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.
## Safety Instructions for the Operator

### WARNING

<table>
<thead>
<tr>
<th>Do not open the equipment.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Only qualified personnel should work inside the equipment.</td>
</tr>
<tr>
<td><strong>Immediately turn off the power at the switchboard if water leaks into the equipment or something is dropped in the equipment.</strong></td>
</tr>
<tr>
<td>Continued use of the equipment can cause fire or electrical shock. Contact a FURUNO agent for service.</td>
</tr>
<tr>
<td><strong>Do not disassemble or modify the equipment.</strong></td>
</tr>
<tr>
<td>Fire, electrical shock or serious injury can result.</td>
</tr>
<tr>
<td><strong>Do not place liquid-filled containers on the top of the equipment.</strong></td>
</tr>
<tr>
<td>Fire or electrical shock can result if a liquid spills into the equipment.</td>
</tr>
<tr>
<td><strong>Immediately turn off the power at the switchboard if the equipment is emitting smoke or fire.</strong></td>
</tr>
<tr>
<td>Continued use of the equipment can cause fire or electrical shock. Contact a FURUNO agent for service.</td>
</tr>
<tr>
<td><strong>Make sure no rain or water splash leaks into the equipment.</strong></td>
</tr>
<tr>
<td>Fire or electrical shock can result if water leaks in the equipment.</td>
</tr>
</tbody>
</table>

### WARNING

<table>
<thead>
<tr>
<th>Keep heater away from equipment.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A heater can melt the equipment’s power cord, which can cause fire or electrical shock.</td>
</tr>
<tr>
<td><strong>Use the proper fuse.</strong></td>
</tr>
<tr>
<td>Fuse rating is shown on the equipment. Use of a wrong fuse can result in equipment damage.</td>
</tr>
</tbody>
</table>

### CAUTION

<table>
<thead>
<tr>
<th>Do not use the equipment for other than its intended purpose.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of the equipment as a stepping stool, for example, can result in personal injury or equipment damage.</td>
</tr>
<tr>
<td><strong>No one navigation device should ever be solely replied upon for the navigation of a vessel.</strong></td>
</tr>
<tr>
<td>Always confirm position against all available aids to navigation, for safety of vessel and crew.</td>
</tr>
</tbody>
</table>
**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:

<table>
<thead>
<tr>
<th>Display unit</th>
<th>Standard</th>
<th>Steering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display unit</td>
<td>0.9 m</td>
<td>0.7 m</td>
</tr>
</tbody>
</table>
# TABLE OF CONTENTS

**FOREWORD** .................................................. v

**1. OPERATIONAL OVERVIEW**

1.1 System Configuration .................. 1-1
1.2 Control Description ................... 1-2
1.3 Turning On and Off the Power ....... 1-3
1.4 Adjusting Display Dimmer and Contrast ........................................ 1-3
1.5 Display Modes ......................... 1-4
1.6 Basic Menu Operation ................. 1-7
1.7 Simulator Display ..................... 1-8

**2. PLOTTER DISPLAY OVERVIEW**

2.1 Enlarging/Shrinking the Display .... 2-1
2.2 Shifting the Cursor .................... 2-1
2.3 Shifting the Display ................... 2-2
2.4 Centering Own Ship’s Position ..... 2-2
2.5 Changing Track Plotting Interval, Stopping Plotting of Track ........ 2-2
2.6 Erasing Track .......................... 2-3

**3. WAYPOINTS (MARKS)**

3.1 Entering Waypoints ............... 3-1
3.2 Entering the MOB Mark ............. 3-3
3.3 Displaying Waypoint Name .......... 3-3
3.4 Editing Waypoints on the WYPTS/MARKS List ......................... 3-4
3.5 Deleting Waypoints ................. 3-4

**4. ROUTES**

4.1 Creating a Route .................... 4-1
4.2 Editing a Route ...................... 4-2
4.3 Deleting a Route .................... 4-4

**5. SETTING, CANCELLING DESTINATION**

5.1 Setting Destination by Cursor ...... 5-1
5.2 Setting Destination by Waypoint ... 5-1
5.3 Setting Route as Destination ........ 5-2
5.4 Canceling Destination ............... 5-2

