FURUNO

OPERATOR'S MANUAL

GPS NAVIGATOR

Model **GP-150**

FURUNO ELECTRIC CO., LTD.

www.furuno.com

(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

All rights reserved. Printed in Japan

A : FEB. 2006
E : SEP. 18, 2014

Pub. No. OME-44400-E

(REFU) GP-150

0 0 0 1 5 8 0 1 4 1 4

IMPORTANT NOTICES

General

- 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

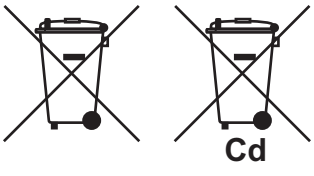
Discard this product according to local regulations for the disposal of industrial waste. For disposal in the USA, see the homepage of the Electronics Industries Alliance (http://www.eiae.org/) for the correct method of disposal.

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. Follow the instructions below if a battery is used. Tape the + and - terminals of battery before disposal to prevent fire, heat generation caused by short circuit.

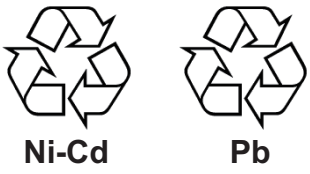
In the European Union

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.



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.



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 personnel 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.

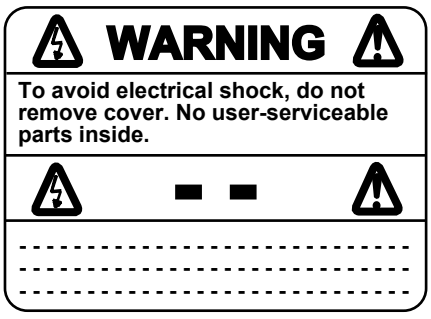
No single navigation aid (including this unit) should ever be relied upon as the exclusive means for navigating your vessel.

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



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

TABLE OF CONTENTS

FOREWORD iv

SYSTEM CONFIGRATION v

1. OPERATIONAL OVERVIEW
1.1 Control Description.....1-1
1.2 Turning On and Off the Power 1-2
1.3 Adjusting Display Contrast and Brilliance 1-3
1.4 Selecting the Display Mode.....1-3
1.5 Icons 1-6

2. TRACK
2.1 Enlarging/Shrinking the Display 2-1
2.2 Selecting Display Orientation 2-1
2.3 Shifting the Cursor 2-1
2.4 Shifting the Display 2-2
2.5 Centering Cursor Position 2-2
2.6 Centering Own Ship's Position.....2-2
2.7 Stopping/Starting Plotting and Recording of Track.....2-2
2.8 Erasing Track 2-3
2.9 Selecting Track Plotting Interval.....2-4
2.10 Apportioning the Memory 2-5
2.11 Selecting Bearing Reference.....2-6

3. MARKS
3.1 Entering/Erasing Marks.....3-1
3.2 Selecting Mark Shape 3-2
3.3 Connecting Marks (selecting mark connection line) 3-2
3.4 Entering Event Marks.....3-3
3.5 Selecting Event Mark Shape.....3-3
3.6 Entering the MOB Mark.....3-4

4. NAVIGATION PLANNING
4.1 Registering Waypoints 4-1
4.2 Editing Waypoints.....4-5
4.3 Deleting Waypoints 4-5
4.4 Registering Routes.....4-6
4.5 Deleting Route Waypoints.....4-7
4.6 Replacing Route Waypoints 4-7
4.7 Deleting Routes.....4-8

5. STARTING FOR DESTINATION
5.1 Setting Destination 5-1
5.2 Canceling Destination 5-5
5.3 Erasing Route Waypoints (flags).....5-6
5.4 Finding Range and Bearing Between Two Points 5-7

6. SETTING UP VARIOUS DISPLAYS
6.1 Selecting Data to Display on the Data Display 6-1
6.2 Selecting Position Format 6-2
6.3 Demo Display.....6-4

7. ALARMS
7.1 Arrival Alarm, Anchor Watch Alarm ...7-1
7.2 Cross Track Error (XTE) Alarm 7-2
7.3 Ship's Speed Alarm.....7-2
7.4 Trip Alarm.....7-3
7.5 Water Temperature Alarm 7-3
7.6 Depth Alarm 7-3
7.7 WAAS/DGPS Alarm 7-4
7.8 Alarm Mode.....7-4
7.9 Remote ACK IF 7-4

8. MENU SETTINGS
8.1 GPS Menu 8-1
8.2 Selecting Units of Measurement.....8-4
8.3 Mark, Character Size and Brilliance 8-5
8.4 Settings for Connection of Navigator.....8-7
8.5 Receiving Data from Personal Computer 8-9
8.6 WAAS/DGPS Settings 8-11
8.7 Displaying GPS Monitor Displays ...8-13

9. MAINTENANCE & TROUBLESHOOTING
9.1 Clearing the Memory.....9-1
9.2 Preventive Maintenance 9-2
9.3 Error Messages.....9-2
9.4 Troubleshooting 9-4
9.5 Diagnostic Tests.....9-5

APPENDIX
MENU TREE.....AP-1
Digital Interface (IEC 61162-1 Edition 4) AP-4
Time Differences AP-22
Geodetic Chart List AP-23
Loran C Chains AP-24
Decca Chains.....AP-25
Parts List AP-26
WHAT IS WAAS AP-28
LIST OF TERMS/SYMBOLS.....AP-29
ALARM LIST AP-32

SPECIFICATIONS SP-1

INDEX IN-1

FOREWORD

A Word to GP-150 Owners

Congratulations on your choice of the FURUNO GP-150 GPS Navigator. 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.

Your navigator 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 GPS Navigator is a totally integrated GPS receiver and video plotter consisting of a display unit and an antenna unit.

In most cases the operator needs to do is to turn on the power to find position.

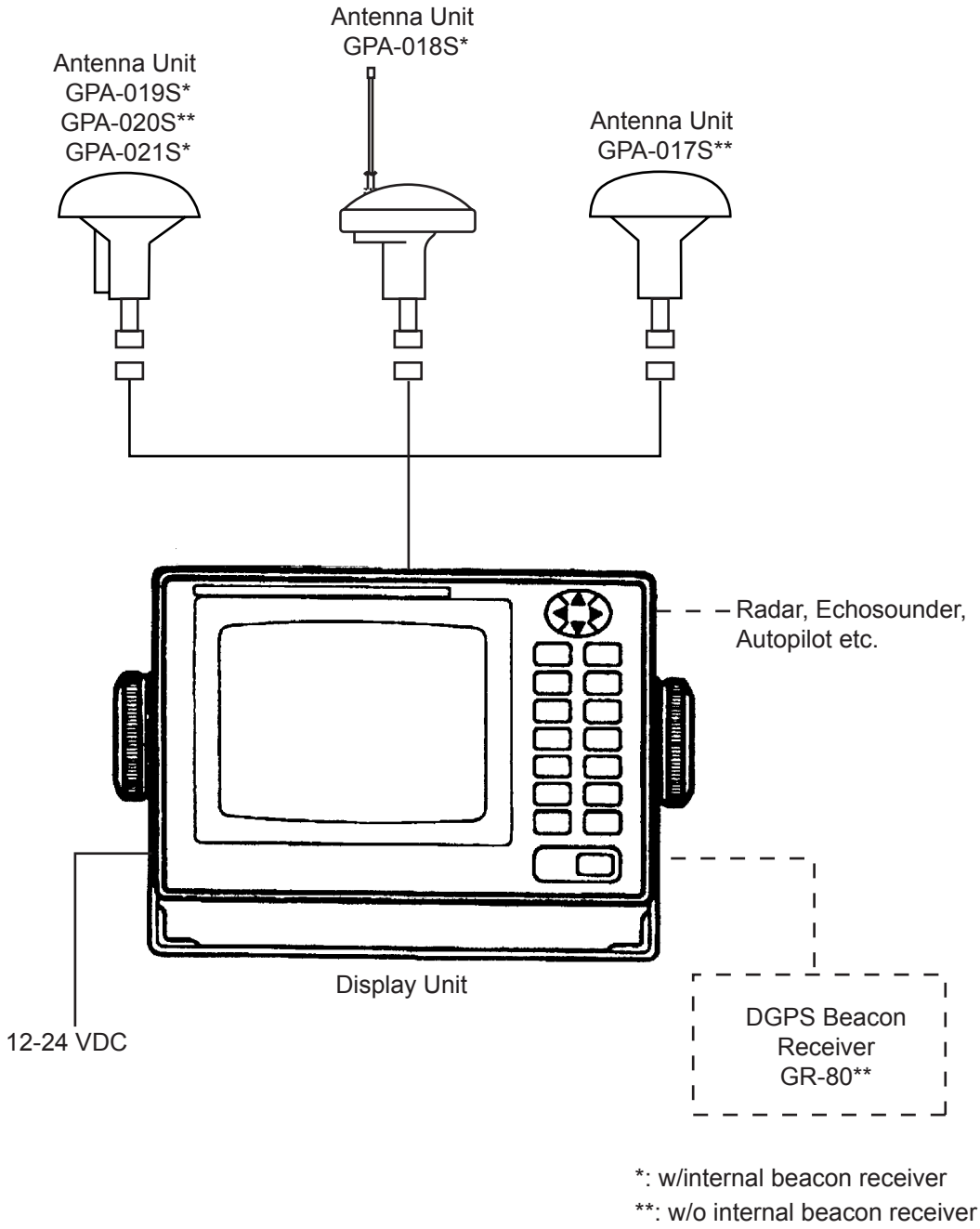
The main features of the GP-150 are

- Comprehensive navigation data displays
- Storage for 999 waypoints and 30 routes
- Alarms: Waypoint Arrival, Anchor Watch, Cross-track Error, Ship's 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.
- DGPS capability - with built-in DGPS beacon kit accepts DGPS correction data from external DGPS beacon receiver
- Menu-driven operation
- Bright 122 x 92 mm LCD with temperature compensated tone and brilliance adjustment
- Power consumption is a low 10 W.
- Provision for connection of autopilot (option) - steering data output to autopilot
- Digital display of water temperature and depth with connection of echo sounder (with NMEA input)
- Memory stores 2,000 points of track and marks.
- "Highway" display provides perspective view.
- Position may be shown in latitude and longitude or LOP (Loran or Decca).
- Four connectors for optional equipment two IEC 61162-1/NMEA 0183 I/O, one IEC 61162-1/NMEA 0183 (or log) output and one DGPS for personal computer I/O
- Fully meets the following regulation: IMO MSC. 112(73), IEC 61108-1 and IEC 62288.

Program No.

2051518-04.xx

SYSTEM CONFIGURATION



*: w/internal beacon receiver
**: w/o internal beacon receiver

CATEGORY OF UNITS

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

This page intentionally left blank.

1. OPERATIONAL OVERVIEW

1.1 Control Description

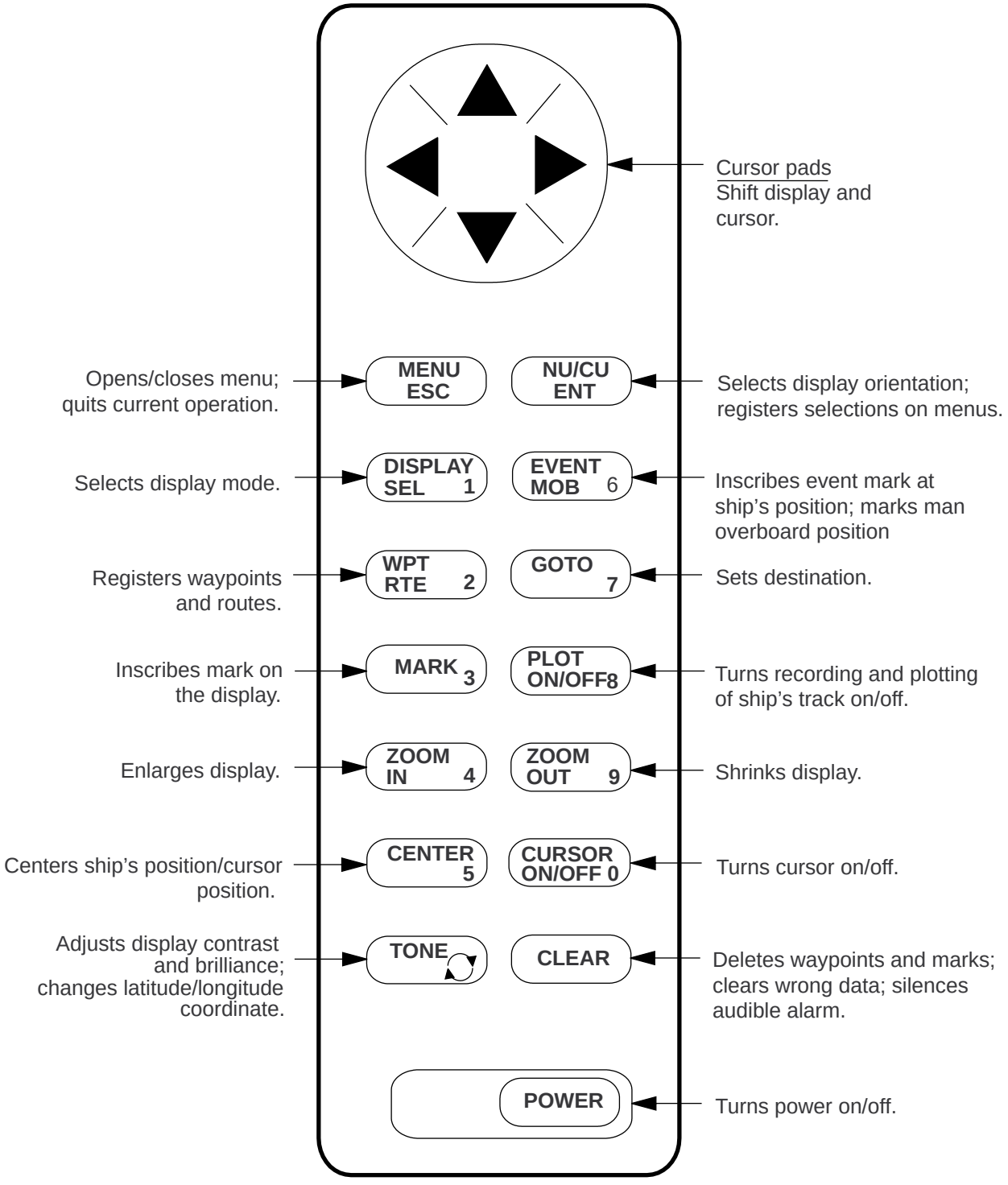


Figure 1-1 Control Panel

1.2 Turning On and Off the Power

The GP-150 takes about 90 seconds to find position when turned on for the very first time. Thereafter it takes about 12 seconds to find position each time the power is turned on.

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. The unit starts up with the last used display mode.

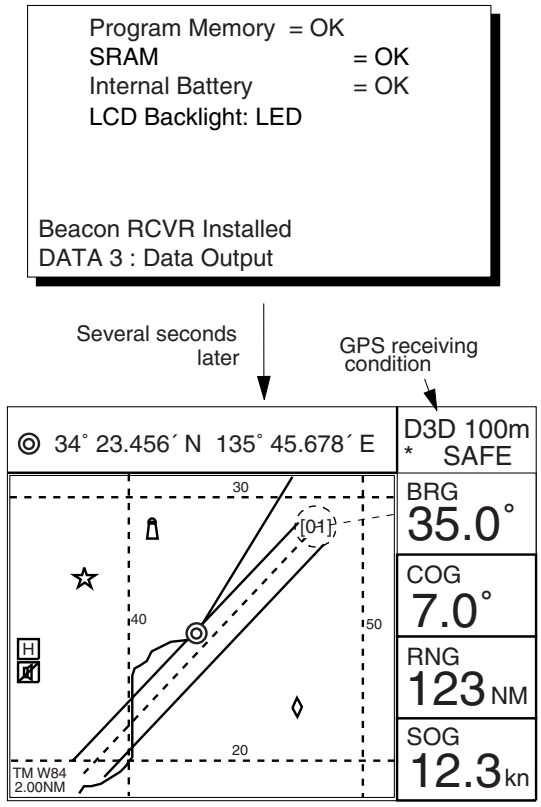


Figure 1-2 Appearance of display when turning on the power

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 could not be 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	**2D**
3D	**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 S icon appears when the display is in the demonstration mode. To return to normal mode, turn off the power and turn it on while pressing and holding down the **NU/CU ENT** key.

Turning the power off

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.

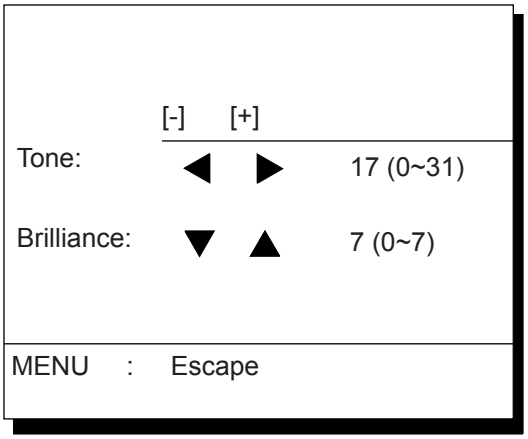


Figure 1-3 Screen for adjustment of display contrast and brilliance

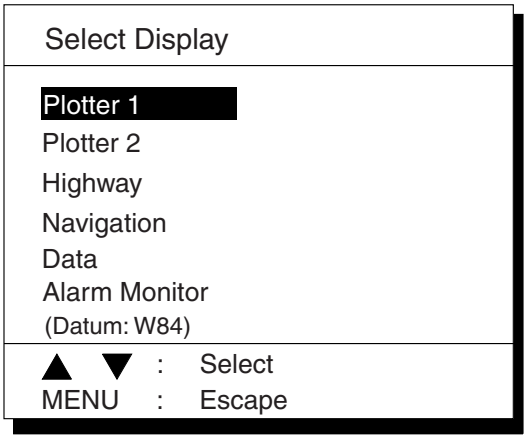
2) To adjust contrast, press ◀ or ▶. Current setting and setting range (0-31, default: 17) are shown to the right of "▶".
To adjust brilliance, press ▲ or ▼. Current setting and setting range (0-7, default: 7) are shown to the right of "▲".

Note 1: Operate cursor keys within 10 seconds after pressing the **TONE** key. Otherwise, the screen for adjustment of contrast and brilliance will be cleared.

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

1.4 Selecting the Display Mode

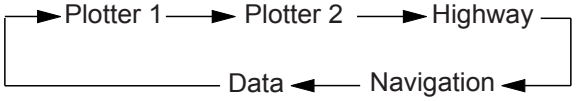
1) Press the **DISPLAY SEL** key. The display shown in Figure 1-4 appears.



* Shows currently selected geodetic chart datum.

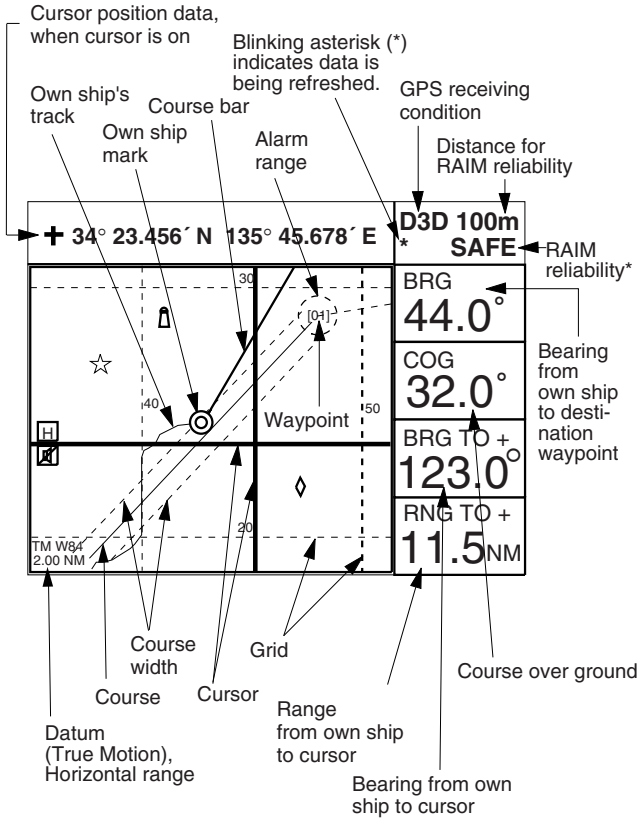
Figure 1-4 Screen for selection of display mode

2) Press the **DISPLAY SEL** key, ▲ or ▼ to select display mode. (When the **DISPLAY SEL** key is pressed, the display mode changes in sequence shown below.) Selected display mode appears.



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

Plotter 1 display



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

Figure 1-5 Plotter 1 display

Plotter 2 display

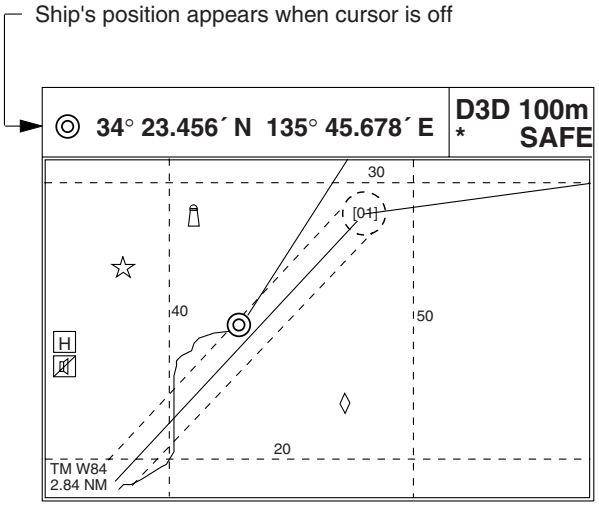


Figure 1-6 Plotter 2 display

Highway display

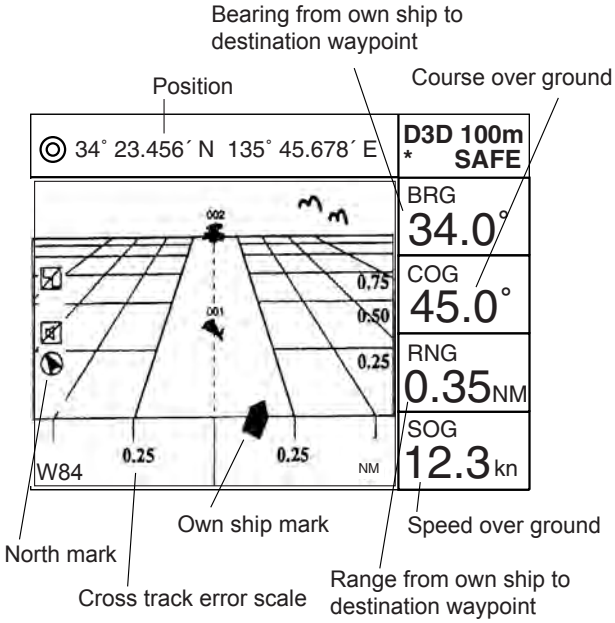
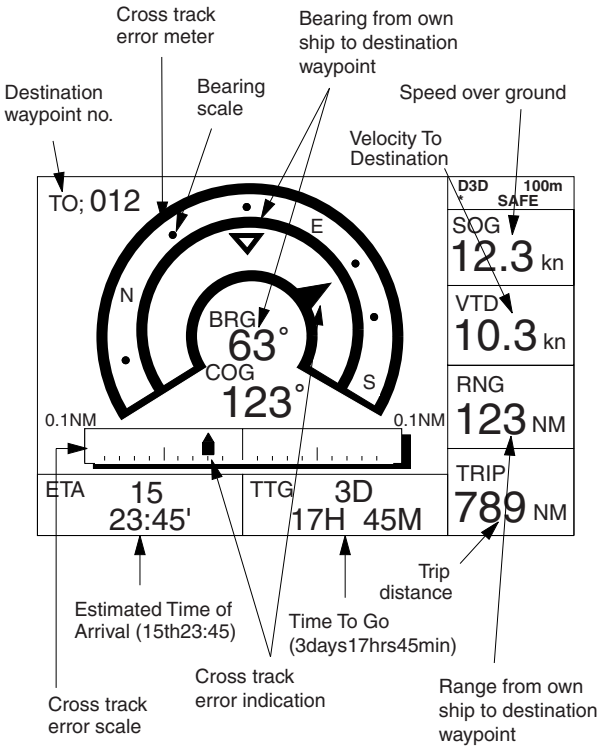


