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GPS 60

How GPS works
Position Fixing Accuracy: HDOP
The Installation of The GPS ANT.

Important Notice

Manual Handling	Keep this manual in a safe place where you can access it quickly. This Manual must be passed to a new owner of the AQUA when it is transferred.
------------------------	--

The Global Positioning System (GPS) consists of a total 24 GPS satellites that orbit the earth, enabling you to determine your position anywhere in the world, 24 hours a day, if you can receive satellite signals. During actual navigation, carefully compare the position data with all available navigation sources such as Loran C, Decca, other navigators, charts, visual navigation, depth, water temperature and others. It is your responsibility to make navigation judgments.

DGPS Operation Note:

Your position can be improved by DGPS correction. However, when you are communicating with other ships, you may use a DGPS corrected position but they may not. Make your position source known during communication.

The Electronic Chart:

Only official authorized charts and notices to mariners contain all the information needed for the safety of navigation and, as always remember, the user is responsible for their prudent use.

Pictorials

This manual uses the following symbols for easy understanding safety instructions. Always follow these instructions carefully.

	WARNING	Always follow this safety instruction to prevent death or injury.
	CAUTION	Follow this safety instruction to avoid possible injury or damage to your property. Symbol “△” is a CAUTION or WARNING label indicating the safety instruction.
	WARNING	This symbol is an Electrical Shock WARNING label.
		Symbol “ ” is an instruction that you must not violate. (This symbol instructs NOT to disassemble the system components)
		Symbol “ ” is an operation instruction that you must follow. (This symbol shows the main power OFF instruction.)



WARNING <For System Operators>

Always follow this instruction to prevent death or personal injury.

	Turn power off During abnormality.	If smoke or a small of burning occurs, a fire or an electrical short circuit may result. Turn the power switch OFF and shut down the power supply immediately. Never try to repair the system yourself. Call for service.
 	Do not open Cabinet.	High voltage exists in the instrument. Contact with voltage may cause possible injury or death.
	Do not touch back side of the equipment.	Harmful line voltage is present on back side of the equipment. Never try to touch back side while power is turned on.
	Avoid excessive shock to display unit.	The LCD display module contains a liquid. Do not apply any mechanical shock to the display. If the display broken, liquid may leak and injure your skin and eyes.
	Do not use with poor ventilation.	If you cover this unit or use in an enclosed place, it may malfunction or become damaged as a result of overheating. Use only where there is sufficient ventilation.



Installation Cautions <For service Personnel>

Follow installation instructions to avoid personal injury and system malfunction.

Installation in rigid location.	Mount your AQUA on a rigid frame or base to prevent your unit from working loose.
Use correct Installation materials.	Use the installation materials provided in the standard accessory pack only. If you use hardware of insufficient strength, your system may loosen causing damaged.
Keep away from direct sunlight.	Keep your system out of direct sunlight as it may become damaged by overheating.
Keep away from water.	Take care not to get water on or in your unit as it may be damaged and/or cause an electrical shock.
Keep away from heat source.	Keep your system away from other heat source as it may malfunction, be damaged, or burn.
Use correct power source.	Operate your system within the specified power voltage. An incorrect power supply may cause



Maintenance Cautions<For Maintenance Personnel>

Use the following safety precaution internal inspection.

Discharge capacitors.	High voltage may be retained in the capacitors if the high-tension circuit several minutes after you have turned the power switch off.
Check that power is OFF	To prevent an electrical injury due to erroneous power switching, make sure that the main power supply and the system power switch are both in the off position. Additionally, attach a safety label showing that service is in progress.
Avoid EMI.	Take care not to damage the ESDs (Electrostatic Sensitive Devices) by static electricity from carpet and cloths.
Avoid dust.	Wear a safety mask so as not to breath in dust during inspection or cleaning inside your system instruments.

Operation Notes <For operators>

Observe the following operation notes, otherwise the system failure or deterioration can result. And periodical inspection and maintenance are required for keeping the system in an optimum condition.

Backup important data.	The waypoint and other registered data may become unreadable by unexpected failure. We recommend recording this data separately.
Use correct transducer only.	If you use incorrect transducer, the transmitter circuit may be damaged due to a matching error. Consult us for system information.
Check transducer Connection before power on	Do not turn the power switch ON if the transducer is disconnected or if it is not inserted into the water. If done, the transducer or transmitter circuit may be damaged.
Always clean the transducer	Since transducer performance can drop due to accumulated bottom growth, keep the transducer clean. Never paint transducer surface.
Transducer must be installed by authorized personnel.	Consult us for transducer installation by authorized personnel.



WARNING

This product is designed to assist a navigation.
When you are sailing, use the certified chart from the Government or IMO.

AQUA Color LCD Charting System

Welcome

The AQUA Color LCD Charting System opens a new chapter of performance and integration in vessel navigation system display and management. Whether you are a Cruiser or Sport fisherman or both, AQUA gives you the information you need.

CAUTION

The AQUA is Color LCD Charting Systems employs the latest in proven technology to provide accurate navigation information. The Plotter functions of the AQUA are totally dependent upon the capability of the navigation source to provide accurate position information. This device is only an aid to navigation. It should be used in conjunction with all other navigation accuracy. For safety, always resolve any uncertainty before continuing navigation.

CAUTION

Electronic charts in AUQA are derived from geographical data – including official government charts – which we believe to be accurate. They are neither verified nor approved by Hydrographic Authorities. Electronic charts in AQUA are designed only to ease and speed navigation calculations and so must not be relied upon as a primary source of navigation information, but rather a backup to the use of official government charts and prudent navigation habits.

There is no direct relationship between the color of water areas and their depth. The navigator shall always query the area for depth information and use the official paper chart.

CAUTION

The performance of LCD displays are degraded by continuous direct exposure to ultraviolet rays. Locate your AQUA Display away from direct sunlight. When not in use. Keep the display covered.

DISPLAY BREAKAGE WARNING

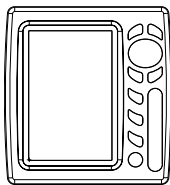
The LCD display module contains a liquid. If the display is broken and the liquid contacts your skin, wash it off immediately in running water for 15 minutes. If the liquid contacts your eyes, immediately flush your eyes with running water for 15 minutes. Contact a physician if any abnormal symptom is experienced.

AQUA Color LCD Charting System

Introduction

The AQUA Color LCD Charting System is a premium multifunction command and control center. It combines in one unit, display of worldwide cartography, GPS navigation and Echo Sounder. AQUA front panel keyboard and its large screen with wide viewing area make placement easy. Although AQUA offers many advanced features, operation is simplified through the use of popup menus similar to those found on personal computers. Also, the front panel keyboard has specific keys for direct access to the most used functions and settings.

Equipment Supplied



AQUA Display unit



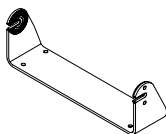
GPS ANT.
(stand is option)



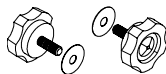
Fixable Band(option)



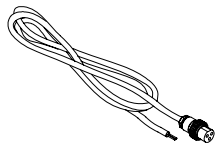
Protector



Mounting Bracket



Knobs



Power cable



Manual

AQUA Color LCD Charting System

GETTING STARTED

This getting Started section will help you become acquainted with the displays and the front panel keyboard functions of your AQUA Color LCD Charting System. This section is intended to demonstrate the main functions and basic operation of your AQUA System. More detailed procedures may be found in the Operation section.

AQUA has built-in simulators which present realistic displays of cartography, GPS and Sounder. Note: Sounder option is required is required to use the sounder simulator. Simulators are interactive so the front panel keyboard can be used to browse through menus and change setting in the same manner as actual operation. The internal simulators allow AQUA to operate without having transducers or remote sensors connected. However, it is necessary to connect the power cable to 12 to 24 Vdc power source. Please refer to *Power Connection* in the installation section.

If AQUA is already installed on your vessel, simulators are still useful doe familiarity with displays and practice with operating procedures.

AQUA Color LCD Charting System

SPECIFICATION

GENERAL SPECIFICATION

1. Display Screen
wide 6.5 inch color TFT LCD(752 X 480 pixels)
2. Operating Temperature
Display Unit: $-15^{\circ}\text{C} \sim 50^{\circ}\text{C}$
Antenna Unit: $-25^{\circ}\text{C} \sim 70^{\circ}\text{C}$
3. Performance Standard
IMO Resolution MSC.112(73)
4. Back-up
SD Card (Optional)
5. Optional
HAIYANG Chart with SD Card

CHARTPLOTTER SPECIFICATION

1. Display Method
Mercator Projection
2. Display Mode
True motion / North up / Course up / Head up
3. Latitude Limits
Between 85°N to 85°S
4. Map Scale
0.05nm to 500nm
5. Map Datum
WGS-84(Standard), 270 different Datums
6. Waypoint
5,000 points
7. Event Mark
10,000 points
*Total of 16 colors and 16 icons are selectable each point
with name tag (8 alphanumeric characters)
8. Track Point
50,000 points
9. Route Max capacity
100 Routes
*20 WPTs per each Route. Each with name tags
(8 alphanumeric characters)
10. Draw Point
1,000 points
11. Area Name
1,000 points
12. Chart Data
C-MAP / HY Chart(Inter/Exter)