**6. ALARMS**

6.1 Arrival Alarm, Anchor Watch Alarm ........................................ 6-1
6.2 XTE (Cross Track Error) Alarm .... 6-3
6.3 Speed Alarm ........................................ 6-3

**7. OTHER FUNCTIONS**

7.1 Calculating Range, Bearing and TTG ........................................ 7-1
7.2 DGPS Setup ............................. 7-2
7.3 Bearing Reference ..................... 7-2
7.4 Magnetic Variation ..................... 7-3
7.5 Geodetic Chart System ............... 7-3
7.6 Units of Measurement ................. 7-4
7.7 Displaying Position in LOPs ........ 7-4
7.8 Time Difference (using local time) 7-4
7.9 GPS Setup ............................... 7-5
7.10 Uploading, Downloading Waypoint, Route Data ..................... 7-6

**8. MAINTENANCE & TROUBLESHOOTING**

8.1 Maintenance ............................. 8-1
8.2 Displaying the Message Board ...... 8-1
8.3 Displaying the GPS Satellite Monitor Display ............................ 8-1
8.4 Self Test ................................ 8-2
8.5 When “BATTERY ALARM!” Appears ........................................ 8-3
8.6 Clearing Data .......................... 8-3
9. INSTALLATION
9.1 Installation of Display Unit .......... 9-1
9.2 Installation of Antenna Unit .......... 9-1
9.3 Wiring ............................................ 9-2
9.4 Initial Settings .............................. 9-3

APPENDIX
SPECIFICATIONS ............................... A-1
EQUIPMENT LISTS ............................. A-3
GEOETIC CHART LIST ......................... A-4
DGPS REFERENCE STATIONS .......... A-5
LORAN C CHAINS ............................ A-11
DECCA CHAINS ............................... A-12
MENU TREE ..................................... A-13

OUTLINE DRAWINGS ......................... D-1
SCHEMATIC DIAGRAMS ..................... S-1
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

Figure 1-1a GP-30 system configuration

![Diagram of GP-30 system configuration]

Figure 1-1b GP-35 system configuration

![Diagram of GP-35 system configuration]

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

*2: Equipped with DGPS beacon receiver.
1.2 Control Description

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

Selects display mode.

---

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

**MENU**
**ENT**

Registers items on menus.

**DISP**
**GOTO**

Sets/cancels destination.

**MARK**
**MOB**

Inscribes mark, MOB mark on the display.

**DIM**
**PWR**

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

<table>
<thead>
<tr>
<th>Indication</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>2D</td>
<td>Normal 2D GPS position fix</td>
</tr>
<tr>
<td>DOP</td>
<td>GPS position fix with DOP more than 4</td>
</tr>
<tr>
<td>3D</td>
<td>Normal 3D GPS position fix</td>
</tr>
<tr>
<td>DOP</td>
<td>DOP (DOP more than 6)</td>
</tr>
<tr>
<td>D2D</td>
<td>Normal differential GPS position fix</td>
</tr>
<tr>
<td>DOP</td>
<td>Differential GPS position fix with DOP more than 4</td>
</tr>
<tr>
<td>D3D</td>
<td>Normal 3D differential GPS position fix</td>
</tr>
<tr>
<td>DOP</td>
<td>Differential GPS position fix with DOP more than 6</td>
</tr>
<tr>
<td>SIM</td>
<td>Simulation mode.</td>
</tr>
</tbody>
</table>

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.

![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.

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.

![Plotter Display Diagram](image)

*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.

![Highway Display Diagram](image)

*Figure 1-6 Highway display*
**Steering Display**

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

![Figure 1-7 Steering display](image)

**Nav Data Display**

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

![Figure 1-8 Nav data display](image)
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](image)

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

![Figure 1-10 PLOTTER SETUP menu](image)

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](image)

5. Press ▲ or ▼ to select option desired.


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.

![Figure 1-12 SYSTEM SETUP menu](image)

3. Press ▼ to select the TIME DIFF line.

4. Press the [ENT] key. A cursor circumscribes “+”. The cursor selects the data to change.

![Figure 1-13 SYSTEM SETUP menu, TIME DIFF line selected](image)

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.
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*


```
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.
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
```

*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.


