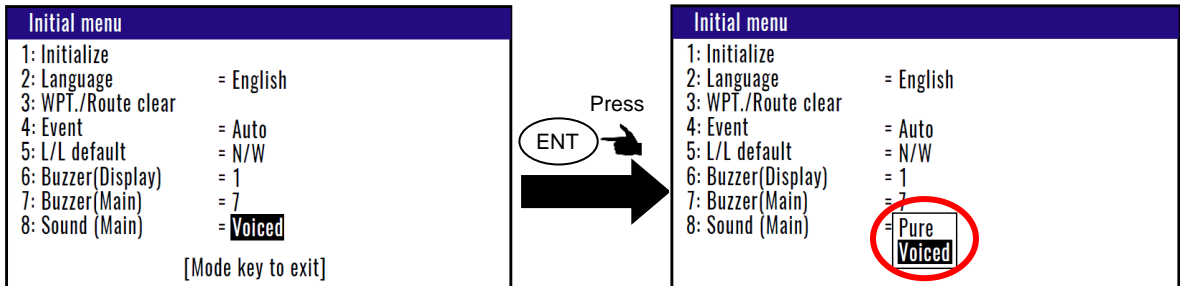
Initial setup: Voiced

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Chapter 7   Installation

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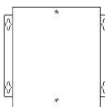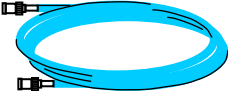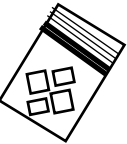
Qualified service technicians should perform the installation of KGC-300 that comprises the following operations.

(1) Unpacking each component of the system.

(2) Inspection of the exterior of each component unit and accessory.

(3) Checking the ship's mains voltage and current capacity.

(4) Determining the installation site

(5) Installing the Display unit

(6) Planning the cable routing and connections

(7) Adjustment and setups

7.2   Unpacking of the goods

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

No	Item	Type name	Remarks	Weight/ Length	Q'ty
1	Display unit	KGC-300.DU	With mounting bracket and front cover	0.74 kg	1
2	Processor unit	KGC-300.MU		1.1kg	1
3	Antenna unit	GA-14	With bird protector	2.2kg	1
4	DC power cable	CW-276-2M	With a 5-pin connector and one end plain	2.0m	1
5	Connecting cable	CW-419-5M	6 pin water resistant connector and other end plain w/EMI core	5.0m	1

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

Note: **Option of equipment is not included.**

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

7.3 Siting the units

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

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

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

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

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

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

7.4   Display unit installation

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

7.4.1   Table mounting

(1) Remove the two knurled fixing knobs that fix the display unit to the mounting bracket.

(2) Remove the display unit from the bracket and place it on a flat and safe area.

(3) Place the mounting bracket to the place where the display unit is to be installed, and fix the bracket with four tapping screws.

(4) Reset the display unit on to the bracket and fix it using the two knurled fixing knobs that were removed in step (1). Refer to Figure 7.1 for detail.
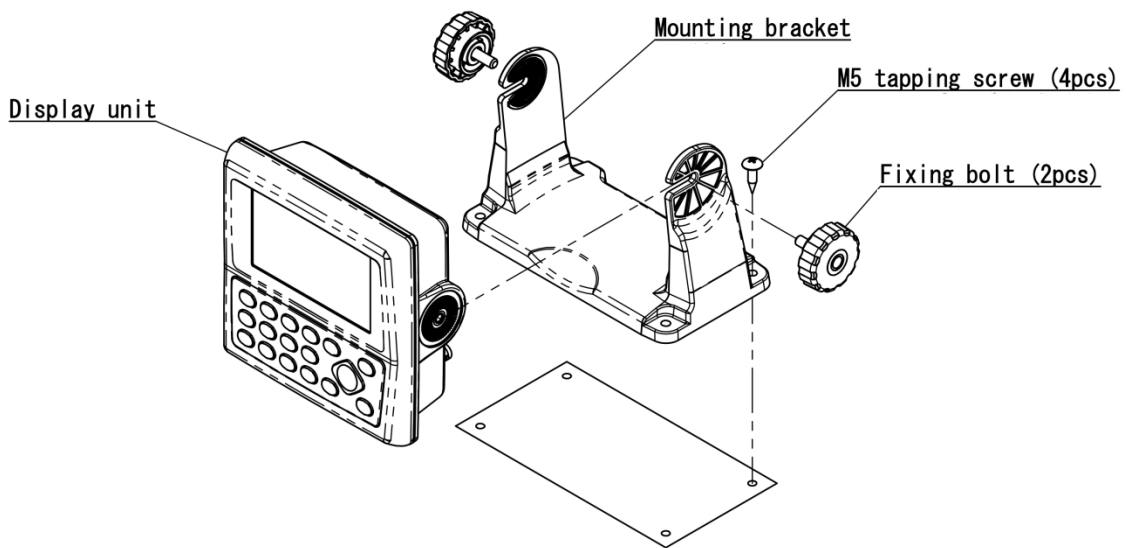
Figure 7.1 Fitting detail of KGC-300 in table mounting mode
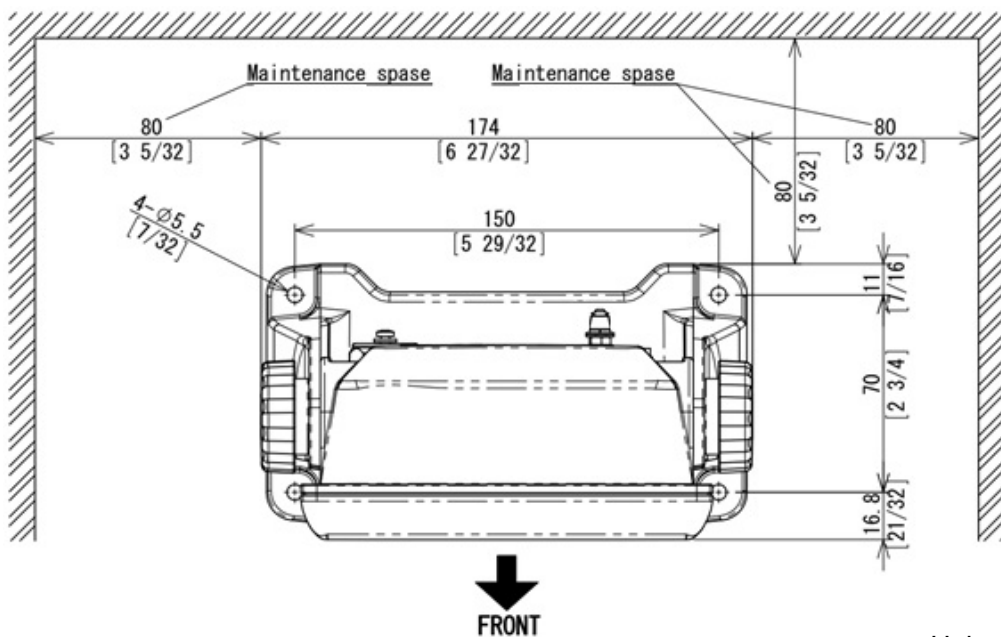
Unit: mm (inch)

Figure 7.2 Maintenance space required for KGC-300

7.4.2   Flush mounting

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

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

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

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

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

(6) Install the front frame removed in step (3).
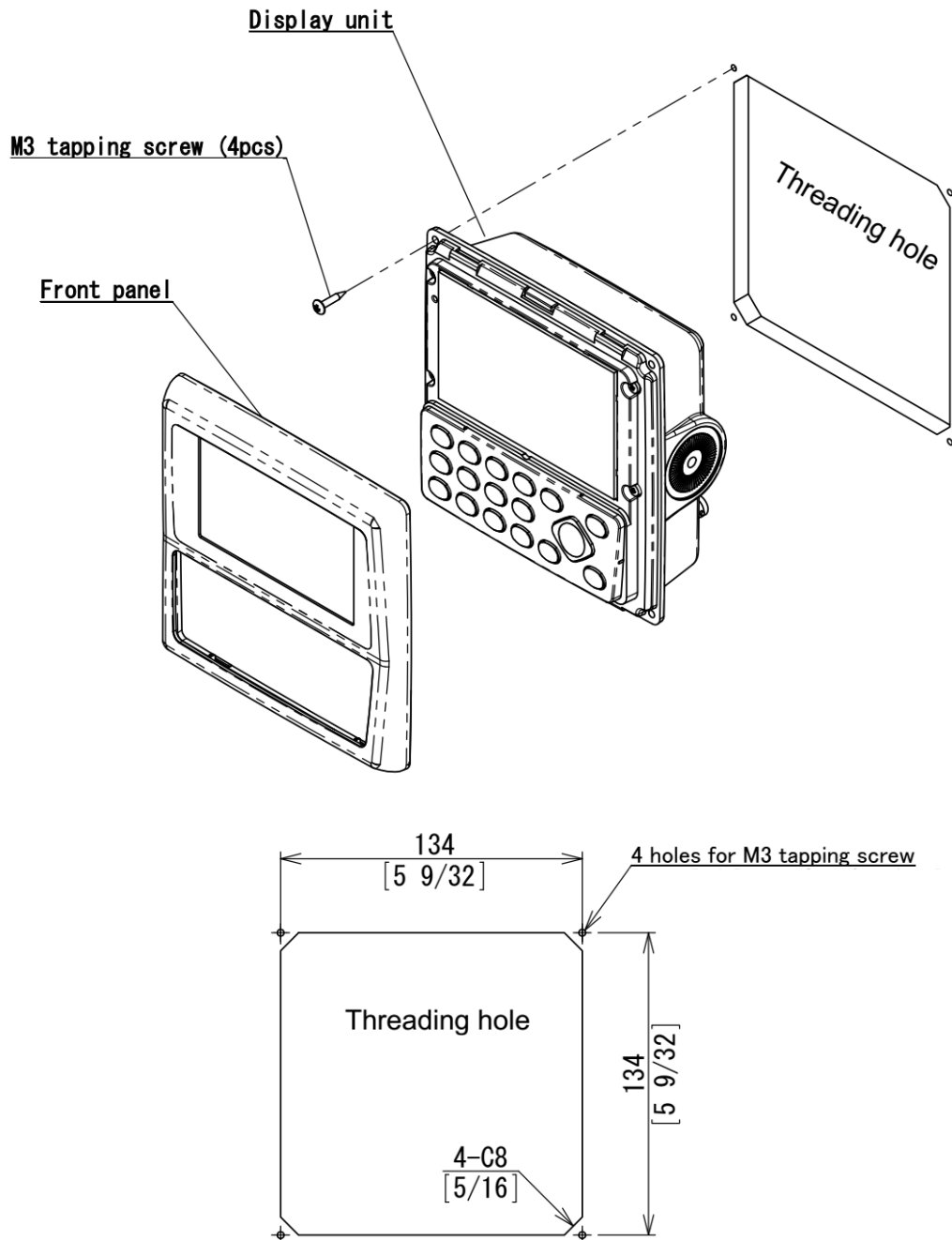
Figure 7.3 Flush mount installation   Unit: mm (inch)

