FURUN0

OPERATOR'S MANUAL

COLOR GPS PLOTTER   GP-280/380/680
COLOR VIDEO PLOTTER   GD-280/380/680

FURUNO ELECTRIC CO., LTD.

NISHINOMIYA, JAPAN

PRINTED IN JAPAN

© **FURUNO ELECTRIC CO., LTD.**

9-52, Ashihara-cho,
Nishinomiya, Japan

Telephone: 0798-65-2111
Telefax: 0798-65-4200

•Your Local Agent/Dealer

FIRST EDITION : SEP. 1999
K : JUL. 5, 2000

00080880800

⚠ SAFETY INSTRUCTIONS

⚠ WARNING

**ELECTRICAL SHOCK HAZARD
Do not open the equipment.**

Only qualified personnel should work inside the equipment.

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

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

Do not disassemble or modify the equipment.

Fire, electrical shock or serious injury can result.

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

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

Immediately turn off the power at the switchboard if the equipment is emitting smoke or fire.

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

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

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

⚠ WARNING

Keep heater away from equipment.

A heater can melt the equipment's power cord, which can cause fire or electrical shock.

Use the proper fuse.

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

Do not operate the equipment with wet hands.

Electrical shock can result.

⚠ CAUTION

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

Use of the equipment as a stepping stool, for example, can result in personal injury or equipment damage.

No one navigation device should ever be solely replied upon for the navigation of a vessel.

Always confirm position against all available aids to navigation, for safety of vessel and crew.

⚠ **CAUTION**

A warning label is attached to the equipment. Do not remove the label. If the label is missing or illegible, contact a FURUNO agent or dealer.

⚠ WARNING ⚠

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

⚠   ⚠

Name: Warning Label (1)
Type: 86-003-1011-0
Code No.: 100-236-230

TABLE OF CONTENTS

INTRODUCTION

FURUNO Electric Company thanks you for considering and purchasing the FURUNO Color GPS Plotter GP-280/380/680, Color Video Plotter GD-280/380/680. We are confident you will discover why FURUNO has become synonymous with quality and reliability.

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

Your unit is designed and manufactured to meet the rigorous demands of the marine environment. However, no machine can perform to the utmost of its ability unless properly operated and maintained. 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.

Features

Plotter section

- The GP/GD-280/380/680 mostly shares the same features. The main difference between the units is the display unit size and equipment incorporated.

    GP/GD-280: 12-inch display
    GP/GD-380: 15-inch display
    GP/GD-680: 21-inch display

    Equipment available with the GP-280/380/680
    - Standard supply (GPS Plotter)
    - DGPS Kit (Built in DGPS beacon receiver)
    - FD Kit (Floppy disk drive), Radar Overlay Kit
    - DGPS Kit, FD Kit, Radar Overlay Kit

    Equipment available with the GD-280/380/680
    - Standard supply (Plotter functions only)
    - FD Kit (Floppy disk drive), Radar Overlay Kit

- On-screen data include ship's position in latitude and longitude, speed and course, cursor position, range and bearing to cursor, and range and bearing to waypoint.

- Alarms: Arrival alarm, Anchor Watch alarm, Cross-track Error alarm, Border alarm, Ship's speed alarm, Wake-up alarm, etc.

- Built-in memory stores 20,000 points total of tracks, marks, lines and comments, 194 waypoints, 10 routes with up to 10 waypoints per route.

- Target points (Max. 10) for marking special locations.

- Comprehensive navigation display of alphanumeric navigation data plus automatic track plotting.

- Own ship and cursor positions may be shown in latitude and longitude, Loran A, C and Decca LOPs.

- Two lines of nav data input enables display of two tracks, main and sub, simultaneously.

- Unlimited data storage on memory cards, floppy disks.

- Programmable one-touch function keys (nine keys) provide instant execution of desired function. 72 (81 with no radar) extension key functions also available.

Radar section (requires optional radar overlay kit)

- Radar and plotter combination display.

- Range 0.125 to 120 nm.

- Target trails feature displays ships' tracks in afterglow.

- Clutter wiper suppresses noise in selected area.

- One-touch setup of radar for optimal detection of buoys, birds, etc.

- Built in auto plotter ARP-10 (GP/GD-280) or ARP-17 (GP/GD-380/680) optionally available.

SYSTEM CONFIGURATION

GP/GD-280

GPS/DGPS Antenna Unit (GP-280 only)

GPA-018S (DGPS)

GPA-019S (DGPS)

Whip Antenna
1.2 m

GPA-016 (GPS)

Display Unit
GP/GD-2800

Navigation device
(Required for GD-280)

Radar Display Unit

Ship's Mains
12/24/32 VDC

Gyrocompass
Speed Log

Rectifier
RU-3423

Radar Control Panel
GD-2821

(Requires radar overlay kit.)

100/110/115/220/230 VAC
1ϕ, 50/60 Hz

------------- : Option

— · — · — · — · : External Equipment
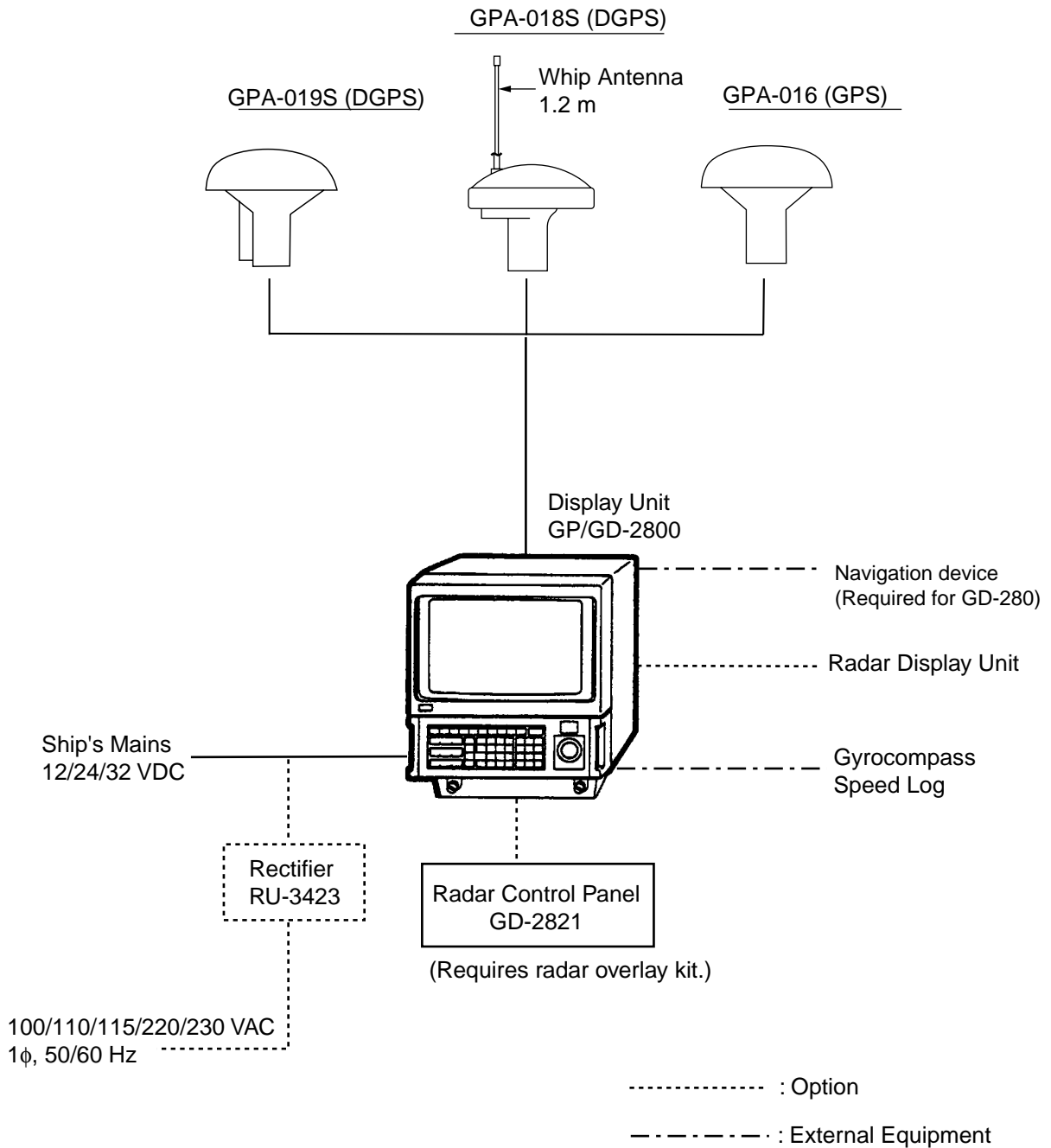
GP/GD-380

GPS/DGPS Antenna Unit (GP-380 only)

GPA-018S (DGPS)

GPA-019S (DGPS)   Whip Antenna 1.2 m   GPA-016 (GPS)

Display Unit
GP/GD-3800

Navigation device
(Required for GD-380)

Radar Display

Ship's Mains
24/32 VDC

Gyrocompass
Speed Log

Rectifier
RU-3423

Radar Control Panel
GD-2821

(Requires radar overlay kit.)

100/110/115/220/230 VAC
1φ, 50/60 Hz

- - - - - - - - - : Option

— · — · — · — · : External Equipment
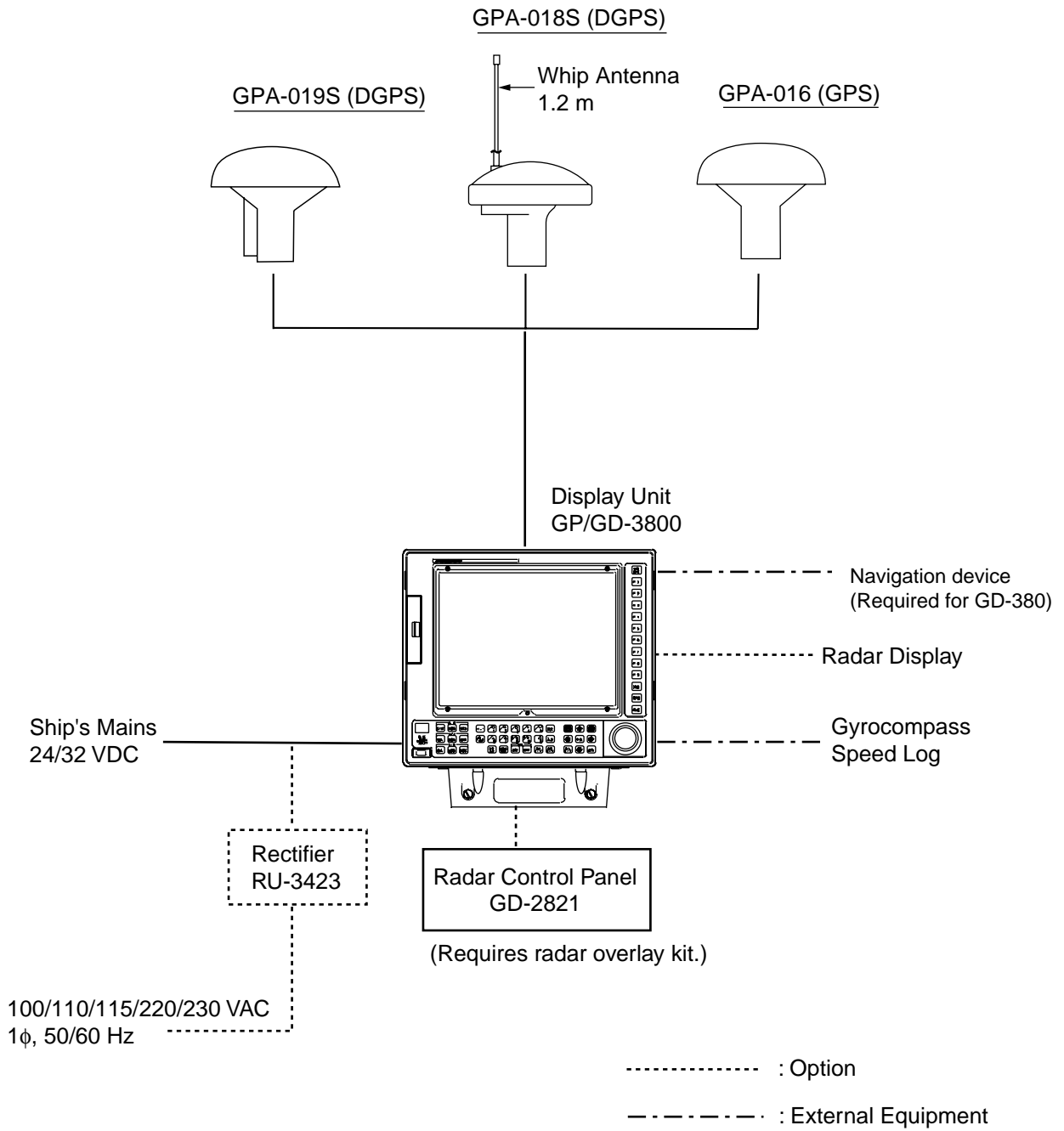
GP/GD-680

GPS/DGPS Antenna Unit (GP-680 only)

GPA-018S (DGPS)

GPA-019S (DGPS)

← Whip Antenna
1.2 m

GPA-016 (GPS)

Display Unit
GP/GD-6800

Navigation device
(Required for GD-680)

Radar Display Unit

Ship's Mains
24/32 VDC

Gyrocompass
Speed Log

Rectifier
RU-3423

100/110/115/220/230 VAC
1φ, 50/60 Hz

------------- : Option

—·—·—·— : External Equipment
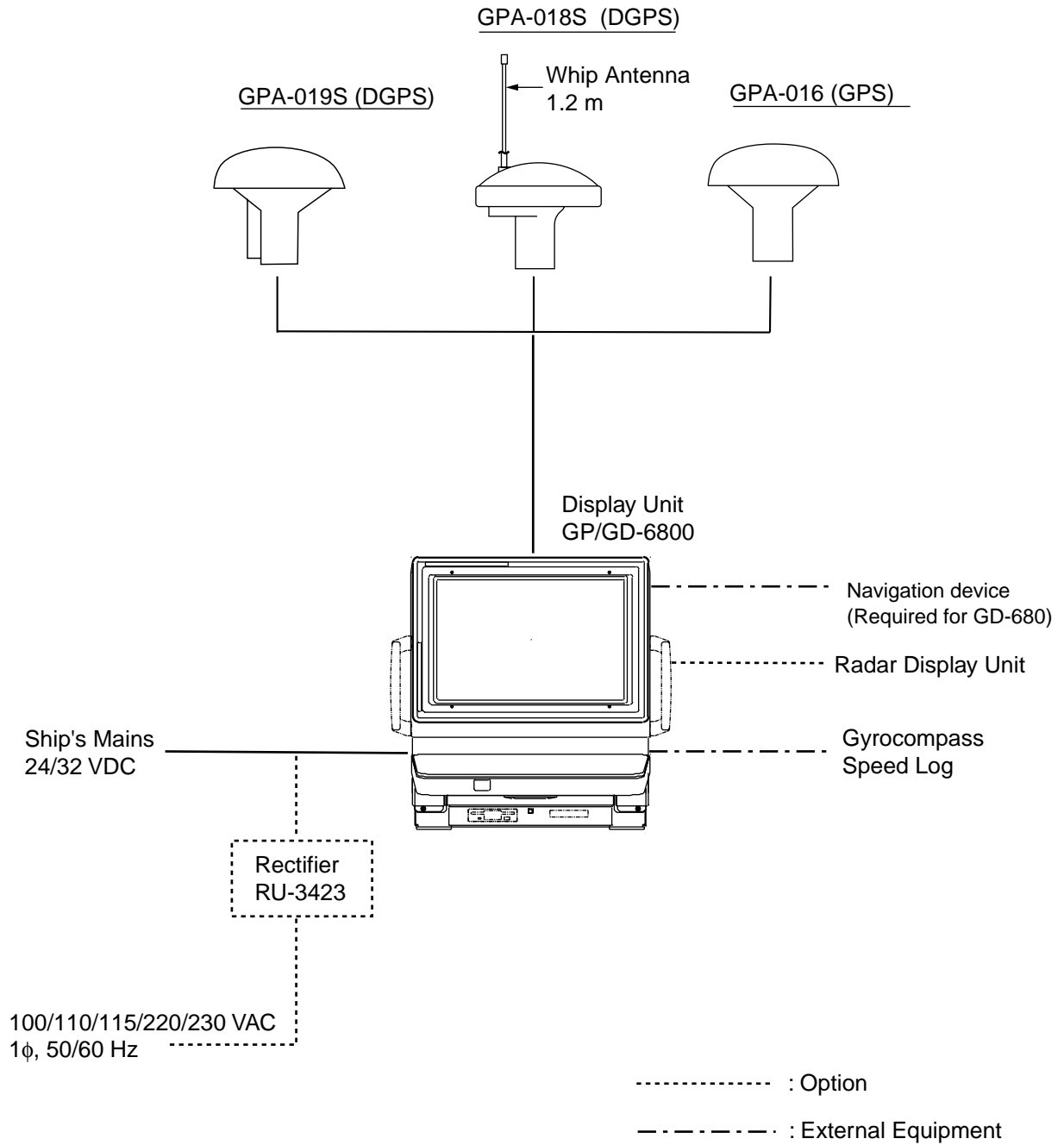
CONTROLS, MENU OPERATION

Using the Remote Controller

The remote controller provides armchair operation of the display unit from up to five meters away. It is powered by two AA batteries. Install the batteries as below. To operate the GD/GP-280/380/680 by the remote controller, point the remote controller toward the optical sensor on the display unit and operate its keys. When the battery voltage is low the distance from which the display unit can be controlled decreases.

⚠ **CAUTION**

Do not operate the remote controller with wet hands.

The remote controller may be damaged. Leave the remote controller in its vinyl case.
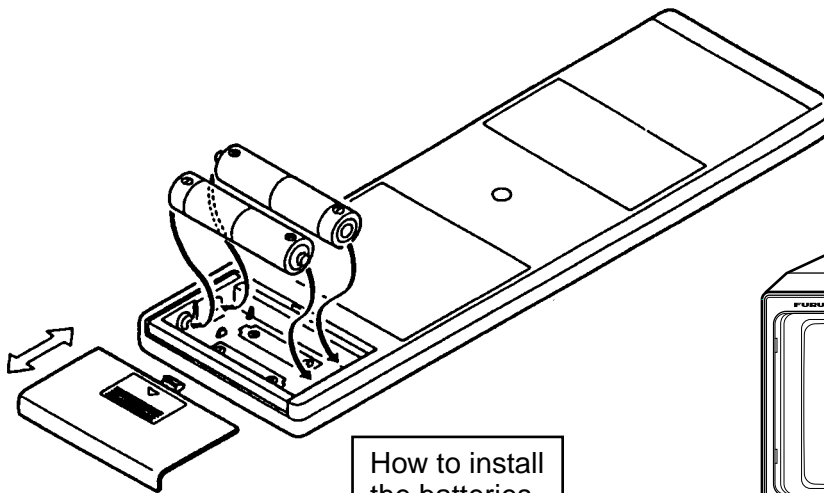
How to install the batteries
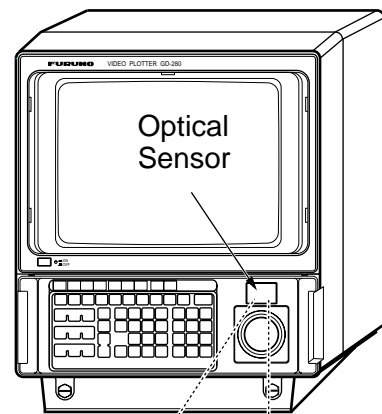
Optical Sensor
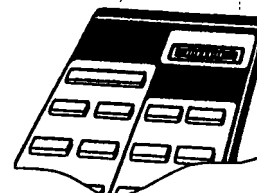
Display unit shown: GP/GD-280

Control Description

GP/GD-280

Display

POWER Switch

Optical sensor for remote controller

Keyboard

Trackball

• Stops/resumes plotting.
• Selects track color.
• Erases track by color.

Opens/closes waypoint entry menu.

Opens/closes comment entry menu.

Opens/closes main menu.

Enter numerical data; select menu; select mark.

Degausses screen.

Function Keys

Inscribes mark at ship's position.

Enlarges/shrinks display.

Returns own ship/cursor to screen center.

Shift cursor and display; select items on menu.

Selects heading mode; CU, NU, HU.

Enables operation with trackball.

Adjusts display brilliance.

Displays data; temporarily hides menu, dialog box.

Switches between TM (True Motion) and RM (Relative Motion).

Registers items on menu.

• Enters mark.
• Selects mark color.
• Selects mark shape.

Sets/cancels destination.

• Enters lines.
• Selects line color.
• Enters line starting point.

• Silences buzzer.
• Erases mark, waypoint.

Turns cursor on/off; switches between +/-, N/S, E/W. (Shown on menu as CHG key.)

Adjusts keyboard backlighting.

GP/GD-380

Chart Card Slot/
Memory Card Slot

Floppy Disk Drive
(Requires FD Kit.)

GP/GD-380 Display Unit

POWER Switch

Optical Sensor

Trackball

GP/GD-380 Keyboard

GP/GD-680

Optical Sensor

Floppy Disk Drive
(Requires FD Kit.)

Chart Card Slot/
Memory Card Slot

GP/GD-680 Display Unit

: Require radar overlay kit. Inoperative
otherwise; buzzer sounds when
operated.

AUDIO Control

POWER Switch

BRILL Control

Requires ARP-17.
Buzzer sounds
when not so
equipped.

Trackball
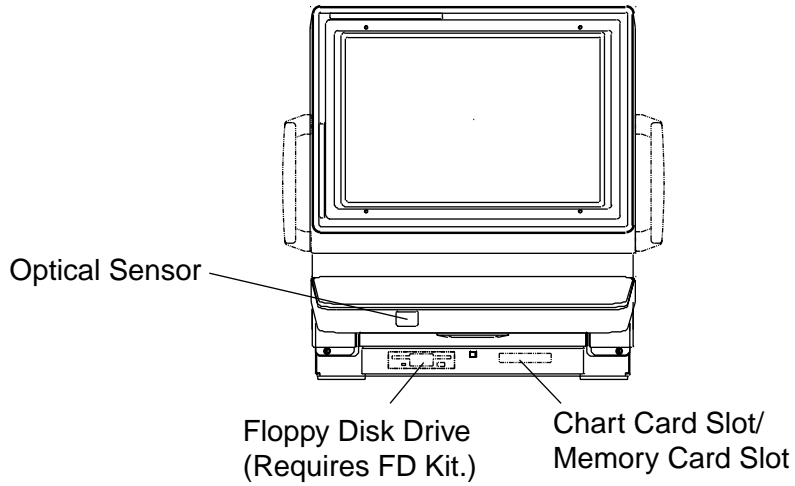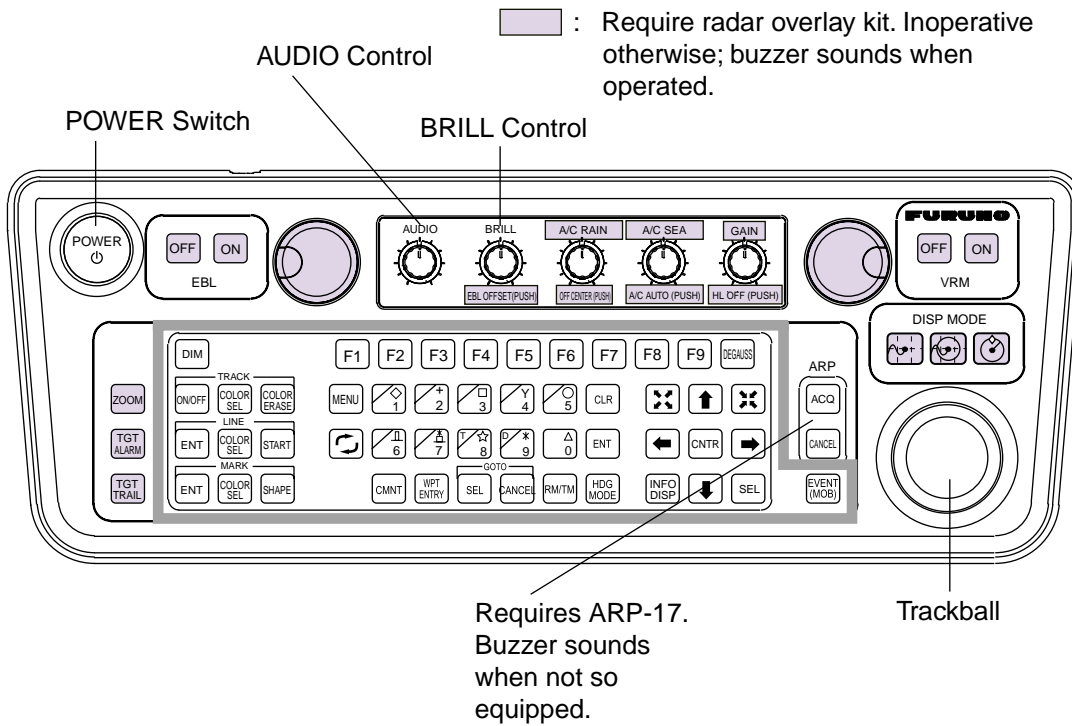
GP/GD-680 Keyboard

Remote Controller

The remote controller provides armchair control of the display unit from a distance of up to 4 m. The remote controller keys operate exactly the same as keys on the display unit.

Note 1: Power on/off, F3-F9, degauss, panel illumination and brilliance are conducted from the display unit.

Note 2: Replace the batteries when the distance from which the display can be controlled decreases.
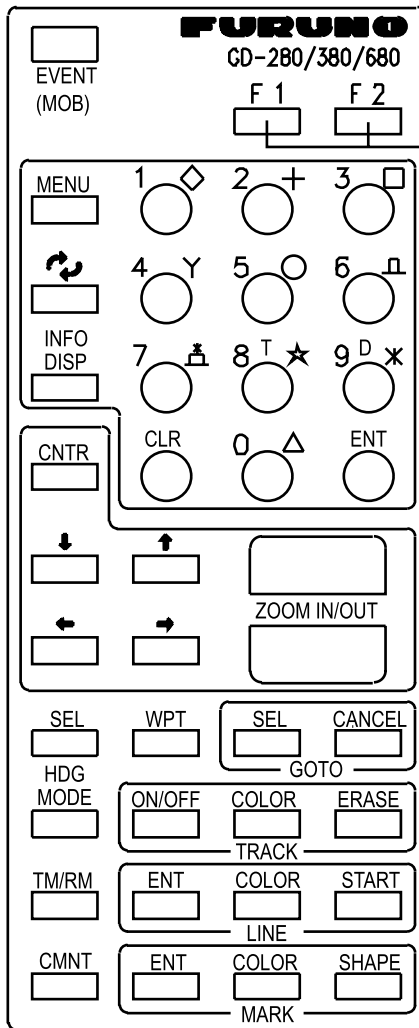
Operates same as F1 and F2 on the display unit. However, they cannot be set independently from the display unit.

Menu Operation

Most functions are carried out through the menu. This section provides information necessary for menu operation.

1. Press the [MENU] key to display the main menu.

```
Main Menu
─────────────────────

0    Plotter Display
1    Track
2    Mark/Line
3    Waypoint/Route
4    Alarm
5    File
6    Target Point
7    Calculate Rng/Brg
8    System Setting
9    Initial Setting
─────────────────────

0~9   : Next Page
Menu : Close Menu
```

2. Press appropriate numeric key to display the menu desired. For example, press the [1] key to select the Plotter Display menu.

```
Plotter Display
─────────────────────

1    Plotter Display
2    Plotter & Graph Disp.
3    Nav Data Display
4    GPS Data Display
5
6
7
8
9
0
─────────────────────
1~4   : Setting
Menu : Esc
```

Menu conventions

- Return to main menu: Press the [MENU] key several times.
- Return to previous screen: Press the [MENU] key once.
- Close menu: Press the [MENU] key several times.
- CLR key: Clears entire line of numeric data.
- INFO DISP key: Temporarily hides menu, dialog box. Menu, dialog box reappear after ten seconds.

1. OPERATIONAL OVERVIEW

The basic function of a video plotter is to record and plot ship's track, using position data fed from a navigation device which is built in the display unit or is installed separately.

Once the equipment is properly installed, you need do no more than turn on the power to plot ship's track. Of course, your equipment does much more than just plot ship's track, and it is our intention to guide you along in the use of your equipment with instructions that start at a basic level and proceed forward in a logical manner.

In this chapter you will learn the most basic functions of your equipment, from turning on the power to how to read the navigation data display.

1.1 Getting Started in Operation

This paragraph provides a quick introduction to some of the most frequently used functions.

All controls respond immediately to the operator's command and a correct key input is accompanied by a beep. Incorrect operation will emit several beeps.

1.1.1 Inserting a chart card

1. **GP/GD-280:** Open the keyboard.
   GP/GD-380: Open the card slot door at the left side of the display unit.
   GP/GD-680: Open the chart slot cover below the keyboard.

2. Insert appropriate chart card in the card slot. Your equipment has two card slots, and either may be used.

POWER switch

Keyboard

EJECT Button

Insert with grooves facing upward.
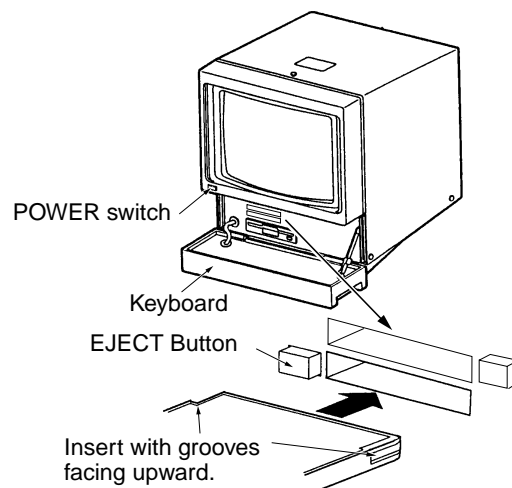
Display unit GP/GD-280

3. Close the keyboard, card slot door or card slot cover as appropriate. Leave the chart card in the slot while the equipment is turned on. This will allow redrawing of the chart when the chart is shifted, etc.

1.1.2 Turning the power on/off

Press the [POWER] switch to turn the power on. The picture changes in the sequence shown in the figure below.

For equipment using the built-in GPS navigator, the own ship marker (●) immediately starts blinking (0.5-second intervals) as soon as the power is turned on. This blinking means GPS position is not yet accurate. The first time the power is applied it takes about 90 seconds to find position. This is because the Almanac, which contains information about all GPS satellites, is not stored in the navigator. Once the Almanac is stored, it takes approx. 12 seconds to find position. When position is found the own ship marker blinks slowly (one-second intervals).

For external navigation device, the own ship mark blinks in one-second intervals when position is accurate.

```
        STARTUP SELFTEST
        MEMORY TEST
         ROM    OK
         DRAM   OK
    (1)  SRAM   OK
         VRAM   OK

         BATTERY TEST
          INT. BATTERY  OK           **: Program Version
                                          No.
         PROGRAM NUMBER
          PLOTTER  14506880**

        Press any key.
```
Diagnosis Test
(Displayed momentarily)

↓

```
    (2)                             Displayed about 30
                                    seconds. Press any
            CAUTION                 key except [DIM] key
         Data displayed by this unit  and [HL OFF] control
         is intended as reference.  to show the
         Position should be         plotter display.
         confirmed against nautical
         charts.

         FURUNO ELECTRIC CO., LTD
```

↓

Position in lat./long.   +cursor

Own ship marker
(blinking)
PLOTTER DISPLAY

If the diagnosis finds fault, the display freezes. To restore normal operation, try to press any key.

To turn off the power, press the [POWER] switch again.

1.1.3 Adjusting display brilliance, keyboard backlighting

Display brilliance: For the GP/GD-280/380, press the [BRILL] key to adjust display brilliance. Eight levels of brilliance (including off) are available. For the GP/GD-680, adjust the [BRILL] control.

Keyboard backlighting: Press the [DIM] key to adjust keyboard backlighting. Four levels (including off) are available. Note that this key does not beep when operated.

1.1.4 Selecting chart scale

The chart scale can be selected with ⌧, ⌧. The arrows on the keys indicate which direction the chart scale may be changed with the key pressed. Note that a larger range in essence shrinks the picture while a smaller range "blows up" the picture. With a smaller range, you may find that the track appears in tiers. If the chart is overenlarged its land areas are not filled; they are hollow.

Display Scale

1/300000   8.00nm)

· Plotter Display: Horizontal Range
· Radar Display/
  Plotter Display: Range from screen
  center to outermost range ring
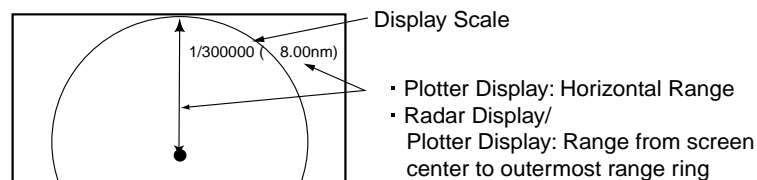
1.1.5 Shifting the display

The display can only be shifted in True motion.

1. Press 🔁 to turn off the cursor. Each press of this key turns the cursor on or off.

2. Operate the trackball to shift the display. The display follows the movement of the trackball. Note that the display can also be shifted with the arrow keys.

3. To return own ship mark to the screen center, press the [CNTR] key.

1.1.6 Shifting the +cursor

1. Press 🔁 to turn on the +cursor.

2. Operate the trackball to shift the +cursor. The +cursor follows the movement of the trackball. The cursor can also be shifted with the arrow keys.

The latitude and longitude of the cursor intersection appear at the top left-hand corner of the screen.

Own ship position in latitude and longitude

Speed, course

Latitude and longitude
of +cursor intersection

+cursor
(Cursor format can
be selected on the menu.)

Range and bearing
to +cursor

Own ship
position
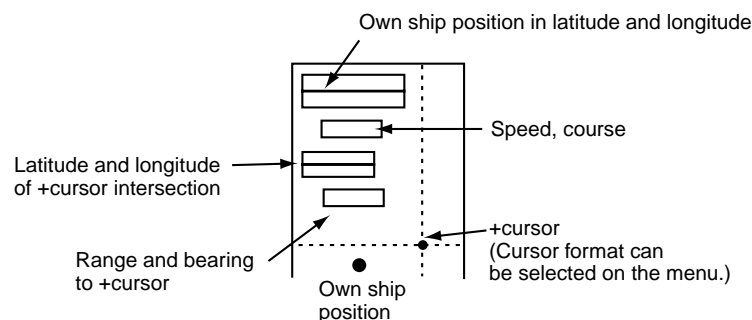
1.1.7 Selecting presentation mode

Three presentation modes are available: head-up, north-up, and course-up.

Head-up (Radar display only): Heading is at the top of the screen.

North-up: North (0°) is at the top of the screen. This mode is useful as a general navigation monitor.

Auto course-up (radar display, radar/plotter combination display): For the plotter display, current course is at the top of screen the moment this mode is selected. When the course is deviated by more than ±22.5°, the course at that moment will be at the top of the screen. For the radar/plotter combination display, heading is at the top of screen the moment this mode is selected. When the heading is deviated by more than ±22.5° in the bow direction, the heading at that moment will be at the top of the screen.

Course-up: When destination is set, the destination waypoint is at the top of the display. North is shown at the top of the screen with the north marker ⊛. When no destination is set the course at the moment the course-up mode is selected is set at the top of the display.

To select display orientation, press the [HDG MODE] key. Current selection is shown at the right side of the display.

1.1.8 Selecting display mode

Two display modes are available: True Motion (TM) and Relative Motion (RM).

True Motion: Own ship mark moves according to own ship's movement. Land is stationary.

Relative Motion: Own ship mark is at the display center. Land objects move.

To select display mode, press the [TM/RM] key. Selected display mode is shown at the right side of the screen.

Note that the auto course-up and head-up modes are only available in relative motion.

1.1.9 Selecting track color for main track

1. If own ship is moored at a pier or the like, turn off the cursor with ⟳, and then press ⊠ to enlarge the chart scale.

2. Press the [TRACK COLOR SEL] key to display the Change Track Color menu.

```
Change Track Color
────────────────────────────────────────

Main       R  Y  G  C  P  B  W  Temp  Dep

Sub        R  Y  G  C  P  B  W  Temp  Dep

GPS Buoy   R  Y  G  C  P  B  W

ARP        R  Y  G  C  P  B  W




────────────────────────────────────────

↑↓←→: Sel, Fix

TRACK COLOR SEL key: Close Menu
```
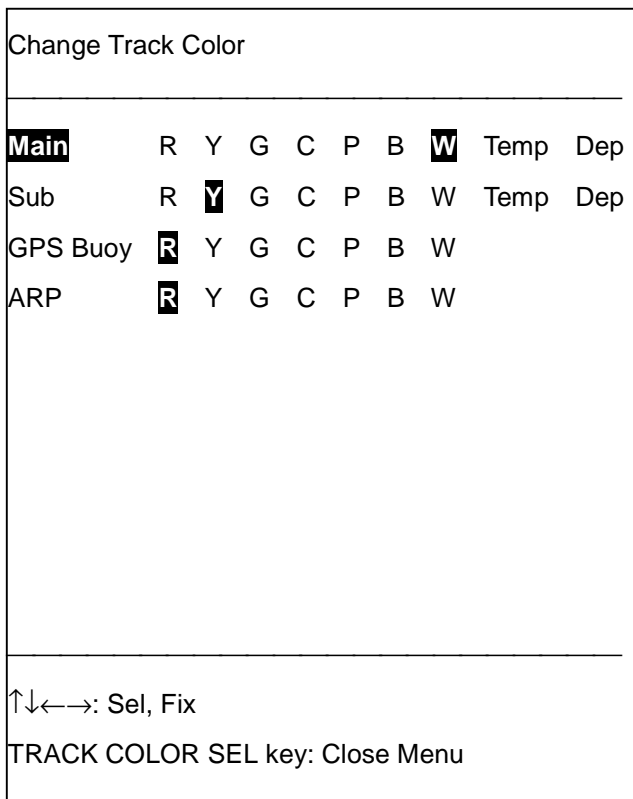
3. Operate [←] or [→] to select color desired among Red, Yellow, Green, Cyan, Purple, Blue and White. (You may also select color by pressing appropriate numeric keys 1-7. Color selectable is shown on those keys.) Track plotted from this point will be painted in the color selected. For further details see Chapter 2.

4. Press the [TRACK COLOR SEL] key to close the menu.

1.1.10 Suspending, resuming track plotting

Press [TRACK ON/OFF] key to suspend or restart track plotting. When plotting is suspended own ship marker is hollow and track is not recorded.
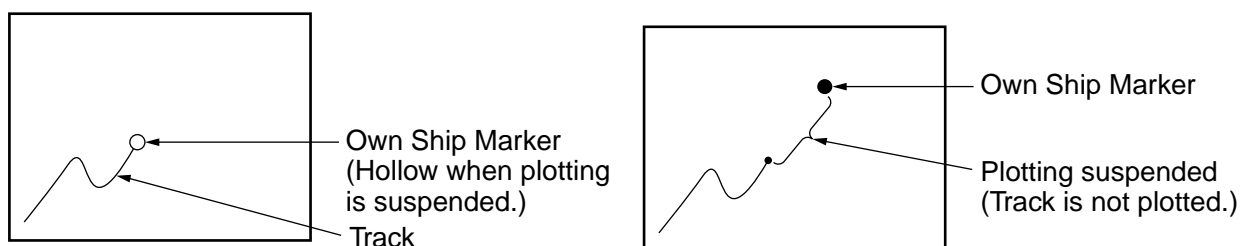
Own ship marker appearance when plotting is suspended

1.1.11 Erasing track by color

This procedure is also effective for GPS buoy track and ARP track.

1. Press the [TRACK COLOR ERASE] key to display the Track Color Erase menu.

```
Track Color Erase
_____

Red       No   Yes

Yellow    No   Yes

Green     No   Yes

Cyan      No   Yes

Purple    No   Yes

Blue      No   Yes

White     No   Yes


Track     Main   Sub    GPS Buoy
          ARP (00)
          [00~20*, 00: All]

_____

↑↓←→: Sel    Ent: Fix

TRACK COLOR ERASE key: Close Menu
```

* 20 for GP/GD-380/680
  10 for GP/GD-280

2. To erase the red track, press [→] to select Yes. (To erase other types of track, press [↓] to select Track followed by track type desired. ARP track may be erased by ARP target number. For further details see page 12-13.

3. Press the [ENT] key. The following display appears.

```
Are you sure to erase?




ENT:          Erase

Other Keys:  Escape
```

4. Press the [ENT] key again to erase track color(s) selected.

1.1.12 Entering marks, selecting mark color and shape

This section shows you how to enter a mark with the +cursor, the default mark entry method, and change mark color and shape.

1. Operate the trackball to place the +cursor on the location desired. If the +cursor is not displayed, press ⟳ to display it.

2. Press the [MARK ENT] key. A purple triangle mark is placed at the +cursor intersection. This is the default mark shape and color. Further, the mark icon at the bottom right corner of the screen shows mark type plus a numeric (⬦) which shows mark color by numeric key.

3. To inscribe another mark with a different color and shape follow steps 4 through 9.

4. Press the [MARK COLOR SEL] key to display the Mark Color Select menu.

```
Mark Color Select
_____

MK Color    R   Y   G   C   P   B   W


_____

↑↓←→: Sel, Fix
MARK COLOR SEL key: Close Menu
```
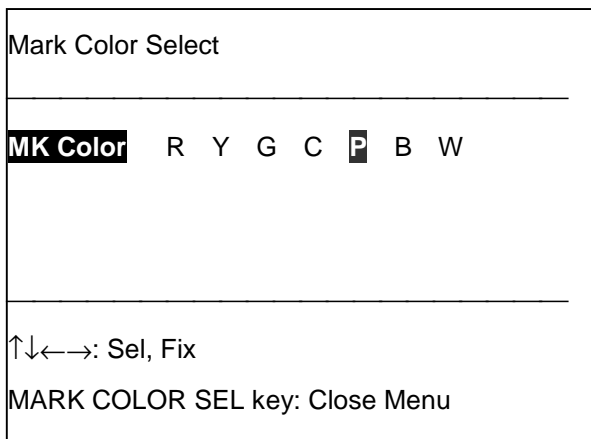
5. Press [←] or [→] to select mark color desired among Red, Yellow, Green, Cyan, Purple, Blue and White. (You may also select color by pressing appropriate numeric key among 1-7. Color available is shown on their key labels.)

6. Press the [MARK COLOR SEL] key to erase the menu.

7. To change mark shape, press the [MARK SHAPE] key to display the Mark Shape Select menu.

```
Mark Shape Select
_____

Mark Shape    ◈ + ▢ Υ ⊙ ⚑ ⚐ ★ ✳ ▲
Line          NA  ___ ------ ____ -·-·-



_____

↑↓←→: Sel, Fix
MARK SHAPE key: Close Menu
```
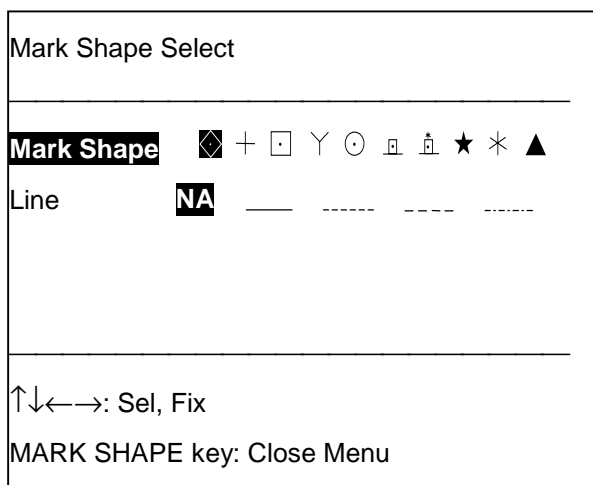
8. Press [←] or [→] to select mark shape desired. (You may also select mark shape by pressing appropriate numeric key among 0-9. Mark shape is shown on their key labels.)

9. Press the [MARK SHAPE] key to close the menu.

10. Place the +cursor on the location desired for a mark and press the [MARK ENT] key. The mark is inscribed in the shape and color selected here.

For further details about marks, see Chapter 3.

To erase individual marks, place the +cursor on the mark to erase, and press the [CLR] key.
To enter a mark at own ship position, press the [EVENT (MOB)] key.

1.1.13 Entering lines

This section shows you how to enter lines with the +cursor, the default line entry method.

1. Operate the trackball to place the +cursor on the starting point for the line.

2. Press the [LINE START] key.

3. Operate the trackball to place the +cursor on another location for the line.

4. Press the [LINE ENT] key to inscribe the line. The default line color is green and type is solid line.

5. Operate the trackball to place the +cursor on another location.

6. Press the [LINE ENT] key.

7. Press the [LINE COLOR SEL] key to display the Line Color Select menu, where you can select line color and line type.

```
┌─────────────────────────────────────┐
│ Line Color Select                    │
│ ─────────────────────────────────── │
│                                      │
│ Color  R  Y  G  C  P  B  W          │
│ Type   ▬▬▬  ------  ----  ......     │
│                                      │
│ ─────────────────────────────────── │
│ ↑↓←→: Sel, Fix                       │
│ LINE COLOR SEL key: Close Menu       │
└─────────────────────────────────────┘
```
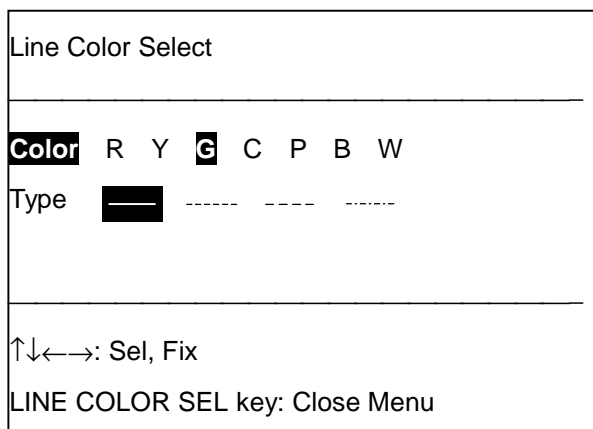
8. Press [←] to select "R" (Red), for example.

9. Press [↓] to select Type.

10. Press [←] or [→] to select line type desired.

11. Press the [LINE COLOR SEL] key to close the menu.

12. Operate the trackball to select line location.

13. Press the [LINE ENT] key. Then, the line is inscribed in the color and type selected. Current line color (shown by numeric corresponding to key number) and line type are shown at the bottom right-hand corner on the screen by the "line" icon (▭). For details see the illustration on page 1-16.

Erasing lines: Place the +cursor on the line point to erase and press the [CLR] key. The line is then redrawn excluding the point erased.

Connecting own ship position with a line: Turn off the +cursor with the ⟳ key and follow the procedure for inscribing a line. For further details about lines, see Chapter 4.

1.1.14 Entering a comment

You can inscribe a comment next to marks, lines, waypoints and routes on the display. A comment may contain 12 alphanumeric characters for a mark or line and 10 for a waypoint and route.

1. Press the [CNMT] key. The following display appears.

   ```
   Place +cursor on mark or edge
   of line and press ENT.


    Other Keys: Escape
   ```
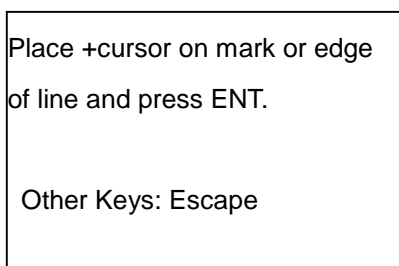
2. Operate the trackball to set the +cursor on the line or mark to which you want to attach a comment.

3. Press the [ENT] key. The screen should look something like the left-hand figure below, showing upper case alphabets, numerics and symbols. Lower case letters are also available. Use the ⟳ key to switch between upper case and lower case alphabets.

4. Operate the trackball to select alphanumeric character desired with the highlight. Selected character appears in reverse video. Numerics can be entered through the keyboard or selected with the highlight.

   ```
   A B C D E F G H I J K L M N O P Q R S T
   U V W X Y Z 0 1 2 3 4 5 6 7 8 9 $ & # %
   ╲ , • ; ? !   ⌁, [ ] ⎰ ⎱ ⌐ ⌐ + - = < >
   ¥ * @ ( ) ｡ :
                                      Enter

   Comment ▮ – – – – – – – – – – –
   ─────────────────────────────────
   ↑↓←→, BALL: Select Character
   ENT: Set   CHG: Change Case   CMNT: Escape
   ```

   ```
   a b c d e f g h i j k l m n o p q r s t
   u v w x y z 0 1 2 3 4 5 6 7 8 9 $ & # %
   ╲ , • ; ? !   ⌁, [ ] ⎰ ⎱ ⌐ ⌐ + - = < >
   ¥ * @ ( ) ｡ :
                                      Enter

   Comment ▮ – – – – – – – – – – –
   ─────────────────────────────────
   ↑↓←→, BALL: Select Character
   ENT: Set   CHG: Change Case   CMNT: Escape
   ```
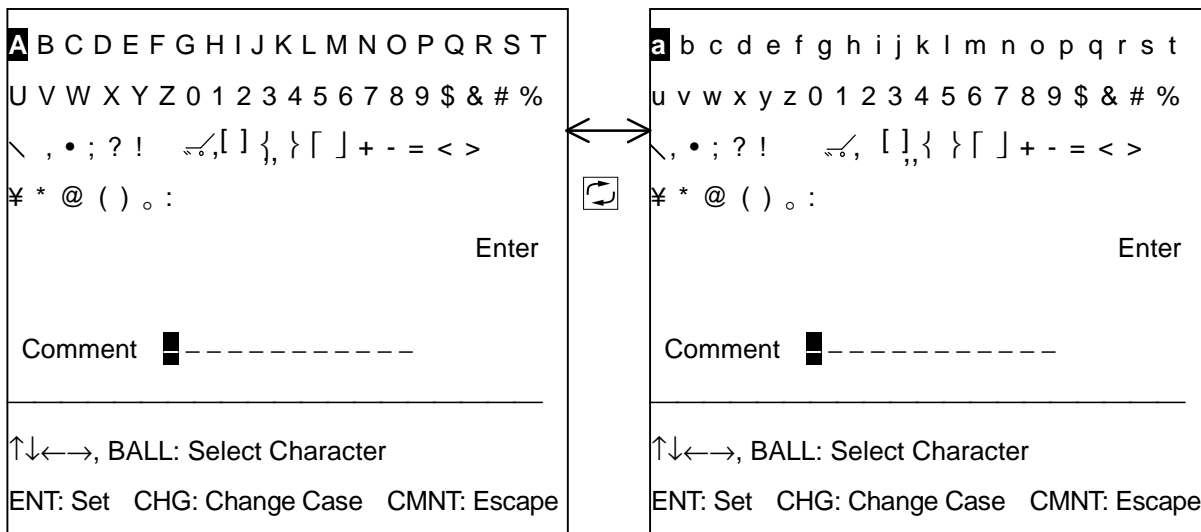
5. Press the [ENT] key. The character selected appears in the Comment field at the bottom of the display.

6. Repeat steps 4 and 5 to complete the comment.

7. Operate the trackball to place the highlight on Enter.

8. Press the [ENT] key. Entered comment is placed near mark or line selected.
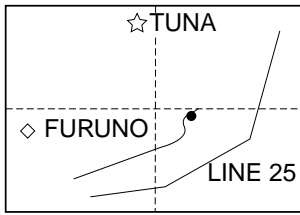
Sample comments

Note 1: Comments can be turned on or off collectively from the screen by pressing [MENU], [0], [1] and setting the Comment Mark to Off or On as appropriate.

Note 2: Comments can also be affixed to marks/lines generated by external equipment. To do this, first enlarge the display to maximum size, and then do the following:

1) Place the +cursor near the mark for which you want to attach a comment.

2) Press the [LINE START] key. A point appears at the +cursor intersection.

3) Press the [CMNT] key. Enter comment.

1.1.15 Entering waypoints

Waypoints are mainly used to mark important positions and locations. This section shows you how to enter a waypoint by using the +cursor, the default entry method.

1. Press the [WPT ENTRY] key to display the waypoint list.

```
Enter WPT [+Cursor]                              Screen 1
    ↑↓: Sel   CHG: Page   CLR: Erase   ENT: Entry Mode
    WPT ENTRY key: Close
_____

01 – – ° – – . – – – 'N   – – – ° – – . – – – 'W  _____
02 – – ° – – . – – – 'N   – – – ° – – . – – – 'W  _____
03 – – ° – – . – – – 'N   – – – ° – – . – – – 'W  _____
04 – – ° – – . – – – 'N   – – – ° – – . – – – 'W  _____
05 – – ° – – . – – – 'N   – – – ° – – . – – – 'W  _____
06 – – ° – – . – – – 'N   – – – ° – – . – – – 'W  _____
07 – – ° – – . – – – 'N   – – – ° – – . – – – 'W  _____
08 – – ° – – . – – – 'N   – – – ° – – . – – – 'W  _____
09 – – ° – – . – – – 'N   – – – ° – – . – – – 'W  _____
10 – – ° – – . – – – 'N   – – – ° – – . – – – 'W  _____
.
. .
.
20 – – ° – – . – – – 'N   – – – ° – – . – – – 'W  _____
```

2. Press [↓] to select waypoint where to enter position. For example, select 07. Waypoints 01 through 97 are available for selection.

3. Press the [ENT] key. The following message appears.

```
Place +cursor on lat/long desired
and press ENT.


 Other Keys: Escape
```

4. Place the +cursor on the location desired for a waypoint.

5. Press the [ENT] key. The display should look something like the one below.

```
WPT
_____

35°11.118'N 135°14.861'E

Waypoint entered at this position.
_____

Number          07

Color          [R]  Y   G   C   P   B   W

[Comment]       [→]  _____




_____

↑↓←→: Sel    ENT: Fix

WPT ENTRY key  : Close
```

6. Press [→]. The display for entry of comment appears.

7. Enter comment (max. 10 alphanumeric characters) as follows:
    a) Use the trackball to display desired character in reverse video.
    b) Press the [ENT] key.
    c) Repeat steps a) and b) to complete the comment.
    d) Operate the trackball to place the highlight on Enter.
    e) Press the [ENT] key.

