KODEN

OPERATION MANUAL

GPS NAVIGATOR

KGP-920

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.

KGP-920.OM.E 0093121662-08

Amendment History

KGP-920 Operation Manual

Doc No: 0093121662

No.	Document No & Rev No.	Date Y/M/D	Amendments
0	93121662-00	2005/05/31	First issue
1	93121662-01	2005/08/10	Chapter 2:Add optional item
2	93121662-02	2005/10/17 2005/10/18	Chapter 2:Correct standard equipment and optional items Chapter 4:Correct cable connections
3	0093121662-03	2006/06/16	Chapter 4;Cover
4	0093121662-04	2007/01/25	Cover Certificate
5	0093121662-05	2007/10/19	DECLARATION
6	0093121662-06	2008/04/15	Add Chapter 12
7	0093121662-07	2008/08/06	Cover
8	0093121662-08	2009/03/25	Chapter 2,Chapter 4,Chapter 10,Inserted DECLARATION
9			
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Amendment policy

When any change is applied in the document, only the document number of the relevant sheet(s) and cover sheet are modified and the rest of the sheets are not changed. The document number is shown in the footer area, right or left bottom of each sheet.

Safety Precautions

- **Disconnect Main Power**

It is still possible to receive an electric shock caused by unintentionally switching on the power during repair work. To prevent this from happening, make sure to completely disconnect the unit from the ship's main supply before attempting any inspection and repair.

- **Dust**

Dust can accumulate inside the unit after long periods of use. Allergies can result from the inhalation of this dust, therefore during inspection and cleaning it is advisable to use a mask.

- **Static Electricity**

Static sensitive semiconductor devices are used in this unit. Before changing the printed boards be careful not to damage any of these devices due to electrostatic build up from carpet, clothes, seats, etc

- **Liquid Crystal Display**

A Liquid Crystal Display contains mercury, which is harmful to the human body when touched. When you attempt to discard this device, follow the proper disposal procedures.

Symbols used in this manual

The following symbols are used in this manual. You are requested to be fully aware of the meaning of each symbol before carrying out inspection and maintenance of this equipment.

Alarm mark

Alarm

To handle the equipment ignoring this sign may lead to injury to the human body or damage to the equipment.

Caution mark

Caution

To handle the equipment ignoring this sign may lead to a malfunction of the equipment.

Warning High Voltage mark

To handle the equipment ignoring this sign may lead to electrical shock to the human body.

Prohibition mark

This sign indicates that a specified action is prohibited. The prohibited action will be shown in the vicinity of the mark.

How to use this manual

Scope of this manual

This manual contains information about installation, operation and maintenance of the KGP-920 GPS navigator.

Structure of this manual

This manual is divided into sections according to the contents as described below. This arrangement will help you overview the whole contents as well as refer to detailed information for your specific requirement.

Chapter 1: General Information

- About GPS
- Outline of the equipment
- Equipment composition
- Software type name

Chapter 2: Equipment Composition

- Standard equipment list
- Optional items list

Chapter 3: Specification

- GPS receiver
- Display section
- Data Input/Output
- Power requirements
- Compass safe distance
- Environmental conditions
- External dimensions and weight

Chapter 4: Installation

- Installation consideration
- Unpacking of the goods
- Inspection of the goods
- Siting the units
- Display unit installation
- Antenna unit installation
- Cable connections to the KGP-920
- Connector pin outs
- Inspection after installation

Chapter 5 : Basic Operations

- The name and function of each part
- Power On/Off
- Adjusting display contrast and brightness
- Selecting the screen
- String present position (EVENT)
- Using MOB (Man over-board)
- Recalling event or MOB position
- Displaying average speed, average bearing and elapsed time

Chapter 6: Various Navigation

- Storing waypoint (LAT/LONG) data
- Setup of waypoint navigation
- Cross track error and course deviation angle
- Storing and erasing route
- Route setup
- Setting an anchor position
- Track display

Chapter 7: Alarms

- Kinds of alarms
- Alarm explanation
- Setting and canceling

Chapter 8: Setup Procedure

- Menu options
- Menu 3: GPS
- Menu 4: Differential GPS (DGPS)
- Menu 5: Compensation
- Menu 8: Initial setting
- Menu 9: Interface
- Initialization

Chapter 9: How to use LOPs

- Initial setup for LOPs display
- Storing waypoints (LOPs data)
- Correcting your position (LOPs)
- Calculating LOPs based on LAT/LONG data

Chapter 10: Maintenance and Trouble shooting

- Periodic inspection and cleaning

- Trouble shooting

Chapter 11: Technical Reference

- Digital interface (IEC 61162-1 second edition)

Chapter 12: Communication with external navigation system

- Changing to the EXTERNAL mode
- Route data transfer

Annex

- Local Geodetic Systems
- Decca zone

Chapter 1 General Information

Chapter 1 General Information

1.1 About GPS

1.1.1 General

GPS is a navigation system using 24 satellites (21 plus 3 in service) orbiting 20,183 km high from the earth every 11 hours 58 minutes.

1.1.2 Positioning by GPS

Your position is determined by calculating the distance from two satellites (in 2-dimensional positioning) or three satellites (in 3-dimensional positioning) to your position. The distance is determined by the time taken for a message to be sent from the satellites to the receiver. In 2-dimensional positioning, your position (latitude and longitude; height is preset) is determined at the intersection point of three spheres formed by three satellites. In 3-dimensional positioning, your position (latitude, longitude and height) is determined at the intersection point of four spheres formed by four satellites.

NOTE

The GPS system is based on a geodetic system called WGS-84. In conventional world map, one coordinate system differs from others with region, and this causes the position fix made on the map and GPS measurement to differ to a certain extent.

1.1.3 Time required for position fix

In the following circumstances, your GPS receiver takes more time to fix position:

(1) When you turned the GPS receiver for the first time.

(2) The stored orbital data is not suitable for the available satellite, or purged due to lengthy storage.

(3) When you use it after moving a long distance

The GPS receiver first turned on starts to store the orbital data sent from the satellite. It takes about 2 or 3 minutes before the first fix is available. After this, the receiver can fix your position within a minute by using the previously stored data.

1.2 Outline of the equipment

The KGP-920 of GPS navigator is designed and manufactured to meet the carriage requirement of the latest IMO/SOLAS regulation and its harmonized IMO resolution MSC.112(73) and IEC technical standards, shown below.

- IEC 60945 4th Edition 2002-08, General
- IEC 61108-1 Ed.2.0 2003-07: Ship borne GPS-Receiver
- IEC 61162-1 2nd Edition: Digital Interface

1.3 Equipment composition

The equipment composition of KGP-920 is shown in Figure 1.1.

1.4 Software type name

The following software type is used in KGP-920 GPS navigator.

Software type	Application
KM-D94	Main logic board
KM-D89	GPS receiver module

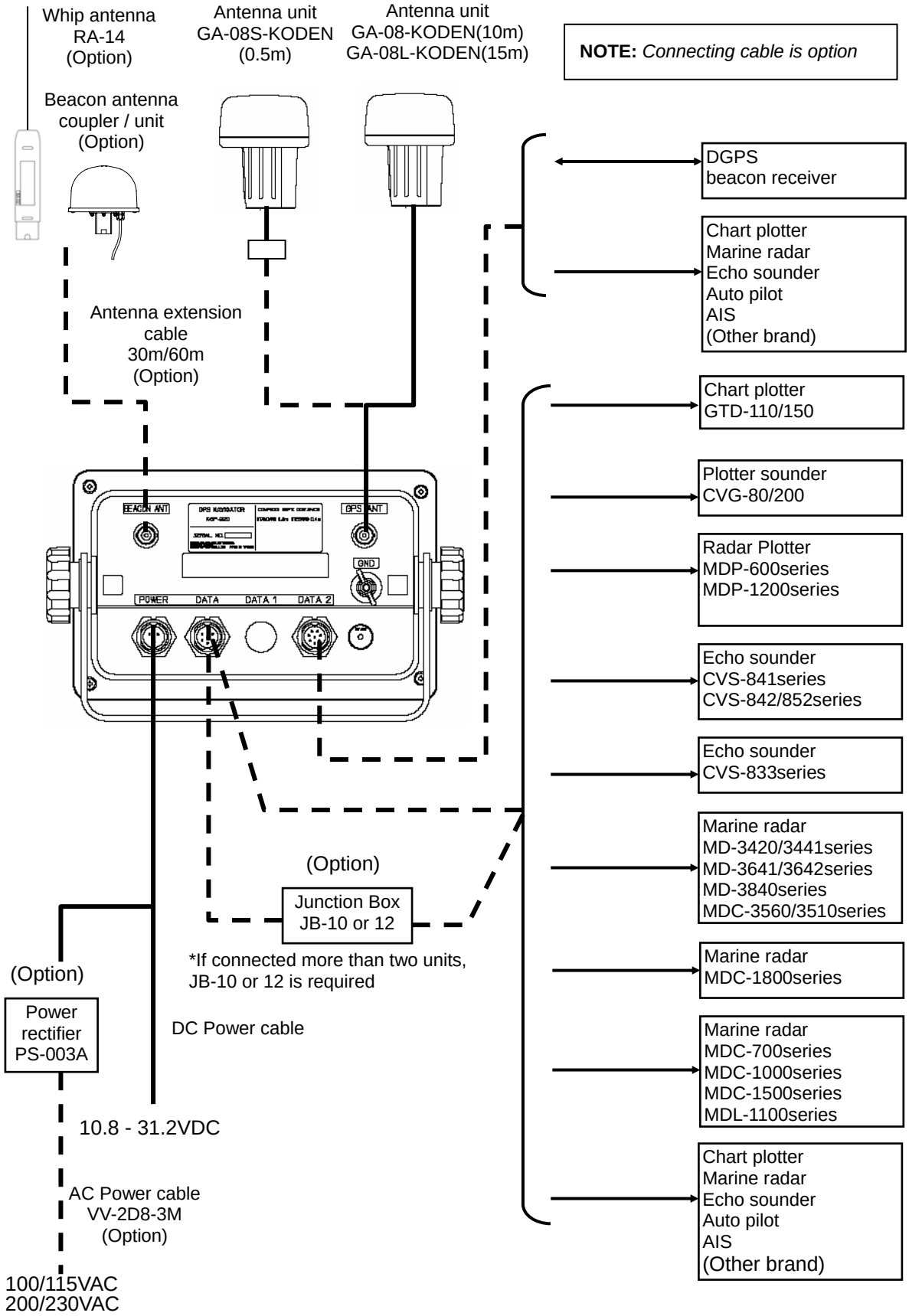


Figure 1.1 equipment composition of KGP-920

Chapter 2 Equipment Composition

Chapter 2 Equipment composition

2.1 Standard equipment list

No	Item	Type name	Remarks	Weight/Length	Q'ty
01	Display unit	KGP-920.MU	With vinyl cover	0.86 kg	1
02	Antenna unit	GA-08-KODEN	Connected to GA-08, other end BNC connector	0.62kg 10m	1
03		GA-08L-KODEN		0.81kg 15m	
04		GA-08S-KODEN	Connected to GA-08, other end N-P connector	0.26kg 0.5m	
05	DC power cable	CW-267-1.8M	With 3-pin connector, other end plain	1.8m	1
06	Fuse	F-7161,2A	For spare		1
07	Truss tapping screw	TPT5X20U	For mounting bracket		2
08	Operation manual	KGP-920.OM.E	English		1

2.2 Optional items list

No	Item	Type name	Remarks	Weight/ Length
01	Connecting cable	CW-373-1-5M	6 pin water resistant connectors both ends w / EMI core	5m
02		CW-373-1-10M		10m
03		CW-374-1-5M	A 6 pin water resistant connector and a 6 pin connector w / EMI core	5m
04		CW-374-1-10M		10m
05		CW-376-1-5M	A 6 pin water resistant connector and other end plain w / EMI core	5m
06		CW-376-1-10M		10m
07		CW-391-1-5M	A 8 pin water resistant connector and other end plain w / EMI core	5 m
08		CW-391-1-10M		10 m
09		CW-154A-5M	A 6 pin connector and other end plain	5 m
10	Junction box	JB-10	1 input,3 outputs X 2 circuits	0.4kg
11	Junction box	JB-12	3 inputs1 output, 1 input 3 outputs	0.42kg
12	Hose band	738-1015	2pcs for antenna fixture	--
13	Power rectifier	PS-003A	With 5A fuses 2pcs	2.8kg
14	AC power cable	VV-2D8-3M	For PS-003A, both ends plain	3 m
15	Flush mount kit	FMK-1	Flush mount frame with bolts, washers and screws	--
16	Connector	FM14-6P	6 pin for TD, CVS, MD	--
17	Connector	LTWBD-06BFFA-L180	6 pin water resistant connector for TD, CVS	--
18	Antenna cable extension kit	CW-839-30M KIT	5DFB cable with N-J connector and other end plain, N-J connector, and CW-826-0.5M	30m

19	Antenna cable extension kit	CW-394-60M KIT	8DSFA cable with N-J connector and other end plain, N-J connector, N-BNC connector* and CW-826-0.5M	60m
20	Conversion cable	CW-826-0.5M	A BNC connector / N-P connector	0.5m
21	Internal beacon receiver kit	INT-DGPS KIT	Receiver PCB, connector, harness (install at the factory)	--
22	Beacon antenna coupler (Electric field type)	BA-02-K	With antenna cable with a connector	0.85kg 10m
23		BA-02L-K		0.81kg 15m
24		BA-02S-K		0.47kg 0.5m
25	Whip antenna	RA-14	2.45m, for BA-02	0.3kg
26	Beacon antenna unit (Magnetic field type)	BA-03	With antenna cable with a connector	1.4kg 10m
27		BA-03L		1.6kg 15m
28		BA-03S		0.99kg 0.5m
29	Operation manual	KGP-920.OM.E	English	
30	Service manual	KGP-920.SM.E	English	

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

Chapter 3 Specifications

Chapter 3 Specifications

3.1 GPS receiver

Receiving frequency		1575.42 MHz
Receiving channel		18 channel parallel
Receiving code		C/A code
Sensitivity		Better than –130 dBm (elevation angle: 5° or over)
Accuracy	Position	10 m 2drms(GPS), 5 m 2drms(DGPS), 8 m 2drms(SBAS)
	SOG	0.1 kt rms
HDOP≦4	COG	± 3° (SOG 1-17 kt), ±1° (SOG >17 kt)

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

3.2 Display section

Display		LCD with backlight (128 x 64 dot's, effective picture area: 85.71 x 54.35 mm)
Display mode		NAV1, NAV2, NAV3, PLOT, MOB (Man Over Board)
Track display	Display range	0.025, 0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20 nm (sm, km)
	Usable ground	Within 80° in latitude
	Plotting interval	10, 20, 30 seconds, 1, 3, 5 minutes, 0.1, 0.5, 1 nm (sm, km)
	Plotting capacity	2,000 points
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, velocity made good/course made good/elapsed time, altitude, distance/bearing/cross track error/course deviation/time to go to waypoint, total time to go and distance on route, DOP value, present time (UTC or LTC), satellite status, beacon receiving status, distance/bearing between two points, MOB display
Instant (event) memory		200 points
Waypoint memory		200 points
Route memory		20 routes (Max. 400 waypoints) 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), antenna height unit (ft, m), antenna height, averaging (smooth) factor, position mode (2D or 3D automatic selection), beacon stations selection

3.3 Data Input/Output

Output data format (DATA connector)	IEC 61162-1/ NMEA 0183 Ver.1.5 (NMEA1, 2)/ CIF/ SHIPMATE (AAM, APB, BOD, BWC, DCN, DTM, GBS, GGA, GLC, GLL, GNS, GSA, GSV, MSS, RMB, RMC, Rnn, RTE, SGR, VTG, WDC, WPL, XTE, ZDA)
Output data format (DATA2 connector)	IEC 61162-1 (AAM, APB, BOD, BWC, DCN, DTM, GBS, GGA, GLC, GLL, GNS, GSA, GSV, MSS, RMB, RMC, Rnn, RTE, SGR, VTG, WDC, WPL, XTE, ZDA)
Input data format	RTCM SC104 Ver.2.0 (DGPS)

3.4 Power requirements

Input voltage: 10.8 - 31.2 VDC

Power consumption: Less than 4.5 W (at 24VDC)

AC Operation: AC/DC rectifier PS-003A is required.

Input voltage range: 115 VAC or 230 VAC

3.5 Compass safe distance

Standard: 0.8m

Steering: 0.4m

3.6 Environmental conditions

(1) Temperature and humidity

Operating temperature	Display unit: - 15° to + 55°C
	Antenna unit: - 25° to + 70°C
Humidity	93% (+40°C)

(2) Vibration

The equipment operates normally under the following vibrating conditions.

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

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

(3) Water proof

Display unit: IPX4

Antenna unit: IPX6

3.7 External dimensions and weight

External dimensions: Width x Height x Depth

Dimensions (WxHxD): 220 x 131 x 90 (mm)

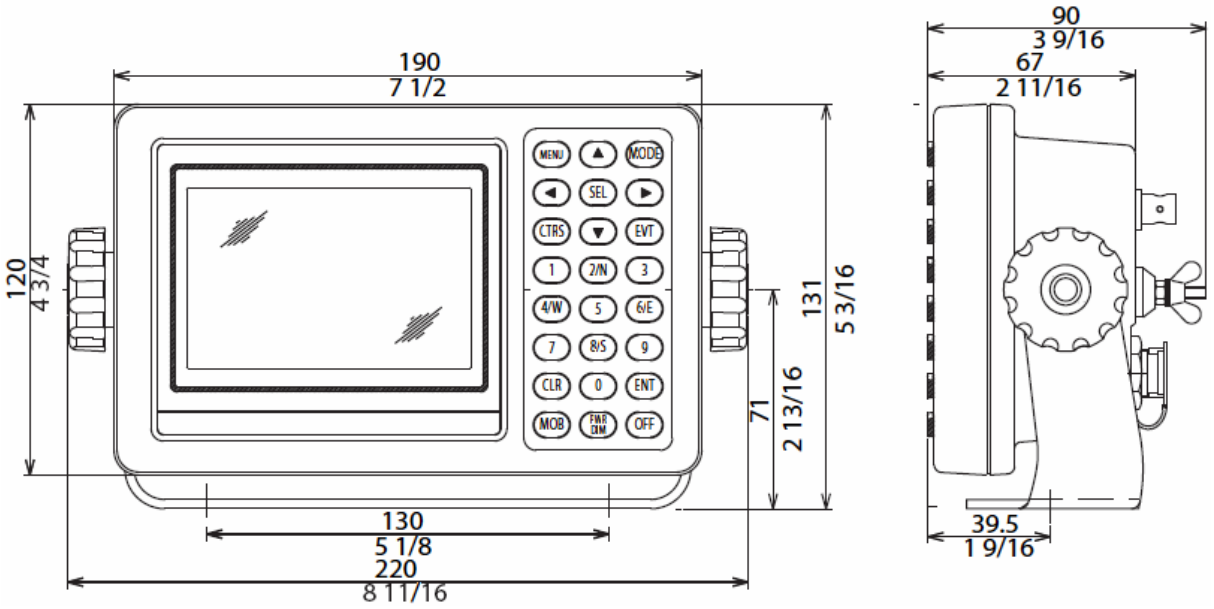
Weight: 0.86 kg

Refer to Figure 3.1 for the exterior with dimensions.

Refer to Figure 3.2 for service space required.

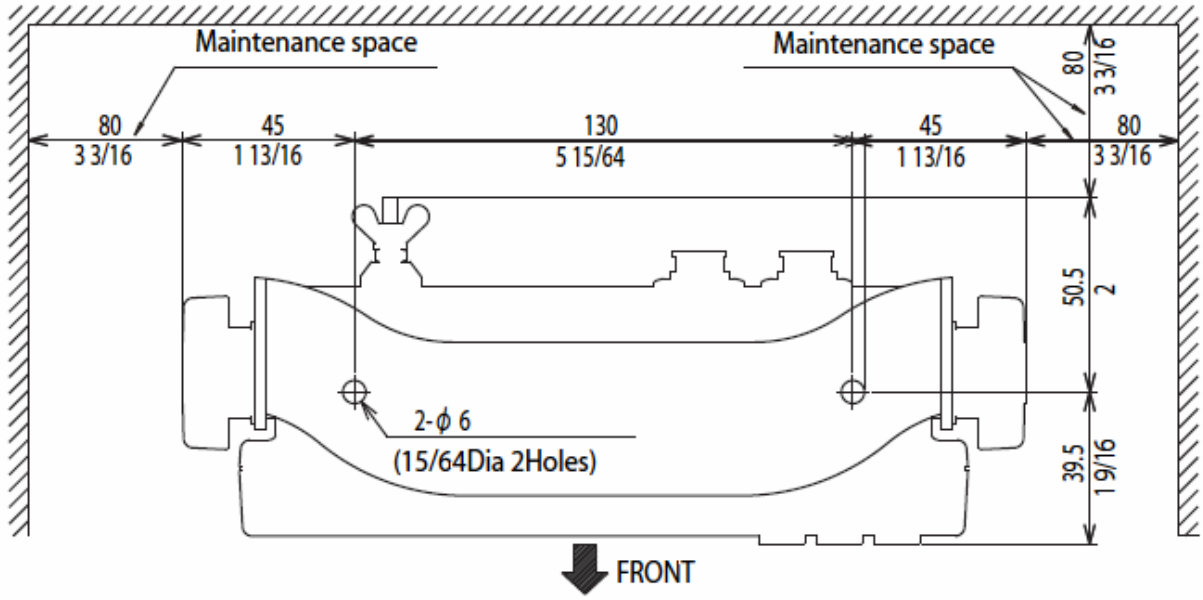
Refer to Figure 3.3 for exterior of antenna unit with dimensions.

Refer to Figure 3.4 for exterior of DGPS antenna unit(option) with dimensions.



Unit: mm (inch)

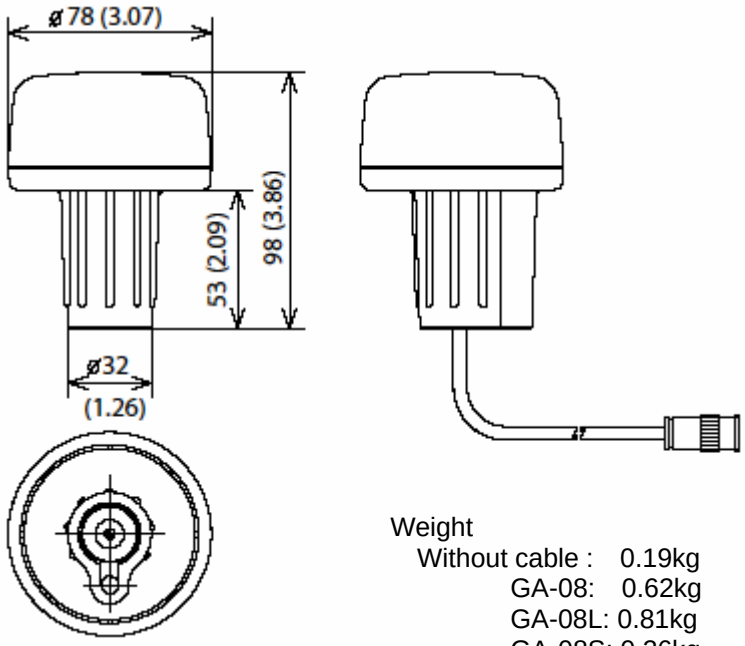
Figure 3.1 The Exterior of KGP-920 with dimensions



Unit: mm (inch)

Figure 3.2 Service space required for KGP-920

GA-08: with cable (10m)
GA-08L: with cable (15m)
GA-08S: with cable (0.5m, for extension)

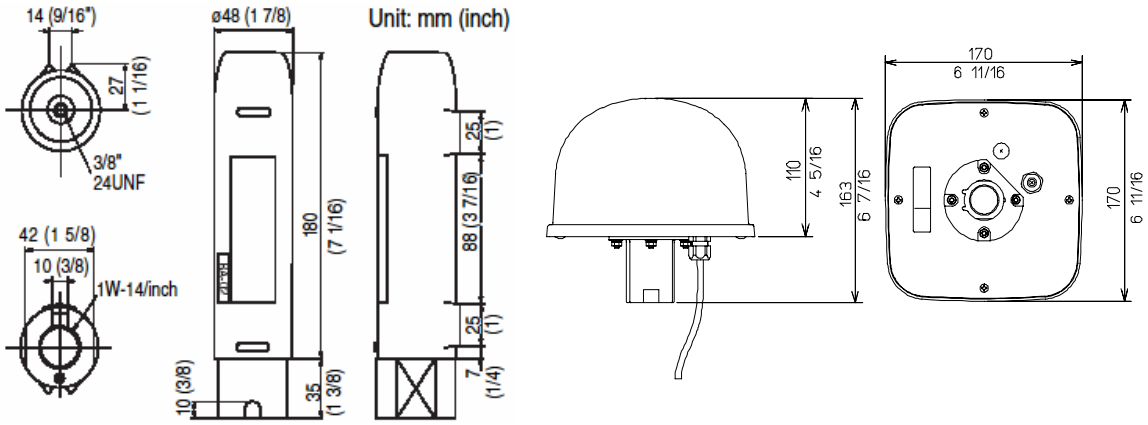


Weight
Without cable : 0.19kg
GA-08: 0.62kg
GA-08L: 0.81kg
GA-08S: 0.26kg

Figure 3.3 The Exterior of antenna unit with dimensions

BA-02-K / -03: with cable (10m)
BA-02L-K / -03L: with cable (15m)
BA-02S-K / 03S: with cable (0.5m, for extension)

Unit: mm



Weight
Without cable : 0.4kg
BA-02-K: 0.85kg
BA-02L-K: 1.2kg
BA-02S-K: 0.33kg

Weight
Without cable : 0.92kg
BA-03: 1.4kg
BA-03L: 1.6kg
BA-03S: 0.99kg

Figure 3.4 The Exterior of DGPS antenna unit (option) with dimensions

Chapter 4 Installation

Chapter 4 Installation

4.1 Installation consideration

General

Qualified service technicians should perform the installation of the KGP-920 series 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

4.2 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.

4.3 Inspection of the goods

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

4.4 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.

4.5 Display unit installation

The display unit is designed for table mount and flush mount. Refer to Figure 4.1or 4.3 for installation.

4.5.1 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 two (2) 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 4.2 for detail.

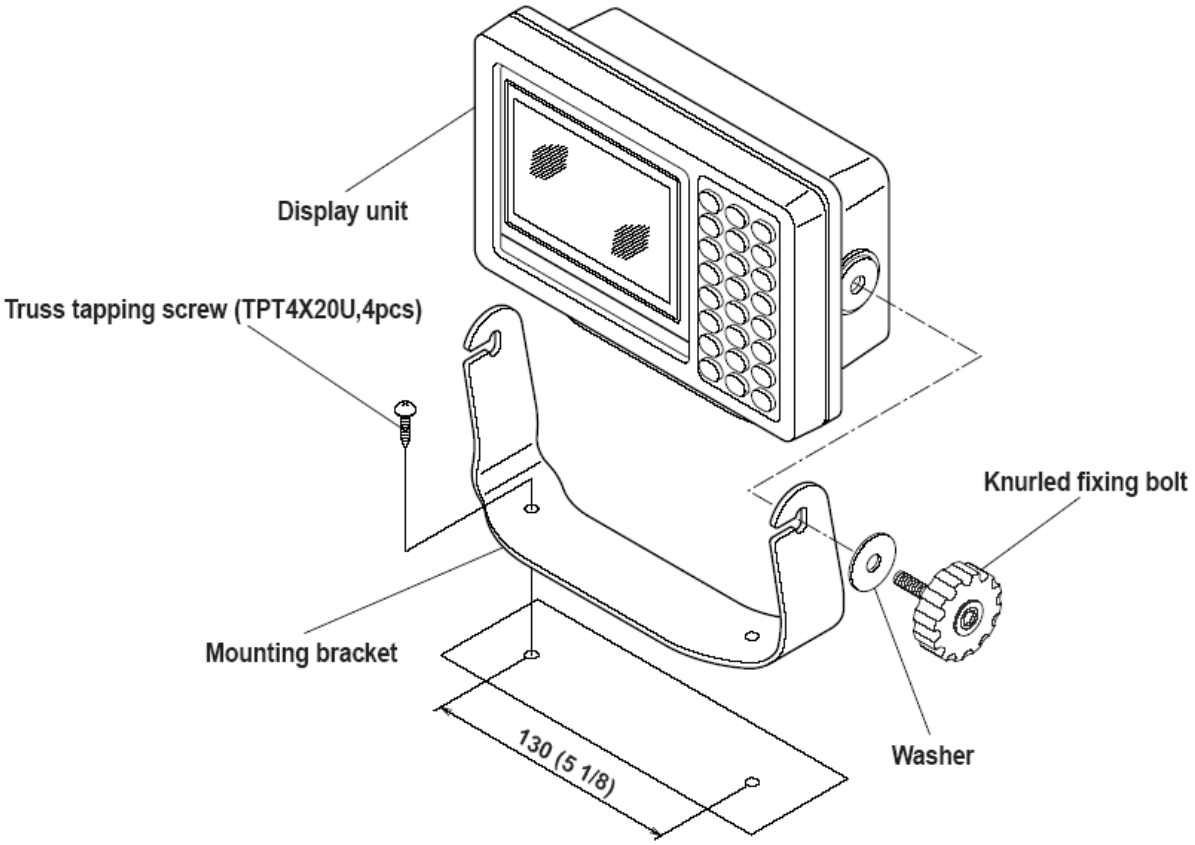


Figure 4.1 Fitting detail of KGP-920 in table mounting mode

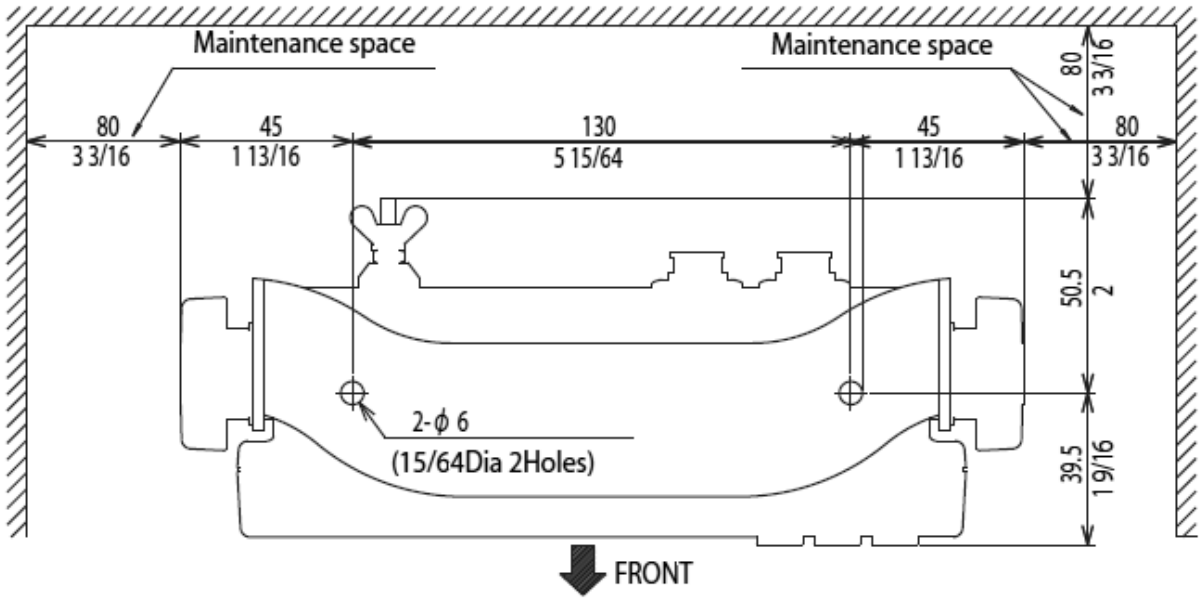


Figure 4.2 Service space required for KGP-920

4.5.2 Flush mounting

(1) Cut a rectangle opening as shown in a figure4.3.

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

(3) Put the display on the flush mount and fix with two (2)slotted –head screws.

(4) Put the display on the opening and fix with four (4) tapping screws. In case you use M4 screws to fix the display, select an appropriate screw length that best suits fixing the unit to the panel thickness.

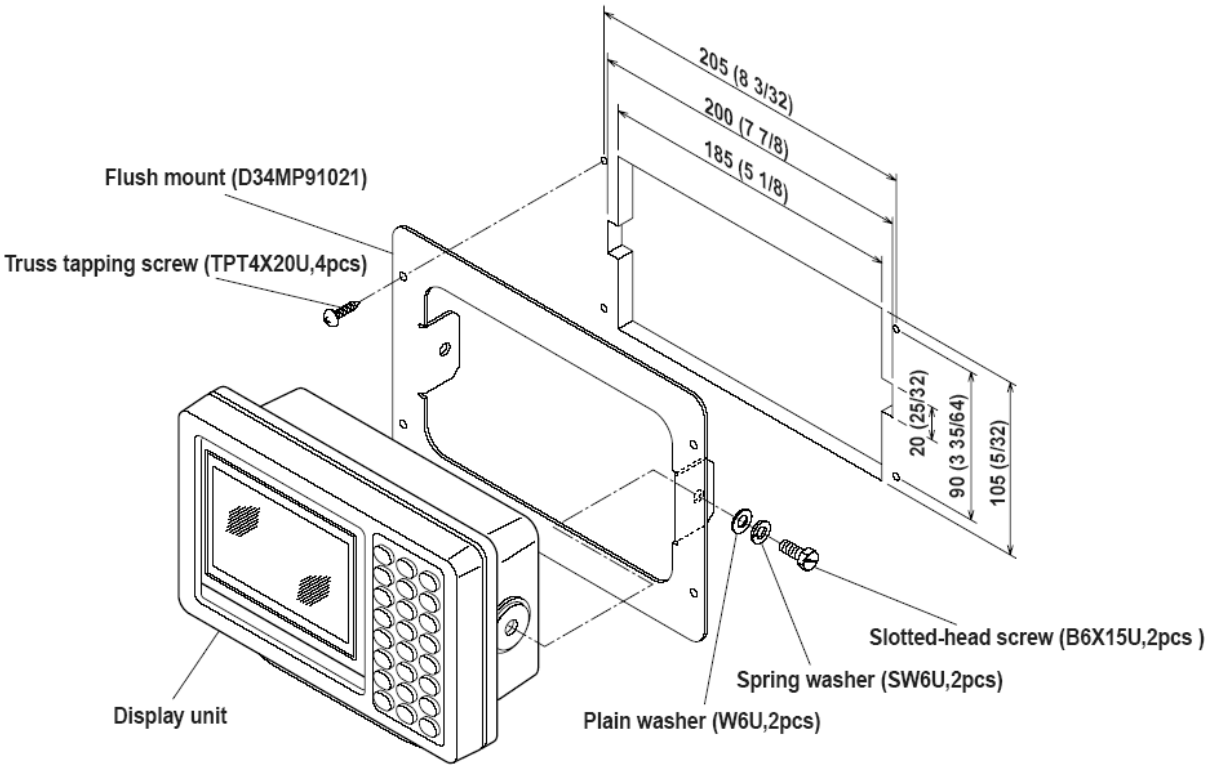


Figure 4.3 Fitting KGP-920 in flush mounting mode

4.6 Antenna unit installation

4.6.1 Selecting the best site of GPS / Beacon antenna

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

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

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

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

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

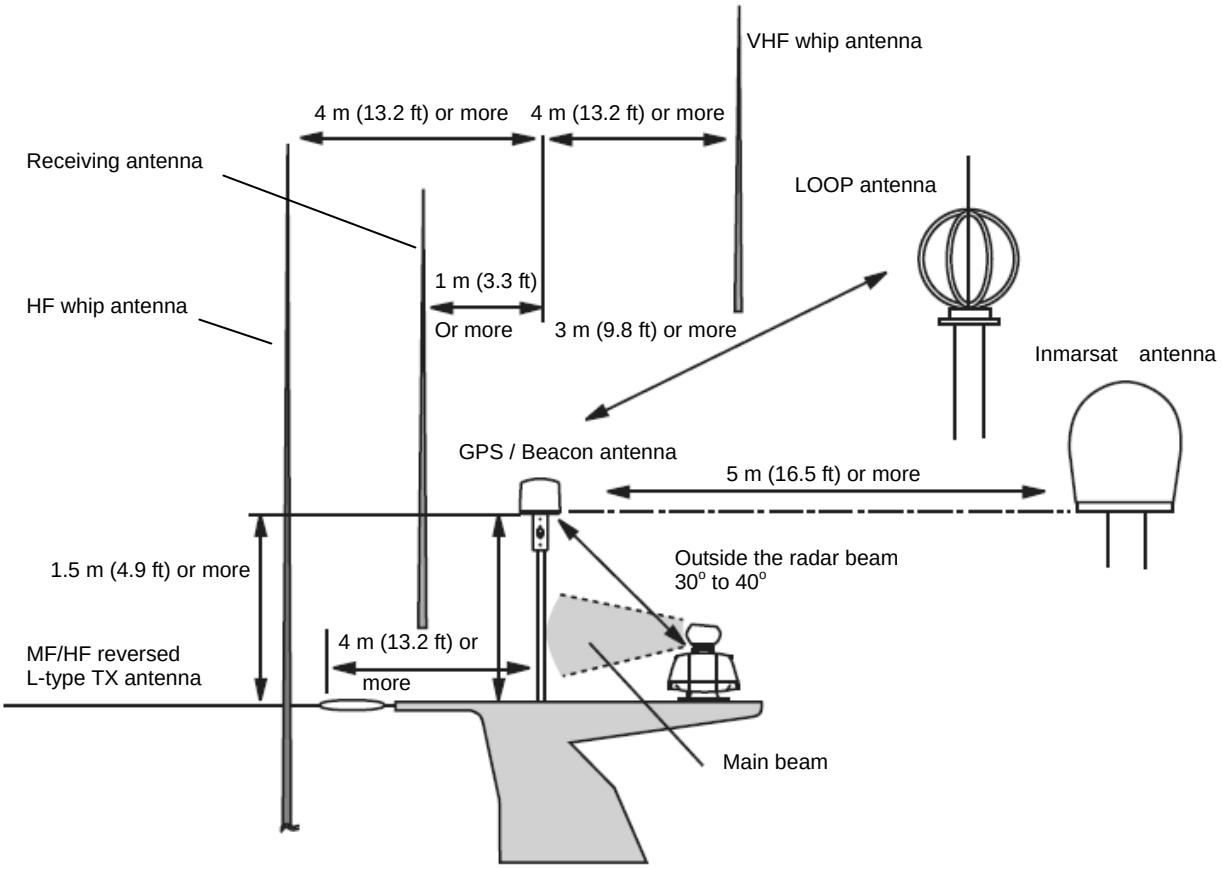
(5) Outside radar transmitting beam (30° to 40°).

