FURUNO

OPERATOR'S MANUAL

GPS NAVIGATOR
DGPS NAVIGATOR

MODEL GP-31/GP-36

FURUNO ELECTRIC CO., LTD.
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(YOSH) GP-31/36

Your Local Agent/Dealer

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⚠ SAFETY INSTRUCTIONS

Safety Instructions for the Operator

⚠ WARNING

Do not open the equipment.

Only qualified personnel should work inside the equipment.

Do not disassemble or modify the equipment.

Fire, electrical shock or serious injury can result.

Immediately turn off the power at the switchboard if the equipment is emitting smoke or fire.

Continued use of the equipment can cause fire or electrical shock. Contact a FURUNO agent for service.

Keep heater away from equipment.

A heater can melt the equipment's power cord, which can cause fire or electrical shock.

Use the proper fuse.

A 1A fuse is provided in the power/data cable. Use only a 1A fuse—use of a wrong fuse can result in equipment damage.

⚠ CAUTION

Do not use the equipment for other than its intended purpose.

Improper use of the equipment can result in personal injury or equipment damage.

No one navigation device should ever be solely replied upon for the navigation of a vessel.

Always confirm position against all available aids to navigation, for safety of vessel and crew.

GPS position and velocity accuracies are controlled by the U.S. Department of Defense. Position may be degraded up to 100 meters.

Safety Instructions for the Installer

⚠ WARNING

Do not open the cover unless totally familiar with electrical circuits and service manual.

Improper handling can result in electrical shock.

Turn off the power at the switchboard before beginning the installation.

Fire or electrical shock can result if the power is left on.

Be sure that the power supply is compatible with the voltage rating of the equipment.

Connection of an incorrect power supply can cause fire or equipment damage. The voltage rating of the equipment appears on the label above the power connector.

DO NOT CUT THE ANTENNA CABLE.

See the instructions on the CAUTION SHEET and the chapter on installation.

⚠ CAUTION

Ground the equipment to prevent mutual interference.

Observe the following compass safe distances to prevent interference to a magnetic compass:

	Standard compass	Steering compass
Display unit	0.5 m	0.3 m

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A Word to GP-31/GP-36 Owners

Congratulations on your choice of the GP-31 GPS Navigator, GP-36 DGPS Navigator. We are confident you will see why the FURUNO name has become synonymous with quality and reliability.

For over 50 years FURUNO Electric Company has enjoyed an enviable reputation for innovative and dependable marine electronics equipment. This dedication to excellence is furthered by our extensive global network of agents and dealers.

Your navigator is designed and constructed to meet the rigorous demands of the marine environment. However, no machine can perform its intended function unless installed, operated and maintained properly. Please carefully read and follow the recommended procedures for installation, operation, and maintenance.

We would appreciate hearing from you, the end-user, about whether we are achieving our purposes.

Thank you for considering and purchasing FURUNO equipment.

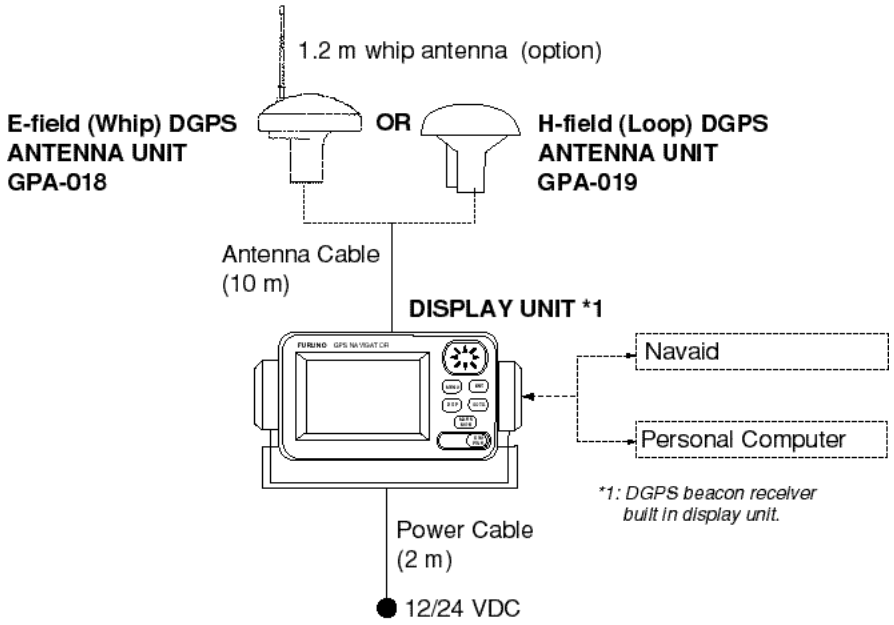
Features

The GP-31/GP-36 is a totally integrated GPS receiver and video plotter, and consists of a display unit and an antenna unit.

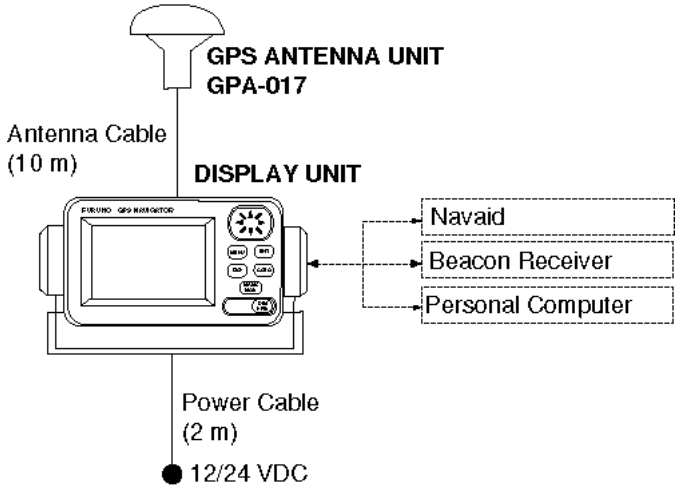
The GP-36 additionally has a DGPS beacon receiver built in its display unit. The high sensitivity GPS receiver tracks up to twelve satellites simultaneously. An 8-state Kalman filter ensures optimum accuracy in determination of vessel position, course and speed.

The main features of the GP-31/GP-36 are

- A DGPS beacon receiver (external) may be connected to the GP-31 to add DGPS function.
- Comprehensive navigation data displays
- Storage for 950 waypoints and 50 routes
- Alarms: Arrival, Anchor Watch, XTE (Cross-track Error), Trip, Time, DGPS, and Speed.
- Man overboard feature records latitude and longitude or TD (Loran C or Decca) coordinates at time of man overboard and provides continuous updates of range and bearing when navigating to the MOB position.
- Menu-driven operation
- Bright 95 x 60 mm LCD with adjustable contrast and brilliance
- Autopilot (option) may be connected, and steering data output to the autopilot.
- Unique “Highway” display provides a graphic presentation of ship’s progress toward a waypoint.
- Own ship’s position may be shown in latitude and longitude or TD (Loran C or Decca).
- Waypoint and route data can be uploaded from a PC or downloaded to a PC.



GP-36 System configuration



GP-31 System configuration

EQUIPMENT LISTS

Standard supply

Name	Type	Qty	Remarks	
Display Unit	GP-36	1	BEACON board incorporated	Including hanger and knob bolts
	GP-31		No BEACON board	
Antenna Unit	GPA-017	1	For GP-31, with 10 m cable	
	GPA-018		For GP-36, E-field (whip) DGPS antenna, w/10 m cable	
	GPA-019		For GP-36, H-field (loop) DGPS antenna, w/10 m cable	
Installation Materials		1 set	• Power/Data cable (Type: MJ-A7SPF0005-020, Code No.: 000-139-384) • Spring washer (1 pc., for whip antenna of GPA-018, Type: M10, Code No.: 000-864-261) • Tapping screw (4 pcs., for fixing display unit, Type: 5X20, Code No.: 000-802-081	
Spare Parts		1 set	Fuse (2 pcs., Type: FGMG1A, Code No.: 000-114-805)	
Accessories		1 set	Hard cover (Type: 20-016-1091, Code No.: 100-297-032)	

Optional equipment

Name	Type	Code No.	Remarks
Right Angle Antenna Base	No.13-QA330	000-803-239	For antenna unit
L-type Antenna Base	No.13-QA310	000-803-240	
Handrail Antenna Base	No.13-RC5160	000-806-114	
Mast Mount Kit	CP20-01111	004-365-780	
Cable Assy.	MJ-A7SPF0005-020	000-139-384	
Flush Mount Kit S	OP-20-17	000-040-720	For flush mounting the display unit
Flush Mount Kit F	OP-20-29	000-041-405	

1. OPERATIONAL OVERVIEW

1.1 Control Description

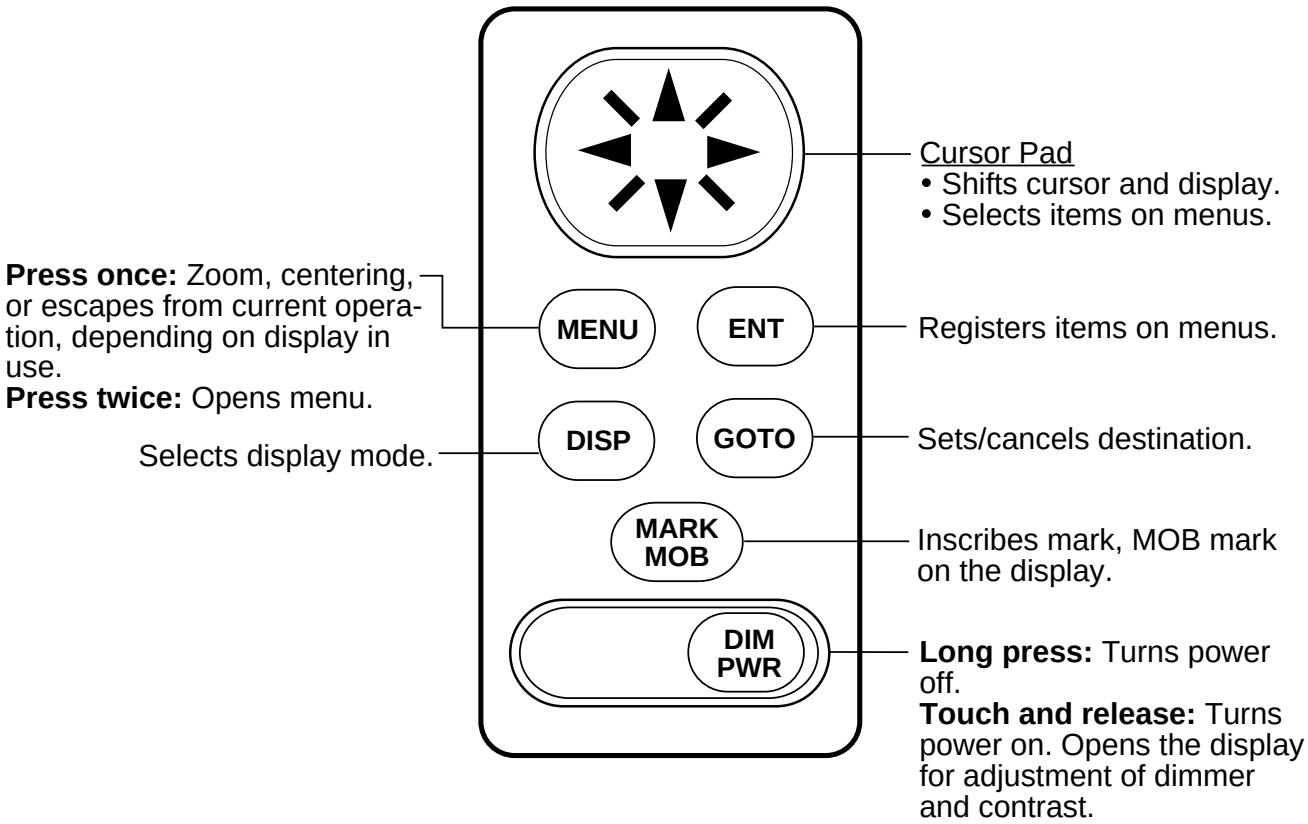
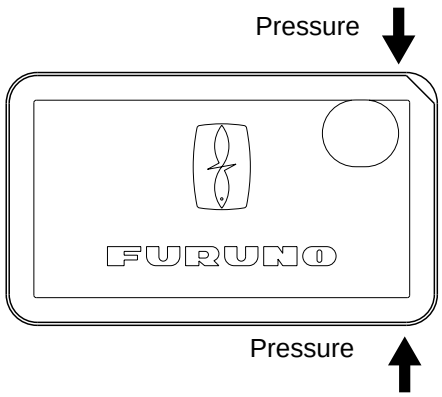


Figure 1-1 Control panel

Removing the hard cover

To remove the hard cover, squeeze it at its top and bottom right (or left) corners and pull it toward you.



1.2 Turning On and Off the Power

Turning on the power

Press the [DIM/PWR] key. The unit beeps and then starts up with the last-used display mode.

Your equipment takes about two minutes to find its position when turned on for the very first time.

The equipment shows receiver status indications at the top left-hand corner in all display modes. Table 1-1 shows these indications and their meanings.

Table 1-1 Receiver status indications

Indication	Meaning
2D	Normal 2D GPS position fix
DOP	GPS position fix with DOP more than 4 (2D position fix) or 6 (3D position fix)
3D	Normal 3D GPS position fix
D2D	Normal differential GPS position fix
D3D	Normal 3D differential GPS position fix
SIM	Simulation mode.

DOP: Dilution of Precision. The index for position-fixing accuracy. The higher the number the higher the accuracy of the position fix.

Note: Position accuracy also depends on satellite position.

Turning off the power

Press and hold down the [DIM/PWR] key until the screen goes blank, approx. three seconds. The time remaining until power off is counted down on the display.

1.3 Adjusting Display Dimmer and Contrast

1. Press the [DIM/PWR] key with a touch-and-release action. The display shown in Figure 1-2 appears.

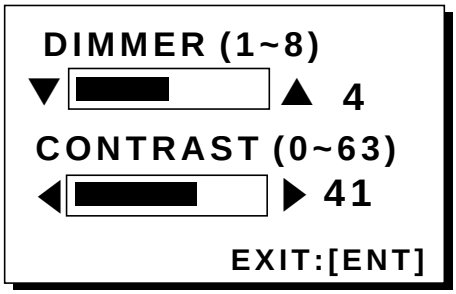


Figure 1-2 Screen for adjustment of display dimmer and contrast

2. To adjust the dimmer, press ▲ or ▼. Current setting is shown to the right of "▲".
3. To adjust the contrast, press ◀ or ▶. Current setting is shown to the right of "▶".
4. Press the [ENT] key to finish.

Note: If you turn off the power with minimum contrast,nothing appears on the display when you turn on the power again.Adjust the contrast as described above.

1.4 Display Modes

Your unit has five display modes: Plotter Display, Highway Display, Steering Display, Nav Data Display and User Display (digital data or speedometer). Press the [DISP] key to select a display mode. Each time the key is pressed, the display mode changes in the sequence shown below.

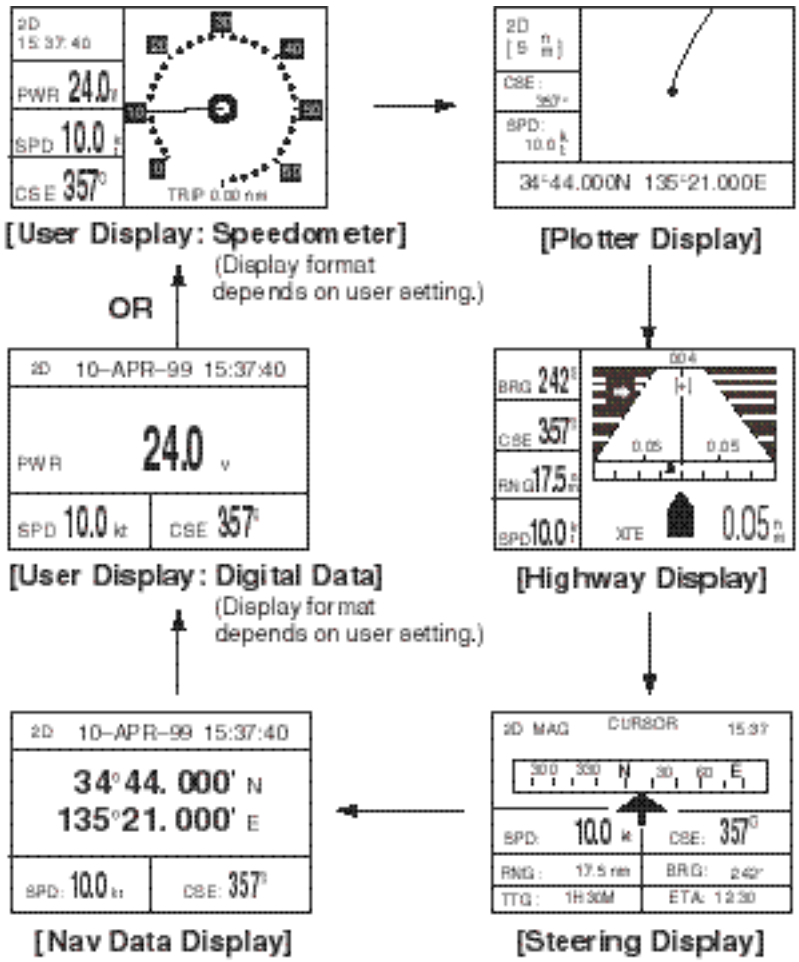


Figure 1-3 Display modes

Note: Position data can be shown in latitude and longitude or TDs (Loran C or Decca).

Plotter display

The plotter display traces own ship's track, and shows position, course, speed, and horizontal display range setting.

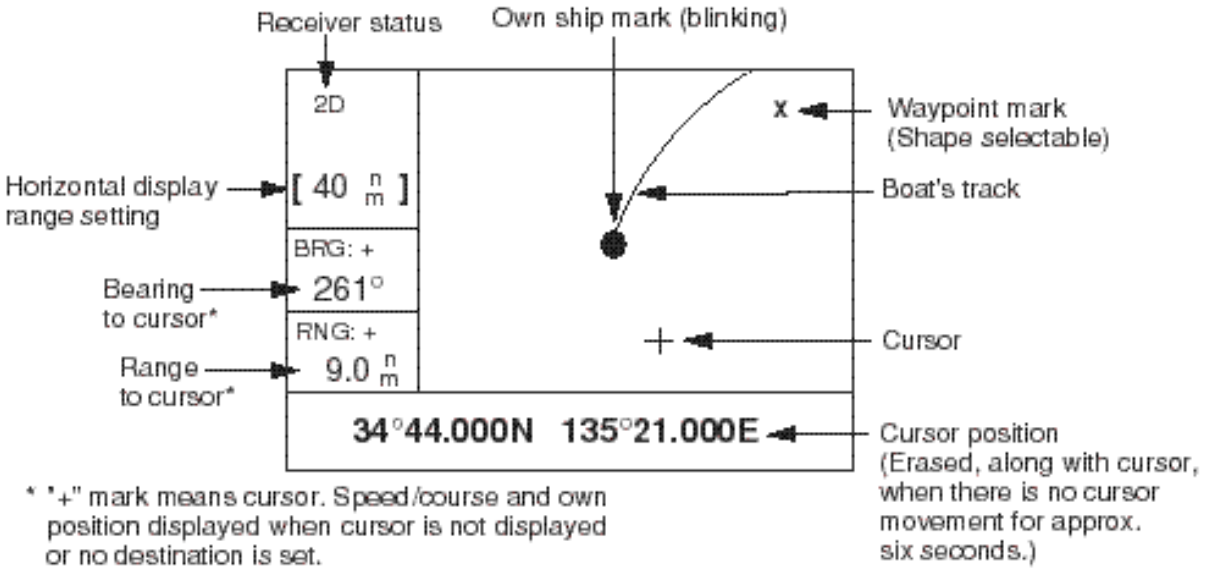


Figure 1-4 Plotter display

Highway display

The highway display provides a 3-D view of own ship's progress toward destination. Nav data is also shown.

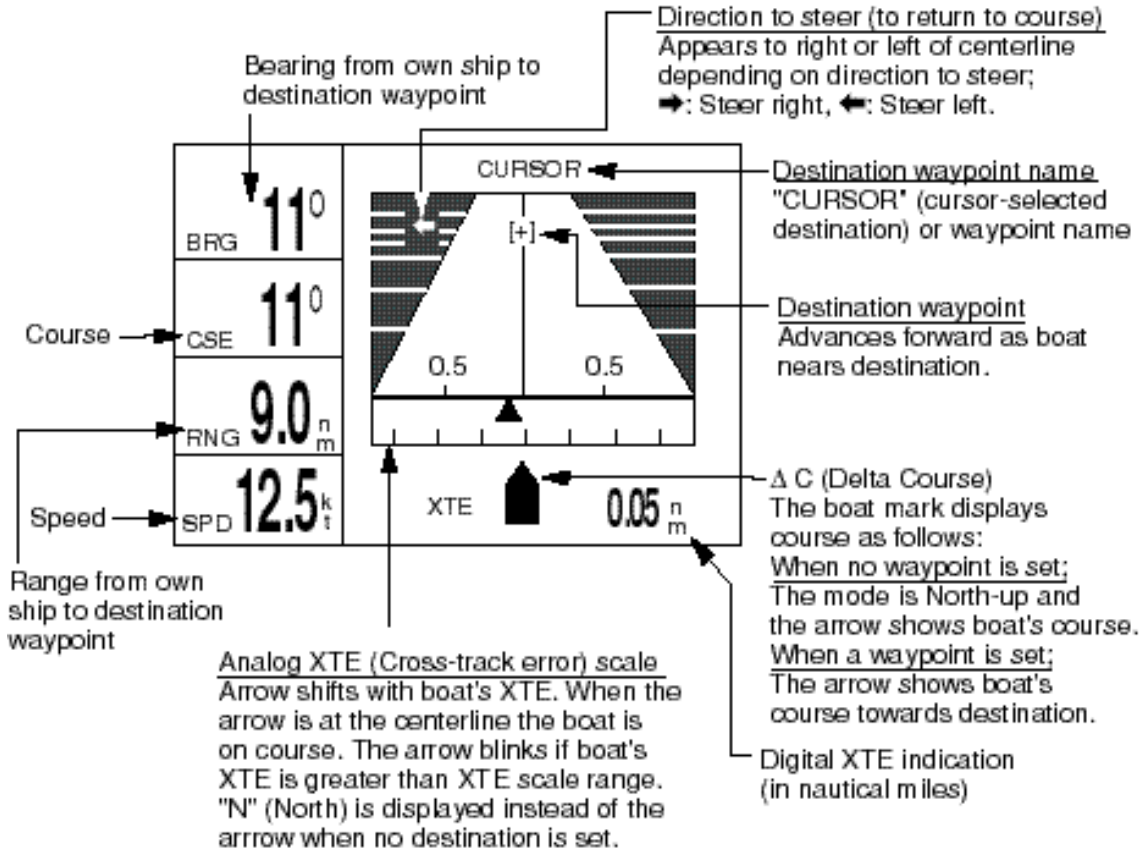


Figure 1-5 Highway display

Steering display

The steering display provides steering information such as ship's speed, course; range, bearing, ETA and TTG (Time-To-Go) to destination.

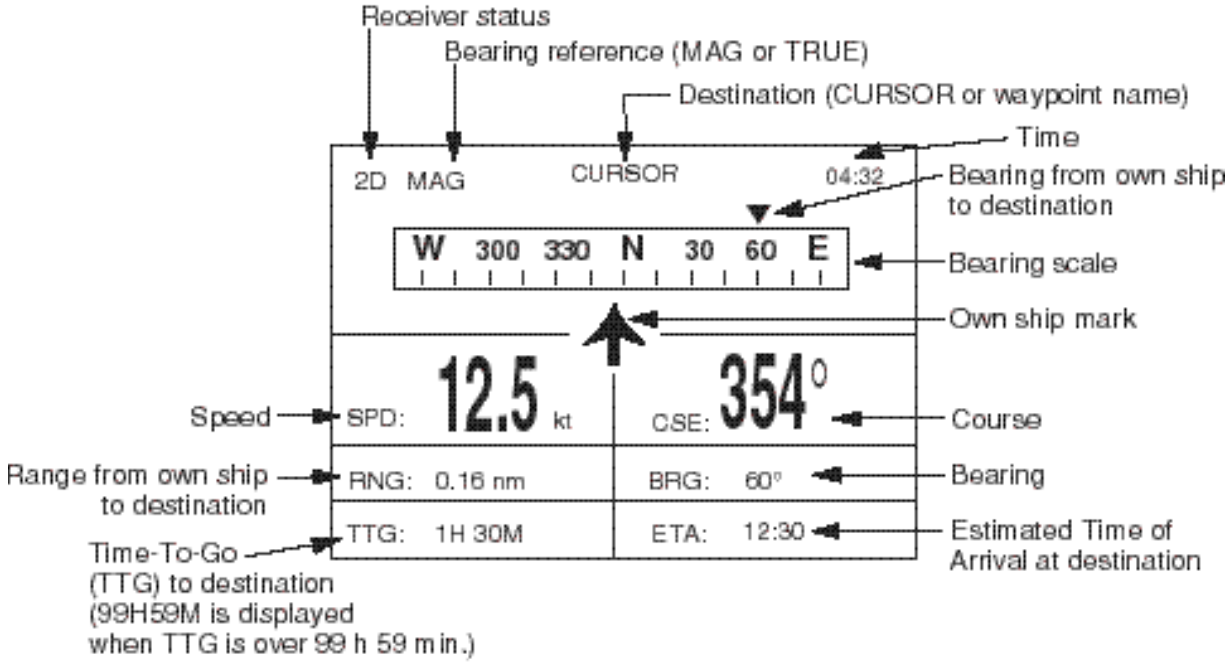


Figure 1-6 Steering display

Nav data display

The nav data display shows position in latitude and longitude (or TDs), course, speed, date and time.

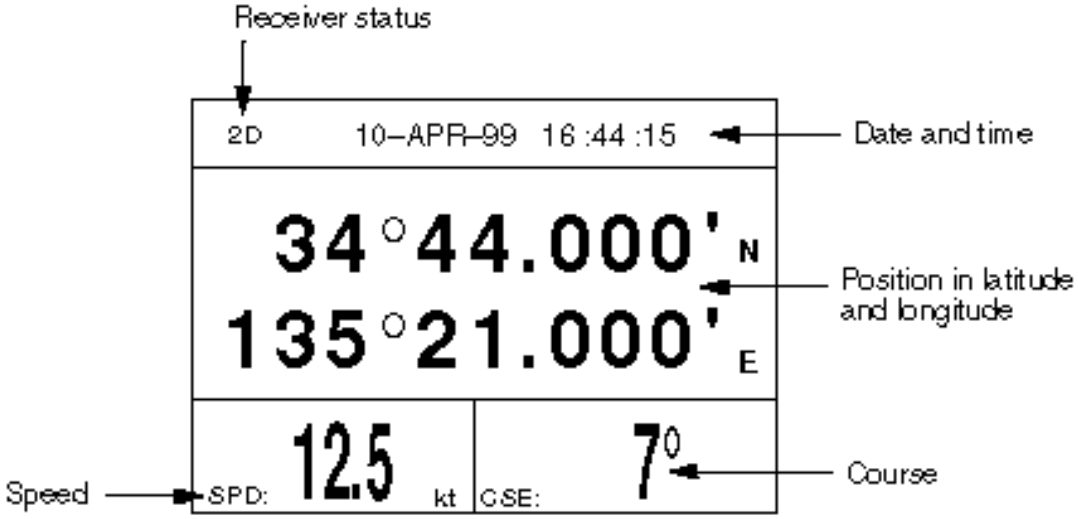


Figure 1-7 Nav data display

User displays

Two user displays are available, digital and speedometer, and the operator may select which to display. The default display is the digital display.

Digital display

The digital display shows digital navigation data. The user may choose what data to display in the three cells below the receiver status, date and time indications. The choices of data are speed, course, range, bearing, time-to-go, estimated time of arrival, trip distance and power source voltage.

