FURUNO

OPERATOR'S MANUAL

Dual GPS

Model **GP-150-DUAL**

FURUNO ELECTRIC CO., LTD.

ECF
(Elemental Chlorine Free)

The paper used in this manual
is elemental chlorine free.

FURUNO ELECTRIC CO., LTD.

9-52 Ashihara-cho,
Nishinomiya, 662-8580, JAPAN

・FURUNO Authorized Distributor/Dealer

A : FEB. 2006
H1 : MAR. 22, 2019

0 0 0 1 5 8 0 2 0 1 7

IMPORTANT NOTICES

General

- This manual has been authored with simplified grammar, to meet the needs of international users.
- The operator of this equipment must read and follow the descriptions in this manual. Wrong operation or maintenance can cancel the warranty or cause injury.
- Do not copy any part of this manual without written permission from FURUNO.
- If this manual is lost or worn, contact your dealer about replacement.
- The contents of this manual and equipment specifications can change without notice.
- The example screens (or illustrations) shown in this manual can be different from the screens you see on your display. The screens you see depend on your system configuration and equipment settings.
- Save this manual for future reference.
- Any modification of the equipment (including software) by persons not authorized by FURUNO will cancel the warranty.
- All brand and product names are trademarks, registered trademarks or service marks of their respective holders.

How to discard this product

Discard this product according to local regulations for the disposal of industrial waste. For disposal in the USA, see the homepage of the Electronics Industries Alliance (http://www.eiae.org/) for the correct method of disposal.

How to discard a used battery

Some FURUNO products have a battery(ies). To see if your product has a battery, see the chapter on Maintenance. If a battery is used, tape the + and - terminals of battery before disposal to prevent fire, heat generation caused by short circuit.

In the European Union

The crossed-out trash can symbol indicates that all types of batteries must not be discarded in standard trash, or at a trash site. Take the used batteries to a battery collection site according to your national legislation and the Batteries Directive 2006/66/EU.

Cd
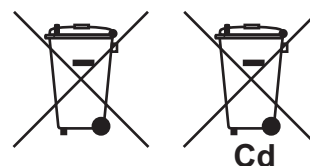
In the USA

The Mobius loop symbol (three chasing arrows) indicates that Ni-Cd and lead-acid rechargeable batteries must be recycled. Take the used batteries to a battery collection site according to local laws.

Ni-Cd   **Pb**
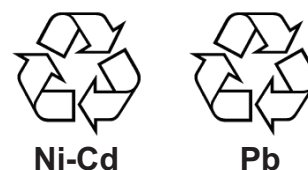
In the other countries

There are no international standards for the battery recycle symbol. The number of symbols can increase when the other countries make their own recycling symbols in the future.

⚠ **SAFETY INSTRUCTIONS**

⚠ **WARNING**

Do not open the cover of the equipment.

This equipment uses high voltage electricity which can shock, burn or cause death. Only qualified person-nel should work inside the equipment.

Do not dissasemble or modify the equipment.

Fire, electrical shock or serious injury can result.

Immediately turn off the power at the ship's mains switchboard if water or foreign object falls into the equipment or the equipment is emitting smoke or fire.

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

⚠ **CAUTION**

Use the correct fuse.

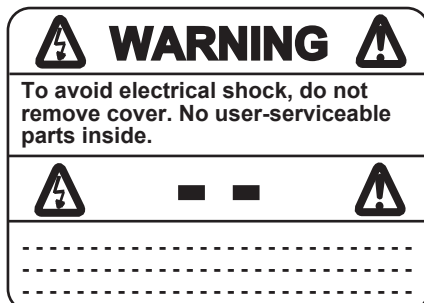Use of the wrong fuse can cause fire or equipment damage.

No single navigation aid (including this unit) should ever be relied upon as the exclusive means for navigating your vessel.

The navigator is responsible for checking all aids available to confirm his position. Electronic aids are intended to assist, not replace, the navigator.

Use of an autopilot with this unit, to provide automatic steering to destination, does not eliminate the need to maintain a watch.

Always maintains a vigilant watch to prevent collision or grounding.

WARNING Label attached

⚠ **WARNING** ⚠

To avoid electrical shock, do not remove cover. No user-serviceable parts inside.

Name: Warning Label (1)
Type: 86-003-1011-1
Code No.: 100-136-231

TABLE OF CONTENTS

FOREWORD

A Word to GP-150-DUAL Owners

Congratulations on your choice of the FURUNO GP-150-DUAL dual differential GPS navigation system. We are confident you will see why the FURUNO name has become synonymous with quality and reliability.

Since 1948, 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-150-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 and video plotter, a GPS antenna. The interface unit functions to exchange data between the GPS navigators and external equipment.

The main features of the GP-150-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 echo 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 61162-1, IEC 61108-1 and IEC 62288.

Program No.

2051520-04.xx

SYSTEM CONFIGURATION

```
                    ┌─────────────────────────────┐
                    │        GPS ANTENNA          │
                    │  GPA-017S/018S/019S/020S/021S│
                    └─────────────────────────────┘

┌───────────────────────┐  ┌──────────────┐  ┌───────────────────────┐
│     GPS ANTENNA       │  │ GPS/BEACON   │  │     GPS ANTENNA       │
│ GPA-017S/018S/019S/   │  │  ANTENNA     │  │ GPA-017S/018S/019S/   │
│      020S/021S        │  │ DISTRIBUTOR  │  │      020S/021S        │
└───────────────────────┘  │   MD-GB2*    │  └───────────────────────┘
                           └──────────────┘

   ┌─────────────────┐                          ┌─────────────────┐
   │  DISPLAY UNIT   │                          │  DISPLAY UNIT   │
   │  GP-150-DUAL    │                          │  GP-150-DUAL    │
   └─────────────────┘                          └─────────────────┘

   ┌─────────────────┐                          ┌─────────────────┐
   │ INTERFACE UNIT  │                          │ INTERFACE UNIT  │
   │   IF-2503**     │                          │   IF-2503**     │
   └─────────────────┘                          └─────────────────┘

   ┌──────────────────────────────────────────────────────────────┐
   │                 INTERFACE UNIT IF-2500                        │
   └──────────────────────────────────────────────────────────────┘
```

| Position, waypoint, etc. (RS-422/Current loop) | Position, etc. (Current loop) | Arrival alarm | Cross track error alarm | Abnormal receiving alarm |

*: When an antenna unit is commonly used, GPS/BEACON Antenna Distributor MD-GB2 is required

**: Required for the contact output to AMS. When you use the serial output to AMS, IF-2503 is not required.

CATEGORY OF UNITS

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

EQUIPMENT LISTS

Standards

Name	Type	Q'ty	Remarks	
Antenna Unit	GPA-017S	1	For GPS	
	GPA-018S		For DGPS	
	GPA-019S			
Display Unit	GP-150-E-N	1	Without Beacon RX	
	GP-150-E-A		With Beacon RX	
Installation Materials	CP20-01900	1	See lists at end of manual.	With Antenna Cable
	CP20-01950			Without Antenna Cable
Accessories	FP20-01100	1		
Spare Parts	SP20-00500	1		

Options

Name	Type	Code No.	Remarks
Flush Mount Kit S	OP20-24	004-393-000	For display unit.
Flush Mount Kit F	OP20-25	004-393-280	
Antenna Cable Set	CP20-01700	004-372-110	CP20-01701+30 m cable
	CP20-02700	004-381-160	CP20-02701+30 m cable
	CP20-01720	001-207-980	CP20-01701+40 m cable
	CP20-02720	001-207-990	CP20-02701+40 m cable
	CP20-01710	004-372-120	CP20-01701+50 m cable
	CP20-02710	004-381-170	CP20-02701+50 m cable
Antenna Cable Assy.	TNC-PS/PS-3D-L15M-R	001-173-110-10	15 m
Right Angle Antenna Base	No.13-QA330	000-803-239	For antenna unit.
L-Type Antenna Base	No.13-QA310	000-803-240	
Handrail Antenna Base	No.13-RC5160	000-806-114	
Mast Mount Kit	CP20-01111	004-365-780	
Cable Assy	MJ-A6SPF0011-050C (03S9202)	000-159-690-10	Cross Cable 5m, 6P-4P
	MJ-A6SPF0011-100C (03S9226)	000-159-691-10	Cross Cable 10m, 6P-4P
	MJ-A7SPF0003-050C (20S0241)	000-159-688-11	5 m, For DATA4
	MJ-A6SPF0003-050C (20S0093)	000-154-054-10	5 m
	MJ-A6SPF0012-050C (64S4073)	000-154-053-10	Cross cable 5 m
	MJ-A6SPF0012-100C (64S4071)	000-154-037-10	Cross cable 10 m

Beacon Receiver Set	OP20-32-1	000-041-018	With GPA-018S Built-in beacon receiver GR-7000A
	OP20-32	000-041-019	With whip antenna and OP20-32-1 Built-in beacon receiver GR-7000A
	OP20-33	000-041-596	With GPA-019S Built-in beacon receiver GR-7000A
	OP20-34	000-041-598	Without antenna unit Built-in beacon receiver GR-7000A
	OP20-43	000-025-115	Without antenna unit Built-in beacon receiver GR-1700
	OP20-44	000-025-229	With GPA-019S Built-in beacon receiver GR-1700
Rectifier	PR-62	000-013-485	For 100VAC mains
		000-013-486	For 220VAC mains
DGPS Beacon Receiver	GR-80	-	
Whip Antenna	FAW-1.2	000-130-046	1.2 m
Interface Unit	IF-2500	-	
	IF-2503	-	For alarm system
Printer	PP-505-FP	000-011-792	
Data Switch Box	MD-200	-	
Antenna Unit	GPA-020S	-	For GPS
	GPA-021S	-	For DGPS

1. OPERATIONAL OVERVIEW

1.1   Control Description

Cursor pad
Shift display and cursor.

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/OFF8

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 and brilliance; changes latitude/longitude coordinate.

TONE

CLEAR

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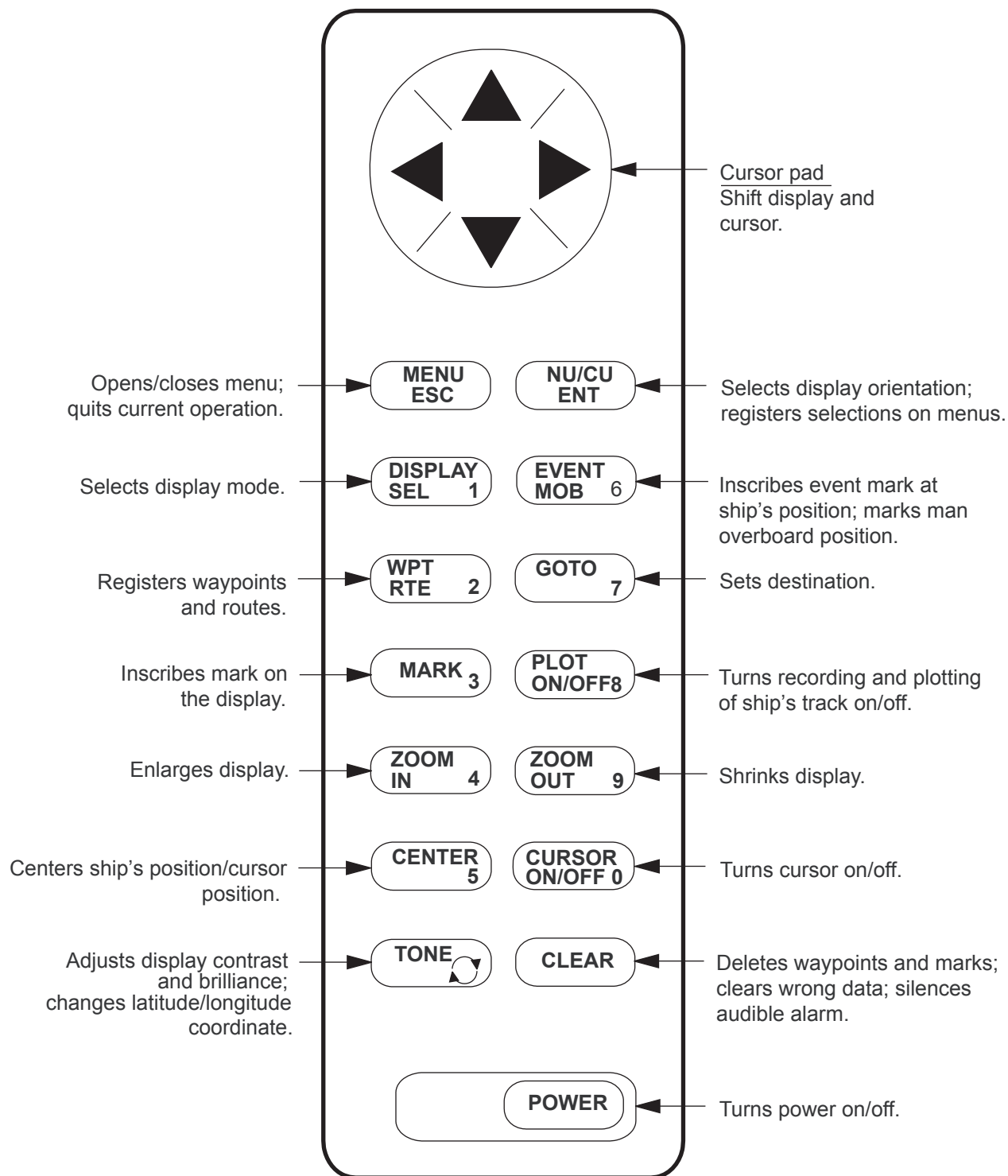
POWER

Turns power on/off.

Figure 1-1 Control Panel

1-1

1.2   Turning On and Off the Power

The GP-150-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. If equipped with the internal beacon receiver, "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.
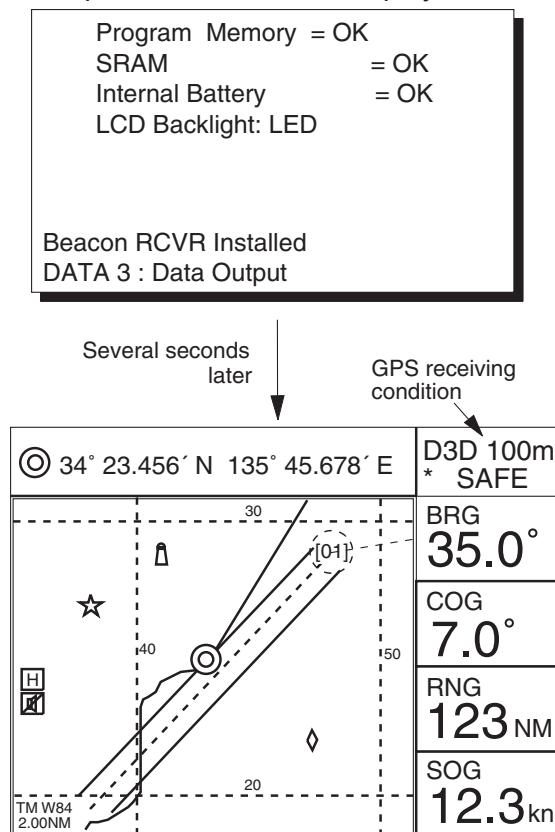

Figure 1-2 Appearance of display when turning on the power

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" blinks at the GPS receiving condition window. When PDOP (Position Dilution Of Precision) value exceeds 6 in the 3D mode or HDOP (Horizontal Dilution Of Precision) value exceeds 4 in the 2D mode, "DOP" blinks 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

Indication	Meaning
2D	GPS 2D
3D	GPS 3D
D2D	Differential 2D
D3D	Differential 3D
W2D	WAAS 2D
W3D	WAAS 3D

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.

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: ▼   ▲        7 (0~7)


MENU   :   Escape
```
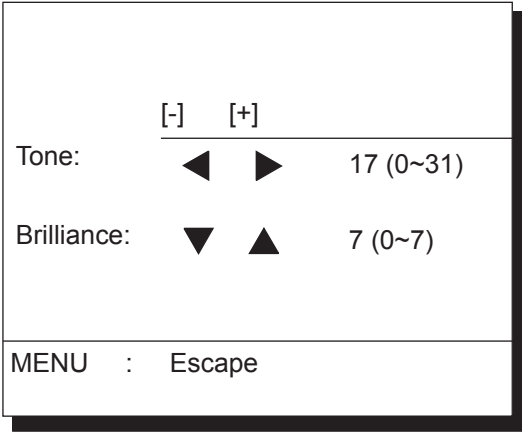
Figure 1-3 Screen for adjustment of display tone and brilliance

2) **To adjust tone**, press ◀ or ▶. Current setting and setting range (0-31, default: 17) are shown to the right of "▶".

3) **To adjust brilliance**, press ▲ or ▼. Current setting and setting range (0-7, default: 7) 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
Alarm Monitor
(Datum: W84)

▲  ▼  :   Select
MENU   :   Escape
```
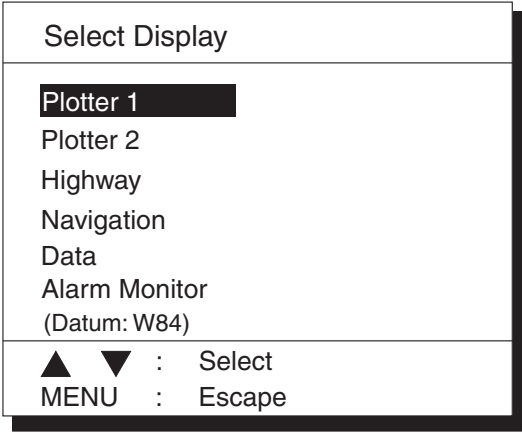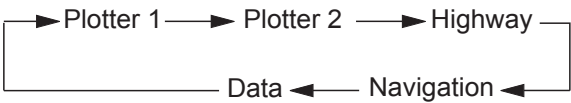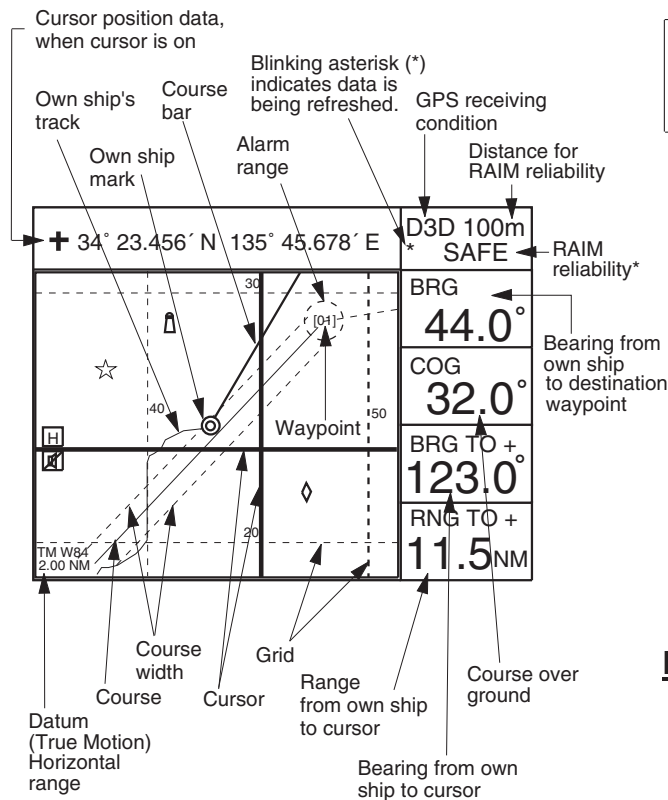
Figure 1-4 Screen for selection of display mode

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.

```
► Plotter 1 ──► Plotter 2 ──► Highway ─┐
│                                       │
└── Data ◄── Navigation ◄───────────────┘
```

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

Plotter 1 display

Cursor position data, when cursor is on

Own ship's track

Course bar

Own ship mark

Blinking asterisk (*) indicates data is being refreshed.

GPS receiving condition

Alarm range

Distance for RAIM reliability

RAIM reliability*

Bearing from own ship to destination waypoint

Waypoint

Course width

Course

Cursor

Grid

Range from own ship to cursor

Course over ground

Datum (True Motion) Horizontal range

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
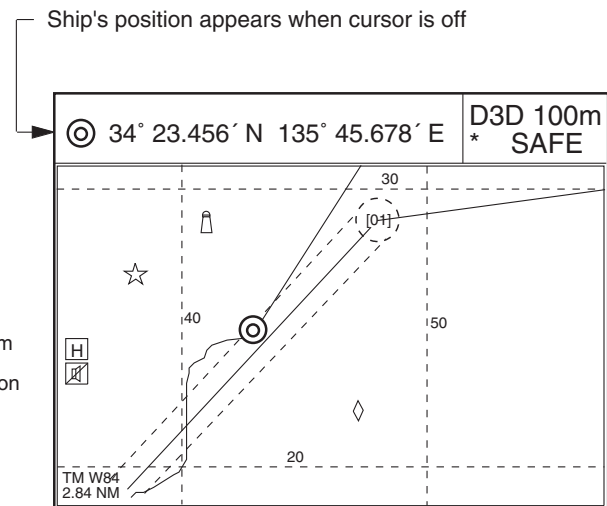
Figure 1-6 Plotter 2 display

Highway display

Bearing from own ship to destination waypoint

Position

Course over ground

Own ship mark

Speed over ground

North mark

Cross track error scale

Range from own ship to destination waypoint
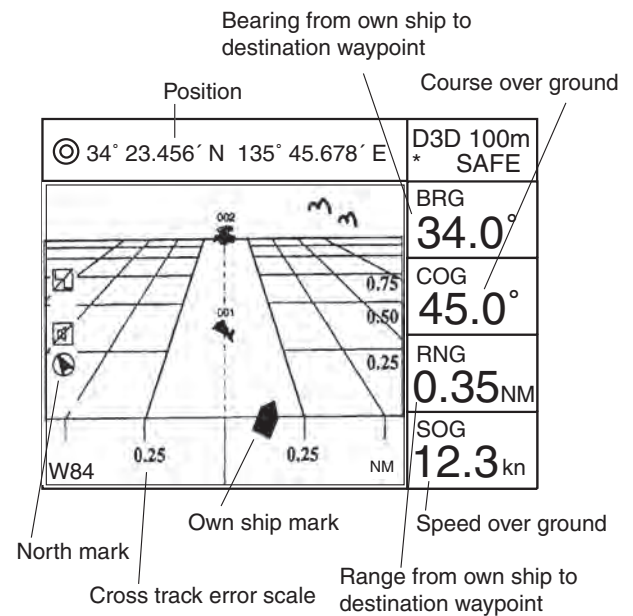
Figure 1-7 Highway display

Navigation display

1) No autopilot

Cross track error meter

Bearing from own ship to destination waypoint

Destination waypoint no.

Bearing scale

Velocity To Destination

Speed over ground

TO: 012

D3D   100m
SAFE

SOG
12.3 kn

E

N

BRG
63°

COG
123°

S

VTD
10.3 kn

RNG
123 NM

0.1NM   0.1NM

ETA   15
23:45'

TTG   3D
17H 45M

TRIP
789 NM

Estimated Time of Arrival (15th23:45)

Time To Go (3days17hrs45min)

Trip distance

Cross track error scale

Cross track error indication

Range from own ship to destination waypoint

Waypoint

VTD   SOG

Figure 1-8 Navigation display, no autopilot

2) Autopilot connected, automatic mode

TO: 012

D3D   100m
*   SAFE

SOG
12.3 kn

E

N

BRG:
63°

COG:
123°

S

VTD
10.3 kn

AP COG
19°

0.1NM   0.1NM

Autopilot
AUTO

HDG
123°

STR
P 23°

TRIP
789 NM

AUTO mode

Heading

Steering

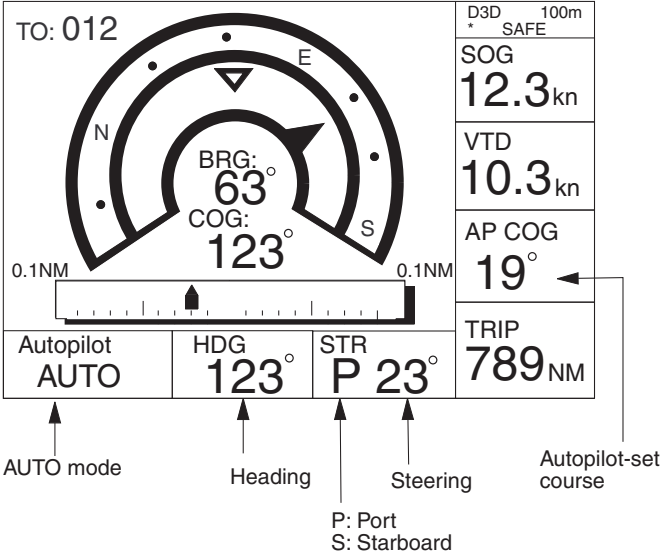P: Port
S: Starboard

Autopilot-set course

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

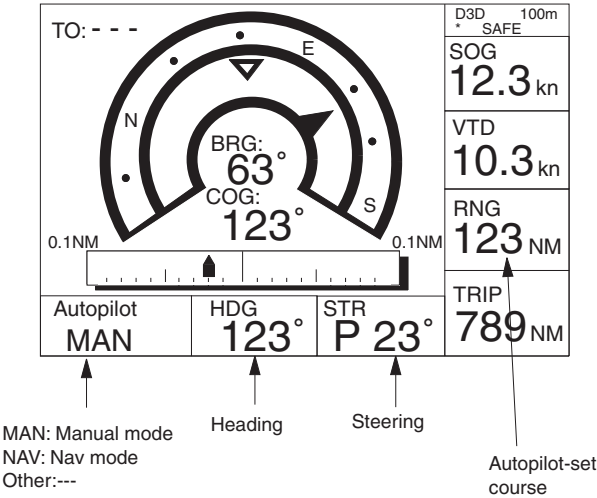### 3) Autopilot connected, modes other than automatic mode (manual, nav, etc.)