AQUA Color LCD Charting System

13. Output Data

NMEA-0183

14. Input Data

NMEA-0183

15. Alarm

Arrival, Anchor, Off course, Interval timer

GPS RECEIVER GENERAL SPECIFICATION

1. Receive Type

L1 frequency(1575.42MHz), C/A code

2. Number of Channel

16 channels

3. Accuracy

Position 2.5m CEP

DGPS/SBAS 2.0m CEP

4. Sensitivity

Acquisition -140 dBm

Tracking -149 dBm

5. Data Update Rate

1 Second

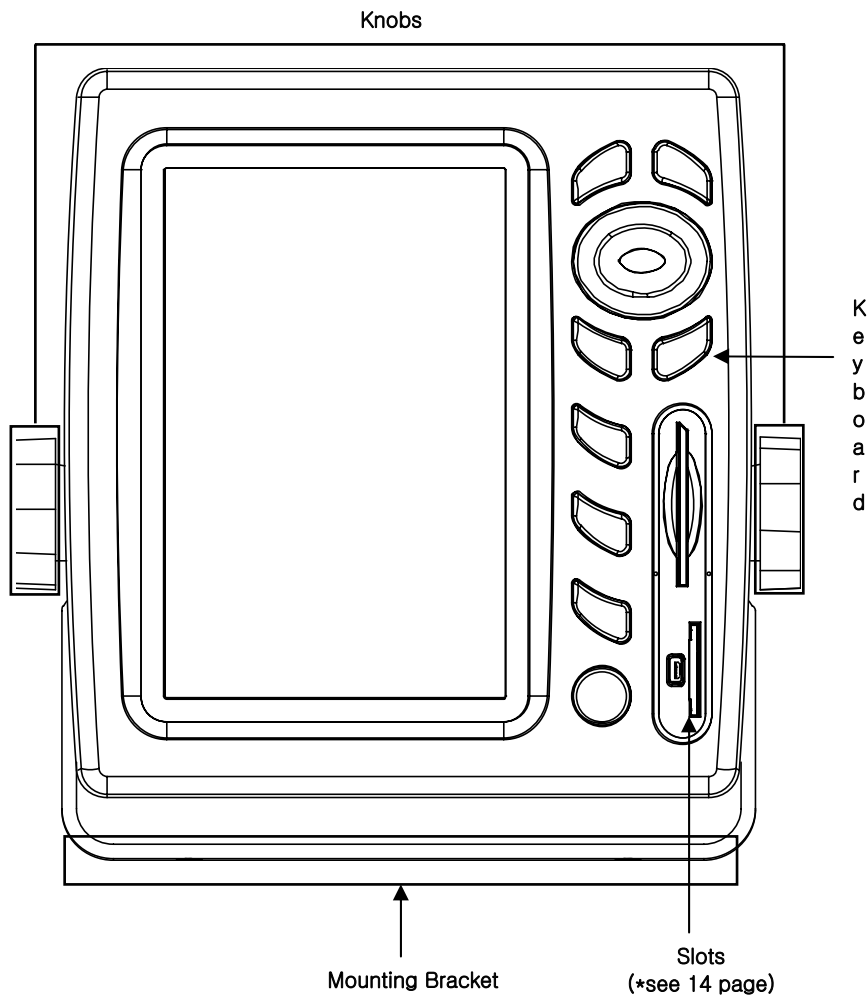
6. Support

DGPS, SBAS (WAAS, EGNOS, MSAS)

AQUA Color LCD Charting System

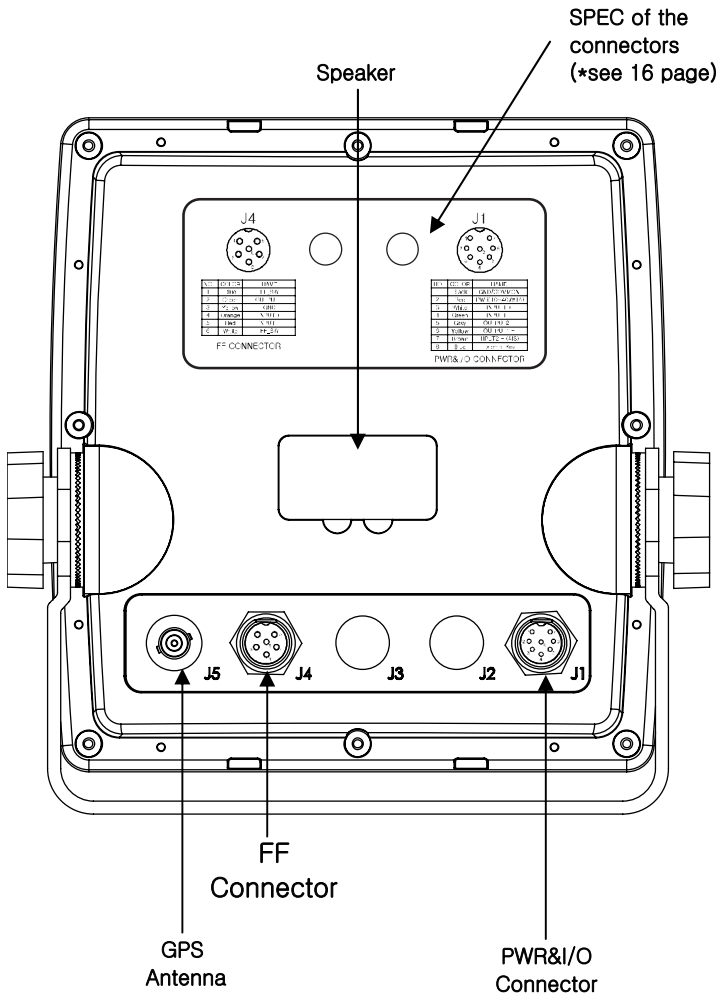
Display Unit

The heart of the AQUA Color LCD Charting System is the display unit. Within the display unit are the powerful central processor and integrated display system, built-in cartography. The bright 6.5 inch active matrix color LCD, is easily viewed over a wide area on the bridge or nav center.



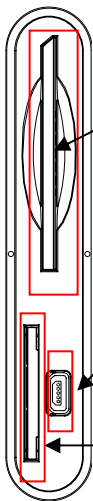
AQUA Color LCD Charting System

Interconnecting diagram



AQUA Color LCD Charting System

Slots

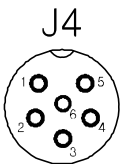


C-CARD slot
C-MAP NT+ and C-MAP MAX NT are available

Mini USB port
Upgrade of new S/W and charts is available through the USB port. The particular upgrade S/W, “DNW” is necessary for upgrade.

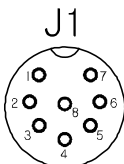
SD card slot
Upgrade, back-up of user data(WPT, Mark, Track, etc) and loading data are available with a SD card of which the maximum memory is 1GB.

SPEC of the connectors



NO	COLOR	NAME
1	Blue	FF_SW
2	Green	OUTPUT +
3	Yellow	GND
4	Orange	INPUT +
5	Red	INPUT -
6	White	FF_SW

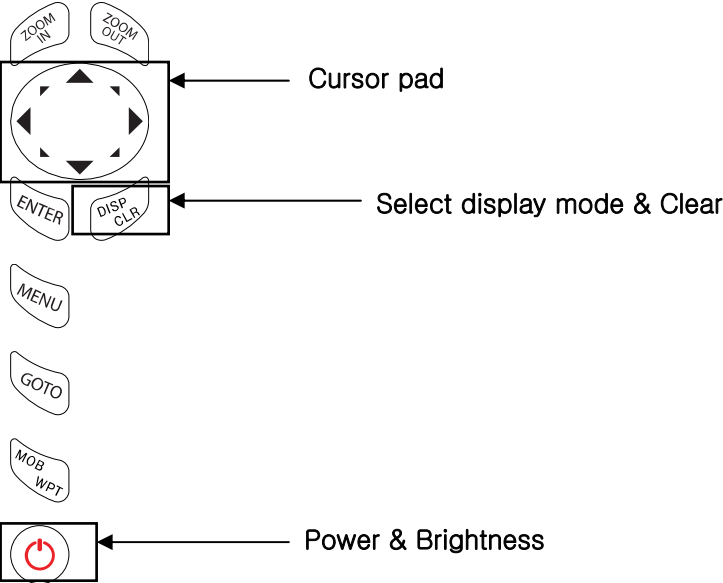
FF CONNECTOR



NO	COLOR	NAME
1	Black	GND/COMMON
2	Red	PWR(10~40V±1A)
3	White	INPUT1 +
4	Green	INPUT1 -
5	Gray	OUTPUT2 +
6	Yellow	OUTPUT1 +
7	Brown	INPUT2 + (AIS)
8	Blue	External Key

PWR&I/O CONNECTOR

The Keyboard



[ZOOM-IN]	CHANGE THE CHART OF SCALE BIGGER IN PLOTTER
[ZOOM-OUT]	Change the chart of scale smaller in plotter
[MENU]	Menu opens menu to select options
[GOTO]	Cursor display: Place the cursor and press "GOTO" to set WPT No cursor/Pointed WPT: Save WPT and set free the pointed WPT No cursor/No pointed WPT: List for WPT, route
[DISP/CLR]	Selects function to display on HY Display, Plotter Display, LAT/LOT Display, Highway Display, Steering Display, Nav data Display. (* When the menu or the cursor appears, it's used fro ESC.
[ENTER]	Completes pending selection or operation
[MOB/WPT]	WPT: Places a WPT on the plotter main screen. MOB: Is a special navigation function that immediately stores your present position as a waypoint and activates navigation to the stored coordinates.
[Power/Brightness]	BRT: Brightness adjust the brightness in day mode or night. PWR: Turns On/Off
[CURSOR PAD]	Cursor On and use to move the cursor, select menu items, scroll lists, select options, change settings in plotter (*To make the cursor deleted, press [MAIN SCREEN].

How to use [Power/Brightness]

Use PWR:

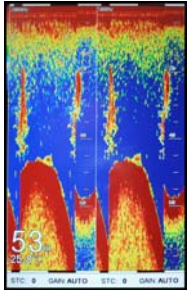
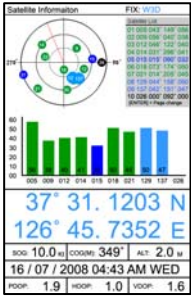
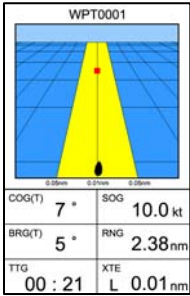
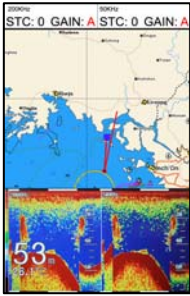
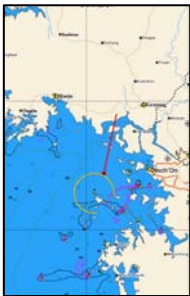
To turn off the power, keep pressing the [BRT/PWR] until the end of counting.

Use BRT:

Press [BRT/PWR] shortly and the brightness can be controlled. Use the arrow keys of the cursor to control the brightness and the contrast.