Figure 1-7 Highway display

Navigation display

1) No autopilot connection



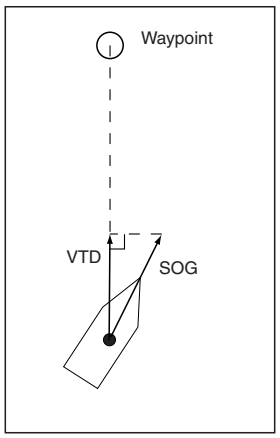


Figure 1-8 Navigation display, no autopilot connection

2) With autopilot connection, automatic mode

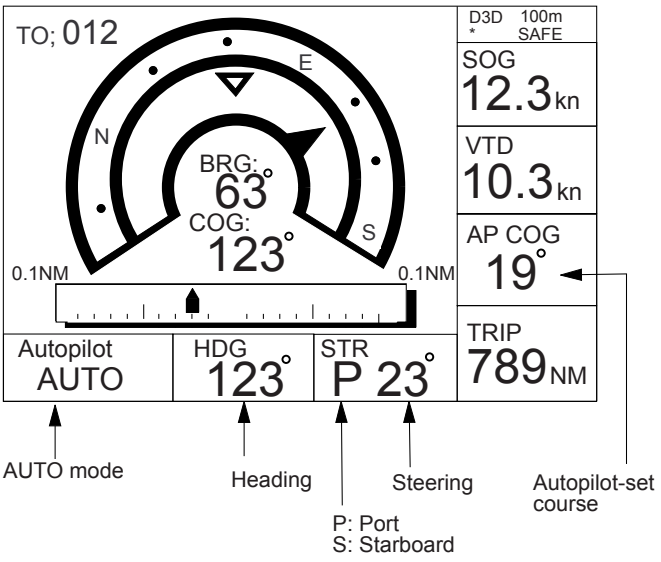


Figure 1-9 Navigation display, with autopilot connection, automatic mode

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

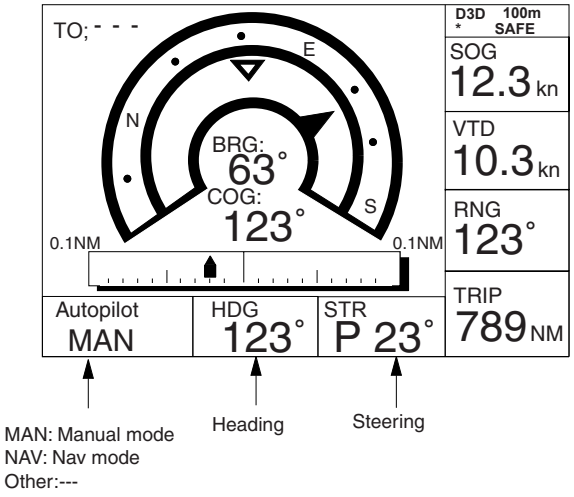


Figure 1-10 Navigation display, with autopilot connection, modes other than the automatic mode

Data display

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

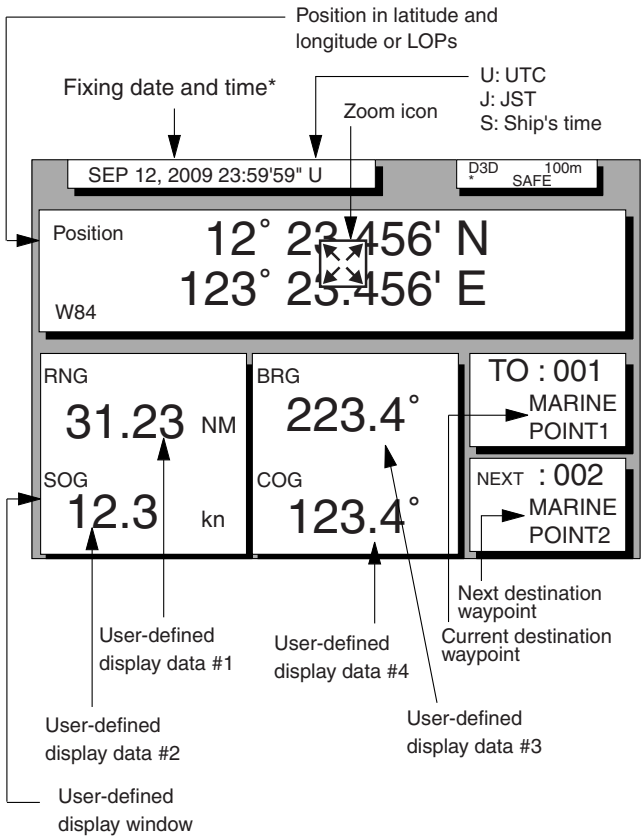


Figure 1-11 Data display mode

*: "- -" appears until calculating position after turning on the power. If fixing error occurs this indication stops.

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.

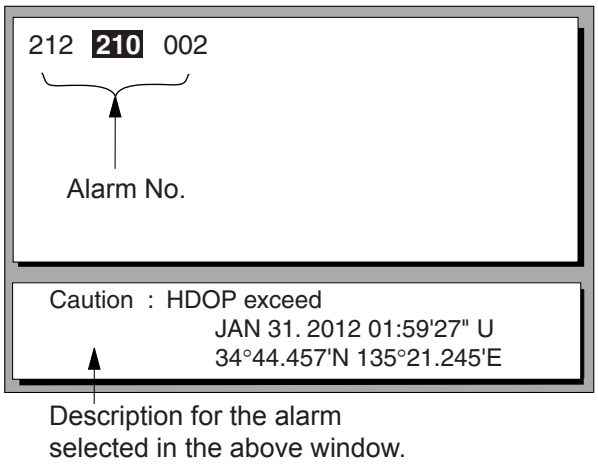


Figure 1-12 Alarm Monitor display mode

1.5 Icons

Various icons appear on the left-hand side of display to alert you to equipment status.

L/L : L/L position offset applied.
H : Track recording is suspended.
: Alarm is violated.
: North mark.
S : Demonstration display.

2. TRACK

2.1 Enlarging/Shrinking the Display

You may enlarge and 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 for Plotter 1 and Highway, and 0.36, 0.71, 1.42, 2.84, 5.69, 11.38, 22.76, 45.51, 91.02, 182.04, 273.07 nautical miles for Plotter 2 display.
The **ZOOM IN** key enlarges the display and the **ZOOM OUT** key shrinks it. Each time a zoom key is pressed the display range appears at the center of the display for about one second.

2.2 Selecting 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 motion. (“TM” appears at the bottom of the Plotter 1 and 2 displays.) Land is stationary.

Course-up display

Destination set

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

Destination not set

Ship's course is upward on the screen at the moment the course-up mode is selected. The north mark appears at the left side of the display.

2.3 Shifting the Cursor

The cursor can be shifted with the cursor pads.

1) Press the **CURSOR ON/OFF** key to turn on the cursor.
2) Press the cursor pads.

The cursor moves in the direction of the cursor pads pressed. When the cursor reaches the edge of the display, the display shifts in the direction opposite.

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.

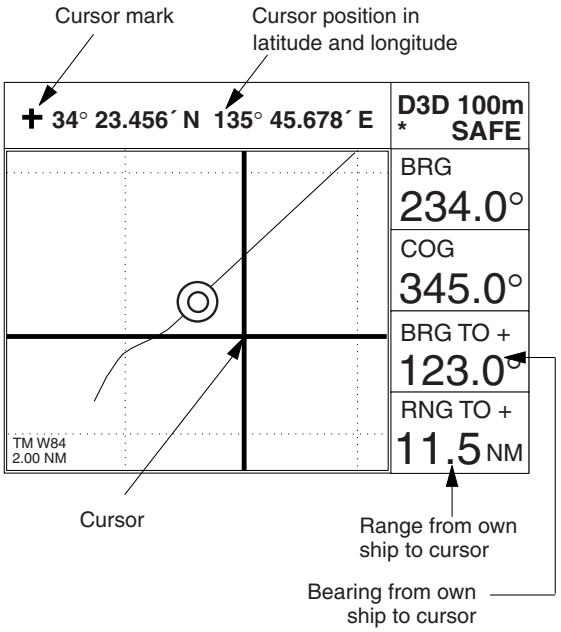


Figure 2-1 Data displayed when the cursor is turned on

Cursor turned off

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

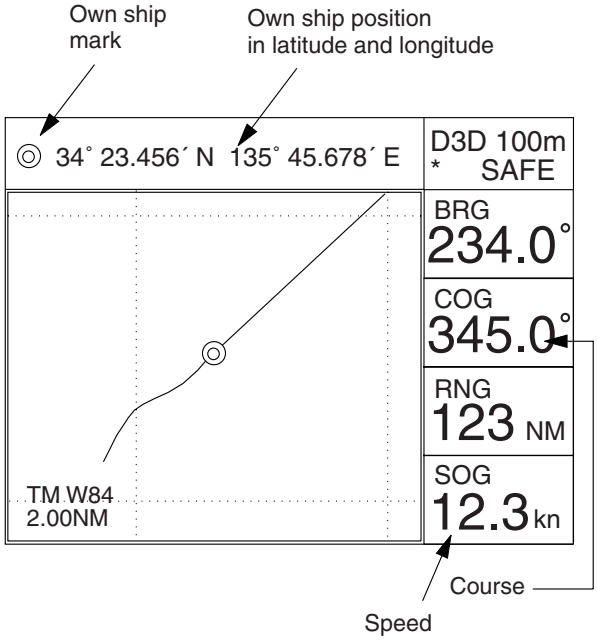


Figure2-2 Data display when the cursor is turned off

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 pads. The display shifts in the direction of the cursor pads pressed.

2.5 Centering Cursor Position

1) Press the **CURSOR ON/OFF** key to turn on the cursor.
2) Press the cursor pad to position the cursor.
3) Press the **CENTER** key.

2.6 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.

2.7 Stopping/Starting Plotting and Recording of Track

The GP-150 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.)

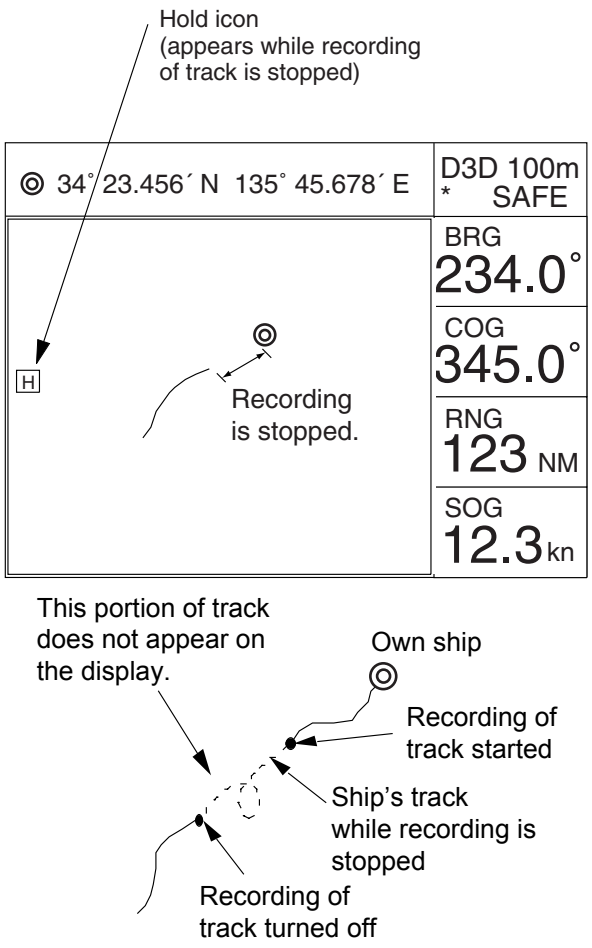


Figure 2-3 Track not plotted or recorded when plotting is stopped

2.8 Erasing Track

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

CAUTION

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

1) Press the **MENU ESC** key. The MAIN MENU appears.

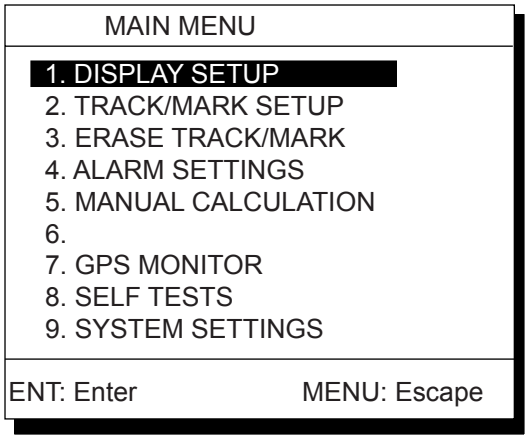


Figure 2-4 MAIN MENU

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

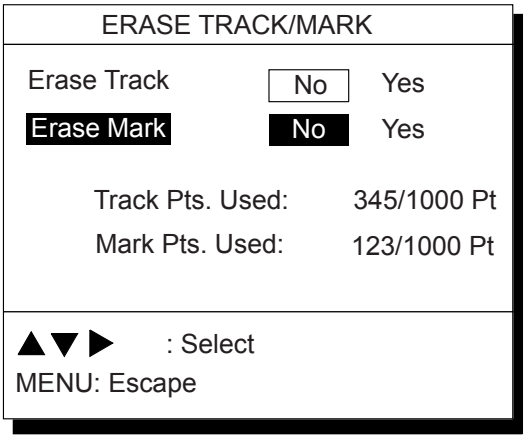


Figure 2-5 ERASE TRACK/MARK menu

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

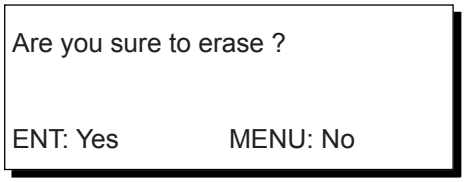


Figure 2-6 Prompt for erasure of track

5) Press the **NU/CU ENT** key.

2.9 Selecting 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.

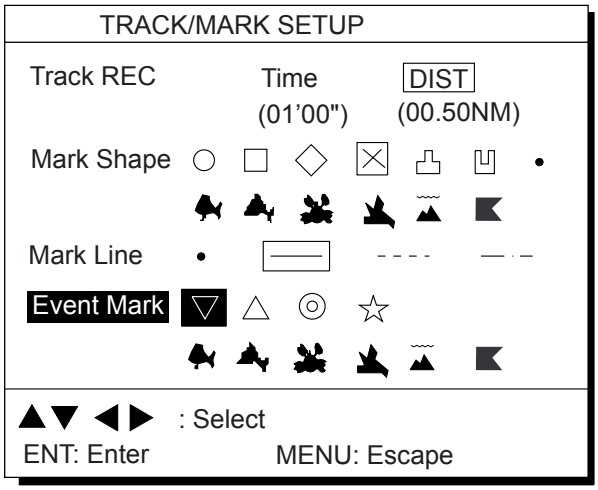


Figure 2-7 TRACK/MARK SETUP menu

3) Press ▲ or ▼ 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 0.00 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 ▲ or ▼ to select Track REC.
4) Press ▶ to select Distance.
5) Enter plotting interval. To enter 0.1 nautical miles, for example, press **0**, **0**, **0**, **1**.
6) Press the **NU/CU ENT** key.
7) Press the **MENU ESC** key.

2.10 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.

CAUTION

All data are erased whenever the memory apportion setting is changed, even when the previous value is re-entered.

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.

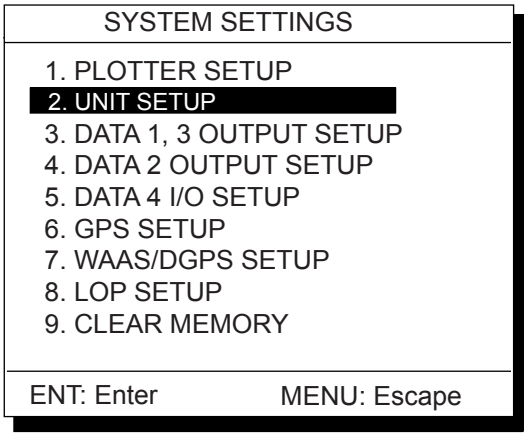


Figure 2-8 SYSTEM SETTNGS menu

3) Press **1** to display the PLOTTER SETUP menu.

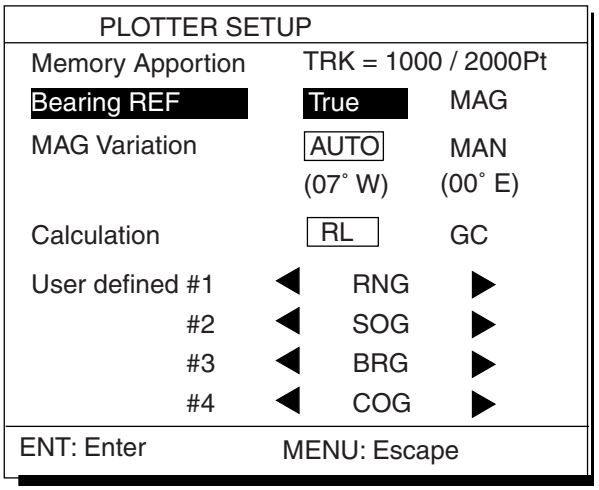


Figure 2-9 PLOTTER SETUP menu

4) Press ▲ or ▼ 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 ▼. You are asked if it is all right to erase all data.

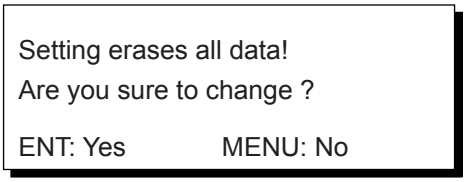


Figure 2-10

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

2.11 Selecting 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.

Displaying 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, ▲ or ▼.
7) Press the **MENU ESC** key.

Entering 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/Erasing Marks

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

Note 1: 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 alert you. To enter a mark when the mark memory is full, erase unnecessary marks.

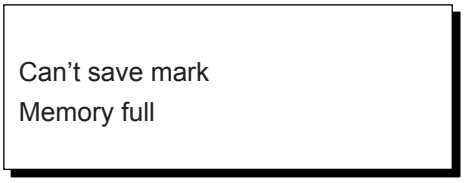


Figure 3-1

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 keys to place the cursor on the location for the mark. Select a mark shape you want. Refer to section 3.2.
3) Press the **MARK** key.

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 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.

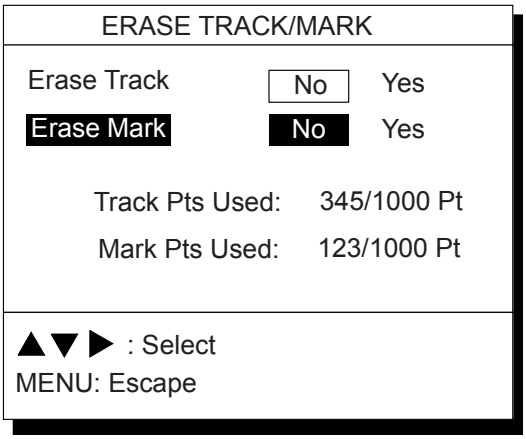


Figure 3-2 ERASE TRACK/MARK menu

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

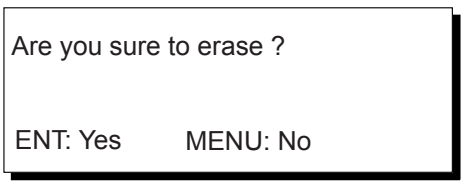


Figure 3-3

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

3.2 Selecting 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.

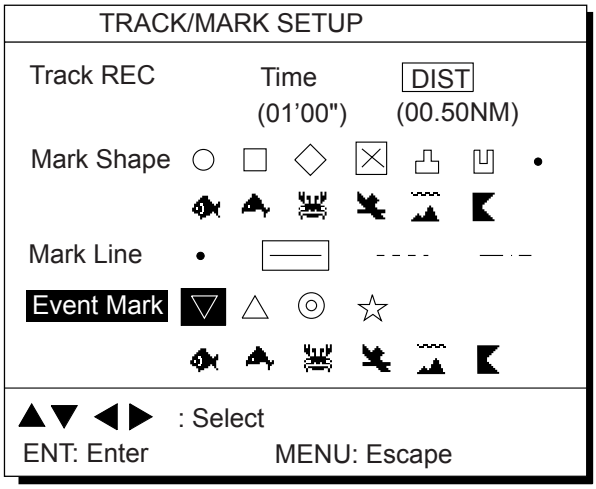


Figure 3-4 TRACK/MARK SETUP menu

2) Press ▲ or ▼ to select Mark Shape.
3) Press ◀ 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.

3.3 Connecting Marks (selecting mark connection line)

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 ◀ to ▶ to select mark line desired other than "•".
4) Press the **NU/CU ENT** key.
5) Press the **MENU ESC** key.

3.4 Entering Event Marks

Event marks can denote any important present position. Event marks can be saved as ordinary marks and the unit automatically numbers them from 01 to 99.

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.

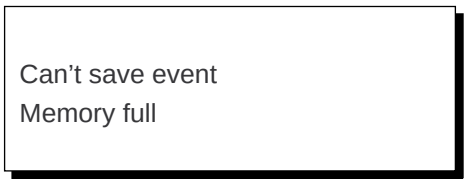


Figure 3-5

Entering event marks

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.

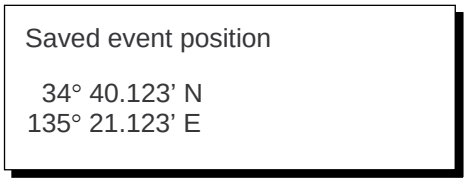


Figure 3-6

To erase event marks, see "3.1 Entering/Erasing Marks".

3.5 Selecting Event Mark Shape

Event marks are available in 10 shapes. Select event mark shape as follows.

1) Press **MENU ESC** and **2** to display the TRACK/MARK SETUP menu.
2) Press ▲ or ▼ 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.

3.6 Entering the MOB Mark

The MOB mark denotes man overboard position. To mark man overboard position, press the **EVENT MOB** key 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, and each time the MOB mark is entered the previous MOB mark and its position data are written over.

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 3-7 appears.

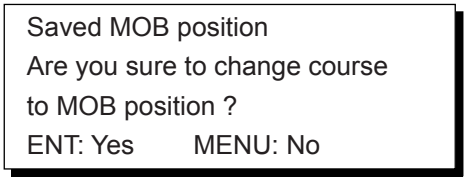


Figure 3-7

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 MOB mark

To erase a MOB mark, you must first cancel it as a GOTO waypoint and then erase all marks.

1) Press the **GOTO** key.
2) Press the **5** key to choose Cancel.
3) You are prompted to release GOTO; press the **NU/CU ENT** key.
4) Press the **MENU ESC** and **3** to display the ERASE TRACK/MARK menu.
5) Press ▼ to choose Erase Mark.
6) Press ▶ to choose Yes.
7) Press the **NU/CU ENT** key.

4. NAVIGATION PLANNING

4.1 Registering 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 can store 999 waypoints, numbered from 001-999. Waypoints can be registered five ways:

- by cursor
- by MOB position or event position
- at own ship's position
- by range and bearing from position, and
- through the waypoint list.

Registering waypoints by the cursor

1) Press the **WPT RTE** key. The Waypoint/Route menu appears.

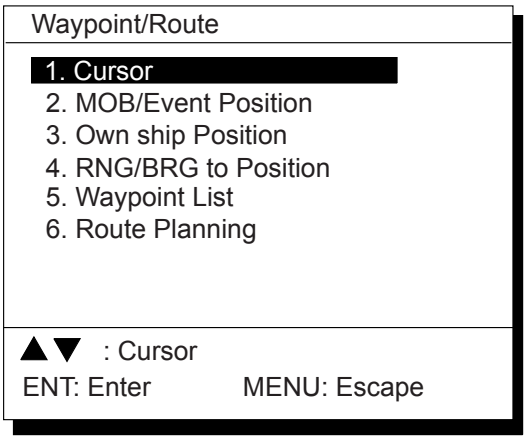


Figure 4-1 Waypoint/Route menu

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

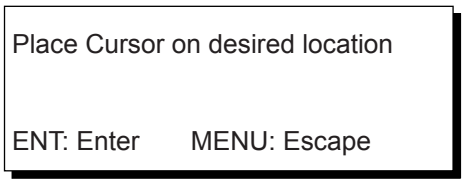


Figure 4-2

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

3) Press 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 deleted.