TO: - - -

D3D   100m
*   SAFE

SOG
12.3 kn

E

N

BRG:
63°

COG:
123°

S

VTD
10.3 kn

RNG
123 NM

0.1NM   0.1NM

Autopilot
MAN

HDG
123°

STR
P 23°

TRIP
789 NM

MAN: Manual mode
NAV: Nav mode
Other:---

Heading

Steering

Autopilot-set course

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

1-5

Data display

Refer to Chapter 6 for user-defined window setting. The ZOOM icon can be displayed by pressing the **CURSOR ON/OFF** key.
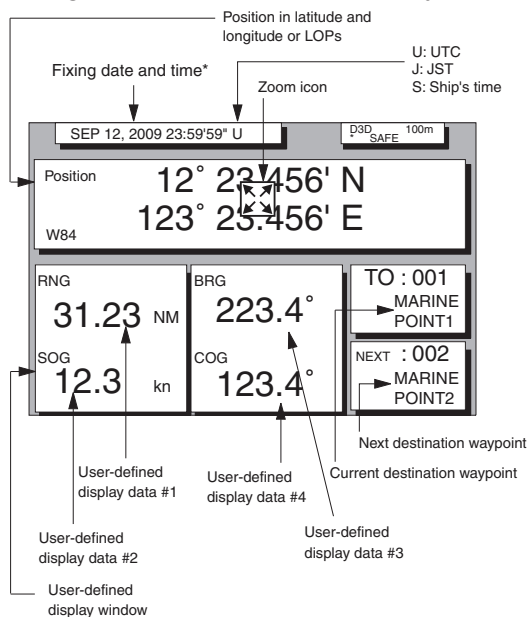

Figure 1-11 Data display mode

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

Alarm Monitor display

The alarm monitor display shows the currently active alarms with three-digit numbers. When there are no active alarms, "No Alarm" is shown.
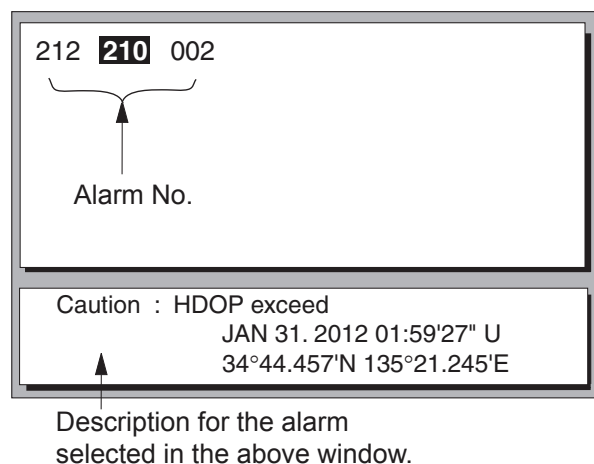

Description for the alarm selected in the above window.

Figure 1-11a Alarm Monitor display mode

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
- MOB/Event mark data
- Route data
- Waypoint data

Note: This operation is necessary after receiving waypoint data through the DATA 4 port.

Transmitting data

To mutually transmit data, do the following:
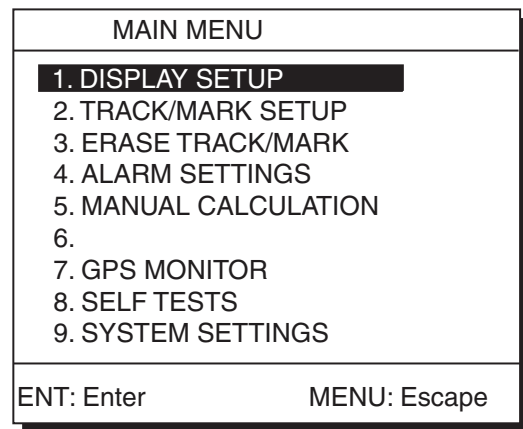
1) Press the **MENU ESC** key to display the MAIN menu.

Figure 1-12 MAIN menu

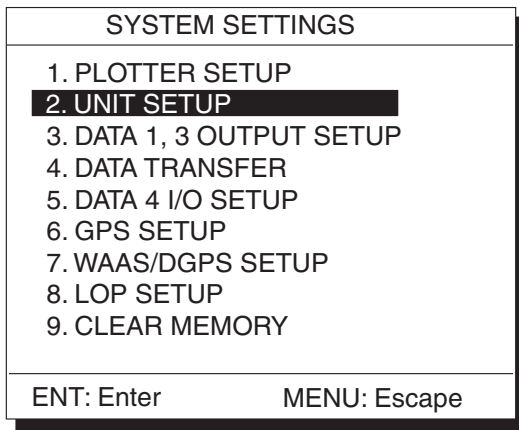2) Press the **9** key to display the SYSTEM SETTINGS menu.

```
      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. WAAS/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
```
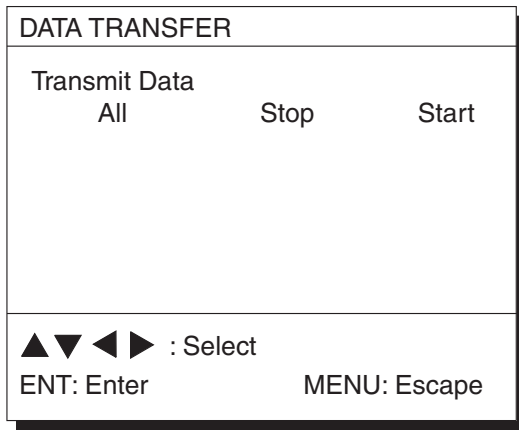
Figure 1-14 DATA TRANSFER menu

4) Press ▶ to select Start. The following
    message appears. Press the **NU/CU ENT**
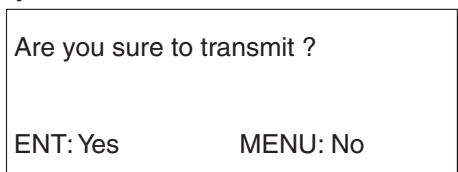   key to transmit, or **MENU ESC** to escape.

```
  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
```
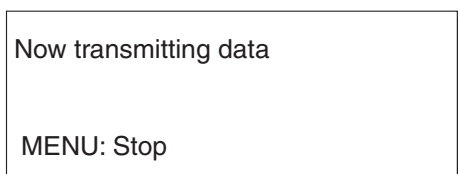
Figure 1-16

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.

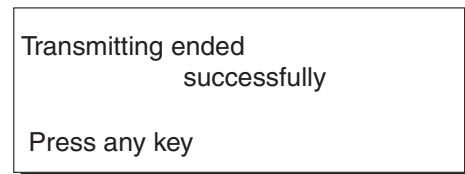6) The following message appears when
    data was transmitted successfully.

```
  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
```
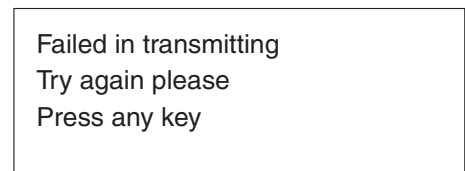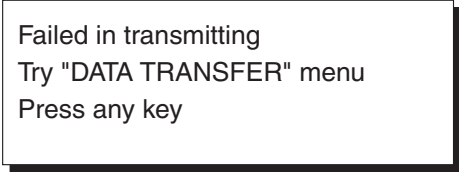
Figure 1-19

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.

1.6   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.

2. DISPLAY AND TRACK

2.1 Enlarging/Shrinking the Display

You may enlarge/shrink the display on the Plotter 1, Plotter 2 and Highway 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 (Plotter 1 and Highway displays). For the Plotter 2 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 one second.

2.2 Display Orientation

Display orientation can be selected on the Plotter 1 and Plotter 2 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. ("TM" appears at the bottom of the Plotter 1 and 2 displays.) Land is stationary.

Course-up display

Destination set

Ship's course is upward on the screen at the moment the course-up mode is selected 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.
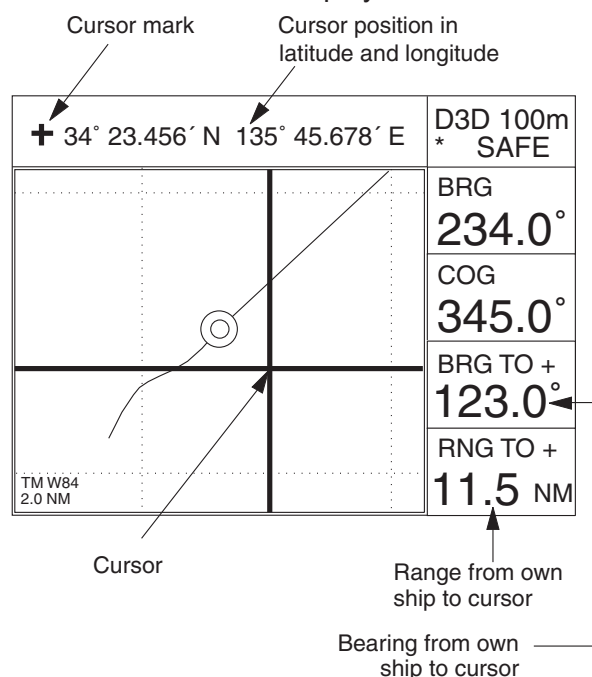

Figure 2-1 Data displayed when the cursor is on

Cursor turned off

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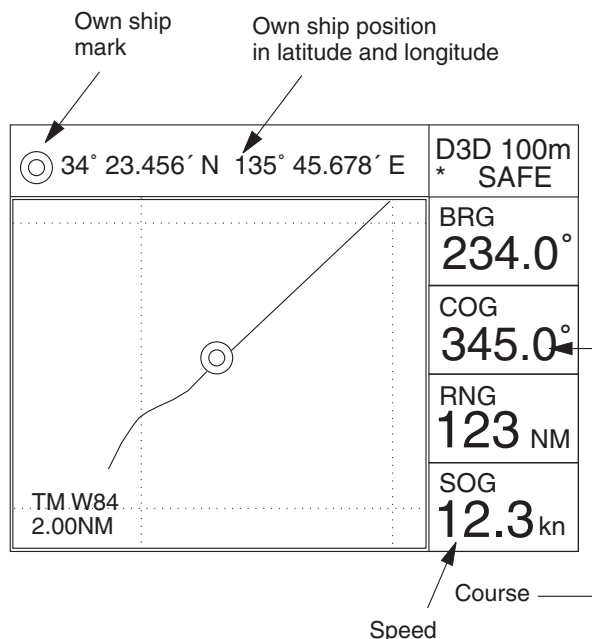

Figure 2-2 Data displayed when the cursor is turned off

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. If own ship tracks off the display, press the **CENTER** key to return it 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.

Note: When own ship's position reaches an edge of the screen, the display moves to set own ship's position center of the display.

2.6   Stopping/Starting Plotting and Recording of Track

The GP-150-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.

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.)
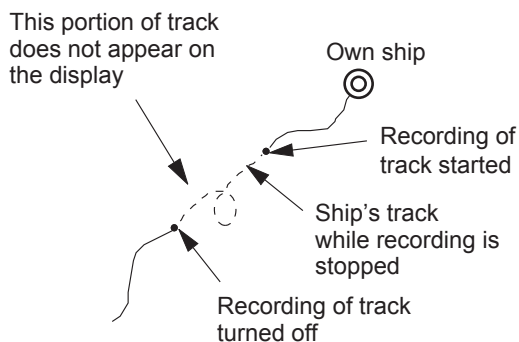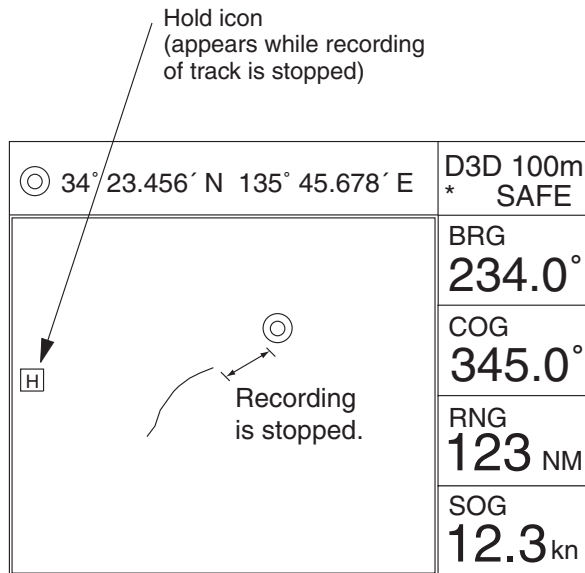

Figure 2-3 Track not plotted or recorded when plotting is stopped

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.

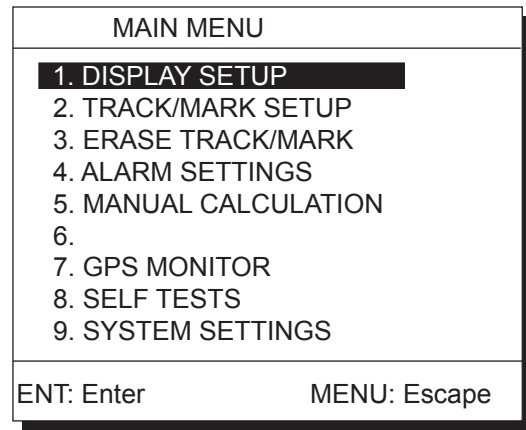1) Press the **MENU ESC** key to show the MAIN MENU.

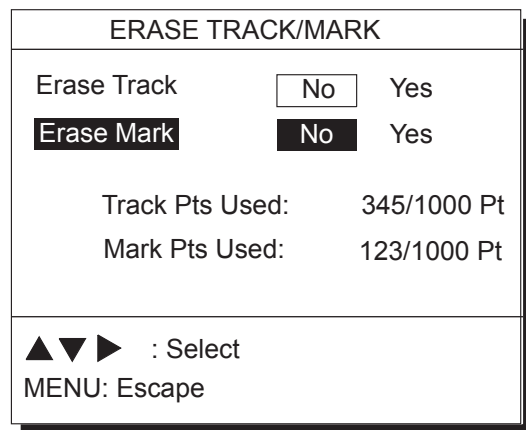*Figure 2-4 MAIN menu*

2) Press **3** to select ERASE TRACK/MARK.

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.

```
Are you sure to erase ?



ENT: Yes          MENU: No
```
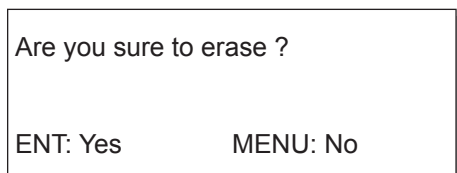
*Figure 2-6 Prompt for
erasure of track*

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.
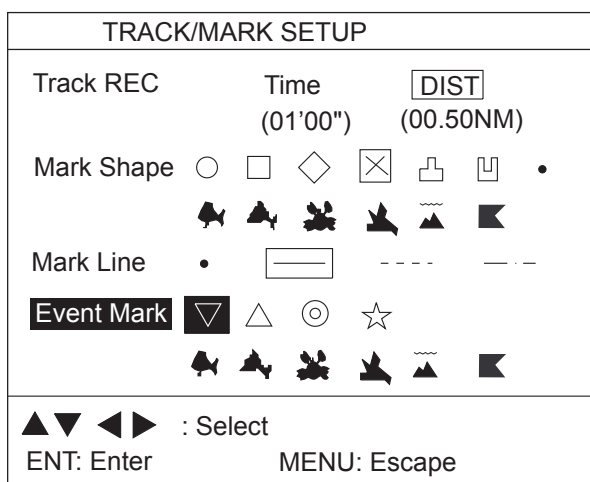2) Press **2** to display the TRACK/MARK
    SETUP menu.

```
        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 DIST.
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.

2.9 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. WAAS/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        RL         GC
  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.

Note: Two display units in a system should be set the same points for memory setting store to share waypoints data.

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 true 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.

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
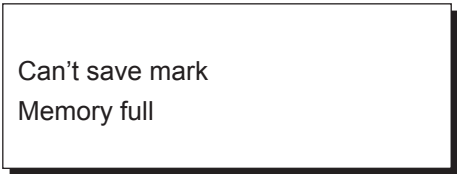automatically or manually.

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
   (00-99°). 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.

3. MARKS

3.1 Entering Marks

Marks can be inscribed on the Plotter 1 and Plotter 2 displays, in one of 13 mark shapes. Further, marks can be connected with lines.

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.

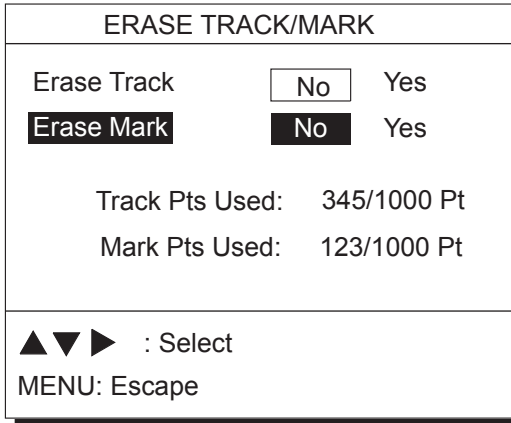## 3.2 Erasing Marks

```
          CAUTION
```

All marks, including event marks and the MOB mark, are 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
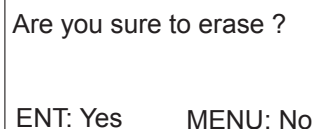
1) Press **MENU ESC** and **3** to display the ERASE TRACK/MARK menu.

```
            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.

3.3   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.
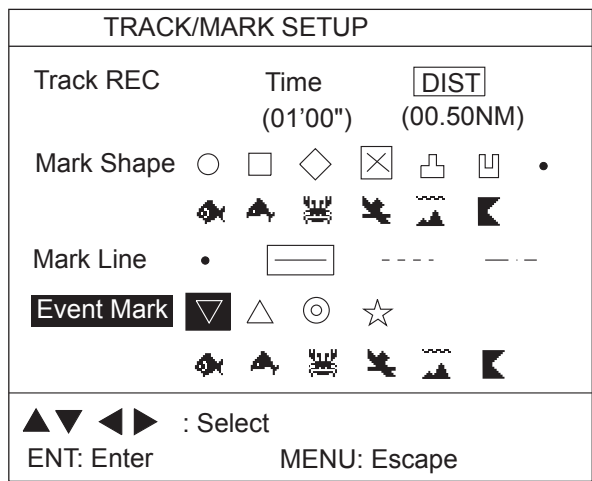4) Press the **NU/CU ENT** key.
5) Press the **MENU ESC** key.

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

3.4   Connecting Marks

Marks can be connected with lines. 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. 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 event
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.
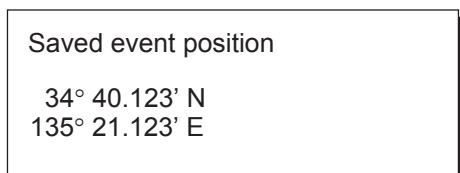
```
Saved event position

  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 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
```
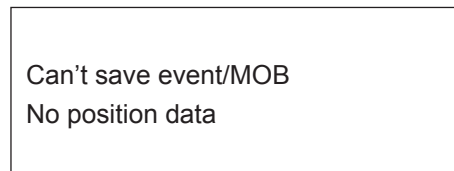
Figure 3-8

1) Press the **EVENT MOB** key for at least three seconds.
    The MOB mark (▱) 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
```
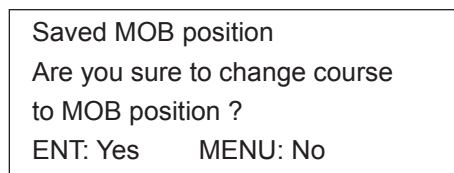
Figure 3-9

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

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-150-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│
 └─────────────────────────────┘
```
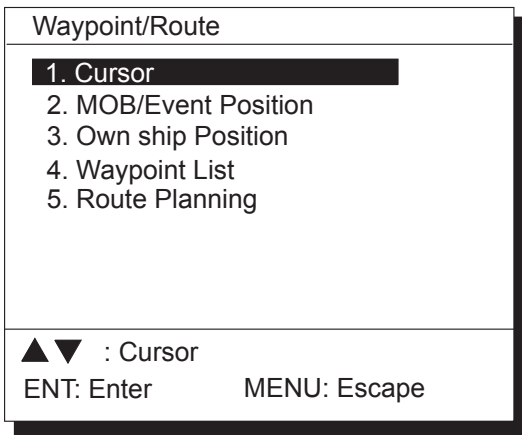
Figure 4-1 Waypoint/Route menu

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

```
 ┌─────────────────────────────┐
 │ Place Cursor on desired location │
 │                             │
 │                             │
 │ ENT: Enter    MENU: Escape  │
 └─────────────────────────────┘
```

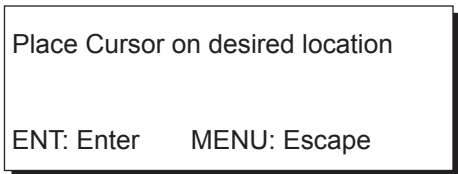*Figure 4-2*

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' 95  12 : 34U        │
 │ ┌─────┐                            │
 │ │ No. │ : 123                      │
 │ └─────┘                            │
 │ Mark : ____                        │
 │ CMNT: _ _ _ _ _ _ _ _ _ _ _ _ _    │
 │                                    │
 │ ◄► : Cursor    ▼ : Column         │
 │ ENT: Enter         MENU: Escape   │
 └────────────────────────────────────┘
```

Figure 4-3

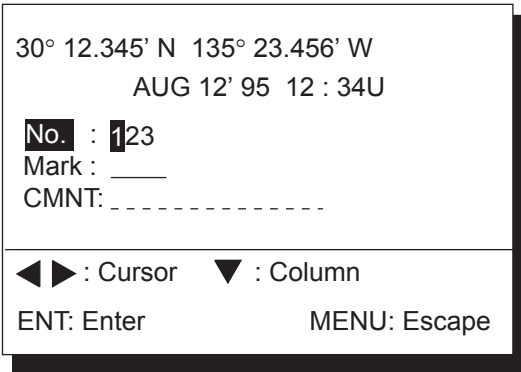The remaining steps show how to change waypoint number, choose mark shape and enter a comment. If you do not need to change these items, press the **NU/CU ENT** to register the waypoint under the number shown and the current waypoint mark shape. You may also choose the waypoint item to change by pressing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

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

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

Figure 4-4 Screen for selecting waypoint mark shape

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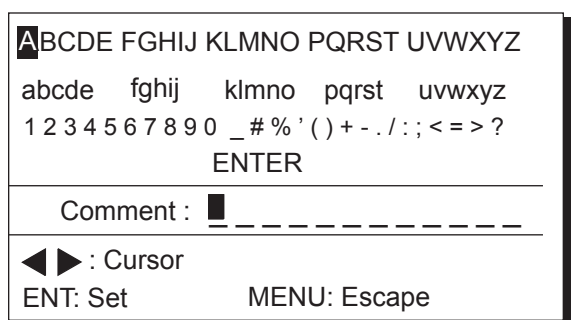8) Press the **NU/CU ENT** key. The display shown in Figure 4-5 appears.

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 4-6 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 **NU/CU ENT** key. To change waypoint number, press the **MENU ESC** key.
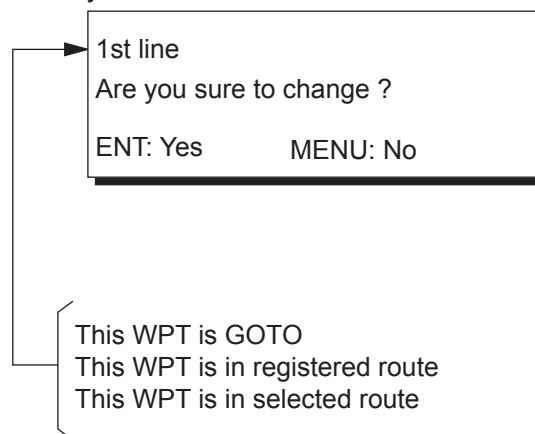

Figure 4-6

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

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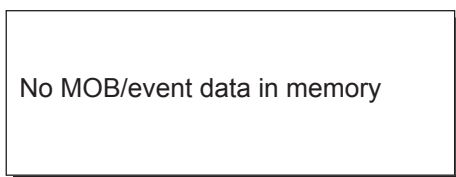
```
No MOB/event data in memory
```

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' 95  19 : 25U

       ◄ ►  : Paging
  ENT: Enter     MENU: Escape
```

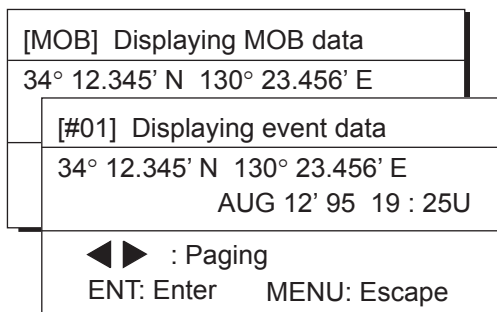*Figure 4-8*

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 10 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
```
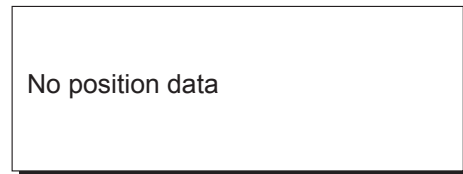
Figure 4-9

1) Press the **WPT/RTE** key.
2) Press **3** to select Own Ship Position.
3) Follow steps 5 through 10 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' 95   12 : 35U

 002   36° 12.345' N  135° 23.456' W
 ___  A POINT           AUG 13' 95   13 : 45U

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

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

 ↻ : L/L↔LOP      ◄ ►  : Edit
 ENT: Enter       MENU: Escape
```

Figure 4-10

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

```
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.
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.

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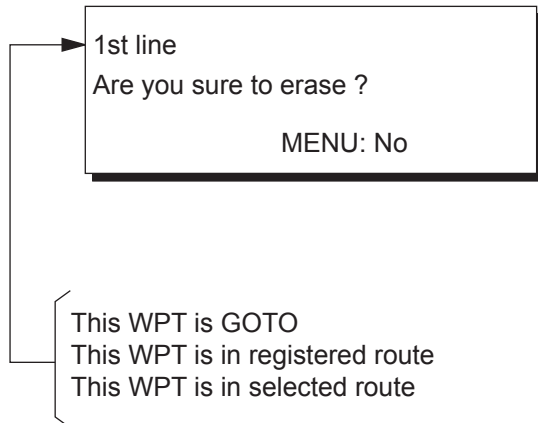
```
1st line
Are you sure to erase ?

            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-150-DUAL can automatically advance to the next waypoint on a route, so you do not have to change the destination waypoint repeatedly.

The GP-150-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      Remark
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.

```
Route  : 01  (In Use , Reverse)
     Skip Distance    TTG
Trial Speed : AUTO   MAN (012.0kn)
  01        EN  _ _ _ . _ _ NM _ _ D _ _ H _ _ M        Route
  02        EN  _ _ _ . _ _ NM _ _ D _ _ H _ _ M        editing
                                                         screen
 001  34° 12.345' N  130° 23.456' E
  ⚓  MARINE POINT  AUG 12' 95  12: 35U
 002  36° 12.345' N  135° 23.456' E                     Waypoint
 ___  A POINT         AUG 13' 95  13 : 45U              list
 ↻: ROUTE ↔ WPT   CLEAR: Delete
 ENT: Enter           MENU: Escape
```

In Use
Forward: Traverse waypoints in forward order
Reverse: 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.
   MAN(UAL): 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 5-5. 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 planning 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 4 through 6 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
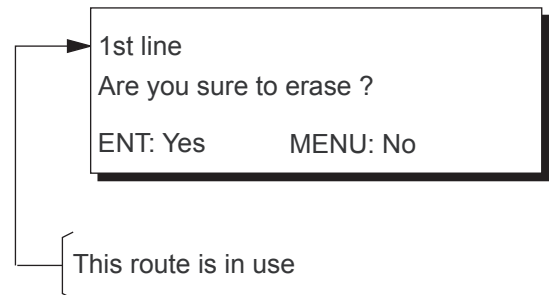
Note: When the waypoint number entered at step 5 is not registered, the message "This waypoint not registered. Copy original data to this No.?" appears. Press **NU/CU ENT** key to copy the position data.