Page Select

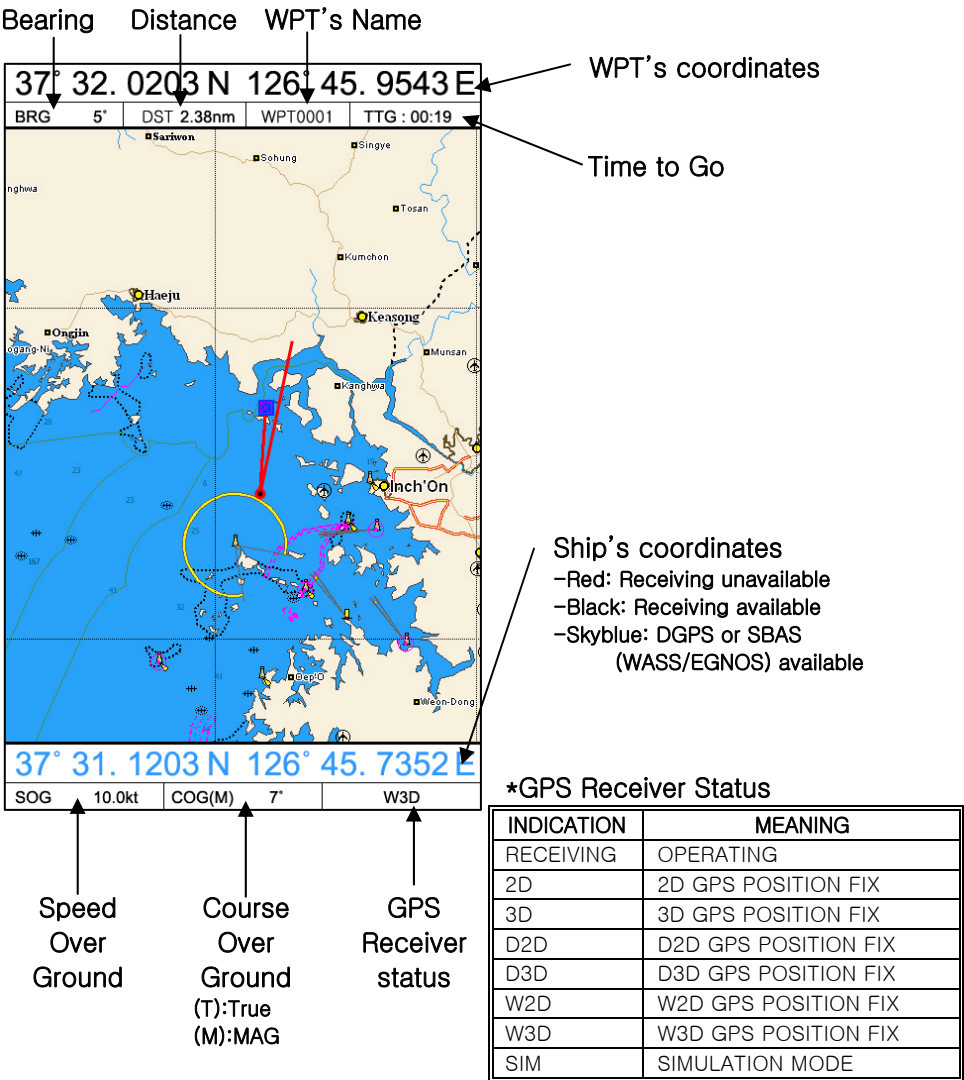
Pressing the key, [DISP], you will see the following pages. Move the red box with the arrow key and press the key, "ENTER". The chosen page will be active. Please, kindly note that the FF page will be available when the display is connected with a black box FF.



Page Select

1. Simply LAT/LOT mode

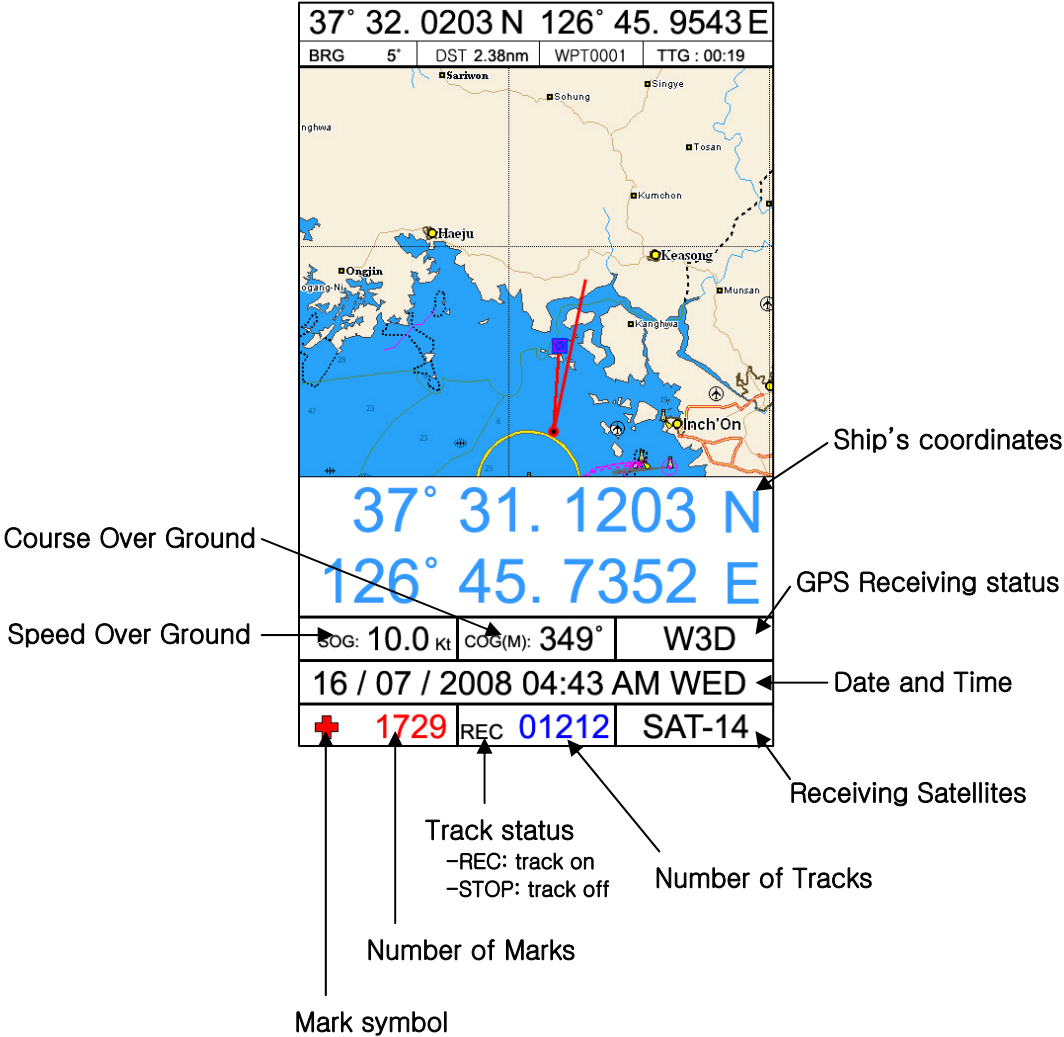
Simple LAT/LON mode supplies LAT/LON, speed, bearing only. The large chart supports on display.



Page Select

2. Full Information mode

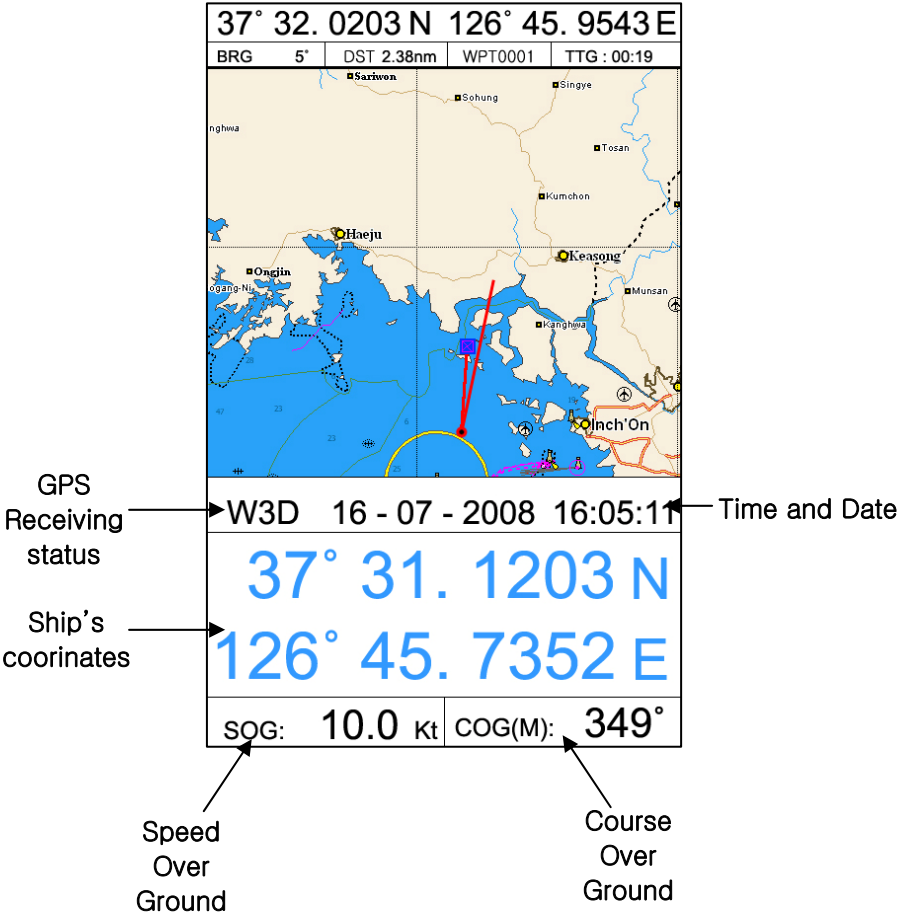
Full information mode supplied all details for navigation.
(LAT/LON, Speed, Bearing, GPS status, Date & Time, Symbol of marks and numbers, Number of tracks, Number of receiving Satellites)



Page Select

3. Large LAT/LON mode

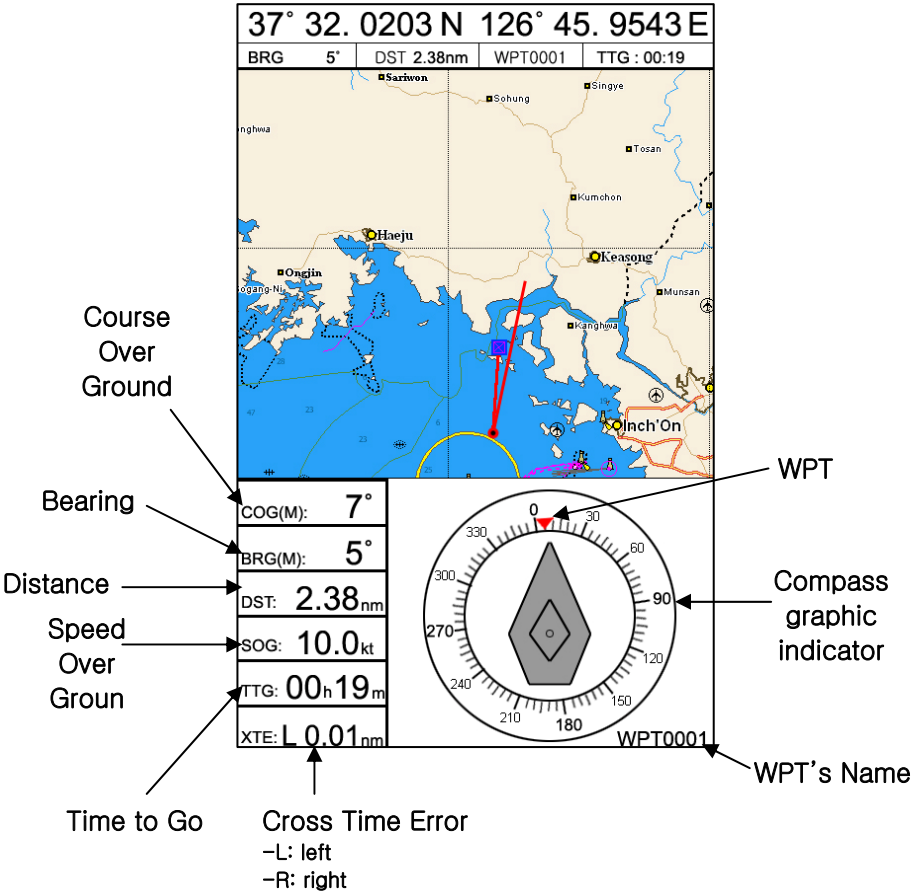
Large LAT/LON shows receiver status, position in latitude and longitude, course over ground, speed over ground, date and time.