![ZOOM IN/OUT?](image)

**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](image)

**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.

![Cursor state and data](image)

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

![Track Recording Method Selection Window](image)

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.

![ERASE Menu](image)

Figure 2-8 ERASE menu

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

   ![Prompt for Erasure of Track](image)

   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.

   **Figure 3-1 Waypoint entry window-1**
   
   | ENTER A NEW WYPT NAME. |
   | 0 0 1 – – – ? |
   | ( 001: DEFAULT NAME ) |

   Quit : [MENU]

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

   **Figure 3-3 Mark sequence**
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.

```
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.


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

*Figure 3-5 WYPTS/MARKS menu*

4. Press the [ENT] key.

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

*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?
```

*Figure 3-7 Screen for entering waypoint latitude and longitude*

*Present position*

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**

   **Exit?**  **MOB?**

   *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?**

   **YES**  **NO**

   *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.

   ![MOB position set as destination](image)

### 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.

   **DSP GOTO**  **DSP ALL**

   *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.

Figure 3-12 CREATE, RENAME prompt

7. Change position, mark shape, comment as desired.

3.5 Deleting Waypoints

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

Figure 3-13 ERASE menu

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

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.

Figure 3-15 ERASE prompt

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

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.

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.

Figure 4-2 Routes menu

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

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 ---

<table>
<thead>
<tr>
<th>NO</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>KOBE → OSAKA</td>
<td></td>
</tr>
</tbody>
</table>

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.

--- Window for editing waypoint in route ---

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

--- Waypoint screen ---

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.

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 prompt ---

10. Select Exit?.
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.
7. Select REMOVE?.
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.
7. Select INSERT?.
9. Press ▲ or ▼ to select waypoint.
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.

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.
7. Place the cursor in the 2nd intermediate waypoint.
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.
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 ?](image)

   **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.
   ![Figure 5-1 GOTO window]
2. Select CURSOR?.
3. Press the [ENT] key.
   ![Figure 5-2 Cursor appearance when setting destination by cursor]
   2D [40 40] n m
   BRG: + 72°
   RNG: + 54.5 n
   34°44.000N 135°21.000E
   Cursor appears with "?".
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.
   ![Figure 5-4 GOTO WYPT list]
   NEW? MOB CURSOR OSAKA KOBE START
   ------ ------ ------ ------
   ------ ------ ------ ------
   ------ ------ ------ ------
   ------ ------ ------ ------
   ------ ------ ------ ------
   ------ ------ ------ ------

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]

1. [NEW?]
2. KOBE → OSAKA

Figure 5-5 GOTO ROUTE list

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

![FORWARD? REVERSE?]

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

![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.
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.)

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](image)

1. Press the [MENU] key twice.
2. Select ALARMS.

![Figure 6-3 ALARMS menu](image)
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](image)

5. Press the [ENT] key. Enter the alarm range (0.01 – 99.99 nm) with the Cursor Pad.


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](image)

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.
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.

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.
7. Enter alarm range with the Cursor Pad.

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.

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.

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

5. Select WAYPOINTS and 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.

10. Select AUTO or MANU. AUTO uses ship’s average speed; MANU is for manual entry of speed.
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.

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.
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.

![Figure 7-5 Typical calculation display (route)](image)

### 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.
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.
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.
4. Select the BRG. REF. line.

5. Press the [ENT] key. The following window appears.

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.