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

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

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

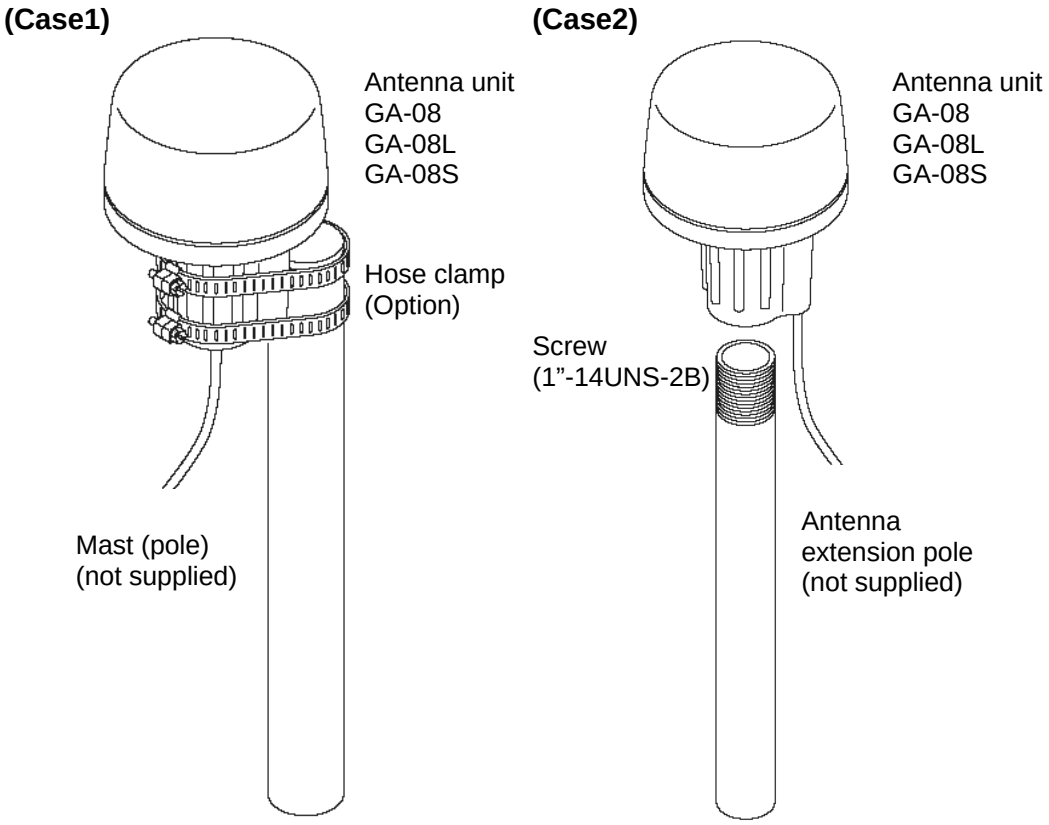
(9) At least 0.5 meters (1.6 feet) above the large metal surface.



* AT least 0.5 m (1.6 ft) above the large metal surface

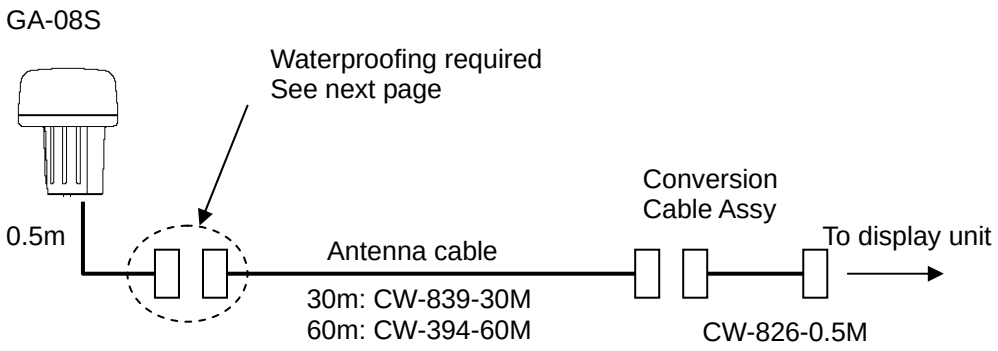
Figure. 4.4 Recommended GPS / Beacon Antenna installation

4.6.2 Fixing the GPS antenna unit



4.6.3 Extension of an antenna cable

Although the standard length of an antenna cable is 10m or 15m, extension of 30m or 60m is possible by the antenna and extension cable of an option.



4.6.4 Waterproofing on the connector jointing section

(1) Wind the self-fusible tape around the jointing section.

Pull the tape end to stretch its length to be doubled and wind it overlaid by half to 3 plies. When winding is completed, apply gentle pressure over the surface with fingers to expedite the fusion.

(2) Apply windings of PVC tape to reinforce the protection.

PVC tape should not be strained. Wind it overlaid by half to 3 plies. When finished, press the surface evenly without strain for complete adhesion of the tape.

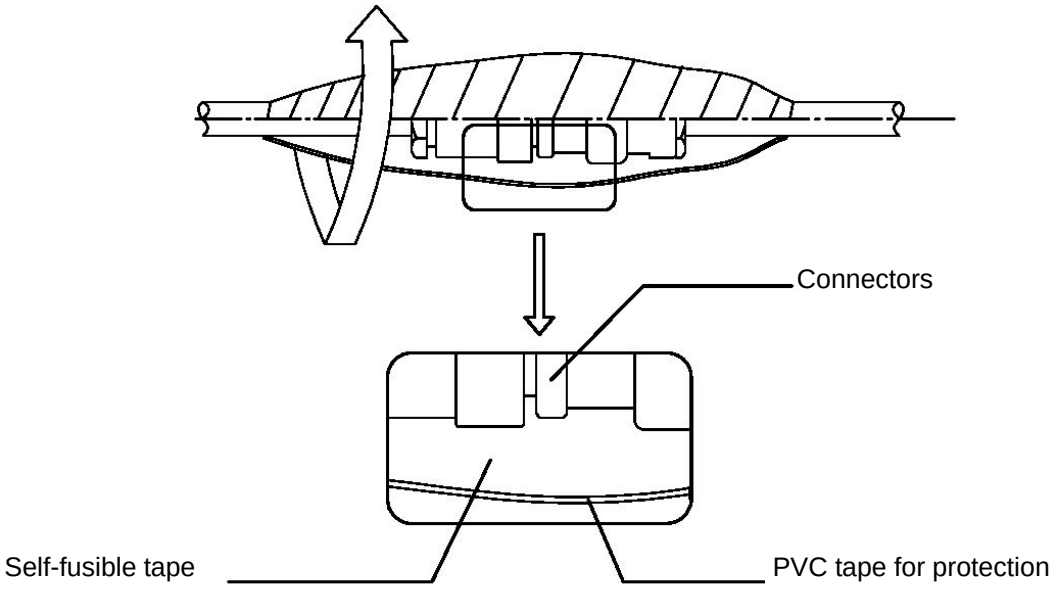
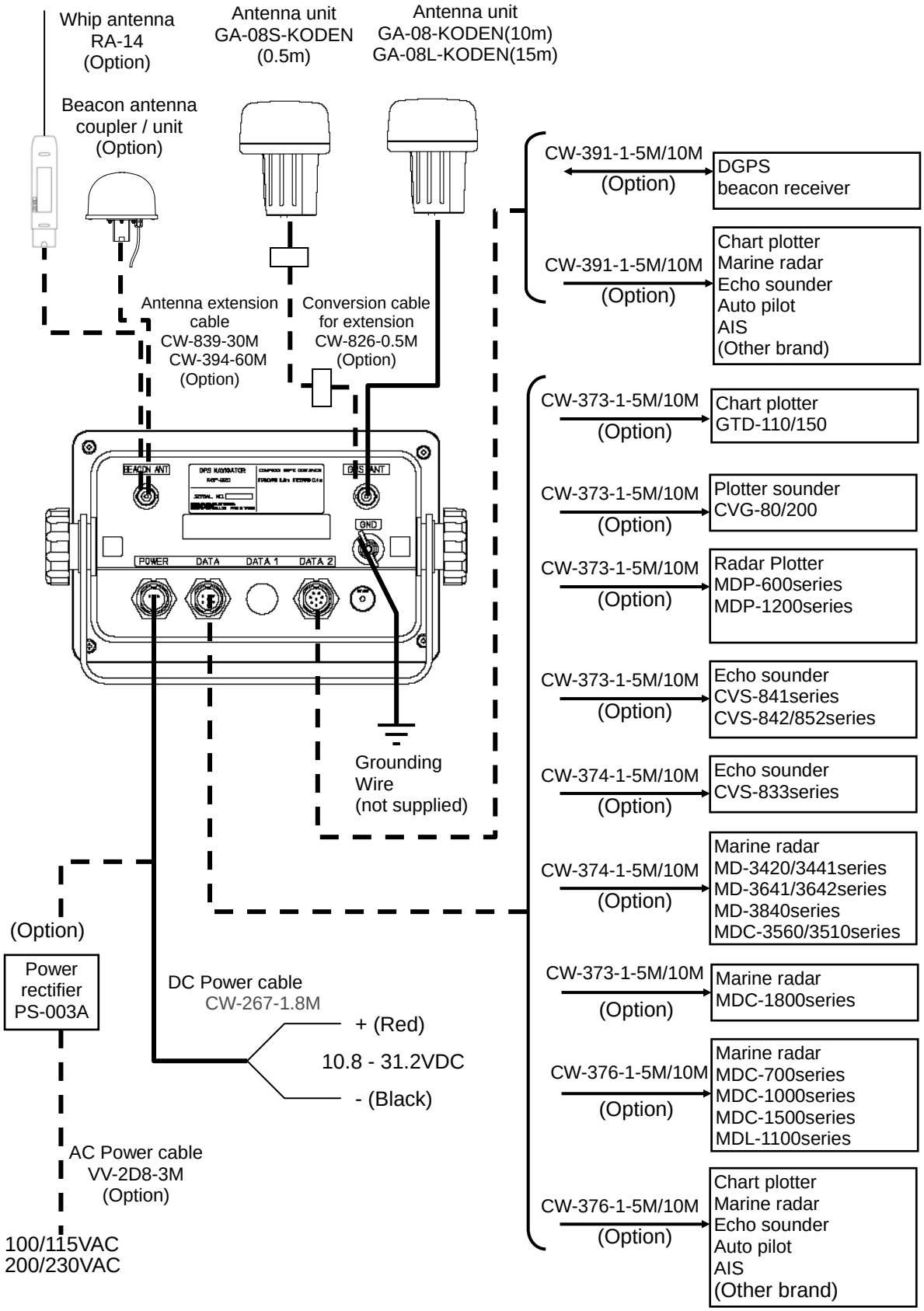


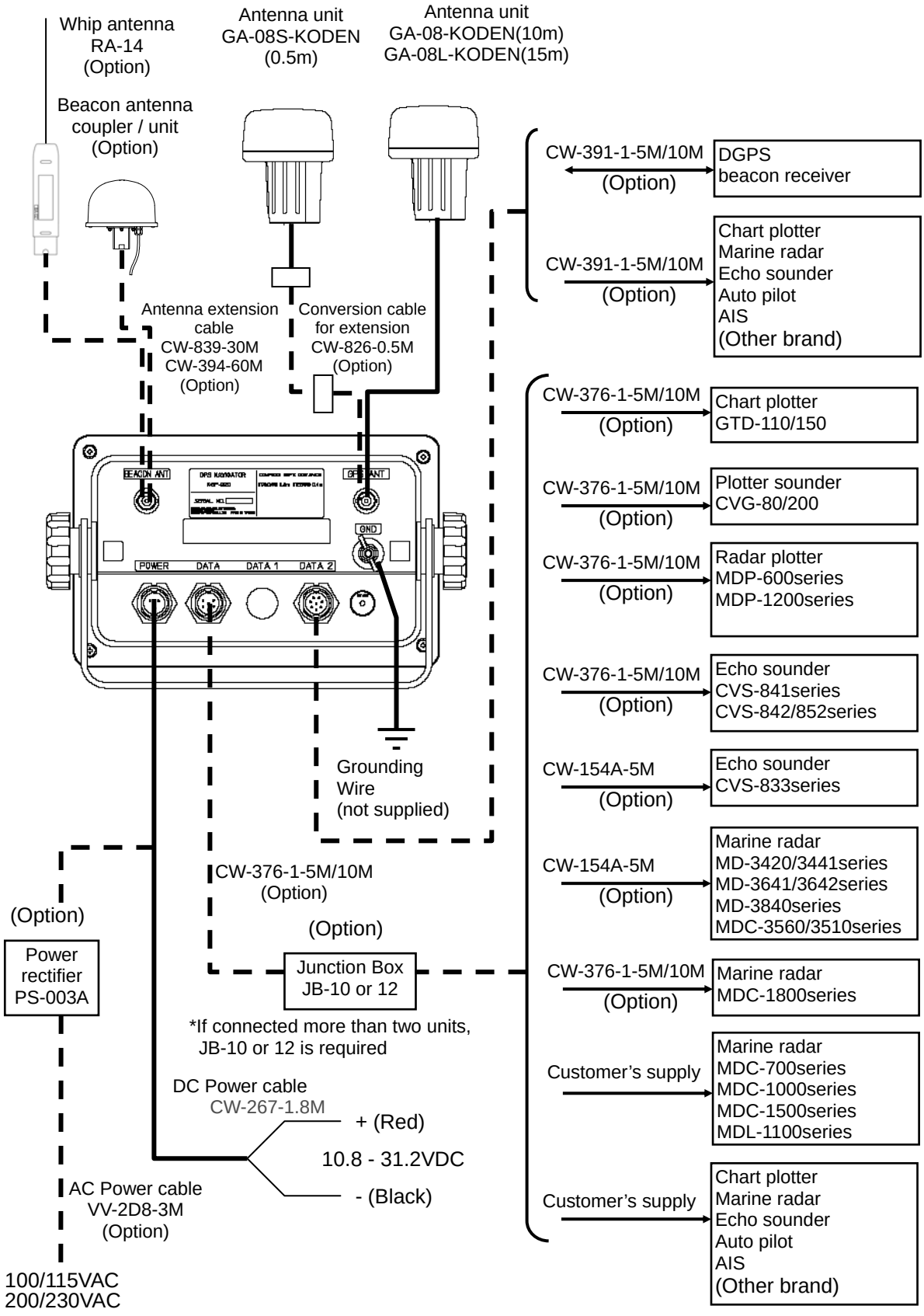
Figure. 4.5 Processing on the coax cable jointing section

4.7 Cable connections to KGP-920

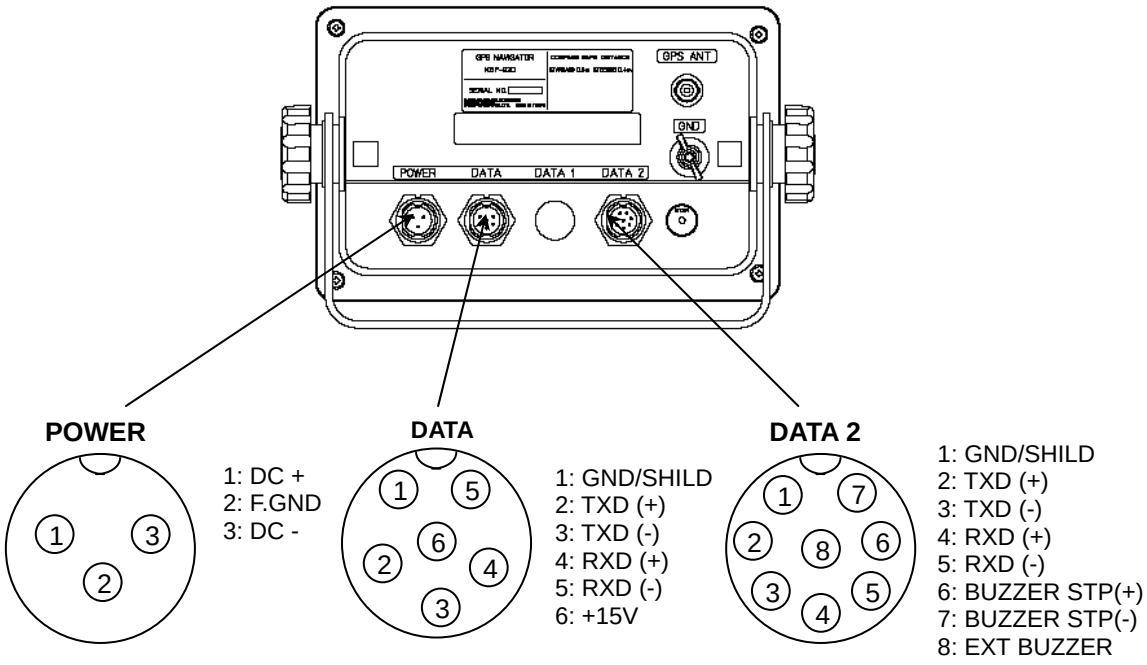
4.7.1 Single connection



4.7.2 Multi connections



4.8 Connector pin outs



(General data output)

* RXD is used only maintenance

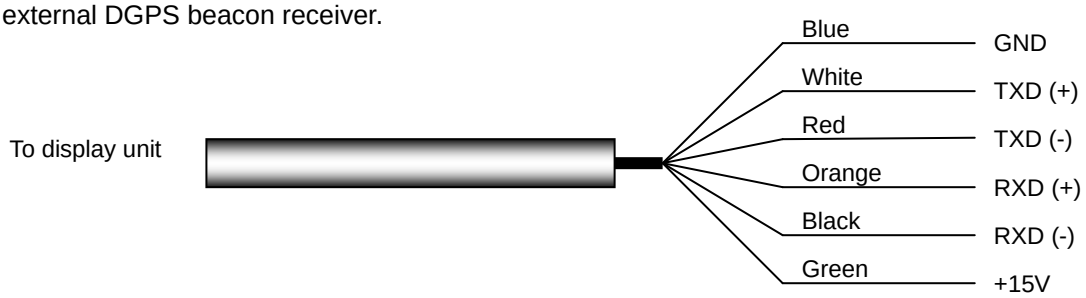
(DGPS beacon receiver)

(Extension data output)

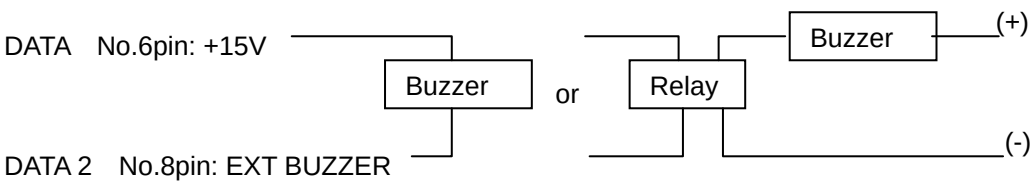
(External buzzer)
2:ACK/ALR OUT(+)
3:ACK/ALR OUT(-)
*When ACK/ALR Mode is ON
See page 8-19

(CW-376-1-5M/10M, CW-391-1-5M/10M Pin number form cable side)

These cables are used as a general/extension data port and external DGPS beacon receiver.



(External buzzer connection)



(DATA port)

This port is general data output port. Output data is selected by the menu among the output of IEC 61162-1,NMEA Ver.1.5, CIF, and SHIPMATE. Output signal level is RS-422.

(DATA 2 port)

When CW-376/391 are used.

This port is data input/output port for DGPS beacon receiver. If a DGPS receiver is not connected, it can be used as a data output port for extension, but unlike the DATA port, output is possible only for IEC 61162-1. Output signal level is RS-422.

> ***NOTE:*** *ACK/ALR of menu 9-3 needs to be turned off. See chapter 8.6.5 (page 8-19)*

When CW-398 are used.

This port is an only for external alarm system. ACK/ALR output signal level is RS-422,and EXT BUZZER out put can drive a relay(24V/10mA). BUZZER STP is an input port for stopping a buzzer, and impresses 24V.

> ***NOTE:*** *ACK/ALR of menu 9-3 needs to be turned on. See chapter 8.6.5 (page 8-19)*

4.9 Inspection after installation

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

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

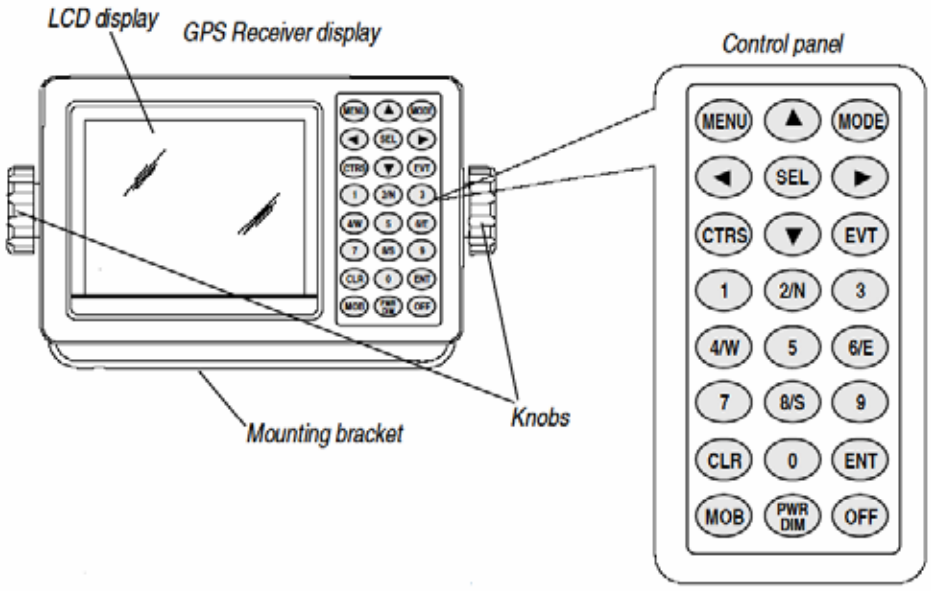
(2) Is the connection between the display and antenna unit correct?

(3) Are the cables routed and connected properly?

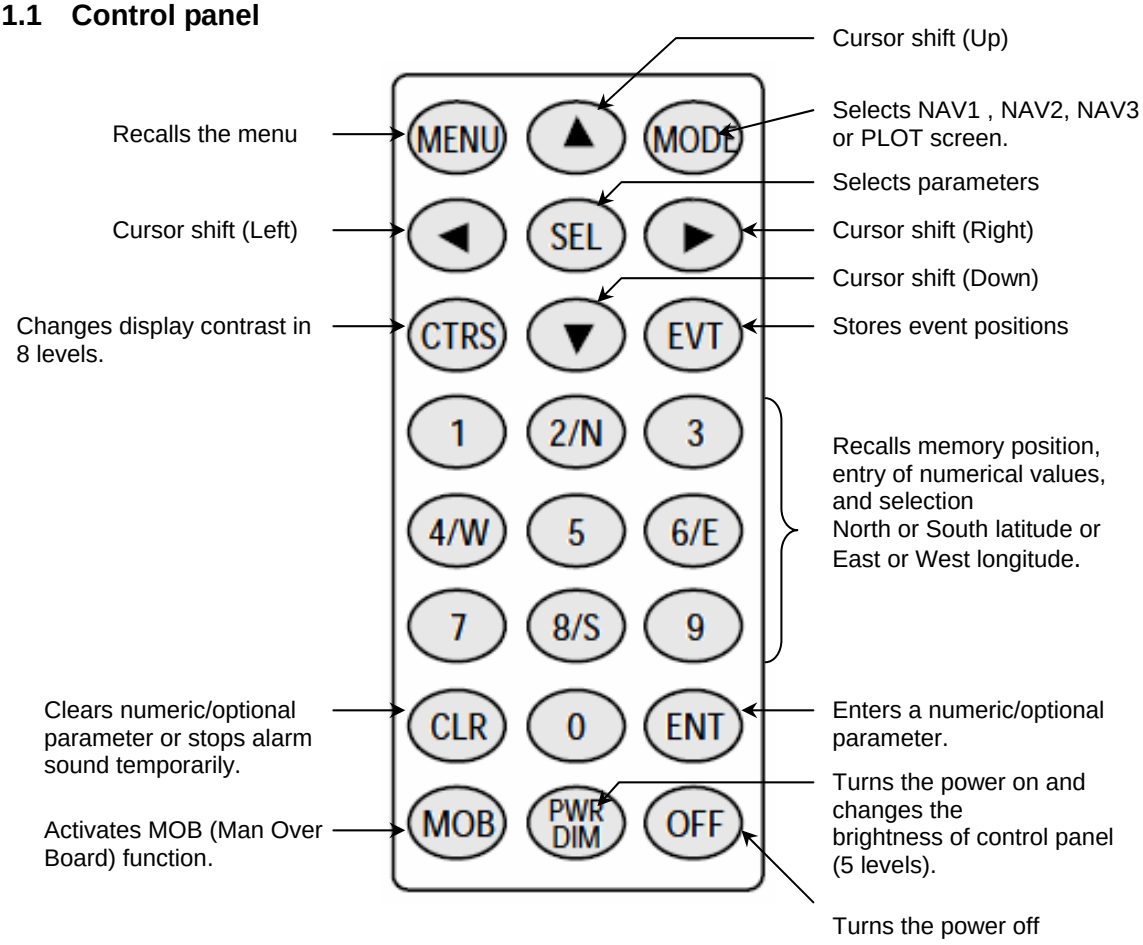
Chapter 5 Basic Operation

Chapter 5 Basic Operation

5.1 The name and function of each part



5.1.1 Control panel



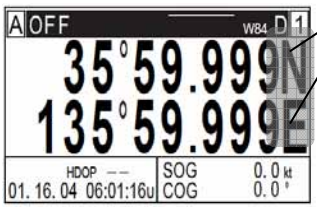
5.2 Power On/Off

PWR DIM

Press to power on.

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

Message to indicate checking of GPS receiver and display has been completed.



Blinking

Blinks when NAVIGATOR is searching GPS satellites.

No blinking

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

OFF

Press for 2 seconds to turn NAVIGATOR off. All data before power-off is kept in memory for later use.

5.3 Adjusting display contrast and brightness

PWR DIM

Press to change the LCD brightness in 5 levels.

CTRS

Press to change the LCD contrast in 8 levels.

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

5.4 Selecting the screen

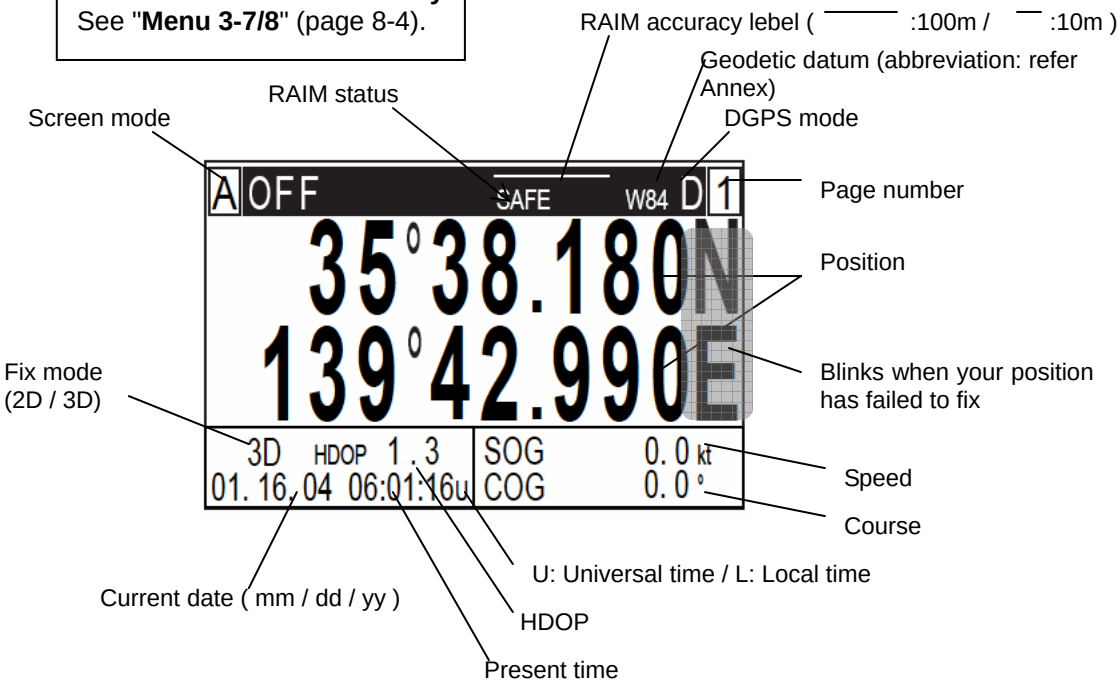
A (NAV1) screen: Indicates your present position as numerical data.
B (NAV2) screen: Displays a bearing circle (with your boat positioned at the graph center). It shows the bearing, course, deviation, distance and cross track error from the waypoint.
C (NAV3) screen: Shows a 3-dimensional view indicating the distance, course, cross track error, and deviation from the waypoint.
D (PLOT) screen: Indicates the track of your boat, your present position, waypoint, and memory position.

> **NOTE:** *Each following is each screen in the state where waypoint, routes, and anchor watch are not set up. A screen when they are set up is mentioned later.*

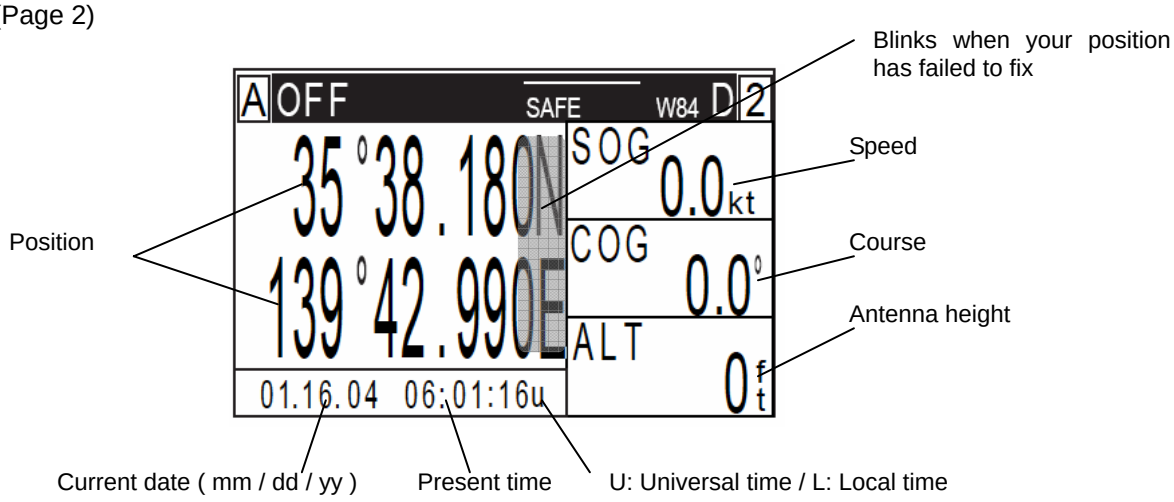
5.4.1 A (NAV1) screen : Standard Text mode

(Page 1)

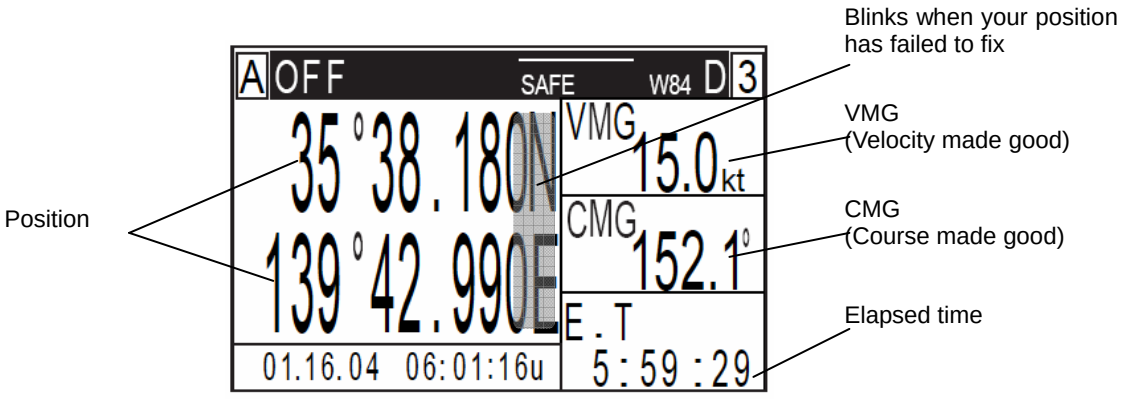
RAIM status / RAIM accuracy
See "**Menu 3-7/8**" (page 8-4).



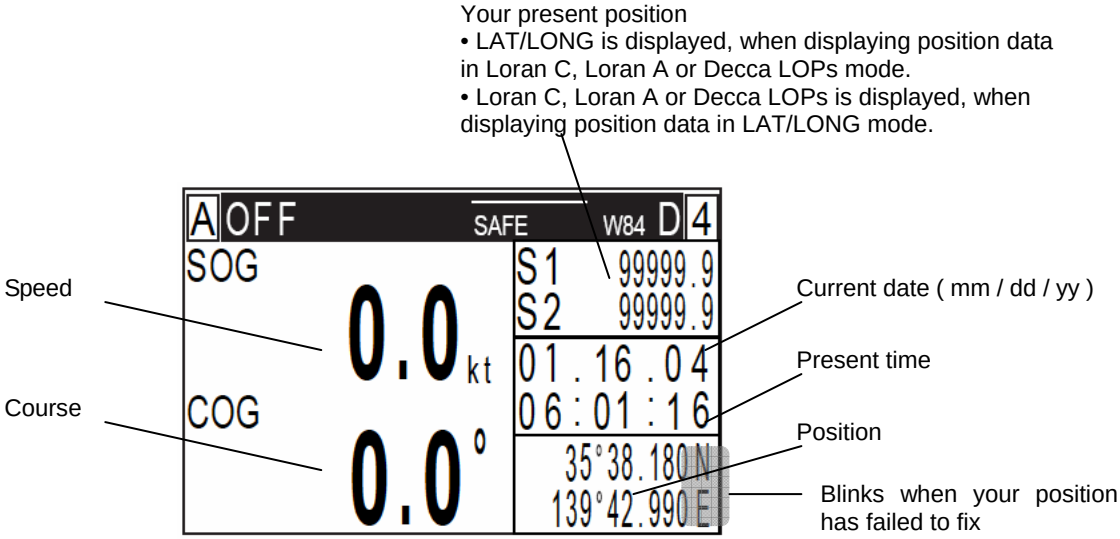
(Page 2)



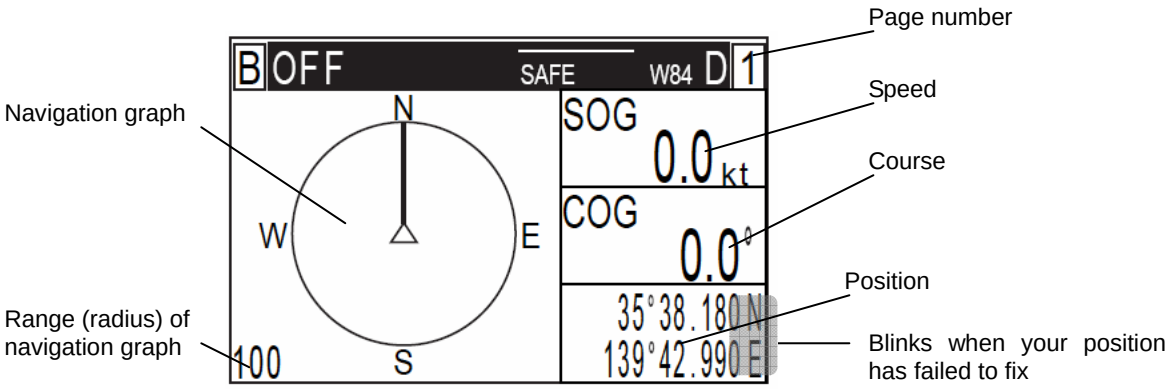
(Page 3)



(Page 4)

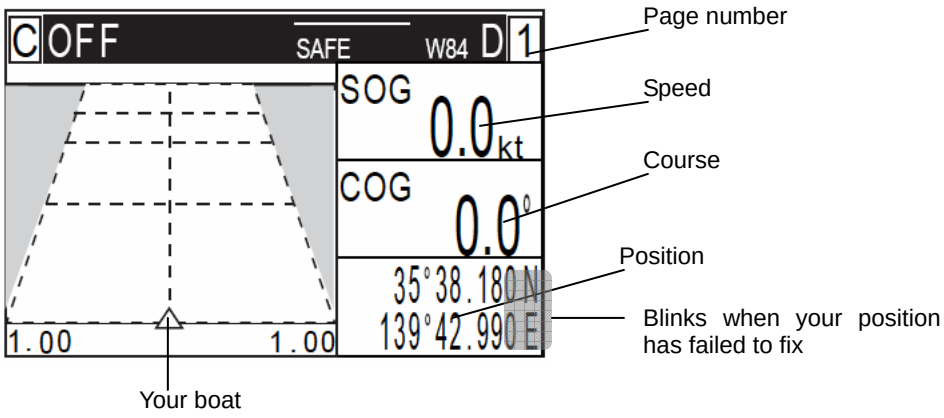


5.4.2 B (NAV2) screen : Navigation Graph mode



NOTE: *The navigation graph shows your boat position and the relative bearing.*

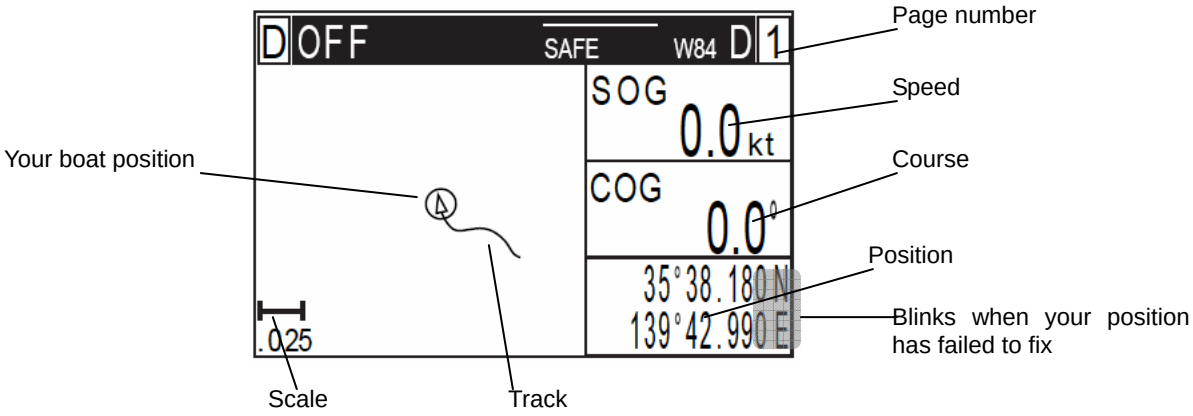
5.4.3 C (NAV3) screen : 3-D Highway mode



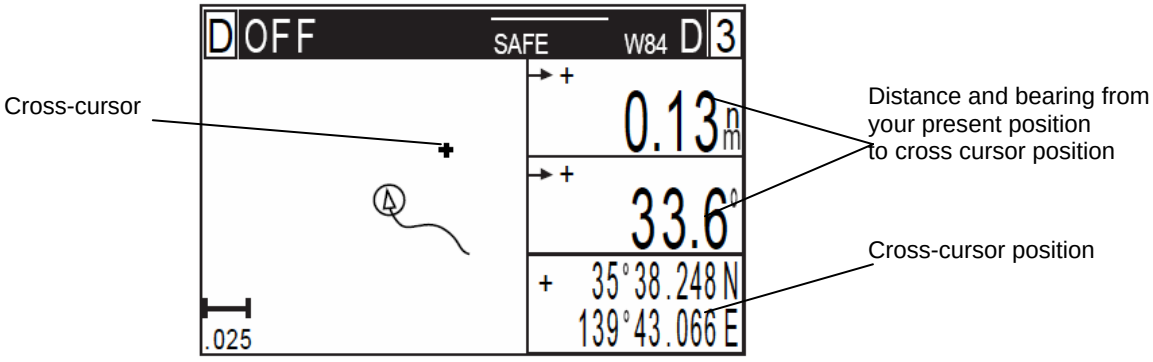
NAV3 screen shows a 3-dimensional view indicating the distance, course, cross track error, and deviation from the waypoint.
The boat icon does not move in OFF mode.