To assign waypoint number, go to step 5. If you do not want to change the waypoint number, go to step 6 to select mark shape and enter comment.

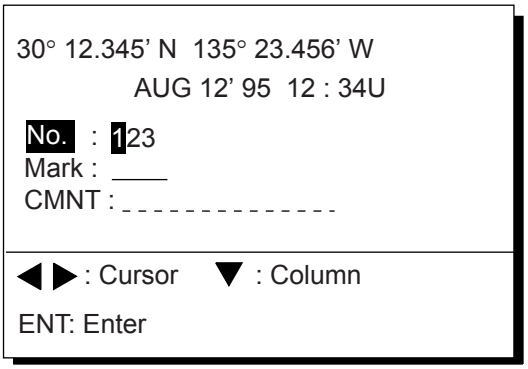


Figure 4-3

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.

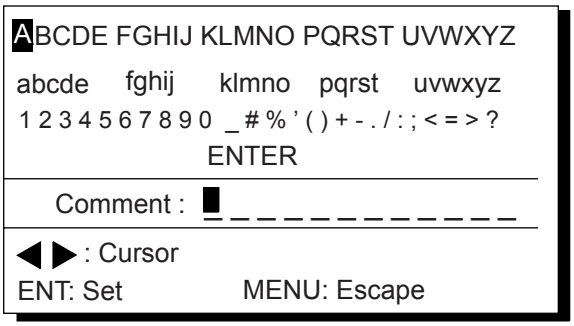


Figure 4-5 Screen for entry of comment for waypoint

9) You may enter a comment, as shown in the procedure which follows, or skip to step 10 to finish. The comment may consist of up to 12 alphanumeric characters.
   ① Press the cursor keys 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 it is alright to write over the waypoint and its data, press the **NU/CU ENT** key. To change waypoint number, press the **MENU ESC** key.

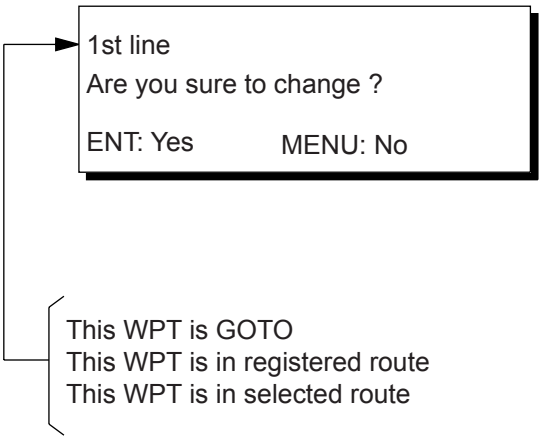


Figure 4-6

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

Registering 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.

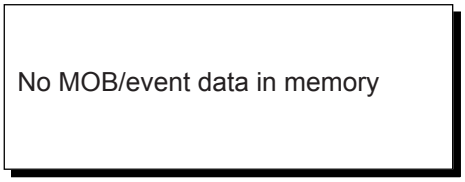


Figure 4-7

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

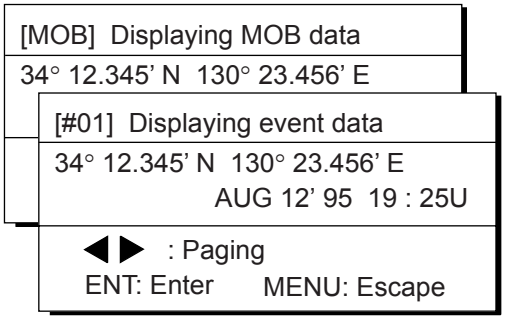


Figure 4-8

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 "Registering waypoints by the cursor" on page 4-1.

Registering waypoints by 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.



Figure 4-9

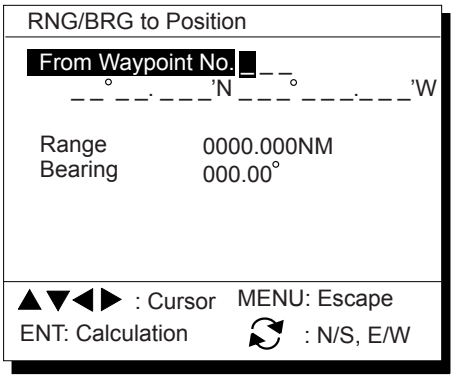
1) Press the **WPT/RTE** key.
2) Press **3** to select Own Ship Position.
3) Follow steps 5 through 10 in "Registering waypoints by the cursor" on page 4-1.

Registering waypoints using range and bearing from a position

This method is useful for entering a waypoint using range and bearing from a pre-registered waypoint.

Range and bearing to a position are calculated according to the sailing method (rhumb line or great circle) chosen on the PLOTTER SETUP menu. You may choose the unit of range on the UNIT SETUP menu.

1) Press the **WPT/RTE** key.
2) Press the **4** key to display the RNG/BRG to Position display.

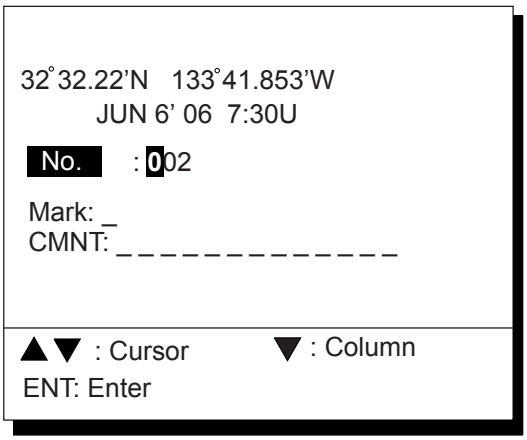


RNG/BRG Position Display

3) Enter waypoint (000-999) from which to reference range and bearing. (000 is own ship position.)

Note: Alternatively, you may enter position, leaving the waypoint number blank.

4) Enter range and bearing you wish to use to calculate position of new waypoint.
5) Press the **NU/CU ENT** key. The display now looks something like the one below.



6) If necessary, change waypoint number and add a comment. For how to enter a comment see page 4-2.
7) Press the CU/NU ENT key to finish.

Note: If waypoint number entered at step 6) is an existing number, a part of a registered route, a part of a currently selected route, or a GOTO waypoint, a prompt asks if it is OK to write over the waypoint. Follow the instructions in the prompt to write over the mark number or escape.

Registering waypoints through the waypoint list

1) Press the **WPT/RTE** key.
2) Press **5** to display the waypoint list.
3) Press ↻ to select position format; latitude and longitude or LOP.

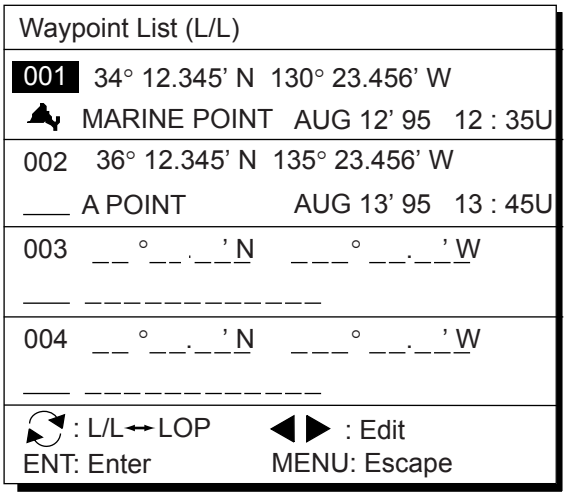


Figure 4-10

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

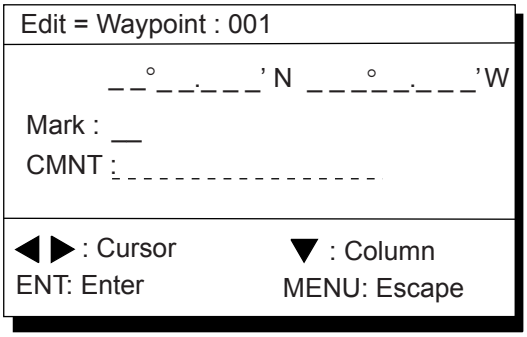


Figure 4-11

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, return to step 4.
13) Press the **MENU ESC** key to finish.

4.2 Editing Waypoints

1) Press **WPT RTE** and **5**.
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.

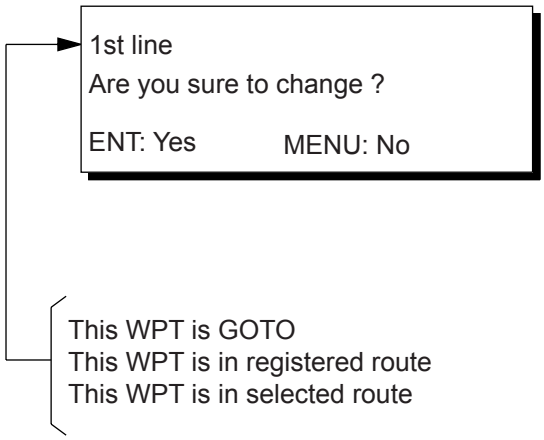


Figure 4-12

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

4.3 Deleting Waypoints

Deleting waypoints by the cursor

1) Place the cursor on the waypoint to delete.
2) Press the **CLEAR** key.

Deleting waypoints through the waypoint list

1) Press **WPT RTE** and **5**.
2) Press ▲ or ▼ to select waypoint to delete.
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.

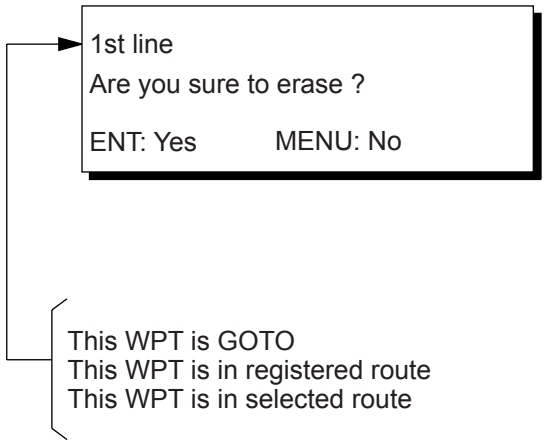


Figure 4-13

Note: All waypoint marks (as well as all other marks) and their data can be cleared 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.

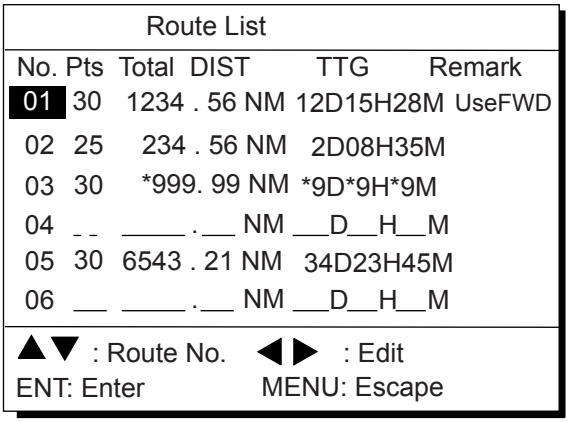
5) Press the **MENU ESC** key.

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

Registering routes

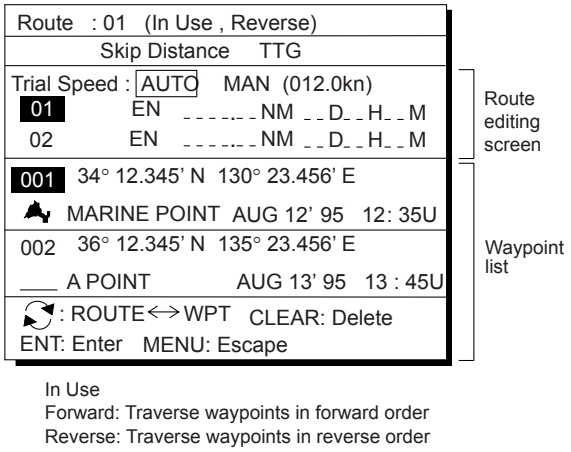
1) Press the **WPT/RTE** key.
2) Press **6** to select Route Planning. The route list appears.



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 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.



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

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

① Entering waypoint number directly

7) Enter waypoint number, in three digits. The cursor shifts to the "Skip" window. The procedure for skipping a waypoint is shown on page 5-5. 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 Deleting Route Waypoints

1) Press **WPT RTE** and **6** to display the route list.
2) Press ▲ or ▼ to select route.
3) Press ▶ to display route editing screen.
4) Select the waypoint to delete.
5) Press the **CLEAR** key.
6) Press the **NU/CU ENT** key.
7) Repeat steps 4 through 6 to continue deleting waypoints.
8) Press the **MENU ESC** key. The route is rearranged to reflect the change.

4.6 Replacing Route Waypoints

1) Press WPT **RTE** and **6** 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.

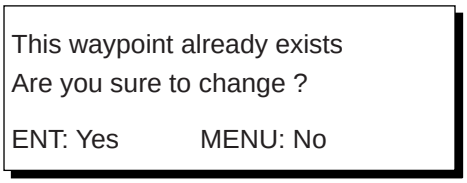


Figure 4-16

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 Deleting Routes

1) Press **WPT RTE** and **6** to display the route list.
2) Press ▲ or ▼ to select route to delete.
3) Press the **CLEAR** key. The display shown in Figure 4-17 appears if the route is in use.

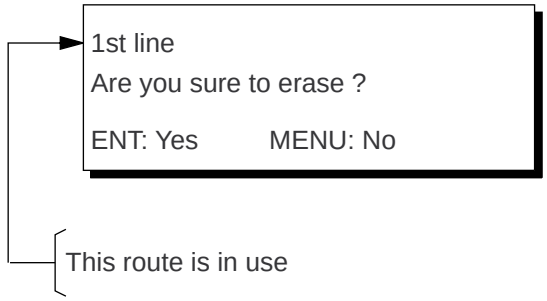


Figure 4-17

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

5. STARTING FOR 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.

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 automatically disables further entry.

Setting single destination

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

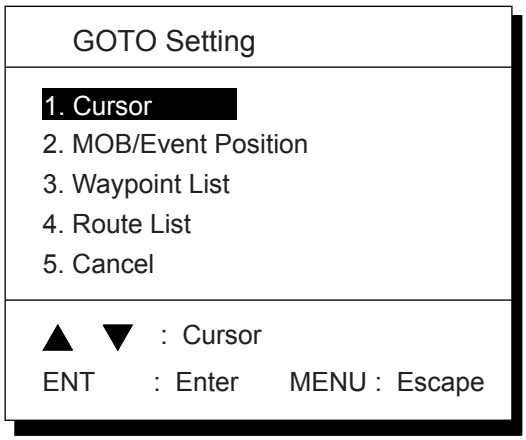


Figure 5-2 GOTO setting menu

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

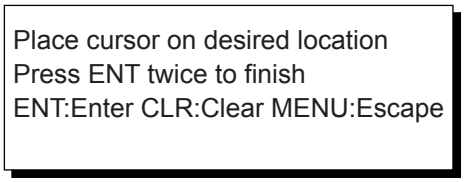


Figure 5-3

If the display in use is Highway, Navigation or Data display, 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.