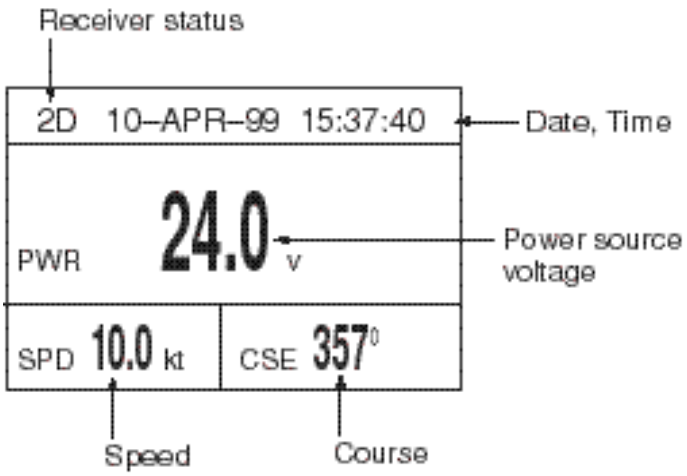


Figure 1-8 Digital display

Speedometer display

The speedometer display provides both digital and analog speed readouts. Additionally it provides three cells of data (below the receiver status and time indication) which the user may choose. The choices are the same as those for the digital display.

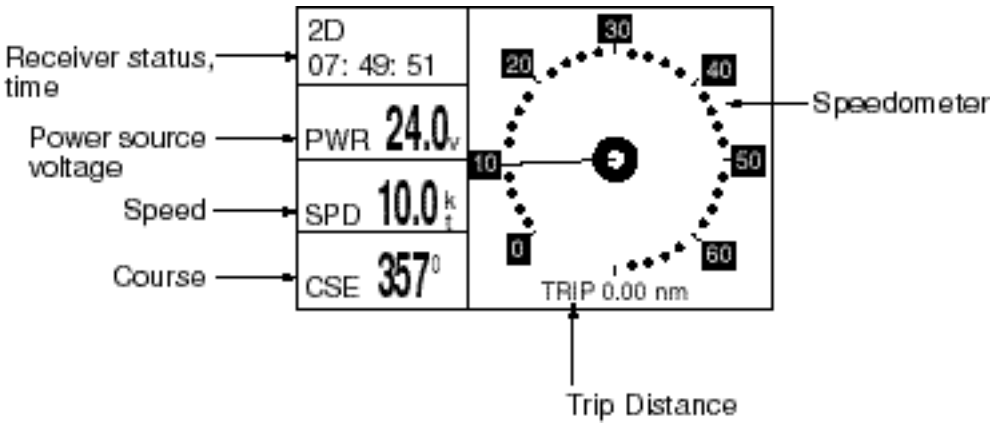


Figure 1-9 Speedometer display

1.5 Basic Menu Operation

Most operations of the your unit are carried out through the menu. Below is a quick introduction to how to select a menu and change menu settings. If you get lost in operation, press the [MENU] key to return to the MAIN menu. A complete menu tree appears in the Appendix.

1. Press the [MENU] key once or twice to display the menu.

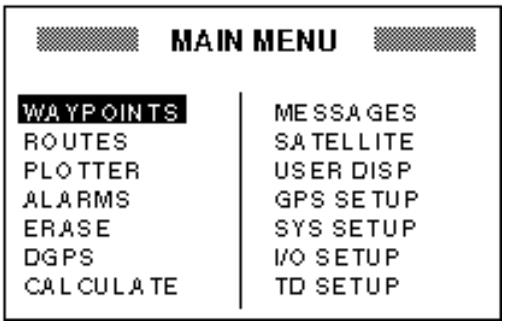


Figure 1-10 Menu

Once: At the steering display, nav data display, user display.
Twice: At the plotter display, highway display.

2. Operate the cursor pad to select a menu and press the [ENT] key. For example, select PLOTTER and press the [ENT] key.

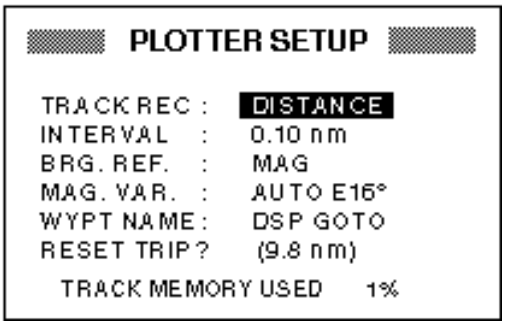


Figure 1-11 PLOTTER SETUP menu

3. Press ▲ or ▼ to select menu item. For example, select the TRACK REC field.
4. Press the [ENT] key. A window showing options appears. (The figure below shows the options available for TRACK REC.)

Figure 1-12 Options of TRACK REC

5. Press ▲ or ▼ to select option desired.
6. Press the [ENT] key.
7. Press the [MENU] key twice to finish.

How to enter alphanumeric data

In some instances it is necessary to enter alphanumeric or character data. The example below shows how to enter a time difference of –6:30, to use local time instead of UTC time.

1. Press the [MENU] key once or twice to display the menu.
2. Select SYS SETUP and press the [ENT] key.

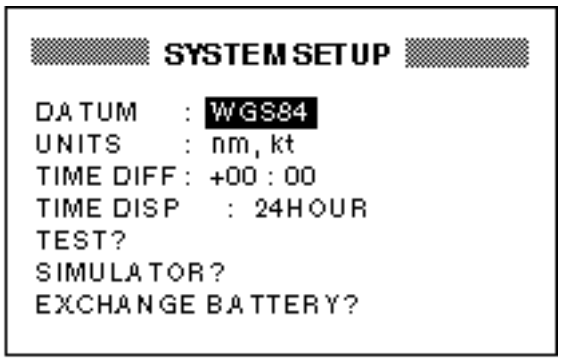


Figure 1-13 SYS SETUP menu

3. Press ▼ to select the TIME DIFF field.
4. Press the [ENT] key. A cursor circumscribes “+”. This cursor appears whenever selected data can be changed with the cursor pad.

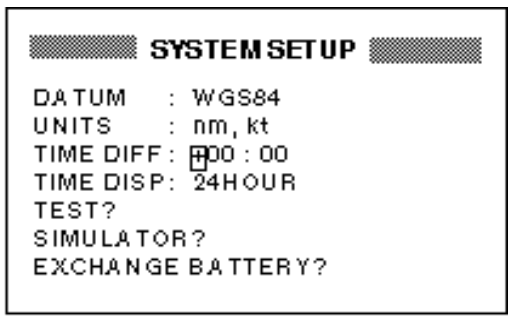


Figure 1-14 SYSTEM SETUP menu, TIME DIFF field selected

5. Press ▲ to display "–".
6. Press ▶ to send the cursor to the next digit.
7. Press ▲ or ▼ to display 0.
8. Press ▶ to send the cursor to the next digit.
9. Press ▲ or ▼ to display 6.
10. Press ▶ to send the cursor to the next digit.
11. Press ▲ or ▼ to display 3.
12. Press ▶ to send the cursor to the last digit.
13. Press ▲ or ▼ to display 0.
14. Press the [ENT] key.
15. Press the [MENU] key twice to finish.

1.6 Simulator Display

The simulator display provides simulated operation of this unit. You may set the speed manually and the course manually or automatically. All controls are operative – you may enter marks, set destination, etc.

1. Press the [MENU] key twice to display the menu.
2. Select SYS SETUP and press the [ENT] key.

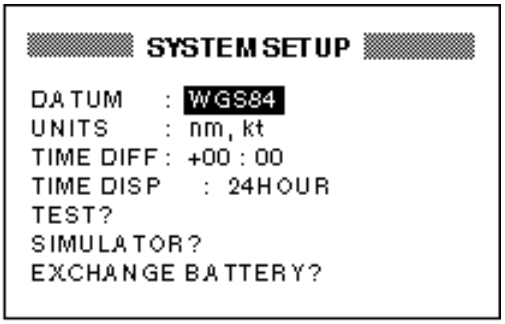


Figure 1-15 SYSTEM SETUP menu

3. Select "SIMULATOR?" and press the [ENT] key.

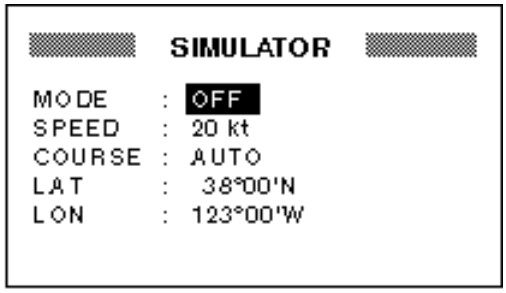


Figure 1-16 SIMULATOR menu

4. Press the [ENT] key. A window appears which shows the choices ON or OFF.
5. Select ON and press the [ENT] key.
6. Press the [ENT] key, enter speed to use for the simulation with the cursor pad, and press the [ENT] key.
7. Press the [ENT] key.
8. Select course entry method (AUTO or MANU) and press the [ENT] key. For manual entry of course, press the [ENT] key again, enter course with the cursor pad, and press the [ENT] key again. (The AUTO course tracks a circular course.)
9. Press the [ENT] key, enter latitude (usually current latitude) with the cursor pad, and press the [ENT] key.
10. Press the [ENT] key, enter longitude (usually current longitude), and press the [ENT] key.
11. Press the [MENU] key twice.
12. Select the PLOTTER display with the [DISP] key. SIM appears at the upper left-hand corner when the simulator display is active.

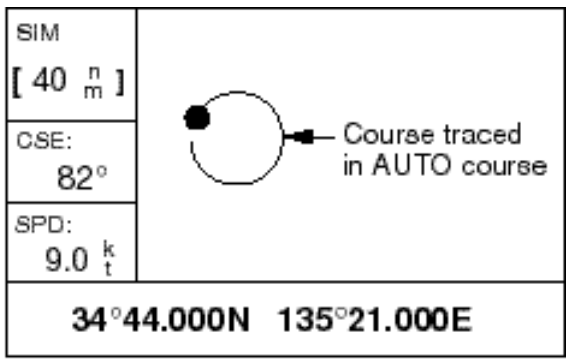


Figure 1-17 Simulator display, auto course selected

13. To turn off the simulator display, select OFF at step 5 in this procedure, press the [ENT] key, and press the [MENU] key twice to finish.

Note: If the power is reset while the simulator display is in use, the indication SIMULATION MODE appears at the top of the screen at the next power up, in addition to the indication SIM. SIMULATION MODE disappears when any key is pressed.

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2. PLOTTER DISPLAY OVERVIEW

2.1 Enlarging/Shrinking the Display Range

You may increase or decrease the display range on the plotter and highway displays. The horizontal range in the plotter display is available among .02 (40 yd), .05 (101 yd), 0.1 (202 yd), 0.2 (405 yd), 0.5, 1, 2, 5, 10, 20, 40, 80, 160 and 320 nautical miles. (Nautical mile is the default unit of display range. Display range may also be shown in kilometers or miles. Ranges shorter than the value 0.5 are also shown in yards or meters.) The horizontal range in the highway display is available among 0.2, 0.4, 0.8, 1, 2, 4, 8 and 16 nautical miles.

1. Press the [MENU] key. The zoom, ship centering window appears.

Figure 2-1 Zoom, ship centering window

Note: The prompt "SHIP TO CENTER?" does not appear when the highway display mode is active.

2. Press the [ENT] key. The zoom window appears.

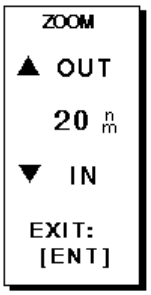

Figure 2-2 Zoom window

3. Press ▲ (increase) or ▼ (decrease) to select range desired.
4. Press the [ENT] key to finish.

2.2 Shifting the Cursor

Use the cursor pad to shift the cursor. The cursor moves in the direction of the arrow or diagonal pressed on the cursor pad.

Cursor state and data

Cursor state determines what data is shown on the display.

Cursor turned on

Cursor position is displayed in latitude and longitude or TDs (depending on menu setting) at the bottom of the plotter display when the cursor is on. The range and bearing from own ship to the cursor appear at the left-hand side of the display.

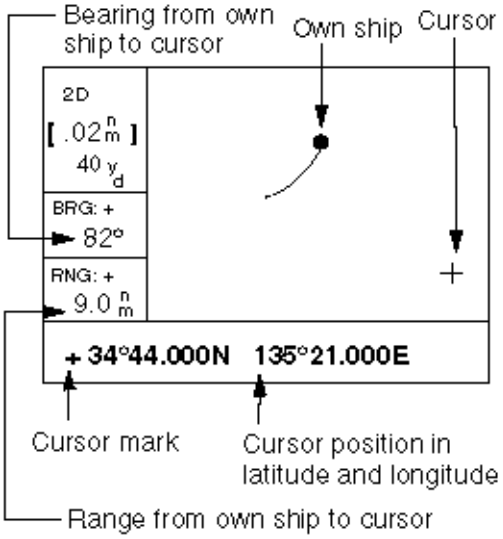

Figure 2-3 Data displayed on the plotter display when the cursor in on

Cursor turned off

The cursor is erased when there is no cursor pad operation for about six seconds. Ship's position, speed and course appear at the left side of the plotter display when the cursor is off.

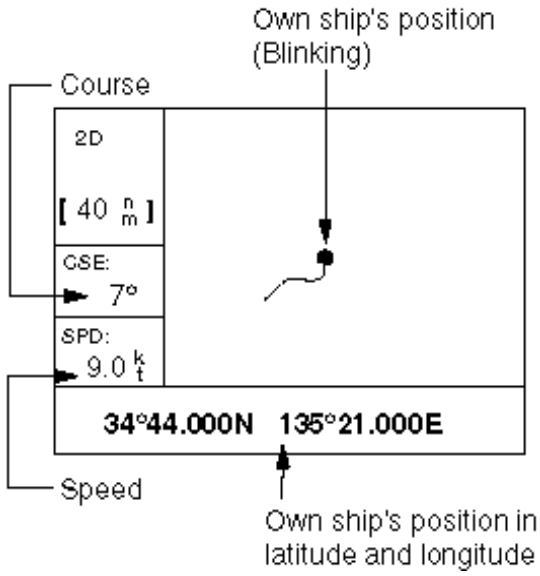

Figure 2-4 Data displayed on the plotter display when the cursor is turned off

2.3 Shifting the Display

The display can be shifted on the plotter display. Operate the cursor pad to place the cursor at an edge of the screen. The display shifts in the direction opposite to cursor pad operation.

2.4 Centering Own Ship's Position

When own ship tracks off the display the own ship mark is automatically returned to the screen center. You can also return it manually as follows:

1. Press the [MENU] key.
2. Select SHIP TO CENTER?.
3. Press the [ENT] key.

2.5 Changing Track Plotting Interval, Stopping Plotting of Track

To trace the ship's track, the ship's position is stored into the memory at an interval of distance or automatic recording (memory capacity: 1,000 points). For distance, a shorter interval provides better reconstruction of the track, but the storage time of the track is reduced. When the track memory becomes full, the oldest track is erased to make room for the latest.

1. Press the [MENU] key once or twice to display the menu.

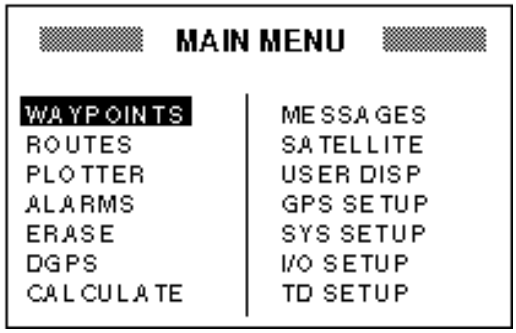

Figure 2-5 Menu

2. Select PLOTTER.
3. Press the [ENT] key.

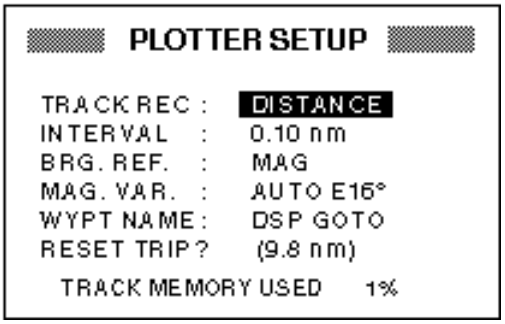

Figure 2-6 PLOTTER SETUP menu

4. The cursor should be on the TRACK REC field. Press the [ENT] key. The track recording method selection window appears.

Figure 2-7 Track recording method selection window

5. Select OFF, DISTANCE or AUTO and then press the [ENT] key.

   OFF: Track is neither recorded or plotted. This setting is useful when you do not need to record track, for example, when returning to port.
   DISTANCE: Track is recorded and plotted at the distance interval set.
   AUTO: Plotting and recording interval changes with chart scale selected.

   If you selected DISTANCE, enter the recording interval as follows:

   a) Press the [ENT] key.
   b) Press ◀ or ▶ to select digit to change.
   c) Press ▲ or ▼ to change value.
   d) Press the [ENT] key after setting.

6. Press the [MENU] key twice to finish.

2.6 Erasing Track

All track can be erased. Track cannot be restored once erased, therefore be absolutely sure you want to erase all track.

1. Press the [MENU] key once or twice to display the menu.
2. Select ERASE and press the [ENT] key to display the ERASE menu.

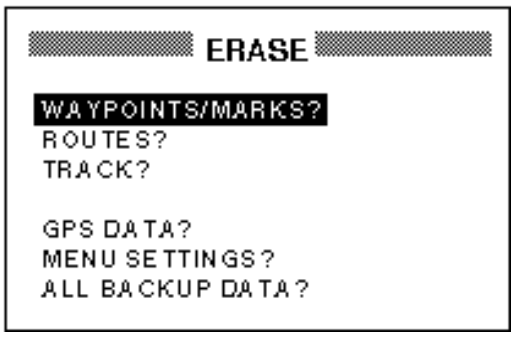

Figure 2-8 ERASE menu

3. Select “TRACK?” and press the [ENT] key. The message shown in Figure 2-9 appears.

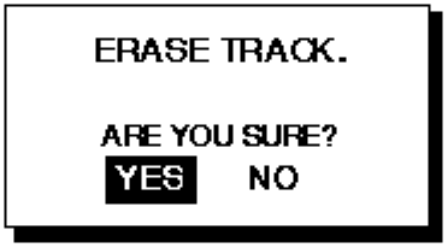

Figure 2-9 Prompt for erasure of track

4. Press the [ENT] key to erase all track.
5. Press the [MENU] key twice to finish.

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3. WAYPOINTS (MARKS)

3.1 Entering Waypoints

In navigation terminology a waypoint is a particular location on a voyage whether it be a starting, intermediate or destination waypoint. Your unit can store 950 waypoints. Waypoints can be entered on the plotter display four ways: at cursor position, at own ship's position, through the menu (manual input of L/L or TD), and by MOB position.

Entering a waypoint by the cursor

1. On the plotter display, use the cursor pad to place the cursor on the location you want to make a waypoint.
2. Press the [ENT] key. The following window appears.

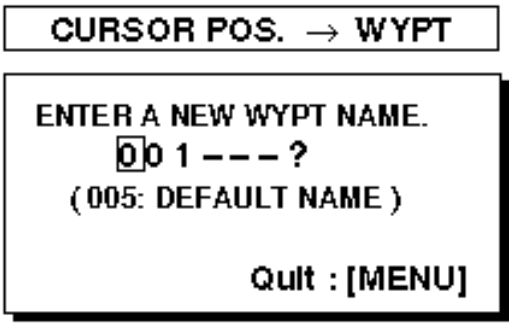

Figure 3-1 Waypoint name entry window

3. The cursor is on the second line of the display. This is where you may enter waypoint name, which may consist of six characters. (The number shown is the youngest empty waypoint number. If you would rather have the unit register the waypoint under that number, and you do not need to change mark shape or enter a comment, press the [ENT] key twice to register the waypoint and finish.) To enter KOBE as the waypoint name, for example, do the following:
   a) Press ▲ or ▼ to display K.
   b) Press ▶ to move the cursor to the next column and press ▲ or ▼ to display O.
   c) Press ▶ to move the cursor to the next column and press ▲ or ▼ to display B.
   d) Press ▶ to move the cursor to the next column and press ▲ or ▼ to display E.
   e) Press the [ENT] key. The following window appears.

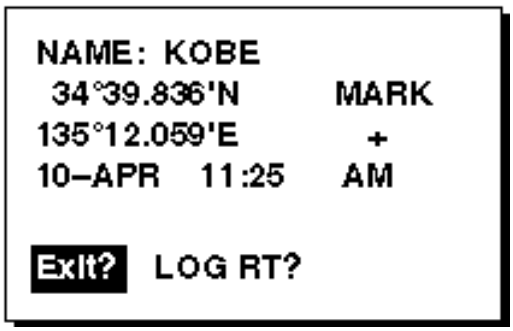

Figure 3-2 Waypoint position, comment entry window

4. This window is where you can select mark shape, enter a comment, and log the waypoint to a route. (If you do not need to change mark shape, enter a comment, or save waypoint to a route, select "Exit?" and press the [ENT] key to finish.) How to log waypoints to a route will be discussed in the chapter on routes.
   a) Use the cursor pad to place the cursor under MARK.
   b) Press the [ENT] key.
   c) Select mark desired with ▲ or ▼.

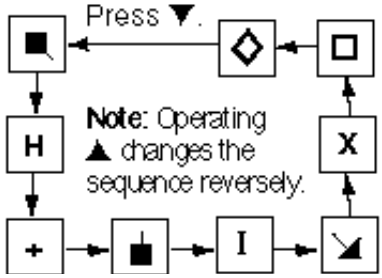

Figure 3-3 Mark selection sequence

   d) Press the [ENT] key.

e) The cursor is on the date/time field. Press the [ENT] key.

f) Enter a comment (max. 16 characters) with the cursor pad (the same as you did when entering waypoint name) and press the [ENT] key. To create a space, select "blank" character. To remove all characters which follow the cursor, select the underline.

g) The cursor is on "Exit?." Press the [ENT] key.

h) Press the [ENT] key again to finish.

Note: "LOG RT?" function is explained in the chapter on routes.

Entering a waypoint at own ship's position

1. Press the [MARK/MOB] key on any display. The following window appears.

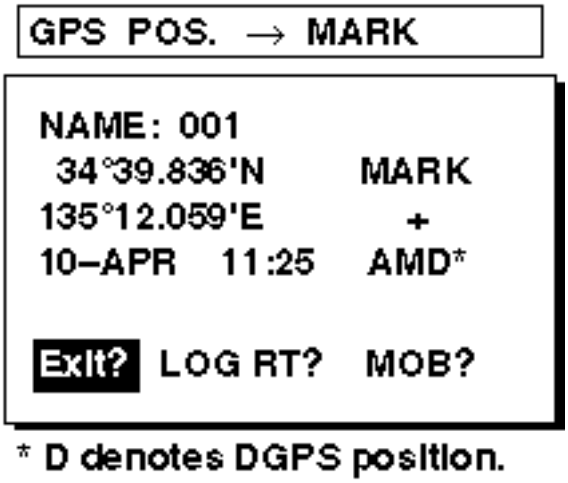

Figure 3-4 Own ship's position window

2. If you want to register the waypoint under the number shown, and you do not need to change mark shape, enter a comment, or log the waypoint to a route, press the [ENT] key to finish.
3. To change name, select the NAME field, press the [ENT] key, select name with the cursor pad, and press the [ENT] key.
4. To change mark shape, place the cursor under MARK. Press the [ENT] key, select mark shape with the cursor pad, and press the [ENT] key again.
5. The cursor is on the date/time field. To change the date to a comment, press the [ENT] key, enter a comment with the cursor pad, and press the [ENT] key again.
6. Place the cursor on "Exit?." Press the [ENT] key to finish.

Entering a waypoint through the waypoint list

1. Press the [MENU] key once or twice to display the menu.
2. Select WAYPOINTS.
3. Press the [ENT] key. The following window appears. Select LIST. (NEAREST displays waypoints from nearest to furthest; however, waypoints cannot be entered from this display.)

Figure 3-5 Waypoint list selection window

4. Press the [ENT] key. The WPTS/MRKS list appears.

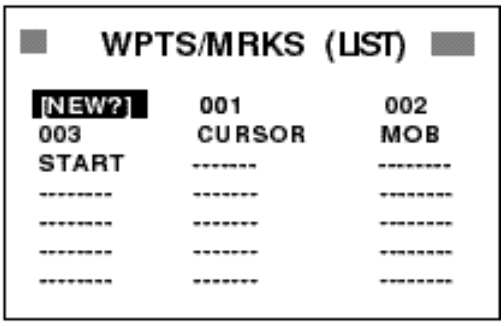

Figure 3-6 WPTS/MRKS list

CURSOR: Cursor position when destination is set with cursor.
MOB: Man overboard position.
START: Starting point when destination is selected.

5. The cursor is on NEW. Press the [ENT] key.

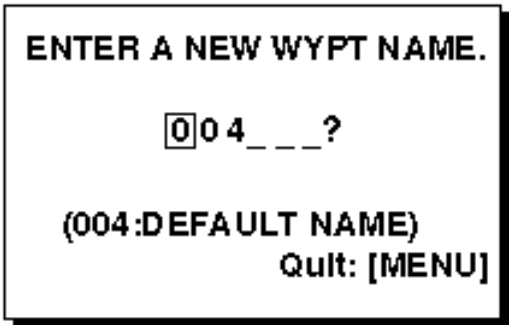

Figure 3-7 Screen for entering waypoint name

6. Enter name (if desired) with the cursor pad and press the [ENT] key.

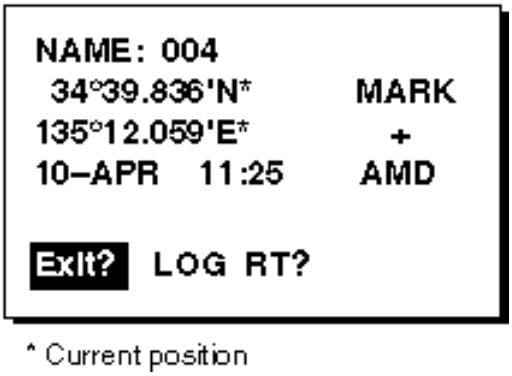

Figure 3-8 Screen for entering waypoint latitude and longitude

7. Use the cursor pad to place the cursor on the second line (latitude or TD) and press the [ENT] key. Enter latitude (TD) and press the [ENT] key.
8. Press the [ENT] key, enter longitude (TD) in similar fashion as you did with latitude and press the [ENT] key.

   Note: To enter position by TDs, see paragraph 7.7 “Displaying Position in TDs.”

9. To change mark shape, select mark shape currently shown and press the [ENT] key. Select mark desired with the cursor pad and press the [ENT] key.
10. To change date and time to the comment of your choice, press the [ENT] key, enter comment, and press the [ENT] key again.
11. Place the cursor on “Exit?.” Press the [ENT] key.
12. Press the [MENU] key twice to finish.

3.2 Entering the MOB Mark

The MOB mark denotes man overboard position. Only one MOB mark may be entered. Each time the MOB mark is entered the previous MOB mark and its position data are written over.

1. Press the [MARK/MOB] key.

Figure 3-9 MOB window

2. Press ▶ to select “MOB?.”

   Note: Pressing the [ENT] key instead of ▶ at step 2 saves the position as a waypoint. “LOG RT?” function is explained in the chapter on routes.

3. Press the [ENT] key.

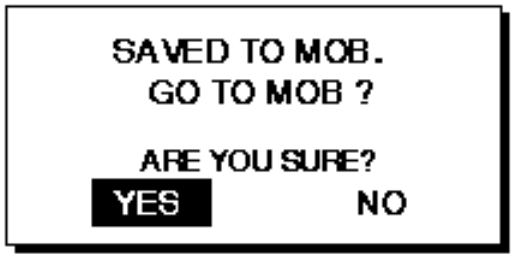

Figure 3-10 MOB window-2

4. To set MOB position as destination, press the [ENT] key. Then, the plotter display marks MOB position as shown in Figure 3-11.

