FURUNO

OPERATOR'S MANUAL

GPS NAVIGATOR

MODEL GP-30/35

Notice on Mounting the Antenna Unit

When mounting the antenna unit, keep in mind the following points:

- Don't cut the antenna cable.
- To pass the antenna cable through a small hole, unfasten the connector shell.

For detailed information, see this manual.

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NISHINOMIYA, JAPAN

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•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.

Immediately turn off the power at the switchboard if water leaks into the equipment or something is dropped in the equipment.

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

Do not disassemble or modify the equipment.

Fire, electrical shock or serious injury can result.

Do not place liquid-filled containers on the top of the equipment.

Fire or electrical shock can result if a liquid spills into the equipment.

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.

Make sure no rain or water splash leaks into the equipment.

Fire or electrical shock can result if water leaks in the equipment.

⚠ WARNING

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.

Fuse rating is shown on the equipment. Use of a wrong fuse can result in equipment damage.

⚠ CAUTION

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

Use of the equipment as a stepping stool, for example, 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.

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.

Do not install the equipment where it may get wet from rain or water splash.

Water in the equipment can result in fire, electrical shock or equipment damage.

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.

⚠ CAUTION

Ground the equipment to prevent mutual interference.

Observe the following compass safe distances:

	Standard	Steering
Display unit	0.9 m	0.7 m

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FOREWORD

A Word to GP-30/35 Owners

Congratulations on your choice of the FURUNO GP-30/35 GPS Navigator. We are confident you will see why the FURUNO name has become synonymous with quality and reliability.

For over 40 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-30/35 GPS Navigator is a totally integrated GPS receiver and video plotter, and consists of a display unit and an antenna unit. The high sensitivity receiver tracks up to eight satellites simultaneously. An 8-state Kalman filter ensures optimum accuracy in determination of vessel position, course and speed.

The main features of the GP-30/35 are

- GP-35 has a built-in DGPS beacon receiver which improves position accuracy.
- A DGPS beacon receiver may be connected to the GP-30.
- Comprehensive navigation data displays
- Storage for 350 waypoints and 30 routes
- Alarms: Arrival, Anchor Watch, Cross Track Error and Ship’s Speed
- Man overboard feature records latitude and longitude or LOP (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
- Power consumption is a low 3 W.
- Provision for connection of autopilot (option) – steering data output to 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 LOP (Loran C or Decca).
- Waypoint and route data can be uploaded from a PC or downloaded to a PC.

1. OPERATIONAL OVERVIEW

1.1 System Configuration

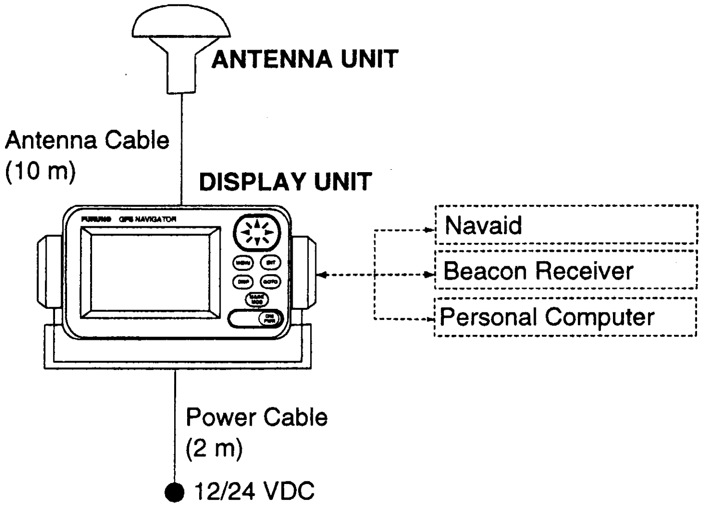
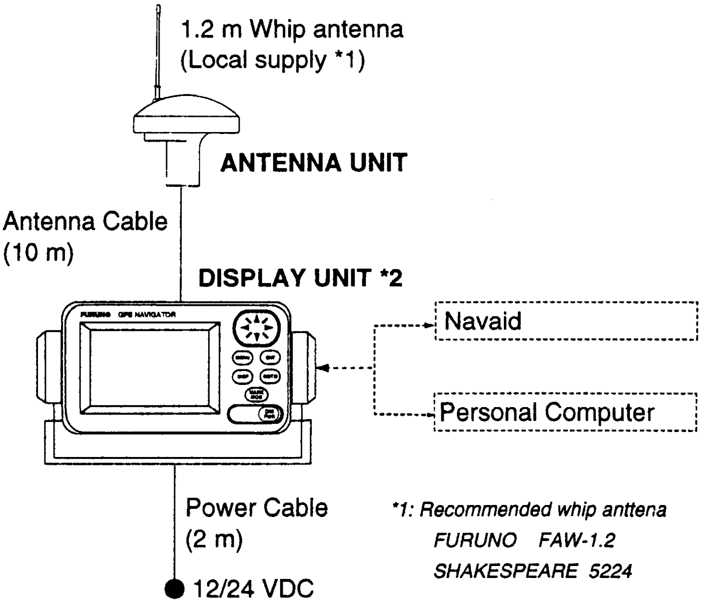

ANTENNA UNIT
Antenna Cable
(10 m)
DISPLAY UNIT
Navaid
Beacon Receiver
Personal Computer
Power Cable
(2 m)
12/24 VDC

Figure 1-1a GP-30 system configuration

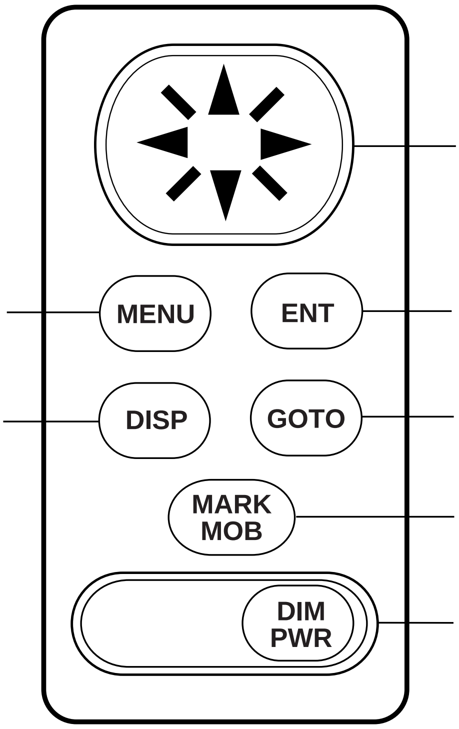

1.2 m Whip antenna
(Local supply *1)
ANTENNA UNIT
Antenna Cable
(10 m)
DISPLAY UNIT *2
Navaid
Personal Computer
Power Cable
(2 m)
12/24 VDC

**1: Recommended whip anttena*
FURUNO FAW-1.2
SHAKESPEARE 5224

**2: Equipped with DGPS beacon receiver.*

Figure 1-1b GP-35 system configuration

1.2 Control Description



Cursor Pad
- Shifts cursor and display.
- Selects items on menus.

One pressing: Zoom, centering.
Two pressings: Opens menu.

Registers items on menus.

Selects display mode.

Sets/cancels destination.

Inscribes mark, MOB mark on the display.

Long press: Turns power on/off.
Touch and release: Opens the display for adjustment of dimmer and contrast.

Figure 1-2 Control panel

1.3 Turning On and Off the Power

Turning on the power

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

The GP-30/35 takes about two minutes to find its position when turned on for the very first time. This is because the default position is San Francisco, USA. If you want to lessen the time needed to find position you may enter your position manually on the SIMULATOR screen of the SYSTEM SETUP MENU, referring to 1.7 Simulator Display on page 1-8. Thereafter it takes about 20 seconds to find position each time the power is turned on.

If position could not be found, “GPS NO FIX” appears at the center of the display.

When the satellite signal is being received normally, the GP-30/35 displays various abbreviations at the top left-hand corner of the display which show receiver status. Table 1-1 shows these abbreviations and their meanings.

Table 1-1 Display abbreviations

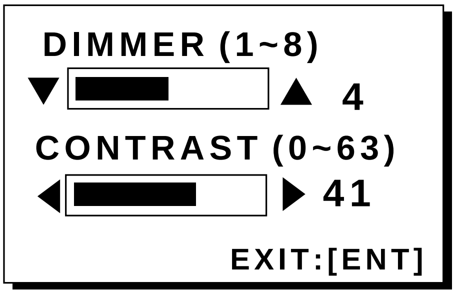
Indication	Meaning
2D	Normal 2D GPS position fix
DOP	GPS position fix with DOP more than 4
3D	Normal 3D GPS position fix
DOP	DOP (DOP more than 6)
D2D	Normal differential GPS position fix
DOP	Differential GPS position fixwith DOP more than 4
D3D	Normal 3D differential GPS position fix
DOP	Differential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

Turning off the power

Press and hold down the [DIM/PWR] key until the screen goes blank.

1.4 Adjusting Display Dimmer and Contrast

1. Press the [DIM/PWR] key. The display shown in Figure 1-3 appears.



DIMMER (1~8)
▼ ▲ 4
CONTRAST (0~63)
◀ ▶ 41
EXIT:[ENT]

Figure 1-3 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.

1.5 Display Modes

The GP-30/35 has four display modes: Plotter Display, Highway Display, Steering Display, and Nav Data Display. Press the [DISP] key to select a display mode. Each time the key is pressed, the display mode changes in the sequence shown below.

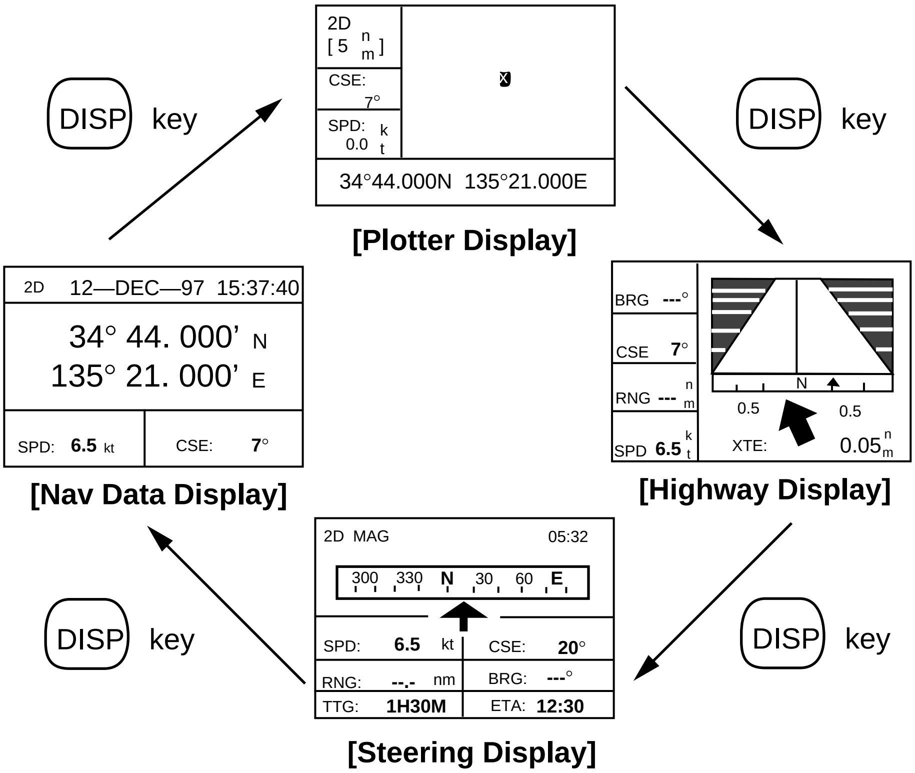

2D
[5 nm]
CSE: 7°
SPD: 0.0 kt
34°44.000N 135°21.000E
[Plotter Display]
DISP key
DISP key
DISP key
DISP key
BRG ---°
CSE 7°
RNG --- nm
SPD 6.5 kt
N
0.5
0.5
XTE: 0.05nm
[Highway Display]
2D MAG 05:32
300 330 N 30 60 E
SPD: 6.5 kt
CSE: 20°
RNG: --.- nm
BRG: ---°
TTG: 1H30M
ETA: 12:30
[Steering Display]
2D 12—DEC—97 15:37:40
34° 44. 000' N
135° 21. 000' E
SPD: 6.5 kt
CSE: 7°
[Nav Data Display]

Figure 1-4 Display modes

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

Plotter Display

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

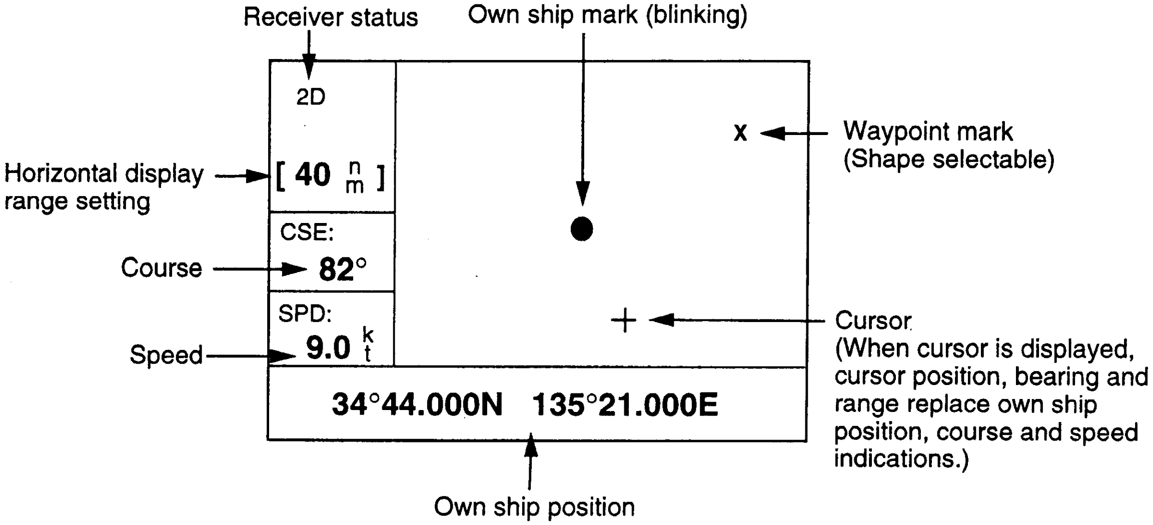

Receiver status
Own ship mark (blinking)
2D
X
Waypoint mark
(Shape selectable)
Horizontal display range setting
[40 nm]
CSE:
Course
82°
SPD:
Speed
9.0 kt
+
Cursor
(When cursor is displayed, cursor position, bearing and range replace own ship position, course and speed indications.)
34°44.000N 135°21.000E
Own ship position

Figure 1-5 Plotter display

Highway Display

The highway display provides a 3-D view of own ship's progress toward a waypoint and displays navigation data.

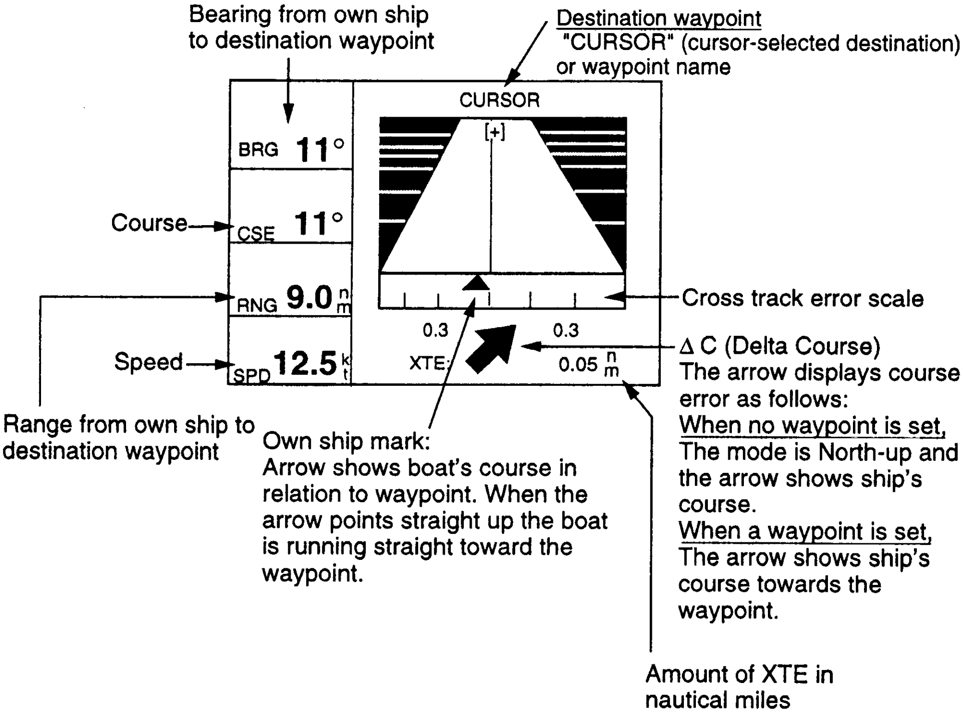

Bearing from own ship to destination waypoint
Destination waypoint
"CURSOR" (cursor-selected destination) or waypoint name
CURSOR
[+]
BRG 11°
Course
CSE 11°
RNG 9.0 nm
Speed
SPD 12.5 kt
Cross track error scale
0.3
0.3
XTE
0.05 nm
Δ C (Delta Course)
The arrow displays course error as follows:
When no waypoint is set,
The mode is North-up and the arrow shows ship's course.
When a waypoint is set,
The arrow shows ship's course towards the waypoint.
Range from own ship to destination waypoint
Own ship mark:
Arrow shows boat's course in relation to waypoint. When the arrow points straight up the boat is running straight toward the waypoint.
Amount of XTE in nautical miles

Figure 1-6 Highway display

Steering Display

The steering display provides steering information such as range, bearing and ETA to destination, course, and speed.

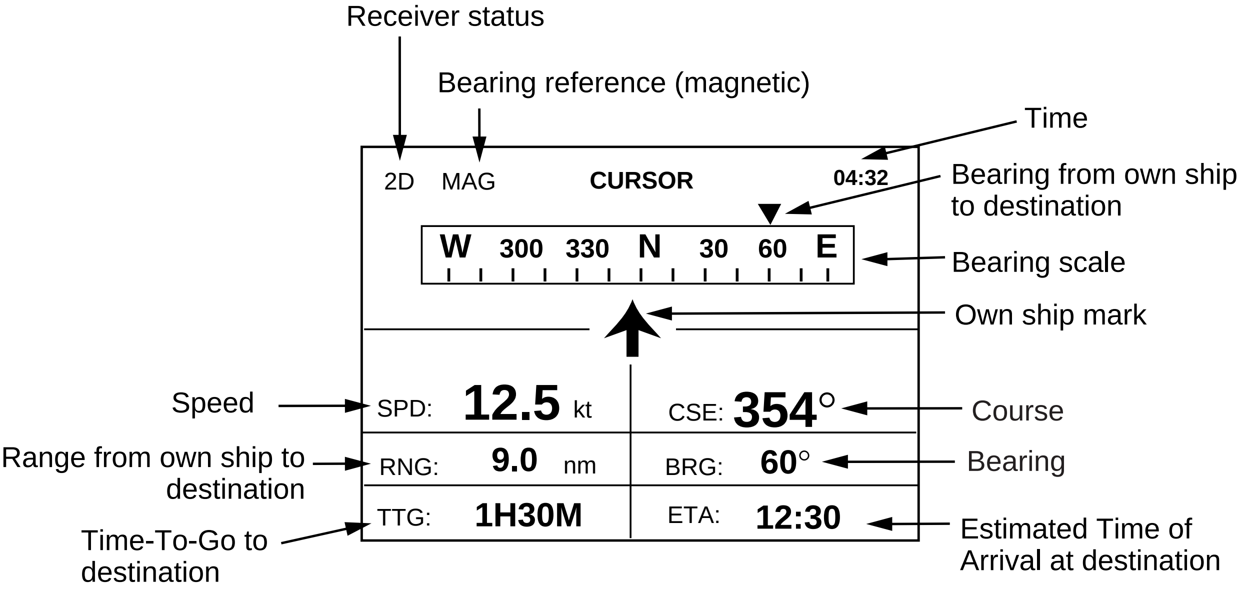

Receiver status
Bearing reference (magnetic)
Time
Bearing from own ship to destination
Bearing scale
Own ship mark
Speed
Range from own ship to destination
Time-To-Go to destination
Course
Bearing
Estimated Time of Arrival at destination
2D
MAG
CURSOR
04:32
W
300
330
N
30
60
E
SPD: 12.5 kt
CSE: 354°
RNG: 9.0 nm
BRG: 60°
TTG: 1H30M
ETA: 12:30

Figure 1-7 Steering display

Nav Data Display

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

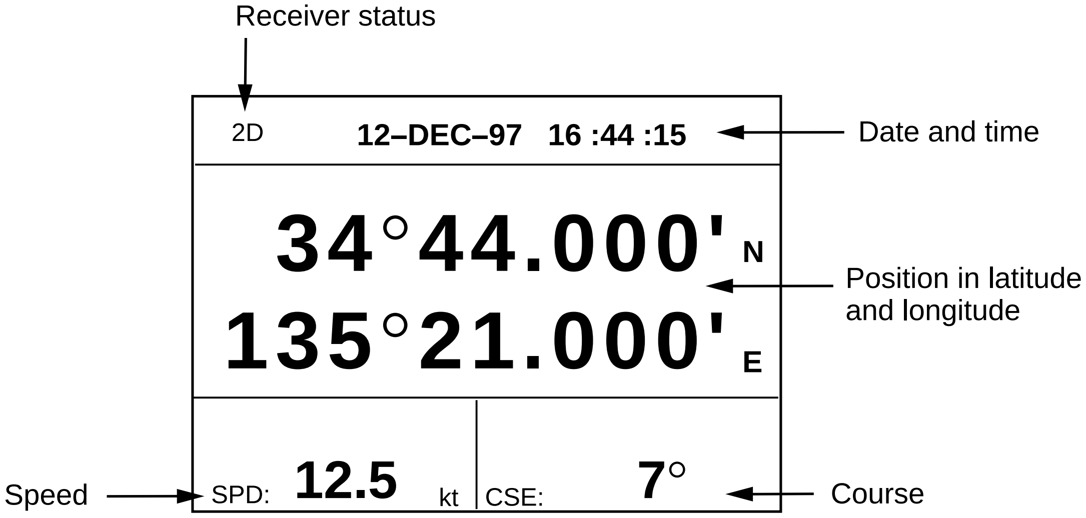

Receiver status
Date and time
Position in latitude and longitude
Speed
Course
2D
12–DEC–97 16 :44 :15
34°44.000' N
135°21.000' E
SPD: 12.5 kt
CSE: 7°

Figure 1-8 Nav data display

1.6 Basic Menu Operation

Most operations of the GP-30/35 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 on page A-12.