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.
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.
3. The cursor is on the first line. Press the [ENT] key. The following window appears.
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.
4. Press ▲ or ▼ to display + or −.
5. Enter time difference with the Cursor Pad.
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 :    – –  – –
```

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”.

---

Figure 7-12 GPS SETUP menu
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**

<table>
<thead>
<tr>
<th>IN/OUT</th>
<th><strong>PC/AT</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 TD</td>
<td>1 DSUB 9-pin (EIA-574)</td>
</tr>
<tr>
<td>2 SG</td>
<td>2 (GND)</td>
</tr>
<tr>
<td>3 SD</td>
<td>3 (RxD)</td>
</tr>
<tr>
<td>4 RD</td>
<td>4 (TxD)</td>
</tr>
<tr>
<td>5 +</td>
<td>5 (DTR)</td>
</tr>
<tr>
<td>6 ☓</td>
<td>6 (DSR)</td>
</tr>
<tr>
<td>7 FG</td>
<td>7 (RTS)</td>
</tr>
</tbody>
</table>

(Blue) (Yellow) (Green) (Red) (Black)

12/24 VDC

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?.

**Figure 7-14 I/O SETUP menu**
3. Press the [ENT] key.

![Figure 7-15 SAVE WP/RTE display](image)

4. Press the [ENT] key.

![Figure 7-16 SAVING START? prompt](image)

5. Operate the computer to receive data there.


![Figure 7-17 Displays when downloading data](image)

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.

![Figure 7-18 LOAD WP/RTE display](image)

4. Press the [ENT] key.

![Figure 7-19 LOADING START? prompt](image)

5. Press the [ENT] key.

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

![Figure 7-20 Display when data is being loaded](image)

6. Operate the computer to output data from the computer.

7. When data loading is finished, the following message appears.

![Figure 7-21 Display when data is loaded successfully](image)

8. Press any key to escape.
Waypoint data format

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Waypoint latitude</td>
</tr>
<tr>
<td>2</td>
<td>N/S</td>
</tr>
<tr>
<td>3</td>
<td>Waypoint longitude</td>
</tr>
<tr>
<td>4</td>
<td>E/W</td>
</tr>
<tr>
<td>5</td>
<td>Waypoint name (Number of characters is fixed to 6 and space code is placed when the number of characters are less than 6.)</td>
</tr>
<tr>
<td>6</td>
<td>Waypoint color (This field is always kept NULL.)</td>
</tr>
<tr>
<td>7</td>
<td>Waypoint comment (2 byte for mark code + 16 characters of comment.)</td>
</tr>
</tbody>
</table>
| 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: (t) 0x14: (u)
0x15: (v) 0x16: (w) 0x17: (x) 0x18: (y)
```

*Figure 7-22 Waypoint data format*

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

![MESSAGE board image]

Figure 8-1 MESSAGE board

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.

### Messages

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


   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.)

<table>
<thead>
<tr>
<th>SELF TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROM : OK</td>
</tr>
<tr>
<td>RAM : OK</td>
</tr>
<tr>
<td>DATA2 : OK</td>
</tr>
<tr>
<td>BEACON : OK</td>
</tr>
<tr>
<td>BATTERY : OK</td>
</tr>
<tr>
<td>RTC : OK</td>
</tr>
</tbody>
</table>

   No. of consecutive tests

   205-1111-XXX (STOP: PWR OFF)

   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.

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.