8. Press the [ENT] key.

9. Press the [WPT ENTRY] key to close the menu.

The waypoint is registered with the latitude and longitude position selected by the +cursor. A red 07 (default waypoint color) inside an octagon marks the waypoint location on the display. For further details see Chapter 5.

To switch to a different method of waypoint entry, press [MENU], [4], [1]. For further details see paragraph 5.1.

1.1.16 Setting destination

Setting destination by waypoint

1. Press the [GOTO SEL] key. The following menu appears.

```
Select WPT
_____

  Ship Position   : 00
  +Cursor         : 98
  External WPT    : 99
_____

WPT Number    00 → ▮ _




_____

ENT: Fix
GOTO SEL key: Close Menu
```

2. Enter waypoint number and press the [ENT] key. For example, press [0], [7], [ENT] to set waypoint 07 as the destination.

   Then, waypoint 00 marks own ship position and a light-blue line runs between own ship position and waypoint selected. At the upper-right corner on the screen waypoint position in latitude and longitude, range and bearing to the waypoint and time-to-go to the waypoint are shown.
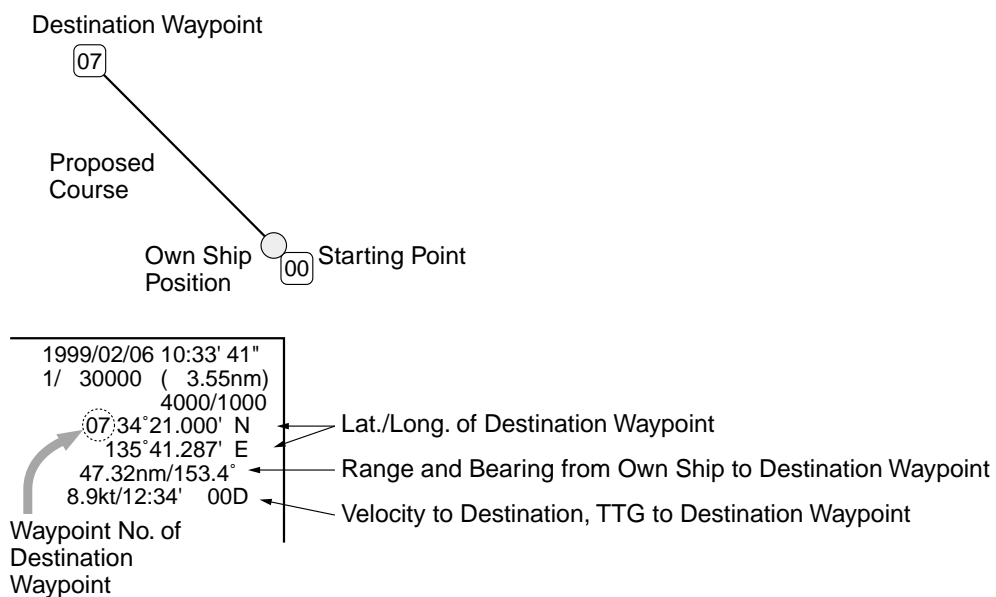
Setting destination by +cursor

1. Press ⟳ to turn on the +cursor. Select destination with the cursor.

2. Press the [GOTO SEL] key.

3. Press [9], [8], [ENT] in order. (Waypoint 98 is special waypoint for setting destination by the +cursor.) Waypoint position is temporarily registered as a waypoint and set as destination.

To cancel destination, press the [GOTO CANCEL] key.

1.1.17 Information display

The data (date, position, comment) of marks, lines, etc. can be shown on the display as follows:

1. Use the trackball to place the +cursor on the item of which you want to know data.

2. Press the [INFO DISP] key.

Data is displayed about 10 seconds. To erase the display immediately, press any key.

```
┌─────────────────────────────┐
│ Mark          ◈     GREEN   │
│                             │
│ 1999/04/10    05:37'14"     │
│ Lat.          34° 41.512'N  │
│ Long.        135° 19.846'E  │
│ Comment                     │
└─────────────────────────────┘
```

Some FURUNO and NAVIONICS chart cards contain navigation information about lighthouses and buoys. You can display information about them by selecting them with the cursor and pressing the [INFO DISP] key. Below is an example of lighthouse information.

```
┌─────────────────────┐
│                     │
│  FL 5S 13M          │
│                     │
│                     │
└─────────────────────┘
```

1.2 Function Keys

The nine keys labeled F1-F9 at the top of the keyboard are the function keys. These keys provide one touch control of commonly used functions. The default settings for the keys are shown below. Users may reprogram the keys to suit individual needs.

Default function key functions

F1: Displays which alarms have been violated.

F2: Changes position, destination entry method to latitude and longitude.

F3: Changes position, destination entry method to Loran C.

F4: Opens menu for selection of mark entry method.

F5: Opens menu for selection of waypoint entry method.

F6: Displays mark/comment list.

F7: Shows plotter display.

F8: Displays plotter graph (water temperature graph).

F9: With no radar overlay kit, opens initial setting menu for the plotter display. With the radar overlay kit, alternately selects FUNC1, FUNC2, FUNC3.

For the GP/GD-280, the functions shown on the labels above the function keys are executed when corresponding function key is pressed. The user may change function key programs as desired. For further details see page 13-26.
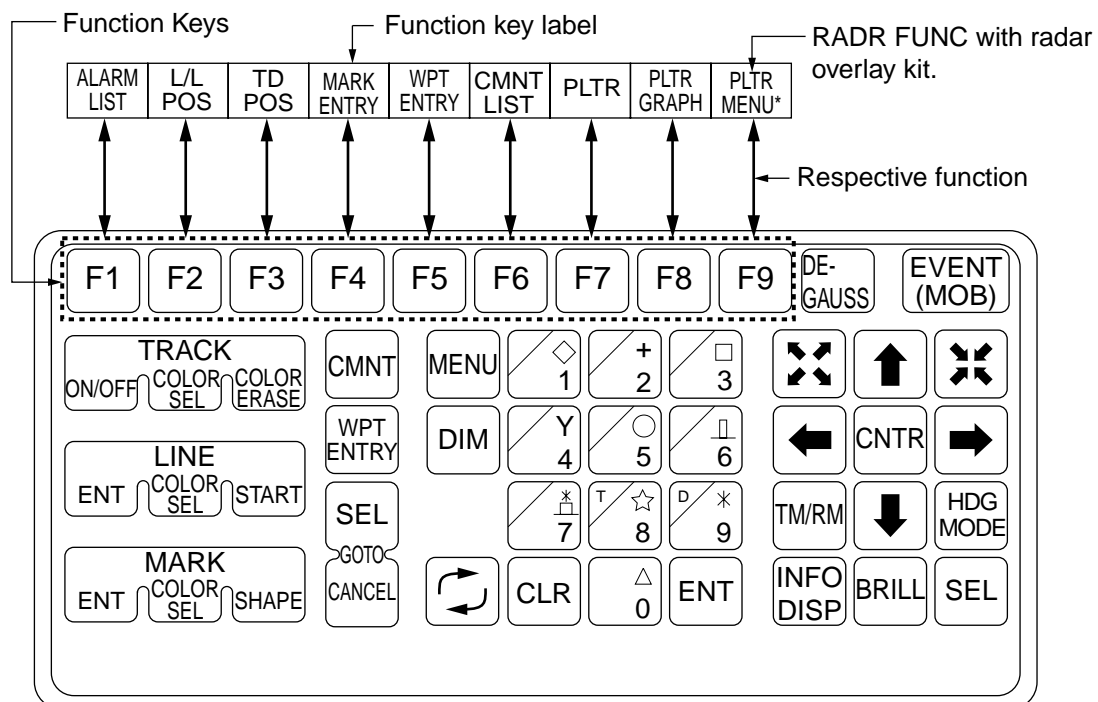
GD-280 Keyboard

1.3 Indications

1.3.1 Plotter display

The plotter display appears by pressing [MENU], [1], [1].
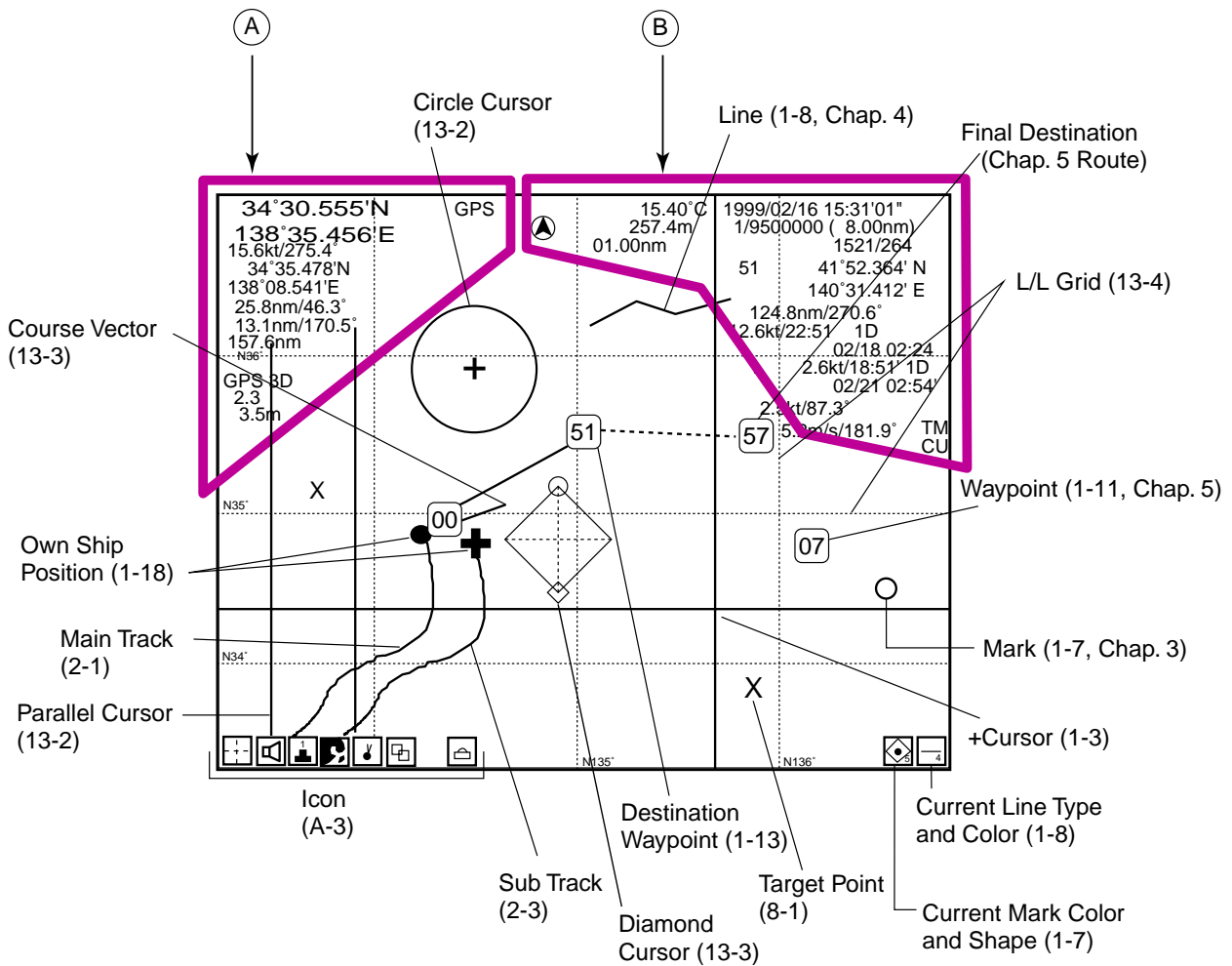
- Marks, track, markers, graphics, grid and +cursor can be erased from the plotter display. The procedure is explained in a later chapters.

- In addition to the plotter display your equipment also provides track plus graph, nav data monitor screen, etc.

A in figure on preceding page

Radius of circle cursor (13-2)

Width, slant of parallel cursor (13-2)

Range and bearing from own ship to +cursor (1-3)

Latitude and longitude of +cursor (1-3)

Speed, course

Ship's latitude (1-18)

Ship's longitude (1-18)

Navigator

Circle Cursor

34°30.555' N
138°35.456' E
15.6kt/275.4°
34° 35.478' N
138° 08.54' E
25.8nm/46.3°
13.1nm/170.5°
157.6nm

GPS

GPS Fixing Mode — GPS 3D
DOP Value — 2.3
GPS Altitude — 3.5m

Diamond Cursor

Course Vector

+Cursor

Displayed with internal GPS receiver only (10-4)

N35°

Parallel Cursor

Own Ship Position

B in figure on preceding page

Track Plotting Interval (2-15)

Date

Time

Water Temp*

North Marker (1-4)

Scale (1-3)

Depth*

Horizontal Range

15.40°C 1999/02/16 15:31'01"
257.4m   1/9500000 (8.00nm)
01.00nm   1521/264

Track Pts. Used/Marks Used (13-23)

Dest. WPT No. (1-12)

51

41°52.364' N — Lat./Long of Dest. WPT (1-12)
140°31.412' E — Range/Bearing from OS to Dest. WPT (1-13)
124.8nm/270.6°
12.6k/22:51' 1D — Velocity to Dest., TTG, Days to Dest. (1-13)
02/18 02:24
12.6kt/18:51' 1D — Velocity to Dest., ETA to Dest., Days to
02/21 02:54'   Dest. (Chap. 5: Routes)
2.5kt/87.3° — Tide Speed*, Direction*
5.2m/s/181.9° TM — Wind Speed*, Direction (True)*
CU — Display Mode (1-4)
Presentation Mode (1-4)

51 ------- 57

00

* Requires appropriate sensor.

1-17

1.3.2 Own ship position display

Own ship position is shown on the display with a filled circle (●). This is called the own ship marker. For the equipment fitted with the built-in GPS navigator the own ship marker flashes quickly as soon as the power is turned on. This rapid flashing means position is not yet reliable. When position becomes reliable, the marker blinks more slowly and the indication "GPS 2D" appears. The first time the power is turned on it takes about two minutes to find position. Thereafter it takes about 20 seconds.

For the equipment using an external navigator, the own ship marker flashes slowly when position is reliable and rapidly when there is no position data.

<u>Receiver status</u>

Receiver status is shown on the display using the following indications:

NO FIX: No position fix
GPS 2D: Two-dimension GPS position fixing
GPS 3D: Three-dimension GPS position fixing
DGPS 2D: Two-dimension Differential GPS position fixing (Requires DGPS Kit.)
DGPS 3D: Three-dimension Differential GPS position fixing (Requires DGPS Kit.)
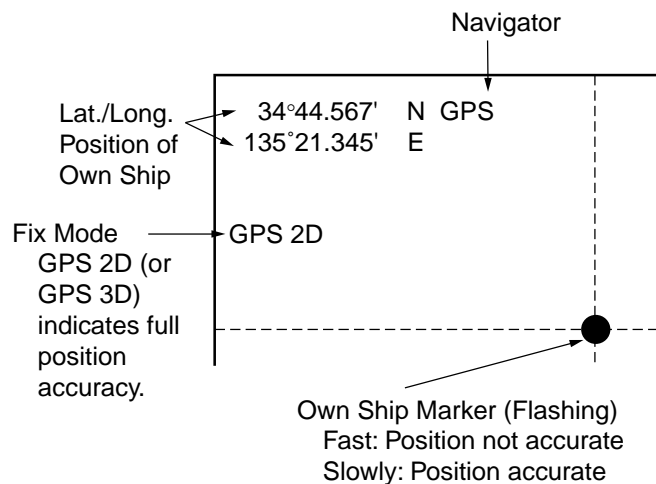
1.3.3 Chart cards, charts

Before turning on the power set a chart card of your area in the card slot. Turn on the power, and the card data is automatically read and shown on the display. If you set a chart card in the card slot after turning on the power, operate ⊠, ⊠ to display the chart.

Leave the chart card in the slot while the plotter is in use. This enables redrawing of the chart when chart scale is changed or display is shifted.

The chart card can generally be classified in two types: general and detailed. For example, a general card might shows the shoreline of California, and a detailed one might show San Francisco Bay.

Note: Chart cards are intended for reference purposes only. The navigator always confirms his position against other aids to navigation.
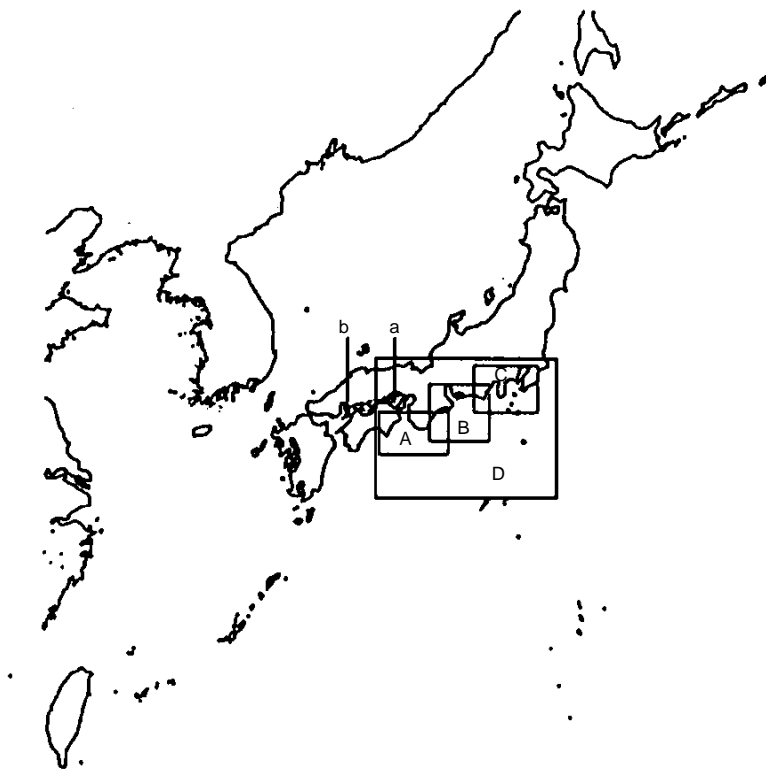
The sample chart above shows the Ise and Tokai districts of Japan. On the chart there are four areas circumscribed and labeled A, B, C and D. These rectangles are called indices, and they show locations on the chart which can/cannot be enlarged without losing detail. For example, chart detail for a point within A, B, and C, for example, point "a", would be reduced. For a location outside of D, for example, point "b", detail would be greater than point "a".

Note: Chart indices can be erased or displayed as desired.

Chart status is shown with icons as follows:

Icon	Meaning
	Icon filled in-position reliable.
	Icon hollow-chart overenlarged.
	No or wrong chart card inserted.

1.3.4 Navigation data display

The navigation data display can be shown by pressing [MENU], [1], [3].


```
                        1999/08/11
                        09:58'27"  (Note 2)

1999/08/11        09:58'27"

Navaids      GPS                  Own Ship   →    WPT     05
Lat.         34˚44.654'N            WPT Lat.       45˚21.623'N
Long.        135˚21.842'E           WPT Long.      155˚34.128'E

Speed          12.5 kt            Distance         253.6 nm
Course        325.4˚              Bearing           56.7˚

Temp.          13.71˚C            Speed             21.4 kt
Depth         235.4m              Time to Go       1D  10:32'
                                  ETA              08/12  20:30

Wind (Rel)#     **.* m/s          Current (1)#      1.2 kt
Wind Dir#      ***.*˚                              243.6˚

Note 1  Wind (True)#    **.* m/s  Current (2)#      1.6 kt
        Wind Dir#      ***.*˚                       236.2˚

                 809.743 (Note 3) Current (3)#      2.6 kt
                                                   185.7˚
```

Note 1: When wind speed/direction indicator is not interfaced with a gyrocompass, true wind speed cannot be output. The wind speed/direction indication is shown in true or relative in accordance with how it is received.

Note 2: The default setting shows the date in large characters. To enlarge other indications, see page 13-5.

Note 3: Fishing area determined by Japanese government. Displayed only when near Japan.

 # Requires appropriate external sensor.

2. TRACK

The track is drawn on the display using position data fed from position-fixing equipment. With connection of two position-fixing devices, this unit can trace two own ship's tracks: main track and sub track.

2.1 Track Basics

Main track or sub track can be traced using position data can be fed from a GPS navigator, Loran A, Loran C or Decca, Omega, and Dead Reckoning.

2.1.1 Turning main track on/off

Main track is displayed in the default setting. To turn it off do the following:

1. Press [MENU], [2] to display the Track menu.

```
Track
_____

1  Main Track

2  Sub Track

3  GPS Buoy Track

4  ARP Track

5  Common Function

6  Erase by Attribute

7  Erase by Two Points

8  Change Color/Line Type

9  Change Track Color

0  Track Color Erase
_____

0~9    : Next Page

MENU  : Esc
```

2. Press the [1] key to display the Main Track menu.

```
Main Track
────────────────────────────────────────────────────

  Navaid Priority
      [1] Int. GPS*      (*Built-in GPS receiver only)
      [2] GPS
      [3] Loran C
      [4] Decca
      [5] DR
      [6] Loran A
      [7] Omega
  ────────────────────────────────────────────────────
  Display          No   Yes
  Disp. Pt. No.    All   Set (10000 points)
  Select Navaid    →    Change



  ────────────────────────────────────────────────────
  ↑↓←→ : Sel, Fix
  MENU : Esc
```

3. Press [←] to select No, and the main track display is then turned off. To redisplay it, select Yes.

4. Press the [MENU] key several times to close the menu.
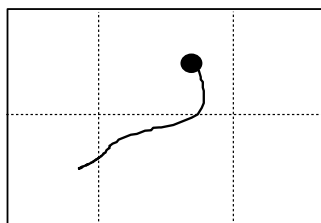
Main track example

Note: Each pressing of the [MENU] key returns control to the previous screen. To close all menus, press the [MENU] key several times.

2.1.2　Turning sub track display on/off

The sub track display may be turned on or off. The default setting is off. To turn it on follow the procedure below.

Note: The default setting for number of sub track points is zero (0). Before executing the procedure below, set Memory Apportion for the main track to "Half" (see page 13-24).

1. Press [MENU], [2], [2] to display the Sub Track menu.

```
Sub Track

Display          No  Yes
Disp. Pt. No.    All  Set (00000 points)
Select Navaid    GPS  Loran C  Decca  DR  Loran A  Omega
                 Int. GPS*
Pos. Memory      Unavailable Available

↑↓ ←→ : Sel, Fix
 MENU    : Esc
```

* Built in GPS receiver only

2. Press [→] to select Yes.

3. Press the [MENU] key several times to close the menu.
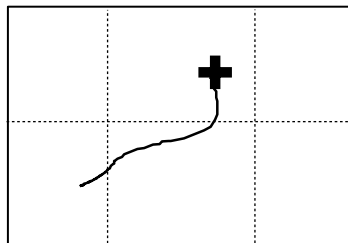
Sub track example

2.1.3 Setting navigator priority order for main track

When the navigator feeding position data fails, the equipment automatically selects a back-up navaid to feed position data, from highest to lowest priority. Automatic switching can be turned on or off as shown in "2.1.5 Automatic navigator switching for main track" on the next page.

1. Press [MENU], [2], [1] to display the Main Track menu.

2. Press [↓] to choose Select Navaid.

3. Press [→] to select Change. The following display appears.

```
Select Navaid
_____

2    GPS          Not use → Use
3    Loran C       Not use → Use
4    Decca         Not use → Use
5    DR            Not use → Use
6    Loran A       Not use → Use
7    Omega         Not use → Use
1    Int. GPS*     Not use → Use



_____

↑↓←→ : Sel    CLR, CHG: Cancel
ENT: Fix
MENU : Esc

```

   Built in GPS receiver only

4. Press the [CLR] key. The options of all items are temporarily set to "Not use."

5. Select the navigator which you want to assign the highest priority with [→]. For example, if GPS and Loran C navigators are connected, select GPS with [↑] or [↓] and then press [→] to select "Use." Next, set Loran C to "Use" with [↓] and [→].

6. Press the [ENT] key.

7. Press the [MENU] key several times to close the menu.

Note: Navigator priority can also be set for sub track.

2.1.4 Selecting navigator for sub track

You may select the navigator which feeds position data for plotting of the sub track.

1. Press [MENU], [2], [2] to display the Sub Track menu.

2. Press [↑] or [↓] to choose Select Navaid.

3. Press [←] or [→] to select navaid desired.

4. Press the [MENU] key several times to close the menu.

2.1.5 Automatic navigator switching for main track

You may switch (or don't switch) navigators when position error is detected.

Automatic switching when error is detected

1. Press [MENU], [2], [5] to display the Common Function menu, and select Page 1.

2. Press [↑] or [↓] to select Nav. Switching.

```
Common Function
_____

Page    1   2
_____

  Display Track

    Color      R   Y   G   C   P   B   W
    Type       ──   ------  ----  -·-·-
    Start      1996/01/01 00:00'
    End        2046/12/31 23:59'
_____

Display Track Setting

  By Color        No   ←→    Yes
  By Line Type    No   ←→    Yes
  By Time         No   ←→    Yes

Plot Interval          Range (00.01 nm)   Time (00M05S)
Nav. Switching         Off   On
Smoothing              00 [00~15]
Connect TRK Not R'cd.  Disconnect   Connect
Track Ind. While Holding   No   Yes
_____

↑↓←→ : Sel, Fix
MENU : Esc
```

3. Press [→] to select On.

4. Press the [MENU] several times to close the menu.

No switching when error is detected

1. Press [MENU], [2], [5], and select Page 1.

2. Press [↑] or [↓] to select Nav. Switching.

3. Press [←] to select Off.

4. Press the [MENU] key several times to close the menu.

2.1.6 Turning sub track plotting on/off

You may turn sub track plotting on or off as desired. The default setting is on. When the sub track is plotted the track memory is equally divided between the main and sub tracks.

1. Press [MENU], [2], [2] to open the Sub Track menu.

2. Press [↓] to select Pos. Memory.

3. Press [←] or [→] to select Unavailable (Off) or Available (On) as appropriate.

4. Press the [MENU] key several times to close the menu.

2.1.7 GPS buoy track

With connection of a GPS Buoy Receiver, the track (1000 points/target) of up to five GPS buoys may be plotted on the display. GPS buoy and color are #1, Red; #2, Yellow; #3, Green; #4, Cyan, and #5, Purple.

1. Press [MENU], [2], [3] to display the GPS Buoy Track menu.

```
GPS Buoy Track
─────────────────────────────────────────
Memory          No  Yes
Display         No  Yes



─────────────────────────────────────────
↑ ↓  ← → : Sel, Fix
MENU : Esc
```

2. Press [←] or [→] to select No or Yes to don't plot or plot the GPS buoy track, respectively.

3. Press [↓] to select Display, and then press [←] or [→] to turn the GPS buoy track on or off as appropriate.

4. Press the [MENU] key several times to close the menu.

GPS buoy 1-5
(Track color changes
with buoy number.)
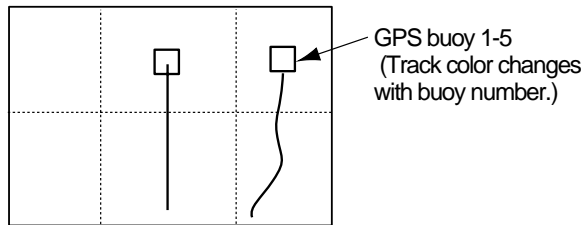
GPS buoy track example

2.1.8 ARP track

With connection of the optional Auto Plotter ARP-10 (GP/GD-280) or ARP-17 (GP/GD-380/680) and the radar overlay kit, the radar automatically plots the track of 10 (GP/GD-280) or 20 (GP/GD-380/680) operator-selected targets. You can turn the ARP track display on or off as below. ARP operation is described in Chapter 12.

Maximum of 500 points can be memorized per target track.

1. Press [MENU], [2], [4] to display the ARP Track menu.

```
ARP Track

Memory       No  Yes
Display      No  Yes




↑↓ ← → : Sel, Fix
MENU : Esc
```

2. Press [←] or [→] to select No or Yes to don't record or record the ARP track, respectively.

3. Press [↓] to select Display, and then press [←] or [→] to turn the ARP track off or on as appropriate.

4. Press the [MENU] key several times to close the menu.
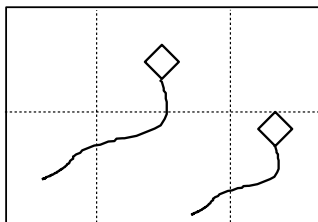
ARP track example

2.2 Track Color

The color of the track can be changed manually, or automatically according to water temperature or depth.

Manually changing track color

Track is available in seven colors. It can be beneficial to change track color when, for example, starting or stopping fishing. For how to change track color manually see Chapter 1.

Automatically changing track color by water temperature

With connection of a temperature sensor or video sounder, you can set up to automatically change track color in seven colors according to water temperature. The user may select color and corresponding temperature range on the menu. This feature is particularly useful when searching for a particular species of fish, since each species has its own habitable temperature.

Automatically changing track color by depth

With connection of a video sounder, you can set up to automatically change track color in seven colors according to depth. The user may select color and corresponding depth range on the menu.

2.2.1 Automatically changing track color by water temperature

There are two methods by which track color is changed according to water temperature: by preset temperature range or unit place.

Changing track color by preset temperature range

This method changes the color of track when the water temperature is within a preset range. For example, you can set up to paint the track yellow when the water temperature is between 17 and 20 degrees Centigrade.

Changing track color by unit place

This setting paints the track in up to five colors according to unit place selected. For example, you could paint the track red when the water temperature is between 17.0 and 17.1 degrees; yellow when the water temperature is between 17.2 and 17.3 degrees.

Changing track color by preset temperature range

1. Press [MENU], [2], [5] to display the Common Function menu.

2. Press [→] to select Page 2.

```
Common Function
_____

Page    1  2
_____

Temp color setting by range       Depth color setting by range
W: 005.0°F MAX                     W: 0010.0ft MAX
B: 005.0°F MIN   010.0°F MAX       B: 0010.0ft MIN    0050.0ft MAX
P: 010.0°F MIN   012.5°F MAX       P: 0050.0ft MIN    0100.0ft MAX
C: 012.5°F MIN   015.0°F MAX       C: 0100.0ft MIN    0200.0ft MAX
G: 015.0°F MIN   017.5°F MAX       G: 0200.0ft MIN    0500.0ft MAX
Y: 017.5°F MIN   020.0°F MAX       Y: 0500.0ft MIN    0900.0ft MAX
R: 020.0°F MIN                     R: 0900.0ft MIN
_____

Track color by temp        By range   ←→   By step
Track color by depth        By range   ←→   By step


_____

↑↓←→ : Sel, Fix
MENU : Esc
```

Note: You can select the unit of water temperature measurement by the key sequence of [MENU], [0], [2].

3. Press [↓] or [↑] to select Track color by temp.

4. Press [←] to select By range. The following display appears.

```
By range
_____

Red          020.0°F MIN ...... ①

Yellow       017.5°F MIN ...... ②

Green        015.0°F MIN ...... ③

Cyan         012.5°F MIN ...... ④

Purple       010.0°F MIN ...... ⑤

Blue         005.0°F MIN ...... ⑥




_____
↑↓←→ : Sel     ENT: Fix

MENU : Esc
```

① Red track for temp. over 20.0°F

② Yellow track for temp. between 17.5°F and 20.0°F

③ Green track for temp. between 15.0°F and 17.5°F

④ Blue track for temp. between 12.5°F and 15.0°F   Default setting

⑤ Light-blue track for temp. beween 10.0°F and 12.5°F

⑥ Purple track for temp between 5.0°F and 10.0°F

Track is painted in white for temp. less than 5°F

5. Set the temperature range desired for each color. For example, if you want to paint the track red when the water temperature is higher than 18 degrees Centigrade, do the following:

   a) Press the [↑] key to select Red.
   b) Key in [0], [1], [8], [0].

   To paint the track yellow when the temperature is between 16 degrees and 18 degrees, for example, do the following:

   a) Press [↓] to select Yellow.
   b) Key in [0], [1], [6], [0].

6. Press the [ENT] key.

7. Press the [MENU] key several times to close the menu.

2-10

Changing track color by temperature unit place

1. Press [MENU], [2], [5] to display the Common Function menu, and select Page 2.

2. Press [↑] or [↓] to select Track color by temp.

3. Press [→] to select By step.

```
By step
_____

0.2 °F step
2.0 °F step




_____

↑↓      : Sel
ENT    : Fix
CLR    : Cancel
MENU : Esc
```

[EXAMPLE]
Preset unit 0.2˚

Own Ship

YEL
70.2
RED
70.0
PPL
BLU   60.8
GRN
60.6
YEL
60.4
RED   60.2
60.0˚F
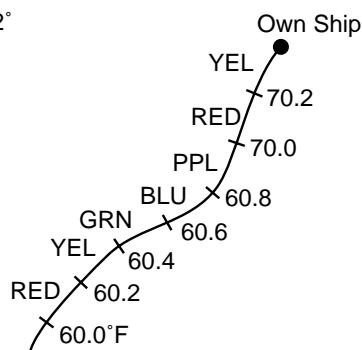
4. Press [↓] or [↑] to select preset unit.
   0.2°F: Track changes color every 0.2 degrees of water temperature change. When the
   When the temperature changes totally one degree the track is painted in red again.
   2.0°F: Track changes color every two degrees of water temperature change. When the water
   temperature changes totally 10 degrees the track is painted in red again.

5. Press the [ENT] key.

6. Press the [MENU] key several times to close the menu.

2.2.2 Changing track color according to depth

The color of the track can be changed according to depth range or depth amount.

Changing track color by preset depth range

1. Press [MENU], [2], [5] to display the Common Function menu, and select Page 2.

2. Press [↓] to select Track color by depth.

3. Press [←] to select By range.

```
By range
_____

Red        0900.0ft MIN ...... ①

Yellow     0500.0ft MIN ...... ②

Green      0200.0ft MIN ...... ③

Cyan       0100.0ft MIN ...... ④

Purple     0050.0ft MIN ...... ⑤

Blue       0010.0ft MIN ...... ⑥




_____

↑↓←→ : Sel    ENT: Fix

MENU : Esc
```

①900 ft or higher = Red

②500 ft to 900 ft = Yellow

③200 ft to 500 ft = Green

④100 ft to 200 ft = Cyan   Default setting

⑤50 ft to 100 ft = Purple

⑥10 ft to 50 ft = Blue

Less than 10 m = White

4. Set depths as desired. For example, to change track color to red when the depth is more than 700 meters;
   a) Press [↑] to select Red.
   b) Press [0], [7], [0], [0], [0], [ENT].

5. Press the [ENT] key

6. Press the [MENU] key several times to close the menu.

Changing track color by depth unit

This setting paints the track in up to five colors according to unit place selected. For example, you could set up to change the track color for every two meters of depth change.

1. Press [MENU], [2], [5] to show the Common Function menu, and select Page 2.

2. Press [↓] to select Track color by depth.

3. Press [→] to select By step.

```
By step
_____

 2 ft step
  20 ft step
200 ft step




_____

↑↓      : Sel

ENT    : Fix

CLR    : Cancel

MENU : Esc
```

[Example]
Track color changes with
every 20 ft of depth change

Depth steadily
increasing.

Own Ship

Red
Purple ✕ 200
Cyan ✕ 180
Green ✕ 160
Yellow ✕ 140
Red ✕ 120
✕ 100 ft
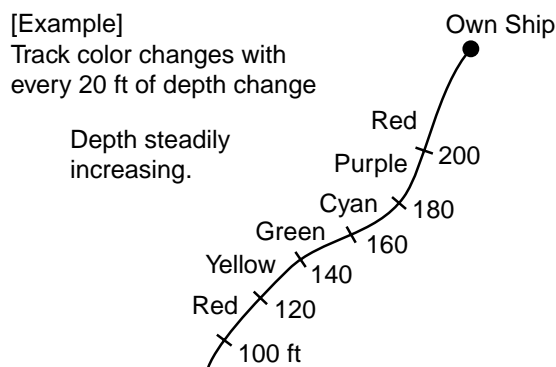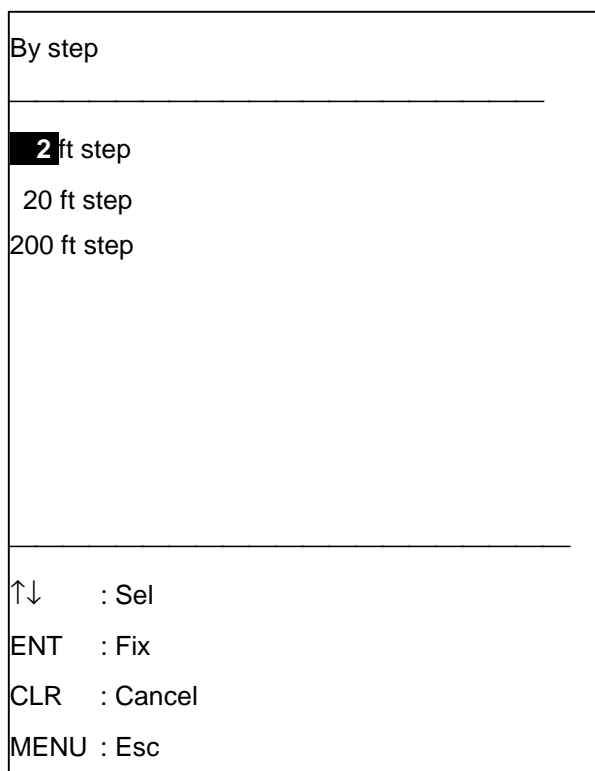
4.   Press [↓] or [↑] to set depth amount.
     2 feet step: Track color changes every 2 feet of depth change up to 10 feet.
     20 feet step: Track color changes every 20 feet of depth change up to 100 feet.
     200 feet step: Track color changes every 200 feet of depth change up to 2000 feet.

5.   Press the [ENT] key.

6.   Press the [MENU] key several times to close the menu.

2.2.3 Selecting track color for sub track/GPS track/ARP track

1.   Press the [TRACK COLOR SEL] key.

```
┌─────────────────────────────────────────────────────────────┐
│  Change Track Color                                          │
│  ─────────────────────────────────────────────────────────  │
│  Main        R   Y   G   C   P   B   W  Temp   Dep           │
│  Sub         R   Y   G   C   P   B   W  Temp   Dep           │
│  GPS Buoy    R   Y   G   C   P   B   W                       │
│  ARP         R   Y   G   C   P   B   W                       │
│  ─────────────────────────────────────────────────────────  │
│  ↑ ↓ ← → : Sel, Fix                                          │
│  TRACK COLOR SEL key : Close Menu                           │
└─────────────────────────────────────────────────────────────┘
```

2.   Press [↑] or [↓] to select track type.

3.   Press [←] or [→] to select color desired. Note that you can also select color with the numeric keys 1-7. The colors selectable with these keys are shown on their key labels.

     Note: When changing the ARP track color, newly acquired targets, track and mark color are colored in accordance with the color selected here.

4.   Press the [TRACK COLOR] key to close the menu.

2.3 Setting Track Plotting Interval (main track)

Track plotting interval may be set by range or time, and the default setting is range (0.01 nm). A shorter interval provides better reconstruction of track, but the total storage time of the track is reduced. One advantage of plotting by range is you won't use the track memory when your ship is dead in water.

2.3.1 Setting track interval by range

1. Press [MENU], [2], [5] to display the Common Function menu, and select Page 1.

2. Press [↑] or [↓] to select Plot Interval.

3. Press [←] to select Range.

4. Key in plotting interval and press the [ENT] key. For example, if the plotting interval is one mile, press [0], [1], [0], [0], [ENT].

5. Press the [MENU] key several times to close the menu.

2.3.2 Setting track plotting interval by time

1. Press [MENU], [2], [5] to display the Common Function menu, and select Page 1.

2. Press [↓] or [↑] to select Plot Interval.

3. Press [→] to select Time.

4. Key in plotting interval and press the [ENT] key. For example, if the plotting interval is one minute, press [0], [1], [0], [0], [ENT].

5. Press the [MENU] key several times to close the menu.

2.4 Smoothing

Even when the vessel is sailing in a straight line the track shown on the display looks irregular. This is due to signal variation of the navaid. To smooth out the irregularity, change the smoothing factor.

2.4.1 Setting smoothing

The default smoothing is 00 (no smoothing). To change the smoothing factor to 05, for example, do the following:

1. Press [MENU], [2], and [5] to display the Common Function menu, and select Page 1.

2. Press [↓] or [↑] to select Smoothing.

3. Enter smoothing factor with the numeric keys and press the [ENT] key. To enter 05, for example, press [0], [5], [ENT].

4. Press the [MENU] key several times to close the menu.

2.4.2 More about smoothing

In the figure below, a wide hatched arrow shows ship's track and the position fed from the navigator by black dots. If no smoothing is applied, the track shown on the display will look irregular due to signal variation.
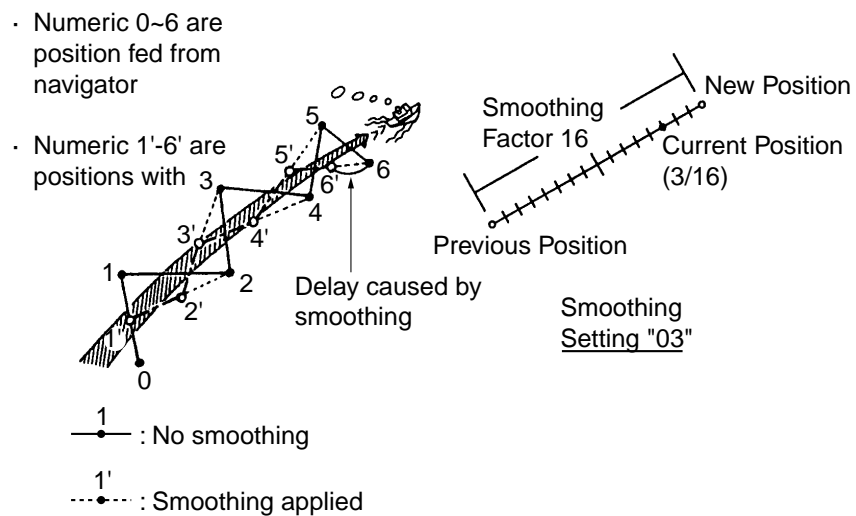
For instance, smoothing factor 03 provides a weighting factor of 13/16 for new data and 3/16 for previous data. The higher the smoothing number, the slower the position updating becomes. In the figure below, the track shown by the broken line has a time delay more than the one shown by the dot-dash line, because of higher smoothing rate.

Actual Track

——————— : Track with no smoothing

— · — · — : Track with smoothing setting 12/16

- - - - - - - - - : Track with smoothing setting 14/16
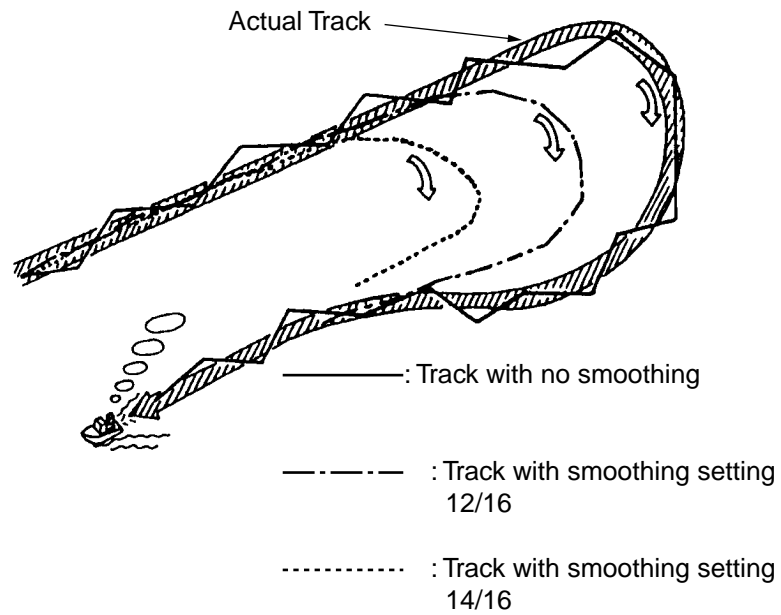
2.5 Suspending, Resuming Plotting of the Track

When your ship is at anchor or returning to port you probably will not need to plot (or record) the track. You can stop plotting the track, to conserve the track memory, by actuating the "track hold" function.

2.5.1 Suspending, resuming plotting

Press the [TRACK ON/OFF] key to suspend or resume plotting. When recording is suspended, the own ship marker is shown by a hollow circle.

2.5.2 Connecting track when recording is resumed

When you resume plotting the track, the location where track plotting was stopped and started can be connected with a straight line.

1. Press [MENU] [2], [5] to display the Common Function menu, and select Page 1.

2. Press [↑] or [↓] to select Connect TRK Not R'cd.

3. Press [←] or [→] to select Disconnect or Connect as appropriate.

Track shown by
dashed lines
not displayed.

Plotting
Restarted

Own Ship

Actual Track

Plotting
Suspended
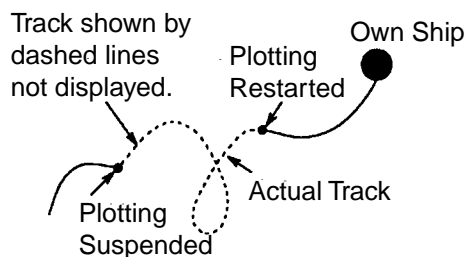
Track points where plotting was suspended
and restarted are not connected.

Own Ship
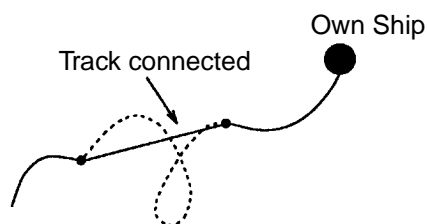
Track connected

Track points where track plotting was
stopped and restarted are connected
with a straight line.

4. Press the [MENU] key several times to close the menu.

2.5.3 Displaying track not plotted

You can display the track which is not plotted while recording of the track is suspended. However, if you shift, shrink or enlarge the display the portion of the track which is not plotted is erased.

1. Press [MENU], [2], [5] to display the Common Function menu, and select Page 1.

2. Press [↓] to select Track Ind. While Holding.

3. Press [←] or [→] to select No or Yes as appropriate.

"Track Ind. White Holding" set to yes.

Own Ship

Resumed

Stopped

Stopped   Resumed

"X" are track points; they do not appear on the display.

· Display shifted
· Display enlarged
· Display shrunk

· Display shifted
· Display enlarged
· Display shrunk

Track disappears.

Own Ship

Resumed

Stopped

Resumed

Stopped

Stopped   Resumed

Solid line: Actual track
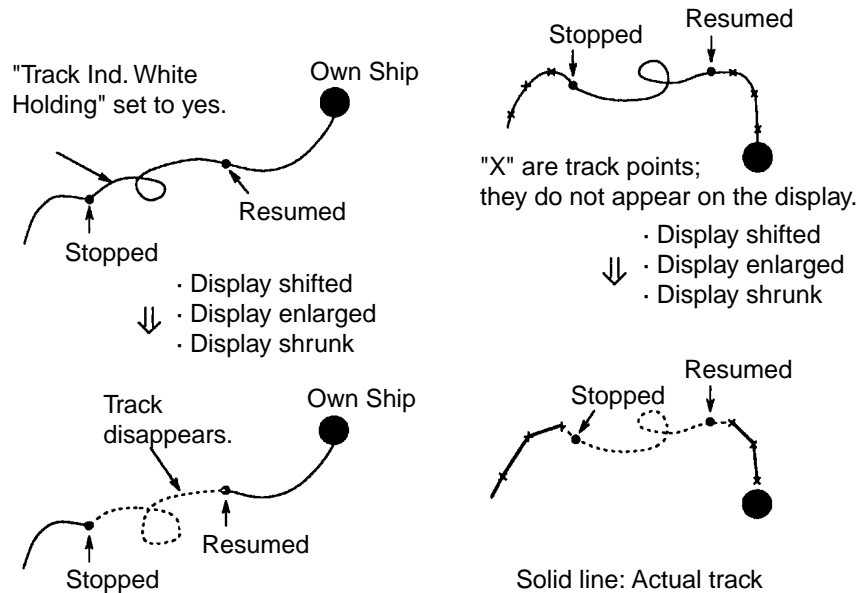
4. Press the [MENU] key several times to close the menu.

2.6 Changing Track Color, Line Type

This section shows how to change past track color and track line type.

2.6.1 Changing color of main and sub tracks

Changing color of all sections of specified track

1. Press [MENU], [2], [8] to display the Change Color/Line Type menu.

```
Change Color/Line Type
_____

Set Area      +Cursor   All
Old Color     R   Y   G   C   P   B   W
New Color     R   Y   G   C   P   B   W   Same
Old Type      ─────   ------   ----   --·--
New Type      ────    ------   ----   --·--   Same
Track         Main    Sub     GPS Buoy
              ARP(00)   [00-10, 00: All]*
              (*10 for GP/GD-280; 20 for GP/GD-380/680)


_____
<CAUTION>
   This MENU is only for setting of own ship track line.
   Not applicable for track lines of GPS buoy nor ARP target.


↑↓←→ : Sel, Fix     ENT: Execute
MENU : Esc
```

2. Press [→] to select All.

3. Press [↓] to select Old Color, and then select color desired.

4. Press [↓] to select New Color, and then select color desired.

5. Press [↓] to select Track followed by track type and press the [ENT] key.

```
Are you sure to change?
 ENT: Change
 Other Keys: Escape
```

6. Press the [ENT] key again to confirm.

7. Press the [MENU] key several times to close the menu.

Changing color of specific section of track

1. Press [MENU], [2], [8] to display the Change Color/Line Type menu.

2. Press [←] to select +Cursor.

3. Press [↓] to select Old Color, and then select color desired.

4. Press [↓] to select New Color, and then select color desired.

5. Press [↓] to select Track followed by track type.

6. Press the [ENT] key. The following message appears.

Place +cursor on starting

point and press ENT.

 Other Keys: Escape

7. Place the +cursor on the starting point and press the [ENT] key.

8. Place the +cursor on the end point and press the [ENT] key.
   Note: Error is notified when +cursor is not correctly placed on a track point. If this occurs, place the +cursor on the track and press the [ENT] key.

9. Press the [ENT] key.

10. Press the [MENU] key several times to close the menu.

2.6.2 Changing track line type of past track

Own ship's track is traced on the display with a solid line. If desired, past track can be traced in a different line type to differentiate between recent and past tracks. Four types of track lines are available as below.

1) Solid line —————— 2) Dashed line --------------
3) Dotted line _ _ _ _ _ _ 4) Dot-dash line················

Changing line type of all past track

1. Press [MENU], [2], [8] to display the Change Color/Line Type menu.

2. Press [→] to select All.

3. Press [↓] to select Old Type, and then select line type desired.

4. Press [↓] to select New Type, and then select line type desired.

5. Press [↓] to select Track followed by track type.

6. Press the [ENT] key.

7. Press the [ENT] key.

8. Press the [MENU] key several times to close the menu.

Changing line type of specific section of track

1. Press [MENU], [2], [8] to display the Change Color/Line Type menu.

2. Press [←] to select +Cursor.

3. Press [↓] to select Old Type, and then select line type desired.

4. Press [↓] to select New Type, and then select line type desired.

5. Press [↓] to select Track followed by track type.

6. Press the [ENT] key.

7. Operate the +cursor to place the trackball on the starting point of the track you wish to change line type and then press the [ENT] key.

8. Operate the +cursor to place the trackball on the ending point of the track you wish to change line type and then press the [ENT] key.

9. Press the [ENT] key.

10. Press the [MENU] key several times to close the menu.

2.7 Displaying Specific Track

When the screen becomes full of track you can temporarily display a specific portion of the track to clear the screen. You can display track by color(s), by time, by line type(s) or by number of track points. When you are finished viewing a specific portion you can completely or partially restore any track temporarily erased.

2.7.1 Displaying track by color

1. Press [MENU], [2], [5] to display the Common Function menu, and select Page 1.

2. Press [↑] or [↓] to select By Color.

3. Press [→] to select Yes.

```
┌──────────────────────────────────┐
│ By Color                         │
│ ─────────────────────────────    │
│                                  │
│ Red          No  Yes             │
│ Yellow       No  Yes             │
│ Green        No  Yes             │
│ Cyan         No  Yes             │
│ Purple       No  Yes             │
│ Blue         No  Yes             │
│ White        No  Yes             │
│                                  │
│                                  │
│                                  │
│                                  │
│                                  │
│ ─────────────────────────        │
│ ↑↓←→ : Sel    ENT: Fix           │
│ MENU : Esc                       │
└──────────────────────────────────┘
```

4. Display Yes for the colors you want to display; No for the colors you do not wish to display.

5. Press the [ENT] key.

6. Press the [MENU] key several times to close the menu.

2.7.2 Displaying track by track line type

1. Press [MENU], [2], [5] to display the Common Function menu, and select Page 1.

2. Press [↑] or [↓] to select By Line Type.

3. Press [→] to select Yes.

```
By Line Type
_____

━━━━        No  Yes
------      No  Yes
– – – –     No  Yes
-··-··-     No  Yes




_____
<CAUTION>
This MENU is only for setting of own ship
track line. Not applicable for track lines
of GPS buoy nor ARP target.


↑↓←→ : Sel   ENT: Fix
MENU : Esc
```

4. Display Yes for the line type(s) you want to display; No for the line type(s) you do not wish to display.

5. Press the [ENT] key.

6. Press the [MENU] key several times to close the menu.

2.7.3 Displaying track color by time

1. Press [MENU], [2], [5] to display the Common Function menu, and select Page 1.

2. Press [↑] or [↓] to select By Time.

3. Press [→] to select Yes.

```
┌─────────────────────────────────────┐
│ By Time                             │
│ ─────────────────────────────────── │
│                                     │
│ Start    1986/01/01   00:00'        │
│ End      2046/12/31   23:59'        │
│                                     │
│                                     │
│                                     │
│                                     │
│ ─────────────────────────────────── │
│ ↑↓←→ : Sel   ENT: Fix               │
│ MENU : Esc                          │
└─────────────────────────────────────┘
```

4. Enter the starting date and time (in 24-hour notation) of track you want to display and then press the [ENT] key. To enter February 15, 1999, 2:05 p.m., for example, press [1], [9], [9], [9], [0], [2], [1], [5], [1], [4], [0], [5], [↓].