1. Press the [MENU] key twice to display the MAIN MENU.

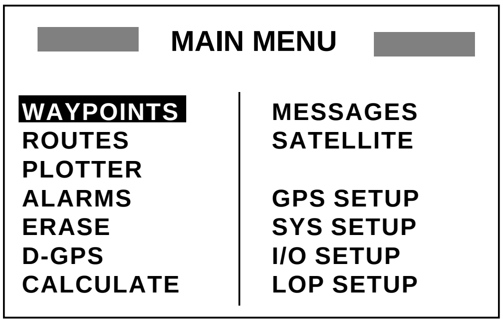
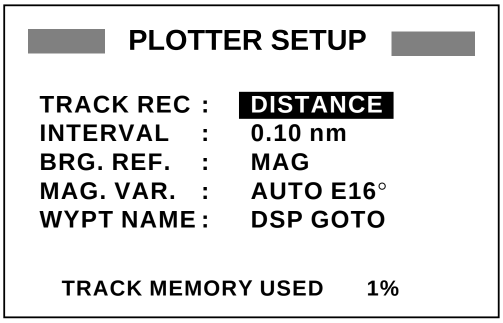


Figure 1-9 MAIN MENU

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



PLOTTER SETUP

TRACK REC : DISTANCE
INTERVAL : 0.10 nm
BRG. REF. : MAG
MAG. VAR. : AUTO E16°
WYPT NAME : DSP GOTO

TRACK MEMORY USED 1%

Figure 1-10 PLOTTER SETUP menu

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

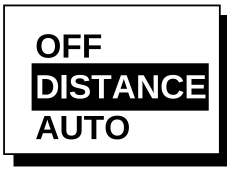


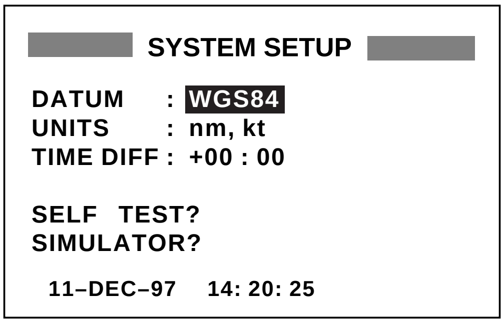
Figure 1-11 Options of TRACK REC

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

How to enter numeric, character data

In some instances it is necessary to enter numeric 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 twice to display the MAIN MENU.
2. Select SYS SETUP and press the [ENT] key.



SYSTEM SETUP

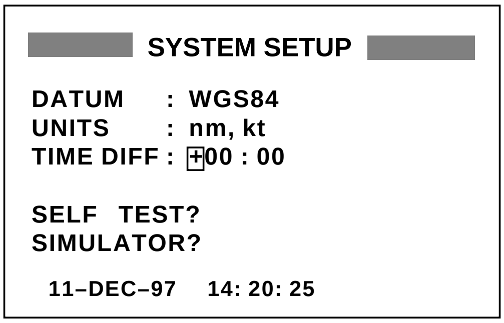
DATUM : WGS84
UNITS : nm, kt
TIME DIFF : +00 : 00

SELF TEST?
SIMULATOR?

11–DEC–97 14: 20: 25

Figure 1-12 SYSTEM SETUP menu

3. Press ▼ to select the TIME DIFF line.
4. Press the [ENT] key. A cursor circumscribes "+". The cursor selects the data to change.



SYSTEM SETUP

DATUM : WGS84
UNITS : nm, kt
TIME DIFF : +00 : 00

SELF TEST?
SIMULATOR?

11–DEC–97 14: 20: 25

Figure 1-13 SYSTEM SETUP menu, TIME DIFF line selected

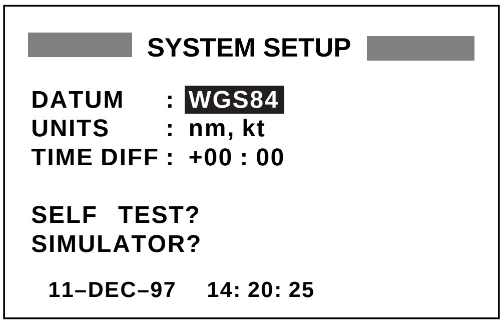
5. Press ▲ to display "–".
6. Press ▶ to send the cursor to the next digit.
7. Press ▲ or ▼ to display 0.
8. Press ▶ to send the cursor to the next digit.

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.

1.7 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 MAIN MENU.
2. Select SYS SETUP and press the [ENT] key.



SYSTEM SETUP

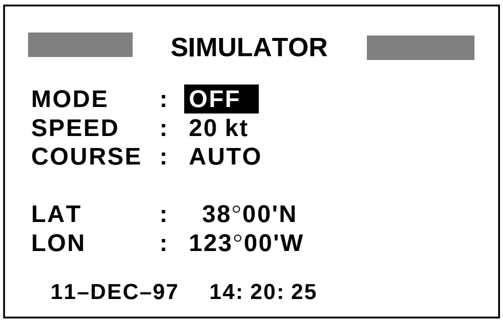
DATUM : WGS84
UNITS : nm, kt
TIME DIFF : +00 : 00

SELF TEST?
SIMULATOR?

11–DEC–97 14: 20: 25

Figure 1-14 SYSTEM SETUP menu

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



SIMULATOR

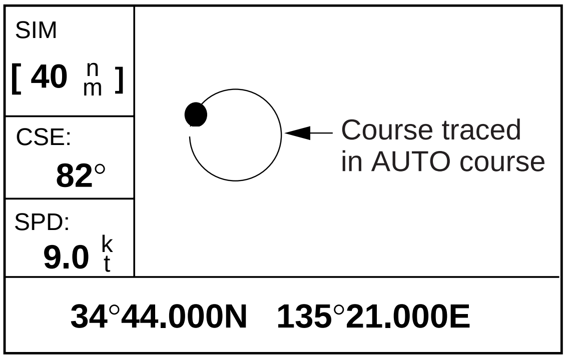
MODE : OFF
SPEED : 20 kt
COURSE : AUTO

LAT : 38°00'N
LON : 123°00'W

11–DEC–97 14: 20: 25

Figure 1-15 SIMULATOR menu

4. Press the [ENT] key.
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.



SIM
[40 nm]
CSE: 82°
SPD: 9.0 kt
34°44.000N 135°21.000E

Course traced in AUTO course

Figure 1-16 Simulator display, auto course selected

13. To turn off the simulator display, select OFF on the MODE line of the SIMULATOR menu, press the [ENT] key, and press the [MENU] key twice to finish.

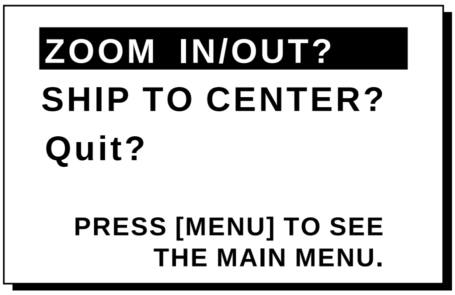
Note: If the power is reset while the simulator display is in use, the indication SIMULATION MODE appears in addition to the indication SIM.

2. PLOTTER DISPLAY OVERVIEW

2.1 Enlarging/Shrinking the Display

You may enlarge and shrink the display on the Plotter and Highway displays. The horizontal range in the Plotter display is available among 0.2, 0.5, 1, 2, 5, 10, 20, 40, 80, 160 and 320 nautical miles. The horizontal range in the Highway display is available among 0.2, 0.4, 0.8, 1, 2, 4, 8, 16 nautical miles.

1. Press the [MENU] key. ZOOM IN/OUT? appears in reverse video.



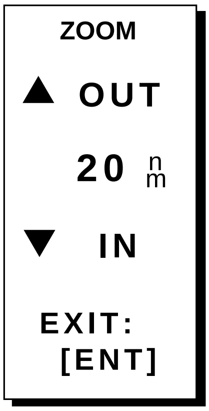
ZOOM IN/OUT?
SHIP TO CENTER?
Quit?

PRESS [MENU] TO SEE
THE MAIN MENU.

Figure 2-1 Zoom, ship centering window

Note: The prompt SHIP TO CENTER? does not appear in the Highway display mode.

2. Press the [ENT] key. The window changes as below.



ZOOM
▲ OUT
20 nm
▼ IN
EXIT:
[ENT]

Figure 2-2 Zoom window

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

2.2 Shifting the Cursor

Operate 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 LOPs (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.

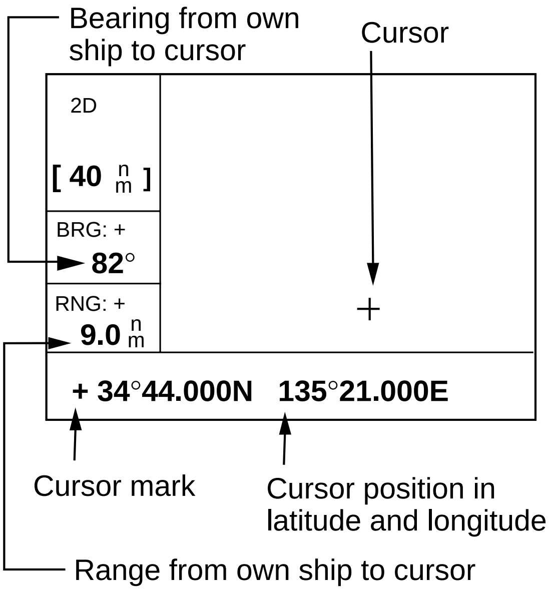

Bearing from own ship to cursor
Cursor
2D
[40 nm]
BRG: +
82°
RNG: +
9.0 nm
+
+ 34°44.000N 135°21.000E
Cursor mark
Cursor position in latitude and longitude
Range from own ship to cursor

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 five seconds. Ship's position, speed and course appear at the left side of the Plotter display when the cursor is off.

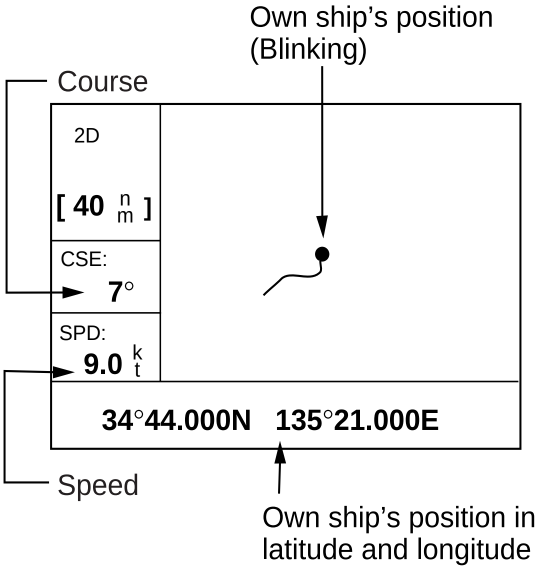

Own ship's position (Blinking)
Course
2D
[40 nm]
CSE:
7°
SPD:
9.0 kt
34°44.000N 135°21.000E
Speed
Own ship's position in latitude and longitude

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.

When own ship tracks off the display it is automatically returned to the screen center.

2.4 Centering Own Ship's Position

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

In drawing track, first the ship's position (fed from the GPS receiver) is stored into the memory at an interval of distance or automatic recording. 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 twice.

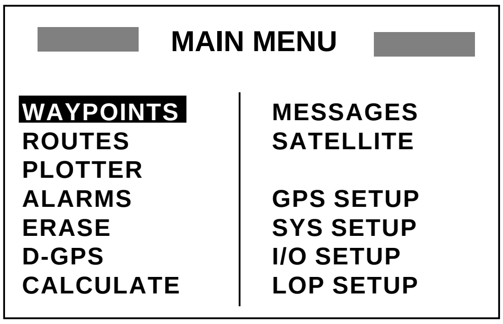
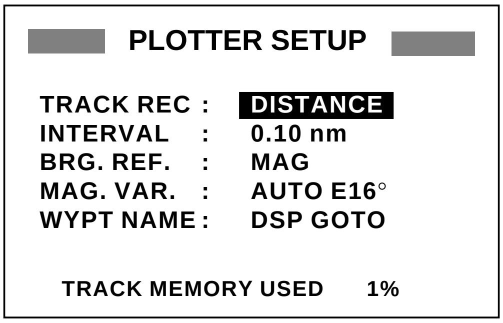

MAIN MENU
WAYPOINTS
ROUTES
PLOTTER
ALARMS
ERASE
D-GPS
CALCULATE
MESSAGES
SATELLITE
GPS SETUP
SYS SETUP
I/O SETUP
LOP SETUP

Figure 2-5 MAIN MENU

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



PLOTTER SETUP

TRACK REC : DISTANCE
INTERVAL : 0.10 nm
BRG. REF. : MAG
MAG. VAR. : AUTO E16°
WYPT NAME : DSP GOTO

TRACK MEMORY USED 1%

Figure 2-6 Plotter setup menu

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

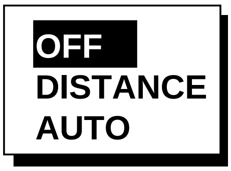


Figure 2-7 Track recording method selection window

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. Be absolutely sure you want to erase all track.

1. Press the [MENU] key twice.
2. Select ERASE and press the [ENT] key. The ERASE menu appears.

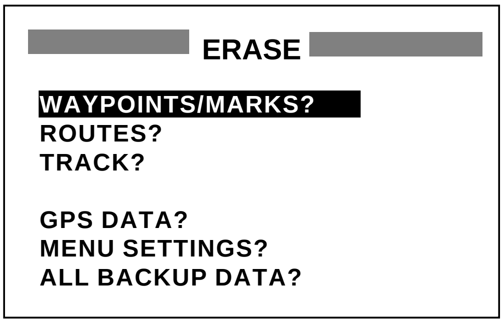
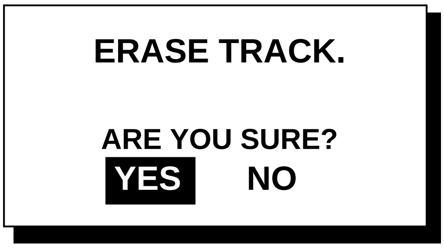


Figure 2-8 ERASE menu

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


ERASE TRACK.

ARE YOU SURE?

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.

3. WAYPOINTS (MARKS)

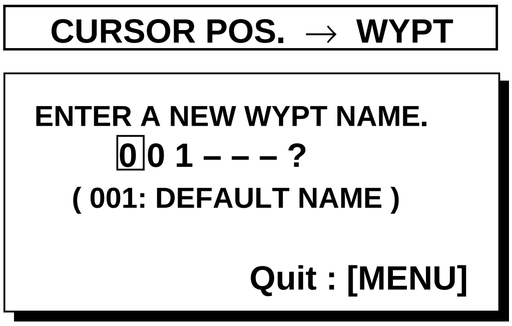
3.1 Entering Waypoints

In navigation terminology a waypoint is a particular location on a voyage whether it be a starting, intermediate or destination waypoint. The GP-30/35 can store 350 waypoints. Waypoints can be entered on the Plotter display four ways:

- By cursor
- At own ship's position
- Through the menu (L/L or LOP)
- By MOB position

Entering a waypoint by the cursor

1. On the Plotter display, operate 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.



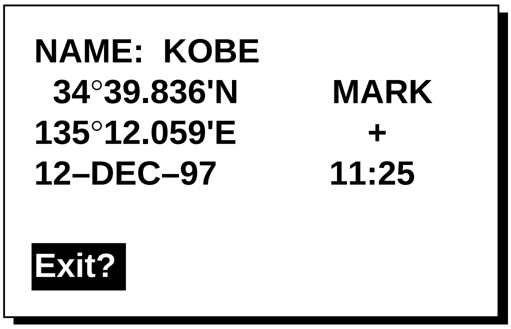
CURSOR POS. → WYPT

ENTER A NEW WYPT NAME.
0 0 1 – – – ?
(001: DEFAULT NAME)

Quit : [MENU]

Figure 3-1 Waypoint entry window-1

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. (If you would rather have the unit automatically number your waypoints, and you do not need to change mark shape or enter a comment, press the [ENT] key twice to 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.



NAME: KOBE
34°39.836'N MARK
135°12.059'E +
12–DEC–97 11:25

Exit?

Figure 3-2 Waypoint entry window-2

4. This window is where you can select mark shape and enter a comment. (If you do not need to change mark shape or enter a comment, select Exit? and press the [ENT] key to finish.)
   a) Operate the Cursor Pad to place the cursor under MARK.
   b) Press the [ENT] key.
   c) Select mark desired with ▲ or ▼.

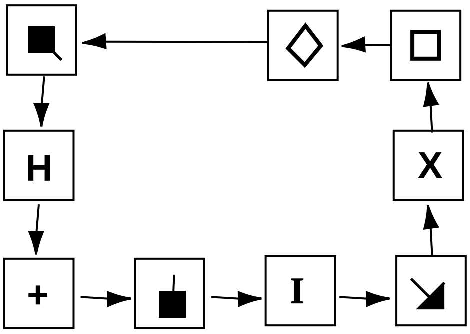


Figure 3-3 Mark sequence

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

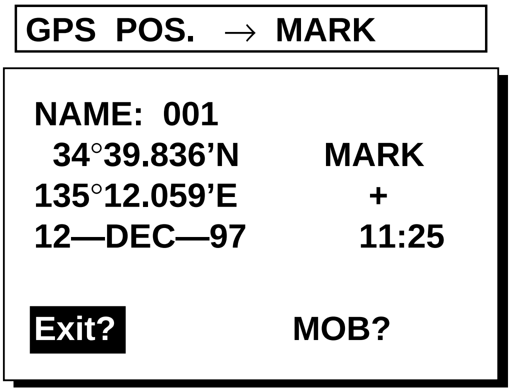
f) Enter a comment (max. sixteen characters) with the Cursor Pad and press the [ENT] key. To create a space select "blank" character. To remove all characters which follow the cursor, select the underline.

g) Press the [ENT] key.

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

Entering a waypoint at own ship's position

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



```
GPS  POS.  →  MARK

NAME:  001
  34°39.836'N        MARK
135°12.059'E           +
12—DEC—97             11:25

Exit?              MOB?
```

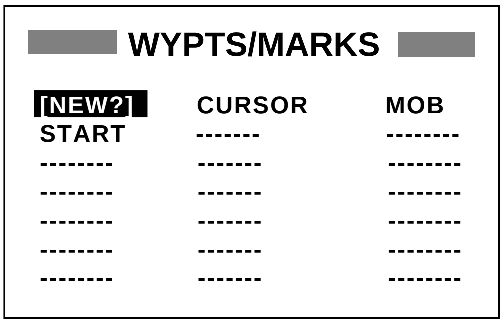
Figure 3-4 Own ship's position window

2. If you do not need to change mark shape or enter a comment, press the [ENT] key to finish.
3. If you want to change mark shape, place the cursor under MARK. Press the [ENT] key, select mark shape, and press the [ENT] key again.
4. The cursor is on the date/time line. To change the date to a comment, press the [ENT] key, enter a comment, and press the [ENT] key again.
5. The cursor is on Exit?. Press the [ENT] key to finish.

Note: The name of a waypoint entered at own ship's position cannot be changed when entered. However, it can be changed on the WYPTS/MARKS menu.

Entering a waypoint through the menu

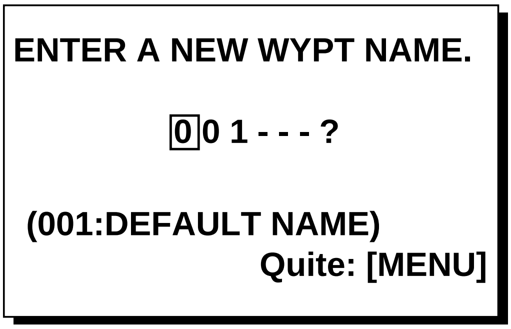
1. Press the [MENU] key twice.
2. Select WAYPOINTS.
3. Press the [ENT] key. The WYPTS/MARKS menu appears.



```
WYPTS/MARKS

[NEW?]      CURSOR      MOB
START       -------     --------
--------    -------     --------
--------    -------     --------
--------    -------     --------
--------    -------     --------
--------    -------     --------
```

Figure 3-5 WYPTS/MARKS menu

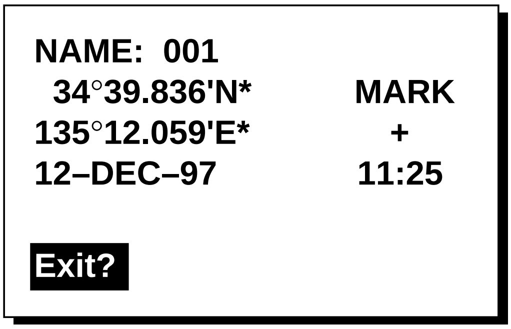
4. Press the [ENT] key.



```
ENTER A NEW WYPT NAME.

        00 1 - - - ?

 (001:DEFAULT NAME)
               Quite: [MENU]
```

Figure 3-6 Screen for entering waypoint name

5. Enter name (if desired) and press the [ENT] key.



```
NAME:  001
  34°39.836'N*       MARK
135°12.059'E*          +
12–DEC–97            11:25

Exit?
```

* Present position

Figure 3-7 Screen for entering waypoint latitude and longitude

6. Operate the Cursor Pad to place the cursor on the second line (latitude) and press the [ENT] key. Enter latitude (LOP) and press the [ENT] key.

7. Press the [ENT] key, enter longitude (LOP) in similar fashion and press the [ENT] key.

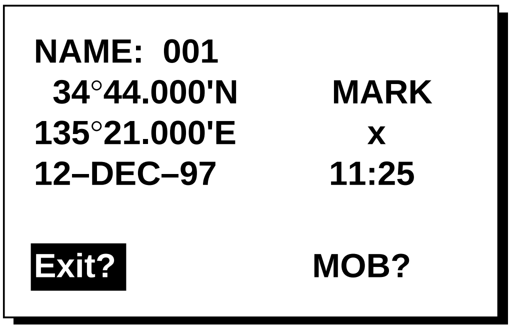
   Note: To enter position by LOPs, see "7.8 Displaying Position in LOPs."

