FURUNO

OPERATOR'S MANUAL

Dual GPS

MODEL   GP-90-DUAL

FURUNO ELECTRIC CO., LTD.
NISHINOMIYA, JAPAN

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PUB.No. OME-44271

(TENI) GP-90 DUAL

Your Local Agent/Dealer

FIRST EDITION : SEP. 2003

00014754100

OME44271A00

⚠ SAFETY INSTRUCTIONS

⚠ WARNING

⚡ **Hazardous voltage.
Can shock.**

Do not open the cover.
Only qualified personnel should work inside the equipment.

Do not dissasemble or modify the equipment.

Fire, electrical shock or serious injury can result.

Turn off the power immediately if water leaks into the equipment, or the equipment is emitting smoke or fire.

Continued use of the equipment can cause fire or electrical shock.

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.

Keep heater away from equipment.

Heat can alter equipment shape and melt the power cord, which can cause fire or electrical shock.

⚠ CAUTION

Use the proper fuse.

Use of a wrong fuse can result in fire or permanently damage the equipment.

Power the equipment with the proper power supply.

Powering the equipment with a wrong power supply can permanently damage the equipment.

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FOREWORD

A Word to GP-90-DUAL Owners

Congratulations on your choice of the FURUNO GP-90-DUAL dual differential GPS navigation system. We are confident you will see why the FURUNO name has become synonymous with quality and reliability.

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

This equipment is designed and constructed to meet the rigorous demands of the marine environment. However, no machine can perform its intended function unless operated and maintained properly. Please carefully read and follow the recommended procedures for 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-90-DUAL consists of two dual differential GPS navigator systems and an interface unit. Each GPS navigator consists of a display unit combining a GPS receiver, beacon receiver and video plotter, a GPS antenna and a beacon antenna. The interface unit functions to exchange data between the GPS navigators and external equipment. A high sensitivity receiver tracks up to 12 satellites simultaneously. An 8-state Kalman filter ensures optimum accuracy in determination of vessel position, course and speed.

The main features of the GP-90-DUAL are

- Comprehensive navigation data displays
- Storage for 999 waypoints and 30 routes
- Alarms: Waypoint Arrival, Anchor Watch, Cross track Error, Speed, Water Temperature, Depth, and Trip
- Man overboard feature records latitude and longitude coordinates at time of man overboard and provides continuous updates of range and bearing to that point.
- Menu-driven operation
- Bright 122 x 92 mm LCD with temperature compensated tone and brilliance adjustment
- Power consumption is a low 10 W per navigator.
- Connection of autopilot (option) - steering data output to autopilot
- Digital display of water temperature and depth with connection of video sounder having IEC 61162-1/NMEA input
- Memory stores 2,000 points of track and marks.
- 3D "Highway" display shows ship's track overlaid on intended course.
- Position may be shown in latitude and longitude or LOP (Loran or Decca).
- Navaid information (lighthouse data, lighted buoys, etc.) can be displayed by downloading database from personal computer.
- Fully meets the following regulations: IMO MSC. 112(73), IEC 61162-2 and IEC 61108-1.

Program No.

2051513-02.02 (August. 2003)

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SYSTEM CONFIGURATION

```
┌─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─┐        ┌─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─┐
│   ┌───────────────┐    │        │   ┌───────────────┐    │
│   │     GPS       │    │        │   │     GPS       │    │
│   │   ANTENNA     │    │        │   │   ANTENNA     │    │
│   │GPA-017S/018S/019S  │        │   │GPA-017S/018S/019S  │
│   └───────┬───────┘    │        │   └───────┬───────┘    │
│           │            │        │           │            │
│   ┌───────┴───────┐    │        │   ┌───────┴───────┐    │
│   │               │    │        │   │               │    │
│   │  DISPLAY UNIT ├────┼────────┼───┤  DISPLAY UNIT │    │
│   │  GP-90-DUAL   │    │        │   │  GP-90-DUAL   │    │
│   │               │    │        │   │               │    │
│   └───────┬───────┘    │        │   └───────┬───────┘    │
└─ ─ ─ ─ ─ ─┼─ ─ ─ ─ ─ ─┘        └─ ─ ─ ─ ─ ─┼─ ─ ─ ─ ─ ─┘
            │                                  │
      ┌─────┴──────────────────────────────────┴─────┐
      │          INTERFACE UNIT IF-2500               │
      └───────────────────────────────────────────────┘
```

Position, waypoint, etc.
(RS-422/Current loop)

Position, etc.
(Current loop)

Arrival
alarm

Cross track
error alarm

Abnormal receiving
alarm

CATEGORY OF UNITS

Unit	Category
ANTENNA UNIT	Exposed to weather
DISPLAY UNIT	Protected from weather

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MENU TREE

Main menu

```
┌──────────┐
│  MENU    │
│  ESC     │──── 1. DISPLAY SETUP ──────── Grid (Dark, Light, Off)
└──────────┘                              Course Bar (Dark, Light, Off)
                                          Time Mark (Dark, Light, Off)
                                          Waypoint Size (Large, Small)
                                          Cursor Size (Large, Small)

            2. TRACK/MARK SETUP ──────── Track Rec (Time, Dist)
                                          Mark Shape ( ○ □ ◇ ✕ ⛫ ⊔ •
                                              🐟 🦆 🦀 🦞 ⛰ ◤ )
                                          Mark Line ( • , ──── , ---- , —·— )
                                          Event Mark ( ▽ △ ◎ ☆
                                              🐟 🦆 🦀 🦞 ⛰ ◤ )

            3. ERASE TRACK/MARK ──────── Erase Track (No, Yes)
                                          Erase Mark (No, Yes)

            4. ALARM SETTINGS ─────────── Arrival/Anchor (Arr., Anc., Off)
                                              └─ Alarm Range (0.500 nm)
                                          XTE (On, Off)
                                              └─ Alarm Range (0.250 nm)
                                          Ship Speed (In, Over, Off)
                                              └─ Speed Range (011.0 - 015.0 kt)
                                          Trip (CLR:Reset) (On, Off)
                                              └─ Trip Range (0100.00 nm)
                                          Water Temp. (In, Over, Off)
                                              └─ Temp. Range (+11.0 - +15.0 °C)
                                          Depth (In, Over, Off)
                                              └─ Depth Range (0011.0 - 0015.0 ft)
                                          DGPS ALARM (On, Off)

            5. MANUAL CALCULATION ─────── From
                                          To
                                          Trial Speed (Auto, Man)
                                                      (010.0 kt)
            6.

            7. GPS MONITOR ─────────────── SATELLITES MONITOR
                         ↻                  BEACON RCVR MONITOR
                                            STATION MESSAGE

            8. SELF TESTS ─────────────── 1. Memory, I/O Port Test
                                          2. Keyboard Test
                                          3. Test Pattern
                                          4. Automatic Testing

            ①
```

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MENU TREE

①

9. SYSTEM SETTINGS

├─ 1. PLOTTER SETUP ┬─ Memory Apportion (Trk: 1000/2000 Pt)
│   ├─ Bearing Ref. (True, **Mag**)
│   ├─ Mag Variation (**Auto**, Man)
│   │   (07°W) (00°E)
│   ├─ Calculation (**RL**, GC)
│   └─ User defined #1 ◀ RNG ▶   SOG, COG, RNG, BRG,
│   #2 ◀ SOG ▶   W. TMP, W. DPT, XTE, dCOG,
│   #3 ◀ BRG ▶   AVR SOG, AVR COG, TTG, ETA,
│   #4 ◀ COG ▶   TRIP, TRIP TM, RT. DIST, RT. TTG,
│   RT. ETA, ALT, VTD

├─ 2. UNIT SETUP ┬─ Unit of Distance (**nm**, km, sm)
│   ├─ Unit of Depth (m, **ft**, FA)
│   ├─ Unit of Temp. (°**C**, °F)
│   └─ Unit of Altitude (m, **ft**)

├─ 3. DATA1, 3 OUTPUT SETUP ┬─ Data Fmt. (V1.5, **V2.0**, IEC)
│   ├─ Talker ID (**GP**, LC, DE)
│   └─ Output Data
│
│   AAM: 00, APA: 00, APB: 01, BOD: 00,
│   BWR: 00, BWW: 00, GGA: 01, GLL: 00,
│   RMB: 01, RMC: 01, VTG: 01, WCV:00,
│   WNR: 00, WPL: 00, XTE: 00, ZDA: 01,
│   GNS: 00, GBS: 00, Rnn: 00, RTE: 00

├─ 4. DATA TRANSFER ── ALL (**Stop**, Start)

├─ 5. DATA4 I/O SETUP ┬─ Data4. Level (**RS232C**, RS422)
│   ├─ Data (**Out**, Com., DGPS)
│   ├─ Data Fmt. (V1.5, V2.0, **IEC**)
│   ├─ Talker ID (**GP**, LC, DE)
│   └─ Output Data
│
│   AAM: 00, APA: 00, APB: 04, BOD: 00,
│   BWR: 00, BWW: 00, GGA: 00, GLL: 01,
│   RMB: 01, RMC: 00, VTG: 01, WCV:00,
│   WNR: 00, WPL: 00, XTE: 00, ZDA: 01,
│   GNS: 00, GBS: 01, Rnn: 00, RTE: 00

②

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②

6. GPS SETUP ——— Fix Mode (2D, **2/3D**)
— ANT Height (016 ft, 000 - 999 ft)
— Disable Satellite (1 - 32)
— GPS Smoothing ——— Posn (**0000**, 0000 - 9999 sec)
                   └— Spd (**0005**, 0000 - 9999 sec)
— Speed Average (**0060**, 0000 - 9999 sec)
— RAIM Function (Off, **On**)
— RAIM Accuracy (**100**, 1 - 999)
— Geodetic Datum (**WGS84**, NAD27, OTHER)
                                    (001)
— Posn Offset (0.000'N, 0.000'W)
— Time Diff. (+00:00)
— Posn (38°00.000'N, 123°00.000'W)

7. DGPS SETUP ——— DGPS MODE (**On**, Off)
— Ref. Station (Auto, **Man** (ID: 0274))
— Freq. (323.0 kHz)
— Baud Rate (25, 50, 100, 150, **200** bps)

8. LOP SETUP ——— Pos Display (**Lat/Long**, LOP)
— LOP Display (**LC**, DE)
— LC Chain (7980: 23 - 43)
       └— △LOP (+00.0 μs +00.0 μs)
— DE Chain (24: G - P)
       └— △LOP (+0.00 Lane, +0.00 Lane)

9. CLEAR MEMORY ——— Clear Plotter (**No**, Yes)
— Clear GPS (**No**, Yes)
— Clear All (**No**, Yes)

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1. OPERATIONAL OVERVIEW

1.1 Control Description

Opens/closes menu; quits current operation. — **MENU ESC**

NU/CU ENT — Selects display orientation; registers selections on menus.

Selects display mode. — **DISPLAY SEL 1**

EVENT MOB 6 — Inscribes event mark at ship's position; marks man overboard position.

Registers waypoints and routes. — **WPT RTE 2**

GOTO 7 — Sets destination.

Inscribes mark on the display. — **MARK 3**

PLOT ON/OFF 8 — Turns recording and plotting of ship's track on/off.

Enlarges display. — **ZOOM IN 4**

ZOOM OUT 9 — Shrinks display.

Centers ship's position/cursor position. — **CENTER 5**

CURSOR ON/OFF 0 — Turns cursor on/off.

Adjusts display contrast; changes latitude/longitude coordinate. — **TONE**

CLEAR — Deletes waypoints and marks; clears wrong data; silences audible alarm.

POWER — Turns power on/off.

Cursor pad — Shift display and cursor.

Figure 1-1 Control Panel

1.2   Turning On and Off the Power

The GP-90-DUAL takes about 90 seconds to find its position when turned on for the very first time. Other times it takes about 12 seconds.

Note: The GPS provides highly accurate position information. However, position should always be checked against other aids to navigation to confirm reliability, for the safety of vessel and crew.

Turning on the power

Press the [POWER] key.

The unit tests the PROGRAM MEMORY, SRAM and battery for proper operation and shows the results on the display. "BEACON RCVR INSTALLED" appears at the bottom of the display. After the test has been completed, the unit starts up with the last-used display mode.

```
PROGRAM MEMORY  = OK
SRAM            = OK
Internal Battery = OK




BEACON RCVR INSTALLED
DATA 3 : DATA OUTPUT
```

Several seconds later

GPS receiving condition

▲ 34° 23.456´ N 135° 45.678´ E   **D3D 100m**
SAFE

BRG
234°

COG
345°

RNG
123 nm

SOG
12.3 kt

WGS84
2nm

Figure 1-2 Appearance of display when turning on the power

When turning on the power the following occurs:

12 seconds after turning on the power, accurate position (in latitude and longitude) appears on the display.

If position could not be found, "NO FIX" appears at the GPS receiving condition window. When PDOP value exceeds 6 in the 3D mode or HDOP value exceeds 4 in the 2D mode, "DOP" appears to indicate abnormal fixing and the position indication is not updated.

When the satellite signal is being received normally, one of the indications shown in Table 1-1 appears depending on equipment setting and GPS receiver state.

Table 1-1 GPS receiver indication

Equipment setting	GPS receiver state indication
2D	GPS 2D (normal)
3D	GPS 3D (normal)
Differential 2D	D2D (normal)
Differential 3D	D3D (normal)

Note 1: When PDOP value exceeds 6 in the 3D mode, the position fixing method is automatically changed to 2D.

Note 2: The "DEMO" icon appears when the display is in the demonstration mode. To return to the normal mode, turn off the power and turn it on while pressing and holding down the [NU/CU ENT] key.

Turning off the power

Press the [POWER] key.

The next time you turn on the power the unit starts up with the last-used display mode.

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1.3 Adjusting Display Contrast and Brilliance

1) Press the [TONE] key. The display shown in Figure 1-3 appears.

```
            [-]    [+]

Tone:        ◀    ▶      17 (0~31)

Brilliance:  ▼    ▲      4 (0~4)


MENU    :   Escape
```

Figure 1-3 Screen for adjustment of display tone and brilliance

2) **To adjust tone**, press ◀ or ▶. Current setting and setting range (0-31) are shown to the right of "▶".

3) **To adjust brilliance**, press ▲ or ▼. Current setting and setting range (0-4) are shown to the right of "▲".

Note 1: Operate cursor pad within 10 seconds after pressing the [TONE] key. Otherwise, the screen for adjustment of tone and brilliance will be cleared.

Note 2: If the display is turned off with minimum tone it will be blank at the next power up. When this occurs press the [TONE] key continuously to adjust tone.

1.4 Display Mode

1) Press the [DISPLAY SEL] key. The display shown in Figure 1-4 appears.

```
    Select Display

Plotter 1
Plotter 2
Highway
Navigation
Data
(DATUM: WGS-84)*

▲  ▼   :   Select
MENU    :   Escape
```

*Shows currently selected geodetic chart datum.

Figure 1-4 Screen for selection of display mode

2) Press the [DISPLAY SEL] key, ▲ or ▼ to select display mode. (When the [DISPLAY SEL] key is pressed, the display mode changes in sequence shown below.) Selected display mode appears about 15 seconds later.

```
→ Plotter 1 → Plotter 2 → Highway
     Data ← Navigation ←
```

Sample displays of each display mode are shown in the figures on the next several pages.

1-3

Plotter 1 display

Cursor position data, when cursor is on

Own ship's track

Own ship mark

Course bar

Alarm range

Course

RAIM reliability*

GPS receiving condition

Bearing from own ship to destination waypoint

Distance for RAIM reliability

✚ 34° 23.456´ N 135° 45.678´ E

30

[04]

40

50

H

WGS84
2.00 nm

20

D3D 100m
SAFE

BRG
44°

COG
32°

BRG TO +
123°

RNG TO +
11.5 nm

Horizontal range

Course width

Course

Cursor

Grid

Speed, or range from own ship to cursor

Course

Range from own ship to destination waypoint, or bearing from own ship to cursor

*: For RAIM function, refer to page 8-1.

Figure 1-5 Plotter 1 display

Plotter 2 display

Ship's position appears when cursor is off.

▲ 34° 23.456´ N 135° 45.678´ E

30

[04]

40

50

H

WGS84
2 nm

20

D3D 100m
SAFE

Figure 1-6 Plotter 2 display

Highway display

Position

Bearing from own ship to destination waypoint

Course

▲ 34˚ 23.456´ N   135˚ 45.678´ E

[02]

[01]

H

☆

2   1   1   2 nm

D3D 100m
SAFE

BRG
234°

COG
345°

RNG
123 nm

SOG
12.3 kt

North mark

Cross track error scale

Own ship mark

Own ship's track

Course

Course width

Speed

Range from own ship to destination waypoint

Figure 1-7 Highway display

Navigation display

1) No autopilot

Figure 1-8 Navigation display, no autopilot

2) Autopilot connected, automatic mode

Figure 1-9 Navigation display, with autopilot connected, automatic mode

3) Autopilot connected, modes other than automatic mode (manual, nav, etc.)

Figure 1-10 Navigation display, autopilot connected, modes other than the automatic mode

1-5

Data display

Data to display and size of characters can be selected by the operator.

Figure 1-11 Data display mode

*: "--" appears until position is fond. If fixing error occurs the time indication freezes.

1.5   Transmitting Data

The GPS navigators share the data listed below when transmitting data to each other. Any action initiated against those data is automatically repeated on the other navigator. For example, if you register waypoint 27 on one navigator it will be registered on the other navigator under the same waypoint number.

- Alarm settings, alarm buzzer
- Destination data
- Disabled satellite data
- Error messages
- MOB/Event mark data
- Route data
- Waypoint data

Transmitting data

To mutually transmit data, do the following:

1) Press the [MENU ESC] key to display the MAIN menu.

```
            MAIN MENU

   1. DISPLAY SETUP
   2. TRACK/MARK SETUP
   3. ERASE TRACK/MARK
   4. ALARM SETTINGS
   5. MANUAL CALCULATION
   6.
   7. GPS MONITOR
   8. SELF TESTS
   9. SYSTEM SETTINGS

ENT: Enter          MENU: Escape
```

Figure 1-12 MAIN menu

2) Press the [9] key to display the SYSTEM SETTINGS menu.

```
         SYSTEM SETTINGS

   1. PLOTTER SETUP
   2. UNIT SETUP
   3. DATA 1, 3 OUTPUT SETUP
   4. DATA TRANSFER
   5. DATA 4 I/O SETUP
   6. GPS SETUP
   7. DGPS SETUP
   8. LOP SETUP
   9. CLEAR MEMORY

ENT: Enter          MENU: Escape
```

Figure 1-13 SYSTEM SETTINGS menu

3) Press the [4] key to select DATA TRANSFER.

```
DATA TRANSFER

  Transmit Data
      All         Stop        Start




▲ ▼ ▶ ◀ : Select
ENT: Enter          MENU: Escape
```

Figure 1-14 DATA TRANSFER menu

1-6

4) Press ▶ to select All and press the [NU/CU ENT] key. The following message appears. Press the [NU/CU ENT] key to transmit, or [MENU ESC] to escape.

```
Are you sure to transmit ?


ENT: Yes          MENU: No
```

Figure 1-15

The following message appears while data is being transmitted.

```
Now transmitting data


 MENU: Stop
```

Figure 1-16

5) To stop transmitting data, press the [MENU ESC] key. The following display appears.

```
Are you sure to stop ?


ENT: Yes          MENU: No
```

Figure 1-17

Press the [NU/CU ENT] key to stop. In this case, data is partially transmitted to the other GPS navigator. You should follow "Transmsitting data" in this paragraph to transmit data again.