5. Enter the end date and time (in 24-hour notation) of track you want to display and then press the [ENT] key.

6. Press the [ENT] key.

7. Press the [MENU] key several times to close the menu.

2.7.4 Displaying track by number of track points

1. Press [MENU], [2], [1] to display the Main Track menu. (For Sub Track press [MENU], [2], [2].)

2. Press [↑] or [↓] to select Disp. Pt. No.

3. Press [→] to select Set.

4. Enter number of track points to display in five digits (max. number of points: 99,999) and press the [ENT] key. To display 1,000 points, for example, press [0], [1], [0], [0], [0], [ENT].

5. Press the [MENU] key several times to close the menu.

2.8 Erasing Track

Unnecessary track (main track, sub track, GPS buoy track, ARP track) can be erased from the memory three ways: by line type(s), by time range, and track between two points.

2.8.1 Erasing track by line type

1. Press [MENU], [2], [6] to display the Erase by Attribute menu.

```
Erase by Attribute
_____

  Type
  Start   1986/01/01   00:00'
  End     2046/12/31   23:59'
_____

By Line Type      No   ←→   Yes
By Time           No   ←→   Yes
Set Area          On Screen   Off Screen   +Cursor   All
 Track            Main    Sub    GPS Buoy
                  ARP(00)   [00-10, 00: All]*
                  (*10 for GP/GD-280; 20 for GP/GD-380/680)
_____

↑↓←→ : Sel, Fix     ENT: Execute
MENU : Esc
```

2. Press [→] to select Yes.

```
By Line Type
_____

_____            No   Yes
------              No   Yes
- - - -             No   Yes
-·-·-·              No   Yes




_____

↑↓←→ : Sel     ENT: Fix
MENU : Esc
```

3. Display Yes next to line type(s) you want to erase; No for line type(s) you want to keep.

4. Press the [ENT] key.

5. Press [↑] or [↓] to select Set Area.

6. Press [←] or [→] to select range to erase. On screen, track currently shown on the display; Off Screen, track stored in the memory; +Cursor, +cursor-selected area, or All.

    Note: On Screen and Off Screen are only available in North-up, True Motion.

7. Select type of Track to erase from the Track field.

8. Press the [ENT] key. If you selected +Cursor at step 6, go to step 9. For On Screen, Off Screen or All go to step 11.

    ```
    Place +cursor at lower-

    left corner and press ENT.


     Other Keys: Escape
    ```

9. Place the +cursor at the lower-left corner of the area which will enclose the track to erase and then press the [ENT] key. The following message appears.

    ```
    Place +cursor at upper-

    right corner and press ENT.


     Other Keys: Escape
    ```

10. Place the +cursor at the upper-right corner of the area which will enclose the track to erase and then press the [ENT] key. You are asked if it is all right to erase the track selected.

    ```
    Are you sure to erase?


     ENT        : Erase
     Other Keys : Escape
    ```

11. Press the [ENT] key.

12. Press the [MENU] key several times to close the menu.

2.8.2 Erasing track by time

1. Press [MENU], [2], [6] to display the Erase by Attribute menu.

2. Press [↑] or [↓] to select By Time.

3. Press [→] to select Yes.

```
┌─────────────────────────────────────────┐
│ By Time                                  │
│ ──────────────────────────────────────   │
│                                          │
│ Start     1986/01/01   00:00'            │
│ End       2046/12/31   23:59'            │
│                                          │
│                                          │
│                                          │
│                                          │
│ ──────────────────────────────────────   │
│ ↑↓←→ : Sel    ENT: Fix                   │
│ MENU : Esc                               │
└─────────────────────────────────────────┘
```

4. Enter the starting date and time (in 24-hour notation) of track you want to. To enter April 10, 1999, 3:05 p.m., for example, press [1], [9], [9], [9], [0], [4], [1], [0], [1], [5], [0], [5], [↓].

5. Enter the end date and time (in 24-hour notation) of track you want to erase and then press the [ENT] key.

6. Press [↓] to select Set Area.

7. Press [←] or [→] to set area desired. (Note that On Screen and Off Screen are only available in North-up, True Motion.)

8. Select type of track to erase from the Track field.

9. Press the [ENT] key. If you selected On Screen, Off Screen or All at step 7 go to step 12. For +Cursor, go to step 10.

10. Place the +cursor at the lower-left corner of the area which will enclose the track to erase and then press the [ENT] key.

11. Place the +cursor at the upper-right corner of the area which will enclose the track to erase and then press the [ENT] key. You are asked if it is all right to erase the track selected.

12. Press the [ENT] key.

13. Press the [MENU] key several times to close the menu.

2.8.3 Erasing track between two points

1. Press [MENU], [2], [7]. The following message appears.

```
Place +cursor on starting
point and press ENT.


 Other Keys: Escape
```

2. Place the +cursor on the starting point of the track to erase and press the [ENT] key. The following message appears.

```
Place cursor on end
point and press ENT.


 Other Keys: Escape
```

3. Place the +cursor on the end point of the track to erase and press the [ENT] key. You are asked if it is all right to erase the track.

4. Press the [ENT] key.

5. Press the [MENU] key several times to close the menu.

Note: Unconnected track cannot be erased by the above procedure.

2.9 Offsetting Chart Data

In some instances chart position may be off by a few minutes. For example, the ship is shown to be at sea while it is in fact moored to a pier. This error can be corrected by shifting the chart with the trackball or entering appropriate offset values.

2.9.1 Chart offset by trackball

1. Press [MENU], [0] to display the Initial Setting menu.

```
Initial Setting
_____

1    Plotter Display
2    Plotter Disp. Standard
3    Graph Display
4    Function Keys
5    Mark Pattern
6    Misc. Setting
7    Setup
8    Test
9
0
_____

1~8    : Next Page
Menu : Esc
```
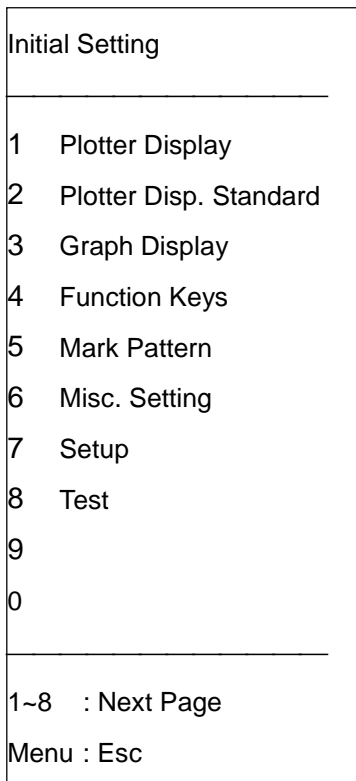
2. Press the [1] key to select Plotter Display.

3. Press [←] or [→] to select (Page) 4.

```
┌────────────────────────────────────────────────┐
│ Plotter Display [Chart Attributes]             │
│ _____ │
│                                                │
│ Page    1  2  3  4  5  6  7  8  9  10  11       │
│ _____ │
│                                                │
│ Chart Data          Off   On                   │
│ Land Pattern        Off  Dim  Medium  Bright    │
│ Land Color          R  Y  G  C  P  B  W         │
│ Index               Off   On                    │
│ Place Name          Off   On                    │
│ Chart Pos. Offset   Off  ←→  On [00.000'N]      │
│                                 [00.000'E]      │
│                                                │
│                                                │
│ _____ │
│ ↑↓←→ : Sel, Fix                                 │
│ MENU : Esc                                      │
└────────────────────────────────────────────────┘
```

4. Press [↓] to select Chart Pos. Offset.

5. Press [→] to select On.

```
┌──────────────────────────────────────────┐
│ Chart Position Offset                     │
│ _____  │
│                                           │
│ By cursor    ←→    By L/L Position         │
│                    (– –.– – –'N  – –.– – –'W) │
│                                           │
│                                           │
│                                           │
│                                           │
│                                           │
│ _____  │
│ ←→      : Sel, Fix                         │
│ MENU : Esc                                 │
└──────────────────────────────────────────┘
```

6. Press [←] to select By cursor. The following message appears.

Place +cursor and press ENT.

Other Keys: Escape
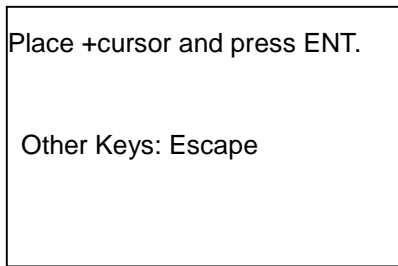
7. Operate the trackball to place the +cursor where to shift the chart.

8. Press the [ENT] key. The "offset" icon (⊞) appears at the bottom of the display.

9. Press the [MENU] key several times to close the menu.

Note: To remove the offset, select Off at step 5 in the above procedure.

2.9.2 Offsetting chart position by latitude and longitude values

1. Press [MENU], [0], [1] to display the Plotter Display [Chart Attributes] menu, and select Page 4.

2. Press [↓] to select Chart Pos. Offset.

3. Press [→] to select On.

4. Press [→] to select By L/L Position.

5. Enter latitude offset value. If it is 13.097'N, for example, press [1], [3], [0], [9], [7], (↻). Use the ↻ key to switch coordinates if necessary.

6. Enter longitude offset value. If it is 08.169'E, for example, press [0], [8], [1], [6], [9], (↻). Use the ↻ key to switch coordinates if necessary.

7. Press the [ENT] key.

8. Press the [MENU] key several times to close the menu.

3. MARKS

Marks can be electrically drawn on the screen to depict navigation buoys, sunken vessels, lighthouses, etc. Further, marks can denote when a net is thrown, fishing started, net retrieved, etc.

Marks are available in ten types (see below) and seven colors (red, yellow, blue, cyan, green, white, and purple). The colors available appear on key labels of the numeric keys 1 through 7. In addition to those marks, marks fed from external equipment are automatically inscribed on the display. These include time mark, water temperature mark, tide mark, external event mark, depth mark, fish mark, and course mark. (Appropriate equipment is required to display these marks.) Chapter 13 describes how to display marks generated by external equipment.

◇、 +、 ⊡、 Y、 ⊙、
⊡、 ⛩、 ☆、 ✳、 △

Standard Marks

3.1 Entering Marks

Marks can be entered seven ways: by entering latitude and longitude, range and bearing from own ship, Loran C LOPs, Decca LOPs, own position mark, by +cursor, and by Loran A LOPs.

3.1.1 Entering marks by latitude and longitude position

1. Press [MENU], [3] to display the Mark/Line menu.

    Mark/Line
    _____

    1   Comment List

    2   Setting

    3   Erase Mark

    4   Erase Line(1)

    5   Erase Line(2)

    6   Mark Color Select

    7   Mark Shape Select

    8   Line Color Select

    9   Comment

    0   Enter
    _____

    0~9   : Next Page

    MENU : Esc

2. Press [2] to select Setting.

```
Setting
_____

Display Specific Mark          Display Specific Line

 Shape  ◇＋▫Y⊙♨⛊★✳▲    Type   ——  ------  - - - -  --·--

 Color   R Y G C P B W         Color   R Y G C P B W

 Start   1986/01/01  00:00'    Start   1986/01/01  00:00'

 End     2046/12/31  23:59'    End     2046/12/31  23:59'
_____

Disp. Spec. MK Shape      No  ⟨←→⟩  Yes

Disp. Spec. MK Color      No   ←→   Yes

Disp. Spec. MK Time       No   ←→   Yes

Change MK Attribute            →    Yes

Set MK Entry Method       Lat./Long.   Rng/Brg   Loran C   Decca
                          Ship Pos/+Cursor   Loran A

Disp. Spec. Line          No   ←→   Yes

Disp. Spec. LN Color      No   ←→   Yes

Disp. Spec. LN Time       No   ←→   Yes

Change LN Attribute            →    Yes

Set LN Entry Method       Lat./Long.   Rng/Brg   Loran C   Decca
                          Ship Pos/+Cursor   Loran A
_____

↑↓←→ : Sel, Fix

MENU : Esc
```

3. Press [↑] or [↓] to select Set MK Entry Method.

4. Press [←] to select Lat./Long.

5. Press the [MARK ENT] key.

```
Enter Mark [Lat./Long.]
_____

Lat.         33°59.988'N

Long.        134°59.979'E



_____

MARK ENT key: Close

↑↓←→: Sel    ENT: Enter
```

3-2

6. Enter latitude desired for the mark and press the [↓] key. If the latitude is 34°38.838'N, for example, press [3], [4], [3], [8], [8], [3], [8], [↓]. Use the ⟳ key to switch between North and South and vice versa.

7. Enter longitude desired for the mark. If the longitude is 135°34.638'E, for example, press [1], [3], [5], [3], [4], [6], [3], [8]. Use the ⟳ key to switch between East and West and vice versa.

8. Press the [ENT] key. If the entered position is within the current display range the mark can be seen on the screen. To continue entering marks by this method, repeat steps 6 through 8 in this procedure.
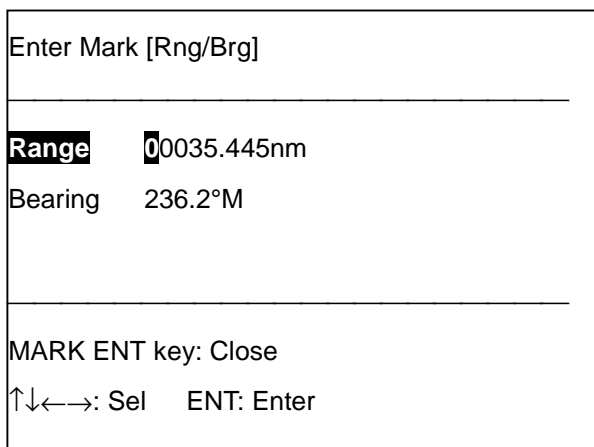
Note 1: To escape from the position entry screen without entering position, press the [MARK ENT] key.

Note 2: When the mark memory becomes fall, the buzzer sounds, and no further marks can be entered. In this case, increase mark memory capacity (see Chapter 13) or erase unnecessary marks (see paragraph 3.2 Erasing Marks).

3.1.2 Entering marks by range and bearing

This method is useful for denoting the location of a target found on radar.

1. Press [MENU], [3], [2] to open the Setting menu.

2. Press [↑] or [↓] to select Set MK Entry Method.

3. Press [←] or [→] to select Rng/Brg.

4. Press the [MARK ENT] key.

```
┌─────────────────────────────────────┐
│ Enter Mark [Rng/Brg]                │
│ ─────────────────────────────────── │
│                                      │
│ Range      00035.445nm               │
│ Bearing    236.2°M                   │
│                                      │
│                                      │
│ ─────────────────────────────────── │
│ MARK ENT key: Close                  │
│ ↑↓←→: Sel    ENT: Enter             │
└─────────────────────────────────────┘
```

5. Enter the range from own ship to mark position and then press the [↓] key. (The available range is 00000.000 to 99999.999.) If the range is 45 miles, for example, press [0], [0], [0], [4], [5], [0], [0], [0], [↓].

6. Enter the bearing from own ship to mark position. (The available bearing range is 000.1 to 359.9°.) If the bearing is 135°, for example, press [1], [3], [5].

7. Press the [ENT] key to inscribe mark, in the shape and color specified.
   To continue entering marks by this method, repeat steps 4 through 7.

3.1.3 Entering marks by Loran C LOPs

1. Press [MENU], [3], [2] to open the Setting menu.

2. Press [↑] or [↓] to select Set MK Entry Method.

3. Press [←] or [→] to select Loran C.

4. Press the [MARK ENT] key.

```
Enter Mark [Loran C]
_____

LOP 1          17425.6

LOP 2          36111.4

Estim Lat       34°44.189'N

Estim Long     140°27.889'E


_____

MARK ENT key: Close

↑↓←→: Sel     ENT: Enter
```

5. Enter LOP1 and LOP2. If the LOPs are 26214.3 and 47314.6, for example, press [2], [6], [2], [1], [4], [3], [↓], [4], [7], [3], [1], [4], [6], [↓].

6. Enter estimated latitude and longitude position of the LOPs' intersection. If the latitude is 34°40N and the longitude 135°20E, for example, press [3], [4], [4], [0], [0], [0], [0], [↓], [1], [3], [5], [2], [0], [0], [0], [0]. Use the ↻ key to switch from N to S, E to W and vice versa.

7. Press the [ENT] key to inscribe the mark, in the shape and color specified.
   To continue entering marks by this method, repeat steps 4 through 7.

3.1.4 Entering marks by Decca LOPs

1. Press [MENU], [3], [2] to open the Setting menu.

2. Press [↑] or [↓] to select Set MK Entry Method.

3. Press [←] or [→] to select Decca.

4. Press the [MARK ENT] key.

```
Enter Mark [Decca]
_____

LOP 1          1J: 13.29

LOP 2          1A: 47.35

Estim Lat        34°44.189'N

Estim Long     140°27.892'E

               [A:1 B:2 C:3 D:4 E:5]

               [F:6 G:7 H:8 I:9 J:0]

_____

MARK ENT key: Close

↑↓←→: Sel    ENT: Enter
```

5. Enter LOP1 and LOP2. If the LOPs are 1A: 40.90 and 1G: 70.21, for example, press [1], [1], [4], [0], [9], [0], [↓], [1], [7], [0], [2], [1], [↓].

   A: 1   B: 2   C: 3   D: 4   E: 5   F: 6   G: 7   H: 8   I: 9   J: 0

6. Enter estimated latitude and longitude position of the LOPs' intersection. If the latitude is 34°44N and the longitude 135°15E, for example, press [3], [4], [4], [4], [0], [0], [0], [↓], [1], [3], [5], [1], [5], [0], [0], [0]. Use the ⟳ key to switch from N to S, E to W and vice versa.

7. Press the [ENT] key to inscribe the mark, in the shape and color specified.
   To continue entering marks by this method, repeat steps 4 through 7.

3.1.5 Entering marks by Loran A LOPs

1. Press [MENU], [3], [2] to open the Setting menu.

2. Press [↑] or [↓] to select Set MK Entry Method.

3. Press [→] to select Loran A.

4. Press the [MARK ENT] key.

```
Enter Mark [Loran A]
_____

LOP 1          1L0: 2062.6
LOP 2          1L1: 4206.1
Estim Lat        32°50.924'N
Estim Long     137°07.346'E


_____

MARK ENT key: Close
↑↓←→: Sel    ENT: Enter
```

5. Enter LOP1 and LOP2. If the LOPs are 1992.0 and 4191.6, for example, press [1], [9], [9], [2], [0], [↓], [4], [1], [9], [1], [6], [↓].

6. Enter estimated latitude and longitude position of the LOPs' intersection. If the latitude is 34°35'N and the longitude 135°00'E, for example, press [3], [4], [3], [5], [0], [0], [0], [↓], [1], [3], [5], [0], [0], [0], [0], [0]. Use the ⟳ key to switch from N to S, E to W and vice versa.

7. Press the [ENT] key to inscribe the mark, in the shape and color specified.
    To continue entering marks by this method, repeat steps 4 through 7.

3.2 Erasing Marks

Marks can be erase individually (with the +cursor) or collectively. This section explains how to erase marks collectively by mark color, mark shape, and time entered.

3.2.1 Erasing marks by mark color

1. Press [MENU], [3], [3] to display the Erase Mark menu.

```
Erase Mark
_____

   Shape          —        ·
   Color
   Start      1986/01/01   00:00'
   End        2046/12/31   23:59'
_____

By Shape       No   ←→   Yes
By Color       No   ←→   Yes
By Time        No   ←→   Yes
Set Area          On Screen   Off Screen   +Cursor   All




_____

↑↓←→ : Sel, Fix    ENT: Execute
MENU : Esc
```

2. Press [↑] or [↓] to select By Color.

Note: Set By Shape and By Time to "No."

3.   Press [→] to select Yes.

```
By Color
_____

Red           No    Yes
Yellow        No    Yes
Green         No    Yes
Cyan          No    Yes
Purple        No    Yes
Blue          No    Yes
White         No    Yes




_____

↑↓←→ : Sel    ENT: Fix
MENU : Esc
```

4.   Display Yes (erase) or No (keep) beside color(s) as appropriate.

5.   Press the [ENT] key.

6.   Press [↓] to select Set Area.

7.   Press [←] or [→] to select range to erase; On Screen, Off Screen, +Cursor, or All.

     Note: On Screen and Off Screen available with North-up or True Motion.

8.   Press the [ENT] key. If you selected +Cursor at step 7, the following prompt appears. Follow
     the instructions in step 9. For other selections go to step 11.

```
Place +cursor on lower-

left corner and press ENT.


 Other Keys: Escape

```

9. Place the +cursor on the lower-left corner of the area and press the [ENT] key. The following message appears.

```
Place +cursor on upper-
right corner and press ENT.


 Other Keys: Escape
```

10. Place the +cursor at the upper-right corner of the area and press the [ENT] key. The following message appears.

```
Are you sure to erase?


 ENT        : Erase
 Other Keys : Escape
```
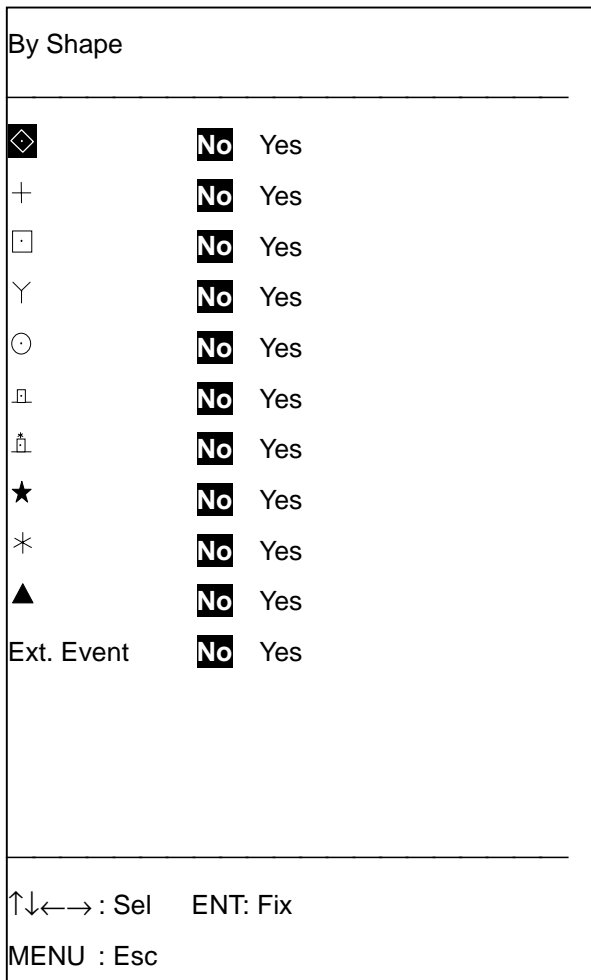
11. Press the [ENT] key.

12. Press the [MENU] key several times to close the menu.

3.2.2 Erasing marks by mark shape

1. Press [MENU], [3], [3] to display the Erase Mark menu.

2. Press [→] to select Yes.

```
By Shape
_____

◇          No   Yes
+          No   Yes
⊡          No   Yes
Y          No   Yes
⊙          No   Yes
⌂          No   Yes
⌂          No   Yes
★          No   Yes
✳          No   Yes
▲          No   Yes
Ext. Event  No   Yes




_____

↑↓←→ : Sel    ENT: Fix
MENU : Esc
```

3. Display Yes (erase) or No (keep) beside shape(s) as appropriate.

4. Press the [ENT] key.

5. Press [↓] to select Set Area.

6. Press [←] or [→] to select range to erase. (On Screen and Off Screen are only available in North-up, True Motion.)

7. Press the [ENT] key. If you selected On Screen, Off Screen or All at step 6, go to step 10. For +cursor go to step 8.

8. Place the +cursor at the lower-left corner of area and press the [ENT] key.

9. Place the +cursor at the upper-right corner of area and press the [ENT] key.

10. Press the [ENT] key.

11. Press the [MENU] key several times to close the menu.

3.2.3 Erasing marks by time range

1. Press [MENU], [3], [3] to display the Erase Mark menu.

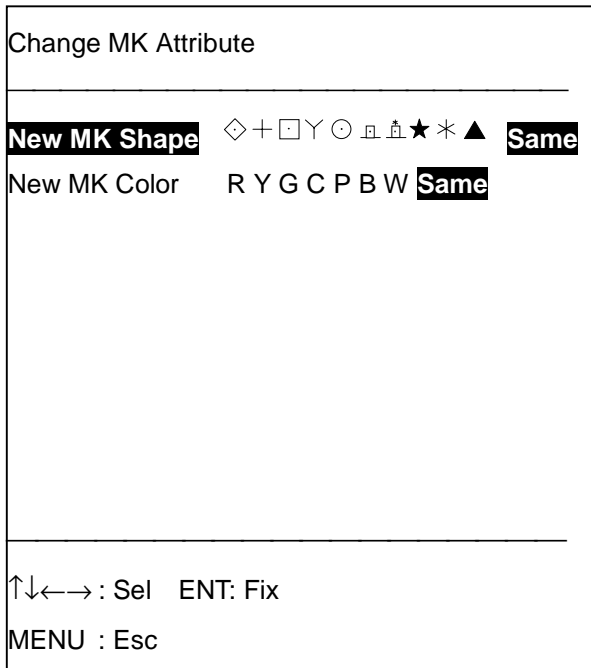2. Press [↑] or [↓] to select By Time.

3. Press [→] to select Yes.

```
┌─────────────────────────────────────┐
│ By Time                             │
│ _____│
│                                     │
│ Start       1986/01/01   00:00'     │
│ End         2046/12/31   23:59'     │
│                                     │
│                                     │
│                                     │
│ _____│
│                                     │
│ ↑↓←→ : Sel    ENT: Fix              │
│ MENU : Esc                          │
│                                     │
└─────────────────────────────────────┘
```

4. Enter starting time (use 24-hour notation) in the order of year, month, day, hour and minutes and then press the [↓] key. Enter year in four digits, and day, hour and minutes in two. If the starting time is May 31, 1999, 13:01 for example, press [1], [9], [9], [9], [0], [5], [3], [1], [1], [3], [0], [1], [↓].

5. Enter end time (use 24-hour notation) in the order of year, month, day, hour and minutes. If the end time is June 01, 1999, 15:05 for example, press [1], [9], [9], [9], [0], [6], [0], [1], [1], [5], [0], [5].

6. Press the [ENT] key.

7. Press [↓] to select Set Area.

8. Press [←] or [→] to select range to erase. (On Screen and Off Screen are only available in North-up, True Motion.)

9. Press the [ENT] key If you selected On Screen, Off Screen or All, go to step 12. For +Cursor go to step 10.

10. Place the +cursor on the lower-left corner of the area and press the [ENT] key.

11. Place the +cursor on upper -right corner of the area and press the [ENT] key. You are asked if it is all right to erase marks selected.

12. Press the [ENT] key.

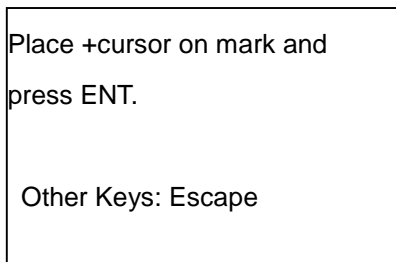13. Press the [MENU] key several times to close the menu.

3.3 Changing Mark Shape and Color

You can change the color and shape of marks already entered as follows:

1. Press [MENU], [3], [2] to display the Setting menu.

2. Press [↑] or [↓] to select Change MK Attribute.

3. Press [→] to select Yes.

```
Change MK Attribute
_____

New MK Shape    ◇＋⊡Υ⊙ 且 Ⱥ ★ ＊ ▲   Same
New MK Color      R Y G C P B W  Same




_____

↑↓←→ : Sel   ENT: Fix
MENU : Esc
```

4. Select shape or color to change.

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

```
Place +cursor on mark and
press ENT.


 Other Keys: Escape
```

6. Place the +cursor on the mark you want to change and press the [ENT] key.

7. Press the [MENU] key several times to close the menu.

3.4 Displaying the Mark Comment List

The mark comment list displays comment number, position, mark, mark color and comment of marks entered. You can display the list as follows:

1. Press [MENU], [3], [1] to display the comments list.

```
Comment List                          Mark
_____

00001    33°02.734'N      135°18.831'E    □·    R    Buoy

00002    32°01.232'N      135°20.211'E    ·     Y    Catch
                                          ↑
                                         Line




_____

↑↓: Change Page    MENU: Esc
```

Use the [↑], [↓] keys to scroll the list. Comment entry is described on page 1-9.

3.5 Displaying Specific Marks

There may be times when you want to display only specific marks. You can select the marks to display by color(s), by shape(s), and by time.

3.5.1 Displaying marks by mark shape

1. Press [MENU], [3], [2] to display the Setting menu.

2. Press [→] to select Yes.

```
Display Specific MK Shape
_____

◇        No  Yes
+        No  Yes
⊡        No  Yes
Y        No  Yes
⊙        No  Yes
⌂        No  Yes
🛆        No  Yes
★        No  Yes
✳        No  Yes
▲        No  Yes




_____

↑↓←→ : Sel    ENT: Fix
MENU : Esc
```

3. Display Yes (display) or No (temporarily erase) beside mark shape(s) as appropriate.

4. Press the [ENT] key.

5. Press the [MENU] key several times to close the menu.

3.5.2 Displaying marks by mark color

1. Press [MENU], [3], [2] to display the Setting menu.

2. Press [↑] or [↓] to select Disp. Spec. MK Color.

3. Press [→] to select Yes.

```
Display Specific MK Color
_____

Red          No   Yes
Yellow       No   Yes
Green        No   Yes
Cyan         No   Yes
Purple       No   Yes
Blue         No   Yes
White        No   Yes




_____

↑↓←→ : Sel    ENT: Fix
MENU : Esc
```

4. Display Yes (display) or No (temporarily erase) beside mark color(s) as appropriate.

5. Press the [ENT] key.

6. Press the [MENU] key several times to close the menu.

3.5.3 Displaying marks by time range

1. Press [MENU], [3], [2] to display the Setting menu.

2. Press [↑] or [↓] to select Disp. Spec. MK Time.
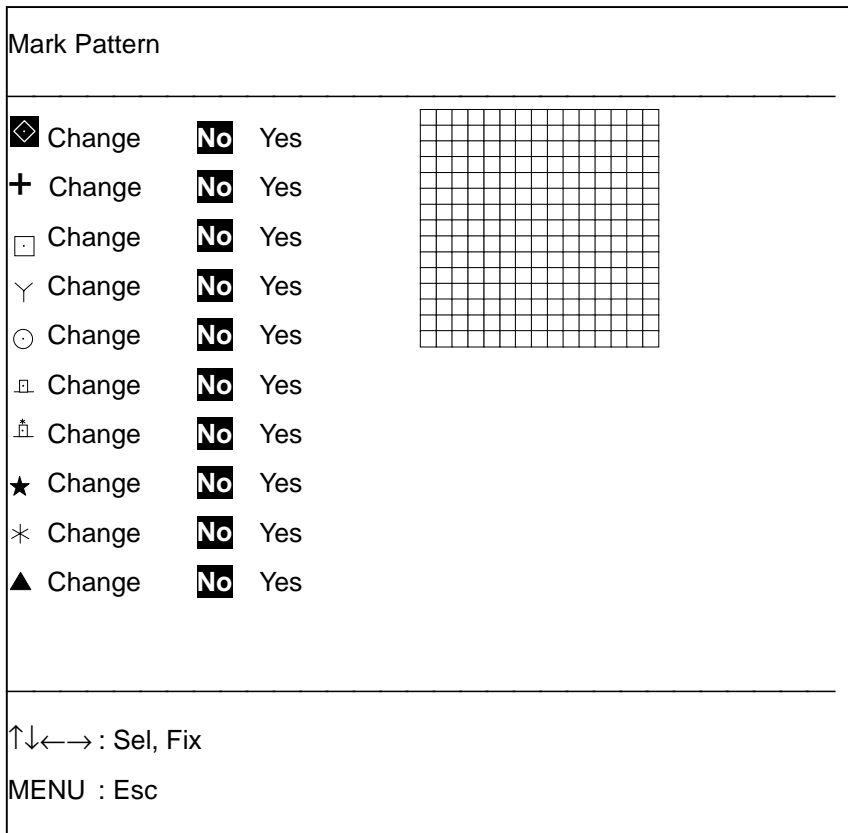
3. Press [→] to select Yes.

```
Display Specific MK Time
_____

Start        1986/01/01   00:00'
End          2046/12/31   23:59'



_____

↑↓←→ : Sel    ENT: Fix
MENU : Esc
```

4. Enter starting time (use 24-hour notation) in the order of year, month, day, hour and minutes and then press the [↓] key. Enter year in four digits, and day, hour and minutes in two. If the starting time is May 31, 1999, 13:01 for example, press [1], [9], [9], [9], [0], [5], [3], [1], [1], [3], [0], [1], [↓].

5. Enter end time (use 24-hour notation) in the order of year, month, day, hour and minutes. If the end time is June 01, 1999, 15:05 for example, press [1], [9], [9], [9], [0], [6], [0], [1], [1], [5], [0], [5].

6. Press the [ENT] key.

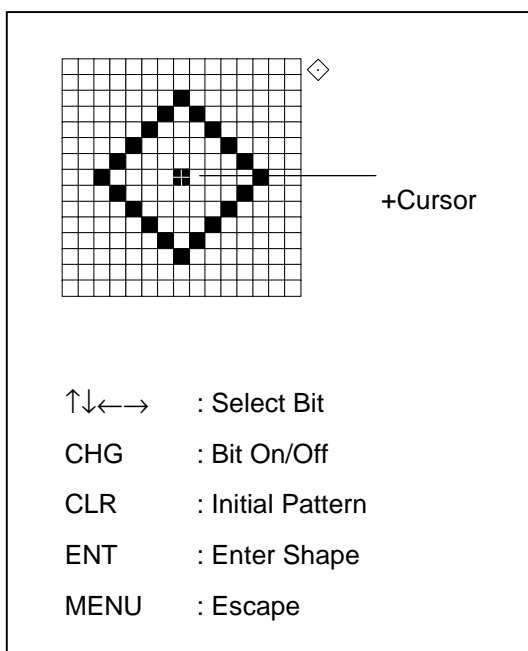7. Press the [MENU] key several times to close the menu.

3.6 Changing Mark Pattern

Your unit provides 10 types of marks, and you may change their shapes as desired.

1. Press [MENU], [0], [5] to display the Mark Pattern menu.

```
Mark Pattern
_____

◇ Change    No   Yes      ┌─────────────┐
＋ Change    No   Yes      │             │
□ Change    No   Yes      │             │
Y Change    No   Yes      │             │
⊙ Change    No   Yes      │             │
⊥ Change    No   Yes      └─────────────┘
⊥ Change    No   Yes
★ Change    No   Yes
＊ Change    No   Yes
▲ Change    No   Yes


_____

↑↓←→ : Sel, Fix
MENU : Esc
```

2. Press [↑] or [↓] to select mark shape to change.

3. Press [→] to select Yes. If you selected the diamond mark, for example, your screen should look like the one below.

```



                                    ◇


                            ───────── +Cursor






    ↑↓←→      : Select Bit

    CHG       : Bit On/Off

    CLR       : Initial Pattern

    ENT       : Enter Shape

    MENU      : Escape
```

4. Use the +cursor to select pixel to process.

5. Press ⟳ to erase or display pixel as desired.

6. Press the [ENT] key. Mark pattern is changed as specified.

7. Press the [MENU] key several times to close the menu.

4. LINES

Lines can be electrically drawn on the screen to depict important locations such as fishing spots and danger areas.

Lines are available in four line types and seven colors (red, yellow, blue, cyan, green, white, and purple). The default line type is the solid line.

1) Solid line——— 2) Dashed line --------- 3) Dotted line ---------- 4) Dash-dot line---------

As with marks, you may enter comments (12 alphanumeric characters) for lines.

End Point

Intermediate Point

Fish

[Comment]

Starting Point
Intermediate Point
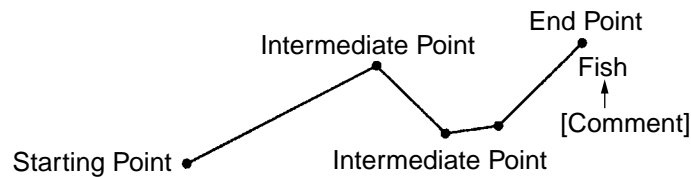
Comment may be affixed at any point on a line.

4.1 Entering Lines

Lines can be entered seven ways: by latitude and longitude, range and bearing from own ship, Loran C LOPs, Decca LOPs, line connection with own ship position, by +cursor, and by Loran A LOPs.

4.1.1 Entering lines by latitude and longitude position

1. Press [MENU], [3], [2] to display the Setting menu.

2. Press [↓] to select Set LN Entry Method.

3. Press [←] to select Lat./Long.

4. Press the [LINE START] key.

```
Start Point [Lat./Long.]
_____

Lat.        33°08.121'N

Long.       138°46.433'E



_____

LINE START key: Close

↑↓←→: Sel     ENT: Enter
```

5. Enter latitude desired for the line and press the [↓] key. If the latitude is 34°38.838'N, for example, press [3], [4], [3], [8], [8], [3], [8], [↓]. Use the ⟳ key to switch between North and South and vice versa.

6. Enter longitude desired for the line. If the longitude is 135°34.638'E, for example, press [1], [3], [5], [3], [4], [6], [3], [8]. Use the ⟳ key to switch between East and West and vice versa.

7. Press the [ENT] key.

8. Press the [LINE ENT] key. If the entered position is within the current display range the line point can be seen on the screen.

9. Enter latitude of next point. (Same procedure as step 5.)

10. Enter longitude of next point. (Same procedure as step 6.)

11. Press the [LINE ENT] key to inscribe the line.

12. Repeat step 9 through 11 to complete the line.

Note: When you attempt to enter a line and the line memory is full, a buzzer sounds. To enter a line, erase unnecessary lines or increase line memory capacity. For further details, see Paragraph 13.4.

4.1.2 Entering lines by range and bearing

1. Press [MENU], [3], [2] to open the Setting menu.

2. Press [↓] to select Set LN Entry Method.

3. Press [←] or [→] to select Rng/Brg.

4. Press the [LINE START] key.

```
┌─────────────────────────────────────────┐
│ Start Point [Rng/Brg]                    │
│ ──────────────────────────────────────   │
│                                          │
│ Range       00204.117 nm                 │
│ Bearing     232.8 °M                     │
│                                          │
│                                          │
│ ──────────────────────────────────────   │
│ LINE START key: Close                    │
│ ↑↓←→: Sel    ENT: Enter                   │
└─────────────────────────────────────────┘
```

5. Enter the range from own ship to line position and then press the [↓] key. (The available range is 00000.000 to 99999.999.) If the range is 45 miles, for example, press [0], [0], [0], [4], [5], [0], [0], [0], [↓].

6. Enter the bearing from own ship to line position. (The available bearing range is 000.0 to 359.9°.) If the bearing is 135°, for example, press [1], [3], [5].

7. Press the [ENT] key.

8. Press the [LINE ENT] key to inscribe line, in the shape and color specified.

9. Enter the range and bearing for the next point on the line.

10. Press the [LINE ENT] key to inscribe the line.

11. Repeat steps 9 and 10 to complete the line.

4.1.3 Entering lines by Loran C LOPs

1. Press [MENU], [3], [2] to open the Setting menu.

2. Press [↓] to select Set LN Entry Method.

3. Press [←] or [→] to select Loran C.

4. Press the [LINE START] key.

```
Start Point [Loran C]
_____

LOP 1          18398.3
LOP 2          37558.7
Estim Lat        32°50.400'N
Estim Long     136°47.016'E

_____

LINE START key: Close
↑↓←→: Sel     ENT: Enter
```

5. Enter LOP1 and LOP2. If the LOPs are 26214.3 and 47314.6, for example, press [2], [6], [2], [1], [4], [3], [↓], [4], [7], [3], [1], [4], [6], [↓].

6. Enter estimated latitude and longitude position of the LOPs' intersection. If the latitude is 34°40N and the longitude 135°20E, for example, press [3], [4], [4], [0], [0], [0], [0], [↓], [1], [3], [5], [2], [0], [0], [0], [0]. Use the ⟳ key to switch from N to S, E to W and vice versa.

7. Press the [ENT] key.

8. Press the [LINE ENT] key. Line point appears on the display.

9. Enter LOP 1 and LOP 2.

10. Enter estimated latitude and longitude position of the LOPs' intersection.

11. Press the [LINE ENT] key to inscribe the line.

12. Repeat steps 9 through 11 to complete the line.

4.1.4 Entering lines by Decca LOPs

1. Press [MENU], [3], [2] to open the Setting menu.

2. Press [↓] to select Set LN Entry Method.

3. Press [←] or [→] to select Decca.

4. Press the [LINE START] key.

```
┌─────────────────────────────────────┐
│ Start Point [Decca]                  │
│ ─────────────────────────────────    │
│                                      │
│ LOP 1          1H: 12.34             │
│                                      │
│ LOP 2          1C: 33.75             │
│                                      │
│ Estim Lat        32°50.400'N         │
│                                      │
│ Estim Long     136°47.016'E          │
│                                      │
│                [A:1 B:2 C:3 D:4 E:5] │
│                                      │
│                [F:6 G:7 H:8 I:9 J:0] │
│                                      │
│ ─────────────────────────────────    │
│                                      │
│ LINE START key: Close                │
│                                      │
│ ↑↓←→: Sel     ENT: Enter             │
└─────────────────────────────────────┘
```

5. Enter LOP1 and LOP2. If the LOPs are 1A: 40.90 and 1G: 70.21, for example, press [1], [1], [4], [0], [9], [0], [↓], [1], [7], [0], [2], [1], [↓].

   A: 1   B: 2   C: 3   D: 4   E: 5   F: 6   G: 7   H: 8   I: 9   J: 0

6. Enter estimated latitude and longitude position of the LOPs' intersection. If the latitude is 34°44N and the longitude 135°15E, for example, press [3], [4], [4], [4], [0], [0], [0], [↓], [1], [3], [5], [1], [5], [0], [0], [0]. Use the ⟳ key to switch from N to S, E to W and vice versa.

7. Press the [ENT] key.

8. Press the [LINE ENT] key to inscribe the line.

9. Enter LOP 1 and LOP 2.

10. Enter estimated latitude and longitude of position intersection.

11. Press the [LINE ENT] key to inscribe the line.

12. Repeat steps 9 through 11 to complete the line.

4.1.5 Entering lines by Loran A LOPs

1. Press [MENU], [3], [2] to open the Setting menu.

2. Press [↓] to select Set LN Entry Method.

3. Press [→] to select Loran A.

4. Press the [LINE START] key.

```
Start Point [Loran A]
_____

LOP 1          1L0: 2072.1
LOP 2          1L1: 4207.0
Estim Lat        32°50.400'N
Estim Long     136°47.016'E


_____

LINE START key: Close
↑↓←→: Sel    ENT: Enter
```

5. Enter LOP1 and LOP2. If the LOPs are 1992.0 and 4191.6, for example, press [1], [9], [9], [2], [0], [↓], [4], [1], [9], [1], [6], [↓].

6. Enter estimated latitude and longitude position of the LOPs' intersection. If the latitude is 34°35'N and the longitude 135°00'E, for example, press [3], [4], [3], [5], [0], [0], [0], [↓], [1], [3], [5], [0], [0], [0], [0], [0]. Use the 🔃 key to switch from N to S, E to W and vice versa.

7. Press the [ENT] key

8. Press the [LINE ENT] key.

9. Enter LOP 1, LOP 2.

10. Enter estimated latitude and longitude position of the LOPs' intersection.

11. Press the [LINE ENT] key.

12. Repeat steps 9 through 11 to complete the line.

4.2 Erasing Lines

Lines can be erased by individually, collectively, by line type, by line color, by line point and by time.

4.2.1 Erasing lines by line point

1. Place the +cursor on the starting point, an intermediate point or the end point of the line.

2. Press the [CLR] key. The line is then redrawn excluding the point(s) erased.

The point is erased.

Erased point
(Point not shown.)
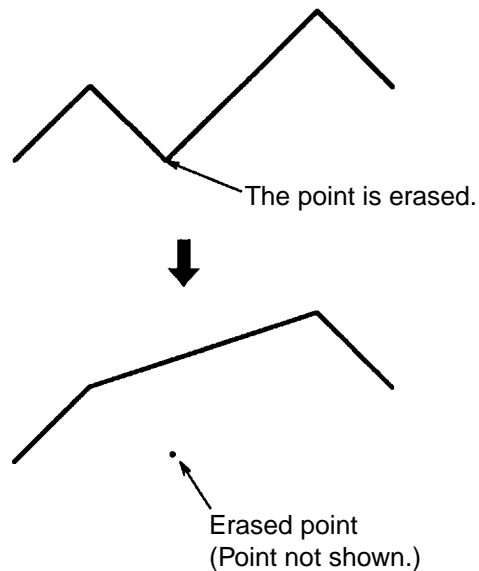
4.2.2 Erasing specific lines

1. Press [MENU], [3], [4] to display the Erase Line(1) menu.

```
Erase Line(1)
_____

Erase Specific Line    ⟼    Yes
Erase All Lines        →    Yes




_____
↑↓←→ : Sel, Fix
MENU : Esc
```

2. Press [→] to select Yes. The following message appears.

```
Place +cursor on edge of line
and press ENT.



 Other Keys: Escape

```

3. Place the +cursor on the point on the line which you want to erase and press the [ENT] key. The point can be the starting point, an intermediate point or end point. The following message appears.

```
Are you sure to erase?


 ENT       : Erase
 Other Keys : Escape

```

4. Press the [ENT] key.

5. Press the [MENU] key several times to close the menu.

4.2.3 Erasing all lines

All lines can be collectively erased, including those currently not shown on the display.

1. Press [MENU], [3], [4] to display the Erase Line menu.

2. Press [↓] to select Erase All Lines.

3. Press [→] to select Yes. You are asked if it is all right to erase all lines.

4. Press the [ENT] key.

5. Press the [MENU] key several times to close the menu.

4.2.4 Erasing lines by color

When erasing by color, line type or time,

1. Press [MENU], [3], [5] to display the Erase Line(2) menu.

```
Erase Line(2)
_____

By Type
By Color
Start      1986/01/01   00:00'
End        2046/12/31   23:59'
_____

By Line Type    No   ←→      Yes
By Color        No   ←→      Yes
By Time          No   ←→      Yes
Set Area         On Screen    Off Screen    Cursor    All




_____

↑↓←→ : Sel, Fix     Ent: Execute
MENU    : Esc
```

2. Press [↑] or [↓] to select By Color.

   Note: Set By Line Type and Time to "No."

3. Press [→] to select Yes.

```
┌─────────────────────────────────────┐
│ By Color                            │
│ _____ │
│                                     │
│ ▌Red▐        ▌No▐  Yes               │
│                                     │
│ Yellow       ▌No▐  Yes               │
│                                     │
│ Green        ▌No▐  Yes               │
│                                     │
│ Cyan         ▌No▐  Yes               │
│                                     │
│ Purple       ▌No▐  Yes               │
│                                     │
│ Blue         ▌No▐  Yes               │
│                                     │
│ White        ▌No▐  Yes               │
│                                     │
│                                     │
│                                     │
│                                     │
│                                     │
│                                     │
│ _____ │
│                                     │
│ ↑↓←→ : Sel    ENT: Fix              │
│ MENU  : Esc                         │
└─────────────────────────────────────┘
```

4. Display Yes for the colors you want to erase. (You may select as many colors as desired.)

5. Press the [ENT] key.

6. Press [↓] to select Set Area.

7. Press [←] or [→] to select On Screen, Off Screen or Cursor as desired. (Off Screen and On Screen available only with North-up and True Motion.

8. Press the [ENT] key. If you selected Cursor at step 7 the following message appears. Go to step 9. For other selections go to step 11.

```
┌─────────────────────────┐
│ Place +cursor at lower-  │
│ left corner and press ENT.│
│                          │
│                          │
│  Other Keys: Escape      │
│                          │
│                          │
└─────────────────────────┘
```

9. Place the cursor on the lower-left corner of the area and press the [ENT] key. The following message appears.

```
Place +cursor at upper-
right corner and press ENT.


 Other Keys: Escape

```

10. Place the cursor on the upper-right corner and press the [ENT] key.

11. Press the [ENT] key again to confirm.

12. Press the [MENU] key several times to close the menu.

4.2.5 Erasing lines by line type (shape)

1. Press [MENU], [3], [5] to display the Erase Line(2) menu.

2. Press [→] to select Yes.

```
By shape
_____

────        No    Yes
·············    No    Yes
-----·        No    Yes
─·─        No    Yes


_____

↑↓←→ : Sel    ENT: Fix
MENU    : Esc

```

3. Display Yes for the line type(s) you want to erase. (You may select as many line types as desired.)

4. Press the [ENT] key.

5. Press the [↓] key to select Set Area.

6. Press [←] or [→] to select range to erase.

7. Press the [ENT] key. If you selected Off Screen, On Screen or All at step 6, go to step 10. For cursor go to step 8.

8. Place the cursor on the lower-left corner of the area and press the [ENT] key.

9. Place the cursor on upper-right corner of the area and press the [ENT] key.

10. Press the [ENT] key, and then press the [MENU] key several times to close the menu.

4.2.6 Erasing lines by time

The time lines are entered is stored in the memory. Therefore, you can erase lines by specifying a time interval.

1. Press [MENU], [3], [5] to display the Erase Line(2) menu.

2. Press [↑] or [↓] to select By Time.

3. Press [→] to select Yes.

```
┌──────────────────────────────────────┐
│ By Time                              │
│ ────────────────────────────         │
│                                      │
│ Start       1986/01/01   00:00'      │
│ End         2046/12/31   23:59'      │
│                                      │
│                                      │
│                                      │
│ ────────────────────────────         │
│                                      │
│ ↑↓←→ : Sel    ENT: Fix              │
│ MENU : Esc                           │
└──────────────────────────────────────┘
```

4. Enter starting time (use 24-hour notation) in the order of year, month, day, hour and minutes and then press the [↓] key. Enter year in four digits, and day, hour and minutes in two. If the starting time is May 31, 1999, 13:01 for example, press [1], [9], [9], [9], [0], [5], [3], [1], [1], [3], [0], [1], [↓].

5. Enter end time (use 24-hour notation) in the order of year, month, day, hour and minutes. If the end time is June 01, 1999, 15:05 for example, press [1], [9], [9], [9], [0], [6], [0], [1], [1], [5], [0], [5].

6. Press the [ENT] key.

7. Press the [↓] key to select Set Area.

8. Press [←] or [→] to select range to erase. (Off Screen and On Screen available only in North-up and True Motion.)

9. Press the [ENT] key. If you selected Off Screen, On Screen or All at step 9, go to step 12. For cursor go to step 10.

10. Place the cursor on the lower-left corner of the area and press the [ENT] key.

11. Place the cursor on the upper-right corner of the area and press the [ENT] key.

12. Press the [ENT] key.

13. Press the [MENU] key several times to close the menu.

4.3 Changing Line Shape and Color

The color and shape of lines currently shown on the display can be changed as desired.

1. Press [MENU], [3], [2] to display the Setting menu.

2. Press [↑] or [↓] to select Change LN Attribute.

3. Press [→] to select Yes.

```
Line Change LN Attribute
_____

New LN Type      ——   ------   – – –   ------    Same
New LN Color     R  Y  G  C  P  B  W    Same




_____

↑↓←→ : Sel   ENT: Fix
MENU : Esc
```

4. Select the line type and color which you want to change.

5. Press the [ENT] key, and the following message appears.

```
Place +cursor on edge of line
and press ENT.


 Other Keys: Escape
```

6. Place the +cursor on the end point of the line which you want to change and press the [ENT] key.

Select point marked with arrow
to change are selected with dashed oval.

Starting Point
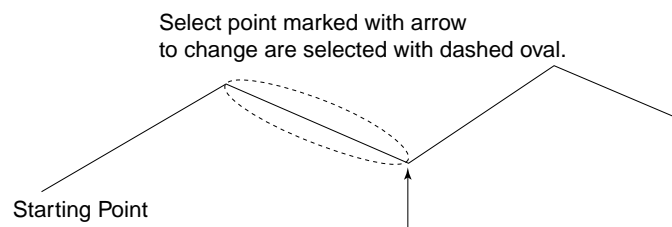
7. Press the [MENU] key to close the menu.

4.4 Displaying Specific Lines

There may be times when you want to display only specific lines. You can select the lines to display by line type(s), color(s), and by time.

4.4.1 Displaying lines by line type

1. Press [MENU], [3], [2] to display the Setting menu.

2. Press [↑] or [↓] to select Disp. Spec. Line.

3. Press [→] to select Yes.

```
Display Specific Line
_____

 ━━━      No  Yes
 ------   No  Yes
 -·-·-·   No  Yes
 - - - -  No  Yes




_____
↑↓←→ : Sel    ENT: Fix
MENU :Esc
```

4. Display Yes (display) or No (temporarily erase) beside line type(s) as appropriate.

5. Press the [ENT] key.

6. Press the [MENU] key several times to close the menu.

4.4.2 Displaying line by line color

1. Press [MENU], [3], [2] to display the Setting menu.

2. Press [↑] or [↓] to select Disp. Spec. LN Color.

3. Press [→] to select Yes.

```
Display Specific LN Color
_____

Red          No   Yes
Yellow       No   Yes
Green        No   Yes
Cyan         No   Yes
Purple       No   Yes
Blue         No   Yes
White        No   Yes




_____
↑↓←→ : Sel    ENT: Fix
MENU : Esc
```

4. Display Yes (display) or No (temporarily erase) beside line color(s) as appropriate.

5. Press the [ENT] key.

6. Press the [MENU] key several times to close the menu.

4.4.3 Displaying lines by time range

1. Press [MENU], [3], [2] to display the Setting menu.

2. Press [↑] or [↓] to select Disp. Spec. LN Time.

3. Press [→] to select Yes.

```
┌─────────────────────────────────────────┐
│ Display Specific LN Time                 │
│ ─────────────────────────────────────    │
│                                          │
│ Start        1986/01/01   00:00'         │
│ End          2046/12/31   23:59'         │
│                                          │
│                                          │
│                                          │
│                                          │
│                                          │
│                                          │
│ ─────────────────────────────────────    │
│ ↑↓←→ : Sel    ENT: Fix                   │
│ MENU : Esc                               │
└─────────────────────────────────────────┘
```

4. Enter starting time (use 24-hour notation) in the order of year, month, day, hour and minutes and then press the [↓] key. Enter year in four digits, and day, hour and minutes in two. If the starting time is May 30, 1999, 13:01 for example, press [1], [9], [9], [9], [0], [5], [3], [0], [1], [3], [0], [1], [↓].