8. To change mark shape, press the [ENT] key, select mark desired and press the [ENT] key.
9. To change date and time to the comment of your choice, press the [ENT] key, enter comment, and press the [ENT] key again.
10. The cursor is on Exit?. Press the [ENT] key.
11. 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.



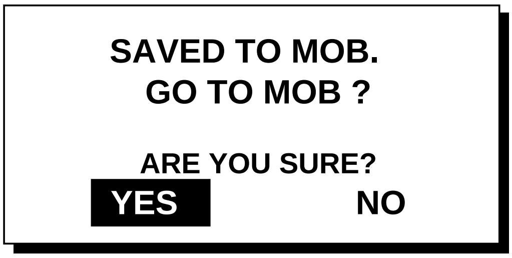
NAME: 001
34°44.000'N MARK
135°21.000'E x
12–DEC–97 11:25

Figure 3-8 MOB window

2. Press ▶ to select MOB?.

   Note: Pressing the [ENT] key instead of ▶ at step 2 saves the position as a waypoint.

3. Press the [ENT] key.



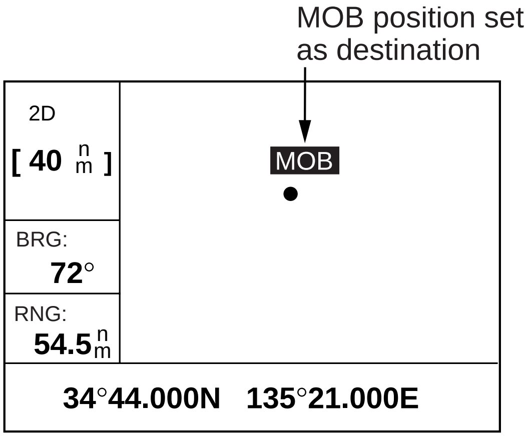
SAVED TO MOB.
GO TO MOB ?

ARE YOU SURE?

Figure 3-9 MOB window-2

4. To set MOB position as destination, press the [ENT] key. Then, the Plotter display marks MOB position.

   Note: Selecting "NO" at step 4 saves the position as a waypoint.



2D
[40 nm]
BRG: 72°
RNG: 54.5 nm
34°44.000N 135°21.000E

Figure 3-10 MOB set as destination

3.3 Displaying Waypoint Name

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

1. Press the [MENU] key twice.
2. Select PLOTTER and press the [ENT] key.
3. Place the cursor on the WYPT NAME line and press the [ENT] key. The following window appears.

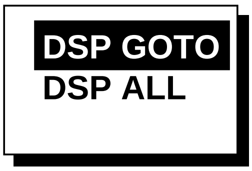


Figure 3-11 DSP GOTO, DSP ALL selection window

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

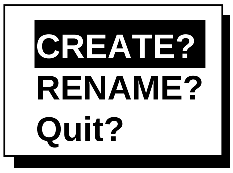
3.4 Editing Waypoints on the WYPTS/MARKS List

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

1. Press the [MENU] key twice.
2. Select WAYPOINTS and press the [ENT] key.
3. Select waypoint to edit and press the [ENT] key.

   Note: You cannot edit CURSOR, MOB or START.

4. To change waypoint name or create a new waypoint from an existing one, first select the NAME line and press the [ENT] key.
5. 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.



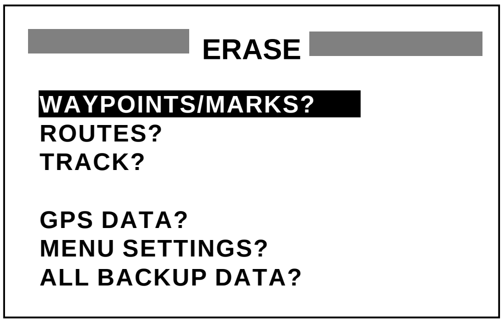
```
CREATE?
RENAME?
Quit?
```

Figure 3-12 CREATE, RENAME prompt

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

3.5 Deleting Waypoints

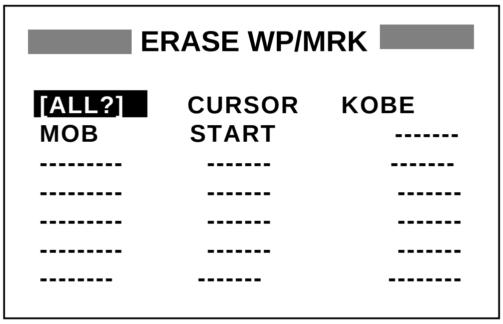
1. Press the [MENU] key twice.
2. Select ERASE and press the [ENT] key.



```
ERASE
WAYPOINTS/MARKS?
ROUTES?
TRACK?

GPS DATA?
MENU SETTINGS?
ALL BACKUP DATA?
```

Figure 3-13 ERASE menu

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



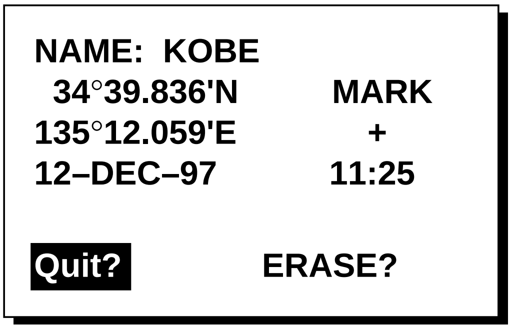
```
ERASE WP/MRK

[ALL?]     CURSOR     KOBE
MOB        START      -------
---------  -------    -------
---------  -------    -------
---------  -------    -------
---------  -------    -------
--------   -------    --------
```

Figure 3-14 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.



```
NAME:  KOBE
 34°39.836'N        MARK
135°12.059'E          +
12–DEC–97          11:25

Quit?            ERASE?
```

Figure 3-15 ERASE prompt

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

4. ROUTES

In many cases a trip from one place to another involves several course changes, requiring a series of route points (waypoints) which you navigate to, one after another. The sequence of waypoints leading to the ultimate destination is called a **route.** The GP-30/35 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 30 routes and each route may contain up to 30 waypoints. The unit numbers routes from 01 to 30. The easiest way to create a route is to enter appropriate waypoints beforehand and select them from the waypoint list. However, you may also enter waypoints while creating a route.

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

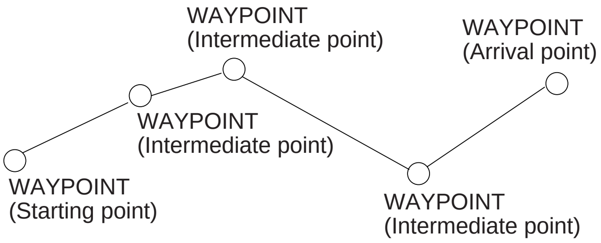
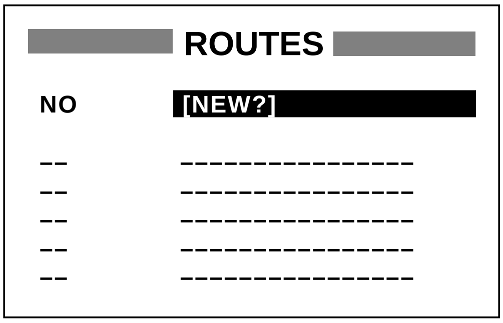


Figure 4-1 Sample route

Registering a route

The procedure which follows describes how to create a route from two waypoints in Japan, KOBE and OSAKA.

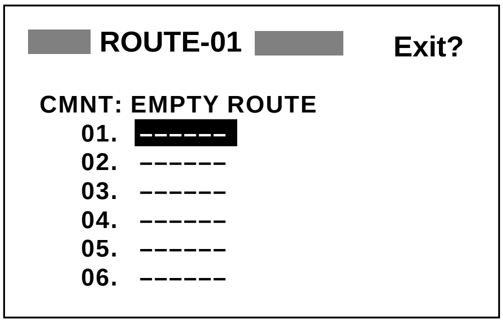
1. Press the [MENU] key twice.
2. Select ROUTES.
3. Press the [ENT] key. The screen shown in Figure 4-2 appears.



```
ROUTES
NO        [NEW?]
--        ----------------
--        ----------------
--        ----------------
--        ----------------
--        ----------------
```

Figure 4-2 Routes menu

4. Press the [ENT] key. The screen shown in Figure 4-3 appears.



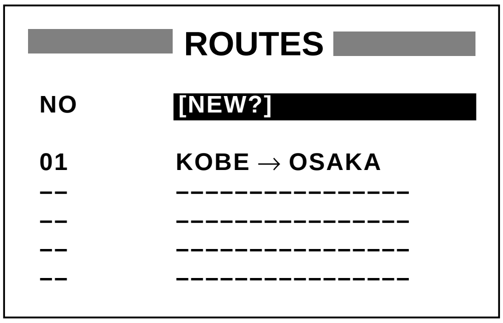
```
ROUTE-01            Exit?
CMNT: EMPTY ROUTE
   01.  ------
   02.  ------
   03.  ------
   04.  ------
   05.  ------
   06.  ------
```

Figure 4-3 Screen for entering route

5. Press the [ENT] key.
6. Press ▲ or ▼ to display starting waypoint. (In the example, KOBE.)
7. Press the [ENT] key twice. The cursor moves to the head of next line.
8. Repeat steps 6 and 7 until you have entered all intermediate waypoints desired.
9. Finally, select arrival point. (In the example, OSAKA.)

10. Select Exit?.
11. Press the [ENT] key to register the route.

    Then, the display shows the names of starting and arrival waypoints next to route number.



```
ROUTES

NO      [NEW?]

01      KOBE → OSAKA
--      ----------------
--      ----------------
--      ----------------
--      ----------------
```

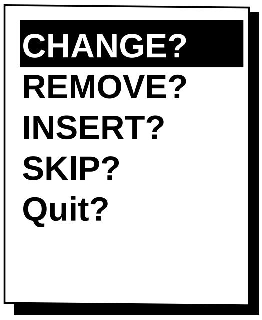
Figure 4-4 ROUTES list

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

4.2 Editing a Route

Replacing a waypoint in a route

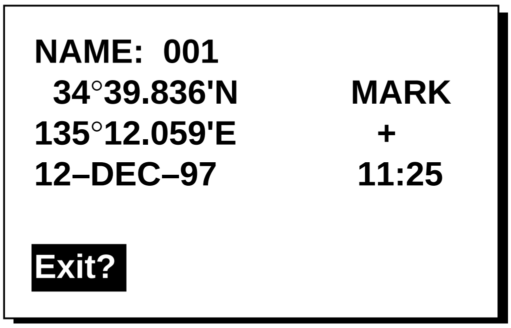
1. Press the [MENU] key twice.
2. Select ROUTES and press the [ENT] key.
3. Select the route to edit.
4. Press the [ENT] key.
5. Place the cursor on the waypoint to replace.
6. Press the [ENT] key. The following window appears.



```
CHANGE?
REMOVE?
INSERT?
SKIP?
Quit?
```

Figure 4-5 Window for editing waypoint in route

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

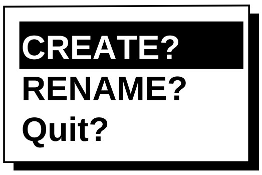


```
NAME:  001
 34°39.836'N        MARK
135°12.059'E          +
12–DEC–97           11:25

Exit?
```

Figure 4-6 Waypoint screen

8. Press the [ENT] key. Press ▲ or ▼ to select a waypoint.
9. Press the [ENT] key.

   Note: If the name selected at step 9 has not been used, the window shown in Figure 4-7 appears. Select CREATE? or RENAME? as appropriate and press the [ENT] key.



```
CREATE?
RENAME?
Quit?
```

Figure 4-7 CREATE, RENAME prompt

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

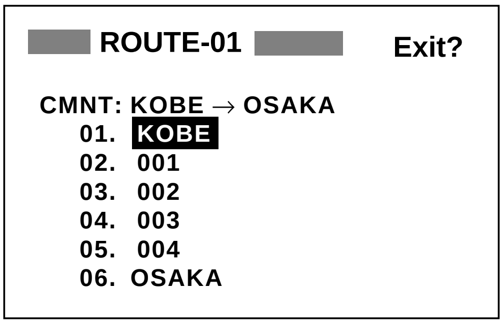
Permanently deleting a waypoint from a route

1. Press the [MENU] key twice.
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. Select Exit? and press the [ENT] key.
10. 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 twice.
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 waypoint to be inserted. In Figure 4-8, for example, if you want to insert a waypoint between KOBE and 001, select 001.



```
ROUTE-01              Exit?

CMNT: KOBE → OSAKA
   01.  KOBE
   02.  001
   03.  002
   04.  003
   05.  004
   06.  OSAKA
```

Figure 4-8 ROUTE screen

6. Press the [ENT] key.
7. Select INSERT?.
8. Press the [ENT] key.
9. Press ▲ or ▼ to select waypoint.
10. Press the [ENT] key.
11. Select Exit? and press the [ENT] key.
12. 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 4-9 as an example, deselect the 2nd intermediate waypoint.

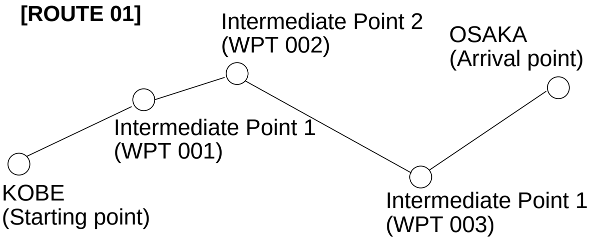

[ROUTE 01]
Intermediate Point 2
(WPT 002)
OSAKA
(Arrival point)
Intermediate Point 1
(WPT 001)
KOBE
(Starting point)
Intermediate Point 1
(WPT 003)

Figure 4-9 Sample route

If you reconstruct the route without the 2nd intermediate point it would look like Figure 4-10.

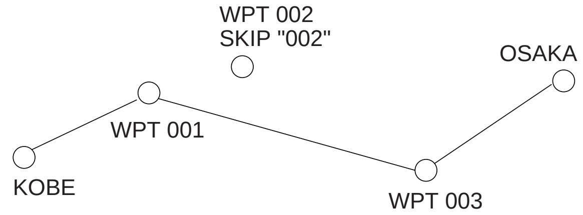
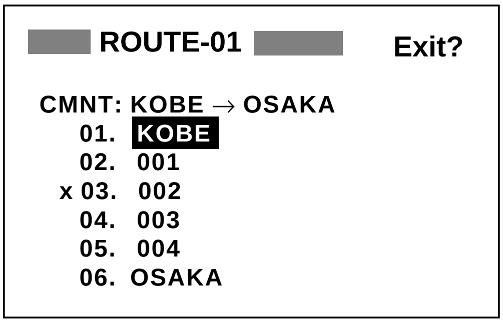

WPT 002
SKIP "002"
OSAKA
WPT 001
KOBE
WPT 003

Figure 4-10 Route in Figure 4-9 reconstructed without 2nd intermediate waypoint

1. Press the [MENU] key twice.
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.



```
ROUTE-01              Exit?

CMNT: KOBE → OSAKA
   01.  KOBE
   02.  001
 x 03.  002
   04.  003
   05.  004
   06.  OSAKA
```

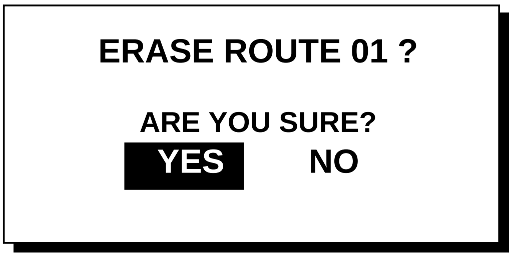
Figure 4-11 ROUTE screen

7. Select Exit? and press the [ENT] key.
8. Press the [MENU] key twice to finish.

To restore a waypoint to a route, select SKPoFF at step 6.

4.3 Deleting a Route

1. Press the [MENU] key twice.
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.



ERASE ROUTE 01 ?

ARE YOU SURE?

YES NO

Figure 4-12 ERASE ROUTE prompt

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

5. SETTING, CANCELLING DESTINATION

Destination can be set four ways: by cursor, by waypoint, by route, and by MOB position. Destination cannot be set when there is no GPS position data. When there is no position data, the buzzer sounds and the message “GPS NO FIX” appears. 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.

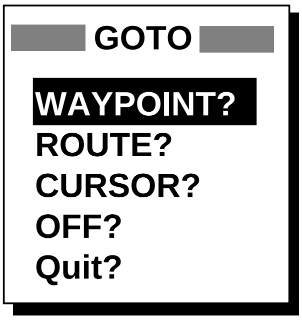

GOTO
WAYPOINT?
ROUTE?
CURSOR?
OFF?
Quit?

Figure 5-1 GOTO window

2. Select CURSOR?.
3. Press the [ENT] key.

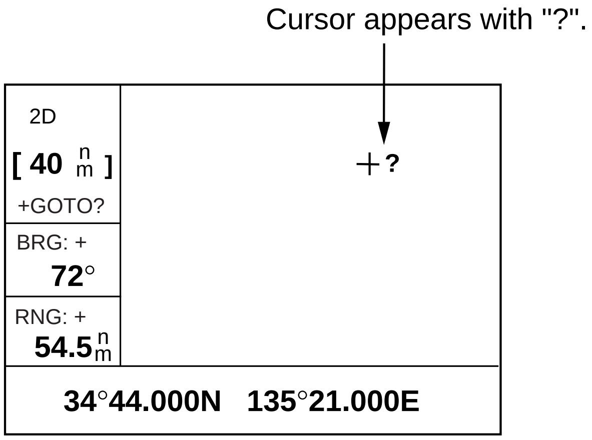

Cursor appears with "?".
2D
[40 nm]
+GOTO?
BRG: +
72°
RNG: +
54.5nm
34°44.000N 135°21.000E
+?

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.

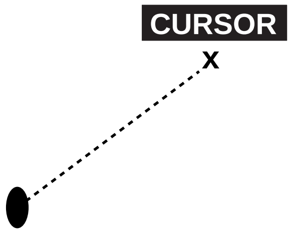


Figure 5-3 Destination set by cursor

5.2 Setting Destination by Waypoint

1. Press the [GOTO] key.
2. Select WAYPOINT?.
3. Press the [ENT] key. The GOTO WYPT list appears.

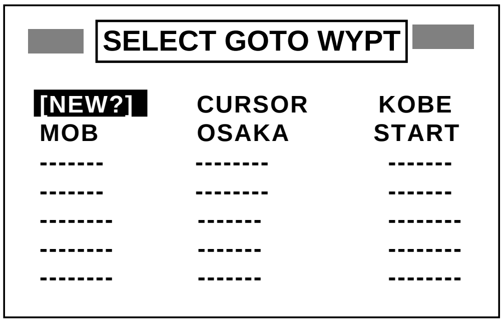

SELECT GOTO WYPT
[NEW?]
MOB
CURSOR
OSAKA
KOBE
START

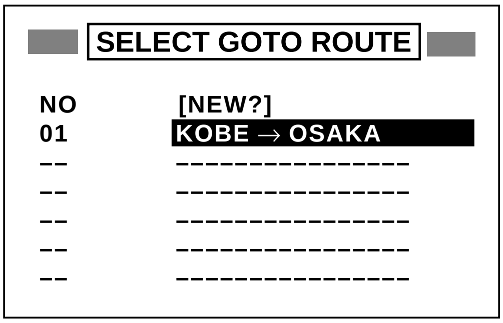
Figure 5-4 GOTO WYPT list

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

Own ship’s position becomes starting point and a dotted line runs between it and the waypoint selected.

5.3 Setting Route as Destination

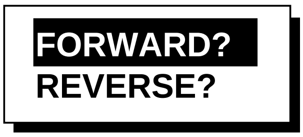
1. Press the [GOTO] key.
2. Select ROUTE?.
3. Press the [ENT] key.



```
SELECT GOTO ROUTE

NO        [NEW?]
01        KOBE → OSAKA
--        ----------------
--        ----------------
--        ----------------
--        ----------------
--        ----------------
```

Figure 5-5 GOTO ROUTE list

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



```
FORWARD?
REVERSE?
```

Figure 5-7 FORWARD, REVERSE prompt

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

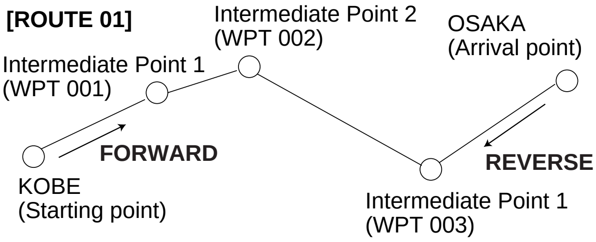

[ROUTE 01]
Intermediate Point 2
(WPT 002)
OSAKA
(Arrival point)
Intermediate Point 1
(WPT 001)
FORWARD
REVERSE
KOBE
(Starting point)
Intermediate Point 1
(WPT 003)

Figure 5-8 Meaning of forward and reverse

Current position becomes starting point. A dotted line runs between all route points.

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 four alarm conditions which generate both audible and visual alarms: Arrival alarm, Anchor watch alarm, Speed alarm, and XTE (Cross Track Error) 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 but the alarm icon remains on the screen until the reason for the alarm is cleared.

You can also see which alarm(s) is sounding by displaying the MESSAGE board. The keying sequence is [MENU] (twice), select MESSAGES and press the [ENT] key. (The message board is explained in 8.2 Displaying the Message Board.)

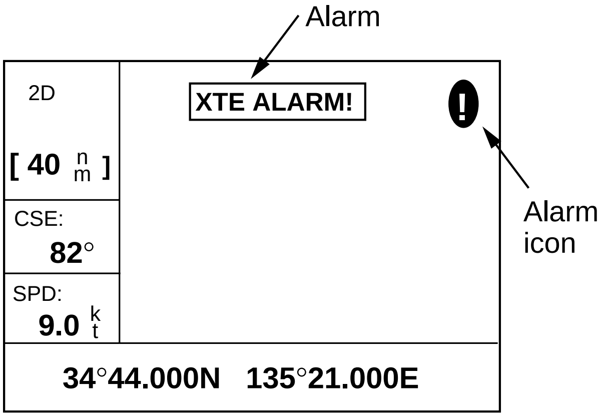


Figure 6-1 Location of alarm message and icon

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 goes out of the circle.

