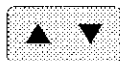


Setting



• Move cursor to desired item
• by pressing arrow key.



• Changes the contents corresponding
• to the item selected.

Options on MENU screen

MENU

```
1  GPS STATUS
2  CALCULATION
3  ALARM
4  COMPENSATION
5  NAVIGATION
6  INTERFACE
7  GPS
8  DATUM
9  NMEA-0183 EDIT
10 MARK
11 ROUTE
12 BEACON
```

1. **Display of GPS satellites being received**
2. **Navigation calculation**
 - Setting Loran C chain and secondary stations
 - Setting Decca chain
 - Automatically calculating route for a great circle navigation
 - Calculating distance and bearing between two memory points
3. **Alarms**
 - Setting range (proximity, anchor watch, cross track error, CDI, and boundary)
 - Setting boundary line
 - Setting differential GPS alarm
4. **Correction**
 - Position correction
 - Applying magnetic correction compensation
 - Time difference setting
5. **Setup of navigation information**
 - Selecting speed and distance unit
 - Selecting altitude unit
 - Selecting position display (lat/lon, Loran C LOPs or Decca LOPs)
 - Selecting navigation mode (great circle navigation or thumb line navigation)
 - Selecting external data input and display mode
 - Gyro log data: GRA-20A
 - Depth: Echo sounder
 - Loran C LOP or Decca LOP: Navigator
 - Lat/lon: Navigator
 - Changing the LAT/LONG display digits (between 0.001' and 0.0001')
6. **Interface setup**
 - Selecting input format
 - Selecting data input connector
 - Selecting output format
 - Selecting output log pulse ratio
7. **GPS setup**
 - Setting altitude
 - Selecting position averaging factor
 - Setting HDOP mask value
 - Setting PDOP mask value
 - Setting elevation angle mask value
 - Selecting positioning mode
 - Selecting DGPS mode
 - Setting DGPS time-out
8. **Selection of geodetic datum**
9. **Editing of NMEA-0183 format**
10. **Display and editing of position memory data**
11. **Display and editing of route and boundary memory data**
12. **Selecting beacon station (frequency and bit rate)**

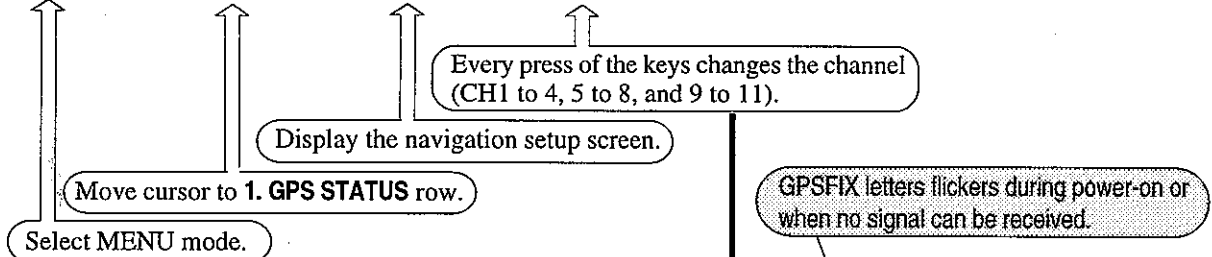
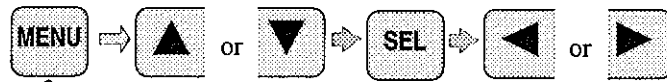
For option items 10 and 11, see pages 14 to 19.

▲ ▼ . Move cursor to desired item
 by pressing arrow key.

SEL . Changes the contents corresponding
 to the item selected.

Displaying GPS satellites being received

The satellites being received can be displayed by the following procedure.



SV STATUS		GPSFIX			
CH		1	2	3	4
No.		32	20	14	03
S/N		10	12	10	17
ELV		74	30	10	25
AZI		181	41	318	130
TOTAL	SV				24
VISIBLE	SV				07
XTAL OFFSET				40.	5 Hz
HDOP		2.	1		

GPS satellite number being received

S/N of satellite signal being received
 A value from 10 to 20 is usually displayed when the elevation angle is 10° or more.

Elevation angle of satellite being received

Azimuth of satellite being received

Total number of satellites (currently available to use)

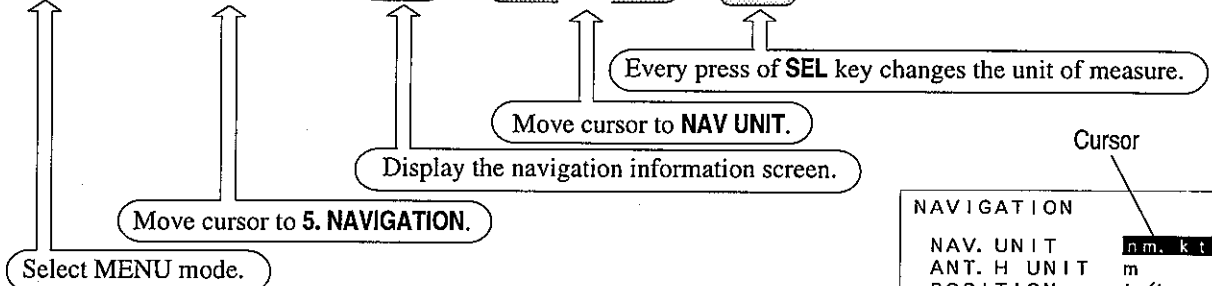
Number of satellites that can be received (above the horizontal line)

HDOP value (for 2-dim. positioning)
 PDOP value (for 3-dim. positioning)
 If it exceeds the DOP limit, the positioning is suspended.
 The large value shows the reduced accuracy.

Frequency error of receiver crystal
 Normal range: 20 to 80 Hz
 Center value: 50 Hz

Changing the unit of measure for velocity and distance

The unit of measure for velocity, distance to waypoint (or destination), trip mileage, scale factor of plotter screen (PLOT mode), and plotting interval can be changed by the following procedures:



Rotation of the unit of measure

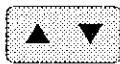
→ nm, kt → km, kmh → sm, mph →

Equivalent

1 nm: 1.852 km
 1 sm: 1.609 km

Cursor

NAVIGATION	
NAV. UNIT	nm, kt
ANT. H UNIT	m
POSITION	L/L
SAILMODE	GREAT CIR
EXT. DATA	DEPTH fm
L/L UNIT	0.001'



• Move cursor to desired item
• by pressing arrow key.



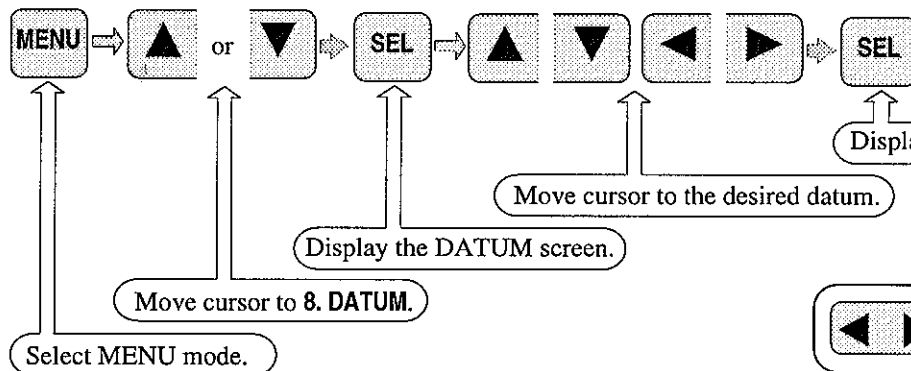
• Changes the contents corresponding
• to the item selected.

Selecting datum

The datum is factory-set to WGS-84 for positioning your location. However, various sea charts based on different datums are used all over the world. When required, the same datum as your sea chart can be specified so that your position is displayed based on the newly specified datum for compensation.

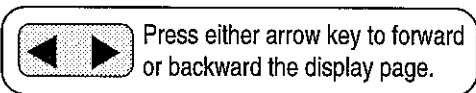
For setting datum, refer to the Appendix A Local geodetic systems on Page 76.

Domestic: Select 00 : WGS-84.



Selected datum

DATUM
WGS-84
00. WGS-84
01. WGS-72
02. TOKYO
03. NAD27
04. ALASKA CANADA
05. EUROPEAN 50
06. AUSTRALIA 84
07. SOUTH ASIA
08. SOUTH AMERICA
09. GREENLAND

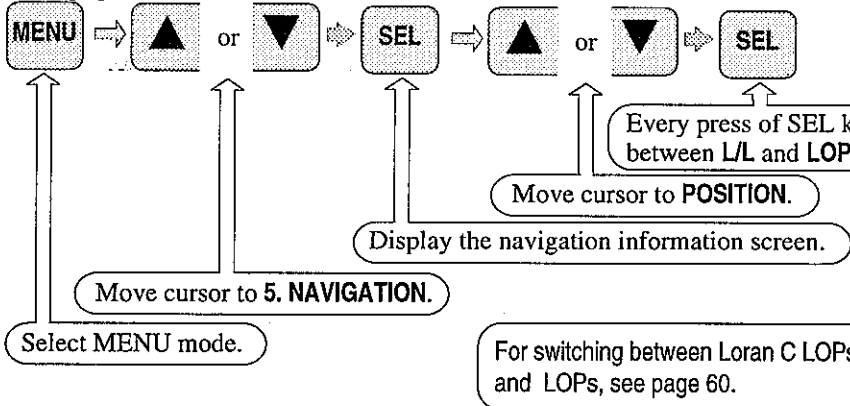
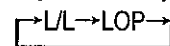


Changing the coordinates for present position display

Position data can be displayed either Local C LOPs (or Decca LOPs) or Lat/lon. It can be selected by the following procedure.

For Loran C LOPs display, make sure to perform the operation of "Changing the combination of Loran C chain and secondary stations" below. For Decca LOPs display, perform the operation of "Changing Decca chain" below.

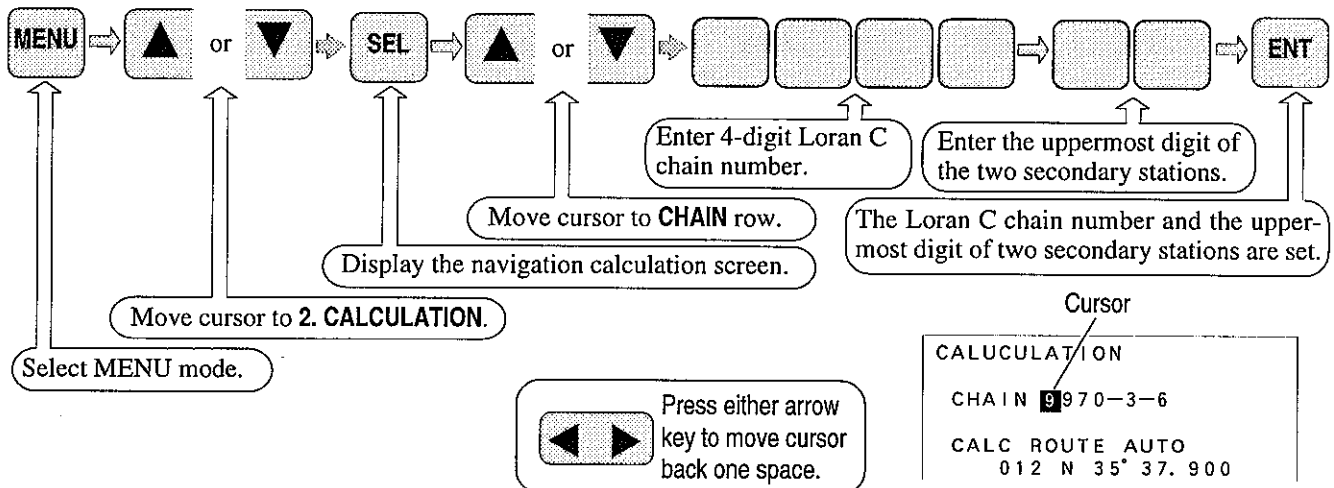
Rotation of the coordinates for position display



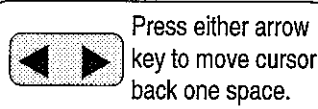
NAVIGATION
NAV. UNIT nm, kt
ANT. H UNIT m
POSITION L/L
SAILMODE GREAT CIR
EXT. DATA DEPTH fm
L/L UNIT 0.001'

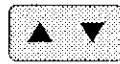
Changing the combination of Loran C chain and secondary stations

Present position data in Lat/lon, permanent memory position data in Lat/Lon (with mark), instant memory position data (with event mark), can be displayed in Loran C LOPs by the following procedures:



CALCULATION
CHAIN 9 970-3-6
CALC ROUTE AUTO
012 N 35° 37.900





Move cursor to desired item by pressing arrow key.

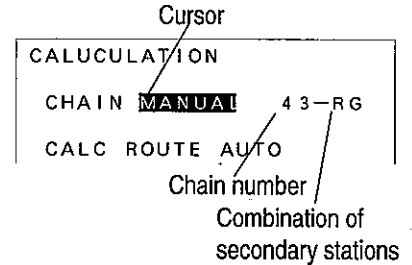
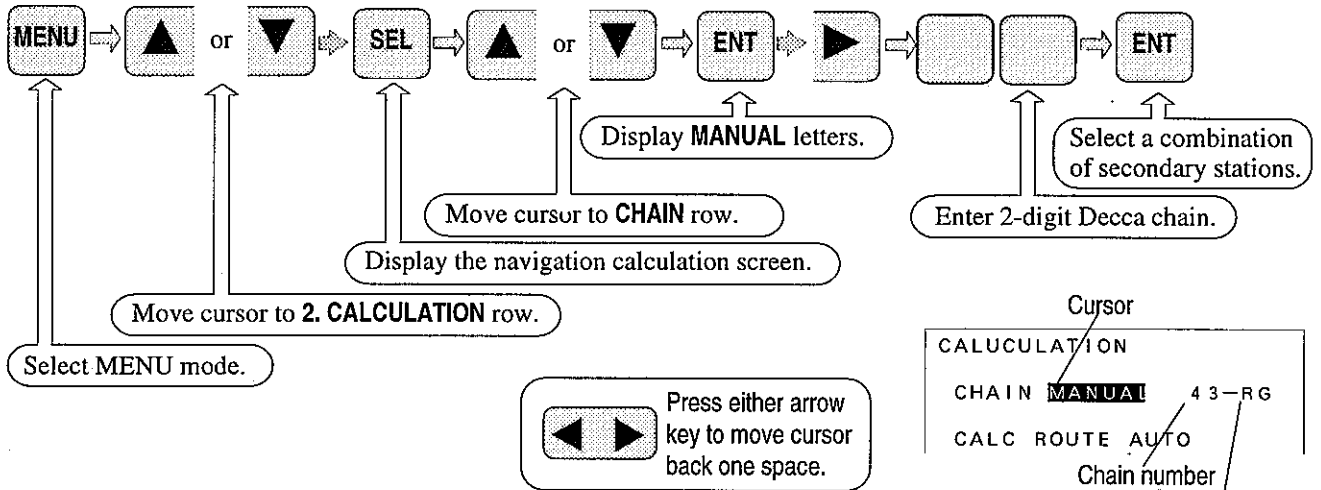


Changes the contents corresponding to the item selected.

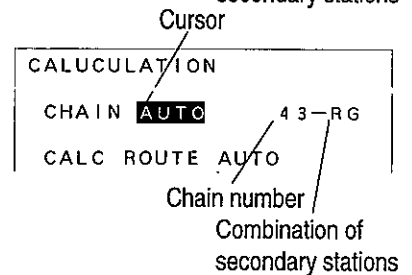
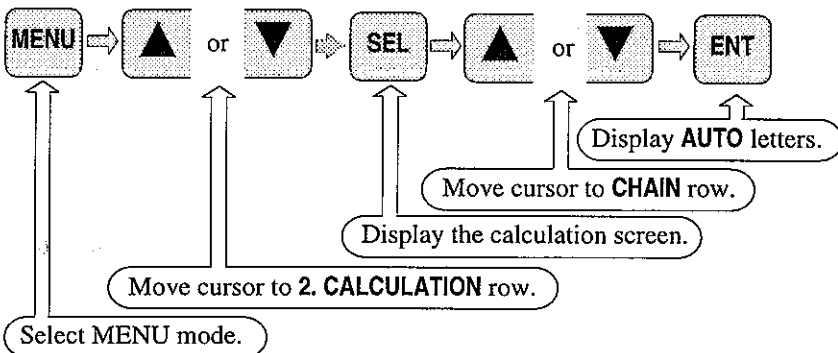
Changing Decca chain

If the following procedure has been made, the Lat/Lon data can be converted into Decca LOPs data and displayed. These data includes the present position, any memory position (Stored mark), and memory position (Event memory) calculated by GPS.

Manual selection of Decca chain



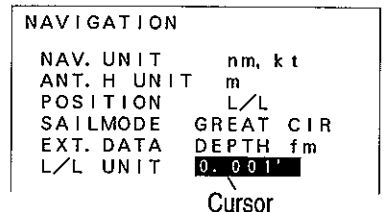
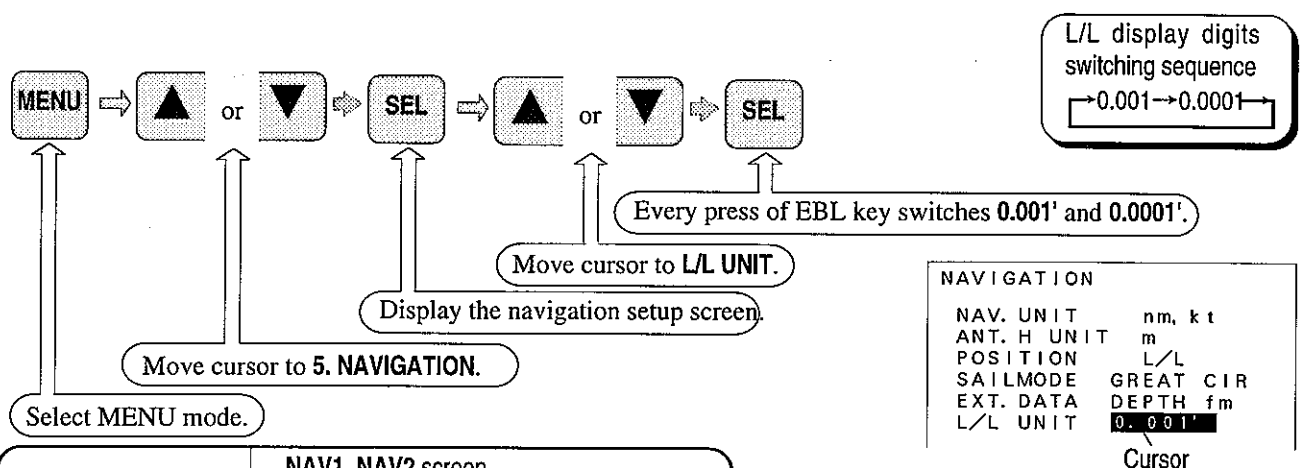
Automatic selection of Decca chain



Changing the latitude and longitudinal display digits (between 0.001' and 0.0001')

Initial setup: 0.001'

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




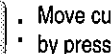
Sample displays when 0.0001 is selected:


NAV1, NAV2 screen

OFF	OFF			
OFF	OFF	N	.	.
▼H2.	IOFF	E	.	.
DGPS	35	38	1450	
N	139	43	2800	
SPEED	COURSE			
10.2	kt	270.	5	
STG	XTE	DIST		
.	.	nm	.	nm

Present position display

If you select 0.0001', the latitude and longitude data of GGA sentence will also be output in 0.0001' in the Output Data Format 0183. (However, the data is available only for DGPS measurement).

  . Move cursor to desired item
 by pressing arrow key.

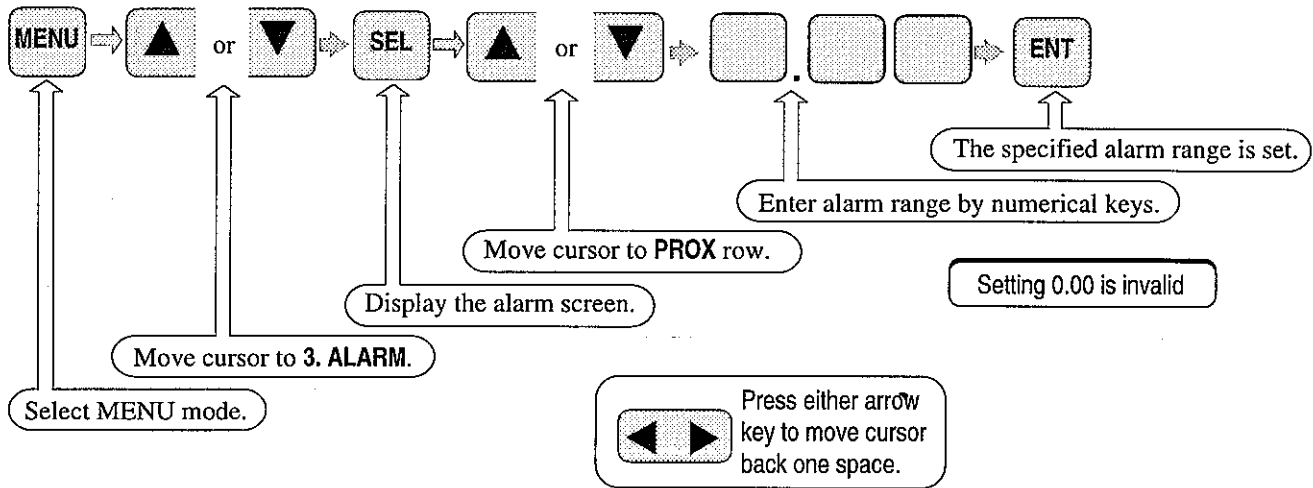
 . Changes the contents corresponding
 to the item selected.