7.5   Processor unit installation

7.5.1   Processor unit Installation of direction

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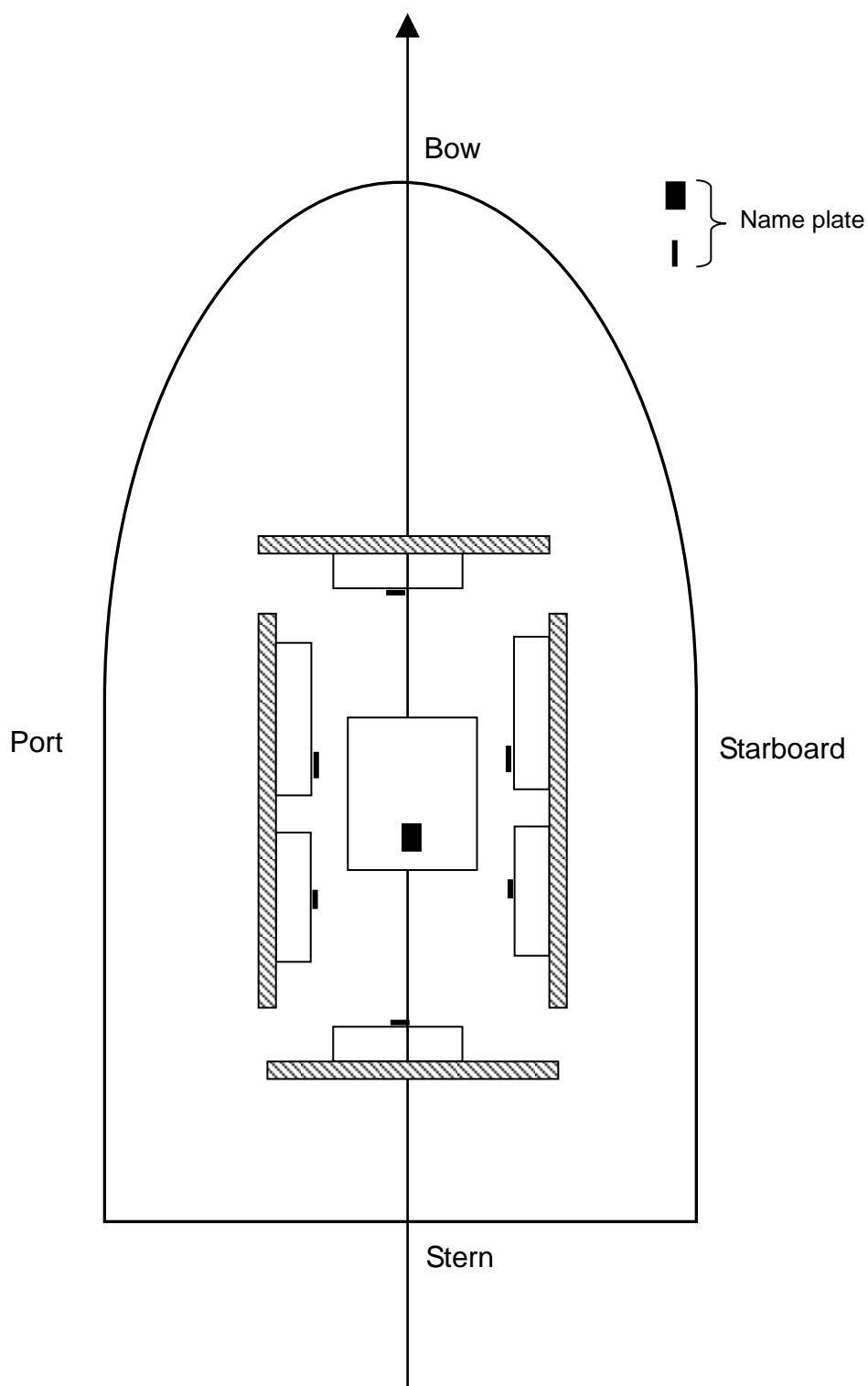
7.6   Antenna unit installation

7.6.1   Selecting the best site of GA-14 antenna

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

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

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

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

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

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

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

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

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

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

(10) At least 0.5 meters (1.6 feet) above the large metal surface.
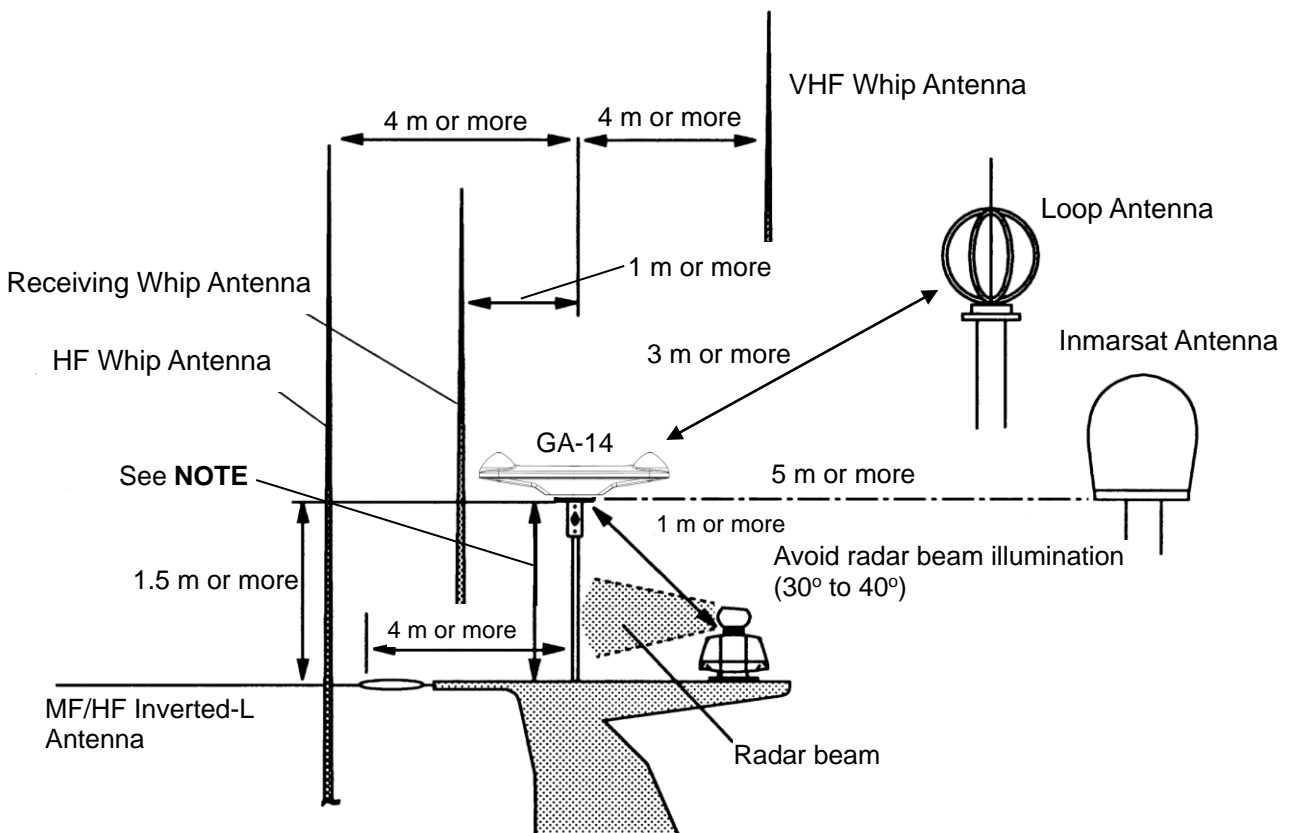
NOTE: Keep away from metallic objects at least 0.5 m.

Figure 7.4 Recommended GA-14 Antenna installation

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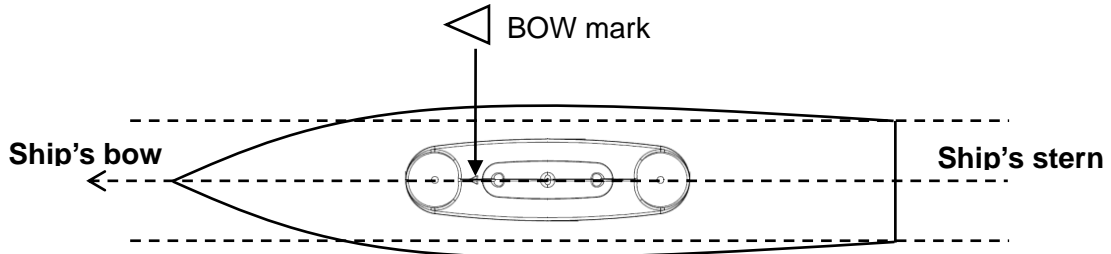
7.6.2   Antenna cable layout method

Two ways to run antenna cable from the antenna.

(1) Antenna cable inserted into the bracked and ran inside the mast pipe.
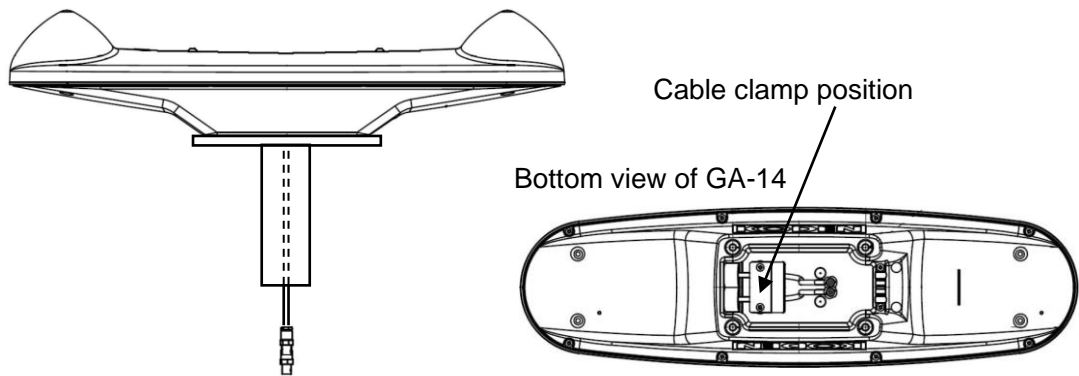
(2) Antenna cable is dropped off from the side of the antennal and ran outside of the mast pipe.
In this case it is necessary to change the setting position of the cable clamp.
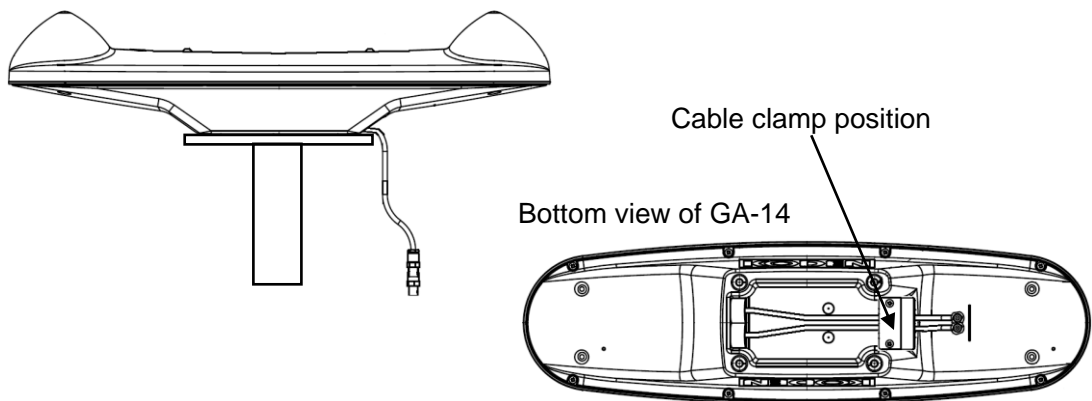
7.6.3   Installation of GPS antenna