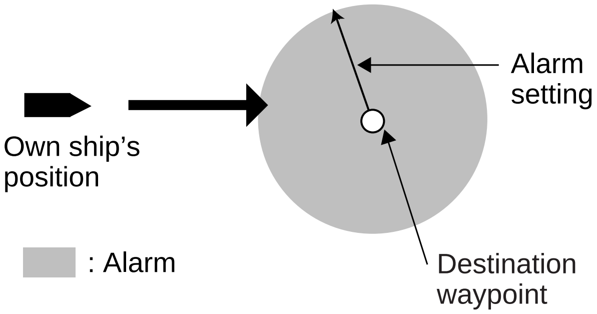
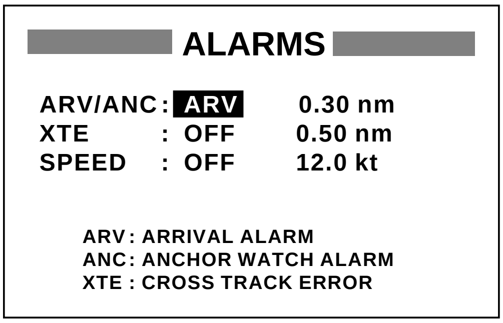


Figure 6-2 How the arrival alarm works

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



```
ALARMS

ARV/ANC : ARV     0.30 nm
XTE     : OFF     0.50 nm
SPEED   : OFF     12.0 kt

     ARV : ARRIVAL ALARM
     ANC : ANCHOR WATCH ALARM
     XTE : CROSS TRACK ERROR
```

Figure 6-3 ALARMS menu

4. The cursor is on the first line of the display. If ARV is already selected, press ▶ and [ENT], set the alarm range with the Cursor Pad and then go to step 6. If ARV is not selected, press the [ENT] key. The display shown in Figure 6-4 appears. Select ARV and press the [ENT] key.

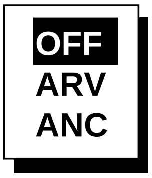


Figure 6-4 Arrival/anchor window

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! appears.

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.

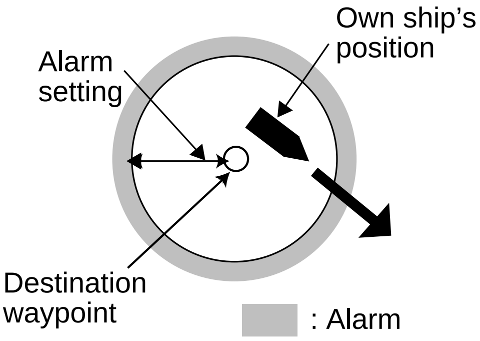


Figure 6-5 How the anchor watch alarm works

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

1. Press the [MENU] key twice.
2. Select ALARMS.
3. Press the [ENT] key.
4. If ANC is already selected, press ▶ and [ENT], set the alarm range with the Cursor Pad and then go to step 7. If ANC is not selected, press the [ENT] key. The display shown in Figure 6-4 appears. Select ANC and press the [ENT] key.
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! appears.

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.

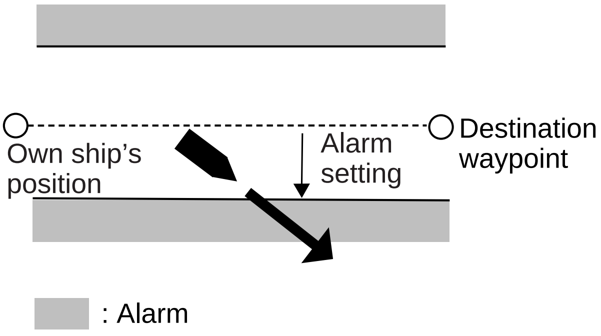


Figure 6-6 How the XTE alarm works

1. Press the [MENU] key twice.
2. Select ALARMS.
3. Press the [ENT] key.
4. Select the XTE line and press the [ENT] key.
5. Select ON and press the [ENT] key.
6. Press the [ENT] key.
7. Enter alarm range 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! appears.

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 twice.
2. Select ALARMS.
3. Press the [ENT] key.
4. Select the SPEED line and press the [ENT] key.
5. Select BELOW or OVER.

   BELOW: Alarm sounds when speed is lower than speed set.
   OVER: Alarm sounds when speed is higher than speed set.
6. Press the [ENT] key twice.
7. Enter speed 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! appears.

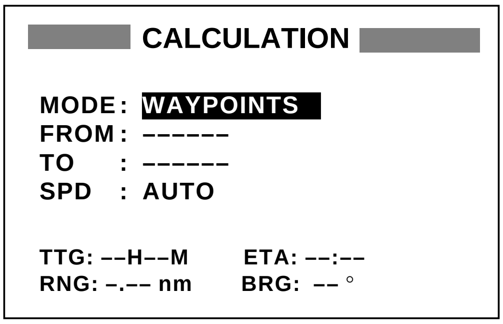
To disable the alarm, select OFF at step 4.

7. OTHER FUNCTIONS

7.1 Calculating Range, Bearing and TTG

Range and bearing between two waypoints

1. Press the [MENU] key twice.
2. Select CALCULATE.
3. Press the [ENT] key.



```
CALCULATION

MODE : WAYPOINTS
FROM : ------
TO   : ------
SPD  : AUTO

TTG: --H--M       ETA: --:--
RNG: -.-- nm      BRG:  -- °
```

Figure 7-1 CALCULATION menu

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

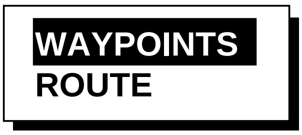


Figure 7-2 WAYPOINTS, ROUTE prompt

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

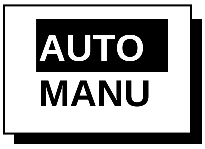
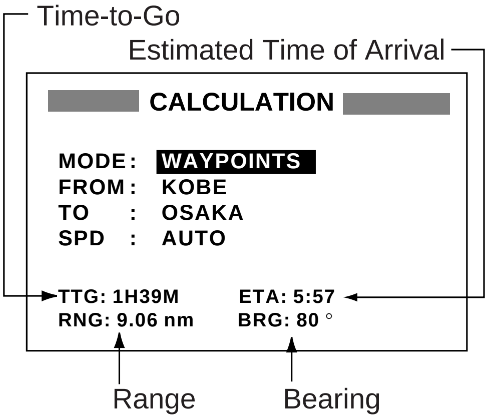


Figure 7-3 AUTO, MANUAL prompt

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.



```
CALCULATION

MODE : WAYPOINTS
FROM : KOBE
TO   : OSAKA
SPD  : AUTO

TTG: 1H39M        ETA: 5:57
RNG: 9.06 nm      BRG: 80 °
```

Figure 7-4 Typical calculation display

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

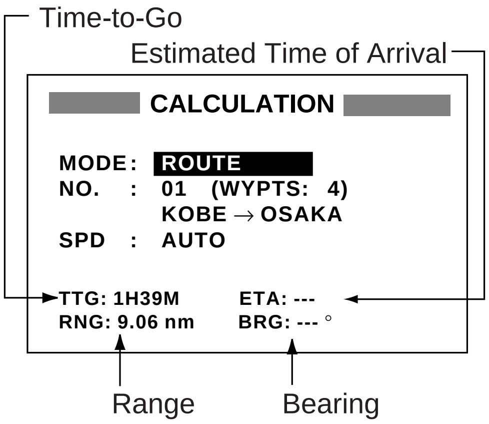
Range and bearing between first and final waypoints of a route

You can easily find the range, bearing TTG and ETA between the first point and final point of a route.

1. Press the [MENU] key twice.
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.
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 for an example.



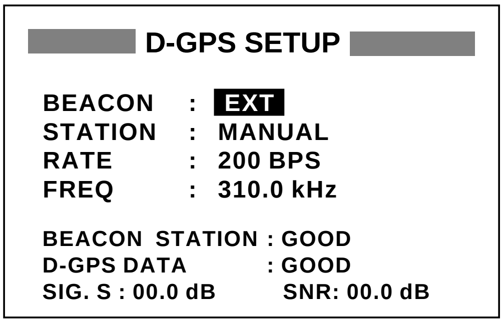
```
CALCULATION

MODE: ROUTE
NO.  : 01  (WYPTS:  4)
       KOBE → OSAKA
SPD  : AUTO

TTG: 1H39M        ETA: ---
RNG: 9.06 nm      BRG: --- °
```

Figure 7-5 Typical calculation display (route)

7.2 DGPS Setup

The GP-35 is equipped with a DGPS beacon receiver, and the GP-30 may be connected to a DGPS beacon receiver. Set up to receive the DGPS beacon signal as follows:

1. Press the [MENU] key twice.
2. Select D-GPS and press the [ENT] key.



```
D-GPS SETUP

BEACON     :  EXT
STATION    :  MANUAL
RATE       :  200 BPS
FREQ       :  310.0 kHz

BEACON  STATION : GOOD
D-GPS DATA      : GOOD
SIG. S : 00.0 dB     SNR: 00.0 dB
```

Figure 7-6 D-GPS SETUP menu

3. Press the [ENT] key.
4. Select INT for internal DGPS beacon receiver; EXT for external DGPS beacon receiver. Press the [ENT] key.
5. The cursor is on the STATION line. Press the [ENT] key.
6. Choose DGPS beacon station selection method: AUTO 1, AUTO 2 or MANUAL.

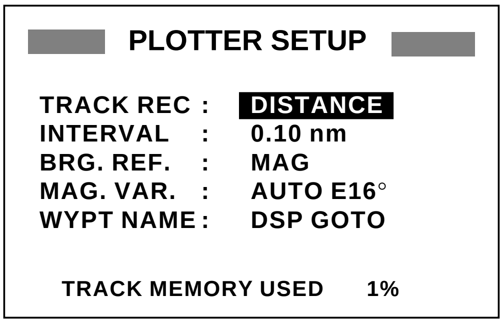
   AUTO 1, AUTO 2: Automatically search for nearest DGPS beacon station. The GP-35 always searches for nearest DPGS beacon station.
   MANUAL: Manually enter DGPS beacon station specifications (on the RATE and FREQ lines), referring to the DGPS reference station list in the Appendix.
7. If you selected AUTO, no further operation is necessary; you may press the [MENU] key twice to finish. For MANUAL, the cursor is now on the RATE line. Press the [ENT] key.
8. Select the transmission rate of the DGPS beacon station nearest you, among 50, 100 or 200 bps. Press the [ENT] key.
9. The cursor is now on the FREQ line. Press the [ENT] key.
10. Enter nearest DGPS beacon station’s frequency with the Cursor Pad.
11. Press the [ENT] key.
12. Press the [MENU] key twice to finish.

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.

The default setting displays magnetic bearings.

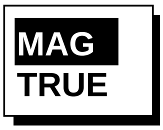
1. Press the [MENU] key twice.
2. Select PLOTTER.
3. Press the [ENT] key.



```
PLOTTER SETUP

TRACK REC :  DISTANCE
INTERVAL  :  0.10 nm
BRG. REF. :  MAG
MAG. VAR. :  AUTO E16°
WYPT NAME :  DSP GOTO

TRACK MEMORY USED    1%
```

Figure 7-7 PLOTTER SETUP menu

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



```
MAG
TRUE
```

Figure 7-8 Bearing reference window

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

7.4 Magnetic Variation

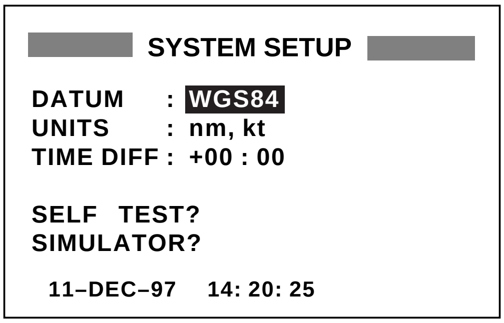
The location of the magnetic north pole is different from the geographical north pole. This causes a difference between the true and magnetic north direction. This difference is called magnetic variation, and varies with respect to the observation point on earth. The GP-30/35 is preprogrammed with all the earth's magnetic variation. However, you may wish to enter variation manually to refine accuracy.

1. Press the [MENU] key twice.
2. Select PLOTTER and press the [ENT] key.
3. Select the MAG. VAR. line.
4. Press the [ENT] key.
5. Select AUTO or MANU and press the [ENT] key. For automatic magnetic variation, current 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

Select the geodetic chart system you are using as follows:

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



```
SYSTEM SETUP

DATUM      : WGS84
UNITS      : nm, kt
TIME DIFF  : +00 : 00

SELF  TEST?
SIMULATOR?

11–DEC–97    14: 20: 25
```

Figure 7-9 SYSTEM SETUP menu

3. Press the [ENT] key.
4. Select WGS84, WGS72 or OTHER 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-4.
    c) Press the [ENT] key.
    d) Press the [MENU] key twice to finish.

7.6 Units of Measurement

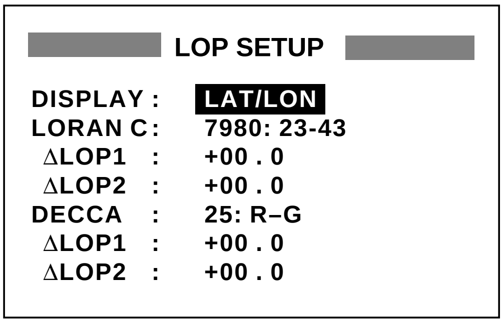
Distance and speed can be displayed in the combinations of nautical miles/knots, kilometers/kilometers per hour, or miles/miles per hour.

1. Press the [MENU] key twice.
2. Select SYS SETUP and press the [ENT] key.
3. Press ▼.
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 Displaying Position in LOPs

Position may shown in LOPs (Loran C or Decca) as follows:

1. Press the [MENU] key twice.
2. Select LOP SETUP and press the [ENT] key.



```
LOP SETUP

DISPLAY :   LAT/LON
LORAN C:    7980: 23-43
 ΔLOP1   :  +00 . 0
 ΔLOP2   :  +00 . 0
DECCA    :  25: R–G
 ΔLOP1   :  +00 . 0
 ΔLOP2   :  +00 . 0
```

Figure 7-10 LOP SETUP menu

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

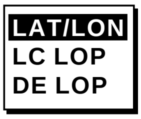


Figure 7-11 LAT/LON, LC, DE window

4. Select LC LOP (Loran C) or DE LOP (Decca).
5. Press the [ENT] key.
6. Do one of the following:

   For Loran C LOP;

   a) Press the [ENT] key and enter GRI code and secondary code with the Cursor Pad, referring to the Loran C chain list on the page A-10.
   b) Press the [ENT] key.

   For Decca LOP;

   a) Select the DECCA line and press the [ENT] key.
   b) Enter Decca chain number and lane pair (Red; R, Green; G and Purple; P) referring to the Decca chain list on the page A-11.
   c) Press the [ENT] key.
7. Enter LOP offsets at appropriate Δ LOP1 and Δ LOP2 if necessary.
8. Press the [MENU] key twice to finish.

7.8 Time Difference (using local time)

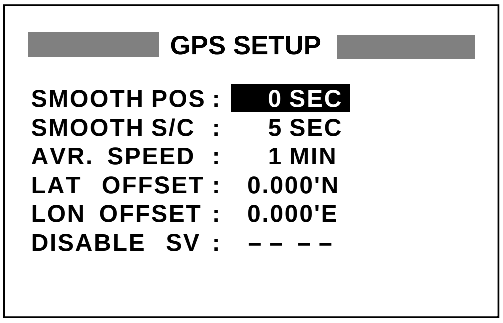
GPS uses UTC time. If you would rather use local time, enter the time difference (-13:00 to +13:00) between local time and UTC time.

1. Press the [MENU] key twice.
2. Select SYS SETUP and press the [ENT] key.
3. Press ▼ twice 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 twice.
2. Select GPS SETUP and press the [ENT] key.



```
GPS SETUP

SMOOTH POS :    0 SEC
SMOOTH S/C  :    5 SEC
AVR.  SPEED  :    1 MIN
LAT   OFFSET :  0.000'N
LON  OFFSET :  0.000'E
DISABLE   SV :  – – – –
```

Figure 7-12 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 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. A setting between 0 and 999 is available. 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. For no smoothing, enter “0”.

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.

LAT/LON OFFSET (Position offset)

You may apply an offset to 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 “0”.

7.10 Uploading, Downloading Waypoint, Route Data

Waypoint and route data may be downloaded to a PC or upload from a PC to the GP-30/35.

Wiring

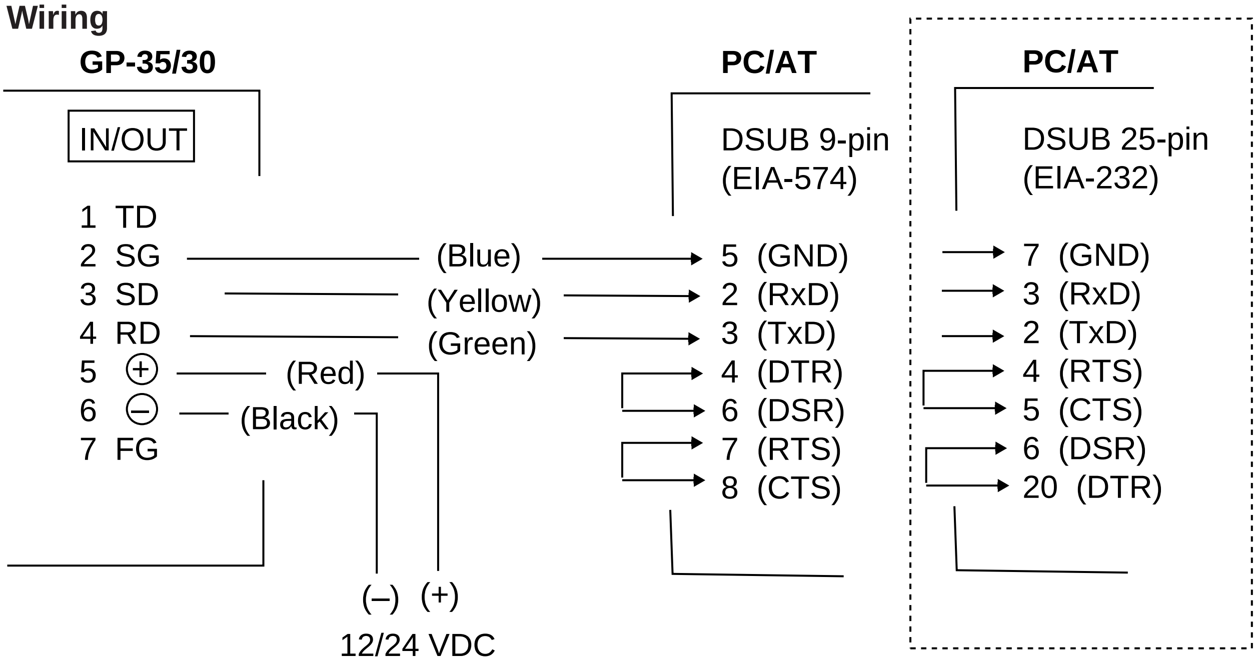

GP-35/30
IN/OUT
1 TD
2 SG
3 SD
4 RD
5 ⊕
6 ⊖
7 FG
(Blue)
(Yellow)
(Green)
(Red)
(Black)
(–) (+)
12/24 VDC
PC/AT
DSUB 9-pin
(EIA-574)
5 (GND)
2 (RxD)
3 (TxD)
4 (DTR)
6 (DSR)
7 (RTS)
8 (CTS)
PC/AT
DSUB 25-pin
(EIA-232)
7 (GND)
3 (RxD)
2 (TxD)
4 (RTS)
5 (CTS)
6 (DSR)
20 (DTR)

Figure 7-13 Connection of GP-35 to PC

Setting for communication software on PC

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

Downloading/Uploading between PC and GP-30/35

The following data can be downloaded/uploaded between a personal computer and GP-30/35.

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

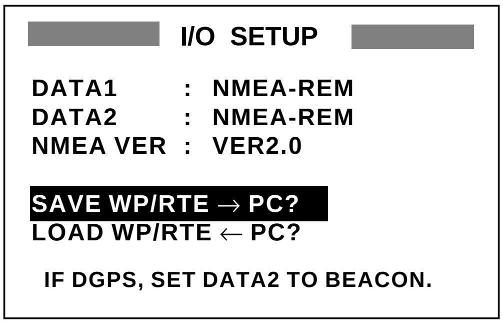
Note 1: There are two kinds of data for route data: route data and route comment data.

Note 2: Data cannot be uploaded or downloaded when a DGPS beacon receiver is active. To receive or transmit data, set BEACON on the D-GPS SETUP menu to OFF.

Note 3: DPGS position fix is not available when uploading or downloading data.

Downloading to PC

1. Open the I/O SETUP menu.
2. Select SAVE WP/RTE → PC?.



I/O SETUP

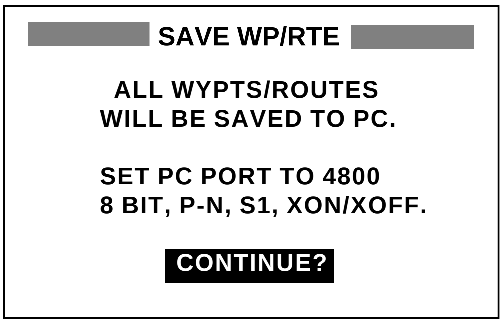
DATA1 : NMEA-REM
DATA2 : NMEA-REM
NMEA VER : VER2.0

SAVE WP/RTE → PC?
LOAD WP/RTE ← PC?

IF DGPS, SET DATA2 TO BEACON.

Figure 7-14 I/O SETUP menu

3. Press the [ENT] key.



SAVE WP/RTE

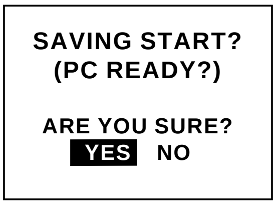
ALL WYPTS/ROUTES
WILL BE SAVED TO PC.

SET PC PORT TO 4800
8 BIT, P-N, S1, XON/XOFF.

CONTINUE?

Figure 7-15 SAVE WP/RTE display

4. Press the [ENT] key.

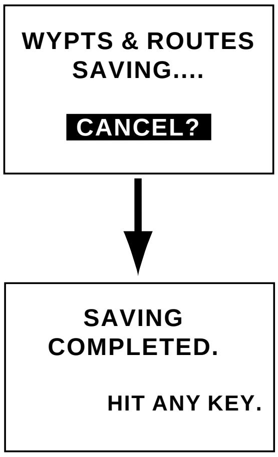


SAVING START?
(PC READY?)