5.4.4 D (PLOT) screen : Simple Plotter mode

(Page 1)

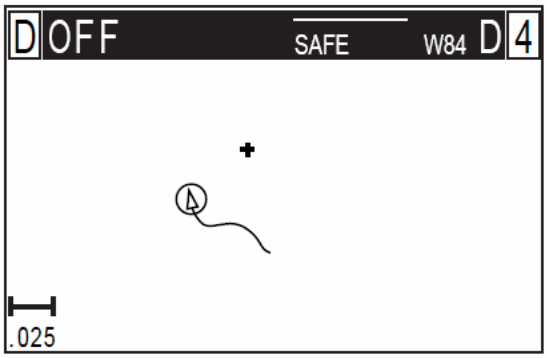


(Page 3)



(Page 4)

Close-up of PLOT screen



5.5 Storing present position (EVENT)

You can store up to 199 present positions with numbers 001 to 199. 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, position data, and symbols (selectable on the PLOT screen) 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 "5. EVENT" in the INITIAL MENU.

CAUTION
EVT key does not function when positioning is invalid

5.5.1 AUTO

EVT

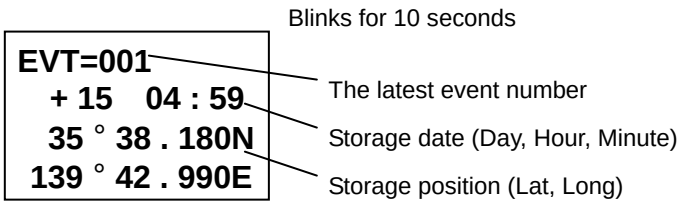
(1) Press [EVT] key to store your present position.
(2) You can store up to 199 present positions by pressing this key. They have storage numbers 001 to 199.

NOTE: *Auto or Manual selection is made at the "5. EVENT" in the INITIAL MENU.*

5.5.2 MANUAL

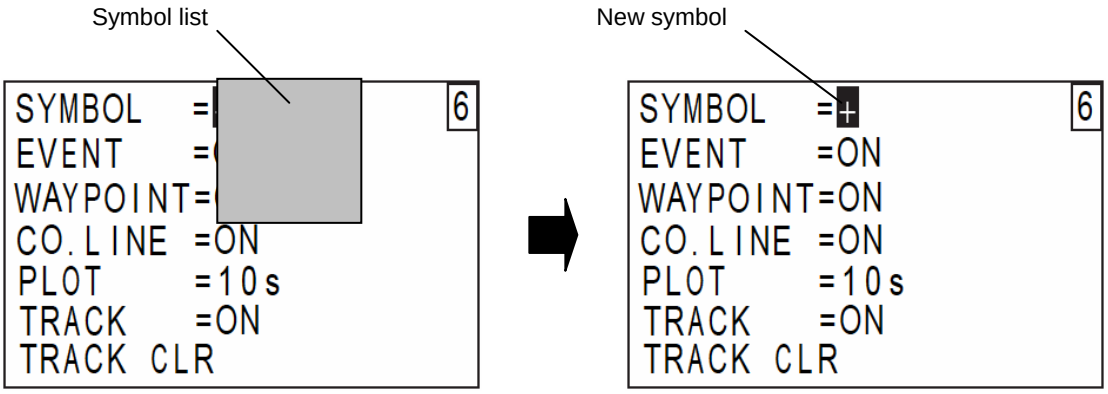
EVT

(1) Press [EVT] key to show the registration number display window.
(2) Specify a desired registration number from the numerical keypad.
(3) Press [ENT] key. The event will be registered to the number specified.



5.5.3 Changing the event symbols

(1) Press [MODE] key until D(PLOT) screen appears.
(2) Press [SEL] key until page 6 screen appears.
(3) Press [▲] or [▼] key and move cursor onto the SYMBOL.
(4) Press [ENT] key to display symbol list.
(5) Press [◀] [▶] or [▲] [▼] key and move cursor onto the new symbol.
(6) Press [ENT] key to select new symbol.



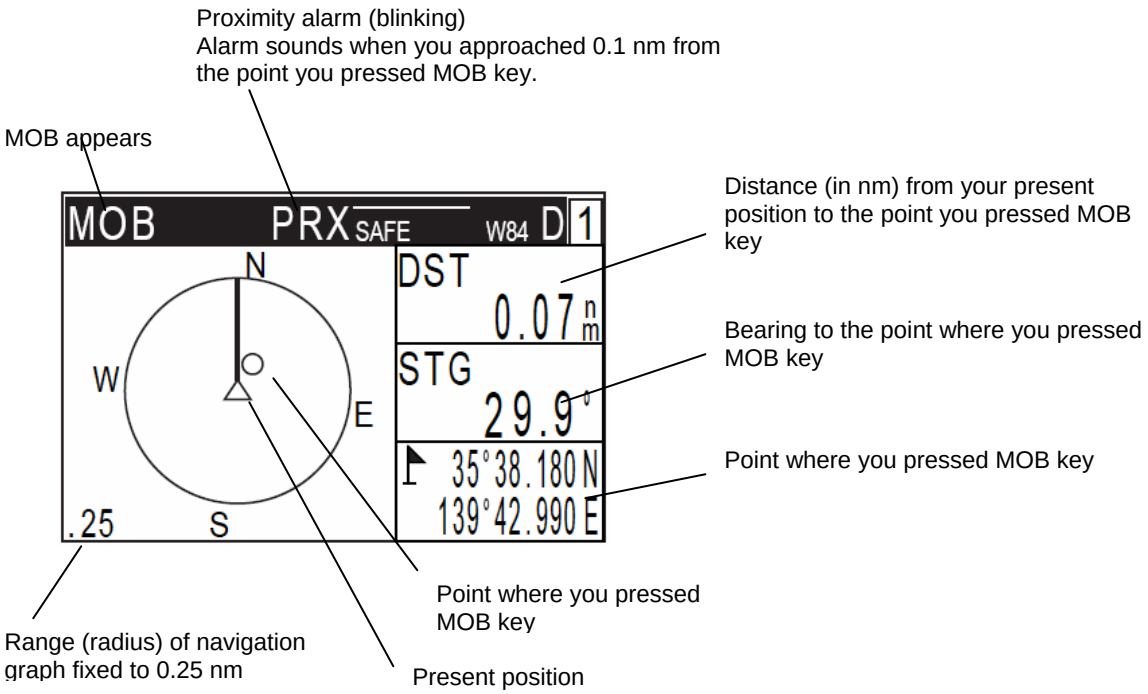
5.6 Using MOB (Man over-board) key

MOB function is provided for an emergency situation (if a person falls into the water) to make it easier to return to MOB point.

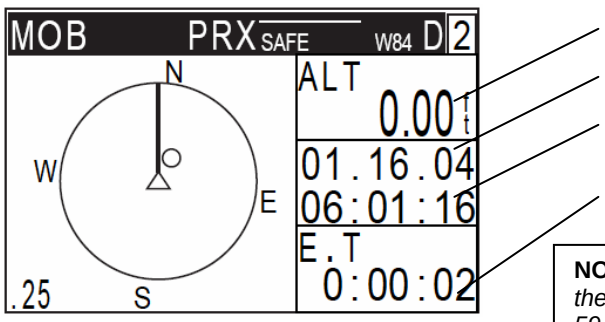
CAUTION
MOB key does not function when positioning is invalid

MOB

Press MOB key, and your position is stored immediately and MOB screen appears. You can see the distance and bearing from your present position to the point you pressed MOB key.



(Page 2) Press [SEL] key when changing a page.



Antenna height

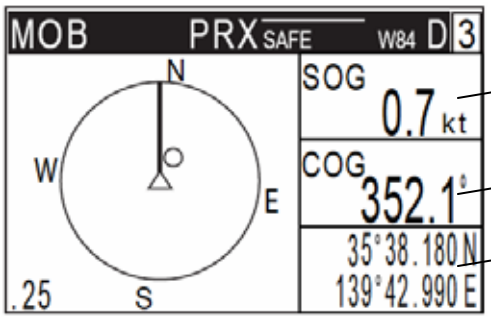
Present Date (Month, Day, Year)

Present time (Greenwich or local time)

The elapsed time (mm:ss) after you pressed MOB key

NOTE: *The time display that is shown when the elapsed time has exceeded 99 minutes 59 seconds after the MOB key was pressed.*

(Page 3)



Speed (in knots)

Course

Present position

NOTE: *You can use only the following five keys in MOB mode: [EVT] [CLR] [CTRS] [PWR] [OFF]*

CLR

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

5.7 Recalling event or MOB position

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

(2) Press [1] key to select “1:WAYPOINT”.

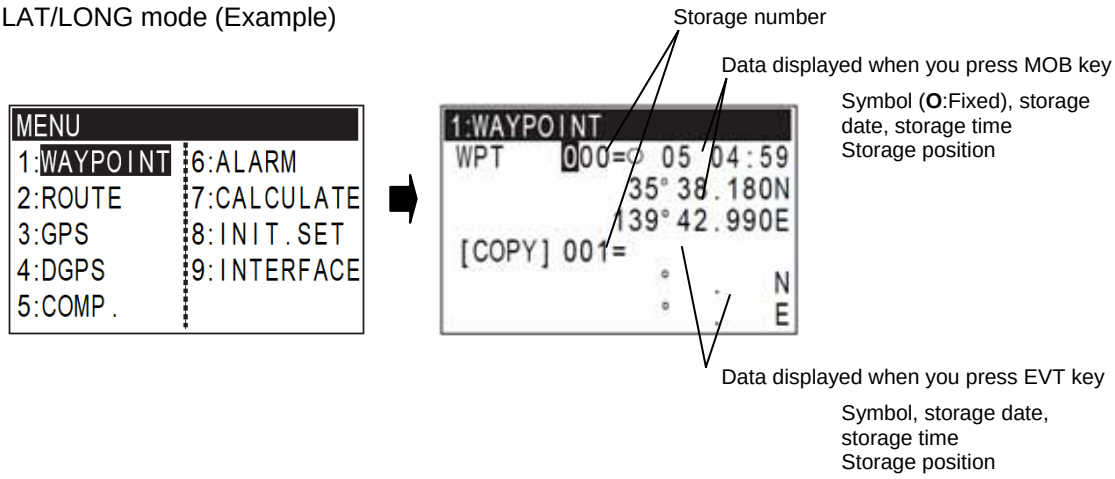
(3) Enter a storage number (000 or 199) of position data you wish to check.

NOTE:*000: Position data where you pressed MOB key*
001 to 199: Position data that contains events

Use [CLR] key if you have entered an incorrect number. You can reenter an event number.

(4) Press [ENT] key to recall data of the selected storage number.

LAT/LONG mode (Example)

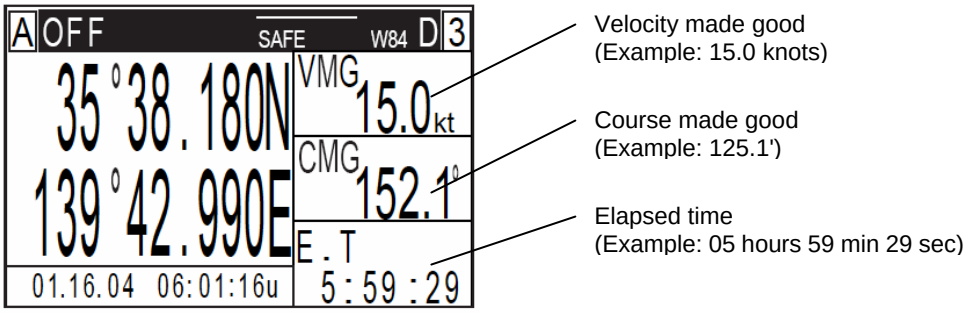


5.8 Displaying average speed, average bearing and elapsed time

(1) Press [MODE] key until **A** (NAV1) screen appears.

(2) Press [SEL] key until page 3 screen appears.

> **NOTE:** *This function is also available even when the waypoint navigation, root navigation or anchor position is in operation.*



What are velocity made good, course made good,

and elapsed time?

Velocity made good: Speed that is calculated by dividing the distance between the origin (the point where you set the elapsed time) and the present position by the elapsed time.

Course made good: A true bearing from origin to present position.

Elapsed time: The time elapsed after your power-on or after you have pressed the **CLR** (Reset) key.

Chapter 6 Various Navigation

Chapter 6 Various Navigation

6.1 Storing waypoints (LAT/LONG) data

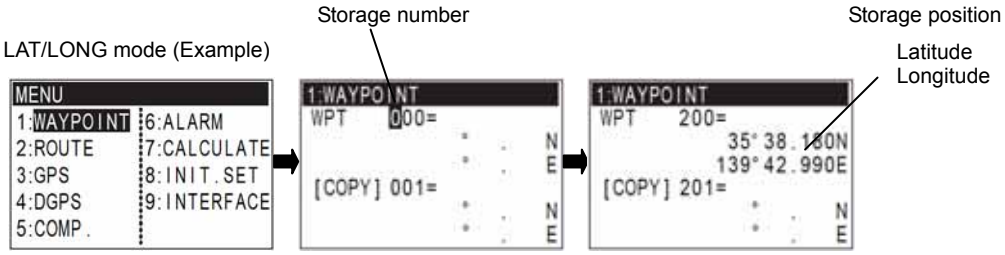
◀ **NOTE:** *Press to backspace the cursor to correct an input error.*

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

6.1.1 Storing a new position or updating an existing one

Up to 200 waypoints can be stored in memory. As 200 points (numbers 000 and 199) are reserved for MOB and event registration, you can use 200 to 399 (total of 200 points) to store waypoints.

(1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**1**] key to select "**1:WAYPOINT**".
(3) Enter storage number (200 to 399) using numeric keys.
(4) Press to [**ENT**] key to display data of the specified storage number.
(5) Press [▶] key to move cursor to letter " = ".
(6) Press [▼] key to move cursor to the numeric input field.
(7) Enter 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**].

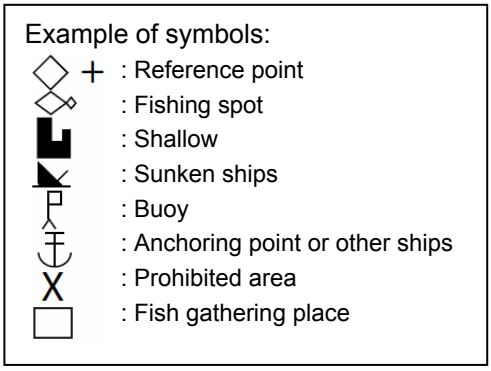


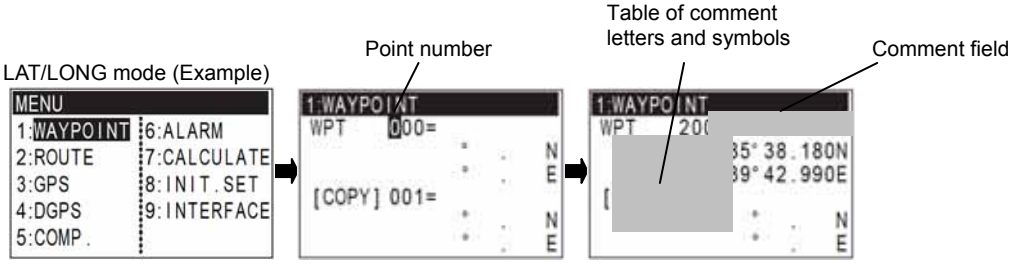
6.1.2 Writing comment

Try to use comments for often used positions. Nine symbols are available. If you set a symbol at the beginning of your comment, the symbol is shown at waypoint. If not, an asterisk (*) and waypoint number are shown on PLOT screen.

(1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**1**] key to select "**1:WAYPOINT**".
(3) Enter storage number (200 to 399) using numeric keys.
(4) Press [**ENT**] key to display data of the specified memory.
(5) Press [▶] key twice to move cursor to the comment field.
(6) Press [▲] [▼] [▶] [◀] key to select a comment letter or symbol from the comment letter table by locating cursor on it, or enter a value using numeric keys.
(7) Press [**SEL**] key . And one letter or symbol are made to decide.
(8) You can enter up to 10 letters by repeating (6) and (7) steps.

(9) Press [ENT] key and decide of a comment.





6.1.3 Copying a position

You can copy the position data (stored with numbers 000 to 399) to the waypoint data (having numbers 200 to 399).

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

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

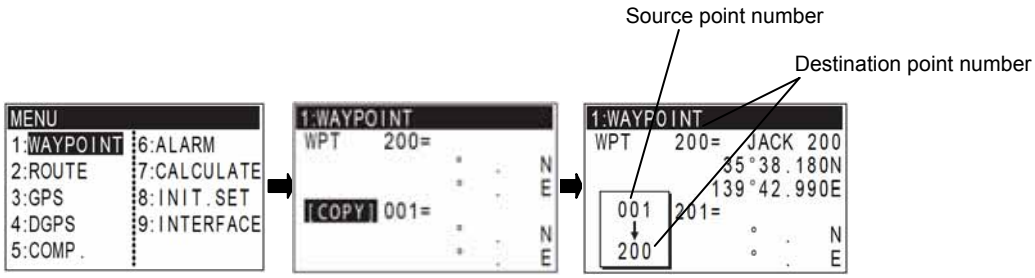
(3) Press [◀] key to move cursor to "**COPY**" reverse its display.

(4) Enter a source point number (000 to 399) using numeric keys. The coordinates will appears.

(5) Press [**ENT**] key to enter the source point number.

(6) Enter a destination point number (200 to 399) using numeric keys. The coordinates will appears.
Use another number if you do not wish to erase the existing number data.

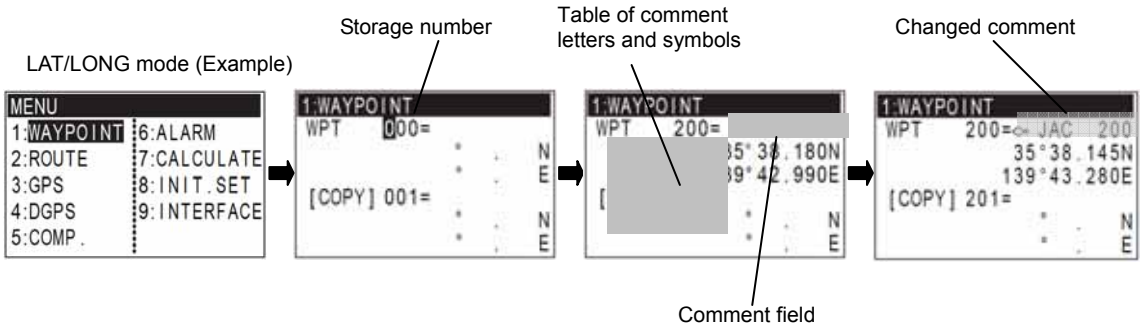
(7) Press [**ENT**] key to copy the storage data. A comment if any is also copied.



6.1.4 Changing comment I.D.

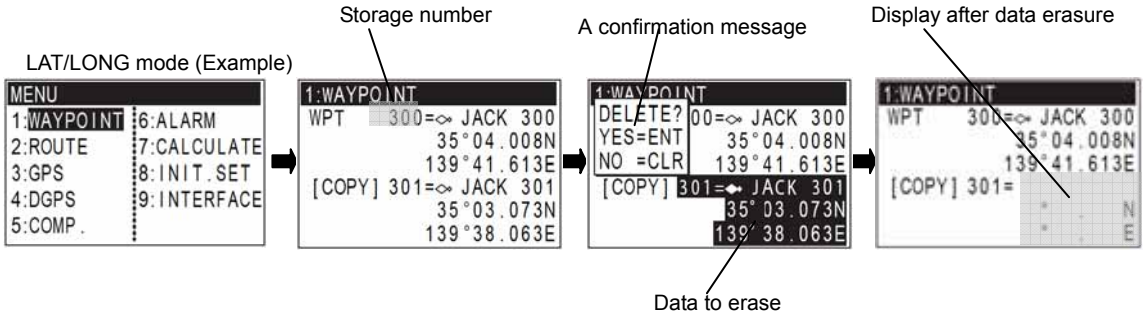
You can change a comment stored in memory.

(1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**1**] key to select "**1:WAYPOINT**".
(3) Enter storage number (001 to 399) using numeric keys.
(4) Press [**ENT**] key. The storaged number data will appears.
(5) Press [▶] key twice to move cursor to the comment field.
(6) Press [▲] [▼] [▶] [◀] key to select a comment letter or symbol from the comment letter table by locating cursor on it, or enter a value using numeric keys.
(7) Press [**SEL**] key . And one letter or symbol are made to decide.
(8) You can enter up to 10 letters by repeating (6) and (7) steps.
(9) Press [**ENT**] key and decide of a comment.



6.1.5 Erasing a single waypoint

(1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**1**] key to select "**1:WAYPOINT**".
(3) Enter storage number (001 to 399) using numeric keys.
(4) Press [**ENT**] key. The storaged number data will appears.
(5) Press [**CLR**] key. A confirmation message will apprars.
(6) If OK, press [**ENT**] key to erase the data from storage. If cancel erasing, press [**CLR**] key.



NOTE: *To erase an entire data from memory simultaneously, see "**Erasing entire data from memory**" (page 63).*

6.2 Setup of waypoint navigation

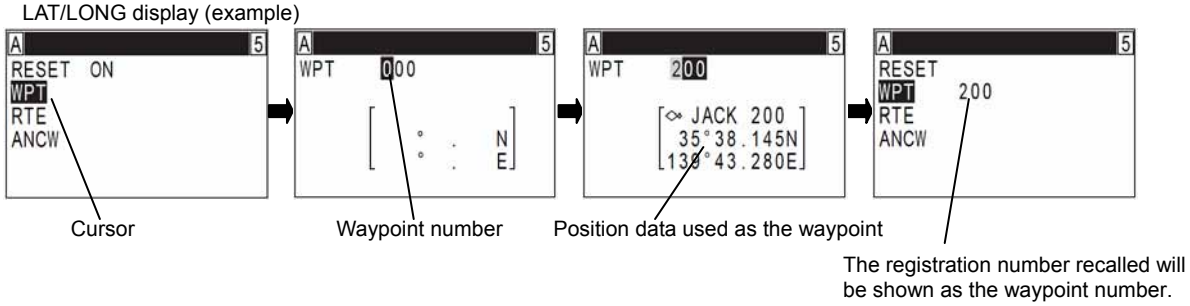
◀ **NOTE:** *Press to backspace the cursor to correct an input error.*

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

6.2.1 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 on **A** (NAV1), **B** (NAV2), **C** (NAV3) or **D** (PLOT) screen (called the quick waypoint navigation).

(1) Press [**MODE**] key until **A** (NAV1), **B** (NAV2), **C** (NAV3) or **D** (PLOT) screen appears.
(2) Press [**SEL**] key until page 5 screen appears.
(3) Press [▲] [▼] key to move cursor to the "**WPT**" letters.
(4) Press [**ENT**] key.
(5) Enter a waypoint number (001 to 399) using numeric keys.
(6) Press [**ENT**] key to set the point as **WPT**.



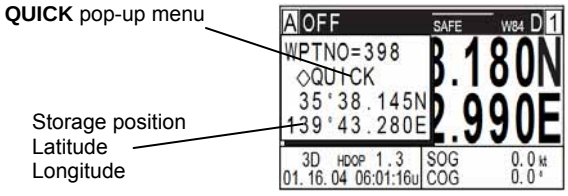
6.2.2 Quick waypoint setup

Quick WPT (first priority waypoint) can be set by specifying it directly either from the **A** (NAV 1), **B** (NAV 2), **C** (NAV 3) or **D** (PLOT) 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 398. Old data is replaced with a new during quick WPT setup.

While the 1st to 4th pages of either the A (NAV 1), B (NAV 2), C (NAV 3) or D (PLOT), are displayed.

(1) Press [**0**] key to display "**QUICK**" pop-up menu.
(2) Enter latitude and longitude.
For example, if "N35 ° 38.180 / E139 ° 42.990" is inputted, a key will be pressed in order of
[**3**],[**5**],[**3**],[**8**],[**1**],[**8**],[**0**],[**N**],[**ENT**],[**1**],[**3**],[**9**],[**4**],[**2**],[**9**],[**9**],[**0**],[**E**]
(3) Press [**ENT**] key. The waypoint is set and the point data is stored in number 398.

All the entry should be in lat/long except Loran C LOPs.



6.2.3 Reentering the starting point in waypoint navigation

Once reset, the present position is used as the new point of origin for waypoint navigation.

While the 1st to 4th pages of either the A (NAV 1), B (NAV 2), C (NAV 3) or D (PLOT), are displayed.

(1) Press [ENT] key to set the point as WPT.

6.2.4 Canceling waypoint navigation

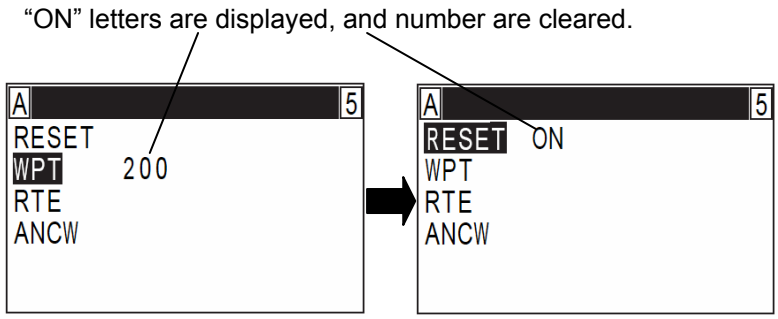
To cancel waypoint navigation, turn WPT to OFF on A (NAV1), B(NAV2), C (NAV3) or D (PLOT) screen.

(1) Press [**MODE**] key until **A** (NAV1), **B** (NAV2), **C** (NAV3) or **D** (PLOT) screen appears.

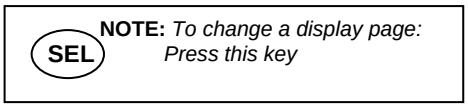
(2) Press [**SEL**] key until page 5 screen appears.

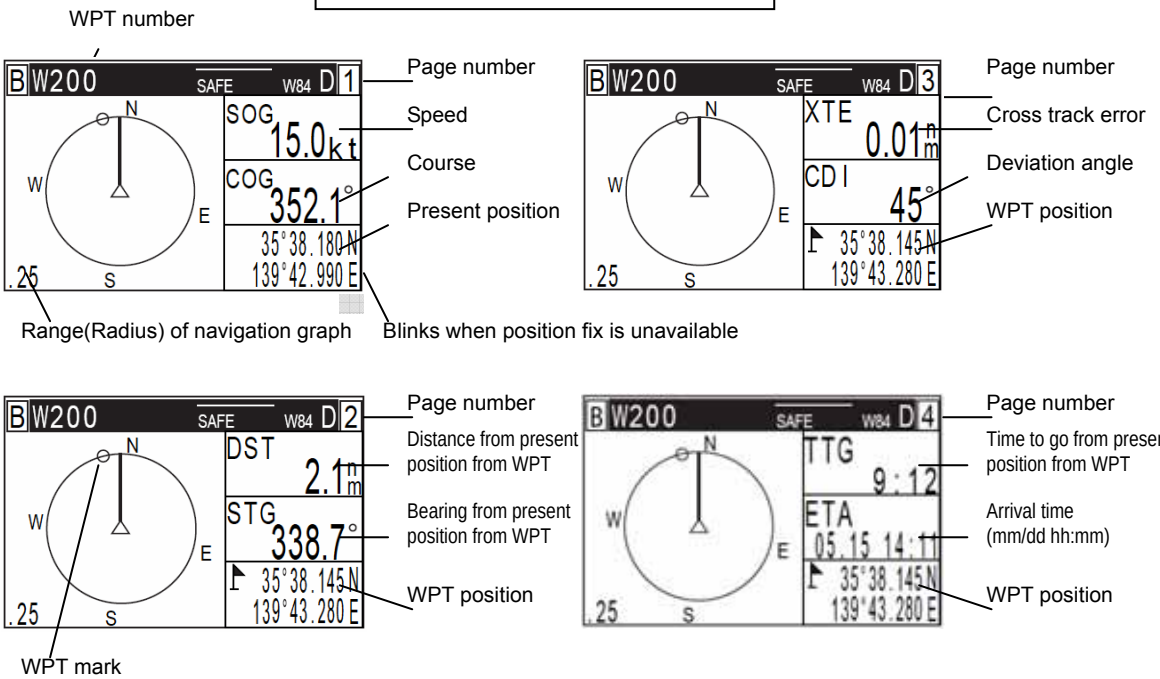
(3) Press [▲] [▼] key to move cursor to the "**RESET**" letters.

(4) Press [**ENT**] key to cancel WPT setting.



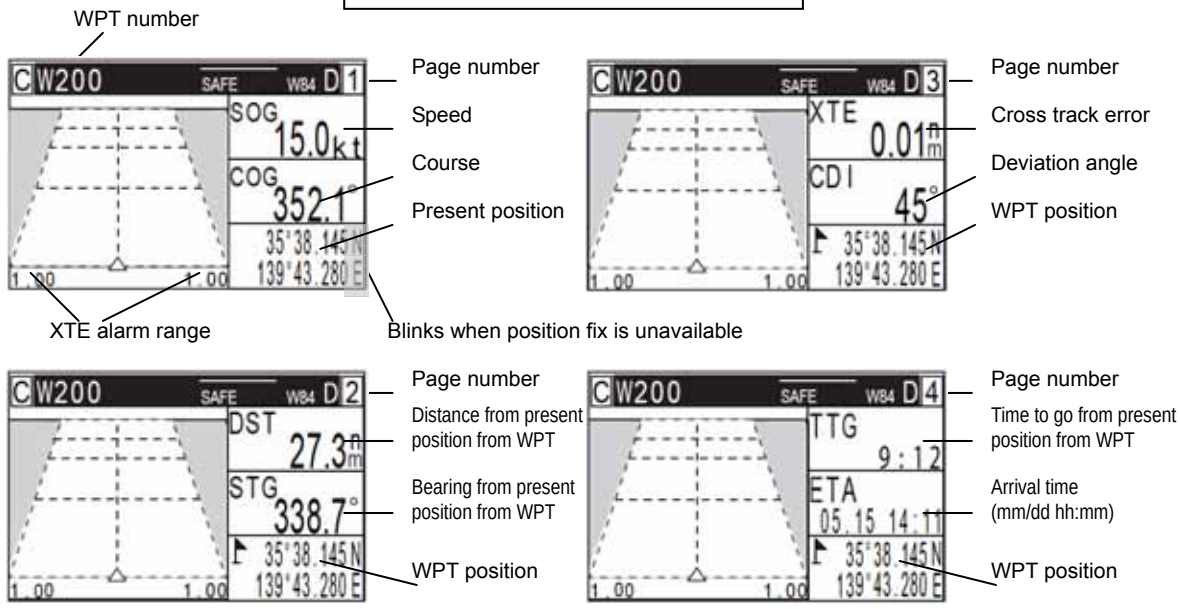
6.2.5 B (NAV2) screen during waypoint navigation



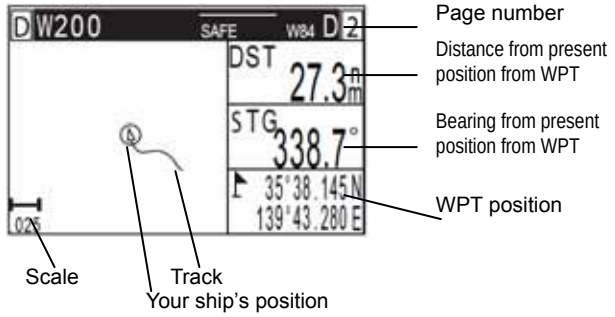


6.2.6 C (NAV3) screen during waypoint navigation

NOTE: *To change a display page:*
SEL *Press this key*



6.2.7 D (PLOT) screen during waypoint navigation



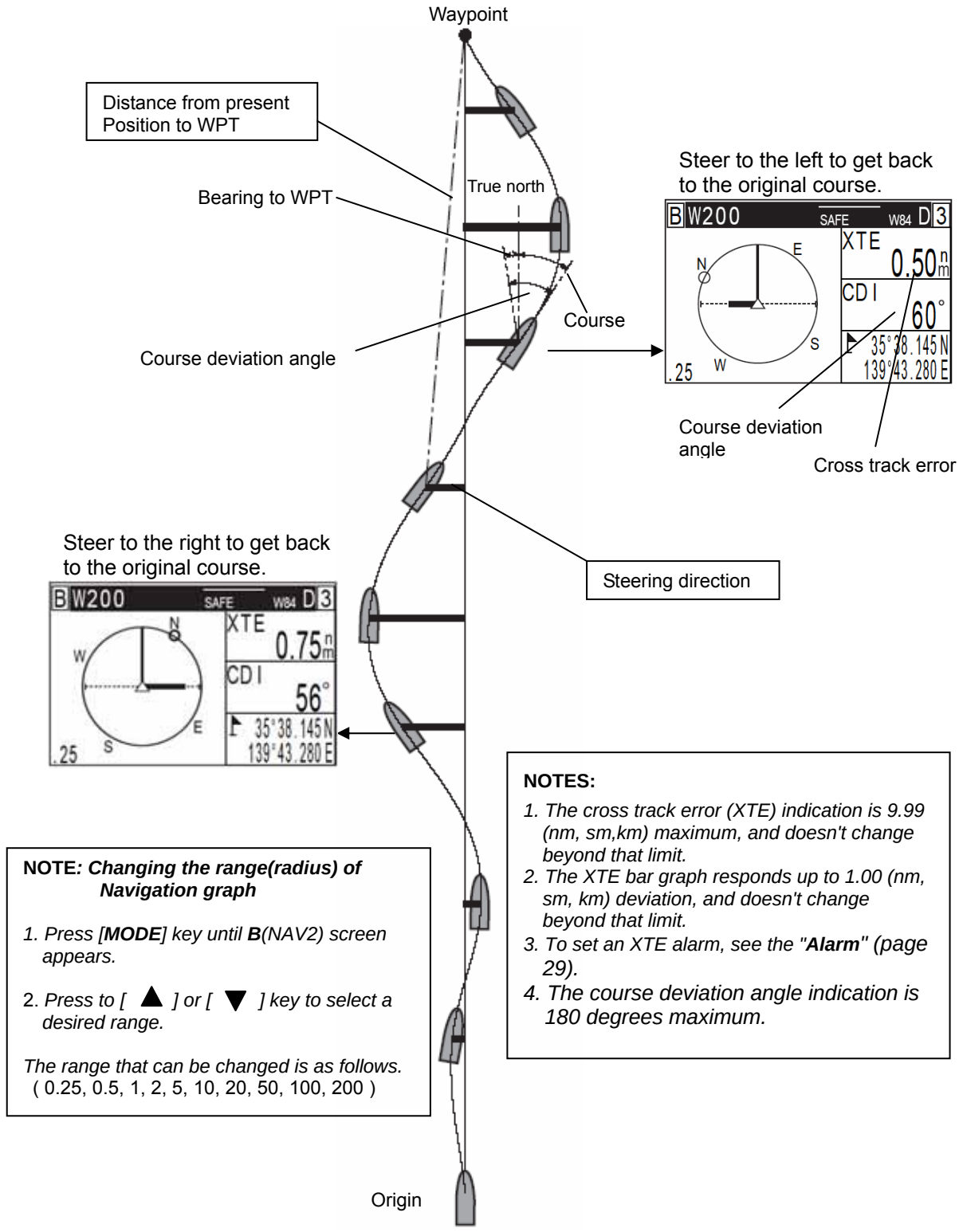
NOTE: *To change a display page:*
SEL *Press this key*

For description of the parameters shown in the 1st, 3rd and 4th pages of the D (PLOT) screen, refer to "**D (PLOT) screen in OFF mode**" in page 8. They are used in the same manner.

6.3 Cross track error and course deviation angle

6.3.1 Navigation graph of (NAV2) screen

Use the navigation graph to check the distance and bearing to the waypoint. When the distance to WPT is further than the range (radius) of navigation graph, the WPT locates on the circle of navigation graph. When the distance is closer than the graph range, the WPT marking shows in the circle. The XTE bar graph and course deviation angle bar graphs appear only when the WPT is on the circle (these graphs are cleared in the short distance).



NOTE*: Changing the range(radius) of Navigation graph*

*1. Press [**MODE**] key until **B**(NAV2) screen appears.*

2. Press to [▲] or [▼] key to select a desired range.

The range that can be changed is as follows.
(0.25, 0.5, 1, 2, 5, 10, 20, 50, 100, 200)

NOTES:

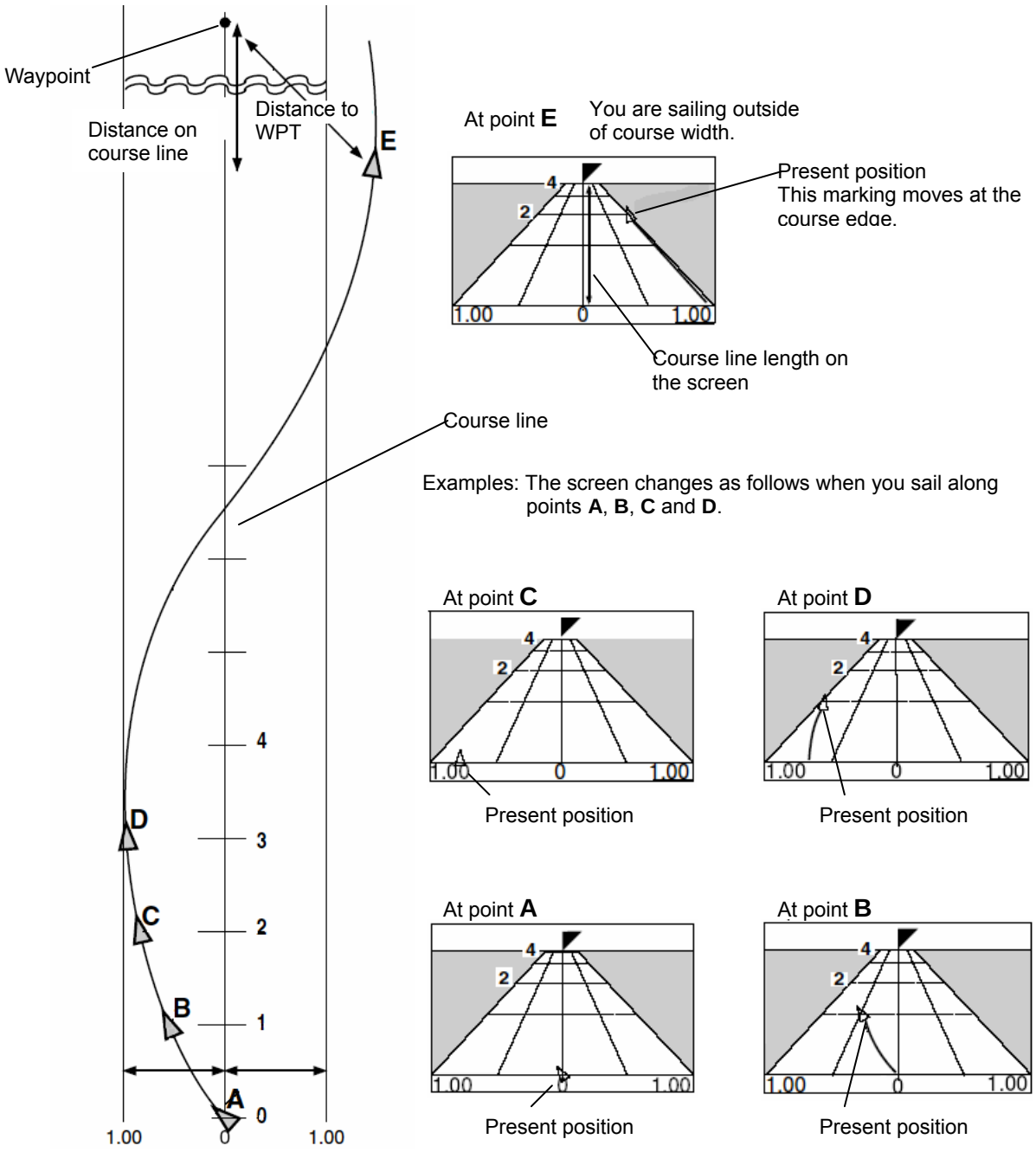
1. The cross track error (XTE) indication is 9.99 (nm, sm,km) maximum, and doesn't change beyond that limit.
2. The XTE bar graph responds up to 1.00 (nm, sm, km) deviation, and doesn't change beyond that limit.
*3. To set an XTE alarm, see the "**Alarm**" (page 29).*
4. The course deviation angle indication is 180 degrees maximum.