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

4.7 Erasing Routes
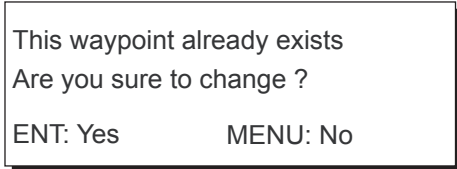
Routes are mutually erased when the navigators are sharing data.

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.

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: 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-150-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
```
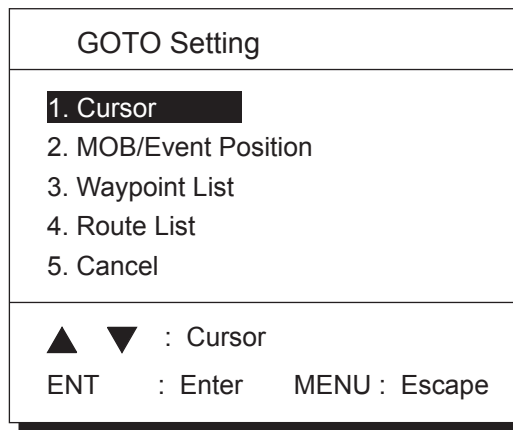
Figure 5-2 GOTO setting menu

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.
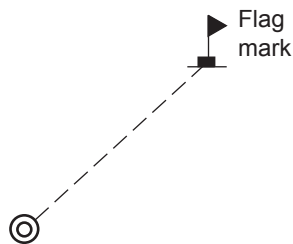
Figure 5-4 Single destination set by cursor

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.

Note: For the simple route, press the **CLEAR** key and then go to step 8. The simple route is not registered in the route list.


Enter route number
    0 1
ENT:Enter MENU: Escape
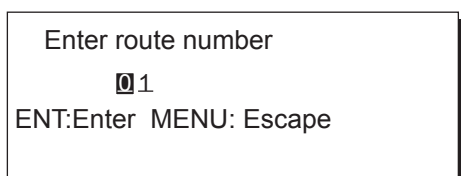
Figure 5-5

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.

Overwrite ?
ENT:Yes   MENU:No
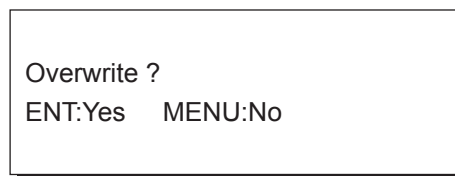
Figure 5-6

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
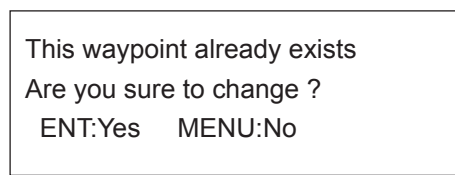
Figure 5-7

   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 through ⑥ 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.

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' 95 19 : 25U

◀ ▶ : Paging
ENT: Enter　　MENU: Escape
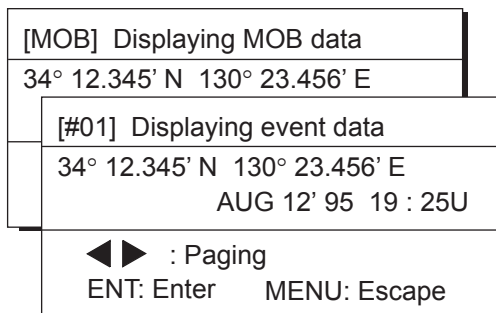
Figure 5-9

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.)
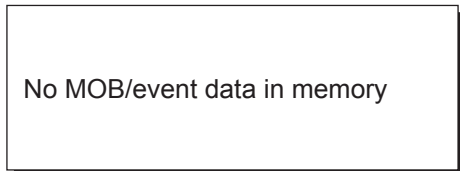4) Press the **NU/CU ENT** key. A flag appears at position selected if it is within the current display range. A dashed line connects between own ship and MOB position or event position.

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
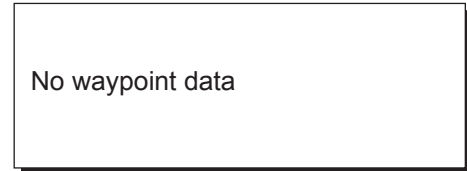
Figure 5-10

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.＿＿
001 34° 12.345' N 132° 23.456' E
🏠 MARINE POINT AUG 12' 95 12:35U
002 34° 12.345' N 133° 12.345' E
＿＿ A POINT　　AUG 13' 95 13:28U
005 41° 34.567' N 135° 23.456' E
❀ B POINT　　AUG 14' 95 09:45U

🔄 No./List　　　　ENT:Enter
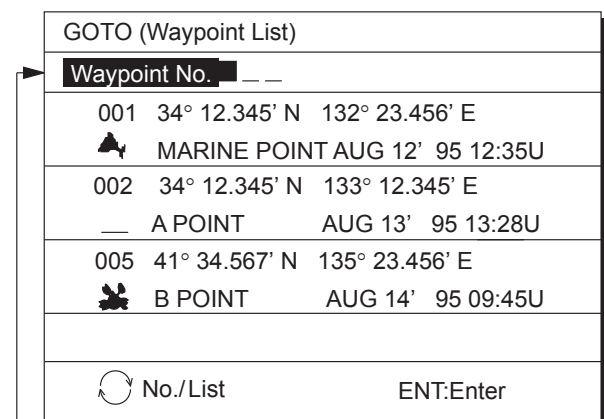
Waypoint number can be entered here when this line appears in reverse video.

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
```
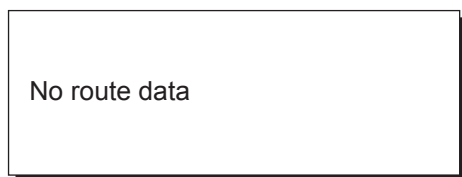
Figure 5-12

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	*9D*9H*9M
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.

Waypoint 01
Port A
Waypoint 02
Waypoint 03
Waypoint 04
New course
Waypoint 05
Port B
Waypoint 06
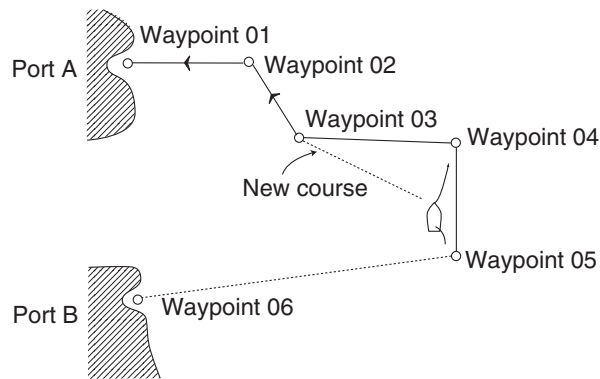
Figure 5-14

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, Reverce)
Skip Distance	TTG

Trial Speed AUTO MAN (012.0kn)
01 0 04 EN _ _ _._ _NM _ _D_ _H_ _M
02 0 03 EN 345.67NM 2D 12H 34M

004 34° 12.345' N 130° 23.456' E
MARINE POINT APR 10' 95 12:35U

003 36° 12.345' N 135° 23.456' E
A POINT APR 10' 95 13:45U

: ROUTE↔WPT   CLEAR: Delete
ENT:Enter   MENU:Escape

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.

Note: If you are using the simple route, it will be erased when the destination is canceled.

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.
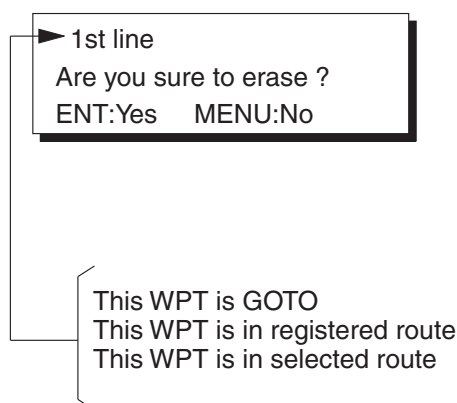
Figure 5-17

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.
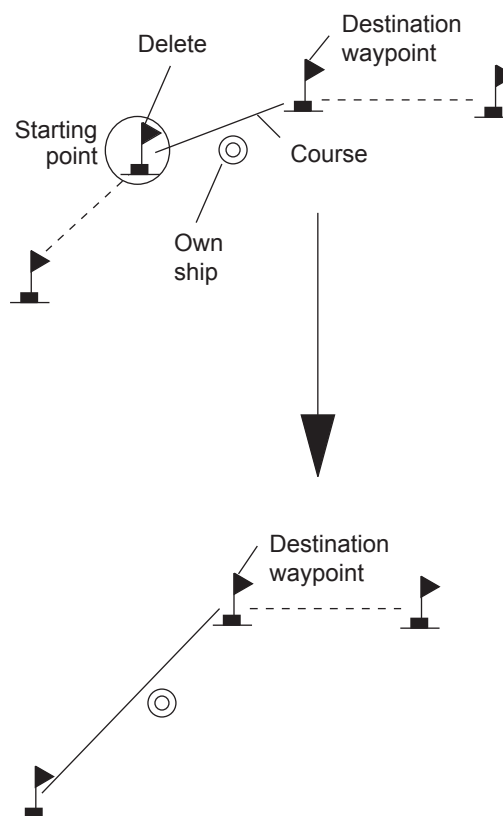
Figure 5-18 Route rearranged after erasing flag

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         RL         GC
 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 RL (Rhumb Line) or GC (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
                         (_ _ _ . _ kn)
 RNG:  _ _ _ . _ _ NM   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.

5-7

    AUTO 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.

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.
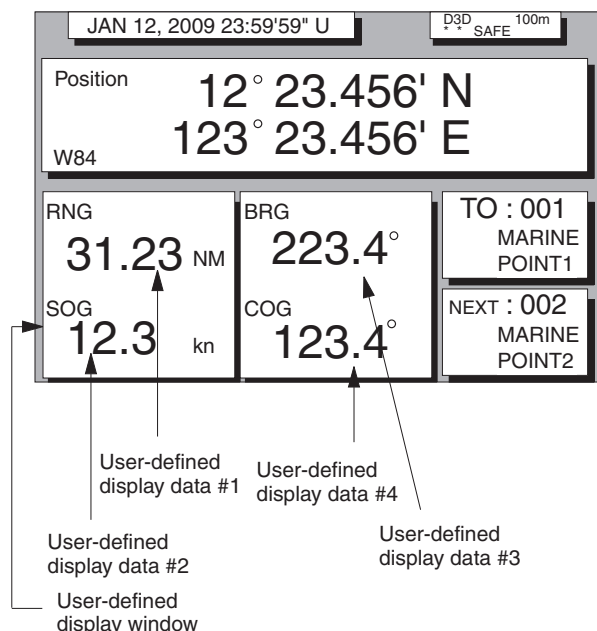
Figure 6-1 Data display

The data the user may display are;

- Altitude (ALT)*

- Average course (AVR COG)

- Average speed (AVR SOG)

- Course (COG)

- Course error (dCOG)

- Cross track error (XTE)

- Depth (WAT DPTH)#

- ETA to waypoint (ETA)

- Range to waypoint (RNG)

- Bering to waypoint (BRG)

- Route time-to-go (ROUTE TTG)

- Speed (SOG)

- Time-to-go to waypoint (TTG)

- Total route distance (ROUTE DIST)*

- Trip distance (TRIP)

- Trip elapsed time (TRIP TIME)

- Water temperature (WAT TEMP)#, and

- Velocity to destination (VTD)*

- ETA to route

*ALT: Displayed only in 3D position fixing.
*ROUTE 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.

6.2   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 / LON    LOP
  LOP Display      LC           DE
  LC Chain         7980 : 23-43
    △ LOP        -12.3μs   +0.34μ s
  DE Chain           24:G - P
    △ LOP        +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/LON.
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.

① **For Loran LOPs**

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 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.

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'  95 12 : 35U

 002  36512.3        59134.5
 ___   A POINT        AUG13'  95 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
```

<u>Loran C LOP input screen</u>

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

<u>Decca LOP input screen</u>

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   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                      │
│        00.0kn               │
│ ├───────────────────────────┤
│ ◄ ► : 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.

Note: The return to the normal mode, turn off the power and then turn it on while pressing and hold down **NU/CU ENT** key.

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 alarm window appears on the display.

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

```
Alarm Window

001    002    003    004    005
006    007    008    210    211
212    213    214

Speed Alarm
 aaaaaaaa
 bbbbbbbb
 cccccccc

▲▼◀▶    : Select
CLEAR      : Acknowledge
```

Figure 7-1 Alarm Window

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.
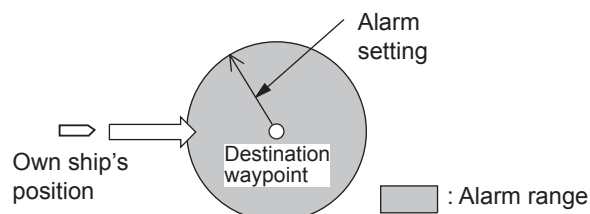
Figure 7-2 How the arrival alarm works

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

```
ALARM SETTINGS        1/3

Arrival/Anchor     ARRV  ANCH  Off
   Alarm Range     0.100NM
XTE                 On    Off
   Alarm Range     0.050NM
Ship Speed              In  Over  Off
   Speed Rage      000.0 ~ 025.0kn
To Next Page

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

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

3) Press ▲ to select Arrival/Anchor.
4) Press ◀ or ▶ to select ARRV.
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.

Anchor watch alarm

The anchor watch alarm sounds to warn you that own ship is moving when it should be at rest.
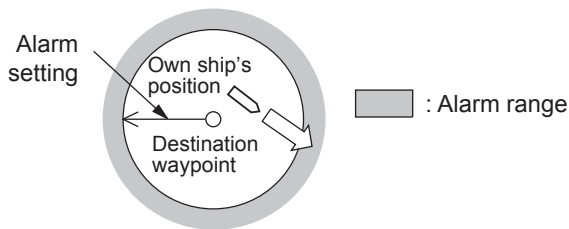
Figure 7-4 How the anchor watch alarm works

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 ANCH.
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.
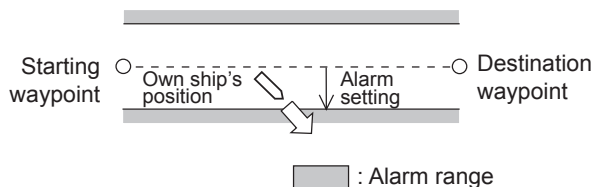
Figure 7-5 How the XTE alarm works

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.

7.4   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          2/3
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
To Next Page

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

Figure 7-6 Alarm settings menu, page 2/3

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.

Note: The water temperature alarm is deactivated when the water temperature is –9.8°C or below. Set –9.7°C or higher.

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 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 WAAS/DGPS Alarm

The WAAS/DGPS alarm sounds when the WAAS/DGPS signal is lost.

7.9 Alarm Mode

Set the alarm mode on the alarm settings menu.

1. Press **MENU ESC** and **4**.
2. Press ▼ to select Alarm Mode.

```
┌─────────────────────────────────┐
│   ALARM SETTINGS        3/3      │
│ To Previous Page                 │
│ Alarm Mode      Legacy  AlertIF1 │
│ Remote ACK IF    ACK    BuzzerStop│
│                                  │
│                                  │
│                                  │
│                                  │
│ ▲ ▼ ◀ ▶   : Select               │
│ ENT : Enter      MENU : Escape   │
└─────────────────────────────────┘
```

Figure 7-7 Alarm setting menu, page 3/3

3. Press ◀ or ▶ to select Legacy or AlertIF.
   Legacy: The alarms are controlled by the interface unit IF-2503.
   AlertIF1: The alarms are controlled by AMS (alert management system). This mode uses ALR/ACK sentences.

Note: The alarm signals shown below are not output to the external device with the ALR sentence or contact signal.
- "WAAS Error" (alarm no. 008)
- "HDOP exceeded" (alarm no. 210)

7.10 Remote ACK IF

Select the function when receiving the remote ACK from the interface unit IF-2503 connected to DATA1 port.

1. Press **MENU ESC** and **4**.
2. Press ▼ to select Remote ACK IF.
3. Press ◀ or ▶ to select ACK or Buzzer Stop.
   ACK: Accepts the remote ACK function.
   BuzzerStop: Stops the buzzer (ACK is not available).

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, POSN

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, SPD

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. To use the RAIM function, enter the range (from own ship in meters) for which you want to know position confidence, on the GPS Setup 2/2 menu. The receiver estimates position confidence using range value and detected satellite error, and displays (provided the RAIM function is active) the results as one of three levels of position confidence, at the top right-hand corner of the screen. The three levels are as follows:

SAFE: GPS signal is normal. The positioning accuracy satisfies the setting value.
CAUTION: RAIM accuracy cannot be calculated. (Signals from more than five GPS satellites are necessary.) The positioning accuracy does not satisfy the setting value.
UNSAFE: GPS signal is abnormal, therefore the positioning accuracy is not reliable. Note that the GP-150-DUAL does not exclude abnormal signals automatically.

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.

POSN 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 DIFF

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.

POSN

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          1/3         │
│                                  │
│ 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 1/3

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.

GPS position smoothing

1) Press **MENU ESC**, **9** and **6**.
2) Press ▲ or ▼ to select Posn.
3) Enter smoothing factor in four digits (0000-9999).
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 four digits (0000-9999).
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 four digits (0000-9999).
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 2/3.

```
        GPS SETUP          2/3
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
To Next Page
ENT : Enter              MENU : Escape
```

Figure 8-2 GPS SETUP menu, page 2/3

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 2/3.
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 2/3.
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 2/3.
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.
   The ⌧ icon appears when L/L offset is applied.

Time difference

1) Press **MENU ESC**, **9** and **6**.
2) Press ▲ or ▼ to select Time Diff on page 2/3.
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 2/3.
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.

GPS antenna position

Set the GPS antenna position as below.
1) Press **MENU ESC**, **9** and **6**.
2) Press ▼ to select GPS Antenna Position on page 3/3.

```
           GPS SETUP          3/3

To Previous Page

GPS Antenna Position
Equipment No. 00
ANT Position X    +000.0m
ANT Position Y    +000.0m
ANT PositionZ     +000.0m
Ship's Width       000.0m
Ship's Length      000.0m

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

Figure 8-2a GPS SETUP menu, page 3/3

3) Enter the antenna position data.
4) Press the **NU/CU ENT** key.

5) Press the **MENU ESC** key.
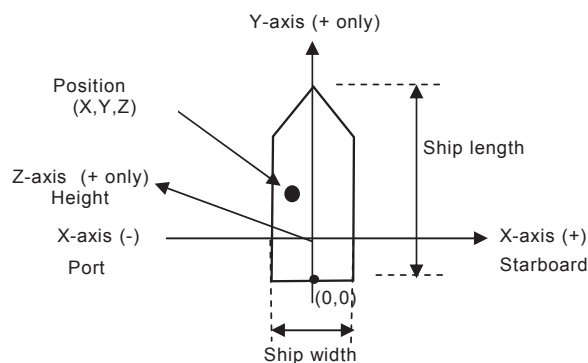
8.2   Units of Measurement

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]   fm
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.

8.3 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
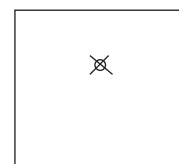
Figure 8-5 Waypoint mark size

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.
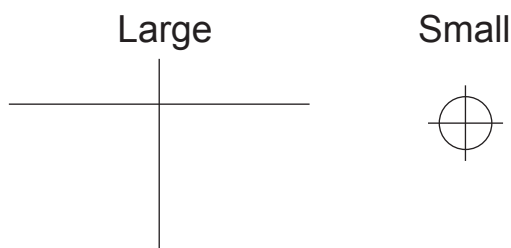
Figure 8-6 Cursor size

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.

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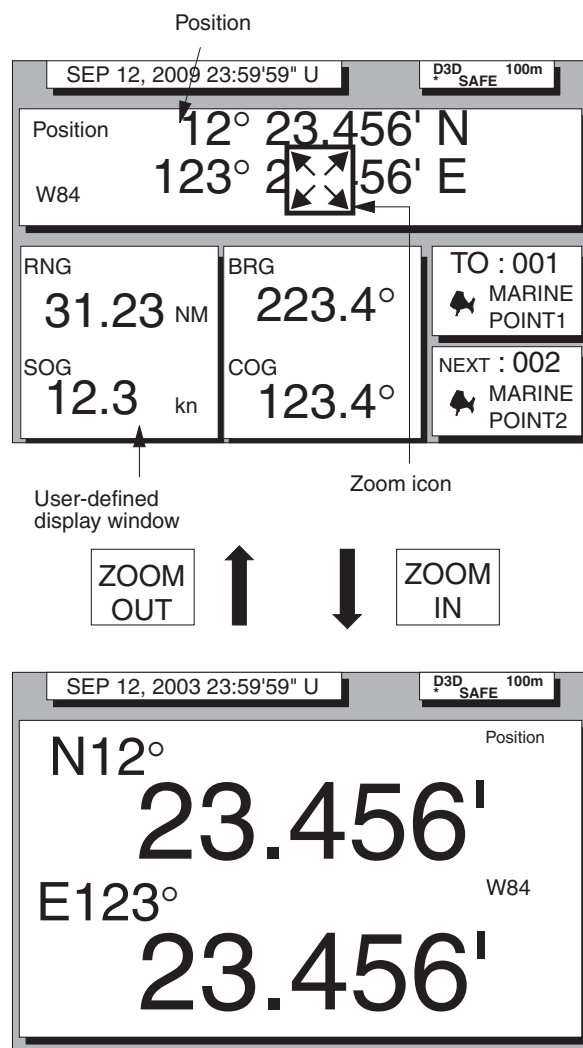
Figure 8-7 How to enlarge indications on the data display

8.4 Outputting Data

Besides its fundamental function of displaying position, the GP-150-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-150-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.

```
        DATA 1, 3 OUTPUT SETUP

 Data FMT        V1.5   V2.0  Ed3 Ed4
     Talker ID      GP    LC     DE
 Output Data   (00-90 sec)98%
    1. AAM:00  APA:00   APB:00   BOD:00
    2. BWR:00  BWW:00  GGA:01   GLL:00
    3. RMB:00  RMC:00  VTG:01   WCV:00
    4. VDR:00  WPL:00   XTE:00   ZDA:01
    5. GNS:00  GBS:00   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 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 (Ed3 or Ed4).
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-150-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.

```
   DATA 4 I/O SETUP    <Out>    2/2
   To Previous Page
 Data FMT              V1.5   V2.0  Ed3  Ed4
        Talker ID    GP    LC    DE
 Output Data      (00-90 sec)       98%
     1. AAM:00   APA:00   APB:00    BOD:00
     2. BWR:00  BWW:00  GGA:01   GLL:00
     3. RMB:00  RMC:00  VTG:01   WCV:00
     4. VDR:00   WPL:00   XTE:00   ZDA:01
     5. GNS:00   GBS:00   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/ROUTE  WPT
 Command              Stop      Start
 Save Data           WPT/ROUTE
 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; 4800 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
```
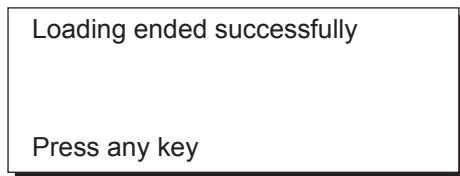
Figure 8-14

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

```
Failed in loading
Invalid data
Press any key
```
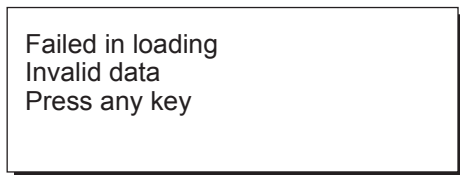
Figure 8-15

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
```
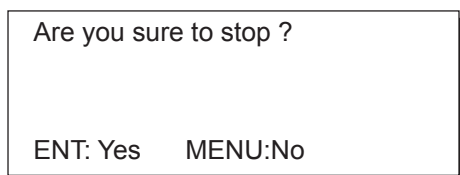
Figure 8-16

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
```
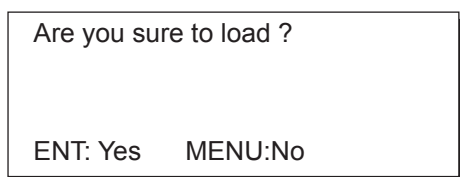
Figure 8-17

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

```
Now loading
Waypoint data !

MENU:Stop
```
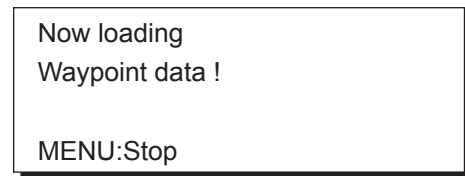
Figure 8-18

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
```
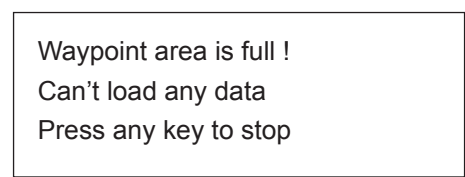
Figure 8-19

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
```
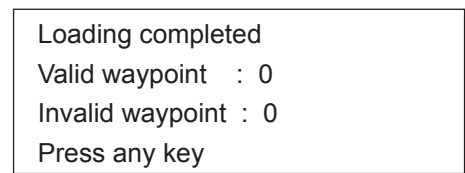
Figure 8-20

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; 4800bps, 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

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 WAAS/DGPS Setting

This menu sets the using WAAS or when the DGPS beacon receiver GR-80 is connected. The default setting is "GPS".

WAAS

1) Press **MENU ESC**, **9** and **7** to display the WAAS/DGPS SETUP menu.

```
        WAAS/DGPS SETUP
Mode                ◀  GPS  ▶
WAAS Search  AUTO  MAN (GEO=134)
Corrections Data Set* : 00

DGPS Station    AUTO  MAN   List
    FREQ       323.0kHz
Baud Rate     ◀  200  bps  ▶

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

*: Determines how to use the WAAS signal. Use the default setting "00".

Figure 8-23 WAAS/DGPS SETUP menu

2) Press ◀ or ▶ to select WAAS or AUTO.
3) Press ▼ to select WAAS SEARCH.
4) Press ◀ or ▶ to select AUTO or MAN.

DGPS

1) Press **MENU ESC**, **9** and **7** to display the WAAS/DGPS SETUP menu.

```
        WAAS/DGPS SETUP
Mode                ◀  GPS  ▶
WAAS Search  AUTO  MAN (GEO=134)
Corrections Data Set : 00

DGPS Station    AUTO  MAN   List*
    FREQ       323.0kHz
Baud Rate     ◀  200  bps  ▶

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

⌐ ¬ : These items appear when "Man" is selected.
*: Only when the internal beacon receiver is equipped.