ARE YOU SURE?
YES NO

Figure 7-16 SAVING START? prompt

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



WYPTS & ROUTES
SAVING....

CANCEL?

Data is being saved. To cancel, press the [ENT] key.

SAVING
COMPLETED.

HIT ANY KEY.

Data is saved completely. Hit any key to escape. saved.

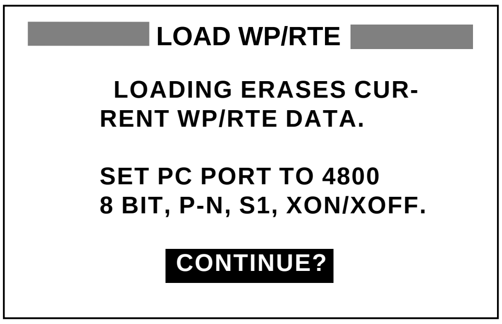
Figure 7-17 Displays when downloading data

7. Press any key to escape.

Uploading from PC

Note that all waypoint and route data stored in GP-30/35 will be deleted when data is uploaded.

1. Open the I/O SETUP menu.
2. Select LOAD WP/RTE ← PC?.
3. Press the [ENT] key.



LOAD WP/RTE

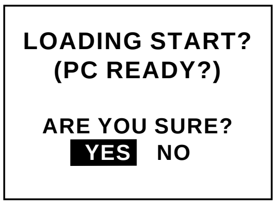
LOADING ERASES CURRENT WP/RTE DATA.

SET PC PORT TO 4800
8 BIT, P-N, S1, XON/XOFF.

CONTINUE?

Figure 7-18 LOAD WP/RTE display

4. Press the [ENT] key.



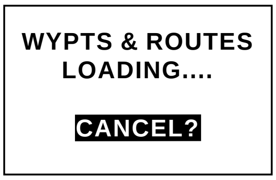
LOADING START?
(PC READY?)

ARE YOU SURE?
YES NO

Figure 7-19 LOADING START? prompt

5. Press the [ENT] key.

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



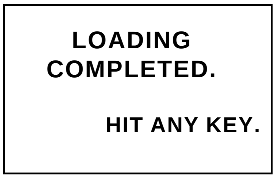
WYPTS & ROUTES
LOADING....

CANCEL?

Preparing for data loading.

Figure 7-20 Display when data is being loaded

6. Operate the computer to output data from the computer
7. When data loading is finished, the following message appears.



LOADING
COMPLETED.

HIT ANY KEY.

Figure 7-21 Display when data is loaded successfully

8. Press any key to escape.

Waypoint data format

```
PFEC, GPwpl, llll.lll, a, yyyyy.yyy, a, c----c, c, c----c, a, hhmmss, xx, xx, xxxx <CR><LF>
                1      2      3      4    5     6    7     8      9     10   11   12
```

Figure 7-22 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:

```
_ABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789&()+-/=?}

0x10: □ (q)   0x11: ╳ (r)   0x12: ↘ (s)   0x13: I (t)   0x14: ▟ (u)

0x15: + (v)   0x16: ├┤ (w)  0x17: ▚ (x)   0x18: ✚ (y)
```

Figure 7-23 Characters available for comments

Route data format

```
$GPRTE, x, x, a, cc, c----c,  c----c, ... , c----c <CR><LF>
        1  2  3  4     5        6            12
```

Figure 7-24 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 30, 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

```
$PFEC, GPrtc, xx, c----c <CR><LF>
              1     2
```

Figure 7-25 Route comment data format

1: Route No. (01 to 30, 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

```
$PFEC, GPxfr, CTL, E <CR><LF>
```

Figure 7-26 End of sentence

8. MAINTENANCE & TROUBLESHOOTING

8.1 Maintenance

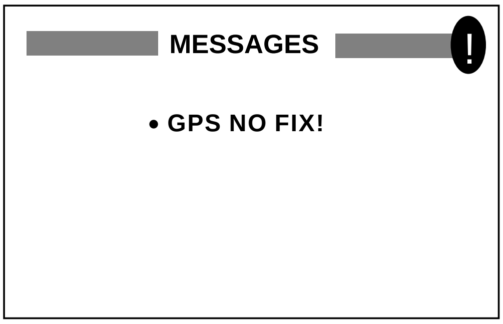
Check the following points regularly to maintain performance:

- 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 twice.
2. Select MESSAGES.
3. Press the [ENT] key.



• GPS NO FIX!

Figure 8-1 MESSAGE board

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

Messages

Table 8-1 Messages and their meanings

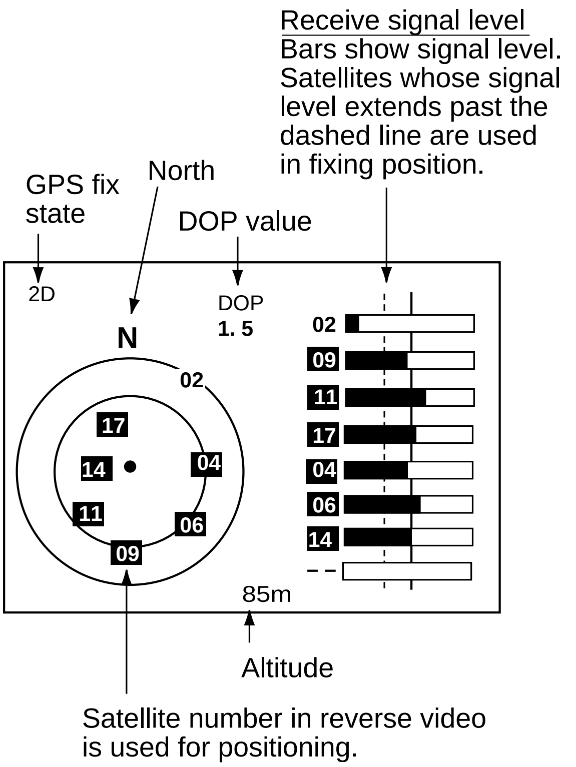
Message	Meaning, Remedy
ANCHOR WATCH ALARM!	Anchor watch alarm setting violated.
ARRIVAL ALARM!	Arrival alarm setting violated.
BACKUP DATA ERROR!	RAM data corrupted. Try to clear backup data. See page 8-3.
BATTERY ALARM!	Voltage of internal battery is low. Request replacement.
DGPS ERR!	No DGPS signal. Check antenna.
NO FIX!	No GPS signal. Check antenna cable.
RAM ERROR!	Request service.
ROM ERROR!	Request service.
RTC ERROR!	Request service.
SPEED ALARM!	Speed alarm setting 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 twice.
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.



Receive signal level
Bars show signal level. Satellites whose signal level extends past the dashed line are used in fixing position.

Satellite number in reverse video is used for positioning.

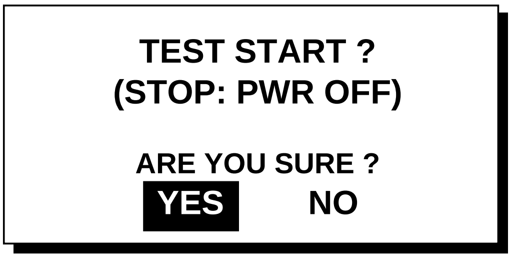
Figure 8-2 GPS satellite monitor display

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

8.4 Self Test

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

1. Press the [MENU] key twice.
2. Select SYS SETUP and press the [ENT] key.
3. Select SELF TEST? and press the [ENT] key.



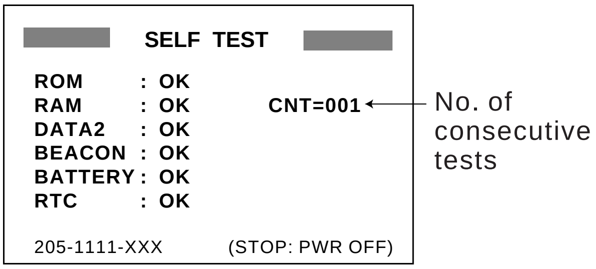
TEST START ?
(STOP: PWR OFF)

ARE YOU SURE ?
YES **NO**

Figure 8-3 TEST START screen

4. Press the [ENT] key to start the test.

5. The equipment tests devices, data port, beacon receiver, battery and RTC. The results are individually displayed as OK or NG (No Good). (NONE appears next to BEACON when no beacon receiver is connected.)



```
SELF  TEST
ROM      : OK
RAM      : OK           CNT=001
DATA2    : OK
BEACON   : OK
BATTERY  : OK
RTC      : OK

205-1111-XXX        (STOP: PWR OFF)
```

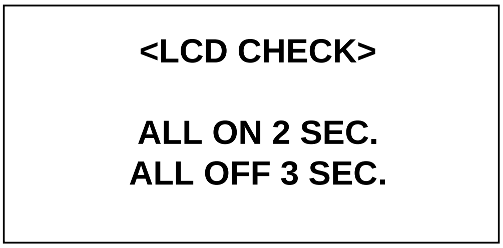
No. of consecutive tests

Figure 8-4 SELF TEST display

6. After the equipment has checked the items mentioned in step 5, a beep sounds and the message PUSH KEY appears.
7. Press each key one by one. The name of the key pressed momentarily appears at the lower right-hand corner if the key is functioning properly.

   Note: If no key is pressed within several 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:



<LCD CHECK>

ALL ON 2 SEC.
ALL OFF 3 SEC.

Figure 8-5 LCD CHECK screen

9. The test repeats after the LCD is checked. To stop the test, turn off the power.

8.5 When "BATTERY ALARM!" Appears

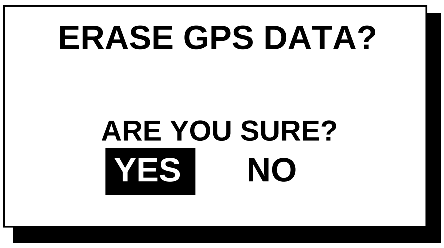
A lithium battery (type: TZ6580553A, code no.: 000-139-051) is installed on the circuit board inside the display unit and it preserves data when the power is turned off. The life of the battery is about three years. When the battery voltage is low "BATTERY ALARM!" appears on the display to alert you. When this happens, contact your dealer to request replacement of the battery.

8.6 Clearing Data

You may clear GPS data and menu settings individually or collectively, to start afresh with default settings or, in some cases, restore normal operation. If you require previous menu settings jot them down before clearing data. To fix position again, when GPS data is cleared, reset the power.

GPS data

1. Press the [MENU] key twice.
2. Select ERASE and press the [ENT] key.
3. Select GPS DATA? and press the [ENT] key. The following message appears.

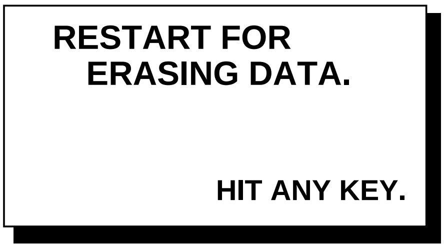


ERASE GPS DATA?

ARE YOU SURE?
YES NO

Figure 8-6 Prompt for erasure of GPS data

4. Press the [ENT] key.



RESTART FOR
ERASING DATA.

HIT ANY KEY.

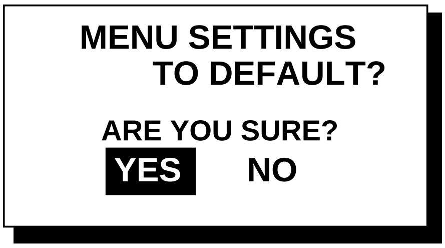
Figure 8-7 Prompt for restarting

5. Press any key. The buzzer sounds while GPS data is being cleared.

Clearing menu settings

All default menu settings are restored when menu settings are cleared. Note that waypoints and routes are not cleared.

1. Press the [MENU] key twice.
2. Select ERASE and press the [ENT] key.
3. Select MENU SETTINGS? and press the [ENT] key. The following message appears.

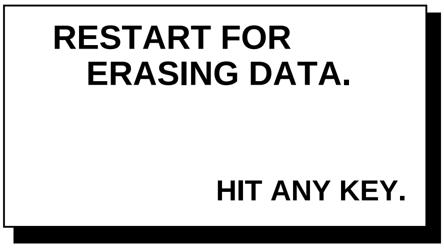


MENU SETTINGS
TO DEFAULT?

ARE YOU SURE?
YES NO

Figure 8-8 Prompt for erasure of menu settings

4. Press the [ENT] key.



RESTART FOR
ERASING DATA.

HIT ANY KEY.

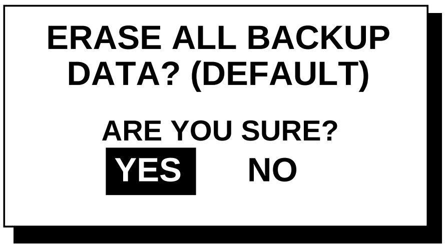
Figure 8-9 Prompt for restarting

5. Press any key. The buzzer sounds while menu settings are being cleared.

Clearing all backup data

When the equipment detects backup data error it displays the message BACKUP DATA ERROR!. In this case it may be necessary to clear all backup data (GPS data, menu settings including waypoints and routes) to restore normal operation. When backup data is cleared all default menu settings are restored.

1. Press the [MENU] key twice.
2. Select ERASE and press the [ENT] key.
3. Select ALL BACKUP DATA? and press the [ENT] key. The following message appears.

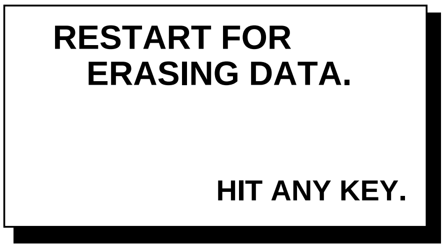


ERASE ALL BACKUP
DATA? (DEFAULT)

ARE YOU SURE?
YES NO

Figure 8-10 Prompt for erasure of all backup data

4. Press the [ENT] key.



RESTART FOR
ERASING DATA.

HIT ANY KEY.

Figure 8-11 Prompt for restarting

5. Press any key. The buzzer sounds while backup data is being cleared.

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 drawing on page D-2, D-3 or D-4 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 display 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.

Tabletop and overhead mounting

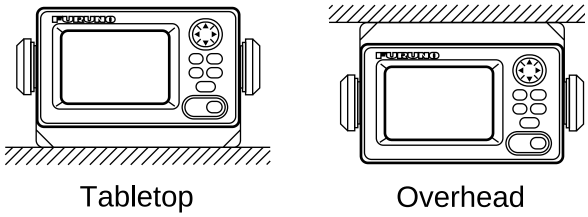


Figure 9-1 Tabletop and overhead mounting methods

Flush mounting

There are two types of flush mounting kits. For details, see the outline drawing on page D-3 and D-4.

9.2 Installation of Antenna Unit

Mounting considerations

Install the antenna unit referring to the installation diagram on page D-1. When selecting a mounting location for the antenna unit, keep in mind the following points:

- Select a location out of the radar beam. The radar beam will obstruct or prevent reception of the GPS satellite signal.
- The location should be well away from a VHF antenna. A GPS receiver is interfered by a harmonic wave of a VHF 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 GP-35 should be no longer than 1.2 meter to prevent antenna damage. **Do not use a 2.5 meter whip antenna.**
- Do not shorten the antenna cable.
- 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.

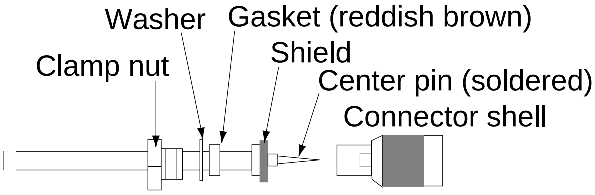


Figure 9-2 How to assemble the connector

9.3 Wiring

The figure below shows where to connect cables on the rear of the display unit.

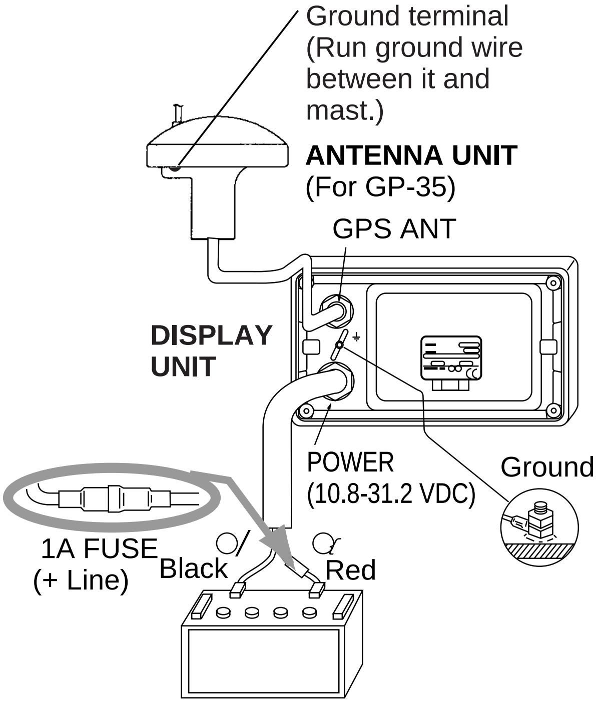

Ground terminal
(Run ground wire
between it and
mast.)
ANTENNA UNIT
(For GP-35)
GPS ANT
DISPLAY
UNIT
POWER
(10.8-31.2 VDC)
Ground
1A FUSE
(+ Line)
Black
Red

Figure 9-3 Wiring

Note: The fuse holder contains a spring which fixes the fuse. To fix the spring, tie the line as shown in Figure 9-4.

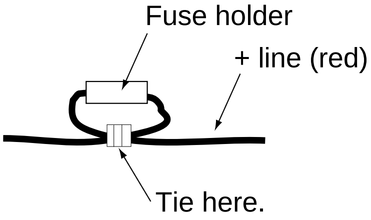

Fuse holder
+ line (red)
Tie here.

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 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 lugs on the ground wire with silicone sealant.
- The power of the GP-35 is not isolated, thus the earth lamp may light when the antenna unit is grounded. If it lights, attach two capacitors (1µF, 0.1µF) 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 for connection.

9.4 Initial Settings

The GP-35 can output navigation information 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.

Menu Item	Output data sentences
NMEA-REM	BWC, GGA, GLL, RMC, RMB, VTG, ZDA
NMEA-AP	GLL, APB, BOD, XTE, AAM, VTG

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

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)

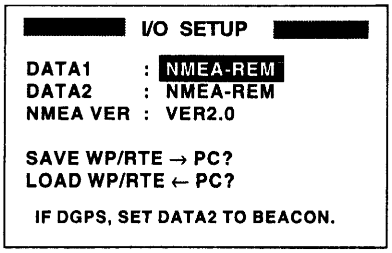
VTG: Actual track and ground speeds

XTE: Course error amount and direction to steer

ZDA: UTC time (minutes, seconds, date, time difference)

Output setting

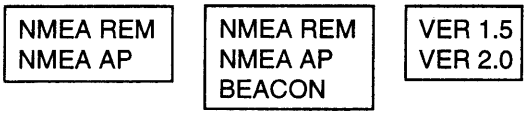
1. Press [MENU] twice to display the MAIN MENU.
2. Operate the Cursor Pad to select I/O SETUP.
3. Press the [ENT] key.



```
I/O SETUP

DATA1     : NMEA-REM
DATA2     : NMEA-REM
NMEA VER  : VER2.0

SAVE WP/RTE → PC?
LOAD WP/RTE ← PC?

IF DGPS, SET DATA2 TO BEACON.
```

Figure 9-5 I/O SETUP menu

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



```
NMEA REM
NMEA AP
```

For DATA1

```
NMEA REM
NMEA AP
BEACON
```

For DATA2

```
VER 1.5
VER 2.0
```

For NMEA

Figure 9-6 Screens for output and NMEA version setup

6. Select desired option with ▼.
7. Press the [ENT] key.
8. Repeat steps 4 to 7 to set other items.
9. Press the [MENU] key to finish.

Note: The GP-30/35 cannot receive or transmit data when a DGPS beacon receiver is active. To receive or transmit data, set BEACON on the D-GPS SETUP menu to OFF.

SPECIFICATIONS

The GP-30 and GP-35 are essentially the same except the GP-35 has an internal DGPS beacon receiver.

1. GPS Receiver

Receiving Channels	8 channels, 8 satellite tracking, Parallel tracking
Rx Frequency	1575.42 MHz
Rx Code	C/A code
Position Fixing System	All in view, 8-state Kalman filter
Position accuracy	Approx. 50 m (GPS) or 5 m (DGPS), 95% of the time, horizontal dilution of position (HDOP) $\leqq 4$ ***Note:** All GPS receivers are subject to degradation of position and velocity accuracy under the U.S. Department of Defense.*
Tracking Velocity	900 kts
Position-fixing Time	Warm start: 20 seconds, Cold start: 2 minutes
Beacon Receiver of GP-35	Frequency range: 283.5 to 325.0 kHz MSK rate: 25, 50, 100, 200 bps (auto or manual, selectable)

2. Display Section

LCD	95 x 60 mm (120 x 64 dot matrix)
Display Mode	Plotter, Highway, Steering, Nav Data Display
Display	Mercator projection Position indication Latitude/longitude or LOPs
Storage Capacity	Track: 1,000 pts Waypoint: 350 pts with comment (16 characters) Route: 30 routes with 30 waypoints each
Alarms	Arrival, Anchor watch, Cross track error, Speed
Display Scale	Plotter Display: 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

3. Data Input/Data Output

Number of Ports	Output: 2 ports, Input: 1 Port
Input Data	DGPS: RTCM SC104 Ver. 2.1 TYPE 1, 9 (For uploading from PC or downloading to PC)
Output Data	NMEA0183: Ver. 1.5 or Ver. 2.0 For Remote: BWC, GGA, GLL, RMC, RMB, VTG, ZDA For Autopilot: GLL, APB, BOD, XTE, AAM, VTG

4. Power Supply & Power Consumption

Power Supply	10.8 to 31.2 VDC
Power Consumption	less than 3 W

5. Environmental Conditions

Useable Temperature	Antenna unit: -25°C to +70°C Display unit: -15°C to +55°C
Humidity	95% (40°C)
Waterproofing	Antenna unit: IEC 529 1PX6 Receiver unit: IEC 529 1PX5(USCG CFR-46)

EQUIPMENT LISTS

Standard Supply

Name	Type	Qty	Remarks	
Display Unit	GP-35	1	BEACON board incorporated	Including hanger and knob bolts
	GP-30	1	No BEACON board	
Antenna Unit	GPA-018	1	For GP-35, GPS/DGPS beacon antenna w/10 m cable	
	GPA-017	1	For GP-30, with 10 m cable	
Installation Materials		1 set	• Power cable • Tapping screw (4 pcs.) • Spring washer	
Spare Parts		1 set	Fuse (2 pcs.)	