6) The following message appears when data was transmitted successfully.

```
Transmitting ended
                successfully

 Press any key
```

Figure 1-18

7) Press any key to escape.

8) If transmission failed, transmission is stopped and the following message appears.

```
Failed in transmitting
Try again please
Press any key
```

Figure 1-19

9) Press any key to return to the DATA TRANSFER menu and select Stop. Since data will be not the same on both GPS navigator, repeat this procedure from step 4 until data is successfully transmitted.

Transmission failure during operation

Data is transmitted only once. When transmission error occurs, the following message appears.

```
Failed in transmitting
Try "DATA TRANSFER" menu
Press any key
```

Figure 1-20

Press any key to erase the message. Follow "Transmitting data" in this paragraph to transmit data again.

1-7

1.6 The Interface Unit

The Interface Unit IF-2500 outputs data received from the navigators to external equipment. Operational status is shown by the LEDs on the unit. For further details, see the chapter on installation. For how to select data to output, see paragraph 8.4 Outputting Data.

Output data conventions

Since both navigators output data to the IF-2500 (through two ports on the interface) confusion would reign if it were to try to output two sets of mostly identical data. Therefore, data output is governed by the following rules:

- When both navigators are outputting data correctly, data received at the port having higher priority is output.

- When the GPS abnormal receive signal is received at the port having higher priority, data received from the other port is output.

- 30 seconds after data received at the port having higher priority becomes normal, the interface unit resumes outputting data received from that port.

- When data from both navigators is in error, data received at the port having higher priority is output.

- Arrival alarm signal or cross track error alarm is converted to a contact signal and output when received at the port having higher priority.

- When no data is received from one or both navigators, a contact signal is output.

1-8

2. DISPLAY AND TRACK

2.1 Enlarging/Shrinking the Display

You may enlarge/shrink the display on the Plotter 1 and Plotter 2 displays, with the [ZOOM IN] and [ZOOM OUT] keys. The horizontal range is available among 0.25, 0.5, 1, 2, 4, 8, 16, 32, 64, 128 and 192 nautical miles. For the Plotter 1 display the ranges are 0.36, 0.71, 1.42, 2.84, 5.69, 11.38, 22.76, 45.51, 91.02, 182.04 and 273.07 nautical miles.

The [ZOOM IN] key enlarges the display and the [ZOOM OUT] key shrinks it. Each time a zoom key is pressed the horizontal range appears at the center of the display for about three seconds.

2.2 Display Orientation

Display orientation can be selected on the Plotter 1, Plotter 2 and Highway displays, with the [NU/CU ENT] key. Two display orientations are available: north-up and course-up.

North-up display

In the north-up display, true north (0°) is at the top of the display. Own ship moves on the display in accordance with true speed and true motion. Land is stationary.

Course-up display

Destination set

The destination is at the top of the display and the north mark (◓) appears at the left side of the display.

Destination not set

Ship's heading or course is at the top of the display. The north mark appears at the left side of the display.

2.3 The Cursor

The cursor (+) functions to select location for a mark; erase marks; measure range and bearing, etc.

Data and cursor state

Cursor state determines what data are shown on the display.

Cursor turned on, cursor data

Cursor position is displayed in latitude and longitude or LOPs (depending on menu setting) at the top of the display. The range and bearing from own ship to the cursor appear at the right hand side of the display, when in the Plotter 1 display.

Figure 2-1 Data displayed when the cursor is on

Cursor turned off

Ship's position (in latitude and longitude or LOPs), speed and course appear on the display.

Figure 2-2 Data displayed when the cursor is turned off

Shifting the cursor

1) Press the [CURSOR ON/OFF] key to turn on the cursor.
2) Press the cursor pad to shift the cursor. The cursor moves in the direction of the arrow pressed. When the cursor reaches the edge of the display, the display shifts in the direction opposite of the arrow pressed.

Centering the cursor

Press the [CENTER] key.

2.4 Shifting the Display

The display can be shifted on the Plotter 1 and Plotter 2 displays, with the [CURSOR ON/OFF] key. When own ship tracks off the display it is automatically returned to the screen center.

1) Press the [CURSOR ON/OFF] key to turn off the cursor.
2) Press the cursor pad continuously. The display shifts in the direction of the arrow pressed.

2.5 Centering Own Ship's Position

1) Press the [CURSOR ON/OFF] key to turn off the cursor.
2) Press the [CENTER] key.

2.6 Stopping/Starting Plotting and Recording of Track

The GP-90-DUAL stores 2,000 points of track and marks. When the memory becomes full the oldest track is erased to make room for the latest.

Procedure

Press the [PLOT ON/OFF] key to start/stop recording and plotting of track.

When plotting is resumed

"Resuming track plot" appears at the center of the display for about three seconds.

2-2

When plotting is stopped

"Stopping track plot" appears at the center of the display for about three seconds and "H" appears at the left side of the display. ("H" does not appear on the Navigation and Data displays.)

Hold icon
(appears while recording of track is stopped)

▲ 34° 23.456´ N 135° 45.678´ E	D3D 100m SAFE
	BRG 234°
	COG 345°
H	RNG 123 nm
	SOG 12.3 kt

This portion of track does not appear on the display

Own ship

Recording of track started

Ship's track while recording is stopped

Recording of track turned off

Figure 2-3 Track not plotted or recorded when plotting is stopped

2.7 Erasing Track

The track stored in the memory and displayed on the screen can be erased.

Note: Track cannot be restored once erased. Be absolutely sure you want to erase track.

1) Press the [MENU ESC] key to show the MAIN MENU.

```
          MAIN MENU

   1. DISPLAY SETUP
   2. TRACK/MARK SETUP
   3. ERASE TRACK/MARK
   4. ALARM SETTINGS
   5. MANUAL CALCULATION
   6.
   7. GPS MONITOR
   8. SELF TESTS
   9. SYSTEM SETTINGS

ENT: Enter          MENU: Escape
```

Figure 2-4 MAIN menu

2) Press [3] to select ERASE TRACK/MARK.

```
      ERASE TRACK/MARK

Erase Track       No    Yes

Erase Mark        No    Yes

    Track Pts. Used:    345/1000 Pt
    Mark Pts. Used:     123/1000 Pt

▲ ▼ ▶ ◀ : Select
MENU: Escape
```

Figure 2-5 ERASE TRACK/MARK menu

3) Press ▲ to select Erase Track.
4) Press ▶ to select Yes. The message shown in Figure 2-6 appears.

2-3

Are you sure to erase ?

ENT: Yes   MENU: No

Figure 2-6 Prompt for erasure of track

5) Press the [NU/CU ENT] key.

2.8   Track Plotting Interval

The plotting interval determines both how the track will be reconstructed on the display and track storage time. A shorter interval provides more accurate reconstruction of track line, however total storage time is reduced. The plotting interval can be selected by time or distance. Plotting by distance offers the advantage that the track is not stored when the vessel is anchored.

Plotting interval by time

The setting range for plotting by time is 00 to 60 minutes.

1) Press the [MENU ESC] key.
2) Press [2] to display the TRACK/MARK SETUP menu.

TRACK/MARK SETUP

Track Rec	Time	Dist
	(01'00)	(00.50nm)

Mark Shape ○ □ ◇ ⊠ ⊓ ⊔ •

🐟 🦅 🦀 🦑 🏔 ◤

Mark Line • ▭ - - - - — - —

Event Mark ▽ △ ◎ ☆

🐟 🦅 🦀 🦑 🏔 ◤

▲▼ ◀▶ : Select
ENT: Enter   MENU: Escape

Figure 2-7 TRACK/MARK SETUP menu

3) Press ▲ to select Track Rec.
4) Press ◀ to select Time.
5) Enter plotting interval in four digits. To enter 30 seconds, for example, press [0] [0] [3] [0].
6) Press the [NU/CU ENT] key.
7) Press the [MENU ESC] key.

Plotting interval by distance

The setting range for plotting by distance is 0.01 to 99.99 nautical miles. To plot all track, enter 00.00.

1) Press the [MENU ESC] key.
2) Press [2] to display the TRACK/MARK SETUP menu.
3) Press ▲ to select Track Rec.
4) Press ▶ to select Distance.
5) Enter plotting interval. To enter 0.1 nautical miles, for example, press [0] [0] [1].
6) Press the [NU/CU ENT] key.
7) Press the [MENU ESC] key.

2-4

2.9   Apportioning the Memory

The memory holds 2,000 points of track and marks and may be apportioned as you like. The default memory setting stores 1,000 points each of track and marks.

Note: All data are erased when the memory apportion setting is changed, even when the previous value is reentered.

To store 1,500 points of track and 500 marks, for example, do the following:

1) Press the [MENU ESC] key.
2) Press [9] to display the SYSTEM SETTINGS menu.

```
            SYSTEM SETTINGS
     1. PLOTTER SETUP
     2. UNIT SETUP
     3. DATA 1, 3 OUTPUT SETUP
     4. DATA TRANSFER
     5. DATA 4 I/O SETUP
     6. GPS SETUP
     7. DGPS SETUP
     8. LOP SETUP
     9. CLEAR MEMORY

     ENT: Enter        MENU: Escape
```

Figure 2-8 SYSTEM SETTNGS menu

3) Press [1] to display the PLOTTER SETUP menu.

```
       PLOTTER SETUP
  Memory Apportion    Trk = 1000 / 2000Pt
  Bearing Ref.        True      Mag
  Mag Variation       Auto      Man
                      (07° W)   (00° E)
  Calculation         R.L       G.C
  User defined #1     ◄   RNG   ►
             #2       ◄   SOG   ►
             #3       ◄   BRG   ►
             #4       ◄   COG   ►
  ENT: Enter        MENU: Escape
```

Figure 2-9 PLOTTER SETUP menu

4) Press ▲ to select Memory Apportion.
5) Enter amount of track to store, in four digits. To store 1,500 track points, for example, press [1] [5] [0] [0].
6) Press the [NU/CU ENT] key, or ▲ or ▼. You are asked if it is all right to erase all data.

```
  Setting erases all data!
  Are you sure to change ?

  ENT: Yes        MENU: No
```

Figure 2-10

7) Press the [NU/CU ENT] key.
8) Press the [MENU ESC] key.

2.10   Bearing Reference

Ship's course and bearing to waypoint may be displayed in true or magnetic bearing. Magnetic bearing is true bearing plus (or minus) earth's magnetic deviation.

True or magnetic bearing

The default setting displays magnetic bearings.

1) Press the [MENU ESC] key.
2) Press [9] to display the SYSTEM SETTINGS menu.
3) Press [1] to display the PLOTTER SETUP menu.
4) Press ▲ or ▼ to select Bearing Ref.
5) Press ◄ or ► to select True or Mag.
6) Press the [NU/CU ENT] key.
7) Press the [MENU ESC] key.

2-5

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 the earth. Magnetic variation may be entered automatically or manually.

1) Press the [MENU ESC] key.
2) Press [9] to display the SYSTEM SETTINGS menu.
3) Press [1] to display the PLOTTER SETUP menu.
4) Press ▲ or ▼ to select Mag Variation.
5) Press ◀ or ▶ to select Auto or Man. For automatic, current variation appears in parentheses.
6) **For manual entry**, enter variation in two digits, referring to a nautical chart (00-30°). If the variation is 10°, for example, press [1] [0].
7) If necessary, press the [↻] key to change coordinate from east to west or vice versa.
8) Press the [NU/CU ENT] key.
9) Press the [MENU ESC] key.

2-6

3. MARKS

3.1 Entering Marks

Marks can be inscribed on the Plotter 1 and Plotter 2 displays, in one of 12 mark shapes. Further, marks can be connected with lines to denote net location, etc.

Note: When the mark memory becomes full no marks can be entered. When this occurs, the buzzer sounds and the message shown below appears on the display for three seconds. To enter a mark when the mark memory is full, erase unnecessary marks.
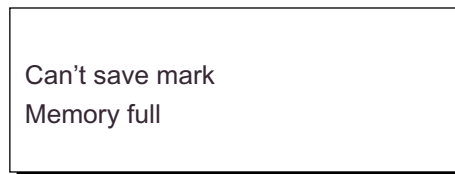
```
Can't save mark
Memory full
```

Figure 3-1

Entering marks

At own ship position

1) Press the [CURSOR ON/OFF] key to turn off the cursor.
2) Press the [MARK] key.

At cursor intersection

1) Press the [CURSOR ON/OFF] key to turn on the cursor.
2) Operate the cursor pad to place the cursor on the location for the mark. Select the mark shape you want, referring to paragraph 3.3.
3) Press the [MARK] key.

3.2 Erasing Marks

Marks can be erased individually or collectively.

Note: All marks, including event marks and the MOB mark, can be erased on the ERASE MARK menu. Be absolutely sure you want to erase all marks; erased marks cannot be restored.

Erasing individual marks

1) Place the cursor on the mark to erase.
2) Press the [CLEAR] key.

Erasing all marks

1) Press [MENU ESC] and [3] to display the ERASE TRACK/MARK menu.

```
          ERASE TRACK/MARK

  Erase Track        No     Yes

  Erase Mark         No     Yes


     Track Pts. Used:    345/1000 Pt
     Mark Pts. Used:     123/1000 Pt


  ▲▼ ▶ ◀ : Select
  MENU: Escape
```

Figure 3-2 ERASE TRACK/MARK menu

2) Press ▼ to select Erase Mark.
3) Press ▶ to select YES.

```
  Are you sure to erase ?


  ENT: Yes          MENU: No
```

Figure 3-3

4) Press the [NU/CU ENT] key.
5) Press the [MENU ESC] key.

3-1

3.3 Mark Shape

13 mark shapes are available. Select mark shape as follows:

1) Press [MENU ESC] and [2] to display the TRACK/MARK SETUP menu.

Figure 3-4 TRACK/MARK SETUP menu

2) Press ▲ or ▼ to select Mark Shape.
3) Press ◀ or ▶ to select mark shape desired.
4) Press the [NU/CU ENT] key.
5) Press the [MENU ESC] key.

The next mark entered will be inscribed in the shape selected here.

3.4 Connecting Marks

Marks can be connected with lines to denote net location, fishing spot, etc. Three types of connection lines are available and the "•" setting disables connection of lines.

1) Press [MENU ESC] and [2].
2) Press ▲ or ▼ to select Mark Line.
3) Press ◀ or ▶ to select other than "•".
4) Press the [NU/CU ENT] key.
5) Press the [MENU ESC] key.

3.5 Entering Event Marks

Event marks can denote any important present position; for example, a good fishing spot. 99 event marks can be saved, and the unit automatically numbers them from 01 to 99.

Event marks are mutually entered when the navigators are sharing data.

Note 1: When the mark memory becomes full no event marks can be entered. When this occurs, the buzzer sounds and the message shown below appears on the display for three seconds to alert you. To enter an event mark when the mark memory is full, erase unnecessary event marks.

Can't save mark
Memory full

Figure 3-5

Note 2: Event marks cannot be entered when there is no position data. When this occurs, the buzzer sounds and the message shown below appears on the display for three seconds to alert you. Check that the antenna cable is tightly connected.
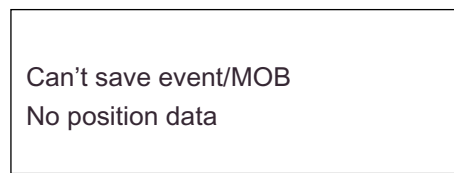
Can't save event/MOB
No position data

Figure 3-6

To enter an event mark;

1) Press the [EVENT MOB] key less than three seconds. The position at the exact moment the key is pressed is saved as an event position.

```
Saved event position

  34° 40.123' N
135° 21.123' E
```

Figure 3-7

To erase event marks, see "3.2 Erasing Marks".

3.6　Event Mark Shape

Event marks are available in 10 shapes.

Event mark shape is mutually changed when the navigators are sharing data.

Select event mark shape as follows.

1) Press [MENU ESC] and [2] to display the TRACK/MARK SETUP menu.
2) Press ▼ to select Event Mark.
3) Press ◀ or ▶ to select event mark shape desired.
4) Press the [NU/CU ENT] key.
5) Press the [MENU ESC] key.

The next event mark entered will be inscribed in the shape selected here.

3.7　Entering the MOB Mark

The MOB mark denotes man overboard position. To mark man overboard position, press the [EVENT MOB] key for more than three seconds. When the key is pressed, the position at the exact moment the key is pressed automatically becomes the destination. Further, the Plotter 1 display replaces the display in use when it is other than a plotter display.

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. The MOB mark is mutually entered

when the navigators are sharing data.

Note: The MOB mark cannot be entered when there is no position data. When this occurs, the buzzer sounds and the message shown below appears on the display for three seconds to alert you. Check that the antenna cable is tightly connected.

```
Can't save event/MOB
No position data
```

Figure 3-8

1) Press the [EVENT MOB] key for at least three seconds.
   The MOB mark ("M") is entered at the MOB position and the message shown in Figure 3-9 appears.

```
Saved MOB position
Are you sure to change course
to MOB position ?
ENT: Yes      MENU: No
```

Figure 3-9

2) Press the [NU/CU ENT] key. If the display in use is Highway, Navigation or Data, they are automatically replaced by the Plotter 2 display.

Note: You may cancel MOB position as destination by pressing the [MENU ESC] key instead of the [NU/CU ENT] key at step 2. Note that the MOB mark remains on the display.

Erasing the MOB mark

See "3.2 Erasing Marks". (MOB mark cannot be erased with the cursor.) The MOB mark is mutually erased when the navigators are sharing data.

3-3

This page is intentionally left blank.

4. NAVIGATION PLANNING

4.1 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-90-DUAL can store 999 waypoints, numbered from 001-999. Waypoints can be registered four ways:

• by cursor

• by MOB position or event position

• at own ship's position, and

• through the waypoint list.

Waypoints are mutually entered when the navigators are sharing data.

Entering waypoints by the cursor

1) Press the [WPT RTE] key to show the Waypoint/Route menu.

```
Waypoint/Route

  1. Cursor
  2. MOB/Event Position
  3. Own ship Position
  4. Waypoint List
  5. Route Planning



▲▼ : Cursor
ENT: Enter       MENU: Escape
```

Figure 4-1 Waypoint/Route menu

2) Press [1] to select Cursor. The following display appears.

```
Place cursor on desired location


ENT: Enter      MENU: Escape
```

Figure 4-2

The display changes to Plotter 2 when the Highway, Navigation or Data mode is in use.

3) Use the cursor pad to place the cursor on the location desired for the waypoint.

4) Press the [NU/CU ENT] key.

A window similar to the one shown in Figure 4-3 appears. The waypoint's position and date and time registered appear on the first and second lines. Waypoints are automatically given the youngest empty waypoint number and this number appears on the third line. You may, however, assign a different number. If the waypoint shares the same position with a mark, the mark's position and date and time entered are registered as waypoint data.

If the waypoint memory is full, the waypoint number line in the window is blank. In this case waypoints cannot be entered unless a waypoint is written over or erased.

```
30° 12.345' N  135° 23.456' W
           AUG 12' 03  12 : 34U

No.  : 123
Mark : ____
Cmnt : _ _ _ _ _ _ _ _ _ _ _ _ _ _

◀▶ : Cursor     ▼ : Column
ENT: Enter       MENU: Escape
```

Figure 4-3

The remaining steps show how to change waypoint number, choose mark shape and enter a comment. If you do not need to change these items, press the [NU/CU ENT] to register the waypoint under the number shown and the current waypoint mark shape. You may also choose the waypoint item to change by pressing ▲ or ▼ and following the appropriate step in this procedure.