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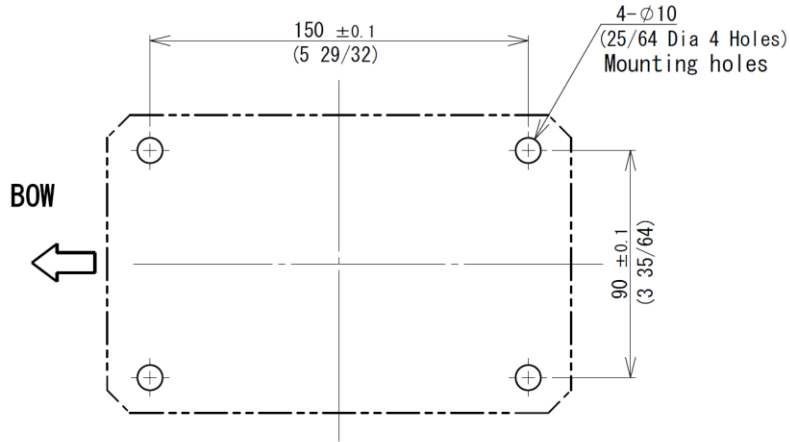
Unit: mm (inch)

Drawing of work for mounting holes

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

4-M8 hexagon bolt
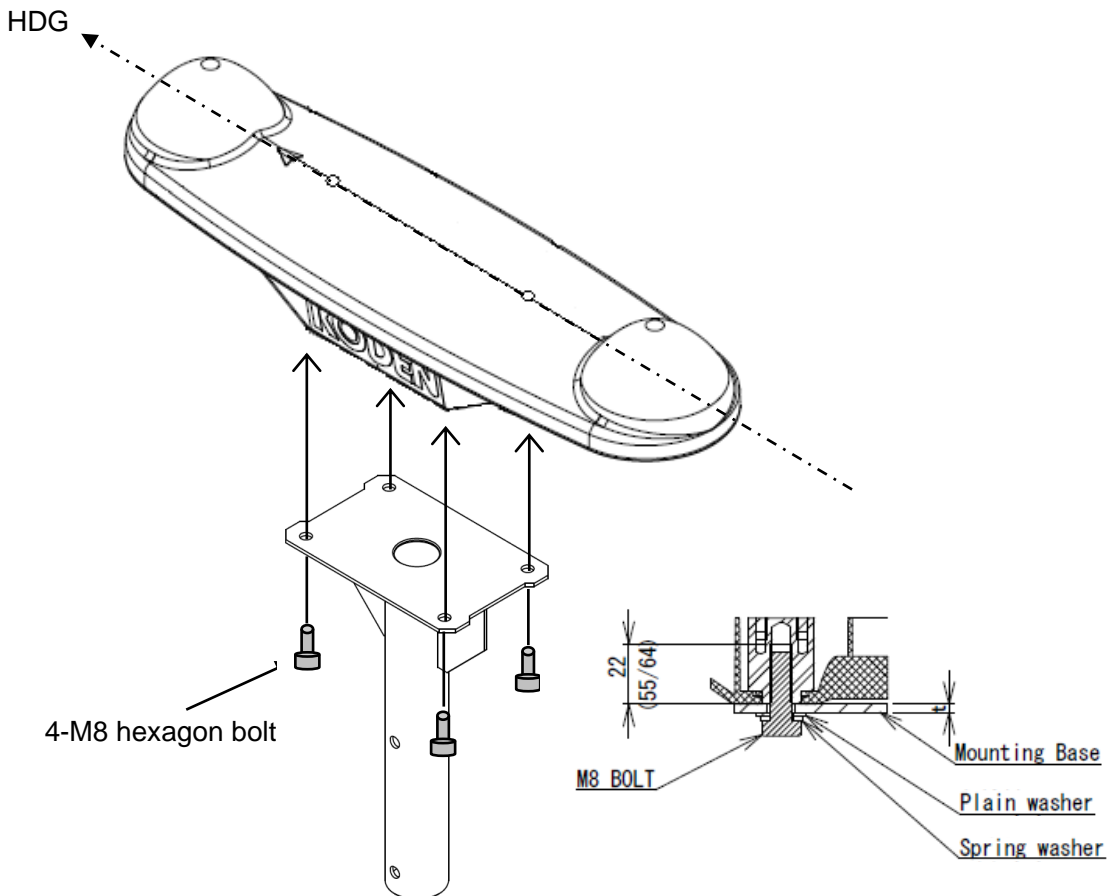
7.6.4   Angle compensation of Antenna

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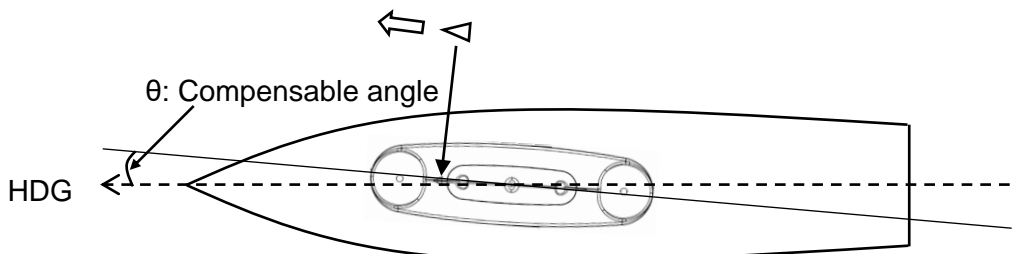
7.6.5   Waterproofing connection

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

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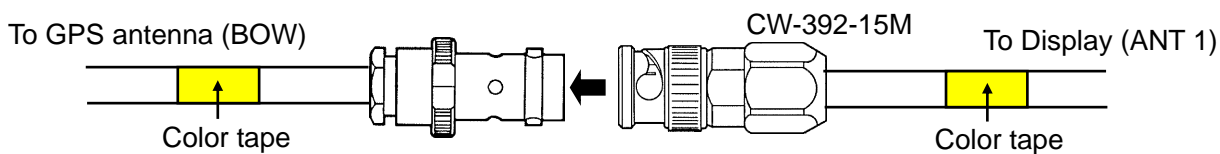
(2)   Wind the self-bonding tape around the joint section after connecting.
      Pull the end of the tape and stretch it to twice its length. Wrap it around joint section a total of 3 layers. When completed, apply gentle pressure over the surface with fingers to expedite the fusion.

(3)   Use PVC tape for extra protection.
      PVC tape should not be strained. Wrap it around joint section a total of 3 layers. When finished, press the surface evenly without strain for complete adhesion of the tape.
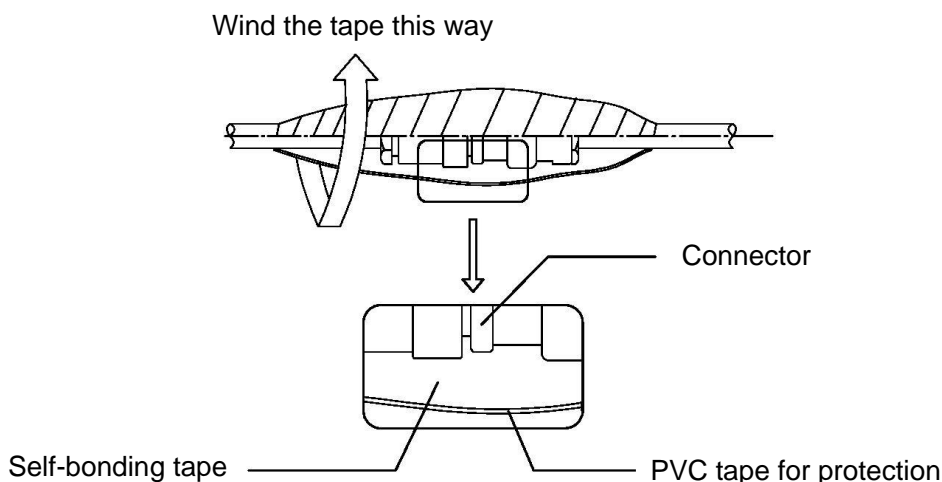
To prevent the tension hanging over the connector junction, the cable shall be fixed as described in the illustration below.

Connector junction

Fix the cable by forming a loop on the mast.
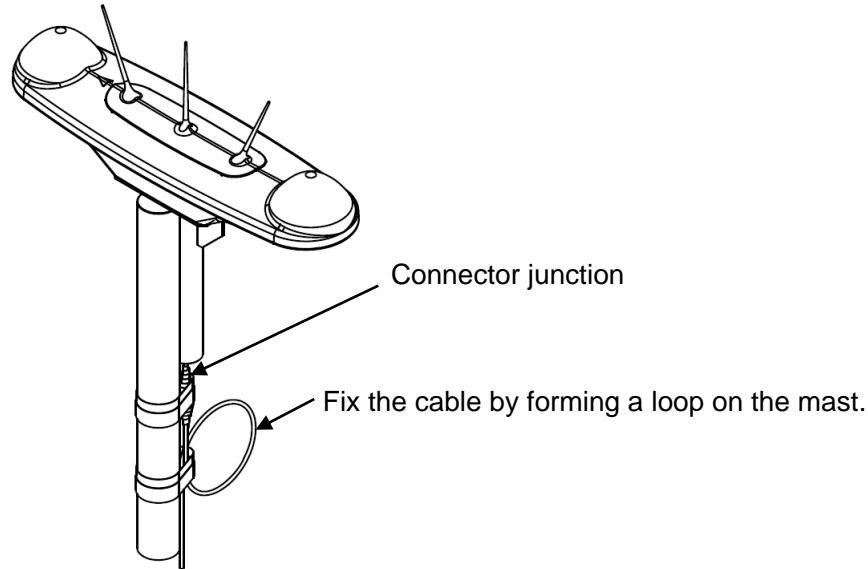
7.6.6   Connecting the 60m antenna cable kit CW-394.KIT to GPS antenna

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

To GPS antenna   **To Display unit**

Conversion connector   Antenna cable
NP-BNCP   CW-394-60M
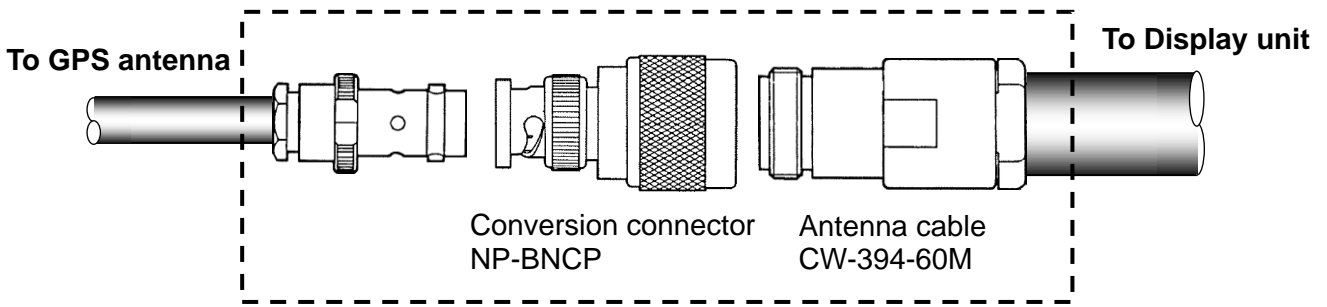
Waterproof the jointing section using self-bonding tape

and PVC tape. (Refer to page 7-9 for detail)