Optional Equipment

Name	Type	Code No.	Remarks
Flush Mount Kit S	OP20-17	000-040-720	For display unit
Flush Mount Kit F	OP20-29	000-041-405	
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	000-807-114	
Mast Mount Kit	CP20-01111	004-365-780	
GP-30 Modification Kit			Internal DGPS beacon receiver
Rectifier	PR-62	000-013-485	For 110 VAC mains
		000-013-486	For 220 VAC mains

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

DGPS REFERENCE STATIONS

The following table shows the updated DGPS reference stations (as of May 1998), including the expected stations.

Location	Freq.	Latitude	Longitude	MSK Rate	Country
ALEXANDRIA	305	N38.45	W77.07	100	VA,USA
ANNETTE ISLAND	323	N55.04	W131.36	100	AK,USA
APPLETON	300	N45.47	W121.19	100	WA,USA
ARANSAS PASS	304	N27.50	W97.04	100	TX,USA
BARBERS PT	325	N21.18	W158.07	100	HI,USA
BASS HARBOR	316	N44.13	W68.20	100	ME,USA
BRUNSWICK	316	N43.53	W69.57	100	ME,USA
BUFFALO	322	N42.52	W78.54	100	NY,USA
C.MENDOCINO	292	N40.26	W124.24	100	CA,USA
CAPE CANAVERAL	289	N28.28	W80.33	100	FL,USA
CAPE HENLOPEN	298	N38.47	W75.05	200	DE,USA
CAPE HENRY	289	N36.56	W76.00	100	VA,USA
CAPE HINCHEN-BROOK	292	N60.14	W146.39	100	AK,USA
CHARLESTON	298	N32.45	W79.51	100	SC,USA
CHATHAM	325	N41.40	W69.57	200	MA,USA
CHEBOYGAN	292	N45.39	W84.28	200	MI,USA
COLD BAY	289	N55.06	W162.32	100	AK,USA
DETROIT	319	N42.18	W83.06	200	MI,USA
DULUTH	296	N46.47	W92.05	100	MN,USA
EGMONT KEY	312	N27.36	W82.46	200	FL,USA
ENGLISH TURN	293	N29.53	W89.57	200	LA,USA
FORT MACON	294	N34.42	W76.41	100	NC,USA
FORT STEVENS	287	N46.12	W123.57	100	OR,USA
GALVESTON	296	N29.20	W94.44	100	TX,USA
GUSTAVUS	288	N58.25	W135.42	100	AK,USA
ISABELLA	295	N18.28	W67.04	100	PR,USA
KANSAS CITY	305	N39.07	W95.25	200	MO,USA
KENAI	310	N60.40	W151.21	100	AK,USA
KEY WEST	286	N24.00	W82.00	100	FL,USA
KODIAK	313	N57.37	W152.12	100	AK,USA
KOKOLE POINT	300	N21.59	W159.46	200	HI,USA
MEMPHIS	310	N35.28	W90.12	200	TN,USA
MIAMI	322	N25.44	W80.10	100	FL,USA
MILLERS FERRY	320	N32.05	W87.24	200	AL,USA
MILWAUKEE	297	N43.00	W87.53	100	WI,USA
MOBILE PT	300	N30.14	W88.01	100	AL,USA
MONTAUK PT	293	N41.04	W71.52	100	NY,USA
NEEBISH IS.	309	N46.19	W84.09	200	MI,USA
OMAHA	298	N41.47	W95.55	200	NE,USA
PIGEON PT	287	N37.11	W122.24	100	CA,USA
PORTSMOUTH	288	N43.04	W70.43	100	NH,USA
POTATO PT	298	N61.04	W146.42	100	AK,USA
PRESQUE ILE	293	N45.21	W83.30	100	MI,USA
PT ARGUELLO	321	N34.35	W120.39	100	CA,USA

Location	Freq.	Latitude	Longitude	MSK Rate	Country
PT BLUNT	310	N37.51	W122.25	200	CA,USA
PT LOMA	302	N32.40	W117.15	100	CA,USA
REEDY POINT	309	N39.34	W75.34	200	DE,USA
ROBINSON PT	323	N47.23	W122.23	200	WA,USA
ROCK ISLAND	311	N42.00	W90.14	200	IA,USA
SAGINAW BAY	301	N43.38	W83.50	100	MI,USA
SALLISAW	299	N35.22	W94.49	200	OK,USA
SANDY HOOK	286	N40.28	W74.00	200	NJ,USA
SEUL CHOIX PT	322	N45.55	W85.55	200	MI,USA
ST LOUIS	322	N38.37	W89.46	200	MO,USA
ST PAUL	317	N44.18	W91.54	200	MN,USA
STURGEON BAY	322	N44.48	W87.19	100	WI,USA
UPOLU PT	285	N20.15	W155.53	100	HI,USA
UPPER KEWEENAW	298	N47.14	W88.38	100	MI,USA
VICKSBURG	313	N32.20	W90.55	200	MS,USA
WHIDBEY IS	302	N48.19	W122.42	100	WA,USA
WHITEFISH PT	318	N46.46	W84.57	100	MI,USA
WILDWOOD	301	N38.57	W74.52	200	NJ,USA
WISCONSIN PT	296	N46.43	W92.01	100	WI,USA
YOUNGSTOWN	322	N43.14	W78.58	100	NY,USA
ALERT BAY	309	N50.35	W126.55	200	CANADA
AMPHITRITE POINT	315	N48.55	W125.32	200	CANADA
BASSANO	317	N50.47	W112.27	200	CANADA
CAPE NORMAN	310	N51.29	W55.49	200	CANADA
CAPE RACE	315	N46.45	W53.11	200	CANADA
CAPE RAY	290	N47.38	W59.14	200	CANADA
CAPE SPEAR	314.5	N47.31	W52.37	100	CANADA
CARDINAL	306	N44.47	W75.25	200	CANADA
CRANBERRY ISLAND	286	N45.19	W60.55	100	CANADA
EAST POINT	314	N46.27	W61.58	100	CANADA
FOX ISLAND	307	N45.19	W61.04	200	CANADA
LAUZON	309	N46.48	W71.09	200	CANADA
MOISIE	313	N50.12	W66.07	200	CANADA
PARTRIDGE ISLAND	295	N45.14	W66.03	200	CANADA
PISTOLET BAY	317	N51.29	W55.48	100	CANADA
RICHMOND(ATKINSON)	320	N49.10	W123.07	200	CANADA
POINT PETRIE	303	N43.50	W77.09	100	CANADA
PORT AUX BASQUES	290	N47.34	W59.09	100	CANADA
PORT WELLER	302	N43.14	W79.13	100	CANADA
PT.ESCUMINAC	319	N47.40	W64.47	200	CANADA
RACE ROCKS	309	N48.18	W123.31	100	CANADA
RIGOLET	299	N54.15	W58.30	200	CANADA
RIVIERE DU LOUP	300	N47.45	W69.36	200	CANADA
SANDSPIT	300	N53.14	W131.48	200	CANADA
SOMBRA	306	N42.42	W89.29	100	CANADA
ST JEAN SUR RICHELIEU	296	N45.19	W73.18	200	CANADA
TRIPLE ISLAND	308	N54.17	W130.53	100	CANADA
TROIS RIVIERES	321	N46.23	W72.27	200	CANADA
WATROUS	321	N50.40	W105.26	200	CANADA
WESTERN HEAD	312	N43.59	W64.39	200	CANADA
WIARTON	286	N44.45	W81.07	200	CANADA
WINNIPEG	312	N49.50	W97.30	200	CANADA
ST.DAVIDS HEAD	323	N32.22	W64.39	100	BERMUDA

Location	Freq.	Latitude	Longitude	MSK Rate	Country
OOSTENDE PHARE	311.5	N51.14	E02.55	100	BELGIUM
BLAAVANDS HUK	296.5	N55.34	E08.05	100	DENMARK
HAMMERODDE	289	N55.18	E14.46	100	DENMARK
SKAGEN	298.5	N57.44	E10.35	100	DENMARK
RISTNA LT	307	N58.56	E22.04	100	ESTONIA
MANTYLUOTO	298	N61.36	E21.28	200	FINLAND
OUTOKUMPU	293.5	N62.41	E29.01	200	FINLAND
PORKKALA	285	N59.58	E24.23	200	FINLAND
PUUMALA	301.5	N61.24	E28.14	200	FINLAND
TURKU	304	N60.26	E22.13	200	FINLAND
CAP BEAR	304.5	N42.31	E03.08	100	FRANCE
CAP FERRET	287	N44.39	E01.15	100	FRANCE
ECKMUHL	312.5	N47.48	W04.23	100	FRANCE
GATTEVILLE	297.5	N49.42	W01.16	100	FRANCE
LES BALEINES	299.5	N46.15	W01.34	100	FRANCE
PORQUEROLLES	314.5	N42.59	E06.12	100	FRANCE
REVELLATA	294.5	N42.35	E08.46	100	FRANCE
SAINT MATHIEU	291.5	N48.19	W04.46	100	FRANCE
HELGOLAND	313	N54.11	E07.53	200	GERMANY
WUSTROW	314.5	N54.20	E12.23	200	GERMANY
BJARGTANGAR	289	N65.30	W24.32	100	ICELAND
DJUPIVOGUR	295.5	N64.39	W14.16	100	ICELAND
RAUFARHOFN	301.5	N66.27	W15.57	100	ICELAND
REYKJANES	292.5	N63.49	W22.42	100	ICELAND
SKAGATA	304.5	N66.07	W20.06	100	ICELAND
SKARDSFJARA	313	N63.31	W17.59	100	ICELAND
LOOP HEAD	312	N52.34	W09.56	100	IRELAND
MIZEN HEAD	300.5	N51.27	W09.49	100	IRELAND
TORY ISLAND	313.5	N55.16	W08.15	100	IRELAND
VENTSPILS	308.5	N57.22	E21.31	100	LATVIA
HOEK VAN HOLLAND	287.5	N51.59	E04.07	200	HOLLAND
VLIELAND(AMELAND)	299.5	N53.27	E05.38	200	HOLLAND
ANDENES	284.5	N69.19	E16.07	100	NORWAY
FAERDER	288	N59.02	E10.32	100	NORWAY
FRUHOLMEN	309.5	N71.06	E23.59	100	NORWAY
HALTEN	313.5	N64.10	E09.25	100	NORWAY
LISTA	301	N58.07	E06.34	100	NORWAY
SKLINNA	288.5	N65.12	E11.00	100	NORWAY
SKOMVAER	300	N67.25	E11.53	100	NORWAY
SVINOEY	293.5	N62.20	E05.16	100	NORWAY
TORSVAAG	291.5	N70.15	E19.31	100	NORWAY
TORUNGEN	292.5	N58.23	E08.48	100	NORWAY

Location	Freq.	Latitude	Longitude	MSK Rate	Country
UTSIRA	307	N59.19	E04.52	100	NORWAY
UTVAER	300	N61.02	E04.31	100	NORWAY
VARDOE	307	N70.23	E31.09	100	NORWAY
DZIWNOW	288	N54.01	E14.44	100	POLAND
ROZEWIE	311	N54.49	E18.20	100	POLAND
CABO DE LA NAO	284.5	N38.44	E00.14	0	SPAIN
CABO DE PALOS	313.5	N37.38	W00.41	0	SPAIN
CABO FINISTERRE	289	N42.53	W09.16	0	SPAIN
CABO GATA	298.5	N36.43	W02.11	0	SPAIN
CABO PENAS	297	N43.39	W05.51	0	SPAIN
CABO SALOU	289	N41.03	E01.10	0	SPAIN
CABO SAN SEBASTIAN	290.5	N41.53	E03.12	0	SPAIN
CASTELLON	311	N39.58	E00.01	0	SPAIN
CEUTA	311.5	N35.54	W05.18	0	SPAIN
ESTACA DE BARES	310	N43.47	W07.41	0	SPAIN
LA ENTALLADA	292.5	N28.13	W13.56	0	SPAIN
MACHICHACO	285	N43.27	W02.45	0	SPAIN
MAHON	292.5	N39.52	E04.18	0	SPAIN
MALAGA	304.5	N36.43	W04.25	0	SPAIN
PUNTA DE CALA FIGUERA	286	N39.27	E02.31	0	SPAIN
ROTA	302.5	N36.38	W06.23	0	SPAIN
TENERIFE	287.5	N28.30	W16.30	0	SPAIN
ALMAGRUNDET	287	N59.09	E19.10	200	SWEDEN
BJUROKLUBB	303.5	N64.29	E21.35	200	SWEDEN
HJORT UDDE	297	N58.38	E12.40	200	SWEDEN
HOBURG	302	N56.55	E18.09	200	SWEDEN
KULLEN	293.5	N56.18	E12.27	200	SWEDEN
OERSKAER	291.5	N60.32	E18.23	200	SWEDEN
SKAGS UDDE	306.5	N63.11	E19.01	200	SWEDEN
BUTT OF LEWIS	294	N58.31	W06.16	100	U.K.
FLAMBOROUGH HEAD	302.5	N54.07	W00.05	100	U.K.
GIRDLE NESS	311	N57.08	W02.03	100	U.K.
LIZARD	284	N49.58	W05.12	100	U.K.
NASH POINT	299	N51.24	W03.34	100	U.K.
NORTH FORELAND	310.5	N51.23	E01.27	100	U.K.
POINT LYNAS	305	N53.25	W04.17	100	U.K.
RHINNS OF ISLAY	293.5	N55.40	W06.31	100	U.K.
ST.CATHERINE'S	293.5	N50.35	W01.18	100	U.K.
SUMBURGH HEAD	304	N59.52	W01.16	100	U.K.
AL BANDAR	298	N28.07	E50.39	200	BAHRAIN
MINA AL AHMADI	295	N29.07	E48.08	200	KUWAIT
ADU DHABI	314	N24.06	E52.56	200	U.A.E.
RAS AL KHAIMAH	292	N25.59	E56.04	200	U.A.E.

Location	Freq. (kHz)	Latitude	Longitude	MSK Rate	Country
ABASHIRI	309	N44.00	E144.18	200	JAPAN
INUBOSAKI	288	N34.17	E136.54	200	JAPAN
ESAKI	320.5	N34.36	E135.00	200	JAPAN
HAMADA	305	N34.53	E132.02	200	JAPAN
HACHIJOJIMA	302	N33.05	E139.51	200	JAPAN
HEKURAJIMA	295	N37.51	E136.55	200	JAPAN
INUBOZAKI	295	N35.42	E140.52	200	JAPAN
KINKAZAN	316	N38.17	E141.35	200	JAPAN
KUSIROZAKI	288	N43.04	E145.09	200	JAPAN
MATSUMAE	309	N41.25	E140.05	200	JAPAN
MEJIMA	302	N31.59	E128.21	200	JAPAN
MUROTO MISAKI	295	N33.15	E134.11	200	JAPAN
OHAMA	321	N34.05	E132.59	200	JAPAN
OSEZAKI	302	N32.37	E128.36	200	JAPAN
SAKATA	288	N38.57	E139.50	200	JAPAN
SETO	320	N33.26	E132.13	200	JAPAN
SHAKOTAN MISAKI	316	N43.22	E140.28	200	JAPAN
SHIRIYAZAKI	302	N41.26	E141.28	200	JAPAN
SOUYA MISAKI	295	N45.31	E141.56	200	JAPAN
TOI MISAKI	309	N31.22	E131.20	200	JAPAN
TURUGIZAKI	309	N35.08	E139.41	200	JAPAN
WAKAMIYA	295	N33.52	E129.41	200	JAPAN
CHANGGI	310	N36.05	E129.34	100	KOREA
CHINDO	290	N34.13	E125.58	100	KOREA
CHUMUNJIN	295	N37.54	E128.50	100	KOREA
KOMUNDO	287	N34.00	E127.20	100	KOREA
OCHONGDO	295	N36.07	E125.58	100	KOREA
PALMIDO	313	N37.21	E126.30	100	KOREA
YONGDO	300	N35.03	E129.06	100	KOREA
KAU YI CHAU	289	N22.15	E114.04	200	HONG KONG
CAPE SCHANCK	314	S38.30	E144.53	200	AUSTRALIA
HORN ISLAND	320	S10.36	E142.17	200	AUSTRALIA
KARRATHA	304	S20.45	E116.27	200	AUSTRALIA
MACKAY	315	S21.06	E149.13	200	AUSTRALIA
SYDNEY	308	S33.59	E150.59	200	AUSTRALIA
ABROLHOS	290	S17.57	W38.41	100	BRAZIL
ARACAJU	320	S10.58	W37.02	100	BRAZIL
CALCANHAR	305	S05.09	W35.29	100	BRAZIL
CANIVETE	310	N00.30	W50.24	100	BRAZIL
I.MOELA	305	S24.02	W46.15	100	BRAZIL
PONTA DE SAO MARCOS	300	S02.29	W44.18	100	BRAZIL
RIO GRANDE	290	S32.08	W52.06	100	BRAZIL
SANTA MARTA	310	S28.36	W48.48	100	BRAZIL
SAO TOME	300	S22.02	W41.03	100	BRAZIL

Location	Freq. (kHz)	Latitude	Longitude	MSK Rate	Country
SAN BERNARDO	317.5	S36.22	W60.03	100	ARGENTINA
SAN CARLOS CENTRO	297.5	S31.58	W60.55	100	ARGENTINA
AFRICA	291.5	N56.11	E163.21	100	RUSSIA
ALEVINA	303.5	N58.50	E151.21	100	RUSSIA
ANAPSKY	315.5	N44.53	E37.18	100	RUSSIA
ANDREA	291.5	N76.44	E110.27	100	RUSSIA
ASTRAHNASKY	291.5	N44.28	E48.01	100	RUSSIA
BALTIYSK	298.5	N54.41	E19.59	100	RUSSIA
BEGICHEV	300.5	N47.31	E112.15	100	RUSSIA
CAMENKA	318.5	N69.28	E161.14	100	RUSSIA
CANIN NOSE	285.5	N68.38	E43.18	100	RUSSIA
CARAGINSKY	301.5	N58.33	E163.33	100	RUSSIA
CORSAKOVSKY	312.5	N46.37	E142.48	100	RUSSIA
COTELNY	310.5	N75.59	E137.53	100	RUSSIA
CRUTOGOROVA	300.5	N55.05	E155.35	100	RUSSIA
DEDGNEVA	303.5	N66.01	E169.43	100	RUSSIA
DGEDGINSKY	298.5	N65.13	E36.49	100	RUSSIA
ELIZAROVA	318.5	N54.25	E143.43	100	RUSSIA
ENISEY	315.5	N68.25	E86.18	100	RUSSIA
GAMOV	306.5	N42.33	E131.13	100	RUSSIA
INDYGIRSKY	324.5	N71.16	E150.17	100	RUSSIA
OLENIY	294.5	N72.35	E77.39	100	RUSSIA
PETROPAVLOVSKY	291.5	N52.33	E158.42	100	RUSSIA
RUSSIAN CAT	315.5	N64.34	E178.33	100	RUSSIA
SET.NAVOLOCK	318.5	N69.24	E33.03	100	RUSSIA
SHEPELEVSKIY	298.5	N59.59	E29.09	100	RUSSIA
STERLEGOV	318.5	N75.24	E88.45	100	RUSSIA
STOLBOVOY	306.5	N74.10	E135.27	100	RUSSIA
TONKY	303.5	N69.51	E61.06	100	RUSSIA
VAN DER LINDA	312.5	N45.35	E149.24	100	RUSSIA
VASILIEVA	294.5	N50.00	E155.23	100	RUSSIA
VIZE	294.5	N79.30	E76.59	100	RUSSIA
VRANGELIA	309.5	N70.59	E178.29	100	RUSSIA
YARANGAI	291.5	N69.54	E170.32	100	RUSSIA

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
01	South Baltic	0A	Europe
02	Vestlandet	0E	"
03	Southwest British	1B	"
04	Northumbrian	2A	"
05	Holland	2E	"
06	North British	3B	"
07	Lofoten	3E	"
08		3F	"
09	North Baltic	4B	"
10	North West	4C	"
11	Trondelag	4E	"
12	English	5B	"
13	North Bothnian	5F	"
14	Southern Spanish	6A	"
15	North Scottish	6C	"
16	Gulf of Finland	6E	"
17	Danish	7B	"
18	Irish	7D	"
19	Finnmark	7E	"
20	French	8B	"
21	South Bothnian	8C	"
22	Hebridean	8E	"
23	Frisian Islands	9B	"
24	Helgeland	9E	"
25	Skagerrak	10B	"
26	North Persian Gulf	5C	Persian Gulf & India
27	South Persian Gulf	1C	"
28	Bombay	7B	"
29	Calcutta	8B	"
30	Bangladesh	6C	"
31	Saliyah	2F	"
32	Hokkaido	9C	Japan
33	Tohoku	6C	"

Chain No.	Chain	Chain code	Location
34	Kanto	8C	Japan
35	Shikoku	4C	"
36	Hokuriku	2C	"
37	Kita Kyushu	7C	"
38	Namaqualand	4A	Southern Africa
39	Cape	6A	"
40	Eastern Province	8A	"
41	South West Africa	9C	"
42	Natal	10C	"
43	Dampier	8E	Australia
44	Port Headland	4A	"
45	Anticosti	9C	Northern America
46	East Newfoundland	2C	"
47	Cabot Strait	6B	"
48	Nova Scotia	7C	"

MENU TREE

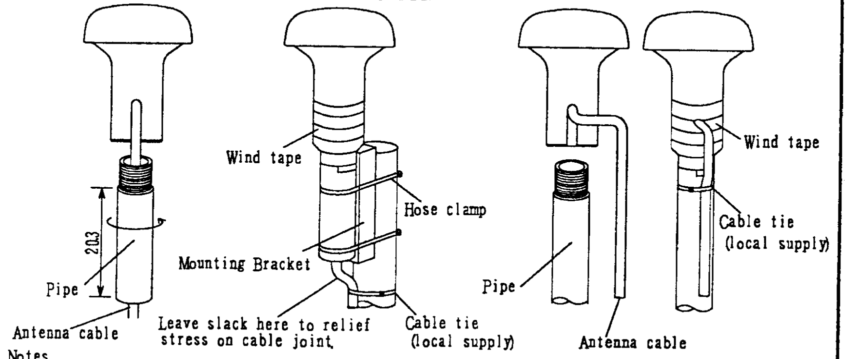
- MENU
  - WAYPOINTS
  - ROUTES
  - PLOTTER
    - TRACK REC (OFF, DISTANCE, AUTO)
    - INTERVAL
    - BRG. REF (MAG, TRUE)
    - MAG. VAR. (AUTO, MANUAL)
    - WYPT NAME (DSP GOTO, DSP ALL)
  - ALARMS
    - ARV/ANC (OFF, ARV, ANC)
    - XTE (OFF, ON)
    - SPEED (OFF, BELOW, OVER)
  - ERASE
    - WAYPOINTS/MARKS?
    - ROUTES?
    - TRACK?
    - GPS DATA?
    - MENU SETTINGS?
    - ALL BACKUP DATA?
  - D-GPS
    - BEACON (OFF, INT, EXT)
    - STATION (AUTO1, AUTO2, MANUAL)
    - RATE (50, 100, 200 BPS)
    - FREQ
  - CALCULATE
    - MODE (WAYPOINTS, ROUTE), SPD (AUTO, MANUAL)
  - MESSAGES
  - SATELLITE
  - GPS SETUP
    - SMOOTH POS
    - SMOOTH S/C
    - AVR. SPEED
    - LAT OFFSET
    - LON OFFSET
    - DISABLE SV
  - SYS SETUP
    - DATUM (WGS84, WGS72, OTHER)
    - UNITS (nm, kt; km, km/h; mi, mi/h)
    - TIME DIFF
    - SELF TEST
    - SIMULATOR (MODE (ON/OFF), SPEED, COURSE (AUTO, MANUAL), LAT, LON)
  - I/O SETUP
    - DATA1 (NMEA-REM, NMEA-AP)
    - DATA2 (NMEA-REM, NMEA-AP, BEACON)
    - NMEA VER (VER 1.5, VER 2.0)
    - SAVE WP/RTE → PC?
    - LOAD WP/RTE ← PC?
  - LOP SETUP
    - DISPLAY (LAT/LON, LC LOP, DE LOP)

FURUNO

A) Mast mounting

a) Use mast mounting kit CP20-01111.