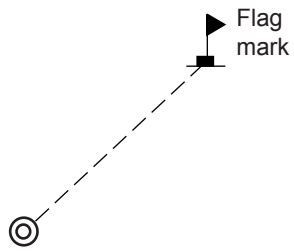


Figure 5-4 Single destination set by cursor

Setting multiple destinations

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

```
Enter route number
      01
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 **6** 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.

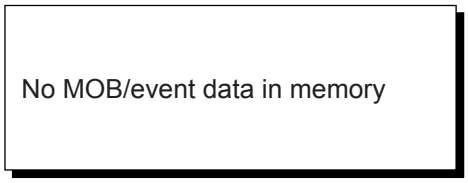


Figure 5-8

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

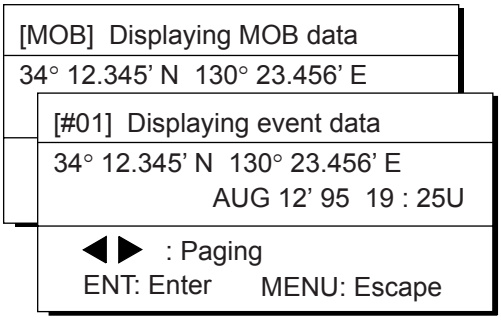


Figure 5-9

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.

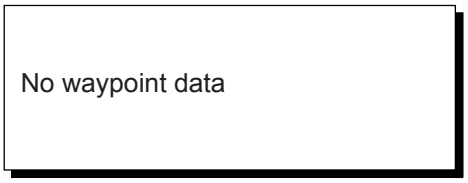


Figure 5-10

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.

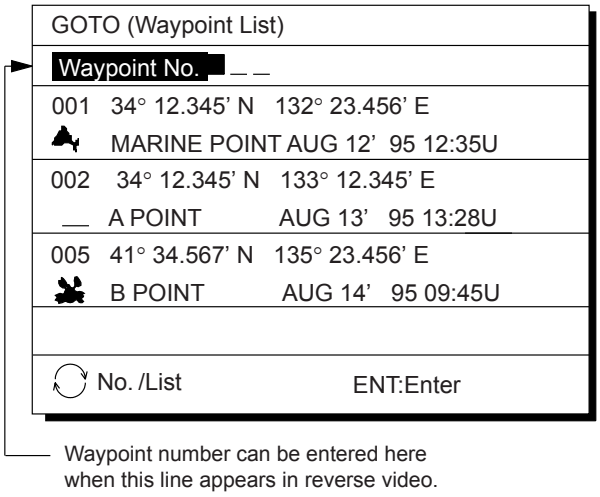


Figure 5-11 Waypoint list

Set destination by following ① or ② on the next page.

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.

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.



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.

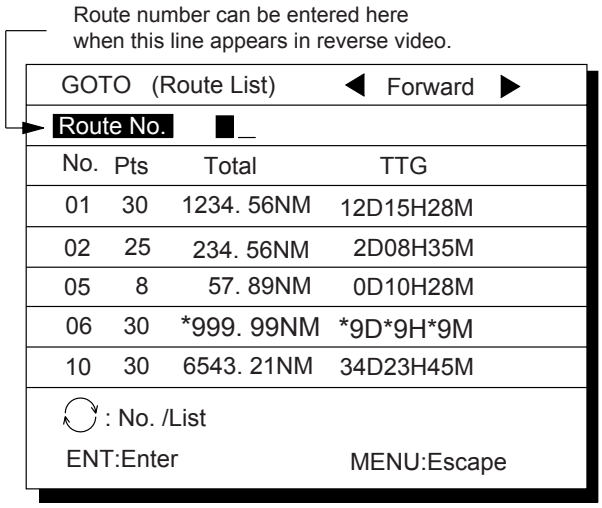


Figure 5-13 Route list

① B**y 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 dashed line connects the starting point and all route waypoints.

② **By selecting a route**

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

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

Skipping route waypoints

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

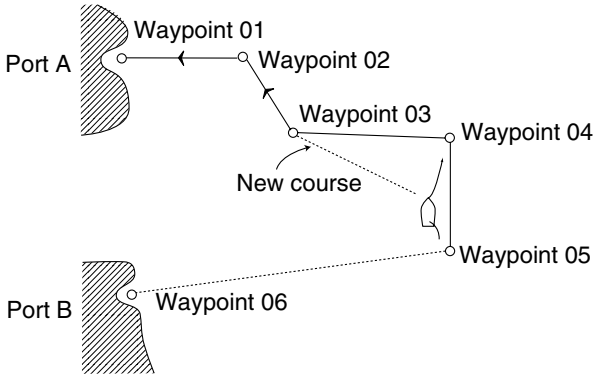


Figure 5-14

1) Press **WPT RTE** and **6** to display the route list. Press the cursor keys to select route.

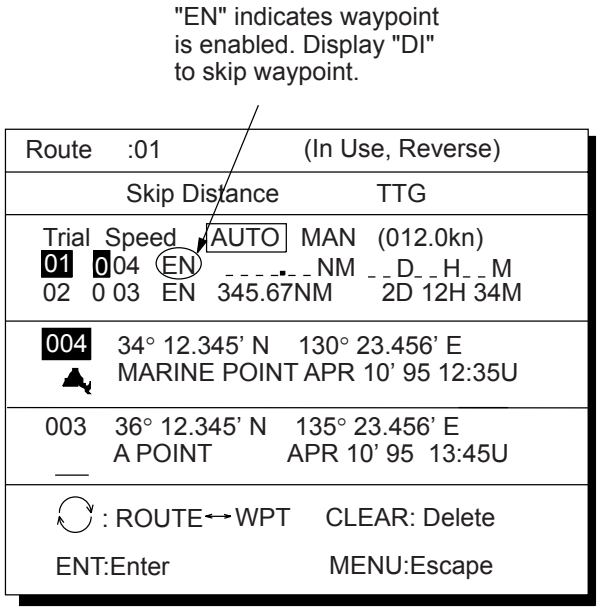


Figure 5-15 Route list

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".

5.2 Canceling Destination

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

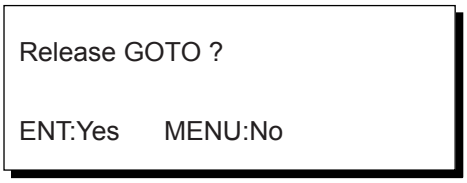


Figure 5-16

3) Press the **NU/CU ENT** key.

5.3 Erasing Route Waypoints (flags)

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.

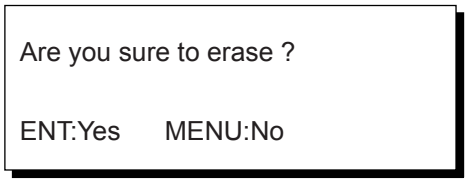


Figure 5-17

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.

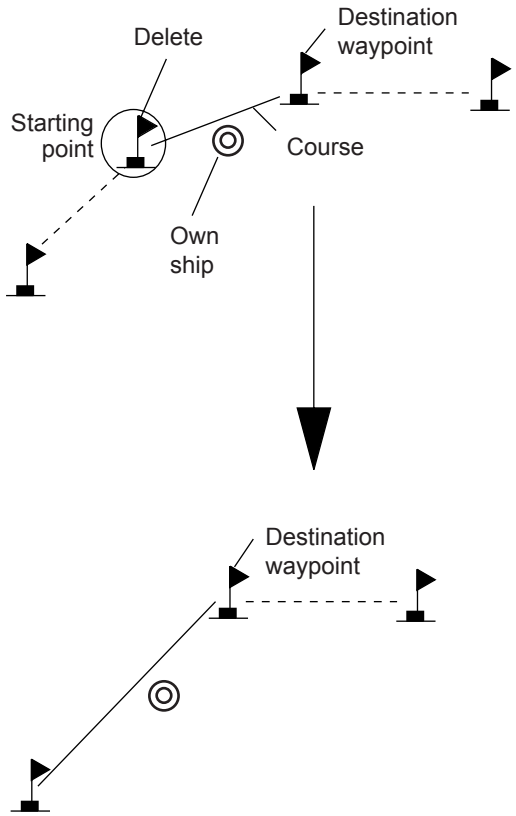


Figure 5-18 Route rearranged after erasing flag

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 are calculated by two ways: Great Circle or Rhumb Line. However, cross track error is calculated by 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.

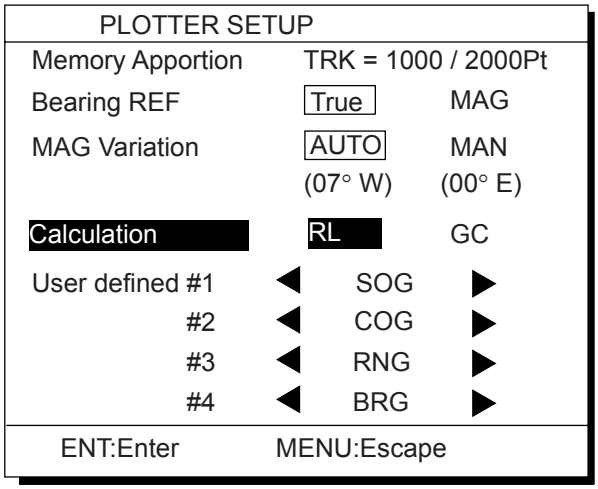


Figure 5-19 PLOTTER SETUP menu

2) Press ▲ or ▼ to selection Calculation.
3) Press ◀ or ▶ to select R.L (Rhumb Line) or G.C (Great Circle).
4) Press the **NU/CU ENT** key.
5) Press the **MENU ESC** key.

Calculation Procedure

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

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

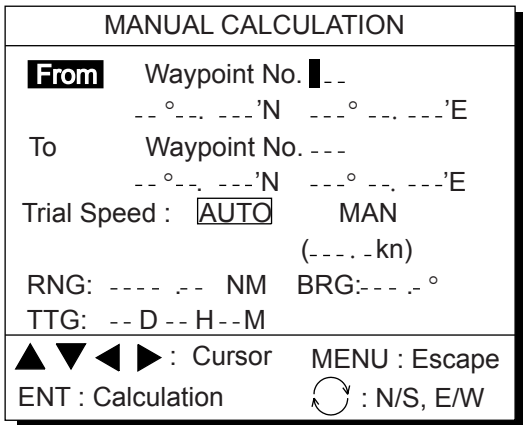


Figure 5-20 MANUAL CALCULATION menu

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 (001-999). (000 is reserved for own ship position.)
2) Press ▼ twice.
3) Key in other waypoint number (001-999).

(Continued on next page)

4) Press ▼ to shift the cursor to the Trial Speed line.
5) Press ◀ or ▶ to select AUTO or MAN. 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 Selecting Data to Display on the Data Display

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

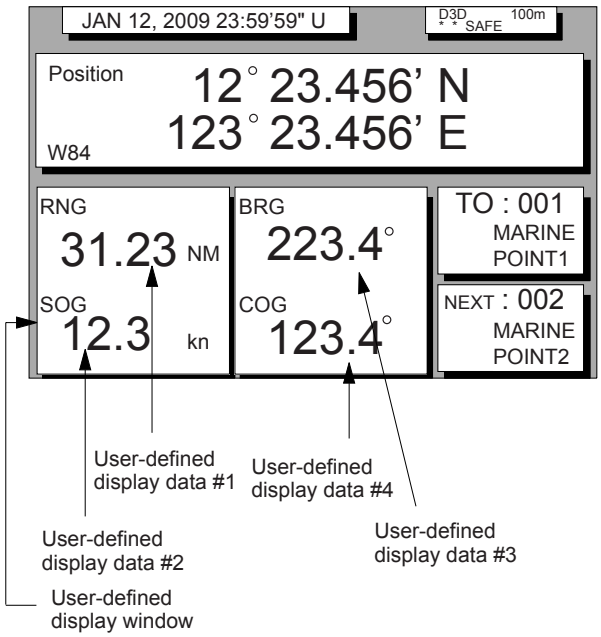


Figure 6-1 Data display

The data the user may select to display are;

- Altitude (ALT)*
- Average course (AVR COG)
- Average speed (AVR SOG)
- Course (COG)
- Course error (dCOG)
- Cross track error (XTE)
- Depth (WAT DPTH)#
- Drift (DRIFT)
- ETA to waypoint (ETA)
- Heading (HDG)
- Range to waypoint (RNG)
- Bearing to waypoint (BRG)
- Route time-to-go (ROUTE TTG)
- Set (SET)
- Speed over ground (SOG)
- Speed thru water (STW)
- Time-to-go to waypoint (TTG)
- ETA to route (ROUTE ETA)
- Total route distance (ROUTE DIST)*
- Trip distance (TRIP)
- Trip elapsed time (TRIP TIME)
- Water temperature (WAT TEMP)#, and
- Velocity to destination (VTD)*

***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.

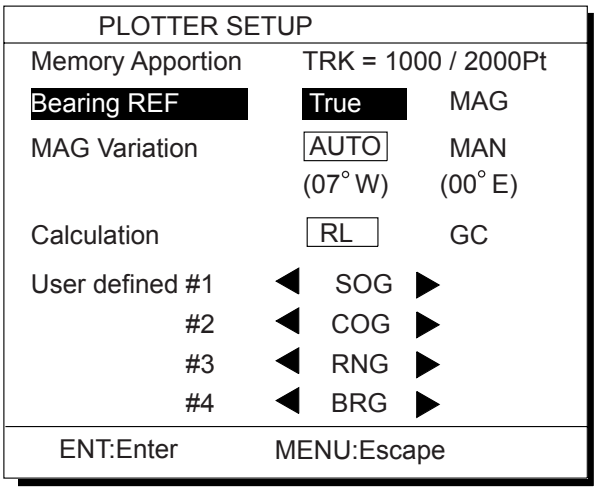


Figure 6-2 PLOTTER SETUP menu

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 Selecting Position Format

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

Selecting position format (L/L or LOPs)

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

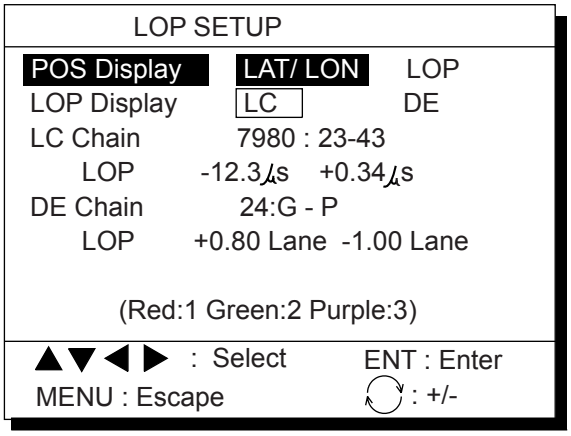


Figure 6-3 LOP SETUP menu

2) Press ▲ or ▼ to select POS Display.
3) Press ◀ or ▶ to select LAT/LON or LOP.
4) Press the **NU/CU ENT** key.

Displaying LOPs

1) Press **MENU ESC**, **9** and **8**.
2) Press ▲ or ▼ to select POS Display.
3) Press ◀ or ▶ 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 appears 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) Press ▼.
10) Key in correction value.
11) If necessary, press ↻ to switch from plus to minus or vice versa.
12) Press the **NU/CU ENT** key.
13) 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) Press ▼.
10) Key in lane correction value.
11) If necessary, press ↻ to switch from plus to minus or vice versa.
12) Press the **NU/CU ENT** key.
13) Press the **MENU ESC** key.

Registering waypoints using LOPs

1) Press **WPT RTE** and **5**.
2) Press ↻ to display LOPs.

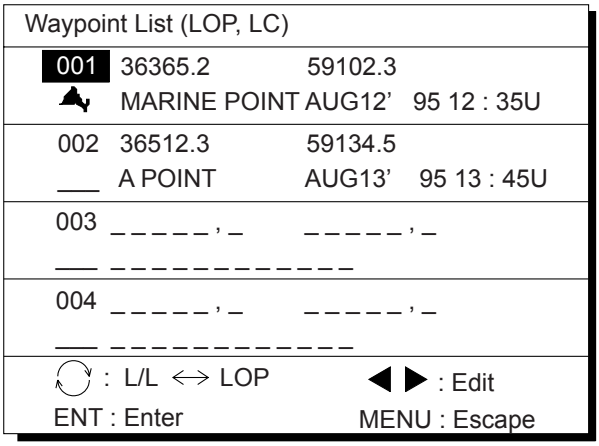
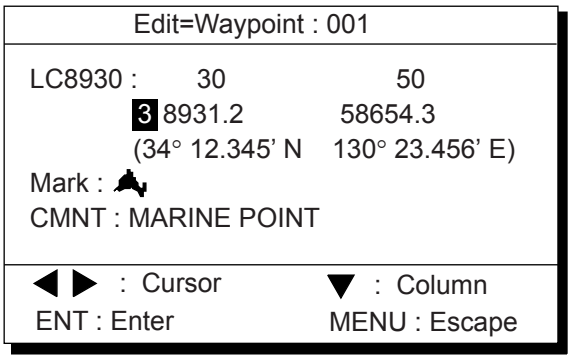
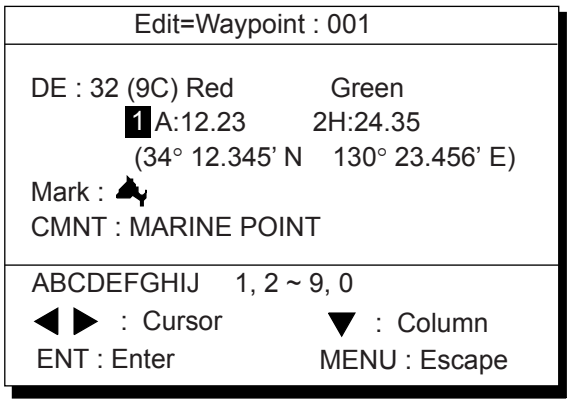


Figure 6-4 LOP display on the waypoint list

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



Loran C LOP input screen



Decca LOP input screen

Figure 6-5 LOP input screens

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

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. After the test results appear, the Simulation Mode menu appears.

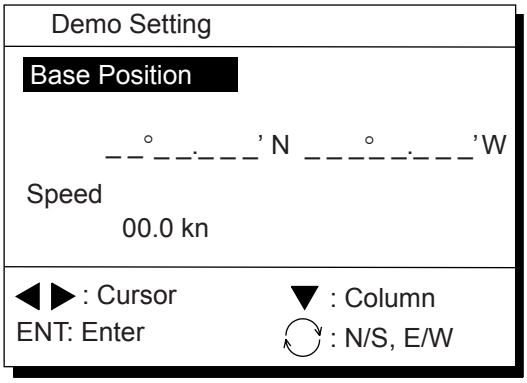


Figure 6-6 Simulation mode menu

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 ▼ key.
7) Key in speed.
8) Press the **NU/CU ENT** key to start the simulation mode.

   The icon S appears in the plotter 1, 2, and highway display. All controls are operative.

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

Note: When the memory is cleared while in the demonstration mode, the equipment starts up in the normal mode.

7. ALARMS

There are seven alarm conditions which generate both audible and visual alarms. When an alarm setting is violated, the buzzer sounds and the alarm window appears.

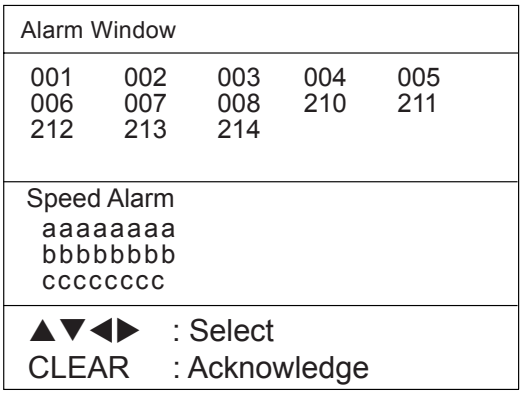


Figure 7-1 Alarm Window

7.1 Arrival Alarm, Anchor Watch Alarm

Arrival alarm

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

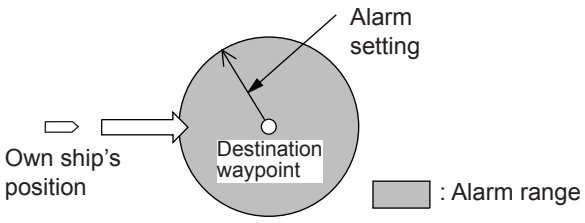


Figure 7-2 How the arrival alarm works

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

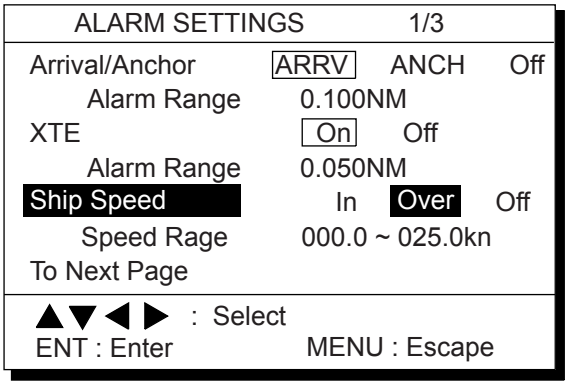


Figure 7-3 ALARM SETTINGS menu, page 1/3

3) Press ▲ or ▼ 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. You can silence the audible alarm by pressing the **CLEAR** key. To erase the visual alarm, press the **CLEAR** key again.

To disable the alarm, select Off at step.

Anchor watch alarm

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

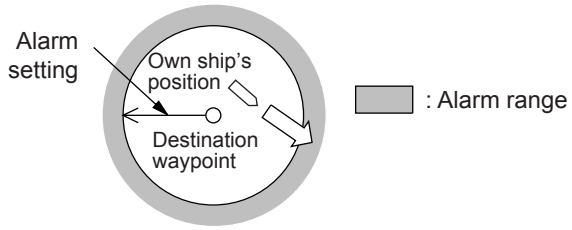


Figure 7-4 How the anchor watch alarm works

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

1) Press **MENU ESC** and **4**.
2) Press ▲ or ▼ 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. You can silence the audible alarm by pressing the **CLEAR** key. To erase the visual alarm, press the **CLEAR** key again.
To disable the alarm, select Off at step 3.

7.2 Cross Track Error (XTE) Alarm

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

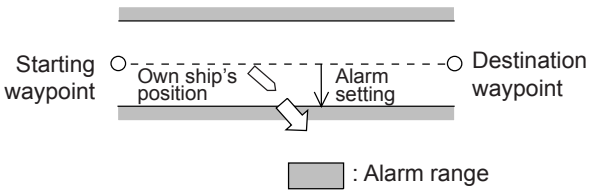


Figure 7-5 How the XTE alarm works

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. You can silence the audible alarm by pressing the **CLEAR** key. To erase the visual alarm, press the **CLEAR** key again.
To disable the alarm, select Off at step 3.

7.3 Ship's Speed Alarm

The ship's 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. You can silence the audible alarm by pressing the **CLEAR** key. To erase the visual alarm, press the **CLEAR** key again.

To disable the alarm, select Off at step 3.

7.4 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 ▲ or ▼ to select To Next Page. The menu shown in Figure 7-6 appears.

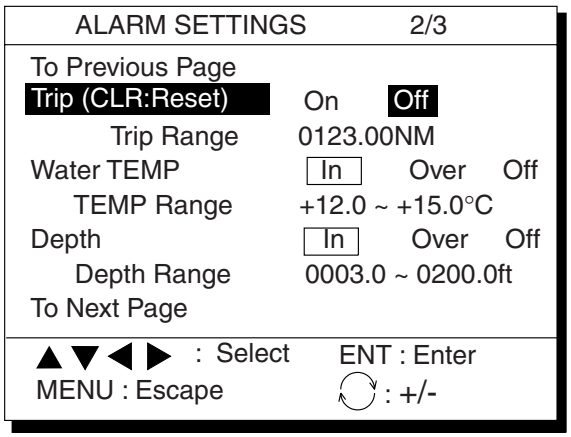


Figure 7-6 Alarm settings menu, page 2/3

3) Press ▲ or ▼ to select Trip.
4) If necessary, press **CLEAR** to reset the trip distance and trip elapsed time (see page 6-1).
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. You can silence the audible alarm by pressing the **CLEAR** key. To erase the visual alarm, press the **CLEAR** key again.

To disable the alarm, select Off at step 5.

7.5 Water Temperature Alarm

The water temperature alarm sounds when the water temperature is higher or lower (or within) the preset temperature. This alarm requires 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) 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. You can silence the audible alarm by pressing the **CLEAR** key. To erase the visual alarm, press the **CLEAR** key again.

To disable the alarm, select Off at step 3.

7.6 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) 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. You can silence the audible alarm by pressing the **CLEAR** key. To erase the visual alarm, press the **CLEAR** key again.

To disable the alarm, select Off at step 3.

7.7 WAAS/DGPS Alarm

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

7.8 Alarm Mode

Set the alarm mode for GP-150.

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

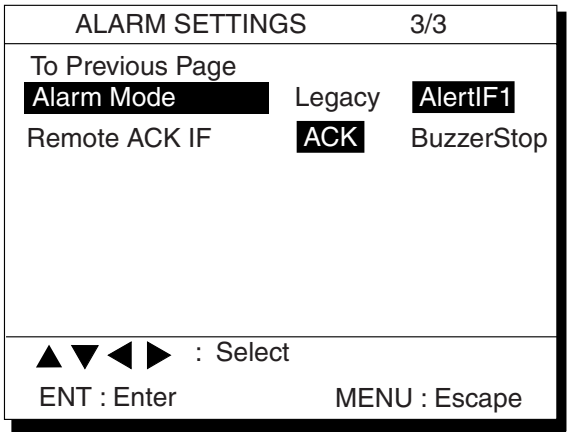


Figure 7-7 Alarm settings menu, page 3/3

3. Press ◀ or ▶ to select Legacy or AlertIF1.
   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)

7.9 Remote ACK IF

Select the function when receiving the remote ACK from the 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 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 light 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.

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 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. This disables 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 numeric 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.

Selecting fix mode

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

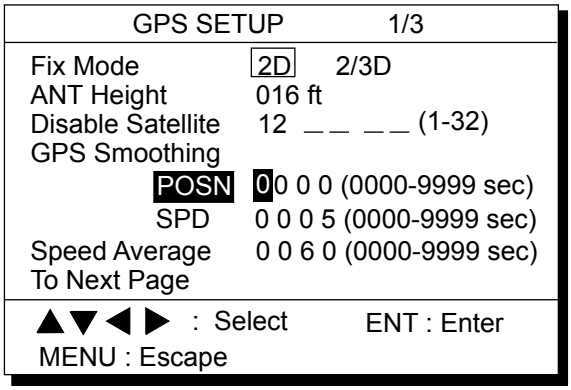


Figure 8-1 GPS SETUP menu, page 1/3

2) Press ▲ or ▼ to select Fix Mode.
3) Press ◀ or ▶ to select the fix mode desired.
4) Press ▼ to change other settings, or press **MENU ESC** key to register settings and escape.

Disabling satellites

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.

Entering 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.

Entering 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.

Entering speed averaging

1) Press **MENU ESC**, **9** and **6**.
2) Press ▲ or ▼ 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.

Selecting RAIM Function

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

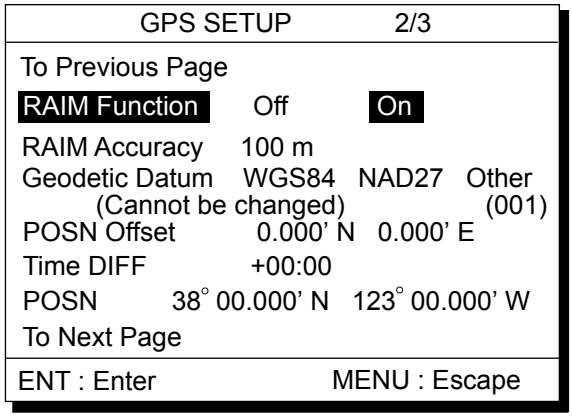


Figure 8-2 GPS SETUP menu, page 2/3

3) Press ◀ or ▶ to select RAIM Function desired.
4) Press the **NU/CU ENT** key.
5) Press the **MENU ESC** key.

Entering 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.
   Press the **MENU ESC** key.

Entering 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.

Entering 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.

Entering 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.

Entering 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.

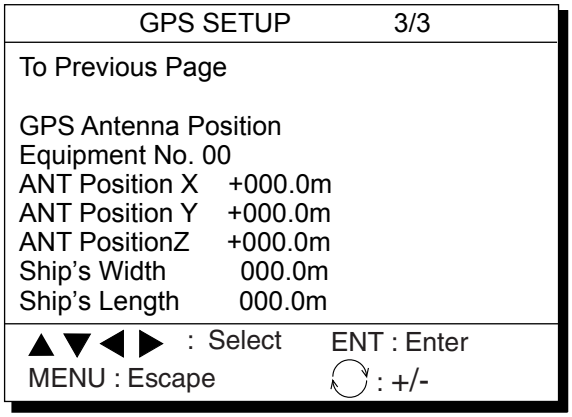
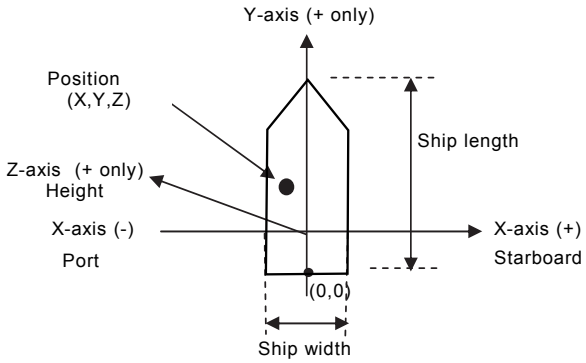


Figure 8-2a GPS SETUP menu, page 3/3

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



8.2 Selecting 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.

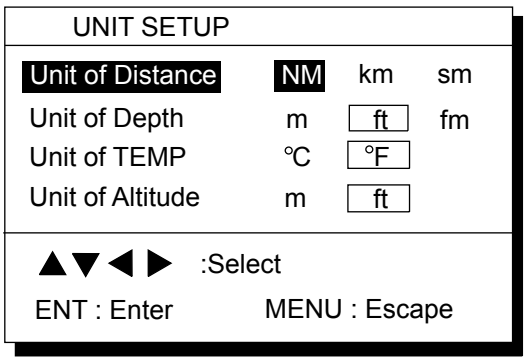


Figure 8-3 UNIT SETUP menu

2) Press ▲ or ▼ 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 Mark, Character Size and Brilliance

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.

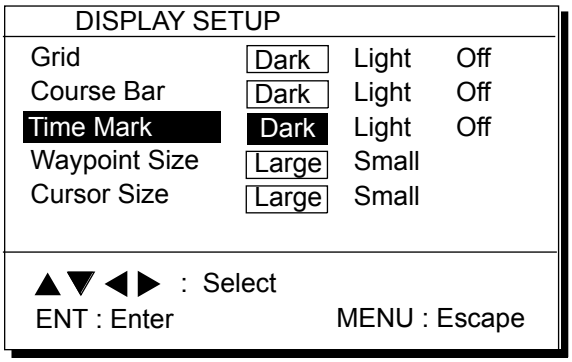


Figure 8-4 DISPLAY SETUP menu

2) Press ▲ or ▼ 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.

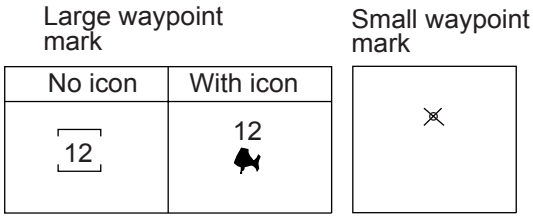


Figure 8-5 Waypoint mark size

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.

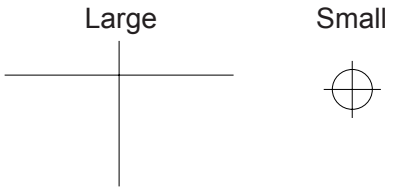


Figure 8-6 Cursor size

1) Press **MENU ESC** and **1**.
2) Press ▲ or ▼ to select Cursor Size.
3) Press ◀ or ▶ to select Large or Small.
4) Press the **NU/CU ENT** key.
6) 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.

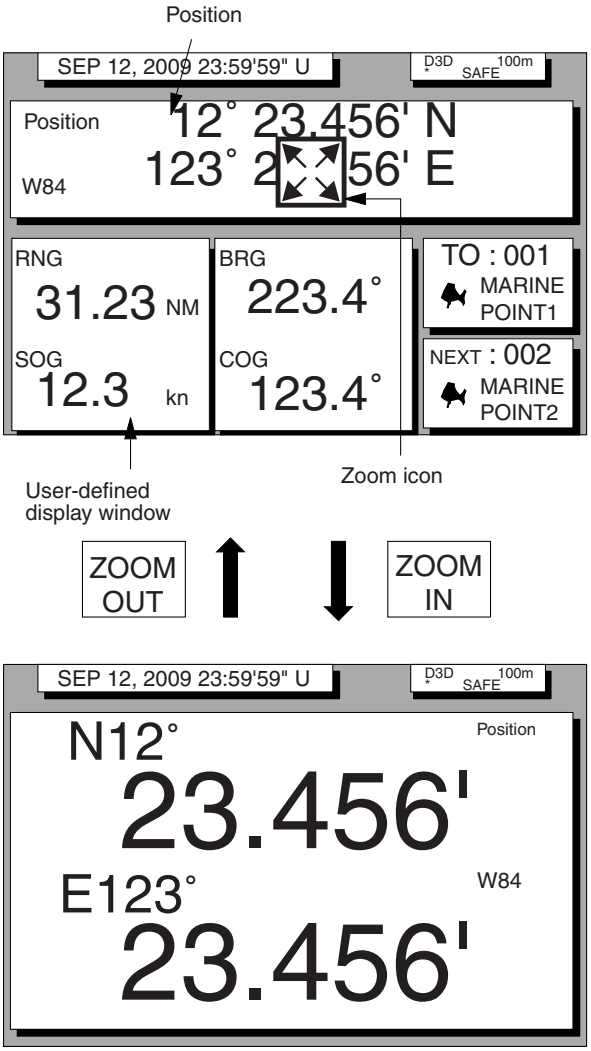


Figure 8-7 How to enlarge indications on the data display

8.4 Settings for Connection of Navigator

Besides its fundamental function of displaying position, the GP-150 can also output various data to external equipment. 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 transmits data using the GP (GPS talker), however it can also transmit using the Loran (LC) or Decca (DE) talker.