6.3.2 Electronic fairway (NAV3) screen

Use the three-dimensional chart for navigation on the course line. You can set a course width from Menu (**6: Alarm**). Symbol " " shows the waypoint, and your ship and track are shown along the course line.

(When waypoint is distance)

When the distance is greater than 4 (nm,sm, km), the 4-(nm,sm, km) course line is shown on the screen. When you have sailed 2 (nm,sm, km), the present position indication moves toward you and the next 4 (nm,sm, km) are shown.

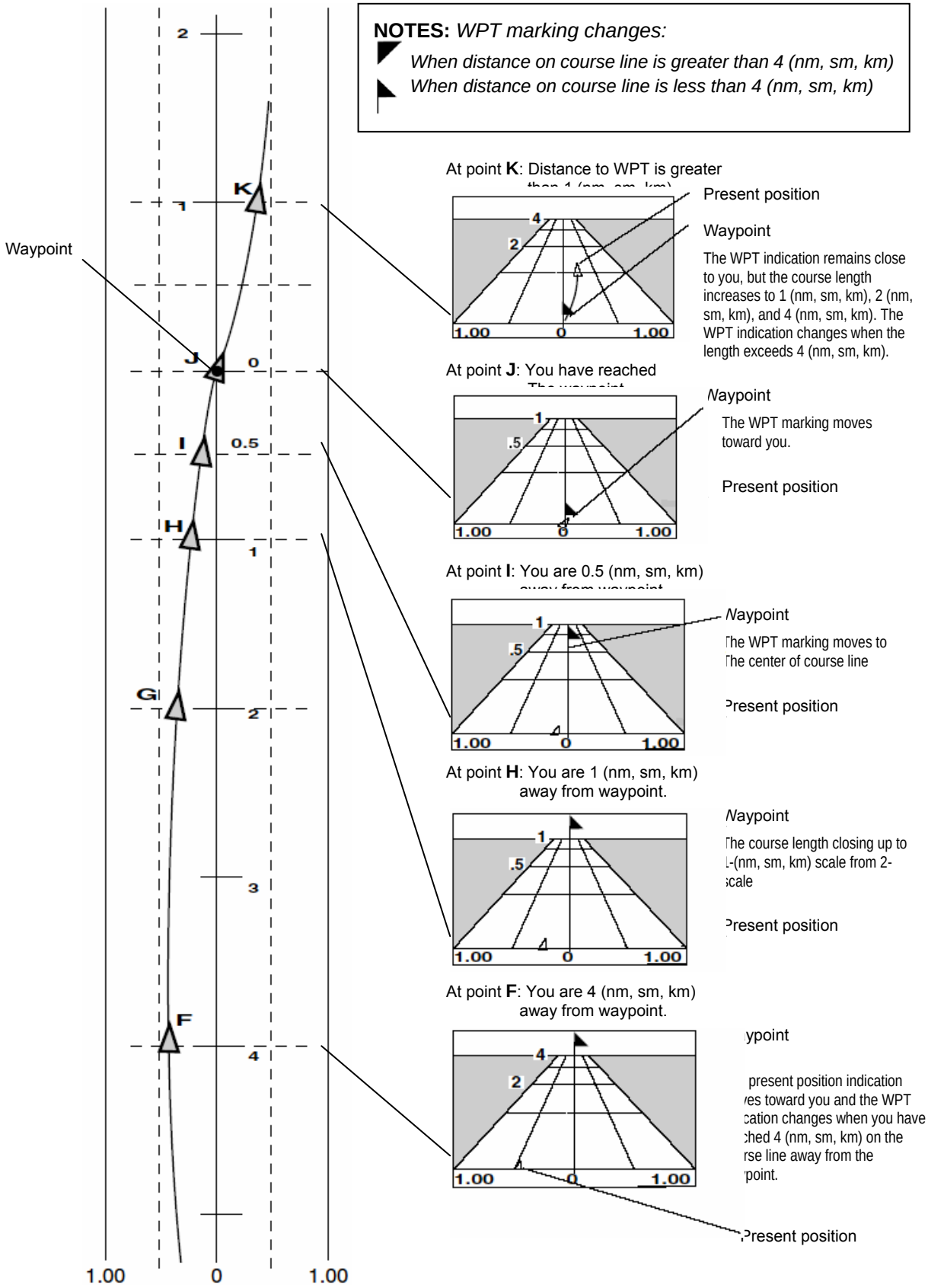


XTE alarm range

You can change the XTE alarm range by "**Setting and canceling an XTE alarm**" (page 29 to 31).

(Nearing to the WPT)

When you close to the waypoint, the course line length decreases to 4 (nm, sm, km), 2 (nm, sm, km) and 1 (nm, sm, km). Then, the WPT marking closes to your ship.



6.4 Storing and erasing routes

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

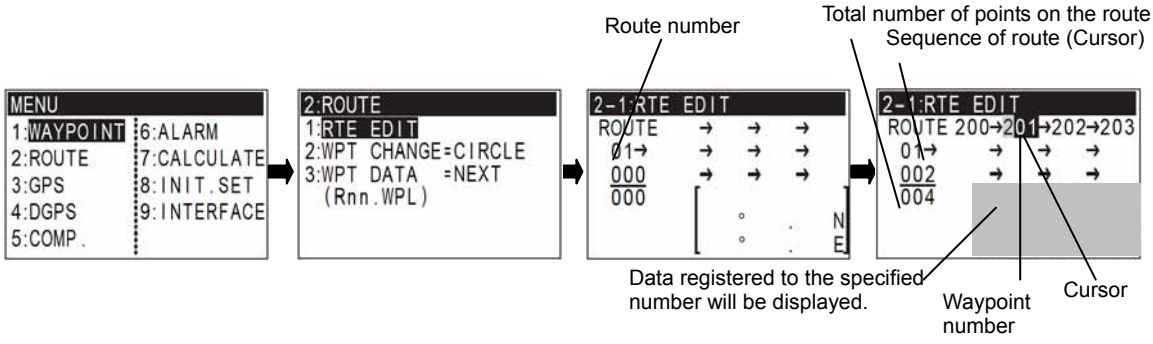
CLR **NOTE:** *Press to clear incorrect Input. You can reenter Numeric data.*

6.4.1 Storing your route

• Up to 20routes and 230 waypoints can be registered for one route.

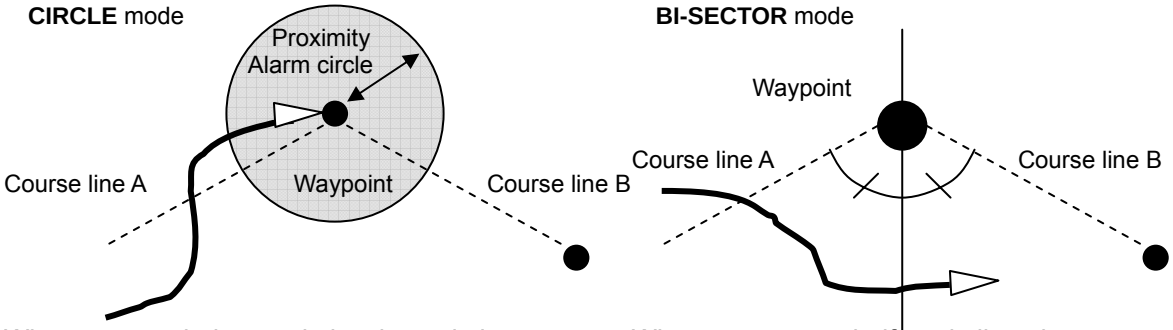
NOTE: 230 waypoints are the maximum number of waypoints the system can handle.
In case you have registered 230 waypoints for one route only, you cannot register any waypoint to other routes. To store the route, you first need to register the waypoint on route in the menu, "1. WAYPOINT".

(1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**2**] key to select "**2:ROUTE**".
(3) Press [**1**] key to select "**1: RTE EDIT**". Route Input screen is displayed.
(4) Enter a route number (01 to 20) using numeric keys.
(5) Press [**ENT**] key to store the route number.
(6) Press [▶] key to move cursor to the forward(→)or backward(←) route setup column.
(7) Press [**SEL**] key to select the forward or backward route navigation.
(8) Press [▼] key to move cursor to the waypoint number column.
(9) Enter a waypoint number (200 to 399) of the route using numeric keys. (You can check its memory data on the screen.)
(10) Press [**ENT**] key to store the waypoint number.
(11) Repeat (9) and (10) steps to set another waypoint of the route.



6.4.2 Automatic switching of waypoints

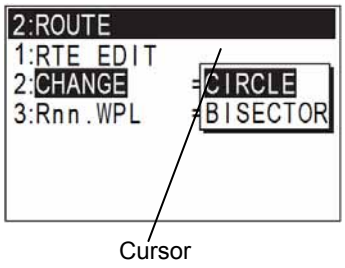
Route navigation can switch the current waypoint in two ways: switching in CIRCLE mode and switching in BI-SECTOR mode. In CIRCLE mode, the next waypoint is shown when you reach the proximity alarm circle. In BI-SECTOR mode, the next waypoint is shown when you cross a half-angle line.



When you reach the proximity alarm circle, the course line is switched from A to B. To change the proximity alarm range, see "**Setting and canceling a proximity alarm**" (page 37).

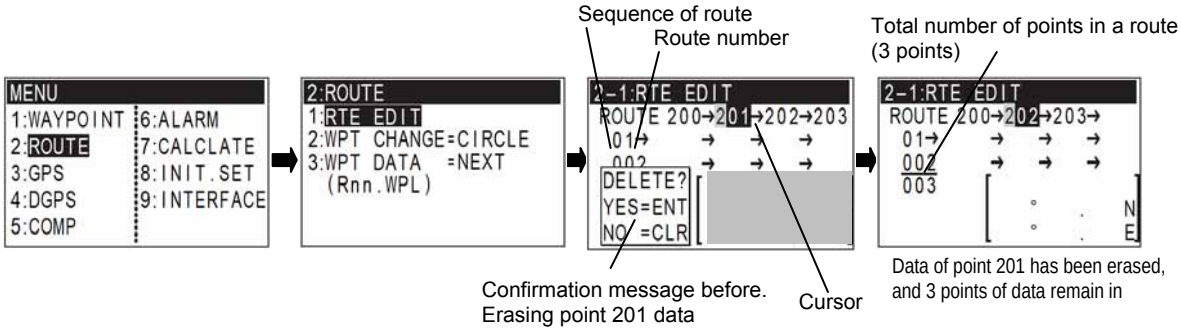
When you cross a half-angle line, the course line is switched from A to B.

(1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**2**] key to select "**2:ROUTE**".
(3) Press [**2**] 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.



6.4.3 Erasing point data

(1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**2**] key to select "**2:ROUTE**".
(3) Press [**1**] key to select "**1: RTE EDIT**". Route Input screen is displayed.
(4) Enter a route number (01 to 20) using numeric keys.
(5) Press [▲] [▼] [▶] [◀]key to move cursor to the waypoint number you wish to erase. Its data and comment (if any) are displayed.
(6) Press [**CLR**] key. A confirmation message appears.
(7) If OK, press [**ENT**] key to erase all points of this route. If cancel erasing, press [**CLR**] key.



6.4.4 Erasing a single route

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

(2) Press [**2**] key to select "**2:ROUTE**".

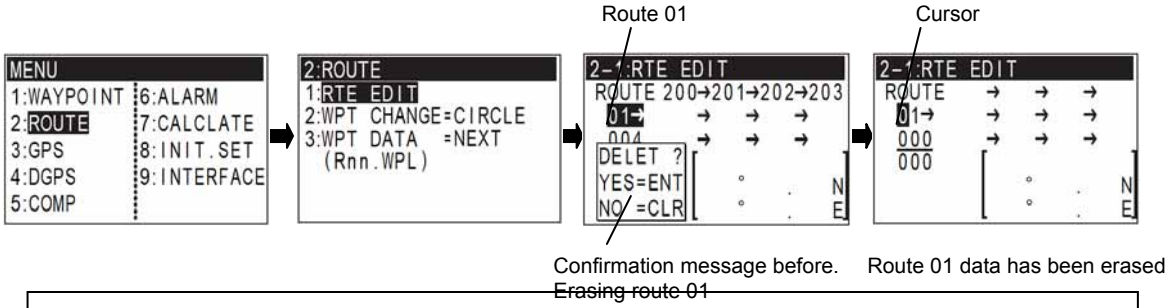
(3) Press [**1**] key to select "**1: RTE EDIT**". Route Input screen is displayed.

(4) Enter a route number (01 to 20) using numeric keys.

(5) Press [**ENT**] key to recall the route number.

(6) Press [**CLR**] key. A confirmation message appears.

(7) If OK, press [**ENT**] key to erase all points of this route. If cancel erasing, press [**CLR**] key.



NOTE: *To erase all stored data from memory, see "**Erasing entire data from memory**" (page 63).*

6.5 Route setup

You can use up to 400 points (maximum) 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 route from Menu (using option 2). See "**Storing waypoints (LAT/LONG)**" (page 6-1 to 6-3) and "**Storing and Erasing Routes**" (page 7-1 to 7-3).

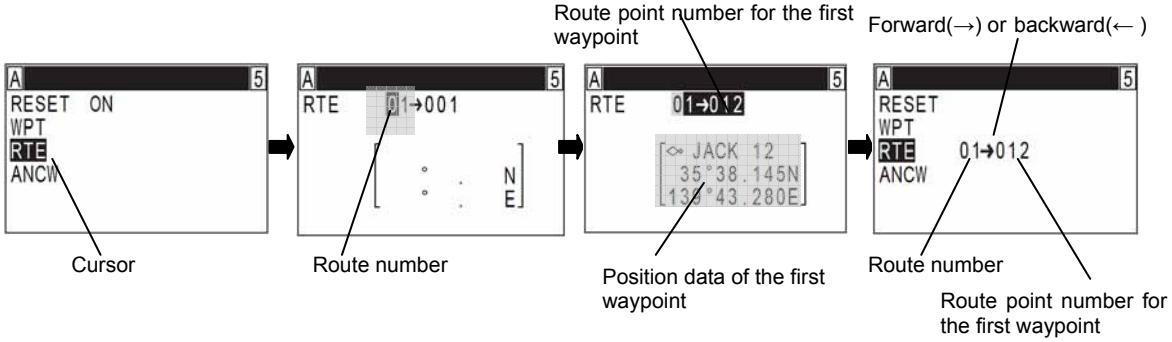
You can set the route by entering a route number, forward/backward navigation, and route start point number of the route from the **A** (NAV1), **B** (NAV2), **C** (NAV3) or **D** (PLOT) screen.

6.5.1 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 [**MODE**] key until **A** (NAV1), **B** (NAV2), **C** (NAV3) or **D** (PLOT) screen appears.
(2) Press [**SEL**] key until page 5 screen appears.
(3) Press [▲] or [▼] key to move cursor to "**RTE**" letters.
(4) Press [**ENT**] key.
(5) Enter a route number (01 to 20) using numeric keys.
(6) Press [▶] key
(7) Enter the route start point number using numeric keys.
(8) Press [**ENT**] key.



6.5.2 Reentering the origin of route navigation

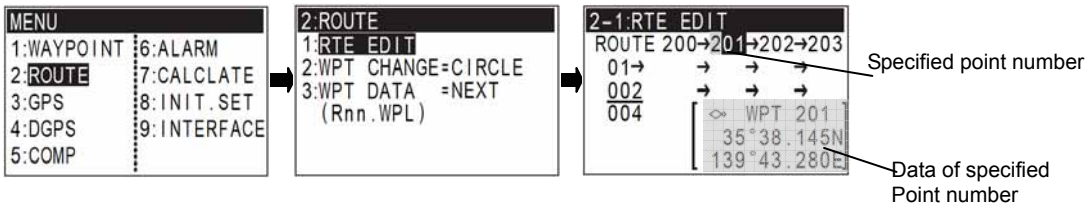
You can reset the present position as a new point of origin and start navigation.

(1) Press [**ENT**] key while the 1st to 4th pages of either the A (NAV 1), B (NAV 2), C (NAV 3) or D (PLOT), are displayed.

6.5.3 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**] key to select "**2:ROUTE**".
(3) Press [**1**] key to select "**1: RTE EDIT**". Route Input screen is displayed.
(4) Press [▲] [▼] [▶] [◀] key to move cursor onto the desired point number. Its data and comment, if any, are displayed.



6.5.4 Skipping a route point in route navigation

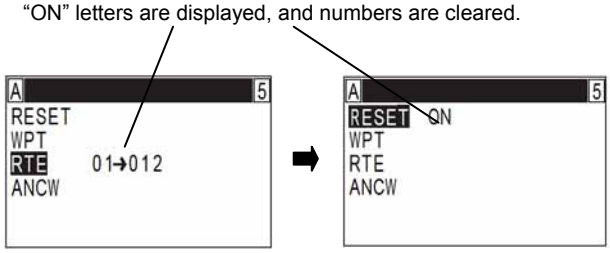
You can skip the next route point and go to a new route point.

(1) Press [**MODE**] key until **A** (NAV1), **B** (NAV2), **C** (NAV3) or **D** (PLOT) screen appears.
(2) Press [**SEL**] key until page 5 screen appears.
(3) Press [▲] or [▼] key to move cursor to "**RTE**" letters.
(4) Press [**ENT**] key.
(5) Enter a route number (01 to 20) using numeric keys.
(6) Press [▶] key
(7) Enter the new route start point number using numeric keys.
(8) Press [**ENT**] key.

6.5.5 Canceling route navigation

To cancel waypoint navigation, turn RTE to OFF on A (NAV1), B (NAV2), C (NAV3) or D (PLOT) screen.

(1) Press [**MODE**] key until **A** (NAV1), **B** (NAV2), **C** (NAV3) or **D** (PLOT) screen appears.
(2) Press [**SEL**] key until page 5 screen appears.
(3) Press [▲] or [▼] key to move cursor to "**RESET**" letters.
(4) Press [**ENT**] key.

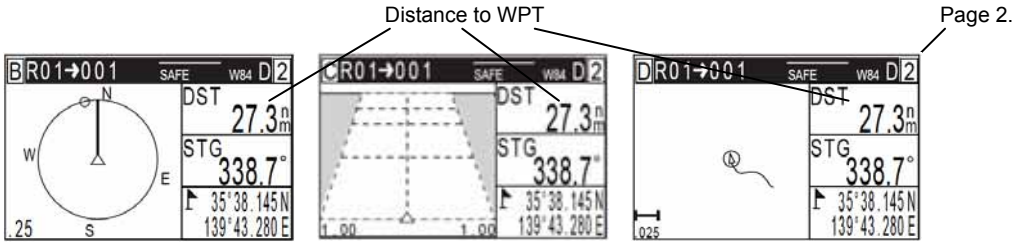


6.5.6 Switching between distance and time to go

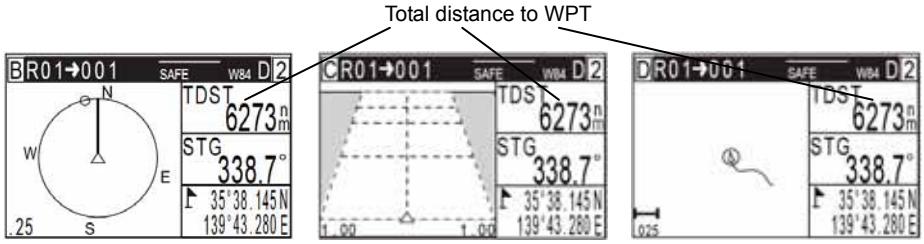
When you select the "**DIST**" (Distance to WPT) or "**TDIST**" (Total distance) on NAV1, NAV2 or NAV3 screen in route navigation, the respective "**TTG**" (Time to go to WPT) or "**T.TTG**" (Total time to go) is shown.

> **NOTE:** *"**DIST**" shows the distance to the next waypoint.*
> *"**TDIST**" shows the total distance to the final destination.*
> *"**TTG**" shows the time to the next waypoint.*
> *"**T.TTGT**" shows the total time to the final destination.*

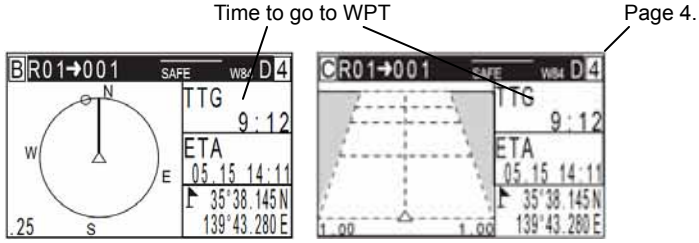
(1) Press [**MODE**] key until **B** (NAV2), **C** (NAV3) or **D** (PLOT) screen appears.
(2) Press [**SEL**] key until page 2 screen appears.
(3) Press [◀] key to display "**DST**" .



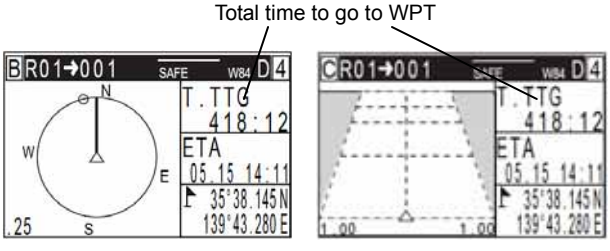
(4) Press [▶] key to display "**TDST**".



(1) Press [**MODE**] key until **B** (NAV2), **C** (NAV3) or **D** (PLOT) screen appears.
(2) Press [**SEL**] key until page 4 screen appears.
(3) Press [◀] key to display "**TTG**" .



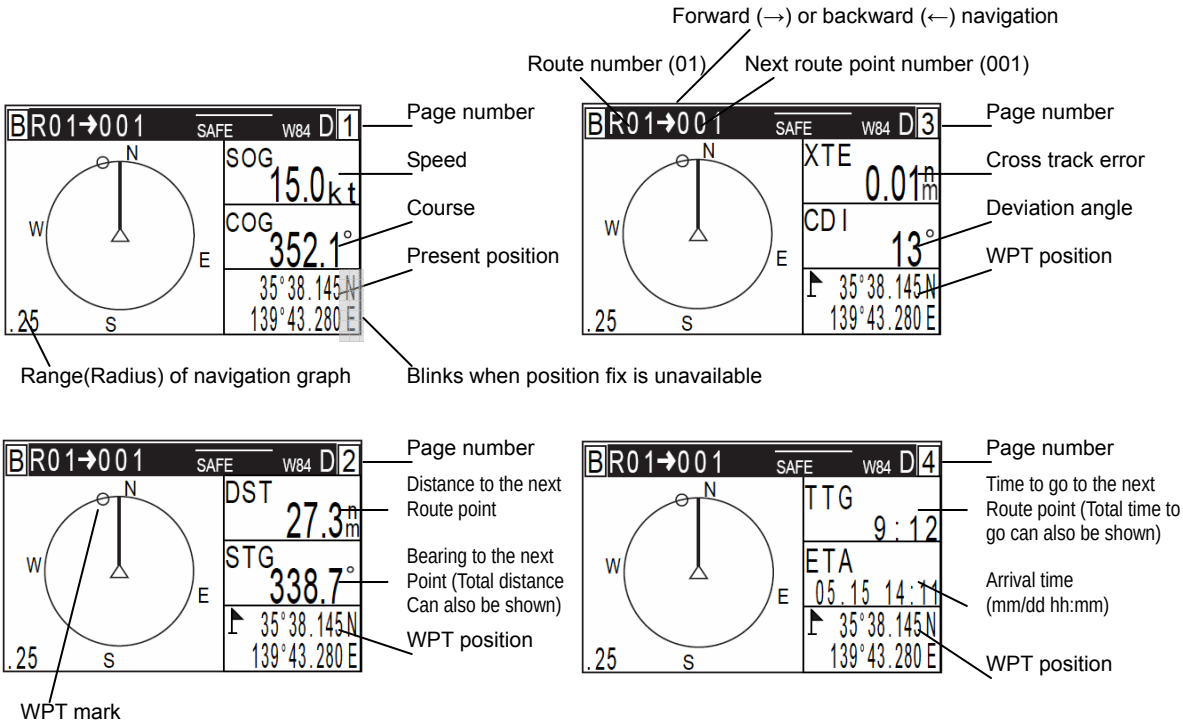
(4) Press [▶] key to display "**T.TTG**".



6.5.7 B (NAV2) screen during route navigation

SEL **NOTE:** *To change a display page: Press this key*

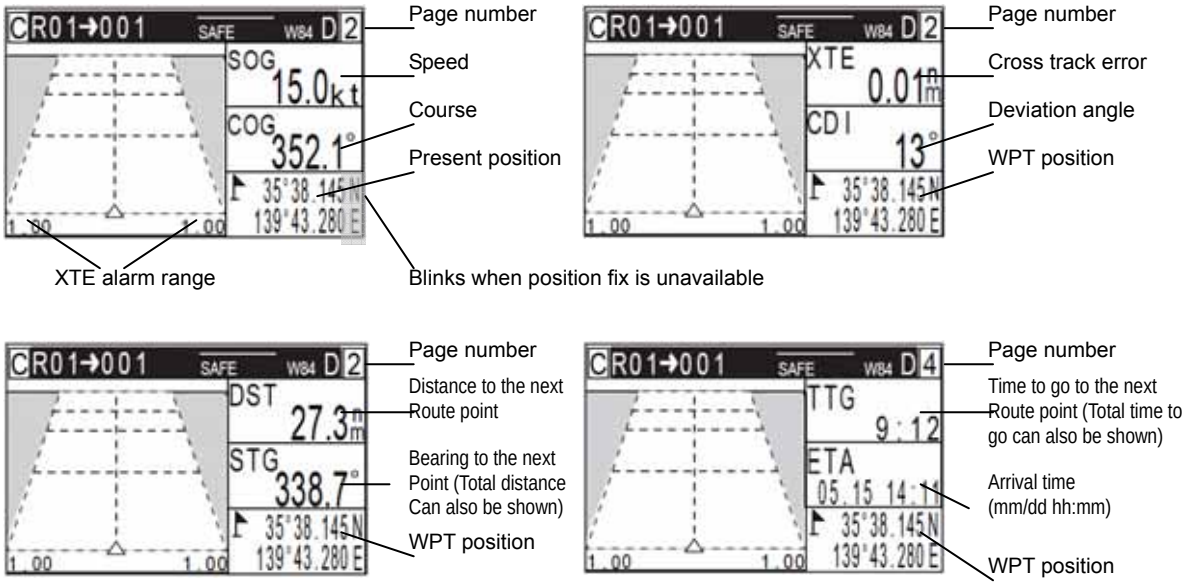
DST: 9999 **NOTE:** *Positioning has failed or the distance has exceeded 9999 nm, sm or km.*



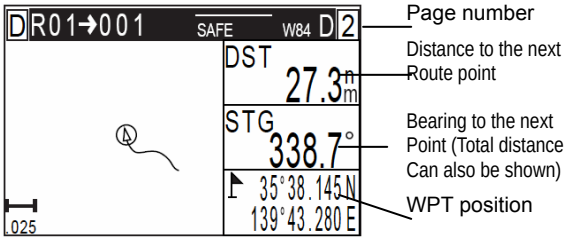
6.5.8 C (NAV3) screen during route navigation

SEL **NOTE:** *To change a display page: Press this key*

DST: 9999
ETA: 12.31 23:59 **NOTE:** *Positioning has failed or the time to go has exceeded 999 hours 59 minutes.*



6.5.9 D (PLOT) screen during route navigation



NOTE: *To change a display page: Press this key*
SEL

For description of the parameters shown in the 1st, 3rd and 4th pages of the D (PLOT) screen, refer to "**D (PLOT) screen in OFF mode**" in page 8. They are used in the same manner.

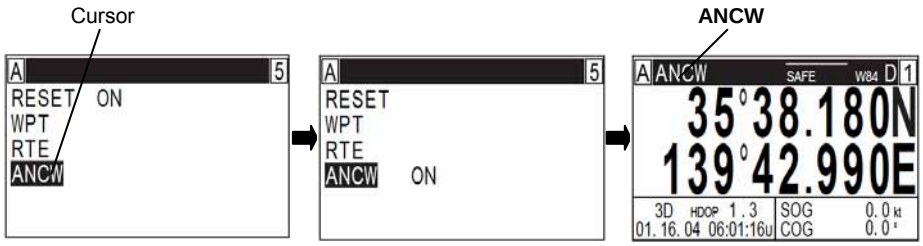
6.6 Setting an anchor position

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.

6.6.1 String an anchor position

You can set the anchor position from the **A** (NAV1), **B** (NAV2), **C** (NAV3) or **D** (PLOT) 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 397 along with the comment (ANCW).

(1) Press [**MODE**] key until **B** (NAV2), **C** (NAV3) or **D** (PLOT) screen appears.
(2) Press [**SEL**] key until page 5 screen appears.
(3) Press [▲] or [▼] key to move cursor to the letters "**ANCW**".
(4) Press [**ENT**] key. Current position is registered and selected as the anchor position.

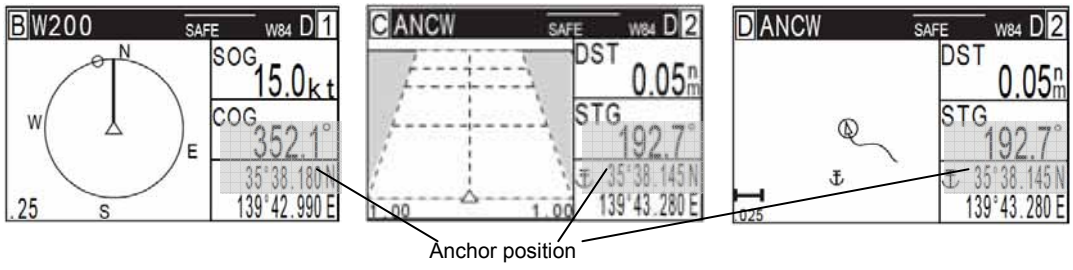


6.6.2 Recalling anchor position

You can check the anchor position on any of **A** (NAV1), **B** (NAV2), **C** (NAV3) and **D** (PLOT) screens during anchoring.

(1) Press [**MODE**] key until **B** (NAV2), **C** (NAV3) or **D** (PLOT) screen appears.
(2) Press [**SEL**] key to display anchor position data. The anchor position and comment " **ANCW**" are displayed.

B (NAV2) screen **C**(NAV3) screen **D** (PLOT) screen



Anchor positions will be displayed in the 2nd, 3rd and 4th pages.

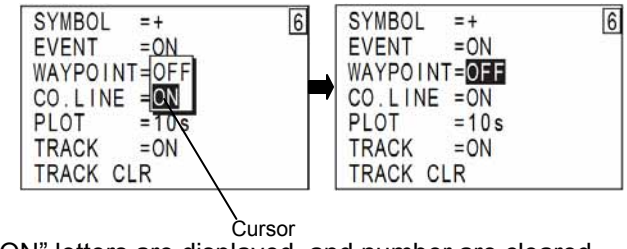
Anchor positions will be displayed in the 2nd, 3rd and 4th pages.

Anchor position will be displayed in the 2nd page.

6.6.3 Removing the anchor position symbol on PLOT screen

You can remove the anchor position as a symbol on the PLOT screen.

(1) Press [**MODE**] key until **D** (PLOT) screen appears.
(2) Press [**SEL**] key until page 6 screen appears.
(3) Press [▲] or [▼] key to move cursor to "**WAYPOINT**" letters.
(4) Press [**ENT**] key.
(5) Press [▲] or [▼] key to move cursor onto "**OFF**" letters.
(6) Press [**ENT**] key.



"ON" letters are displayed, and number are cleared.

6.6.4 Reentering an anchor position

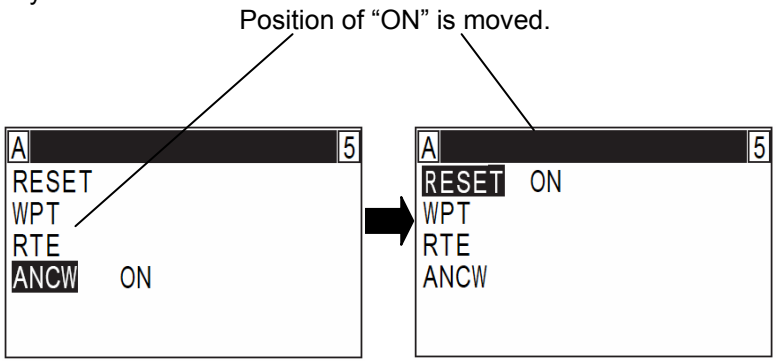
You can reenter a new anchor position and start to calculate navigation.

While the 1st to 4th pages of either the A (NAV 1), B (NAV 2), C (NAV 3) or D (PLOT), are displayed.

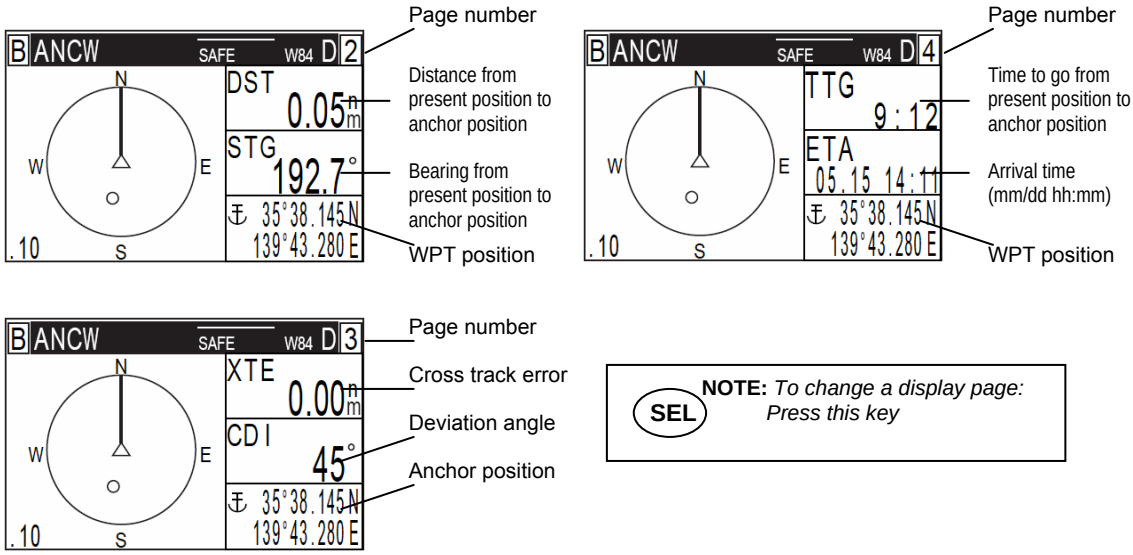
(1) Press [ENT] key to set the point as WPT.

6.6.5 Canceling anchor position

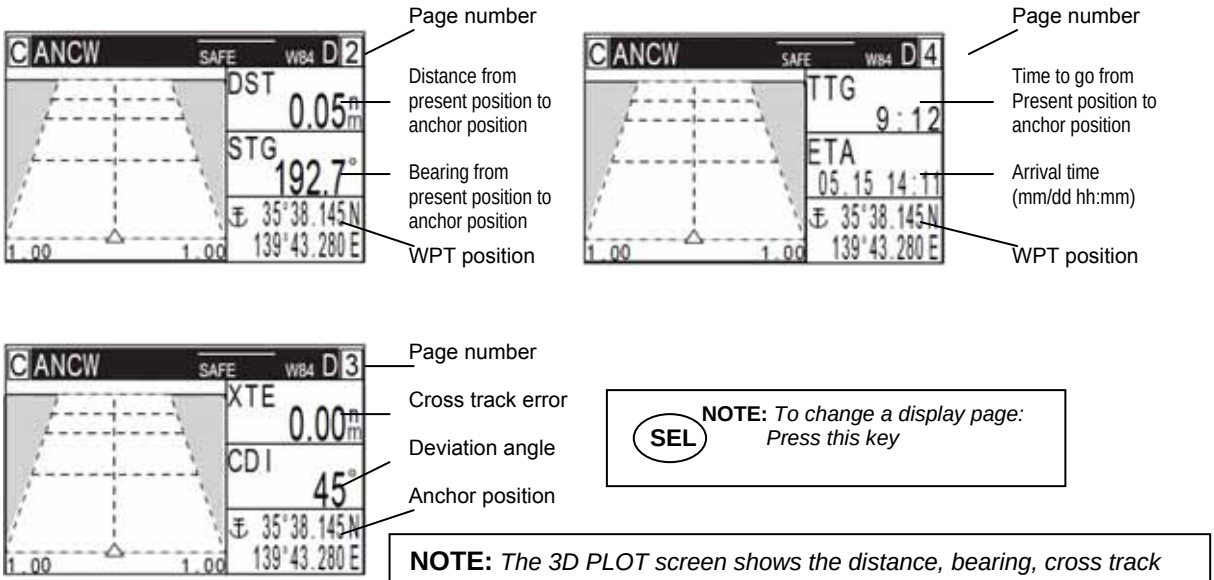
(1) Press [**MODE**] key until **A** (NAV1), **B** (NAV2), **C** (NAV3) or **D** (PLOT) screen appears.
(2) Press [**SEL**] key until page 5 screen appears.
(3) Press [▲] [▼] key to move cursor to the "**RESET**" letters.
(4) Press [**ENT**] key to cancel the anchor watch.