   Note: Selecting “NO” and pressing the [ENT] key at step 4 saves the position as a waypoint.

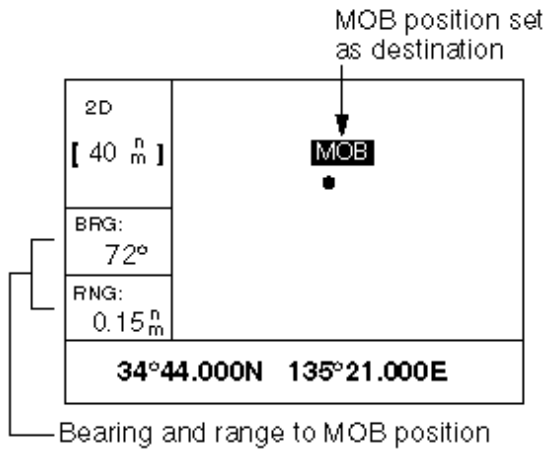

Figure 3-11 Screen appearance when MOB is set as destination

3.3 Displaying Waypoint Name

You may display on the plotter display all waypoint names or only the GOTO waypoint name as follows:

1. Press the [MENU] key once or twice to display the menu.
2. Select PLOTTER and press the [ENT] key.
3. Place the cursor on the WYPT NAME field and press the [ENT] key. The following window appears.

Figure 3-12 DSP GOTO, DSP ALL selection window

4. Select DSP GOTO or DSP ALL as appropriate and press the [ENT] key.
5. Press the [MENU] key twice to finish.

3.4 Editing Waypoints on the WPTS/MRKS List

Waypoint position, waypoint name, mark shape and comment can be edited on the WPTS/MRKS List.

1. Press the [MENU] key once or twice to display the menu.
2. Select WAYPOINTS and press the [ENT] key.
3. Select LIST or NEAREST and press the [ENT] key.
4. Select waypoint to edit and press the [ENT] key.

   Note: CURSOR, MOB or START are automatically updated according to destination setting or MOB setting.Therefore,editing these items has no meaning.

5. Select the NAME field and press the [ENT] key.
6. Change name with the cursor pad and press the [ENT] key. You are then asked if you want to create or rename the waypoint, or quit (escape) this display.

Figure 3-13 CREATE, RENAME prompt

7. Select objective and press the [ENT] key.
8. Change position, mark shape, comment as desired.
9. Select “Exit?” and press the [ENT] key.
10. Press the [MENU] key twice to finish.

3.5 Deleting Waypoints

1. Press the [MENU] key once or twice to display the menu.
2. Select ERASE and press the [ENT] key.

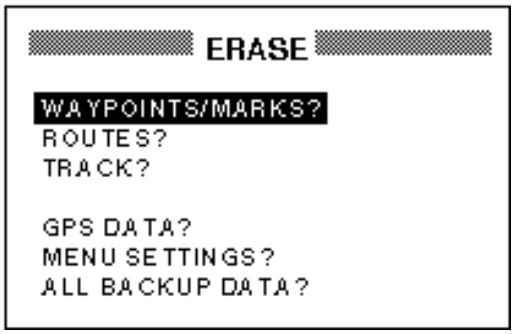

Figure 3-14 ERASE menu

3. The cursor is on the “WAYPOINTS/MARKS?” field. Press the [ENT] key.

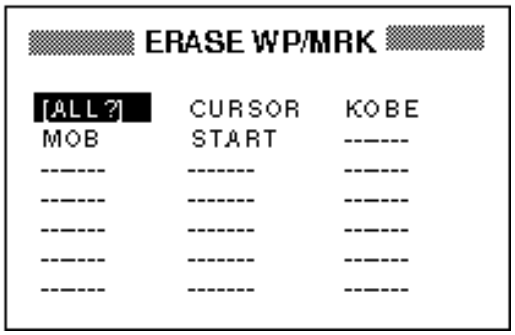

Figure 3-15 ERASE WP/MRK display

4. Select the waypoint you want to erase.

   Note: You cannot erase CURSOR, MOB or START.

5. Press the [ENT] key. A screen showing position and other particulars of the waypoint selected appears.

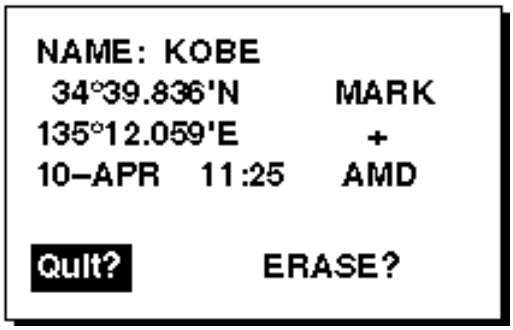

Figure 3-16 ERASE prompt

6. Select “ERASE?” and press the [ENT] key.
7. Press the [MENU] key twice to finish.

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In many cases a trip from one place to another involves several course changes, requiring a series of waypoints which you navigate to, one after another. The sequence of waypoints leading to the ultimate destination is called a **route.** Your unit can automatically advance to the next waypoint on a route, so you do not have to change the destination waypoint repeatedly.

4.1 Creating a Route

You can store up to 50 routes (numbered 01 to 50) and one LOG route, and each route may contain up to 30 waypoints. A route may be constructed four ways: by the cursor, through the waypoints list, current position (track-based route) and through the route menu.

Note: Be sure to record all important routes in a separate log. This unit is not a fail-safe record keeping device.

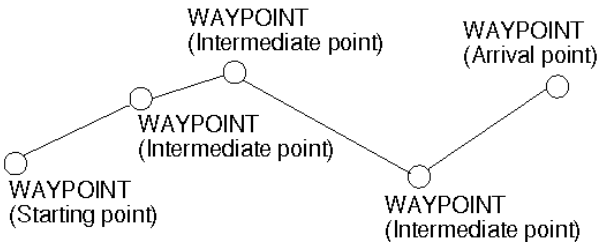


Figure 4-1 Sample route

Creating a route with cursor positions

This is probably the easiest method by which to create a route.

1. Use the cursor pad to place the cursor on position desired. (Cursor position is shown at the bottom of the screen.)
2. Press the [ENT] key. The following window appears.

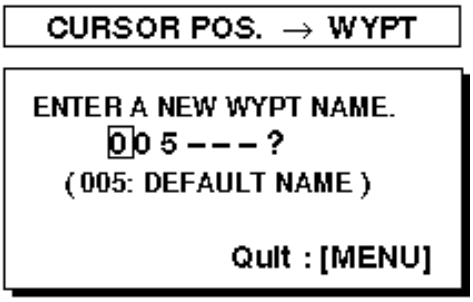


Figure 4-2 Waypoint name entry window

The cursor is on the second line of the display. This is where you may enter waypoint name. The number shown is the youngest empty waypoint number. If you would rather have the unit register the waypoint under that number, and you do not need to change mark shape or enter a comment, press the [ENT] key to register the waypoint and proceed to step 5.

3. If desired, change the waypoint name.(See page 3-1 for how to enter waypoint name.) Press the [ENT] key.

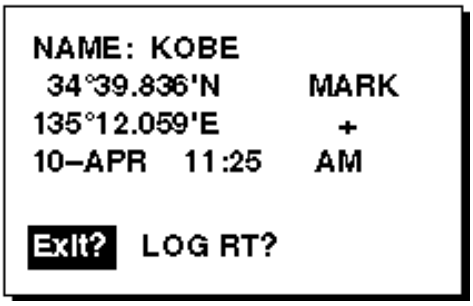


Figure 4-3 Waypoint position, comment entry window

4. If necessary, change waypoint, position, mark shape, and comment (date and time).
5. Select the item “LOG RT?” and press the [ENT] key.
6. Repeat steps 1 through 5 to complete the route.
7. When you have entered all the waypoint positions desired, press the [MENU] key twice, select ROUTES and press the [ENT] key.

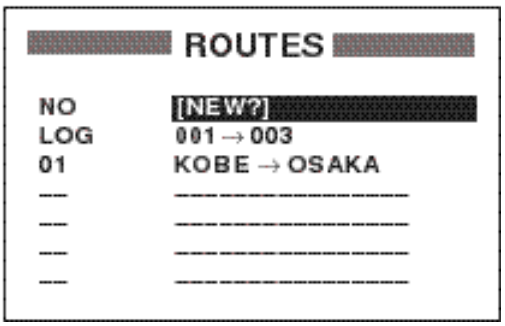


Figure 4-4 ROUTES menu

8. The LOG field shows the first and last waypoints entered for the log route you are currently creating. Select the LOG field and press the [ENT] key. The EDIT/MOVE window appears.

Figure 4-5 EDIT/MOVE window

9. Select “MOVE?” and press the [ENT] key. The route is moved from the LOG field and is registered under the next sequential route number.

Creating a route with preregistered waypoints from the route menu

The procedure which follows describes how to create a route from two preregistered waypoints, KOBE and OSAKA, on the ROUTE screen.

1. Press the [MENU] key once or twice to display the menu.
2. Select ROUTES.
3. Press the [ENT] key. The screen shown in Figure 4-6 appears.

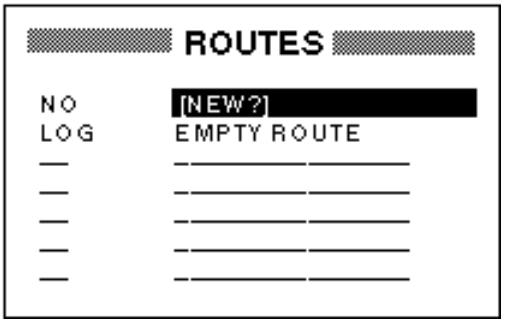


Figure 4-6 ROUTES list

4. Select “NEW?” and press the [ENT] key. The screen shown in Figure 4-7 appears.

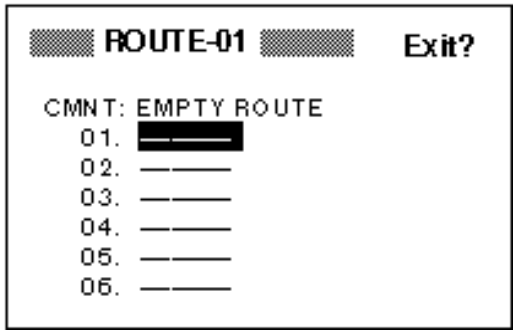


Figure 4-7 Screen for entering route

5. Press ▲ and the [ENT] key to change route name, if desired. (If no name is entered the name of the first and last waypoints in the route will become the route name, although you may change the name at a later time.) Enter route name and press the [ENT] key.The cursor is on line 01 and press the [ENT] key.
6. Press [ENT] key and press ▲ or ▼ to display waypoint name. (In the example, KOBE.)
7. Press the [ENT] key. The cursor moves to the next line.
8. Repeat steps 6 and 7 until you have entered all waypoints desired.

Note: If you enter a waypoint which has not been registered, the display will look something like the one below. Select YES to create a new waypoint; NO to return to the route entry screen.

Figure 4-8 New waypoint name screen

When you select YES followed by [ENT] key,following screen appears.Edit the waypoint,select Exit and press the [ENT] key.

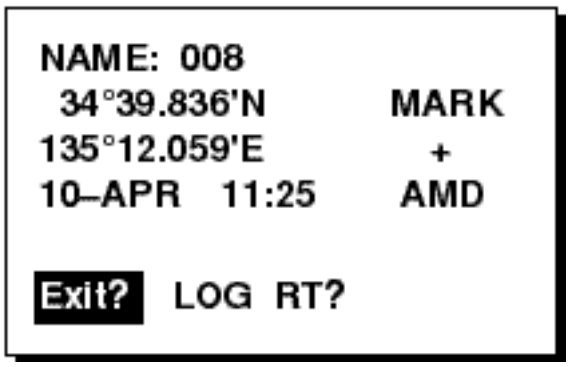


Figure 4-9Waypoint data screen

9. Select “Exit?.”
10. Press the [ENT] key to register the route.

    Then, ROUTES list shows the name of the first and last waypoints, next to route number.

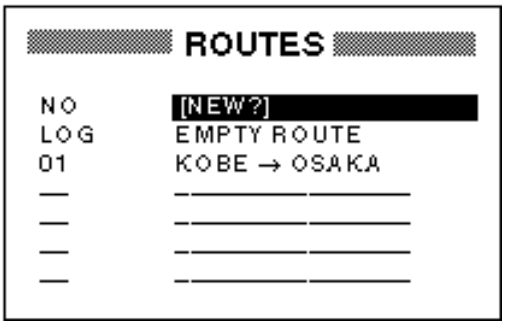


Figure 4-10 ROUTES list

11. Press the [MENU] key twice to finish.

Creating a route with preregistered waypoints from the waypoint list

1. Press the [MENU] key once or twice to display the menu.
2. Select WAYPOINTS and press the [ENT] key.
3. Select LIST or NEAREST and press the [ENT] key.

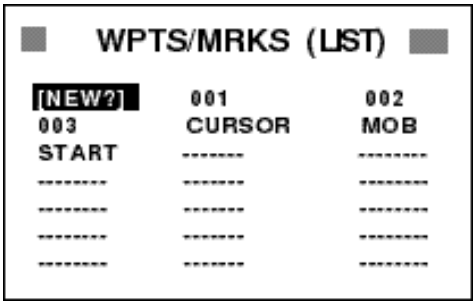


Figure 4-11 Waypoints/marks (list)

4. Select a waypoint and press the [ENT] key. Your screen should look something like the one in Figure 4-11.

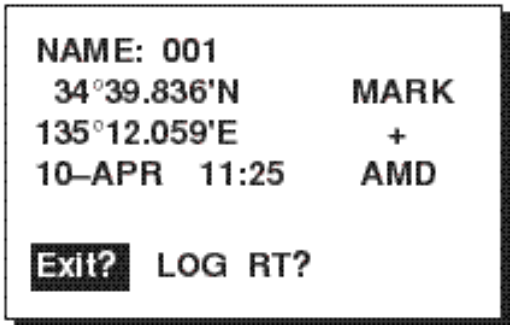


Figure 4-12 Waypoint data screen

5. Select “LOG RT?” and press the [ENT] key.
6. Repeat steps 4 and 5 to complete the route.
7. Press the [MENU] key once.
8. Select ROUTES and press the [ENT] key. Your screen should now look something like the one shown in Figure 4-12.

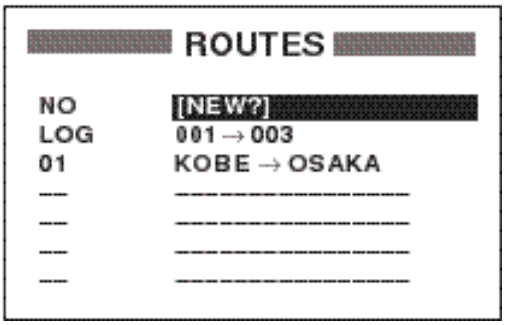


Figure 4-13 ROUTES list

9. Select the LOG field and press the [ENT] key. The EDIT/MOVE window appears.

Figure 4-14 EDIT/MOVE window

10. Select “MOVE?” and press the [ENT] key. The route is moved from the LOG field and assigned the next sequential route number.

Creating a track-based route

This method stores current position at appropriate intervals. It is useful for retracing previous ship's track.

1. Press the [MARK/MOB] key.

Figure 4-15 MOB window

2. Change name, comment, mark shape if desired. Select "LOG RT?" and press the [ENT] key.
3. Repeat steps 1 and 2 at appropriate intervals.
4. When you have entered all the waypoint positions desired, press the [MENU] key twice, select ROUTES and press the [ENT] key.

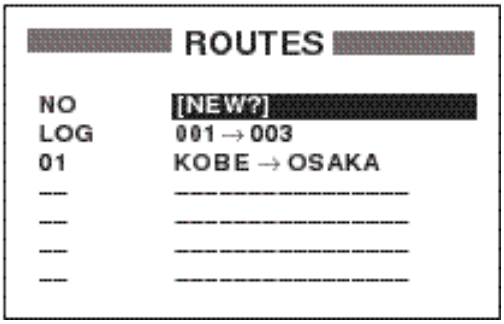


Figure 4-16 ROUTES menu

5. Select the LOG field and press the [ENT] key. The EDIT/MOVE window appears.

Figure 4-17 EDIT/MOVE window

6. Select "MOVE?" and press the [ENT] key. The route is moved from the LOG field and is registered under the next sequential route number.

Note: You can create a route using a combination of current positions and waypoint positions (including cursor position). The route can be started from a waypoint position or current position. The former method allows you to select the route name beforehand.

4.2 Editing Routes

Replacing waypoints in a route

1. Press the [MENU] key once or twice to display the menu.
2. Select ROUTES and press the [ENT] key.
3. Select the route to edit.
4. Press the [ENT] key.
5. Place the cursor on the waypoint to replace.
6. Press the [ENT] key. The following window appears.

Figure 4-18 Route editing method selection window

7. "CHANGE?" is selected; press the [ENT] key.

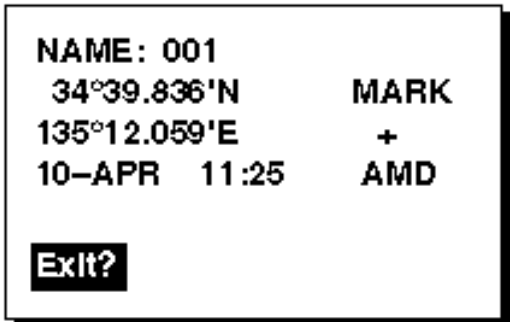


Figure 4-19 Waypoint screen

8. Press the [ENT] key. Use the cursor pad to select waypoint.
9. Press the [ENT] key.

Note: If the name selected at step 8 has not been used, the window shown in Figure 4-19 appears. Select "CREATE?" or "RENAME?" as appropriate and press the [ENT] key.

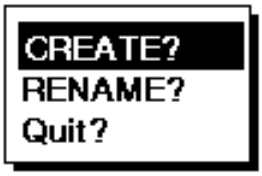


Figure 4-20 CREATE, RENAME prompt

10. Select "Exit?."
11. Press the [ENT] key.
12. Press the [MENU] key twice to finish.

Permanently deleting a waypoint from a route

1. Press the [MENU] key or twice to display the menu.
2. Select ROUTES and press the [ENT] key.
3. Select the route from the ROUTES list.
4. Press the [ENT] key.
5. Select the waypoint you want to delete.
6. Press the [ENT] key.
7. Select "REMOVE?."
8. Press the [ENT] key.
9. Press the [MENU] key twice to finish.

Inserting a waypoint in a route

To insert a waypoint in a route, do the following:

1. Press the [MENU] key once or twice to display the menu.
2. Select ROUTES and press the [ENT] key.
3. Select the route from the ROUTES list.
4. Press the [ENT] key.
5. Select the waypoint which will come after the waypoint to be inserted. In Figure 4-20, for example, if you want to insert a waypoint between KOBE and 001, select 001.

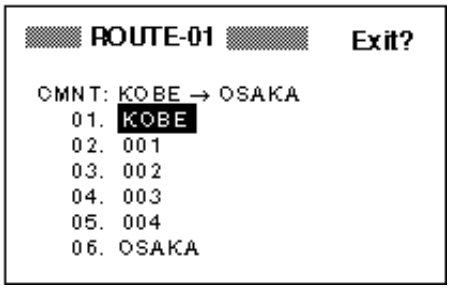


Figure 4-21 ROUTE screen

6. Press the [ENT] key.
7. Select "INSERT?."
8. Press the [ENT] key.
9. Use the cursor pad to select waypoint.
10. Press the [ENT] key.
11. Press the [MENU] key twice to finish.

Temporarily deselecting a waypoint in a route

You can temporarily deselect an unnecessary waypoint from a route. Using the route created in Figure 4-21 as an example, deselect the 2nd intermediate waypoint.

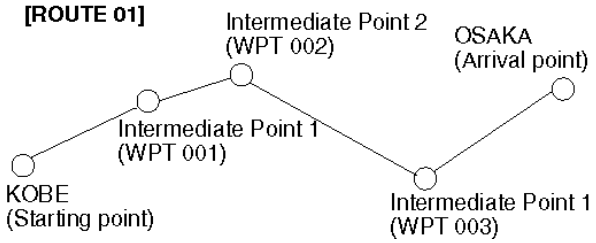


Figure 4-22 Sample route

If you reconstruct the route without the 2nd intermediate point it would look like Figure 4-22.

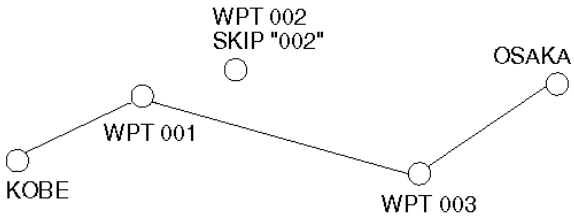


Figure 4-23 Route in Figure 4-21 reconstructed without 2nd intermediate waypoint

1. Press the [MENU] key once or twice to display the menu.
2. Select ROUTES and press the [ENT] key.
3. Select a route from the ROUTES list, and press the [ENT] key.
4. Place the cursor on the waypoint to skip.
5. Press the [ENT] key.
6. Select “SKIP?” and press the [ENT] key. X appears to the left of the waypoint.

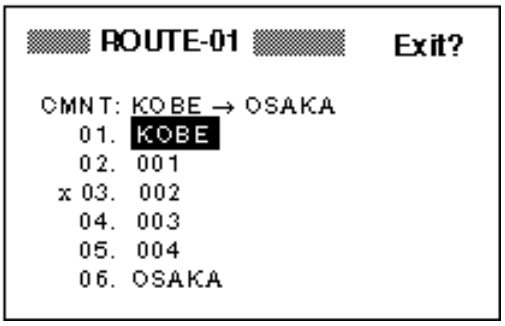


Figure 4-24 ROUTE screen

7. Press the [MENU] key twice to finish.

To restore a waypoint to a route, select “SKPoFF ?”at step 6 and press the [ENT] key.

Changing route comment (name)

When a waypoint- or track-based route is saved, it is done under the next sequential route number and the comment (name) under the starting and final destination waypoints. You can change the comment as below. Up to 16 characters may be used.

1. Press the [MENU] key or twice to display the menu.
2. Select ROUTES and press the [ENT] key.
3. Select route number and press the [ENT] key.
4. Select the CMNT field and press the [ENT] key.
5. Enter comment with the cursor pad and press the [ENT] key.
6. Press the [MENU] key twice to finish.

4.3 Deleting a Route

1. Press the [MENU] key or twice to display the menu.
2. Select ERASE and press the [ENT] key.
3. Select “ROUTES?” and press the [ENT] key.
4. Select the route you want delete. If you want to delete all routes, select “ALL?.”
5. Press the [ENT] key. You are asked if you are sure to delete the route.

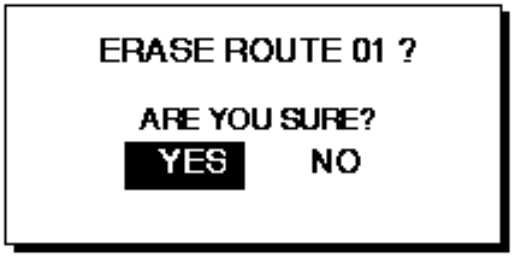


Figure 4-25 ERASE ROUTE prompt

6. Press the [ENT] key again.
7. Press the [MENU] key twice to finish.

Destination can be set four ways: by cursor, by waypoint, by route, and by MOB position. Previous destination is cancelled whenever a destination is newly set.

5.1 Setting Destination by Cursor

1. Press the [GOTO] key to display the GOTO window.

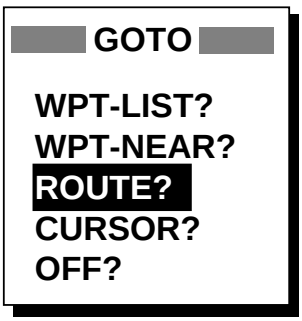


Figure 5-1 GOTO window

2. Select “CURSOR?.”
3. Press the [ENT] key. The plotter display appears with “?” shown to the right of the cursor.

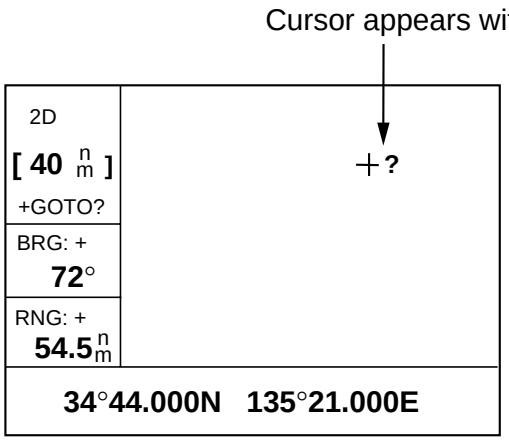


Figure 5-2 Cursor appearance when setting destination by cursor

4. Place the cursor on the location desired for destination.
5. Press the [ENT] key.

A dashed line connects own ship and the destination, which is marked with CURSOR and an X, as shown in Figure 5-3.

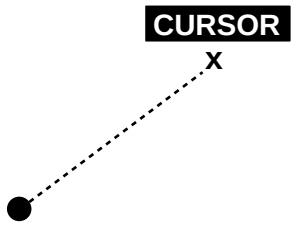
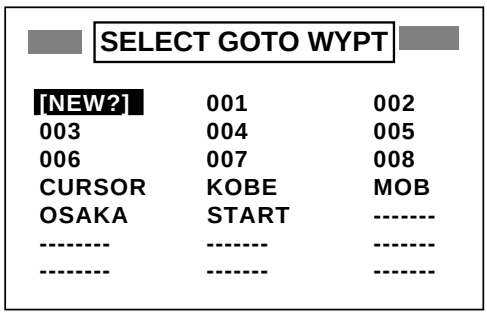


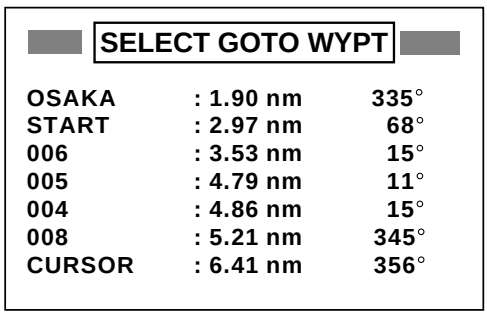
Figure 5-3 Destination set by cursor

5.2 Setting Destination by Waypoint

1. Press the [GOTO] key.
2. Select “WPT-LIST” or “WPT-NEAR?”.
3. Press the [ENT] key. The SELECT GOTO WYPT list appears.



WPT-LIST



WPT-NEAR

Figure 5-4 SELECT GOTO WYPT screens

4. Select a waypoint.
5. Press the [ENT] key.

Own ship's position becomes starting point and a dashed line runs between it and the waypoint selected, which is shown in reverse video.