Page Select

4. Steering mode

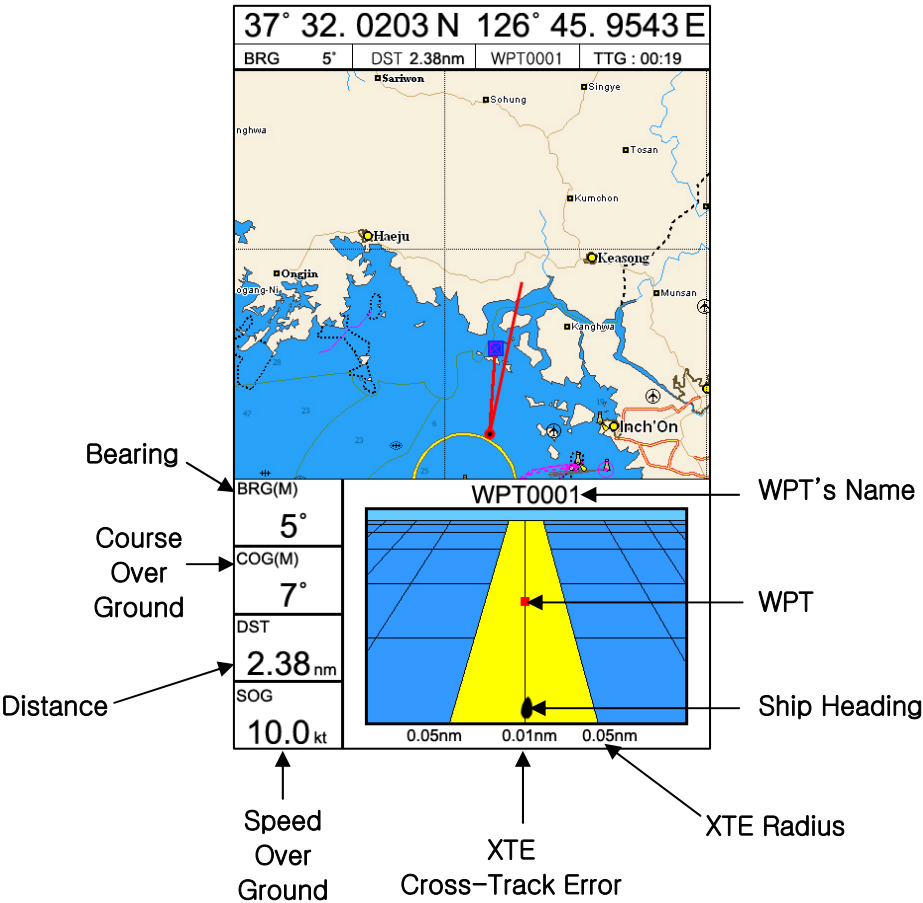
The steering display provides steering information such as ship's speed, course, range, bearing, TTG.



Page Select

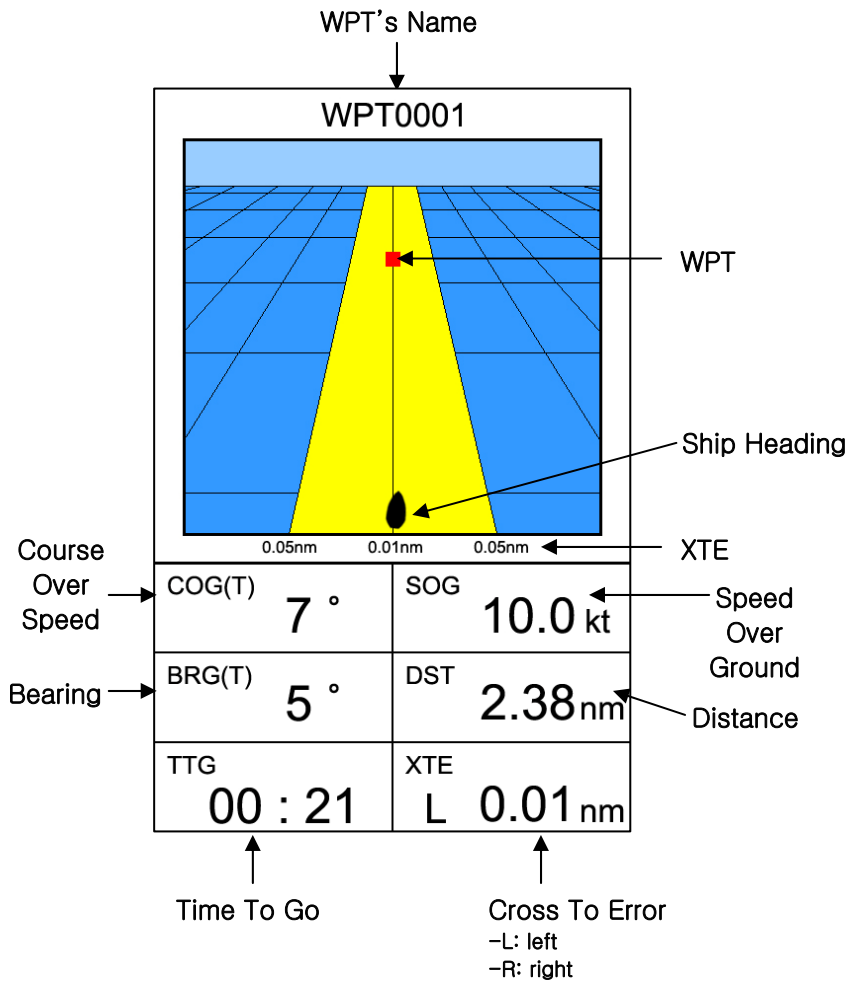
5. Highway Mode

The highway Mode provides a 3D view of own ship's progress toward destination (waypoint).



6. Full Highway mode

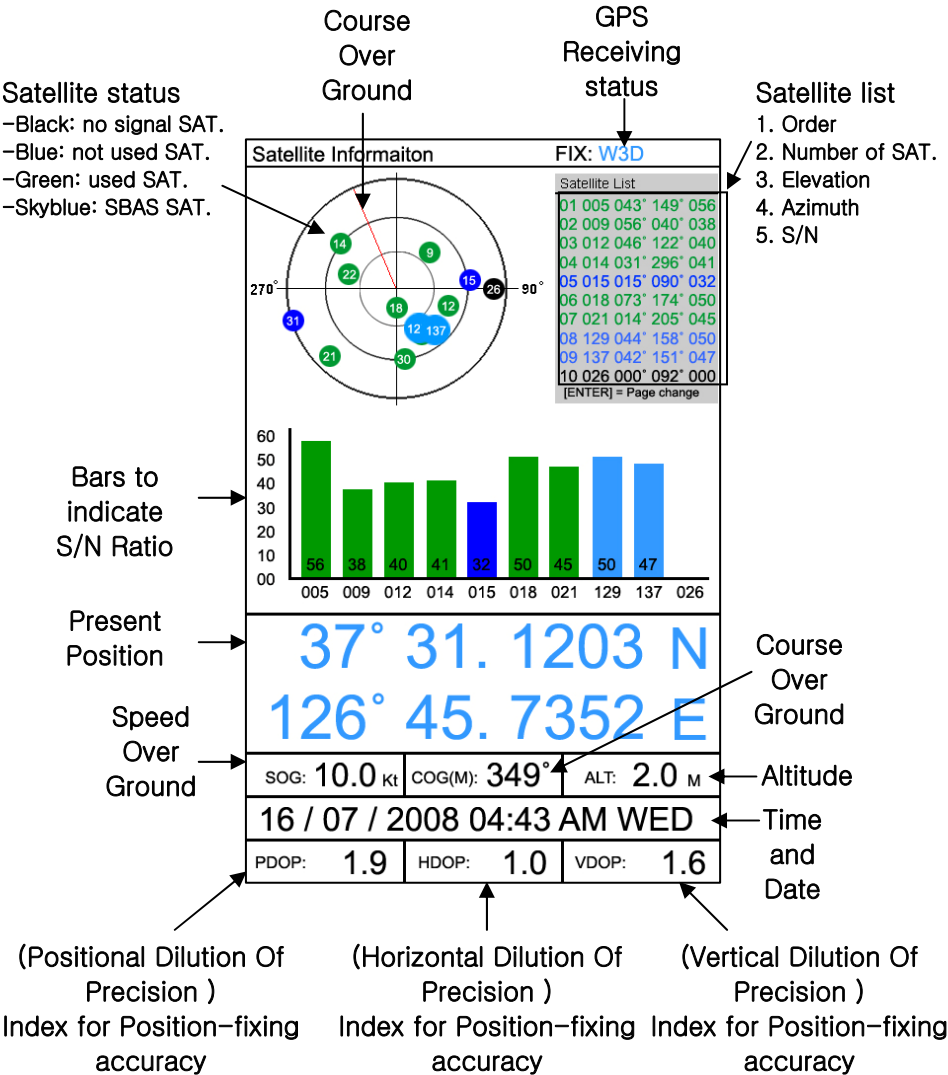
The highway mode provides a 3D view of own ship's progress toward destination (waypoint).



Page Select

6. Full GPS Data

Full GPS data mode supplies all information of GPS data.

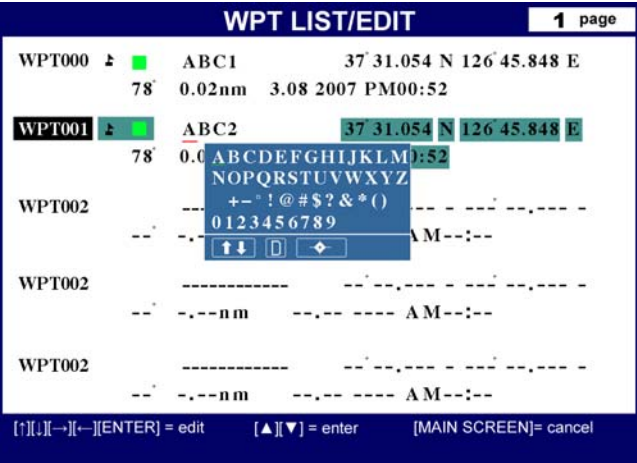


Operations

Edit

Edit numbers, symbols, colors of Mark, WPT, Route.