5. Enter end time (use 24-hour notation) in the order of year, month, day, hour and minutes. If the end time is June 01, 1999, 15:05 for example, press [1], [9], [9], [9], [0], [6], [0], [1], [1], [5], [0], [5].

6. Press the [ENT] key.

7. Press the [MENU] key several times to close the menu.

4.5 Displaying Line Comments List

Any comment entered for a line is saved to the line comments list. You can display this list as follows.

1. Press [MENU], [3], and [1] to display the Comments List.

```
Display Comment List                    Mark
                                         ↓
00001    33°02.734'N      135°18.831'W   [·]  R   Buoy
00002    32°01.232'N      135°20.211'W   ·    Y   Catch
                                         ↑
                                        Line




↑↓: Change Page    MENU: Esc
```

Use the [↑] and [↓] keys to scroll the list.

5. WAYPOINTS, ROUTES

5.1 Entering Waypoints

In navigation terminology, a particular location is known as a "waypoint," whether it be a starting point, a destination point or an intermediate point on a voyage.

Your unit has two pages (page 1 and page 2) for storage of waypoints. Each page holds 97 waypoints, numbered 01-97, for a total of 194 waypoints, and each page is independent of the other.

There are also three special waypoints: 00, marks own ship position; 99, waypoint from external equipment, and 98, +cursor position.

Waypoints can be entered seven ways:

- by latitude and longitude coordinates
- by range and bearing from your ship
- by Loran C LOPs
- by Decca LOPs
- by own ship position
- by the +cursor, and
- by Loran A LOPs.

The waypoint mark is an octagon with waypoint number in the center and its default color is red. Waypoint color may be changed as desired; however, waypoint mark shape cannot be changed.

5.1.1 Changing waypoint page

As noted above there are two pages in which you can enter waypoints, page 1 and page 2. The default waypoint page is page 1. To switch pages do the following:

1. Press [MENU], [4] to display the Waypoint/Route menu.

```
Waypoint/Route
_____

1    Setting
2    Enter Route
3    Route List
4    Enter WPT
5    WPT (00-##)
6
7
8
9
0
_____

1~5   : Next Page
MENU    : Esc
```

2. Press the [1] key to select Setting.

```
Setting
_____

[Waypoint]
 WPT Page No.          1   2
 Color                 R   Y   G   C   P   B   W
 WPT Entry Method      Lat./Long.   Rng/Brg   Loran C   Decca
                       Ship Pos   +Cursor   Loran A
Disp. List Method      Numerical Order   Nearest Dist. Order

[Route]
 Select WPT            Route No.   ←→   +Cursor

 Set WPT Change Rng    00.10 nm
 Skip Waypoint         →   Yes
_____

↑↓←→: Sel, Fix
MENU : Esc
```

3.   Press [←] or [→] to select "1" or "2" as appropriate.

4.   Press the [MENU] key to close the menu.

Note: Waypoint page cannot be changed when a destination has been set.

5.1.2 Changing waypoint mark color

The default waypoint color is red. If you want to change the color of the waypoint mark do it as follows, before entering the waypoint.

1.   Press [MENU], [4], [1] to display the Setting menu.

2.   Press [↑] or [↓] to select Color.

3.   Press [←] or [→] to select color desired.

4.   Press the [MENU] key to close the menu. Waypoints registered hereafter will be shown in the color selected at step 3.

5.1.3 Entering waypoints by latitude and longitude

1.   Press [MENU], [4], [1] to display the Setting menu.

2.   Press [↑] or [↓] to select WPT Entry Method.

3.   Press [←] to select Lat./Long.

4.   Press the [WPT ENTRY] key. The following display appears.

```
Enter WPT [Lat./Long.]                                    Screen 1
    ↑↓: Sel   CHG: Page   CLR: Erase   ENT: Entry Mode
    WPT ENTRY key: Close
_____

01 – – ° – – . – – – 'N   – – – ° – – . – – – 'W   ————————————
02 – – ° – – . – – – 'N   – – – ° – – . – – – 'W   ————————————
03 – – ° – – . – – – 'N   – – – ° – – . – – – 'W   ————————————
04 – – ° – – . – – – 'N   – – – ° – – . – – – 'W   ————————————
05 – – ° – – . – – – 'N   – – – ° – – . – – – 'W   ————————————
06 – – ° – – . – – – 'N   – – – ° – – . – – – 'W   ————————————
07 – – ° – – . – – – 'N   – – – ° – – . – – – 'W   ————————————
08 – – ° – – . – – – 'N   – – – ° – – . – – – 'W   ————————————
09 – – ° – – . – – – 'N   – – – ° – – . – – – 'W   ————————————
10 – – ° – – . – – – 'N   – – – ° – – . – – – 'W   ————————————
 .
 .
19 – – ° – – . – – – 'N   – – – ° – – . – – – 'W   ————————————
20 – – ° – – . – – – 'N   – – – ° – – . – – – 'W   ————————————
```

5. Press [↑] or [↓] to select empty waypoint number.

6. Press the [ENT] key. The following display appears.

```
WPT
_____

Number      01
Color       R  Y  G  C  P  B  W
Lat./Long.  ––°––.–––'N  –––°––.–––'W
Comment     →  _____




_____
↑↓←→: Sel     ENT: Fix
WP ENTRY key    : Close
```

7. Enter latitude of the waypoint. For example, enter 34°44.00'E. The keying sequence is [3], [4], [4], [4], [0], [0], [0], (🔄).

8. Enter longitude of waypoint. For example, 135°21.000'W. Press [1], [3], [5], [2], [1], [0], [0], [0], (🔄).

9. Press [↓].

10. Press [→].

```
A B C D E F G H I J K L M N O P Q R S T         a b c d e f g h i j k l m n o p q r s t
U V W X Y Z 0 1 2 3 4 5 6 7 8 9 $ & # %         u v w x y z 0 1 2 3 4 5 6 7 8 9 $ & # %
\ , . • ; ? ! �ó, [ ],{ }⌈ ⌋ + - = < >          \ , . • ; ? ! ⚓, [ ],{ }⌈ ⌋ + - = < >
¥ * @ ( ) 。:                           🔄       ¥ * @ ( ) 。:
                              Enter                                        Enter


  Comment  ▮– – – – – – – – – –               Comment  ▮– – – – – – – – – –
_____       _____
↑↓←→, BALL: Select Character                   ↑↓←→, BALL: Select Character
ENT: Set   CHG: Change Case   WPT ENT: Escape  ENT: Set   CHG: Change Case   WPT ENT: Escape
```

5-4

11. Enter appropriate comment (up to 10 alphanumeric characters).
    a) Use the trackball to place the highlight cursor on the character desired.
    b) Press the [ENT] key.
    c) Repeat a) and b) to complete the comment.
    d) Use the trackball to place the highlight cursor on Enter.
    e) Press the [ENT] key.

12. Press the [ENT] key. The waypoint menu screen appears and the latitude and longitude of the waypoint is displayed. To continue entering waypoints by the latitude and longitude repeat steps 5 through 12.

13. Press the [WPT ENTRY] key to quit.

5.1.4 Entering waypoints at own ship position

1. Press [MENU], [4], [1] to display the Setting menu.

2. Press [↑] or [↓] to select WPT Entry Method.

3. Press [←] or [→] to select Ship Pos.

4. Press the [WPT ENTRY] key to show the waypoint list.

5. Press [↑] or [↓] to select empty waypoint number.

6. Press the [ENT] key.

7. Press [→].

8. Enter comment.

9. Press the [ENT] key.

10. Press the [WPT ENTRY] key to close the waypoint list. The waypoint mark appears at own ship position.

5.1.5 Entering waypoints by range and bearing

1. Press [MENU], [4], [1] to display the Setting menu.

2. Press [↑] or [↓] to select WPT Entry Method.

3. Press [←] or [→] to select Rng/Brg.

4. Press the [WPT ENTRY] key to show the waypoint list.

5. Press [↑] or [↓] to select empty waypoint number.

6. Press the [ENT] key. The following display appears.

```
WPT
_____

Number      01
Color       R   Y   G   C   P   B   W
Rng/Brg     █ – – – . – – – nm    – – –. – °M
Comment     →  _____



_____

↑↓←→ : Sel     ENT: Fix
WPT ENTRY key   : Close
```

7. Confirm that the Rng/Brg field is selected. Enter range from own ship (setting range: 00000.000 to 99999.999) in eight digits. If the range is 15.2 miles, for example, press [0], [0], [0], [1], [5], [2], [0], [0].

8. Enter the bearing from own ship (setting range: 000.1 to 359.9°) in four digits and then press the [ENT] key. If it is 23.4°, for example, press [0], [2], [3], [4].

9. Press [↓].

10. Press [→].

11. Enter comment.

12. Press the [ENT] key.

13. Press the [WPT ENTRY] key to close the waypoint list.

5.1.6 Entering waypoints by Loran C LOPs

1. Press [MENU], [4], [1] to display the Setting menu.

2. Press [↑] or [↓] to select WP Entry Method.

3. Press [←] or [→] to select Loran C.

4. Press the [WPT ENTRY] key to display waypoint list.

5. Press [↑] or [↓] to select vacant waypoint.

6. Press the [ENT] key. The following display appears.

```
WPT
_____

Number      01
Color       R  Y  G  C  P  B  W
LOPs        █ _ _ _ _ . _   _ _ _ _ _ . _
Estim Pos   35°12.000'N   139°43.799'E
Comment     →  _____



_____

↑↓←→: Sel    ENT: Fix
WPT ENTRY key  : Close
```

7. Enter LOP1 and LOP2. If the LOPs are 26214.3 and 47314.6, for example, press [2], [6], [2], [1], [4], [3], [↓], [4], [7], [3], [1], [4], [6], [↓].

8. Enter estimated latitude and longitude position of the LOPs' intersection. If the latitude is 34°40N and the longitude 135°20E, for example, press [3], [4], [4], [0], [0], [0], [0], [↓], [1], [3], [5], [2], [0], [0], [0], [0]. Use the ⟳ key to switch from N to S, E to W and vice versa.

9. Press the [↓] key to enter comment.

10. Press the [ENT] key.

11. Press the [WPT ENTRY] key to close the waypoint list.

Note: L/L data cannot be calculated if the estimated latitude and longitude differ greatly from the Loran C position. An error message appears in this case. Reenter accurate latitude and longitude.

5.1.7 Entering waypoints by Decca LOPs

1. Press [MENU], [4], [1] to display the Setting menu.

2. Press [↑] or [↓] to select WP Entry Method.

3. Press [←] or [→] to select Decca.

4. Press the [WPT ENTRY] key to show the waypoint list.

5. Press [↑] or [↓] to select vacant waypoint.

6. Press the [ENT] key. The following display appears.

```
WPT
_____

Number      01
Color       ▉  Y   G   C   P   B   W
LOPs        ▉ _ _ : _ _ . _   _ _ : _ _ . _ _
            [A:1 B:2 C:3 D:4 E:5]
            [F:6 G:7 H:8 I:9 J:0]
Estim Pos   35°12.000'N   139°43.799'E
Comment     →  _____



_____

↑↓←→ : Sel     ENT: Fix
WPT ENTRY key  : Close
```

7. Enter LOP1 and LOP2. If the LOPs are 1A: 40.90 and 1G: 70.21, for example, press [1], [1], [4], [0], [9], [0], [↓], [1], [7], [0], [2], [1], [↓].

   A: 1   B: 2   C: 3   D: 4   E: 5   F: 6   G: 7   H: 8   I: 9   J: 0

8. Enter estimated latitude and longitude position of the LOPs' intersection. If the latitude is 34°44N and the longitude 135°15E, for example, press [3], [4], [4], [4], [0], [0], [0], [↓], [1], [3], [5], [1], [5], [0], [0], [0]. Use the ⟳ key to switch from N to S, E to W and vice versa.

9. Press the [↓] key to enter comment.

10. Press the [ENT] key.

11. Press the [WPT ENTRY] key to close the waypoint list.

5.1.8 Entering waypoints by Loran A LOPs

1. Press [MENU], [4], [1] to display the Setting menu.

2. Press [↑] or [↓] to select WP Entry Method.

3. Press [←] or [→] to select Loran A.

4. Press the [WPT ENTRY] key to display the waypoint list.

5. Press [↑] or [↓] to select vacant waypoint.

6. Press the [ENT] key. The following display appears.

```
WPT
_____

Number     01
Color      ▌R  Y   G   C   P   B   W
LOPs       1L0: ▌ _ _ _ . _   1L1: _ _ _ _ . _
Estim Pos  35°12.000'N   139°43.799'E
Comment    →  _____


Fix        No   ← →   Yes


_____

↑↓←→          : Sel
WPT ENTRY key  : Close
```

7. Enter LOP1 and LOP2. If the LOPs are 1992.0 and 4191.6, for example, press [1], [9], [9], [2], [0], [↓], [4], [1], [9], [1], [6], [↓].

8. Enter estimated latitude and longitude position of the LOPs' intersection. If the latitude is 34°35'N and the longitude 135°00'E, for example, press [3], [4], [3], [5], [0], [0], [0], [↓], [1], [3], [5], [0], [0], [0], [0], [0]. Use the ↻ key to switch from N to S, E to W and vice versa.

9. Press the [↓] key to enter comment.

10. Press the [ENT] key.

11. Press the [WPT ENTRY] key to close the waypoint list.

5.2 Editing Waypoints

5.2.1 Viewing the waypoint list

The waypoint list displays latitude and longitude position and comment for all waypoints entered. You can display it by pressing the [WPT ENTRY] key.

5.2.2 Changing waypoint color of specific waypoint

This feature is not available when the waypoint entry method is "Cursor."

1. Press the [WPT ENTRY] key to display the waypoint list.

2. Press [↑] or [↓] to select waypoint.

3. Press the [ENT] key.

4. Press [↑] or [↓] to select Color.

5. Press [←] or [→] to select color desired.

6. Press the [ENT] key.

7. Press the [WPT ENTRY] key to close the waypoint list.

5.2.3 Changing waypoint number

The waypoint number of registered waypoints can be freely changed. This feature is not available when the waypoint entry method is "Cursor."

1. Press the [WPT ENTRY] key to display the waypoint list.

2. Press [↑] or [↓] to select waypoint.

3. Press the [ENT] key.

4. Press [↑] or [↓] to select Number.

5. Enter new waypoint number.

6. Press the [ENT] key.

7. Press the [WPT ENTRY] key to close the waypoint list.

Note: If the waypoint number entered at step 5 is already used, the following message appears. In this case, you may overwrite the waypoint number by pressing the [ENT] key, or press any key to escape.

```
New WPT number is used.


 ENT        : Entry
 Other Keys : Escape
```

5.3 Deleting Waypoints

Waypoints can be deleted with the +cursor and through the waypoint list.

5.3.1 Deleting waypoints by the +cursor

1. Use the trackball to place the +cursor on the waypoint to delete.
2. Press the [CLR] key.

5.3.2 Deleting waypoints through the waypoint list

1. Press the [WPT ENTRY] key to display the waypoint list.
2. Press [↑] or [↓] to select waypoint.
3. Press the [CLR] key. The following message appears.

```
Are you sure to erase?


 ENT        : Erase
 Other Keys : Escape

```

4. Press the [ENT] key. Position data of the waypoint selected is erased and replaced by " - -".
5. Press the [WPT ENTRY] key to close the waypoint list.

5.4 Setting Course by Waypoints

A waypoint is the simplest piece of information the GP/GD-280/380/680 requires to guide you to your destination. When a waypoint is set as destination, a straight line connects own ship position with waypoint position. This line shows the shortest possible distance to the destination. In Chapter 1 you learned how to set a course from own ship position to a waypoint. This paragraph shows you how to set a course between two waypoints.

1. Press the [GOTO SEL] key to display the Select WPT menu.

```
Select WPT
─────────────────────────────────

 Ship Position  : 00
 +Cursor        : 98
 External WPT   : 99

─────────────────────────────────

WPT Number   00 →  ▌ _
                ⇑    ⇑

             Start   Destination
─────────────────────────────────

ENT : Fix

GOTO SEL Key      : Close Menu
```

2. Press the [CLR] key.

3. Enter the two waypoints (in two digits each) which you want to set as destination and press the [ENT] key. For example, set waypoints 07 and 15 by pressing [0], [7], [1], [5], [ENT].

   Then, the display shows the course set.

Destination

Course (Light-blue line)

Starting
Point
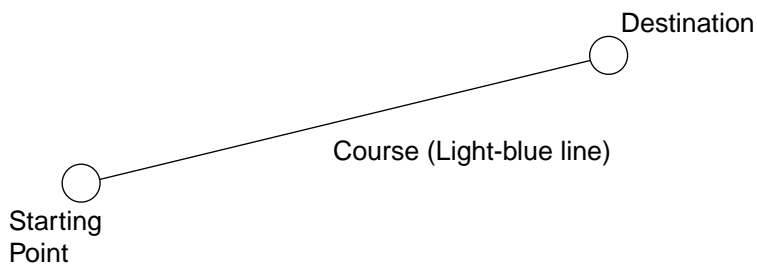
To cancel course, press the [GOTO CANCEL] key.

5.5 Registering, Changing, Deleting Routes

5.5.1 Registering routes

In many cases a trip from one place to another involves several course changes, requiring a series of route points (waypoints) which you navigate to, one after another. The sequence of route points leading to the ultimate destination is called a route. Your unit can automatically advance to the next route point on a route so you do not have to change the destination waypoint repeatedly.

10 routes may be registered and each route may contain 10 waypoints. Be sure to record all important routes in a separate log and record them onto a memory card.

Routes are created with waypoints and the waypoints used in a route must be contained on the same waypoint page.

1. Press [MENU], [4], [1] to display the Settings menu.

2. Press [←] or [→] to select page 1 or 2 as appropriate.

    Note: You cannot change waypoint page number when destination is set.

3. Press [MENU], [4], [2] to display the Enter Route menu.

```
┌─────────────────────────────────────────────────┐
│ Enter Route                                       │
│ ─────────────────────────────────────────────    │
│ No.  Comment          Total Distance (nm)   TTG (H)│
│ ─────────────────────────────────────────────    │
│ ▊01                                               │
│ 02                                                │
│ 03                                                │
│ 04                                                │
│ 05                                                │
│ 06                                                │
│ 07                                                │
│ 08                                                │
│ 09                                                │
│ 10                                                │
│                                                   │
│ ─────────────────────────────────────────────    │
│ ↑↓ : Sel   ENT: Entry Mode   CLR: Erase Route     │
│ MENU : Esc                                        │
└─────────────────────────────────────────────────┘
```

4. Press [↑] or [↓] to select route number desired.

5. Press the [ENT] key to show the route entry screen.

```
Route 01     ↑↓: Page     CHG: Skip     MENU: Esc        Screen 1
Comment      →
WPT Number __⇒ __⇒ __⇒ __⇒ __⇒ __⇒ __⇒ __⇒ __⇒ __
_____

01 – – ° – – . – – – 'N   – – – ° – – . – – – 'W   ——————————
02 – – ° – – . – – – 'N   – – – ° – – . – – – 'W   ——————————
03 – – ° – – . – – – 'N   – – – ° – – . – – – 'W   ——————————
04 – – ° – – . – – – 'N   – – – ° – – . – – – 'W   ——————————
05 – – ° – – . – – – 'N   – – – ° – – . – – – 'W   ——————————
06 – – ° – – . – – – 'N   – – – ° – – . – – – 'W   ——————————
07 – – ° – – . – – – 'N   – – – ° – – . – – – 'W   ——————————
08 – – ° – – . – – – 'N   – – – ° – – . – – – 'W   ——————————
09 – – ° – – . – – – 'N   – – – ° – – . – – – 'W   ——————————
10 – – ° – – . – – – 'N   – – – ° – – . – – – 'W   ——————————
11 – – ° – – . – – – 'N   – – – ° – – . – – – 'W   ——————————
 .
 .
19 – – ° – – . – – – 'N   – – – ° – – . – – – 'W   ——————————
20 – – ° – – . – – – 'N   – – – ° – – . – – – 'W   ——————————
20 – – ° – – . – – – 'N   – – – ° – – . – – – 'W   ——————————
```

6. Press [→] to enter a comment if desired. A comment may contain 10 alphanumeric characters.

7. Press the [ENT] key. "WPT Number" appears in reverse video.

8. Enter waypoints (each in two digits) in the order they are to be traversed.

9. Press the [ENT] key.

10. Press the [MENU] key several times to close the menu.

5.5.2 Changing route contents

1. Press [MENU], [4], [2] to display the Enter Route menu.

2. Press [↑] or [↓] to select route number and then press the [ENT] key. To change comment go to step 6 in paragraph 5.5.1 Registering routes.

3. Press the [ENT] key.

4. Press [←] or [→] to show waypoint number to change in reverse video.

5. Enter new waypoint number.

6. Press the [ENT] key.

7. Press the [MENU] key several times to close the menu.

5.5.3 Deleting routes

1. Press [MENU], [4], [2] to display the Enter Route menu.

2. Press [↑] or [↓] to select route number.

3. Press the [CLR] key.

4. Press the [ENT] key.

5. Press the [MENU] key several times to close the menu.

5.5.4 Temporarily removing route waypoints

1. Press [MENU], [4], [2] to display the Enter Route menu.

2. Press [↑] or [↓] to select route number and press the [ENT] key.

3. Press the [ENT] key.

4. Press [←] or [→] to select waypoint number to skip.

5. Press ⟳. A minus (-) sign appears next to waypoint.

6. Press the [ENT] key.

7. Press the [MENU] key several times to close the menu.

To restore the route waypoint repeat the procedure to erase the minus sign.

5.6 Following a Route

Following a route is the process by which you use a stored route for navigation. Your unit displays navigation information to guide you from one waypoint to the next, as it automatically switches from one waypoint another in sequence.

5.6.1 Setting waypoint switching distance

The first step in navigating a route is to set the waypoint change distance, which is the distance from which your vessel is from a route waypoint when the equipment switches to the next waypoint. The distance should not be too small so as to allow ample time to switch waypoints.

1. Press [MENU], [4], [1] to display the Setting menu.

2. Press [↑] or [↓] to select Set WPT Change Rng.

3. Enter distance in four digits and press the [ENT] key. If the distance is 0.5 nm, for example, press [0], [0], [5], [0], [ENT].

WPT change distance

ROUTE

Own Ship Position   Waypoint is switched when vessel arrives here.
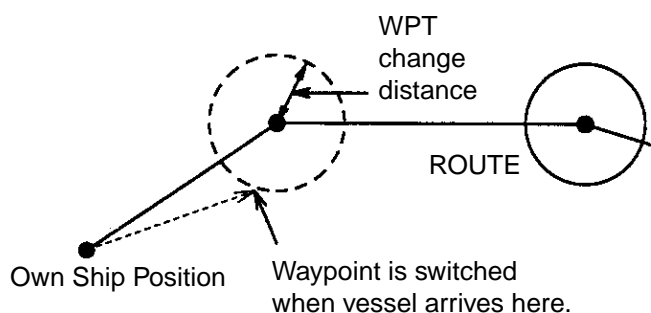
4. Press the [MENU] key several times to close the menu.

5.6.2 Following a route

1. Press [MENU], [4], [1] to display the Setting menu.

2. Press [↑] or [↓] to select [Route] Select WPT.

3. Press [←] to select Route No.

4. Key in route number in two digits and press the [ENT] key. For example, key in [0], [1], [ENT] to follow route no. 01. You can connect up to five routes. To navigate a route in reverse order, press ⟳ before entering route number.

5. Press the [MENU] key several times to close the menu.

A solid light-blue line runs between own ship position and the first route waypoint. Other waypoints are connected with a green dashed line.

Solid blue line   Green dashed line

06   12   15

00   02

Own Ship Position
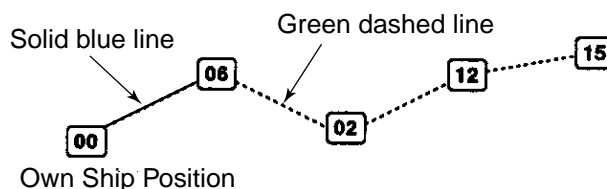
5.6.3 Skipping route waypoints

In some instances you may want to "skip" waypoints while following a route. In the figure below, for example, the vessel has decided to navigate from waypoint 05 to waypoint 03, skipping waypoint 04.
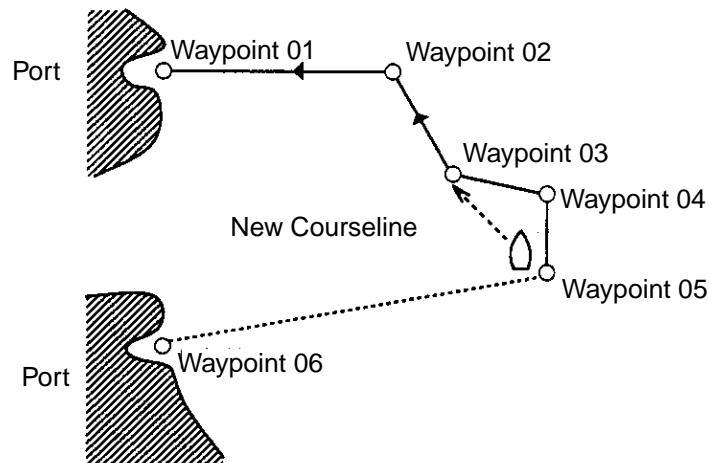
1. Press [MENU], [4], [1] to display the Setting menu.

2. Press [↑] or [↓] to select Skip Waypoint.

3. Press [→] to select Yes.

4. Press the [ENT] key. At the moment the key is pressed own ship position becomes waypoint 00 and the course is redrawn excluding the waypoint skipped.

5. Press the [MENU] key several times to close the menu.

5.6.4 Following a +cursor-created route

This paragraph shows you how to create and follow a route created with the +cursor. This type of route is for temporary use - it is deleted when the power is turned off.

1. Press [MENU], [4], [1] to display the Setting menu.

2. Press [↑] or [↓] to select [Route] Select WP.

3. Press [→] to select +cursor.

```
Move +cursor to desired
point.
 Change : Flag MK Disp
 Erase    : Flag MK Erase
 ENT      : Finish
 MENU   : Pause
```

4. Use the trackball to place the +cursor on the first route waypoint.

5. Press ⟳. A green square (■) appears at the +cursor intersection. To delete selection, press the [CLR] key.

6. Repeat steps 4 and 5 to complete the route. 10 points may be entered.

7. Press the [ENT] key.

8. Press the [MENU] key several times to close the menu.

All green squares are replaced with flag marks. A solid light-blue line connects between own ship position and first route waypoint, and a dotted green connects between all other route waypoints.
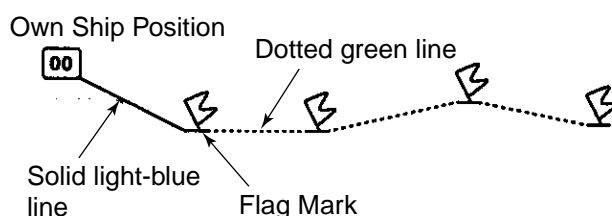
5.7 Calculating Time-to-Go

The route list stores all route data. From the list you can calculate the time-to-go for a route.

1. Press [MENU], [4], [3] to display the route list.

2. Press [↑] or [↓] to select route number and then press the [ENT] key.

```
Route 01
───────────────────────────────────────────────
WPT No. Lat.            Long.          Leg (nm)     TTG (H)
───────────────────────────────────────────────
1    01   34°43.021'N   135°19.191'E   ─────.───    ─────.─
2    02   34°11.231'N   135°22.000'E   00000.533    00000.1
3    03   35°03.000'N   135°30.511'E   00000.990    00000.9
4    04   34°43.021'N   135°19.191'E   00001.200    00001.5




Ship's Speed for TTG   10.0 kt
───────────────────────────────────────────────
ENT   : Fix
MENU : Esc
```

3. Enter speed for the calculation of TTG and press the [ENT] key. For example, enter [1], [2], [3], [ENT] if the speed is 12.3 knots.

4. Press the [MENU] key several times to close the menu.

6. ALARMS

This chapter covers the eleven alarms which generate audio and visual alarms to alert you to certain conditions.

Note: Several alarms are useful for alerting you to possibly dangerous situations. However, the captain is always responsible for the safe operation of his ship. FURUNO Electric Company will not assume responsibility for any damages associated with the use of the alarms.

The eleven alarms which trigger the audio and visual alarms are:

- **Arrival alarm** tells you that you are near a destination waypoint.
- **Anchor Watch alarm** warns that your ship may be dragging its anchor.
- **XTE (cross-track error) alarm** sounds when the cross-track error exceeds a predetermined value.
- **Border alarm** notifies you when your ship is approaching an area you want to avoid.
- **Target Proximity alarm** warns that you are approaching too close to a target point mark.
- **Water Temperature alarm** sounds when the water temperature goes higher or lower than the predetermined value, or when it exceeds a predetermined value for more than one minute.
- **Water Depth alarm** tells you the water depth is higher (or lower) than the predetermined value.
- **Current alarm** lets you know when the current (tide) speed of a current layer is higher (or lower) than the preset speed.
- **Ship's Speed** alarm sounds when the ship's speed is higher (or lower) than present speed, or is out of a preset range.
- **Wake-up alarm** works like an alarm clock.
- **Timer alarm** counts down time, sounding the alarm when time set has elapsed.

When an alarm setting is violated the audio alarm sounds and the alarm violation icon (speaker mark) appears on the display. When the audio alarm sounds you may silence it with the [CLR] key. However, the alarm will sound again if the alarm setting is violated.

6.1 Arrival and Anchor Watch Alarms

6.1.1 Arrival alarm description

The arrival alarm warns you that your ship is approaching a destination waypoint. The area that defines an arrival zone is that of a circle which you approach from outside the circle. The alarm will be released if your ship enters into the circle.
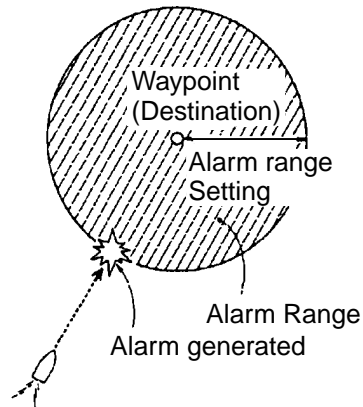
6.1.2 Anchor watch alarm description

The anchor watch alarm sounds to warn that your ship is moving when it should be at rest.
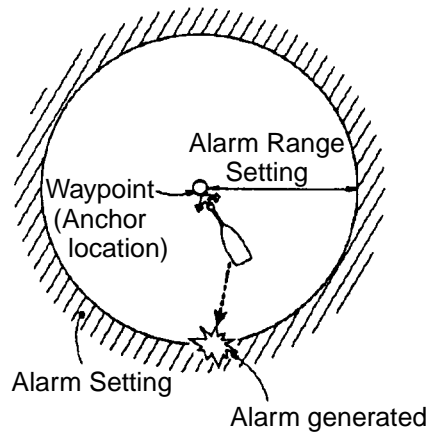
Note: The arrival and anchor watch alarms cannot be turned on together.

6.1.3 Setting the arrival alarm

To set an arrival alarm limit of 0.1 nautical miles from your ship's position to a destination waypoint, for example, do the following:

1. Set a destination waypoint, referring to paragraph 1.1.16 on page 1-13 for instructions.

2. Press [MENU], [5], [1] to display the Alarm menu, and select Page 1.

```
Alarm
_____

Page      1   2
_____

Arr/Anch          Arr.  Off   Anch
 Alarm            00.100 nm
 Auto Zoom        No    Yes (1/0005000)

XTE/Border        XTE   Off   Border
 Alarm            00.000 nm

Target Proximity  Off   Set
 Alarm            00.000 nm

Temperature       In RNG  Off   Out RNG
 Alarm            000.0 ~ 000.0 °F
 Current Rip      No    Yes (000.0 °F)

Depth             In RNG  Off   Out RNG
 Alarm            0000.0 ~ 0000.0 ft
_____

↑↓←→ : Sel, Fix
MENU : Esc
```

Note: Unit of distance and water temperature may be set with the keying sequence of [MENU], [0], [2].

3. Select Arr. from the Arr/Anch field.

4. Press [↓], set the alarm range and press the [ENT] key. For example, press, [0], [0], [1], [0], [ENT] to set an alarm range of 0.1 nm. The available alarm range is 0.001 to 99.999 nm.

5. Press the [MENU] key several times to close the menu.

A red dotted ring is drawn about the destination waypoint, the radius of the ring equivalent to the arrival alarm range. When your boat nears the destination waypoint by the distance set here the audio and visual alarms will be released.

6.1.4 Setting the anchor watch alarm

To set an anchor watch of 0.05 nautical miles about your ship's position, for example, do the following:

1. Set a waypoint, usually own ship position.

2. Press [MENU], [5], [1] to display the Alarm menu, and select Page 1.

3. Select Anch from the Arr/Anch field.

4. Press [↓], set the alarm range and press the [ENT] key. For example, press [0], [0], [0], [5], [ENT] to enter 0.05 nm. The setting range is 0.001 to 99.999 nm.

5. Press the [MENU] key several times to close the menu.

When your boat drifts by the distance set here the audio and visual alarms will be released. You can silence the audio alarm with the [CLR] key.

6.1.5 Automatic scale selection upon arrival at destination waypoint

You can have desired chart scale automatically selected for you when you near a destination waypoint.

1. Press [MENU], [5], [1] to display the Alarm menu, and select Page 1.

2. Set Auto Zoom to Yes.

3. Enter chart scale and press the [ENT] key. The chart scale range is 1000-950000.

4. Press the [MENU] key several times to close the menu.

6.1.6 Canceling arrival, anchor watch alarm

To cancel the arrival or anchor watch alarm do the following:

1. Press [MENU], [5], [1] to display the Alarm menu, and select Page 1.

2. Select Off from the Arr/Anch field.

3. Press the [MENU] key several times to close the menu.

6.2 XTE and Border Alarms

6.2.1 XTE alarm description

The XTE (cross-track error) alarm alerts you when your ship strays from its intended course. You may preset the alarm limit from 0.001 nautical miles to a maximum lane width of 99.999 nautical miles. The audio and visual alarms will be released if your ship goes out of the lane limits.
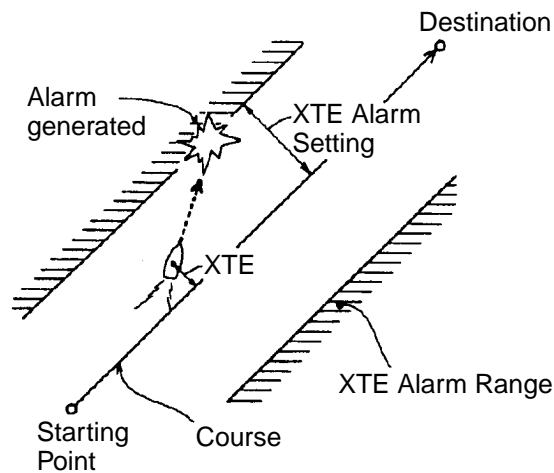
6.2.2 Border alarm description

The border alarm defines an area, defined by two waypoints, which you do not want to cross. The audio and visual alarms will be released when your ship crosses the area defined by the two waypoints.
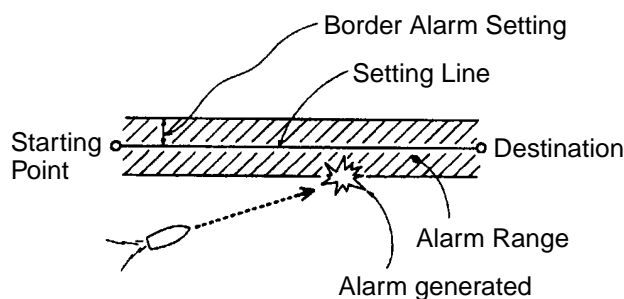
Note: The XTE and border alarms cannot be turned on together.

6.2.3 Setting the XTE alarm

To set a cross track error limit of two nautical miles between ship's position and a destination waypoint, for example, do the following:

1. Set a course, referring to page 1-13 for instructions.

2. Press [MENU], [5], [1] to display the Alarm menu, and select Page 1.

3. Select XTE from the XTE/Border field.

4. Press [↓], enter the alarm range, and press the [ENT] key. For an alarm range of 0.5 nm, for example, press [0], [0], [5], [0], [0], [ENT]. The setting range is 0.001-99.999 nm.

5. Press the [MENU] key to close the menu.

When the boat veers off the lane limits set here the audio and visual alarms will be released. You may silence the audio alarm with the [CLR] key.

6.2.4 Setting the border alarm

1. Draw a line which represents the area where you do not want to cross. See Chapter 4 for how to draw a line.

2. Press [MENU], [5], [1] to display the Alarm menu, and select Page 1.

3. Select Border from the XTE/Border field.

4. Press [↓], enter the alarm range (0.001-99.999 nm) and press the [ENT] key. To enter an alarm range of two nautical miles, for example, press [0], [2], [0], [0], [0], [ENT].

5. Press the [MENU] key to close the menu.

When the boat crosses the line drawn in step 1 the audio and visual alarms will be released. You may silence the audio alarm with the [CLR] key.

6.2.5 Canceling XTE, border alarm

To cancel the XTE or border alarm do the following:

1. Press [MENU], [5], [1] to display the Alarm Menu, and select Page 1.

2. Select Off from the XTE/Border field.

3. Press the [MENU] key to close the menu.

6.3 Target Proximity Alarm

Chapter 8 explains how to enter a target point mark (red X). Using target point marks you have entered, your unit can release the audio and visual alarms if your ship moves within a distance you specify from all target points. A good example of a target point would be a wreck.

Target Point

Red dotted circle shows target proximity alarm area.
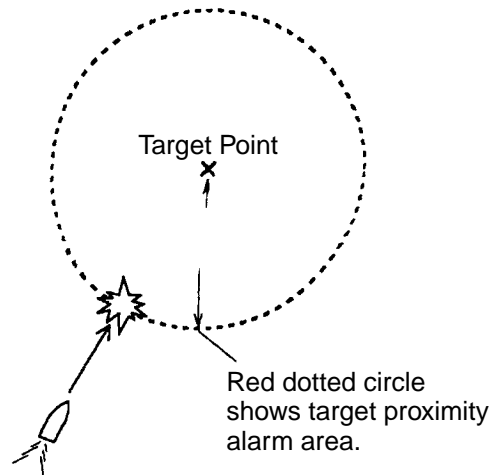
6.3.1 Setting the target proximity alarm

To set the target proximity alarm:

1. Press [MENU], [5], [1] to display the Alarm menu, and select page 1.

2. Select Set from the Target Proximity field.

3. Press [↓], enter alarm range (00.001-99.999 nm), and press the [ENT] key. To enter an alarm range of 0.02 nautical miles, for example, press [0], [0], [0], [2], [0], [ENT].

4. Press the [MENU] key several times to close the menu.

A red dotted circle encloses the target point, the radius of the circle equivalent to target proximity alarm range. When the boat nears any target mark by the distance set here audio and visual alarms will be released. You may silence the audio alarm with the [CLR] key.

6.3.2 Canceling the target proximity alarm

You may cancel the target proximity alarm by setting Target Proximity to Off.

6.4 Water Temperature Alarm

All fish species have their respective habitable water temperature range. If the water temperature of the area you are in is far out of the habitable temperature range for a target fish, you can hardly expect a good catch. The equipment can alert you to changes in water temperature, by using water temperature data fed from an external water temperature sensor.

The equipment can bet set to release the water temperature alarm in one of three conditions:

- When the water temperature is higher than the preset temperature
- When the water temperature is lower than the preset temperature, or
- When the present temperature is higher (or lower) than the last sampled reference. This is called the current rip alarm.

Current Rip

(a) Temperature increases   (b) Temperature decreases
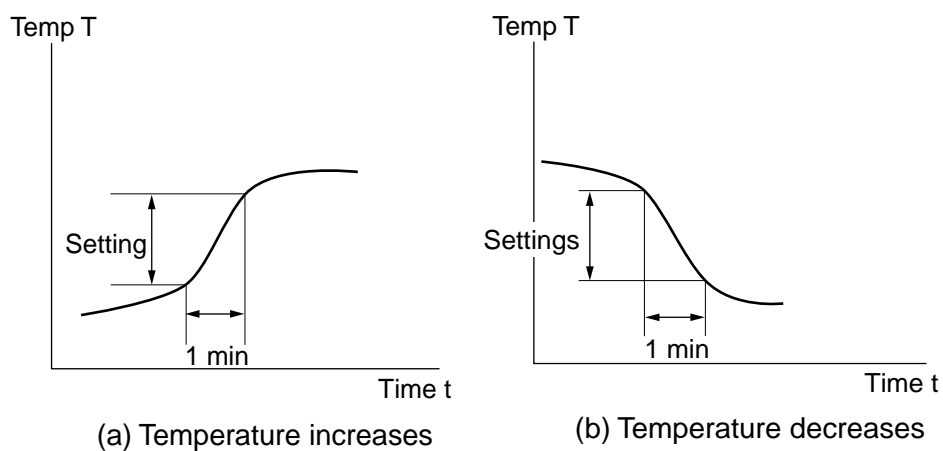
6.4.1 Setting the water temperature alarm

1. Press [MENU], [5], [1] to display the Alarm menu, and select Page 1.

2. Select In RNG or Out RNG from the Temperature field as appropriate.

3. Press [↓], enter temperature range (-999.9 to +999.9°F) and press the [ENT] key. Use the ⟳ key to switch from plus to minus and vice versa.

4. Press the [MENU] key to close the menu.

6.4.2 Setting the current rip alarm

The current rip alarm warns you when the present temperature is higher (or lower) than the last sampled reference by more than the one you have set. Current rips, caused along sea stream and currents or at their junction, often gather dense fish shoals. For the current rip alarm minus value cannot be entered.

1. Press [MENU], [5], [1] to display the Alarm menu, and select Page 1.

2. Set Current Rip to Yes.

3. Press [→], enter temperature desired and press the [ENT] key.

4. Press the [MENU] key several times to close the menu.

When the setting value is violated for more than one minute the audio and visual alarms are released.

6.4.3 Canceling the water temperature alarm, current rip alarm

Select Off (or No in case of Current Rip) in respective field on the Alarm menu.

6.5 Depth Alarm

The depth alarm alerts the operator when the present depth is deeper (or shallower) than the preset depth. In waters where the depth is know to rise or fall suddenly without warning it may be a good idea to set the depth alarm 10 (or even 20) feet below your ship's draft to warn of impending danger. This function requires depth data.

6.5.1 Setting the depth alarm

1. Press [MENU], [5], [1] to display the Alarm menu, and select Page 1.

2. Select In RNG or Out RNG from the Depth field as appropriate.

3. Press [↓], enter depth range in five digits in the Depth Alarm field, and press the [ENT] key.

4. Press the [MENU] key several times to close the menu.

6.5.2 Canceling the depth alarm

When the depth alarm sounds, press the [CLR] key to silence the audio alarm. To cancel the alarm, set Depth on the Alarm menu to off.

6.6 Current (Tide) Alarm

The current alarm is released when the speed of the current layer selected is higher or lower than the preset current speed, depending on alarm type selected. The current alarm requires current indicator data input to function.

1. Press [MENU], [5], [1] to display the Alarm menu.

2. Select 2 from the Page field at the top of the screen.

```
Alarm
_____

Page    1  2
_____

Currrent            In RNG   Off   Out RNG
 Alarm              000.0 ~ 000.0 kt
 Sel. Layer         1   2   3


Speed               In RNG   Off   Out RNG
 Alarm              000.0 ~ 000.0 kt


Wake-up             Off   Set
 Time               00H00M


Timer               One Alarm   Off   Repeat Alarm
 Time               00H00M


_____

↑↓←→ : Sel, Fix
MENU : Esc
```

3. Select In RNG or Out RNG from the Current field as appropriate.

4. Press [↓], enter alarm range (0.1-999.9 knots) and press the [ENT] key.

5. Select current layer (1 to 3) to use from the Sel. Layer field.

6. Press the [MENU] key several times to close the menu.

6.6.1 Canceling the current alarm

When the current alarm sounds, press the [CLR] key to silence the audio alarm. To cancel the alarm set Current on page 2 of the Alarm menu to Off.

6.7 Ship's Speed Alarm

This alarm uses ship's speed data fed from the navigator to release the alarms when the ship's speed is higher or lower the preset speed range.

In RNG alarm
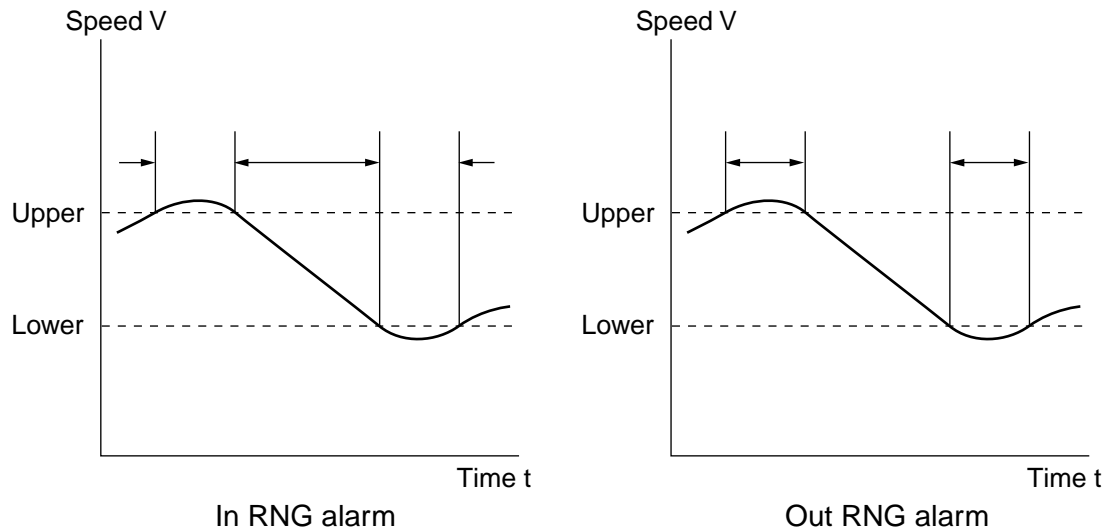
Out RNG alarm

6.7.1 Setting the ship's speed alarm

1.   Press [MENU], [5], [1] to display the Alarm menu.

2.   Select Page 2.

3.   Select In RNG or Out RNG from the Speed field as appropriate.

4.   Press [↓], enter alarm range (0.1-999.9 knots) in four digits and press the [ENT] key.

5.   Press the [MENU] key several times to close the menu.

6.7.2 Disabling the ship's speed alarm

When the ship's speed alarm sounds, press the [CLR] key to silence the audio alarm. To cancel the alarm set Speed on page 2 of the Alarm menu to Off.

6.8 Wake-up Alarm

This alarm works just like an alarm clock, releasing the audio and visual alarms when the preset time has arrived.

6.8.1 Setting the wake-up alarm

To set the wake-up alarm;

1. Press [MENU], [5], [1] to display the Alarm menu.
2. Select Page 2.
3. Select set from the Wake-up field.
4. Press [↓], set alarm time using 24-hour notation and press the [ENT] key.
5. Press the [MENU] key several times to close the menu.

6.8.2 Disabling the wake-up alarm

When the wake-up alarm sounds, press the [CLR] key to silence the audio alarm. To cancel the alarm set Wake-up on page 2 of the Alarm menu to Off.

6.9 Timer Alarm

This timer alarm counts down time, releasing the audio and visual alarms when the time entered has come.

6.9.1 Setting the timer alarm

1. Press [MENU], [5], [1] to display the Alarm menu.
2. Select Page 2.
3. Select One Alarm or Repeat Alarm from the Timer field as appropriate. (One Alarm is for one-time count down; Repeat Alarm is for repeated count down with audio alarm at every terminal count.)
4. Press [↓], set time using 24-hour notation and press the [ENT] key. For example, press [0], [2], [3], [0], [ENT] to get the alarm 2 hours and 30 minutes later.
5. Press the [MENU] key several times to close the menu.

6.9.2 Canceling the timer alarm

Press the [CLR] key to silence the audio alarm. To cancel the alarm select Off at step 3 in the above procedure.

6.10 Confirming Violated Alarm

The Alarm Confirmation display shows which alarm(s) have been violated. You can show this display as follows:

1. Press [MENU], [5], [2] to display the Alarm Confirmation menu.

```
Alarm Confirmation
_____

    Arrival/Anchor Watch

    XTE/Border

    Target Proximity

    Temperature

    Rip

    Depth

    Current

    Speed

    Wake-up

    Timer

    Guard Alarm

    Guard Zone


_____

MENU: Esc
```
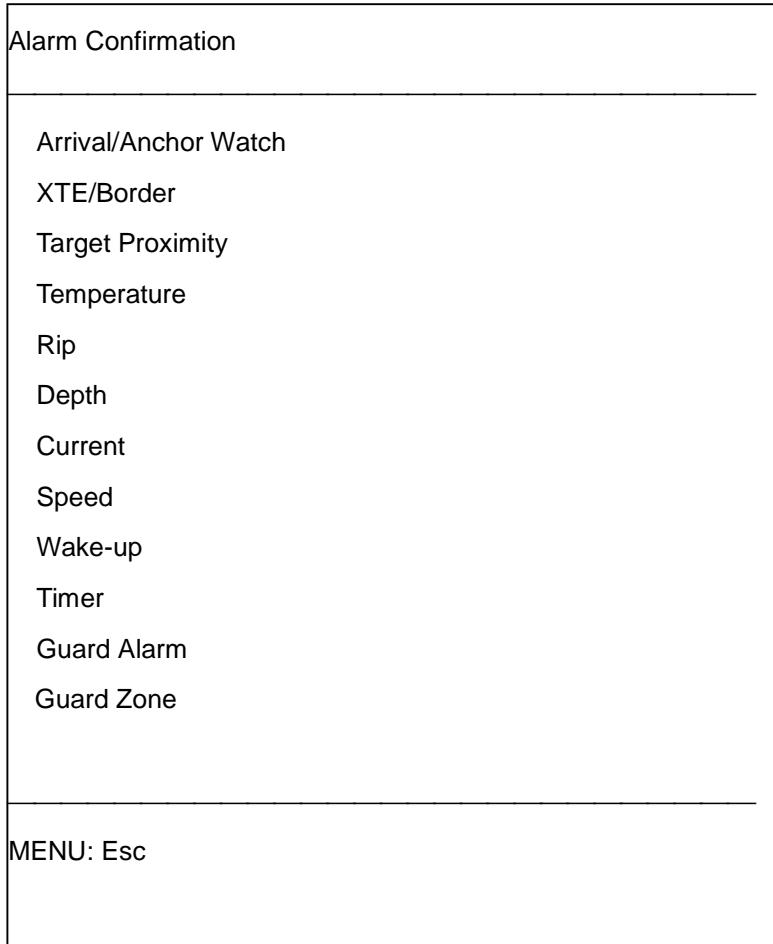
2. Press the [MENU] key to close the menu.

7. RECORDING & PLAYING BACK DATA

This chapter provides information necessary for recording and playing back data from memory cards (RAM cards) and floppy disks (FD Kit required).

RAM cards come in two types according to storage capacity: 512 K and 1 MB. The floppy disk can be either 2DD or 2HD.

7.1 Data Recording and Memories

7.1.1 Recording data

Data can be recorded on memory cards and floppy disks. The working memory stores data such as position, marks, lines, waypoints, water temperature data, and depth data. When it is full earliest data are erased one by one to make room for new data. Thus it is a good idea to save important data to a floppy disk or memory card.

The GP/GD-280/380/680's memory configuration is as shown below.
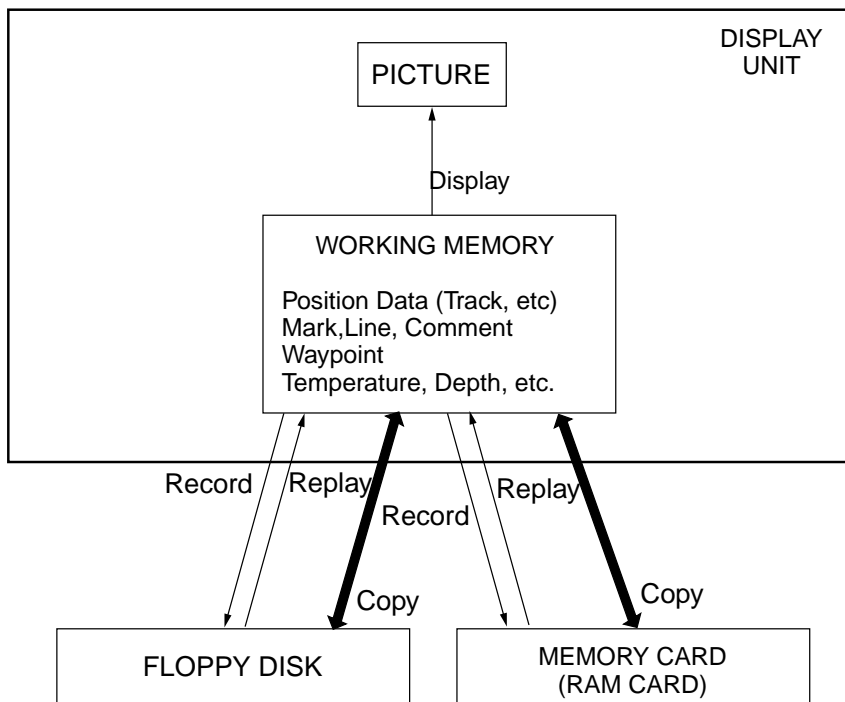
Double arrow at "Copy" means copying can be done in both directions.