6.6.6 B (NAV2) screen during anchor position setup

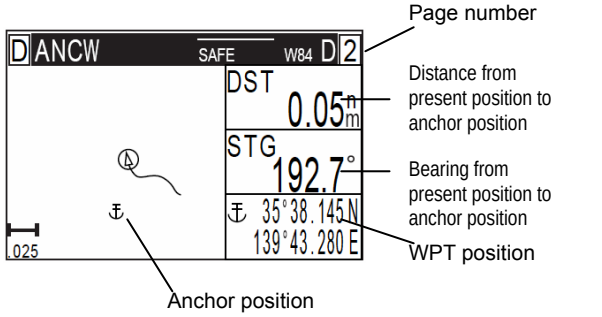


6.6.7 C (NAV3) screen during anchor position setup



NOTE: *The 3D PLOT screen shows the distance, bearing, cross track error (XTE), and course deviation angle to the waypoint. Your boat icon does not move in the ANCW mode.*

6.6.8 D (PLOT) screen during anchor position setup



6.7 Track display

You can display track, the waypoint, course line, and cross cursor on the PLOT screen.

6.7.1 Display a cross cursor on PLOT screen

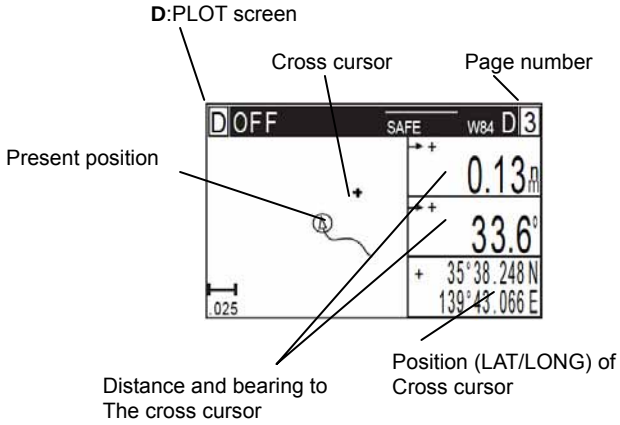
You can display a cross cursor and position it on the screen.

(How to use cross cursor)

(1) Press [**MODE**] key until **D** (PLOT) screen appears.

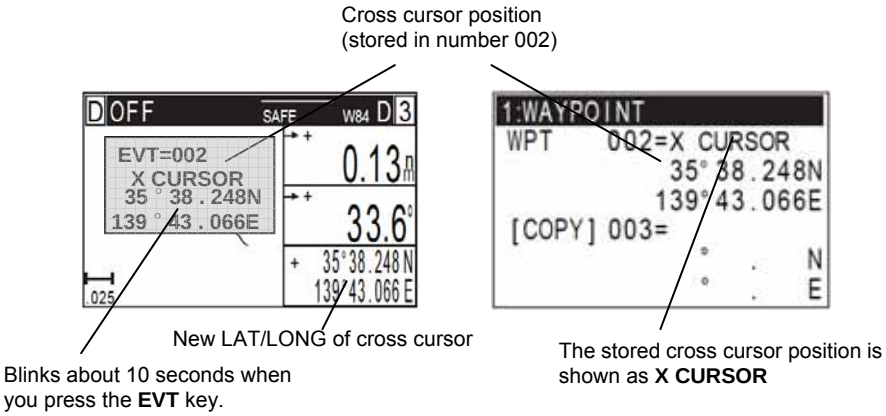
(2) Press [**SEL**] key until page 3 screen appears.

(3) Press [▲] [▼] [▶][◀] key to shift the cross cursor.



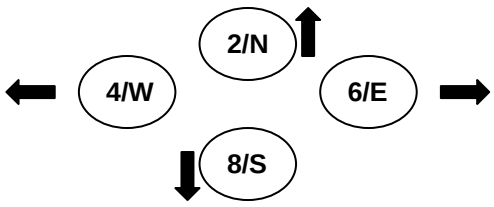
(How to store cross cursor position)

(1) With the cross cursor activated, press the **EVT** key to store the cross cursor position. (Note: not the present shipís position).



6.7.2 Screen scrolling

You can scroll the PLOT screen (pages: 1, 2, 3 or 4) in any direction so that your ship is always shown on the screen. If your ship moves off the screen, it will automatically return to the center of the display.

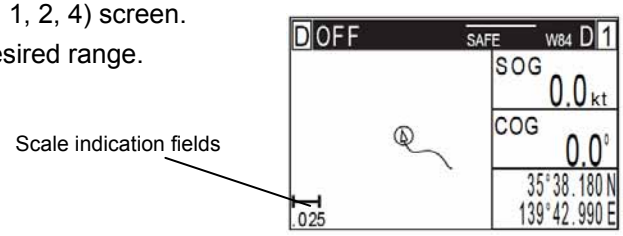


6.7.3 Scaling the PLOT screen

Initial scale: 0.025

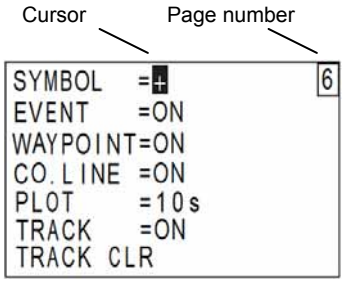
You can select a display scale of PLOT (pages: 1, 2, 4) screen.
(1) Press to [▲] or [▼] key to select a desired range.

The range that can be changed is as follows.
(0.25, 0.5, 1, 2, 5, 10, 20, 50, 100, 200)



NOTE: *You can change the scale unit from Menu **2: UNIT (nm)** of **8: INITIAL** options*.

6.7.4 Changing the setup contents



(1) Press [**MODE**] key until **D** (PLOT) screen appears.
(2) Press [**SEL**] key until page 6 screen appears.
(3) Press [▲] or [▼] key to locate cursor and select an item.
(4) Press to [**ENT**] key to display the option.
(5) Press [▲] or [▼] key to locate cursor and select an option.
(6) Press [**ENT**] key. Selected option is setup.

(Changing the event symbol)

To change the event symbol, place cursor on **SYMBOL** option and press **ENT** key.

Initial setup: +

(Activating event numbers (000 to 199))

Turn **ON** the **EVENT** option and you can save events (the present position marking) into memory numbers (000 to 199).

Initial setup: ON

(Activating event numbers (200 to 399))

Turn **ON** the **WAYPOINT** option and save events (the present position marking) into memory numbers (200 to 399).

Initial setup: ON

(On/off of course line (dotted lines))

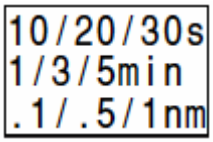
During waypoint or route navigation, you can display or clear the course line from your present position to the waypoint.

Initial setup: ON

(Adjusting the track recording interval)

To adjust the track recording interval (time or distance interval), locate cursor on **PLOT** option, and press **ENT** key.

You can set the unit of track distance interval from the Menu **2: UNIT (DST) of 8 INITIAL.**



Initial setup: 10sec.

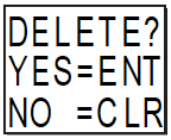
(Turning tracking off)

Set the "TRACK" option to OFF to stop recording the track on PLOT screen. Your present position marking moves on the screen.

Set the "TRACK" option to ON to record the track on PLOT screen. Initial setup: ON

(Erasing the track)

If you press the **CLR** key when the cursor is positioned at **TRACK CLR**, a confirming message (DELETE?) will appear. Press the **ENT** key to delete every track line currently displayed on the plotter screen.



Chapter 7 Alarms

Chapter 7 Alarms

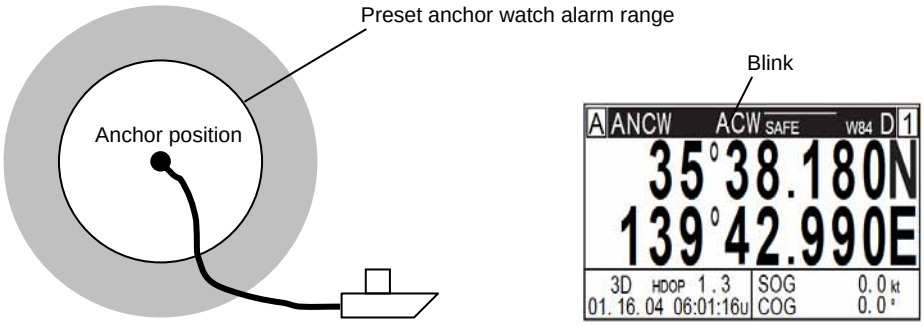
7.1 Kinds of alarms

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

7.1.1 Anchor watch alarm (ANCW)

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". **ACW** letters blink and buzzer (short beep) sounds when outside of alarm range.

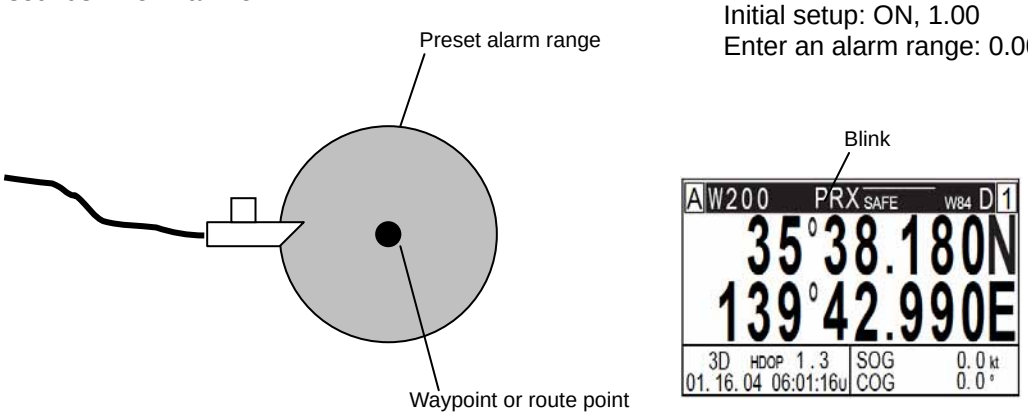
Initial setup: OFF, 1.00
Enter an alarm range: 0.00 to 9.99



7.1.2 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 6-15). **PRX** letters blink and buzzer (short beep) sounds when I arrive.

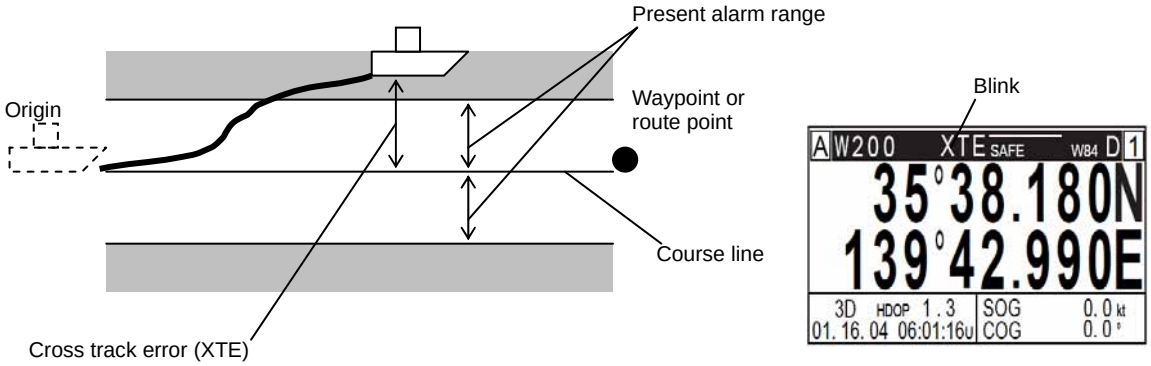
Initial setup: ON, 1.00
Enter an alarm range: 0.00 to 9.99



7.1.3 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'. The course width shown on NAV3 screen is the same as the XTE alarm value you have set. **XTE** letters blink and buzzer (long beep) sounds when I'm away from XTE range.

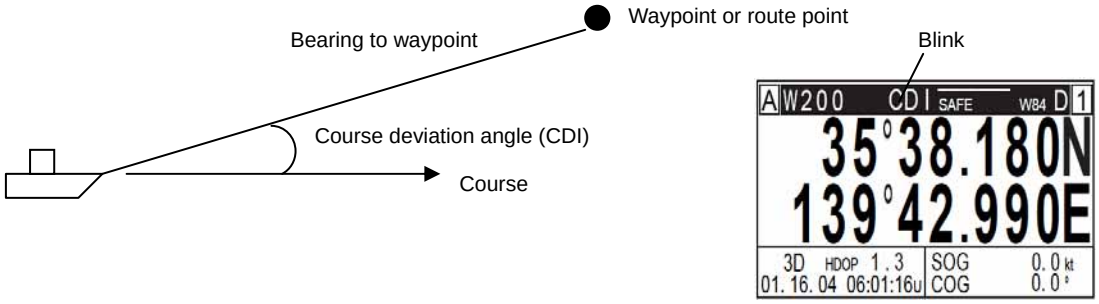
Initial setup: ON, 1.00
Enter an alarm range: 0.00 to 9.99



7.1.4 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.

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



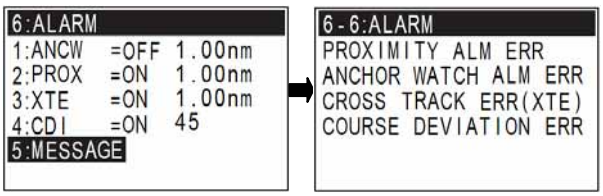
7.2 Alarm explanation

The reason of an alarm can be seen in the following ways.

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

(2) Press [**6**] key to select "**6:ALARM**".

(3) Press [**5**] key to select "**5:MESSAGE**". Reason for alarm notification is displayed



7.3 Setting and canceling

(Setting alarm)

(1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**6**] key to select "**6:ALARM**".
(3) Select item number of the alarm to be set from the numerical keypad.
(4) Press [▲] or [▼] key to move cursor to **ON**.
(5) Press [**ENT**] key.

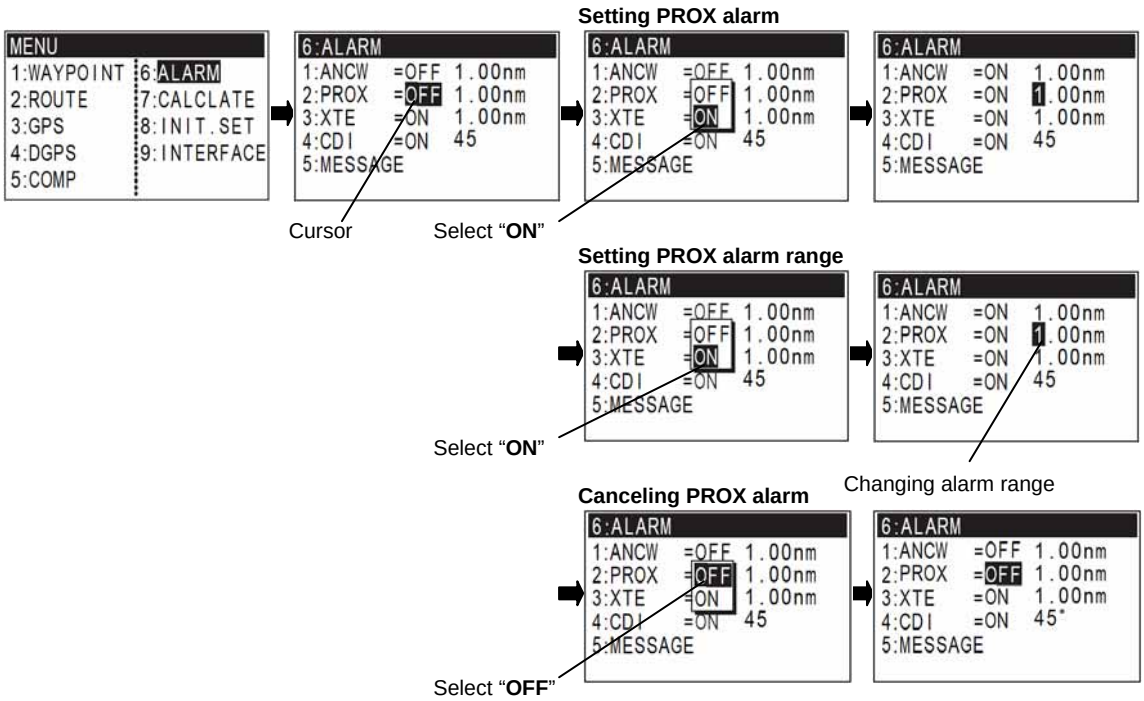
(Changing alarm range)

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

(Canceling alarm)

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

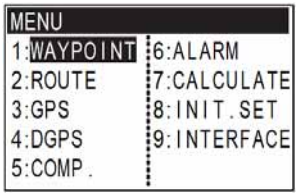
Example



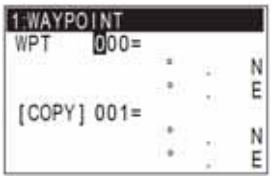
Chapter 8 Setup Procedure

Chapter 8 Setup Procedure

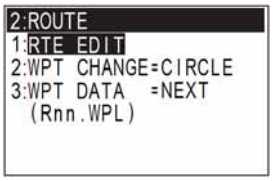
8.1 Menu options



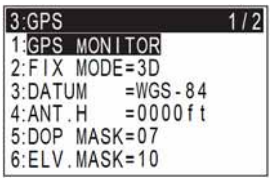
NOTE: *You can select an option from Menu in two ways: by direct numeric key entry and by cursor shifting. This manual explains how to enter numeric values for easy understanding, but you can also use the cursor for option selection.*

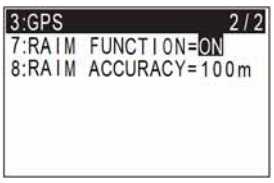


1. Waypoints
Store, edit, copy and erase waypoints (see pages 6-1 to 6-6)

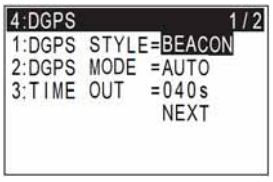


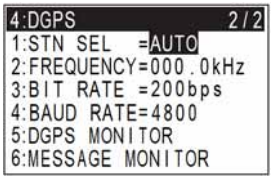
2. Route
(See pages 6-13 to 6-17).
Store and erase a route.
Forward/backward navigation Selection.
Automatic route switching.
Waypoint data switching.





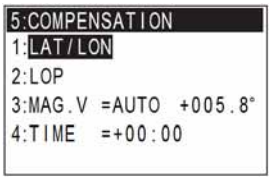
3. GPS
Display GPS satellite status.
Switch (2- and 3-dimensional) positioning modes.
Select datum.
Set antenna height (above sea level).
See DOP value to limit fix data
Set satellite elevation angle limit.
Select RAIM function.
Select RAIM accuracy.



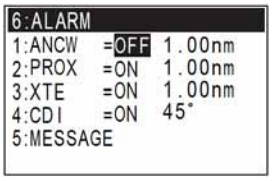


4. Differential GPS (DGPS)
Select DGPS style.
Select DGPS mode.
Set DGPS timeout.

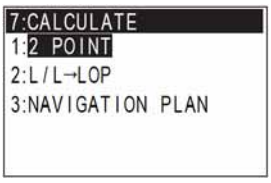
Select beacon station.
Set beacon frequency.
Select beacon bit rate.
Set DGPS input baud rate.
m Monitor DGPS data.
Monitor beacon message.



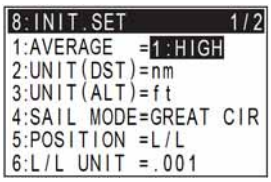
5. Compensation
Position correction (LAT/LONG, LOPs)
Compass correction
Time difference

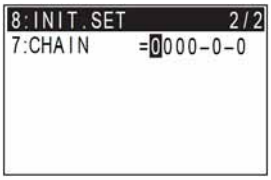


6. Alarm (See pages 7-1 to 7-3)
Anchor watch alarm.
Proximity alarm.
XTE alarm.
CDI alarm.
Alarm message.

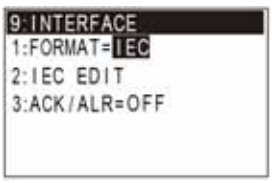


7. Calculation
Distance and bearing between two points
LAT/LONG into LOPs data conversion
Calculation of estimated time length from the current position to the destination, or required speed.





8. Initial value setup
Set average constants.
Select distance/speed units.
Select antenna height (above sea level) units.
Select navigation mode.
Select position display mode (LAT/ LONG, LOPs)
Select LAT/LONG display digits
Set chain.



9. Interfacing
Select output format.
Edit the output format (IEC 61162-1).
Select ACK/ALR output

8.2 Menu 3: GPS

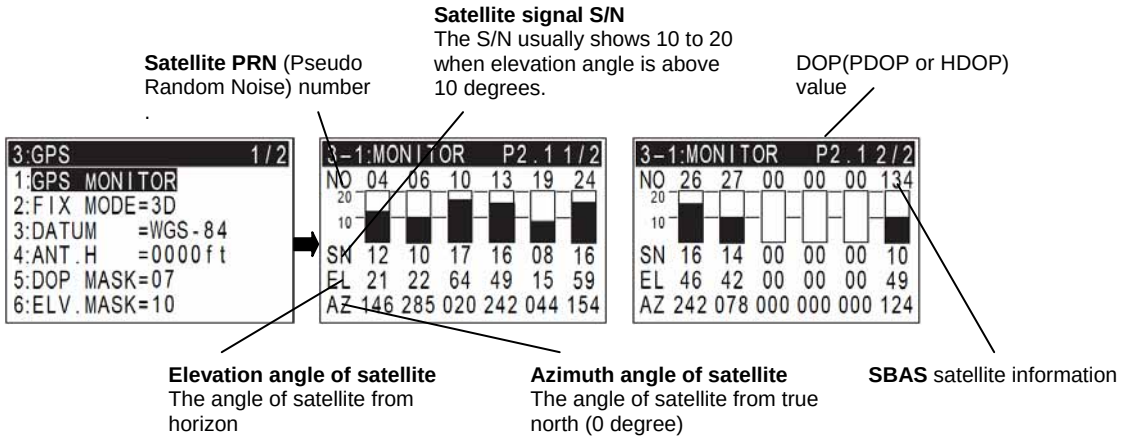
8.2.1 Monitoring GPS satellite signal reception

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**". Reason for alarm notification is displayed



8.2.2 Selecting a measuring system mode

initial setup: 3D

There are the two modes, 2D and 3D, in a measuring mode. Usually, it is used in 3D mode. Usually, in 3D mode, in case use it in 2D mode, they need to set up an antenna height manually. (see 7.2.4)

If you cannot receive signals from four satellites or if the PDOP value exceeds the limit, the **3D**(three-dimensional measurement) mode is automatically switched to the **2D** mode.

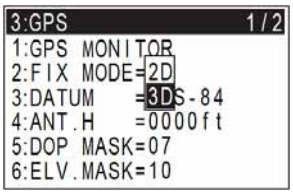
(1) Press [**MENU**] key until Menu options 1 to 9 appears.

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

(3) Press [**2**] key to select "**2:FIX MODE**".

(4) Press [▲] or [▼] key to select desired measuring system mode.

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



8.2.3 Selecting a geodetic datum

Initial setup: WGS-84

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 datums. 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 System" (Annex).

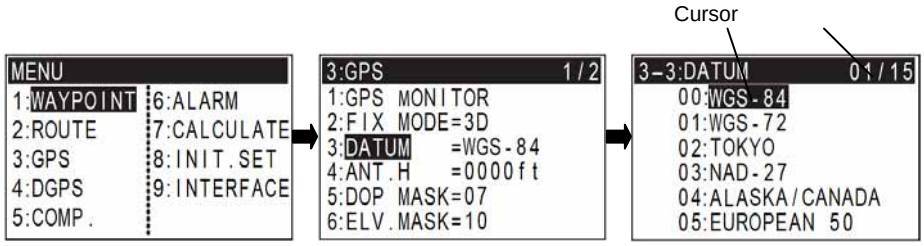
(1) Press [**MENU**] key until Menu options 1 to 9 appears.

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

(3) Press [**3**] key to select "**3:DATUM**".

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

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

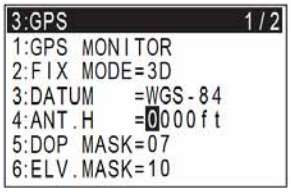


8.2.4 Setting antenna height (above sea level)

Initial height: 0

In case of 2D mode, the antenna height from sea level must be entered within 5 meters or 16 3/8 feet in accuracy. If failed, the positioning accuracy may be worsened. The data can be set in either metric or imperial system. For detail, refer to the setting procedure “Menu 8, Changing the antenna height unit”, on page 8-13 in this manual.

(1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**3**] key to select “**3:GPS**”.
(3) Press [**4**] key to select “**4:ANT.H**”.
(4) Enter a (4-digit) antenna height above sea level using numeric keys.
(5) Press [**ENT**] key.

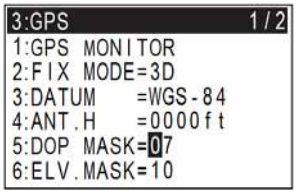


8.2.5 Masking DOP

Initial setup: 07

You can set a DOP mask value in two-dimensional positioning to minimize the position fluctuation. When the HDOP value exceeds this limit, positioning is stopped. During three-dimensional positioning, you can set a PDOP mask value. When a satellite combination exceeds this limit, two-dimensional positioning is selected automatically.

(1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**3**] key to select “**3:GPS**”.
(3) Press [**5**] key to select “**5:DOP MASK**”.
(4) Enter a DOP mask value (00 to 99) using numeric keys.
(5) Press [**ENT**] key.

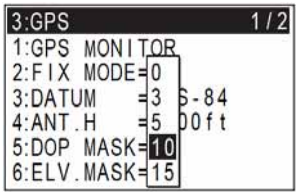


8.2.6 Masking satellite elevation angle

Initial setup: 10degrees

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 [**6**] key to select “**6:ELV MASK**”.
(4) Press [▲] or [▼] key to move cursor onto elevation angle masking.
(5) Press [**ENT**] key.

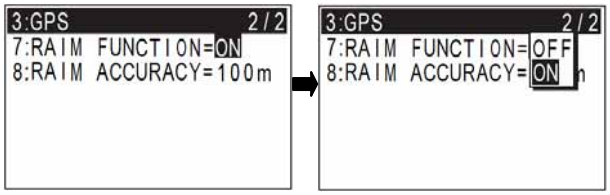


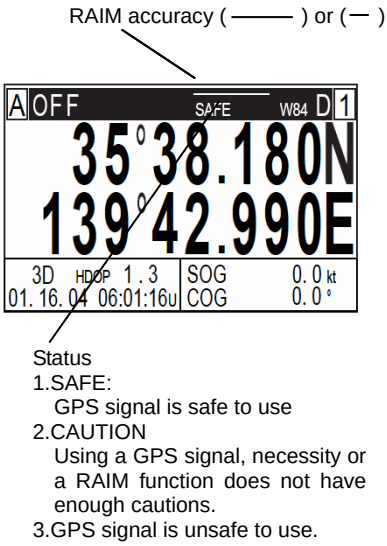
8.2.7 Setting RAIM function

Initial setup: ON

RAIM (Receiver Autonomous Integrity Monitoring) is the function, which supervises whether GPS holds the accuracy, which the user chose (100m or 10m). If this function is turned ON, the bar of RAIM accuracy will be displayed. 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 [▲] or [▼] key to move cursor onto "**7:RAIM FUNCTION**"
(4) Press [**ENT**] key.
(5) Press [▲] or [▼] key to select desired RAIM function.
(6) Press [**ENT**] key.



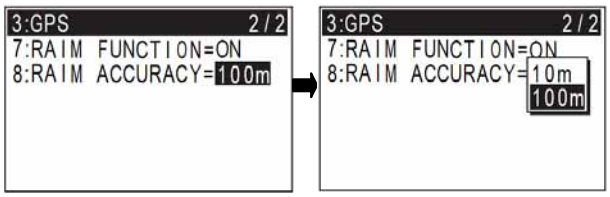


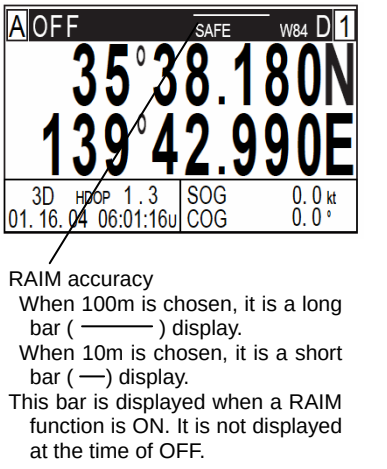
8.2.8 Selecting RAIM accuracy

Initial setup: 100m

RAIM accuracy can be chosen from 100m and 10m.

(1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**3**] key to select "**3:GPS**".
(3) Press [▲] or [▼] key to move cursor onto "**8:RAIM ACCURACY**"
(4) Press [**ENT**] key.
(5) Press [▲] or [▼] key to select desired RAIM accuracy (100m or 10m).
(6) Press [**ENT**] key.



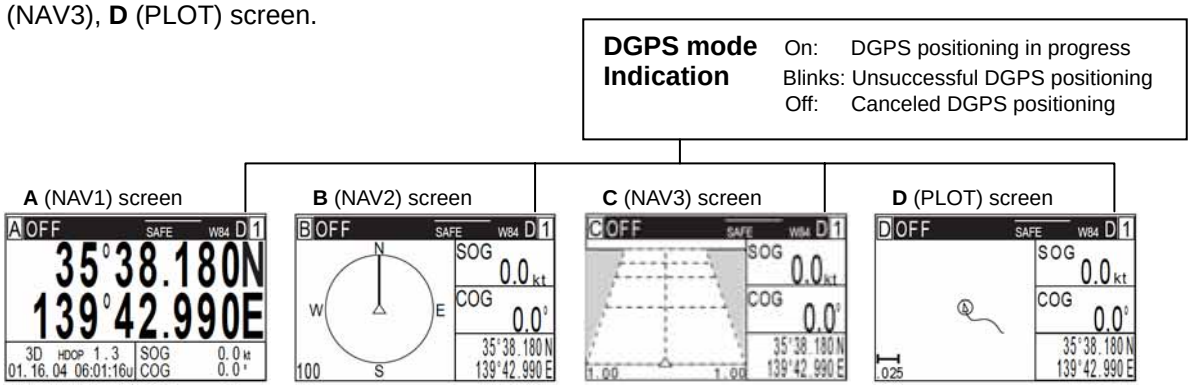


8.3 Menu 4: Differential GPS (DGPS)

This DGPS system can improve the GPS positioning accuracy. There are two styles, BEACON and SBAS, in DGPS, and BEACON is further divided into the system of internal receiver and external receiver. The internal receiver system requires internal beacon receiver kit of option. The external receiver system requires an external differential beacon receiver, which outputs the compensation data of RTCM SC-104, connected to a GPS navigator.

8.3.1 Displaying DGPS

When the DGPS is set, the DGPS positioning status is displayed with letters **D** on **A** (NAV1), **B** (NAV2), **C** (NAV3), **D** (PLOT) screen.



8.3.2 Selecting a style of DGPS

Initial setup: BEACON

BEACON: DGPS for RTCM SC-104 .

SBAS: WAAS / EGNOS / MSAS

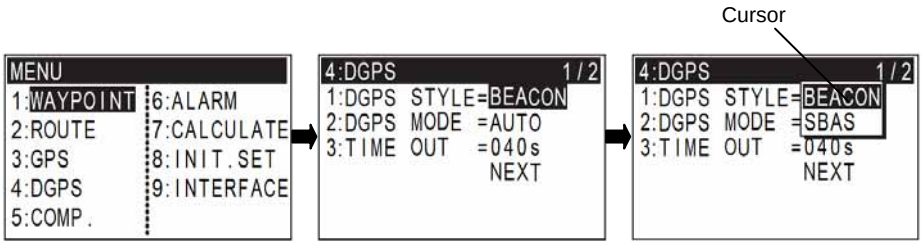
(1) Press [**MENU**] key until Menu options 1 to 9 appears.

(2) Press [**4**] key to select "**4:DGPS**".

(3) Press [**1**] key to select "**1:DGPS STYLE**".

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

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



8.3.3 DGPS measurement

Initial setup: AUTO

OFF: Normal GPS positioning takes place. **D** letter is not shown.

ON: DGPS correction takes place only. **D** letter continues during DGPS correction.

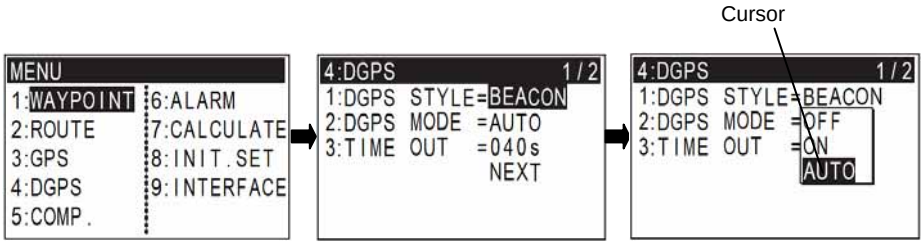
AUTO: DGPS correction takes place when DGPS correction data is received.

When no data is received, the normal GPS positioning is automatically changing from DGPS positioning.

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

(2) Press [**4**] key to select "**4:DGPS**".

(3) Press [**2**] key to select "**2:DGPS MODE**".
(4) Press [▲] or [▼] key to move cursor onto "**AUTO**", "**ON**" or "**OFF**".
(5) Press [**ENT**] key.

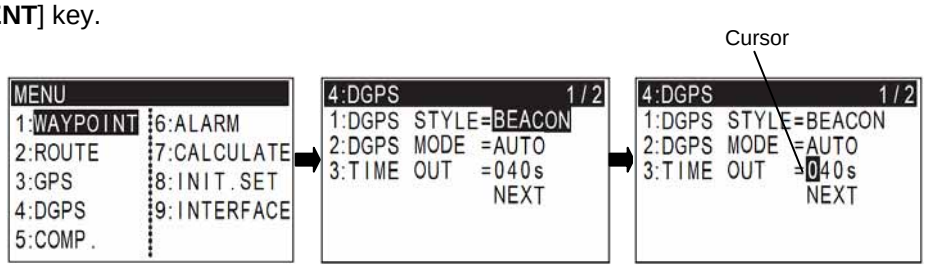


8.3.4 Setting a DGPS timeout

Initial setup: 40 sec

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 TIMEOUT to 010 to 180 seconds. However, the position accuracy degrades as TIMEOUT lengthens.

(1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**4**] key to select "**4:DGPS**".
(3) Press [**3**] key to select "**3:TIME OUT**".
(4) Enter a timeout (010 to 180 seconds) using numeric keys.
(5) Press [**ENT**] key.



8.3.5 Selecting a beacon station (Beacon DGPS only)

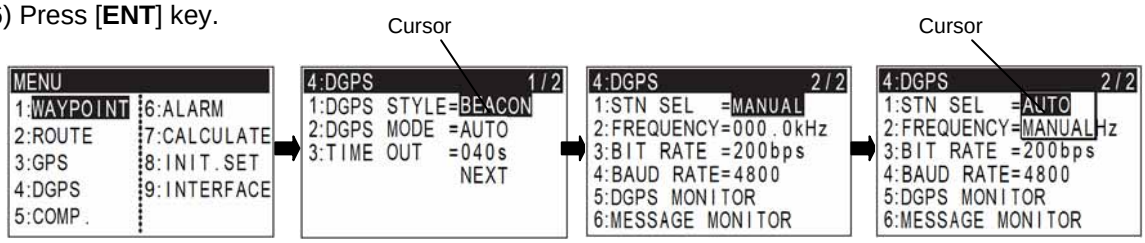
Initial setup: AUTO

A beacon station is selectable in both the manual or auto mode. The manual mode differs by the internal system and an external system.

(Selecting a station in the auto mode)

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

(1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**4**] key to select "**4:DGPS**".
(3) Press [▲] or [▼] key to move cursor onto "**NEXT**" and 2/2 page is displayed.
(4) Press [**1**] key to select "**1:STN SEL**".
(5) Press [▲] or [▼] key to move cursor onto "**AUTO**".
(6) Press [**ENT**] key.

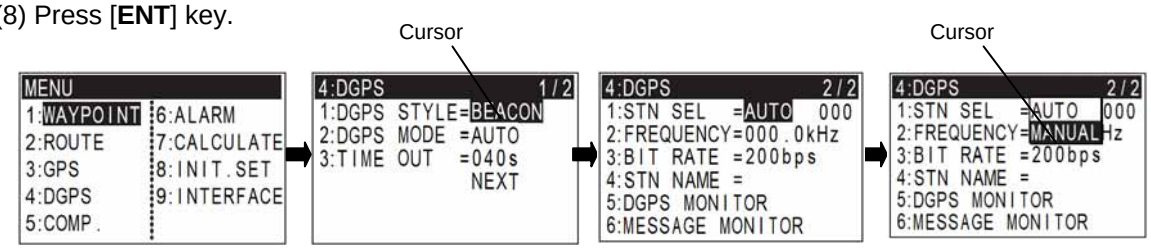


(Selecting a station in the manual mode)

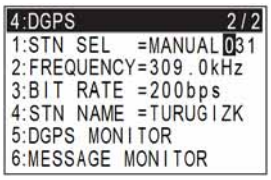
Internal beacon receiver system

In the manual mode of internal beacon receiver system, specify the station number between 001 and 480. (Refer “Table of DGPS reference stations” of supplement.)

(1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**4**] key to select “**4:DGPS**”.
(3) Press [▲] or [▼] key to move cursor onto “**NEXT**” and 2/2 page is displayed.
(4) Press [**1**] key to select “**1:STN SEL**”.
(5) Press [▲] or [▼] key to move cursor onto ”**AUTO**”.
(6) Press [**ENT**] key.
(7) Press [▲] or [▼] key to move cursor onto ”**MANUAL**”.
(8) Press [**ENT**] key.



(9) Press [▶] key to move cursor to the station number field.
(10) Enter station number (001 to 480) by numerical keys.
(11) Press [**ENT**] key.



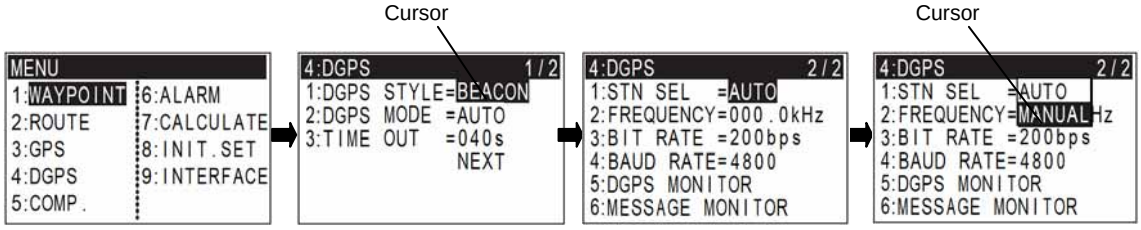
Description of the station number
001 - 020: Numbers which can be registered by the user.
021 - 030: Numbers which are stored as the beacon almanac data.
031 - 480: Numbers stored in the ROM (worldwide beacon stations are stored).