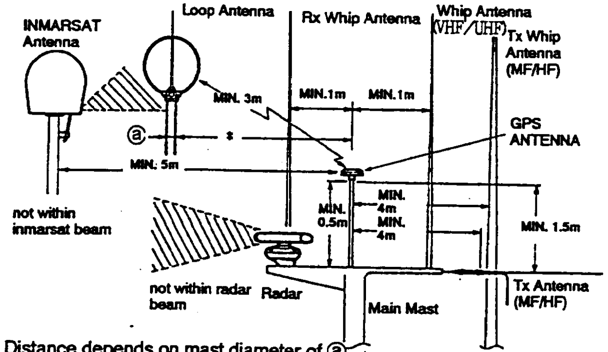
b) Use a pipe only.


203
Pipe
Antenna cable
Wind tape
Hose clamp
Mounting Bracket
Leave slack here to relief stress on cable joint.
Cable tie (local supply)
Pipe
Antenna cable
Wind tape
Cable tie (local supply)

Notes
1) Fasten pipe to antenna first then fix them to mast.
2) When fixing antenna to pipe, turn pipe; not the antenna Turning the antenna may twist the cable and place stress on connector.

Mounting location

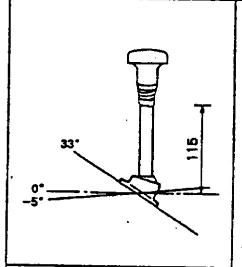
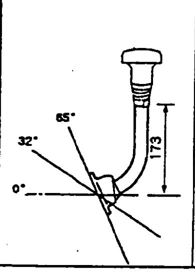
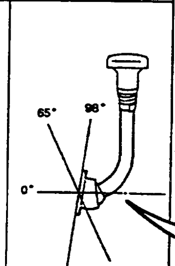
The figure below shows the recommended separation distances from other antennas to avoid mutual interference.


INMARSAT Antenna
Loop Antenna
Rx Whip Antenna
Whip Antenna (VHF/UHF)
Tx Whip Antenna (MF/HF)
GPS ANTENNA
MIN. 3m
MIN.1m
MIN.1m
ⓐ
*
MIN. 5m
not within inmarsat beam
MIN. 0.5m
MIN. 4m
MIN. 4m
MIN. 1.5m
not within radar beam
Radar
Main Mast
Tx Antenna (MF/HF)

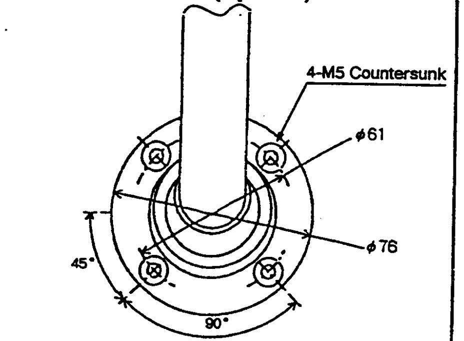
* Distance depends on mast diameter of ⓐ
ⓐ mast diameter 10cm : minimum 1.5m
ⓐ mast diameter 30cm : minimum 3m

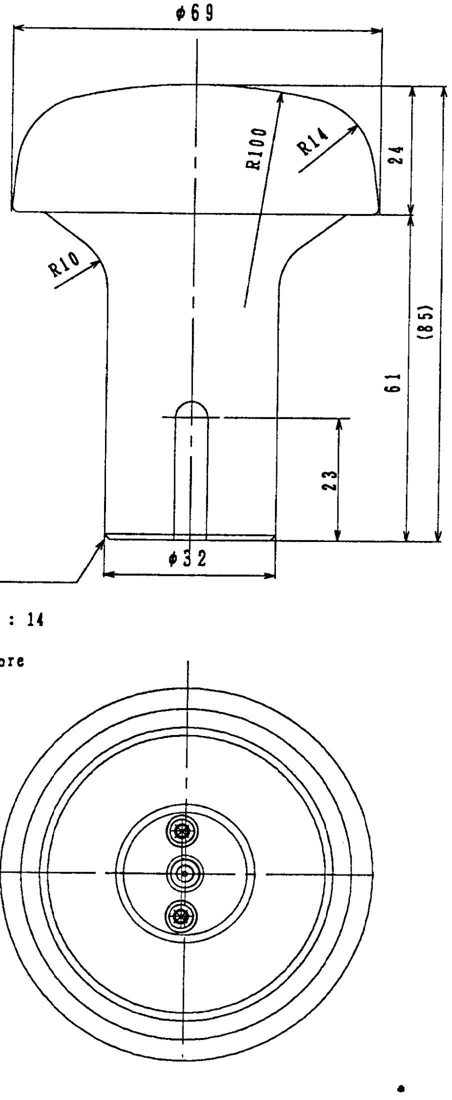
B) Antenna base mounting

Use optional antenna base No.13-QA300 or No.13-QA310.

Inclination -5° to 33°	32° to 65°	65° to 98°
		
Right angle antenna base No.13-QA300 (code No. 000-803-239)	L-type antenna base No.13-QA310 (code No. 000-803-240)	

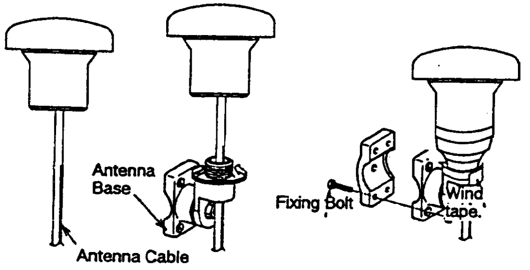
Mounting dimensions of antenna base (option)


4-M5 Countersunk
φ61
φ76
45°
90°


φ69
R100
R14
24
R10
(85)
61
23
φ32

THREAD DIMENSION (for PIPE)
Thread Type: 1x14UNS1B
Threads per 25.4 mm (1 inch) : 14
Pitch: 1.8143 mm
Thread Length: 19 mm or more
Pitch Diameter: 24.17 mm

C) Handrail mounting


Antenna Base
Antenna Cable
Fixing Bolt
Wind tape.

Use handrail mounting base No.13-RC5160 (Code No. 000-861-114, option). The diameter of the handrail may be from ϕ19mm to ϕ32mm.

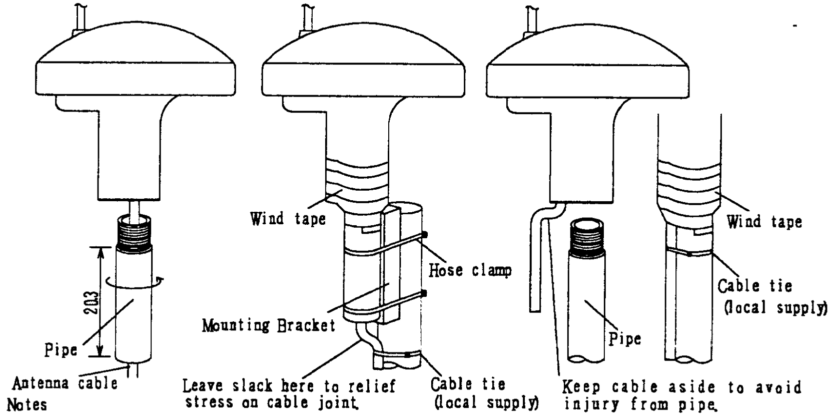
NOTES
1) Fasten antenna base to antenna first then fix them to handrail.

2) When fixing antenna to antenna base, turn antenna base; not the antenna. Turning the antenna may twist the cable and place stress on connector.

DRAWN Jan. 8 '98 T. YAMASAKI		TITLE	GPA-017
CHECKED Jan. 8 '98 K.Kusunoki		名称	空中線部
APPROVED Jan. 8 '98	GP-30		外寸図
SCALE	MASS 0.3 kg	NAME	ANTENNA UNIT
DWG.No. C4384-G04- C			OUTLINE DRAWING

A) Mast mounting

a) Use mast mounting kit CP20-01111.   b) Use a pipe only.

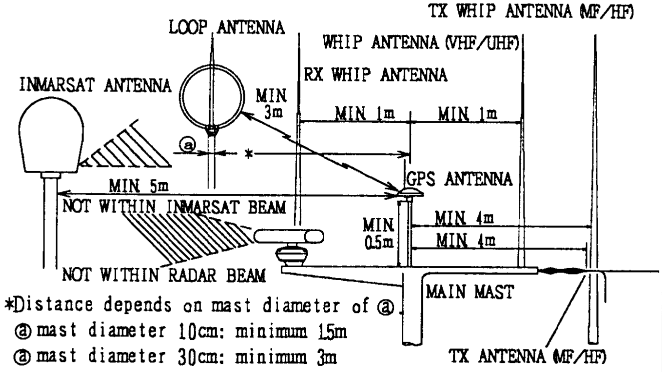


203
Pipe
Antenna cable
Wind tape
Hose clamp
Mounting Bracket
Leave slack here to relief stress on cable joint.
Cable tie (local supply)
Pipe
Wind tape
Cable tie (local supply)
Keep cable aside to avoid injury from pipe.

Notes
1) Fasten pipe to antenna first then fix them to mast.
2) When fixing antenna to pipe, turn pipe; not the antenna
Turning the antenna may twist the cable and place stress on connector.

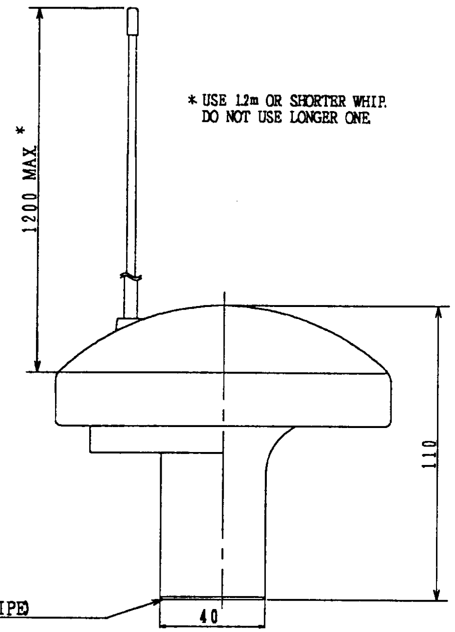
Mounting location

The figure below shows the recommended separation distance from antennas to avoid mutual interference.



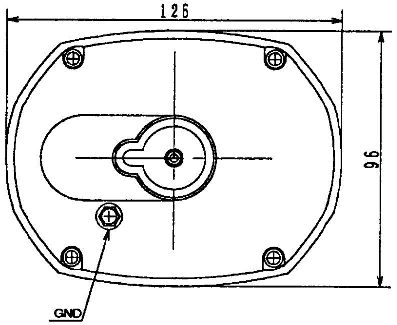
TX WHIP ANTENNA (MF/HF)
LOOP ANTENNA
WHIP ANTENNA (VHF/UHF)
INMARSAT ANTENNA
RX WHIP ANTENNA
MIN 3m
MIN 1m
MIN 1m
ⓐ
*
GPS ANTENNA
MIN 5m
NOT WITHIN INMARSAT BEAM
MIN 0.5m
MIN 4m
MIN 4m
NOT WITHIN RADAR BEAM
MAIN MAST
TX ANTENNA (MF/HF)

*Distance depends on mast diameter of ⓐ.
ⓐ mast diameter 10cm: minimum 1.5m
ⓐ mast diameter 30cm: minimum 3m



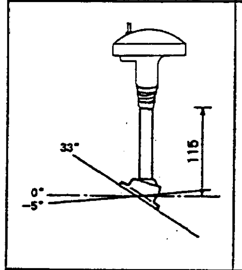
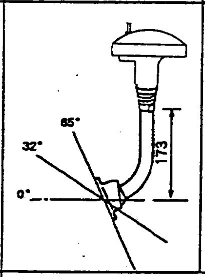
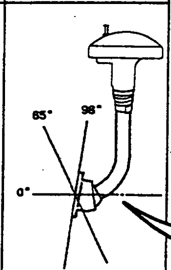
1200 MAX. *
* USE 1.2m OR SHORTER WHIP. DO NOT USE LONGER ONE.
110
40

THREAD DIMENSION (for PIPE)
Thread Type: 1x14UNS1B
Threads per 25.4 mm (1 inch) : 14
Pitch: 1.8143 mm
Thread Length: 19 mm or more
Pitch Diameter: 24.17 mm



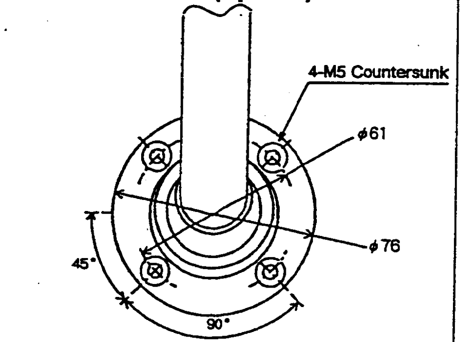
B) Antenna base mounting

Use optional antenna base No.13-QA300 or No.13-QA310.

Inclination -5° to 33°	32° to 65°	65° to 98°
		
Right angle antenna base No.13-QA300 (code No. 000-803-239)	L-type antenna base No.13-QA310 (code No. 000-803-240)	

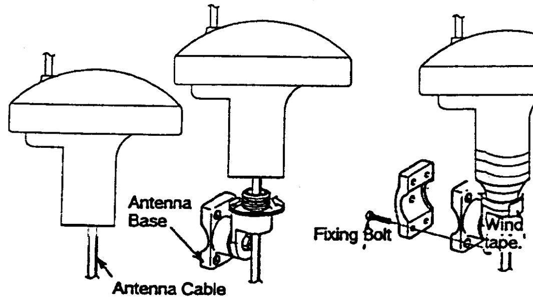
33°
115
0°
-5°
32°
65°
173
0°
65°
98°
0°

Mounting dimensions of antenna base (option)



4-M5 Countersunk
φ61
φ76
45°
90°

C) Handrail mounting



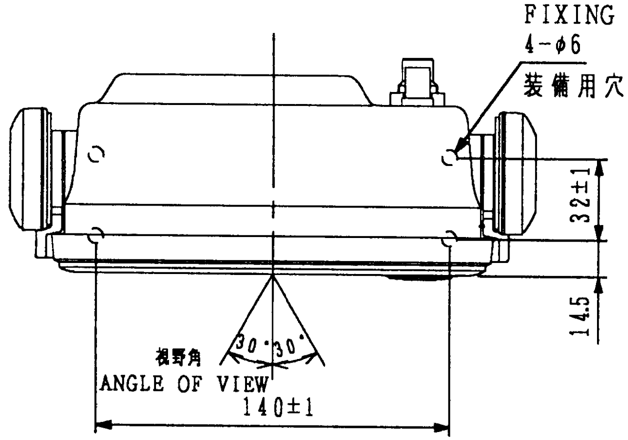
Antenna Base
Antenna Cable
Fixing Bolt
Wind tape.

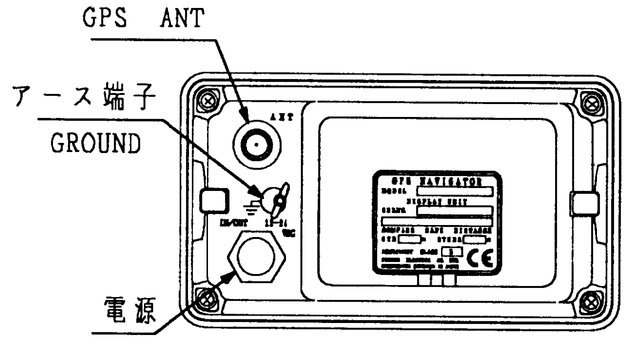
Use handrail mounting base No.13-RC5160 (Code No. 000-861-114, option). The diameter of the handrail may be from φ19mm to φ32mm.

NOTES
1) *Fasten antenna base to antenna first then fix them to handrail.*
2) *When fixing antenna to antenna base, turn antenna base; not the antenna. Turning the antenna may twist the cable and place stress on connector.*

DRAWN Jan. 8 '98 T.YAMASAKI		TITLE GPA-018
CHECKED Jan 8 '98 K.Kusumoki		名称 空中線部
APPROVED Jan 8 '98	GP-35	外寸図
SCALE / MASS 1.5 kg		NAME ANTENNA UNIT
DWG.No. C4385-G01-B		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

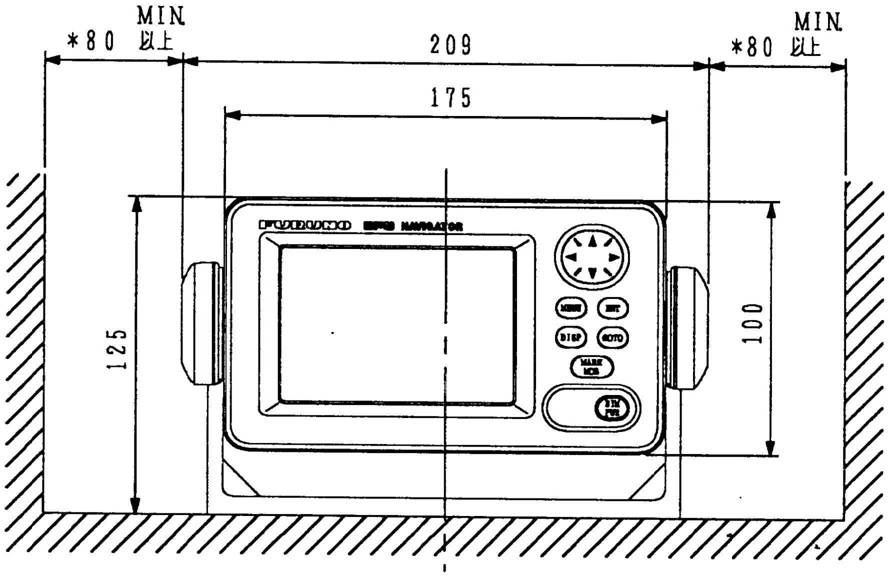

FIXING HOLES
4-φ6
装備用穴
32±1
14.5
視野角
ANGLE OF VIEW
30° 30°
140±1

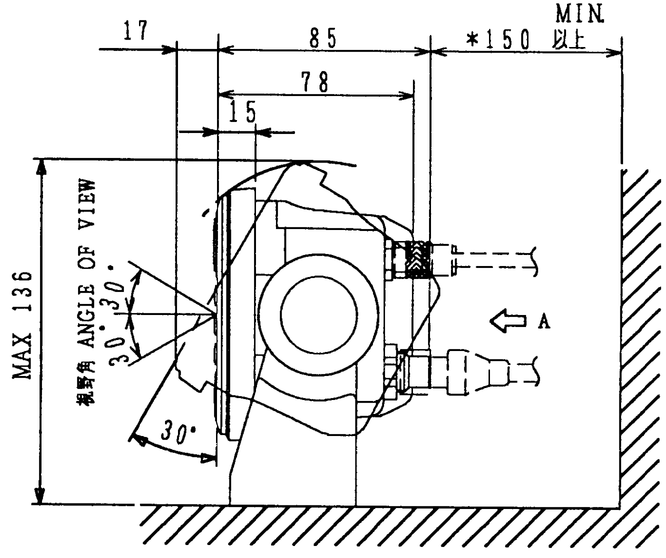

GPS ANT
アース端子
GROUND
電源
SOURCE

A矢視図
VIEW A

範囲 DIMENSIONS	公差 TOL
L≦50	±1mm
50<L≦100	±2mm
100<L≦500	±3mm
500<L≦1000	±4mm
1000<L≦2000	±5mm
2000<L≦4000	±7mm
4000<L≦8000	±10mm
8000<L	±15mm