Figure 8-24

2) Press ▲ or ▼ to select Mode, and then press ◀ or ▶ to choose INT BEACON.
3) Press ▼ to select DGPS Station.
4) Press ◀ or ▶ to select AUTO or MAN or List.
   For automatic search, the GP-150 automatically search DGPS reference station.
   For manual search, enter frequency of DGPS reference station and select the transmission rate of that. The List shows

five closest DGPS beacon stations, including user-programmed stations.

Manual

1) Press ◄ or ► to select MAN.
2) Enter frequency in four digits (283.5kHz to 325.0kHz, in 0.5 kHz step).
3) Press the **NU/CU ENT** key. "Baud Rate" appears in reverse video.
4) Press ◄ or ► to select baud rate; 25, 50, 100 or 200bps.
5) Press the **MENU ESC** key.

List

1) Press ◄ or ► to select List to show the STATION NEAREST list.

```
Station Nearest
User Setup         No   Yes
    FREQ          RNG     BRG
1  320.5kHz      0.6NM   202°*
2  320.5kHz     22.3NM   244°
3  316.0kHz     70.3NM   348°
4  320.0kHz     87.2NM    77°
5  288.0kHz     93.7NM   110°

▲▼◄►  :  Select
ENT : Enter      MENU : Escape
```

*: User-programmed station

Figure 8-25

2) Press ▲ or ▼ to select the station desired.
3) Press the **ENTER** key.
4) Press the **MENU ESC** key.

Programming DGPS user stations

You may program 20 DGPS beacon stations from which to use in DGPS beacon station selection. This function is available only when equipped with the internal beacon receiver.

Entering new DGPS stations

1) Press **MENU ESC, 9** and **7** to display the WAAS/DGPS SETUP menu.
2) Press ▼ to select DGPS Station.
3) Press ► to select List to show the Station Nearest list.
4) Press ▲ or ▼ to select USER Setup, and then press ► to go to the DGPS

Station (USER) list. While searching stations, the message "Please wait" appears. Each page shows six stations.

```
DGPS Station (User)
No.  FREQ  Rate     Position
     (kHz) (bps)
01   284.0  200   20° 0'N   0° 0'W
02   285.0  200   20° 0'N  20° 0'E
03   286.0  200    0° 0'S  20° 0'E
04   287.0  200   20° 0'S  20° 0'E
05   288.0  200   20° 0'S   0° 0'W
06   289.0  200   20° 0'S   0° 0'W

▲▼  : Station No.    ◄ ►  : Edit
CLEAR : Erase      MENU : Escape
```

Figure 8-26

5) Press ▲ or ▼ to select No. desired, which has not been used.
6) Press ◄ or ► to show the Edit window.

```
Edit=DGPS station: 18
FREQ                    ▮_ _. _ kHz
Rate                  ◄ 200 bps ►
Position            _ _ _ _'N  _ _ _ _ _'W



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

Figure 8-27

7) Press ▲ or ▼ to select Freq, and then enter frequency of the station, and then press ▼. (Setting range: 283.5 to 320.5, in 0.5 step)
8) Press ◄ or ► to select the baud rate, 100 or 200 bps, and then press ▼.
9) Enter latitude and longitude of the station. To change N to S or E to W, press ⟳. The message "Are you sure to change?" appears.
10) Press the **NU/CU ENT** key.
    The message "Please wait" appears, and then the DGPS Station (User) list appears.
    Wrong frequency or position was entered at step 7 to 9, the beep sounds and the message "Incomplete Data" appears for three seconds.
11) Press the **MENU ESC** key.

Editing DGPS stations

1) Press **MENU ESC**, **9** and **7** to display the WAAS/DGPS SETUP menu.
2) Press ▼ to select DGPS Station.
3) Press ▶ to select List to show the Station Nearest list.
5) Press ▲ or ▼ to select USER Setup, and then press ▶ to go to the DGPS Station (User) list.
6) Press ▲ or ▼ to select the station from the list, and then press ◀ or ▶ to show the Edit window.

```
Edit=DGPS station: 17

FREQ              3 20. 5 kHz
Rate             ◀ 200 bps ▶
Position          34°44'N  135°21'W




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

Figure 8-28

7) Edit data, and then press the **NU/CU ENT** key.
8) After displaying the message "Are you sure to change?", press the **NU/CU ENT** key. The DGPS Station (User) list appears after the message "Please Wait".
9) Press the **MENU/ESC** key.

Erasing individual DGPS station

1) Press **MENU ESC**, **9** and **7** to display the WAAS/DGPS SETUP menu.
2) Press ▼ to select DGPS Station.
3) Press ▶ to select List to show the Station Nearest list.
4) Press ▲ or ▼ to select USER Setup, and then press ▶ to go to the DGPS Station (USER) list.
5) Press ▲ or ▼ to select the station from the list, and then press the **CLEAR** key. The message "Are you sure to erase?" appears.
6) Press the **NU/CU ENT** key. If cacelling, press the **MENU/ESC** key.

7) 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.

Press [↻].

Jan 21 2009 23:59'59" U   D3D SAFE 100m *
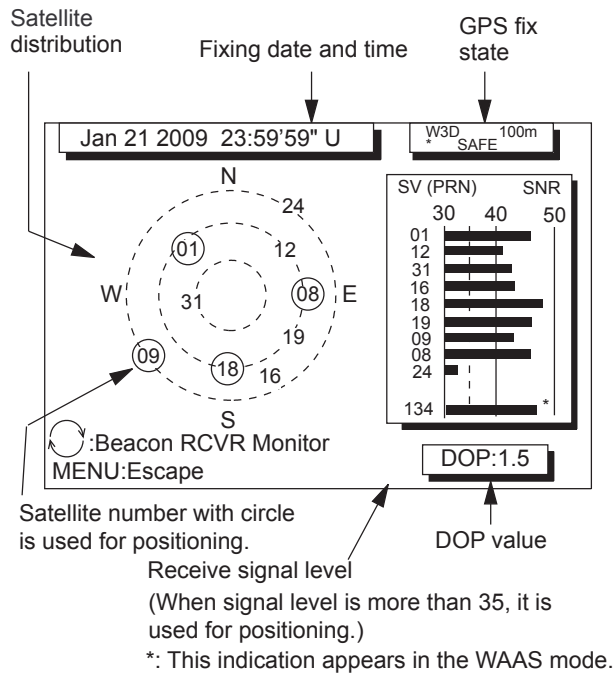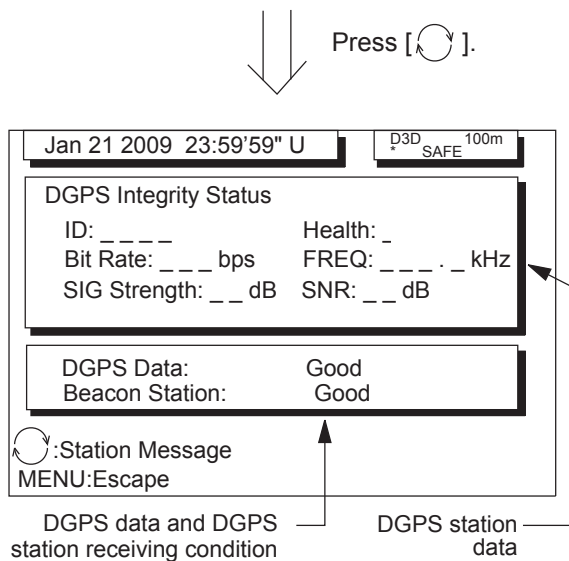
Message:

↻:Satellites Monitor
MENU:Escape
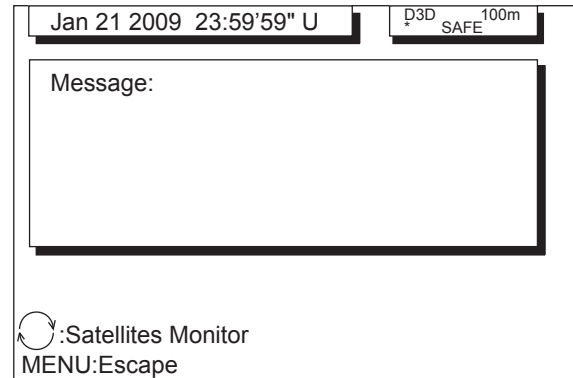
Station Message

Press [↻].

Return to Satellites
Monitor

Figure 8-29 GPS monitor displays

Satellite distribution   Fixing date and time   GPS fix state

Jan 21 2009 23:59'59" U   W3D SAFE 100m *

N
24
01   12
W   31   08   E
19
09   18   16
S

SV (PRN)   SNR
30   40   50
01
12
31
16
18
19
09
08
24
134   *

↻:Beacon RCVR Monitor
MENU:Escape

DOP:1.5

Satellite number with circle is used for positioning.

DOP value

Receive signal level
(When signal level is more than 35, it is used for positioning.)
*: This indication appears in the WAAS mode.

Satellites Monitor

Press [↻].

Jan 21 2009 23:59'59" U   D3D SAFE 100m *

DGPS Integrity Status
  ID: _ _ _ _   Health: _
  Bit Rate: _ _ _ bps   FREQ: _ _ _ . _ kHz
  SIG Strength: _ _ dB   SNR: _ _ dB

  DGPS Data: Good
  Beacon Station: Good

↻:Station Message
MENU:Escape

DGPS data and DGPS station receiving condition

DGPS station data

DGPS Integrity Status

8-13

This page is intentionally left blank.

9. MAINTENANCE & TROUBLESHOOTING

9.1 Clearing the Memory

The GP-150-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 tracks 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.

NOTICE

Do not apply paint, anti-corrosive sealant or contact spray to coating or plastic parts of the equipment.

Those items contain organic solvents that can damage coating and plastic parts, especially plastic connectors.

For the LCD screen, wipe the LCD carefully to prevent scratching, using tissue paper and an LCD cleaner. To remove dirt or salt deposits, use an LCD cleaner, wiping slowly with tissue paper so as to dissolve the dirt or salt. Change paper frequently so the salt or dirt will not scratch the LCD. Do not use solvents such as thinner, acetone or benzene for cleaning. Also, do not use degreaser or antifog solution, as they can strip the coating from the LCD.

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 (Type: FGBO-A 2A AC125V, Code No.: 000-549-062) 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.

No calculation of position

When GPS signal is suddenly lost and position cannot be calculated within one second, a related message appears in the Alarm Window.

```
Alarm Window

211

No calculation of position
JAN 31. 2012 01:59'27" U
34° 45.459 'N  134  45.459'E


▲▼◀▶: Select
CLEAR:  Acknowledge
```

Figure 9-5 Alarm Window (GPS)

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.

HDOP exceed

When HDOP value exceeds 4 in the 2D mode, this error appears in the Alarm Window.

```
210

Caution : HDOP exceed
        JAN 31. 2012 01:59'27" U
        34° 45.459 'N  134  45.459'E
```
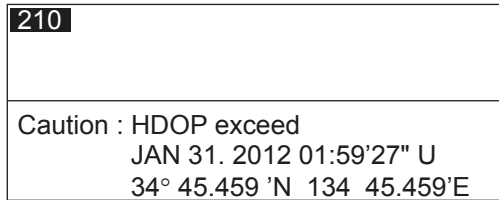
Figure 9-6 Alarm Window (HDOP)

Differential corrections not applied

When DGPS data contains errors or the DGPS beacon station is experiencing transmitting problems, this error appears in the Alarm Window.

```
Alarm Window

214

Differential corrections not applied


▲▼◄►: Select
CLEAR:  Acknowledge
```
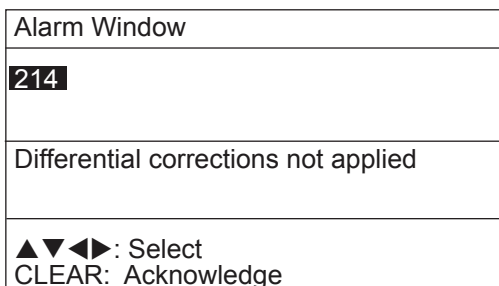
Figure 9-7 Alarm Window (DGPS)

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 Self Test Error
```
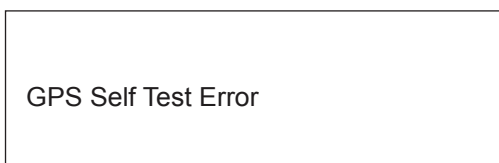
Figure 9-8 Self test error message

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

Output sentence exceed message

When the total output sentence exceeds 100%, the message shown in Figure 9-9 appears. For details of the setting for the total output sentence, see section 8.4.

```
            <Warning>
Output sentence exceeds 100%.
Please reduce sentence to avoid
error with connection equipment.
CLEAR : Agree and close window
```

Figure 9-9 Output sentence exceed message

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-150-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
    DGPS Program No.    08501820XX
    GPS  Program No.    48505640XX
    NAV Program No.     2051520-XX.XX
    BOOT Program No.    2051521-XX.XX

       ▲▼ :Cursor
    ENT:Enter        MENU:Escape
```
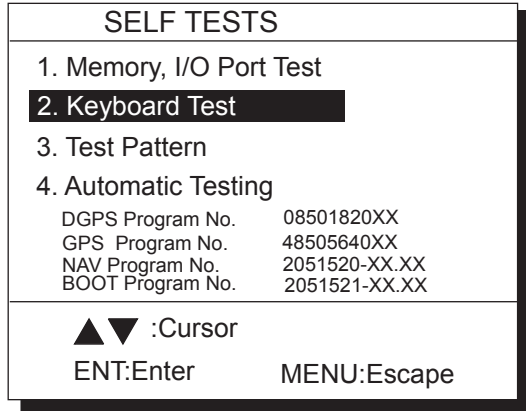
Figure 9-9 Diagnostic TESTS menu

Note: Program version No. shown as "xx" is a field which denotes minor changes and is subject to change under responsibility of the manufacturer.

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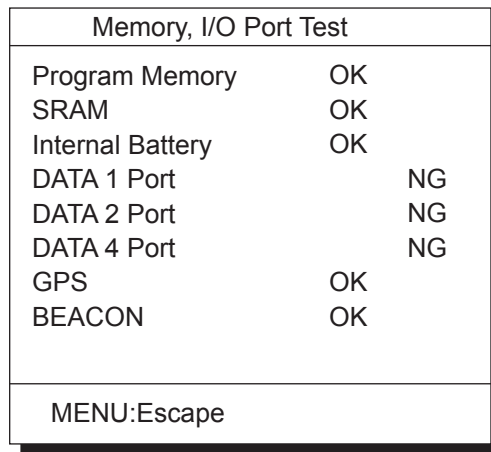
Figure 9-10 MEMORY, I/O PORT TEST display