5) Enter waypoint number, in three digits (001-999).

4-1

6) Press ▼ to select waypoint mark shape. The following display appears.

◀ ▶ : Cursor
ENT: Enter   MENU: Escape

Figure 4-4 Screen for selecting

waypoint mark shape

7) Press ◀ or ▶ to select mark shape.
8) Press the [NU/CU ENT] key. The display shown in Figure 4-5 appears.

ABCDE FGHIJ KLMNO PQRST UVWXYZ

abcde   fghij   klmno   pqrst   uvwxyz
1 2 3 4 5 6 7 8 9 0 _ # % ' ( ) + - . / : ; < = > ?
                    ENTER

   COMMENT: ■ _ _ _ _ _ _ _ _ _ _ _

◀ ▶ : Cursor
ENT: Set   MENU: Escape

Figure 4-5 Screen for entry

of comment for waypoint

9) You may enter a comment, using up to 12 alphanumeric characters.
   ① Press the cursor pad to select alphanumeric character.
   ② Press the [NU/CU ENT] key. Selected character appears on the COMMENT line.
      • To create a space, select "_".
      • Numeric data can be input directly by pressing numeric keys.
      • To clear wrong data, press the [CLEAR] key.
   ③ Repeat steps ① and ② to complete the comment.
   ④ Select ENTER and press the [NU/CU ENT] key.

10) Press the [NU/CU ENT] key.

Control is returned to the last-used display mode.

When the waypoint number entered at step 5 already exists, the message shown in Figure 4-4 appears if the waypoint is part of the current destination or route or is part of a route. If you want to write over the waypoint and its data, press the [Y] key. To change waypoint number, press the [N] key.

1st line
Are you sure to change ?

ENT: Yes   MENU: No

This wpt is GOTO
This wpt is in registered route
This wpt is in selected route

Figure 4-6

Note: If you fail to enter waypoint number, "Enter waypoint number" appears on the display for three seconds.

4-2

Entering waypoints by MOB position/event position

The MOB position or an event position can be registered as a waypoint. Event marks are numbered from 01 to 99; 01 is the latest event mark.

Note: You cannot register a MOB position or event position when there are no MOB positions or event positions saved. The buzzer sounds and the message shown in Figure 4-7 appears for three seconds to alert you.

```
No MOB/event data in memory
```

Figure 4-7

1) Press the [WPT/RTE] key.
2) Press [2] to select MOB/Event Position. The display shown in Figure 4-8 appears.

```
[MOB]  Displaying MOB data
34° 12.345' N  130° 23.456' E

    [#01]  Displaying event data
    34° 12.345' N  130° 23.456' E
                    AUG 12' 03  19 : 25U

        ◀ ▶  : Paging
    ENT: Enter      MENU: Escape
```

Figure 4-8

3) Press ◀ or ▶ to display the MOB position or event position to register as a waypoint.
4) Press the [NU/CU ENT] key.
5) Follow steps 5 through 11 in "Entering waypoints by the cursor" on page 4-1.

Entering waypoints at own ship's position

Note: When there is no position data, you cannot register a waypoint at own ship's position. The buzzer sounds and the following message appears.

```
No position data
```

Figure 4-9

1) Press the [WPT/RTE] key.
2) Press [3] to select Own Ship Position.
3) Follow steps 5 through 11 in "Entering waypoints by the cursor" on page 4-1.

Entering waypoints through the waypoint list

1) Press the [WPT/RTE] key.
2) Press [4] to display the waypoint list.
3) Press [↻] to select position format; latitude and longitude or LOP.

```
WAYPOINT LIST (L/L)

001  34° 12.345' N  130° 23.456' W
⚓  MARINE POINT  AUG 12' 03  12 : 35U

002  36° 12.345' N  135° 23.456' W
___  A POINT         AUG 13' 03  13 : 45U

003  __ ° __ . __' N   ___ ° __ . __' W
___  _____

004  __ ° __ . __' N   ___ ° __ . __' W
___  _____

↻ : L/L' LOP        ◀ ▶ : Edit
ENT: Enter          MENU: Escape
```

Figure 4-10

4) Press ▲ or ▼ to select waypoint number.
5) Press ◀ or ▶ to enter position. The display should now look something like Figure 4-11.

4-3

```
Edit = Waypoint : 001

    _ _°_ _._ _ _' N  _ _ _ _°_ _._ _ _'W

Mark : _ _
Cmnt : _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

◄ ► : Cursor          ▼ : Column
ENT: Enter           MENU: Escape
```

Figure 4-11

6) Enter latitude and longitude. To enter 34°12.345' N 135°23.456' E, for example, press;

   ([🔄]) [3] [4] [1] [2] [3] [4] [5]

   ([🔄]) [1] [3] [5] [2] [3] [4] [5] [6]

   To change N to S or E to W, press [🔄].

7) Press ▼.
8) Press ◄ or ► to select mark.
9) Press the [NU/CU ENT] key.
10) Enter comment.
11) Press the [NU/CU ENT] key twice.

   The waypoint list reappears. Waypoint position and date and time the waypoint was entered appear on the list.

12) To enter another waypoint through the waypoint list, repeat steps 4-11.
13) Press the [MENU ESC] key to finish.

4.2 Editing Waypoints

Waypoints are mutually edited when the navigators are sharing data.

1) Press [WPT RTE] and [4].
2) Press ▲ or ▼ to select waypoint to edit.
3) Press ►.
4) Edit the contents of the waypoint.
5) Press the [NU/CU ENT] key. The message shown in Figure 4-12 appears if the waypoint is currently selected as destination, is part of a route, or is in the route currently selected as destination.

```
1st line
Are you sure to change ?

ENT: Yes          MENU: No
```

```
This wpt is GOTO
This wpt is in registered route
This wpt is in selected route
```

Figure 4-12

6) Press the [NU/CU ENT] key.
   Enter new data, referring to "4.1 Entering Waypoints".
7) Press the [MENU ESC] key.

4.3 Erasing Waypoints

Waypoints are mutually erased when the navigators are sharing data.

Erasing waypoints by the cursor

1) Place the cursor on the waypoint to erase.
2) Press the [CLEAR] key.

4-4

Erasing waypoints through the waypoint list

1) Press [WPT RTE] and [4].
2) Press ▲ or ▼ to select waypoint to erase.
3) Press the [CLEAR] key. The message shown in Figure 4-13 appears if the waypoint is currently selected as destination, is part of a route, or is in the route currently selected as destination.

```
1st line
Are you sure to erase ?

ENT: Yes          MENU: No
```

This wpt is GOTO
This wpt is in registered route
This wpt is in selected route

Figure 4-13

Note: All waypoint marks (as well as all other marks) and their data can be erased collectively by clearing the Plotter memory. For further details, see page 9-1.

4) Press the [NU/CU ENT] key.

   Note: To cancel erasure, press the [MENU ESC] key instead of the [NU/CU ENT] key. The waypoint list appears.

5) Press the [MENU ESC] key.

4.4   Entering Routes

Often a trip from one place to another involves several course changes, requiring a series of route points which you navigate to, one after another. The sequence of waypoints leading to the ultimate destination is called a route. The GP-90-DUAL can automatically advance to the next waypoint on a route, so you do not have to change the destination waypoint repeatedly.

The GP-90-DUAL can store 30 routes and each route may contain up to 30 waypoints. Routes can be registered while in the Plotter 1 or Plotter 2 display mode. Routes are mutually registered when the navigators are sharing data.

Entering routes

1) Press the [WPT/RTE] key.
2) Press [5] to select Route Planning. The route list appears.

```
              ROUTE LIST
No. PTS  Total  Dist.     TTG       Remarks
01  30   1234 . 56 nm  12D15H28M  UseFwd
02  25    234 . 56 nm   2D08H35M
03  30   *999. 99 nm   *9D*9H*9M
04  __   ____ . __ nm  ___D__H__M
05  30   6543 . 21 nm  34D23H45M
06  __   ____ . __ nm  ___D__H__M

▲▼ : Route No.   ◀▶   : Edit
ENT: Enter            MENU: Escape
```

Remarks
Use: In use
Fwd: Traverse waypoints in forward order
Rvs: Traverse waypoints in reverse order

Figure 4-14 Route list

3) Press ▲ or ▼ to select an empty route number.
4) Press ▶.

   The route planning/waypoint list window appear as shown in Figure 4-15. The waypoint list window lists the position and data for each registered waypoint. No position or data appears for empty waypoints.

4-5

```
ROUTE  : 01  (In Use , REVERSE)
       skip Distance   TTG
Trial Speed : [Auto]  Man (012.0kt)
  01         EN  _ _ _._.._nm  _ _ D_ _ M_ _ H       Route
  02         EN  _ _ _._.._nm  _ _ D_ _ M_ _ H       editing
                                                     screen
 001   34° 12.345' N  130° 23.456' E
 ▲   MARINE POINT  AUG 12' 03  12: 35U
 002   36° 12.345' N  135° 23.456' E                 Waypoint
                                                     list
 ___   A POINT           AUG 13' 03  13 : 45U
 ⟳ : RTE ↔ WPT  CLEAR: Delete
ENT: Enter  MENU: Escape
```

Use: In use
Fwd: Traverse waypoints in forward order
Rvs: Traverse waypoints in reverse order

Figure 4-15 Route editing screen

5) If required, press ▲ to choose Trial Speed to enter the speed by which to calculate time-to-go.

6) Press ◀ or ▶ to select Auto or Man.
   Auto: Current average speed is used to calculate the time-to-go.
   Manual: Entered speed is used to calculate the time-to-go. Enter speed and press ▼.

Route waypoints may be registered two ways: entering waypoint number directly or through the route editing screen. Follow ① or ② below.

① **Entering waypoint number directly**

7) Enter waypoint number, in three digits. The cursor shifts to the "Skip" window. The procedure for skipping a waypoint is shown on page 5-4. For now, go to the next step.

8) Press ▼ to continue. If the waypoint entered in step 7 does not exist, you are informed that the waypoint does not exist and entry is cancelled.

9) Enter other route waypoints by repeating steps 7 and 8.

10) Press [MENU ESC] to finish.

② **Using previously registered waypoints**

Enter waypoints in the order they will be traversed; not by waypoint number order.

7) Press [⟳]. The reverse video on the waypoint on route planing screen disappears.

8) Press ▲ or ▼ to select waypoint number.

9) Press the [NU/CU ENT] key. Selected waypoint number appears on the route editing screen. The distance and time-to-go indications to the first waypoint entered are blank.

10) To enter other route waypoints, repeat steps 8 and 9.

11) Press the [MENU ESC] key to finish.

Note: To return to the route editing screen, press [⟳].

4.5   Erasing Route Waypoints

Route waypoints are mutually erased when the navigators are sharing data.

1) Press [WPT RTE] and [5] to display the route list.

2) Press ▲ or ▼ to select route.

3) Press ▶ to display route editing screen.

4) Select the waypoint to erase.

5) Press the [CLEAR] key.

6) Press the [NU/CU ENT] key.

7) Repeat steps 2 through 4 to continue erasing waypoints.

8) Press the [MENU ESC] key. The route is rearranged to reflect the change.

4.6 Replacing Route Waypoints

Route waypoints are mutually replaced when the navigators are sharing data.

1) Press [WPT RTE] and [5] to display the route list.
2) Press ▲ or ▼ to select route.
3) Press ▶ to display route editing screen.
4) On the route editing screen, place the cursor on waypoint number to replace.
5) Enter new waypoint number.
6) Press the [NU/CU ENT] key. The message shown in Figure 4-16 appears.

```
This waypoint already exists
Are you sure to change ?

ENT: Yes          MENU: No
```

Figure 4-16

7) Press the [NU/CU ENT] key.
8) Press the [MENU ESC] key twice.

4.7 Erasing Routes

Routes are mutually erased when the navigators are sharing data.

1) Press [WPT RTE] and [5] to display the route list.
2) Press ▲ or ▼ to select route to erase.
3) Press the [CLEAR] key. The display shown in Figure 4-17 appears if the route is in use.

```
1st line
Are you sure to erase ?

ENT: Yes          MENU: No
```

This route is in use

Figure 4-17

4) Press the [NU/CU ENT] key.
5) Press the [MENU ESC] key.

4-7

This page is intentionally left blank.

5. SETTING DESTINATION

5.1 Setting Destination

There are four ways by which you can set destination:

- By cursor
- By MOB position or event position
- By waypoint, and
- By route.

The same destination is set on both navigators when they are sharing data.

Note 1: Destination cannot be set when there is no GPS position data. When there is no position data, the buzzer sounds and the message shown in Figure 5-1 appears.

```
No position data
```

Figure 5-1

Note 2: Previous destination is cancelled whenever a destination is set.

Setting destination by cursor

Using the cursor you may set a destination consisting of 30 points. When all 30 points are entered, the GP-90-DUAL automatically disables further entry.

Setting single destination

1) Press the [GOTO] key. The menu shown in Figure 5-2 appears.

```
        GOTO Setting

    1. Cursor
    2. MOB/Event Position
    3. Waypoint List
    4. Route List
    5. Cancel

    ▲   ▼    : Cursor
    ENT    : Enter    MENU : Escape
```

Figure 5-2 GOTO setting menu

2) Press [1] to select Cursor. The display shown in Figure 5-3 appears.

```
Place cursor on desired location
Press ENT twice to finish
ENT:Enter CLR:Clear MENU:Escape
```

Figure 5-3

If the display in use is other than Plotter 1, the Plotter 2 display is automatically selected.

3) Place the cursor on the location desired for destination.
4) Press the [NU/CU ENT] key.

   Note: To clear selection, press the [CLEAR] key.

5) Press the [NU/CU ENT] key to finish.

Control is returned to the display mode in use before you set destination. A dashed line connects own ship and the destination, which is marked with a flag, as shown in Figure 5-4.

Figure 5-4 Single destination set by cursor

Setting multiple destinations

1) Press [GOTO] and [1].
2) Place the cursor on the location desired for a waypoint.
3) Press the [NU/CU ENT] key.
4) Repeat steps 2 and 3 to enter other points. Waypoints are connected with a line.
5) Press the [NU/CU ENT] key to finish. The route number entry display appears as shown in Figure 5-5. If no route number appears or you want to change the route number shown, go to step 6 to enter route number. To register the route under the number shown, go to step 8.

```
Enter route number
        0 1
ENT:Enter  MENU: Escape
```

Figure 5-5

6) Key in route number.
7) Press the [NU/CU ENT] key. Waypoints are marked with flags and are connected with a dashed line.

   If the route number entered already exists the message shown in Figure 5-6 appears.

```
Overwriting ?
ENT:Yes    MENU:No
```

Figure 5-6

8) Press the [NU/CU ENT] key.

The waypoints do not have waypoint numbers, however you can attach waypoint numbers by doing the following.

① Press [WPT RTE] and [5] to display the route list.
② Press ▲ or ▼ to select route number entered.
③ Press ▶.
④ Enter waypoint number, in three digits.
⑤ Press ▼. If the waypoint number already exists the message shown in Figure 5-7 appears.

```
This waypoint already exists
Are you sure to change ?
 ENT:Yes    MENU:No
```

Figure 5-7

⑥ Press the [NU/CU ENT] key. The waypoint entered here replaces previously entered waypoint.

   Note: To cancel replacement of waypoint, press the [MENU ESC] key at step ⑥.

⑦ Repeat steps ④ and ⑤ to enter other waypoint numbers.
⑧ Press the [MENU ESC] key twice to finish.

When destination is cancelled, dashed lines are erased but flags remain on the screen.

5-2

Setting destination by MOB position or event position

Note: This operation cannot be performed when there is no MOB position or event position. The buzzer sounds and the message shown in Figure 5-8 appears to alert you when there is no MOB position or event position.

```
No MOB/event data in memory
```

Figure 5-8

1) Press the [GOTO] key.
2) Press [2] to select MOB/Event Position. The display shown in Figure 5-9 appears.

```
[MOB]  Displaying MOB data
34° 12.345' N  130° 23.456' E
    [#01]  Displaying event data
    34° 12.345' N  130° 23.456' E
                      AUG 12' 03  19 : 25U
          ◀ ▶  : Paging
    ENT: Enter    MENU: Escape
```

Figure 5-9

3) Press ◀ or ▶ to select MOB position or event position. The MOB position appears first. To select event position, press ▶. If selected position is within the current display range, the cursor marks the position. (The cursor does not appear on the Highway, Navigation and Data displays.)
4) Press the [NU/CU ENT] key. A flag appears at position selected if it is within the current display range. A dashed line connects between own ship and MOB position or event position.

When destination is cancelled, dashed lines are erased but flags remain on the screen.

Setting destination through waypoint list

Note: A waypoint must exist to set it as destination. When a waypoint does not exist, the buzzer sounds and the message shown in Figure 5-10 appears.

```
No waypoint data
```

Figure 5-10

Destination waypoint can be set through the waypoint list two ways:

- By entering waypoint number, and

- By selecting waypoint by cursor

1) Press the [GOTO] key.
2) Press [3] to display the Waypoint List.

```
GOTO (Waypoint List)
Waypoint No. _ _
No.001   34° 12.345' N   132° 23.456' E
  ▲      MARINE POINT AUG 12' 03 12:35U
   002   34° 12.345' N   133° 12.345' E
  __     A POINT         AUG 13' 03 13:28U
   005   41° 34.567' N   135° 23.456' E
  ❋      B POINT         AUG 14' 03 09:45U

  ↻ No ↔ List              ENT:Enter
```

Waypoint number can be entered here when this line appears in reverse video.

Figure 5-11 Waypoint list

Set destination by following ① or ② below.

① **Setting destination by waypoint no.**

3) Enter waypoint number, in three digits. You can clear entry by pressing the [CLEAR] key.
4) Press the [NU/CU ENT] key.

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

5-3

② **Setting destination by selecting wpt.**

3) Press [↻]. Each press of the key alternately enables manual entry of waypoint number and selection of waypoint number by cursor (through the waypoint window).
4) Press ▲ or ▼ to select waypoint.
5) Press the [NU/CU ENT] key.

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

Setting route as destination

Note: Route entered must exist to set it as destination. The buzzer sounds and the message shown in Figure 5-12 appears if you set enter a route which does not exist.

```
No route data
```

Figure 5-12

A route to set as destination may selected through the route list two ways:

• By entering route number, and

• By selecting route.

1) Press the [GOTO] key.
2) Press [4] to display the Route List. Then, follow ① or ② in the adjacent column.

Route number can be entered here when this line appears in reverse video.

GOTO (Route List)		◀FORWARD▶	
Route No.	■_		
No.	PTS	TOTAL	TTG
01	30	1234. 56nm	12D15H28M
02	25	234. 56nm	2D08H35M
05	8	57. 89nm	0D10H28M
06	30	*999. 99nm	*9D23H59M
10	30	6543. 21nm	34D23H45M

↻ : No. ↔ List

ENT:Enter   MENU:Escape

Figure 5-13 Route list

① **By entering route number**

3) Press ◀ or ▶ to select direction which to traverse the route waypoints; forward or reverse.
4) Enter route number.
5) Press the [NU/CU ENT] key.

Current position becomes starting point. A solid line connects between the starting point and first route waypoint and a dashed line connects all other route waypoints.

② **By selecting a route**

3) Press [↻]. Each press of the key alternately enables manual entry of route number and selection of route number (through the route window)
4) Press ▲ or ▼ to select route.
5) Press ◀ or ▶ to select direction in which to traverse the route waypoints; forward or reverse.
6) Press the [NU/CU ENT] key.