7.1.2 Formatting media

Before you can use a floppy disk or memory card it must be formatted. Formatting prepares the disk or card for use with the system. To format a floppy disk or memory card:

1. Insert new memory card or floppy disk in appropriate drive. For memory card, use the bottom slot (GP/GD-280/380), right slot (GP/GD-380).

Floppy Disk Drive

Memory Card Slot
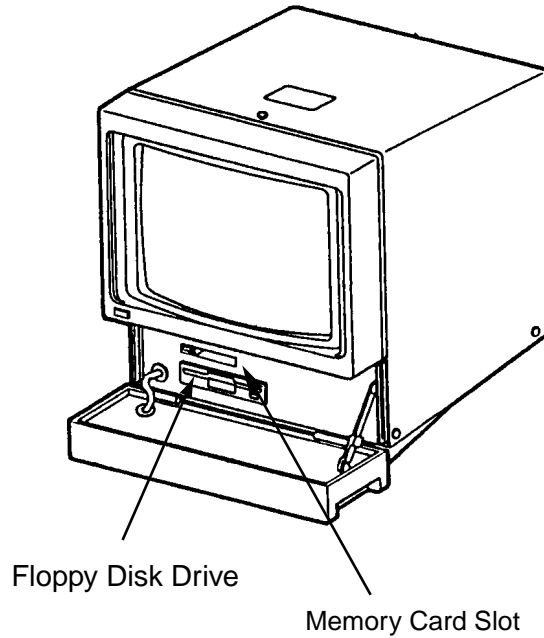
GP/GD-280 Display unit

2. Press [MENU], [6], [4] to display the Format Medium menu.

```
Format Medium
_____

Medium        Memory Card  Floppy

















_____
↑↓←→ : Sel, Fix    ENT: Execute
MENU : Esc
```
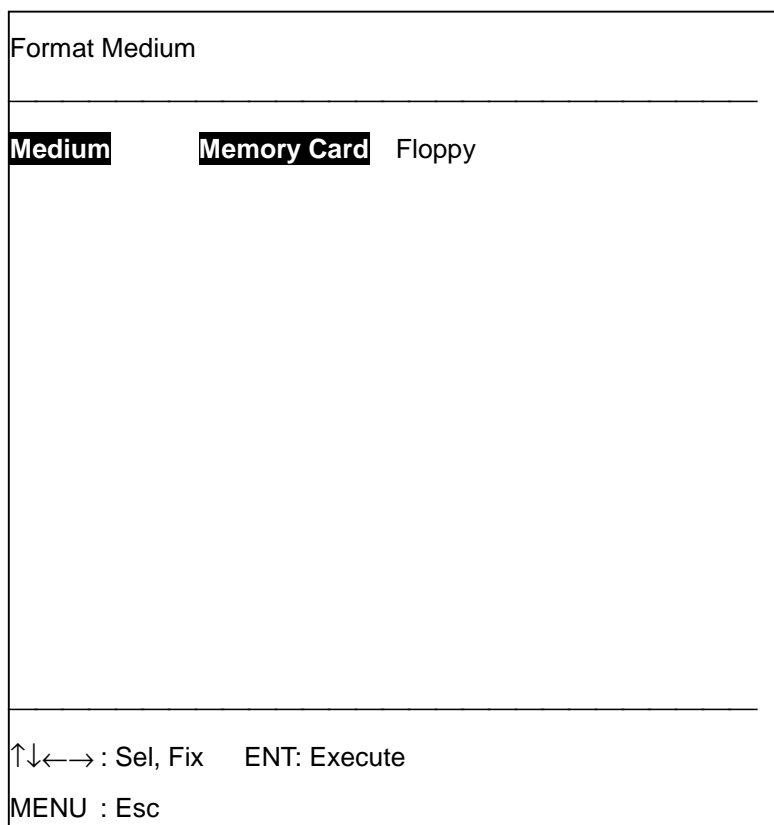
3. Press [←] or [→] to select medium.

4. Press the [ENT] key. The following prompt appears.

```
Are you sure to format?


 ENT       : Format
 Other Keys : Escape
```

5. Press the [ENT] key. Formatting begins.

   Note: It takes a few seconds to format a memory card; about three minutes for a floppy disk.

6. Press the [MENU] key several times to close the menu.

7.2 Recording Data

This section shows you to record data stored in the working memory to a floppy disk or memory card.

7.2.1 Recording data to a new file

Format a floppy disk or memory card and then follow the procedure below to record data to it.

1. Insert a blank floppy disk or memory card in the appropriate drive.

2. Press [MENU], [6], [1] to display the Record menu.

```
Record
_____

Medium              Memory Card   Floppy
Recording Area      On Screen    +Cursor   All

Main Track          No    Yes
Sub Track           No    Yes
GPS Buoy Track      No    Yes
ARP Track           No    Yes
Mark/Line           No    Yes
Waypoint/Route      No    Yes
Target Point        No    Yes
Init. Data          No    Yes

File Name           New    ←→    File List
                    [                    :            ]
Own Track Max Pts    18000points*
Sub Track Max Pts    18000points*

_____

↑↓←→ : Sel, Fix     ENT: Execute
MENU : Esc
```

*: Maximum points for 2DD floppy disk.

3. From the Medium field select media; floppy disk or memory card.

4. Press [↓].

5. Select how to record data:
    On screen: All track, marks, lines currently displayed.
    +Cursor: Select area with the +cursor.
    All: Record all data.

6. Select the data to record by displaying Yes for items which you want to record.
    Main Track
    Sub Track
    GPS Buoy Track
    ARP Track (if ARP is installed)
    Mark/Line
    Waypoint/Route
    Target Point
    Init. Data

    Note: For 2HD floppy disk, the maximum number of points recordable for main track/sub track is 36,000 points.

7. Select New from the File Name field.

8. Assign file name, using up to 16 alphanumeric characters. Select character with the trackball and press the [ENT] key. Repeat to complete file name. Select "Enter" and press the [ENT] key.

```
A B C D E F G H I J K L M N O P Q R S T          a b c d e f g h i j k l m n o p q r s t
U V W X Y Z 0 1 2 3 4 5 6 7 8 9 $ & # %          u v w x y z 0 1 2 3 4 5 6 7 8 9 $ & # %
\ , . • ; ? !  ╱,  [ ] { } ⌈ ⌋ + - = < >        \ , . • ; ? !  ╱,  [ ] { } ⌈ ⌋ + - = < >
¥ * @ ( ) 。 :                                    ¥ * @ ( ) 。 :
                                  Enter                                            Enter


File Name  ▮ – – – – – – – – –                  File Name  ▮ – – – – – – – – –
_____                      _____
↑↓←→, BALL: Select Character                     ↑↓←→, BALL: Select Character
ENT: Set   CHG: Change Case   CMNT: Escape       ENT: Set   CHG: Change Case   CMNT: Escape
```
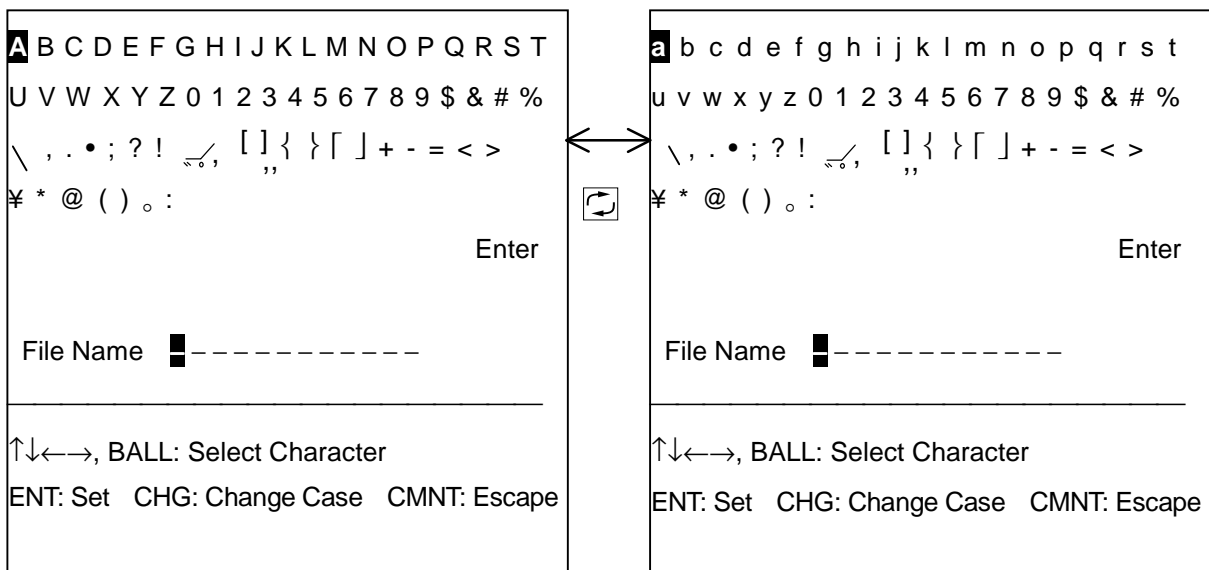
9. Press the [ENT] key. If you selected +Cursor at step 5 go to step 10. For other selections go to step 12.

10. Using the trackball, place the +cursor on lower-left corner of the area.

① Place +cursor on lower-left corner and press [ENT].
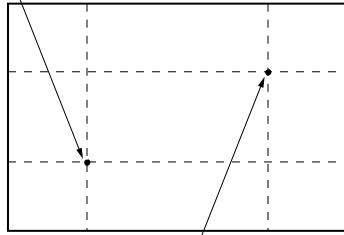
② Place cursor on upper-right corner
and press [ENT].

11. Place the +cursor on upper-right corner and press the [ENT] key.

12. Press the [ENT] key again to record the data.

13. After recording is completed, press the [MENU] key several times to close the menu.
    Note: If a floppy disk or memory card is not inserted at step 6, 7 or 8 an error message
    appears. Do not remove medium while data is being recorded. See the error message list in
    the Appendix for details.

7.2.2 Recording data to an existing file

You can write over the contents of an existing file to save new data to the medium.

1. Insert media in appropriate drive.

2. Press [MENU], [6], [1] to open the Record menu.

3. Select media to use; floppy disk or memory card.

4. Select how to record, from the Recording Area field.

5. Display Yes for items to record.

6. Select File List from the File Name field.

7. Press [↑] or [↓] to select file name and press the [ENT] key.

8. Press the [ENT] key. If you selected cursor at step 4 follow steps 10-12 in paragraph 7.2.1.
   For other selections press the [ENT] key again to record.

When data cannot be recorded…

When data cannot be recorded the buzzer sounds and an error message appears. If this occurs
refer to the table below to find the cause.

Condition	Error Message	Remedy
Data volume too large	Data too large to save.	Decrease size of are to record.
Number of data points exceeds storage capacity of medium.	Not enough space on medium. Insert new medium and press ENT.	Insert new disk or card.

7.3 Playing Back Data

Files stored on a memory card or floppy disk can be replayed to the working memory and displayed on the screen. However, replayed data will be mixed with current data, making it difficult to distinguish replayed data from current data. If the track memory is full when you replay data, parts of both the ship's track and replayed picture will be erased to make room for the replayed file. For those reasons, you may want to record and then clear the current display before replaying data.

Note: Data cannot be played back when a destination is set.

1. Insert medium in appropriate drive.

2. Press [MENU], [6], [2] to display the Replay menu.

```
Replay
_____

Medium             Memory Card   Floppy
Recording Area     On Screen    +Cursor   All


Main Track         No    Yes
Sub Track          No    Yes
GPS Buoy Track     No    Yes
ARP Track          No    Yes
Mark/Line          No    Yes
Waypoint/Route     No    Yes
Target Point       No    Yes
Init. Data         No    Yes


File Name          New    ←—→    File List
                        [                    ]


_____

↑↓←→ : Sel, Fix    ENT: Execute
MENU : Esc
```

3. Select appropriate media from the Medium field.

4. Select data to replay by displaying Yes for item(s) which you want to replay.

5. Select File List from the File Name field.

6. Press [↑] or [↓] to select file name from the file list.

7. Press the [ENT] key.

8. Press the [ENT] key twice to replay data.

9. Press the [MENU] key several times to close the menu.

Note 1: An error message appears at step 4 and 5 when an unformatted medium is inserted. (See the error message list in the Appendix for details.) Further, do not remove the disk or card during the replaying process.

Note 2: Waypoints, routes and targets points of the current display are erased when they share the same number with associated waypoints, routes and target points in a replayed picture.

Note 3: Waypoints and routes are replayed regardless of waypoint page number currently selected.

Note 4: Replayed track is erased when the track memory becomes full.

7.4 Copying Data

You may copy data between storage memory card and floppy disk as below. This is possible only with the FD kit.

1. Press [MENU], [6], [7] to display the Copy menu.

```
Copy
_____

Source Medium        Memory Card    Floppy
Target Medium        Memory Card    Floppy


Main Track           No    Yes
Sub Track            No    Yes
GPS Buoy Track       No    Yes
ARP Track            No    Yes
Mark/Line            No    Yes
Waypoint/Route       No    Yes
Target Point         No    Yes
Init. Data           No    Yes


File Name         New   ←→   File List
                     [                              ]



_____

↑↓←→ : Sel, Fix    ENT: Execute
MENU : Esc
```

2. Select location of source data from the Source Medium field; floppy disk or memory card.

3. Select target medium from the Target Medium field.

4. Display Yes for the items which you want to copy data.

5. Select File List from the File Copy field.

6. Press [↑] or [↓] to select file name to copy and press the [ENT] key.

7. Press the [ENT] key.

8. Press the [ENT] key.

9. Press the [MENU] key several times to close the menu.

Note 1: An error message appears at step 4 and 5 in the above procedure when an unformatted medium is inserted. (See the error message list in the Appendix for details.) Further, do not remove the disk or card during the copying process.

Note 2: When you copy data from a memory card or floppy disk to the working memory;
- Data are copied to an empty area of the working memory.
- Parts of copied data may be erased, when the working memory becomes full, to record new track.
- When copying is completed, copied data may be erased, to record new track, when the working memory becomes full.

7.5 Confirming Free Space on a Medium

You can confirm free memory space on a floppy disk, a memory card or the file memory as follows:

1. Insert floppy disk or memory card into proper drive.

2. Press [MENU], [6], [5] to display the Check Memory menu. The free space remaining on the medium appears on the display.

3. Press the [MENU] key several times to close the menu.

7.6 Deleting Files

1. Insert floppy disk or memory card in proper drive.

2. Press [MENU], [6], [3] to display list of files stored on the medium.

3. Select medium from the Medium field.

4. Select data to erase by displaying Yes for item(s) to delete.

5. Select File List from the File Name field.

6. Press [↑] or [↓] to select file name and then press the [ENT] key.

7. Press the [ENT] key.

8. Press the [ENT] key again.

9. Press the [MENU] key several times to close the menu.

Note: An error message appears at steps 4 and 5 when no medium is inserted. (See the error message list in the Appendix for details.) Further, do not remove the medium while files are being deleted.

7.7 Offsetting Memory Card Files

If the position of data stored on a memory card is wrong, you may apply position offset as follows to correct it. The offset can be applied automatically or manually.

7.7.1 Manual offset

1. Insert memory card in proper drive.
2. Press [MENU], [6], [6] to display the Display SRAM Card menu. A list of files stored on the card appears on the display.

```
Display SRAM Card                    *: Displaying Card
_____

  01   Fishing              1997-07-16 16:31      333
  02   Marking              1999-07-14 14:21      489




_____

↑↓: Sel   CHG: Page   ENT: Entry Mode   MENU: Esc
```

3. Select file and measure offset as follows:
   a) Press [↑] or [↓] to select file and press the [ENT] key. The following display appears.

```
Setting Page
_____

Display        No   Yes
Offset         Off   Auto   Manual
Manual         00.000'N   00.000'E




_____

↑↓←→ : Sel    ENT: Execute
MENU : Esc
```

   b) Select Yes from the Display field.
   c) Press the [ENT] key.
   d) Press the [MENU] key several times to close the menu.

4. Press [MENU], [6], [6].

5. Reselect file selected at step 3 a), and press the [ENT] key.

6. Select Manual from the Offset field.

7. Press [↓] to select the Manual field.

8. Enter latitude and longitude offset values. Use the ⟳ key to switch coordinates if necessary.

9. Press the [ENT] key.

10. Press the [MENU] key several times to close the menu.

To remove the offset, select Off from the Offset field at step 6 in the above procedure.

Note: Error message appears when an unformatted card is inserted or the card contains no files. See the error message list in the Appendix for details.

7.7.2 Automatic offset

1. Insert memory card in proper drive.

2. Press [MENU], [6], [6] to display the Display SRAM Card menu. A list of files stored on the card appears on the display.

3. Press [↑] or [↓] to select file and press the [ENT] key.

4. Select Auto from the Offset field.

5. Press the [ENT] key.

6. Press the [MENU] key several times to close the menu.

To remove the offset, select Off from the Offset field at step 4 in the above procedure.

7.8 Recording/Replaying Data by Data Logger

In addition to its basic function of displaying ship's track, this equipment can also function as a data logger, automatically recording ship's position, date and data fed from an external source (water temperature, depth, etc.) to a floppy disk. You can record one type of data to a floppy disk by time or distance. This feature requires the FD kit.

7.8.1 Recording data by logger

1. Insert a formatted floppy disk into the floppy disk drive.

2. Press [MENU], [6], [8] to display the Data Logger menu.

```
Data Logger
_____


_____

1 Record
2 Replay
3 Pause/Resume Replay
4 Stop Log



_____
Enter Number.
MENU: Esc
```

3. Press the [1] key (Record).

```
Record
_____

File        New    Continue
Interval    Time (00'01")   Dist. (00.01 nm)




_____
↑↓←→ : Sel, Fix     ENT: Execute
MENU  : Esc
```

4. Select recording method: New or Continue. New to overwrite past data to start recording afresh or replace floppy disk; Continue to add data to existing data.

5. Set recording interval (time or distance) from the Interval field. Enter time or distance in four digits and press the [ENT] key. For 30 minutes, for example, press [0], [0], [3], [0], [ENT].

6. To stop recording press [4].

7. Press the [ENT] key.

8. Press the [MENU] key several times to close the menu.

7.8.2 Replaying logger data

1. Insert floppy disk in proper drive.

2. Press [MENU], [6], [8], [2] to display the Replay menu.

```
Replay
_____

Replay Starting Pos.        00%




_____

↑↓←→ : Sel, Fix     ENT: Execute
MENU : Esc
```
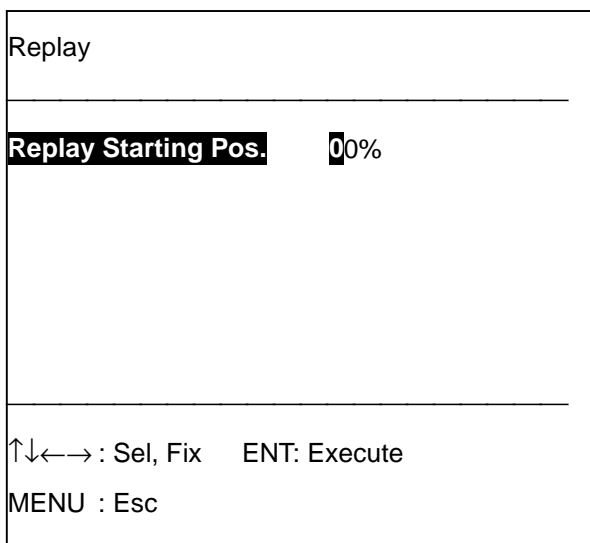
3. Enter point in percentage where you want to start replaying and press the [ENT] key. For example, if you want to replay data from the 20% point, press [2], [0], [ENT].

```
Starting              Entire logger
position              data file
   ↓                     ↓
   |_|_|_|_|_|_|_|_|_|_|
  0%        50%       100%
```
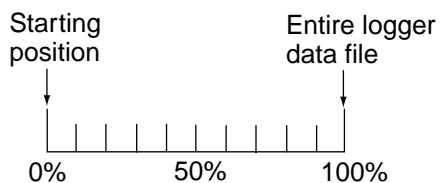
4. The screen displays "REPLAYING LOG". The larger the amount of data the longer the time required to replay.

5. To temporarily stop replaying, press the [3] key.

6. Press the [ENT] key.

7. To completely stop replaying, press [4], [ENT].

8. Press the [MENU] key several times to close the menu.

8. TARGET POINT MARK

The target point mark is a special mark which you can use to denote any important location. A good example of a target point mark is a wreck. The target point mark appears on the display as a red "X". Ten such marks may be entered.

Using a target point mark, you can set up the equipment to release audio and visual alarms when your vessel comes within a certain distance to any target point mark. For further details see paragraph 6.3 Target Proximity Alarm on page 6-7.

8.1 Entering a Target Point Mark

1. Press [MENU], [7] to display the Target Point menu.

```
Target Point
_____

1    Setting
2    List/Entry
3
4
5
6
7
8
9
0.
_____
1, 2     : Next Page
MENU  : Esc
```

2. Press the [1] key to select Setting. The following display appears.

```
Setting
_____

Pos. Entry Method    Lat./Long.   Rng/Brg   Loran C   Decca
                     Ship Pos   +Cursor    Loran A




_____

←→     : Sel, Fix
MENU  : Esc
```

3. Choose how to enter a target point mark: Latitude/longitude, Loran C, Decca, Ship Position, +Cursor, or Loran A.

4. Press the [ENT] key.

5. Press [2] to display the List/Entry screen. (Example below shows screen appearance when latitude and longitude is selected at step 3.)

```
List/Entry [Lat./Long.]
_____

01
02
03
04
05
06
07
08
09
10
_____

↑↓     : Sel   CLR: Erase   ENT: Entry Mode
MENU : Esc
```

6. Press [↑] or [↓] to select vacant target point number.

7. Press the [ENT] key. The display below appears when latitude and longitude are selected at step 3.

```
Setting Page
_____

Lat./Long.   █_°__.___'N   ___°__.___'W




_____

←→    : Sel    ENT: Execute
MENU : Esc
```

8. Enter position according to selection made at step 3.

9. Press the [ENT] key.

10. Press the [MENU] key several times to close the menu.

A red X marks the location on the screen.

8.2 Erasing a Target Point Mark

8.2.1 Erasing by +cursor

1. Place +cursor on target point to erase.

2. Press the [CLR] key.

8.2.2 Erasing through target point list

1. Press [MENU], [7], [2] to display the target point list.

2. Press [↑] or [↓] to select target point to erase.

3. Press the [CLR] key. You are asked if it is OK to erase the target point.

4. Press the [ENT] key.

5. Press the [MENU] twice to close the menu.

9. CALCULATING RANGE & BEARING

This section shows you how to measure the range and bearing between two points.

1. Press [MENU], [8] to display the Calculate Rng/Brg menu, and then follow one of the procedures below.

```
Calculate Rng/Brg
_____

_____

Lat./Long.      █ °__.___'N   ___°__.___'W
                __°__.___'N   ___°__.___'W
+Cursor         →   Indicate by Two Points
Waypoint        __ → __


_____

↑↓←→ : Sel, Fix
MENU : Esc
```

Selection of points by manual input of latitude and longitude

2. Enter latitude and press the [ENT] key.

3. Enter longitude and press the [ENT] key.

4. Press the [ENT] key. The range and bearing appear at the upper part of the screen.

5. Press the [MENU] key several times to close the menu.

Selection of points by +cursor

2. Select the +Cursor field and press the [ENT] key.

3. Use the trackball to place the +cursor on the starting point and then press the [ENT] key.

4. Place the +cursor on the end point and press the [ENT] key. The range and bearing appear on the display.

5. Press the [MENU] key several times to close the menu.

Selection of points by waypoints

2. Select the Waypoint field, and then enter two waypoint numbers.

3. Press the [ENT] key.

4. Press the [MENU] key several times to close the menu.

Note: An error message appears when waypoint number entered has not been registered.

10. GPS, DGPS SETTINGS

10.1 GPS Receiver (built-in GPS receiver only)

10.1.1 GPS overview

GPS is an acronym meaning Global Positioning System. GPS (sometimes referred to as NAVSTAR) is a highly precise satellite navigation system developed by the U.S. Department of Defense.

A constellation of satellites (approximately four satellites each in six orbital paths) emplaced in nearly 20,000-kilometer high 12-hour circular orbits provides highly precise, continuous, worldwide, all-weather position plus time and velocity information to GPS receiver-equipped vehicles, vessels and aircraft.

How the GPS receiver calculates position

The GPS receiver's position is continuously fixed by receiving 3 (or 4) satellites in line-of-sight of the GPS receiver. The basic steps in position fixing are as below.

- GPS satellites continually transmit their own precise orbital data called ephemeris. The GPS receiver computes satellites' position by this data.

- The GPS receiver measures very accurate distance to the satellites.

- Satellite locations and their distances from the GPS receiver are known. The GPS receiver fixes its own position by triangulation.
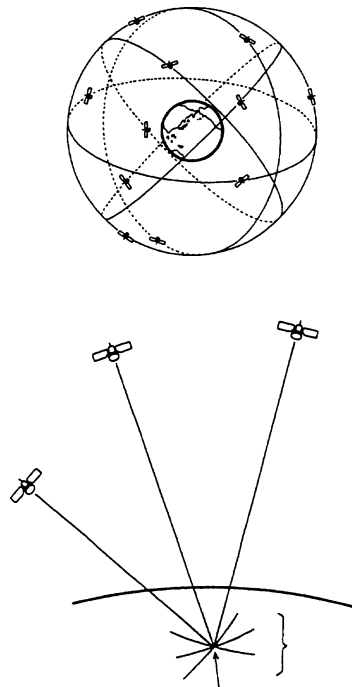
Position-fixing accuracy (HDOP)

In radar position-fixing, most accurate position fixes are obtained when the targets used are spaced nearly 90° from each other. Similarly, GPS position fixing accuracy is subject to satellite location. Generally, the further apart the satellites are from one another, the greater the position-fixing accuracy.

For example, take a look at the figure below. In both situations a fix is obtainable in the Northern Pacific region because three satellites are in line-of-sight. However, accuracy will be higher in the bottom figure since the satellites are spread farther apart than the satellites in the top figure.

Low Accuracy
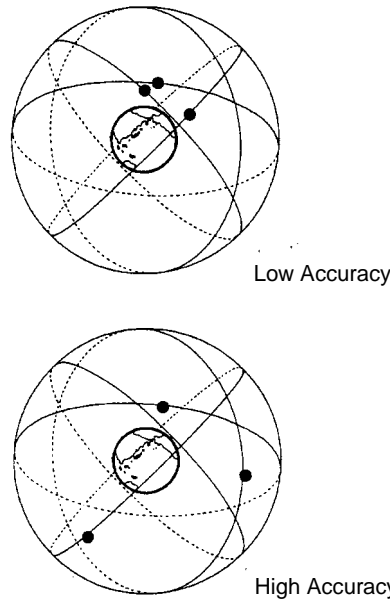
High Accuracy

The index for position-fixing accuracy is known as HDOP (Horizontal Dilution of Precision). In simpler terms it is the geometrical relationship among 3 (or 4) satellites. The higher the HDOP value the less accurate the position fix. The error in distance is proportional to the HDOP value as shown in the figure below.
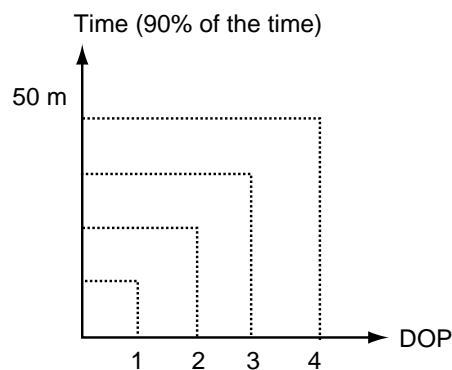
Note: Built-in GPS receiver's position fixing error under ideal receiving conditions.

10.1.2 GPS receiver settings

After the unit is installed, enter GPS settings as below:
- Antenna height above the waterline
- Estimated position
- Time difference (to use local time if required)
- Geodetic chart system used
- Position offset (if necessary)

1. Press [MENU], [9], [2] to display the GPS Setup menu, and select "GPS Page."

```
GPS Setup
_____

Page    GPS   DGPS

_____

Pos. Fixing Mode      2D    2D/3D

Geodetic Datum        WGS-84   WGS-72   Tokyo   N. America
                      Europe   Australia   Others (002)

Time Difference       09:00

Lat/Long              38°00.000'N   123°00.000'W

Lat/Long Offset       00.000'N   00.000'E

Smoothing             Pos. 00   Spd. 05 [0~99]

Antenna Height        0005ft

Cold Start            →   Yes

Min Elev. Angle       05° [5~90]

Disable Sat No.       →   Yes



_____

↑↓←→ : Sel, Fix

MENU : Esc
```

2. Enter settings as appropriate.

3. Press the [ENT] key.

4. Press the [MENU] key several times to close the menu.

Latitude and longitude

At initial power application it takes about 90 seconds to find position. To decrease this time, enter estimated latitude and longitude. Select "Lat/Long" from the GPS page, enter latitude and longitude and press the [ENT] key.

Time difference

The GPS uses UTC time. If you would rather use local time enter the time difference between local time and UTC time. Select Time Difference from the GPS page, enter time difference (use the ⟳ key to switch between plus and minus and vice versa), and press the [ENT] key.

Antenna height

Enter the height (in meters) of the GPS antenna above the waterline to get full position accuracy. Select Antenna Height from the GPS page, enter antenna height, and press the [ENT] key.

Geodetic chart system

The WGS-84 chart system is now the most widely used chart system. However, other chart systems still exist, thus it is necessary to apply a correction value to the WGS-84 system to match it to local geodetic chart systems. Select Geodetic Datum from the GPS page, select chart system used and press the [ENT] key. For Others, enter chart number referring to the Geodetic Chart List in the on page A-1.

Position offset

The GPS position may be off by some degrees due to signal propagation and other factors. For example, the GPS shows your boat to be out at sea while in fact it is moored to a pier. In this case apply an offset to GPS position to correct it. Select the Lat/Long Offset from the GPS page, enter offset, and press the [ENT] key.

10.1.3 Position fixing criteria

Position-fixing mode

For ships, the position-fixing mode is 2D (default setting) which means position is fixed using three GPS satellites. For high altitude use, select 2D/3D.

EL mask

Sets the minimum elevation angle a satellite must be located above the horizon in order for the GPS receiver to fix position. The default setting is 5°, which is suitable for most conditions.

Position and speed smoothing

When the DOP or receiving condition is unfavorable, the GPS fix may change greatly, even when the vessel is dead in water. This change be reduced or smoothed by smoothing the raw GPS fixes and speed. A setting between 0 and 99 is available, and the default setting is 0 for position and 5 for speed. The higher the setting the more the smoothed the raw data, however too high a setting slows response time to change in position.

10.1.4 Disabling unhealthy satellites

Every GPS satellite contains information about abnormal satellite number(s) in its Almanac, which is received each time the GPS receiver is turned on. Using this information the GPS receiver automatically eliminates any malfunctioning satellite from the GPS satellite schedule. Once the malfunctioning satellite is returned to online status it is automatically restored to the satellite schedule when the GPS receiver receives the Almanac. In some instances however the Almanac may not contain information which announces a malfunctioning or restored satellite. If you hear of this information from another source you can manually delete or restore the satellite to the satellite schedule as appropriate.

1. Select Yes from the Disable Sat No. field. A list of satellite numbers appears.

2. Select satellite to disable with arrow keys, and press the ⟳ key to display it in reverse video to deselect; normal video to restore it.

3. Press the [ENT] key.

10.1.5 Cold starting the receiver

Cold start erases all GPS data (including the Almanac) stored in the GPS receiver. If the GPS receiver is not used for more than one year it will take quite a long time for the receiver to find its position. This is because the data in the Almanac is too old to use to find position. In this case, execute cold start to receive the latest Almanac.

1. Select Yes from the Cold Start Field.

2. Press the [ENT] key.

It takes about two minutes to find position. GPS 2D appears when position is found.

10.2 DGPS Setting (set with built-in DGPS receiver)

10.2.1 How DGPS works

Position accuracy for users of GPS is about 10 meters. With Differential GPS (DGPS), however, differential corrections can improve position accuracy to better than 5 meters.

Differential GPS is based upon accurate knowledge of the accurate geographical location of a reference station which is used to compute corrections to GPS parameters, error sources and resultant positions. These differential corrections are transmitted to GPS users, who apply the corrections to their received GPS signals or computer position.

The DGPS reference stations are fixed at a geodetically surveyed position. The reference station tracks all satellites in view, downloads ephemeric data from them, and computes corrections based on its measurement and geodetic position. These corrections are then broadcast to GPS users by radio beacons (transmitters) to improve their position solution.

The radio beacons broadcast in the frequency range of 283.5-325.0 kHz and have a transmitting range from 40 nm to 300 nm depending on radio beacon.
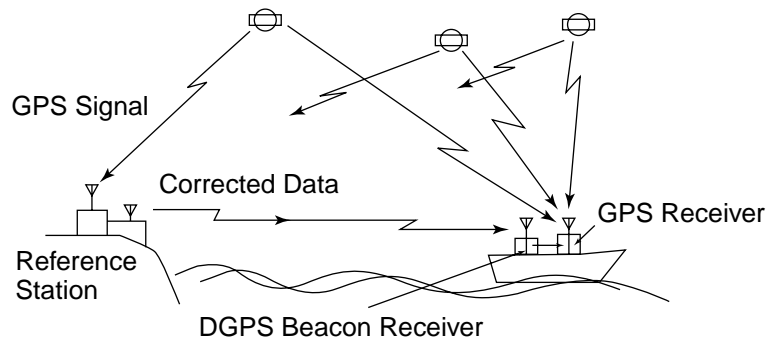
10.2.2 Activating the DGPS receiver

1. Press [MENU], [9], [2] to display the GPS setup menu.

2. Select DGPS from the Page field at the top of the screen.

```
GPS Setup
_____

Page     GPS   DGPS
_____

DGPS Mode           No   Yes
Beacon Receiver     Int.   Ext.
Beacon Station      Auto   Manu.
Frequency           320.5 kHz [←: Dec.   →: Inc.]
Bit Rates           50   100   200


_____

↑↓←→ : Sel, Fix
MENU : Esc
```

3. Set DGPS Mode to Yes.

4. Set Beacon Receiver to Int. to use built-in DGPS beacon receiver; Ext. to use external DGPS beacon receiver.

5. The built-in DGPS beacon receiver is set at the factory for automatic beacon station selection. If it takes more than five minutes to find position in this condition, switch to manual following steps 6-9. Consult a DGPS reference station list for station data. For automatic operation go to step 9.

6. Select Manu. from the Beacon Station field.

7. Select the Frequency field and enter frequency of beacon station.

8. Select the Bit Rates field and enter bit rate of beacon station.

9. Press the [MENU] key several times to close the menu.

11. RADAR OPERATION

11.1 Operation Panel

A radar is required to display the radar picture on the display.

11.1.1 GP/GD-680 operation panel

ROTATE: Adjusts screen brilliance.
PUSH: Enables/disables offset EBL.

ROTATE: Suppresses precipitation clutter.
PUSH: Enables/disables off-centered display.

ROTATE: Suppresses sea clutter.
PUSH: Enables/disables automatic clutter suppression.

ROTATE: Adjusts sensitivity.
PUSH: Temporarily erases heading line.

Adjusts VRM.

Erases an EBL.
Selects an EBL.
Adjusts EBL.

Selects a VRM.
Erases a VRM.

Select display mode.

Enables/disables target trails.
Sets/cancels target zone.
Turns zoom on/off.

Acquires target.
Cancels tracking on acquired target.

11.1.2 GP/GD-380/280 radar control panel
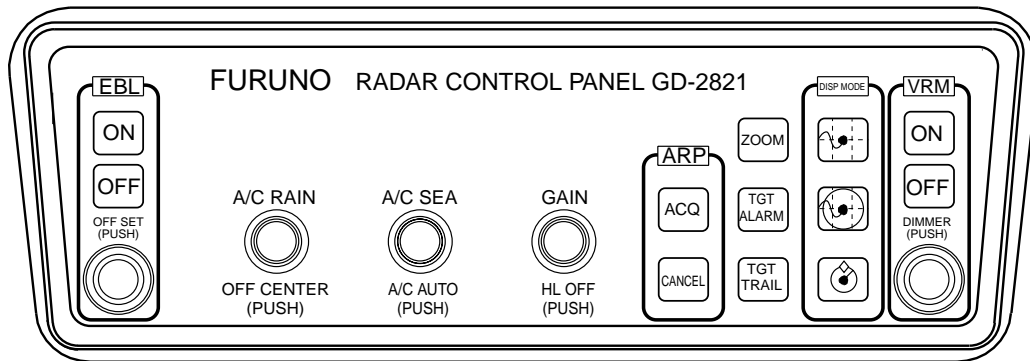
11.2 Picture Selection

⬚ : Displays plotter display.

⬚ : Displays radar/plotter combination display.

⬚ : Displays radar display.

Radar display

Labels on the figure:

- Alarm Zone
- No.2 EBL
- No.1 EBL
- Range
- Range Ring Interval
- North Marker
- Heading Line
- Range Ring
- Interference Rejector
- Echo Averaging
- Echo Stretch
- Off-center
- Target Alarm
- Echo Enhance
- Noise Rejector
- Video Contrast
- A/C Auto
- No.1 VRM Range
- No.2 VRM Range
- Range and Bearing to Cursor
- Gyro Heading
- Acquired TGT Data (Requires optional ARP Board.)
- Function
- Radar in Use
- Target Trail
- No.1 EBL
- No.2 EBL
- +Cursor
- ARP Track (Requires optional ARP Board.)
- No.1 VRM
- No.2 VRM

Display text:

35°30.555' N
135°35.4567' E
15.6kt/45.4°
34°35.478'N
134°08.54' E
3.5nm/100.2°

4.0nm
1.0nm

270.0°

1 5.0kt 95.0
2
3
N35
5
6
7
8
9
10

FUNC2
COAST
NO1 RADAR
15m(T)00'32"

11.1°R
>310.2°R

TM
CU

IR1
EAV0.5
ES1

OFFCENTER
>TA1 IN

ECHO ENHANCE
NOISE REJECTION
VIDEO CONTRAST2
A/C AUTO

>0.521NM
2.500NM

Radar/plotter combination display

ARP Track

11.3 Radar Picture Adjustment

11.3.1 Sensitivity (gain) adjustment

The [GAIN] control adjusts the sensitivity of the radar receiver. This control works precisely in the same manner as the volume control of a broadcast receiver, amplifying the signals received. Adjust it so that noise is just visible on the screen. If you set up for too little sensitivity, weak echoes may be missed. On the other hand excessive sensitivity yields too much background noise; weak targets may be missed because of the poor contrast between desired echoes and the background noise on the display.

11.3.2 Suppressing sea clutter

In rough weather, returns from the sea surface are received over several miles around own ship and mask nearby targets. This situation can be improved by properly using the[A/C SEA] control. In most cases adjust the [A/C SEA] control until clutter has disappeared to leeward, but a little is still visible windward.

Sea clutter at screen center   A/C SEA control adjusted;
                                      sea clutter suppressed
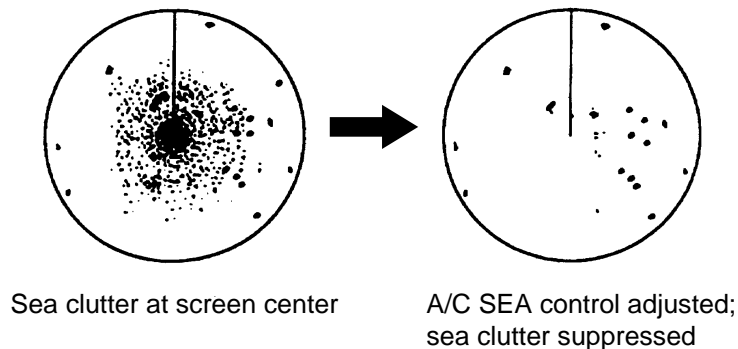
11.3.3 Suppressing sea clutter

In adverse weather, clouds, rain or snow produce spray-like spurious echoes which impair target detection over a long distance. These echoes can be suppressed by adjusting the [A/C RAIN] control.

Precipitation clutter   A/C RAIN control adjusted;
                               precipition clutter suppressed
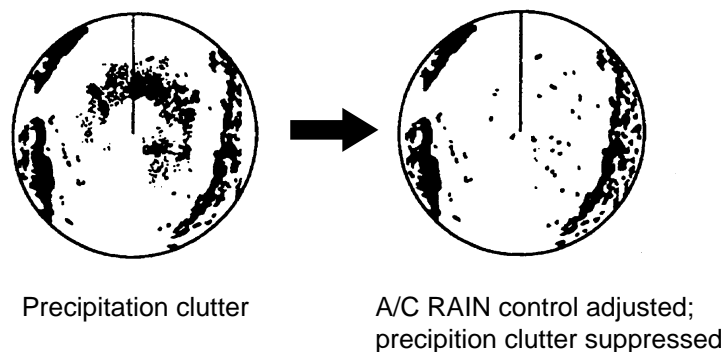
11.3.4 Automatic suppression of sea and rain clutters

The A/C AUTO function automatically suppresses sea and rain clutters. To activate or deactivate it, press the [A/C SEA] control. A/C AUTO appears on the display when the A/C AUTO function is active.

⚠ CAUTION

The A/C auto function can erase weak targets.

11.3.5 Suppressing radar interference

Mutual radar interference may occur in the vicinity of another shipborne radar operating in the same frequency band (9 GHz). It is seen on the screen as a number of bright spikes either in irregular patterns or in the form of usually curved spoke-like dotted lines extending from the center to the edge of the picture. This type of interference can be reduced by activating the interference rejector circuit.
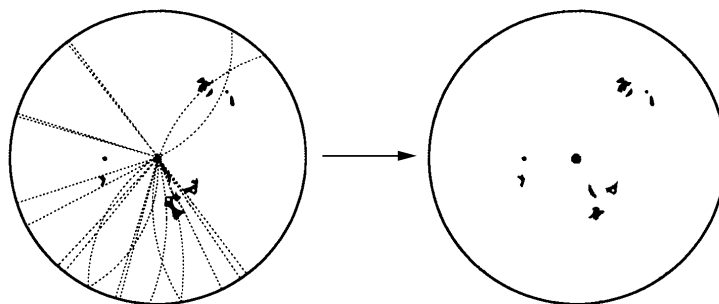
1. Press [MENU], [9], [3] to display the Radar Menu.

```
[RADAR]
_____

1   Target Trail
2   Target Alarm
3   Echo Signal
4   Function
5   ARP
6   Brilliance
7   Initial Setting
8   Installation


_____

1~8    : Next
MENU  : Back to MAIN Menu
```

2. Press the [3] key to display the Echo Signal menu.

```
[ECHO SIGNAL]
_____

Echo Color              Yellow   Green   Color

Clutter Sweep           Off   On (Link)   Off (Fix)

Sweep Level             1   2   3

Echo Average            Off   0.5   1   2   3

Interference Rejection  Off   1   2   3

Echo Stretch            Off   1   2

Echo Enhance            Off   On

Noise Rejection         Off   On

Video Contrast          1   2   3

A/D Curve               A   B   C   D
_____

↑↓←→ : Select & Set.

MENU : Back to Main Menu.      HL-OFF: Menu off temporarily.
```

3. Press [↑] or [↓] to select Interference Rejection.

4. Press [←] or [→] to select level of interference rejection desired. The higher the number the greater the degree of suppression. Select Off when no interference exists, so as not to miss weak targets.

5. Press the [MENU] key several times to close the menu.

The indication IR1, IR2 or IR3 appears at the top right corner on the screen when the interference rejector is active.

11.3.6 Echo averaging

The echo average feature effectively suppresses sea clutter. Echoes received from stable targets such as ships appear on the screen at almost the same position every rotation of the antenna. On the other hand, unstable echoes such as sea clutter appear at random positions.

To distinguish real target echoes from sea clutter, this radar performs scan-to-scan correlation. Correlation is made by storing and averaging echo signals over successive picture frames. If an echo is solid and stable, it is presented in its normal intensity. Sea clutter is averaged over successive scans resulting in the reduced brilliance, making it easier to discriminate real targets from sea clutter.

To properly use the echo average function, it is recommended to first suppress sea clutter with the [A/C SEA] control and then do the following:

1. Press [MENU], [9], [3], [3] to display the Echo Signal menu.

2. Press [↑] or [↓] to select Echo Average.

11-7

3. Press [←] or [→] to select echo average function desired.

   Off: No averaging effect

   0.5: Distinguishes small targets from sea clutter.

   1: Helps distinguish targets from sea clutter and suppresses brilliance of unstable echoes.

   2: Distinguishes small stationary targets such as navigation buoys.

   3: Stably displays distant targets.

4. Press the [MENU] key several times to close the menu.

The indication EAV and echo averaging number (0.5, 1, 2, or 3) appear at the left side of the screen when the echo averaging feature is active.

11.4 Radar Picture Functions

11.4.1 Range selection

The range selected automatically determines the pulselength and number of range rings. Select the range with the ⊠, ⊠ keys. Ranges (nm) available are 0.125, 0.25, 0.5, 0.75, 1, 1.5, 2, 3, 4, 6, 8, 12, 16, 24, 36, 48, 64, 72, 96, 120. Range selected appears at the top-right corner on the screen.

11.4.2 Off-centering

Own ship position, or sweep origin, can be displaced up to 75% of the range in use to expand the view field without switching to a larger range scale.

1. Place the +cursor at a position where you wish to move the sweep origin by operating the trackball.

2. Press the [A/C RAIN] control (OFF CENTER control). Then, the sweep origin is off-centered to the +cursor position.

3. To cancel off-centering, press the [A/C RAIN] control again.

If the +cursor disappears from the plotter/radar combination display, press the [CNTR] key.

Note that off-centering is not available on the 64, 96 and 120 mile ranges.

11.4.3 Erasing the heading line, north marker

The heading line is a line from the own ship position to the outer edge of the radar display area and appears at zero degrees on the bearing scale in head-up mode, and in the north-up and true motion modes it changes with ship's movement.

The north marker appears as a short dashed line. In the head-up mode the north marker moves around the bearing scale. In accordance with compass signal.

To temporarily extinguish the heading line and north marker to look at targets hidden by them, press the [GAIN] control. The heading line and north marker reappear when the control is released.
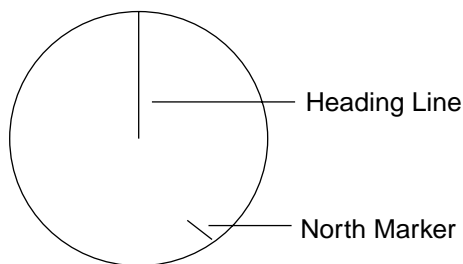
11.4.4 Zoom

The zoom function enlarges an area of interest as large as twice the normal viewing. Note that the zoom feature is inoperative when the display is off centered or the mode is true motion or course up.

1.   Place the +cursor close to the point of interest by operating the trackball.

2.   Press the [ZOOM] key. The area around the +cursor and own ship is enlarged twice as large as the original size and the label ZOOM appears at the lower-right corner of the screen.

3.   To cancel zoom, press the [ZOOM] key again.

Note: Zoom is canceled whenever the range or mode is changed.

11.4.5 Echo stretch

On long ranges target echoes tend to shrink in the bearing direction, making them difficult to see. On short and medium ranges such as 1.5, 3 and 6 nm scales, the same size targets get smaller on screen as they approach own ship. These are due to the inherent property of the radiation pattern of the antenna. To enhance target video, use the echo stretch function. There are two settings: echo stretch 1 (ES1) to enlarge in bearing direction for long range detection, and echo stretch 2 (ES2) to enlarge in both bearing and range directions.

The echo stretch magnifies not only small target pips but also returns (clutter) from sea surface, rain and radar interference. For these reasons make sure these types of interference have been sufficiently suppressed before activating this function.

To activate the echo stretch:

1. Press [MENU], [9], [3], [3] to show the Echo Signal menu.

2. Press [↑] or [↓] to select Echo Stretch.

3. Press [←] or [→] to select echo stretch feature desired:
    1: Stretch echoes in bearing direction.
    2: Stretch echoes in bearing and range directions.

4. Press the [MENU] key several times to close the menu. ES1 or ES2 appears at the right side of the display when the echo stretch feature is active.

Note: ES2 is not available on the 0.125-0.5 nm ranges.

OFF   Echo stretch 1   Echo stretch 2
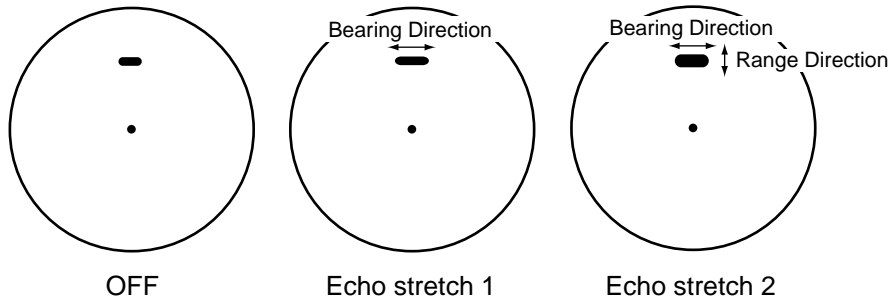
11.5 Measuring Range and Bearing to a Target

This section shows you how to measure the range and bearing to a target.

11.5.1 Measuring range

Measuring range with the range rings, +cursor

Use the fixed range rings or +cursor to obtain a rough estimate of the range to a target. The range rings are the concentric solid circles about own ship, or the sweep origin. The number of rings is automatically determined by the selected range scale and their interval is displayed at the upper-right position of the screen. For measurement by the +cursor place the +cursor on the inner edge of the target. See the range to the cursor at the left side of the screen.

Measuring the range with the VRM

Use the Variable Range Markers (VRMs) for more accurate measurement of the range to a target. There are two VRMs, No. 1 and No. 2, which appear as dashed rings so that you can discriminate them from the fixed range rings. The two VRMs can be distinguished from each other by different lengths of dashes.

1. Press the [VRM ON] key to display either of the VRMs. Successive presses of the [VRM ON] key toggle the active VRM between No. 1 and No. 2 and the currently active VRM readout is marked with >.

2. Turning the VRM control, align the active variable range marker with the inner edge of the target of interest and read its distance at the lower-right corner of the screen. Each VRM remains at the same geographical distance when you operate the ⊠, ⊠ key. This means that the apparent radius of the VRM ring changes in proportion to the selected range scale. Check the VRM range indication at the lower-right hand corner on the screen.

3. Press the [VRM OFF] key to key to erase each VRM.

Note: The unit of range can be selected to nautical miles, statute miles or kilometers. This can be done on page 2 of the radar Initial Setting. For further details see page 11-33.
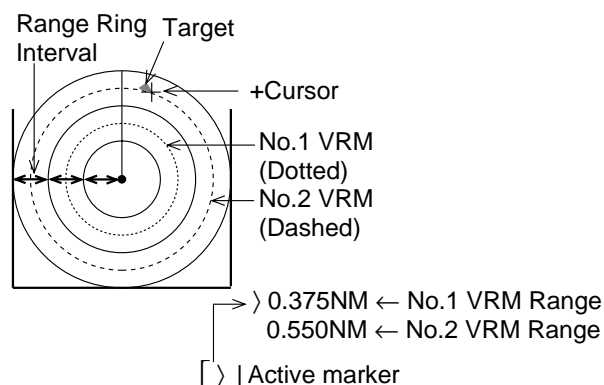
11.5.2 Measuring bearing

Measuring bearing by the +cursor

Use the +cursor to take a rough measurement of the bearing to a target. Place the +cursor on the center of the target. The range and bearing to the target are shown at the top-left corner on the display.

Measuring bearing by the EBL

Use the Electronic Bearing Lines (EBLs) to take bearings to a target. There are two EBLs, No. 1 and No. 2, which are toggled by successive presses of the [EBL ON] key. Each EBL is a straight dashed line extending out from the own ship position up to the circumference of the radar picture. The fine dashed line is the No. 1 EBL and the coarse dashed one is the No. 2 EBL.

1. Press the [EBL ON] key to display either of the EBLs. Successive presses of the [EBL ON] key toggle the active EBL between No. 1 and No. 2 and the currently active EBL readout is marked with >.

2. Rotate the EBL rotary control clockwise or counterclockwise until the active EBL bisects the target of interest, and read its bearing at the lower-left corner of the screen.

3. Press the [EBL OFF] key to erase each EBL.
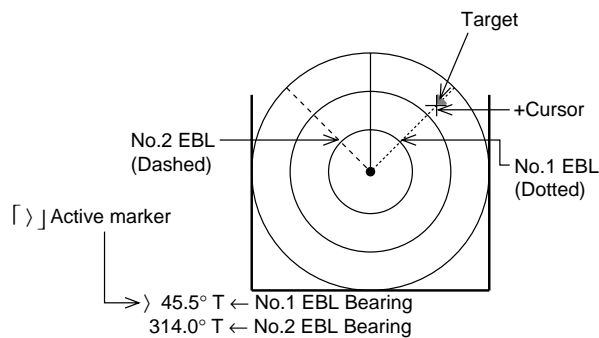
The EBL readout is affixed by R (relative) if it is relative to own ship's heading, or T (true) if it is referenced to the north. You can choose relative or true bearing on the page 2 of the radar Initial Setting menu.

11.6 Cursor Offset

The origin of the EBL can be placed anywhere with the trackball to enable measurement of range and bearing between any two targets and assesses the possibility of collision.

11.6.1 Measuring range and bearing between two targets

This procedure shows you how to measure the range and bearing between two targets using the example below.

1. Display the No.1 EBL and the No. 1 VRM.

2. Push the [EBL OFFSET] control.

3. Place the origin of the No. 1 EBL, for example, on a target of interest   (Target A in the example) by operating the trackball.

4. Push the [EBL OFFSET] control.

5. Adjust the EBL rotary control to bisect the other target with the No.1 EBL.

6. Adjust the VRM rotary control to place the No.1 VRM on the inner edge of the other target until the EBL passes through another target of interest (Target B in the example).