Because the GP talker is a relatively new system some early model equipment may not recognize this talker.

DATA 1 output setting

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

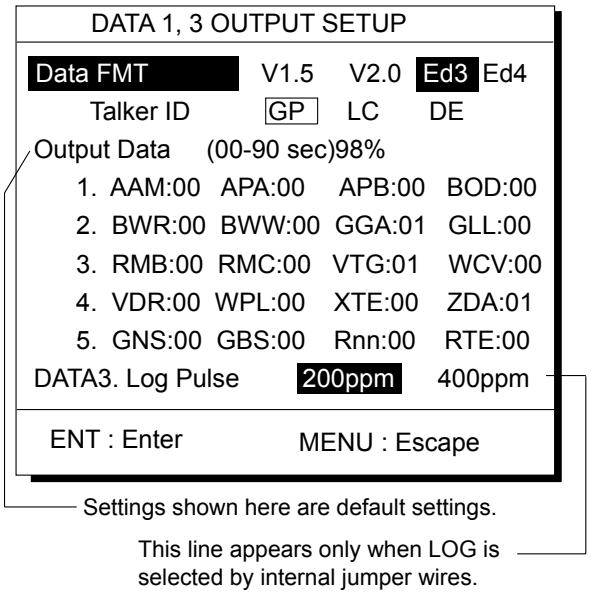


Figure 8-8 DATA 1, 3 OUTPUT SETUP menu

2) Press ▲ or ▼ to select Data FMT.
3) Press ◀ or ▶ to select NMEA 0183 (V1.5 or V2.0) or IEC 61162 (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 installation manual. However, the settings entered by the installer of the equipment should not be changed unless absolutely necessary.

BWC is for great circle navigation; BWR is for rhumb line navigation.

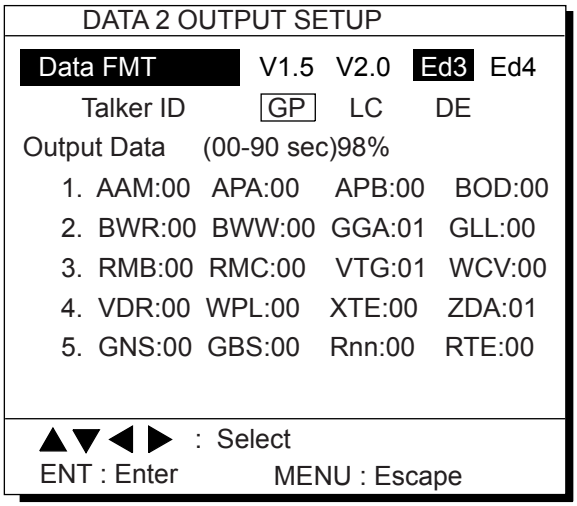
The total data output are shown by percentage on the third line. For best results the total output should not exceed 90%; lengthen the Tx interval of less important data to make the total output less than 90%.

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 then 60% for the Temperature Indicator TI-20.

DATA 2 output setting

1) Press **MENU ESC**, **9** and **4**. The DATA 2 OUTPUT SETUP menu appears.



Settings shown here are default settings.

Figure 8-9 DATA 2 OUTPUT SETUP menu

2) Follow the procedure for setting DATA 1 output.

DATA 3 output setting

The DATA 3 connector can output IEC 61162-1/NMEA 0183 data or log pulse. (For details, see the Installation Manual.) 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 ▲ or ▼ to select DATA 3. Log Pulse.
3) Press ◀ or ▶ to select log pulse of external equipment; 200ppm or 400ppm.
4) Press the **NU/CU ENT** key twice.

Setting DATA 4 to NMEA

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.

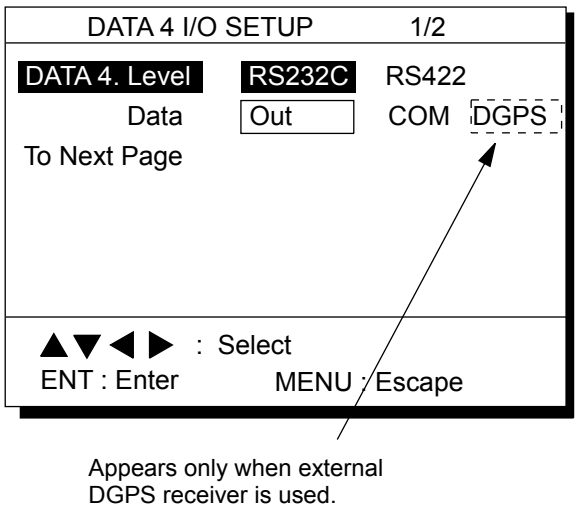


Figure 8-10 DATA 4 I/O SETUP menu (1/2)

2) Press ▲ or ▼ 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.

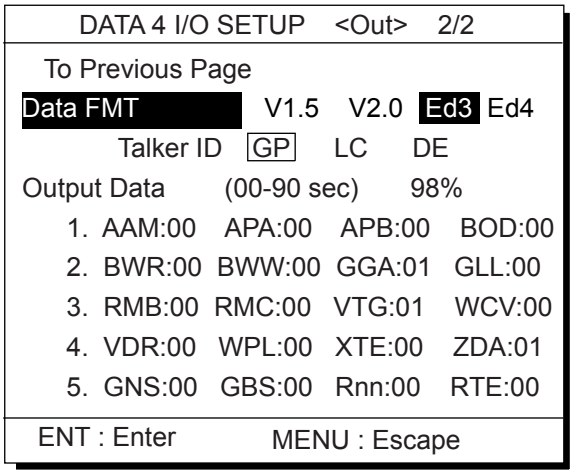


Figure 8-11 DATA 4 I/O SETUP menu (2/2)

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

8.5 Receiving Data from Personal Computer

Loading Waypoints/Routes 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 ▲ or ▼ to select Level.
3) Press ◀ or ▶ to select level of personal computer; RS232C or RS422.
4) Press the **NU/CU ENT** key.
5) Press ▶ to select COM.
6) Press ▼ to select To Next Page. The DATA 4 I/O SETUP menu appears.

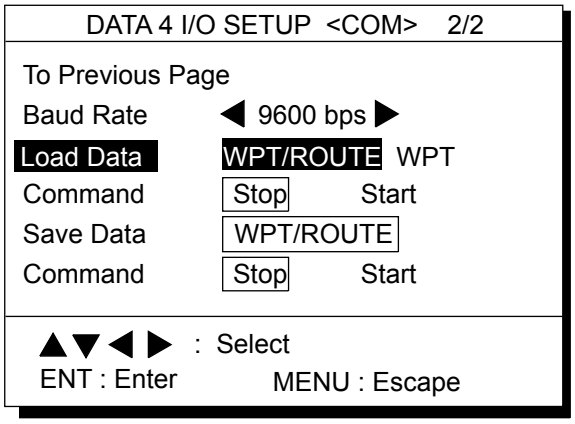


Figure 8-12 DATA 4 I/O SETUP menu (2/2)

7) Press ▲ or ▼ to select Baud Rate.
8) Press ◀ or ▶ to select baud rate; 4800bps, 9600bps, or 19200bps.
9) Press the **NU/CU 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 Figure 8-13 appears.

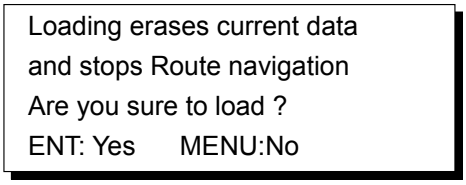


Figure 8-13

13) Press the **NU/CU ENT** key. The message shown in Figure 8-14 appears while data is being loaded.

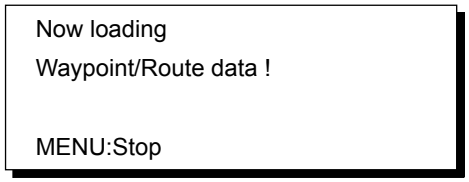


Figure 8-14

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 in Figure 8-15 appears.

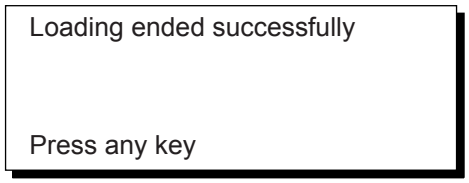


Figure 8-15

If data could not be loaded, the message shown in Figure 8-16 appears.

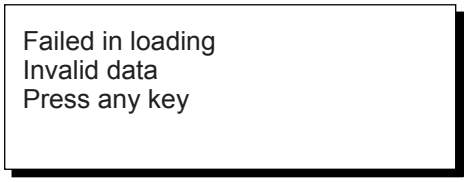


Figure 8-16

Stopping loading of data

1) Press the **MENU ESC** key. The message shown in Figure 8-17 appears.

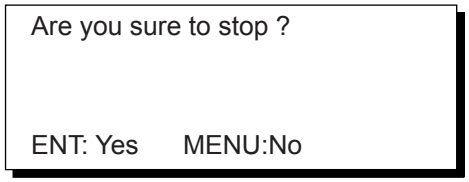


Figure 8-17

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 lighthouse data."
2) Press ◀ or ▶ to select WPT.
3) Press t to select Command.
4) Press ▶ to select Start. The message shown in Figure 8-18 appears.

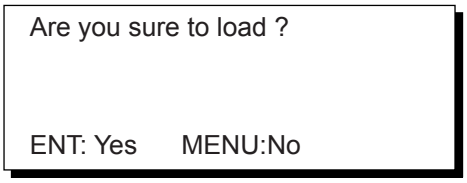


Figure 8-18

5) Press the **NU/CU ENT** key. The message shown in Figure 8-19 appears.

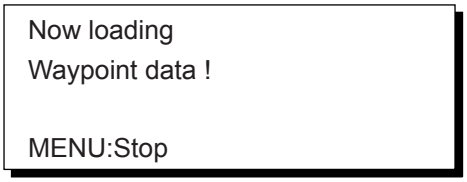


Figure 8-19

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 8-20 appears.

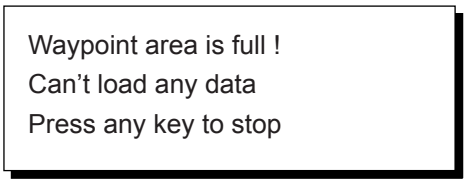


Figure 8-20

7) When the data is loaded, press **CU/NU ENT** and **MENU ESC**. The message shown in Figure 8-21 appears.
The number of valid and invalid waypoints appears in the message.

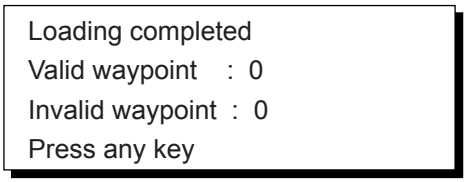


Figure 8-21

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 ▲ or ▼ 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 ▲ or ▼ 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 8-22 appears.

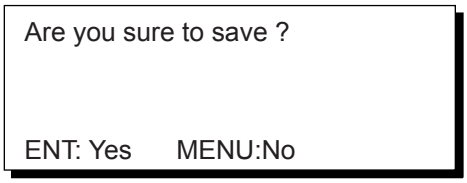


Figure 8-22

11) Press the **NU/CU ENT** key. The message shown in Figure 8-23 appears while data is being saved.

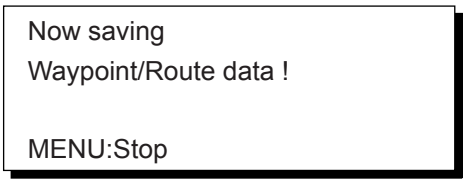


Figure 8-23

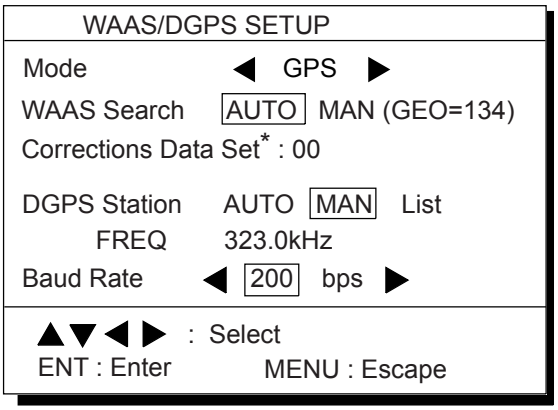
12) Save data at the computer.
13) Press the **MENU ESC** key. When data is saved, the cursor shifts to Stop.
14) Press the **MENU ESC** key.

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.



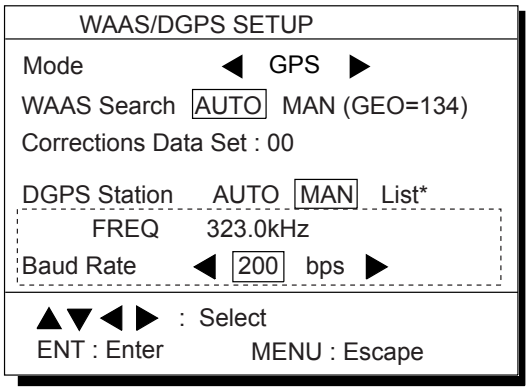
*: Determines how to use the WAAS signal. Use the default setting "00".

Figure 8-24 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.



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

Figure 8-25

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, 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.

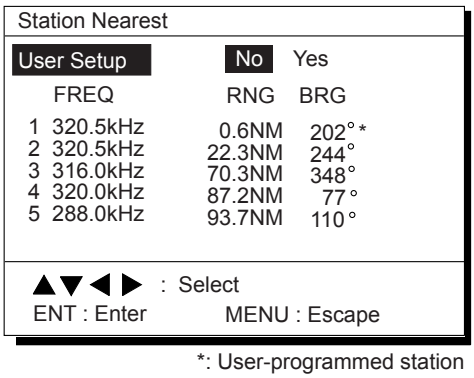


Figure 8-26

2) Press ▲ or ▼ to select the station desired.
3) Press the **ENTER** 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.

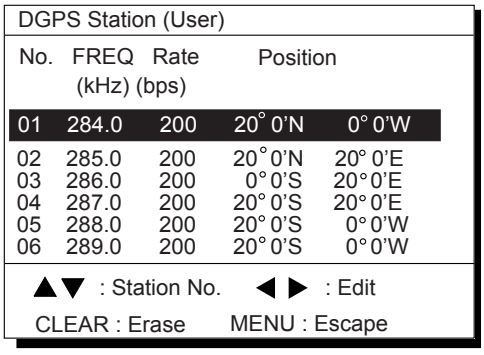


Figure 8-27

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

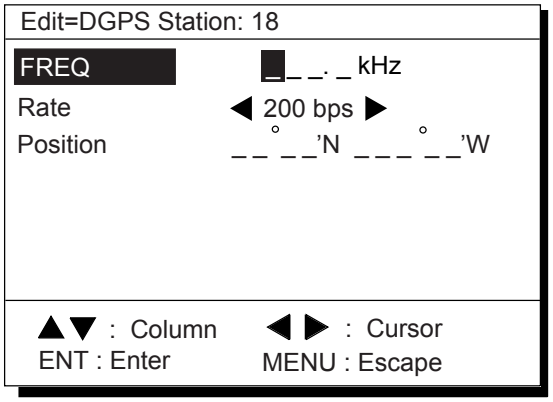


Figure 8-28

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 . Message “ARE YOU SURE?” 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.
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 ◀ or ▶ to show the Edit window.

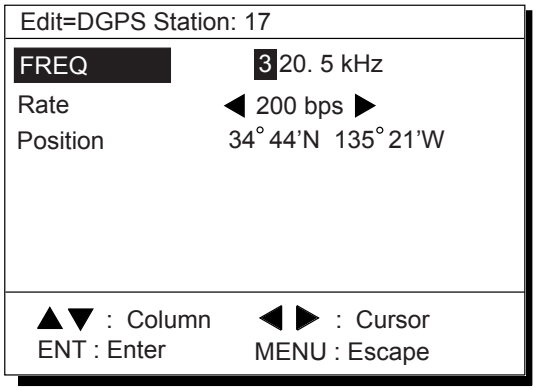


Figure 8-29

6) Edit data, and then press the **NU/CU ENT** key.
7) 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".
8) 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.

Setup for external DGPS beacon receiver

When an external DGPS beacon receiver is connected to the DATA 4 connector, set up the GP-150 according to specification of DPGS beacon receiver connected as follows.

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

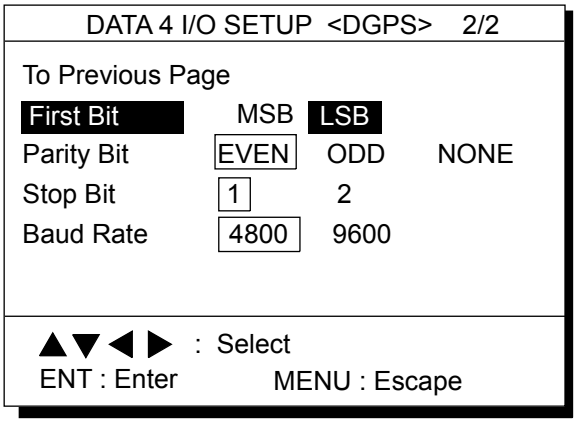


Figure 8-30 DATA 4 I/O SETUP "DGPS" 2/2 menu

7) Press ▲ or ▼ to select First Bit.
8) Press ◀ or ▶ to select first bit; MSB or LSB.
9) Press ▼ to select Parity Bit.
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 **MENU ESC** key.

8.7 Displaying GPS Monitor Displays

Three GPS monitor displays provide GPS information:

- **Satellite monitor** which shows position of GPS satellites
- **Beacon receiver monitor** 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** and **7**.
2) Press ☐ to display the GPS monitor you want to view.

3) Press the **MENU ESC** to escape.

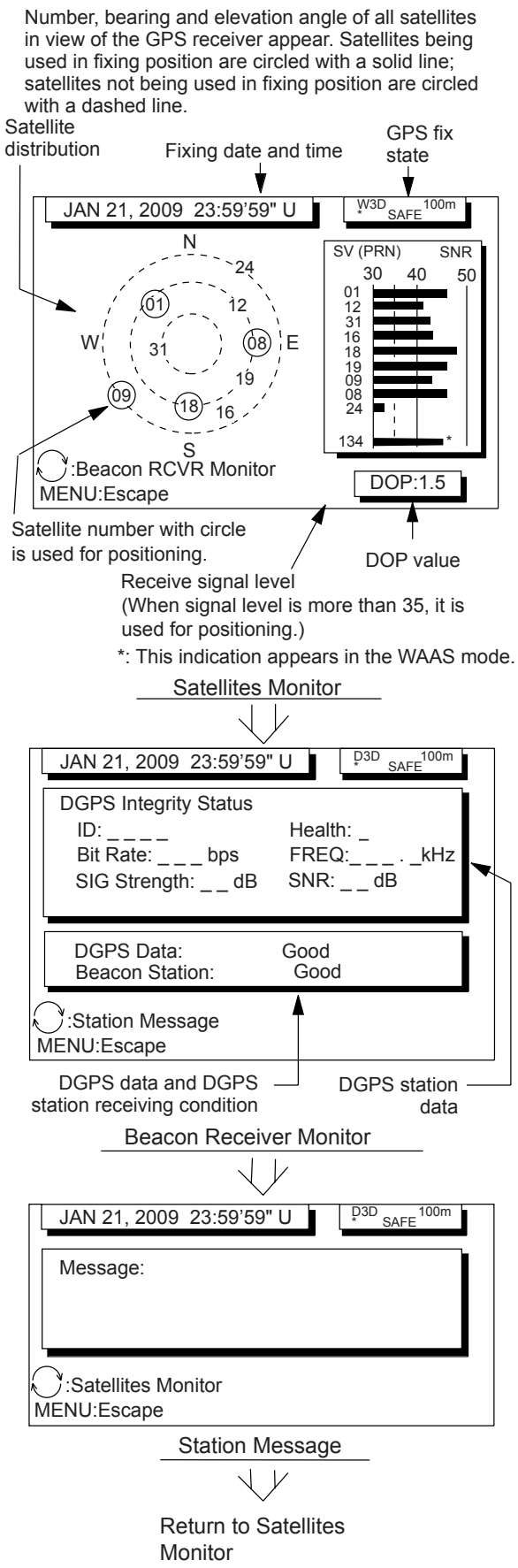


Figure 8-31

9. MAINTE-NANCE & TROUBLE-SHOOTING

9.1 Clearing the Memory

The GP-150 has two memories: GPS memory and plotter memory.

Clearing the plotter memory

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

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

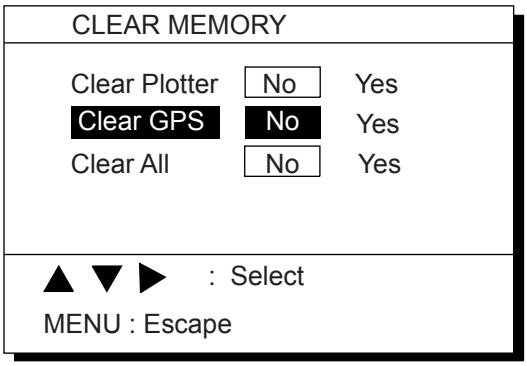


Figure 9-1 CLEAR MEMORY menu

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

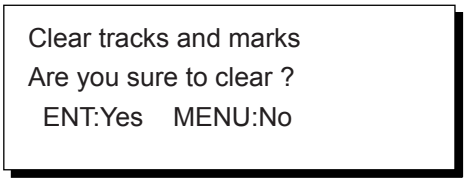


Figure 9-2

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.

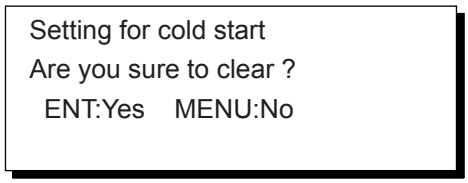


Figure 9-3

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 ▲ or ▼ to select Clear All.
3) Press ▶ to select Yes. The message shown in Figure 9-4 appears.

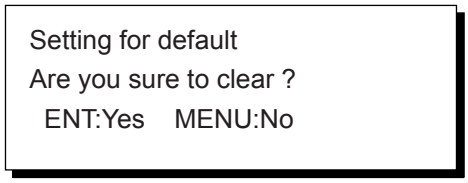


Figure 9-4

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.

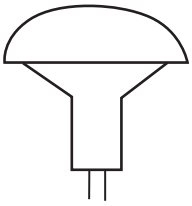
For the LCD screen, wipe the LCD carefully to prevent scratching, using tissue paper and an LCD cleaner. To remove dirt or salt deposits, use an LCD cleaner, wiping slowly with tissue paper so as to dissolve the dirt or salt. Change paper frequently so the salt or dirt will not scratch the LCD. Do not 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 for 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.

9.3 Error Messages

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

⚠ WARNING

Do not open the display unit cover. High voltage exists inside.

If the unit is not working properly, contact your dealer.

No calculation of position

When GPS signal is suddenly lost and position cannot be calculated within one second, the message shown below 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.

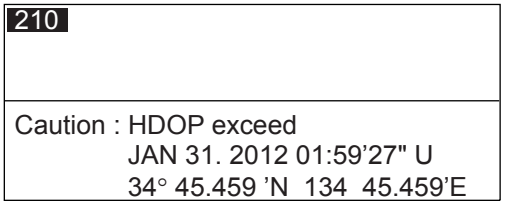


Figure 9-6 Alarm Window (HDOP)

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.

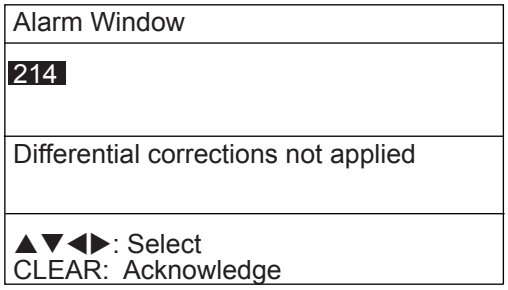


Figure 9-7 Alarm Window (DGPS)

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.



Figure 9-8 Self test error message

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

Output sentence exceed

When 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.

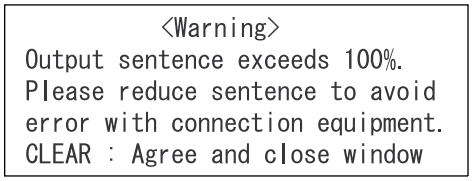


Figure 9-9 Output sentence error message

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…	**Them…**
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**
Data cannot be transmitted to external equipment	• Check if data format is correct: **MENU ESC**, **9-3**, **9-4**, **9-5** See the installation manual for further details. • Tx interval may be set to "0". Select proper interval. **MENU ESC, 9-3**, **9-4**, **9-5** See the installation manual for further details. • Check appropriate settings on external equipment. • Check connections: GP-150 external equipment TD-A RD-A TD-B RD-B

9.5 Diagnostic Tests

Memory and I/O circuits test

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

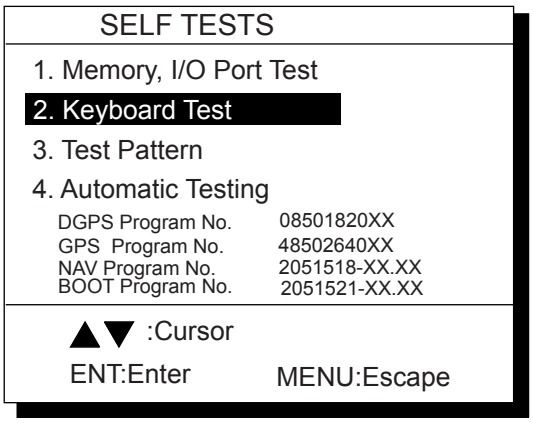


Figure 9-10 Diagnostic TESTS menu

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**.

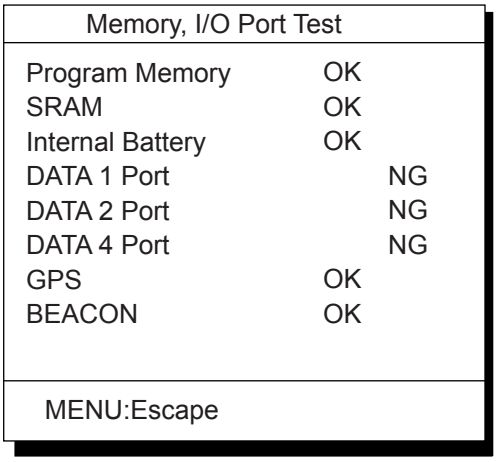


Figure 9-11 MEMORY, I/O PORT TEST display

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.

Note: The life of the internal battery is approximately 5 years.

Name	Type	Code No.
Lithium	CR2450-F2SST2L	000-144-941

Keyboard test

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

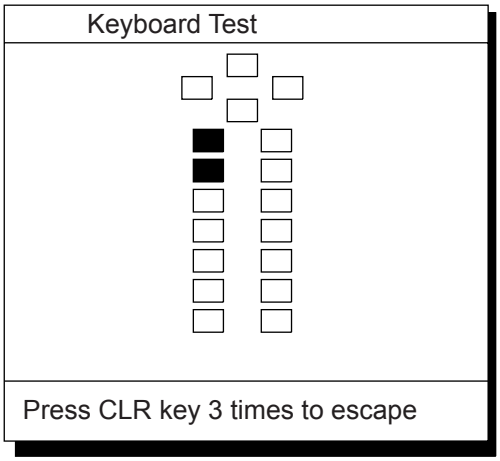


Figure 9-12 KEYBOARD TEST screen

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.

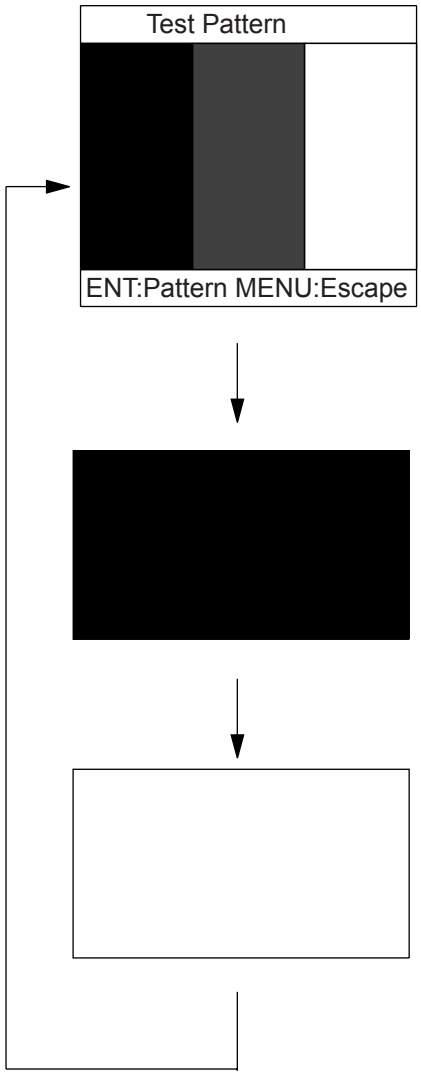


Figure 9-13 Test patterns 1 and 2

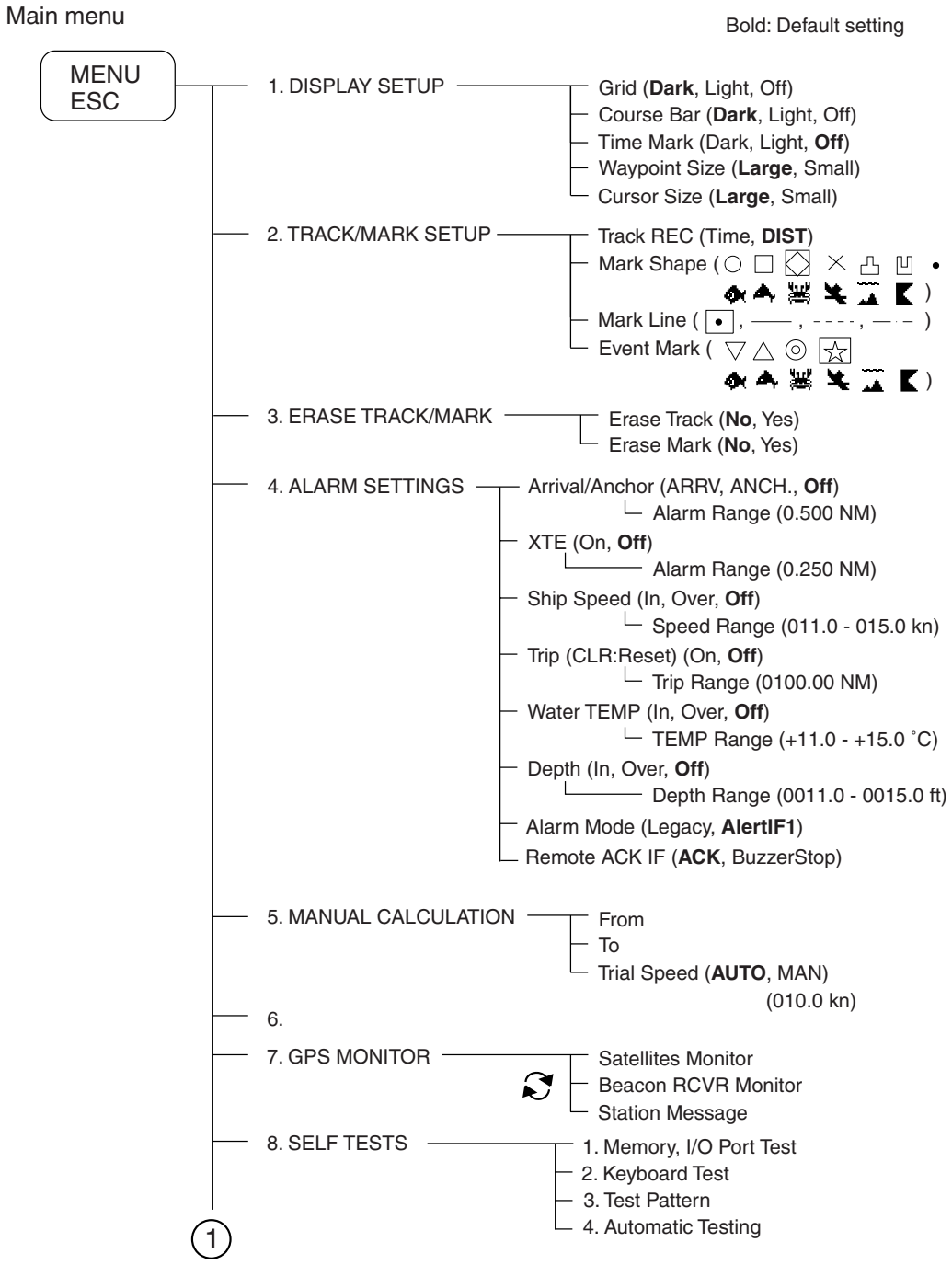
3) Press the **MENU ESC** key.

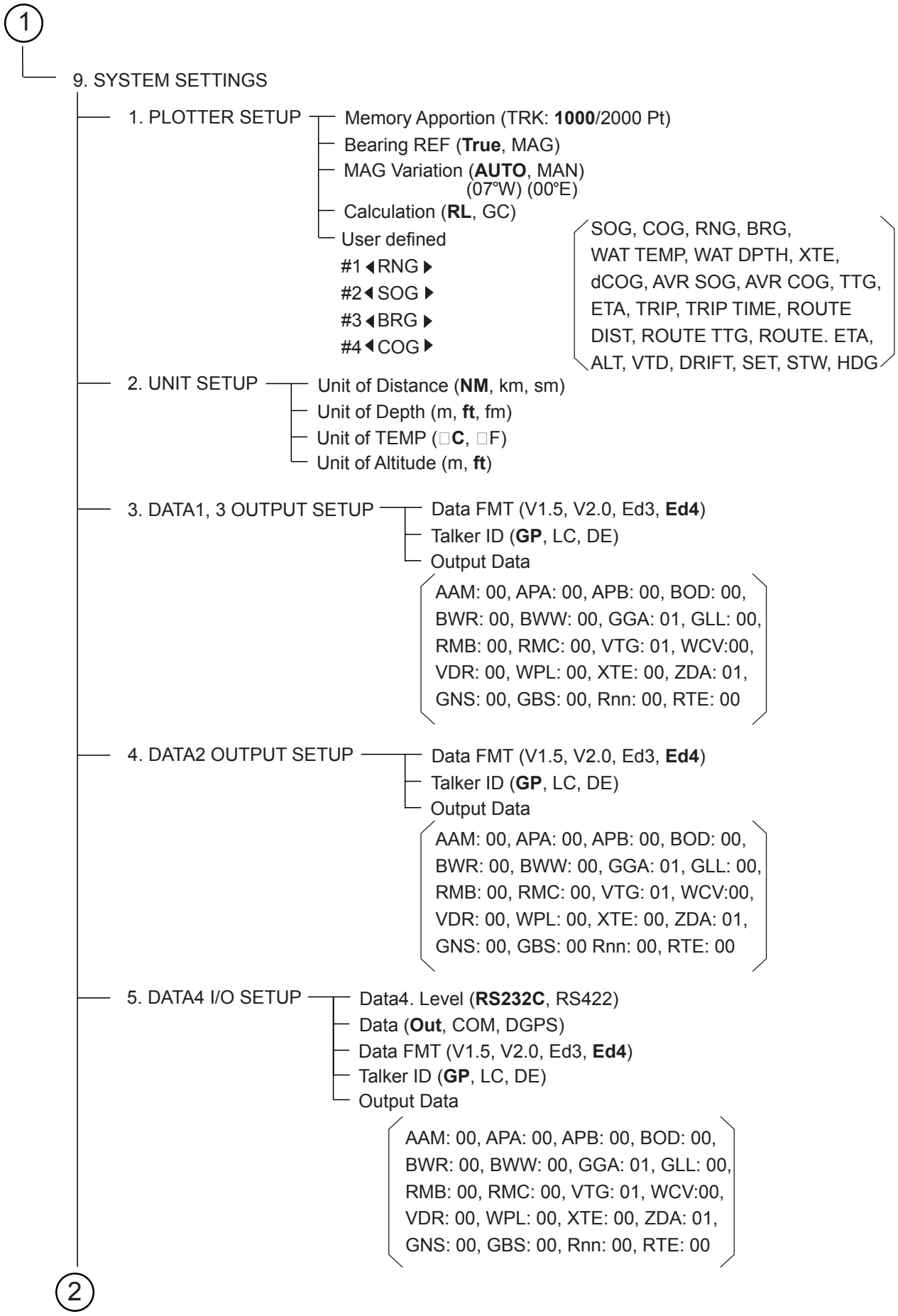
Automatic testing

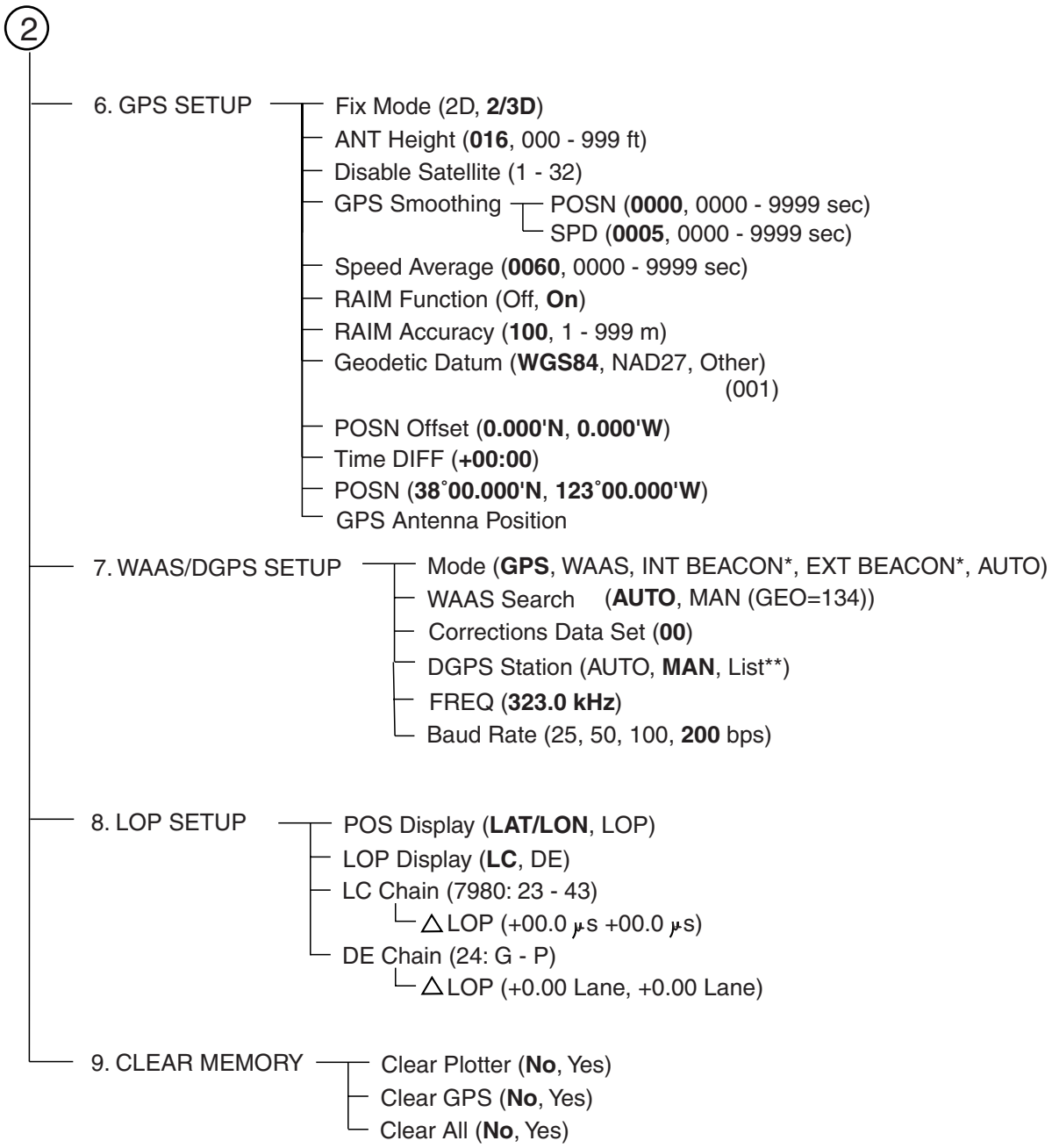
This feature conducts all self tests continuously.

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.

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 ( )
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 DPTH, 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: 00, APA: 00, APB: 00, BOD: 00,
BWR: 00, BWW: 00, GGA: 01, GLL: 00,
RMB: 00, RMC: 00, VTG: 01, WCV:00,
VDR: 00, WPL: 00, XTE: 00, ZDA: 01,
GNS: 00, GBS: 00, Rnn: 00, RTE: 00
4. DATA2 OUTPUT SETUP
Data FMT (V1.5, V2.0, Ed3, **Ed4**)
Talker ID (**GP**, LC, DE)
Output Data
AAM: 00, APA: 00, APB: 00, BOD: 00,
BWR: 00, BWW: 00, GGA: 01, GLL: 00,
RMB: 00, RMC: 00, VTG: 01, WCV:00,
VDR: 00, WPL: 00, XTE: 00, ZDA: 01,
GNS: 00, GBS: 00 Rnn: 00, RTE: 00
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: 00, APA: 00, APB: 00, BOD: 00,
BWR: 00, BWW: 00, GGA: 01, GLL: 00,
RMB: 00, RMC: 00, VTG: 01, WCV:00,
VDR: 00, WPL: 00, XTE: 00, ZDA: 01,
GNS: 00, GBS: 00, Rnn: 00, RTE: 00
2



*: One is displayed according to kind of beacon receiver used.

**: Only when the internal beacon receiver is equipped.

DIGITAL INTERFACE
(IEC 61162-1 EDITION 4)

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

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

Input sentences (DATA 1, DATA2)

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

Transmission interval

All sentences output at the interval selected (00-90 s).
Load requirements as listener
Isolation: Photo coupler
Input impedance: 470 ohms
Max. voltage: ±15V
Threshold: 3 mA (in case of connection of FURUNO device talker)

Data transmission

Data is transmitted in serial asynchronous form 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.

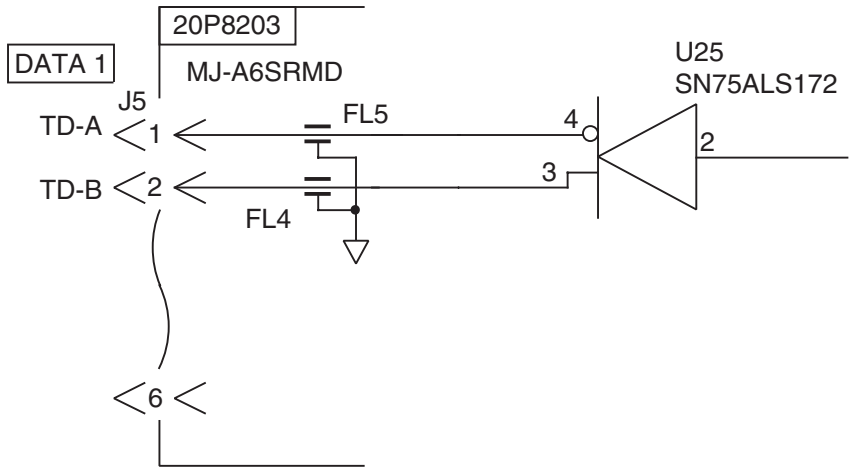
The following parameters are used:

Baud rate: 4800
Data bits: 8 (D7 = 0), parity none
Stop bits: 1

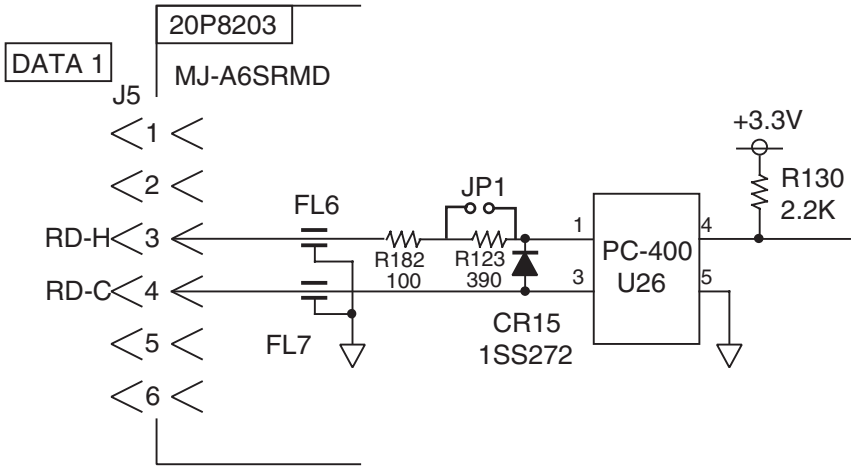
Schematic diagrams

DATA 1 port (output)

Output drive capability: Max. 15 mA



DATA 1 port (input)

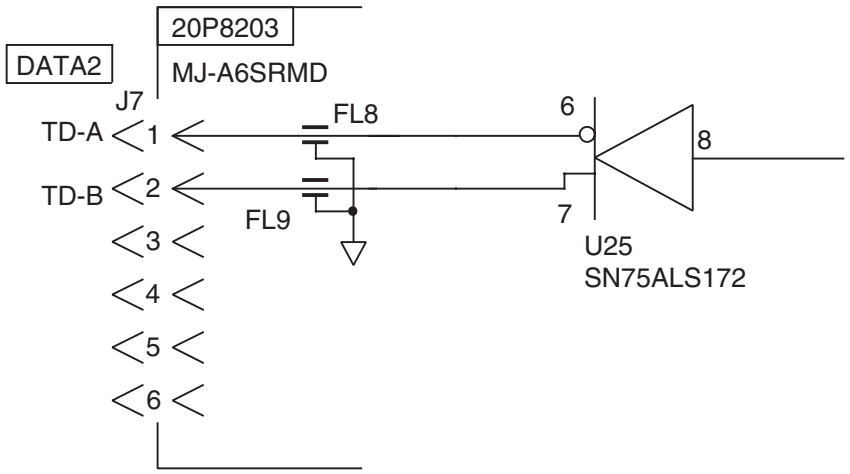


- Load Requirements

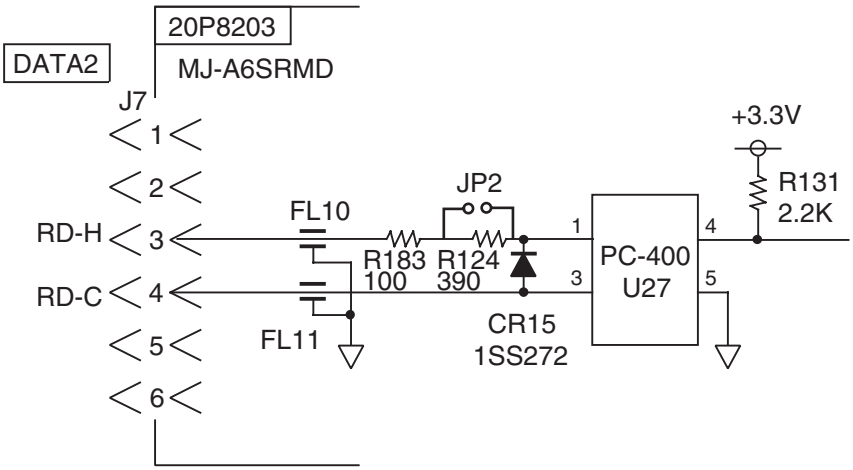
  Isolation: Photo coupler
  Input Impedance: 470 Ω
  Max. Voltage: ±15V
  Threshold: 3mA (In case of FURUNO device talker connection)

DATA 2 port (output)

Output drive capability: Max. 15mA



DATA 2 port (input)

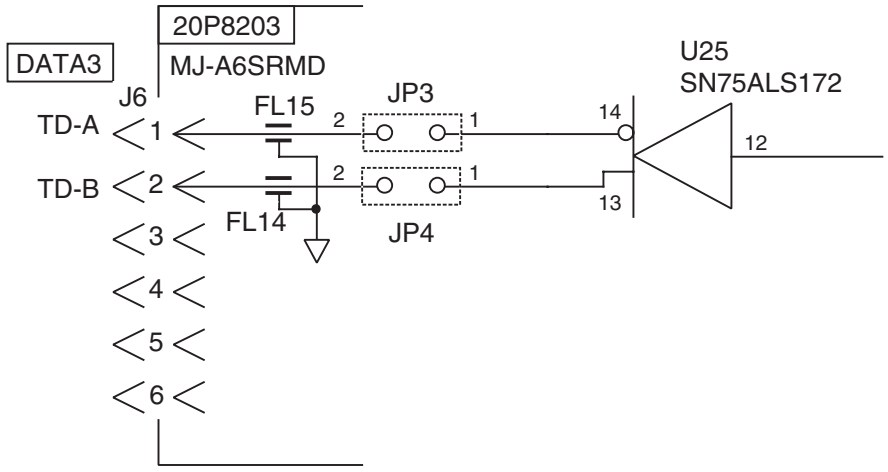


- Load Requirements

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

DATA 3 port (output)

Output drive capability: Max. 15mA



DATA 4 port

IN/OUT signal is selected by the menu among the output of IEC 61162-1, NMEA Ver. 1.5/2.0, PC input/output and DGPS signal.

Sentence description

AAM-Waypoint arrival alarm