   **MENU SETTINGS TO DEFAULT?**
   
   **ARE YOU SURE?**
   
   **YES**  **NO**

   *Figure 8-8 Prompt for erasure of menu settings*

4. Press the [ENT] key.

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.

```
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.
9.1 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

![Tabletop and Overhead Mounting](image)

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.

![Connector Assembly](image)

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.

![Figure 9-3 Wiring](image)

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

![Figure 9-4 How to fix spring in fuse holder](image)

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.

<table>
<thead>
<tr>
<th>Menu Item</th>
<th>Output data sentences</th>
</tr>
</thead>
<tbody>
<tr>
<td>NMEA-REM</td>
<td>BWC, GGA, GLL, RMC, RMB, VTG, ZDA</td>
</tr>
<tr>
<td>NMEA-AP</td>
<td>GLL, APB, BOD, XTE, AAM, VTG</td>
</tr>
</tbody>
</table>

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.

![Figure 9-5 I/O SETUP menu](image)

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.

![Figure 9-6 Screens for output and NMEA version setup](image)

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

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) ≤ 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

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Qty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display Unit</td>
<td>GP-35</td>
<td>1</td>
<td>BEACON board incorporated</td>
</tr>
<tr>
<td>Display Unit</td>
<td>GP-30</td>
<td>1</td>
<td>No BEACON board</td>
</tr>
<tr>
<td>Antenna Unit</td>
<td>GPA-018</td>
<td>1</td>
<td>For GP-35, GPS/DGPS beacon antenna w/10 m cable</td>
</tr>
<tr>
<td>Antenna Unit</td>
<td>GPA-017</td>
<td>1</td>
<td>For GP-30, with 10 m cable</td>
</tr>
<tr>
<td>Installation Materials</td>
<td>1 set</td>
<td></td>
<td>• Power cable</td>
</tr>
<tr>
<td>Installation Materials</td>
<td></td>
<td></td>
<td>• Tapping screw (4 pcs.)</td>
</tr>
<tr>
<td>Installation Materials</td>
<td></td>
<td></td>
<td>• Spring washer</td>
</tr>
<tr>
<td>Spare Parts</td>
<td></td>
<td>1 set</td>
<td>Fuse (2 pcs.)</td>
</tr>
</tbody>
</table>

## Optional Equipment

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Code No.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flush Mount Kit S</td>
<td>OP20-17</td>
<td>000-040-720</td>
<td>For display unit</td>
</tr>
<tr>
<td>Flush Mount Kit F</td>
<td>OP20-29</td>
<td>000-041-405</td>
<td></td>
</tr>
<tr>
<td>Right Angle Antenna Base</td>
<td>No.13-QA330</td>
<td>000-803-239</td>
<td>For antenna unit</td>
</tr>
<tr>
<td>L-type Antenna Base</td>
<td>No.13-QA310</td>
<td>000-803-240</td>
<td></td>
</tr>
<tr>
<td>Handrail Antenna Base</td>
<td>No.13-RC5160</td>
<td>000-807-114</td>
<td></td>
</tr>
<tr>
<td>Mast Mount Kit</td>
<td>CP20-01111</td>
<td>004-365-780</td>
<td></td>
</tr>
<tr>
<td>GP-30 Modification Kit</td>
<td></td>
<td></td>
<td>Internal DGPS beacon receiver</td>
</tr>
<tr>
<td>Rectifier</td>
<td>PR-62</td>
<td>000-013-485</td>
<td>For 110 VAC mains</td>
</tr>
<tr>
<td></td>
<td></td>
<td>000-013-486</td>
<td>For 220 VAC mains</td>
</tr>
</tbody>
</table>
001: WGG64
002: WGS72
003: TOKYO
004: NORTH AMERICAN 1927
005: EUROPEAN 1950
006: AUSTRALIAN GEODETIC 1984
007: ADIDANDAN
008: 009:
010: AFG
012: AIN EL ABD 1970
014: ANNA 1 ASTRO 1965
