No. : OM-E4344-0E

FURUNO

OPERATOR'S MANUAL

GPS NAVIGATOR

MODEL GP－70

FURUNO ELECTRIC CO., LTD.
NISHINOMIYA, JAPAN

9208200KS(9208,shni)
PRINTED IN JAPAN

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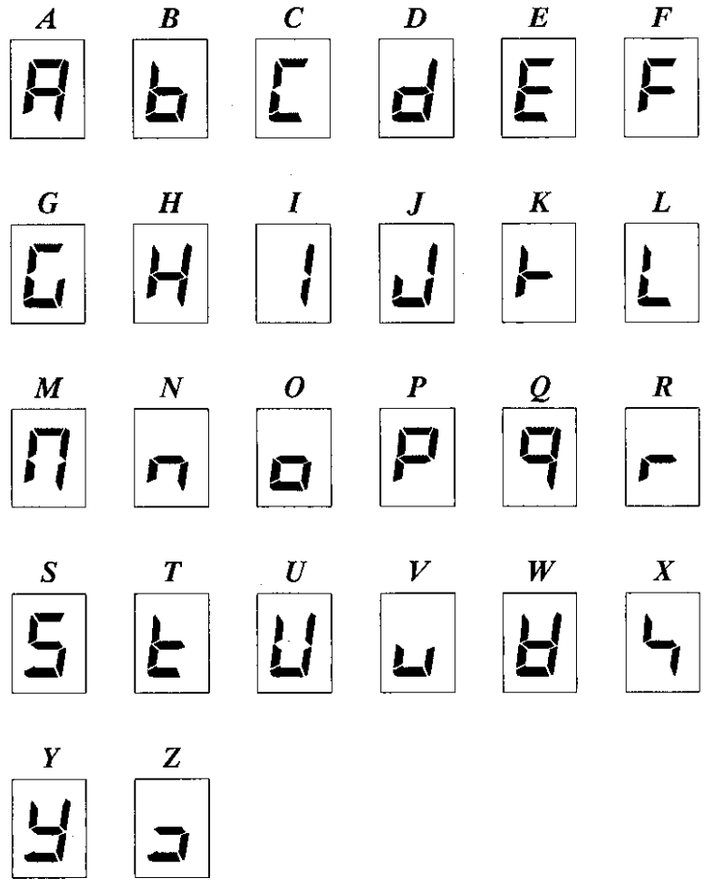
Graphic Display

The GP-70 employs symbols to indicate letters on the display screen. The symbols and their corresponding letter are as shown in the table below:



Graphic Diaplay	Meaning	
ACQ	**ACQ**	Acquiring
AEr	**AER**	Antenna Error
ALL	**ALL**	All Clear
ALM	**ALM**	Alarm
ALM	**ALM**	Almanac
ALM LEV	**ALM LEV**	Alarm Level
ALMn	**ALMN**	Almanac
ALt	**ALT**	Altitude
Ato	**ATO**	Automatic
AUSt	**AUST**	Australian Geodetic 1984
bEr	**BER**	Battery Error
br-G	**BRG**	Bearing
CALC	**CALC**	Calculation
CLr	**CLR**	Memory Clear
Cr-S	**CRS**	Course
CSt	**CST**	Cold Start
d	**d**	Disable Satellite
dAt	**DAT**	Data Clear
dAtA	**DATA OUT**	Data Format
dC	**dC**	Delta Course
dL -L	**dL – L**	Delta Longitude and Latitude
dEC	**DEC**	Decca
dEr	**DER**	Data Backup Error

Graphic Display	Meaning	
dEv	**DEV**	Frequency Deviation
dr	**DR**	Dead Reckoning
Err	**ERR**	System Error
EtA	**ETA**	Estimated Time of Arrival
Euro	**EURO**	European 1950
F	**F**	Forced Health
FMt	**FMT**	Output Data Format
FUt SAt	**FUT SAT**	Future Satellite
Fwd	**FWD**	Forward
G72	**G72**	WGS-72
G84	**G84**	WGS-84
GEod	**GEOD**	Geodetic System
GPS	**GPS**	GPS
H	**H**	Health
HLtH	**HLTH**	Health
IMP	**IMP**	Impossible
In It	**INIT**	Initial Setting
Int	**INT**	Interrupted
tEY tESt	**KEY TEST**	Keyboard Test
L-L	**L – L**	Latitude/Longitude
LA	**LA**	Loran – A
LAt	**LAT**	Latitude
LC	**LC**	Loran-C

Graphic Display	Meaning	
LEv	**LEV**	Level
Lon	**LON**	Longitude
MAn	**MAN**	Manual
Mod	**MOD**	Position Fixing Mode
nAd	**NAD**	North American Datum 1927
nL	**NL**	Noise Level
nzL	**NZL**	New Zealand Geodetic Datum 1949
oMG	**OMG**	Omega
oSuy	**OSVY**	Ordance Survay of Great Britain 1936
P- 1	**P – 1**	Port 1
PrOG	**PROG**	Program
rCAL	**RCAL**	Recall
rEv	**REV**	Reverse
rnG	**RNG**	Range
rtE PLAn	**RTE PLAN**	Route Plan
SAt	**SAT**	Satellite
SAt Cond	**SAT COND**	Satellite Condition
SAvE	**SAVE**	Save Event Position
SEL	**SEL**	Route Select
SEr	**SER**	Selftest Error
SMtH	**SMTH**	Smoothing
SPd	**SPD**	Speed
SPd ALM	**SPD ALM**	Speed Alarm

Graphic Display	Meaning	
t IM	**TIM**	Time
tkr	**TKR**	Talker Name
tkYo	**TKYO**	Tokyo Datum
trP	**TRP**	Trip Distance
trIP	**TRIP**	Trip Distance
ttG	**TTG**	Time To Go
U	**U**	Unhealthy
USEr ProG	**USER**	User Program
vAr	**VAR**	Magnetic Variation
vtd	**VTD**	Velocity To Destination
WCH ALM	**WGH ALM**	Watch Alarm
xtE	**XTE**	Cross Track Error
xtE ALM	**XTE ALM**	Cross Track Error Alarm
2Pt CALC	**2 PT CALC**	2 Point Calculation
2d	**2D**	2 Dimensional Position Fix
2d-3d	**2D – 3D**	2 or 3 Dimensional Position Fix
3d	**3D**	3 Dimensional Position Fix

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Chapter 1 INTRODUCTION

This chapter describes what the GPS is and how the position fixing is obtained. Experenced users of GPS navigator may skip this chapter.

1 Principle of GPS

GPS is an acronym meaning Global Positioning System. The Global Positioning System, also known as NAVSTAR, is a precise satellite navigation system developed by the U.S. Department of Defense.
When full global coverage becomes available, a constellation of 21 satellites (including 3 spares) placed in nearly 20,000-kilometer high 12-hour circular orbits will provide highly precise, continuous, worldwide, all-weather position plus time and velocity information to user-equipped land vehicles, marine vessels, and aircraft.

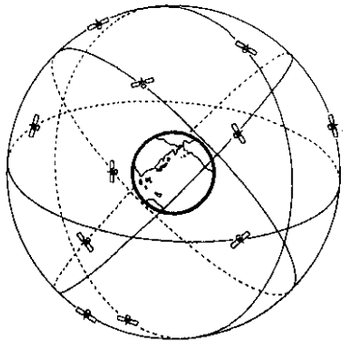


Fig. 1-1 The Orbits of the GPS

Unlike a conventional navaid, GPS offers 3-dimensional position-fixing. Thus, it can be utilized not only on surface boats and vehicles but also on aircraft. 3-dimensional position-fixing requires four satellites within lines of sight, while 2-dimensional position-fixing requires only three. At the present stage, where a limited number of satellites are in orbit, 2-dimensional position-fixing is preferable for surface boats and vehicles. This is because the possibility of having 3 satellites simultaneously within view is higher than the 4-satellite possibility, and you can expect GPS fixes for longer periods every day.

GPS versus TRANSIT & LORAN-C

Many people surmise that GPS is similar to TRANSIT since their position is fixed by using satellites. However, as detailed in the following table, it is quite different from TRANSIT, but is rather similar to LORAN-C. (It might be called "**Loran chains in the sky**.")

Table 1-1 Comparison of the Systems

GPS	TRANSIT(satnav)	LORAN-C
Position is fixed by receiving 3 (or 4) satellites within line of sight. Position can be fixed continually while 3 (or 4) satellites are in line of sight.	Position is fixed by receiving only one satellite. Position is fixed once when a satellite comes in line of sight.	Position is fixed by receiving 3 stations (= 1master +2 slaves). Position can be fixed continually while the ship is in the loran chain coverage.

However, please note that a GPS fix is obtainable by receiving any 3 (or 4) satellites. There is no specific combination requirement unlike LORAN-C where the master and slave combination is fixed.

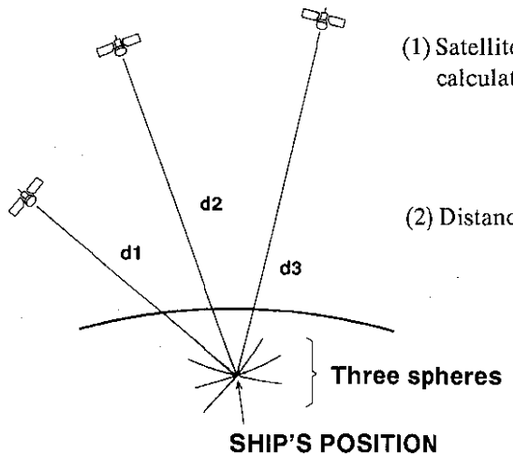
How a GPS fix is obtained

As mentioned earlier, GPS satellites are not geostationary. They are orbiting the earth as illustrated on the preceding page. Your position is repeatedly fixed through the following three steps while any 3 (or 4) satellites are in line of sight.

(1) GPS satellites continually transmit their own precise orbital data (called **"ephemeris"**). The GPS receiver computes their locations by receiving this data.

(2) In the above-mentioned receiving process, the GPS receiver measures very accurate distances to the satellites, using what is known as "**spread spectrum modulation**." The excellence of GPS's position-fixing accuracy is mainly due to this technology.

(3) Satellite locations and their distances are known already. Now the GPS receiver fixes its own position by triangulation.



(1) Satellite locations are calculated.

(2) Distances are measured.

(3) The GPS fix is calculated as the intersecting point of three spheres which are drawn from the three satellites with diameters, d1, d2 and d3.

Fig 1-2 Position Fixing

2 Position-fixing Accuracy (HDOP)

As you may have noticed, a GPS fix is obtained in the same manner as position-fixing on a radar using the VRM (variable range marker). The following figures show a radar screen and sea chart. A, B and C are known locations (lighthouse, cape, etc.), and the distances to those targets are measured on the radar screen by using the VRM. The ship's location is fixed as the intersection of three circles which are drawn with the diameters of VRM readouts, centering around A, B and C. (In case of GPS, A, B and C correspond to satellites.)

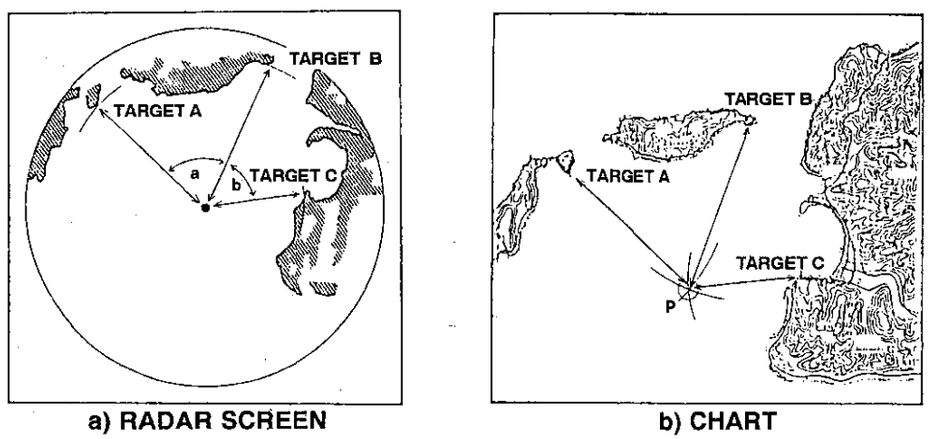
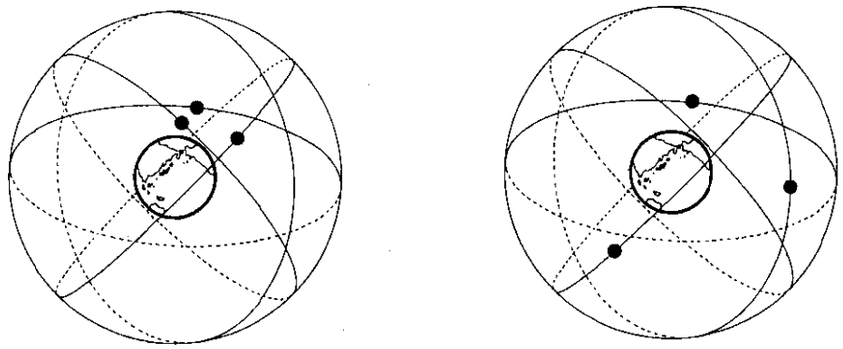


Fig. 1-3 Position Fixing Manner

As experienced navigators know, high accuracy can be expected when the targets are spaced nearly 90 degrees approx. from each other.

Similarly, GPS fix accuracy is subject to the locations of the satellites in the sky. Roughly speaking, high accuracy is obtainable when the satellites are widely scattered in the sky; on the contrary, accuracy is reduced when the satellites have gathered in a narrow area (angle).

See the drawings below. In both cases a GPS fix is obtainable in Northern Pacific since 3 satellites are within our line of sight. However, accuracy in the right case will be much higher than the left case because the 3 satellites are spread widely apart.



Low Accuracy **High Accuracy**

Fig. 1-4 Position Fixing Accuracy

As the index for position-fixing accuracy, HDOP (Horizontal Dilution of Precision) is widely used. The smaller the HDOP value, the more accurately position can be fixed. For instance, HDOP of 3 to 5 is considered desirable, but values above 10 represent poor GPS fix accuracy. While each satellite is revolving in a different direction, the geometrical relationship among 3 (or 4) satellites, that is, HDOP value, changes as time elapses.

Error in distance is proportional to the HDOP value as shown on next page.

NOTE 1 The error shown above is observed on the GP-70 under favorable receiving conditions.

2 GPS system accuracy is controlled by the US Government. The error shown above is subject to change.

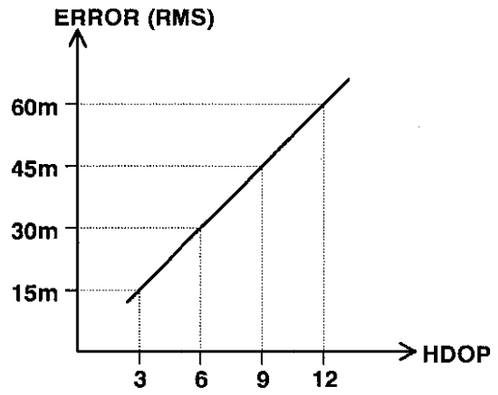


Fig. 1-5 Position Fixing Error Versus HDOP

3 GPS Satellite Arrival Time & Almanac

Until the full complement of GPS satellites is launched, it is important to note that limited hours of position-fixing are available. The period and time differ with respect to geographical location on the earth.

The time required for a GPS satellite to revolve around the earth is 11 hours and 58 minutes. This means that the predicted satellite arrival time in a given area will be 4 minutes earlier each succeeding day. (4 min. per day, half an hour per week, 2 hours per month and whole a day per year). For example, supposing that the satellite arrival time was 3:00 to 5:00 PM today, the same satellite will be in line of sight from 2:56 to 4:56 PM tomorrow. The hours of position-fixing also advance 4 minutes a day.

Every satellite is broadcasting not only its own orbital data (ephemeris as explained on page 2) but also rough orbital data of all the GPS satellites, called the Almanac. Therefore, the GP-70 can predict arrival times of all the GPS satellites by receiving a single satellite. The GP-70 acquires/receives GPS satellites in accordance with this prediction. Unless the Almanac is available in the GP-70, position-fixing is not initiated. As the GP-70 is shipped from the factory with the Almanac memorized, you may use it immediately after installation. Whenever the GP-70 receives a satellite, the Almanac is replaced.

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Chapter 2 BASIC OPERATION

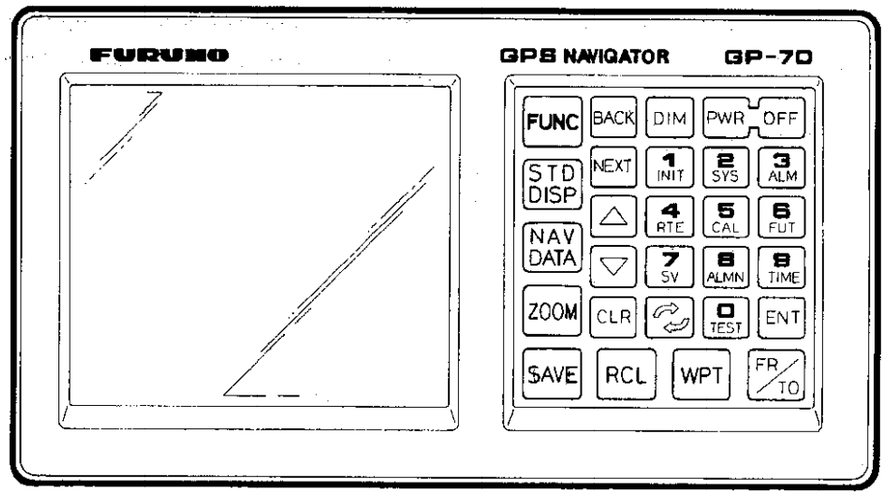


Fig.2-1 Display Unit

1 Power & Dimmer Key

1) Power

Turn on: Press [PWR] key.

Turn off: Press [PWR] and [OFF] keys simultaneously.

2) Dimmer key

Every hit of [DIM] key adjusts the backlighting of the LCD and the keyboard. There are in eight steps including off.

2 Daily Start-up Procedure

In day-to-day operation, you need do no more than turn on the power to start up your unit. If you've just installed the unit however, enter parameter settings as described in chapter 8.

Entry of initial Lat/Long

This operation is required only in the following cases.

1. Using the equipment for the first time.
2. After clearing all the data.
3. After 600 NM trip without turning on the equipment.

Procedure

1) Press [FUNC] [1] to display initial setting menu.

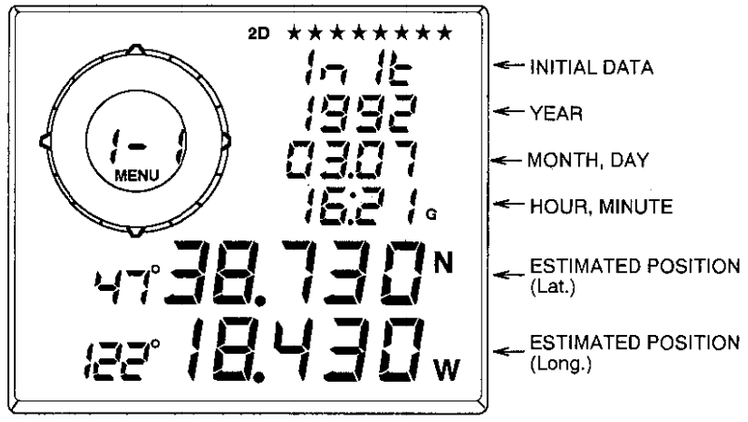


Fig. 2-2 Initial Data Entry Screen

2) Type the "**year**". (4 digits)
3) Press [ENT].
4) Type "**month**" and "**day**". (4 digits)
5) Press [ENT].
6) Check the local zone time indicator.
   "**G**": GMT
   "**S**": Ship's local time
   "**J**": JST.
   The local zone will be registered on the initial setting menu (menu 1-2).
7) Type "**time**". (4 digits)
8) Press [ENT].
9) Type estimated latitude.

10) Press [⇄] to switch N/S.

11) Press [ENT].

12) Type estimated longitude.

13) Press [⇄] to switch E/W.

14) Press [ENT].

15) To escape from menu screen, press any blue key.

3 Beep

The beep sounds when an alarm is violated or an equipment fault is detected. To silence the beep press [CLR] key.

4 Data Entry Procedure

[0] [1] [2] [3] ..... [9] : Numeric keys; they enter numeric data.

[⇄] ..... : Changes the polarity of numeric value and lat/long data or to scroll the item displayed on the screen.
(+/ − , N/S, E/W, ON/OFF, select a data)

[CLR] ..... : Clears incorrectly entered numeric data.

[ENT] ..... : Stores the data typed on the screen.

5 Direct Function Keys

1) FUNC key

Press the key to display the menu number input screen. To select a menu, press corresponding numeric key.

Press "**NEXT**" or "**BACK**" to scroll the menu screen.

FUNCTION TREE

- **1. INITIAL SETTING**
  - 1 – 1 Date / Time / Position
  - 1 – 2 DOP Threshold / Time Difference / Antenna Height
- **2. SYSTEM DATA**
  - 2 – 1 Geodetic System
  - 2 – 2 L/L Correction
  - 2 – 3 Magnetic Variation
  - 2 – 4 Smoothing
  - 2 – 5 Displaying Unit
  - 2 – 6 Output Data Format (Port 1)
  - 2 – 7 Output Data Format (Port 2)
  - 2 – 8 "**NAV DATA**" / "**ZOOM**" Display
  - 2 – 9 User Program
- **3. ALARM**
  - 3 – 1 Arrival / Anchor Watch
  - 3 – 2 Border / Cross Track Error
  - 3 – 3 Ship's Speed
  - 3 – 4 Buzzer Loudness
- **4. ROUTE**
  - 4 – 1 Register
  - 4 – 2 Select
- **5. CALCULATION**
  - 5 – 1 Distance
  - 5 – 2 Register Waypoint by Range and Bearing
  - 5 – 3 Manual ETA
- **6. FUTURE POSITION-FIXING SCHEDULE**
  - 6 – 1 Future Position-fixing Schedule
- **7. SV CONDITION**
  - 7 – 1 DOP / Noise Level / Frequency Deviation
  - 7 – 2 Satellite Number
  - 7 – 3 Azimuth / Elevation / Signal Level
- **8. ALMANAC**
  - 8 – 1 Cold Start
  - 8 – 2 Healthiness / Usability
- **9. TIME**
  - 9 – 1 Present Time / Altitude
  - 9 – 2 Trip Distance / Trip Alarm
- **10. TEST**
  - 0 – 1 Program Version
  - 0 – 2 Selftest
  - 0 – 3 Memory Clear
  - 0 – 4 Key / LCD Test

2) STD DISP key

Presents the standard display screen. The screen shows ship's speed, distance to the TO waypoint, bearing to the TO waypoint, waypoint number in use, latitude and longitude.

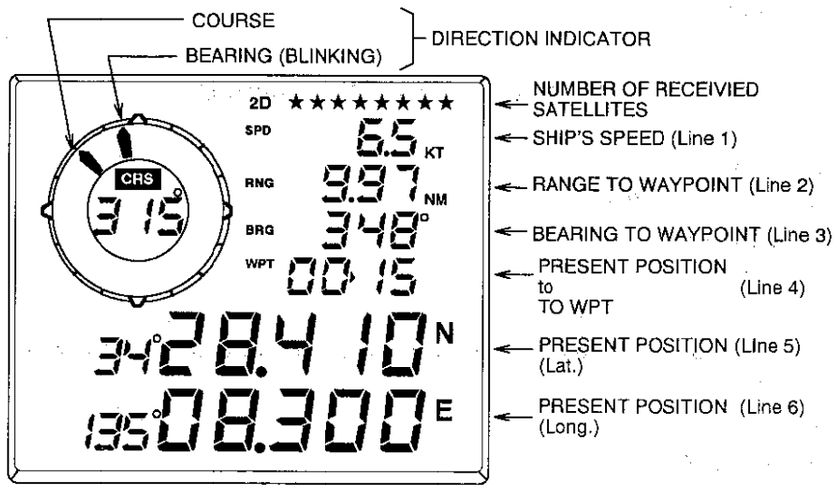


Fig. 2-3 Standard Display Screen

3) NAV DATA key

Presents navigation data selected by the system menu (menu 2-8). Default settings are as follows:

Line 1	: Velocity to destination
Line 2	: Time to go
Line 3	: Estimated time of arrival
Analog meter	: Course
Digital display	: Course

Select the desired data for line 1 to line 3 among the followings.

Speed (**SPD**)
Course (**CRS**)
Range (**RNG**)
Bearing (**BRG**)
Velocity to destination (**VTD**)
Time to go (**TTG**)
Estimated time of arrival (**ETA**)
Cross track error (**XTE**)
Altitude (**ALT**)

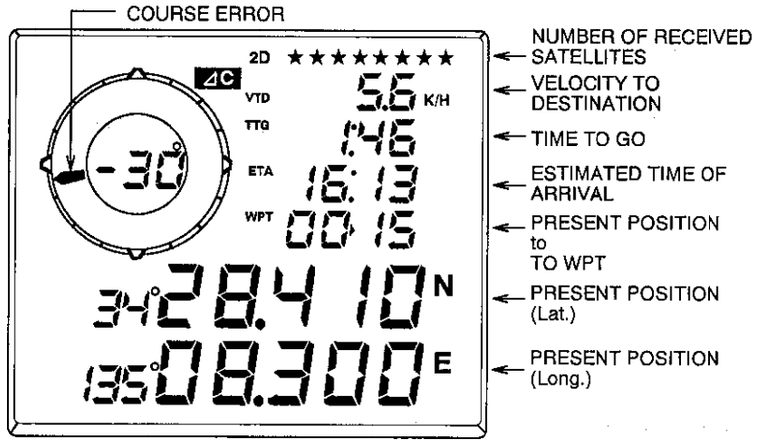
Trip distance (**TRP**)
Course error (**dC**)
Present time (**TIM**)
HDOP (**DOP**)
None (**OFF**)

The direction indicator can display one of the followings.

Speed (**SPD**)
Course (**CRS**)
Cross track error (**XTE**)
Course error (**dC**)
None (**OFF**)

The digital display of the direction indicator can show one of the following.

Course (**CRS**)
Cross track error (**XTE**)
Course error (**dC**)
None (**OFF**)



NOTE : You can select the items you want to display with the system data MENU 2-8.

Fig.2-4 Navigation Display Screen

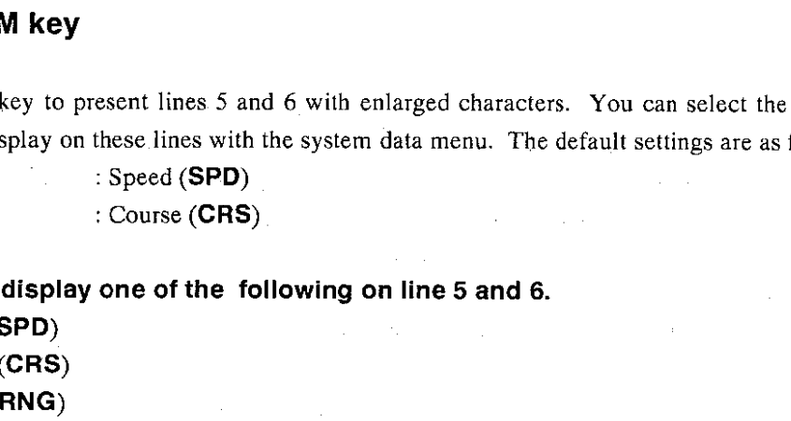
4) ZOOM key

Press the key to present lines 5 and 6 with enlarged characters. You can select the items you want to display on these lines with the system data menu. The default settings are as follows:

Line 5 : Speed (**SPD**)
Line 6 : Course (**CRS**)

You can display one of the following on line 5 and 6.

Speed (**SPD**)
Course (**CRS**)
Range (**RNG**)
Bearing (**BRG**)
Velocity to destination (**VTD**)
Time to go (**TTG**)
Estimated time of arrival (**ETA**)
Cross track error (**XTE**)
Altitude (**ALT**)
Trip distance (**TRP**)
Course error (**dC**)
Present time (**TIM**)
HDOP (**DOP**)
None (**OFF**)



NOTE : You can select the items you want to display on lines 5 and 6 on the system data menu.

Fig. 2-5 Zoom Display

5) SAVE key

Saves L/L position as event position when pressed. This feature can be useful to mark L/L positions where the fishing was good, etc. The GP-70 stores up to 20 event positions, sequentially numbering them from 100 to 119. When the event position memory is full, the oldest position is overwritten to make room for the latest one. thus, if you want more permanent storage of position, enter the position as a waypoint.

Registering event data into a waypoint memory

1) Press [SAVE] to save event position.
2) Type the waypoint memory number using two digits.
3) Press [ENT].

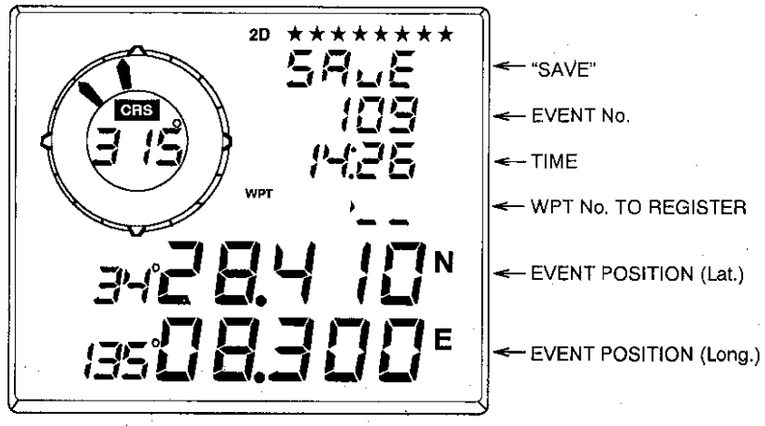


Fig. 2-6 "SAVE" Screen

6) RCL key

Recalls event data.

Recalling event data

Press [BACK] or [NEXT] to call up the desired event data.

Registering stored event data into the waypoint memory

1) Press [RCL] followed by [BACK] or [NEXT] key to select event data.
2) Type a waypoint memory number using two digits.
3) Press [ENT].

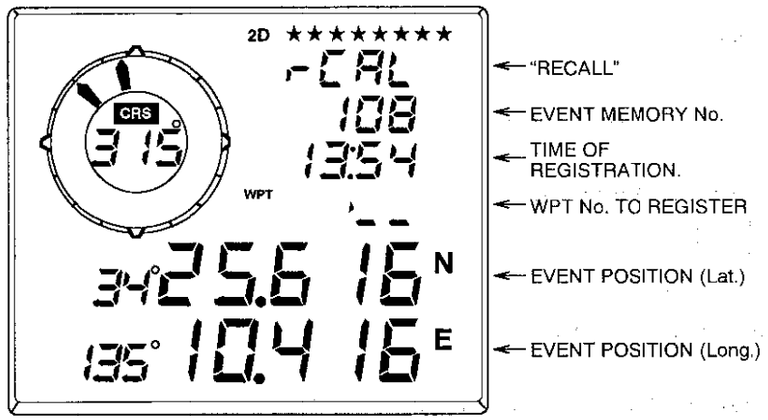


Fig. 2-7 Recall Screen

7) WPT key

This key stores waypoints.

1) Press [WPT].
2) Type a waypoint memory number in two digits.
3) Press [ENT].
4) Type the Latitude of waypoint.
5) Press [ENT].
6) Type the Longitude of waypoint.
7) Press [ENT].
8) The date and time [ENT] is pressed is memorized automatically.

Another way to select a waypoint number.

After pressing the [WPT] key, press [BACK] or [NEXT] key for desired waypoint number.