Current position becomes starting point. A solid line connects between the starting point and first route waypoint and a dashed line connects all other route waypoints.

Skipping route waypoints

You may skip route waypoints by displaying "DI" (DIsable) next to the route waypoint in the route list. Using Figure 5-14 as an example, your ship is currently heading toward waypoint 04 but is to switch course and head to waypoint 03. In this case you would want to skip waypoint 04.

Figure 5-14

1) Press [WPT RTE] and [5] to display the route list. Press the cursor keys to select route.

"EN" indicates waypoint is enabled. Display "DI" to skip waypoint.

ROUTE	:01	(In Use, REVERSE)

Figure 5-15 Route list

2) Press ▲ or ▼ to select route waypoint to skip.
3) Press ◀ or ▶ to shift the cursor to the right of the waypoint number.
4) Press [⟳] to change "EN"(ENable) to "DI"(DIsable).
5) Press the [NU/CU ENT] key.

To reselect the waypoint, select it on the route list and press [⟳] to change "DI" to "EN".
Route waypoints are mutually skipped when the navigators are sharing data.

5.2 Cancelling Destination

Destination is cancelled at both GPS navigators when they are sharing data.

1) Press the [GOTO] key.
2) Press [5] to select Cancel. The message shown in Figure 5-16 appears.

Release GOTO ?

ENT:Yes   MENU:No

Figure 5-16

3) Press the [NU/CU ENT] key.

5-5

5.3 Erasing Route Waypoints (flags)

Flags are erased at both GPS navigators when they are sharing data.

1) Place the cursor on the flag to erase.
2) Press the [CLEAR] key. The message shown in Figure 5-17 appears if the waypoint is currently selected as destination, is part of a registered route, or is part of the route currently being navigated.

```
► 1st line
  Are you sure to erase ?
  ENT:Yes    MENU:No
```

```
This wpt is GOTO
This wpt is in registered route
This wpt is in selected route
```

Figure 5-17

3) Press the [NU/CU ENT] key.

Note: Flags can be erased collectively by clearing the Plotter memory or both the Plotter memory and GPS memory. See page 9-1 for further details.

When flags are erased

When the origin waypoint is erased the waypoint before it becomes the origin waypoint. If there is no waypoint before the origin waypoint, current position becomes the origin waypoint.

Figure 5-18 Route rearranged after erasing flag

When a destination is erased, the waypoint which follows it becomes the destination. If there is no waypoint after the destination waypoint erased, route navigation is cancelled.

5.4 Finding Range and Bearing Between Two Points

Selecting course sailing method

The range and bearing to a destination can be calculated two ways: Great Circle or Rhumb Line. However, cross track error is calculated in rhumb line only.

Great Circle: The great circle courseline is the shortest course between two points on the surface of the earth. (Imagine stretching a piece of yarn between two points on the earth.) However, this course requires frequent change of heading to follow course faithfully.

Rhumb Line: The rhumb line courseline is the straight line drawn between two points on a nautical chart. This course does not require frequent changes of heading however it is not the shortest since it follows the earth's curvature.

1) Press [MENU ESC], [9] and [1] to display the PLOTTER SETUP menu.

```
        PLOTTER SETUP
 Memory Apportion   Trk = 1000 / 2000Pt
 Bearing Ref.        True       Mag
 Mag Variation       Auto       Man
                    (07° W)    (00° E)
 Calculation         R.L        G.C
 User defined #1   ◄   SOG   ►
            #2     ◄   COG   ►
            #3     ◄   RNG   ►
            #4     ◄   BRG   ►
   ENT:Enter       MENU:Escape
```

Figure 5-20 PLOTTER SETUP menu

2) Press ▲ or ▼ to selection Calculation.
3) Press ◄ or ► to select R.L (Rhumb Line) or G.C (Great Circle).

4) Press the [NU/CU ENT] key.
5) Press the [MENU ESC] key.

Calculation procedure

You can find the range and bearing between two points by two waypoints or two latitude and longitude positions.

1) Press [MENU ESC] and [5]. The MANUAL CALCULATION menu appears.

```
         MANUAL CALCULATION
 From     Waypoint No. ▮ _ _
          _ _°_ _. _ _ _'N    _ _ _° _ _. _ _ _'E
 To       Waypoint No. _ _ _
          _ _°_ _. _ _ _'N    _ _ _° _ _. _ _ _'E
 Trial speed :  Auto       Man
                         (_ _ _._ kt)
 Rng:  _ _ _ _. _ _ m      Brg:_ _ _.._°
 TTG:  _ _ D _ _ H _ _ M
 ▲ ▼ ◄ ►  : Cursor    MENU : Escape
 ENT : Calculation    ↻ : N/S, E/W
```

Figure 5-19 MANUAL CALCULATION menu

2) Choose two points by one of the methods below.

Latitude and longitude positions
1) Press ▼.
2) If necessary press [↻] to switch from North latitude and to South latitude vice versa.
3) Key in latitude.
4) If necessary press [↻] to switch from West longitude to East longitude and vice versa.
5) Key in longitude.
6) Press ▼.
7) Repeat 2-5 to enter other point.

Waypoints
1) Key in first waypoint number (000-999). (000 is reserved for own ship position.)
2) Press ▼ twice.
3) Key in other waypoint number (000-999).
4) Press ▼ to shift the cursor to the Trial Speed line.
5) Press ◄ or ► to select Auto or Man. Auto

5-7

uses ship's average speed to calculate
time-to-go.

6) If you selected Man, enter speed.

7) Press the [NU/CU ENT] key.

The range, bearing and time-to-go between
two points appear on the display. If data
entered is wrong or insufficient the buzzer
sounds and the message "INCOMPLETE
DATA" appears. If the data contains error,
"*" and all nines appear as the calculation
results.

8) Press the [MENU ESC] key.

5-8

6. SETTING UP VARIOUS DISPLAYS

6.1 The Data Display

The user may select what data to display in four locations on the data display.

Figure 6-1 Data display

The data the user may display are;

- Altitude (ALT)*
- Average course (AVR COG)
- Average speed (AVR SPD)
- Course (COG)
- Course error (dCOG)
- Cross track error (XTE)
- Depth (W.DPT)#
- ETA to waypoint (ETA)
- Range to waypoint (RNG)
- Route time-to-go (RT.TTG)
- Speed (SOG)
- Time-to-go to waypoint (TTG)
- Total route distance (RT.DIST)*
- Trip distance (TRIP)
- Trip elapsed time (TRIP TM)

- Water temperature (W.TMP)#, and
- Velocity to destination (VTD)*
- ETA to route

*ALT: Displayed only in 3D position fixing.
*RT. DIST: Total distance from current position to ultimate destination. Appears when following a registered route or a cursor-created route.
*VTD: When following a route, plus or minus appears next to indication to denote which direction the route is being traversed.

Requires external sensor.

1) Press [MENU ESC], [9] and [1] to display the PLOTTER SETUP menu.

Figure 6-2 PLOTTER SETUP menu

2) Press ▲ or ▼ to select one of four of "User defined" (#1, #2, #3, #4).
3) Press ◀ or ▶ to select data to display.
4) Press the [NU/CU ENT] key. To select the data to display at other user defined displays, repeat steps 2 and 3.
5) Press the [MENU ESC] key.

6-1

6.2   Position Format

Position can be displayed in latitude and longitude, Loran C LOPs, or Decca LOPs, and the default format is latitude and longitude.

Displaying position in latitude and longitude

1) Press [MENU ESC], [9] and [8] to display the LOP SETUP menu.

```
              LOP SETUP

 Pos Display     Lat / Long      LOP
 LOP Display     LC              DE
 LC Chain        7980 : 23-43
   ΔLOP          -12.3us   +0.34 us
 DE Chain        24:G - P
   ΔLOP          +0.80 Lane  -1.00 Lane

       (RED:1 GREEN:2 PURPLE:3)

 ▲▼◀▶  :  Select        ENT : Enter
 MENU : Escape           ⟳ : +/-
```

Figure 6-3 LOP SETUP menu

2) Press ▲ to select Pos Display.
3) Press ◀ to select Lat/Long.
4) Press the [NU/CU ENT] key.
5) Press the [MENU ESC] key.

Displaying position in LOPs

1) Press [MENU ESC], [9] and [8].
2) Press ▲ to select Pos Display.
3) Press ▶to select LOP.
4) Press ▼ to select LOP Display.
5) Press ◀ or ▶ to select LC (Loran C) or DE (Decca).

Follow ① or ② in the adjacent column according to selection in step 5.

6) Press ▼ to select LC Chain.
7) Key in GRI code referring to the Loran C chain list in the Appendix. If the GRI code is 9970, for example, press [9] [9] [7] [0].
8) Key in secondary code pair referring to the Loran C chain list in the Appendix.
9) If necessary press ▼ to choose ΔLOP to enter correction value. Key in correction value. Use [⟳] to switch from plus to minus or vice versa.
10) Press the [NU/CU ENT] key.
11) Press the [MENU ESC] key.

② **For Decca LOPs**

6) Press ▼ to select DE Chain.
7) Key in Decca chain number referring to the Decca chain list in the Appendix. For the Europe chain, for example, press [0] [1].
8) Key in Decca lane pair. Red, [1]; Green [2], and Purple [3].
9) If necessary press ▼ to choose ▲ LOP to enter correction value. Key in correction value. Use [⟳] to switch from plus to minus or vice versa.
10) Press the [NU/CU ENT] key.
11) Press the [MENU ESC] key.

6-2

Entering waypoints using LOPs

1) Press [WPT RTE] and [4].
2) Press [↻] to display LOPs.

```
WAYPOINT LIST (LOP, LC)

 001  36365.2        59102.3
 ⚓    MARINE POINT AUG12' 03 12 : 35U

 002  36512.3        59134.5
 ___  A POINT       AUG13'  03 13 : 45U

 003  _ _ _ _ _ , _    _ _ _ _ _ , _
 ___  _ _ _ _ _ _ _ _ _ _ _ _

 004  _ _ _ _ _ , _    _ _ _ _ _ , _
 ___  _ _ _ _ _ _ _ _ _ _ _ _

 ↻ : L/L ↔ LOP        ◀ ▶ : Edit
 ENT : Enter          MENU : Escape
```

Figure 6-4 LOP display on the waypoint list

3) Press ▲ or ▼ to select waypoint number.
4) Press ◀ or ▶. Your display should look like one of the displays in Figure 6-5.

```
          Edit=Waypoint : 001

LC8930 :    30            50
         3 8931.2       58654.3
         (34° 12.345' N   130° 23.456' E)
Mark : ⚓
Cmnt : MARINE POINT

 ◀ ▶  : Cursor       ▼ : Column
 ENT : Enter         MENU : Escape
```

Loran C LOP input screen

```
          Edit=Waypoint : 001

DE : 32 (9C) RED         GREEN
         1 A:12.23      2H:24.35
         (34° 12.345' N   130° 23.456' E)
Mark : ⚓
Cmnt : MARINE POINT

 ABCDEFGHIJ  fi 1, 2 ~ 9, 0
 ◀ ▶  : Cursor       ▼ : Column
 ENT : Enter         MENU : Escape
```

Decca LOP input screen

Figure 6-5 LOP input screens

5) Key in LOP1 and LOP2, to enable calculation.
6) Press ▼ to calculate LOPs. "Calculating" appears between parentheses during the calculation. Actual LOPs replace "Calculating" upon completion of the calculation.
   If the conversion fails, the message "Failed in Conversion" appears for three seconds.
   Press the [CLEAR] key and reenter the right LOP1 and LOP2.
7) Press ◀ or ▶ to select mark.
8) Press the [NU/CU ENT] key.
9) Enter comment, if desired.
10) Press the [NU/CU ENT] key twice. The waypoint list appears.

6-3

6.3   Demo Display

The demo display provides simulated operation of this unit. Own ship tracks, at the speed selected, a figure eight course, starting from position entered. All controls are operative; you may change course, enter marks, etc.

1) While pressing and holding down [NU/CU ENT], turn on the power.

```
DEMO SETTING

 BASE POSITION

      _ _°_ _._ _ _' N  _ _ _°_ _._ _ _'W
 SPEED
       00.00kt


 ◄ ► : Cursor          ▼ : Column
 ENT: Enter           ⟲ : N/S, E/W
```

Figure 6-6 DEMO SETTING menu

2) Key in latitude of initial position.
3) If necessary, press [⟲] to switch from north latitude to south latitude or vice versa.
4) Key in longitude.
5) If necessary, press [⟲] to switch from east longitude to west longitude or vice versa.
6) Press ▼.
7) Key in speed.
8) Press the [NU/CU ENT] key to start the demonstration mode. The plotter display appears and the demo mode begins. After the test results appear, the demo setting mode menu appears.
9) To quit the demo display, turn off the power.

All tracks, marks and data entered during the simulation are erased and default demo mode settings are restored.

6-4

7. ALARMS

7.1 Overview

There are seven alarm conditions which generate both aural and visual alarms.

When an alarm setting is violated, the buzzer sounds and the name of the alarm being violated appears on the display. The alarm icon also appears on the Plotter 1, Plotter 2 and Highway displays. This occurs on both navigators when they are sharing data.

Alarm status is output to external equipment through the DATA1 port and the DATA4 port when it outputs data in NMEA format.

Figure 7-1 Location of alarm messages and alarm icon

Clearing the aural and visual alarms

Press the [CLEAR] key. When the navigators are sharing data, the "reset alarm signal" is transmitted to the other navigator to clear aural and visual alarms there.

Disabling an alarm

Select OFF instead of alarm name on the appropriate menu. This disables the alarm on both navigators when they are sharing data.

7.2 Arrival Alarm, Anchor Watch Alarm

Arrival alarm

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

Figure 7-2 How the arrival alarm works

1) Press the [MENU ESC] key.
2) Press [4] to display the ALARM SETTINGS menu.

Figure 7-3 ALARM SETTINGS menu, page 1/2

3) Press ▲ to select Arrival/Anchor.
4) Press ◄ or ► to select Arr.
5) Press ▼ to select Alarm Range.
6) Key in alarm range (0.001-9.999 nm).
7) Press the [NU/CU ENT] key.
8) Press the [MENU ESC] key.

When own ship nears a waypoint by the range set here, the buzzer sounds and the message "Arrival alarm" appears.

7-1

Anchor watch alarm

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

Figure 7-4 How the anchor watch alarm works

Before setting the anchor watch alarm, set present position as destination waypoint, referring to chapter 5.

1) Press [MENU ESC] and [4].
2) Press ▲ to select Arrival/Anchor.
3) Press ◀ or ▶ to select Anc.
4) Press ▼ to select Alarm Range.
5) Key in alarm range (0.001-9.999 nm).
6) Press the [NU/CU ENT] key.
7) Press the [MENU ESC] key.

When own ship drifts by the range set here, the buzzer sounds and the message "Anchor alarm" appears.

7.3 Cross Track Error (XTE) Alarm

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

Figure 7-5 How the XTE alarm works

1) Press [MENU ESC] and [4].
2) Press ▲ or ▼ to select XTE.
3) Press ◀ or ▶ to select On.
4) Press ▼ to select Alarm Range.
5) Key in alarm range (0.001-9.999 nm).
6) Press the [NU/CU ENT] key.
7) Press the [MENU ESC] key.

When own ship strays from the intended track by the range set here, the buzzer sounds and the message "Cross track error alarm" appears.

7-2

7.4 Speed Alarm

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

1) Press [MENU ESC] and [4].
2) Press ▲ or ▼ to select Ship Speed.
3) Press ◄ or ► to select In or Over.

   In: Alarm sounds when speed is within range set.

   Over: Alarm sounds when speed is higher or lower than range set.
4) Press ▼ to select Speed Range.
5) Key in low speed.
6) Key in high speed.
7) Press the [NU/CU ENT] key.
8) Press the [MENU ESC] key.

When speed is higher or lower (or within) than the speed set here, the buzzer sounds and the message "Speed alarm" appears.

7.5 Trip Alarm

The trip alarm sounds when the distance run is greater than the trip alarm setting.

1) Press [MENU ESC] and [4].
2) Press ▼ to select Next Page. The menu shown in Figure 7-6 appears.

```
ALARM SETTINGS          2/2
To Previous Page
Trip (CLR:Reset)     On    Off
   Trip Range       0123.00nm
Water Temp.         In   Over   Off
   Temp. Range      +12.0 ~ +15.0°C
Depth               In   Over   Off
   Depth Range      0003.0 ~ 0200.0ft
DGPS Alarm          On    Off

▲▼◄► : Select      ENT : Enter
MENU : Escape        ⟲ : +/-
```

Figure 7-6 Alarm settings menu, page 2/2

3) Press ▲ or ▼ to select Trip.
4) If necessary, press [CLEAR] to reset the trip distance and trip elapsed time.
5) Press ◄ or ► to select On.
6) Press ▼ to select Trip Range.
7) Key in trip range.
8) Press the [NU/CU ENT] key.
9) Press the [MENU ESC] key.

When the ship's distance run is higher than the trip range set here, the buzzer sounds and the message "Trip alarm" appears.

7.6 Water Temperature Alarm

The water temperature alarm sounds when the water temperature is higher or lower (or within) the preset temperature. This alarm requires a water temperature signal from external equipment.

1) Press [MENU ESC] and [4].
2) On page 2/2 of the ALARM SETTINGS menu, press ▲ or ▼ to select Water Temp.
3) Press ◀ or ▶ to select In or Over.
4) Press ▼ to select Temp. Range.
5) Key in low temperature.
6) Key in high temperature.
7) Press the [NU/CU ENT] key.
8) Press the [MENU ESC] key.

When the water temperature is higher or lower (or within) the preset value, the buzzer sounds and the message "Water temp alarm" appears.

7.7 Depth Alarm

The depth temperature alarm sounds when the depth is higher or lower (or within) the preset depth. This alarm requires video sounder connection.

1) Press [MENU ESC] and [4].
2) On page 2/2 of the ALARM SETTINGS menu, press ▲ or ▼ to select Depth.
3) Press ◀ or ▶ to select In or Over.
4) Press ▼ to select Depth Range.
5) Key in low depth.
6) Key in high depth.
7) Press the [NU/CU ENT] key.
8) Press the [MENU ESC] key.

When the depth is higher or lower (or within) the preset value, the buzzer sounds and the message "Depth alarm" appears.

7.8 DGPS Alarm

The DGPS alarm sounds when the DGPS signal is lost. This alarm may be enabled or disabled as below.

1) Press [MENU ESC] and [4].
2) On page 2/2 of the ALARM SETTINGS menu, press ▲ or ▼ to select DGPS Alarm.
3) Press ◀ to select On, or ▶ to select off.
4) Press the [NU/CU/ENT] key.
5) Press the [MENU ESC] key.

8. MENU SETTINGS

8.1　GPS SETUP Menu

Menu description

Fix mode

Two position fixing modes are available: 2D and 2/3D. The 2D mode provides two dimensional position fixes (latitude and longitude only) and is used when three satellites are in line of sight of the GPS receiver.

The 2/3D mode switches between two and three dimension position fixing automatically depending on how many satellites (three or four) are in line of sight of the GPS receiver.

ANT Height

Enter the height of the antenna unit above sea surface (000-999 ft, 000-304 m). The default setting is 16 ft.

Disable satellite

Every GPS satellite is broadcasting abnormal satellite number(s) in the Almanac. 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 on the GPS SETUP menu.

GPS 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 9 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.

GPS smoothing, speed

During position fixing, ship's velocity (speed and course) is directly measured by receiving GPS satellite signals. The raw velocity data may change 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." "5" is suitable for most conditions.