(2)   Connecting the Display unit

Cut the cable to a required length and   **To ANT 1 or ANT 2**
attach the type N plug to its end.   **connector at Display**
                                                 unit

To GPS antenna

Antenna cable   Connecting cable
CW-394-60M   CW-826

Type N connector
N-SJ-8DSFA
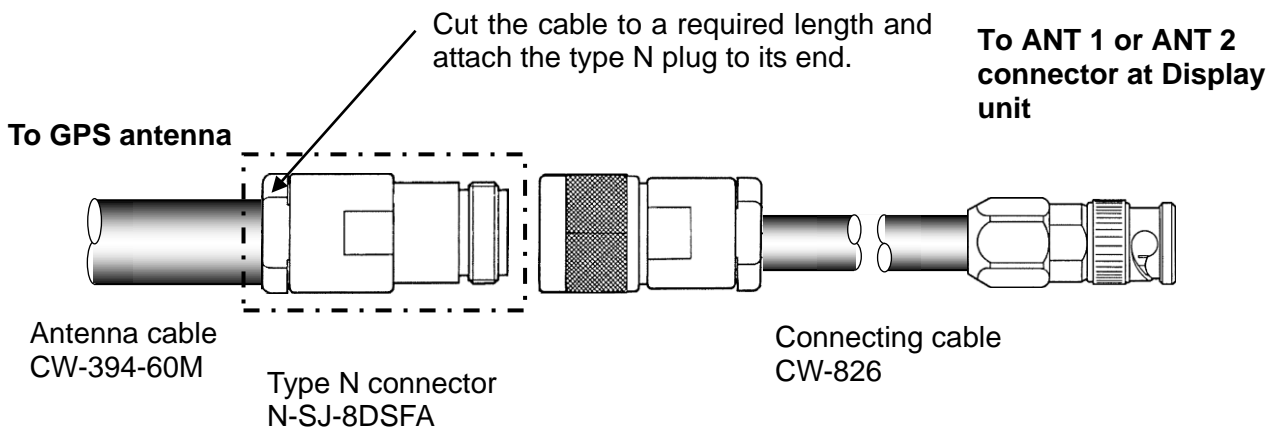
7.6.7   Installing the bird protector to Antenna unit

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.

Bird protector

Remove the surface sheet of
a self-adhesive tape and put
it on.

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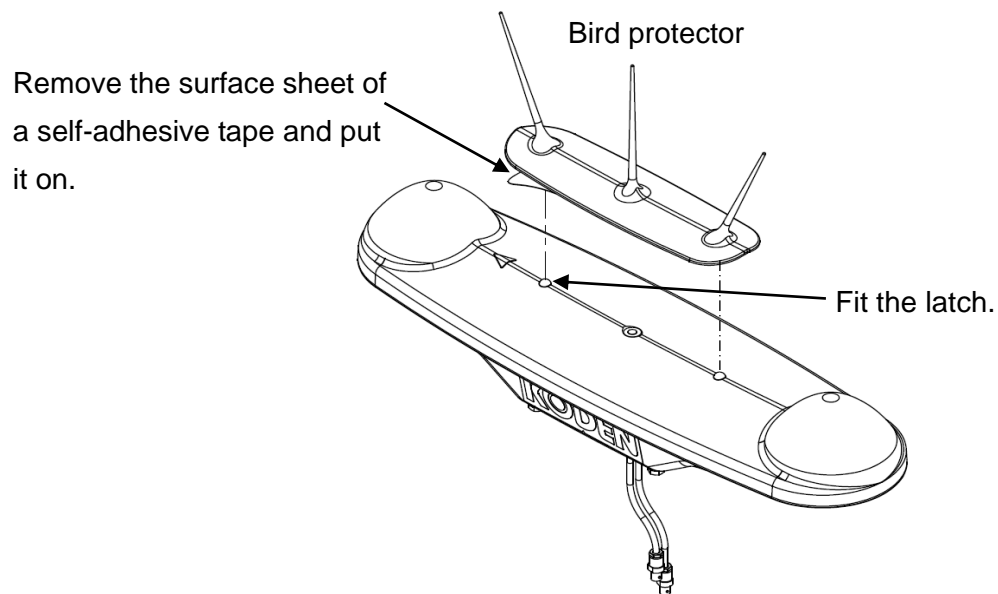
⚠ **Caution: Put it on the surface without any gaps.**

7.7   Cable connections to KGC-300

Legend
Standard configuration
Option
Owner supply

Antenna unit GA-14

Processor unit KGC-300.MU

Color tape
(BOW side)

DISPLAY

DATA4B

DATA2

DATA4A

ALM/LOGP

DATA1

DATA3.

DATA5

CW-392-15M

J1   J2

Color tape
(BOW side)

DISPLAY

Display unit KGC-300.DU

Owner supply

ALM/LOGP

Ext alarm (Including
Power Failer)
Log pulse

CW-376-5/10M
or
Owner supply

DATA1-5

Marine radar
Chart Plotter
Echo sounder
Auto pilot
ECDIS
AIS
VDR
Tidal current meter
Beacon receiver

DATA1

POWER

CW-419-5M

Red +

10.8 to 31.2VDC

Black -

CW-276-2M

DATA1/DATA2

HDG 38.4K DATA2
BAM/INS   DATA1

7.8   Connector pin outs

Display unit

POWER

1: F.GND
2: DC+
3: DC -
4: N.C
5: N.C

DATA1

1: GND/SHIELD
2: TX+
3: TX-
4: RX+
5: RX-
6: +12V

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

Processor unit

DISPLAY

J1   J2

DATA1   DATA2   DATA3   DATA4A   DATA4B   DATA5   ALM/LOG

ALM/LOGP
1: +12VOUT1
2: +12VOUT2
3: SHIELD
4: LOGP (-)
5: LOGP (+)
6: ALARM (COM)
7: ALARM (NO)
8: ALARM (NC)
9: ALARM (SHIELD)
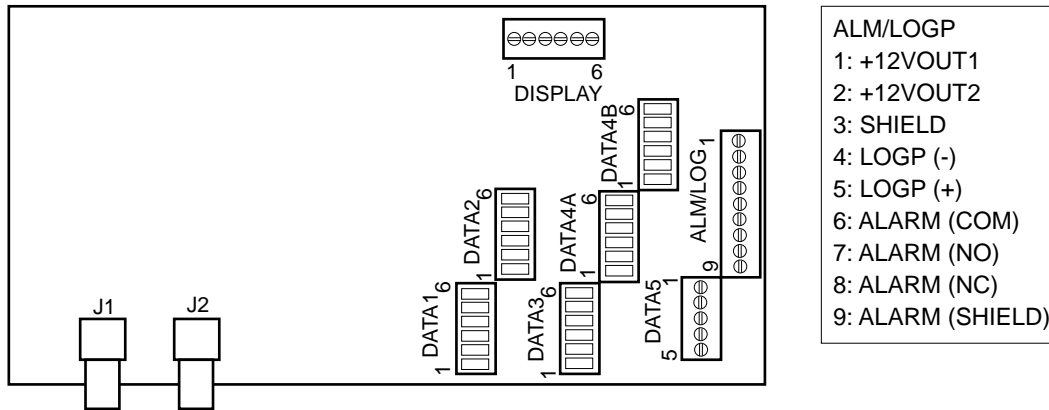
*Pin6 and Pin8 of [ALM/LOGP] are output of the power failer.

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

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

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

Display

1: GND/SHIELD
2: RX+
3: RX-
4: TX+
5: TX-
6: +12V

To display unit

Gray(Shield)
Blue —————— 1: GND/SHIELD
Orange
Black —————— 2: TX+
White —————— 3: TX-
Red —————— 4: RX+
Green —————— 5: RX-
—————— 6: 12V
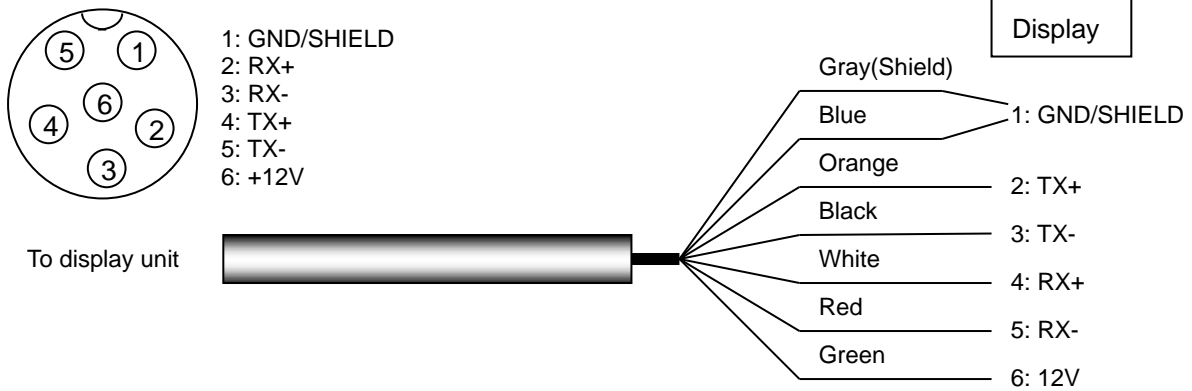
(CW-376-5M/10M Pin number from cable side)

DATA1-DATA3

1: GND/SHIELD
2: RX*+
3: RX*-
4: TX*+
5: TX*-
6: N.C

To external unit

Green —————— N.C (Cut)
Red —————— 6: RX*-
White —————— 5: RX*+
Black —————— 4: TX*-
Orange —————— 3: TX*+
Blue —————— 2: GND
Shield —————— 1: SHIELD