Setting proximity alarm range

Range limit for proximity alarm: 0.00 to 9.99

The alarm can sound with the letters PROX flickering when your vessel arrives at the specified waypoint. This alarm range can be set by the following procedures:
 To activate the proximity alarm, highlight the letters PROX on NAV 1 or NAV 2 mode display.

ALARM	
PROX	0.05 nm
ANCW	0.05 nm
XTE	0.05 nm
CDI	30.0°
BDY	0.10 nm
BDY SET	01-00:49
DGPS	OFF

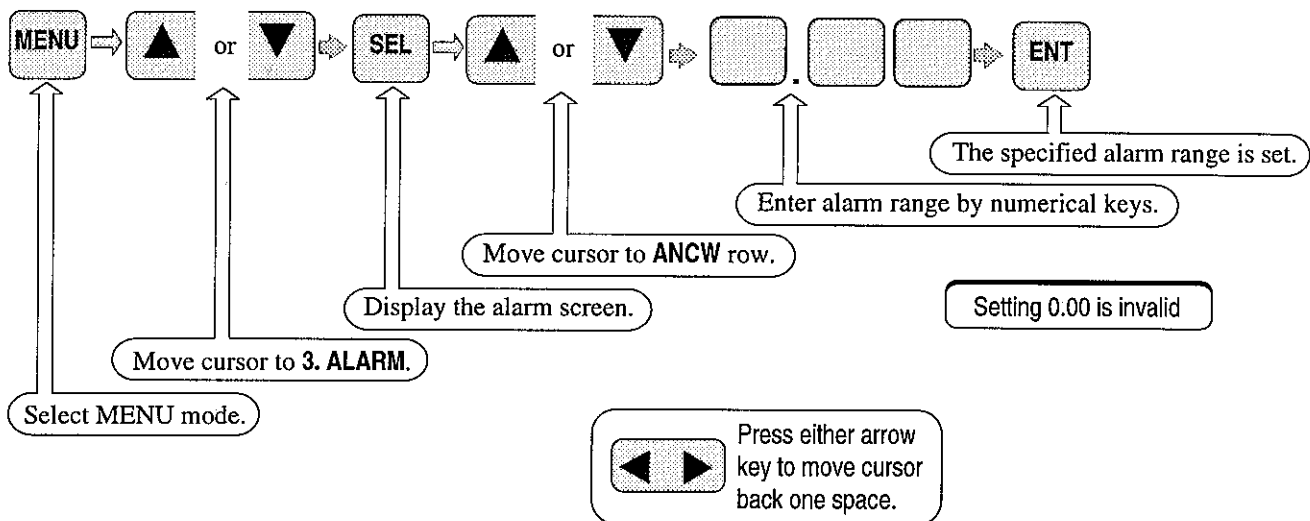


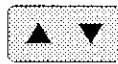
Setting anchor watch alarm range

Range limit for anchor watch alarm: 0.00 to 9.99

The alarm sounds with the letters ANCW flickering when your vessel shifts out of the specified range. This alarm range can be set by the following procedures:
 To activate the anchor watch alarm, highlight the letters ANCW on NAV 1 or NAV 2 mode display.

ALARM	
PROX	0.05 nm
ANCW	0.05 nm
XTE	0.05 nm
CDI	30.0°
BDY	0.10 nm
BDY SET	01-00:49
DGPS	OFF





• Move cursor to desired item
• by pressing arrow key.



• Changes the contents corresponding
• to the item selected.

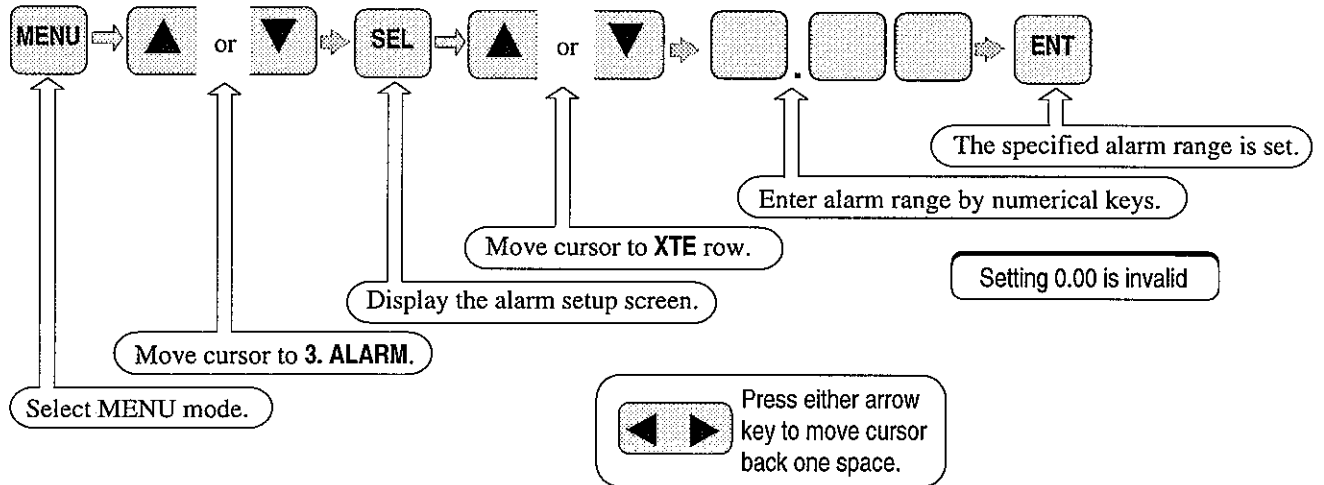
Setting cross track error alarm range

The alarm sounds with the letters XTE flickering when your vessel deviates from the course to the waypoint specified. This alarm range from the course can be set by the following procedures:

To activate the cross track error alarm, highlight the letters XTE on NAV 1 or NAV 2 mode display.

Range limit for cross track error alarm:
0.00 to 9.99

	Cursor
ALARM	
PROX	0.05 nm
ANCW	0.05 nm
XTE	0.05 nm
CDI	30.0°
BDY	0.10 nm
BDY SET	01-00:49
DGPS	OFF



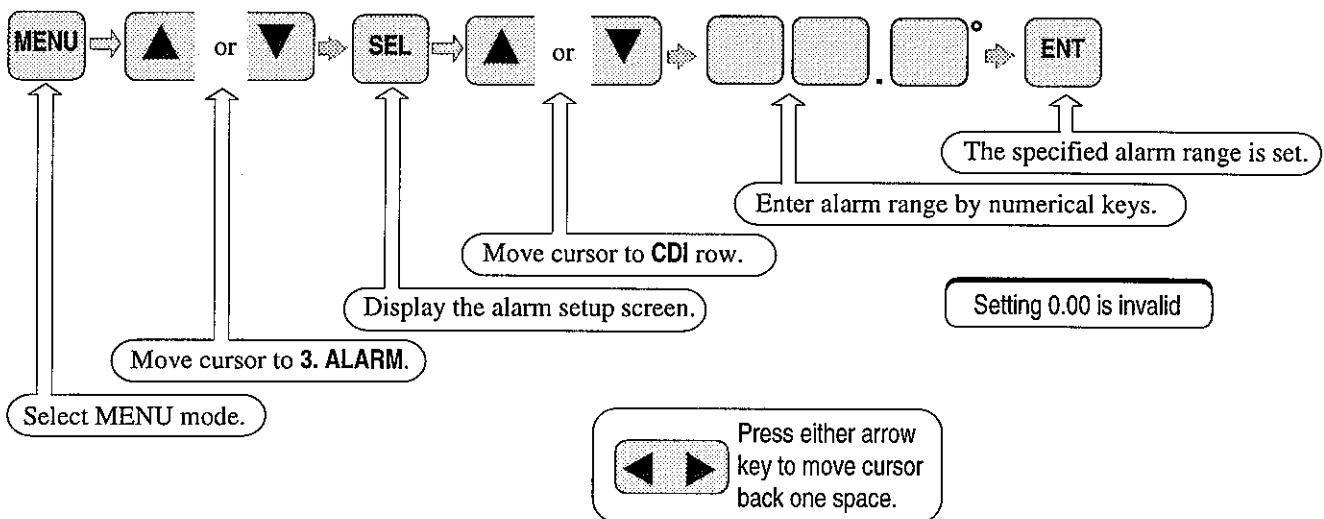
Setting the CDI alarm range

The CDI alarm can be set by the following procedure. If the CDI (course deviation angle) between the present position and waypoint exceeds the preset value, the buzzer sounds and CDI letters flicker.

To activate the CDI alarm, display CDI letters on NAV 1 or NAV 2 mode screen.

CDI setup range: 00.0° to 45.0°

	Cursor
ALARM	
PROX	0.05 nm
ANCW	0.05 nm
XTE	0.05 nm
CDI	00.0°
BDY	0.10 nm
BDY SET	01-00:49
DGPS	OFF



▲ ▼ . Move cursor to desired item
by pressing arrow key.

SEL . Changes the contents corresponding
to the item selected.

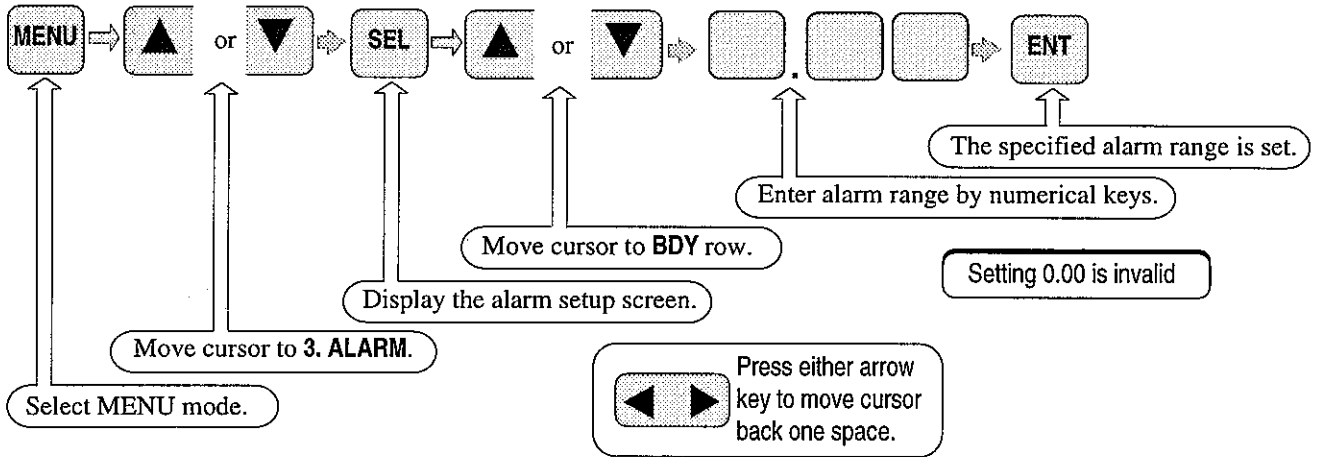
Setting boundary alarm range

The boundary alarm function provides an audible alarm when the vessel enters the pre-set alarm range of a dangerous area such as shallow, wreck, and coastal line. At the same time, the BDY letters blinks.

To activate the boundary alarm, display BDY letters on NAV 1 or NAV 2 mode screen.

Boundary alarm setup range: 0.00 to 9.99

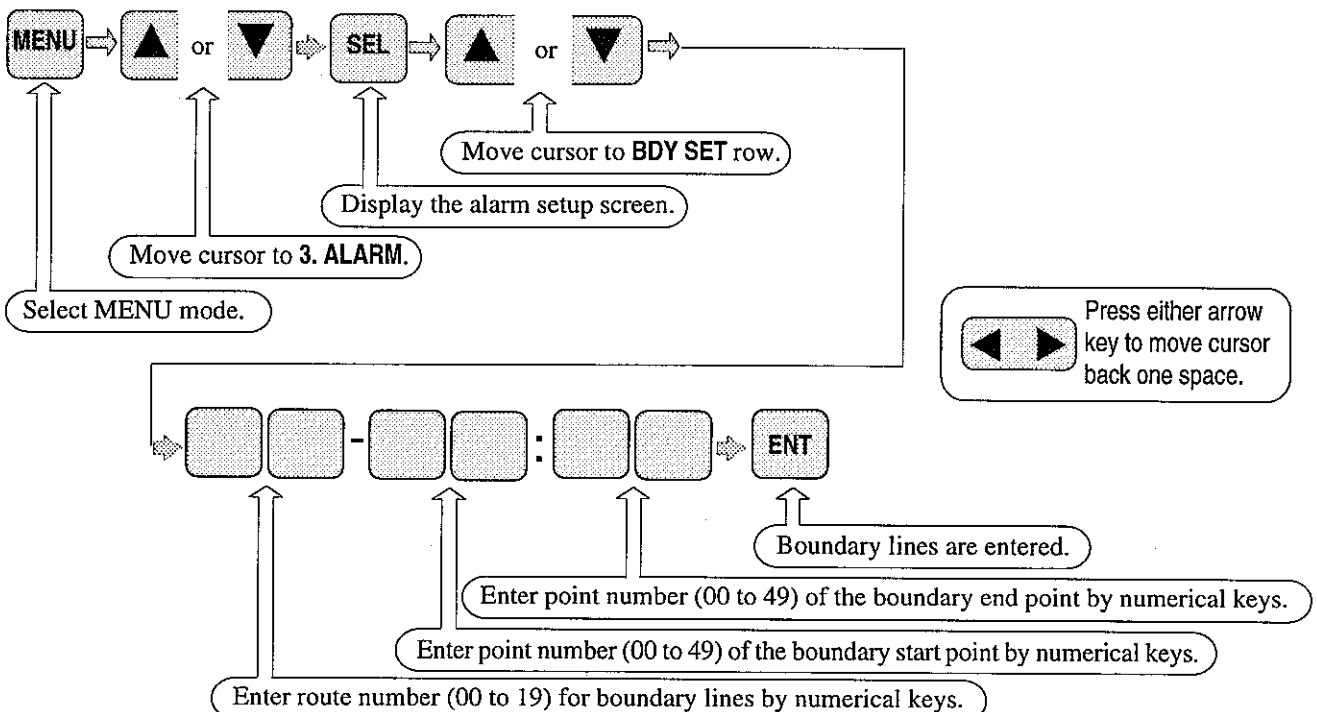
	Cursor
ALARM	
PROX	0.05 nm
ANCW	0.05 nm
XTE	0.05 nm
CDI	30.0°
BDY	0.10 nm
BDY SET	01-00:49
DGPS	OFF

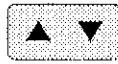


Entering boundary line

The boundary line should be established by the following procedure beyond using boundary alarm. To do so, enter the route memory number and point number on the route. For route entry, see page 17.

	Cursor
ALARM	
PROX	0.05 nm
ANCW	0.05 nm
XTE	0.05 nm
CDI	30.0°
BDY	0.10 nm
BDY SET	01-00:49
DGPS	OFF





Move cursor to desired item
by pressing arrow key.

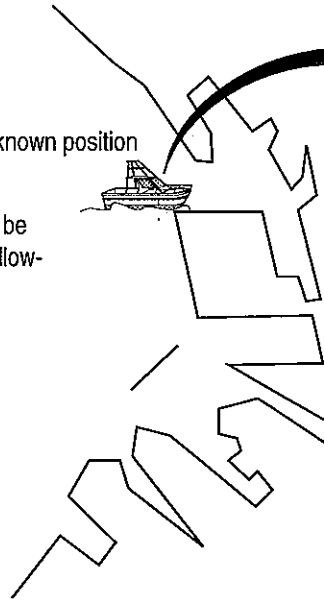


Changes the contents corresponding
to the item selected.

Correcting vessel position

The position in Lat/lon or Loran C LOPs can be corrected, if necessary, by performing the following procedures:

Present known position

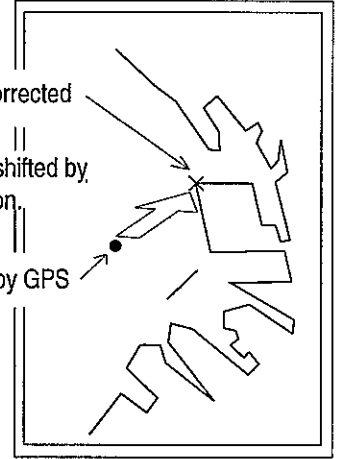


Sea chart

Position after corrected

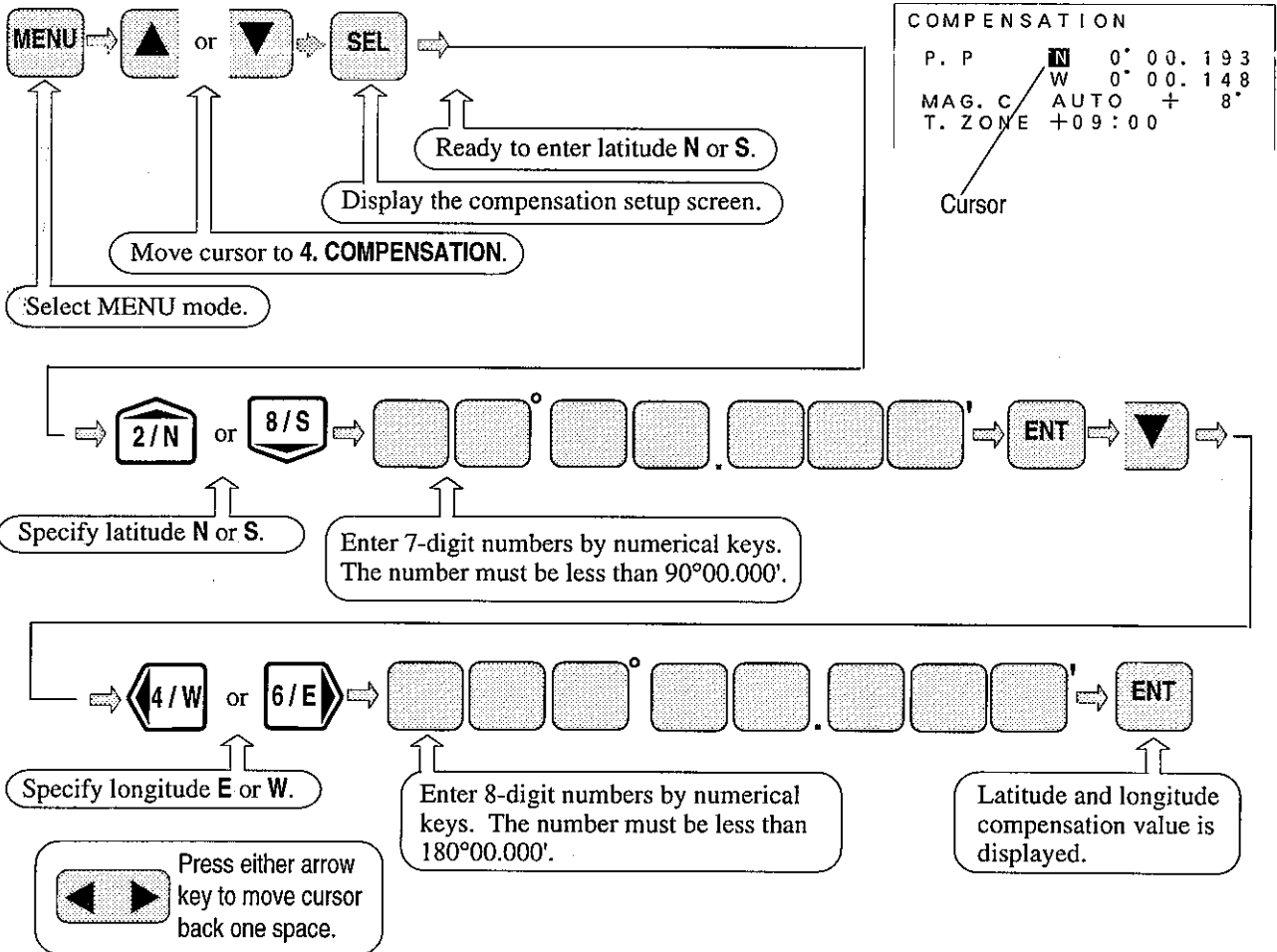
Position can be shifted by
correction function.

Fixed position by GPS



1 Correcting present position in Lat/lon

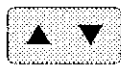
When the present position is shown as Lat/lon value, it can be corrected by the following:



COMPENSATION
P. P **N** 0° 00. 193
W 0° 00. 148
MAG. C AUTO + 8'
T. ZONE +09:00

Cursor

Present position	Entered position	Compensation value
Lat N 35°37.893	Lat N 35°37.700	Lat S 0°00.193
Lon E 139°43.348	Lon E 139°43.200	Lon W 0°00.148



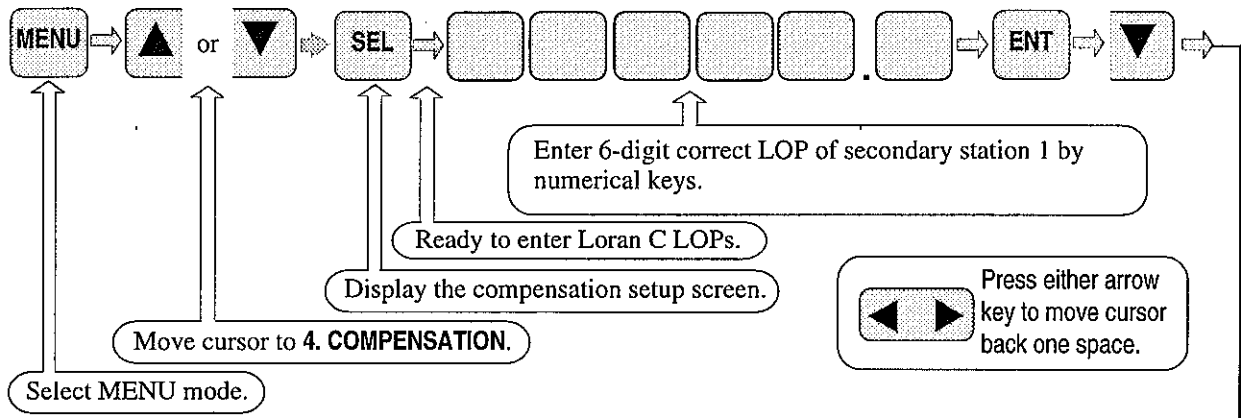
Move cursor to desired item by pressing arrow key.