External beacon receiver system

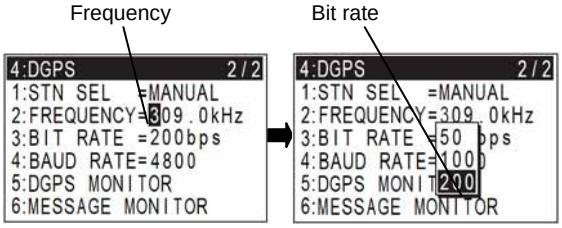
Frequency Initial setup: **283.5kHz**
Selectable range: **283.5 to 325.0kHz**
Bit rate Initial setup: **200bps**

In the manual mode of external beacon receiver system, frequency and bit rate of the receiving beacon station must be entered.

(1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**4**] key to select “**4:DGPS**”.
(3) Press [▲] or [▼] key to move cursor onto “**NEXT**” and 2/2 page is displayed.
(4) Press [**1**] key to select “**1:STN SEL**”.
(5) Press [▲] or [▼] key to move cursor onto ”**AUTO**”.
(6) Press [**ENT**] key.
(7) Press [▲] or [▼] key to move cursor onto ”**MANUAL**”.
(8) Press [**ENT**] key.



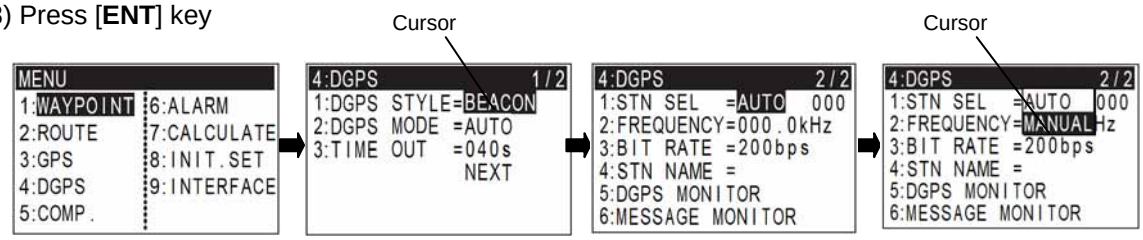
(9) Press [**2**] key to select "**2:FREQUENCY**".
(10) Specify receiving frequency (4-digit) of beacon station using numeric keys (0 to 9).
(11) Press [**ENT**] key to set receiving frequency.
(12) Press [▼] key to move cursor onto bit rate.
(13) Press [**ENT**] key.
(14) Press [▲] or [▼] key to set bit rate.
(15) Press [**ENT**] key .



8.3.6 String a beacon station (internal beacon receiver system only)

When a beacon station is not stored or when change takes place in the data of a beacon station, reception from that station is done by registering the station data. The user can register up to 20 station numbers in the range of 001 to 020.

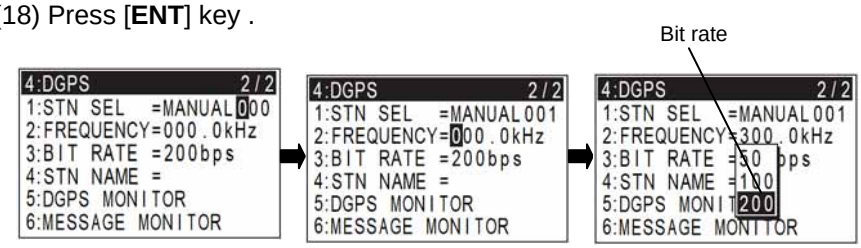
1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**4**] key to select "**4:DGPS**".
(3) Press [▲] or [▼] key to move cursor onto "**NEXT**" and 2/2 page is displayed.
(4) Press [**1**] key to select "**1:STN SEL**".
(5) Press [▲] or [▼] key to move cursor onto "**AUTO**".
(6) Press [**ENT**] key.
(7) Press [▲] or [▼] key to move cursor onto "**MANUAL**".
(8) Press [**ENT**] key



(9) Press [▶] key to move cursor to the station number field.
(10) Enter station number (001 to 020) by numerical keys.
(11) Press [**ENT**] key.
(12) Press [▼] key to move cursor to the frequency input field.
(13) Specify receiving frequency (4-digit) of beacon station using numeric keys (0 to 9).
(14) Press [**ENT**] key to set receiving frequency.
(15) Press [▼] key to move cursor onto bit rate.
(16) Press [**ENT**] key.

(17) Press [▲] or [▼] key to set bit rate.

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



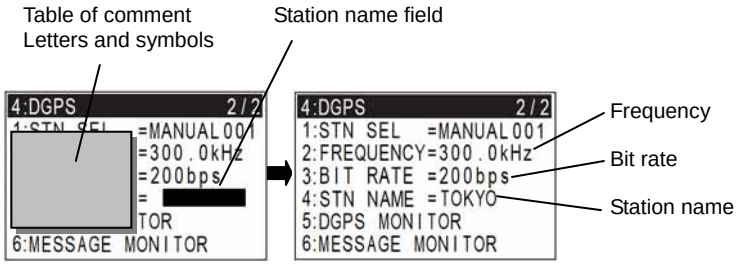
(19) Press [▼] key to move cursor to the station name (STN NAME) field.

(20) Press [▲] [▼] [▶] [◀] key to select a comment letter or symbol from the comment letter table by locating cursor on it, or enter a value using numeric keys.

(21) Press [**SEL**] key . And one letter or symbol are made to decide.

(22) You can enter up to 10 letters by repeating (20) and (21) steps.

(23) Press [ENT] key and decide of a station name.



8.3.7 Selecting the DGPS input signal baud rate (External beacon receiver system only)

Initial setup: 4800 bps

Adjust the baud rate of RTCM SC-104 format signal reception to the output signal baud rate of beacon receiver.

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

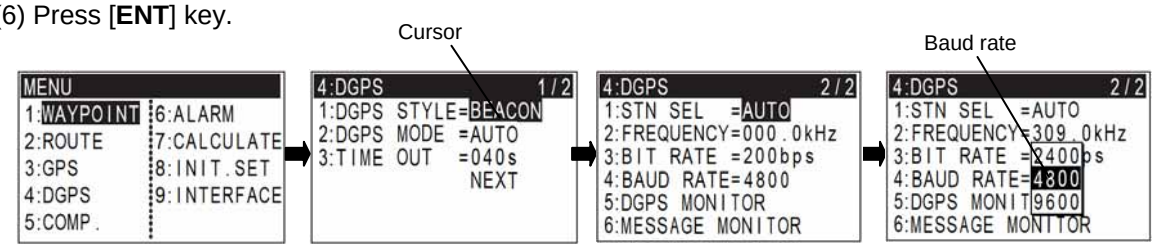
(2) Press [**4**] key to select "**4:DGPS**".

(3) Press [▲] or [▼] key to move cursor onto "**NEXT**" and 2/2 page is displayed.

(4) Press [**4**] key to select "**4:BAUD RATE**".

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

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



8.3.8 DGPS monitor (Beacon DGPS only)

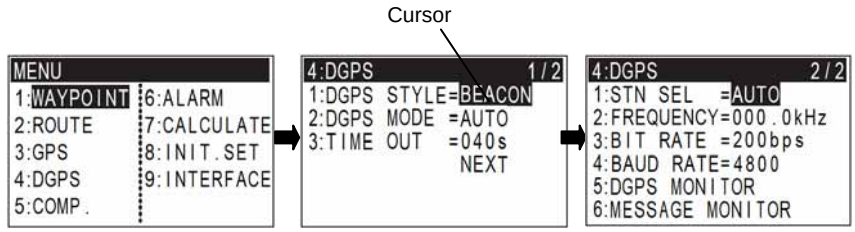
DGPS monitor provides information on the DGPS beacon receiver interface and receiving status.

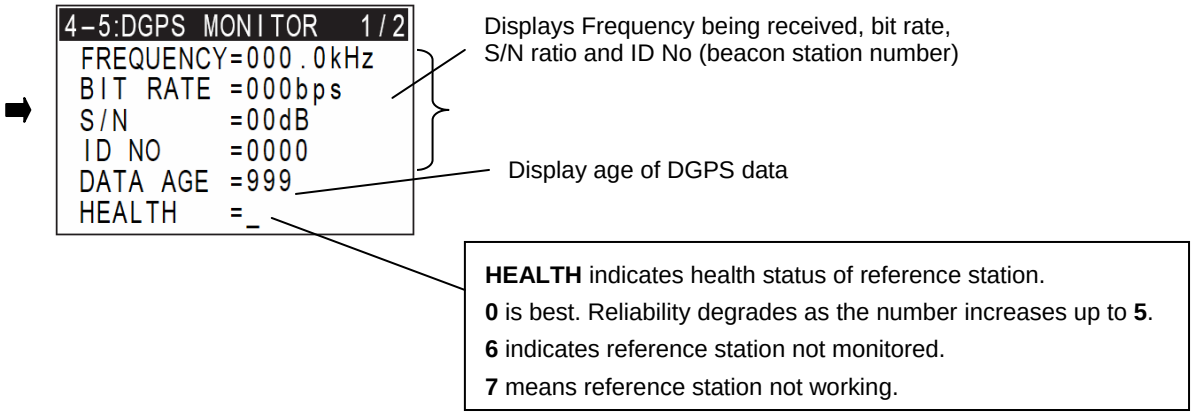
(1) Press [**MENU**] key until Menu options 1 to 9 appears.

(2) Press [**4**] key to select "**4:DGPS**".

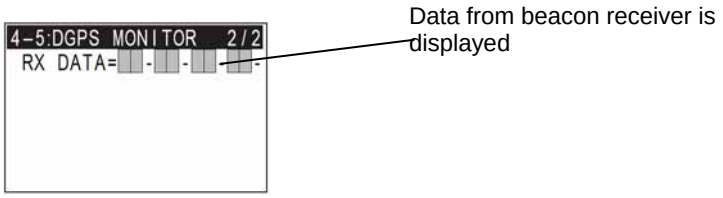
(3) Press [▲] or [▼] key to move cursor onto "**NEXT**" and 2/2 page is displayed.

(4) Press [**5**] key to select "**5:DGPS MONITOR**".





(5) Press [▲] or [▼] key to change pages of DGPS monitor.



8.3.9 Message monitor (Beacon DGPS only)

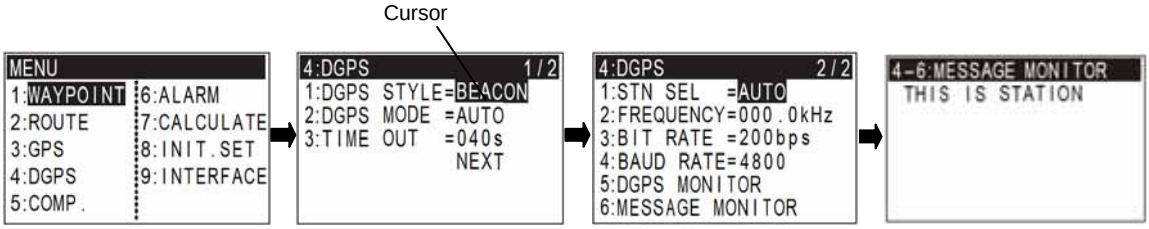
Message monitor provides DGPS text message.

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

(2) Press [**4**] key to select "**4:DGPS**".

(3) Press [▲] or [▼] key to move cursor onto "**NEXT**" and 2/2 page is displayed.

(4) Press [**6**] key to select "**6:MESSAGE MONITOR**".



8.4 Menu 5: Compensation

8.4.1 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 using numeric keys.

• Enter the correction offset to use.

> **NOTE:** *The latitude and longitude correction is also available in LOPs mode.*

(Direct entry of actual position data)

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

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

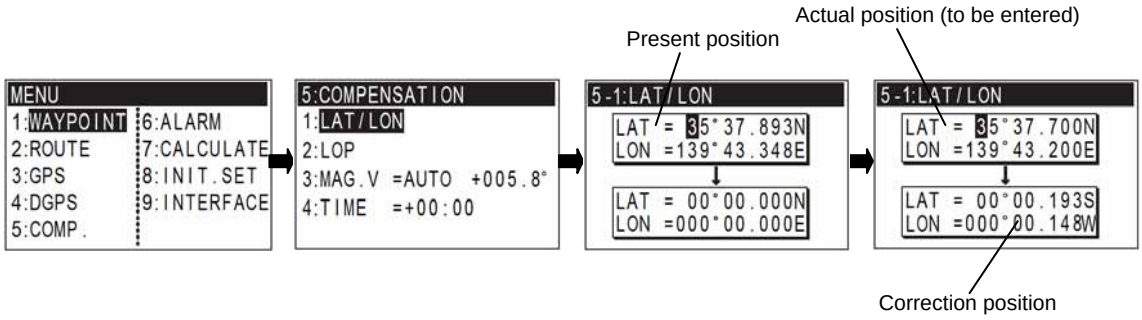
(2) Press [**5**] key to select "**5:COMP.**".

(3) Press [**1**] key to select "**1:LAT/LON**".

(4) Enter the correct latitude and longitude value.

Example: The position "N35 ° 37.700 / E139 ° 43.200" is entered by pressing the following keys in exact order given below. [**3**],[**5**],[**3**],[**7**],[**7**],[**0**],[**0**],[**N**],[**ENT**],[▼],[**1**],[**3**],[**9**],[**4**],[**3**],[**2**],[**0**],[**0**],[**E**],[**ENT**]

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



Present position	Actual position (to be entered)	Correction offset
Latitude 35 °37.893 N	Latitude 35 °37.700 N	Latitude 0°00.193 N
Longitude 139 °43.348 E	Longitude 139 °43.200 E	Longitude 0°00.148 W

(Entry of correction offset)

When your present position is shown in LAT/LONG mode, you can correct it by entering the LAT/LONG correction data.

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

(2) Press [**5**] key to select "**5:COMP.**".

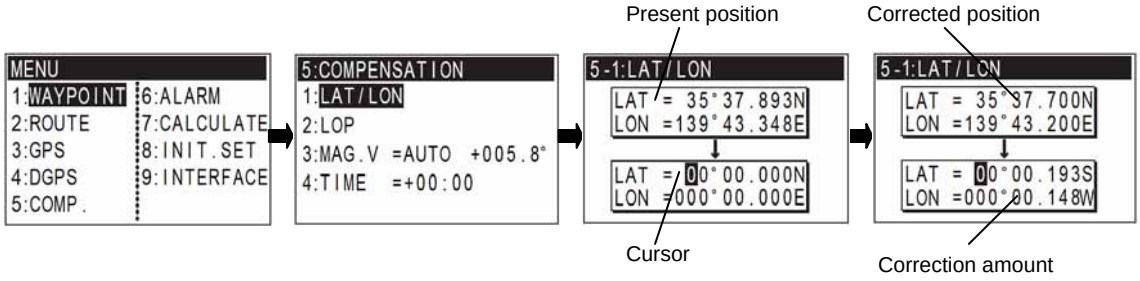
(3) Press [**1**] key to select "**1:LAT/LON**".

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

(5) Enter the latitude/longitude correction offset.

Example: The correction offset “S0 ° 0.193 / W0 ° 0.148” is entered by pressing the following keys in exact order given below. [**0**],[**0**],[**0**],[**0**],[**1**],[**9**],[**3**],[**S**],[**ENT**],[**▼**],[**0**],[**0**],[**0**],[**0**],[**0**],[**1**],[**4**],[**8**],[**W**],[**ENT**]

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



Correction offset (to be entered)	Present position	Correction position
Latitude 0°00.193 S	Latitude 35 °37.893 N	Latitude 35 °37.700 N
Longitude 0°00.148 W	Longitude 139 °43.348 E	Longitude 139 °43.200 E

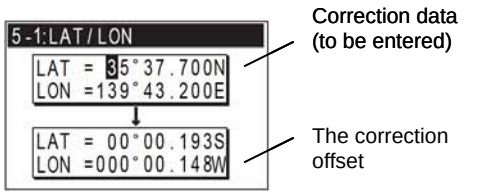
8.4.2 Checking the correction offset

You can check the correction offset as follows:

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

(2) Press [**5**] key to select “**5:COMP.**”.

(3) Press [**1**] key to select “**1:LAT/LON**”.



8.4.3 Disable position correction

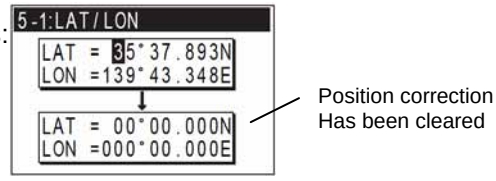
To delete and disable the correction offset follow these steps:

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

(2) Press [**5**] key to select “**5:COMP.**”.

(3) Press [**1**] key to select “**1:LAT/LON**”.

(4) Press [**CLR**] key to set correction offset to 0 correction is disabled.



8.4.4 Compensating the compass

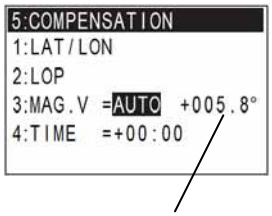
Initial setup: Auto mode

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. As 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:COMP.**".
(3) Press [**3**] key to select "**3:MAG.V**".
(4) Press [▲] or [▼] key to move cursor onto "**AUTO**" .
(5) Press [**ENT**] key.

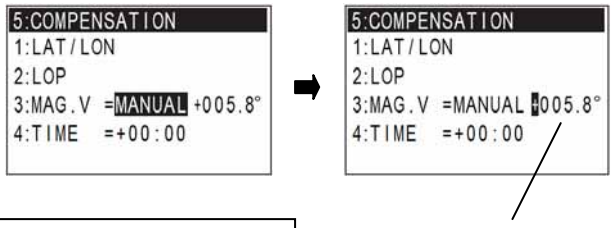


An error (compensation amount)
From true bearing is shown

(Manual compensation)

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

(1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**5**] key to select "**5:COMP.**".
(3) Press [**3**] key to select "**3:MAG.V**".
(4) Press [▲] or [▼] key to move cursor onto "**MANUAL**" .
(5) Press [**ENT**] key.
(6) Press [▶] key .
(7) Press [**SEL**] key to change the positive (+) or negative (-) sign of correction offset.
or
(8) Press [**0**] key to use the current positive (+) or negative (-) sign as it is.
(9) Enter a (4-digit) compensation offset using numeric keys.
(10) Press [**ENT**] key.



An error (compensation amount)
From true bearing is shown

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

8.4.5 Displaying local time

Initial setup: 00:00 hour

You can display your local time by entering a time difference from the Greenwich Mean Time (GMT).
See the following figure 8.1 to determine zone time difference.
(1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**5**] key to select "**5:COMP.**".
(3) Press [**4**] key to select "**4:TIME**".
(7) Press [**SEL**] key to change the positive (+) or negative (-) sign of correction offset.
or
(8) Press [**0**] key to use the current positive (+) or negative (-) sign as it is.
(9) Enter a time difference from GMT using numeric keys.
(10) Press [**ENT**] key.

CLR

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

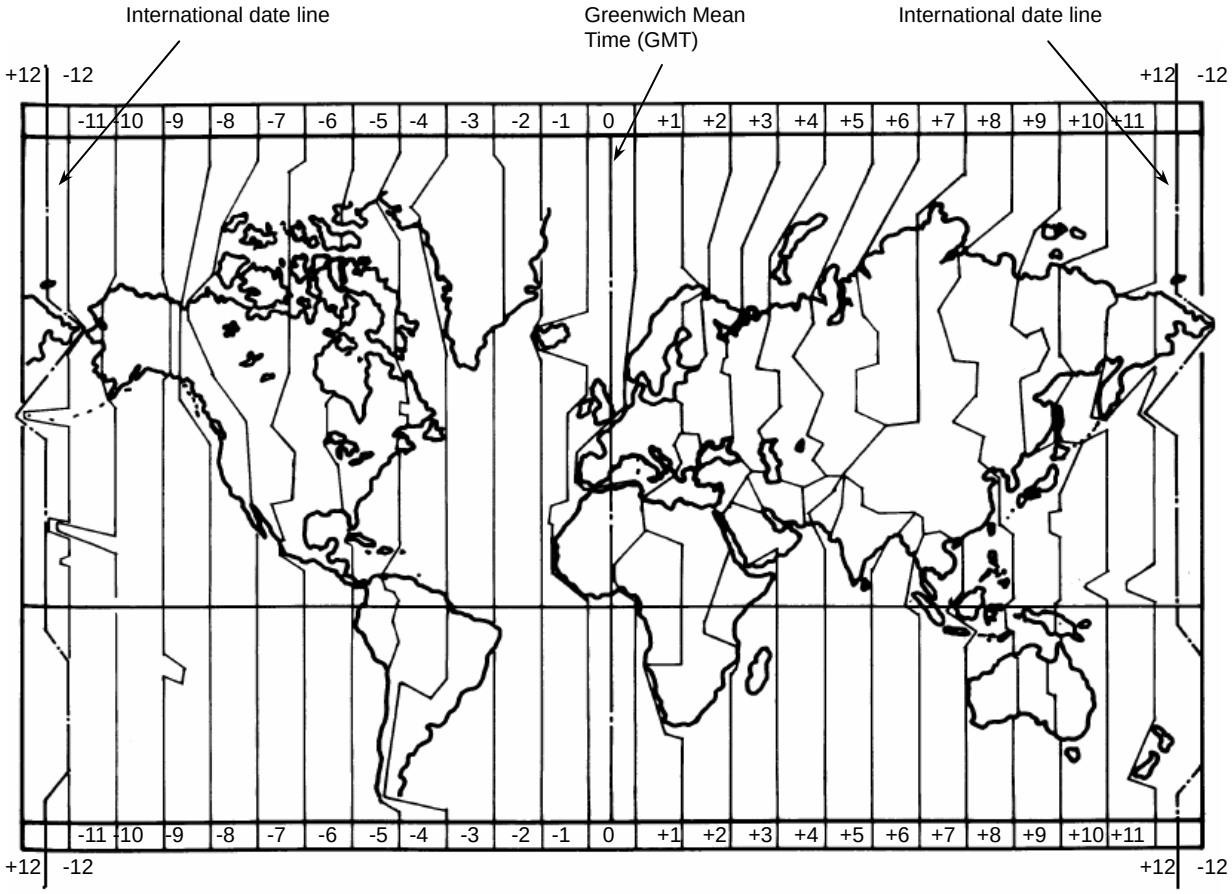


Figure 8.1 Time difference chart

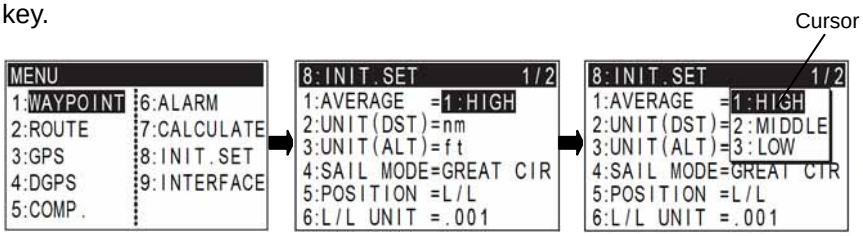
8.5 Menu 8: Initial setting

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

Initial setup: HIGH

Use the averaging function to compare GPS sensor signals several times and get their average. This stabilizes the GPS position (latitude and longitude), speed and course data. The maximum averaging rate is “LOW” and the minimum averaging rate is “HIGH”. When you select “LOW” value, data is averaged more often and the display data has smaller variations. However, delays for updating occur. When you select a “HIGH” 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 the boat position, course and speed.

(1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**8**] key to select “**8:INIT.SET**”.
(3) Press [**1**] key to select “**1:AVERAGE**”.
(4) Press [▲] or [▼] key to move cursor onto the average constants to choose”.
(5) Press [**ENT**] key.

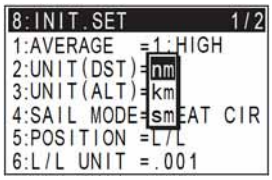


8.5.2 Changing the distance or speed unit

Initial setup: nm

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**] key to select “**8:INIT.SET**”.
(3) Press [**2**] key to select “**2:UNIT(DST)**”.
(4) Press [▲] or [▼] key to move cursor onto the distance or speed unit to choose.
(5) Press [**ENT**] key.

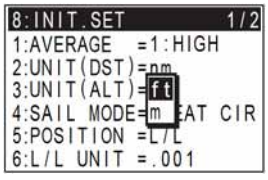


8.5.3 Changing the antenna height unit

Initial setup: ft

You can change the measuring unit of antenna height (above sea level).

(1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**8**] key to select “**8:INIT.SET**”.
(3) Press [**3**] key to select “**3:UNIT(ALT)**”.
(4) Press [▲] or [▼] key to move cursor onto the antenna height unit to choose.
(5) Press [**ENT**] key.



8.5.4 Changing sail mode

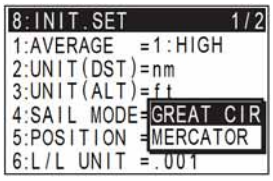
Initial setup: GREAT CIRCLE

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 Mercator chart.

(1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**8**] key to select "**8:INIT.SET**".
(3) Press [**4**] key to select "**4:SAIL MODE**".
(4) Press [▲] or [▼] key to move cursor onto the sail mode to choose.
(5) Press [**ENT**] key.

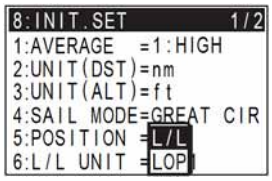


8.5.5 Displaying position data in LAT/LONG mode

Initial setup: L/L mode

For the switching procedure, refer to the "Registering a Position in LOP".

(1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**8**] key to select "**8:INIT.SET**".
(3) Press [**5**] key to select "**5:POSITION**".
(4) Press [▲] or [▼] key to move cursor onto the LAT/LON mode to choose.
(5) Press [**ENT**] key.

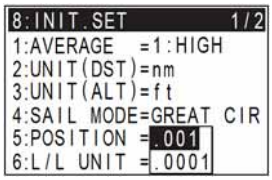


8.5.6 Changing the latitude and longitudinal display digits

Initial setup: .001'

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

(1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**8**] key to select "**8:INIT.SET**".
(3) Press [**6**] key to select "**6:L/L UNIT**".
(4) Press [▲] or [▼] key to move cursor onto the display digits to choose.
(5) Press [**ENT**] key.



> **NOTE:** *If you select .0001', the latitude and longitude data of GGA sentence will also be output in 0.0001' only when Format IEC is selected.*

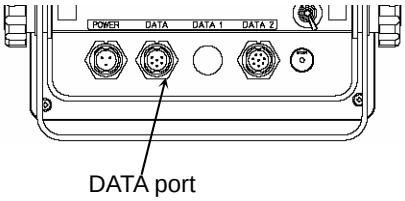
8.5.7 Specifying the chain and secondary stations for Loran C, Loran A or Decca

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

8.6 Menu 9: Interface

8.6.1 Selecting an output data format of DATA port .

Initial setup: IEC



You can select the format of output data.

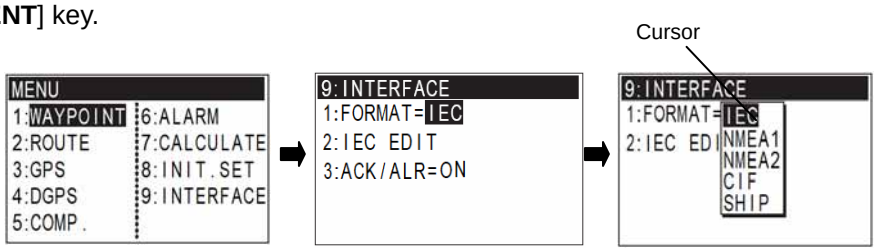
(1) Press [**MENU**] key until Menu options 1 to 9 appears.

(2) Press [**9**] key to select "**9:INTERFACE**".

(3) Press [**1**] key to select "**1:FORMAT**".

(4) Press [▲] or [▼] key to move cursor onto the output data format to choose.

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



8.6.2 Editing the IEC 61162-1 output data format of DATA port

initial setup: Sentence: GGA, GLL, GBS, VTG, ZDA
Cycle: 1 second

You can select the output sentence and set the output cycle (in seconds) of the IEC 61162-1 output data format.

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

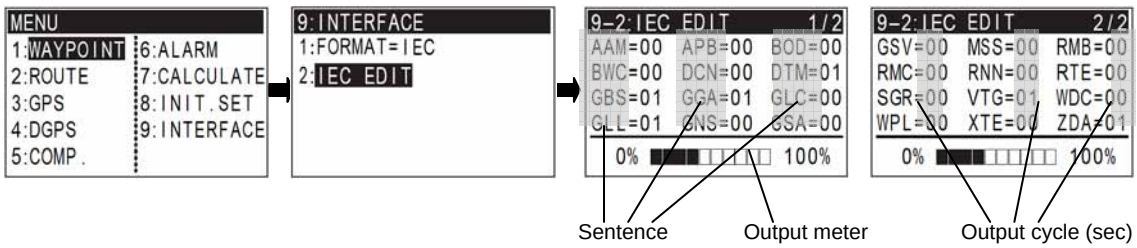
(2) Press [**9**] key to select "**9:INTERFACE**".

(3) Press [**2**] key to select "**2:IEC EDIT**".

(4) Press [▲] [▼] [▶] [◀] key to move cursor onto the sentence to change its cycle.

(5) Enter an output cycle of selected sentence using numeric keys.

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



NOTE: *Set the output cycle for the required sentence only and set the unused data to "00". The output meter indicates the ratio of total data amount (of selected sentence) to the data transmission capacity (about 10% per scale). Do not maximize at 100% or poor performance may result.*

8.6.3 Explanation of output data (sentence)

IEC	**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
	DCN	Decca Position
	DTM	Datum reference
	GBS	GPS satellite fault detection
	GGA	Global Positioning System Fix Data (Time, Lat/long, S/N, SV, DOP)
	GLC	Geographic Position - Loran-C LOPs
	GLL	Geographic Position - Latitude/Longitude
	GNS	GNSS fix data
	GSA	GPS DOP and Active Satellites
	GSV	GPS Satellites in View
	GTD	Geographical Position - Loran-C LOPs (NMEA-0183 Ver.1.5)
	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/long, ground speed, true bearing, magnetic deviation, date)
	Rnn	Route number and waypoint number (Max. 4 points including next waypoint)
	RTE	Route number and waypoint number (Max. 4 points including next waypoint)
	SGR	Loran-C Chain Identifier
	VTG	Course Over Ground (true and magnetic bearing) and Ground Speed
	WDC	Distance to Waypoint
	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
NMEA 1		GLL, GGA, VTG, ZDA: Fixed (1-sec cycle), NMEA-0183 (version 1.5)
NMEA 2		GLL, GGA, VTG, ZDA: Fixed (2- to 3-sec cycle), NMEA-0183 (version 1.5)
CIF		LAT/LONG, speed, course, and Loran C LOPs (Furuno's format)
SHIP		LAT/LONG data (SHIPMATE 0183)

8.6.4 Selecting an output format of waypoint data

Initial setup: NEXT

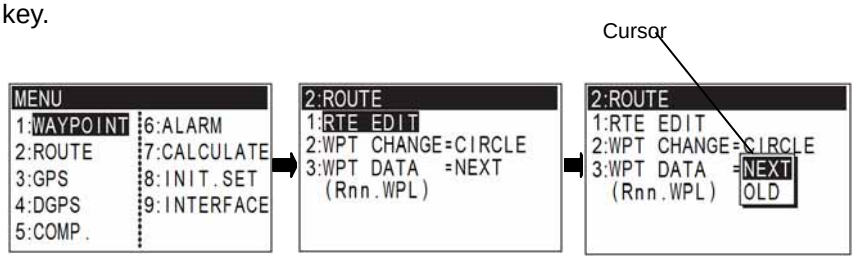
(1) Press [**MENU**] key until Menu options 1 to 9 appears.

(2) Press [**2**] key to select "**2:ROUTE**".

(3) Press [**3**] key to select "**3:WPT DATA**".

(4) Press [▲] or [▼] key to move cursor to select "**NEXT**" or "**OLD**".

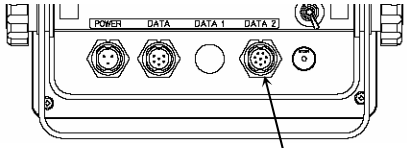
(5) Press [**ENT**] key.

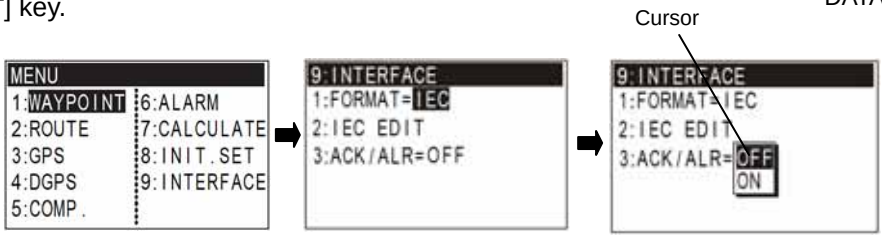


8.6.5 Selecting an output data format of DATA 2 port . Initial setup: Extension data port

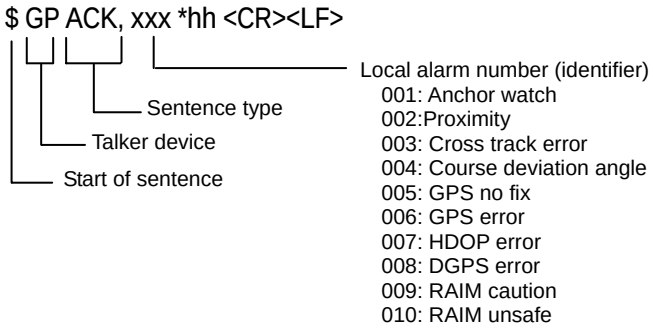
You can select either the extension data port or exclusive port of ACK/ALR for DATA 2 port.
It can select ACK/ALR of a menu3 in turning on or turning off. If ACK/ALR is turned ON, it will be set to exclusive port of ACK/ALR, and it will be set to extension data port if it turns OFF.

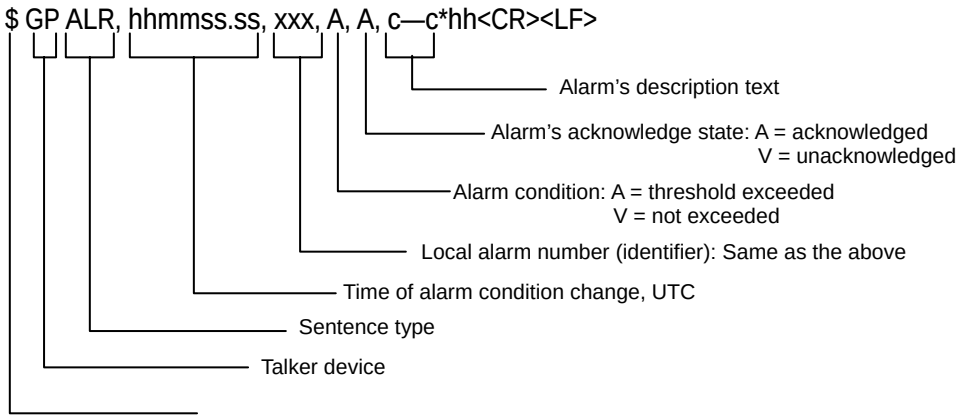
(1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**9**] key to select "**9:INTERFACE**".
(3) Press [**3**] key to select "**3:ACK/ALR**".
(4) Press [▲] or [▼] key to move cursor onto the mode to choose.
(5) Press [**ENT**] key.





(ACK/ALR)
ACK and ALR is a sentence of IEC 61162-1.
ACK: Acknowledge alarm. ALR: Set alarm state.





(Extension data port)
When IEC format is selected, both DATA and DATA 2 ports output IEC format. But when output format other than IEC is selected, DATA 2 port only outputs the position data for external beacon receiver.

8.7 Initialization

(Displaying the menu)

Turn power on, then press the **ENT** key while the screen message "**CHECK OK**" is displayed.

(How to use menus)

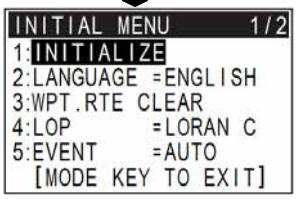
Initialization

1) Press [**1**] key to select "**1:INITIALIZE**".

2) Press [**ENT**] key. Menu is initialized and the screen for powering off will appear.

or

Press [**CLR**] key. Initialization will be canceled.

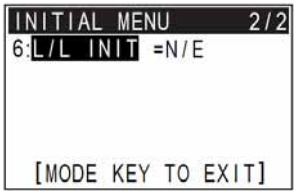


Other menu

(1) Press [**2**] to [**6**] key to select a desired item.

(2) Press [▲] or [▼] key to select a desired content.

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

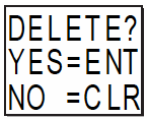


(Exit from the menu)

Press the [**MODE]** key to display the screen for powering off.

8.7.1 Initialization

If your GPS position has failed due to satellite maintenance or other reason, initialize your GPS navigator. Then, set all system parameters again.



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

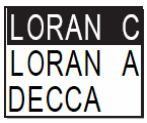
8.7.2 Erasing entire data from memory

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

8.7.3 Switching between Loran C LOPs, Loran A LOPs and Decca LOPs

initial setup: LORAN C

This menu option allows you to select a desired display among the loran C LOP, Loran A LOP and Decca LOP.



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

8.7.4 Changing a storing method for present position (EVENT)

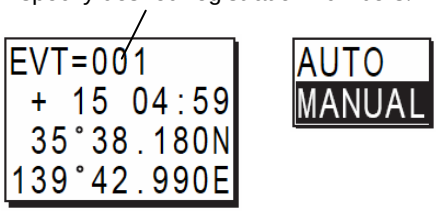
initial setup: AUTO

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

AUTO: Pressing the **EVT** key automatically registers the points starting from No. 001 through 199. When the 200th point is reached, the number is returned to 001 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 001 to 199) from the numerical keypad.

In the **MANUAL** mode, you can specify desired registration numbers.



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

Initial setup: N/W

N/W (N. Lat./W. Long.): When power is turned on, GPS or DGPS position measurement is started using the north latitude/west longitude region as the initial value.

N/E (N. Lat./E. Long.): When power is turned on, GPS or DGPS position measurement is started using the north latitude/east longitude region as the initial value.

S/W (S. Lat./W. Long.): When power is turned on, GPS or DGPS position measurement is started using the south latitude/west longitude region as the initial value.

S/E (S. Lat./E. Long.): When power is turned on, GPS or DGPS position measurement is started using the south latitude/west longitude region as the initial value.

Chapter 9 How to use LOPs

Chapter 9 How to use LOPs

9.1 Initial setup for LOPs display

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

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

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

9.1.1 Selecting LOP (Loran C, Loran A or Decca)

See Page 8-19 “8.7.3 Switching between Lran C LOPs, Loran A LOPs, and Decca LOPs”.