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 CLR key 3 times to escape
```
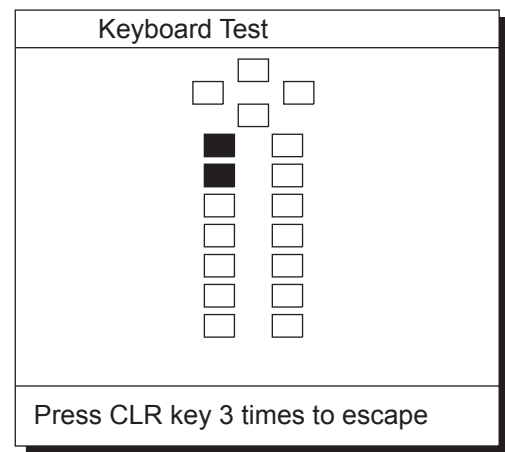
Figure 9-11 KEYBOARD TEST screen

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.

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.
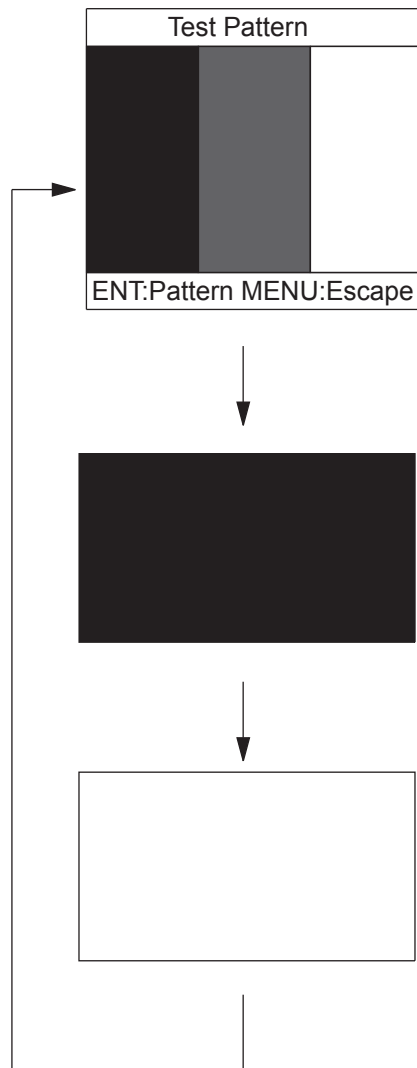
Figure 9-13 Test patterns 1 and 2

3) 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 CR6 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.

10. INSTALLATION

10.1 General

The figure below shows the system configuration of the GP-150-DUAL.
For MD-GB2 connection, see the interconnection diagram attached at back of this manual.
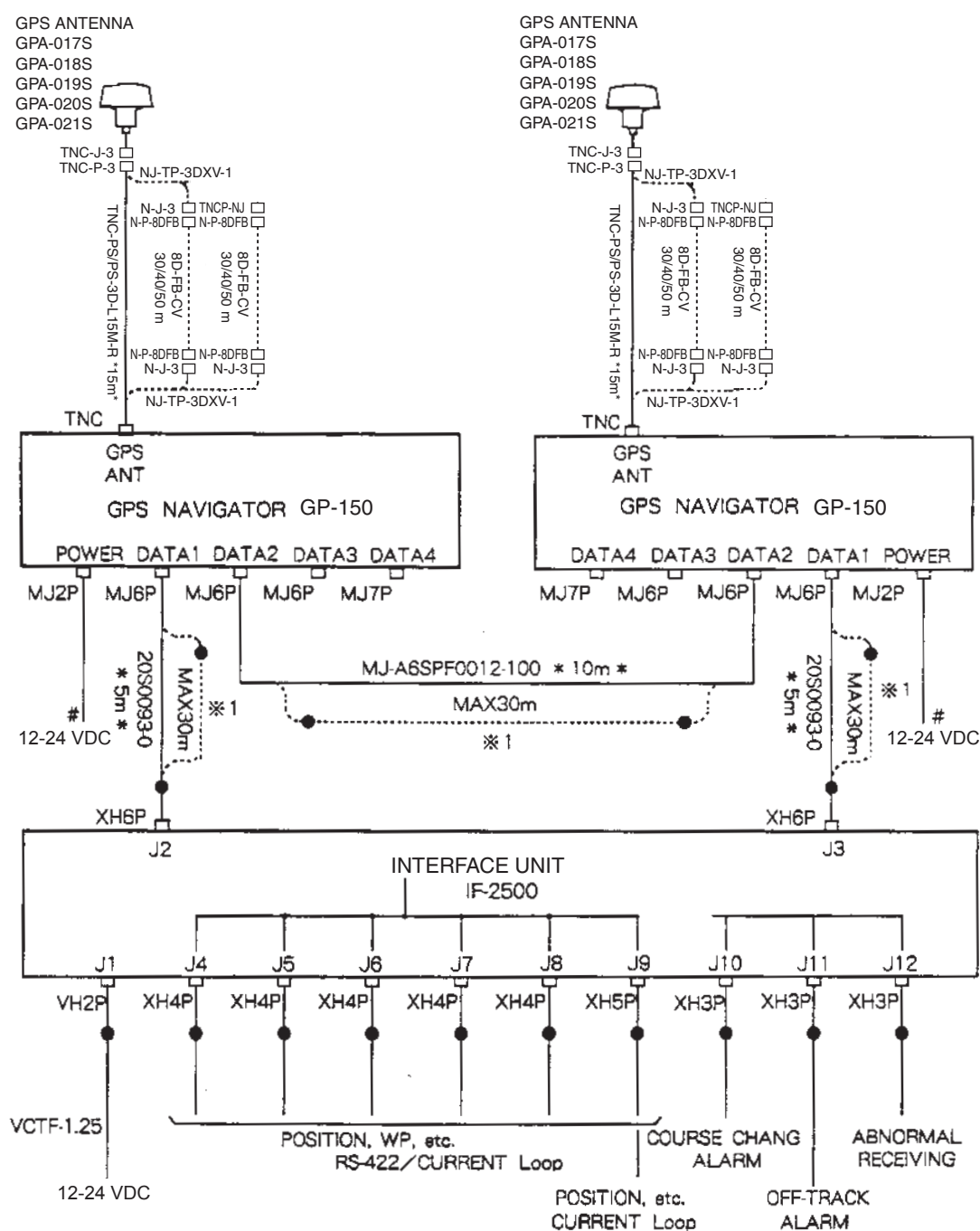
1) #: MJ-A2SPF004-030 *3m*
2) Cable type is CO-SPEVV-SB-C 2P or equivalent, unless noted otherwise.
3) *1: Interface Unit IF-1422 is required if cable length is more than 30 m.

Figure 10-1 System Configuration

10.2 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.

- The optimal viewing distance is 500 mm. Select a suitable mounting location considering the applicable distance.

Table Top and Overhead Mounting

TABLE TOP   **OVERHEAD**
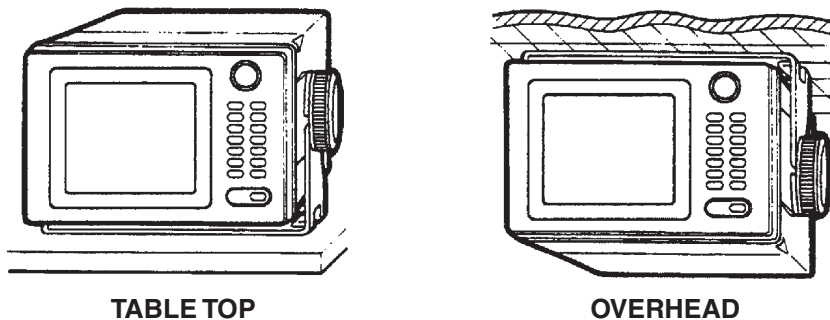
Figure 10-2 Display unit mounting methods

Flush mounting type F

An optional flush mount kit type F is required. For details, see outline drawing page D-3. (Name: Flush Mount Kit F, Type: OP20-25, Code No.: 004-393-280)

Name	Type	Code No.	Qty
Self-tapping screw	5X20	000-162-609-10	4
Hex. bolt	M6X12 SUS304	000-162-897-10	2
Spring washer	M6 SUS304	000-158-855-10	2
Cosmetic panel	20-013-1121	100-234-240	1

Flush mounting type S

An optional flush mount kit type S is required. (Name: Flush Mount Kit S, Type: OP20-24, Code No.: 004-393-000)

Name	Type	Code No.	Qty
Wing bolt	M4X30 YBSC2	000-804-799	4
Hex. bolt	M6X12 SUS304	000-162-897-10	2
Wing nut	M4 YBCS2	000-863-306	4
Spring washer	M6 SUS304	000-158-855-10	2
Flush mount metal	20-013-1111	100-234-230	2

1. Prepare a cutout in the mounting location whose dimensions are 242 (W) X 152 (H) mm.
2. Insert the unit to the cutout.
3. Attach two flush mount metals to the unit with two hex bolts (M6X12) and two spring washers.
4. Screw four wing bolts to wing nut.
5. Fasten the unit with four wing bolts assembled at step 4, and then tighten nuts.
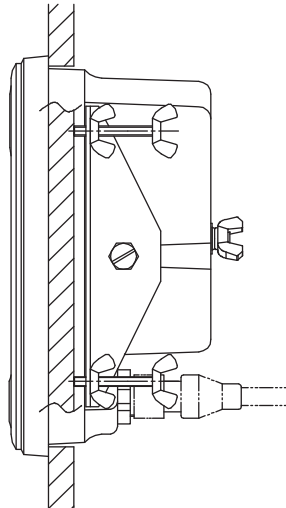
10.3   Antenna Unit

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.

- **The antenna unit GPA-018S must be taped.** See next page.

- **The antenna unit should be fixed to the mast as below.**

Coat here with silicone sealant to prevent breakage of the cable by vibration.

Wrap the vinyl sheet to prevent the breakage of the cable, and then fix it with a hose clamp.
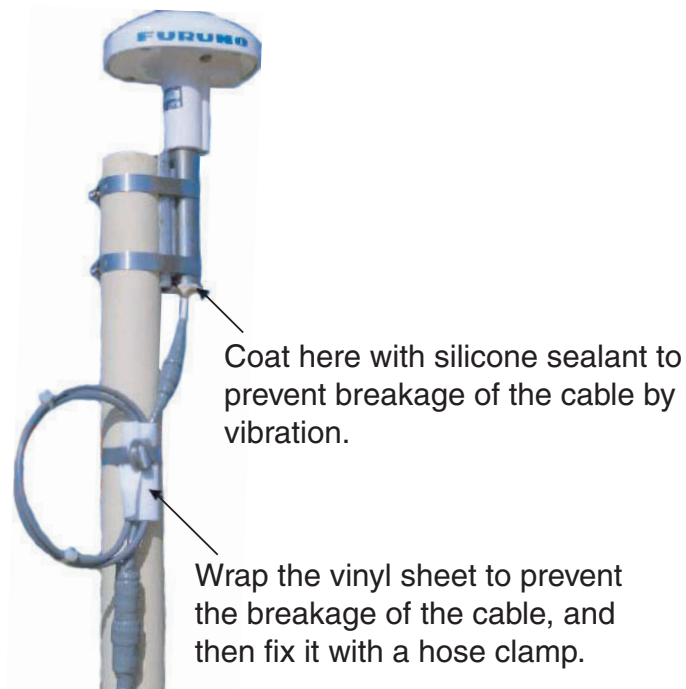
Taping antenna unit GPA-018S

After inserting the whip antenna to the antenna base of GPA-018S, tape the antenna base and whip antenna with self-vulcanizing tape and vinyl tape to reinforce the whip antenna.

1. Wrap the antenna junction point with butyl rubber tape No. 15 (NITTO SINKO COOP.) or the equivalent.
   How to wrap
   1) Pull the tape to be about two times in length and wind it up, overlapping by 1/2 the width of the tape.
   2) Wrap from bottom to top, i.e., from right to left as in the picture below.
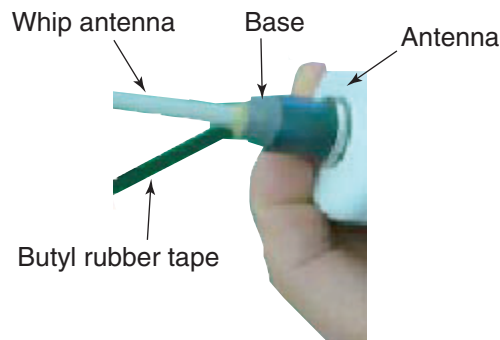
   3) Wrap the tape from the base to a point about 60 mm, and then back to the base.
      Keep tension on edge of tape, using finger to hold tape. Then, squeeze edges of tape with thumb and index finger.
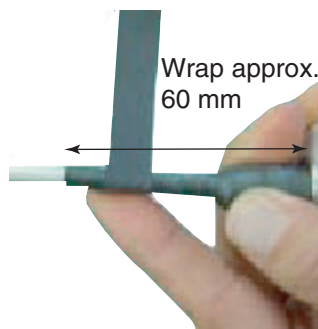
2. Completely cover the butyl rubber tape with white vinyl tape, wrapping from the base to the last wind of butyl rubber tape and then back to the base.
   How to wrap
   1) Being careful not to pull the tape too tightly, wind tape, overlaping by approx. 1/3 of tape width.
   2) Squeeze edges of tape with thumb and index finger.
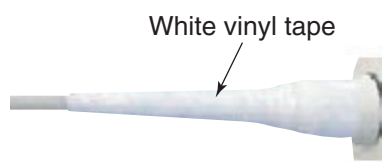
Extending antenna cable length

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.

Cable length	Necessary parts	Code no.
30 m	CP20-01700	004-372-110
	CP20-02700	004-381-160
40 m	CP20-01720	001-207-980
	CP20-02720	001-207-990
50 m	CP20-01710	004-372-120
	CP20-02710	004-381-170

Antenna Unit
GPA-019S
GPA-020S
GPA-021S   GPA-018S   GPA-017S

20cm

☐ : Connector

Conversion Cable Assy.
Antenna Cable
1 m   30 m, 40 m or 50 m   1 m   To display unit
Fabricate locally. (See the next page.)
For CP20-01700, CP20-01710, CP20-01720

OR

TNCP-NJ   Conversion Cable Assy.
Antenna Cable
30 m, 40 m or 50 m   1 m   To display unit
Fabricate locally. (See the next page.)
For CP20-02700, CP20-02710, CP20-02720

Extension Cable Line-up

◆Waterproofing the connector

Wrap connector with vulcanizing tape and then vinyl tape. Bind the tape end with cable-tie.
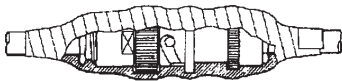
How to waterproof the connector of the antenna cable

How to attach the N-P-8DFB connector

Dimensions in millimeters.

Outer Sheath
Armor   Inner Sheath   Shield

50   30
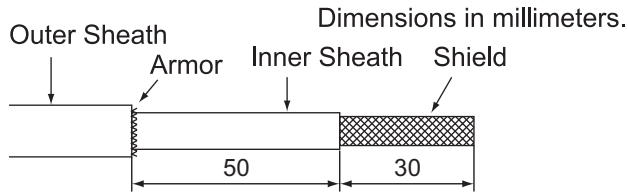
Remove outer sheath and armor by the dimensions shown left.
Expose inner sheath and shield by the dimensions shown left.

Cover with heat-shrink tubing and heat.

30   10
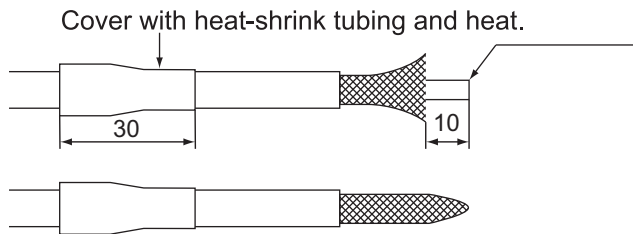
Remove insulator and core by 10 mm.

Twist shield end.

U-gap

Clamp Nut   Clamp
Gasket (reddish brown)
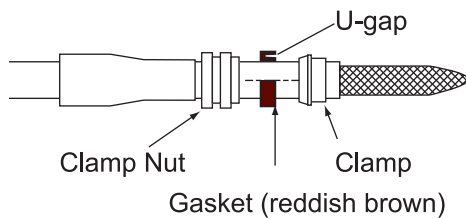
Slip on clamp nut, gasket and clamp as shown left.

Aluminum Foil

Trim shild here.
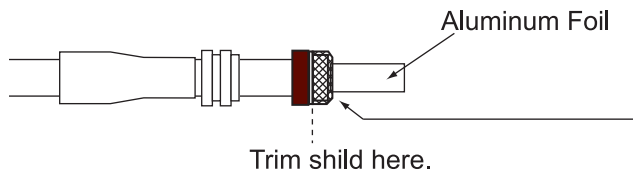
Fold back shield over clamp and trim.
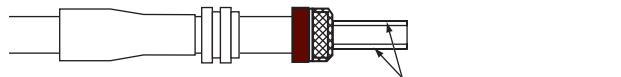
Cut aluminum foil at four places, 90° from one another.

Insulator

Trim aluminum tape foil here.
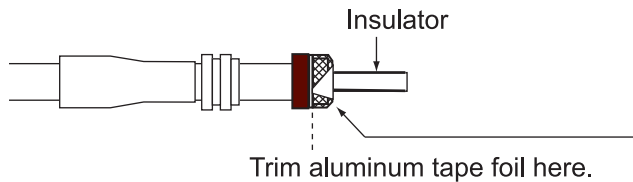
Fold back aluminum tape foil onto shield and trim.
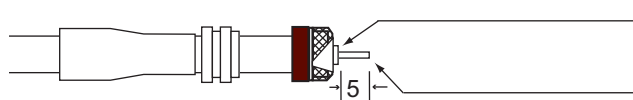
Expose the insulator by 1 mm.

5

Expose the core by 5 mm.

Clamp Nut   Pin   Shell

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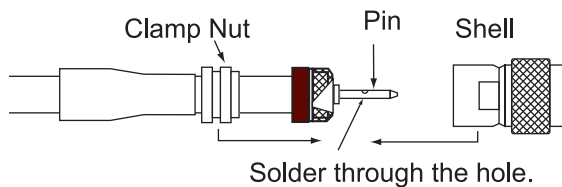
Slip the pin onto the conductor. Solder them together through the hole on the pin.

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

10-7

How to attach the N-P-8DSFA connector

Outer sheath

50

15

Armor   Inner sheath   Braided Shield

Twist the shield and pass the clamp.

30

10

Cover with heat-shrink
tube or bynil tape.

Nut   Washer   Gasket

Core

Clamp

Core (Adjust
the length)

Center pin

Fold back the shield. Cut off the
shield hang over the gasket.
Apply solder to core.

Center pin
(Soldering)

Set the shell to the cable
then turn the nut to tighten.
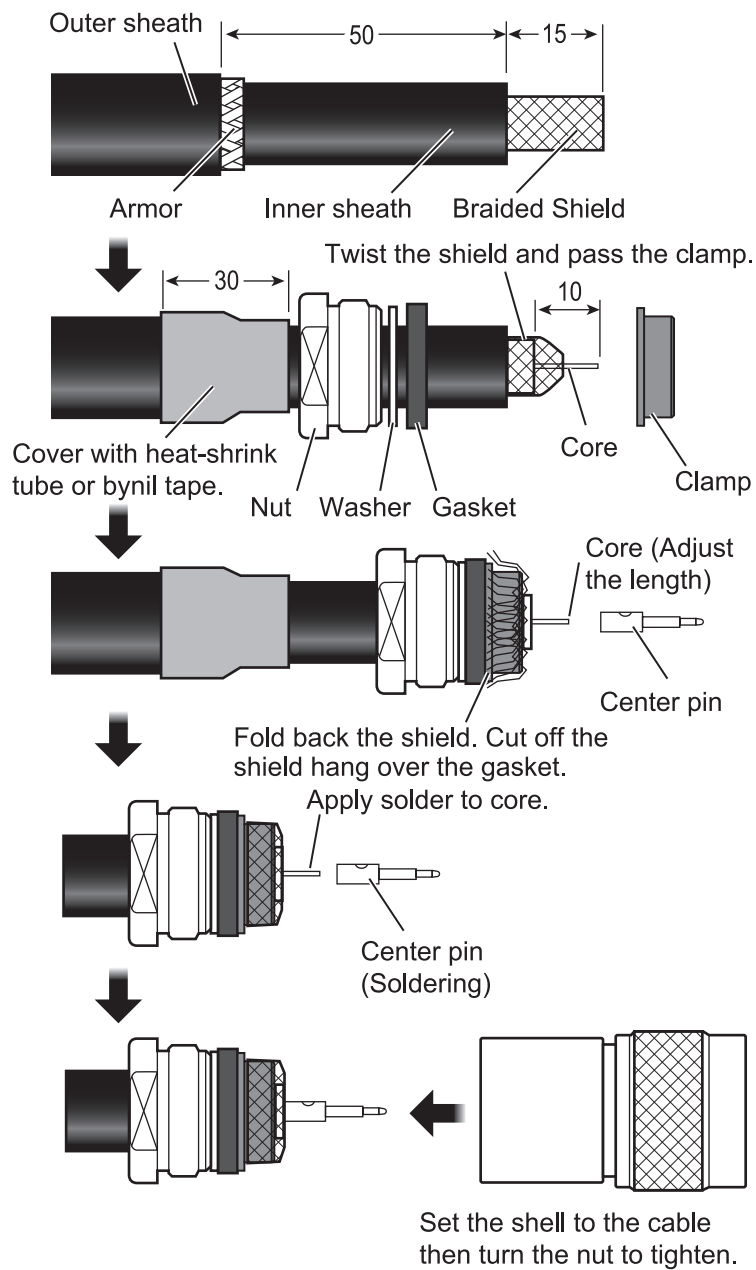
10.4 Wiring

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
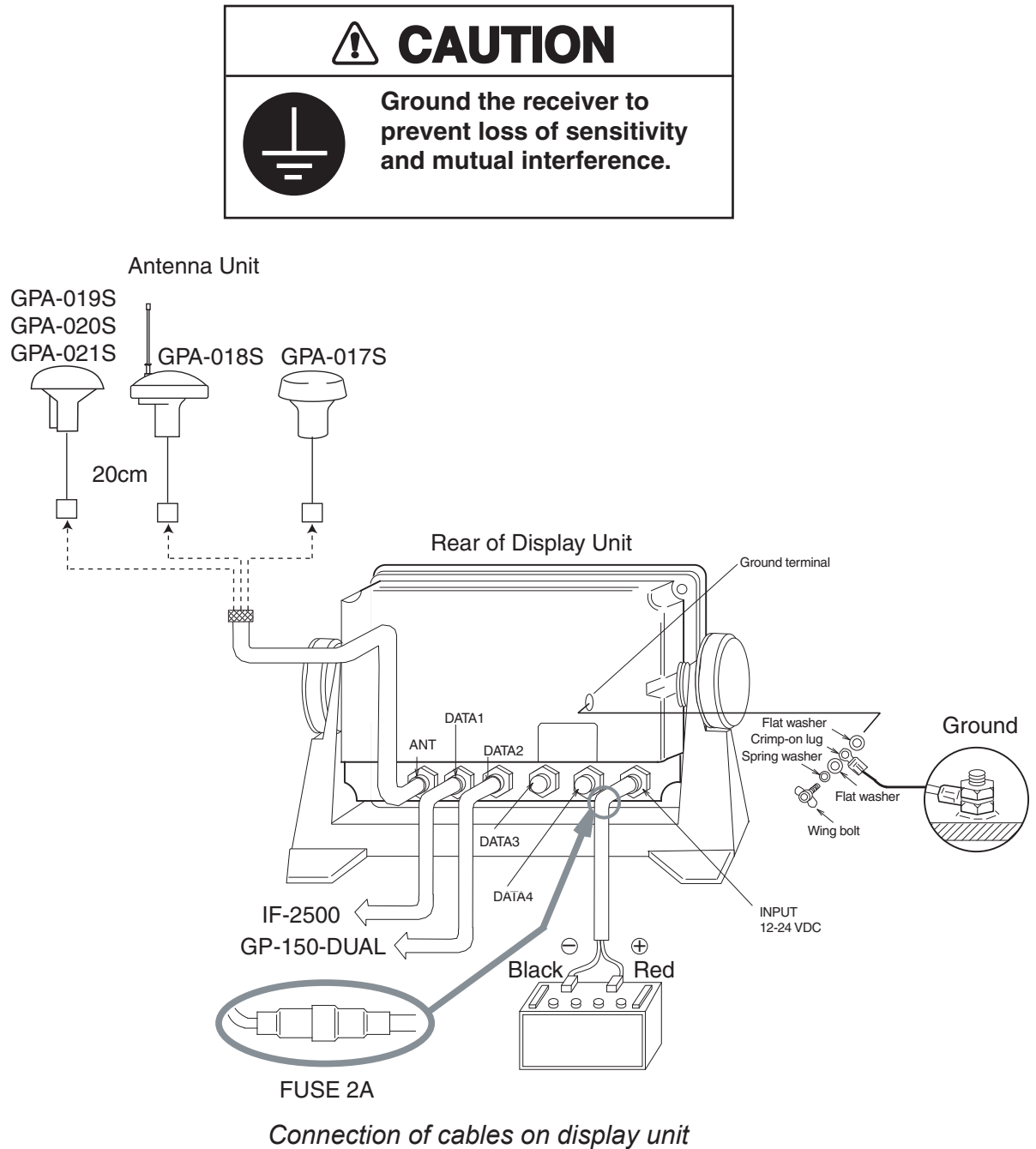
Grounding

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.

10-9

10.5　Initial Settings

The GP-150-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-150-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
ALR:	Set alarm state
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
GBS:	GNSS satellite fault detection
GNS:	GNSS fix data
POS:	Device position and ship dimensions report or configuration command
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 GNSS data
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

Note: BWC, BWR, GGA, GLL, RMB, RMC or WPL is required to output DTM. (FURUNO proprietary sentences)
$PFEC,IIalr: Contact signal control sentence
$PFEC,GPxfr: Alarm reset sentence

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.
ACK: AIS channel assignment message

Acknowledge device alarm. This sentence is used to acknowledge an alarm condition reported by a device.

$--ACK,xxx*hh<CR><LF>

           Unique alarm number (identifier) at alarm source

DBT: Depth below transducer

    $--DBT,xxxx.x,f,xxxx.x,M,xxxx.x,F,*hh<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,x.x,x.x,x.x,*hh<CR><LF>
          a   b c d
a: Water depth relative to the transducer, meters
b: Offset from transducer, meters (not used)
c: Maximum range scale in use
d: Checksum

MTW: Water temperature
     $--MTW,   23.4,   C*34<CR><LF>
               a   b c
  a: Temperature, b: degrees, C, c: Checksum

TLL: Target latitude and longitude

$--TLL,xx,llll.ll,a,yyyyy.yy,a,c--c,hhmmss.ss,a,a*hh<CR><LF>
      a b c   d   e f   g   h i j

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

$PFEC,AGFPA: Autopilot information from FURUNO autopilot
$PFEC,IIals: Contact signal status sentence

Port	Input	Output
DATA1	NMEA 0183 Ver. 1.5/2.0 ACK, DBT, DPT, MTW, TLL, $PFEC,AGFPA, $PFEC,IIals	IEC 61162-1/NMEA 0183 Ver. 1.5/2.0 AAM, ALR, APA, APB, BOD, BWC, BWR, BWW, GGA, GLL, GNS, RMB, RMC, VTG, WCV, WNC, WNR, WPL, XTE, ZDA, GBS, POS, Rnn, RTE, $PFEC,IIalr, $PFEC,GPxfr
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, POS, RMB, RMC, VTG, WCV, WNC, WNR, WPL, XTE, ZDA, GBS, Rnn, RTE

Note: BWC, BWR, GGA, GLL, RMB, RMC or WPL is required to output DTM.

General data

1) **Input of waypoint data:** Connect YEOMAN to DATA4 port
2) Input and output of waypoint/route data

TX 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 rate of operation: Low

TX rate of operation: High
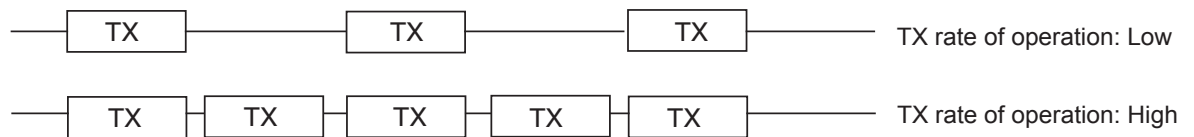
Note 1: When outputting data without rest intervals between data, TX rate of operation is 100%. In this case, wrong data may be shown on the receiver because it cannot recognize intervals between data. Thus, do not output unnecessary data or set TX interval to large value so that TX rate of operation becomes small.

Note 2: When the external equipment cannot display correct data input from the GP-150, 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]  Ed3  Ed4  │
│ └──────────────┘                          │
│    Talker ID    [GP]  LC    DE            │
│ Output Data   (00-90 sec)   82%  ◄─── TX rate of operation
│   1. AAM:01   APA:00   APB:00   BOD:00    │
│   2. BWR:00   BWW:00  GGA:01   GLL:00     │
│   3. RMB:00   RMC:00   VTG:01   WCV:00    │
│   4. WNR:00   WPL:00   XTE:00   ZDA:01    │
│   5. GNS:00   GBS:00   Rnn:00   RTE:00    │
│ DATA3. Log Pulse   [200ppm]   400ppm  ─── This line appears only when LOG is
│                                            selected by internal jumper blocks.
│   ENT : Enter        MENU : Escape        │
│                                    Settings shown above are default settings.
└─────────────────────────────────────────┘
```

DATA1, 3 OUTPUT SETUP menu

2) Press ▲ to select DATA FMT.
3) Press ◄ or ► to select V1.5, V2.0, Ed3 or Ed4.
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 sec.
8) Press the **MENU ESC** key.
9) Enter TX interval for each output data sentence in lines 2 through 5. Press the **CU/NUENT** key after setting each line.

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%.

10-13

DATA 3 output setting

The DATA 3 can output NMEA 0183 (V1.5/V2.0) /IEC 61162-1 (Ed3/Ed4), data or log pulse depending on jumper block setting on the NAV board. For NMEA 0183 (V1.5/V2.0) /IEC 61162-1 (Ed3/Ed4), the same signal of DATA 1 is output from DATA 3.

Selection of NMEA0183 or log pulse

Output data / NP board	NMEA 0183/IEC 61162-1 (Default Setting)	Log pulse
JP3	#1-2	#2-3
JP4	#1-2	#2-3
JP10	#1-2	#2-3

Rate of log pulse output

150 mA Max.
50 VDC

Procedure for setting of log pulse rate

1) Press **MENU ESC**, **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.
4) Press the **MENU ESC** key.

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                      ▲
                                   └─── Appears only when external
                                        DGPS receiver is used.



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

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  Ed3  Ed4
        Talker ID   GP    LC     DE
 Output Data    (00-90 sec)      98%
   1. AAM:01  APA:00   APB:00   BOD:00
   2. BWR:00  BWW:00  GGA:01   GLL:00
   3. RMB:00  RMC:00  VTG:01   WCV:00
   4. WNR:00  WPL:00  XTE:00   ZDA:01
   5. GNS:00  GBS:00  Rnn:00   RTE:00
  ENT : Enter         MENU : Escape
```

DATA4 I/O SETUP <Out> menu

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

Setting DATA 4 to "COM" (general data)

Waypoint data can be received from a personal computer, through the DATA 4 port. Note that the data transmitting operation should be done after receiving data using DATA 4 port. For details, see page 1-6.

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
```

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/ROUTE.
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 below appears.

```
Now loading
Waypoint/Route data !

MENU: Stop
```

13) Press the **CU/NU ENT** key. The message shown in below appears while data is being loaded.

```
Are you sure to stop ?

ENT: Yes    MENU: No
```