表 1
TABLE 1


MIN.
*80 以上
209
MIN.
*80 以上
175
125
100

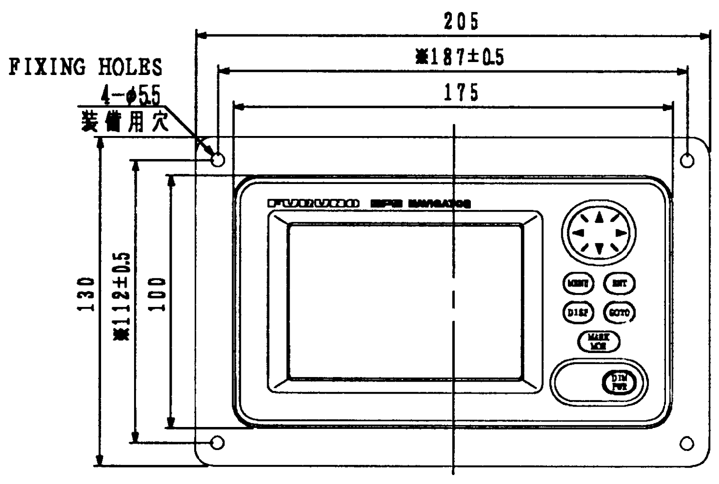

17
85
MIN.
*150 以上
78
15
MAX 136
視野角 ANGLE OF VIEW
30° 30°
30°
A

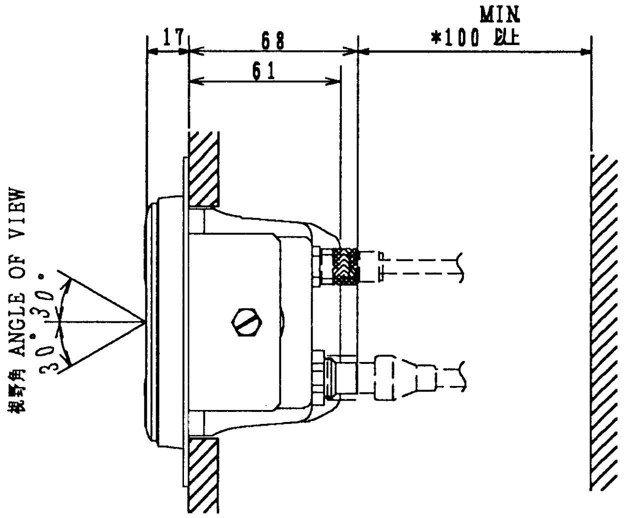
注記　1）＊印寸法は最小サービス空間寸法とする。

NOTE 1: DIMENSIONS WITH "*" INDICATES
RECOMMENDED SERVICE CLEARANCE

DRAWN Dec. 9 '97 T. YAMASAKI		TITLE	GP-30/35
CHECKED Dec 11 '97 K. Kusunoki		名称	GPS受信機　指示部
APPROVED Dec 11 '97 H. Yamaguchi			外寸図
SCALE	MASS 0.6 kg	NAME	GPS RECEIVER DISPLAY UNIT
DWG.No. C4384-G01- B	20-016-1000-G2		OUTLINE DRAWING

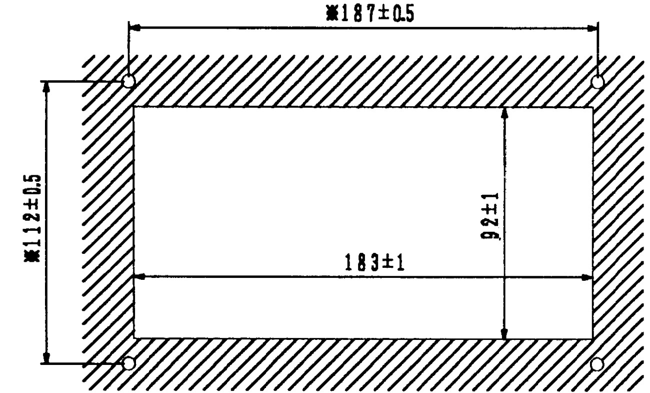
FURUNO ELECTRIC CO., LTD.


205
※187±0.5
175
FIXING HOLES
4-φ5.5
装備用穴
130
※112±0.5
100


17
68
61
MIN
*100 以上
視野角 ANGLE OF VIEW
30°
30°

範囲 DIMENSIONS	公差 TOL
L≦50	±1mm
50<L≦100	±2mm
100<L≦500	±3mm
500<L≦1000	±4mm
1000<L≦2000	±5mm
2000<L≦4000	±7mm
4000<L≦8000	±10mm
8000<L	±15mm

表 1
TABLE 1


※187±0.5
※112±0.5
92±1
183±1

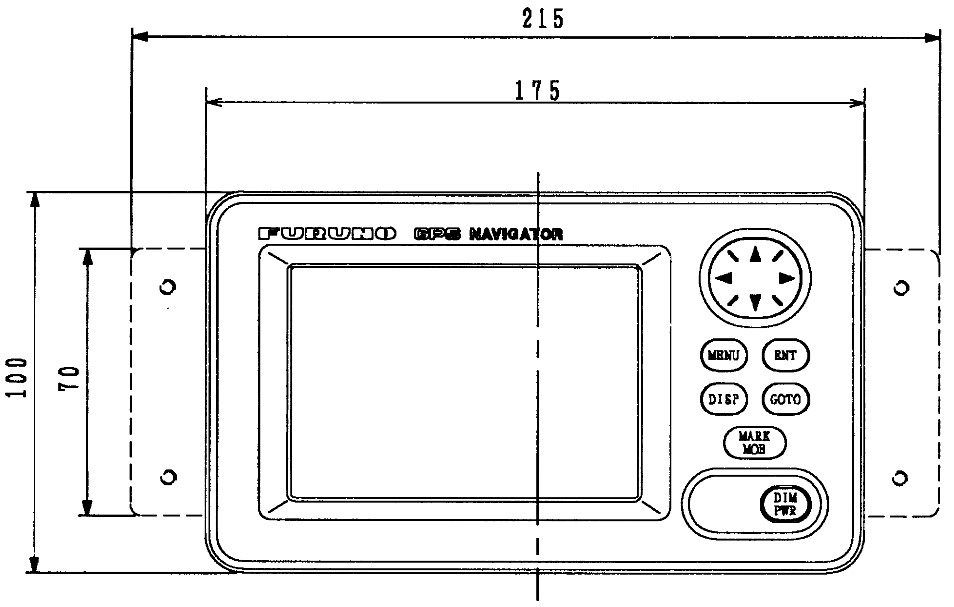
取付穴寸法図（参考図）
CUTTING DIMANSION

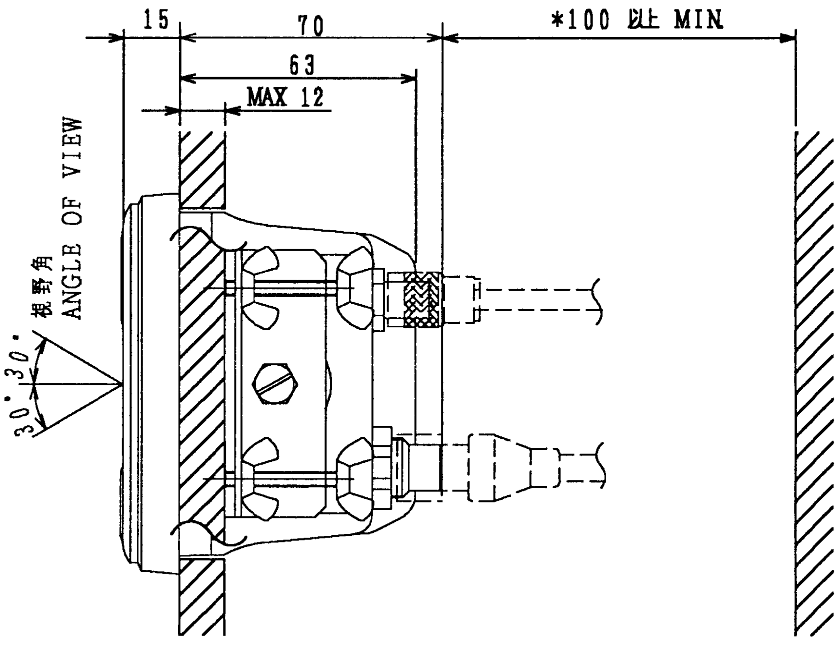
注　記
1）※印寸法は取付穴位置寸法とする。
2）取付ネジはタッピンネジ呼び径5×20を使用。
3）＊印寸法は最小サービス空間寸法とする。

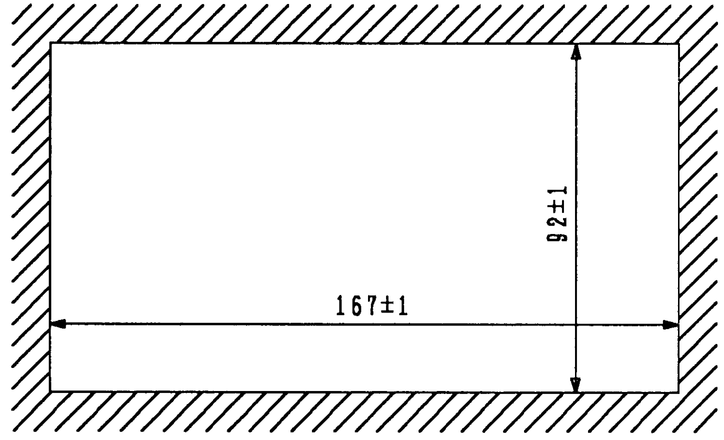
NOTE
1: "※" INDICATES DIMENSION OF FIXING HOLES PITCH
2: USE φ5×20 TAPPING SCREWS FOR FIXING THE UNIT.
3: DIMENSIONS WITH "*" INDICATES
RECOMMENDED SERVICE CLEARANCE.

DRAWN Dec 25 '97 T.YAMASAKI		TITLE GP-30/35
CHECKED Dec 25 '97 K.Kusunoki		名称 指示部 フラッシュマウントF
APPROVED Dec 25 '97 T.Yamaguchi		外寸図
SCALE	MASS 0.6 kg	NAME DISPLAY UNIT FLUSH MOUNT F
DWG No. C4384-G02- B	20-016-1050-G1	OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.


215
175
100
70
FURUNO GPS NAVIGATOR
MENU
ENT
DISP
GOTO
MARK MOB
DIM PWR


15
70
*100 以上 MIN
63
MAX 12
視野角
ANGLE OF VIEW
30°
30°



取付穴寸法図（参考図）
CUTTING DIMENSION

範囲 DIMENSIONS	公差 TOL
L≦50	±1mm
50<L≦100	±2mm
100<L≦500	±3mm
500<L≦1000	±4mm
1000<L≦2000	±5mm
2000<L≦4000	±7mm
4000<L≦8000	±10mm
8000<L	±15mm

表 1
TABLE 1

注　記

1）＊印寸法は最小サービス空間寸法とする。

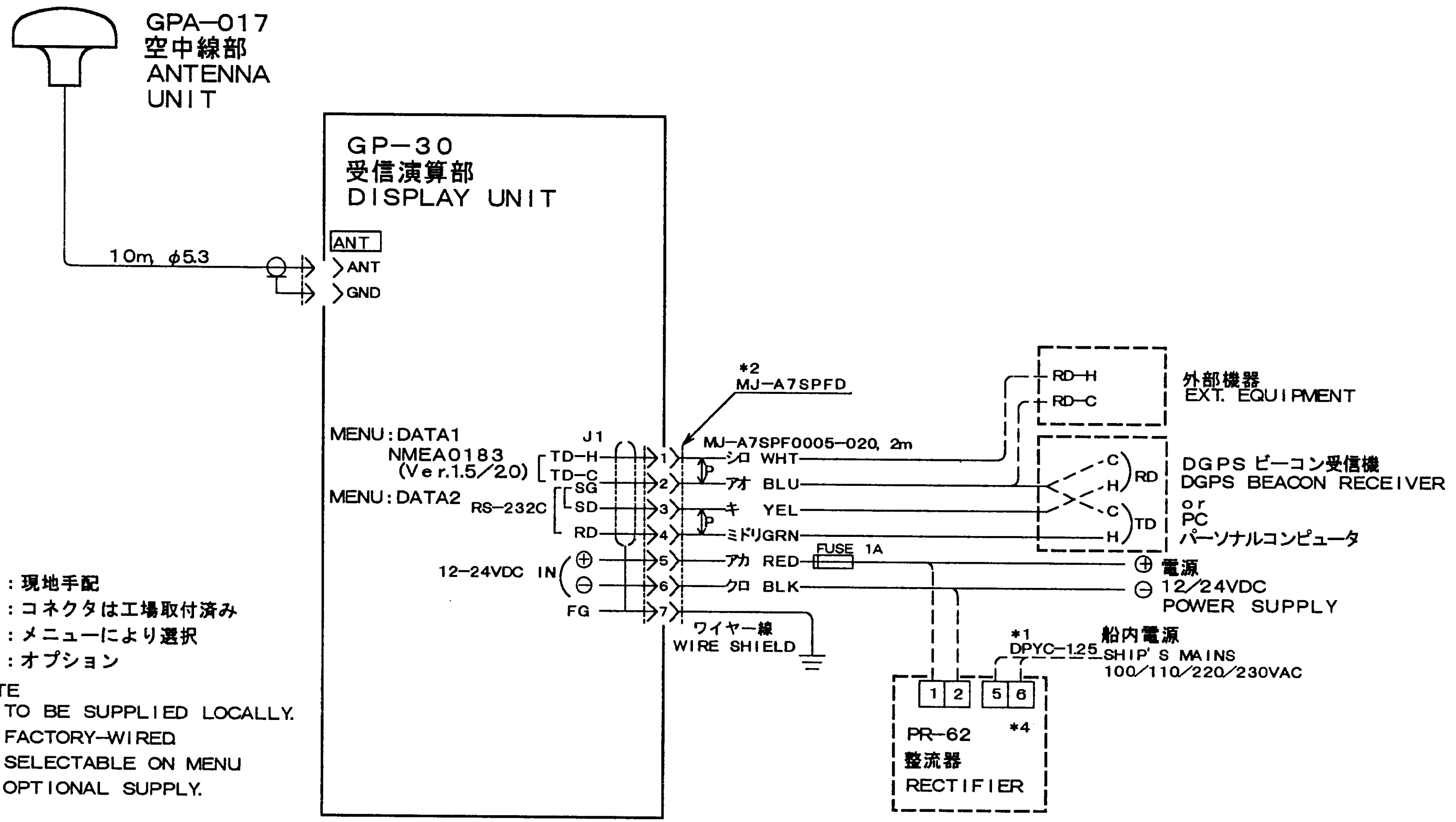
NOTE

1: DIMENSION WITH "*" INDICATES RECOMMENDED SERVICE CLEARANCE

DRAWN Dec 25 '97 T.YAMASAKI	TITLE	GP−30／35
CHECKED Dec 25 '97 K.Kusunoki	名称	指示部　フラッシュマウントS
APPROVED Dec 25 '97 T.Yamaguchi		外寸図
SCALE / MASS 0.6 kg	NAME	DISPLAY UNIT FLUSH MOUNT S
DWG.No. C4384−G03− B / 20−016−1060−G1		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

FURUNO

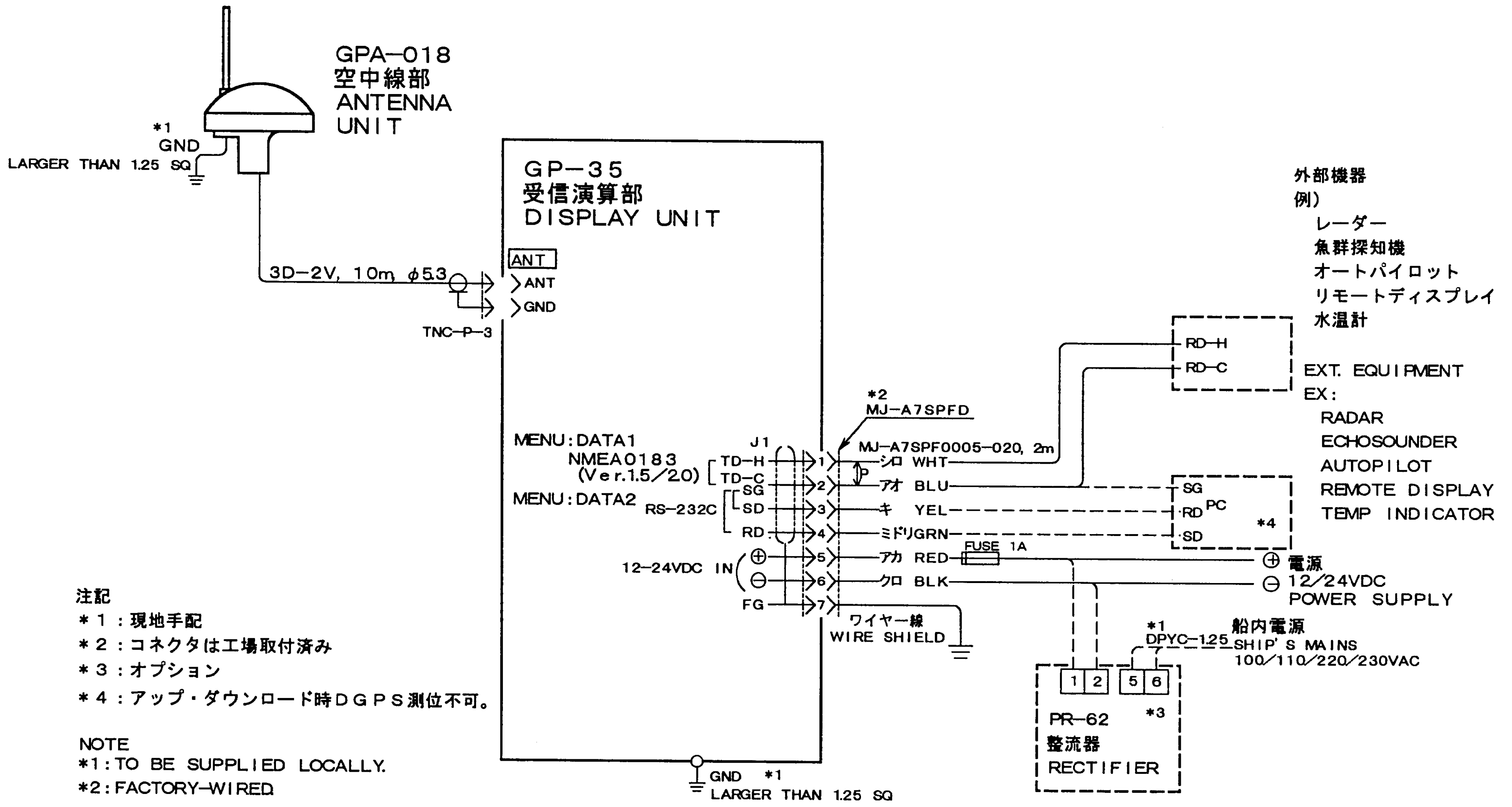

GPA−017
空中線部
ANTENNA UNIT
10m φ5.3
GP−30
受信演算部
DISPLAY UNIT
ANT
ANT
GND
MENU:DATA1
NMEA0183 (Ver.1.5/2.0)
MENU:DATA2
RS−232C
J1
TD−H
TD−C
SG
SD
RD
12−24VDC IN
⊕
⊖
FG
1
2
3
4
5
6
7
P
P
*2
MJ−A7SPFD
MJ−A7SPF0005−020, 2m
シロ WHT
アオ BLU
キ YEL
ミドリGRN
アカ RED
クロ BLK
FUSE 1A
ワイヤー線
WIRE SHIELD
RD−H
RD−C
外部機器
EXT. EQUIPMENT
C
H
RD
C
H
TD
DGPS ビーコン受信機
DGPS BEACON RECEIVER
or
PC
パーソナルコンピュータ
⊕ 電源
⊖ 12/24VDC
POWER SUPPLY
*1
DPYC−1.25
船内電源
SHIP'S MAINS
100/110/220/230VAC
1 2 5 6
PR−62
整流器
RECTIFIER
*4

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

NOTE
*1:TO BE SUPPLIED LOCALLY.
*2:FACTORY−WIRED.
*3:SELECTABLE ON MENU
*4:OPTIONAL SUPPLY.

DRAWN	Jan. 8 '97 T. YAMASAKI	TITLE	GP−30
CHECKED	Jan 8 '97 K. Kusunoki	名称	GPS受信機
APPROVED	Jan 8 '97 Yamaguchi		相互結線図
SCALE	MASS kg	NAME	GPS RECEIVER
DWG.No.	C4384−C01− D		INTERCONNECTION DIAGRAM

FURUNO ELECTRIC CO., LTD.


GPA−018
空中線部
ANTENNA
UNIT
*1
GND
LARGER THAN 1.25 SQ
3D−2V, 10m, φ5.3
TNC−P−3
GP−35
受信演算部
DISPLAY UNIT
ANT
ANT
GND
MENU:DATA1
NMEA0183
(Ver.1.5/2.0)
MENU:DATA2
RS−232C
J1
TD−H
TD−C
SG
SD
RD
12−24VDC IN
⊕
⊖
FG
1
2
3
4
5
6
7
P
*2
MJ−A7SPFD
MJ−A7SPF0005−020, 2m
シロ WHT
アオ BLU
キ YEL
ミドリGRN
アカ RED
クロ BLK
ワイヤー線
WIRE SHIELD
FUSE 1A
GND *1
LARGER THAN 1.25 SQ
RD−H
RD−C
SG
RD
SD
PC
*4
外部機器
例）
レーダー
魚群探知機
オートパイロット
リモートディスプレイ
水温計
EXT. EQUIPMENT
EX:
RADAR
ECHOSOUNDER
AUTOPILOT
REMOTE DISPLAY
TEMP INDICATOR
⊕ 電源
⊖ 12/24VDC
POWER SUPPLY
*1
DPYC−1.25
船内電源
SHIP'S MAINS
100/110/220/230VAC
1
2
5
6
*3
PR−62
整流器
RECTIFIER

注記
＊１：現地手配
＊２：コネクタは工場取付済み
＊３：オプション
＊４：アップ・ダウンロード時ＤＧＰＳ測位不可。

NOTE
*1: TO BE SUPPLIED LOCALLY.
*2: FACTORY-WIRED.
*3: OPTIONAL SUPPLY.
*4: DGPS NAVIGATION IS NOT AVAILABLE DURING UP/DOWN LOADING

DRAWN Jan. 8 '97 T.YAMASAKI
CHECKED Jan 8 '98 K.Kusunoki
APPROVED Jan 8 '98 A.Yamaguchi
SCALE
MASS kg
DWG No. C4385−C01− B

TITLE GP−35
名称 ＧＰＳ航法装置
相互結線図
NAME GPS NAVIGATOR
INTERCONNECTION DIAGRAM

FURUNO ELECTRIC CO., LTD.

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