5.3 Setting Route as Destination

1. Press the [GOTO] key.
2. Select ROUTE?.
3. Press the [ENT] key.

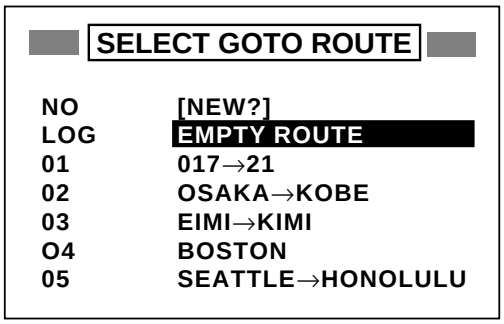


Figure 5-5 GOTO ROUTE list

4. Select a route.
5. Press the [ENT] key. The following window appears.

Figure 5-6 FORWARD, REVERSE prompt

6. Select "FORWARD?" or "REVERSE?", the order in which to traverse the route waypoints, and press the [ENT] key.

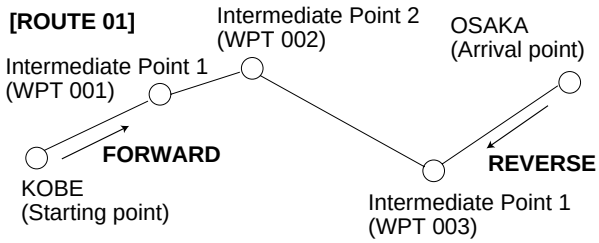
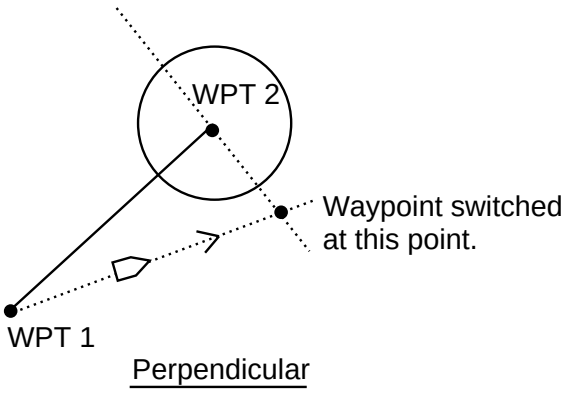
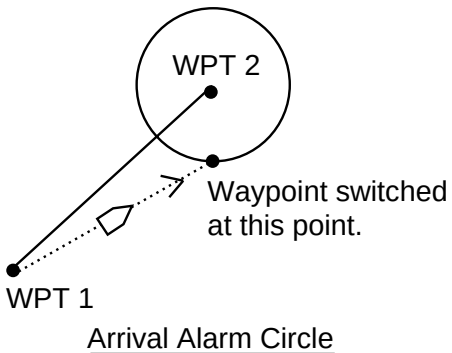


Figure 5-7 Meaning of forward and reverse

Current position becomes the starting point. A dotted line runs between the starting point and all route waypoints. Next destination waypoint is shown in reverse video. The destination waypoint is automatically switched when the boat enters the arrival alarm range or the boat passes an imaginary perpendicular line passing through the center of the destination waypoint. For how to set the arrival alarm, see page 6-1.





5.4 Canceling Destination

You can cancel destination as follows:

1. Press the [GOTO] key.
2. Select OFF?.
3. Press the [ENT] key.

6. ALARMS

There are seven alarm conditions which generate both aural and visual alarms: Arrival alarm, Anchor watch alarm, XTE (Cross-Track Error) alarm, Speed alarm, DGPS alarm, Time alarm, and Trip alarm.

When an alarm setting is violated, the buzzer sounds, and the name of the offending alarm and the alarm icon appear on the display. You can silence the buzzer and remove the alarm name indication by pressing any key; the alarm icon remains on the screen until the reason for the alarm is cleared.

You can see which alarm(s) is sounding by displaying the message board by the following keying sequence: [MENU] (once or twice) MESSAGE, [ENT]. The message board is discussed in paragraph 8.2 “Displaying the Message Board.”

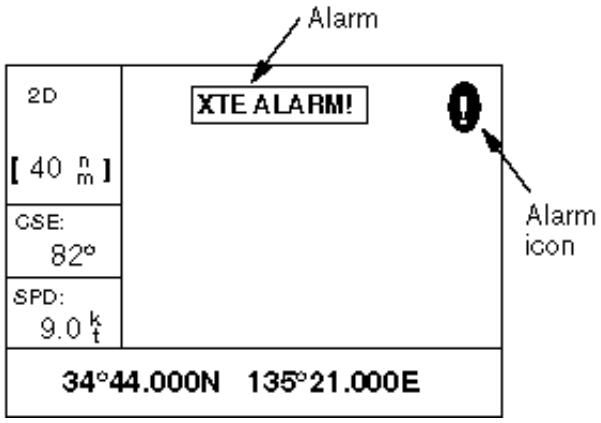


Figure 6-1 Location of alarm message and icon

6.1 Arrival Alarm, Anchor Watch Alarm

You may activate the arrival alarm or the anchor watch alarm; they cannot be activated together.

Arrival alarm

The arrival alarm informs you that own ship is approaching a destination waypoint. The area that defines an arrival zone is that of a circle which you approach from the outside of the circle. The alarm will be released if own ship enters the circle.

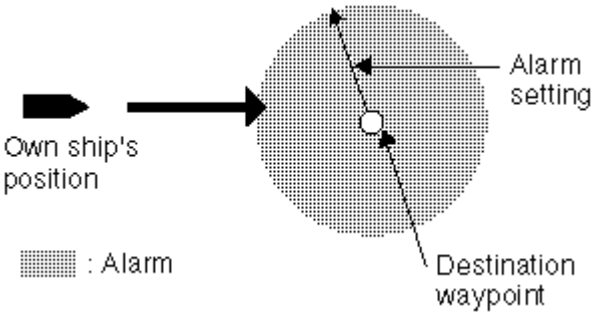


Figure 6-2 How the arrival alarm works

1. Press the [MENU] key once or twice to open the menu.
2. Select ALARMS.
3. Press the [ENT] key. The ALARMS menu appears.

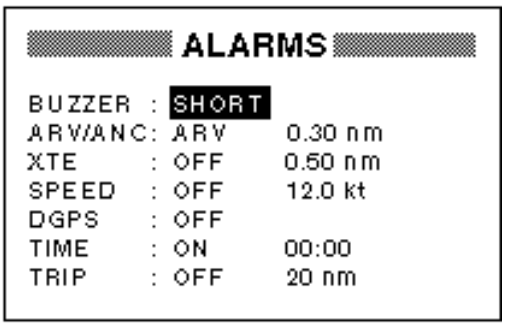


Figure 6-3 ALARMS menu

4. If ARV is not selected from the ARV/ANC field, select the ARV/ANC field and press the [ENT] key. The display shown in Figure 6-4 appears. Select ARV and press the [ENT] key. (If ARV is already selected, select the ARV/ANC field and press ▶.)

Figure 6-4 Arrival/anchor window

5. Press the [ENT] key. Enter the alarm range (0.01-99.99 nm) with the cursor pad.
6. Press the [ENT] key.
7. Press the [MENU] key twice to finish.

When own ship nears the GOTO waypoint by the range set here, the buzzer sounds and the message ARV ALARM! and the alarm icon appear. To disable the alarm, select OFF at step 4.

Anchor watch alarm

The anchor watch alarm sounds to warn you that own ship is moving when it should be at rest.

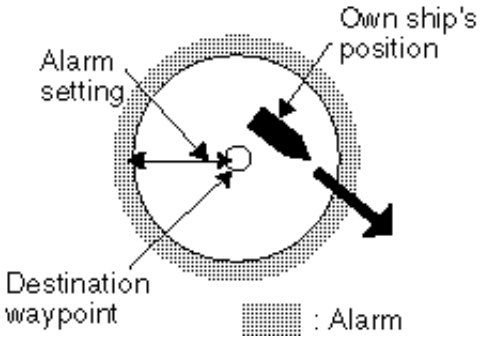


Figure 6-5 How the anchor watch alarm works

Before setting the anchor watch alarm, set current position as destination waypoint.

1. Press the [MENU] key once or twice to open the menu.
2. Select ALARMS.
3. Press the [ENT] key.
4. If ANC is not selected from the ARV/ANC field, select the ARV/ANC field and press the [ENT] key. The display shown in Figure 6-4 appears. Select ANC and press the [ENT] key. (If ANC is already selected, select the ARV/ANC field and press ▶.)
5. Press the [ENT] key. Enter the alarm range (0.01-99.99 nm) with the cursor pad.
6. Press the [ENT] key.
7. Press the [MENU] key twice to finish.

When own ship drifts more than the range set here, the buzzer sounds and the message ANC ALARM! and the alarm icon appear. To disable the alarm, select OFF at step 4.

6.2 XTE (Cross Track Error) Alarm

The XTE alarm warns you when own ship is off its intended course.

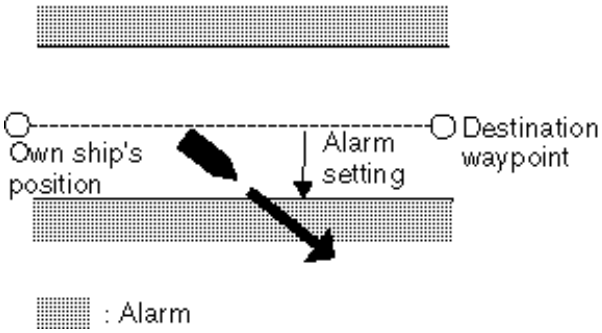


Figure 6-6 How the XTE alarm works

1. Press the [MENU] key once or twice to open the menu.
2. Select ALARMS.
3. Press the [ENT] key.
4. Select the XTE field and press the [ENT] key.
5. Select ON or OFF as appropriate and press the [ENT] key.

6. For ON, press the [ENT] key again.
7. Enter alarm range (range: 0.01-99.99 nm) with the cursor pad.
8. Press the [ENT] key.
9. Press the [MENU] key twice to finish.

When own ship strays from the intended track by the range set here, the buzzer sounds and message XTE ERROR! and the alarm icon appear. To disable the alarm, select OFF at step 5.

6.3 Speed Alarm

The speed alarm sounds when ship's speed is higher (or lower) the alarm range set.

1. Press the [MENU] key once or twice to open the menu.
2. Select ALARMS.
3. Press the [ENT] key.
4. Select the SPEED field and press the [ENT] key.
5. Select OFF, LO or HI as appropriate.
   OFF: Disables the speed alarm.
   LO: Alarm sounds when speed is lower than speed set.
   HI: Alarm sounds when speed is higher than speed set.
6. For LO or HI, Press the [ENT] key twice.
7. Enter speed (range: 0.1-999.9 kt) with the cursor pad.
8. Press the [ENT] key.
9. Press the [MENU] key twice to finish.

When the speed alarm setting is violated, the buzzer sounds and the message SPD ALARM! and the alarm icon appear. To disable the alarm, select OFF at step 5.

6.4 DGPS Alarm

This alarm alerts you by aural and visual alarms when the DGPS beacon signal is lost.

1. Press the [MENU] key once or twice to open the menu.
2. Select ALARMS.
3. Press the [ENT] key.
4. Select the DGPS field and press the [ENT] key.
5. Select ON or OFF as appropriate.
6. Press the [ENT] key.
7. Press the [MENU] key twice to finish.

When the DGPS alarm setting is violated, the buzzer sounds and the message DGPS ALARM! and the alarm icon appear. To disable the DGPS alarm select OFF at step 5.

6.5 Time Alarm

This alarm alerts you by aural and visual alarms when the time entered has come.

1. Press the [MENU] key once or twice to open the menu.
2. Select ALARMS.
3. Press the [ENT] key.
4. Select the TIME field and press the [ENT] key.
5. Select ON or OFF as appropriate and press the [ENT] key.
6. For ON, press the [ENT] key again.
7. Enter time desired with the cursor pad.
8. Press the [ENT] key.
9. Press the [MENU] key twice to finish.

When the time entered has come, the buzzer sounds and the message TIME ALARM! and the alarm icon appear. To disable the timer alarm select OFF at step 5.

6.6 Trip Distance Alarm

This alarm alerts you by aural and visual alarms when your boat has traveled a greater distance than the preset trip alarm distance.

1. Press the [MENU] key once or twice to open the menu.
2. Select ALARMS.
3. Press the [ENT] key.
4. Select the TRIP field and press the [ENT] key.
5. Select ON or OFF as appropriate and press the [ENT] key.
6. For ON, press the [ENT] key again.
7. Enter distance desired (range: 1-999 nm) with the cursor pad.
8. Press the [ENT] key.
9. Press the [MENU] key twice to finish.

When the boat has traveled further than the preset trip distance, the buzzer sounds and the message TRIP ALARM! and the alarm icon appear. To disable the trip alarm select OFF at step 5.

6.7 Buzzer Type Selection

The buzzer sounds whenever an alarm setting is violated. You can select the type of buzzer to use as follows:

1. Press the [MENU] key once or twice to open the menu.
2. Select ALARMS.
3. Press the [ENT] key.
4. Select the BUZZER field and press the [ENT] key. The following display appears.

Figure 6-7 Buzzer type selection window

5. Select buzzer type desired and press the [ENT] key.

   SHORT: Two short beeps

   LONG: Three long beeps

   CONSTANT: Continuous beeps
6. Press the [MENU] key twice to finish.

7. OTHER FUNCTIONS

7.1 Calculating Range, Bearing and TTG

Range and bearing between two waypoints

1. Press the [MENU] key once or twice to open the menu.
2. Select CALCULATE.
3. Press the [ENT] key.

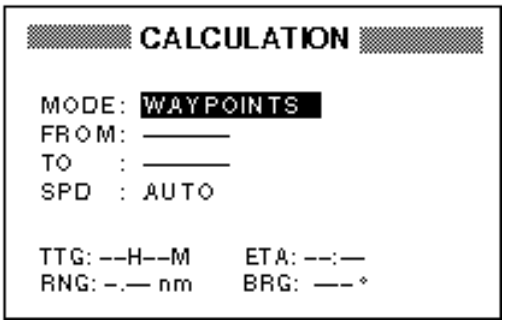


Figure 7-1 CALCULATION menu

4. Press the [ENT] key to display the window shown in Figure 7-2.

Figure 7-2 WAYPOINTS, ROUTE prompt

5. Select WAYPOINTS and press the [ENT] key.
6. Press the [ENT] key.
7. Enter the FROM waypoint and press the [ENT] key.
8. Press the [ENT] key, enter the TO waypoint and press the [ENT] key.
9. Press the [ENT] key. The window shown in Figure 7-3 appears.

Figure 7-3 AUTO, MANUAL prompt

10. Select AUTO or MANU. AUTO uses ship's average speed; MANU is for manual entry of speed.
11. Press the [ENT] key.
12. If you selected MANU, press the [ENT] key again. Enter speed with the cursor pad and press the [ENT] key.

Figure 7-4 shows what the display might look like using waypoints KOBE and OSAKA as the FROM and TO waypoints, respectively.

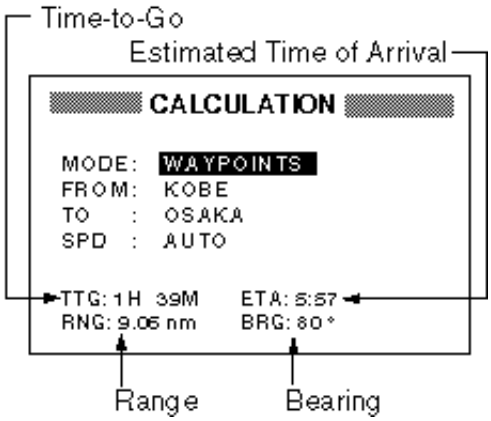


Figure 7-4 Typical range and bearing calculation display

13. Press the [MENU] key twice to finish.

Range, TTG, ETA between first and final waypoints of a route

You can easily find the range, TTG and ETA between the first and final waypoints of a route as follows:

1. Press the [MENU] key once or twice to open the menu.
2. Select CALCULATE and press the [ENT] key.
3. Press the [ENT] key.
4. Select ROUTE and press the [ENT] key.
5. Press the [ENT] key.
6. Select route number from the route list with the cursor pad.

7. Press the [ENT] key to display the window shown in Figure 7-3.
8. Select AUTO or MANU. AUTO uses ship's average speed to calculate time-to-go; MANU is for manual entry of speed.
9. Press the [ENT] key. If you selected AUTO no further operation is necessary. For MANU, press the [ENT] key again. Enter speed with the cursor pad and press the [ENT] key.

Figure 7-5 shows what the display might look like using Route-01 as an example.

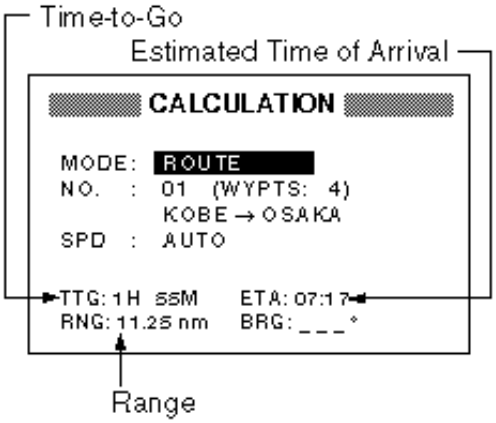


Figure 7-5 Typical calculation display (route)

7.2 DGPS Setup, DGPS Data

The GP-36 is equipped with a DGPS beacon receiver, and is set at the factory for automatic beacon receiver operation. To manually adjust the GP-36's beacon receiver, or set up the GP-36 or GP-31 to use an external DPGS beacon receiver, do the following:

1. Press the [MENU] key once or twice to open the menu.
2. Select D-GPS and press the [ENT] key.

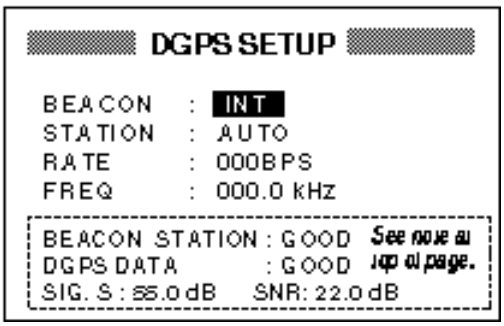


Figure 7-6 DGPS SETUP menu

DGPS Data

BEACON STATION: Shows GOOD or NG.

DGPS DATA: Shows GOOD or NG.

SIG. S = Signal Strength. A figure between 0 and 99 is shown. The higher the figure the stronger the beacon signal.

SNR = Signal to Noise Ratio. A figure between 1and 22 is shown. A figure under 18 means position will be inaccurate. When your boat is in the service area of a beacon station, SNR should be 21 or 22. If not, the problem may lie with the grounding, radar interference or generator noise on own boat.

3. The cursor is on the BEACON field. Press the [ENT] key.
4. A window showing the choices INT, EXT and OFF appears. Select one of those items and press the [ENT] key.

Figure 7-7 Beacon receiver selection window

INT: For internal DGPS beacon receiver (GP-36 only)
EXT: For external DGPS beacon receiver
OFF: Disables DGPS function. When the DGPS function turns off,it takes about 1 minute to fix GPS position.

Note: When connecting a FURUNO external DGPS beacon receiver (such as GR-80) to the GP-31, turn the GR-80's remote function on to set up the beacon receiver with data set on the GP-31.

5. The cursor is on the STATION field. Press the [ENT] key.
6. Choose DGPS beacon station selection method: AUTO, MANUAL or LIST.

   AUTO: Automatically searches for best of five nearest DGPS beacon station. It first searches DGPS beacon stations from closest to furthest. If unsuccessful it searches stations by signal strength. This procedure is repeated until a suitable station is found.

   MANUAL: Manually enter DGPS beacon station specifications in the RATE and FREQ fields, referring to a DGPS beacon station list.

   LIST: Lists 5 of the closest DGPS beacon stations, including user-programmed stations.
7. Press the [ENT] key. If you selected AUTO no further operation is required; press the [ENT] key to finish. For MANUAL or LIST do one of the following:

   MANUAL

   a) The cursor is now on the RATE field. Press the [ENT] key.
   b) Select the transmission rate of the DGPS beacon station to be used, among 50, 100 or 200 bps. Press the [ENT] key.
   c) The cursor is now on the FREQ field. Press the [ENT] key.
   d) Enter the transmission frequency of the DGPS beacon station to be used and press the [ENT] key.

   LIST

   a) The following display appears after pressing the [ENT] key at step 7.

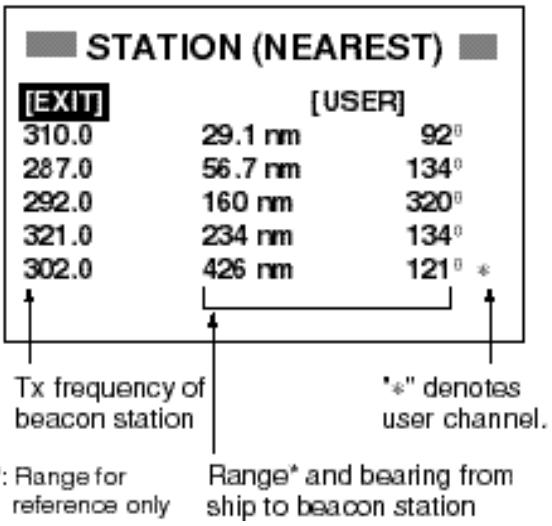


Figure 7-8 DGPS beacon station list

   b) Select desired station with the Cursor Pad.
   c) Press the [ENT] key.
11. Press the [MENU] key twice to finish. Note that the STATION field in the DGPS menu now shows MANUAL.

Programming user channels (stations)

The user may program 20 DGPS beacon stations from which to use in DGPS beacon station selection. Whenever a new station is constructed you include it in the list.

1. Press the [MENU] key twice to open the menu.
2. Select DGPS and press the [ENT] key.
3. Select STATION and press the [ENT] key.
4. Select LIST and press the [ENT] key. The display shown in Figure 7-8 appears.
5. Select USER and press the [ENT] key. The following display appears.

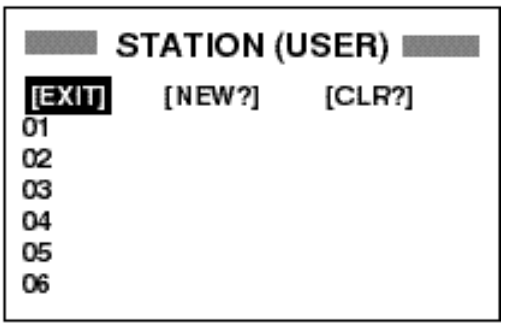


Figure 7-9 STATION (USER) display

6. Select “NEW?” and press the [ENT] key. The following display appears.

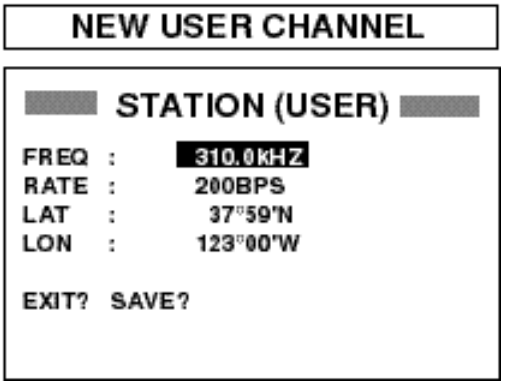


Figure 7-10 NEW USER CHANNEL display

7. Press the [ENT] key, enter frequency of the station, and press the [ENT] key.
8. Press the [ENT] key, enter baud rate of the station, and press the [ENT] key.
9. Press the [ENT] key, enter latitude of the station, and press the [ENT] key.
10 Press the [ENT] key, enter longitude of the station, and press the [ENT] key.
11. Select “SAVE?” and press the [ENT] key.
12. Press the [MENU] key twice to finish.

Editing user channels

1. Press the [MENU] key twice to open the menu.
2. Select DGPS and press the [ENT] key.
3. Select STATION and press the [ENT] key.
4. Select LIST and press the [ENT] key.
5. Select USER and press the [ENT] key.
6. Select a station from the list and press the [ENT] key. The display looks something like the one below.

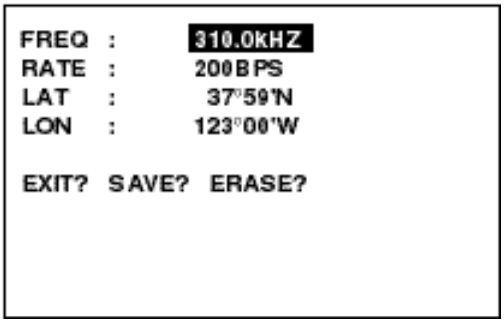


Figure 7-11 Display for editing user channels

7. Select item, press the [ENT] key, edit data, and press the [ENT] key.
8. Select “SAVE?” and press the [ENT] key.
9. Press the [MENU] key twice to finish.

Erasing all user channels

1. Press the [MENU] key twice to open the menu.
2. Select DGPS and press the [ENT] key.
3. Select STATION and press the [ENT] key.
4. Select LIST and press the [ENT] key.
5. Select USER and press the [ENT] key.
6. Select CLR? and press the [ENT] key. The following message appears.

Figure 7-12 Prompt for erasure of all user channels

7. Press the [ENT] key to erase all user channels.

Erasing individual user channels

1. Press the [MENU] key twice to open the menu.
2. Select D-GPS and press the [ENT] key.
3. Select STATION and press the [ENT] key.
4. Select LIST and press the [ENT] key.
5. Select USER and press the [ENT] key.
6. Select a channel from the list and press the [ENT] key.
7. Select “ERASE?”.
8. Press the [ENT] key to erase channel selected.

7.3 Bearing Reference

Ship's course and bearing to a waypoint may be displayed in true or magnetic bearing. Magnetic bearing is true bearing plus (or minus) earth’s magnetic deviation. Use the bearing reference according to compass interfaced: magnetic for magnetic compass, true for gyrocompass.

The default setting displays magnetic bearings.

1. Press the [MENU] key once or twice to open the menu.
2. Select PLOTTER.
3. Press the [ENT] key.

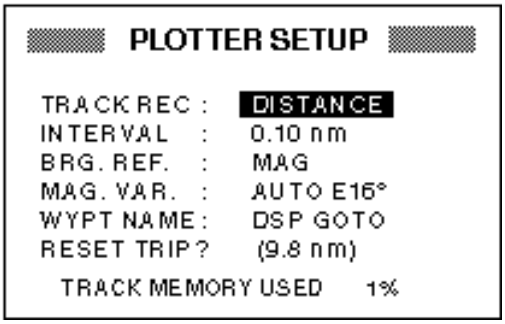


Figure 7-8 PLOTTER SETUP menu

4. Select the BRG. REF. field.
5. Press the [ENT] key. The following window appears.

Figure 7-9 Bearing reference selection window

6. Select MAG or TRUE.
7. Press the [ENT] key.
8. Press the [MENU] key twice to finish.

7.4 Magnetic Variation

The location of the magnetic north pole is different from the geographical north pole. This causes a difference between the true and magnetic north direction. This difference is called magnetic variation, and varies with respect to the observation point on earth. Your unit is preprogrammed with all the earth's magnetic variation. However, you may wish to enter variation manually to refine accuracy. When the option MAG is selected on the item BRG REF., use magnetic variation.

1. Press the [MENU] key once or twice to open the menu.
2. Select PLOTTER and press the [ENT] key.
3. Select the MAG. VAR. field.
4. Press the [ENT] key.

5. Select AUTO or MANU and press the [ENT] key. For automatic magnetic variation, current magnetic variation appears to the right of AUTO.
6. If you selected AUTO, no further operation is necessary; press the [MENU] key twice to finish. For MANU, press the [ENT] key and enter magnetic variation as follows:
   a) If necessary, change coordinate from east to west or vice versa by pressing ▲ or ▼.
   b) Enter variation in two digits with the cursor pad, referring to a nautical chart.
   c) Press the [ENT] key.
   d) Press the [MENU] key twice to finish.

7.5 Geodetic Chart System

Your unit is preprogrammed to recognize most of the major chart systems of the world. Although the WGS-84 system, the GPS standard, is now widely used other categories of charts still exist. Select the chart system used, not the area where your boat is sailing. The default chart system is WGS-84.

1. Press the [MENU] key once or twice to open the menu.
2. Select SYS SETUP and press the [ENT] key.

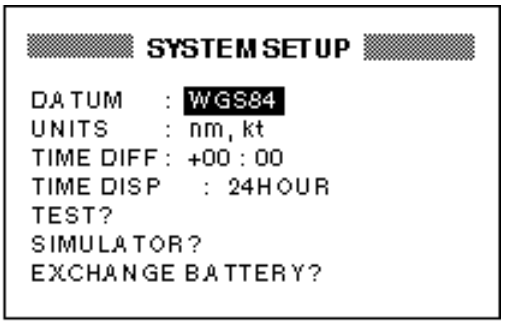


Figure 7-10 SYSTEM SETUP menu

3. Press the [ENT] key.
4. Select WGS84, (GPS standard) WGS72 or OTHER as appropriate and press the [ENT] key.
5. If you selected WGS72 or WGS84, press the [MENU] key twice to finish. For OTHER, do the following:
   a) Press the [ENT] key.
   b) Select chart number referring to the geodetic chart list on page A-5.
   c) Press the [ENT] key.
   d) Press the [MENU] key twice to finish.