14) Output data from the computer. When data is loaded, the cursor shifts to Stop.
15) Press the **MENU 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-150-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
```

I/O SETUP <DGPS> 2/2 menu

7) Press ▲ or ▼ to select First Bit.
8) Press ◀ or ▶ 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.

10.6   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.
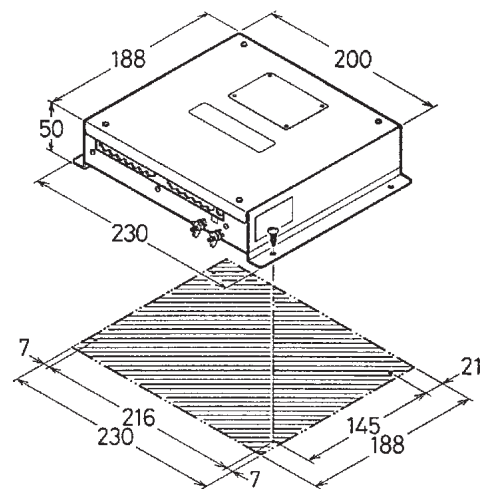
Mounting

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.
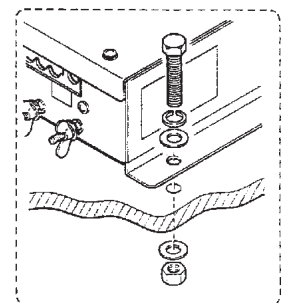
Interface unit mounting

10-17

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.
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.
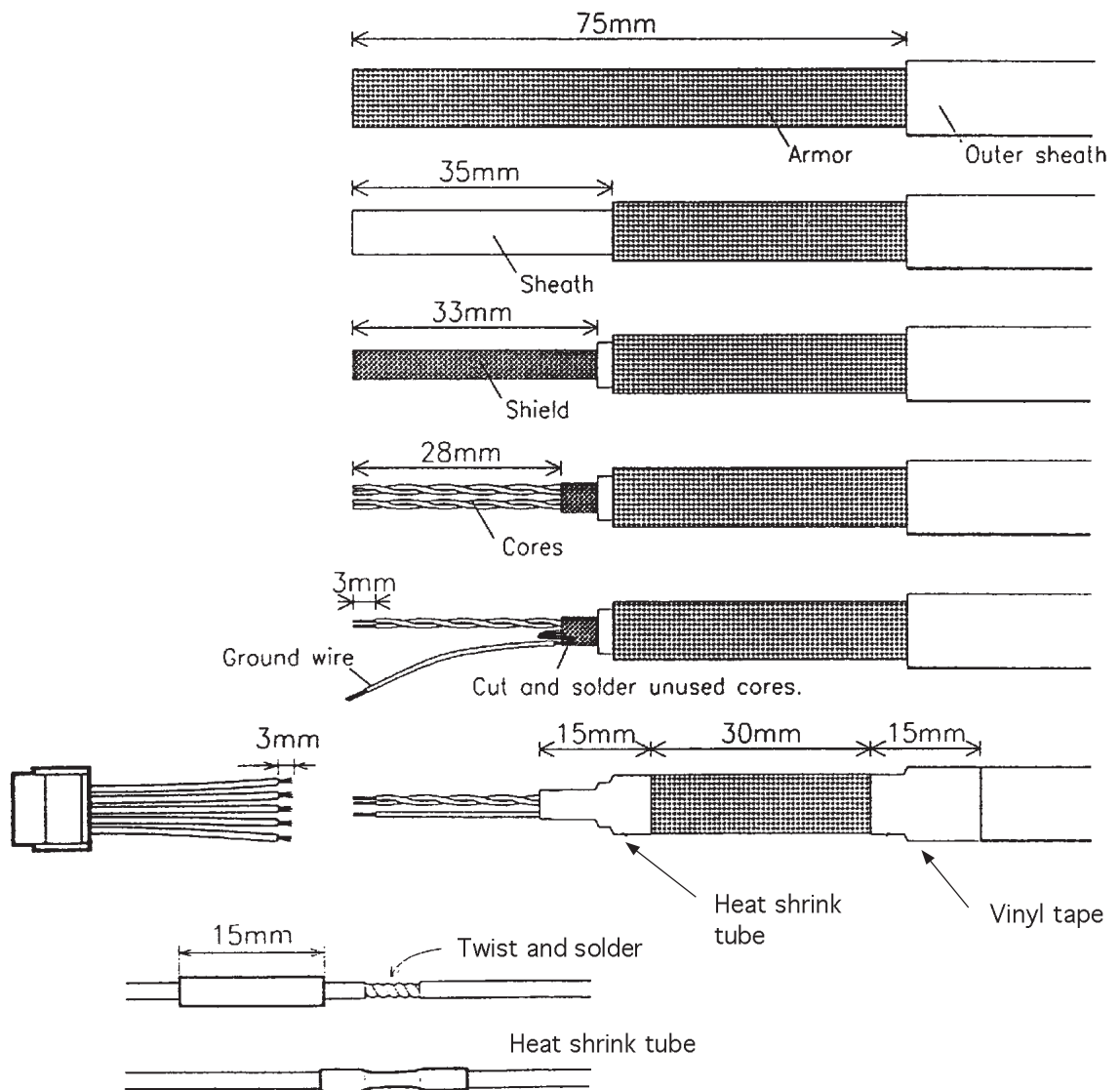
How to fabricate the signal cable

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 (24 VDC)

Pin no.	Designation
#1	+
#2	-

Input signal (NMEA)

The signal from GPS navigator 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	RD1-H	#3	RD2-H
#4	RD1-C	#4	RD2-C
#6	GND	#6	GND

Output signal (RS-422 or NMEA)

J4, J5, J6, J7, J8, J9

Pin no.	RS-422	NMEA
#1	TD-B	TD-H
#2	TD-A	TD-C
#4*	GND	GND

*#5 for J9

Output signal (contact closure signal)

J10 (Arrival alarm)		J11		J12	
Pin no.	Designation	Pin no.	Designation	Pin no.	Designation
#1	Alarm out 1 (H)	#1	Alarm out 2 (H)	#1	Alarm out 3 (H)
#2	Alarm out 1 (C)	#2	Alarm out 2 (C)	#2	Alarm out 3 (C)

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.

No.	Jumper	Pin no.	Jumper	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.

   XH, 6 pin   XH, 4 pin
   #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.

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.
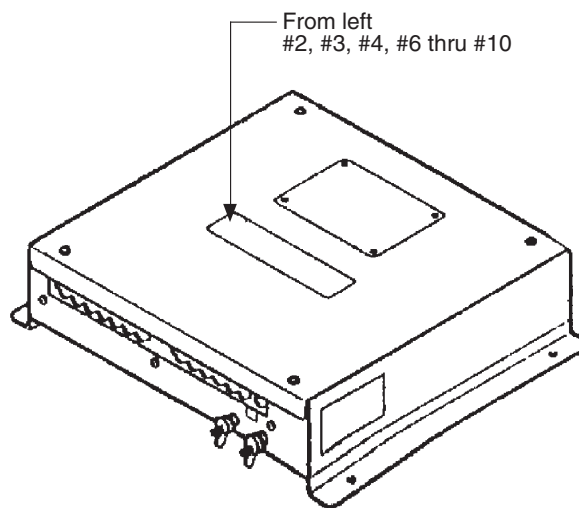
Location of LEDs

10.7   GPS/BEACON Antenna Distributor MD-GB2

Specification

Transmission frequency	GPS	: 1575.42MHz
	Beacon	: 283.5～325.0kHz
Loss	GPS	: 4dB
	Beacon	: 3dB
Power supply to antenna	One line fed from two distribution lines	
Connector type	TNC	
Ambient temperature	-15 to +55°C	
Humidity	95% or less	
Waterproofing	None	

Note: Furuno GPS Receivers are designed, considering 10dB antenna cable loss. Because this distributor loses 4dB, shorten antenna cables so that loss is 6dB or less.

Refer to the following formula for calculation of loss.

8D-FB cable: 0.165dB/m

3D-2V cable: 0.65 dB/m

For the mounting, see the outline drawing at the back of this manual.

10-21

This page is intentionally left blank.

APPENDIX

Menu Tree

Main menu

Bold: Default setting

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 (○ □ ◇ ✕ 凸 凵 •
  🐟 🐠 🦀 🐙 ⛰ ◀)
- Mark Line (•, ——, ----, —·—)
- Event Mark (▽ △ ◎ ☆
  🐟 🐠 🦀 🐙 ⛰ ◀)

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

4. ALARM SETTINGS
- Arrival/Anchor (ARRV, ANCH., **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 kn)
- 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)
- Alarm Mode (Legacy, **AlertIF1**)
- Remote ACK IF (**ACK**, BuzzerStop)

5. MANUAL CALCULATION
- From
- To
- Trial Speed (**AUTO**, MAN)
  (010.0 kn)

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

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▶
│   #2 ◀SOG▶
│   #3 ◀BRG▶
│   #4 ◀COG▶

SOG, COG, RNG, BRG,
WAT TEMP, WAT DEPTH, XTE,
dCOG, AVR SOG, AVR COG, TTG,
ETA, TRIP, TRIP TIME, ROUTE
DIST, ROUTE TTG, ROUTE. ETA,
ALT, VTD, DRIFT, SET, STW, HDG

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

├─ 3. DATA1, 3 OUTPUT SETUP ─┬─ Data FMT (V1.5, V2.0, Ed3, **Ed4**)
│ ├─ Talker ID (**GP**, LC, DE)
│ └─ Output Data

AAM: 01, APA: 00, APB: 00, BOD: 00,
BWR: 00, BWW: 00, GGA: 01, GLL: 00,
RMB: 00, RMC: 00, 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, Ed3, **Ed4**)
  ├─ Talker ID (**GP**, LC, DE)
  └─ Output Data

AAM: 01, APA: 00, APB: 00, BOD: 00,
BWR: 00, BWW: 00, GGA: 01, GLL: 00,
RMB: 00, RMC: 00, VTG: 01, WCV:00,
WNR: 00, WPL: 00, XTE: 00, ZDA: 01,
GNS: 00, GBS: 00, Rnn: 00, RTE: 00

②

②

— 6. GPS SETUP ——— Fix Mode (2D, **2/3D**)
— ANT Height (**016**, 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 m)
— 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**)
— GPS Antenna Position

— 7. WAAS/DGPS SETUP ——— Mode (**GPS**, WAAS, INT BEACON*, EXT BEACON*, AUTO)
— WAAS Search   (**AUTO**, MAN (GEO=134))
— Corrections Data Set (**00**)
— DGPS Station (AUTO, **MAN**, List**)
— FREQ (**323.0 kHz**)
— Baud Rate (25, 50, 100, **200** bps)

— 8. LOP SETUP ——— POS Display (**LAT/LON**, 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)

*: One is displayed according to kind of
   beacon receiver used.
**: Only when the internal beacon receiver
    is equipped.

World Time Standards

Geodetic Chart List

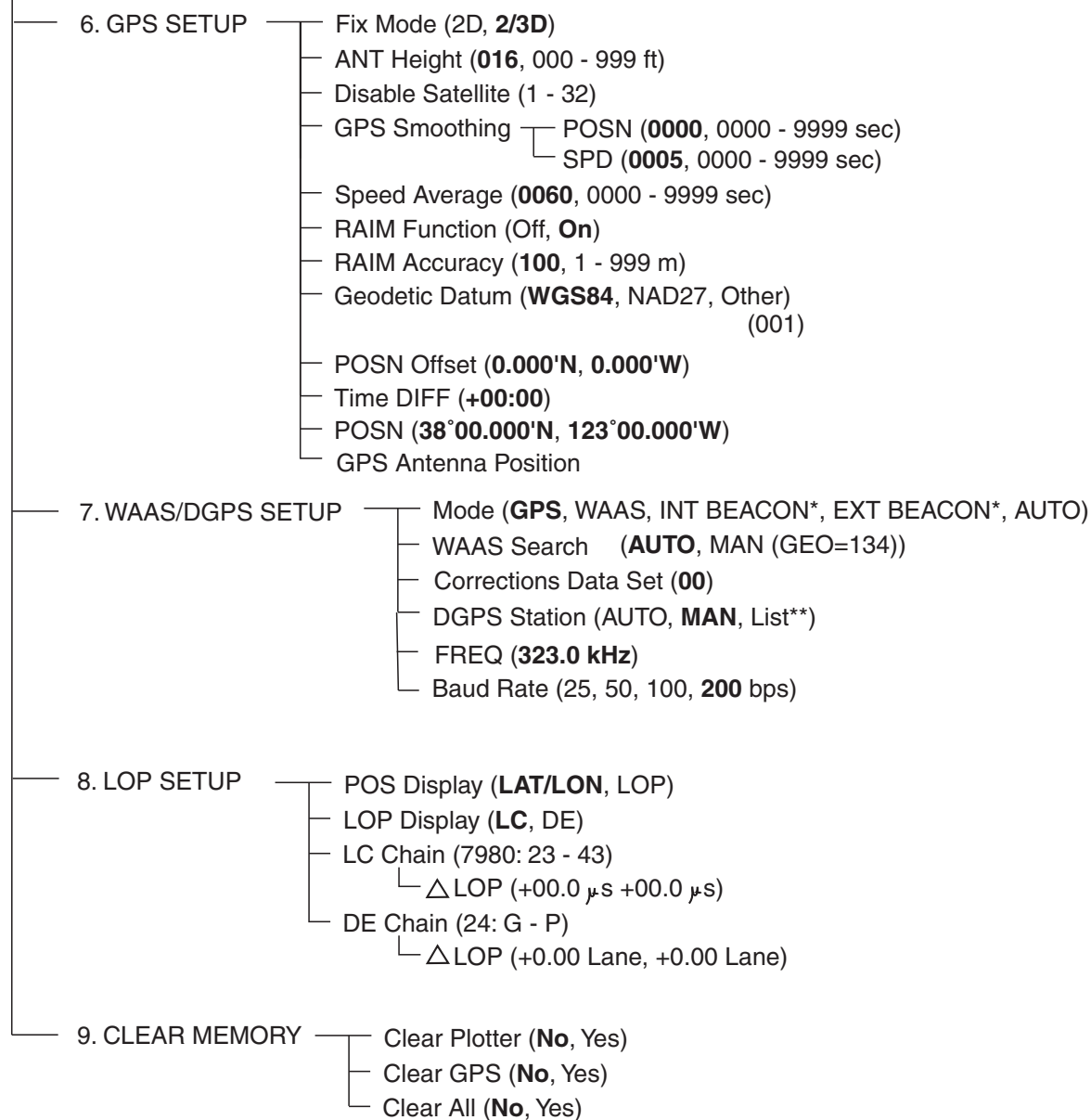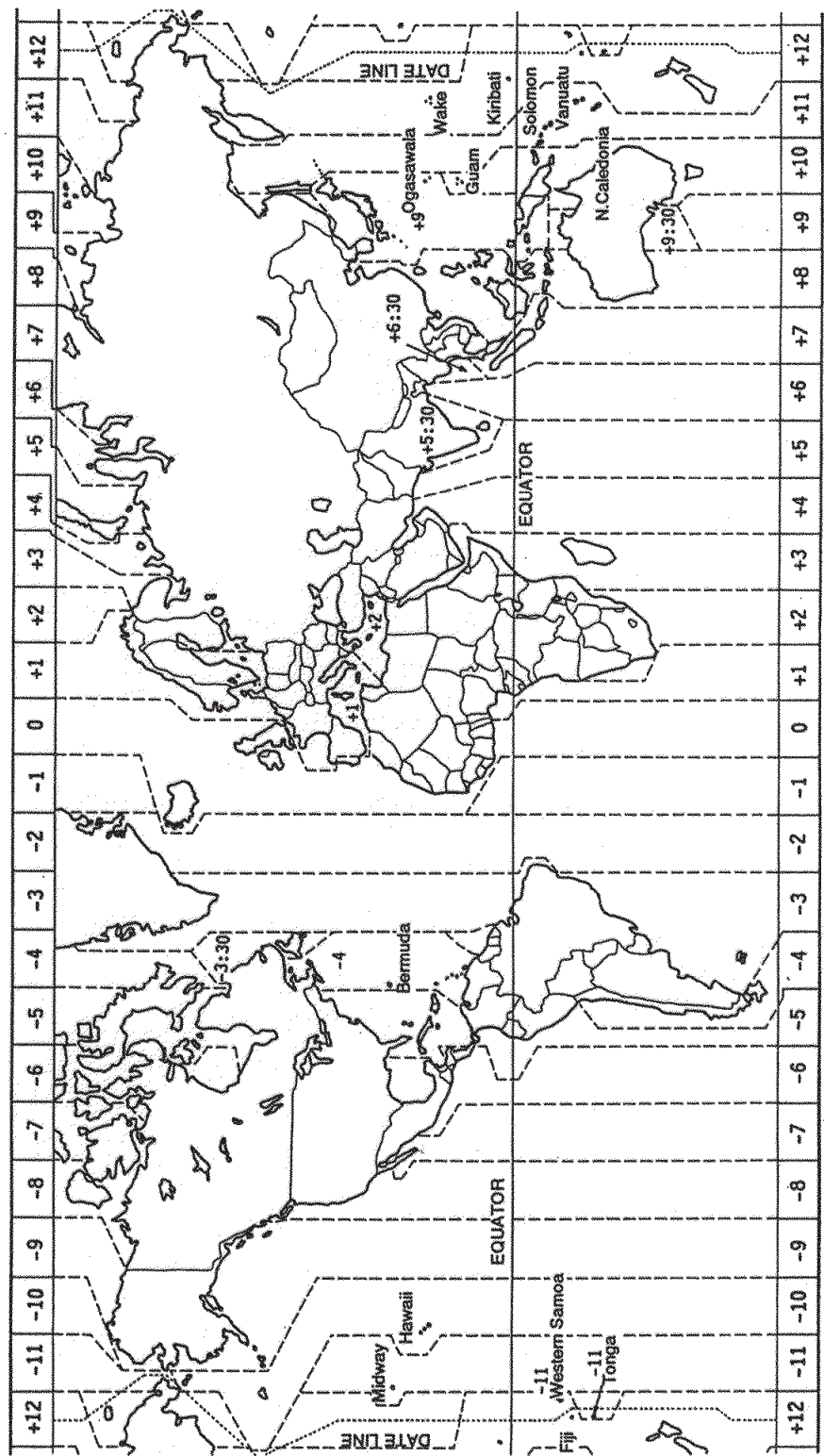|		
001: WGS84		
002: WGS72		
003: TOKYO	:	Mean Value (Japan, Korea & Okinawa)
004: NORTH AMERICAN 1927	:	Mean Value (CONUS)
005: EUROPEAN 1950	:	Mean Value
006: AUSTRALIAN GEODETIC 1984	:	Australia & Tasmania
007: ADINDAN	:	Mean Value (Ethiopia & Sudan)
008:	:	Ethiopia
009:	:	Mali
010:	:	Senegal
011	:	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	

Decca Chains

Chain No.	Chain	Chain code	Location
01	South Baltic	0A	Europe
02	Vestlandet	0E	"
03	Southwest British	1B	"
04	Northumbrian	2A	"
05	Holland	2E	"
06	North British	3B	"
07	Lofoten	3E	"
08		3F	"
09	North Baltic	4B	"
10	North West	4C	"
11	Trondelag	4E	"
12	English	5B	"
13	North Bothnian	5F	"
14	Southern Spanish	6A	"
15	North Scottish	6C	"
16	Gulf of Finland	6E	"
17	Danish	7B	"
18	Irish	7D	"
19	Finnmark	7E	"
20	French	8B	"
21	South Bothnian	8C	"
22	Hebridean	8E	"
23	Frisian Islands	9B	"
24	Helgeland	9E	"
25	Skagerrak	10B	"
26	North Persian Gulf	5C	Persian Gulf & India
27	South Persian Gulf	1C	"
28	Bombay	7B	"
29	Calcutta	8B	"
30	Bangladesh	6C	"
31	Saliyah	2F	"
32	Hokkaido	9C	Japan
33	Tohoku	6C	"

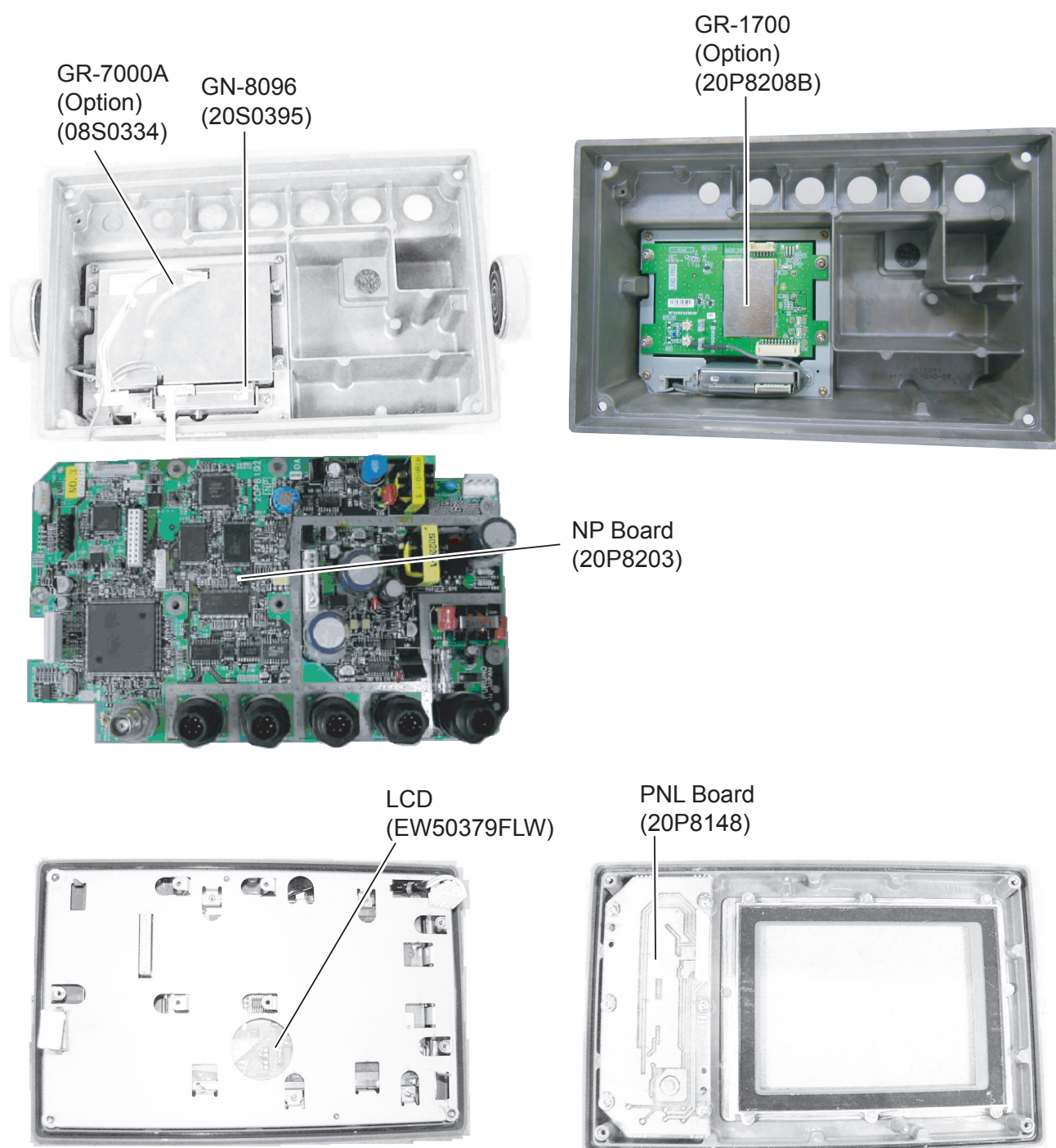| Chain no.	Chain	Chain code	Location
34	Kanto	8C	Japan
35	Shikoku	4C	"
36	Hokuriku	2C	"
37	Kita Kyushu	7C	"
38	Namaqualand	4A	Southern Africa
39	Cape	6A	"
40	Eastern Province	8A	"
41	South West Africa	9C	"
42	Natal	10C	"
43	Dampier	8E	Australia
44	Port Headland	4A	"
45	Anticosti	9C	Northern Africa
46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

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-150-DUAL	
	Unit	DISPLAY UNIT GP-150-DUAL	
ELECTRICAL PARTS LIST			
FEBRUARY/2014	Blk.No.		
SYMBOL TYPE			

DISPLAY UNIT GP-150	Code No.
PRINTED CIRCUIT BOARD	
20P8148, PNL	004-401-410
20P8203, NP	001-140-360
ASSEMBLY	
20S0395, GN-8096	000-150-957-12
08S0334, GR-7000A (option)	000-143-249
20P8208B, GR-1700 (option)	001-284-700
LCD	
EW50379FLW	001-140-300

Parts Location

Display unit

GR-7000A
(Option)
(08S0334)

GN-8096
(20S0395)

GR-1700
(Option)
(20P8208B)

NP Board
(20P8203)

LCD
(EW50379FLW)

PNL Board
(20P8148)

Digital Interface (IEC 61162-1 EDITION 4)

Output sentences of channel 1, 2, 3, 4 (DATA 1, DATA 2, DATA 3, DATA 4)

AAM, ALR, APA, APB, BOD, BWC, BWR, BWW, DTM , GBS, GGA, GLL, GNS, POS, RMB, RMC, RTE, VTG, WCV, WNC, WNR, WPL, XTE, ZDA

Input sentences of channel 1 (DATA 1, DATA 2, DATA 4)

ACK, DBT, DPT, MTW, TLL

Data transmission

Data is transmitted in serial asynchronous from in accordance with the standard referenced in 2 of IEC 61162-1. The first bit is a start bit and is followed by data bits.
The following parameters are used:
Baud rate: 4800
Data bits: 8 (D7=0), parity none
Stop bits: 1

Interface Documentation

"DATA1" Port

IEC 61162-1/NMEA 0183 Ver. 1.5 Output

- Output Schematic Diagram (Talker)
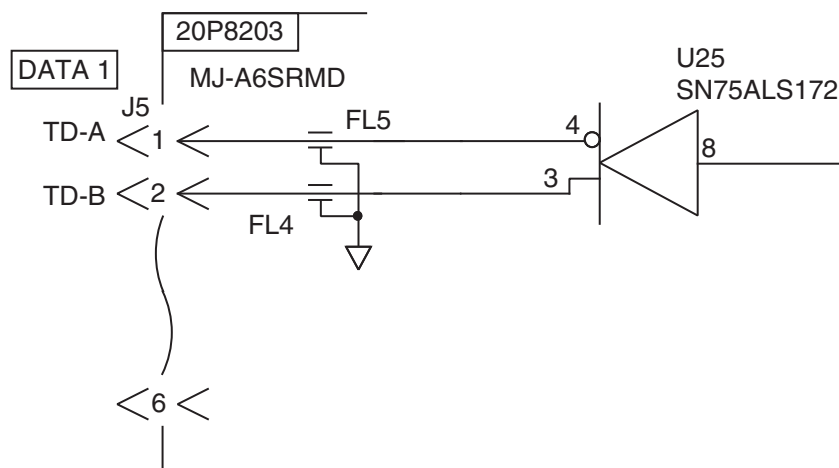
- Output Drive Capability

  Max. 15mA

NMEA 0183 Input
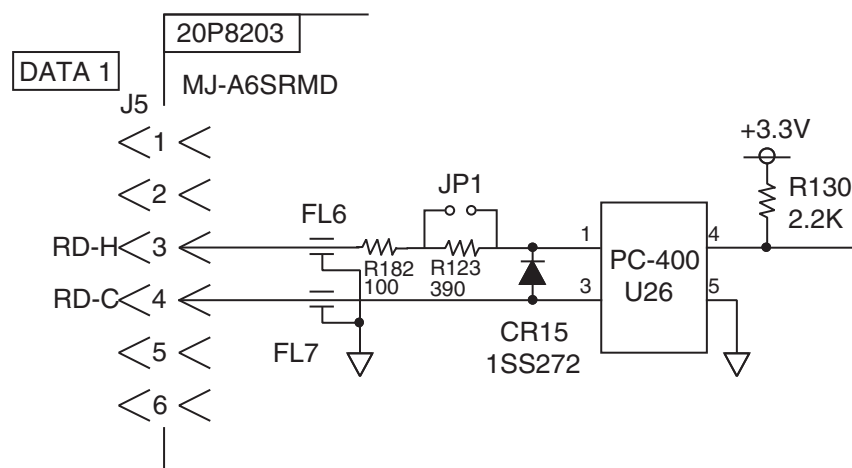
- Load Requirements

  Isolation: Photo coupler
  Input Impedance: 470 Ω
  Max. Voltage: ±15V
  Threshold: 3mA (In case of FURUNO device talker connection)

"DATA3" Port

- Output Drive Capability

  Max. 15mA

AP-11
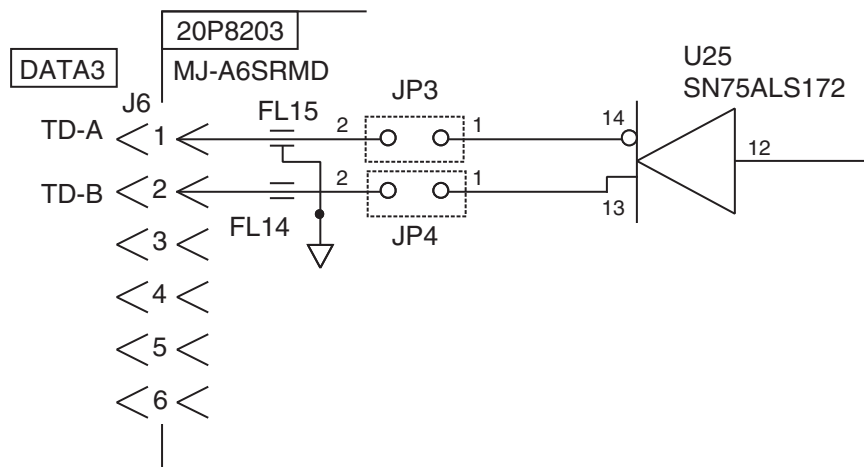
What is WAAS?

WAAS (Wide Area Augmentation System), available in North America is a provider in the worldwide SBAS (Satellite Based Augmentation System) navigation system. This system provides GPS signal corrections to SBAS users, for even better position accuracy, typically better than three meters. There are three more SBAS providers, MSAS (Multi-Functional Satellite Augmentation System) for Japan, EGNOS (Euro Geostationary Navigation Overlay Service) for Europe and GAGAN (GPS And GEO Augmented Navigation) for India. The illustration below shows the coverage area. (Accuracy may be affected when using a GEO satellite not within your current location.) This manual uses "WAAS" for these three providers generically.
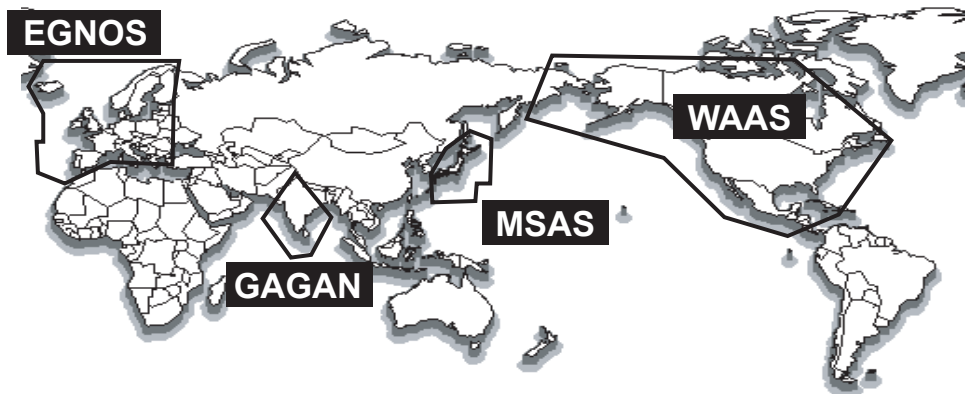
Provider	Satellite type	Longitude	Satellite No.
WAAS	Intelsat Galaxy XV	133° W	135
	TeleSat Anik F1R	107.3° W	138
	Inmarsat-4-F3	98°W	133
EGNOS	Inmarsat-3-F2/AOR-E	15.5° W	120
	Artemits	21.5° E	124
	Inmarsat-4-F2	25° E	126
MSAS	MTSAT-1R	140° E	129
	MTSAT-2	145° E	137
GAGAN	Inmarsat-4-F1	64° E	127

List of Terms/Symbols

The following table shows the terms used in the GP-150-DUAL.

Term/Symbol	Meaning
◎,	Own Ship
○ □ ◇ × ⌂ ⌂ • / marks	Marks/Lines
▽ △ ◎ ☆ / marks	Event Marks
○ □ / marks	Waypoints
- - - - -	Routes
◰, MOB	Man Overboard
＋	Cursor
ENT	Enter
%	Percentage
2D, 3D	Dimensions
ALARM	Alarm
ALT	Altitude
AP	Autopilot
APR	April
ARRV	Arrival
AUG	August
AUTO	Automatic
AVG	Average
BRG	Bearing
℃	Degree(s) Celsius
CLR	Clear
CMNT	Comment
COG	Course Over the Ground
COM	Communication
CURS	Cursor
DE	Decca
deg, °	Degree(s)
DEC	December
DFT	Drift
DGPS	Differential GPS
DISP	Display
DIST	Distance
DPTH	Depth
DRIFT	Drift
E/W	East/West
ENT	Enter
ERR	Error
ETA	Estimated Time of Arrival
EXT	External
℉	Degree(s) Fahrenheit

Term/Symbol	Meaning
FEB	February
FIX	Fix
fm	Fathom
FMT	Format
FREQ	Frequency
ft	Feet
FWD	Forward
GPS	Global Positioning System
GC	Great Circle
EVENT	Event
HDG	Heading
hr(s)	hours
IN	In
I/O	Input/output
ID	Identification
JAN	January
JUL	July
JUN	June
kHz	kilo Heltz
km	kilo metre
kn	knot
LAT	Latitude
LC	Loran-C
LON	Longitude
LOP	Line Of Position
LOG	Log
LORAN	Loran
m	metre(s)
m/s	Meter/second
MAG	Magnetic
MAN	Manual
MAR	March
MAY	May
MENU	Menu
min, '	minute(s)
N/S	North/South
NAV	Navigation
NG	No Good
NM	nautical Mile
No.	Number
NOV	November
OCT	October
OFF	Off
OFFSET	Offset
ON	On
Pt, Pts	Point(s)
PORT	Port/Portside
POSN	Position
RAIM	Receiver Autonomous Integrity Monitoring

Term/Symbol	Meaning
RAM	Random Access Memory
RCVR	Receiver
REC	Record
REF	Reference
RL	Rhumb Line
RNG	Range
ROUTE	Route
s, "	second(s)
SEP	September
SET	Set
sm	Statute Mile
SNR	Signal to Noise Ratio
SOG	Speed Over the Ground
SPD	Speed
STBD	Starboard/Starboard

Term/Symbol	Meaning
	Side
STN	Station
STR	Steer
STW	Speed Through the Water
T	True
TEMP	Temperature
TEST	Test
TIME	Time
TRIAL	Trial
TRK	Track
TTG	Time To Go
UTC	Universal Time, Coordinated
VAR	Variation
WAT	Water
WPT	Waypoint
XTE	Cross Track Error

AP-14

Alarm List

No.	Name	Category	Level*	Condition