1. Editing Character



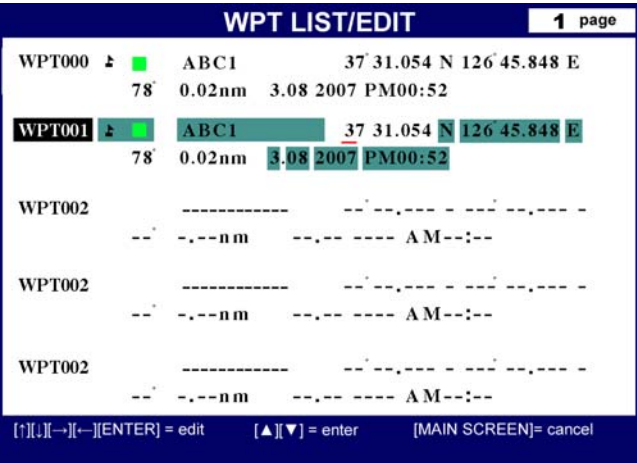
[←],[→]:
move the position

[↑],[↓]:
move the bar

[ZOOM IN][ZOOM OUT]:
input letters

[ENTER]:
choice and input

2. Editing Number



[←],[→]:
move the position

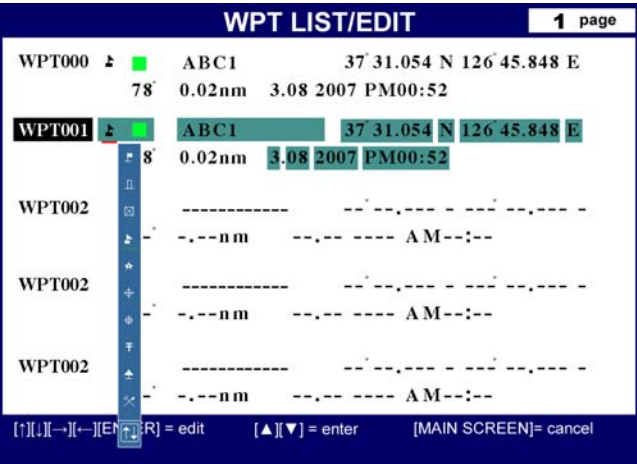
[↑],[↓]:
change the number

[ENTER]:
choice and input

Operations

Edit

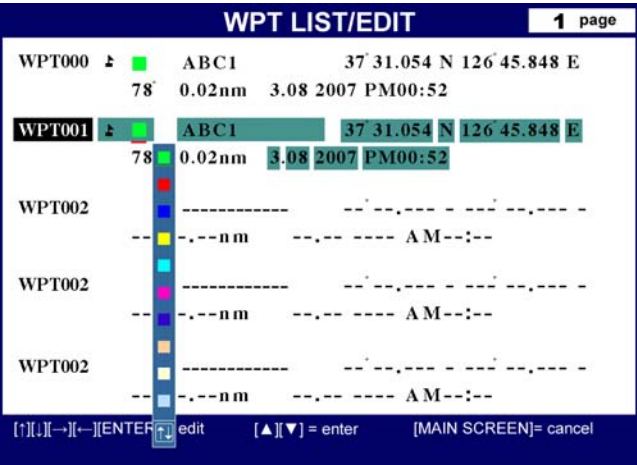
3. Editing Symbol



[↑],[↓]:
move the bar

[ENTER]:
choice and input

4. Editing Color



[↑],[↓]:
move the bar

[ENTER]:
choice and input

Operations

※MOB/Mark key

- without the cursor : MOB or inputting a mark at the present position
MOB :
 - ▶ [MOB/WPT] -> [ENTER]Mark :
 - ▶ [MOB/WPT] -> all keys except [ENTER]
- with cursor : only mark is available at the cursor
 - ▶ [MOB/WPT]

MOB(Man Over Board)

MOB is a special navigation function that immediately stores your present position as a waypoint and activates navigation to the stored coordinates. MOB waypoints are stored in the waypoint library at the next available position in the WPT mark list. MOB waypoints appear in the list and on the Plotter Min Screen in the same manner as normal waypoints.

(※ MOB available only without the cursor)

- ▶ [MARK/MOB]->[ENTER]

Operations

MARK

Mark means that a user indicates an important position or a point such as a fish heaven or a danger area for sailing. This is one of the most important functions in the plotter.

1. Creating Mark

- ▶ move the position to where you want and press [MARK/MOB].

– addition in the edit of mark:

(※PLS, refer the edit list)

2. Changing Mark symbol

Ten symbols are for Mark.

i) Cursor isn't displayed :

- ▶ [MENU] -> [8.User data Edit] -> [4. Mark Symbol]->[←][→]

ii) Cursor is displayed :

- ▶ [ENTER]->[2.Mark]->[2. Mark Symbol]->[←],[→]

3. Changing Mark color

Then colors are for Mark.

i) Cursor isn't displayed :

- ▶ [MENU] -> [8.User data Edit] -> [5. Mark Color]->[←][→]

ii) Cursor is displayed :

- ▶ [ENTER]->[1.Mark]->[3. Mark Color]->[←],[→]

4. Deleting Mark

Delete the mark in the list

(※PLS, refer the edit list)

5. Editing Mark

- ▶ [MENU]->[1.Edit]->[3.Mark Edit]

i) Creating Mark

- ▶ [↑][↓]->[ENTER]

ii) Editing Mark

- ▶ [↑][↓]->[ENTER]

iii) Deleting Mark

- ▶ [↑][↓]->[MENU]->[ENTER]

iv) All deleting Mark

- ▶ [MENU]->[MENU]

Operations

Waypoint(WPT)

Waypoints may be entered and stored in the waypoint library by any of two different methods. You may use the cursor to select locations from a chart, or store vessel present position as a waypoint

1. Creating destination point

You can place the destination point and immediately start navigating to it.

► [GOTO]→[ENTER]

– Saving destination: when saving the present instant route

► [GOTO]→[ENTER]

– Deleting Destination: when deleting the present instant route

► [GOTO]→[MENU]

2. Creating WPT

– Cursor is displayed :

► [MOB/WPT]→press any keys except [ENTER].

(※ inputting a WPT at the present position)

ii) Cursor is displayed :

► [ENTER]→[1.Waypoint]→[ENTER]

3. Selecting WPT

► [GOTO]→[1.WPT List/Edit]→[↑][↓]→[GOTO]

4. Editing WPT

► [MENU] → [1.Edit] → [1.WPT.Edit]

i) Creating WPT

► [↑][↓]→[ENTER]

ii) Editing WPT

► [↑][↓]→[ENTER]

iii) Deleting WPT

► [↑][↓]→[MENU]→[ENTER]

iv) All deleting WPT

► [MENU]→[MENU]

v)Selecting WPT

► [↑][↓]→ [5.TRACK COLOR]→[CLEAR]→[CLEAR]

Operations

Route

1. Instant Route

Use waypoints to create an instant route for your sailing. The capacity of waypoints is 20 points. Every time you put waypoints on the screen, the temporary route is drawn on the screen.

▶ [CURSOR PAD]→[GOTO]→[CURSOR PAD]→[GOTO]→.....→[ENTER]

– Saving Instant Route: when saving the present instant route

▶ [GOTO]→[ENTER]

– Deleting Destination: when deleting the present instant route

▶ [GOTO]→[MENU]

2. Creating Route

▶ [MENU] → [1. Edit] → [2. Route Edit] → [BRT/PWR]

3. Selecting Route

▶ [MENU]→[1.Edit]→[2.Route List & Edit]→[↑][↓]→[GOTO]

4. Deleting Route

▶ [MENU]→[1.EDIT]→[2.Route List/Edit]→[↑][↓]→[MENU]→[ENTER]

5. Reversing Route

▶ [MENU]→[8.User Data Edit]→[0.Route Forward/Reverse]→[←][→]

6. Setting Point

Move the point step by step.

▶ [MENU]→[8.User Data Edit]→[9.Skip Routes]→[ENTER]

7. Edit the existing route

Choose the route you want to edit and press [MARK/MOB]

– Adding saved WPT

▶ Move the cursor where you want → Press the [MARK/MOB] → Choose the WPT on the [Insert WPT] → press the [ENTER]

– Adding new WPT

▶ Move the cursor where you want → Press the [BRT/PWR] → Add your WPT → press the [ENTER] → Edit the WPT

8. Editing Route

▶ [MENU]→[1.Edit]→[2.Route List & Edit]

i) Creating Route

▶ Press [BRT/PWR]

ii) Route seeing & edit

▶ [↑][↓]→[MARK/MOB]

(※ PLS, refer Editing for the WPTs in the route)

iii) Route deleting

▶ [↑][↓]→[MENU]→[ENTER]

Operations

Track

The Track function provides a record of the path over which your vessel has traveled. A track is a series of lines connecting points of vessel present position which are plotted at wither time or distance intervals. Tracks are recorded and stored one at a time. AQUA supports five different tracks, each has up to ten thousand (10,000) points of track history. Tracks are displayed on the Main Plotter Screen in any user selectable combination from none to five. Current track status is displayed on the lower line of the GPS area of the information display. Track number, on/off condition, and number of track points used are presented.

1. Track ON/OFF

► [ENTER]→[1.Track]→[←][→]. For displaying on/off, use the arrow keys, right and left.

2. Changing Track Color

► [MENU]→[8.User Data Edit]→[2. Track Color]. For choosing the color you want, use the arrow keys, right and left.

3. Deleting Track

► [MENU]→[8.User Data Edit]→[3. Track Deletion]→Choose the color you want to delete →[ENTER]

(* If you want to delete all tracks, choose "All Delete")

4. Saving Track

Saving 10,000 points are available in each .

► [MENU]→[4.Setup 1/2]→[enter]→[8.Save track]→[ENTER]

5. Loading Track

Saving 10,000 points are available in each .

► [MENU]→[4.Setup 1/2]→[enter]→[9.Load track]→[ENTER]

User Data

Save User Data(Back-up)

► Insert the SD card → [MENU] → [1. Edit] → [6. Save User Data] → [ENTER]

*SD card must be a normal type.(mini SD and Mirco SD are not available) Please, kindly note that the maximum is 1GB.

Load User Data

► Insert the SD card → [Menu] → [1. Edit] → [7. Load User Data] → [ENTER]

*SD card must be a normal type.(mini SD and Mirco SD are not available) Please, kindly note that the maximum is 1GB.

Operations

Display ON/OFF

The menu selects icons or symbols and lines displayed ON/OFF.

► [MENU]→[2.Display ON/OFF] →[Enter]→[←][→]

(* If you want to go to next page of the menu, press [MENU])

(* In C-MAP, it could be different from HY-chart.)