7.6 Units of Measurement

Distance/speed can be displayed in nautical miles/knots, kilometers/kilometers per hour, or miles/miles per hour.

1. Press the [MENU] key once or twice to open the menu.
2. Select SYS SETUP and press the [ENT] key.
3. Select UNITS.
4. Press the [ENT] key.
5. Choose combination desired; nm, kt; nm, km/h; mi, mi/h.
6. Press the [ENT] key.
7. Press the [MENU] key twice to finish.

7.7 Position Display Format

Position may shown in Lat./Long., TDs (Loran C or Decca) as follows. Decca and Loran C chain data is preprogrammed.

1. Press the [MENU] key once or twice to open the menu.
2. Select TD SETUP and press the [ENT] key.

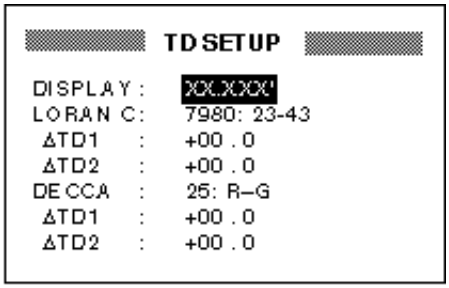


Figure 7-11 TD SETUP menu

3. The cursor is on the first line. Press the [ENT] key. The following window appears.

Figure 7-12 LAT/LON, LC TD, DE TD selection window

4. Select XX.XXX', XX'XX.X", LC TD (Loran C) or DE TD (Decca).

   XX.XXX': Shows position with no seconds.
   XX'XX.X": Displays position with seconds.

5. Press the [ENT] key. If you selected latitude and longitude go to step 7.

6. For Loran C or Decca, do one of the following:

   For Loran C TD;

   a) The cursor is on the LORAN C field. Press the [ENT] key.
   b) Use the cursor pad to choose GRI code and secondary codes, referring to the Loran C chain list on page A-3.
   c) Press the [ENT] key.
   d) If necessary enter TD offsets in appropriate TD field(s) to refine position accuracy.

   For Decca TD;

   a) Select the DECCA field and press the [ENT] key.
   b) Use the cursor pad to choose Decca chain number and lane pair (R, Red, G, Green, P, Purple), referring to the Decca chain list on page A-4.
   c) Press the [ENT] key.
   d) If necessary enter TD offsets in appropriate TD field(s) to refine position accuracy.

7. Press the [MENU] key twice to finish.

7.8 Time Difference (using local time)

GPS uses UTC time. If you would rather use local time, enter the time difference (range: -13:30 to +13:30) between local time and UTC time.

1. Press the [MENU] key once or twice to open the menu.
2. Select SYS SETUP and press the [ENT] key.
3. Press ▼ to select the TIME DIFF field and press the [ENT] key.
4. Press ▲ or ▼ to display + or –.
5. Enter time difference with the cursor pad.
6. Press the [ENT] key.
7. Press the [MENU] key twice to finish.

7.9 GPS Setup

The GPS SETUP menu smooths position and course, averages speed, applies position offset, and deactivates unhealthy satellites.

1. Press the [MENU] key once or twice to open the menu.
2. Select GPS SETUP and press the [ENT] key.

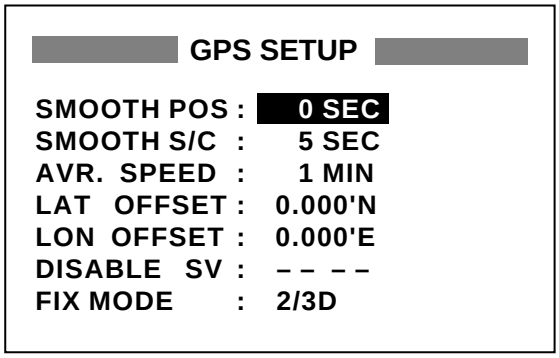


Figure 7-13 GPS SETUP menu

3. Select item and press the [ENT] key.
4. Change setting with the cursor pad and press the [ENT] key.
5. Press the [MENU] key twice to finish.

GPS SETUP menu description

SMOOTH POS (Smoothing position)

When the DOP (Dilution of Precision, the index for position-fixing accuracy) or receiving condition is unfavorable, the GPS fix may change greatly, even if the vessel is dead in water. This change can be reduced by smoothing the raw GPS fixes. The setting range is from 0 (no smoothing) to 999 seconds. The higher the setting the more smoothed the raw data, however too high a setting slows response time to change in latitude and longitude. This is especially noticeable at high ship's speeds. "0" is the normal setting; increase the setting if the GPS fix changes greatly.

SMOOTH S/C (Smoothing speed/ course)

During position fixing, ship's velocity (speed and course) is directly measured by receiving GPS satellite signals. The raw velocity data may changes randomly depending on receiving conditions and other factors. You can reduce this random variation by increasing the smoothing. Like with latitude and longitude smoothing, the higher the speed and course smoothing the more smoothed the raw data. If the setting is too high, however, the response to speed and course change slows. The setting range is from 0 (no smoothing) to 999 seconds.

AVR. SPEED (Speed averaging)

Calculation of ETA and TTG, etc. is based on average ship's speed over a given period. If the period is too long or too short calculation error will result. Change this setting if calculation error occurs. The default setting is one minute. The setting range is from 0 (no averaging) to 99 minutes.

LAT/LON OFFSET (L/L position offset)

You may apply an offset to latitude and longitude position generated by the GPS receiver, to increase position accuracy.

DISABLE SV (Disable satellite)

Every GPS satellite is broadcasting abnormal satellite number(s) in its Almanac, which contains general orbital data about all GPS satellites. Using this information, the GPS receiver automatically eliminates any malfunctioning satellite from the GPS satellite schedule. However, the Almanac sometimes may not contain this information. You can disable an inoperative satellite manually. Enter satellite number in two digits and press the [ENT] key. To restore a satellite enter "00".

FIX MODE

Selects position fixing method; 2D or 2/3D. 2D requires three satellites in view of the GPS receiver; 2/3D requires three or four satellites in view of the GPS receiver, whichever is available. When the 2D mode is selected, enter the antenna height above the waterline, to obtain accurate position data. The default setting is 5 m. The table provides common feet equivalents.

	Meters	Feet
Default	5 meters	16.4 feet
	3 meters	10 feet
	0.3 meters	1 feet

7.10 User Display Setup

The user display, which appears when the [DISP] key is pressed several times, may be either digital data (default display) or the speedometer display.

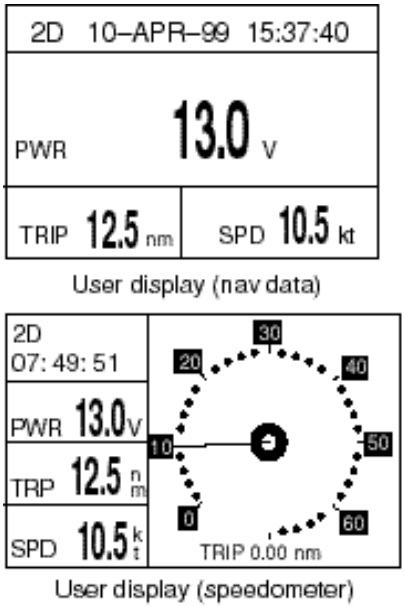


Figure 7-14 User displays

The user may choose three items of navigation data to display on each user display. The default items are battery power, speed and course.

1. Press the [MENU] key once or twice to open the menu.
2. Select USER DISP and press the [ENT] key. The following display appears.

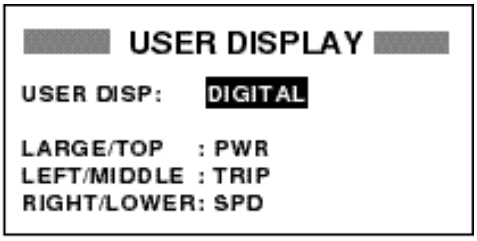


Figure 7-15 USER DISPLAY menu

3. Press the [ENT] key. The following display appears.

Figure 7-16 User display selection window

4. Select OFF (no user display), DIGITAL or SPDOMETER as appropriate and press the [ENT] key.
5. The cursor is now on the LARGE/TOP field. LARGE means the center indication on the digital display; TOP is the indication below receiver status and time on the speedometer display. Press the [ENT] key. The following display appears.

Figure 7-17 User display choices

6. Select item desired to display and press the [ENT] key. (SPD: Speed, TTG: Time-to-go to destination, CSE: Course, ETA: Estimated Time of Arrival at destination; RNG: Range to destination, TRIP: Trip distance, BRG: Bearing to destination, PWR: Power source voltage)
7. Select the items LEFT/MIDDLE and RIGHT/LOWER and set their options like you did for LARGE/TOP, referring to Figure 7-18 for location of indications.

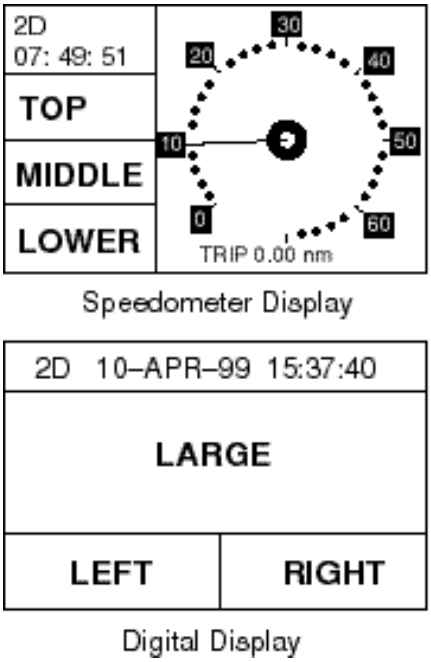


Figure 7-18 Location of user-selectable indications on user displays

9. Press the [MENU] key twice to finish.

7.11 Resetting Trip Distance

1. Press the [MENU] key once or twice to open the menu.
2. Select PLOTTER and press the [ENT] key.
3. Select the RESET TRIP? field and press the [ENT] key. The following display appears.

Figure 7-19 Reset trip window

4. Press the [ENT] key to reset trip distance.
5. Press the [MENU] key twice to finish.

7.12 Uploading, Downloading Waypoint, Route Data

Waypoint and route data may be downloaded to a PC or uploaded from a PC to your unit.

Wiring

Your equipment provides a wiring diagram which shows how to connect to a PC using a DSUB 9-pin connector (EIA-574). You may display it as follows.

1. Press the [MENU] key once or twice to open the menu.
2. Select I/O SETUP and press the [ENT] key.
3. Select WIRING INFO and press the [ENT] key to display the wiring diagram

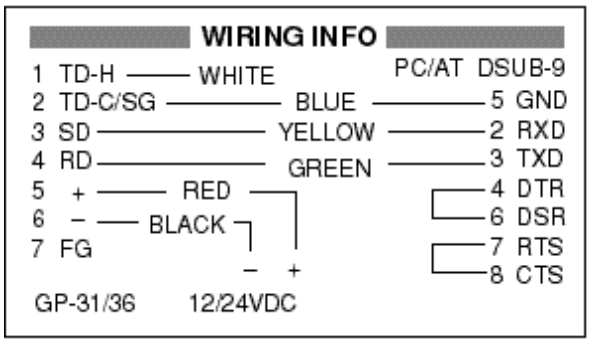


Figure 7-20 Connection of GP-36/GP-31 to PC using a DSUB 9-pin connector

A DSUB 25-pin (EIA-232) may also be used to make the connection. In this case the wiring diagram is as follows.

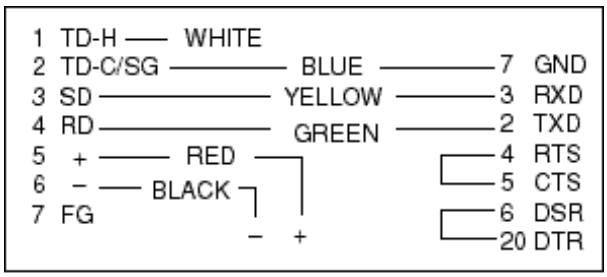


Figure 7-21 Connection of GP-36/GP-31 to PC using a DSUB 25-pin connector

Setting for communication software on PC

Baud Rate:	4800 bps
Character Length:	8 bit
Stop Bit:	1 bit
Parity:	None
X Control:	XON/OFF

Downloading/Uploading between PC and GP-36/GP-31

The following data can be downloaded/uploaded between a personal computer and the GP-36/GP-31:

- Waypoint data (In alphanumerical order)
- Route data (In order of route number)

Note 1: There are two kinds of data for route data: route data and route comment data.

Note 2: DPGS position fix is not available when uploading or downloading data.

Downloading data to a PC

1. Press the [MENU] key once or twice to open the menu, select I/O SETUP and press the [ENT] key.

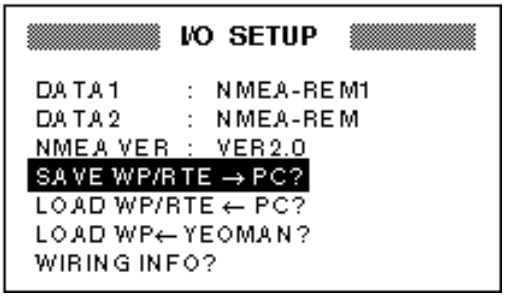


Figure 7-22 I/O SETUP menu

2. Select SAVE WP/RTE → PC?.
3. Press the [ENT] key.

Figure 7-23 SAVE WP/RTE display

4. Press the [ENT] key.

Figure 7-24 SAVING START? prompt

5. Setup the computer to receive data.
6. Press the [ENT] key.

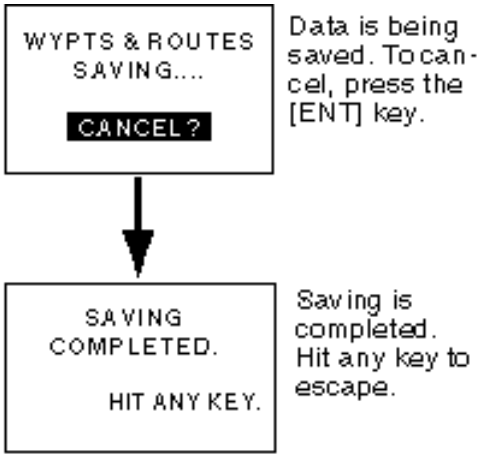


Figure 7-25 Displays when downloading data

7. Press any key to escape.

Uploading data from a PC

Note that all waypoint and route data stored in GP-36/GP-31 will be deleted when data is uploaded.

1. Press the [MENU] key once or twice to open the menu, select I/O SETUP and press the [ENT] key.
2. Select LOAD WP/RTE ← PC?.
3. Press the [ENT] key.

Figure 7-26 LOAD WP/RTE display

4. Press the [ENT] key.

Figure 7-27 LOADING START? prompt

5. Set up the computer to output data.

6. Press the [ENT] key.

   Note: The waypoint and route data are deleted when the [ENT] key is pressed.

Figure 7-28 Display when data is being loaded

7. When the loading is completed, the following message appears.

Figure 7-29 Display when data is loaded successfully

8. Press any key to escape.

Loading data from a YEOMAN

Waypoint data from a YEOMAN has the same format as does the NMEA 0183 data sentences WPL.

1. Press the [MENU] key twice, select I/O SETUP and press the [ENT] key.
2. Select LOAD WP ← YEOMAN?.
3. Press the [ENT] key.

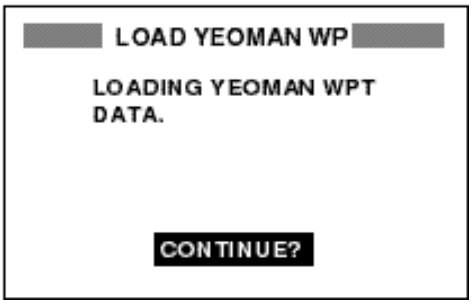


Figure 7-30 LOAD WP/RTE display

4. Press the [ENT] key.

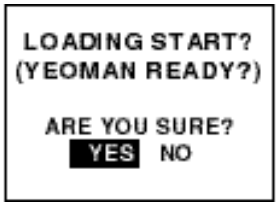


Figure 7-31 LOADING START? prompt

5. Set up the YEOMAN to output data.
6. Press the [ENT] key.

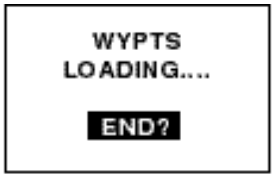


Figure 7-32 Display when data is being loaded

7. Press the [ENT] key to start the loading. Data is loaded to empty location and the buzzer sounds twice to signify successful loading. If there is not enough memory free to store the waypoints the message below appears.

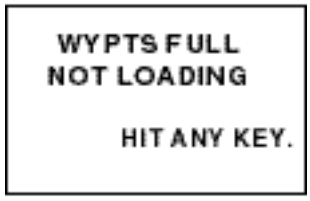


Figure 7-33 Display when waypoints could not be loaded

Waypoint data format

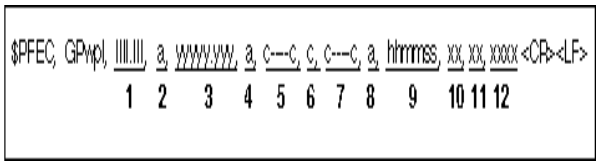


Figure 7-34 Waypoint data format

1: Waypoint latitude

2: N/S

3: Waypoint longitude

4: E/W

5: Waypoint name (Number of characters is fixed to 6 and space code is placed

when the number of characters are less than 6.)

6: Waypoint color (This field is always kept NULL.)

7: Waypoint comment (2 byte for mark code + 16 characters of comment.)

1st byte of mark code: Fixed to '@'.
2nd byte of mark code:Internal mark code + 'a' (0 x 61). See Note 1.
Number of characters for comment is less than 16 (variable length). See Note 2.

8: Flag making waypoint. Always set to "A".

"A": Displayed
"V": Not displayed

9: UTC (Always NULL)

10: Day (Always NULL)

11: Month (Always NULL)

12: Year (Always NULL)

Note 1: Internal mark code is 0 x 10 through 0 x 18. 0 x 71 through 0 x 79 are always placed at 2nd byte of mark code.

Note 2: Following characters can be used for comments:

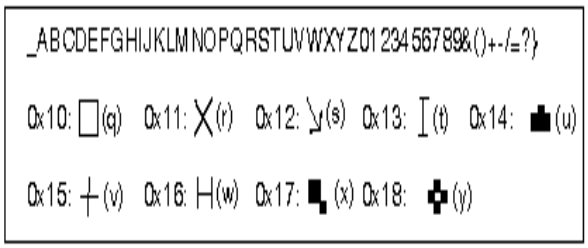


Figure 7-35 Characters available for comments

Route data format

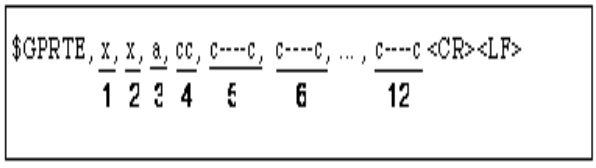


Figure 7-36 Route data format

1: Number of sentences required for one complete route data (1 to 4). See Note.

2: Number of sentences currently used (1 to 4)

3: Message mode (Always set to C).

4: Route No. (01 to 51 (51 is LOG route, 2 digits required)

5 through **12**: Waypoint name (Max. 8 names, length of each waypoint name is fixed to 7 byte)

1st byte: Skip code '–' (Hyphen) = Skip ON, Space code = Skip OFF

After 2nd byte: Waypoint name (fixed to 6 bytes)

Note: A route can contain max. 30 waypoints and GPRTE sentence for one route data may exceed 80 byte limitation. In this case, route data is divided into several GPRTE sentences (Max. 4 sentences). This value shows the number of sentences route data has been divided.

Route comment data format

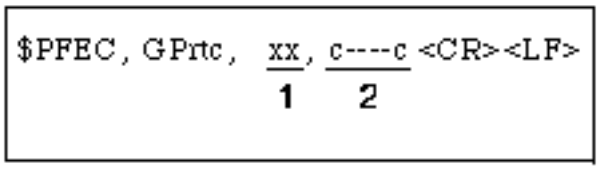


Figure 7-37 Route comment data format

1: Route No. (01 to 51, 2 digits required)

2: Route comment (Max. 16 characters, variable length)

The same characters of the comment for waypoint comment can be used.

End of sentence

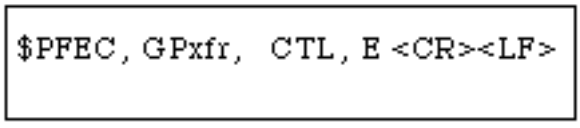


Figure 7-38 End of sentence

7.13 Time Display

You may display the time in 12-hour or 24-hour notation, and the default setting is 24-hour notation. AM or PM is shown when 12-hour notation is selected.

1. Press the [MENU] key once or twice to open the menu.
2. Select SYS SETUP and press the [ENT] key.
3. Select TIME DISP and press the [ENT] key.
4. Select 12HOUR or 24HOUR as appropriate.
5. Press the [ENT] key followed by the [MENU] key.

8. MAINTENANCE & TROUBLESHOOTING

⚠ WARNING

Do not open the equipment.

Only qualified personnel should work inside the equipment. Further, watertightness may be reduced.

8.1 Maintenance

Check the following points regularly to maintain performance:

- Check that connectors on the rear panel are firmly tightened and free of rust.
- Check that the ground system is free of rust and the ground wire is tightly fastened.
- Check that battery terminals are clean and free of rust.
- Check the antenna for damage. Replace if damaged.
- Dust and dirt on the keyboard and display screen may be removed with a soft cloth. Do not use chemical cleaners to clean the equipment; they may remove paint and markings.

8.2 Displaying the Message Board

The message board displays error messages and alerts. You can display it as follows:

1. Press the [MENU] key once or twice to open the menu.
2. Select MESSAGES.
3. Press the [ENT] key.

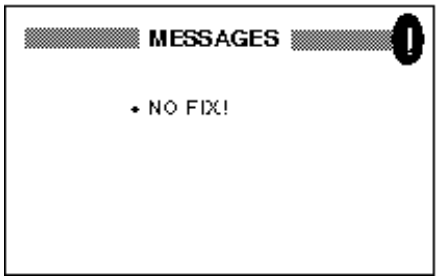


Figure 8-1 MESSAGE board

4. Press the [MENU] key twice to quit the message board.

Messages

Table 8-1 Messages and their meanings

Message	Meaning, Remedy
ANCHOR WATCH ALARM!	Anchor watch alarm setting violated.
ARRIVAL ALARM!	Arrival alarm setting violated.
BACKUP DATA ERROR!	RAM data corrupted. Try to clear backup data. See page 8-4.
BATTERY ALARM!	Voltage of internal battery is low. Request replacement.
DGPS ERROR!	No DGPS signal, or out of service area.
GPS NO FIX!	No GPS signal. Check antenna cable.
HIGH VOLTAGE!	Power source voltage too high.
LOW VOLTAGE!	Power source voltage too low.
RAM ERROR!	Request service.
ROM ERROR!	Request service.
RTC ERROR!	Request service.
SPEED ALARM!	Speed alarm setting violated.
TIME ALARM!	Timer alarm violated.
TRIP ALARM!	Trip distance alarm violated.
XTE ALARM!	XTE alarm setting violated.

8.3 Displaying the GPS Satellite Monitor Display

The GPS satellite monitor display shows information about GPS satellites.

1. Press the [MENU] key once or twice to open the menu.
2. Select SATELLITE.
3. Press the [ENT] key.

   Number, bearing and elevation angle of all satellites in view of the GPS receiver appear. Satellites being used in fixing position are displayed in reverse video; satellites not being used are shown in normal video.

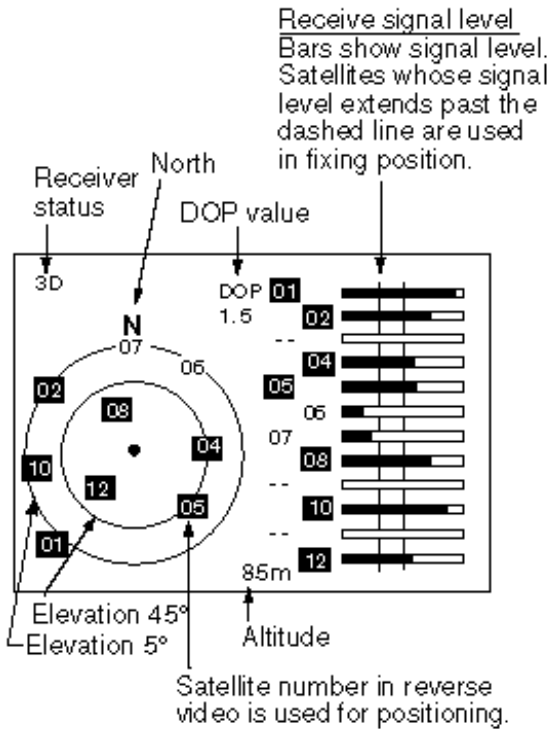


Figure 8-2 GPS satellite monitor display

4. Press the [MENU] key twice to quit the SATELLITE display.

8.4 Diagnostic Test

The diagnostic test checks ROM, RAM, data port, beacon receiver, battery, RTC, keyboard and LCD for proper operation.

1. Press the [MENU] key once or twice to open the menu.
2. Select SYS SETUP and press the [ENT] key.
3. Select "TEST?" and press the [ENT] key. You are asked if you are ready to start the test.

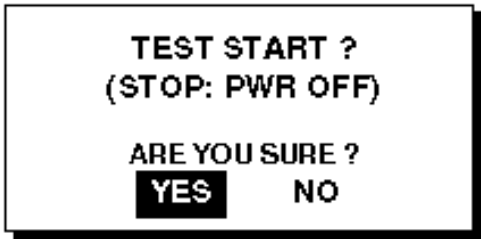


Figure 8-3 TEST START screen

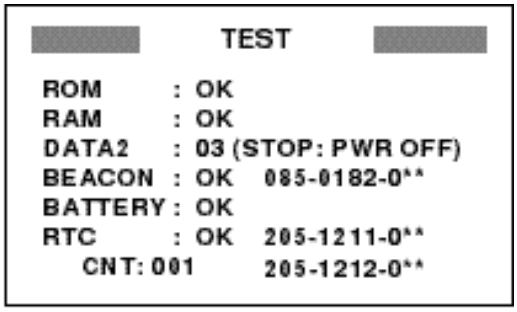
4. Press the [ENT] key to start the test.
5. The equipment tests ROM, RAM, data port, beacon receiver, internal battery and RTC. The results are individually displayed as OK or NG (No Good).

   Note 1: NONE appears next to BEACON when no beacon receiver is connected to the GP-31.

   Note 2: DATA2 requires a special connector to check. 03 appears as the result when no connector is connected.

   Note 3: No program number shown for BEACON in case of the GP-31.

   Note 4: CNT is the number of times test has been consecutively executed.



** Program version no.

Figure 8-4 TEST display (GP-36)

6. After the equipment has checked the items shown in Figure 8-4, a beep sounds and the message PUSH KEY appears at the top right-hand corner.
7. Press each key one by one. The name of the key pressed momentarily appears at the top right-hand corner if the key is functioning properly.

   Note: If no key is pressed within approx. five seconds, the equipment automatically proceeds to step 8.

8. The equipment displays the following message to inform you that it is now going to check the LCD:

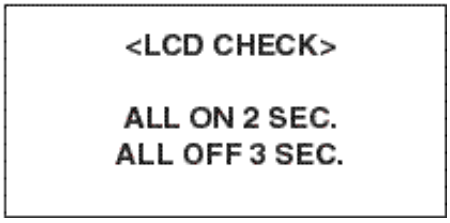


Figure 8-5 LCD CHECK screen

9. The LCD is checked as shown in the message in Figure 8-5. Then, the test repeats. To stop the test, turn off the power.