001	Arrival Alarm	B	W	When the distance between own ship and destination waypoint is smaller than (or same with) alarm range.
002	Anchor Alarm	B	W	When the distance between own ship and destination waypoint is larger than alarm range.
003	Cross Track Error Alarm	B	W	When own ship is off its intended course.
004	Speed Alarm	B	W	In: When ship's speed is between minimum and maximum value set. Over: When ship's speed is smaller than minimum value, or larger than maximum value set.
005	Trip Alarm	B	W	When trip distance is larger than trip range set.
006	Water TEMP Alarm	B	W	In: When water temperature is between minimum and maximum value set. Over: When water temperature is smaller than minimum value, or larger than maximum value set.
007	Depth Alarm	B	W	In: When water depth is between minimum and maximum value set. Over: When water depth is smaller than minimum value, or larger than maximum value set.
008	WAAS Error	B	C	When using the single point positioning.
210	HDOP exceed	B	C	When HDOP exceeds 4.0.
211	No calculation of position	B	W	When the equipment does not receive GPast sentence from the GPS receiver more than three seconds.
212	Loss of position	B	W	When the positioning is not available.
213	Loss of differential signal	B	W	When the equipment does not receive DGPS correction data from DGPS beacon receiver more than 10 seconds.
214	Differential corrections not applied	B	W	When using the single point positioning.
215	Differential integrity status	B	W	- When the equipment does not receive DGPS correction data from DGPS beacon receiver more than 10 seconds. - When the beacon station selected manually/automatically receive unhealthy (or does not receive healthy).

*Level
W: Warning
C: Caution

This page is intentionally left blank.

SPECIFICATIONS OF GPS NAVIGATOR
GP-150/150-DUAL

1   GPS RECEIVER

1.1	Receiving frequency	1575.42 MHz
1.2	Tracking code	C/A code
1.3	Number of channel	GPS: 12 channels parallel, 12 satellites
1.4	Accuracy	
	GPS	10 m approx. (2drms)
	DGPS	5 m approx. (2drms)
	WAAS	3 m approx. (2drms)
	MSAS	7 m approx. (2drms)
1.5	Ship's speed accuracy	0.2kn (10kn or less), 2 % of ship's speed (more than 10kn)
1.6	Course accuracy	±3° (within 1 to 17kn), ±1° (more than 17kn)
1.7	Position fixing time	Warm start: 12 s typical, Cold start: 90 s typical
1.8	Tracking velocity	999 kn
1.9	Position update interval	1 s
1.10	RAIM indicators	Safe, Unsafe, Caution
1.11	Beacon receiver (internal kit, option)	
	Frequency range	283.5 to 325.0 kHz
	MSK rate	25, 50, 100, 200 bps; select auto or manual

2   DISPLAY SECTION

2.1	LCD display	Monochrome LCD 122 x 92 mm, 320 x 240 dot matrix
2.2	Display modes	Plotter 1 (NU), Plotter 2 (CU), Highway, Navigation, Data
2.3	Projection	Mercator
2.4	Track plotter display	
	Scale	0.02 to 320 NM, 14 steps
	Latitude limits	Between 85°N and 85°S
	Plot interval	By time 0 to 60m00s or by distance 0 to 99.99 nm, sm or km, or halt
2.5	Memory capacity	
	Track and marks	2,000 points
	Waypoints	999 points with 12 characters comment each
	Route	30 (containing 30 waypoints/route) and 1 simplified route
2.6	Alarms	Arrival and anchor watch, XTE, Speed, Trip*, Water temperature*, Water depth*
		*: external sensor required
2.7	Satellite information	Satellite number, Bearing, Elevation, Signal level, DOP, Status

3   INTERFACE

3.1	Number of ports	4
3.2	Data format	IEC61162-1 Ed.4, NMEA0183 Ver1.5/2.0
3.3	Data sentences	

Data port 1 and 2 (GP-150-DUAL: DATA 2 port is used for the system connection)

IN: ACK, DBT, DPT, HDG*, HDM*, MTW, THS*, TLL, HDT*, VBW*, VHW*

OUT: AAM, ALR, APA, APB, BOD, BWC, BWR, BWW, DTM, GBS, GGA,
                       GLL, GNS, POS, RMB, RMC, Rnn, RTE, VDR*, VTG, WCV,
                       WNC**, WNR**, WPL, XTE, ZDA   (ALR: data port 1 only)

Data port 3

IN: MOB from external device (contact closure)

OUT: AAM, ALR, APA, APB, BOD, BWC, BWR, BWW, DTM, GBS, GGA,
                       GLL,GNS, POS, RMB, RMC, Rnn, RTE, VDR*, VTG, WCV, WNC**,
                       WNR**, WPL, XTE, ZDA
                       or LOGOUT (exchanged by jumper on circuit board)

Data port 4

IN: DGPS correction data in RTCM SC-104 V2.0
                       Waypoint data downloaded from YEOMAN plotter
                       Waypoint data or navaids information from conventional PC

OUT: AAM, APA, APB, BOD, BWC, BWR, BWW, DTM, GBS, GGA,
                       GLL, GNS, POS, RMB, RMC, Rnn, RTE, VDR*, VTG, WCV,
                       WNC**, WNR**, WPL, XTE, ZDA
                       Waypoint data to conventional PC

* GP-150 only,   **: GP-150-DUAL only

4   POWER SUPPLY

4.1   Display unit   12-24VDC: 0.8-0.4A (w/ internal beacon receiver)

4.2   Rectifier (PR-62, option) 100/110-115/220/230 VAC, 1 phase, 50/60Hz

5   ENVIRONMENTAL CONDITION
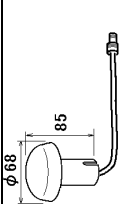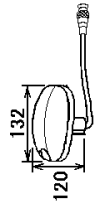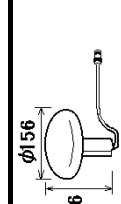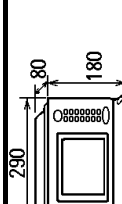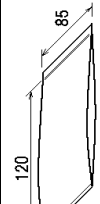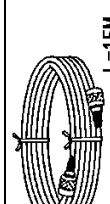
5.1   Ambient temperature
       Antenna unit   -25°C to 70°C
       Display unit   -15°C to 55°C

5.2   Relative humidity   95 % or less at +40°C

5.3   Degree of protection
       Antenna unit   IPX6
       Display unit   IPX5 (USCG CFR-46)

5.4   Vibration   IEC 60945 ed.4

6   UNIT COLOR

6.1   Antenna unit   N9.5 (white)

6.2   Display unit   N3.0
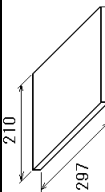
PACKING LIST GP-150-DUAL-E-*0-15-*
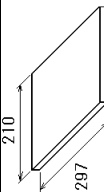
NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ユニット UNIT			
アンテナ ANTENNA UNIT		GPA-017S / 000-146-294-18	1 / (*1)
空中線部 ANTENNA UNIT		GPA-018S / 000-041-895-00	1 / (*1)
空中線部 H-FIELD BEACON/GPS ANTENNA		GPA-019S ケーブルナシ / 000-142-545-17	1 / (*1)
受信演算部 DISPLAY UNIT		GP-150-DUAL-E-N/A / 000-042-081-00 **	1
予備品 SPARE PARTS			
予備品 SPARE PARTS		SP20-00500 / 000-040-717-00	1
付属品 ACCESSORIES		FP20-01100	
フィルタークリーナー LCD CLEANING CLOTH		19-028-3125-5 / 100-360-675-10	1
工事材料 INSTALLATION MATERIALS		CP20-01900	
ケーブル組品 CABLE ASSEMBLY		TNC-PS/PS-3D-L15M-R / 001-173-110-10	1

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ケーブル組品MJ CABLE ASSEMBLY	L=3M	MJ-A2SPF0014-030C / 000-158-000-10	1
ケーブル組品MJ CABLE ASSEMBLY	L=5M	MJ-A6SPF0003-050C / 000-154-054-10	1
操作・表示部工事材料 INSTALLATION MATERIALS		CP20-01101 / 004-369-790-00	1
図書 DOCUMENT			
取扱説明書 OPERATOR'S MANUAL		OME-44410-* / 000-160-427-1*	1
操作要領書 OPERATOR'S GUIDE		OSE-44400-* / 000-169-198-1*	1

1.コード番号末尾の[**]は、選択品の代表コードを表します。
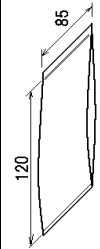CODE NUMBER ENDING WITH "**" INDICATES THE CODE NUMBER OF REPRESENTATIVE MATERIAL.

2.(*1)の空中線部は仕様により決定されます。
ANTENNA UNIT HAS BEEN DETERMINED BY SPECIFICATION.

(略図の寸法は、参考値です。DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

A-1

C4441-Z11-A

A-2

PACKING LIST　GP-150-DUAL-E-*0-N-*

ユニット　UNIT

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
アンテナ ANTENNA UNIT		GPA-017S	1
		000-146-294-18	(*1)
空中線部 ANTENNA UNIT		GPA-018S	1
		000-041-895-00	(*1)
空中線部 H-FIELD BEACON/GPS ANTENNA		GPA-019S ケーブルナシ	1
		000-142-545-17	(*1)
受信演算部 DISPLAY UNIT		GP-150-DUAL-E-N/A	1
		000-042-081-00　**	

予備品　SPARE PARTS

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
予備品 SPARE PARTS		SP20-00500	1
		000-040-717-00	

付属品　ACCESSORIES　FP20-01100

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
フィルタークリーナー LCD CLEANING CLOTH		19-028-3125-5	1
		100-360-675-10	

工事材料　INSTALLATION MATERIALS　CP20-01950
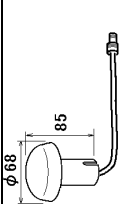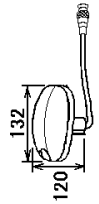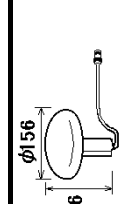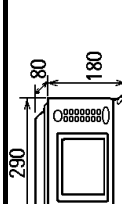
NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ケーブル組品MJ CABLE ASSEMBLY	L=3M	MJ-A2SPF0014-030C	1
		000-158-000-10	

NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
ケーブル組品MJ CABLE ASSEMBLY	L=5M	MJ-A6SPF0003-050C	1
		000-154-054-10	
操作・表示部工事材料 INSTALLATION MATERIALS		CP20-01101	1
		004-369-790-00	

図書　DOCUMENT

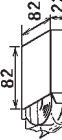| NAME	OUTLINE	DESCRIPTION/CODE No.	Q'TY
取扱説明書 OPERATOR'S MANUAL	210 × 297	OME-44410-*	1
		000-160-427-1*　**	
操作要領書 OPERATOR'S GUIDE	210 × 297	OSE-44400-*	1
		000-169-198-1*　**	

1.コード番号末尾の[**]は、選択品の代表コードを表します。
CODE NUMBER ENDING WITH "**" INDICATES THE CODE NUMBER OF REPRESENTATIVE MATERIAL.

2.(*1)の空中線部は仕様により決定されます。
ANTENNA UNIT HAS BEEN DETERMINED BY SPECIFICATION.

(略図の寸法は、参考値です。DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

C4441-Z04-Z

FURUNO

SPARE PARTS LIST FOR

	CODE NO	000-040-717-00	20AA-X-9301-2 1/1
	TYPE	SP20-00500	BOX NO P

SHIP NO | USE | SETS PER VESSEL

ITEM NO	NAME OF PART	OUTLINE	DWG NO OR TYPE NO	QUANTITY			REMARKS/CODE NO
				WORKING		SPARE	
				PER SET	PER VES		
1	FUSE	30 / φ6	FGBO-A 125V 2A RBF	1		3	000-155-849-10
			FGBO-A 2A AC125V				000-549-062-00

MFR'S NAME	FURUNO ELECTRIC CO., LTD	DWG NO	C4354-P01-D	1/1

TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.

DIMENSIONS IN DRAWING FOR REFERENCE ONLY.

FURUNO

INSTALLATION MATERIALS

	CODE NO	004-369-790-00	20AX-X-9404-1 1/1
	TYPE	CP20-01101	

NO	NAME	OUTLINE	DESCRIPTIONS	Q'TY	REMARKS
1	SELF-TAPPING SCREW	20 / φ5	5X20 SUS304	4	
			CODE NO 000-162-608-10		

TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.

DIMENSIONS IN DRAWING FOR REFERENCE ONLY.

C4427-M03-B

FURUNO

工事材料表
INSTALLATION MATERIALS

CODE NO.	004-381-190-00	20AX-X-9401 -9
TYPE	CP20-02701	1/1

番号 NO.	名称 NAME	略図 OUTLINE	型名/規格 DESCRIPTIONS	数量 Q'TY	用途/備考 REMARKS
1	変換ケーブル組品 ADAPTOR CABLE ASSEMBLY	L=1M	NJ-TP-3DXV-1 / CODE NO. 001-248-160-00	1	
2	コネクタ(N) COAXIAL CONNECTOR *N TYPE*		N-P-8DFB-1-CF / CODE NO. 000-156-918-10	1	
3	コネクタ(TMC-N) COAXIAL CONNECTOR ADAPTOR		TNCP-NJ / CODE NO. 000-156-599-10	1	
4	絶縁テープ INSULATION TAPE		Uテープ 0.5X19X5M / CODE NO. 000-165-833-10	1	
5	ビニールテープ VINYL TAPE		V360K01 / CODE NO. 000-177-579-10	1	

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO ELECTRIC CO .,LTD.

C4427-M01-J

FURUNO

工事材料表
INSTALLATION MATERIALS

CODE NO.	004-372-420-00	20AG-X-9405 -7
TYPE	CP20-01701	1/1

番号 NO.	名称 NAME	略図 OUTLINE	型名/規格 DESCRIPTIONS	数量 Q'TY	用途/備考 REMARKS
1	変換ケーブル組品 ADAPTOR CABLE ASSEMBLY	L=1M	NJ-TP-3DXV-1 / CODE NO. 001-248-160-00	2	
2	コネクタ(N) COAXIAL CONNECTOR *N TYPE*		N-P-8DFB-1-CF / CODE NO. 000-156-918-10	1	
3	絶縁テープ INSULATION TAPE		Uテープ 0.5X19X5M / CODE NO. 000-165-833-10	1	
4	ビニールテープ VINYL TAPE		V360K01 / CODE NO. 000-177-579-10	1	

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO ELECTRIC CO .,LTD.

C0014-M20-L

FURUNO

明細書
DESCRIPTION

| CODE NO. | | 20AG-X-9404 -4 |
| TYPE | | 1/1 |

番号 NO.	名 称 NAME	略 図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	アンテナケーブ ル組品 ANTENNA CABLE ASSY.	L=30M	8D-FB-CV *30M* CODE NO. 000-167-889-11	1	選択 BE SELECTED TO
2	アンテナケーブ ル組品 ANTENNA CABLE ASSEMBLY	L=40M	8D-FB-CV 40M CODE NO. 000-167-890-12	1	選択 BE SELECTED TO
3	アンテナケーブ ル組品 ANTENNA CABLE ASSY.	L=50M	8D-FB-CV *50M* CODE NO. 000-168-241-11	1	選択 BE SELECTED TO

型式/コード番号が2段の場合、下段より上段に代わる過渡期品であり、どちらかが入っています。　なお、品質は変わりません。

TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM.　THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT.
QUALITY IS THE SAME.