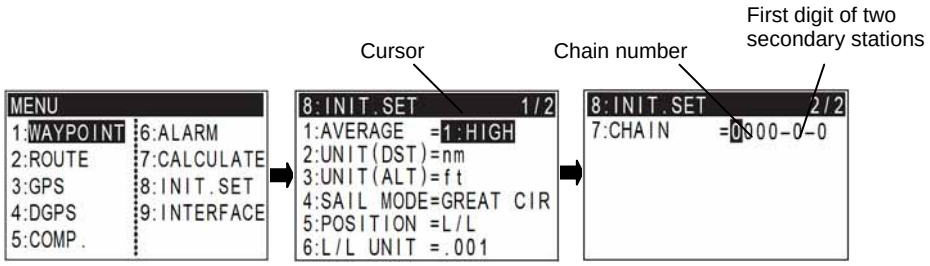
9.1.2 Setting the chain and secondary stations to be displayed

Select the chain and secondary stations to be displayed. Settings depend on the LOPs mode to be used as described below.

(Setting chain and secondary stations in Loran C LOPs mode)

You can convert your GPS present position and stored memory data (waypoints and events) from LAT/LONG into Loran C LOPs.

(1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**8**] key to select “**8:INIT.SET**”.
(3) Press [▼] key to move cursor to the letters “**7:CHAIN**”.
(4) Enter a (4-digit) Loran C chain number.
(5) Enter the highest digit (10 thousand microseconds) of two Loran C secondary stations.
(6) Press [**ENT**] key.

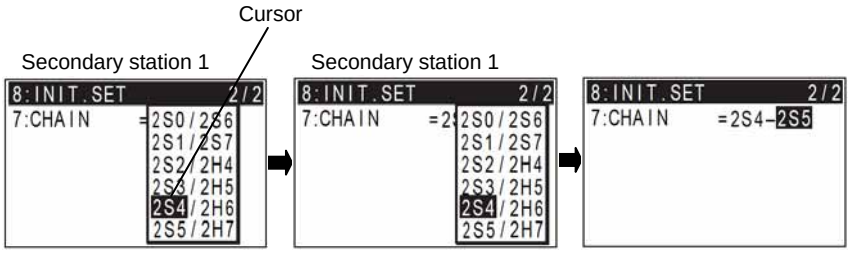


(Specifying combinations of secondary stations in Loran A LOPs mode)

You can convert your present position given by GPS and stored position data (waypoints and event data) from LAT/LONG into Loran A LOPs.

(1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**8**] key to select “**8:INIT.SET**”.
(3) Press [▼] key to move cursor to the letters “**7:CHAIN**”.
(4) Press [**ENT**] key.
(5) Press [▼] or [▲] key to select the secondary station 1.
(6) Press [**ENT**] key.

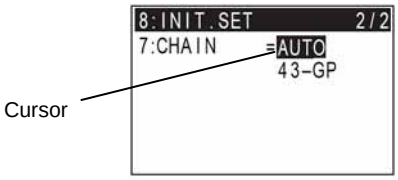
(7) Press [▶] key.
(8) Press [**ENT**] key.
(9) Press [▼] or [▲] key to select the secondary station 2.
(10) Press [**ENT**] key.



(Automatic chain selecting in Decca LOPs mode)

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.

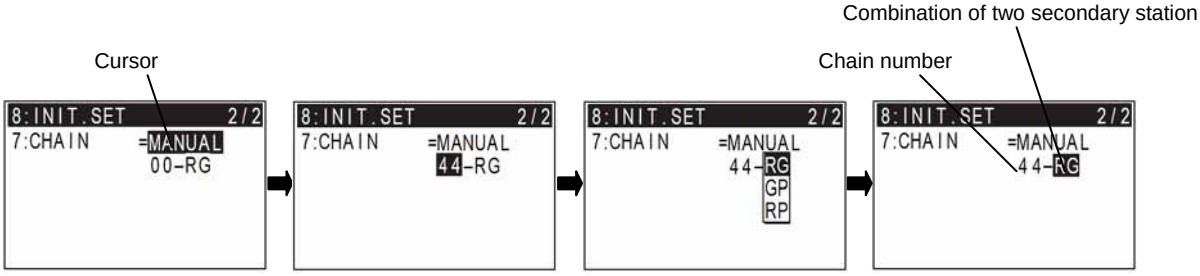
(1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**8**] key to select "**8:INIT.SET**".
(3) Press [▼] key to move cursor to the letters "**7:CHAIN**".
(4) Press [**ENT**] key.
(5) Press [▼] or [▲] key to move cursor onto "**AUTO**".
(6) Press [**ENT**] key.



(Manual chain selecting in Decca LOPs mode)

You can convert both your present position given by GPS and stored position data (waypoints and event data) from LAT/LONG into Decca LOPs.

(1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**8**] key to select "**8:INIT.SET**".
(3) Press [▼] key to move cursor to the letters "**7:CHAIN**".
(4) Press [**ENT**] key.
(5) Press [▼] or [▲] key to move cursor onto "**MANUAL**".
(6) Press [**ENT**] key.
(7) Enter a (2-digit) Decca chain number
(8) Press [**ENT**] key.
(9) Press [▶] key .
(10) Press [▼] or [▲] key to select a combination of secondary stations.
(11) Press [**ENT**] key.



9.1.3 Registering a position in LOPs

Following describes the procedure for replacing LAT/LONG display with LOP and registering a position in LOP

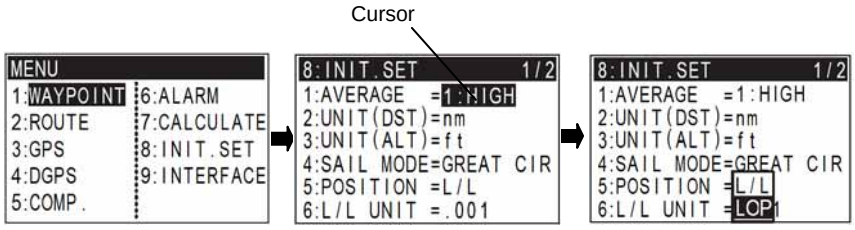
(1) Press [**MENU**] key until Menu options 1 to 9 appears.

(2) Press [**8**] key to select "**8:INIT.SET**".

(3) Press [**5**] key to select "**5:POSITION**".

(4) Press [▼] or [▲] key to select "**LOP**" letters.

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



9.2 Storing waypoints (LOPs data)

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

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

9.2.1 String a new position or updating an existing one

Up to 200 waypoints can be stored in memory. As 200 points (numbers 000 and 199) are reserved for MOB and event registration, you can use 200 to 399 (total of 200 points) to store waypoints.

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

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

(3) Enter storage number (200 to 399) using numeric keys.

(4) Press to [**ENT**] key to display data of the specified storage number.

(5) Press [▶] key to move cursor to letter " = ".

(6) Press [▼] key to move cursor to the numeric input field.

(Loran C LOPs mode)

(7) Enter a 6-digit data (LOPs of secondary station 1) using numeric keys.

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

(9) Enter a 6-digit data (LOPs of secondary station 2) using numeric keys.

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

(Loran A LOPs mode)

(7) Enter a 5-digit data (LOPs of secondary station 1) using numeric keys.

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

(9) Enter a 5-digit data (LOPs of secondary station 2) using numeric keys.

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

(Decca LOPs mode)

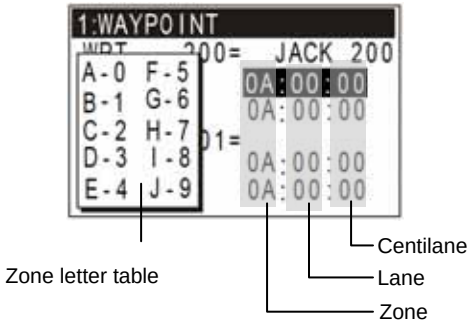
(7) Enter 2-digit numbers (zone, lane, centilane) of secondary station 1 using numeric keys.

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

(9) Enter 2-digit numbers (zone, lane, centilane) of secondary station 2 using numeric keys.

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

NOTES:. *Refer to "Decca zone" of annex about a zone.*
See "Zone letter table", when you input the alphabet



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

- **"Registering additional comments" (see page 6-1).**
- **"Copying a position" (see page 6-2)**
- **"Changing the comment I.D." (see page 6-3)**
- **"Erasing a single waypoint" (see page 6-3)**

9.3 Correcting your position (LOPs)

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

• Enter the LOPs of your actual position using numeric keys.

• Enter the correction offset to use.

NOTE: *The LOP correction is ineffective in latitude and longitude mode*

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

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

9.3.1 Direct entry of actual position data

(Correction by Loran C LOPs data entry)

When your position is displayed in Loran C LOPs mode, you can correct it by entering the Loran C LOPs correction offset.

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

(2) Press [**5**] key to select "**5:COMP.**".

(3) Press [**2**] key to select "**2:LOP**".

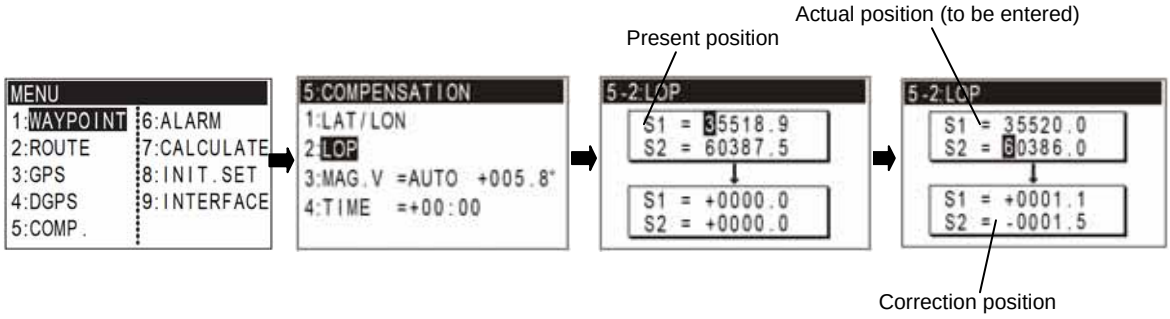
(4) Enter correct (6-digit) LOPs of secondary station 1 using numeric keys.

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

(6) Press [▼] key to move cursor to Loran C LOPs field of secondary station 2.

(7) Enter correct (6-digit) LOPs of secondary station 2 using numeric keys.

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



Present position (GPS fix)	Actual position (to be entered)	Correction offset
Secondary st.1 35518.9 usec	Secondary st.1 35520.9 usec	Secondary st.1 +0001.1 usec
Secondary st.2 60387.5 usec	Secondary st.2 60386.0 usec	Secondary st.2 –0001.5 usec

(Correction by Loran A LOPs data entry)

When your position is displayed in Loran A LOPs mode, you can correct it by entering the Loran A LOPs correction offset.

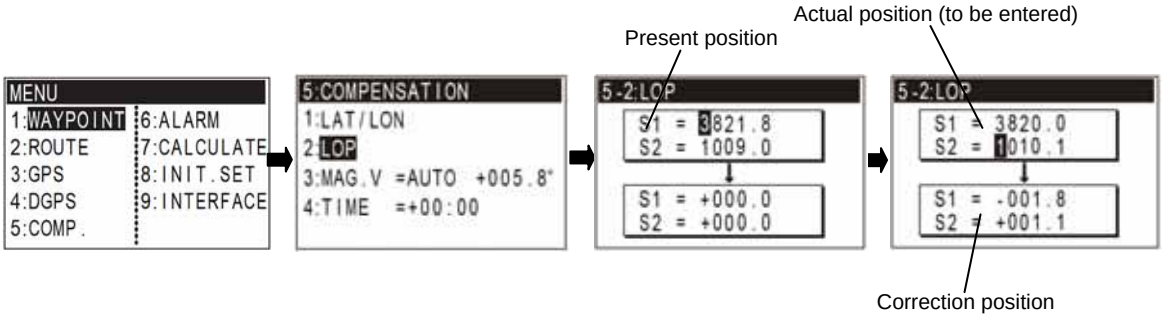
(1) Press [**MENU**] key until Menu options 1 to 9 appears.

(2) Press [**5**] key to select "**5:COMP.**".

(3) Press [**2**] key to select "**2:LOP**".

(4) Enter correct (5-digit) LOPs of secondary station 1 using numeric keys.

(5) Press [**ENT**] key.
(6) Press [▼] key to move cursor to Loran A LOPs field of secondary station 2.
(7) Enter correct (5-digit) LOPs of secondary station 2 using numeric keys.
(8) Press [**ENT**] key.

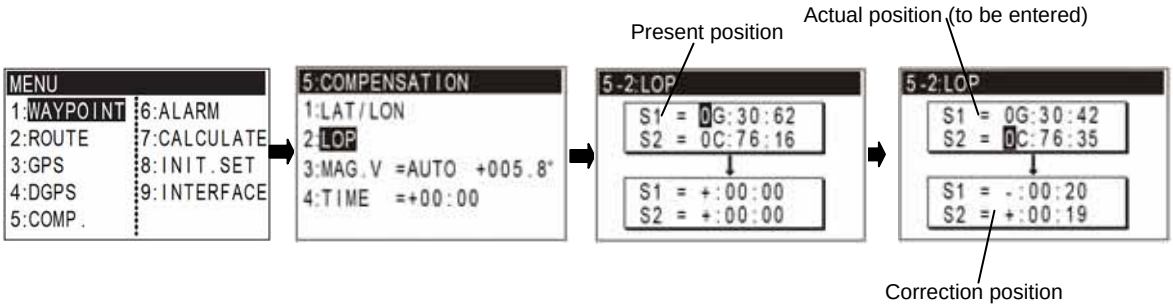


Present position (GPS fix)	Actual position (to be entered)	Correction offset
Secondary st.1 3821.8 msec	Secondary st.1 3820.0 msec	Secondary st.1 –001.8 msec
Secondary st.2 1009.0 msec	Secondary st.2 1010.0 msec	Secondary st.2 +001.1 msec

(Correction by Decca LOPs data entry)

When your position is displayed in Decca LOPs mode, you can correct it by entering the Decca LOPs correction offset.

(1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**5**] key to select "**5:COMP.**".
(3) Press [**2**] key to select "**2:LOP**".
(4) Enter correct Decca LOPs (lane and centilane) of secondary station 1 using numeric keys.
(5) Press [**ENT**] key.
(6) Press [▼] key to move cursor to Loran A LOPs field of secondary station 2.
(7) Enter correct Decca LOPs (lane and centilane) of secondary station 2 using numeric keys.
(8) Press [**ENT**] key.



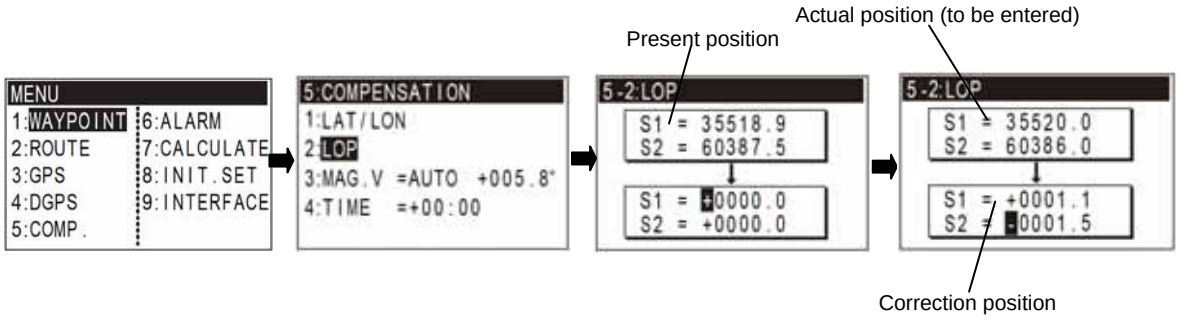
Present position (GPS fix)	Actual position (to be entered)	Correction offset
Green st. 0G:30:62 usec	Secondary st.1 30:42	Secondary st.1 –00:20 usec
Purple st. 0C:76:16 usec	Secondary st.2 76:35	Secondary st.2 +00:19 usec

9.3.2 Entry of correction offset

(Correction by Loran C LOPs data entry)

When your position is displayed in Loran C LOPs mode, you can correct it by entering the Loran C LOPs correction offset.

(1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**5**] key to select "**5:COMP.**".
(3) Press [**2**] key to select "**2:LOP**".
(4) Press [▼] key to move cursor to correction offset field of secondary station 1.
(5) Press [**SEL**] key to change the positive (+) or negative (-) sign of correction offset.
or
Press [**0**] key to use the current positive (+) or negative (-) sign as it is.
(6) Enter correction offset (6-digit) of secondary station 1 using numeric keys.
(7) Press [**ENT**] key.
(8) Press [▼] key to move cursor to correction offset field of secondary station 2.
(9) Press [**SEL**] key to change the positive (+) or negative (-) sign of correction offset.
or
Press [**0**] key to use the current positive (+) or negative (-) sign as it is.
(10) Enter correction offset (6-digit) of secondary station 2 using numeric keys.
(11) Press [**ENT**] key.



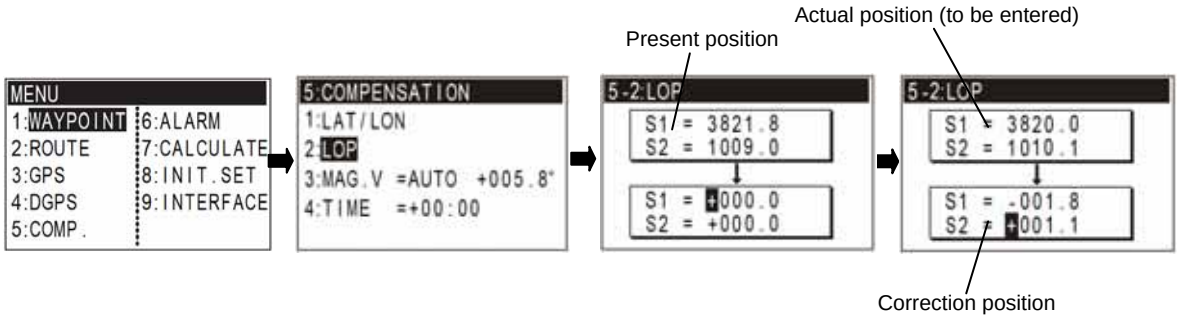
Present position (GPS fix)	Actual position (to be entered)	Correction offset
Secondary st.1 +0001.1 usec	Secondary st.1 35518.9 usec	Secondary st.1 35520.0 usec
Secondary st.2 –0001.5 usec	Secondary st.2 60387.5 usec	Secondary st.2 60386.0 usec

(Correction by Loran A LOPs data entry)

When your position is displayed in Loran A LOPs mode, you can correct it by entering the Loran A LOPs correction offset.

(1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**5**] key to select "**5:COMP.**".
(3) Press [**2**] key to select "**2:LOP**".
(4) Press [▼] key to move cursor to correction offset field of secondary station 1.
(5) Press [**SEL**] key to change the positive (+) or negative (-) sign of correction offset.
or
Press [**0**] key to use the current positive (+) or negative (-) sign as it is.
(6) Enter correction offset (5-digit) of secondary station 1 using numeric keys.

(7) Press [**ENT**] key.
(8) Press [▼] key to move cursor to correction offset field of secondary station 2.
(9) Press [**SEL**] key to change the positive (+) or negative (-) sign of correction offset.
or
Press [**0**] key to use the current positive (+) or negative (-) sign as it is.
(10) Enter correction offset (5-digit) of secondary station 2 using numeric keys.
(11) Press [**ENT**] key.

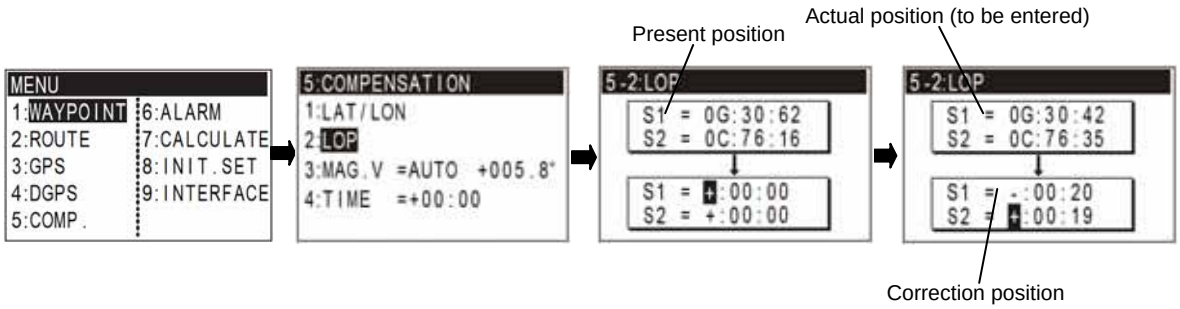


Present position (GPS fix)	Actual position (to be entered)	Correction offset
Secondary st.1 -001.8 usec	Secondary st.1 3821.8 usec	Secondary st.1 3820.0 usec
Secondary st.2 +001.1 usec	Secondary st.2 1009.0 usec	Secondary st.2 1010.1 usec

(Correction by Decca LOPs data entry)

When your position is displayed in Decca LOPs mode, you can correct it by entering the Decca LOPs correction offset.

(1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**5**] key to select "**5:COMP.**".
(3) Press [**2**] key to select "**2:LOP**".
(4) Press [▼] key to move cursor to correction offset field of secondary station 1.
(5) Press [**SEL**] key to change the positive (+) or negative (-) sign of correction offset.
or
Press [**0**] key to use the current positive (+) or negative (-) sign as it is.
(6) Enter correct Decca LOPs (lane and centilane) of secondary station 1 using numeric keys.
(7) Press [**ENT**] key.
(8) Press [▼] key to move cursor to correction offset field of secondary station 1.
(9) Press [**SEL**] key to change the positive (+) or negative (-) sign of correction offset.
or
Press [**0**] key to use the current positive (+) or negative (-) sign as it is.
(10) Enter correct Decca LOPs (lane and centilane) of secondary station 2 using numeric keys.
(11) Press [**ENT**] key.



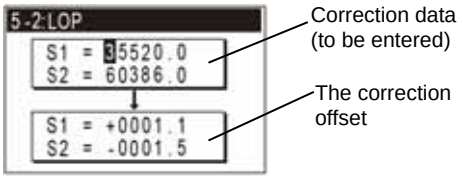
Present position (GPS fix)	Actual position (to be entered)	Correction offset
Secondary st. –00:20 usec	Green st.1 0G:30:42 usec	Secondary st.1 0G:30:42
Secondary st. +00:19 usec	Purple st.2 0C:76:35 usec	Secondary st.2 0C:76:35

9.3.3 Checking the correction offset

You can check the correction offset as follows:

(1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**5**] key to select "**5:COMP.**".
(3) Press [**2**] key to select "**2:LOP**".

Example: Loran C

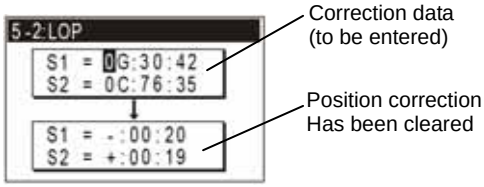


9.3.4 Disable position correction

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:COMP.**".
(3) Press [**1**] key to select "**1:LAT/LON**".
(4) Press [**CLR**] key to set correction offset to 0 correction is disabled.

Example: Decca

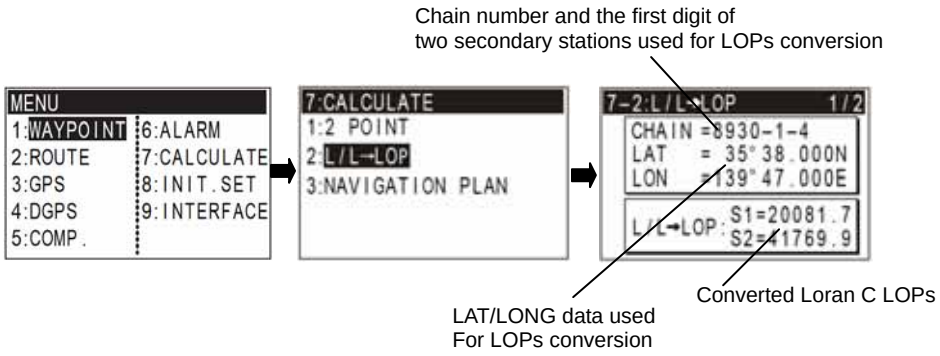


9.4 Calculating LOPs based on LAT/LONG data

9.4.1 Calculating Loran C LOPs based on LAT/LONG data

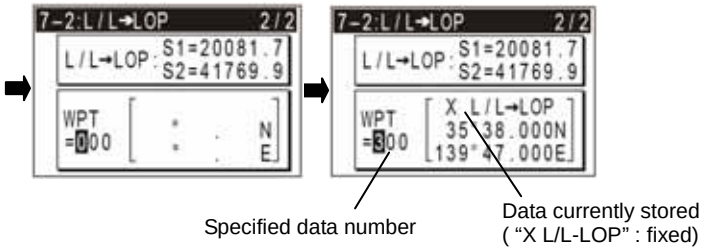
You can enter a Loran C chain number and the first digit of two secondary stations, NAVIGATOR calculates the Loran C LOPs based on the specified LAT/LONG data and displays the LOP values.

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



If you store the calculation result.

(1) Press [▼] key to display page 2/2.
(2) Enter a data number (200 to 399) using numeric keys. The existing data, if any, is displayed for your checkout.
(3) Press [**ENT**] key.



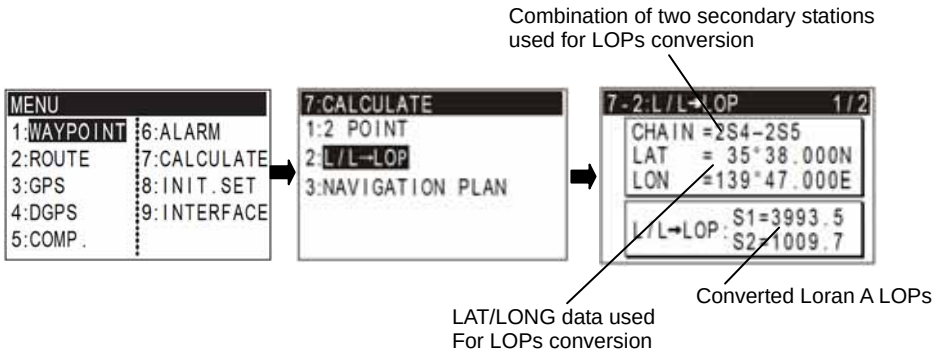
CAUTION

Do not use the converted LOPs position data for waypoint or route navigation because of likely conversion errors. Accuracy of converted positions can be off 1/4 mile or more.

9.4.2 Calculating Loran A LOPs based on LAT/LONG data

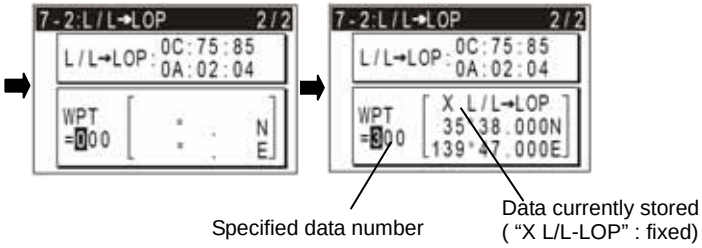
When You enter a combination of two secondary stations of Loran A, NAVIGATOR calculates the Loran A LOPs based on the specified LAT/LONG data and displays the LOP values.

(1) Press [**MENU**] key until Menu options 1 to 9 appears.
(2) Press [**7**] key to select "**7:CALCULATE**".
(3) Press [**2**] key to select "**2: L/L→LOP**".
(4) Press [**ENT**] key.
(5) Press [▼] 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 a (8-digit) longitude using numeric keys.
(16) Enter "E" for east or "W" for west latitude.
(17) Press [**ENT**] key.



If you store the calculation result.

(1) Press [▼] key to display page 2/2.
(2) Enter a data number (200 to 399) using numeric keys. The existing data, if any, is displayed for your checkout.
(3) Press [**ENT**] key.



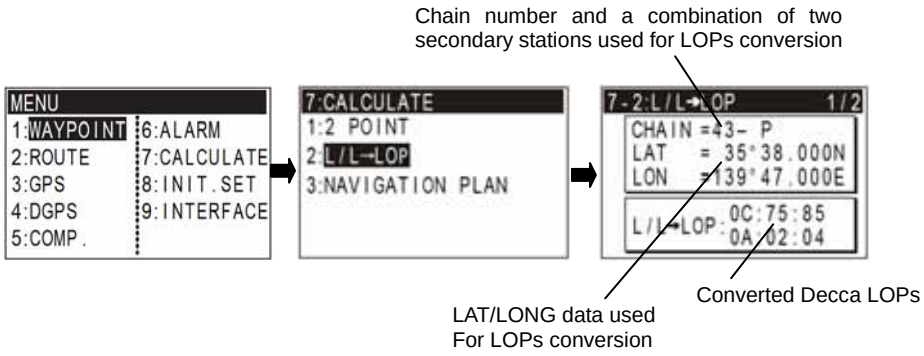
CAUTION

Do not use the converted LOPs position data for waypoint or route navigation because of likely conversion errors. Accuracy of converted positions can be off 1/4 mile or more.

9.4.3 Calculating Decca LOPs based on LAT/LONG data

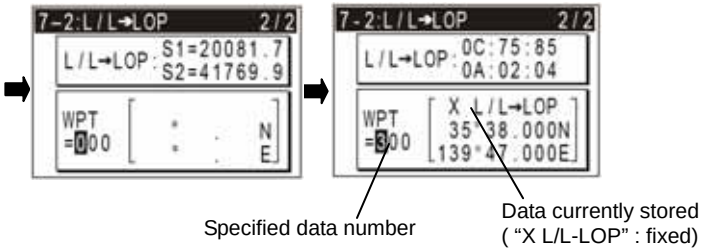
When you enter a Decca chain number and a combination of two secondary stations, NAVIGATOR calculates the Decca LOPs based on the specified LAT/LONG data and displays the LOP values.

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



If you store the calculation result.

(1) Press [▼] key to display page 2/2.
(2) Enter a data number (200 to 399) using numeric keys. The existing data, if any, is displayed for your checkout.
(3) Press [**ENT**] key.



CAUTION

Do not use the converted LOPs position data for waypoint or route navigation because of likely conversion errors. Accuracy of converted positions can be off 1/4 mile or more.

Chapter 10 Maintenance and Trouble shooting

Chapter 10 Maintenance and troubleshooting

10.1 Periodic inspection and cleaning

10.1.1 Monthly check

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

10.1.2 Maintenance

If the Processor 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.

10.2 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.

10.2.1 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

10.2.2 Trouble shooting

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

Faults detected	Possible cause of the failure	Remedial action
Equipment does not turn on	1. Is the fuse attached to the power cable blown?	1. Replace the blown fuse with a new one. (Refer to figure 10.1 for the replace method of fuse.)
	2. Dose the power supply voltage line within the rated range (10.8 to 31.2VDC)?	2. Use a proper rated main supply.
	3. Is the connection between the display unit and power supply cable firmly connected?	3. Reconnect the cable firmly to the display unit.
	4. Is the power cable firmly connected to ship's battery?	4. Reconnect the cable firmly to the battery.

Faults detected	Possible cause of the failure	Remedial action
Unstable signal reception	1. Are the connections between the GPS antenna and the display unit is correct and firm? 2. Is there any obstacle preventing the GPS unit from receiving the GPS signal?	1. Check the connection and reconnect, if necessary. 2. If an obstacle exists viewed from the GPS antenna site, the GPS signal cannot be received properly. Remove the obstacle or, if this is not possible, change the antenna position for better viewing range available.
Differential GPS (DGPS) Positioning fails	1. Are the baud rate you have set and the output signal baudrate of DGPS beacon receiver match? (See page 8-7) 2. Are the elevation angle set greater than 10 degrees? (See page 8-3)	1. Match the baud rate. 2. Set the elevation angle greater than 10 degrees.
Data cannot be Transmitted to external equipment.	1. Is the connection between the display unit and interface cable firmly connected? 2. Are the output data format and input data format of external equipment match? (See page 8-15)	1. Reconnect the cable firmly to the display unit. 2. Match the data format.

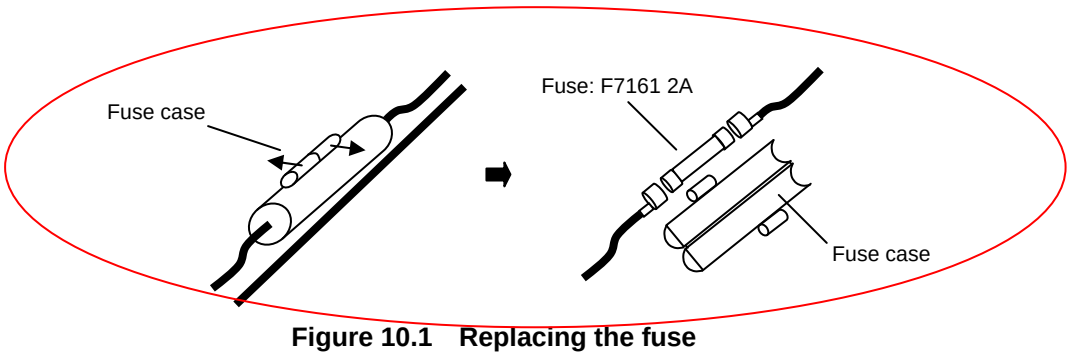


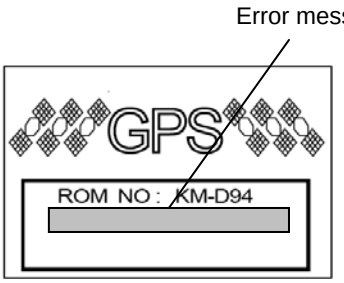
Figure 10.1 Replacing the fuse

CAUTION
Always turn off power supply before replacing the fuse

10.2.3 Error message

(An error message may appear when you power on)

BACKUP ERROR	The backup data saved at RAM is faulty.
ROM CHANGED	A checksum differs from the backed-up value.
ROM ERROR	Communication between CPU and ROM is faulty.
RAM ERROR	Communication between CPU and RAM is faulty.
BATTERY LOW	A voltage of back-up battery is low.
BEACON ERROR	Communication between CPU and internal beacon receiver is faulty.



- Call for service.
- The **ROM CHANGED** message appears when ROM has been replaced. In this case, turn the power off, and then restart again.

(An error message under operation)

There are some, which are described below in the error message under operation.

The latitude / longitude, and time in this message are a thing when an error occurs.

GPS NO FIX
35 °37.893N
141 °05.719E
01.16.04 06:01:16

1. GPS NO FIX
   This message is that it became impossible to receive a GPS signal, and when the positioning of it becomes impossible, it appears.
   Please check whether the connector of an antenna cable has separated, or the cable is not disconnected.
   A buzzer will become quiet if a key is pressed

GPS ERROR
35 °37.893N
141 °05.719E
01.16.04 06:01:16

2. GPS ERROR
   This message appears, when the data output from an internal GPS sensor becomes poor.
   Please check an internal connecting cable.
   A buzzer will become quiet if a key is pressed

HDOP ERROR
35 °37.893N
141 °05.719E
01.16.04 06:01:16

3. HDOP ERROR
   This message appears, when a HDOP value exceeds 4.
   A buzzer will become quiet if a key is pressed.

DGPS ERROR
CHECK MENU 4-5
STATION HEALTH

4. DGPS ERROR
   When the transmitting station is not working or the monitor of this message is not carried out, it appears.
   Check the station health of menu 4-5.