To cancel the offset +cursor, push the [EBL OFFSET] control again.
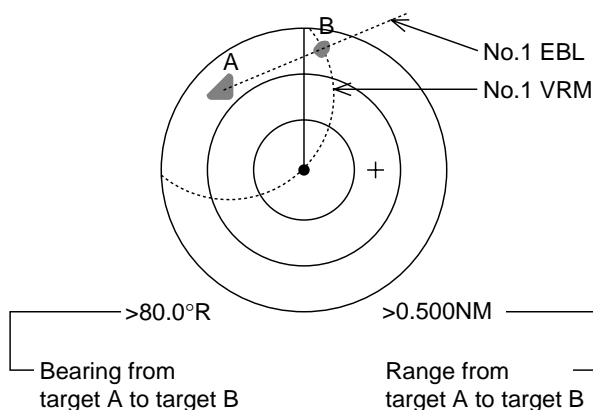
11.6.2 Assessing risk of collision

1. Display the No.1 EBL.

2. Push the [EBL OFFSET] control.

3. Use the trackball to place the +cursor on a target appearing as threatening.

4. Push the [EBL OFFSET] control, and the origin of the active EBL shifts to the +cursor position.

5. After waiting for a few minutes (at least 3 minutes), operate the EBL control until the EBL bisects the target at the new position.

If the EBL passes through the screen center, the target may be on a collision course. Take evasive action as necessary.

To return the EBL origin to the own ship's position, push the [EBL OFFSET] control again.

Several minutes

No.1 EBL
(Initial position
of target)

Current position
of target

Own Ship
Position
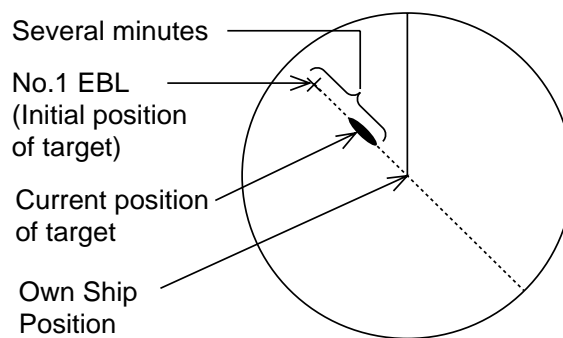
11.7 Target Trails

It is possible to display the trails of radar echoes in the form of synthetic afterglow. The afterglow can be selected in a single tone or gradual shading as set on the Target Trail menu.

11.7.1 True or relative target trails

You may display target trails in true or relative motion (only true trail on TM). Relative trails show relative movements between targets and own ship. True motion trails require a gyrocompass signal and speed input to cancel out own ship's movement, and present true target movements in accordance with their over-the-ground speeds and courses.
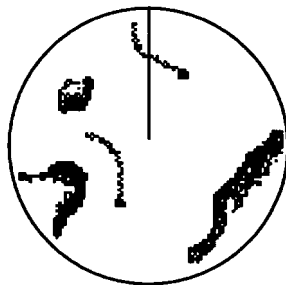
(a) True target trails	(b) Relative target trails
(No smearing of stationary targets)	(All targets moving relative to own ship)
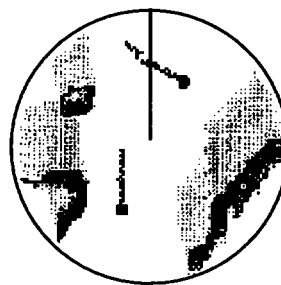
To select true or relative target trail presentation:

1. Press the [MENU], [9], [3], [1] to display the Radar menu.

2. Press [↑] or [↓] to select Target Trail.

```
[TARGET TRAIL]
_____

Trail Time        15s  30s  1m  3m 6m  15m  30m Cont

Trail Mode        Relative   True

Trail Shade       Mono   Multi

Trail Level       1  2  3

Trail Copy        Off  On

Thin Trail        Off  On


_____

↑↓←→ : Select & Set.

MENU : Back to Main Menu.      HL-OFF: Menu off temporarily.
```

3. Select Relative (or True) from the Trail Mode field as appropriate.

4. Press the [MENU] key several times to close the menu.

11.7.2 Selecting target trail time

1. Press [MENU], [9], [3], [1] to display the Target Trail.

2. Press [←] or [→] to select time desired; 15, 30 seconds; 1, 3, 6 15, 30 minutes, or continuous.

3. Press the [MENU] key several times to close the menu.

When the target trail feature is activated, trails extend from targets. When the trail time elapses, the timer freezes and then only the latest trails remain on the display.

For continuous trail, the timer counts up to 99:59.

11.7.3 Target trail gradation

Target trails may be shown in monotone or gradual shading. Gradual shading paints the trails getting thinner with time just like the afterglow on an analog PPI radar.

Single   Multiple

1. Press [MENU], [9], [3], [1] to display the Target Trail menu.

2. Select Mono or Multi from the Trail Shade field as appropriate field.

3. Press the [MENU] key several times to close the menu.

11.7.4 Starting, canceling target trails

1. Press the [TGT TRAIL] key. Afterglow starts extending from targets. Trail time, trail mode and elapsed time (timer) appear at the lower-left corner on the display.

Relative Trail
Trail TIme

30s(R)00'27"

Trail Elapsed Time
(27 sec.)
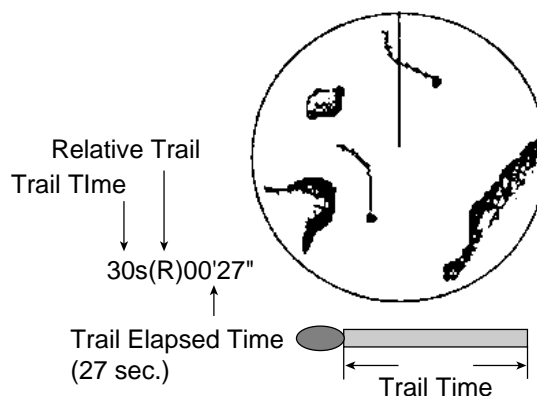
Trail Time

2. To remove target trails from the display, press the [TGT TRAIL] key with a touch-and-release action. Target trails are removed from the display however they are stored in the memory, with the target trail timer count continuing.

3. To deactivate target trials, press and hold down the [TGT TRAIL] key more than two seconds.

Note: Target trails are restarted whenever the zoom is activated or the range is changed.

11.7.5 Restoring trails after changing range

Trails are normally canceled and restarted whenever the range is changed. However, you can continue trails on the same range, without restarting, when the newly selected range scale is half or double the previous range scale. Note however that when the range is changed, only those target trails within the previous range are continued; no trails are generated for targets outside the previous range.

Targets within hatched
area are not copied.

Previous Range   New Range
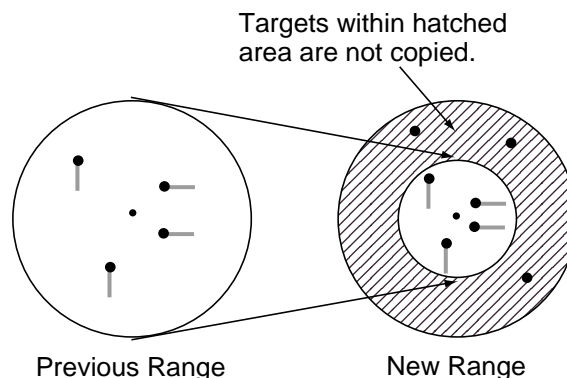
1. Press [MENU], [9], [3], [1] to open the Target Trail menu.

2. Press [↑] or [↓] to select Trail Copy.

3. Press [→] to select On.

4. Press the [MENU] key several times to close the menu.

11.7.6 Trail thinness

Target trails may be painted in thinner trails if desired. This can be useful when there are a lot of targets on the screen.

1. Press [MENU], [9], [3], [1] to open the Target Trail menu.

2. Press [↑] or [↓] to select Thin Trail.

3. Select Off or On as appropriate.

4. Press the [MENU] key several times to close the menu.

11.7.7 Trail level

You may choose by strength level which targets to generate trails for.

1. Press [MENU], [9], [3], [1] to open the Target Trail menu.

2. Press [↑] or [↓] to select Trail Level.

3. Press [→] to select 1, 2 or 3 as appropriate. "3" trails only targets having the strongest signal level; 1 weak-to-strong level targets.

4. Press the [MENU] key several times to close the menu.

11.8 Target Alarm

The target alarm serves to alert the navigator to targets (ships, landmasses, etc.) entering (or exiting) a certain area, with audio and visual alarms. The outer and inner boundaries can be set at any distance. The sector of the zone can be set anywhere between 0 and 360 degrees in any direction. Two alarms may be set.

> ⚠ **CAUTION**
>
> - **The alarm should not be relied upon as the sole means for detecting possible collision situations.**
>
> - **A/C SEA, A/C RAIN and GAIN controls should be properly adjusted to be sure the alarm system does not overlook target echoes.**

11.8.1 Target alarm type

Two alarm types are available: inward and outward. The inward target alarm generates audio and visual warnings when a target enters the guard zone from any direction. The outward target alarm is produced when a target leaves the target alarm zone. The type of alarm active is shown at the bottom right corner on the screen as TA1(2) IN or TA1(2) OUT.
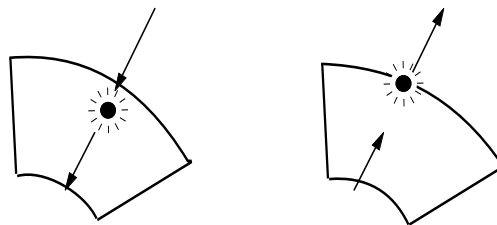
(a) Inward target alarm   (b) Outward target alarm

11.8.2 Setting a target alarm zone

1. Press [MENU], [9], [3], [2] to open the Target Alarm menu.

```
[TARGET ALARM]
_____

Area Select          No.1   No.2

Area 1 Mode          In    Out

Area 2 Mode          In    Out



_____

↑↓←→ : Select & Set.

MENU : Back to Main Menu.     HL-OFF: Menu off temporarily.
```

2. Press [←] or [→] to select No.1 or No.2.

3. Press [↓] to select Area 1 Mode or Area 2 Mode depending on selection made at step 2.

4. Press [←] or [→] to select In or Out as appropriate.

5. Press the [MENU] key several times to close the menu.

6. Using the illustration at the top of the next page as an example, use the +cursor to place the trackball at point A (or B).

7. Press the [TGT ALARM] key. TA1 SET or (TA2 SET) appears at the right side of the screen.

8. Drag the +cursor to point C (or D).

9. Press the [TGT ALARM] key. TA1(2) IN (or TA1(2) OUT) replaces TA1 SET or (TA2 SET) at the right side of the screen.

Note 1: If you wish to create a target alarm zone having a 360-degree coverage around own ship, set point "B" in almost the same direction (approx. ±3°) as point "A".

Note 2: If you change the range scale to less than half of the target alarm zone, the warning TA1(2) INVALID appears instead of TA1(2) IN (or TA1(2) OUT).

Set cursor
on point A
(or B) and
press **TGT
ALARM**.

Guard zone
to set

A
B

D
C

A

(1)

(2)

Set cursor
on point C
(or D).

Guard zone

Press
**TGT
ALARM**.

(4)

(3)
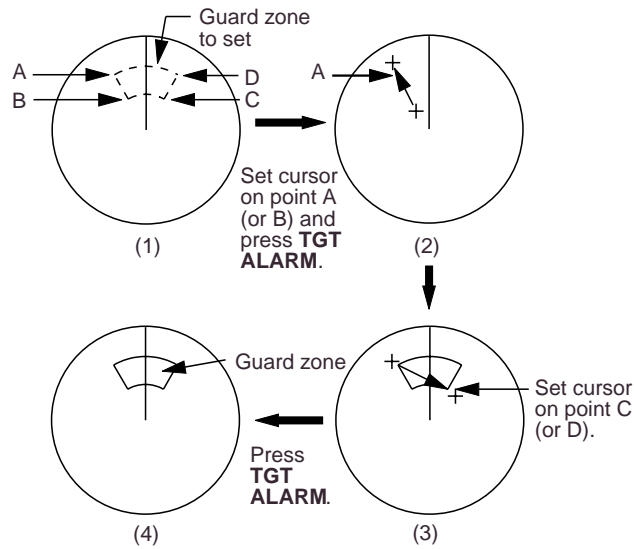
11.8.3 Acknowledging target alarm

A target entering (or exiting) the target alarm zone produces both visual (flashing) and audio (beeping) alarms. To silence the audio alarm, press the [TGT ALARM] key with a touch-and-release action. This will deactivate the audio alarm but will not stop the flashing of the target in the target alarm zone. The indication TA1(2) ACK appears at the right side of the screen to let you know the alarm is temporarily deactivated. To reactivate the audio alarm, press the [TGT ALARM] key. When an external buzzer is connected, the audio alarm does not stop until the target alarm is deactivated.

The audio may also be silenced with the [CLR] key. In this case any target entering (or exiting) the alarm will generate the audio alarm.

11.8.4 Deactivating target alarm

Press the [TGT ALARM] key until the target alarm zone and its indication disappear.

11.9 Parallel Index Lines

Parallel index lines are useful for keeping a constant distance between own ship and a coastline or a partner ship when navigating. Index lines are drawn in parallel with the No. 2 EBL (No. 2 EBL must be active). The orientation of the index lines is controlled with the EBL control (without effecting the EBL indication) and the intervals between the lines adjusted with the VRM rotary control (provided that No. 2 VRM is active).

The maximum number of the index lines to display can be set for 2, 3 or 6 on the radar Initial Setting menu.
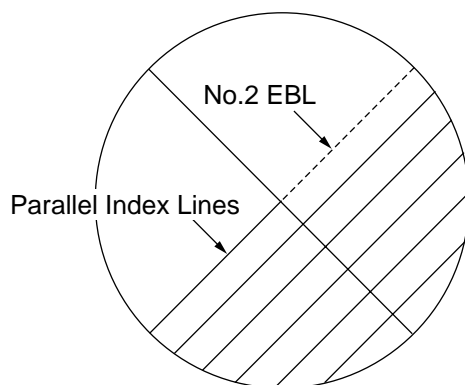
11.9.1 Displaying, erasing the index lines

1. Press [MENU], [9], [3], [7] to display the Initial Setting menu.

2. Press [→] to select 2.

```
[INITIAL SETTING]
_____

Page               1  2

VRM 1              nm  km  sm

VRM 2              nm  km  sm

EBL 1              Relative  True

EBL 2              Relative  True

Index Lines        Off  2  6

Stern Mark         Off  On

Own Ship Mark      Off  On

Center Enhance     Off  On

Test               → (RUN)


_____

↑↓←→    : Select & Set.

MENU    : Back to Main Menu.    HL-OFF: Menu off temporarily.
```

3. Press [↑] or [↓] to select Index Lines.

4. Press [←] or [→] to select number parallel index lines to display (2 or 6), or turn off (Off) the parallel index lines.
    Note: The maximum number of parallel index lines is six. However, the number of lines visible on the screen may be less than six depending on the line intervals.

5. Press the [MENU] key several times to close the menu.

11.9.2 Changing parallel index line bearing

1. Display the No.2 EBL.

2. Adjust the EBL rotary control to change bearing.

11.9.3 Changing parallel index line interval

1. Display the No.2 VRM.

2. Adjust the VRM rotary control to change index line interval.

11.10 Clutter Sweep

The clutter sweep feature suppresses sea and rain clutters within the area selected with the trackball to discriminate specific targets from sea and rain clutters. The user may select the area to process and the level of clutter suppression to apply.

Clutter suppression area
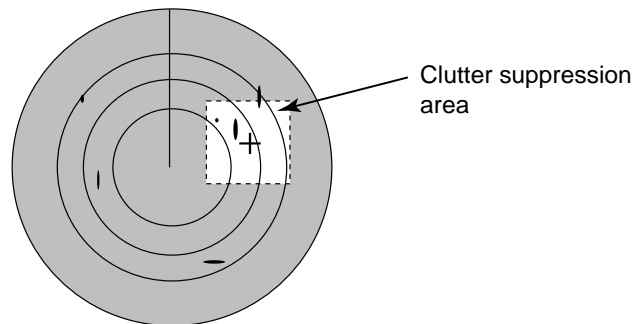
11.10.1 Activating, deactivating clutter sweep

1. Press [MENU], [9], [3], [3] to open the Echo Signal menu.

2. Press [↑] or [↓] to select Clutter Sweep.

3. Press [←] or [→] to turn clutter sweep on or off as appropriate.
    OFF: Turns off clutter sweep.
    ON (Link): Sweep area moves with trackball operation. Sweep cursor shown with dashed lines.
    ON (Fix): Sweep area is fixed on the screen. Sweep cursor shown with solid lines.

    For ON (Link)
    a) Press the [MENU] key several times to close the menu.
    b) Use the trackball to position the sweep cursor where desired.

    For ON (Fix)
    a) Use the trackball to position the sweep cursor where desired.
    b) Press the [ENT] key.
    c) Press the [MENU] key several times to close the menu.

11.10.2 Clutter sweep level

The level of clutter suppression for the clutter sweep feature may be selected as follows:

1. Press [MENU], [9], [3], [3] to open the Echo Signal menu.

2. Press [↑] or [↓] to select Sweep Level.

3. Press [←] or [→] to select level of suppression desired. The larger the number the stronger the suppression.

4. Press the [MENU] key several times to close the menu.

11.11 Function Key [F9]

The [F9] key provides for a macro function to instantly select a combination of assigned functions or settings. This key provides optimum radar settings for a specific purpose with a single key operation. For example, suppose that you have been navigating along a coast for hours and now you are approaching a harbor, your final destination.

You will have to adjust your radar to change from the settings for coastal navigation to those for harbor approach. Every time your navigating environment or task changes, you must adjust the radar, which can be a nuisance in a busy situation. Instead of changing radar settings case by case, it is possible to assign the function key [F9] to provide optimum settings for often encountered situations.

The function key [F9] key can be assigned a combination of three sets of particular radar settings that will be most suited to your specific navigating purpose, such as buoy, harbor or coast.

Each function defines a combination of several radar settings for achieving optimum setup for a particular navigating situation. Those involved are interference rejector, echo stretch, echo average, automatic anti-clutter, pulselength, video contrast and noise rejector settings.

Note 1: Function key presetting requires a good knowledge of optimum radar settings. If you want to change the original function key settings, consult your nearest FURUNO representative or dealer.

Note 2: The function key feature uses the echo averaging function thus a gyrocompass or log signal is required to use the function key.

Functions

Function	Description
COAST	Optimum setting for short range detection using a range scale between 1.5 and 6 nm on calm seas.
OCEAN	Optimum setting for long range detection using a range scale between 6 and 24 nm.
R-SEA	Optimum setting for heavy seas using a range scale between 3 and 12 nm.
RAIN	Optimum setting for heavy rain using a range scale between 6 and 24 nm
BIRD-NEAR	Optimum setting for detecting birds using a range scale between 3 and 8 nm.
BIRD-FAR	Optimum setting for detecting birds using a range scale between 16 and 24 nm.
FLOAT	Optimum setting for discriminating buoys from sea clutter using a range scale between 6 and 24 nm.
BUOY	Optimum setting for detecting buoys and other small targets using a range scale between 6 and 24 nm.
PORT	Optimum setting for short range navigation in a harbor using a range scale of 1.5 nm or less.
FAR	Optimum setting for long range detection using a range scale of 6 nm or larger.

Default function settings

	Echo Avg	Int Rej	Echo Stretch	Echo Enhance	Noise Rej	A/C Auto	Contrast
COAST	0.5	1	OFF	OFF	OFF	OFF	2
OCEAN	0.5	1	OFF	OFF	OFF	OFF	2
R-SEA	1	1	OFF	OFF	OFF	OFF	2
RAIN	0.5	1	OFF	OFF	OFF	OFF	2
BIRD-NEAR	1	1	OFF	OFF	OFF	OFF	2
BIRD-FAR	3	1	2	OFF	ON	OFF	3
FLOAT	1	1	OFF	OFF	OFF	OFF	2
BUOY	3	1	2	OFF	OFF	OFF	3
PORT	0.5	1	OFF	OFF	OFF	OFF	2
FAR	1	1	1	OFF	ON	OFF	3

11.11.1 Setting function key [F9]

The procedure below shows how to set function 1.

1.   Press [MENU], [9], [3], [4] to open the Function menu, and select page 1.

```
[FUNCTION]
_____

Page                    1   2   3
Function 1              Off   On
Function Select         Cst   Ocean   R-Sea   Rain   Bird-N

                        Bird-F   Float   Buoy   Port   Far
Echo Average            Off   0.5   1   2   3
Interference Rejection  Off   1   2   3
Echo Stretch            Off   1   2
Echo Enhance            Off   On
Noise Rejection         Off   On
A/C Auto                Off   On
Video Contrast          1   2   3

_____


↑↓←→ : Select & Set.
MENU : Back to Main Menu.     HL-OFF: Menu off temporarily.
```

2. Press [↑] or [↓] to select Function Select.

3. Press [←] or [→] to select function desired.

4. Press [↑] to select Function 1.

5. Press [→] to select On.

6. Press the [MENU] key several times to close the menu.

Set functions 2 and 3 by selecting Page 2 and Page 3, respectively.

Note: The default echo averaging setting is considered the optimum setting, and thus should not be changed. All other items may be changed as desired.

11.11.2 Activating a function

Press the [F9] key to show desired function number at the bottom of the display.

11.12 A/D Converter Curve

You may select an A/D curve according to objective, referring to the table below. The default setting is A.

Setting	Characteristic	Objective
A	A lot of green but little red. Noise is green in color.	Float detection Reduce sea reflections General navigation
B	Between A and C	Normal use: Useful for target
C	Little green but lot of red. Fine noise. Noise in yellow and red.	Long range detection. Buoy detection.
D	Little green but lot of red. Fine noise. Noise in red.	Long range detection. Buoy detection. Longer range detection than C.

1. Press [MENU], [9], [3], [3] to display the Echo Signal menu.

2. Press [↓] to select A/D Curve.

3. Press [←] or [→] to select A, B, C or D as appropriate.

4. Press the [MENU] key several times to close the menu.

11.13 Set and Drift

Set, the direction of ocean current, can be manually entered in the nearest degree. Drift, the speed of the ocean current, can also be entered manually, in 0.1-knot increments. Set and drift corrections are beneficial for increasing the accuracy of vector data. The correction is best made on relative motion with true vector, watching landmasses, buoys, or stationary targets. Thus, the speed and course over the ground are reciprocally calculated and compared with the relative bearing and range to the reference target produce set and drift.

1. Press [MENU], [9], [3], [7] to open the Initial Setting menu, and select Page 1.

```
[INITIAL SETTING]
_____

Page                    1   2
Speed Mode              Manual   Log   Nav
Manual Speed             00.0 kt
Set & Drift             Off   On
Set                     000.0°
Drift                    00.0 kt
Main Radar              No.1   No.2




_____
↑↓←→ : Select & Set.
MENU : Back to Main Menu.     HL-OFF: Menu off temporarily.
```

2. Press [↑] or [↓] to select Set & Drift.

3. Press [→] to select On.

4. Press [↓] to select Set.

5. Use the numeric keys to enter Set value.

6. Press [↓] to select Drift.

7. Use the numeric keys to enter Drift value.

8. Press the [ENT] key.

9. Press the [MENU] key several times to close the menu.

To cancel set and drift, select Off at step 3 in the above procedure.

11.14 Setting Ship's Speed

The ARP requires own ship's speed and heading inputs. Speed may be entered automatically from a speed log or navaid, or manually through the keyboard.

1. Press [MENU], [9], [3], [7] to open the Initial Setting menu, and select Page 1.

```
[INITIAL SETTING]
_____

Page              1   2

Speed Mode        Manual   Log   Nav

Manual Speed       00.0 kt

Set & Drift       Off   On

Set               000.0°

Drift              00.0 kt

Main Radar        No.1   No.2




_____

↑↓←→ : Select & Set.

MENU : Back to Main Menu.    HL-OFF: Menu off temporarily.
```

2. Press [↑] or [↓] to select Speed Mode.

3. Press [←] or [→] to select Manual, Log or Nav as appropriate. For Log or Nav go to step 7. In case of manual input go to step 4.

4. Press [↓] to select Manual Speed.

5. Use the numeric keys to enter speed.

6. Press the [ENT] key.

7. Press the [MENU] key several times to close the menu.

11.15 Radar Menus

This section provides information necessary for operation on the three menus concerned with radar operation. Description is given for items not previously discussed.

11.15.1 Echo Signal menu

The Echo Signal menu mainly provides items for processing the radar picture, such as echo averaging, contrast and interference rejection.

1. Press [MENU], [9], [3], [3] to open the Echo Signal menu.

```
[ECHO SIGNAL]
_____

Echo Color            Yellow   Green   Color

Clutter Sweep         Off   On (Link)   On (Fix)

Sweep Level           1   2   3

Echo Average          Off   0.5   1   2   3

Interference Rejection  Off   1   2   3

Echo Stretch          Off   1   2

Echo Enhance          Off   On

Noise Rejection       Off   On

Video Contrast        1   2   3

A/D Curve             A   B   C   D

_____

↑↓←→ : Select & Set.

MENU : Back to Main Menu.     HL-OFF: Menu off temporarily.
```

2. Press [↑] or [↓] to select item desired; [←] or [→] to select option.

3. Press the [MENU] key several times to close the menu.

Echo Color: Select radar echo color. "Color" displays echoes in colors among red (strongest), yellow and green (weakest), in accordance with echo strength.

Echo Enhance: On long ranges target echoes tend to shrink in bearing direction, making them difficult to see. On short and medium ranges such as the 1.5, 3 and 6 nm scales, the same size targets get smaller on the screen as they approach own ship. These are due to the inherent property of the radiation pattern of the antenna. To enhance target video on short and medium ranges use the Echo Enhance feature.

Noise Rejection: The noise rejector suppresses white noise, which appears on the screen as many dots scattered randomly over the display.

Video Contrast: Video contrast is adjustable in three levels according to the radar video sampling level. Select the level which changes the dynamic range of the video signal, to improve picture contrast.

11.15.2 Brill menu

This menu adjusts the brilliance level of radar markers such as the fixed range rings, EBL and VRM.

1.   Press [MENU], [9], [3], [6] to open the Brill menu.

```
[BRILL]
_____

Target Trail
  ┌──────────────┐
  │══════════════│
  └──────────────┘
Heading Line
  ┌──────────────┐
  │══════════════│
  └──────────────┘
EBL/VRM
  ┌──────────────┐
  │══════════════│
  └──────────────┘
ARP Symbol
  ┌──────────────┐
  │══════════════│
  └──────────────┘
Own Ship Mark
  ┌──────────────┐
  │══════════════│
  └──────────────┘
Rings
  ┌──────────────┐
  │══════════════│
  └──────────────┘

_____

↑↓←→ : Select & Set.
Menu   : Back to Main Menu
```

2.   Press [↑] or [↓] to select item desired.

3. Press [←] to increase brilliance; [→] to lower it. The adjustment ranges are as follows:
   Target trail: 10%-50%
   Heading line: 60%-100%
   EBL/VRM, ARP symbol, Own ship mark: 40%-100%
   Range rings: 0%-100%

4. Press the [MENU] key several times to close the menu.

11.15.3 Initial setting menu

This menu consists of two pages of menus.

1. Press [MENU], [9], [3], [7] to open the Initial Setting menu.

```
[INITIAL SETTING]
_____

Page                  1   2

Speed Mode            Manual   Log   Nav

Manual Speed           00.0 kt

Set & Drift           Off   On

Set                   000.0°

Drift                  00.0 kt

Main Radar            No.1   No.2




_____

↑↓←→ : Select & Set.

MENU : Back to Main Menu      HL-OFF: Menu off temporarily
```

Initial Setting menu Page 1

```
┌─────────────────────────────────────────────────────┐
│                                                     │
│  [INITIAL SETTING]                                  │
│  ─────────────────────────────────────────────     │
│                                                     │
│  Page              1  2                             │
│                                                     │
│  VRM 1             nm  km  sm                       │
│                                                     │
│  VRM 2             nm  km  sm                       │
│                                                     │
│  EBL 1             Relative  True                   │
│                                                     │
│  EBL 2             Relative  True                   │
│                                                     │
│  Index Lines       Off  2  6                        │
│                                                     │
│  Stern Mark        Off  On                          │
│                                                     │
│  Own Ship Mark     Off  On                          │
│                                                     │
│  Center Enhance    Off  On                          │
│                                                     │
│  Test              → (RUN)                          │
│                                                     │
│                                                     │
│  ─────────────────────────────────────────────     │
│  ↑↓←→ : Select & Set.                               │
│  MENU : Back to Main Menu    HL-OFF: Menu off       │
│                              temporarily            │
└─────────────────────────────────────────────────────┘
```

Initial Setting menu Page 2

2.   Press [↑] or [↓] to select item desired; [←] or [→] to select option.

3.   Press the [MENU] key several times to close the menu.

Initial setting menu Page 1

Main Radar: Selects radar to use.

Initial setting menu Page 2

VRM1, VRM2: Select the unit of range measurement (nm, km, sm) for the No.1 and No.2 VRMs.

EBL1, EBL2: Select the bearing reference (true or relative) for the No.1 and No.2 EBLs.

Stern Mark: Turns the stern marker on/off.

Own Ship Mark: Turns the own ship marker on/off. The symbol is scaled to indicate the length and beam of the vessel. If the largest dimension of the symbol gets smaller than 6 nm, the symbol will disappear and own ship will be represented with a small dot or circle depending on the range in use. Ship's dimensions should be entered at installation.

Center Enhance: Enlarges all targets within the first range ring.

Test: Executes the radar self test. See Chapter 14 for details.

11.16 Error Messages

Radar error messages appear at the left-hand side of the display as below. To erase the error message display, press the [CLR] key.

```
Radar Signal Error
Trigger Error
Antenna Rotation Error
Bearing Signal Error
Heading Data Error
Log Error
```

Radar error messages

Error Message	Meaning
Radar Signal Error	No radar signal.
Trigger Error	No trigger signal.
Bearing Signal Error	Bearing signal not received at RADAR Board. Check that antenna switch is on. Also check RADAR Board.
Antenna Rotation Signal Error	Radar antenna is not rotating. If it is rotating the problem may lie with the connector on the RADAR Board.
Heading Data Error	No heading data from heading sensor.
Log Error	No speed log signal from speed log.
Radar Board Error. Power off and Check Please.	This message appears when there is something wrong with the RADAR Board. Contact a FURUNO agent for assistance.

12.1 Auto Plotter Usage Precautions

⚠ WARNING

No one navigational aid should be relied upon for the safety of vessel and crew. The navigator has the responsibility to check all aids available to confirm position. Electronic aids are not a substitute for basic navigational principles and common sense.

• This auto plotter automatically tracks an automatically or manually acquired radar target and calculates its course and speed, indicating them by a vector. Since the data generated by the auto plotter are based on what radar targets are selected, the radar must always be optimally tuned for use with the auto plotter, to ensure required targets will not be lost or unwanted targets such as sea returns and noise will not be acquired and tracked.

• A target does not always mean a land-mass, reef, ships or other surface vessels but can imply returns from sea surface and clutter. As the level of clutter changes with environment, the operator should properly adjust the A/C SEA, A/C RAIN and GAIN controls to be sure target echoes are not eliminated from the radar screen.

⚠ CAUTION

The plotting accuracy and response of this auto plotter meets IMO standards. Tracking accuracy is affected by the following:

• Tracking accuracy is affected by course change. One to two minutes is required to restore vectors to full accuracy after an abrupt course change. (The actual amount depends on gyrocompass specifications.)
• The amount of tracking delay is inversely proportional to the relative speed of the target. Delay is on the order of 15-30 seconds for high relative speed; 30-60 seconds for low relative speed.

Display accuracy is affected by the following:

• Echo intensity
• Radar transmission pulsewidth
• Radar bearing error
• Gyrocompass error
• Course change (own ship or target)

12.2 Introduction to the Auto Plotter

This series of video plotters can accommodate an optional ARP (Automatic Radar Plotter) module. With the optional ARP circuit board ARP-10 (GP/GD-280) or ARP-17 (GP/GD-380, GP/GD-680) fitted in the display unit, the equipment will automatically acquire 10 targets (GP/GD-280) or 20 targets (GP/GD-380, GP/GD-680) coming into the acquisition area. Once a target is acquired automatically or manually it is automatically tracked within 0.1 to 32 nm, whether inside or outside the acquisition area. Heading signal is required to use the Auto Plotter.

12.2.1 Criteria of tracking

A target measuring 800 m or more in the radial or circumferential direction is regarded as a landmass and not acquired or tracked. Echoes smaller than 800 m are regarded as targets to be tracked.

The FURUNO ARP video processor detects targets in the midst of noise and discriminates radar echoes on the basis of their size. Target whose echo measurements are greater than those of the largest ship in range or tangential extent are usually land and are displayed only as normal radar video. All smaller ship-sized echoes which are less than this dimension are further analyzed and regarded as ships and displayed as small circles superimposed over the video echo.

When a target is first displayed, it is shown as having zero true speed but develops a course vector as more information is collected. In accordance with the International Marine Organization Automatic Radar Plotting Aid (IMO ARP) requirements, an indication of the motion trend should be available within 20 scans of antenna and full vector accuracy within 60 scans. The FURUNO ARPs/ATAs comply with these requirements.

12.2.3 Acquisition and tracking

A target which is hit by five consecutive radar pulses is detected as a radar echo.

Auto acquisition is not defined in paints but in time, which should be less than three seconds of initial stage.

Manual acquisition is done by designating a detected echo with the trackball. Automatic acquisition is done in the acquisition area when a target is detected 5-7 times continuously depending upon the congestion. Tracking is achieved when the target is clearly distinguishable on the display for five consecutive or alternate paints out of 10 consecutive scans whether acquired automatically or manually.

Targets not detected in five consecutive scans become "lost targets."

12.2.4 Quantization

The entire picture is converted to a digital from called "Quantized Video." A sweep range is divided into small segments and each range element is "1" if there is radar echo return above a threshold level, or "0" if there is no return.

The digital radar signal is then analyzed by a ship-sized echo discriminator. As the antenna scans, if there are five consecutive radar pulses with 1's indicating an echo presence at the exact same range, a target "start" is initiated. Since receiver noise is random, it is not three-bang correlated, and it is filtered out and not classified as an echo.

The same is true of radar interference. Electronic circuits track both the closet and most distant edges of the echo. At the end of the scanning of the echo, the discriminator indicates the measured maximum range extent and total angular extent subtended by the echo. If the echo is larger than a ship-sized echo in range extent and/or angular width, adjusted as a function of range, it is declared to be a coastline and the closest edge is put into the memory as a map of the area.

This land outline is used to inhibit further acquisition and tracking of ship-sized echoes beyond the closest coast outline. Five consecutive scans of coastal outline are retained in memory to allow for signal variation. All smaller echoes are declared to be ship sized and the middle of the leading edge is used to provide precise range and bearing coordinates of each echo on every scan. This range/bearing data is matched to previous data and analyzed from scan-to-scan for consistency. When it is determined to be as consistent as a real target, automatic acquisition occurs and tracking is initiated.

Continued tracking and subsequent calculation develop the relative course and speed of the target just as a man would do when plotting the relative course and speed of the target on the scope with a grease pencil.

The true course and speed of own ship are computed from own ship's gyro and speed inputs, and the resulting course and speed of each tracked target is easily computed by vector summing of the relative motion with own ship's course and speed. The resulting true or relative vector is displayed for each of the tracked targets. This process is updated continually for each target on every scan of the radar.

12.2.5 Automatic acquisition area

Performance of auto-acquisition is enhanced by the use of an automatic acquisition ring. The acquisition area may be a full 360-degree circle or sector of any angles. It is gyro stabilized. The area should be placed clear of a landmass or shoreline.

12.2.6 Qualitative description of tracking error

The FURUNO ARP accuracy complies with or exceed IMO standards.

Own ship maneuvers

For slow turns there is no effect. For very high turning rates (greater than 150°/minute, depending on gyro), there is some influence on all tracked targets which last for a minute or two and then all tracked targets revert to full accuracy.

Other ship maneuvers

Target ship courses, lag 15 to 30 seconds at high relative speed, or 3 to 6 seconds at low (near 0) relative speed. It is less accurate during a turn due to lag, but accuracy recovers quickly.

12.3 Activating, Deactivating the Auto Plotter

The Auto Plotter is activated/deactivated through the menu. Acquired targets are tracked internally when the Auto Plotter is deactivated.

1.   Adjust the [A/C RAIN], [A/C SEA] and [GAIN] controls for proper radar picture.

2.   Press [MENU], [9], [3], [5] to show the ARP menu and select Page 1.

```
[ARP MENU]
_____

Page                1  2

Mark Display        Off  On

All Symbol Erase    → (RUN)

Vector Reference    Relative  True

Vector Time         30s  1m   3m   6m   15m   30m

CPA Set             Off  0.5nm   1nm   1.5nm

                    2nm   3nm   4nm   5nm   6nm

TCPA Set            30s  1m   2m   3m   4m   5m

                    6m   12m   15m

Track Display       Off  On

Audio Alarm         Off  On
_____

↑↓←→ : Select & Set.

MENU : Back to Main Menu.      HL-OFF: Menu off temporarily.
```

3.   Press [↑] or [↓] to select Mark Display.

4.   Press [→] to select On.

5.   Press the [MENU] key several times to close the menu.

Note 1: To quit the ARP, select Off at step 4 in the above procedure.

Note 2: The ARP requires own ship's speed and heading data. Of these, the speed data can be entered automatically from a speed log or navaid, or manually through the keyboard.

12.4 Acquiring Targets

12.4.1 Manual acquisition

The GP/GD-280 permits manual acquisition of 10 targets in the range of 2-16 nm, while the GP/GD-380 and GP/GD-680 permit manual acquisition of 20 targets within the range of 0.2-32 nm. The targets are automatically tracked and numbered. When the automatic acquisition feature is active, the number of targets manually acquirable are five (GP/GD-280) or ten (GP/GD-380, GP/GD-680).

Before starting the ARP, check that heading and speed readouts at the top of the screen are correct. To manually acquire a target, do the following:

1. Place the cursor on a target of interest by operating the trackball.

2. Press the [ACQ] key.

The plot symbol changes its shape according to the status as below, with plot number to the right of the plot symbol. A vector appears in about 20 antenna scans after acquisition, indicating the target's motion trend. If the target is consistently detected for three minutes, the plot symbol changes to a solid mark. If acquisition fails, the target symbol blinks and disappears shortly.

① At acquisition ② 1 min. after acquisition ③ 3 min. after acquisition
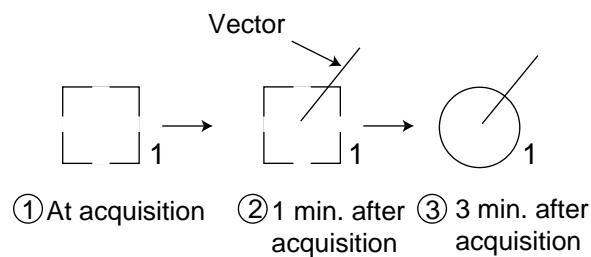
Note: When the ARP has acquired all targets possible, the buzzer sounds, and no more acquisition is possible unless targets are lost. Should this happen, cancel tracking of individual targets or all targets by the procedure described on page 12-8.

12.4.2 Automatic acquisition

With the automatic acquisition feature on, the GP/GD-280 can automatically acquire five targets, and the GP/GD-380, GP/GD-680, 10 targets.

For the GP/GD-280, the ARP automatically acquires five targets which come into the acquisition area. However, if move than five targets have been acquired manually, only the remaining number out of ten may be acquired automatically. For example, if seven targets have been acquired manually, only three targets may be automatically acquired. For the GP/GD-380, GP/GD-680, if more than 10 targets have been acquired manually, only the remaining number of targets out of twenty may be acquired automatically.

To acquire targets automatically do the following:

1. Press [MENU], [9], [3], [5] to display the ARP menu.

2. Select Page 2.

```
[ARP MENU]
_____

Page                      1   2

Track Interval            30s   1m   2m   3m   6m

Auto Acquisition          Off   On   Set

Guard Zone                Off   On   Set

Track Test                Off   On

Land Discrimination       0   1   2   3   4

Vector Start              1 m   20 Scans

Reference Target Vector   Off   On

Target Based Speed        → (RUN)
_____

↑↓←→ : Select & Set.

MENU : Back to Main Menu.      HL-OFF: Menu off temporarily.
```

3. Press [↑] or [↓] to select the Auto Acquisition field.

4. Press [→] to select Set.

5. Place the +cursor at upper (lower) left edge of area (A in figure below) and press the [ENT] key.

6. Place the +cursor at the lower (upper) right edge of the area (B in figure below) and press the [ENT] key.
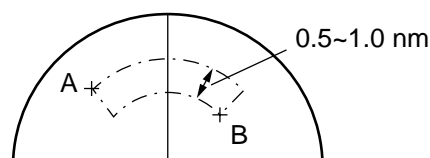
7.   Press the [MENU] key several times to close the menu.

Note 1: If you wish to create an auto acquisition area having a 360-degree coverage around own ship, set point B in almost the same direction (approx. ±5°) as point A and press the [ENT] key.

Note 2: To terminate automatic acquisition select Off at step 4 in the above procedure.

12.5 Terminating Tracking of Targets

When the target capacity is reached, no more acquisition occurs unless tracking of targets is terminated. Should this happen, cancel tracking of individual targets or all targets by the procedure described below.

12.5.1 Terminating tracking of individual targets

Use the trackball to place the +cursor on a target which you do not want to be tracked any longer and press the [CANCEL] key.

12.5.2 Terminating tracking of all targets

All targets can be canceled by pressing and holding down the [CANCEL] key for several seconds, or from the ARP menu as follows:

1.   Press [MENU], [9], [3], [5] to display the ARP menu and select Page 1.
2.   Press [↑] or [↓] to select the All Symbol Erase field.
3.   Press [→] to select RUN.
4.   Press the [MENU] key several times to close the menu.

12.6 Displaying Target Data

The Auto Plotter calculates speed and course of all targets under tracking. You may display this data on the display as follows:

1. Press [MENU], [9], [4] to display the ARP menu.

```
ARP
_____

Change MK Color      →    Yes

Speed/Course        No    Yes




_____

↑↓←→ : Sel, Fix

MENU : Esc
```

2. Press [↓] to select Speed/Course.

3. Press [→] to select Yes.

4. Press the [MENU] key several times to close the menu. Target data appears at the left side of the screen. Below is a typical ARP target data display.

```
1     4.9 kt     098.0°

2     0.5 kt     320.1°

3     6.2 kt     242.1°

4     8.2 kt     123.5°

5     7.0 kt     090.2°

6     3.2 kt     226.8°

7     5.2 kt     034.2°

8     4.2 kt     134.6°

9     8.4 kt     074.8°

10    5.5 kt     356.8°
```

5. For the GP/GD-380/680, press the [ENT] key to switch between targets 1-10 and 11-20.

12.7 True or Relative Vectors

Target vectors are displayed in relative or true mode. Own ship does not have a vector in the relative mode. You may select true or relative vector on the ARP menu.

1. Press [MENU], [9], [3], [5] to display the ARP menu and select Page 1.

2. Press [↑] or [↓] to select the Vector Reference field.

3. Press [←] or [→] to select Relative or True as appropriate.

4. Press the [MENU] key several times to close the menu.

12.8 Vector Time

Vector time (or the length of vectors) can be set to 30 seconds, 1, 3, 6, 15 or 30 minutes and the selected vector time is indicated on the screen.

The vector tip shows an estimated position of the target after the selected vector time elapses. It can be valuable to extend the vector length to evaluate the risk of collision with any target.
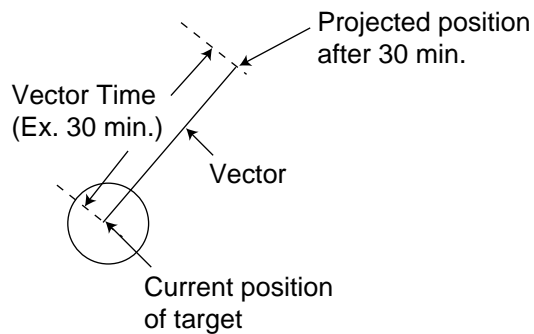
1. Press [MENU], [9], [3], [5] to display the ARP menu and select Page 1.

2. Press [↑] or [↓] to select the Vector Time field.

3. Press [←] or [→] to select appropriate vector time.

4. Press the [MENU] key several times to close the menu.

12.9 Changing Color of Acquisition Symbol/Vector/ARP Track

You may change the color of individual acquisition symbol and vector as below.

Vector

Normally in white

1

Acquisition mark

Color of previous ARP track is not changed.
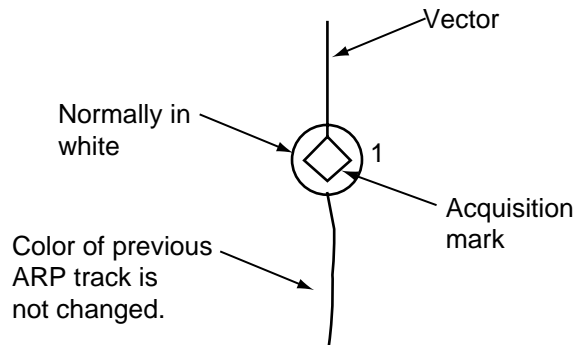
1. Press [MENU], [9], [4] to display the ARP menu.

2. Press [→] to select Yes. The following menu appears.

For GP/GD-380, GP/GD-680 "20" is shown.

```
Change MK Color
_____

Number    ▌ [01 ~ 10]
Color     R  Y  G  C  P  B  W




_____

↑↓←→ : Sel    ENT: Fix
MENU : Esc
```

3. Key in the target number of which you want to change the color.

4. Press [↓] to select Color.

5. Press [←] or [→] to select new color.

6. Press the [ENT] key.

7. Press the [MENU] key several times to close the menu.

Color of newly acquired marks, vectors and track will be drawn in the color selected here.

12.10 ARP Past Position Display

The ARP can show equally time-spaced dots (maximum 10 dots at intervals of 30 seconds, 1, 2, 3 or 6 minutes) marking the past positions of any targets being tracked (max. 10 targets for GP/GD-280; 20 for GP/GD-380/680).

If a target changes its speed, the spacing will be uneven. If it changes course, its plotted course will not be a straight line in the TM mode. In TM, the past position display is produced relative to North (True Trails). In RM, it is relative to North or Heading as selected.

To turn the past position display on/off:

1. Press [MENU], [9], [3], [5] to open the ARP menu and select Page 1.

2. Press [↑] or [↓] to select Track Display.

3. Select On or Off as appropriate.

4. Press [↑] to select Page.

5. Press [→] to select 2.

6. Press [↑] or [↓] to select Track Interval.

7. Press [←] or [→] to select ARP track plotting interval desired.

8. Press the [MENU] key several times to close the menu.

(a) Ship has turned   (b) Ship running straight
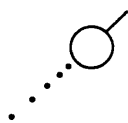
(c) Ship has slowed down   (d) Ship has speeded up
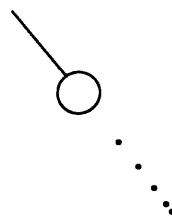
Note 1: The past position display is shown with solid lines (instead of dots) on the plotter display and radar/plotter combination display.

Note 2: If you do not require the past position display select OFF at step 3 in the above procedure.

12.11 Erasing ARP Track

ARP track may be erased from the plotter display and the radar/plotter combination display as below.

1. Press [MENU], [2], [0] to display the Track Color Erase Menu.

```
Track Color Erase
_____

Red          No   Yes

Yellow       No   Yes

Green        No   Yes

Cyan         No   Yes

Purple       No   Yes

Blue         No   Yes

White        No   Yes

Track        Main    Sub    GPS Buoy

             ARP (00)
             [00~10, 00: All] ——————————— 20 for GP/GD-380, GP/GD 680


_____

↑↓←→ : Sel    ENT: Fix

MENU : Esc
```

2. Press [↓] to select Track and press [→] to select ARP.

3. Select ARP track acquisition number to erase.
    GP/GD-280: 01-10
    GP/GD-380/680: 01-20
    All: 00

4. Press [↑] to select color to erase and press [→] to select Yes.

5. Press the [ENT] key. You are asked if you are sure to erase the track.

6. Press the [ENT] key again.

7. Press the [MENU] key several times to close the menu.

12.12 Changing ARP Track Color

You may change the color of the ARP track as desired.

1. Press [MENU], [2], [8] to display the Change Color/Line Type.

```
Change Color/Line Type
_____

Set Area       +Cursor   All
Old Color      R   Y   G   C   P   B   W
New Color      R   Y   G   C   P   B   W   Same
Old Type       ▬▬▬   ------   ----   --·--
New Type       ——   ------   ----   --·--   Same
Track          Main   Sub   GPS Buoy
               ARP(00)   [00-10, 00: All] ——————————————  20 for GP/GD
                                                           380, GP/GD-680
_____

<CAUTION>
   This MENU is only for setting of own ship track line.
   Not applicable for track lines of GPS buoy nor ARP target.


↑↓←→ : Sel, Fix     ENT: Execute
MENU : Esc
```

2. Press [↓] to select Track and press [→] to select ARP.

3. Enter ARP acquisition number.

4. Press [↑] to select Old Color and press [←] or [→] to select color desired.

5. Press [↓] to select New Color and press [←] or [→] to select color desired

6. Press [↑] to select Set Range and [→] to select Cursor or All.

7. Press the [ENT] key.

8. If you selected Cursor at step 6, go to step 9. For other selections go to step 11.

9. Place the cursor on the starting point of the track to process and press the [ENT] key.

10. Place the cursor on ending point of the track to process and press the [ENT] key.

11. Press the [ENT] key.

12. Press the [MENU] key several times to close the menu.

12.13 Alarms

12.13.1 CPA/TCPA alarm

Audio and visual alarms are generated when the predicted CPA and TCPA of any target become less than their preset limits. Press the [CLR] key to acknowledge and silence the CPA/TCPA audio alarm.

The ARP continuously monitors the predicted range at the Closest Point of Approach (CPA) and predicted time to CPA (TCPA) of each tracked target to own ship.

When the predicted CPA of any target becomes smaller than a preset CPA alarm range and its predicted TCPA less than a preset TCPA alarm limit, the ARP releases an audio alarm. In addition, the target plot symbol changes to a triangle and flashes together with its vector.

Provided that this feature is used correctly, it will help prevent the risk of collision by alerting you to threatening targets. It is important that GAIN, A/C SEA, A/C RAIN and other radar controls are properly adjusted and the ARP is set up so that it can track targets effectively.

CPA/TCPA alarm ranges must be set up properly taking into consideration the size, tonnage, speed, turning performance and other characteristics of own ship.

The CPA/TCPA alarm feature should never be relied upon as a sole means for detecting the risk of collision. The navigator is not relieved of the responsibility to keep visual lookout for avoiding collisions, whether or not the radar or other plotting aid is in use.

Follow the steps shown below to set the CPA/TCPA alarm ranges:

1. Press [MENU], [9], [3], [5] to open the ARP menu, and select Page 1.

2. Press [↑] or [↓] to select CPA Set.

3. Press [←] or [→] to choose CPA limit desired (or Off).

4. Press [↓] to choose TCPA Set.

5. Press [←] or [→] to choose TCPA limit desired (or Off).

6. Press the [MENU] key several times to close the menu.

Silencing CPA/TCPA audio alarm

Press the [CLR] key to acknowledge and silence the CPA/TCPA audio alarm.

The flashing of the triangle plot symbol and vector remain on the screen until the dangerous situation is no longer present or you intentionally terminate tracking of the target by using the [CANCEL] key.

12.13.2 Confirming lost target

When the system detects a lost target, tracking on the target is discontinued and the target symbol becomes a flashing diamond (◇). The normal plotting symbol is restored to the target when the target is manually acquired. If the target is not reacquired the flashing diamond will be erased from the screen. To confirm a target as a lost target do the following:

1. Place the +cursor on target.

2. Press the [CANCEL] key.

12.13.3 Guard zone alarm

When a target comes in the guard zone, the buzzer sounds and the indication GUARD ZONE appears. The intruding target is denoted by an inverted triangle mark. The mark disappears when the target exits the zone. This function is only available with the GP/GD-380/680.

You can set the guard zone as follows:

1. Press the [MENU], [9], [3], [5] to display the ARP menu, and select Page 2.

2. Press [↑] or [↓] to select Guard Zone.

3. Press [→] to select Set.

4. Set the +cursor on one boundary of the guard ring and press the [ENT] key.

5. Set the +cursor on the other boundary and press the [ENT] key.
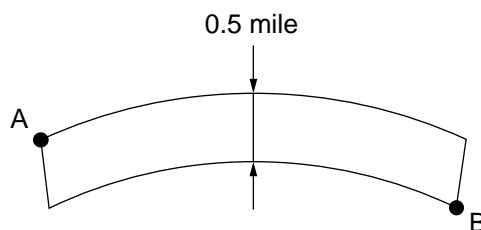
6. Press the [MENU] key several times to close the menu.

Note 1: The range of the alarm is fixed at 0.5 nm. The bearing may be set as desired.
Note 2: The [CLR] key silences the audio alarm.
Note 3: To disable the guard ring, select Off at step 3 in the above procedure.

12.13.4 Enabling/disabling the audio alarm

The default audio alarm status is "ON." If you do not require the audio alarm you may turn it off as follows:

1. Press the [MENU], [9], [3], [5] to display the ARP menu, and select Page 1.

2. Press [↓] to select Audio Alarm.

3. Select On or Off as appropriate.

4. Press the [MENU] key several times to close the menu.

12.14 Auto Plotter Menu Description

This paragraph covers items on page 2 of the ARP menu not previously discussed.

Track Test: Tests tracking performance of the auto plotter. For details see paragraph 12.13.

Land Discrimination: Sets the size of the echo to be recognized as a landmass. The sizes are 0, more than 600 m; 1, more than 800 m; 2, more than 1200 m; 3, more than 1600 m, and 4, no limitation.

Vector Start: Selects when to start reestablishment of vectors after the range is changed; 1 minute or 20 scans of radar antenna.