Operations

GPS Setup

It is available to control and confirm information in GPS receiver.

(* For next page, press [MENU])

▶ [MENU]→[3.GPS Setup] →[Enter]

GPS Setup 1/2

1. Datum:

It shows GPS Datum. WGS-84, which is the worldwide standard is only available.

( The default setting is WGS-84.)

2. Satellite Information:

It shows the receiving condition of the signal from satellites.

3. Latitude Modification:

There could be a receiving signal error from satellites. If it is on the latitude, modify in the latitude modification.

4. Longitude Modification:

There could be a receiving signal error from satellites. If it is on the longitude, modify in the longitude modification.

5-1. Average SOG:

It sets time by second for average speed. It is a special function for a fishing boat.

( The default setting is incorrect every the country.)

5-2. Smoothing set(*):

How to set the calculation of Smoothing.

OFF : No use.

Mode 1: Calculation in short time.

Mode 2: Calculation in long time.

( The default setting is Mode 1.)

6-1. COG Filter:

Step 1(OFF)~12(MAX) the COG Filter. When it is On(over step 2), you can filter the COG of the vessel, to optimize it.

( The default setting is incorrect every the country.)

6-2. Average COG(*):

It sets time by second for average bearing. It is a special function for a fishing boat.

(* Although you set a time to the menu, it is unavailable if the menu, No. 5(Smoothing ser is off.)

( The default setting is incorrect every the country.)

7-1. SOG Filter:

Step 1(OFF)~12(MAX) the SOG Filter. When it is On(over step 2), you can filter the SOG of the vessel, to optimize it.

( The default setting is incorrect every the country.)

Operations

GPS Setup

7-2. Average SOG(*):

It sets time by second for average speed. It is a special function for a fishing boat.

(※ Although you set a time to the menu, it is unavailable if the menu, No. 5(Smoothing ser is off.)

( The default setting is incorrect every the country.)

8. Lat/Lon Unit:

It is to select the number of the unit for Lat/Lon.

( The default setting is 4 unit.)

9. GPS Receiving Port:

It is to select Inter receiver Interior or Exterior.

The default setting is Interior.

0. Coordinate System:

It sets coordinate system of GPS or Loran.

( The default setting is GPS.)

Operations

GPS Setup

It is available to control and confirm information in GPS receiver.

(* For next page, press [MENU])

GPS Setup 2/2

1. AIS Setup

It sets AIS on/off, AIS Scale, CPA Alarm, CPA Limit, TCPA Alarm, TCPA Limit.

CPA	Closest Point of Approach is the closest distance that will be achieved between your vessel and the tracked target, based on your vessel's speed and direction and the target's speed and direction.
CPA Alarm	Occurs if CPA is less or equal to CPA Radius. This test is done for active targets only.
CPA Radius	This is the distance from your vessel that a target may reach before a target is deemed a threat.
TCPA	Time to Closest Point of Approach is the time remaining until the CPA will occur.
TCPA Alarm	Occurs if TCPA is less or equal to TCPA Radius. This test is done for active targets only and if CPA value is less or equal to CPA Radius.
TCPA Radius	This is the time remaining before the CPA is reached.

1-1. AIS on/off

Turns the display of AIS targets overlay on the cartography ON or OFF.

The default setting is OFF.

1-2. AIS Scale

It is possible to setup AIS Targets with Scale. The default setting is 2nm.

1-3. CPA Alarm

Turns ON/OFF the alarm. The default setting is OFF.

1-4. CPA Radius

The values allowed are from 0.1nm to 10nm. The default setting is 0.1nm.

1-5. TCPA Alarm

Turns ON/OFF the alarm. The default setting is OFF.

1-6. TCPA Radius

The values allowed are from 1 to 50 min. The default setting is 1 min.

Operations

Setup

It is available to set the menu or units for user's visual confidence.

(* For next page, press [MENU])

► [MENU]→[4.Setup] →[Enter]

Setup 1/2

1. Distance/Speed Unit:

Select desired unit of measure for distance and speed. Choose from: nautical mile/knots (nm/kt), kilometer/kilometers per hour(km/kmh), yard/knot(yd/kt).

cf) 1nm = 1.852km, 1kt /h= 1.852km/h, less than 1nm display in yard and over 1nm display in mile

2. Present Position Size:

The size of the present position is adjustable from 0 to 9. The biggest size is '0'.

3. Track Size:

The size of a track is selectable between thin and pan.

4. Track Display Interval:

Track display interval is adjustable by distance or time.

5. Time Interval:

If track interval is set in time, a track displays by track time interval. The track time interval and the maximum capacity is 10,000 points.

6. Distance Interval:

If track interval is set in distance, a track displays by track distance interval.

7. Heading Line Length:

The length of the heading line is adjustable from 50 until 300. The bigger number, the longer line. The heading line is used in modes of the true motion and the north/south up.

8. True/Magnetic:

There is a difference degree where you are in the earth. This function is to modify the error from true and Magnetic.

9. Compass Modification:

There could be a difference between the magnetic compass and the GPS compass. An error depends upon your area. It is necessary to use AUTO PILOT together with GPS Plotter.

0. TD setup

It sets Chain, Pair, ASF

Operations

Setup

It is available to set the menu or units for user's visual confidence.

(* For previous page, press [MENU])

▶ [MENU]→[4.Setup 1/2] →[Enter]→[MENU]

Setup 2/2

1. Displaying Time Setup:

Provides for local time offset (−12:00 to +13 hours in 1/2 hour steps) from UTC.

2. Data Output:

AQUA can be connected with a radar and an autopilot, which needs to get a signal from the radar and the autopilot. These data are necessary to communicate with NMEA 0183.

DESCRIPTIONS	CONTENTS OF DATA FIELD
\$GPGGA	Global Positioning System Fix Data
\$GPGLL	Geographic Position, Latitude/Longitude
\$GPGSA	GPS DOP and active satellites
\$GPGSV	GPS Satellites in View
\$GPVTG	Course and Ground Speed
\$GPZDA	Time & Date
\$GPRMC	Recommended Minimum Specific GPS/TRANSIT DATA
\$GPAPB	Heading/track controller (Autopilot) sentence B
\$GPXTE	Cross-track error, measured
\$GPBOD	Bearing, origin to destination
\$GPRMB	Recommended minimum navigation information

3. Land Color Select:

Choose the color of the land.

(*This function is only available in HY-chart)

4. Chart Change:

Choose the chart system. (HY-MAP/External MAP/C-MAP)

5. Reset

All systems returns to the initial system.

- ▶ [ENTER] : reset without deleting user data.
- ▶ [GOTO]→[ENTER]: returning to the initial system from the releasing of factory.
(All user data will be deleted)

6. WPT Name Font Size

Choose the font size of the WPT.

7. SOG Setup

Control the abnormal speed an anchoring.

Operations

Setup

8. Save Track

Current Track save to Track data.

9. Load Track

Saved Track load to display

0. Time Format

Sets you preferred time between 12 hour and 24 hour. The default setting is 12 hour.

Operations

Maintenance

It is necessary to check the system or the version for maintenance and demonstrate AQUA with the simulators

► [MENU]→[5.Maintenance] →[Enter]

1. System Information

It contains ID and the program version, and it has important information for maintenance and upgrade.

2. Chart Information:

It contains the version of the chart, the datum and the number, which is necessary for maintenance and upgrade

3. Keyboard Test:

It tests the keyboard if it's working properly.

4. GPS Simulator:

It is necessary for an indoor demonstration. The simulations of GPS plotter are two in the memory.

5. Sounder Simulator

It is necessary for an indoor demonstration. The simulation of sounder is in the memory.

6. Language:

AQUA supports three different kinds of languages, English, Chinese, Arabic, Thai etc. Pressing the [ENTER], AQUA turns off and reboot the system for the new language.

( When the language does not come out, inquiry to purchase place.)

Operations

Map Setting

It is available to set the menu of the chart options.

► [MENU]→[6.Map Setting]→[Enter]

1. Vessel Offset

It is possible to be set up positions of 0, 1/3, and 2/3 by the standard of the center of chart screen.

( The Vessel offset does not work on True Motion.)

2. Correction Offset for LAT.

Though GPS information is accurate, there could be an error in the chart at longitude. The error can be modified in the chart latitude modification.

3. Correction Offset for LOT.

Though GPS information is accurate, there could be an error in the chart at longitude. The error can be modified in the chart longitude modification.

4. Compute Correction

Corrects fixes from the positioning instrument. By placing the cursor on the ship's real position and selecting this option, the error is calculated and internally memorized for appropriate correction.

( It does not apply when the vessel is out of 5nm.)

5. Depth unit

Select the depth unit.

- M: Meter unit
- Ft: Feet unit
- FM: Femten unit

6. Fonts & Symbols

On MAX Charts it is possible to set the size of all names and symbols drawn on the charts, selecting between Normal and Large.

7. Mixing Levels

When the map coverage at the current zoom level does not fill the entire screen, the chartplotter draws the rest of the map expanding the cartographic information read from, at most, two zoom levels above the current zoom level. For this reason the map is drawn three times: firstly it draws the two levels before the current level and then the current level. The area covered by the cartographic data read from the previous levels is identified by a dotted pattern. When the cursor is moved area not covered by data of the current level the chartplotter zooms out to the first level covered by cartographic data. The default setting is ON.

Operations

Map Setting

It is available to set the menu of the chart options.

► [MENU]→[6.Map Setting]→[Enter]

8. Perspective View

Chart data may be projected in perspective mode during navigation. This function allows setting the panoramic View of the chart.

As the upper side of the map is more compressed than the lower side, a wider map area is visible. The perspective view allows showing more chart information immediately ahead and around the cursor.

9. Dynamic Nav-Aids

This function allows setting s blinking lights on Nav-Aids. The blink period and color of each Nav-Aid attributes available on the data cartridge. When the ship is inside the Nav-Aid nominal range, the light of the Nav-Aid will start blinking.

When Dynamic Nav-Aids option is set to ON, when the flashing light is OFF, or when fix position is out of the sector, the light color is displayed by using a faint light color.

0. Chart Boundaries

Sets ON/OFF the displaying of the chart boundaries, which represents the boundaries of the charts available on the chartplotter. Selecting Auto instead, if we are in background charts only the first chart levels contained in the C-CARD are displayed, if we are in a charts level contained in the C-CARD the next four charts level are displayed.

Operations

Alarm

Special notices are necessary on sailing. AQUA has four kinds of alarm, arrival, out of the course, anchor and time.

► [MENU]→[7.Alarm]

1. Arrival Alarm:

When you approach into the waypoint range, it gives you a notice with alarm.

2. Arrival Radius:

It is to adjust the range of arrival from your waypoint. If you have a route, it changes to the next waypoint automatically.

3. XTE Alarm:

If you are out of the course, it gives you a notice with alarm.