```
$--AAM,A,A,x.x,N,c--c*hh<CR><LF>
       | |  |  |  |   |
       | |  |  |  |   +--------- 5
       | |  |  |  +------------- 4
       | |  +---+---------------- 3
       | +---------------------- 2
       +------------------------ 1
```

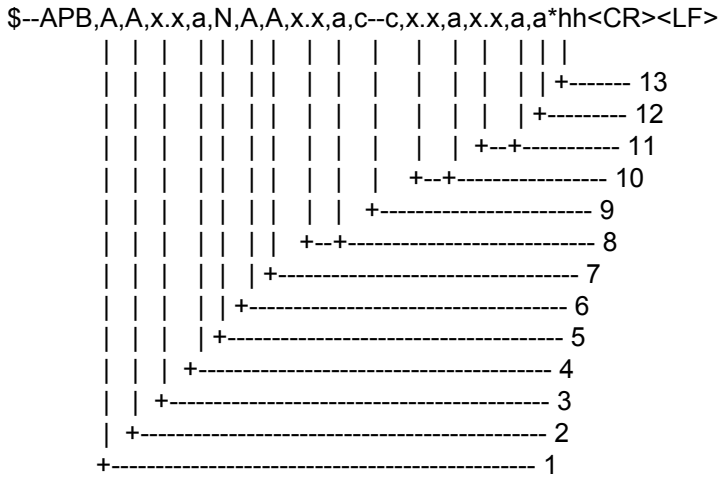
1. Status: A=arrival circle entered, V=not entered
2. Status: A=perpendicular passed at waypoint, V=not passed
3. Arrival sircle radius, nautical miles
4. Waypoint ID
5. Checksum

ACK – Acknowledge alarm

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
```