DATA4A

1: GND/SHIELD
2: RX4+
3: RX4-
4: TX4A+
5: TX4A-
6: N.C

To external unit

Green —————— N.C (Cut)
Red —————— 6: RX4-
White —————— 5: RX4+
Black —————— 4: TX4A-
Orange —————— 3: TX4A+
Blue —————— 2: GND
Shield —————— 1: SHIELD
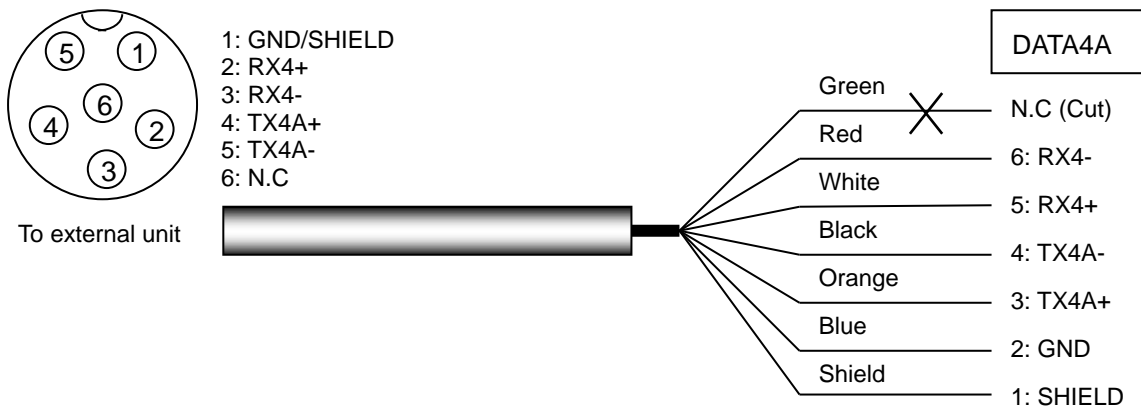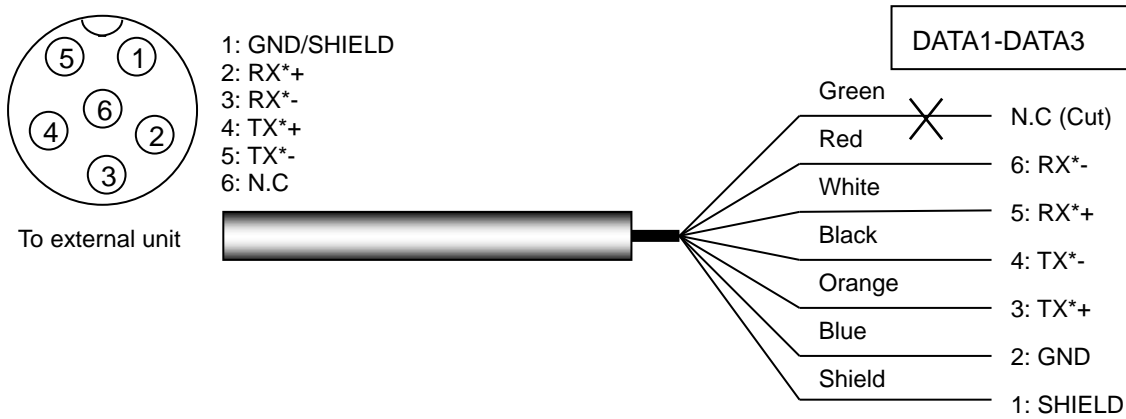
*DATA1-3, DATA4A/4B connection and connector insertion are shown below

Tighten the screw after inserting the core wire

6
5
4
3
2
1

1: GND/SHIELD
2: N.C
3: N.C
4: TX4B+
5: TX4B-
6: N.C

To external unit

DATA4B

Green — N.C (Cut)
Red — N.C (Cut)
White — N.C (Cut)
Black — 4: TX4B-
Orange — 3: TX4B+
Blue — 2: GND
Shield — 1: SHIELD

1: GND/SHIELD
2: TX5B+
3: TX5B-
4: TX5A+
5: TX5A-
6: N.C

To external unit

DATA5

Shield/Blue — 1: SHIELD
Orange — 2: TX5A+
Black — 3: TX5A-
White — 4: TX5B+
Red — 5: TX5B-
Green — N.C (Cut)
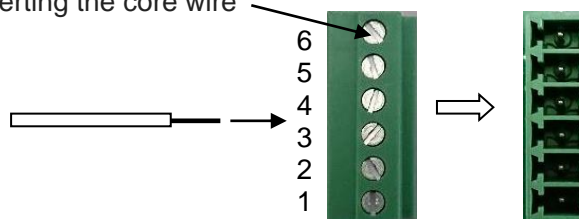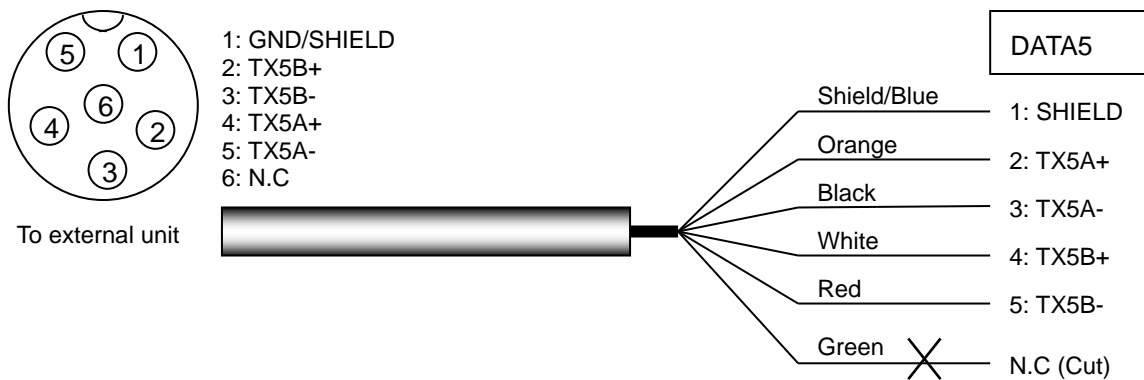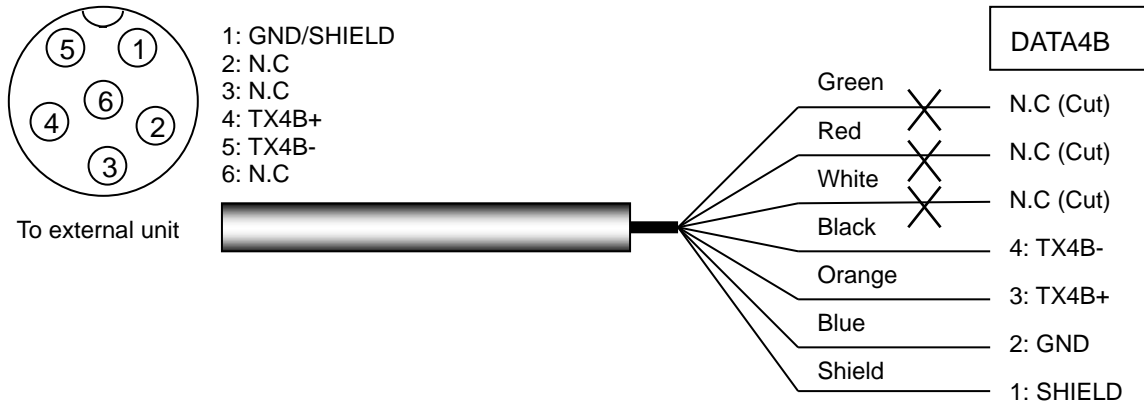
7.9   Inspection after installation

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

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

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

(3) Are the cables routed and connected properly?

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Chapter 8   Specifications

8.1   Specification

8.1.1   Main function

Receiving frequency		1575.42 MHz±1MHz
Receiving channel		16 channel parallel
Receiving code		C/A code
Sensitivity		Better than −130 dBm
Setting time		2 minutes (at standard hot-start time)
Time to Position fix	Cold start	50sec (standard)
	Warm start	45sec (standard)
	Hot start	20sec (standard)
Accuracy 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 role/pitch angle		30 °
Maximum follow-up acceleration		1g
Base line length		0.5m
Display		4.3 inch color LCD (480×272 dot's, effective picture area: 95.04 x 53.86 mm)
Display mode		HDG1, HDG2, ROT, NAV1, NAV2, 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:	Processor unit: 0.4m Display unit: 0.8m
Steering:	Processor unit: 0.2m Display unit: 0.4m

8.1.4 Environmental conditions

(1) Temperature and humidity

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

(2) Vibration

The equipment operates normally under the following vibrating conditions.

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

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

(3) Water proof

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

8.2   External dimensions and weight

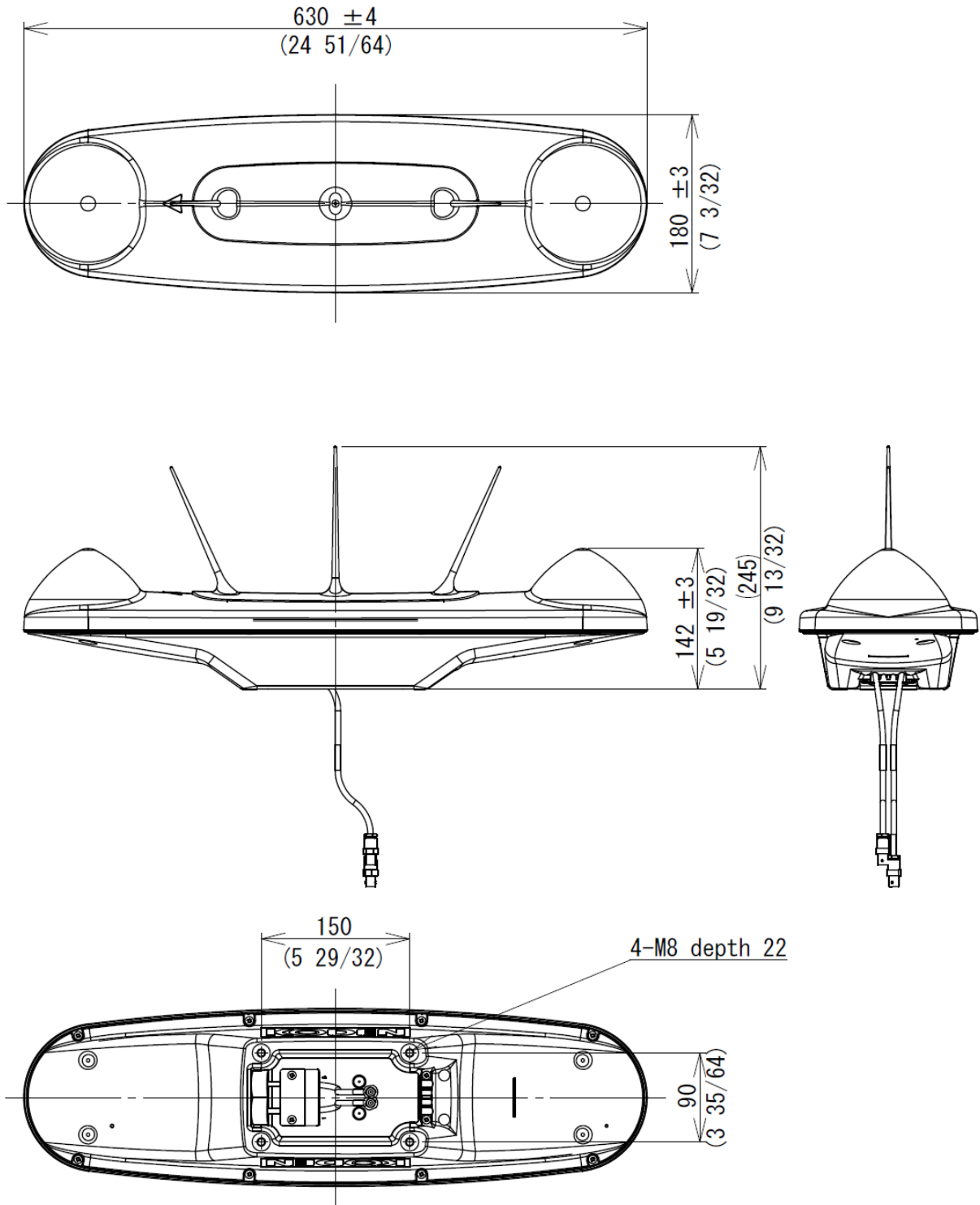### 8.2.1   External dimensions and weight of the display unit : KGC-300.DU