Speed average

Calculation of ETA and TTG, etc. is based on average ship's speed over a given period. The default setting is one minute. Change the setting if the ETA seems wrong.

RAIM function/RAIM accuracy

RAIM (Receiver Autonomous Integrity Monitoring) is a diagnostic function which tests the accuracy of the GPS signal within the range set with "RAIM Accuracy" on the GPS SETUP 2/2 menu. The receiver displays (provided the RAIM function is active) three levels of position confidence according to the results of the test as shown below. "CAUTION" indicates that RAIM could not be assessed. In this case, provided the GPS signal is normal, GPS position is safe to use.

SAFE: GPS signal is safe to use.
CAUTION: RAIM accuracy is shorter than protected level or RAIM measurement not possible.
UNSAFE: GPS signal is not safe to use.

Enter the range for which you want to know position confidence

Geodetic datum

Select the geodetic chart system you are using. WGS-84 (standard GPS chart system) and NAD 27 can be directly selected. For other charts, select "OTHER" and enter chart number referring to the geodetic chart list in the Appendix.

To output position data to ECDIS (Electronic Chart Display and Information System), turn on the power while holding down the [0] key to disable access to the Geodetic Datum menu. Then, "Cannot be changed" is shown in the Geodetic Datum menu as in Figure 8-2 on the next page. To stop outputting position data to ECDIS, turn on the power while holding down the [0] key.

Position offset

You may apply an offset to position generated by the internal GPS receiver, to compensate for difference between GPS position and chart position.

Time difference

The GPS system uses UTC time. If you would rather use local time, enter the difference in hours between local time and UTC. Use the [+] and [-] keys for times later or earlier than UTC, respectively.

Position

When executing cold start there is no satellite information in the unit's memory, thus it may take some time to find position. To fix position faster, enter estimated position.

Setting up the GPS SETUP menu

Fix mode

1) Press [MENU ESC], [9] and [6] to display the GPS SETUP menu.

```
┌─────────────────────────────────┐
│        GPS SETUP        1/2      │
├─────────────────────────────────┤
│ Fix Mode           2D   2/3D    │
│ ANT Height         016 ft       │
│ Disable Satellite  12 _ _ _ _ (1-32)│
│ GPS Smoothing                   │
│         Posn  0 0 0 0 (0000-9999 sec)│
│          Spd  0 0 0 5 (0000-9999 sec)│
│ Speed Average 0 0 6 0 (0000-9999 sec)│
│ To Next Page                    │
├─────────────────────────────────┤
│ ▲▼◄ ►  : Select     ENT : Enter │
│ MENU : Escape                   │
└─────────────────────────────────┘
```

Figure 8-1 GPS SETUP menu, page 1/2

2) Press ▲ to select Fix Mode.
3) Press ◄ or ► to select fix mode desired.
4) Press ▼ to change other settings, or press [MENU ESC] to register settings and escape.

Disabling satellites

When the navigators are sharing data, satellites are disabled on both navigators.

1) Press [MENU ESC], [9] and [6].
2) Press ▲ or ▼ to select Disable satellite.
3) Key in satellite number, in two digits (01-32). Three sets of satellite numbers may be entered.
4) Press the [NU/CU ENT] key. If an invalid number is entered the buzzer sounds.
5) Press the [MENU ESC] key.

Note: To enable all disabled satellites, press the [CLEAR] key at step 3. All satellite numbers on the Disable satellite line are erased.

8-2

GPS position smoothing

1) Press [MENU ESC], [9] and [6].
2) Press ▲ or ▼ to select Posn.
3) Enter smoothing factor in three digits (001-999).
4) Press the [NU/CU ENT] key.
5) Press the [MENU ESC] key.

GPS speed smoothing

1) Press [MENU ESC], [9] and [6].
2) Press ▲ or ▼ to select Spd.
3) Enter smoothing factor in three digits (001-999).
4) Press the [NU/CU ENT] key.
5) Press the [MENU ESC] key.

Speed averaging

1) Press [MENU ESC], [9] and [6].
2) Press ▼ to select Speed Average.
3) Enter smoothing factor in two digits (00-99).
4) Press the [NU/CU ENT] key.
5) Press the [MENU ESC] key.

RAIM function

1) Press [MENU ESC], [9] and [6].
2) Press ▲ to select RAIM function on page 2/2.

```
          GPS SETUP          2/2

To Previous Page
RAIM Function     OFF    ON
RAIM Accuracy     100 m
Geodetic Datum    WGS84  NAD27  OTHER
    (Cannot be changed)          (001)
Posn Offset       0.000' N  0.000' E
Time Diff.        +00:00
Posn        38  00.000' N  123  00.000' W

▲▼◀▶ : Select        ENT : Enter
MENU : Escape          ⟳ : +/
```

Figure 8-2 GPS SETUP menu, page 2/2

3) Press ◀ or ▶ to turn RAIM function ON or OFF as appropriate.
4) Press the [NU/CU ENT] key.
5) Press the [MENU ESC] key.

RAIM accuracy

1) Press [MENU ESC], [9] and [6].
2) Press ▲ or ▼ to select RAIM accuracy on page 2/2.
3) Key in the range for which you want to know RAIM accuracy (1 to 999 m).

   Note: Unit is meter only.

4) Press the [NU/CU ENT] key.
5) Press the [MENU ESC] key.

Geodetic datum

1) Press [MENU ESC], [9] and [6].
2) Press ▲ or ▼ to select Geodetic Datum on page 2/2.
3) Press ◀ or ▶ to select geodetic datum to use. For geodetic datum other than WGS-84 or NAD-27, select OTHER and key in chart number (001-173) referring to the geodetic chart list in the Appendix.
4) Press the [NU/CU ENT] key.
5) Press the [MENU ESC] key.

Position offset

If you do not know the type of chart you are using, GPS position may be wrong. Note the difference in position when moored to a pier and enter it on the GPS SETUP menu, to get correct position.

1) Press [MENU ESC], [9] and [6].
2) Press ▲ or ▼ to select Posn Offset on page 2/2.
3) If necessary press [⟳] to switch from north latitude to south latitude or vice versa.
4) Key in latitude correction.
5) If necessary press [⟳] to switch from east longitude to west longitude or vice versa.
6) Key in longitude correction.
7) Press the [NU/CU ENT] key.
8) Press the [MENU ESC] key.

8-3

Time difference

1) Press [MENU ESC], [9] and [6].
2) Press ▲ or ▼ to select Time Diff on page 2/2.
3) Key in time difference (-14:00 to +14:00).
4) Press [↻] to change from plus to minus or vice versa.
5) Press the [MENU ESC] key.

Position

After the unit is installed you may enter position to shorten the time it takes to find position. (It takes about two minutes when there is no position data entered.)

1) Press [MENU ESC], [9] and [6].
2) Press ▲ or ▼ to select Posn on page 2/2.
3) If necessary, press [↻] to switch from north latitude to south latitude or vice versa. Key in latitude.
4) If necessary, press [↻] to switch from east longitude to west longitude or vice versa. Key in longitude.
5) Press the [NU/CU ENT] key.
6) Press the [MENU ESC] key.

8.2 Units of Measurement

Unit of distance

Distance can be displayed in nautical mile, kilometer or statute mile as follows.

1) Press [MENU ESC], [9] and [2]. The UNIT SETUP menu appears.

```
┌─────────────────────────────────┐
│   UNIT SETUP                     │
│ ┌────────────────┐               │
│ │Unit of Distance│ ▓nm▓  km   sm │
│ └────────────────┘               │
│  Unit of Depth      m   │ft│  FA │
│  Unit of Temp.     ° C  │° F│    │
│  Unit of Altitude   m   │ft│     │
│                                  │
│  ▲▼◀▶   :Select                 │
│  ENT : Enter     MENU : Escape   │
└─────────────────────────────────┘
```

Figure 8-3 UNIT SETUP menu

2) Press ▲ to select Unit of Distance.
3) Press ◀ or ▶ to select unit; nm, km or sm.
4) Press the [NU/CU ENT] key.
5) Press the [MENU ESC] key.

Unit of depth

1) Press [MENU ESC], [9] and [2].
2) Press ▲ or ▼ to select Unit of Depth.
3) Press ◀ or ▶ to select unit; meter, feet, or fathom.
4) Press the [NU/CU ENT] key.
5) Press the [MENU ESC] key.

Unit of water temperature

1) Press [MENU ESC], [9] and [2].
2) Press ▲ or ▼ to select Unit of Temp.
3) Press ◀ or ▶ to select unit; Centigrade or Fahrenheit.
4) Press [NU/CU ENT] and [MENU ESC].

Unit of altitude

Available only in 3D mode.

1) Press [MENU ESC], [9] and [2].
2) Press ▲ or ▼ to select Unit of Altitude.
3) Press ◀ or ▶ to select unit.
4) Press the [NU/CU ENT] key.
5) Press the [MENU ESC] key.

8-4

8.3 Size and Brilliance of Markers

The DISPLAY SETUP menu lets you select the size and brilliance of various markers.

Grid tone

The grid can be displayed in light or dark tone, or turned off.

1) Press [MENU ESC] and [1]. The DISPLAY SETUP menu appears.

```
     DISPLAY SETUP

  Grid          Dark    Light   Off
  Course Bar    Dark    Light   Off
  Time Mark     Dark    Light   Off
  Waypoint Size Large   Small
  Cursor Size   Large   Small

  ▲ ▼ ◀ ▶  : Select

  ENT : Enter          MENU : Escape
```

Figure 8-4 DISPLAY SETUP menu

2) Press ▲ to select Grid.
3) Press ◀ or ▶ to select brilliance.
4) Press [NU/CU ENT] and [MENU ESC].

Course bar tone

The course bar can be displayed in light or dark tone, or turned off.

1) Press [MENU ESC] and [1].
2) Press ▲ or ▼ to select Course Bar.
3) Press ◀ or ▶ to select brilliance.
4) Press the [NU/CU ENT] key.
5) Press the [MENU ESC] key.

Time mark tone

The time mark can be displayed in light or dark tone, or turned off.

1) Press [MENU ESC] and [1].
2) Press ▲ or ▼ to select Time Mark.
3) Press ◀ or ▶ to select brilliance.
4) Press the [NU/CU ENT] key.
5) Press the [MENU ESC] key.

Waypoint mark size

The size of the waypoint mark can be selected to large or small.

Large waypoint mark

No icon	With icon
12	12

Small waypoint mark

$\times$

Figure 8-5 Waypoint mark size

1) Press [MENU ESC] and [1].
2) Press ▲ or ▼ to select Waypoint Size.
3) Press ◀ or ▶ to select Large or Small.
4) Press [NU/CU ENT] and [MENU ESC].

Cursor size

The size of the cursor can be selected to large or small.

Large cursor   Small cursor

Figure 8-6 Cursor size

1) Press [MENU ESC] and [1].
2) Press ▼ to select Cursor Size.
3) Press ◀ or ▶ to select Large or Small.
4) Press the [NU/CU ENT] key.
5) Press the [MENU ESC] key.

8-5

Enlarging characters

The size of the indications of position or user-defined display areas can be enlarged on the Data display.

1) On the Data display, with no enlarged characters, press the [CURSOR ON/OFF] key to turn on the cursor.
2) Operate the cursor keys to select data to enlarge in the window.
3) Press the [ZOOM IN] key.

To switch character size from enlarged to normal, press the [ZOOM OUT] key at step 3.

Figure 8-7 How to enlarge indications on the data display

8.4   Outputting Data

Besides its fundamental function of displaying position, the GP-90-DUAL can also receive data and output data to external equipment, through an interface unit. Before outputting data to external equipment, first determine what data the external equipment requires. Output only necessary data to ensure data will be output correctly.

All data transmitted by marine electronics equipment are prefixed with a two-character code called a talker. The same talker must be shared by the transmitting and receiving equipment to transmit and receive data successfully. The GP-90-DUAL transmits data using the GP (GPS talker), LC (Loran) or DE (Decca) talker.

DATA 1 output setting

1) Press [MENU ESC], [9] and [3]. The DATA 1, 3 OUTPUT SETUP menu appears.

Settings shown here are default settings.

This line appears only when LOG is selected by internal jumper wires.

Figure 8-8 DATA 1 OUTPUT SETUP menu

2) Press ▲ to select Data Fmt.

3) Press ◀ or ▶ to select NMEA 0183 (V1.5 or V2.0) or IEC 61162-1.

4) Press the [NU/CU ENT] key. Talker ID appears in reverse video.

5) Press ◀ or ▶ to select GP, LC or DE.

6) Press the [NU/CU ENT] key.

7) Enter Tx interval for each output data sentence in line 1. Tx interval is available in 00, 01, 02, 03, 04, 05, 06, 10, 15, 20, 30, 60 and 90 (seconds).

8) Press the [NU/CU ENT] key.

9) Enter Tx interval for each output data sentence in lines 2 through 5. Press the [NU/CU ENT] key after setting each line.

For detailed information about Tx interval see the chapter on installation. However, the Tx interval settings entered by the installer of the equipment should not be changed unless absolutely necessary.

BWC and WNC are for great circle navigation and BWR and WNR are for rhumb line navigation. However, all output data are calculated by rhumb line.

When the external equipment cannot display data input from the GP-90-DUAL correctly, the rate of operation should be lowered.

For example, set a rate of operation less then 60% for the Temperature Indicator TI-20.

DATA 3 output setting

The DATA 3 connector can output IEC 61162-1/NMEA 0183 data or log pulse. For NMEA 0183, IEC 61162-1 the same data output by DATA 1 is output from DATA 3.

For log pulse, select 200 or 400 pulse per second depending on the device connected.

1) Press [MENU ESC], [9] and [3].

2) Press ▼ to select DATA 3 or Log Pulse.

3) For log pulse, press ◀ or ▶ to select log pulse of external equipment; 200 ppm or 400 ppm.

4) Press the [NU/CU ENT] key twice.

Setting DATA 4 to data output

The DATA 4 port connects to a personal computer, DGPS receiver or YEOMAN equipment.

1) Press [MENU ESC], [9] and [5]. The DATA 4 I/O SETUP (1/2) menu appears.

```
DATA 4 I/O SETUP          1/2

DATA 4. Level    RS232C   RS422
       Data       Out     Com.  DGPS
To Next Page




▲▼◀▶   : Select
ENT : Enter          MENU : Escape
```

Figure 8-9 DATA 4 I/O SETUP menu (1/2)

2) Press ▲ to select Level.

3) Press ◀ or ▶ to select level of external equipment; RS232C or RS422.

4) Press the [NU/CU ENT] key.

5) Press ◀ or ▶ to select Out.

6) Press ▼ to select To Next Page. The DATA 4 I/O SETUP (2/2) menu appears.

8-7

```
   DATA 4 I/O SETUP   <Out>   2/2
  To Previous Page
 Data Fmt.        V1.5   V2.0   IEC
       Talker ID  GP   LC   DE
 Output Data     (00-90 sec)    98%
    1. AAM:00  APA:00  APB:04  BOD:00
    2. BWR:00  BWW:00  GGA:00  GLL:01
    3. RMB:01  RMC:00  VTG:01  WCV:00
    4. WNR:00  WPL:00  XTE:00  ZDA:01
    5. GNS:00  GBS:01  Rnn:00  RTE:00
  ENT : Enter        MENU : Escape
```

Figure 8-10 DATA 4 I/O SETUP menu (2/2)

7) Follow "DATA 1 output setting" from step 2.

8.5 Receiving Data from Personal Computer

Loading waypoint/route data

Waypoints and routes data can be downloaded from a personal computer, through the DATA 4 connector.

1) Press [MENU ESC], [9] and [5].
2) Press ▲ to select DATA 4 Level.
3) Press ◀ or ▶ to select level of personal computer; RS232C or RS422.
4) Press the [NU/CU ENT] key.
5) Press ◀ or ▶ to select Com.
6) Press ▼ to select To Next Page. The DATA 4 I/O SETUP menu appears.

```
   DATA 4 I/O SETUP  <Com.>   2/2
  To Previous Page
  Baud Rate      ◀ 9600 bps ▶
  Load Data     WPT/RTE  WPT
  Command       Stop     Start
  Save Data     WPT/RTE
  Command       Stop     Start

   ▲▼◀▶  : Select
   ENT : Enter      MENU : Escape
```

Figure 8-11 DATA 4 I/O SETUP menu (2/2)

7) Press ▲ to select Baud Rate.
8) Press ◀ or ▶ to select baud rate; 400 bps, 9600 bps, or 19200 bps.
9) Press the [NU/CU ENT] key.
10) Press ◀ or ▶ to select WPT/RTE.
11) Press ▼ to select Command. Stop, on the same line as Command, appears in reverse video.
12) Press ▶ to select Start. The message shown in Figure 8-12 appears.

```
 Loading erases current data
 and stops Route navigation
 Are you sure to load ?
 ENT: Yes     MENU:No
```

Figure 8-12

13) Press the [NU/CU ENT] key. The message shown in Figure 8-13 appears.

```
 Now loading
 Waypoint/Route data !

 MENU:Stop
```

Figure 8-13

14) Operate the computer to output data. When data is loaded, the cursor shifts to Stop.
15) Press the [MENU ESC] key. When data is loaded successfully, The message shown in Figure 8-14 appears.

```
 Loading ended successfully


 Press any key
```

Figure 8-14

If data could not be loaded, the message shown in Figure 8-15 appears.

```
 Failed in loading
 Invalid data
 Press any key
```

Figure 8-15

8-8

Stopping loading of data

1) Press the [MENU ESC] key. The message shown in Figure 8-16 appears.

```
Are you sure to stop ?



ENT: Yes     MENU:No
```

Figure 8-16

2) To quit loading, press the [NU/CU ENT] key. The cursor shifts to Stop.
3) To start loading, select Start.
4) Press the [NU/CU ENT] key.

Loading waypoint data from YEOMAN equipment

1) Do steps 1 through 9 in "Loading Waypoint/route data."
2) Press ◀ or ▶ to select WPT.
3) Press ▼ to select Command.
4) Press ▶ to select Start. The message shown in Figure 8-17 appears.

```
Are you sure to load ?



ENT: Yes     MENU:No
```

Figure 8-17

5) Press the [NU/CU ENT] key. The message shown in Figure 8-18 appears.

```
Now loading
Waypoint data !

MENU:Stop
```

Figure 8-18

6) Operate the YEOMAN to output data.

When data is loaded, the cursor automatically shifts to "Stop". Waypoints are loaded into empty areas. When the waypoint area becomes full, the message shown in Figure 8-19 appears.

```
Waypoint area is full !
Can't load any data
Press any key to stop
```

Figure 8-19

7) When the data is loaded, press [CU/NU ENT] and [MENU ESC]. The message shown in Figure 8-20 appears.

The number of valid and invalid waypoints appear in the message.

```
Loading completed
Valid waypoint   :  0
Invalid waypoint :  0
Press any key
```

Figure 8-20

8) Press the [MENU ESC] key twice.

Saving data to personal computer

Waypoint and route data can be saved to a personal computer.