8.5 When "BATTERY ALARM!" Appears

A lithium battery (type: TZ6580553A, code no.: 000-139-951) is installed on the circuit board inside the display unit, and it preserves data when the power is turned off. The life of the battery is about 3-5 years. When its voltage is low "BATTERY ALARM!" appears on the display to alert you. When this happens, do the following to prevent loss of data, and contact your dealer to request replacement of the battery.

1. Press the [MENU] key once or twice to open the menu.
2 Select SYS SETUP and press the [ENT] key.

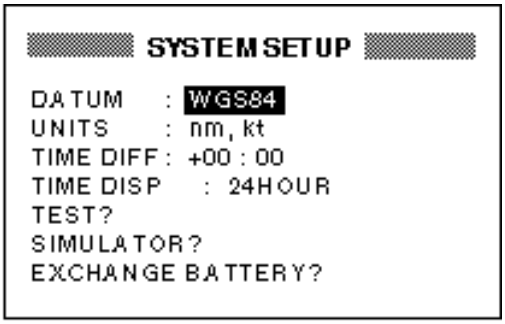


Figure 8-6 SYSTEM SETUP menu

3. Select "EXCHANGE BATTERY?" and press the [ENT] key. The display shows the following:

Figure 8-7 Exchange battery window

4. Press the [ENT] key. Then, the following display appears.

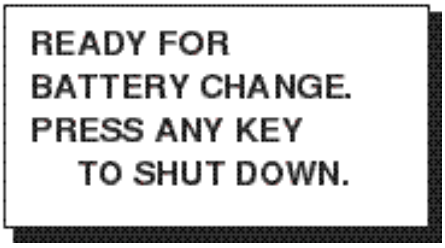


Figure 8-8 Battery exchange confirmation window

5. Press any key to automatically turn off the unit.

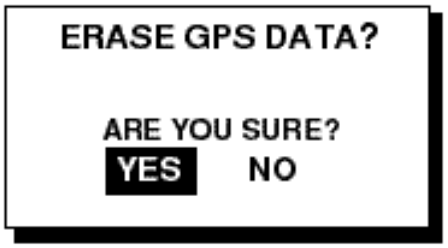
Then, important items in the RAM area are transferred to a temporary area in the flash memory to prevent loss of data.

Note : When it is expected that the GP-31/36 will not be used for a long time, execute the above procedure before turning the power off,to prevent loss of data.

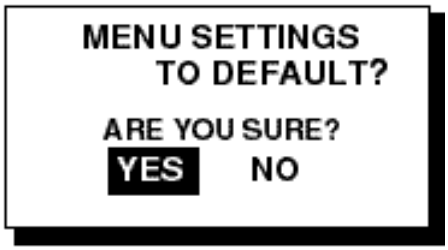
8.6 Clearing Data

You may clear GPS data, menu settings and all backup data to start afresh.

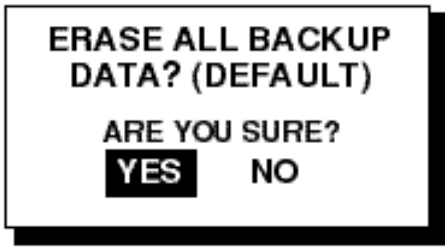
1. Press the [MENU] key once or twice to open the menu.
2. Select ERASE and press the [ENT] key.
3. Select GPS DATA?, MENU SETTINGS, or ALL BACKUP DATA as appropriate and press the [ENT] key. One of the following messages appears.



GPS DATA



MENU SETTINGS



BACKUP DATA

Figure 8-9 Prompt for erasure of GPS data, menu settings, backup data

4. Press the [ENT] key. The following display appears.

Figure 8-7 Prompt for restarting

5. Hit any key to erase item selected. A beep sounds while the selected item is being erased, and then the plotter display appears.

9. INSTALLATION

9.1 Installation of Display Unit

Mounting considerations

The display unit can be installed on a tabletop, on the overhead, or in a panel (optional flush mounting kit required). Refer to the outline drawings at the end of this manual for installation instructions. When selecting a mounting location, keep in mind the following points:

- Locate the unit away from exhaust pipes and vents.
- The mounting location should be well ventilated.
- Mount the unit where shock and vibration are minimal.
- Locate the unit away from equipment which generates electromagnetic fields such as a motor or generator.
- Allow sufficient maintenance space at the sides and rear of the unit and leave sufficient slack in cables, to facilitate maintenance and servicing.
- Observe the following compass safe distances to prevent deviation of a magnetic compass. Standard compass, 0.5 m, Steering compass, 0.3 m.

Tabletop and overhead mounting

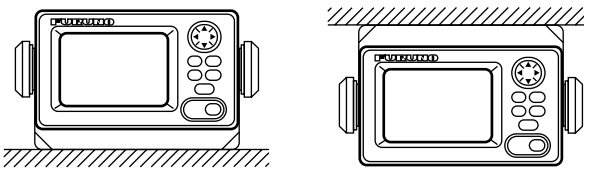


Figure 9-1 Tabletop and overhead mounting methods

Flush mounting

There are two types of flush mounting kits. For details, see the outline drawings at the end of this manual for details.

9.2 Installation of Antenna Unit

Mounting considerations

Install the antenna unit referring to the antenna installation diagram at the end of this manual. When selecting a mounting location for the antenna unit, keep in mind the following points:

- **Do not shorten the antenna cable.**
- Select a location out of the radar beam. The radar beam will obstruct or prevent reception of the GPS signal.
- The location should be well away from a VHF/UHF antenna. A GPS receiver is interfered by a harmonic wave of a VHF/UHF antenna.
- There should be no interfering object within the line-of-sight to the satellites. Objects within line-of-sight to a satellite, for example, a mast, may block reception or prolong acquisition time.
- Mount the antenna unit as high as possible. Mounting the antenna unit as high as possible keeps it free of interfering objects and water spray, which can interrupt reception of GPS satellite signal if the water freezes.
- The length of the whip antenna for the GPA-018 (for GP-36) should be no longer than 1.2 meter to prevent antenna damage. **Do not use a 2.5 meter whip antenna.**
- If the antenna cable is to be passed through a hole which is not large enough to pass the connector, you may unfasten the connector with a needle nose pliers and 3/8-inch open-end wrench. Refasten it as shown in Figure 9-2, after running the cable through the hole.

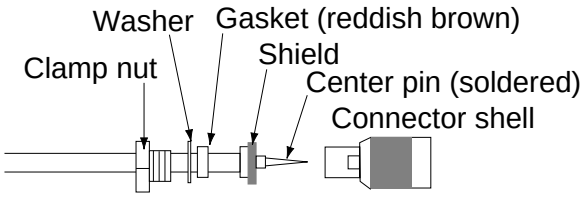
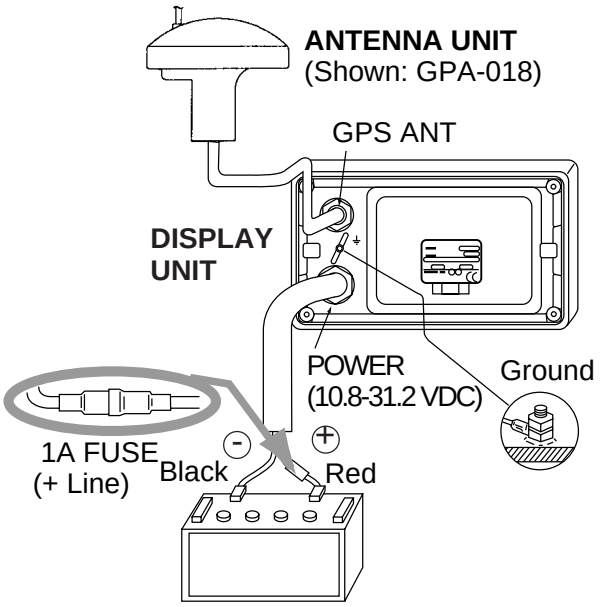


Figure 9-2 How to assemble the connector

9.3 Wiring

The figure below shows where to connect cables on the rear of the display unit. Please review the WARNING SHEET at the front of this manual before wiring the equipment.



⚠ CAUTION

Ground the equipment to prevent mutual interference.

Figure 9-3 Wiring

Note: The fuse holder contains a spring which fixes the fuse. To prevent detachment of the spring, which would cause loss of power, tie the line as shown in Figure 9-4.

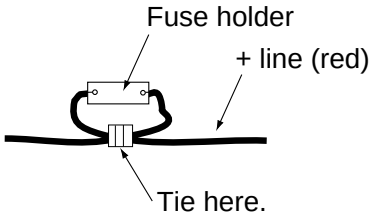


Figure 9-4 How to fix spring in fuse holder

Grounding

The display unit contains a CPU. While it is operating, it radiates noise, which can interfere with radio equipment. Ground the unit as follows to prevent interference:

- The ground wire should be 1.25sq or larger.
- The ground wire should be as short as possible.
- The signal ground and frame ground are separated, however the power line is not isolated. Therefore, do not connect the signal ground to the frame ground when connecting other equipment to a positive ground battery.
- The antenna unit GPA-018 (for GP-36) must be grounded. Connect a ground wire of 1.25sq or larger (local supply) between the ground terminal on the antenna unit and a stainless steel screw fastened to the mast. Coat the ground terminal, stainless steel screw and crimp-on lug on the ground wire with silicone sealant.
- The power of this equipment is not isolated, thus the earth lamp may light when the antenna unit GPA-018 is grounded. If it lights, attach two capacitors (1mF, 0.1mF) in parallel to the antenna earth line.

External equipment

The power supply port is commonly used for connection of external equipment such as navigation equipment or a PC. Refer to the interconnection diagram on page S-1 or S-2 for connection.

9.4 Initial Settings

This equipment can output navigation data to external equipment, in NMEA 0183 format. For example, it can output position data to a radar or echo sounder for display on its display screen.

Output data format, data sentences

NMEA 0183 version 1.5 or 2.0 can be selected through the menu.

DATA1: Current loop data

No Waypoint		
AP	REM-1	REM-2
GLL VTG ZDA AAM APB BOD BWC XTE (1 sec. interval)	GLL GGA VTG ZDA RMC RMB (1 sec. interval)	GLL GGA VTG ZDA RMA* GTD* RMC RMB BWC (2 sec. interval)

* Output when LC TD is displayed.
RMA: Ver. 2.0 only
GTD: Ver. 1.5 only
AP: Autopilot
REM-1, REM-2: Radar, echosounder, etc.

DATA2: RS-232C level

With Waypoint	
AP	REM
GLL VTG ZDA AAM APB BOD BWC XTE (1 sec. interval)	GLL GGA VTG ZDA RMA* GTD* RMC RMB BWC (1 sec. interval)

* Output when LC TD is displayed.
RMA: Ver. 2.0 only
GTD: Ver. 1.5 only

DATA2

External Beacon Receiver Setting	Internal Beacon Receiver Setting
Output GGA MSK Input Correction data of external beacon receiver	Output of internal beacon receiver's correction data (correction data and $CRMSS)
BEACON on DGPS SETUP menu set to EXT	BEACON on DGPS SETUP menu set to INT

Data sentence description

AAM: Arrival alarm

APB: Autopilot data (XTE and bearing to waypoint)

BOD: Bearing from own ship to destination

BWC: Range and bearing to waypoint (great circle navigation)

GGA: GPS position fixing condition (time of fix, latitude, longitude, receiving condition, number of satellites used, DOP)

GLL: Latitude and longitude

GTD: Loran-C time difference

RMA: Generic navigational information (latitude, longitude, Loran-C time differences, ground speed, true course

RMB: Generic navigational information (cross track error, steering direction, starting waypoint no., destination waypoint no., latitude and longitude of starting waypoint, latitude and longitude of destination waypoint, range and bearing to waypoint, range and bearing from present position to destination waypoint, velocity to destination, arrival alarm)

RMC: Generic navigational information (UTC time, latitude, longitude, ground speed, true course, day, month, year)

VTG: Actual track and ground speeds

XTE: Course error amount and direction to steer

ZDA: UTC time (day, month, year)

Output setting

1. Press [MENU] once or twice to open the menu.
2. Operate the cursor pad to select I/O SETUP.
3. Press the [ENT] key.

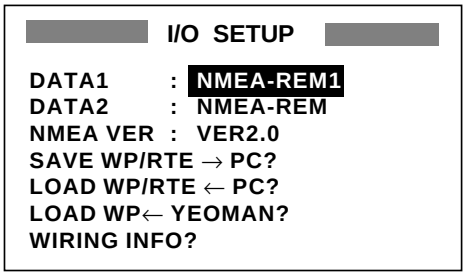
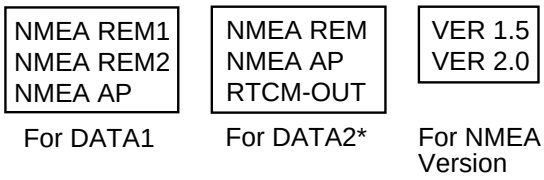


Figure 9-5 I/O SETUP menu

4. To change setting, press ▼ to select DATA1, DATA2 or NMEA VER as appropriate.
5. Press the [ENT] key. One of the following screens appears depending on the item selected at step 4.



* BEACON displayed when DGPS setting is EXT.

Figure 9-6 Screens for setup of data output and selection of NMEA version

6. Select desired option with ▲ or ▼.

   NMEA-REM1, 2: Output data to radar, echo sounder, etc.

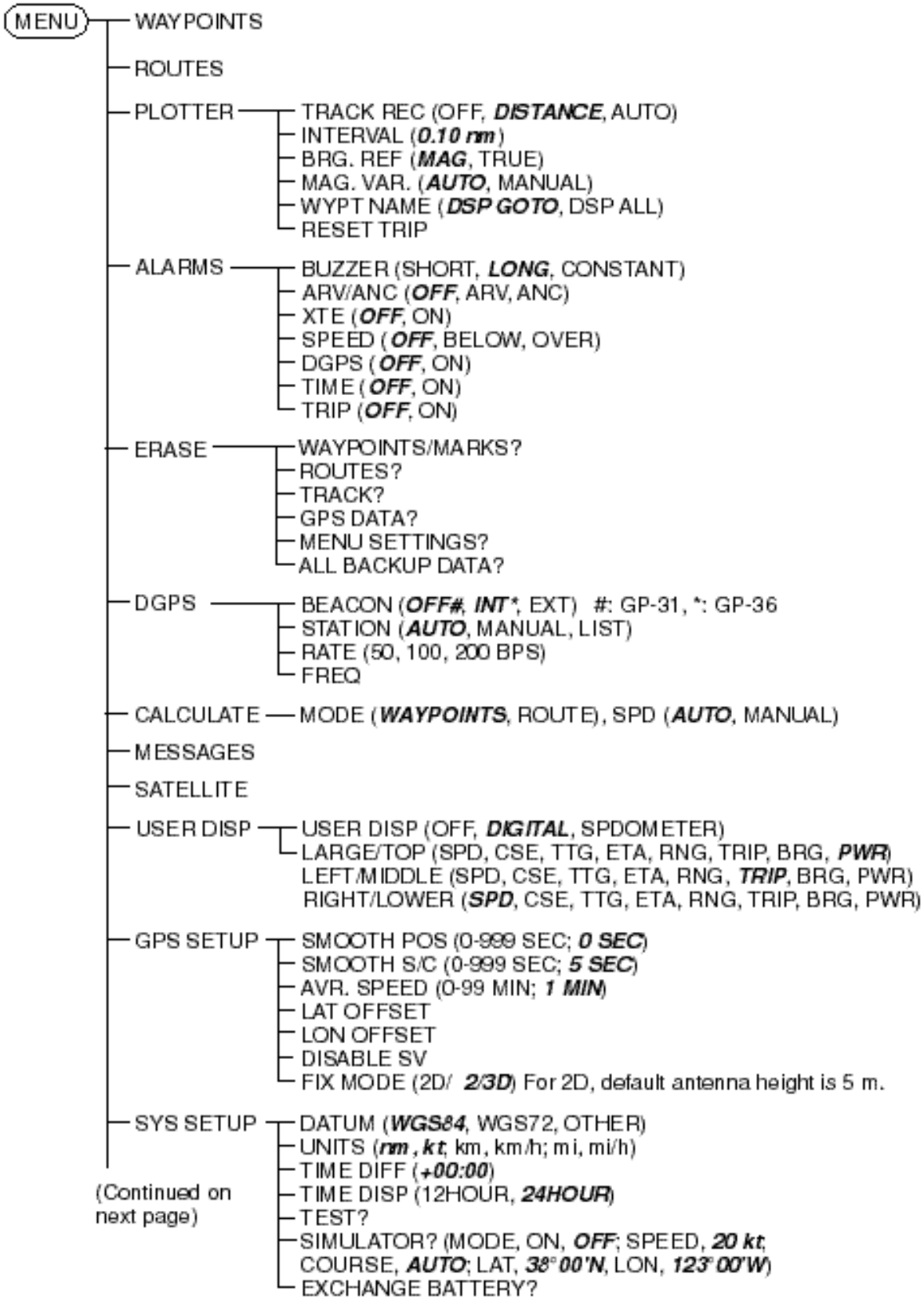
   NMEA-AP: Output data to an autopilot.

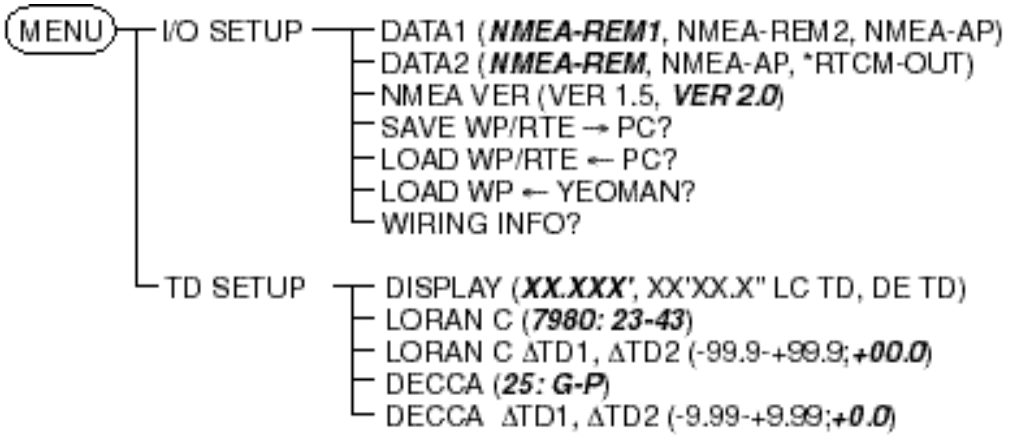
   RTCM-OUT: Select when equipped with internal DPGS beacon receiver.

   VER 1.5, 2.0: Select NMEA version of external equipment. If you are unsure of NMEA version no., try both and select the one which successfully outputs data.
7. Press the [ENT] key.
8. Press the [MENU] key to finish.

Menu Tree

Default settings shown in boldface italic.





** BEACON when BEACON receiver is active.*

Loran C Chains

Chain	GRI	S1	S2	S3	S4	S5
Central Pacific	4990	11	29	–	–	–
Canadian East Coast	5930	11	25	38	–	–
Commando Lion (Korea)	5970	11	31	42	–	–
Canadian West Coast	5990	11	27	41	–	–
South Saudi Arabia	7170	11	26	39	52	–
Labrador Sea	7930	11	26	–	–	–
Eastern Russia	7950	11	30	46	61	–
Gulf of Alaska	7960	11	26	44	–	–
Norwegian Sea	7970	11	26	46	60	–
Southeast USA	7980	11	23	43	59	–
Mediterranean Sea	7990	11	29	47	–	–
Western Russia	8000	10	25	50	65	–
North Central USA	8290	11	27	42	–	–
North Saudi Arabia	8990	11	25	40	56	69
Great Lakes	8970	11	28	44	59	–
South Central USA	9610	11	25	40	52	65
West Coast USA	9940	11	27	40	–	–
Northeast USA	9960	11	25	39	54	–
Northeast Pacific (old)	9970	11	30	55	81	–
Icelandic	9980	11	30	–	–	–
North Pacific	9990	11	29	43	–	–
Suez	4991	10	24			
England, France	8940	12	30			
Northwest Pacific	8930	11	30	50	70	
Newfoundland East Coast	7270	11	25			
Lessay	6731	10	39			
BØ	7001	11	27			
Sylt	7499	11	26			
Ejde	9007	10	23	38		
Saudia Arabia North	8830	11	25	39	56	
Saudia Arabia South	7030	11	25	37	55	

Decca Chains

Chain No.	Chain	Chain code	Location	Chain No.	Chain	Chain code	Location
01	South Baltic	0A	Europe	25	Skagerrak	10B	"
02	Vestlandet	0E	"	26	North Persian Gulf	5C	Persian Gulf & India
03	Southwest British	1B	"	27	South Persian Gulf	1C	"
04	Northumbrian	2A	"	28	Bombay	7B	"
05	Holland	2E	"	29	Calcutta	8B	"
06	North British	3B	"	30	Bangladesh	6C	"
07	Lofoten	3E	"	31	Saliyah	2F	"
08		3F	"	32	Hokkaido	9C	Japan
09	North Baltic	4B	"	33	Tohoku	6C	"
10	North West	4C	"	34	Kanto	8C	Japan
11	Trondelag	4E	"	35	Shikoku	4C	"
12	English	5B	"	36	Hokuriku	2C	"
13	North Bothnian	5F	"	37	Kita Kyushu	7C	"
14	Southern Spanish	6A	"	38	Namaqualand	4A	Southern Africa
15	North Scottish	6C	"	39	Cape	6A	"
16	Gulf of Finland	6E	"	40	Eastern Province	8A	"
17	Danish	7B	"	41	South West Africa	9C	"
18	Irish	7D	"	42	Natal	10C	"
19	Finnmark	7E	"	43	Dampier	8E	Australia
20	French	8B	"	44	Port Headland	4A	"
21	South Bothnian	8C	"	45	Anticosti	9C	Northern America
22	Hebridean	8E	"	46	East Newfoundland	2C	"
23	Frisian Islands	9B	"	47	Cabot Strait	6B	"
24	Helgeland	9E	"	48	Nova Scotia	7C	"

Geodetic Chart List

001:	WGS84	
002:	WGS72	
003:	TOKYO	: Mean Value (Japan, Korea & Okinawa)
004:	NORTH AMERICAN 1927	: Mean Value (CONUS)
005:	EUROPEAN 1950	: Mean Value
006:	AUSTRALIAN GEODETIC 1984	: Australia & Tasmania
007:	ADINDAN	: Mean Value (Ethiopia & Sudan)
008:		: Ethiopia
009:		: Mali
010:		: Senegal
011		: Sudan
012:	AFG	: Somalia
013:	AIN EL ABD 1970	: Bahrain Is.
014:	ANNA 1 ASTRO 1965	: Cocos Is.
015:	ARC 1950	: Mean Value
016:		: Botswana
017:		: Lesotho
018:		: Malawi
019:		: Swaziland
020:		: Zaire
021:		: Zambia
022:		: Zimbabwe
023:	ARC 1960	: Mean Value (Kenya & Tanzania)
024:		: Kenya
025:		: Tanzania
026:	ASCENSION IS. 1958	: Ascension Is.
027:	ASTRO BEACON “E”	: Iwo Jima Is.
028:	ASTRO B4 SOR. ATOLL	: Tern Is.
029:	ASTRO POS 71/4	: St. Helena Is.
030:	ASTRONOMIC STATION 1952	: Marcus Is.
031:	AUSTRALIAN GEODETIC 1966	: Australia & Tasmania
032:	BELLEVUE (IGN)	: Efate & Erromango Islands
033:	BERMUDA 1957	: Bermuda Islands
034:	BOGOTA OBSERVATORY	: Columbia
035:	GAUPO INCHAUSPE	: Argentina
036:	CANTON IS. 1966	: Phoenix Islands
037:	CAPE	: South Africa
038:	CAPE CANAVERAL	: Mean Value (Florida & Bahama Islands)
039:	CARTHAGE	: Tunisia
040:	CHATHAM 1971	: Chatham Is. (New Zealand)
041:	CHUA ASTRO	: Paraguay
042:	CORREGO ALEGRE	: Brazil
043:	DJAKARTA (BATAVIA)	: Sumatra Is. (Indonesia)
044:	DOS 1968	: Gizo Is. (New Georgia Is.)
045:	EASTER IS. 1967	: Easter Is.
046:	EUROPEAN 1950 (Cont’d)	: Western Europe
047:		: Cyprus
048:		: Egypt
049:		: England, Scotland, Channel & Shetland Islands
050:		: England, Ireland, Scotland, & Shetland Islands
051:		: Greece
052		: Iran
053:		: Italy, Sardinia
054:		: Italy, Sicily
055:		: Norway & Finland
056:		: Portugal & Spain
057:	EUROPEAN 1979	: Mean Value
058:	GANDAJIKA BASE	: Republic of Maldives
059:	GEODETIC DATUM 1949	: New Zealand
060:	GUAM 1963	: Guam Is.
061:	GUX 1 ASTRO	: Guadalcanal Is.
062:	HJORSEY 1955	: Iceland
063:	HONG KONG 1363	: Hong Kong
064:	INDIAN	: Thailand & Vietnam
065:		: Bangladesh, India & Nepal
066:	IRELAND 1965	: Ireland
067:	ISTS 073 ASTRO 1969	: Diego Garcia
068:	JOHNSTON IS. 1961	: Johnston Is.
069:	KANDAWALA	: Sri Lanka
070:	KERGUELEN IS.	: Kerguelen Is.
071:	KERTAU 1948	: West Malaysia & Singapore
072:	LA REUNION	: Mascarene Is.
073:	L. C. 5 ASTRO	: Cayman Brac Is.
074:	LIBERIA 1964	: Liberia
075:	LUZON	: Philippines (excl. Mindanao Is.)
076:		: Mindanao Is.
077:	MAHE 1971	: Mahe Is.
078:	MARCO ASTRO	: Salvage Islands
079:	MASSAWA	: Eritrea (Ethiopia)
080:	MERCHICH	: Morocco
081:	MIDWAY ASTRO 1961	: Midway Is.
082:	MINNA	: Nigeria
083:	NAHRWAN	: Masirah Is. (0man)
084:		: United Arab Emirates
085:		: Saudi Arabia
086:	NAMIBIA	: Namibia
087:	MAPARIMA, BWI	: Trinidad & Tobago
088:	NORTH AMERICAN 1927	: Western United States
089:		: Eastern United States
090:		: Alaska
091:		: Bahamas (excl. San Salvador Is.)
092:		: Bahamas, San Salvador Is.
093:		: Canada (incl. Newfoundland Is.)
094:		: Alberta & British Columbia
095:		: East Canada
096:		: Manitoba & Ontario
097:		: Northwest Territories & Saskatchewan
098:		: Yukon
099:		: Canal Zone
100:		: Caribbean
101:		: Central America
102:		: Cuba
103:		: Greenland
104:		: Mexico
105:	NORTH AMERICAN 1983	: Alaska
106:		: Canada
107:		: CONUS
108:		: Mexico, Central America
109:	OBSERVATORIO 1966	: Corvo & Flores Islands (Azores)
110:	OLD EGYPTIAN 1930	: Egypt
111:	OLD HAWAIIAN	: Mean Value
112:		: Hawaii
113:		: Kauai
114:		: Maui
115:		: Oahu
116:	OMAN	: Oman
117:	ORDNANCE SURVEY OF GREAT BRITAIN 1936: Mean Value	
118:		: England
119:		: England, Isle of Man & Wales
120:		: Scotland, & Shetland Islands
121:		: Wales
122:	PICO DE LAS NIVIES	: Canary Islands
123:	PITCAIRN ASTRO 1967	: Pitcairn Is.
124:	PROVISIONS SOUTH CHILEAN 1963: South Chile (near 53˚ S)	
125:	PROVISIONAL SOUTH AMERICAN 1956: Mean Value	
126:		: Bolivia
127:		: Chile-Northern Chile (near 19˚S)
128:		: Chile-Southern Chile (near 43˚S)
129:		: Columbia
130:		: Ecuador
131:		: Guyana
132:		: Peru
133:		: Venezuela
134:	PUERTO RICO	: Puerto Rico & Virgin Islands
135:	QATAR NATIONAL	: Qatar
136:	QORNOQ	: South Greenland
137:	ROME 1940	: Sardinia Islands
138:	SANTA BRAZ	: Sao Maguel, Santa Maria Islands (Azores)
139:	SANTO (DOS)	: Espirito Santo Is.
140:	SAPPER HILL 1943	: East Falkland Is.
141:	SOUTH AMERICAN 1969	: Mean Value
142:		: Argentina
143:		: Bolivia
144:		: Brazil
145:		: Chile
146:		: Columbia
147:		: Ecuador
148:		: Guyana
149:		: Paraguay
150:		: Peru
151:		: Trinidad & Tobago
152:		: Venezuela
153:	SOUTH ASIA	: Singapore
154:	SOUTHEAST BASE	: Porto Santo & Madeira Islands
155:	SOUTHWEST BASE	: Faial, Graciosa, Pico, Sao Jorge, & Terceira Is.
156:	TIMBALAI 1948	: Brunei & East Malaysia (Sarawak & Sadah)
157:	TOKYO	: Japan
158:		: Korea
159:		: Okinawa
160:	TRISTAN ASTRO 1968	: Tristan da Cunha
161:	VITI LEVU 1916	: Viti Levu Is. (Fiji Islands)
162:	WAKE-ENIWETOK 1960	: Marshall Islands
163:	ZANDERIJ	: Surinam
164:	BUKIT RIMPAH	: Bangka & Belitung Islands (Indonesia)
165:	CAMP AREA ASTRO	: Camp Mcmurdo Area, Antarctica
166:	G. SEGARA	: Kalimantan Is. (Indonesia)
167:	HERAT NORTH	: Afghanistan
168:	HU-TZU-SHAN	: Taiwan
169:	TANANARIVE OBSERVATORY 1925	: Madagascar
170:	YACARE	: Uruguay
171:	RT-90	: Sweden
172:	Pulkovo 1942	: Russia
173:	FINNISH KKJ	: Finland