External dimensions: Width x Height x Depth

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

Weight: 0.74 kg
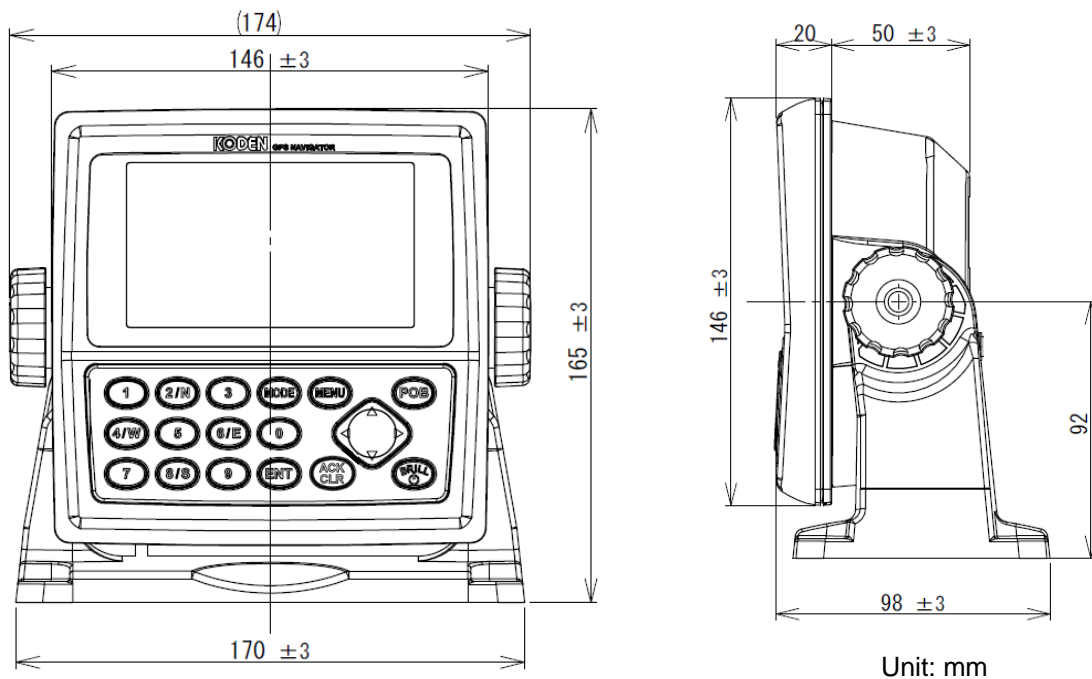
Unit: mm

8.2.2   GPS Antenna : GA-14

Weight: 2.2kg (With antenna cables)

Unit: mm (inch)

8.2.3   Processor unit : KGC-300.MU
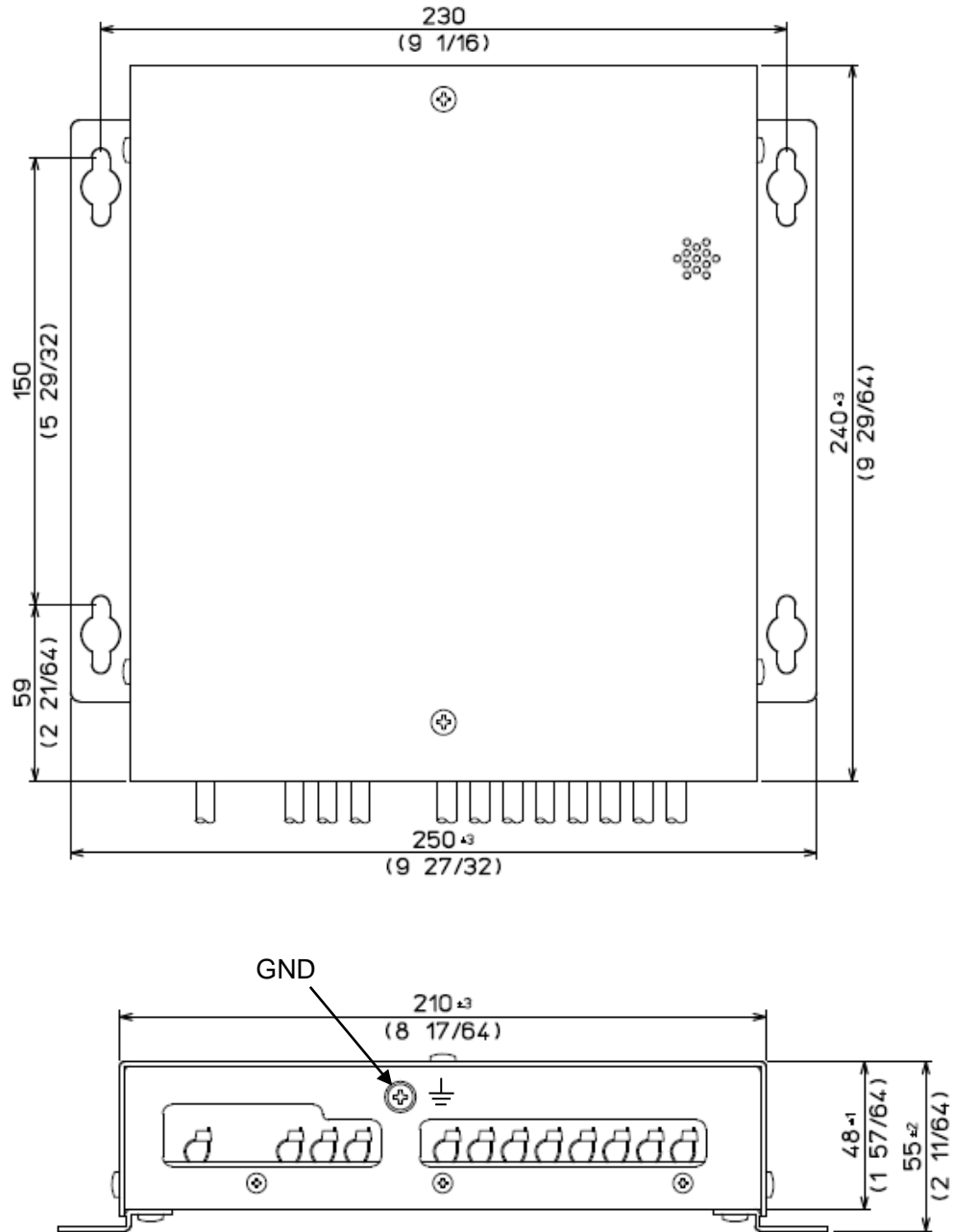
Weight: 1.1kg

Unit: mm (inch)

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Chapter 9   Maintenance and troubleshooting

9.1   Periodic inspection and cleaning

9.1.1   Monthly check

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

9.1.2   Maintenance

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

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

9.2   Trouble shooting

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

9.2.1   Information required for service

Please advise the following details:

(1) Name of vessel, Satcom number if available.

(2) Equipment type name

(3) Equipment serial number

(4) Next port of call, ship's agent name, fax number, email address, etc.

(5) Faulty conditions (precisely as possible) and the result of on board check

9.2.2   Trouble shooting

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

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

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

Chapter 10 Technical Reference

10.1   Input data format / sentence

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

ACN sentence *Baud rate: 4800/9600/19200/38400, DATA1 connector only. Sentences ACN, 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	Alert command **$ --ACN, hhmmss.ss,aaa,x.x,x.x,c,a*hh <CR><LF>** Sentence status flag Alert command { A = acknowledge / Q = request / repeat infomation / O = responsibility transfer / S = silence Alert Instance, 1 to 999999 Alert Identifier Manufacturer mnemonic code Time Sentence type Talker device Start of sentence

10.2   Output data format

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

NMEA 0183 Ver.2.0

Data per one byte is as follows:

Parity bit: none

Logic 0

Logic 1

Start bit   D0   D1   D2   D3   D4   D5   D6   D7   Stop bit

1 bit, Logic 0   Data bit (ASCII code)   1 bit
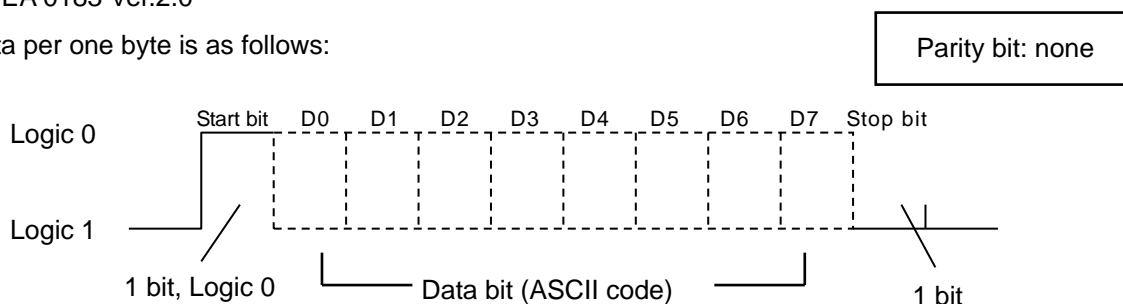
10.3   Output data specification

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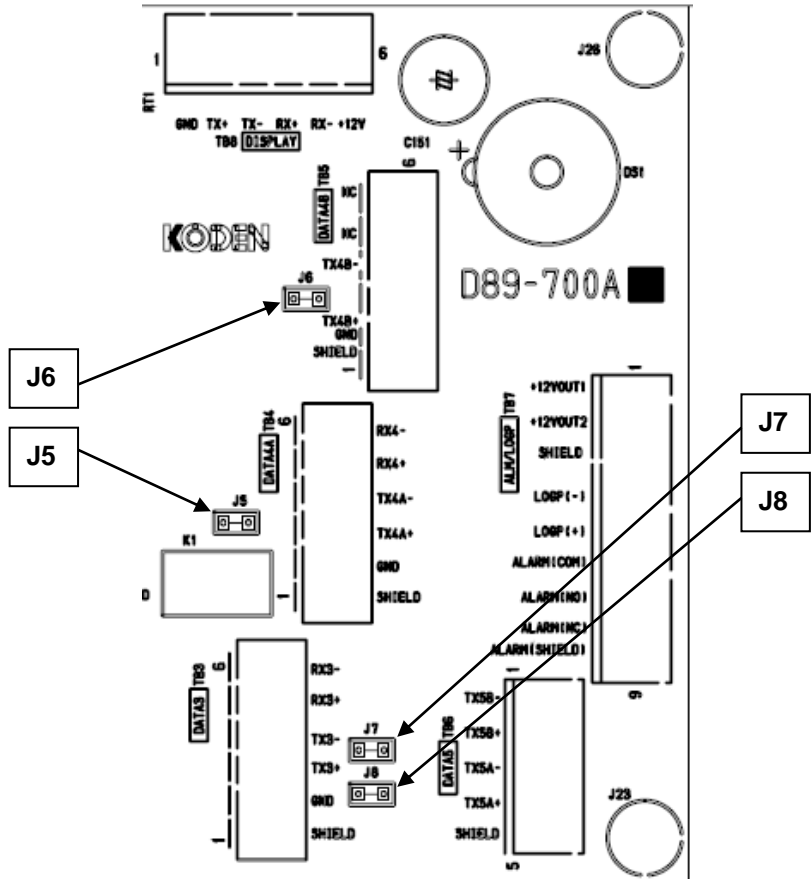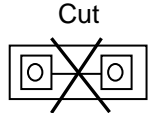
DATA4A
6: RX4-
5: RX4+
4: TX4A-   AD-10 CLOCK-H
3: TX4A+ AD-10 CLOCK-C
2: GND
1: SHIELD