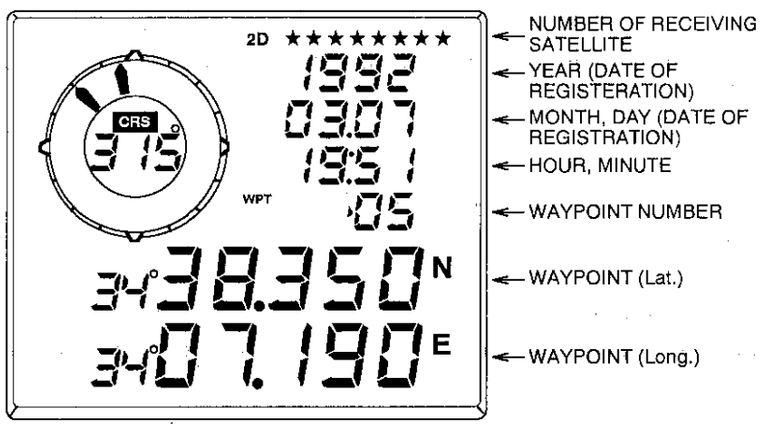


Fig. 2-8 Waypoint Entry Screen

8) FR/TO key

Enables or disables the waypoint navigation function.

To quit waypoint navigation.

1) Press [FR/TO].
2) Press [CLR] then [ENT].
3) The previous screen appears.

To start waypoint navigation from present position.

1) Press [FR/TO].
2) Type a TO waypoint number using two digits.
3) Press [ENT].
4) The previous screen appears.

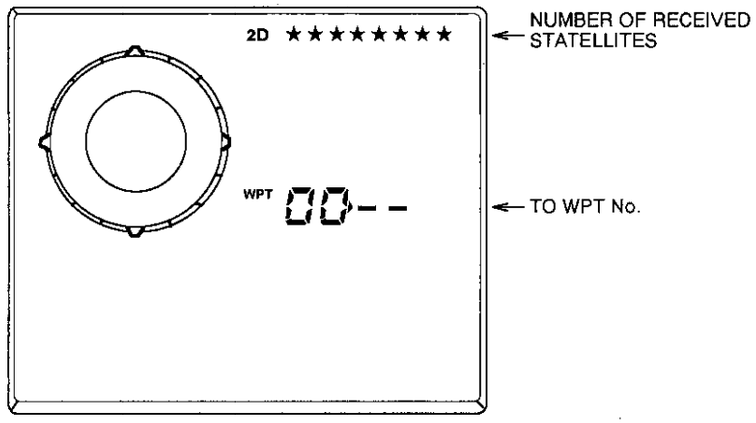


Fig. 2-9 Starting Waypoint Navigation

To start waypoint navigation from position other than current position.

1) Press [FR/TO].
2) Press [CLR].
3) Type a FROM waypoint number using two digits.
4) Type a TO waypoint number using two digits.
5) Press [ENT].
6) The previous screen appears.
7) The displayed bearing and distance is the data from present position to destination waypoint .

6 Direction Indicator

The direction indicator shows one of the following:

•Course
•Course Error
•Cross Track Error
•No display

You can select one on the system data menu (MENU 2-8). The factory setting is "Course".

Course

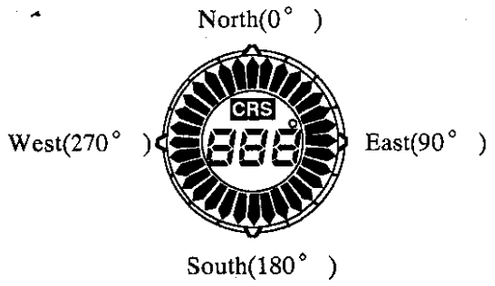


Fig. 2-10 Course Direction Indicator

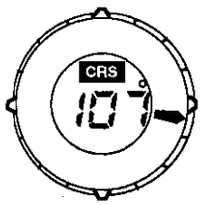


Fig. 2-11 The Example of Indication

1) Each pointer on the direction indicator is equal to 11.25 degrees.
2) During waypoint navigation, both the ship's course and bearing to waypoint (Blinking) are indicated.
3) The figure 2-11 show the example of course 107 degrees.
4) The indication is "North Up".

Course Error

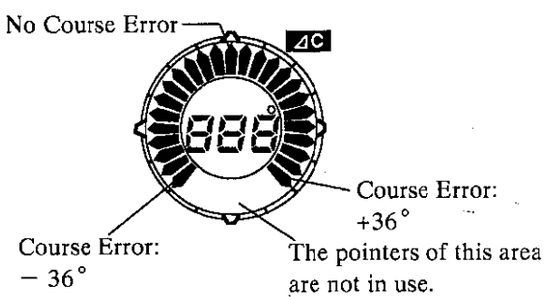


Fig. 2-12 Course Error Indicator

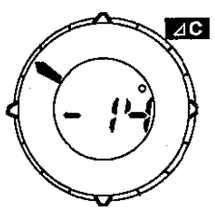


Fig. 2-13 The Example of Indication

1) Each pointer on the direction indicator equals 3 degrees of course error.

2) Indication is course up.
3) Indication range is from − 36 degrees to +36 degrees.
4) A blinking pointer shows the course error is out of range.
5) The figure 2-13 show the example of course error − 14 degrees.

Cross Track Error

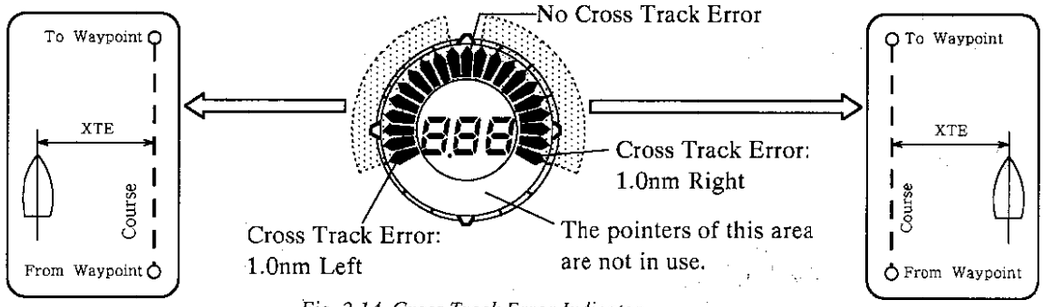
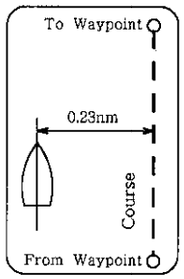


Fig. 2-14 Cross Track Error Indicator

1) Each pointer on the direction indicator equals to 0.1 nm of track error.
2) Center top segment indicates no cross track error.
3) Indication range of the pointer is from 1.0 nm left to 1.0 nm right.
4) Indication range of the digital indicator is from 9.99nm left to 9.99nm right.
5) A pointer or a digital indicator blink to shows the cross track error is out of range.
6) The figure 2-15 show the example of cross track error 0.23nm.



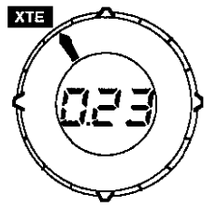


Fig. 2-15 The Example of Cross Track Error Indication

7 Digital display

"Speed", "Course", "Course Error" or "Cross Track Error" can be displayed on the digital display. The default setting is "Course".

You can select the item you want to show on the digital display from the following:

Speed (SPD)
Course (CRS)

Cross track error (XTE)
Course error (dC)
None (OFF)

8 Displaying Future Position Fixing Schedule

Each time you get a GPS fix, the GP-70 calculates a future position fixing schedule. You can display this data as follows.

Procedure

1) Press [FUNC] [6] to display menu 6-1.

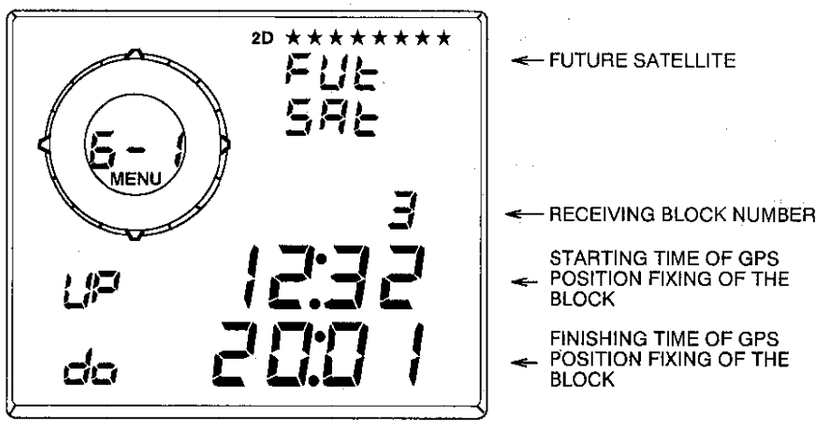


Fig. 2-16 Future Position Fixing Schedule Screen

2) The position fixing schedule appears on the screen.
3) Press [△] or [▽] to scroll the presentation. Up to six periods are available.
4) To escape, press any blue key.

NOTE: 1) Prediction is made based on the almanac. The lower (more strict) the DOP threshold setting, the shorter are the position fixing periods.
2) Up to six periods within 24 hours can be presented.
3) Each position fixing period advances about 4 minutes a day.
4) During GPS position-fixing, the presentation is updated every 15 minutes approx. If the Lat/Long or DOP threshold is entered when GPS position fixing is not performed, the presentation will be updated 3 to 4 minutes later.

9 Displaying Present Time & Altitude

The present time and the altitude (in meter) calculated at 3D mode can be pesented on the screen.

Procedure

1) Press [FUNC] [6] to display menu 6-1.

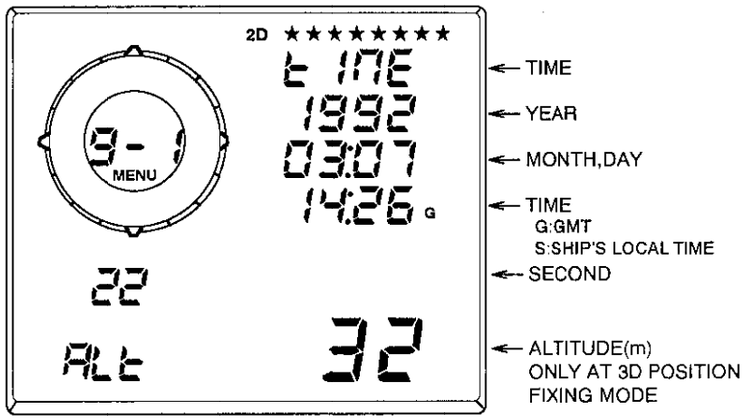
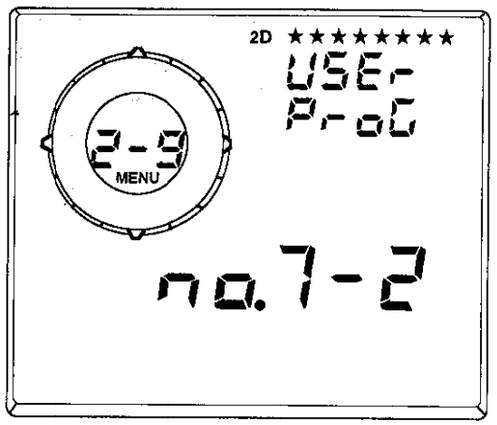


Fig. 2-14 Present Time and Altitude Screen

2) The present data, time and the altitude in meter is presented on the screen.
3) To escape from menu screen, press any blue key.

10 Single Menu Mode

The GP-70 has 32 menu screens but most of them are not needed for daily operation. To avoid the inconvenience of pressing many keys to select the desired screen, the most often needed menu screen can be preset. Just one press of [FUNC] key displays the preset screen. The default setting of single menu mode is menu 7-2 (Satellite number display screen).



User Program

To select menu 7-2, press
"7" "2" "ENT"

Fig. 2-15 User Program Screen

Presetting Menu Screen

Procedure

1) Confirm that the GP-70 is in full menu mode.
   If not, follow the sequence "To change the mode" on next page. To figure out which menu mode GP-70 is in, refer to "Difference between two modes" on next page.
2) Press [FUNC] [3] [BACK] to display menu 2-9.
3) Key in the desired menu number (two digits).
4) Press [ENT] key.

To change the mode

1) Turn off the power.
2) While holding down [FUNC] key, turn on the equipment.
3) The LCD blinks once.
4) Release [FUNC] key.

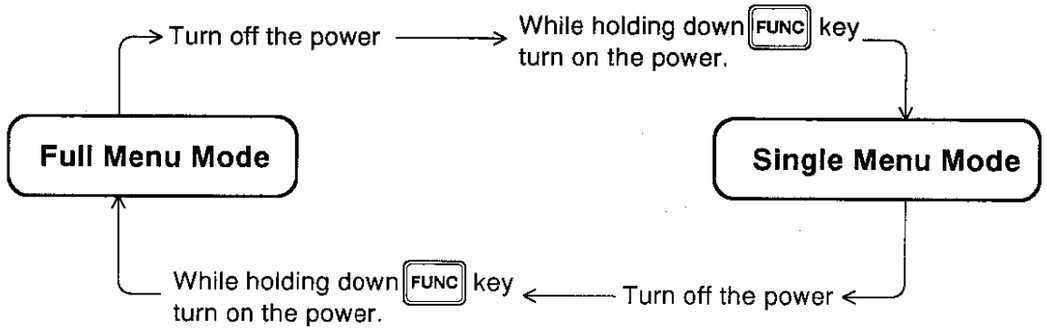


Fig. 2-19 Changing the Mode

CAUTION

Never turn on the equipment while holding down [STD DISP] key. This operation changes operational mode and factory testing mode alternately. The waypoint data, initial setting data (MENU 1-1 and 1-2) and system data (MENU 2-1 to 2-9) are cleared while changing the mode from operational mode to factory testing mode.

Difference between two modes

The current setting of the mode can be determined when the "FUNC" key is pressed. The difference is as follows.

Full Menu Mode

1) Press [FUNC] key.
2) Menu number input screen appears. 32 menu screens are available.
3) Key in the first digit of the menu number.
4) Selected menu screen appears.

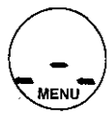


Fig. 2-20 Menu Number Input Screen

5) Press [NEXT] or [BACK] to scroll the menu screen.
6) To escape from a menu screen, press any blue key.

Single Menu Mode

1) Press [FUNC] key.
2) "MENU 7-2" or the other user-programmed screen appears. Only the one menu screen is available.

Fig. 2-21 Single Menu Screen

3) To escape, press any blue key.

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Chapter 3 MENU SCREENS

This chapter describes the functions of 32 menu screens available on the GP-70. You may use this chapter as a function index of the menu. The 32 menu screens are available in full menu mode. For the details of the full menu mode, you may refer to chapter 2 section 8, "Single Menu Mode"

FUNCTION TREE

1. INITIAL SETTING
- 1 – 1 Date / Time / Position
- 1 – 2 DOP Threshold / Time Difference / Antenna Height

2. SYSTEM DATA
- 2 – 1 Geodetic System
- 2 – 2 L/L Correction
- 2 – 3 Magnetic Variation
- 2 – 4 Smoothing
- 2 – 5 Displaying Unit
- 2 – 6 Output Data Format (Port 1)
- 2 – 7 Output Data Format (Port 2)
- 2 – 8 "**NAV DATA**" / "**ZOOM**" Display
- 2 – 9 User Program

3. ALARM
- 3 – 1 Arrival / Anchor Watch
- 3 – 2 Border / Cross Track Error
- 3 – 3 Ship's Speed
- 3 – 4 Buzzer Loudness

4. ROUTE
- 4 – 1 Register
- 4 – 2 Select

5. CALCULATION
- 5 – 1 Distance
- 5 – 2 Register Waypoint by Range and Bearing
- 5 – 3 Manual ETA

6. FUTURE POSITION-FIXING SCHEDULE
- 6 – 1 Future Position-fixing Schedule

7. SV CONDITION
- 7 – 1 DOP / Noise Level / Frequency Deviation
- 7 – 2 Satellite Number
- 7 – 3 Azimuth / Elevation / Signal Level

8. ALMANAC
- 8 – 1 Cold Start
- 8 – 2 Healthiness / Usability

9. TIME
- 9 – 1 Present Time / Altitude
- 9 – 2 Trip Distance / Trip Alarm

10. TEST
- 0 – 1 Program Version
- 0 – 2 Selftest
- 0 – 3 Memory Clear
- 0 – 4 Key / LCD Test

1 Initial Setting

1) MENU 1-1 Date/Time/Position

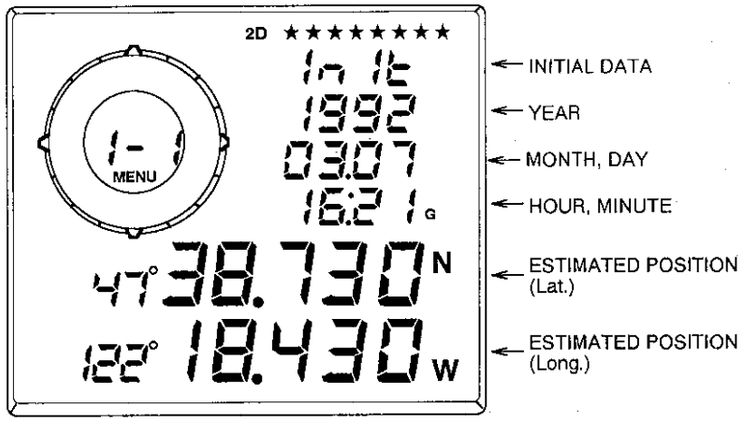


Fig. 3-1 MENU 1-1

Function

Enter initial date, time and Lat/Long at the following cases.

1. Using the equipment for the first time.
2. After clearing all the data.
3. After 600 NM trip without turning on the equipment.

Procedure

1) Press [FUNC] [1] to display menu 1-1.
2) Type the "year". (4 digits)
3) Press [ENT].
4) Type "month" and "day". (4 digits)
5) Press [ENT].
6) Check the local zone time indicator.
   "G": GMT; "S": Ship's local time ; "J": JST.
7) Press [FUNC] [1] [NEXT] to display menu 1-2.
8) Type "time". (4 digits)
9) Press [ENT].
10) Type estimated latitude.
11) Press [↻] to switch N/S.
12) Press [ENT].
13) Type estimated longitude.
14) Press [↻] to switch E/W.

15) Press [ENT].
16) To escape from menu screen, press any blue key.

Details

You may refer to chapter 2 section 2 "Daily Start-up Procedure" for the detail.

2) MENU 1-2 DOP Threshold/Time Difference/Antenna Height

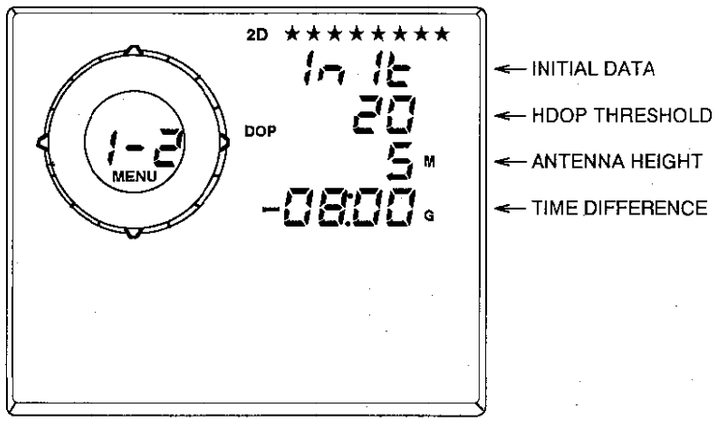


Fig. 3-2 MENU 1-2

Function

Enter HDOP threshold level, antenn height and time difference after installation

Procedure

1) Press [FUNC] [1] [NEXT] to display menu 1-2 screen.
2) Enter DOP threshold level (2 digits).
3) Press [ENT].
4) Enter antenna height (4 digits).
5) Press [↻] to switch +/ − .
6) Press [ENT].

NOTE: The antenna height is used for 2-D position fixing only. As this data is never updated, inaccurate height entry affects the position fixing accuracy continuously. Actually measure the antenna height as precisely as possible.

7) Register local zone time (4 digits).
8) Press [↻] to switch +/ − .
+ : Advanced from GMT.
− : Delayed from GMT.

9) Press [ENT].
10) To escape from menu screen, press any blue key.

Details

You may refer to chapter 9 section 1 "Initial Data" for the detail.

2 System Data

1) MENU 2-1 Geodetic System

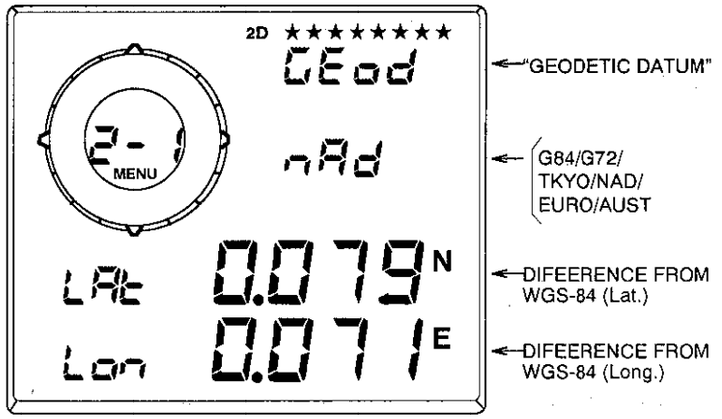


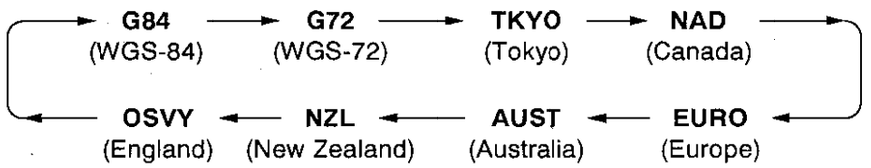
Fig. 3-3 MENU 2-1

Function

Enter the geodetic system which is used in your sea chart.

Procedure

1) Press [FUNC] [2] to display menu 2-1.
2) Press [↻] to scroll for desired geodetic system.



Canada	:North America 1927
Europe	:European 1950
Australia	:Australian Geodetic 1984

New Zealand :Geodetic Datum 1949
England :Ordance Survay of Great Britain 1936

3) Press [ENT].
4) The difference in minutes between the system selected and WGS-84 is displayed.
5) To escape from menu screen, press any blue key.

Details

You may refer to chapter 9 section 2-1) "Selecting a geodetic system" for the detail.

2) MENU 2-2 L/L Correction

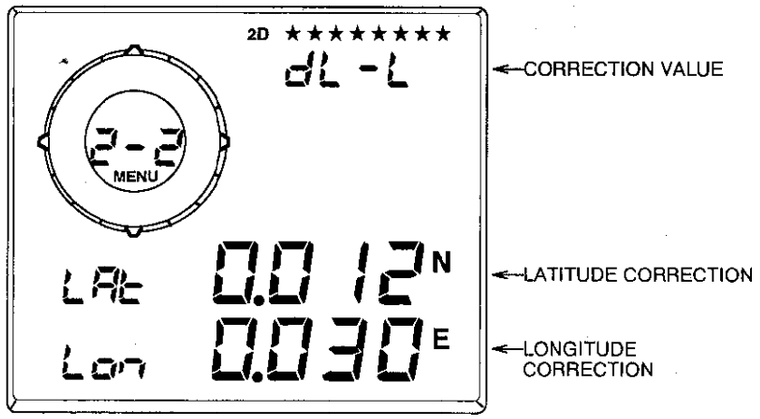


Fig. 3-4 MENU 2-2

Function

Enter a correction value for Lat/Long when a constant error is obtained in a GPS fix.

Procedure

1) Presss [FUNC] [2] [NEXT] to display menu 2-2.
2) Type latitude correction value (4 digits).
3) Press [↻] to switch N/S.
4) Press [ENT].
5) Type longitude correction value (4 digits).
6) Press [↻] to switch E/W.
7) Press [ENT].
8) To escape from menu screen, press any blue key.

Details

You may refer to chapter 9 section 2-2) "Setting Lat/Long correction value" for the detail.

3) MENU 2-3 Magnetic Variation

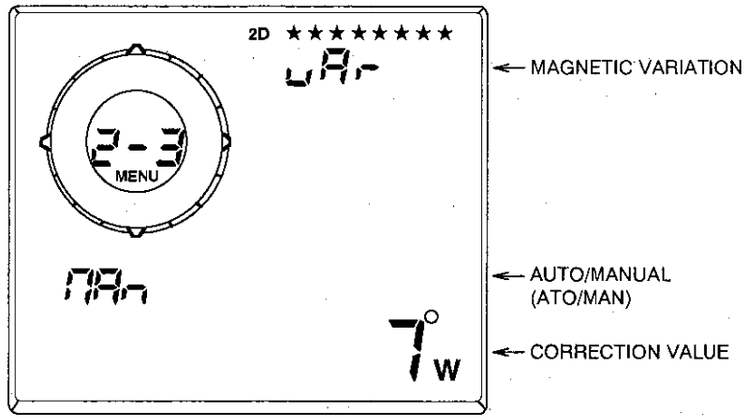


Fig. 3-5 MENU 2-3

Function

Display a magnetic bearing on the screen.

Procedure

1) Press [FUNC] [2] [NEXT] [NEXT] to display menu 2-3.
2) Press [↻] to select manual correction or automatic correction.
3) Press [ENT].
4) Automatic correction

The correction value is presented.

Manual correction

Type the correction value (3 digits).
Press [↻] to change E/W.
Press [ENT].

For true bearing presentation:

Select 0 degree on manual correction

5) To escape from menu screen, press any blue key.

Details

You may refer to chapter 9 section 2-3) "Setting magnetic variation" for the detail.

4) MENU 2-4 Smoothing

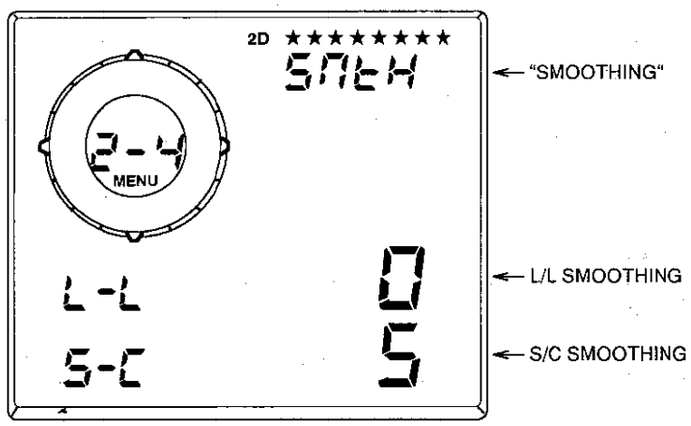


Fig. 3-6 MENU 2-4

Function

The fluctuation of the Lat/Long and the Speed/Course can be reduced by smoothing the raw GPS fixes

Procedure

1) Press [FUNC] [2] [NEXT] [NEXT] [NEXT] for menu 2-4.
2) Type a smoothing value for L-L.
3) Press [ENT].
4) Type a smoothing value for S-C.
5) Press [ENT].
6) To escape from menu screen, press any blue key.

Details

You may refer to chapter 9 section 2-4) "Setting Lat/Long & speed/course smoothing" for the detail.

5) MENU 2-5 Display Unit

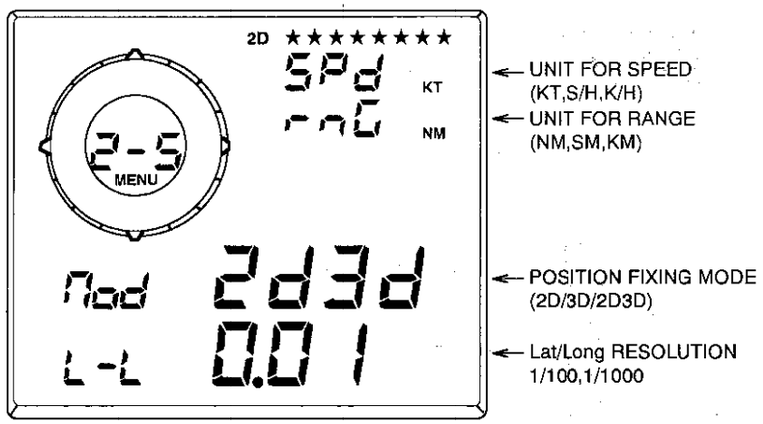


Fig. 3-7 MENU 2-5

Function

Select the unit for measurement and mode of measurement.

Procedure

1) Press [FUNC] [2] [NEXT] [NEXT] [NEXT] [NEXT] to display menu 2-5.
2) Press [↻] to select KT, S/H or K/H for speed unit.
3) Press [ENT].
4) Press [↻] to select NM, SM or KM for range unit.
5) Press [ENT].
6) Press [↻] to select position fixing mode among 2D, 3D and 2D3D for position fixing mode.
   2D : 2 dimensional position fixing.
   3D : 3 dimensional position fixing.
   2D3D : 2 and 3 dimensional position fixing automatic switching mode.
7) Press [ENT].
8) Press [↻] to select the resolution; 0.001 or 0.01.
9) Press [ENT].
10) To escape from menu screen, press any blue key.

Details

You may refer to chapter 9 section 2-5) "Selecting unit for measurement and mode of measurement" for the detail.

6) MENU 2-6 Output Data Format (Port-1)

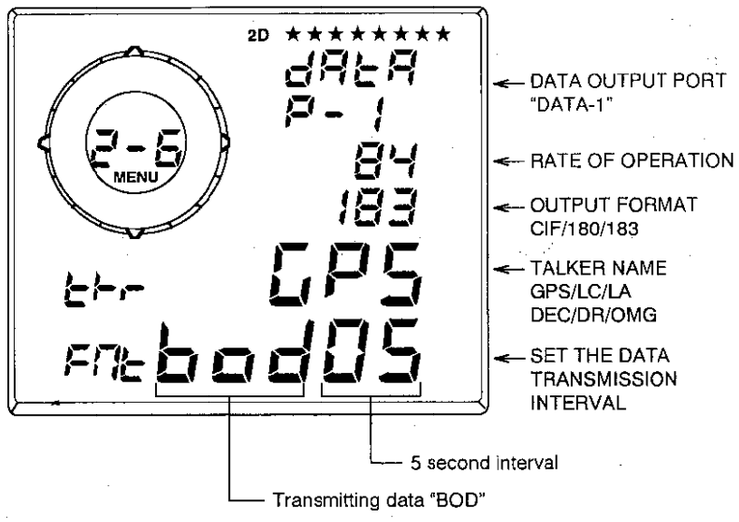


Fig. 3-8 MENU 2-6

Function

Select the data output format of "DATA-1" connector.

Procedure

1) Press FUNC 3 BACK BACK BACK BACK to display menu 2-6.
2) Press ↻ to select data output format among CIF, NMEA0183 and NMEA0180 for the data format.
3) Press ENT.
4) For CIF and NMEA0183.
   Press ↻ to select a talker name among GPS, LC, LA, DEC, DR, and OMG

   There is no talker name selection for NMEA0180.
5) Type a data transmitting interval (2 digits).

   For CIF; 00, 01, 02, 03, 04, 05, 10, 12, 15, 20, 30, 40, 50, 60 or 90

   L-L : Latitude and Longitude
   S-C : Speed and Course
   R-B : Range and Bearing
   Alt : Altitude (For 3D positioning only)

   For NMEA0183; 00, 01, 02, 03, 04, 05, 10, 12, 15, 20, 30, 40, 50 or 60

   AAM : Arrival alarm
   APA : Autopilot format A
   APB : Autopilot format B

   BOD : Bearing to TO waypoint from FROM waypoint
   BWC : Range and bearing to TO waypoint in great circle
   BWW : Bearing to TO waypoint
   GGA : Lat/Long of GPS
   GLL : Lat/Long

6) To escape from menu screen, press any blue key.

Details

You may refer to chapter 9 section 2-6) "Selecting interfaceing data" for the detail.