1) Press [MENU ESC], [9] and [5].
2) Press ▲ to select Level.
3) Press ◀ or ▶ to select level; RS232C or RS422.
4) Press the [NU/CU ENT] key. "Data" appears in reverse video.
5) Press ▶ to select Com.
6) Press ▼ to select Next Page.
7) Press ▲ to select Baud Rate.
8) Press ◀ or ▶ to select baud rate; 400bps, 9600bps, or 19200bps.
9) Press ▼ to select Command (under the Save Data line). Stop, on the same line as Command, appears in reverse video.
10) Press ▶ to select Start. The message shown in Figure 8-21 appears.

```
Are you sure to save ?



ENT: Yes     MENU:No
```

Figure 8-21

8-9

11) Press the [NU/CU ENT] key. The message shown in Figure 8-22 appears while data is being saved.

```
Now saving
Waypoint/Route data !


MENU:Stop
```

Figure 8-22

12) Save data at the computer.
13) Press the [MENU ESC] key. When data is saved, the cursor shifts to Stop.
14) Press the [MENU ESC] key.

8.6　DGPS Settings

A DGPS beacon receiver may be connected to the GP-90-DUAL to further refine position accuracy. Set up to receive the DGPS beacon signal as follows.

Selecting DGPS station

The default setting is "manual".

Automatic

The DGPS beacon receiver can automatically select optimum reference station by feeding it position data. If it takes more than 5 minutes to fix DGPS position at the automatic mode, switch to manual mode. Use the manual mode when an external beacon receiver cannot select reference station automatically.

1) Press [MENU ESC], [9] and [7] to display the DGPS SETUP menu.

```
          Frequency appears when
          "MAN" is selected.

   DGPS SETUP

 DGPS MODE   On      Off
 Ref. Station   Auto    Man (ID=_ _ _ _ )
 ┌─────────────────────────────────┐
 ┊  Freq.      288.0kHz              ┊
 ┊ Baud Rate   ◀  200  bps ▶         ┊
 └─────────────────────────────────┘



 ▲ ▼ ◀ ▶ : Select
 ENT : Enter        MENU : Escape
```

Figure 8-23 DGPS SETUP menu

2) Set DGPS MODE to "On."
3) Press ▲ or ▼ to select Ref. Station.
4) Press ◀ to select Auto.
5) Press the [NU/CU ENT] key.
6) Press the [MENU ESC] key.

Manual selection of DGPS station

Manual

Enter four-digit ID number, frequency and baud rate of station.

Reference

• ID number: Appendix at end of this manual

• Frequency, baud rate: "DGPS REFERENCE LIST"

1) Press [MENU ESC], [9] and [7] to display the DGPS SETUP menu.
2) Press ▲ or ▼ to select Ref. Station.
3) Press ▶ to select Man.
4) Enter four-digit ID number. You can clear an entry by the [CLEAR] key. If the number entered is invalid, the buzzer sounds and the message "INVALID ID" appears on the display for three seconds. If there is no ID number, press the [CLEAR] key.

8-10

5) Press the [NU/CU ENT] key.

6) Enter frequency in four digits (283.5 kHz to 325.0 kHz).

7) Press the [NU/CU ENT] key. "Baud Rate" appears in reverse video.

8) Press ◀ or ▶ to select baud rate; 25, 50, 100 or 200 bps.

9) Press the [MENU ESC] key.

8.7   GPS Monitor Display

Three GPS monitor displays provide GPS information:

- **Satellite monitor** which shows position of GPS satellites

- **DGPS INTEGRITY STATUS** which displays DGPS beacon station information

- **DGPS beacon station message monitor** which displays messages received from beacon stations

To display the GPS monitor displays;

1) Press [MENU ESC], [7].

2) Press [↻] to choose the GPS monitor you want to view.

3) Press the [MENU ESC] key to escape.

Number, bearing and elevation angle of all satellites in view of the GPS receiver appear. Satellites being used in fixing position are circled with a solid line; satellites not being used in fixing position are circled with a dashed line.

SATELLITES MONITOR

Press [↻].

DGPS INTEGRITY STATUS

Press [⟳].

| Aug 21 2003 23:59'59" U | D3D
SAFE   100m |

Message:
    STATION IS OPERATING.

⟳:SATELLITES MONITOR
MENU:Escape

STATION MESSAGE

Press [⟳].

Return to SATELLITES
MONITOR

Figure 8-24 GPS monitor displays

9. MAINTENANCE & TROUBLESHOOTING

9.1　Clearing the Memory

The GP-90-DUAL has two memories: GPS memory and plotter memory.

Clearing the plotter memory

The plotter memory holds plotted track and mark data. When you clear the plotter memory, all track and marks are cleared and all corresponding defaults settings are restored.

1) Press [MENU ESC], [9] and [9] to display the CLEAR MEMORY menu.

```
┌─────────────────────────────┐
│  CLEAR MEMORY               │
│                             │
│  Clear Plotter   No   Yes   │
│  Clear GPS       No   Yes   │
│  Clear All       No   Yes   │
│                             │
│  ▲ ▼ ▶     : Select         │
│  MENU : Escape              │
└─────────────────────────────┘
```

Figure 9-1 CLEAR MEMORY menu

2) Press ▲ to select Clear Plotter.
3) Press ▶ to select Yes. The following message appears.

```
┌─────────────────────────────┐
│  Clear tracks and marks     │
│  Are you sure to clear ?    │
│   ENT:Yes    MENU:No        │
│                             │
└─────────────────────────────┘
```

Figure 9-2

4) Press the [NU/CU ENT] key.

Clearing the GPS memory

The GPS memory stores GPS information, including the Almanac. When you clear the GPS memory, all GPS information is erased.

1) Press [MENU ESC], [9] and [9] to display the CLEAR MEMORY menu.
2) Press ▲ or ▼ to select Clear GPS.
3) Press ▶ to select Yes. The following message appears.

```
┌─────────────────────────────┐
│  Setting for cold start     │
│  Are you sure to clear ?    │
│   ENT:Yes    MENU:No        │
│                             │
└─────────────────────────────┘
```

Figure 9-3

4) Press the [NU/CU ENT] key.

Clearing GPS and plotter memories

To clear both GPS and plotter memories;
1) Press [MENU ESC], [9] and [9] to display the CLEAR MEMORY menu.
2) Press ▼ to select Clear All.
3) Press ▶ to select Yes. The message shown in Figure 9-4 appears.

```
┌─────────────────────────────┐
│  Setting for default        │
│  Are you sure to clear ?    │
│   ENT:Yes    MENU:No        │
│                             │
└─────────────────────────────┘
```

Figure 9-4

4) Press the [NU/CU ENT] key.

Note: The equipment may lock after clearing the GPS and plotter memories. Reapply power to the equipment to restore normal operation.

9.2   Preventive Maintenance

Regular maintenance is necessary to maintain performance. Check the items mentioned below monthly to keep the equipment in good working order.

Antenna unit

Check fixing bolts for tightness.

Antenna cable

Check connector for tightness, rust, damage and water leaks.

Power cable

Check for tight connection.

Ground terminal

Check for rust and tight connection.

Fuse

The 2A fuse in the power cable protects the unit from overvoltage and equipment fault. If the fuse blows, find out the cause before replacing the fuse. If the fuse blows after replacement, request service.

⚠ WARNING

Use only a 2A fuse in the power cable.

Use of different fuses may cause fire.

Battery

A battery installed on the NP board inside the display unit preserves date when the power is turned off. The life of the battery is about three years. When the battery voltage is low "NG" appears on the start-up display. When this happens, contact your dealer to request replacement of the battery.

	Type	Code Number
Lithium Battery	CR2450-F2ST2L	000-144-941

9.3   Error Messages

Error messages appear on the display to alert you to possible trouble.

GPS error

When the GPS signal is suddenly lost and position cannot be calculated within one second the message shown in Figure 9-5 appears.

```
GPS No fix
```

Figure 9-5 GPS error message

This message may appear when there is an interfering object between the satellite and GPS receiver (for example, mast) or the antenna cable is disconnected.

Press the [CLEAR] key to silence the buzzer. If the [CLEAR] key is not pressed, several beeps sound every three minutes.

Error message disappears automatically when normal operation is restored.

DOP error

When PDOP value exceeds 6 in the 3D mode, or HDOP value exceeds 4 in the 2D mode, this error occurs and the following message appears.

```
DOP Error
```

Figure 9-6 DOP error message

Press the [CLEAR] key to silence the buzzer. If the [CLEAR] key is not pressed, several beeps sound every three minutes.

Error message disappears automatically when normal operation is restored.

DGPS error

When the DGPS alarm is active and DGPS data contains errors or the DGPS beacon station is experiencing transmitting problems, the message shown in Figure 9-7 appears. Normal operation is restored when DGPS signal is acquired.

```
DGPS Error
```

Figure 9-7 DGPS error message

Refer to DGPS INTEGRITY STATUS in "8.7 Display GPS Monitor Displays" to confirm DGPS Beacon station status.

Self test error message

If the self test (conducted when turning on the power) finds equipment error, the message shown in Figure 9-8 appears.

```
GPS No fix  GPS SEFTTEST error XX
```

Figure 9-8 Self test error message

If the self test error message appears, consult your dealer for advice.

9.4   Troubleshooting

The table which follows provides
troubleshooting procedures which you can
follow to restore normal operation. If normal
operation cannot be restored, ask your
dealer for advice.

Table 9-1 Troubleshooting table

If…	Then…
you cannot turn on the power	• check power connector for tight connection. • check if ship's main is off. • check for blown fuse.
position cannot be fixed	• check antenna cable for tight connection and water leakage. • check if functional satellite has been disabled: [MENU ESC] [9] [6]
position is wrong	• Check if correct geodetic chart is entered: [MENU ESC][9][6] • apply position correction to GPS position: [MENU ESC][9][6]
position sometimes cannot be fixed	• dop figure may be too small. Enter larger figure; 20 is the usual setting.
data cannot be transmitted to external equipment	• check if data format is correct: [MENU ESC][9][3] ([9][4]or[9][5]) See the chapter on installation for further details. • tx interval may be set to "0". Select proper interval. [MENU ESC] [9][3] ([9][4]or[9][5]) See chapter on installation for further details. • check appropriate settings on external equipment. • check connections: GP-90-DUAL Ext. equipment TXD-H ↔ RXD-H TXD-C ↔ RXD-C

9.5   Diagnostic Tests

Memory and I/O port test

1) Press [MENU ESC] and [8] to display the SELF TESTS menu.

```
         SELF TESTS
  1. Memory, I/O Port Test
  2. Keyboard Test
  3. Test Pattern
  4. Automatic Testing
         GPS  PROGRAM No. 4850237003
         NAV PROGRAM No. 2051513-XX.XX
         BOOT PROGRAM Code B

    ▲▼  :Cursor
  ENT:Enter      MENU:Escape
```

XX.XX: Version no.

Figure 9-9 Diagnostic TESTS menu

2) Press [1].

```
    MEMORY, I/O PORT TEST

  PROGRAM MEMORY    OK
  SRAM              OK
  Internal Battery  OK
  DATA 1 PORT            NG
  DATA 2 PORT            NG
  DATA 4 PORT            NG
  GPS               OK
  BEACON            OK


    MENU:Escape
```

Figure 9-10 MEMORY, I/O PORT TEST display

3) When testing is finished, press the [MENU ESC] key to escape and return to the SELF TESTS menu. (Testing continues if the key is not pressed.) OK appears to the right of PROGRAM, SRAM and Internal Battery when those devices are normal; NG (No Good) appears when an abnormality is found. OK appears to the right of GPS and BEACON when they are normal; NG and 16 hexadecimal figure appear when an abnormality is found.

Whenever NG or 16 hexadecimal figure appears contact your dealer for advice.

DATA 1 PORT, DATA 2 PORT and DATA 4 PORT show results of communication interface test. A special test connector is required to test those ports. NG appears as the results of the self test when there is no test connector attached.

4) Press the [MENU ESC] key to escape.

Keyboard test

1) Press [MENU ESC], [8] and [2] to display the KEYBOARD TEST screen.

```
         KEYBOARD TEST




  Press CLEAR 3 times to escape
```

Figure 9-11 KEYBOARD TEST screen

2) Press each key one by one. A key's corresponding location on the screen lights in reverse video if the key is normal.

3) To quit the keyboard test, press the [CLEAR] key three times. Control is returned to the SELF TESTS menu.

4) Press the [MENU ESC] key.

9-5

Display test

1) Press [MENU ESC], [8] and [3] to display the test pattern screens.
2) To change the test pattern, press the [NU/CU ENT] key. Each time the key is pressed one of the patterns shown in Figure 9-12 appears.

Figure 9-12 Test patterns 1 and 2

3) To quit the test pattern, press the [CLEAR] key three times. Control is returned to the SELF TESTS menu.
4) Press the [MENU ESC] key.

Automatic testing

This feature conducts all self tests continuously.

1) Press [MENU ESC], [8] and [4]. Self tests are conducted continuously in the order of memory, I/O test, keyboard test and test pattern.
2) To stop testing, press the [MENU ESC] key.
3) Press the [MENU ESC] key.

9.6 Interface Unit IF-2500

Fuse replacement

If the fuse blows, find the cause of the problem before replacing it. Do not use a fuse rated more than 0.5A, since it may cause more serious damage to the equipment.

Self test 1

The unit performs an internal self-check in the following sequence each time power is turned on.

1) LEDs CR7 to CR10 blink twice every 2 seconds.
2) ROM and RAM are tested.
3) LED CR13 blinks every second for normal operation. If an error is detected during the test, the corresponding LED is turned on.
   - When CR7 is on, ROM is defective.
   - When CR8 is on, RAM is defective.

9-6

10. INSTALLATION

10.1 General

The figure below shows the system configuration of the GP-90-DUAL.

1) #: MJ-A2SPF004-030 *3m*
2) Cable type is CO-SPEVV-SB-C 2P or equivalent, unless noted otherwise.
3) *1: Interface Unit IF-1422 is required if cable length is more than 30 m.

Figure 10-1 System Configuration

10-1

10.2 Display Unit

The display unit can be installed using either of four methods as shown below. Refer to the outline drawing page D-1, D-2, and D-3.

- 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.

- Keep the display unit away from electromagnetic field generating equipment such as motor, generator.

- Allow sufficient maintenance space and a sufficient slack in cables for maintenance and repair.

Table Top and Overhead Mounting

TABLE TOP   OVERHEAD

Figure 10-2 Display unit mounting methods

Flush mounting type F

An optional flush mount kit type F is required. For details, see outline drawing page D-3.

Name	Type	Code No.
Flush Mount Kit F	OP20-25	004-393-280

Flush mounting type S

An optional flush mount kit type S is required. For details, see outline drawing page D-4.

Name	Type	Code No.
Flush Mount Kit S	OP20-24	004-393-000

10.3 Antenna Unit

Mounting

Install the antenna unit referring to the installation diagram on page D-4. 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.

- **Be sure the location offers a clean line-of-sight to satellite.** Objects within line-of-sight to a satellite, for example, a mast or funnel, block reception and cause prolonged acquiring time or interruption of position fix.

- **Mount the unit as high as possible.** Mounting the antenna as high as possible keeps it free of water spray, which can interrupt or prevent reception of GPS satellite signal, if water spray is frozen.

- **The antenna unit GPA-018S must be grounded.** Connect ground wire of 1.25 sq or larger (local supply) between the antenna unit and a stainless steel screw fastened to the mast.

Extending antenna cable length

The standard cable is 15m long. 30m and 50m long extension cable sets are optionally available.

◆Extension cable line-up

Fabricate the end of antenna cable and attach the coaxial connector. Details are shown on the next page.

Extension Cable Line-up

◆Waterproofing the connector

Wrap connector with vulcanizing tape and then vinyl tape. Bind the tape end with cable-tie.

How to waterproof the connector of the antenna cable

10-3

How to attach the N-P-8DFB connector

Outer Sheath
Armor   Inner Sheath Shield

50   30

Remove outer sheath and armor by the dimensions shown left.
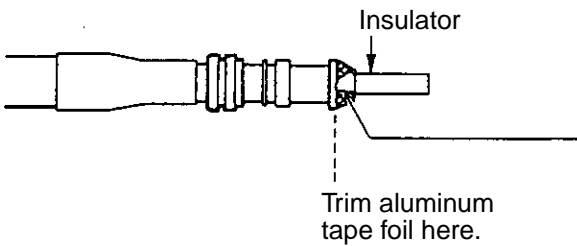Expose inner sheath and shield by the dimensions shown left.

Cover with heat-shrink tubing and heat.

30   10

Cut off insulator and core by 10mm.

Twist shield end.

Clamp Nut   Gasket (reddish brown)   Clamp

Slip on clamp nut, gasket and clamp as shown left.

Aluminum Foil

Trim shield here.

Fold back shield over clamp and trim.

Cut aluminum foil at four places, 90° from one another.

Insulator

Trim aluminum tape foil here.

Fold back aluminum foil onto shield and trim.

1

5

Expose the insulator by 1mm.

Expose the core by 5mm.

Clamp Nut   Pin   Shell

Solder through the hole.

Slip the pin onto the conductor. Solder them together through the hole on the pin.

Insert the shell into the pin. Screw the clamp nut into the shell.
(Tighten by turning the clamp nut. Do not tighten by turning the shell.)

10-4

10.4   Wiring

The figure below shows the connection of cables on rear of display unit.

⚠ **CAUTION**

Ground the receiver to
prevent loss of sensitivity
and mutual interference.

Connection of cables on display unit

Grounding

The display unit contains several CPUs. While they are operating, they radiate
noise, which can interfere with other radio equipment. Ground the unit as follows
to prevent it.

- The grounding wire should be 1.25sq or larger.

- The grounding wire should be as short as possible.

10.5   Initial Settings

The GP-90-DUAL can output navigation information to external equipment through the Interface Unit IF-2500. For example, it can output position data to a radar or echo sounder for display on their screen.

Before selecting data to output, confirm what data the external equipment requires. Output necessary data only. Outputting unnecessary data can cause receiving problems at the external equipment.

Talker

All data transmitted by marine electronics equipment is prefixed with a two-character code which tells external equipment what equipment is transmitting data. This two-character code is called the "talker." The GP-90-DUAL contains the talkers GP, LC and DE.

Data format and data output availability

The type of data which can be transmitted depends on format. Output data sentence of IEC 61162-1 and NMEA 0183 Ver. 1.5/Ver. 2.0.

AAM:	Waypoint arrival alarm
APB:	Autopilot sentence B
	magnitude of cross track error, direction to steer, arrival alarm, bearing to waypoint
	("Heading to steer to destination waypoint data" not used)
BOD:	Bearing-origin to destination
BWC:	Bearing and distance to waypoint-great circle
BWR:	Bearing and distance to waypoint-rhumb line
BWW:	Bearing-waypoint to waypoint
DTM:	Datum reference
GGA:	Global positioning system (GPS) fix data
	time of fix, latitude, longitude, quality indicator, number of satellites in use, DOP, altitude, geoidal separation
	("age of dgps data" and "differential reference station ID" not used)
GLL:	Geographic position-latitude/longitude

10-6

GNS: GNSS fix data

GPS: GPS satellite fault detection

RMB: Recommended minimum navigation information. Cross-track error, direction to steer, origin and destination waypoint latitude and longitude, range and bearing of destination waypoint, destination closing velocity, arrival alarm.

RMC: Recommended minimum specific GPS/TRANSIT data. UTC of position fix, latitude and longitude, ground speed and course, data, magnetic variation

RTE: Routes

VTG: Course over ground and ground speed

WCV: Waypoint closure velocity

WNC: Distance-waypoint to waypoint-great circle

WPL: Waypoint location

XTE: Cross-track error, measured

ZDA: Time and data

Also, the following NMEA 0183 Ver. 1.5 sentences are output

APA: Autopilot sentence "A". Magnitude of cross-track error, direction to steer, arrival alarm, bearing origin to destination.