SPECIFICATIONS OF GPS NAVIGATOR
GP-31/36

1. ANTENNA UNIT

(1) GP-31	GPA-017 (GPS antenna)
(2) GP-36	GPA-019 (GPS antenna with H-field Beacon ANT) GPA-018 (GPS antenna with E-field Beacon ANT) selectable

2. GPS RECEIVER

(1) Receiving System	12 channels parallel, 12 satellite tracking
(2) Rx Frequency	1575.42 kHz
(3) Rx code	C/A code
(4) Position Fixing System	All in view, 8-state Kalman filter
(5) Position Accuracy	Approx. 50 m (GPS), or approx. 5 m (DGPS), 95% of the time, horizontal dilution of position (HDOP) ≤4 Note: All GPS receiver are subject to degradation of position and velocity accuracy under the U.S. Department of Defense. Position may be degraded.
(6) Tracking velocity	999 kts
(7) Position-fixing time	Warm start: 12 seconds, Cold start: 90 seconds
(8) Position Update Interval	1 second
(9) Beacon Receiver (GP-36)	Frequency range: 283.5 to 325.0 kHz MSK rate: 50, 100, 200 bps (auto or manual, selectable)

3. DISPLAY SECTION

(1) Display	95 x 60 mm (120 x 64 dot matrix)
(2) Display Mode	Plotter, Steering, Highway, NAV data, User display (Digital data or Speedometer)
(3) Display	Mercator projection Position indication (L/L, Loran C LOP or Decca LOP)
(4) Memory Capacity	Track: 1000 pts, Waypoint: 950 pts with comment (16 charactor)
(5) Storage Capacity	50 routes with 30 waypoints each
(6) Alarms	Arrival and anchor watch, Cross track error, Ship’s speed in and out alarms, DGPS alarm, Time alarm, Trip alarm
(7) Display Scale	
Plotter display:	0.02, 0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 40, 80, 160, 320 nm
Highway display:	0.2, 0.4, 0.8, 1, 2, 4, 8, 16 nm

4. INPUT/OUTPUT DATA

(1) Data 1	Current Loop
Output Data:	NMEA0183 Ver 1.5/2.0 selected
	NMEA-REM1: GLL, GGA, VTG, ZDA, RMC, RMB
	NMEA-REM2: GLL, GGA, VTG, ZDA, RMC, RMB, BWC, RMA (Ver2.0), GTD (Ver1.5) when TD indication selected
	NMEA-AP: GLL, VTG, ZDA, AAM, APB, BOD, BWC, XTE
(2) Data 2	RS-232C
Output Data:	NMEA0183 Ver 1.5/2.0 selected
	NMEA-REM: GLL, GGA, VTG, ZDA, RMC, RMB, BWC, RMA (Ver2.0), GTD (Ver1.5) when TD indication selected
	NMEA-AP: GLL, VTG, ZDA, AAM, APB, BOD, BWC, XTE
	DGPS RTCM SC-104 (GP-36 only)
	Downloading to PC (WP/ Route Data)
Input Data:	DGPS RTCM SC-104 Ver 2.1
	Uploading from PC (WP/ Route Data)
	NMEA WPL (WP Data)

5. POWER SUPPLY

(1) GP-31	12-24 VDC: 0.12-0.06 A (at max. level dimmer)
(2) GP-36	12-24 VDC: 0.23-0.12 A (at max. level dimmer)

6. ENVIRONMENTAL CONDITION

(1) Ambient Temperature	Antenna Unit: -25°C to +70°C
	Display Unit: -15°C to +55°C
(2) Relative Humidity	95% at 40°C
(3) Water proofing	Antenna Unit: IEC60529 IPX6
	Display Unit: IEC60529 IPX5 (USCG CFR-46)
(4) Vibration	±1 mm ±10%, 2(5) to 13.2 Hz,
	Maximum acceleration 7 m/s^2, 13.2 to 100 Hz (IEC 60945)

7. COATING COLOR

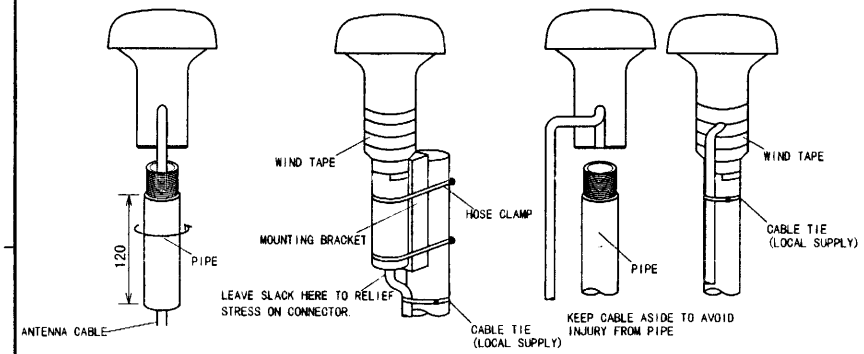
(1) Display Unit	Cover: Munsell 2.5GY5/1.5, Panel: N3.0
(2) Antenna Unit	N9.5

FURUNO

A) MAST MOUNTING

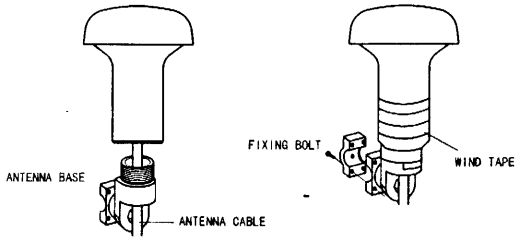
a) USE MAST MOUNTING KIT CP20-01111.

b) USE A PIPE ONLY.



B) HANDRAIL MOUNTING

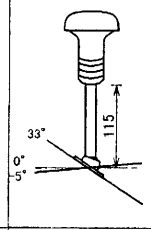
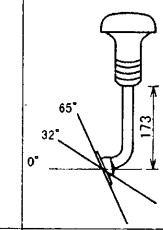
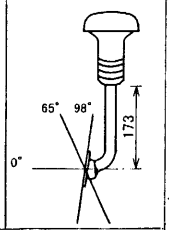
USE HANDRAIL MOUNTING BASE No. 13-RC5160 (CODE No. 000-806-114, OPTION).
THE DIAMETER OF THE HANDRAIL MAY BE FROM ϕ19mm TO ϕ32mm.



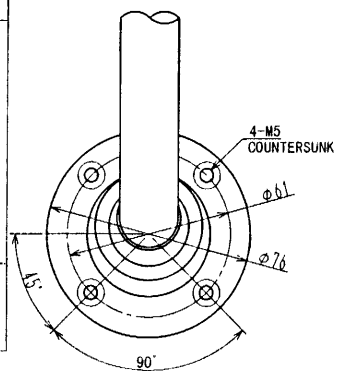
NOTE 1. FASTEN PIPE(ANTENNA BASE) TO ANTENNA UNIT FIRST THEN FIX THEM TO MAST OR HANDRAIL.
2. WHEN FIXING ANTENNA, TURN PIPE OR ANTENNA BASE; NOT THE ANTENNA.
TURNING THE ANTENNA MAY TWIST THE CABLE AND PLACE STRESS ON CONNECTOR.

C) ANTENNA BASE MOUNTING

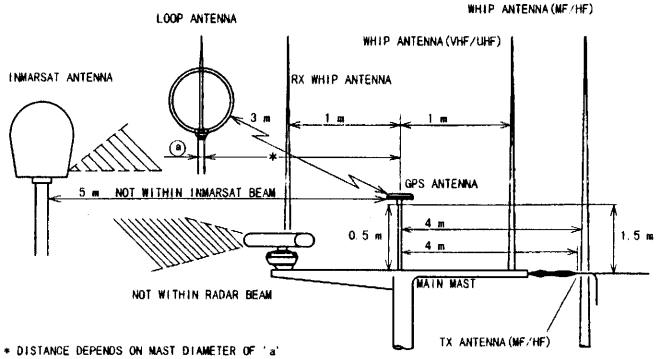
USE OPTIONAL ANTENNA BASE No. 13-QA330/QA310.

INCLINATION	-5° - 33°	32° - 65°	65° - 98°
MOUNTING METHOD			
ANTENNA BASE TYPE	RIGHT ANGLE ANTENNA BASE No. 13-QA330	L-TYPE ANTENNA BASE No. 13-QA310	
CODE No.	000-803-239	000-803-240	

MOUNTING DIMENSIONS OF ANTENNA BASE



MOUNTING LOCATION THE FIGURE BELOW SHOWS THE RECOMMENDED SEPARATION DISTANCES FROM OTHER ANTENNAS TO AVOID MUTUAL INTERFERENCE.

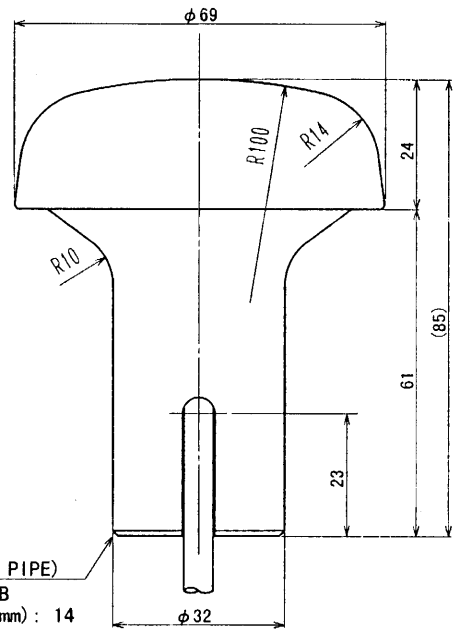


* DISTANCE DEPENDS ON MAST DIAMETER OF 'a'

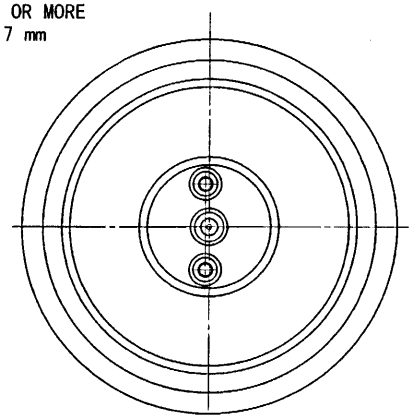
DIA. OF 'a'	DISTANCE (MIN.)
10 cm	1.5 m
30 cm	3 m

DIMENSION (mm)	TOL. (mm)
L ≦ 50	±1.5
50 < L ≦ 100	±2.5
100 < L ≦ 500	±3

TABLE 1



THREAD DIMENSION (FOR PIPE)
THREAD TYPE: 1x14UNS1B
THREADS PER INCH(25.4mm): 14
PITCH: 1.8143 mm
THREAD LENGTH: 19 mm OR MORE
PITCH DIAMETER: 24.17 mm



NOTE
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.

DRAWN June 17 '99 T.YAMASAKI		TITLE	GPA-017
CHECKED Jun 17 '99 K.Kitsuneki		名称	空中線部
APPROVED Jun 17 '99 K.Kitsuneki			外寸図
SCALE 1/1 MASS 0.59 kg		NAME	ANTENNA UNIT
DWG. No. E4384-G04- F			OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

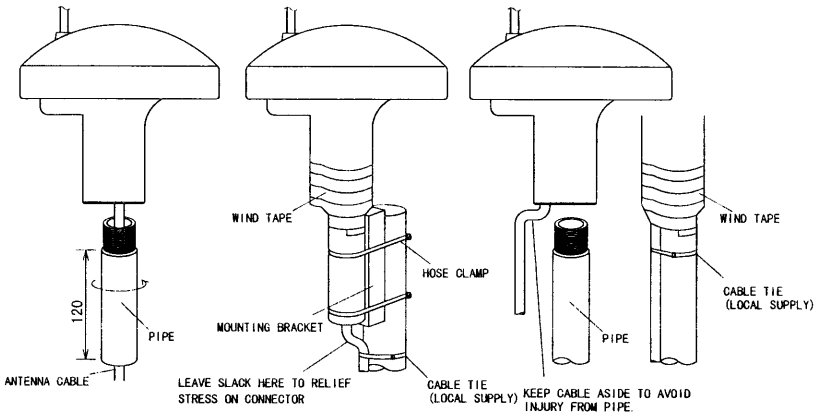
D-1

FURUNO

A) MAST MOUNTING

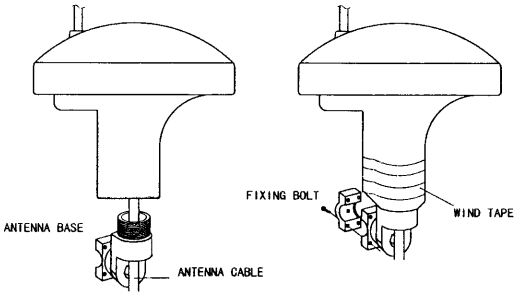
a) USE MAST MOUNTING KIT CP20-01111.

b) USE A PIPE ONLY.



B) HANDRAIL MOUNTING

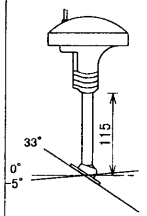
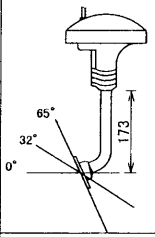
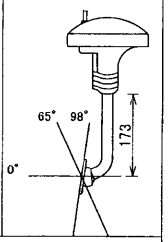
USE HANDRAIL MOUNTING BASE No. 13-RC5160 (CODE No. 000-806-114, OPTION).
THE DIAMETER OF THE HANDRAIL MAY BE FROM ϕ19mm TO ϕ32mm.



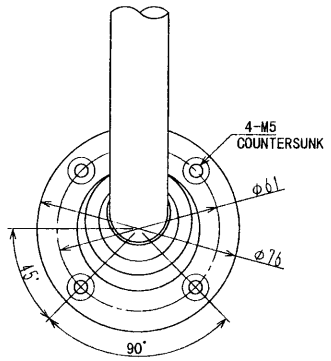
NOTE 1. FASTEN PIPE(ANTENNA BASE) TO ANTENNA UNIT FIRST THEN FIX THEM TO MAST OR HANDRAIL.
2. WHEN FIXING ANTENNA, TURN PIPE OR ANTENNA BASE; NOT THE ANTENNA.
TURNING THE ANTENNA MAY TWIST THE CABLE AND PLACE STRESS ON CONNECTOR.

C) ANTENNA BASE MOUNTING

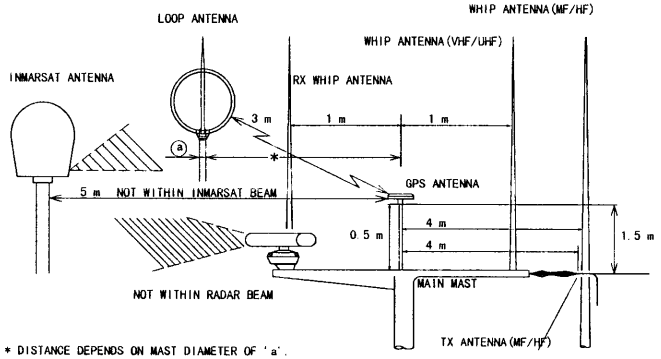
USE OPTIONAL ANTENNA BASE No. 13-QA330/QA310.

INCLINATION	-5° - 33°	32° - 65°	65° - 98°
MOUNTING METHOD			
ANTENNA BASE TYPE	RIGHT ANGLE ANTENNA BASE No. 13-QA330	L-TYPE ANTENNA BASE No. 13-QA310	
CODE No.	000-803-239	000-803-240	

MOUNTING DIMENSIONS OF ANTENNA BASE

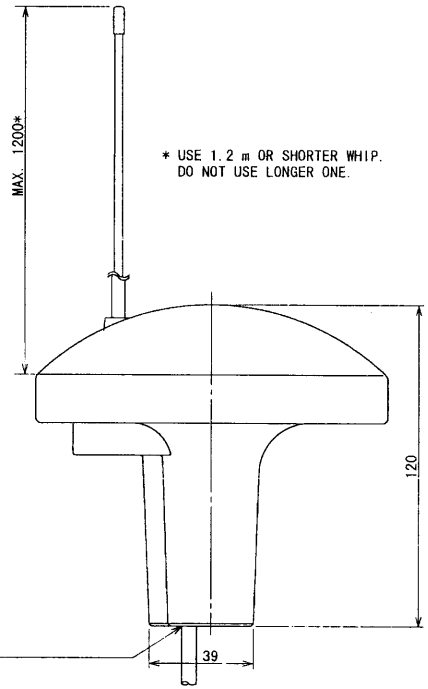


MOUNTING LOCATION THE FIGURE BELOW SHOWS THE RECOMMENDED SEPARATION DISTANCES FROM OTHER ANTENNAS TO AVOID MUTUAL INTERFERENCE.



* DISTANCE DEPENDS ON MAST DIAMETER OF 'a'.

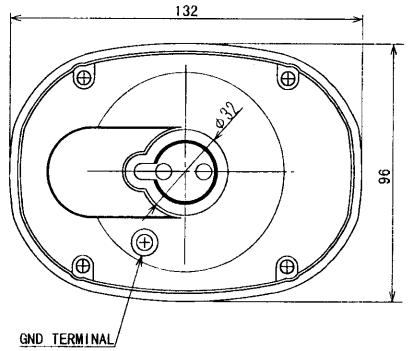
DIA. OF 'a'	DISTANCE (MIN.)
10 cm	1.5 m
30 cm	3 m



DIMENSION (mm)	TOL. (mm)
L ≦ 50	±1.5
50 < L ≦ 100	±2.5
100 < L ≦ 500	±3

TABLE 1

THREAD DIMENSION (FOR PIPE)
THREAD TYPE: 1x14UNS1B
THREADS PER INCH(25.4mm): 14
PITCH: 1.8143 mm
THREAD LENGTH: 19 mm OR MORE
PITCH DIAMETER: 24.17 mm



NOTE
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.

TYPE	CABLE LENGTH(m)	PLUG	MASS (kg)
GPA-018	10	TNC-P-3	0.79
GPA-018S	0.2	TNC-J-3	0.35

TABLE 2

DRAWN	Jun 12 '99 T.YAMASAKI	TITLE	GPA-018/018S
CHECKED	Jun 17 '99 K.Furuno	名称	空中線部
APPROVED	Jun 17 '99 K.Furuno		外寸図
SCALE	1/2	MASS	TABLE 2
DWG. No.	E4385-G01- G	NAME	ANTENNA UNIT
			OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

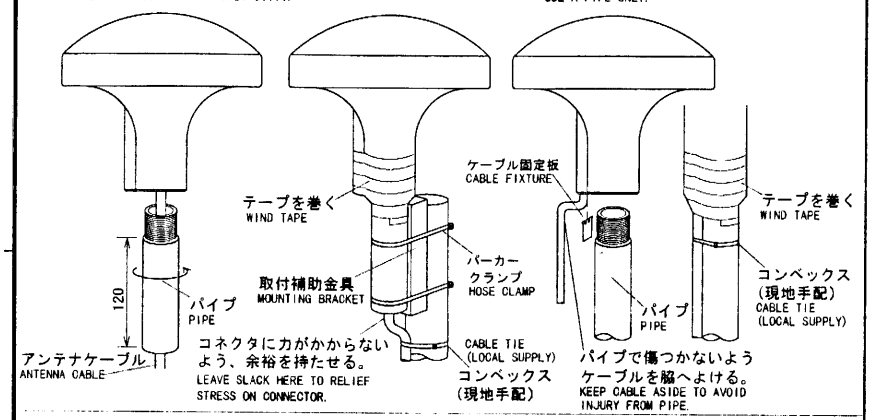
D-2

FURUNO

A) マストへの取付け　MAST MOUNTING

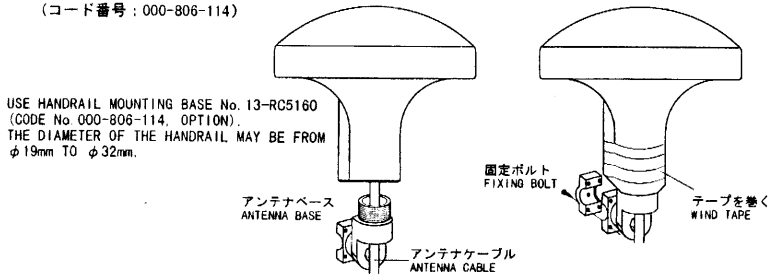
a) マスト取付金具CP20-01111(工事材料)でマストに固定する。
USE MAST MOUNTING KIT CP20-01111.

b) パイプのみを使うとき
USE A PIPE ONLY.



B) スタンションやパルピットにつけるとき　HANDRAIL MOUNTING

レール用アンテナベース No. 13-RC5160 (取付可能レール直径：φ19～φ32)
(コード番号：000-806-114)

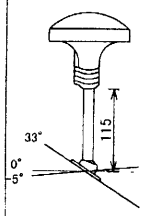
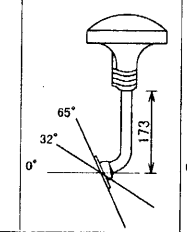
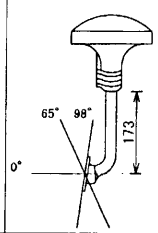


注記 1) パイプ(アンテナベース)はアンテナユニットにねじ込んだ後に固定する。
2) アンテナを固定するときはパイプ（アンテナベース）をアンテナにねじ込むこと。
アンテナ側をねじるとコネクタ部やケーブルに無理がかかり、故障の原因となる。

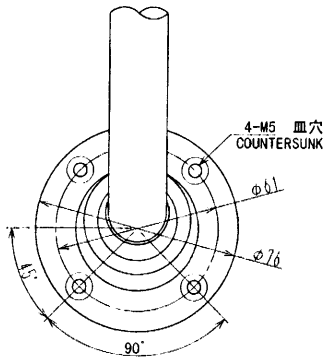
NOTE 1. FASTEN PIPE(ANTENNA BASE) TO ANTENNA UNIT FIRST THEN FIX THEM TO MAST OR HANDRAIL.
2. WHEN FIXING ANTENNA, TURN PIPE OR ANTENNA BASE; NOT THE ANTENNA.
TURNING THE ANTENNA MAY TWIST THE CABLE AND PLACE STRESS ON CONNECTOR.

C) 取付ける場所が傾斜しているとき　ANTENNA BASE MOUNTING

オプションのアンテナベースを使う。
USE OPTIONAL ANTENNA BASE No. 13-QA330/QA310.

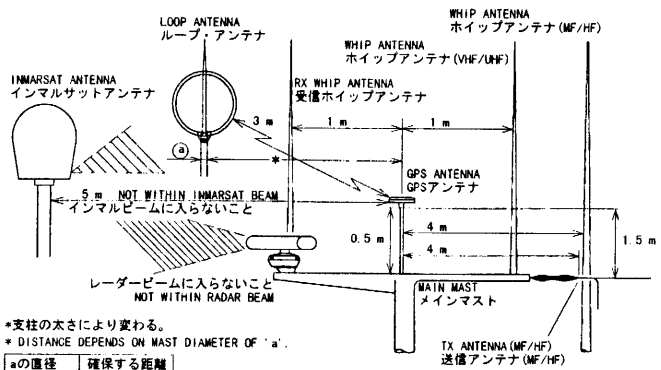
傾斜 INCLINATION	-5° - 33°	32° - 65°	65° - 98°
装備方法 MOUNTING METHOD			
アンテナベース型式 ANTENNA BASE TYPE	直型アンテナベース RIGHT ANGLE ANTENNA BASE No. 13-QA330	L型アンテナベース L-TYPE ANTENNA BASE No. 13-QA310	
コード番号 CODE No.	000-803-239	000-803-240	

アンテナベース基部
MOUNTING DIMENSIONS OF ANTENNA BASE



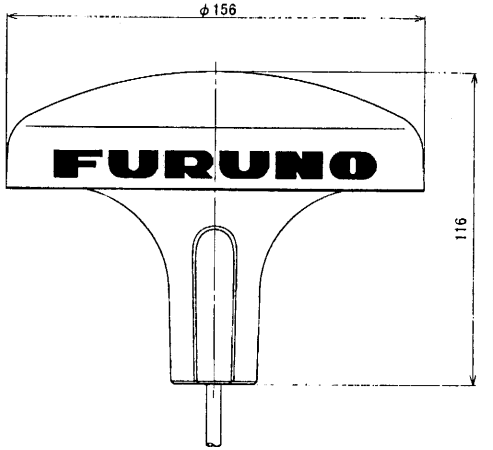
取付場所　MOUNTING LOCATION

THE FIGURE BELOW SHOWS THE RECOMMENDED SEPARATION DISTANCES FROM OTHER ANTENNAS TO AVOID MUTUAL INTERFERENCE.
他の機器のアンテナから下の図の距離以上離す。



*支柱の太さにより変わる。
* DISTANCE DEPENDS ON MAST DIAMETER OF 'a'.

aの直径 DIA. OF 'a'	確保する距離 DISTANCE (MIN.)
10 cm	1.5 m
30 cm	3 m

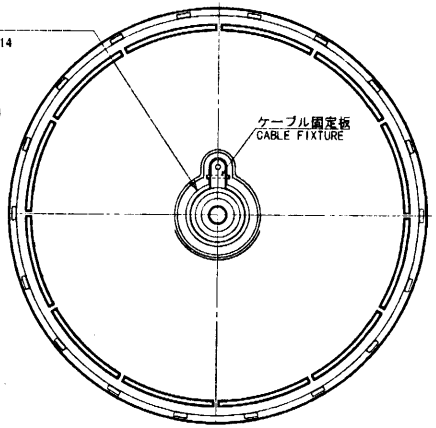


寸法区分(mm) DIMENSION	公差(mm) TOL.
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3

表 1　TABLE 1

1-14UNS1B
ねじ山数(25.4mmにつき)： 14
ピッチ： 1.8143 mm
オネジ有効長さ： 15.17 mm
オネジ有効径： 24.17 mm

THREAD PER 25.4mm (1 INCH): 14
PITCH: 1.8143 mm
THREAD LENGTH 15.17 mm
PITCH DIAMETER: 24.17 mm



注記： 指定外の寸法公差は表1による

NOTE: TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.