7) MENU 2-7 Output Data Format (Port-2)

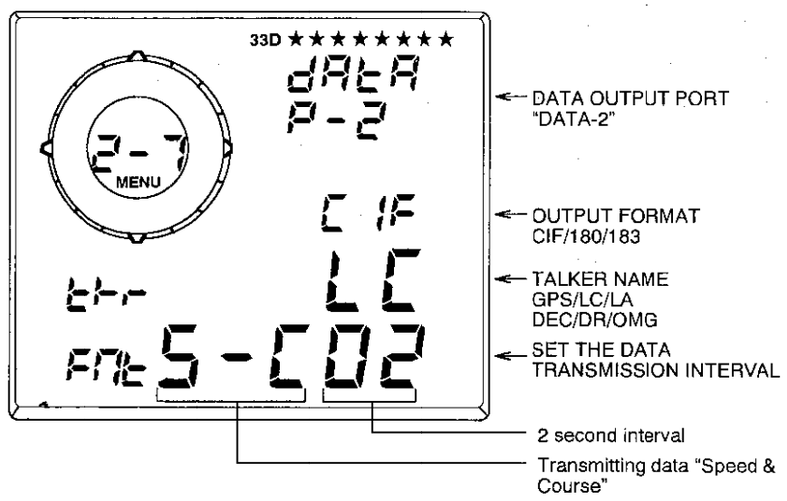


Fig. 3-9 MENU 2-7

Function

Select the data output format of "DATA-2" connector.

Procedure

1) Press [FUNC] [3] [BACK] [BACK] [BACK] to display menu 2-7.
2) Press [↻] to select data output format among CIF, NMEA0183 and NMEA0180 for the data format.
3) Press [ENT].
4) For CIF and NMEA0183.
   Press [↻] to select a talker name among GPS, LC, LA, DEC, DR, and OMG

   There is no talker name selection for NMEA0180.
5) Type a data transmitting interval (2 digits).

   For CIF; 00, 01, 02, 03, 04, 05, 10, 12, 15, 20, 30, 40, 50, 60 or 90

   L-L : Latitude and Longitude
   S-C : Speed and Course
   R-B : Range and Bearing
   Alt : Altitude (For 3D positioning only)

   For NMEA0183; 00, 01, 02, 03, 04, 05, 10, 12, 15, 20, 30, 40, 50 or 60

   AAM : Arrival alarm
   APA : Autopilot format A
   APB : Autopilot format B
   BOD : Bearing to TO waypoint from FROM waypoint

   BWC : Range and bearing to TO waypoint in great circle
   BWW : Bearing to TO waypoint
   GGA : Lat/Long of GPS
   GLL : Lat/Long

6) To escape from menu screen, press any blue key.

Details

You may refer to chapter 9 section 2-6) "Selecting interfaceing data" for the detail.

8) MENU 2-8 NAV DATA/ZOOM Display

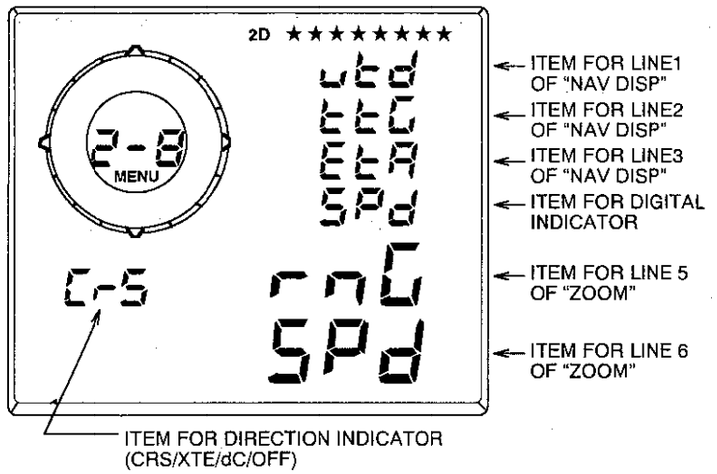


Fig. 3-10 MENU 2-8

Function

Select the desired navigational data among the following to display on LCD

RNG (Range) BRG (Bearing)
VTD (Velocity to destination)
TTG (Time to go)
ETA (Estimated time of arrival)
XTE (Cross track error)
dC (Course error)

Procedure

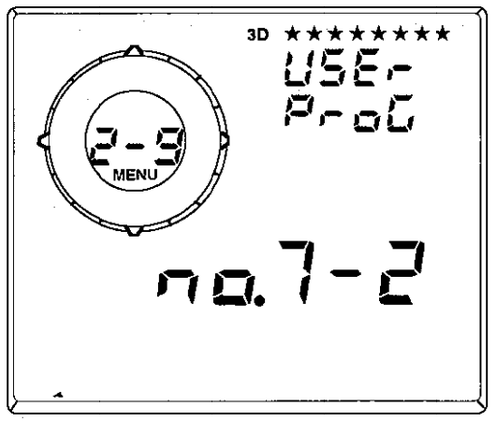
1) Press [FUNC] [3] [BACK] [BACK] to display menu 2-8.
2) Press [△] or [▽] to locate the cursor on line 1.
   The data presented on line 1 will be the data of line 1 on "NAV DATA" screen.
3) Press [↻] for desired data.
4) Press [ENT].
5) The cursor is on line 2.
   The data presented on line 2 will be the data of line 2 on "NAV DATA" screen.
6) Press [↻] for desired data.
7) Press [ENT].
8) The cursor is on line 3.
   The data presented on line 3 will be the data of line 3 on "NAV DATA" screen.
9) Press [↻] for desired data.

10) Press [ENT].
11) The cursor is on line 4.
    The data presented on line 4 will be the data of the digital indication for all the direct key screens.
12) Press [↻] for desired data.
13) Press [ENT].
14) The cursor is on left side of line 5.
    The data presented on left side of line 5 will be the data of the direction indicator for all the direct key screens.
15) Press [↻] for desired data.
16) Press [ENT].
17) The cursor is on right side of line 5.
    The data presented on right side of line 5 will be the data of line 5 on the "ZOOM" screen.
18) Press [↻] for desired data.
19) Press [ENT].
20) The cursor is on line 6.
    The data presented on line 6 will be the data of line 6 on the "ZOOM" screen.
21) To escape from menu screen, press any blue key.

Details

You may refer to chapter 4 section 4 "Displaying Navigational Data" for the detail.

9) MENU 2-9 User Program



To select
「7」「2」「ENT」

Fig. 3-11 MENU 2-9

Function

The GP-70 has 32 menu screens but most of them are not needed for daily operation. To avoid the inconvenience of pressing many keys to select the desired screen, the most often needed menu screen can be preset. Just one press of [FUNC] key displays the preset screen. The default setting of single menu mode is menu 7-2 (Satellite number display screen).

Presetting Menu Screen

Procedure

1) Confirm that the GP-70 is in full menu mode.
   If not, follow the sequence "To change the mode" on page 2-14. To figure out which menu mode GP-70 is in, refer to "Difference between two modes" on page 2-14.
2) Press [FUNC] [3] [BACK] to display menu 2-9.
3) Key in the desired menu number (two digits).
4) Press [ENT] key.
5) To escape from menu screen, press any blue key.

Details

You may refer to chapter 2 section 8 "Single Menu Mode" for the detail.

3 Alarm

1) MENU 3-1 Arrival / Anchor Watch

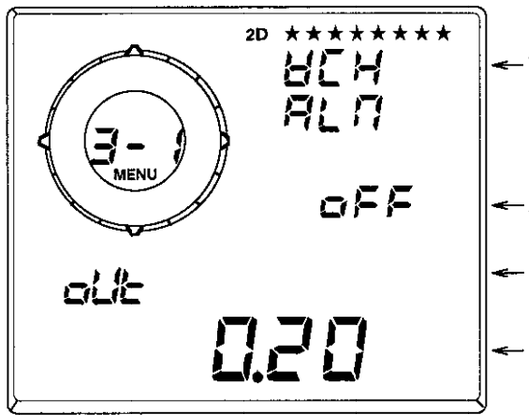


Fig. 3-12 MENU 3-1

Function

Set the range for arrival or anchor wach alarm.

Arrival alarm: The alarm sounds when the ship enters into a zone on the TO waypoint

Anchor wach alarm: The alarm sounds when the ship leaves the alarm zone on the TO waypoint

Procedure

1) Press [FUNC] [3] to display menu 3-1.
2) Press [↻] to switch the alarm function on or off.
3) Press [ENT].
4) Press [↻] to select "**IN**" (or "**OUT**").
5) Type an alarm range (3 digits).
6) To escape from menu screen, press any blue key.

Details

You may refer to chapter 6 section 1-1) "Anchor watch/Arrival" for the detail.

2) MENU 3-2 Border / Cross Track Error

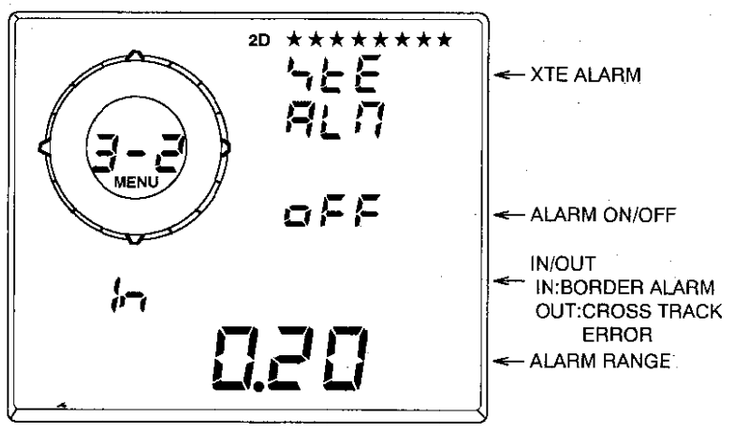


Fig. 3-13 MENU 3-2

Function

Set the border or cross track error alarm range.

Border alarm: The alarm sounds when the ship enters into a zone selected by FROM and TO waypoints.

Cross track eror alarm: The alarm sounds when the cross track error exceeds the alarm range.

Procedure

1) Press [FUNC] [3] [NEXT] to display menu 3-2.
2) Press [↵] to switch the alarm function on or off.
3) Press [ENT].
4) Press [↵] to select "**IN**" (or "**OUT**").
5) Type a alarm range (3 digits).
6) To escape from menu screen, press any blue key.

Details

You may refer to chapter 6 section 1-2) "Cross track error (XTE)/Border" for the detail.

3) MENU 3-3 Ship's Speed

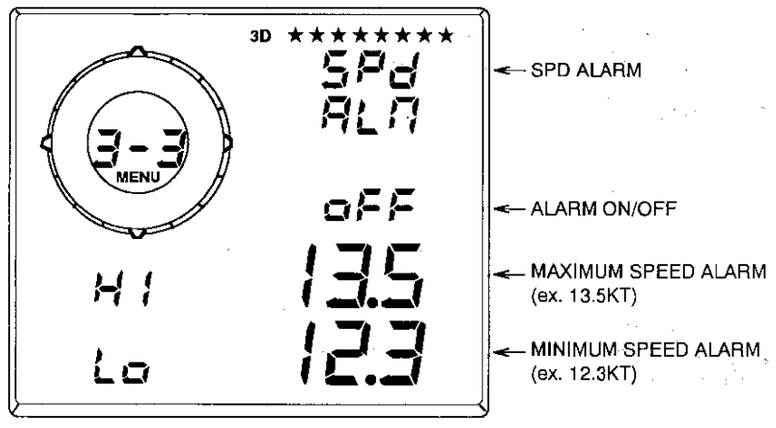


Fig. 3-14 MENU 3-3

Function

The maximum speed alarm sounds when the ship runs faster than the preset value.

The minimum speed alarm sounds when the ship runs slower than the preset value.

When the maximum speed alarm preset value is lower than minimum speed preset value, the alarm sounds when the ship runs at the speed between two values.

Procedure

1) Press [FUNC] [3] [NEXT] [NEXT] to display menu 3-3.
2) Press [↵] to switch the alarm function on or off.
3) Press [ENT].
4) Type maximum speed (4 digits).
5) Press [ENT].
6) Type minimum speed (4 digits).
7) Press [ENT].
8) To escape from menu screen, press any blue key.

Details

You may refer to chapter 6 section 1-3) "Max. speed/Min. speed" for the detail.

4) MENU 3-4 Buzzer Loudness

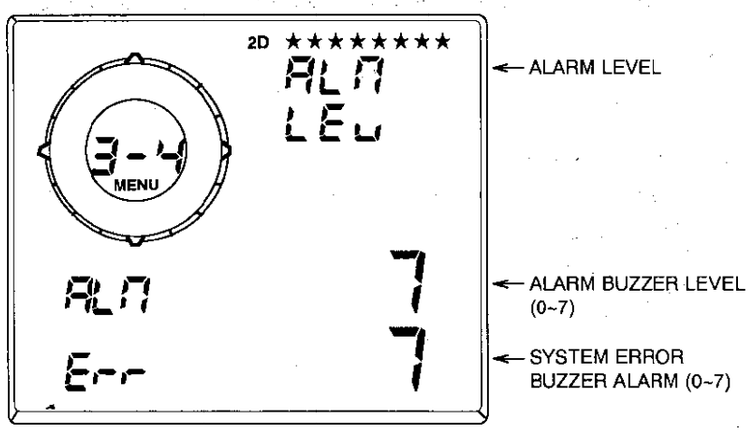


Fig. 3-15 MENU 3-4

Function

Set the alarm buzzer loudness for desired level.

Procedure

You can select alarm buzzer volume for alarm and system error on menu 3-3.

1) Press [FUNC] [3] [NEXT] [NEXT] [NEXT] to display menu 3-4.
2) Type desired alarm level for alarm (Arrival/Anchor/Border/Cross Track Error).
3) Press [ENT].
4) Type desired alarm level for system error.
5) Press [ENT].
6) To escape from menu screen, press any blue key.

Details

You may refer to chapter 6 section 2 "Alarm Level" for the detail.

4 Route

1) MENU 4-1 Register

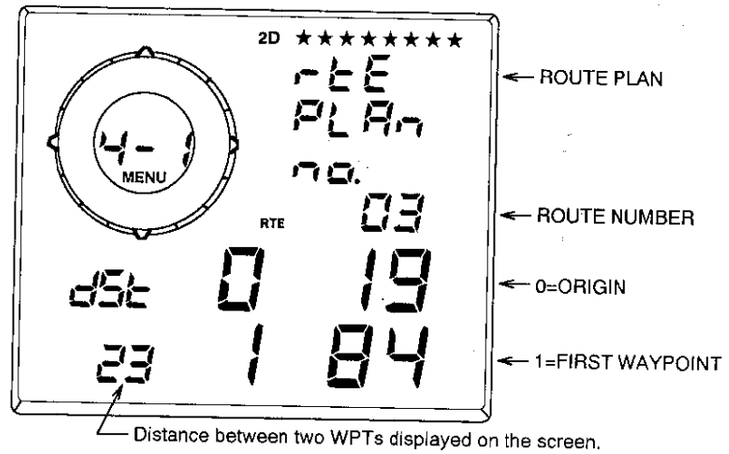


Fig. 3-16 MENU 4-1

Function

Register waypoints in route memory for route navigation. The GP-70 stores up to 10 routes.

Procedure

1) Press [FUNC] [4] to display menu 4-1.
2) Type a route number (2 digits),
3) Press [ENT].
4) Type waypoint number (2 digits).
5) Press [ENT].
6) The distance between the two waypoints presented on the screen appears on the left-hand side of the 6th line.
7) Repeat steps 4 and 5 to complete the route. You can register up to 10 waypoints .
8) The total distance of the route appears on the screen.
9) To escape from menu screen, press any blue key.

Details

You may refer to chapter 5 section 1-1) "Registering waypoints in a route" for the detail.

2) MENU 4-2 Select

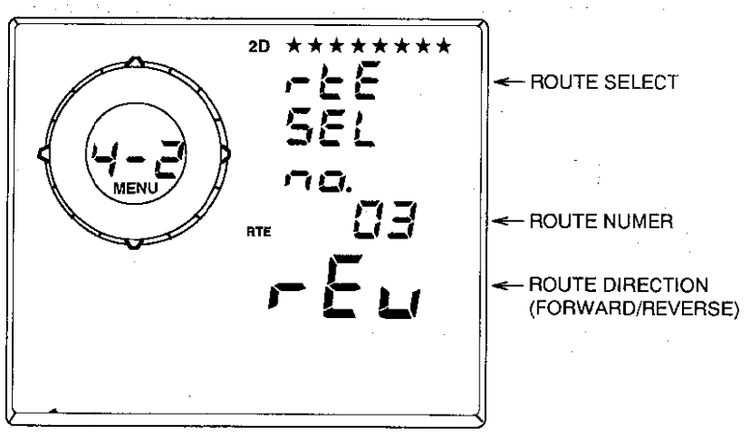


Fig. 3-17 MENU 4-2

Function

Select one route number from the route memory you have registered. The FROM and TO waypoints automatically switches to follow the waypoints consisting the route.

Procedure

1) Press [FUNC] [4] [NEXT] to display menu 4-2.
2) Type a route number (2 digits).
3) Press [ENT].
4) Press [↻] to change the route direction, forward or reverse.
5) Press [ENT].
6) To escape from menu screen, press any blue key.

Details

You may refer to chapter 5 section 2 "Selecting a Route" for the detail.

5 Calculation

1) MENU 5-1 Distance

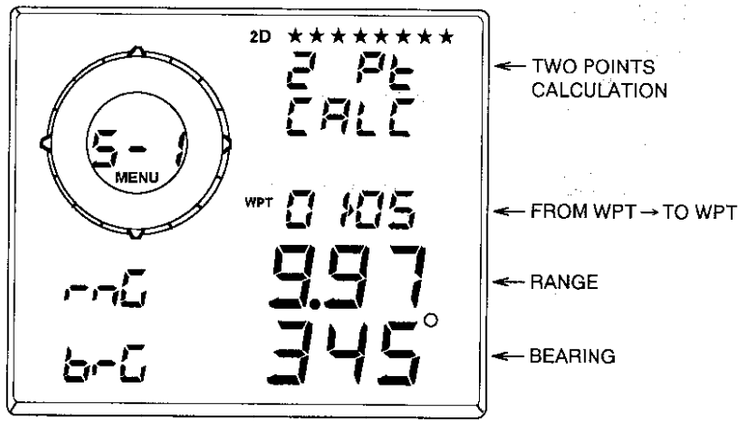


Fig. 3-18 MENU 5-1

Function

The calculation of the range and the bearing between two waypoints can be done. The range and bearing are calculated in great circule.

Procedure

1) Press [FUNC] [5] to display menu 5-1.
2) Type a FROM waypoint number using two digits.
3) Type a To waypoint number using two digits.
4) Press [ENT]
5) The calculated range and bearing are presented on the screen.

Details

You may refer to chapter 4 section 5-1) "Distance calculation" for the detail.

2) MENU 5-2 Register Waypoint by Range and Bearing

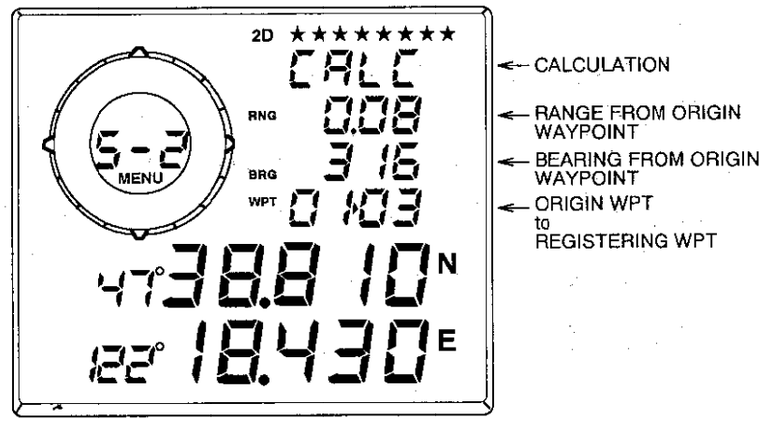


Fig. 3-19 MENU 5-2

Function

The calculation of the Lat/Long based on the range and the bearing from origin waypoint can be done. The range and bearing are calculated in great circule.

Procedure

1) Press [FUNC] [5] [NEXT] to display menu 5-2.
2) Type range from FROM waypoint using 4 digits.
3) Press [ENT].
4) Type bearing from FROM waypoint using 4 digits.
5) Press [ENT].
6) Type FROM waypoint and a waypoint number (2 digits each).
7) Press [ENT].
8) The Lat/Long presented on screen is the calculated position.
9) The data is stored in the waypoint memory automatically.
10) To escape, press any blue key.

Details

You may refer to chapter 4 section 1-3) "By range/bearing" for the detail.

3) MENU 5-3 Manual ETA

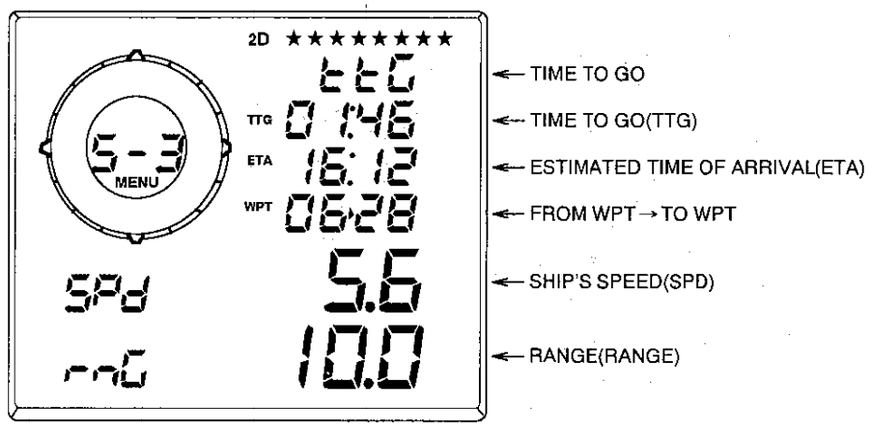


Fig. 3-20 MENU 5-3

Function

You may calculate the estimated time of arrival (ETA) between two waypoints.
The ETA presented on STD display or ZOOM display upon preset is automatic ETA. The difference between automatic and manual ETA is the ship's speed used for caluculation. For manual ETA you need to key in the ship's speed. The automatic ETA uses the ship's speed calculated inside the GP-70 automatically. In rough sea, result of the automatic ETA is unstable as the ship's speed is unsettled. In such a case manual ETA can be used for better presentation.

Procedure

1) Press [FUNC] [5] [NEXT] to display menu 5-2.
2) Type a FROM waypoint number using two digits.
3) Type a To waypoint number using two digits.
4) Press [ENT]
5) Type a ship's speed using three digits.
6) Press [ENT]
7) The calculated ETA is presented on the screen.

Details

You may refer to chapter 4 section 5-2) "Manual estimated time of arrival calculation" for the detail.

6 Future Position-Fixing Schedule

1) MENU 6-1 Future Position-Fixing Schedule

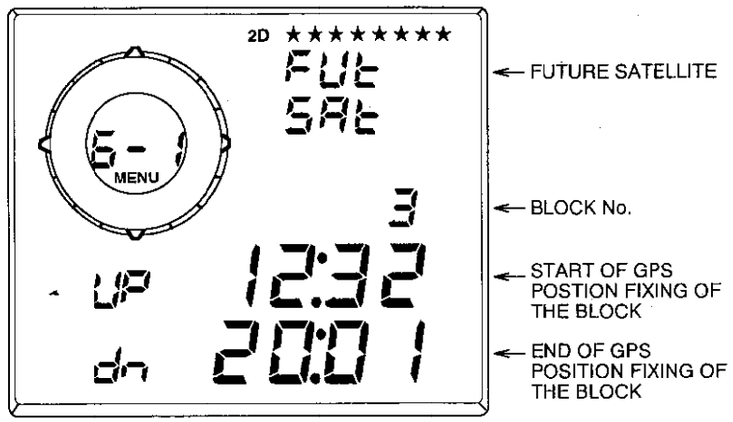


Fig. 3-21 MENU 1-1

Function

Each time you get a GPS fix, the GP-70 calculates a future position fixing schedule.

Procedure

1) Press [FUNC] [6] to display menu 6-1.
2) The position fixing schedule appears on the screen.
3) Press [△] or [▽] to scroll the presentation. Up to six periods are available.
4) To escape, press any blue key.

NOTE: 1) Prediction is made based on the almanac. The lower (more strict) the DOP threshold setting, the shorter are the position fixing periods.
2) Up to six periods within 24 hours can be presented.
3) Each position fixing period advances about 4 minutes a day.
4) During GPS position-fixing, the presentation is updated every 15 minutes approx. If the Lat/Long or DOP threshold is entered when GPS position fixing is not performed, the presentation will be updated 3 to 4 minutes later.

Details

You may refer to chapter 2 section 9 "Displaying Future Position-Fixing Schedule" for the detail.

7 SV Condition

1) MENU 7-1 DOP/Noise Level/Frequency Deviation

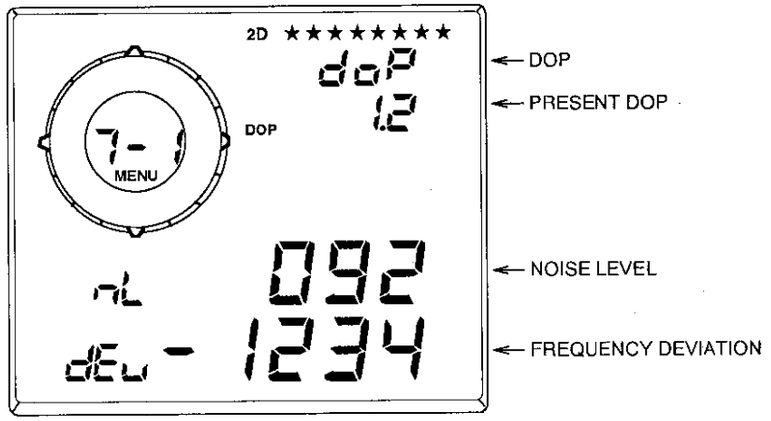


Fig. 3-22 MENU 1-1

Function

The present receiving condition are presented.

Procedure

1) Press [FUNC] [7] to display menu 7-1.
2) The present DOP, noise level and frequency deviation appear on the screen.
3) To escape, press any blue key.

Details

You may refer to chapter 8 section 1-1) "Receiving-satellite's condition" for the detail.

2) MENU 7-2 Satellite Number

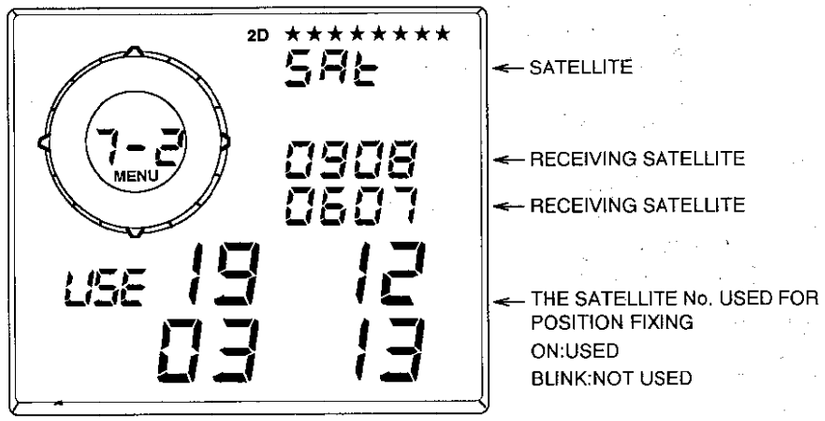


Fig. 3-23 MENU 7-2

Function

The numbers of the satellite presently available are presented.

Procedure

1) Press [FUNC] [7] [NEXT] to display menu 7-2.
2) The satellites presently available appears on the screen.
3) To escape, press any blue key.

Details

You may refer to chapter 8 section 1-2) "Receiving-satellite's number" for the detail.

3) MENU 7-3 Azimuth/Elevation/Signal Level

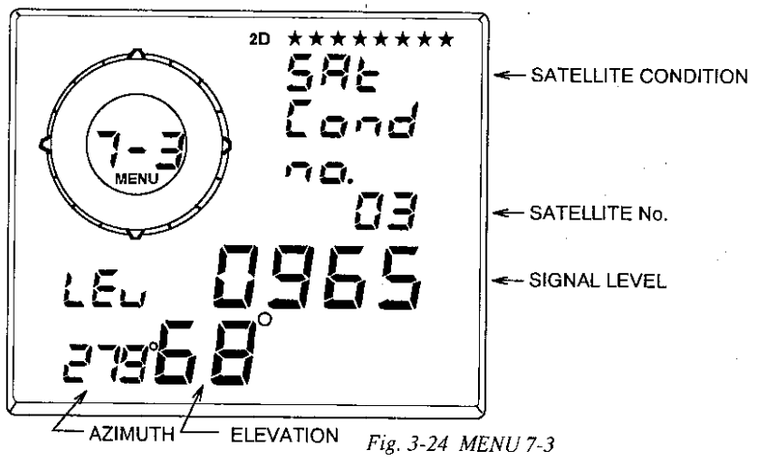


Fig. 3-24 MENU 7-3

Function

The signal level, azimuth and elevation of the satellites presently available are presented.

Procedure

1) Press [FUNC] [7] [NEXT] [NEXT] to display menu 7-3.
2) A satellite number and the signal level, azimuth, elevation of the satellite appear on the screen.
3) Press [△] or [▽] to scroll the satellite number.
4) To escape, press any blue key.

Details

You may refer to chapter 8 section 1-3) "Displaying the receiving signal level of each satellite" for the detail.

8 Almanac

1) MENU 8-1 Cold Start

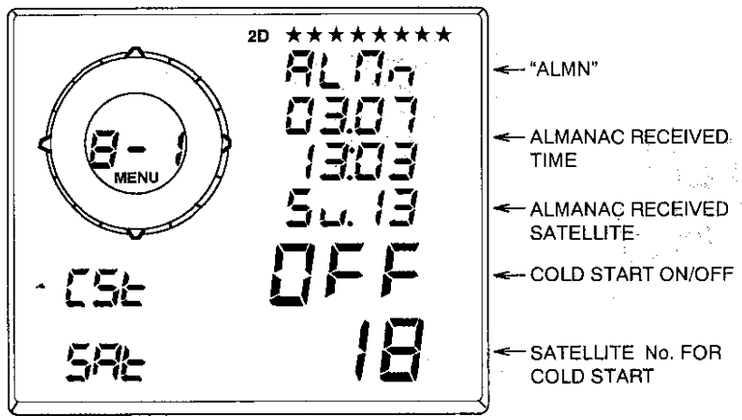


Fig. 3-25 MENU 8-1

Function

The screen to start the cold start.

Procedure

1) Press [FUNC] [8] to display menu 8-1.
2) Almanac data is presented on the screen.
3) Press [↻] to change "**OFF**" to "**ON**".
4) Press [ENT] .
5) Type an available satellite number.
6) Press [ENT] .
7) To escape from menu screen, press any blue key.

Details

You may refer to chapter 8 section 6 "Cold Start" for the detail.

2) MENU 8-2 Healthiness/Usability

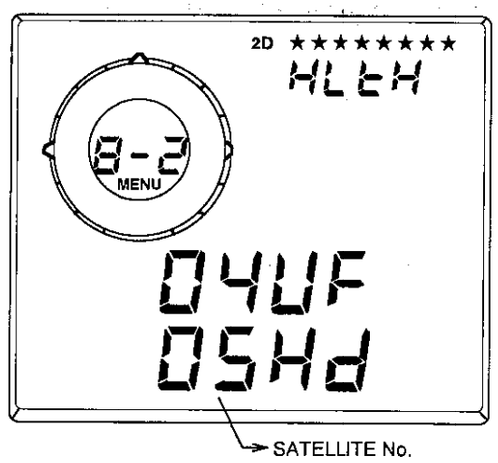


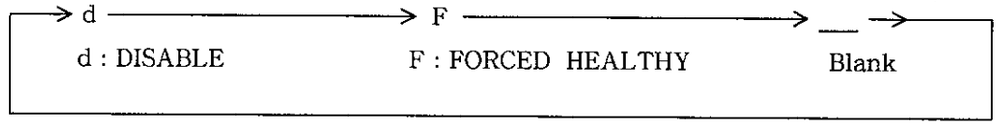
Fig. 3-26 MENU 8-2

Function

The health of the satellite is presented on the screen.