Changes the contents corresponding to the item selected.

2 Correcting present position in Loran C LOPs

When the present position is displayed in Loran C LOPs, the position can be corrected in Loran C LOPs.



COMPENSATION

```

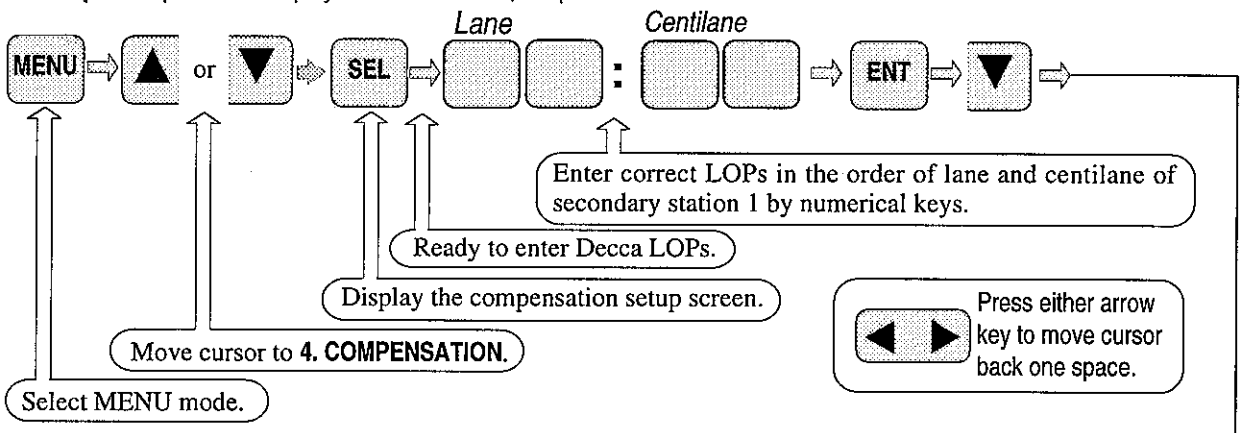
P. P      00001.1
          -00001.5
MAG. C    AUTO + 8°
T. ZONE   +09:00
  
```

Cursor

Present position	Entered position	Compensation value
Secondary station 1 35518.9 μ sec	Secondary station 1 35520.0 μ sec	Secondary station 1 + 00001.1 μ sec
Secondary station 2 60387.5 μ sec	Secondary station 2 60386.0 μ sec	Secondary station 2 - 00001.5 μ sec

3 Correcting present position in Decca LOPs

When the present position is displayed in Decca LOPs, the position can be corrected in Decca LOPs.



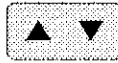
COMPENSATION

```

P. P      00:00:20
          +00:00:19
MAG. C    AUTO + 8°
T. ZONE   +09:00
  
```

Cursor

Present position	Entered position	Compensation value
Green 0G:30:62 μ sec	Green 30:42	Green - 00:00:20 μ sec
Purple 0C:76:16 μ sec	Purple 76:35	Purple + 00:00:19 μ sec



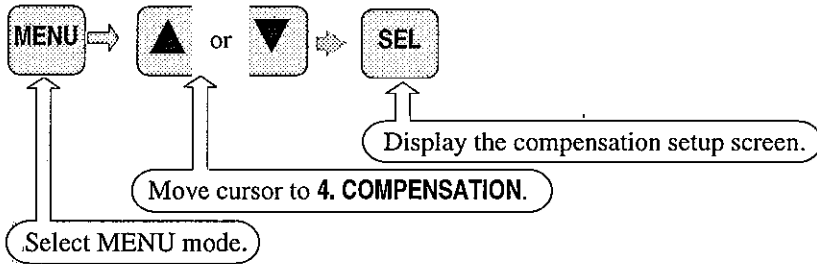
• Move cursor to desired item
• by pressing arrow key.



• Changes the contents corresponding
• to the item selected.

Checking the correction

The correction value can be checked by the following procedure:



When Lat/lon is displayed:

```

COMPENSATION
P. P      N  0° 00. 193
          W  0° 00. 148
MAG. C    AUTO  +  8°
T. ZONE   +09:00
  
```

Latitude 0.193 N and longitude 0.148 W are displayed as correction value.

When Loran C LOPs is displayed:

```

COMPENSATION
P. P      +00001. 1
          -00001. 5
MAG. C    AUTO  +  8°
T. ZONE   +09:00
  
```

Shifted 1.5 μ sec toward master station
Shifted 1.1 μ sec toward secondary station

When Decca LOPs is displayed:

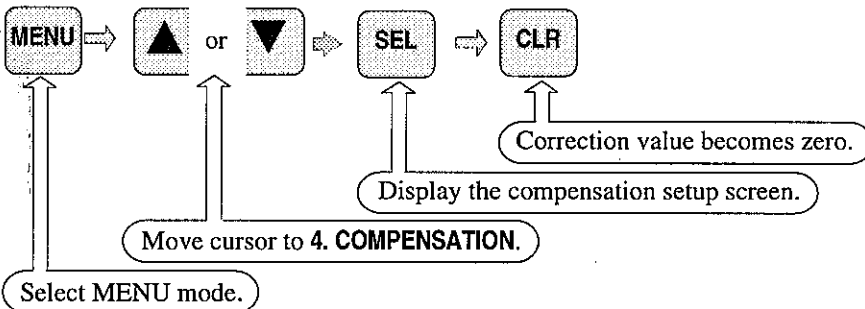
```

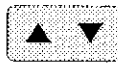
COMPENSATION
P. P      -00:00:20
          +00:00:19
MAG. C    AUTO  +  8°
T. ZONE   +09:00
  
```

Shifted 0.19 lanes toward secondary station
Shifted 0.20 lanes toward master station

Cancelling position correction

The correcting operation can be cancelled by the following procedures:





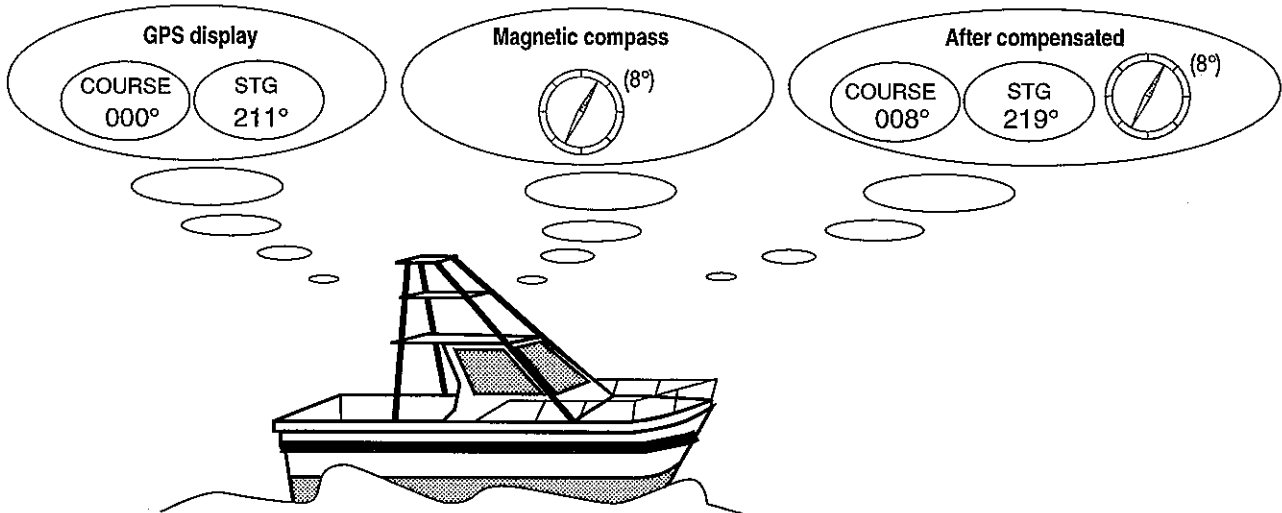
• Move cursor to desired item
• by pressing arrow key.



• Changes the contents corresponding
• to the item selected.

Applying magnetic compensation

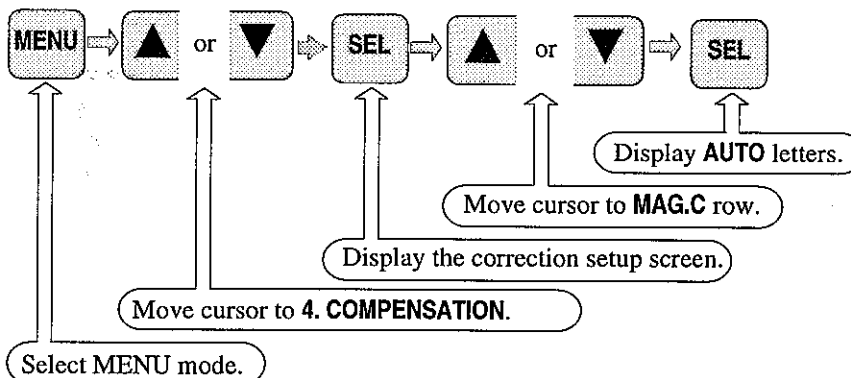
Course and Steering (STG) are normally based on the true north. However, they can be displayed based on the magnetic north by performing the following procedures:



1 Automatic compensation

Initial setup : **AUTO**

Based on the world-wide magnetic field variations stored in the unit, bearing is compensated automatically. This compensation is effective within latitude 75° latitude North or South. However, we recommend you compensate manually for minor magnetic deviation.



COMPENSATION			
P. P	N	0° 00. 1.93	
	W	0° 00. 1.48	
MAG. C		AUTO	+ 8°
T. ZONE		+09:00	

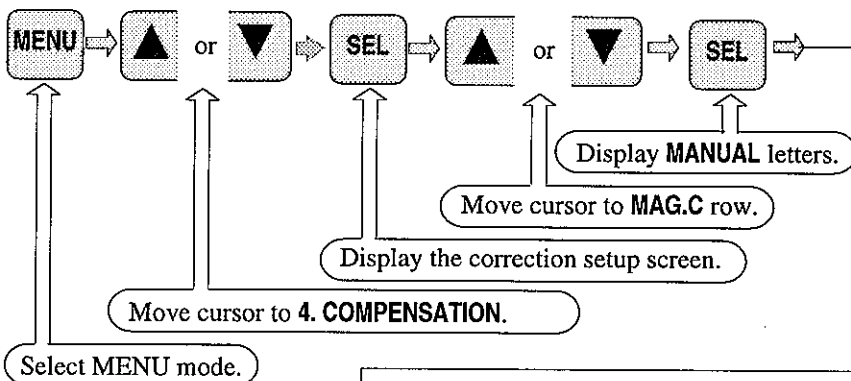
Cursor points to the 'MAG. C' row. A line indicates the compensated value (from true north) is 8°.

Compensation rotation

→ **AUTO** → **MANUAL** →

2 Manual compensation

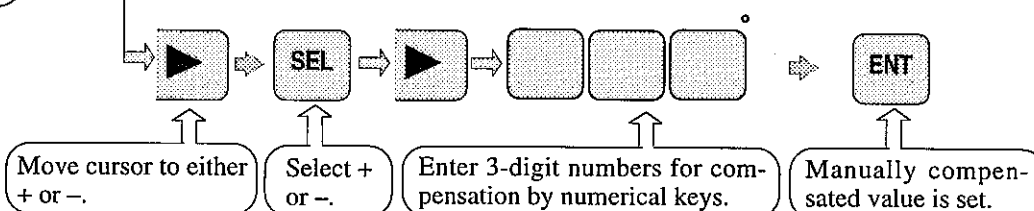
Initial setup : **0°**
(Setup range: - 180° to + 180°)



COMPENSATION			
P. P	N	0° 00. 1.93	
	W	0° 00. 1.48	
MAG. C		MANUAL	+ 8°
T. ZONE		+09:00	

Cursor points to the 'MAG. C' row. A line indicates the compensated value (from true north) is 8°.

← → Press either arrow key to move cursor back one space.

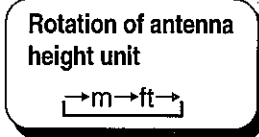
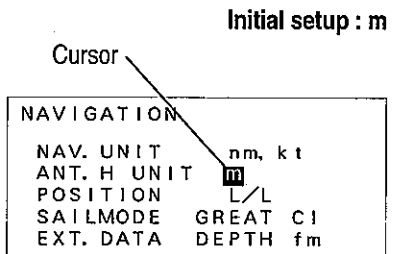
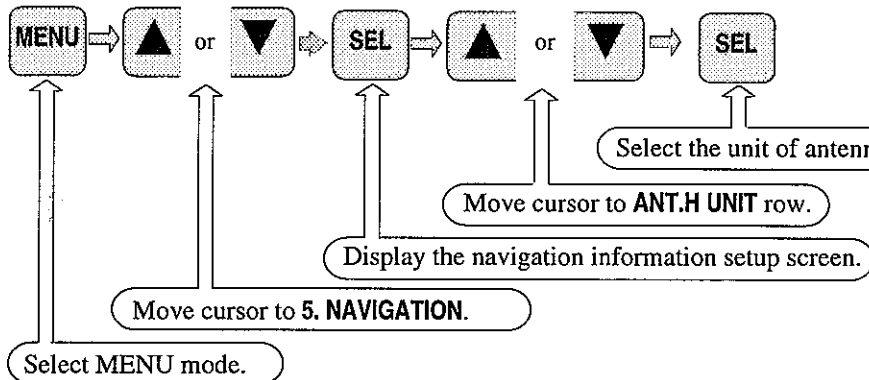


▲ ▼ . Move cursor to desired item
by pressing arrow key.

SEL . Changes the contents corresponding
to the item selected.

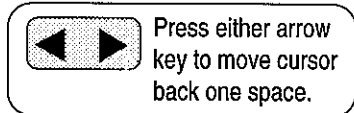
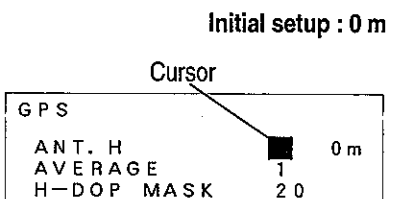
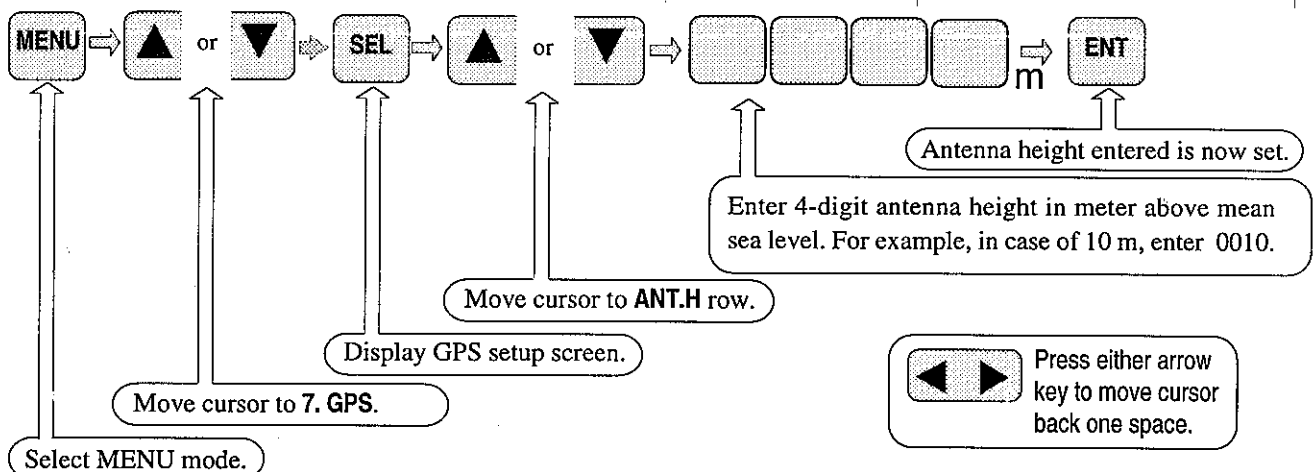
Selecting the unit of antenna height setup

The antenna height above mean sea level can affect on the accuracy of two-dimensional positioning. The height in meters or feet can be selected.



Setting antenna height

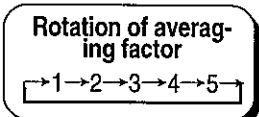
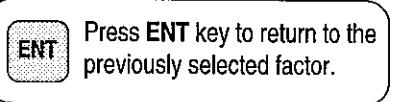
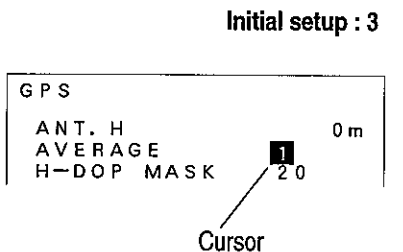
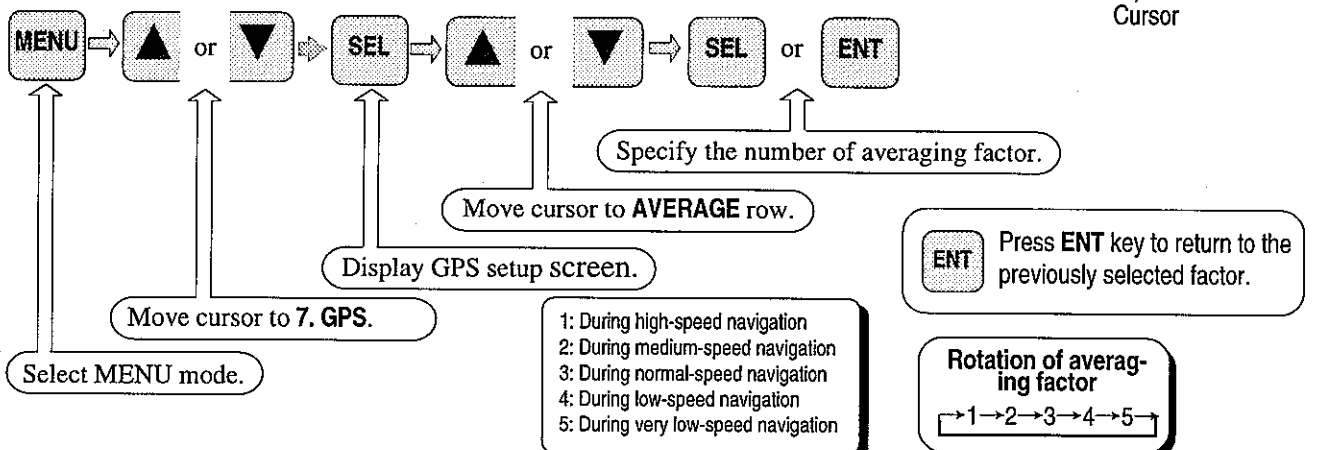
The antenna height above mean sea level for 2-dimensional positioning mode can be entered. We recommend you enter the antenna height as accurately as possible. The error should be within ± 5 m. The more the antenna height error is, the greater the positioning error is.



Selecting positioning averaging factor

The selection of the averaging factor may be required to eliminate fluctuations in present position, speed, and bearing.

The higher the factor value, the less fluctuation. However, the information has the longer time delay and the lower tracking speed. Five averaging factor is provided. High: 5, low: 1. We recommend you select appropriate factor for your particular vessel speed. By setting this factor, stable vessel speed and heading can be displayed.



- 1: During high-speed navigation
- 2: During medium-speed navigation
- 3: During normal-speed navigation
- 4: During low-speed navigation
- 5: During very low-speed navigation

▲ ▼ . Move cursor to desired item
 by pressing arrow key.

SEL . Changes the contents corresponding
 to the item selected.

Selecting positioning mode

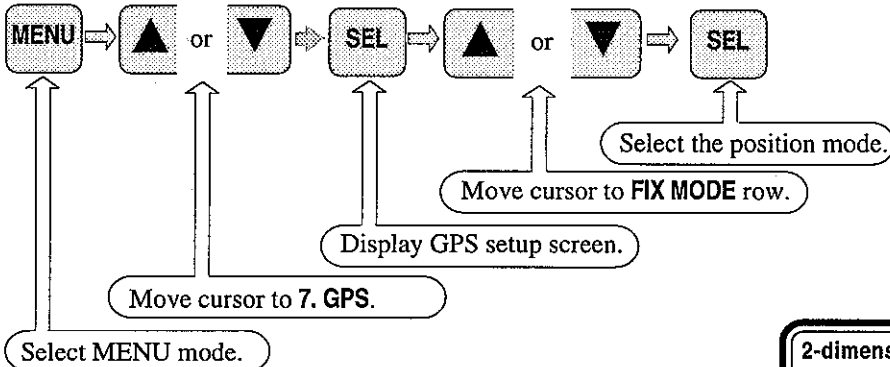
Initial setup : 2D

When using your GPS in the sea or lake, make sure to select 2-dimensional (2D) mode to minimize positioning error.

When four satellites are not visible or DOP value exceeds the mask value during 3-dimensional positioning, 2-dimensional positioning is automatically selected.

GPS		
ANT. H		0 m
AVERAGE	1	
H-DOP MASK	2 0	
P-DOP MASK	1 0	
ELV MASK	5°	
FIX MODE	2 D	

Cursor



Rotation of positioning mode

→ 2D → 3D ←

After changing 3-dimensional positioning to 2-dimensional positioning

Antenna height measured by 3-dimensional mode is displayed on NAV 1 mode screen.