WNR: Distance-waypoint to waypoint-rhumb line

Input data sentence of NMEA 0183 Ver. 1.5/2.0

Checksum is checked if attached, and if any error is found, the sentence becomes invalid. Talker ID is not distinguished.

DBT: Depth below transducer

　　　$--DBT,   1234.5   f,   1234.5,   M,   1234.5 F*12<CR><LF>

　　　　　　　　　　　　a   b   c   d   e   f   g

　　　a, b: Water depth, feet

　　　c, d: Water depth, m

　　　e, f: Water depth, fathoms

　　　g: Checksum

DPT: Depth

　　　$--DPT,   1234.5   1234.5,   1234.5*23<CR><LF>,

　　　　　　　　　　　a   b   c

　　　a: Water depth relative to the transducer, meters

　　　b: Offset from transducer, meters... not used

　　　c: Checksum

MTW: Water temperature

　　　$--MTW,   23.4,   C*34<CR><LF>

　　　　　　　　　　　a   b c

　　　a: Temperature: degrees, C

　　　c: Checksum

10-7

TLL: Target latitude and longitude
       $--TLL, 00, 3445.678,   N, 13521.234,   E, abcd,
       121530, T
                   a   b   c   d   d   f   g
        h
       R*A5<CR><LF>
       a: Target number... not used
       b, c: Latitude
       d, e: Longitude
       f: Target name... not used
       g: UTC... not used
       h: Target status... not used
       i: Reference target... not used
       j: Checksum

FURUNO proprietary sentences

AGFPA: Autopilot information from FURUNO autopilot

Port	Input	Output
DATA1, DATA2	NMEA 0183 Ver. 1.5/2.0 AGFPA, DBT, DPT, MTW, TTL	IEC 61162-1/NMEA 0183 Ver. 1.5/2.0 AAM, APA, APB, BOD, BWC, BWR, BWW, GGA, GLL, GNS, RMB, RMC, VTG, WCV< WNC, WNR, WPL, XTE, ZDA, GBS, Rnn, RTE
DATA3	External MOB	LOG PULSE
		Same as for DATA1.
DATA4	DGPS or general data (selected through menu)	General data
		IEC 61162-1/NMEA 0183 Ver. 1.5/2.0 AAM, APA, APB, BOD, BWC, BWR, BWW, GGA, GLL, GNS, RMB, RMC, VTG, WCV< WNC, WNR, WPL, XTE, ZDA, GBS, Rnn, RTE

General data

1) **Input of lighthouse/buoy information:** Floppy disk stored lighthouse/buoy information is supplied from PC connected to DATA4 port.
2) **Input of waypoint data:** Connect YEOMAN to DATA4 port
3) Input and output of waypoint/route data

10-8

Rate of operation

The TX rate or operation is the percentage of data output in one second, and it appears on the screen. If short intervals are assigned to many sentences, the rate of operation increases as illustrated below.

| TX | | TX | | TX | |

A rate of operation exceeding 100% is impractical.

When the external equipment cannot display correct data input from the GP-90-DUAL, the rate of operation should be lowered.

For example, set a rate of operation less than 60% for the Temperature Indicator TI-20.

DATA1 output setting

1) Press [MENU ESC], [9] and [3] keys to show the DATA1, 3 OUTPUT SETUP menu.

```
          DATA 1, 3 OUTPUT SETUP
  ┌─────────────┐
  │ Data Fmt.   │    V1.5   [V2.0]   IEC
  └─────────────┘
        Talker ID    [GP]   LC     DE
 Output Data    (00-90 sec)82%
       1. AAM:00   APA:00   APB:01   BOD:00
       2. BWR:00   BWW:00   GGA:01   GLL:00
       3. RMB:01   RMC:01   VTG:01   WCV:00
       4. WNR:00   WPL:00   XTE:00   ZDA:01
       5. GNS:00   GBS:01   Rnn:00   RTE:00
 DATA3. Log Pulse      [200ppm]   400ppm

  ENT : Enter        MENU : Escape
```
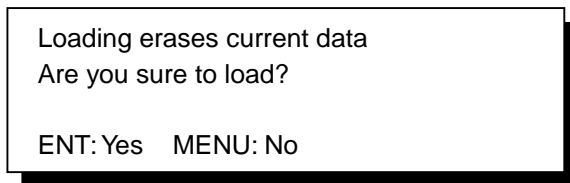
Settings shown here are default settings.

This line appears only when LOG is selected by internal jumper wires.

Figure 4-1 DATA1, 3 OUTPUT SETUP menu

2) Press ▲ to select DATA FMT.
3) Press ◄ or ► to select V1.5, V2.0 or IEC.
4) Press the [CU/NU ENT] key. Talker ID appears in reverse video.
5) Press ◄ or ► to select GP, LC or DE.
6) Press the [CU/NU ENT] key.
7) Enter TX interval for each output data sentence in line 1. TX interval is available in 00, 01, 02, 03, 04, 05, 06, 10. 15, 20. 30, 60 and 90 msec.
8) Press the [MENU ENT] key.
9) Enter TX interval for each output data sentence in lines 2 through 5. Press the [CU/NUENT] key after setting each line.

10-9

In great circle calculation, BWC and WNC are output but BWR and WNR are not. In rhumb line navigation, BWR and WNR are output but BWC and WNC are not. The total data output are shown by percentage on the third line.

For best results the total output should be less than 90%; lengthen the Tx interval of less important data to make the total output less than 90%.

DATA 3 output setting

The DATA 3 can output NMEA 0183 (V1.5/V2.0) /IEC 61162-1 data or log pulse depending on jumper wire setting on the NAV board. For NMEA 0183 (V1.5/V2.0) /IEC 61162-1, the same signal of DATA 1 is output from DATA 3.

Selection of NMEA0183 or log pulse

Output data / NAV board	NMEA 0183 (V1.5/ V2.0)/IEC 61162-1	Log pulse
JP4 (2 pcs.)	ON	OFF
JP5 (3 pcs.)	OFF	ON

Rate of log pulse output

500 mA Max.
50 VDC

Procedure for setting of log pulse rate

1) Press [ESC MENU], [9] and [3].
2) Press ▼ to select DATA 3. Log Pulse.
3) Press ◀ or ▶ to select log pulse for external equipment; 200ppm or 400ppm.
4) Press the [CU/NU ENT] key.
5) Press the [MENU ESC] key.

10-10

Setting DATA 4 to Data Output

1) Press [MENU ESC], [9] and [5] to show the DATA4 I/O SETUP menu.

```
┌─────────────────────────────────┐
│    DATA 4 I/O SETUP        1/2   │
├─────────────────────────────────┤
│ DATA 4. Level    RS232C  RS422  │
│        Data       Out    Com. DGPS │
│ To Next Page                    │
│                                 │
│                                 │
│                                 │
├─────────────────────────────────┤
│ ▲ ▼ ◀ ▶ : Select                │
│ ENT : Enter      MENU : Escape  │
└─────────────────────────────────┘
```

Appears only when external
DGPS receiver is used.

Figure 4-2 DATA4 I/O SETUP menu

2) Press ▲ to select DATA 4. Level.
3) Press ◀ or ▶ to select level of external equipment; RS-23C or RS422.
4) Press the [CU/NU ENT] key.
5) Press ◀ or to select Out.
6) Press ▼ to go to the next page to show the DATA I/O SETUP <Out> menu.

```
┌─────────────────────────────────┐
│  DATA 4 I/O SETUP   <Out>  2/2  │
├─────────────────────────────────┤
│ To Previous Page                │
│ Data Fmt.      V1.5   V2.0  IEC │
│      Talker ID  GP   LC   DE    │
│ Output Data  (00-90 sec)   98%  │
│   1. AAM:00  APA:00  APB:04  BOD:00 │
│   2. BWR:00  BWW:00  GGA:00  GLL:01 │
│   3. RMB:01  RMC:00  VTG:01  WCV:00 │
│   4. WNR:00  WPL:00  XTE:00  ZDA:01 │
│   5. GNS:00  GBS:01  Rnn:00  RTE:00 │
├─────────────────────────────────┤
│ ENT : Enter      MENU : Escape  │
└─────────────────────────────────┘
```

Figure 4-3 DATA4 I/O SETUP <Out> menu

7) Follow "DATA 1 output setting" from step 2.

10-11

Setting DATA 4 to "COM." (general data)

Waypoint data can be received from a personal computer, through the DATA 4 port.

1) Press [MENU ESC], [9] and [5].
2) Press ▲ to select Level.
3) Press ◀ or ▶ to select level of personal computer; RS232C or RS422.
4) Press the [CU/NU ENT] key.
5) Press ◀ or ▶ to select Com.
6) Press ▼ to select To Next Page. The DATA 4 I/O SETUP <Com.> menu appears.

```
Loading erases current data
Are you sure to load?


ENT: Yes    MENU: No
```

Figure 4-4 DATA 4 I/O SETUP <Com.> menu

7) Press ▲ to select Baud Rate.
8) Press ◀ or ▶ to select baud rate; 4800bps, 9600bps, or 19200bps.
9) Press the [CU/NU ENT] key.
10) Press ▲ to select WPT/RTE.
11) Press ▼ to select Command. Stop, on the same line as Command, appears in reverse video.
12) Press ▼ to select Start. The message shown in Figure 4-5 appears.

```
Now loading
WPT/RTE data !

MENU: Stop
```

Figure 4-5

13) Press the [CU/NU ENT] key. The message shown in Figure 4-6 appears while data is being loaded.

```
Are you sure to stop ?


ENT: Yes    MENU: No
```

Figure 4-6

14) Output data from the computer. When data is loaded, the cursor shifts to Stop.
15) Press the [ESC] key.

Setting DATA 4 to DGPS

An external DGPS receiver can be connected to the DATA 4 port.
Follow the procedure below to setup the GP-90-DUAL according to the specifications of the DGPS receiver.

1) Press [MENU ESC], [9] and [5].
2) Press ▲ to select Level.
3) Press ◀ or ▶ to select level; RS232C or RS422.
4) Press the [CU/NU ENT] key.
5) Press ▶ to select DGPS.
6) Press ▼ to select To Next Page.

```
┌─────────────────────────────────────────┐
│    DATA 4  I/O SETUP <DGPS>      2/2      │
│                                          │
│   To Previous Page                       │
│   First Bit          MSB   LSB           │
│   Parity            EVEN   ODD   NONE     │
│   Stop Bit           1       2           │
│   Baud Rate         4800    9600         │
│                                          │
│   ▲▼ ◀ ▶ : Select                        │
│   ENT: Enter    MENU: Escape             │
└─────────────────────────────────────────┘
```

Figure 4-7 DATA 4 I/O SETUP <DGPS> 2/2 menu

7) Press π or θ to select First Bit.
8) Press τ or υ to select first bit; MSB or LSB.
9) Press ▼ to select Parity.
10) Press ◀ or ▶ to select parity bit; EVEN, ODD or NONE.
11) Press ▼ to select Stop Bit.
12) Press ◀ or ▶ to select stop bit; 1 or 2.
13) Press ▼ to select Baud Rate.
14) Press ◀ or ▶ to select baud rate; 4800 or 9600.
15) Press the [CU/NU ENT] key.
16) Press the [MENU ESC] key.

10-13

10.6   Interface Unit IF-2500

Specifications

Input port   2 ports for NMEA 0183 data
Output port   6 ports for either of NMEA 0183 or RS-422 data
                 3 ports for alarm signal
Power supply   10 to 35 VDC
Power consumption   2.2 W maximum
Color   2.5G5/1.5 Newtone no. 5
Ambient temperature -15°C to +55°C
Humidity   Relative humidity 95% at +40°C
Waterproofing None

Installation

Mounting considersations

The installation site is important for proper operation and continued performance. Select it keeping the following points in mind.
The unit is not waterproof; locate it away from water spray.
Select a clean and cool place.
Select a place where shock,vibration and electrical noise are minimal.
Leave sufficient space at the sides and rear of the unit for maintenance and service.

Mounting

The unit can be mounted on a bulkhead, overhead or tabletop. Secure the unit to mounting location with woodscrews. For added support, use nuts, bolts and washers instead of woodscrews.

• All dimensions in millimeters.
• For added support, use nuts, bolts and washers instead of woodscrews.
• Leave sufficient space at the sides and rear of the unit for maintenance and servicing.

Figure B-1 Interface unit mounting

Cable fabrication

1)   Remove the outer sheath, armor, and shield as illustrated.
2)   Remove the insulation of cores 3 mm.
3)   Cut and solder unused cores to the shield.

10-14

4) Solder a ground wire to the shield.

5) Dress the shield and the outer sheath with heat shrink tube, leaving 30 mm of shield and outer sheath exposed.

6) Heat the heat shrink tube.

7) Remove the insulation of NH connector (supplied) 3 mm.

8) Heat the heat shrink tube.

Figure B-2 How to fabricate the signal cable

Grounding

To prevent electrical shock and mutual interference, run a ground wire between the earth terminal on the unit and ship's superstructure.

Cabling schedules

The signal cable should be a twisted-pair, double-screened cable. Ground the signal cable at the cable clamp.

Connections

Power supply

J1 (10 to 35 VDC)

Pin no.	Designation
#1	+
#2	-

Input signal (NMEA)

The signal from DGPS is connected to J2 and J3.   Data being fed to J2 has higher priority than J3.

J2		J3	
Pin no.	Designation	Pin no.	Designation
#3	NMEA RD1-H	#3	NMEA RD2-H
#4	NMEA RD1-C	#4	NMEA RD2-C
#6	GND	#6	GND

Output signal (RS-422 or NMEA)

J4, J5, J6, J7, J8, J9

Pin no.	Designation
#1	TD-H
#2	TD-C
#4	GND

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Output signal (contact closure signal)

J10 (WPT alarm)		J11		J12	
Pin no.	Designation	Pin no.	Designation	Pin no.	Designation
#1	Alarm signal	#1	Alarm signal	#1	Alarm signal
#2	Alarm signal	#2	Alarm signal	#2	Alarm signal
#3	GND	#3	GND	#3	GND

Selection of output data format

The output data format is selectable by changing a jumper block; A for RS-422 and B for NMEA. For example, to select NMEA for J4, change the jumper block from A to B on J401 and J402. Do the same on J5 thru J9.

J10 (WPT alarm)		J11		J12	
Pin no.	Jumper	Pin no.	Jumper	Pin no.	Jumper
J4	J401/J402 (A)	J5	J501/J502 (A)	J6	J601/J602 (A)
J7	J701/J702 (A)	J8	J801/J802 (A)	J9	J901/J902 (B)

Default jumper setting is shown in parenthesis.

Self test 2

The test requires an external loop to check I/O. Follow the steps below to carry out the test.

1) Set the #4 segment of DIP switch S1 to the ON position.
2) Temporarily disconnect input and output connectors J2 and J4.
3) Solder a jumper block between J2 and J4; #3 and #4 of J2 are connected to #1 and #2 of J4, respectively.

   Jumper block consists of XH-6 pin and 4 pin connectors with two short wires as below.

   <u>XH, 6 pin</u>   <u>XH, 4 pin</u>
     #3   -   -   - #1
     #4   -   -   - #2
4) Change the jumper block between J2 and J5; J2/J6, J2/J7, J2/J8, J2/J9, J3/J4, J3/J5, J3/J6, J2/J7, J2/J8, J2/J9.

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LED status

The LEDs light according to equipment status as follows:

CR2: Lights when receiving NMEA data from J2.

CR3: Lights when sending NMEA data from J3.

CR4: Lights when sending NMEA data from J4 to J9.

CR6: Blinks every second.

CR7: Lights when ROM error is detected, or no signal at J2 for 300 ms.

CR8: Lights when RAM error is detected, or no signal at J3 for 300 ms.

CR9: Lights when SIO error is detected, or NMEA data is input at J2.

CR10: Lights when NMEA data is input at J2.

From left
#2, #3, #4, #6 thru #10

Figure B-3 Location of LEDs

APPENDEX

WORLD TIME STANDARDS

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: PROVISIONAL SOUTH CHILEAN 1963: South Chile (near 53°S)
125: PROVISIONAL SOUTH AMERICAN 1956: Mean Value
126:	: Bolivia
127:	: Chile-Northern Chile (near 19°S)
128:	: Chile-Southern Chile (near 43°S)
129:	: Columbia
130:	: Ecuador
131:	: Guyana
132:	: Peru
133:	: Venezuela
134: PUERTO RICO	: Puerto Rico & Virgin Islands
135: QATAR NATIONAL	: Qatar
136: QORNOQ	: South Greenland
137: ROME 1940	: Sardinia Islands
138: SANTA BRAZ	: Sao Maguel, Santa Maria Islands (Azores)
139: SANTO (DOS)	: Espirito Santo Is.
140: SAPPER HILL 1943	: East Falkland Is.
141: SOUTH AMERICAN 1969	: Mean Value
142:	: Argentina
143:	: Bolivia
144:	: Brazil
145:	: Chile
146:	: Columbia
147:	: Ecuador
148:	: Guyana
149:	: Paraguay
150:	: Peru
151:	: Trinidad & Tobago
152:	: Venezuela
153: SOUTH ASIA	: Singapore
154: SOUTHEAST BASE	: Porto Santo & Madeira Islands
155: SOUTHWEST BASE	: Faial, Graciosa, Pico, Sao Jorge, & Terceira Is.
156: TIMBALAI 1948	: Brunei & East Malaysia (Sarawak & Sadah)
157: TOKYO	: Japan
158:	: Korea
159:	: Okinawa
160: TRISTAN ASTRO 1968	: Tristan da Cunha
161: VITI LEVU 1916	: Viti Levu Is. (Fiji Islands)
162: WAKE-ENIWETOK 1960	: Marshall Islands
163: ZANDERIJ	: Surinam
164: BUKIT RIMPAH	: Bangka & Belitung Islands (Indonesia)
165: CAMP AREA ASTRO	: Camp Mcmurdo Area, Antarctica
166: G. SEGARA	: Kalimantan Is. (Indonesia)
167: HERAT NORTH	: Afghanistan
168: HU-TZU-SHAN	: Taiwan
169: TANANARIVE OBSERVATORY 1925	: Madagascar
170: YACARE	: Uruguay
171: RT-90	: Sweden
172: Pulkovo 1942	: Russia
173: Finish KKJ	: Finland

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	11	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	--
Northwest 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	

AP-3

DECCA CHAINS

Chain No.	Chain	Chain code	Location		Chain no.	Chain	Chain code	Location
01	South Baltic	0A	Europe		34	Kanto	8C	Japan
02	Vestlandet	0E	"		35	Shikoku	4C	"
03	Southwest British	1B	"		36	Hokuriku	2C	"
04	Northumbrian	2A	"		37	Kita Kyushu	7C	"
05	Holland	2E	"		38	Namaqualand	4A	Southern Africa
06	North British	3B	"		39	Cape	6A	"
07	Lofoten	3E	"		40	Eastern Province	8A	"
08		3F	"		41	South West Africa	9C	"
09	North Baltic	4B	"		42	Natal	10C	"
10	North West	4C	"		43	Dampier	8E	Australia
11	Trondelag	4E	"		44	Port Headland	4A	"
12	English	5B	"		45	Anticosti	9C	Northern Africa
13	North Bothnian	5F	"		46	East Newfoundland	2C	"
14	Southern Spanish	6A	"		47	Cabot Strait	6B	"
15	North Scottish	6C	"		48	Nova Scotia	7C	"
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	"					

AP-4

Parts List

This equipment contains complex modules in which fault diagnosis and repair down to component level are not practical (IMO A.694(17)/8.3.1). Only some discrete components are used. FURUNO Electric Co., Ltd. believes identifying these components is of no value for shipboard maintenance; therefore, they are not listed in the manual. Major modules can be located on the parts location photos on the next page.