Procedure

1) Press [FUNC] [2] [NEXT] to display menu 8-2.
2) A satellite number and its condition appears.
3) Press [△] or [▽] to scroll the satellite number.
   H : Healthy
   U : Unhealthy
4) To disable a healthy satellite or force health an unhealthy satellite, press [△] or [▽] to scroll the satellite number.
5) Press [↻] to change F, D, _.
   F : Forced health
   D : Disable
   _ : Leave the condition as it is



6) To escape from menu screen, press any blue key.

Details

You may refer to chapter 8 section 1-3) "Displaying the health of each satellite" for the detail.

9 Time

1) MENU 9-1 Present Time/Altitude

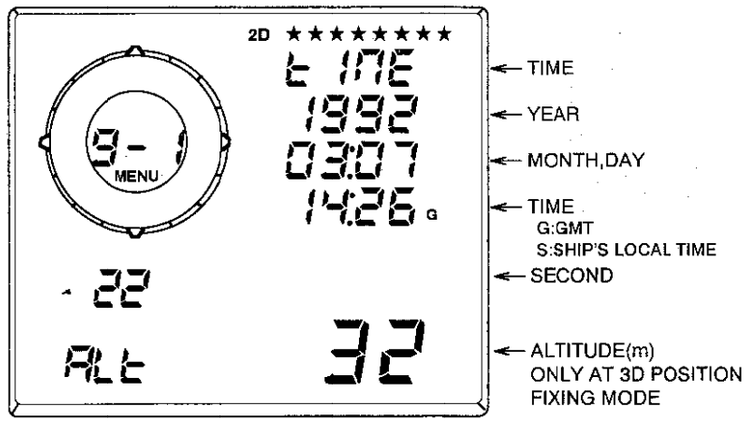


Fig. 3-22 MENU 9-1

Function

The present data, time and the altitude in meter is presented on the screen.

Procedure

1) Press [FUNC] [9] to display menu 9-1.
2) The present data, time and the altitude in meter is presented on the screen.
3) To escape from menu screen, press any blue key.

Details

You may refer to chapter 2 section 9 "Displaying Present Position and Altitude" for the detail.

2) MENU 9-2 Trip Distance/Trip Alarm

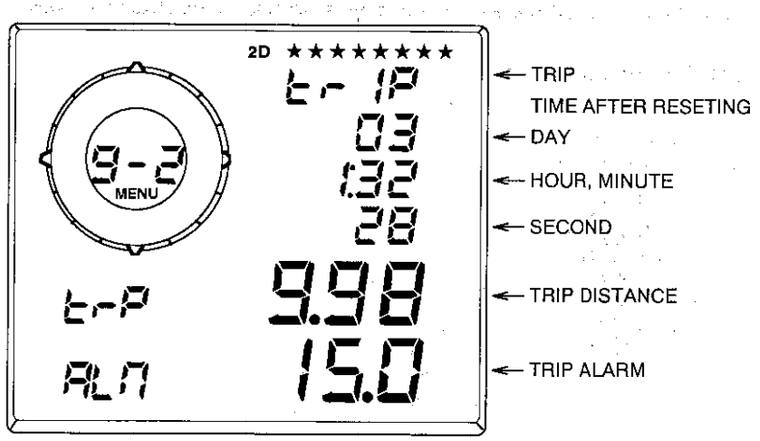


Fig. 3-28 MENU 9-2

Function

The integrated distance after reset and the distance to sound the alarm is presented on the screen.

Procedure

1) Press [FUNC] [9] [NEXT] to display menu 9-2.
2) The passage time after the reset is presented on the screen.
3) The trip distance integrated after the reset is presented on the screen.
4) Press [△] or [▽] to locate the cursor to the trip distance.
5) Press [CLR] [ENT] to reset the trip distance.
6) The trip distance is integrated automatically.
7) Type the value for the trip alarm using five digits.
8) The alarm sounds when the integrated trip distance reaches the preset value
9) To escape from menu screen, press any blue key.

Details

You may refer to chapter 6 section 1 "Alarms" for the detail

10 Test

1) MENU 0-1 Program Version

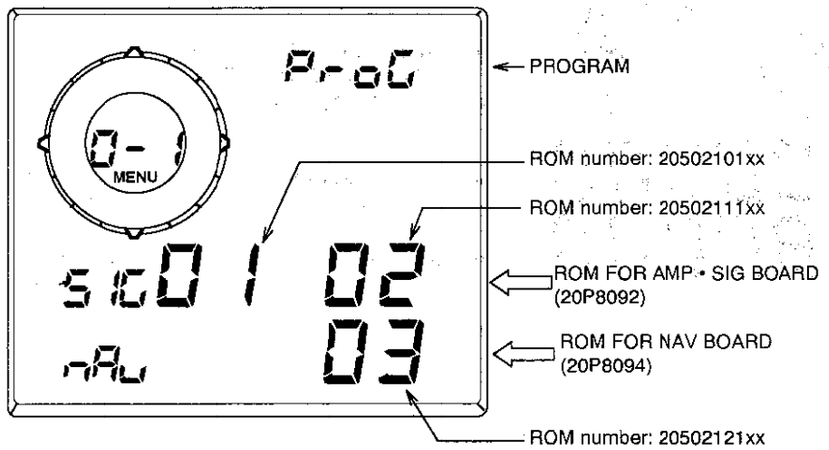


Fig. 3-29 MENU 0-1

Function

The ROM versions installed in the GP-70 are presented. The ROM versions on the screen are the "xx"s of the ROM numbers on fig. 3-29.

Procedure

1) Press FUNC 0 to display menu 0-1.
2) The program versions for each ROM appear on the screen.
3) To escape, press any blue key.

Details

You may refer to chapter 8 section 2 "Program Version" for the detail.

2) MENU 0-2 Selftest

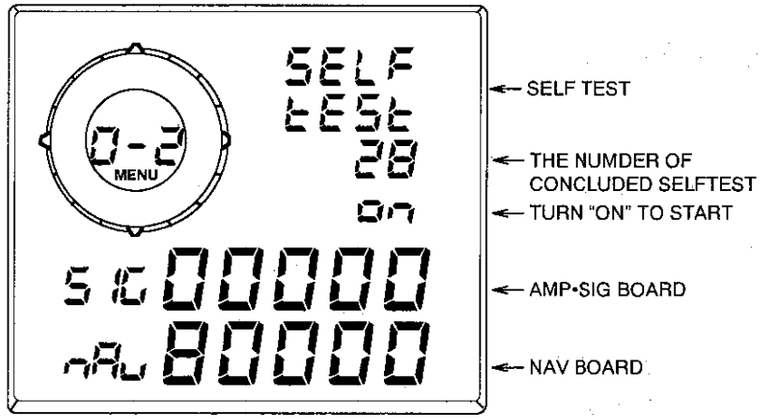


Fig. 3-30 MENU 0-2

Function

The GP-70 employs selftest to check it for proper operation.

Procedure

1) Press FUNC 0 NEXT to display menu 0-2.
2) Press ↻ to display "**ON**".
3) Press ENT.
4) Continuously selftests.
5) The number of times the selftest is conducted appears on line 3.
6) Results of the selftest appears on line 5 and 6.
7) To quit the selftest, turn off the equipment.

Details

You may refer to chapter 8 section 3 "Selftest" for the detail.

3) MENU 0-3 Memory Clear

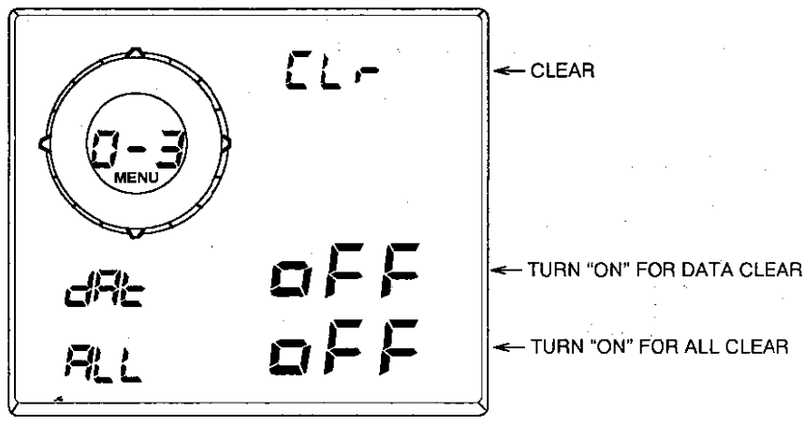


Fig. 3-31 MENU 0-3

Function

The memory clear is required when the contents of the RAM is destroyed or the almanac is older than a year.

Procedure

1) Press [FUNC] [0] [NEXT] [NEXT] to display menu 0-3.
2) To clear part of the memory. Refer to the table below.
   Press [△] or [▽] to move the cursor to "**DAT**".
   Press [↻] to change the display "**ON**".
   Press [ENT].
3) To clear all the memory.
   Press [△] or [▽] to move the cursor to "**ALL**".
   Press [↻] to change the display to "**ON**".
   Press [ENT].
4) To escape from the menu screen, press any blue key.

Cleared data at "**Data Clear**".

- Route data
- Navigational data (Waypoint data, Trip data)
- Alarm data (Alarm range, Alarm settings)
- Event position data

Data not cleared at "**Data Clear**".

- Initial setting (Menu 1-1, 1-2)

- Geodetic datum selected (Menu 2-1)

Details

You may refer to chapter 8 section 5 "Memory Clear" for the detail.

4) MENU 0-4 Key/LCD Test

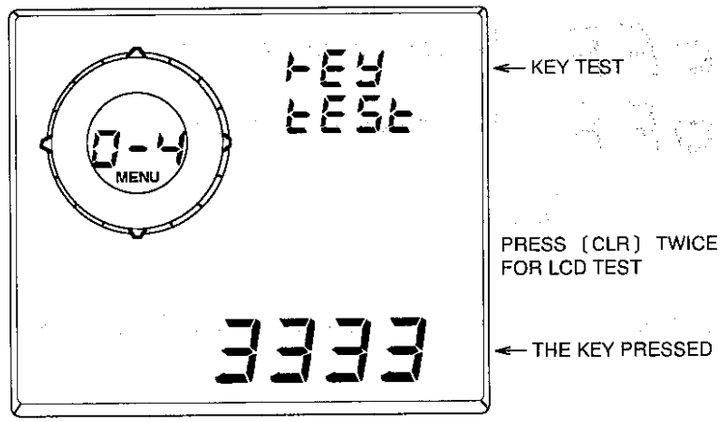


Fig. 3-1 MENU 1-1

Function

This test checks the keyboard and the LCD for proper operation.

Procedure

1) Press [FUNC] [0] [NEXT] [NEXT] [NEXT] to display menu 0-4.
2) Press [↻] to switch the selftest function on (or off)
3) Press [ENT].
4) Press each key one by one. The key pressed appears on the display if the key is functioning properly.
5) Press [CLR] [CLR] for LCD test.
6) All LCD segments should turn on.
7) To escape from the LCD test screen, press any blue key.

Details

You may refer to chapter 8 section 4 "Keyboard/LCD Test" for the detail.

Chapter 4 HANDLING WAYPOINTS

In navigational terminology, a particular location is known as a waypoint whether it be an origin, a destination or an intermediate point. The GP-70 stores up to 99 waypoints.

1 Registering Waypoints

1) By Lat/Long

1) Press [WPT].

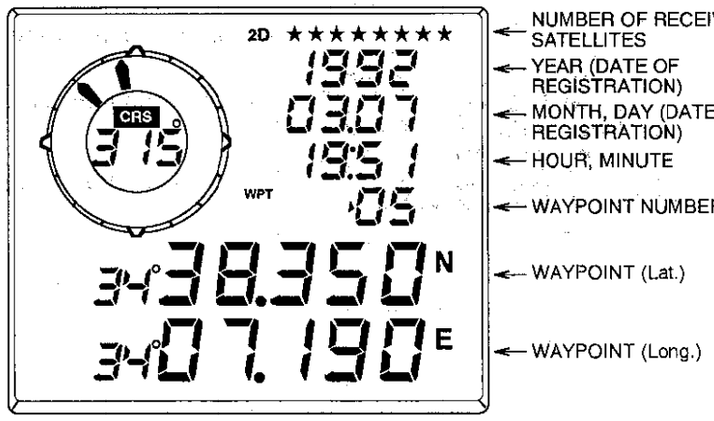


Fig. 4-1 Waypoint Entry Screen

2) Type a waypoint memory number using two digits.
3) Press [ENT].
4) Type the Latitude of waypoint.
5) Press [ENT].
6) Type the Longitude of waypoint.
7) Press [ENT].
8) The date and time at this moment are memorized automatically.

Another way to select a waypoint number.

After pressing [WPT] key, press [NEXT] or [BACK] key for desired waypoint number.

2) By event position

By event data into waypoint memory

1) Press [SAVE] to save event position data.

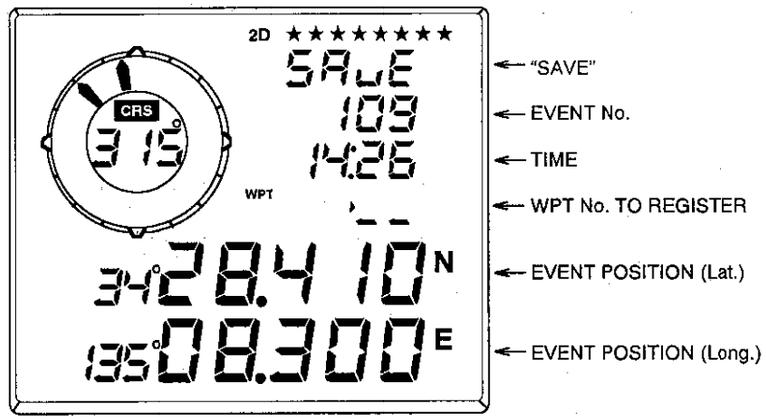


Fig. 4-2 Save Screen

2) Type the waypoint memory number in two digits.
3) Press [ENT].

Recalling an event position

Press [RCL]. The latest event data appears. Press [NEXT] or [BACK] to call up the desired event position data.

Registering stored event data into the waypoint memory

1) Press [RCL] followed by [NEXT] or [BACK] to recall the event data.

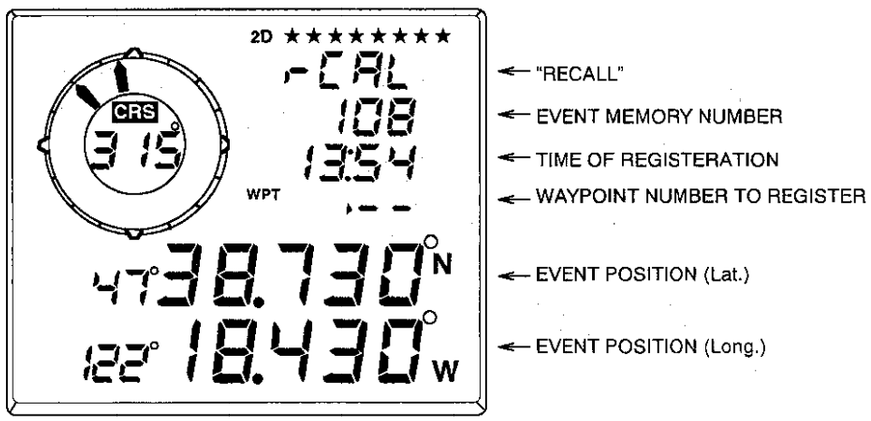


Fig. 4-3 Recall Screen

2) Type a waypoint memory number in two digits.
3) Press [ENT].
4) Press [FUNC] [NEXT] to display menu 5-2.

3) By range/bearing

You may register a latitude and longitude position calculated by range and bearing from the FROM waypoint into the waypoint memory. The data is stored into the memory number selected as destination.

Procedure

1) Press [FUNC] [5] [NEXT] to display menu 5-2.

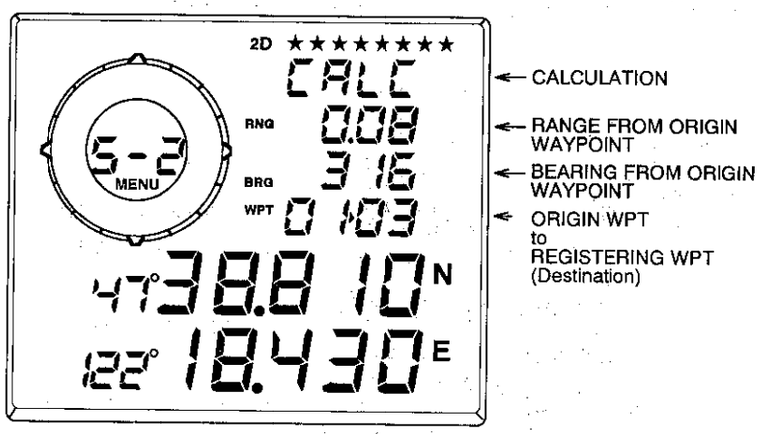


Fig. 4-4 Calcultion Screen

2) Type range from FROM waypoint using 4 digits.
3) Press [ENT].
4) Type bearing from FROM waypoint using 4 digits.
5) Press [ENT].
6) Type FROM waypoint and a waypoint number (2 digits each).
7) Press [ENT].
8) The Lat/Long presented on screen is the calculated position. The calculation is great circle.
9) The data is stored in the waypoint memory automatically.
10) To escape, press any blue key.

2 Displaying Waypoint Data

1) Press [WPT].
2) Type a waypoint number (two digits).

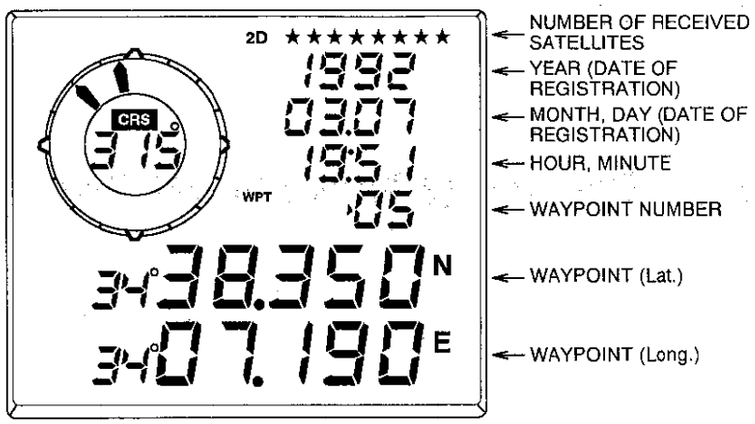


Fig. 4-5 Waypoint Screen

3 Waypoint Navigation

1) Selecting FROM and TO waypoint

To start waypoint navigation from present position.

1) Press [FR/TO].
2) Type a TO waypoint number (two digits).
3) Press [ENT].
4) The previous screen appears.

To start waypoint navigation from a position other than current position.

1) Press [FR/TO].
2) Press [CLR].
3) Type a FROM waypoint number (two digits).

4) Type a TO waypoint number (two digits).
5) Press [ENT].
6) The previous screen appears.

To quit waypoint navigation.

1) Press [FR/TO].
2) Press [CLR] then [ENT].
3) The previous screen appears.

4 Displaying Navigational Data

The following data is calculated using the selected FROM and TO waypoints.

RNG (Range) ..... Displayed on "**STD DISP**" screen.
BRG (Bearing) ..... Displayed on "**STD DISP**" screen.
VTD (Velocity to destination)
TTG (Time to go)
ETA (Estimated time of arrival)
XTE (Cross track error)
dC (Course error)
} Appear on "**NAV DATA**", "**ZOOM**" screen. Select them on menu 2-8

To present VTD, TTG, ETA, XTE, dC;

Press [FUNC] [2] [NEXT] [NEXT] [NEXT] [NEXT] [NEXT] [NEXT] [NEXT] to display menu 2-8.

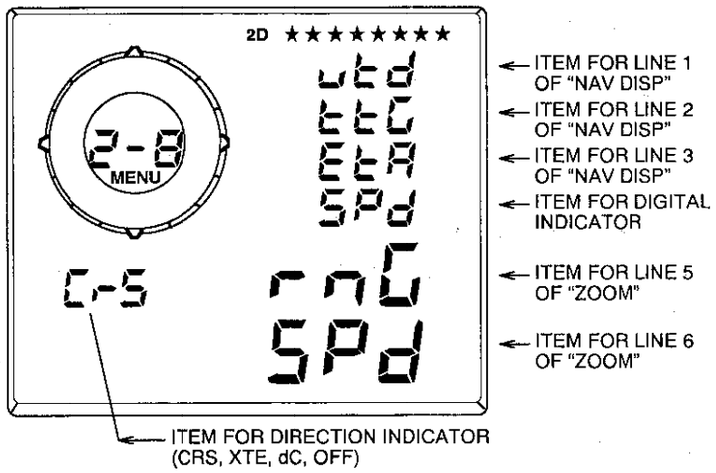


Fig. 4-6 Navigational Data Screen

Press [△] or [▽] to position the cursor on line 1.

The data presented on line 1 will be the data of line 1 on "**NAV DATA**" screen.

Press [↻] for desired data.

Press [ENT].

The cursor is on line 2.

The data presented on line 2 will be the data of line 2 on "**NAV DATA**" screen.

Press [↻] for desired data.

Press [ENT].

The cursor is on line 3.

The data presented on line 3 will be the data of line 3 on "**NAV DATA**" screen.

Press [↻] for desired data.

Press [ENT].

The cursor is on line 4.

The data presented on line 4 will be the data of the digital indication for all the direct key screens.

Press [↻] for desired data.

Press [ENT].

The cursor is on left side of line 5.

The data presented on left side of line 5 will be the data of the direction indicator for all the direct key screens.

Press [↻] for desired data.

Press [ENT].

The cursor is on right side of line 5.

The data presented on right side of line 5 is the data of line 5 on the "**ZOOM**" screen.

Press [↻] for desired data.

Press [ENT].

The cursor is on line 6.

The data presented on line 6 is the data of line 6 on the "**ZOOM**" screen.

5 Navigational Calculation

1) Distance calculation

You can calculate the distance and the bearing between two waypoints.

Procedure

1) Press [FUNC] [5] to display menu 5-1.

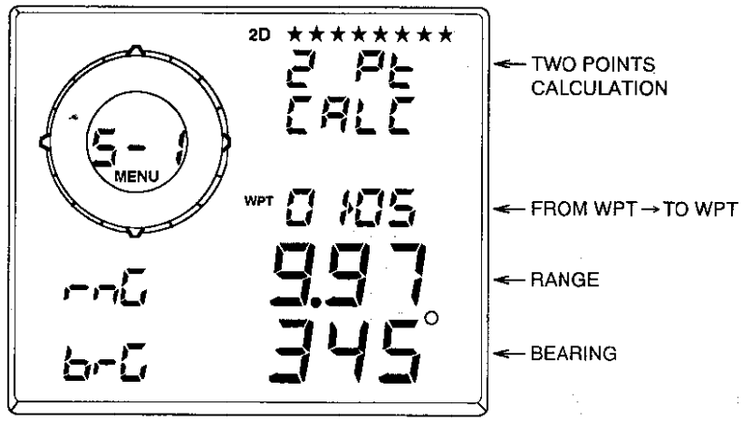


Fig. 4-6 Navigational Data Screen

2) Type a FROM waypoint number using two digits.
3) Type a To waypoint number using two digits.
4) Press [ENT]
5) The calculated range and bearing are presented on the screen.
   The range and bearing are calculated in great circule.

2) Manual estimated time of arrival (ETA) calculation

You may calculate the estimated time of arrival (ETA) between two waypoints.
The ETA presented on STD display or ZOOM display upon preset is automatic ETA. The difference between automatic and manual ETA is the ship's speed used for caluculation. For manual ETA you need to key in the ship's speed. The automatic ETA uses the ship's speed calculated inside the GP-70 automatically. In rough sea, result of the automatic ETA is unstable as the ship's speed is unsettled. In such a case manual ETA can be used for better presentation.

Procedure

1) Press [FUNC] [5] [NEXT] to display menu 5-2.

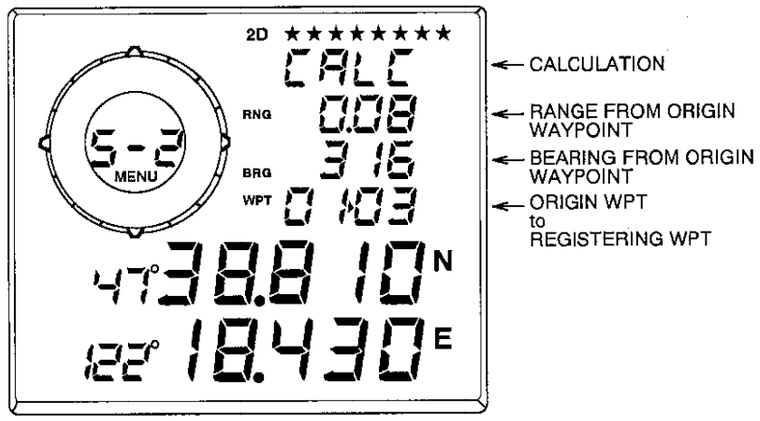


Fig. 4-6 Navigational Data Screen

2) Type a FROM waypoint number using two digits.
3) Type a To waypoint number using two digits.
4) Press [ENT]
5) Type a ship's speed using three digits.
6) Press [ENT]
7) The calculated ETA is presented on the screen.
   The calculation is great circle.

Chapter 5 HANDLING ROUTES

This chapter describes how to select a route and follow it. A route consists of several waypoints, which you navigate to one after another.

In the route below, for example;

•While sailing segment "**A**", 19/64 are selected as FROM/TO waypoints.

•While sailing segment "**B**", 64/03 are selected as FROM/TO waypoints.

•While sailing segment "**C**", 03/77 are selected as FROM/TO waypoints.

While following a route, FROM and TO waypoints are automatically switched. This is done when the ship reaches the range of arrival alarm.

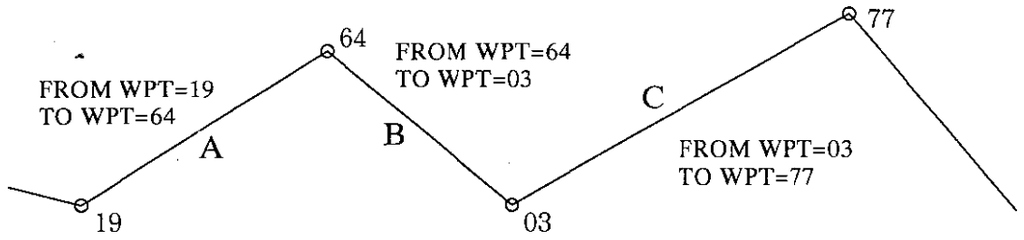


Fig. 5-1 Sample Route

The GP-70 stores up to 10 routes.

1 Registering Routes

A route consists of at least three waypoints; an origin, intermediate and destination waypoint.

1) Registering waypoints in a route

1) Press [FUNC] [4] to display menu 4-1.
2) Type a route number (2 digits).
3) Press [ENT].
4) Type waypoint number (2 digits).
5) Press [ENT].
6) The distance between the two waypoints presented on the screen appears on the left-hand side of the 6th line.

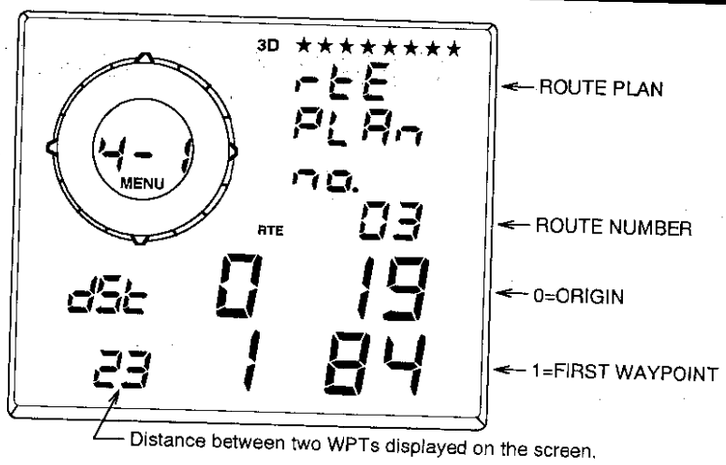


Fig. 5-2 Route Entry Screen

7) Repeat steps 4 and 5 to complete the route. You can register up to 10 waypoints.
8) The total distance of the route appears on the screen.
9) To escape from menu screen, press any blue key.

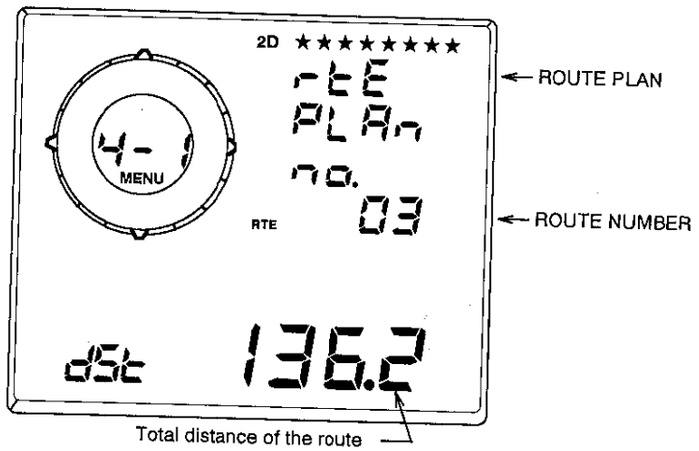


Fig. 5-3 Route Entry Sceen, Showing Total Distance of Route

2) Temporarily omitting a waypoint from a route

1) Press [FUNC] [4] to display menu 4-1.
2) Type a route number (2 digits).
3) Press [ENT].
4) Press [△] or [▽] to move the cursor to the waypoint you want to temporarily omit.
5) Press [↻].
6) Press [ENT].
7) To escape from menu screen, press any blue key.

3) Restoring a temporarily omitted waypoint to a route

1) Press [FUNC] [4] to display menu 4-1. Press [NEXT] or [BACK] for menu 4-1.
2) Type a route number (2 digits).
3) Press [ENT].
4) Press [△] or [▽] to move the cursor to waypoint you want to restore.
5) Press [↻].
6) Press [ENT].
7) To escape from menu screen, press any blue key.

4) Delete a waypoint from a route

You can not delete individual waypoints.

2 Selecting a Route

Procedure

1) Press [FUNC] [4] [NEXT] to display menu 4-2.

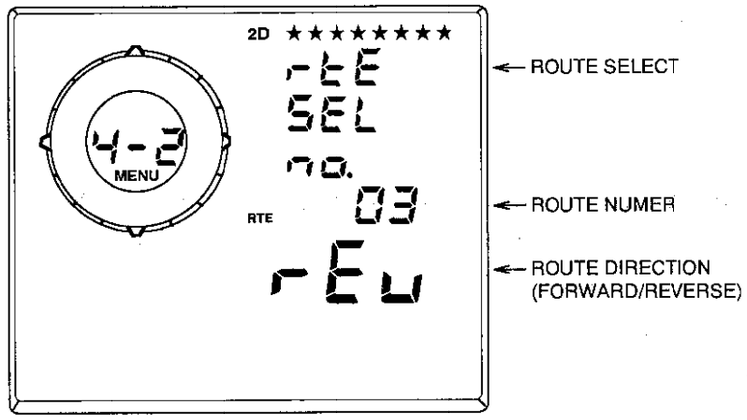


Fig. 5-4 Route Selection Screen

2) Type a route number (2 digits).
3) Press [ENT].
4) Press [↻] to change the route direction, forward or reverse.
5) Press [ENT].
6) To escape from menu screen, press any blue key.

Chapter 6 ALARM FUNCTION

This chapter describes the conditions which can trigger both audible and visual alarms in the GP-70. When the audible alarm sounds you can silence it by pressing the CLR key. The visible alarm remains the screen until the cause of the alarm is removed.