For changing antenna height manually, see "Setting antenna height."

2-dimensional positioning: Position is fixed based on the antenna height set through ANT.H of MENU mode screen.

3-dimensional positioning: The antenna height from the sea level is automatically calculated based on the position fix data.

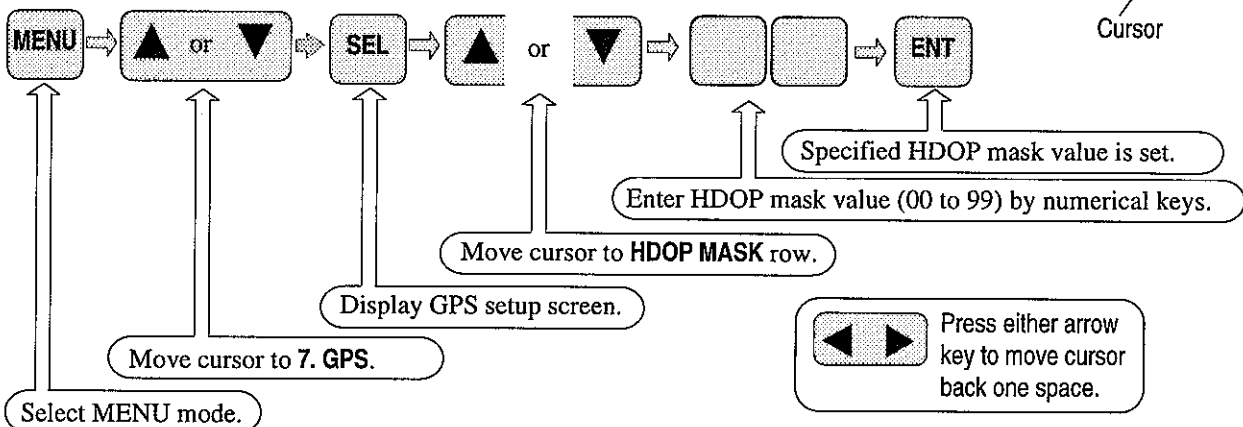
Setting HDOP mask value (for 2-dimensional positioning)

Initial setup : 20

By specifying DOP mask value, positioning error variations can be minimized. For relationship between DOP value and positioning error, see "GPS signal reception" on Page 5. When lower DOP mask value is set, the receiving time will be shortened because the satellite combinations with the DOP value more than the setting one will be rejected.

GPS		
ANT. H		0 m
AVERAGE	1	
H-DOP MASK	2 0	
P-DOP MASK	1 0	
ELV MASK	5°	
FIX MODE	2 D	

Cursor



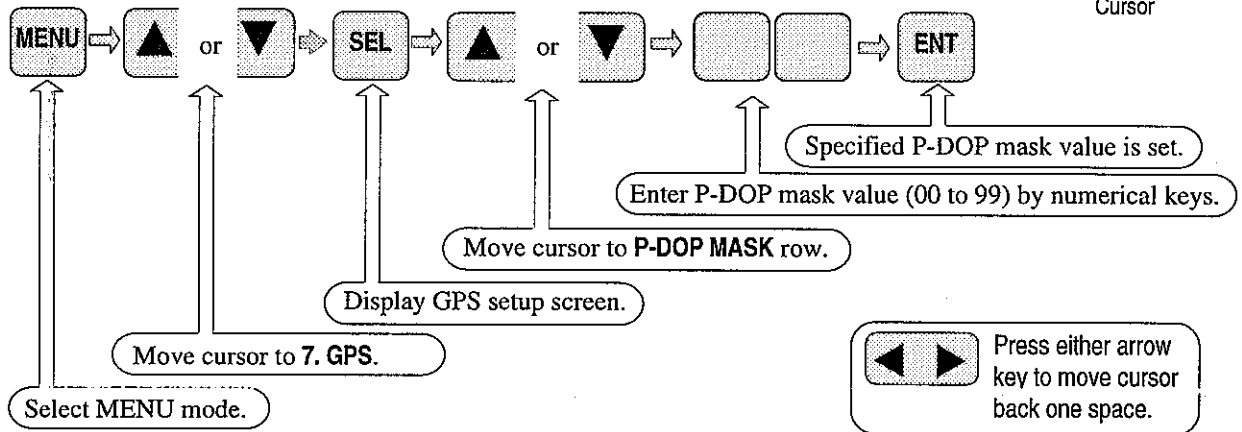
◀ ▶ Press either arrow key to move cursor back one space.

Setting PDOP mask value (for 3-dimensional positioning)

Initial setup : 10

By specifying DOP mask value, position fluctuation can be minimized. When a satellite combination exceeding the PDOP value setup is received, two-dimensional positioning is selected automatically.

GPS		0 m
ANT. H		1
AVERAGE		2 0
H-DOP MASK		1 0
P-DOP MASK		1 5
ELV MASK		2 0
FIX MODE		

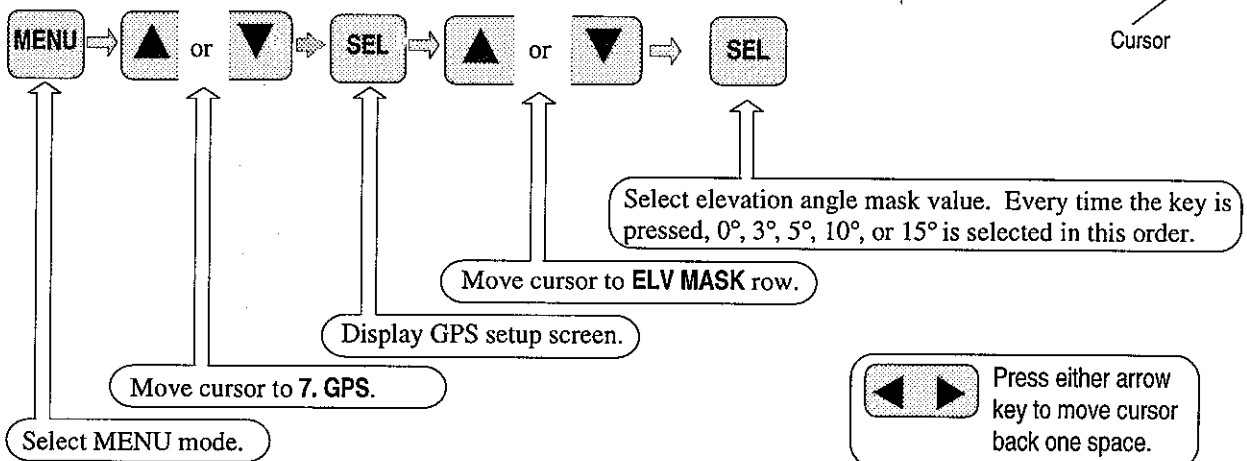


Setting elevation angle mask value

Initial setup : 5°

Positioning by receiving the satellites below 5° above the horizon often provides erroneous positioning because of reflection of radio wave or interference with delayed radio waves. When elevation angle mask value is set, the positioning accuracy can be improved; however, the receiving time will be shortened because the satellite combinations with the elevation mask value more than the setting one will be rejected.

GPS		0 m
ANT. H		1
AVERAGE		2 0
H-DOP MASK		1 0
P-DOP MASK		1 0
ELV MASK		5
FIX MODE		2 D



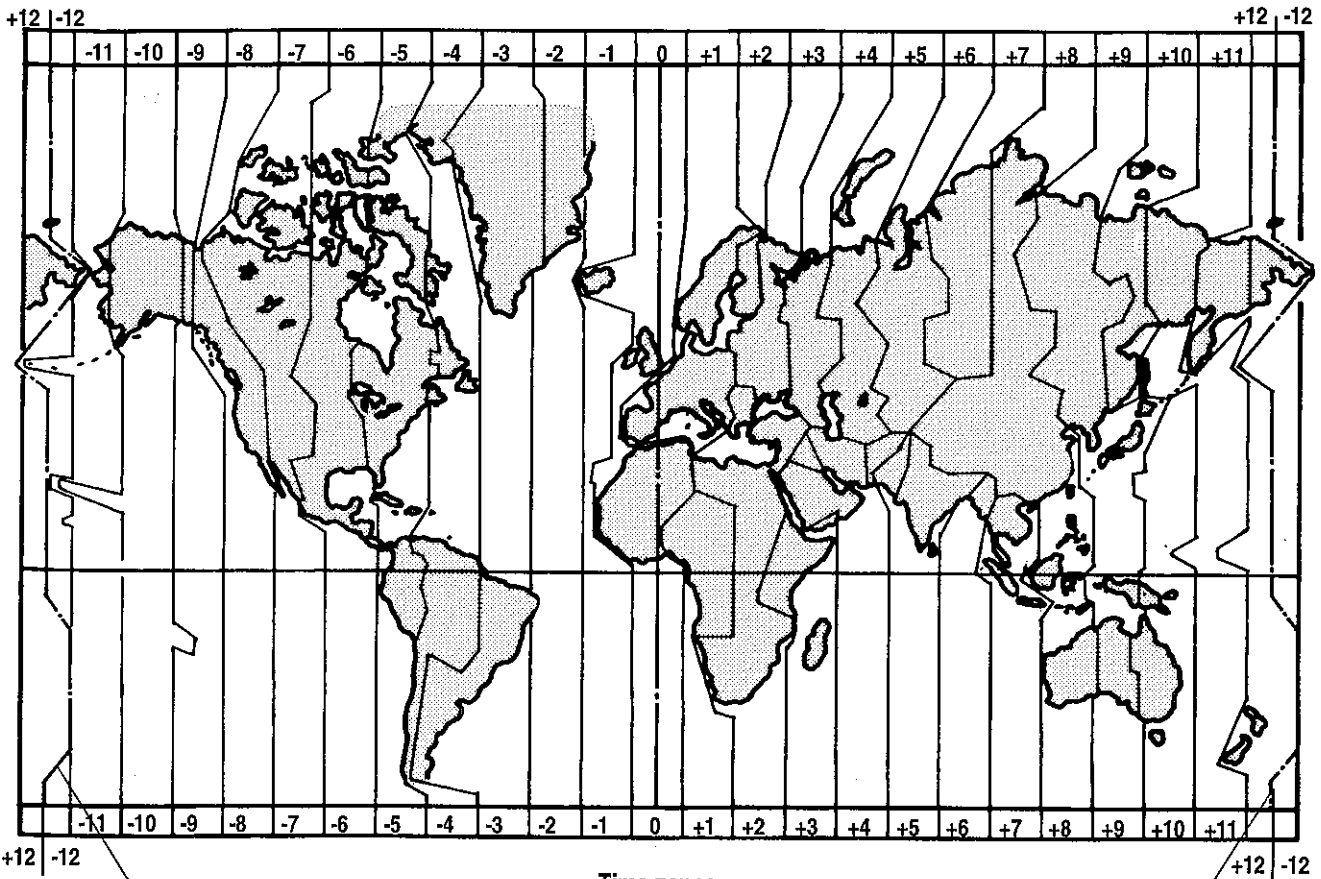
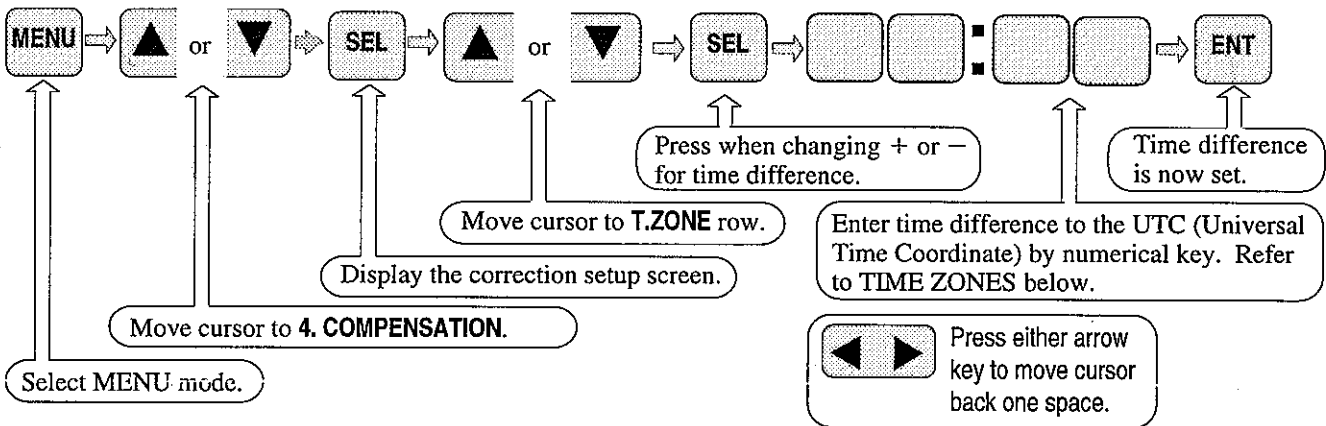
Displaying local time

Initial setup : 00:00

Local time can be displayed by entering the time difference between Greenwich Mean Time) GMT and LMT (Local Mean Time). For the time difference, refer to the drawing of the **Time Zones** below.

COMPENSATION			
P. P	N	0° 00.	193
	W	0° 00.	148
MAG. C	AUTO	+	8°
T. ZONE		09:00	

Cursor



The date line

The date line

Time zones

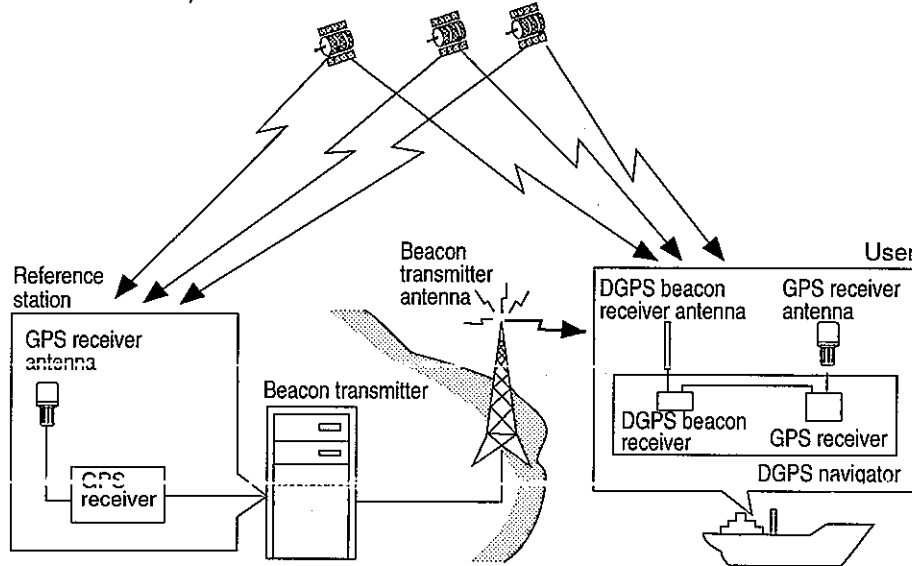
▲ ▼ Move cursor to desired item by pressing arrow key.

SEL Changes the contents corresponding to the selected.

What is Differential GPS (DGPS)?

This system can improve the GPS positioning accuracy when boating near the coast. Using DGPS requires a reference station at nearby location.

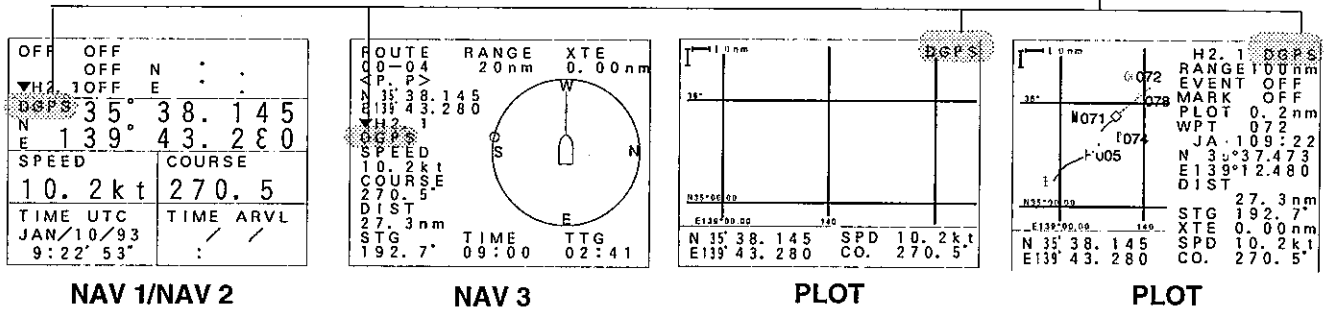
The on-shore reference station (existing radio beacon station) receives position data (measured by the GPS) and compares the known position data of the station itself, calculates the measuring error based on this data, and generates the correction information. The station sends the correction data (RTCM SC-104) using the beacon transmitter, and your NAVIGATOR receives it using the beacon receiver. The NAVIGATOR eliminates the positioning error and improves the positioning accuracy. This accuracy is high when you are close to the DGPS station. Generally, the DGPS system can be used within 100 to 200 nautical miles from the reference station. (RTCM: Radio Technical Commission for Maritime Service)



Displaying differential GPS (DGPS)

Upon selecting the DGPS mode, the characters DGPS will appear on the NAV 1, NAV 2, NAV 3 and Plotter screens. The characters DGPS indicate that the DGPS positioning is in progress.

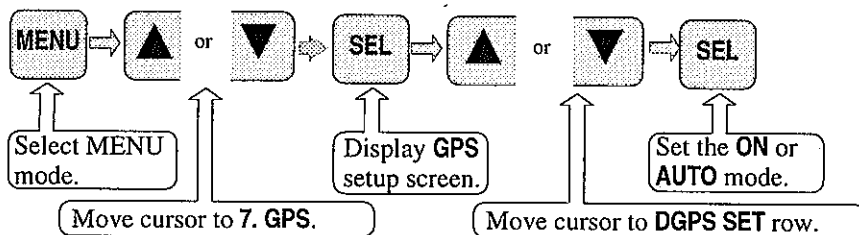
DGPS mode indication
 On: DGPS positioning in progress
 Blinks: Unsuccessful DGPS positioning
 Off: Canceled DGPS positioning



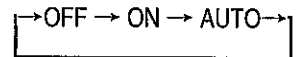
DGPS measurement

Initial setup: AUTO

- OFF:** Normal GPS positioning takes place. **DGPS** letters are not shown.
- ON:** DGPS correction only. **DGPS** displayed 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.



DGPS mode selection sequence



GPS	
ANT. H	0 m
AVERAGE	1
H-DOP MASK	20
P-DOP MASK	10
ELV MASK	5°
FIX MODE	2D
DGPS SET	OFF
DGPS TIMEOUT	10 sec

cursor

▲ ▼ Move cursor to desired item by pressing arrow key.

SEL Changes the contents corresponding to the selected.

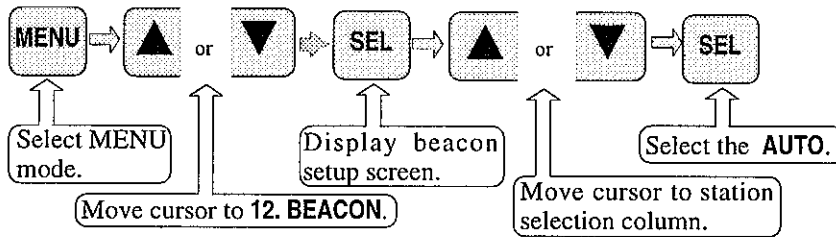
Selecting a beacon station

Initial setup: AUTO

A beacon station is selectable both in the manual or auto mode.

Selecting a station in the auto mode

In the auto mode, the nearest station will be selected based on measured longitude and latitude among all the stored beacon stations.



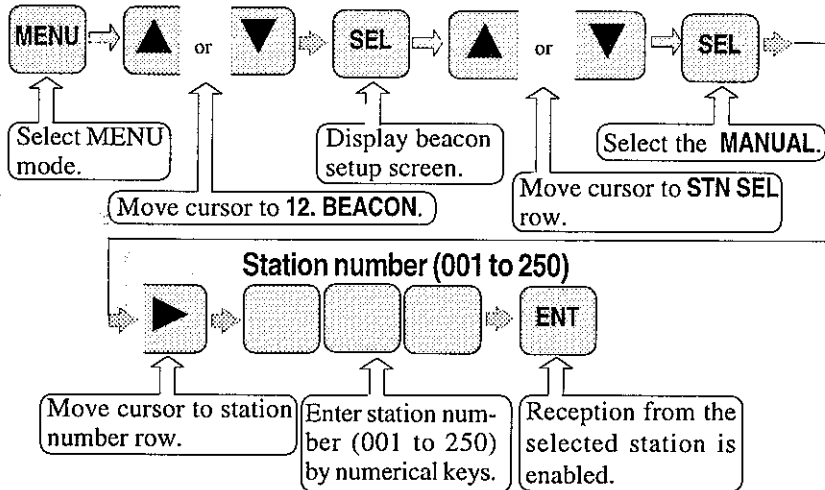
Cursor	Station number
BEACON	
STN SEL	0 3 1
AUTO	
STN NAME	
TURUGIZK	
FREQUENCY	
309.0kHz	
BIT RATE	
200bps	
ID NO	
S/N	
0dB	
DATA AGE	
s	

When the selected beacon station sends the beacon almanac (Message type No. 7), the received station data is stored in the station number memory 021 to 030 as the beacon almanac data. This ensures an optimum DGPS positioning from the next use.

Beacon almanac: Denotes frequency, bit rate and positioning data of a station adjacent to the currently selected beacon station.

Selecting a station in the manual mode

When selecting a beacon station in the manual mode, specify the station number between 001 and 250.