015: ARC 1950
016: 017: 018: 019: 020: 021: 022:
023: ARC 1960
024: 025: ASCENSION IS. 1958
026: ASTRO BEACON "E" 1958
028: ASTRO BM SOR. ATOLL 1959
029: ASTRO POS 714
030: ASTRONOMIC STATION 1952
031: AUSTRALIAN GEODETIC 1966
032: BELLEVUE (IGN)
033: BERLIN 1957
034: BOGOTA OBSERVATORY
035: CALIFORNIA INCHAUPE
036: CANTON IS. 1966
037: CAYMAN IS.
038: CAPE CANAVERAL
039: CARTHAGE
040: CHATHAM 1971
041: CHUO ASTRO
042: CORREIGE ALEGRE
043: DJAKARTA (BATAVIA)
044: DUS 1966
045: EASTER IS. 1967
046: EUROPEAN 1950 (Cont'd)
047: 048: 049:
087: MAPARIMA, BWI
088: NORTH AMERICAN 1927
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
106: Alaska
107: Canada
108: CONUS
109: Mexico, Central America
110: OBSERVATORIO 1966
111: OLD EGYPTIAN 1930
112: OLD HAWAIIAN
113: Hawaii
114: Kauai
115: Maui
116: OAHU
117: ORDINANCE SURVEY OF GREAT BRITAIN 1936: Mean Value
118: England
119: England, Isle of Man & Wales
120: Scotland, & Shetland Islands
121: Wales
122: PICOS DE LAS NIVES
123: PITCAIRN ASTRO 1967
124: PROVISIONS SOUTH CHILEAN 1963: South Chile (near 53° S)
125: PROVISIONAL SOUTH AMERICAN 1956: Mean Value
126: Bolivia
127: Chile-Northern Chile (near 15° S)
128: Chile-Southern Chile (near 43° S)
129: Columbia
130: Ecuador
131: French Guiana
132: Peru
133: Venezuela
134: PUERTO RICO
135: QATAR NATIONAL
136: CORINCO
137: ROME 1940
138: SANTA BRAZ
139: SANTO (DOS)
140: SARFETY HILL 1943
141: SOUTH AMERICAN 1969
142: Argentina
143: Bolivia
144: Brazil
145: Chile
146: Columbia
147: Ecuador
148: Guyana
149: Paraguay
150: Peru
151: Trinidad & Tobago
152: 153: SOUTH ASIA
154: SOUTHEAST BASE
155: SOUTHWEST BASE
156: TIMBALAI 1948
157: TOKYO
The following table shows the updated DGPS reference stations (as of May 1998), including the expected stations.

<table>
<thead>
<tr>
<th>Location</th>
<th>Freq.</th>
<th>Latitude</th>
<th>Longitude</th>
<th>MSK Rate</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALEXANDRIA</td>
<td>305</td>
<td>N38.45</td>
<td>W77.07</td>
<td>100</td>
<td>VA,USA</td>
</tr>
<tr>
<td>ANNETTE ISLAND</td>
<td>323</td>
<td>N55.04</td>
<td>W131.36</td>
<td>100</td>
<td>AK,USA</td>
</tr>
<tr>
<td>APPLETON</td>
<td>300</td>
<td>N45.47</td>
<td>W121.19</td>
<td>100</td>
<td>WA,USA</td>
</tr>
<tr>
<td>ARANSAS PASS</td>
<td>304</td>
<td>N27.50</td>
<td>W97.04</td>
<td>100</td>
<td>TX,USA</td>
</tr>
<tr>
<td>BARBERS PT</td>
<td>325</td>
<td>N21.18</td>
<td>W158.07</td>
<td>100</td>
<td>HI,USA</td>
</tr>
<tr>
<td>BASS HARBOR</td>
<td>316</td>
<td>N44.13</td>
<td>W68.20</td>
<td>100</td>
<td>ME,USA</td>
</tr>
<tr>
<td>BRUNSWICK</td>
<td>316</td>
<td>N43.53</td>
<td>W69.57</td>
<td>100</td>
<td>ME,USA</td>
</tr>
<tr>
<td>BUFFALO</td>
<td>322</td>
<td>N42.52</td>
<td>W78.54</td>
<td>100</td>
<td>NY,USA</td>
</tr>
<tr>
<td>C.MENDOCINO</td>
<td>292</td>
<td>N40.26</td>
<td>W124.24</td>
<td>100</td>
<td>CA,USA</td>
</tr>
<tr>
<td>CAPE CANAVERAL</td>
<td>289</td>
<td>N28.28</td>
<td>W80.33</td>
<td>100</td>
<td>FL,USA</td>
</tr>
<tr>
<td>CAPE HENLOPEN</td>
<td>298</td>
<td>N38.47</td>
<td>W75.05</td>
<td>200</td>
<td>DE,USA</td>
</tr>
<tr>
<td>CAPE HENRY</td>
<td>289</td>
<td>N36.56</td>
<td>W76.00</td>
<td>100</td>
<td>VA,USA</td>
</tr>
<tr>
<td>CAPE HINCHEN-BROOK</td>
<td>292</td>
<td>N60.14</td>
<td>W146.39</td>
<td>100</td>
<td>AK,USA</td>
</tr>
<tr>
<td>CHARLESTON</td>
<td>298</td>
<td>N32.45</td>
<td>W79.51</td>