1 Alarms

The GP-70 incorporates five alarms;
•ANCHOR WATCH or ARRIVAL
•CROSS-TRACK ERROR or BORDER
•MAXIMUM SPEED
•MINIMUM SPEED
•TIP DISTANCE

ARRIVAL ALARM

The alarm sounds when the ship nears a TO waypoint.

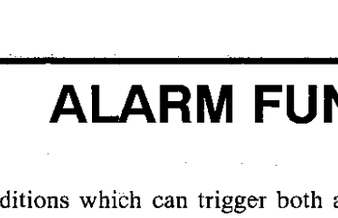


Fig. 6-1 Arrival Alarm

ANCHOR WATCH

The alarm sounds when the ship enters into the alarm zone on the TO waypoint. This alarm is useful to alert you when the boat may be dragging the anchor.

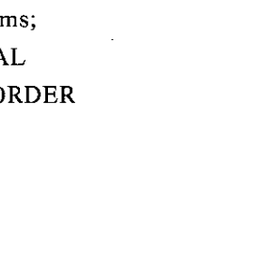


Fig. 6-2 Anchor Watch Alarm

BORDER ALARM

This alarm sounds when the boat is approaching an area which you do not want to enter. You set the alarm by registering two waypoints then selecting them as FROM and TO waypoints.

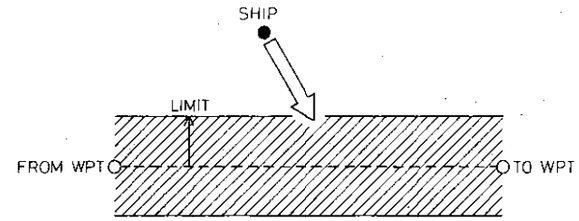


Fig. 6-3 Border Alarm

CROSS TRACK ERROR ALARM

The alarm sounds when the cross track error exceeds the alarm range.

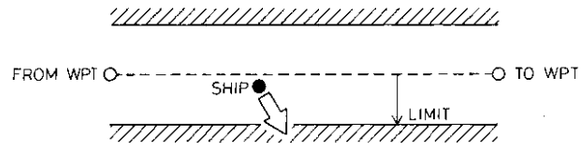


Fig. 6-4 Cross Track Error

SPEED ALARM

The speed alarm sounds on one of the following conditions;

Maximum Mode

The alarm sounds when the ship's speed becomes higher than the preset value.

Minimum Mode

The alarm sounds when the ship's speed becomes lower than the preset speed.

Window Mode

The alarm sounds when the ship's speed becomes lower than the minimum and higher than the maximum preset value. Set the maximum speed alarm value lower than the minimum speed alarm value.

TRIP DISTANCE ALARM

Trip distance alarm sounds when the trip distance reaches the preset value.

1) Anchor watch/Arrival

Procedure

1) Press [FUNC] [3] to display menu 3-1.

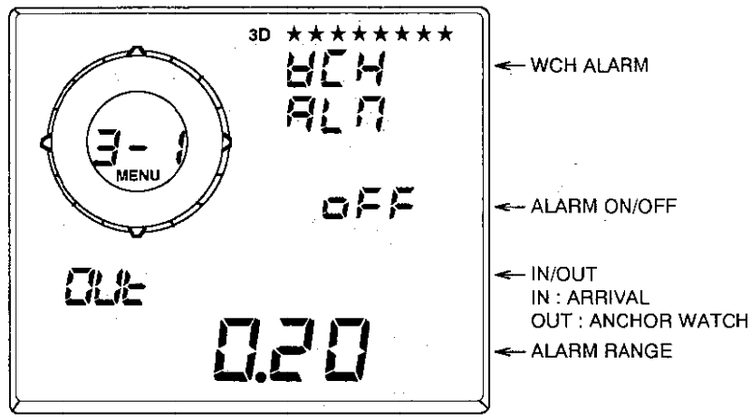
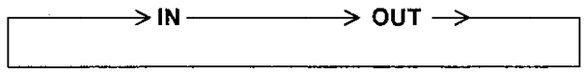


Fig. 6-5 Anchor Watch/Arrival Alarm Screen

2) Press [↻] to switch the alarm function on or off.

3) Press [ENT].

4) Press [↻] to select either arrival alarm (**IN**) or anchor wach alarm(**OUT**).



IN : Arrival alarm
OUT : Watch alarm

5) Type an alarm range (3 digits).

6) To escape from menu screen, press any blue key.

2) Cross track error (XTE)/Border

Procedure

1) Press [FUNC] [3] [NEXT] to display menu 3-2.

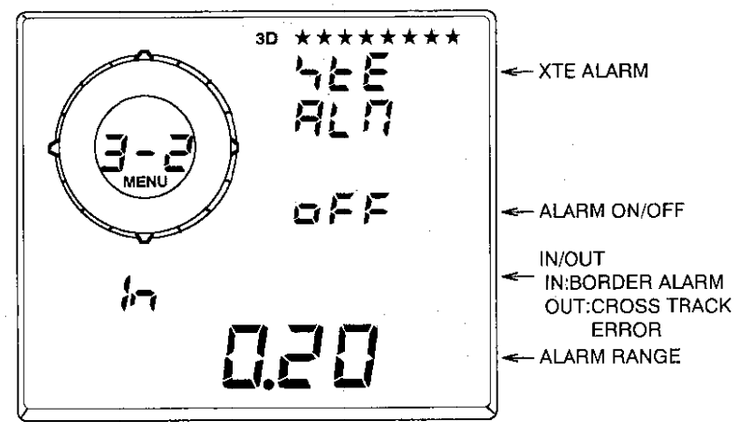
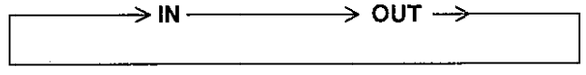


Fig. 6-6 XTE Alarm Screen

2) Press [↻] to switch the alarm function on or off.

3) Press [ENT].

4) Press [↻] to select either border alarm (**IN**) or cross track error (**OUT**).



IN : Border
OUT : Cross track error

5) Type a alarm range (3 digits).

6) To escape from menu screen, press any blue key.

3) Max. speed/Min. speed

Procedure

1) Press [FUNC] [3] [NEXT] [NEXT] to display menu 3-3.

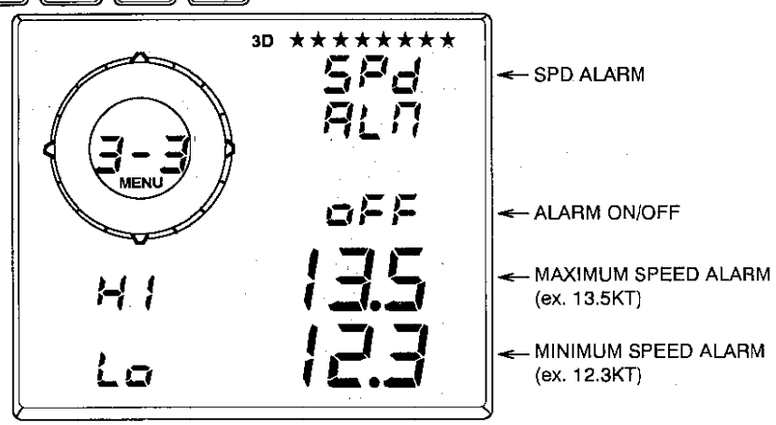
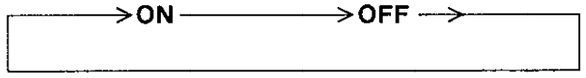


Fig. 6-7 Speed Alarm Screen

2) Press [⇄] to switch the alarm function on or off.

3) Press [ENT].

4) Type maximum speed (4 digits).



5) Press [ENT].

6) Type minimum speed (4 digits).

7) Press [ENT].

8) To escape from menu screen, press any blue key.

4) Trip distance

Procedure

1) Press [FUNC] [9] [NEXT] to display menu 9-2.

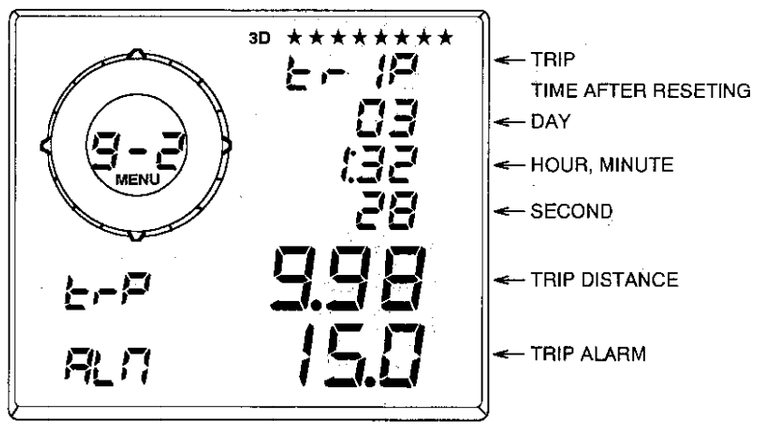


Fig. 6-8 Speed Alarm Screen

2) The passage time after the reset is presented on the screen.

3) The trip distance integrated after the reset is presented on the screen.

4) Press [△] or [▽] to locate the cursor to the trip distance.

5) Press [CLR] [ENT] to reset the trip distance.

6) The trip distance integrates automatically.

7) Type the value for the trip alarm using five digits.

8) The alarm sounds when the integrated trip distance reaches the preset value

9) To escape from menu screen, press any blue key.

2 Alarm Level

You can select alarm buzzer volume for alarm and system error on menu 3-3.

Procedure

1) Press [FUNC] [3] [NEXT] [NEXT] [NEXT] to display menu 3-4.

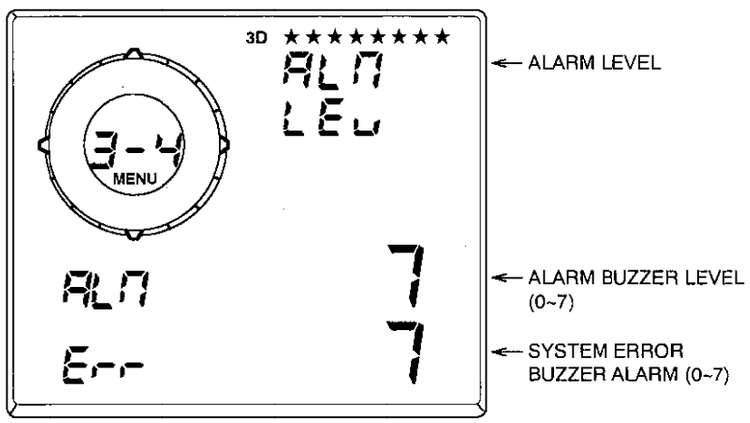


Fig. 6-9 Alarm Level Setting Screen

2) Type desired alarm level for alarm (Arrival/Anchor/Border/Cross Track Error).
3) Press [ENT].
4) Type desired alarm level for system error.
5) Press [ENT].
6) To escape from menu screen, press any blue key.

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Chapter 7 ALARM/ERROR MESSAGES

1 Interpreting Alarm and Error Indication

When any alarm condition is breached or system error is detected, both a visual and an audible alarm are generated. To identify the cause of the alarm, observe the alarm/error indication at the top left corner and the digital display.

The audible alarm can be silenced by pressing [CLR] key. The visual alarm remains on the screen until the cause of the alarm is removed. .

1) Alarm indications

The alarms which are on appear (blinking) at the upper left-hand corner of the display.

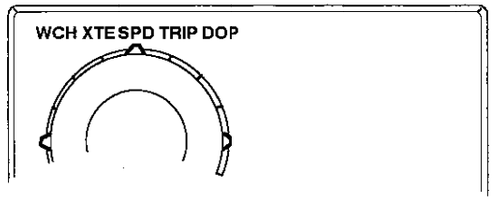

Fig. 7-1 Alarm Indications

WCH The setting of menu 3-1
- **"OUT"** Anchor Watch alarm breached
- **"IN"** Arrival Watch alarm breached

XTE The setting of menu 3-2
- **"OUT"** Cross Track alarm breached
- **"IN"** Border alarm breached

SPD Speed alarm breached

TRIP Trip alarm breached

DOP DOP alarm breached

2) System error indications

When system error is detected during operation, an error message appears(blinking).

SER Selftest error

The equipment tests itself periodically. Equipment fault displays "**SER**" on digital display.

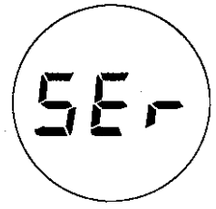

Fig. 7-2 "Selftest Error" Indication

BER Battery error

The memory contents of the RAM are preserved by an internal lithium battery, of which the estimated life is 4 years. The indication "BER" appears when the battery voltage is low. Call your technician to replace the lithium battery.

AER Antenna error

The indication "**AER**" appears when the antenna is not connected or is shorted.

DER Data backup error

The indication "**DER**" appears when the contents of the RAM, backupped by the lithium battery are destroyed. Execute the "**Data Clear**" to clear the RAM.

3) GPS receiver status

CST Cold Start

The equipment was turned on without the almanac inside. The receiver immediately starts acquiring a satellite in order to receive the almanac. When a satellite number available in sight is known, conduct the cold start operation described in chapter 7.

IMP Impossible to receive

According to the almanac, no satellite is available in line of sight.

ACQ Acquiring a satellite

According to the almanac, a satellite is availabble in line of sight, and the GP-70 is acquiring it, but have not received yet. If the ACQ status lasts a long time without changing to ALM (see

below), 2D or 3D suspect that satellite signal is not received norrmally.

ALM Receiving almanac

According to the almanac in GP-70, 3 satellites (or 4 satellites in case of the 3D mode) are not yet avilable in line of sighte. Since position fixing can not be done, the GP-70 is receiving almanac.

INT Position fixing interrupted

Reception is interrupted due to objects around the GPS antenna. According to the almanac, DOP is still superior to the DOP threshold. When the lost satellite rerappears, 2D or 3D position fixing will be resumed.

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Chapter 8 MAINTENANCE

1 SV Condition Display

1) Receiving condition

The present receiving condition appear on the screen.

Procedure

1) Press [FUNC] [7] to display menu 7-1.

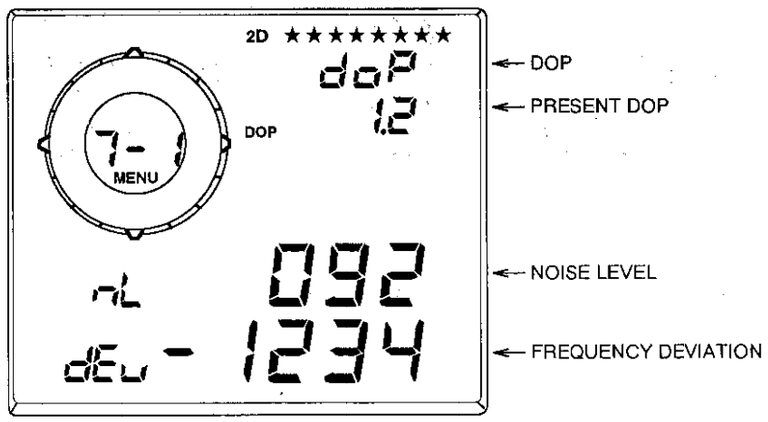


Fig. 8-1 Receiving Satellite Data Screen

2) The present DOP, noise level and frequency deviation appear on the screen.

3) To escape, press any blue key.

2) Numbers of receiving satellites

The satellite numbers presently available appear on the screen.

Procedure

1) Press [FUNC] [7] [NEXT] to display menu 7-2. Press [NEXT] or [BACK] for menu 7-2.

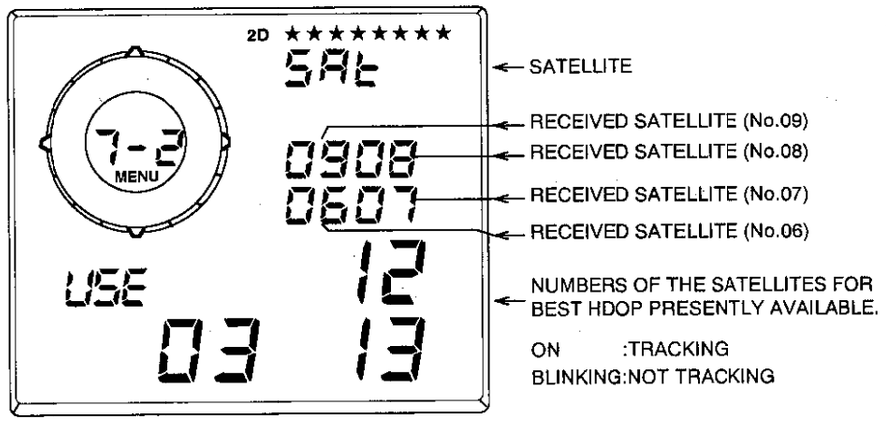


Fig. 7-1 Receiving Satellite Data Screen

2) The satellites presently available appears on the screen.

3) To escape, press any blue key.

3) Displaying the receiving signal level of each satellite

Procedure

1) Press [FUNC] [7] [NEXT] [NEXT] to display menu 7-3.

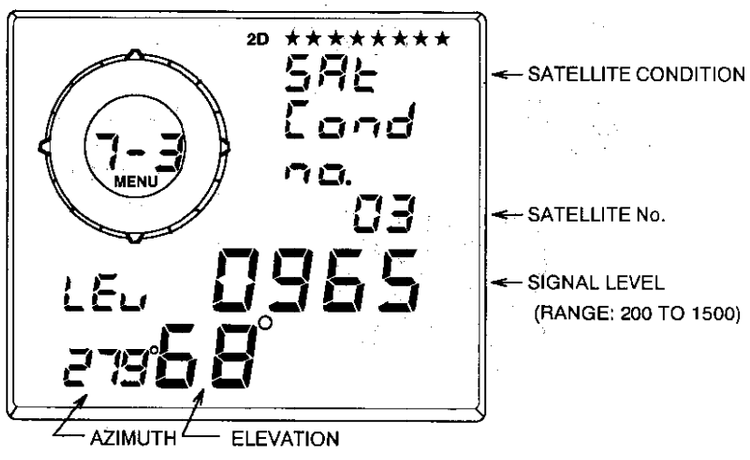


Fig. 8-2 Satellite Signal Level Screen

2) A satellite number and the signal level, azimuth, elevation of the satellite appear on the screen.
3) Press [△] or [▽] to scroll the satellite number.
4) The value for the signal level usually ranges from 200 to 1500 and fluctuates within the range of 300. The signal level must be higher than noise level presented on MENU 7-1.
5) To escape, press any blue key.

4) Displaying the health of each satellite

Procedure

1) Press [FUNC] [8] [NEXT] to display menu 8-2.

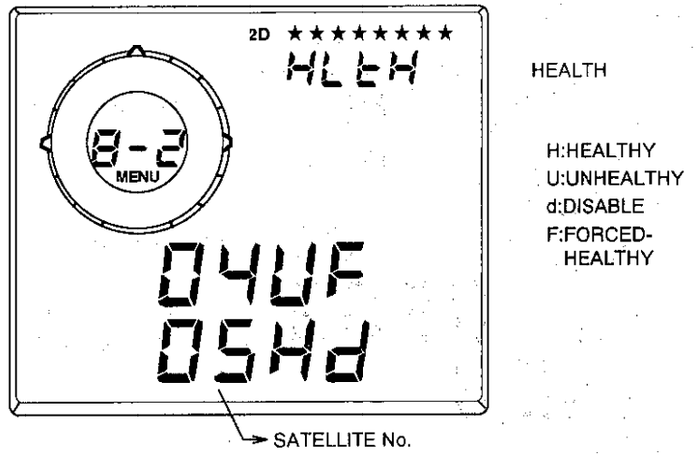
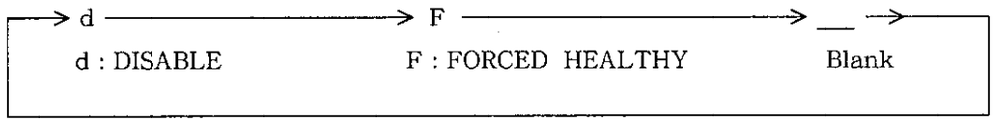


Fig. 8-3 Satellite Condition Screen

2) A satellite number and its condition appears.
3) Press [△] or [▽] to scroll the satellite number.
   H : Healthy
   U : Unhealthy
4) To disable a healthy satellite or force health an unhealthy satellite, press [△] or [▽] to scroll the satellite number.
5) Press [↻] to change F, D, _.
   F : Forced health
   D : Disable
   _ : Leave the condition as it is



6) To escape, press any blue key.

2 Program Version

The program version for AMP•SIG board and NAV board appear on the screen.

Procedure

1) Press [FUNC] [0] to display menu 0-2.

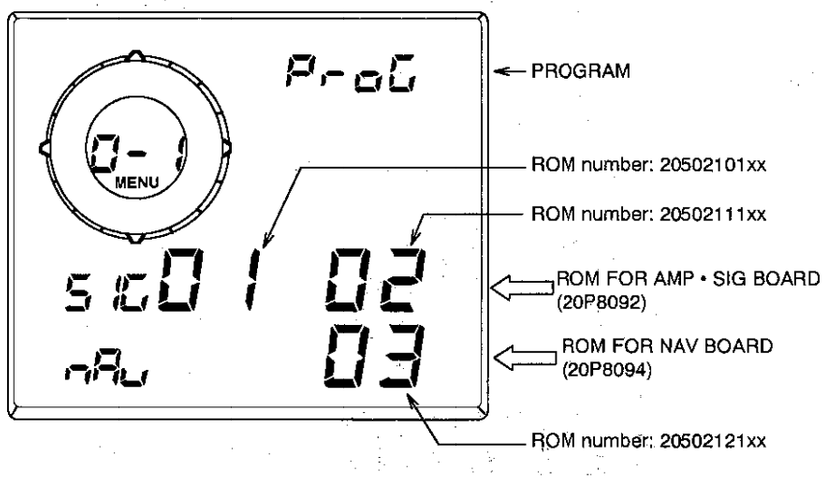


Fig. 8-4 Program Version Screen

2) The program versions (shown as "xx" on the figure above) for each ROM is presented on the screen.
3) To escape, press any blue key.

3 Selftest

As mentioned earlier, this equipment tests itself periodically, and "**SER**" appears if an equipment fault is found. This selftest is initiated by the equipment itself, and can not be controlled by the user.
The selftest discussed in this paragraph is a different type of selftest which can be initiated by the user. Note that the basic function of the GP-70 is disabled during the test.

Procedure

1) Press [FUNC] [0] [NEXT] to display menu 0-2.

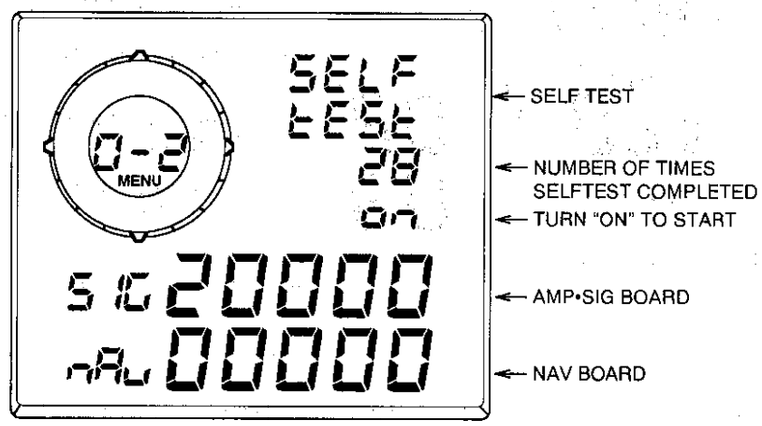


Fig. 8-4 Selftest Screen

2) Press [↻] to display "**ON**".
3) Press [ENT].
4) Continuously selftests.
5) The number of times the selftest is conducted appears on line 3.
6) Results of the selftest appears on line 5 and 6.
7) To quit the selftest, turn off the equipment.

Result

For AMP•SIG board 20P8092

2^3	2^2	2^1	2^0
Antenna	Common RAM	Local RAM	ROM
SPARE	CPU and Peripheral ICs		
SPARE			
Backup RAM	Common RAM	Local RAM	ROM
SPARE	SPARE	RTC	Serial I/O

Fig. 8-5 Result for AMP•SIG Board

The result of the selftest is shown in hexadecinormal notation (0 to F). You may refer to the example of the result shown below:

EXAMPLE 1): The antenna defective.

Fig. 8-7 Example of the Result 1)

EXAMPLE 2): The antenna defective, common RAM of SIG part defective, local RAM of FIX part defective.

Fig. 8-8 Example of the Result 2)

For NAV board 20P8094.

Test Items	Result	
	0	Else
ROM	Good	Error
Local RAM	Good	Error
Backup RAM	Good	Error
Battery Voltage	Normal	Low
DATA-2 Terminal	Good	Error

Fig. 8-9 Result for NAV Board

The DATA-2 terminal test

This test is done with the RX input coupled to the TX output with jumper as shown below.

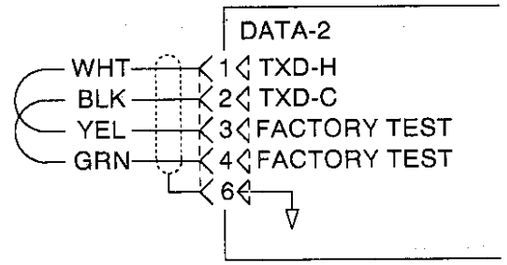


Fig. 8-10 Jumper Wire for DATA-2 Terminal Test

The GP-70 transmits a test data and receives it. If the received data match the transmitted one, the result shows "normal". If a jumper is not connected, the result shows "error".

EXAMPLE 3): The jumper wire for DATA-2 terminal test is not connected.

Fig. 8-11 Example of the Result 3)

EXAMPLE 4): The ROM defective, the voltage of the battery low and no jumper wire for DATA-2 terminal test.

Fig. 8-12 Example of the Result 4)

Remedy

If any defective part is detected, replace the P.C.Board.

4 Keyboard/LCD Test

Procedure

1) Press [FUNC] [0] [NEXT] [NEXT] [NEXT] to display menu 0-4.

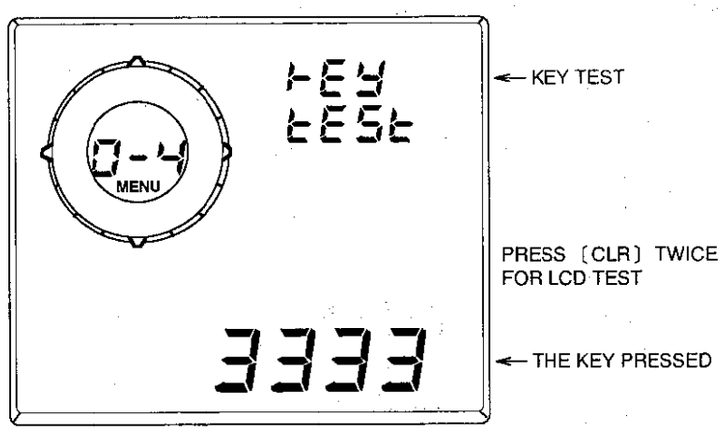


Fig. 8-13 Keyboard Test Screen

2) Press [↻] to switch the selftest function on (or off).

3) Press [ENT].

4) Press each key one by one. The key pressed appears on the display if the key is functioning properly.

5) Press [CLR] [CLR] for LCD test.

6) All LCD segments should turn on.

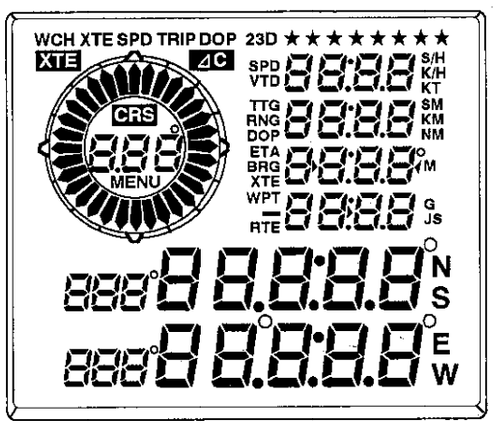


Fig. 8-14 LCD Test Screen

7) To escape from the LCD test screen, press any blue key.

5 Memory Clear

You can clears some or all the data memorized in the RAM.

Procedure

1) Press [FUNC] [0] [NEXT] [NEXT] to display menu 0-3.

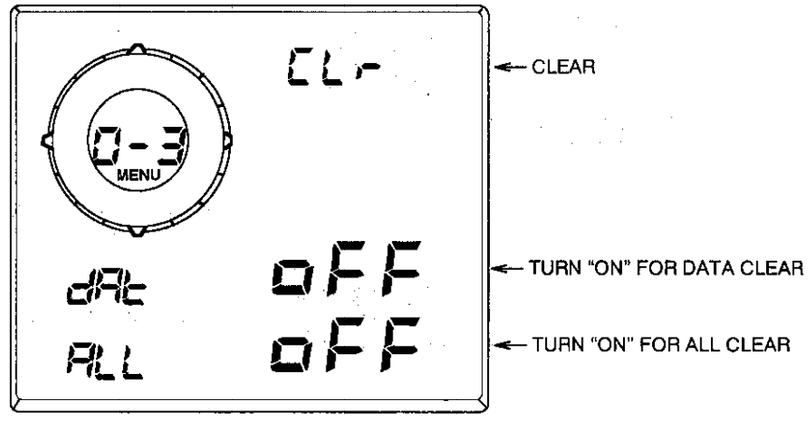


Fig 8-15 Clear Screen

2) To clear part of the memory. (Data Clear)

You may refer to the table below for the data to be cleared at "Data Clear".

Press [△] or [▽] to move the cursor to "**DAT**".

Press [↻] to change the display "**ON**".

Press [ENT].

3) To clear all the memory. (All Clear)

Press [△] or [▽] to move the cursor to "**ALL**".

Press [↻] to change the display to "**ON**".

Press [ENT].

4) To escape from the menu screen, press any blue key.

Cleared data at "**Data Clear**".

Route data

Navigational data (Waypoint data, Trip data)

Alarm data (Alarm range, Alarm settings)
Event position data

Data not cleared at "**Data Clear**".
Initial setting (Menu 1-1, 1-2)
Geodetic datum selected (Menu 2-1)

6 Cold Start *(erasing/receiving Almanac)*

If the equipment has been left unused for more than a 6 month, it may not acquire a satellite because the existing Almanac is too old to predict a proper satellite arrival time. In such a case, perform the COLD START described below to clear the existing Almanac and receive a new one. Note that extreme error in the current time or Lat/Long position also causes this trouble.

Procedure

1) Press [FUNC] [8] to display menu 8-1.

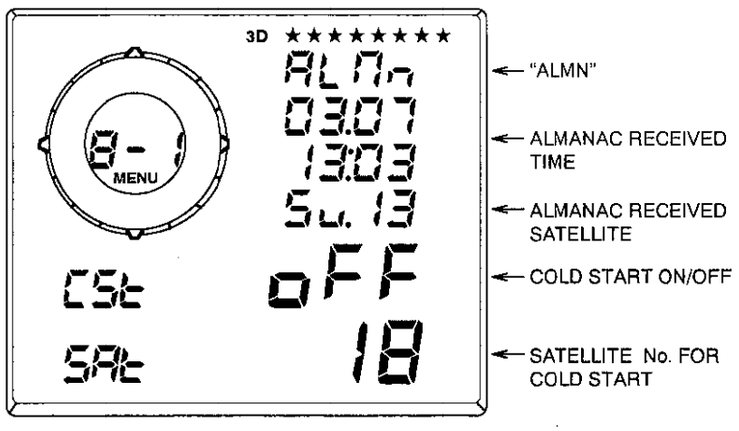


Fig. 8-16 Almanac Screen

2) Almanac data is presented on the screen.
3) Press [↻] to change "**OFF**" to "**ON**".
4) Press [ENT] .
5) Type an available satellite number.
6) Press [ENT] .
7) To escape from menu screen, press any blue key.

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Chapter 9 SETTING PARAMETERS AFTER INSTALLATION

After the unit is installed, enter initial data and various parameters as instructed in this chapter.