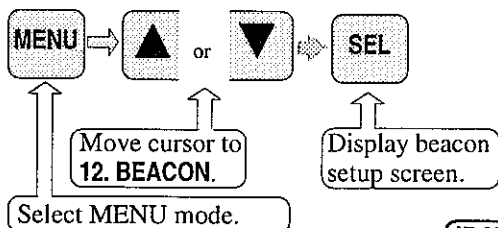
MANUAL	Station number	Cursor
BEACON		
STN SEL		
MANUAL	0 3	
STN NAME		
TURUGIZK		
FREQUENCY		
309.0kHz		
BIT RATE		
200bps		
ID NO		
S/N		
0dB		
DATA AGE		
s		

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 - 250: Numbers stored in the ROM (worldwide beacon stations are stored).

Checking the beacon reception quality

You can check the beacon reception quality in the following manner.



BEACON	
STN SEL	0 3 1
AUTO	
STN NAME	
TURUGIZK	
FREQUENCY	
309.0kHz	
BIT RATE	
200bps	
ID NO	
0686	
S/N	
19dB	
DATA AGE	
6s	

ID NO.: ID number of the selected beacon station.
It appears as long as the DGPS positioning is executed.

S/N: S/N value of the selected beacon station.

DATA AGE: Age of differential GPS data.
If it exceeds the specified timeout duration, the DGPS will be stopped.

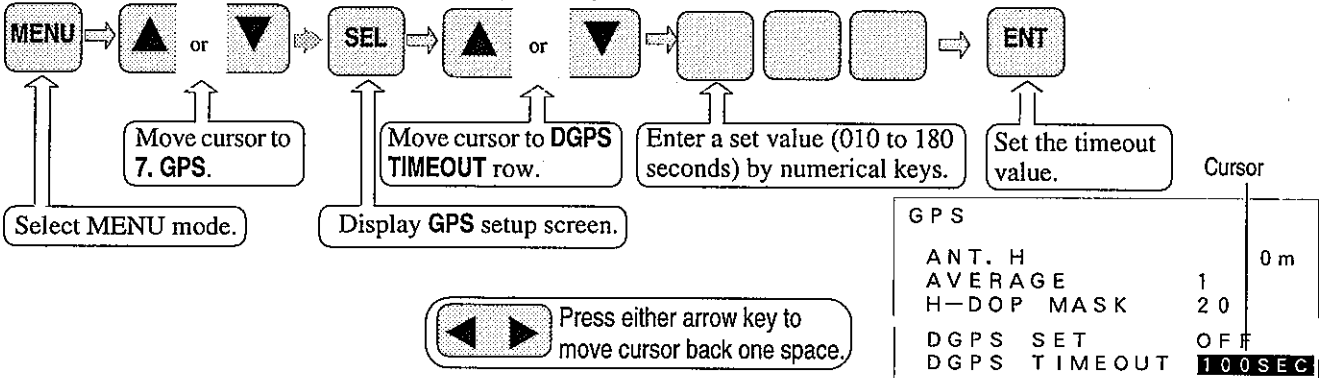
▲ ▼ Move cursor to desired item by pressing arrow key.

SEL Changes the contents corresponding to the selected.

Setting DGPS timeout

Initial setup: 100 sec

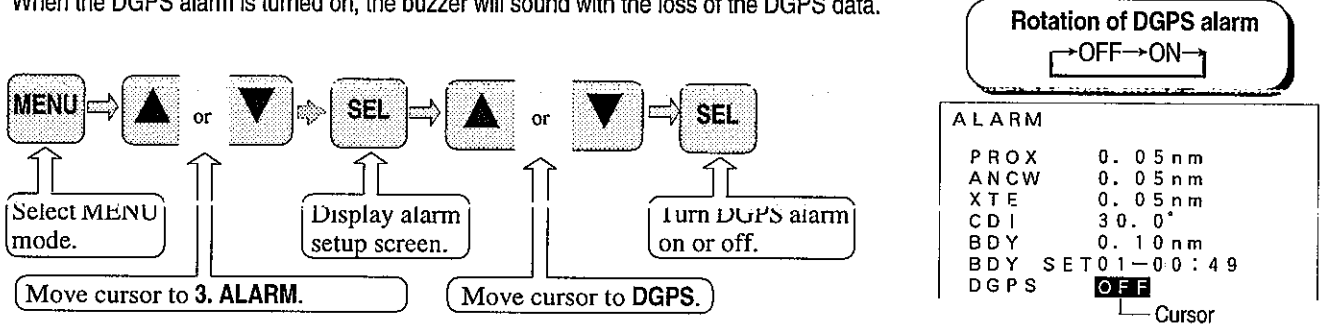
Even if the position correction data is interrupted, the position correction will be continued for a duration of the specified timeout time, based on the correction data received just before the interruption. Although the timeout duration can be selected between 10 and 180 seconds, the longer the time the less the positioning accuracy.



Setting DGPS alarm

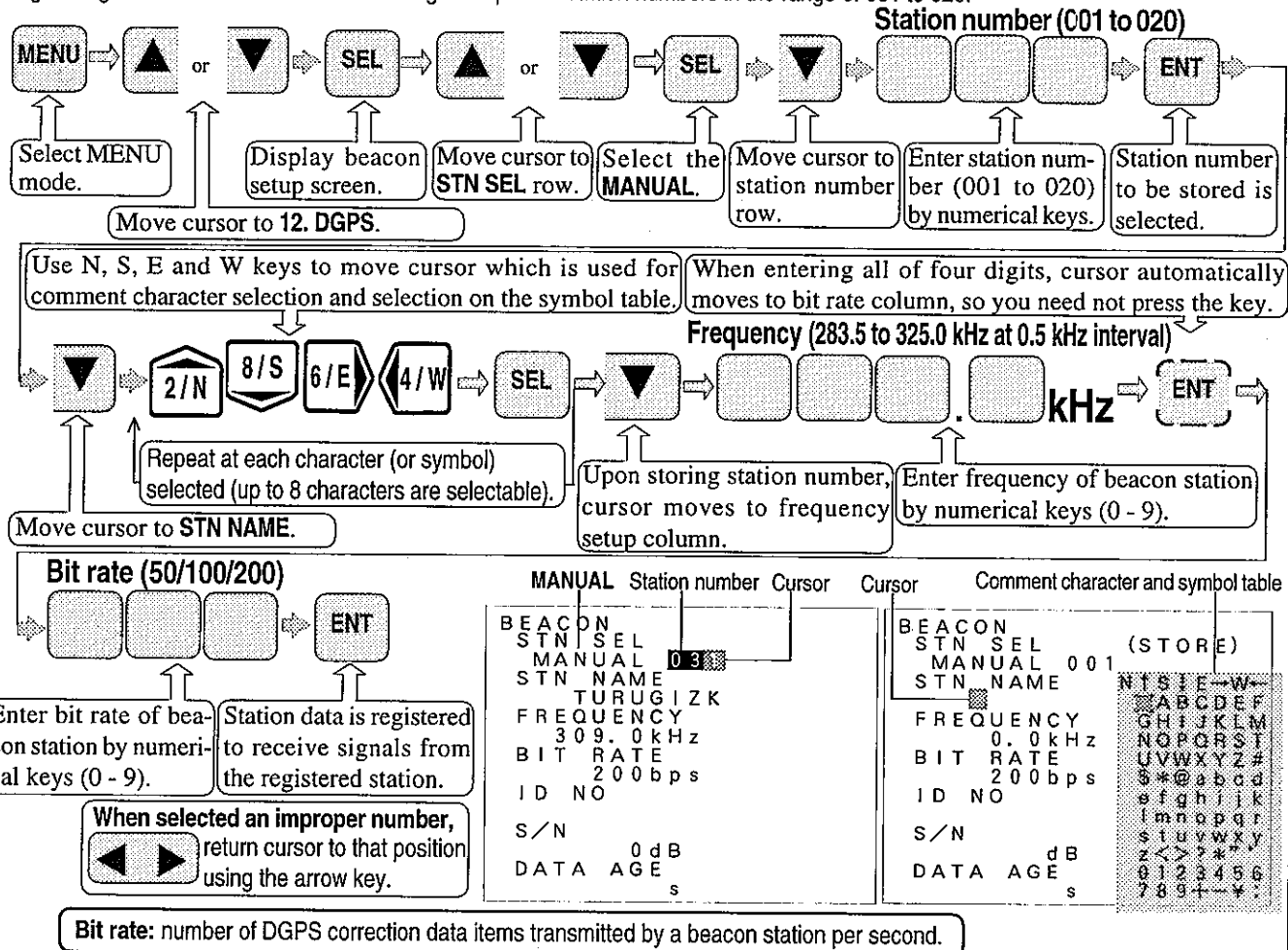
Initial setup: OFF

When the DGPS alarm is turned on, the buzzer will sound with the loss of the DGPS data.



Storing a beacon station

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



▲ ▼ . Move cursor to desired item
 by pressing arrow key.

SEL . Changes the contents corresponding
 to the item selected.

Selecting data input format and connector

Initial setup : OFF

The input signal format and connector can be selected by performing the following procedures:

When you connect , make sure to select input format.

Rotation of data format

OFF → 183 → 717 → 182 →
 JRC2 ← JRC1 ← CIF ←

INTERFACE

```

IN FORMAT      0183
IN CONNECTC    DATA2
OUT FORMAT     0183-A
LOG RATE       100
  
```

Cursor

Specify input connector
 (DATA2 or DATA3).

Move cursor to IN CONNECT row.

Specify the format to use.

Move cursor to IN FORMAT row.

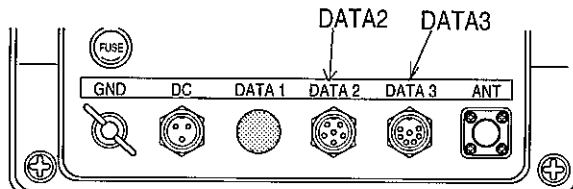
Display the interface setup screen.

Move cursor to 6. INTERFACE.

Select MENU mode.

Note: Input/output to/from DATA3 connector
 matches the RS-232C signal level.

Locations of connector
 on the rear panel



INTERFACE

```

IN FORMAT      0183
IN CONNECTC    DATA2
OUT FORMAT     0183-A
LOG RATE       100
  
```

Cursor

After setting IN format, make sure
 to confirm the OUT format again.

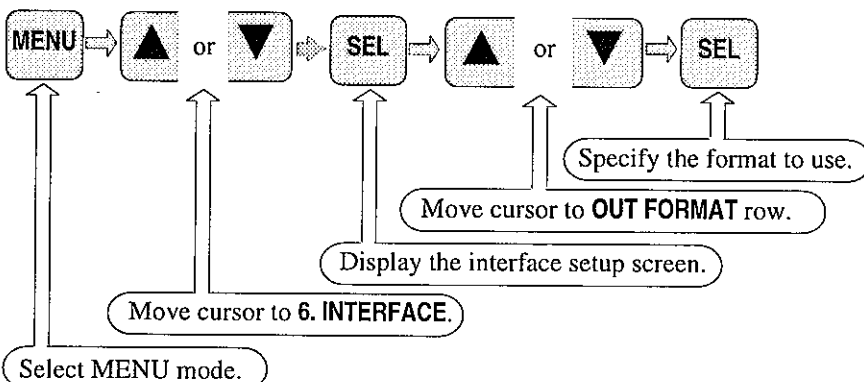
Rotation of input connector selection

DATA 2 → DATA 3 →

Selecting OUT output signal format

Initial setup : NMEA-0183-A

The output signal format from DATA 2 and DATA 3 connectors can be selected by performing the following procedures:



Rotation of data format

The selectable signal format differs according
 to the format selection.

Input	Output
OFF	0183, 0182, 717, CIF, JRC
0183	0183, 717
0182	0182
717	0183, 717

INTERFACE

```

IN FORMAT      0183
IN CONNECTC    DATA2
OUT FORMAT     0183-A
LOG RATE       100
  
```

Cursor

After setting OUT format, make sure
 to confirm the input format again.

Notes: 1. Input/output to/from DATA3 matches the RS-232C signal level.

2. Select one of the following formats for NMEA-0183:

NMEA-0183-A: Short data frequency

NMEA-0183-B: Long data frequency

NMEA-0183-C: BOD+GGA+GLL+R00+SNU+VTG+WDC+WPL+ZDA (Version 2.0)

NMEA-0183-D: GGA+GLL+VTG+ZDA (Version 1.5)

NMEA-0183-E: GGA+GLL+SNU+VTG+ZDA+Rnn+WPL (Version 2.0)



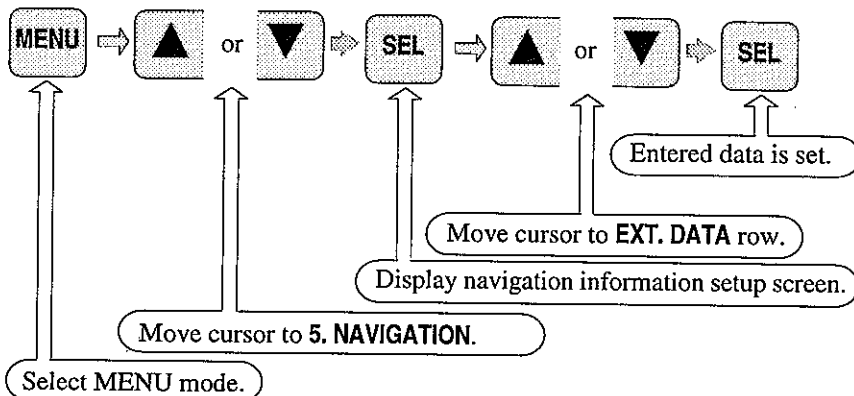
• Move cursor to desired item
• by pressing arrow key.



• Changes the contents corresponding
• to the item selected.

Externally selecting the input data

The input data can be selected externally by the following procedure. The entered data can be displayed on NAV 1 mode screen.

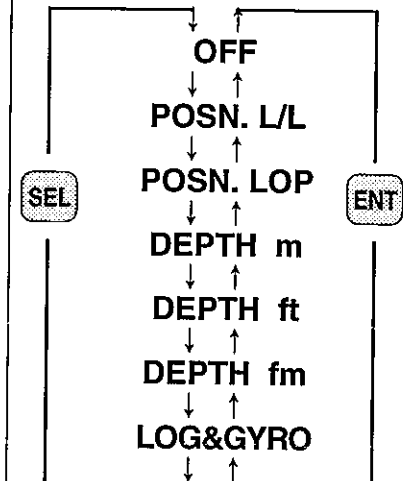


NAVIGATION

NAV. UNIT nm, k t
 ANT. H UNIT m
 POSITION L/L
 SAILMODE GREAT CIR
 EXT. DATA DEPTH f m
 L/L UNIT 0.001

Cursor

Switching rotation of entry data

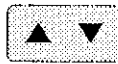


Conversion of Depth unit

1 ft: 0.3048 m
 1 fm: 1.83 m

Some echo sounders may require water depth adjustment. (See mutual wiring diagrams.)

Display data	Display on NAV 1 or NAV 2 screen	
OFF		No external data is displayed.
POSN. L/L		The present position (latitude and longitude) is displayed. Position data (latitude and longitude) must be sent from the Loran C or Decca navigator.
POSN. LOP		The present position (Loran C LOP or Decca LOP) is displayed. Position data (Loran C LOP or Decca LOP) must be sent from the Loran C or Decca navigator.
DEPTH m		Water depth (meter; m) and temperature (°C) data from the echo sounder is displayed. Water depth and temperature data must be sent from the echo sounder.
DEPTH ft		Water depth (feet; ft) and temperature (°C) data from the echo sounder is displayed. Water depth and temperature data must be sent from the echo sounder.
DEPTH fm		Water depth (fathom; fm) and temperature (°C) data from the echo sounder is displayed. Water depth and temperature data must be sent from the echo sounder.
LOG&GYRO		Speed (log) and bearing (gyro) data from the GRA-20A gyro-log interface is displayed. Log and gyro data must be sent from the GRA-20A gyro-log interface.



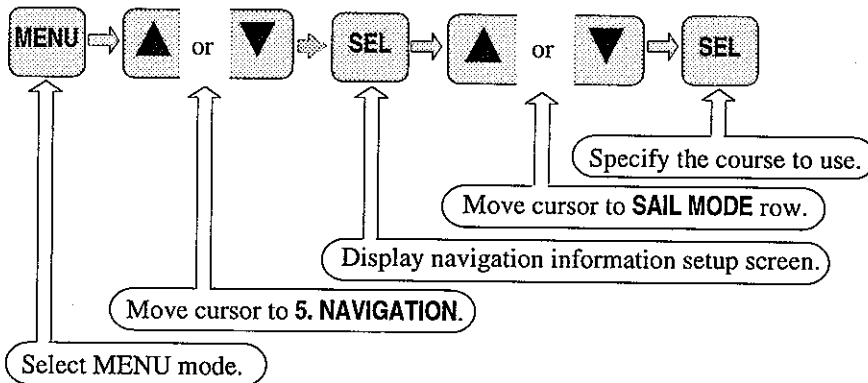
Move cursor to desired item by pressing arrow key.



Changes the contents corresponding to the item selected.

Changing navigation mode

The navigation mode can be selected by performing the following procedures:



Navigation mode rotation

→ GREAT CIR. → RHUMB LINE

Great circuit:

Shortest course on a sphere.

Rhumb line:

Straight course on a Mercator chart.

NAVIGATION	
NAV. UNIT	nm, kt
ANT. H UNIT	m
POSITION	L/L
SAILMODE	GREAT CIR
EXT. DATA	DEPTH fm
L/L UNIT	GREAT CIR

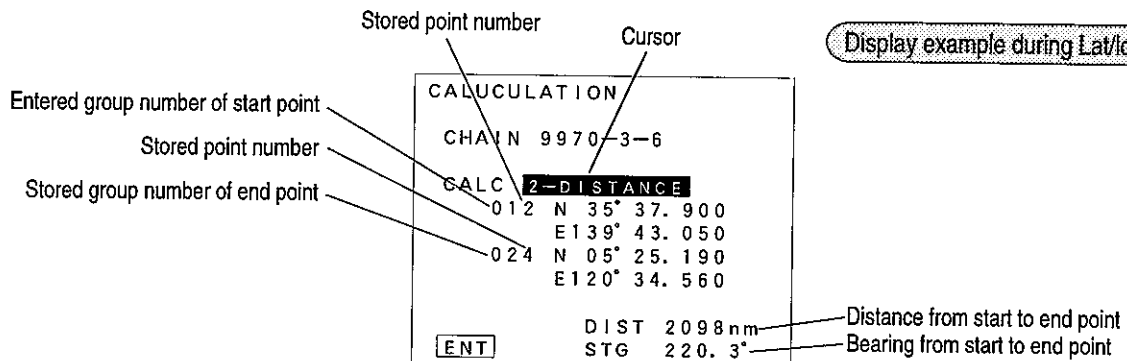
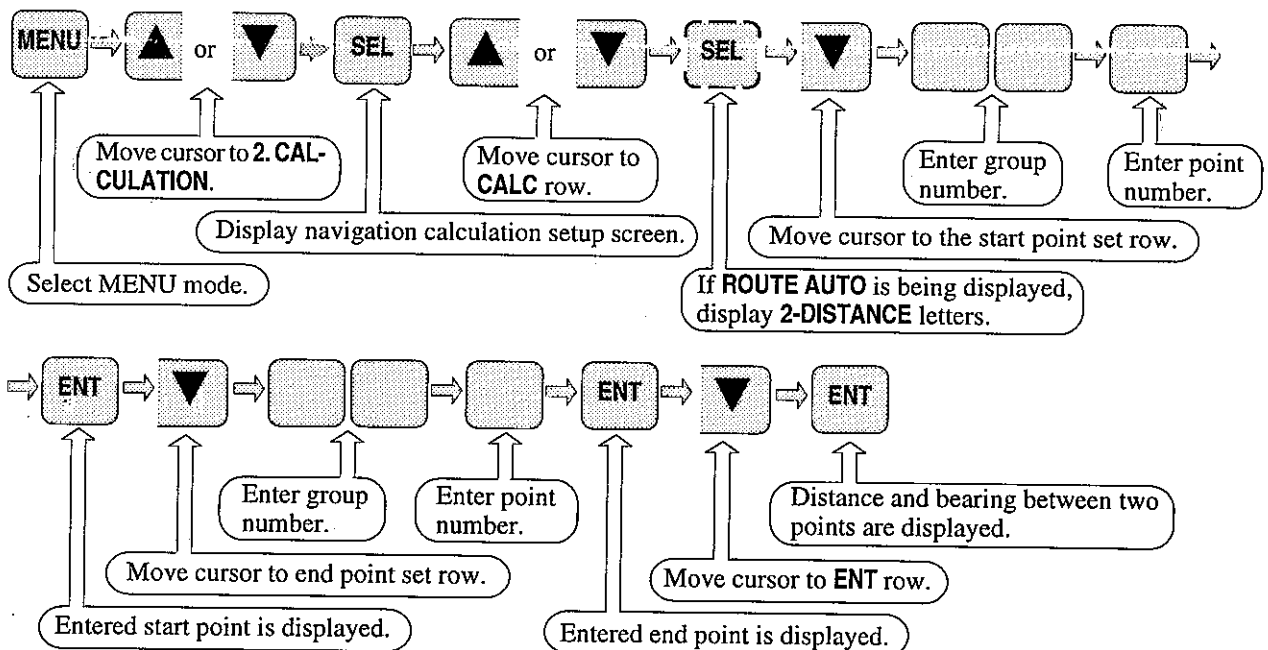
Cursor

Calculating distance and bearing between two points

The distance and bearing between two points stored can be calculated and be displayed.

Navigation mode rotation

→ ROUTE AUTO → 2-DISTANCE



Display example during Lat/lon display

Note: The distance between two points is calculated based on the above navigation mode (great circle or rhumb line).