型式 TYPE	ケーブル長(m) CABLE LENGTH	プラグ PLUG	質量(kg) MASS
GPA-019	10	TNC-P-3	1.0
GPA-019S	0.2	TNC-J-3	0.54

表 2　TABLE 2

DRAWN	June 17'99 T.YAMADA	TITLE	GPA-019/019S
CHECKED	June 17'99 K.Furuuchi	名称	空中線部
APPROVED	June 17'99 K.Furuuchi		外寸図
SCALE	1/2	MASS	TABLE 2 表2参照
DWG. No.	C4400-G01- D	NAME	ANTENNA UNIT
			OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

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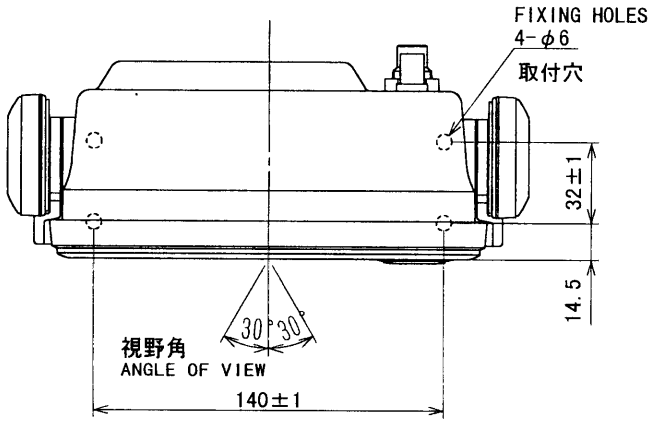
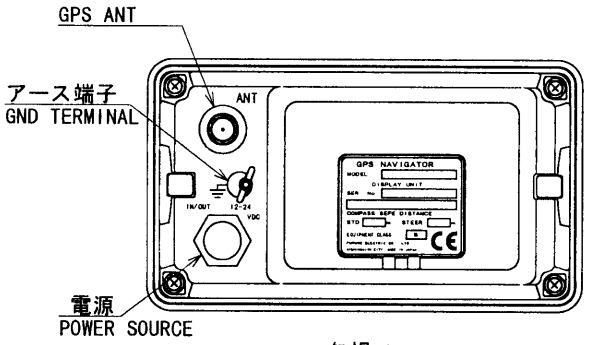
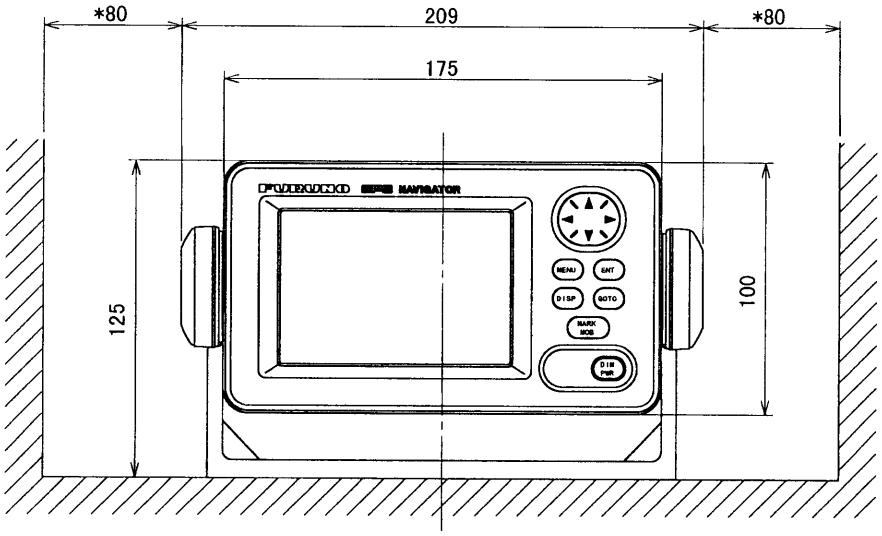


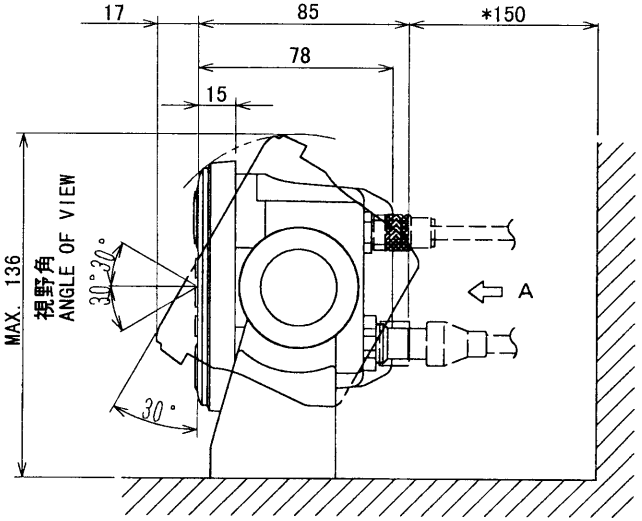


矢視 A
VIEW A

寸法区分(mm) DIMENSION	公差(mm) TOLERANCE
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3

表 1
TABLE 1





型式 TYPE	質量(kg) MASS
GP-31	0.6
GP-36	0.7

表 2
TABLE 2

注記 1）＊印寸法は最小サービス空間寸法とする。

NOTE 1. *: RECOMMENDED SERVICE CLEARANCE.

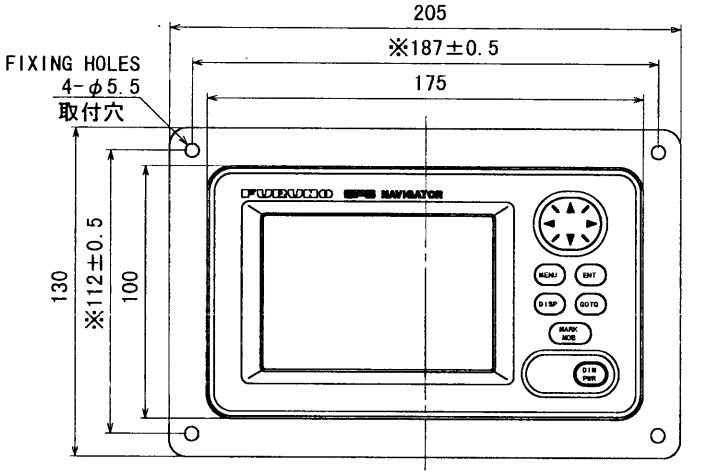
DRAWN Sep 9 '99 T.YAMASAKI		TITLE	GP-31/36
CHECKED Sep 9 '99 K.Furuuchi		名称	受信演算部
APPROVED Sep 9 '99 K.Furuuchi			外寸図
SCALE 1/3	MASS TABLE 2 表2参照	NAME	RECEIVER UNIT
DWG. No. C4384-G01- E	20-016-1000-G2		OUTLINE DRAWING

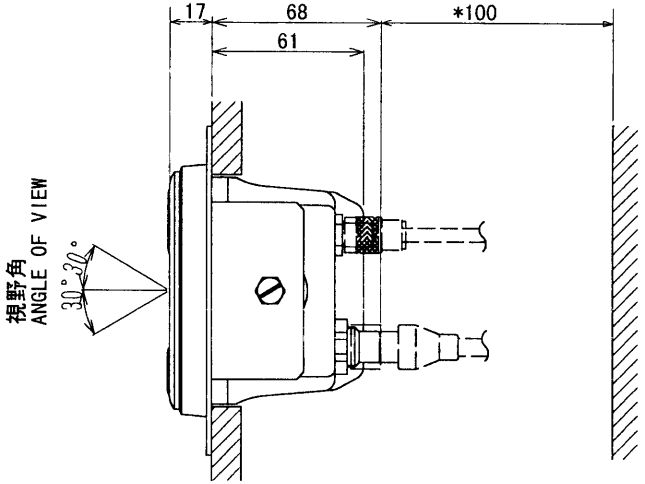
FURUNO ELECTRIC CO., LTD.

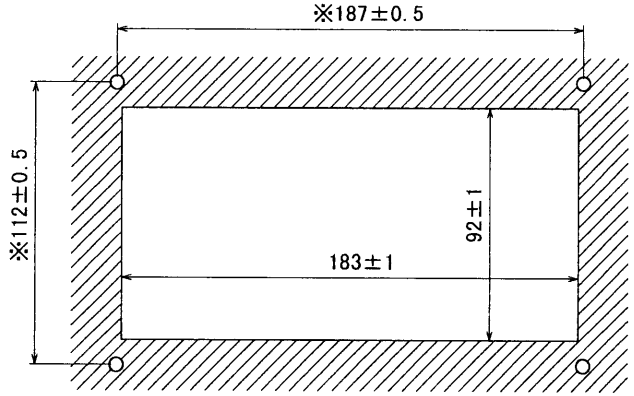
FURUNO

寸法区分(mm) DIMENSION	公差(mm) TOLERANCE
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3

表 1
TABLE 1







取付穴寸法図（参考図）
CUTTING DIMENSIONS

型式 TYPE	質量(kg) MASS
GP-31	0.6
GP-36	0.7

表 2
TABLE 2

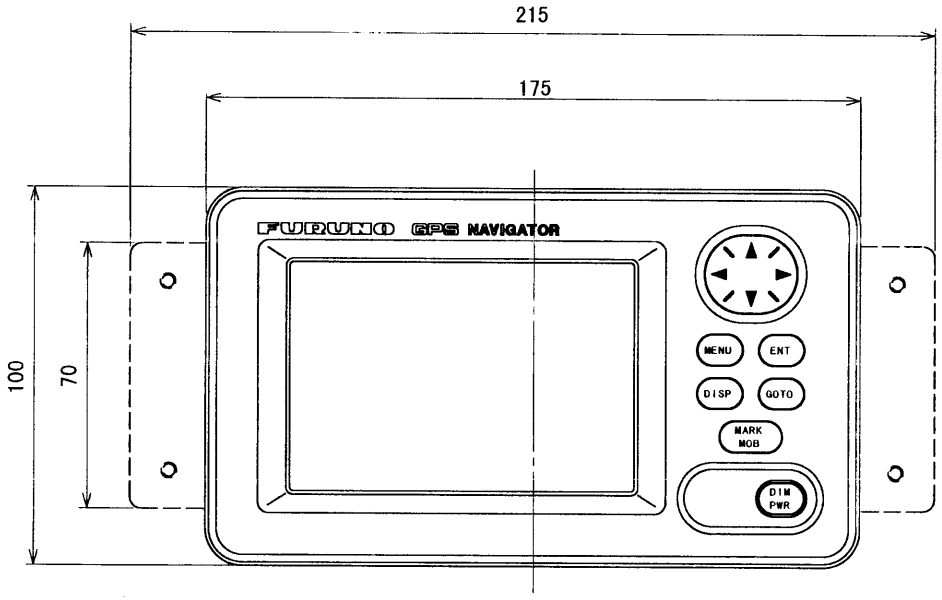
注記
1）※印寸法は取付穴位置寸法とする。
2）取付ネジはタッピンネジ呼び径５×２０を使用。
3）＊印寸法は最小サービス空間寸法とする。

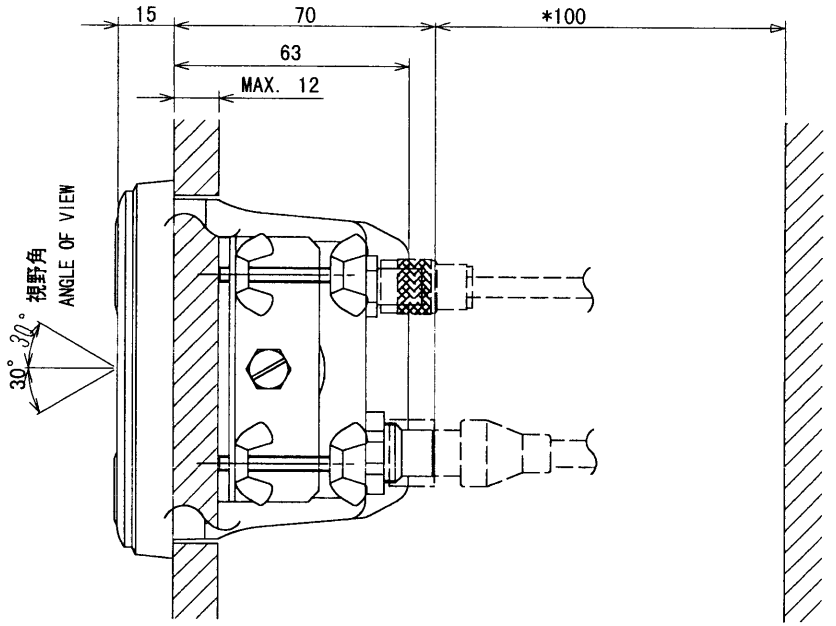
NOTE
1. "※" INDICATES DIMENSION OF FIXING HOLES PITCH.
2. USE φ5x20 TAPPING SCREWS FOR FIXING UNIT.
3. *: RECOMMENDED SERVICE CLEARANCE.

DRAWN Sep 9'99 T.YAMASAKI			TITLE GP-31/36
CHECKED Sep 9'99 K.Furuno			名称 受信演算部 フラッシュマウントF
APPROVED Sep 9'99 K.Furuno			外寸図
SCALE 1/3	MASS TABLE 2 表2参照		NAME RECEIVER UNIT FLUSH MOUNT F
DWG. No. C4384-G02- E		20-016-1050-G1	OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

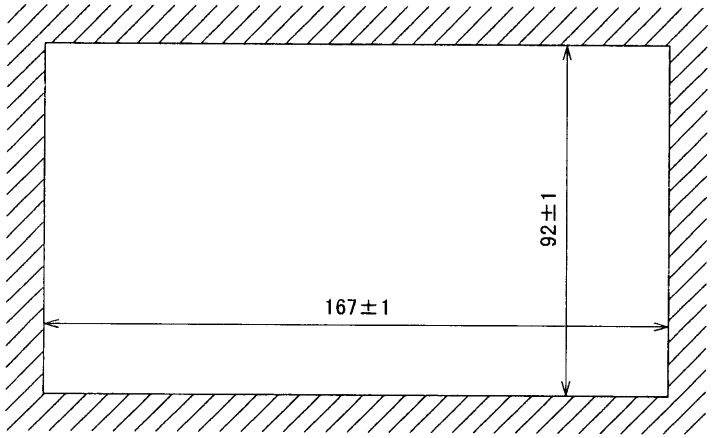
FURUNO





寸法区分(mm) DIMENSION	公差(mm) TOLERANCE
L≦50	±1.5
50<L≦100	±2.5
100<L≦500	±3

表 1
TABLE 1



取付穴寸法図（参考図）
CUTTING DIMENSION

型式 TYPE	質量(kg) MASS
GP-31	0.6
GP-36	0.7

表 2
TABLE 2

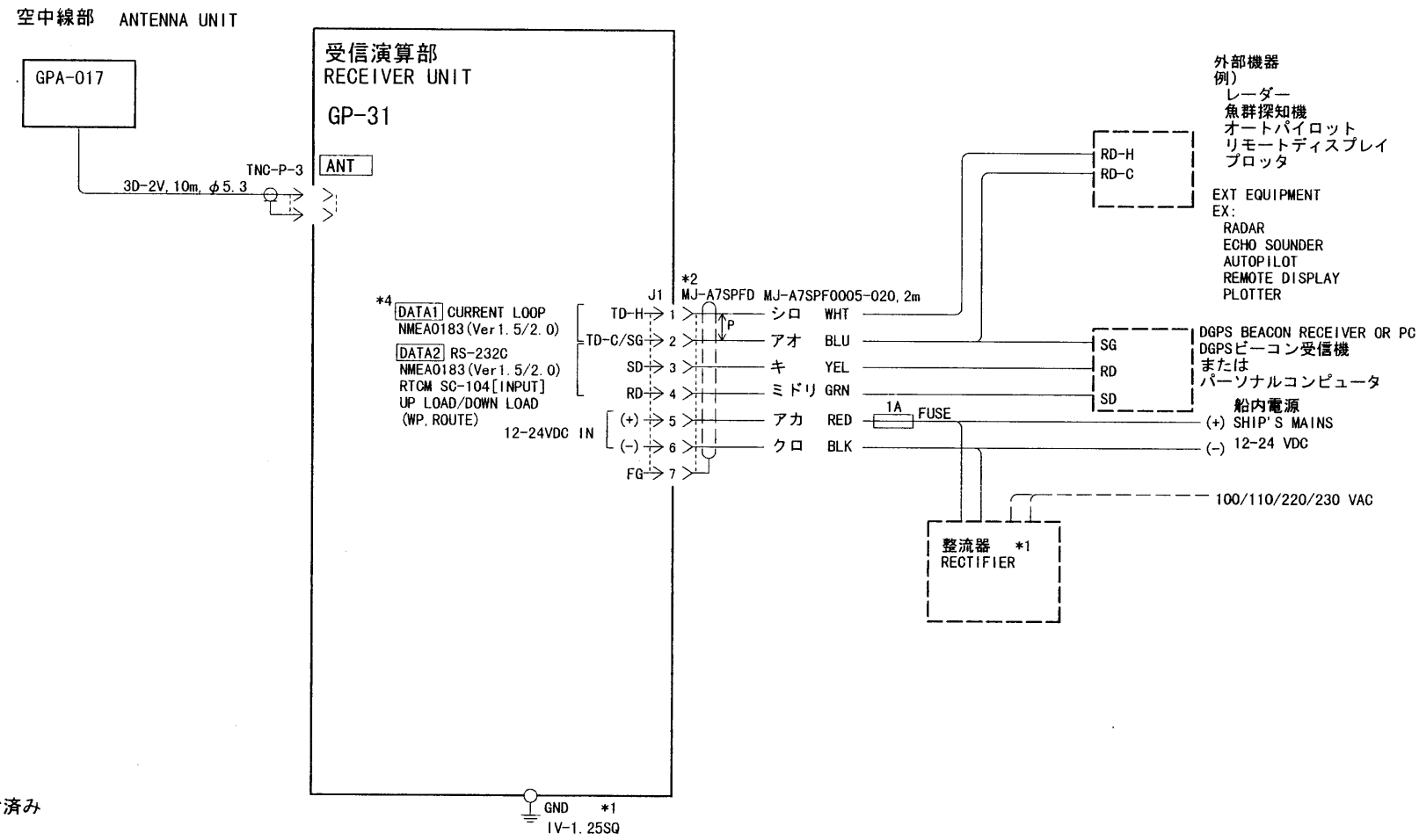
注記　1）＊印寸法は最小サービス空間寸法とする。

NOTE 1. *: RECOMMENDED SERVICE CLEARANCE.

DRAWN Sep 9'99 T.YAMASAKI		TITLE	GP-31/36
CHECKED Sep 9'99 K.Kitsuwoka		名 称	受信演算部　フラッシュマウントS
APPROVED Sep 9'99 K.Kitsuwoka			外寸図
SCALE 1/2 MASS TABLE 2 表2参照		NAME	RECEIVER UNIT FLUSH MOUNT S
DWG. No. C4384-G03- E	20-016-1060-G1		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

FURUNO



注記
＊1）現地手配
＊2）コネクタは工場にて取付済み
＊3）オプション
＊4）メニューにより選択

NOTE
*1. LOCAL SUPPLY.
*2. FITTED AT FACTORY.
*3. OPTION
*4. SELECT ON MENU

DRAWN Nov. 11 '99 T.YAMASAKI		TITLE	GP-31
CHECKED Nov 11 '99 K.Kusunoki		名称	GPS航法装置
APPROVED Nov 11 '99 K.Kusunoki			相互結線図
SCALE / MASS kg		NAME	GPS NAVIGATOR
DWG. No. C4399-C01- F			INTERCONNECTION DIAGRAM

FURUNO ELECTRIC CO., LTD.

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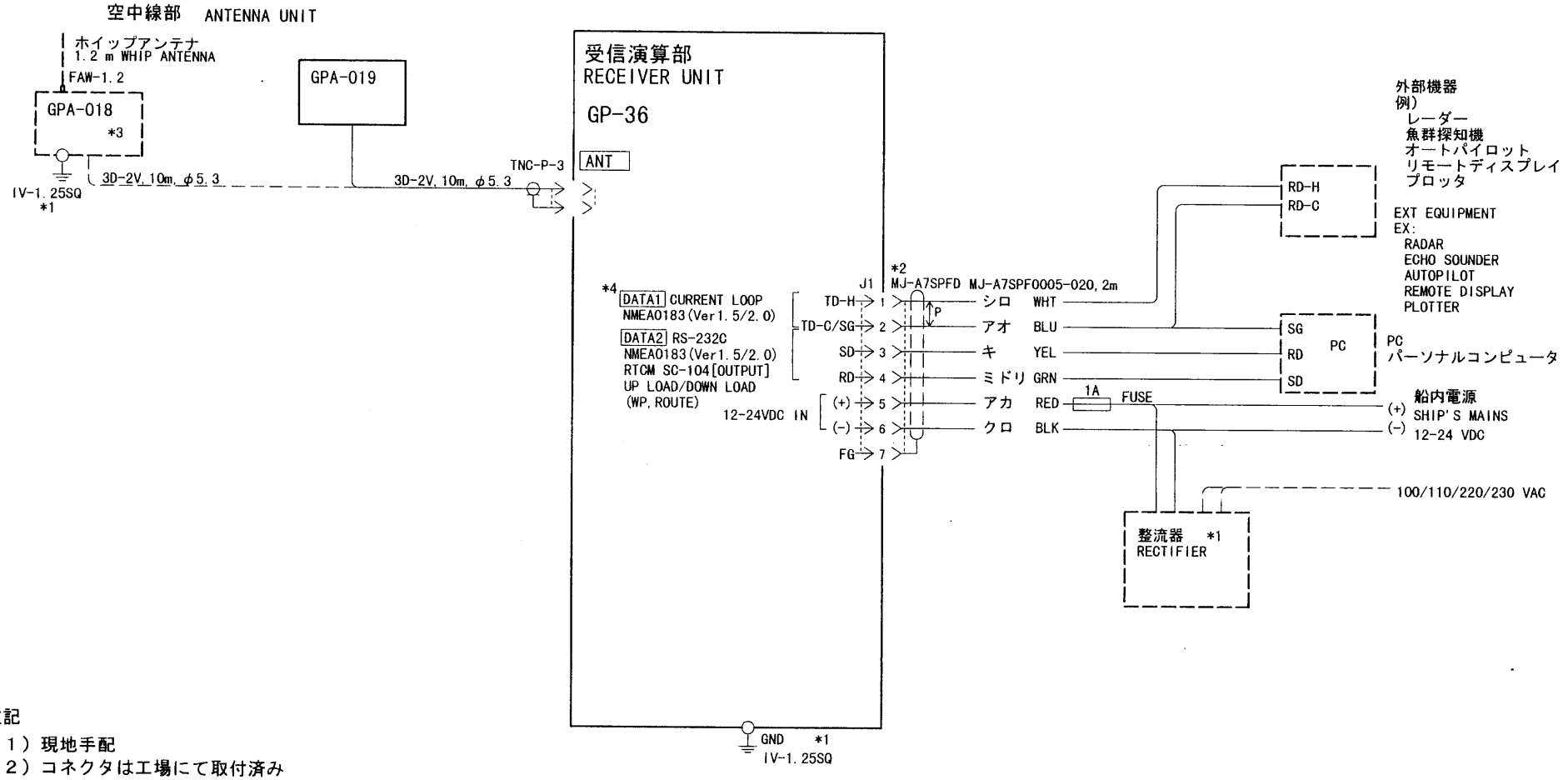
FURUNO



注記
＊1）現地手配
＊2）コネクタは工場にて取付済み
＊3）オプション
＊4）メニューにより選択

NOTE
*1. LOCAL SUPPLY.
*2. FITTED AT FACTORY.
*3. OPTION
*4. SELECT ON MENU.

DRAWN Nov.11'99 T.YAMASAKI		TITLE	GP-36
CHECKED Nov11'99 K.Kusunoki		名称	DGPS航法装置
APPROVED Nov11'99 K.Kusunoki			相互結線図
SCALE / MASS kg		NAME	DGPS NAVIGATOR
DWG. No. C4400-C01- F			INTERCONNECTION DIAGRAM

FURUNO ELECTRIC CO., LTD.

INDEX

FURUNO ELECTRIC CO., LTD.
9-52 Ashihara-Cho, Nishinomiya City, 662-8580, Hyogo, Japan
Tel: +81 798-65-2111 Fax: +81 798-65-4200

Pub NO. DOC-322

Declaration of Conformity CE 0560

We FURUNO ELECTRIC CO., LTD.

(Manufacturer)

9-52 Ashihara-Cho, Nishinomiya City, 662-8580, Hyogo, Japan

(Address)

declare under our sole responsibility that the product

Marine GPS Navigator Model GP-31 consisting of Display unit GP-31 and Antenna unit GPA-017
(Serial No. 3425-0031)

(Model name, serial number)

is in conformity with the essential requirements as described in the Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment (R&TTE Directive) and satisfies all the technical regulations applicable to the product within this Directive

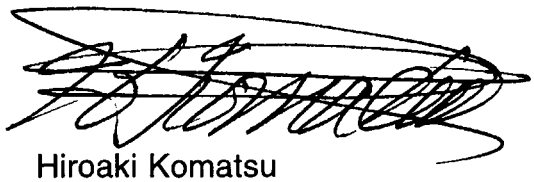
EN 60945: 1997-01 (IEC 60945 Third edition: 1996-11)

(title and/or number and date of issue of the standard(s) or other normative document(s))

For assessment, see

- Statement of Opinion N° 01214005/AA/00 of 11 January 2001 issued by KTL Certification, The Netherlands
- Test report FLI 12-99-004 of 5 March 1999 prepared by Furuno Labotech International Co., Ltd.

On behalf of Furuno Electric Co., Ltd.



Hiroaki Komatsu
Manager,
International Rules and Regulations

Nishinomiya City, Japan
January 25, 2001

(Place and date of issue)

(name and signature or equivalent marking of authorized person)

FURUNO ELECTRIC CO., LTD.
9-52 Ashihara-Cho, Nishinomiya City, 662-8580, Hyogo, Japan
Tel: +81 798-65-2111 Fax: +81 798-65-4200

Pub NO. DOC-323

Declaration of Conformity CE 0560

We FURUNO ELECTRIC CO., LTD.

(Manufacturer)

9-52 Ashihara-Cho, Nishinomiya City, 662-8580, Hyogo, Japan

(Address)

declare under our sole responsibility that the product

Marine DGPS Navigator Model GP-36 consisting of Display unit GP-36 and Antenna unit GPA-018 or GPS-019
(Serial No. 3433-0034)

(Model name, serial number)

is in conformity with the essential requirements as described in the Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment (R&TTE Directive) and satisfies all the technical regulations applicable to the product within this Directive

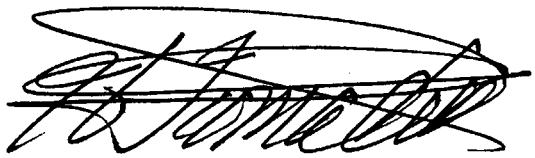
EN 60945: 1997-01 (IEC 60945 Third edition: 1996-11)

(title and/or number and date of issue of the standard(s) or other normative document(s))

For assessment, see

- Statement of Opinion N° 01214006/AA/00 of 11 January 2001 issued by KTL Certification, The Netherlands
- Test report FLI 12-99-005 of 5 March 1999 prepared by Furuno Labotech International Co., Ltd.

On behalf of Furuno Electric Co., Ltd.



Hiroaki Komatsu
Manager,
International Rules and Regulations

Nishinomiya City, Japan
January 25, 2001

(Place and date of issue)

(name and signature or equivalent marking of authorized person)