Chapter 11 Technical Reference

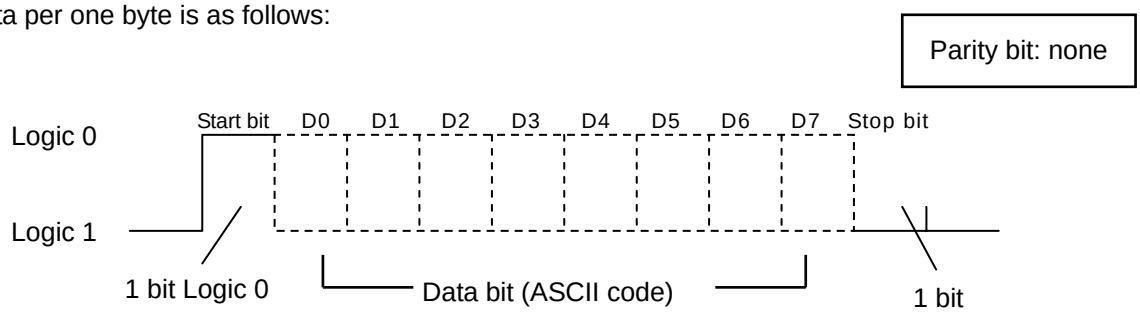
11.1 Digital Interface (IEC 61162-1 second edition)

11.1.1 Input data format (DATA 2 port)

RTCM SC104 Ver.2.0 (DGPS)

11.1.2 Output data format (DATA / DATA 2 port)

Data per one byte is as follows:

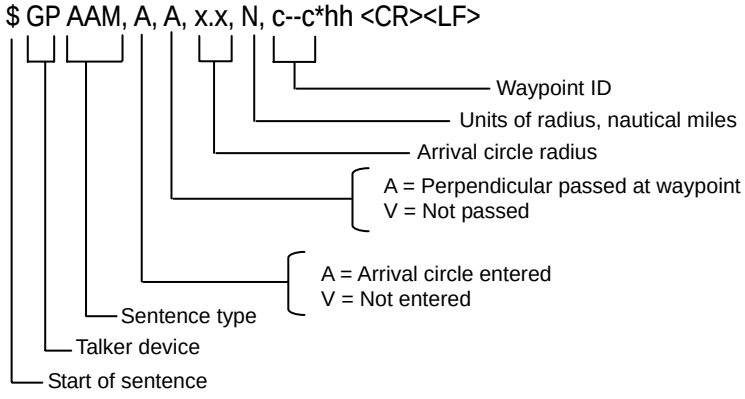


11.1.3 Output data specification

Baud rate	Output level	Output current	Sentence	Update rate
4800	RS422	20mA max	AAM, APB, BOD, BWC, DCN, DTM, **GBS**, **GGA**, GLC, **GLL**, GNS, GSA, GSV, MSS, RMB, RMC, RTE, **VTG**, WPL, XTE, **ZDA** **NOTE:** The sentences of bold character are set in 1 second cycle during initial setup.	Any of 1 to 99sec

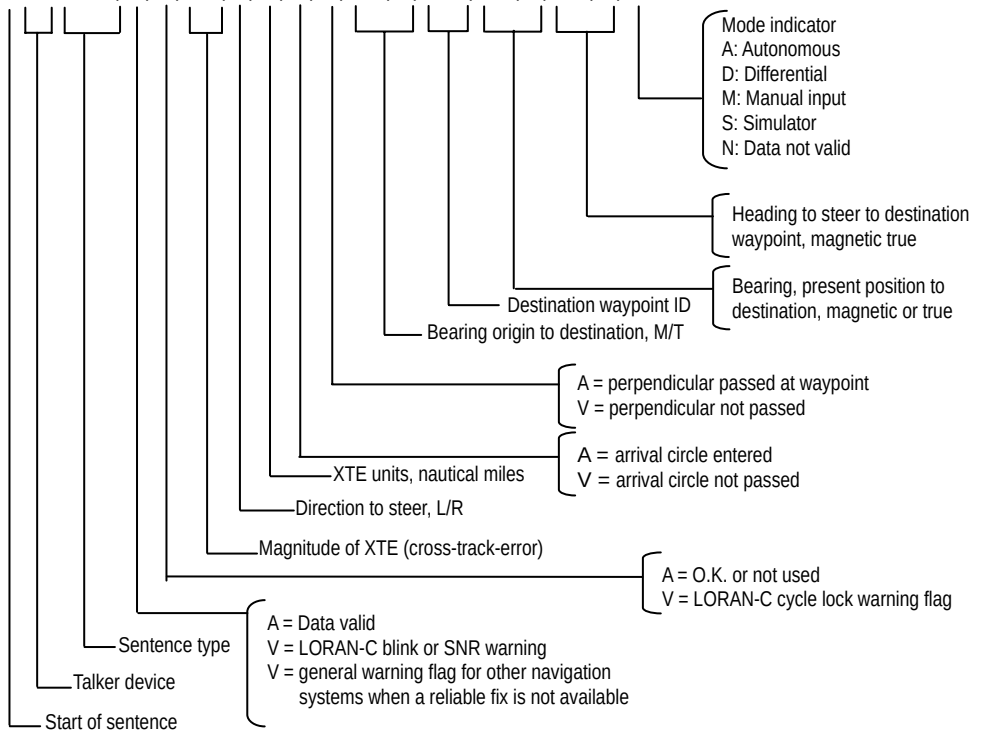
11.1.4 Output sentence

Description	**Contents of data field**
GPAAM	**Waypoint arrival alarm**



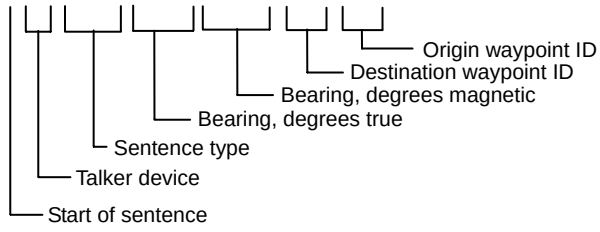
Description	Contents of data field
GPAPB	**Heading / Track controller (auto pilot) sentence B**

$ GP APB, A, A, x.x, a, N, A, A, x.x, a, c--c, x.x, a, x.x, a, a*hh<CR><LF>

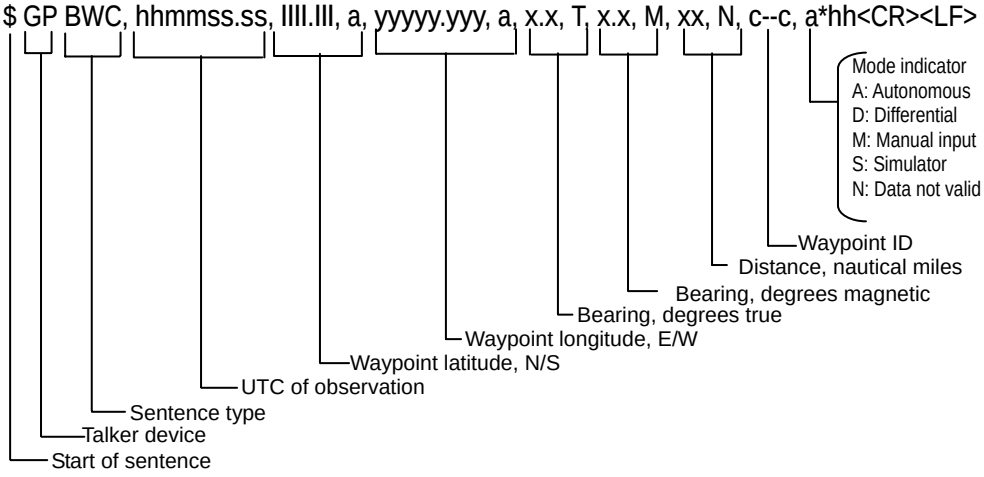


GPBOD	**Bearing origin to destination**

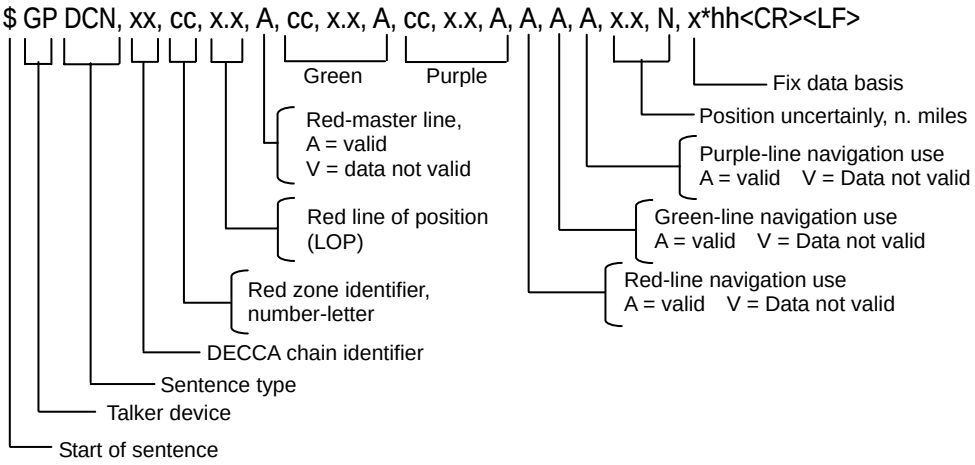
$ GP BOD, x.x, T, x.x, M, c--c, c--c*hh <CR><LF>



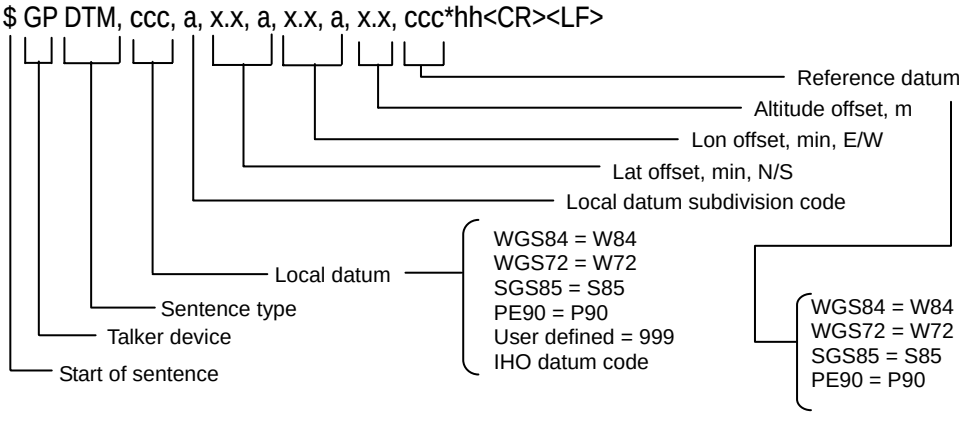
Description	Contents of data field
GPBWC	**Bearing and distance to waypoint**



GPDCN	**DECCA position**



GPDTM	**Datum reference**



Description	Contents of data field
GPGBS	**GPS satellite fault detection**

$ GP GBS, hhmmss.ss, x.x, x.x, x.x, x.x, x.x, x.x, x.x *hh<CR><LF>

- 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
- Sentence type
- Talker device
- Start of sentence

GPGGA	**GPS fix data**

$ GP GGA, hhmmss.ss, llll.lll, a, yyyyy.yyy, a, x, xx, x.x, x.x, M, x.x, M,

- UTC of position fix (hr/min/sec)
- Latitude, N/S
- Longitude, E/W
- Geoidal separation, m
- Antenna altitude, m
- HDOP value
- Number of satellites in use, 00-12,
- GPS quality indicator
  0: Fix not available or invalid
  1: GPS fix valid
  2: DGPS fix valid
- Sentence type
- Talker device
- Start of sentence

xxx, xxxx*hh<CR><LF>

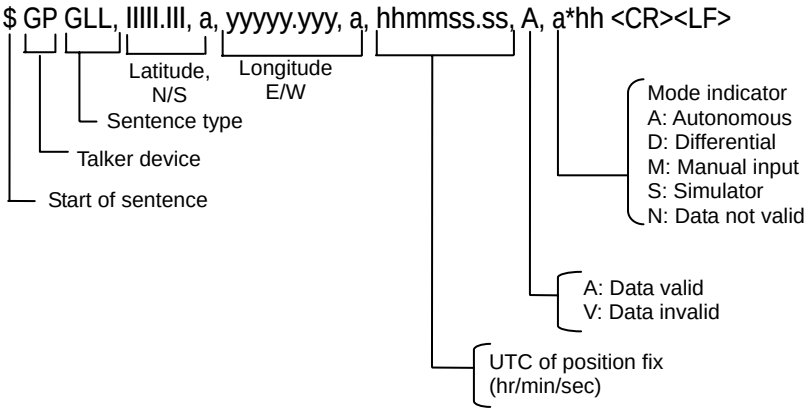
- Differential reference station ID
- Age of differential data (sec)

GPGLC	**Geographic position (LORAN-C)**

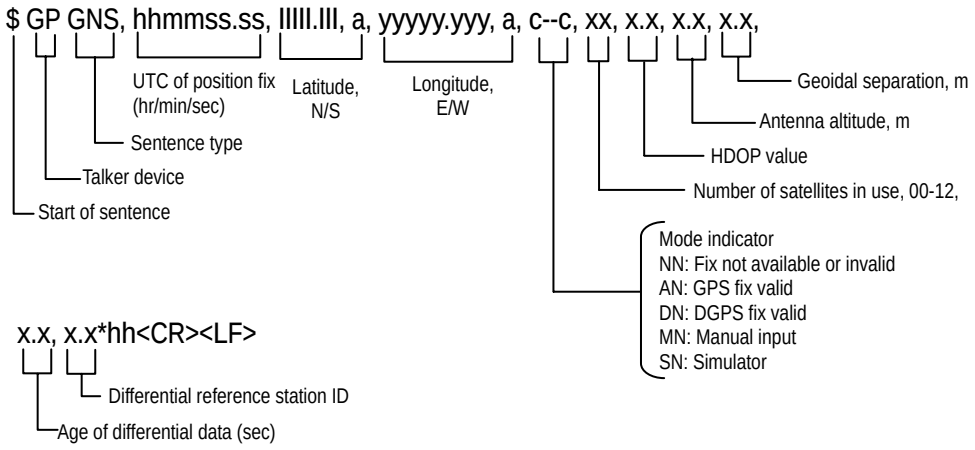
$ GP GLC, xxxx, x.x, a, x.x, a, x.x, a, x.x, a, x.x, a, x.x, a*hh<CR><LF>

- TD1 TD2 TD3 TD4 TD5
- Signal status in order of priority
  B = blink warning
  C = cycle warning
  S = SNR warning
  A = valid
- Master TOA microseconds
- GRI, in tens of microseconds
- Sentence type
- Talker device
- Start of sentence

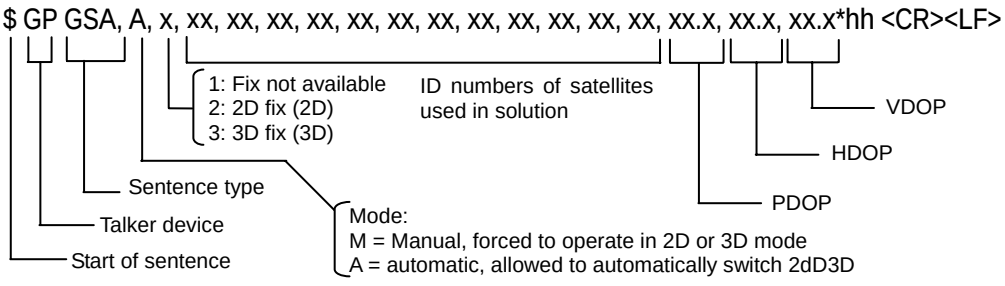
Description	Contents of data field
GPGLL	**Geographic position (latitude/longitude)**



GPGNS	**GNSS fix data**

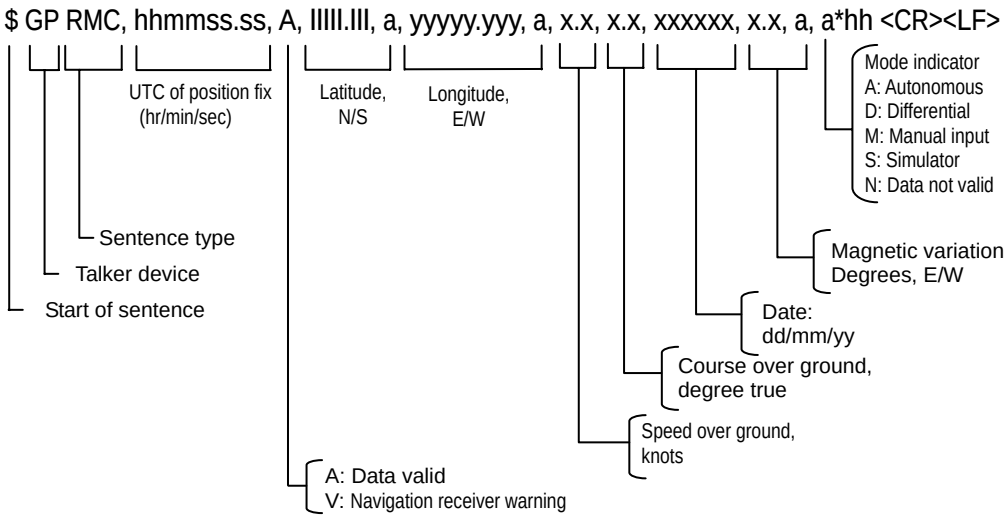


GPGSA	**GPS DOP and active satellites**

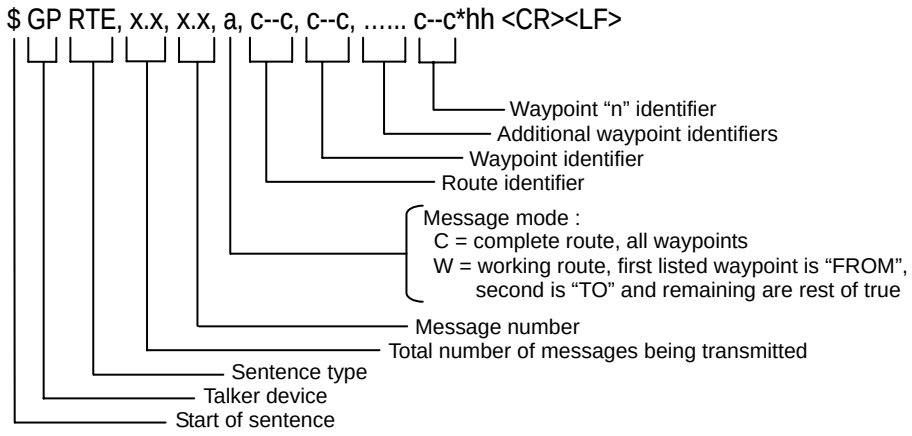


Description	Contents of data field
GPGSV	**GPS Satellite in view**
	$ GP GSV, x, x, xx, xx, xx, xxx, xx, ……, xx, xx, xxx, xx*hh <CR><LF> Start of sentence Talker device Sentence type Total number of messages (1 to 9) Message number (1 to 9) Total number of satellites in view Satellite ID number Elevation, degrees, 90 ° maximum Azimuth, degrees true, (000 to 359) SNR (C/No) 00-99 dB Hz, null when not tracking "2nd and 3rd sv 4th sv
GPMSS	**MSK receiver signal status**
	$ GP MSS, x.x, x.x, x.x, x.x, x*hh<CR><LF> Start of sentence Talker device Sentence type Signal strength (SS), dB/1 uV/m Signal-to-noise ratio (SNR), dB Beacon frequency, 285.5 – 325.5kHz Beacon bit rate (25,50,100,200) bits/s Channel number
GPRMB	**Recommended minimum navigation information**
	$ GP 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> Start of sentence Talker device Sentence type A = data valid V = navigation receiver warning Cross track error, nautical miles Direction to steer L/R Origin waypoint ID Destination waypoint ID Destination waypoint latitude, N/S Destination waypoint longitude, E/W Range to destination, nautical miles Bearing to destination, degrees true Destination closing velocity, knots A=arrival circle, entered or perpendicular passed V = not entered or passed Mode indicator A: Autonomous D: Differential M: Manual input S: Simulator N: Data not valid

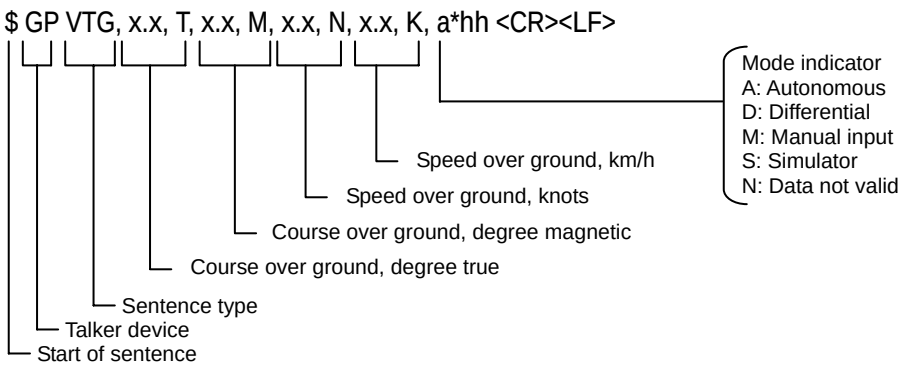
Description	Contents of data field
GPRMC	**Recommended minimum specific GPS data**



GPRTE	**Routes** *A maximum of four Waypoints are outputted.



GPVTG	**Course over ground and ground speed**



Description	Contents of data field
GPWPL	**Waypoint location** *A maximum of four Waypoints are outputted.
	$ GP WPL, llll.lll, a, yyyyy.yyy, a, c--c*hh <CR><LF> Waypoint identifier Waypoint latitude, E/W Waypoint latitude, N/S Sentence type Talker device Start of sentence
GPXTE	**Cross-track error, measured**
	$ GP XTE, A, A, x.x, a, N, a*hh <CR><LF> Mode indicator A: Autonomous D: Differential M: Manual input S: Simulator N: Data not valid Units, nautical miles Direction to steer, L/R Magnitude of cross-track error A = data valid V = LORAN-C cycle lock warning flag A = data valid V = LORAN-C blink or SNR warning, V = general warning flag for other navigation systems When a reliable fix is not available Sentence type Talker device Start of sentence

11.1.5 Input / Output circuit

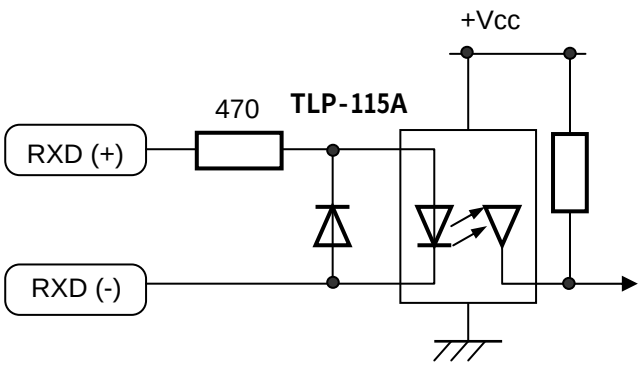
Port (connector) name: DATA, DATA2

The connector used: LTWBD-06BFFA-L180 (DATA) / LTWBD-08BFFA-L180 (DATA 2)

(DATA port Input circuit)

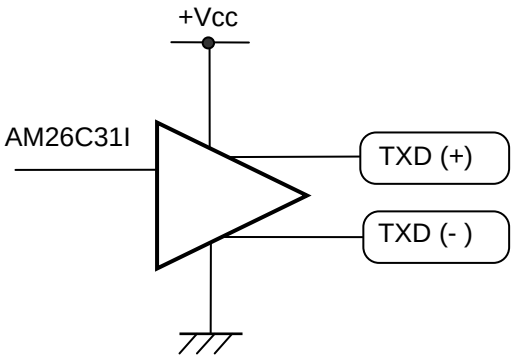
Input load: 470 ohm

Device: Photo-coupler TLP151A (Toshiba)



(DATA port output circuit)

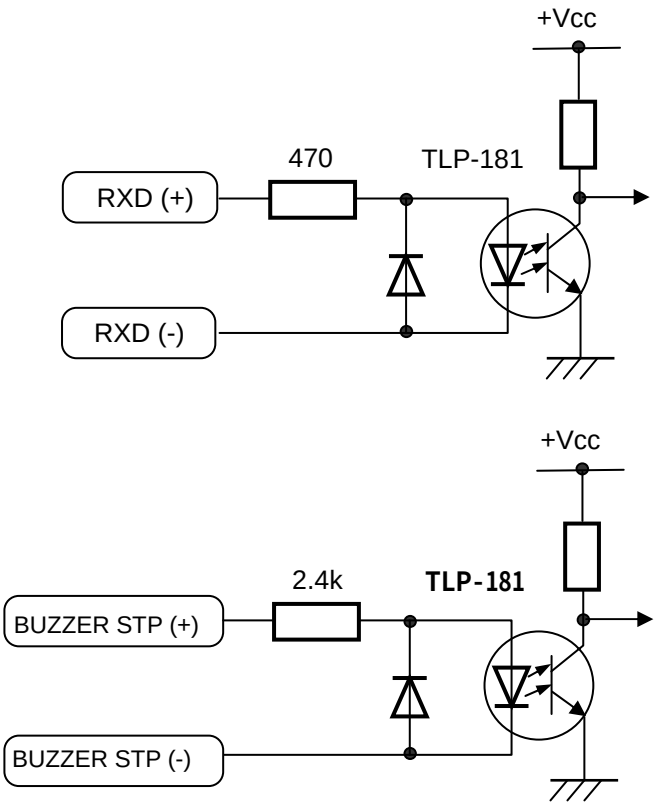
Device: Driver IC AM26C311 (T.I)



(DATA 2 port input circuit)

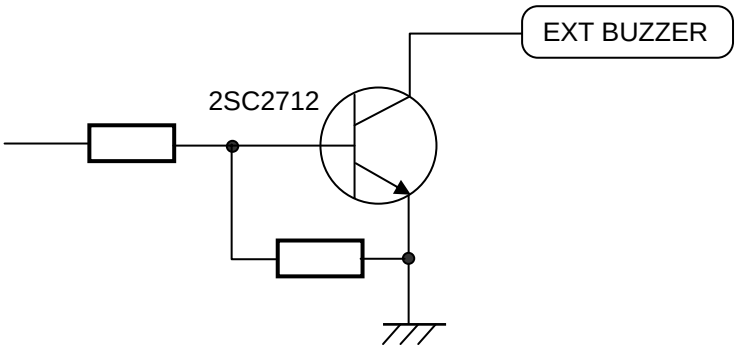
Input load: 470 / 2.4k ohm

Device: Photo-coupler TLP181(Toshiba)



DATA 2 port output circuit

Device: Transistor 2SC2712



Chapter 12 Communication with external navigation system

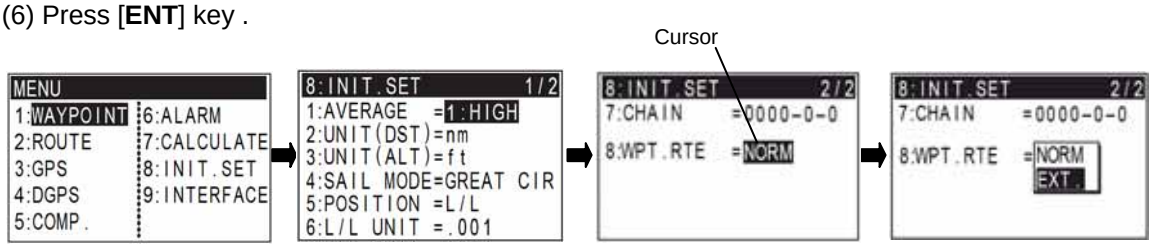
Communication with external navigation system

KGP-920 is provided with a mode having capability to communicate with external system such as ECDIS and can take in route data from the interfaced external system.
Then KGP-920 can work on the same route as the external system does.
If a route is transferred to KGP-920 from the external system before voyage, KGP-920 can play a role as back up system in case of failed external system by any reason. While the external system is in working navigation mode, the working route information is automatically transferred to KGP-920 and KGP-920 navigates on the same route as the external system does.
In order to utilize this function, connection between KGP-920 and an external system should be established by a connecting cable according to the operation manual (Page 69 and 70 interconnecting Diagram).

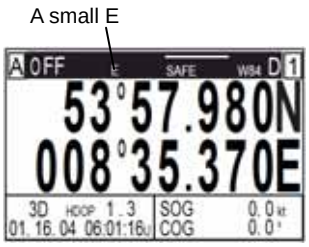
12.1 Changing to the EXTERNAL mode

Communication with an external system such as ECDIS is established by switching KGP-920 from NORMAL mode to EXTERNAL mode.
However switching to EXTERNAL mode is not acceptable when KGP-920 is in Route/Waypoint navigation or Anchor watch operation in NORMAL mode. Reset those functions before switching to EXTERNAL mode.
Switching steps are as follows.

(1) Press [**MENU**] key until Menu options 1 to 9 appear.
(2) Press [**8**] key to select "**8:INIT.SET**".
(3) Press [▼] key to move cursor to "**8:WPT.RTE**" .
(4) Press [**ENT**] key .
(5) Press [▼] key to select "**EXT.**".
(6) Press [**ENT**] key .



A small E is displayed at the end of the way point identifier to show KGP-920 is in external mode.
Route identifier shows maximum leading 5 characters of the original route name while waypoint identifier shows maximum leading 6 characters of the original waypoint name.



12.2 Route data transfer

Only a single route date can be transferred to KGP-920.

Route data should consist of a combination of $--RTE (Route) and $--WPT (Waypoint) sentences specified by IEC61162.

Maximum number of characters including checksum in a RTE sentence line is limited to 124 bytes.

Route data can be two kinds of data, a Complete route or a Working route. A Complete route can contain 100 waypoints (waypoints excess of 100 are ignored) while a Working route can contain 9 waypoints and the last passed over waypoint (waypoints excess of 9 are ignored).

In EXT. mode, working route has priority over other functions including route navigation. When KGP-920 receives a Working route data, it automatically goes into Working route navigation.

Maximum waypoint storage capacity is for 400 points combined with both NORMAL and EXT. modes.

12.2.1 Complete route transfer

When KGP-920 receives a Complete route data, “OVERWRITING last sent route” is indicated and then it indicates “LOADED ext. route” to notify the route was successfully transferred.

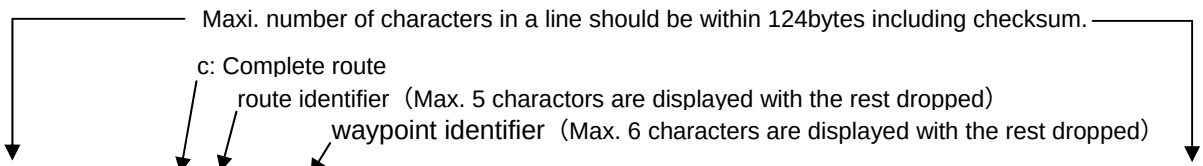
When consecutive more than single routes are received. It indicates “INVALID ext. route” and voids received data but the previously loaded route data remains and valid.

KGP-920 judges data transfer is ended when more than 10 second interruption of data transfer occurs.

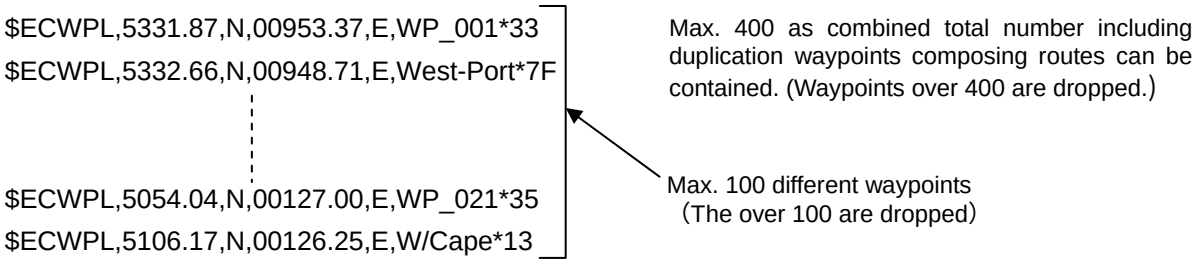
The Complete route is stored as number 19th route.

ORVERWRITING last sent route	Receiving indication of a Complete route
LOADED ext. route	A Complete route became valid
INVALID ext. route	Received route was voided

Following is an example of Complete rote data. Refer to IEC61126 for detail.



$ECRTE,3,1,c,Dover,WP_001,West-Port,WP_003,WP_004,WP_005,E:Cape,WP_007,WP_008*0B
$ECRTE,3,2,c,Dover,WP_009,WP_010,WP_011,East.Port,WP_013,WP_014,WP_015,WP_016*3D
$ECRTE,3,3,c,Dover,WP_017,WP_018,WP_019,WP_020,WP_021,W/Cape*4D



12.2.2 Selecting route navigation

Procedure to navigate by the received Complete route by following steps.

(1) Press [**MODE**] key until **A** (NAV1), **B** (NAV2), **C** (NAV3) or **D** (PLOT) screen appears.

(2) Press [**SEL**] key until page 5 screen appears.

(3) Press [▲] or [▼] key to move cursor to "**RTE**" letters.

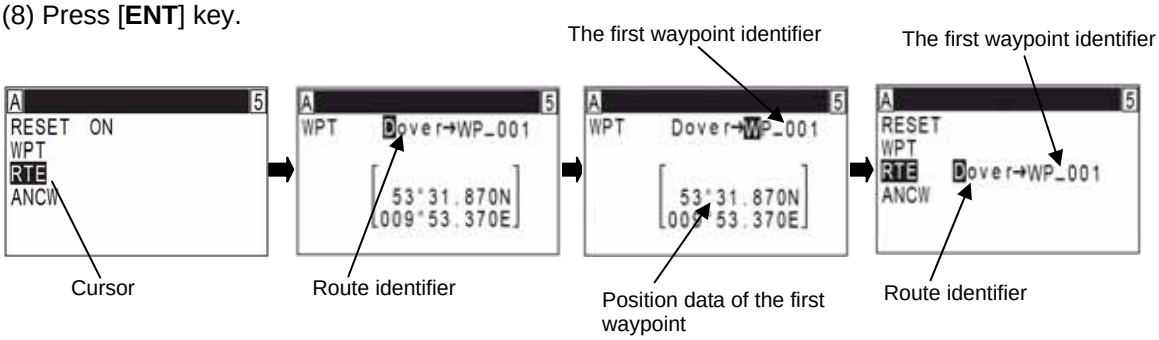
(4) Press [**ENT**] key.

(5) Press [▲] or [▼] key to select the required Complete route identifier (name or number).

(6) Press [▶] key

(7) Press [▲] or [▼] key to select the start waypoint identifier (name or number).

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



12.2.3 Working (active) route transfer

When KGP-920 receives Working route data for the first time, it shows "LOADED ext. active route" and goes into Working route mode regardless of previous navigation mode due to the first priority.

As far as KGP-920 receives Working route data within 10 seconds consecutively, it continues to work for the received working route.

When waypoint is changed by reaching to the next waypoint or other reasons, "LOADED waypoint change " is indicated.

If interruption of Working route data transfer exceeds 10 seconds, KGP-920 judges working route navigation has ended and quits working in route navigation by indicating "DEACTIVATED ext. active route" and goes back to the previous mode.

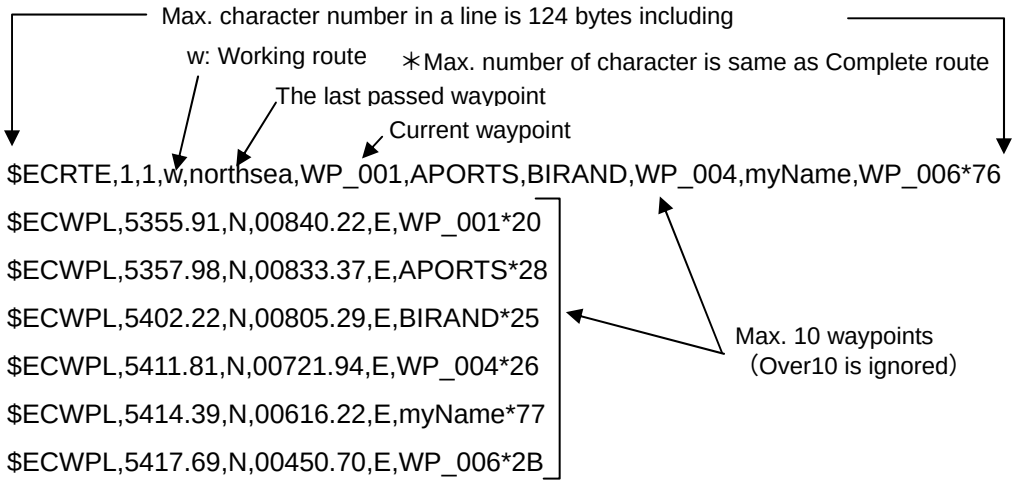
When an external route is received during working route navigation, it is rejected by showing "REJECTED ext. route Route is active".

The working (active) route is stored as number 20th route.

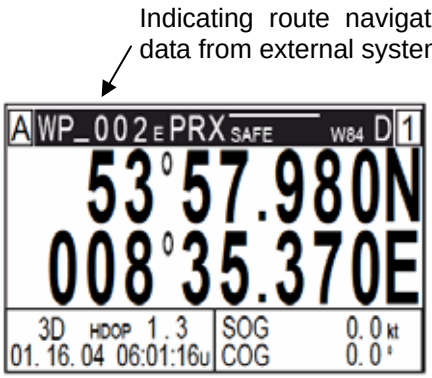
LOADED ext. active route	New Working route became valid
LOADED waypoint change	Waypoint was changed

DEACTIVATED ext. active route	Working route is finished

Following is an example of Working route data. Refer to IEC61162-1 for detail.



Working route has priority and route navigation by Working route automatically begins by reception of working route data. It is updated every time Working route data is received.



12.2.4 Error message

Following indications are displayed during transfer of data from an external navigation system for user's reference.

Press (CLR)key to erase the indication and try transfer again.

ERROR overflow	Number of characters in a line is exceeding 124 bytes.
ERROR checksum	Checksum error.
ERROR format	Sentence format error.

Annex

Local Geodetic Systems

The number assigned to each place name is the set values used in the “Selecting a geodetic datum” (Page 8-3)

In alphabetical order

Name	Abbreviation	No.	Name	Abbreviation	No.
ALASKA / CANADA	A/C	04	IWO JIMA	IWO	32
ARC 50	ARF	29	JAPAN	JAP	24
ARC 60	ARS	30	JOHNSTON	JOH	53
ARGENTIN	ARG	39	KELGUELEN	KEL	55
ASCENSION	ASC	31	LIBERIA 64	LIB	57
AUSTRALIAN 84	AUS	06	MAHA 71	MAH	58
BAHRAIN	BAH	27	MALAYSIA	MAL	23
BERMUDA	BER	37	MALDIVE	MLD	48
BRAZIL	BRZ	45	MARCUS	MCS	35
CANARY	CAN	68	MARSHALL	MSL	82
CAYMAN BRAC	CYB	56	MASCARENE	MAS	73
CHATHAM	CAT	43	MIDWAY 61	MID	62
COCOS	CCS	28	MOROCCO	MOR	61
COLOMBIA	CLB	38	NAD-27	N27	03
CORVO/FLORES	C/F	65	NAD-83	N83	10
DIEGO GARCIA	DEG	52	NEW GEORGIA	NEG	46
DJAKARTE	DJK	22	NEW ZELAND	NEZ	13
EAST FALKLAND	EAF	76	NIGERIA	NIG	63
EAST MALAYSIA	EAM	79	OMAN	OMA	67
EASTER	EST	47	PARAGUAY	PAR	44
EFATE	EFA	36	PHILLIPPINES	PHI	19
EGYPT	EGY	66	PHOENIX	PNX	40
ENGLAND	ENG	20	PITCAIRN	PIT	69
ERITREA	ERI	60	PORTO SANTO	POS	77
ETHIOPIA	ETH	25	PUERTO RICO	PUR	71
EUROPEAN 50	E50	05	QATAR	QAT	72
EUROPEAN 79	EUS	14	ROME 40	ROM	15
FAIAL	FAI	78	SALVAGE	SAV	59
FIJI	FIJ	81	SANTA MARIA	SAM	75
FINLAND	FIN	84	SANTO	SAE	74
FLORIDA	FLO	41	SAUDIARABIA	SAR	17
GREENLAND	GRE	09	SOMALIA	SOM	26
GUADALCANAL	GUD	50	SOUTH AFRICA	SAF	16
GUAM 63	GUA	49	SOUTH AMERICA	SAN	08
HAWAII	HAW	21	SOUTH ASIA	SOA	07
HONG KONG 63	HKD	51	SOUTH CHILE	SCH	70
ICELAND 55	ICE	11	SRILANKA	SRI	54
INDIAN / NEPAL	I/N	18	ST.HELENA	STH	34
IRELAND 65	IRL	12	SURINAM	SUR	83

Local Geodetic Systems

Name	Abbreviation	No.	Name	Abbreviation	No.
SWEDEN	SWE	85			
TERN	TER	33			
TOKYO	TOY	02			
TRINIDAD	TRD	64			
TRISTAN	TRI	80			
TUNISIA	TUN	42			
WGS-72	W72	01			
WGS-84	W84	00			
HU-TZU-SHAN	HTN	86			

Decca zone

Chain	No.	Code
EUROPE		
South Baltic	00	0A
Vestlandet	01	0E
Southwest British	02	1B
Northumbrian	03	2A
Holland	04	2E
North British	05	3B
Lofoten	06	3E
German	07	3F
North Baltic	08	4B
Northwest Spanish	09	4C
Trondelag	10	4E
English	11	5B
North Bothnian	12	5F
South Spanish	13	6A
North Scottish	14	6C
Gulf of Finland	15	6E
Danish	16	7B
Irish	17	7D
Finnmark	18	7E
French	19	8B
South Bothnian	20	8C
Hebridean	21	8E
Frisian Islands	22	9B
Helgeland	23	9E
Skagerrak	24	10B
PERSIAN GULF		
North Persian	25	5C
South Persian	26	1C
INDIAN OCEAN		
Bombay	27	7B
Calcutta	28	8B
Bangladesh	29	6C
JAPAN		
Hokkaido	30	9C
North Kyushu	32	7C
SOUTH AFRICA		
Namaqua	33	4A
Cape	34	6A
Eastern province	35	8A

Chain	No.	Code
NORTH WEST AUSTRALIA		
Dampier	36	8E
Port Hedland	37	4A
CANADA		
Anticosti	38	9C
Newfoundland	39	2C
Cabot Straits	40	6B
Nova Scotia	41	7C
INDIAN OCEAN		
Salaya	42	2F
SOUTH AFRICA		
Southwest Africa	44	9C
Natal	45	10C

KODEN

Koden Electronics Co., Ltd.

Tamagawa Office:
2-13-24 Tamagawa, Ota-ku, Tokyo, 146-0095 Japan
Tel: +81-3-3756-6501 Fax: +81-3-3756-6509
Uenohara Office:
5278 Uenohara, Uenohara-shi, Yamanashi, 409-0112 Japan
Tel: +81-554-20-5860 Fax: +81-554-20-5875

www.koden-electronics.co.jp

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