<td>100</td>
<td>SC,USA</td>
</tr>
<tr>
<td>CHATHAM</td>
<td>325</td>
<td>N41.40</td>
<td>W69.57</td>
<td>200</td>
<td>MA,USA</td>
</tr>
<tr>
<td>CHEBOYGAN</td>
<td>292</td>
<td>N45.39</td>
<td>W84.28</td>
<td>200</td>
<td>MI,USA</td>
</tr>
<tr>
<td>COLD BAY</td>
<td>289</td>
<td>N55.06</td>
<td>W162.32</td>
<td>100</td>
<td>AK,USA</td>
</tr>
<tr>
<td>DETROIT</td>
<td>319</td>
<td>N42.18</td>
<td>W83.06</td>
<td>200</td>
<td>MI,USA</td>
</tr>
<tr>
<td>DULUTH</td>
<td>296</td>
<td>N46.47</td>
<td>W92.05</td>
<td>100</td>
<td>MN,USA</td>
</tr>
<tr>
<td>EGGMONT KEY</td>
<td>312</td>
<td>N27.36</td>
<td>W82.46</td>
<td>200</td>
<td>FL,USA</td>
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A) Mast mounting

- Use mast mounting kit CP21-0111L
- Use a pipe only.

B) Antenna base mounting

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

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<th>32° to 65°</th>
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<td>L-type antenna base No.13-QA310 (code No. 000-803-240)</td>
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C) Handrail mounting

Use handrail mounting base No.13-RCS160 (Code No. 000-851-14, optional). 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.

**Mounting location**

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

**Mounting dimensions of antenna base (option)**

**Thread dimension (for pipe)**

- Thread Type: L8UN10
- Threads per 25.4mm (1 inch): 14
- Pitch: 1.143 mm
- Thread Length: 19 mm or more
- Pitch Diameter: 9.047 mm
A) Mast mounting
1) Use mast mounting kit C220-0111L
2) Use a pipe only

- Use slack here to relieve stress on cable joint
- Keep cable aside to avoid injury from pipe.

B) Antenna base mounting
Use optional antenna base No.13-QA300 or No.13-QA310.

- Inclination: -5° to 33°, 32° to 65°, 65° to 99°

Right angle antenna base No.13-QA300 (code No. 000-093-293)
L-type antenna base No.13-QA310 (code No. 000-093-240)

C) Handrail mounting
Use handrail mounting base No.13-RC5160
(Code No. 900-861-114, 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.

Mounting dimensions of antenna base (option)

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

- Distance depends on mast diameter of φ
  1) mast diameter 10cm: minimum 15m
  2) mast diameter 30cm: minimum 3m

- Use 12m or shorter whip do not use longer one.
**注意**
1. 印寸法は取付欠位置寸法とする。
2. 取付ネジはタッピングネジスrews for fixing the unit。520を使用。
3. *印寸法は最小サービス空間寸法とする。

**NOTE**
1. *W* INDICATES DIMENSION OF FIXING HOLES PITCH.
2. USE #15×20 TAPPING SCREWS FOR FIXING THE UNIT.
3. DIMENSIONS WITH "*" INDICATES RECOMMENDED SERVICE CLEARANCE.

**TABLE 1**

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<tr>
<td>51 ≤ L ≤ 100</td>
<td>±2 mm</td>
<td></td>
</tr>
<tr>
<td>101 ≤ L ≤ 500</td>
<td>±3 mm</td>
<td></td>
</tr>
<tr>
<td>501 ≤ L ≤ 1000</td>
<td>±4 mm</td>
<td></td>
</tr>
<tr>
<td>1001 ≤ L ≤ 2000</td>
<td>±5 mm</td>
<td></td>
</tr>
<tr>
<td>2001 ≤ L ≤ 4000</td>
<td>±7 mm</td>
<td></td>
</tr>
<tr>
<td>4000 ≤ L ≤ 8000</td>
<td>±10 mm</td>
<td></td>
</tr>
<tr>
<td>8000 ≤ L</td>
<td>±15 mm</td>
<td></td>
</tr>
</tbody>
</table>

**DRAWN**

**CHECKED**

**APPROVED**

**SCALE**

**NAME**

**MATERIAL 0.6 kg**

**NAME**

**DISPLAY UNIT FLUSH MOUNT F**

**FURUNO ELECTRIC CO., LTD.**
注記
1）*印は最小サービス間隔を表す。

NOTE
1: DIMENSION WITH * INDICATES RECOMMENDED SERVICE CLEARANCE