AD-10-1-

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

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

AD-10-2-
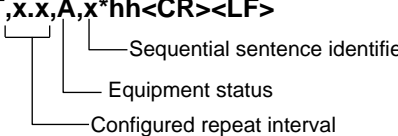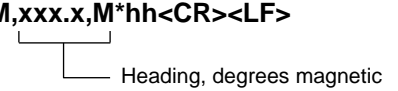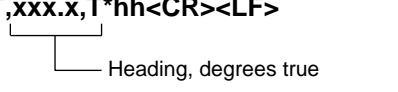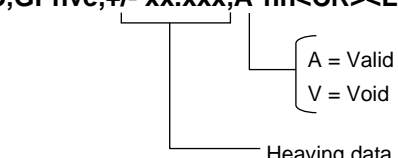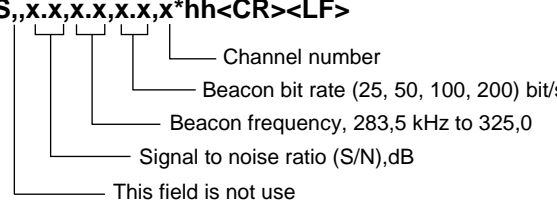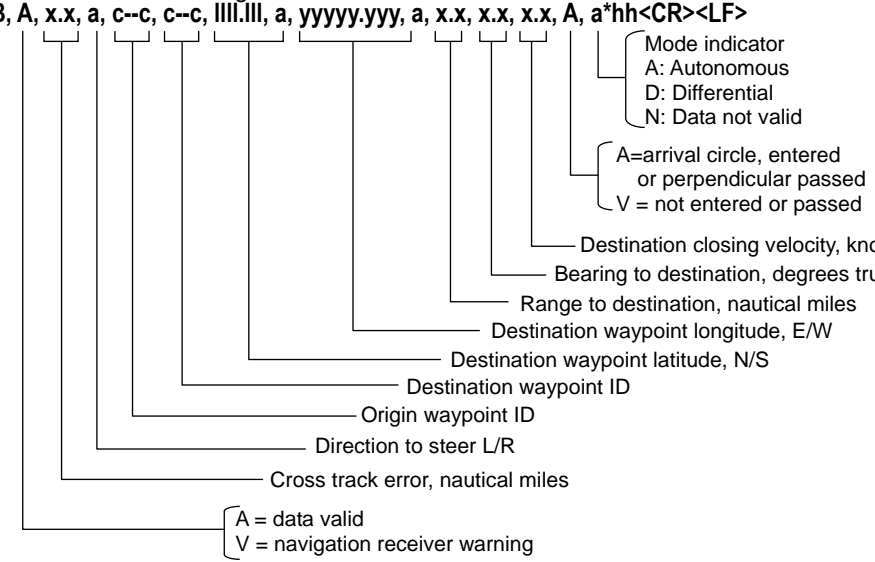
10.5   Output sentence

Description	Contents of data field
AAM	Waypoint arrival alarm **$ GP AAM, A, A, x.x, N, c--c*hh <CR><LF>** Waypoint ID Units of radius, nautical miles Arrival circle radius A = Perpendicular passed at waypoint V = Not passed A = Arrival circle entered V = Not entered Sentence type Talker device Start of sentence
ALC *DATA1 only	Cyclic alert list **$--ALC,xx,xx,xx,x.x,aaa,x.x,x.x,x.x,.........,aaa,x.x,x.x,x.x*hh<CR><LF>** Alert entry n Additional Alert entries Revision counter Alert instance Alert identifier Manufacturer mnemonic code Number of alert entries Sequential message identifier, 00 to 99 Sentence number, 01 to 99 Total number of sentences for this message, 01 to 99
ALF *DATA1 only	Alert sentence **$--ALF,x,x,x,hhmmss.ss,a,a,a,aaa,x.x,x.x,x.x,x,c---c*hh<CR><LF>** Alert text Escalation counter, 0 to 9 Revision counter, 1 to 99 Alert instance, 1 to 999999 Alert identifier Manufacturer mnemonic code V = active - unacknowledged S = active - silenced A = active - acknowledged or active O = active - responsibility transferred U = rectified - unacknowledged E = Alert priority, Emargency Alarm A = Alarm W = Warning C = Caution A = Category A B = Category B C = Category C Time of last change Sequential message identifier, 0 to 9 Sentence number, 1 to 2 Total number of ALF sentences for this message, 1 to 2

Description	Contents of data field
ALR *DATA1 only	Set alarm state **$--ALR,hhmmss.ss,xxx,A,A,c--c*hh\<CR>\<LF>** Alarm's description text A = acknowledged V = unacknowledged A = threshold exceeded V = not exceeded Unique alarm number (identifier) at alarm source Time of alarm condition change, UTC
APB *Do not use on SOLAS ships	Heading / track contoroller (autopoilot) sentence B **$--APB,A,A,x.x,a,N,A,A,x.x,a,c--c, x.x,a,x.x,a,a*hh\<CR>\<LF>** Mode indicator A: Autonomous D: Differential N: Data not valid Heading to steer to destination waypoint, magnetic or true Bearing origin to destination, magnetic or true Destination waypoint ID Bearing origin to destination, M/T A = perpendicular passed at waypoint V = perpendicular not entered A = arrival circle entered V = arrival circle not passed XTE units, nautical miles Direction to steer, L/R Magnitude of XTE (cross track error) A = OK or not used V = No good A = Data valid V = Data invalid
ATT	Ship's heading, Pitch and Roll information (FURUNO proprietary sentence) **$ PFEC,GPatt, xxx.x, +/-00.0, +/-00.0 *hh \<CR>\<LF>** Rolling data Pitching data Ship's Heading
BOD	Bearing origin to destination **$--BOD, x.x, T, x.x, M, c--c, c--c*hh\<CR>\<LF>** Origin waypoint ID Destination waypoint ID Bearing, degrees magnetic Bearing, degrees true
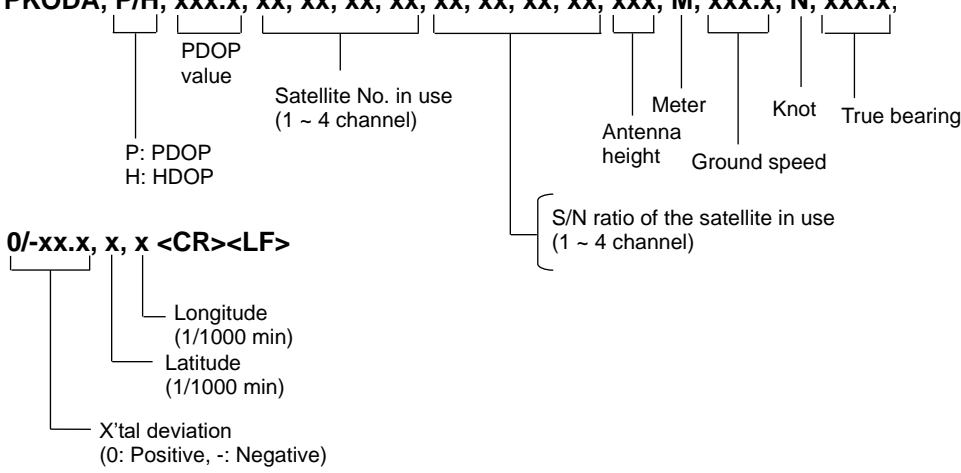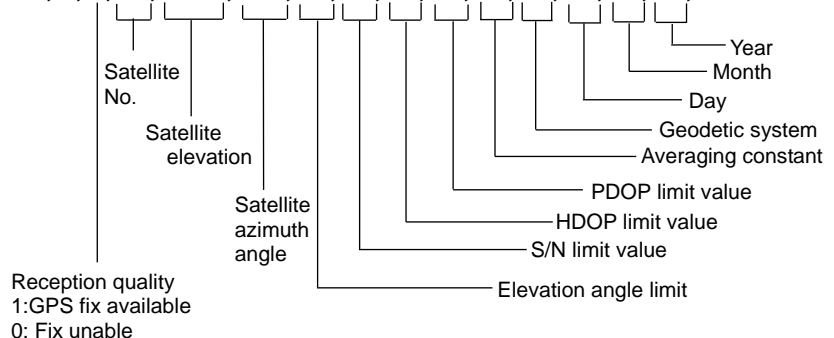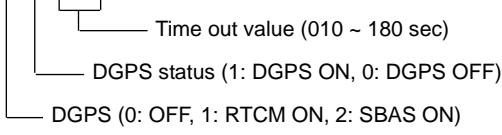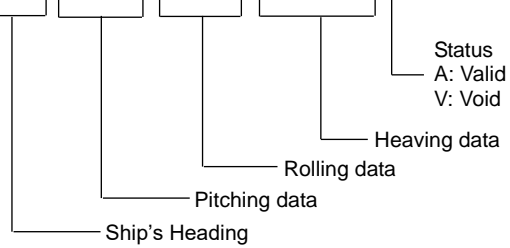
Description	Contents of data field
BWC	Bearing and distance to waypoint **$--BWC, hhmmss, llll.lll, a, yyyyy.yyy, a, x.x, T, x.x, M, xx, N, c--c, a*hh<CR><LF>** Mode indicator A: Autonomous D: Differential N: Data not valid Waypoint ID Distance, nautical miles Bearing, degrees magnetic Bearing, degrees true Waypoint longitude, E/W Waypoint latitude, N/S UTC of observation
DTM	Datum reference **$--DTM,ccc,a,x.x,a,x.x,a, x.x,ccc*hh<CR><LF>** Reference datum WGS84 Altitude offset, m Lon offset, min, E/W Lat offset, min, N/S Local datum subdivision code Local datum: IHO datum code W84 = WGS84 W72 = WGS72 999 = user defined
GBS	GPS satellite fault detection **$--GBS, hhmmss.ss, x.x, x.x, x.x, x.x, x.x, x.x, x.x, h, h*hh<CR><LF>** 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

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

Description	Contents of data field

HBT
 	
*DATA1 only
	Heartbeat supervision sentence
	$--HBT,x.x,A,x*hh\<CR>\<LF>
	             └── Sequential sentence identifier
	         └── Equipment status
	      └── Configured repeat interval

HDM	Heading magnetic **$--HDM,xxx.x,M*hh\<CR>\<LF>** └── Heading, degrees magnetic
HDT	Heading true **$--HDT,xxx.x,T*hh\<CR>\<LF>** └── Heading, degrees true