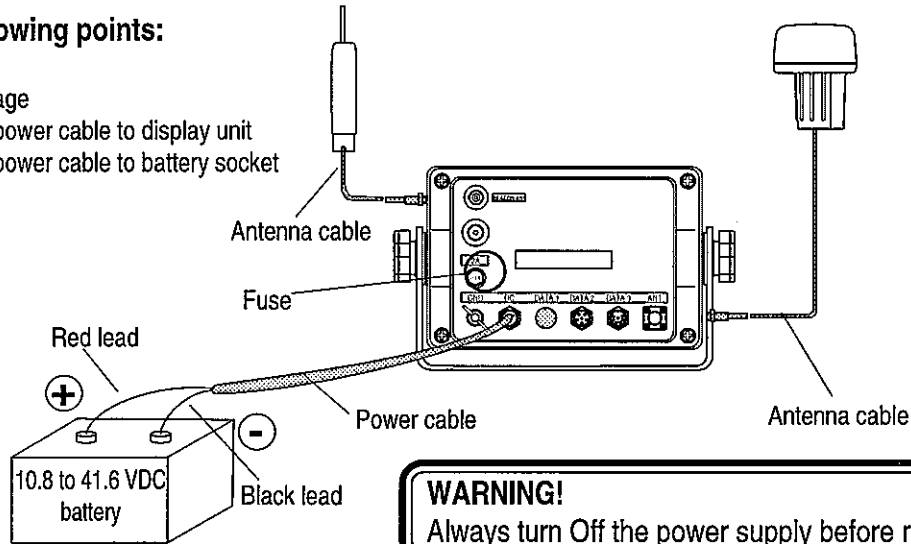
Troubleshooting Guide

If NAVIGATOR does not function properly, check the following items. If the problem continues, call for service.

Nothing appears when you press PWR/DIM key

Check the following points:

- Blown fuse
- Low battery voltage
- Poor contact of power cable to display unit
- Poor contact of power cable to battery socket

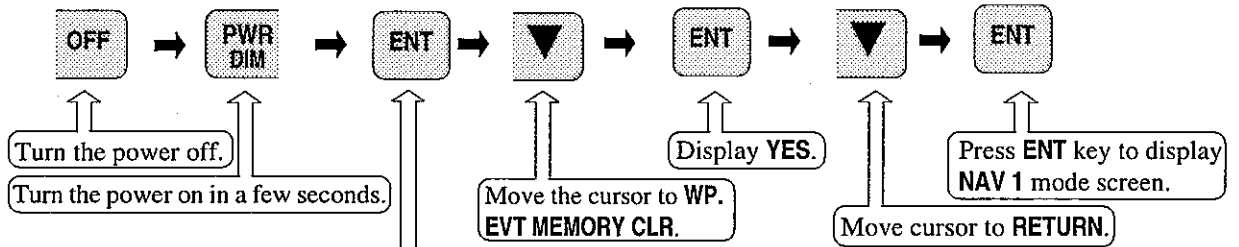


WARNING!
Always turn Off the power supply before replacing the fuse.

Positioning is not available (Initial setting)

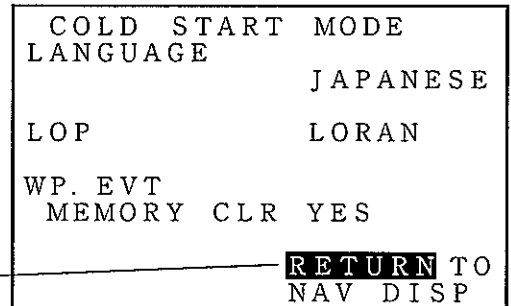
Check the following points.

- The antenna cable may not be connected securely between the antenna and receiver.
- If signals not received or key operation not effective, try the following steps.



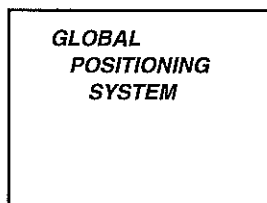
Press **ENT** key while letters **GLOBAL POSITIONING SYSTEM** are displayed. The letters **COLD START MODE** appears.

The operation above will not delete the position data stored in the memory. The event memory position data, however, is deleted. The GPS unit begins so called, **COLD START** operation. In such a case, each parameter last set becomes default value. Therefore, you are requested to enter each parameter for your particular application again.

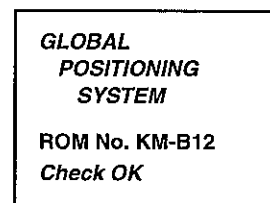


The display is frozen to the start-up screen

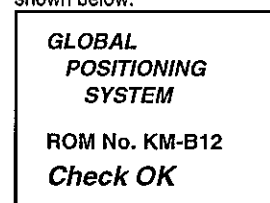
The below screen appears for a few seconds after the power is turned on.



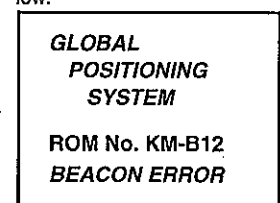
When the display unit (Logic) in trouble, the screen messages freeze as shown below.



When the GPS receiver processor (Logic) in trouble, the screen messages freeze as shown below.



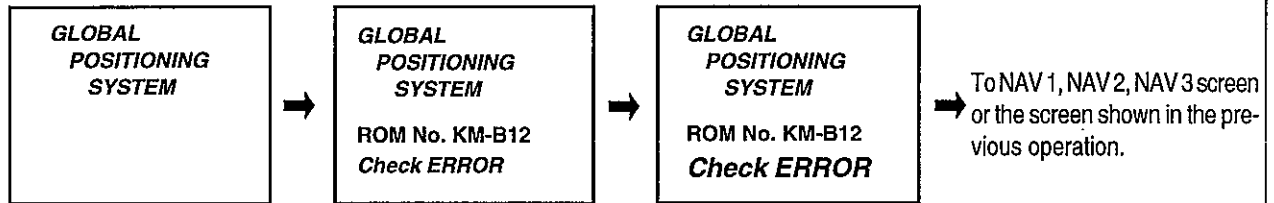
When the beacon receiver unit (Logic) in trouble, the screen messages freeze as shown below.



When the display "GROBAL POSITIONING SYSTEM" freezes, contact us at a sales office or dealer.

The letters ERROR appear after the power is turned on.

The below screen appears for a few seconds after the power is turned on.



This screen appears only once after replacing the receiver display unit (Logic) ROM. Select NAV 1, NAV 2, NAV 3 screen from the display.

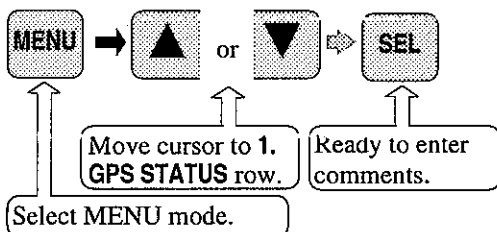
This screen appears when the receiver display unit (Logic) back-up battery went low. Contact us at a sales office or dealer.

Alarm buzzer sounds intermittently with no display after the power is turned on.

CPU peripheral circuit is faulty in receiver-indicator (display unit).

Call your authorized local dealer or Koden.

Receiving condition is unstable.



GPS monitor display

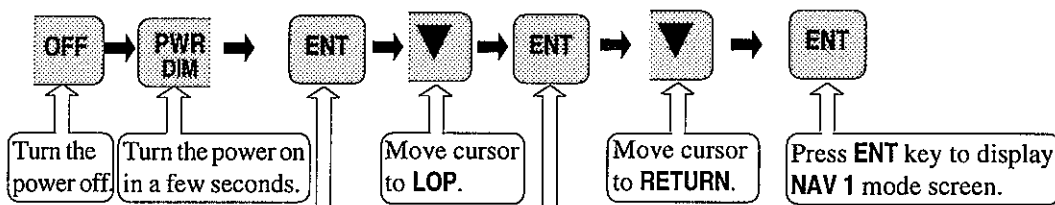
SV STATUS		GPS FIX	
CH		1	2
No.		3 2	2 0
S/N		1 0	1 2
ELV		7 4	3 0
AZI		1 8 1	4 1
TOTAL	SV		2 4
VISIBLE	SV		0 7
XTAL OFFSET		4 0.	5 Hz
HDOP		2.	1

1. Checking for signal to noise ratio (S/N) of receiving satellites
Generally, when the elevation angle of receiving satellite is more than 10°, the S/N value will read 10 to 20.
2. Checking for offset value of crystal oscillator
The frequency is usually between +20 to +80 Hz. When the frequency is out of the range, call your authorized local dealer or Koden.
3. Checking for HDOP value of receiving satellites
Positioning stops temporarily when HDOP value exceeds 20.
The smaller the number, the better the accuracy.
4. Check if some obstacles exist around or above the antenna unit.
Such object may prevent the GPS receiver from receiving signals from the satellites. In such a case remove obstacles or re-install the antenna in an appropriate location.

HDOP value	Accuracy
1 to 6	Normal
6 to 12	Acceptable
12 to 20	Low

Alternating Loran C LOP and Decca LOP

When this operation is carried out, the fixed position data now displayed will also be lost. It may take 2 to 30 minutes to display the present position again.



Press ENT key while letters GLOBAL POSITIONING SYSTEM are displayed. The letters COLD START MODE appears.

Display LORAN or DECCA
LORAN: Displays in Loran C LOP.
DECCA: Displays in Decca C LOP.

COLD START MODE	
LANGUAGE	JAPANESE
LOP	DECCA
WP. EVT	
MEMORY CLR	NO
RETURN TO NAV DISP	

Cursor

Specifications

Major Specifications

* Specifications subject to change without notice.

GPS receiver section	
Receiving frequency	1575.42 MHz \pm 1 MHz
Receiving channel	Digital 11-channel parallel/sequential
Receiving code	C/A code
Sensitivity	Better than -130 dBm (elevation angle: 5° or over)
Tracking speed	200 knots maximum
Accuracy	15 meters RMS (without SA), 100 meters 2DRMS (with SA)
(PDOP \leq 3)	Position Velocity
	0.1 knot RMS (without SA)
Note: Accuracy is subject to change in accordance with DoD civil GPS user policy.	
Beacon receiver section	
Receiving frequency	283.5 to 325.0 kHz
Channel separation	500 Hz step
Modulation	MSK : 50, 100, 200 bit/second
Sensitivity	5 μ V/m
Signal detection (S/N)	6 dB or more
Dynamic range	92 dB
GPS display section	
Display	Dot matrix LCD with backlight (320 x 240 pixels, usual picture area: 112 x 85 mm)
Display mode	NAV1, NAV2, NAV3, PLOT, MOB (Man Over Board), MENU
Track display	Display range
	Usable ground
	Plotting interval
	Plotting capacity
	1/4, 1/2, 1, 2, 5, 10, 20, 50, 100, 200 nm (sm, km)
	Within 80° in latitude
	OFF, 5, 10, 20, 30 sec, 1, 2, 3, 4, 5, 10 min, 0.1, 0.2, 0.5, 1, 2 nm (sm, km)
	2,000 points
Position data display	Latitude/longitude in increments of 0.0001 minute, converted Loran C LOP, converted Decca LOP
Differential	ON, OFF, AUTO
Beacon station selection	Auto (requires position information) or manual
Beacon station data	User entry (20 stations), beacon almanac data (10 stations), ROM (built-in stations around the world)
Navigational display	Speed, course, velocity made good/course made good, distance and bearing to waypoint, cross track error, time to go, total time to go and distance on route, DOP value, present time (UTC or LTC), satellite status, proximity time, MOB display, navigation graphic, water temperature/depth (by interfacing with external device), CDI (for tide calculation, GRA-20A is required.)
Instant (event) memory	100 points (Usable as waypoint.)
Waypoint memory	400 points (Usable as waypoint.)
Route memory	20 routes (up to 50 points for each route; commonly used for boundary memory) with reverse trail
Boundary line	20 routes (up to 50 points for each route; commonly used for route memory)
Alarm	Proximity, CDI, cross track error, anchor watch, boundary line, DGPS
Position compensation	Latitude/longitude, Loran C LOPs, Decca LOPs, datum
Magnetic compensation	Auto or manual
Parameters	LOP conversion, tide calculation, memory of position mark and comments (up to 10 letters), selection of measuring unit (km, nm, miles), antenna height
Input data format	KODEN-717, NMEA-0182, NMEA-0183, CIF, JRC
Output data format	KODEN-717, NMEA-0182, NMEA-0183, CIF, JRC, SHIPMATE 0183
Log pulse output	100, 200, or 400 pulses/mile: effective when positioning
Memory protection	By built-in battery
Power supply	10.8 to 41.6 VDC
Power consumption	10 W or less (at 24 VDC)
Operating temperature	Display unit: -15 °C to +55 °C (5 °F to 131 °F)
	Antenna unit: -30 °C to +70 °C (-22 °F to 158 °F)
	Antennacoupler: -30 °C to +70 °C (-22 °F to 158 °F)

Standard Equipment List

No.	Article	Type	Remarks	Weight/length	Quantity
1	Display unit	KGP-931D	With mounting bracket and vinyl cover	2.3 kg (5.1 lb)	1
2	Antenna unit Antenna cable ^{Note 1}	GA-08	With antenna cable Connected to GA-08/ BNC connector	0.62 kg (1.4 lb) 10 m (32 13/16 ft)	1
		GA-08L	With antenna cable Connected to GA-08L/ BNC connector	0.81 kg (1.8 lb) 15 m (49 3/16 ft)	
3	Antenna coupler Antenna cable	BA-02	With antenna cable Connected to BA-02/ BNC connector	0.85 kg (1.9 lb) 10 m (32.8 ft)	1
		BA-02L	With antenna cable Connected to BA-02L/ BNC connector	1.2 kg (2.7 lb) 15 m (49 3/16 ft)	
4	DC power cable	CW-227	With 3-pin connector	1.8 m (5 15/16 ft)	1
5	Fuse	F-7142, 2A	For spare		1
6	Installation material				1 set
7	Operation manual				1

Note 1: Antenna cable and antenna unit GA-03 with more than 15 m (49 3/16 ft) antenna cable are optional.

Installation materials

No.	Article	Type	Remarks	Quantity
1	Hose band	738-1015	Antenna unit	4
2	Truss tapping screw	TPT5 x 20U	Display unit	4

Options

No.	Article	Type	Remarks	Weight/length
1	Receiving antenna	RA-14	2.45 m whip	0.3 kg (0.67 lb)
2	Gyro/log interface	GRA-20A	With power and connecting cable	2.5 kg (5.6 lb)
3	Printer	KGP-9001A	With power and connecting cable	1.7 kg (3.8 lb)
4	Remote display	UR-7	With power and connecting cable	1.3 kg (2.9 lb)
5	Junction box	JB-10	1-IN/3-OUT, 1-IN/3-OUT	0.4 kg (0.89 lb)
		JB-12	1-IN/3-OUT, 3-IN/1-OUT	0.42 kg (0.93 lb)
6	Antenna unit ^{Note 1}	GA-03		0.9 kg (2.0 lb)
7	H-field loop antenna Antenna cable	BA-03	With antenna cable Connected to BA-03/BNC connector	1.4 kg (3.1 lb) 10 m (32 13/16 ft)
		BA-03L	With antenna cable Connected to BA-03L/BNC connector	1.6 kg (3.6 lb) 15 m (49 3/16 ft)
		BA-03S	With antenna cable Connected to BA-03S/BNC connector	0.99 kg (2.2 lb) 0.5 m (1 5/8 ft)
8	GPS/H-field beacon antenna Antenna cable	GBA-01	With antenna cables Connected to GBA-01/BNC connector	1.9 kg (4.2 lb) 10 m (32 13/16 ft)
		GBA-01L	With antenna cables Connected to GBA-01L/BNC connector	2.2 kg (4.9 lb) 15 m (49 3/16 ft)
		GBA-01S	With antenna cables Connected to GBA-01S/BNC connector	1.1 kg (2.5 lb) 0.5 m (1 5/8 ft)
9	Antenna extension cable	CW-826	With N-P/BNC connectors For BA-03S/GBA-01S	0.5 m (1 5/8 ft)
		RG-10U/Y	With N-P connectors For BA-03S/GBA-01S	20 m (66 ft)
		RG-10U/Y	With N-P connectors For BA-03S/GBA-01S	30 m (98 7/16 ft)
		RG-10U/Y	With connectors (N-J-10U) For GA-03	^{Note 2}
		10DFB	With connectors (for 10DFB) For GA-03	^{Note 3}
10	Connecting cable	CW-60	With BNC connector and lugs	10 m (32 13/16 ft)
		CW-94	With 6-pin and BNC connectors	5 m (16 3/8 ft)
		CW-153A	With 6-pin connectors	5 m (16 3/8 ft)
		CW-154A	With 6-pin connector, one end plain	5 m (16 3/8 ft)
		CW-155	With 6-pin and BNC connectors	5 m (16 3/8 ft)
		CW-157A	With 6-pin and 5-pin connectors	5 m (16 3/8 ft)
		CW-158	With 6-pin connector, one end plain	5 m (16 3/8 ft)
		CW-311	With 7-pin connector, one end plain	5 m (16 3/8 ft)
11	Power rectifier	PS-003A	With two 5A fuses	2.8 kg (6.2 lb)
12	AC power cable	VV-2D8	Both end plain, for power rectifier	3 m (9 13/16 ft)
13	Antenna holder	RAH-29	Ratchet mount	0.68 kg (1.5 lb)

Note 1: Required if the receiving cable length exceeds 15 m (49 3/16 ft).

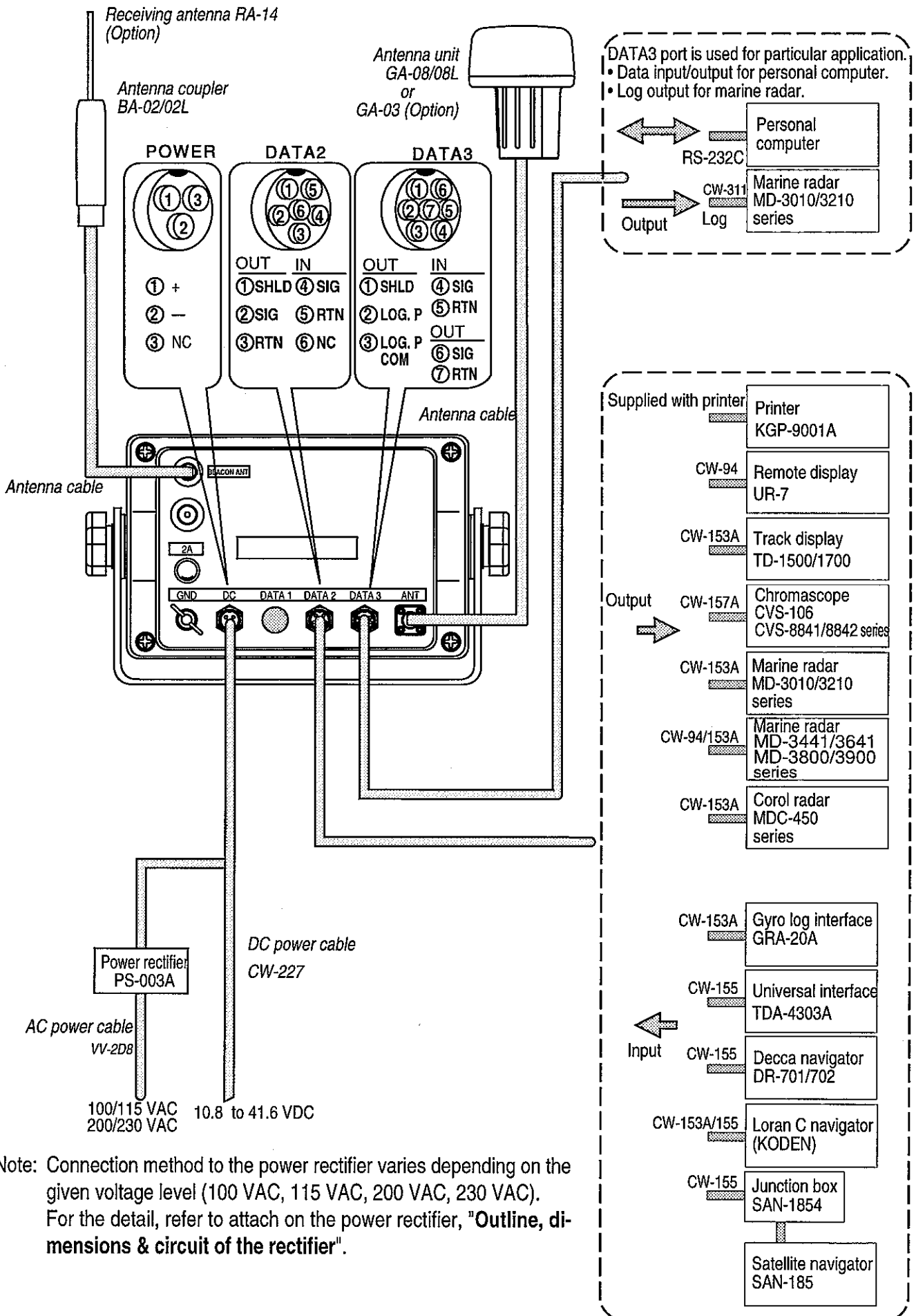
Note 2: The RG-10U/Y receiving cable of 15 m (49 3/16 ft), 20 m (66 ft), or 30 m (98 7/16 ft) long can be selected.

Note 3: The 10DFB receiving cable of 40 m (131 1/4 ft), 50 m (164 ft), or 60 m (197 ft) long can be selected.