Reference Target Vector: In relative motion reference targets may be affixed with vectors.

Target Based Speed: This mode is used when the ship's SDME (log) is not operating properly or the vessel has no device which detects ship's leeward movement (Doppler sonar 2-axis speed log, etc.) and leeward movement is not disregarded.

If you select target based speed, the radar calculates own ship's speed relative to fixed reference targets. The number of targets may be 1, 2 or 3. They appear as tracked targets, each shown in a small circle, but without a vector. When a plural of reference targets are selected, the mean value is used for stabilization and speed. This function is only available with the GP/GD-380/680.

To use target based speed:

Note: Do not mark an acquired target as a target based speed target. It will become a lost target.

1. Press the [MENU], [9], [3], [5] to display the ARP menu, and select Page 2.

2. Press [↓] to select Target Based Speed.

3. Press [→] to select RUN.

4. Use the trackball to place the +cursor on the target to mark as a reference target.

5. Press the [ENT] key. The display shows a dotted square with reference target number to the right of the square (⬚ R).

6. Press the [MENU] key several times to close the menu. The dotted square changes to a solid circle (○ R).

12.15 Track Test

The track test checks the auto plotter processor for proper operation. The figure below shows the starting picture of the simulation display. Each mark moves as time passes. Check that each target's data is reasonable. **Do this test when the radar is not being used.** This feature is only available with the GP/GD-380/680.
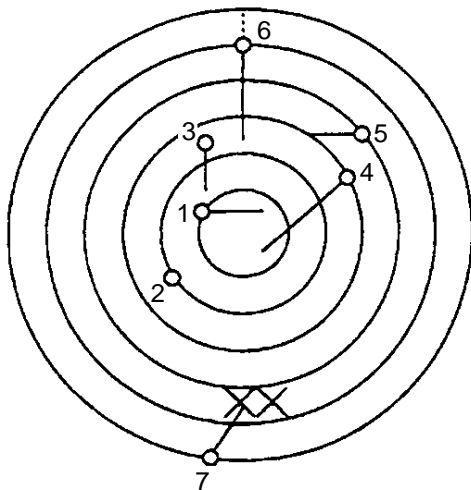
12.15.1 Starting the track test

1. At the radar, select the north-up presentation mode, and manually set the speed for 0 knots.

2. Select the 12 nm radar range.

3. Press [MENU], [9], [3], [5] to display the ARP menu and then select Page 2.

4. [↑] or [↓] to select Track Test.

5. Press [→] to select On.

6. Press the [MENU] key several times to close the menu.

XX appears flashing at the bottom of the display during the test. It takes about three minutes for all vectors to be displayed completely on the screen; seven targets on various courses and speeds are provided.

12.15.2 Stopping the track test

1. Press [MENU], [9], [3], [5] and then select page 2 of the menu.

2. Press [↑] or [↓] to select Track Test.

3. Press [←] to select Off.

4. Press the [MENU] key several times to close the menu.

13. CUSTOMIZING YOUR UNIT

13.1 Plotter Display Attributes

This section shows you how to customize the plotter display to suit your needs, using the Plotter Display menu. The number of pages contained in the Plotter Display menu depends on equipment incorporated:

No built-in GPS receiver: 8 pages
Built-in GPS receiver: 9 pages
Radar overlay kit: 10 pages
Built in GPS receiver plus Radar overlay kit: 11 pages

1. Press [MENU], [0], [1] to open the Plotter Display menu.

2. Select page with [←] or [→].

13.1.1 Plotter display menu, page 1

```
Plotter Display [Drawing Type on Plotter Display]
_____

Page      1   2   3   4   5   6   7   8   9   10   11
_____

Back Color            Black   Blue
+Cursor               R   Y   G   C   P   B   W
+Cursor Size          Small   Large
○Cursor               Off   R   Y   G   C   P   B   W
||Cursor              Off   R   Y   G   C   P   B   W
Own Ship Mark         R   Y   G   C   P   B   W
Standard Mark/Line    Off   On
Waypoint Mark         Off   Small   Large
Comment Mark          Off   Small   Large
External Event Mark   Off   On
Time Mark             Off   "T" Mark Only   Time   Y/M/D
Temperature/Depth     Off   On
Course                Off   Course Vector   Course Line
 Auto Course Bar      2 kt lower limit
Heading Line          Off   On
Current Vector        Off   On
◊Cursor               Off   R   Y   G   C   P   B   W
◊Cursor Shape Adjust → Yes
_____

↑↓←→ : Sel, Fix

MENU : Esc
```

Back Color: Selects background color to black or blue.

+Cursor: Selects color of +cursor among red, yellow, green, cyan, purple, blue and white.

+Cursor Size: Selects size of +cursor for large or small.

Large   Small

Fills width
and breadth
of display.

Crosshairs
are about
1 cm in length.
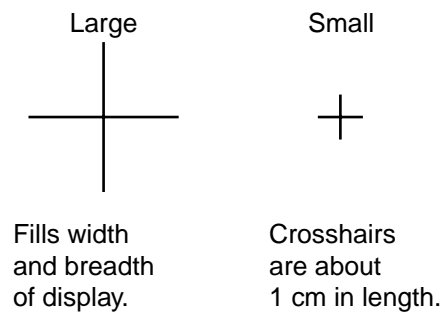
○ Cursor: Selects color of circle cursor among red, yellow, green, cyan, purple, blue and white.

How to use the circle cursor

1.   Press the [SEL] key to display the ⊡ icon.

2.   Roll the trackball to shift the circle cursor.

3.   Operate the ⊠, ⊠ keys to enlarge and shrink the radius, respectively.

I I Cursor: Selects color of parallel cursor among red, yellow, green, cyan, purple, blue and white.

How to use the parallel cursor

1.   Press the [SEL] key to display the ◹ icon.

2.   Roll the trackball to shift the parallel cursor.

3.   Operate the ⊠, ⊠ keys to change the width and slant of the parallel cursor, respectively.

Own Ship Mark: Selects color of own ship mark among seven colors.

Standard Mark/Line: Turns on/off all marks and lines.

Waypoint Mark: Selects waypoint mark size to large or small. Large shows waypoint number inside a square; Small shows all waypoints with an X.

Comment Mark: Turns on/off comment display and selects its size.

External Event Mark: Turns the event mark, which is input from a navigator, on or off.

Time Mark: Selects how to display the time mark; Off (no display), T-mark only, hour, or date.
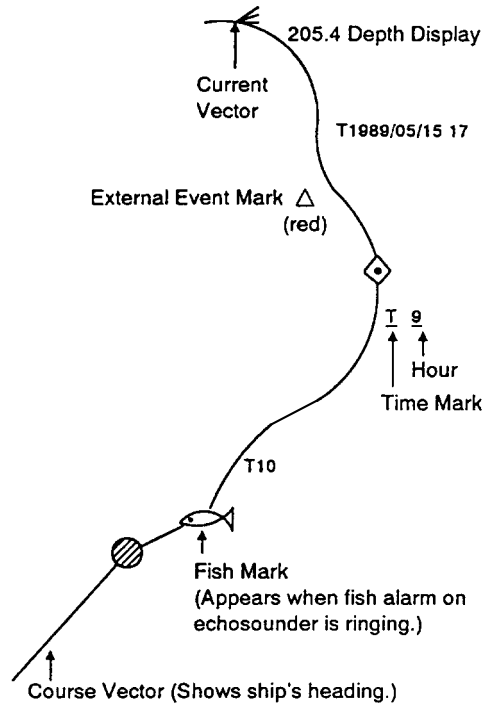
Temperature/Depth: Turns on/off water temperature and depth data. Appropriate sensor(s) required to display water temperature and depth.

Course: Selects how to display own ship's course, Off (no display), course vector or course line. The course marker shows ship's actual movement, not the course in bow direction.

Auto Course Bar: This feature turns off the course display when the ship's speed is below the speed entered here.

Heading Line: Turns heading line on/off.

Current Vector: Turns current vector, which shows current direction, on/off. This feature requires connection of a Current Indicator.

◊ Cursor: Selects color of the diamond cursor, which is shown below. The size and shape may be changed with ◊ Cursor Adjust.
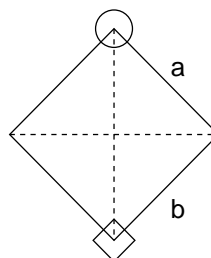
◊ **Cursor Adjust:** You may adjust the size and shape of the diamond cursor when the range scale is 1/100,000 and lower. Select Yes and the following screen appears.

```
↑↓←→          : Adjust
ZOOM IN       : Enlarge
ZOOM OUT      : Reduce
ENT           : Fix
MENU          : End
WARP LENGTH: XXXX.X ─────────── Length of from a to b in figure at bottom of
                                previous page
```

- Enlarge top portion (**O** part): ⊠ and [↑].

- Shrink top portion (**O** part): ⊠ and [↑].

- Enlarge top portion (◊ part): ⊠ and [↓].

- Shrink top portion (◊ part): ⊠ and [↓].

- Enlarge/shrink horizontal width: ⊠/⊠ and [←] or [→].

- Press [MENU] key to set cursor and close window.

- To position diamond cursor, press the [SEL] key to display the diamond cursor icon and then use the trackball.

- To rotate the diamond cursor, select it with the [SEL] key and use [←] or [→].

13.1.2 Plotter display menu, page 2

```
Plotter Display [Drawing Type on Plotter Display]
_____

Page     1  2  3  4  5  6  7  8  9  10  11
_____

Fish Mark          Off  On
Grid Format        Off  ←→   On [GRN   Pattern 1]


_____

↑↓←→ : Sel, Fix
MENU : Esc
```

Fish Mark: Turns the fish mark on/off. Requires connection of a video sounder.

Grid Format: Turns the latitude and longitude grid on/off and selects grid pattern.

```
Grid Format
_____

  Pattern 1
    Grid is displayed with 2 to 4 lines.


_____

Color            R   Y   G   C   P   B   W
Pattern          1   2   3
Lat. Grid Int.   00°30'
Divided into     03
Long. Grid Int.  00°30'
Divided into     03




_____

↑↓←→ : Sel    Ent: Fix
MENU : Esc
```

The grid may be displayed in one of seven colors. Three grid patterns are available; select the pattern which best suits your needs.

Pattern 1: Displays between two and four each of latitude and longitude lines depending on range.
Pattern 2: Latitude up to 60°; latitude to longitude ratio 1:1.

Pattern 3: User may set distance between lines of latitude and longitude.

For example, for 30' interval do the following:

a) At the Lat. Grid Int. field, key in [0], [0], [3], [0].
b) At the Divided into field for Lat. Grid field, key in [0], [1].
c) At the Long. Grid Int. field, key in [0], [0], [3], [0].
d) At the Divided into field for Long. Grid field, key in [0], [1].
e) Press the [ENT] key.

13.1.3 Plotter display menu, page 3

```
┌─────────────────────────────────────────────────────┐
│ Plotter Display [Text on Nav Data Display]          │
│ ─────────────────────────────────────────────────── │
│                                                      │
│ Page      1  2  3  4  5  6  7  8  9  10  11         │
│ ─────────────────────────────────────────────────── │
│                                                      │
│ Headline   Date Time   Navaid in Use    Lat/Long    │
│                                                      │
│            Ship's Spd/Crs           Water Temp./Depth│
│                                                      │
│            Wind Spd/Dir. (True)     Wind Spd/Dir. (Rel.)│
│                                                      │
│                      WPT Lat/Long   Rng/Brg to WPT  │
│                                                      │
│            ETA        Current 1      Current 2      │
│                                                      │
│            Current 3  NA                            │
│                                                      │
│                                                      │
│ ─────────────────────────────────────────────────── │
│ ↑↓←→ : Sel, Fix                                     │
│ MENU : Esc                                          │
└─────────────────────────────────────────────────────┘
```

You may select the nav data item which to display in larger characters on the nav monitor display.

13.1.4 Plotter display menu, page 4

```
Plotter Display [Chart Attributes]
_____

Page    1  2  3  4  5  6  7  8  9  10  11
_____

Chart Data          Off  On
Land Pattern        Off  Dim  Medium  Bright
Land Color          R  Y  G  C  P  B  W
Index               Off  On
Place Name          Off  On
Chart Pos. Offset   Off  ←→   On [00.000'N]
                                 [00.000'E]
_____

↑↓←→ : Sel, Fix
MENU : Esc
```

This menu provides for setup of chart card attributes.

Chart Data: Turns the chart on or off. Chart must be inserted in drive to display chart.

Land Pattern: Hollows or fills land on chart.

Land Color: Selects color of land on chart.

Index: Turns on/off indices display.

Place Name: Turns on/off place-name display.

Chart Pos. Offset: Offsets chart position to refine position accuracy. For example, enter an offset when chart position shows your ship to be at sea when in actuality it is moored to a pier.

1. Select On from the Chart Pos. Offset field.

```
Chart Position Offset
_____

By cursor       ←→     By L/L Position
                       (--.---'N   --.---'W)


_____

↑↓←→ : Sel, Fix
MENU : Esc
```

2. Press [←] or [→] to select offset method; By cursor or By L/L Position.

For Cursor, place the +cursor on correct own ship position and press the [ENT] key. For L/L position, enter offset value with the numeric keys and press the [ENT] key. The maximum offset in latitude or longitude direction is 59.999°.

The offset icon (⊞) appears at the bottom of the display when an offset is applied.

13.1.5 Plotter display menu, page 5

Sets the color of chart features, and turns them on or off.

```
┌────────────────────────────────────────────────────────┐
│                                                        │
│  Plotter Display [Chart Attributes]                    │
│  _____  │
│                                                        │
│  Page    1  2  3  4  5  6  7  8  9  10  11             │
│                                                        │
│  _____  │
│                                                        │
│  Lighthouse      R  Y  G  C  P  B  W  Not Disp         │
│  Lighted Buoy    R  Y  G  C  P  B  W  Not Disp         │
│  Buoy            R  Y  G  C  P  B  W  Not Disp         │
│  Radio Trans.    R  Y  G  C  P  B  W  Not Disp         │
│  Wreck           R  Y  G  C  P  B  W  Not Disp         │
│  Hazard          R  Y  G  C  P  B  W  Not Disp         │
│  Fish Reef       R  Y  G  C  P  B  W  Not Disp         │
│  Mountain Peak   R  Y  G  C  P  B  W  Not Disp         │
│  Platform        R  Y  G  C  P  B  W  Not Disp         │
│                                                        │
│  _____  │
│                                                        │
│  ↑↓←→ : Sel, Fix                                       │
│                                                        │
│  MENU : Esc                                            │
│                                                        │
└────────────────────────────────────────────────────────┘
```

13.1.6 Plotter display menu, page 6

This menu sets the format and color of various lines shown on charts.

```
Plotter Display [Chart Attributes]
_____

Page    1  2  3  4  5  6  7  8  9  10  11
_____

                Type        Color
Danger Area     ........     R
Fairway         — —          B


_____
↑↓←→ : Sel, Fix     ENT: Entry Mode
MENU : Esc
```

1. Select the line or color you want to change and press the [ENT] key.

```
Setting Page
_____

Color    R  Y  G  C  P  B  W  Not Disp
Type     — —   ___   ___.   ......




_____
↑↓←→ : Sel     ENT: Fix
MENU : Esc
```

2. Change line color or format as desired.
3. Press the [ENT] key.

13.1.7 Plotter display menu, page 7

```
Plotter Display [Text on Plotter Display]
─────────────────────────────────────────────
Page     1  2  3  4  5  6  7  8  9  10  11
─────────────────────────────────────────────

                         Display  Color  Size   Pos.[row,col.]

Ship's Latitude            On     WHT    MED    01 01

Ship's Longitude           On     WHT    MED    02 01

Ship's Speed/Course        On     WHT    STD    03 01

Waypoint Latitude          On     WHT    STD    04 68

Waypoint Longitude         On     WHT    STD    05 68

Range/Bearing to Waypoint  On     WHT    STD    06 63

Waypoint No.               On     WHT    STD    04 64

Scale                      On     WHT    STD    02 61

Range                      On     WHT    STD    02 70

+Cursor Latitude           On     WHT    STD    04 01

+Cursor Longitude          On     WHT    STD    05 01

Range/Bearing to +Cursor   On     WHT    STD    06 01

Radius of ○Cursor          On     WHT    STD    08 01

Width/Slant of ||Cursor    On     WHT    STD    07 01

Date                       On     WHT    STD    01 61

Time                       On     WHT    STD    01 72
─────────────────────────────────────────────

↑↓←→ : Sel, Fix    ENT: Entry Mode
MENU : Esc
```

This menu turns alphanumeric indications on/off, and selects their size, color and location on the display. To customize an alphanumeric indication do the following:

1. Select it on the menu with [↑] or [↓] and press the [ENT] key. The display then looks something like the one at the top of the next page.

2. Turn the indication On or Off in the Display field.

3. Enter position in the Pos. field, referring to the table and illustration below.

```
Setting Page
_____

Display      Off  On
Pos.         01r01c [Max. 30r80c]
Color        Red  White
Size         MED  STD  VERT  HOR  LR




_____

↑↓←→ : Sel    ENT: Fix
MENU : Esc
```

Text off, on

Unnecessary text may be turned off.

Text position

Text Size	Picture Configuration (lines X characters)
Medium	30X80
Standard	30X40
Horizontal	15X40
Vertical	30X20
Large	15X20
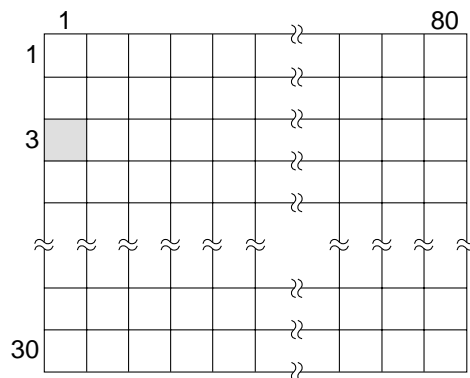
Position of shaded area is 3, 1.

For example, own ship's latitude position (1, 1) is displayed from the top-left corner on the screen.

Color

Choose the color of text from red or white.

Text size

Text size is available in five sizes as below.
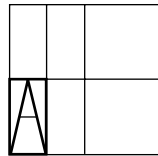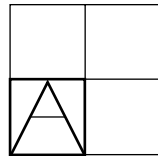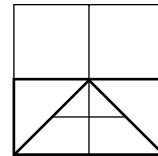
| Medium | Standard | Horizontal |

| Vertical | Large |
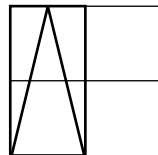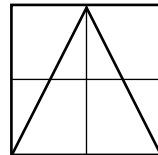
4. After changing settings as desired, press the [ENT] key.

13.1.8 Plotter display menu, page 8

```
┌─────────────────────────────────────────────┐
│ Plotter Display [Text on Plotter Display]     │
│ ─────────────────────────────────────────    │
│                                               │
│ Page    1  2  3  4  5  6  7  8  9  10  11     │
│ ─────────────────────────────────────────    │
│                                               │
│                   Display  Color  Size  Pos.[row,col.] │
│ Temperature         On     WHT    STD    01 53 │
│ Depth               On     WHT    STD    02 50 │
│ Current Speed/Direction On WHT    STD    11 64 │
│ Wind Speed/Direction On    WHT    STD    12 64 │
│ Memory Points Used  On     WHT    STD    03 69 │
│                     Off    WHT    STD    01 40 │
│ Track Plot Interval On     WHT    STD    03 53 │
│ Navaid in Use       On     WHT    STD    01 27 │
│ Orientation Mode    On     WHT    STD    14 77 │
│ North Mark          On     WHT    MED    02 34 │
│ Mark Shape Icon     On     WHT    MED    30 72 │
│ Line Type Icon      On     WHT    MED    30 76 │
│ Arrival Time        On     WHT    STD    07 59 │
│ ETA at Destination  On     WHT    STD    09 59 │
│ TM/RM               On     WHT    STD    13 79 │
│                                               │
│ ─────────────────────────────────────────    │
│ ↑↓←→ : Sel, Fix    ENT: Entry Mode            │
│ MENU : Esc                                    │
└─────────────────────────────────────────────┘
```

Like page 7 of the plotter display menu, page 8 lets you change the attributes of text. Note however that the north marker, mark type icon and line type icon are fixed to Medium.

13.1.9 Plotter display menu, page 9

```
Plotter Display [Text on Plotter Display]
_____

Page     1  2  3  4  5  6  7  8  9  10  11
_____

                   Display  Color  Size  Pos.[row, col.]

GPS Fix Dimensions    On     WHT   STD     09 01

GPS DOP               On     WHT   STD     10 01

GPS Altitude          On     WHT   STD     11 01

_____

↑↓←→ : Sel, Fix     ENT: Entry Mode
MENU : Esc
```

This page appears on the units equipped with the built-in GPS receiver and radar overlay kit. For units not so equipped page 10 of the Plotter Display menu appears.

This menu changes the attributes of GPS indications. Operation is the same as on page 7 of this menu.

13.1.10 Plotter display menu, page 10

```
┌────────────────────────────────────────────┐
│ Plotter Display [Text on Plotter Display]    │
│ ──────────────────────────────────────────   │
│                                              │
│ Page    1  2  3  4  5  6  7  8  9  10  11    │
│ ──────────────────────────────────────────   │
│                                              │
│                  Display  Color  Size  Pos. [row, col.] │
│ Interference Rejection  On   WHT   STD    16 76 │
│ Echo Average            On   WHT   STD    17 74 │
│ Zoom                    On   WHT   STD    19 69 │
│ Echo Stretch            On   WHT   STD    18 76 │
│ Alarm Zone 1            On   WHT   STD    20 68 │
│ Alarm Zone 2            On   WHT   STD    21 68 │
│ VRM1                    On   WHT   STD    28 72 │
│ VRM2                    On   WHT   STD    29 72 │
│ EBL1                    On   WHT   STD    28 01 │
│ EBL2                    On   WHT   STD    29 01 │
│ Range Ring Interval     On   WHT   STD    02 72 │
│ Range                   On   WHT   MED    01 67 │
│ Gyro Bearing            On   WHT   STD    12 01 │
│ Echo Trail Time         On   WHT   STD    27 01 │
│                                              │
│ ──────────────────────────────────────────   │
│ ↑↓←→ : Sel Fix    ENT: Entry Mode            │
│ MENU : Esc                                   │
└────────────────────────────────────────────┘
```

This menu changes the attributes of radar indications. Operation is the same as on page 7 of this menu.

13.1.11 Plotter display menu, page 11

```
Plotter Display [Text on Plotter Display]
_____

Page    1  2  3  4  5  6  7  8  9  10  11
_____

                    Display  Color  Size  Pos.[row, col.]

Echo Enhance          On     WHT    STD    22 69

Noise Reject          On     WHT    STD    23 66

A/C Auto              On     WHT    STD    25 71

Video Cont            On     WHT    STD    24 66

Function No           On     WHT    STD    24 01

Function Sel          On     WHT    STD    25 01

Radar No              On     WHT    STD    26 01
_____

↑↓←→ : Sel Fix     ENT: Entry Mode
MENU : Esc
```

This menu changes the attributes of radar indications. Operation is the same as on page 7 of this menu.

13.2 Plotter Display Setup

This section provides information for setting up the plotter display.

1. Press [MENU], [0], [2] to display the Plotter Display Standard menu.

```
Plotter Display Standard
_____

Unit of Distance      nm   sm   km
Unit of Speed         kt   sm/h   km/h
Unit of Temp.         °C   °F
Unit of Depth         m   ft   Fa   Hiro   PB
Direction             True   Mag.
Mag. Variation        Auto [07.0°W]   Man. (00.0°E)
Scale                 Step Scale   ←→   User-defined
Pos. Disp. Meth.      Lat/Long   LC LOPs   Decca LOPs   LA LOPs


  Loran C Chain       7980: 23-43
    Offset            000.0 μs   000.0 μs


  Decca Chain         24: G-P [R: 1   G: 2   P: 3]
    Offset            000.0 Lane   000.0 Lane


  Loran A Chain       1L0-1L1 [L: 1   S: 2   H: 3]
    Offset            000.0 μs   000.0 μs


_____

↑↓←→ : Sel, Fix
MENU : Esc
```

Unit of Distance: Selects unit of range measurement; nautical mile, statute mile and kilometer.

Unit of Speed: Selects unit of speed measurement; knot, statute mile/hour, kilometer/hour.

Unit of Temp.: Selects unit of water temperature measurement, °C (Celsius) or °F (Fahrenheit).

Unit of Depth: Selects unit of depth measurement; meters, feet, fathoms, hiro (Japanese), passi-braza.

Direction: Ship's course and bearing to a waypoint may be shown in true or magnetic bearing. Magnetic bearing is true bearing plus (or minus) earth's magnetic deviation. Select bearing reference according to compass interfaced: magnetic for magnetic compass, true for gyrocompass.

Mag. Variation: The location of the magnetic north pole is different from the geographical north pole. This causes a difference between the true and magnetic north direction. This difference is called magnetic variation, and varies with respect to the observation point on earth. Your unit is preprogrammed with all the earth's magnetic variations. However, you may wish to enter variation manually to refine accuracy. Consult a nautical chart for magnetic variation.

Scale: Two sets of chart scales are available: step-scale and user-defined. The 10 default chart scales are as below. The chart scale range is 1000 to 9500000.

```
┌─────────────────────────────────────┐
│ User-defined                         │
│ ───────────────────────────────────  │
│                                      │
│ ▐01▌      1/▐0▌005000                │
│                                      │
│ 02       1/0010000                   │
│                                      │
│ 03       1/0030000                   │
│                                      │
│ 04       1/0050000                   │
│                                      │
│ 05       1/0100000                   │
│                                      │
│ 06       1/0300000                   │
│                                      │
│ 07       1/0500000                   │
│                                      │
│ 08       1/1000000                   │
│                                      │
│ 09       1/3000000                   │
│                                      │
│ 10       1/9500000                   │
│                                      │
│                                      │
│ ───────────────────────────────────  │
│ ↑↓←→ : Move    ENT: Fix             │
│ MENU : Esc                           │
└─────────────────────────────────────┘
```

Pos. Disp. Meth: Position may be displayed in latitude and longitude, Loran A LOPs, Loran C LOPs or Decca LOPs.

Loran C GRI and secondary codes

GRI	Secondary Code
4990	11,29
7960	11, 26, 44
7980	11, 23, 43, 49
8970	11, 28, 44, 59
9940	11, 27, 40
9960	11, 25, 39, 54
9990	11. 29, 43
5930	11, 25, 38
5990	11, 27, 41
5970	11, 31, 42
9970	11, 30, 55, 81
7930	11, 26
7970	11, 26, 46, 60
7990	11, 29, 47
9980	11, 30
7170	11, 26, 39, 52
8990	11, 25, 40, 56, 69
7950	11, 30, 46, 61
8000	10, 25, 50, 65
9610	11, 25, 40, 52, 65
8290	11, 27, 42
4991	10, 24
8940	12, 30
8930	11, 30, 50, 70
7270	11, 25
6731	10, 39
7001	11, 27
7499	11, 26
9007	10, 23, 38
8830	11, 25, 39, 56
7030	11, 25, 37, 56

Decca chain and lane codes

Chain	Lane	Chain	Lane
01	R, G	25	R, G, P
02	R, G, P	26	R, G
03	R, G, P	27	R, G, P
04	R, G, P	28	R, G, P
05	R, G, P	29	R, G, P
06	R, G, P	30	R, G, P
07	R, G, P	31	R, G, P
08	R, G, P	32	R, G, P
09	R, G, P	33	R, G, P
10	R, G, P	34	R, G, P
11	R, G, P	35	R, G
12	R, G, P	36	R, G
13	R, G, P	37	R, G, P
14	R, G, P	38	R, G, P
15	R, G, P	39	R, G, P
16	R, G	40	R, G, P
17	R, G, P	41	R, G, P
18	R, G, P	42	R, G, P
19	R, G, P	43	R, G
20	R, p	44	R, G
21	R, G	45	R, G, P
22	R, G, P	46	R, G, P
23	R, G, P	47	R, G
24	R, G, P	48	R, G, P

Loran A GRI and secondary codes

GRI and secondary code
1L0, 1L1, 1L4, 1L5, 1L6, 1L7, 1S1, 1S2, IS3, IS4, IS6, 2H3, 2H4, 2H5, 2H6, 2S0, 2S1, 2S2, 2S3, 2S4, 2S5, 2S6, 2S7

13.3 Graphs

With connection of appropriate sensors, water temperature and depth graphs can be displayed.

13.3.1 Water temperature graph

1. Press [MENU], [0], [3] to open the Graph Display menu.

```
Graph Display
_____

Set Time Span          02


Water Temp. Graph      No   Yes
 Set Temp. Range       05 ~ 20°F
 Set Ref Temp. 1       010.0°F
 Set Ref Temp. 2       015.0°F


Water Depth Graph      No   Yes
 Set Depth Range       0100 ~ 1000 ft
 Set Ref Depth 1       0450 ft
 Set Ref Depth 2       0800 ft

_____

↑↓←→ : Sel, Fix
MENU : Esc
```

2. Enter time span in two digits in the Set Time Span field. The maximum time is 24 hours.

3. Select Yes from the Water Temp. Graph field. Selecting Yes inscribes the water temperature measurement marker (white) at present intervals, as selected at step 2 above.

Water temperature measurement marker

Track
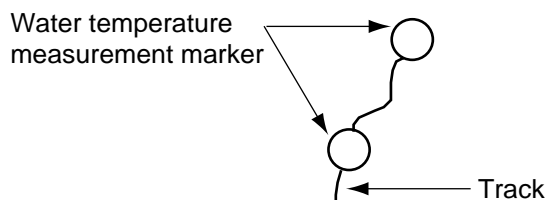
4. Set the temperature range (-01°F to +99°F) on the Set Temp. Range field in a total of four digits, and press the [ENT] key. For example, if the temperature range is 50°F to 70°F, enter [5], [0], [7], [0], [ENT]. Use the ⟳ key to switch between plus and minus. The high temperature value must be at least two degrees higher than the low temperature value.

5. Enter reference temperature no. 1 in the Set Ref. Temp. 1 field in four digits, and press the [ENT] key. If it is 50°F, for example, enter [0], [5], [0], [0], [ENT].

6. Enter reference temperature no. 2 in the Set Ref. Temp. 2 field and press the [ENT] key.
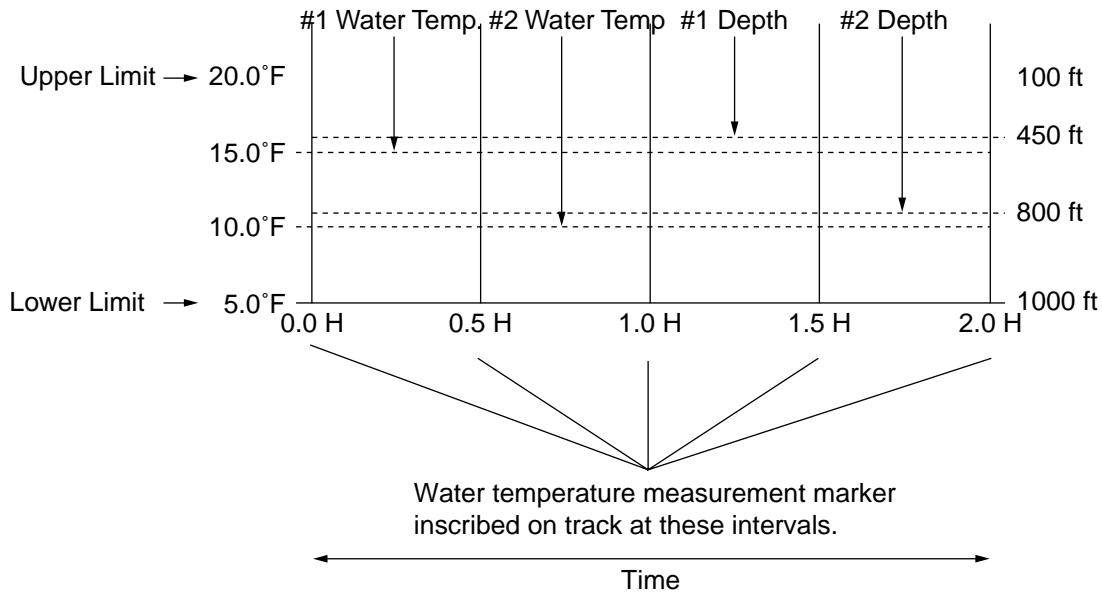
7. Press the [MENU] key several times to close the menu.

13.3.2 Depth graph

1. Press [MENU], [0], [3] to display the Graph Display menu.

2. Select Yes from the Water Depth Graph field.

3. Enter depth range (0000-9999 m) in the Set Depth Range field, in four digits, and press the [ENT] key.

4. Enter the no. 1 reference depth in the Set Ref Depth 1 field in four digits, and press the [ENT] key.

5. Enter the no. 2 reference depth in the Set Ref Depth 2 field in four digits, and press the [ENT] key.

6. Press the [MENU] key to close the menu.

13.3.3 Displaying water temperature, depth graph

1. Press [MENU], [1], [2] to display the Water temperature and depth graphs (at the bottom of the display).
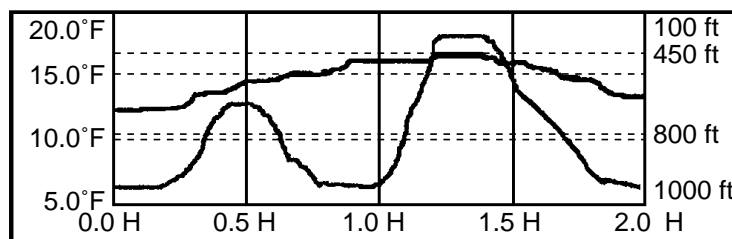
2. Press the [MENU] key several times to close the menu.

13.3.4 About the water temperature measurement marker

The water temperature measurement marker (white) is automatically inscribed on the track at preset intervals when the Water Temp. Graph in the Graph Display menu is turned on. When the track is erased so is this marker. To hide the marker, turn Water Temp. Graph off in the Graph Display menu.

13.4 Apportioning the Memory

The working memory stores a total of 20,000 points of track (main and sub) and user data (marks, lines, etc), and you may apportion this amount between track and user data as desired. The number of points currently used is shown at the top right corner on the screen.

⚠ **CAUTION**

All existing track, marks, lines, etc. are erased when the memory is apportioned. If you require the data, save it to a floppy disk or memory card before apportioning the memory.

```
   15.4°C        1999/02/16 15:31'01"
   257.4ft       1/9500000 ( 8.00nm)       Track Pts. Used/Marks
 01.00nm                        1521/264   Used
```

The default setting is 10,000 points each of track and user data and sub track is 0 points. To change this setting, for example, 15,000 points of track and 5,000 of user data, do the following:

1. Press [MENU], [0], [7] to display the Setup menu.

```
Setup                     Max. No. of Points
                                   ↓

Memory Apportion      ⊢→   Yes [10000/20000 pts]
                                ∧
Clear All Memories     →   Yes   No. of Main & Sub track pts.

Clear Specific Memory  →   Yes

GPS Clear*             →   Yes




_____

↑↓←→ : Sel, Fix

MENU  : Esc
```

*: Internal GPS receiver only

Note: Track memory is divided between main and sub tracks, even if the sub track is not displayed.

2. Select Yes from the Memory Apportion field.

```
Memory Apportion
_____


_____

Main + Sub Track     10000/20000 pts

Main Track           All      half
_____

ENT    : Fix
MENU : Esc
```
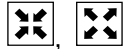
3. Enter the track storage capacity desired and press the [ENT] key. For example, set the track storage capacity to 15,000 points by pressing [1], [5], [0], [0], [0], [ENT].

4. A message tells you to turn off the power.

5. Turn off the power to register memory setting.

Note: To record sub track, set Main Track in the above procedure to "half." This divides the memory for track equally between main and sub tracks.

13.5 Programming the Function Keys (F1-F8)

Instead of repeating keystrokes manually, you can define a function key to perform the task automatically. For example, you can define a function key to select a plotting interval. And to select that plotting interval simply press the corresponding function key. Note that function key F9 is available when no radar is connected.

Below are the keys used to program the function keys.

Key	Function	Display
⌘, ⌘	Open/close the menu.	M
[CNTR]	Inputs numeric data.	*
[SEL]	Selects menu options.	N

For ease of programming, jot down the operating procedure to use before programming a function key.

13.5.1 How to program function keys

Example 1: Program [F1] for arrival alarm range of 0.5 nm

1. Press [MENU], [0], [4] to display the Function Keys menu.

```
Function Keys
_____

1   Group 1
2   Group 2
3   Group 3
4   Group 4
5   Group 5
6   Group 6
7   Group 7
8   Group 8
9   Group 9
0   Group 9
_____

0~9: Next Page
Menu: Esc
```

2. Press the [0] key.

```
Function Keys
_____

F1   52

F2   02DDDDDDLLLMMM

F3   02DDDDDDLLLRMMM

F4   32DDDDNMMM

F5   41 DDNMMM

F6   31

F7   11MM

F8   12MM


?_____

 [Entry Key]/Character

 [↑]/U      [Number]/0~9      [EXPAND]/M (Use MENU key)

 [↓]/D      [CHG]/S           [REDUCE]/M (Use MENU key)

 [←]/L      [ENT]/E           [CNTR]/* (For number ent)

 [→]/R                        [SEL]/N (For select)


_____

F1 ~ F8: Sel

MENU  : Esc
```

Note: F9 cannot be registered when radar is interfaced.

3. Follow the sequence below to enter arrival alarm range of 0.5 nm.
    a) Press the [F1] key.
    b) Press the [5] key to select Alarm menu.
    c) Press the [1] key to select Alarm Setting.
    d) Press [←] to select page 1.
    e) Press [↓], [←] to select Arrival.
    f) Press [↓] to select Alarm Range.
    g) Press [0], [0], [5], [0], [0], [ENT] to enter alarm range of 0.5 nm.
    h) Press ⌘ or ⌘ twice to close the menu. The display shows 51LDLD00500EMM. L = [←], D = [↓], E = [ENT], M = ⌘ / ⌘.

4. Press the [F1] key again. A message asks if you want to register the program.

5. Press the [ENT] key to register the program. To register another program, start from step 2 in this procedure.

6. To quit, Press the [MENU] key several times to close the menu.

Example 2: Display XTE alarm range setting screen by [F2]

1. Press [MENU], [0], [4], [0] to display the Function Keys menu.

2. Press [F2], [5], [1], [←], [↓], [↓], [↓], [↓], [↓], [CNTR], ⊠, ⊠. The display shows 51LDDDDD*MM.

3. Press [F2], [ENT].

4. Press the [MENU] key several times to close the menu.

Then, pressing the [F2] key calls up the XTE alarm range setting screen.

Example 3: Program [F3] to change background color

1. Press [MENU], [0], [4], [0] to display the Function Keys menu.

2. Press [F3], [0], [1], [1], [↓], [SEL], ⊠, ⊠, ⊠. The display shows 011DNMMM.

3. Press [F3], [ENT].

4. Press the [MENU] key several times to close the menu.

Then, pressing the [F3] key calls up plotter display page 1. Press [←] or [→] to switch background color.

Example 4: Program [F4] to show Loran A TDs

1. Press [MENU], [0], [4], [0] to display the Function Keys menu.

2. Press [F4], [0], [2], [↓], [↓], [↓], [↓], [↓], [↓], [↓], [→], [→], [→], ⊠, ⊠, ⊠. The display shows 02DDDDDDDRRRMMM.

3. Press [F4], [ENT].

4. Press the [MENU] key several times to close the menu.

Then, pressing the [F4] key displays own ship position in Loran A TDs.

Example 5: Program [F5] to turn on the parallel cursor

1. Press [MENU], [0], [4], [0] to display the Function Keys menu.

2. Press [F5], [9], [3], [7], [→], [↓], [↓], [↓], [↓], [↓], [→], ⊠, ⊠, ⊠. The display shows 937RDDDDDRMMM.

3. Press [F5], [ENT].

4. Press the [MENU] key several times to close the menu.

Then, pressing the [F5] key displays the parallel cursor.

13.5.2 Programming extension keys

Like with the function keys the extension keys provide one-touch set up of specified function. Nine sets of eight extensions, numbered 11-18, 21-28, 31-38, 41-48, 51-58, 61-68, 71-78, 81-88 and 91-98, are available for programming, for a total of 72 extension functions. (81 extensions functions are available when no radar is connected. In this case replace the last 8 in each series above with 9.)

<u>Example: Program extension key 23 to set course-error alarm range of 0.5 nm</u>

1. Press [MENU], [0], [4], [2] to show the Group 2 menu.

2. Press the [F3] key.

3. Press [5], [1], [←], [↓], [↓], [↓], [↓], [←], [←], [↓], [0], [0], [0], [5], [0], [ENT], ⊠, ⊠. The display shows 51LDDDDLLD00050EMM.

4. Press [F3], [ENT].

5. Press the [MENU] key several times to close the menu.

Then, pressing [2], [F3] sets the course error alarm range for 0.5 nm.

13.6 Other Functions

The Misc. Setting menu sets date and time, alarm/keyboard beep volume, enables/disables trackball operation, and sets log pulse rate.

1. Press [MENU], [0], [6] to display the Misc. Setting menu.

```
Misc. Setting
_____

Set Date/Time       No   Yes
                    █ _ _ / _ _ / _ _    _ _ : _ _ ' _ _ "
Alarm/Key Volume    Min.   Low   High   Max.
Trackball On/Off    Disable   Enable
Log Pulse           200   400   NA




_____
↑↓←→ : Sel, Fix
MENU : Esc
```

2. Press [↑] or [↓] to select item desired; [←] or [→] to set option.

3. Press the [MENU] key several times to close the menu.

Set Date/Time: When the date or time is wrong, re-set it here (GD-280/380/680 only).

Alarm/Key Volume: A beep sounds each time a key is pressed. You can select the loudness of this beep here.

Trackball On/Off: If trackball moves by vibration or is malfunctioning select Disable.

Log Pulse: Sets the pulse output rate of the speed log interface with this video plotter. If no speed log is connected select NA.

14. MAINTENANCE & TROUBLESHOOTING

Regular maintenance is important for good performance. Following the recommended procedures in this chapter will keep the equipment in good working condition.

⚠ **WARNING**

ELECTRICAL SHOCK HAZARD
Do not open the equipment.

Only qualified personnel should work inside the equipment.

Use the proper fuse.

Use of a wrong fuse can result in damage to equipment or fire and void the warranty.
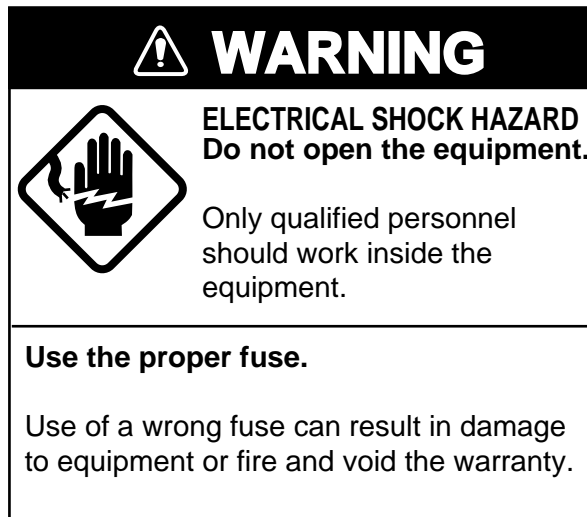
14.1 Maintenance

Regular maintenance helps maintain performance. Important points to check from time to time are as below.

1) Antenna unit (GP-280/380/680 only)

Check for loosened fixing bolts. If corroded, replace.

2) Antenna cable (GP-280/380/680 only)

Check antenna cable for tight connection and signs of water leakage.

3) Display unit connectors

Check for tight connection.

4) Earth connection

Check for rust and tight connection.

5) Fuse replacement

If the power cannot be turned on check the fuse on rear panel. If it has blown find out the cause before replacing it. If it blows again after replacement request service.

Model	12 V	24-32 V
GP/GD-280	15A	10A
GP/GD-380	-	15A
GP/GD-680	-	10A

6) Battery replacement

A battery icon (🔋, 🔋, 🔋) appears at the bottom of the display when the voltage of the battery in the memory card or on the circuit board in the display unit is low. The life of the battery in the memory card is about 3 years and about 5 years for the one on the circuit board. The user may replace the battery in the memory card; however, the battery on the circuit board must be replaced by a qualified technician.

🔋: Battery on the circuit board

🔋: Battery in the memory card

🔋: Both batteries

	Battery Type	FURUNO Code No.
Memory card	CR2025	000-141-093
Circuit board 14P0318A	CR2450-F2ST2	000-133-495

How to replace the battery in the memory card

⚠ **CAUTION**
Replace the battery within 10 minutes to prevent loss of data.
Be sure the battery is inserted "plus" side up to prevent damage to card and equipment.

1. Slide the stopper on the card leftward.

2. Pull out the battery case and remove the battery.

3. Insert new battery in battery case positive (+) side up.

4. Set battery case to battery card.

Stopper

"+" mark up

Battery Case
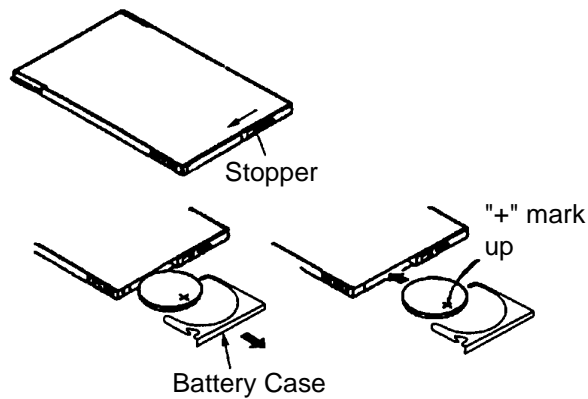
7) Cleaning

Dust accumulates on the display screen over time. Wipe off dust with a soft cloth. Do not use chemical cleaners to clean the display unit - they can remove paint and markings.

8) Floppy disk drive

The floppy disk drive should be cleaned monthly. Foreign material on the head can scratch the sensitive floppy disk, preventing play back of data. An optional floppy disk drive cleaner is available.

Cleaning floppy disk: Type, MCD-2-1K, Code No., 000-116-420

1. Insert the cleaning floppy disk in the floppy disk drive.

2. Press [MENU], [6], [5].

3. Press the [ENT] key.

4. Remove the cleaning floppy disk.

5. Repeat steps 1 through 3 five times.

    The life of the cleaning floppy disk is about 50 plays.

9) Demagnetizing the display

Color contamination may occur because of earth's magnetism or magnetized ship structure. When the display color appears to be abnormal, press the [DEGAUSS] key to restore normal display color.

14.2 Troubleshooting

The troubleshooting table below provides common faults and the remedy with which to restore normal operation. If you cannot restore normal operation do not check inside the equipment – there are no user-serviceable parts inside.

If…	Then…	Remedy
the power cannot be turned on	• power connector may have loosened. • ship's mains is off. • fuse has blown.	• Check connector. • Check ship's mains. • Replace fuse
NG appears when the power is turned on	• error was found by diagnostic test at power-on.	• Press [MENU], [0], [8] to execute the diagnostic test.
nothing appears on the display	• brilliance is too low.	• Adjust the [DIM] key.
remote controller does not function	• batteries in remote controller are dead. • poor contact of keys	• Replace batteries. • Execute self test ([MENU], [0], [8]).
track is erased	• the memory is full.	• Store track on memory card or floppy disk. • Erase unnecessary track.
track is not displayed	• track is not being recorded. • track is not displayed.	• Press the [TRACK ON/OFF] key to display track. • Press [MENU], [2], [1] and set Main Track to Yes.
marks cannot be erased	• marks may be superimposed on one another.	• Press the [CLR] key several times.
position cannot be found (GP-280/380/680 only)	• antenna cable may have loosened.	• Connect antenna cable. • Check for water leakage at antenna cable.
position fed from internal GPS navigator is wrong	• wrong geodetic chart may have been selected. • try offsetting position. • wrong antenna height may have been entered. • **Note:** For external navigator, check its receiver settings.	• Press [MENU], [9], [2] to check geodetic chart selection. • Press [MENU], [9], [2] to enter offset. • Press [MENU], [9], [2] to enter antenna height.
Available position fixing time is shorter than that on other ships	• minimum permissible elevation angle is higher than that set on other ships.	• Press [MENU], [9], [2] to enter elevation angle. (Setting higher than 10° shortens position fixing time. 5° is default setting.)

14.3 Diagnostic Test

A diagnostic facility is provided to check the equipment for proper operation.

14.3.1 Memory, I/O test

1. Press [MENU], [0], [8] to display the Test menu.

2. Select Yes from the Memory & I/O field. The memory test starts. An asterisk marks the item currently being checked.

```
MEMORY TEST                SIO PORT TEST

ROM OK            SI01 (GPS)    - -

DRAM OK           SI02 (DGPS)   - -

SRAM OK           S103 (DATA1)  - -

VRAM OK           S104 (DATA2)  - -

DPRAM OK          S105 (DATA3)  - -


BATTERY TEST               PIO PORT TEST

INT. BATTERY   OK            DIP SWITCH    10010000

MEMORY CARD A   OK*1

MEMORY CARD B   - - *1       PROGRAM NUMBER

                              PLOTTER       14506880**

RECEIVER                      GPS           48502060**

 GPS          OK *2           DGPS1         08501781**

 DGPS         OK*2            DGPS2         08501791**


Press any key to escape and return to normal operation.
```

                                        ** Program Version No.

OK denotes normal operation; NG (No Good) error. If NG appears, contact your dealer for advice.

To quit the memory test, press the [MENU] key.

*1:   "- -" appears when memory card is not inserted.
*2:   "- -" appears when not equipped with GPS, DGPS kit.

14.3.2 Keyboard test

The keyboard test checks the plotter keyboard and radar operation panel (option) for proper operation.

1. Press [MENU], [0], [8] to display the Test menu.

2. Select Yes from the Main Unit Keyboard field.
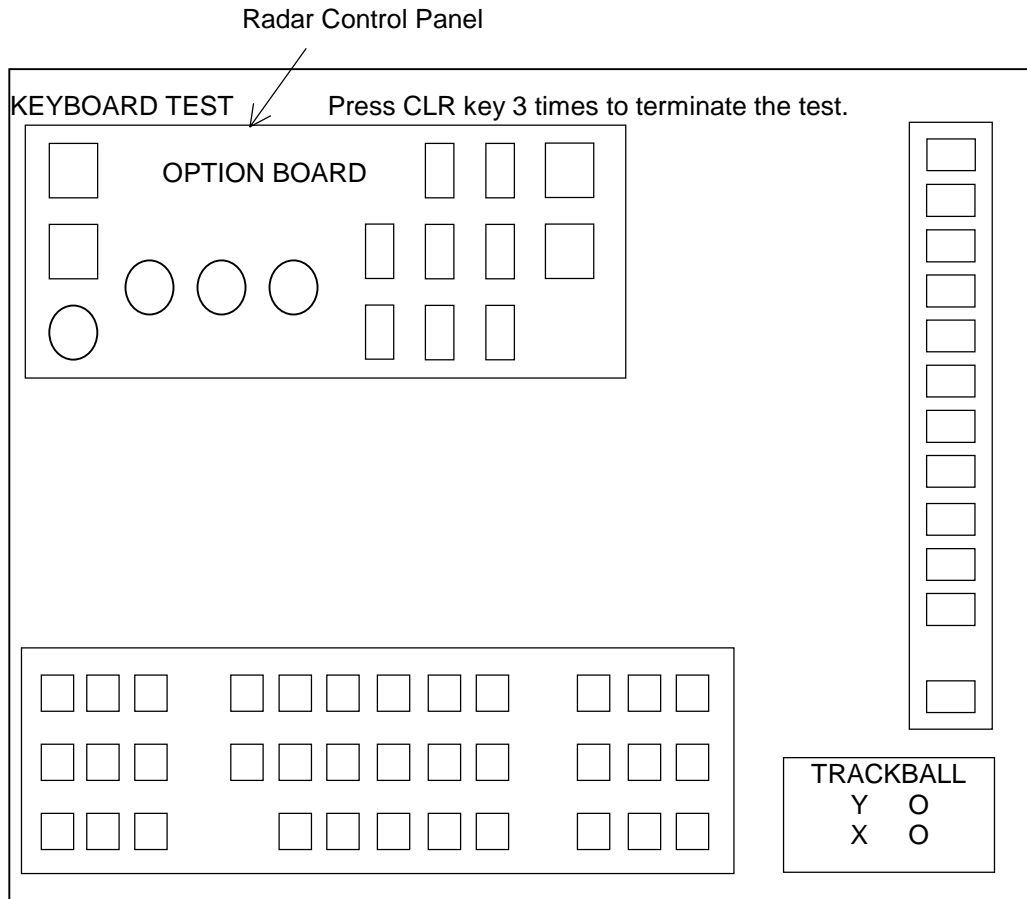
GP/GD-380 keyboard test

3. Press each key one by one. The pressed key's on-screen location lights in red if the key is normal and a beep sounds. A key's location is blank if the key is faulty. The [DIM] key cannot be checked.

    Note: For key panel (GP/GD-680), radar control panel (GP/GD-280/380) two beeps sounds when the [HL OFF] control is pressed.