HVE	Heaving information (FURUNO proprietary sentence)
	$PFEC,GPhve,+/- xx.xxx,A*hh\<CR>\<LF>
	            ┌── A = Valid
	            └── V = Void
	         └── Heaving data

MSS	MSK receiver signal status
	$--MSS,,x.x,x.x,x.x,x*hh\<CR>\<LF>
	            └── Channel number
	          └── Beacon bit rate (25, 50, 100, 200) bit/s
	        └── Beacon frequency, 283,5 kHz to 325,0
	       └── Signal to noise ratio (S/N),dB
	      └── This field is not use

RMB	Recommended minimum navigation information
	$--RMB, A, x.x, a, c--c, c--c, llll.lll, a, yyyyy.yyy, a, x.x, x.x, x.x, A, a*hh\<CR>\<LF>
	      ┌── Mode indicator
	      │ A: Autonomous
	      │ D: Differential
	      └── N: Data not valid
	      ┌── A=arrival circle, entered
	      │ or perpendicular passed
	      └── V = not entered or passed
	   ── Destination closing velocity, knots
	   ── Bearing to destination, degrees true
	   ── Range to destination, nautical miles
	   ── Destination waypoint longitude, E/W
	   ── Destination waypoint latitude, N/S
	   ── Destination waypoint ID
	   ── Origin waypoint ID
	   ── Direction to steer L/R
	   ── Cross track error, nautical miles
	   ┌── A = data valid
	   └── V = navigation receiver warning

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

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

Description	Contents of data field
PKODA	Satellite information (KODEN proprietary sentence) **$ PKODA, P/H, xxx.x, xx, xx, xx, xx, xx, xx, xx, xx, xxx, M, xxx.x, N, xxx.x,** PDOP value P: PDOP H: HDOP Satellite No. in use (1 ~ 4 channel) S/N ratio of the satellite in use (1 ~ 4 channel) Antenna height Meter Ground speed Knot True bearing **0/-xx.x, x, x <CR><LF>** Longitude (1/1000 min) Latitude (1/1000 min) X'tal deviation (0: Positive, -: Negative)
PKODG,1	Satellite information (KODEN proprietary sentence) **$ PKODG, 1, x, xx, +/-xx, xxx, xx, xx, xx, xx, xx, xx, xx, xx, xx, <CR><LF>** Satellite No. Satellite elevation Satellite azimuth angle Reception quality 1:GPS fix available 0: Fix unable Elevation angle limit S/N limit value HDOP limit value PDOP limit value Averaging constant Geodetic system Day Month Year
PKODG,7	DGPS information (KODEN proprietary sentence) **$ PKODG, 7, x, x, xxx <CR><LF>** Time out value (010 ~ 180 sec) DGPS status (1: DGPS ON, 0: DGPS OFF) DGPS (0: OFF, 1: RTCM ON, 2: SBAS ON)
PKODG,21	Ship's heading, Pitch/Roll and Heaving information (KODEN proprietary sentence) **$PKODG, 21 ,xxx.x, +/-xx.x, +/-xx.x, +/-xx.xxx, a *hh <CR><LF>** Status A: Valid V: Void Heaving data Rolling data Pitching data Ship's Heading

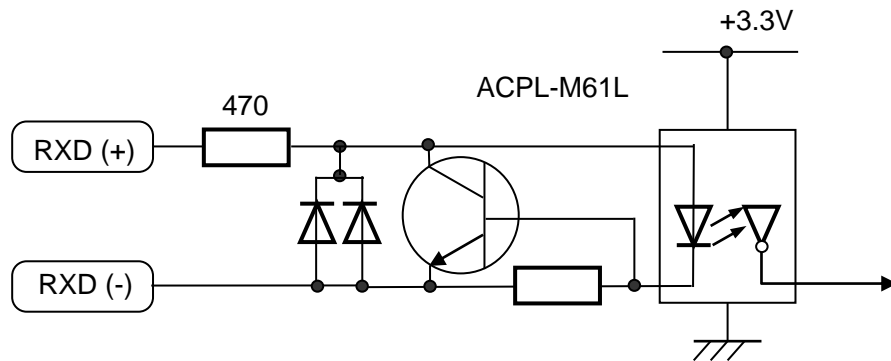## 10.6   Input / Output circuit

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)
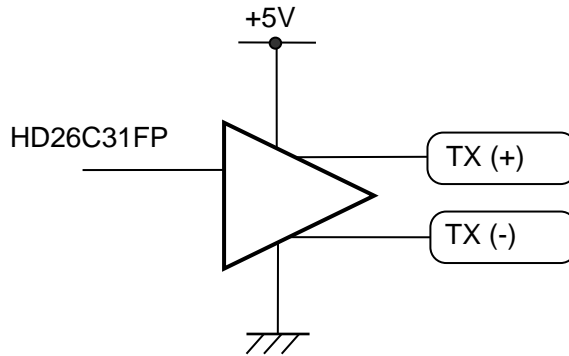
(LOGP circuit)
Device: Photo-coupler TLP185 (Toshiba)
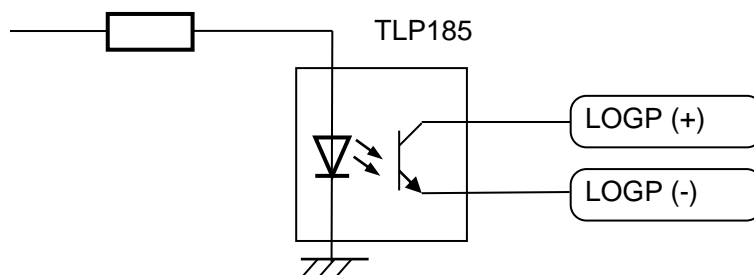
(Alarm circuit)

Device: Relay AHY129

```
                                              +5V
                                               |
                                              [R]
                                               |
              ┌────────┬──────▷│──────┐        |
              │        │       ▷│     │        |
          ┌───┴──┐  AHY129            │        |
    [R]───┤ transistor │     ┌────────┴────────┘
          └───┬──┘     │     │
              │        │  ┌──┴──────┐
             ─┴─       │  │  relay  │         ┌──────────────────┐
             ///       │  └─────────┘    ○────┤  ALARM (NC)      │
                       │    ╱                 └──────────────────┘
                    ┌──┴─┐ ╱                  ┌──────────────────┐
                    │    │○              ○────┤  ALARM (NO)      │
                    └──┬─┘                    └──────────────────┘
                       │                      ┌──────────────────┐
                       └──────────────────────┤  ALARM (COM)     │
                                              └──────────────────┘
```
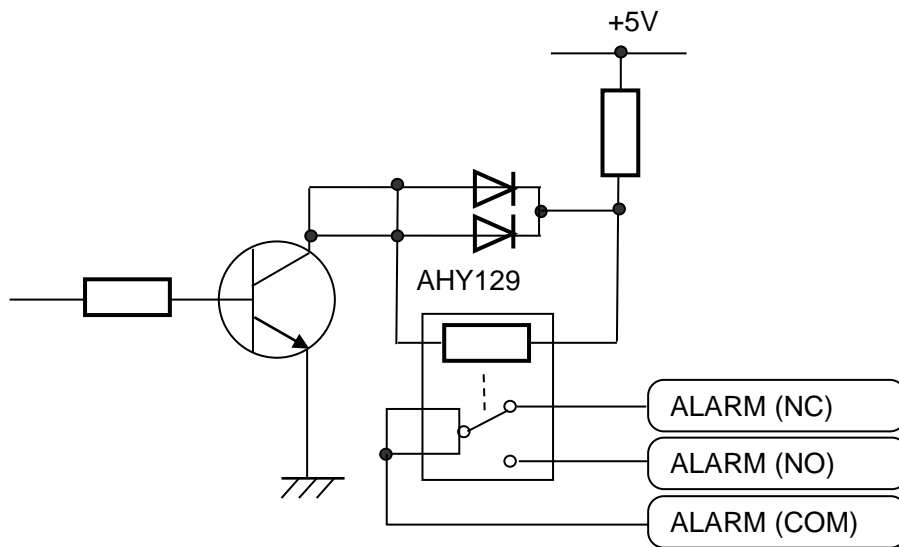
Chapter 11 Annex

11.1   Menu configuration

The factory set value is shown by the surrounding boxes.

(MENU)

- 1: Waypoints
- 2: Routes
  - 1: Route Set / Edit
  - 2: Waypoint change (Circle, Bisector)
- 3: GPS
  - 1: GPS monitor
  - 2: Datum (00 to 87)
  - 3: Elevation mask (5, 10, 15, 20, 25)
  - 4: RAIM Limit (10, 50, 100)

- 4: DGPS
  - 1: GPS mode (OFF, Beacon, SBAS,)
  - 2: Time out (010s ~ 100s ~180s)
  - 3: Beacon selection (Auto, Manual)
  - 4: Frequency (283.5 kHz to 325.0 kHz)
  - 5: Bit rate (50, 100, 200)
  - 6: Beacon monitor
- 5: Compensation
  - 1: Heading (-359.9° ~ +000.0° ~ +359.9°)
  - 2: Latitude / Longitude
  - 3: LOP
  - 4: Magnetic variation (Auto, Manual [-180°~ +000.0° ~ +180.0°])
  - 5: Time difference (-13:30 ~ +00:00 ~ +13:00)
  - 6: Pitching (-12.7° ~ +00.0° ~ +12.7°)
  - 7: Rolling (-12.7° ~ +00.0° ~ +12.7°)

- 6: Alerts
  - 1: ANCH (ON [0.00 to 9.99], OFF)
  - 2: PROX (ON [0.00 to 9.99], OFF)
  - 3: XTE (ON [0.00 to 9.99], OFF)
  - 4: CDI (ON [00 to 99], OFF)
  - 5: ALF/ALR (OFF, ALF, ALR)
  - 6: Alert Log
  - 7: Alert History

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

A

A

8: Initial setup (Compass) —— 1: Backup (000s ~ 060s ~ 600s)
— 2: Averaging (Heading) (0, 1, 2, 3, 4)
— 3: Accel (g) (0, 1, 2, 3, 4)
— 4: Averaging (ROT) (0, 1, 2, 3, 4)

8: Initial setup (Others) —— 1: Averaging (0, 1, 2, 3, 4)
— 2: Units (NM, km, sm)
— 3: Sailing mode (Great circle, Rhumb Line)
— 4: Position (L/L, Lop)
— 5: L/L units (.001, .0001)
— 6: Language (English, 日本語 , -------)
— 7: LOG Pulse (50, 100, 200, 400)
— 8: Lop (LoranC, LoranA, DECCA)
— 9: Chain

9: Interface —— 1: Connector (DATA1, DATA2, DATA3, DATA4, DATA5)
— 2: Initialize (Compass, Plotter, Radar-1, Radar-2)
— 3: Format (IEC61162-1 ed5, IEC61162-1 ed3, NMEA 0183 Ver.2.0,
        AD10) * AD10:DATA4, 5 only
— 4: Baud rate (4800, 9600, 19200, 38400)
— 5: Talker ID (GP, HE)
— 6: Sentence edit

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

11.2 Local Geodetic Systems

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

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

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Chapter 12 Index

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