Other materials

No.	Article	Type	Remarks	Quantity
1	Antenna holder	RAH-23	Stainless steel made For GA-03, BA-03/03L/03S, GBA-01/01L/01S	Each 1
2	Mounting bracket	RAH-22A	For GA-03	1
3	Hose band	SD-2050	For BA-03/03L/03S, GBA-01/01L/01S	Each 1
4	Hose band	738-1015	For BA-03/03L/03S, GBA-01/01L/01S	Each 2

Interconnection diagram

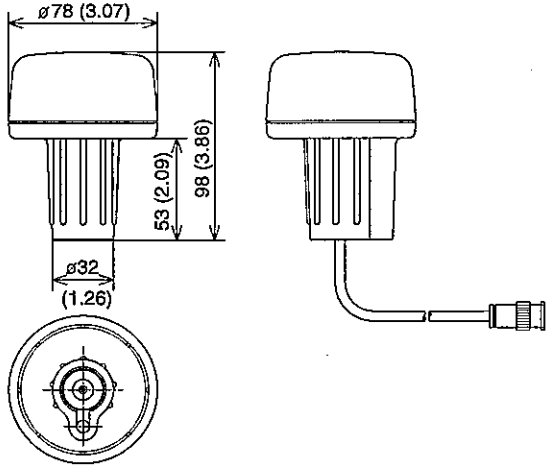


Outline and Dimensions

Scale differs among drawings.

Antenna unit (GA-08/08L)

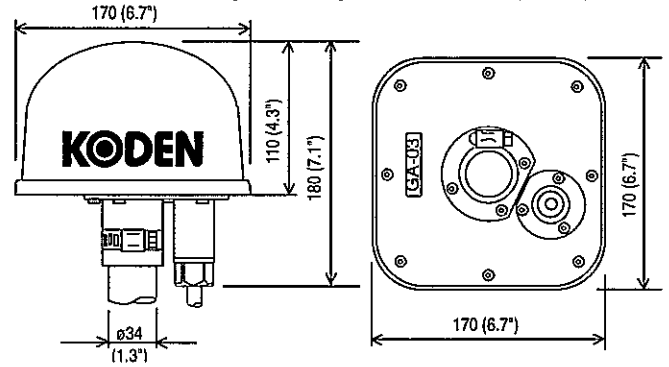
Unit: mm (inch)



Antenna unit (GA-03): Optional

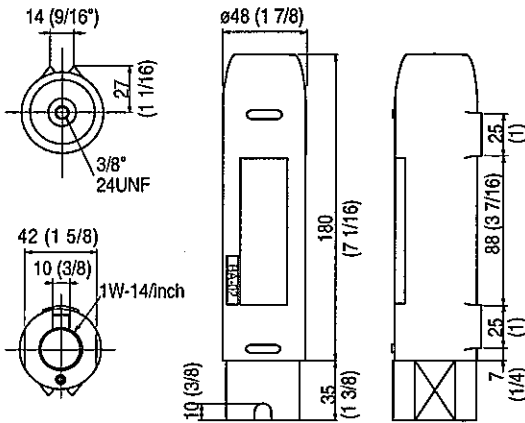
Unit: mm (inch)

Use GA-03 if the receiving cable length exceeds 15 m (49.2 ft).



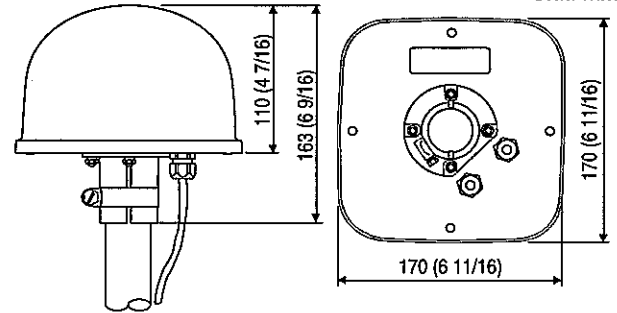
Antenna coupler (BA-02/02L)

Unit: mm (inch)

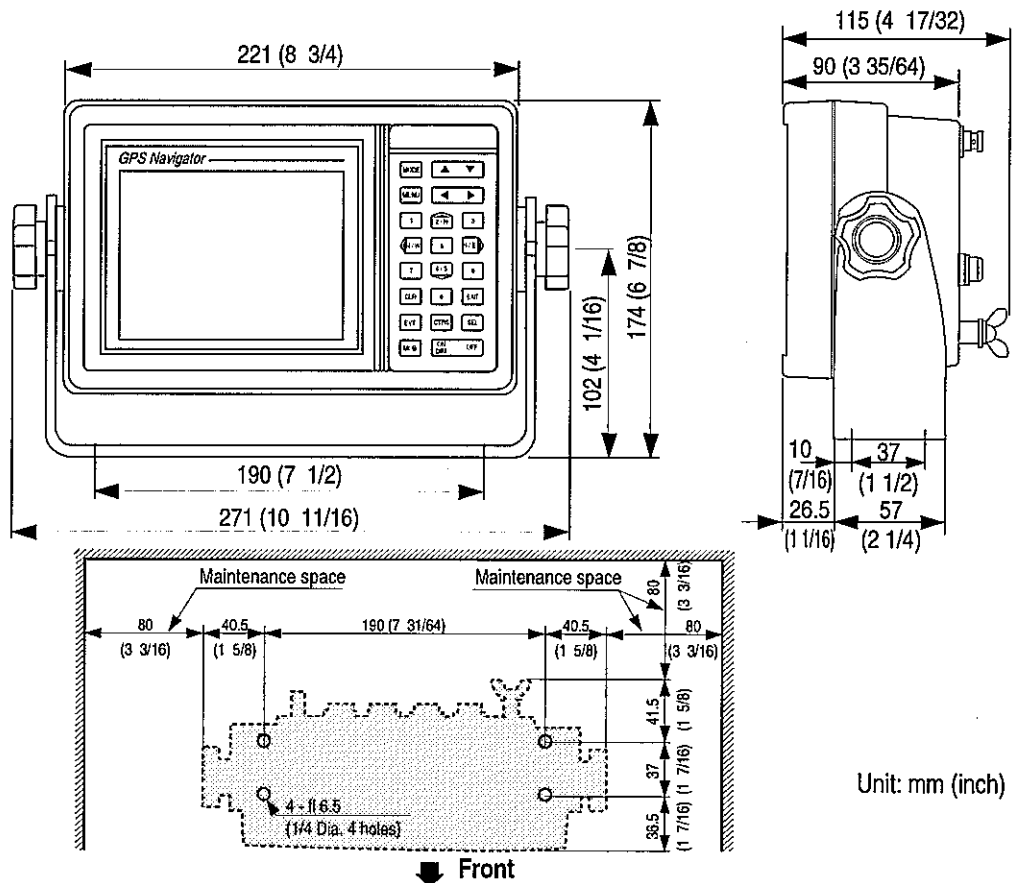


Antenna unit (GBA-01/01L/01S, BA-03/03L/03S): Optional

Unit: mm (inch)



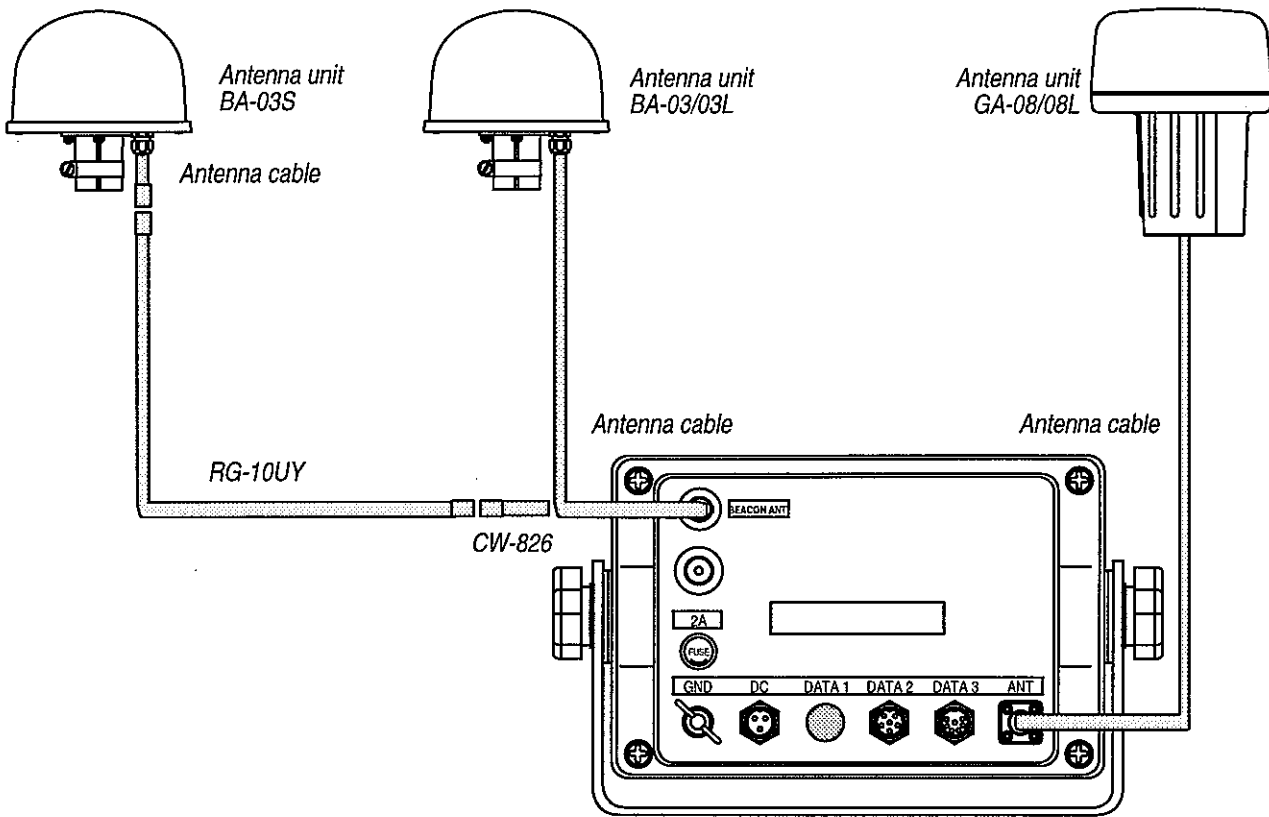
Display unit



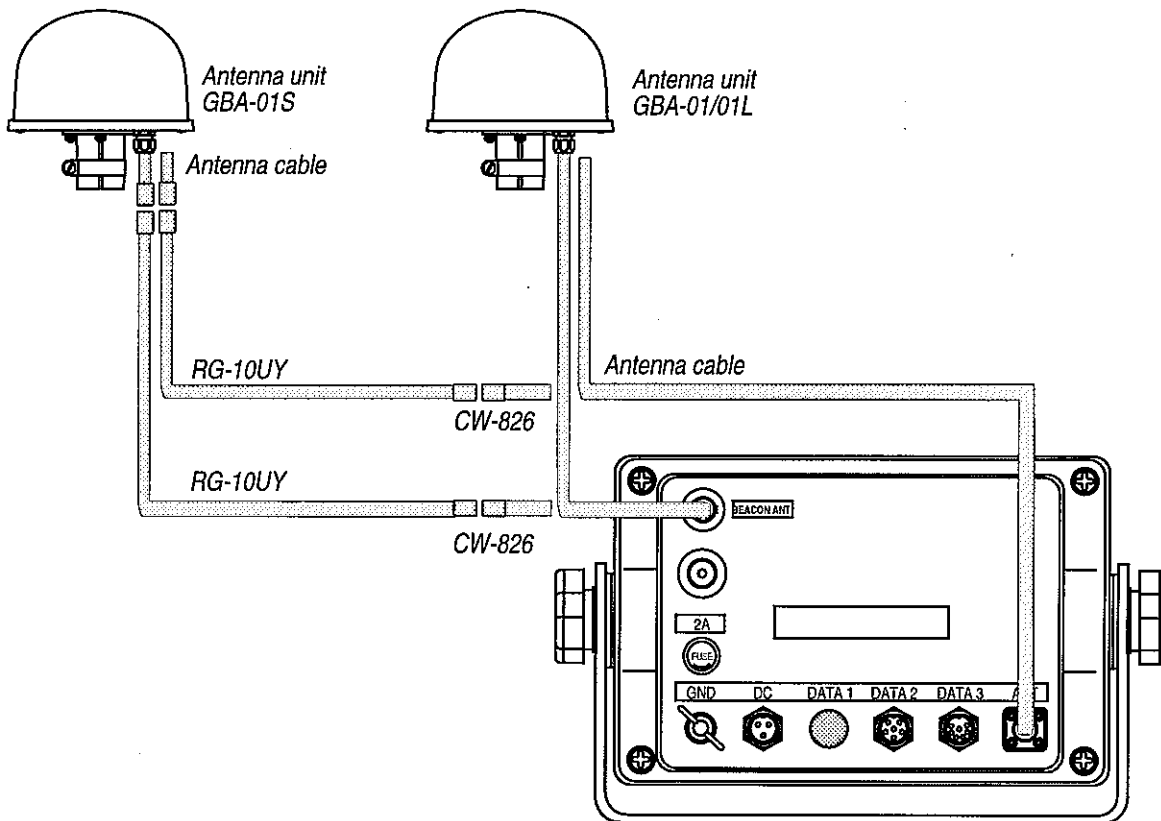
Unit: mm (inch)

Front

Connection using H-field loop antenna (GA-08/08L and BA-03/03L/03S)

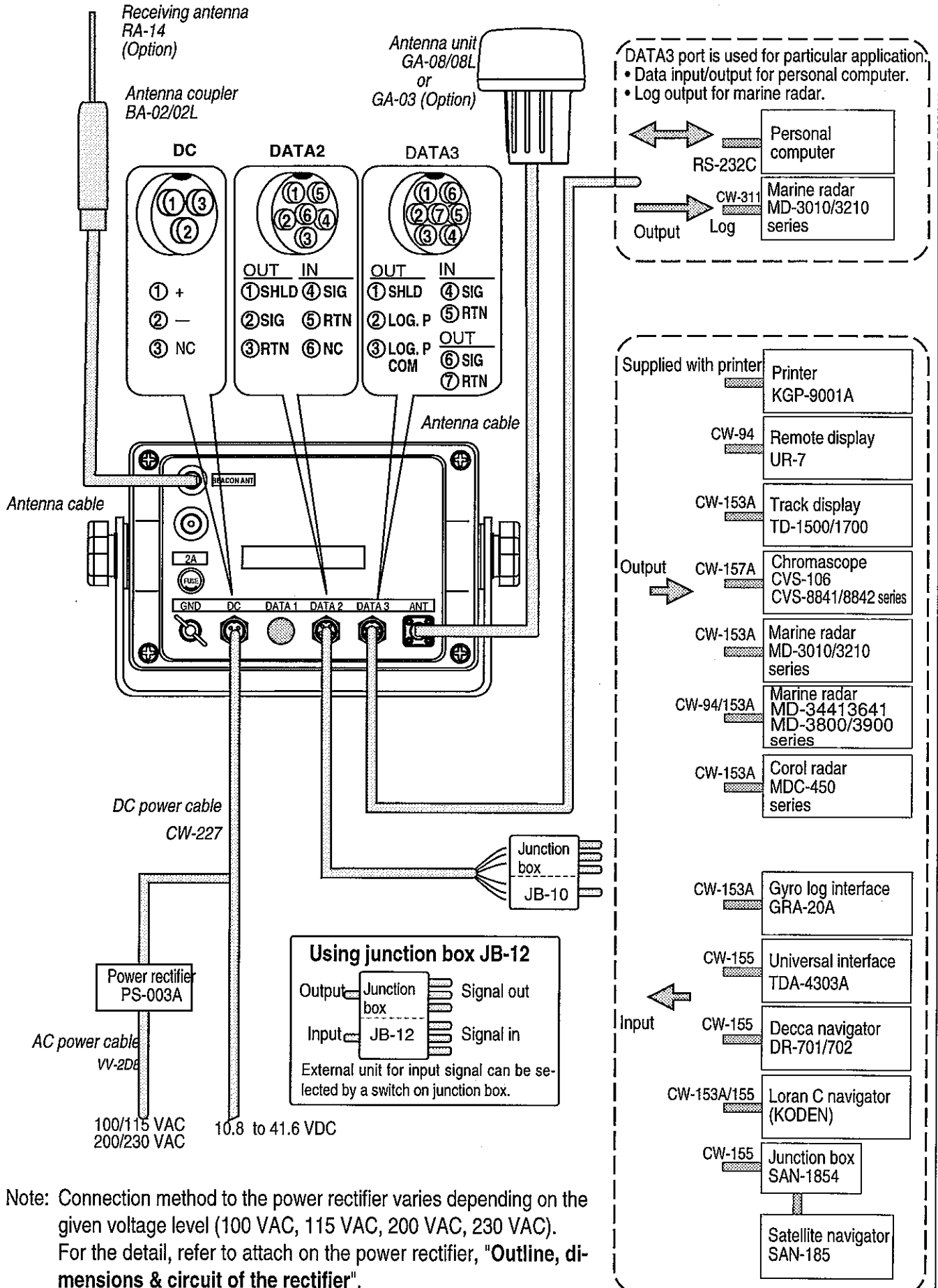


Connection using GPS/H-field beacon antenna (GBA-01/01L/01S)



Multi-connection using junction box (JB-10/12)

Consult to our sales agency when connecting the JB-10 or JB-12 junction box.



Note: Connection method to the power rectifier varies depending on the given voltage level (100 VAC, 115 VAC, 200 VAC, 230 VAC). For the detail, refer to attach on the power rectifier, "Outline, dimensions & circuit of the rectifier".

Installing Antenna

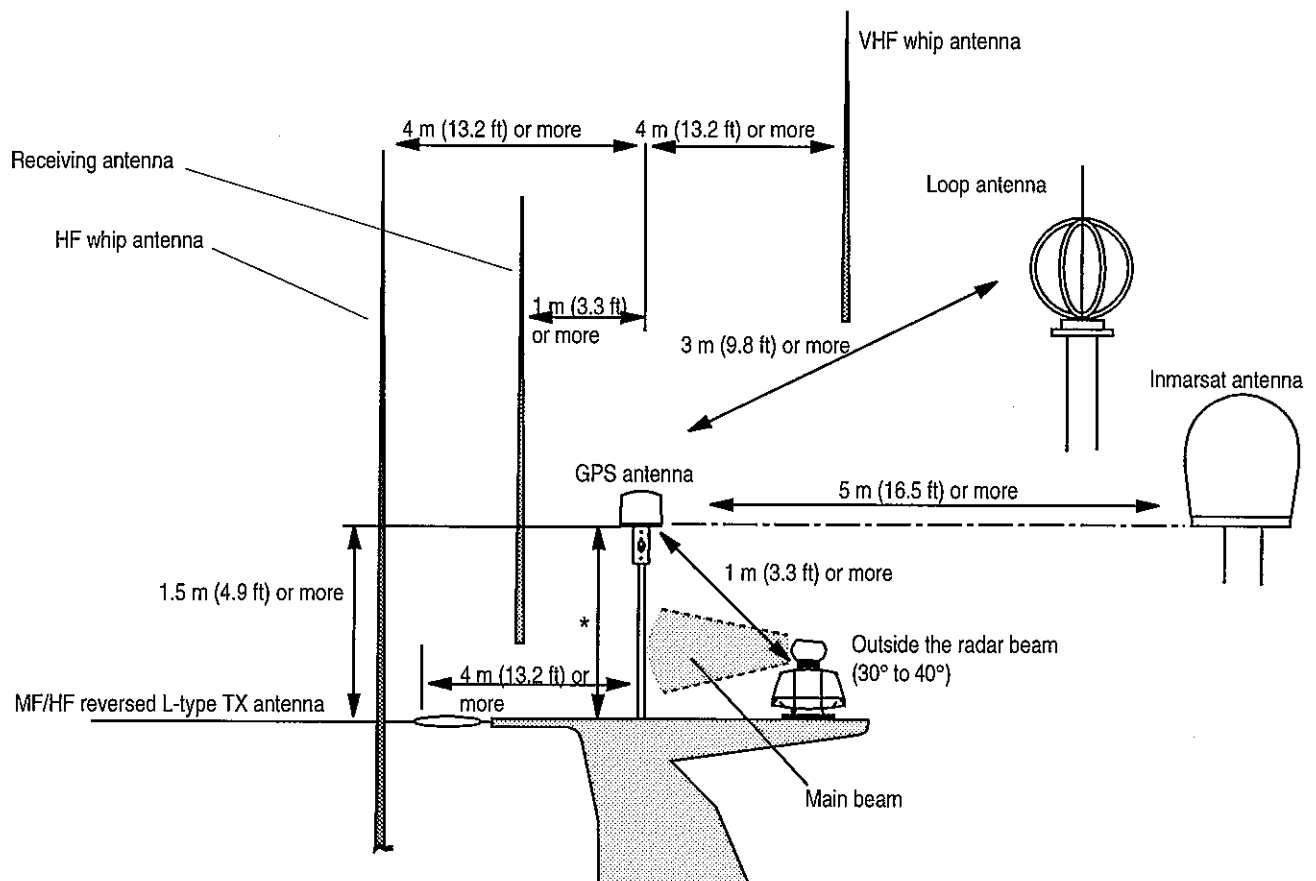
Installation site

Scale differs among drawings.

Make sure to install the antenna unit at a location where the minimum interruption of view above the horizon could be achieved.

Objects placed above the antenna unit or too close to the antenna unit may cause signal to noise ratio degradation and shorten measuring time.

- (1) As far away from the metallic object as possible.
- (2) At least 4 meters (13.2 feet) away from the MF/HF reversed L-type TX antenna, VHF or HF whip antenna.
- (3) At least 1.5 meter (4.9 feet) above the MF/HF reversed L-type TX antenna.
- (4) At least 1 meter (3.3 feet) away from the receiving antenna.
- (5) Outside radar transmitting beam (30° to 40°).
- (6) At least 1 meter (3.3 feet) away from the radar antenna.
- (7) At least 5 meters (16.5 feet) away from the Inmarsat antenna.
- (8) At least 3 meters (9.8 feet) away from the loop antenna.
- (9) At least 2 meters (6.6 feet) away from the engine.
- (10) At least 0.5 meters (1.6 feet) above the large metal surface.