NOTE: Although the memories are preserved internally, even in the case of power failure, it is a good idea to keep a record of the various parameter settings. The GP-70 is not a fail-safe record keeping log.

1 Initial Data

Dilution of Precision (DOP) changes as time elapses. While DOP is better (lower) than the entered threshold, GPS position fixing is performed. When DOP becomes worse (higher) than the threshold, the DOP alarm appears on the screen.

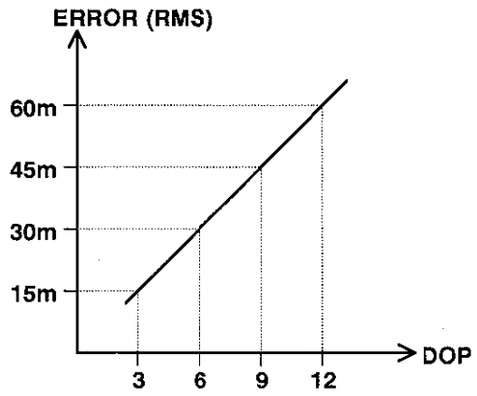


Fig. 9-1 Error Against DOP

If the threshold is set low, GPS position fixing is performed only when a high accuracy is expected. The trade-off of for a low setting of the DOP threshold is short GPS position fixing period.

Call up the FUTURE POSITION FIXING SCHEDULE ([FUNC] [6]) with various DOP threshold settings, and you can see how GPS position fixing periods are influenced.

Procedure

1) Press [FUNC] [1] [NEXT] to display menu 1-2 screen.

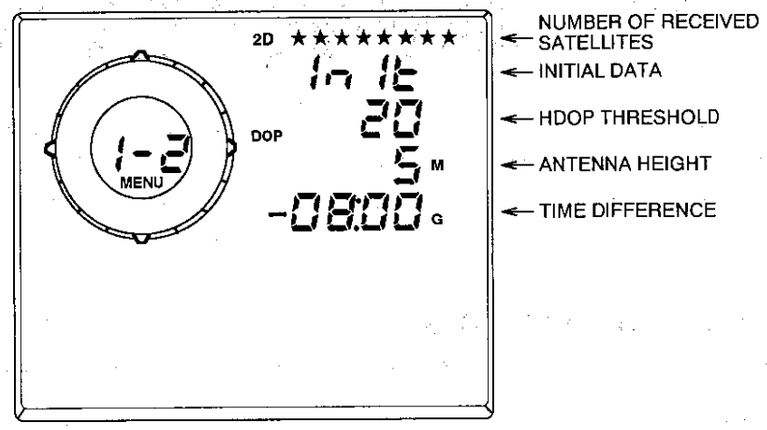


Fig. 9-2 Initial Data Entry Screen

2) Enter DOP threshold level (2 digits).
3) Press [ENT].
4) Enter antenna height (4 digits).
5) Press [↻] to switch +/ − .
6) Press [ENT].

NOTE: The antenna height is used for 2-D position fixing only. As this data is never updated, inaccurate height entry affects the position fixing accuracy continuously. Actually measure the antenna height as precisely as possible.

7) Register local zone time (4 digits).
8) Press [↻] to switch +/ − .
   + : Advanced from GMT.
   − : Delayed from GMT.
9) Press [ENT].
10) To escape from menu screen, press any blue key.

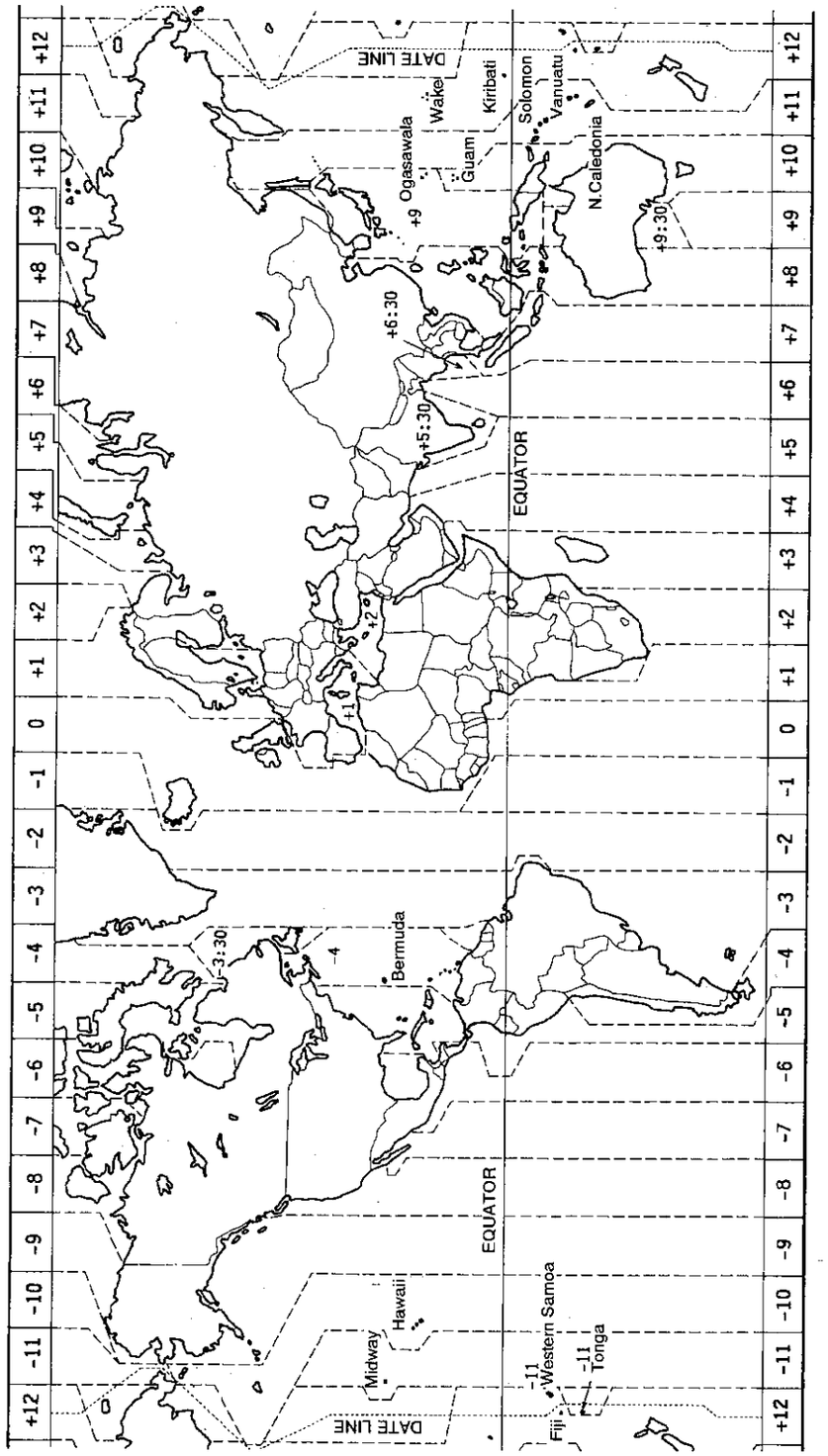


Fig. 9-3 Local Zone Times

2 System Data

1) Selecting a geodetic system

Various geodetic systems are available in the world. Select the geodetic system which is used in your sea charts. If a wrong system is selected, a constant difference will be observed between the Lat/Long readings on the screen and those on the sea chart. Note however that this difference may be offset by the Lat/Long Correction described on next page.
Refer to page 9-13 for geodetic system.

Procedure

1) Press [FUNC] [2] to display menu 2-1.

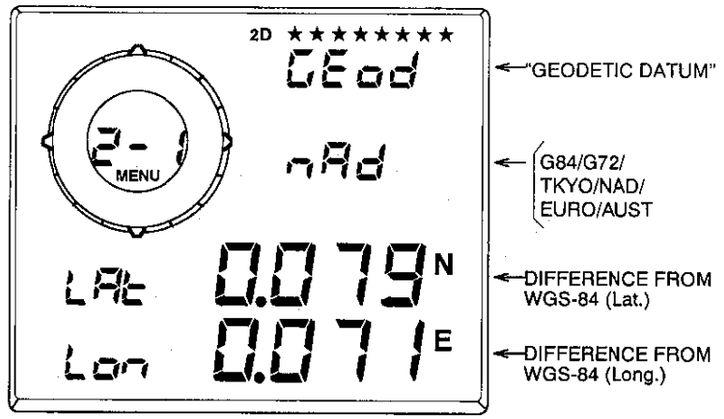
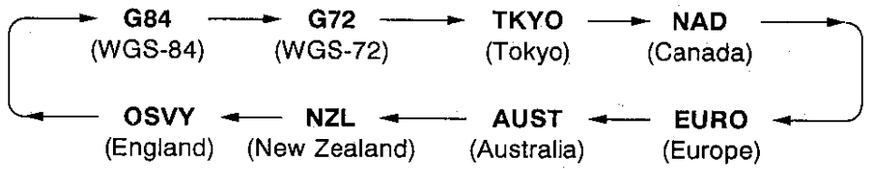


Fig. 9-4 Geodetic datum Selection Screen

2) Press [↻] to scroll for desired geodetic system.



Canada	:North America 1927
Europe	:European 1950
Australia	:Australian Geodetic 1984
New Zealand	:Geodetic Datum 1949
England	:Ordance Survay of Great Britain 1936

3) Press [ENT].

4) The difference in minutes between the system selected and WGS-84 is displayed.

5) To escape from menu screen, press any blue key.

2) Setting Lat/Long correction value

When a constant error is observed in a GPS fix, this may be offset.

Procedure

1) Presss [FUNC] [2] [NEXT] to display menu 2-2.

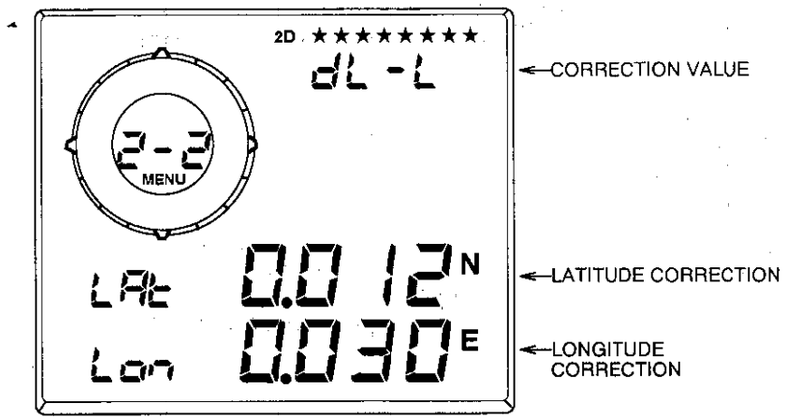


Fig. 9-5 Lat/Long Correction Screen

2) Type latitude correction value (4 digits).

3) Press [⇄] to switch N/S.

4) Press [ENT].

5) Type longitude correction value (4 digits).

6) Press [⇄] to switch E/W.

7) Press [ENT].

8) To escape from menu screen, press any blue key.

3) Setting magnetic variation

The location of the magnetic north pole is deviated from the geographical one. This causes a difference between the true and magnetic north direction. The difference is called magnetic variation, and varies with respect to the observation point on the earth. In order to display magnetic bearings on the screen, read the magnetic variation from your sea chart, and enter it as follows.

Procedure

1) Press [FUNC] [2] [NEXT] [NEXT] to display menu 2-3.

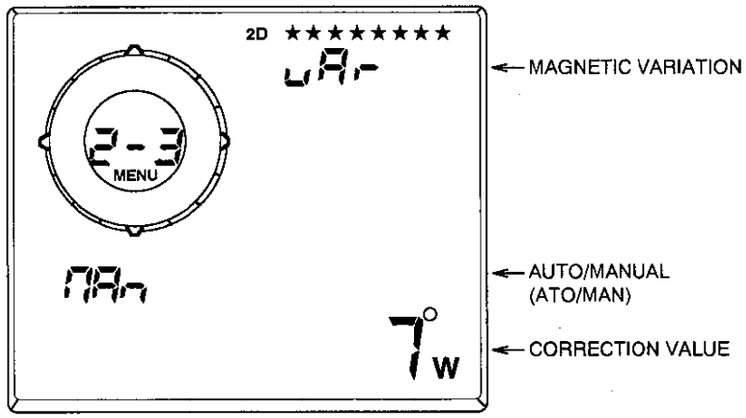


Fig. 9-5 Magnetic Variation Enter Screen

2) Press [⇄] to select manual correction or automatic correction.

3) Press [ENT].

4) Automatic correction

The correction value is presented.

Manual correction

Type the correction value (3 digits).

Press [⇄] to change E/W.

Press [ENT].

5) To escape from menu screen, press any blue key.

4) Setting Lat/Long & speed/course smoothing

L-L (Latitude & Longitude) smoothing

When the DOP or receiving condition is unfavorable, the GPS fix fluctuates randomly. This fluctuation can be reduced by smoothing (averaging) the raw GPS fixes.

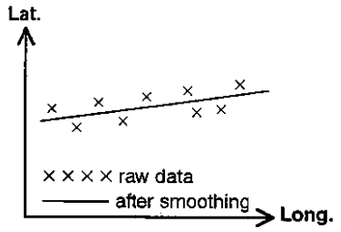


Fig. 9-7 L/L Smoothing

S-C (Speed & Course) smoothing

During GPS position fixing, ship's speed and course is directly measured by receiving GPS satellite. The raw GPS velocity data usually varies randomly depending on receiving condition, etc. This random variation is reduced by smoothing (averaging) the raw data.

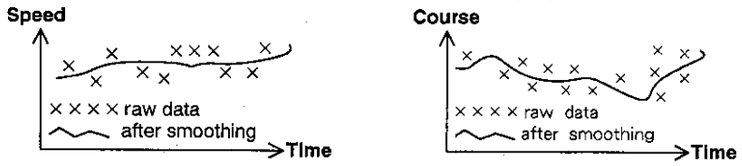


Fig. 9-8 S-C Smoothing

Procedure

1) Press FUNC 2 NEXT NEXT NEXT for menu 2-4.

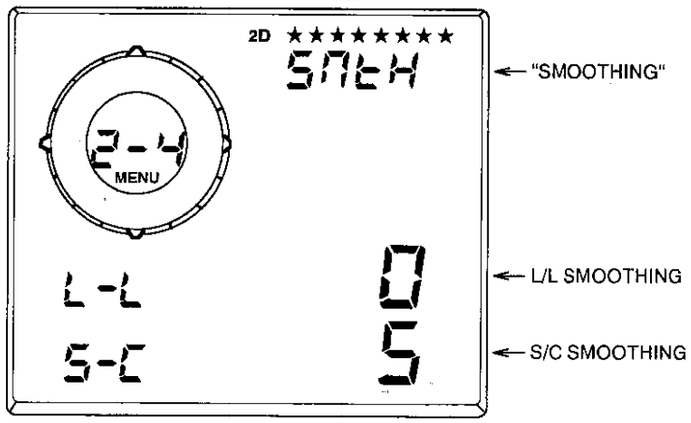


Fig. 9-9 Smoothing Entry Screen

2) Type a smoothing value for L-L.
3) Press ENT.
4) Type a smoothing value for S-C.
5) Press ENT.
6) To escape from menu screen, press any blue key.

5) Selecting unit of measurement and mode of measurement

Procedure

1) Press FUNC 2 NEXT NEXT NEXT NEXT to display menu 2-5.

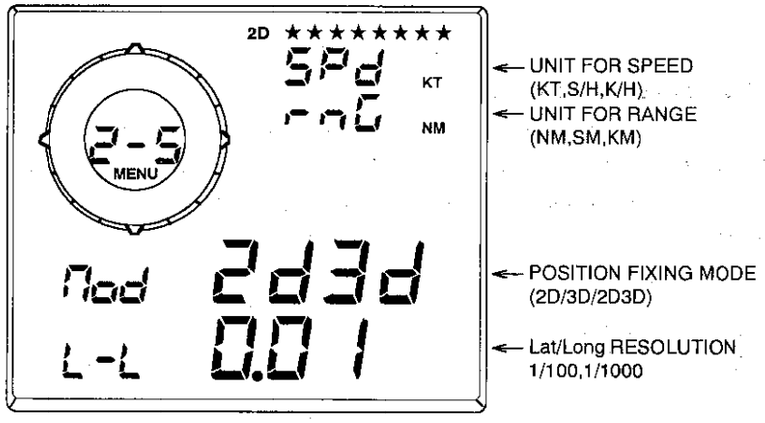


Fig. 9-10 Unit of Measurement Selection Screen

2) Press ↻ to select KT, S/H or K/H for speed unit.

→ KT → S/H → K/H →

3) Press ENT.
4) Press ↻ to select NM, SM or KM for range unit.

→ NM → SM → KM →

5) Press [ENT].

6) Press [↻] to select position fixing mode among 2D, 3D and 2D3D for position fixing mode.

2D : 2 dimensional position fixing.
3D : 3 dimensional position fixing.
2D3D : 2 and 3 dimensional position fixing automatic switching mode.

→ 2D → 3D→ 2D/3D →

7) Press [ENT].

8) Press [↻] to select the resolution; 0.001 or 0.01.

→0.01→ 0.001 →

9) Press [ENT].

10) To escape from menu screen, press any blue key.

6) Selecting interfacing data

Select the data output format of output data-1 and output data-2 on menu 2-6 and menu 2-7 respectively.

Procedure

1) Press [↻] to select data output format among CIF, NMEA0183 and NMEA0180 for the data format.

2) Press [ENT].

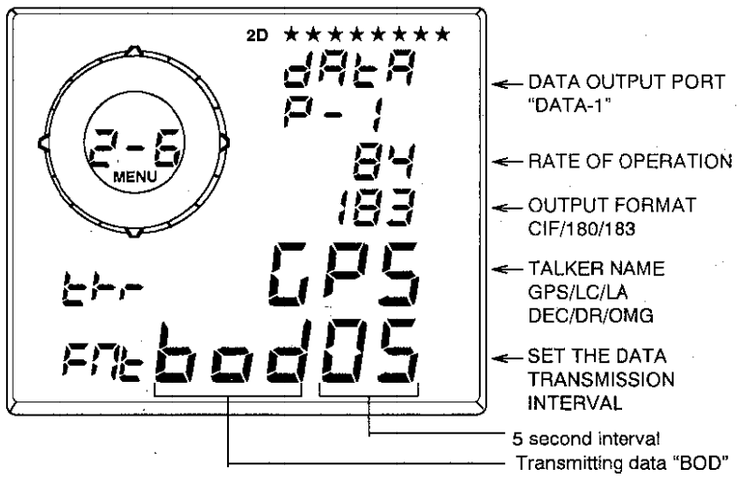


Fig. 9-11 Data Output Selection Screen (Data-1)

→CIF→ 180→ 183 →
(NMEA0180) (NMEA0183)

3) For CIF and NMEA0183.

Press [↻] to select a talker name among GPS, LC, LA, DEC, DR, and OMG

→GPS→ LC → LA → DR → DC → OMG →
(Loran C) (Loran A) (Dead Reckoning) (Decca) (Omega)

GPS : Lat/Long data are transmitted as GPS data.
LC : Lat/Long data are transmitted as LC data.
LA : Lat/Long data are transmitted as LA data.
DEC : Lat/Long data are transmitted as DEC data.
DR : Lat/Long data are transmitted as DR data.
OMG : Lat/Long data are transmitted as OMG data.

For NMEA0180.

There is no talker name selection for NMEA0180.

4) Type a data transmitting interval (2 digits).

For CIF;

00, 01, 02, 03, 04, 05, 10, 12, 15, 20, 30, 40, 50, 60 or 90

L-L : Latitude and Longitude
S-C : Speed and Course
R-B : Range and Bearing
Alt : Altitude (For 3D positioning only)

For NMEA0183;

00, 01, 02, 03, 04, 05, 10, 12, 15, 20, 30, 40, 50 or 60

AAM : Arrival alarm
APA : Autopilot format A
APB : Autopilot format B
BOD : Bearing to TO waypoint from FROM waypoint
BWC : Range and bearing to TO waypoint in great circle
BWW : Bearing to TO waypoint
GGA : Lat/Long of GPS
GLL : Lat/Long

RMB : Generic navigational information (To immediately follow RMC)
RMC : Generic navigational information (To be followed immediately by RMB)
VTG : Actual track and ground speed
WCV : Waypoint closure velocity
WNC : Range to TO waypoint in great circle
WPL : Waypoint location
XTE : Cross track error
ZDA : UTC, local zone time
ZLZ : UTC, day, month, year
ZTG : Time to go to waypoint

For NMEA0180;
00, 01, 02, 03, 04 or 05
For transmitting cross track error data to an autopilot.

5) Press [ENT].
6) To escape from menu screen, press any blue key.

Table 9-1 Default settings for output ports 1 and 2

		DEFAULT SETTING	
		DATA-1	DATA-2
FORMAT		CIF	CIF
TALKER NAME		GPS	
CIF	L-L	01	
	S-C	01	
	R-B	60	
	ALT	01	
NMEA0183	AAM	04	
	APA	04	
	APB	00	
	BOD	04	
	BWC	00	
	BWW	00	
	GGA	10	
	GLL	01	
	RMB	00	
	RMC	00	
	VTG	01	
	WCV	00	
	WNC	00	
	WPL	60	
	XTE	04	
	ZDA	01	
	ZLZ	00	
	ZTG	00	
NMEA0180S		01	
Lat/Long resolution		0.001	

GEOGRAPHIC AREA

A nautical chart is usually made by either trigonometrical survey or astronomical survey and according to the geodetic chart standards of the country it is used in. For example, the U.S.A. uses the system called "**Clarke**," India, "**Everest**," and Japan, "**Bessel**." Accordingly when you are getting position fixes by GPS in the U.S.A., the system should be Clarke so that you don't get a position fix which shows you're somewhere offshore when you're actually moored to a dock.

While the use of one category of chart system is fine if you don't do transoceanic voyages, ocean-going vessels may require all categories to get reliable position information. To solve this inconvenience, a standard chart system was adopted for GPS : the WGS-84.

Although the WGS-84 system is now widely used the other categories of charts still exist. Thus it is necessary to apply a correction value to the WGS-84 to match it to local geodetic systems. Below is the formula for calculation of correction value.
This unit can perform this calculation automatically if you tell it what type of chart you're using, by following the procedure on page 9-4. For Clarke charts, for example, select NAD (North America 1927). Select the chart system used, not the area where the boat is sailing.

Position Fix by GPS
+) Correction Value
L/L on Chart

Switch the selection only when the chart system used changes.

For charts which you don't know their geodetic system, there is no automatic correction. By observing the position fix carefully however you can calculate how much the error is, and input it as described on page 9-5. As this value changes with area adjust it periodically when making long voyages.

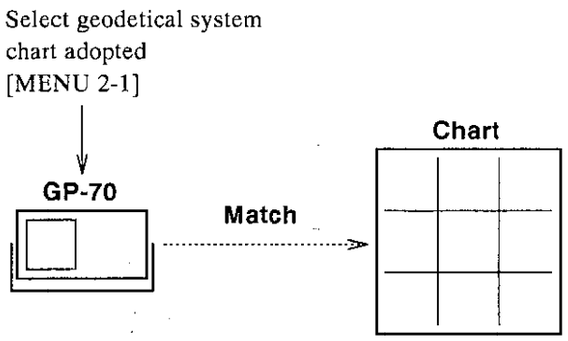


Fig. 9-12 Select Geodetic System

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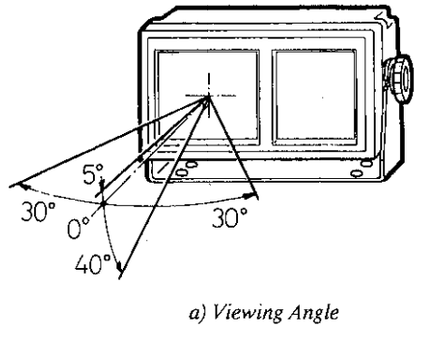
Chapter 10 INSTALLATION

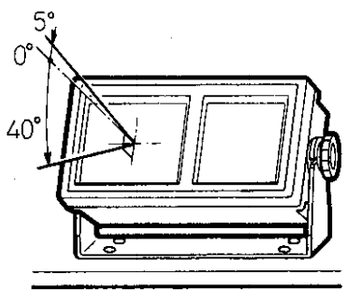
1 Display Unit

1) Viewing angle

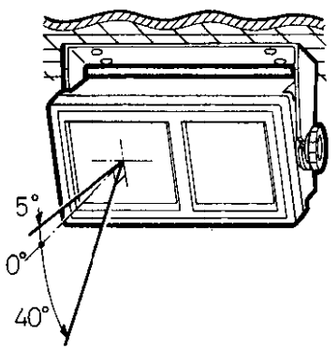
Adjust the angle of the unit for proper viewing angle. The LCD display can be seen only in the range of the viewing angle.



a) Viewing Angle



b) Table top Installation



c) Overhead Installtion

Fig. 10-1 Viewing Angles for Various Mounting Methods

2) Mounting considerations

1) Avoid the following places.

(1) A place exposed to direct sunlight.

(2) A place exposed to direct water splash or rain.

NOTE: Although the display unit is designed to withstand the rigors of the marine environment (I.E.C. IPX6), it is not impervious to the effects of immersion, nor is it strictly corrosion proof. Therefore, prudence dictates that it should be protected as much as possible from the effect of sun, weather and salt water. The LCD can be damaged by heat or over-exposure to the sun. The equipment should be covered when not in use, and after use should be wiped with a damp cloth and dried, particularly in a salt-water environment. If there is a chance it may receive water spray, wrap the connectors with the vulcanizing tape provided. If the unit is removed from the boat, the cable ends should be protected with plastic bags and tape.

(3) A place exposed to direct air from an air-conditioner.

(4) A place with excessive vibration.

(5) High-temperature, poorly ventilated environment.

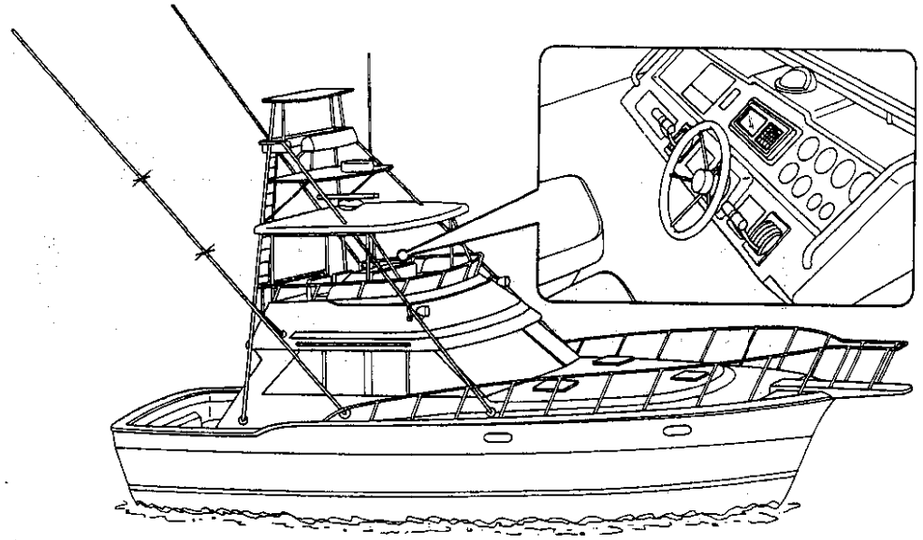
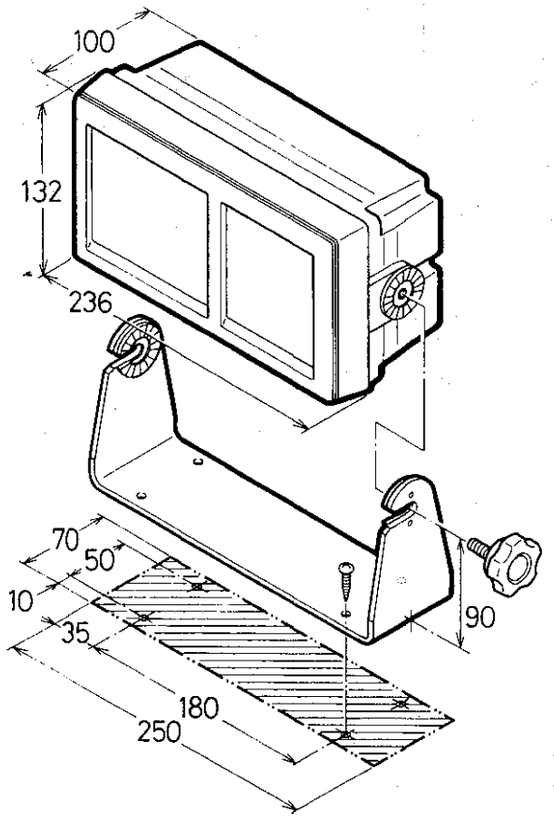


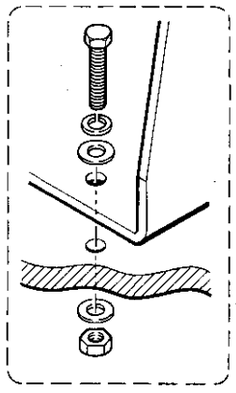
Fig. 10-2 Typical Flush Mount

2) Tabletop and bulkhead mountings are available by using the hanger bracket supplied. Flush mount kit FP20-00610, FP20-00620 and hanger holder FP20-00600 are optionally available.

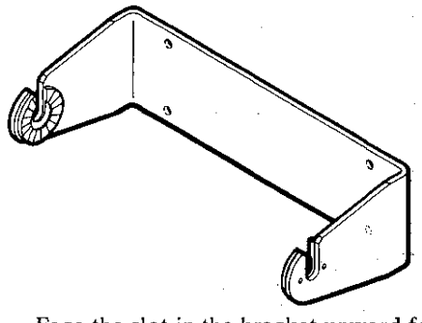
3) Mounting dimensions

Tabletop / Bulkhead





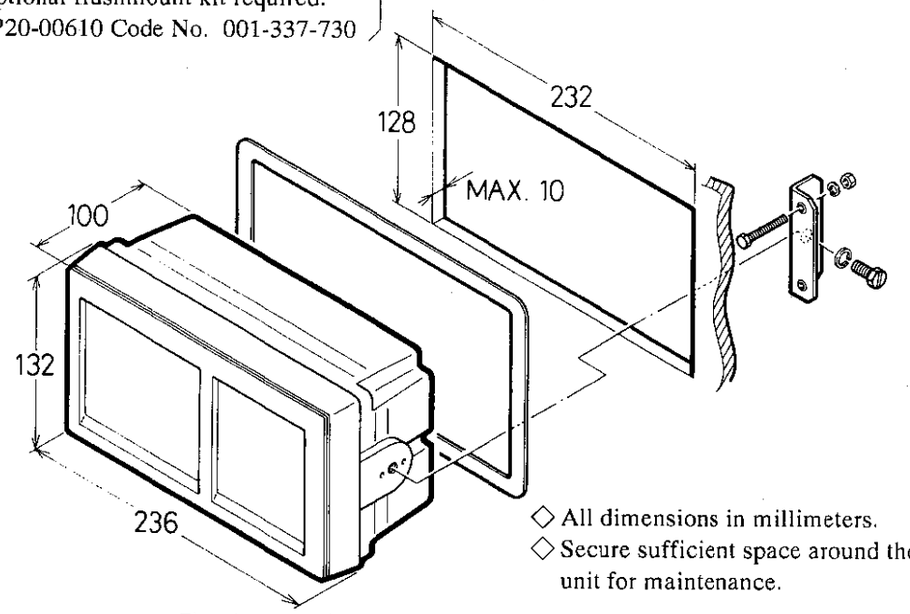
◇ All dimensions in millimeters.
◇ For thin walls, use nuts, bolts and washers instead of woodscrews.
◇ Secure sufficient space around the unit for maintenance.



Face the slot in the bracket upward for bulkhead mounting.