APB - Autopilot sentence data



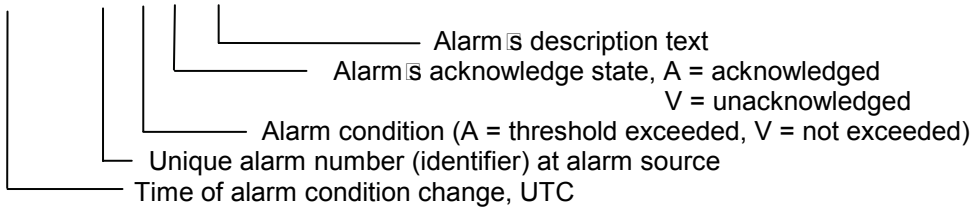
1. Status: A=Data varid V=LORAN-C blink or SNR warning
   V=general warning flag for other navigation systems when a reliable fix is not available
2. Status: A=OK or not used
   V=LORAN-C cycle lock warning flag
3. Magnitude of XTE(cross-track-eror)
4. Direction to steer,L/R
5. XTE units, nautical miles
6. Status: A=arrival circle entered
   V=arrival circle not passed
7. Status: A=perpendicular passed at waypoint
   V=perpendicular not entered
8. Bearing origin to destination, M/T
9. Destination waypoint ID
10. Bearing, present potition to destination, magnetic or true
11. Heading to steer to destination waypoint, magnetic or true
12. Mode indicator(see Note)
13. Checksum

NOTE Positioning system Mode indicator:
A = Autonomous mode
D = differential mode
S = Simulator mode
N = Data not valid

ALR – Set alarm state

Local alarm condition and status. This sentence is used to report an alarm condition on a device and its current state of acknowledgement.

$--ALR,hhmmss.ss,xxx,A, A,c--c*hh<CR><LF>

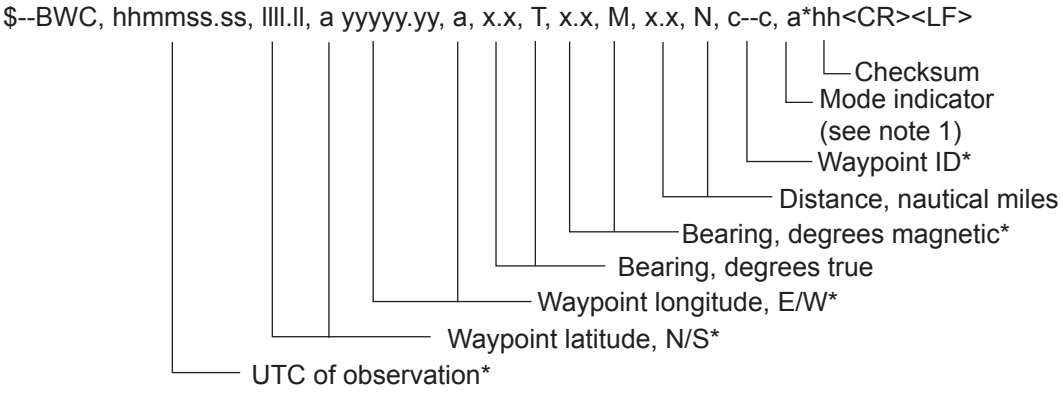


BOD - Bearing, origin to destination

```
$--BOD,x.x,T,x.x,M,c--c,c--c*hh<CR><LF>
       |   |  |   |   |    |  |
       |   |  |   |   |    |  +--------- 5
       |   |  |   |   |    +------------ 4
       |   |  |   |   +------------------ 3
       |   |  +--+---------------------- 2
       +--+--------------------------- 1
```

1. Bearing, degrees true
2. Bearing, degrees magnetic
3. Destination waypoint ID
4. Origin waypoint ID
5. Checksum

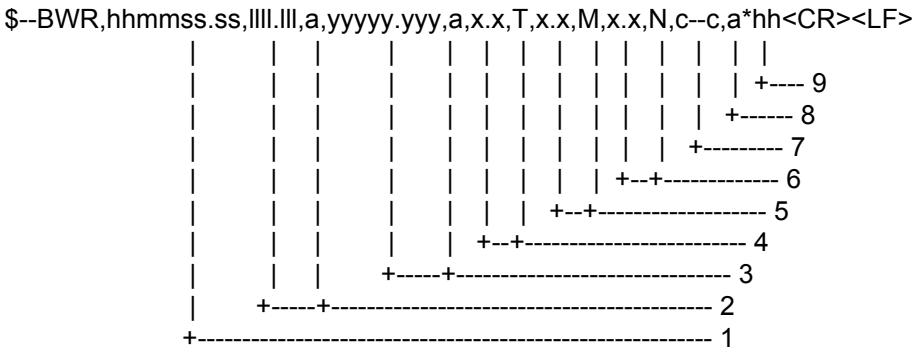
BWC - Bearing and distance to waypoint



*: Not used

NOTE 1: Positioning system Mode indicator:
A= Autonomous mode
D= Differential mode
S= Simulator mode
N= Data not valid
The Mode indicator field shall not be a null field.

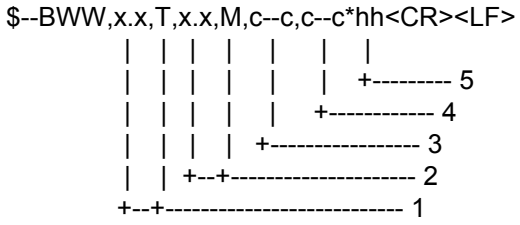
BWR - Bearing, waypoint to range



1. UTC of observation
2. Waypoint latitude, N/S
3. Waypoint longitude, E/W
4. Bearing, degrees true
5. Bearing, degrees magnetic
6. Distance, nautical miles
7. Waypoint ID
8. Mode indicator(see note)
9. Checksum

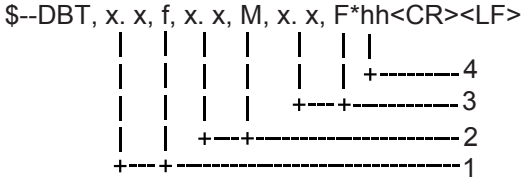
NOTE Positioning system Mode indicator:
A = Autonomous mode
D = differential mode
S = Simulator mode
N = Data not valid
The Mode indicator field shall not be a null field.

BWW - Bearing, waypoint to waypoint



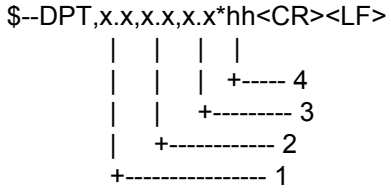
1. Bearing, degrees true
2. Bearing, degrees magnetic
3. TO waypoint ID
4. FROM waypoint ID
5. Checksum

DBT - Depth below transducer



1. Water depth, feet
2. Water depth, m
3. Water depth, fathoms
4. Checksum

DPT - Depth



1. Water depth relative to trancsducer, in meters
2. Offset from transeducer, in meters(see notes 1 and 2)
3. Maximum range scale in use
4. Checksum

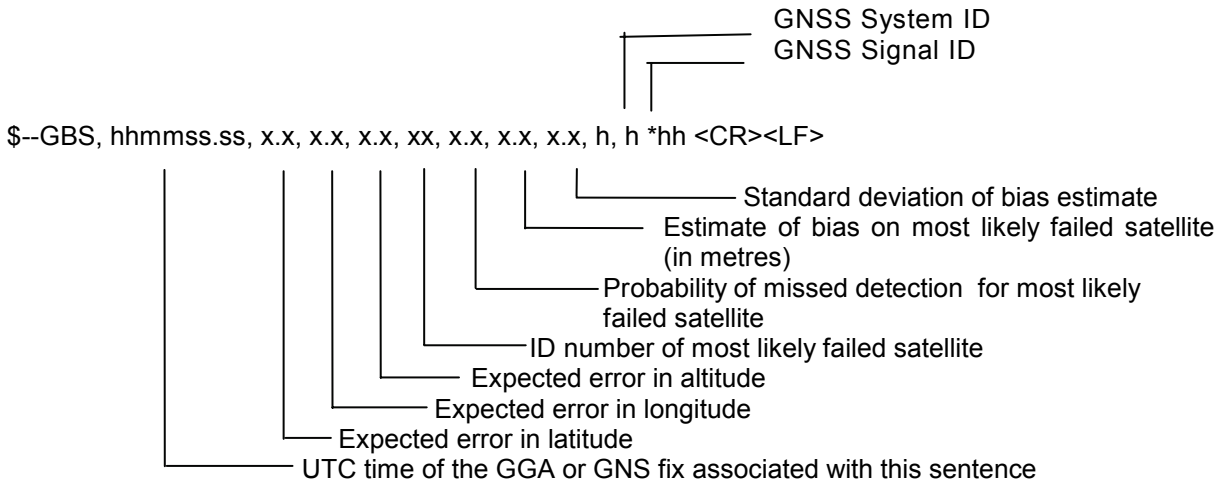
NOTE1 "positive"=distance from transeduser to water-line.
"-"=distance from transducer to keel.
NOTE2 For IEC applications the offset should always be applied so as to provide depth relative to the keel.

DTM - Datum reference

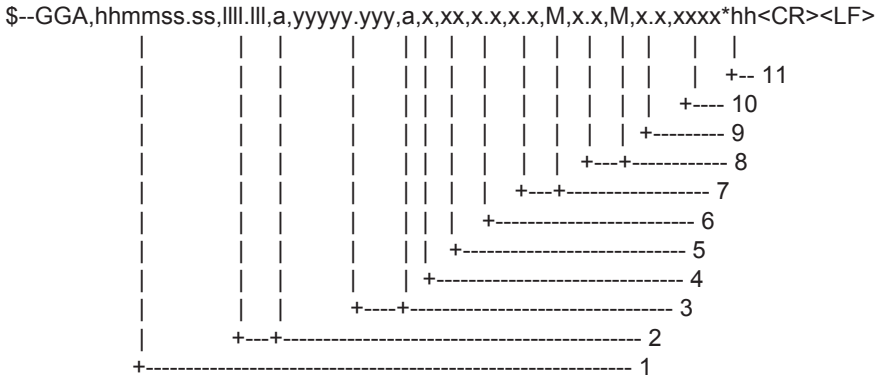
```
$--DTM,ccc,a,x.x,a,x.x,a,x.x,ccc*hh<CR><LF>
          |  |  |   | |  |  |   |  |
          |  |  |   | |  |  |   |  +--- 7
          |  |  |   | |  |  |   +------ 6
          |  |  |   | |  |  +---------- 5
          |  |  |   | +--+-------------- 4
          |  |  +---+------------------- 3
          |  +------------------------- 2
          +---------------------------- 1
```

1. Local datum W84 - WGS84
   W72 - WGS72
   S85 - SGS85
   P90 - PE90
   999 - User defined
   IHO datum code
2. Local datum subdivision code
3. Lat offset, min, N/S
4. Lon offset, min, E/W
5. Altitude offset, m
6. Reference dattum W84 - WGS84
   W72 - WGS72
   S85 - SGS85
   P90 - PE90
7. Checksum

GBS -GNSS satellite fault detection

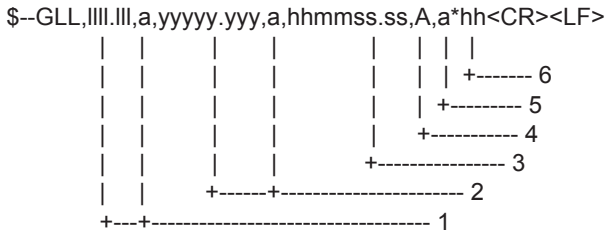


GGA -Global positioning system fix data



1. UTC of position
2. Latitude, N/S
3. Longitude, E/W
4. GPS quality indicator (0: No fix, 1: GPS, 2: Differential, 8: Demo mode)
5. Number of satllite in use,00-12, may be different from the number in view
6. Horizontal dilution of precision
7. Antenna altitude above/below mean sealevel, m
8. Geoidal separation, m
9. Age of differential GPS data
10. Differential reference station ID, 0000-1023
11. Checksum

GLL - Geographic position, latitude and longitude

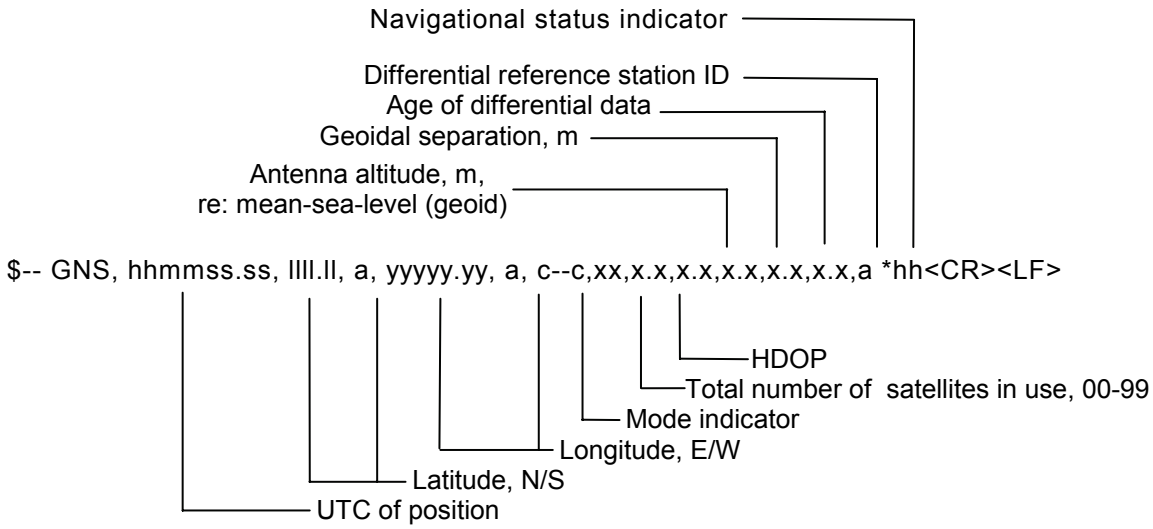


1. Latitude, N/S
2. Longitude, E/W
3. UTC of position
4. Status: A=data valid, V=data invalid
5. Mode indicator(see note)
6. Checksum

NOTE Positioning system Mode indicator:
A = Autonomous
D = Differential
S = Simulator
N = Data not valid

The Mode indicator field supplements the Status field. The Status field shall be set to V=invalid for all values of Operating Mode except for A=Autonomous and D=Differential. The positioning system Mode indicator and Status field shall not be null fields.

GNS - GNSS fixed data



HDG – Heading, deviation and variation

```
$--HDG,x.x,x.x,a,x.x,a*hh<CR><LF>
       |   |   |   |  | |
       |   |   |   |  | +--------- 4
       |   |   |   +--+------------ 3
       |   +---+-------------------- 2
       +-------------------------- 1
```

1. Magnetic sensor heading, degrees
2. Magnetic deviation, degrees E/W
3. Magnetic variation, degrees E/W
4. Checksum

HDM - Heading, magnetic

```
$--HDM,x.x,M*hh<CR><LF>
       |   |  |
       |   |  +--------- 2
       +---+------------ 1
```

1. Heading, degrees magnetic
2. Checksum

HDT - Heading, true

```
$--HDT,x.x,T*hh<CR><LF>
       |   |  |
       |   |  +--------- 2
       +---+------------ 1
```

1. Heading, degrees true
2. Checksum

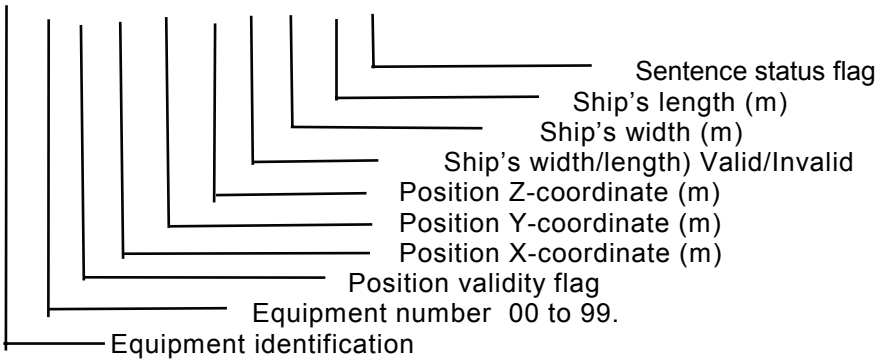
MTW - Water temperature

```
$--MTW,x.x,C*hh<CR><LF>
       |   |  |
       |   |  +--------- 2
       +---+------------ 1
```

1. Temperature, degrees C
2. Checksum

POS – Device position and ship dimensions report or configuration command

$- - POS,cc,xx,a,x.x,x.x,x.x,a,x.x,x.x,a*hh<CR><LF>

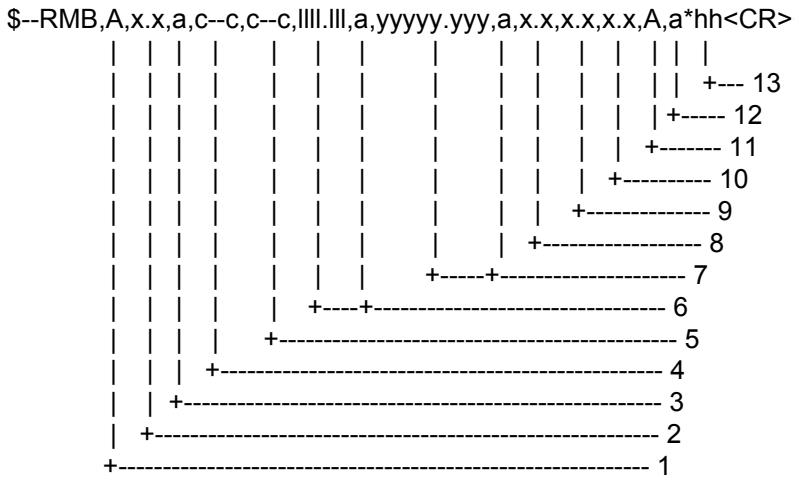


NOTE This field is used to indicate a sentence that is a status report of current settings or a configuration command changing settings. This field should not be null.

R = Sentence is a status report of current settings (use for a reply to a query).

C = Sentence is a configuration command to change settings. A sentence without □C□sinot a command.

RMB - Recommended minimum navigation information



1. Data status: A=data valid, V=navigation receiver warning
2. Cross track error(see note 2) n.miles
3. Direction to steer L/R
4. Origin waypoint ID
5. Destination waypoint ID
6. Destination waypoint latitude,N/S
7. Destination waypoint longitude,E/W
8. Range to destination, n.miles(see note 1)
9. Bearing to destination, degrees true
10. Destination closing velocity, knots
11. Arrival status: A=arrival circle entered or perpendicular passed, V=not entered or passed
12. Mode indicator(see note 3)
13. Checksum

NOTES

1 If range to destination exceeds 999.9 nautical miles, display 999.9.

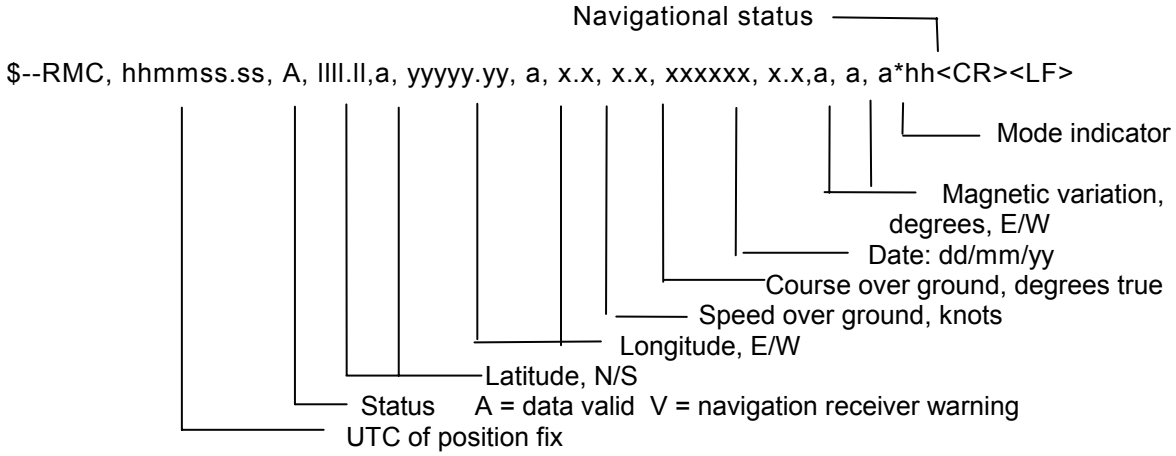
2 If cross track error exceeds 9.99 nautical miles, display 9.99.

3 Positioning system Mode indicator:

A = Autonomous
D = Differential
S = Simulator
N = Data not valid

The Mode indicator field supplements the Status field. The Status field shall be set to V=invalid for all values of Operating Mode except for A=Autonomous and D=Differential. The positioning system Mode indicator and Status field shall not be null fields.