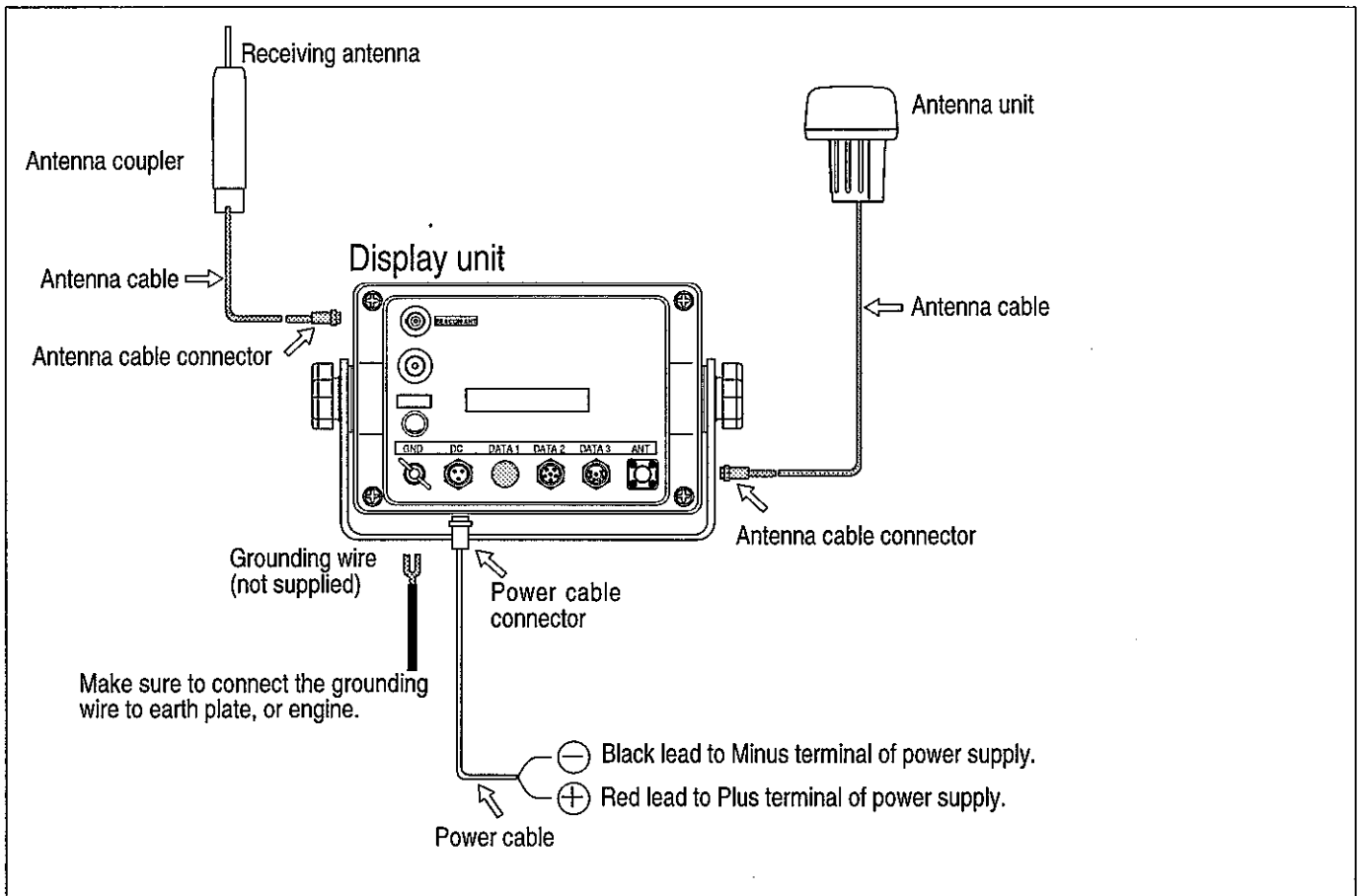


* At least 0.5 meters (1.6 feet) above the large metal surface.

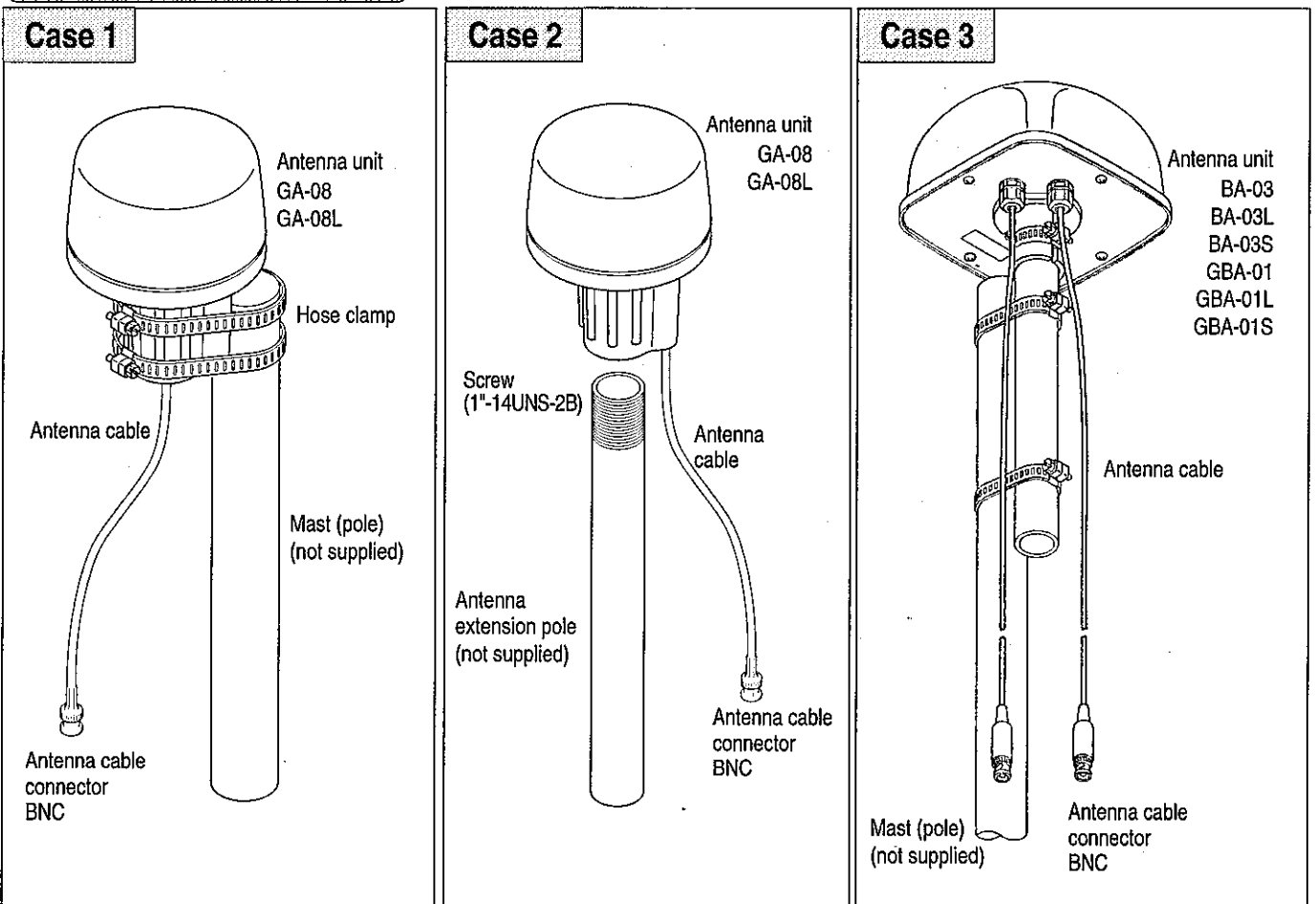
Should you find no place is available under the conditions as described in (1) through (10), then find the largest metal object and set up the antenna as far away as possible.

Guide line		
Object	Size in diameter	Minimum distance
Pole	10 cm (3 15/16 inches)	1.5 m (4.9 ft)
Pole	30 cm (11 13/16 inches)	3.0 m (9.8 ft)

Cable Connections



Antenna Installation



Positions of receiving antenna and its coupler

Install the receiving antenna and its coupler at the highest position on the vessel. Do not mount under or inside a place where metal is present. A metallic object between the transmitting station and antenna might not allow reception within the service area.

Notice for installation

As an installation site, select a place free from any metallic objects.

Install the antenna coupler at least one meter away from the receiver or remote display.

An appropriate installation position for the receiving antenna and coupler is as follows according to different types of vessel.

- On a sail boat, an insulated aft stay is usable as an antenna.
- In case of center cabin vessel, install the coupler on a side or on top of the cabin.
- On a power boat, install the coupler on the top or side of the cabin.

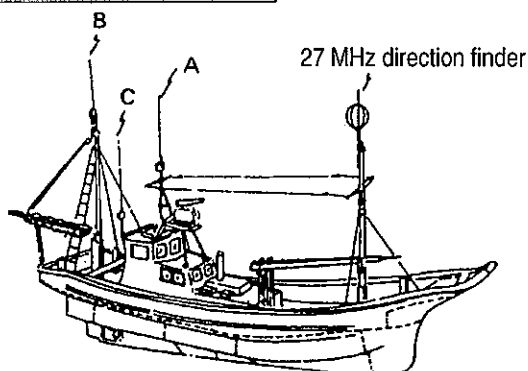
Select a place where the antenna can be mounted vertical.

Install the coupler as far away from other antennas, particularly transmitting antennas of intermediate or high frequency. Keep away from the TV set and receiving antenna.

Installation site

Select an optimum position for your boat.

For small fishing boats



Select an optimum position from A, B, and C below.

Position A (above radar mast)

A short antenna cable suffices.

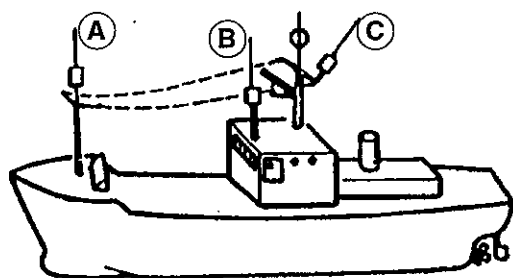
Position B (on mast)

Installation is possible at a high point, but the antenna cable length may fall short.

Position C (bridge)

A short antenna cable suffices.

For medium to large sized fishing boats



Position A

Mount the antenna at least one meter above the yard and as far away from the transmitting antenna as possible.

Position B

Mount the antenna on the end of the bridge and as far away from any transmitting antennas as possible. Mount the antenna coupler so the horizontal antenna element will be positioned below the middle of the whip antenna.

Position C

Tilt the antenna outward at least two meters away from the loop antenna. Even this may slightly affect the bearing measurement on the two MHz band.

Position A and B

Mount on the bridge and as far away from the transmitting antenna as possible.

Position C

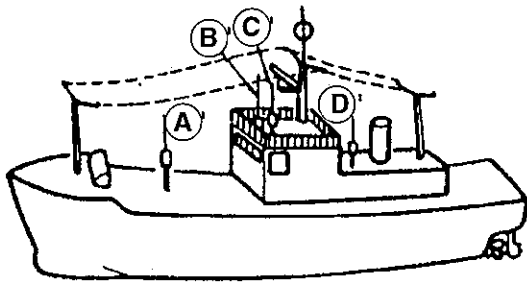
Mount at least one meter above the yard and as far away from the transmitting antenna as possible.

Tilt outward at least two meters away from the loop antenna. Even this may slightly affect the bearing measurement on the two MHz band.

Position D

Mount at least one meter above the yard and as far away from the transmitting antenna as possible.

If no mounting position is available matching the above conditions and when the operation is able only where the beacon signal is strong, refer to the following.



Position A'

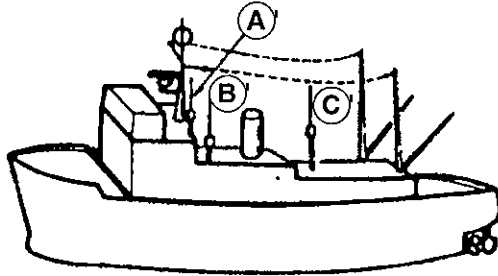
Absolutely avoid any place immediately below the transmitting antenna.

Position B' and C'

Separate as far away from the transmitting antenna. Mount the receiving antenna so its top end is located above the transmitting antenna. Separate as far away from the radar mast and other obstacles as possible.

Position D'

Absolutely avoid any place surrounded by obstacles.



Position A' and B'

Separate as far away from any transmitting antenna as possible, and mount the receiving antenna so its top end is located above the transmitting antenna. Separate as far away from the radar mast and other obstacles.

Position C'

Absolutely avoid any place immediately below the transmitting antenna.

RF ground

Tip 1: Grounding the antenna coupler is essential

The whip antenna used for DPS NAVIGATOR exhibits high impedance, causing the antenna to be sensitive to external noise. To lessen the noise and to make sure better reception of beacon signal, proper grounding of the antenna coupler BA-02 is quite essential.

There is a variance in grounding method according to the material of the hull.

Steel hull: Connect the grounding wire to the nearest grounding point on the hull.

Wooden or FRP hull: Connect the grounding wire from the antenna coupler to the grounding plate attached to the bilge. Make sure the length of the wire is kept shortest as possible.

Tip 2: Grounding method

In general there are three ways for grounding as shown in right figure.

Method 1 (Grounding to another equipment):

This method is considered most convenient and simple to implement, however, in case the noise level is considerable, its effect will be less than expected.

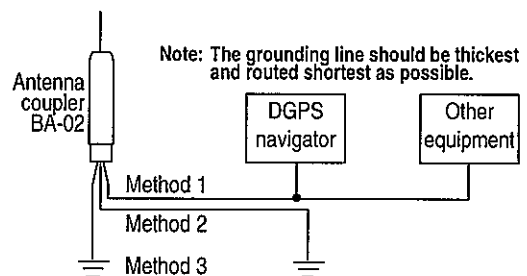
Method 2 (Grounding direct to the bilge):

This method may provide better result than method 1. Make sure the connection is shortest as possible and, good contact on common grounding point.

Method 3: (Grounding direct to independent bilge ground):

In case you cannot reduce the noise from other source even if the method 1 or 2 is implemented, we recommend the method 3. This approach reduces the common mode noise by applying a direct grounding to the bilge, that should be virtually common potential. The independent ship's ground should be located nearest to the antenna coupler, and the ground connection should be shortest and thickest as possible.

NOTE: The independent ship's ground should be provided with a thick copper plate which is attached to the bottom of the hull. The ground connection must be routed in a shortest distance.

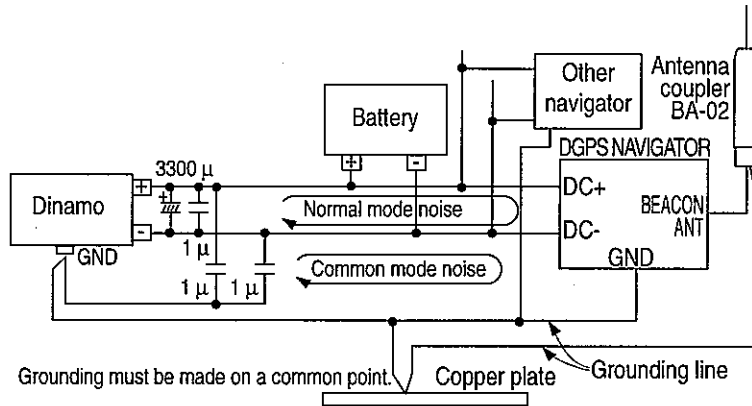


Tip 3. Reducing the noise from other equipment

When you connect DGPS NAVIGATOR to another equipment, the noise can possibly be induced via connection cables from the equipment in operation. To eliminate the noise DGPS NAVIGATOR should be bonded to the equipment to maintain these units at common ground potential. This arrangement may contribute to reduce the noise.

Tip 4. Reducing the noise from dynamo

The noise generated from dynamo can often become a serious interference that worsens the beacon signal reception. As shown in right figure, the noise current flows in two different paths, i.e. Normal Mode and Common Mode, respectively. The noise can be discriminated from other noise source by increasing or decreasing the output of the engine. Should the noise be detected, connect the capacitors as specified in right figure. It is known that the common mode noise can often become a major cause of the interference to the receiver.



Tip 5. Checking the overall function

When you have implemented the above countermeasures, use the following procedures to verify the modification is effective.

Confirm a reception status of the beacon signal by the S/N ratio shown on the DGPS monitor, which is menu driven. The S/N ratio of more than 6 is acceptable for normal operation.

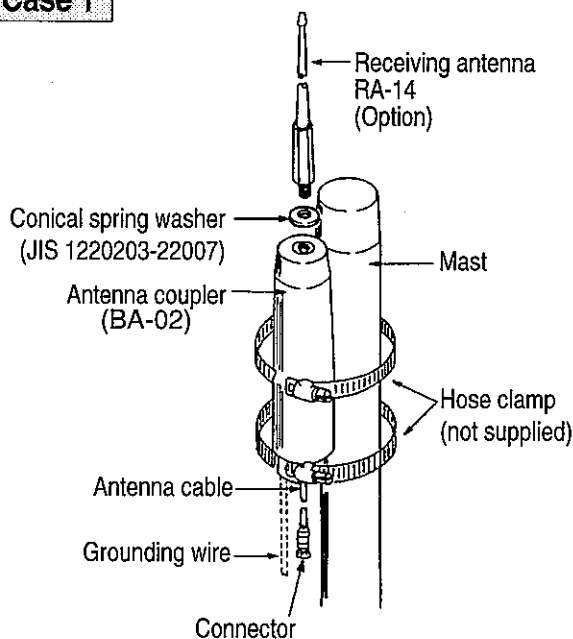
As the situation on board varies according to a ship, in terms of the material of the hull, cable layout, etc, we recommend to try out a possible combination of the countermeasures described above.

This test method should also be performed in the following conditions on board.

- Ship's engine is stopped.
- Ship's engine is driven at lower revolution.
- Ship's engine is driven at higher revolution.
- The drainage pump is run.
- The ventilation fan in the engine room is operated.
- The fluorescent lamps are turned on.

Receiving antenna and antenna coupler installation

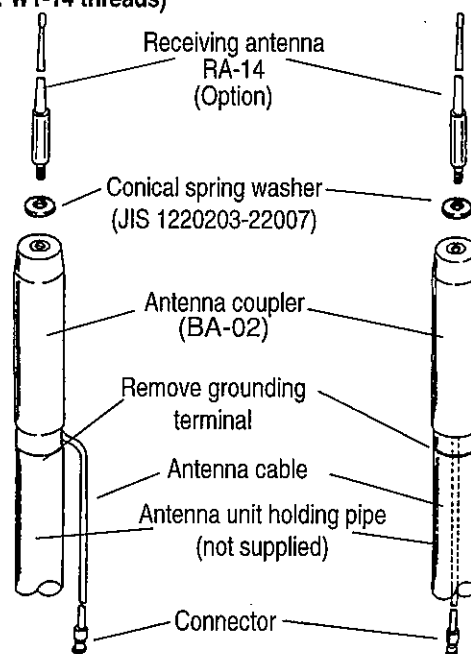
Case 1



Connect the grounding wire to the ground terminal of the unit or ship's bottom hull steel plate earth.

Case 2

Receiving antenna holding pipe (Screw: W1-14 threads)



Local Geodetic System

The number assigned to each place name is the set values used in the "Selecting a geodetic datum " (page 42).

In alphabetical order

Name	No.	Name	No.
ALASKA/CANADA	4	LIBERIA 64	57
ARC 50	29	MAHA 71	58
ARC 60	30	MALAYSIA	23
ARGENTIN	39	MALDIVE	48
ASCENSION	31	MARCUS	35
AUSTRALIAN 84	6	MARSHALL	82
BAHRAIN	27	MASCARENE	73
BERMUDA	37	MIDWAY 61	62
BRAZIL	45	MOROCCO	61
CANARY	68	NAD-27	3
CAYMAN BRAC	56	NAD-83	10
CHATHAM	43	NEW GEORGIA	46
COCOS	28	NEW ZEALAND	13
COLOMBIA	38	NIGERIA	63
CORVO/FLORES	65	OMAN	67
DIEGO GARCIA	52	PARAGUAY	44
DJAKARTA	22	PHILLIPPINES	19
EAST FALKLAND	76	PHOENIX	40
EAST MALAYSIA	79	PITCAIRN	69
EASTER	47	PORTO SANTO	77
EFATE	36	PUERTO RICO	71
EGYPT	66	QATAR	72
ENGLAND	20	ROME 40	15
ERITREA	60	SALVAGE	59
ETHIOPIA	25	SANTA MARIA	75
EUROPEAN 50	5	SANTO	74
EUROPEAN 79	14	SAUDI ARABIA	17
FAIAL	78	SOMALIA	26
FIJI	81	SOUTH AFRICA	16
FINLAND	84	SOUTH AMERICA	8
FLORIDA	41	SOUTH ASIA	7
GREENLAND	9	SOUTH CHILE	70
GUADALCANAL	50	SRI LANKA	54
GUAM 63	49	ST. HELENA	34
HAWAII	21	SURINAM	83
HONG KONG 63	51	SWEDEN	85
ICELAND 55	11	TERN	33
INDIAN/NEPAL	18	TOKYO	2
IRELAND 65	12	TRINIDAD	64
IWO JIMA	32	TRISTAN	80
JAPAN	24	TUNISIA	42
JHONSTON	53	WGS-72	1
KELGUELEN	55	WGS-84	0

In numerical order

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