4. To quit the keyboard test, press the [CLR] key three times.

14.3.3 Remote controller test

1. Press [MENU], [0], [8] to display the Test menu.

2. Select Yes from the Remote Controller Kybd. field. The following display appears.

REMOTE CONTROLLER TEST

EVENT SWITCH

Press CLR Key on Remote Cont. 3 times or on Panel once to terminate the test.
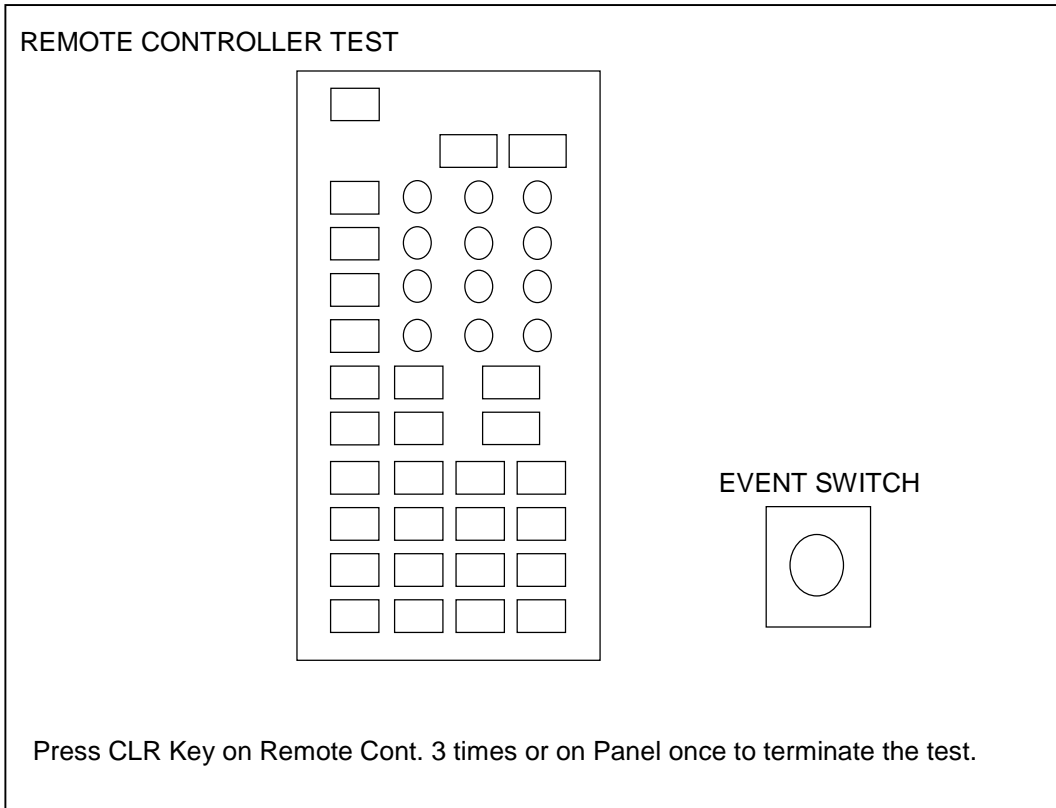
3. Press each key on the remoter controller one by one. The pressed keys on-screen location lights in red if the key is normal. A key's location is blank if the key is faulty. The [DIM] key cannot be checked. If screen does not light try replacing the batteries in the remote controller. If that does not work, the problem may lie with the remote controller or a circuit board in the display unit.

4. To quit the remote controller test, press the [CLR] key three times. (You may also quit the remote controller test by pressing the [CLR] key on the display unit once.)

14.3.4 Color test

1. Press [MENU], [0], [8] to display the Test menu.

2. Select Yes from the Color field. The following display appears. Check for missing or abnormal colors. If color is abnormal try degaussing the screen with the [DEGAUSS] key.

RED		RED
YELLOW		YELLOW
GREEN	FURUNO	GREEN
CYAN	GP-380	CYAN
PURPLE	PATTERN TEST	PURPLE
BLUE	1-7: Paint Color Sel. BRIL: Brilliant Cont. Other: ESC	BLUE
WHITE		WHITE

3. Press numeric keys 1-7 one by one. The color of the display changes with the color shown on the key pressed. To quit the display test, press the [MENU] key.

4. The brilliance can be changed with the [BRILL] key (GP/GD-280/380) or [BRILL] control (GP/GD-680).

5. To quit the test press any key except numeric keys 1-7.

14.3.5 Radar test (option)

1. Press [MENU], [9], [3], [7] to display the Initial Setting menu, and select Page 2.

2. Select Run from the Test field.

```
 RADAR TEST
1   Prog. No.        1 4 5 0 6 8 7 0 **
2   ROM Check        OK
3   RAM Check        OK
4   Ant Rot          24 rpm                              Set
5   Tx Trig          0585Hz                              having
6   Video Lvl        0 0 0                               ARP
7   Video Sig        OK                                  Board
8   Log Pulse        0.0KT
    ........................................................
    ARP TEST

    1   PROGRAM NO.      18590411**#      18590421**#
    2   ROM CHECK        OK               OK
    3   RAM CHECK        OK
    4   SPEED            NAV.   0.0KT
    5   COURSE           OK     0.0
    6   TRIGGER          OK
    7   VIDEO SIGNAL     OK               # for ARP-10
    8   BEARING PULSE    OK               (GP/GD-280)
    9   HEADING PULSE    OK               the sole ARP
    10  MINIMUM HIT      0000             program no is
    11  SCAN TIME        0000             18590271**.
    12  MANUAL ACQ.      00
    13  AUTO ACQ.        00
    14  FE-DATA 1        0000
    15  FE-DATA 2        0000


    0 0 0    [     ]   [     ]   [≡≡≡]    0 0 0
    EBL       RAIN      SEA      GAIN     VRM
    ↑↓←→, ENTER: Back
```

** = Program Version No.

3. OK denotes normal operation; NG (No Good) error. If NG appears, contact your dealer for advice.

4. Operate EBL and VRM rotary controls, and [A/C RAIN], [A/C SEA] and [GAIN] controls. For the EBL and VRM rotary controls, the corresponding indication on the screen should increment up or down with control adjustment. The bar above the indication [A/C RAIN], [A/C SEA] and [GAIN] should lengthen or shorten with operation of corresponding controls.

To quit the radar test, press the [MENU] key.

14.4 Clearing Memories

Memories should be cleared whenever the program ROM is changed or error is found by the diagnostic facility. Be sure to save required data to a floppy disk or memory card before clearing a memory.

This equipment has three methods by which to clear memories:

Clear all memories: Clears all memories.
Clear specific memory: Clears specific memory.
Clear GPS memory (GP-280/380/680 only): Clears Almanac stored in built-in GPS receiver. When the Almanac is cleared Cold start is executed to receive the latest Almanac.

14.4.1 Clearing all memories or working memory

1. Press [MENU], [0], [7] to open the Setup menu.

2. Select Clear All Memories and Yes to clear all memories or Clear Specific Memory and Yes to clear the working memory.

3. Press [9], [9], [9], [ENT] to clear.

4. Turn the power off.

Note: External waypoint (99) from external navigator is not cleared; it is shown on the display at next power-up.

14.4.2 Clearing GPS memory

1. Press [MENU], [0], [7] to open the Setup menu.

2. Show Yes from the GPS Clear field.

3. Press [9], [9], [9], [ENT] to clear.

4. Turn the power off.

14.5 GPS Monitor Display

This display shows, for built in GPS or DGPS receiver, GPS receiver status. Press [MENU], [1], [4] to show the display.

Course — | — Speed | — Date | — Time

LAT. 35°1237'N	12.5 km/h	1999/03/10
LONG. 140°337'E	34.5°	19:25'55"
FIX MODE: DGPS 3D	DOP: 1.2	ALTITUDE: 10.5 m

RCVG STATUS:

N

W

E

SN

Satellites in pattern: 14, 09, 15, 11, 22, 25, 20, 05, 08, 07

SV (PRN)   SNR

30   40   50

| NO |
| 11 |
| 15 |
| 20 |
| 22 |
| 07 |
| 14 |
| 25 |
| 05 |
| 08 |
| 09 |
| 21 |
| 06 |

DGPS RCVR DATA

Bit Rate	: 100 bps	Freq: 295.0 kHz
Sig Strength	:85 dB	SNR: 89 dB
Data Receive	: OK	Station Health: OK
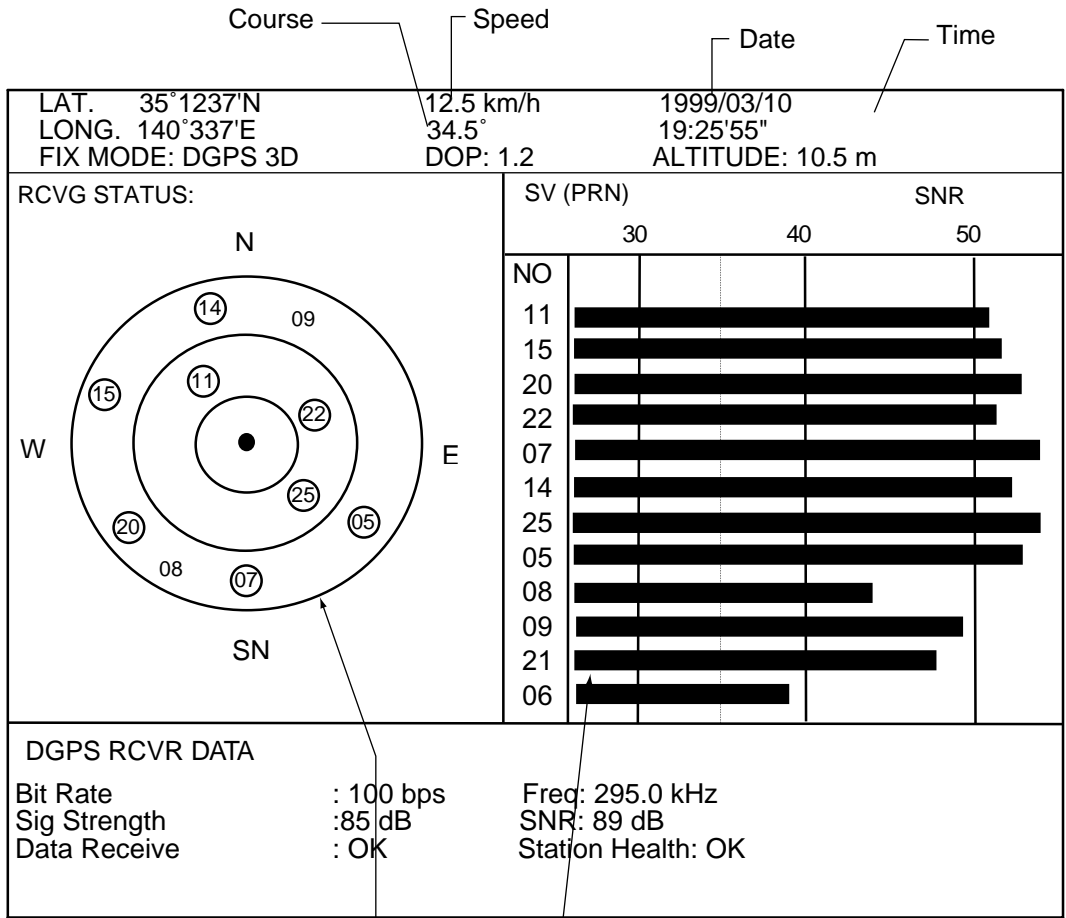
Satellite Pattern
Circled satellites are
currently being received.

Signal strength (35 or higher used in
fixing position)

1. Geodetic Chart Datum

001: WGS84
002: WGS72
003: TOKYO : Mean Value (Japan, Korea, and Okinawa)
004: NORTH AMERICAN 1927 : Mean Value (CONUS)
005: EUROPEAN 1950 : Mean Value
006: AUSTRALIAN GEODETIC 1984 : Australia and Tasmania Island
007: ADINDAN : Mean Value (Ethiopia and Sudan)
008:    : Ethiopia
009:    : Mall
010:    : Senegal
011:    : Sudan
012: AFG : Somalia
013: AIN EL ABD 1970 : Bahrain Island
014: ANNA 1 ASTRO 1965 : Cocos Island
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 ISLAND 1958 : Ascension Island
027: ASTRO BEACON "E" : Iwo Jima Island
028: ASTRO B4 SOR. ATOLL : Tem Island
029: ASTRO POS 71/4 : St. Helena Island
030: ASTRONOMIC STATION 1952 : Marcus Island
031: AUSTRALIAN GEODETIC 1966 : Australia and Tasmania Island
032: BELLEVUE (IGN) : Efate and Erromango Islands
033: BERMUDA 1957 : Bermuda Islands
034: BOGOTA OBSERVATORY : Colombia
035: CAMPO INCHAUSPE : Argentina
036: CANTON ISLAND 1966 : Phoenix Islands
037: CAPE : South Africa
038: CAPE CANAVERAL : Mean Value (Florida and Bahama Islands)
039: CARTHAGE : Tunisia
040: CHATHAM 1971 : Chatham Island (New Zealand)
041: CHUA ASTRO : Paraguay
042: CORREGO ALEGRE : Brazil
043: DJAKARTA (BATAVIA) : Sumatra Island (Indonesia)
044: DOS 1968 : Gizo Island (New Georgia Island)
045: EASTER ISLAND 1967 : Easter Island
046: EUROPEAN 1950 (Cont'd) : Western Europe
047:    : Cyprus
048:    : (Egypt
049:    : England, Scotland, Channel, and Shetland Islands
050:    : England, Ireland,   Scotland, and Shetland Islands
051:    : Greece
052:    : Iran
053:    : Italy Sardinia
054:    : Italy Sicily
055:    : Norway and Finland
056:    : Portugal and Spain
057: EUROPEAN 1979 : Mean Value
058: GANDAJIKA BASE : Republic of Maldives
059: GEODETIC DATUM 1949 : New Zealand
060: GUAM 1963 : Guam Island
061: GUX 1 ASTRO : Guadalcanal Island
062: HJORSEY 1955 : Iceland
063: HONG KONG 1963 : Hong Kong
064: INDIAN : Thailand and Vietnam
065:    : Bangladesh, India, and Nepal
066: IRELAND 1956 : Ireland
067: ISTS 073 ASTRO 1969 : Diego Garcia
068: JHONSTON ISLAND 1961 : Johnston Island
069: KANDAWALA : Sri Lanka
070: KERGUELEN ISLAND : Kerguelen Island
071: KERTAU 1948 : West Malaysia and Singapore
072: LA REUNION : Mascarene Island
073: L.C. 5 ASTRO : Cayman Brac Island
074: LIBERIA   1964 : Liberia
075: LUZON : Philippines (Excluding Mindanao Island)
076:    : Mindanao Island
077: MAHE 1971 : Mahe Island
078: MARCO ASTRO : Salvage Islands
079: MASSAWA : Eritrea (Ethiopia)
080: MERCHICH : Morocco
081: MIDWAY ASTRO 1961 : Midway Island
082: MINNA : Nigeria
083: NAHRWAN : Masirah Island(Oman)
084:    : United Arab Emirates
085:    : Saudi Arabia
086: NAMIBIA : Namibia
087: MAPARIMA, BWI : Trinidad and Tobago
088: NORTH AMERICAN 1927 : Western United States
089:    : Eastern United States
090:    : Alaska
091:    : Bahamas (Excluding San Salvador Island)

092:    : Bahamas San Salvador Island
093:    : Canada (Including Newfoundland Island)
094:    : Alberta and British Columbia
095:    : East Canada
096:    : Manitoba and Ontario
097:    : Northwest Territories and 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 and Flores Islands (Azores)
110: OLD EGYPTIAN 1930 : Egypt
111: OLD HAWAIIAN : Mean Value
112:    : Hawaii
113:    : Kaual
114:    : Maui
115:    : Oahu
116: OMAN : Oman
117: ORDNANCE SURVEY OF GREAT BRITAIN 1936 : Mean Value
118:    : England
119:    : England, Isle of Man, and Wales
120:    : Scotland and Shetland Islands
121:    : Wales
122: PICO DE LAS NIVIES : Canary Islands
123: PITCAIRN ASTRO 1967 : Pitcairn Island
124: PROVISIONAL SOUTH CHILEAN 1963 : South Chile (near 53°s)
125: PROVISIONAL SOUTH AMERICAN 1956 : Mean Value
126:    : Bolivia
127:    : Chile Northern Chie (near 19°s)
128:    : Chile Southern Chile (near 43°s)
129:    : Colombia
130:    : Ecuador
131:    : Guyana
132:    : Peru
133:    : Venezuela
134: PUERTO RICO : Puerto Rico and Virgin Islands
135: QATAR NATIONAL : Qatar
136: QORNOQ : South Greenland
137: ROME 1940 : Sardinia Islands
138: SANTNA BRAZ : Sao Maguel, Santa Maria Islands (Azores)
139: SANTO (DOS) : Espirito Santo Island
140: SAPPER HILL 1943 : East Falkland Island
141: SOUTH AMERICAN 1969 : Mean Value
142:    : Argentina
143:    : Bolivia
144:    : Brazil
145:    : Chile
146:    : Colombia
147:    : Ecuador
148:    : Guyana
149:    : Paraguay
150:    : Peru
151:    : Trinidad and Tobago
152:    : Venezuela
153: SOUTH ASIA : Singapore
154: SOUTHEAST BASE : Porto Santo and Medeira Islands
155: SOUTHWEST BASE : Faial, Graciosa, Pico, Sao Jorge, and Terceira Islands
156: TIMBALAI 1948 : Brunel and East Malaysia (Sarawak and Sadah)
157: TOKYO : Japan
158:    : Korea
159:    : Okinawa
160: TRISTAN ASTRO 1968 : Tristan da Cunha
161: VITI LEVU 1916 : Viti Levu Island (Fiji Islands)
162: WAKE-ENIWETOK 1960 : Marshall Islands
163: ZANDERIJ : Suriname
164: BUKIT RIMPAH : Bangka and Belitung Islands (Indonesia)
165: CAMP AREA ASTRO : Camp Mcmurdo Area, Antarctica
166: G. SEGARA : Kalimantan Islands(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

2. World Time Chart

3. Icons

Adjust cursor with trackball/arrow keys.
Select cursor with [SEL] key.

+Cursor (page 1-3)

Display shift (page 1-3)

Circle cursor (page 13-2)

Parallel index cursor (page 13-2)

Diamond cursor (page 13-3)

Magnetic bearing
(page 13-16)

Trackball operative
(page 13-28)

Current mark type (10 types)

$+$ · Y ⊙ · · ★ ✳ ▲

Number corresponds to numeric key.
(page 1-16)

Current line type (4 type)

Number corresponds to numeric key.
(page 1-16)

- Chart card not inserted.
- Wrong chart card inserted.
- Chart scale too small.
 (page 1-20)

- Full chart reliability.
 (page 1-20)

- Chart overenlarged.
- Data not reliable.
 (page 1-20)

- Alarm violated.
- Disappears when cause of alarm is removed, or alarm is disabled.
 (page 6-1)

Position offset.
(page 2-30, 13-6)

Low voltage of lithium battery
in display unit.
(page 14-2)

Low voltage of lithium battery
in memory card.
(page 14-2)

Low voltage of lithium battery
in display unit and memory card.
(page 14-2)

4. Menu Tree

Default settings are underlined.

*1: Built in GPS receiver-equipped set only
*2: Radar overlay kit-equipped set only
*3: ARP Board-equipped set only
*4: ARP-17 Board-equipped set only

1 Plotter Display
└── 1 Plotter Display, 2 Plotter & Graph Disp, 3 NAV Data Display, 4 GPS Data Display*1

2 Track

```
├── 1 Main Track ──────── Display ──────────────── No/Yes
│                         Disp. Pt. No. ────────── All/Set (10000 pts)
│                         Select Navaid ────────── Change (Int.GPS, GPS, Loran C, Decca, DR, Loran A, Omega)
├── 2 Sub Track ───────── Display ──────────────── No/Yes
│                         Disp. Pt. No. ────────── All/Set (00000 pts)
│                         Select Navaid ────────── GPS, Loran C, Decca, DR, Loran A, Omega, Int.GPS
│                         Pos. Memory ──────────── Unavailable/Available
├── 3 GPS Buoy Track ──── Memory ───────────────── No/Yes
│                         Display ──────────────── No/Yes
├── 4 ARP Track ───────── Memory ───────────────── No/Yes
│                         Display ──────────────── No/Yes
├── 5 Common Function ─── Color ────────────────── No/Yes (Red, Yellow, Green, Cyan, Purple, Blue, White)
│   (Page 1)              Type ─────────────────── No/Yes (———— , ········· , – – – , ·–·– )
│                         Time ─────────────────── No/Yes (Enter starting and end times)
│                         Plot Interval ────────── Range (00.01 nm) /Time (00M 05S)
│                         Nav. Switching ───────── Off/On
│                         Smoothing ────────────── 00 [00~15]
│                         Connect TRK Not R'cd. ── Disconnect/Connect
│                         Track Ind. While Holding ── No/Yes
│   (Page 2) ──────────── Temp Color Setting ───── Temp. range (7 color)/temp. change amt. (0.2˚F, 2˚F selection)
│                         by step
│                         Depth Color Setting ──── Depth range (7 color)/depth change amount (2 ft, 20 ft, 200 ft)
│                         by range
├── 6 Erase by Attribute ─ By Line Type ─────────── No/Yes ( ———— , ········· , – – –, ·–·– )
│                         By Time ──────────────── No/Yes (Enter starting and end times)
│                         Set Area ─────────────── On Screen/Off Screen/+Cursor/All
│                         Track ────────────────── Main/Sub/GPS Buoy/ARP(00) [00-20*: All] *10 for GP/GD-280
├── 7 Erase by Two Points ─ Specify
├── 8 Change Color/ ────── Set Area ─────────────── +Cursor/All
│      Line Type           Old Color ────────────── Red, Yellow, Green, Cyan, Purple, Blue, White
│                         New Color ────────────── Red, Yellow, Green, Cyan, Purple, Blue, White, Same
│                         Old Type ─────────────── ———— , ········· , – – –, ·–·–
│                         New Type ─────────────── ———— , ········· , – – –, ·–·– , Same
│                         Track ────────────────── Main/Sub/GPS Buoy/ARP(00) [00-20*: All] *10 for GP/GD-280
├── 9 Change Track Color ─ Main ─────────────────── Red, Yellow, Green, Cyan, Purple, Blue, White, Temp, Dep
│                         Sub ──────────────────── Red, Yellow, Green, Cyan, Purple, Blue, White, Temp, Dep
│                         GPS Buoy ─────────────── Red, Yellow, Green, Cyan, Purple, Blue, White, Temp, Dep
│                         ARP ──────────────────── Red, Yellow, Green, Cyan, Purple, Blue, White, Temp, Dep
└── 0 Track Color Erase ── Red, Yellow, Green, Cyan,  No/Yes (For each color)
                          Purple, Blue, White, Track
                          Track ────────────────── Main/Sub/GPS Buoy/ARP(00) [00-20*: All] *10 for GP/GD-280
```

3 Mark/Line

- 1 Comment List
- 2 Setting
  - Disp. Spec. MK Shape — No/<u>Yes</u> (◇ + ▫ Y, ⊙ ⊞, ♨, ★, ✳ ▲)
  - Disp. Spec. MK Color — No/<u>Yes</u> (Red, Yellow, Green, Cyan, Purple, Blue, White)
  - Disp. Spec. MK Time — No/<u>Yes</u> (Enter starting and end times.)
  - Change MK Attribute — Yes (Select Shape, Color)
  - Set MK Entry Method — Lat./Long., Rng/Brg, Loran C, Decca, <u>Ship Pos/+Cursor</u>, Loran A
  - Disp. Spec. Line — No/<u>Yes</u> (——, ·······, – – –, ·–·–·)
  - Disp Spec. LN Color — No/<u>Yes</u> (Red, Yellow, Green, Cyan, Purple, Blue, White)
  - Disp Spec. LN Time — No/<u>Yes</u> (Enter starting and end times.)
  - Change LN Attribute — Yes (Type, Color)
  - Set LN Entry Method — Lat./Long., Rng/Brg, Loran C, Decca, <u>Ship Pos/+Cursor</u>, Omega, Loran A
- 3 Erase Mark
  - By Shape — No/<u>Yes</u> (◇ + ▫ Y, ⊙ ⊞, ♨, ★, ✳ ▲)
  - By Color — No/<u>Yes</u> (Red, Yellow, Green, Cyan, Purple, Blue, White)
  - By Time — No/<u>Yes</u> (Enter starting and end times)
  - Set Area — On Screen, Off Screen, +Cursor, All
- 4 Erase Line(1)
  - Erase Specific Line — Select point.
  - Erase All Lines
- 5 Erace Line(2)
  - By Line Type — <u>No</u>/Yes
  - By Color — <u>No</u>/Yes
  - By Time — <u>No</u>/Yes
  - Set Area — On Screen/Off Screen/Cursor/<u>All</u>
- 6 Mark Color Select — Red, Yellow, Green, Cyan, Purple, Blue, White
- 7 Mark Shape Select
  - Mark Shape — ◇ + ▫ Y, ⊙ ⊞, ♨, ★ ✳ ▲
  - Line — NA, ——, ·······, – – –, ·–·–·
- 8 Line Color Select
  - Color — Red, Yellow, <u>Green</u>, Cyan, Purple, Blue, White
  - Type — ——, ·······, – – –, ·–·–·
- 9 Comment (Enter comment.)
- 0 Enter
  - Enter Mark
  - Start Point
  - Enter Line

4 Waypoint/Route

- 1 Setting
  - WPT Page No. — <u>1</u>/2
  - Color — <u>Red</u>, Yellow, Green, Cyan, Purple, Blue, White
  - WPT Entry Method — Lat./Long., Rng/Brg, Loran C, Decca, Ship Pos, <u>+Cursor,</u> Loran A
  - Disp List Method — <u>Numerical Order</u>/Nearest Dist.
  - [Route] Select WPT — Route No./+Cursor
  - Set WPT Change Range — 00.10 nm
  - Skip Waypoint — Yes
- 2 Enter Route — Enter comment, Waypoint No.
- 3 Display Route List — Enter speed for TTG calculation.
- 4 Enter WPT — Enter waypoint.
- 5 WPT — Ship Position, +Cursor, External WPT

5 Alarm

- 1 Alarm (Page 1)
  - Arrival/Anchor — Arr/<u>Off</u>/Anch — Enter alarm range.
    - Auto Zoom — <u>No</u>/Yes (Enter scale.)
  - XTE/Border — XTE/<u>Off</u>/Border — Enter alarm range.
  - Target Proximity — <u>Off</u>/Set — Enter alarm range.
  - Temperature — In RNG/<u>Off</u>/Out RNG — Enter alarm range.
    - Current Rip — <u>No</u>/Yes — Enter temp. change width.
  - (Page 2) Depth — In RNG/<u>Off</u>/Out RNG — Enter alarm range.
  - Current — In RNG/<u>Off</u>/Out RNG — Enter alarm range.
    - Sel. Layer — <u>1</u>/2/3
  - Speed — In RNG/<u>Off</u>/Out RNG — Enter alarm range.
  - Wake-up — <u>Off</u>/Set — Enter time.
  - Timer — One Alarm/<u>Off</u>/Repeat Alarm — Enter time.
- 2 Alarm Confirmation — Displays alarms violated.

6 File

```
┌─ 1 Record ─────────┬─ Medium ─────────────────── Memory Card/Floppy
│                    ├─ Recording Area ──────────── On Screen/+Cursor/All
│                    ├─ Main Track, Sub Track, GPS Buoy Track, ARP Track, ──┬── No/Yes
│                    │  Mark/Line, Waypoint/Route, Target Point, Init. Data ─┘
│                    ├─ File Name ──────────── New/File List ───────── Enter file name.
│                    ├─ Own Track Max Pts. 18000pts.
│                    └─ Sub Track Max Pts. 18000pts.
│
├─ 2 Replay ────────┬─ Medium ─────────────────── Memory Card/Floppy
│                    ├─ Main Track, Sub Track, GPS Buoy Track, ARP Track, ──┬── No/Yes
│                    │  Mark/Line, Waypoint/Route, Target Point, Init. Data ─┘
│                    └─ File Name ──────────── Select file to replay.
│
├─ 3 Delete File ───┬─ Medium ─────────────────── Memory Card/Floppy
│                    ├─ Main Track, Sub Track, GPS Buoy Track, ARP Track, ──┬── No/Yes
│                    │  Mark/Line, Waypoint/Route, Target Point, Init. Data ─┘
│                    └─ File Name ──────────── Select file to delete.
│
├─ 4 Format Medium ─── Medium ─────────────────── Memory Card/Floppy
├─ 5 Check Memory ──── Displays no. of memory pts. remaining.
├─ 6 Display SRAM Card ─ Display file name. ──────────────────────── Edit file data.
├─ 7 Copy ──────────┬─ Source Medium ──────────── Memory Card/Floppy
│                    ├─ Target Medium ──────────── Memory Card/Floppy
│                    ├─ Main Track, Sub Track, GPS Buoy Track, ARP Track, ──┬── No/Yes
│                    │  Mark/Line, Waypoint/Route, Target Point, Init. Data ─┘
│                    └─ File Name ──────────── Select file to copy.
│
└─ 8 Data Logger ───┬─ 1 Record
                     │   ┌─ File ──────────── New/Continue
                     │   └─ Interval ──────── Time/Range (Enter time, range.)
                     ├─ 2 Replay
                     │   └─ Enter replay starting position.
                     ├─ 3 Pause/Resume Replay
                     └─ 4 Stop Log
```

7 Target Point

```
┌─ 1 Setting ─────────── Pos. Entry Method ──────── Lat./Long, Rng/Brg, Loran C Decca, Ship Pos, +Cursor, Loran A
└─ 2 List/Entry ──────── List ──────────────── Enter position of target point.
```

8 Calculate Rng/Brg

```
┌─ Lat./Long. ─────────── Enter latitude and longitude of two points.
├─ +Cursor ───────────── Place cursor on point.
└─ Waypoint ──────────── Enter starting and end points.
```

9 System Setting

```
├─ 1 TX/RX Data Format ────────── See Installation Manual
├─ 2 GPS Setup *1 (GPS Page) ──┬─ Pos. Fixing Mode ──────── 2D, 2D/3D
│                              ├─ Geodetic Datum ────────── WGS-84, WGS-72, Tokyo, N. America, Europe
│                              │                             Australia, Others
│                              ├─ Time Difference ───────── 09:00
│                              ├─ Lat/Long ───────────────── 38˚00.000'N  123˚00.000'W
│                              ├─ Lat/Long Offset ───────── 00.000'N  00.000'E
│                              ├─ Smoothing ─────────────── Pos. 00  Spd 05 [0~99]
│                              ├─ Antenna Height ─────────── 0005 ft
│                              ├─ Cold Start ─────────────── Yes
│                              ├─ Min Elev. Angle ────────── 05˚ [5~90]
│                              ├─ Disable Sat No. ────────── Yes (Enter satellite no. to disable.)
│       (DGPS Page) ──────────┬─ DGPS Mode ─────────────── No/Yes
│                              ├─ Beacon Receiver ────────── Int./Ext
│                              ├─ Beacon Station ─────────── Auto/Manu
│                              ├─ Frequency ─────────────── 320.5 kHz [←: Dec.  →: Inc]
│                              └─ Bit Rates ──────────────── 50/100/200
```

```
├─ 3 Radar *2 ──────────────┬─ 1 Target Trail
│                           │   ├─ Trail Time ─────────────── 15 s, 30 s, 1 m, 3 m, 6 m, 15 m, 30 m, Cont.
│                           │   ├─ Trail Mode ─────────────── Relative/True
│                           │   ├─ Trail Shade ────────────── Mono/Multi
│                           │   ├─ Trail Level ────────────── 1/2/3
│                           │   ├─ Trail Copy ────────────── Off/On
│                           │   └─ Thin Trail ────────────── Off/On
│                           ├─ 2 Target Alarm
│                           │   ├─ Area Select ────────────── No.1/No.2
│                           │   ├─ Area 1 Mode ───────────── In/Out
│                           │   └─ Area 2 Mode ───────────── In/Out
│                           ├─ 3 Echo Signal
│                           │   ├─ Echo Color ────────────── Yellow/Green/Color
│                           │   ├─ Clutter Sweep ─────────── Off/On (Link)/On (Fix)
│                           │   ├─ Sweep Level ───────────── 1/2/3
│                           │   ├─ Echo Average ───────────── Off/0.5/1/2/3
│                           │   ├─ Interference Rejection ──── Off/1/2/3
│                           │   ├─ Echo Stretch ───────────── Off/1/2
│                           │   ├─ Echo Enhance ──────────── Off/On
│                           │   ├─ Noise Rejection ────────── Off/On
│                           │   ├─ Video Contrast ─────────── 1/2/3
│                           │   └─ A/D Curve ─────────────── A/B/C/D
│                           ├─ 4 Function
│                           │   ├─ Page ─────────────────── 1/2/3
│                           │   ├─ Function 1 ───────────── Off/On
│                           │   ├─ Function Select ────────── Cst, Ocean, R-Sea, Rain, Bird-N, Bird-F, Float, Buoy, Port, Far
│                           │   ├─ Echo Average ───────────── Off/0.5/1/2/3
│                           │   ├─ Interference Rejection ──── Off/1/2/3
│                           │   ├─ Echo Stretch ───────────── Off/1/2
│                           │   ├─ Echo Enhance ──────────── Off/On
│                           │   ├─ Noise Rejection ────────── Off/On
│                           │   ├─ A/C Auto ─────────────── Off/On
│                           │   └─ Video Contrast ─────────── 1/2/3
│                           ├─ 5 ARP (Page 1) *3
│                           │   ├─ Mark Display ───────────── Off/On
│                           │   ├─ All Symbol Erase ────────── Run
│                           │   ├─ Vector Reference ────────── Relative/True
│                           │   ├─ Vector Time ────────────── 30 s, 1 m, 3 m, 6 m, 15 m, 30 m
│                           │   ├─ CPA Set ───────────────── Off, 0.5 nm, 1 nm, 1.5 nm, 2 nm, 3 nm, 4 nm, 5 nm, 6 nm
│                           │   ├─ TCPA Set ────────────── 30 s, 1 m, 2 m, 3 m, 4 m, 5 m, 6 m, 12 m, 15 m
│                           │   ├─ Track Display ───────────── Off/On
│                           │   └─ Audio Alarm ────────────── Off/On
│                           └─ 5 ARP (Page 2) *3
│                               ├─ Track Interval ────────────── 30 s, 1 m, 2 m, 3 m, 6 m
│                               ├─ Auto Acquisition ──────────── Off/On/Set
│                               ├─ Guard Zone *4 ───────────── Off/On/Set
│                               ├─ Track Test *4 ────────────── Off/On
│                               ├─ Land Discrimination *4 ────── 0/1/2/3/4
│                               ├─ Vector Start *4 ──────────── 1 m/20 Scans
│                               ├─ Refence Target Vector*4 ──── Off/On
│                               └─ Target Based Speed *4 ────── Run
```

Continued on
next page

A-7

```
                          ─ 6 Brilliance
                          │   └─ Target Trail, Heading Line, EBL/VRM, ARP Symbol, Own Ship Mark, Rings
                          ├─ 7 Initial Setting (Page 1)
                          │   ├─ Speed Mode ───────── Manual/Log/Nav
                          │   ├─ Manual Speed ─────── 00.0 kt
                          │   ├─ Set & Drift ──────── Off/On
                          │   ├─ Set ──────────────── 000.0˚
                          │   ├─ Drift ────────────── 00.0 kt
                          │   └─ Main Radar ───────── No.1/No.2
                          ├─ 7 Initial Setting (Page 2)
                          │   ├─ VRM 1 ───────────── nm/km/sm
                          │   ├─ VRM 2 ───────────── nm/km/sm
                          │   ├─ EBL 1 ───────────── Relative/True
                          │   ├─ EBL 2 ───────────── Relative/True
                          │   ├─ Index Lines ─────── Off/2/6
                          │   ├─ Stern Mark ──────── Off/On
                          │   ├─ Own Ship Mark ───── Off/On
                          │   ├─ Center Enhance ──── Off/On
                          │   └─ Test ────────────── Run
                          └─ 8 Installation ──────── See Installation Manual.
         ─ 4 ARP ──────────── Change MK Color ─────── Yes (Red, Yellow, Green, Cyan, Purple, Blue, White)
         │               └─ Speed/Course ──────────── No/Yes
         └─ 5 ARP Acquisition ─── Color ────────────── Red, Yellow, Green, Cyan, Purple, Blue, White


0 Plotter Display
   ─ 1 Plotter Display ─── Back Color ───────────── Black/Blue
      (Page 1)        ├─ +Cursor ────────────────── Red, Yellow, Green, Cyan, Purple, Blue, White
                      ├─ +Cursor Size ───────────── Small/Large
                      ├─ ○Cursor ────────────────── Off, Red, Yellow, Green, Cyan, Purple, Blue, White
                      ├─ ||Cursor ───────────────── Off, Red, Yellow, Green, Cyan, Purple, Blue, White
                      ├─ Own Ship Mark ──────────── Red, Yellow, Green, Cyan, Purple, Blue, White
                      ├─ Standard Mark/Line ─────── Off/On
                      ├─ Waypoint Mark ──────────── Off/Small/Large
                      ├─ Comment Mark ───────────── Off/On
                      ├─ External Event Mark─────── Off/On
                      ├─ Time Mark ──────────────── Off, "T" Mark Only, Time, Date
                      ├─ Temperature/Depth ──────── Off/On
                      ├─ Course ─────────────────── Off/Course Vector/Course Line
                      │    └─ Auto Course Bar────── 2 kt lower limit
                      ├─ Heading Line ───────────── Off/On
                      ├─ Current Vector ─────────── Off/On
                      ├─ ◇Cursor ────────────────── Off, Red, Yellow, Green, Cyan, Purple, Blue, White
                      └─ ◇Cursor Shape Adjust ──── Yes (Adjust, Enlarge, Reduce, Fix, End)
      (Page 2) ─────── Fish Mark ────────────────── Off/On
                    ─ Grid Format ───────────────── Off/On (Set grid pattern.)
      (Page 3) ─────── Head line (Select indication to enlarge.)
                         Date/Time, Navaid in Use, Lat/Long, Spd/Cse, Water Temp./Depth,
                         Wind Spd/Dir (True or Relative), WP Lat/Long, Rng/Brg to WP, ETA,
                         Current 1/2/3, NA)
      (Page 4) ─────── Chart Data ───────────────── Off/On
                    ─ Land Pattern ──────────────── Off/Dim/Medium/Bright
                    ─ Land Color ────────────────── Red, Yellow, Green, Cyan, Purple, Blue, White
                    ─ Index ─────────────────────── Off/On
                    ─ Place Name ────────────────── Off/On
                    ─ Chart Pos.Offset ──────────── Off/On (Enter position Offset.)
      (Page 5) ─────── Sets attributes of chart marks.
      (Page 6) ─────── Danger Areas ─────────────── Sets attributes of chart marks.
      (Page 7) ─────── Sets attributes of text on plotter display.
                         Ship's Lat/Long, Ship's Spd/Cse, WPT Lat/Long, Rng/Brg to WPT, WPT No., Scale, Range,
                         +Cursor Lat/Long, Rng/Brg to +Cursor, Radius of ○Cursor, Width/Slant of ||Cursor, Date,
                         Time
      (Page 8) ─────── Sets attributes of text on plotter display.
                         Temperature, Depth, Current (Tide) Spd/Dir, Wind Spd/Dir, Memory, Pts Used,
                         Track Plot Interval, Navaid in Use, Orientation Mode, North Mark, Mark Shape Icon,
                         Line Type Icon, Arrival Time, ETA at Destination, TM/RM
      (Page 9) *1 ──── Sets attributes of GPS-related text on plotter display.
                         GPS Fix Mode, GPS DOP, GPS Altitude

  Continued on
  next page
```

A-8

(Page 10) *2 ——— Sets attributes of radar-related text on plotter display.
        Interference Rejection, Echo Average, Zoom, Echo Stretch, Alarm Zone 1, Alarm Zone 2,
        VRM 1, VRM 2, EBL 1, EBL 2, Range Ring Interval, Range, Gyro Bearing, Echo Trail Time

(Page 11) *2 ——— Sets attributes of radar-related text on plotter display.
        Echo Enhance, Noise Reject, A/C Auto, Video Contrast, Function No., Function Selection,
        Radar No.

— 2 Plotter Display ——— Unit of Distance ——————— nm/sm/km
    Standard
          — Unit of Speed ——————— Kt, sm/h, km/h
          — Unit of Temp ——————— ˚C/˚F
          — Unit of Depth ——————— m, ft, Fa, Hiro, PB
          — Direction ——————————— True/Mag.
          — Mag. Variation ——————— Auto [07.0˚ W]/Man. (00.0˚ E)
          — Scale ——————————— Step Scale/User-defined (10 scales may be registered.)
          — Pos. Disp. Meth. ——————— Lat/Long, Loran C LOPs, Decca LOPs, Loran A LOPs

— 3 Graph Display ——— Set Time Span——————— 02
          — Water Temp Graph ——————— No/Yes (Enter #1 and #2 reference temperatures.)
          — Water Depth Graph ——————— No/Yes (Enter #1 and #2 reference temperatures.)

— 4 Function Keys ——— Group 1-Group 9 (Program extension keys. 81 available with no radar; 72 with radar)
          Group 0 (Program functions keys F1-F8. F9 available with no radar.)

— 5 Mark Pattern ——— ◇ + ⊡ Ƴ, ⊙ 🏠, ⚓, ★, ✳, ▲   No/Yes (Change mark pattern.)

— 6 Misc. Setting ——— Set Date/Time ——————— No/Yes (Enter year, month, day, time.)
          — Alarm/Key Volume——————— Min, Low, High, Max
          — Trackball On/Off ——————— Disable/Enable
          — Log Pulse ——————————— 200/400/NA

— 7 Setup ——————— Memory Apportion ——————— Yes (Enter no. of main + sub track points to record.)
          — Clear All Memories ——————— Yes
          — Clear Specific Memory ——————— Yes
          — GPS Clear *1 ——————— Yes

— 8 Test ——————— Memory & I/O ——————— Yes
          — Main Unit Keyboard ——————— Yes
          — Remote Controller Kybd. —— Yes
          — Color ——————————— Yes

5. Plotter Display Error Messages

Below is a list of error messages shown on the plotter display, arranged in alphabetical order.

Message	Meaning	Remedy
All waypoints are set to SKIP.	All route waypoints in a "chained" route are set to "skip."	Restore appropriate waypoints as necessary.
Beacon Receiver is not built in.	Internal beacon receiver selected on menu and system is not equipped with the built in GPS receiver.	Select external GPS receiver on the GPS menu.
Cannot calculate L/L data.	Could not convert LA, LC or Decca to latitude and longitude position, because estimated L/L position is too inaccurate, when you attempted to enter mark, line, target point or waypoint.	Check navigator.
Cannot copy to the same source medium.	Selected target medium is the same as source medium, when attempting to copy data.	Select different target medium.
Cannot delete.	Could not delete a file.	Try again.
Cannot find file.	File could not be found when replacing floppy disk in logger recording, replaying; file selected for display from memory card does not exist.	
Cannot format.	Could not format medium.	Try again. If formatting fails again, replace medium.
Cannot load data.	Could not load data when replaying a file.	Try to replay data again.
Cannot record log, Remove write-protection of FD.	Could not record logger data to floppy disk because it is write protected.	Release write protection.
Cannot record log.	Improperly formatted floppy disk used to record logger data.	Insert formatted floppy disk and try again.
Cannot replay log.	Damaged floppy disk used to replay logger data.	Replace floppy disk.
Cannot replay while destination is selected.	You attempted to playback data when a destination is set.	
Cannot specify area when display mode is other than NU/TM.	"Off Screen" or "On Screen" specified when attempting to erase track, marks or file when mode is other than NU/TM.	Switch to NU/TM mode and try again.
Could not save. Memory space is not enough.	Could not record data because of insufficient space on medium.	Replace medium and try again.
Data Logger replay stopped	Appears when logger recording or replaying is attempted while data logger replay is stopped.	
Distance is too long, cannot be registered.	You attempted to register a mark/line, target point or waypoint by range and bearing but no latitude and longitude position could be found because the distance is too far away.	Reenter position.

Message	Meaning	Remedy
Enter File Name.	File name not specified when attempting to record new file.	Specify file name.
Enter record data type.	No data selected for recording.	Select items to record.
Failed to record Log.	Could not record logger data.	Try again.
Failed to replay Log.	Could not replay logger data.	Try again.
File is not founded.	No file containing items specified could be found when attempting to record, replay, copy or delete selected file.	Recheck file.
File is not specified	No file name specified when attempting to record, replay, copy or delete a file.	Select file.
Main Track Navaid data is not received.	Displayed when attempting to apply automatic position offset to memory card file and there is no position data.	Check navigator.
Medium has been removed. Try again.	Medium removed while recording data.	Replace medium and try again.
Medium is changed, cannot delete.	Medium removed during deleting process.	Replace medium and try again.
Medium is changed, cannot replay.	Medium removed during replay.	Replace medium and try again.
Medium not inserted. Insert again.	Memory card not inserted.	Insert memory card.
Memory is full.	Mark/line storage capacity exceeded when attempting to playback marks/lines.	
No Waypoint	You attempted to skip a waypoint when no destination is set.	
No next waypoint	You attempted to skip a waypoint when there are no more waypoints in the destination set.	
No position fix data cannot calculate L/L data.	Could not find latitude and longitude position, because of no position data, of mark, line, target point or waypoint when you attempted to enter one by range and bearing.	Check navigator.
No position fix data cannot calculate R/B data.	Range and bearing could not be calculated, because of no position data, when route entry screen, route list, mark/line list, waypoint list or target point list is opened.	Check navigator.
No position fix data could not set destination.	Appears whenever you attempt to set a destination and there is no position data.	Check navigator.
No position fix data, cannot move.	No position data found when you attempted to offset chart position.	Check navigator.
Please specify target number.	You attempted to change color of an ARP plot symbol but did not specify ARP target number.	Specify target number.

A-11

Message	Meaning	Remedy
Please specify type of data.	No data specified when attempting to replay data.	Specify data to replay.
Please specify type of data.	No data specified when attempting to copy data.	Specify data to copy.
Recording interrupted due to memory full.	When recording logger data, floppy disk used is full.	Replace floppy disk.
Recording …	Appears when any logger operation is attempted during logger recording.	
Replaying …	Appears when any logger operation is attempted during logger replaying.	
Route is not registered.	Wrong route number entered.	Enter correct route number.
Select data type to delete.	No data selected when attempting to delete a file.	Select file and try again.
Source medium has been replaced.	Source medium removed during copying.	Replace source medium and try again.
Specified target number is not in use.	You attempted to change color of an ARP plot symbol but entered an invalid ARP target number.	Reenter correct number.
Sub Track Navaid data is not received.	Displayed when attempting to apply automatic position offset to sub track on a memory card file and there is no position data.	Check navigator.
Target medium changed, cannot copy data.	Target medium removed during copying.	Replace target medium and try again.
The function key is not registered.	Operated function key has not been programmed.	Program the function key.
The job has not been done.	Appears when logger suspension, restart or completion is attempted when logger operation has been completed.	
Waypoint is not registered.	Appears when you attempt to use and unregistered waypoint when entering a route, calculating range and bearing and setting destination.	Use registered waypoint.
You cannot change WPT page during route navigation.	WPT page cannot be changed when navigating a route.	

A-12

SPECIFICATIONS
COLOR GPS PLOTTER GP-280/380/680
COLOR VIDEO PLOTTER GD-280/380/680

1. DISPLAY UNIT

(1) Display Tube

GP/GD-2800:	12 inch color VDT, 234 mm x 170 mm, 640 x 481 dots
GP/GD-3800:	15 inch color VDT, 278 mm x 208 mm, 640 x 481 dots
GP/GD-6800:	21 inch color VDT, 380 mm x 285 mm, 640 x 481 dots

(2) Display Mode   Plotter mode, Radar mode, Plotter/Radar Combination mode

2. PLOTTER

(1) Display Mode   North-up, Course-up, Automatic Course-up

(2) Projection   Mercator

(3) Usable Area   85º latitude or below

(4) Scale   Desired scale or 10 steps 1/1,000 to 1/9,500,000

(5) Track Display   Plot interval: by time (1 sec. to 59 min. 59 sec.) or
         by distance (0.01 to 99.99 nm)

(6) Electronic Chart   FURUNO chart card or NAVIONICS chart card available

(7) Memory Capacity   Track, mark, line, comment, external event: 20,000 points

       Waypoints (w/ number): 97 points x 2 pages

       Route: 10 routes (10 points/route)

       External waypoint: 1 point

       Target points: 10 points

(8) Information Display   Ship's L/L position (Loran C/A or Decca TDs also available)

       Date and time, Ship's speed, Heading and course,

       Chart scale (display range), waypoint L/L position,

       Range and bearing to destination waypoint

       Cursor intersecton L/L position

       Range and bearing to cursor intersection

       Water temperature and water depth (sensor data required)

(9) Alarms   Arrival and Anchor watch alarms,

       Cross track error and Border alarms,

       Target point approaching,

       Timer, Wake-up,

       *Water temperature, *Depth, *Tide, *Ship's Speed

       *: optional sensor required

3. RADAR FUNCTION (OPTION)

(1) Color	3 colors or 8 levels of tone selectable
(2) Range scales	0.125, 0.25, 0.5, 0.75, 1.5, 2, 3, 4, 6, 8, 12, 16, 24, 36, 48, 64, 72, 96, 120
(3) Off-center	Cursor position off-centered
(4) Minimum range	Radar range + 11.6 m
(5) Range Accuracy	Radar Accuracy + 11.6 m
(6) Bearing Accuracy	±1°
(7) Other Functions	Echo trail, Interference Rejection

4. GPS RECEIVER (GP-280/380/680 ONLY)

(1) Receiving Channels	12 channels, 12 satellite tracking, Parallel tracking
(2) Rx Frequency	1575.42 MHz
(3) Rx Code	C/A code
(4) Position Fixing System	All in view, 8-state Kalman filter
(5) Position Accuracy	Approx. 10 m, 95% of the time, horizontal dilution of position (HDOP)≤1

Note: All GPS receiver are subject to degradation of position and velocity accuracy under the U.S. Department of Defense.

Position may be degraded.

DGPS: Approx. less than 5 m, 95% of the time

(6) Tracking Velocity	900 kts
(7) Position-fixing Time	Warm start: 12 seconds, Cold start: 90 seconds
(8) Position Update Interval	1 second
(9) DGPS Data Receiving	RTCM SC-104 Ver 2.1 formatted

5. DATA I/O

(1) I/O Port NAVAID 2 port, Auto-pilot, Log, GPS buoy

(2) Input Data Sentences (NMEA0183 Ver. 1.5/2.0)

Own Ship's position (GP)	RMC>RMA>GLL>GGA
Own Ship's position (others)	RMA>RMC>GLL>GGA
Bearing and Ship's speed (GP)	RMC>RMA>VTG
Bearing and Ship's speed (LC, LA, DE, DR, OM)	RMA>RMC>VTG
Date and Time	**ZDA
Depth	**DPT>**DBT
Water temperature	**MTW
Wind Speed and Direction	**MDA, **VTW, **VWR
Water current speed and Direction	**VDR
Bearing/Distance to WP	RMB>WPL>BWR>BWC

Course (true)	**HDT
Course (relative)	**HDG>**HDM
Course (true/relative)	**VHW
Target Position	**TLL
**: any talker is readable	

(3) Input CIF data   System clock, Ship's position, Bearing/Distance to WP, Event mark,
Course and Ship's speed, Depth and Water Temperature,
Wind Speed and Direction

(4) Output Data Sentences (NMEA0183 Ver. 1.5/2.0)

Data 1 (talker changeable)	GLL, VTG, ZDA, RMC, GGA, BWR, WPL, GTD
Data 2 (talker not changed)	GLL, VTG, ZDA, RMC, GGA, BWR, WPL, GTD
Data 3 (talker not changed)	GLL, VTG, GGA, AAM, APB, BOD, RMB, XTE

(5) Output CIF data   System clock, Ship's position, Bearing/Distance to WPT,
GPS WPT data, Event mark, GPS Bearing, ship's speed and position,
Loran A/C time difference

(6) Data output interval   WPT data: 10 sec., Others: 2 sec.

6. POWER SUPPLY

(1) GP-2800	24-32 VDC: 3.5 A
(2) GP-3800	24-32 VDC: 5.5 A
(3) GP-6800	24-32 VDC: 5.5 A
(4) Rectifier	100/120/115/220/230 VAC, 1 phase, 50/60 Hz

7. ENVIRONMENTAL CONDITION

(1) Ambient Temperature   Display Unit: -15°C to +55°C
Antenna Unit: -25°C to +70°C

(2) Relative Humidity   95% at 40°C

(3) Waterproofing   Display Unit: IPX2
Antenna Unit: IPX6

(4) Vibration   ±1 mm ±10%, 2(5) to 13.2 Hz,
Maximum acceleration 7 m/s^2, 13.2 to 100 Hz

8. COATING COLOR

(1) Display Unit   Cover: Munsell 2.5GY5/1.5
Panel: N3.0

(2) Antenna Unit   N9.5 white

10. ARP MODULE GD-2830 (OPTION FOR GP/GD-280, ARP-10 EQUIVALENT)

(1)	Acquisition Range	0.2 to 16 nm
(2)	Tracking Range	0.1 to 16 nm
(3)	Maximum Number of Targets Acquirable	
		10 (Auto 5 + Manual 5 or Manual 10)
(4)	Acquisition Time	Within 5 sec (scanner rotation: 24 rpm)
(5)	Alarm Timing	Lost target (blink mark, collision alert)
(6)	Vector Length	30 sec; 1, 3, 6, 15 or 30 min (selected on menu)
(7)	Plotting Interval	30 sec; 1, 2, 3 or 6 min (selected on menu)
(8)	Numeric Data Indication	Course, Speed
(9)	Acquisition Available Speed	100 kt relative
(10)	Number of Plotting Point	10 per target

11. ARP MODULE GD-3830/6830 (OPTION FOR GP/GD-380/680, ARP-17 EQUIVALENT)

(1)	Acquisition Range	0.2 to 32 nm
(2)	Tracking Range	0.1 to 32 nm
(3)	Maximum Number of Targets Acquirable	
		20 (Auto 10 + Manual 10 or Manual 20)
(4)	Acquisition Time	Within 5 sec (scanner rotation: 24 rpm)
(5)	Vector Length	30 sec, 1, 3, 6, 15 or 30 min
(6)	Plotting Interval	30 sec, 1, 2, 3 or 6 min
(7)	Number of Plotting Points	10 per target
(8)	Alarms	Visual and Audible alarm against target violating CPA/TCPA limits
		Visual and Audible alarm against target violating guard-zone limits (5 targets max.)
		Visual Alarm against lost-target, target full and system failure
(9)	Numeric Data Indication	Course, Speed

INDEX

Index-4

V

W

X

Z