Fig. 10-3 Mounting Dimensions of Tabletop/Bulkhead Mount Display Unit

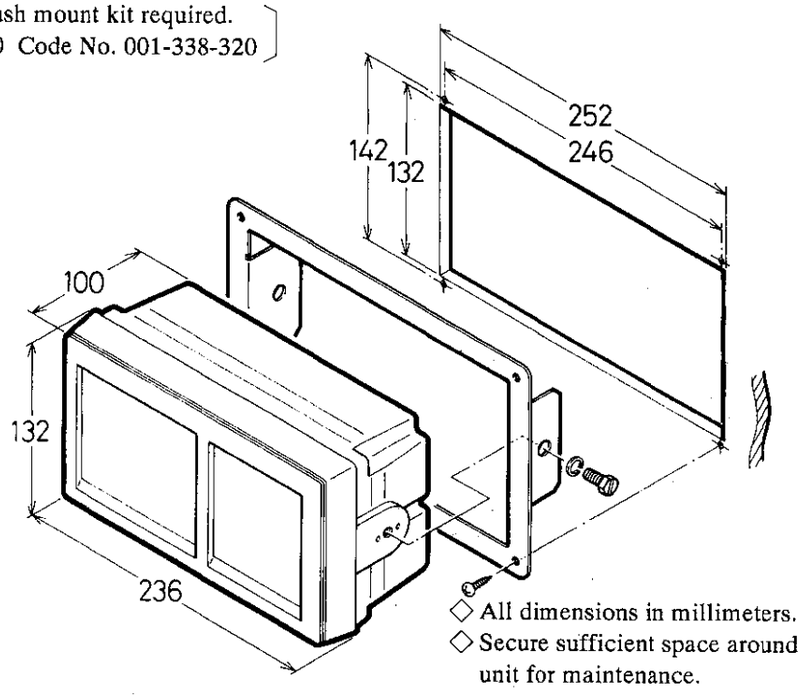
Flushmount Type-S
(Optional flushmount kit required.
FP20-00610 Code No. 001-337-730)



◇ All dimensions in millimeters.
◇ Secure sufficient space around the unit for maintenance.

Fig. 10-4 Mounting Dimensions for Flush Mount Type-S

Flush Mount Type-F
(Optional flush mount kit required.
FP20-00620 Code No. 001-338-320)

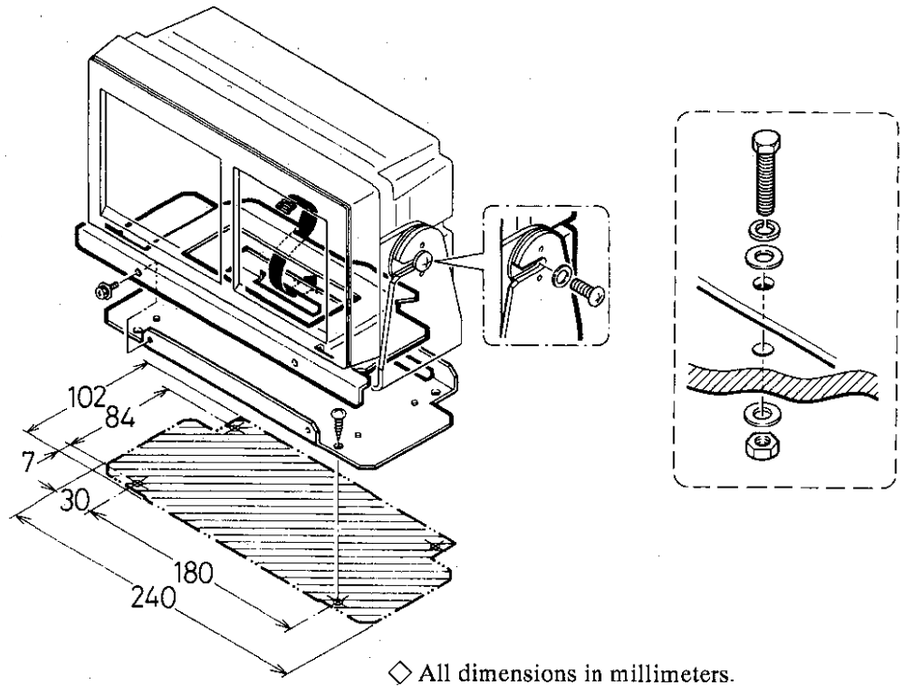


◇ All dimensions in millimeters.
◇ Secure sufficient space around the unit for maintenance.

Fig. 10-5 Mounting Dimensions for Flush Mount Type-F

Hanger Holder Type

(Optional hanger holder kit required.
FP20-00600 Code No. 004-365-500)



◇ All dimensions in millimeters.
◇ For thin walls, use nuts, bolts and washers instead of woodscrews.
◇ Secure sufficient space around the unit for maintenance.

Fig. 10-6 Mounting Dimensions for Hanger Holder Type

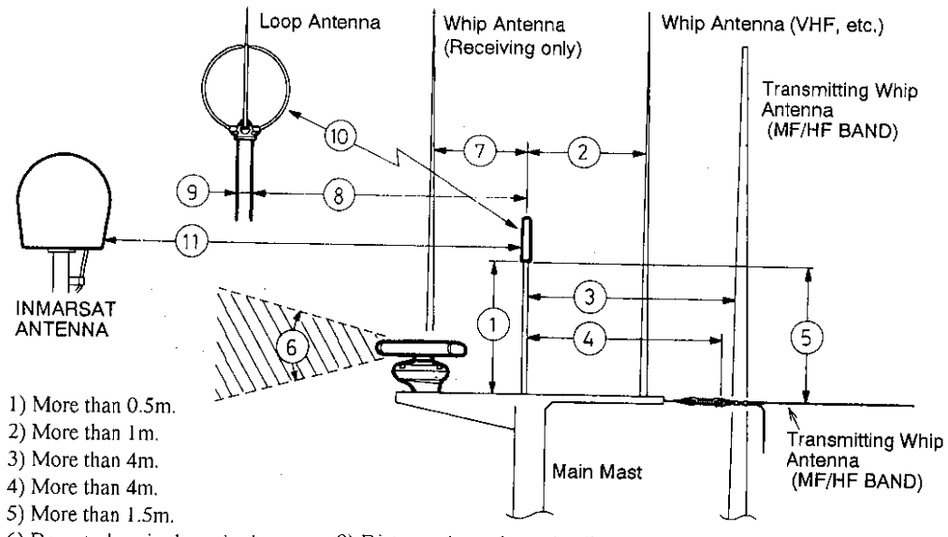
2 Antenna Unit

1) Mounting considerations

When selecting a mounting location keep the following points in mind.

1. Avoid the places where line-of-sight is obstructed by ship's mast, funnel and so on. If a funnel exists near the antenna, sight to a satellite with low elevation angle will be obstructed, resulting in a long-lasting ACQ or INT condition.
2. Ice on the antenna surface may interfere with reception. Locate the antenna where it will be free from sea water spray.
3. A mast top mount offers the best performance.

The following figure shows the minimum distance requirements from other antenna.



1) More than 0.5m.
2) More than 1m.
3) More than 4m.
4) More than 4m.
5) More than 1.5m.
6) Do not place in the radar beam. (Usually 30 to 40 degrees.)
7) More than 1m.
8) Distance depends on the diameter of the steel pole ⑨.
More than 1.5m if ⑨ is up to10cm.
More than 3m if ⑨ is 11cm or greater.
10) More than 3m.
11) More than 5m.

Fig. 10-7 Antenna Separation Distance

2) Antenna cable and the connector

Use only the cables and the connectors specified on the table "Cable Equivalence" on page 10-10 . Usage of an another cable than specified ones reduces the signal. This results as diminution of a receiving time.

3) Assembling the antenna

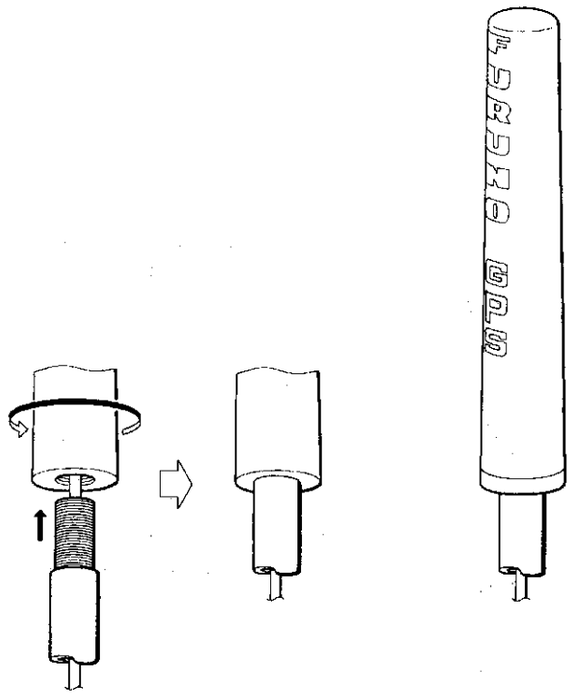


Fig. 10-8 Assembling the Antenna

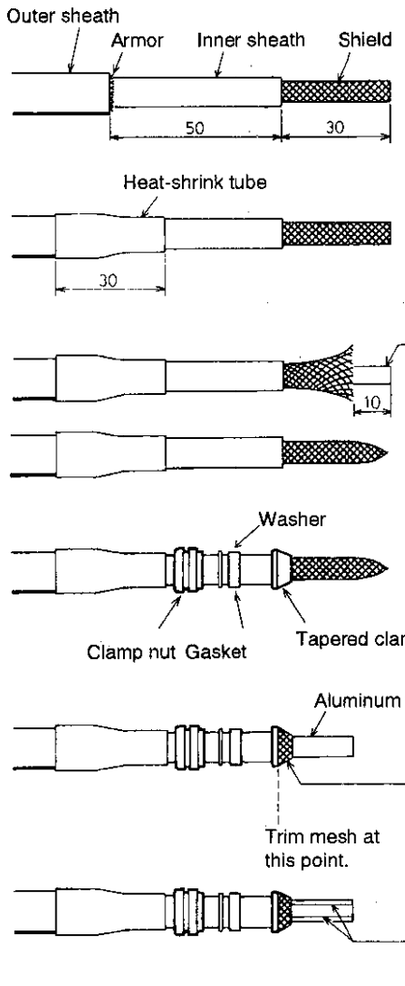
After mating the plugs, wrap them with vulcanizing tape, and further waterproof them by winding vinyl tape in a double layer.

4) Antenna cable extension

Optional 30m or 50m cable (8D-FBCV) can not be connected to the display unit directly because it's larger diameter.

1. Cut the cable to the necessary length.
2. Solder the supplied plug to the cable end as instructed in **"Cable Fabrication"**.
3. Join the cable to the 1m connector conversion cable which comes with the 30m or 50m cable kit.

Cable Fabrication



Remove the outer sheath, armor and inner sheath as specified left.

Insulate the armor with heat-shrink tube.

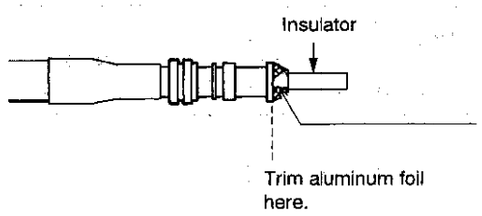
Cut off the insulator and inner conductor by 10mm. Shape the shield as shown left.

In order, pass the cable through the clamp nut, washer, gasket and tapered clamp.

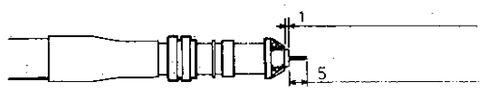
Fold back the shield mesh onto the tapered clamp and trim its end as shown left.

Cut the aluminum foil at four places (every 90 degrees).

Fig. 10-9 Antenna Cable Fabrication (1/2)

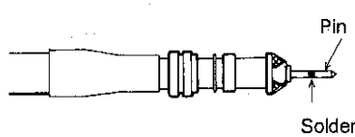


Fold back the four pieces of aluminum foil onto the mesh and trim them as shown left.

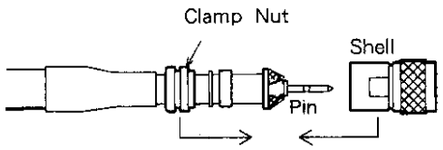


Remove the insulator leaving 1mm.

Remove the conductor, leaving 5mm.



Insert the conductor into the connector pin, and solder them together through the hole in the connector pin.



Insert the connector pin into the shell, and screw the clamp nut into the shell.

(Turn the clamp only. NEVER TURN THE SHELL.)

Fig. 10-10 Antenna Cable Fabrication (2/2)

5) Cable equivalence

Table 10-1 Cable Equivalence

Cable		Config	Plug			Note
Max. Length	Type		Type	Code No.	Qty	
15m	3D-2V, 3D-QEV, 3D-XV	A	BNC-P117NI	000-112-144	2	
25m	5D-2V	A	BNC-P-5	000-500-397	2	
30m	RG-8/U	B	UG-21D/U	Supply Locally	2	BNC-N connector adapter NJ-BNCP-NI [000-123-810] and Converter cable assy. 20S0147 [000-123-809]
35m	8D-2V	B	N-P-8	000-501-512	2	
45m	5D-FB	B	N-P-5	000-107-861	2	
65m	8D-FB	B	N-P-8DFB	000-111-549	2	
83m	10D-FB	B	N-P-10	000-501-517	2	

6) Connection

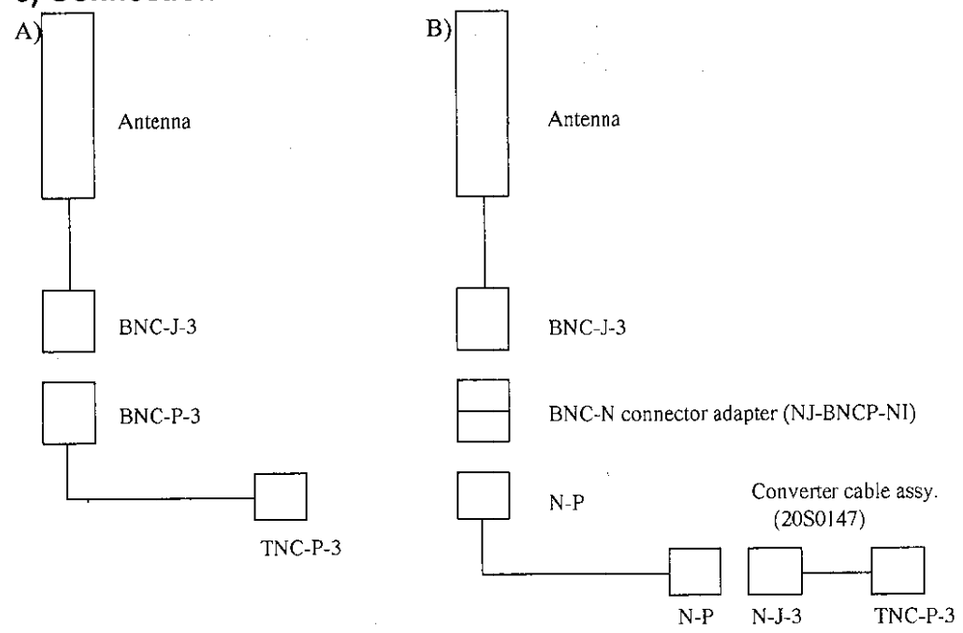


Fig. 10-11 Antenna Cable Connection

3 Power Supply

The GP-70 has an internal 3A fuse and such is amply protected against circuit overload and reverse polarity connection. At the installer's discretion, the additional in-line fuse assembly (Code No. 004-365-360) supplied with the GP-70 can also be fitted. This is supplied with a 2A fuse and is designed to blow first, protecting the input cable as well as keeping the internal fuse intact. Fuse replacement is thus accomplished without opening the case, thereby preserving the waterproof integrity ot the GP-70.

Procedure

1) Cut the cable of fuse assembly at the mid point of the cable.

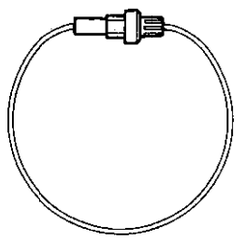


Fig. 10-12 Fuse Assembly.

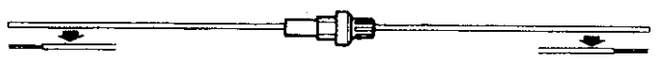


Fig. 10-13 Cut the Cable

2) Twist and solder the power cable and the fuse assembly.
3) Wrap the cable with vinyl tape.

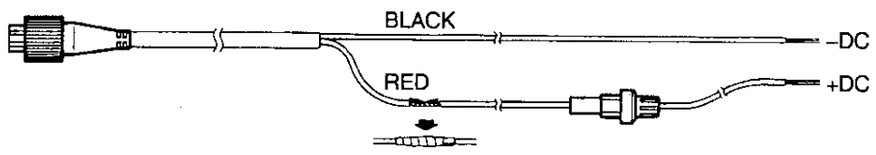


Fig. 10-14 Solder the cables

4 Grounding

As the GPS receiver handles pulse signals, it may cause noise interference to adjacent equipment (for example, ADF or radiotelephone) unless they are grounded properly. The recommended method is:

1) Mount the display unit away from radio equipment.
2) Do not lay the antenna cable together with other cables.
3) All cables must be as short as possible. (But, leave enough slack in cables for future servicing.)
4) For better performance run cables on the ship's ground bus and fix them at a regular intervals with copper straps.
5) Ground the display unit to the ship's grounding bus, using the copper strap supplied.

Chapter 11 SPECIFICATIONS

SPECIFICATIONS OF GP-70

RECEIVER CHARACTERISTICS

1. Receiver Channel
2 channels (up to 8 satellites multiplex-tracked)

2. Receiver
L1, C/A code

3. Position Accuracy (*)
Better than 15m RMS (HDOP<3)

4. Velocity Accuracy (*)
0.1 knots RMS (HDOP<#)

5. Tracking Velocity
250 knots

(*) : Accuracy expected on the current satellite's status. GPS accuracy is subject to change in accordance with the policy of the US Government.

PROCESSOR/DISPLAY CHARACTERISTICS

1. Display
102 × 87 mm LCD (backlighted)

2. Date/Time
Date, Hour, Minute, Second in GMT or Local

3. Waypoints
Total 100

4. Memory of Event positions
20 points max. (L/L and Date/Time)

5. Voyage Plan
1) Waypoint Navigation : You can select any one waypoint as a destination; range/bearing to the destination are shown digitally.
2) Routing Navigation : You can register up to 10 routes, each of which is configured with up to 10 waypoints selected by the user.

6. Alarms (Audio-visual)
1) Cross Track Error or Approach to Border
2) Arrival or Anchor Watch
3) Maximum or Minimum Speed

7. Data Interface

Output in FURUNO Standard format CIF, NMEA0183 or NMEA0180.

8. Power Supply

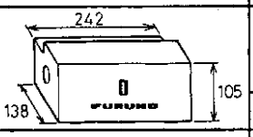
10 to 40 VDC, 10W approx.

110/220 VAC, 50/60Hz with optional rectifier PR-62.

FURUNO

CODE No.	000-040-643	20AD-X-9501-1
TYPE	FP20-00400	

付属品表 ACCESSORIES	GP－70	GPS航法装置 GPS NAVIGATOR	

番号 No.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	ダストカバー DUST COVER		20-005-2021-1 CODE No. 000-802-791	1	
			CODE No.		
			CODE No.		
			CODE No.		
			CODE No.		
			CODE No.		
			CODE No.		
			CODE No.		
			CODE No.		

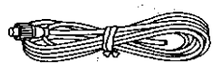
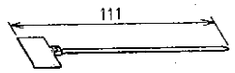
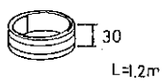
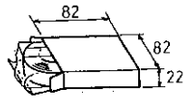
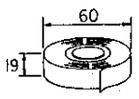
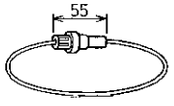
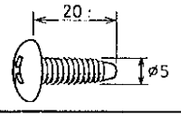
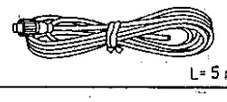
図番 DWG. No. C4344-F01-B	1/1
検図 CHECKED	

FURUNO ELECTRIC CO., LTD.

FURUNO

CODE No.	004-365-350	20AD-X-9401-1
TYPE	CP20-00401	

工事材料表 INSTALLATION MATERIALS	GP-70	GPS航法装置 GPS NAVIGATOR	

番号 No.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	電源コード POWER CABLE		22S0019-2 CODE No. 000-109-000	1	
2	ケーブルバンド CABLE CLAMP		PLF1M-M CODE No. 000-116-921	1	
3	アース銅板 COPPER STRAP		04S40801 30×1200×0.3 CODE No. 000-572-187	1	
4	絶縁テープ SELF-BONDING TAPE		Uテープ 0.5 ×19×5M CODE No. 000-800-985	1	
5	ビニールテープ NO.360 VINYL TAPE		0.2 ×19×10000 黒 エスロン CODE No. 000-835-215	1	
6	ヒューズ組品 FUSE ASSY.		CP20-00402 CODE No. 004-365-360	1	
7	⊕トラスタッピングネジ ⊕TAPPING SCREW		5 ×20 SUS304 1種 CODE No. 000-802-081	4	
8	ミガキ平座金 FLAT WASHER		M5 SUS304 CODE No. 000-864-128	4	
9	信号ケーブル SIGNAL CABLE		MJ型 6芯ケーブル付コネクタ (EV-SA7/ 0.16 ×2P) CODE No. 000-117-603	1	
			CODE No.		

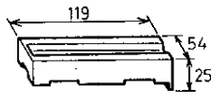
図番 DWG. No.	C4344-M01-A	1/1
検図 CHECKED		

FURUNO ELECTRIC CO., LTD.

FURUNO

CODE No.	004-365-370	20AD-X-9402
TYPE	CP20-00403	

工事材料表 INSTALLATION MATERIALS	GP-70	GPS航法装置 GPS NAVIGATOR	

番号 No.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	バーカクランプ HOSE CLAMP		SS7200N CODE No. 000-570-239	2	
2	取付補助具 INSTALLING SPACER		20-005-3101-0 CODE No. 100-150-540	1	
			CODE No.		
			CODE No.		
			CODE No.		
			CODE No.		
			CODE No.		
			CODE No.		
			CODE No.		
			CODE No.		

図番 DWG. No.	C4344-M02-A	1/1
検図 CHECKED		

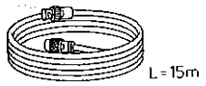
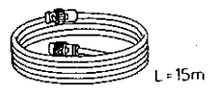
FURUNO ELECTRIC CO., LTD.

FURUNO

CODE No.	
TYPE	

20AD-X-9403

工事材料表 INSTALLATION MATERIALS	GP-70	GPS航法装置 GPS NAVIGATOR		

番号 No.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	アンテナケーブル組品 ANTENNA CABLE ASSY.		TBP-3DXV-15 20S0145-0 CODE No. 000-123-805	1	選択 TO BE SELECTED
2	アンテナケーブル組品 (アジロ外装品) ANTENNA CABLE ASSY. (WITH OVER SHEATH)		TBP-3DQEVCV-15 20S0154-0 CODE No. 000-123-806	1	
			CODE No.		
			CODE No.		
			CODE No.		
			CODE No.		
			CODE No.		
			CODE No.		
			CODE No.		

図番 DWG. No.	C4344-M03-A	1/1
検図 CHECKED		

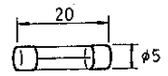
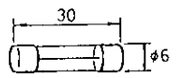
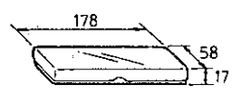
FURUNO ELECTRIC CO., LTD.

FURUNO

CODE No.	000-040-638
TYPE	SP20-00400

BOX No. P

SHIP No.	SPARE PARTS LIST FOR	U S E	SETS PER VESSEL
	GP-70 GPS航法装置 GPS NAVIGATOR		

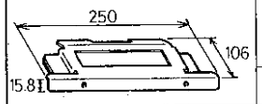
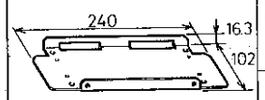
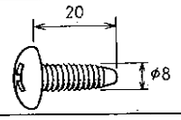
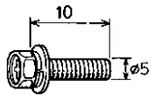
ITEM No.	NAME OF PART	OUTLINE	DWG. No. OR TYPE No.	QUANTITY WORKING PER SET	QUANTITY WORKING PER VES.	QUANTITY SPARE	REMARKS/CODE No.
1	ミゼットヒューズ FUSE		FGMB 3A 125V	1		3	000-104-909
2	管入りヒューズ GLASS TUBE FUSE		FGBO-A 2A AC125V	1		3	000-549-062
	予備品箱 SPARE PARTS BOX		FOR F710用		1		000-831-610

MFR'S NAME	FURUNO ELECTRIC CO., LTD.	DWG. No.	C4344-P01-A	1/1

FURUNO

CODE NO.	004-365-500	20AD-X-9502-1
TYPE	FP20-00600	

付属品表 ACCESSORIES	GP-70	GPS航法装置 GPS NAVIGATOR		

番号 No.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	ﾊﾝｶﾞｰ台組品 UPPER HANGER HOLDER		FP20-00601 2.5GY 5/1.5 CODE NO. 004-365-120	1	
2	ﾊﾝｶﾞｰﾍﾞｰｽ LOWER HANGER HOLDER		20-005-2061-1 2.5GY 5/1.5 CODE NO. 100-150-661	1	
3	+ﾄﾗｽﾀｯﾋﾟﾝｸﾞﾈｼﾞ TAPPING SCREW		M8X20 SUS304 CODE NO. 000-802-792	2	
4	+ｱﾌﾟｾｯﾄUIｾﾑｽB +HEX. BOLT (WASHER HEAD)		M5X10 SUS304 CODE NO. 000-802-288	2	
			CODE NO.		
			CODE NO.		
			CODE NO.		
			CODE NO.		
			CODE NO.		

オプション 前取付タイプ
HANGER HOLDER TYPE

図番 (1/1)
DWG. NO. C4344-F02-B

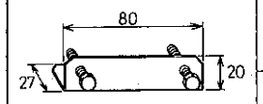
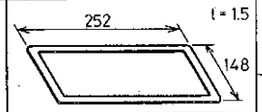
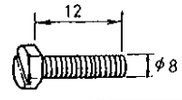
検図 CHECKED 中野 木村 斎木

FURUNO ELECTRIC CO., LTD

FURUNO

CODE NO.	001-337-730	20AD-X-9503-1
TYPE	FP20-00610	

付属品表 ACCESSORIES	GP-70	GPS航法装置 GPS NAVIGATOR		

番号 No.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	ﾌﾗｯｼｭﾏｳﾝﾄ金具組 FIXING PLATE ASSY.		FP20-00611 CODE NO. 004-365-130	2	
2	化粧枠 PANEL TRIM		20-005-2091-0 N-3.0 半ﾂﾔ CODE NO. 100-150-700	1	
3	六角ﾎﾞﾙﾄｽﾘ割付 HEX. BOLT (SLOTTED HEAD)		M8X12 SUS304 CODE NO. 000-862-143	2	
4	ﾊﾞﾈ座金 SPRING WASHER		M8 SUS304 CODE NO. 000-864-262	2	
			CODE NO.		
			CODE NO.		
			CODE NO.		
			CODE NO.		
			CODE NO.		

オプション フラッシュマウントS
FLUSH MOUNT S-TYPE

図番
DWG. NO. C4344-F03-B

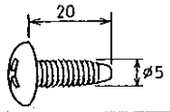
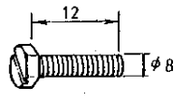
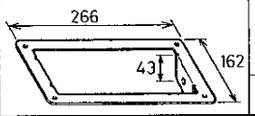
検図 CHECKED 中野 木村 斎木

FURUNO ELECTRIC CO., LTD

FURUNO

CODE NO.	001-338-320	20AD-X-9504-1
TYPE	FP20-00620	

付属品表 ACCESSORIES	GP-70	GPS航法装置 GPS NAVIGATOR	

番号 No.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	+トラスタッピングネジ TAPPING SCREW		5X20 1種 SUS304 CODE NO. 000-802-081	4	
2	六角ボルトスリ割付 HEX. BOLT (SLOTTED HEAD)		M8X12 SUS304 CODE NO. 000-862-143	2	
3	バネ座金 SPRING WASHER		M8 SUS304 CODE NO. 000-864-262	2	
4	化粧パネル FRONT PANEL		20-005-2081-0 N3.0 半ツヤ CODE NO. 100-150-710	1	
			CODE NO.		
			CODE NO.		
			CODE NO.		
			CODE NO.		
			CODE NO.		
			CODE NO.		

オプション フラッシュマウントF
FLUSH MOUNT F-TYPE

図番 DWG. NO. C4344-F04-B

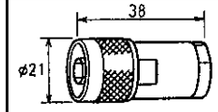
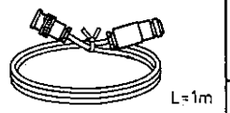
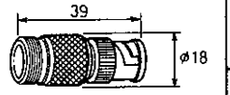
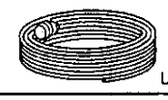
検図 CHECKED

FURUNO ELECTRIC CO., LTD

FURUNO

CODE No.	000-040-644	
TYPE	OP20-3	

工事材料表 INSTALLATION MATERIALS	GP-70	GPS航法装置 GPS NAVIGATOR	

番号 No.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	同軸コネクタ COAX. CONNECTOR		N-P-8DFB CODE No. 000-111-549	1	
2	アンテナケーブル ANTENNA CABLE ASSY.		NJ-TP-3DXV CODE No. 000-123-809	1	20S0147
3	コネクタ CONNECTOR		NJ-BNCP-NI CODE No. 000-123-810	1	
4	アンテナケーブル組品 ANTENNA CABLE ASSY.		8D-FBCV *30m* CODE No. 000-111-547	1	20S0021
			CODE No.		
			CODE No.		
			CODE No.		
			CODE No.		
			CODE No.		
			CODE No.		

図番 DWG. No.

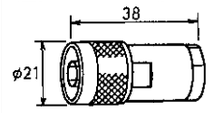
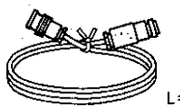
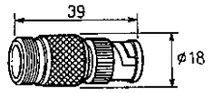
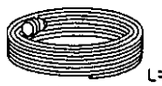
検図 CHECKED

FURUNO ELECTRIC CO., LTD.