（略図の寸法は、参考値です。　DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）
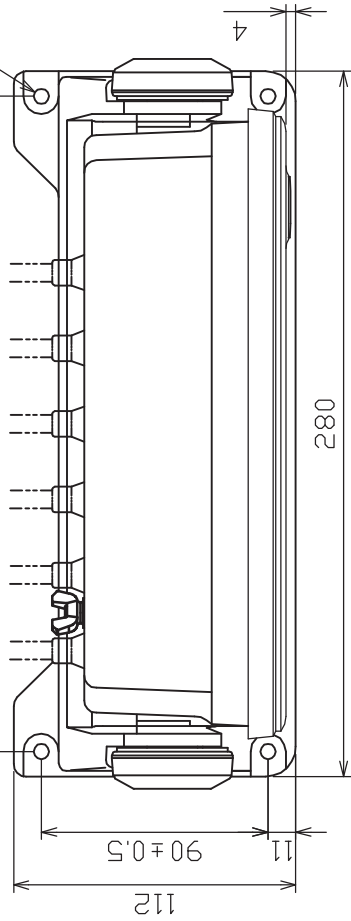☆

FURUNO ELECTRIC CO ., LTD.

C0014-M19-G

D-1

FURUNO

表1 TABLE 1

寸法区分（mm） DIMENSIONS	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

アース端子
GND TERMINAL

電源
POWER SOURCE

型式銘板
NAMEPLATE

信号コネクタ
SIGNAL CONNECTOR

ANTコネクタ
ANT CONNECTOR

4-φ6 取付穴
FIXING HOLES

矢視A
VIEW A

#150

←A

80

15

31±5

189±5

30°

#80

180±5

290±5

250

160

#80

260±0.5

280

4

112

90±0.5

11

FURUNO

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. #: MINIMUM SERVICE CLEARANCE.
     2. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
     3. USE SELF-TAPPING SCREWS 5x20 FOR FIXING THE UNIT.

DRAWN	Sep.15,'05. F.MIYOSHI			TITLE	GP-150
CHECKED		TAKAHASHI		名称	受信演算部（卓上装備）
APPROVED		Y.Hatai		NAME	外寸図
SCALE	1/3	MASS	表2参照 TABLE 2		DISPLAY UNIT (TABLETOP MOUNT) OUTLINE DRAWING
DWG.No.	C4440-G01-A		20-028-150G-0		

FURUNO ELECTRIC CO., LTD.

FURUNO

表 1 TABLE 1

寸法区分（ｍｍ） DIMENSIONS	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

アース端子
GND TERMINAL

型式銘板
NAMEPLATE

電源
POWER SOURCE

信号コネクタ
SIGNAL CONNECTOR

ＡＮＴコネクタ
ANT CONNECTOR

#100

65

15

t

160

120

290

250

FURUNO GPS NAVIGATOR GP-150
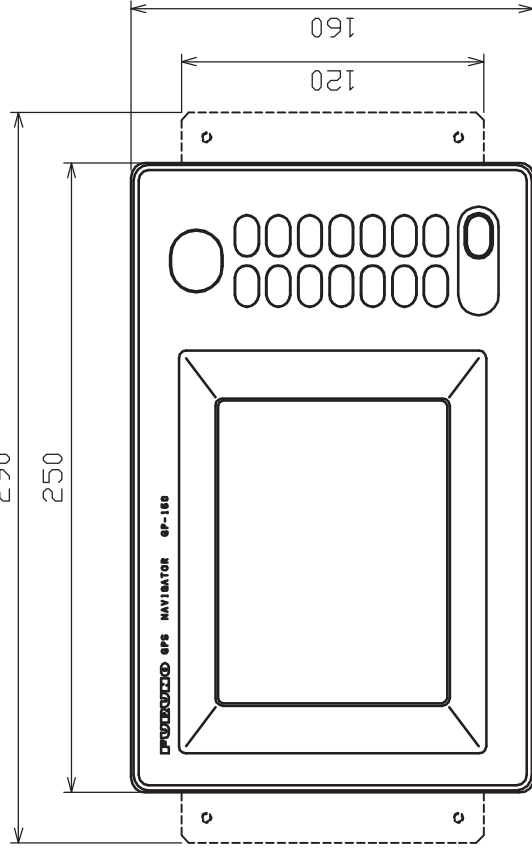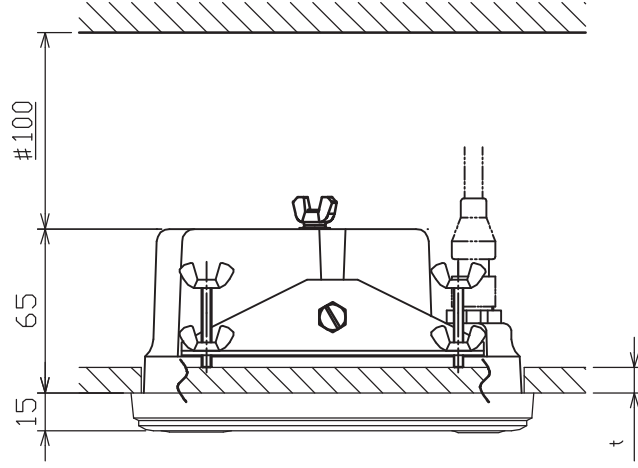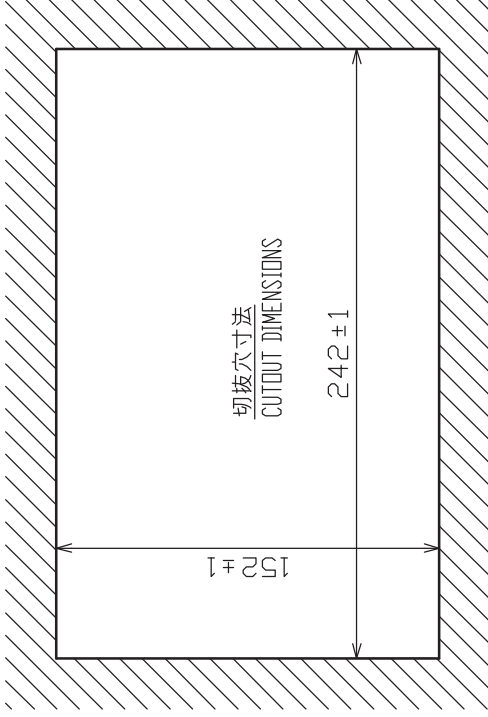
注 記　1)　#印寸法は最小サービス空間寸法とする。
　　　　2)　指定外の寸法公差は表１による。
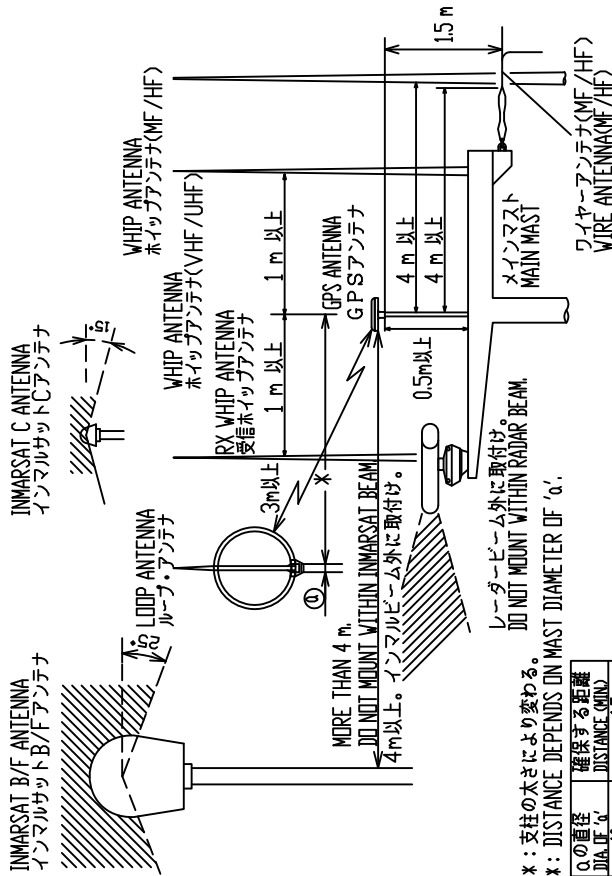　　　　3)　壁の厚さ（t）は、12以下とする。

NOTE　1.　# MINIMUM SERVICE CLEARANCE.
　　　　2.　TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
　　　　3.　THICKNESS OF BULKHEAD (t): t≤12.

DRAWN	Oct.19,'05 F.MIYOSHI
CHECKED	TAKAHASHI
APPROVED	Y. Hatai
SCALE	1/3

MASS 表2参照
TABLE 2

TITLE GP-150

名称 受信演算部（埋込装備Sタイプ）
外寸図

NAME DISPLAY UNIT (FLUSH MOUNT S-TYPE)
OUTLINE DRAWING

DWG.No. C4440-G02-A

20-028-1516-0

FURUNO ELECTRIC CO., LTD.

表1 TABLE 1

寸法区分（mm）DIMENSIONS	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

電源
POWER SOURCE

アース端子(M4)
GND TERMINAL

型式銘板
NAMEPLATE

信号コネクタ
SIGNAL CONNECTOR

ANTコネクタ
ANT CONNECTOR

切抜穴寸法
CUTOUT DIMENSIONS

260±1
156±1
260±0.5
170±0.5

#100
63
17

185
170
4-φ5.5 取付穴
FIXING HOLES

275
260
250
160

FURUNO GPS NAVIGATOR GP-150

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. #:MINIMUM SERVICE CLEARANCE.
2. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
3. USE SELF-TAPPING SCREWS 5x20 FOR FIXING THE UNIT.

DRAWN	Oct.19,'05 F.MIYOSHI
CHECKED	TAKAHASHI T
APPROVED	Y. Hatai
SCALE	1/3	MASS	表2参照 TABLE 2
DWG.No.	C4440-G03-A

TITLE GP-150
名称 受信演算部（埋込装備Fタイプ）
外寸図
NAME DISPLAY UNIT (FLUSH MOUNT F-TYPE)
OUTLINE DRAWING

20-028-1526-0

FURUNO ELECTRIC CO., LTD.

FURUNO

FURUNO

D-4

取付位置 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.

INMARSAT B/F ANTENNA インマルサットB/Fアンテナ
INMARSAT C ANTENNA インマルサットCアンテナ
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)
RX WHIP ANTENNA 受信ホイップアンテナ
GPS ANTENNA GPSアンテナ
WIRE ANTENNA(MF/HF) ワイヤーアンテナ(MF/HF)
MAIN MAST メインマスト

3m以上 MORE THAN 4 m.
1 m 以上
4 m 以上
0.5m以上
1.5 m

レーダービーム外に取付け。 DO NOT MOUNT WITHIN RADAR BEAM.
インマルサットビーム外に取付け。 DO NOT MOUNT WITHIN INMARSAT BEAM.

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

α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ールに取付けるとき HANDRAIL MOUNTING
レール用アンテナベース No.13-RC5160
(取付可能レール直径:φ19~φ32)
(コード番号:000-806-114)
USE HANDRAIL MOUNTING BASE No.13-RC5160 (CODE No.000-806-114, OPTION).
THE DIAMETER OF THE HANDRAIL MAY BE FROM φ19mm TO φ32mm.

固定ボルト FIXING BOLT
アンテナベース ANTENNA BASE
テープを巻く WIND TAPE
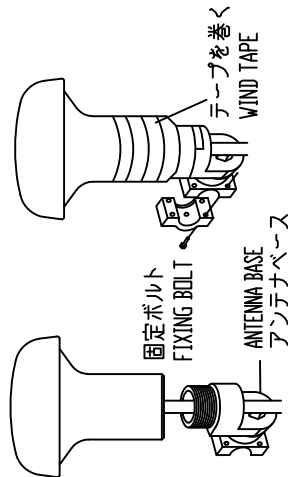
注記 1) パイプやアンテナベースはアンテナユニットにねじ込んだ後に固定する。
2) アンテナを固定するときはパイプ(アンテナベース)をアンテナにねじ込むこと。アンテナ側をねじるとコネクタ部やケーブルに無理がかかり、故障の原因となる。
NOTE 1. FASTEN PIPE(ANTENNA BASE) TO ANTENNA UNIT FIRST THEN FIX THEM TO MAST OR HANDRAIL.
2. WHEN FIXING ANTENNA, TURN PIPE OR ANTENNA BASE; NOT THE ANTENNA. TURNING THE ANTENNA MAY TWIST THE CABLE AND PLACE STRESS ON CONNECTOR.

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)をマストに固定する。
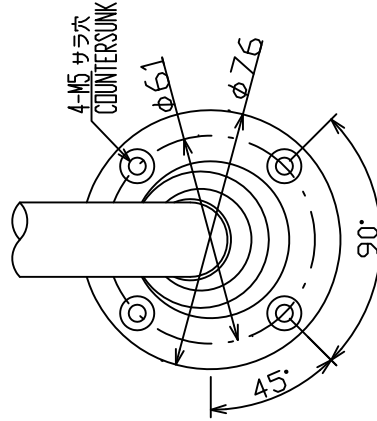USE MAST MOUNTING KIT CP20-0111.

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

マスト MAST φ25~70
バーカークランプ HOSE CLAMP
取付補助金具 MOUNTING BRACKET
パテでケーブルを固定する FIX CABLE WITH SEALANT
コンパックス(現地手配) CABLE TIE (LOCAL SUPPLY)
パイプ PIPE
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 φ26
45° 90°

C) 取付ける場所が傾斜しているとき 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
アンテナベース型式 コード番号 ANT. BASE TYPE CODE No.	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	

TITLE GPA series
名称 空中線部
装備要領図
NAME ANTENNA UNIT
INSTALLATION PROCEDURE
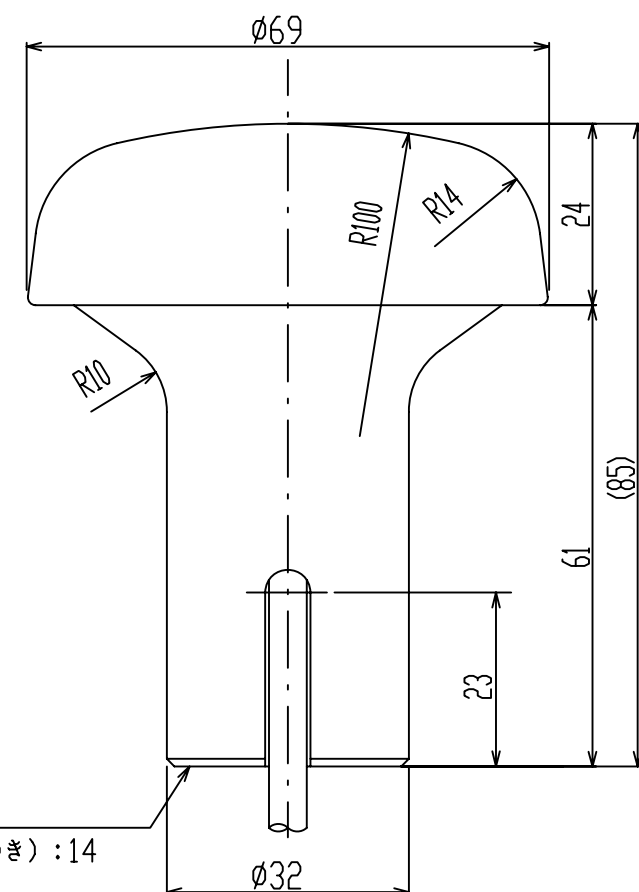
DRAWN 14/MAY/2014 T.YAMASAKI
CHECKED 14/MAY/2014 H.MAKI
APPROVED 15/MAY/2014 H.NAKI
SCALE MASS
DWG.No. C4384-Y01-F

FURUNO ELECTRIC CO.,LTD.

Ø69

R100   R14

R10

24

(85)

61

23

Ø32

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

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：24.17mm

THREAD PER 25.4mm (1 INCH): 14
PITCH: 1.8143 mm
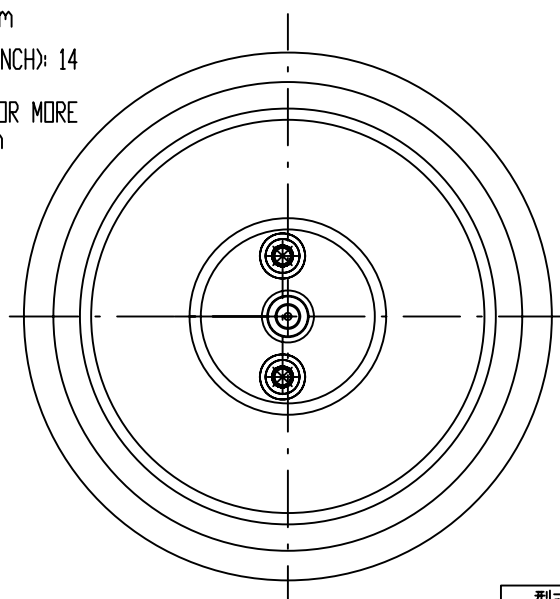THREAD LENGTH: 19 mm OR MORE
PITCH DIAMETER: 24.17mm

表2　TABLE 2

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

注記
指定外の寸法公差は表1による。

NOTE
TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.

DRAWN Mar. 27 '07 T.YAMASAKI		TITLE	GPA-017/017S
CHECKED Mar. 27 '07 T.TAKENO		名称	空中線部
APPROVED Mar, 27' 07 R.Esumi			外寸図
SCALE 1/1	MASS TABLE 2 表2参照	NAME	ANTENNA UNIT
DWG.No. C4384-G04- L			OUTLINE DRAWING

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

A

MAX. 1200※

※ 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.

アース線
GND WIRE (IV-2sq.)
（造船所手配）
(SHIPYARD SUPPLY)

B

120

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

39

シール剤を
塗布する
APPLY SILICONE
SEALANT

C

132

φ33

96

アースボルト
（造船所手配）
M6-M8
STUD BOLT
(SHIPYARD SUPPLY)

マスト
MAST

アース端子
GND TERMINAL

D

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.
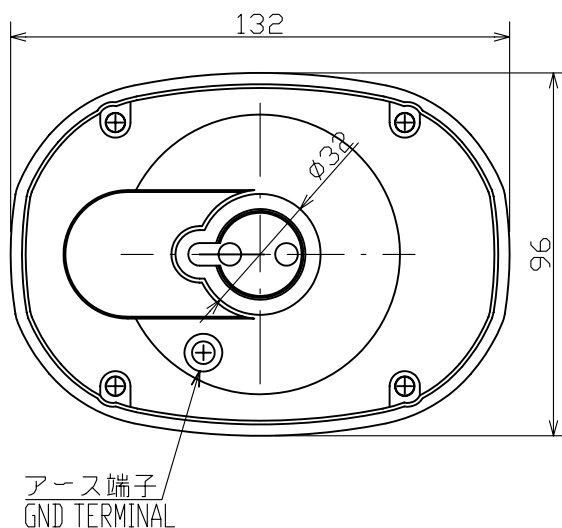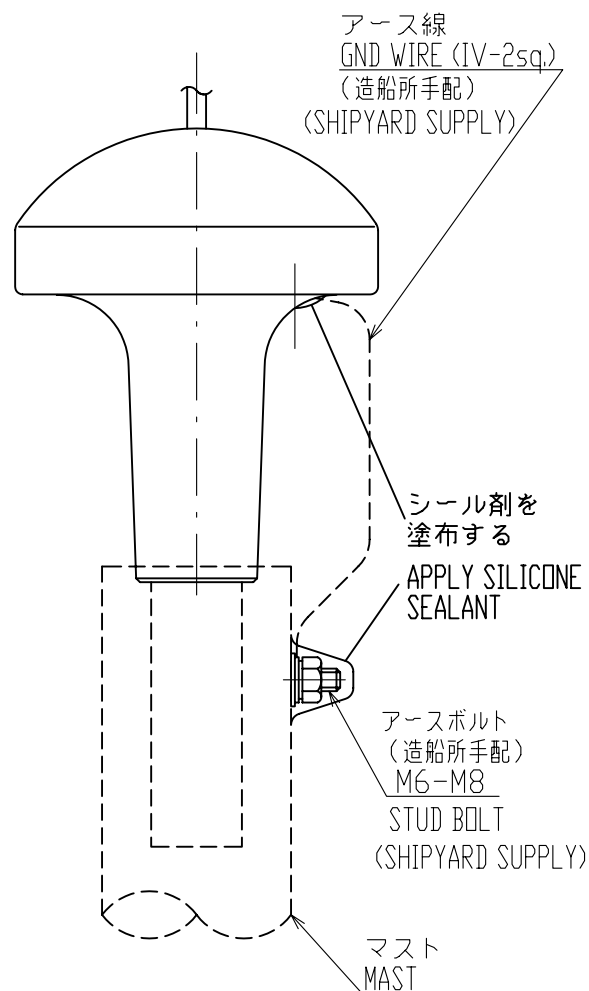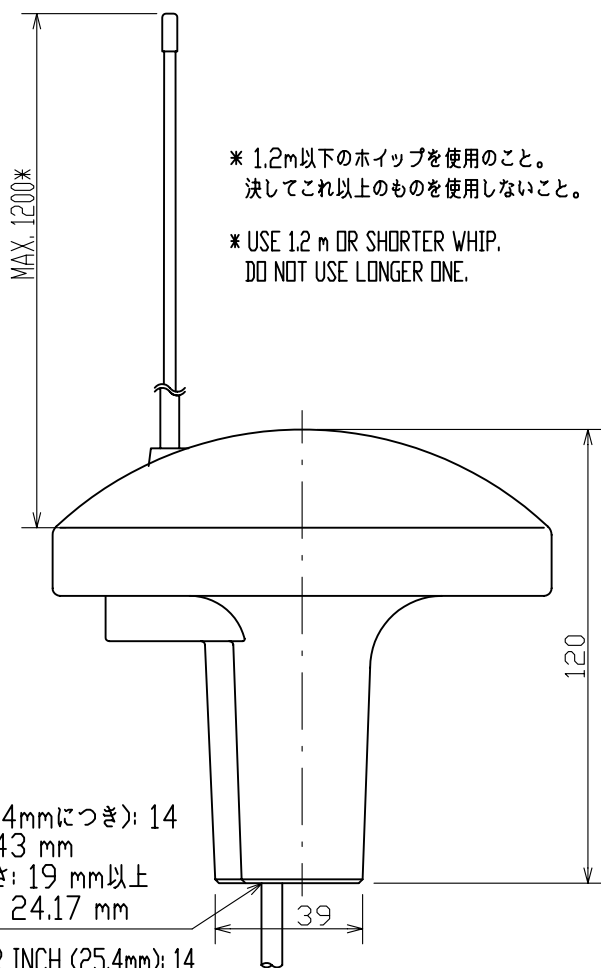
表2　TABLE 2

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

			TITLE	GPA-018/018S
DRAWN Mar. 9 '05 T.YAMASAKI			名称	空中線部
CHECKED Mar. 9 '05 H.HAYASHI				
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-L				OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

φ156

116
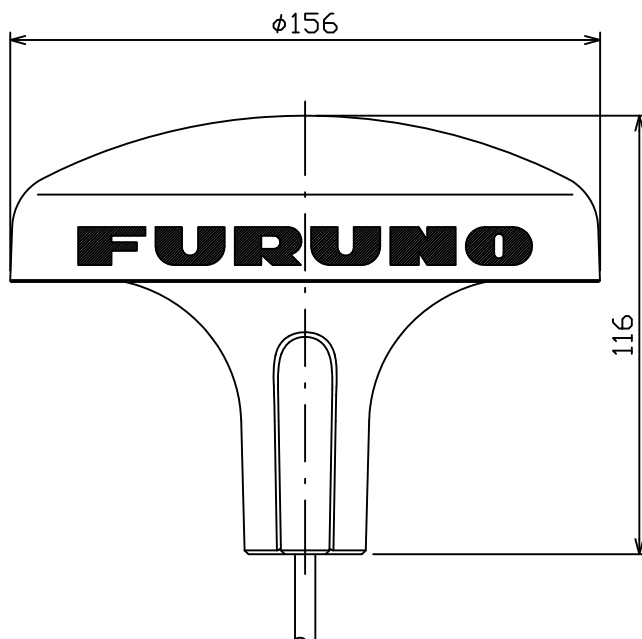
1-14UNS1B

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
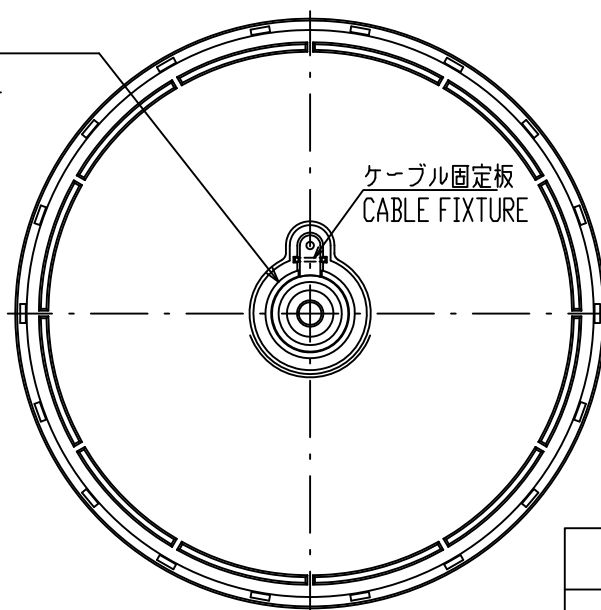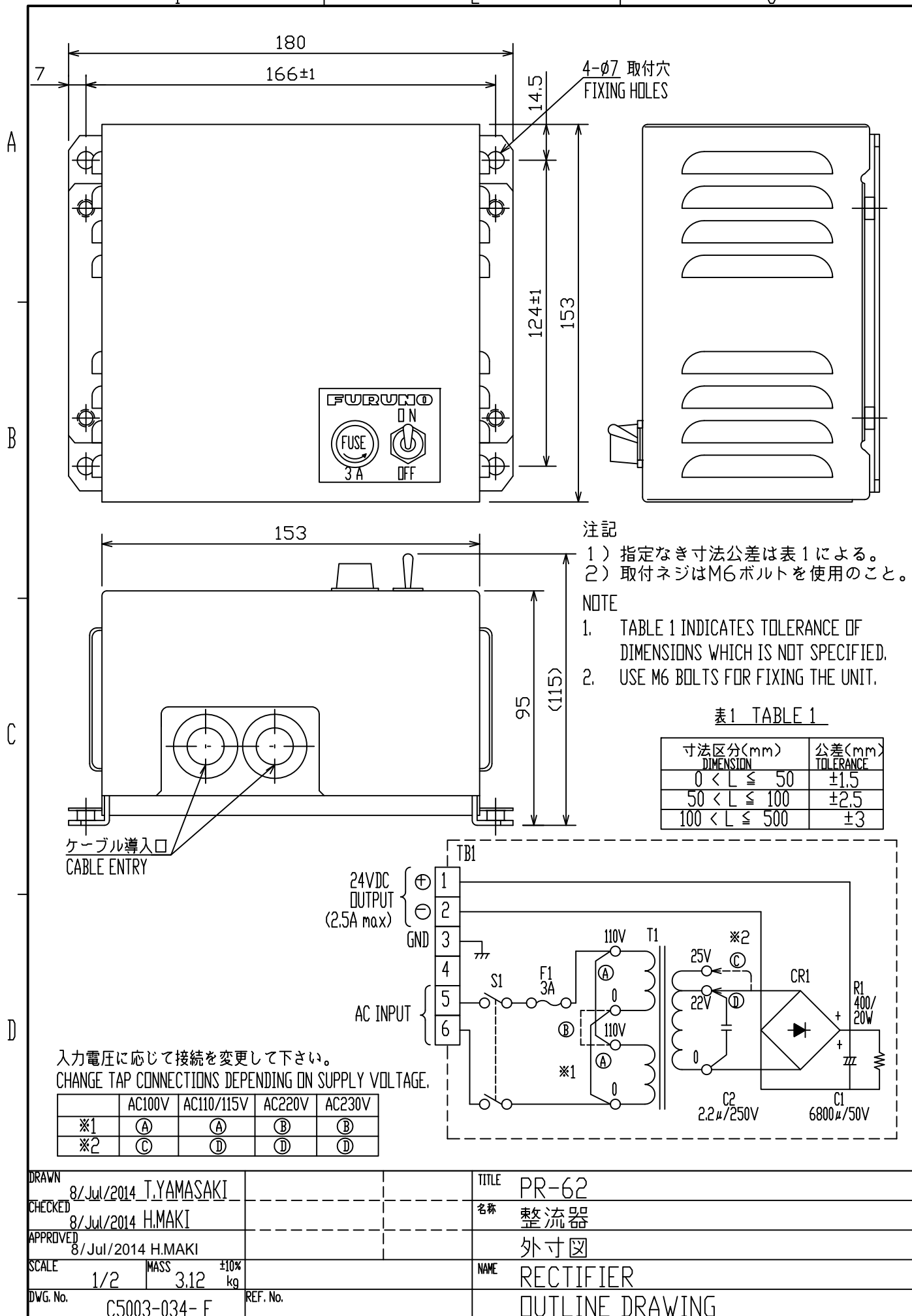PITCH DIAMETER: 24.17 mm

ケーブル固定板
CABLE FIXTURE

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

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	0.98
GPA-019S	0.2	TNC-J-3	0.54
GPA-020S	0.2	TNC-J-3	0.32
GPA-021S	0.2	TNC-J-3	0.52

注記
１）指定外の寸法公差は表１による。

NOTE
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.

DRAWN	14/May/2013 T.YAMASAKI			TITLE	GPA-019/019S/020S/021S
CHECKED	14/May/2013 H.MAKI			名称	空中線部
APPROVED	17/May/2013 H.MAKI				外寸図
SCALE	1/2	MASS TABLE 2 表2参照		NAME	ANTENNA UNIT
DWG. No.	C4400-G01-G	REF. No.	20-016-210G-4		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

FURUNO

180

166±1

7

14.5

4-φ7 取付穴
FIXING HOLES

124±1

153

A

B

153

95

(115)

C

ケーブル導入口
CABLE ENTRY

注記
１）指定なき寸法公差は表１による。
２）取付ネジはM6ボルトを使用のこと。

NOTE
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. USE M6 BOLTS FOR FIXING THE UNIT.

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)

GND

AC INPUT

1
2
3
4
5
6

S1

F1
3A

110V

T1

110V

25V

22V

※2

CR1

R1
400/20W

C2
2.2μ/250V

C1
6800μ/50V

※1

D

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	8/Jul/2014 T.YAMASAKI		TITLE	PR-62
CHECKED	8/Jul/2014 H.MAKI		名称	整流器
APPROVED	8/Jul/2014 H.MAKI			外寸図
SCALE 1/2	MASS 3.12 kg ±10%		NAME	RECTIFIER
DWG. No. C5003-034-F	REF. No.			OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

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

表1　TABLE 1
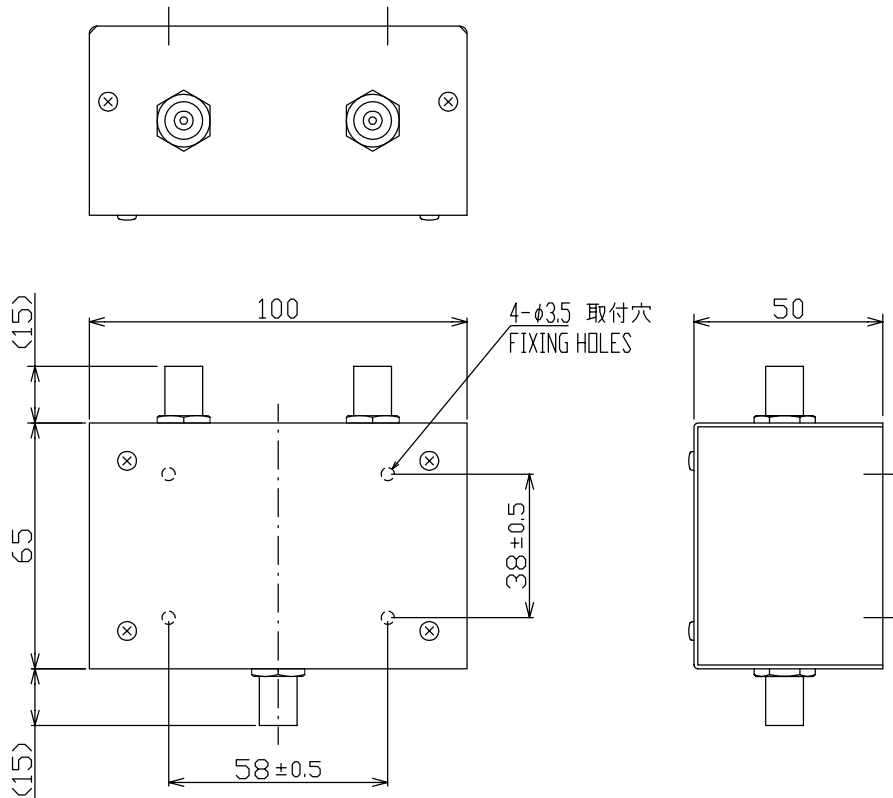
100

(15)

4-φ3.5 取付穴
FIXING HOLES

50

65

38±0.5

(15)

58±0.5

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 WHICH IS NOT SPECIFIED.

DRAWN Jan. 20 '04 T.YAMASAKI			TITLE MD-GB2
CHECKED Jan. 20 '04 T.MATSUGUCHI			名称　GPS／ビーコン分配器
APPROVED Jan. 13 '04　R.Matsuguchi			外寸図
SCALE 1/2	MASS 0.15 kg	±10%	NAME GPS/BEACON DISTRIBUTOR
DWG.No. C4006-G03-B			OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

FURUNO

空中線部
ANTENNA UNIT

GPA-018S GPA-017S / GPA-019S または GPA-020S OR GPA-021S

空中線部
ANTENNA UNIT

空中線部が１つの場合
FOR USING AN ANTENNA ONLY

GPA-018S GPA-017S / GPA-019S

GPS/ビーコン
アンテナ分配器
GPS/BEACON
ANTENNA
DISTRIBUTOR
MD-GB2 *2

空中線部
ANTENNA UNIT

GPA-020S または GPA-021S OR GPA-017S / GPA-019S GPA-018S

受信演算部
DISPLAY UNIT
GP-150-DUAL

受信演算部
DISPLAY UNIT
GP-150-DUAL

GPS ANT DATA2 DATA1 POWER DATA4 DATA3

インターフェイスユニット
INTERFACE UNIT IF-2500 *2

J1 (VH2P) J2 (XH6P) J3 (XH6P)
J4 (XH4P) J5 (XH4P) J6 (XH4P) J7 (XH4P) J8 (XH4P) J9 (XH5P)
J10 (XH3P) J11 (XH3P) J12 (XH3P)

24VDC IEC61162-2 OR NMEA0183 V2.0 (RS-422)
外部機器 EXTERNAL EQUIPMENT
BRIDGE ALARM SYSTEM
(ARRIVAL) (OFF-TRACK) (ABNORMAL RCV)

パソコン
PC FOR MAINTENANCE

パソコン
PC FOR MAINTENANCE

24VDC FUSE 2A 3m, φ6

TTYCS-4, MAX. 20m
TTYCS-1, MAX. 20m
TTYCS-1 *1

GND
IV-1.25sq.

注記
＊１）造船所手配。
＊２）オプション。
＊３）工場にて取付済み。
＊４）損失が合計6dB以下になるようケーブル長を調節する。(8D-FB:0.165dB/m, 3D-2V:0.65dB/m)

NOTE
*1: SHIPYARD SUPPLY.
*2: OPTION.
*3: FITTED AT FACTORY.
*4: ADJUST CABLE LENGTH FOR TOTAL LOSS WITHIN 6dB. (8D-FB:0.165dB/m, 3D-2V:0.65dB/m)

DRAWN	19/Feb/2019 T.YAMASAKI	TYPE	GP-150-DUAL
CHECKED	19/Feb/2019 H.MAKI	名称	GPS航法装置
APPROVED	22/Feb/2019 H.MAKI		相互結線図
SCALE	MASS kg	NAME	GPS NAVIGATOR
DWG. No.	C4441-C01- H		INTERCONNECTION DIAGRAM

FURUNO ELECTRIC CO., LTD.

INDEX

FURUNO

FURUNO ELECTRIC CO., LTD.
9-52 Ashihara-cho, Nishinomiya, 662-8580, Japan
Tel: +81 (798) 65-2111   Fax: +81 (798) 65-4200
www.furuno.co.jp

Declaration of Conformity

0560

We   FURUNO ELECTRIC CO., LTD.

(Manufacturer)

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

(Address)

declare under our sole responsibility that the product

GPS NAVIGATOR GP-150 and GP-150-DUAL

(Model name, type number)

to which this declaration relates conforms to the following standard(s) or normative document(s)

IMO Resolution MSC.112(73)   IEC 61108-1 Ed.2.0: 2003
IMO Resolution MSC.191(79)   IEC 60945 Ed.4.0: 2002 incl.Corr.1: 2008
IMO Resolution A.694(17)   IEC 61162-1 Ed.4.0: 2010
                                     IEC 62288 Ed.1.0: 2008

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

For assessment, see

• EC type-examination (Module B) certificate No. 10212001 issued by Telefication, The Netherlands.
• Production Quality System (Module D) certificate No. P 112 issued by Telefication, The Netherlands.

This declaration is issued according to the provisions of European Council Directive 96/98/EC on marine equipment amended by Commission Directive 2014/93/EU.

On behalf of Furuno Electric Co., Ltd.

Nishinomiya City, Japan   Yoshitaka Shogaki
August 25, 2015   Manager, QMS Secretariat
                                   Quality Assurance Department
----
(Place and date of issue)   (name and signature or equivalent marking of authorized person)