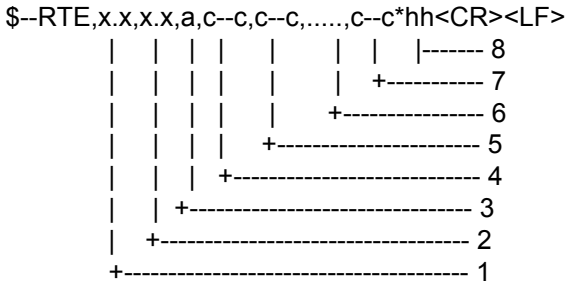
RMC- Recommended minimum specific GPS data



NOTE Positioning system Mode indicator:
A = Autonomous
D = Differential
S = Simulator
N = Data not valid

The Mode indicator field supplements the Status field. The Status field shall be set to V=invalid for all values of Operating Mode except for A=Autonomous and D=Differential. The positioning system Mode indicator and Status field shall not be null fields.

RTE - Routes



1. Total number of messages being transmitted
2. Message number
3. Message mode:
   c=complete route, all waypoints
   w=working route, first listed waypoint is "FROM",
   second is "TO" and remaining reset of route
4. Route identifier
5. Waypoint identifier
6. Additional waypoint identifiers
7. Waypoint "n" identifier
8. Checksum

THS – True heading and status

```
$--THS,x.x,a*hh<CR><LF>
       |  |
       |  └─ Mode indicator
       └──── Heading, degrees true
```

TLL - Target latitude and longitude

```
$--TLL,xx,llll.lll,a,yyyyy.yyy,a,c--c,hhmmss.ss,a,a*hh<CR><LF>
       |  |  |     |     |  |       |       | |  |
       |  |  |     |     |  |       |       | | +--------- 8
       |  |  |     |     |  |       |       | +----------- 7
       |  |  |     |     |  |       |       +------------- 6
       |  |  |     |     |  |       +---------------------- 5
       |  |  |     |     |  +-------------------------- 4
       |  |  |     +-----+----------------------------- 3
       |  +----+---------------------------------------- 2
       +-------------------------------------------------- 1
```

1. Target number 00 - 99
2. Latitude, N/S
3. Longitude, E/W
4. Target name
5. UTC of data
6. Target status(see note)
7. Reference target=R,null otherwise
8. Checksum

NOTE - Target status

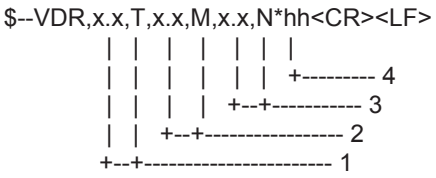
L = lost,tracked target has beenlost
Q = query,target in the process of acquisition
T = tracking

VBW – Dual ground/water speed

```
$--VBW,x.x,x.x,A,x.x,x.x,A,x.x,A,x.x,A*hh<CR><LF>
       |   |  |   |   |  |   |  |   |  |  |
       |   |  |   |   |  |   |  |   |  |  +--- 11
       |   |  |   |   |  |   |  |   |  +----- 10
       |   |  |   |   |  |   |  |   +-------- 9
       |   |  |   |   |  |   |  +------------ 8
       |   |  |   |   |  |   +--------------- 7
       |   |  |   |   |  +------------------ 6
       |   |  |   |   +--------------------- 5
       |   |  |   +------------------------ 4
       |   |  +--------------------------- 3
       |   +------------------------------ 2
       +--------------------------------- 1
```

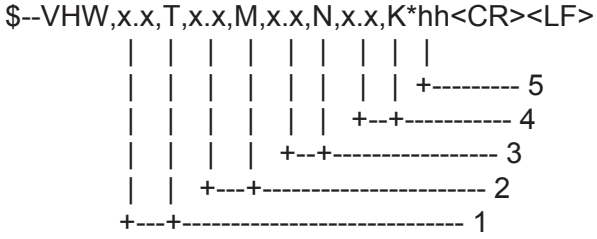
1. Longitudial water speed, knots
2. Transverse water speed, knots
3. Status: water speed, A=data valid V=data invalid
4. Longitudial ground speed, knots
5. Transverse ground speed, knots
6. Status: ground speed, A=data valid V=data invalid
7. Stern transverse water speed, knots
8. Status: stern water speed, A=data valid V=data invalid
9. Stern transverse ground speed, knots
10. Status: stern ground speed, A=data valid V=data invalid
11. Checksum

VDR – Set and drift



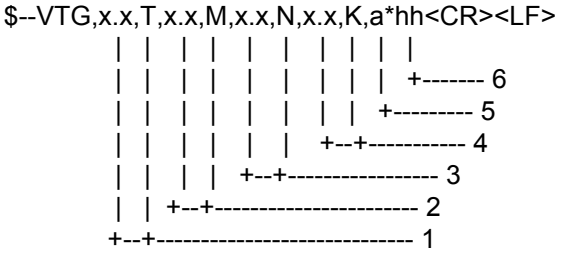
1. Direction, degrees true
2. Direction, degrees magnetic
3. Current speed, knots
4. Checksum

VHW – Water speed and heading



1. Heading, degrees true
2. Heading, degrees magnetic
3. Speed, knots
4. Speed, km/h
5. Checksum

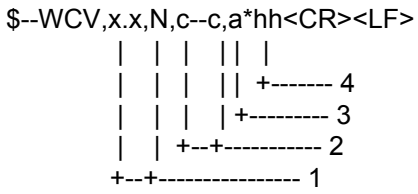
VTG - Course over ground and ground speed



1. Course over ground, degrees true
2. Course over ground, degrees magnetic
3. Speed over ground, knots
4. Speed over ground, km/h
5. Mode indicator(see note)
6. Checksum

NOTE Positioning system Mode indicator:
A = Autonomous
D = Differential
S = Simulator
N = Data not valid
The positioning system Mode indicator field shall not be a null field.

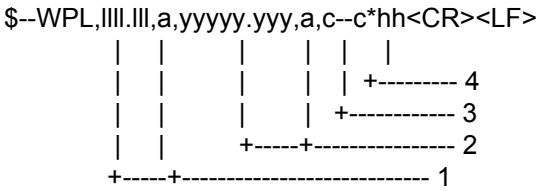
WCV - Waypoint closure velocity



1. Velocity component, knots
2. Waypoint identifier
3. Mode indicator(see note)
4. Checksum

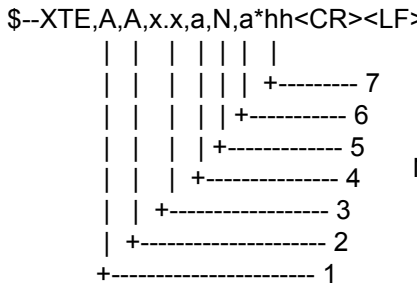
NOTE Positioning system Mode indicator:
A = Autonomous
D = Differential
S = Simulator
N = Data not valid
The positioning system Mode indicator field shall not be a null field.

WPL - Waypoint location



1. Waypoint latitude, N/S
2. Waypoint longitude, E/W
3. Waypoint identifier
4. Checksum

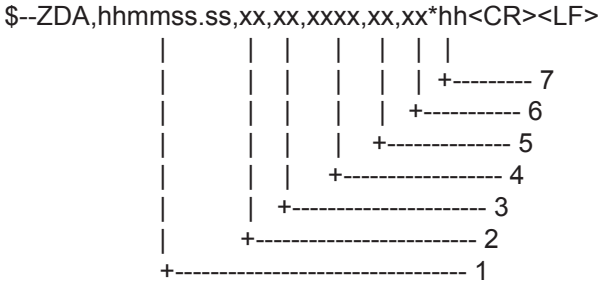
XTE - Cross-track error, measured



NOTE Positioning system Mode indicator:
A = Autonomous mode
D = differential mode
S = Simulator mode
N = Data not valid

1. Status: A=data valid
   V=LORAN-C blink or SNR warning
   V=general warning flag or other navigation systems when a reliable fix is not available
2. Status: A=data valid
   V=LORAN-C cycle lock warning flag
3. Magnitude of cross-track error
4. Direction to steer, L/R
5. Units, nautical miles
6. Mode indicator(see note)
7. Checksum

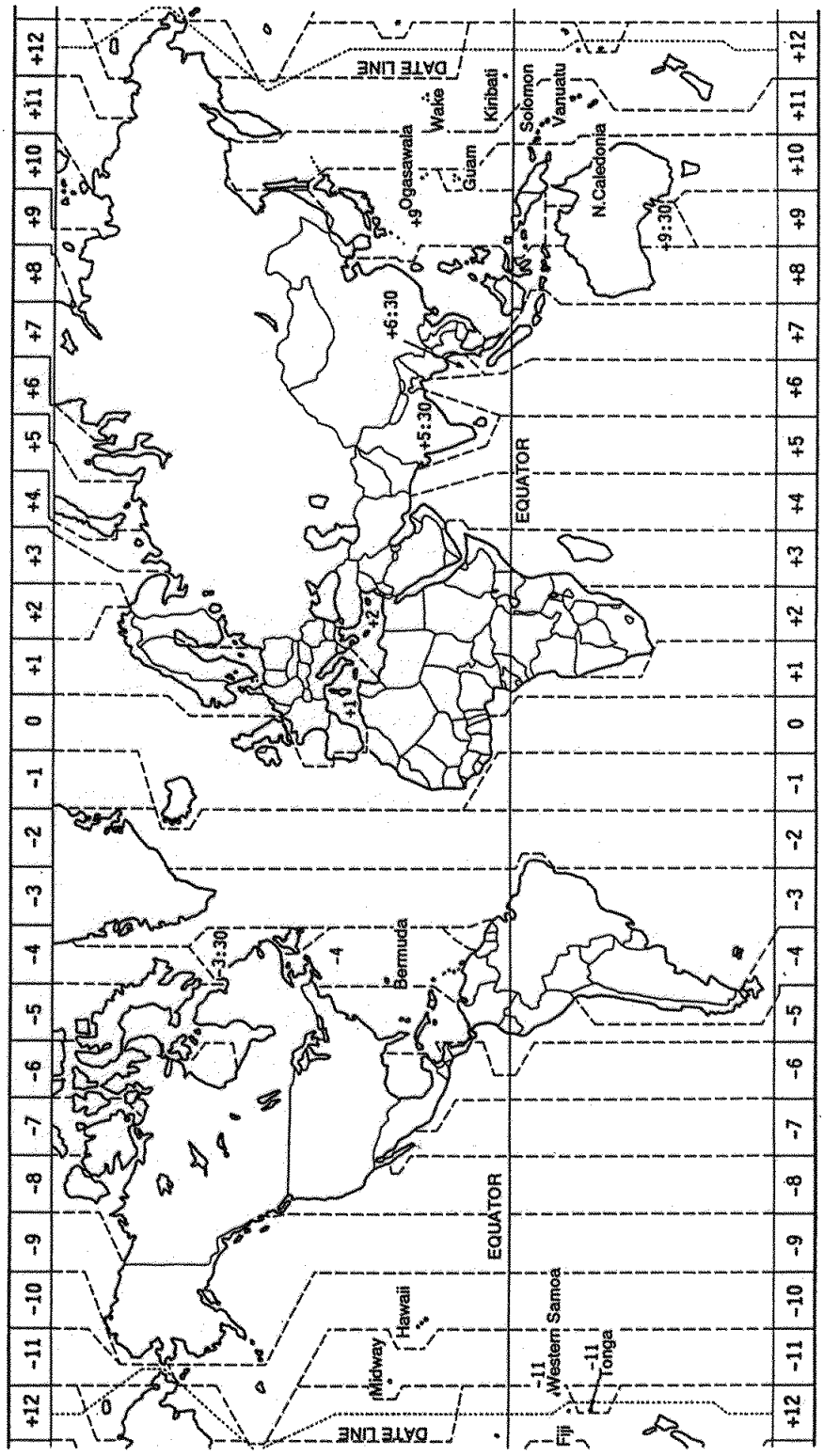
ZDA - Time and date



1. UTC
2. Day, 01 to 31(UTC)
3. Month, 01 to 12(UTC)
4. Year(UTC)
5. Local zone hours, 00h to +-13h
6. Local zone minutes, 00 to +59
7. Checksum

(FURUNO proprietary sentences)
$PFEC,AGFPA: Autopilot information from FURUNO autopilot

TIME DIFFERENCES



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	10	25	50	65	–
North Central USA	8290	11	27	42	–	–
North Saudi Arabia	8990	11	25	40	56	69
Great Lakes	8970	11	28	44	59	–
South Central USA	9610	11	25	40	52	65
West Coast USA	9940	11	27	40	–	–
Northeast USA	9960	11	25	39	54	–
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	Chain no.	Chain	Chain code	Location
01	South Baltic	0A	Europe	34	Kanto	8C	Japan
02	Vestlandet	0E	"	35	Shikoku	4C	"
03	Southwest British	1B	"	36	Hokuriku	2C	"
04	Northumbrian	2A	"	37	Kita Kyushu	7C	"
05	Holland	2E	"	38	Namaqualand	4A	Southern Africa
06	North British	3B	"	39	Cape	6A	"
07	Lofoten	3E	"	40	Eastern Province	8A	"
08		3F	"	41	South West Africa	9C	"
09	North Baltic	4B	"	42	Natal	10C	"
10	North West	4C	"	43	Dampier	8E	Australia
11	Trondelag	4E	"	44	Port Headland	4A	"
12	English	5B	"	45	Anticosti	9C	Northern America
13	North Bothnian	5F	"	46	East Newfoundland	2C	"
14	Southern Spanish	6A	"	47	Cabot Strait	6B	"
15	North Scottish	6C	"	48	Nova Scotia	7C	"
16	Gulf of Finland	6E	"				
17	Danish	7B	"				
18	Irish	7D	"				
19	Finnmark	7E	"				
20	French	8B	"				
21	South Bothnian	8C	"				
22	Hebridean	8E	"				
23	Frisian Islands	9B	"				
24	Helgeland	9E	"				
25	Skagerrak	10B	"				
26	North Persian Gulf	5C	Persian Gulf & India				
27	South Persian Gulf	1C	"				
28	Bombay	7B	"				
29	Calcutta	8B	"				
30	Bangladesh	6C	"				
31	Saliyah	2F	"				
32	Hokkaido	9C	Japan				
33	Tohoku	6C	"				

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.

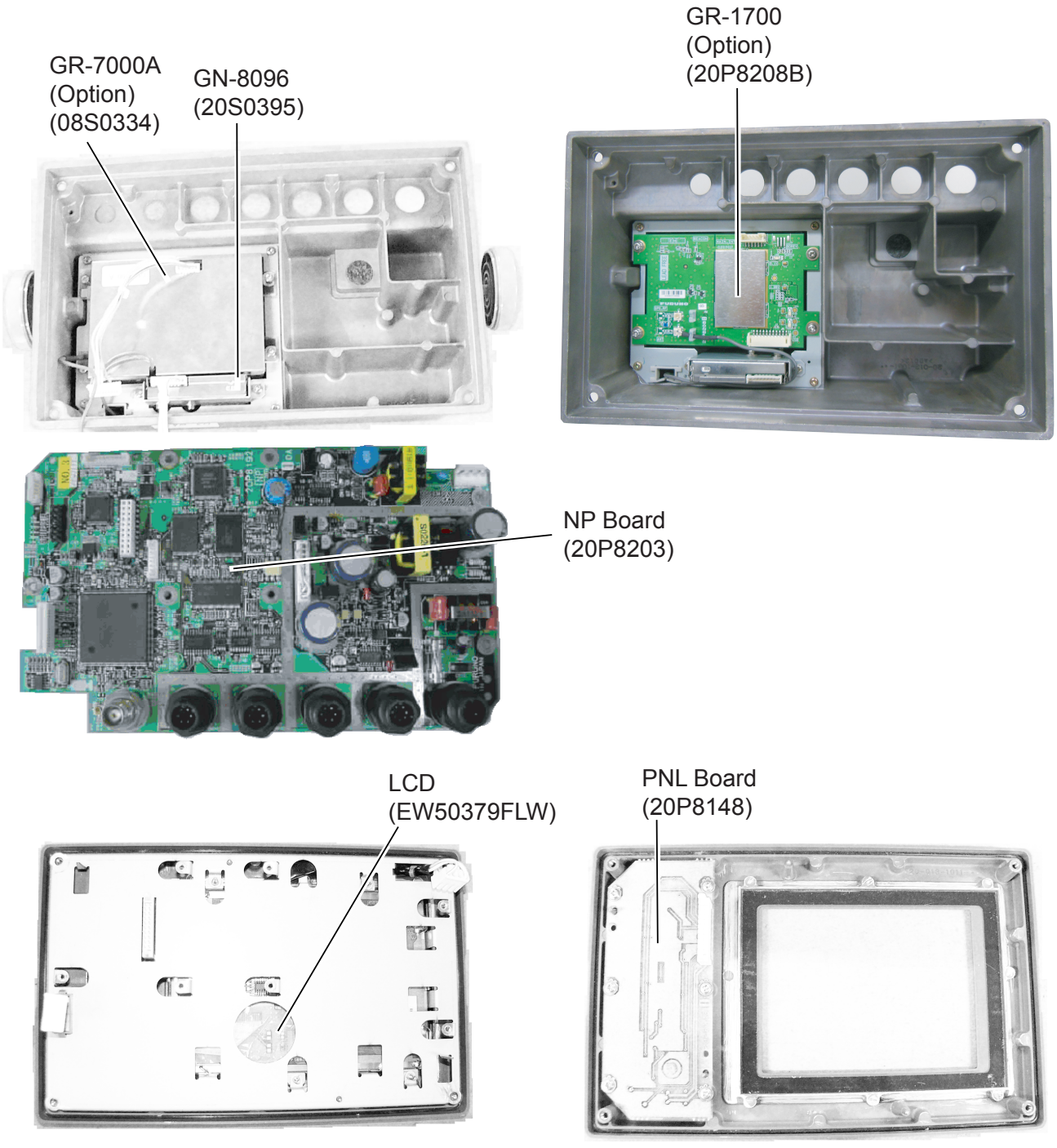
F U R U N O	Model	GP-150	
	Unit	DISPLAY UNIT GP-150	
ELECTRICAL PARTS LIST			
FEBRUARY/2014	Blk.No.		

SYMBOL TYPE

DISPLAY UNIT GP-150	**Code No.**
PRINTED CIRCUIT BOARD	
20P8148, PNL	004-401-410
20P8203, NP	001-140-340
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

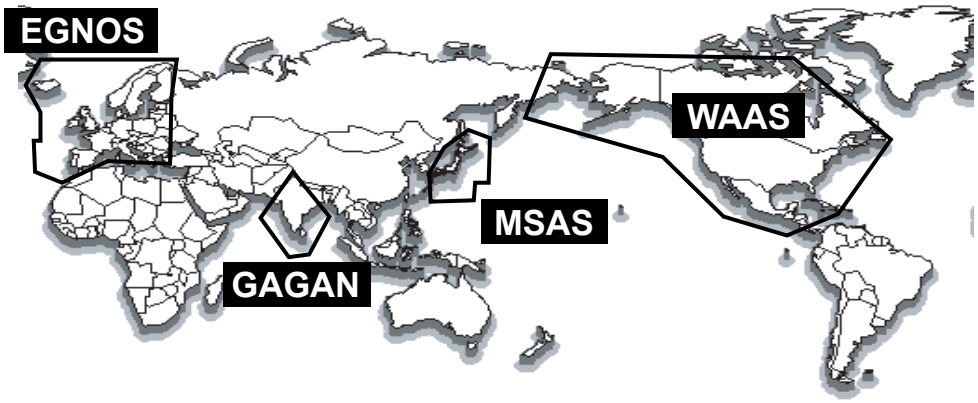
Display unit



Display unit, cover opened, GR-7000A or GR-1700 installed

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
	Artemis	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.

Term/Symbol	Meaning
◎,	Own Ship
○ □ ◇ × 凸 凹 •	Marks/Lines
▽ △ ◎ ☆	Event Marks
○ □	Waypoints
- - - - -	Routes
, MOB	Man Overboard
+	Cursor
ENT	Enter
%	Percentage
2D, 3D	Dimensions
ALARM	Alarm
ALT	Altitude
ANCH	Anchor Watch
ANT	Antenna
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)
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

Term/Symbol	Meaning
EXT	External
℉	Degree(s) Fahrenheit
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	January
kHz	kilo Hertz
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
PORT	Port/Portside
POSN	Position

Term/Symbol	Meaning
RAIM	Receiver Autonomous Integrity Monitoring
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 Side
STN	Station
STR	Steer
STW	Speed Through the Water
T	True
TEMP	Temperature
TEST	Test
TIME	Time
TRIAL	Trial
TRK	Track
Pt, Pts.	Point(s)
TTG	Time To Go
UTC	Universal Time, Coordinated
VAR	Variation
WAT	Water
WPT	Waypoint
XTE	Cross Track Error

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

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

INDEX

A

Anchor watch alarm 7-2
Apportioning the Memory 2-5
Arrival Alarm 7-1
Automatic testing 9-6

B

brilliance 1-3

C

Canceling Destination 5-5
Centering Cursor Position 2-2
Clearing the Memory 9-1
Cross Track Error Alarm 7-2
contrast 1-3
Course-up 2-1
Connecting Marks 3-2
Course bar tone 8-4
Cursor size 8-5
[CURSOR ON/OFF] 2-1

D

Data display 1-6, 6-1
DATA 1 out setting 8-7
DATA 2 output setting 8-8
DATA 3 output setting 8-8
Deleting Waypoints 4-5
Deleting Route Waypoints 4-6
Deleting Routes 4-7
Decca LOPs 6-2
Demo Display 6-4
Depth Alarm 7-4display mode 1-3
DGPS Settings 8-10
Display Orientation 2-1
Displaying LOPs 6-2
Disable satellite 8-1
Display test 9-6

E

Editing Waypoints 4-5
Entering marks 3-1
entry of comment 4-2
Entering position 8-3
Enlarging characters 8-6
Erasing Track 2-3
Erasing marks 3-1
Erasing Route Waypoints 5-6
Error Messages 9-2
Event Marks 3-3
Event Mark Shape 3-3
external DGPS receiver 8-13

F

Fix mode 8-1

G

Geodetic datum 8-1
GPS Menu 8-1
GPS smoothing 8-1
GPS Monitor Displays 8-13
GPS error 9-2
Grid tone 8-5
Great Circle 5-7

H

Highway display 1-4
Hold icon 1-6, 2-3

K

Keyboard test 9-5

L

Loading lighthouse data 8-10
Loran LOPs 6-2

N

Navigation display 1-5
North-up 2-1

M

Magnetic variation 2-6
Mark Shape 3-2
mark connection line 3-2
Memory and I/O circuits test 9-5
MOB Mark 3-4

P

Plotter 1 display 1-4
Plotter 2 display 1-4
[PLOT ON/OFF]key 2-2
Position offset 8-1
Position-fixing Accuracy 1-2
[POWER]key 1-2

R

receiver indication 1-2
Registering Waypoints 4-1
Registering Routes 4-6
Replacing Route Waypoints 4-7
Rhomb Line 5-7

S

Selecting the Display Mode 1-3
Selecting DGPS station 8-11
Self Tests 9-5
Shifting the Display 2-2
Setting Destination 5-1
Setting DATA to NMEA 8-8
Ship's Speed Alarm 7-3
Skipping route waypoint 5-5
Speed average 8-1
Stopping Plotting 2-2
Starting Plotting 2-2

T

Track Plotting Interval 2-4
True bearing 2-6
Trip Alarm 7-3
Turning on the power 1-2
Turning the power off 1-3
Time difference 8-1
Time mark tone 8-5

U

User-defined display 6-1
Unit distance 8-3
Unit of depth 8-4
Unit of water temperature 8-4
Unit of altitude 8-4

W

Water Temperature Alarm 7-4
Waypoint mark size 8-5

X

XTE alarm 7-2

Z

[ZOOM IN] key 2-1
[ZOOM OUT] key 2-1

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

Publication No. DOCQA0299

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)
IMO Resolution MSC.191(79)
IMO Resolution A.694(17)

IEC 61108-1: Ed.2.0: 2003
IEC 60945: Ed.4.0: 2002 incl.Corr.1: 2008
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 N°: 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 2010/68/EU and 2011/75/EU.

On behalf of Furuno Electric Co., Ltd.

Yoshitaka Shogaki

Nishinomiya City, Japan
February 23, 2012
(Place and date of issue)

Yoshitaka Shogaki
Manager, QMS Secretariat
Quality Assurance Department
(name and signature or equivalent marking of authorized person)