FURUNO

CODE No.	000-040-645	
TYPE	OP20-5	

工事材料表 INSTALLATION MATERIALS	GP-70	GPS航法装置 GPS NAVIGATOR	

番号 No.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	同軸コネクタ COAX. CONNECTOR		N-P-8DFB CODE No. 000-111-549	1	
2	アンテナケーブル ANTENNA CABLE ASSY.		NJ-TP-3DXV CODE No. 000-123-809	1	20S0147
3	コネクタ CONNECTOR		NJ-BNCP-NI CODE No. 000-123-810	1	
4	アンテナケーブル組品 ANTENNA CABLE ASSY.		8D-FBCV *50m* CODE No. 000-111-599	1	20S0022
			CODE No.		
			CODE No.		
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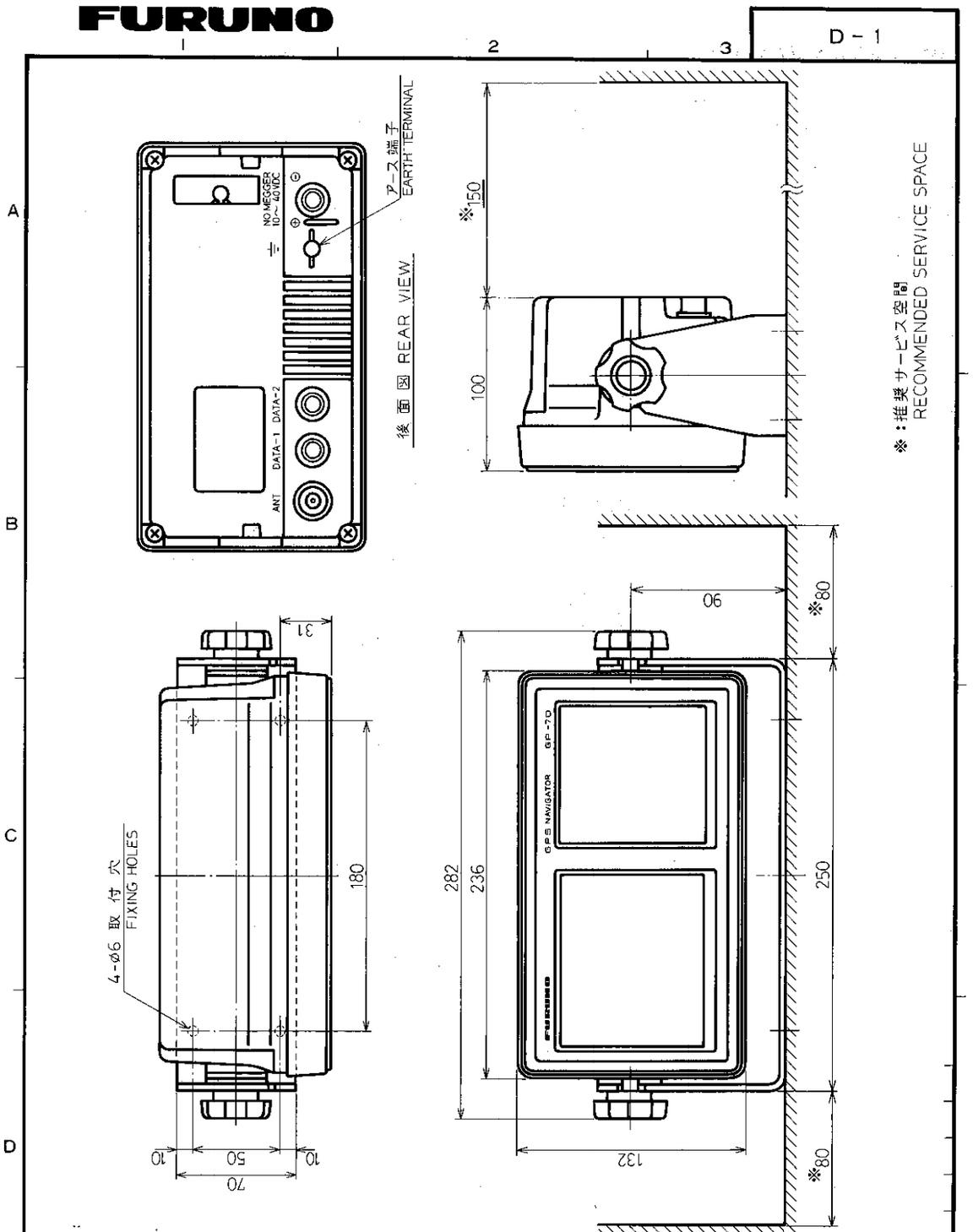
図番 DWG. No.			
検図 CHECKED			

FURUNO ELECTRIC CO., LTD.

FURUNO

D – 1



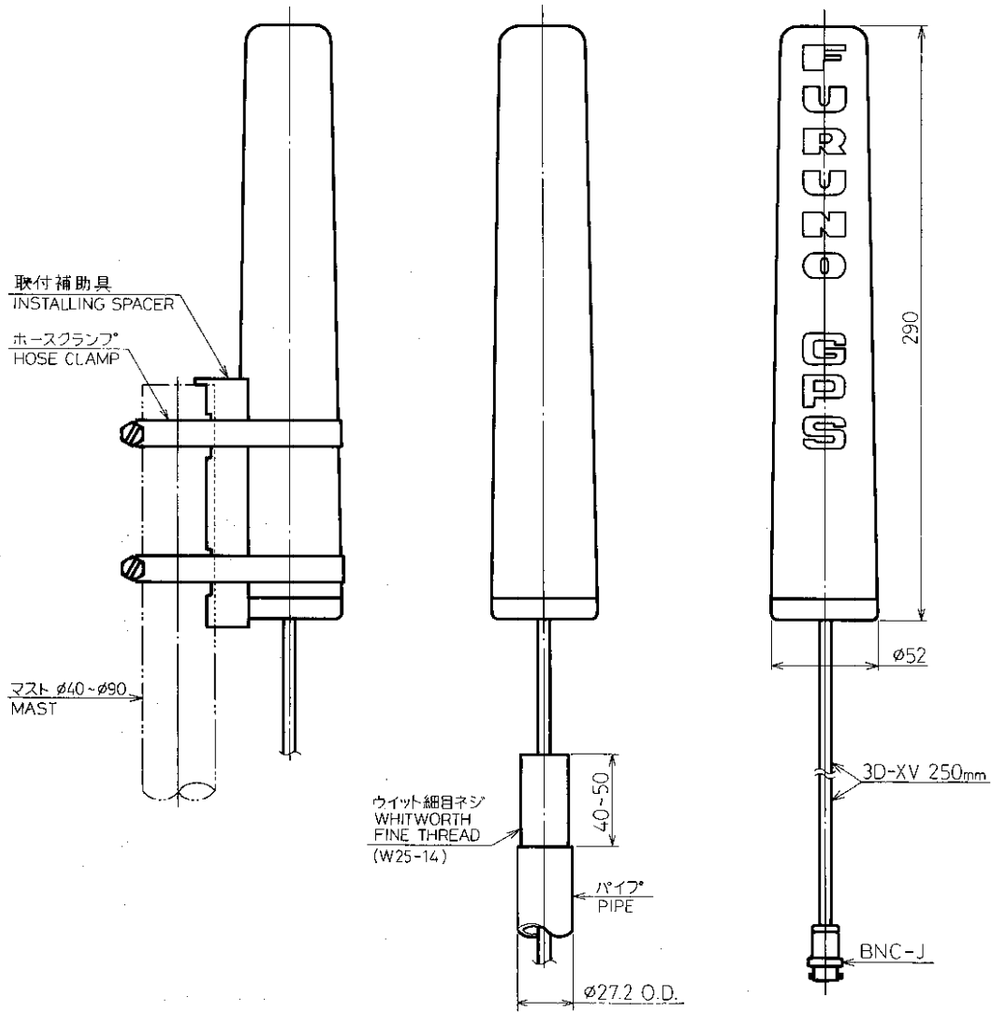
品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG. NO.	摘要 REMARKS

承認 APPROVED	Jun. 4. '91 T.NAKANO	三角法 THIRD ANGLE PROJECTION		名称 TITLE	GPS受信演算部 GPS NAVIGATOR
検図 CHECKED	Jun. 4. '91 N.SAITO	尺度 SCALE	1/3	GP-70	
製図 DRAWN	June. 4. '91 S.Nishi	重量 WEIGHT	3 kg	図番 DWG. NO.	C4344-G01-A

FURUNO ELECTRIC CO., LTD.

装備方法1(標準)
STANDARD
INSTALLATION

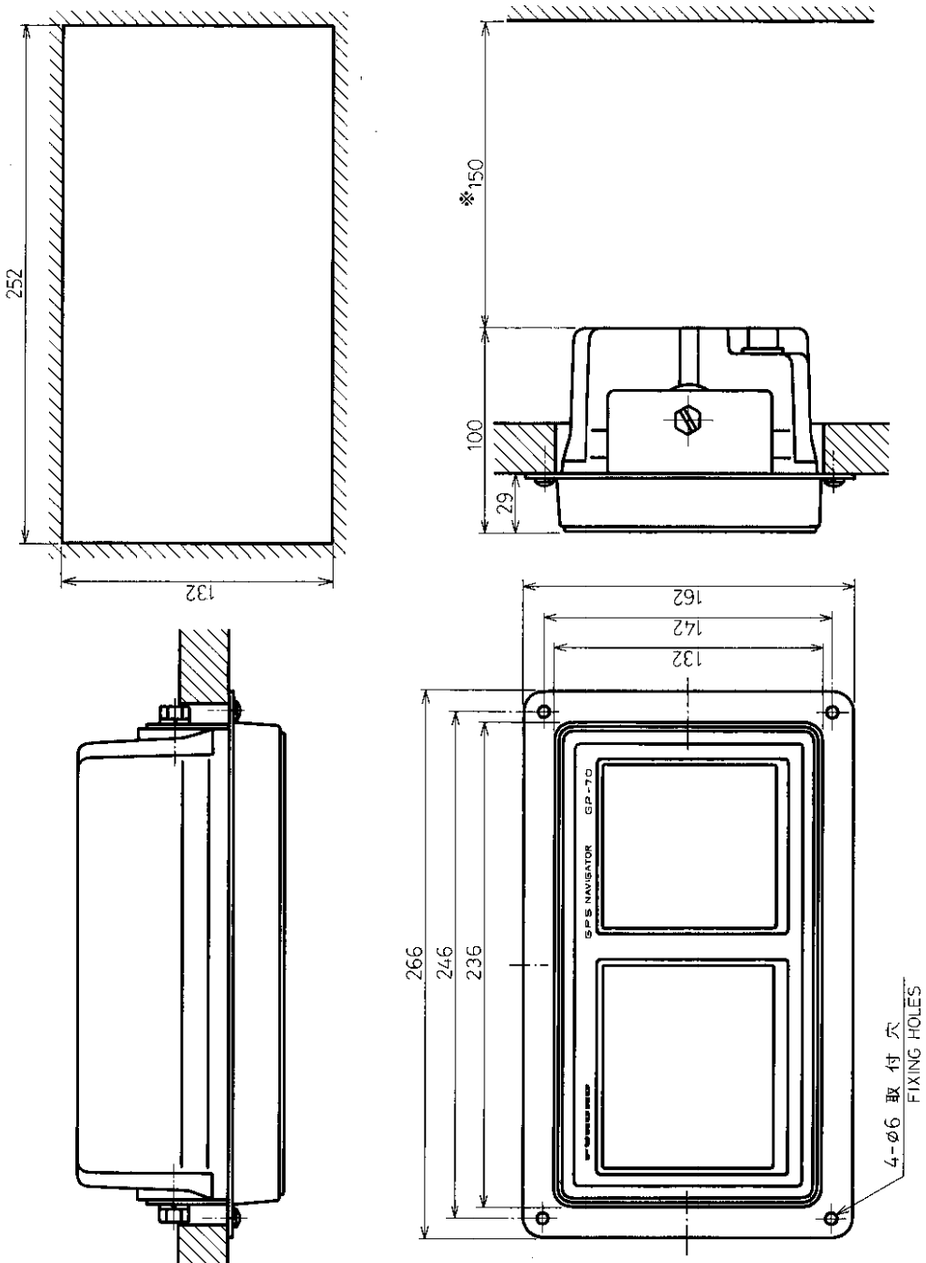
装備方法2
SCREWED
INSTALLATION



GP-1250/70	品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG.NO.	摘要 REMARKS

承認 APPROVED	Jun. 4. '91 T. TAKAKU	三角法 THIRD ANGLE PROJECTION		名称 TITLE	空中線部外観図 ANTENNA UNIT
検図 CHECKED	Jun. 4. '91 N. SAITO	尺度 SCALE	1/3	GPA-014	
製図 DRAWN	June 4. '91 S. Nishi	重量 WEIGHT	0.5 kg	図番 DWG.NO.	C4344-G02-A

FURUNO ELECTRIC CO., LTD.



	品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG.NO.	摘要 REMARKS

承認 APPROVED	Jun. 4. '91 T. TAKAKU	三角法 THIRD ANGLE PROJECTION		名称 TITLE	埋込み装備 F-型 FLUSHMOUNT F-TYPE
検図 CHECKED	Jun. 4. '91 N. SAITO	尺度 SCALE	1/3	GP-70	
製図 DRAWN	June 4. '91 S. Nishi	重量 WEIGHT	2.8 kg	図番 DWG.NO.	C4344-G03-A

FURUNO ELECTRIC CO., LTD.

FURUNO

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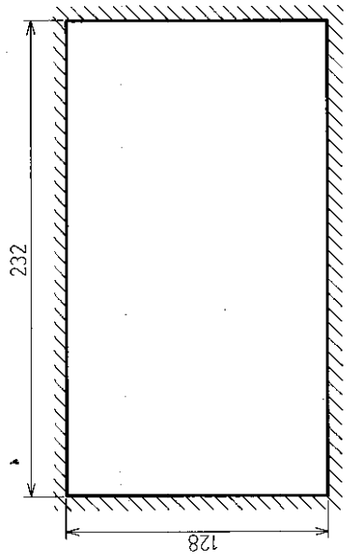
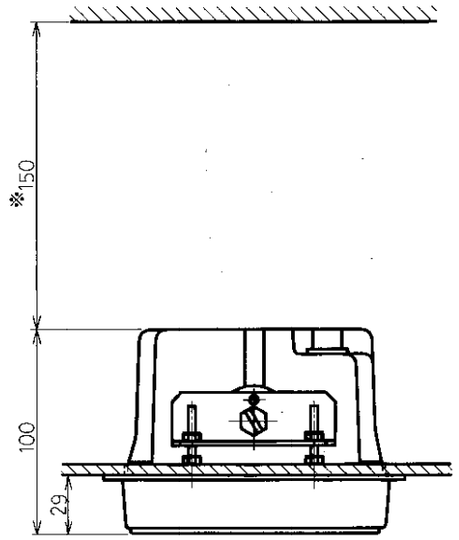
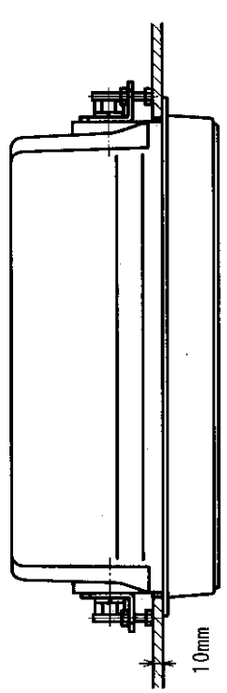
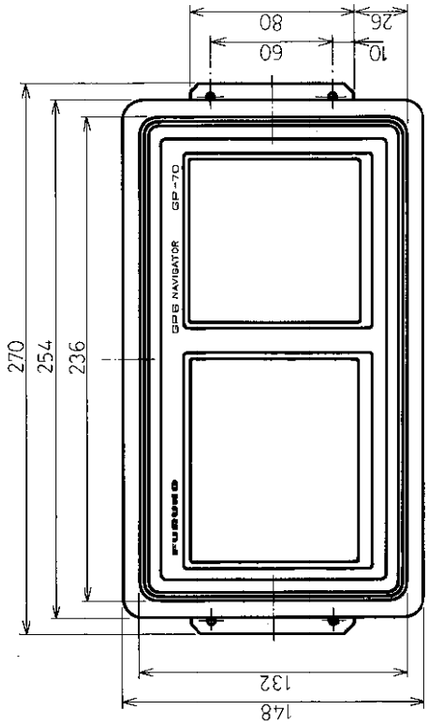




※：推奨サービス空間
RECOMMENDED SERVICE SPACE





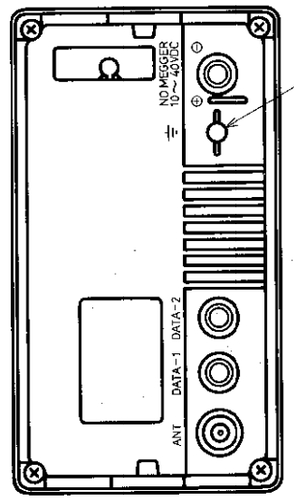
品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG.NO.	摘要 REMARKS

承認 APPROVED	Jun.4.'91 T.NAKAJO	三角法 THIRD ANGLE PROJECTION		名称 TITLE	埋込み装備 S-型
検図 CHECKED	Jun.4.'91 M.SAITO	尺度 SCALE	1/3	GP-70	FLUSHMOUNT S-TYPE
製図 DRAWN	June.4.'91 S.Nishi	重量 WEIGHT	2.8 kg	図番 DWG.NO.	C4344-G04-A

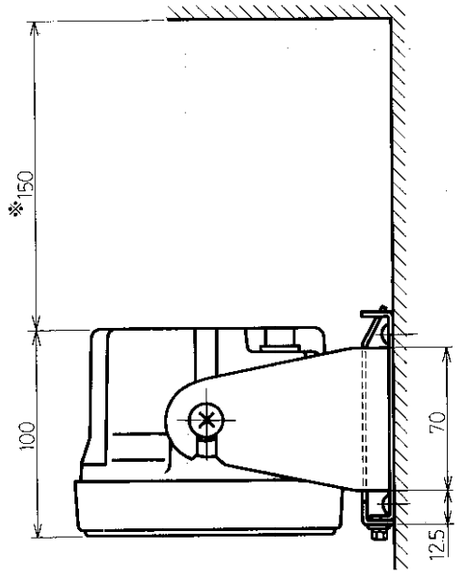
FURUNO ELECTRIC CO., LTD.

FURUNO

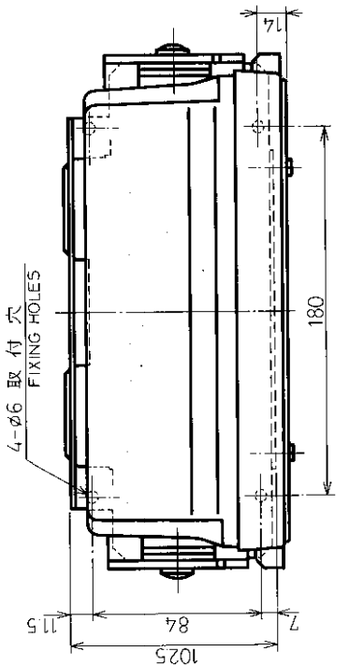
D - 5

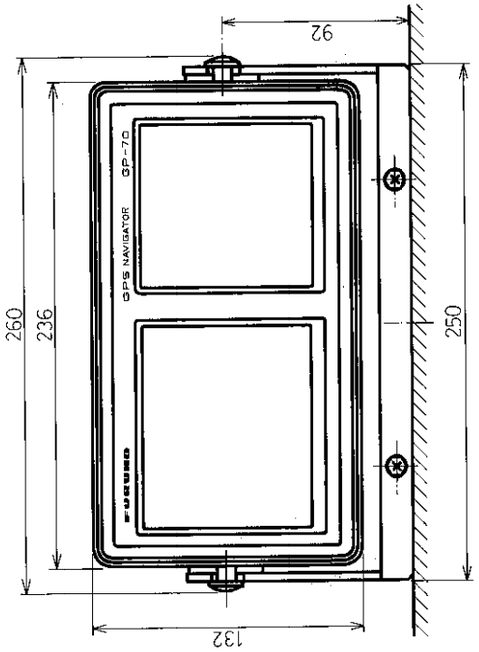


後面図 REAR VIEW



※：推奨サービス空間
RECOMMENDED SERVICE SPACE



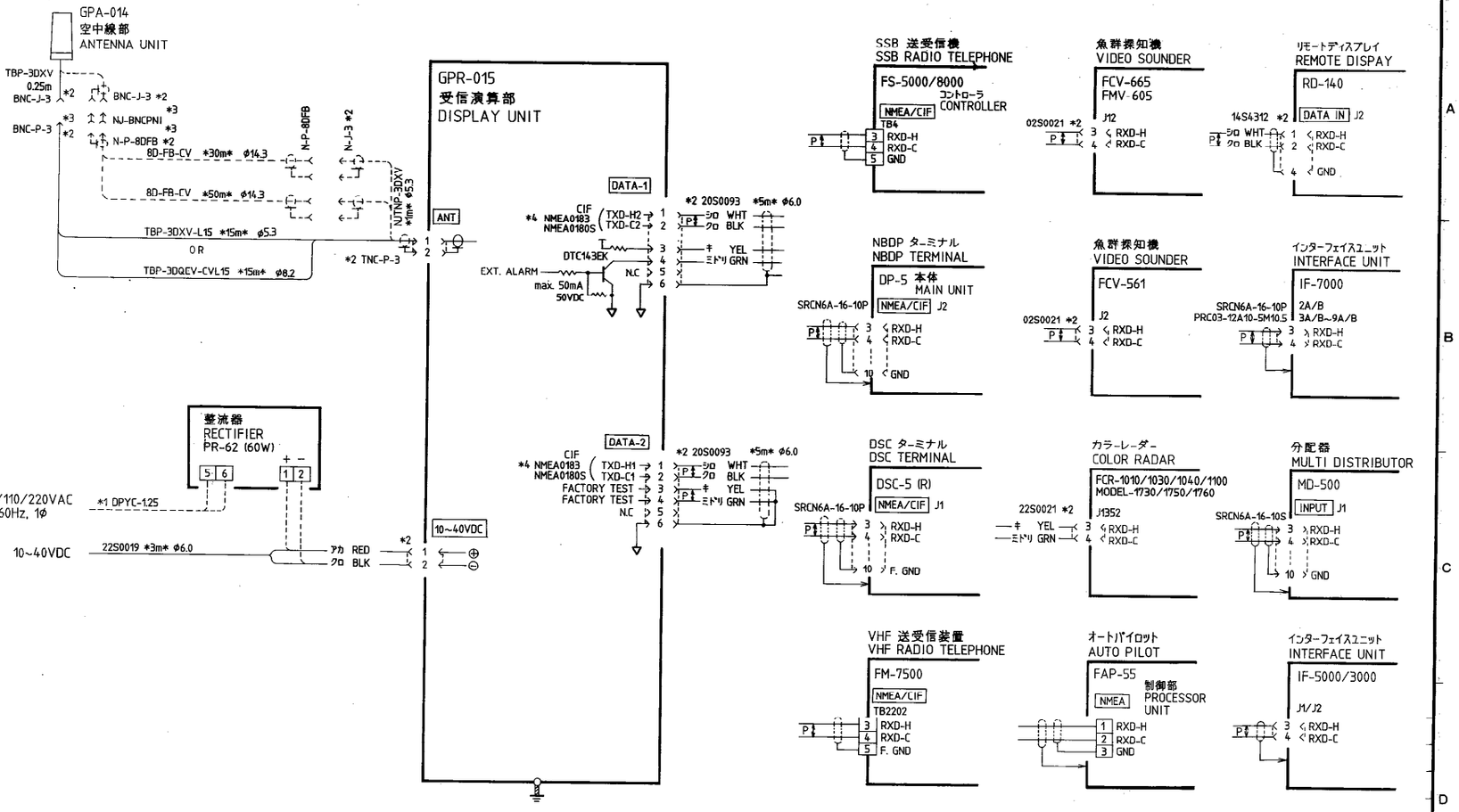


品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG.NO.	摘要 REMARKS

承認 APPROVED	Jun.4.'91 T.NAKAJO	三角法 THIRD ANGLE PROJECTION		名称 TITLE	ハンガー間接固定型
検図 CHECKED	Jun.4.'91 M.SAITO	尺度 SCALE	1/3	GP-70	HANGER HOLDER TYPE
製図 DRAWN	June.4.'91 S.Nishi	重量 WEIGHT	3.5 kg	図番 DWG.NO.	C4344-G05-A

FURUNO ELECTRIC CO., LTD.

FURUNO



注記

*1: 造船所支給
*2: 工場取付済
*3: 防水のためテーピング処理をする事
*4: メニューにて選択
----: オプション支給
: 銅板に接地

NOTE

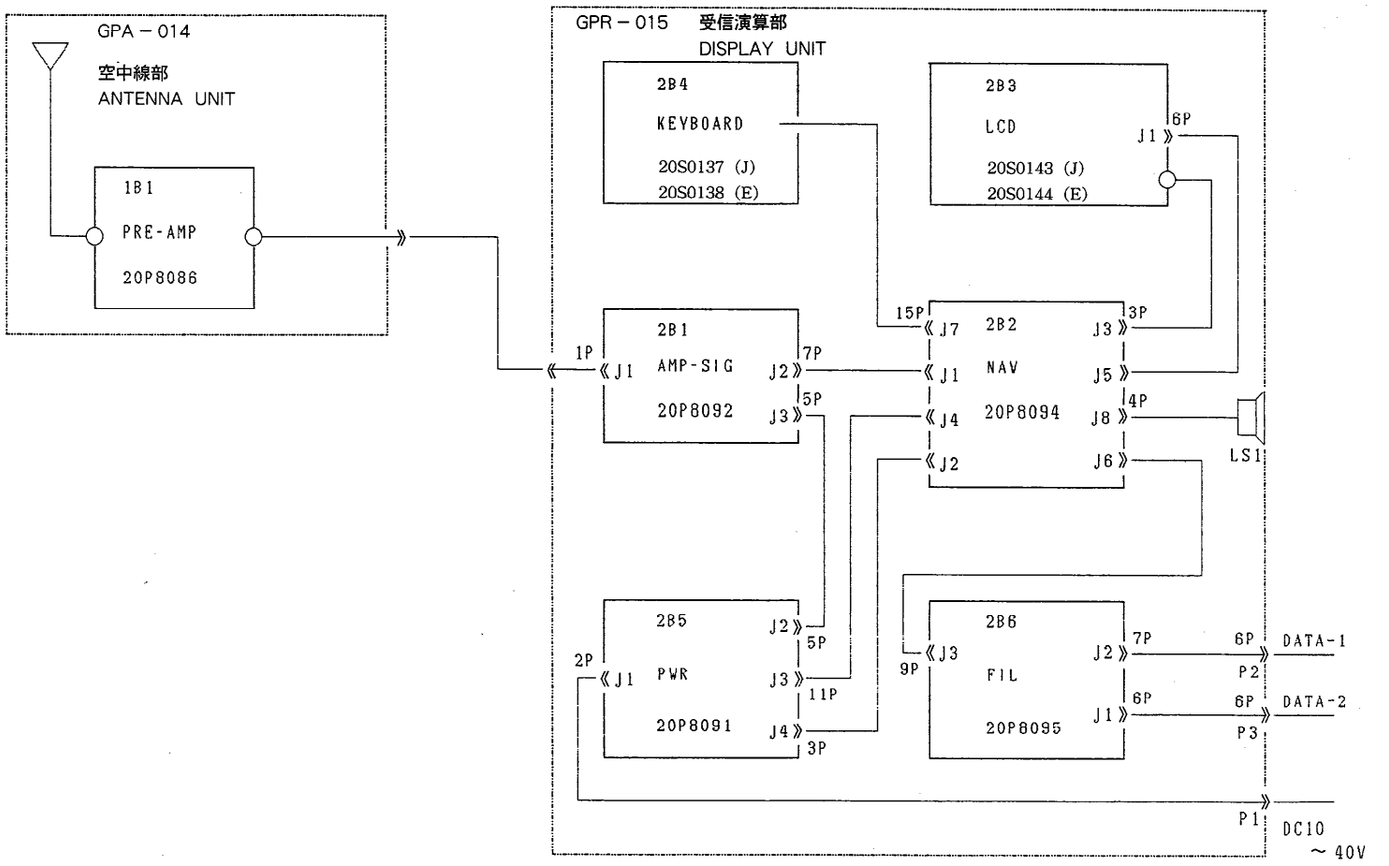
*1: SHIPYARD SUPPLY
*2: FACTORY-SOLDERED
*3: WIND TAPE FOR WATERPROOF
*4: SELECTABLE ON MENU
----: OPTIONAL SUPPLY
: GROUND WITH COPPER STRAP

承認 APPROVED	JUN・25・'91 T.NAKAYO	名称 TITLE	相互結線図 GP-70 INTERCONNECTION DIAGRAM
検図 CHECKED	JUN・25・'91 Y.SAITO		
製図 DRAWN	June・18・'91 S.Nishi	図番 DWG.NO.	C4344-C01-B

FURUNO ELECTRIC CO., LTD.

S-1

FURUNO

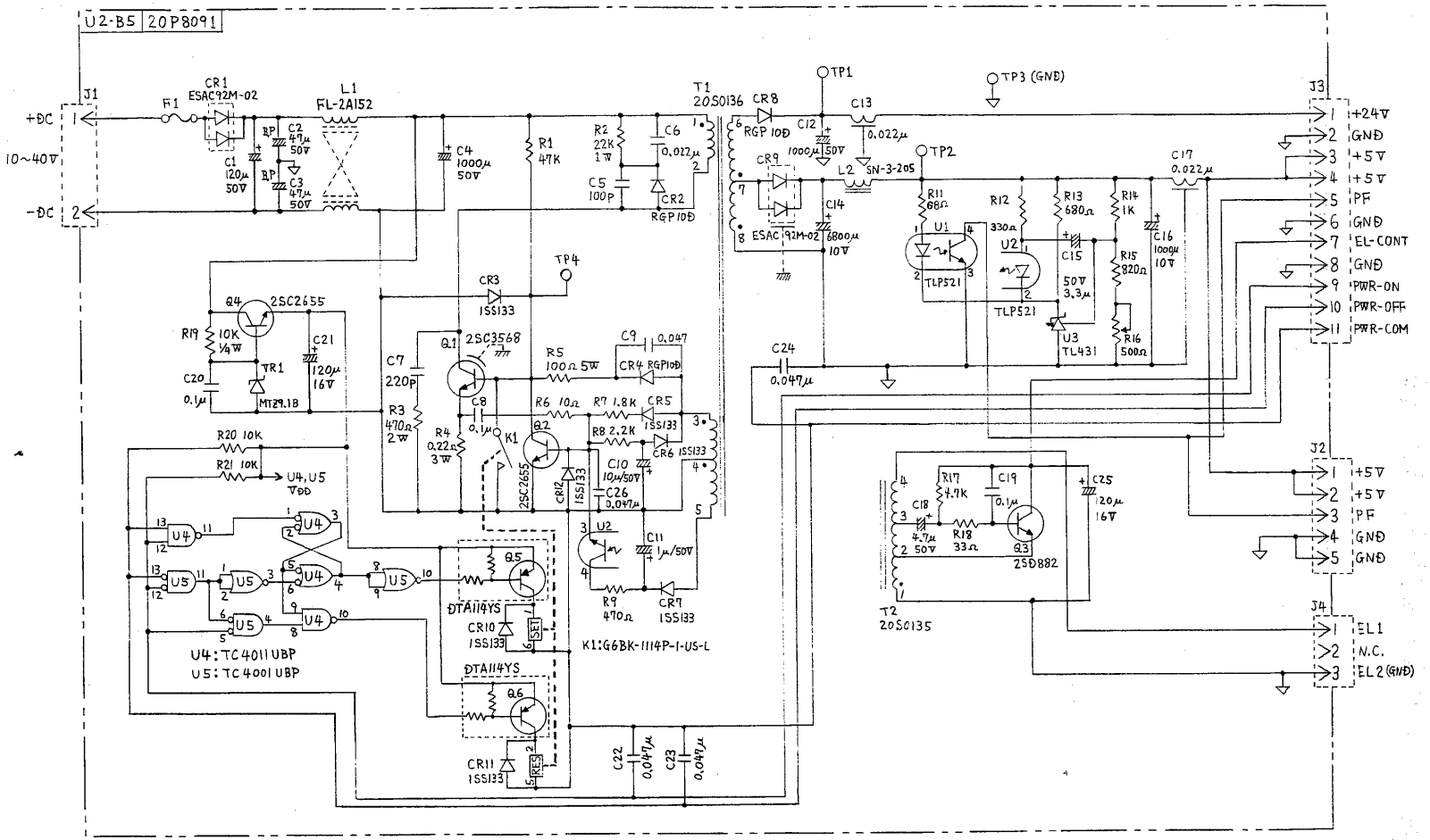


承認 APPROVED	DEC・12・'91 T.NAKAYO	名称 TITLE	総合回路図 GP-70 GENERAL SCHEMATIC DIAGRAM
検図 CHECKED	DEC・12・'91 T.NAKAYO		
製図 DRAWN	Dec・11・'91 S.Nishi	図番 DWG.NO.	C4344-K02-A

FURUNO ELECTRIC CO., LTD.

S-2

FURUNO



承認 APPROVED	DEC.12.'91 TANAKA	名称 TITLE	PWR 基板 GP-70 PWR BOARD
検図 CHECKED	DEC.12.'91 TANAKA		
製図 DRAWN	Dec.11.'91 S.Nishi	図番 DWG.NO.	C4344-K01-A

FURUNO ELECTRIC CO., LTD.

WAYPOINT LOG

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Waypoint Log

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Waypoint Log

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