4. XTE Radius:

It is to adjust the range of the off course.

5. Anchor Alarm:

It is necessary when your vessel anchors.

6. Anchor Radius:

If your vessel is out of the range of the anchor, it gives you notice with alarm.

7. Interval Alarm:

It alarms every time you set.

8. Interval Time

The time is available from one minute until sixty minutes.

9. Course Alarm:

It alarms if it breaks into the setting area.

0. Course Alarm Range:

It sets the range of the course alarm.

Operations

User Data Edit

It is possible to set the menu of user data.
(Track, Mark, WPT, Route)

► [MENU]→[8. User Data Edit]→[Enter]

1. Track On/Off

It is available to set start and stop the track.

2. Track Color

It is available to set the track color. Use cursor to change the color.

3. Track Deletion

Press [ENTER]. "Track deletion" and the window is showed. Use the cursor and select color then press [ENTER] key. All tracks which are selected by color will be deleted.

4. Mark Symbol

It is available to change the Mark symbol. Use the cursor to change symbol.

5. Mark Color

It is available to change the Mark color. Use the cursor to change color.

6. Skip Routes

It is available to set up a next WPT in the Present preferred route. Press [ENTER].

7. Route Forward/Reverse

It is available to set up the route forward and reverse in the Present preferred route.

Fishfinder

Refer to the Fishfinder menu after connect with the blackbox fishfinder.

 It is not available to use without connect fishfinder.

► [MENU]→[0. Sounder]→[Enter]

Operations

Map Orientation

There are four display modes for Main Screen that involve the Plotter or Radar screen. Both Plotter and Radar mode change together regardless of which one is active when a mode change is made.

The display modes are: Normal mode, North up, Course up, Head up

► [MENU]→[9.Mode]

1. True Motion:

The True Motion display is oriented North up or South up depending upon the North/South setting found on the PLOTTER MENU. The difference between True Motion and North/South Up display is in the way the vessel position is presented. In True Motion mode, the vessel position  symbol moves over the map while the map remains stationary.

2. North up:

The North Up/South Up display is oriented North up or South up depending upon the North/South setting found on the PLOTTER MENU. For this mode setting the vessel present position remains fixed in the center of the Main Screen while the map moves under it.

3. Course up:

The Course Up mode screen orientation is determined by whether or not navigation is in progress. During navigation vessel present position is in the center of the Main Screen and the course line to the destination waypoint is straight up. As your present position changes, the map moves under the stationary vessel  symbol. If navigation is stopped, the Main Screen appears as North/South Up.

4. Head up

For Head Up mode, vessel present position is fixed in the center of the Main Screen and vessel heading is upward. As your present position changes, the map moves under the vessel  symbol.

Operations

AIS System

It is a vessel equipped with AIS. Information about the targets is being received by AIS Receiver and displayed on the screen.

( Refer to AIS Setup for GPS Setup 2/2 of AIS setup.)

Name	Name of ship, 20 characters.
MMSI	Maritime Mobile Service Identity.
MMSI number	A unique 9 digit number that is assigned to a DSC radio station. It primarily registers the boat information in the U.S. Coast Guard’s national distress database for use in emergency situations.
Active Target	Target located within the Activation Range. Active target is represented by oriented triangle with COG and Heading vectors. Rate of turn may also be displayed.
Dangerous Target	Target detected by CPA or TCPA alarm. Dangerous target is Active Target by definition. For better visibility dangerous target symbol is red color.
Lost Target	When the AIS info is not received form that vessel for 4 minutes. The presentation will be X display.

AIS INFO window

- 1. Name
- 2. MMSI number
- 3. Nationality
- 4. Navigation Status
- 5. Heading
- 6. COG
- 7. SOG
- 8. Longitude
- 9. Latitude
- 10. CPA
- 11. TCPA

 Press [ENTER] key on Target which wants to see. It shows Information of “AIS INFO” window.

Operations

Plotter Menu

Press [ENTER] key without cursor, it shows Plotter Menu.

1. Track

It is possible to setup start and stop of Track.

2. Navigating

It is possible to setup start and stop of Navigating.

3. Mark

Mark is input on the Vessel Position.

4. Object Information

It is possible to use Find function and to see map information at the Vessel Position.

☞ Information is Port Services, Tides, Lights, Wrecks, Rocks, Buoys, Beacon, Obstructions, Land markers, etc.

☞ Find function works when press [Zoom in] key. Refer to description of find how use

Cursor Menu

Press [ENTER] with cursor, Cursor Menu will be showed up.

1. WPT

WPT is input at position of cursor.

2. Mark

WPT is input at position of Mark.

3. Range/Bearing

Press [ENTER] to place where you want to make start point then move the cursor to place where you want. You can know Range and Bearing between start point and position of cursor on cursor info.

4. Object Information

It is possible to use Find function and to see map information at the Position of cursor.

☞ Informations of map are Port Services, Tides, Lights, Wrecks, Rocks, Buoys, Beacon, Obstructions, Land markers, etc.

☞ Find function works when press [Zoom in] key. Refer to description of find how use.

Operations

Find

The charplotter allows finding Nearest Services, Port By name, Port by distance, Tide Stations, Wrecks, Obstructions.

1. Port Services

To locate and display the nearest available facilities of a particular type.

► [ENTER]→[4.Object Information]→[ENTER]→[Zoom in]→PORT SERVICES→[ENTER]

The icons of the available services are shown. Use the cursor key to select any facility and press [ENTER]. The list of the ports containing the facility will be shown on the screen. Then choose the port you want and press [ENTER]

2. Port by names

To select the Ports by name function following the procedure.

► [ENTER]→[4.Object Information]→[ENTER]→[Zoom in]→PORT BY NAME→[ENTER]

Shows the list of all ports stored on the C-CARD in alphabetical order and allows to search ports by name to locate the ports on the map.

3. Port by distance

To select the ports by distance function following the procedure.

► [ENTER]→[4.Object Information]→[ENTER]→[Zoom in]→PORT BY DISTANCE→[ENTER]

Shows the list of all ports stored on the C-CARD in closest distance order and allows to locate the ports on the map

4. Tide stations

Finds the nearest Tide stations on the map, from the boat position –if a valid fix is received– or from the cursor position–if the received fix position is not good.

► [ENTER]→[4.Object Information]→[ENTER]→[Zoom in]→TIDE STATIONS→[ENTER]

A new window will appear in few seconds. Choose the tide stations you want and press [ENTER] to display the tide graph page.

5. Wrecks

Searches for nearest Wrecks.

► [ENTER]→[4.Object Information]→[ENTER]→[Zoom in]→WRECKS→[ENTER]

Use the cursor key to select the port. Press [ENTER] to locate the selected Wreck on the map.

Operations

Find

The charplotter allows finding Nearest Services, Port By name, Port by distance, Tide Stations, Wrecks, Obstructions.

6. Obstructions

Searches for nearest Obstructions.

► [ENTER]→[4.Object Information]→[ENTER]→[Zoom in]→OBSTRUCTIONS→[ENTER]

Use the cursor key to select the port. Press [ENTER] to locate the selected Obstructions.

Installation

AQUA brings expandable display technology to your bridge or navigation station. A careful installation will assure maximum benefit from AQUA integrated features.

Display Unit Location

Select a location for your AQUA display unit that provides easy viewing from all likely operator's positions. The display unit is designed to be mounted on either a console or from an overhead surface. The AQUA display is also designed for flush mounting using six threaded holes on the rear panel. Locate the display in an area with protection from the elements and avoid direct sunlight on the viewing window. Also, consider access to the rear panel of the unit for connecting power and cables to the various remote sensors. The mounting surface must be flat and solid to support the unit and prevent vibration. There should be access to the inside of the surface to permit through bolt fastening for the mounting bracket.

Display Unit Installation

Temporarily install the mounting bracket on the Genesis display unit and place the unit at the selected location.



CAUTION

The AQUA display unit is unstable when the mounting bracket is not secured. Hold the unit in place at all times.

Check the suitability of the location and make any adjustments. When all is satisfactory, use the holes in the mounting bracket as a guide and mark the holes locations on the mounting surface.

Installation

Drill a 1/4 in. diameter hole at each marked location. Mount the AQUA display bracket using bolts through the mounting surface. Place large flat washers on the opposite side of the mounting surface from the bracket and then install lock washers and nuts. Tighten securely.

Install the display unit into the mounting bracket. Check alignment and operation of the pivots and security of the mounting. Make any adjustments necessary to prevent binding and assure even meshing of the pivot locking washers. It is advised to remove the display unit and store it in a safe place to prevent damage during the rest of the installation process.

- Power Connection

Power is supplied to the AQUA Charting System through a connector on the rear panel of the display unit.

Route the power cable from the AQUA location to the ship's power distribution panel.

Connect the black wire to a battery negative (–) terminal of the power panel.

Connect the white wire to a fused battery positive (+) terminal of the power panel (12 to 24 Vdc nominal). If a fused terminal is not available, install an in-line fuse holder.

Reference

- Care and Cleaning

Your AQUA is made to withstand marine elements but a little care ensures a trouble free life. Accumulations of salt and sand, if not removed, will eventually mar the finish. No solvents or harsh cleaners should be used. The display unit may be wiped down with a damp cloth while avoiding the display window. Be careful not to scratch the display window surface. Gently remove any sand or other grit particles before cleaning the display window. The display window should be cleaned only with water and a clean soft cloth using very light pressure.

- NMEA

A standard developed by the National Marine Electronics Association and used by most marine equipment manufacturers for data communication is known as NMEA 0183 version 1.5 and version 2.0. NMEA0183 specifications offer many recognized sentences for exchanging data between many types of marine equipment.

The following technical information is provided for reference and is accurate to the best of our knowledge at the time of printing. Please refer to the appropriate NMEA specifications for details and the latest information.

The data sentences used by the HGP-660 are as follows.

Output sentences:

DESCRIPTIONS	CONTENTS OF DATA FIELD
\$GPGGA	Global Positioning System Fix Data
\$GPGLL	Geographic Position, Latitude/Longitude
\$GPGSA	GPS DOP and active satellites
\$GPGSV	GPS Satellites in View
\$GPVTG	Course and Ground Speed
\$GPZDA	Time & Date
\$GPRMC	Recommended Minimum Specific GPS/TRANSIT DATA
\$GPAPB	Heading/track controller (Autopilot) sentence B
\$GPXTE	Cross-track error, measured
\$GPBOD	Bearing, origin to destination
\$GPRMB	Recommended minimum navigation information

GPS

For centuries, sailors have been searching for a reliable and precise method of travelling the world's waterways. From celestial navigating to the modern navigation techniques as Loran, Decca navigator, Omega or Transit Satnav, each system has had its problems with weather, range and reliability. Without doubt, the "Global Positioning System", or GPS for short, is the most significant advance in navigation: it gives the navigator a position 24 hours a day, 365 days a year in any weather condition.