F U R U N O	Model	GP-90-DUAL	
	Unit		
		DISPLAY UNIT GP-90-DUAL	
ELECTRICAL PARTS LIST			
May-03	Blk.No.		
SYMBOL TYPE			
DISPLAY UNIT GP-90-DUAL			
PRINTED CIRCUIT BOARD 20P8148, PNL 20P8188, NP **ASSEMBLY** 20S0366, GN-8091D 08S0334, GR-7000A (option) **LCD** EW50136FDW			

Parts Location

Display unit

GR-7000A
(Option)
(08S0334)

GN-8091D
(20S0366)

NP Board
(20P8188)

LCD
EW50136DW

PNL Board
(20P8148)

AP-6

Interface Documentation

"DATA1" Port

IEC 61162-1/NMEA 0183 Ver. 1.5 Output

● Output Schematic Diagram (Talker)

● Output Drive Capability

Max. 10mA

NMEA 0183 Input

AP-7

- Load Requirements

  Isolation: opto coupler

  Input Impedance: 470 Ω

  Max. Voltage: ±15V

  Threshold: 3mA (In case of FURUNO device talker connection)

"DATA3" Port

```
        ┌──────────┐
        │ 20P8188  │
┌───────┤ MJ-A6SRMD│                          U35
│ DATA3 │          │                          SN75ALS172
└───────┘ J6   FL5   1  ┌─────┐ 2      14
  TD-A  <1 ←──┤├──────── o   o ───────────○────┐
             FL5                                 │  ╲
  TD-B  <2 ←──┤├─── 3   ┌ o   o ┐ 4             │    ╲ 12
             FL6        └ JP4  ┘        13      │    ╱──────
  <3<                                            ├──╱
                 ▽                              
  <4<
  <5<
  <6<
```

- Output Drive Capability

  Max. 10mA

AP-8

SPECIFICATIONS OF GP-90-DUAL

GPS Receiver

Number of receiving channels	12 channels, 12 satellite tracking
Rx frequency	1575.42 MHz
Rx code	C/A code
Antenna	Flat antenna
Position fixing system	All in view, 8-state Kalman filter
Position accuracy	Approx. 10m, 95% of the time, Horizontal dilution of position (HDOP) ≤ 4
	DGPS: Approx. 5 m, 95% of the time
SOG Accuracy	±0.001 kt (static position)
COG Accuracy	±3° (SOG / -17 kt)
	±1° (SOG > 17 kt)
Tracking velocity	900 kts
Position-fixing time	Warm start: 20 seconds
	Cold start: 2 minutes
Position update interval	1 second
Integrity indication	Safe, Unsafe, Caution at accuracy level of 10 m or 100 m

Display Section

LCD	122 x 92 mm (320 x 240 dot matrix)
Display mode	Plotter modes 1 and 2, Highway, Navigation Data
Display	Mercator projection
	Track recording capacity: 2,000 pts.
	Buoy graphic (option)
Waypoint storage capacity	999 pts. with comment (12 character)
Route storage capacity	30 routes (30 waypoints per route)
	Simple route: 1 route/30 waypoints
Event mark storage capacity	99 points
Alarms	Waypoint arrival, Anchor watch, Cross track error, Speed, Trip, Water temperature, Depth

Data Input/Output

Number of ports	Four I/O ports
Input data format	IEC 61162-1 Edition 2 (2000-07)/NMEA 0183
Input data	NMEA 0183: AGFPA, DBT, DPT, MTW, TLL
	DPGS; RTCM SC104 Ver. 2.1
	Universal data from personal computer.
Output data	IEC 61162-1/NMEA 0183 (Ver. 1.5/Ver. 2.0): AAM, APA, APB, BOD, BWC, BWR, BWW, GGA, GLL, GNS, RMB, RMC, VTG, WCV, WNC, WNR, WPL, XTE, ZDA, ZLG, GBS, Rnn, RTE (IEC 61162-1)

SP-1

Power Supply & Environmental Conditions

Power supply and power consumption	12-24 VDC, 0.8-0.4 A
Useable environment	GPS antenna unit: -25°C to +70°C
	Display unit:-15°C to +55°C
Humidity	95% (40°C)
Waterproofing specification	GPS antenna unit: IEC 60529 IPX6
	Display unit: IEC 60529 IPX5 (USCG CFR-46)
Vibration	IEC 60945

SP-2

GP-90-**-*Q-**

UNIT

NAME	OUTLINE	DESCRIPTION/CODE	Q'TY
DISPLAY UNIT	250 / 180 / 80	GP-90-E-N / 000-041-054**	1
ANTENNA UNIT	φ156 / 116	GPA-019S / 000-142-545**	1 / (*1)
ANTENNA UNIT	132 / 120 / 85	GPA-018S / 000-041-462**	1 / (*1)
ANTENNA UNIT	φ68	GPA-017S / 000-040-537**	1 / (*1)

SPARE PARTS   SP20-0500

NAME	OUTLINE	DESCRIPTION/CODE	Q'TY
FUSE	30 / φ6	FGBO-A 2A AC125V / 000-549-062	3

INSTALLATION MATERIALS   OP20-01101

NAME	OUTLINE	DESCRIPTION/CODE	Q'TY
+TAPPING SCREW	20 / φ5	5X20 SUS304 1 / 000-802-081	4

OTHER INSTALLATION MATERIALS

NAME	OUTLINE	DESCRIPTION/CODE	Q'TY
ANTENNA CABLE ASSY.	L=15M	TNC-PS-3D-15 2050216 / 000-133-670	1 (*2)
POWER CABLE M	L=3M	M-A2SPF0014-030 (WQ 75X2C * 3M) / 000-128-522	1
CABLE ASSY. M	L=5M	M-A6SPF0003-050 / 000-117-603	1

1.   [**]
DOUBLE ASTERISK DENOTES COMMONLY USED EQUIPMENT.
2.(*1)
ANTENNA UNIT HAS BEEN DETERMINED BY SPECIFICATION.
3.(*2
AVAILABLE WITH OR WITHOUT ANTENNA UNIT.

DIMENSIONS IN DRAWING FOR REFERENCE ONLY.

20AX-X-9852

表 1 TABLE 1

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

表 2 TABLE 2

仕様 MODEL	質量（kg±10%）MASS
ビーコン有り W/ BEACON	2.4
ビーコン無し W/O BEACON	2.2

切抜穴寸法 CUTOUT DIMENSIONS

242±1

152±1

電源 SOURCE

アース端子(M4) GND TERMINAL

型式銘板 NAMEPLATE

信号コネクタ SIG. CONNECTOR

ANTコネクタ ANT CONNECTOR

#100

65

15

t

160

120

290

250

FURUNO GPS NAVIGATOR GP-90

注記 NOTE
1) #印寸法は最小サービス空間寸法とする。
2) 指定外の寸法公差は表1による。
3) 壁の厚さ（t）は、12以下とする。

1. #: RECOMMENDED SERVICE CLEARANCE.
2. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.
3. THICKNESS OF BULKHEAD (t): t≤12.

DRAWN	Apr.17'03 I.YAMASAKI
CHECKED	Apr.17'03 I.Matsuguchi
APPROVED	Apr.18'03 I.Matsuguchi
SCALE 1/3	MASS 表2参照 TABLE 2
DWG.No. C4427-G02-A	20-013-1516-0

TITLE GP-90
名称 受信演算部（埋込装備S）
外寸図
NAME RECEIVER UNIT (FLUSH MOUNT S) OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

FURUNO ELECTRIC CO., LTD.

表 1 TABLE 1

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

表 2 TABLE 2

仕様 MODEL	質量（㎏±10%） MASS
ビーコン有り W/ BEACON	2.4
ビーコン無し W/O BEACON	2.2

電源
SOURCE

アース端子(M4)
GND TERMINAL

型式銘板
NAMEPLATE

信号コネクタ
SIG. CONNECTOR

ＡＮＴコネクタ
ANT CONNECTOR

切抜穴寸法
CUTOUT DIMENSIONS

260±0.5

260±1

156±1

170±0.5

#100

63

17

185

170

160

275

260

250

4-φ5.5 取付穴
FIXING HOLES

TITLE GP-90

名称 受信演算部（埋込装備Ｆ）

外寸図

NAME RECEIVER UNIT (FLUSH MOUNT F)
OUTLINE DRAWING

20-013-152G-0

DRAWN	Apr.17'03 I.YAMASAKI		
CHECKED	Apr.17'03 T.Matsuguchi		
APPROVED	Apr.18'03 T.Matsuguchi		
SCALE 1/3	**MASS** 表2参照 TABLE 2		
DWG.No. C4427-G03-A			

注記
1) #印寸法は最小サービス空間寸法とする。
2) 指定外の寸法公差は表1による。
3) 取付用ネジは＋トラスタッピンネジ呼び径５×２０を使用のこと。

NOTE
1. #: RECOMMENDED SERVICE CLEARANCE.
2. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.
3. USE TAPPING SCREWS 5x20 FOR FIXING THE UNIT.

GPS NAVIGATOR GP-90

FURUNO

取付場所
MOUNTING LOCATION

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

LOOP ANTENNA
ループアンテナ

WHIP ANTENNA
ホイップアンテナ(MF/HF)

WHIP ANTENNA
ホイップアンテナ(VHF/UHF)

1.5 m

1 m 以上

1 m 以上

RX WHIP ANTENNA
受信ホイップアンテナ
受信ホイップアンテナ(MF/HF)

GPS ANTENNA
GPSアンテナ

4 m 以上

4 m 以上

0.5m以上

MAIN MAST
メインマスト

TX ANTENNA(MF/HF)
送信アンテナ(MF/HF)

3m以上

INMARSAT ANTENNA
インマルサットアンテナ

5 m NOT WITHIN INMARSAT BEAM
インマルビームに入らないこと

レーダービームに入らないこと
NOT WITHIN RADAR BEAM

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

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

B) スタンションやハンドレイルにつけるとき
レール用アンテナベース No.13-RC5160
(取付可能レール直径：φ19～φ32)
(コード番号：000-806-114)

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

テープを巻く
WIND TAPE

固定ボルト
FIXING BOLT

ANTENNA BASE
アンテナベース

注記 1）パイプやアンテナベースはアンテナユニットにねじ込んだ後に固定する。
NOTE 1. FASTEN PIPE(ANTENNA BASE) TO ANTENNA UNIT FIRST THEN FIX THEM TO MAST OR HANDRAIL.

2）アンテナを固定するときはパイプ（アンテナベース）をアンテナにねじ込むこと。
アンテナ側をねじるとコネクタ部やケーブルに無理がかかり、故障の原因となる。
2. WHEN FIXING ANTENNA, TURN PIPE OR ANTENNA BASE; NOT THE ANTENNA.
TURNING THE ANTENNA MAY TWIST THE CABLE AND PLACE STRESS ON CONNECTOR.

ケーブル溝のある場合
USING CABLE GUIDE

ケーブル固定板
CABLE FIXTURE

テープを巻く
WIND TAPE

コンパックス（現地手配）
CABLE TIE
(LOCAL SUPPLY)

パイプで傷つかないよう
ケーブルを脇へよける。
KEEP CABLE ASIDE TO AVOID
INJURY FROM PIPE.

b)パイプのみを使うとき
USE A PIPE ONLY.

パイプ
PIPE

アンテナケーブル
ANTENNA CABLE

A）マストへの取付け   MAST MOUNTING
a)マスト取付金具CP20-0111[工事材料]でマストに固定する。
USE MAST MOUNTING KIT CP20-0111.

バーカークランプ
HOSE CLAMP

テープを巻く
WIND TAPE

取付補助金具
MOUNTING BRACKET

コンパックス（現地手配）
CABLE TIE
(LOCAL SUPPLY)

コネクタに力がかからない
ように、少し余給をもたせる
LEAVE SLACK HERE TO RELIEF
STRESS ON CONNECTOR.

パイプ
PIPE

120

アンテナケーブル
ANTENNA CABLE

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

4-M5 サラ穴
COUNTERSUNK

φ61
φ76

90°

45°

C）取付ける場所が傾斜しているとき   ANTENNA BASE MOUNTING
オプションのアンテナベースを使う。
USE OPTIONAL ANTENNA BASE.

傾斜 INCLINATION	-5°～33°	32°～65°	65°～98°
装備方法 MOUNTING METHOD	33° / 0° / -5° 115	65° / 32° / 0° 173	65° 98° / 0° 173
アンテナ ベースタイプ / コード番号 CODE No. ANT. BASE TYPE	直型アンテナベース RIGHT ANGLE ANTENNA BASE No.13-QA330 000-803-239	L型アンテナベース L-TYPE ANTENNA BASE No.13-QA310 000-803-240	

テープを巻く
WIND TAPE

DRAWN	July 22,'02	T.YAMASAKI
CHECKED	July 22,'02	Y.KIMURA
APPROVED	July 22,'02	Y. Kimura
SCALE		MASS
DWG.No.	C4384-Y01- A	

TITLE	GPA series
名称	空中線部
	装備要領図
NAME	ANTENNA UNIT
	INSTALLATION PROCEDURE

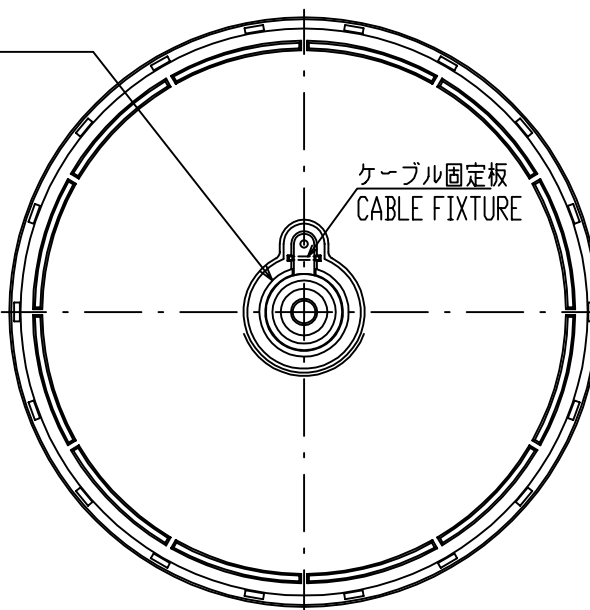**FURUNO ELECTRIC CO., LTD.**

FURUNO

∅69

R100
R14
24

R10

(85)

61

23

1-14UNS1B
ねじ山数（25.4mmにつき）：14
ピッチ： 1.8143 mm
オネジ有効長さ： 24.17 mm
オネジ有効径：19 mm以上

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

∅32

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

表1 TABLE 1

注記
指定外の寸法公差は表1による。

NOTE
TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.

型式 TYPE	ケーブル長(m) CABLE LENGTH	プラグ PLAG	質量(kg±10%) MASS
GPA-017	10	TNC-P-3	0.6
GPA-017S	0.2	TNC-J-3	0.15

表2 TABLE 2

DRAWN	Feb. 19 '03 T.YAMASAKI	TITLE	GPA-017/017S
CHECKED	Feb. 19 '03 Y.KIMURA	名称	空中線部
APPROVED	Feb. 19, '03 Y.Kimura		外寸図
SCALE 1/1	MASS TABLE 2 表2参照	NAME	ANTENNA UNIT
DWG.No.	C4384-G04-J		OUTLINE DRAWING

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FURUNO

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

表1　TABLE 1

＊ 1.2m以下のホイップを使用のこと。
　決してこれ以上のものを使用しないこと。

＊ USE 1.2 m OR SHORTER WHIP.
　DO NOT USE LONGER ONE.

MAX. 1200＊

120

39

1-14UNS1B
ねじ山数(25.4mmにつき): 14
ピッチ: 1.8143 mm
オネジ有効長さ: 19 mm以上
オネジ有効径: 24.17 mm

THREADS PER INCH(25.4mm): 14
PITCH: 1.8143 mm
THREAD LENGTH: 19 mm OR MORE
PITCH DIAMETER: 24.17 mm

132

96

φ33

アース端子
GND TERMINAL

注記
　1）指定なき寸法公差は表1による。

NOTE
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.

型式 TYPE	ケーブル長(m) CABLE LENGTH	プラグ PLAG	質量(kg±10%) MASS
GPA-018	10	TNC-P-3	0.79
GPA-018S	0.2	TNC-J-3	0.35

表2　TABLE 2

DRAWN Feb.19 '03 T.YAMASAKI		TITLE	GPA-018/018S
CHECKED Feb.19 '03 Y.KIMURA		名称	空中線部
APPROVED Feb.19,'03 Y.Kimura			外寸図
SCALE 1/2	MASS TABLE 2 表2参照	NAME	ANTENNA UNIT
DWG.No. C4385-G01-J			OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

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

表1　TABLE 1

φ156

116

1-14UNS1B

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

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

ケーブル固定板
CABLE FIXTURE

注記：　指定外の寸法公差は表1による

NOTE:　TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.

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

表2　TABLE 2

DRAWN	Feb. 19 '03 T.YAMASAKI		TITLE	GPA-019/019S
CHECKED	Feb. 19 '03 Y.KIMURA		名称	空中線部
APPROVED	Feb. 19, '03			外寸図
SCALE	1/2　MASS TABLE 2 表2参照		NAME	ANTENNA UNIT
DWG. No.	C4400-G01-F			OUTLINE DRAWING

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180
166
153
7
4-ø7 取付穴
FIXING HOLES
14.5
124
153

FURUNO
ON
FUSE
3A
OFF

95
(115)

ケーブル導入口
CABLE ENTRY

表1　TABLE 1

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

TB1

24VDC OUTPUT (2.5A max)
⊕ 1
⊖ 2
GND 3
4
AC INPUT 5
6

F1 3A
S1
110V
110V
※1

T1 0253257-0 ※2
25V
22V
0
0

CR1 RB604
Ⓒ
Ⓓ
R1 400/20W

C2 2.2μ/250V
C1 6800μ/50V

入力電圧に応じて接続を変更して下さい。
CHANGE TAP CONNECTIONS DEPENDING ON SUPPLY VOLTAGE.

	AC100V	AC110/ 115V	AC220V	AC230V
※1	Ⓐ	Ⓐ	Ⓑ	Ⓑ
※2	Ⓒ	Ⓓ	Ⓓ	Ⓓ

DRAWN Sep. 14 '01 T.YAMASAKI	TITLE PR-62
CHECKED Y.KI	名称 整流器
APPROVED	外寸図
SCALE 1/2 MASS 3 ±10% kg	NAME RECTIFIER
DWG.No. C5003-034-E	OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

FURUNO

ANTENNA UNIT
GPA-017S
GPA-018S
GPA-019S

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TYPE	GP-90-DUAL
	GPS
NAME	GPS NAVIGATOR
	INTERCONNECTION DIAGRAM

DRAWN Sep. 02'03. T.NISHINO
CHECKED Takahashi T.
APPROVED Y. Hatai
SCALE   MASS   kg
DWG. NO. C4427-C02-A

GPS
GPS NAVIGATOR
GP-90 DUAL

INTERFACE UNIT
IF-2500

BRIDGE ALARM SYSTEM

IEC61162-2 OR NMEA0183 V2.0 (RS-422)

EXTERNAL EQUIPMENT

24VDC

NOTE
*1. LOCAL SUPPLY.
*2. FITTED AT FACTORY.
*3. INTERFACE UNIT IF-1422 IS REQUIRED IF CABLE LENGTH IS MORE THAN 30 m.

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