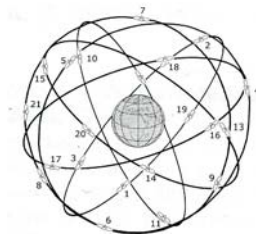
GPS is a satellite based navigation system which provides suitably equipped users with accurate position, velocity and time data. Originally the GPS, developed by the U.S. Department of Defense, was conceived for military purposes, but now it is used in a host of civilian applications. GPS navigation uses satellite signals to determine your position in relation to a set of satellites orbiting the earth. The GPS constellation of satellites continuously send radio signals, containing the precise position for each satellite back to earth. By knowing the position of 3 or 4 satellites and calculating various time differences between transmitted signals, the GPS receiver can determine its present position anywhere on earth, and thanks to continuous updates, calculate speed and course information.

HOW GPS WORKS

Currently, the GPS constellation consists of 26 orbiting satellites (including 3 spares), but this number will increase in the future.

The GPS receiver computes an accurate position by calculating the distance to the GPS satellites that orbit the earth. Signals are required from 3 satellites for two dimensional (2D) position calculation whilst 4 satellites are required for three dimensional (3D) position calculation.

As mentioned earlier, GPS satellites are not geostationary, but they are orbiting the earth as illustrated on the following figure:



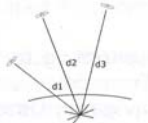
[The GPS constellation]

Note that position is repeatedly fixed through the following three steps while any 3 satellites are in line of sight.

GPS

The position calculation procedure is indicated in the following three steps:

1. GPS satellites continuously transmit their own precise orbital data and the GPS receiver computes their locations by receiving this data.
2. In this receiving process, the GPS receiver measures very accurate distances to the satellites, using the "Spread Spectrum Modulation" method. Excellence in GPS's position-fixing accuracy is mainly due to this technology.
3. When the satellite locations and their distances are known, the GPS receiver fixes its own position by triangulation:

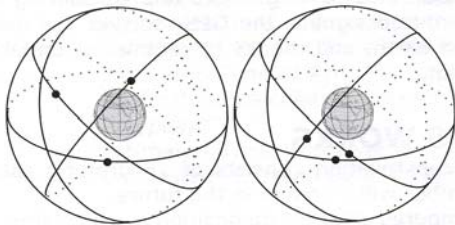


[The GPS position calculation]

As illustrated in the previous figure, the position is calculated as the meeting point of three spheres which are drawn around the three satellites with diameters d_1 , d_2 and d_3 .

Position Fixing Accuracy: HDOP

The GPS fix accuracy is due to the locations of 3 satellites in the sky. 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 space. In the following figure, in both cases it is possible to obtain the GPS fix, but in the left case the accuracy will be higher than the right:



[HDOP]

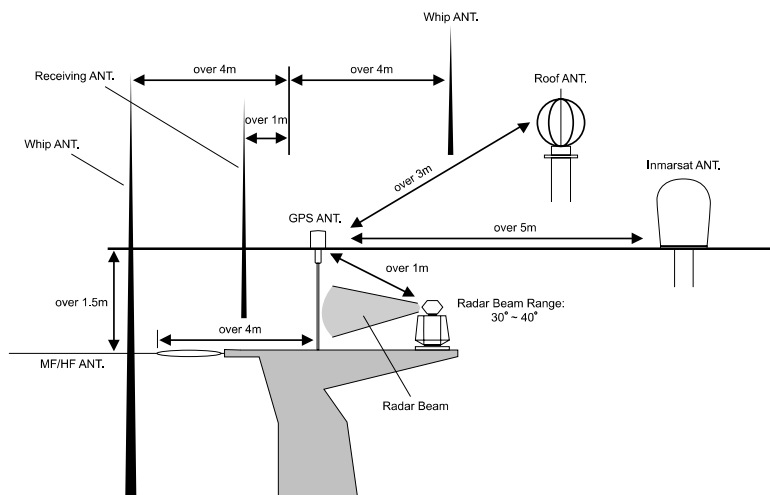
The index for position-fixing accuracy is called HDOP (*"Horizontal Dilution Of Precision"*). The smaller the HDop value, the more accurately the position can be fixed.

GPS

The installation of the GPS ANT.

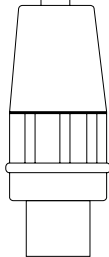
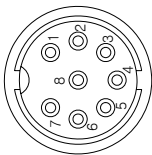
The GPS ANT must be installed at the highest area of the boat and the easiest place to catch the signal from the satellites. If there are obstacles around the GPS ANT, it isn't able to catch all signals. The receiving time would be longer or the receiving power would be weaker. Please, follow the instruction for your installation.

1. Keep from a metal.
2. Over 4m away from a MF/HF ANT, VHF or HF whip ANT.
3. Over 1.5m upper away from MF/HF ANT.
4. Over 1m away from a receiving ANT.
5. Don't put the GPS ANT into the range of radar's beam. (Range: $30^{\circ} \sim 40^{\circ}$)
6. Over 1m away from the scanner of the radar.
7. Over 5m away from the ANT of the inmarsat.
8. Over 3m away from the ANT of the roof.
9. Over 2m away from the engine.
10. Over 0.5m away from the metal surface.

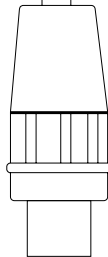
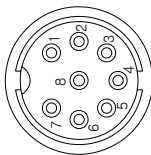


※ Warning: Not less than 0.5m away from the metal surface.

If the environment can't be satisfied from 1 to 10, have NO. 10 satisfied and consider the others.

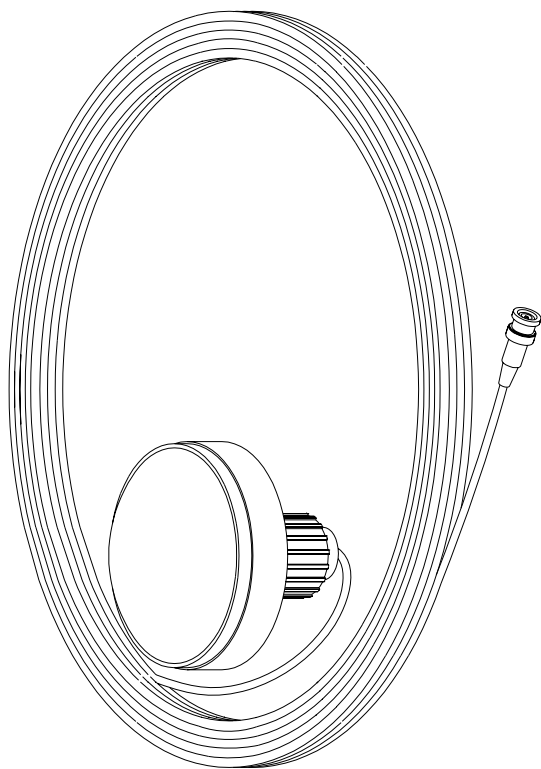


Power Cable		
PIN #	WIRE COLOR	FUNCTION
1	BLACK	GND/COMMON
2	RED	PWR+(10~40V)



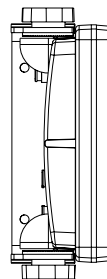
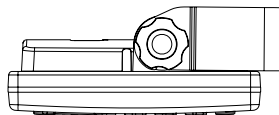
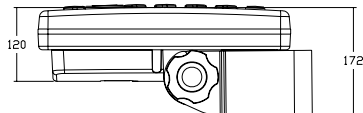
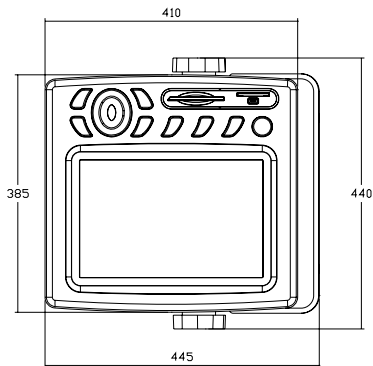
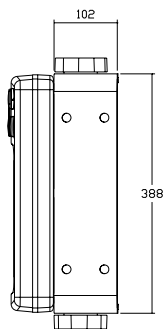
Data Input/Out Cable		
PIN #	WIRE COLOR	FUNCTION
3	WHITE	INPUT +
4	GREEN	INPUT -
5	GREY	OUTPUT2+
6	YELLOW	OUTPUT1+
7	BROWN	INPUT2-(AIS)
8	BLUE	External Key

MATERIAL		DESCRIPTION	
SCALE	MODEL	Power & I/O Cable	
NONE	HGP-660		
PERN	CHK. BY	DES. BY	DWG. NO.
G. T. RYU	Y. S. KIM	Y. S. KIM	HGP-660-0001
		DATE	HAIYANG OLIX CO.,LTD.
		02.23.2007	



To HGP-660 J5
REAR BNC CONNECTOR

MATERIAL		DESCRIPTION	
SCALE NONE	MODEL HGP-660	DWG. NO.	GPS ANT
PERN G.T.RYU	CHK. BY Y.S.KIM	DRA. BY Y.S.KIM	HGP-660-0003
		DATE 07.23.2008	HAIYANG OLX CO., LTD.



				MATERIAL		DESCRIPTION	
SCALE				MODEL		Outline and dimensions	
1:1				HGP-660			
PERN		CHK. BY	DES. BY	DRA. BY	DATE	DWG. NO.	
G.T.RYU		Y.S.KIM	Y.S.KIM	Y.S.KIM	07.18.2008	HGP-660-0004	
							

Declaration of Warranty

Declares of under his sole responsibility that the produced Plotter with Fish Finder manufactured by

HAIYANG OLIX Co., LTD.

103-903 BucheonTechnopark 364 Samcheongdong

Ojeonggu Bucheon Gyeonggi, Korea

TEL +82 2 3240381 FAX +82 32 327 4713

Web-site: <http://www.haiyang.co.kr>

Guarantee for One Year

Haiyang Electronic Equipment Co., LTD warrants the produced Chartplotter and Fish Finder, AQUA for One (1) year for guarantee as bellows.

1. Main Unit: One (1) year guarantee after a user purchases the product within one (1) year
2. LCD and Accessories: One (1) year for consumed accessories (including LCD) after a user purchases them.

Service in Charge

1. Over the term from the guarantee
2. Damage from user's carelessness (inundation, impact)
3. Intentional dismantle, modification or remodeling of the unit.
4. Unauthorized parts, components or accessories are used in the unit.
5. Installed or maintained by unauthorized person
6. Consumed parts and components (batteries, LCD, etc) run out.
7. Faults or damages from other reasons.

Model	HGP - 660	Serial No.	
Date of Purchase		Customer Name	
Name of Dealer		Price	

***Caution - Keep this warranty card with the receipt for fast and good service**